

Main Injector Note #0246
Main Injector DCCT Measurements
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This note has been written to document the results of the main injector DCCT bench testing that was recently performed. It is intended to provide general information concerning the expected range and accuracy for the system when installed in the ring at MI-60.

The system was removed from the main ring and the receiver electronics were modified to provide useful scaling for the three system outputs:

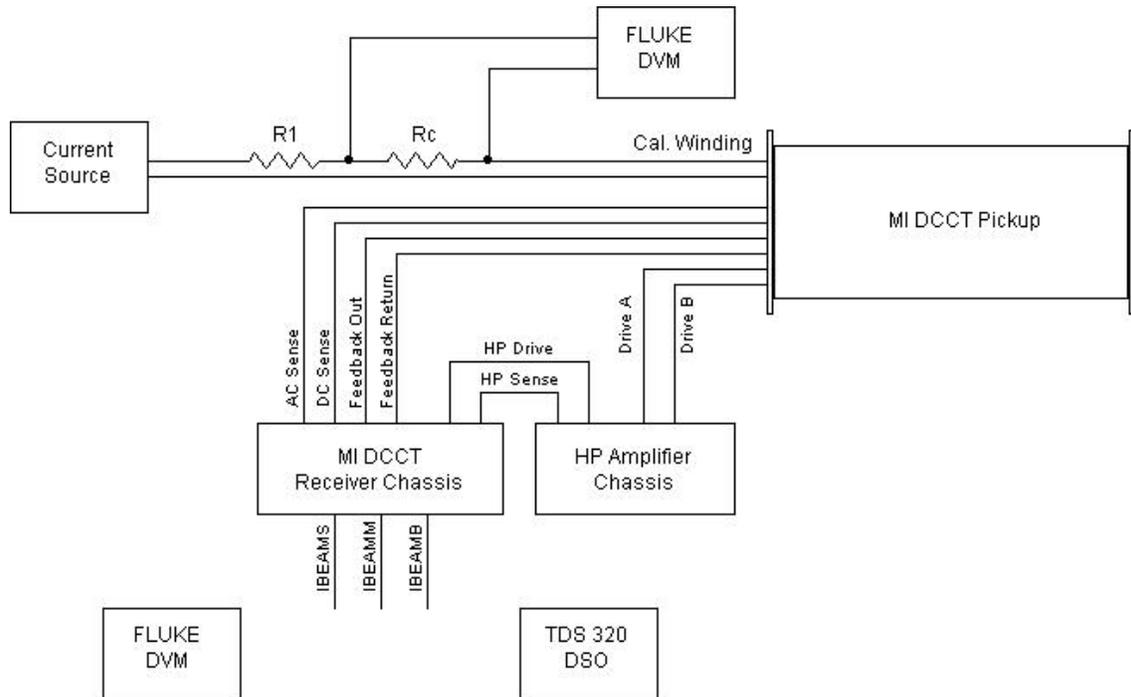
I:IBEAMS	2e10/volt	(2e11 max. range)
I:IBEAMM	1e12/volt	(1e13 max. range)
I:IBEAMB	3.47e12/volt	(3.47e13 max. range)

(The maximum value for each output range is +10 volts.)

The system was tested using the configuration shown below. DC currents were sent through the calibration winding of the detector. The test current was determined by measuring the voltage drop across a calibration resistor (Rc). The basic output of the system, for the current range under test, was measured using a DVM. The DC current for a given intensity was derived using the following formula:

$$I_{dc} * \Delta t / (1.6022e-19) = \text{INTENSITY}$$

where:
 $\Delta t = 11.07 \mu\text{Sec}$



MI DCCT Calibration Test Setup

Data was collected over an intensity range from 1e9 to 3.5e13. Within the usable ranges of each output channel the measured data was accurate to better than 1% as shown below.

<u>Monitor</u>	<u>Useful Range</u>	<u>Maximum Err</u>	<u>Average Err</u>	<u>Settling Time</u>
I:IBEAMS	1e9-2e11	0.29%	0.11%	7.5 mSec
I:IBEAMM	5e10-1e13	0.88%	0.43%	2 mSec
I:IBEAMB	5e11-3.47e13	0.93%	0.05%	1.5 mSec

A current step (rise time of 6 nSec) was also applied to the system in order to measure the settling time for each output channel. This data is also shown above.

Measurements were also performed to compare data acquired via the calibrate winding with data acquired by sending the calibrate signal through a wire passing through the vacuum pipe itself. This test was performed using the IBEAMM output and yielded a maximum difference of 0.2% between the two calibrate configurations.

It should be remembered that the above data is for a bench setup. Calibration tests will be performed again when the system is installed and the results published in an Operations Bulletin.