



CWMorse Pro Keyer



Features:

- Built in speaker with stereo headphone jack for private listening
- Positive OR negative transmitter keying maximum of 200V/120mA/300mW
- Powered with the K1EL K16 Keyer engine
- Keying from 5-99WPM plus QRSS and HSCW modes
- Keying Modes: Bug, Ultimatic, Iambic A or B
- Two User Configurations each with call sign
- Rx and Tx Practice Modes
- Dynamically allocated Non-Volatile Message Memory: 240 letters in twelve Slots/dual banked with embedded commands
- Sidetone Frequency from 300 Hz to 2000Hz.
- Dual User Configuration
- Fast Speed Change Feature The speed can be incremented or decremented quickly by pressing and holding the command push button and then tapping the paddles. Press left to decrease the speed or right to increase the speed.
- Dit/Dah Ratio Control
- Current consumption: Sleep <20uA Idle 1.3mA, keyed no volume 6mA , keyed full volume 30mA

Shipping and Battery Installation

Batteries are included. **There is a jumper on the back of the unit to disable power during shipping or long term storage. Just move the jumper to the ON position.** To replace batteries, remove the 4 screws on the bottom of the unit. Insert 3 AAA batteries observing the polarity as shown on the battery holder. Replace the panel and 4 screws on the bottom.

OPERATION

Plug your Iambic key into the KEY jack. With the key down adjust the volume as needed. If using the headphone/SKPR jack ALWAYS turn the volume control fully counter-clockwise BEFORE plugging in. Then with the key down adjust the volume to a comfortable level. Plug a transmitter into the XMIT jack.

CAUTION: DO NOT plug anything into the speaker or key jacks which could contain a voltage source (such as a transmitter). Damage to the unit may occur.

The following is an excerpt of the K1EL K16 manual. For more details and extended commands refer to the full manual at https://hamcrafters2.com/files/k16man_R10.pdf

Changes to the K16's configuration are made by entering values on the paddles. Before doing this, the K16 must be put into command mode. If the command push-button is pressed and held, the K16 will respond after about two seconds with the letter R in sidetone. This means the K16 is ready to accept a command. Simply enter the command letter in Morse on the paddles and the command will be executed. Some commands require additional parameters. In this case, the K16 will prompt you with the letter E (for enter). When the K16 is in command mode, the KEY and PTT outputs are inactive. All commands provide some sort of feedback to tell you if the command was understood and executed properly. If an illegal command or parameter is entered, the K16 will respond with a question mark.

Important Note: When in command mode, transmitter keying is disabled and replies are sent in sidetone only. If sidetone was disabled with the A command it will be re-enabled automatically for command mode.

K16 Tutorial

1) Power up: After power is applied, the K16 will output the letter **R** to let you know it's ready. Pressing the paddle keys will generate dits and dahs both in sidetone and keyed output.

2) Command Entry: A command cheat sheet can be found on page 18. There are three command types, immediate, extended, and embedded message. The first commands to look at are immediate commands. Press the command pushbutton (CMD) until the K16 answers with an **R**. Then without hesitation enter an immediate command letter on the paddles. Try the **Z** command which allows the sidetone frequency to be changed. The K16 will output a continuous tone and you can adjust the frequency by pressing the paddles. When you are finished, press CMD to return to normal operation. If the K16 does not understand a command or you are too late to enter a command the K16 will respond with a question mark. Some commands require additional parameters, a good example is setting the command speed. Press CMD, wait for the **R**, and then enter **C**. The K16 will respond with an **E** telling you it's waiting for you to enter something. Enter a 1 followed by a 0. Try it again but this time use a **T** for the zero. This is a handy shortcut. You have changed the command entry speed to 10 WPM. If this is too slow, repeat the command with a more comfortable speed.

3) Change Keyer Mode: Enter the K command and the K16 will prompt you for desired keying mode. For example A for Iambic A, B for Iambic B... see the full list under the K command. The K16 will respond with an **R** to let you know it acknowledged the command. The sample adjust command **J** adjusts the paddle sensitivity to home in on the way you want the paddles to respond. By setting sample adjust to zero you can disable the dit and dah paddle memories. Weighting, Keying compensation, and letterspace are a few other ways to adjust the way Morse is generated.

4) Since we have more commands than letters in the alphabet, we added **extended commands**. They work just like immediate commands with the exception that you have to enter two letters. A useful extended command is the 'save settings' command **S**. Press CMD to get an **R** and in response enter an

X for extended command followed by an **S** for save. The K16 saves settings in nonvolatile memory so that when you power down and back up your preferred settings are preserved. Messages are automatically saved in memory when entered but settings have to be preserved using the Save command. It works this way since most users may want to change settings temporarily but always want to go back to their favorite settings when they are done. It's easy to restore default settings, just press and hold CMD until you get the **R** and keep holding until the K16 responds with an **OE** for warm start. This means that your default settings have been restored. Another interesting extended command is **V** which tells the K16 to report the current keyer supply voltage. It plays it in this form: 4r35 which in this case is 4.35 volts.

5) Now let's play with messages. Review the procedure for message loading on page 13. The K16 has two great features associated with message loading. The first is backspace, if you make a mistake while entering a message just hold CMD down and the K16 will back up letter by letter. The second is non-fixed message slot size; if you only use two bytes in slot one, only two bytes of message memory are used up, not an entire slot. Now we will load a message into slot 1. Press and hold CMD until the **R** and then release and then momentarily press CMD again and release. This tells the K16 you want to load a message into slot 1. You can load any other slot in the same manner, just press a different pushbutton. The K16 responds with an **E** to let you know it is ready to accept the message. On the paddles enter: **/S10SLOW /S25FAST**. (/ is the **DN** prosign DAH-DIDI-DAH-DIT) This message has two embedded commands which will change the speed while the message is playing. SLOW at 10 WPM and FAST at 25 WPM. Note that after playing this message the operating speed will be returned to the initial starting speed.

6) It's easy to compose a beacon command: In msg slot 2 enter: **/B60/K05 BCON DE K1EL NH** This will key down for 5 seconds, send BCON DE K1EL NH and repeat every 60 seconds. To cancel a beacon simply press CMD; K16 will stop the loop and return to normal operation.

7) Next we will test out serial numbering. First enter a starting serial number using the **N** command. You need to enter all four digits including leading zeroes. You may want to select the way K16 will send 0s and 9s in a serial number. Use the two extended commands **N** and **T** for that (See extended commands). Here is an example of a message that will play a serial number incorporating the **/P** pause command: **CQ DE K1EL/P UR NR /N QSL?/P**. This message will send CQ and then pause to let you listen for a reply. If no reply, hit the msg PB to repeat the CQ. If there was a reply, enter the station's callsign and the K16 will send the serial number and pause again. If the station needs a repeat of the callsign press 2 to play this message in slot 2: **UR NR /D/N QSL ?** Since the serial number is incremented after an **/N** command you need to pre-decrement it with **/D** to send the original number. The **/P** command is a three-way branch, 1st branch: paddle something to continue, 2nd branch: hit a msg button (other than CMD PB), 3rd branch: hit the CMD PB to cancel the message. Since MSG1 = CMD PB you can't use slot one as a 2nd branch choice.

8) The K16 supports two alternate sending modes. They are selected by putting embedded commands in the message. QRSS is extremely slow CW for VLF operation, while HSCW is extremely fast CW typically used for QSOs via meteor scatter. Here are examples of each: **QRSS: /K10/ Q2EL/2** Key down for 10 seconds followed by EL at QRSS6 rate, repeat. **HSCW: /H3K1EL K1EL K1EL K1EL K1EL K1EL K1EL /1** Callsign is repeated at 3000 LPM 9).

Command Toggles – Many settings such as Paddle Swap and Transmit Mute have just two states, on or off. These settings are turned on or off like a toggle switch. Issuing the command will change the state back and forth between off and on. When a toggle command is turned off, the K16 will echo an N for “Not enabled” Likewise when a toggle command is turned on an A is echoed for enAbleD.

K16 Command List

In the command descriptions below, the **[n]** or **[nn]** notation means that additional parameters must be entered on the paddles after the command. A letter displayed in **BOLD** is something you enter, **BOLD ITALIC** is the K16’s response. **[pb]** means that the K16 will wait for you to press one of the message pushbuttons.

*****IMPORTANT** – When making changes don’t forget to use the Extended S command to permanently save your changes. See below in the manual for using the Extended S command.

A - Sidetone enable: is toggled when this command is entered. Sidetone should be disabled when using a transceiver’s built in sidetone generator. The K16 will acknowledge this command by responding with an **A or N**. Note: If sidetone is disabled, it will be temporarily re-enabled when entering command mode.

B [m,dd] - Easy Beacon: Any message slot in the current bank can be repeated at a specified rate. After entering **B**, the user is prompted to enter a single digit message number (1-6) and then prompted to enter a two digit beacon cycle time (1-99) in seconds. After the command is entered the beacon starts. A beacon is cancelled by hitting either paddle. The beacon is timed from start of beacon to start of next beacon. For example if you set a delay time of 10 seconds, the beacon will start every 10 seconds regardless how long the message is. If the message is longer than delay time, then there will be no gap between beacon messages.

C [nn] – Command WPM: The K16 uses different speeds for command transactions and on air transmitting. Changes in transmit speed will not affect command speed. After the **C** command is issued, enter the speed in WPM. If the speed is valid, the K16 responds with an **R**, otherwise a **?** See the **S** command for details on setting transmit Morse speed.

D - Decrement serial number by 1, K16 responds with a **D**

E - Swap message banks: The K16 has two separate message banks, six messages in each. In response to this command, the K16 will respond with an **E** for bank one or an **I** for bank two.

F [nn] - Set Farnsworth Speed: This is used primarily for code practice. Letters are sent at the Farnsworth speed while maintaining the default code speed. For example, if Farnsworth is set to 25 WPM and the operating speed is set to 7 WPM, individual letters will be sent at 25 WPM while spacing between letters is at a 7 WPM rate. To disable Farnsworth mode, set it to zero. Note that Farnsworth is activated only when it is set faster than the current sending speed. Command response is **R** or **?**.

G - Toggle 50% tune duty cycle: The default tune duty cycle is 100% key down. This command allows either 100% or 50% duty cycle to be selected. Some folks prefer a 50% tuning duty cycle to

reduce power dissipation in transmitter finals and/or linear amplifier. An **A** is echoed when 50% is enabled, an **N** is echoed when set to 100%

H [n] - Set Transmit PTT Hang Delay Time: Sets a PTT delay that is proportional to sending speed. The delay begins after paddle sending stops. You can select one of four delays:

HangTime = 0: wait 1 wordspace + 1 dit before ending PTT

HangTime = 1: wait 1 wordspace + 2 dits before ending PTT

HangTime = 2: wait 1 wordspace + 4 dits before ending PTT

HangTime = 3: wait 1 wordspace + 8 dits before ending PTT

After entering the command letter, you will be prompted with an **E** to enter the desired hang time as a number 0 to 3 as indicated in the table above. Hang delay is different than PTT tail delay in that it is proportional to code speed while PTT delay is a primarily a fixed delay time. This frees you from having to change PTT delay every time you change sending speed. Command response is **R** or **?**.

I [nn] - Set Letterspace Adjustment: **nn** is a value 0 to 31, specifying an additional letterspace to be applied between letters. Multiply **nn** by two to arrive at the actual adjustment percentage. For example a value of 7 applies 14% additional letterspace between letters. The maximum adjustment is 62%.

J [nn] - Paddle Sample Delay: normally the K16 waits one dit time after a paddle press has been sensed before latching a second paddle press. This command allows this delay time to be adjusted longer or shorter than one dit. If the delay is set too short, the keyer may send unwanted dits or dahs, if there is too much delay it can make sending a bit more tedious. Using the formula provided below, delay time can be set greater or smaller than one dit time. The default value is 50 which specifies one dit time. A value of 99 doubles the delay time while a value of 25 halves the delay. Faster operators report a setting somewhat less than default has a nice feel. The command response is **R**. **If the paddle sensitivity is set to zero, both dit and dah paddle memories are disabled.** The delay is calculated with this formula:

$DELAY_TIME = (nn \times DIT_TIME) / 50$ where Switchpoint is a value between 01 and 99.

K - Set Keying Mode: There are six different keying modes supported by the K16: Iambic mode A, Iambic mode B, Straight Key/Bug, Ultimatic, Dit priority mode, and Dah priority mode. In either iambic mode, alternating dits and dahs are sent while both paddles are held closed. In mode B an extra alternate dit or dah is sent after both paddles are released. In straight key/bug mode a dah paddle press will key the transmitter for as long as the paddle is pressed and dits will be generated automatically when the dit paddle is pressed. In Ultimatic mode when both paddles are pressed the keyer will send a continuous stream of whichever paddle was last pressed. Hold dah then press dit->sends dits. Hold dit then press dah -> dahs are sent. Ultimatic dit and dah priority mode will generate dits and dahs automatically in response to single paddle presses, but when both paddles are pressed either dit or dah has priority.

After the **K** command is issued the current mode is set by entering a single letter:

Iambic B: Enter B

Iambic A: Enter A

Ultimatic: Enter U

Straight Key: Enter S (This is also the Bug setting)

Dit Priority: Enter E (Ultimatic with dits always taking priority when both pressed)

Dah Priority: Enter T (Ultimatic with dahs always taking priority when both pressed)

L [nn] - **Set PTT Lead In Time** to a value between 0 and 99 milliseconds. See the Set PTT Lead/Tail description on page 7 for more information.

M - Toggle transmit mute: Mute transmit when you want to use the K16 as a Code Practice Oscillator (CPO) When muted, the K16 will send CW in sidetone only. In response to this command, the K16 will echo an A when mute is turned on and an N when mute is turned off.

N [nnnn] - **Load 4 Digit Serial Number:** All four digits must be entered including leading zeroes. R or ? is the command response. The serial number is played by inserting a play message token /N into a message. The serial number is automatically incremented after playing. See Embedded Command section for more details.

P [m,d] - **Start Practice Mode:** A dual mode multi-level code practice program is built into the K16. There are two styles of practice, receive only and echo (receive/respond) practice. There are four levels of practice organized by easy to difficult letter groups. The four levels are:

Level 1: E T A N I M W S G D U K O R

Level 2: C Q P J F B V Y H X Z L including level 1

Level 3: 1 2 3 4 5 6 7 8 9 0 including level 1 & 2

Level 4: ? / , . AR SK BT AS including level 1 & 2 & 3

The syntax for entering a practice mode is: P m d where m is R for receive or E for echo practice and d is a single digit 1 to 4 to select difficulty level. Examples:

P R 2 selects Level 2 receive practice

P E 4 selects Level 4 echo practice

Receive Practice Description: Random characters from the selected level are sent in groups of five. Practice will continue until the command pushbutton is pressed.

Echo Receive/Transmit Practice Description: The K16 will send a random character from the selected level and you must respond by echoing the character back on the paddles. If you get it right the K16 will repeat the first character followed by a new character. Now you must echo back both characters. The K16 will continue to add characters until a set of five characters has been completed successfully. After that it will start over with a new set. If you miss a character the K16 will respond with an X and start over with a new sequence of characters. When you want to end practice, either respond with di-dah-di-dah or press the command pushbutton. By default practice will be sent on the active output key port, enable transmit mute (M command) to inhibit this.

Q - Query K16 Current Settings: K16 will respond with current settings sent in the following format:

WPM is sent first

N followed by Serial Number

M followed by free msg memory space in letters available

C followed by command WPM

W followed by weight

L followed by lead time

T followed by tail time

E followed by 1st extension (this parameter described in host mode section)

V followed by key compensation

F followed by Farnsworth WPM

I followed by Letterspace adjustment

J followed by Paddle Sample Adjust

Y followed by dit/dah ratio

B followed by speed pot min WPM

T followed by speed pot max WPM firmware revision denoted by a single letter; A or B or C...
etc.

You can abort this command at any time after the first parameter is sent by pressing the Command and PB4 pushbuttons together or holding either the left or right paddle.

R [pb] - Review a message without transmitting: After the R command is entered the K16 will respond with an E. Press the message button of the message you wish to play. The message will be sent in sidetone only. If you try to play an empty slot, the K16 will respond with MT. Embedded commands will be sent as is without expansion. In other words /S10TEST will be sent as: DAH-DI-DI-DAH-DIT 10TEST

S [nn] - Set Favorite Speed in WPM: Enter a WPM value between 5 and 99. The minimum allowable WPM is 5 WPM, the maximum allowable WPM is 99. Response is an R or ?

U - Toggle Autospace Mode Off and On: When autospace is enabled, the K16 will automatically insert proper inter-letter space between letters. When the U command is issued, the K16 will respond with an A for autospace enabled or an N for autospace disabled. Here is how autospace works: If you pause for more than one dit time between a dit or dah K16 will interpret this as a letter-space and will not allow the next the next dit or dah to be started until the proper letter-space time has been met. The normal letter-space is 3 dits however this can be increased by using the I command. K16 has a paddle event memory so that you can enter dits, dahs, or squeeze both during the inter-letter space and K16 will send them as they were entered. With a little practice, autospace will help you to send near perfect Morse.

V [nn] - Keying Compensation: allows a fixed amount of time to be added to the length of all dits and dahs. QSK keying on modern transceivers can cause shortening of these elements which is especially noticeable at high speeds. The K16 allows the length of the elements to be increased uniformly to compensate for this. The adjustments can be made in one-millisecond steps. The maximum adjustment is 31 mSecs. Key compensation is very similar to Weighting in that any adjustment added to the dits and dahs is subtracted from the spacing so the resulting speed is not changed. The difference between weighting and keying compensation is that compensation is independent of speed, so if 10 mSec of key compensation is selected, 10 mSec will be always be added regardless of speed. So be careful, using large values of keying compensation at high speeds may result in dits and dahs being run together with no spacing at all. The command response is an R or ?

W [nn] - Key Weighting: can be adjusted in percentage from 25% to 75%. When set to 50 % the dit time is equal to the inter-element time, which is normal. Values less than 50 reduce weighting while values greater than 50 increase weighting. Note that weighting does not affect sending speed because any increase in keyed time is subtracted from spacing time. Reduction in weighting results in a thinner sound while increased weighting results in a heavier sound. Since weighting tracks speed, a given weighting will sound the same at all speeds. The command response is an R or ? 25 % weighting 50 % weighting 75 % weighting Figure 8 – Key Weighting

X - Extended Keyer Commands: An additional set of commands are located in a sub menu. These commands are ones that are not entered very often so the additional paddle action is not a significant issue. Extended commands require two entries, an X followed by a sub command. Here is the procedure in detail: Press and hold the command pushbutton and the K16 will respond with an R Enter an X and the K16 will respond with an E (command request) Enter desired Extended Command with additional parameters, if required. A list of extended commands is provided in the next section.

Y [nn] - Set Dit/Dah Ratio: nn ranges from 33 to 66. Entering Y 50 sets the standard 1:3 ratio. For example a value of 33 selects a dit/dah ratio of 1:2 while a value of 66 selects 1:4. The ratio formula is: Ratio of 1:N where $N = (nn * 3) / 50$ example $nn = 40$ give a ratio of $1:((40*3)/50) = 1:2.4$ The command response is an R or ?

Z - Change Sidetone Frequency: After this command is entered the sidetone oscillator will be keyed at a steady rate with transmit muted. Pressing the paddles will raise or lower the frequency. The range varies nearly continuously from 300 Hz at the low end to 2000Hz on the high end. It takes a while to sweep through the whole range. Pressing the command pushbutton will end this command and store the new sidetone frequency. Like all settings, use the Preserve Settings extended command to save the new sidetone setting in EEPROM.

AA- This command will key the transmitter for tuning. The K16 will stay in tune mode until either either paddle is pressed (AA is the di-dah-di-dah prosign)

Extended Command List

A – Pushbutton Input Diagnostic: is used to verify the correct operation of the switch network connected to K16 input pin 7. This design allows four switches and a potentiometer to share a single pin on the K16. The state of the network generates a unique numeric value which is then handled appropriately, either as a pushbutton press or speed pot change. After the Extended A command is issued, the numeric pushbutton network value will be sent in Morse sidetone. For proper operation the input values must fall within the following ranges:

Command PB 0 to 7

MSG 2 8 to 17

MSG 3 18 to 31

The K16 will remain in this diagnostic state until power is cycled.

C - Toggle Contest Spacing: When contest spacing is enabled, word space is set to 6 dit times as opposed to the normal 7 dit times. An A is sent when CT space is enabled, an N is sent when it is turned off.

E[nn] - First Element Extension: Forces the first dit or dah of a transmission to be elongated to allow for receive to transmit delay. Enter a value between 0 and 99 mSecs for nn. Response is an R or ?

F - Toggle Fast Command Response Time: Normally the K16 will enter command mode when the command pushbutton is pressed for 2 seconds. This may be too long for some operators. When fast response is enabled, the delay time is reduced to 1.3 seconds. K16 will respond with an A for fast response or an N for normal response.

M - Load Callsign: Use this command to load a stored callsign. It works just like a message entry and the destination is the currently enabled user slot. Each user slot has one unique callsign. Since the callsign is treated like any other message, embedded commands can be included if desired. The only way to play back a callsign is by embedding the /M command in a message.

N - Select Cut Number for number 9: When enabled, an N will be substituted for the number nine when sending a serial number. Command response: an A is sent when enabled, an N is sent when disabled.

S - Preserve Settings in EEPROM: will respond with a letter R to signify that settings were saved successfully.

T - Select Cut Number for Zero: When enabled, a T will be substituted for the number zero when sending a serial number. An A response means this cut is enabled, an N response means it is disabled.

U - Swap Users: The K16 provides two complete user configurations, each with a unique callsign. Both message banks are available to both users. This allows a universal set of messages to be created that will work with either user. For example a message like CQ CQ CQ DE /M /M K will send the selected user's callsign. In response to this command a single dit is echoed when user 1 is selected and two dits when user 2 is selected.

V - Voltage Readout: The K16 will measure the current supply voltage and send it in Morse sidetone. For example a voltage of 4.52 will be sent as 4r52 with the r indicating the decimal point.

X - Toggle paddle swap (Exchange dit/dah inputs): K16 will respond with a letter A to signify when paddle swap is enabled and an N when turned off.

Shortcuts and Speed Ups

A goal for the K16 design was to streamline command entry, here are some notable improvements:

- Faster Command responses – K16 uses an A for positive responses instead of an R or Y
- Cut Numbers on Command Entry – When entering numeric values use cut numbers to save time. For example when changing the command speed to 19 WPM, use S U N instead of S 2 9 These are the command cuts used in the K16: T=0, A=1, U=2, V=3, 4=4, 5=5, 6=6, B=7, D=8, N=9
- Single digit number entry – If you are entering a parameter that usually requires two digits but you only need to enter one, just enter the single digit and the K16 will figure out that it's a single digit. For example instead of entering T 0 7 you can simply enter T 7.
- K16 will respond with an E or I when swapping users, message banks, or output port. Think of it as a single dit for 1 and a double dit for 2. This is much faster than responding with a Morse 1 or 2.
- Fast Message Entry – Just press the command button till you get an R then simply press the message button you want to load. To stop load mode, either press the command button or enter di-dah-di-dah. This technique is used for the review command also. K1EL Single Chip Morse Code Keyer/Processor K16 K16 Keyer Datasheet – A.11 5/9/2020 Page 13

- Fast Tune Mode – Press and hold pushbutton 4 and then press the command button to start tune. Press the command button to end tune.
- Fast Speed change – Press the command button and then press left paddle to decrement and right paddle to increment WPM speed. The K16 echoes a single dit to signify that the command was accepted. This is very useful for keyer setups that don't include a speed pot.
- Fast Command Response – If you think the K16 takes too long to respond to the command button, enable fast command reply mode which halves the delay time. This is the extended command F.
- Command Prompts – The K16 will respond to commands that require additional input with an E. The E stands for “Entry Required” and is fast and efficient. For example if you enter the Weight command W, the K16 will respond with an E to let you know it is waiting for the value.

Message Functionality

Messages are loaded by holding the command button until the K16 responds with an **R**, and then pressing the message pushbutton of the memory slot you wish to enter. When K16 is ready to accept a new message it will respond with an **E**. If you wait too long, K16 will respond with a **?** and you will have to start over. Note message 4 is not available via pushbutton. Since only 3 pushbuttons are provided, messages 5 and 6 are accessed by pressing two pushbuttons in the following sequence after the **R** is echoed:

- Press and hold either message button 2 or 3. (for message 5 or 6 respectively)
- Press the command pushbutton.
- Release both push buttons.

Message 5 and 6 can be played in a similar manner by first pressing and holding pushbutton 2 or 3, then pressing the command pushbutton, and finally releasing both. Don't forget that there are also two separate message banks each containing six slots bringing the total number of unique messages to 12.

After the K16 responds with an **E**, enter a new message directly on the paddles at a steady rate, making sure to leave proper space between letters. To insert a word space simply pause for longer than a word space and K16 will respond with an **E** to signify a word space insertion. You can force a wordspace insertion by entering di-didah-dah (**IM**). This allows you to put a wordspace at the beginning of a message or insert more than one wordspace in a row. A ½ letterspace pad character can be inserted by entering di-di-dah-dah-dit (**IG**).

If a mistake is made while entering a message, press and hold the command pushbutton and K16 will backspace through the letters that have been entered. When you reach the position you want, release the button and new letters can then be added starting at that position. If the message memory becomes full while entering a message, K16 will stop further loading, respond with an **F**, and then return K16 back to non-command mode. When a new message has been completely entered, press the command pushbutton, or enter di-dah-di-dah (**AA**), and K16 will respond with an **R** to signify that the message was accepted and stored. There are 232 letters in message memory that can be distributed in any way between 14 message slots. The length of the individual message slots is not fixed. This means, for example, you could have one message of 80 characters, one message with 5 characters, and a third with 10 characters and still have 141 locations left to split among the remaining three slots. Keep in mind that each word space occupies one memory location.

What if you want to insert one of the message controls (**IM**, **IG**, **AA**) into a message ? Simply precede the control with a / (**DN**) and it will not be acted on as a control code: **/IM /IG /AA**

Usually when you finish a message, the K16 will append a word space before you have a chance to press the command pushbutton. There are cases when you do not want a word space at the end, especially if you are using PTT to key an amplifier. This is because K16 will hold PTT during that added word space. The best way around this is to end a message with the di-dah-di-dah (**AA**) control code inserted immediately after the last letter in the message. This will terminate the message without a trailing word space.

If you are having problems loading messages into the K16, make sure you leave adequate space between letters and are not sending much faster or slower than current command speed. If, for example, you enter an **A** followed by a **T** and end up with a **W**, you are not allowing enough space between letters. It's a fine line though because if you allow too much space K16 will interpret that as an intentional pause and insert a word space. Temporarily lowering the command speed (see command **C**) can help while you learn how the process works.

To play a message back, simply press the desired message button, release, and that message will be sent. If you press a pushbutton that does not have a message loaded, the K16 will respond with an **MT**, short for eMpTy. If you want to review the message without keying the transmitter, use the **R** (review) command. Note that review will ignore control codes and send them explicitly. To abort a message press and hold one of the paddles and K16 will stop transmission immediately. The reason you can't stop a message with a single command press is that the K16 interprets this as a request to stack message 1, in other words, play message 1 after the current message completes.

Gap (Extra Space) Insertion: In messages, K16 interprets the **IG** prosign (di-di-dah-dah-dit) as a ½ dit delay time. The **IG** character can be included in a text string to add extra emphasis to similar sounding sequences. An example is W1OMO, sending it as W1**IG**O**IG**M**IG**O makes it easier to copy. To insert a **IG** prosign in a message without translating it to a gap, enter it as **/IG**.

Word Space Insertion In messages: K16 interprets the **IM** prosign (di-di-dah-dah) as a 7 dit word space delay time. The **IM** character can be included to add a small amount of delay and is easier to use than a delay command. To insert an **IM** prosign in a message without translating it to a word space, enter it as **/IM**.

'Two Press' Message Button Functionality As previously mentioned above, you can trigger message 5 and 6 directly with the following sequence:

1. Press and hold PB2 for message 5 or PB3 for message 6
2. Press the command PB (you now have two PBs pressed)
3. Now release both pushbuttons and selected message will play.

Quick Tune Command: If you use the sequence outlined above but start with PB4 instead, tune mode is turned on. This keys your transmitter until you press either paddle. Use the **G** command to select either a 100% or 50% tune duty cycle.

Quick Serial Number Decrement: Sometimes during contest operation, a serial number has to be reissued. Since the serial number is automatically incremented when it's played, we need a way to

decrement the serial number. This can be done by using the **D** paddle command. After the serial number is decremented, K16 echoes a single dit.

There is another way to decrement a serial number, that is with a **/D** command embedded in a message. A message can be built that predecrements the serial number before sending it. For example the following two messages can be created:

Message 1: 5NN /N QSL ?

Message 2: /D/N QSL ?

Message 1 is played as the initial exchange and if the serial number needs to be resent, message 2 would be used. The second message pre-decrements the serial number before sending it. Both of these messages leave the serial number incremented after it is sent. Here is a way to send the serial number twice in one message:

Message 3: /N/D /N

Message Stacking: Some users like to load small message fragments and then play multiple copies by stacking them. For example instead of loading the message 5NN 5NN 5NN, enter 5NN in the slot and then just stack the number of repeats. So if you want to send three 5NN press the PB three times. For this to work correctly, you need to add a wordspace at the end of 5NN. To do that, enter the message and then just wait for the K16 to send a dit telling you it auto appended a wordspace. If you didn't do this it would come out like this 5NN5NN5NN. You can also do this by adding the **IM** wordspace command.

Fast Speed Change Feature: The sending speed can be changed in 1 WPM increments by holding the command push-button and then pressing either the dit or dah paddle. You must press a paddle before the normal command mode time-out occurs. Once in fast change mode it will stay there until the command push-button is released. A dit is sent each time the speed is incremented or decremented.

Embedded Message Command List

It is an easy procedure to embed commands in a message. The format is the fraction bar **DN** (D and N sent together as one letter) followed by the desired command letter. If you want to insert the **DN** prosign into a message but don't want it to be interpreted as a command simply enter **DN** twice. Example: **K1EL/1** would be entered as **K1EL//1**

Embedded message command table

/Bnn Set a beacon cycle time of nn seconds (nn=00 to 99). Put this at the beginning of a message to set the beacon period.

/Cn Call message in slot n (1-6), return and resume current message.

/D Decrement serial number.

/E Toggle message banks

/Hn Set HSCW speed. See table below for determining n.

/Inn Increase letterspacing within a message, nn is a value from 0 to 31 percent times 2.

/Knn Key transmitter for nn seconds. (nn=00 to 99)

/M Play user callsign.

/N Play Serial Number with auto post increment.

/On Select key output port; 1 for port 1 or 2 for port 2.

/P Pause and wait for paddle entry and then continue after one word space time. The pause is ended three ways 1) paddle entry 2) Press a msg PB (2-6) or 3) Press the cmd PB to cancel.

/Q Set QRSS speed. See table below for determining n.
/Snn Set a speed change within a message. (nn=WPM, 5 to 99)
/Un Turn PTT on or off. PTT is turned on when n = 1 and off when n=0.
/V Send the current voltage in Morse, useful for beacons.
/Wnn Wait for nn seconds. (nn=00 to 99)
/Xn Cancel speed override, for example cancel HSCW, QRSS, or **/Snn** speed.
/Yn Force a relative speed change up. Add n to the current WPM. n=(0-9)
/Zn Force a relative speed change down. Subtract n from the current WPM. n=(0-9)
/1 Jump to message 1 **/2** Jump to message 2
/3 Jump to message 3 **/4** Jump to message 4
/5 Jump to message 5 **/6** Jump to message 6
AA End message load immediately (DI-DAH-DI-DAH)
IG Insert ½ letterspace pad (DI-DI-DAH-DAH-DIT)
IM Insert wordspace pad (DI-DI-DAH-DAH)
Rate Table

n	HSCW Rate	QRSs Rate
0	1000 lpm (200WPM)	3 sec Dit
1	1500 lpm (300WPM)	6 sec Dit
2	2000 lpm (400WPM)	10 sec Dit
3	3000 lpm (600WPM)	12 sec Dit
4	4000 lpm (800WPM)	30 sec Dit
5	6000 lpm (1200WPM)	60 sec Dit

Embedded Command Examples

- **/B60BCON DE K1EL BEDFORD NH** will send BCON DE K1EL BEDFORD NH every 60 seconds
- **UR RST IS /P QSL** will pause to allow the user to enter the RST then resume automatically
- **/K05 /W10 VVV DE K1EL** will key down for 5 secs, wait 10 secs, and then send VVV DE K1EL
- **CQ CQ CQ DE /M /M /M** will send a 3x3 CQ using the user callsign
- **/H2CQ CQ DE K1EL K1EL K1EL/S15 DE K1EL** will send 1st part at 1500 lpm and the 2nd at 15 WPM
- **CQ CQ CQ DE K1/I10TMT/I00 K** will send message with 20% extra space in TMT. A more manageable way of doing this would be to load **K1/I10TMT/I00** in the callsign slot to get this spacing any time **/M** is used.
- **CQ CQ CQ DE /Z4K1EL K1EL K1EL/Y4 K** send the callsigns 4 WPM slower then return to normal WPM.
- **QTH IS /E/C1/E NAME IS STEVE** Will play the QTH from message bank 1 and then return for the name.
- **/Q2EL /1** will continuously send EL at QRSS10 speed (this message is in slot 1). Avoid inserting a space between the QRSS command and the start of text: **/Q2 EL** unless you want a long delay at start of message.

- **/B10K1EL BCON/W2/VVOLTS** sends K1EL BCON, wait 2 secs, send XrXX VOLTS repeat every 10 secs
- **SOM/E/C3/E/U1/W5/U0/S50K1EL//1/XEOM** Send SOM, swap to msg bank 2, call msg 3, swap back to msg bank 1, turn PTT on for 5 seconds, change speed to 50 WPM and send K1EL/1, cancel 50WPM send EOM

Save Settings: K16 setting changes are not automatically copied into permanent storage. That means the settings will be lost if power is cycled. To save the settings permanently, use extended **S** command. Press and hold the command PB until the **R** and enter an **X** followed by an **S**. This will save current settings in nonvolatile memory so that all settings will be retained on power cycling. Note that messages are always saved directly into nonvolatile memory so the **S** command is not required to preserve messages.

Restore User Defaults (Warm Restart): It's possible that a command could get entered by accident and put the K16 into an undesired state. An easy way to restore user default settings is to power off and on. Another way is to or press and hold the command pushbutton and keep holding after the **R** is sent. After an additional 5 seconds, **OE** will be sent signifying that a warm reboot has occurred which reloaded the user default settings.

Restore Factory Defaults: If you want to restore the K16 to original “factory” settings hold the command pushbutton down and wait for the **OE** to be sent. Then before releasing the pushbutton, press and hold both paddles closed. Now when you release the pushbutton, the K16 will send a **C** signifying a cold reboot which erases all settings and messages and then restores factory settings. Factory Defaults are:

Fixed WPM: 15	Command WPM: 15	Sidetone: 800Hz
Weight: No	Aadjustment KeyComp: 0	Interchar Spacing: Normal
SampleAdjust: None	KeyMode: Iambic B	Sidetone: On
Autospace: Off	OutputMode: KEY/PTT	Serial Number: 0001
TX Mute: Off	User: 1	Message Bank: 1
Messages: All Erased	First Extension: 0	Farnsworth: Off
Dit/Dah Ratio: 1:3	Sidetone: On	Tune Duty Cycle: 100%
Extra Letterspace: None		

Keyer Lock and Extreme Low Power Sleep: A lock feature is provided to disable paddle input and message pushbuttons. This is useful when you want to pack up a battery powered keyer and insure that it stays off with batteries still connected. It is also handy to lock the keyer paddles to keep little hands from sending “messages”. While the keyer is locked it is held in low power shutdown mode. To lock the keyer, press the command pushbutton, wait for the **R**, and then enter a period (di-dah-di-dah-di-dah). The K16 will respond with an **L** to let you know it is now in a locked state. To unlock the keyer, press and hold the both paddles closed for about 5 seconds and the K16 will wake up and send an **R**. This is a very reliable lock mechanism because once the paddles are removed there is no possible way to accidentally unlock the K16, the pushbuttons are ignored. The very nice side effect of Lock Mode is that the K16 is placed in a very low power sleep mode, if you want to stretch battery life as long as possible, lock the K16 when you are not using it for an extended period of time.

K16 Command Cheat sheet Immediate Command List

A - Toggle sidetone on/off	N - Load 4 digit serial number
B - Easy Beacon	P - Start a Practice Session
C - Set command speed in WPM	Q - Query: Report current settings
D - Decrement serial number	R - Review message without transmitting
E - Swap Message Banks	S - Set Fixed Speed
F - Set Farnsworth Speed	U - Toggle Autospacing on/off
G - Toggle Tune Duty Cycle 50/100%	V - Set Keying compensation in mSec
H - Set PTT Hang Delay	W - Set Key Weight
I - Set Letter Spacing	X - Enter Extended Command
J - Set Paddle sensitivity	Y - Set Dit/Dah Ratio
K - Select keyer mode	Z - Select sidetone frequency
L - Set PTT Lead In Delay	AA - Tune command (di-dah-di-dah)
M - Toggle Transmit Mute on/off	
Extended Commands:	
X A – Button Diagnostics	X S – Preserve Settings in EEPROM
X C – Toggle Contest Spacing	X T – Select Cut for Number 0
X E – First Element Extension	X U – Swap Users
X F – Toggle Fast Command Response	X V – Voltage Readout
X M – Load Callsign	X X – Toggle Paddle Swap
X N – Select Cut Number for 9	