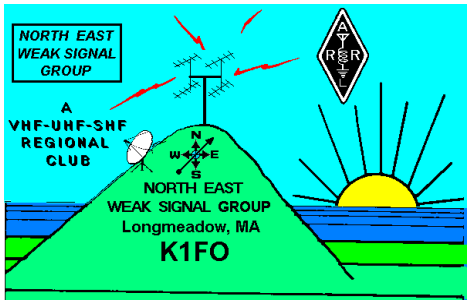


# N.E.W.S. LETTER

The Official Publication of the North East Weak Signal Group – http://www.newsvhf.com/

July 2019 | Volume 28 | Issue 4

## NEWS Group Annual Picnic
## Saturday July 13, 2019

In This Issue



MEMBERSHIP in the N.E.W.S Group is $10 per year
Apply to John Crawford, N2OY. E-mail: n2oy.vhf@gmail.com
You may download an application from our web page: http://www.newsvhf.com

The N.E.W.S. LETTER is the publication of the North East Weak Signal Group
Articles may be reprinted with proper credit given to the author and the N.E.W.S. LETTER
Send articles by e-mail to George Collins, KC1V at news.kc1v@gmail.com

### DON'T FORGET

**The North East Weak Signal Group 2 Meter Net**
**Every Thursday at 8:30 PM local 144.250 MHz**
**W1COT, WZ1V or K1PXE Net Control**

## N.E.W.S. Group PICNIC-Rain or Shine

July 13, 2019 at the Knights of Columbus, Pavilion and Picnic Area
371 Washington Rd., (aka George Washington Road) Enfield, CT 06082
(20 mi North of Hartford, 8 miles South of Springfield)
Social Gathering! Food! Swap-Sell-Tailgate
Everyone is Welcome!
MDS Testing for 10, 24 and 47 GHz!

**See Page 2 for Directions and More Details**

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(See Page 3)

BARBECUE - Noon to 1:00pm
The club will be providing the burgers, hot dogs, chips, and cold drinks.
If anyone would like to bring a side dish, like a salad or dessert, please do!
(Please e-mail Mark what you are bringing - if possible)

Bring any items of VHF+ interest that you would like to sell, swap, or just show off.
Your stories and experiences - True or Not - are all welcome.

Show-Off Items with No VHF+ interest, but with Entertainment Value,
may also be appreciated or ridiculed - take your chances!

All members, spouses, guests and anyone interested in VHF+ operation,
are welcome to attend.

## Here are the Directions

Knights of Columbus, Picnic Area
371 Washington Rd, Enfield, CT 06082
42.016N, 72.559W

From the South or North:

I-91 Exit 48 onto Rt 220 East (Elm St), then 9 lights.
Keep Left at light before Walgreens.
Left at 9th traffic light from Exit 48, on to Washington Rd.
K of C is 1 mile on left.

Lost going that way? Try this:

I-91 Exit 49, go south on Enfield St Rt.5
Drive 1/2 mile, take left on Brainard Rd.
(at North Thompsonville Fire Station)
Drive 2 miles, take right on Washington Rd.
K of C will be less than 1/2 mile on the right.

# N.E.W.S. Picnic MDS / ERP Testing

Minimum Discernable Signal (MSD) and Effective Radiated Power (ERP) testing on 10 GHz, 24 GHz and 47 GHz will be conducted at the picnic this year.

To test for MDS, we set up a distant signal source. After everyone has a chance to peak up on the signal, the signal level is reduced one dB at a time until you can no longer hear it, then you have found the MDS for your system. You decide how well it works, and whether you can hear as well as Dale.

Finally, we also check relative ERP, transmitting one at a time and recording the relative power received at the distant point.

This isn't a competition, just a chance to check out our gear with friends around to help. Most folks have 10-GHz stations that worked pretty well, while a few will find problems to fix before the 10-GHz & Up contest in August. Not only do we know your equipment works, but also that there will be some other good stations to work.

We will be looking for people to help setup and run the tests.

Don W1FKF

Donw1fkf-news@yahoo.com

## Buy, Sell, Swap

**From Don, W1FKF, For Sale:**

| | |
|---|---|
| 1 – Flex 1500 | $350. |
| 2 – Yaesu FT-991 | $775 |

These items will be at the NEWS Group Picnic

You can contact Don by e-mail at:

Donw1fkf-news@yahoo.com.

# Bias Circuit for LDMOS Amplifiers

Paul Wade, W1GHZ and Mike Seguin, N1JEZ ©2019

Many hams are converting to solid-state devices for QRO amplifiers. Most of these amplifiers utilize LDMOS transistors – some are capable of legal limit and beyond. The LDMOS transistors require significant bias current for good gain and linearity, which adds up to a fair amount of power: for example, 2 amps at 50 volts, or 100 watts.

The bias current is often set with a constant gate voltage. However, as the device temperature increases, the device temperature coefficient causes the bias current to increase. This can be a problem, especially for high duty-cycle modes like JT-65 or FT-8. One solution might be more cooling with a big ¼ horsepower blower like we used for tubes; another is temperature compensation of the gate voltage to keep the bias current more constant.

Mike found Ampleon Report R_10032 (www.ampleon.com) describing a temperature compensation circuit for the gate bias voltage. To understand the circuit operation, Paul simulated it using LTspice (www.analog.com ). We adjusted the component values to standard 5% resistors, then added a PTT relay and a high voltage three-terminal regulator for 50 volt operation. Then we did a PC board layout to build some prototypes and try them out.

The circuit schematic is shown in Figure 1. The temperature is sensed by a small NPN transistor connected to the **C**, **B**, and **E** terminals and mounted on the amplifier pallet close to the LDMOS transistor. Our choice is the common 2N3904 NPN transistor, readily available and well characterized. The flat side is clamped against the pallet with a dab of heatsink compound.

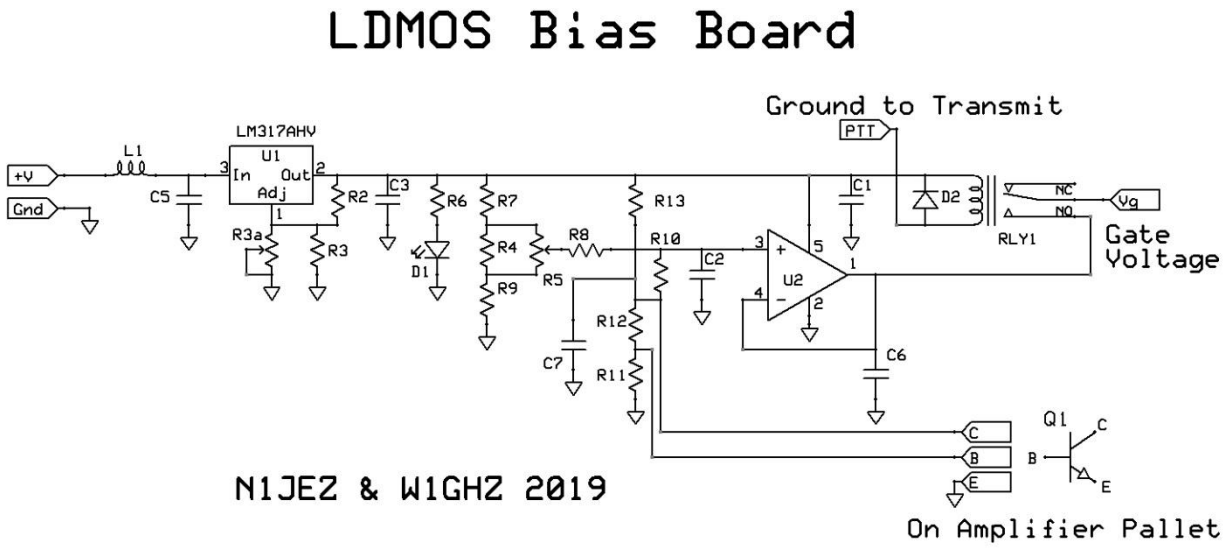



**Figure 1 – LDMOS Bias Board Schematic**

The gate voltage, and the bias current, is set by the potentiometer R5, which has only a small adjustment range. As the NPN transistor heats up, it draws more collector current which pulls the gate voltage lower (Note: The NPN transistor must be connected – without, the gate voltage is significantly higher). The op-amp, U2, is a unity-gain amplifier to drive the gate. The op-amp was chosen by Ampleon to provide a low output impedance and because it is stable with a capacitive load (like the LDMOS gate).

The other potentiometer, R3a, can be used to set the voltage regulator output voltage. Since this voltage isn't critical, a fixed R3 resistor is adequate – if you are fussy, use the next higher value of R3 and a 100K pot at R3a. The Ampleon circuit set this voltage at 8 volts. Mike had some relays suitable for 8 volts, but Paul only had 12 volt relays so adjusted the bias circuit values for 12 volt operation. Resistor values for both options are in the parts list. The relay may also be powered separately, from terminal VR, after cutting the trace next to C3 at the point marked ✘.

Temperature compensation is set by R10. The 10K value shown is for the nominal -2mv/°C. Reducing the value of R10 will increase the temperature compensation, and vice-versa.

Ampleon suggests an additional resistor, 5 to 20 ohms, in series with the LDMOS gate to ensure low-frequency stability. Adding a 5 volt Zener diode to ground might help protect the sensitive LDMOS gate from voltage and static spikes.

Figure 2 shows a prototype PC board mounted on an amplifier. Construction might be more elegant if it weren't an add-on.

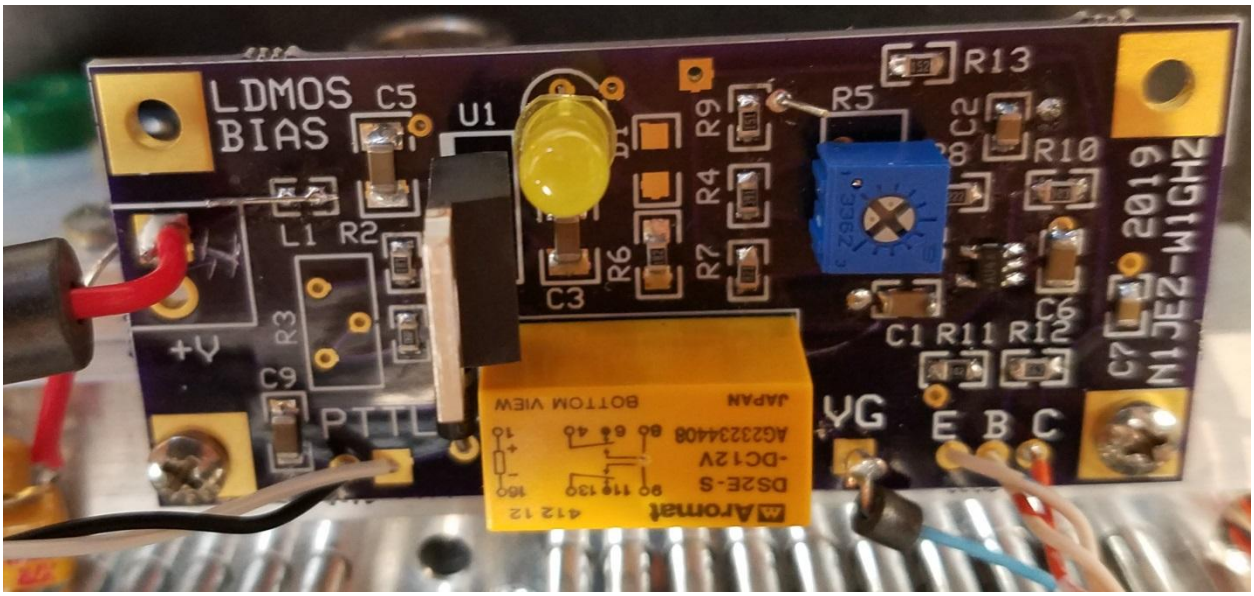


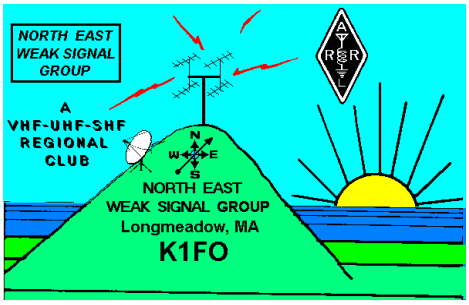

**Figure 2 - LDMOS Bias Board Prototype mounted on amplifier**

If anyone is interested, we can supply Gerber files for the PC board, which can be sent to OshPark (www.oshpark.com) to get 3 boards made at low cost. If there is sufficient interest, Paul might order a batch of PC boards.

## LDMOS Bias Board

### Parts List

| Designator | 8 volts | 12 volts |
|---|---|---|
| C1 | 1uf | 1uf |
| C2 | 0.1uF | 0.1uF |
| C3 | 1uf | 1uf |
| C5 | 0.1uF 100V | 0.1uF 100V |
| C6 | 1uf | 1uf |
| C7 | 0.1uF | 0.1uF |
| C9 | 0.1uF | 0.1uF |
| D1 | LED | LED |
| L1 | Ferrite Bead | Ferrite Bead |
| R2 | 180 | 180 |
| **R3** | **1K** | **1.5K** |
| R3a | optional | optional |
| R4 | 390 | 390 |
| R5 | 200 pot | 200 pot |
| **R6** | **1K** | **1.8K** |
| R7 | 390 | 1K |
| R8 | 2.2K | 2.2K |
| R9 | 75 | 75 |
| R10 | 10K | 10K |
| R11 | 1K | 1K |
| R12 | 5.6K | 5.6K |
| R13 | 1K | 1.5K |
| Q1 | 2N3904 | 2N3904 |
| U1 | LM317AHV | LM317AHV |
| U2 | LM7321MFX | LM7321MFX |




North East Weak Signal group

## MEMBERSHIP APPLICATION

Name: _____

Call sign: _____ Grid: _____

Street: _____

City: _____ State: _____Zip: _____

Phone (home) _____ Optional (work) _____

Email _____

ARRL member: Y N

Electronic Newsletter Delivery: Y N

Operational Bands (circle) 50 MHz 144 MHz 222 MHz 432 MHz 903 MHz 1.2 GHz
2.3 GHz 3.4 GHz 5.6 GHz 10 GHz 24 GHz 47 GHz
76 GHz Light Other (list)

The North East Weak Signal [N.E.W.S.] Group is being established to form a camaraderie among fellow VHF-UHF-SHF enthusiasts and support a convenient means to exchange technical information. We currently have six meetings per year, held at a centrally located facility and provide a “NEWSLETTER” that is distributed two weeks prior to each meeting. Any contributions to this publication are appreciated and can be sent to: George Collins, KC1V by e-mail to news.kc1v@gmail.com. Dues are $10/year. Remember, this group is formed by VHF’ers for VHF’ers.

Mail to:

North East Weak Signal Group
c/o N2OY, John Crawford
PO Box 1112
Latham, NY 12110

**North East Weak Signal Group**

c/o N2OY John Crawford, PO Box 1112, Latham, NY 12110

Check your membership
Expiration date on your mailing label!