Building and Operating:

The PK-Basic
A PIC based keyer kit with pot speed control
from Jackson Harbor Press

General notes about building: The components should be inserted a few at a time, soldered in place and then the leads are clipped. Note that all the leads for any particular pad should be inserted prior to soldering to prevent clogging the holes. The pads and traces are small and delicate - a small tipped, low power (25 watts or less) soldering iron should be used.

Also, machined pin SIP sockets (not supplied) can be used to provide the connection points to the off-board components, then the builder will be able to plug the wires from the components into the SIP sockets which simplifies moving the unit in and out of the enclosure. The builder might also consider using these sockets for the transistors and the voltage regulator. The machined pin sockets are available in snappable strips from most of the mail order surplus electronics parts suppliers.

Finally, the integrated circuit (IC) and the keying transistor are both MOS devices. This means that they should be handled as little as possible to prevent static damage. The builder should use a grounding strap and anti-static mat if available or at the very least, work on a grounded metal surface and be sure to touch ground prior to touching the ICs.

Step 1: Get the parts together: All of the board mounted components have been supplied. You will still have to provide off-board items from the stocklist to fully implement the keyer including the enclosure, speed pot, switch, jacks, battery holder and connector, piezo transducer and mounting hardware. Be sure to get the piezo transducer that requires external drive - basically a very high impedance speaker.

Step 2: Identify and orient the components : Most of the components should be fairly easy to identify and place except for the ceramic bypass caps. The .01 uf monolithic ceramic bypass capacitors are very small yellow or blue parts with 2 radial leads spaced .1" apart. You may need a magnifying glass to see the markings on these parts. The four .01 uf bypass caps are marked 103. Note that C6, the pot timing capacitor, is also a .01 uf capacitor but that it is reddish brown in color and has a .2” lead spacing.

Step 3: Mount and solder the components on the board : Use the parts placement diagram for the placement and orientation of the parts.

Start by inserting the 8 pin IC socket with the small notch towards the top of the circuit board and then soldering it in place.

Then insert the remaining components at the positions shown on the parts placement diagram. Q1, the NPN transistor, should be inserted with the flat face to the right of the board. Be sure to solder all the connections and clip the leads.

Step 4: Check your work: Before proceeding, take the time to check the bottom of the board for solder bridges. Use the Bottom view diagram as a guide to visually check for

these shorts. It may help to clean the flux from the board and then use a strong light in conjunction with a magnifying glass too see these problems. Also, double check the orientation of the critical components such as the transistor. After you are convinced that the board is OK and after you have formed the leads of the IC to fit in the sockets, insert the keyer IC into the socket, being sure to follow the parts placement diagram for proper orientation. Now hook up the Piezo transducer (beeper) to the connection points on the left side of the board (including a connection to ground. Also solder the battery holder leads to the top left side of the board.

Next, power up the board. An FB should be sent by the keyer at powerup through the sidetone if the keyer is functioning correctly. If you don't hear the FB, use a VOM to measure the current drawn. During standby (sleep mode) the keyer will use roughly 1 uA. This will jump up to as much as 1.5 mA or so when the keyer is active.

If you see significantly higher currents, power down immediately and check again for shorts and/or opens. If the currents look reasonable, then power down and hook the unit up to the switch, pot, paddle and output jack and proceed to the Operation section.

Construction Notes: If the keyer is to be packaged in the same case as the transceiver, it is possible to inject the sidetone directly into the audio chain of the radio instead of using a piezo transducer for the sidetone. The circuitry needed for this injection is a fairly simple RC circuit to decrease the level of the sidetone from 5V peak to peak and also to filter the square wave slightly (see the Tick article in the October 1997 issue of QST for more details on this type of circuit). I prefer to mount the keyer in a separate box so that it can be disconnected from the rig and used for practice nearly anywhere.

The keyer will fit into small metal boxes such as the old Sucrets boxes or the new, popular Altoids mint tins. One possible problem area for this type of enclosure is finding a pot that is small enough to fit. Mouser (800 346 6873) sells a 13 mm diameter, 100k pot (# 31CX501) that fits nicely into one of these types of tins. The small 4 mm shaft size of the pot requires a special knob - Mouser also has these (# 45KN050).

Note that the output transistor circuit is designed to switch key inputs of 13.8 volts positive or less. Don't attempt to use the PK-Basic keyer with a vacuum tube transmitter (either grid block or cathode keyed) without an appropriate outboard circuit - consult older ARRL handbooks for these circuits.

The minimum pot speed will increase as the power supply voltage decreases due to the shift in input threshold voltage of the PK-Basic keyer chip.

Operation: The PK-Basic has features similar to other 8 pin PIC based keyer chips but has the unique feature of an always available pot speed control. You can also control the speed via the keyer paddle with no pot.

General notes on using the switches to control the keyer: To give the keys multiple functions, multiple key-press combinations are used. Also, the memory key can be Pressed-

And-Released (PAR) or Pressed-And-Held for two seconds (PAH). This also gives more combinations of the three control switches (dit, dah and memory switch).

Generally, PAR is used for actions: send the code speed, send a memory or start a beacon.

PAH is used for settings: change the code speed (no pot) or record a memory or change the iambic mode.

A function table of the PK-Basic keypress combinations:

keys used	PAR (press and release)	PAH (press and hold)
mem switch	send memory	record memory
mem + dit	send speed	enter menu for paddle set of speed, pot options
mem + dah	send CQ + callsign	record callsign
mem + both	start beacon	enter menu to select bug mode and mode A keying

A menu is also used for setting other options - this is activated by a PAH of the memory switch plus a simulpress of dit and dah. Treat the memory switch like a shift key on a computer keyboard, press it first, then tap either the dit, dah or both paddles.

If the keyer should hang in some unknown state, remove the power and then short out the +5V to ground.

Powerup: After powerup the keyer will send an FB (through the sidetone only) to signal that it is operating correctly.

Speed Readout: The speed setting can be determined by simulpressing the memory switch with the dit paddle and then releasing them both. I normally press the memory switch first and hold it, press the dit paddle and finally release both.

Speed Control: The speed can be adjusted by just turning the pot. Maximum speed is 39 WPM, minimum speed is 5 WPM. Note that the minimum speed can be affected by component tolerances on the timing capacitor and the speed pot - see the pot calibration menu item if a 5 WPM minimum speed is required. The pot position is read continuously when the keyer is sending code, just before each dit, dah or space is sent. This allows the operator to adjust the code speed even in the middle of a memory send.

Mem + dit Menu:

Mem + dit menu (PAR mem to advance to the next menu item)

	Menu item	pressing a dit:	pressing a dah:
S	Speed set with paddle	increases speed by 1 WPM	decreases speed by 1 WPM
P	Pot / paddle speed control	selects pot speed control	selects paddle speed control
C	Calibrate pot speed control	enters the calibration routine	dah is ignored

S - Set speed with paddle If you disconnect the pot from the circuit, the keyer will powerup at a default speed of 16 WPM. The speed menu can be entered by pressing and holding the memory switch along with the dit paddle. Usually I PAH the memory key and then tap the dit paddle. After 2 seconds, the keyer will send an S (for speed set). Then pressing the dit paddle will increase the speed by 1 WPM and send a dit. Pressing the dah paddle will decrease the speed by 1 WPM and send a dah. You can continuously adjust the speed by holding either paddle but note that if you run the keyer "off the scale" at either 5 or 39 WPM, the keyer will exit the set routine and then send the code speed via the sidetone. Exit the speed adjust routine by pressing and releasing the memory key.

P - Selecting Pot speed control Normally the speed will either be controlled by the pot or via switches, but if the keyer is accidentally put into the switch mode the pot speed control can be selected by pressing dit. The keyer will send either a dit or dah and then exit the menu. Or press the memory key to advance to the next item:

C - Calibrating the Pot speed control Due to the variation in capacitors and pots it is possible that the maximum setting of the pot will result in a minimum speed higher than 5 WPM. This menu item will compensate and store an updated calibration value in RAM. Before entering the menu, be sure to turn the pot to the minimum speed. Then press the dit to go into the calibration routine - you then may hear one or more dits and the keyer will exit from the menu. Or press the memory key alone to exit the menu.

Recording the Callsign Memory A callsign of up to 13 characters long can be recorded. This can be handy for things like: WB9KZY/QRP. The callsign memory is recorded by simulpressing the memory and the dah keys and holding them for 2 seconds. I usually PAH the memory key and then tap the dah key. After 2 seconds the keyer will send a question mark. The callsign can then be sent. When complete, press the memory key.

Playing the Callsign Memory (CQ) Play the callsign memory by simulpressing the memory and the dah keys. I usually PAH the memory key and then tap the dah key - the memory starts to play after I release the memory key. The message:

`CQ CQ CQ DE <call> <call> K` will be played.

Recording the Memory A message of up to 16 characters long can be recorded. The memory is recorded by a PAH of the memory for 2 seconds. After 2 seconds the keyer will send a question mark. The message can then be sent. When complete, press the memory key. Note that you can insert the callsign memory at any given point in the message by sending 6 dahs in a row. If you insert the callsign memory once into the regular memory, this results in an effective single memory which is 28 characters long. You can insert the callsign memory multiple times - each insertion takes up one character in memory.

Playing the Memory Play the memory with a PAR of the memory key. The memory will start to play right after the memory key is released.

Beacon Mode Beacon mode will send the contents of the memory continuously with a 2.5 second pause in between each play of the memory. Start the beacon by simulpressing the memory, dit and dah keys. I usually PAH the memory key and then squeeze both paddle switches - the beacon starts to play after I release the memory key. Exit beacon mode by tapping the dit or dah switch.

Mem + both Menu

Mem + both menu (PAR mem to advance to the next menu item)

	Menu item	pressing a dit:	pressing a dah:
B	Bug / straight key mode	enables bug mode (dah = key)	disables bug mode (default)
A	iambic mode A or B	enables iambic mode A	enables mode B (default)

The menu is entered by a PAH of the memory, dit and dah keys for 2 seconds. I usually PAH the memory key and then squeeze both paddle switches. Then pressing dit or dah will change the item in question. Pressing the memory key will advance to the next menu item. After 2 seconds the 3 key simulpress the keyer sidetone will send: B Press the memory key to advance to the next item:

B - Selecting Bug / Straight-key mode To enter bug/straight-key mode (dits are normal but dahs are like a straight key) press the dit switch - you will then enter bug mode. To exit bug mode press the dah paddle switch. The keyer will then send either a dit or dah and exit the menu routine. Or press the memory key to advance to the next item:

A - Selecting Iambic mode A or B The A mentioned above signifies the mode A/B select menu item. The iambic mode of the keyer can be set to either mode using this routine.

Press the dit paddle for mode A. Press the dah paddle for mode B. The keyer will send either a dit or dah and then exit the menu. Or press the memory key to exit the menu.

Notes: The keyer will default to keying mode B.

Jackson Harbor Press
RR1, Box 91C
Washington Island, WI 54246
jacksonharbor@att.net
http://jacksonharbor.home.att.net/

PK-Basic parts list

Qty.	Ref.	Part Name	Description
1	U1	12C509	PK-Basic 8 pin DIP keyer chip
1	C8	.22 uf	axial (cylindrical) multi-layer ceramic capacitor
4	C3,C4,C5,C7	.01 uf	.1” lead space multi-layer ceramic capacitor
1	C6	.01 uf	.2” lead space, 5% polyester capacitor
1	R2	4.7 K ohm	yellow-violet-red - 1/4 watt metal film resistor
1	R3	1 K ohm	Brown-black-red - 1/4 watt metal film resistor
1	R4	180 ohm	Brown-gray-brown - 1/4 watt metal film resistor
1	Q1	NPN	Generic NPN TO-92 package transistor
1	-	socket	8 pin DIP socket
1	-	PCB	PK-x circuit board

The following items are ***NOT*** included with the kit:

1	R1	100 K ohm	Linear potentiometer
1			Piezo transducer (high impedance speaker)
1			stereo paddle jack
1			xmtr jack
1			battery and battery holder
1			normally open, momentary SPST switch