OPERATIONS MANUAL

CMOS SUPER KEYER II
Version 2.0

by KCØQ and NØII

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Note: This manual is for Version 2.0 of the firmware. The only PC board circuitry difference is that the .33 uF capacitor used with Version 1.0 has been replaced with the precision .01 uF capacitor (marked "103") now supplied, as well as, of course, the latest version of the CPU.

The CMOS Super Keyer II is a compact, full-featured memory keyer employing CMOS microprocessor technology for low cost and high reliability. In contrast to other advanced keyers, its control requires neither a myriad of switches and knobs nor complex keypad sequences. Instead, commands are simply sent to the keyer in Morse code using your paddles! Some of its features are listed below:

1. Iambic keyer with dot and dash memories.
2. Four soft-sectored messages w/space for 220 characters.
3. Messages may 'call' others and contain functions.
4. Input queue to store multiple message activations.
5. Contest serial number --- 001 to 9999.
6. Digital and linear analog speed control -- 6 to 60 WPM.
7. Adjustable weight on code elements -- 25% to 75%.
8. Built-in adjustable frequency sidetone monitor
9. Tune function for transmitter adjustment.
10. Selectable automatic character spacing.
11. Timed pauses within messages.
12. Message loop capability for continuous replay.
13. Break in message to allow paddle-inserted text.
14. Emulation available for other keyers, including Curtis "A" timing
15. Ultra Speed mode allows messages at speeds to 990 WPM!
16. Ultra-low power consumption for battery operation.

RESET STATE

After power is applied, the keyer responds with "OK" and is ready for operation. It is initialized as follows:

Speed:	20 WPM	Serial number:	001
Weight:	50%	Emulation:	Super Keyer II
Monitor:	On	Number option:	0
Auto-space:	Off	Function speed:	Equals Paddle speed
Load mode:	character	Monitor Tone:	500 - 900 Hertz
Input queue:	on		Selectable

FUNCTION COMMANDS

Commands to the keyer are entered in Morse code using your paddle. To alert the keyer that a function is desired, momentarily press buttons #1 and #2 simultaneously. The keyer enables the monitor, disables output keying, and acknowledges your request by sending "F".

After hearing the "F", key in the desired function character(s) explained below. When the function is complete, the monitor returns to its previous state, output keying is enabled, and the previous operating speed is restored.

Input command strings and the function performed are as follows:

A   Auto-space -- toggles the automatic character spacing feature on or off. The keyer confirms the new state by sending "ON" or "OFF". Auto-spacing helps form properly spaced characters within a word. Character crowding is prevented by forcing at least 3 space elements whenever more than 1 space is detected. This effect is especially noticeable at low speeds. Without auto-spacing, character spaces are determined by the operator.

D   Decrement -- decrements the serial number by one, effectively canceling the automatic increment applied when last played from a message. The decrement function accommodates resending the last serial number, as might be needed when a repeat of a contest exchange is requested.

F *dd*   Function speed -- sets the speed used for function entry to *dd* WPM, where *dd* are two digits in the range 06 to 30. This speed is used to enter commands and load messages. It is independent of operating speed and is unaffected by the analog speed control. Alternatively, the function speed will track the operating speed when using "*dd* = 00".

H   Hand-key -- causes the keyer to enter the hand-key mode. Keying output will follow closures of the dot or dash paddle levers, allowing hand-sent code. Normal iambic keyer operation is regained by any button closure.

K *dd*   Keying Compensation -- increases keying on-time and decreases keying off-time by *dd* milliseconds, where *dd* are two digits in the range 00 to 25. Although similar to increasing weight, this adjustment is independent of speed. This setting is used primarily to correct keying distortion by certain transceivers, especially when using QSK.

L   Load mode -- toggles the load mode between character and real- time. The keyer confirms the new mode by sending "C" or "R" as appropriate.

M   Monitor -- toggles the sidetone monitor on or off. To conserve battery power, the keyer should normally be operated with the monitor off in favor of the rig's sidetone.

N *dddd* Number -- initializes the contest serial number to *dddd*, where *dddd* are four digits in the range 0000 to 9999. Note that 4 digits must be entered, with leading zeros if needed.

Q Queue -- toggles the input queue on or off. The keyer confirms the new mode by sending "ON" or "OFF" as appropriate. When off, message button activations are acted upon immediately, canceling any message in progress. When on, up to 8 button presses are remembered in order and acted upon in succession as each message completes.

RV Reverse -- reverses the dot and dash paddles as may be desired for left-handed operators.

S *dd* Speed -- sets the current operating speed to *dd* WPM, where *dd* are two digits in the range 06 to 60. The speed function establishes the current knob position at the entered speed. The knob can then be employed to vary the speed faster or slower over a total range of 3:1. Control via the knob is linear and increases speed clockwise.

SU *d* Speed Up -- increases the operating speed by "*d*" WPM, where *d* is a single digit in the range 0 to 9.

SD *d* Slow Down -- decreases the operating speed by "*d*" WPM, where *d* is a single digit in the range 0 to 9.

T *dd* Tone frequency -- Available range is 500 - 990 hertz, where *dd* is the first two digits of the desired monitor frequency.

V *d* Emulation -- allows an operator to select emulation of the timing characteristics of other keyers. See EMULATION

W *dd* Weight -- sets code weight to *dd* percent, where *dd* are two digits in the range 25 to 75. Weight is the duty cycle of a continuous string of dots, which is 50% for perfect code. A higher weight produces a heavier sound, and a lower weight causes characters to sound lighter. Once set, weight remains constant and independent of speed.

X Xmit (tune) -- Continuously keys the output for purposes of transmitter and amplifier adjustment. Tuning is stopped by simply tapping either the dot or dash paddle lever.

Z *d* Zeros and Nines: controls the way that zeros and nines are sent in the serial number. See SERIAL NUMBER OPTIONS.

INQUIRY FUNCTIONS

Inquiry functions annunciate the current state of the keyer. Information is played to the operator in Morse code with the monitor automatically enabled and keying output disabled. Inquiries operate just like command functions: to enter an

inquiry, momentarily press the right two buttons (#3 & #4) simultaneously. After receiving the "?" reply, enter the desired inquiry command as follows:

A Inquire Auto-space -- the keyer responds by sending "ON" or "OFF" as appropriate.

C Inquire Capacity -- the keyer sends the amount of free memory available for message storage.

F Inquire Function Speed -- the keyer sends the current function speed setting in WPM as two digits.

K Inquire Keying Compensation -- the keyer sends the current compensation in milliseconds as two digits.

L Inquire Load mode -- the keyer responds by sending "C" if in character mode or "R" if in real-time mode.

N Inquire Number -- the keyer plays the current contest serial number (but does not increment it).

Q Inquire Queue -- the keyer responds with "ON" or "OFF" as appropriate.

S Inquire Speed -- the keyer sends the current operating speed in WPM as two digits.

T Inquire Tone setting for monitor -- the keyer sends the current monitor tone setting.

V Inquire Emulation Setting -- the keyer sends the current emulation. See EMULATION

W Inquire Weight -- the current weight percentage is sent by the keyer as two digits.

Z Inquire Zeros and Nines: the keyer responds with the option number (0-9) currently in effect.

1 Inquire Message #1 (or 2, 3, or 4) -- message #1 (or 2, 3, or 4) is played.

Note: You can also play back a message sounding the embedded function commands. (See below) Momentarily press buttons #3 & #4 simultaneously. After receiving the "?" reply, press the message memory button you wish to review. The message will be played back with any embedded commands.

EMBEDDED FUNCTIONS

Certain functions can be embedded within character messages. To distinguish them from normal text, the command strings are prefixed by a "/" and are entered

as a separate word. When encountered during a message play, the functions are executed. Note that if "/" is part of a single word, as in W9KNI/ZA2, it is sent as expected and is not interpreted as a command prefix. Embedded command strings and their use are explained below:

/B   Break -- message play pauses for manual text insertion. One or more words may be insert via the paddle. Once paddle input has begun, the break is canceled when inactivity exceeding a word space is detected, and the interrupted message resumes. A break may also be aborted by pressing any button, causing the corresponding message to play immediately.

/D   Decrement -- decrements contest serial number by one.

/G*d*   Gap -- the normal 7-element interword space is modified to 3+*d*, where *d* is a digit in the range 0 - 9. It is used to exaggerate inter-character or inter-word spacing. For example, a call like WØEJ can be entered with slight lengthening of the space between the "E" and the "J" for emphasis, making it easier to copy. Note that /G0 yields a normal character space, while /G4 yields a normal word space.

/N   Number -- the current value of a contest serial number is played. Its value is then automatically increased by one. See SERIAL NUMBER OPTIONS.

/P*dd*   Pause -- a speed-independent pause of *d.d* seconds is inserted, where *dd* are two digits in the range 00 to 99. For example, /P35 will result in a delay of 3.5 seconds. Pauses longer than 9.9 seconds are obtained by using consecutive commands that total the value desired.

/R   Resume -- Stops message playback to allow hand sent entry. When manual keying is completed, press the button for the message being played and the message will resume transmitting from that point on. Multiple "/R" commands are permitted.

/S*dd*   Speed -- the operating speed is set to *dd* WPM, where *dd* are two digits in the range 6 to 60.

/SU*d*   Speed Up -- increases the operating speed by *d* WPM, where *d* is a single digit in the range 0 to 9.

/SD*d*   Slow Down -- decreases the operating speed by *d* WPM, where *d* is a single digit in the range 0 to 9.

/U*dd*   Ultra-speed -- sets the ultra-speed speed mode for a message. Range is 70 - 990 words per minute, where *dd* are the two digits representing the first two numbers of the speed setting desired. For example, "07" is 70 wpm, "77" is 770 wpm. This command is used primarily for meteor scatter work. Note that Weighting (W) and Compensation (K) settings are disabled during Ultraspeed message transmission.

/1   Message #1 - message #1 is played followed by resumption of the current message. If the current message is #1, a continuous loop is created. The same is true for the other messages.

MULTIPLE-BUTTON FUNCTIONS

Single-button closures are reserved for activating messages. As already shown, the #s 1-2 combination alerts the keyer for paddle-entry functions. Certain functions are duplicated, wholly or in part, by other button combinations:

    2-3   Decrement -- the keyer acknowledges with "D" and then decrements the serial number.

    3-4   Inquiry -- the keyer acknowledges with "?" and then waits for paddle entry of the desired option.

    1-3   Hand-key -- the keyer acknowledges with "H", then enters hand-key mode until another button closure occurs.

    2-4   Tune -- the keyer acknowledges with "X" and then keys the output continuously until a paddle closure occurs.

    1-4   Reverse -- the keyer acknowledges with "RV" and then reverses the paddles.

    1-2-3-4 Reset -- the keyer speed is reset to 20 WPM at the current knob position, the function-entry speed is defaulted to follow the knob, and then the keyer acknowledges with "OK".

Note: To kill a message already transmitting without sending a "dit" over the air, press any two buttons and release.

LOADING CHARACTER MESSAGES

In character mode, each Morse character uses one byte of message memory. Precise 3-element intercharacter and 7-element interword spaces are employed when the message is played (unless modified using the /G*d* function). To load a message, first confirm that character-mode loading is in effect by using the "L" Inquiry function. Then press and hold the desired message button. After 2 seconds, a tone is emitted and the button may be released. The keyer then sends "C" to confirm character mode and waits for input.

Morse code text and embedded functions can then be entered with the paddles. When each word is complete, simply stop sending. The keyer will detect and insert a word space, and then prompt you for the next word by sending "I". There is no limit to the elapsed time between words, so there is no need to hurry.

The keyer includes a powerful edit feature for immediate correction of errors during message loading. If a mistake occurs, simply send an error indication of 7 or more dots. The keyer will locate the last word and erase it. It will then play the

'new' last word (if any) so that the position in the message is known exactly. As many words as needed can be erased this way. When the desired position is achieved, continue to enter the remainder of the message.

After the keyer responds with "I" following the final word, the message is ended by a momentary press of the button. To completely clear a message, just end the load in this way immediately after the "C" is sent. In the event that message capacity is exhausted during the load, automatic termination will occur.

LOADING REAL-TIME MESSAGES

Some operators prefer messages containing stretched or compressed spacing rather than perfect timing. Real-time mode stores and replays messages exactly as entered. Along with somewhat reduced message capacity, the primary disadvantage of real-time messages is that they cannot contain embedded functions. Use the Inquiry function "L" command to insure that real-time load mode is in effect. Then press and hold the desired message button. After 2 seconds, a continuous tone will emit, at which time loading is enabled and the button may be released. The keyer then responds by sending "R" to confirm real-time mode and waits for paddle input.

Since the keyer waits until the first paddle closure, there is no need to rush the first entry. Once entry begins, however, the keyer loads continuously -- any pauses are stored as spaces in the message. All inter-character and inter-word spacing is strictly up to the operator. To end the message, simply press the message button momentarily. Note that the elapsed time from the end of the last character to message termination is stored as space at the end of the message. If room is exhausted during the load, the message is terminated automatically.

PLAYING MESSAGES

It couldn't be simpler: just tap the desired message button. Both character-mode and real-time messages can be played regardless of the current load mode.

If the input queue is enabled, multiple message button closures will be remembered. Each message will be played in succession as the previous completes. As a simple example, suppose that message #1 contains "CQ" and message #4 contains "DE WB8ZRL". Then pressing button #1 three times and button #4 once, in quick succession, will cause "CQ CQ CQ DE WB8ZRL" to be played. As many as 8 button activations will be remembered in this mode. With the input queue disabled, however, a button closure immediately cancels any current message and starts the commanded one.

When a paddle closure is detected, messages are immediately aborted and the input queue flushed. The only exceptions are during execution of a /B Break Function or /R Resume function, when paddle input is expected. Otherwise, the paddles always take priority over message playback.

SERIAL NUMBER OPTIONS

The "Z*d*" command selects one of 10 options for sending zeros and nines in the contest serial number. Zeros may be replaced by "O" or "T", nines replaced by "N", and leading zeros suppressed. The options available are:

Option (*d*)	Leading Zeros	Other Zeros	Nines
Ø	Ø	Ø	9
1	-	Ø	9
2	O	Ø	9
3	O	O	9
4	-	O	9
5	T	Ø	9
6	T	T	9
7	-	T	9
8	T	T	N
9	-	T	N

Note: For numbers less than 1000, the first zero is always suppressed.

EMULATION OPTIONS

This parameter allows the keyer timing to mimic that of other keyers, making the "feel" of the keyer more comfortable for operators used to different timing patterns. The default setting is VØ, a timing pattern which has proven to be the most user-friendly for many operators. Other values are as follows:

VØ   Super Keyer II timing w/dot and dash memory
V1   Super Keyer II timing w/dot memory only
V2   Super Keyer II timing w/dash memory only
V3   Accukeyer timing w/dot and dash memory
V4   Accukeyer timing w/dot memory only
V5   Accukeyer timing w/dash memory only
V6   Curtis "A" timing w/dot and dash memory
V7   Curtis "A" timing w/dot memory only
V8   Curtis "A" timing w/dash memory only
V9   Iambic timing w/no dot or dash memory

Note that this makes a full featured memory keyer finally available to those used to the Curtis "A" timing! Tell your Curtis equipped friends! To implement a setting different from VØ, enter the Function Mode and send "V*d*", where "*d*" is the desired setting. To determine the present "V" setting, enter the Inquiry Mode and respond to the "?" prompt with a "V". The keyer will annunciate the "V" setting.

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ERROR INDICATION

When an erroneous input is made, or when all memory is used in message loading, the keyer generates a distinctive raucous tone burst to indicate the error.

EMBEDDED FUNCTION EXAMPLES

An important keyer feature is its ability to execute embedded functions within messages during playback. Consecutive contest serial numbering offers an example. An Sweepstakes answering exchange could be programmed: "NR /N A KCØQ 80 IA BK". A second message might contain a serial number repeat message. This makes use of the decrement function: "/D NR /N BK".

Speed changes can be made within messages, allowing parts of a message to be played at differing speeds. "/SU5 QRZ DE WØSR/7O UP 5 /SD5" plays the message faster, then returns to the previous operating speed. Or several favorite operating speeds can be programmed into messages for instant changes at the tap of a button. For example, a message "/S25" would set the speed to 25 WPM.

Messages may `call' other messages. Suppose #4 holds "WA9CNS/KH7". Then the message "CQ CQ CQ DE /4 /4 K" will, when played, yield "CQ CQ CQ DE WA9CNS/KH7 WA9CNS/KH7 K". Call nesting may be as deep as desired. Thus, message #2 can call #1 which calls #4 which calls #3! In fact, continuous loops can be programmed. A loop will result if a message calls itself (directly or via some other message). Loops can be very useful. A CQ loop in message #1, using a pause, is a good example: "CQ DX CQ DX DE WØWP WØWP K /P35 /1". The message will play continuously, with 3.5 seconds in between. When an answering station is heard, simply tap either paddle to cancel the loop.

The break function and looping offer a real advantage in a contest. Message #1 might contain: "QRZ TEST DE WØWP /B 599 IA BK /B /1". Activating message #1 causes "QRZ TEST DE WØWP" to be sent. The /B breaks the message, allowing copy of a responding caller. His call is sent via the paddles. The message then automatically continues, sending "599 IA BK" followed by another break. The other station's report is then copied while the keyer waits. A "TU" or "R" is sent via the paddles to acknowledge the exchange. This completes the break and causes an automatic loop back, restarting the whole sequence.

If no one responds to the QRZ, simply tap button #1 again to resend the QRZ (remembering that a /B is canceled by a button closure). If the responding station's exchange is missed during the second break, use message #2 to ask for a repeat: "AGN? BK /B /1". After getting the repeat, acknowledge with "TU" or "R" as before, and the QRZ loop is automatically resumed.