

Fermi National Accelerator Laboratory

TM-1708

Multiple Gas Analyzer Sample Test Points

Greg Sellberg
Fermi National Accelerator Laboratory
P.O. Box 500
Batavia, Illinois 60510

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INTRODUCTION

Fermi National Accelerator Laboratory (Fermilab) is now beginning to depend upon dedicated gas analyzers in their collider and large fixed target experiment areas. In the past one or two gas samples were taken and sent off to Argonne National Laboratory for gas analysis, for even a basic check of ratios for Ar (Argon) C₂H₆ (Ethane) 50/50% mixtures.

With the smaller experiments "down time" due to malfunctions with "in house" gas blending or manufacture's blending errors, a "quick purge" of correct gas could be obtained in several hours with the smaller gas systems.

Due to the size of the collider experiments and larger fixed target demands on beam time, a more reliable means of sampling (24 hours a day) is now incorporated into nearly every detectors gas system of these experiments.

Usually a set of smaller (canary) chambers are fabricated into the delivery and return gas lines to constantly monitor gas performance, controlled either by a radioactive source or by cosmic rays.

When a fault is detected by the Canary chamber the problem can then be pinpointed with the analyzer rack system, within a few minutes of monitoring various gas sample points.

At other times, a large gas supply that is on hand (tube trailers), may need the premix to be altered slightly. E-740 (DØ) has the ability to blend in three pure gases [Ar, CO₂, FR4] to correct the gas ratio. By monitoring the blending tanks the mass flow transducers corrections can be validated in a short period of time.

STYLES OF SAMPLING

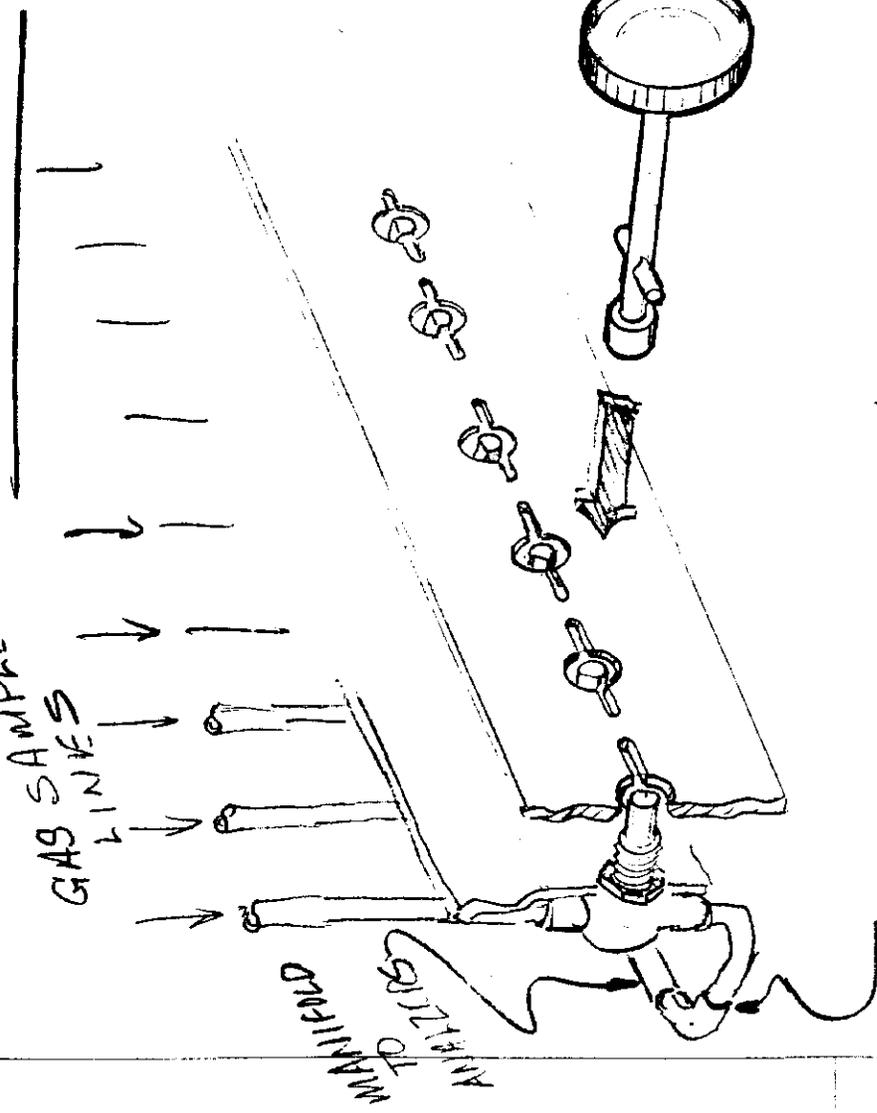
After reviewing several prototype designs of sampling, two styles were selected by the D0 muon users. The first "Keyed Valve Type" (see dia. 1) was thought to be of a reasonable approach with only one (1) valve to be opened with a key type device. But, after reviewing several failure paths (valve not shut completely or seat failure) back mixing would still occur via the common manifold that the sampling valves incorporate.

The second design "Switch Board Type" (see dia. 2a) proved to be a more reliable means of sampling the gas mixtures. An absolute representative of gas can be acquired with only one "Quick Connect" devices installed at a time. The only failure is a rupture in the flexible hose, and this will result in a leak to the room but not a back mix situation in the blending system. This leak can be minimized with fixed orifices installed at the sample lines. Both systems are equally liable to line leakage in this type of failure.

D0 final design incorporates a "Swaglok Bulkhead Type Female Quick-Connector" to lessen the amount of flexible tubing involved in the front panel of the analyzer rack (see dia. 2b), and also a purge line connector of the same make to reduce the contamination of gas samples which have sat for long periods of time in the tubing (see dia. 3).

DO NOT ANALYZE BACK
(SAMPLE VALVING)

"KEYED VALVE TYPE"



SILVER SOLDER 1/4" DIA.
TUBING FOR SMALLEST
VOLUME GAS LINE AREA

FLOWING, NOT 1 - CIRCLES
FLOW GAS SAMPLE LINES
WHEN CHECKING PURITIES

OF ONE GAS LINE.

- 12 GAS LINES -
TO SAMPLE

10.71.88

(DIAGRAM 1)

VALVE KEY

INSERTION TOOL IS KEVED
TO THE OFF POSITION OF THE
VALVES, ONLY ONE SAMPLE LINE
CAN FLOW AT A TIME.

ONE VALVE KEY

- CHAINED TO RACK -

- * VALVE SEAL MAY NOT SEAT FULLY AND LEAK BACK AND MIX GAS
- NOT A POSITIVE ISOLATION -

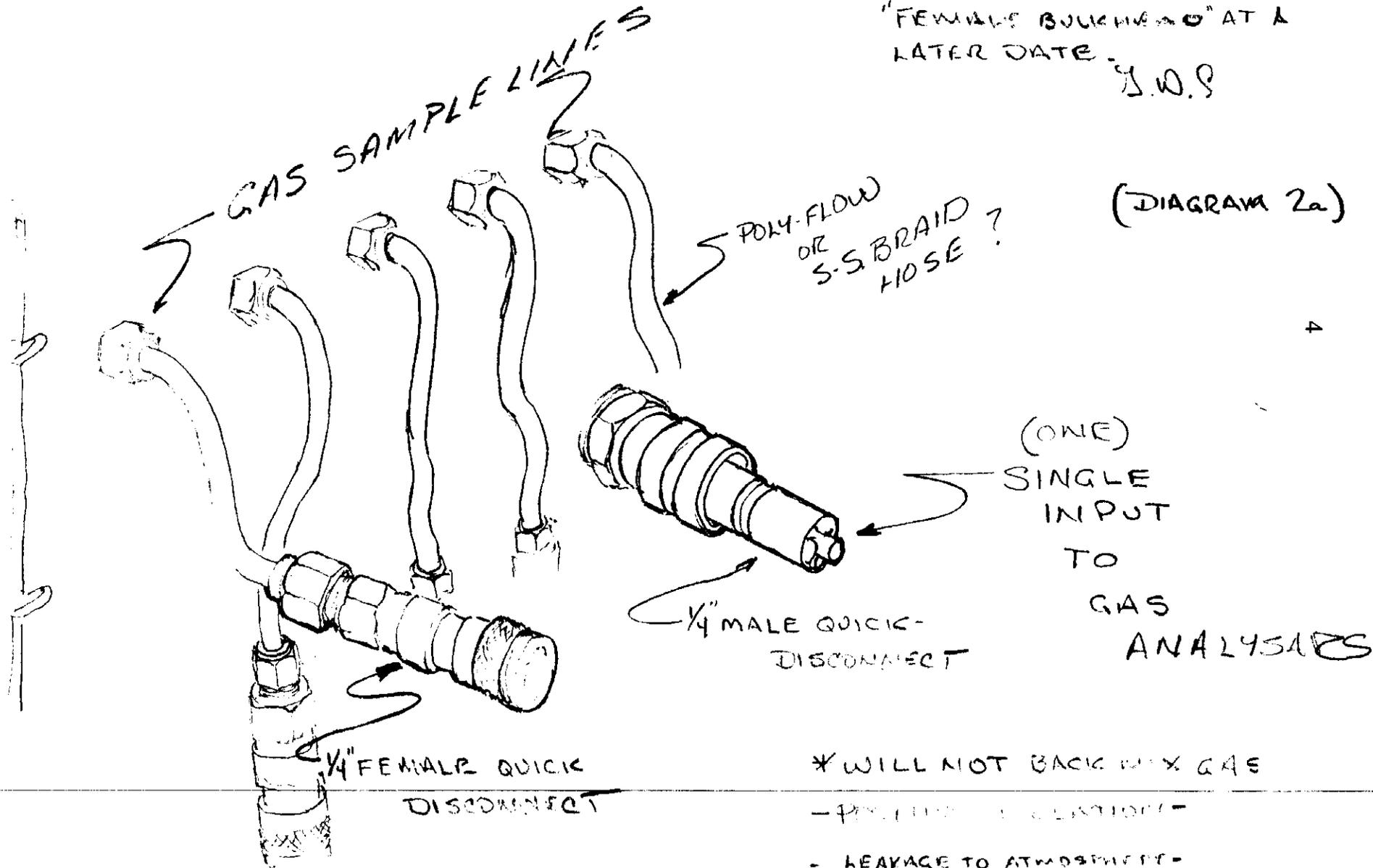
DO NOT ANALYSIS BACK
(SAMPLE VALVING)

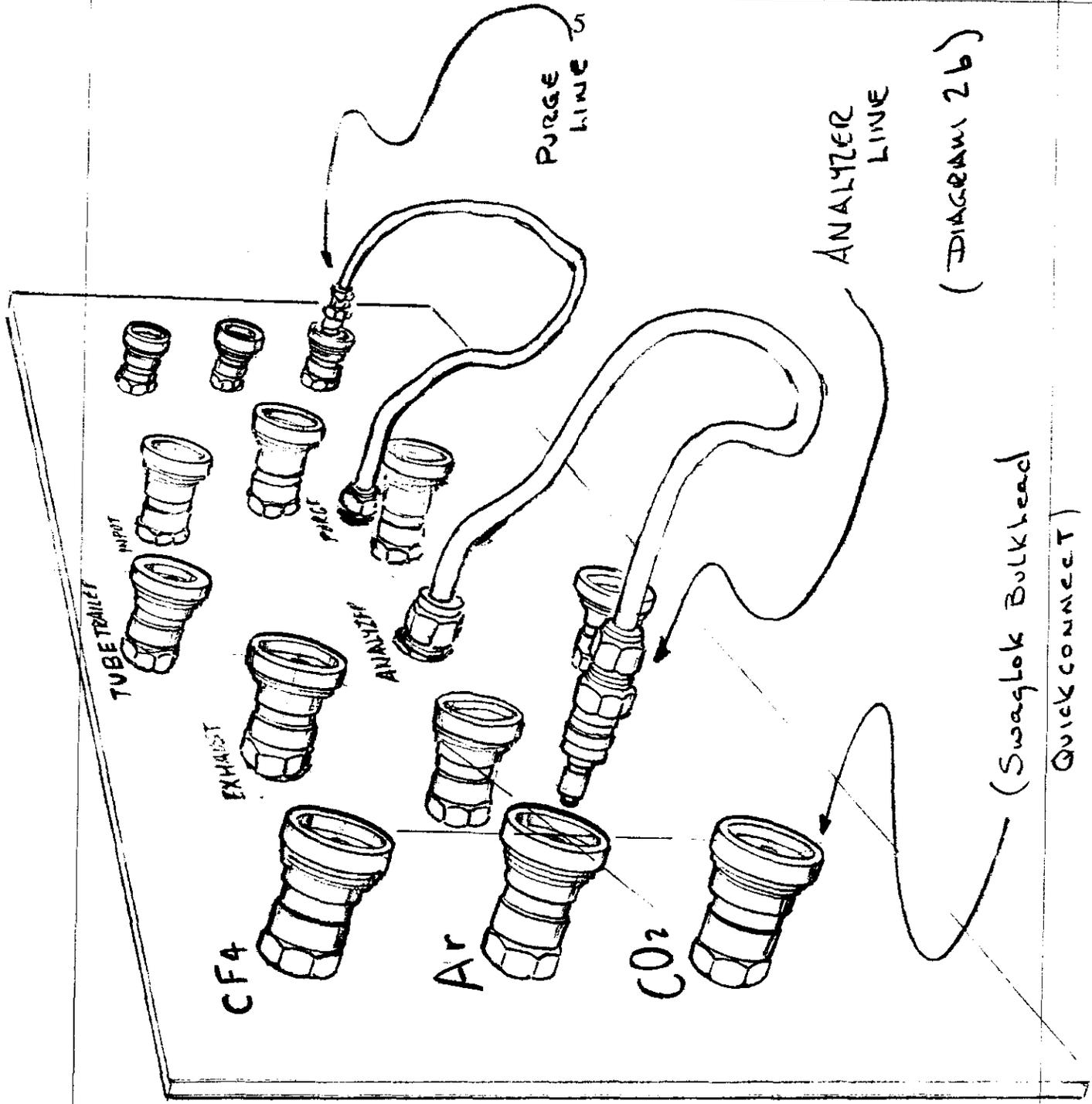
"TELEPHONE SWITCH BOARD"

TEST OF EXISTING EQUIPMENT WITH "BULKHEAD MALS". WILL SWITCH OVER TO "FEMALE BULKHEAD" AT A LATER DATE.

S.W.P

(DIAGRAM 2a)

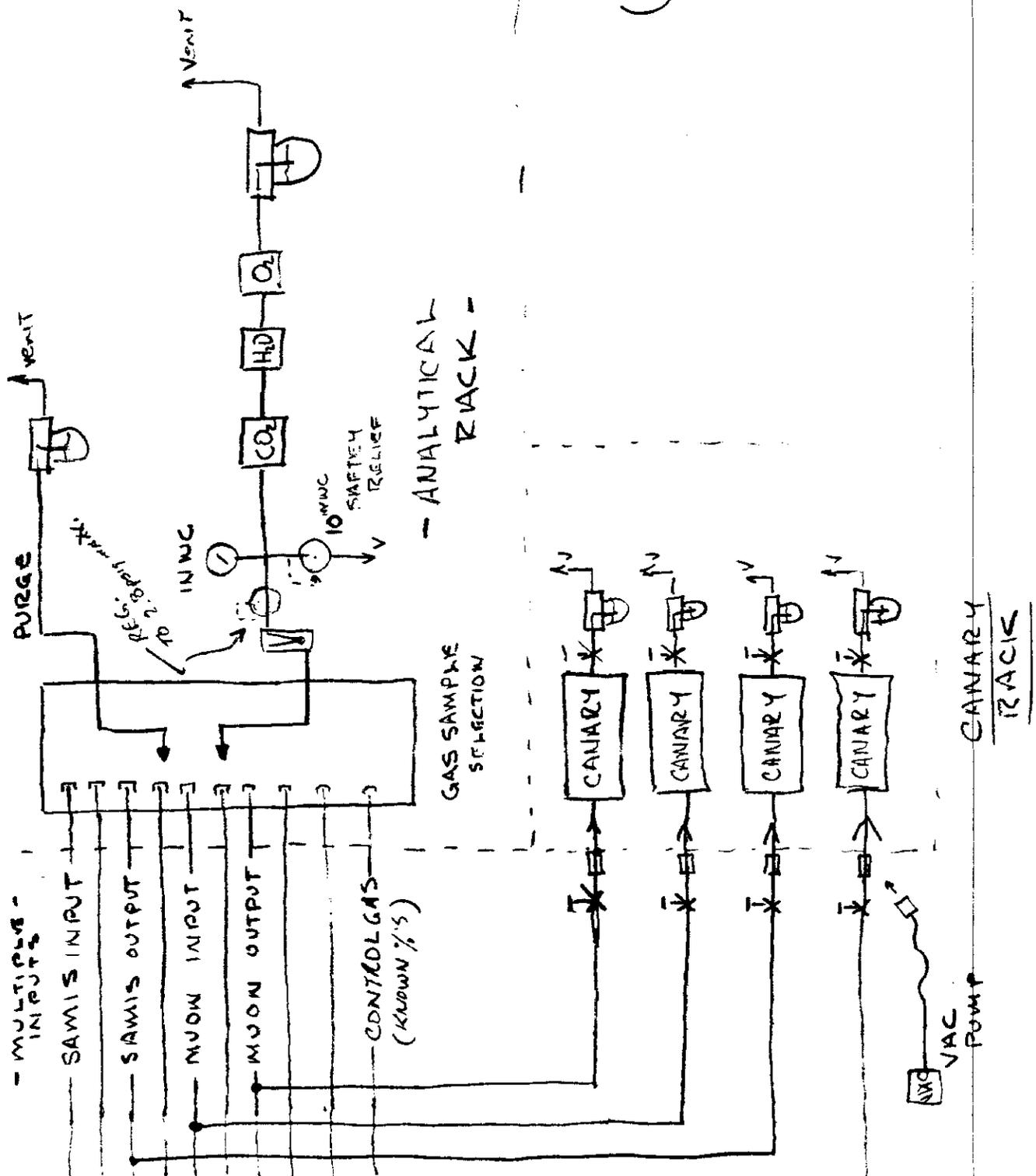




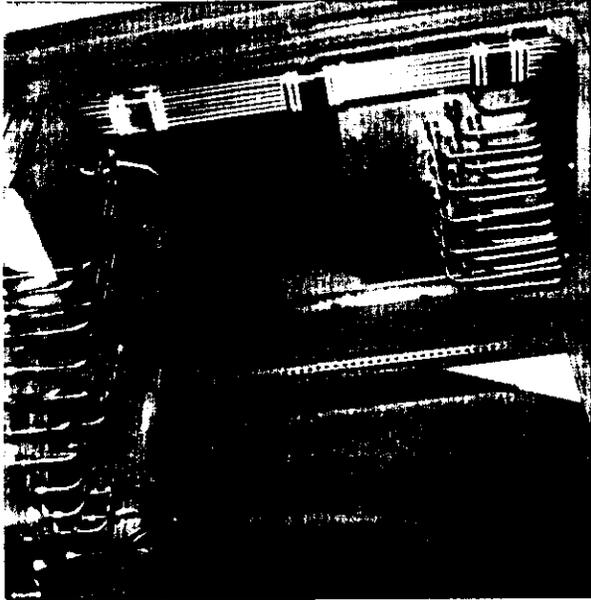
(DIAGRAM 26)

(Swagelok Bulkhead
Quickconnect)

DØ MUON + SAMIS ANALYSIS TRACK



(DIAGRAM 3)



VIEW FROM INSIDE
OF ANALYZER RACK

→ INPUT LINES



BACK SIDE OF PANEL

FRONT VIEW OF
PANEL (DØ, E-740)

