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## "Nighthawk" telegraph transceiver

Kit Instructions **V3.1**

a brief introduction

"Nighthawk" telegraph original design from abroad, developed by the famous SWL-lab, which uses a typical heterodyne circuit, With high sensitivity and low noise, etc., a classic model, once published in the "Radio" magazine, much domestic technology School HAM favorite.

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"Suite Home" was carried out of the transformation products, improvements are as follows:

- 1, add 12F629 microcontroller, supports automatic key support spontaneous call sign, there is a local sidetone
  - 2, received by the potentiometer directly to the diode attenuation Attenuation avoid radio signal interference due to long lead wires, with No potentiometer adjustment murmur
  - 3, the RF transmitter to 2SC1970 promote, RD15HVF1 single tube 10W output, increasing the power output (original Design is only 3-5W)
  - 4, the transceiver is switched by the relay to complete, better isolation transceiver circuit, but with a transmitter delay control circuit, avoid followin Electrical switching frequency
  - 5, is received by the low-pass filter to better bandpass filters (two in the week parallel resonant circuit frequency selection)
  - 6, the vibration of the 3MHz VFO to 11.0592MHz the VXO, greatly improving the stability of the oscillator, while Heterodyne low as superheterodyne architecture.
- Kit developed by the restaurant, combined with the actual usage, after repeated debugging before the formation of the current version. This article describes the hardware version for V3.0, the board name YEYING\_3.

## MAIN INDICATORS

Power: 12V (recommended linear power supply)  
 Antenna: 50 ohm, unbalanced  
 Typical receives current: about 100-120mA  
 Typical Emission current: approximately 1.8A  
 Transmit power: 10W  
 Frequency: covering approximately 7.000-7.040MHz  
 Working Mode: CW

## Circuit principle

See the last page of this document to the drawings, the signal coming from the antenna first through T7, T8 band pass filter circuit processing, the signal, and then by D8, D9 ESC attenuator consisting of the signal amplitude proper treatment, send U4 for mixing. Electric Road in Q3 and the peripheral circuits do this vibration frequency of about 11.000-11.040MHz, which is higher than the frequency of the received signal Receive and transmit signals for use. In U4, and after receiving the signal and local oscillator mixer, 4MHz IF signal output to Y2, Y3, Y4 crystal filter composed of this crystal filter passband narrower, excellent performance, the IF signal is then filtered to U3 for mixing, this mixer LO signals directly generated from the NE602, higher than the IF signal of about 800Hz, so mixing Signal after about 800Hz, and then after the audio amplification and filtering to give the headset.

Emitting portion controlled by a microcontroller to do keying, by controlling the Q8 conduction to start power amplifier. Transmitting a signal from the Q3, after U9 mixer, the output RF signal. The LO signal U5 directly using the internal oscillator, the oscillation frequency of 4MHz, After mixing the output 7.000-7.040MHz signal and then through Q6, Q4, Q5 post power amplifier output low-pass filter network Network.

Muting circuit circuit Q1 constituted at the time of launch for the closing reception tone, while the PIC12F629 internal timer Audio oscillator constituted generate sidetone output to the headset, the headset following the go-ahead to produce "Didi blah" audio.

## Component Selection

The kit contains two ring: NXO-100 and T50-2, where NXO-100 skin color is black, T50-2 as Red, do not misjudge when wound.

T5, T6 is 1: 4 transmission line transformer, using a 0.5 mm enamelled in ferrite ring NXO-100 (black) on Line double hinge line and around 5 laps (see below), then a coil head and a tail connection.

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T4 is the high-frequency transformer, using 0.5 mm wire were wound around a ferrite ring NXO-100 (black), and Junior 12 laps, 10 laps secondary. T2 primary and secondary in the direction of the PCB as shown below, PRI is the primary, SEC is Secondary.

L2, L3 are magnetic inductance, using 0.5 mm enameled wire around the 14 laps in T50-2 toroid core of iron (red) on.  
All of the high-frequency capacitance is less than 1000pF tiles, more than 1uF of capacitance electrolytic capacitors, all resistance is 1 / 4W 5% Fixed resistor.

Note: If you need better performance, you can use self-test 4.000MHz crystal related equipment, the selection of which frequency Close to three crystal filters used.

#### Production testing

Before you install all the components first of all transistors, resistors, capacitors with a multimeter test again. Then the control circuit diagram and Logo PCB board to install all components. General compliance with low-to-high order installation, welding complete welding must check Tin shorted. **Because the kit has MOS FET, in order to prevent electrostatic breakdown, should be properly grounded soldering iron or iron off** Power tube with heat welding MOS. While giving integrated circuit mounted socket, which can effectively prevent the core of the integrated circuit Bad welding. Everything is in order, check and correct polarity connected to the power supply, the power supply must not be connected correctly.

Note: L6 is the same as in the weeks and 7x7 dimensions, but the bottom is no capacitor, please check carefully, not welded wrong!  
Specific Image reference element list.

Note: Q4 must install insulation gaskets and insulation pads! When debugging must be installed heatsink!

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This machine supporting the power plug requirements are as follows:

#### Commissioning steps:

1, welding assembly is complete, the power, the relay will hear a "click" suck chorus, then a few seconds to release.  
When the indicator light the extension

2. Adjust W3, the unit receives quiescent current control in about 100mA-130mA, not too big, to avoid static electricity Road consumption, nor too small, will cause the output power becomes weaker.

3, W2 counter-clockwise in the end, no sense of screwdriver adjustment using L6, while using local oscillation frequency frequency meter test circuit

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Note: Due to superVXO circuit can not be unlimited drop-down frequency, adjust the L6, the side with the headphones to listen to, if there is self-e Sound, pull down too much, then put L6 core outward turn out, reduce the inductance to reduce the drop-down.

After several tests the machine can be pulled down to around 11.000.

When using a local oscillator frequency meter test, **pay attention to the signal input frequency of about 10p a series about a small capacitance**, the lower the better. To avoid affecting the local oscillator frequency.

After the lower limit frequency is determined, then W2 clockwise in the end, and then test the vibration frequency is 11.040MHz, while fine Adjust L6, to ensure that the upper and lower tone W2 when the vibration frequency coverage 11.000-11.040MHz.

4. After adjusting the local oscillator, coupled to the receiver antenna, or signal source. Adjusting W2, the headset signal appears, then Iteratively adjusting T1, T7, T8, so that the maximum amplitude of the signal. OK After adjusting CX1, best sound quality (high-frequency 800Hz,

You can also use the frequency meter test U3 7 feet, to ensure that the oscillation frequency of 4.000800MHz).

Because T1, T7, T8 need to ensure a certain flatness in the passband, may require multiple trimming Amateur conditions, do not rush Once adjustment is completed.

5, adjusting the transmitter can be connected dummy load, while using an oscilloscope or standing tables, etc. to test the power of the instrument, st After adjusting the CX2, to ensure the 7 foot frequency U5 is 4.000000MHz.

6, then adjust T2, T3, while observing the power or voltage dummy load on the maximum you can. Adjustment process Changing W2, in the regulation of T2, T3, ensure that the output power within a relatively flat frequency coverage.

So far, the Nighthawk debugging basically completed, is to be noted amateur conditions may be less tool, but to ensure the use of false launch load! Avoid power tube damage!

#### Instructions

Because this machine is a superheterodyne machine, interference, selectivity performance is outstanding, using the full length of the half-wave dip General conditions communication distance of around 1,000 km security, the greater the distance depends on the propagation environment and operator

#### Chassis installation

The board can be easily placed in a size of 97mm \* 40mm \* 120mm standard aluminum chassis (**this kit does not contain** This case, if necessary, please purchase yourself) in.

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Insulation washers and grommet please use TO220 supporting the use, refer to the following figure:

#### Auto keys / manual key conversion

This circuit has an automatic identification automatic key and manual key function, as long as the manual linkage to mono plugs or press Figure The intermediate ring and below ground to the stereo plug along, turn on the power PIC12F629 microcontroller can be inserted according to The key to automatically detect. Note: The manual mode does not support callsign key input, automatic calling and configuration. Key plug wiring diagram

#### Automatic Call

Short press the SW button immediately released, the machine automatically call "CQ CQ CQ DE callsign callsign callsign PSE K" Again.

#### Code speed adjustment

Press the SW button and hold for about 3 seconds after the headset to hear the first "Da Dada" function tone, then release the SW key, listen After "Didi" tone within 3 seconds (without input automatically exit after three seconds, and keep the original speed) will automatically key Paddles allocated to "draw" leads to code quicker, or allocated to the "point" leads to code speed slows down.

Hear "beep" after the time you can continue to dial Fixed-point plan to the appropriate speed can, after the transfer is not appropriate button, wait for about three seconds later, I heard the "beep beep" you Frequency adjustment

Press the SW button and hold for about three seconds after hearing the first "Da Dada" feature sound, then do not release the SW key, another 3 seconds later heard a second, "Da Dada", then release the SW key. Hear "beep" tone after 3 seconds (without input 3 seconds will automatically exit, and keep the original speed) will automatically dial key paddles to "draw" leads to increased frequency, or call the "pc Resulting in lower frequencies.

Hear "beep" after the time you can continue to toggle dashed to the appropriate frequency can be, do not follow the right tone after

#### Callsign input

Press the SW button and hold for about three seconds after hearing the first "Da Dada" feature sound, then do not release the SW key, another

3 seconds later heard a second, "Da Dada", then still release SW key, another three seconds after hearing the third "Da Dada", this When you release the key to enter the callsign SW configuration mode.

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Callsign entered this way:

Wait for the tone "Didi", according to the first character of the callsign Morse code was the first point or draw, the corresponding flip Key point or draw. After hearing the second "beep" tone, and then struck the first character of the second point or draw, followed by transport After the first character of the points program, we will continue to hear the "beep" tone, this time not to enter dashed. Over three seconds later, again Times have you heard "beep" tone, then you can enter the first point of the second character program.

That is to hear a "beep" tone between the first and the second character after character, but not the keys! Losers When the call sign, hear and do not last a dial tone, over three seconds will issue a "Didi tick" End configuration.

When the configuration is written because internal **EEPROM** microcontroller takes time, do not configure freely down to avoid misuse. with If configuration errors do not panic, again according to the process input configuration.

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Member list		
1 / 4W fixed resistors		
R1, R29, R35, R37	4.7K	
R2, R5, R12, R41	1M	
R3, R6, R24, R25, R30, R39, R42	10K	
R4, R14, R18	22K	
R7	470	
R8, R9, R11	510K	
R10, R13, R26, R27, R36	10	
R15	51	
R16, R19	220	
R17, R21	330 / 1W	
R20, R31, R32, R33, R34, R38 , R40	1K	
R22	1.5K	
R23	100K	
R28	120	
Variable resistor		
W1, W2	10K (103)	
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W3	10K (103)	
Beads, inductors, transformers		
T1, T2, T3, T7, T8	7x7-7MHz	Bottom capacitor
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T4, T5, T6	NXO-100 ring	

L1, L5

22uH

Color ring inductance

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L2, L3

T50-2

L4

100uH

Color ring inductance

L6

7x7

No capacitor bottom

Z1, Z2, Z3

Line Beads

Ceramic capacitors

C1

820p (821)

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C2, C20, C36, C42, C47, C49,  
C54, C55, C56

0.01uF (103)

C3, C9, C12, C15, C16, C17,  
C21, C23, C24, C25, C26, C29  
, C30, C32, C33, C34, C35, C3  
7, C40, C43, C46, C48, C57, C  
58, C59, C60

0.1uF (104)

C4

2200pF (222)

C5

0.033uF (333)

C6, C7, C10, C13, C18, C19,

150p

C53  
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C8, C11, C14, C22, C28, C31,  
C45

47p

C27

220p

C38, C44

1000pF (102)

C39, C41

470p

C50, C52

27p

C51

2p

Electrolytic capacitors

CP1, CP6, CP10, CP11, CP12,

100uF / 25V

CP13

CP2, CP7

10uF / 25V

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CP3, CP4, CP5, CP8, CP9 CP14, CP15	470uF / 25V 1uF / 50V Variable capacitance	
CX1, CX2	5 / 20p	
	Transistor	
D1, D2, D4, D5, D6, D8, D9, D10, D11	1N4148	
D3	1SV149	
		Please insert the board by screen printing direction
D7	1N4001	
LED1	3mm color LED	
Q1, Q7	2SK30A	
Q2	8050	
Q3	9018	
Q4	2SC1970	
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Q5	RD15HVF1	
Q6	2SC3355	
Q8	B772	
Q9	8550	
	switch	
mykits.taobao.com	Push button	
	integrated circuit	
U1	4558 (DIP8)	With IC socket
U2	7808 (TO220)	
U3, U4, U5	NE602 (DIP8)	With IC socket
U6	PIC12F629 (DIP8)	With IC socket
U7	78L05 (TO92)	
	Crystals	
Y1, Y2, Y3, Y4, Y5	4.000MHz	
Y6, Y7	11.0592MHz	
	Other elements	

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J2	BNC (Q9) socket	
J4	Power outlet	
J1	3.5mm stereo jack	SPK (insert earphone)



J3	3.5mm stereo jack	KEY (insert key)
K1	HK4100F-9V Relay	
	PCB circuit board × 1片	
	0.51mm diameter wire section	
	A heat sink, fixing nut four, insulation pads and one each grommet	

Please check whether the device has missing after receipt, have questions, please contact restaurant.

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Identification color ring resistance and ceramic capacitors

Color ring resistance, the most common are 5% and 1% precision accuracy, of which 5% accuracy of four color rings, 1% accuracy of 5 Color ring, reads as follows:

Ceramic capacitor capacitance generally pF (10<sup>th</sup> -12 F) as a unit, some products using direct labeling, such as 1000p, 220p, etc; more exponential notation, such as 102,221, the first two digits are significant figures of capacitance, the latter Median number of zeros added later, such as the number 102 represents the effective representation is 10,2 back Adds 2 0, namely 1000pF; 221 Represents the effective number of 22.1 represents a 0 behind Adds that 220pF.

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Flag 62, namely 62pF

Marked 102, which 1000pF

Polar electrolytic capacitors

Electrolytic capacitors have polarity, make sure that the positive and negative correspond to the PCB board when you insert the correct installation, wrong

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Magnetic coil turns identification

The figure is the number of turns of the coil magnetic determination method is only used to guide the identification number of turns:

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This turns 12 laps, while paying attention to the coil should be evenly distributed around the magnetic ring.

Identification IC's

8-pin DIP pin arrangement

20-pin DIP pin arrangement

Identification of the transistor

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