Building and Operating: The Island Keyboard from Jackson Harbor Press
A PIC based Morse code keyboard to be used with your 8 pin keyer chip

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.

The integrated circuits (U2, U3, U4 & U5) along with the MOSFET keying transistor are 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.

Building the Island Keyboard - Step 1) Get the parts together: All of the board mounted components have been supplied except for the keyer chip (PK-x, Tick or K8). You will still have to provide off-board items from the stocklist to fully implement the Morse keyboard including the enclosure, speed pot (depending on the keyer chip used), switch, jacks, power connector, piezo transducer and mounting hardware. Be sure to get the piezo transducer that requires external drive - basically a very high impedance speaker. You will also need an IBM PC AT compatible keyboard - the original PC-XT keyboards will NOT work with the Island Keyboard unless they have a switch which can allow the keyboard to emulate an IBM-PC AT keyboard. I'd suggest a late model keyboard, the current consumption of recent models is much lower than those from the past, if the keyboard uses too much power the voltage regulator will shut down.

Step 2) Identify and orient the components: Most of the components should be fairly easy to identify and place. The .1 and .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 or .01. Note that C9, the pot timing capacitor, is also a .01 uF capacitor but that it is reddish brown in color and has a .2" lead spacing. U1, the 5V regulator, is a TO-92. Note that this regulator IC should be inserted with the flat side oriented to the outside edge of the circuit board.

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 two 8 pin IC sockets, the 18 pin IC socket with the small notch towards the left side of the circuit board and then soldering them in place. There is a 1 on the top of the circuit board at the left side of each of the three IC positions. Insert and solder the 6 pin socket (if purchased) with the notch towards the top edge of the board.

Note that if you are using a Tick or K8 keyer chip, you will NOT need to use R5 (1K) or C9 (.01 uf, 0.2" lead space) - these are used for the pot speed control of the PK series chips from Jackson Harbor Press. For the K8 or Tick, you may need to either leave pin 2 open or connect it to ground - consult the documentation for the particular chip you are using.

Then insert the remaining components at the positions shown on the parts placement diagram. Three of the components should only be inserted one way or they can be damaged by reversed polarity. C3, the 22 uF electrolytic capacitor, should be inserted with the negative stripe to the left side of the board. C3 can also be inserted with the leads bent at a right angle which results in a lower overall height for the board. Q1, the 2n7000 transistor, should be inserted with the flat face to the top edge

of the board. U1, the LM2936 voltage regulator, should be inserted with the flat side to the outside edge of the board. Be sure to solder all the connections and clip 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 to see these problems. Also, double check the orientation of the critical components such as the electrolytic capacitor, transistor and voltage regulator. After you are convinced that the board is OK and after you have formed the leads of ICs U2, U3 and U4 to fit in the sockets, insert the ICs into their respective sockets, being sure to follow the parts placement diagram for proper orientation (pin 1 indicated by a notch or dimple should be to the left. 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 12 volt power connection to the bottom center edge of the board.

Next, power up the board. The keyer chip should send some kind of powerup greeting through the sidetone if the keyer is functioning correctly. If you don't hear the powerup greeting, power down immediately and check again for shorts and/or opens. If the keyer appears functional, then power down and hook the unit up to the switch, pot, paddle & output jacks and also the keyboard connector. Finally, power off, then connect the keyboard to the keyboard connector - power up the unit and see whether it works by typing a few characters.

Construction Notes:

The builder will note the contact "fingers"on the left side of the board, these are unused in normal keyboard operation, they were intended for use with a Palm keyboard, contact Jackson Harbor Press for more information on using the Palm keyboard to send Morse code.

Although the keyer chip used may have a paddle reverse feature, don't use it since the keyboard chip will continue to use the conventional dit or dah inputs. The characters will be reversed dit for dah. Rewire the keyer paddle jack if the paddle appears to be reversed.

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 Island Keyboard with a vacuum tube transmitter (either grid block or cathode keyed) unless you have purchased the high voltage keying option OR are using the Keyall kit which is also available from Jackson Harbor Press.

The keyboards that were used to develop this project had 5 pin DIN male connectors. There are also keyboards with 6 pin mini-Din connectors (they are often called PS/2 keyboards) - the pinout for them is presented on the schematic. There are adapters which can convert from the 6 pin to 5 pin keyboard connectors.

Please DON'T use your favorite, expensive, "can't live without it" keyboard for this project. Keyboards can be destroyed, especially if the power is connected in reverse OR if the keyboard is connected while the power is ON (this can cause destructive latchup of the internal keyboard chip). Be sure to double check the wiring of the female DIN connector BEFORE applying power to the keyboard - the pinout is shown on the schematic from the BACK of the female connector.

Operation:

The Island Keyboard responds to keyboard input when a key is pressed and released - nothing will happen until the key is actually released - the autorepeat feature is NOT used. The exceptions to this rule are the F11, F12 and Scroll Lock keys. The F11 (dit) and F12 (dah) keys can be used as an

iambic keyer paddle - as long either (or both) are held, a string of dits, dahs or alternating dits and dahs will be sent - this is true even during the keyer command modes, so these keys can be used to set the speed and other options. The Scroll Lock key is used to "press" the keyer switch - it can be used to enter the command modes, to send memories, et cetera. The Scroll Lock key can be used in combination with the F11 and F12 keys if necessary for multipresses as are used in the PK series.

Table of how keyboard keys are mapped to various functions or Morse characters:

Escape key	Esc	cancels play operations and punctuates recording
function keys:	F1, F2	4 (2 normal + 2 shifted) internal eeprom memories (F1 = 22 char, others = 31 char)
	F3 - F10	16 (8 normal + 8 shifted) ext. eeprom memories (127 char)
	F11	actuates the dit keyer input
	F12	actuates the dah keyer input
caps lock key	Caps Lock	plays the current character space length in dit spaces (default=3)
scroll lock key	Scroll Lock	actuates an external switched input (keyer switch)
space bar		inserts a word space into the buffer or a memory
shift 1	!	error character (8 dits)
shift =	+	AR prosign (also keypad +)
shift 7	&	AS prosign
single quote	'	BK prosign - this key is programmable
equal sign	=	BT prosign (double slash) - this key is programmable
slash	/	DN prosign (portable) also on backslash \ - keys are programmable
left bracket	[	KA or CT prosign - this key is programmable
shift 9	(	KN prosign (also right bracket:]) - right bracket is programmable
shift 8	*	SK prosign (also semi-colon, keypad *) semi-colon is programmable
dash	-	SN prosign (also on keypad) - this key is programmable
shift /	?	question mark
0-9		0-9 (also on numeric keypad)
A-Z		A-Z (shift not needed)
comma	,	comma
period	.	period (also on numeric keypad)
grave ` (grave is above the tab)		inserts a beacon delay into a memory during record, plays the delay
backspace (left pointing arrow)		deletes a character from the end of buffer
shift Num Lock		toggles between live keying and practice mode
Pause (Break)		pauses the keyboard output during memory or buffer play

The Island Keyboard has a type ahead buffer which is 90 characters long. When the operator starts typing the characters are entered into the buffer FIFO (first-in, first-out) style. The PIC will begin sending the characters in the buffer to the keyer at the speed which the keyer is currently set. If the operator overflows the buffer, characters are just dropped. The operator can kill (flush) the buffer by pressing the escape key - the current character will play and then the buffer will be cleared out. The backspace key (left pointing arrow on top row right of the main key group) can be used to delete characters at the end of the buffer during general sending OR during memory recording. Each press and release of the backspace key will delete the previous keystroke stored in the buffer. The buffer "fullness" is displayed on the 3 keyboard LEDs. The num lock led will light when the buffer is at 80

characters. Caps lock LED lights at 85 characters and scroll lock LED indicates the buffer is full at 90.
The shift key is used to select an alternate bank of memory. As the shift key is pressed and held, then a function key (f1-f10) can be used to play or record an alternate bank message.

The Ctrl keys can be used to send non-standard prosigns or international characters. Pressing the Ctrl key first and then pressing two (or more) letters in sequence will eliminate the normal character space between the characters. So, Ctrl A S will send as the prosign AS (di-dah-di-di-dit). The Ctrl key can also be used to record non-standard prosigns into memory.

The keyboard controller IC (U2) has 4 internal eeprom memories - these are non-volatile, meaning that when the project power is removed, the memory contents are retained. The memories are recorded by a press and hold of the corresponding function keys (either f1, f2, shift + f1 OR shift + f2) for about 3 seconds. The operator will then hear a question mark followed by a 1 or 2 (depending on the function key pressed). The fn key should be released when the operator hears the question mark. If the fn key isn't released during the question mark, additional question marks will be sent until the user does release the fn key - then the number of the fn key pressed will be sent. The message can then be entered from the keyboard - this is fully buffered, too. When the message recording is complete, press the escape key to end the recording session. If the operator records past the first 22 characters (31 characters in the case of F2), the recording will overflow into the bank 1 (shifted) internal memories. The two bank 1 memories can hold a maximum of 31 characters.

Note that during record, the operator should wait until AFTER the last character in the buffer has played before pressing the escape key - otherwise the recording will be cut off prematurely. Also, be sure to use the space bar to enter word spaces where required - word spacing is NOT automatically captured during the recording process.

The 24LC16 external eeprom (U3) provides another 16 memories, which correspond to the f3-f10 function keys. These memories are recorded similarly to the 4 internal memories - one exception is that they hold up to 127 characters each (although the bank 0 memories can be overflowed into bank 1 if a longer message of up to 255 characters is required). These memories are also non-volatile.

Any of the 20 possible memories are played with a press and release of the corresponding function (and shift) keys. The message play can be terminated by pressing and releasing the escape key. The message will stop playing after the character currently being played. Note that the function keys are also entered into the buffer so the operator can press a sequence of memory keys and then sit back while the complete sequence of Morse code is sent.

Note that if the dit or dah paddle (either the external paddle or the F11 and F12 keys) is pressed during a memory play, the play will be aborted. Keyer paddle presses during recording will be ignored. The scroll lock (mem switch) should NOT be pressed during either record or play.

Eight of the keys are programmable - they may be set to any letter, number or prosign that the operator desires by using a recording method similar to that used with the memories. The 8 keys are: - (dash), = (equal sign), \ (back slash), [(left bracket),] (right bracket), ; (semi-colon), ‘ (single quote), / (slash). Record the keys by pressing and holding the key to be recorded for about 3 seconds. The keyboard will respond by sending a question mark followed by a P. The key should be released when the operator hears the question mark. If the key isn't released during the question mark, additional question marks will be sent until the user does release the key - then the P will be sent. The prosign sequence can then be entered from the keyboard. Note that the key will only hold up to 7 elements - the prosign recording will automatically terminate after a 7 dit/dah combination has been

entered. Also note that during key recording, the Ctrl key does not have to be pressed for the elimination of the character space between letters. Finally note that the shifted characters on these 9 keys CANNOT be changed.

The user can insert a memory play into another memory with a press and release of the memory key to be inserted during the recording process. The keyboard will play a unique 7 element nonsense prosign for each memory key press during the recording. If placed at the end of the message, this feature can be used to string memories together to make a longer memory if needed. This feature can also be used to make a loop for beacon purposes, simply insert the same memory key being recorded at the end of the memory. The user can also end one memory with a play of another and end that second memory with a play of the first thus creating a larger loop. Memory insertion can be handy for inserting frequently sent code like the callsign - one of the shorter memories such as F1 can be dedicated to your callsign and simply inserted into another memory such as a CQ sequence when needed.

The current character space duration (in dit spaces) can be read with a press and release of the Caps Lock key. The character space duration length is set by “recording” the number of dit spaces - press and hold the Caps Lock key for about 3 seconds until a ? is sent, release the key and the keyboard will send a C (for Character space delay). Then enter a 1 or 2 digit delay ranging from 1 to 99 dit spaces (the default is 3 dit spaces). Finally hit Esc to complete the “recording”.

A beacon delay can be inserted into a memory by a press and release of the ` (grave - above tab) key during a memory record. The delay length is set by “recording” the delay - press and hold the grave key for about 3 seconds until a ? is sent, release the key and the keyboard will send a D (for delay). Then enter a 1 or 2 digit delay ranging from 1 to 99 seconds. Finally hit Esc to complete the “recording”. The user can stop the delay during playback by a press and release of the Esc key. Note that the delay length is approximate depending on code speed setting and U2 internal clock accuracy. The delay can be queried by a press and release of the grave key during normal keyboard input mode.

To create a beacon in memory 3:
1) enter record mode with a press and hold of F3
2) type in the beacon message,
3) hit the grave key to insert a delay,
4) hit the F3 key to insert a loop back to the start of memory 3
5) end the recording process with a hit of the Esc key

Pressing Pause will alternately stop and start the keyboard play of characters from a memory or from the buffer. No keyboard input can be sent while paused, but the keyer paddles can be used to send during a pause. When Pause is pressed, the keyboard IC will stop playing AFTER the current character. Pressing Pause again will restart the memory or buffer after the last character sent.

Pressing shift + Num Lock will alternately turn the keyer output transistor on and off. This allows the user to practice using the keyboard without keying the transmitter.

Gotchas:

Although F11, F12 and the Scroll Lock keys can be used to control the dit, dah and switch inputs to a keyer, the user should be aware that the keyboard may not work correctly for "command" mode keyer usage, such as memory recording. When a keyer is in "command" mode the keyer output is shut off - thus U2 can't send dits or dahs correctly because the output is not present - this will only happen when the user attempts to use the keyboard to send code - for example, recording a memory on the keyer with the keyboard won't be successful because the PIC will assert either the dit or dah input and

then wait forever for the keyer output to change - since the keyer output is off, this will result in a continual string of dits or dahs. This is also true if the keyer is put into a practice mode.

Immediately after powerup and after a speed change, the keyboard may output incorrect word spacing until a character with a dit is sent, for example if OK is sent right after power is applied, the K will be sent noticeably later than it should be - the keyboard chip “times” dits for spacing.

The keyboard LEDs should blink on for a short time, then go off when the Island Keyboard unit is turned on. If this doesn’t happen, the keyboard probably won’t function correctly - try turning the unit on and off if the keyboard seems frozen - some keyboards work poorly with slow rise time power supplies - sometimes a series DC switch is the best way to apply power to the unit.

If you press the Ctrl key and then hit a memory key (F1-F10) all the character spaces will be eliminated from the memory play.

A 6 dit recorded prosign will be converted to 8 dits (error character) by the Island Keyboard.

The Caps Lock key is NOT read by the Island Keyboard

Island Keyboard Kit Parts List

Qty.	Ref.	Part Name	Description
1	U1	LM2936	5 volt, LDO, low power regulator, TO92 package
1	U2	16F628	16F628a PIC microcontroller, 18 pin DIP package
1	U3	24LC16	24LC16 serial EEPROM memory, 8 pin DIP package
3	C1,C4,C5	.1 uF	marked 104 - radial multi-layer ceramic capacitor
4	C2,C6,C7,C8	.01 uF	marked 103 - .1" lead space multi-layer ceramic capacitor
1	C9	.01 uF	marked 103 - .2" lead space, 5% polyester capacitor
1	C3	22 uF	.079" lead space 25V electrolytic capacitor
1	C10	2.2 uF	surface mount, tantalum capacitor - pre-installed
1	R1	4.7 K ohm	Yellow-violet-red - 1/4 watt resistor
	R2		not used
1	R3	180 ohm	Brown-gray-brown - 1/4 watt resistor
	R5	1 K ohm	Brown-black-red - 1/4 watt resistor
1	R6	10 K ohm	Brown-black-orange - 1/8 watt resistor
1	Q1	2n7000	n-channel MOSFET transistor, TO-92 package
2	-	socket	8 pin DIP socket (machine pin) for U3, U4
1		socket	18 pin DIP socket (machine pin) for U2
1	-	PCB	Island Keyboard circuit board

The following items are ***OPTIONALLY*** included with the kit:

1	-	socket	6 pin DIP socket (machine pin) for U3, U4
1	R7	1 k ohm	brown - black - red - gokd- 1/4 watt resistor
1	U5		solid state relay (SSR), 6 pin DIP package

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

1	U4	keyer	8 pin keyer chip furnished by user (PK series, Tick series, K8)
1	R4	100 K ohm	Linear potentiometer (not needed with Tick or K8 chips)
1			knob for pot R1 (not needed with Tick or K8 chips)
1	piezo speaker		Piezo transducer (speaker) Digi-key P992 4-ND or equivalent
1	J1		+12V power connector
1	J2		xmtr jack
1	J3-J6		5 pin DIN or 6 pin mini-DIN keyboard connector
1	J7, J9		stereo paddle jack
1	Mem		normally open, momentary SPST switch
1			PC compatible keyboard

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