

Technical Service Bulletin 040112**Calibration of Beam Voltage and Current Sensors: DCX Paragon**

The **beam current** meter plays a critical role in assessing the performance of a transmitter. The level of beam current indicates how "hard" an IOT is working on the inside. Errors in tube tuning or power meter calibrations are often discovered by the presence of abnormally high or low level of beam current. A correct beam current meter calibration is also necessary to set the proper idle current (bias point) for the IOT.

The level of **beam voltage** has a significant effect on the amount of peak signal compression. This translates to residual (uncorrectable) IMD sidebands with ATSC/DVB signals. The beam voltage meter calibration should be checked in cases when it is impossible to achieve acceptable peak signal performance or the meter indication has suddenly changed from its previous nominal value.

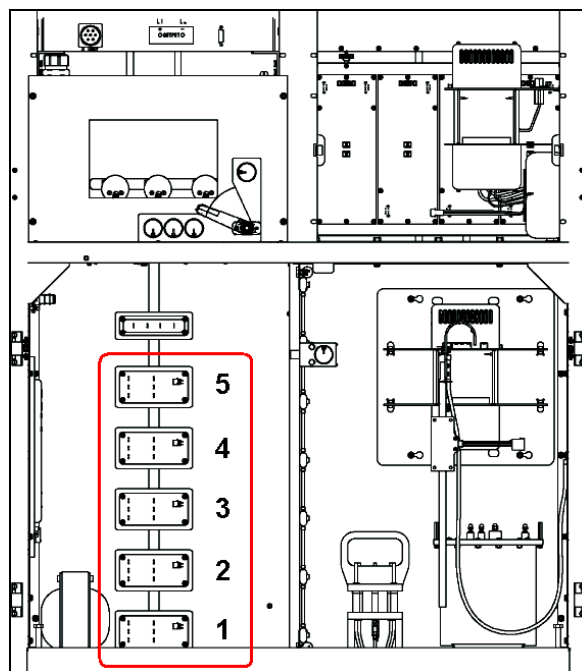
For a multistage depressed collector IOT to function normally, the electrons of the spent beam must be properly divided among the multiple collectors in proportions appropriate to the design of the tube and the operating power level. An incorrect sharing of the beam current among the various collectors could result in a loss of performance, a loss of efficiency, or even permanent damage to the tube. The calibration of the various **collector current** and/or **collector voltage** meters may require verification if the level of one or more collector currents has significantly departed from the last known acceptable reading.

Procedure 040112: Calibration of Beam and Collector Sensors: DCX Paragon	
Applicability	DCX Paragon transmitters.
Prerequisites	None
Equipment Required	High voltage probe, Precision current shunt (25A), Multimeter. External DC power supply (2A or greater) with built-in current meter or external ammeter.
Comments	Procedure for calibration of collector current, beam current, collector voltage, and beam voltage sensors.

WARNING: The procedure described in this document involves potentially lethal high voltages if not executed properly. Do not attempt this procedure without a second person present. Do not attempt this procedure while tired or otherwise not fully alert. Always use the transmitter grounding hook to properly ground all high voltage circuits before attempting to touch them. Consult Service Bulletin 940911 for information on proper high voltage safety procedures.

Collector Current Sensors Calibration

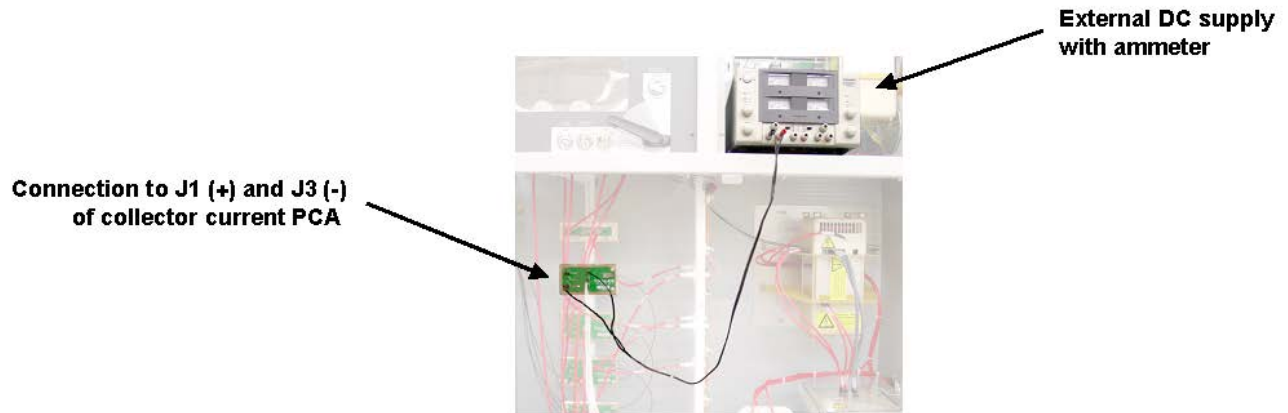
1. Place amplifier cabinet in **STANDBY** mode, let high voltage drop off, and place ground switch in ground position using key interlock system. Turn off HVPS breaker (CB4) on front of cabinet. Open high voltage compartment with key.
2. Ground all areas inside the high voltage compartment with grounding hook.
3. Turn on external DC power supply, ensure voltage is set to zero, turn off power supply.
4. Pull J1 (Load) and J3 (Supply) leads off current sensor for collector 1.



Location of collector current sensors one through five in high voltage compartment.

5. Place amplifier cabinet in **STANDBY** mode (unnecessary to wait, you may continue while **STANDBY** mode is building).
6. Select **Collector #1** option on front panel current meter to obtain reading of collector 1 current. Reading should be close to zero.
7. Navigate to collector current calibration menus via following sequence of buttons on LCD screen: **Information Access > System Operations > HPA Maintenance > Sensor Calibration > Focus, Beam, Body > Beam, Collectors > More Collectors > Collector 1 > Current > Offset**. Default technician password is 4444.

8. Use **Up** and **Down** menu options to adjust reading to zero. Press **Ok** button to save setting and return to previous menu.
9. Attach external power supply (+) lead to J1 (Load) and (-) lead to J3 (Supply). If external power supply does not have built-in current meter, place external ammeter in series with (+) lead.



10. Turn on external power supply and slowly raise voltage until current draw is 0.5 amps.
11. Press **Scale** menu selection. Meter will move to approximately 0.5 amps. Use keypad to set cabinet meter reading to 0.5 amps. Once proper current reading is obtained, press **Ok** button to save setting and return to previous menu.
12. Turn off power supply, remove power supply leads from collector current sensor, and reattach original wires.
13. Repeat procedure above for collectors 2 through 5 (where applicable).

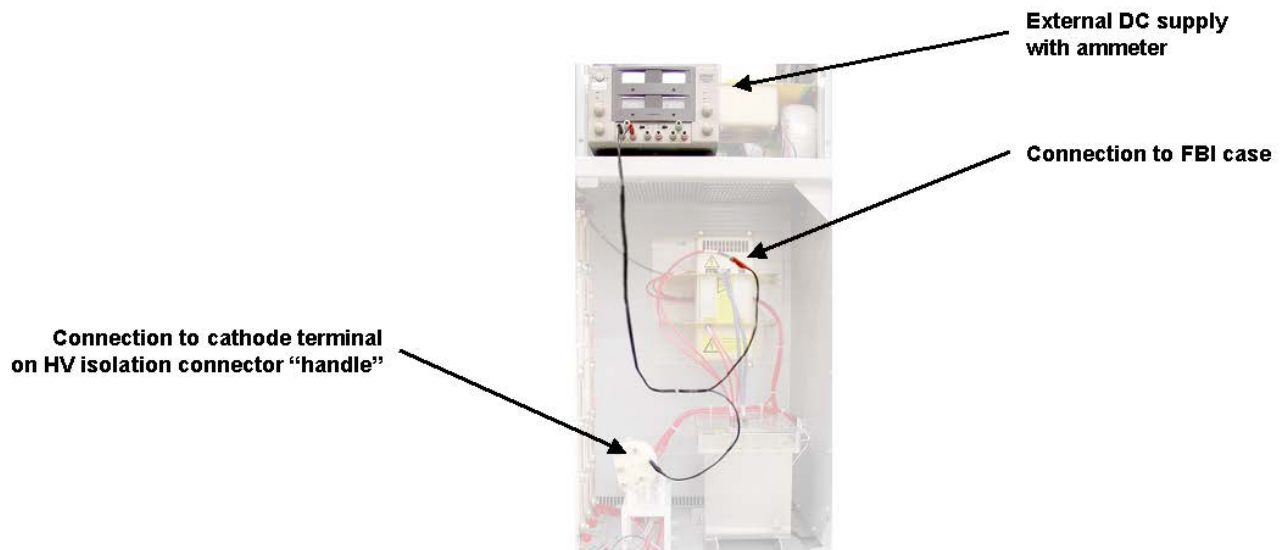
NOTE: For collectors 4 and 5, the **More Collectors** menu option must be pressed twice.

14. Procedure complete.

Beam Current Sensor Calibration

1. Place amplifier cabinet in **STANDBY** mode, let high voltage drop off, and place ground switch in ground position using key interlock system.
2. Open high voltage compartment, and ground all areas inside high voltage compartment with grounding hook. Leave grounding hook in contact with FBI supply case while working on it.

3. Pull tube isolation connector assembly “handle” in high voltage compartment.
4. Turn on external DC power supply, ensure voltage is set to zero, turn-off power supply.
5. Attach power supply negative lead to cathode point on “handle”. If external power supply does not have built-in current meter, place external ammeter in series with (-) lead.

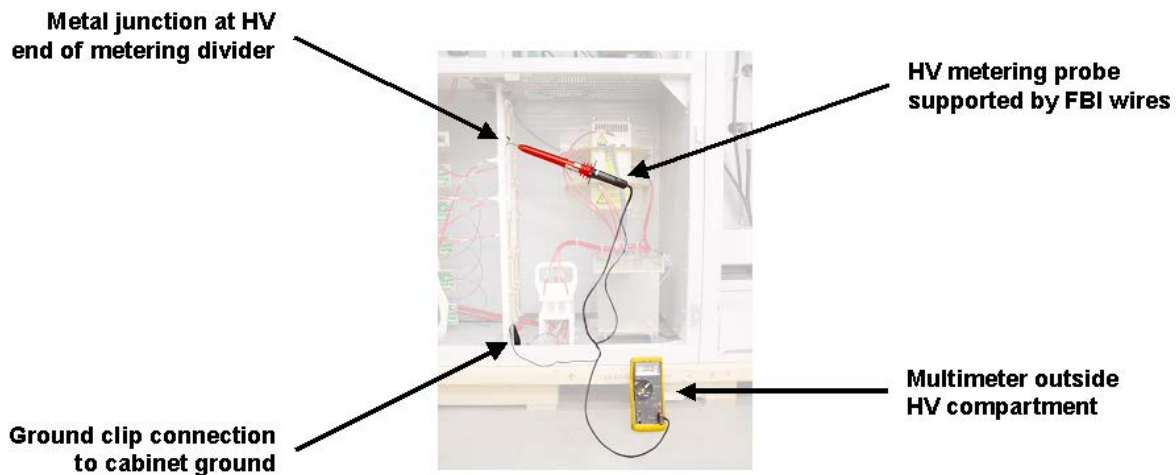


6. Connect positive power supply lead to metal case of Filament / Bias / Ion (FBI) supply. Do not yet activate power supply.
7. Select **Beam** option on front panel current meter to obtain reading of beam (cathode) current. Reading should be close to zero.
8. Navigate to beam current calibration menus via following sequence of buttons on LCD screen: **Information Access > System Operations > HPA Maintenance > Sensor Calibration > Focus, Beam, Body > Beam, Collectors > Beam > Current > Offset**. Default technician password is 4444.
10. Use **Up** and **Down** menu options to adjust reading to zero. Press **Ok** button to save setting and return to previous menu.
11. Turn on power supply and slowly raise voltage until current draw is 1.5 amps.
9. Press **Scale** menu selection. Meter will move to approximately 1.5 amps. Use keypad to set cabinet meter to read 1.5 amps. Once proper current reading is obtained, press **Ok** button to save setting and return to previous menu.
12. Turn power supply off, remove power supply leads from “handle” and FBI supply, and re-seat “handle” in “High Voltage” position.
13. Procedure complete.

Collector Voltage and Beam Voltage Sensors Calibration

1. Place amplifier cabinet in **STANDBY** mode, let high voltage drop off, and place ground switch in ground position using key interlock system. Open high voltage compartment with key.
2. Ground all areas inside the high voltage compartment with grounding hook. Isolate tube high voltage by placing isolation connector assembly "handle" into ground receptacles.
3. Attach high voltage probe ground clip to case of Filament / Bias / Ion (FBI) supply.
4. Place tip of high voltage probe into metal junction at high voltage end of collector 2 metering divider (metal donut connected to pink jumper wire). Mechanically support HV probe on FBI supply wires in vicinity. Consult labels on red HV wires leading to metering dividers to determine which divider corresponds to collector 2.

NOTE: Collector 1 is grounded. It is not necessary to calibrate a voltage sensor for Collector 1.



5. Route high voltage probe wires out of high voltage compartment and attach to multimeter. Turn on multimeter and set to appropriate DC voltage range.
6. Close high voltage compartment, and move ground switch to "operate" position via key interlock system. Multimeter is resting on floor outside of closed high voltage compartment.
7. Select **Collector #2** option on front panel voltage meter to obtain reading of collector 2 voltage. Reading should be close to zero.

8. Navigate to collector voltage calibration menus via following sequence of buttons on LCD screen: **Information Access > System Operations > HPA Maintenance > Sensor Calibration > Focus, Beam, Body > Beam, Collectors > More Collectors > Collector 2 > Voltage > Offset**. Default technician password is 4444.
9. Use **Up** and **Down** menu options to adjust reading to zero. Press **Ok** button to save setting and return to previous menu.
10. Place amplifier cabinet into **BEAM** mode. High voltage will activate after warm-up cycle is complete.

WARNING: Avoid coming into contact with multimeter or its leads while transmitter is in any mode above **STANDBY** and multimeter leads are inside high voltage compartment.

11. Press **Scale** menu option. Meter will move to a value. Use keypad to set cabinet meter to same value as multimeter voltage reading (as properly scaled with probe multiplier factor). When proper voltage reading is obtained, press **Ok** button to save setting and return previous menu.
12. Place amplifier cabinet in **STANDBY** mode, let high voltage drop off, and place ground switch in ground position using key interlock system. Open high voltage compartment with key.
13. Ground all areas inside the high voltage compartment with grounding hook. Remove high voltage probe from collector 2 metal junction.
14. Repeat calibration procedure for collectors 3 through 5 (where applicable).

NOTE: For collectors 4 and 5, the **More Collectors** menu option must be pressed twice.

15. To perform beam voltage calibration, repeat procedure but place tip of high voltage probe into metal junction at top of beam voltage metering divider. Wire leading to beam voltage divider will have a "K" label. Access beam voltage calibration page at following location on LCD screen: **System Operations > HPA Maintenance > Sensor Calibration > Focus, Beam, Body > Beam, Collectors > Beam > Voltage**.
16. Procedure complete.

At Comark, we are constantly striving to improve the satisfaction of both our new and existing customers. Please do not hesitate to contact Comark Customer Service with any questions you may have concerning the contents of this service bulletin.