

1. General

The Code Cube was designed as an addition to the Palm Mini Paddle. The marriage of these two units create the world's smallest full-featured electronic memory keyer and paddle. An integrated sidetone oscillator drives the built-in piezo buzzer for both code practicing and programming. The tone frequency is adjustable, covering the resonant frequency of the piezo buzzer of about 4 KHz.

For those who prefer a different brand paddle, we provide a stand-alone version with a powder-coated aluminum housing.

The Code Cube utilizes the popular Jackson Harbor Press PK3 chip. It is powered by the readily available, long lasting (200 mAh) CR2032 3V lithium cell.

The Code Cube keying speed is adjustable from 5 to 39 WPM not through a hard to find menu, but via a handy thumbwheel. The preferred speed range can be selected with a trim pot on the bottom of the PCB.

Two 50+ character memories make the Code Cube usable for most contest exchanges. It also features storage of your call sign and automatic CQ generation, so you don't have to devote one of the two memories to a CQ!

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3. Operating

Powerup: The Code Cube is delivered ready for operation (memories clear, default-parameters). The lithium cell has a very low rate of self-discharge, therefore the Code Cube normally will be ready even after five years and/or thousand QSOs.

Setting speed: The Code Cube is equipped with a SPEED control pot utilizing a handy thumbwheel.

Turn counterclockwise (ccw) for lower, clockwise (cw) for higher speed.

Important: DO NOT turn the thumbwheel to it's end positions using force!

The speed (in WPM) will be played through the sidetone if the MEM key is simulpressed with the DIT lever and then both released. Press the MEM key first and hold it, then press the DIT lever and finally release both.

Note: You may continuously change the keying speed while keying.

To adjust the range of the the SPEED pot, a trim pot (RANGE) has been added in series with the SPEED pot. In combination with the calibration mode (menu 1, »C«), an individual speed range can be selected.

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MEM key To select the various functions and menus of the keyer, multiple key-press combinations are used. The MEM key can be pressed and released or pressed and held for two seconds. It is often used in combination with the DIT and/or DAH paddle.

Pressing and holding the MEM key (> 2 seconds) alone or in combination with the DIT or DAH lever selects the four menus. The different menu items are sent in Morse via the sidetone. Use a short press on the MEM key to advance to the next menu item. Return to the normal keyer mode either after changing a menu item or upon reaching the end of the menu.

A short press on the MEM key (in combination with DIT or DAH, see table) reads the following memories:

4. Function table of keypress combinations

MEM	sends memory 1
MEM + DIT	sends keyer speed (or memory 3 if selected)
MEM + DAH	sends CQ (or only callsign if selected)
MEM + DIT+DAH	sends memory 2

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C Calibrating the Pot speed control

Because we think that a speed below 14 WpM would be little utilized, we didn't include the full range down to 5 WPM. However, this menu item allows selection of the complete speed range from 5 to 39 WPM

Important: Before entering the calibrating mode the pots SPEED and RANGE have to be in ccw-position. Then press DIT to go into the calibration routine - you may hear one or more dits and then the keyer will exit from the menu.

RC Restore the default pot Calibration

If the pot calibration is run with both pots (SPEED-Pot and/or RANGE-Trimmer) above midscale, the keyer may jump into »paddle speed control« if the SPEED-pot is tuned below mid-scale after calibration is complete. It won't be possible to exit »paddle speed control« because the calibration value is too low. This menu item will restore the default powerup calibration value in RAM and thus allow normal pot speed control again.

TM Third Memory (enable - record - disable)

This option enables then records (or disables) an optional 3rd memory. Memory 2 is split into two 26 character memories. After selection »O?« ist sent and then the new memory is recorded.

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A built-in TUNE key allows instant keying of the connected radio without the hassle of going through any menus. Other Code Cube features are selectable Dit / Dah memory, the possibility of operating the iambic modes A or B and the easy reversing of the Dit and Dah levers.

2. Specifications

Dimensions:	25 x 25 x 34 mm (without plug)
Weight:	0.49 Oz. (incl. lithium-cell CR2032, 200 mAh)
Processor:	12CE674 - firmware (V. 2.2) by Chuck Olson, WB9KZY
Speed:	5 - 39 WPM
Memory:	text: 2 x 52 characters, call: 1 x 10 characters, CQ: 9 modes
Power supply:	3 Volt; operating current: 0.6 mA (sleep mode current ≤ 0,01µA)
Sidetone:	adjustable from approx. 500 Hz to over 7 kHz
Tone signal:	3 V _{pp} out at 20 k Ri - C-coupled, short-circuit proof
Keyer output:	N-FET (BS170 as SMD, max. 60 V; 0,1A; typ. 5 Ω)
Life (MTBF):	pot: 10 000 cycles - key: 100 000 plays

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There may be a tolerance due to parts variation of +/- 3 WPM in the following speed values.

Without using the calibration mode, there will be the following speed ranges:

range trim pot set fully ccw:	13 - 31 WPM
range trim pot set in center position (default):	18 - 35 WPM
range trim pot set fully cw:	21 - 39 WPM

Those who desire a speed below 16 WPM (really? In this case you should preferably use Farnsworth keying!) can run the calibration mode with the RANGE trim pot set fully ccw. The following approximate speed ranges should result:

range trim pot set fully ccw:	5 - 28 WPM
range trim pot set in center position:	10 - 33 WPM
range trim pot set fully cw:	17 - 39 WPM

TUNE key Pushing this key on the right side of the Code Cube keys the connected transmitter. A similar function can be found in menu 2, »TU«.

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5. Menu 1 Activate: MEM + DIT (≥ 2 s) bold = default

	Menu item	DIT-Paddle	DAH-Paddle
S	Speed set from paddle	increase by 1 WpM	decrease by 1 WpM
P	Pot or Paddle speed control	by pot (default)	by paddle
C	Calibrate SPEED - pot	calibration	ignored
RC	Restore pot Calibration	restores default	ignored
TM	Third Memory selection	selects 3rd memory	2 memories

S This page of menu can be ignored because the Code Cube works with the SPEED-pot only.

P Select Pot or Paddle speed control
If the keyer is accidentally put into the paddle speed control mode (see remarks to »RC«) the pot speed control can be resumed by pressing DIT.

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Record memory 3 in the same fashion as the other 2 memories. Note: You can also insert the callsign or a stop.

The speed send is moved into the MEM + DIT menu as the first item. Press either DIT or DAH to exit the menu 1 after speed has been sent.

6. Menu 2 Activate: MEM + DAH (≥ 2 s) bold = default

	Menu item	DIT-Paddle	DAH-Paddle
TU	Tune mode	on - off	off
?	Callsign-memory	records a dit	records a dah
CS	Callsign Select	3 x CQ + 3 x Call	4 x CQ + 2 x Call
Q	/QRP after last callsign	on	off
2	double the CQ send	on	off
N	No CQ, only call	only callsign	CQ and Callsign

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Remarks: This menu records the operator's call sign <call> and selects the CQ sequences. The call can be up to 10 characters long - it remains stored in the EEPROM even if the battery is removed permanently.

TU TUNE mode

Pressing of DIT enters the »tune mode« (key down). Exit tune mode by pressing DIT (or DAH) again.

? Record the Callsign Memory (up to 10 characters)

The Callsign can now be recorded. When complete, press the MEM-key.

CS CQ select

There are two different CQ sequences to select:

Default: (4 + 2) CQ CQ CQ CQ de <call> <call> k
Optional: (3 + 3) CQ CQ CQ de <call> <call> <call> k

Note: The <call> mentioned above is the callsign memory.

Q /QRP after last callsign

This option will allow the operator to append a »/QRP« to the last callsign sent.

Example: CQ CQ CQ CQ de WB9KZY WB9KZY/QRP k

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7. Menu 3 Activate: MEM (alone) (2 s) bold = default

Menu item	DIT-Paddle	DAH-Paddle
BE Beacon mode	starts/stops beacon	stops beacon
M? Memory 1	records a dit	records a dah
KD Key Down beacon delay	pause with key down	no key down
BA Beacon Alternate mode	Mem 1 and Mem 2	only memory 1
D Delay length	increases by 1 s	decreases by 1 s

BE Beacon Mode

Beacon mode will send the contents of memory 1 (or memory 1 and memory 2 alternativ) continuously with a pause of up to 60 s (»D«) in between each play.

Start: Press and hold MEM (≥ 2 s until »BE« in sidetone), then press DIT.

Stop: Short pressing DIT (or DAH) stops the beacon.

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8. Menu 4 Activate: MEM + DIT+DAH (2 s) bold = default

Menu item	DIT-Paddle	DAH-Paddle
T? Memory 2	records a dit	records a dah
PR Practice mode	transistor disabled	output enabled
B Bug / straight key mode	on	off
L Live / dead recording	output to TX enabled	output disabled
A iambic mode A or B	Mode A	Mode B
R Reverse paddle mode	switch paddles	switch paddles
ST SideTone on - off	off	on
SF Sidetone Float mode	floats AF	turns off float
DI DIt memory on - off	off	on
DA DAh memory on - off	off	on
AU Autospace on - off	autospace on	autospace off

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R Reverse Paddle mode

Reverses the DIT and DAH levers (easier than resoldering a jack).

ST SideTone on - off

The sidetone will still be engaged during any menu or recording entry even if it is turned off. This item allows the user to employ his rig sidetone.

SF Sidetone Float on - off

The reason for floating the sidetone pin is to minimize thump from the sidetone when the Code Cube is used to inject sidetone into a rig audio chain. The float has to remain disabled to prevent excessive power consumption in the sleep mode.

DI DIt memory on - off

DA DAh memory on - off

AU Autospace on - off

The autospace feature inserts a character space automatically if the operator has not pressed a paddle 1 dit after the last dit/dah is sent.

Note that this feature turns a dirty given character into a real wrong character!

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2 Double the CQ send

This option will allow the operator to send two CQs in a row.

Example: CQ CQ CQ CQ de WB9KZY WB9KZY CQ CQ CQ CQ de WB9KZY WB9KZY k

Note: When playing CQ or any of the memories a tap of either the DIT or DAH lever will stop the message play (except during the play of /QRP).

If a memory is empty only a single E will be sent via sidetone.

N No CQ send

This option will allow the operator to send just the callsign. This is effectively a 4th memory for the keyer - very handy for contests or pileups.

7. Menu 3 Activate: MEM (only) (≥ 2 s)

Remarks: When playing any of the memories a longer tap of MEM will stop the message play to pause the message at the end of the play of the current character. You can then send manually with the paddles and re-enter the message play with short pressing the MEM-key. A multiple pausing of the memories is possible. A pause can also be programmed - see page 12, »M?«.

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M? Record Memory 1

Start the record of your message. When complete, press MEM. (The memory is 57 characters long - recording will terminate automatically after the 52nd character)

Note: You can insert the callsign at any given point in the message by sending 6 dahs in a row. You can also insert a stop by recording AS (di-dah-di-di-dit). To continue: press MEM. (see also page 10 for manually stop the sending)

KD Key Down beacon delay

Default: No key down between messages in beacon-mode.

Pressing DIT inserts a key down between every message.

BA Beacon Alternate (between memory 1 and memory 2) mode

This routine selects / deselects alternating the beacon between the memories.

D Delay of beacon

The normal delay is one word space - the maximum is 60 s. After pressing either DIT or DAH the keyer will send the new delay time via sidetone. When getting the desired time, press MEM to exit from the menu. The keyer then will send the delay one final time. The routine will »wraparound« from high to low or from low to high values. Note that the delay times are approximate.

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T? Record Memory 2

Start the record of your message. When complete, press MEM.

Note: To insert the callsign or a stop see the remarks to M? on page 12.

PR PRACTICE mode

The output transistor is not keyed but the sidetone (adjust pitch with TONE pot) is retained. (This allows to get used the Code Cube without disconnecting the rig.)

B Bug / Straight-key mode

Dits are sent normally but dahs are sent like a straight key.

L Live or Dead recording

Normally, the memories or callsign will be recorded by the user »off the air« (dead) but sometimes it's desirable to be able to record a message »on the air« (live).

A Curtis Mode A or B

The iambic mode of the keyer can be set to either mode A or B. Keep in mind that these keying modes are not identical with dit or dah memory! Check this web site for more information:

Chuck Olson, WB9KZY (www.jacksonharbor@worldnet.att.net)

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9. Connections, battery replacement, RESET

Connections: The Code Cube has to be connected to dual-lever paddles. The input is contact bounce proof, but not very resistant to HF irradiations or larger glitches.

The output jack (see schematic) has to be hooked up to the transmitter, using an appropriate and not too-long cable. The side tone signal is connected to the output jack and can be used if the radio doesn't have an internal side tone.

Changing the lithium battery: Do not short circuit the battery or press the MEM key while changing battery, because C4 can hold the content of the RAM for more than 10 minutes.

Reset on hookups: The processor can be reset by removing the battery and pressing MEM to discharge C4. After inserting the battery again, the keyer will send »FB« to indicate correct operation - all memories are now empty.

If you want to clear all parameters in EEPROM, press and hold MEM while inserting the battery!

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