

Electro-Resales

Morse code trainer and Oscillator

Background

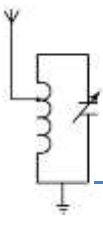
The electro-resales Morse code trainer is designed to provide those who wish to learn the code with a device that is not only a trainer but once the code is mastered can be used as a sender, by attaching a suitable paddle, additionally it can also key a transmitter. The benefit of this device is its dual functionality as both training tool and easy conversion to use in a radio transmitting station.

The following notes are designed to assist in getting the unit operational and deployed. The appendix also has a few suggestions on how the unit may be improved or modified if required.

Initial set up as trainer – Receiving Morse code

Out of the box, the unit is ready to use, requiring only a suitable power source and a speaker to become operational. The photo below identifies the key functional parts of the trainer; it is advised to take a few moments to become familiar with this.





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Power Supply needs

The trainer has an onboard 5 volt regulator that ensures that the microcomputer has a stable working voltage. The DC input jack is a center positive 2.1mm barrel jack – this is a common jack used on many of today's electronics. While the power source can be from 9 Volts to 20 volts DC, it is advised that a power supply of 12- 15 VDC is used, at a pinch a 9 VDC battery can be used, but as consumption is around 40mA, this is not a long term solution.

Audio

To be fully operational the trainer also requires a speaker to be attached. This can be a 4Ω or 8Ω speaker, and needs to be terminated with a 3.5mm jack. The output volume is fixed and quite loud, so earphones are not advised.

First time use

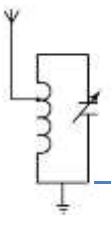
After connecting a speaker to the unit, next connect the power source. There is no on/off switch so as soon as power is supplied the unit will be ready to use.

Applying power resets the microcomputer and this is confirmed by a short beep. The 8 switch DIP selector at the lower side of the PCB is used to select the code bank desired. See the code bank table to determine which switch to activate. There are two practice banks and a selection header is just above the switch, when closed this selects the first set of practice tables and when open the second bank.

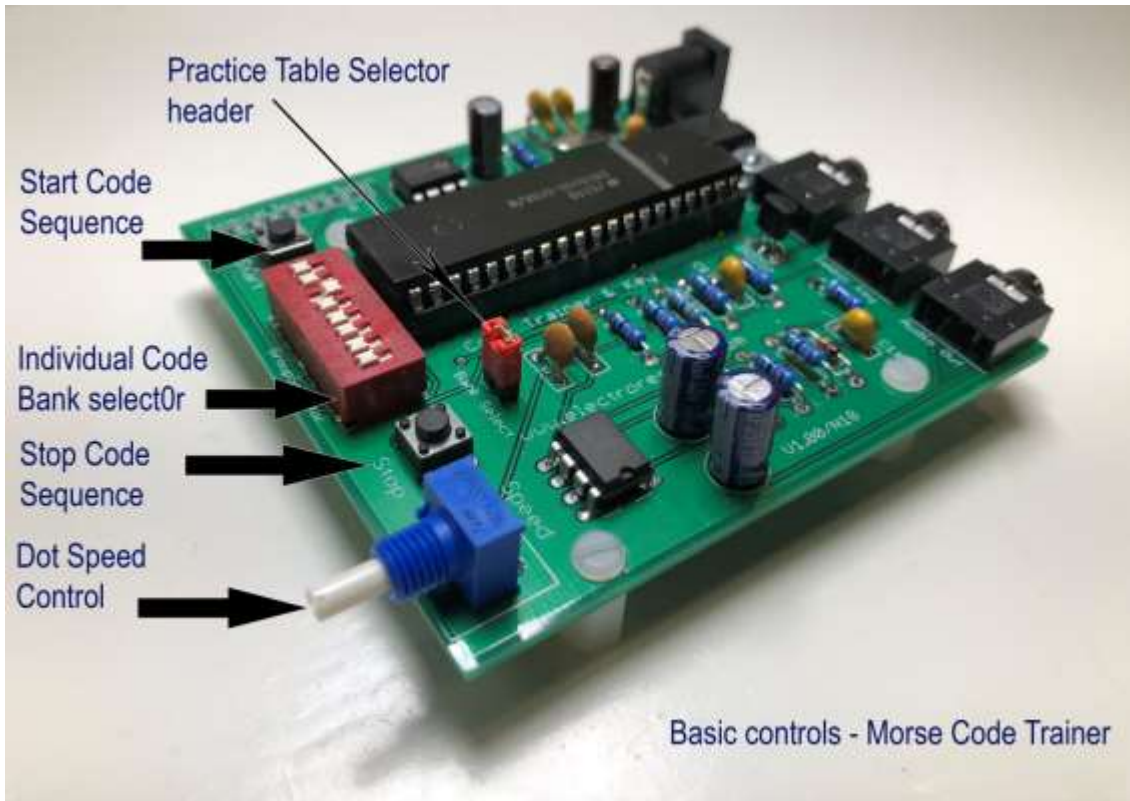
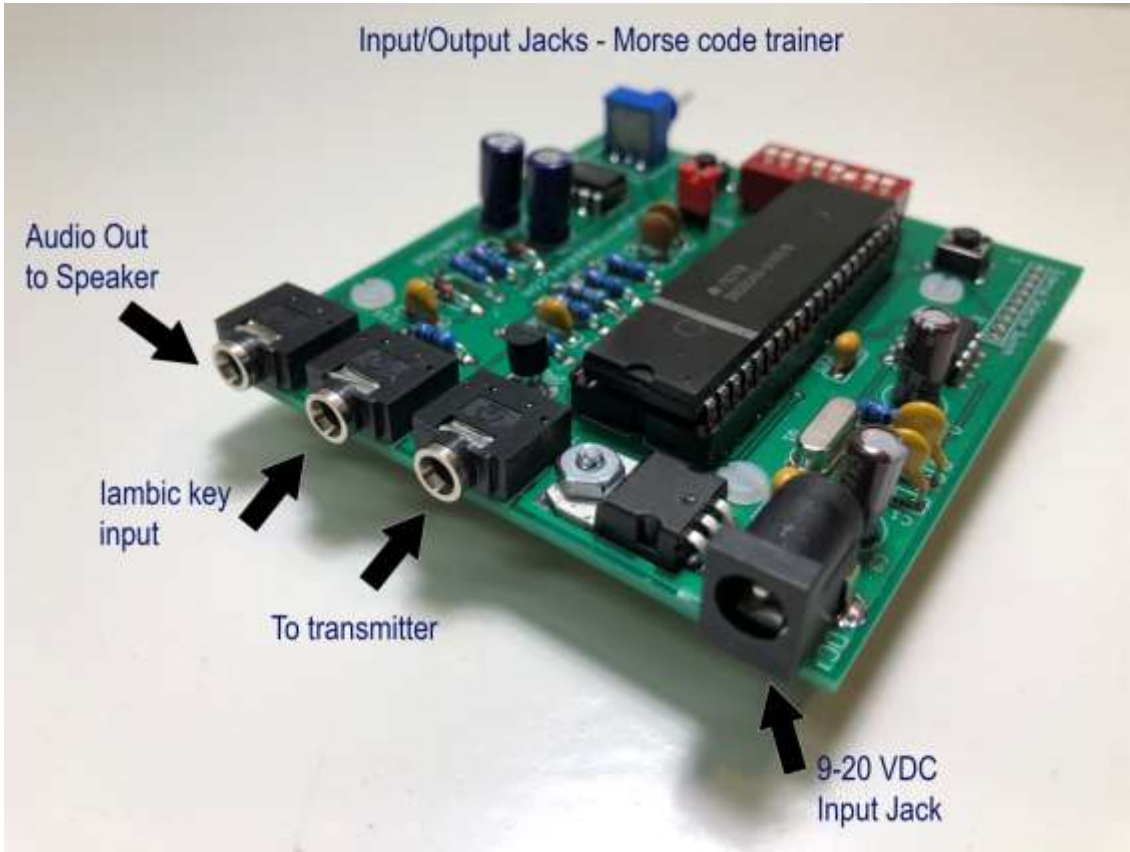
When the desired practice bank and table is known, the header is either left closed or moved to open, and one (and only one) of the dip switches is moved from the off position to the on position. To start the code playing the 'Start' button needs to be depressed; code will play after a short pause.

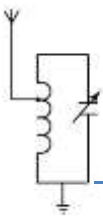
To stop the code playing and play a different bank, press the 'Stop' button for about 1 second.

How fast or slowly the code is played can be changed by use of the speed control located on the right side of the selector DIP switch. Moving this control anti-clockwise increases the code speed. To assist with initial set up the following page has photos of the jacks and various operation controls.



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Morse code tables

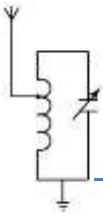
Practice bank 1 selected – Header is closed

Dip Switch	Code groups played for selected DIP switch								
1	::-"/	-(?)?	-::--	()"/,:	::--.?	?"/():	.-:--,	:(),,:	
	?"-./	()"/-?							
2	92837	46510	49628	53709	96821	13579	25680	95062	13467
	53751								
3	0:,ZO	798Q:	ZQO87	O9:,8	,OO9Z	O:78Z	ZQ8,9	,8O:Q	:9Q9O
	07ZO,	ZOQ9:	Q,9:Z	9OZ7O	QZO:9	8O7,Q			
4	J.L1P	"WPJ1	LW1."	L1JWP	.PJWL	P1"PL	1J.WW	LPJ1W	.WI1J
	J"LWP	LJWP1	".JPL	1PWJL	LJ"P1	W.1JP			
5	X;()GC	/--MXG	()XGCM	M/XM--	;C()--X	CGM--X	GXCM--	()MGX()	
	;-X/C	X/()M;	MXCGM	--X;C/	GM;/C	CXM--G	M;()X		
6	V4R2A	?3R42	A?VR3	24VA?	3A?V3	A23?3	24RAV	RRVV?	43?4A
	V?A23	RAV42	3R2V4	AVR?2	V4R2V	?RV42			
7	B-YTD	NK6BY	-KTD6	TYNKD	BKNT-	DY6D-	TBDKT	YKTND	-6KYK
	BN-TB	KYTDN	6-KYD	D6YTK	YBTND	K6NYT			
8	HEFSU	5IEUH	H5EIF	USH5H	I5SFE	EI5S5	FEIHS	SUI5F	UEFHE
	FUI5E	SIFHE	5UESH	HEFIU	FEH5I	USEFI			

Switch 1, All Punctuation

Switch 2, All Number groups

Switch 3 - 8, Mixed Groups

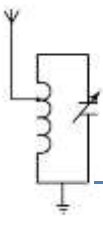


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Practice bank 2 selected – Header is open

DIP Switch	Code groups played for selected DIP switch			
1	E?LTZ	I2WN()	SVPD7	JOT1A
	H3BCJ	654.X	KUAIO	YFR”M
	,GVK9	A;JQ--	/80EL	:-ZBI
	EBLWP	B4ARV	J0Z?2	V35UF
	G;8-E	ISH6K	Y,A/:	XLCQP
	V2FEK	:J--DK	WR?U-	6/79N
	“LAZ5	8HAM()	T1B40	3;S,Z
	O1.EB	JVGIY		
2	Z7O098:Q			
3	LWPJ1.”			
4	()C;X/--MG			
5	?2V34AR			
6	TNDB6-KY			
7	EISH5UF			

Switch 1 is suggested for use as a CW Test option due to its large & varied table contents including the complete alphabet and numerals 0-9 + punctuation.



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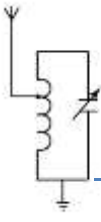
Initial set up – Sending Morse

As mentioned at the start of this document, the trainer has several uses beyond teaching morse code by reception. By adding a typical iambic paddle to the trainer, and following these steps the trainer becomes an iambic key oscillator.

In this photo a key has been added, it is connected to the trainer by means of a stereo audio cable terminated at one end in a stereo 3.5mm jack. The trainer is set up so that the dash paddle is connected to the tip, while the dot paddle is connected to the ring of the cable/jack. Typically cables of this type use a red inner wire to denote the tip connection, and a white cable for the ring. The shield or ground is the paddle common. A set up like this is taken as the 'standard configuration' if a reverse configuration is desired, this is achieved by reversing the wires.

To set the trainer in send mode, unplug the power cord, ensure all the DIP switches are in the OFF position and remove the bank select header. Reconnect the power cord, after the unit beeps, indicating it has reset, press the 'Start' button and the unit is now ready to send Morse.





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Use with a transmitter

The unit when set to use a paddle for sending practice, may also be used to send Morse over the air. The port marked TX on the PCB may be connected to the transmit jack on a transmitter to key the transmitter. The connection is a simple low voltage transistor switch, so is only suitable for low voltage switching, and is not suited to tube (valve) transmitters.

The exact connection on the transmitter will be determined by the transmitter make and the user manual for the transmitter should be consulted for details on this connection. The transmitter may also need to be set to disable any internal Keyer that may be installed. Again the user manual should be consulted on how to achieve this.

Speed control

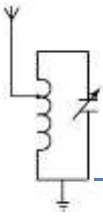
How fast or slow the Morse code is sent is determined by the setting of the speed control pot. The speed of sending is between 5 WPM and over 30 WPM. As the control is not calibrated a little ingenuity is needed to determine the speed of received code.

With the speed control set to a comfortable speed, and the trainer set up in send mode with paddle attached, count the number of dots sent per second or known period of time, then use this formula to determine speed:

2.4 x dots/second.

For example 2 dots counted/second = $2 \times 2.4 = 4.8$ WPM (~5 WPM)

12 wpm would be 5 dots counted per second.



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Modification possibilities

1. Audio out tone control

The unit as provided has an approx. 500Hz tone, while this may be acceptable to many; often a different tone is desired. By changing R8 from the fixed resistor to a variable resistor. A value of 22K Linear track will allow the tone to be varied from around 400Hz to 900 Hz.

2. Add a rotary selector switch

As provided the unit uses a built in dip switch array to control which code bank is selected for play. As a bare PCB this is convenient, however, if the unit is to be cased or included in another unit this may not work. A set of solder pads have been provided on the edge of the PCB to allow a rotary switch to be added to the unit.

3. Use a rotary switch for speed control

To gain better control over the speed of the Morse code played, the rotary pot. could be replaced with a rotary switch that switches in fixed resistors. This would allow the RC time constant of the Dot clock to be determined more accurately.