12-19-72
154

sh. 2370

LA-5085-MS

INFORMAL REPORT

MASTER

Using the CA3054 MWPC Amplifier

los alamos
scientific laboratory

of the University of California

LOS ALAMOS, NEW MEXICO 87544

UNITED STATES
ATOMIC ENERGY COMMISSION
CONTRACT W-7405-ENG. 36

REPRODUCTION OF THIS DOCUMENT IS UNLIMITED

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Atomic Energy Commission, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or 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.

In the interest of prompt distribution, this LAMS report was not edited by the Technical Information staff.

Printed in the United States of America. Available from
National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151
Price: Printed Copy \$3.00; Microfiche \$0.95

LA-5085-MS
Informal Report
UC-28

ISSUED: November 1972

Using the CA3054 MWPC Amplifier

by

D. F. Jones
E. R. Martin

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Atomic Energy Commission, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or 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.

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

GG

USING THE CA3054 MWPC AMPLIFIER

by

D. F. Jones

E. R. Martin

ABSTRACT

MP-Division has designed a front-end amplifier, discriminator and driver for multiwire proportional chamber signals, of which 4K have already been built for off-chamber use and another 4K are presently under construction. This note details the circuit waveform analysis and the amplifier tune-up and troubleshooting procedure.

INTRODUCTION

The multiwire proportional chamber front-end amplifier described in Nucl. Instr. and Methods 92, 535 (1972) has been built in quantity in MP-Division, in both the model described in the paper; namely, the off-chamber configuration, and more recently in an 8-amplifier per card version designed to be used on the chamber. The purpose of this report is to make the user conversant with both of these variations of essentially the same amplifier, and to permit the technician to tune and troubleshoot the amplifier.

Setting the Amplifier Threshold

Fig. 1 is a detailed schematic with waveforms

Fig. 1. Schematic of off-chamber amplifier

for the off-chamber amplifier. Constant reference to this schematic and the waveforms will aid the intelligent technician in any troubleshooting and setup problems, without specific mention of problems and cures being detailed here. After the boards have been fabricated, the initial threshold determination must be made for each amplifier individually by adjusting the value of the resistor indicated in Fig. 1 by an asterisk. Once this threshold has been correctly adjusted, no readjustment of threshold should thereafter be necessary for the life of the amplifier.

To set amplifier thresholds, the following equipment will be necessary:

1. A good pulse generator with variable rise and fall times.
2. Two low ripple (below 1 mV) power supplies capable of at least six volts at one amp.
3. A good DVM or other meter capable of setting the power supply voltages to within 10 mV of the prescribed values.
4. An oscilloscope of at least 100 MHz bandwidth and 5 mV sensitivity.
5. A precision ten-turn potentiometer with a calibrated dial and resistance of 100 K ohms.

With this equipment, the threshold adjustment is made by the following procedure.

1. Connect the power supplies to the amplifier card as indicated in Table 1, and adjust the

TABLE 1

Output Conn.		Input Conn.	
1A	+5.5 V	1A	GND
2B	+5.5 V	2B	No. 1 Signal In
3C	+5.5 V	3C	No. 1 Return
4D	GND	4D	No. 2 Signal In
5E	Out No. 2	5E	No. 2 Return
6F	GND	6F	No. 3 Signal In
7H	Out No. 1	7H	No. 3 Return
8J	GND	8J	No. 4 Signal In
9K	GND	9K	No. 4 Return
10L	GND	10L	GND
11M	GND		
12N	GND		
13P	Out No. 4		
14R	GND		
15S	Out No. 3		
16T	GND		
17U	GND		
18V	GND		
19W	GND		
20X	-5 V		
21Y	-5 V		
22Z	-5 V		

voltages to within 10 mV of the required +5.5 V and -5 V.

- Adjust the pulser to supply to the amplifier a negative input pulse with a risetime less than 20 nsec and falltime at least 1 microsecond, and having an amplitude equal to the threshold desired - between 1 and 10 mV. (See Fig. 1a for input signal.)
 - Look at the output of the amplifier (Fig. 1h) with the oscilloscope. At this point, the output should be at ground.
 - With the ten-turn potentiometer turned to 100 K ohms, connect it across the terminals of the appropriate amplifier as shown in Fig. 2.
 - While watching the oscilloscope, turn the potentiometer down until an output is just visible. (See Fig. 1h)
- CAUTION: Make certain that there is no excessive feedthrough, as shown in Fig. 3, just before the full output occurs.
- Read the dial on the potentiometer and install

a resistor of that value across the terminals of the amplifier under test.

- After repeating the above steps for each amplifier on the board, set the input signal to 200 mV, and with this signal at each input successively, test the other outputs to make certain that the amplifiers are not crosstalking at this input level.

Troubleshooting

As indicated above, Fig. 1 is the primary aid to troubleshooting. It shows the waveforms for each vital point in the schematic for a properly operating and tuned amplifier. The waveforms shown are for an amplifier with a 5 mV input signal, whose threshold has been correctly set for 1 mV.

Differences between On- and Off-Chamber Amplifiers

The schematic shown in Fig. 1 is for the off-chamber amplifier, which in MP-Division have been packaged four to a card. The MP-Division on-chamber amplifier is packaged eight to a card, and its schematic is shown in Fig. 4. Note that the only significant changes are at the input, where the on-chamber amplifier has omitted the coupling transformer, the input diode protection, and the input coupling capacitor. Note also that for the on-chamber amplifier, the positive supply voltage is now set at 5 V. The procedure for amplifier threshold determination is exactly the same for both amplifiers.

Fig. 2. Physical location of trimmer resistors

Fig. 4. Schematic of on-chamber amplifier