

Lawrence Berkeley National Laboratory

Recent Work

Title

POWER-SUPPLY SYSTEM FOR THE BEVATRON AUXILLIARY MAGNETS

Permalink

<https://escholarship.org/uc/item/71c5v5j3>

Author

Harris, C.A.

Publication Date

1959-05-01

UNIVERSITY OF
CALIFORNIA
Ernest O. Lawrence
Radiation
Laboratory

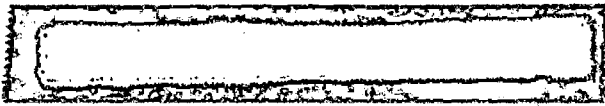
POWER-SUPPLY SYSTEM
FOR THE BEVATRON AUXILIARY MAGNETS

TWO-WEEK LOAN COPY

*This is a Library Circulating Copy
which may be borrowed for two weeks.
For a personal retention copy, call
Tech. Info. Division, Ext. 5545*

DISCLAIMER

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.



UCRL-8616
Particle Accelerators
and High-Voltage Machines

UNIVERSITY OF CALIFORNIA
Lawrence Radiation Laboratory
Berkeley, California

Contract No. W-7405-eng-48

POWER-SUPPLY SYSTEM FOR THE BEVATRON AUXILIARY MAGNETS

C. A. Harris

May 1959

Printed for the U. S. Atomic Energy Commission

Printed in USA. Price 75 cents. Available from the
Office of Technical Services
U. S. Department of Commerce
Washington 25, D. C.

POWER-SUPPLY SYSTEM FOR THE BEVATRON AUXILIARY MAGNETS

C. A. Harris

Lawrence Radiation Laboratory
University of California
Berkeley, California

May 1959

ABSTRACT

This report describes some of the basic considerations in the design of the protective interlocking of the dc power system for auxiliary magnets used at the Bevatron. The required current-regulation tolerances are given along with a discussion of the various problems associated with certain special applications of the magnets.

POWER-SUPPLY SYSTEM FOR THE BEVATRON AUXILIARY MAGNETS

C. A. Harris

Lawrence Radiation Laboratory
University of California
Berkeley, California

May 1959

Introduction

This report describes some of the basic considerations incorporated in the protective circuits employed in the distribution and regulation of dc power supplied to the auxiliary magnets used for high-energy-particle research on the Bevatron. The Bevatron is a 6.3-Bev synchrotron-proton accelerator located at the University of California Lawrence Radiation Laboratory.

Power Requirements

The auxiliary magnets required for analyzing and focusing high-energy charged particles are many and varied. Table I lists the magnets and the installed dc power sources used to energize them. The required dc power ranges from 11 kw per section of the 4-in. quadrupole focusing magnet to a maximum of 3,000 kw for the 72-in. Bubble Chamber. The required current regulation for analyzing magnets is 0.1%; for focusing magnetic lenses, 0.5%.

It requires 8,450 kw to energize all the dc magnets to full power simultaneously. At present 7,930 kw of auxiliary dc power is available. Simultaneous experiments are programmed to take advantage of the multiplexing provided in the control of the beam and targets of the Bevatron. To make a change-over to a new run in a minimum of time, it is required that the dc distribution be flexible enough to change a power source rapidly from one load to another.

The primary ac voltage used to feed the different power supplies varies according to the wattage required. The following 60-cps voltages are used currently:

- 240 volts, 3-phase for less than 20 kw
- 480 volts, 3-phase from 20 to 400 kw
- 2400 volts, 3-phase from 360 to 1400 kw
- 12000 volts, 3-phase above 1500 kw

Table Ia

Bevatron auxiliary magnets					
Type	dc Power rating (amp) (volts)		Reference prints		Number of magnets
4 in. Quadrupole	575	69	Mech.	6M8566	7
	406	76			
	575	69	Elec.	6Y4064	
8 in. Quadrupole	1250	79		6Y6535	4
	1250	127		7G4155	
	1250	79		7G4226	
8 in. Quadrupole low-power	1000	44		7G9044	5
	1000	44			
"C" 13×24 in.	1000	180		6Y9164	2
				LO40333	
				9A2713	
Analyzer 12×60 in.	2000	220		6Y1734	2
				6M8175	
"C" 9×12 in.	194	114		7Y1553	2
"H" 18×36 in.	2000	158		6Y9614	2
				LO40323	
"H" 18×36 in. low power	1000	165		7Y4354	3
				LO41504	
Coaxial spectrometer	4000	6			2
Plane spectrometer	200	24			2
30 in. Propane bubble chamber	1100	370			1
15 in. H ₂ bubble chamber	2000	108			1
Cloud chamber	2000	108			1
72 in. Bubble chamber	4700	521			1

Table Ib

Bevatron auxiliary magnets dc power sources

Type and designation of source	Available dc power			Percent regulation	Notes and reference prints
	(volts)	(amp)	(kw)		
<u>Motor Generators</u>					
#1	8,000	8,330(pK)	2,600	0.1%	Main magnet power supply 6Y6745
#2	8,000	8,330(pK)	2,600		Motor 4Y4325
#3	180	2,000	360		Gen. 4Y4334
#4	180	2,000	360	0.1	Cont. 6Y7325
					Motor 3R2175
					Gen. 6Y8585
#5	180	2,000	360	0.1	Cont. 6Y7945
					Motor 4R1025
					Gen. 6Y7955
#6	415	2,705	1,120	0.1	Cont. 6Y7585
					Motor 4R3255
					Gen. 6Y7265
#7A	180	1,225	220	0.1	Cont. 6Y7275
					Gen. 6Y9715
					Cont. 6Y9735
#7B	150	1,600	240	0.1	Motor 4R4445
					Gen. 6Y9725
					Cont. 6Y9745
#8	300	5,000	1,500	0.1	Motor 4R5455
					Gen. 6Y9815
					Cont. 6Y9825
#9	300	5,000	1,500	0.1	Motor 4R5775
					Gen. 6Y9915
					Cont. 6Y9925
#10	137	300	41	0.1	3R8454
#11A	250	1,000	250	0.1	
#11B	250	1,200	300	0.1	
#12A	250	1,000	250		Motor 4R6655
#12B	250	1,000	250		Typ. gen. 7Y4115
<u>Rectifiers</u>					
Perkins #1	70	400	28	0.5	Schem 6Y7244
#2	70	400	28	0.5	Cont. 6Y6015
					Cont. 6Y6025
					Cont. 6Y6035
					Cont. 6Y6045
					Cont. 6Y6055
					Cont. 6Y6065
					7Y2925
					7Y2925
					7Y2925
					7Y2925
Lee #1A	60	200	12	none	3Z3634
					3Z3634
					3Z3634
					3Z3634
					3Z3894
Lee 6V #1	6	300	1.8	0.5	5Z6013
					5Z6013
GE 6V #1	6	300	1.8	none	5Z5003
Lee 96 kw	12	8,000	96	0.5	6Y7303
20 kw	125	160	20	0.1	3R4542
20 kw	125	160	20	0.1	3R4542

Terminal Cans

Figure 1 shows a typical experimental setup, laid out on the available Bevatron experimental area. For our particular purpose we have found that at least three terminations for each power source are desirable. These permanent terminations should be so located that the various parts of the experimental area may be served with portable cables less than 50 feet long.

The original dc terminal cans (see Fig. 2) required that all the cables be disconnected from one terminal can in order to connect a new load to a different termination of the same generator. In a new approach, secondary terminals are used in the terminal can (see Figs. 3 and 4) for the portable cables, and a set of easily removed links connects to the main terminals. This allows a faster change-over from one load to another, and makes the change-over more foolproof.

Electrical interlocks on the positions of the links are used in the generator interlock chain so that the generator may be energized only when one set of links for a given dc power source is in place. The secondary terminals of the other boxes may be worked on at any time.

The terminal boxes also contain other bits of information such as:

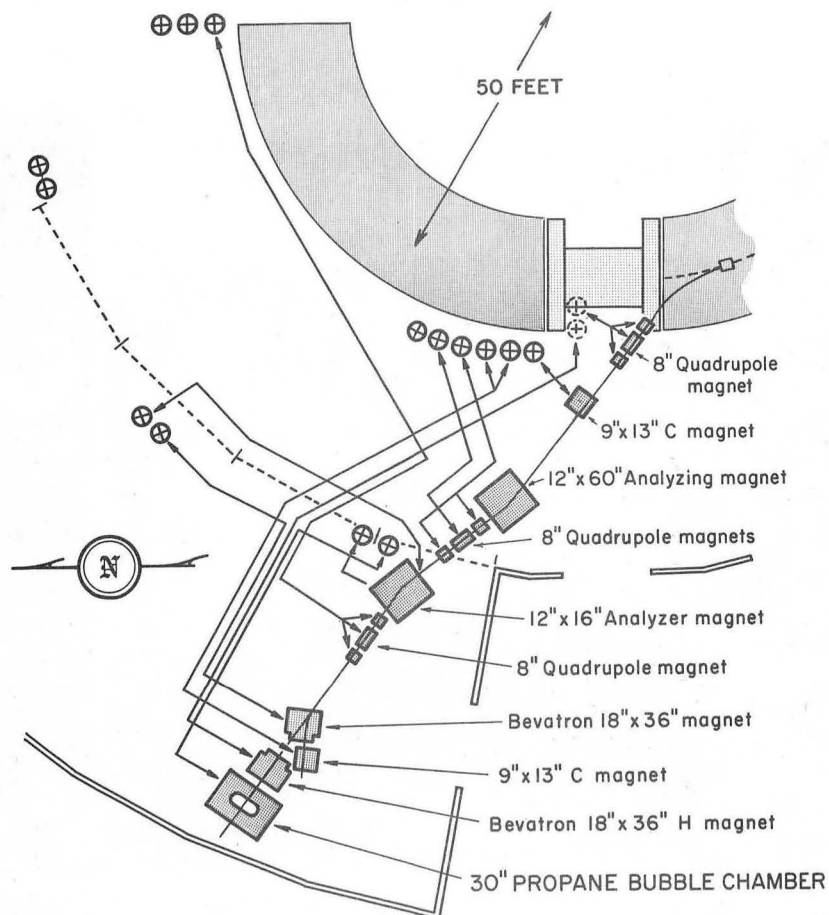
1. Interlock lights for the terminal-can interlocks.
2. A warning light to indicate when the motor of the MG set is turned on.
3. Meters to show the generator output voltage and current.
4. An emergency "off" button for the motor power.
5. Keyed interlocks that prevent opening of the terminal can unless the generator field power and the motor power have been turned off.
6. A plug in the terminal can for connecting to that can the appropriate interlocks for cooling protection of the magnet.
7. Additional plugs are provided inside the terminal can so that it is possible to control the generator regulation from the distribution can instead of from the main control center.

Portable Cables

The temporary cables used are extra-flexible (5320 strands of 34 AWG rope-laid) 4/0 cable with 600-volt insulation. The cables are used in parallel for currents greater than 300 amperes.

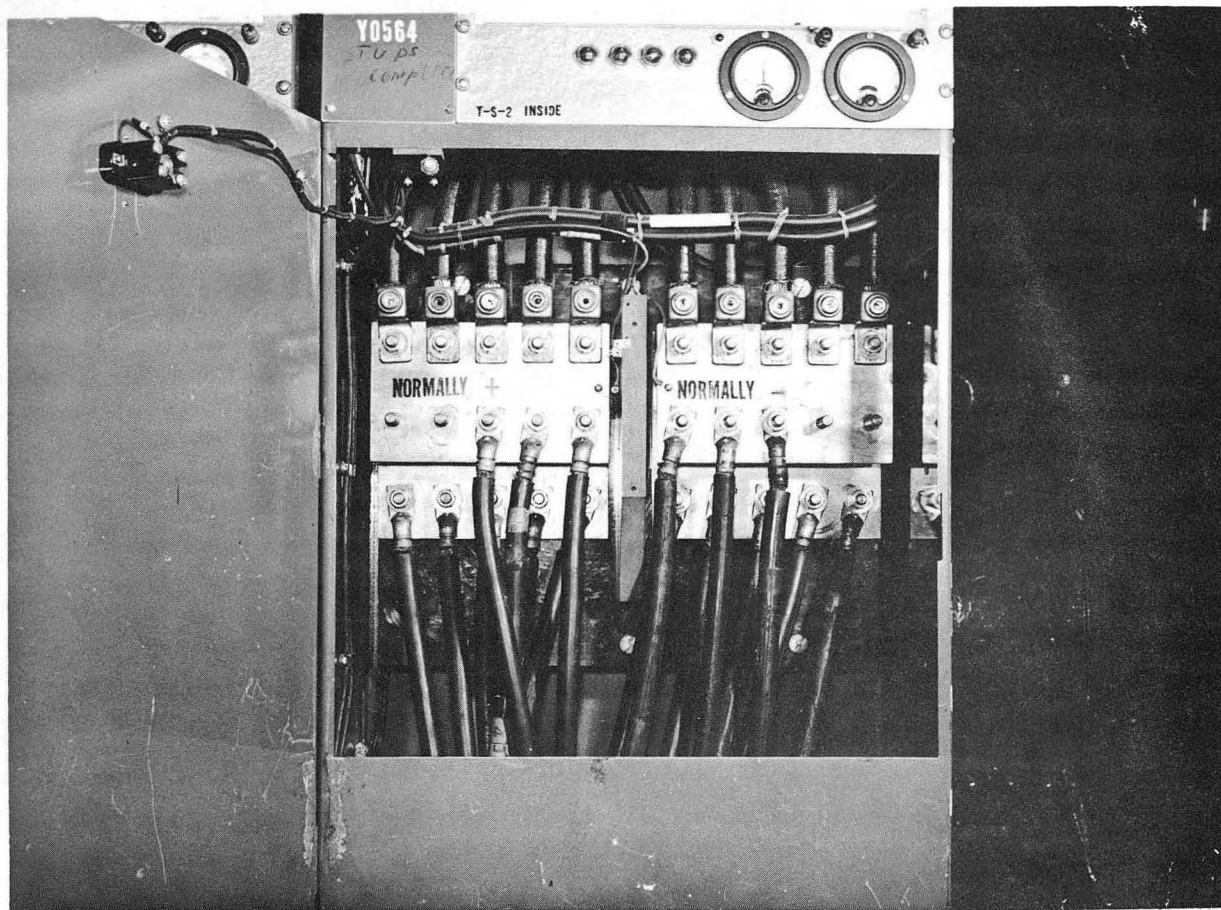
Rolled-on lugs (Anthony Insulock, Type 4/0 F) gave us considerable trouble until we soldered the ends of the small wires into the lug. We believe, also, that these small wires should be soldered to any other type of clamping device used to attach the lug to the cable.

Cables bundled together can be identified by the serial number stamped near each end.



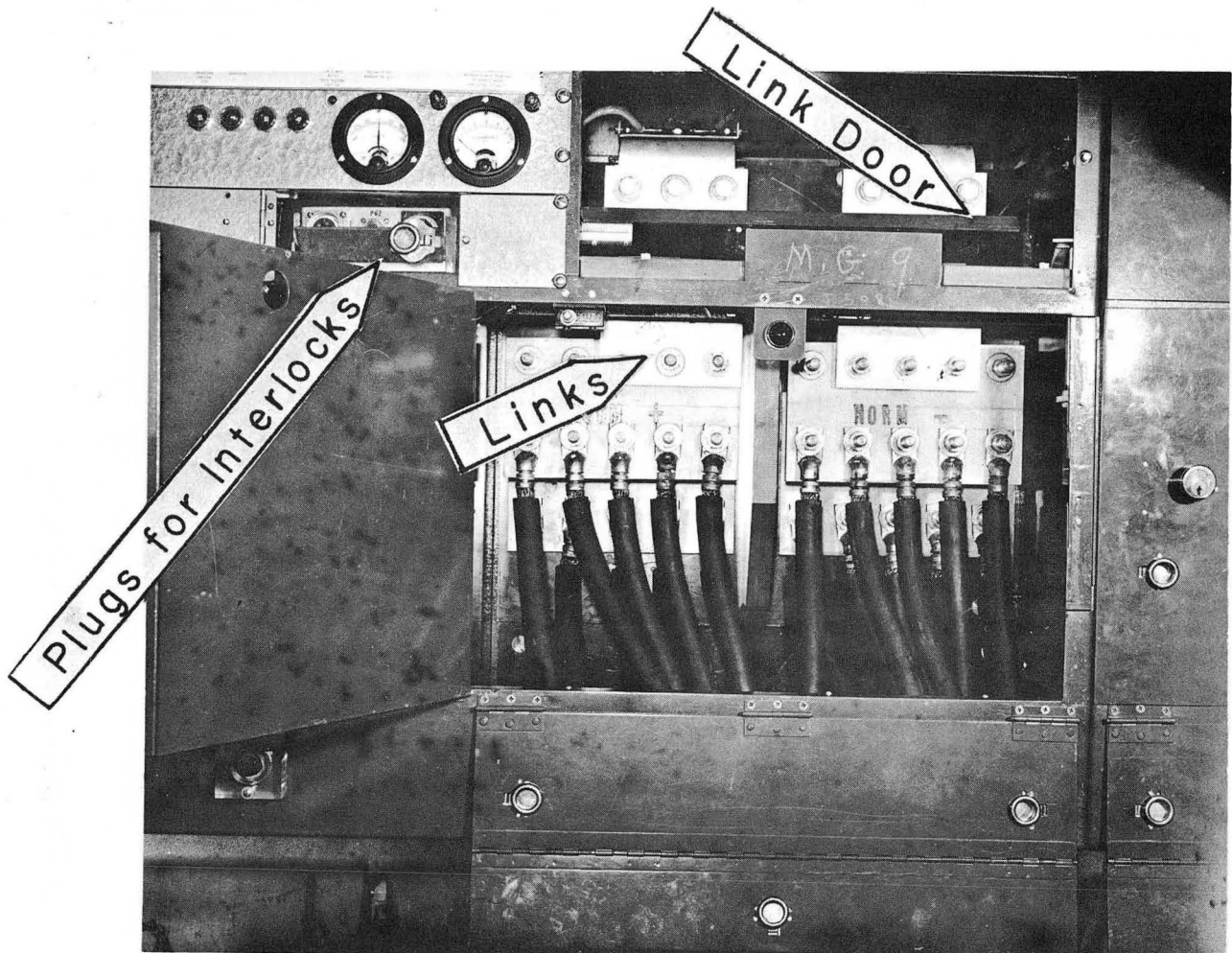
MU-17355

Fig. 1. Part of Bevatron research area. Typical experimental setup. Note that some of these portable cables are more than the recommended length of 50 ft; this condition will be corrected with the addition of new terminal cans. There would normally be two or more setups on the floor at one time. Each setup may be more or less complicated than the one shown.



ZN-2126

Fig. 2. An older style of dc terminal can; 200 v, 2,000 amp. Leads from the generator on top; portable leads to a magn at the bottom. (Note serial number just visible on one cable.)



ZN-2125

Fig. 3. New-style terminal can with links and portable cables. (Note the link door, interlocked to indicate that the links are in place.) To complete the interlock the small door in front of the plugs must be opened and the magnet interlocks plugged in.

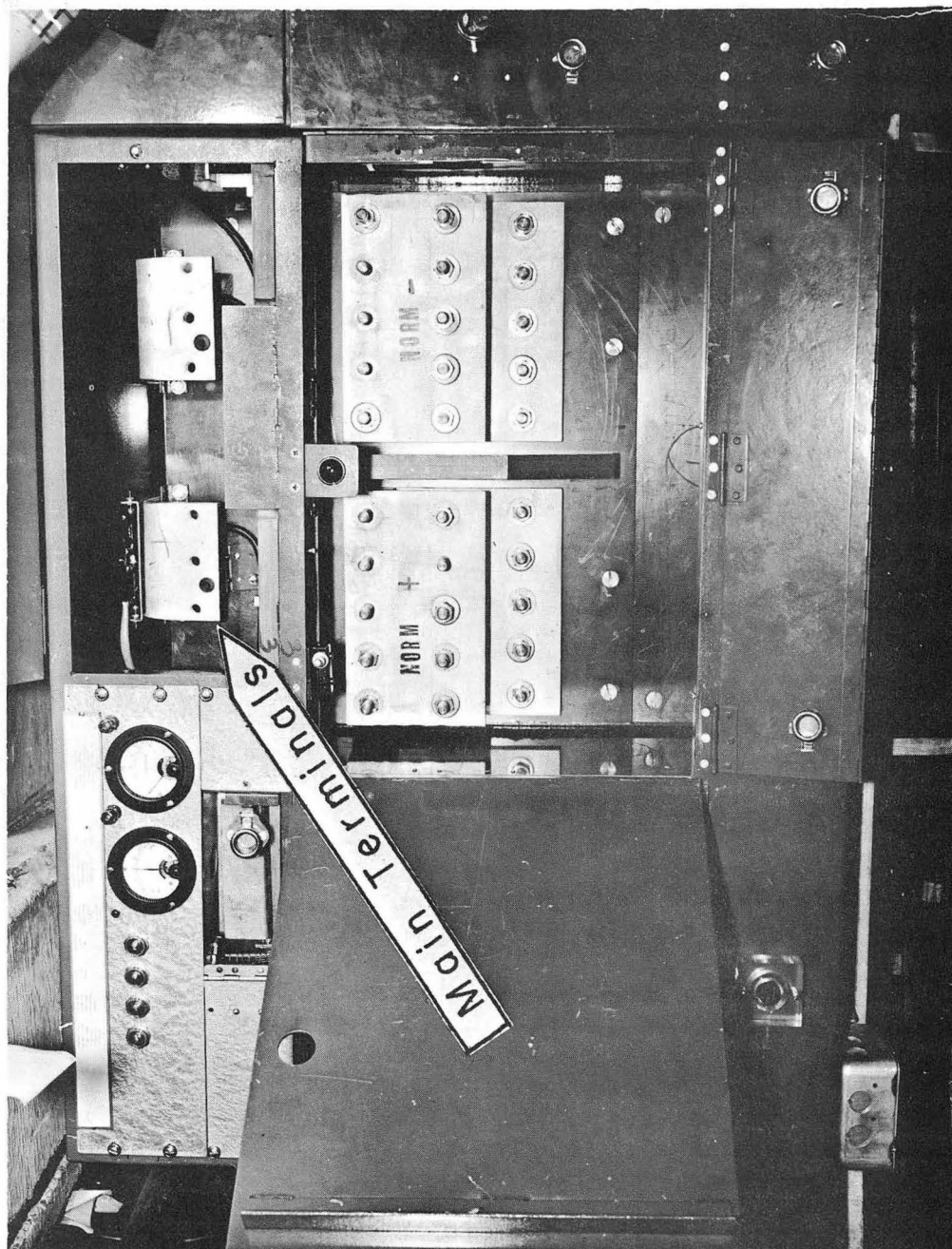


Fig. 4. New style terminal can; 300 v, 2,500 amp.

Short-Circuit and Grounding Protection

The dc output from rectifiers or generators goes directly to the various dc terminal cans; no intervening dc circuit breakers are installed in these lines. We felt that the additional equipment required to protect the inductive loads, if we used dc contactors in series with them, was too costly considering the remoteness of the possibility of a terminal-to-terminal short circuit.

In the event of a minor short circuit, the current regulator used on all the generators tends to keep the current within rating of the machine. If the short is terminal-to-terminal, however, the response time of the regulator plus the field of the generator is not fast enough to prevent high currents which may result in such damage as commutator flash-over.¹ The overload relays normally should operate within 100 milliseconds and turn off the field of the generator as well as the motor.

To protect the generator and magnet from arc damage resulting from accidental grounding of one of the conductors, the whole dc power circuit is tied to ground at a single point through a 20-ohm resistor. This resistance limits the ground current to reasonable values. Protective relays are installed in the 20-ohm circuit to detect ground current and trip off the motor power and generator field power. This resistance is low enough to prevent stray voltages from disturbing the current regulator.

Special Slow Current Decay

For certain types of loads, such as the bubble chamber, it is desirable to provide protective circuits that will not allow the magnet current to change more rapidly than, say, 1,000 amp per second. This rate of change applies to either direction because eddy-current forces in the cold sections of the chamber may result in mechanical damage, or in heating that causes boiling of liquid hydrogen in the chamber.²

A voltage-feedback circuit may be incorporated in the regulator to prevent a fast voltage change. A coil can be mounted in the magnetic field of the magnet to be protected; a voltage induced in the coil will indicate a fast change of field, and this signal may be used to actuate the protective circuits.

A diode is connected across the field of the generator to prevent the field current from decaying too rapidly if, for any reason, the field is turned off or the regulator fails.

Relays with normally closed contacts are connected across the field of the generator to give further protection if the above-mentioned diodes fail or if the circuit power is turned off. These special circuits extend the time for a short-circuit current to decay, but are deemed necessary to protect some loads.

Operational Control

We have found it desirable to concentrate all the generator controls in the main control room (Fig. 5) so that the accelerator operators are continuously aware of the use of water and power around the accelerator. Before the controls were in the main control rooms, it occasionally happened that several hours of Bevatron operation were lost because the stray field of one of the auxiliary magnets affected the injection orbits of the accelerator when no one realized that this auxiliary magnet was energized.

The interlock-chain indicator lights for each of the generators or rectifiers are located adjacent to the controls in the main control room. Figures 6 and 7 show the motor-generator control system. The main control-room panel has provisions for selecting and indicating the dc terminal can in use on the machine.

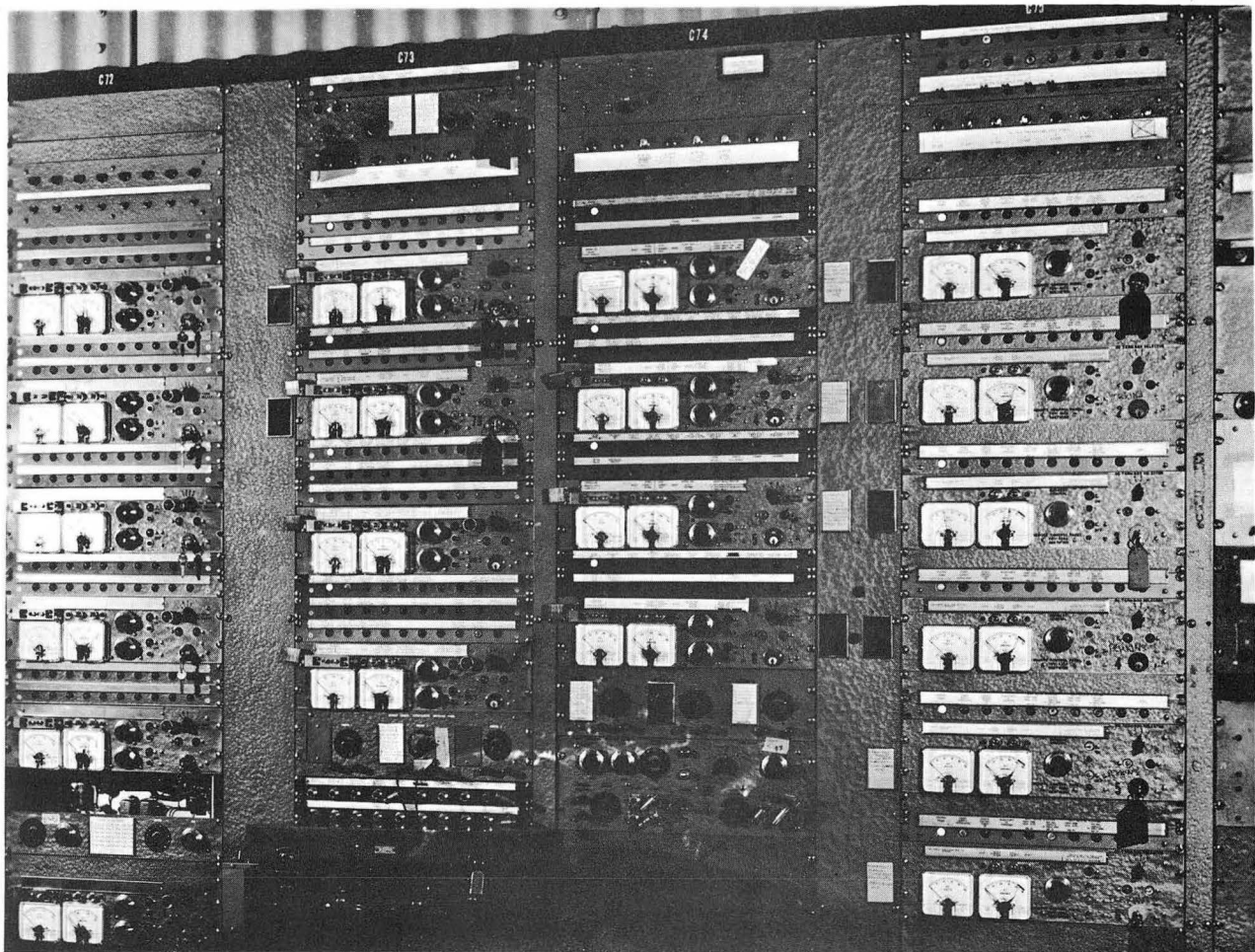
A key interlock located on the panel completes the interlock chain which permits the motor to be started. The motor can be started only at the MG set. The generator field power and the current regulator are controlled from the main control room. Provision is being included in the generator controls so that when a load change is desired, a special circuit is energized that uses the load to dynamic-brake the MG sets to a stop more rapidly. This permits earlier removal of the cables or links at a terminal can without breaking some small current flowing because the generator is still turning. Without dynamic braking the MG set would roll for 15 to 20 minutes.

It may be possible to reverse the direction of rotation of the generator during dynamic braking. This reversal can occur for only moderate ratios of total stored electrical energy to mechanical energy of the magnet-generator combination. Rotation reversal should be avoided because it causes uneven brush wear. (Garren and Heckrotte describe the conditions under which rotation reversal will occur.³)

Polarity Reversing

During a physics experiment it usually becomes necessary to reverse the polarity of the auxiliary magnet. Sometimes this has occurred several times a day. Removing and reconnecting several 4/0 cables at a terminal can is time-consuming, and can lead to confusion and error when repeated. The installation of polarity-reversing knife switches in the field circuit of the generators, associated relays to reverse the input to the regulator, and some metering, has resulted in a relatively foolproof system that takes a minimum of time.

Where rectifiers are used, the reversing problem is more difficult because it is necessary to reverse the high-current leads between the rectifier and the load. This may be done with large knife switches properly interlocked (or by the confusing method of changing the leads at the terminal cans).



ZN-2127

Fig. 5. Control center for auxiliary m.g. sets and rectifiers.

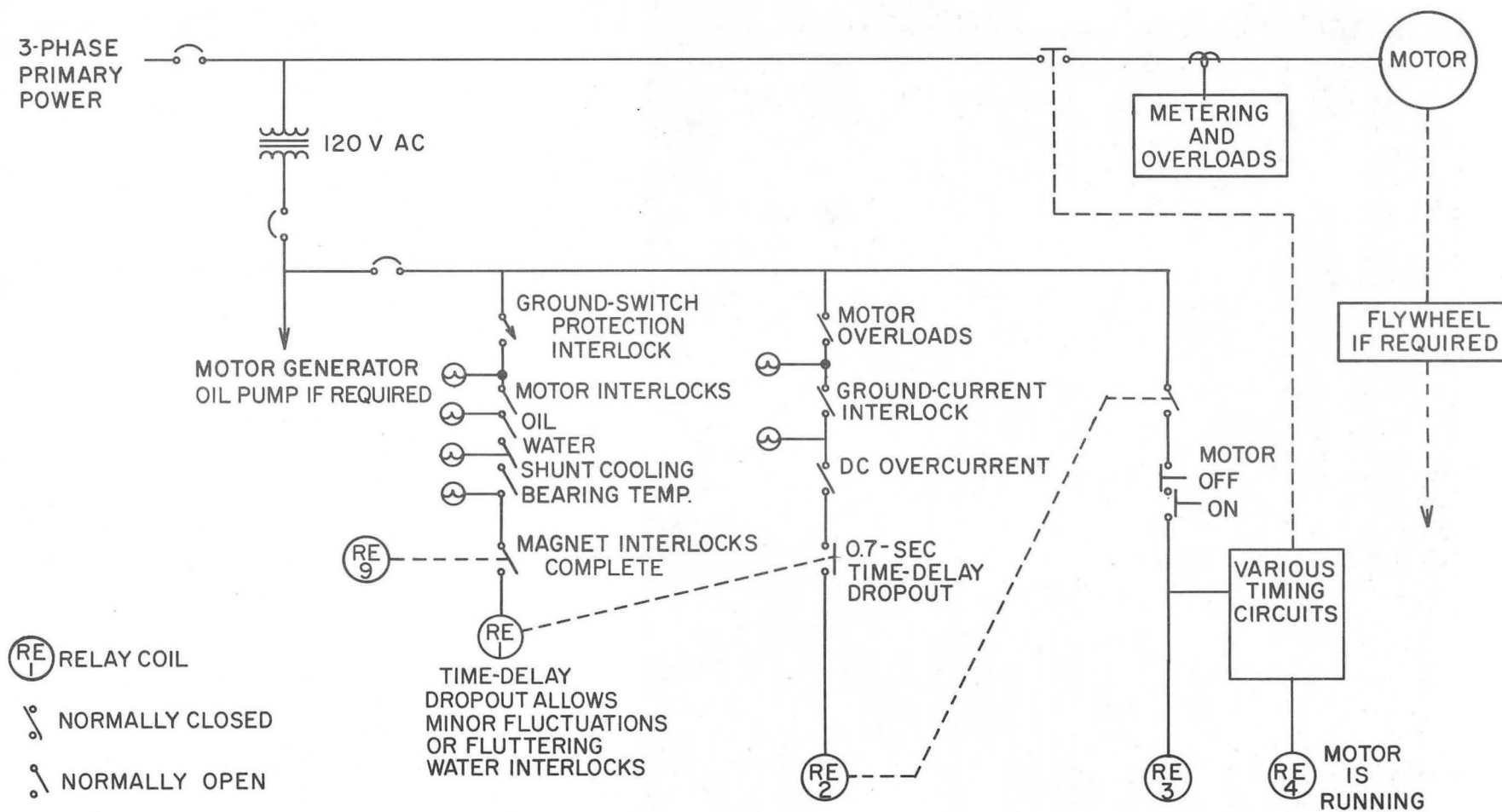


Fig. 6. Typical m. g. set. Motor control circuit. (See Fig. 7 for control of Re9.)

MUB-278



Fig. 7. Typical m. g. set. Generator field control. (See Fig. 6 also.)

Current Regulation

Current regulation required for auxiliary magnets used in physics experiments is of two degrees:

- $\pm 0.1\%$ variation for analyzing or bending magnets
- $\pm 0.5\%$ variation for quadrupole magnetic lenses

0.1% Regulation

The 0.1% requirement applies to magnetic-field ripple variations, as well as to the dc average value. This usually means that the dc power is best obtained from MG sets. The MG set has very good voltage-ripple characteristics, as well as a flywheel effect which isolates the dc output from rapid line voltage fluctuations.

The current regulators used with the motor generator sets consist of a chopper-synchronous-amplifier with a single-phase full-wave grid-controlled thyatron power section to feed the field of the main generator directly, rather than an exciter MG set or amplidyne.⁴

Since the report on magnet regulators⁴ was written (November 1949) many improvements have been made on the magnet regulator, culminating in a better control system, designed by William S. Flood, that provides a way to introduce voltage feedback into the final power section. (See W. S. Flood, Regulation of the 3-Mw Power Supply for the 72-Inch Bubble Chamber Magnet, Lawrence Radiation Laboratory, Elect. Engineer Note EE608, March 12, 1959).

Another system for a power amplifier does not use thyatrons but employs a hard-tube type of control in what we call a "Quentin Kerns circuit."⁵ This system gives a better (although more expensive) system of control, which is capable of faster regulation than the thyatron unit. The "Quentin Kerns circuit" for magnet regulators will soon be reported on by Ivan Lutz.

Magnetic amplifiers and transducers are also being considered as ways of isolating static regulators from generator circuits.

Even if an exciter MG set is not used, and a fast-response regulator supply feeds the field of the generator directly, there may still be two comparable time constants left; the generator field and the inductive load. These present a stability problem in regulation that may require voltage feedback for stable loop gains over 100. The voltage feedback is also a vital necessity for protection against rapid current changes.

For 0.1% regulation, or better, on short-time constant pulsed loads, the normally available eddy-current shielding obtained by the steel of the magnet is not sufficient to permit the high-voltage ripple of a single-phase 60-cps thyatron-controlled rectifier to be used on the field of the generator. In this situation a "Quentin Kerns" or other multiphase power actuator would be required.

0.5% Regulation

The 0.5% requirement normally allows control of power rectifiers by magnetic amplifiers or saturable reactors. Sometimes the time constant of the load and the lack of sufficient eddy-current filtering may require that the rectifier be equipped with at least a narrow range of a fast-response system such as the "Quentin Kerns amplifier." This system will then ride through a 2% or 3% line-voltage transient without exceeding the permitted regulation limits.

The design of the magnet should include some degree of eddy-current filtering if it is not intended for pulsed operation, because eddy-current ripple filtering relieves the regulation problem.

Magnetic field Ripple

Measurements of magnetic field ripple have been made by L. G. Ratner on the 8-in. quadrupoles 7G-4155, low-powered "H" Magnet LO-41504, and the C Magnet LO-40333.^{6, 7, 8} The magnets were powered with a saturable-reactor-controlled 200-volt three-phase bridge rectifier and were operated in a "phased-back" condition to develop a large percentage of ripple voltage. The bridge rectifier also performed as a "free-wheeling" diode to prevent the ripple voltage from reversing its sign on the magnet during the high-ripple-voltage operation.

Magnetic measurements were made with an 8-foot-long, narrow search coil to include the fringe field of these magnets.

The following chart shows the results for the most adverse set of conditions: the rectifier was phased back to give a large ripple, and the search coil was located near the magnet windings.

	dc Voltage	% pk-to-pk voltage ripple	dc Current (amps)	%pk-pk cur- ent ripple	% pk-pk mag- netic field ripple
8-in Quad	80	238	312	1.9	0.5
H magnet	46	402	300	1.3	0.08
C magnet	90	214	520	1.9	0.11

These data show that in most cases it will be permissible to use either saturable-reactor or magnetic-amplifier type of rectifier control for these magnets.

Parallel and Series Loads

In order to utilize fully the total power output of the MG sets it is quite often necessary to combine loads in various parallel or series arrangements. Because the currents to be used in the magnets are not always equal, it was necessary to develop stable, adjustable resistors capable of handling several kw of power.

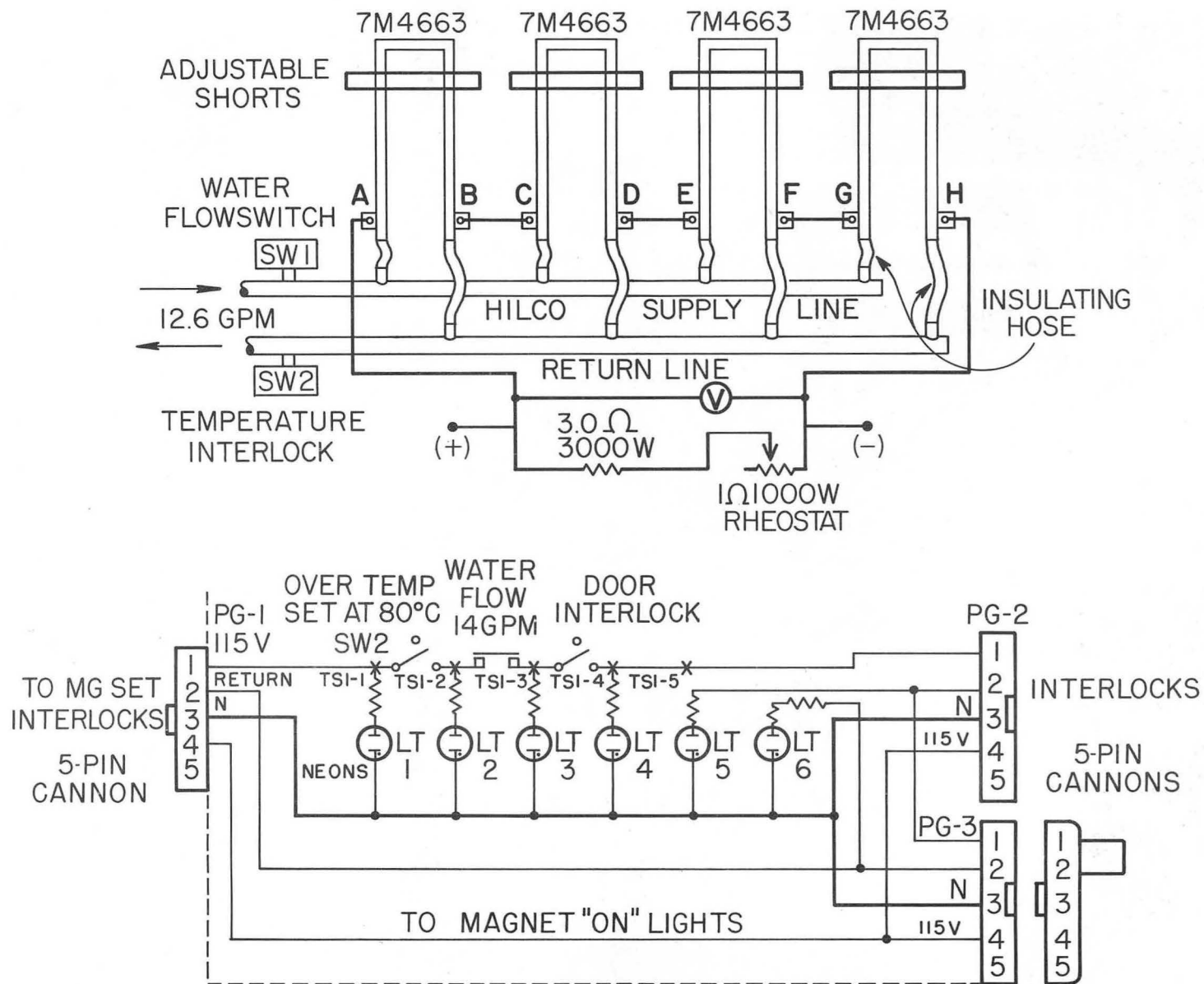
Two types are in general use: a water-cooled adjustable unit, Figs. 8, 9, and 10 and an air-cooled resistor, Fig. 11.

Sometimes adjusting the currents through various loads when connected in series or parallel can be quite time-consuming. We have found that the initial adjustment can be made more rapidly if the power supply, or motor generator set, is connected for voltage regulation instead of current regulation. After this first adjustment is made, the power source may be set for current regulation of the most critical magnet in the group.

Stray-Field Interference

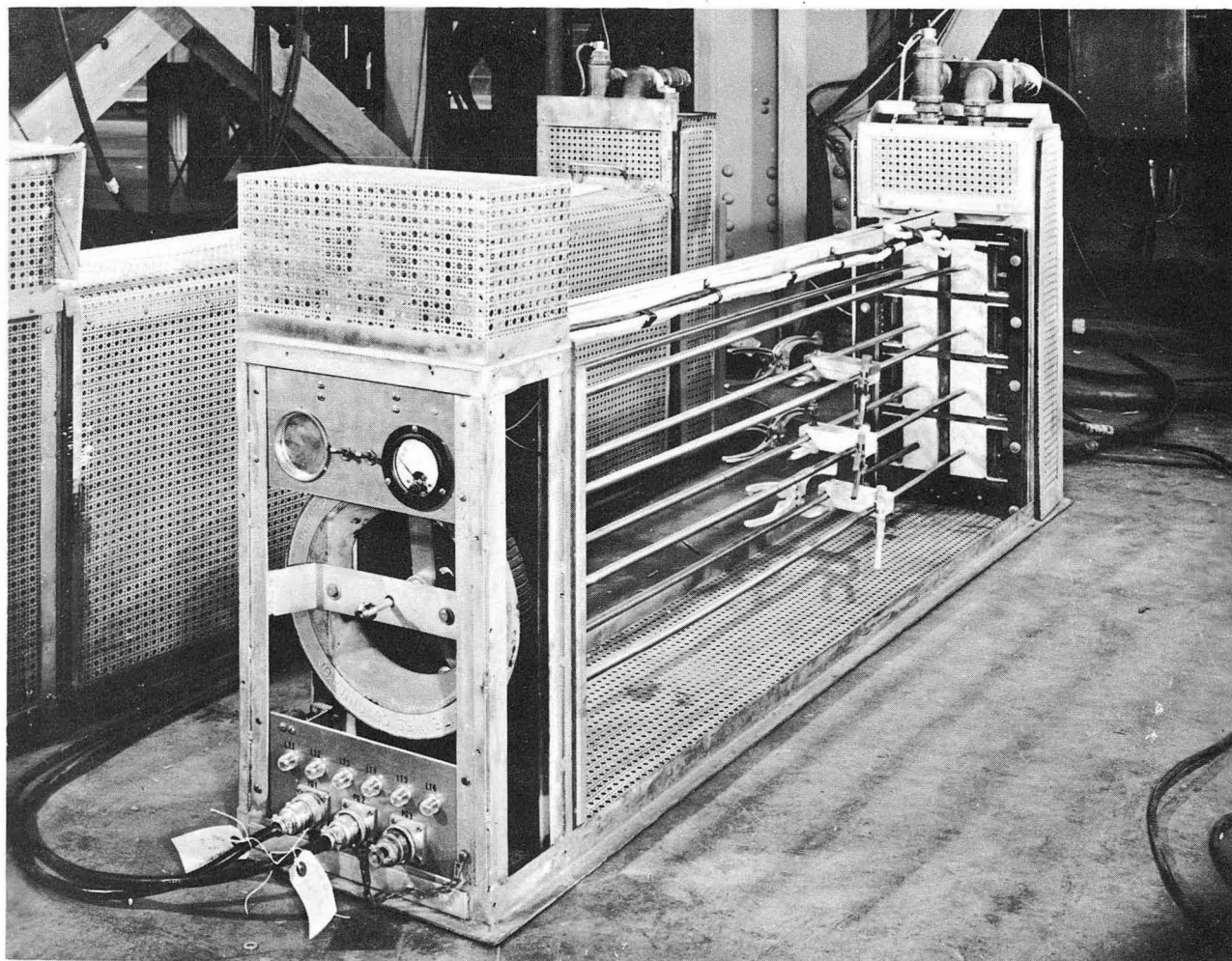
When an auxiliary magnet is located in the fringing field of the pulsed main accelerator magnet, some degree of coupling will modify the field of the auxiliary magnet. This interference may be a direct influence on the field, or the $d\phi/dt$ in the auxiliary magnet may put an impulse into its current regulator of 1% to 2%, and cause additional variation. This effect is quite noticeable at the Bevatron, but because it is repetitive from pulse to pulse, and dies out before the next pulse, it can be included in the calculations for the magnetic field channels. If this effect became a problem, a fast-response system would be designed and installed in series with the main current of the auxiliary magnet, with the regulator sensing the magnetic field instead of current. Negative voltage feedback derived from a coil sensing the field change would aid in stabilizing the system.

It may also be possible to design a magnetic shield to go between the Bevatron magnet and the auxiliary magnet. This would then eliminate coupling between these magnets.



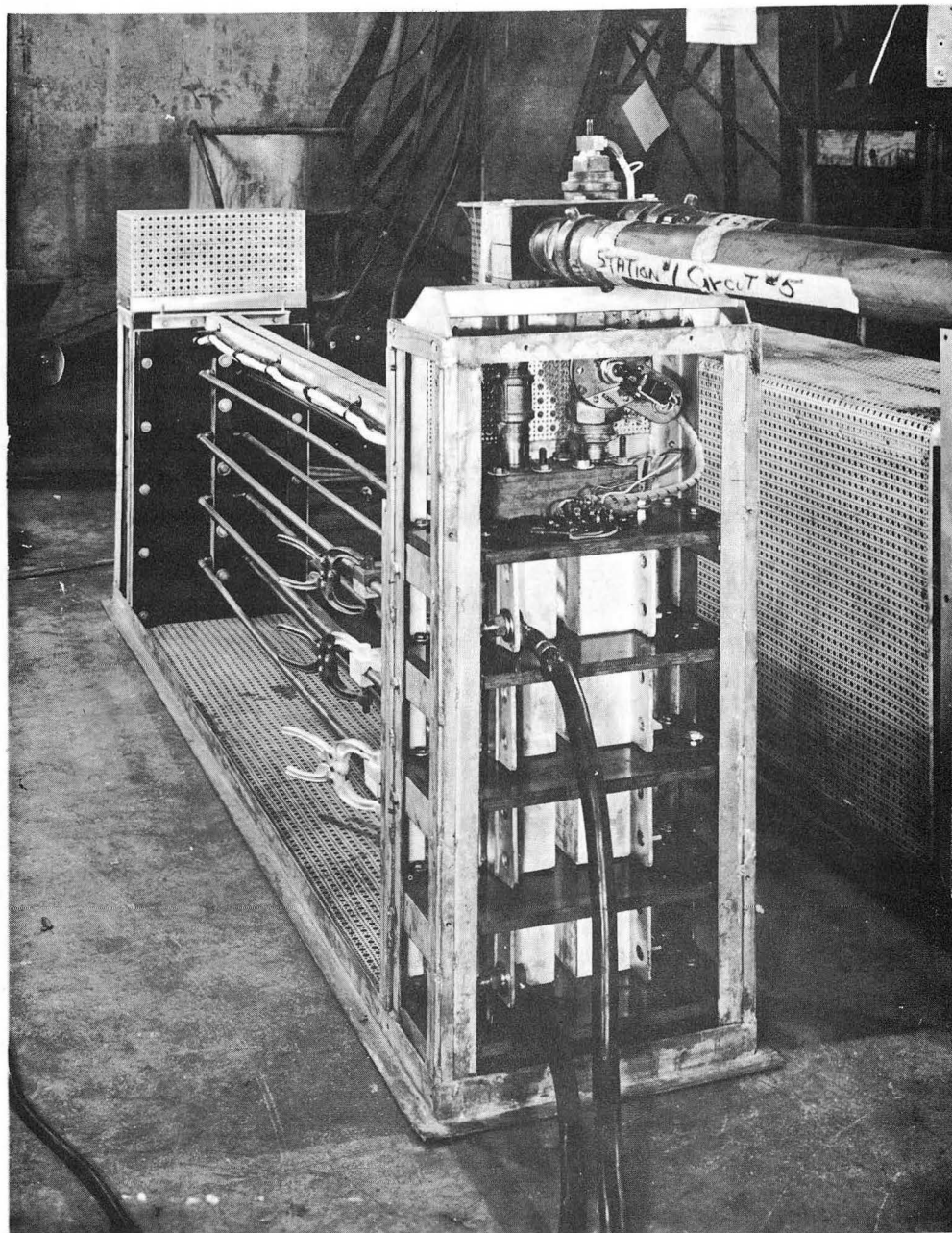
MUB-281

Fig. 8. Bevatron miscellaneous magnet power; water-cooled variable resistor.



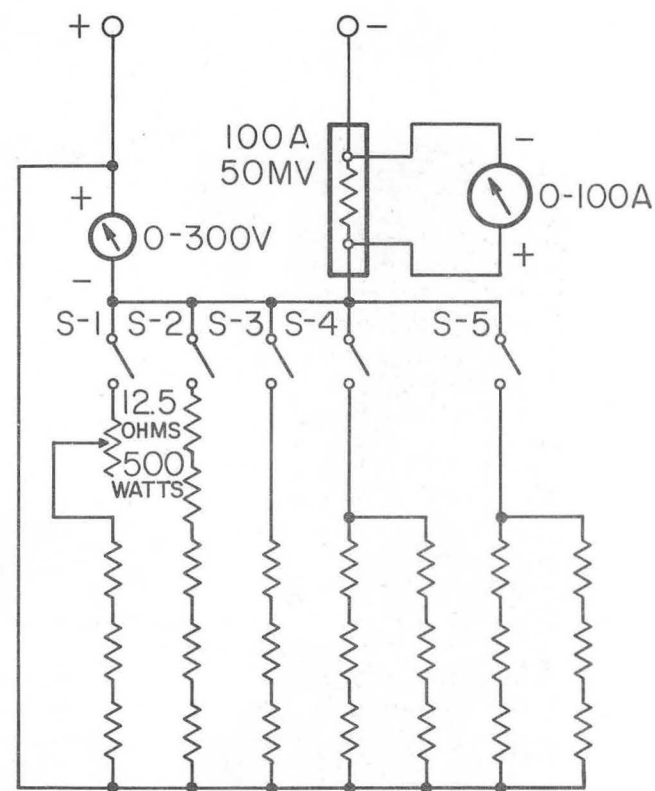
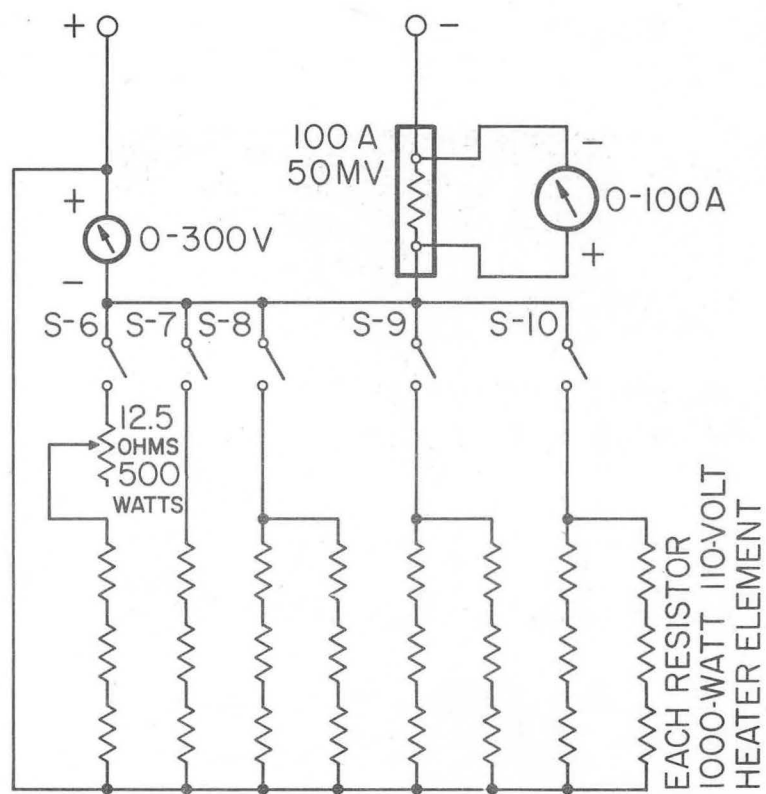
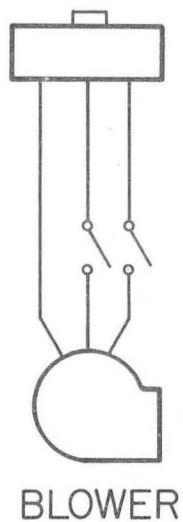
ZN-2128

Fig. 9. Water cooled variable resistor.



ZN-2129

Fig. 10. Water cooled variable resistor.



MUB-280

Fig. 11. Air cooled shunt - 8" quad-pole magnet schematic.

Pulsed Magnet for Proton Extraction

The Piccioni arrangement of target and deflecting magnet⁹ is being tested by Warren Chupp, Glen Lambertson, and Lloyd Smith for the purpose of developing an external proton beam from the Bevatron. The deflecting magnet now being used is limited to short current pulses (approximately 500 msec rise and fall time) because of limited cooling available in the magnet design. This pulsing is now being accomplished with small relays that change the reference voltage of the regulator. With this system it is possible to pulse from some intermediate current to full current within a short time, thus reducing the magnet-cooling requirement.

For rapid current decay it is necessary to remove the diode which has been connected across the generator field for slow-decay protection. The thyatron power-amplifier firing system is then modified to fire the thyatrons as inverters for rapid removal of the energy stored in the generator field. The inverter firing is controlled by the relays that change the reference voltage.

Remarks

The location of the controls and terminations for the auxiliary dc power sources should be planned for maximum operating convenience and service, with all possible safety provisions included in the control circuits.

The maximum permissible magnetic-field ripple and regulation required will determine whether the power source should be best supplied with a motor generator set or rectifier.

If a magnetic-amplifier or saturable-reactor control is planned for large amounts of power, care should be exercised to prevent the harmonic distortion generated by such control from disturbing the critical apparatus fed from the same power source.

The ease of reversing the output polarity of a generator may make the MG set more desirable than a rectifier.

We have found that the cost of used dc motor generator sets is comparable to that of other dc power sources. Although used generators seem to be satisfactory, the motor-control equipment should not use oil circuit breakers, and should not be more than 15 years old, because of the difficulty of obtaining replacement parts.

Low-current operation of dc generators for even a few hours may cause the commutator film to disappear;¹⁰ this will subsequently shorten the useful life of the brushes and should be an important consideration when applying generators to experimental loads.

Most of the large generating equipment should be remote from the experimental area to eliminate noise and congestion near critical experiments.

Even in the best-planned system the portable 4/0 cables will eventually become a tangled mess around the experimental areas. It should be possible to run these cables from termination boxes to various magnets through a network of trenches. This would at least get them out of sight and out from underfoot.

Acknowledgments

The interlock system and dc distribution system have been developed over a period of several years and are still being improved. Those who have contributed largely to the system, and have made this report possible, are Walter D. Hartsough, A. James Shand, Marion J. Jones, Jack W. Kelso, William S. Flood, C. Marvin Hartley, and A. LeRoy Loop.

This work was done under the auspices of the U. S. Atomic Energy Commission.

References

1. C. A. Harris, 15-inch bubble chamber $d\phi/dt$ protection of MG Set #4. UCRL-EE 540, March 14, 1958.
2. L. R. Lucas, Power Dissipation in the 72-inch Bubble Chamber Due to Flux Decay, UCID-552, April 2, 1958.
3. Alper Garren and Warren Heckrotte, Transient Behavior of the Berkeley Bubble Chamber Motor Generator Magnet System During Emergency Procedure, UCRL-8333, June 19, 1958.
4. C. A. Harris, Radiation Laboratory Magnet Regulators, Service and Operation, UCRL-520, Nov. 1949.
5. Quentin Kerns, Improved dc Control System, Reg. U. S. Patent #2579235 issued 12/18/51.
6. L. G. Ratner, Ripple Measurements of 8-in. -Bore 16-32-16-Inch Quadrupole Magnet, Engineering Note 4901-02-MT5, May 18, 1959.
7. L. G. Ratner, Ripple Measurements of 12-by-24-Inch Bevatron C Magnet, Engineering Note 7900-61-MT5, April 29, 1959.
8. L. G. Ratner, Ripple Measurements of Bevatron Low-Power H Magnet, Engineering Note 4310-11-MT8, May 20, 1959.
9. Piccioni, Clark, Cool, Friedlander, and Kassner, External Proton Beam of Cosmotron, BNL-2075.
10. Carbon, Graphite, and Metal-Graphite Brushes. Practical Subjects Relating to Brushes and Commutation, W. C. Kalb, Ed. (National Carbon Co., New York, N. Y., 1946).

This report was prepared as an account of Government sponsored work. Neither the United States, nor the Commission, nor any person acting on behalf of the Commission:

- A. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or
- B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in this report.

As used in the above, "person acting on behalf of the Commission" includes any employee or contractor of the Commission, or employee of such contractor, to the extent that such employee or contractor of the Commission, or employee of such contractor prepares, disseminates, or provides access to, any information pursuant to his employment or contract with the Commission, or his employment with such contractor.