Dedicated rf

the all new....Commander Amplifiers

Current Design Status - Original vs. Redesigned Amplifiers

QSK

- Original - Amplifier hot-switched upon initial key-up (bias applied before T/R changeover was complete and upon key-down). PTT keying was performed using a series of relays, leading to a collective T/R time of about 20 mS.

Redesigned - Solved. Upon key-down, the microprocessor applies current to the T/R relay, waits a fixed interval (8 mS) for the T/R relay to stop bouncing, then applies tube bias instantly bringing the tubes out of cutoff. Upon key-release, the microprocessor immediately removes tube bias (cutting off tubes) before T/R relay begins the receive transition. The result is a consistent and greatly improved QSK T/R changeover time (8 mS), with no hot-switching.

Reliability

- Original - Amplifiers had no step-start circuitry. Upon initial power-on, inrush current was excessive, causing significant current stress on the HV power supply and to the (cold) tube filament. AC mains fuse aging / failures are fairly common especially in the original Export model HF amplifiers due to the initial inrush current.

Redesigned - Microprocessor controlled step-start circuitry temporarily switches in an AC mains resistor during initial power-on, reducing initial AC current inrush and thereby minimizing the associated stresses on the tube filament and HV power supply.

- Original - Meters were held in place with glue and double-sided tape, and were illuminated with fuse-shaped lamps that were both difficult to find, and hard to replace.

Redesigned - The meters now form an integral part of the microprocessor-based control circuit board located just behind the front panel, and are back-lit by LED. No more odd-ball lamps to replace. As part of the control circuit board, the meters are therefore mechanically held in place.

- Original - Shorted turns on Tank Circuit toroidal power inductor when operating on 80 or 40 meters.

Redesigned - Separate toroidal power inductors for 160, 80 and 40 meters.

- Original - Relay-based grid protection circuitry was slow to operate, unreliable and inconsistent from amplifier to amplifier. Grid trip circuitry provided no ready cues that the grid had tripped.

Redesigned - Reliable grid protection solved. Grid current is constantly and accurately monitored by microprocessor. If grid current is excessive, the microprocessor immediately (within a few micro-seconds) biases the tubes off, un-keys the amplifier and rapidly flashes the standby / operate LED on the front panel.

- Original - Tube bias transistor mounted to control board without heat sink, resulting in transistor becoming excessively hot and sometimes failing during long key-down at high power levels.

Redesigned - Bias transistors, when necessary, are mounted directly to the chassis for cooling purposes, resulting in component reliability being greatly enhanced.

- Original - Poorly designed tube warm-up timer. Should be 3 minutes, but due to design and assembly, this varied widely from amp to amp from 15 seconds, to 2, 3, 4, 5, 6 minutes, to instant-on, to never-on.

Redesigned - Tube warm-up timer is now under microprocessor control, yielding consistent 3 minute warm up interval.

- Original - HF amplifier anode choke had in-band resonance in 10 meter band (around 28.8 MHz and above), leading to failure of this component when operated at the upper end of 10 meters.

Redesigned - HF amplifiers now feature two separate anode chokes (low-band and high-band) that are switched via vacuum relay, thereby eliminating in-band anode choke resonance issues.

- Original - PTT keying of amplifier was done via a series of signal relays, which provided slow, unreliable and noisy keying.

Redesigned - All keying now done by solid state devices, controlled by the microprocessor, allowing for very rapid switching which is also quiet, reliable and accurate.

Usability

- Original - Metering consisted of two single meter movements (or a single meter in the 2 meter amplifier), requiring the user to switch between display of Grid current, Plate current or Plate voltage. No provision was available to ever display RF output power, making tuning the amplifier more difficult.

Redesigned - All amplifier models now feature two dual-needle meters, continuously displaying Grid current, Plate current, Plate voltage, and relative output power. The need to switch the meters has been eliminated and tuning of the amplifier is much more practical and straight forward.

- Original - 2 meter amplifier provided no indication of the actual Plate tuning capacitor setting.

Redesigned - A turns counter has been added to the 2 meter amplifier in order to display consistent and repeatable Plate tune settings.

- Original - PTT keying circuits required shunting 12VDC to ground @ several hundred mA. This sometimes required intermediate keying circuitry (external relays) between the amp and exciter.

Redesigned - Opto-Isolated keying circuitry presents ~5VDC @ ~10mA, fully compatible with solid state transceivers, etc.

Fit & Finish

- Original - General inferior cabinetry. Screw openings in metalwork did not freely line up unless considerable force was applied.

Redesigned - All cabinetry has been redesigned & redrawn for a professional fit and finish. Now there is easy access to everything on the amplifier.

- Original - HV power transformer was difficult to remove / install due to the amplifiers high side panels and the weight of the transformer which caused the chassis to sag. Electrical connections were inconsistent and not clearly marked, which was dangerous and prone to error.

Redesigned - New amplifier models use much heavier (0.090" thick) aluminum chassis. High side panels have been eliminated and a heavy steel reinforcement plate has been added to the chassis to support the HV power transformer without any mechanical chassis sag. Now the power transformer simply plugs into the amplifier, eliminating the potential to misconfigure the transformer wiring.

- Original - Holes for the tuned input adjustments did not line up with the actual adjustable components themselves, making adjustment difficult.

Redesigned - New redesigned circuit boards and metalwork now line up properly with each other.

- Original - Power cords were hard-wired to the amplifier.

Redesigned - All amplifier models now use industry standard power inlets, making the AC power cord removable from the amplifier for easier shipping, storage, etc.

- Original - Amplifiers used many plastic / nylon parts in the RF deck.

Redesigned - Plastic parts count has been greatly reduced, and eliminated where possible.

Cooling System

- Original - Blower motors were loud and vibrated excessively.

Redesigned - All amplifier models now feature high-end EBM Pabst blowers which are all manufactured with a ball-bearing race design, are very precisely balanced, and as a result will remain turning nearly 1/2 minute after the amplifier is fully powered down. Roll and tumble are removed over earlier blowers. These new blowers also offer a slightly higher CFM rating.

Proper Design Practice

- Original - The voltage regulators in the original amplifiers were generally not properly bypassed. Per voltage regulator data sheet, this often led to oscillating voltage regulators, creating significant QRM up and down several amateur bands.

Redesigned - The new controller features properly designed and RF bypassed circuitry.

Serviceability

- Original - HV power supply and cathode circuitry was inaccessible unless entire RF deck was removed from the amplifier - a considerable inconvenience. Power supply connections were soldered into place and not easily removed.

Redesigned - Access panel on underside of amplifier models provides ready access to HV power supply, sporting plug-in connections and several screw terminals. Power supply bolts in place, is easily removed and very serviceable.

- Original - All circuit board connections consisted of soldered-in wire leads, making board removal for servicing / repair extremely difficult.

Redesigned - All circuit boards now use plug-in connections, or where necessary, screw terminal strips. All circuit boards are now easily removed for servicing / replacement.

- Original - Circuit boards were lower quality, had no component legends and the individual circuit boards varied from amp to amp with little or no adherence to published schematics.

Redesigned - All circuit boards are industry standard, featuring component silk screen legend and solder mask. Amplifier circuitry matches the published schematics depicted in the manual.

- Original - The amplifiers used a range of fuses which were both expensive and difficult to locate.

Redesigned - All amplifiers now use readily available, inexpensive, industry-standard fuses.

- Original - User had to attach HV transformer secondary leads to screws on hand-made plexiglass strip. This was dangerous and prone to error.

Redesigned - HV transformer leads now feature plug-in connectors. Error potential and danger has been removed.