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NEUTRAL BEAM INJECTOR SYSTEM DEFLECTION MAGNET - MAGNET CONNECTIONS

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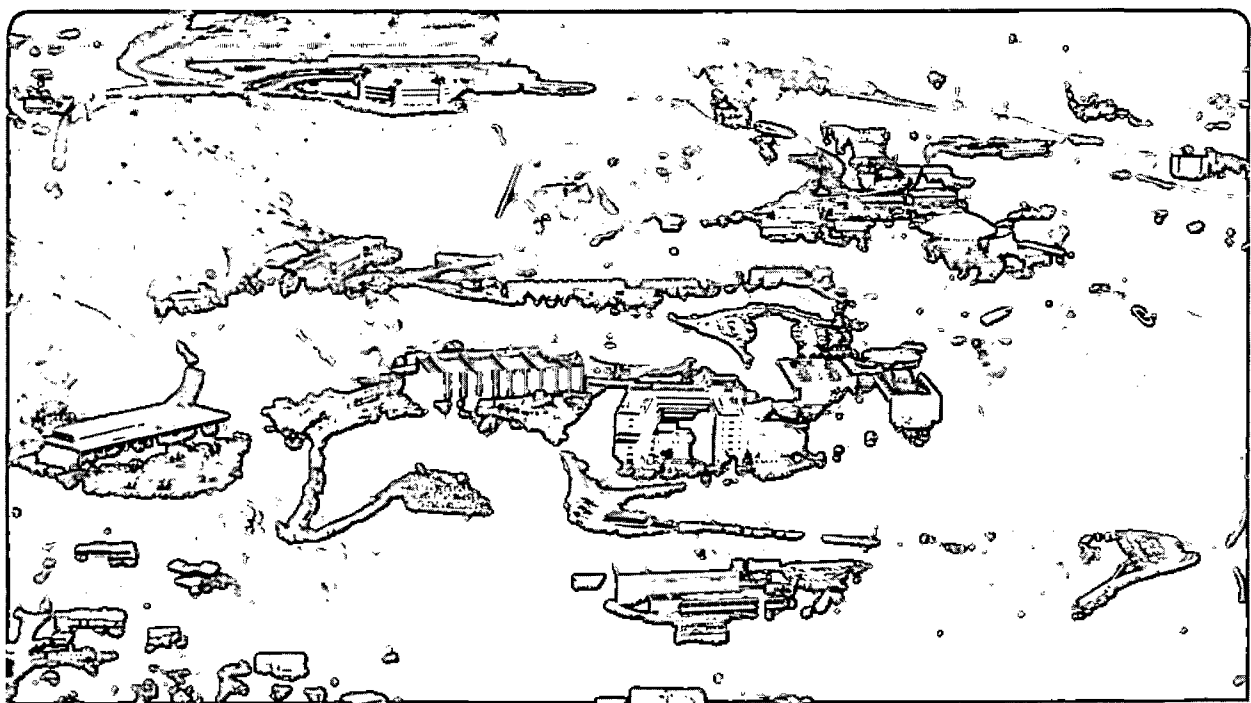
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LAWRENCE BERKELEY LABORATORY - UNIVERSITY OF CALIFORNIA		CODE	SERIAL	PAGE
ENGINEERING NOTE		TF0700	M5234	1 of 2
AUTHOR	DEPARTMENT	LOCATION	DATE	
Ron Yourd	Mechanical Engineering	B71G	August 30, 1978	
PROGRAM - PROJECT - JOB				
NBSTF/TFTR				
Neutral Beam Injector System Deflection Magnet				
TITLE				
Magnet Connections				

The following connections are required for the 3 channel deflection magnet installation:

- 1 - Coil Power
- 2 - Coil Water
- 3 - Coil Water Flow Switch
- 4 - Coil Thermal Switch
- 5 - Magnetic Flux Integrating Coil
- 6 - Magnetic Gap Hall Probe
- 7 - Poletip Thermistors

1 - Coil Power (6 each coils)

The 6 coils are essentially identical (drawing 18N 5546). They differ only in the way their leads and umbilical tube vacuum jackets are assembled (18N 5806). Each pair of coils is to be connected electrically in series and driven by a separate power supply. The coils are rated at $I = 870$ amps, $R = .011 \Omega$ each, $.022 \Omega$ each gap; $V = 10$ V each, 20 V each gap; $P = 8.7$ kw each, 17.4 kw each gap.

Each power bus bar on each coil allows 4 each 4/0 cable lugs to be attached. To properly connect the two adjacent coils in series, the two innermost bus bars must be joined together, (this jumper can be made using either 4 each 4/0 cables or by fabricating a permanent "hard" jumper of approximately 1 square inch copper cross section current carrying area.) The power supply connections must be made such that the magnet gap field direction causes the positive ions to deflect upward into the ion dump collectors. The bundles of 4/0 cables must be adequately supported and the bus bar connections carefully made to prevent undue loading or strains to be transferred to the long coil leads.

2 - Coil Water (6 each circuits)

Each coil comprises a separate water circuit. The bus bars are stamped "supply" and "return", and rubber hose connections should be made directly at the bus. Low conductivity water (LCW) must be used. The measured flow data for each coil is approximately 0.95 gpm @ 40 psi differential, 1.20 gpm @ 60 psi, and 1.35 @ 80 psi.

3 - Coil Water Flow Switch (6 each required)

A separate flow switch should be installed in the return line of each circuit. A flow dropping below 0.75 gpm on any circuit should cause the power supply to shut off to protect the coils from damage.

LAWRENCE BERKELEY LABORATORY - UNIVERSITY OF CALIFORNIA.		CODE	SERIAL	PAGE
ENGINEERING NOTE		TF0700	M5234	2 of 2
AUTHOR	DEPARTMENT	LOCATION	DATE	
Ron Yourd	Mechanical Engineering	B71G	August 30, 1978	

4 - Coil Thermal Switch (6 each required)

A separate coil thermal switch should be installed in the "return" (warm) bus bar block for each coil. Any thermal switch trip should also cause the power supply to trip off. The initial switches specified are:

"Klixon" thermostat switch, Texas Instrument; series 11041 or C4344; open @ 150°F, close @ 130°F.

They are installed with a thin coating of Dow Corning #340 silicon heat sink compound (or equivalent) and threaded directly into the bus bar blocks.

5 - Magnetic Flux Integrating Coil (6 each optional/later implementation)

These monitoring devices may be implemented at a later date if desired. During fabrication and assembly of each coil, a single turn coil loop was formed to encircle each poletip. This wire loop was brought out with the coil leads and is a small gauge coaxial shielded cable tied off at the coil bus bar blocks. These coil loops may prove useful in the future, if it is desirable to monitor average field level by integrating changes in flux passing through the loop.

6 - Magnetic Gap Hall Probe (6 each)

A Hall probe monitor is installed with each poletip. Each probe has 4 wires (2 each input, 2 each output) associated with it, and terminated on a mounting block in 2 small coax connectors (Amphenol # 27-9 subminax connectors).

The Hall probes initially installed are:

Ohio Semitronics Inc. (OSI) model HR-36, control current = 350 ma, nominal Hall output, $V_h = 350 \text{ mv} \pm 25\%$ (calibrate) for $B = 10 \text{ kg ref}$, temperature coefficient = $-0.1\%/^{\circ}\text{C}$

Input resistance approximately 1.2 ohms, (red/black color code)

Output resistance approximately 1.0 ohms, (yellow/blue color code)

The connecting harnesses to be fabricated and installed to join the coax connectors to the external multi pin connector "PM" are described elsewhere. The first 24 pins for "PM" are reserved for the Hall probes.

7 - Poletip Thermistors (6 each)

Thermistors are mounted on each poletip to indicate operating temperatures during beam pulsing. Excessive temperatures caused by beam scraping or mis-alignment should be noted, monitored and perhaps even interlocked to control circuits in the future. The initial thermistor units installed are:

16000 ohm, ISO - curve FENWAL small bead thermistor, #GB 42JM65

Pins 25-36 of plug "PM" are reserved for thermistor connections.

This report was done with support from the Department of Energy. Any conclusions or opinions expressed in this report represent solely those of the author(s) and not necessarily those of The Regents of the University of California, the Lawrence Berkeley Laboratory or the Department of Energy.

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