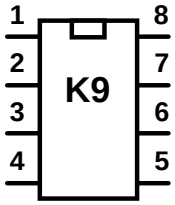
FEATURES

- Keyer speed range: 5 - 49 WPM
- Built in messages: 5
- Programmable message memory: 15 characters
- Callsign Memory: 8 characters
- Keying Modes: Straight key, Iambic A or B
- Spacing Control: Programmable extra inter-letter spacing of 0 to 9 dit times
- Automatic letterspace mode
- Paddle swap command
- Beacon: Optionally enabled at purchase
- Sidetone Output: TTL Square wave, 100Ω output Z
- Sidetone frequency: approx. 800 Hz
- Keying output: TTL, high true when keyed
- Single Push-button command interface
- 14 easy to use commands
- Built in receive code practice mode
- Operating Voltage: 3-7 VDC, built in oscillator
- Power Consumption: 5 ma active, 1 µA standby

DESCRIPTION

The K9 is a single chip Morse keyer with an extended set of features that will be described in this datasheet. It employs a Microchip PIC12C509 single chip microprocessor and requires minimal components to construct a powerful iambic keyer. The K9 has a rich set of commands that are entered directly in Morse code. Besides low power and low cost the K9 also provides practice and beacon capability.



Top View

Pin 1: VCC
Pin 2: Aux Sidetone/Beacon
Pin 3: Sidetone Audio Output
Pin 4: Command Pushbutton
Pin 5: Key Output
Pin 6: Dah Paddle Input
Pin 7: Dit Paddle Input
Pin 8: Ground

Introduction

A unique feature of the K9 keyer IC is that it is customized at time of purchase for your desired configuration. Before shipping, your callsign is hard coded into the K9 along with default code speed, sidetone enable, and iambic mode. This insures that the keyer will be setup the way you want at power on, no tedious configuration is required. You still have the option of overriding any and all defaults if desired. The K9 is pin compatible with the popular TiCK keyer series.

Typical Keyer Application

Figure 1 is a schematic of a complete K9 keyer using a minimum of components :

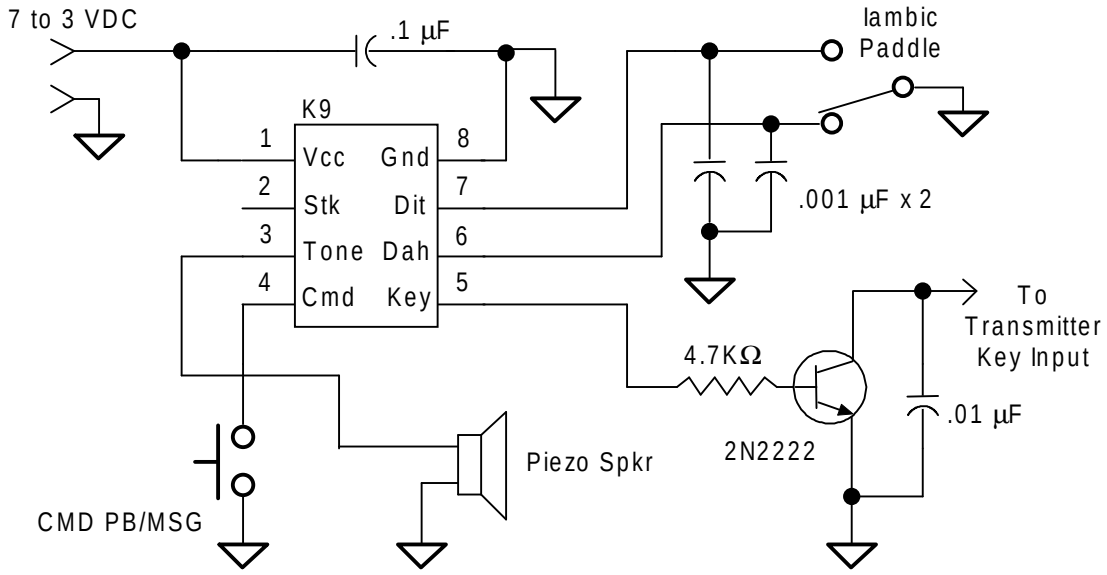


Figure 1

Keying Considerations

The K9 is not capable of directly keying a transmitter and requires a transistor buffer between the keyer chip and the transmitter. The schematic in Figure 1 uses positive keying. The diagram shown in Figure 2 would be used for negative keying. Most modern rigs utilize positive keying while older tube style rigs generally are negatively keyed.

The negative keying circuit in Figure 2 has a maximum rating of -30 volts at 20 ma. Some transmitters may exceed this rating and will require a more robust circuit

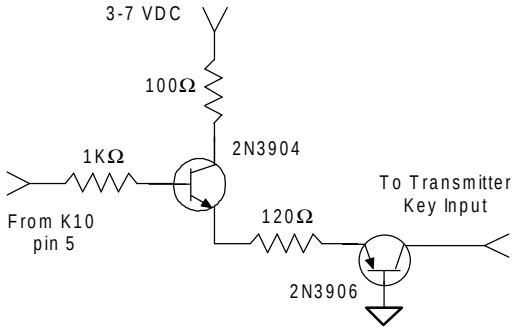


Figure 2

Construction

A K9 keyer can be constructed on a small piece of perf-board. The layout is not critical, be sure to include a .1 µF power supply bypass capacitor and place it as close as possible to K9 pins 1 and 8. If using a supply greater than 7 volts, use a 78L05 regulator to provide 5 volts for the K9. A socket for the K9 is recommended to avoid damage during assembly and to allow future upgrades. Be sure to use an normally open switch for the push-button. All parts can be purchased at a local Radio Shack store. The RS 273-073 piezo element works well as a sidetone output speaker. Use the interface shown in Figure 3 if you wish to drive a small speaker. If installing the K9 directly in a transceiver, the sidetone audio should be fed into the receiver's audio chain, it may be necessary to reduce the output level by using an attenuator network such as shown in Figure 4. Select R1 and R2 to give you the desired attenuation: **$V_{OUT}=(V_{IN}\times R2)/(R1+R2)$**

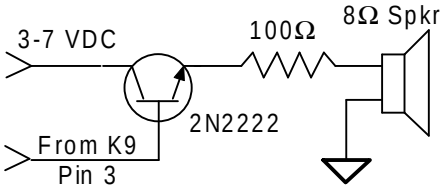


Figure 3

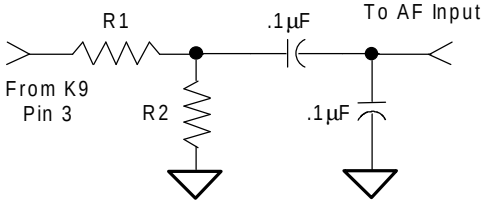


Figure 4

External Voltage Regulator/Battery Backup

The schematic in figure 5 shows a recommended circuit for providing a means of operating the K9 from higher voltages than 7 VDC. Also shown is a way to provide a battery backup in addition to the regulator. If the battery connection is not required then the two diodes can be removed from the circuit.

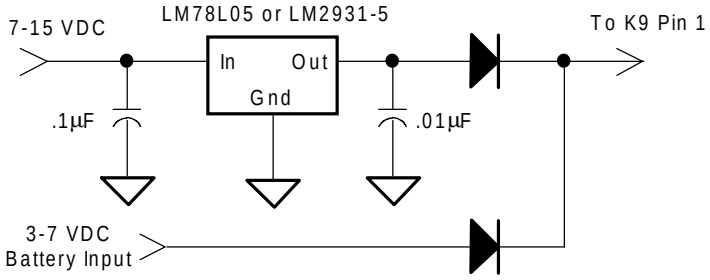


Figure 5

Input Considerations

A paddle or command push-button input is activated by switching it to ground. Pull-ups for all three are built into the K9 so no external pull-up resistors are required. A shunt .001µF capacitor is recommended on each input to prevent RF from getting into the K9.

Command Push-button Functionality

The command push-button connects to pin 4. It serves two functions, command entry and message playback control.

Command Mode

If the command push-button is pressed and held, the K9 will respond after about two seconds with the letter ***R*** in sidetone only. This means the K9 is ready to accept a command, you simply enter the command letter in Morse on the paddles and the command will be executed. Some commands require additional information which the K9 will prompt you for by outputting the letter ***E*** (for enter). All commands provide some sort of feedback to tell you if the command was understood and executed properly. If an illegal command is entered the K9 will respond with a question mark.

K9 Command List

A - Select sidetone on or off
C - Load Callsign Memory
D - Dump contents of message memory
F - Adjust Inter-letter spacing
I - Select Iambic mode A or B
K - Select straight or iambic key mode
L - Load User Memory
M - Select current message
P - Put keyer in practice mode
S - Set CW transmit speed in WPM
T - Key transmitter for tuning
U - Select Autospacing on/off
W - Reply with current CW speed in WPM
X - Exchange Paddles

In the command descriptions below, the [n] or [nn] notation means that additional parameters must be entered on the paddles after the command.

A - Sidetone enable is toggled when this command is entered. Toggle means if the sidetone was on when this command was issued it will be turned off and vice versa.

C - This command is used to load the callsign memory. After you issue the **C** command the keyer will respond with a single dit. This is the signal to enter the first letter of the callsign. When that letter has been accepted the keyer will send another dit and you then enter a second letter. This will continue until either 8 letters are entered or you press the pushbutton. To signal that loading mode is over the letter ***K*** will be sent by the keyer.

D - This command is used to check the contents of the programmable message memory. On keyer power-up the message memory is cleared.

F[n] - This command is used to add extra letter spacing between characters. After the command is issued the K9 will wait for a single number from 0 to 9 to be entered. This value is the number of extra "dit" times to be added between letters. The default value at power up is 0.

I - Toggle between Iambic mode A and B. 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. An ***A*** or ***B*** is the K9's response to this command.

K - The K9 can be placed in straight key mode with this command. A dah paddle press will key the transmitter for as long as the paddle is pressed. Use the swap command: **X** to choose either the left or right paddle. To get back to normal keyer mode, just press and hold the push-button, wait for the ***R***, and enter the **K** command again. The K9 will leave straight key mode for command entry but will return after the command is completed.

L - This command is used to load the programmable message memory. It works exactly like the **C** command with the exception that up to fifteen letters can be entered. If you want to enter a word space, simply wait for two dits before entering the next letter. Loading is completed when you either enter more than fifteen characters or when the push-button is pressed. If you accidentally issue a **C** or **L** command just press the push-button and the command will be ignored. If you would like to blank out the memory for some reason, enter a word space as the first letter followed by a period.

M - This command is used to change the current message. When you enter this command the keyer will reply with a menu of five choices. These are presented in a list of short message identifiers separated by pauses.

For the standard message set the identifiers are:

CQ - This is the short CQ message: CQ CQ CQ DE K1EL K1EL AR K
CQL - Long CQ: CQ CQ CQ DE K1EL K1EL CQ CQ CQ DE K1EL K1EL AR K
DX - CQ DX Message: CQ DX CQ DX DE K1EL K1EL DX AR K
CQC - Custom CQ: (Message Memory) DE K1EL K1EL AR K
MSG - Message memory: (Message Memory)

For the Contest message set the second identifier is

TST - Contest: TEST K1EL K1EL TEST
For the QRP message set the second identifier is

QRP - QRP CQ: CQ CQ CQ CQ DE K1EL K1EL/QRP AR K

(Note: The Contest and QRP message sets are optionally chosen at time of purchase)

The menu selections will be repeated in order until you press a paddle to select one. For example if you want the **CQ DX** message, just wait until ***DX*** is sent, press a paddle, and wait for the keyer to respond with an R as an acknowledgment. From that point on, whenever the push-button is quickly pressed and released, the **CQ DX** message is sent.

Note that on keyer power-up the short **CQ** message is selected as the default.

P - The K9 keyer has a built in CW practice mode. If the **P** command is issued the keyer will continually send random CW characters at the currently configured speed. To end practice mode simply press either paddle until the practice stops.

S[nn] - The CW sending speed is changed with this command. It works like the **C** and **L** commands in that you enter the code speed directly on prompts from the keyer. After the **S** command is issued the keyer will respond with a single dit, you then respond with the first digit of the speed. The keyer will then send a second dit after which you send the second digit. For example if 18 WPM is desired, a 1 is sent first followed by an 8. As a short cut a T can be entered for zero. If the desired speed is a single digit, enter either a zero or T as the first number, .i.e. ***07*** or ***T7*** for 7 WPM. Likewise ***2T*** can be entered for 20 WPM. If an illegal value is entered, the keyer will respond with a question mark.

T - This command will key the transmitter for tuning. The K9 will stay in tune mode until either paddle is pressed.

U - This command toggles autospace mode. When autospace is enabled the K9 will automatically insert proper inter-letter space between letters. Each time the **U** command is issued the K9 will toggle between modes responding with an ***A*** for autospace enabled an ***N*** for autospace disabled.

Here is how it works: If you pause for more than one dit time between a dit or dah the K9 will interpret this as a letter-space and will not send the next dit or dah until the letter-space time has been met. The normal letter-space is 3 dit spaces but this can be increased up to 3+9=12 by using the **F** command. The K9 has a paddle event memory so that you can enter dits or dahs during the inter-letter space and the K9 will send them as they were entered. With a little practice, autospace will allow you to send near perfect Morse. When entering the **U** command, an ***A*** will be sent when changing to autospace mode or an ***N*** when changing to normal mode. Autospace is off at power-up.

W - This command is used to find out what speed the keyer is currently set to. The speed can easily be changed at any time with the **S** command or by the fast change feature.

X - This command will cause the K9 to exchange paddle Inputs (dit and dah). The K9 will always respond with a letter ***R*** to signify that this command was accepted.

Important Note !

While the K9 is in command mode, transmitter keying is disabled and replies are sent in sidetone only. Thus in order to use command mode you must have some sort of sidetone connected. Even if sidetone has been disabled with the **A** command, it will be forced on during command mode. Also note that command mode always operates at the default code speed.

Fast Speed Set Feature

The sending speed can be quickly changed by holding the command push-button and then pressing the dit paddle to decrease the speed by 2 wpm or pressing the dah paddle to increase by 2 wpm. You must press the paddle before the normal command mode time-out occurs, but 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.

Message Functionality

Whenever the push-button is pressed and quickly released the keyer's currently selected built-in message will be output. You have a choice between five different messages most of which are varieties of CQs. When the K9 keyer chip was purchased your callsign was permanently programmed into the K9's on board memory. The programmed callsign is used in sending the built-in message. The basic K9 has the following message selection list which was also programmed at purchase:

The Standard message list is:

1) CQ CQ CQ DE K1EL K1EL AR K
2) CQ CQ CQ DE K1EL K1EL CQ CQ CQ DE K1EL K1EL AR K
3) CQ CQ CQ DX DE K1EL K1EL DX AR K
4) (MESSAGE MEMORY) DE K1EL K1EL AR K
5) (MESSAGE MEMORY)

The optional Contest List is exactly the same except for slot 2:

2) TEST K1EL K1EL TEST

The optional QRP List is exactly the same except for slot 2:

2) CQ CQ CQ CQ DE K1EL K1EL/QRP AR K

Note that the **AR** character was optionally chosen as well. Your pre-programmed callsign will be substituted for K1EL in these examples. The message can be canceled at any time by pressing and holding either paddle until sending stops.

(MESSAGE MEMORY) is sent from an internal fifteen character memory that can be loaded with whatever the you desire. This message is intended for contest use, or a custom CQ message. For example if **CQ FD CQ FD** was loaded into message memory:

(MESSAGE MEMORY) DE K1EL K1EL AR K

will be sent as

CQ FD CQ FD DE K1EL K1EL AR K

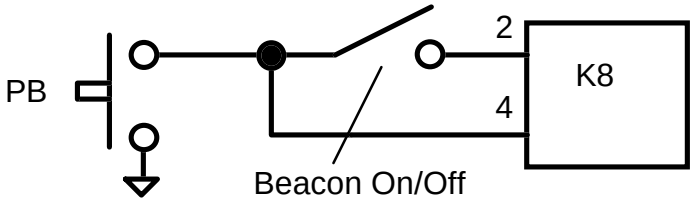
The message memory can be sent by itself if the fifth message is selected. Although 15 characters is not very large, it is useful for a short special purpose message or beacon.

In the event the you would like to participate in a club sponsored event or lend the keyer to another ham, the built in callsign can be replaced by loading in a different one. The new callsign will remain in effect until power is turned off or new callsign is loaded.

Remember that even though there are five messages available, only one of these can be selected as the current message. It is easy to pick a different one but it does take a few seconds to change.

Beacon Control/ Auxiliary Sidetone Pin

Beacon transmit is an option you select when ordering a K9. The function of Pin 2 depends on this option. If the beacon option is selected, a switch connected between pin 2 and pin 4 will control beaconing. When the switch is open the keyer will operate normally, when closed the keyer will repeat the selected message every 3 seconds. If you don't select the beacon option, Pin 2 is active high (+5V) whenever the sidetone is activated. This is intended to be used to key an external sidetone oscillator or Sonalert™ style beeper.



Push button and Beacon Enable Switch Wiring

Sleep Mode

The keyer utilizes the automatic sleep mode of the PIC CPU. The K9 normally rests in sleep mode and draws about 1 μA of DC current. When either the paddles or push button is pressed, the chip wakes up and goes into active mode drawing about 5 mA. After the paddle or push button is serviced the PIC goes back to sleep.

The K9 keyer is fully guaranteed and if you are not satisfied please return the K9 IC for a full refund. Any questions will be handled by snail-mail or e-mail via these addresses:

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