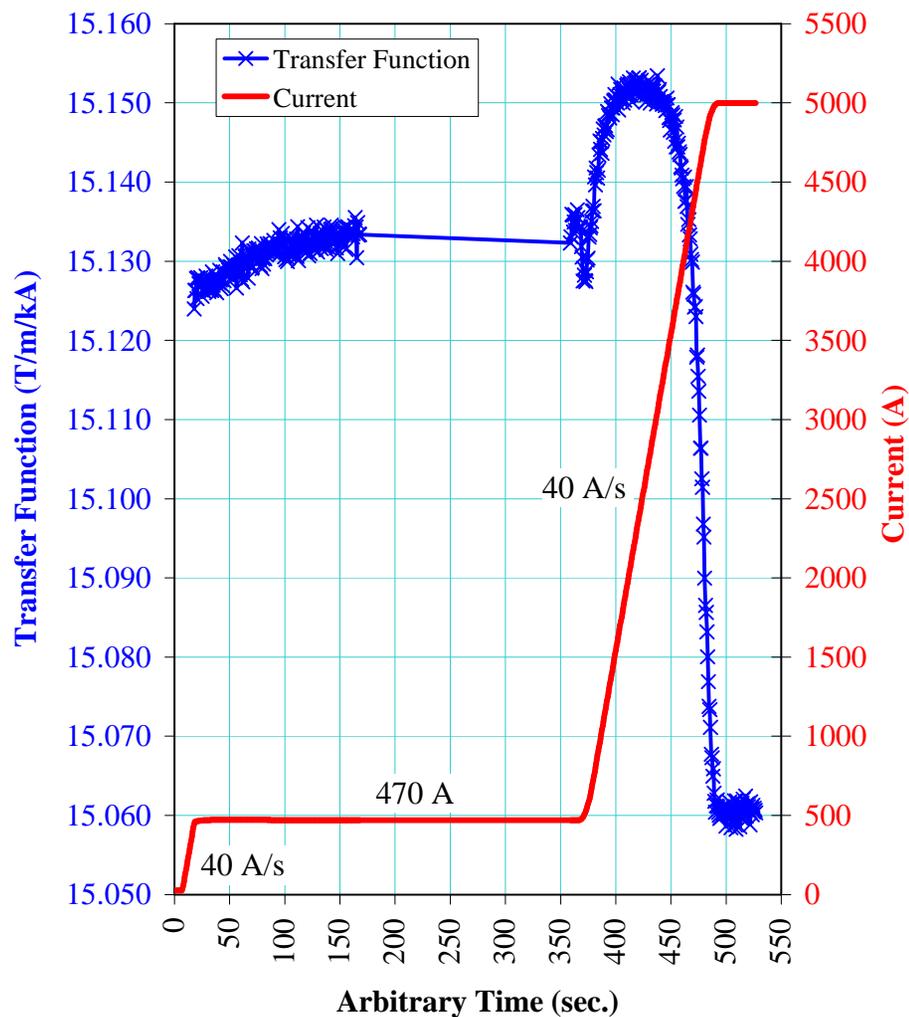


## Snap-back on Ramping from 470A to 5000A in QR7109

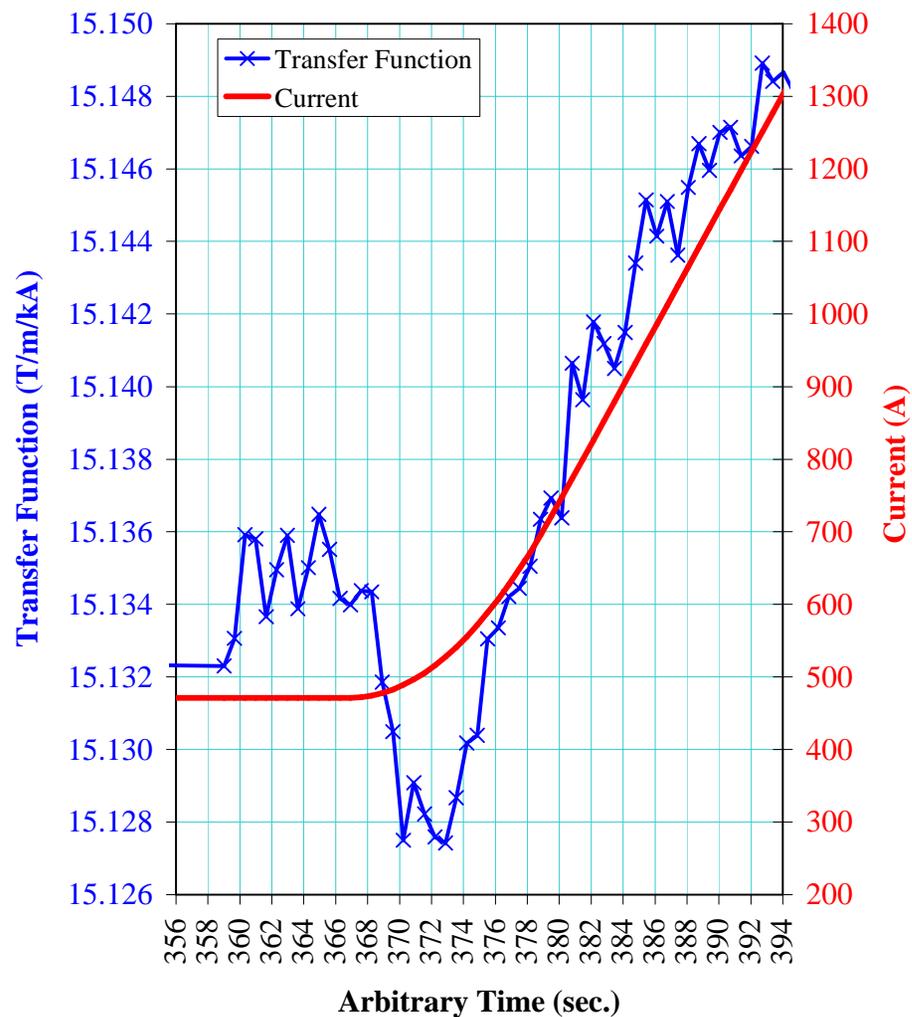
- Measurements are in the straight section with a 0.23 meter (9") long coil.
- Measurements are with a time resolution of ~0.66 second.
- An AC cycle was done from 25 A to 5000 A and back at 60 A/s. The magnet was then ramped from 25 A to 470 A at 40 A/s. The current was held at 470 A for approx. 350 s during which time decay measurements were made (results distributed on January 25, 2000). Finally, the current was ramped from 470 A to 5000 A at a ramp rate of 40 A/s. Measurements were made again during this final ramp. The initial few readings in these measurements give information about snap-back behaviour. Similar measurements were also made for the final ramp at 60 A/s and 70 A/s, but the time decay was not measured before those ramps.
- Smooth current ramp profile with quadratic time dependence at the beginning and the end of the ramp.
- The left hand figures in the following pages show the transfer function or the normal 12-pole measured over the entire ramp sequence from 470 A (or 25 A) to 5000 A. These figures show the snap-back at the final ramp, and also the initial time decay in the case of 40 A/s data. The time in these plots is measured from an arbitrary reference point, typically the first measurement in the entire data sequence.
- Both the transfer function and the 12-pole return quickly to their initial values as soon as the final ramp is started. The right hand figures in the following pages show the snap-back behaviour in detail. A time resolution of 0.66 s is seen to be adequate. The snap-back is faster at higher ramp rates. The snap-back time is ~4 s at 40 A/s, and reduces to ~2 s at 70 A/s. Irrespective of the ramp rate, snap-back to the full initial value occurs when the current has increased from 470 A to ~500 A.

**Transfer Function Snap-back in QR7109 on Ramp from 470A**  
(470A to 5000A at 40A/s; Runs 96 and 97)



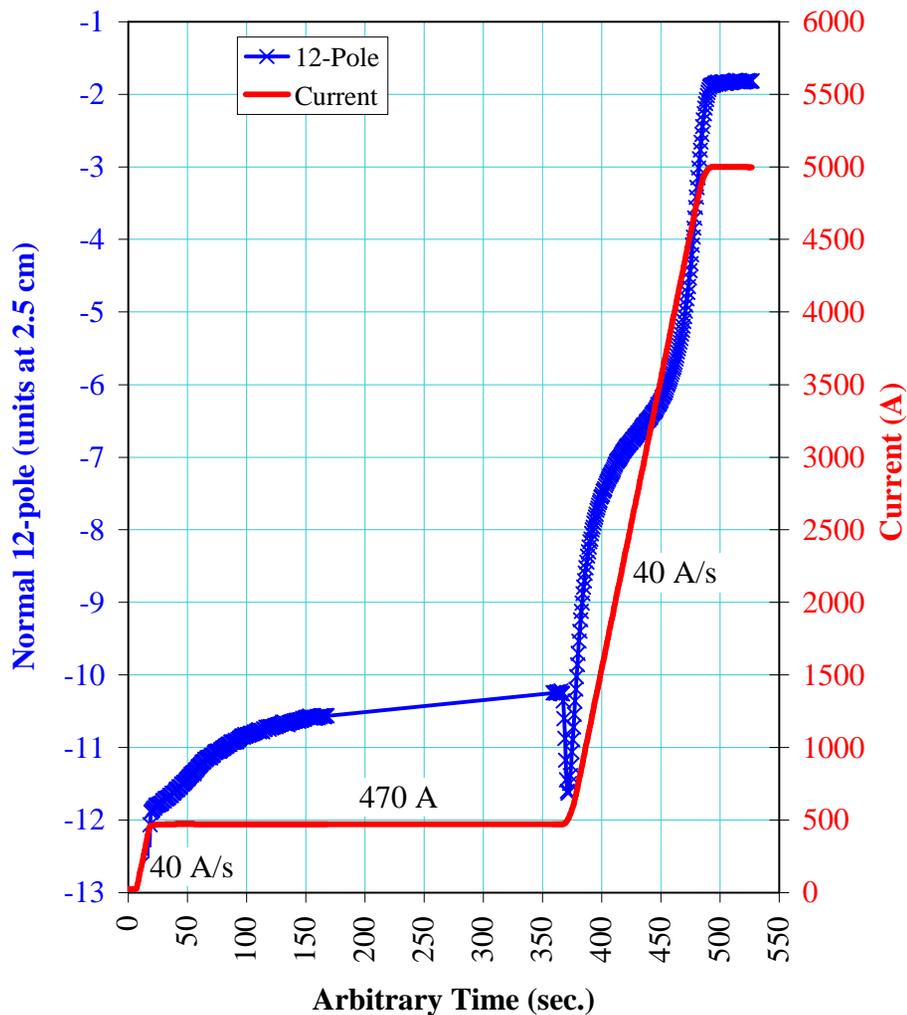
Complete ramp from 25A to 470A to 5000A

**Transfer Function Snap-back in QR7109 on Ramp from 470A**  
(470A to 5000A at 40A/s; Runs 96 and 97)



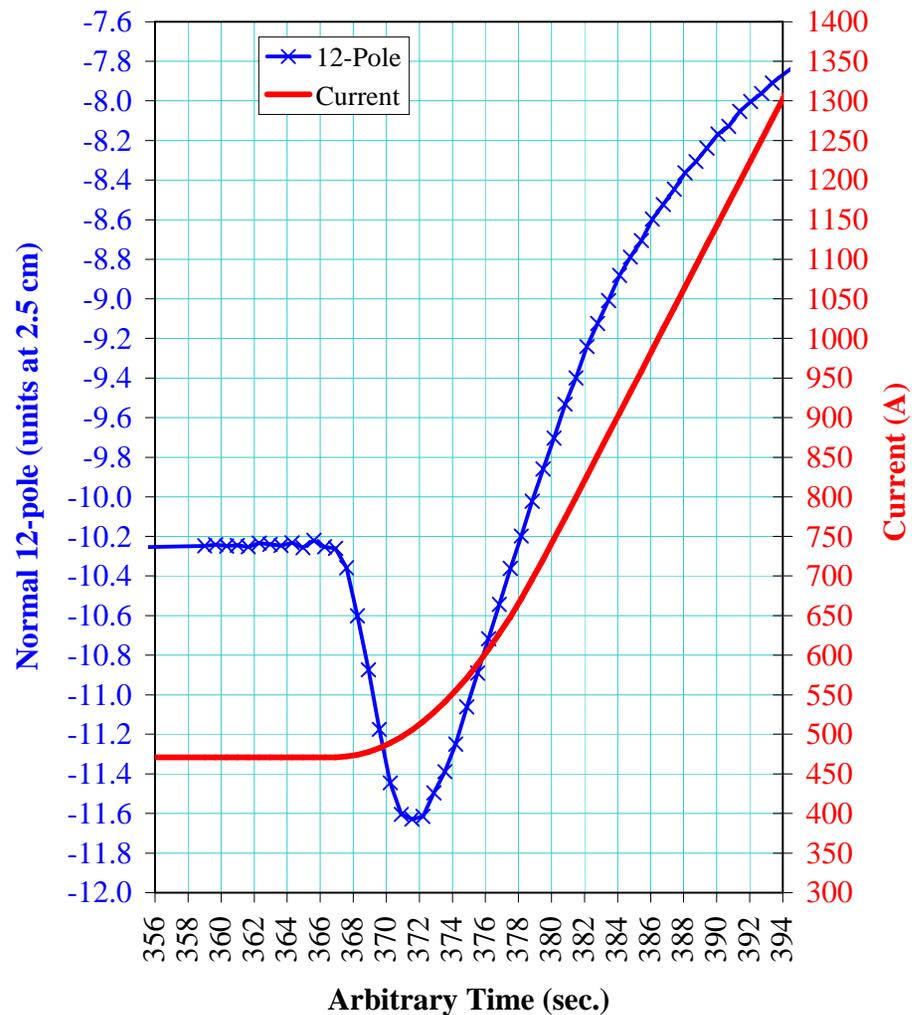
Details of snap-back at 40 A/s

**12-Pole Snap-back in QR7109 on Ramp from 470A**  
 (470A to 5000A at 40A/s; Runs 96 and 97)



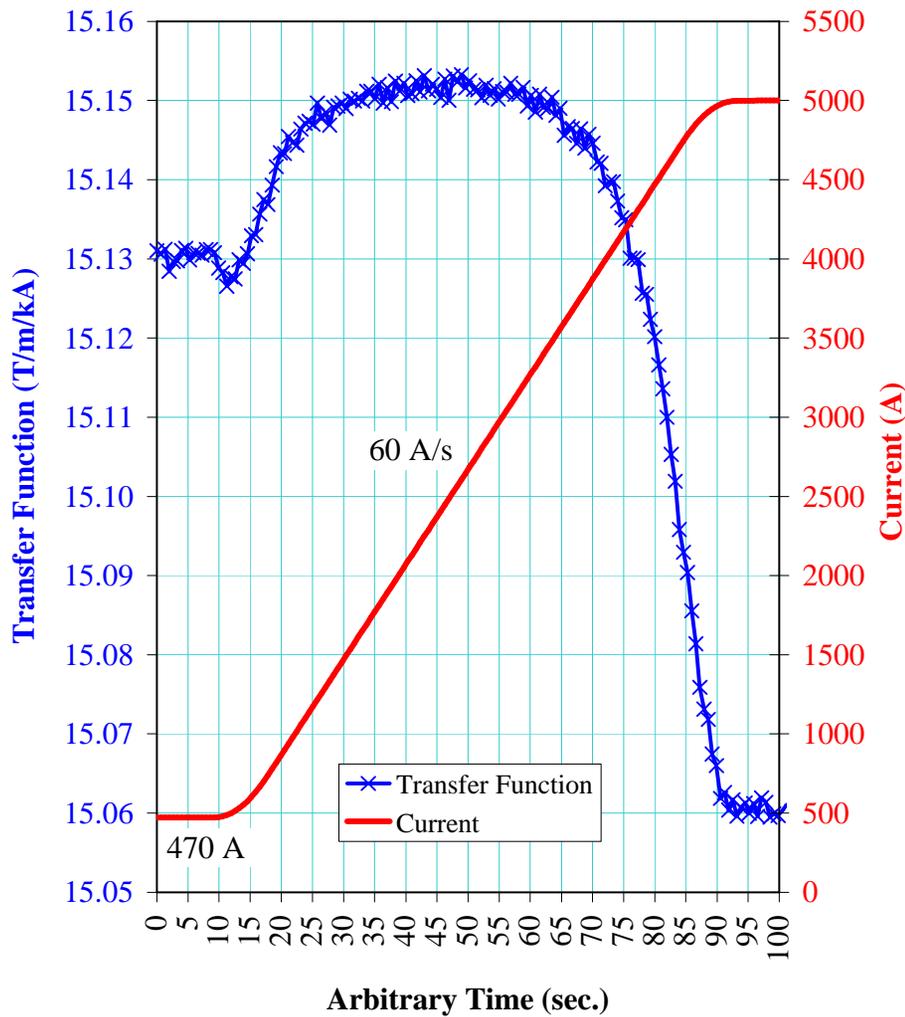
Complete ramp from 25A to 470A to 5000A

**12-Pole Snap-back in QR7109 on Ramp from 470A**  
 (470A to 5000A at 40A/s; Runs 96 and 97)



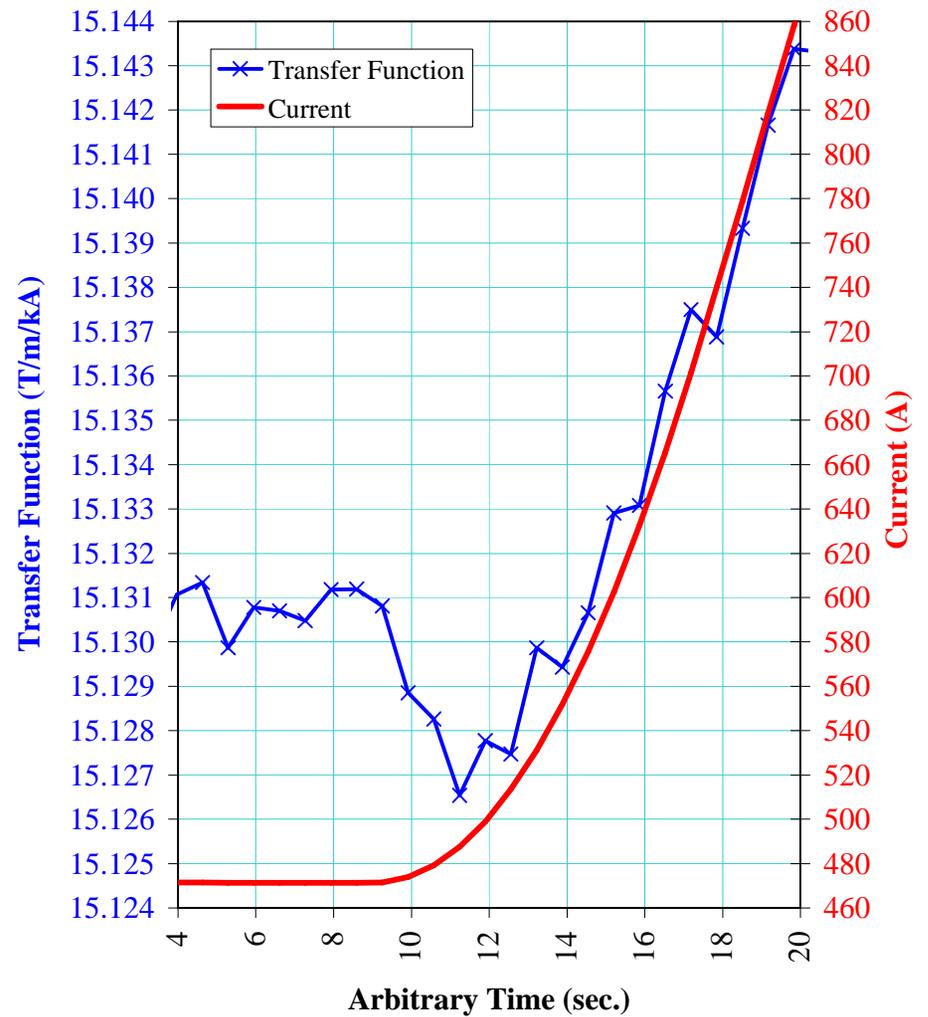
Details of snap-back at 40 A/s

**Transfer Function Snap-back in QR7109 on Ramp from 470A**  
(470A to 5000A at 60A/s; Run 100)



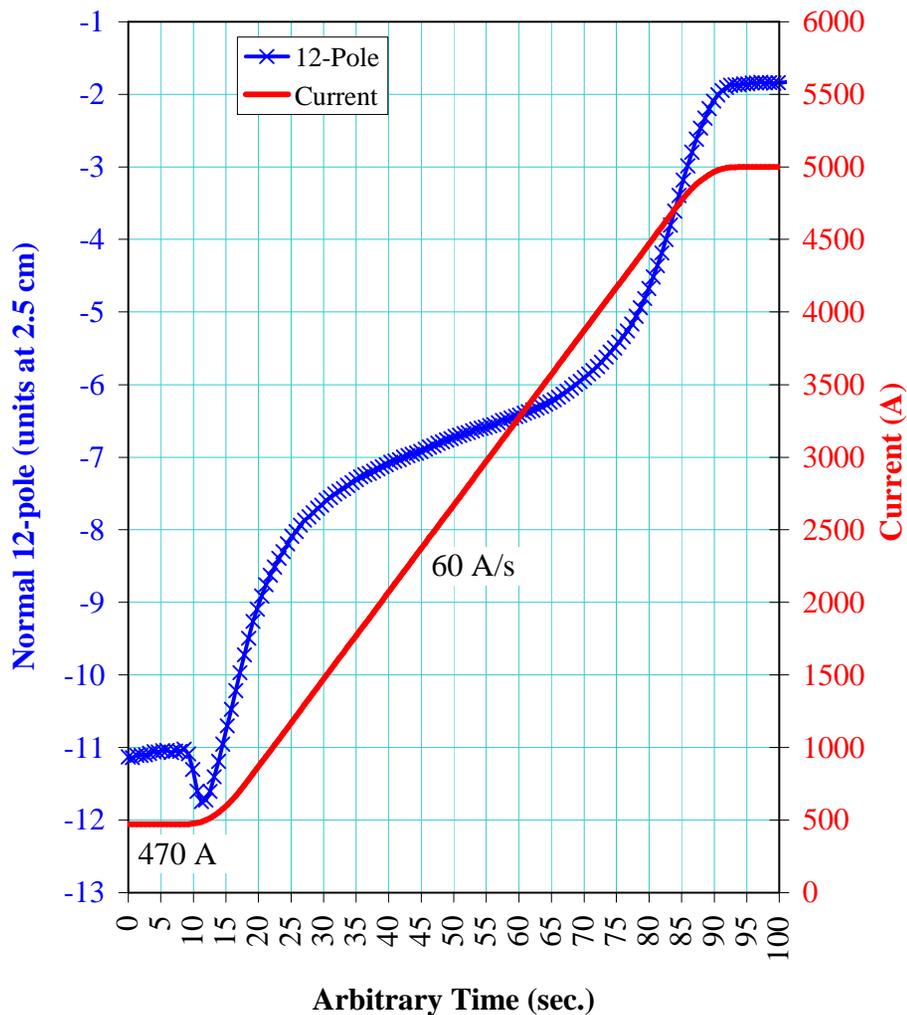
Complete ramp from 470A to 5000A

**Transfer Function Snap-back in QR7109 on Ramp from 470A**  
(470A to 5000A at 60A/s; Run 100)



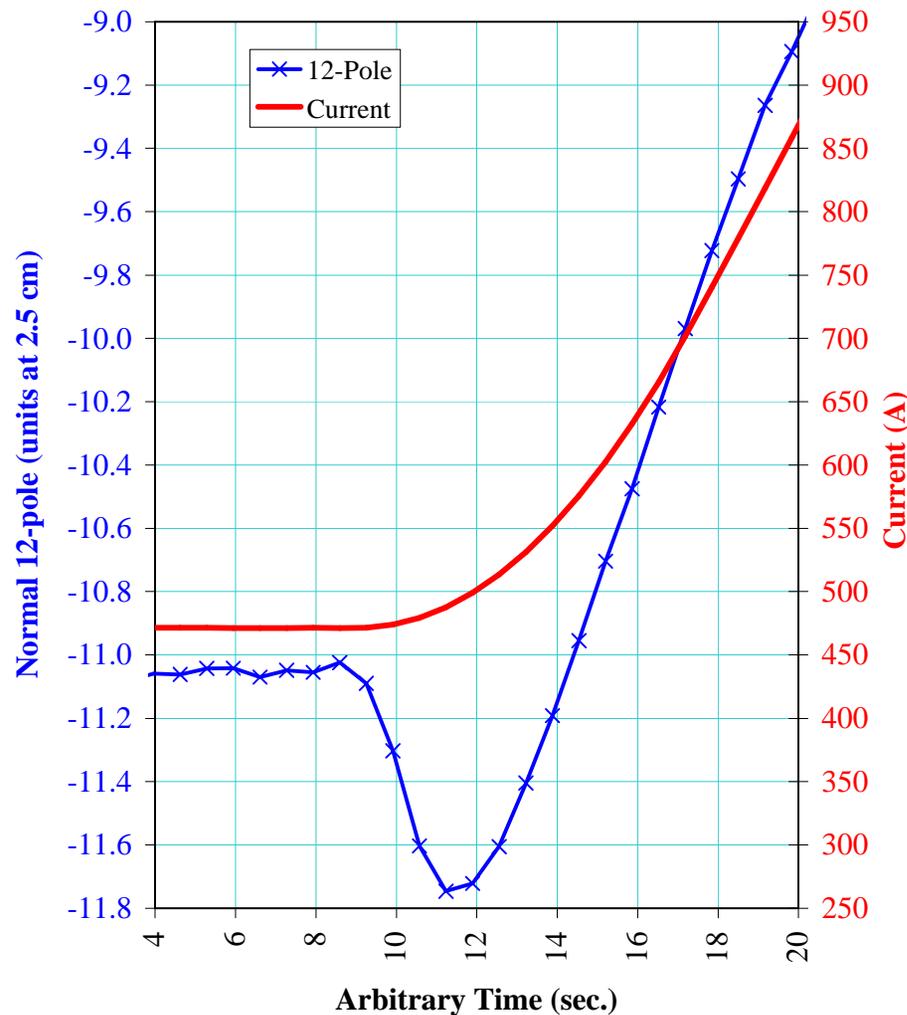
Details of snap-back at 60 A/s

**12-Pole Snap-back in QR7109 on Ramp from 470A**  
 (470A to 5000A at 60A/s; Run 100)



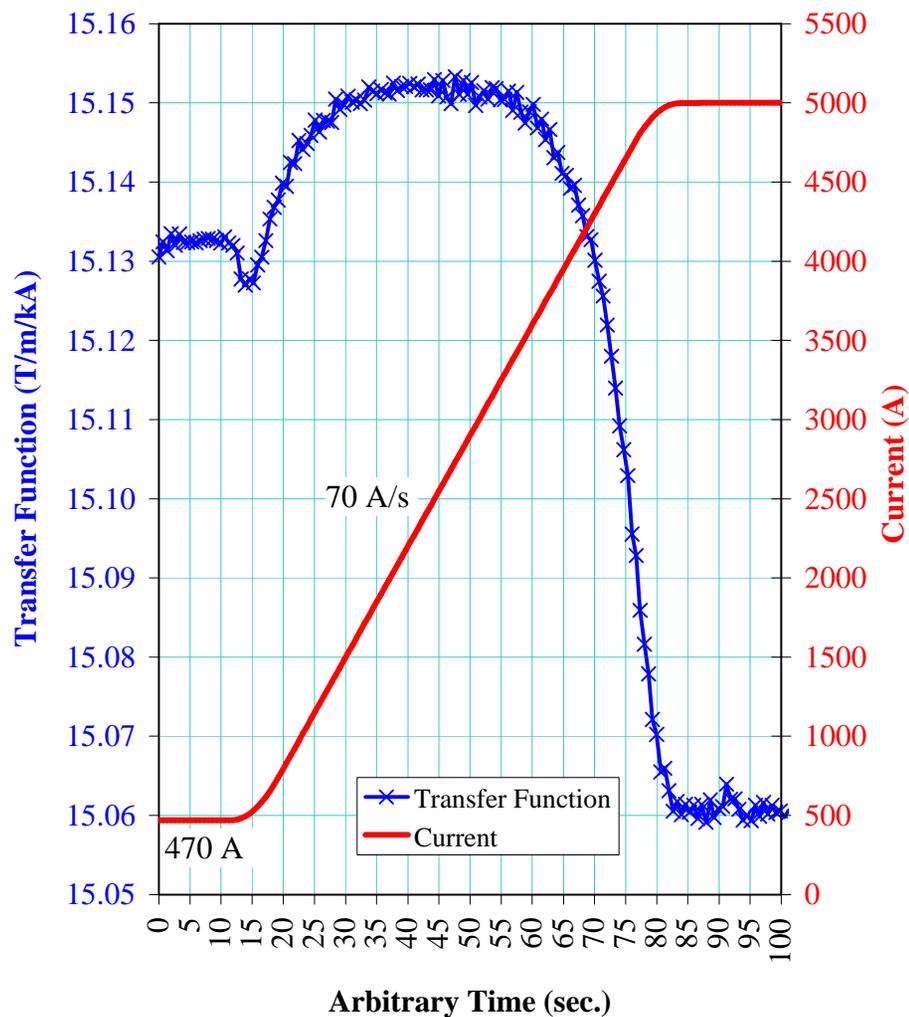
Complete ramp from 25A to 470A to 5000A

**12-Pole Snap-back in QR7109 on Ramp from 470A**  
 (470A to 5000A at 60A/s; Run 100)



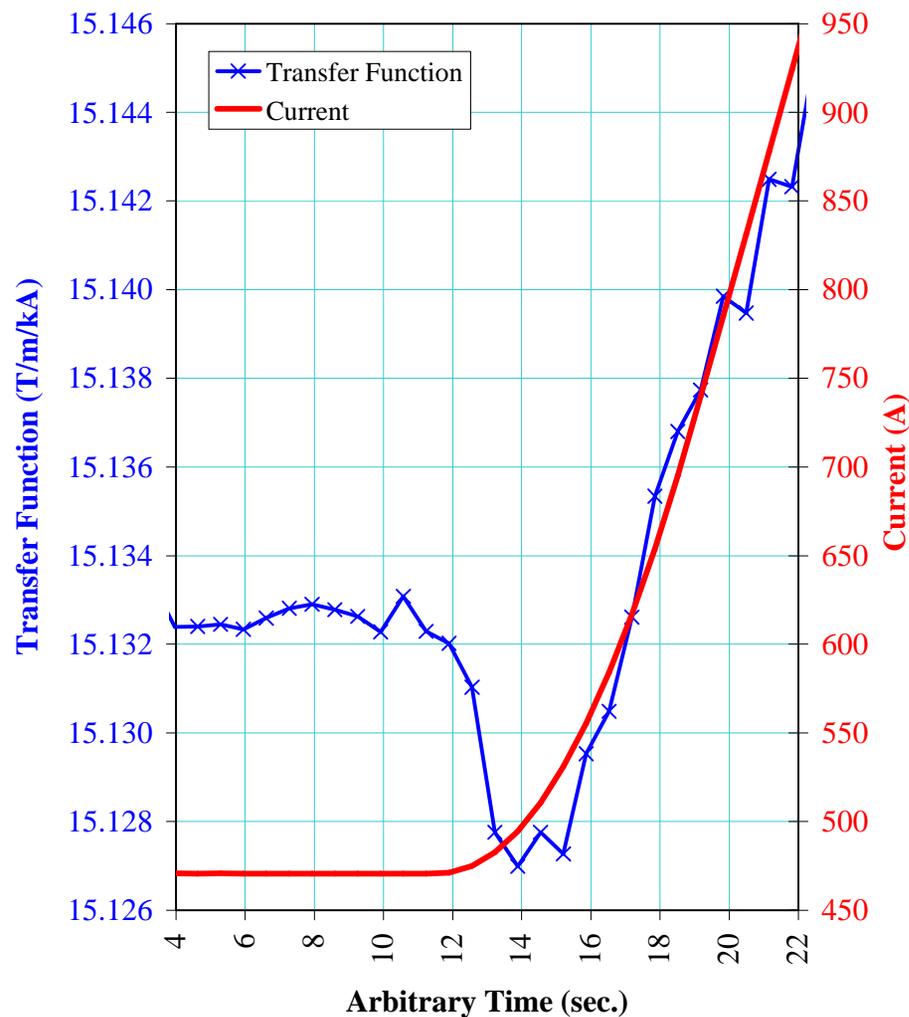
Details of snap-back at 60 A/s

**Transfer Function Snap-back in QR7109 on Ramp from 470A**  
 (470A to 5000A at 70A/s; Run 103)



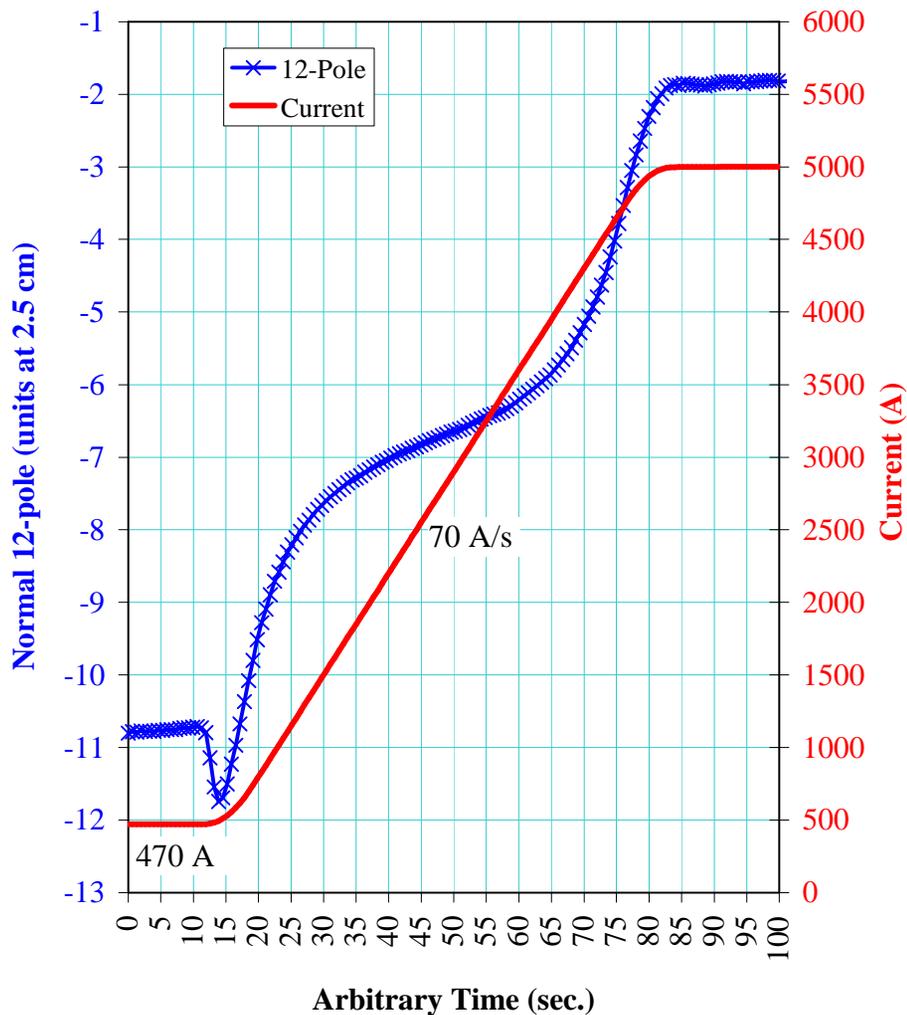
Complete ramp from 25A to 470A to 5000A

**Transfer Function Snap-back in QR7109 on Ramp from 470A**  
 (470A to 5000A at 70A/s; Run 103)



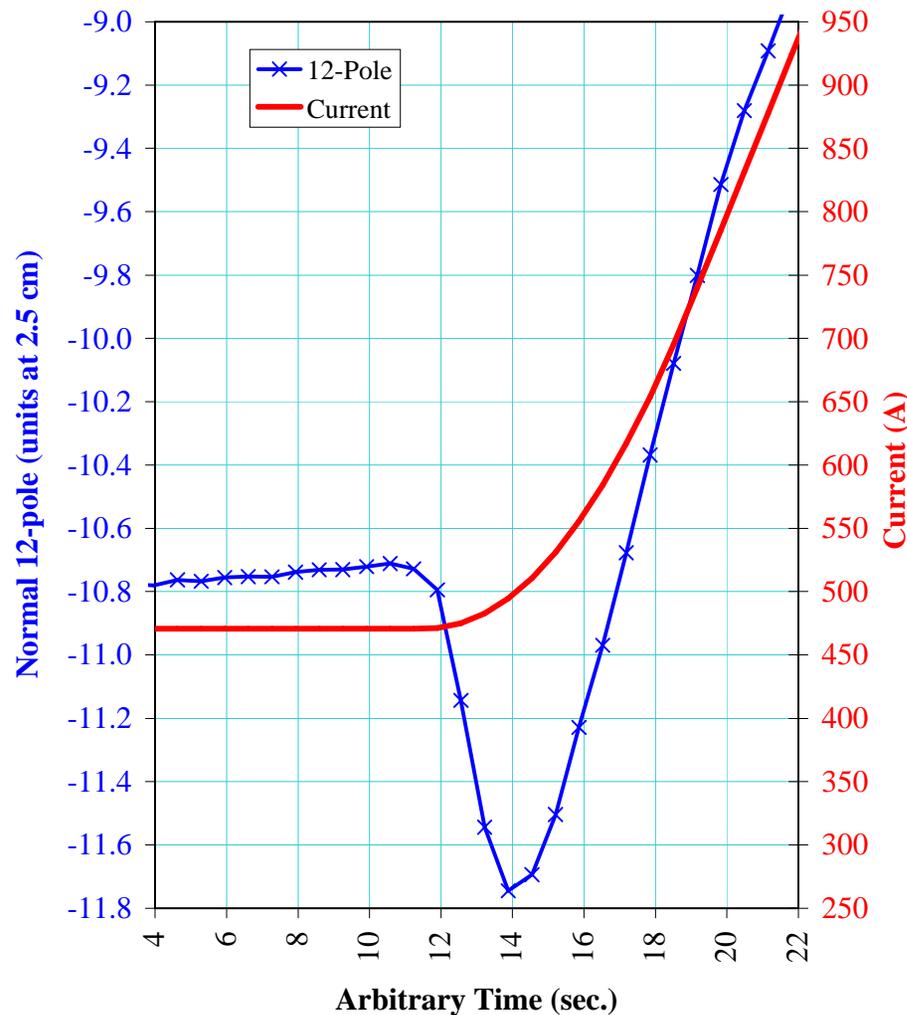
Details of snap-back at 70 A/s

**12-Pole Snap-back in QR7109 on Ramp from 470A**  
 (470A to 5000A at 70A/s; Run 103)



Complete ramp from 25A to 470A to 5000A

**12-Pole Snap-back in QR7109 on Ramp from 470A**  
 (470A to 5000A at 70A/s; Run 103)



Details of snap-back at 70 A/s