

Review: The Ameritron ALS-600 600-Watt HF Power Amplifier  
Phil Salas – AD5X

Introduction

While more and more new solid-state HF power amplifiers continue to show up in the ham market, one solid state amplifier that has been around for quite awhile is the Ameritron ALS-600. This is an HF-only (160-10 meter) amplifier with manual band switching, 600-watts output power, and no microprocessors. However, these reduced specs result in a modestly priced solid-state amplifier that can operate from the standard 120VAC wall outlet. And 600-watts is significant, giving you a gain of almost 8dB which is over an S-unit more than your typical 100-watt transceiver. This is normally plenty to make the difference when chasing that DX. And remember, 600 watts is only 4dB down from full legal limit.

The ALS-600 Amplifier

The ALS-600 consists of two separate units – the amplifier itself, and a separate 50VDC/25 amp linear or switching power supply. The amplifier and power supply can be separated by up to 6-feet with the supplied power cable, letting you place the amplifier at your operating position and the power supply out of the way. Both units are very compact making this amplifier/power supply combo convenient for portable and DX operations. Photos A and B are close-up photos of the front and inside of the amplifier.



Photo A: Front View of the ALS-600

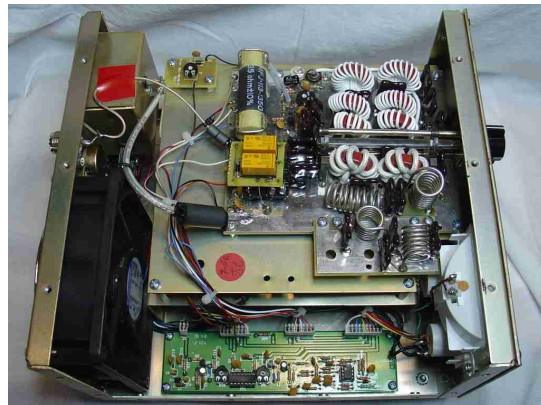


Photo B: Inside view of the ALS-600 with QSK board (discussed later).

The ALS-600 uses four Motorola MRF-150 TMOs FETs operating at 50 volts to provide the 600 watts typical output power. In order to protect the amplifier from user mistakes or antenna system problems, reflected power in excess of 75 watts causes the amplifier to be automatically bypassed. The amplifier heat sink temperature is also monitored, and the amplifier is bypassed if this temperature exceeds a safe value. Whenever the amplifier is bypassed, you can restore it to normal operation by first clearing the fault and then simply switching from “Operate” to “Standby” and then back to “Operate”.

The ALC interface is unique in that a rear ALC adjustment is user-adjusted to customize the ALC range for virtually any transceiver. Once this control is set, you can adjust your

amplifier output power from the front panel “ALC Set” control. When properly adjusted, the ALC also prevents you from accidentally overdriving the amplifier.

Amplifier metering consists of a cross-needle SWR/Peak-Power meter. The power supply also uses a cross-needle meter which gives simultaneous voltage and current readings. Some of the other specifications are as follows:

Output Power:	Typically 600 Watts PEP SSB, 500 Watts CW, 300 Watts continuous.
Input SWR:	1.5:1 or less
Spurious Outputs:	Greater than 45 dB down
Intermodulation Distortion:	Greater than 25 dB down
Operate/Standby Switch:	Selects exciter or full amplifier power instantly .
T/R Switching:	Semi- or Manual break-in. Full break-in is not supported. <b>(See my comments on a QSK modification below)</b>
T/R Relay Drive:	12VDC at 100ma maximum, ground to enable
Indicators:	ALC, XMT and Load Fault LED indicators.
Inrush Current Protection:	Step-start extends life of power supply components.
Power Requirements:	120VAC/12 amps, 240VAC/6 amps (Linear power supply) 120VAC/14 amps, 240VAC/7 amps (Switching power supply)
Dimensions (ALS-600):	6"H x 9.5"W x 12"D
Dimensions (Power Supply):	6"H x 9.5"W x 14"D
Weight (ALS-600):	12.5 pounds (amplifier only)
Weight (ALS-600PS):	32.5 pounds (linear power supply)
Weight (ALS-600SPS):	10 pounds (switching power supply)

You'll note that the switching power supply actually draws more AC current than the linear power supply. This is because the linear power supply is unregulated and is therefore very inefficient (regulator circuitry causes poor efficiency in linear power supplies). If you are using the switching power supply, you should probably plug the amplifier into a separate AC branch than the one your transceiver is connected to unless you have a 20-amp AC branch circuit. The advantage of the switching power supply is a savings of 22.5 pounds – which may be desirable for portable use.

#### Let's Fire-Up the Amplifier

Connecting up the ALS-600 is trivial. Since it comes wired for 120VAC operation, it is ready to plug into your wall outlet. You'll also need a ground wire from the amplifier to your station's single-point ground connection point, and ALC and amp keying cables (typically RCA cables) to interface with your transceiver. Photo C shows the back-side connectors of the ALS-600.



Photo C: Rear panel of the ALS-600

To key the ALS-600, your transceiver’s amplifier keying output must be able to handle 12VDC at 100ma. If there is any doubt about this, use a transceiver interface buffer such as the Ameritron ARB-704. The ARB-704, along with a transceiver-specific cable, provides high current solid state switching capability and ALC interfaces for any amplifier.

### Performance Measurement

My first tests included measuring amplifier power output and checking the amplifier’s internal power meter against an Array Solutions PowerMaster NIST-traceable digital peak-hold wattmeter. As Table 1 shows, the ALS-600 does a good job meeting its typical power output specifications. I also found ALS-600 peak-reading wattmeter to be quite accurate – within my ability to read the amplifier’s analog meter. The worst-case discrepancy with the external digital power meter was 6%, with most readings within 1-2%.

TABLE 1: Amplifier Power Output Measurements (external digital wattmeter)

<u>Band</u>	<u>Drive</u>	<u>Key Dwn</u>	<u>CW “Dits”</u>	<u>Peak SSB</u>
160M	90 watts	600 watts	630 watts	650 watts
80M	90 watts	480 watts	490 watts	500 watts
40M	90 watts	525 watts	550 watts	550 watts
20M	90 watts	600 watts	600 watts	600 watts
17M	90 watts	650 watts	610 watts	610 watts
15M	90 watts	650 watts	620 watts	600 watts
12M	90 watts	550 watts	550 watts	550 watts
10M	90 watts	560 watts	575 watts	580 watts

I also verified that the SWR protection shutdown occurs at 75 watts reflected power, corresponding to an SWR of 2.1:1 at 600 watts. Since the amplifier protects itself at an absolute value of 75 watts reflected power, operating into a higher SWR is possible by simply reducing your output power. But you really should address the high SWR issue.

### On the Air

Actual operation of the ALS-600 is very simple. All you have to do is set the band switch, select “Operate”, and transmit. It is amazing how often I find that the amplifier comes in handy, even in rag-chewing QSOs. When conditions degrade, I just flip the

mode switch to “Operate” and continue with the contact. It is very nice not to have to worry about tuning the amplifier when I need to transmit. As all of my antennas are resonant in the band segment I’m interested in (CW end of the HF bands), high SWR isn’t a problem. For the rare occasions when I move out of the CW bands, I use a MFJ-994B auto-tuner to instantly trim the SWR. The MFJ-994B also controls a modified ARB-704 which takes the ALS-600 off-line automatically whenever the MFJ -994B starts tuning (info in the “Equipment Modifications” section of this website).

And incidentally, I can vouch for the robustness of the amplifier and the operation of the protection circuitry. I’ve accidentally transmitted into a disconnected antenna or transmitted with the amplifier band switch in the wrong position more times than I’d care to admit!

### QSK Modification

Unfortunately the ALS-600 is not QSK compatible. This is a problem for me as a CW operator because I find QSK almost a necessity when working DX pile-ups. The open-frame T/R relay has a 13ms enable time which relegates you to semi break-in CW or manual keying of the amplifier using MOX . Of course, this just wouldn’t do. As some of you know, I am not hesitant about modifying equipment. So it was only a matter of time before I modified the amplifier for QSK operation. The QSK modification consists of replacing the existing open-frame T/R relay with a printed-circuit board assembly containing a pair of high-speed telecom relays . Details of this modification can be found in the “Equipment Modifications” section of this website.

### Conclusion

If you need a little extra oomph to break that pile-up or help combat the poor conditions due to the current sunspot cycle, you might consider the compact ALS-600M solid-state amplifier from Ameritron. The price and features make this an amplifier that will fit many budgets and operating locations.