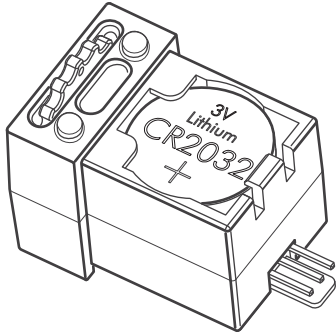


CODE CUBE

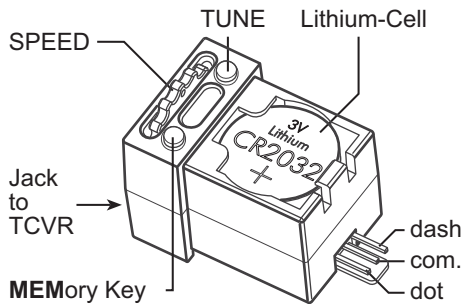


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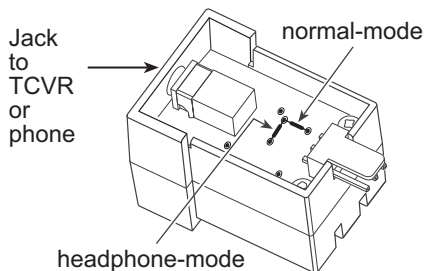
English

07.12

Top View



Bottom View



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Important Notes

- The **Code Cube** is designed to switch max. plus 24 volts to ground. Continuous current **may not exceed 200 mA**, otherwise the switching transistor will become too hot.
- Do not attempt to key either grid-block or cathode keyed tube transmitters! For negative keying voltages make sure to use a suitable onboard circuit adaptor.
- In case of **high SWR**, block common mode waves using a balun.
- The **lithium cell** must not be shorted or put into fire. Empty cells have to be disposed off properly.

Menu Overview Code Cube

Menu 1 Activate: MEM + DIT

Menu item	DIT-Paddle	DAH-Paddle
SH SPEED-Pot high limit	1 WpM up	1 WpM down
SL SPEED-Pot low limit	1 WpM up	1 WpM down
W Weight	increases 0,8%	decreases 0,8%
C Calibrate SPEED-Pot	calibration	restores default
TM 3 or 2 memories	3 memories	2 memories

Menu 2 Activate: MEM + DAH

Menu item	DIT-Paddle	DAH-Paddle
TU Tune mode	on - off	enter Menu 2a
CL CQ-Loop	on	off
? Call - Memory	records a dit	records a dah
CS Number of »CQ« (def. 4)	increases by 1	decreases by 1
Q »QRP« after last <Call>	on	off
RP CQ-call transits (def. 1)	increases by 1	decreases by 1
CR Number of <Call> (def. 2)	increases by 1	decreases by 1
PS »PSE« suffix to CQ	with PSE	without PSE

Menu 2a

Menu item	DIT-Paddle	DAH-Paddle
TO Timeout after 128 elements	off	on
SP Single-Paddle-Tune	on	off
H »long« keypress	≥ 1 sek	≥ 2 sek
SF Sidetone Float mode	floats AF	floating off
ST SideTone	off	on

Menu 3 Activate: MEM (alone)

Menu item	DIT-Paddle	DAH-Paddle
BE Beacon mode	starts/stops beacor	enter Menu 3a
M? Memory 1	records a dit	records a dah
KD Beacon delay mode	key down	no key down
BA Beacon alternate mode	M 1 + M 2	only Memory 1
D Beacon delay (default 0 s)	increases 1 s	decreases 1 s

Menu 3a

Menu item	DIT-Paddle	DAH-Paddle
SS Sidetone frequency	down	up
DD Debounce delay	increases 1.66 ms	decreases 1.66 ms
AU Autospace	on	off
ES Straight key	on	off
DI DIT memory	off	on
DA DAH memory	off	on

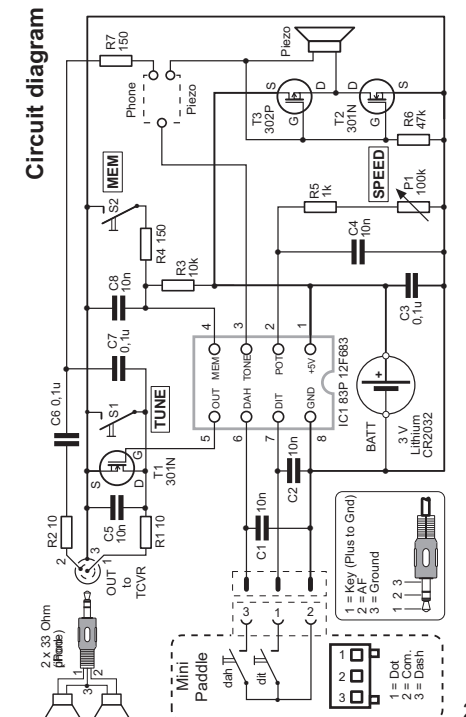
Menu 4 Activate: MEM + DIT + DAH

Menu item	DIT-Paddle	DAH-Paddle
B Bug mode	on	off
T? Memory 2	records a dit	records a dah
PR Practice mode	transistor disabled	output enabled
A lambic mode	mode A	mode B
U »Ultimate« mode	on	off
R Reverse paddle	switch paddles	switch paddles

MEM	Memory 1	MEM+DAH	CQ
MEM+DIT	Speed	MEM+DIT+DAH	Memory 2

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22

1 General

The **Code Cube** (CC) was designed as an addition to the »Mini Paddle«. The combination of these two units creates the world's smallest full featured electronic memory keyer and paddle.

A sidetone oscillator is included and offers enough volume to practice morse code in a quiet environment. The »keying output« can be converted to an »audio output« for standard headphones by simply changing a jumper.

The **CC** can optionally be equipped with an IR-Module. This allows cordless transmission of Morse code to a transmitter.

A housing kit (Aluminium, powder-coated) for the Code Cube is also available. It is useful if you want to use your CC in combination with other brand paddles.

The electronic part of the Code Cube is based on a PK4-processor from Jackson Harbor press with customized software (version 83P) for Palm Radio.

The CC keying speed is adjustable via a handy thumbwheel. A built-in »TUNE« key facilitates continuous keying of the TX.

1

4. Operating

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

MEM	sends memory 1
MEM + DIT	sends keyer speed
MEM + DAH	sends CQ
MEM + DIT + DAH	sends memory 2

The memories are pre-programmed:

Menu 1, »TM«memory 3 „**Hi**“ (default off)
Menu 2, »?« call memory,»**VVV**“
Menu 3, »M?«memory 1 „**73 de palm radio**“
Menu 4, »T?« memory 2 „**83P**“ (software)

5. Example 1: Entering own call sign

Please unfold front and back pages of this manual firstly. Your own call sign can be recorded through menu 2, item »?«.

Hints:

1. Adjust adequate speed at first.
2. Notice that the »auto space« feature is always active in the memory record routines (see also page 16, item »AU«).

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A callsign-memory (40 char.), two text memories (80 char. each) and several CQ and beacon options make the Code Cube usable for everyday use and for most contest exchanges.

2. Specifications

Dimensions: 25 x 25 x 34 mm (without plug)
Processor 1: 12F683 - firmware 83P by WB9KZY
Speed: 5 - 50 WPM
Current at 3 V: 0,6 mA (sleep mode typ. 40 nA)
Lithium-cell: CR2032 - 220 mAh
Sidetone: adjustable from 325 Hz to 4 kHz
Keyer output: N-FET max. 25 V/0,2 A; typ. 5 Ohm
Life (MTBF): pot: 10k cycles - key: 100k plays

3. Instructions for use

3.1 Powerup

The **CC** is delivered ready for operation (M1 - M3 pre-programmed, default-parameters).

3.2 Speed

The CC is equipped with a SPEED control pot utilizing a handy thumbwheel.

- counterclockwise (ccw) - lower speed
- clockwise (cw) - higher speed

2

3. To avoid mistakes it can be necessary to change lmbic mode A/B (menu 4, »A«) and/or the DIT/DAH memories (menu 3a, »DI«, »DA«).

- Press MEM plus DAH for about **2 s**. The Code Cube sends the first corresponding menu item: „**TU**“ „**U**“ „**U**“ etc. Release both keys now!
- Press MEM **short** again, CC will send: „**CL**“
- Press MEM short once again: CC will send „**?**“ This is the menu item for your own call.
- **Now record your call** - press MEM short when done. That's all!
- You can **control your call sign** by making the CC call CQ (short MEM plus DAH).

6. Example 2: Changing the sidetone

The frequency of the sidetone can be adjusted through menu 3a, item »SS«.

- Press MEM long to activate menu 3. CC responds: „**BE**“ „**E**“ „**E**“ etc. Release key!
- Press DAH shortly to access menu 3a. CC sends „**SS**“
- Hit DIT or DAH: Hear the sidetone and change its frequency (**325 Hz to 4 kHz**).
- Hit MEM again to **store** the desired tone and **leave** the menu.

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Important: DO NOT turn the thumbwheel to its end positions using force!

The speed (in WpM) will be played in CW through the sidetone if the **MEM key** is simulated 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)

The keying speed can be continuously changed while keying.

The speed range is from 5 WpM to 50 WpM. Both high and low limits can be defined through a software menu.

The CC is being delivered with a calibrated speed-pot and a default setting of 16 to 32 WpM (low and high limit). Menu 1, »SL« and »SH« allows to preset both limits according to personal needs also page 9.

3.3 TUNE key

Pushing this key on the right side on top of the Code Cube keys the transmitter.

There are 3 additional means to key the TX via the »**quick tune**« software feature:

- send ³ 5 „a“ or „n“ in a row
- send ³ 10 „e“ or „t“ in a row (default off)
- use »TU« in Menu 2

3

7. Using the memories

7.1 Recording memories

Recording of memory texts will be made with the paddles as described above. Before you record, select the corresponding menu item:

- Call-memory - menu 2, »?«
- Text-memory 1 - menu 3, »M?«
- Text-memory 2 - menu 4, »T?«

You can insert your <CALL> at any given point in the message by recording **6 DAHs**.

Insert a **pause** by recording »as« (di-dah-di-di-dit) to stop memory play at the embedded pause. Now you can insert RST etc.

»**Di-dah-dah-dah-dit**« compels a pause of 6 dits. (Word-space)

Multiple use of those special signs is possible and each use counts as one character in the capacity of the memory.

In case of making errors, the complete memory text will have to be recorded again.

Short pressing of MEM terminates the recording mode.

Permanent keying by the »quick tune« feature, described on page 3, can not be embedded in the memory message.

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3.4 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 (short) or pressed and held for two seconds (long). It is often used in combination with the DIT and/or DAH paddle.

Hint: It is advisable to press MEM always a little ahead of the additional DIT and/or DAH keys to avoid unwanted transmitting of a dot or a dash.

Pressing and holding the MEM key ³ 2 seconds (**long**) alone or in combination with the DIT or DAH lever selects one of the four main menus.

Within a menu, menu items (characterized by their abbreviations in CW) can be skipped by a **short** press of the MEM key

Return to the normal keyer mode:

- after changing a menu item
- upon reaching the end of the menu
- through renewed push and release MEM (after entering <CALL> or texts etc.)

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7.2 Playing memories

The CQ memory and the text memories can be played with the following MEM and paddle combinations:

- CQ-call - MEM + DAH
- Text-memory 1 - MEM
- Text-memory 2 - MEM + DAH + DIT

Remember: Press keys only shortly and **always press MEM first**.

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 current character. This allows manual insertion of text and the message play will automatically resume after a word space length delay. If a pause into the memory was embedded by recording »as«, the Code Cube waits for a text entry before continuing the memory play.

All informations given under 7.1 und 7.2 also apply for the optional third memory. Restriction: M3 is only 40 characters long.

Remark: After a reset (the CC will send „**FB**“ to indicate correct operation) all parameters are set to default values but the memory contents will not be erased.

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8. Explaining the menu items

8.1 Menu 1 Activate: long MEM + DIT

SH Speed pot, set High limit *default: 32*

Important: Only after a reset: Calibrate the speed-pot first (see next page »C«)

After the message „SH” „H” „H” etc. shortly press DAH or DIT. The Code Cube sends out the high limit, e.g. „32”.

To **decrease** this limit, press DAH as often as necessary. Decrease is 1 WpM per DAH-press. To set the limit e.g. from 32 WpM to 28 WpM press DAH 4 times.

A press on MEM finalizes the input, the Code Cube reads out the new setting.

To increase the limit: Press the DIT paddle as often as necessary.

SL Speed pot, set Low limit *default: 16*
After the message „SL” set the low limit as described in „SH”

W »Weight« *default: 1:3*
The normal (!) DAH-DIT ratio of 1:3 can be changed. Both DITs and DAHs are shortened or lengthened about 0,8% of a DIT length. (Max. 50 percent in 63 steps)

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Also, tune mode will be automatically exited after about 14 seconds. These timeouts can be turned off with DIT.

SP Single-Paddle-Tune *default: off*
This menu item allows the single lever paddle user to key the TX after either 10 DITs or 10 DAHs in a row. Tuning will be stopped with a tap to DIT or DAH.

H Half delay length *default: 2s*
Press a DIT to shorten the delay length of the »long« key-pressing from 2 to 1 second.

SF Can be ignored - not relevant for the CC.

ST SideTone on - off *default: on*
This item allows the user to employ his rig sidetone. The »signal tone« will still be engaged during any menu or recording entry.

8.4 Menu 3 Activate: long MEM

BE Beacon Mode

The Beacon mode will send the contents of memory 1 (or M1 and M2 alternating) continuously.

The delay length is adjustable (»D«). This delay is also the delay between calls in the CQ-loop. (see menu 2, item »CL«)

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- DAH-Paddle: decrease 0,8 % Control character: „N”
- DIT-Paddle: increase 0,8 % Control character: „A”
- DIT + DAH: reset to 1:3 ratio Control character: „R”

C Calibrate the speed pot range
Important: Before entering the calibrating mode the speed-pot has to be fully in ccw-position. Then press DIT to go into the calibration routine - you may hear some dits and then the keyer will exit from the menu. (Hitting DAH will restore the default value.)

TM Third Memory *default: off*

This option enables (then records) or disables an optional 3rd memory. The 80 character callsign-memory is then split into two 40 character memories.

After selection with DIT „O?” ist sent and then the new memory has to be recorded. Record memory 3 in the same fashion as the other 2 memories.

Note: You can also insert the <CALL>, a stop (as) or a pause (di-dah-dah-dah-dit).

Note: The send speed (formerly MEM+DIT) is now moved into the MEM + DIT menu as the first item. To exit the menu 1 after speed has been sent press either DIT or DAH.

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The sending of a constant key down during the interval between sending the beacon message (»KD«) can also be selected. (There is no key down in the CQ mode!)

Start: Press MEM (² 2 s) until „BE” in sidetone, then press DIT.

Stop: Short DIT or DAH stops the beacon.

M? Record Memory 1
Start the record of your message. When complete, press MEM. (The memory is 80 characters long - recording will terminate automatically after the 80th character)
Hint: See also 7.1, page 7

KD Key Down *default: No key down*
Pressing DIT inserts a key down between every message in beacon mode.

BA Beacon Alternat *default: only M1*
This routine selects/deselects alternating the beacon between M1 and M2.

D Increase the beacon Delay *default: 0*
The beacon delay will be default only 7 bits. (See also menu 2, »CL«.)
DIT extends beacon delay by 1s, DAH shortens it by 1s. The max. beacon delay

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8.2 Menu 2 Activate: long MEM + DAH

Remarks: This menu records the callsign <CALL> and selects the different CQ features.

TU Selecting menu 2a
DIT en-/disables tune mode (keydown).
Press DAH to activate submenu 2a. Status message: „TO”

CL CQ Loop mode *default: off*
Changes the normal CQ call to a continuous CQ sequence, spaced apart by the beacon delay set in menu 3, item »D«.

? Record the Callsign
The Callsign <CALL> can now be recorded. When complete, hit the MEM key.

CS CQ Select *default: 4 x CQ*
The number of CQs sent during the CQ-call can be varied from Ø (no CQ) to 7 with this menu item. The CC sends corresponding numbers to confirm the changes. Short pressing of MEM will exit the menu and send the number of CQ repeats.

Q „/QRP” after last callsign *default: off*
This option will allow the operator to append a „/QRP” to the last callsign sent.

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is 63 seconds. MEM stores the desired delay time - it will be sent through the side tone and the menu will be left.

Pressing both paddles at the same time will reset the delay to zero. Control character: „R” and after storing with short MEM: „Ø”.

8.5 Menu 3a Activate: from menu 3, »BE«

SS Sidetone Set *default: 580 Hz*
The Sidetone can be adjusted from 325 Hz to 4 kHz. (Refer to page 7, »Example 2: Changing the sidetone frequency«).
The »signal tone« frequency remains always unchanged at 4 kHz.

DD Debounce Delay set *default: 20 ms*
The debounce delay (to prevent errors caused by contact bouncing) can be adjusted from 1ms (count Ø) to 104 ms (count 63). Default is 20 ms (count 12).
DAH will decrease the delay by about 1.66 ms - DIT will increase the delay by 1.66 ms. Short MEM will exit the routine, the updated debounce count will be sent. The actual delay is 1.66 ms times the count value.
Simulpressing DAH+DIT **resets** the delay to 20 ms, sending „R” and after MEM: „12”.

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RP Repeat of CQ calls *default: 1*
Changes the number of times (1 to 4) the entire CQ-call is repeated. Changes are confirmed by corresponding numbers. Short pressing of MEM will exit the menu and send the number of CQ-call repeats.

CR Callsign Repeat *default: 2*
Changes the number (1 to 4) of recurrences of <CALL> used in the CQ-call. Changes are confirmed by corresponding numbers. Short pressing of MEM will exit the menu and send the number of callsign repeats.

PS, PSE at end of CQ-call *default: off*
DIT adds „PSE” between the last <CALL> and the final „K”.

Note: When playing CQ or any of the memories a tap of either the DIT or DAH will stop the play directly after the running character. „/QRP” will be always finished too.

8.3 Menu 2a Activate: from menu 2, »TU«

TO TimeOuts *default: on*
To prevent neverending strings of DITs and/or DAHs caused by a stuck paddle, this mode will put the keyer to sleep if the paddle is held for 128 straight DITs and/or DAHs.

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AU Autospace on - off *default: 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 sloppy given character into a real wrong character!

ES Can be ignored - not relevant for the CC

DI Dit memory on - off *default: on*

DAD Ah memory on - off *default: on*

8.6 Menu 4 Activate: long MEM+DIT+DAH

B Bug / Straight-key mode *default: off*
Dits are sent normally but dahs are sent like a straight key.

T? Record Memory 2
Start the record of your message. When complete, press MEM.
Note: See the remarks on page 7.

PR Practice mode *default: off*
The output transistor is not keyed but the sidetone is retained.
The CC can now be used with stereo headphones as a practicing tone generator.

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See # 9, »Headphone practice mode« on the next page.

A Curtis Mode **A** or **B** *default: mode 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!

U »Ultimatic«-mode *default: off*
Ultimatic-mode differs in this way from iambic: Instead of an alternation between dit and dah when both levers are pressed, ultimatic will output the element of the last lever pressed.

Note that Ultimatic setting takes precedence over either of the iambic modes. A DIT will turn on ultimatic mode, a DAH turns ultimatic mode off (default).

R Reverse Paddle mode *default: off*
Reverses the DIT and DAH levers (easier than resoldering a jack).

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9. Headphone practice mode

As mentioned on page 1, the Code Cube has an integrated sidetone generator.

In combination with a piezo buzzer, it allows monitoring the own CW code.

In a silent environment, this is more than sufficient.

By changing the position of a jumper, the keying output can be converted to a headphone output for 3,5mm plugs (see also the drawing on the inside front over).

In addition to that, the CC must be set to practice mode (menu 4, item »PR«, page 16)

Because headphones have different efficiency factors, a very popular headphone (i-pod) was used as the base for the preset audio volume.

Should the volume be too high (when using very good or high impedance headphones), the 10 Ohm jumper can be replaced by a bigger resistor (e.g. 1 kOhm).

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10. Connections

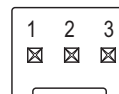
The Code Cube was developed for use together with the Palm Radio »Mini Paddle« and the connection of those two units is made by a 3-pin connector (Molex, available through »Mouser«)

If you want to use paddles from other makers, e.g. Bencher or Schurr, the Code Cube has to be connected by cable. A fitting cable and an aluminum housing is available for that purpose.

The input of the Code Cube is protected against contact bouncing, but not very resistant against RF fields or big RF peaks. The output (see schematic on page 22) has to be connected to the TRX with a suitable and preferably short cable. Also this connection can be sensitive to RF fields.

Important: A »hot« TRX-housing will indicate high SWR and RF on the shield of the coax. In this case, the use of a balun as an isolation transformer is indispensable.

top view



- 1 DIT-lever (left)
- 2 common potential
- 3 DAH-lever (right)

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11. Changing the lithium battery

The battery (CR2032) can be removed by using a toothpick in one of the slots on the backside of the CC.

Note: Do not short-circuit the battery or press the MEM key while changing the battery.

Reason: C3 can hold the content of the RAM for the case of a power loss. This has to be done before the battery is removed to avoid the hassle of reprogramming all parameters.

12. Restart and Reset

Should the processor have gone in an undefined mode (mostly through bad programming, hi!) a reset can be enforced by removing the battery and shortening both battery contacts on the Code Cube.

After that, MEM needs to be pressed during reinstalling the battery until the CC sends „FB“.

All parameters are now reset to default values! Memories M1, M2 (M3) and <CALL> are not affected. If you want to erase them, simply overwrite the old text.

Important: The speed pot also needs to be calibrated: »C«, page 10

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