some wire and then key an HT or FRS radio and see what the counter reads.

Default settings are provided for all menu items. If required, the Mcount can be reset to the defaults by:

1) powering the Mcount down.

2) press and hold the switch

3) power up the Mcount

4) release the switch when FB is sent

Switch Menu item	Default	Option
L (Long gate time)	N (oN)	F (oFf) sets the gate time to .1 second
S (Speed set)	15 wpm	18, 20, 25, 30, 35, 5, 7, 10, 13 wpm,
P (Prescale "display" option)	F (oFf)	N (oN) turns on the prescale "display"
SS (Sidetone Set)	440 Hz	494, 523, 587, 659, 698, 784, 880, 988, 1046, 247, 262, 294, 330, 349, 392 Hz
DL (Display Low order digit)	1	2, 3, 4, 5, 6, 7, 1
DH (Display High order digit)	8	7, 6, 5, 4, 3, 2, 1, 8
CN (Cut Numbers option)	F (oFf)	N (oN) turns on cut number play
CA (calibrate counter, exit with power off)		L sent before entering loop
O (Offset mode)	F (oFf)	P, M, B, F
I HM (IF set, Hundred Megahertz digit)	0	0 - 9
TM (Ten Megahertz digit set)	0	0 - 9
M (Megahertz digit set)	9	0 - 9
HK (Hundred Kilohertz digit set)	0	0 - 9
TK (Ten Kilohertz digit set)	0	0 - 9
K (Kilohertz digit set)	0	0 - 9
H (Hundred hertz digit set)	5	0 - 9
T (Ten hertz digit set)	4	0 - 9

L - after the Switch button is held for 2 seconds, the Mcount will send L and then it will send the current setting either N for oN or F for oFf. LN refers to the Long gate time of 1 second which allows the Mcount to measure to a resolution of 1 Hz. LF refers to a gate time of 0.1 second which has a resolution of 10 Hz. Note that when any of the Offset modes are in use, Mcount will automatically be switched to the shorter 0.1 second gate time.

S - after the L menu item, Mcount will enter the Speed set menu item S. The default speed is 15 wpm. The user can select any speed from 5 to 35 wpm in the 10 step ARRL code practice sequence. PAH the switch to increase to the next speed in the sequence. After 35 wpm, Mcount will "wraparound" to 5 wpm.

P - after the S menu item, Mcount will enter the Prescale on/off menu item P. The default setting is prescaler oFf or PF. The user can turn on the Prescaler display mode with a PAH of the switch or PAR to the next item. Note that this menu item just moves the dah separating the MHz digits from the kHz digits and the dit separating the kHz digits and the Hz digits one digit to the left. It does not electrically turn on the prescaler IC, that will always be on if it is installed..

The Mcount menu items DL and DH are used to limit the number of digits sent by the Mcount when it is being used as a digital dial for a QRP rig or possibly when it is being used to match components like crystals by measuring an oscillator frequency. Hopefully this saves the user time when either the upper or lower digits are always the same or aren't of interest.

SS - after the P menu item, Mcount will enter the Sidetone Set menu item SS. The currently programmed sidetone frequency will then be sent (keydown). The user can select any of 16 sidetone frequencies: 494, 523, 587, 659, 698, 784, 880, 988, 1046, 247, 262, 294, 330, 349, 392 and the default 440 Hz. PAH the switch to increase the sidetone frequency to the next tone in the sequence. After 1046 Hz, Mcount will "wraparound" to 247 Hz. The tones are approximately equal to the notes of the musical scale from B3 to C6.

DL - after the SS menu item, Mcount will enter the Display Low digit set menu item DL. When the Mcount sends a frequency, the first digit sent (leftmost) is numbered as 8. The last or rightmost digit is numbered as 1 The default setting for Display Low digit is 1 sent as DL1 . The user can change DL, increasing it by 1 digit (moving the last digit played one digit left) with a PAH of the switch. When the digits exceed 7, Mcount will "wraparound" back to 1. Yes, it is possible to setup a nonsense situation where the rightmost digit is higher in number than the leftmost digit and thus nothing is sent (other than the starting dit). Also note that the digits not sent when DL is increased are truncated, no rounding is performed on the digits being sent.

DH - after the DL menu item, Mcount will enter the Display High digit set menu item DH. The default setting for Display High digit is 8 sent as DH8 . The user can change DH, decreasing it by 1 digit (moving the first digit played one digit right) with a PAH of the switch. When the digit goes below 1, Mcount will "wraparound" back to 8.

CN - after the DH menu item, Mcount will enter the CN for Cut Numbers menu item. The default setting is Cut Numbers

oFf or CNF. The user can turn on the Cut Numbers display mode (CNN) with a PAH of the switch. PAR the switch to proceed to the next menu item or wait 12 seconds to exit the menu. The Cut Numbers are shorter versions of the normal Morse numbers where letters are substituted for the longer numbers. Here is the Cut Number table:

Number	Cut number
0	T
1	A
2	U
3	W
4	V
5	S
6	B
7	G
8	D
9	N

Note that this menu item also changes the dah separating the MHz digits from the kHz digits to a dah dah to distinguish between that and a zero (T)

CA - after the CN menu item, Mcount will play CA for CAlibrate. If the switch is PAH, Mcount will send an L and then enter an infinite loop, the only way to exit this is to turn off the Mcount. While in the infinite loop the Mcount will output a 250 kHz signal on the piezo output. The user will probably want to disconnect the piezo during calibrate since the

capacitance of the piezo will distort the output waveform so that it is unusable. The user can then either measure the 250 kHz signal with another calibrated counter or use it as a crystal calibrator against a signal source such as WWV. The yellow variable capacitor can be adjusted until the oscillator is zerobeat the harmonics of the 250 kHz signal against WWV at 5, 10 or 15 MHz or until the other calibrated counter reads 250 KHz.

O - after the C menu item, Mcount will enter the Offset mode set menu item O. The default setting for Offset model is oFf sent as OF . The user can change O, cycling through the 4 possible modes (oFf, Plus, Minus, Backwards) with a PAH of the switch. When the digit goes past B, Mcount will "wraparound" back to F. Plus indicates that Mcount will display a frequency derived by adding the measured frequency to the IF frequency set in the following menu item. Minus indicates that Mcount will display a frequency derived by subtracting the IF frequency set in the following menu item from the measured frequency. Backwards indicates that Mcount will display a frequency derived by subtracting the measured frequency from the IF frequency set in the following menu item. Note that if the P, M or B selections are made, the L menu item will be set oFf to a 0.1 second gate time. This was done to allow quick checks of frequency when the Mcount is used as a digital dial in a QRP or other ham radio. When using the Mcount as a digital dial it'll be necessary to connect the normal input to the output of the rig VFO. With some QRP rigs such as the OHR100a, this will be quite easy as a buffered source of the VFO is brought out to a connector on the back panel of the rig. With other rigs, the user may need to get out the schematic and find the best place to tap into the VFO. An additional buffer amplifier may be needed for best results.

I HM - after the O menu item, Mcount will enter the offset frequency set menu item I HM. The default setting for the first digit (Hundred Megahertz) is 0 sent as HM0 . The user can change HM, cycling through the the digits 0 to 9 with a PAH of the switch. A PAR will advance to the TM (Ten Megahertz), M (Megahertz), HK (Hundred Kilohertz), TK (Ten Kilohertz), K (Kilohertz), H (Hundred hertz) and finally T (Ten hertz). Each of these digits are set in the same way, increasing from 0 through 9 with a PAH of the switch. Mcount is preset to a frequency of 00900054 for my OHR100a 40 meter rig. Generally, the offset frequency is roughly equal to the IF (Intermediate Frequency) of the QRP rig in question modified by the audio offset frequency setting of the QRP rig. One way to calculate the correct IF frequency is to tune the rig to a station of known frequency such as W1AW. Then measure the VFO frequency of the rig using the Mcount (offset mode OFF). Then using a little arithmetic, the IF frequency can be calculated by either adding the known station frequency to the VFO frequency or by subtracting them in either of the two ways. The manual for the QRP rig should provide the details on which mixing scheme is used. A direct conversion rig may just require a small audio (usually less than 1000 Hz) offset while a superhet rig will usually be a number hundreds of kilohertz or above.

Gotchas:

The normal input of the Mcount uses a 74HC00 NAND gate as what I think of as a conformable oscillator. Without a significant input, the gate can oscillate at a rate determined by the 24k ohm feedback resistor and the stray capacitance of the circuit. One consequence of using a regular NAND gate is that it doesn't work well with low frequency (audio) sine wave signals because the slowly rising/falling waveforms can cause multiple transitions on the output of the NAND gate as

the signal passes through the switching threshold of the gate. If the gate were a normal DIP in a socket, it would be easy to replace it with a 74HC132 NAND gate with hysteresis, but since the Mcount uses an SMT part, any use of the Mcount at audio should probably be done with an external amplifier that can change the input signal into a fast rise/fall time square wave.

If the normal input is used above 50 MHz, the Mcount will NOT output a frequency, use the prescaler input for frequencies greater than 50 MHz.

For the prescaler, please note that the input 50 ohm resistor is only 1/4 watt, so don't connect the Mcount prescaler input directly to a high power source of RF.

It is normal for the prescaler to output a frequency when the input is unconnected. My prescaler does this at roughly 20 Mhz. If this bothers you, Earl, N8ERO, suggested this fix for the standalone prescaler kit which uses the same prescaler IC, add a 100 k ohm resistor across capacitor C3. This results in slightly lower sensitivity for the prescaler.

Please feel free to email with any questions, comments, suggestion or problems with this kit. My email address is: jacksonharbor@att.net

Thanks for choosing the Mcount kit and best regards,

Chuck Olson, WB9KZY

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Operating the Mcount Morse Code Counter

from Jackson Harbor Press

The **Mcount** is a frequency counter with Morse code output. It includes an on-board prescaler option to extend the counter range above the usual 50 MHz specified for PIC based counters.

To read the frequency, press and release (PAR) the switch. Mcount will then send a dit-dit to indicate the start of the gate period and follow by sending the frequency after the gate period is complete. Note that a dah is sent to separate the MHz digits from the kHz digits (two dahs are sent when cut numbers are used) and a dit is sent to separate the kHz digits and the Hz digits.

If desired, the frequency play can be stopped after the current character with a switch PAR.

The Mcount uses a one switch action/menu system. To perform an action (mainly reading out the frequency, but also moving between menu items and killing a frequency play) a PAR will perform the action. To enter a menu or change a menu item, press and hold (PAH) the switch for 2 seconds and release the switch when the piezo sends a response. In general, N means the item is oN, F means the item is oFf.

To change the current setting, PAH the switch until the Mcount sends the next setting.

PAR the switch to skip to the next menu item.

If the switch is unpressed for about 12 seconds, the Mcount will exit the menu and go to sleep.

As the menus are very long, one quick way to exit the menu is to power cycle the Mcount, (turn off the power and then turn it back on again). The settings are saved in eeprom so are unaffected when the power is turned off.

One easy way to confirm operation of the Mcount (if you have the optional prescaler)is to connect the prescaler input to