

10 Really Basic Transistor Experiments

ELECTRONICS ILLUSTRATED

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MARCH 1968 - 50¢

**Build This Bare-Essentials
Ham Transmitter for Under \$10!**



Build a UniFET Preamp for CB

How to Log 25 Great Cities

The ABCs of Good Record Care

Build a 2-Tube for 2 Meters

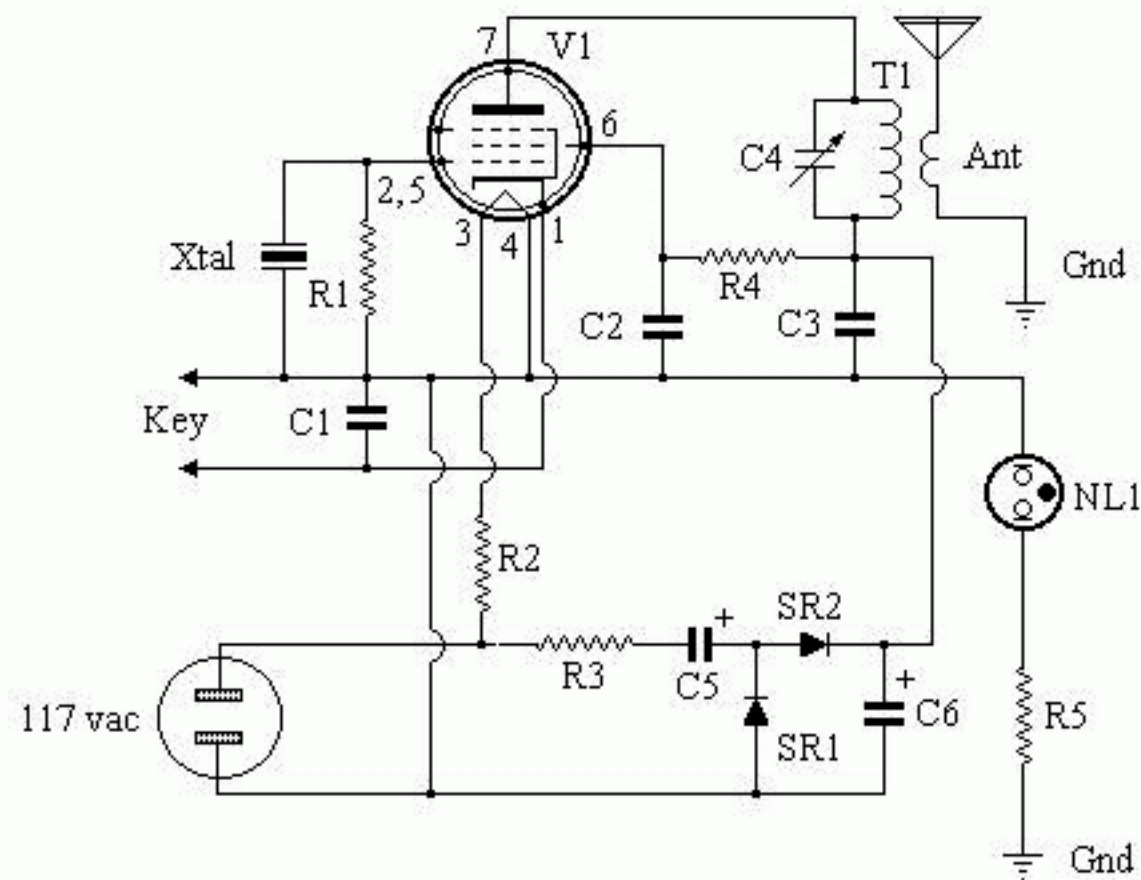
Easy Printed-Circuit Servicing



Bare-Essentials Transmitter

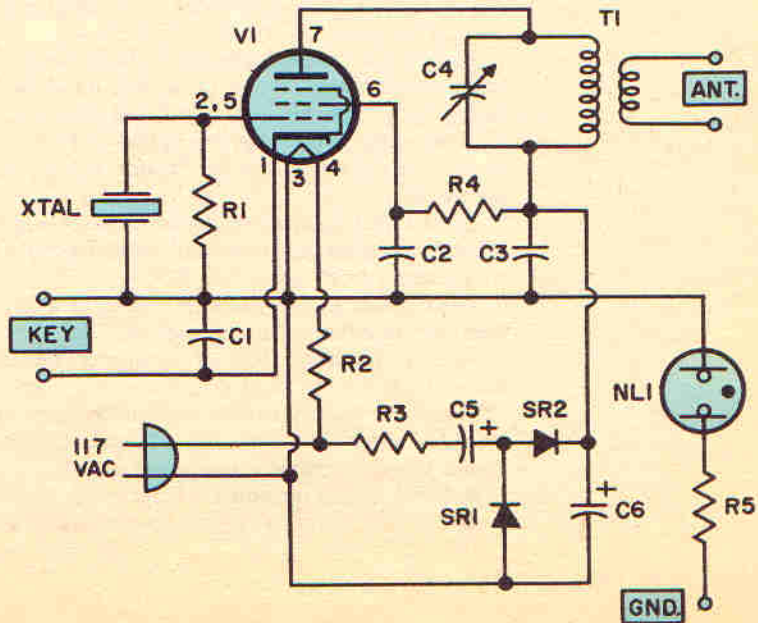


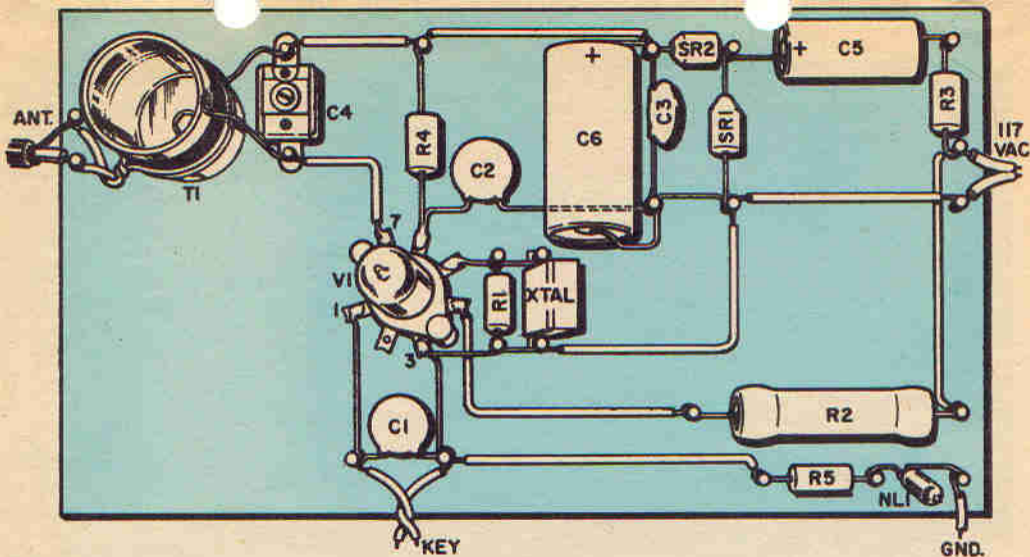
Bare - Essentials Transmitter



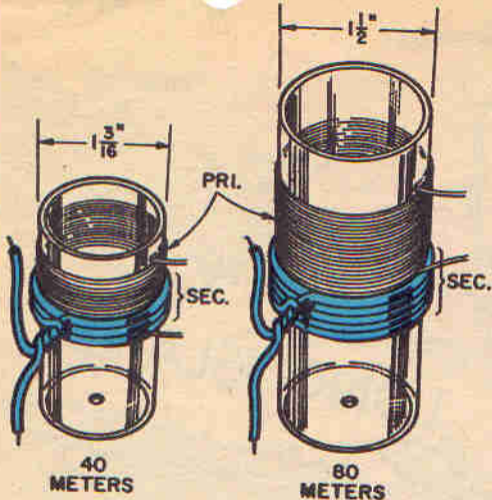
- C1 , C3 - .005 uF / 1000 v CD
 - C2 - .01 uF / 1000 v CD
 - C4 - 2 - 30 pF trimmer
 - C5 - 40 uF / 150 v Elect.
 - C6 - 40 pF / 450 v Elect.
 - NL1 - NE-2 Neon Lamp
 - R1 , R5 - 100k 1/2 w
 - R2 - 400 ohm / 20 w wire
 - R3 - 10 ohm / 1 w
 - R4 - 10k / 1 w
 - SR1 , SR2 - 400v PIV 750 mA
 - T1 - 80 M.: 45t. #24, 1.5" dia
- 40 M.: 23t. #24, 1.25" dia
 - Ant: - 80M.: 4t #20, over T1
- 40M.: 3t #20, over T1
 - V1 - 50C5
 - Xtal - 40 or 80M crystal
- Plastic pill vials, 10 x 6" wood board, finish nails, 7 pin tube socket, AC power cord.

Transmitter schematic. Power supply is a voltage doubler whose output is about 350 V. Output circuit is inductive-link type. Purpose of NL1 is to warn you if AC plug is inserted incorrectly. Be sure to connect R5 to water-pipe ground. If NL1 lights, reverse the plug.





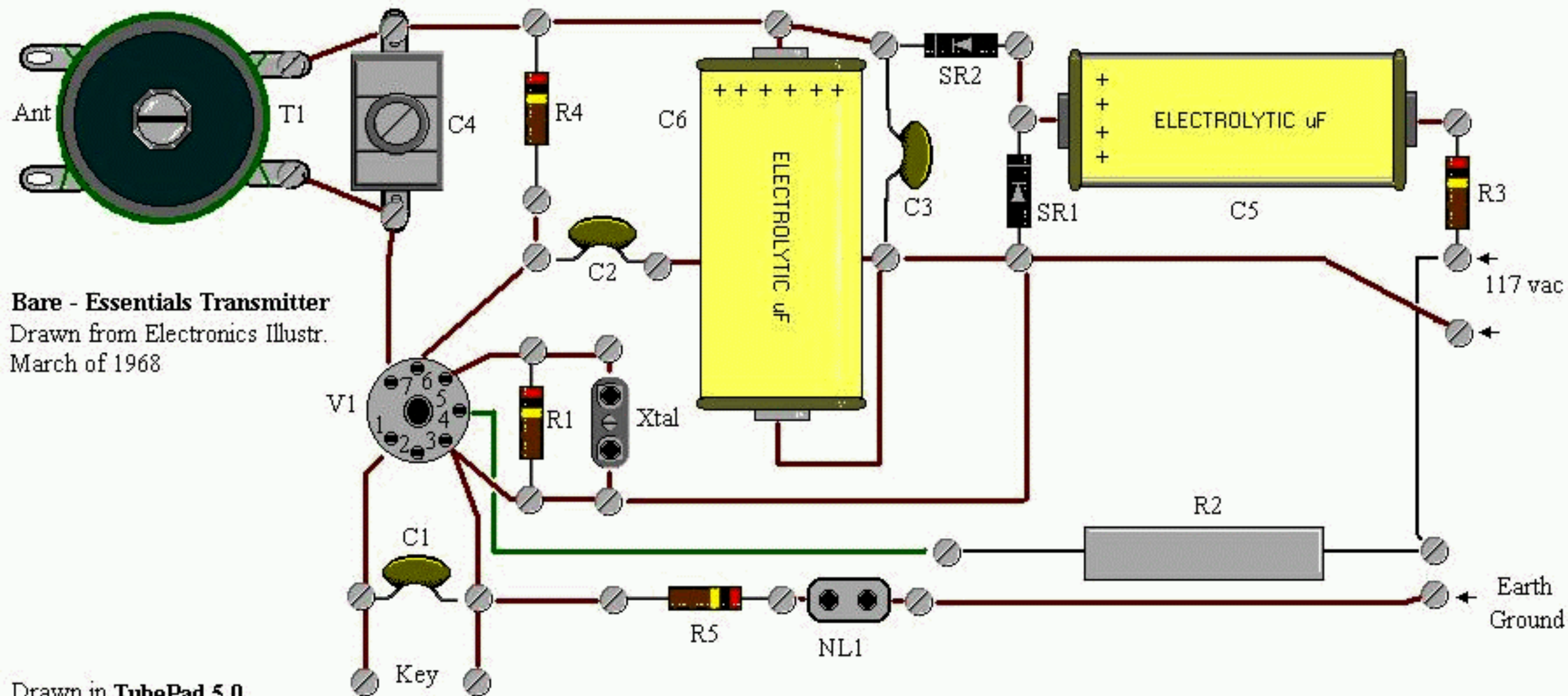
Our model, built on 6 x 10 x 3/4-in.-thick piece of pine, has 23 finishing-nail tie points. V1's socket sits on 3/8-in. spacers; carpet tacks hold it in place. Contacts from discarded tube socket hold crystal.



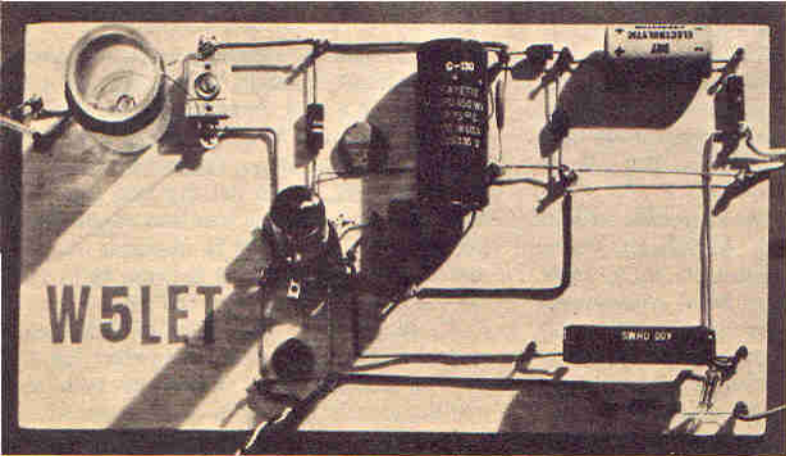
Coils. Our 40-meter coil was wound on 1 3/16-in.-dia. plastic pill bottle; however, 1 1/4 in. would do. Primary is 1/2-in. wide; 80-meter primary is 1 1/8 in.

PARTS LIST

- C1,C3—.005 μ f, 1,000 V ceramic disc capacitor
- C2—.01 μ f, 1,000 V ceramic disc capacitor
- C4—2-30 μ mf trimmer capacitor
- C5—40 μ f, 150 V electrolytic capacitor
- C6—40 μ f, 450 V electrolytic capacitor
- NL1—NE-2 neon lamp
- R1,R5—100,000 ohm, 1/2 watt, 10% resistor
- R2—400 ohm, 20 watt wirewound resistor
- R3—10 ohm, 1 watt, 10% resistor
- R4—10,000 ohm, 1 watt, 10% resistor
- SR1,SR2—Silicon rectifier, 400 PIV, 750 ma
- T1—Transformer; 40- and 80-meter primaries wound of No. 24 enameled wire; secondaries wound of No. 20 solid hookup wire (see text)
- V1—50C5 tube
- Xtal.—40- or 80-meter crystal
- Misc.—plastic pill bottles (see text), 10 x 6 x 3/4-in.-thick piece of wood, finishing nails, 7-pin tube socket, AC cord



Bare - Essentials Transmitter
 Drawn from Electronics Illustr.
 March of 1968



Ready to go on the air. Layout is wide open; there should be no construction problems. Power supply is in upper right corner, neon lamp and current-limiting resistor R5 are in lower-right corner. Lugs of trimmer capacitor C4 are soldered to heads of finishing nails. T1 (upper left) is screwed to board.

ELECTRONICS ILLUSTRATED Bare-Essentials Transmitter

MARCH 1968

By JIM WHITE, W5LET

EVERYBODY talks about inflation these days. According to the experts, we're spending too much and driving the price of everything sky high. Washington now threatens us with higher taxes to stop our spree.

But for hams on a budget there's a way to have your cake and fight inflation, too. You do spend a little of the green stuff but it won't make much of a dent in your wallet or the national economy. The way out: our Bare-Essentials Transmitter. This little 40- and 80-meter rig takes the prize as the anti-inflationary CW transmitter of the year. You spend only \$7 to get it on the air.

There's no chassis. The rig is built on a piece of wood--any kind, like the end of an orange crate, will do. And for tie points you use finishing nails. The 50C5 (or a 50L6) tube can be salvaged from an old AC/DC radio. You'll have to spend 11¢ for a tube socket but you won't have to buy a socket for the crystal.

Its not fancy but it packs a wallop for its price.

Used with a mediocre antenna, it has worked stations all over the U.S.

When conditions are right and with a good antenna there is no reason why it can't work some real DX.

The Circuit: The transmitter consist of a 50C5 crystal oscillator, which operates on either 40 or 80 meters, Since the 50C5 has a 50-V filament it uses a 400-ohm 20-watt dropping resistor instead of a filament transformer.

The power supply for the plate and screen voltages is a doubler which provides about 350 VDC. Two capacitors, two silicon rectifiers and a 1-watt resistor complete the power supply.

Building The Transmitter: First thing is the chassis, which is simply a 10 x 6 x 3/4 -in.-thick piece of wood. Take a close look at the pictorial to see where each part goes. The tube socket is mounted on short spacers so that its lugs clear the wood.

Image 301.jpg and 302.jpg

The rest of the parts are soldered to finishing nails in the board. The power-supply components are located in the upper right comer of the board.

There is no power switch so the AC leads go directly to the nails.

Nails again are used for connecting points for the antenna and for the key.

Another nail, located at the lower right of the board is for a ground connection

for neon lamp NL1. If the AC plug is in the wrong way, the hot side of the line will be connected to the key. This will mean that 117 V exists from the key to ground, enough to cause a severe shock. However, if the plug is reversed, the ground side of the AC line will be connected to the key circuit and a shock hazard will not exist.

By connecting a water-pipe ground to the nail, the neon lamp will light if the AC plug is in the wrong way. Observe carefully the polarity of the silicon rectifiers and the electrolytics.

The coils are wound on plastic pill bottles. The 80 meter coil is wound on a 1 1/2 in. dia. x 3 1/2 in. long bottle. The 40-meter coil is wound on a 1 3/16 or 1 1/4 in. dia. x 2 in. long bottle. First drill a small hole in the bottom of each of the bottles for the mounting screw.

The plate winding (primary) for the 80-meter coil is 45 turns of No. 24 enameled wire, closewound. The 40-meter primary is 23 turns of No. 24 enameled wire also closewound. Both secondaries are No. 20 solid hookup wire: the 80 meter is four turns, the 40 meter three turns.

Before winding the primaries drill four small holes (two at the top and two at the bottom of the primary winding) in each form. Then thread the ends of the primary wire through these holes.

The secondaries are wound over the primary coils and are held in place by twisting the ends together as shown in the coil pictorial(Image 311.jpg)

Image 312.jpg

On The Air: After mounting a coil mount and connect its four leads, then check your work once more. If you're going to work 40, plug a 40-meter crystal into its pin connectors. Plug in the tube, connect an antenna(using 50-ohm coax) to the antenna nails and a key to the key nails. Be sure that you have a water-pipe ground connected to NL1.

Now plug in the transmitter. If NL1 glows, reverse the AC plug. Wait about 30 seconds for VI's filament to reach operating temperature and press the key. Quickly adjust C4 until oscillation starts. Oscillation can be determined by listening to a receiver tuned to the crystal frequency. Or hold a neon lamp against the plate transformer. If the transmitter is working the lamp will glow. Adjust C4. When the lamp glows at maximum brilliance, tuning is correct.

In loading the transmitter into an antenna some adjustment of T1's secondary may be necessary. Closer coupling can be achieved by moving the coil higher up over the primary winding. An input of about 50 ma at about 350 V (17.5 watts) is about right. Do not operate the transmitter without an antenna because this may cause C4 to break down if the key is held down for an extended period of time.-*-

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From: Gary Johanson <wd4nka@juno.com>

To: glowbugs@piobaire.mines.uidaho.edu
Date: Tue, 26 Dec 2000 13:47:07 -0500
Subject: GB> 50C5 Transmitter

Hi, Gang:
Trusting the Holidays are fareing well for you.

I came across an old article mentioned some years ago in a nostalgia review of it in the "World of Ideas" column of CQ mag. The author was waxing nostalgic over classic transmitter projects of the 1960's, and mentioned W5LETs article, the "Bare-Essentials" transmitter. I had cut this piece from a March edition of Electronics Illustrated back in 1968 and kept it folded up in my old Ameco book for years. I pulled it out and re-drew the schematics and cadded up a quick illustration of the layout. It was originally built on a pine board. It is transformerless with a neon current-warning light added for protection. It used a 50C5 tube, which was pretty "garden-variety" in the all-american 5-tuber.

If anyone is interested in it, (and happens to have a pile of 50C5s or 50L6s on hand from old table-tops,) let me know. I'll e-mail it direct.

This article is largely word-for-word transcription with some wise-cracks from yours truly, and a re-edited tuning explanation. But one look at the schematic and you will recognise it as the old, ubiquitous one-tube crystal-cracker, and the text is non-revelational.

It is e-mailable in a zip file, (or however Juno bundles these multi-files) and plays on any .bmp viewer like Paint (TubePad). Text is in window's on-board Wordpad.

vy 73
gary // wd4nka
" . . . who forgets the past forfeits the future . . ."

=====
From: EZela57383@aol.com
To: wd4nka@juno.com, glowbugs@piobaire.mines.uidaho.edu
Date: Wed, 27 Dec 2000 20:44:52 EST

Subject: Re: GB> 50C5 Transmitter

I built that rig when the article first was published, and a second time when I had to present a demonstration in one of my electronics classes. Just be careful, obviously, as 350VDC+ is present on those nail tie points! The rig does work and I was able to make some contacts....but don't expect the note to be a '9'.

Good Luck

KA8GEF

Emil

=====
From: Gary G Johanson <wd4nka@juno.com>
To: EZela57383@aol.com
Cc: glowbugs@piobaire.mines.uidaho.edu
Date: Thu, 28 Dec 2000 23:53:11 -0500
Subject: Re: GB> 50C5 Transmitter

Hi, Emil and gruppe:

I am not surprised that there would be some ripple on the note. I do remember, on that wireless phono oscillator upon which i began my short pirate career, which was also transformerless, using a 35W4 rectifier and, i think, a 50C5 oscillator, had no trace of any line noise or ripple. Of course, it didn't have to buck so much voltage down for the filament, either. Only had to drop 30 volts. Not a whole lot of current, either, for 100 mW. I never knew what IT'S plate voltage was, but i would guess it was 100v. I don't remember 2 caps for a doubler. I think the plates were wired together as a single diode and served as a half-wave rectifier.

The thing i thought might be of some unique value is the power supply's neon hot-line warning light. I know if i ever go transformerless, that is ONE feature i will be sure to incorporate. I'd still float the chassis and make provision to avoid the metal, but it is nice to know the thing isn't gonna bite. Maybe.

I have another transmitter project tucked away that is similar to this one, only using the not-so-garden variety 117L6 . Not an expensive tube yet, but not one found in the good ol' all American 5'er. But, a

lot easier on the heat i bet. No huge hi-watt dropping resistor for the filament. Run the filaments in parallel with the B+ with lots of de-coupling caps and RF chokes and have DC on the filament. Bet there's a lot of interesting arrangements you can make with one of those tubes.

vy 73
gary // wd4nka

=====
From: "Mike Silva" <mjsilva@jps.net>
To: <glowbugs@piobaire.mines.uidaho.edu>
Date: Thu, 28 Dec 2000 23:47:55 -0800
Subject: Re: GB> 50C5 Transmitter

FWIW, the 85V dropped by a 50C5 / 35W4 combination is exactly the effective voltage you get by half-wave rectifying the 120V line. The benefit is the lack of heat dropped in a resistor, not to mention that 1N400Xs are a lot cheaper and more available than the proper dropping resistor.

Given the ample cathodes of the 50C5s and 50L6s, two of them would probably do fine splitting 85V between them in either a MOPA or Jones rig. (Easier, though, to just use a 35C5 or 35L6 osc. in the MOPA)

BTW, you didn't really mean 117L6, did you? Never saw that one, but it would be kinda nice if it existed!

73,
Mike, KK6GM

=====
From: Gary Johanson <wd4nka@juno.com>
To: mjsilva@jps.net
Cc: glowbugs@piobaire.mines.uidaho.edu
Date: Fri, 29 Dec 2000 08:05:54 -0500
Subject: Re: GB> 50C5 Transmitter

Mike:
I downloaded the mail at the clinic, but if it isnt a 117L6, it is something like that. It is a pentode or tetrode with a 117v filament, and the designation is such (117)
I need to look it up when i get home tonight.

vy 73
gary // wd4nka

From: N2EY@aol.com
To: wd4nka@juno.com, mjsilva@jps.net
Cc: glowbugs@piobaire.mines.uidaho.edu
Date: Fri, 29 Dec 2000 10:27:34 EST
Subject: Re: GB> 50C5 Transmitter

Probably the 117L7GT, one of a small family of octal tubes with 117 volt heaters. They are all rectifier/power pentode dual tubes. I think they were meant for AC-DC phonographs and phono oscillators.

73 de Jim, N2EY

=====
From: w8au@sssnet.com
To: "Mike Silva" <mjsilva@jps.net>
Cc: glowbugs@piobaire.mines.uidaho.edu
Date: Fri, 29 Dec 2000 11:19:21 -0500
Subject: Re: GB> 50C5 Transmitter

At 11:47 PM 12/28/2000 -0800, Mike Silva wrote:

>BTW, you didn't really mean 117L6, did you? Never saw that one, but it
>would be kinda nice if it existed!

>> I have another transmitter project tucked away that is similar to
>> this one, only using the not-so-garden variety 117L6 . Not an expensive
>> tube yet, but not one found in the good ol' all American 5'er.

Mike:

The tube is probably the 117L7 or 117N7. This is a pentode/diode combo that was a self-contained oscillator (or whatever) and a diode to supply half-wave rectified DC. A number of articles on simple transmitters using this tube appeared post-WW2 in CQ magazine, among others.

The OT who mentored my Amateur Radio beginnings built many of these and I also built some using his guidelines. I used mine on the 1950's era Novice bands. Some variations included two tubes in a Push-Pull xtal oscillator arrangement.

Today it would be more efficient to just use the pentode sections of these tubes and forget about the diode parts. Silicon diodes would be more efficient and plate voltage could be increased even more by voltage doubling. I recall these tubes running well at 350 volts.

These 117 volt tubes are not real difficult to find, and surprisingly are not too expensive. I suppose that is because there is not much demand for them. I stocked up on a half dozen some years ago anticipating the high cost/unavailability scenario, but it never happened.

Have fun.....

Perry w8au

=====
From: Gary G Johanson <wd4nka@juno.com>

To: w8au@sssnet.com

Cc: glowbugs@piobaire.mines.uidaho.edu

Date: Sat, 30 Dec 2000 01:01:23 -0500

Subject: Re: GB> 117 v tubes

On Fri, 29 Dec 2000 11:19:21 -0500 w8au@sssnet.com writes:

> At 11:47 PM 12/28/2000 -0800, Mike Silva wrote:

>

> Mike:

>

> The tube is probably the 117L7 or 117N7. This is a pentode/diode combo
> that was a self-contained oscillator (or whatever) and a diode to supply
> half-wave rectified DC. A number of articles on simple transmitters using
> this tube appeared post-WW2 in CQ magazine, among others.

***** Aye, that's the one. I think it's a tetrode section, actually, rather than a pentode section. I thought i had a copy of the article from an early '90s CQ which had this along with some other quickie tubester QRP rigs. I did not photocopy it for the note-folder, but i kept the mag . . . deep in that forbidden trunk in the chamber of horrors. I recall, now, that it did use it's diode section for the power supply. I never built it because of my natural suspicion of transformerless power supplies. Once bit, twice shy.

>

>snip<

> Today it would be more efficient to just use the pentode sections of these
> tubes and forget about the diode parts. Silicon diodes would be more
> efficient and plate voltage could be increased even more by voltage
> doubling. I recall these tubes running well at 350 volts.

***** agreed. It would also lessen the jumble of connections to that poor ol' octal socket. Since the 117L7 is a diode / tetrode, every pin would be utilised. Yow !! That's rough in a small underchassis.

>

> These 117 volt tubes are not real difficult to find, and surprisingly are
> not too expensive. I suppose that is because there is not much demand for
> them. I stocked up on a half dozen some years ago anticipating the high
> cost/unavailability scenario, but it never happened.

*****I recall them being available in quantity from Antique Electronics Supply.

>
> Have fun.....
>
> Perry w8au
>
>
vy 73
gary // wd4nka

=====
From: "Mike McKean Sr" <mikemckeanr@earthlink.net>
To: <w8au@sssnet.com>, "Gary G Johanson" <wd4nka@juno.com>
Cc: <glowbugs@piobaire.mines.uidaho.edu>
Date: Sat, 30 Dec 2000 12:13:01 -0500
Subject: Re: GB> 117 v tubes

I built a transmitter a while back using the 117 volt tube with the pentode
and diode...made a 40 meter CW osc out of the pentode and the diode became
the power supply rectifier...main thing is to ensure that the chassis ground
is connected to the neutral side of the AC line...it ran great..lit up a
number 47 light bulb very nicely :-)

Mike N3HJQ

From: "Brian Carling" <bcarling@cfl.rr.com>
To: glowbugs@piobaire.mines.uidaho.edu
Date: Thu, 28 Dec 2000 08:21:32 -0500
Subject: Re: GB> 50C5 Transmitter

The 50C5 TX design is available on-line at:
<http://www.thebizlink.com/am/tech/htm/50c5.htm>

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