

An "ALC" Box for Power Control of a Transmitter

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Some of the info in this article is not all about Drake gear, but can help with most transmitters and transceivers of the past and the new gear of today. I started out in this project with a new radio purchased for repairing the older gear and it replaced four test boxes that took up room on my service bench. Having the new radio worked out so well, I purchased a second radio for operating A.M. in the ham shack and I had to write about it so here is some enlightening info.

See Figure 1 the "ALC" box started out as a power control for a new solid-state radio that we have heard about lately, the Icom IC-7300¹ and I wanted to use it on A.M. As I started this project, another thought came to mind, if this worked with the new gear; it should be nice to control power output on Drake, Collins and most every transmitter with an ALC input jack on the back panel.



Figure #1

Overview:

See Figure 2 First an overview on what is Automatic Level Control ALC? It is a small voltage (0 to -4 volts D.C.) which is developed from the transmitter or transceiver final power amplifier and fed back to the early I.F. stages where it can inject a small voltage change and affect the power output of the final power amplifier. On voice peaks, this voltage will vary at an audio rate for SSB, plus for A.M. the audio rate is also there and this will cause a pumping action, which will sound distorted. Now if you could manually control the ALC, then this would **preset** and **limit** the amount of power output at a steady state.

¹ <http://www.icomamerica.com/en/amateur/>

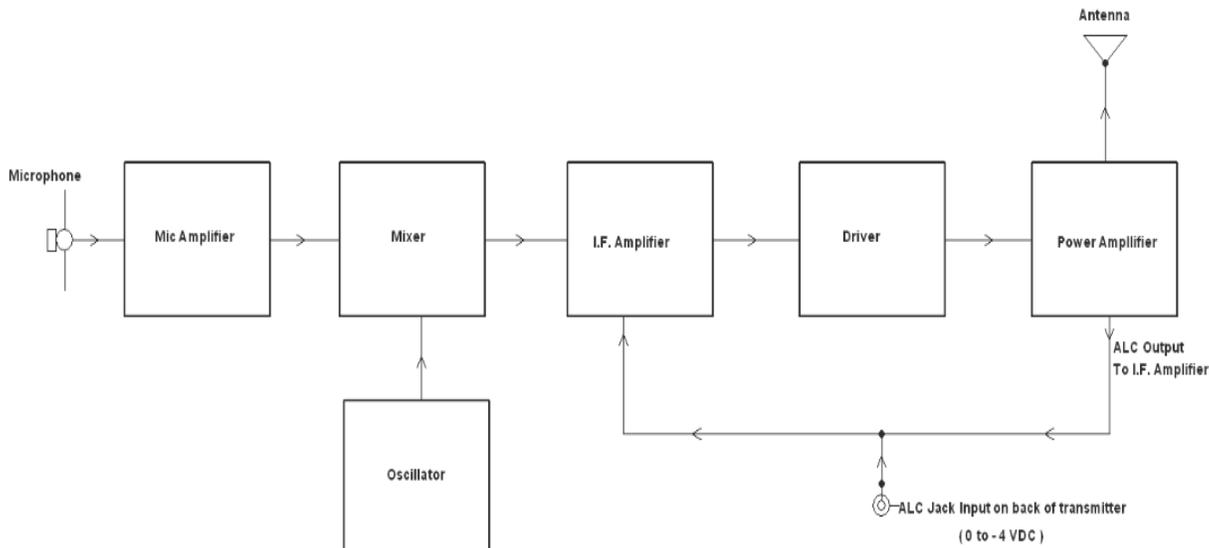


Figure #2

As a bonus for this set up; if you use your transmitter or transceiver to drive an **external** power amplifier such as the Heathkit SB-200, Collins 30L-1, etc they are required to have an ALC output (0 to -4 volts D.C.) to feed back to the driver transmitter or transceiver and automatically reduce power on voice peaks. Now if you could manually adjust the 0 to -4 volts D.C., this could be used to control the drive power without having to put in attenuator pads, or **de-tuning** your transmitter.

Solution:

I'll start off with the new IC-7300 having a good reputation for all modes of operation including A.M. One problem with most of these new rigs running this type of low drive A.M. compared to the big transmitters with plate modulation, the power output will drop or pump on voice peaks as I mentioned earlier and this causes terrible distortion. There are very few rigs that can disable the ALC without going into it and modifying them internally. See Figure 3 & 4 I happen to have one such radio that does this the Elecraft K-3² including all of their radios manufactured. They have the ability to disable ALC on the front panel and it certainly works very well.



Figure #3



Figure #4

² [K-Line Transceivers – Elecraft](#)

See Figure 5, I thought if I were to find a way to develop the negative voltage and feed it into the ALC input jack on the back of the radio, this might work and it does. The solid state rigs are very touchy in trying to put this small voltage into them, so I would recommend a multi-turn potentiometer vs. a standard pot. I only had a few pots to try with most not being multi-turn type, so I used a 500K ohm pot as seen in the schematic. You could try a combination of values to come up with the 0 - 4VDC as I did.

**" ALC " CONTROL BOX FOR HOLDING TRANSMITTER POWER OUTPUT
"STEADY" FOR DRIVING LOW EXCITATION AMPLIFIERS**

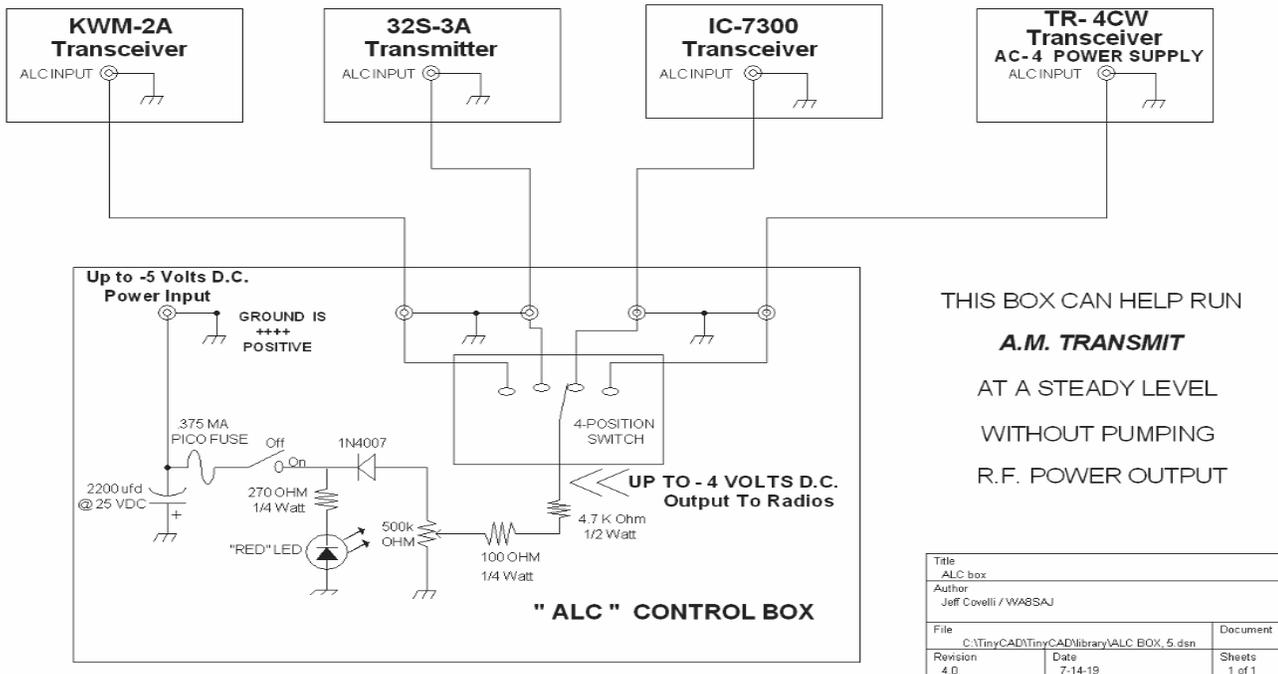


Figure #5

See Figure 6 & 7 I had a wall wart with an output of 0 to +6 VDC and installing it into the plastic box worked great. Reversing the voltage leads at the input jack the +6 VDC now became the ground side providing an output of 0 to -5 VDC to work with, after it goes through all the circuitry. I got the bright idea, this could work with most of the radios I had in the ham shack. I acquired a four position switch and now having installed this switch, selecting the four radios Collins S-line, KWM-2A, Drake TR-4CW/rit, and the IC-7300, makes this a breeze to work with.



Figure #6

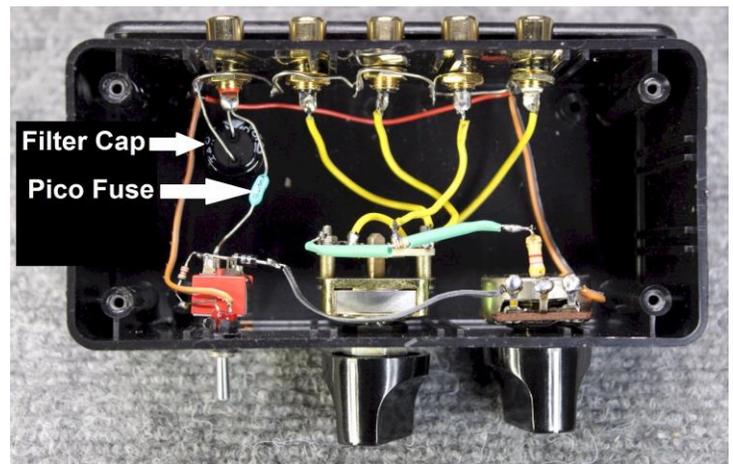


Figure #7

I used a Radio-Shack³ plastic box which was purchased recently from a new Radio Shack store in Ashtabula, Ohio. As a side note; there are hundreds of these new stores now that they are divorced from *SPRINT*. This store I went to had all the parts needed for the project and as I looked around the new store it certainly brought back great memories of the Radio Shacks of the past with walls full of parts and this store is completely full.

The wall wart feeding the ALC box can be replaced with three "AA" batteries (3 x 1.5 VDC = 4.5 VDC) in a plastic battery case and will work fine also. I reversed the leads so ground is positive and the negative D.C. voltage is filtered with an electrolytic cap, since many of the wall warts don't filter very well, plus I added an LED lamp so I know when it is on including a 375 MA pico fuse in case there was a problem down the line for protection. The 500 K potentiometer I used is one I had handy in my junk box, and it works, but can be touchy with the newer transmitter, with the older tube transmitters there is less of a problem and it works great.

Operation with New Radios:

The new radios for all modes only need to set the power control on the front panel, which is nice, but for A.M. operation most new radios must ***NOT*** exceed 20 % (20 watts) of the full power output (100 watts). This power setting is ***without*** modulation applied just steady power output. Most hams drive an external amplifier for A.M. and now we are talking maybe 10 watts and this is nice for the power amplifier inside the driver and usually the ALC will engage depending on the radio. When the ALC engages the power output will fold back causing distortion with a pumping action causing havoc with the person on the other end trying to listen to you. Also you will see the wattmeter swinging down ward, not the best operating method.

I set up the IC-7300 for about 80 % of full output, then turn on the "ALC" box and very slowly turn up the ALC output control until the power output drops to 10 to 20 watts steady on the IC-7300. With the steady state power output set, now when I speak into the microphone and drive an external amplifier, the power output holds steady with ***upwards*** modulation showing up on the wattmeter and a good scope reading on my Heathkit SB-610 scope in series with the antenna line. Usually I run 100 watts of steady carrier with an amplifier before modulation is applied. Having a scope in the shack helps to adjust the audio output and ***without*** the "ALC" box you can see the scope ***shrink*** to almost nothing on voice peaks, so with the box engaged a good audio report is achieved. I have used this system on many tube type amplifiers along with the two solid-state amplifiers I have here in the ham shack an Elecraft KPA-500⁴ and Palstar LA-1K⁵. The actual ALC voltage measured on the IC-7300 ALC jack is about -1.5 VDC, but this will depend on the band used.

Operation for Older Gear:

See Figure 8 & 9 As a bonus, I found having done the first "ALC" box; I hooked up the same box to my Drake TR-4CW and found using it on SSB / CW or A.M. I could now drive my low drive amplifiers with low power and not have to use an attenuator pad or adjust the ***driver tuning*** to lower

³ [RadioShack](#)

⁴ [KPA500 500w Amplifier – Elecraft](#)

⁵ [Palstar - LA-1K RF Sensing Dual HF LDMOS 1000 Watt Amplifier](#)



Figure #8



Figure #9

the drive power, which can be tricky. As seen in the pictures, the TR-4 driver is only at around 200 MA plate current with about 30 watts drive into the amplifier, then you can see the full output over 1000 watts. The steady state of the ALC keeps the drive power at a low level so much so, that if you still wanted to use the ALC from the amplifier you could, but not needed now. I recommend using a "peak-reading" wattmeter for setting up the "ALC" box, since older transmitters / transceivers usually only applies ALC on SSB. You will have to tune up as you normally do into a dummy load at full power with no amplifier, then switch to SSB and as you speak into the microphone, set the microphone gain as you normally would (I use a scope), then adjust the ALC control from the "ALC" box for the power needed to drive the amplifier, then check the output of your amplifier and now you have a perfect setup for your low drive amplifier without any hassle. Now if you are running A.M. with your older tube transmitter / transceiver, this also will work great, since some of these will have some ALC trying to hold back power on A.M. just like the new radios, so the "ALC"

box will keep your output steady and no more folding back power on voice peaks! **NOTE: Drake gear normally does not have "ALC" in A.M. mode, just SSB.**

The TR-7 can be modified better with the article I wrote on this web site on 1-14-15 which works very well in all modes, plus for A.M. another article I wrote on 6-12-07.

The Collins S-line I have is modified for A.M. transmit and the "ALC" box does a good job of keeping the power output low and steady for good sounding A.M. and also for SSB. The Collins KWM-2A and Drake TR-4 CW works great as it does the same by controlling the drive power down for the solid-state or low drive tube amplifier.

Conclusion:

I have had many folks ask how to turn drive power down on the older H.F. gear and it has made it hard to explain to folks just how to do it. Just turning the microphone gain down will not do it correctly; I use the early drive stage tuning method and maybe this is not the perfect way, but for years I have done it with no problems and using a spectrum analyzer to check for spurs, very clean. Now with the "ALC" box, you are really doing it best, since the ALC voltage is applying right to the early stages as engineered by the manufacturer, but in a **steady state**. I know that using the new radio to start this article might have gone out of the norm, but it got me thinking about the older H.F. gear and it certainly worked out for me. The cost is minimal and the "ALC" box is a nice addition to the ham shack and it works well, so try it you will like it. Some hams heard I was writing about this ALC box and I wanted to get the info out for a nice winter project.