BY G.S. Levine DATE 4/4/62SUBJECT Hall Probe Regulation ofSHEET No. 1 OF 3

CHKD. BY _____ DATE _____

Experimental Power SuppliesJOB No. GSL - 2DEPT. OR PROJECT Cosmotron

APR 19 1962

BNL 6906

Introduction

The Hall mode of operation utilizes a signal derived from the magnetic field of an experimental magnet to provide the power supply regulators with the information necessary for it to regulate the magnet current. It has been established that regulation of the field to better than 0.1% is possible with the Hall probes and regulators used at the Cosmotron.

II. Principles of Operation

MASTER

The Hall Effect is a phenomenon whereby the voltage developed across a semiconductor or metal is a function of the current through the material and the magnetic field intensity perpendicular to the direction of current flow. (figure 1)

$$V_H = kIB$$

Where k depends on the orientation of the probe with respect to the magnetic field, and the temperature of the probe is constant.

Consequently, circuitry is required to maintain the probe at a constant temperature and to maintain a constant Hall current. Under these conditions the output Hall voltage is linearly related to the magnetic field, its absolute value being determined by the level of the Hall current. Figure 2 is a block diagram of a regulator using a Hall input signal. Dwg. no.'s and signal information are given where pertinent.

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III. Installation

The Hall probe must be fixed in the magnetic field and connected to the Hall Probe Control Chassis (Dwg. No. 7-12A-1080-4) which in turn must be connected to the regulator at MECCA. To facilitate interconnection jumper cables have been permanently installed between several points in the experimental area and a patch panel in MECCA, rack no. M34, where the Hall inputs to the regulators are also available. Consequently, a jumper cable in that rack will connect a Hall Unit on the experimental floor to any of the power supply regulators, which can then be operated in the Hall mode.

IV. Operational Instructions

After connecting the probe located in the magnetic field to the Hall Probe Control, which is connected to the regulator, certain adjustments are necessary for proper operation.

1. Set the output of the 21 V. supply of the Hall Control Chassis by adjusting the current at Jack 1 (J1) to 100 ma.
2. Set the bleeder current for 100 ma at Jack 2 (J2)
3. Set the Heater dial to the reading corresponding to the particular Hall probe used. (See Table I)
4. Check heater operation by testing for 2 - 10 volts at terminals 7, 8 of the Burndy strip.
5. Turn power supply on in current mode and adjust for a current determined by the desired field in the magnet. (from BI curves)
6. Adjust the Hall current for a Hall output voltage of about 80 mv.
(Note: this voltage then represents the Hall voltage for the given magnetic field at this Hall current and temperature.)
7. Switch to Hall mode of operation of the Power Supply Regulator and set the power supply current to obtain the desired Hall voltage.
8. The regulator will now maintain the Hall voltage and consequently the desired magnetic field.

Notes of Caution

9. The Hall current shunt reading may be monitored at the Hall Control Chassis so that operating conditions in the Hall probe may be reproduced.
10. The probe should be fixed in the field in a manner to prevent motions of the probe of more than a few mils. (.001")
11. The user must understand that if a different magnetic field is desired a portion of this procedure, steps 5 - 8, must be repeated.

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Experimental Power SuppliesJOB No. GLS - 2DEPT. OR PROJECT CosmotronHall Probes - Table I

<u>Serial #</u>	<u>Htr. Setting</u>
733	818
749	818
755	746
762	800
771	923.6
779	865.6
780	840
782	845
785	846.4
788	925.2
790	834.8
792	840.8
794	875.6
795	800.8
796	927.2
797	857.2
798	832.8
804	828

V. References

Hall Probe Regulator Action and Hall Generator Evaluation

A. V. Soukas

A.D. Internal Report AVS-1

A.G.S. Experimental Magnet Power Supplies - Cottingham, Kessler, Soukas

A.D.D. Internal Report

JGC/EAK/AVS-1

NOTES

* ACME RECT. OR AMPLIDYNE-MG. SET

1. FOR ACME: SEE DWGS. 7-12A-1137-4 & 7-12A-1170-3

FOR M.G. SET SEE DWGS. 7-12A-1121-4

FIG. 2

TOLERANCE — DECIMAL ± .005. FRACTIONAL ± 1/64. ANGULAR ± 30' BREAK SHARP EDGES. .005 .015

ITEM NO.		USED ON DWG. NO.		NO. REQD.		BROOKHAVEN NATIONAL LABORATORY ASSOCIATED UNIVERSITIES, INC. UPTON, N. Y.	
CHECKED BY		I L R NO.		ACCOUNT NO.		BLOCK DIAGRAM OF COSMOTRON	
						REGULATOR SYSTEM FOR	
MATERIAL SPEC.		SIZE		WEIGHT		EXP. PS.	
3-26-62 E. HEINS				C. G. L.		-1	
DATE		DRAWN BY		CHECKED BY		DRAWING NUMBER	
						REV.	