

Transceiver Power Control Accessory
Phil Salas – AD5X

Introduction

This project began because of a friend's need to use a TS-520S transceiver and SB-200 amplifier with a MFJ-998RT remote antenna tuner. First he needed an easy way of reducing the transceiver output so as not to overdrive the amplifier. And then he needed an easy way of achieving 10-15 watts output power for auto-tuner tuning. Like many older vacuum-tube or hybrid transceivers, the TS-520S doesn't have a convenient way to reduce power, especially on SSB. You can use the carrier control for CW, but you must still turn this down every time you want to adjust your external tuner. A simple power control solution that has been around for years uses a 9V battery and potentiometer to apply an adjustable negative ALC voltage to the transceiver. I decided to expand on this idea, which resulted in an accessory that is simple to use with any transceiver or transceiver/amplifier combination that has external ALC control capability.

Circuit Description

Figure 1 is the schematic of my solution. When S1 is set to NORM, the ALC output to the transceiver comes from the amplifier (if one is used) or a user-set TX PWR control, and the CW-key and amp-key interfaces are connected straight through. However, when S1 is set to TUNE the CW Key tip is grounded, the amplifier keying line is opened and a user-set ALC voltage is applied to the transceiver from the TUNE PWR control. Because all user-set ALC voltages are diode-or'd, the most negative ALC voltage will control your transceiver's power. This is the amplifier or TX PWR ALC voltage when the switch is in NORM, and the TUNE PWR ALC voltage when the switch is in TUNE.

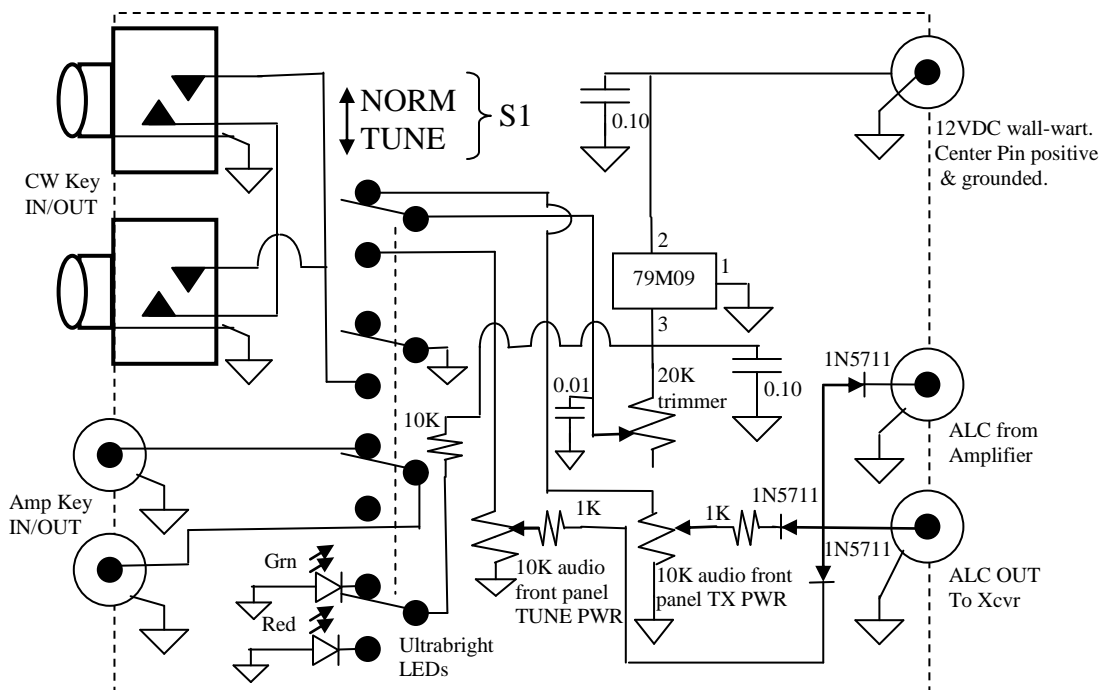


Figure 1: Schematic of the Transceiver Power Control & Tuning Accessory

A DC wall-wart generates the isolated negative ALC user-set voltages. These wall-warts are cheap, and many folks even have a few lying around the house from defunct cordless phones, routers and other electronic devices. My wall wart is rated at 9VDC @ 210ma, but it puts out +15VDC into the 2-3 ma load required in this application (it is unregulated). This wall-wart has the standard 2.1x5.5mm DC plug with center pin positive, as does the wall-wart called out in the parts list. If you use your own wall-wart, ensure that it puts out at least 11VDC when open-circuited. You'll also need to match its DC plug with an appropriate DC jack, or change its plug to a 2.1x5.5mm plug to match the DC jack called out in the parts list. Note that the positive output of the wall-wart is grounded, so the DC jack called out in the parts list is fully isolated from ground.

Most modern transceivers require about -4VDC to fully inhibit their output power, but older tube-type transceivers may require a more negative voltage. Unfortunately, transceiver ALC voltage control is very non-linear and the typical 9V battery-and-pot solution results in a very touchy adjustment. I found that setting the maximum negative ALC voltage right at the radio's ALC power-off threshold and using audio-taper front-panel pots makes power adjustment relatively smooth over the full output power range of any transceiver. The internal 20K trimmer pot sets the ALC power-off threshold, and the 10K audio-taper front panel pots provide adjustment of the normal transmit power and tuning power levels. Finally, a 1K resistor in series with the wiper of each pot provides current limiting protection.

The CW key tip is grounded during TUNE as most boat-anchor transceivers don't have a built-in keyer, and so grounding the tip will constantly key the radio. If your transceiver does have a built-in keyer, many auto tuners and all manual tuners work well with the resulting string of dits. Or you can change the key input from "paddle" to "straight key" - typically a menu selection in radios with built-in keyers.

Construction

Table 1 lists the required parts. Figure 2 shows the -9VDC regulator pin-out and the required connections to the potentiometer. The potentiometer wiring is important as you want power to increase as you rotate the pot in the clockwise direction, as well as get the smooth power adjustment benefit of the logarithmic (audio) taper.

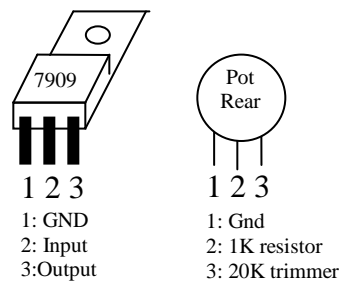


Figure 2: Regulator and pot wiring

I used ultra-bright LEDs for the TX PWR and TUNE PWR indicators, as they light brightly with the less than 1-ma current applied to them. The terminal strip is a convenient place for supporting most of the power supply components. Finally, you may wish to use ¼” mono key jacks, or 1/8” mono or stereo key jacks depending on your particular CW key interface requirements.

Table 1 – Parts List

<u>QTY</u>	<u>Description</u>	<u>Mouser Part Number</u>
1	-9VDC linear regulator	512-LM7909CT
1	0.01uf cap.	581-SR211C103K
2	0.10uf cap	581-SR211C104K
1	10K ¼-watt resistor	71-CMF5510K000FKEK
2	1K ¼-watt resistor	71-CMF551K0000FKEB
2	10K audio-taper pot	31JA401-F
1	20K trimmer pot	652-3386W-1-203LF
2	Knob	450-2034-GRX
4	RCA jack	161-2052
1	4x2.125x1.625” AL box	537-00-P
3	1N5711 shottky diode	511-1N5711
1	Red Ultrabright LED	941-C503BRBSCW0Z0AA2
1	Green Ultrabright LED	941-C503BGCNCY0C0792
1	4PDT toggle switch	108-1M41T1B1M1QE-EVX
2	¼” Stereo Jack	568-NYS230-U
1	2.1x5.5mm isolated DC jack	163-1060-EX
1	5-lug terminal strip	158-1005
1	12VDC wall-wart	552-PSM03A-120-R

Figure 3 shows the interior of the unit. The back and front panels are shown in Figures 4 and 5, respectively. I used Casio 9mm black-on-clear labeling tape for the lettering.



Figure 3: Interior view of the unit



Figure 4: Back panel



Figure 5: Front panel

Set-Up and Operation

Connect the unit as shown in Figure 6. With S1 set to NORM, set both front panel controls fully counter-clockwise and the internal trimmer to minimum resistance. Now with your transceiver in CW mode, key the radio. The output power should be zero. Adjust the internal trimmer potentiometer until your transceiver just starts putting out power. Now you can rotate the TX PWR control clockwise for your desired transmit power. And when S1 is set to TUNE, rotate the TUNE PWR control for the desired tuning power when using an external antenna tuner.

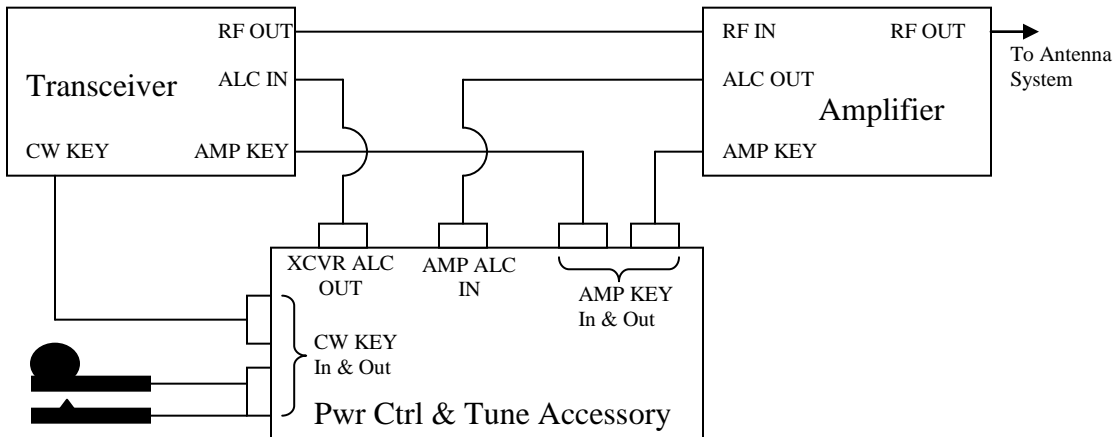


Figure 6: Connection diagram

That's all there is to it. For normal operation, just set the front-panel switch to NORM and set your transceiver output power to the desired level with the TX PWR control. This will normally be full clockwise when running barefoot, or adjusted to your preferred amplifier drive level when using an amplifier. When you need to adjust an external antenna tuner, simply set the switch to TUNE. This disables your amplifier by interrupting the amp-key line, sets the power level to that set by the TUNE PWR front panel control, and keys your transceiver.

Conclusion

I've described an easy-to-build accessory that will permit easy power output adjustment of any transceiver with an ALC connection, and will automatically drop your transceiver to a pre-determined low power level suitable for adjusting an antenna tuner. And while this is particularly useful when used with older vacuum tube or hybrid transceivers, you may find this just as useful for modern transceiver/amplifier set-ups.