

AsharpFretworks' QuadStage BiasPro Q10/MQ13

Operating Instruction for *QuadStage BiasPro Q10/MQ13* with *BiasPro 8C/9C/7591* bias probes

The Advantage of BiasPro

Thank you for purchasing the *BiasPro*. *BiasPro* products are **unique** because they are **versatile / user friendly** in order to protect your investment. *BiasPro* bias probes are **detachable / interchangeable**. It means that you can test both 8-pin tubes such as 6L6s and 9-pin tubes such as EL84s using the same *QuadStage BiasPro Q10/MQ13* unit.

The *BiasPro* probe sockets are assembled with high-temperature grade epoxy for long lasting operations, and a 1ohm 1% 2Watt precision shunt resistor is in place for precise bias current measurements.

Cathode Current Monitoring

The *BiasPro* enables a musician to directly monitor the cathode current flowing through output power tubes, allowing the correct adjustment of the tube bias without disassembly of the amplifier. If your amplifier has a fixed bias (factory preset), the monitoring will show if the bias current is correctly set within the amplifier's output power tube specification. The monitoring will also show if tubes are matched or not. You can also create your own "matched" tube sets by grouping the tubes that draws similar amount of cathode current.

Supported Tube Type

Warning: It is your responsibility to make sure you're using the correct bias probe for the tube types listed under each *BiasPro* bias probes listed below. If you plug an unsupported tube type to any *BiasPro* products or using a wrong *BiasPro* probe (using *BiasPro 8C* for 7591 tube) damage to the tube, amp, and the probe most likely will occur.

- **BiasPro 8C bias probe** (Common 8-pin octal): 12E13, 1622, 5881, 5871, 5932, 6550, 6CA7, 6L6, 6V6, 7027, 7184, 7D11, 7408, 7581, EL34, EL37, KT66, KT77, KT88, KT90
- **BiasPro 9C bias probe** (9-pin miniature): 10BQ5, 10P18, 15CW5, 16A5, 30P16, 30P18, 45B5, 6BQ5, 6CW5, 6P15, 7189, 7189A, 7320, CV10321, CV10709, CV2975, CV5094, CV8069, EL84, EL84M, EL84S, EL86, E84L, N119, N329, N709, PL82, PL84, UL84
- **BiasPro 7571 bias probe** (8-pin 7591/7355 type and its family - Fisher, Scott): 7591, 7591A, 7355

Background in Measuring Cathode Bias Current

The measurement is taken from the cathode (low voltage side) of the tube. When measuring we are actually measuring the voltage rather than the current. The *BiasPro* probe cables are built with a 1 ohm 1% 2W precision shunt resistor at the socket in the path of the cathode current flow. We are measuring the voltage drop across the resistor to know what the cathode current is. **This approach is the safest, simplest and best as it does not break the circuit path.**

By Ohm's Law the current through the resistor is: V/R (Voltage divided by Resistance). For example, if you read 34 milli-volts on your meter, the current would be 34 milli-volts divided by 1 ohm, which equates to 34 milli-amps. So, whatever you read on your meter think of it as if you're reading the value in milli-amps rather than milli-volts. In the photo here, it is displayed 33.1 milli-volts but I choose to read it as 33.1 milli-amps (33.1ma).



Safety Precaution and Common Sense

The amps contain high voltages and can be very dangerous. Use common sense and when the amp is powered-on try not to touch the exposed components such as the transformers. No electronics knowledge is required but if you're not comfortable performing the bias adjustments yourself let a qualified technician do it.

Insert or remove the probe sockets gently as pins may bend. When removing the probe socket pull firmly but gently by the socket base, not the cables. **Tubes generate excessive heat**; try to complete the biasing within 15-20 minutes.

The First Step

You'll need to know if your amp has the bias level control (pot) and where it is located. For most Fender and Marshall amps it is located at the bottom of the chassis. You'll need a small flat blade screwdriver which will be used in adjusting the bias level control potentiometer (pot).

For *non-metered version **QuadStage BiasPro Q10** you'll need a volt-ohm meter (sometimes called multi-meter) that is capable of measuring small DC voltages in the milli-volts (mv) range.

Preparation

1. **Turn off the amp** and allow the output power tubes to cool.
2. Pull output power tubes out of their sockets; insert the *BiasPro* bias probe sockets into the amp's output power tube sockets.
3. Insert the output power tubes into the *BiasPro* bias probe's sockets.
4. Connect the probe cables firmly to the *QuadStage BiasPro Q10/MQ13* housing unit's RCA jacks.
5. For non-metered version s connect the **QuadStage BiasPro Q10's** leads (banana plugs) to your voltmeter. The "red" end goes to the positive, and the "black" end goes to the negative (or common) inputs of the meter.
6. For non-metered version **QuadStage BiasPro Q10** set your volt voltmeter to DC milli-volts (200mV or 300mV) range (**not DC milli-amp range**).
7. **Make sure all the QuadStage BiasPro's connections are in place with the output power tubes in the BiasPro bias probe's sockets.**
For non-metered version **QuadStage BiasPro Q10** make sure the voltmeter is powered on and its setting is at the **DC milli-volts (200mV – 300mV) range**.
8. Power up the amp normally. It is suggested that the amp be placed on stand-by for at least 30 seconds if it is equipped with a stand-by switch. At this point you should be seeing the voltage displayed on your meter, and it should be slowly increasing as the tubes warm up. Leave the amp powered on to let the tubes reach their operating temperature. The reading should stabilize at some point (can be 5 minutes to 30 minutes).

Bias Setting Operation

The *QuadStage BiasPro Q10/Q13's* rotary switch dial is marked respectively to the each of the output power tube. Rotate the switch and you should be seeing a similar reading as the other tube. Generally speaking the current through each of the matched tubes should be very similar, and should not be off by more than 2-3 milliamps from each other. If they are off the tubes are not considered matched.

Switch to the one that is displayed with the higher current value. Using your screwdriver, adjust the current by slowly turning the bias level potentiometer clockwise or counter-clockwise, observing the value displayed on

your meter. You may want to repeat the adjustment procedures as the output power tubes may not have reached the operating temperature.

If you're after a clean sound, set the current at low to mid-point of the suggested cathode current range. Set it to the higher-end of the range to get the earlier breakup sound. It is generally not recommended to set the current outside the suggested cathode current ranges of your tube types.

When you're done with the adjustment, power-off the amp and let the tube(s) cool down to the touch. Remove the *QuadStage BiasPro's* sockets from the amp, remove the output power tubes, and reinsert them back into the amp's tube sockets.

Some Examples of Typical Cathode Current Range (when the plate voltage value is unknown)

Tube Series	Current Range	Note
6L6	30ma - 45ma	In Fenders, usually best results do not exceed 35ma
5881	35ma - 40ma	The Russian large base (WXT) tube is usually good at around 37ma
6V6 Typical 6V6 JJ	15ma - 20ma 19ma - 24ma	Fender Deluxe and Princeton amps sound best at around mid-point of the range
EL34	30ma - 40ma	Wide ranges of acceptable currents
6550, KT88, KT100	35ma - 45ma	Some amps will work best at higher than 45ma

Calculating Bias Current

A precise bias current for your tubes can be calculated if you know your amp's tube plate voltage and the tube's maximum power dissipation rating.

- The tube's maximum power dissipation rating can be found in the tube's datasheet which should be available from the internet.
- The plate voltage information can be found from the amp's schematic which should be available on the internet.
- For those who want to measure the actual plate voltage rather than relying on the schematic, a companion plate voltage cable can be purchased from **www.asharpfretworks.com**.

Example: To calculate the bias current range for 6L6 tubes in an amp with the plate voltage of 475VDC.

- Maximum power dissipation for 6L6 is 30.0W
- Absolute maximum cathode current for the 6L6 in this amp is: $30/475 = 63.2\text{ma}$
- Cool Bias Setting: 50% of 63.2ma = 31.5ma
- Average Bias Setting: 60% of 63.2ma = 37.9ma
- Hot Bias Setting: 70% of 63.2ma = 44.2ma

Setting the bias higher than the "Hot" bias setting is discouraged.

Replacing 9V battery in the QuadStage BiasPro MQ13

The battery in the metered version, *QuadStage BiasPro MQ13* should last several years when the power is switched off after each usage. To replace the battery remove the top four screws and the cover. **It is your responsibility to handle with care to avoid damages to the electronics inside.**

Replacement Probes

The 8-pin octal, 9-pin miniature and 7591 replacement bias probes are available for purchase. Please visit **www.asharpfretworks.com** for details.