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AD-A955 335

MINUTES OF THE HUSKY PUP PREFIELDING INSTRUMENTATION MEETING

DTL-76, 27114

28 - 29 APRIL 1975

DNA

HUSKY
PUP

DEFENSE NUCLEAR AGENCY
TEST DIRECTORATE
KIRTLAND AFB, NEW MEXICO

DNA PRINTING PLANT

DEFENSE NUCLEAR AGENCY
FIELD COMMAND
KIRTLAND AIR FORCE BASE, NEW MEXICO 87115

26 FEB 1976

FCTMEI

SUBJECT: Minutes of HUSKY PUP Pre-Fielding Instrumentation Meeting

SEE DISTRIBUTION

Attached are the minutes of the HUSKY PUP Pre-fielding instrumentation meeting. It is hoped that you will find these to be a beneficial point of reference for future events. I would appreciate written suggestions on ways to improve future instrumentation meetings and their subsequent minutes.

FOR THE COMMANDER:

1 Incl
as

HENRY J. THAYER
FOR LTC, USA
CHIEF, ENGINEERING BRANCH

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

132 p.

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MINUTES OF THE HUSKY PUP PREFIELDING INSTRUMENTATION MEETING

1. The HUSKY PUP Prefielding Instrumentation Meeting was held on 28 and 29 April 1975 at Test Directorate (FCT), Field Command, Defense Nuclear Agency (DNA), Kirtland Air Force Base, New Mexico. The meeting was held as a premortem review of the instrumentation systems to be used on the HUSKY PUP Event.

2. The meeting was opened by Mr. Ray Gann who reemphasized that the purpose of the meeting was to discuss any anticipated problems based upon past results, new systems techniques and methods of acquiring higher quality data. The agenda is shown in Inclosure 1. A list of attendees is included as Inclosure 2.

3. The following is a synopsis of each presentation:

a. Science Applications Inc. (SAI) - Output Diagnostics, Neutron Time of Flight, Energy Coupling (Inclosure 3).

b. Systems, Science and Software (SSS) - Particle Velocity (Inclosure 4).

c. Stanford Research Institute (SRI) - Energy Coupling Stress Measurement (Inclosure 5).

d. Physics International (PI) - Energy Coupling Shock Time of Arrival and Containment Diagnostics (Inclosure 6).

e. DEVELCO, Inc. - Free-Field Stress with Memory and Postevent Interrogation (Inclosure 7).

f. Lockheed Missiles and Space Co. (LMSC) - USN RB Systems and Materials Studies (Inclosure 8).

g. Lockheed Palo Alto Research Laboratory (LPARL) - Output Diagnostics (Inclosure 9).

h. Sandia Laboratories Albuquerque (SLA) - Containment Diagnostic and Materials Phenomenology (Inclosure 10).

i. Los Alamos Scientific Laboratory (LASL) - Output Diagnostics and Materials Studies (Inclosure 11).

j. Air Force Weapons Laboratory (AFWL) - Materials Phenomenology (Inclosure 12).

k. Kaman Sciences Corporation (KSC) - Materials Phenomenology (Inclosure 13).

l. Lockheed Missiles and Space Co., Pipe Division (LMSC(PIPE)) - Closure Monitors and Tunnel Environment Measurements (Inclosure 14).

HUSKY PUP

PREFIELDING INSTRUMENTATION MEETING

AGENDA

Tuesday, 8 April 1975

0845 - 0900	Introduction - Ray Gann
0900 - 0945	SAI (Sunnyvale) - Jim LePage
0945 - 1005	SAI (Albuquerque) - Bob Higgins
1005 - 1020	COFFEE BREAK
1020 - 1045	SSS - Frank Peterson
1045 - 1115	SRI - Lee Hall
1115 - 1200	PI - Coye Vincent, Don Randall
1200 - 1300	LUNCH
1300 - 1400	LMSC - Fred Moyer
1400 - 1445	LPARL - Jim Schallau
1445 - 1500	COFFEE BREAK
1500 - 1600	SLA - Jim McIlmoyle

Wednesday, 9 April 1975

0900 - 1000	LASL - Dr. McQueen
1000 - 1100	AFWL - Lt Warley
1100 - 1115	COFFEE BREAK
1115 - 1145	KSC - Ray Smith
1145 - 1215	LMSC (Pipe) - Jack Neuer
1215	CLOSING COMMENTS

Inclosure 1

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Inclosure 2

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HUSKY PUP PRE-FIELDING INSTRUMENTATION MEETING

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Instrumentation
Fielding Agency: EG&G, Inc.
K. R. Sites
680 East Sunset Road
Las Vegas, Nevada 89119
Phone (702) 739-0681

INTRODUCTION

SAI will field three experiments on this event--a Calorimeter located at station one, a XRD Debris Energy Coupling Experiment and a NTOF Flyer Plate Velocity Experiment both of which will be located near the granite block at the working point.

CALORIMETER EXPERIMENT

Ten channels of data will be recorded from resistive slug sensors exposed to the X-ray fluence. Each channel will contain one exposed slug and one background slug that form two arms of a bridge circuit. All signal conditioning and calibration circuitry will be located in the station one alcove. The conditioned signals will be transmitted from the alcove to trailer 50020 on TSP cable, where it will be recorded on an oscillograph. The data will also be digitized by a 4 to 15 channel multiplexer in the alcove and transmitted in a PCM format to trailer 50020 for processing by the TDIC system.

XRD DEBRIS ENERGY COUPLING EXPERIMENT

Sixteen oscilloscope channels will record data from fourteen XRD detectors and two gamma trigger diodes located near the granite block at the working point. Fourty-seven oscilloscopes and four 7912 digital transient analyzers will be employed to record these data in in trailer 50031. The 7912 digital data will be transmitted in a PCM format to trailer 50020 for processing by the TDIC system.

Inclosure 3

Three measurements will be made to determine the X-ray magnitude and arrival times at the flyer plate, the stagnation region on the block front surface and the shock temperature several centimeters inside the block.

The detector signals will be transmitted to the trailer on RG-333/U cable that will be equalized to about 350 MHz bandwidth.

NTOF FLYER VELOCITY EXPERIMENT

Six oscilloscope channels will record data from six PIN type detectors located near the bypass drift extension. These detectors will be viewing the flyer plate at the front of the granite block.

Three channels will be recorded on two oscilloscopes via RG-331/U cable equalized for approximately 5 MHz bandwidth. The remaining three channels will be conditioned by log amplifiers located at the station two alcove and then transmitted to the trailer to be recorded on two scopes per channel. A third scope will be employed to record log amp calibration data just prior to event zero time.

SAI ACTIVE EXPERIMENTS

- CALORIMETER

  10 CHANNELS

  STATION 1

- ENERGY COUPLING

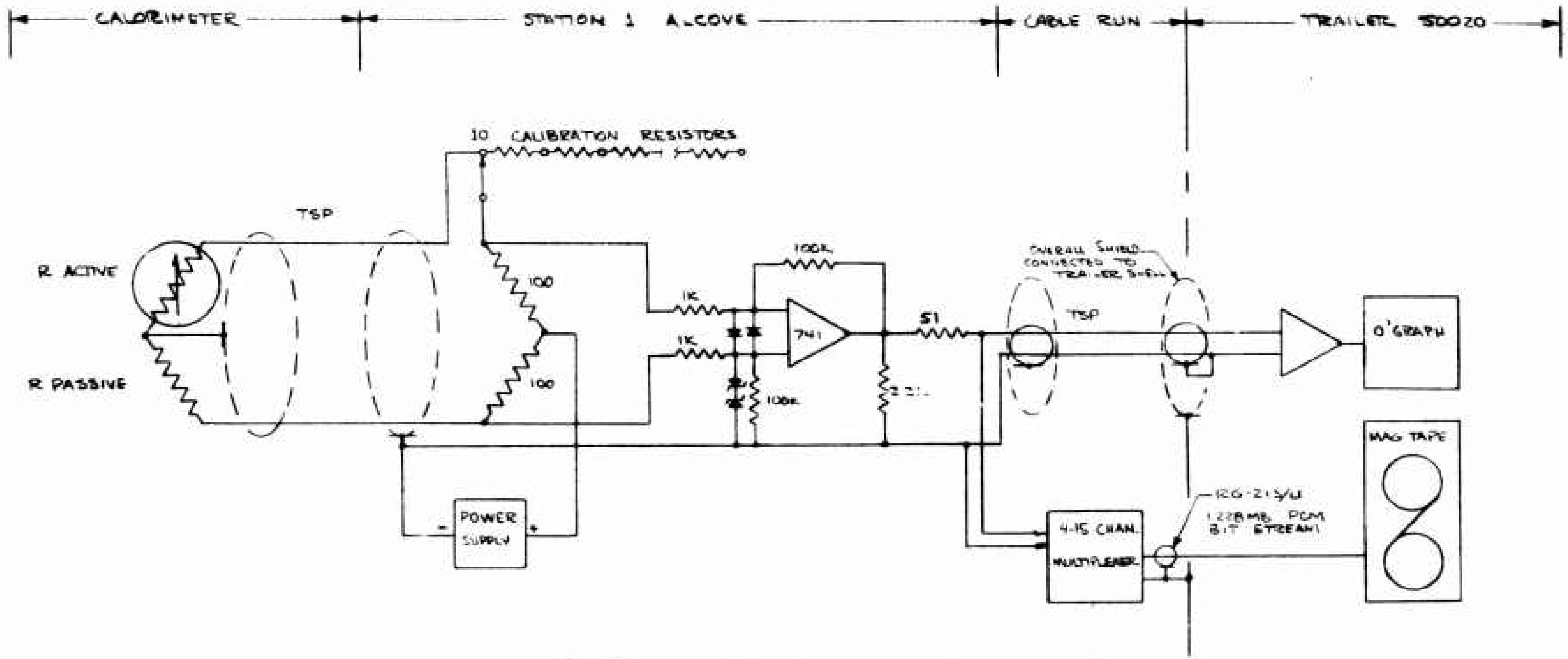
  16 CHANNELS

  WORKING POINT

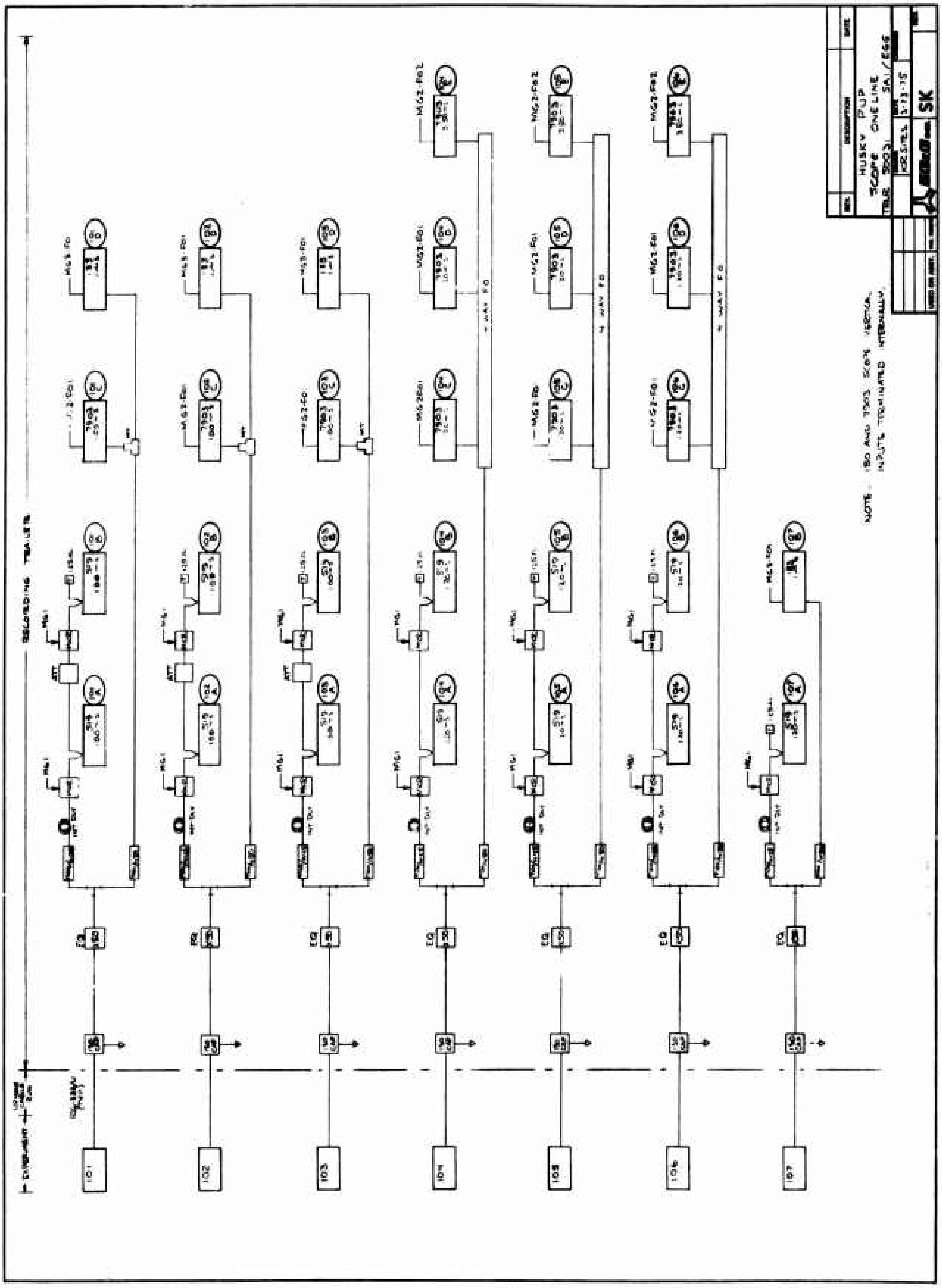
- NTOF FLYER VELOCITY

  6 CHANNELS

  WORKING POINT



CALORIMETER RECORDING CHANNEL


RECORDING TRAILER
4 WAY F.O.
101
102
103
104
105
106
107
NOTE: 150 AND 7903 SCOPE VERTICAL INPUTS TERMINATED INTERNALLY.
HUSKY PUP
SCOPE ONE LINE
TRLR 3003
SK

INSTRUMENTATION AND DATA ACQUISITION
FOR THE TIME OF FLIGHT-DEBRIS VELOCITY EXPERIMENT
HUSKY PUP

1. GENERAL

The time of flight spectrometer scheduled for the HUSKY PUP event will look at the neutron output of the device after it has been attenuated by the debris velocity flyer plate. Shifts in characteristic neutron absorption resonances will be used to measure the velocity of the plate. The experiment should be capable of measuring the total neutron output to an accuracy of approximately 15%. However, the system requires the ability to respond to small changes in the neutron output as a function of time in order to define neutron cross-sections of materials in the line of sight. In this regard, the system requires a bandwidth of approximately 50 MHz.

The spectrometer experiment and its line of sight is shown in plan view in Fig. 1. The spectrometer consists of two sections aligned to a line of sight and set upon a common monolithic support pedestal. The beam is pre-collimated near the working point and channelled to the primary experiment within an evacuated beam pipe. At the experiment the beam is further collimated by means of the staged collimator shown in elevation view in Fig. 2. Here the beam is sized and directed into the experiment canister. In the readiness configuration, the staged collimator-canister system will be completely shielded with lead and steel shot, and a polyethylene-Borax mixture.

2. THE EXPERIMENT CANISTER

Within the evacuated experiment canister are housed the reaction foils, detectors and support components for the experiment array. The experimental arrangement is shown schematically in Fig. 3, giving the relationship between the reaction foils, the detectors, and the collimated beam within the evacuated canister. The reaction foils are mounted at three axial stations as noted in the figure. The solid state silicon diode detectors are similarly mounted at three corresponding stations, with two detectors mounted symmetrically at each of the three stations.

Charged particles are emitted from the reaction foils as the collimated beam interacts with the deposited reaction elements on the foil surfaces.

These particles pass through the diodes, causing them to conduct, and resulting in voltage signals proportional to the charged particle concentration. These signals are correspondingly amplified in the acquisition process.

A typical output signal from a diode is shown plotted in Fig. 4 for the time of interest anticipated for a linearly amplified signal for the time of flight experiment. The gamma flash and onset of 14 MeV neutrons are shown. The output of one detector viewing each foil will be logarithmically amplified in the alcove to provide better resolution of the low level, late time signals. The output of these amplified signals will be 0-10 volts across a 50 ohm load in the trailer. The prime source of background in this experiment is the production of charged particles in the foil backing material. This is measured by having detectors view a blank foil with no deposit.

3. DATA ACQUISITION

The signal outputs of the six solid state detectors will be conditioned and recorded by circuitry and recording equipment mounted in a signal conditioning alcove and in trailer 50031. A typical circuit for a logarithmically amplified signal is shown in pictorial and schematic form in Fig. 5, showing the physical relationship of the experiment canister with conditioning and acquisition components in the alcove and the instrumentation trailer. Typical circuits for linear and logarithmic amplification of the detector signals are shown in the one-line oscilloscope diagrams given in Fig. 6. The conditioning and acquisition circuitry will float with respect to ground potential, with cable shields tied to ground within the 50031 trailer.

Detector bias voltage sufficient to prevent detector saturation will be applied to the detector through an isolation circuit contained within the signal conditioning alcove. The bias voltage supply will be physically located within this alcove and will be remotely controlled from the instrumentation trailer.

The conditioned and amplified signals will be conducted to the instrumentation trailer over RG331 coaxial cable where the signals will be equalized if necessary and split prior to being redundantly recorded on Hewlett-Packard 180 oscilloscopes.

4. SCOPE TRIGGERING AND CROSS TIMING CIRCUITRY

Primary timing and triggering reference for the detector signals will be provided by redundant x-fidu signals, backed by gamma detector timing reference as shown in the one-line oscilloscope diagrams depicted in Fig. 7. The figure represents redundant circuitry required to drive the trigger generators and for ultimate recording of the signal shape on 180 and 519 oscilloscopes.

The signals generated by the redundant trigger generators are shown in the one-line fan out diagram in Fig. 8. Here the anticipated fan out circuitry from the trigger generators is shown for the oscilloscopes required for the experiment. The upper portion of the circuit shows the trigger fan out. The lower half of the figure shows the marker generator and oscillator circuitry required for cross timing reference. The circuit logic for these marker and oscillator signals is incorporated in the prebase sequencer which programs the systematic recording of baseline and oscillator traces on the oscillograph record within the final two seconds prior to the event and acquisition of the detector signals themselves.

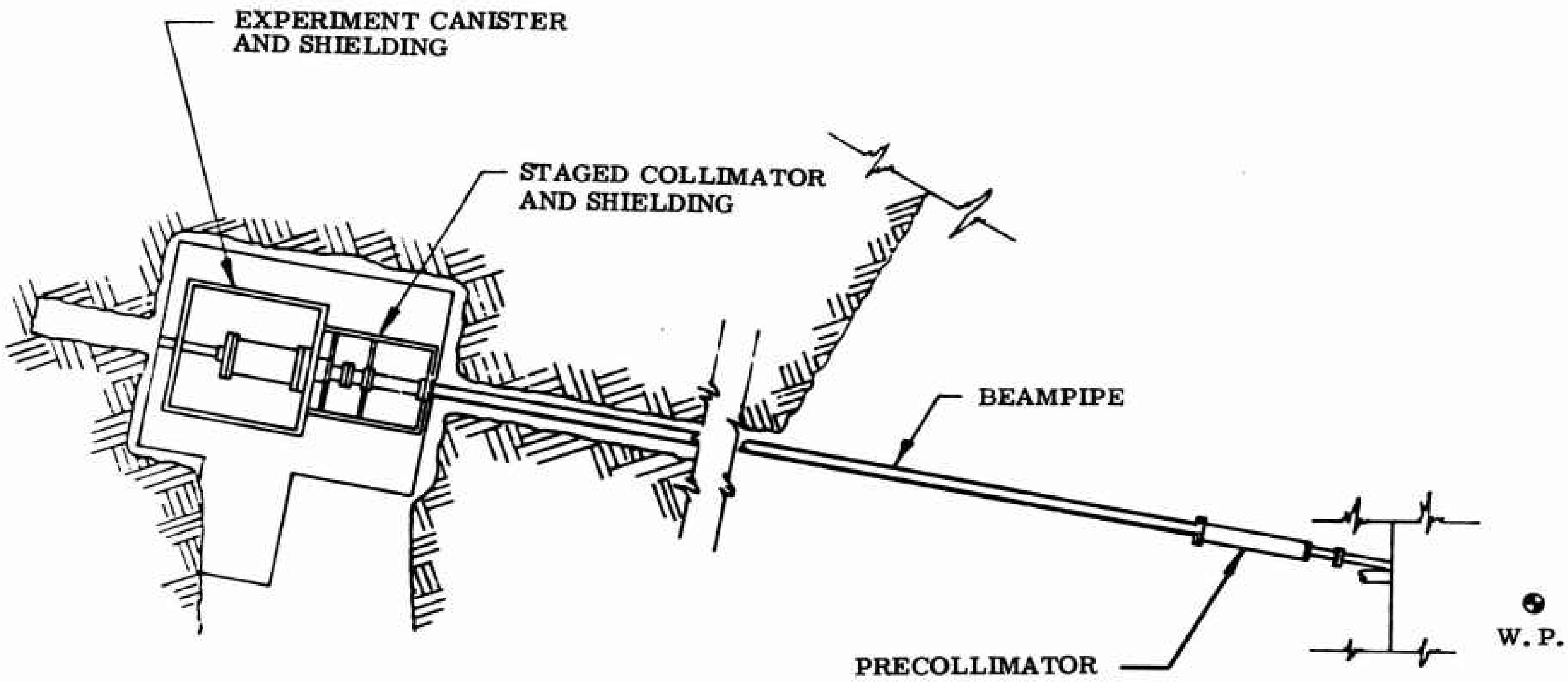


Figure 1. Plan View Representation of the SAI Neutron Time of Flight Debris Velocity Experiment

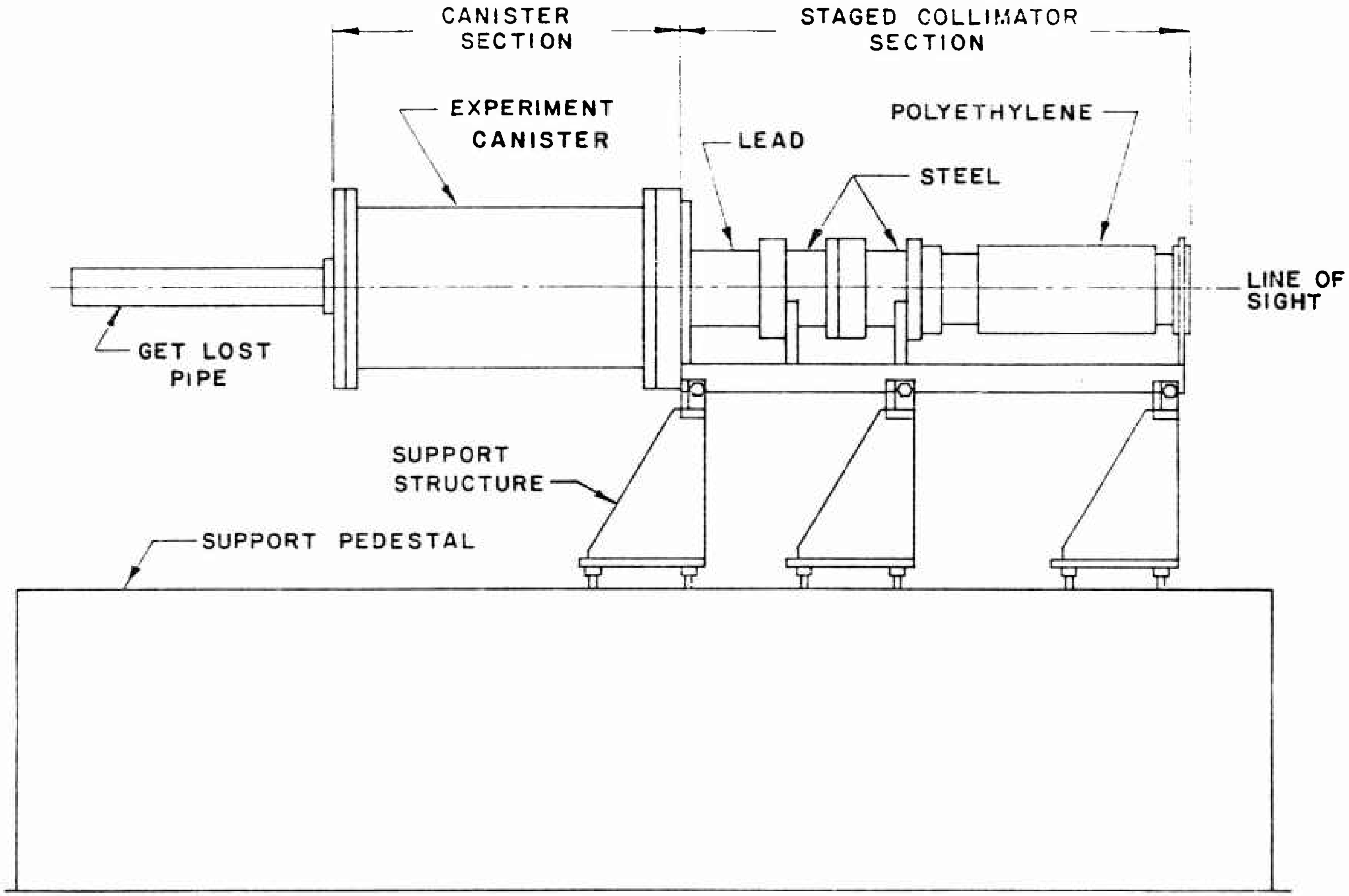


Figure 2. Elevation View of the Time of Flight Experiment

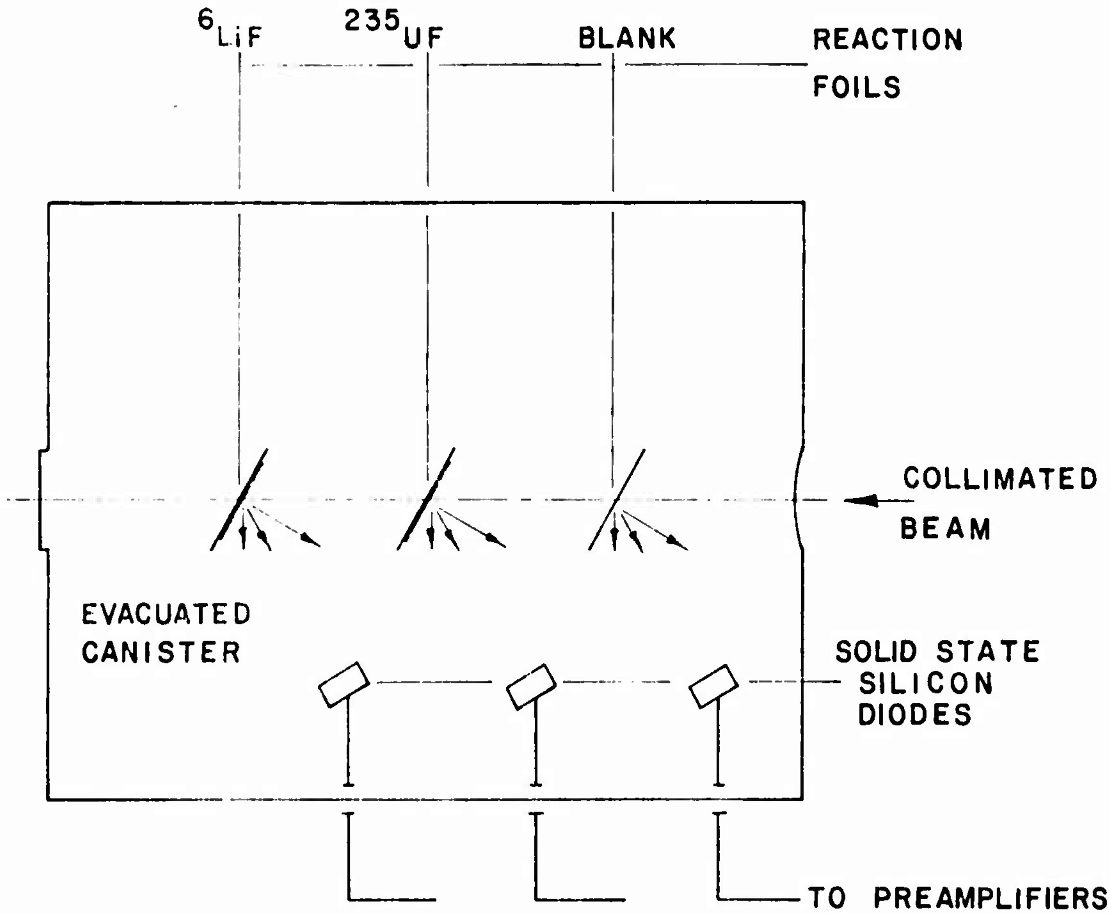


Figure 3. Schematic Representation of the Time of Flight Experiment

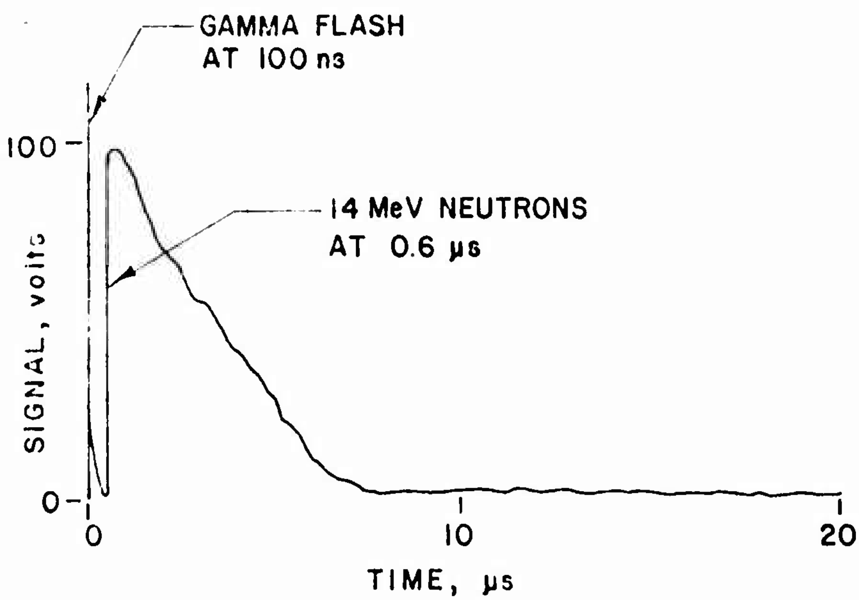


Figure 4. Expected Channel Performance for a Typical 235U Linear Channel

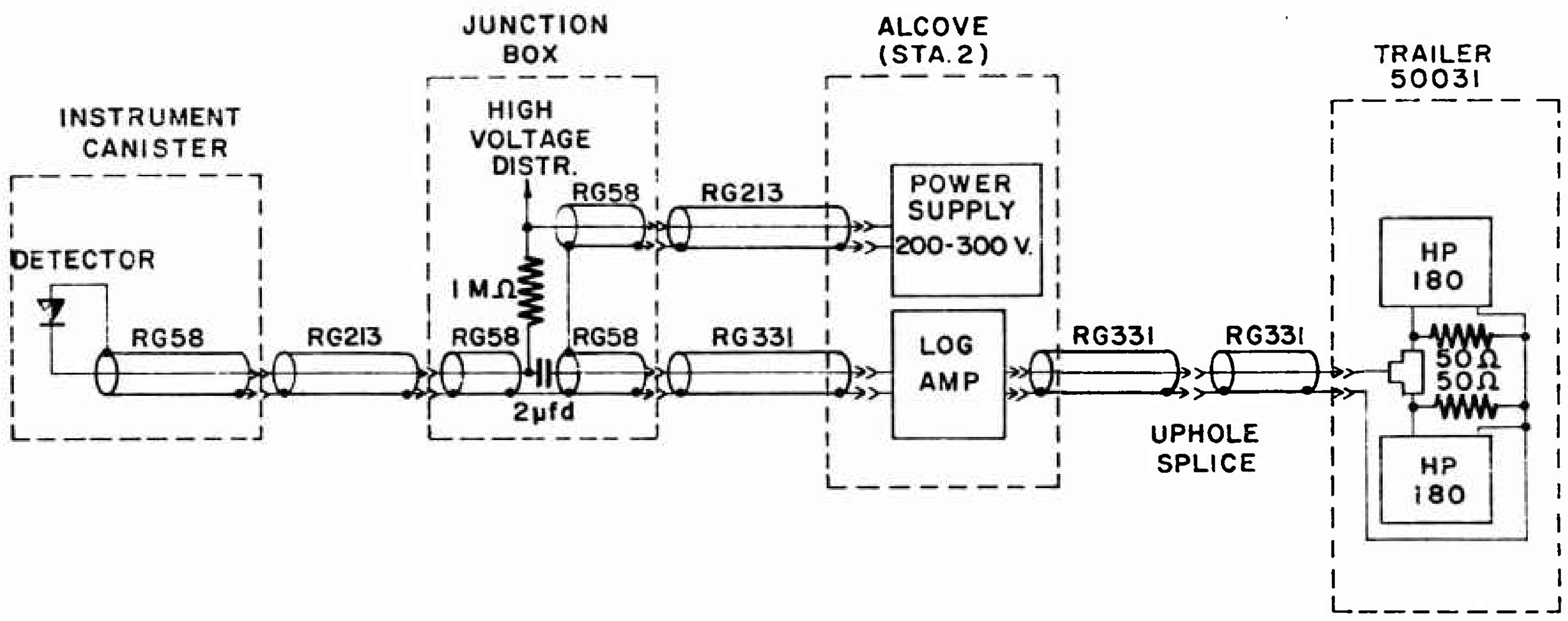


Figure 5. Typical Logarithmically Amplified Channel. Linear Channels will have a Jumper Cable Replacing the Logarithmic Amplifier

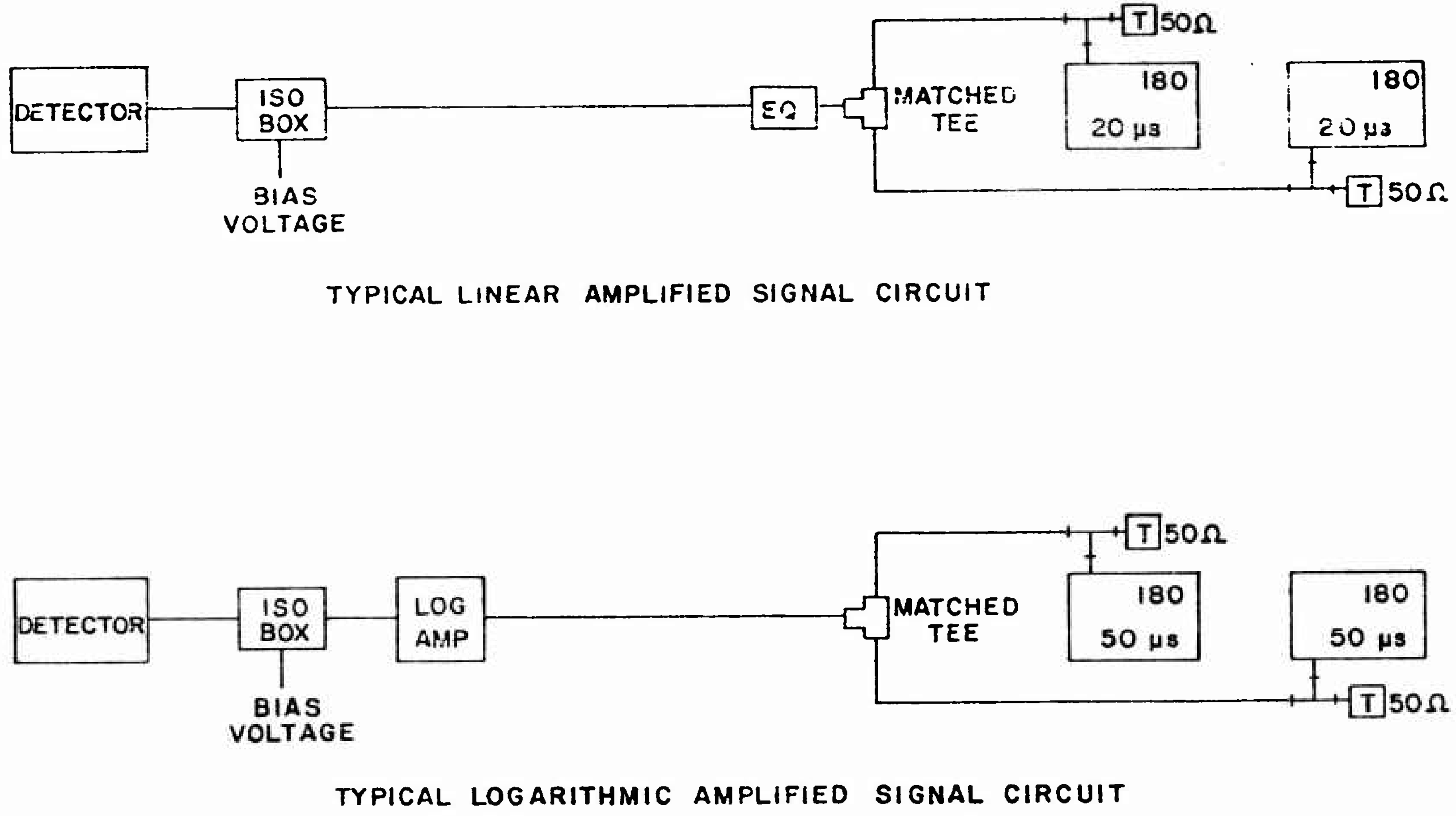


Figure 6. One Line Diagram of the Data Acquisition System Trailer 50031

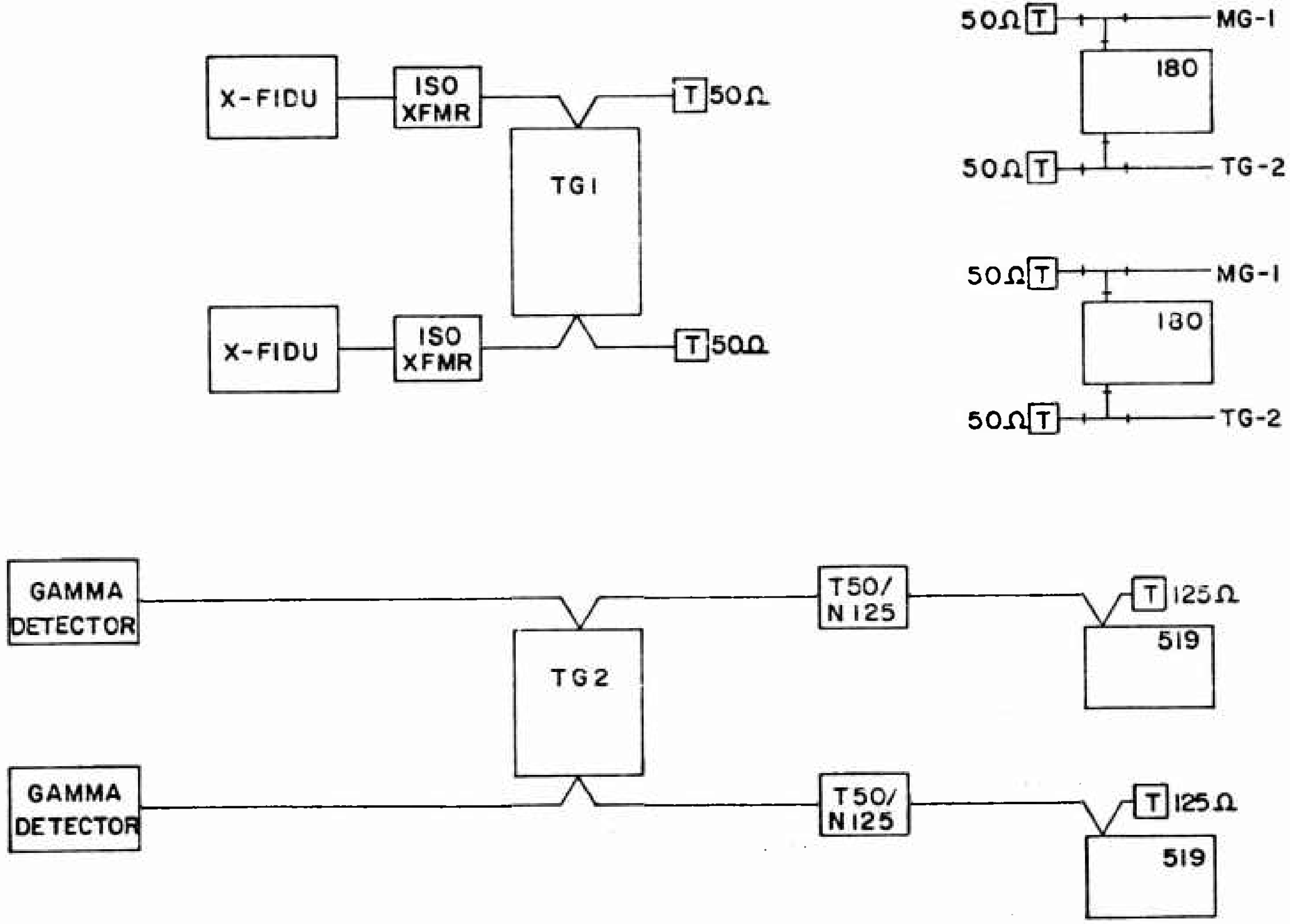


Figure 7. One Line Diagram of X-Fidu and Gamma Trigger Circuits

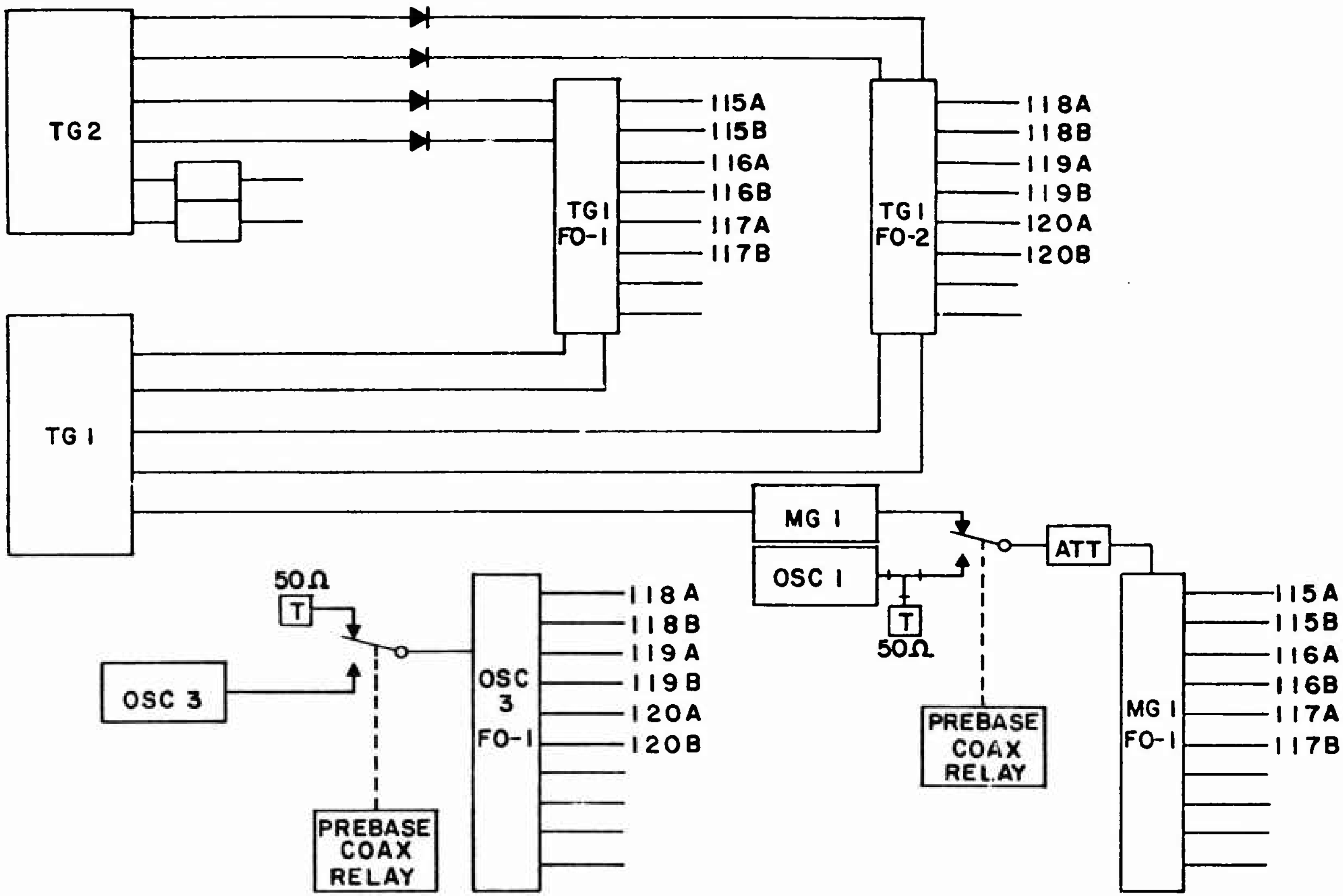
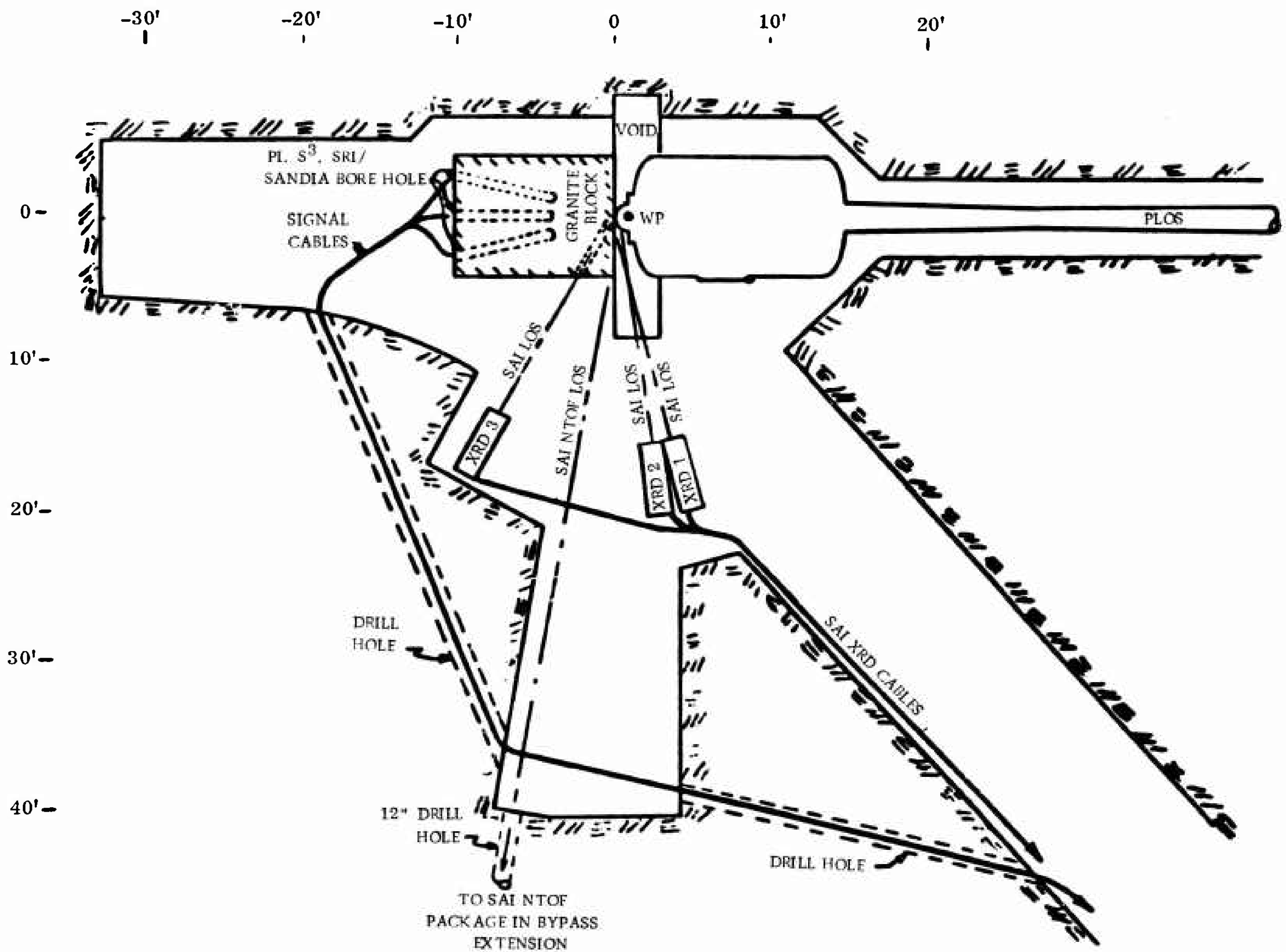


Figure 8. One Line Diagram of the Trigger and Marker Circuits



Debris Energy Coupling Experiment Layout

SYSTEMS, SCIENCE AND SOFTWARE
PARTICLE VELOCITY

GENERAL

The velocity gauge consists of a field coil wound on a thick metal disc, and three coaxial pickup coils located at various distances from the disc along the axis. Motion of the field coil (assumed to move at the particle velocity of the medium in which it is embedded) induces signals in the pickup coils, the amplitudes of which are related to the velocity of the field coil.

Figure 1 is a section of the gauge assembly taken on a diameter and shows the positions of the various coils, assembly, lead dress and cable attachment. The gauge assembly is essentially a granite cylinder consisting of a series of short sections bonded together to facilitate machining and coil fabrication. Present plans are for the gauge to be installed in the block by injecting a viscous alumina filled epoxy at the bottom of the hole and allowing it to extrude out as pressure is applied to the rear of the gauge over a period of several hours.

FIELD COIL

The field coil consists of 140 turns of #12 aluminum magnet wire wound on a 6 inch diameter metal disc, the diameter then being increased to 8 inches by the addition of a metal ring around the disc. The disc and ring together lengthen the time constant of the coil enabling the field to persist for milliseconds after current ceases flowing in the coil. Since the measurements to be made are completed within 100 microseconds, the field remains essentially constant over the period of interest. Current is supplied to the field coil through two #4 conductors from the battery alcove to the rear of the gauge and then forward to the coil in magnet wire.

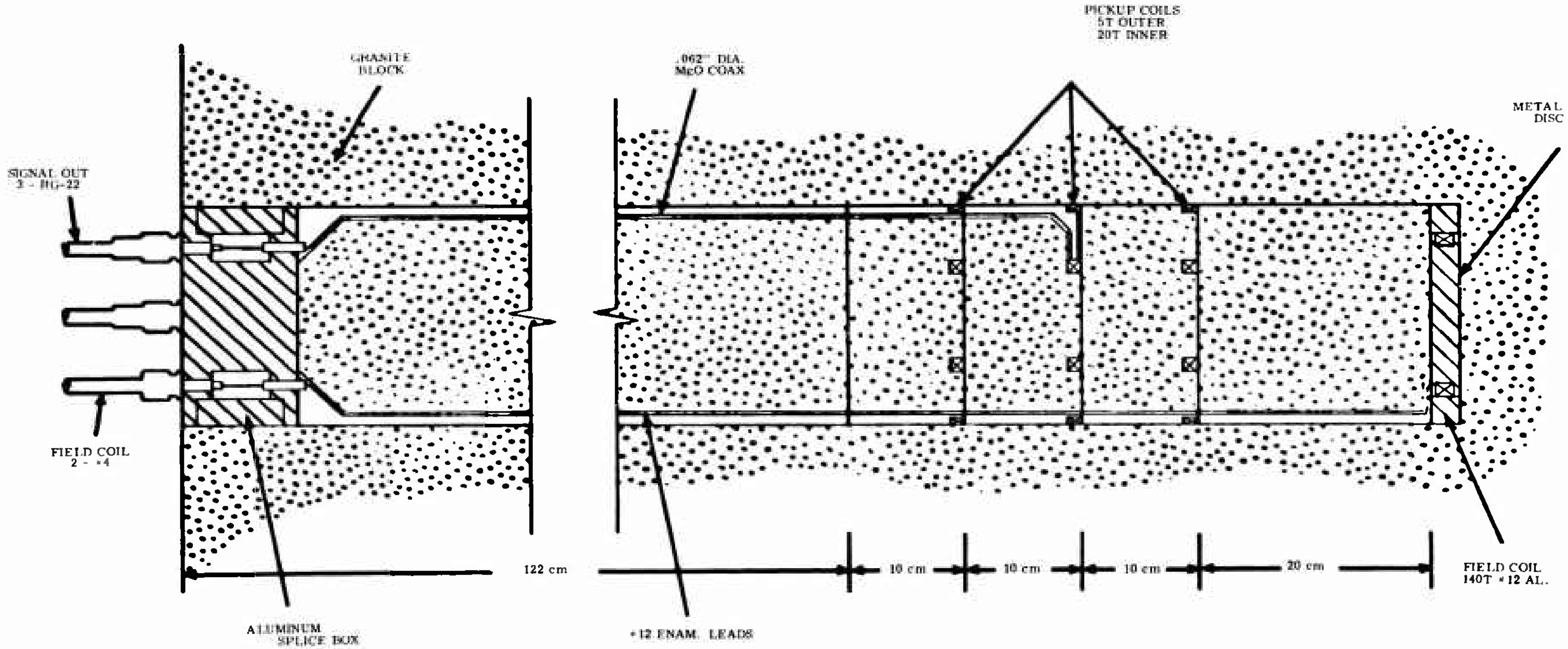


FIGURE 1
ELECTROMAGNETIC VELOCITY GAUGE

PICKUP COIL

The construction details of a single pickup coil are shown in Figure 2 and illustrate how the coils are positioned in grooves machined on the face of a granite cylinder. The coil actually consists of a 20 turn inner and a 5 turn outer coil connected in a "Bucking" configuration. Since the area of the outer coil is four times that of the inner, no signal is produced by a changing uniform field. The inner and outer coil are both wound from a single continuous piece of .062" diameter solid sheath coax with MgO dielectric, the individual turns being insulated from each other by mica composites and bonded together with epoxy. After installation of the coils in the granite, the residual voids will be filled with alumina loaded epoxy.

POWER SUPPLY

The power supply shown in Figure 3 provides approximately 400 amperes to the field coil starting at - 100 milliseconds, and is turned off at zero time. In this circuit the current is turned on with one SCR, flowing through R5 and the field coil. At the appropriate time the second SCR is turned on, turning the first off through the commutating capacitor C, and transferring the load to R4. Complete isolation from instrument ground is provided through the use of transformers to trigger the SCR gates, and a current transformer to monitor the field coil current.

Lead-acid batteries appear to be the only reasonable power source available at the required current levels. Due to the high ambient temperatures present in the battery alcove, charging capability is provided to compensate for the attendant high self discharge rate of the cells. A full wave charger is shown with the charge rate determined by the output voltage

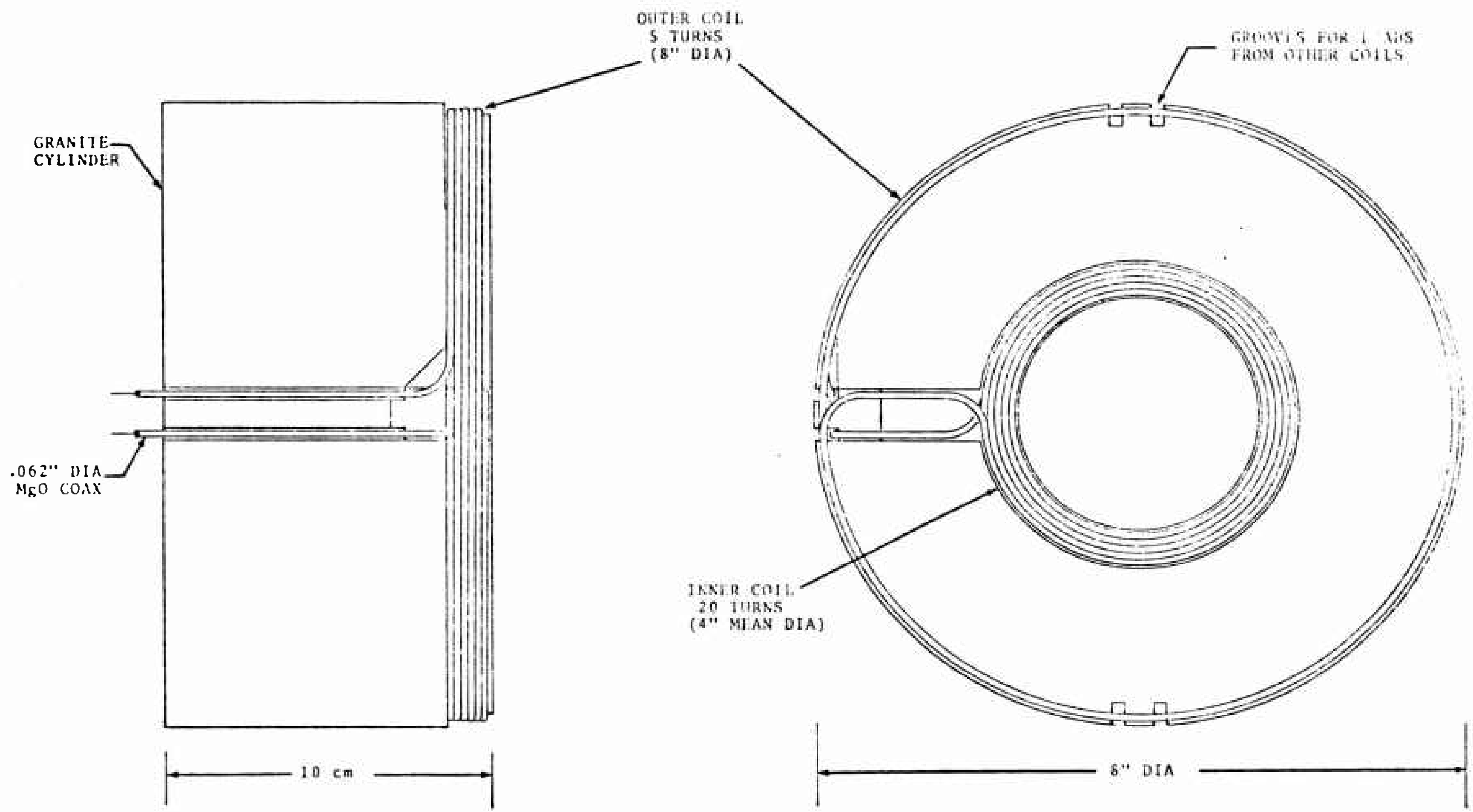


FIGURE 2
PICKUP COIL ASSEMBLY

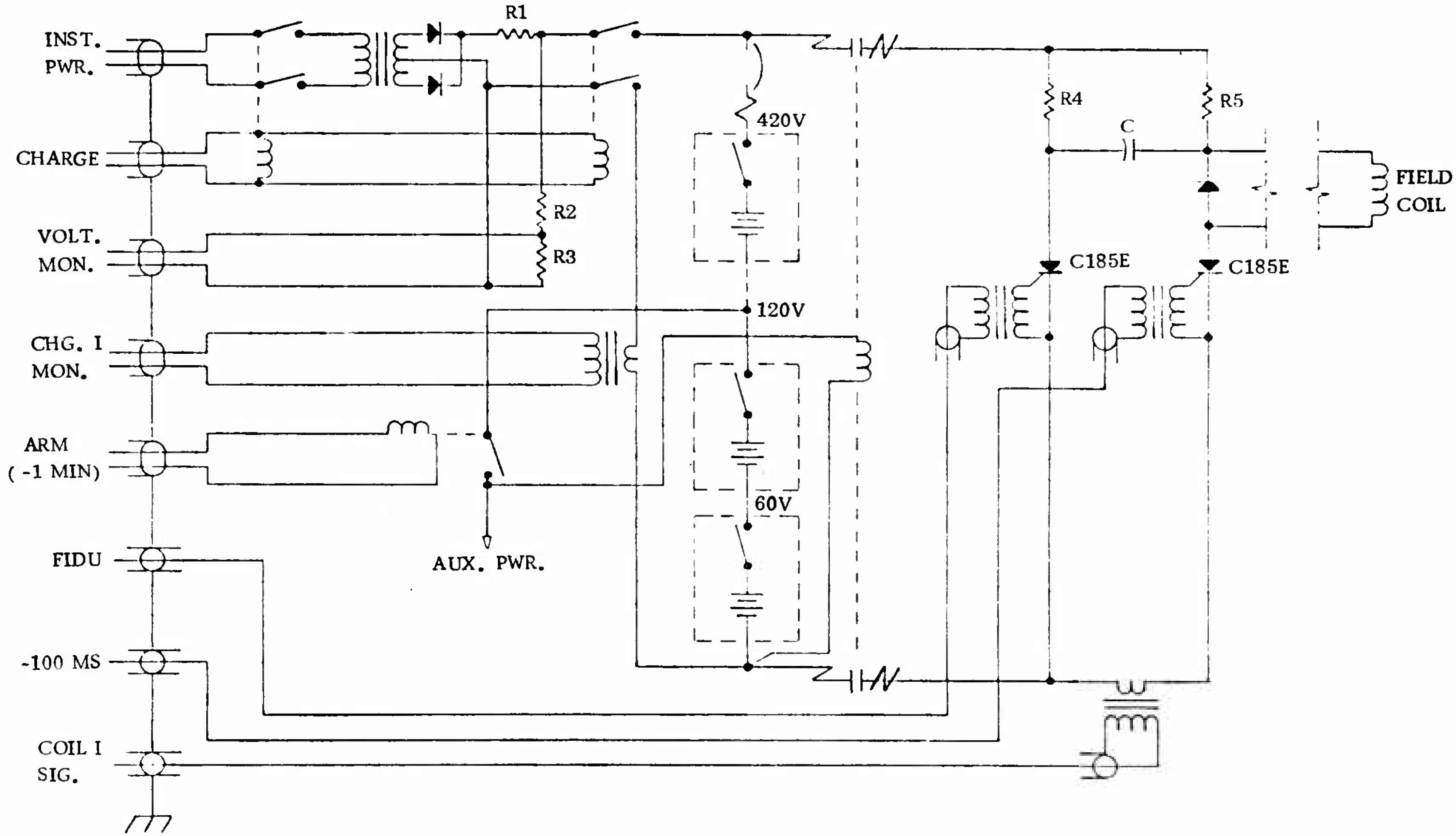


FIGURE 3
FIELD COIL POWER SUPPLY

and the value of R1. No charging is anticipated after stemming which should eliminate the problems created by an accumulation of hydrogen gas evolved during charging. Battery voltage may be monitored by the voltage divider R2 and R3, while charging current is monitored through a current transformer, both circuits being active only during the charge cycle.

Due to the voltage and current capability of the required battery, we feel that it is necessary to divide the battery into discrete, enclosed, sublethal packages. The battery is therefore divided into seven 60 volt groups that can be electrically opened by hand should the need arise. Voltage will be applied to the SCR circuits through a 2 pole normally open DC contactor capable of breaking both ends of the battery at rated voltage and current. This contactor will be closed only when the system is armed at - 1 minute. At the high end of the battery will be a current overload breaker that will open should fault currents develope beyond the capability of the DC contactor.

SIGNAL CONDITIONING

Figure 4 shows a complete data channel proposed for each of the three pickup coils. The signals are carried to the signal conditioning alcove from the pickup coils by RG-22 cable, with all three shields connected to a common earth ground at the gauge. Each signal path is isolated from trailer ground by a wide band isolation transformer with differential input to reduce common mode signals induced in the gauge and cable. Since the signal is expected to exceed 200 volts at the gauge, the transformer output is attenuated to a more reasonable level for transmission to the trailer and recording. Dry run signals will be generated at the alcove by a capacitive discharge through an SCR and coupled

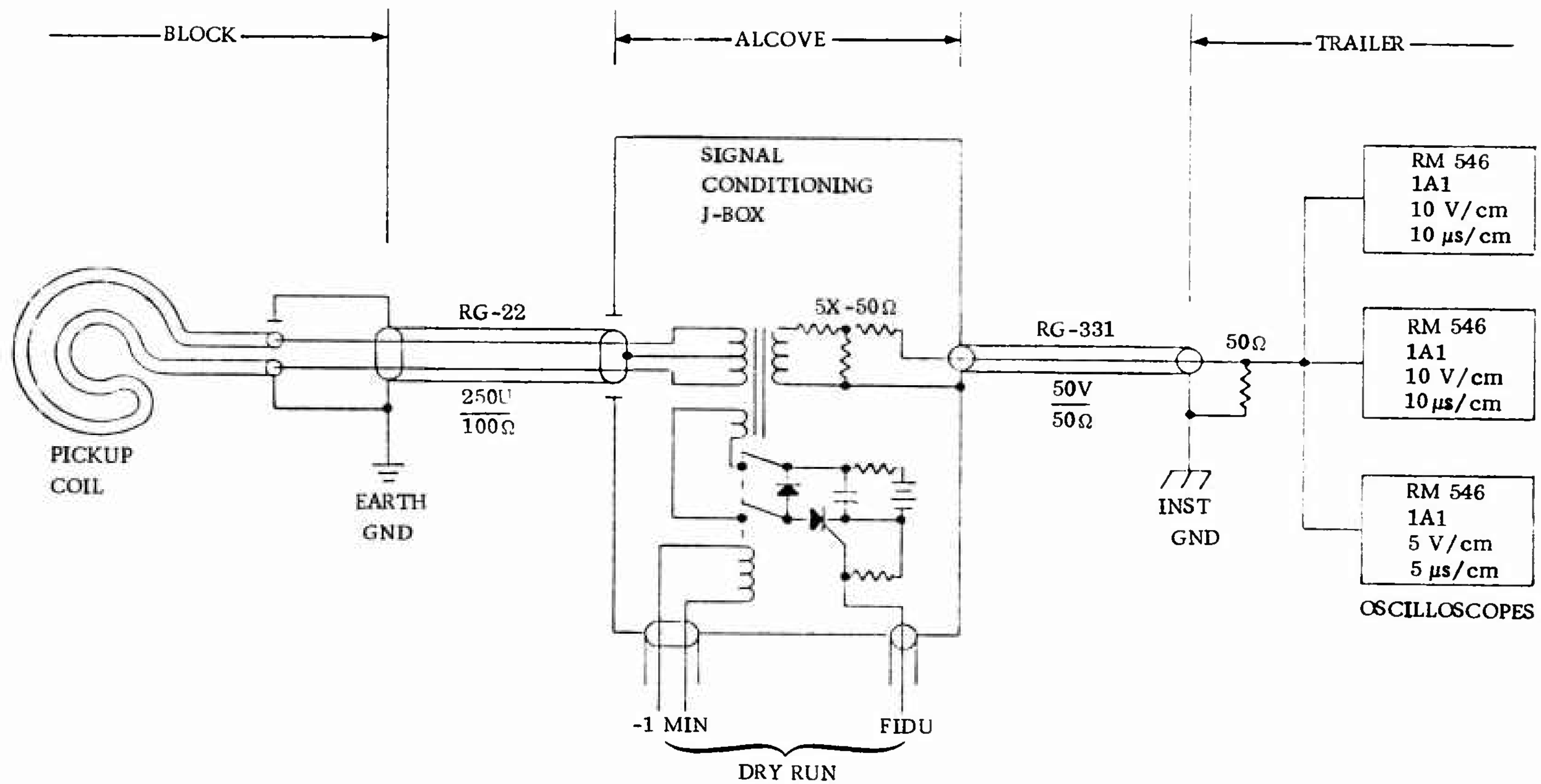


FIGURE 4
DAT/ CH ANNEL SCHEMATIC

into the isolation transformer via a relay that will be disabled at shot time. Each signal is carried to the recording trailer by an RG-331 cable and then recorded on three RM-546 oscilloscopes. Figure 5 is the signal expected at the oscilloscope and shows the small negative component due to the decay of the field after current shutdown in the field coil. The signal rises sharply as the metallic disc starts moving, increasing rapidly as it moves toward the pickup coil.

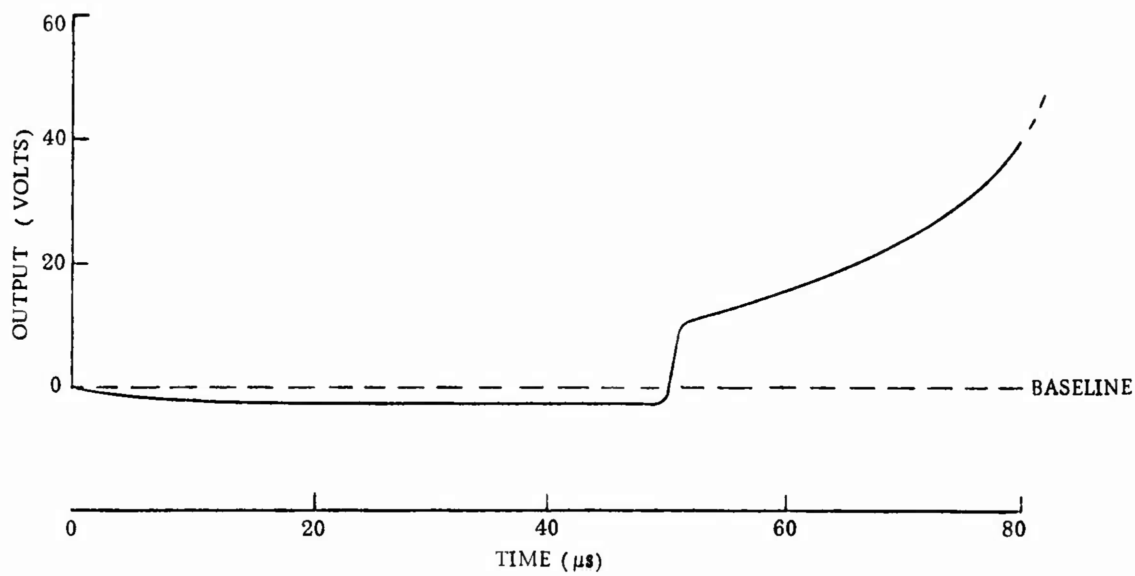


FIGURE 5
ANTICIPATED DATA SIGNAL
(AT OSCILLOSCOPE)

STANFORD RESEARCH INSTITUTE

PROFILE OF PRESSURE VS TIME IN GRANITE BLOCK

SRI will field six manganin gages to be staggered within two 8' cores drilled into the granite block.

Figure 1 shows the general system layout. The dotted enclosure around the gages is an aluminum sheath. Cable shields will be carried all the way to the gages while the outer shields will be terminated and tied together at the granite block rear surface.

Figure 2 is a closer view of the gage installation.

Figure 3 shows a detailed view of gage emplacement.

Figure 4 is the SRI built pulsed manganin Power Supply to be located in the battery alcove. The gage resistance will be between .05 & .1 and hence will probably not be shunted by the increased conductivity of the granite block. At the currents expected the gages will survive $\leq$ 250 ms with signal risetimes of $\leq$ 100ns. The crowbar circuit incorporated is for dry runs only and will be disconnected for the shot.

The system instrumentation diagram is drawn in figure 5; note that all shields are shown as being tied together.

Figure 6 indicates a typical expected channel performance. Signal rise times will probably be longer than 30 ns with a bandwidth of $\approx$ 4 mc. The tape recorder will run in the direct mode.

Inclosure 5

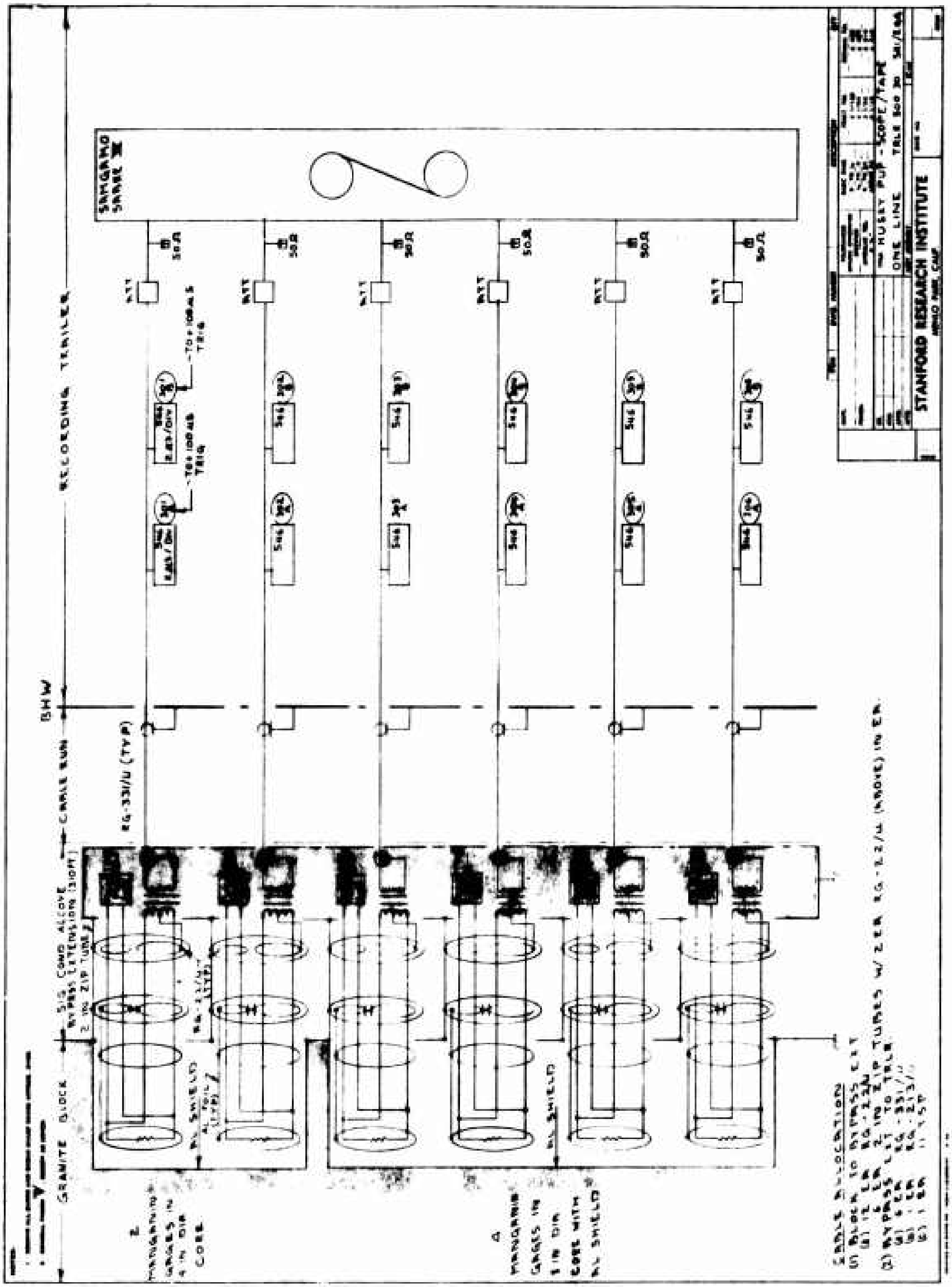

STANFORD RESEARCH INSTITUTE
RECORDING TRAILER
SANGAMO SABRE X
GRANITE BLOCK
CABLE RUN
BHW
RG-331/U (TYP)
CABLE ALLOCATION

Figure 1

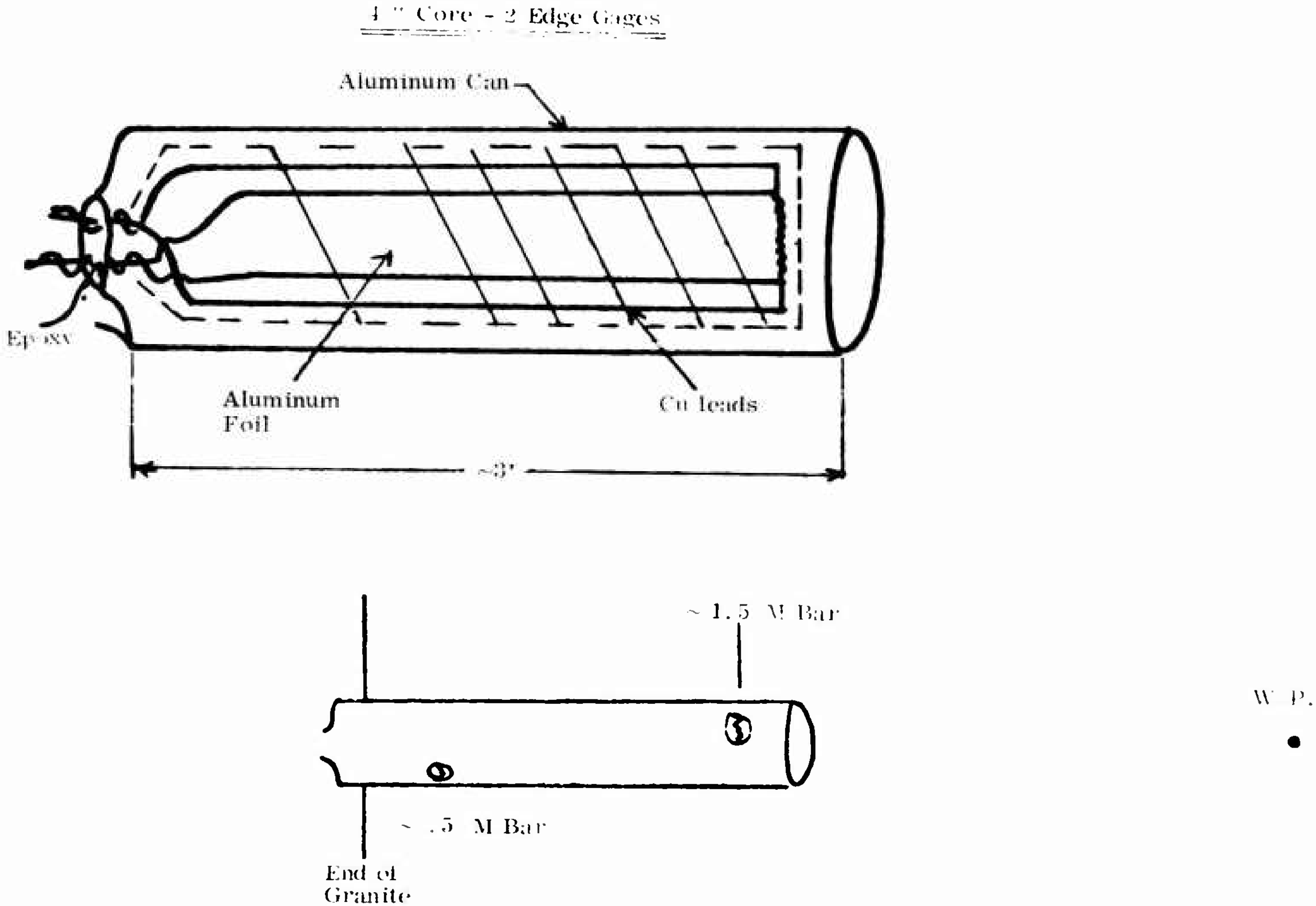
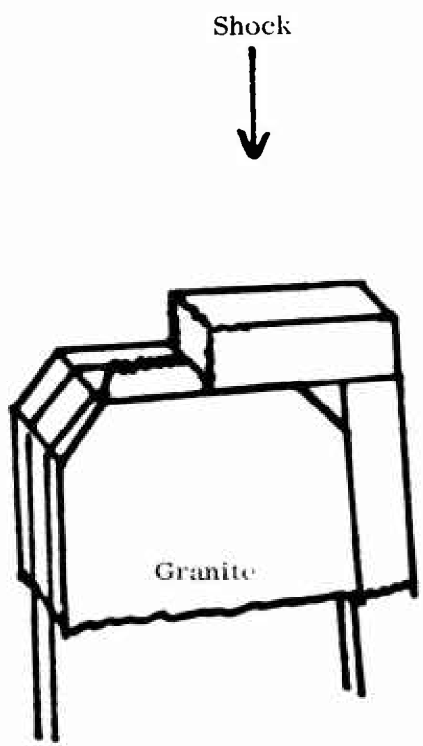
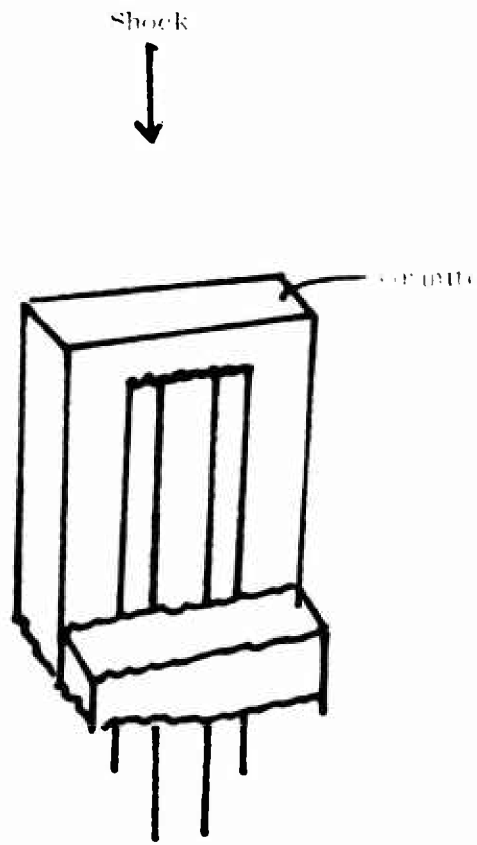

4 " Core - 2 Edge Gages
Aluminum Can
Epoxy
Aluminum Foil
Cu leads
~3'
~ 1.5 M Bar
~ .5 M Bar
End of Granite
W. P.

Figure 2



Flat Gage
~ 10 ns Rise Time



Edge Gage
~ 100 ns Rise Time
Higher Survivability

Figure 3

HUSKY PUP SRI 50A Power Supply

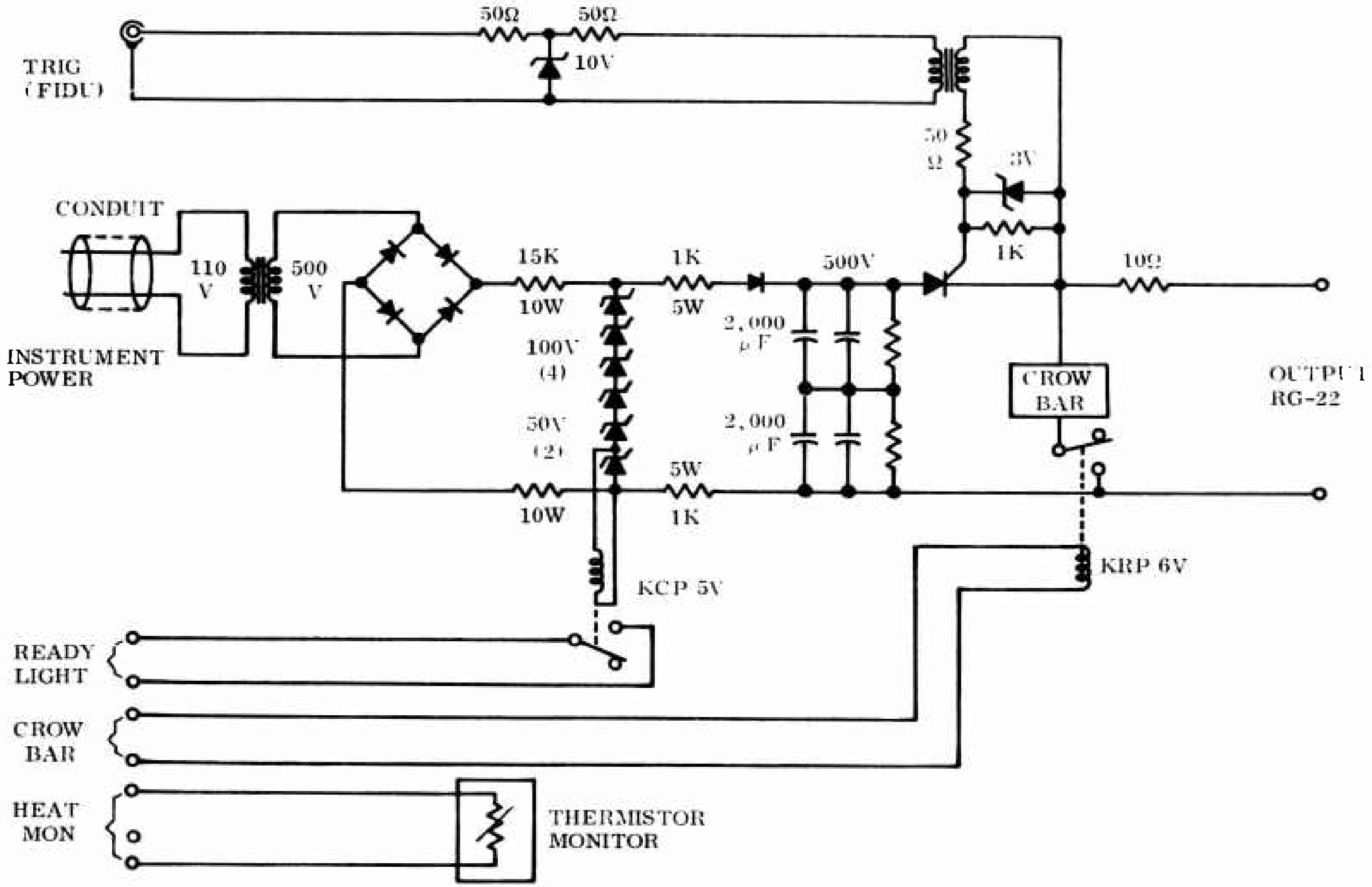


Figure 4

HUSKY PUP-SRI

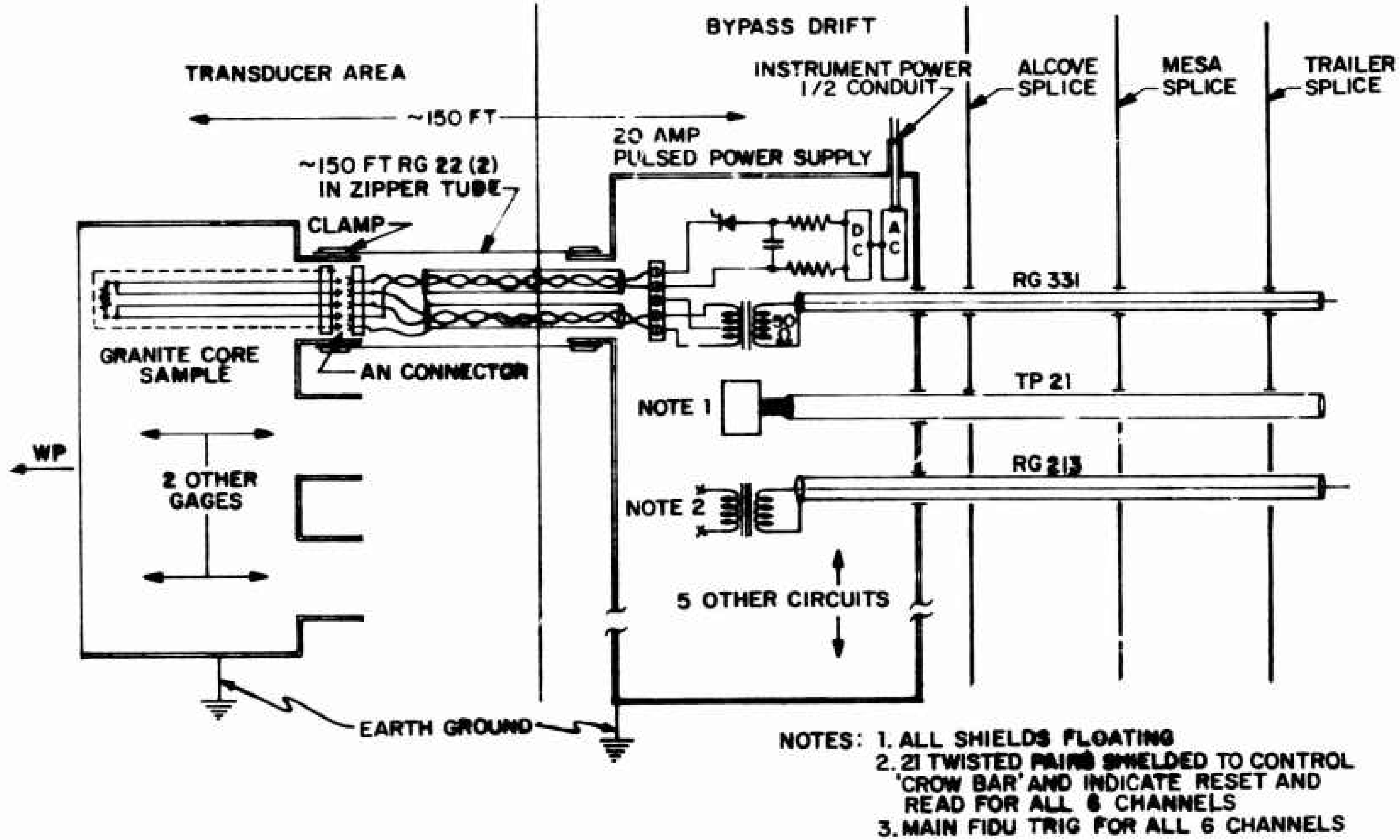
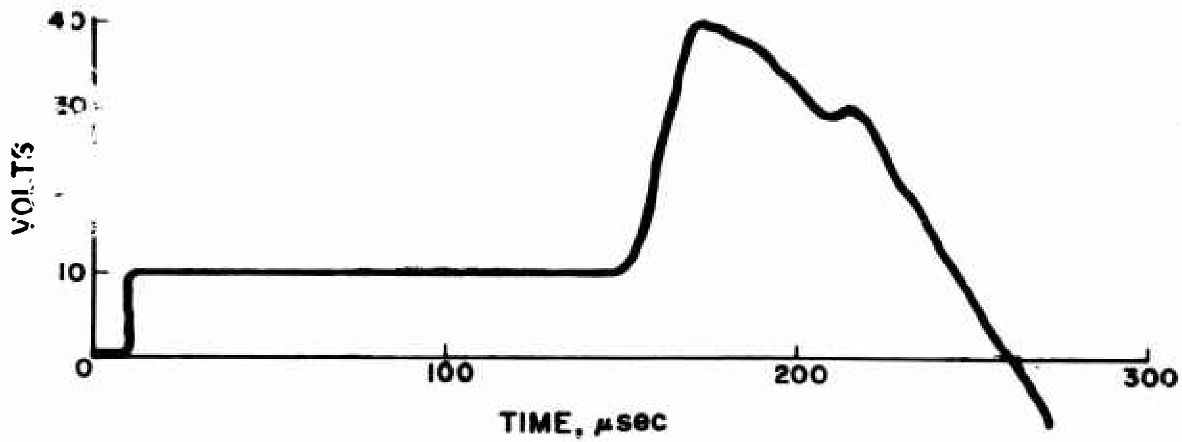


Figure 5

HUSKY PUP- SRI

EXPECTED CHANNEL PERFORMANCE

FULL SCALE AMPLITUDE AT GAGE		~ 40V
FULL SCALE AMPLITUDE AT TRAILER		< 40V
FULL SCALE AMPLITUDE AT SCOPES		~ 5V
BAND WIDTH		~ 10MHZ
RISE TIME		~ 30NSEC
SCOPE SETTING	A	2μsec/cm
	B	5μsec/cm
	C	10μsec/cm
TAPE RECORDER	A CH ± 2V B CH ± 5V	} 407 DEV FM 80 KHZ



Figur-

PHYSICS INTERNATIONAL

SHOCK TIME OF ARRIVAL IN GRANITE BLOCK

1. General view of experiment emplacement.

2. Cutaway showing pin-switch installation and locations.

   a. 12 switches installed in 4 groups of 3 each for recording purposes.
   b. Installed in aluminum shell.

3. Typical recording system for a group of PIN switches.

   a. ≈ 10ms recording time for the entire experiment.
   b. Shields tied to rear of granite block.

4. Cutaway drawing showing the ladder circuit installation.

   a. ≈ 20 electrical steps in the ladder & will be designed for ≈ 75% of these to give data.

   b. will be powered with a constant current power supply.
   c. Installed in an aluminum shell.

5. Ladder circuit recording system.

   a. Recording time ≈ 60 us-90us.
   b. Shield tied to back of block.

6. Predicted output from ladder experiment.

7. Overall general recording schematic for both experiments.

Inclosure 6

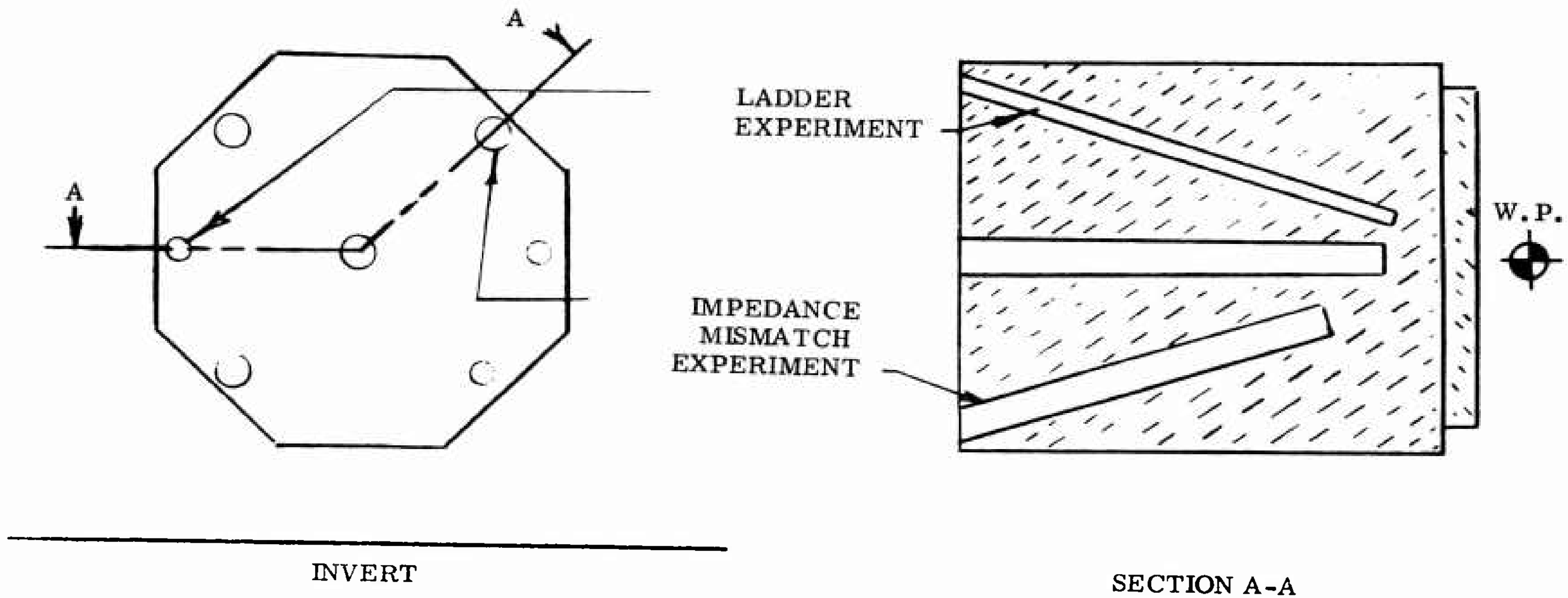


Figure 1. Experiment Emplacement

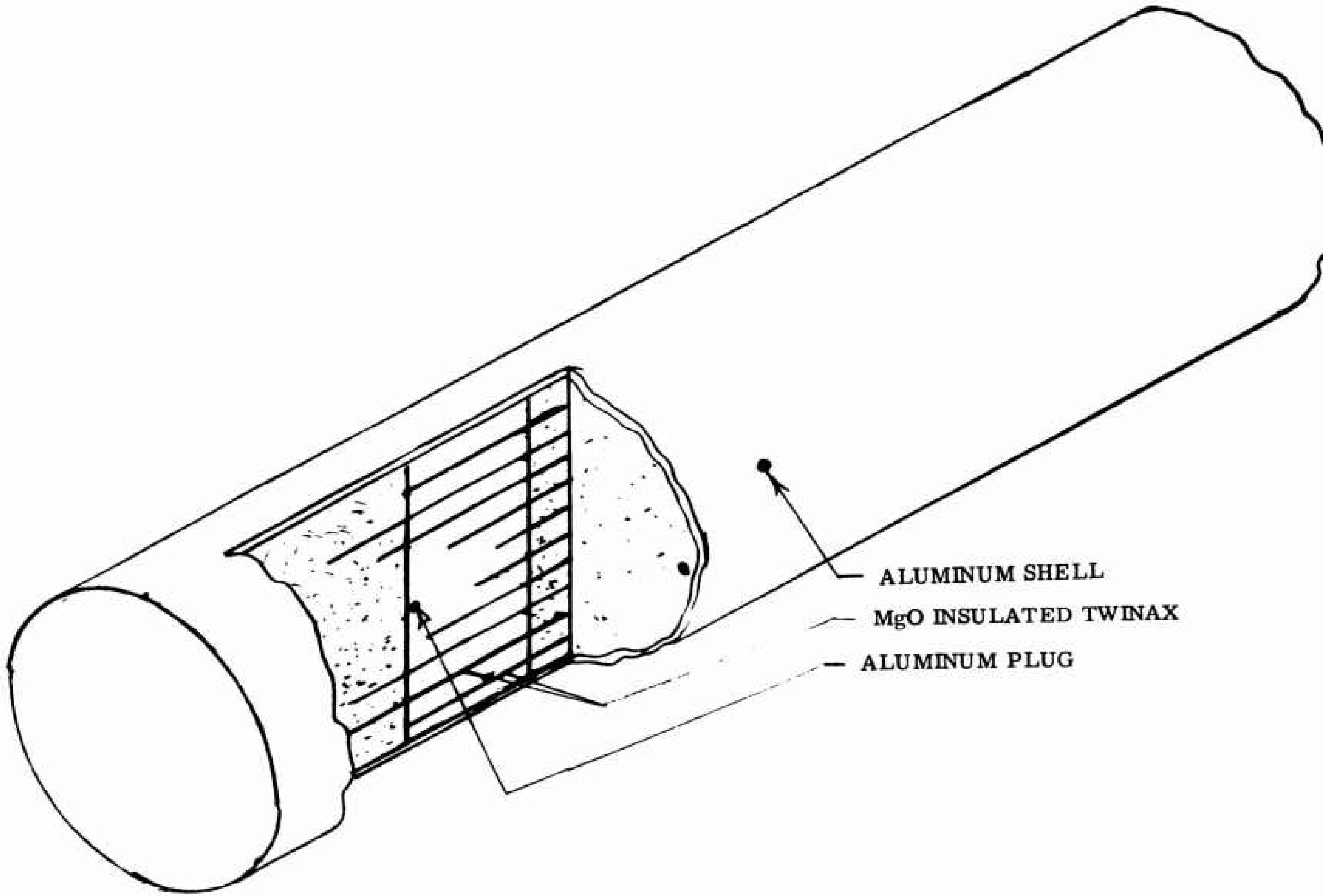


Figure 2. Impedance Mismatch Experiment

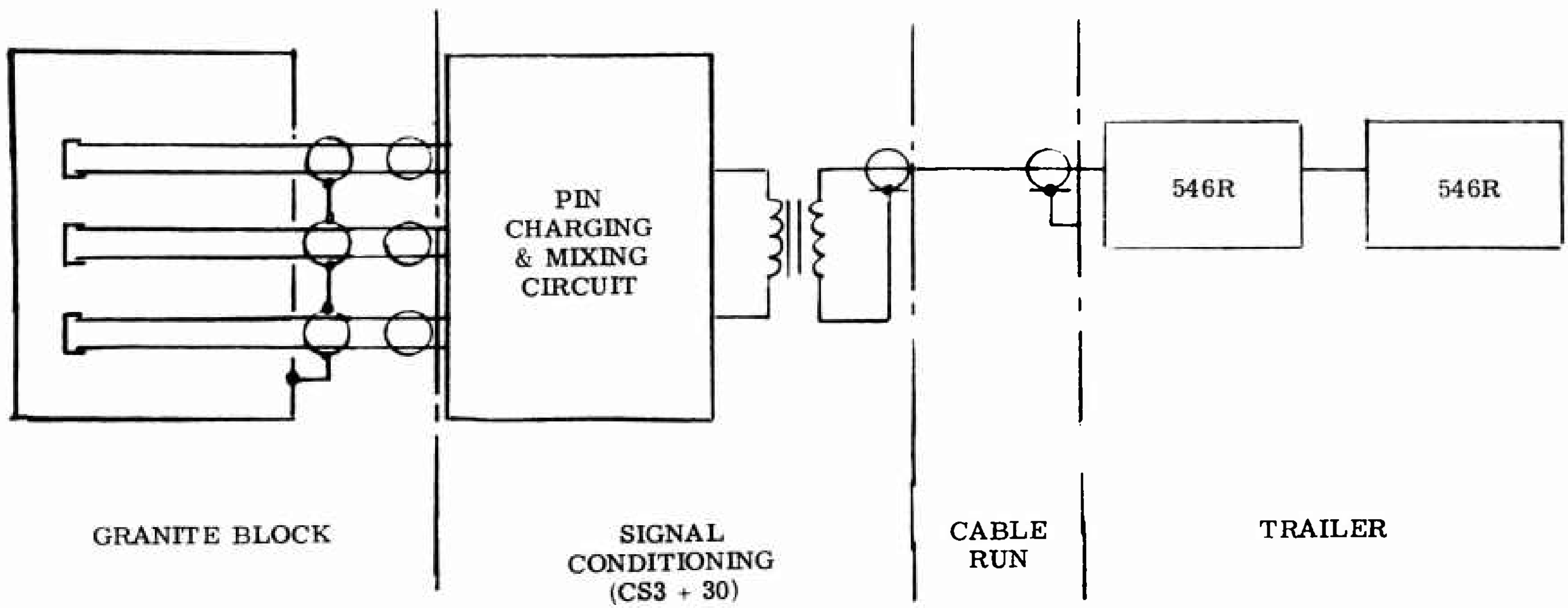


Figure 3. Pin Signal Circuit Typical of Four

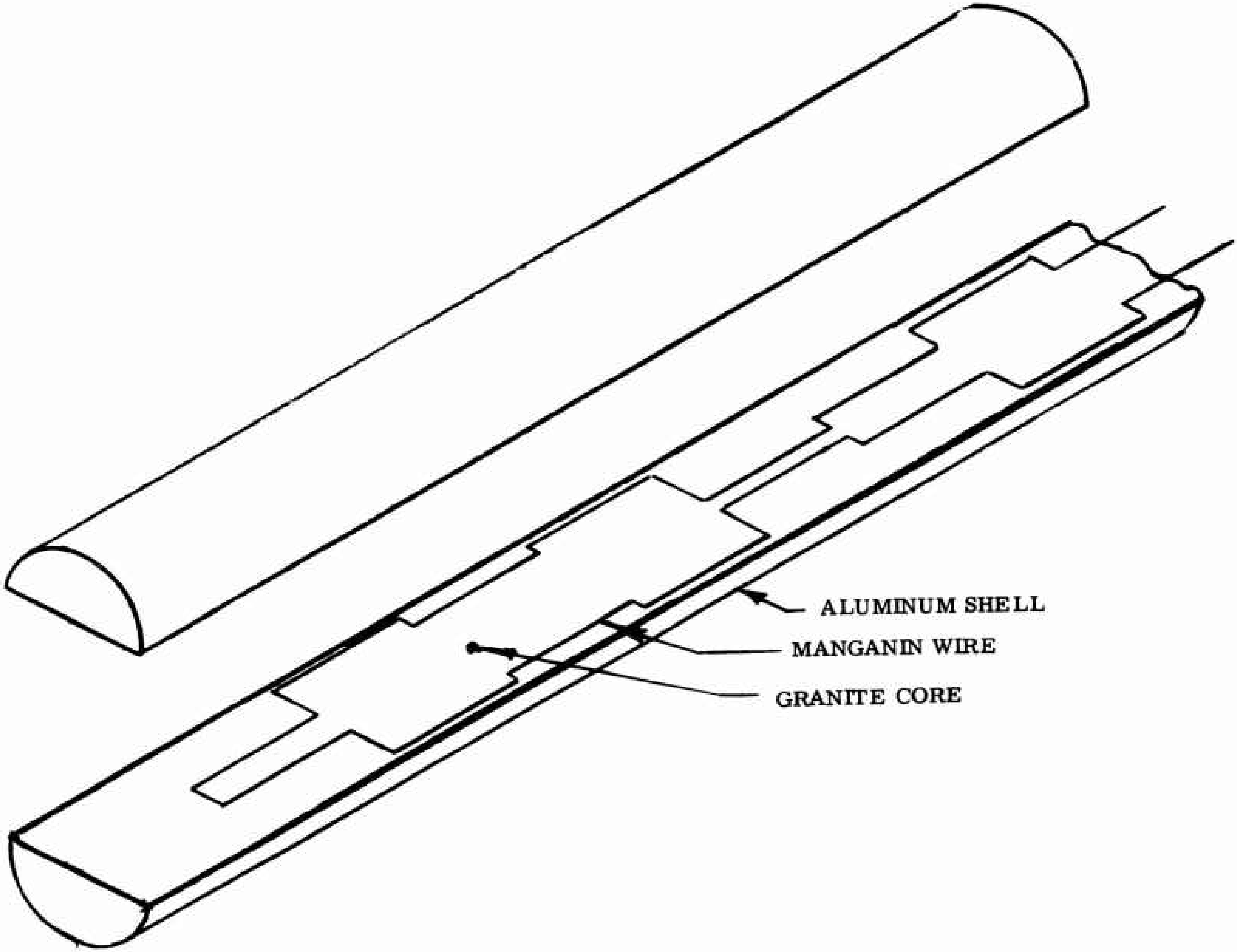


Figure 4. "Ladder" Experiment

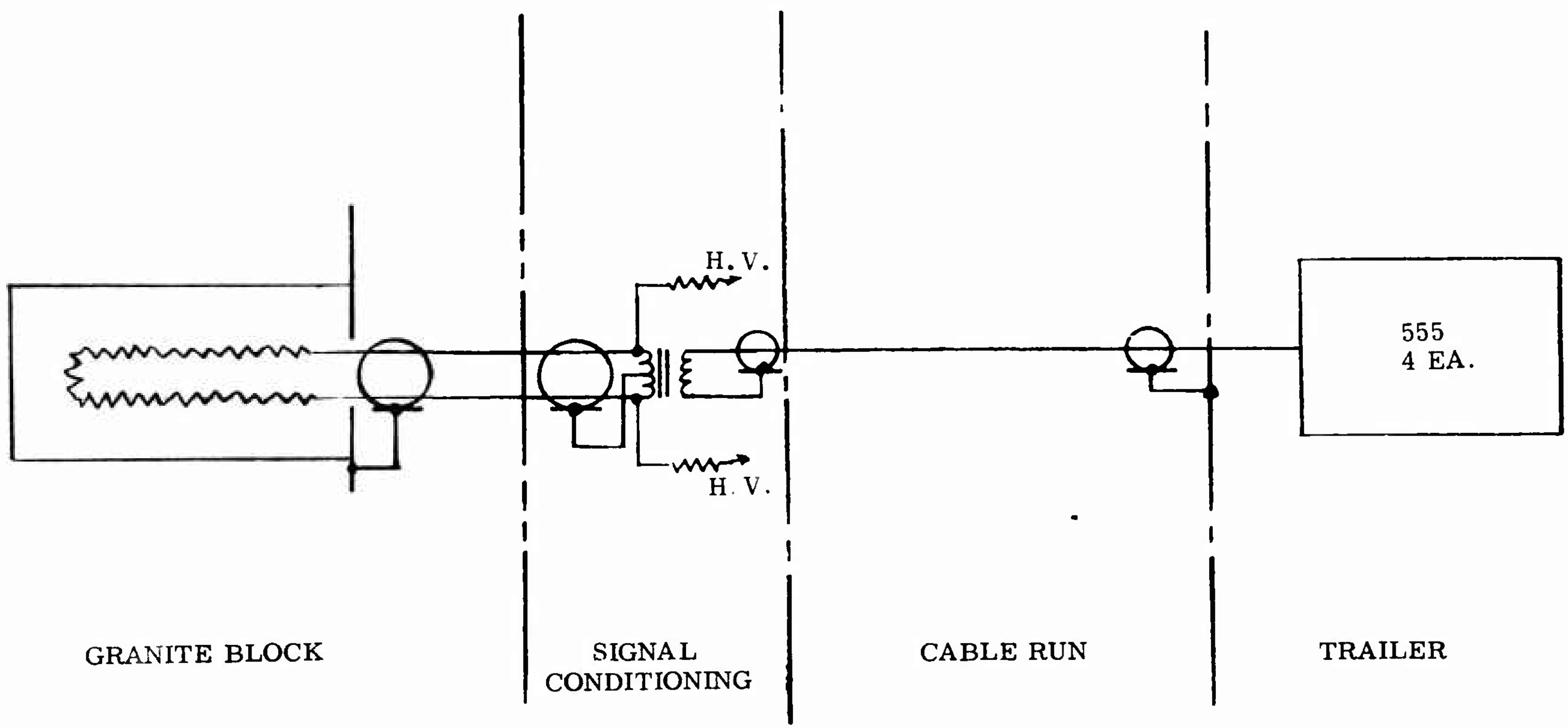


Figure 5. "Ladder" Recording

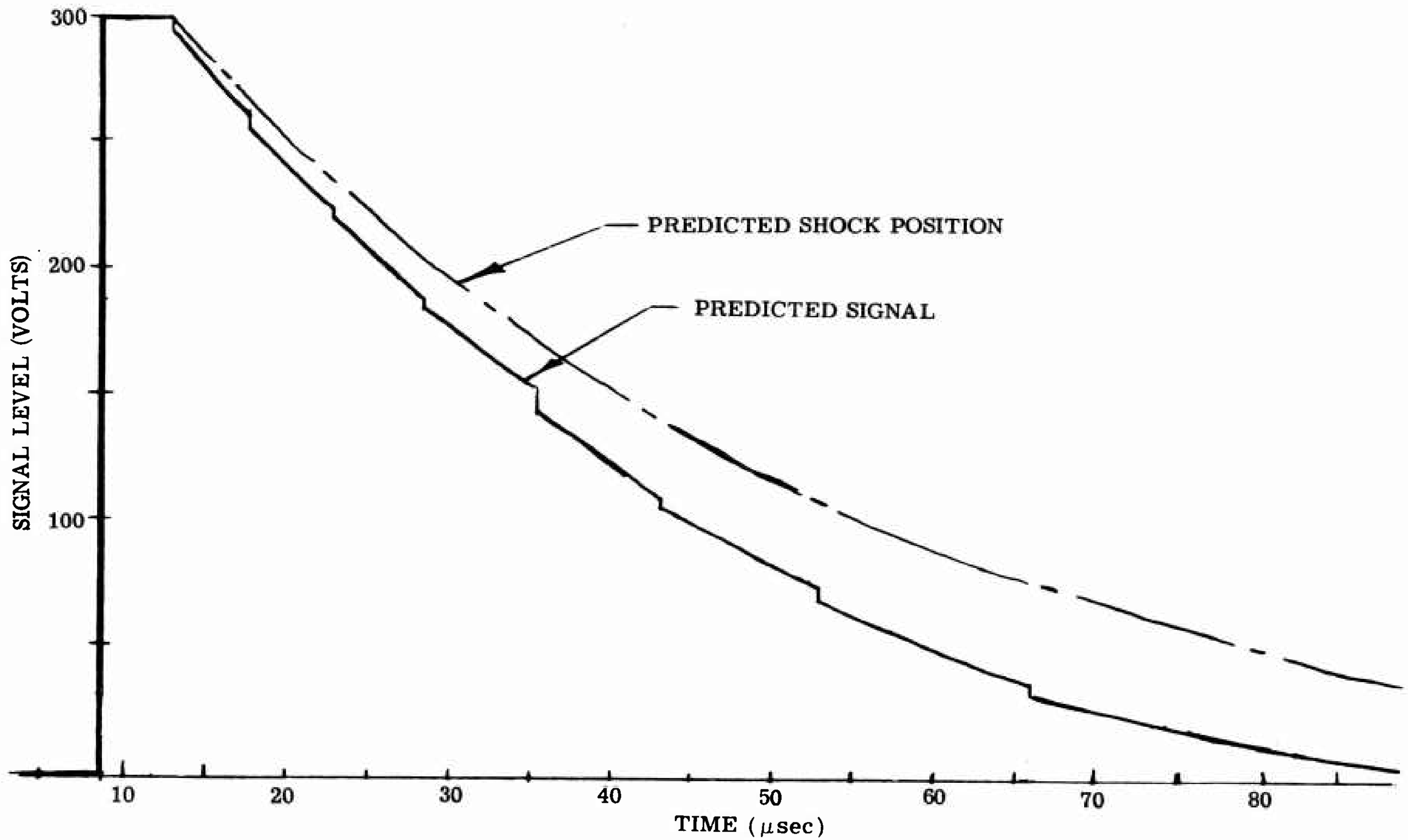


Figure 6. "Ladder" Prediction

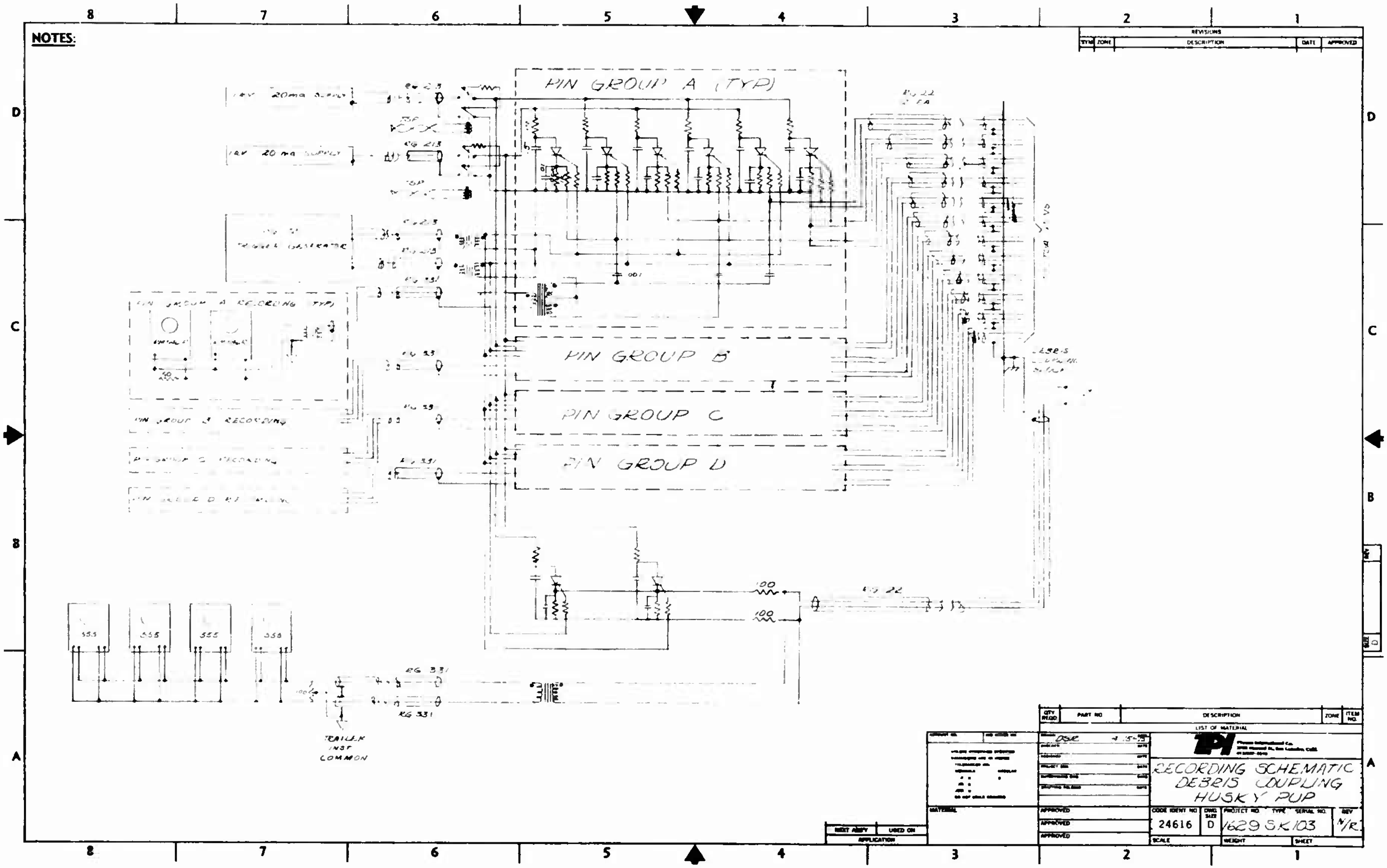


Figure 7. Recording Schematic Debris Coupling (HUSKY PUP)

PHYSICS INTERNATIONAL

STEMMING & CONTAINMENT

The following are the experiments to be fielded on HUSKY PUP.

1. List of measurements.

a. Carlson platter diaphragm moves as a piston (not bound at circumference) for more uniform pressure measurements. These gages will measure the stemming pressure at DAC #2.

b. Slip joint direct coupled pressure gages at muffler possess slip joints between two pipes (containing signal cables) to enable cables to live longer.

2. Detailed breakout of measurements.

3. Simplified typical multiplex system.

a. Only the center frequencies shown will be used on HUSKY PUP.

4. Typical multiplex system with mixed gages.

5. Detailed block diagram of the multiplex system.

a. Flat 3KC VCO response or rise time of 12 ms.

b. Oscillators drive 1/2 gage each, such as an LVDT. Modulator mixes these outputs.

c. Band-pass filter (GCO oscillator filter) filters out all but the difference frequency from the mixer.

d. Alarm relay monitors current to a given multiplex system.

e. Hybrid transformer stage enables external signal injection such as IRIG A, etc.

6. GCO oscillator filter.

7. Typical filter susceptance simulating network.

a. Used to simulate an empty gage slot from the output of the GCO bandpass filter all the way to the gage.

b. Use of this network eliminates reflections and maintains constant impedances.

8. Gas pressure recording system.

9. Ytterbium transient power supply & recording system.

10. Ytterbium gage shot record using transient power supply.

11. Ytterbium gage amplitude-modulated carrier system.

12. Ytterbium gage shot record using carrier system - showing separation of noise phenomena from signal.

13. Quartz (PCB) impulse gage circuit.

a. Gage will listen for debris impacting on WP door of DAC #2.

b. VCO & MUX system will be located in a cross cut (or alcove).

c. Final output filter will keep signal integrity in case a gage runs amuck.

d. All quartz gage systems are multiplexed at the outputs of the final filters.

e. A final filter will be located in the trailer.

P. I. HUSKY PUP INSTRUMENTATION

1.0 STEMMING PHENOMENA

1.1 CAVITY PRESSURE

1.1.1 OIL COLUMN COUPLED PRESSURE GAGES

1.2 MUFFLER EFFECTIVENESS

1.2.1 OIL COLUMN COUPLED PRESSURE GAGES

1.2.2 DIRECT COUPLED PRESSURE GAGES

1.2.3 SLIP JOINT DIRECT COUPLED PRESSURE GAGES

1.2.4 EXTERNAL DIRECT COUPLED YTTERBIUM STEEL FLAT PACK GAGES.

1.3 DAC PERFORMANCE

1.3.1 OIL COLUMN COUPLED PRESSURE GAGES IN LOS PIPE

1.3.2 GROUP PRESSURE CARLSON PLATTERS AND YTTERBIUM C-7 EPOXY GAGES

1.3.3 SOIL PRESSURE YTTERBIUM C-7 EPOXY GAGES IN TUFF

1.3.4 DAC IMPULSE PCB QUARTZ MINIATURE PRESSURE TRANSDUCERS

Figure 1

HUSKY PUP STEMMING AND CONTAINMENT DIAGNOSTICS MEASUREMENTS

TASK	Measured Parameter	Measurement System	Number of Measurements 2nd Location	Recording System	Expected Data
1. Cavity Dynamics	Cavity P (t)	Oil Filled High Pressure Tubing, Diaphragm Pressure gages Piezoresistive gages	Four gages One tube Approx. 200 ft.	VCO. 40 kHz carrier and magnetic tape. chart recorder	Residual Cavity pressure from approx. 0.1 sec to as long as possible (hrs)
2. Muffler Effectiveness	1. Pipe P (t, x) 2. Muffler P (t, x) 3. First arrival 4. Velocity of peak	1. Yb flat pack steel 2. Oil filled tube, diaphragm gages 3. Oil volume, diaphragm gages	1. 10 active Yb 6 dummy 2. 10 active diaphragm 6 dummy From 150 ft. to 216 ft.	1. 40 kHz carrier and mag. tape 2. VCO and mag. tape	Pipe and muffler pressure and plasma velocity decrease due to muffler
3. Grout Flow Dynamics	Grout pressure -time at DAC #2 plug	1. P (t) gages Diaphragm Yb	1. Diaphragm: 3 active, 2 dummy at plug-grout interface 2. Yb-3 active, 2 dummy at plug-grout interface 3. Yb-3 active at SLG - tuff interface	1. VCO and mag. tape 2. 3. } 40 kHz carrier and mag tape	Grout stagnation pressure Pressure-time vs DAC door impulse
4. #2 DAC Door Dynamics	1. Force-time 2. P (t)	1. Piezoelectric impulse gages 2. Oil tube, diaphragm gages	1. 5 gages located on DAC housing 2. 2, one each on WP and portal side of DAC doors	VCO and mag. tape and scopes	Time of door failure Differential Pressure on DAC door
5. Free Field Dynamics	1. Stress-time 2. Velocity (Acc.)-time	1. Yb-epoxy gages 2. High g accelerometers	1. 3 active 3 dummy 2. 3 active 1 dummy Located in pillar at 2.1 and 0.5 kbar in Tuff	1. 40 kHz carrier and mag. tape & scopes 2. Mag. tape & scopes	Free-field stress impulse and velocity

Figure 2

CONSTANT BANDWIDTH FREQUENCY MULTIPLEXED INSTRUMENT SYSTEM (GCO)

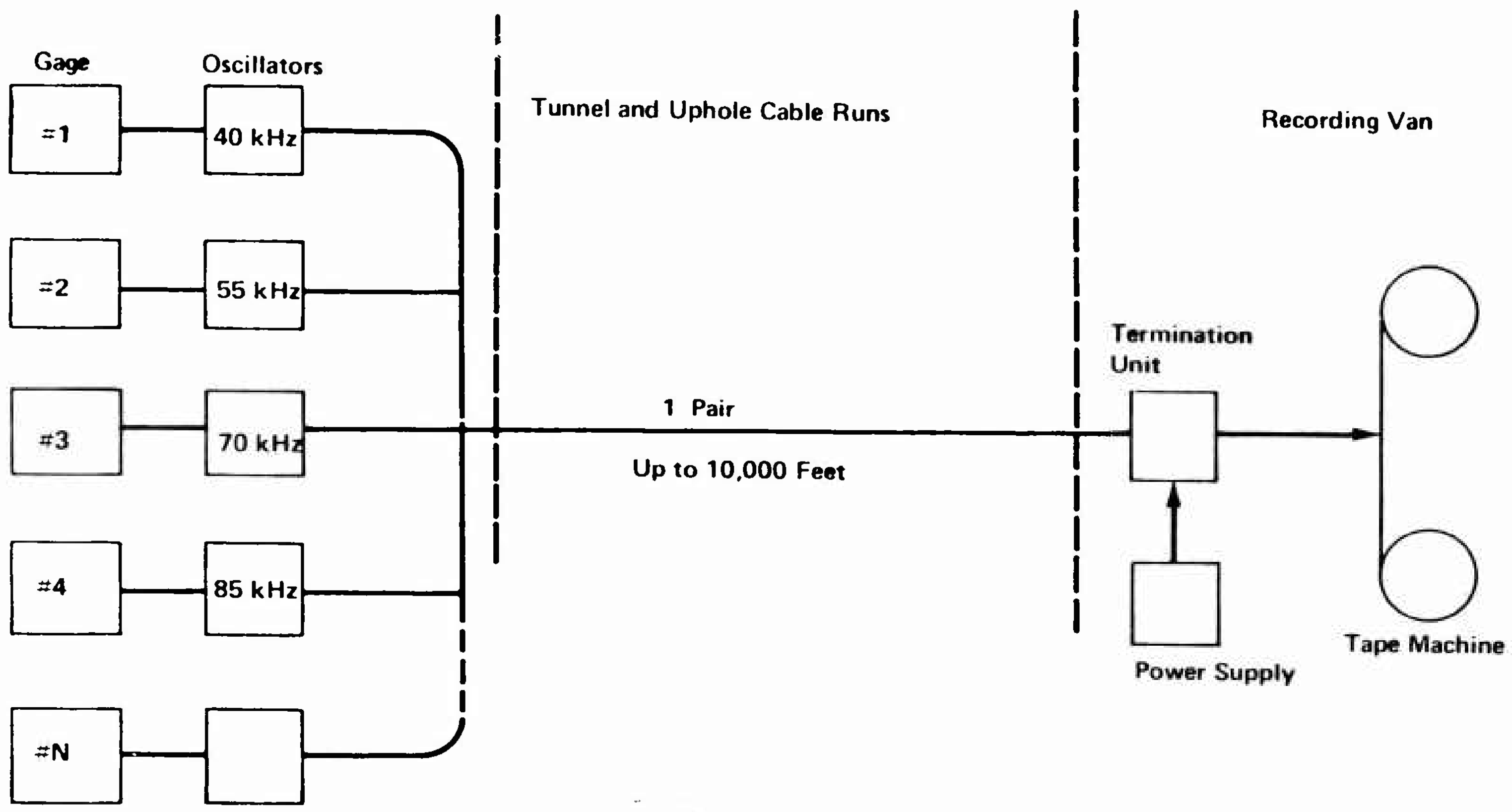
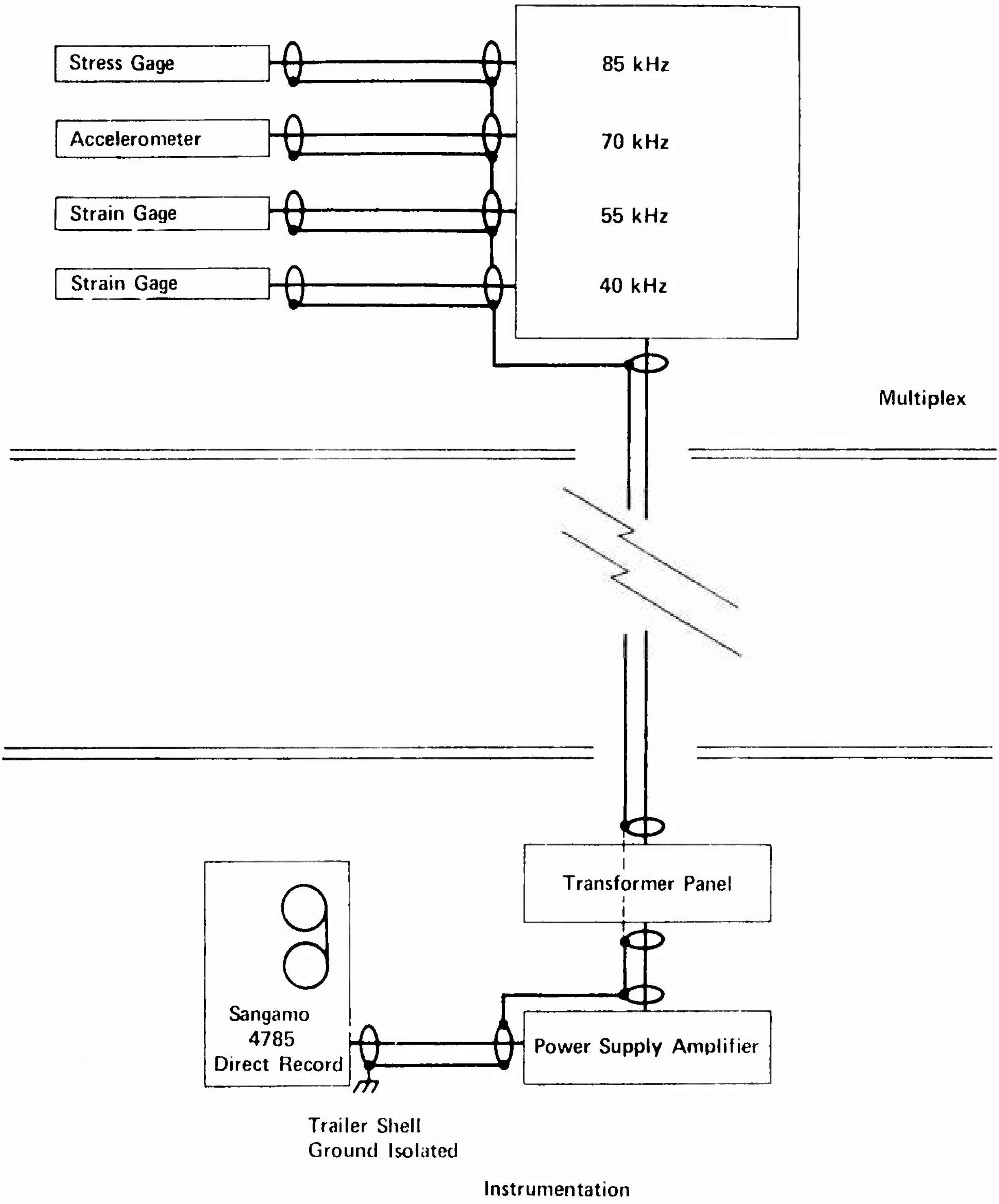


Figure 3



Stress Gage
Accelerometer
Strain Gage
Strain Gage
85 kHz
70 kHz
55 kHz
40 kHz
Multiplex
Transformer Panel
Sangamo
4785
Direct Record
Power Supply Amplifier
Trailer Shell
Ground Isolated
Instrumentation

Figure 4

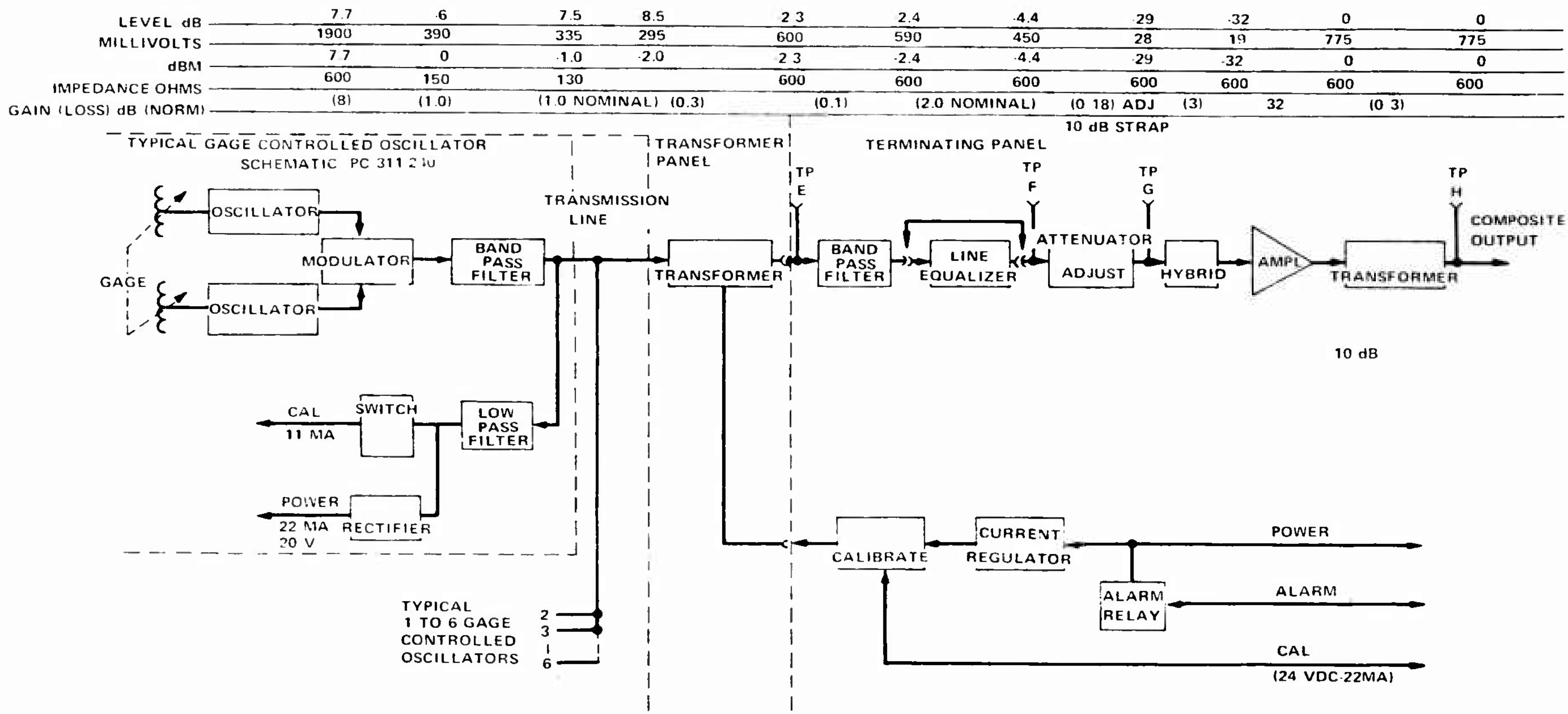

LEVEL dB
MILLIVOLTS
dBM
IMPEDANCE OHMS
GAIN (LOSS) dB (NORM)
7.7
1900
7.7
600
(8)
6
390
0
150
(1.0)
7.5
335
1.0
130
(1.0 NOMINAL)
8.5
295
2.0
(0.3)
2 3
600
2 3
600
(0.1)
2.4
590
2.4
600
(2.0 NOMINAL)
4.4
450
4.4
600
(0 18) ADJ
10 dB STRAP
29
28
29
600
(3)
32
19
32
600
32
0
775
0
600
(0 3)
0
775
0
600
TYPICAL GAGE CONTROLLED OSCILLATOR
SCHEMATIC PC 311 2 ю
OSCILLATOR
OSCILLATOR
GAGE
MODULATOR
BAND PASS FILTER
LOW PASS FILTER
SWITCH
CAL
11 MA
POWER
22 MA
20 V
RECTIFIER
TRANSMISSION LINE
TYPICAL
1 TO 6 GAGE
CONTROLLED
OSCILLATORS
2
3
6
TRANSFORMER PANEL
TRANSFORMER
TERMINATING PANEL
TP E
BAND PASS FILTER
LINE EQUALIZER
TP F
ATTENUATOR
ADJUST
TP G
HYBRID
AMPL
TRANSFORMER
TP H
COMPOSITE OUTPUT
10 dB
CALIBRATE
CURRENT REGULATOR
ALARM RELAY
POWER
ALARM
CAL
(24 VDC-22MA)

Figure 5

GCO OSCILLATOR FILTER

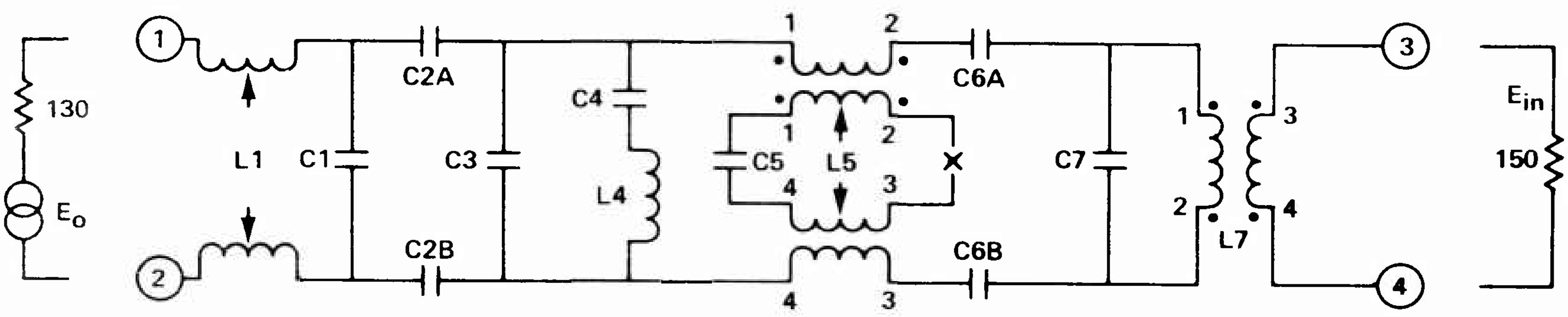


Figure 6

FILTER SUSCEPTANCE SIMULATING NETWORKS

These two terminal networks are to be used in place of the corresponding channel filters when the latter are not required.

They maintain the susceptance of the absent filters over the band of the other filters that are being used for correct performance.

TABLE 3

IN PLACE OF	Network Design	L	C	Fr
40KHz Filter	N_1	3.26MH	4870pf	39.85 KHz
55 " "	N_2	3.26 "	2570	54.90 "
70 " "	N_3	2.87 "	1780	70.00 "
85 " "	N_4	2.87 "	1230	85.00 "
100 " "	N_5	2.87 "	884	100.00 "
115 " "	N_6	2.87 "	666	115.00 "
200 " "	N_7	1.43 "	437	200.00 "
230 " "	N_8	1.43 "	340	230.00 "
260 " "	N_9	1.43 "	257	260.00 "

NOTE: These networks are also for use in checking band performance of each band filter.

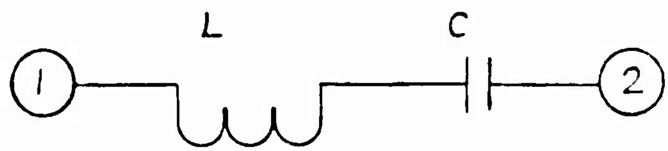


Figure 7

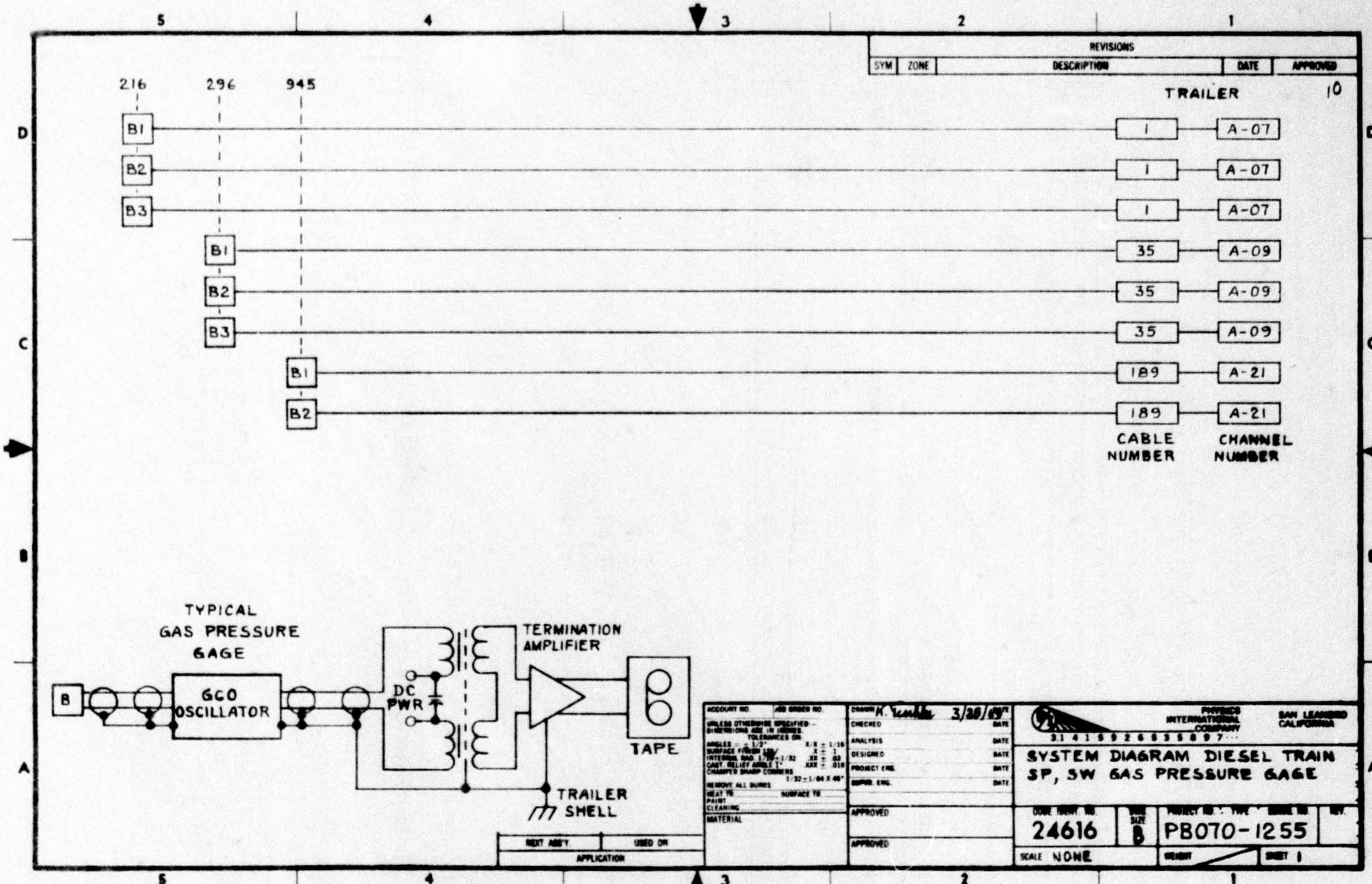

REVISIONS
SYM
ZONE
DESCRIPTION
DATE
APPROVED
10
216
296
945
TRAILER
B1
B2
B3
B1
B2
B3
B1
B2
1
1
1
35
35
35
189
189
A-07
A-07
A-07
A-09
A-09
A-09
A-21
A-21
CABLE NUMBER
CHANNEL NUMBER
TYPICAL GAS PRESSURE GAGE
B
GCO OSCILLATOR
DC PWR
TERMINATION AMPLIFIER
TAPE
TRAILER SHELL
NEXT ASSY
USED ON
APPLICATION
PHYSICS INTERNATIONAL COMPANY
SAN LEANDRO CALIFORNIA
SYSTEM DIAGRAM DIESEL TRAIN
SP, SW GAS PRESSURE GAGE
24616
B
PB070-1255
SCALE NONE
SHEET 1

Figure 8

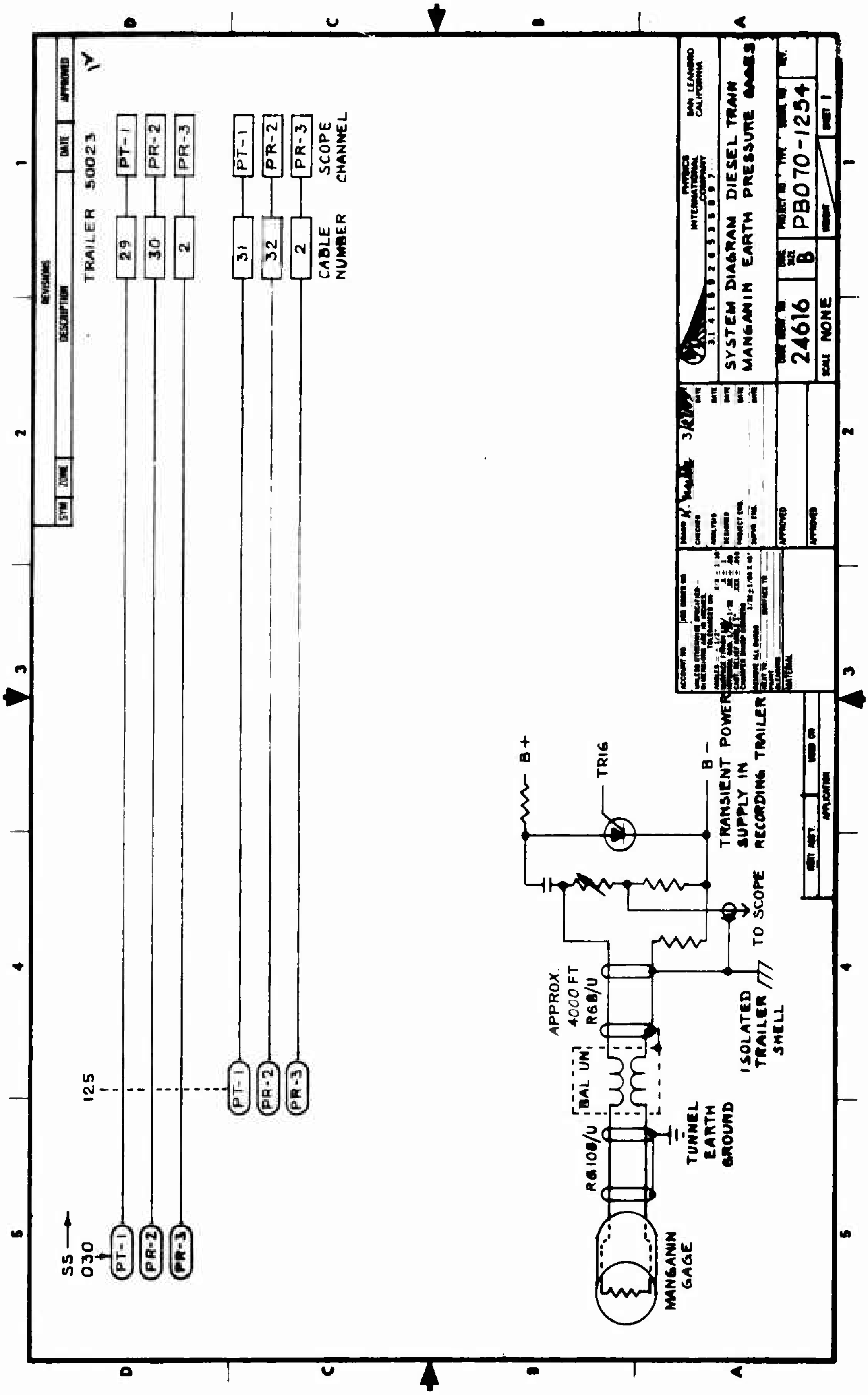

REVISIONS
TRAILER 50023
PT-1
PR-2
PR-3
29
30
2
31
32
2
CABLE NUMBER
SCOPE CHANNEL
SS
030
125
MANGANIN GAGE
RG108/U
BAL UN
APPROX. 4000 FT RG8/U
TUNNEL EARTH GROUND
ISOLATED TRAILER SHELL
TO SCOPE
TRANSIENT POWER SUPPLY IN RECORDING TRAILER
B+
B –
TR16
PHYSICS INTERNATIONAL COMPANY
SAN LEANDRO CALIFORNIA
SYSTEM DIAGRAM DIESEL TRAIN
MANGANIN EARTH PRESSURE GAGES
24616
B
PB070-1254
SCALE NONE
SHEET 1

Figure 9

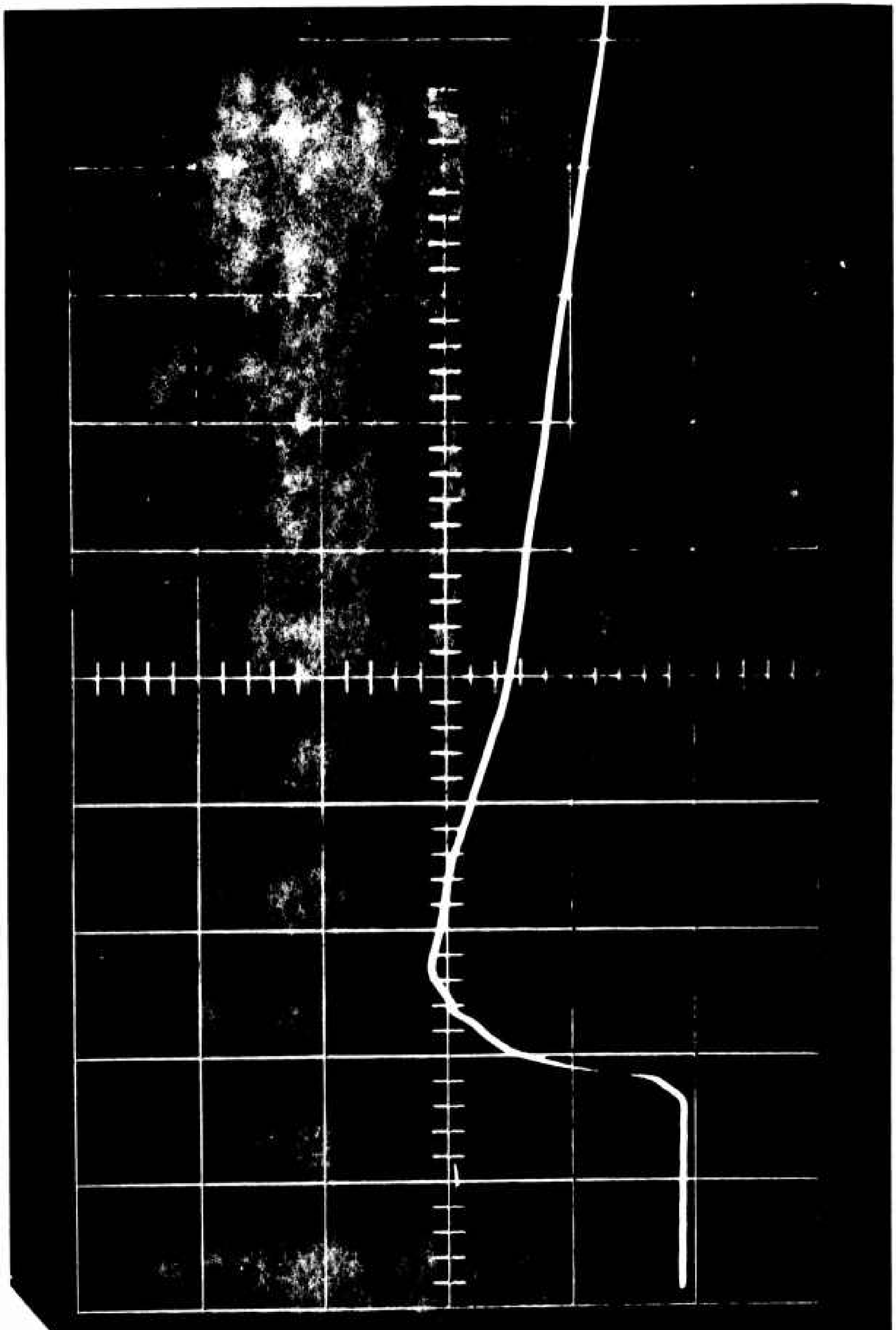


Figure 10

YTTERBIUM CARRIER SYSTEM

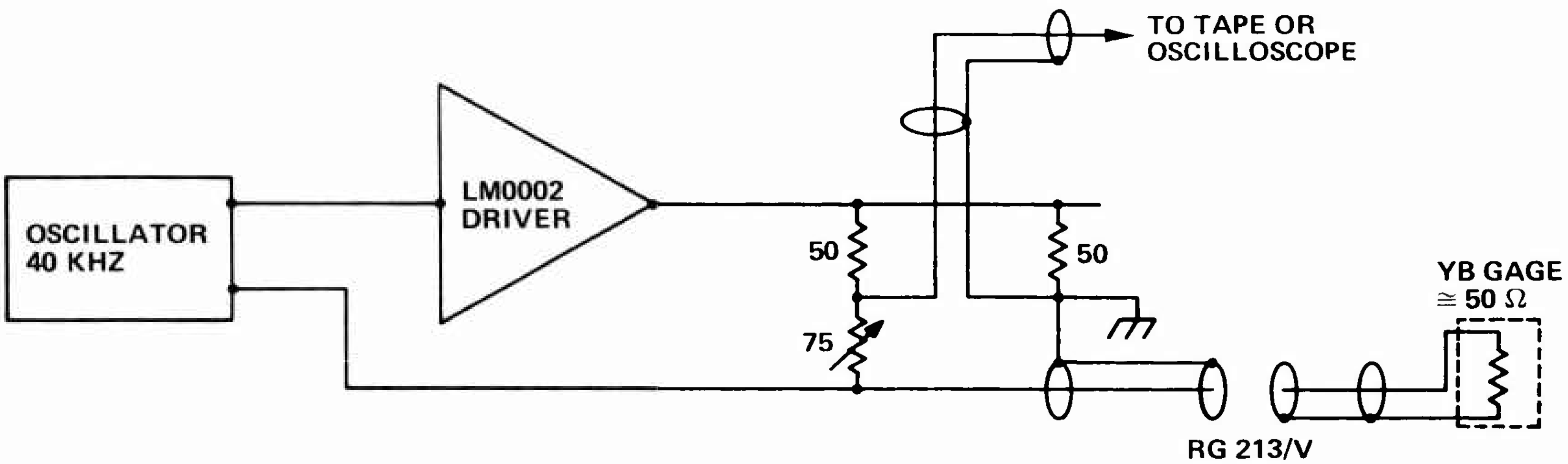


Figure 11

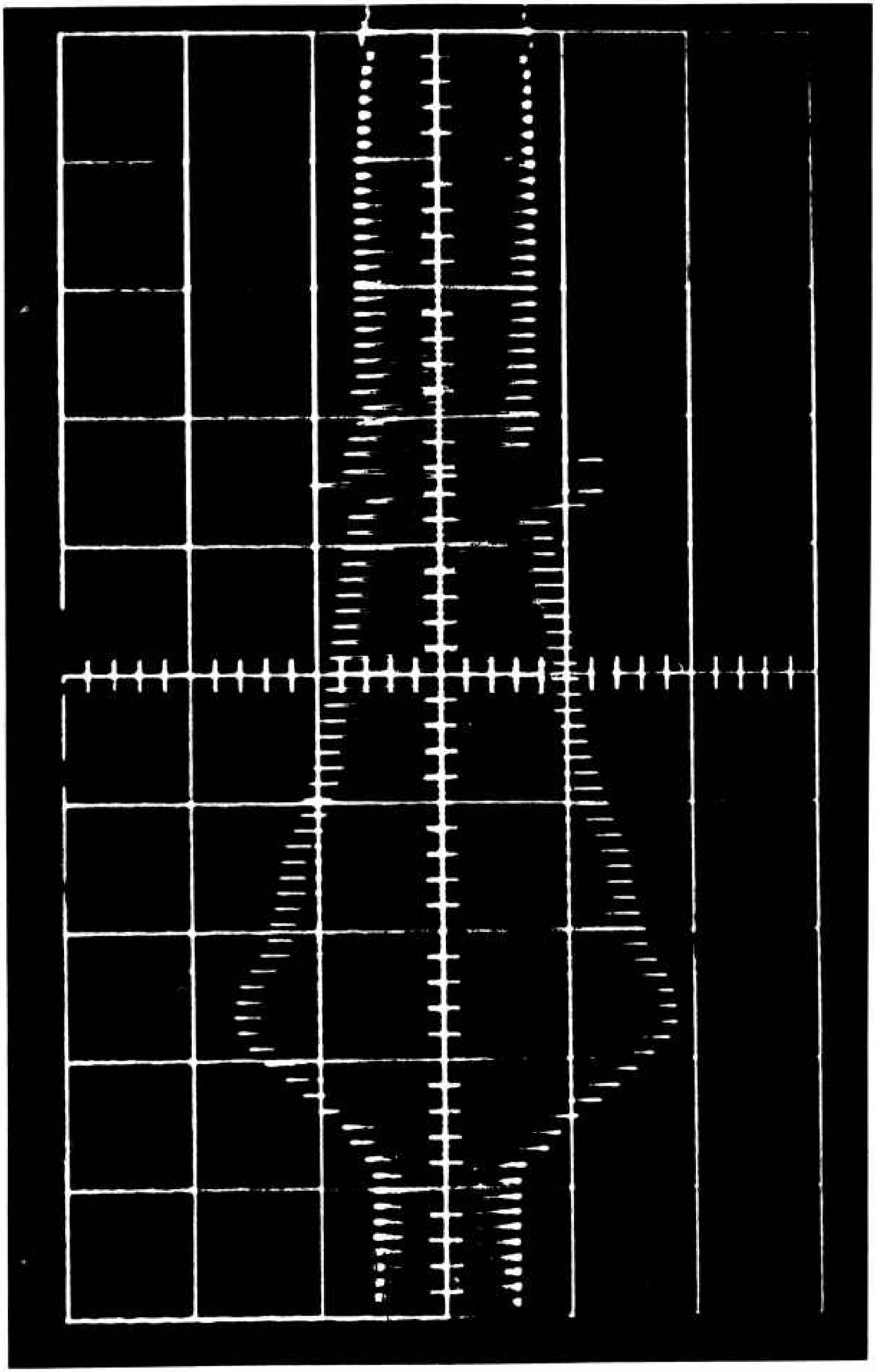


Figure 12

PCB IMPULSE GAGE CIRCUIT

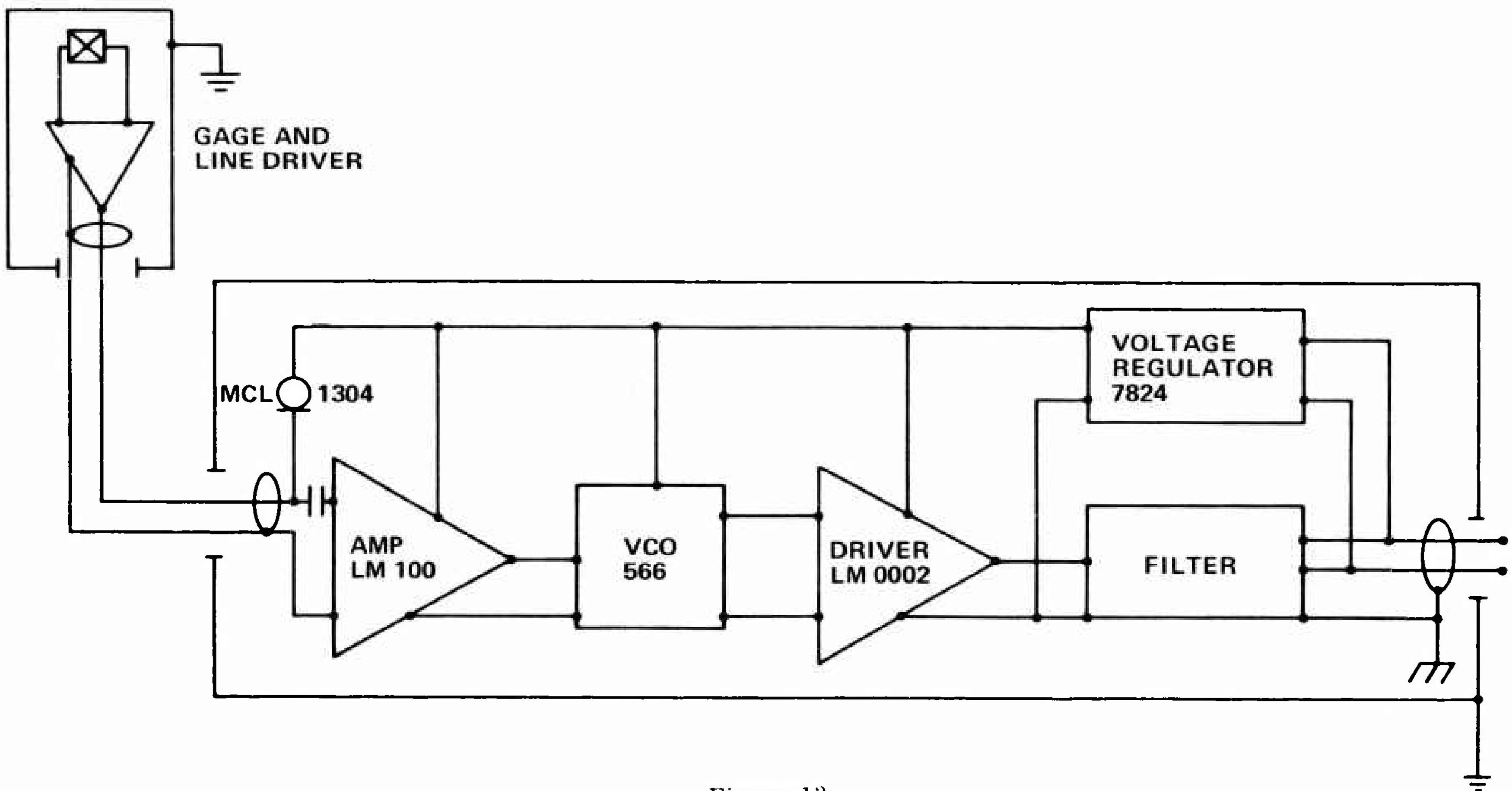


Figure 13

HUSKY PUP PRE-FIELDING INSTRUMENTATION MEETING

Agency: DEVELCO
Charles Moore
530 Logue Avenue
Mountain View, California 94043
Phone (415) 969-1600

Instrumentation
Fielding Agency: EG&G, Inc.
Kenneth R. Sites
680 East Sunset Road
Las Vegas, Nevada 89119
Phone (702) 739-0681

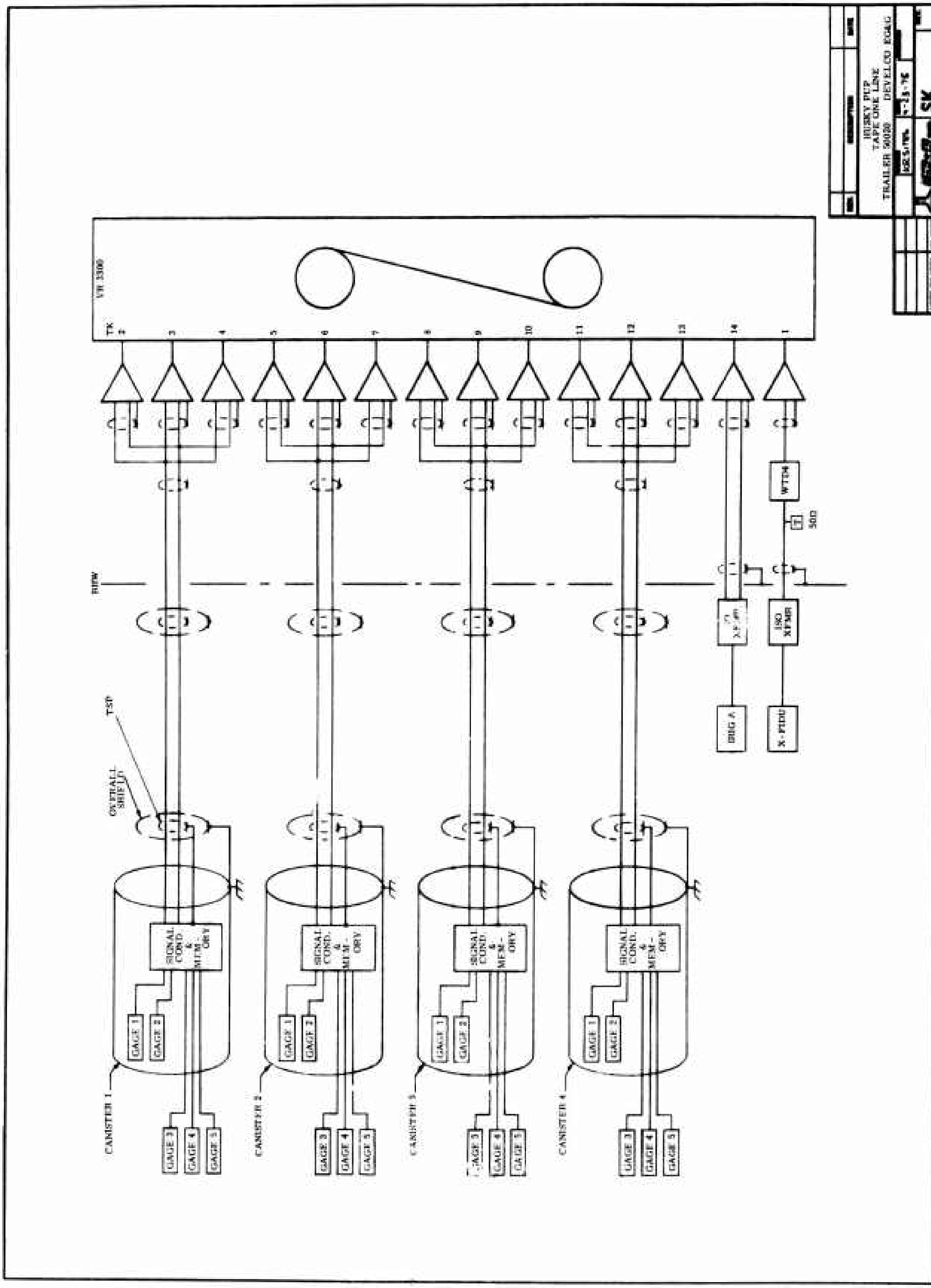
DEVELCO will field four instrumentation canisters that will be buried in the tunnel bypass drift at separate locations with respect to ground zero.

Associated with each canister will be five ground motion sensors. Two sensors will be housed within the canister while the remaining three will be positioned within a drill hole extending from the canister. These data will be conditioned, digitized and stored in a solid state memory within the canister. One channel of analog data will be transmitted from each canister on a TSP cable to trailer 50020 located in the mesa trailer park. These data will be recorded on magnetic tape.

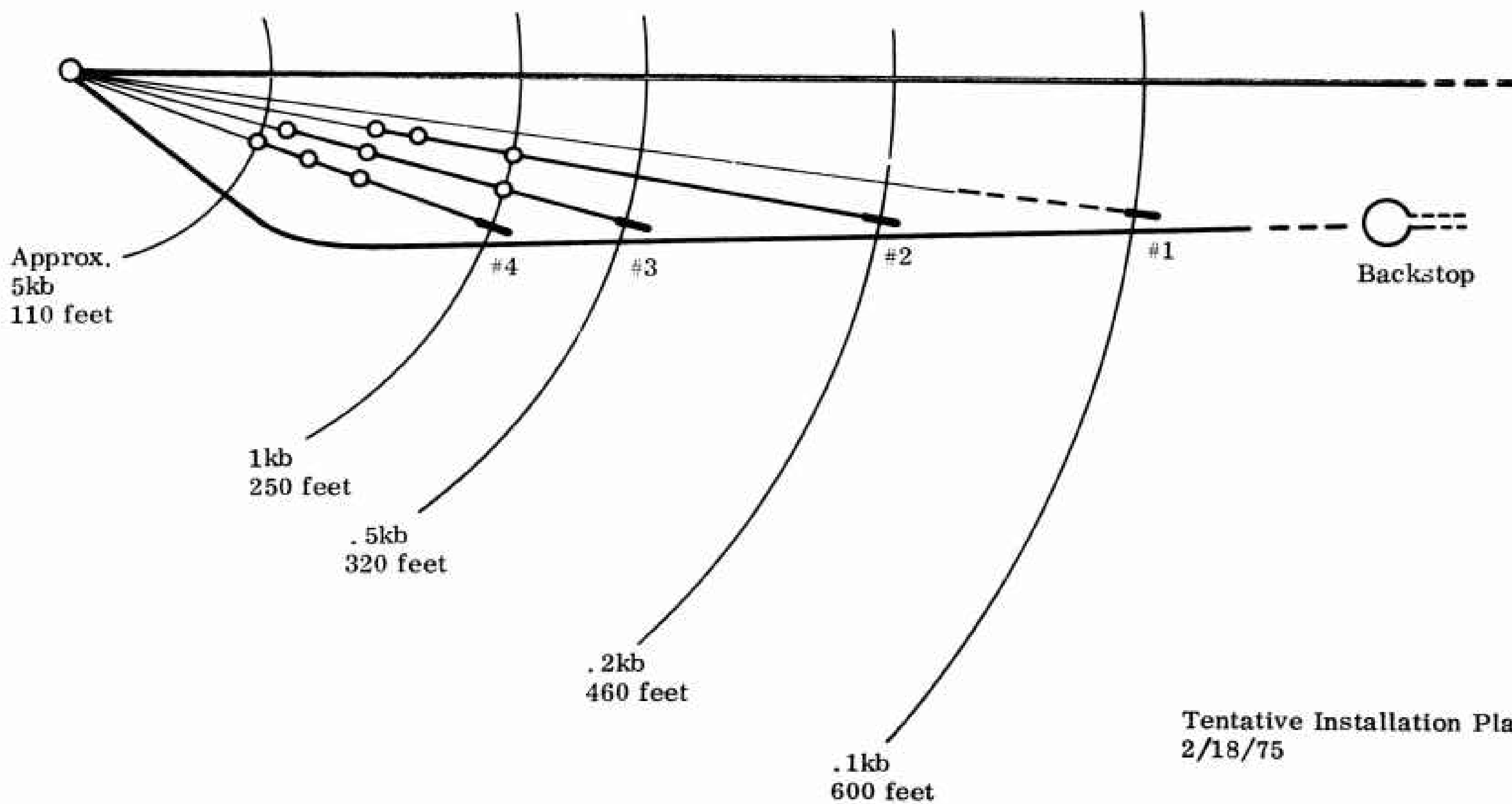
The onboard memories will be interrogated post shot. That data will be transmitted through the earth to a receiving antenna that will be located adjacent to the mesa trailer park. The received data will be recorded on magnetic tape and then converted back to analog data.

T&F and monitor signals will be transmitted between the trailer and the canister via TSP cables. The TSP cables will be fully floated with respect to earth ground while the TSP overall shield will be connected to the canister which will be in intimate contact with the earth. The overall shield will be floating at the recording trailer.

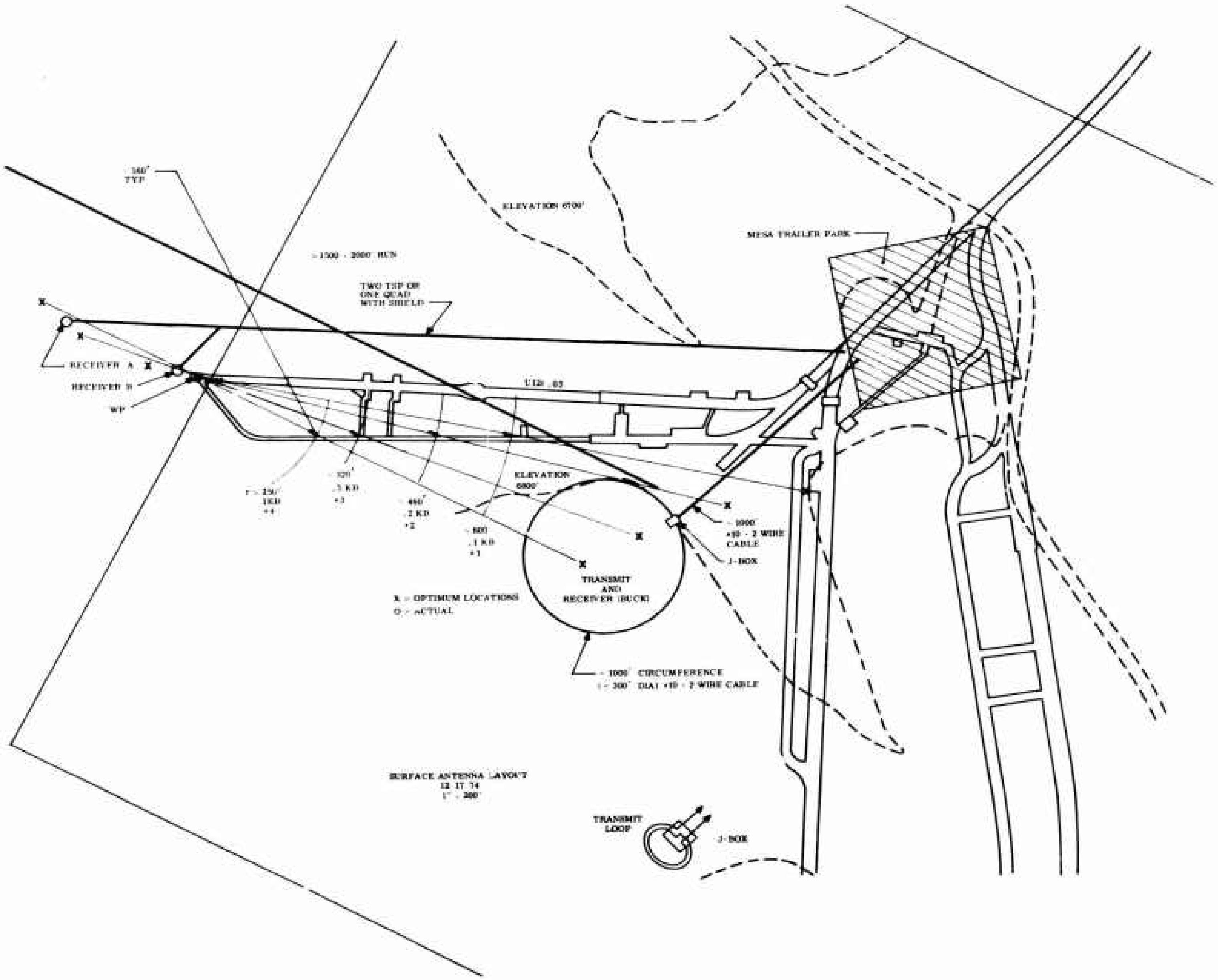
Inclosure 7



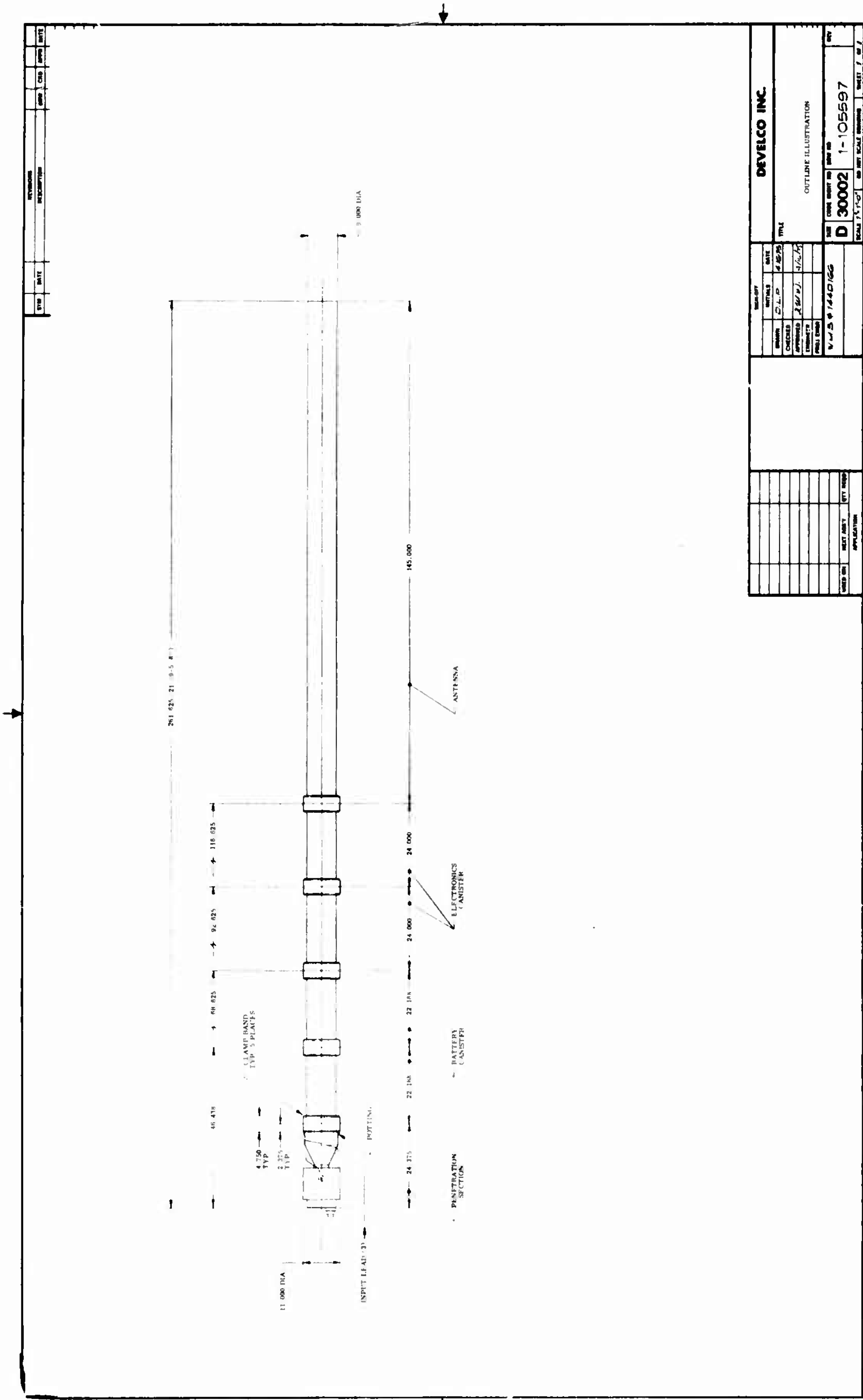
HUSKY PUP
TAPE ONE LINE
TRAILER 50020 DEVELCO EG&G
SK
VR 3300
TK
RFW
TSP
OVERALL SHIELD
SIGNAL COND. & MEM-ORY
GAGE 1
GAGE 2
GAGE 3
GAGE 4
GAGE 5
CANISTER 1
CANISTER 2
CANISTER 3
CANISTER 4
WTD4
ISO XFMR
IRIG A
X-FIDU

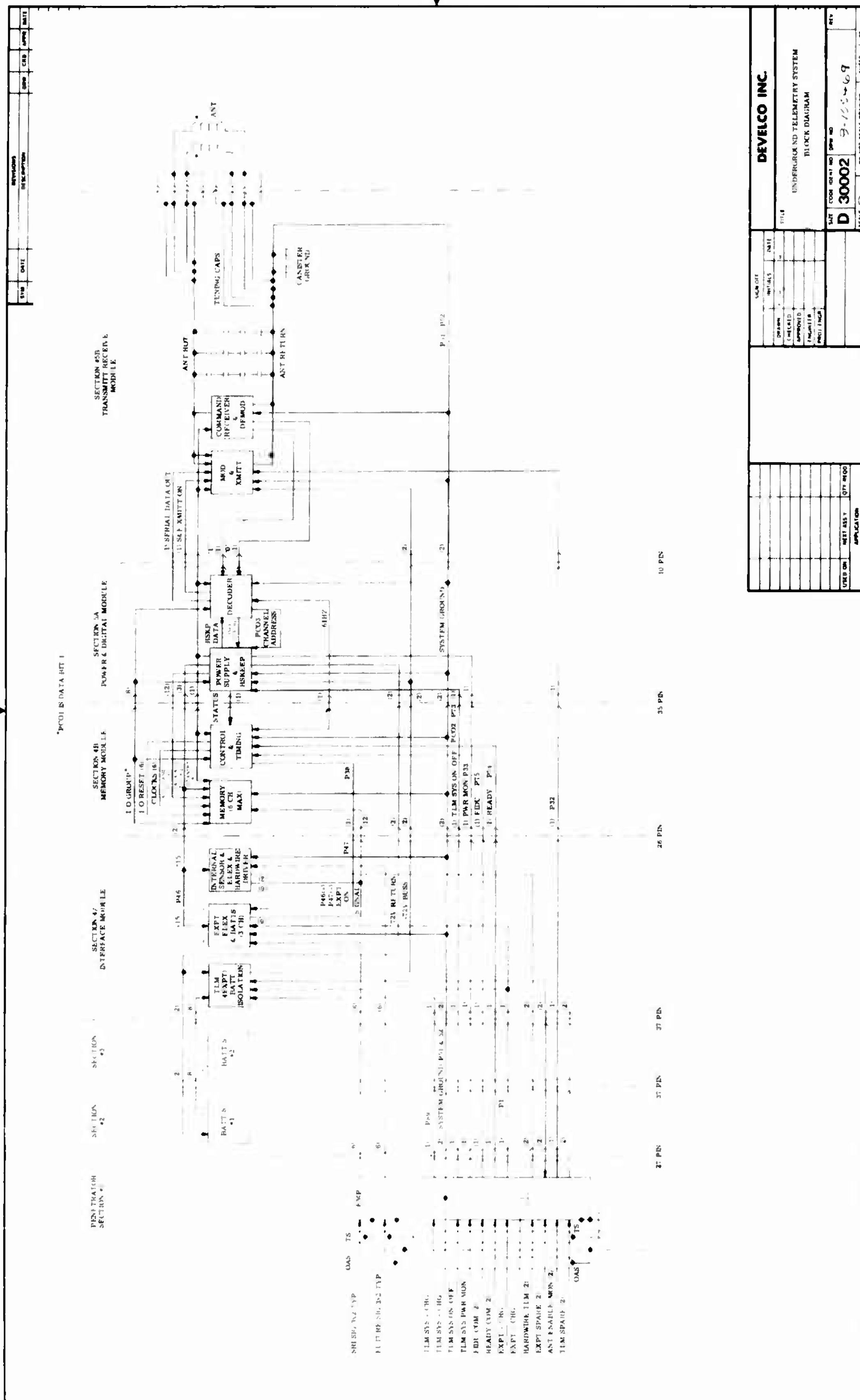


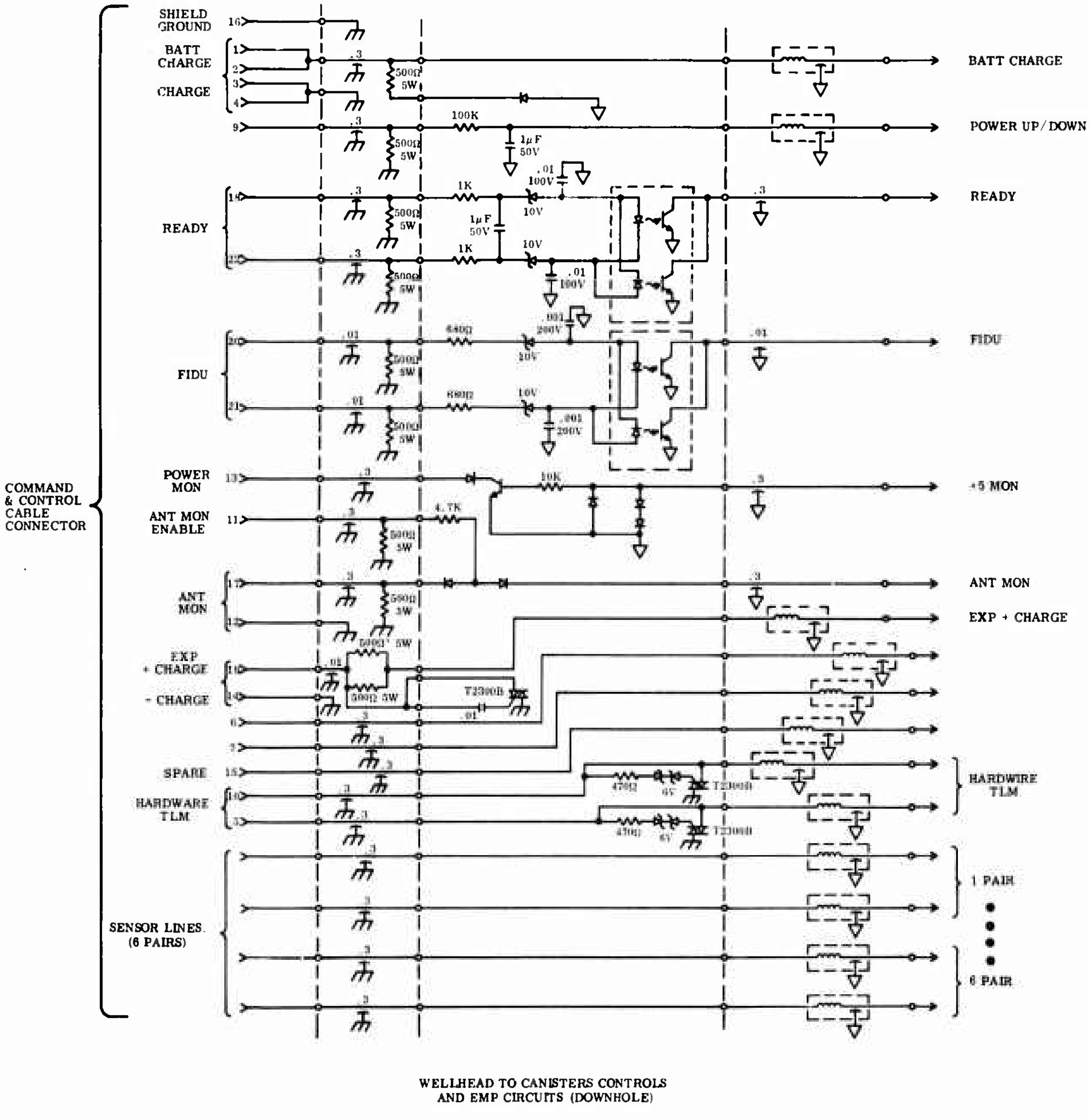
Tentative Installation Plan
2/18/75



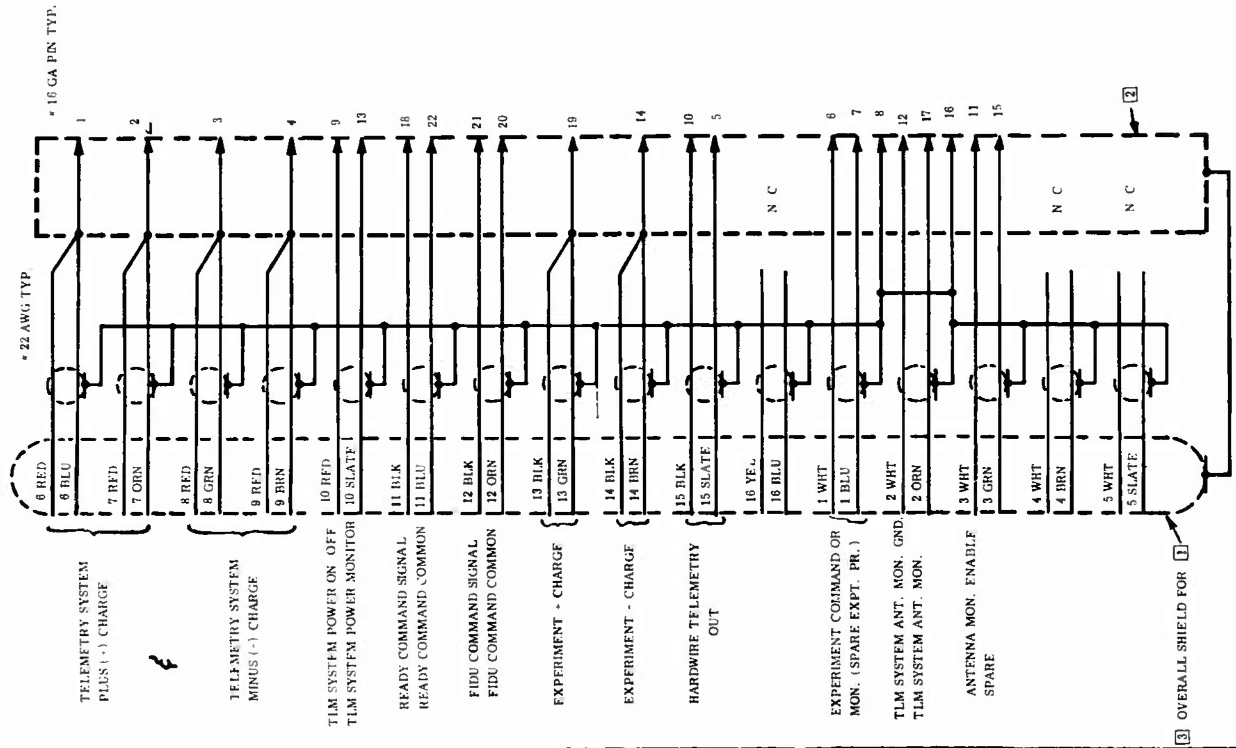
ELEVATION 6700'
MESA TRAILER PARK
TWO TSP OR
ONE QUAD
WITH SHIELD
RECEIVER A
RECEIVER B
WP
ELEVATION
6800'
J-BOX
TRANSMIT
AND
RECEIVER (BUCK)
X = OPTIMUM LOCATIONS
O = ACTUAL
SURFACE ANTENNA LAYOUT
12 17 74
TRANSMIT
LOOP
J-BOX


DEVELCO INC.
OUTLINE ILLUSTRATION
D 30002 1-105597
ANTENNA
ELECTRONICS CANISTER
BATTERY CANISTER
PENETRATION SECTION
CLAMP BAND TYP 5 PLACES
POTTING
145.000
24.000
11.000 DIA
9.000 DIA


DEVELCO INC.
UNDERGROUND TELEMETRY SYSTEM
BLOCK DIAGRAM
D 30002
SECTION 5B TRANSMIT RECEIVE MODULE
SECTION 5A POWER & DIGITAL MODULE
SECTION 4B MEMORY MODULE
SECTION 4 INTERFACE MODULE
COMMAND RECEIVER & DEMOD
MOD & XMITTER
DECODER
POWER SUPPLY & HSKEEP
CONTROL & TIMING
MEMORY
TUNING CAPS
CANISTER GROUND
ANT HOT
ANT RETURN
SYSTEM GROUND
10 PIN
35 PIN
26 PIN
37 PIN



WELLHEAD TO CANISTERS CONTROLS AND EMP CIRCUITS (DOWNHOLE)



REVISIONS						
SYM	DATE	DESCRIPTION	DRW	CHD	APVR	DATE
4	[illegible]	[illegible] Pin Assignment [illegible]			[illegible]	[illegible]

NOTES

1. ( ) = SHIELD FOR TWISTED PAIRS
2. CABLE CONSTRUCTION
   - 1. CABLE P N DOD DNA-NP-13 (22 GA. 16 TSP)
   - 2. CONNECTOR P N ROCHESTER CORR MSS-M22-CCP
   - 3. OUTER CABLE (OVERALL) SHIELD IS TO BE DRESSED SO IT IS ELECTRICALLY GROUNDED TO THE CONNECTOR SHELL WITH NO GAPS WHICH WILL PERMIT STRAY COUPLING INTO THE CONNECTOR CONTACT AREA.
3. CABLE USER
   1. ALL SHIELDS ARE TO BE FLOATED AT THE INSTRUMENT VAN & CONNECTED BY DEVELCO AS REQUIRED AT THE TIME OF INSTALLATION
   2. ALL TWISTED PAIR SHIELDS ARE TO BE CARRIED THROUGH AND TERMINATED AT THE EMP CHASSIS CANISTER 1st STAGE GROUND POINT ONLY
   3. REFERENCE SYSTEM INTERCONNECT DIAGRAM D7-10 EMP SECTION SCHEMATIC D6-105 & WELLHEAD CONTROL & COMMAND SCHEMATIC D6-105 BEFORE ASSIGNING ANY GROUNDS

USED ON	NEXT ASSY	QTY REQD
APPLICATION		

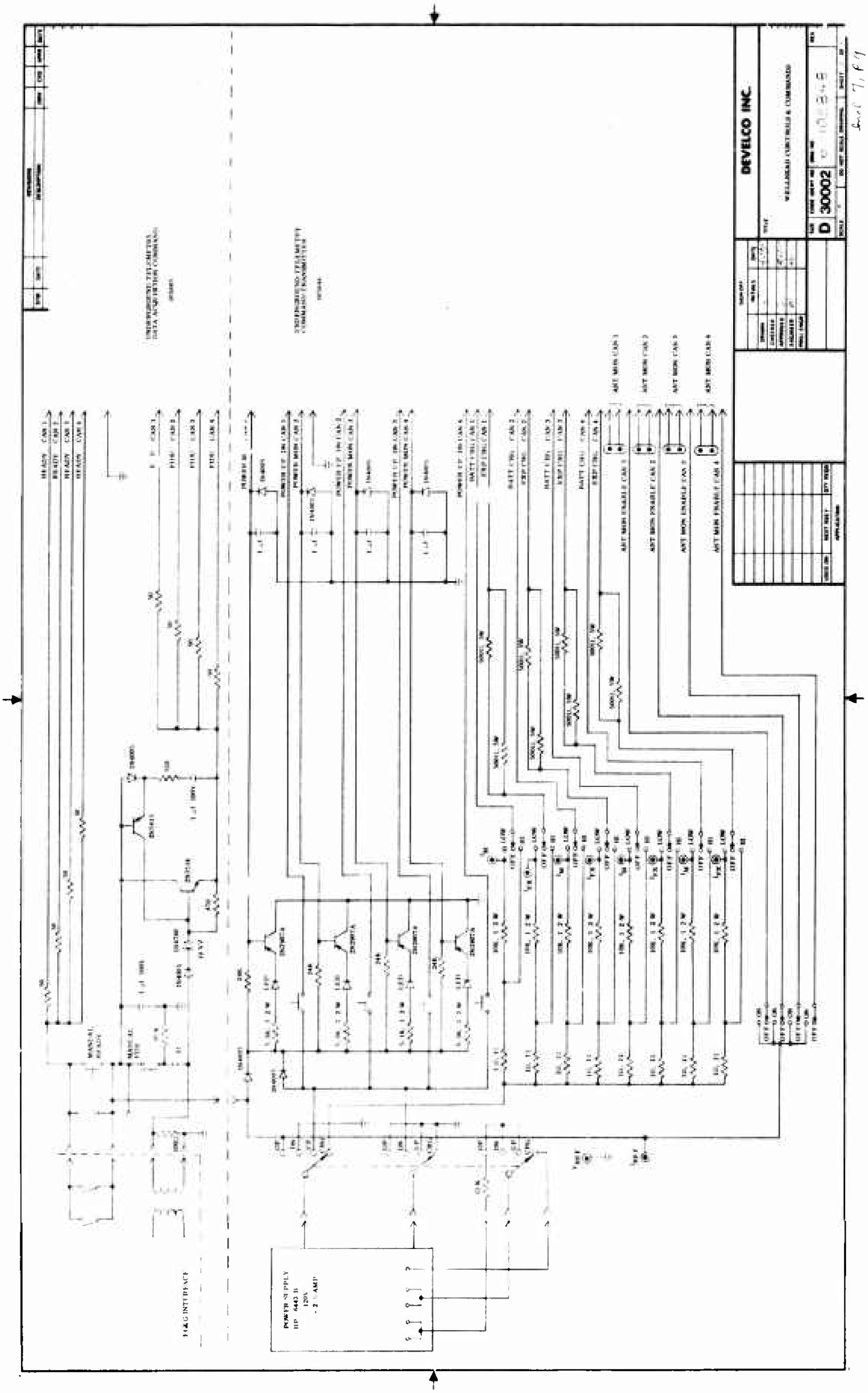
SIGN OFF	INITIALS	DATE
DRAWN	[illegible]	[illegible]
CHECKED		
APPROVED		
ENGINEER		
PROJ ENGR	[illegible]	[illegible]

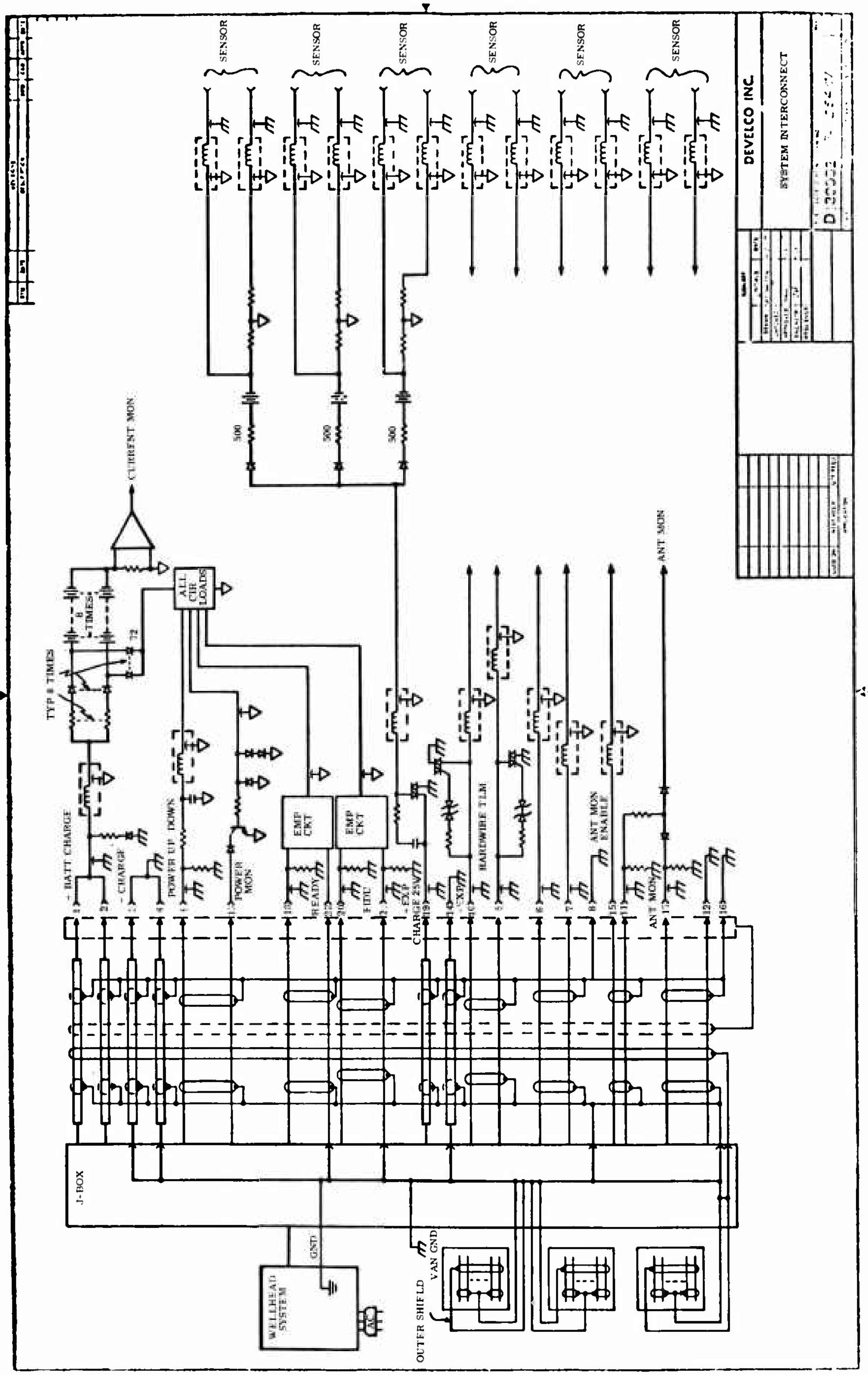
DEVELCO INC.

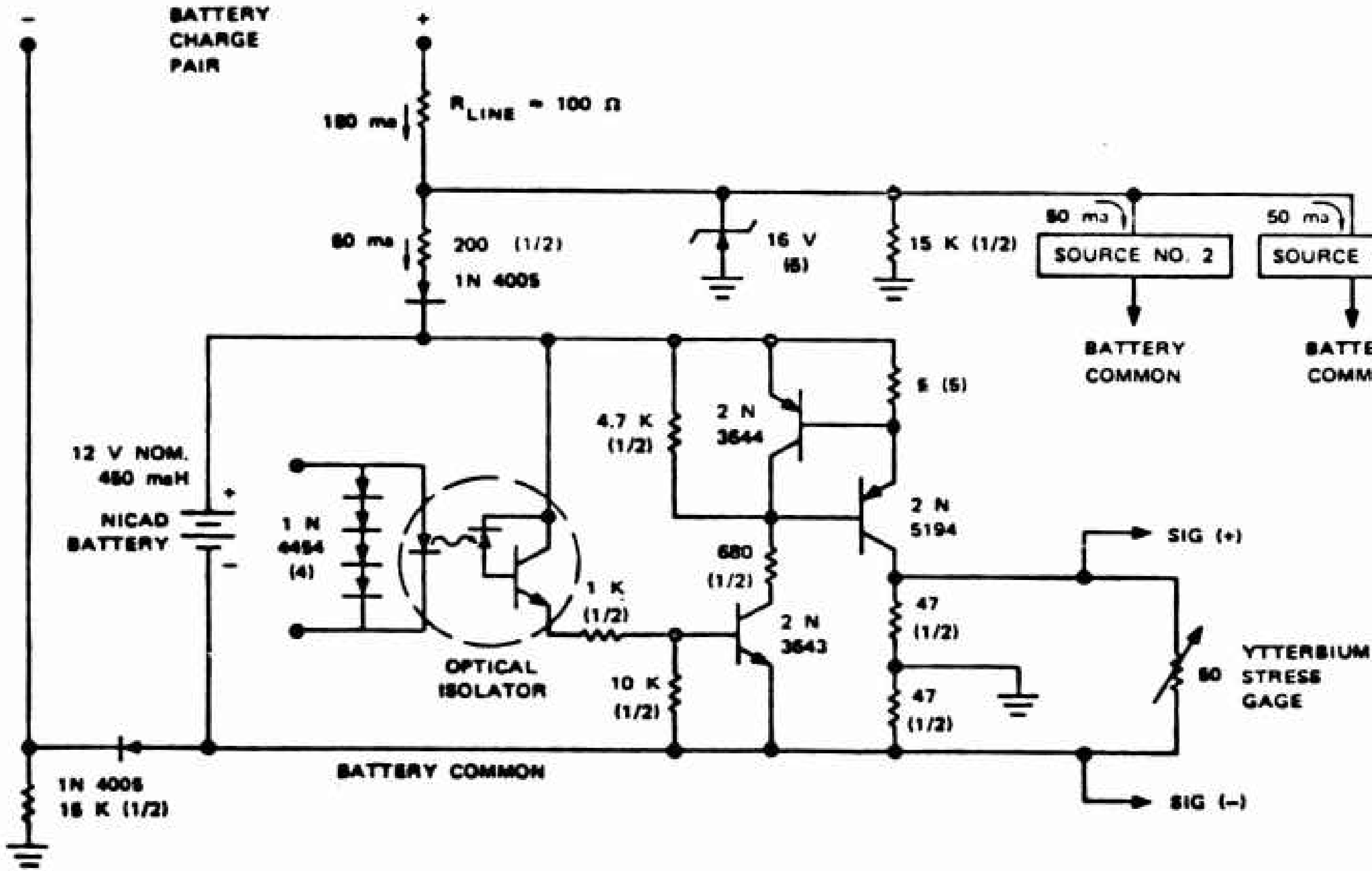
DOWNHOLE CONTROL & POWER CABLE TERMINATION (DOWNHOLE END)

SIZE	CODE IDENT NO	DWG NO	REV
C		6-105456	

SCALE [illegible] | DO NOT SCALE DRAWING | SHEET 1 OF 1


DEVELCO INC.
30002


SENSOR
CURRENT MON
TYP 8 TIMES
8 TIMES
ALL CIR LOADS
EMP CKT
BATT CHARGE
CHARGE
POWER UP DOWN
POWER MON
READY
HARDWIRE TLM
ANT MON ENABLE
ANT MON
J-BOX
WELLHEAD SYSTEM
GND
VAN GND
OUTER SHIELD
DEVELCO INC.
SYSTEM INTERCONNECT



CIRCUIT DIAGRAM OF A 100-mamp CONSTANT-CURRENT SOURCE FOR THE YTTERBIUM STRESS GAGES

LOCKHEED/SSPO INSTRUMENTATION SUMMARY

1. Figure No. 1 is an overview of the instrumentation fielded by LMSC on HUSKY PUP. Three trailers will be on the mesa; two for Station 1 (97-26727 and 50017) and one (50018) for Station 2. A total of 260 measurements will be recorded, 226 on Mag tape and 34 on Oscilloscope/camera systems.

Two types of strain measuring devices will be used, i.e., the conventional foil type and the Kulite semiconductor strain gage. Selection of one or the other depends on the anticipated strain level. Displacements are measured on a Kaman Science Model 2300 non-contact displacement systems.

Impulse and momentum will be measured by momentum and partitioning gages which are electrically similar using a linear velocity transducer (LVT) to detect sample motion. Effects Technology Inc. will install specimen samples in the gages and perform gage calibration. Also supplied by ETI are the Carbon Pressure Gages used for measuring material stress.

Asterisks flag totals that include measurements recorded for SLA and LASL and are described by them.

2. Figure 2 is a block diagram of the Station 1 instrumentation. Analog voltages are transmitted to the instrumentation trailer where signal conditioning and amplification are provided prior to being recorded on Mag tape. To minimize the risk of losing data because of "out of band conditions" or poor "signal-to-noise ratios" at the VCOs 100 percent redundance in recording channels is provided. In an attempt to reduce system noise for six strain measurements, their outputs will be transmitted to the mesa over Twinax RG 22/U cables.

3. In the pressure measurement system shown in Figure 3 the double shielded RG 214/U and RG 223/U from the gage to the alcove is used. From the alcove to the trailer signals are transmitted over RG 331/U to the Pulse Power Supply and RG 59 (75 ohms)

Inclosure 8

cable to the oscilloscopes. Redundant oscilloscopes using different vertical amplitudes and sweep speeds to reduce the danger of losing data will be used.

4. Figure 4 shows Station 2 and instrumentation in trailer 50018. As previously stated this trailer records both Mag tape and oscilloscope data. Figure 5 presents the typical grounding and shielding technique used. The instrumentation Van shell is the reference is floated above earth ground.

Pair shields are carried through to the Amplifier Guard Shield. For strain measurements or transducers requiring bridge excitation these shields are then tied to the low side of the power supply at the Instrument Van terminal board.

Overall shields of multi pair cables are returned to the van shell reference of the van terminal board.

Coax shields are tied to the chassis of the Pulsed Power Supply which also connects to the van shell as are all the low sides of tape recorders and scopes.

5. Figures 6 and 7 show typical strain gage beam and ring installations, respectively.

HUSKY PUP RECORDING SUMMARY

MEASUREMENT	TRAILERS			
MAG TAPE	97-26727	50017	50018	
STRAIN	57*		54*	111
DISPLACEMENT	4*		6*	10
ACCELERATION	6*		17*	23
IMPULSE	59		20	79
PRESSURE	2		1	3
SCOPE				
PRESSURE (C)		26	8	37
TOTAL	128	26	106	263

MARCH 1975

Figure 1

EXPERIMENT EQUIPMENT BLOCK DIAGRAM

INSTR TRLR 97-26727

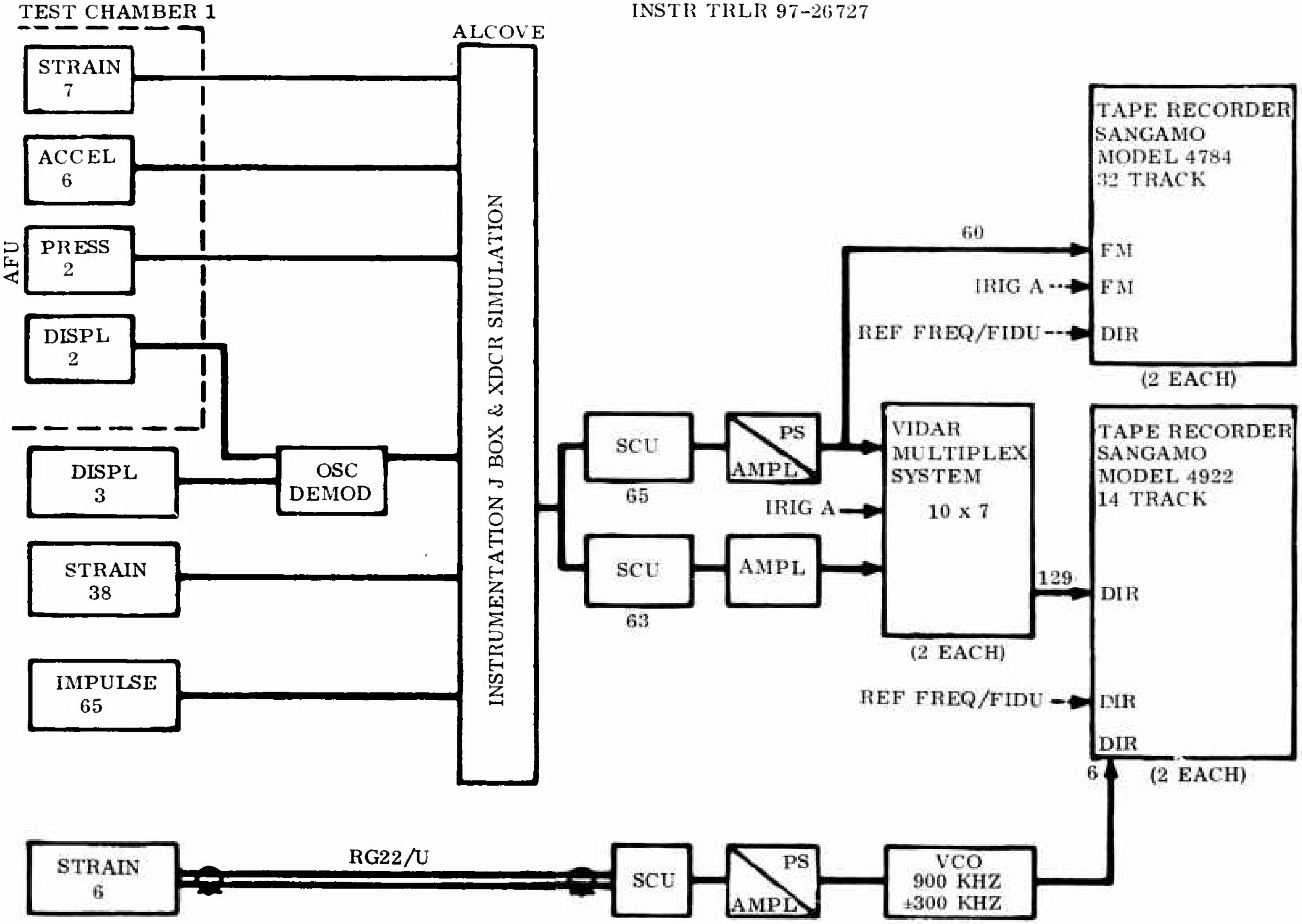


Figure 2

EXPERIMENT EQUIPMENT BLOCK DIAGRAM

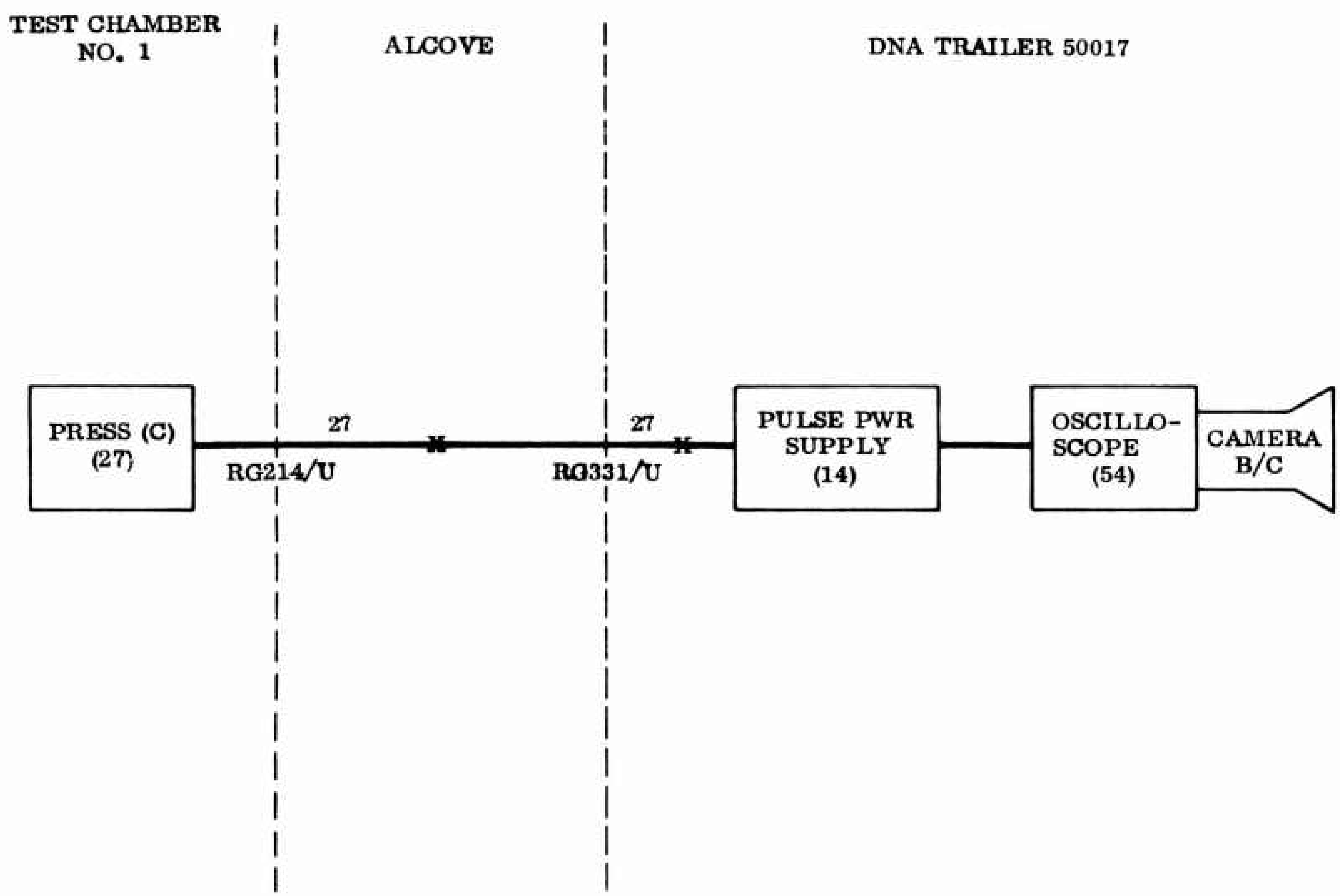


Figure 3

EXPERIMENT EQUIPMENT BLOCK DIAGRAM

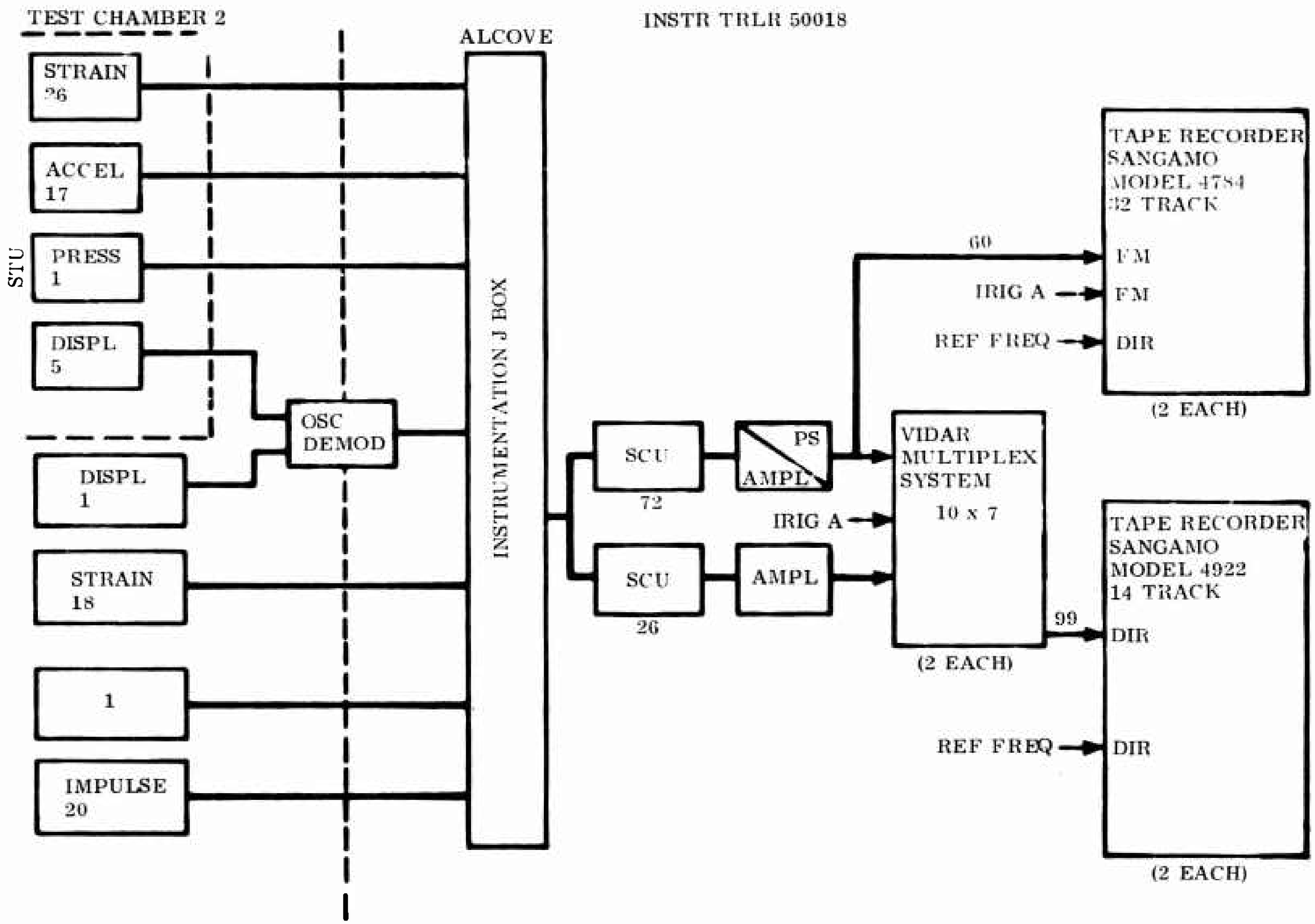
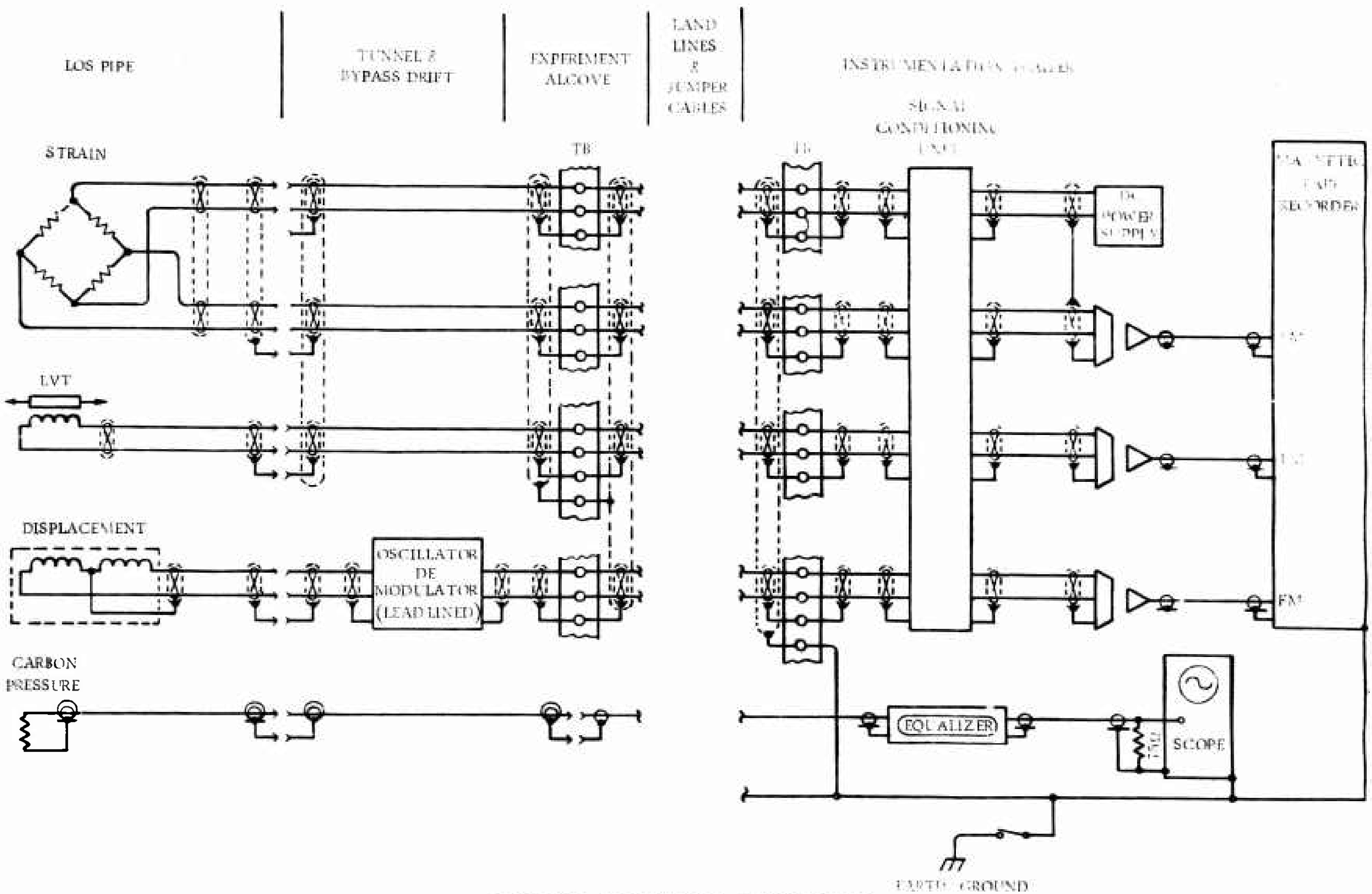


Figure 4



TYPICAL GROUNDING & SHIELDING
HUSKY PUP

Figure 5

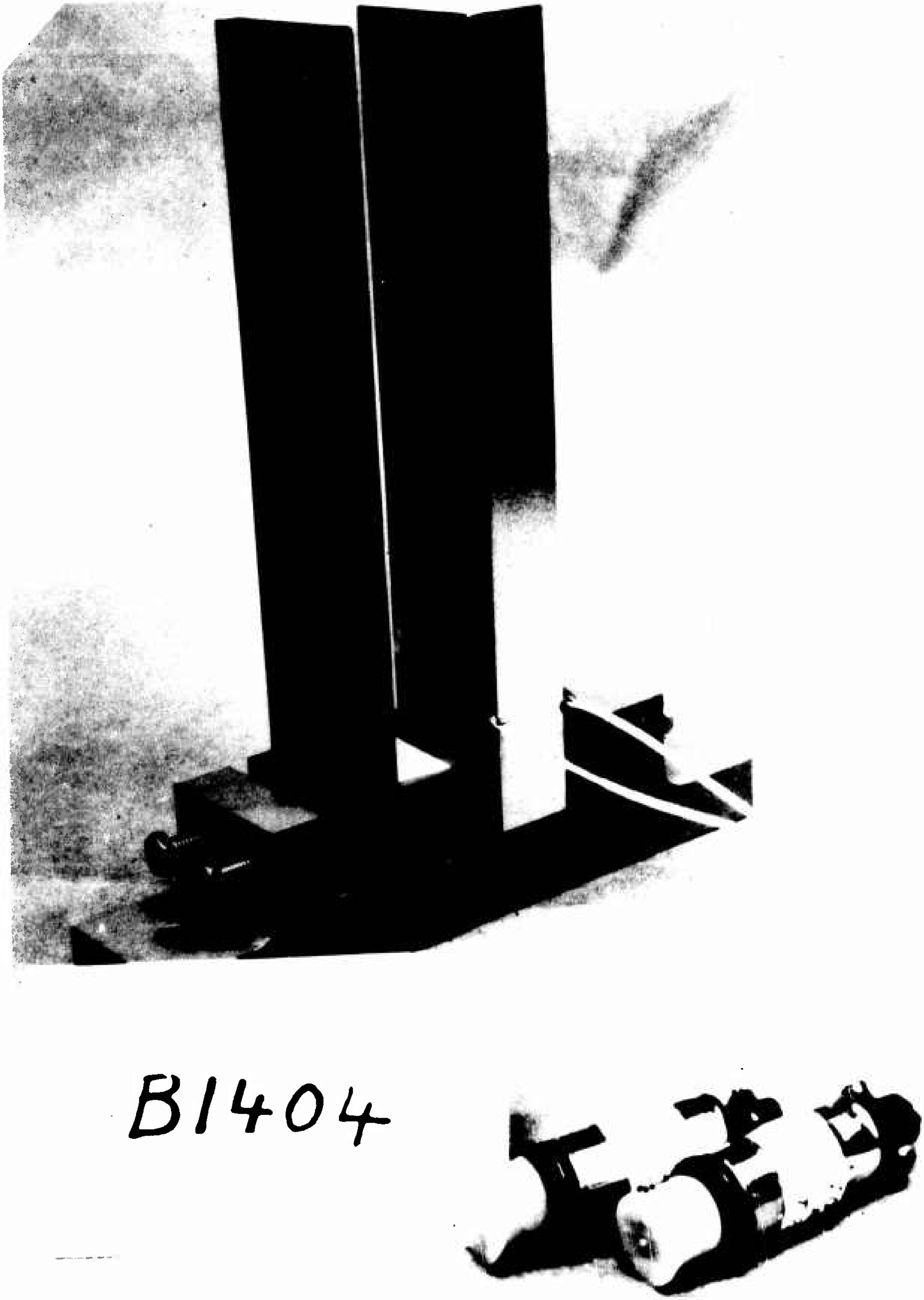


Figure 6

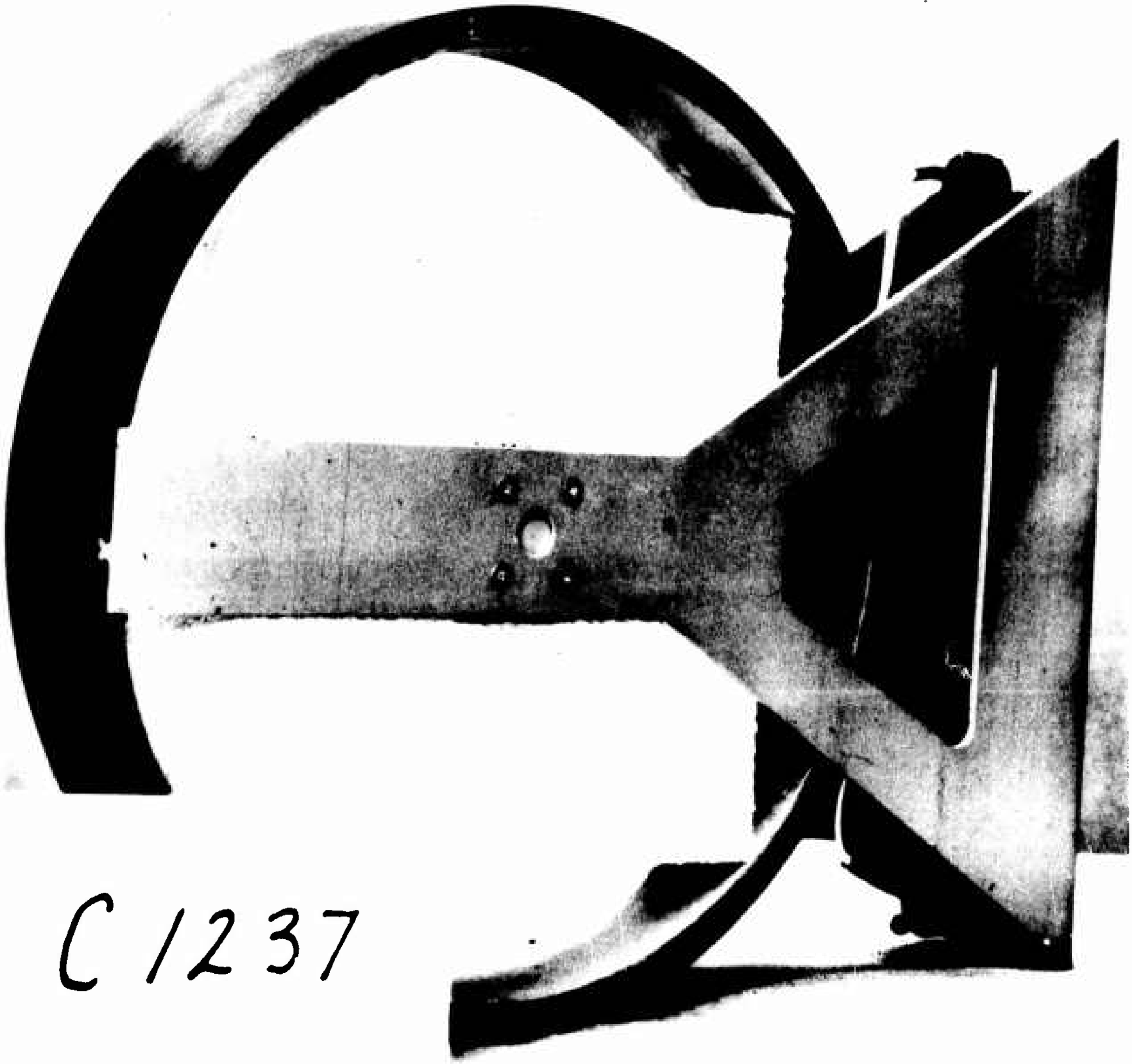


Figure 7

LPARL Measurements HUSKY PUP

LPARL will field diagnostic measurements at a stub pip location behind station1. These measurements will consist of 16 fast spectral channels, 16 slow spectral channels, and 6 total fluence channels.

The fast spectral measurements will utilize 10 photodiode and 6 XRD detectors. The diode assembly (Figure 1) is a design used successfully in many DNA/LPARL experiments. The construction is modular which permits ready replacement of malfunctioning modules in the field. The basic module is an ITT FW114A photodiode assembled with a high frequency connector and surrounded by a coaxial Mylar anode bypass capacitor. Anode bias of about 3KV is delivered by a DC/DC converter module which produces a 3KV output from an input of 28vdc at 3mA. Isolation networks in the trailer and in the detector provide separation of the signal and the dc bias.

A bias of -7.5KV is applied to each XRD detector as shown in Figure 2. A DC/DC converter produces the 7.5KV from an input of 50vdc at 4mA. Isolation networks are utilized in both the trailer and the tunnel.

The XRD channels will utilize RG-333 cables equalized to approximately 200MHZ, depending on the oscilloscopes utilized, the predicted signal amplitude, and the cable length. The diode channels will utilize RG-331 cables equalized to 50 - 100MHZ. The signal paths for these channels are illustrated in Figures 3 and 4.

All detectors are throughly calibrated in the LPARL laboratory before installation in the field.

The sensor designed for the slow spectral channels is a beryllium slug thermopile (Figure 5). The thermocouple junctions - both the active and reference - are connected in a series/parallel arrangement.

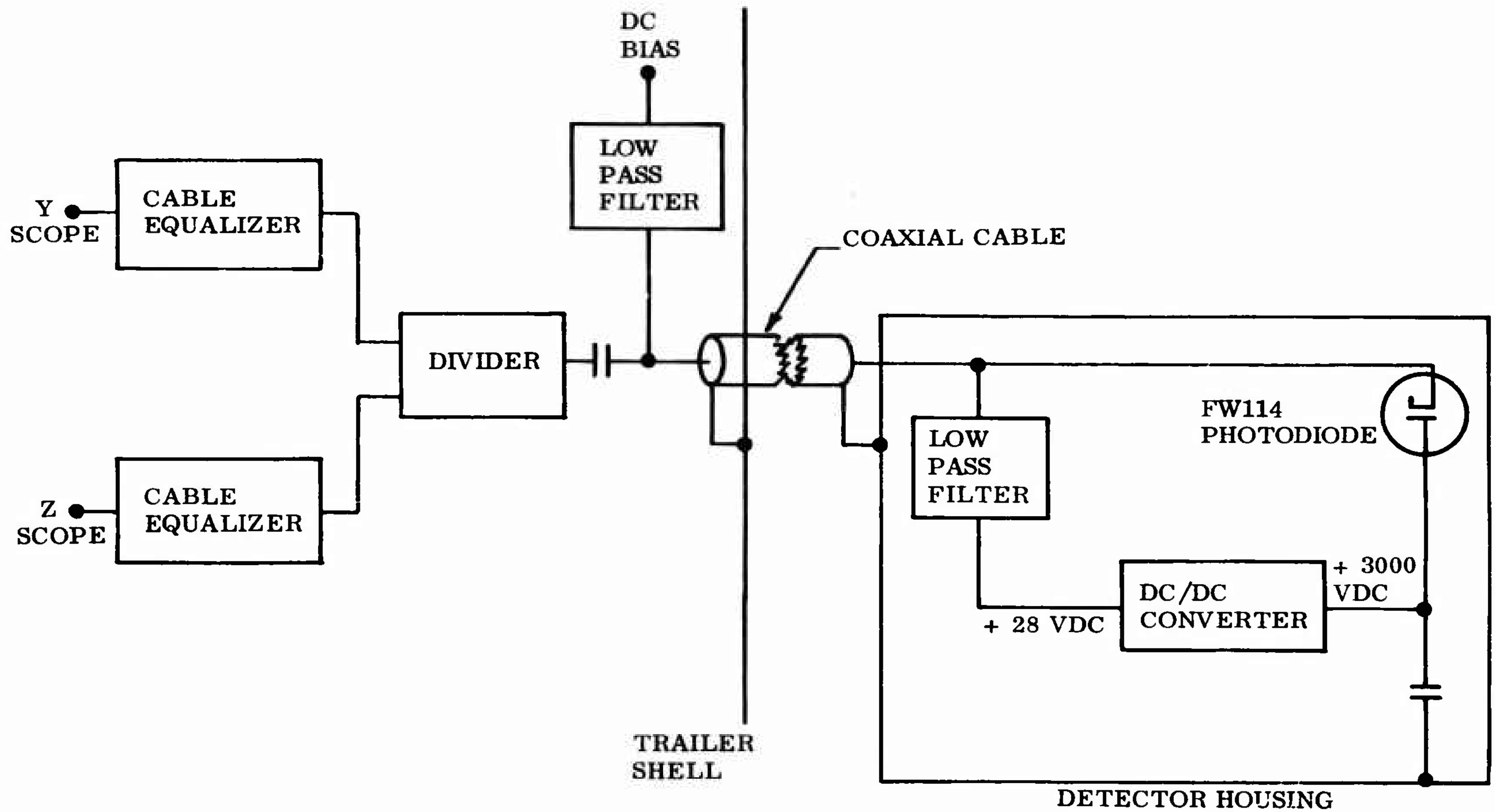
The total fluence calorimeters are the graded-Z type (Figure 6) used for many of our previous measurements. A resistance wire is wound around the slug as the sensor; differential balance is provided by an identical slug

Inclosure 9

and winding located in the same housing as the absorbing slug but shielded from the flux field.

A differential amplifier/line driver system located in the tunnel and powered from the trailer is utilized for the slow spectral and total fluence measurements. VR3300 tape recorders and CEC 5-133 oscillographs will be used for data recording in the trailer. This signal path is illustrated in Figure 7.

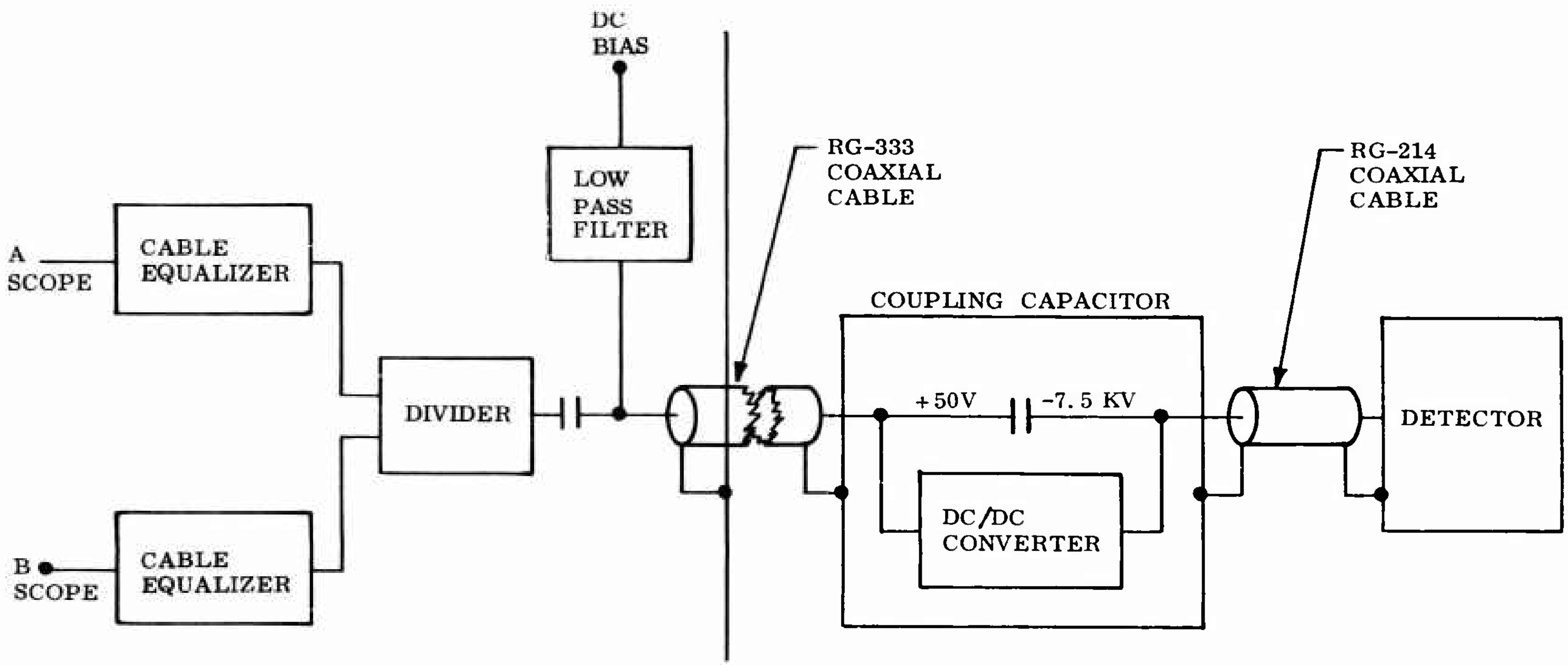
The signal system is designed such that the 20% of response just prior to saturation is a region of somewhat lower gain. This provision is to record signals that are up to a factor of five times the predicted level.



TRAILER SHELL IS SINGLE POINT GROUND FOR ALL DETECTORS. TRAILER IS ISOLATED FROM EARTH GROUND.

(DETECTORS ARE ISOLATED FROM EACH OTHER AND FROM GROUND IN THE TUNNEL)

Figure 1



TRAILER SHELL IS SINGLE POINT GROUND FOR ALL DETECTORS. TRAILER IS ISOLATED FROM EARTH GROUND.

ALL CHANNELS ARE ISOLATED FROM EACH OTHER AND FROM EARTH GROUND IN THE TUNNEL.

Figure 2

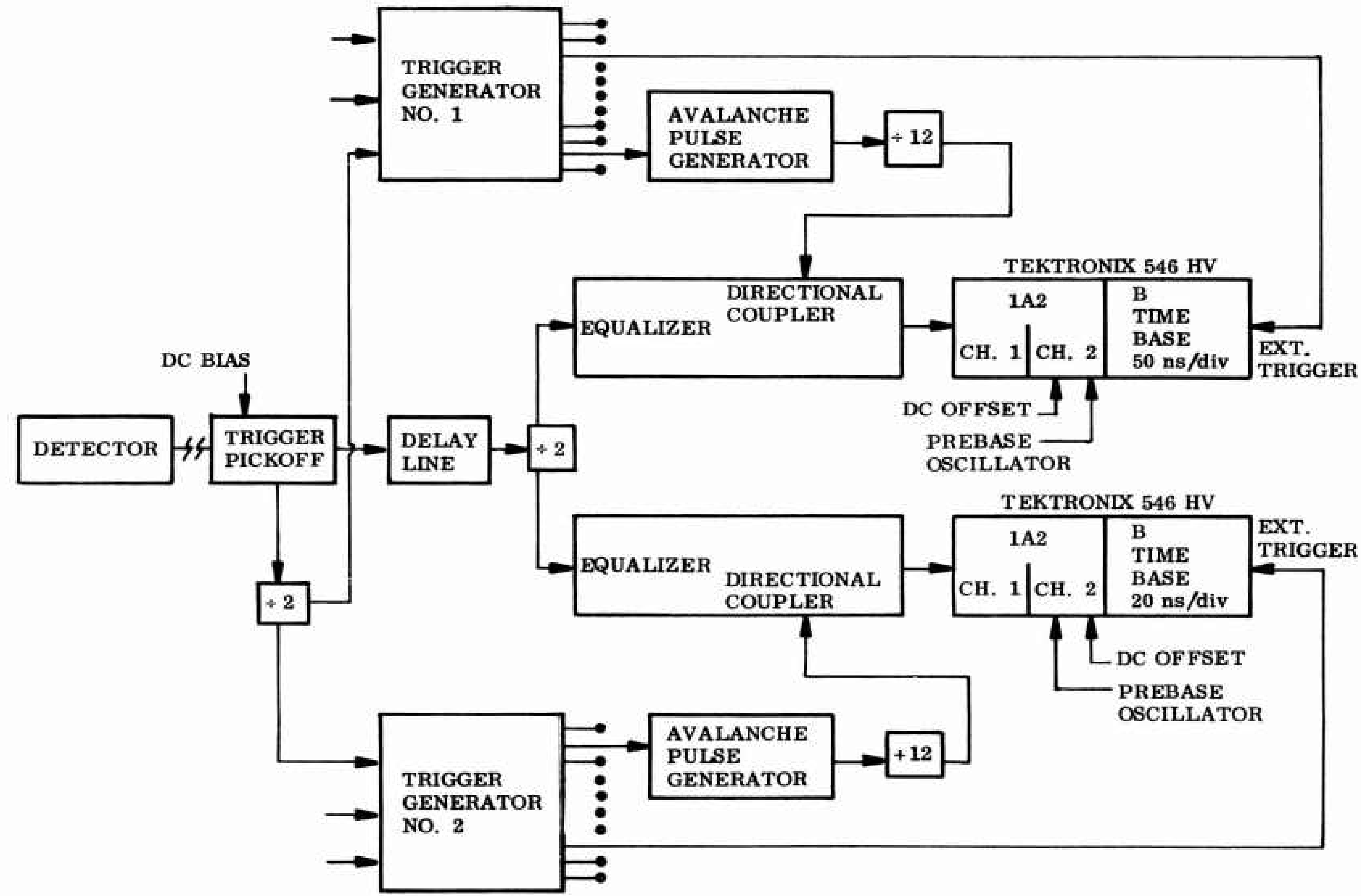
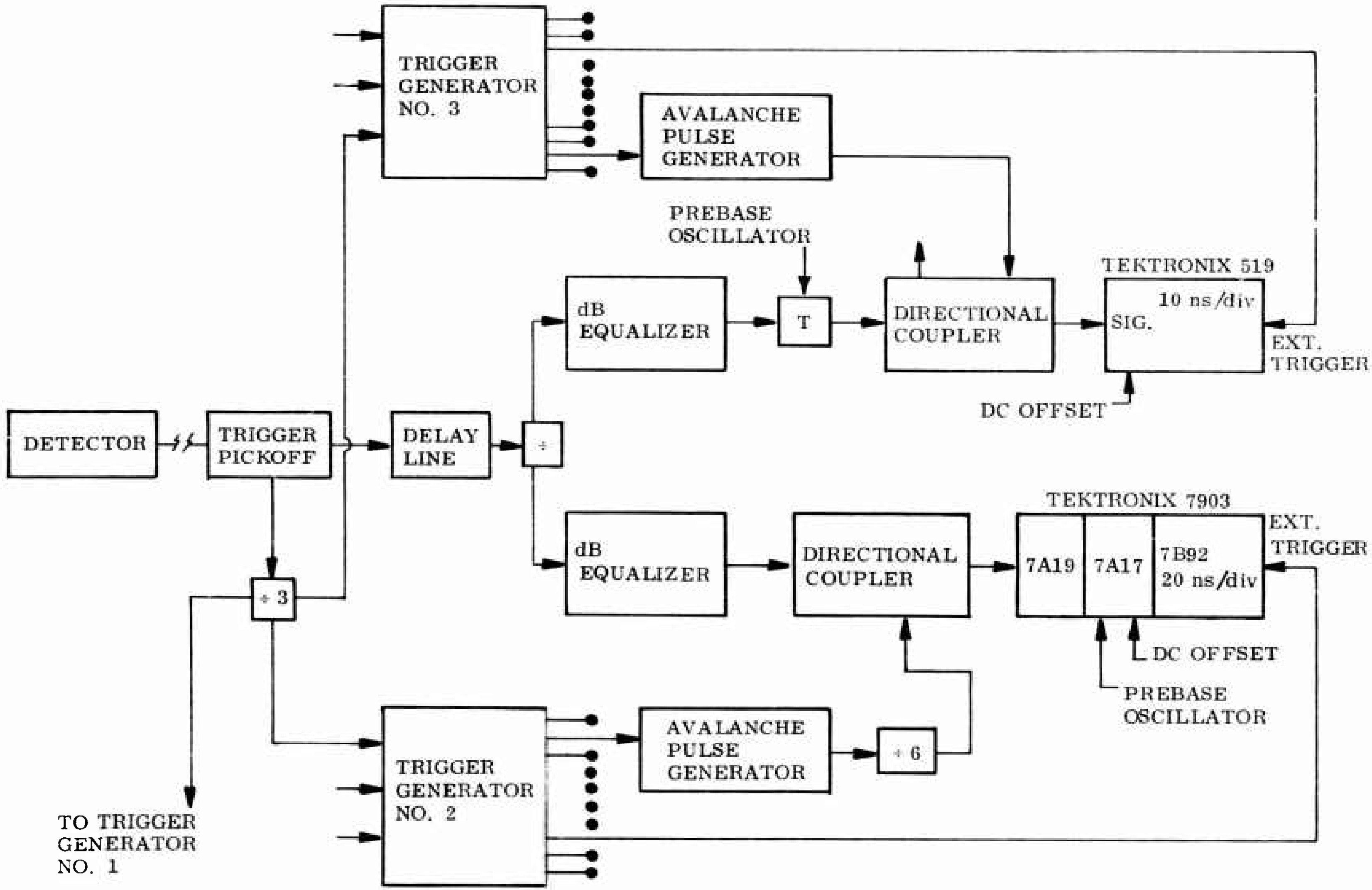
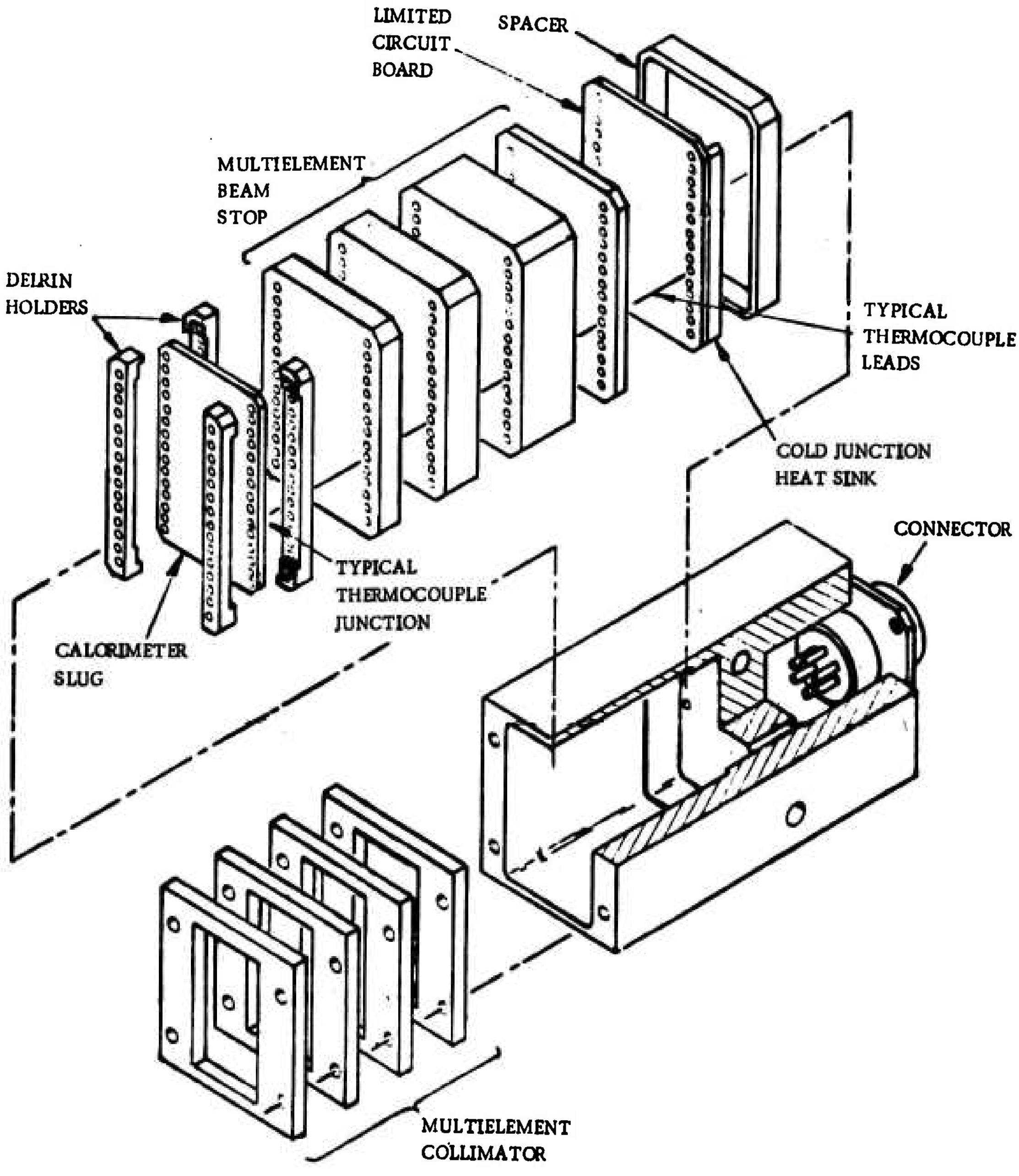

TRIGGER GENERATOR NO. 1
AVALANCHE PULSE GENERATOR
÷ 12
TEKTRONIX 546 HV
1A2
CH. 1
CH. 2
B TIME BASE 50 ns/div
EXT. TRIGGER
EQUALIZER
DIRECTIONAL COUPLER
DC BIAS
DETECTOR
TRIGGER PICKOFF
DELAY LINE
÷ 2
DC OFFSET
PREBASE OSCILLATOR
TEKTRONIX 546 HV
1A2
CH. 1
CH. 2
B TIME BASE 20 ns/div
EXT. TRIGGER
EQUALIZER
DIRECTIONAL COUPLER
÷ 2
DC OFFSET
PREBASE OSCILLATOR
AVALANCHE PULSE GENERATOR
+12
TRIGGER GENERATOR NO. 2

Figure 3



TRIGGER GENERATOR NO. 3
AVALANCHE PULSE GENERATOR
PREBASE OSCILLATOR
TEKTRONIX 519
10 ns/div
SIG.
EXT. TRIGGER
DC OFFSET
DETECTOR
TRIGGER PICKOFF
DELAY LINE
÷
dB EQUALIZER
T
DIRECTIONAL COUPLER
dB EQUALIZER
DIRECTIONAL COUPLER
TEKTRONIX 7903
7A19
7A17
7B92
20 ns/div
EXT. TRIGGER
DC OFFSET
PREBASE OSCILLATOR
÷ 3
TO TRIGGER GENERATOR NO. 1
TRIGGER GENERATOR NO. 2
AVALANCHE PULSE GENERATOR
÷ 6

Figure 4



LIMITED
CIRCUIT
BOARD
SPACER
MULTIELEMENT
BEAM
STOP
DELRIN
HOLDERS
TYPICAL
THERMOCOUPLE
LEADS
COLD JUNCTION
HEAT SINK
CONNECTOR
TYPICAL
THERMOCOUPLE
JUNCTION
CALORIMETER
SLUG
MULTIELEMENT
COLLIMATOR

Figure 5

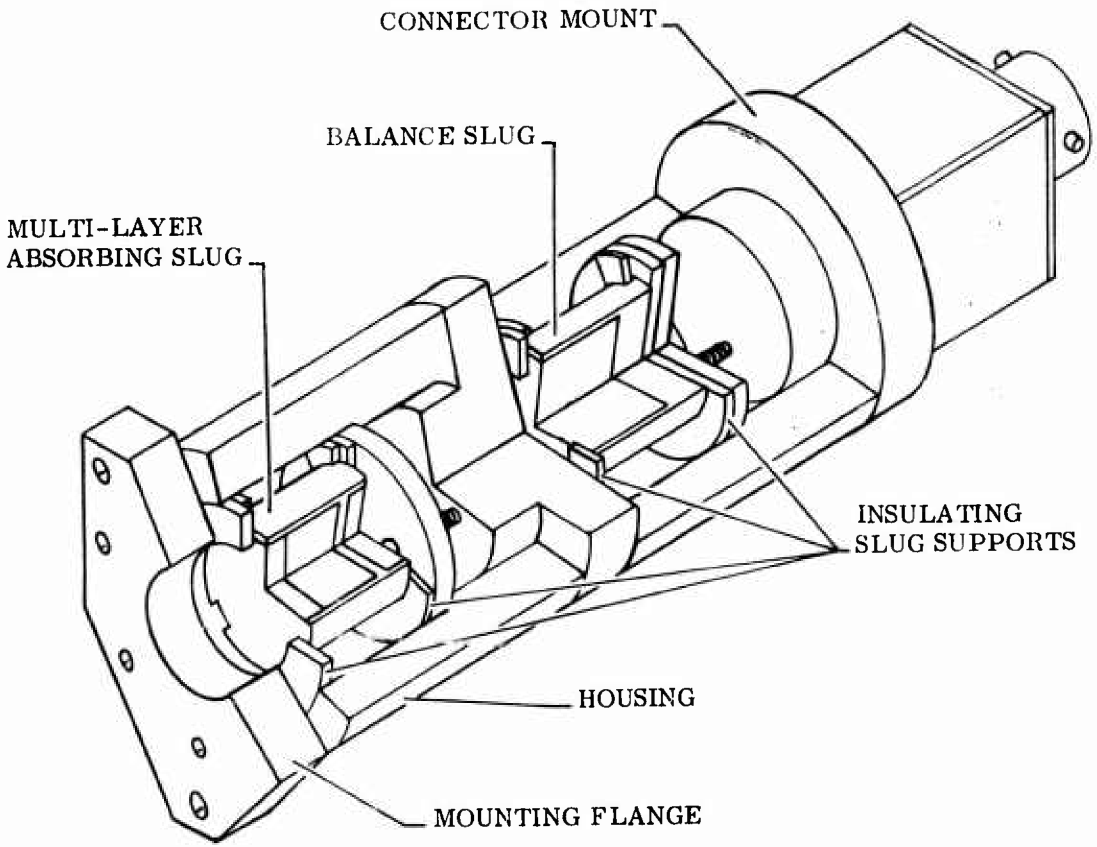
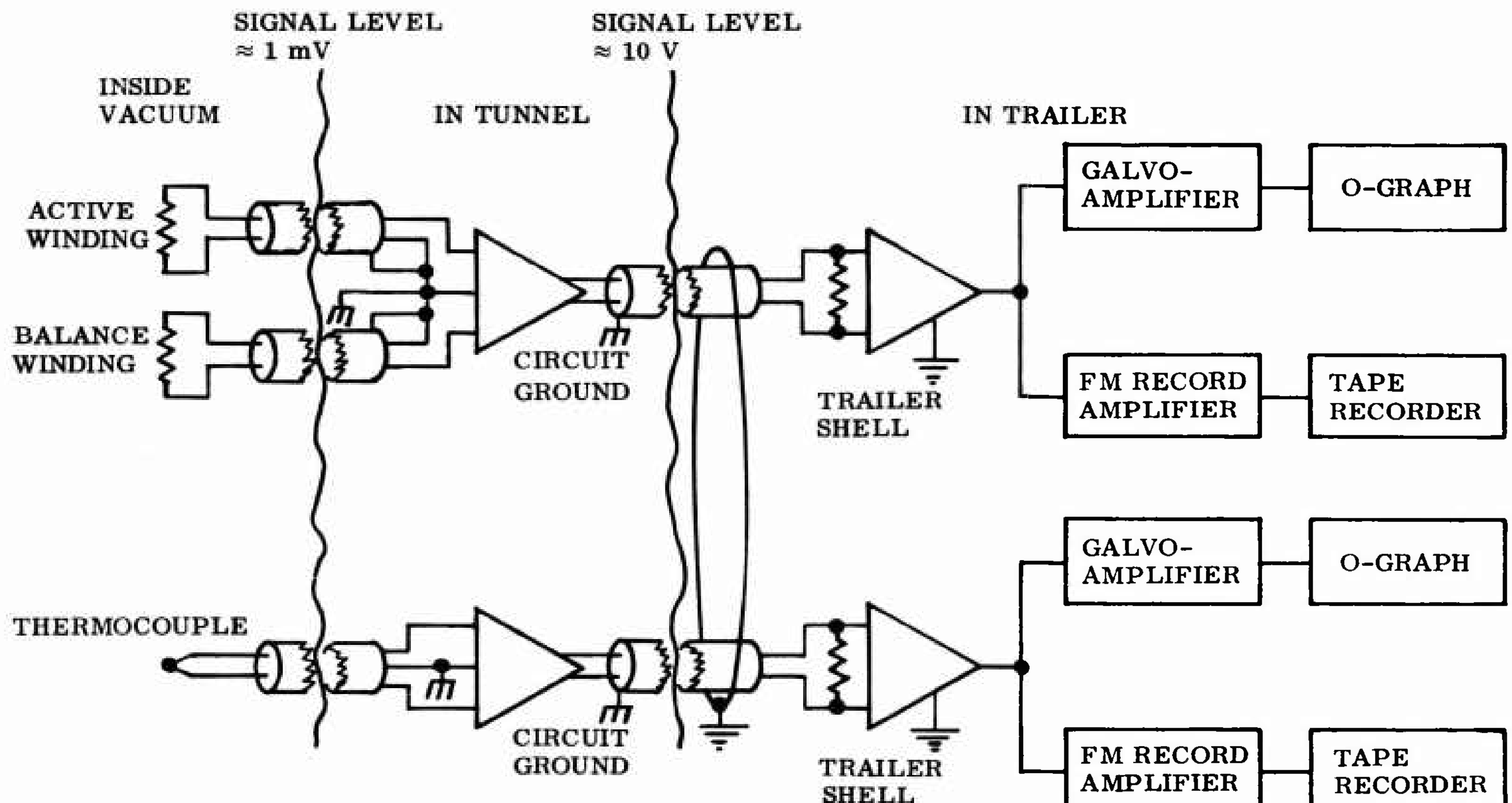

CONNECTOR MOUNT
BALANCE SLUG
MULTI-LAYER
ABSORBING SLUG
INSULATING
SLUG SUPPORTS
HOUSING
MOUNTING FLANGE

Figure 6



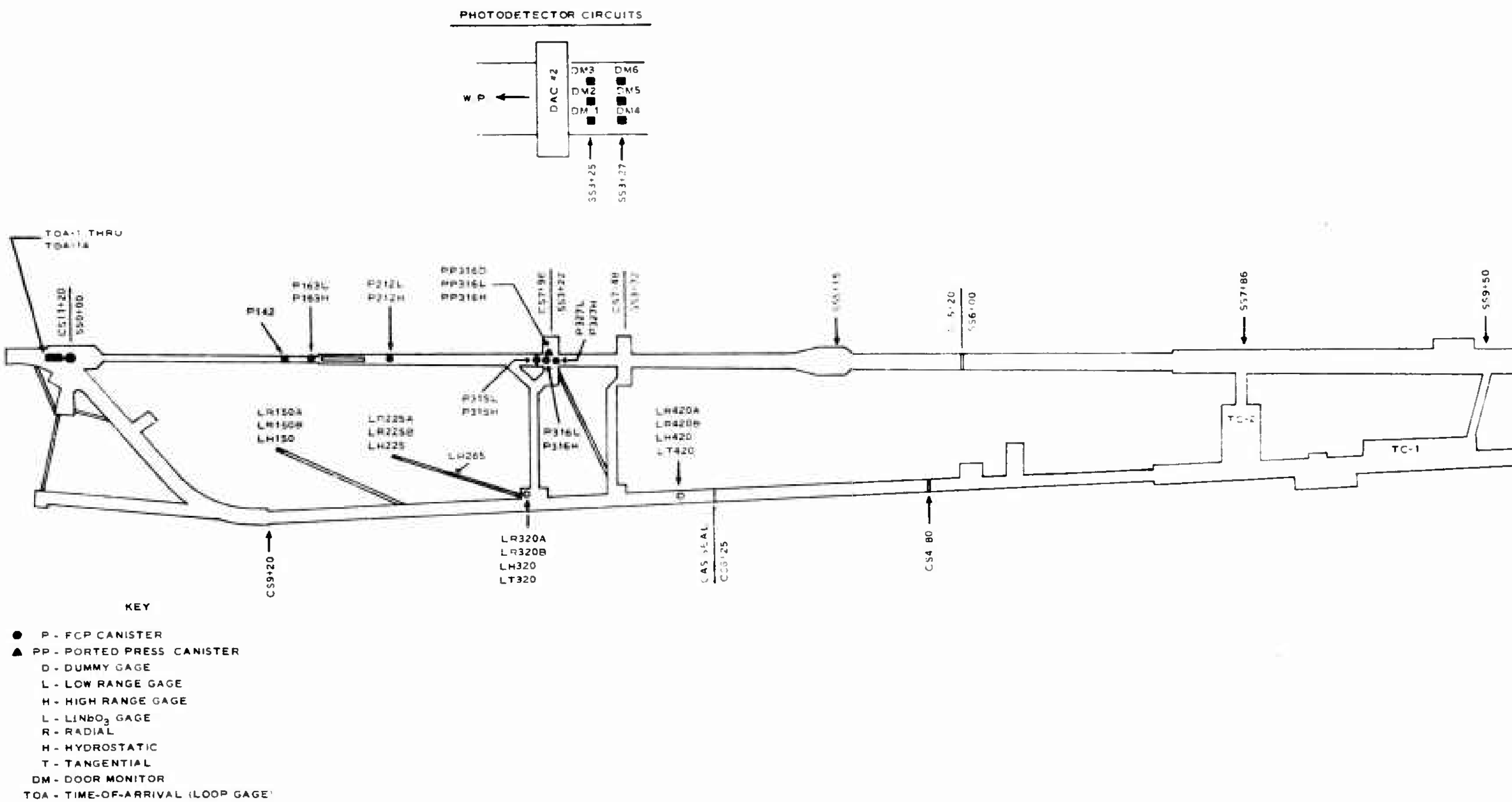
CALORIMETER SIGNAL SYSTEM

Figure 7

SLA HUSKY PUP CONTAINMENT DIAGNOSTIC GAGE LAYOUT

The first viewgraph depicts the location of gages to be used on Husky Pup. FCP canisters P142, 163 and 212 are located on either side of the muffler. Similar canisters, P316 and 327 on the LOS pipe, and P315, located in the bulkhead forward of DAC #2 will be recorded on a SCEMS unit. A ported pressure canister, PP316, is located forward of DAC #2. The GRMS (Gate Rupture Monitor System) located behind DAC #2 is designated DM-1 through DM-6. The 15 Lithium Niobate gages are located in four drill holes, i.e., two horizontal and two vertical. TOA-1 through TOA-14 designate 14 loop gages located in the granite block for the debris coupling experiment.

Inclosure 10

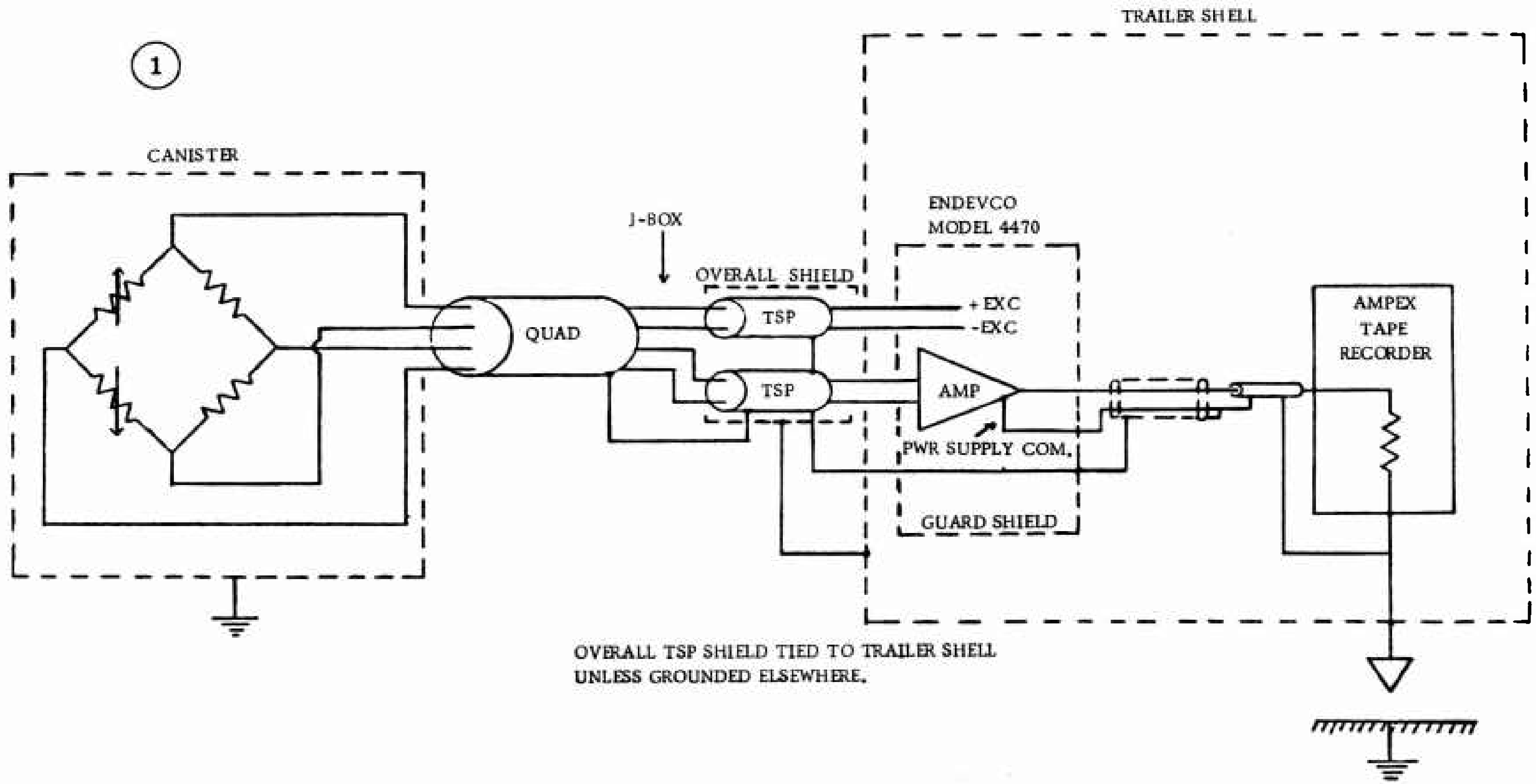


SLA CONTAINMENT DIAGNOSTIC MEASUREMENTS, HUSKY PUP

SLIDE 1: FULL BRIDGE GAUGE CIRCUITRY

The fluid coupled plate (FCP) canister measures the radial pressure due to gaseous material flowing in the LOS pipe. It consists of a rigid force plate supported by a bellows with one corrugation. This portion of the gage is machined from a single piece of ultra-high strength stainless steel. The inside of the gage is filled with Dow Corning 710 fluid which has less than 5 percent compress-ibility at 2 KBAR. The dynamic internal gage pressure is monitored with two ruggedized high pressure silicon diaphram pressure transducers. Time response is less than 20 microseconds.

The transducers are excited by an Endevco Model 4470 Universal Signal Conditioner and a Model 4476.2A Amplified Bridge Conditioner mode card. The output signal is either recorded directly or multiplexed onto magnetic tape.



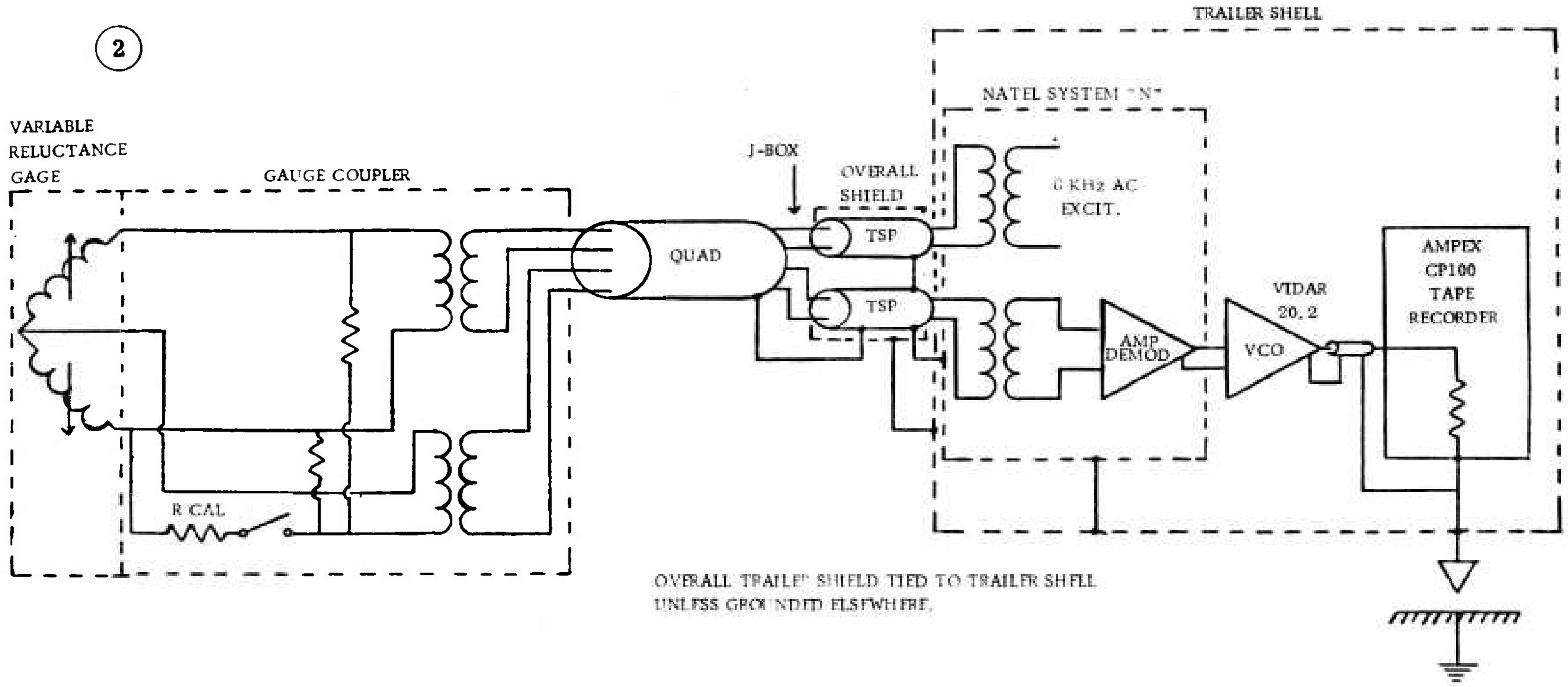
FULL BRIDGE GAUGE CIRCUITRY

SLIDE 2: VARIABLE RELUCTANCE GAGE CIRCUITRY

Ported pressure gauges are used to measure the arrival time, magnitude, and shape of the gas pressure pulse flowing within the LOS pipe. Three 2-arm variable reluctance type pressure transducers are installed in a canister mounted in an 8-in diameter 150-pound flange welded to the LOS pipe. The high and low range gages communicate into the LOS pipe. A third inactive dummy gage monitors motion effects on the system. The canister also contains three gage couplers which house the bridge completion resistors, line matching transformers, relays, and calibration resistors.

The gages are excited by a Natel 6-KHz carrier system located in the instrument trailer. The Natel system also amplifies and demodulates the gage signal prior to multiplex recording on magnetic tape.

2



VARIABLE RELUCTANCE GAUGE CIRCUITRY

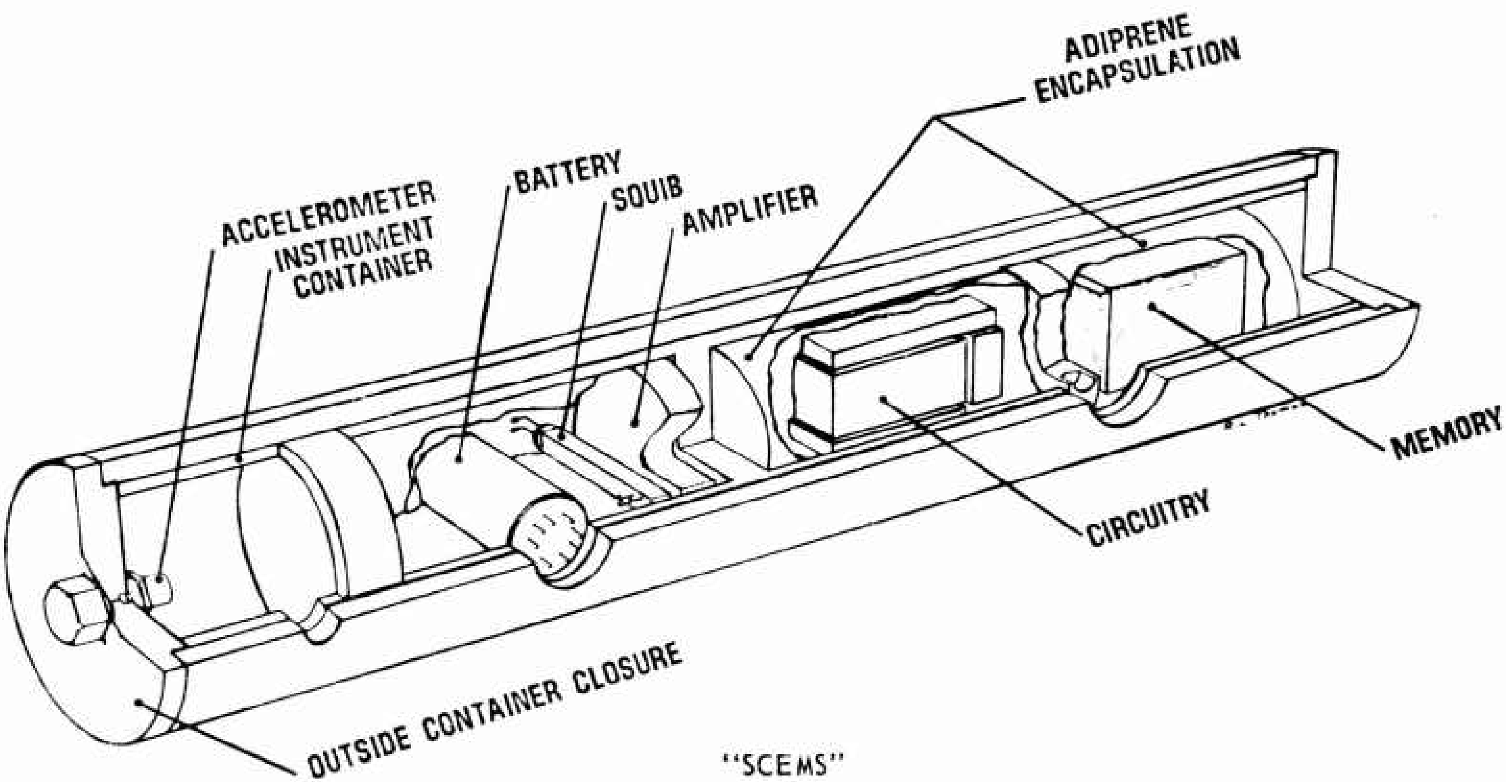
SLIDE 3: SCEMS

The SCEMS (Self-Contained Environmental Measuring System) is a completely self-contained high shock digital instrumentation system which is built to withstand and record environments of up to 5000g's acceleration and 4 kilobars of overpressure. It is contained in a heat tempered 500-pound steel canister that has a 9-inch O.D., 3/4-inch thickness, and 3 feet total length. All necessary functions, i.e., the transducers, amplifiers, A/D converter, data programmer and processor, and the data storage elements are completely contained in the canister. External leads are required only to fire the thermal batteries for internal power, monitor battery condition, and provide a fidu signal to turn on the memory system for 100 to 200 milliseconds. In some cases, a back-up accelerometer is used to turn on the memory prior to data arrival.

The twister memory system contains 1024 storage locations with 14 bits in each location, divided into 2 each 5-bit words and 1 each 4-bit word.

On Husky Pup, SCEMS No. 1, located in grout forward of DAC #2, contains two carbon stress gages, and four accelerometers. SCEMS No. 2, located at DAC #2, will record data from six FCP (Fluid Coupled Plate) pressure gages installed near DAC #2.

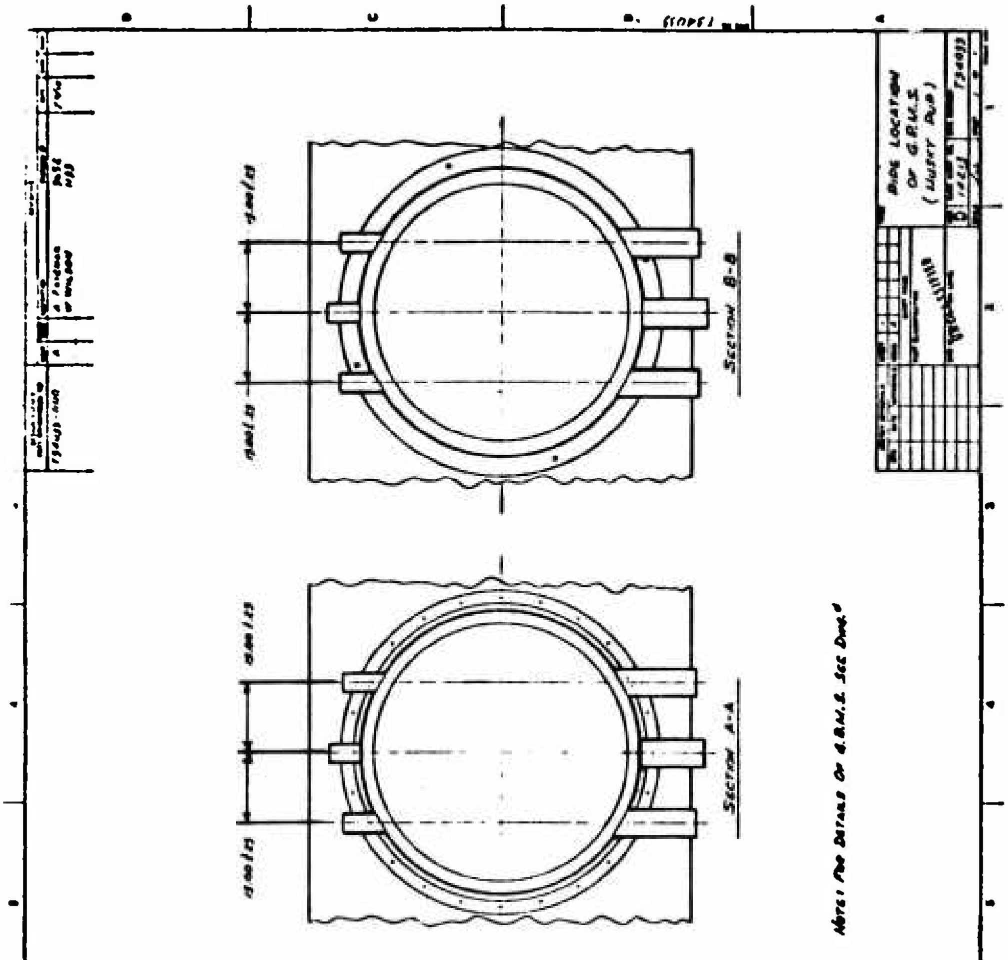
(3)



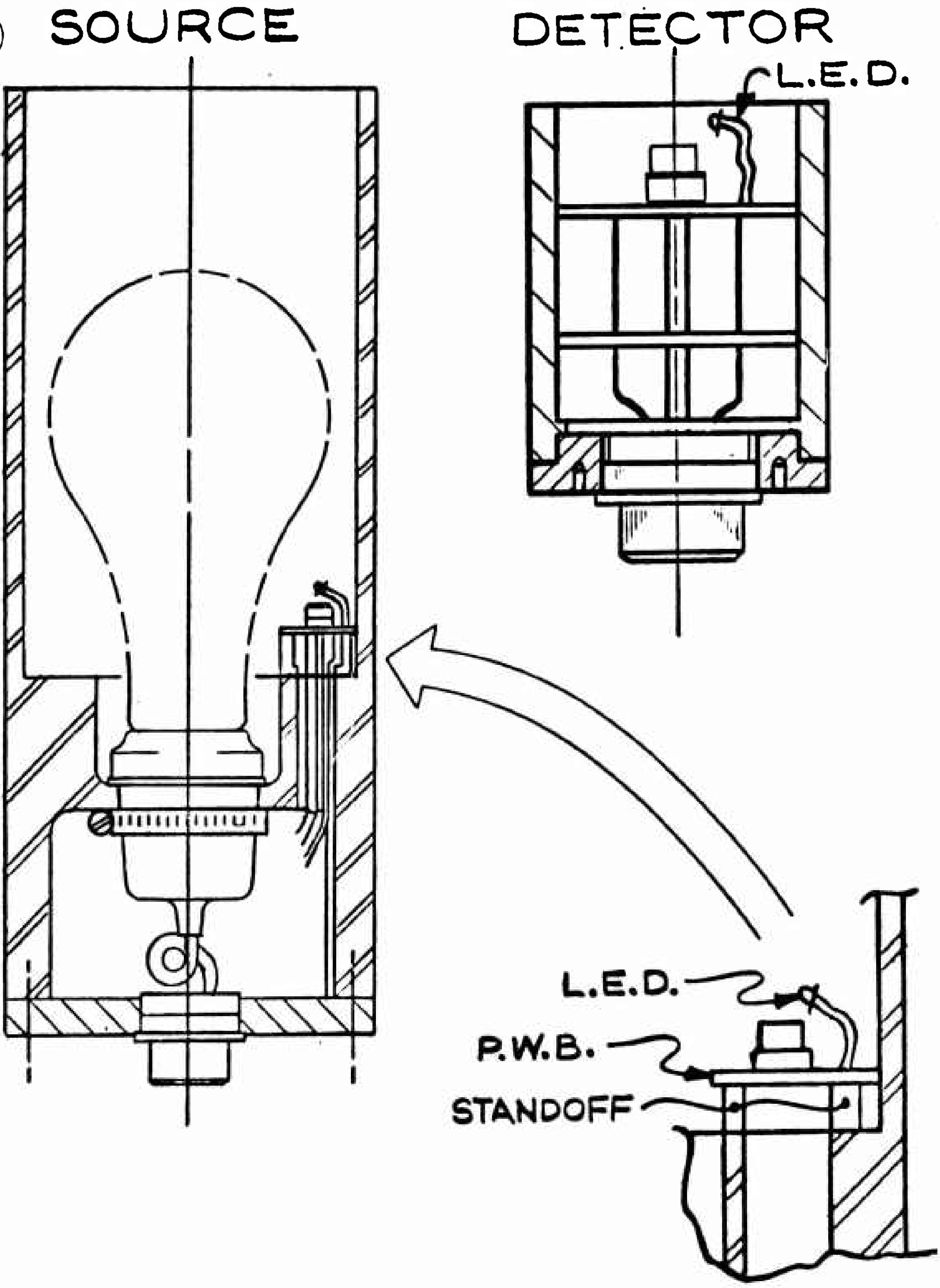
"SCEMS"
SELF-CONTAINED
ENVIRONMENTAL MEASURING
SYSTEM

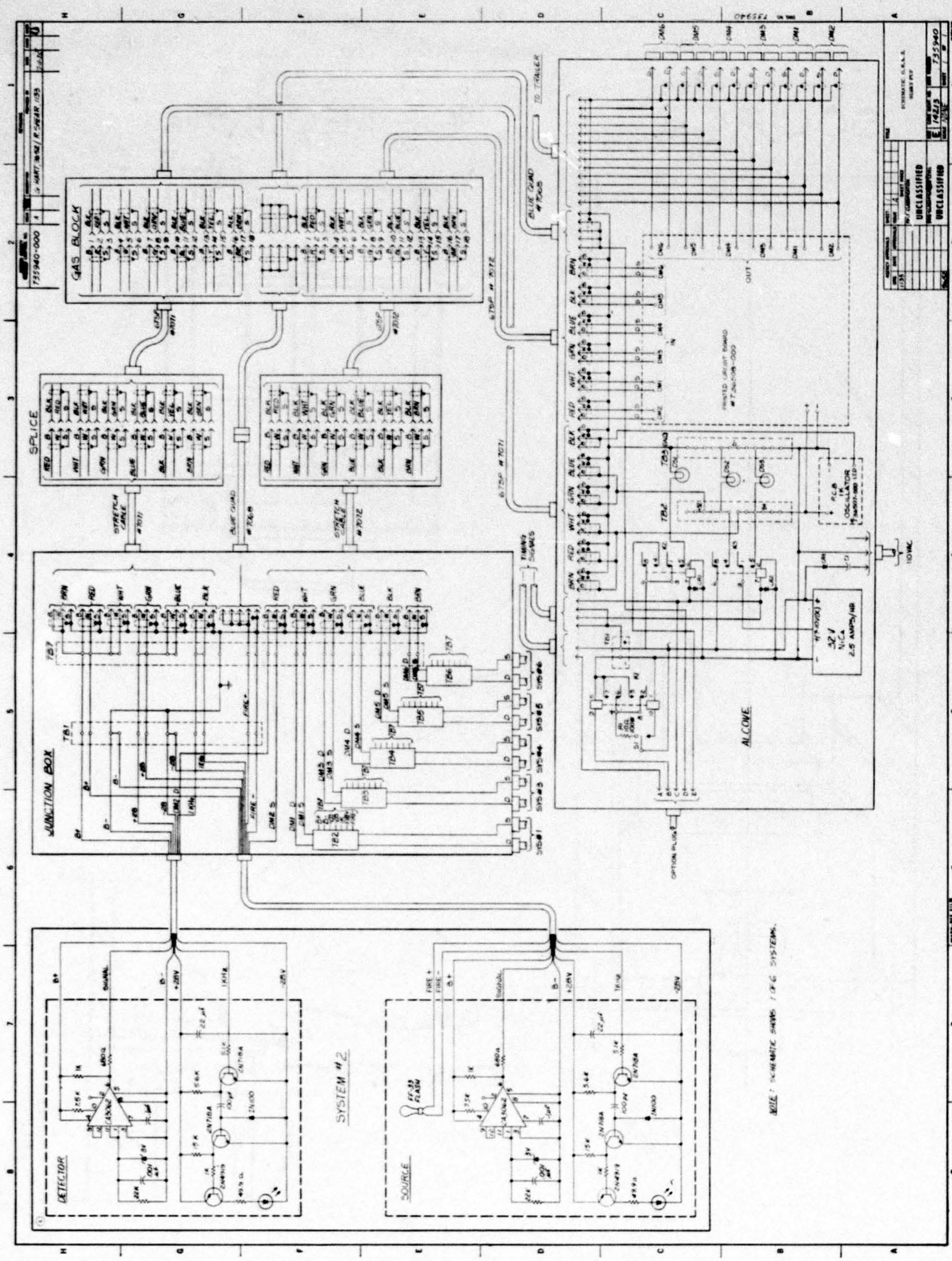
SLIDE 4: GATE RUPTURE MONITOR SYSTEM

The GRMS (Gate Rupture Monitor System) consists of an array of six light sources and six photodetectors located on the portal side of DAC #2 (as shown on slide 4). The light sources (photo flash bulbs) are located under the LOS pipe and are fired at minus 500 ms by an EG&G closure. The light sources are directed at photodetectors at the top of the LOS pipe (Slide 5). Any debris which interrupts the light beams will change the signature of the received signal. Both the source canister and detector canister contains a detector and small LED light source which flashes at a 1 KHz rate to verify integrity of the complete system. A complete schematic of the system is shown in slide 6, and slide 7 shows typical pulses from the LED sources. When the photoflash bulbs are fired, the photodetectors are saturated at 7 volts as shown on slide 8. If debris interrupts the light beam, the signals from the top detectors revert to pulses, as shown on slide 9. All 12 channels are multiplex recorded on magnetic tape in the inst-ument trailer.


SECTION A-A
SECTION B-B
4
W.P.

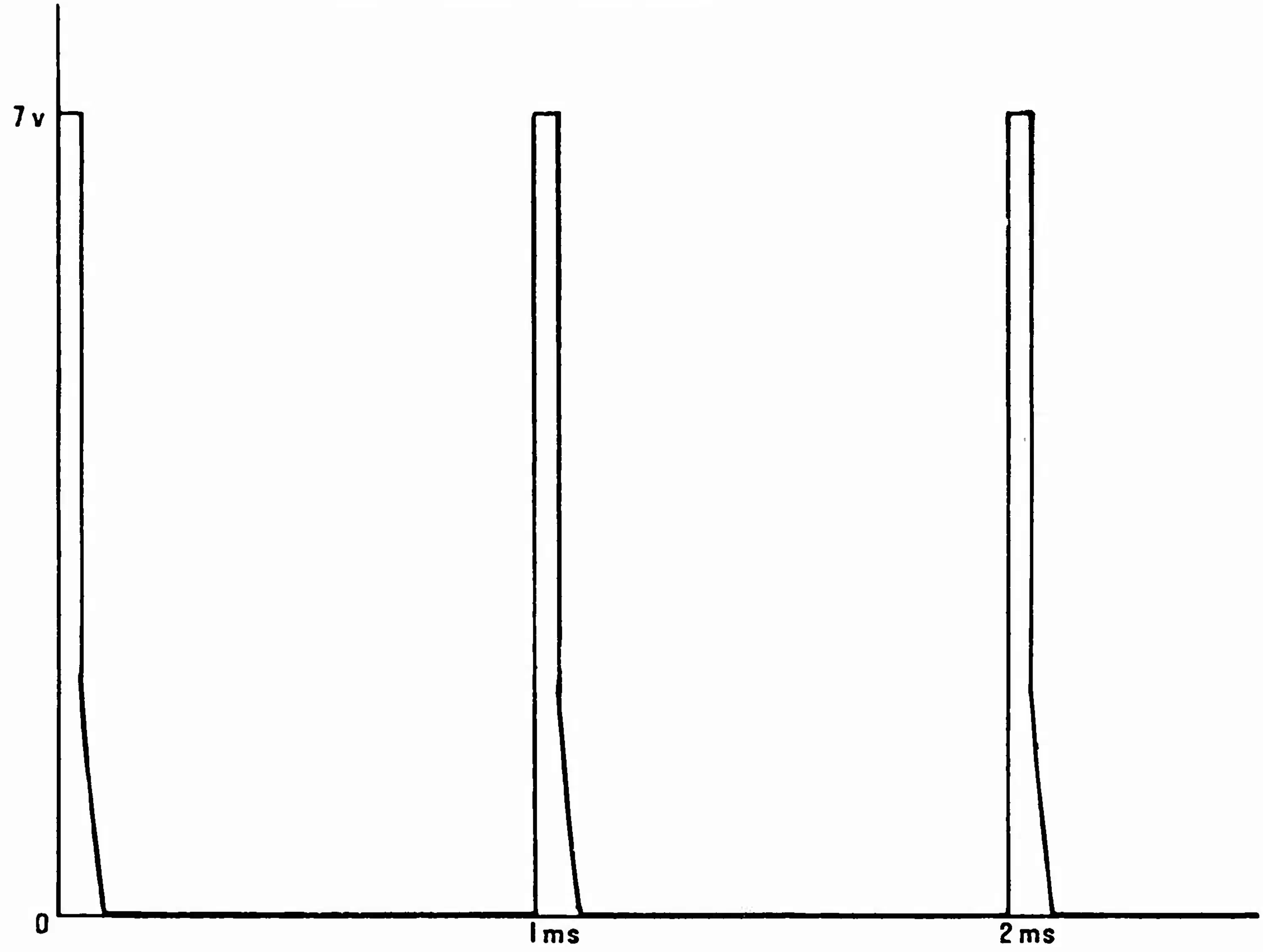
5



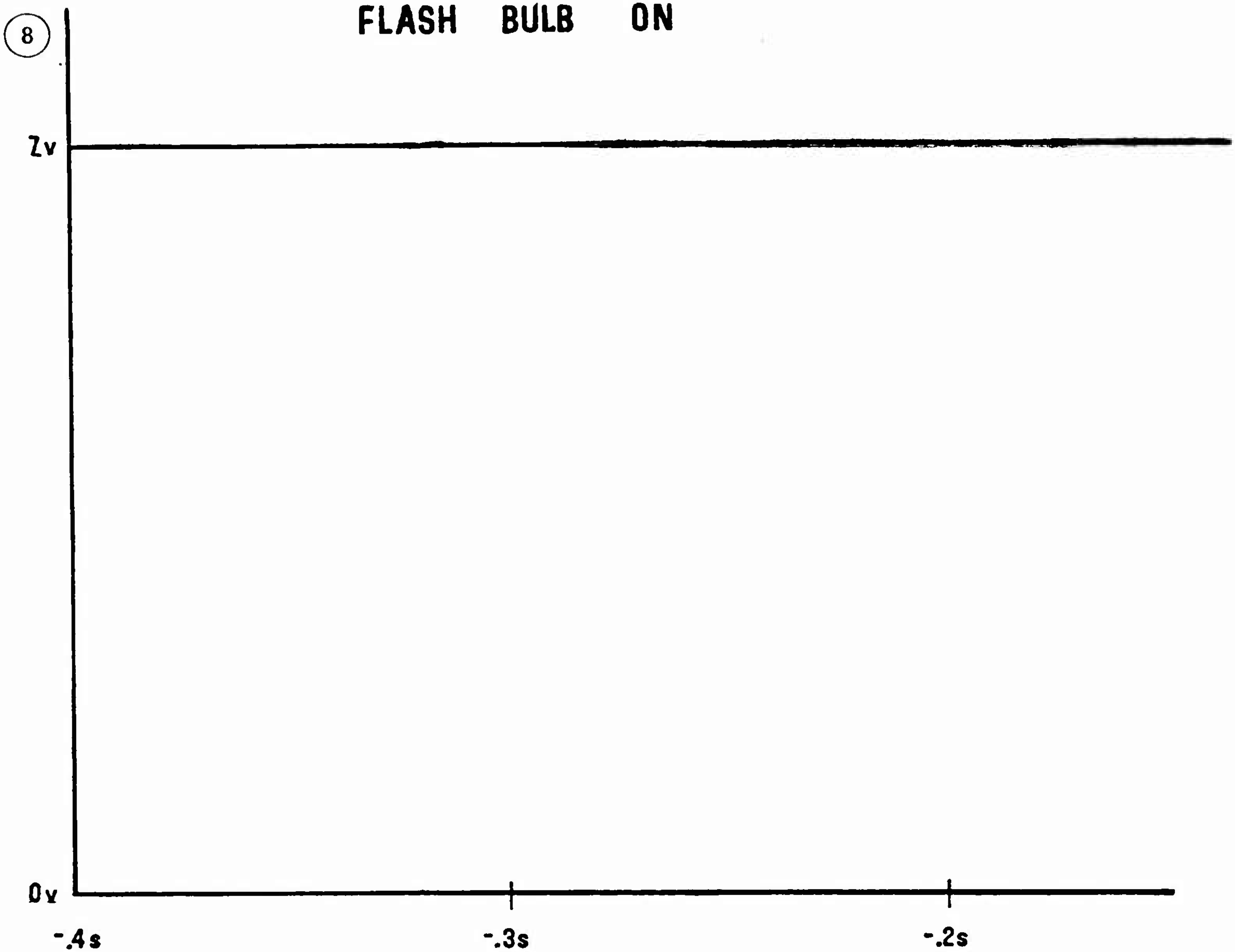

GAS BLOCK
SPLICE
JUNCTION BOX
ALCOVE
TO TRAILER
STRETCH CABLE
TIMING SIGNALS
OPTION PLUGS
PRINTED CIRCUIT BOARD
OSCILLATOR
DETECTOR
SOURCE
SYSTEM #2
NOTE: SCHEMATIC SHOWS 1 OF 6 SYSTEMS.
UNCLASSIFIED
735940

7

PRE SHOT SIGNALS

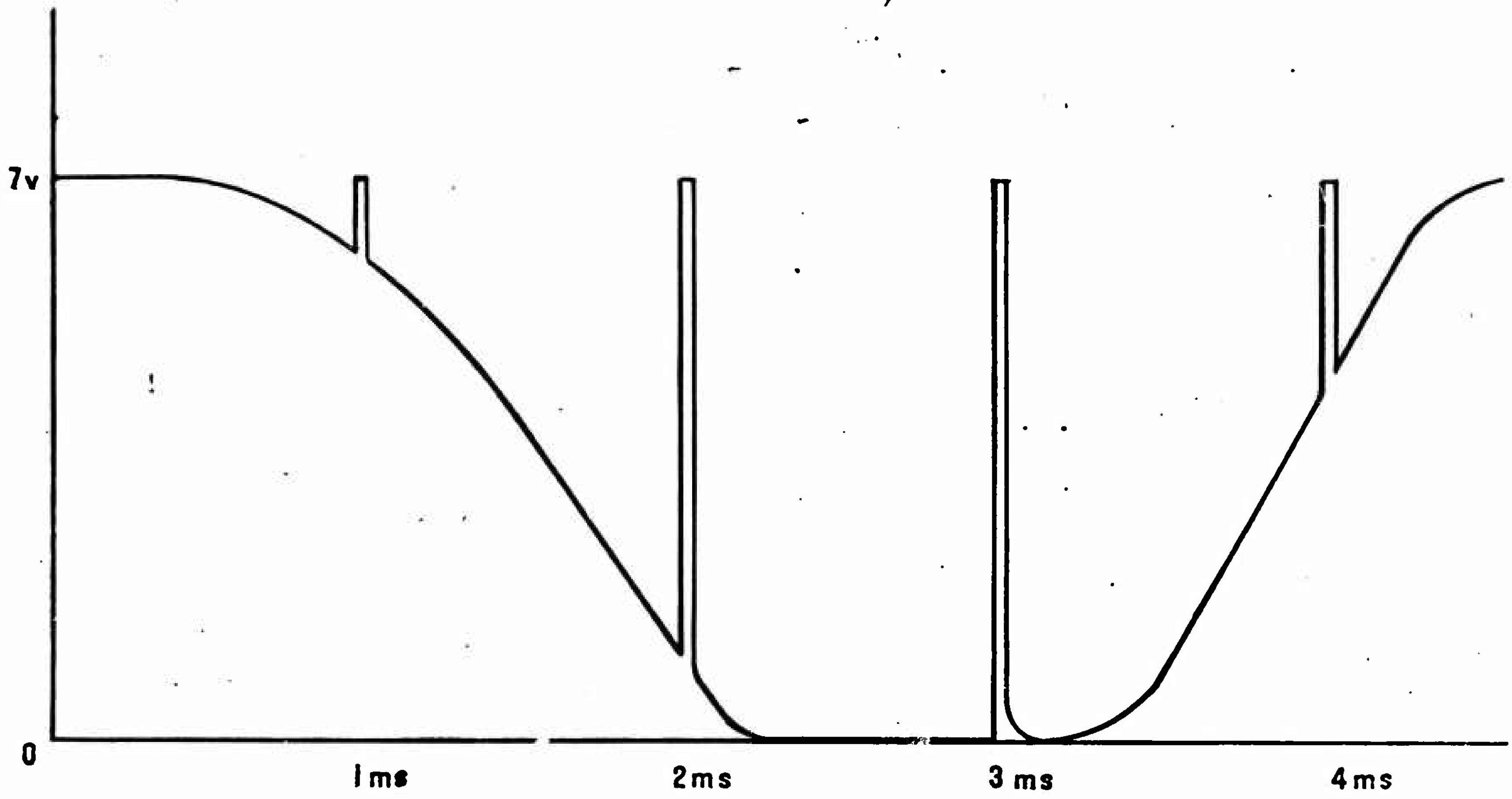


(8) FLASH BULB ON



9

DETECTOR RESPONDING TO DEBRIS

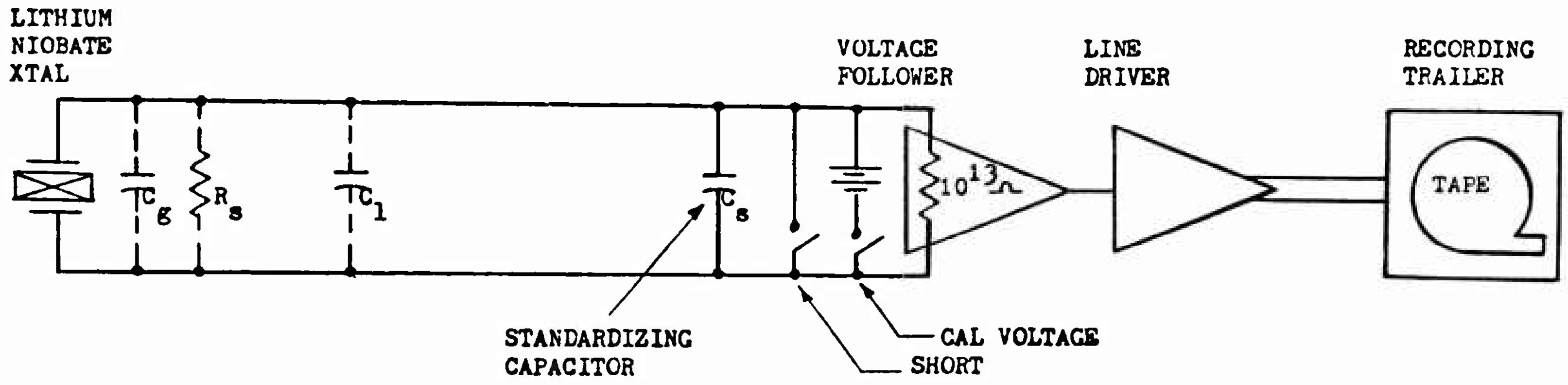


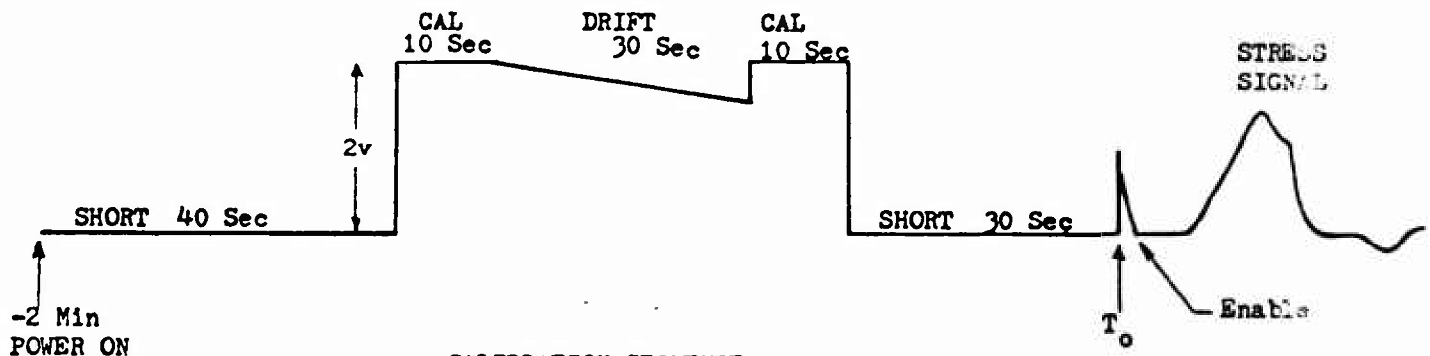
SLIDE 10: LITHIUM NIOBATE GAGES

The signal conditioning for the Lithium Niobate gages will be located in TC-1 alcove on Husky Pup. The gage capacitance (Cg), shunt resistance (Rs), and cable capacitance (C_1) must be accounted for in determing the value of the standardizing capacitor (C_s) to provide a known voltage (usually 2 volts) into the high impedance amplifier. Power is turned on at -2 minutes by an EG&G relay. An automatic timer then shorts the input to the amplifier for 40 seconds, cals for 10 seconds, removes the cal. voltage for 30 seconds to observe system drift, cals again for 10 seconds, and then shorts the input at -30 seconds. At zero time, a fidu signal operates a relay to unshort the system prior to data arrival. All signals are recorded on magnetic tape in the instrument trailer.

(10)

MEASUREMENT SYSTEM
LITHIUM NIOBATE STRESS GAGE



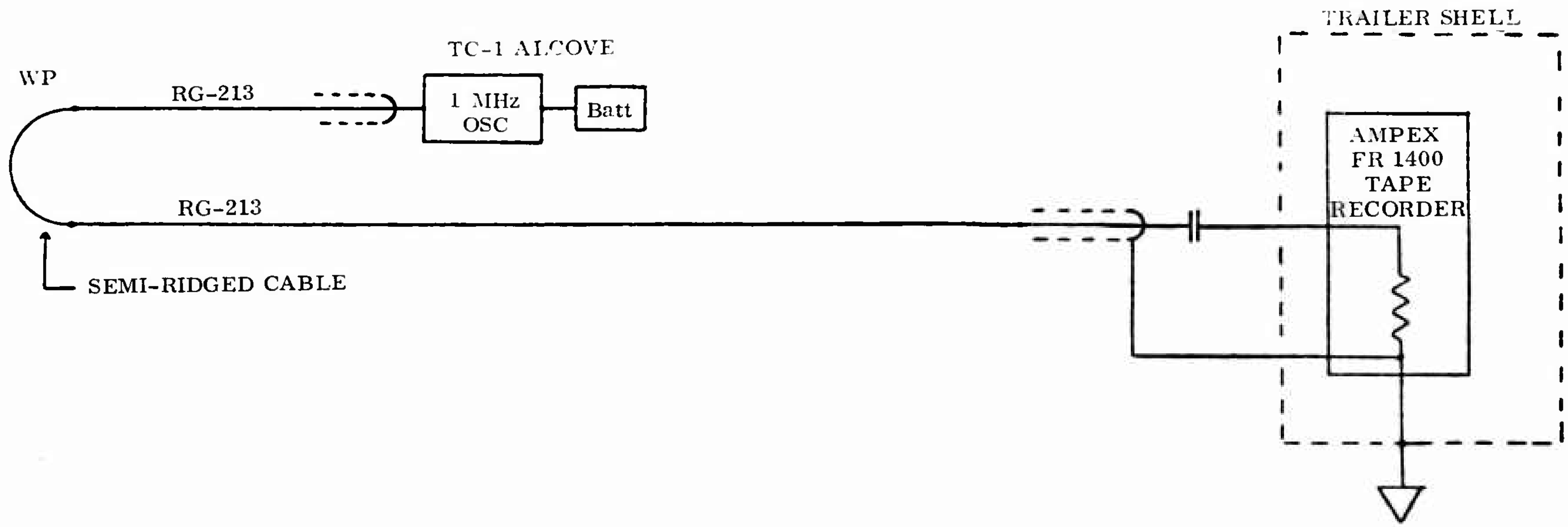


CALIBRATION SEQUENCE

SLIDE 11: TOA LOOP GAGE CIRCUITRY

Time-of-arrival loop gages will be used to measure shock arrival in the debris coupling experiment granite block. The measurement consists of a battery powered oscillator located in a downhole alcove with a coaxial cable extending to the granite block. A transistion is made to a high temperature radiation resistant cable which enters the block for some distance, turns 180 degrees, exits the block, reverts to larger coaxial cable to the trailer for recording. The ideal measurement consists of the shock wave shorting of the loop and cutting off the oscillator. The loops will be installed in an 8-inch and 4-inch cored holes in the granite block. Eleven 1 MHz loops will be used to measure shock TOA at various distances from the 5 MB level and will be recorded on magnetic tape. In addition, three 10 MHz loops will be used to measure free surface velocity across a 2 CM void area in the block. The three 10 MHz loops will be recorded on 15 oscilloscopes in the instrumentation trailer.

11



LOOP GAUGE CIRCUITRY

HUSKY PUP

SANDIA LABORATORIES

Sandia Laboratories instrumentation participation on HUSKY PUP consists of recording 253 active gages located at three stations, 6 levels, 2 STU's and 2 AFU's. These gages are summarized in figure one and include recording for LMSC and LASL, in addition to Sandia. Four trailers will be fielded on the event with the recording divided as shown in figure 2. Trailer B-22 will record multiplex data from ES #1 and scope data from ES #2.

Two methods are utilized to record data on HUSKY PUP. The first method is essentially the way Sandia Labs has done recording in the past. Ring experiments will be treated differently in an attempt to apply knowledge gained in MING BLADE and DINING CAR instrumentation development experiments. The second method will be discussed later.

Explanations of the standard recording method will be given for each figure.

Figure 3: Typical cable routing is given here. Junction boxes in the alcoves can be used for bridge completion, calibration, cable routing, excitation or whatever is required.

Figure 4: Ground reference for all shields will be the instrumentation trailer shell. For balanced cables the individual shield is carried to the signal conditioning card and tied to the shell at that point while overall shield and coax shields are tied to the trailer shell where they enter the trailer. The trailer will be floating from earth ground.

Instrumentation for the STU's and AFU's is presented in figures 5 thru 14. Cabling to each STU from the alcove will consist of six - 20 pair cables which is converted to nine - 15 pair cables going to the mesa. Experiment types and agencies were segregated as much as possible in the cables going to the mesa.

Figure 5: This figure represents SLA strain gages. It is not known at this time the gage configurations which will be fielded so definition is not complete. However, gage completion and calibration will be accomplished in the alcove junction box.

SANDIA LABORATORIES

HUSKY PUP GAGES

2 ea.	STU's	42 STRAIN	(84)
		17 ACCELEROMETERS	(34)
		6 DISPLACEMENT	(12)
		1 PRESSURE	(2)
2 ea.	AFU's	7 STRAIN	(14)
		4 ACCELEROMETERS	(8)
		2 DISPLACEMENT	(4)
		2 PRESSURE	(4)
5 ea.	RINGS	2 STRAIN	(10)
		1 DISPLACEMENT	(5)
4 ea.	RINGS	2 STRAIN	(8)
		1 DISPLACEMENT	(4)
		1 LVT	(4)
2 ea.	PLATE MOTION	3 ACCELEROMETERS	(6)
1 ea.	NEUTRON WHEEL	4 RPM	(4)
17 ea.	STRESS	1 QUARTZ	(17)
5 ea.	IMPULSE	1 LVT	(5)
12 ea.	STU BLOWOFF	1 LVT	(12)
8 ea.	TIME HISTORY	1 COMPTON	(8)
4 ea.	HTRM	1 LVT	(4)
4 ea.	BLOWBACK	1 LVT	(4)

TOTAL OF 253 GAGES

FIGURE 1

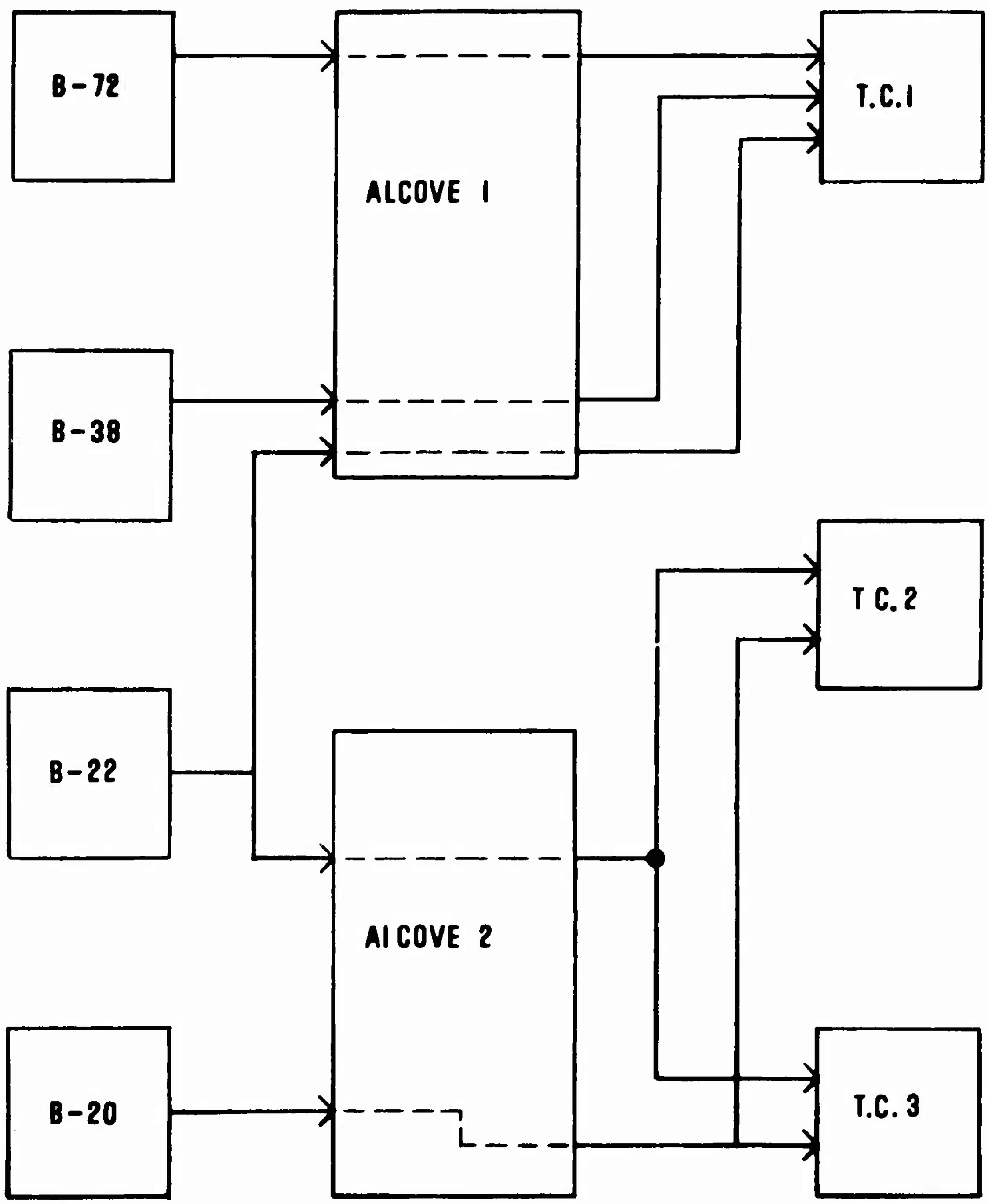
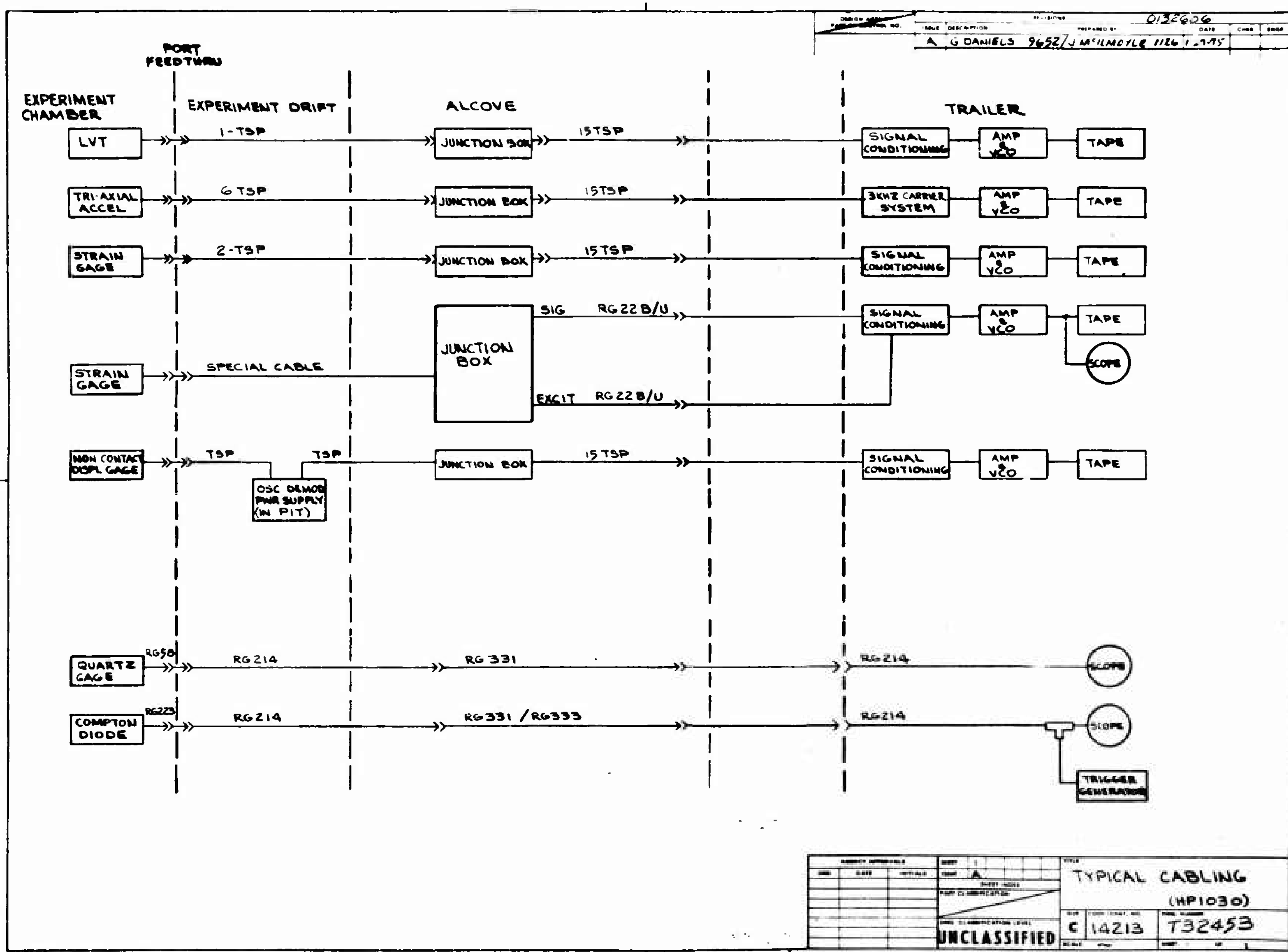


FIGURE 2



EXPERIMENT CHAMBER
PORT FEEDTHRU
EXPERIMENT DRIFT
ALCOVE
TRAILER
LVT
1-TSP
JUNCTION BOX
15TSP
SIGNAL CONDITIONING
AMP & VCO
TAPE
TRI-AXIAL ACCEL
6 TSP
JUNCTION BOX
15TSP
3KHZ CARRIER SYSTEM
AMP & VCO
TAPE
STRAIN GAGE
2-TSP
JUNCTION BOX
15TSP
SIGNAL CONDITIONING
AMP & VCO
TAPE
STRAIN GAGE
SPECIAL CABLE
JUNCTION BOX
SIG
RG 22 B/U
EXCIT
RG 22 B/U
SIGNAL CONDITIONING
AMP & VCO
TAPE
SCOPE
NON CONTACT DISPL GAGE
TSP
OSC DEMOD PWR SUPPLY (IN PIT)
TSP
JUNCTION BOX
15 TSP
SIGNAL CONDITIONING
AMP & VCO
TAPE
QUARTZ GAGE
RG58
RG 214
RG 331
RG 214
SCOPE
COMPTON DIODE
RG223
RG 214
RG 331 / RG333
RG 214
SCOPE
TRIGGER GENERATOR
A G DANIELS 9652/J MCILMOYLE 1126 1-975
0132606
TYPICAL CABLING (HP1030)
C 14213
T32453
UNCLASSIFIED

FIGURE 3

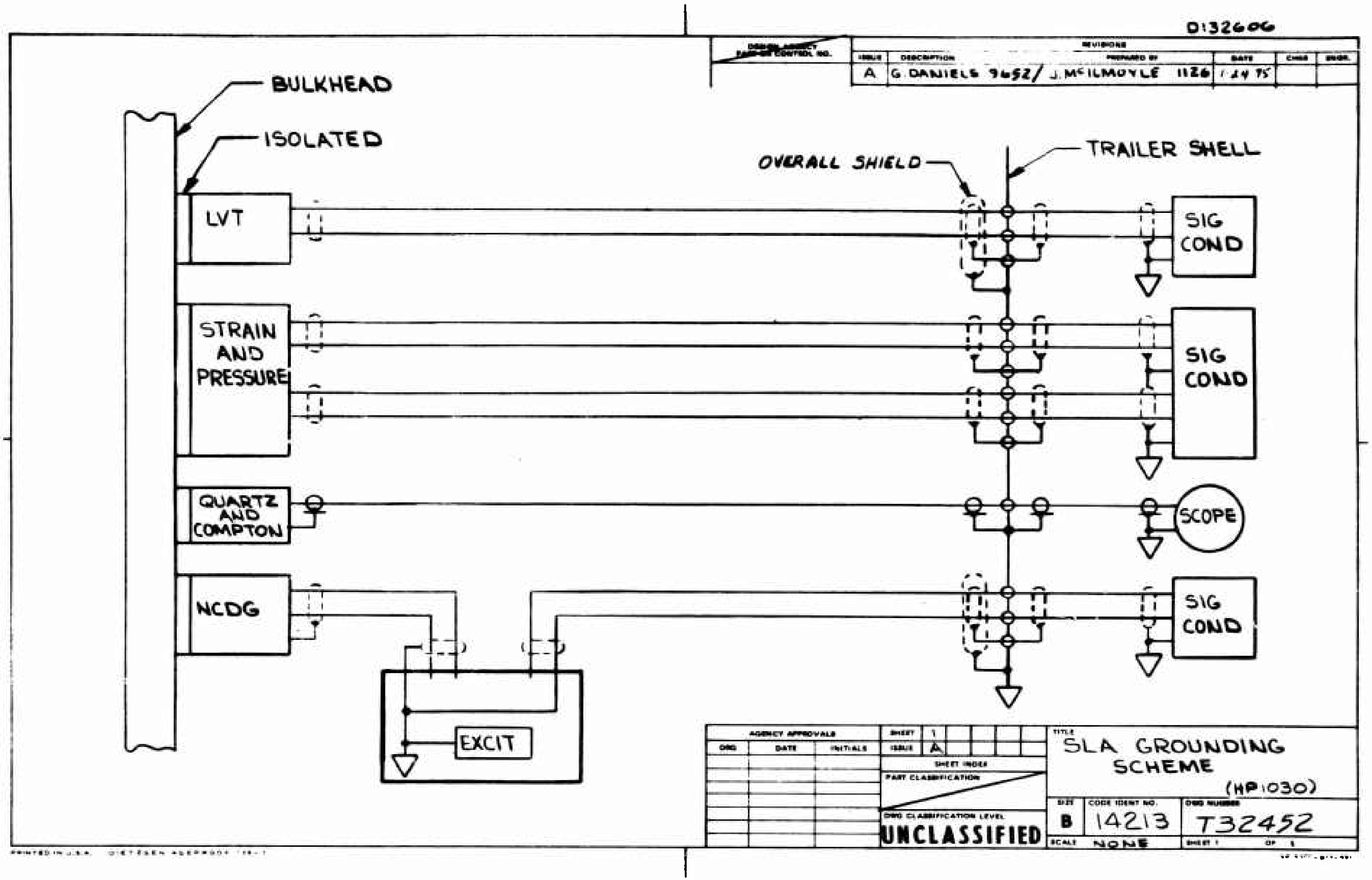
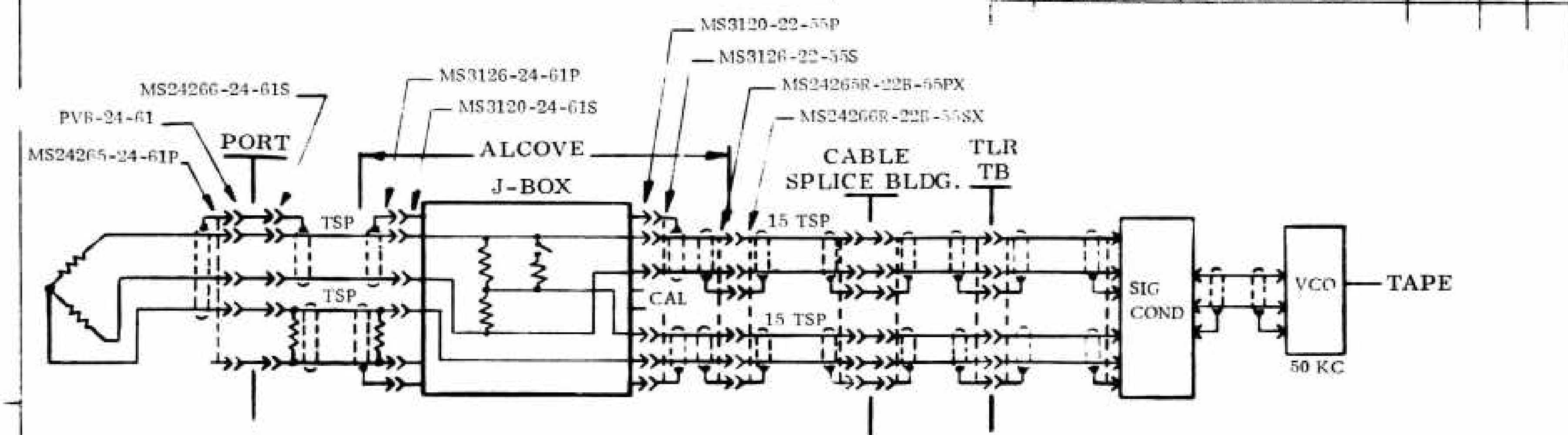

D132606
A
G. DANIELS 9652/ J. McILMOYLE 1126
1-24-75
BULKHEAD
ISOLATED
OVERALL SHIELD
TRAILER SHELL
LVT
STRAIN AND PRESSURE
QUARTZ AND COMPTON
NCDG
SIG COND
SIG COND
SCOPE
SIG COND
EXCIT
UNCLASSIFIED
SLA GROUNDING SCHEME
(HP1030)
B
14213
T32452
NONE

FIGURE 4

D132066

ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKR	ENGR
D	REVISED G. DANIELS 11-22/11	NEELEY 11-26			



SANDIA EXP. NO.	CODE NO/ AGENCY NO	DNA NO.	PORT NO.	TLR CABLE NO+ PAIR	TLR	TLR MUX SK CH	TAPE	TK
1B-1536JL-25.C	1110/5201	[illegible]	10-1	1142-1,2	B-22			
1B-1536JL-25.01	1111/5202	[illegible]	10-1	3,4	B-22			
1B-1536JL-25.01	1112/5203	3032	10-5	5,6	B-22			
1B-1536JL-25.01	1113/5204	E1032	10-5	7,8	B-22			
1B-1536JL-25.01	1114/5205	[illegible]	10-5	1142-9,10	B-22			
1C-1536JL-25.02	1210/5201	[illegible]	12-1	2209-1,2	B-72			
1C-1536JL-25.02	1211/5202	C110	12-1	3,4	B-72			
1C-1536JL-25.02	1212/5203	C110	12-5	5,6	B-72			
1C-1536JL-25.02	1213/5204	C110	12-5	7,8	B-72			
1C-1536JL-25.02	1214/5205	C110	12-5	2209-7,10	B-72			

SANDIA EXP NO.	CODE NO.	DNA NO.	PORT NO	TLR CABLE NO. & PAIR	TLR	TLR MUX CH	TAPE	TK
B-1536JL-26.01	1310	E1033		2202-1,2	B-38			
B-1536JL-26.01	1311	E1033		2202-3,4	B-38			
B-1536JL-26.01	1312	E1033		2202-5,6	B-38			
C-1536JL-26.02	14C	C111		2203-1,2	B-38			
C-1536JL-26.02	14[illegible]	C111		2203-3 4	B-38			
C-1536JL-26.02	412	C111		2203-5,6	B-38			

AGENCY APPROVALS — DWG / DATE / INITIALS

SHEET 1 — ISSUE 3

SHEET INDEX

PART CLASSIFICATION

DWG CLASSIFICATION LEVEL: UNCLASSIFIED

TITLE: CHANNEL DEF. DWG. 2 ARM STRAIN (SLA) (HF[illegible])

SIZE: B — CODE IDENT NO. 14213 — DWG NUMBER

SCALE: ~

PRINTED IN U.S.A.

WASH-OFF FILM

FIGURE 5

Figures 6 & 7: Displacement gages on the units will have the oscillator-demodulators located in pits by the pipe. These pits will be shared with LASL and LMSC, but individual boxes are used by only one agency with the exception of one box.

Figures 8 & 9: These accelerometers are the same model gages having two active arms with completion and calibration done in the alcove. Since the gages are not critically damped, it is expected they will ring at approximately 40 KHz and at an amplitude of up to ten times the signal. This ringing can be removed during data reduction if the gage or recording channel do not limit. To alleviate this problem on some recording channels, a 10 KHz low pass filter is being used to attenuate the ringing. On these the sensitivity of the recording will be increased to give better resolution.

Figures 10 & 11: On the STU's one pressure gage will be recorded while on the AFU's two are utilized. The second gage on the AFU's will monitor a pressure which is actuated at -10 sec.

Figure 12: LMSC gages on the units will have two active arms with completion and cal accomplished in the alcove. Care will have to be taken in selection of the completion resistors to prevent a large quiescent unbalance at the bridge. Predictions indicate less than four milli-volts out of the foil gages when loaded by 100 ohms so an amplifier will be used downhole to boost the signal.

Figure 13: LASL is also using foil gages but with one active arm. Unbalance is not as serious a problem here but once again low level outputs will require an amplifier downhole.

Figure 14: LASL has accelerometers on the STU's which have two active arms which will be completed and calibrated in the alcove.

Sandia Laboratories phenominology and diagnostic experiments which will utilize the standard recording system are represented by figures 15 thru 24.

Figures 15 & 16: These figures show the compton diodes which will be used for both gamma time history and for triggering the scopes. Compensation at 100 = 1 will be used.

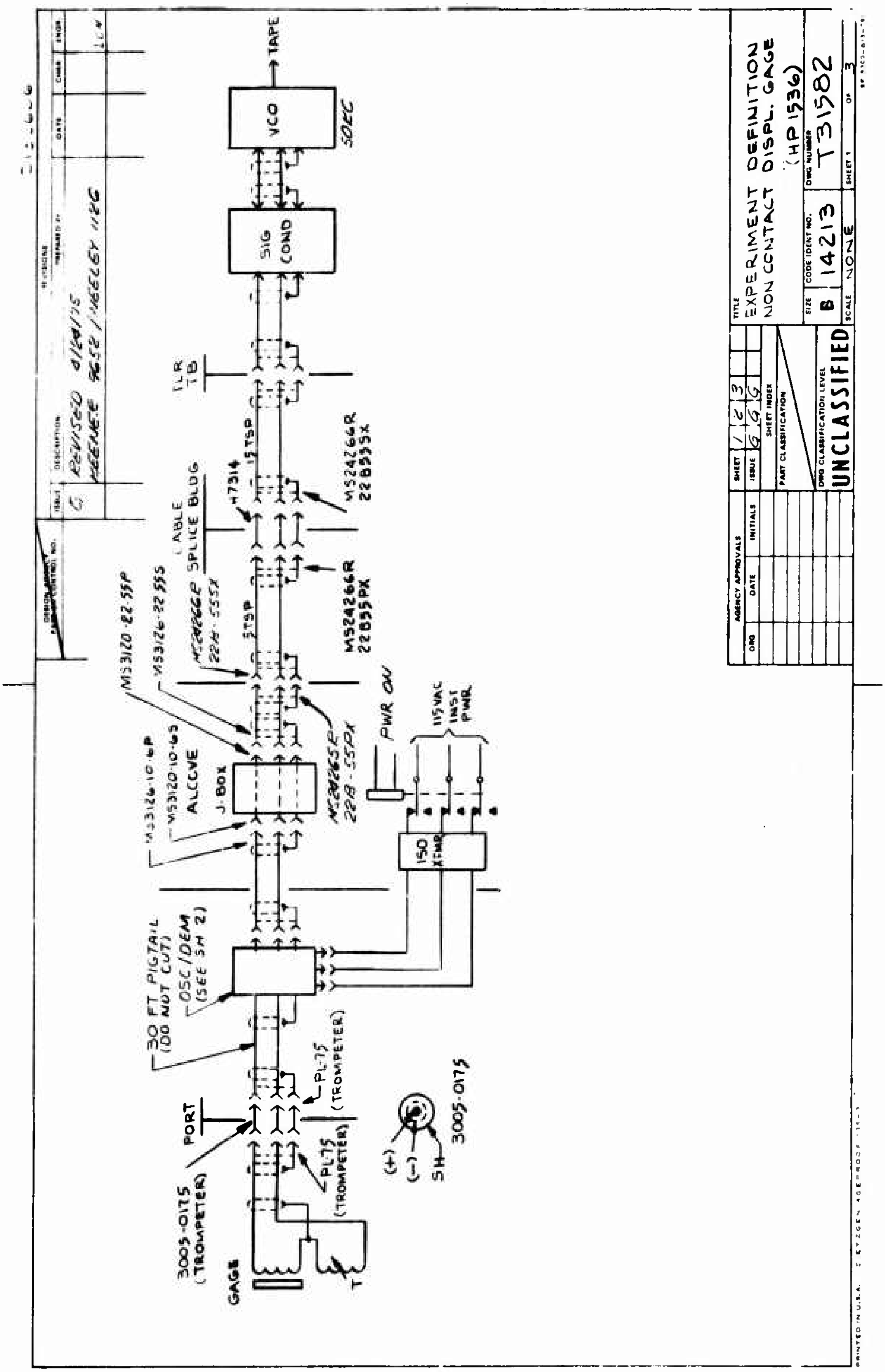

EXPERIMENT DEFINITION
NON CONTACT DISPL. GAGE
(HP 1536)
B
14213
T31582
SCALE NONE
UNCLASSIFIED
TAPE
VCO
SIG COND
J. BOX
GAGE
PORT
PWR ON
115 VAC INST PWR
CABLE SPLICE BLDG
30 FT PIGTAIL (DO NOT CUT)
3005-0175 (TROMPETER)
PL-75 (TROMPETER)

FIGURE 6

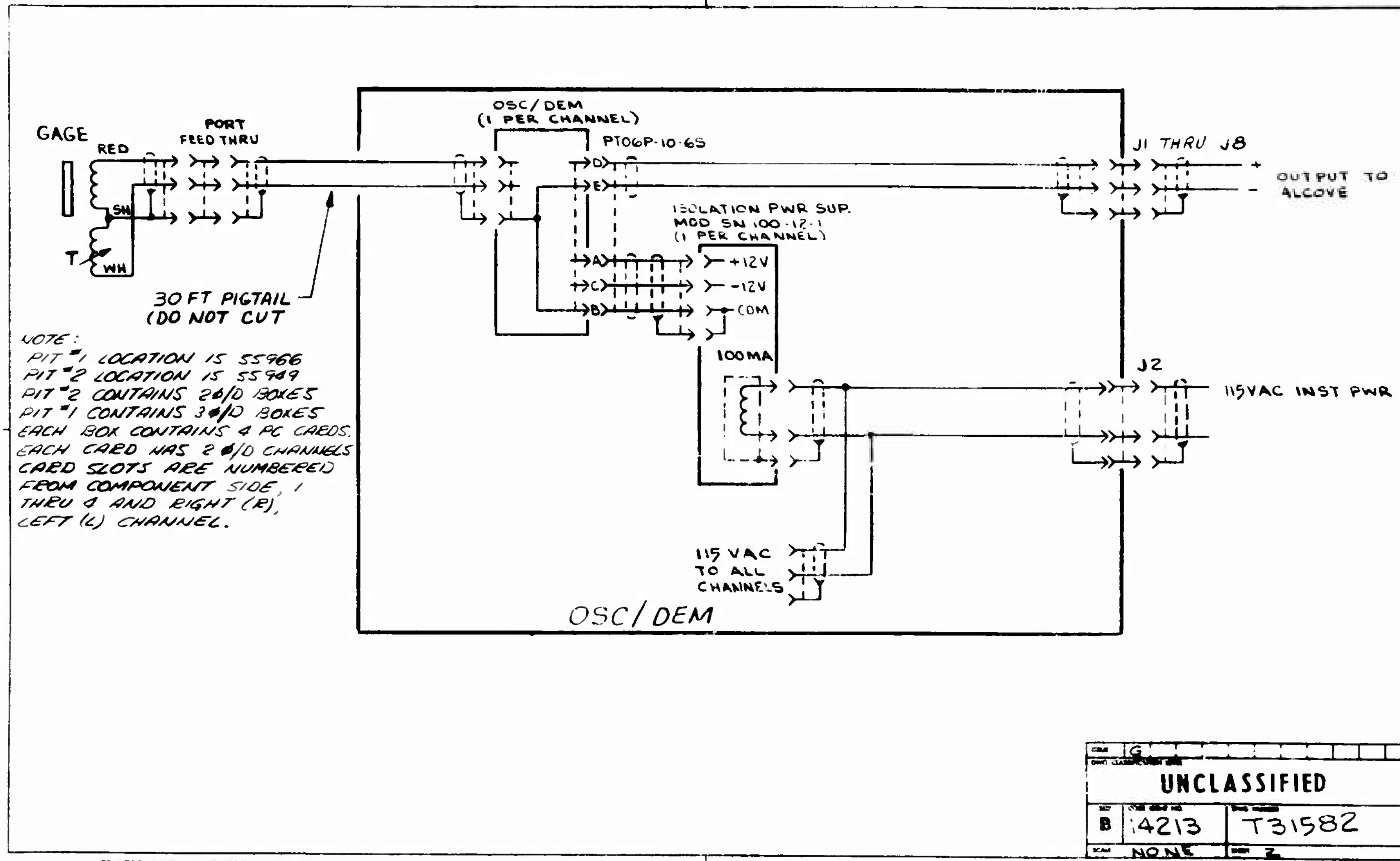
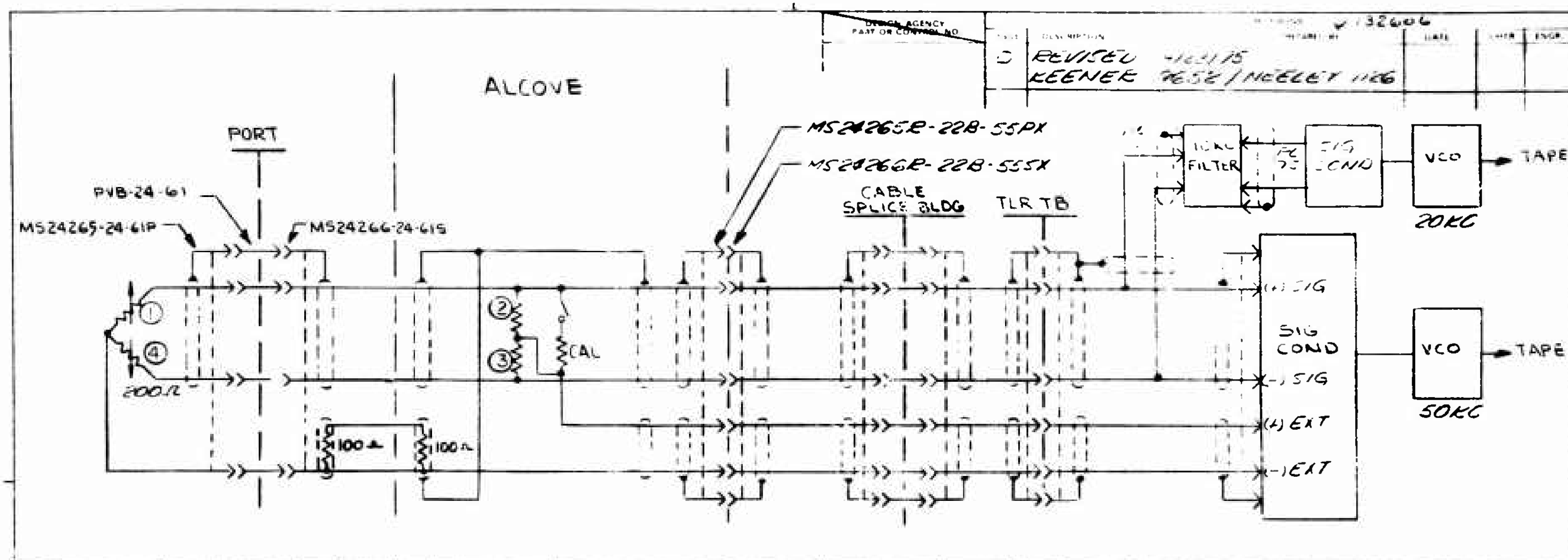

GAGE
RED
SH
T
WH
PORT FEED THRU
30 FT PIGTAIL
(DO NOT CUT
NOTE:
PIT #1 LOCATION IS 55966
PIT #2 LOCATION IS 55949
PIT #2 CONTAINS 2Ø/D BOXES
PIT #1 CONTAINS 3Ø/D BOXES
EACH BOX CONTAINS 4 PC CARDS.
EACH CARD HAS 2 Ø/D CHANNELS
CARD SLOTS ARE NUMBERED
FROM COMPONENT SIDE, 1
THRU 4 AND RIGHT (R),
LEFT (L) CHANNEL.
OSC/DEM
(1 PER CHANNEL)
PT06P-10-6S
D
E
A
C
B
ISOLATION PWR SUP.
MOD SN 100-12-1
(1 PER CHANNEL)
+12V
-12V
COM
100MA
J1 THRU J8
+
-
OUTPUT TO
ALCOVE
J2
115VAC INST PWR
115 VAC
TO ALL
CHANNELS
OSC/DEM
G
UNCLASSIFIED
B
14213
T31582
NONE
2
PRINTED IN U S A K & E HERCULENE NO 19-1153

FIGURE 7



SANDIA EXP NO	CODE NO 10KC FILTER	AGENCY ID	CODE NO DIR	DNA NO	PORT NO	TLR CABLE NO & PAIR	TLR	TLR DIR SIG CH	TAPE	TK	TLR 10KC FIL CH	TAPE	TK
1C-1536JL-25.02	1270	A201	1271	C110	IR-1	2205-1,2	872						
	1272	A202	1273		-1	-3,4	872						
	1274	A203	1275		-1	-5,6	872						
	1276	A204	1277		-1	7,8	872						
	1278	A205	1279		-1	9,10	872						
	1280	A206	1281		-1	12	872						
	1282	A207	1283		-5	2205-13,14	872						
	1284	A208	1285		-5	2206-1,2	872						
	1286	A209	1287		-5	3,4	872						
	1288	A210	1289		-5	5,6	872						
1C-1536JL-25.02	1290	A211	1291	C110	IR-5	2206-7,8	872						

SANDIA EXP NO	CODE NO 10KC FILTER	CODE NO DIR	DNA NO	PORT NO	TLR CABLE NO & PAIR	TLR	TLR DIR SIG CH	TAPE	TK	TLR 10KC FIL CH	TAPE	TK
1B-1536JL-26.01	1370	1371	B1033		2161-1,2	838						
	1372	1373			2161-3,4							
	1374	1375			2161-5,6							
1B-1536JL-26.01	1376	1377	B1033		2161-7,8	838						
1C-1536JL-26.02	1470	1471	C111		2201-1,2	838						
	1472	1473			2201-3,4							
	1474	1475			2201-5,6							
1C-1536JL-26.02	1476	1477	C111		2201-7,8	838						

APPROVALS — DWG — DATE — INITIALS

SHEET 1 — ISSUE D

SHEET INDEX

PART CLASSIFICATION

DWG CLASSIFICATION LEVEL: **UNCLASSIFIED**

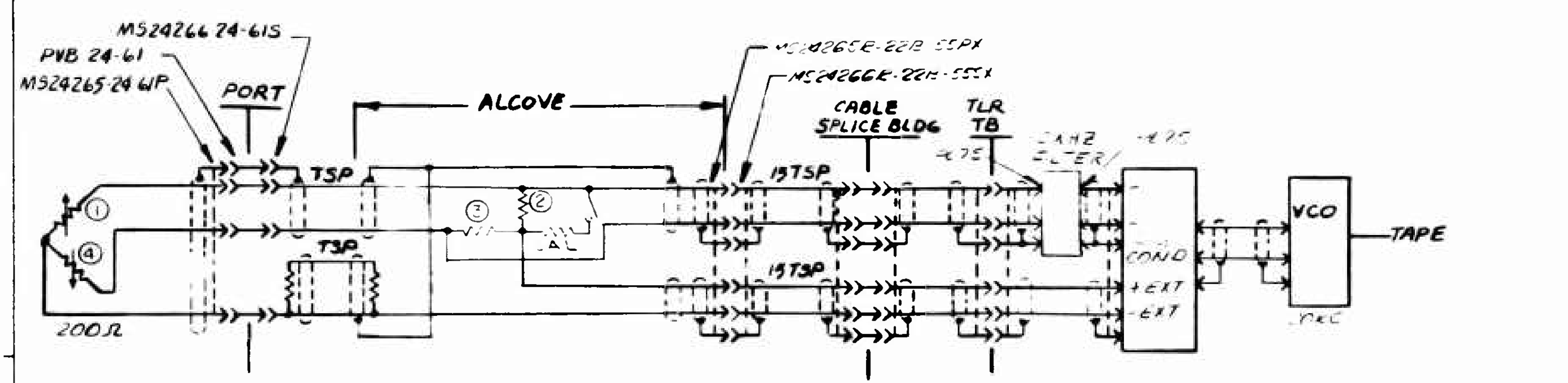
EXPERIMENT DEFINITION
ACCELEROMETER (SLA)
(HP1536)

SIZE	CODE IDENT NO.	DWG NUMBER
B	14213	T34035
SCALE NONE		SHEET 1 OF 1

FIGURE 8

D132066

ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKD	ENGR.
E	REVISED G. DANIELS 9652/L. NEELEY 1126				



SANDIA EXP. NO.	CODE NO/ AGENCY NO	DNA NO.	PORT NO.	TLP CABLE NO. & PAIR	TLR	TLR MUX CH	TAPE	TR
1B-1536JL-25.01	1170/A201	B1032	0-1	2164-2	B 22			
	1171/A202		-1	2164-3,4	B 22			
	1172/A203		-1	2164-5,6	B 22			
	1173/A205		-1	2164-7,8	B-22			
	1174/A207		-5	2164-9,10	B-22			
	1175/A209		-5	2164-11,12	B-22			
1B-15[illegible] 25.01	1176/A211	B1032	0-5	2164-13,14	B-22			

AGENCY APPROVALS			SHEET	1
ORG	DATE	INITIALS	ISSUE	E

SHEET INDEX

PART CLASSIFICATION

DWG CLASSIFICATION LEVEL: UNCLASSIFIED

TITLE: EXPERIMENT DEFINITION ACCELEROMETER (HP1536)

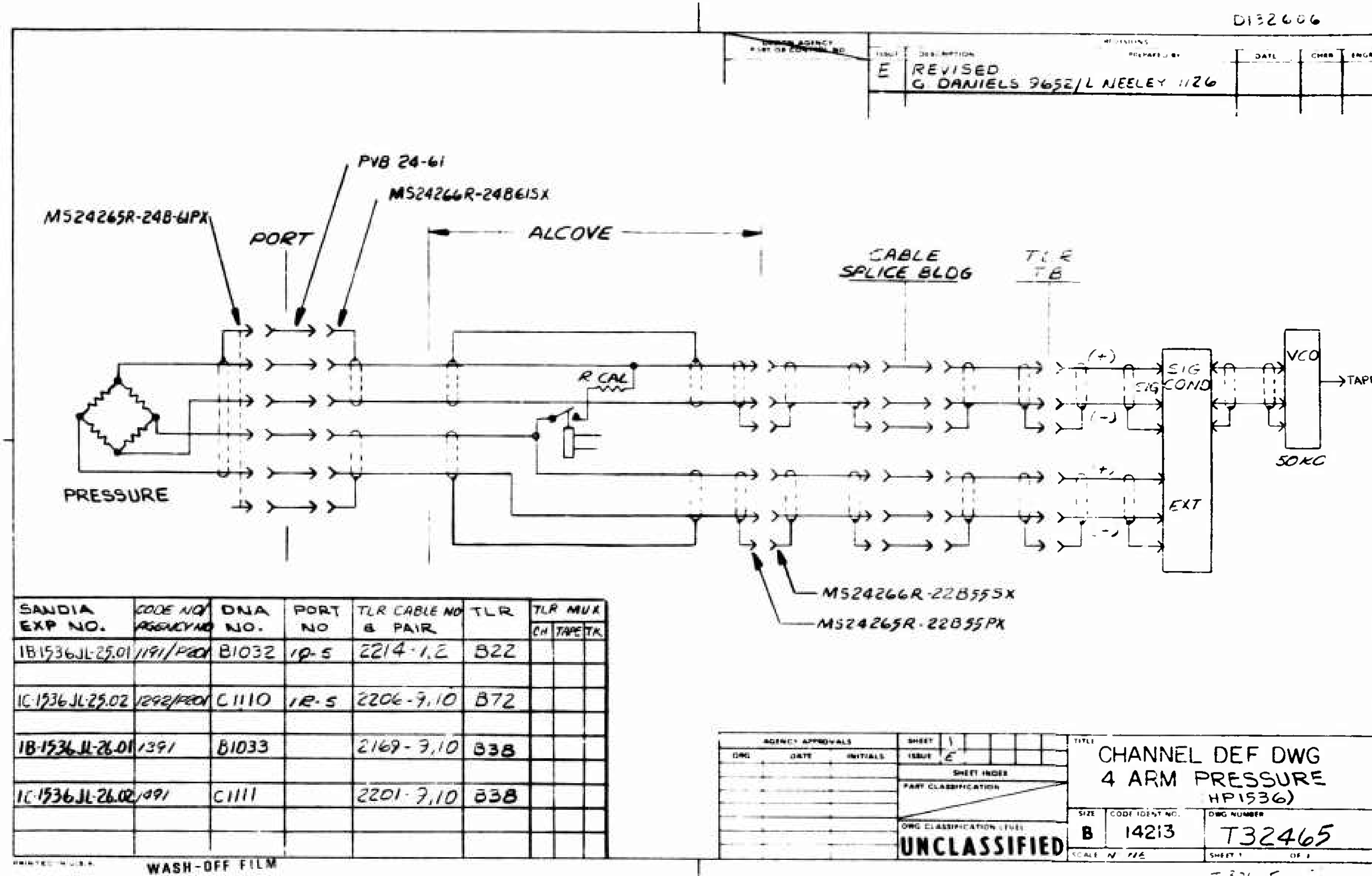
SIZE	CODE IDENT NO.	DWG NUMBER
B	14213	T32858

SCALE ~ SHEET 1 OF 1

PRINTED IN U.S.A.

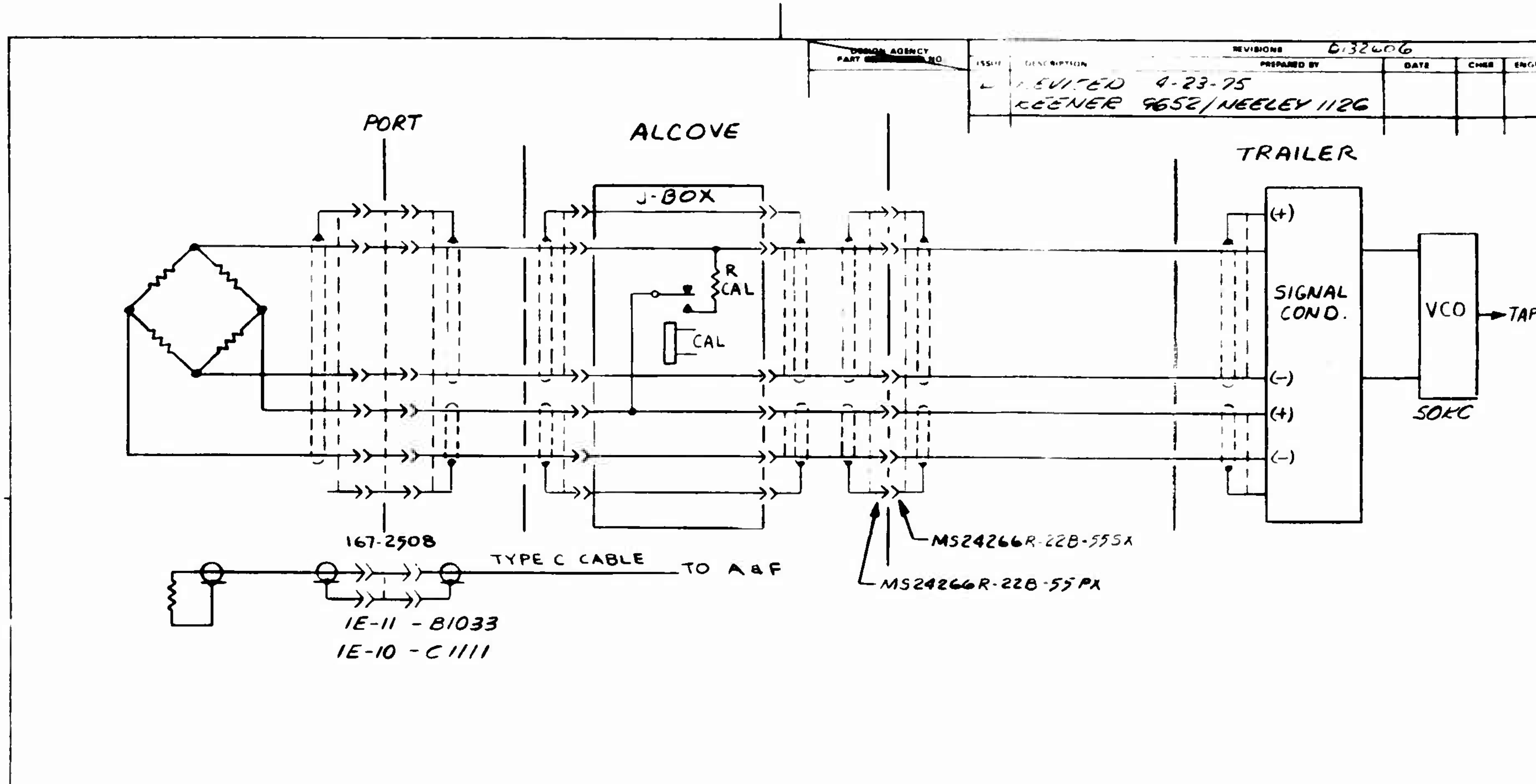
WASH-OFF FILM

FIGURE 9



SANDIA EXP NO.	CODE NO/ AGENCY NO	DNA NO.	PORT NO	TLR CABLE NO & PAIR	TLR	TLR MUX CH	TLR MUX TAPE	TLR MUX TK
1B1536JL-25.01	1191/PEO1	B1032	1Q-5	2214-1,2	B22			
1C-1536JL-25.02	1292/PEO1	C1110	1R-5	2206-9,10	B72			
1B-1536JL-26.01	1391	B1033		2169-9,10	B38			
1C-1536JL-26.02	1491	C1111		2201-9,10	B38			

FIGURE 10



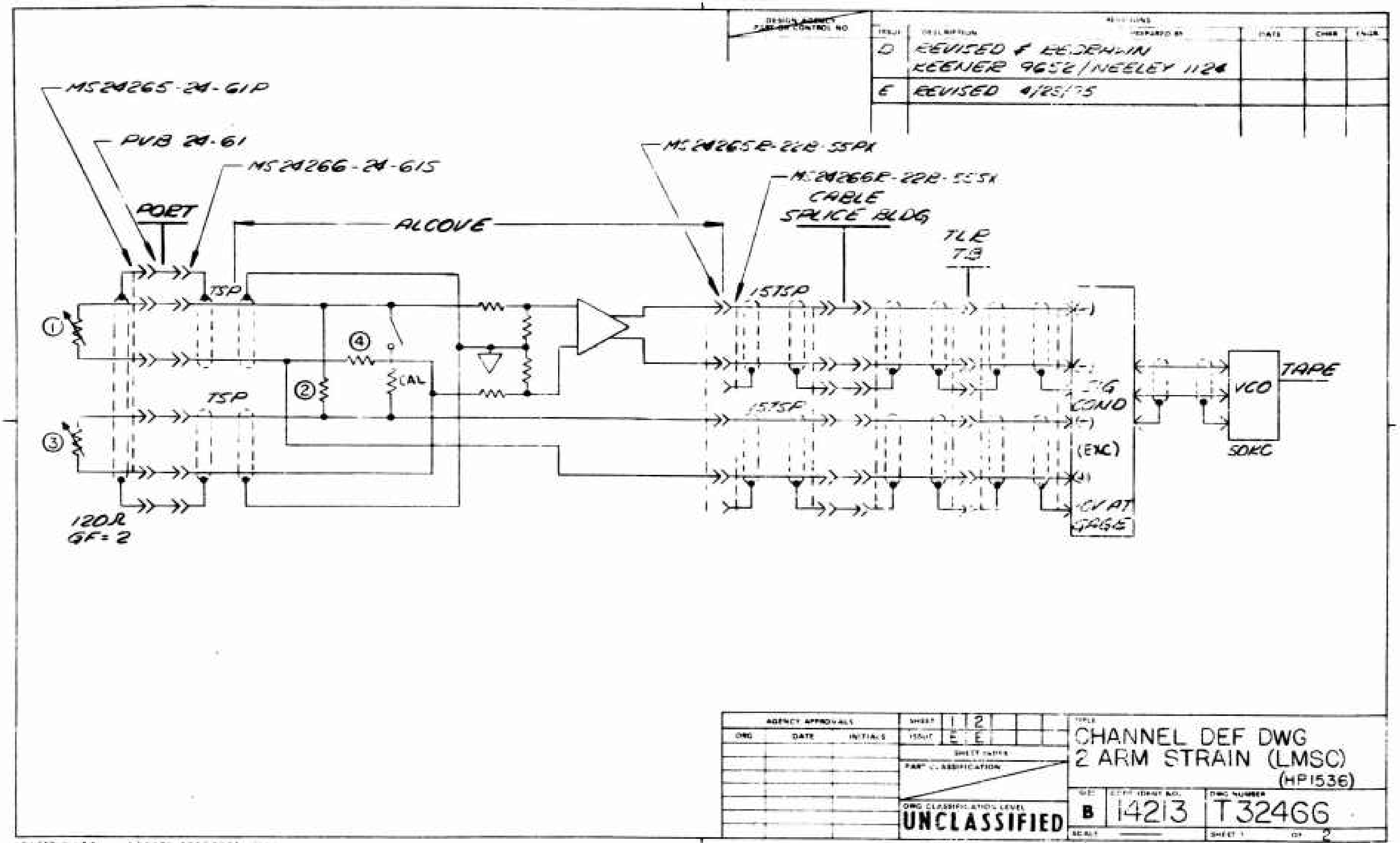
SANDIA EXP NO	CODE NO	DNA NO	PORT NO	TLR CABLE NO & PAIR	TLR	TLR CH. NO
1B-1536 JL-26.01	1393	B1033		2169-11,12	B38	
1C-1536 JL-26.02	1492	C1111		2201-11,12	B38	

PRINTED IN U.S.A. DIETZGEN

AGENCY APPROVALS			SHEET	1	TITLE
ORG	DATE	INITIALS	ISSUE	D	CHANNEL DEF DWG 4 ARM PRESSURE (HP1536)
			SHEET INDEX		
			PART CLASSIFICATION		
			DWG CLASSIFICATION LEVEL: UNCLASSIFIED		SIZE: B · CODE IDENT NO.: 14213 · DWG NUMBER: T34034
					SCALE: 1/1 · SHEET 1 OF 1

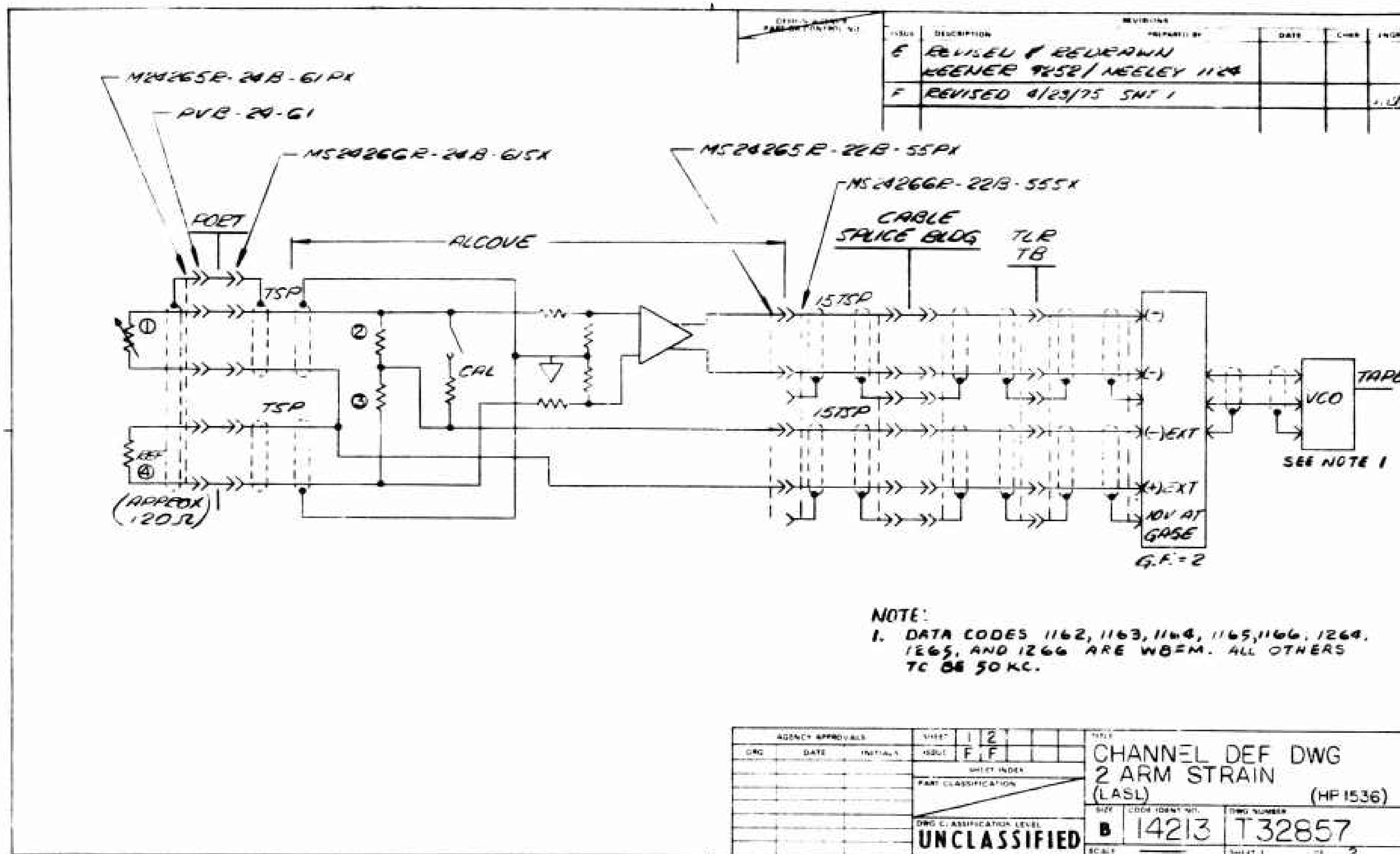
T34034

FIGURE 11



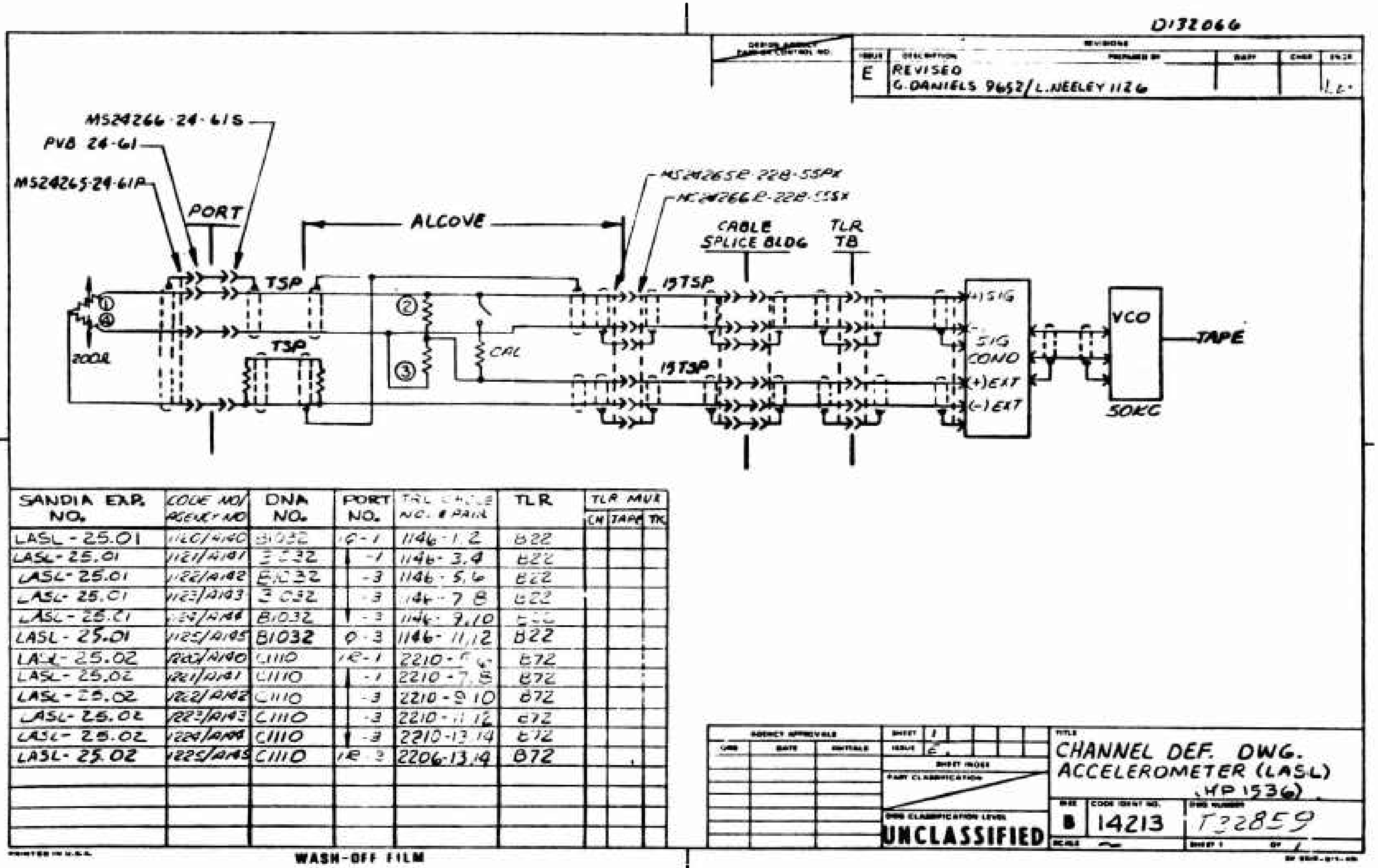
MS24265-24-61P
PVB 24-61
MS24266-24-61S
PORT
ALCOVE
TSP
CAL
120Ω
GF=2
MS24265R-22R-55PX
MS24266R-22R-55SX
CABLE
SPLICE BLDG
TLR
73
15TSP
SIG
COND
(EXC)
VCO
TAPE
50KC
REVISED & REDRAWN
KEENER 9652/NEELEY 1124
REVISED 4/25/75
CHANNEL DEF DWG
2 ARM STRAIN (LMSC)
(HP1536)
B
14213
T32466
UNCLASSIFIED

FIGURE 12



REVISIONS
E REVISED & REDRAWN KEENER 9252/NEELEY 1124
F REVISED 4/23/75 SHT 1
MS24265R-24B-61PX
PVB-24-61
MS24266R-24B-61SX
PORT
ALCOVE
TSP
CAL
MS24265R-22B-55PX
MS24266R-22B-55SX
CABLE SPLICE BLDG
TLR TB
15TSP
(APPROX 120Ω)
(+)
(-)
(-)EXT
(+)EXT
10V AT GAGE
G.F.=2
VCO
TAPE
SEE NOTE 1
NOTE:
1. DATA CODES 1162, 1163, 1164, 1165, 1166, 1264, 1265, AND 1266 ARE WBFM. ALL OTHERS TO BE 50 KC.
UNCLASSIFIED
CHANNEL DEF DWG
2 ARM STRAIN
(LASL)
(HP 1536)
B 14213 T32857

FIGURE 13

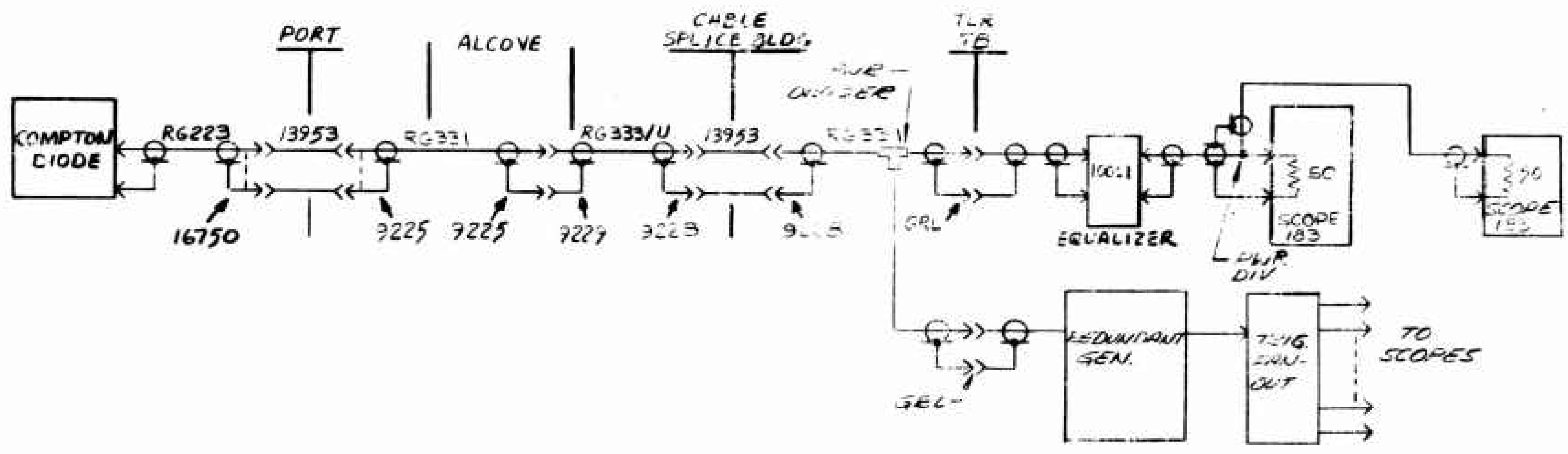


SANDIA EXP. NO.	CODE NO/ AGENCY NO	DNA NO.	PORT NO.	TRL CABLE NO. & PAIR	TLR	TLR MUX CH	TAPE	TK
LASL-25.01	1120/A140	B1032	6-1	1146-1,2	B22			
LASL-25.01	1121/A141	B1032	-1	1146-3,4	B22			
LASL-25.01	1122/A142	B1032	-3	1146-5,6	B22			
LASL-25.01	1123/A143	B1032	-3	1146-7,8	B22			
LASL-25.01	1124/A144	B1032	-3	1146-9,10	B22			
LASL-25.01	1125/A145	B1032	0-3	1146-11,12	B22			
LASL-25.02	1220/A140	C1110	12-1	2210-5,6	B72			
LASL-25.02	1221/A141	C1110	-1	2210-7,8	B72			
LASL-25.02	1222/A142	C1110	-3	2210-9,10	B72			
LASL-25.02	1223/A143	C1110	-3	2210-11,12	B72			
LASL-25.02	1224/A144	C1110	-3	2210-13,14	B72			
LASL-25.02	1225/A145	C1110	12-3	2206-13,14	B72			

FIGURE 14

REVISED
G. DANIELS 9652/L. NEELEY 1126

0132606



SANDIA EXP. NO	CODE NO.	DNA NO.	PORT NO.	TRAILER CABLE NO	TLR	SCOPE NO		B.U SCOPE NO	CODE NO B.U. SCOPE
2D-1112JP-60.01	2700	D5053	2J-2	2431	B20				2710
2D-1112JP-60.02	2701	D5054	2J-3	2432	B20				2711
—									

SHEET 1 ISSUE D

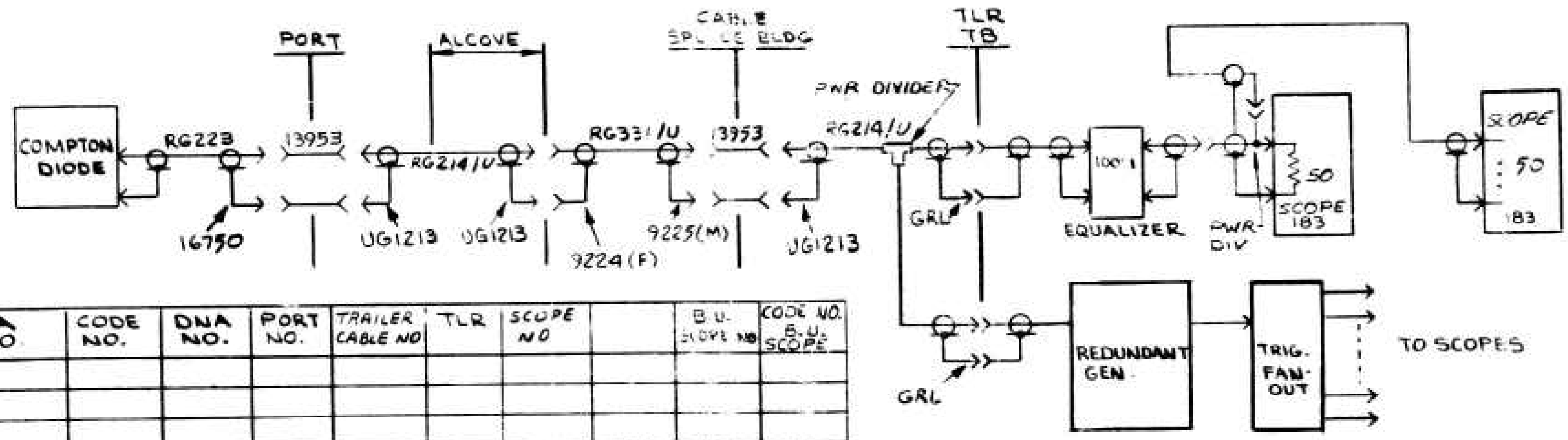
TITLE
CHANNEL DEF. DWG
COMPTON DIODE, TIME HISTORY
(HF1112)

DWG CLASSIFICATION LEVEL
UNCLASSIFIED

SIZE B | CODE IDENT NO. 14213 | DWG NUMBER T34047

FIGURE 15

REVISED G. DANIELS 9652/ L NEELEY 1-26



SANDIA EXP NO	CODE NO.	DNA NO.	PORT NO.	TRAILER CABLE NO	TLR	SCOPE NO		B.U. SCOPE NO	CODE NO. B.U. SCOPE
1C-1126JM-65.01	1700	C5055	1J-1	2462	338				1710
1C-1126JM-65.02	1701	C5056	1J-2	2463	838				1711
1C-1126JM-65.03	1702	C5057	1F-17	2512	872				1712
1C-1126JM-65.04	1703	C5058	1J-3	2513	872				1713
2D-1126JM-65.05	2705	D5059	2B-6	2526	322				2715
2D-1126JM-65.06	2706	D5060	2J-4	2527	822				2716

CHANNEL DEF DWG COMPTON DIODE, TRIGGER (HP1126)

SIZE B CODE IDENT NO. 14213 DWG NUMBER T31697

SHEET 1 ISSUE D

UNCLASSIFIED

FIGURE 16

Figure 17: A total of 17 quartz gages will be fielded on HUSKY PUP. 5 = 1 compensation will be used on the RG-331 cable and the data recorded on two scopes.

Figure 18: One neutron wheel package will be fielded which contains four discs. Two will rotate at 400 r.p.s. and two at 800 r.p.s. Recording is for magnetic pick-ups to give the exact rotational velocity at zero time.

Figures 19 & 20: Two types of High Time Resolved Momentum (HTRM) Gages are shown. The first is an LVT type gage but has a RG-22 cable for frequency response. The other gage is a carbon bridge type gage. It is uncertain at this time if it will be ready for HUSKY PUP. If not, two additional gages will be fielded.

Figure 21: This figure shows the standard LVT gage, however, four of them are on rings so a latch indicator is not used.

Figure 22: Four sets of accelerometers in triaxial configuration are being fielded to determine plate motion. Because of temperature compensation problems, the calibration will be a trailer insertion voltage instead of the normal downhole parallel step.

The remaining figures, 23 thru 28, are for the special system which is a continuation of MING BLADE. There are several basic differences between this system and the standard system. These differences are:

1. An EMR shield is maintained around the cables and alcove equipment from the test chamber ports to where the uphole cables are connected. To maintain this shield a 1 1/2" water pipe will be used to run the cables from the alcove to the test chamber. In addition an RF tight box will house all pertinent alcove equipment.

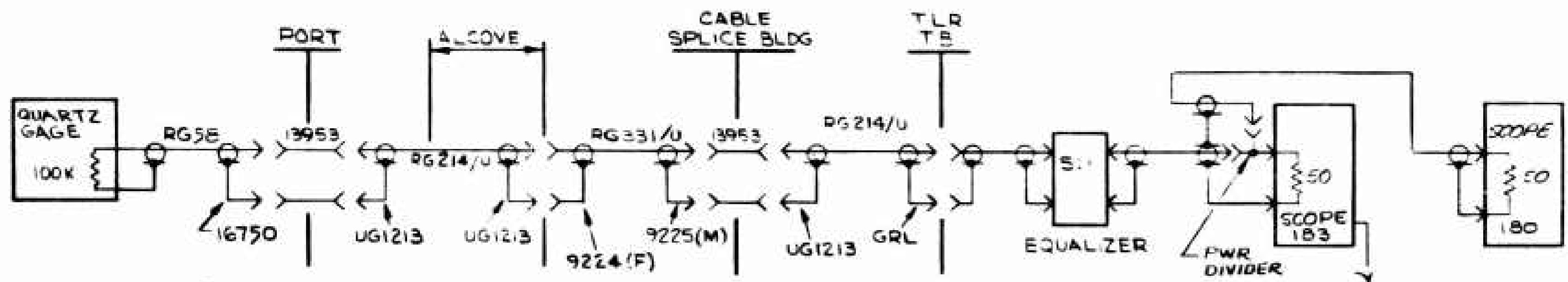
2. A downhole multiplex system will be used to put the data in an FM format which will make it less susceptible to cable bundle noise. In addition, the analog data will be sent on RG-22 cable with a blocking amplifier to prevent cable bundle noise from perturbing the mux channels.

3. Excitation of the gages will come from the alcove instead of the trailer.

4. Triaxial connectors for balanced cable will be used at the ports to carry the shield through uninterrupted, instead of the multipin connectors normally used.

D132606

ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKR	ENGR
G	REVISED 4/25/75	KEENER 7652 / NEELEY 1126			



SANDIA EXP NO.	CODE NO.	DNA NO	PORT NO	TRAILER CABLE NO	TLR SCOPE NO		BU SCOPE NO	CODE NO BU SCOPE
3E-5167RB-10.01	3600	E5000	3B-12	2517	[illegible]			3610
3E-5167RB-10.02	3601	E5001	3E-13	2518	B22			3611
3E-5167RB-10.03	3602	E5002	3B-14	2519	B22			3612
3E-5167RB-10.04	3603	E5003	3B-15	2520	B22			3613
3E-5167RB-10.05	3604	E5004	3B-16	2521	B22			3614
3E-5167RB-10.06	3605	E5005	3B-17	2528	B22			3615
1C-5167RB-15.01	1600	C5006	1F-7	2464	B72			1610
1C-5167RB-15.02	1601	C5007	1F-8	2465	B72			1611
1C-5167RB-15.03	1602	C5008	1F-9	2466	B72			1612
1C-5167RB-15.04	1603	C5009	1F-10	2467	B72			1613
2D-5167RB-15.05	2600	D5010	2J-1	2522	B20			2610
2D-5167RB-15.06	2601	D5068	2J-5	2523	B20			2611
2D-5167RB-15.07	2602	D5069	2J-6	2524	B20			2612
2D-5167RB-15.08	2603	D5070	2J-7	2525	[illegible]			2613

WASH-OFF FILM

SANDIA EXP NO.	CODE NO	DNA NO	PORT NO	TRAILER CABLE NO.	TLR	SCOPE NO		BU SCOPE NO	CODE NO BU SCOPE
2D-1536JL-21.05	2050	D5087	2D-13	2514	[illegible]				2080
2D-1536JL-21.06	2051	D5088	2D-14	2515	B20				2081
2D-1536JL-21.07	2052	D5089	2D-15	2516	B20				2082

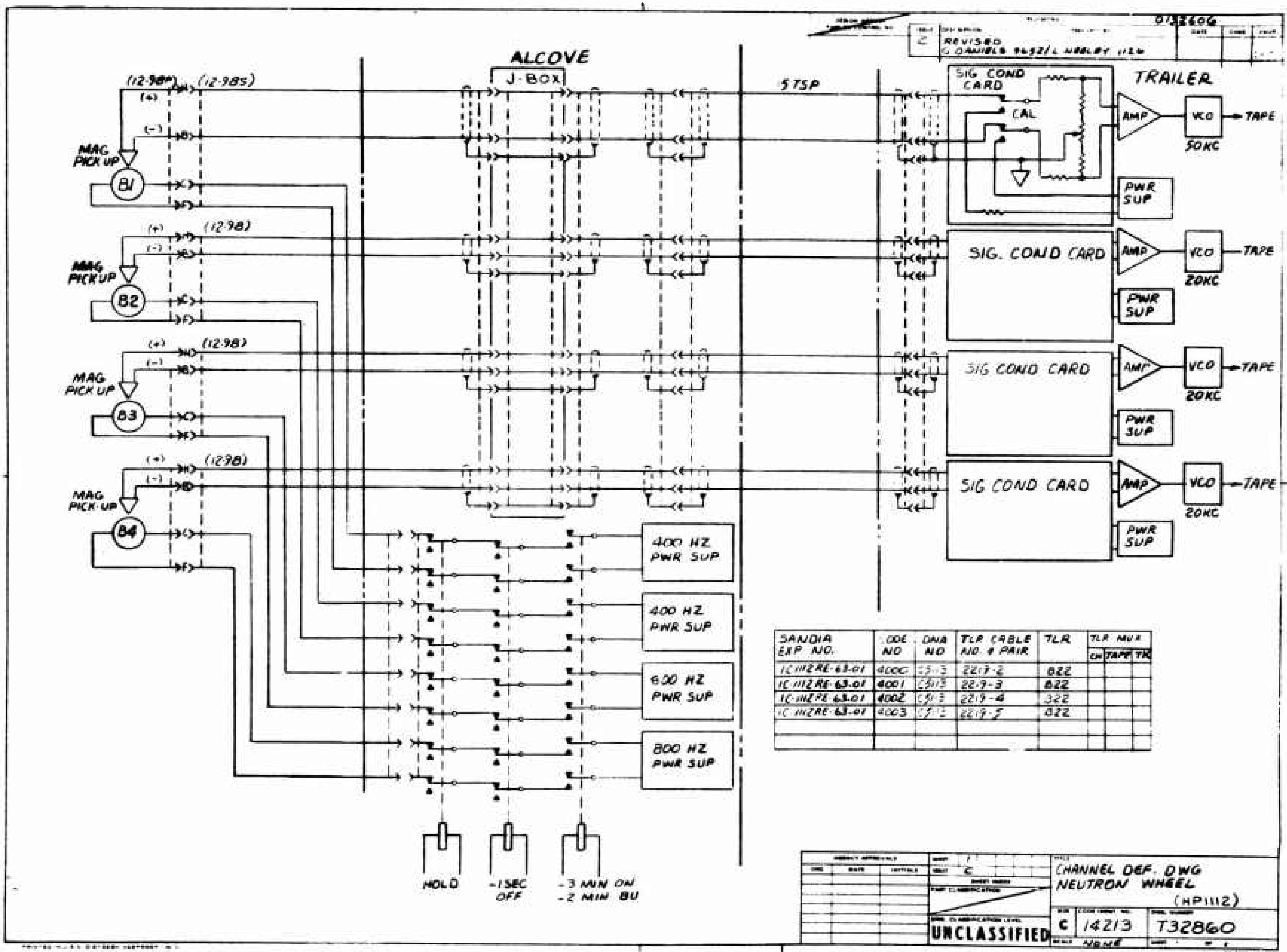
AGENCY APPROVALS | SHEET 1 | ISSUE G | UNCLASSIFIED

TITLE: CHANNEL DEF DWG QUARTZ GAGES (HP 1536) (HP 5167)

SIZE B | CODE IDENT NO. 4213 | DWG NUMBER T31581

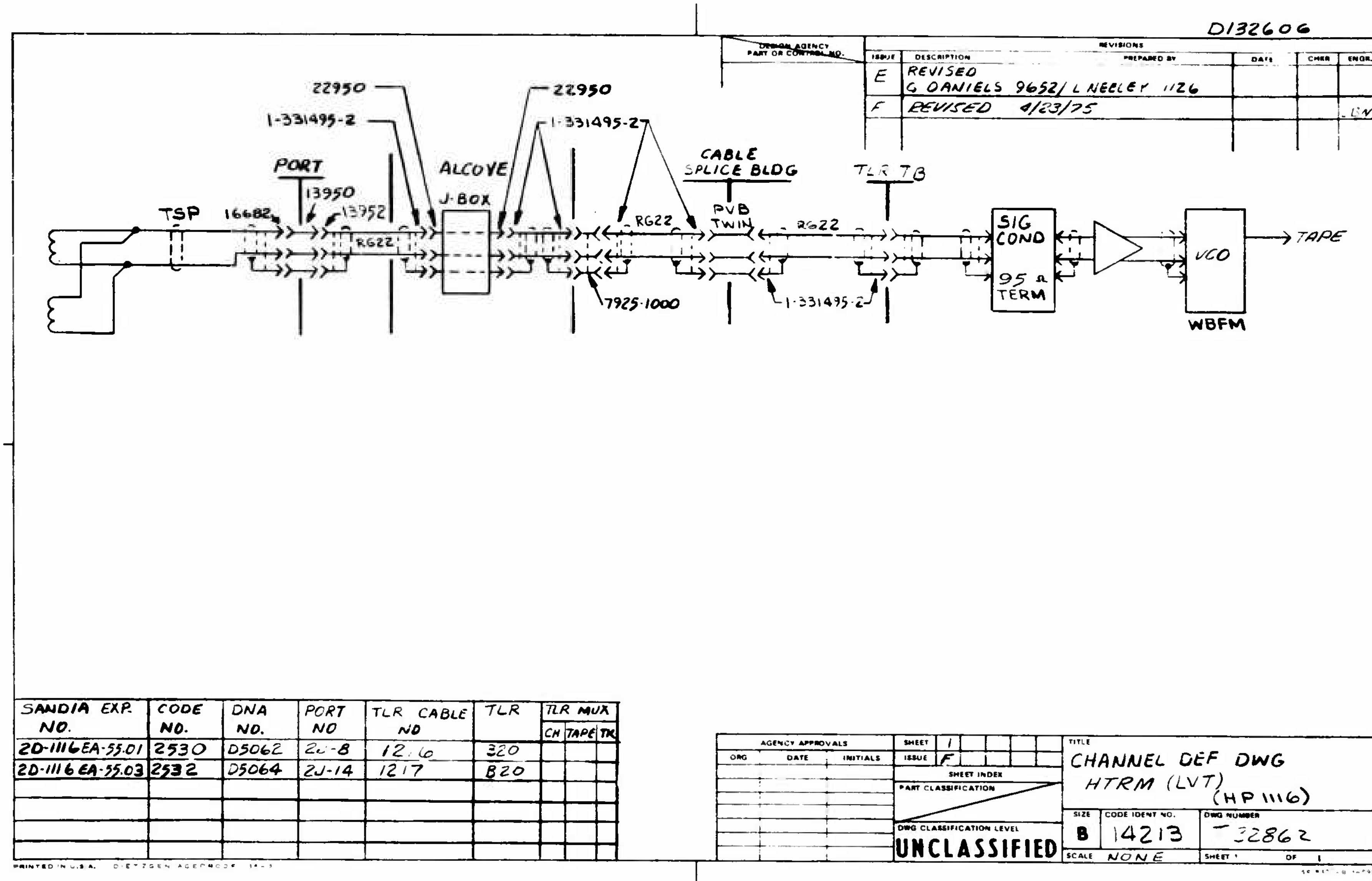
T31581

FIGURE 17



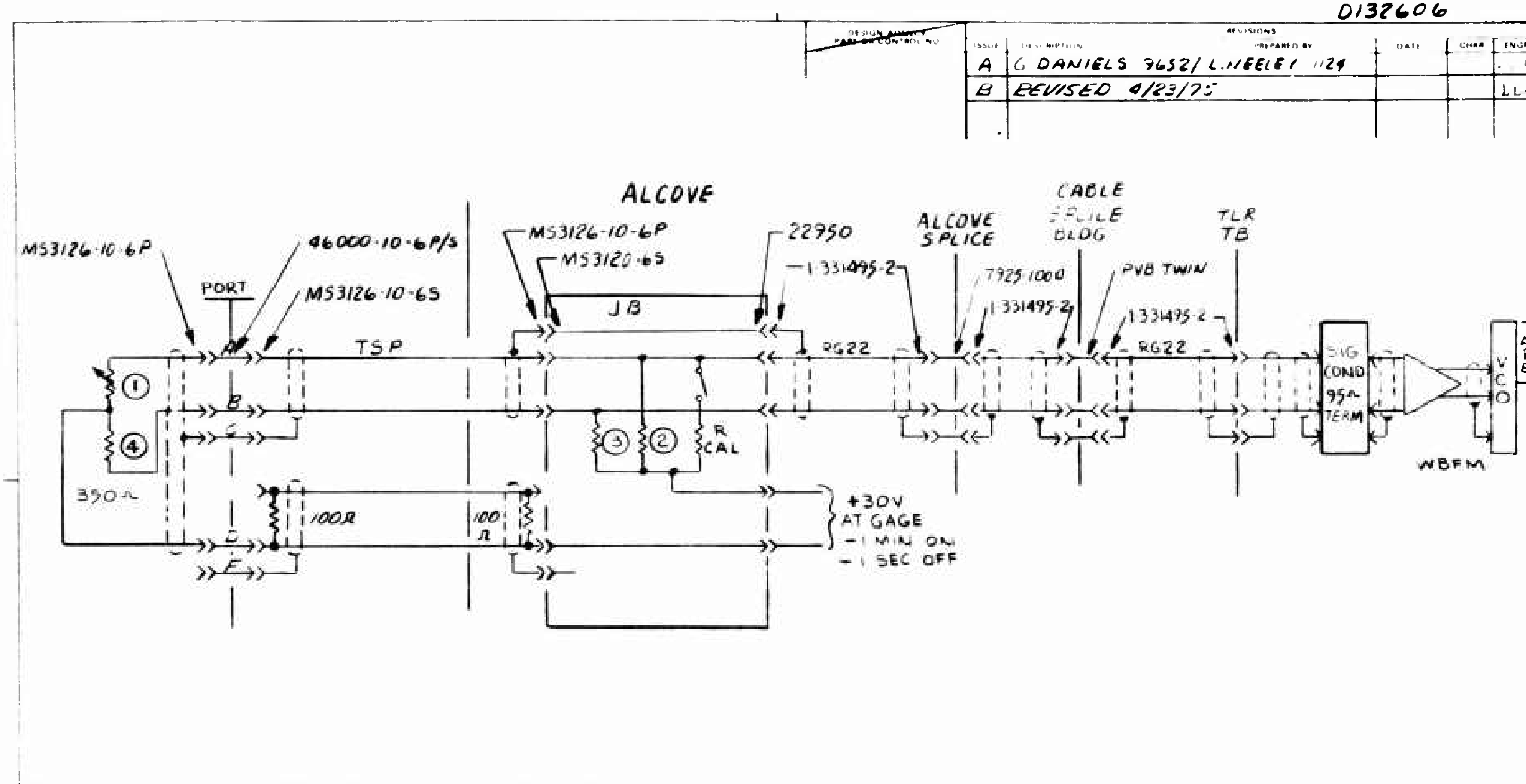
SANDIA EXP NO.	CODE NO	DNA NO	TLR CABLE NO. # PAIR	TLR	TLR MUX CH	TAPE	TR
1C1112RE-63-01	4000	5113	2219-2	822			
1C1112RE-63-01	4001	5113	22-9-3	822			
1C1112RE-63-01	4002	5113	2219-4	322			
1C1112RE-63-01	4003	5113	2219-5	822			

FIGURE 18



SANDIA EXP. NO.	CODE NO.	DNA NO.	PORT NO	TLR CABLE NO	TLR	TLR MUX CH	TLR MUX TAPE	TLR MUX TK
2D-1116EA-55.01	2530	D5062	2J-8	1216	320			
2D-1116EA-55.03	2532	D5064	2J-14	1217	B20			

FIGURE 19



SANDIA EXP NO.	CODE NO.	DNA NO	PORT NO	TLR CABLE NO	TLR	TLR MUX CH	TLR MUX TAPE	TLR MUX TK
2D-1116EA-55.02	2531	D5063	2J-9	1204	B20			
2D-1116EA-55.04	2533	D5065	2J-12	1205	B20			

AGENCY APPROVALS | SHEET 1 | ISSUE B | SHEET INDEX | PART CLASSIFICATION | DWG CLASSIFICATION LEVEL

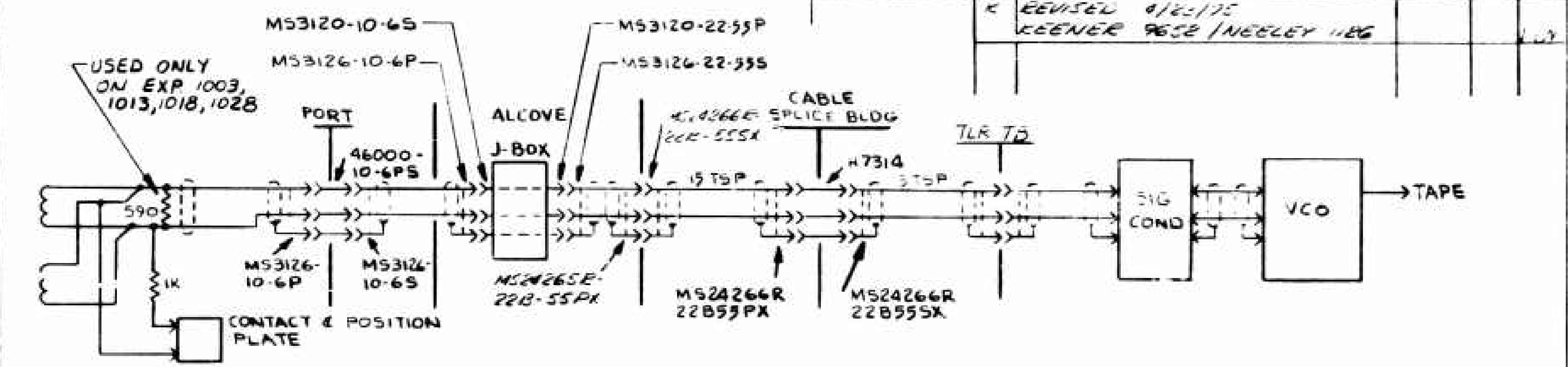
UNCLASSIFIED

TITLE: CHANNEL DEF DWG HTRM (HP1116)

SIZE	CODE IDENT NO	DWG NUMBER
B	14213	T35084

FIGURE 20

D132606



ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKR	ENGR
K	REVISED 4/22/75 KEENER 9652 / NEELEY 1186				

SANDIA EXP NO.	CODE NO.	DNA NO.	PORT NO	TLR CABLE NO # PAIR	TLR	TLR MUX CH	TLR MUX TAPE	TLR MUX TK	VCO BW
1B-1536JL-20.04	1003	B5074	1C-9	2213-6	838				50KC
1B-1536JL-20.06	1013	B5076	1C-15	2213-7	838				
1C-1536JL-20.07	1018	C5077	1J-9	2213-8	838				
1C-1536JL-20.09	1028	C5079	1F-16	2213-9	838				
1B-1536JL-22.01	1090	B5090	1C-16	2213-4	838				
1C-1536JL-22.04	1091	C5093	1G-4	2213-5	838				50KC
1C-1116EA-40.01	1500	C5029	1G-7	2213-2	838				50KC
1C-1116EA-40.02	1501	C5030	1G-3	2213-3	838				
1B-1116EA-70.01	1510	B5021	1D-7	2219-8	822				
1B-1116EA-70.02	1511	B5022	1D-8	2219-9	822				
1B-1116EA-70.03	1512	B5023	1D-9	2219-10	822				
1B-1116EA-70.04	1513	B5024	1D-10	2219-11	822				
1C-1116EA-70.05	1520	C5025	1U-1	2219-12	822				
1C-1116EA-70.06	1521	C5026	1U-2	2219-13	822				
1C-1116EA-70.07	1522	C5027	1U-3	2219-14	822				
1C-1116EA-70.08	1523	C5028	1U-4	2219-15	822				50KC

SANDIA EXP NO.	CODE NO	DNA NO	PORT NO	TLR CABLE NO. # PAIR	TLR	TLR MUX CH	TLR MUX TAPE	TLR MUX TK	VCO BW
2D-1116EA-40.03	2500	D5031	2J-10	2223-12	820				20KC
2D-1116EA-40.04	2501	D5032	2J-11	2223-13	820				20KC
2D-8312MM-76.01	2820	D5125	2E-7	2223-9	820				20KC
2D-8312MM-76.02	2821	D5126	2E-8	2223-10	820				20KC
2D-8312MM-76.03	2822	D5127	2E-9	2223-11	820				20KC
1B-1116EA-70.09	1514	B5134	1D-11	2213-10	838				[illegible]0KC
1B-1116EA-70.10	1515	B5135	1D-12	2213-11	838				50KC
1C-1116EA-70.11	1524	C5136	1U-5	2213-12	838				20KC
1C-1116EA-70.12	1525	C5137	1U-6	2213-13	838				20KC

SHEET 1 ISSUE K

TITLE: CHANNEL DEF. DWG LVT (HP1116) (HP1536) (HP8312)

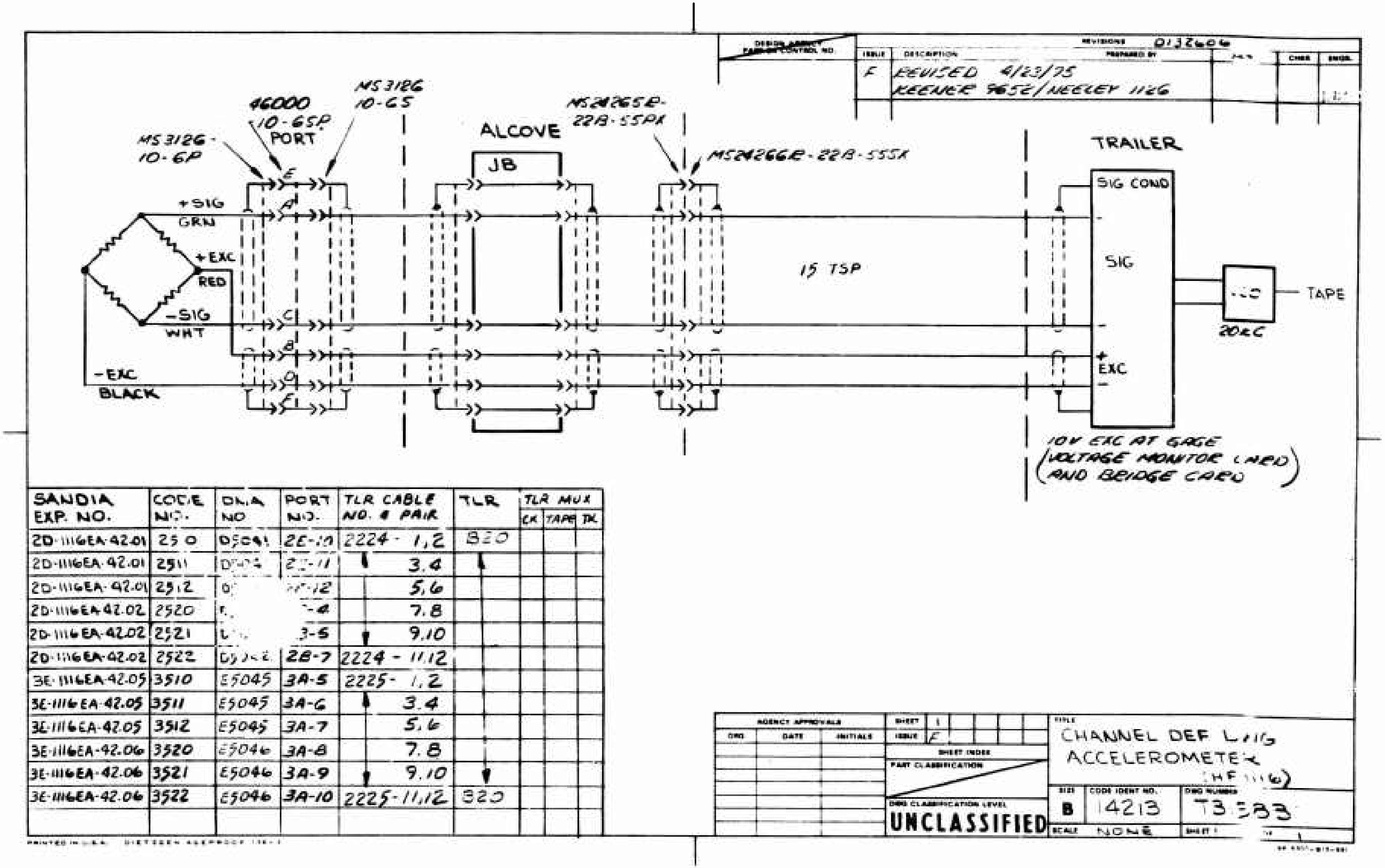
DWG CLASSIFICATION LEVEL: UNCLASSIFIED

SIZE B | CODE IDENT NO. 14213 | DWG NUMBER T31585

SCALE NONE | SHEET 1 OF 1

T31585

FIGURE 21



SANDIA EXP. NO.	CODE NO.	DNA NO	PORT NO.	TLR CABLE NO. & PAIR	TLR	TLR MUX CK	TAPE	TK
2D-1116EA-42.01	25 0	[illegible]	2E-10	2224-1,2	B20			
2D-1116EA-42.01	2511	[illegible]	[illegible]	3.4				
2D-1116EA-42.01	2512	[illegible]	[illegible]	5,6				
2D-1116EA-42.02	2520	[illegible]	[illegible]	7.8				
2D-1116EA-42.02	2521	[illegible]	3-5	9.10				
2D-1116EA-42.02	2522	[illegible]	2B-7	2224-11,12				
3E-1116EA-42.05	3510	E5045	3A-5	2225-1,2				
3E-1116EA-42.05	3511	E5045	3A-6	3.4				
3E-1116EA-42.05	3512	E5045	3A-7	5,6				
3E-1116EA-42.06	3520	E5046	3A-8	7.8				
3E-1116EA-42.06	3521	E5046	3A-9	9.10				
3E-1116EA-42.06	3522	E5046	3A-10	2225-11,12	820			

FIGURE 22

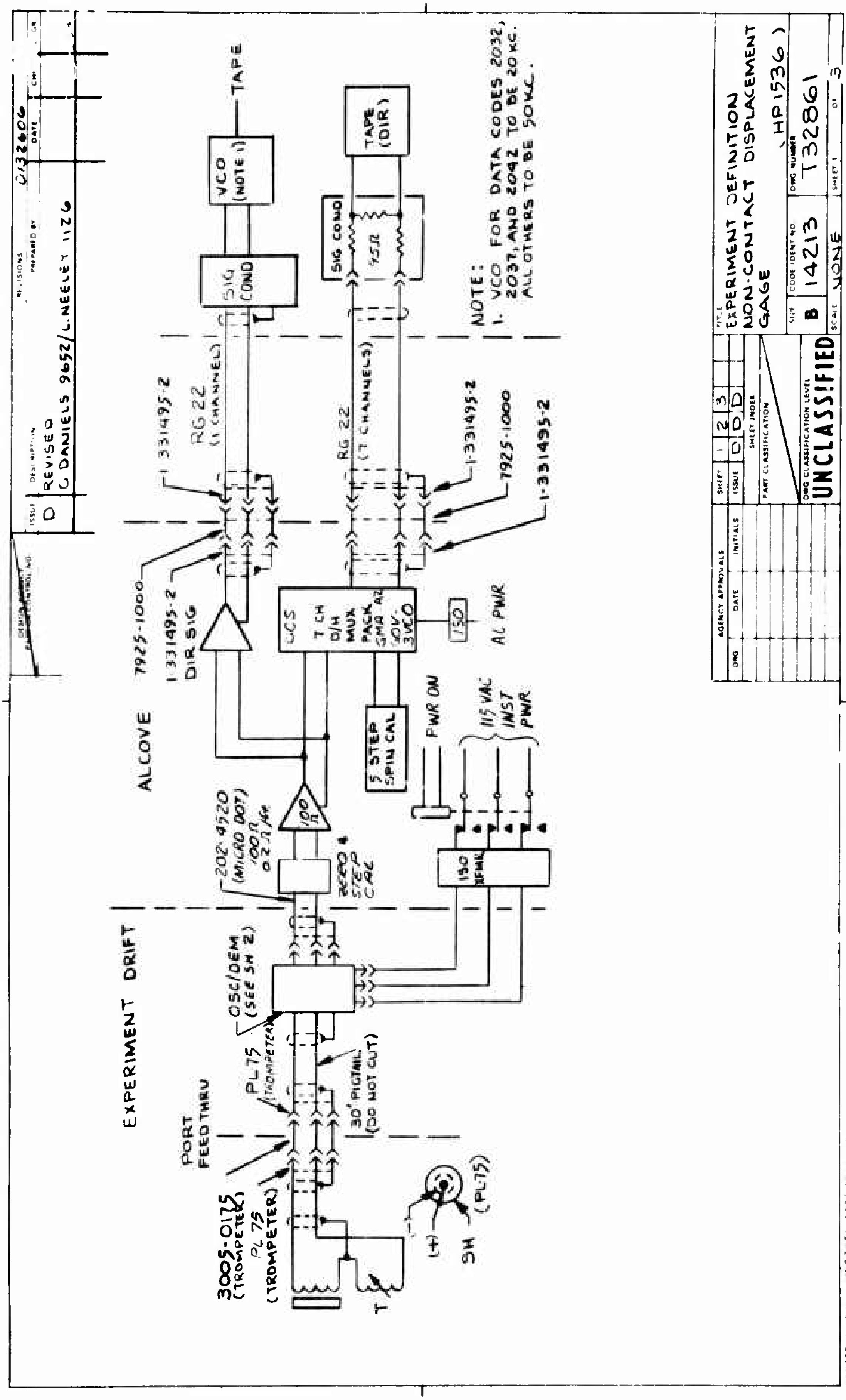
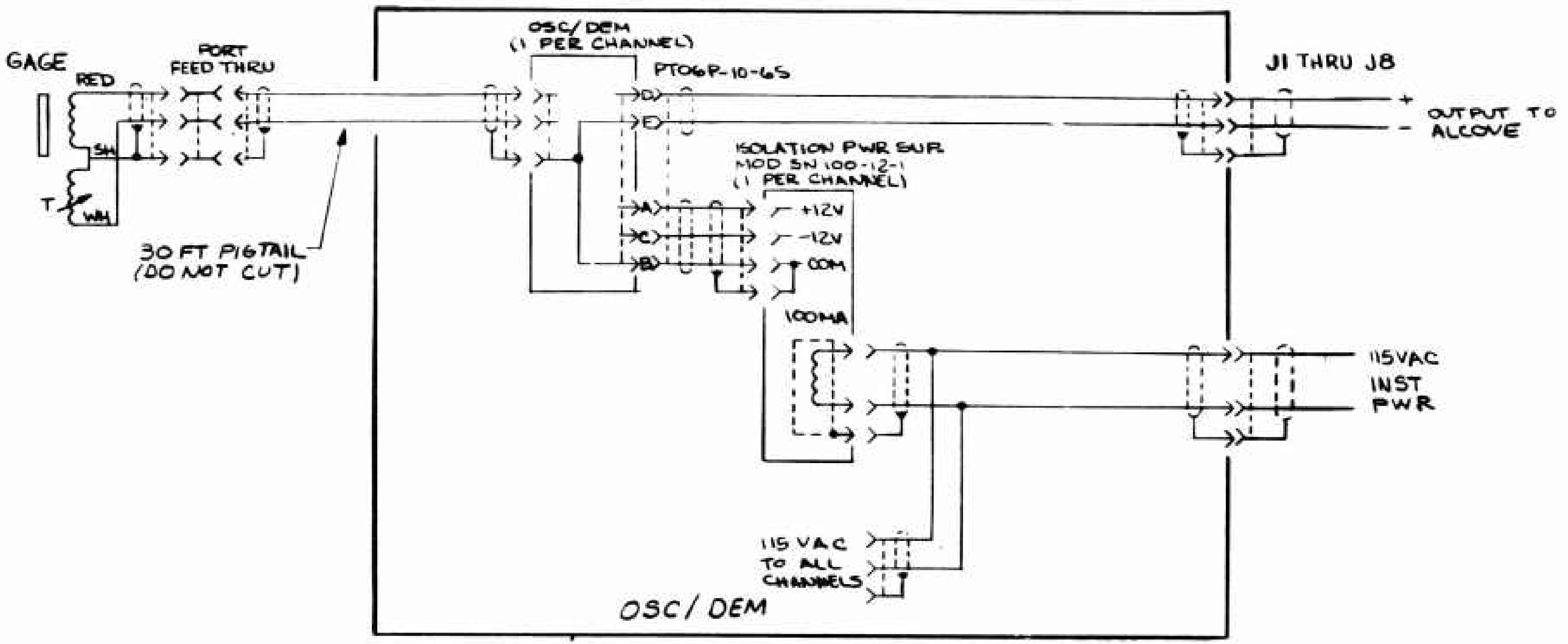

REVISED
C DANIELS 9652/L.NEELEY 1126
EXPERIMENT DRIFT
ALCOVE
TAPE
VCO (NOTE 1)
SIG COND
TAPE (DIR)
RG 22 (1 CHANNEL)
RG 22 (7 CHANNELS)
1-331495-2
7925-1000
1-331495-2 DIR SIG
NOTE:
1. VCO FOR DATA CODES 2032, 2037, AND 2042 TO BE 20 KC. ALL OTHERS TO BE 50KC.
PWR ON
115 VAC INST PWR
AC PWR
5 STEP SPIN CAL
ZERO & STEP CAL
202-4520 (MICRO DOT) 100Ω 0.2Ω/ft
OSC/DEM (SEE SH 2)
PL 75 (TROMPETER)
30' PIGTAIL (DO NOT CUT)
PORT FEED THRU
3005-0175 (TROMPETER)
PL 75 (TROMPETER)
(PL 75)
SH
EXPERIMENT DEFINITION NON-CONTACT DISPLACEMENT GAGE (HP1536)
B 14213 T32861
UNCLASSIFIED
SCALE NONE
SHEET 1 OF 3

FIGURE 23



NOTES:

1. PIT NO.2 LOCATION IS SS949, AND CONTAINS TWO Ø/D BOXES.
2. PIT NO.3 LOCATION IS SS768, AND CONTAINS TWO Ø/D BOXES.
3. EACH BOX CONTAINS 4 P.C. CARDS. EACH CARD HAS TWO Ø/D CHANNELS.
4. CARD SLOTS ARE NUMBERED FROM COMPONENT SIDE 1 THRU 4, CIRCUITS ARE RIGHT (R) AND LEFT (L).

UNCLASSIFIED

B | 14213 | T32861

NONE | 2

PRINTED IN U.S.A. K&E HERCULENE NO 19 1153

FIGURE 24

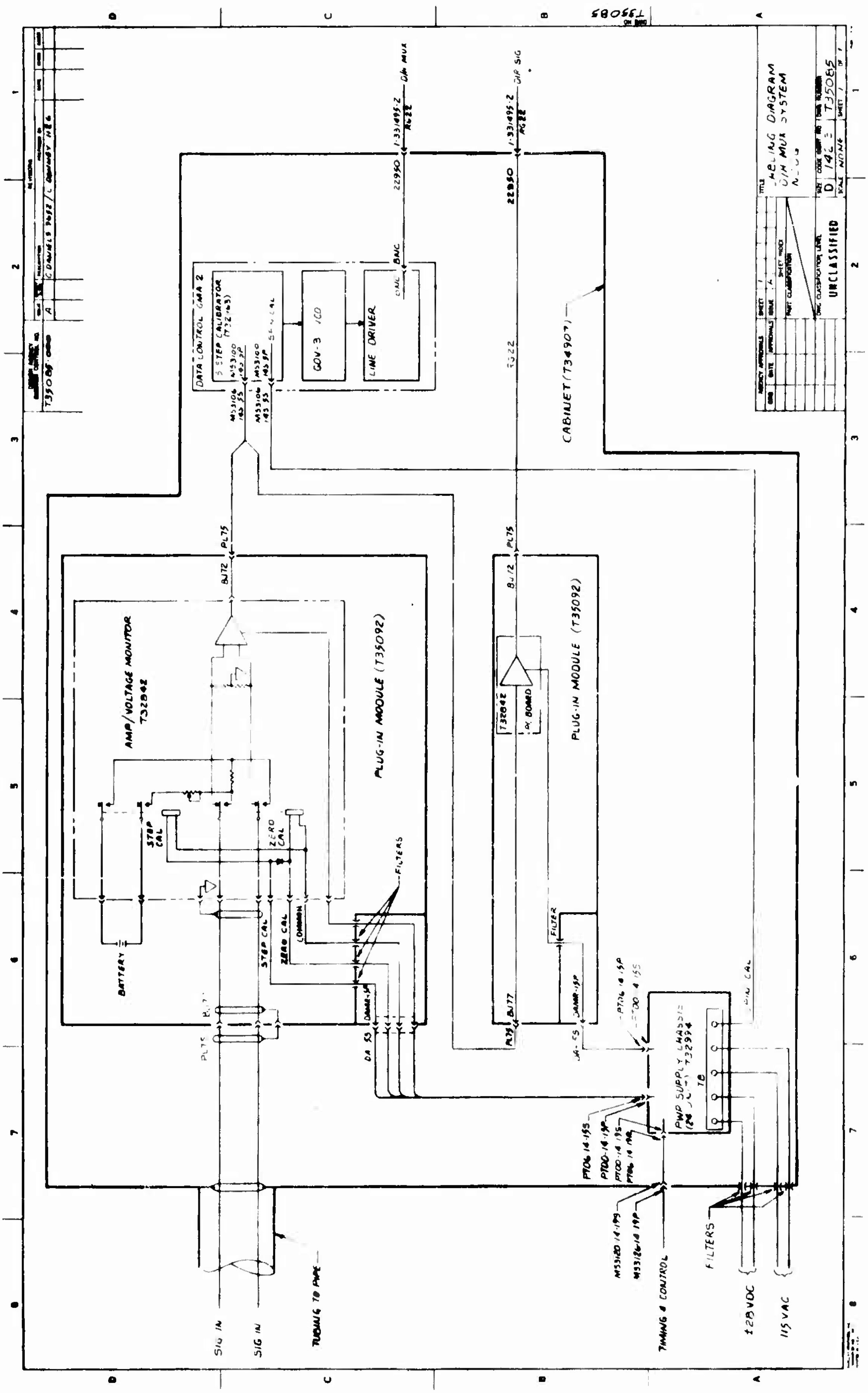

PLUG-IN MODULE (T35092)
AMP/VOLTAGE MONITOR T32842
DATA CONTROL CMA 2
LINE DRIVER
CABINET (T34907)
BATTERY
STEP CAL
ZERO CAL
COMMON
FILTERS
SIG IN
SIG IN
TUBING TO PIPE
TIMING & CONTROL
+28VDC
115VAC
UNCLASSIFIED
T35085

FIGURE 25

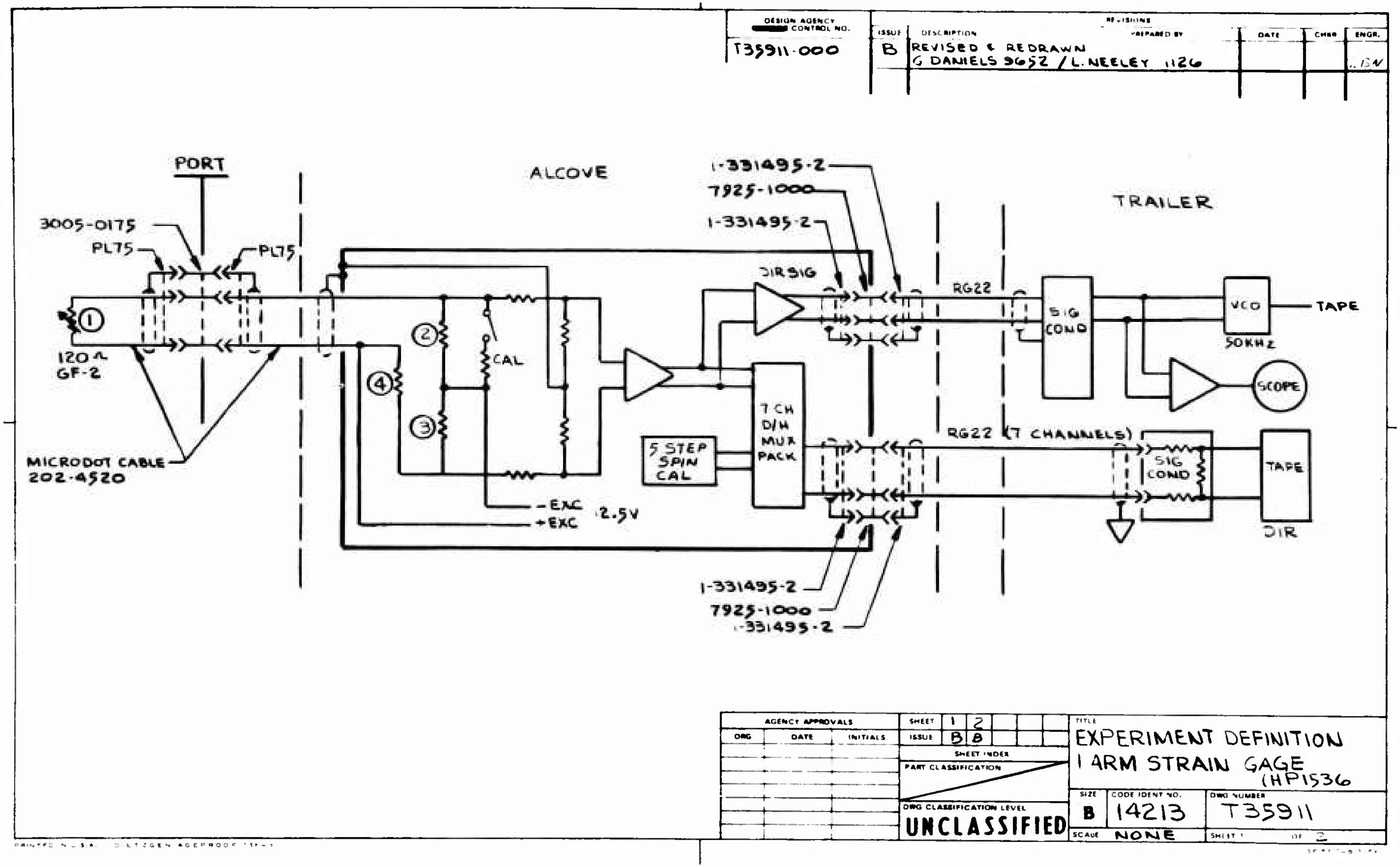

DESIGN AGENCY CONTROL NO.
T35911-000
REVISIONS
ISSUE
DESCRIPTION
PREPARED BY
DATE
CHKR
ENGR.
B
REVISED & REDRAWN
G DANIELS 9652 / L. NEELEY 1126
PORT
ALCOVE
TRAILER
3005-0175
PL75
PL75
120Ω
GF-2
MICRODOT CABLE
202-4520
CAL
-EXC
+EXC
2.5V
DIR SIG
5 STEP SPIN CAL
7 CH D/H MUX PACK
1-331495-2
7925-1000
1-331495-2
1-331495-2
7925-1000
1-331495-2
RG22
RG22 (7 CHANNELS)
SIG COND
SIG COND
VCO
50KHZ
TAPE
SCOPE
TAPE
DIR
AGENCY APPROVALS
ORG
DATE
INITIALS
SHEET 1 2
ISSUE B B
SHEET INDEX
PART CLASSIFICATION
DWG CLASSIFICATION LEVEL
UNCLASSIFIED
TITLE
EXPERIMENT DEFINITION
1 ARM STRAIN GAGE
(HP1536
SIZE
B
CODE IDENT NO.
14213
DWG NUMBER
T35911
SCALE
NONE
SHEET
OF 2

FIGURE 26

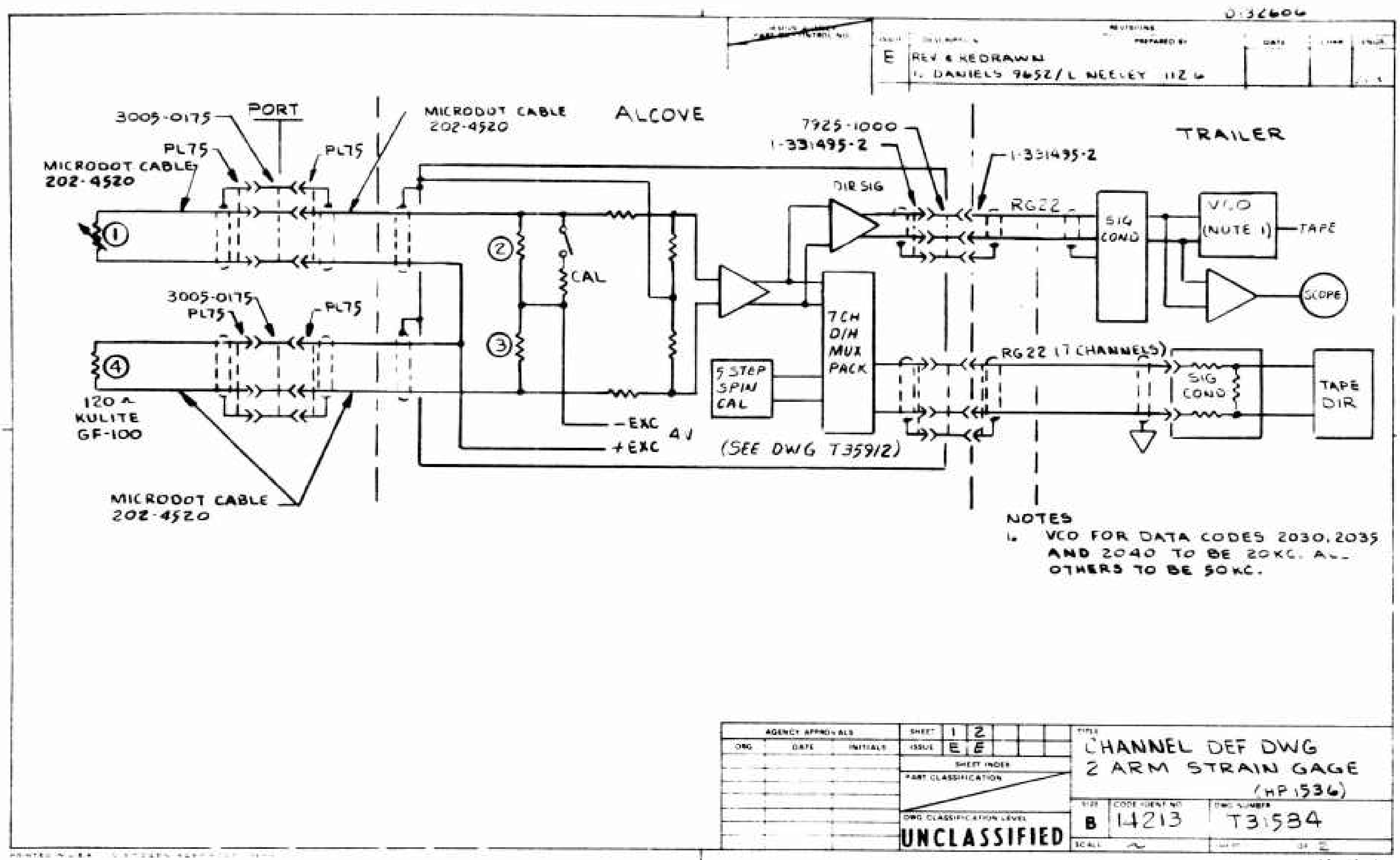

0-32606
E
REV & REDRAWN
I. DANIELS 9652/L NEELEY 112 6
PORT
ALCOVE
TRAILER
3005-0175
PL75
MICRODOT CABLE
202-4520
MICRODOT CABLE 202-4520
7925-1000
1-331495-2
1-331495-2
DIR SIG
RG22
SIG COND
VCO (NOTE 1)
TAPE
SCOPE
CAL
7CH D/H MUX PACK
5 STEP SPIN CAL
RG22 (7 CHANNELS)
SIG COND
TAPE DIR
120 Ω KULITE GF-100
-EXC
+EXC
4 V
(SEE DWG T35912)
NOTES
1. VCO FOR DATA CODES 2030, 2035 AND 2040 TO BE 20KC. ALL OTHERS TO BE 50KC.
CHANNEL DEF DWG
2 ARM STRAIN GAGE
(HP 1536)
B
14213
T31584
UNCLASSIFIED

FIGURE 27

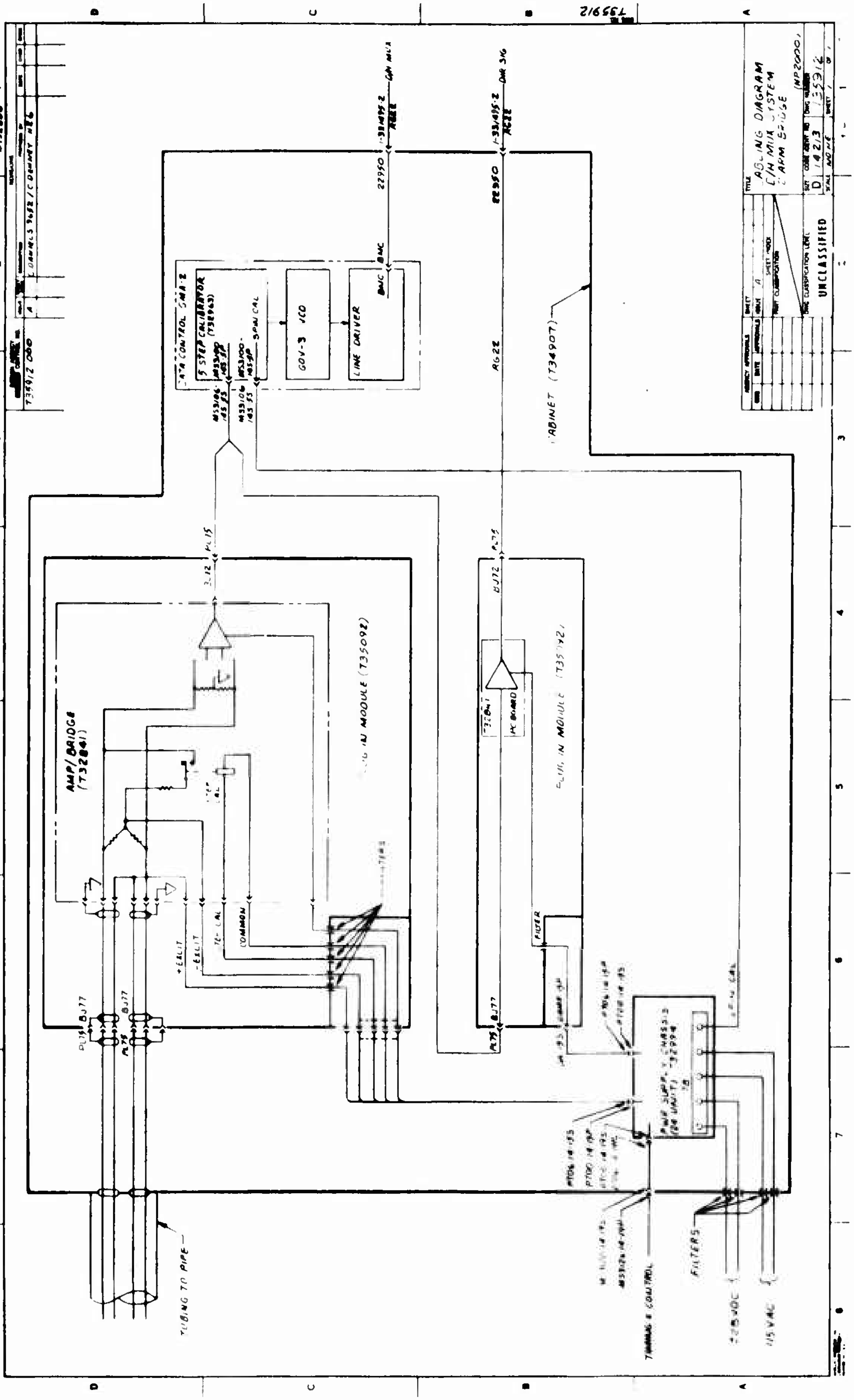

AMP/BRIDGE (T32841)
5 STEP CALIBRATOR (T32963)
GOV-3 VCO
LINE DRIVER
CABINET (T34907)
RG22
COMMON
FILTERS
TUBING TO PIPE
115 VAC
UNCLASSIFIED

FIGURE 28

LASL INSTRUMENTATION

on

HUSKY PUP

The LASL, in addition to providing the timing and firing of the HUSKY PUP source device, of the main auxiliary closures in the pipe (DAC's and TAPS), and of several special operations for individual experiments, will be fielding several other sets of measurements. Briefly, these are:

(Viewgraph 1)

While each of these will be discussed individually, a few general remarks may lend prospective.

The measurements on the STU at T.C. #1 are sort of "stand-alone" in this matrix. The signals-strain, acceleration, displacement, and internal pressure - are all relatively low frequency, and thus compatible with TSP cables and tape recording.

The other four sets of measurements are all prompt signal based using high-frequency transmission and oscilloscope recording. Additionally, they all require precise time cross referencing. Thus, the device REACTION HISTORY measurement will furnish the basic time tie and will provide the source input reference for the OPTICAL ALPHA and the TOTAL GAMMA measurements.

(Viewgraph 2)

This viewgraph shows the geographical locations of the three so-called "close-in" measurements in relation to the WP and the other measurements in this area.

The five REACTION HISTORY detectors (here listed as γ-Alpha) are distributed along two collimator pipes behind the OPTICAL ALPHA pipe at distances from 25 to 28 meters from the WP.

The SLIT-TOA detectors are located just over 10 meters from the WP. The slit is just over two meters distant.

Optical signals for the OPTICAL ALPHA system are relayed by mirrors and lenses into the alcove where the photomultiplier detectors are located in an elaborate FARADAY shield system. The electric and magnetic field detectors are in the main OPTICAL ALPHA pipe.

Inclosure 11

(Viewgraph 3)

This viewgraph is a schematic of the cable and recording station layout to date (4/30/75).

The main station, SKID V, will be recording device-related signals (FRONT-END), the device REACTION HISTORY signals, and the OPTICAL ALPHA optical signals. If we go ahead with the TOTAL GAMMA measurement, it will probably be recorded in this station.

The SLIT-TOA signals will be recorded in the LITTLE ALPHA station (shack) with cross timing reference to SKID V.

The supporting electric and magnetic field measurements associated with OPTICAL ALPHA will be recorded in the ANCHORCITA station.

Though the details of the matrices of the recording systems are still being developed, it is expected that the total oscilloscope compliment of these three stations will exceed 200 in number.

The STU signals - strain, acceleration, displacement, and pressure - will be recorded on tape in the J-8-10 trailer with a primary and backup tape deck. While this diagram shows six each 19 pair bundles in the up-hole run, I believe there is a request for an additional 15 pair cable to handle the total of 126 pairs required.

LASL ON HUSKY PUP

1. STU IN T.C. #1

   42 STRAIN GAGES
   17 ACCELEROMETERS
   6 DISPLACEMENT
   1 PRESSURE

   126 TSP TO J-8-10 TRLR.

2. DEVICE REACTION HISTORY - CLOSE-IN

   5 DETECTORS - 5 COAX CABLES TO SKID V

3. SLIT-TOA ON DEBRIS COUPLING ADD-ON - CLOSE-IN

   6 DETECTORS - 5 COAX CABLES TO LITTLE ALPHA

4. OPTICAL ALPHA - CLOSE-IN

   19 OPTICAL DETECTORS - 19 COAX CABLES TO SKID V
   7 E & B DETECTORS - 7 COAX CABLES TO ANCHORCITA

5. TOTAL GAMMA BEHIND T.C. #1 (TENTATIVE)

   SEVERAL DETECTORS - 1 COAX CABLE TO SKID V

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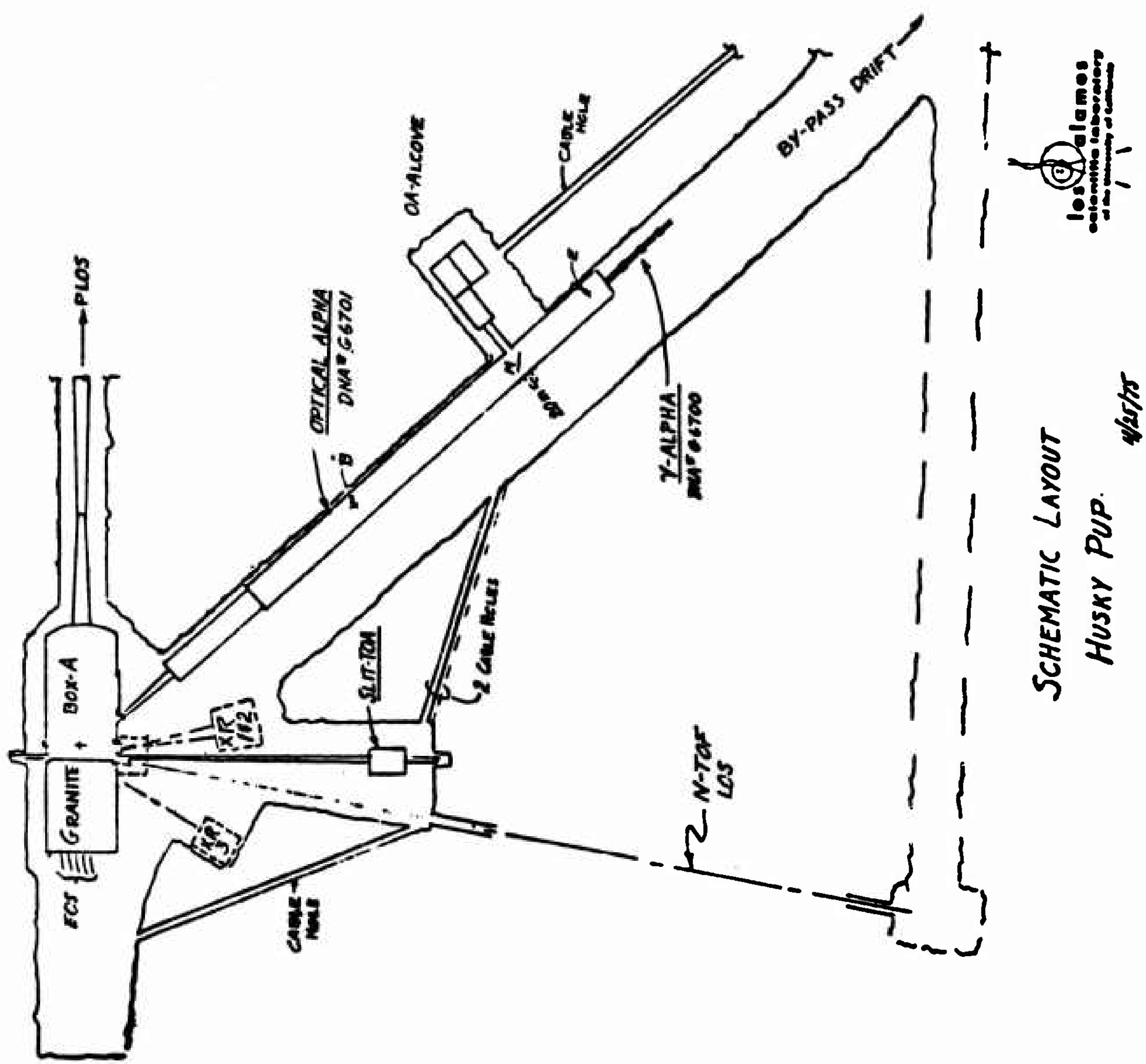
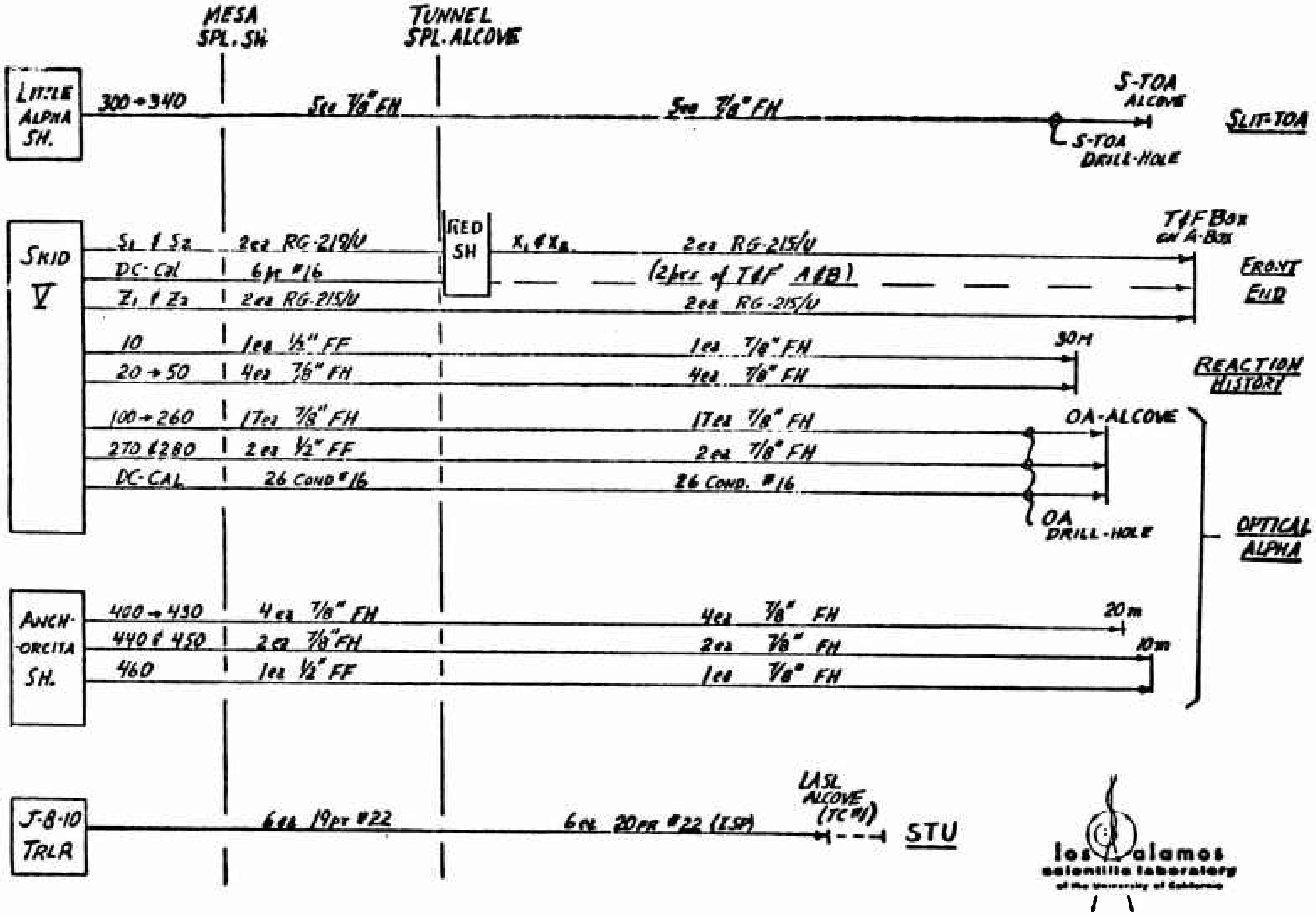

PLOS
OPTICAL ALPHA
DNA# G6701
OA-ALCOVE
CABLE HOLE
BY-PASS DRIFT
Y-ALPHA
DNA# G6700
BOX-A
GRANITE
ECS
XR 1&2
XR 3
SLIT-TOA
2 CABLE HOLES
N-TOF LOS
CABLE HOLE
SCHEMATIC LAYOUT
HUSKY PUP



SCHEMATIC

LASL – HUSKY PUP CABLING

McG 4/23/75

HUSKY PUP
LASL J-14
ALPHA SYSTEM

PURPOSE: 1) TO RECORD REACTION TIME HISTORY OF DEVICE,
2) RECORD ZIPPER PERFORMANCE,
3) RECORD HE TRANSIT TIME,
4) OBTAIN YIELD ESTIMATE.

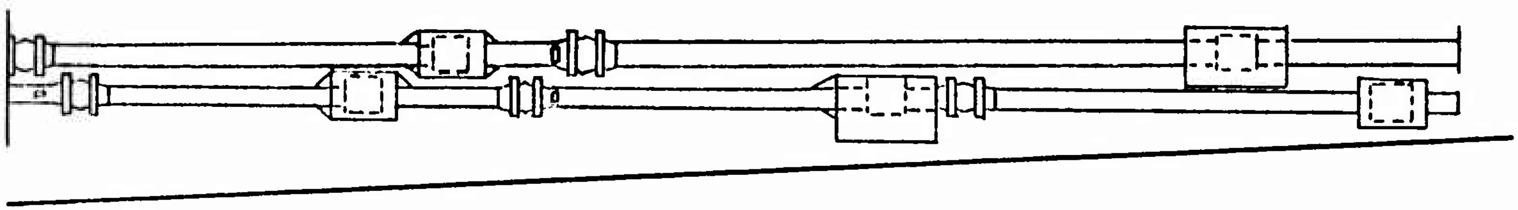
LOCATION: IN EXTENDED LOS OF OPTICAL ALPHA SYSTEM.

RECORDING: ALPHA V

DETECTOR No.	LOCATION, M	CABLE	MAX D.C. VOLTAGE	MAX CURRENT, A
10	30.3	RG331/RF-13	8 kV	60
20	26	RF-13	NONE	1000
30	25.6	RF-13	NONE	1000
40	29.6	RF-13	NONE	200
50	28	RF-13	NONE	200
Z MONITOR 2 EA PHOTOMULTIPLIER	~1	RG-215	3 kV	1000
X UNIT 2 EA, NO DET.	~1	RG219/RG-215	NONE	1000

GROUNDING

CABLE SHIELDS ARE TIED TO DETECTOR HOUSING AND GROUNDED TO LOS PIPE. AT THE RECORDING END, SHIELDS ARE TIED TO STATION WALL AND TO BURIED EARTH GROUND.



Alpha Detectors

HUSKY PUP
LASL J-14
DCAO
SLIT TOA EXPERIMENT

PURPOSE: To measure time dependent velocity of flyer plate. Gamma radiation from the plate is imaged through a pinhole (slit) and recorded by an array of detectors.

LOCATION: LOS to ~11 m, detectors at 10 m.

DETECTOR TYPE: FLUOR PHOTODIODE

CABLE: 5 EA RF13

RECORDING: Little alpha

MAX D.C. Voltage: 6 kV

MAX Current: 10A

GROUNDING: Cable shield tied to detector housing and grounded to LOS pipe. Cable shield is tied to recording station wall and to buried earth ground.

MAX temperature permitted: 63° C.

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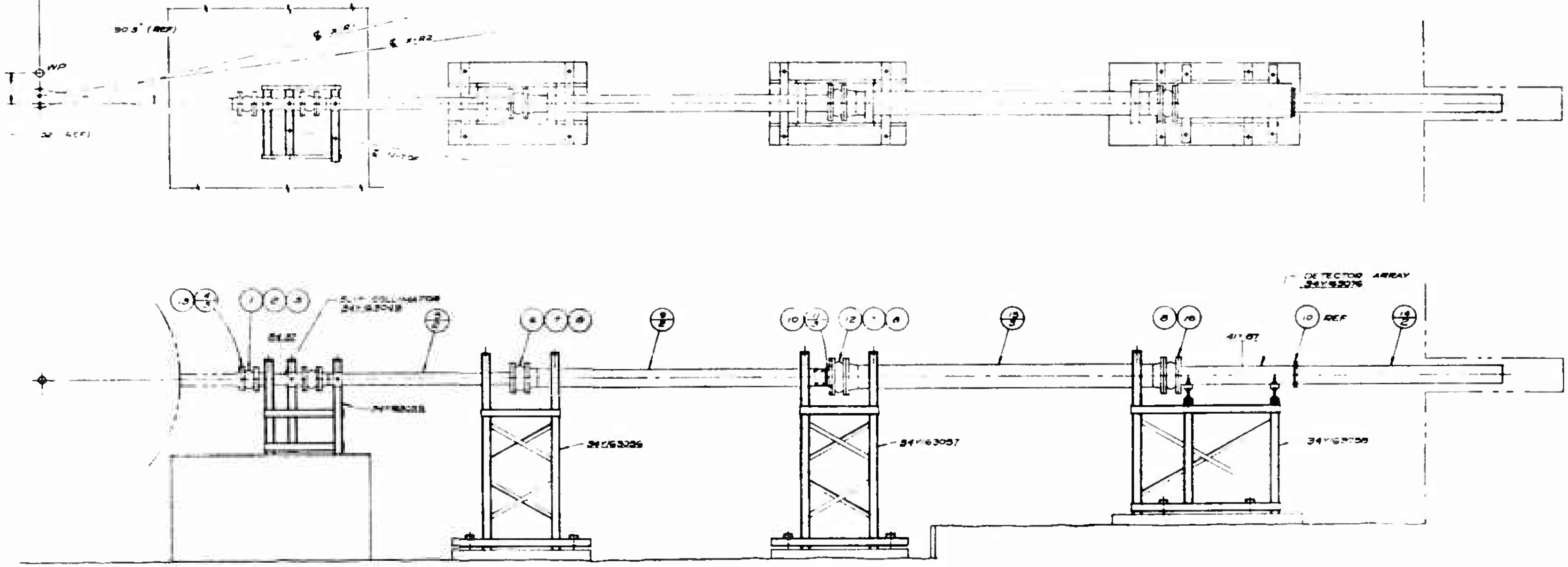
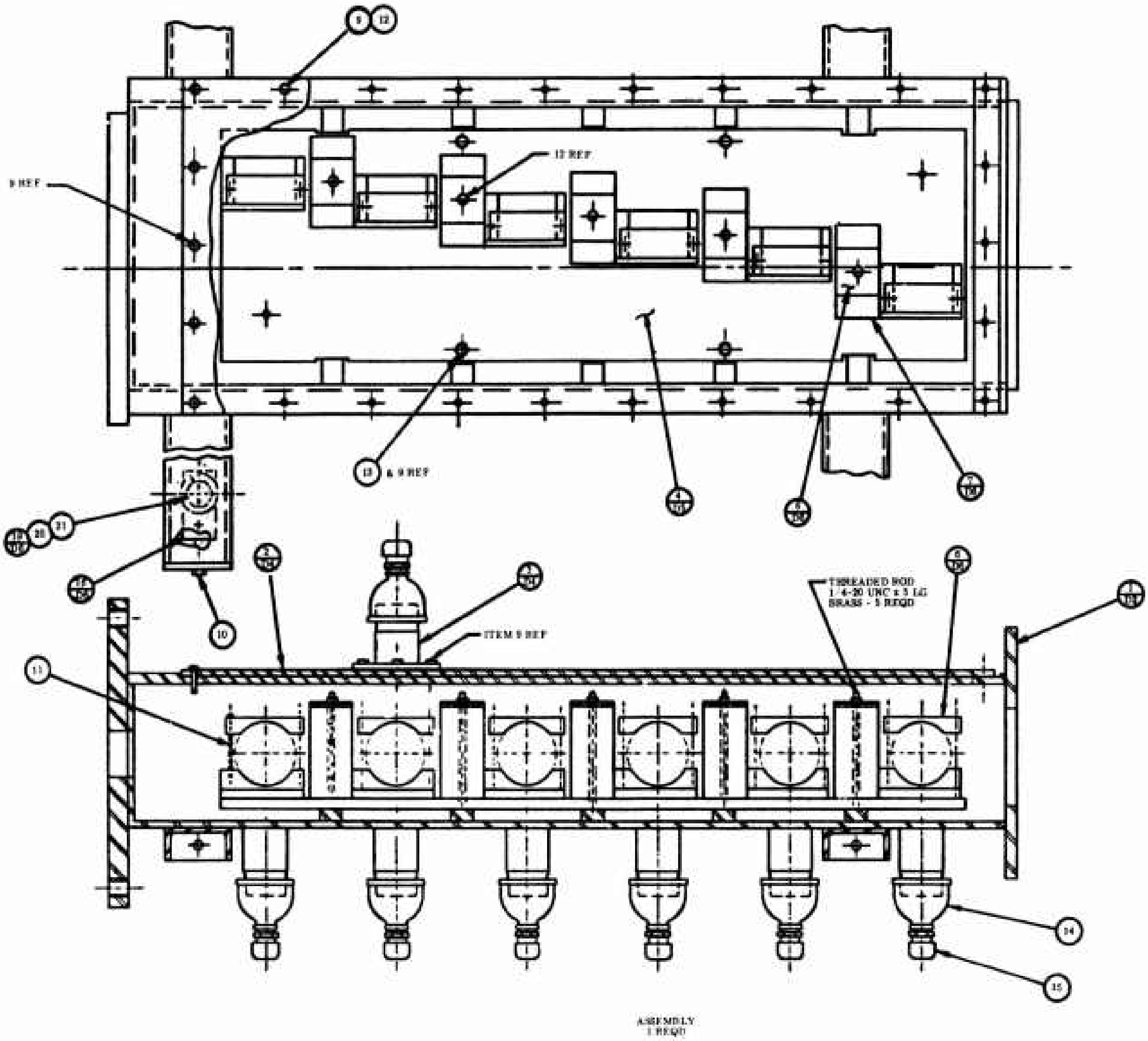


HUSKY PUP
S-TOA EXPERIMENT
PIPELINE ASSEMBLY


12 REF
9 REF
13 & 9 REF
ITEM 9 REF
THREADED ROD
1/4-20 UNC x 5 LG
BRASS - 5 REQD
ASSEMBLY
1 REQD

HUSKY PUP
LASL, J-14
OPTICAL ALPHA

PURPOSE: TO COMPARE REACTION TIME HISTORY OF THE DEVICE OBTAINED BY RECORDING OPTICAL SIGNALS AT VARIOUS WAVELENGTHS WITH THAT OBTAINED BY CONVENTIONAL GAMMA TECHNIQUES.

LOCATION: LOS TO 23 M, DETECTORS IN 20 M ALCOVE.

RECORDING: ALPHA V

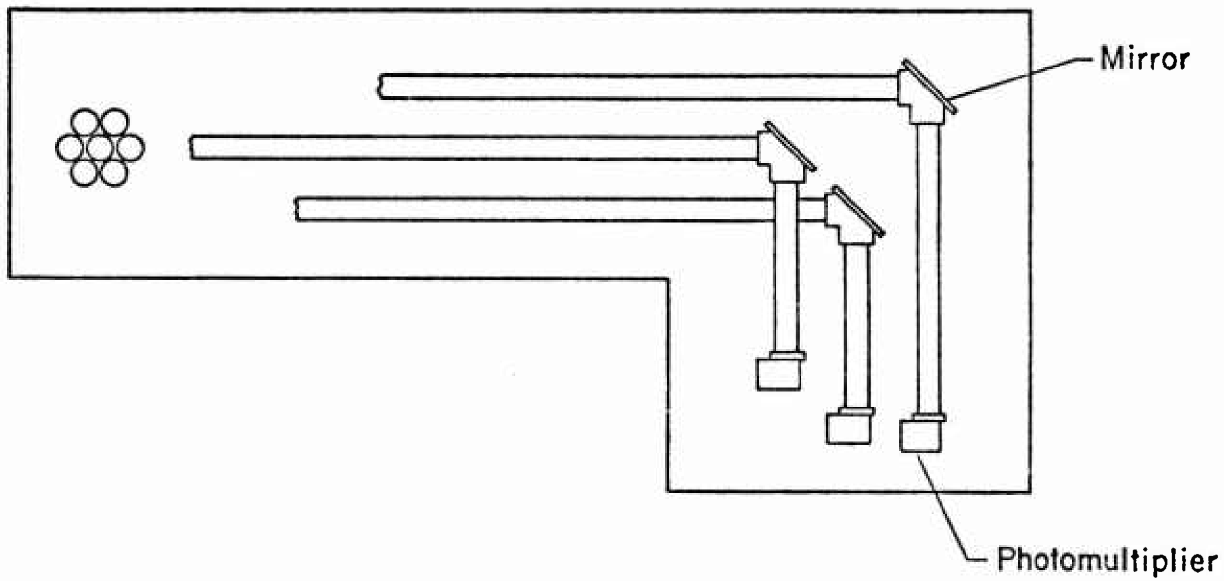
DETECTORS: PHOTOMULTIPLIER (31036)

CABLES: 19, RF13
26 C, #16 D.C. CALIBRATION

MAX D.C. VOLTAGE: 3 KV

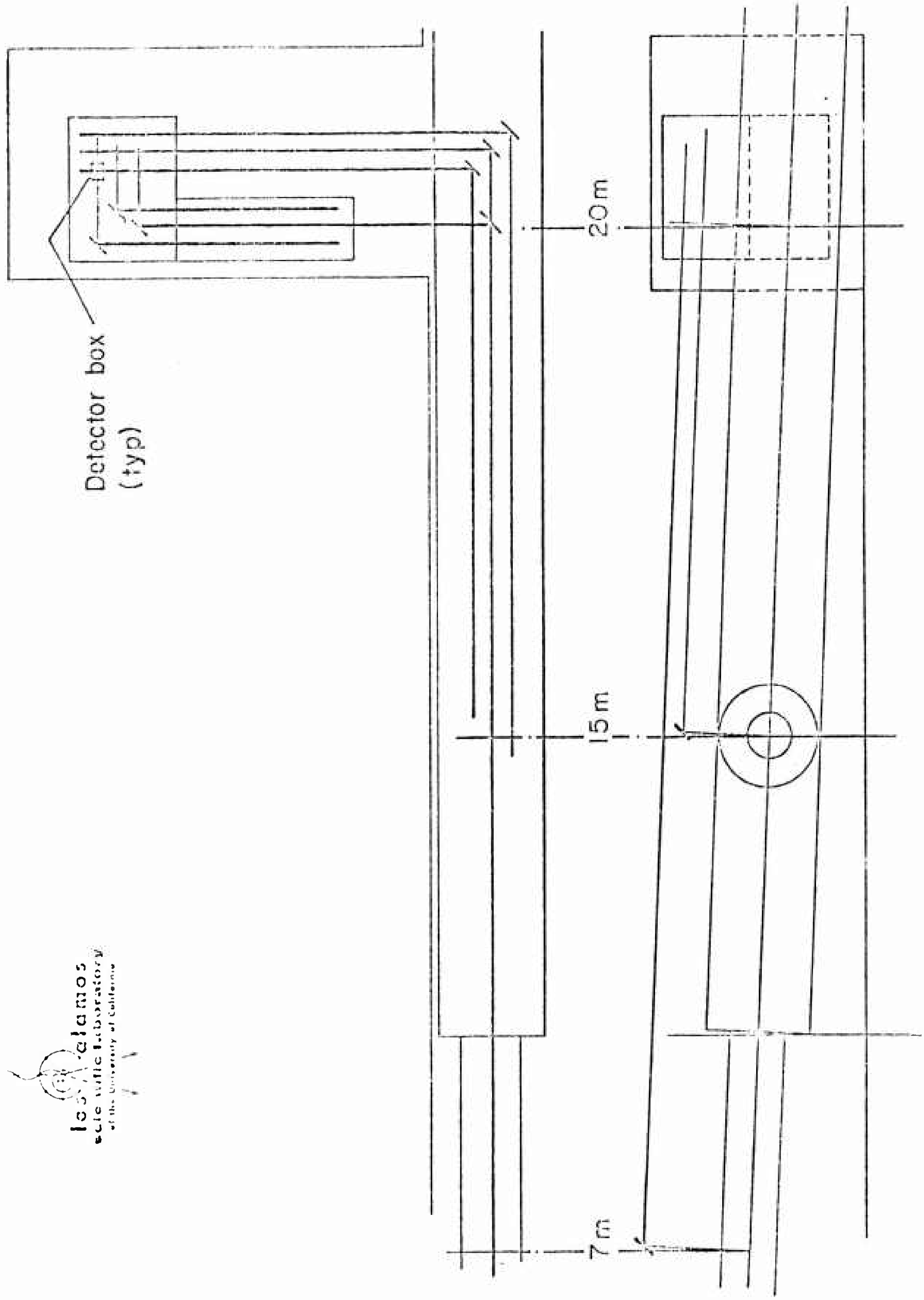
MAX CURRENT: 1 A

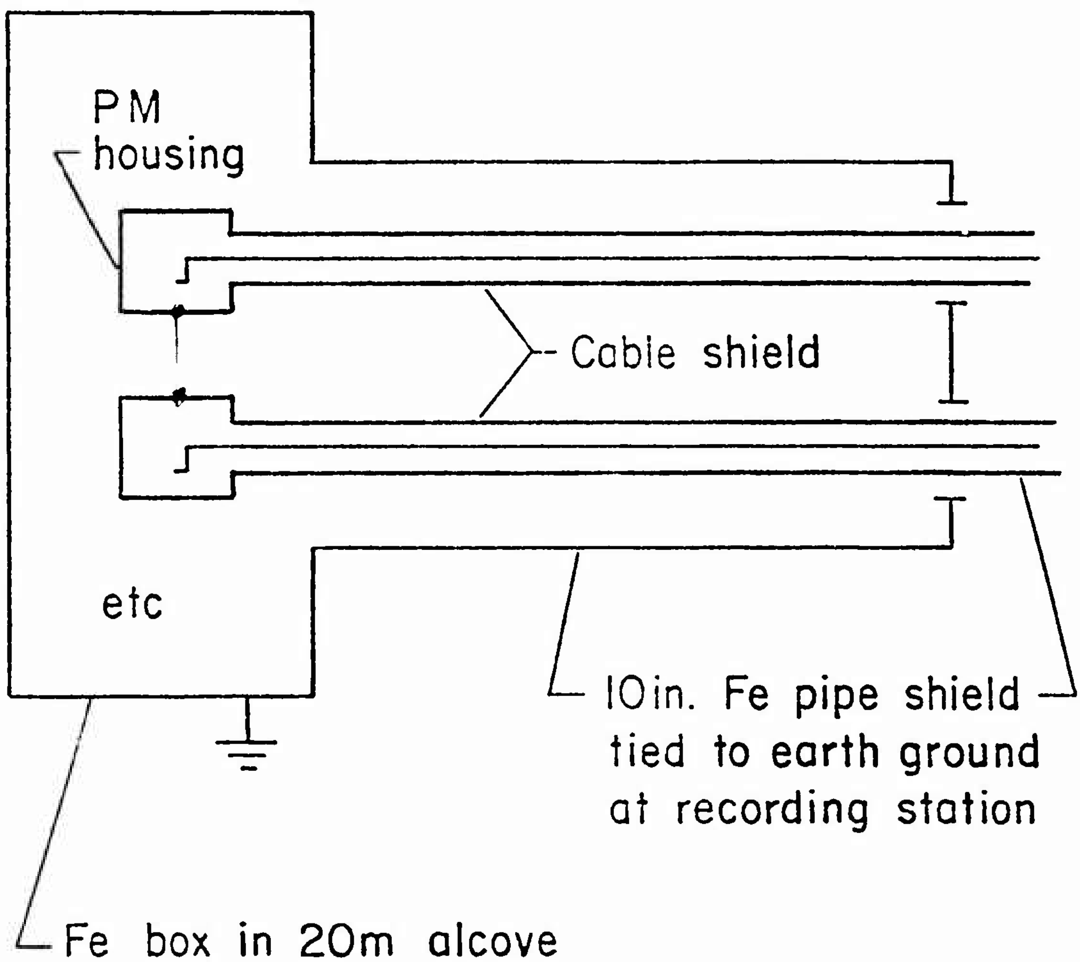
GROUNDING: FLOAT AT DETECTOR
TIED TO EARTH GROUND AT RECORDING STATION



los alamos
scientific laboratory
of the University of California

Optical Alpha - Alcove


Detector box
(typ)
20m
15m
7m



Optical Alpha Grounding

FIELD MEASUREMENTS (P-3)

BAUM $\dot{B}$ SENSORS (12 M)

Sensor 1. At air-foam interface

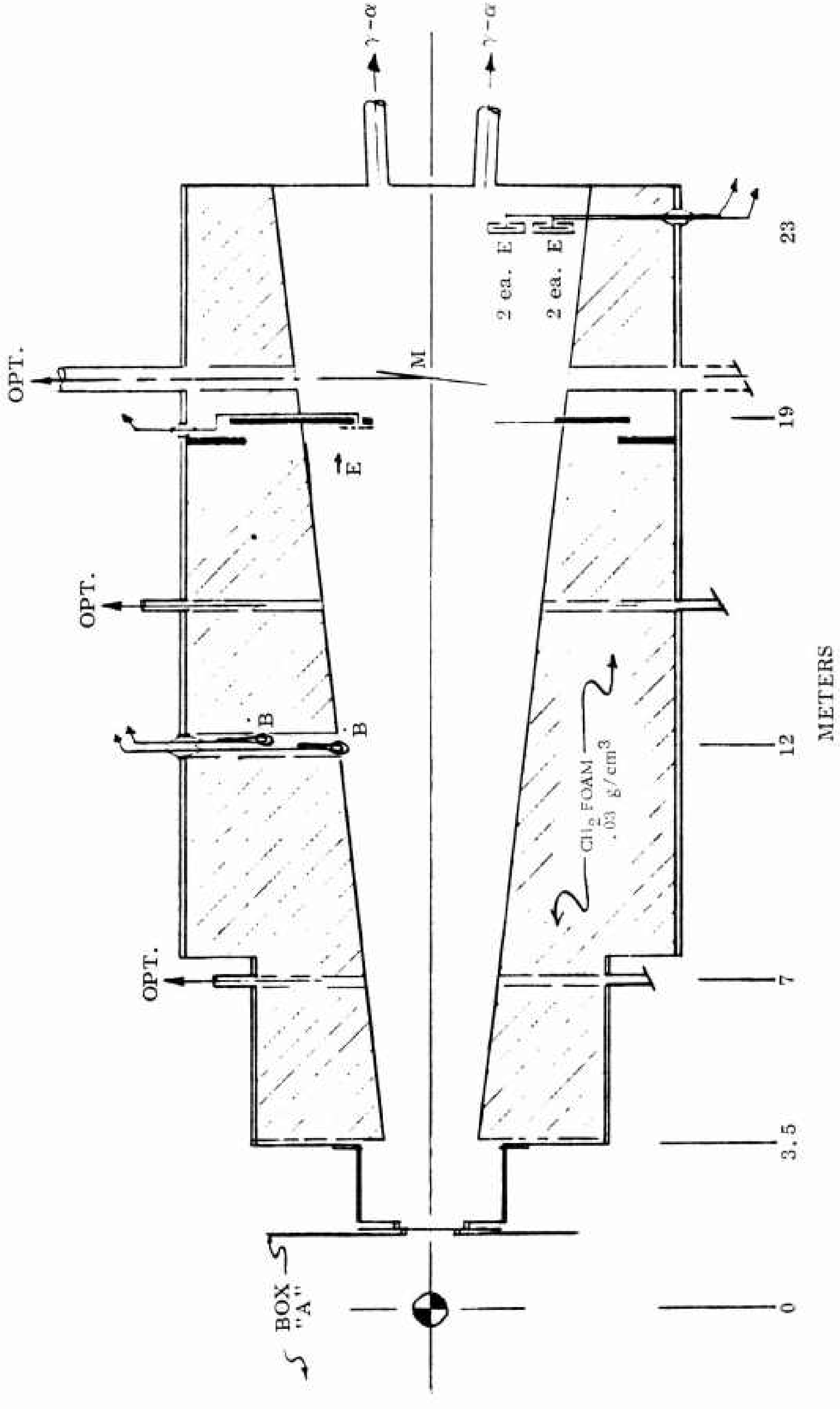
Sensor 2. Between interface and pipe wall

COMPTON-DIODE E SENSORS (22 M)

Sensors 3-6. Various termination R's, longitudinal E field

BAUM PLANAR E SENSOR (19 M)

Sensor 7. Longitudinal E at baffle


γ-α
γ-α
OPT.
OPT.
OPT.
M
2 ea. E
2 ea. E
E
B
B
CH2 FOAM
.03 g/cm3
BOX "A"
0
3.5
7
12
19
23
METERS

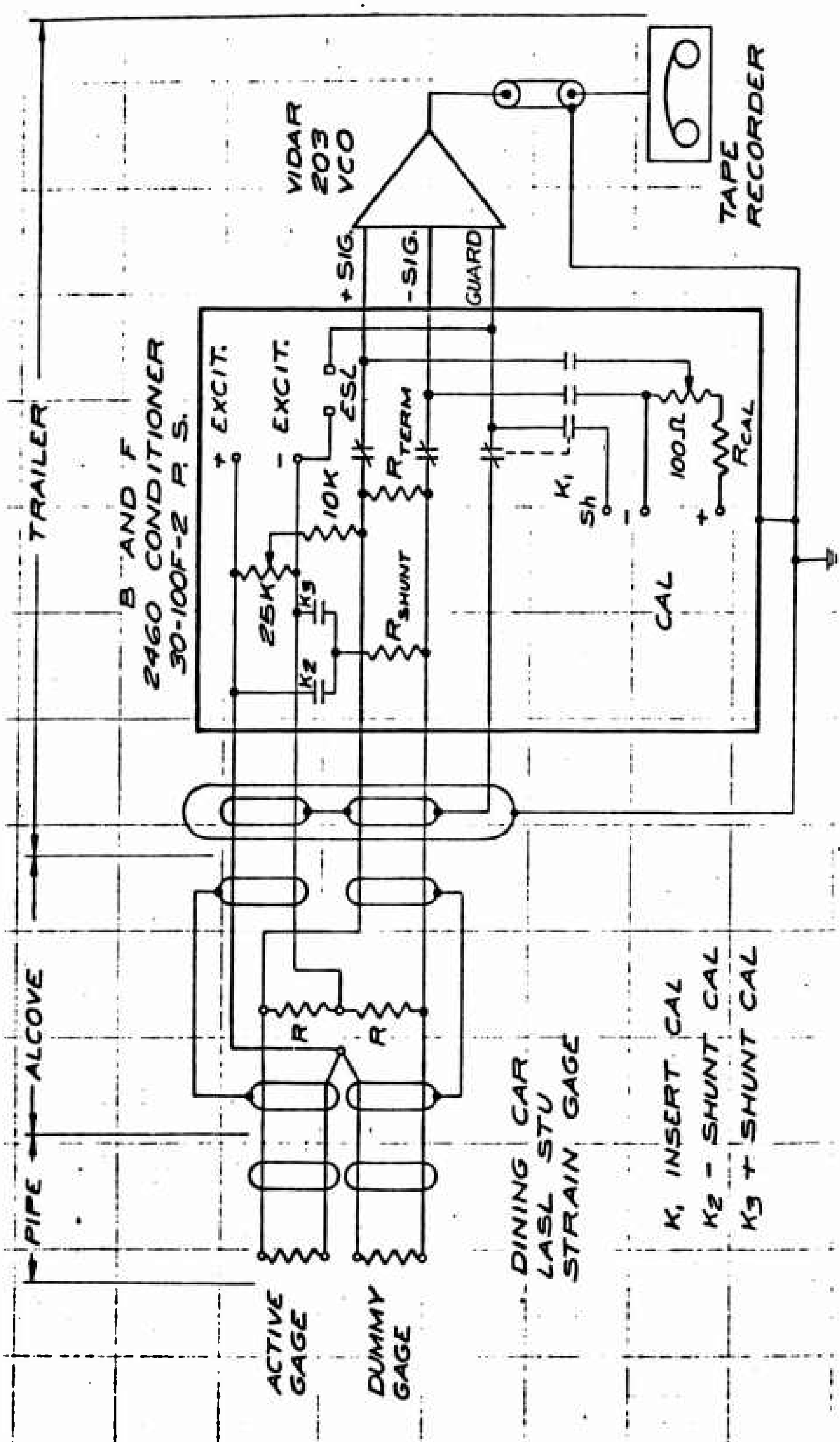
HUSKY PUP INSTRUMENTATION

	LASL	LOCKHEED	SANDIA	TSP
STRAIN	27	10	5	84
ACCELEROMETER	6	0	11	34
DISPLACEMENT	0	0	6	6
PRESSURE	0	0	1	2
	33	10	23	126

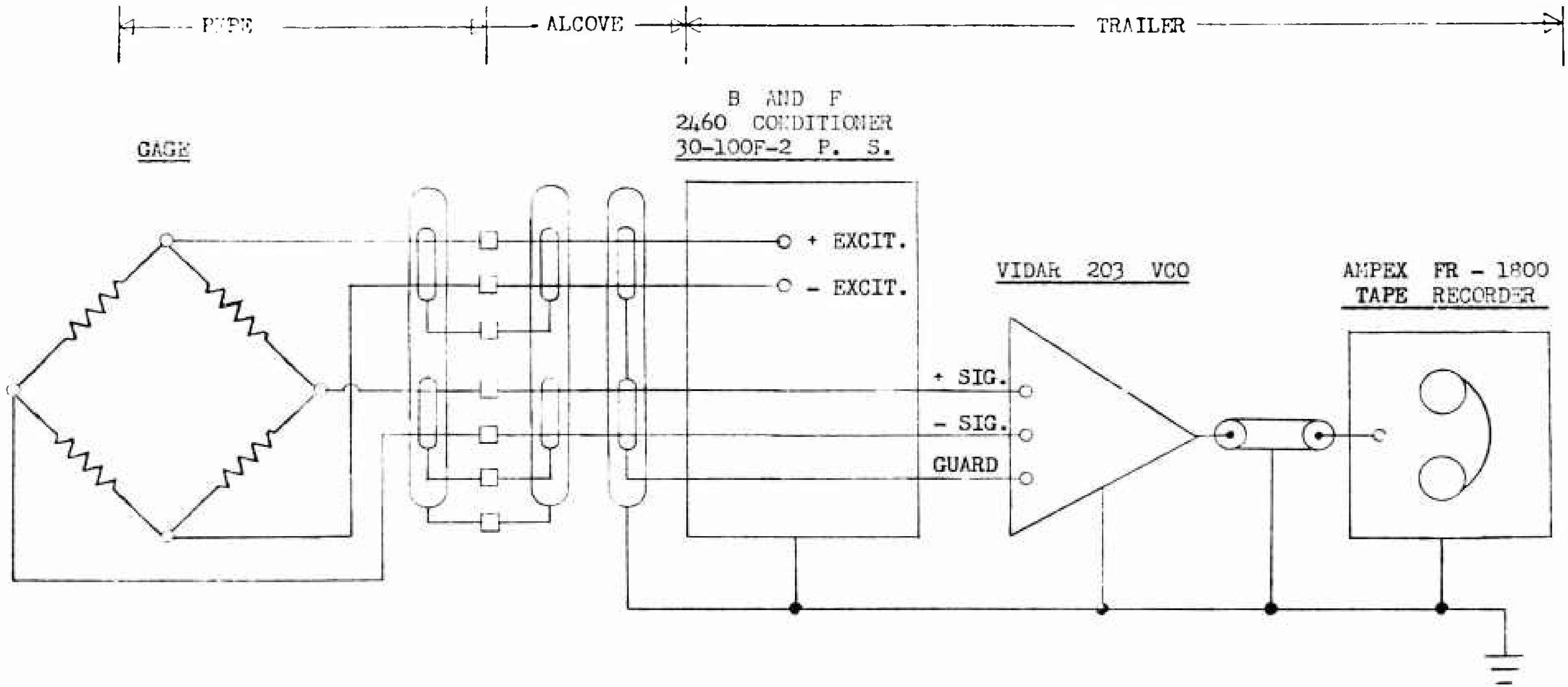
3 PIN/TSP

66 CHANNELS

126 TSP


TRAILER
ALCOVE
PIPE
B AND F
2460 CONDITIONER
30-100F-2 P.S.
+ EXCIT.
- EXCIT.
10K
ESL
R_{TERM}
R_{SHUNT}
25K
K_3
K_2
K_1
Sh
100Ω
R_{CAL}
CAL
+SIG.
-SIG.
GUARD
VIDAR
203
VCO
TAPE
RECORDER
R
R
DINING CAR
LASL STU
STRAIN GAGE
ACTIVE
GAGE
DUMMY
GAGE
K_1 INSERT CAL
K_2 - SHUNT CAL
K_3 + SHUNT CAL

HUSKY PUP
LASL STU INSTRUMENTATION



EG&G

INTER-OFFICE MEMORANDUM

TO Husky Pup File (AFWL) DATE 29 April 1975

FROM W. R. Kitchen : WRK

SUBJECT PRE-FIELDING INSTRUMENTATION MEETING, 30 APRIL 1975

1.0 View Foil No. 1

This figure details the carbon or quartz gage recording scheme. The gage is mounted and electrically connected to the bulkhead in the test chamber. This is the only earth ground point. The gage is connected to the vacuum port with RG-223/U cable The cable from the vacuum port to the alcove is RG-214/U. At the alcove the signal enters the DNA supplied cable system. The cables type RG-223/U and RG-214/U both have two shields in intimate contact.

On the mesa the trailers are connected to the DNA cable system with RG-213/U cable. Internally the trailers are wired with RG-213/U for the major lengths. The minor connections are made with RG-58/U for quartz systems and RG-59/U for the carbon systems.

Two oscilloscopes will record the signal. The first oscilloscope called "prime" is triggered from a gamma derived signal. The second oscilloscope called "back-up" is triggered from a delayed X-Fidu derived signal. If the back-up oscilloscope has a total sweep of less than 5 μ seconds, then it will be triggered with the gamma derived trigger signal.

2.0 View Foil No. 2

This figure shows the method to record cutting wire gages from Level F. The gage is mounted to the bulkhead with the pair shield not connected to the cassette. The pair is cabled directly to the recording trailer on the mesa, via an alcove connecting point, where the resistance portion of the cutting wire gage is completed in a bridge circuit. The output to be recorded on tape is adjusted to be from negative one to positive one volt. The gage drives the VCO from the negative extreme to the positive extreme in ten steps.

Inclosure 12

LAS VEGAS OPERATIONS

3.0 View Foil No. 3

This figure shows the digital recording method. Digital information is generated at five locations and cabled to the recording trailer for Station 1. There it is recorded on three wide band tape recorders. The different locations are isolated with isolation transformers in each cable.

The left side of the figure lists the units which generate the digital information. They are:

A. Pres/Temp is outputs from pressure and temperature transducers (not digital).

B. The CMS is the LLL's device to digitize time information from closures. The CMS units will be recording from about fifty gages from each station. Fifty gages yield a sampling time of 56.2 µsec between samples.

C. The 7912's are wide band oscilloscopes with a digital output.

D. LEA 74-2129 is a 4 to 15 channel encoder. At the bit rates shown (614 K bits) and a 10 bit A to D format, the effective bandwidth is about 1 KHz for 10 channels.

E. DEVELCO is measuring rock pressures and their analog signals are to be conditioned by a LEA 74-2129 conditioning unit in the recording trailer for Station 4.

The Transient Digitizer Interface Controller System (TDICS) will be fed from an output of the tape recorders.

4.0 View Foil No. 4

This table shows the Station 1 wideband tape and digital recording by tape machine number and track number.

5.0 View Foil No. 5

This figure shows the strain gage recording method using a quarter bridge with a compensating strain gage or a half bridge with positive and negative gage factors.

The cable from the alcove to the experiment is shielded with a zip tube grounded at the experiment. The overall shield for each cable bundle starts at the cassette but has no connection to ground. The pair shields will start at the cassette or be extended close to the gages inside the cassette as is practical.

All cable pairs, shields and the cable overall shield have assigned pins in a multi pin connector at the vacuum port. The zip tube will fasten to the connector shell and then connect to a 1/4 inch stud in the vacuum dielectric disc. The atmospheric portion of the feedthrough connector and zip tube system connects to this stud outside the disc. The zip tube continues to the alcove where it ends. The cable overall shield connects to the alcove hardware and continues uphole to the trailer shell. The overall shield system is floating from ground. This includes the alcove equipment and the recording trailer.

The pair shields start inside the cassette or at the back shell of the cassette and are carried to the bridge completion equipment and then to the guard input of the differential amplifier. The output of the amplifier is single ended. The "low" wire of the pair and shield are driven together. The output impedance of the amplifiers is 0.5 ohms. The pairs and their shields are connected to guarded differential amplifier/VCO's units in the trailer. There is a termination network and over voltage clamp in front of the VCO.

Attention must be given to the fact that the downhole amplifiers have a maximum output of 10 volts and 10 milliamps.

6.0 View Foil No. 6

This figure shows the method to record the output from the pressure transducers. The grounding and shielding scheme is the same as was described in Figure No. 5. The calibration resistors are sized to get a voltage unbalance which will be representative of a pressure. The setting of the voltage calibrations will be accomplished pre-shot. During the countdown, Timing and Firing signals will electrically calibrate the tape recorder.

7.0 View Foil No. 7

This figure shows the temperature measuring method. Again, the grounding and shielding scheme is the same as Figure No. 5.

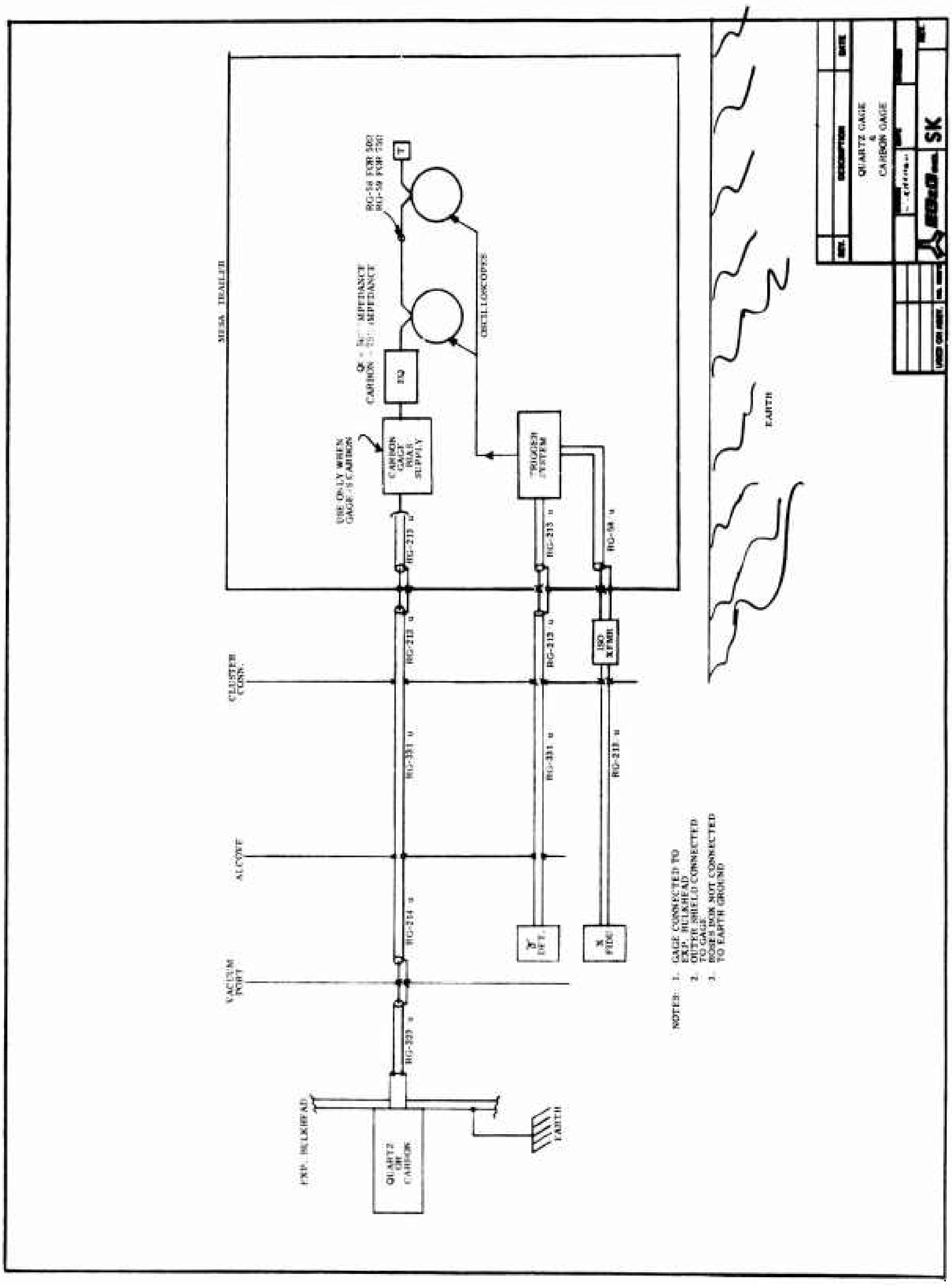
The thermocouple will measure the difference in temperature of the zone block and the experiment. A thermistor is bonded to the zone block to check for zone block temperature and its drift. An attempt will be made to keep all connections at the same temperature so there will be a minimum error due to unexpected and unwanted thermocouple junctions in the thermocouple loop.

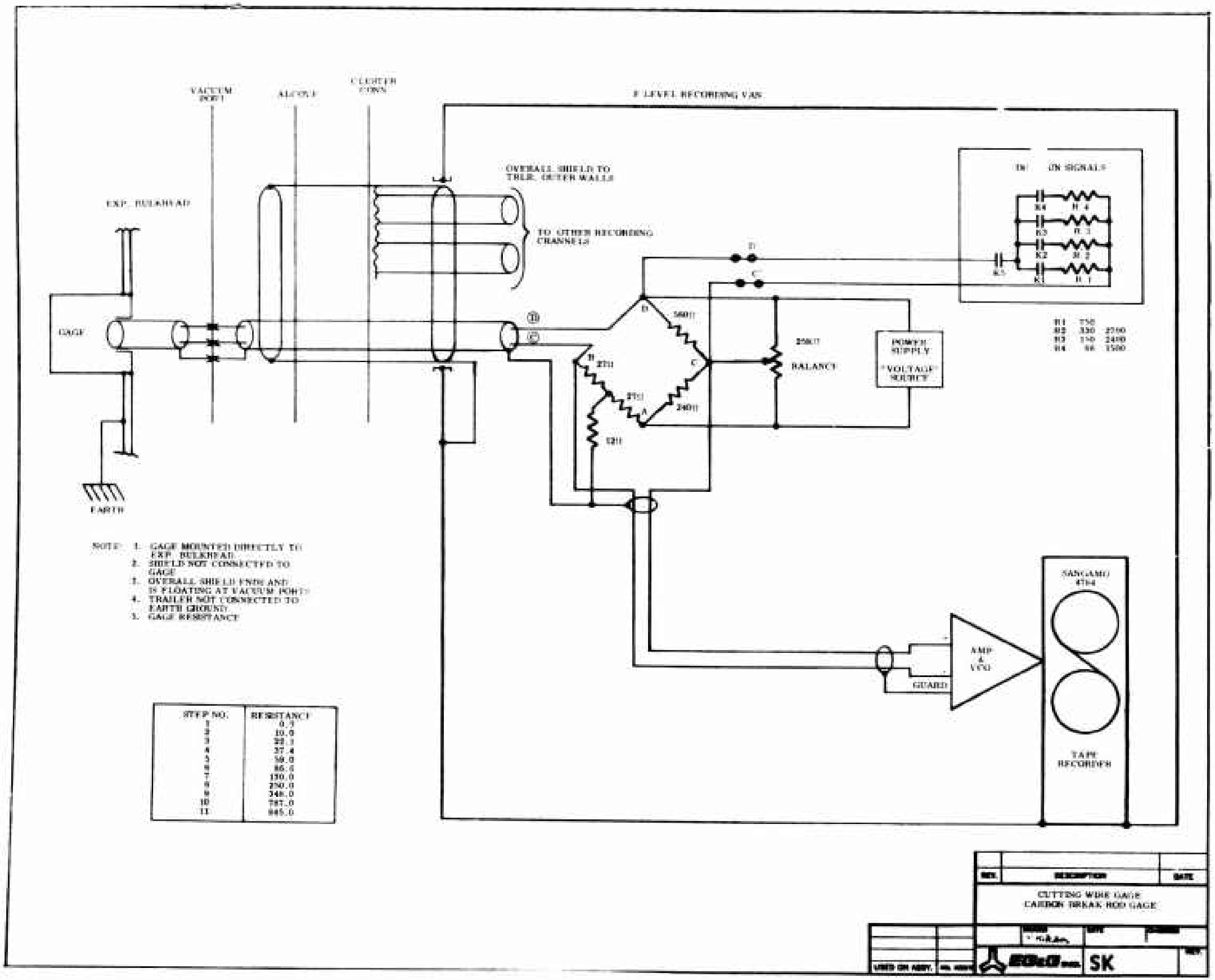
To be determined is the termination method and a protective clamp at the input of the differential amplifier.

WRK:sm

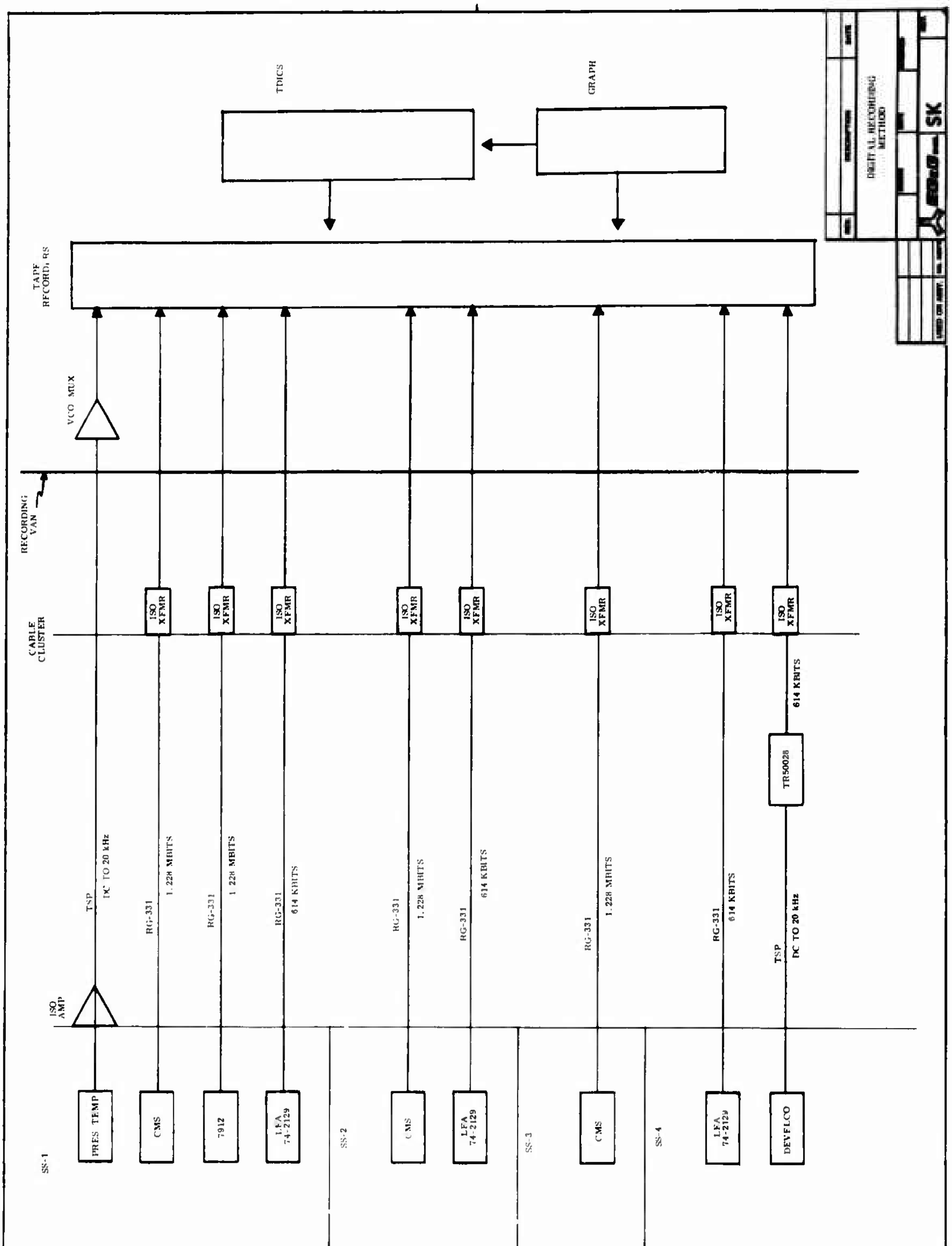
Attachments

cc: R. H. Gann, DNA
J. T. Marshall, AFWL
J. C. Tsitouras
C. M. Wagner


MESA TRAILER
RG-58 FOR 502
RG-59 FOR 7301
OSCILLOSCOPES
CARBON GAGE BIAS SUPPLY
USE ONLY WHEN GAGE IS CARBON
TRIGGER SYSTEM
RG-213 u
RG-58 u
ISO XFMR
EARTH
CLUSTER CONN.
RG-331 u
RG-213 u
ALCOVE
RG-214 u
Y DFT.
X FIDU
VACUUM PORT
RG-223 u
EXP. BULKHEAD
QUARTZ OR CARBON
NOTES: 1. GAGE CONNECTED TO EXP. BULKHEAD
2. OUTER SHIELD CONNECTED TO GAGE
3. BOXES (NOT CONNECTED TO EARTH GROUND
QUARTZ GAGE & CARBON GAGE
SK



STEP NO.	RESISTANCE
1	0.3
2	10.0
3	22.1
4	37.4
5	59.0
6	86.0
7	130.0
8	250.0
9	348.0
10	787.0
11	845.0

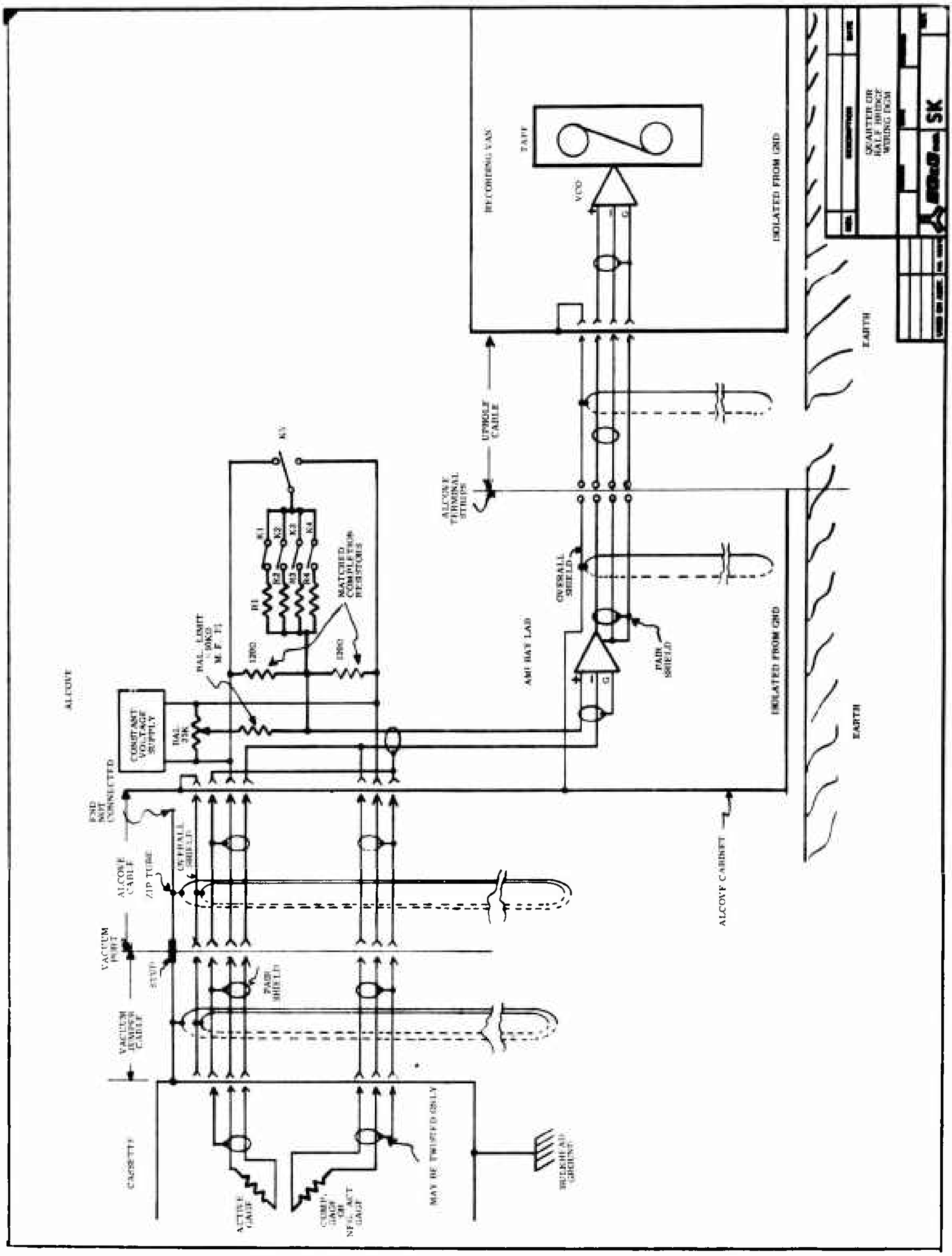

TDICS
GRAPH
TAPE RECORDERS
VCO MUX
RECORDING VAN
CABLE CLUSTER
ISO XFMR
ISO AMP
TSP
DC TO 20 kHz
RG-331
1.228 MBITS
614 KBITS
TR50028
SS-1
SS-2
SS-3
SS-4
PRES TEMP
CMS
7912
LFA 74-2129
DEVELCO
DIGITAL RECORDING METHOD
SK

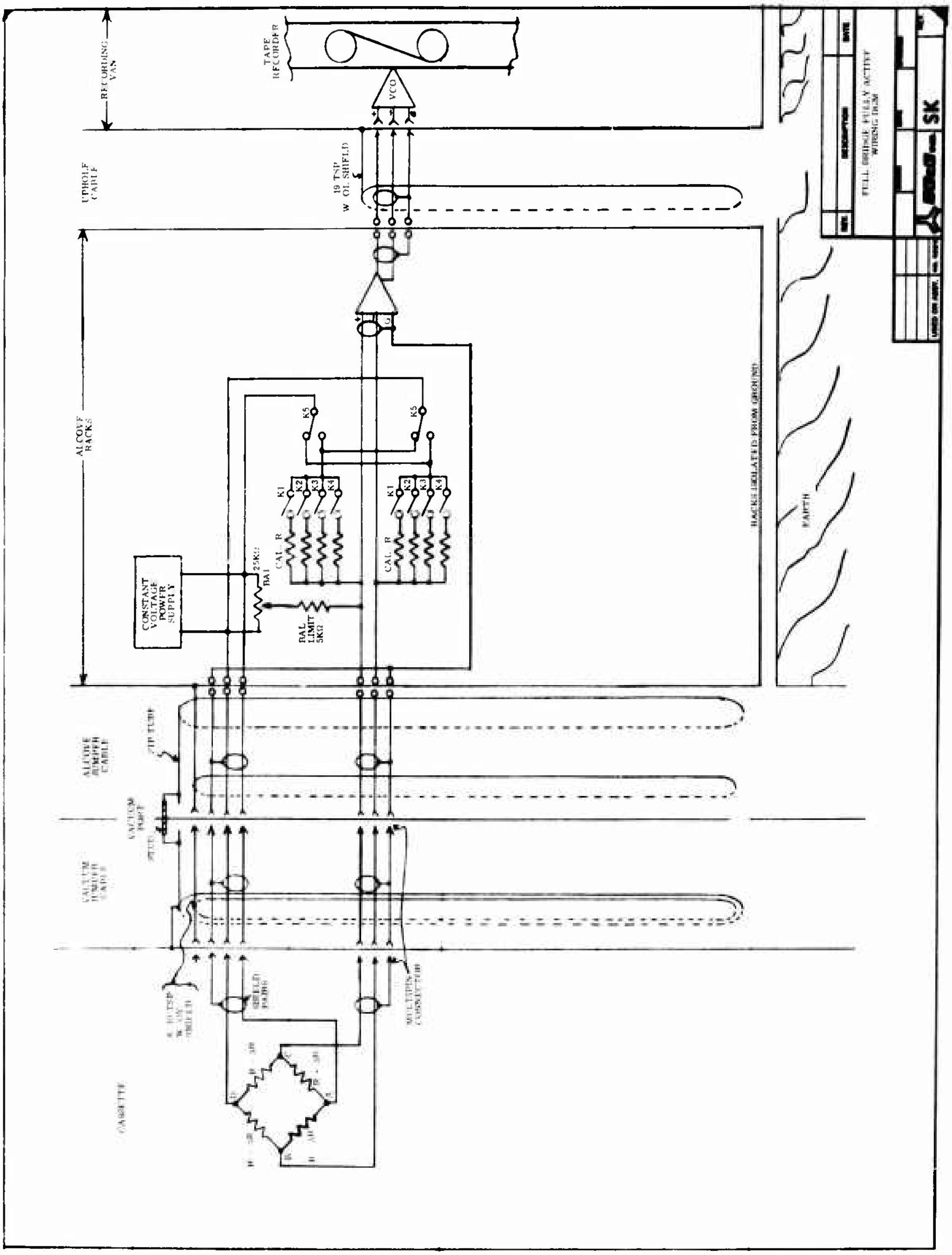
STATION 1 TAPE CHANNEL LISTING

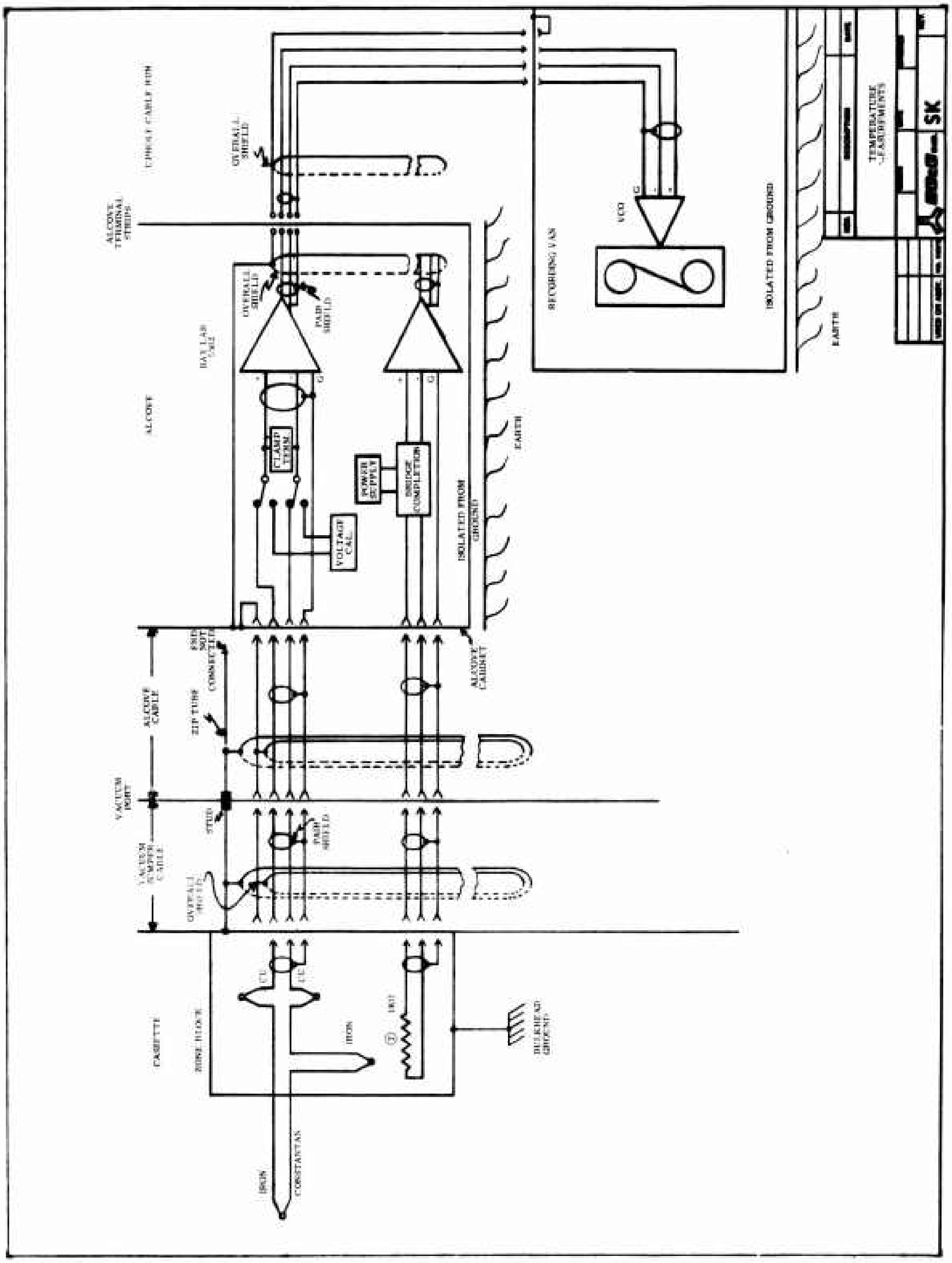
Tape #1 and #2 Sangamo Saber IV, Tape #3 Tidex

Experiment Name	Originating Equipment	Number of Channels	Bit Rate K/Bits or Hertz	Originating Station	Agency		Tape #1 Channel	Tape #2 Channel	Tape #3 Channel	
Pres/Temp	Tricom	7	250-1.5	SS-1	AFWL		1		1	1
Pres/Temp	Tricom	7	250-1.5	SS-1	AFWL			1	2	2
Pres/Temp	Tricom	7	250-1.5	SS-1	AFWL		10		3	3
Pres/Temp	Tricom	7	250-1.5	SS-1	AFWL			10	4	4
Pres/Temp	Tricom	7	250-1.5	SS-1	AFWL		11		5	5
Pres/Temp	Tricom	7	250-1.5	SS-1	AFWL			11	6	6
Pres/Temp	Tricom	7	250-1.5	SS-1	AFWL		12		7	7
Pres/Temp	Tricom	7	250-1.5	SS-1	AFWL			12	8	8
Pres/Temp	Tricom	7	250-1.5	SS-1	AFWL		13		9	9
Pres/Temp	Tricom	7	250-1.5	SS-1	AFWL				10	10
Impulse	CMS	42	1228	SS-1	AFWL		2	2		11
7912	PCM Tx	2	1228	SS-1	IRT		3	3		12
7912	PCM Tx	2	1228	SS-1	IRT		4	4		13
7912	PCM Tx	2	1228	SS-1	IRT		5	5		14
Calorimeter	74-2129	11	614	SS-1	SAI		8		11	15
Temperature	74-2129	10	614	SS-1	AFWL			8		16
Temperature	74-2129	11	614	SS-1	AFWL		9			17
Temperature	74-2129	9	614	SS-2	AFWL			9	13	18
Impulse	CMS	52	1228	SS-2	AFWL		6	6		19
Impulse	CMS	48	1228	SS-3	AFWL		7	7		20
Calorimeter	4-2129	12	614	SS-4	AFWL			13		21
Tape Speed			200				14	14	14	22
Ground Motion	4-2129	4	614	SS-4	Develco				12	23
										24

Figure [illegible]


ALCOVE
RECORDING VAN
TAPE
VCO
ISOLATED FROM GND
EARTH
AMI BAY LAB
CONSTANT VOLTAGE SUPPLY
MATCHED CALIBRATION RESISTORS
OVERALL SHIELD
PAIR SHIELD
ALCOVE TERMINAL STRIPS
UPHOLE CABLE
ALCOVE CABINET
ALCOVE CABLE
ZIP TUBE
VACUUM PORT
STUD
CASSETTE
ACTIVE GAGE
MAY BE TWISTED ONLY
BULKHEAD GROUND
QUARTER OR HALF BRIDGE WIRING DGM


RECORDING VAN
TAPE RECORDER
VCO
UPHOLE CABLE
19 TSP W OL SHIELD
ALCOVE RACKS
CONSTANT VOLTAGE POWER SUPPLY
25KΩ BAL
BAL LIMIT 5KΩ
CAL R
K1
K2
K3
K4
K5
RACKS ISOLATED FROM GROUND
EARTH
VACUUM PORT
MULTIPIN CONNECTOR
SHIELD PAIRS
CASSETTE
FULL BRIDGE FULLY ACTIVE WIRING DGM
SK


CASSETTE
ZONE BLOCK
IRON
CONSTANTAN
CU
IRON
BULKHEAD GROUND
VACUUM PORT
VACUUM JUMPER CABLE
ALCOVE CABLE
OVERALL SHIELD
STUD
PAIR SHIELD
ZIP TUBE
END NOT CONNECTED
ALCOVE CABINET
ALCOVE
BAY LAB
CLAMP TERM
VOLTAGE CAL.
POWER SUPPLY
BRIDGE COMPLETION
OVERALL SHIELD
PAIR SHIELD
ISOLATED FROM GROUND
EARTH
ALCOVE TERMINAL STRIPS
UPHOLE CABLE RUN
OVERALL SHIELD
RECORDING VAN
VCO
G
ISOLATED FROM GROUND
EARTH
TEMPERATURE MEASUREMENTS
SK

HUSKY PUP ACTIVE EXPERIMENT SUMMARY

24 APRIL 1975

	A	B	C	D	E	F	TOTAL(S)	
CWG		12	14	32	48	33	139	(INCLUDES AREA EFFECTS)
IMPULSE			16	16			32	ROTATIONAL & TRANSLATIONAL
STRAIN				42	34	14	90	R-V FRUSTRA & RING
TEMP		6	15	9			30	PEN AIDS INFLATABLES
PRESSURE		4	10	6			20	PEN AIDS INFLATABLES
QUARTZ				2	4	1	7	
CARBON			6	22	11	9	48	
LVT				2	2		4	
DISP				6			6	R-V
CALORIM						14	14	
TRIM			2	6	4	4	16	
							406	

NOTE: SUMMARY DOES NOT REFLECT PROPOSED CHANGES TO NHEP MATRIX

KAMAN SCIENCES CORPORATION

HUSKY PUP
PRETEST INSTRUMENTATION
MEETING

Inclosure 13

INSTRUMENTATION AND GROUNDING

KSC will have one recording instrumentation trailer for all of our channels.

We are using two FM tape recorders with thirty-two tracks each: A Sangamo 4784 and a CEC 2800 machine.

For the fast data channels the data signals will be put on Tektronix 546 oscilloscopes: twelve scopes for Quartz and four for Fast Electromagnetic gages.

The grounding practice typically used at KSC is to electrically isolate all experiments from the LOS pipe and keep the instrumentation trailer shell above earth ground. The trailer shell is used as a reference point for tying dowr all cable shields. Our coax and twinax cable shields are tied at the connector plate on the trailer shell while TSP over shields are tied through A 10 ohm resistor to the shell. However, the TSP shields are carried to a common buss at the tape recorder VCO's.

VIEWGRAPH 1: INSTRUMENTATION SUMMARY

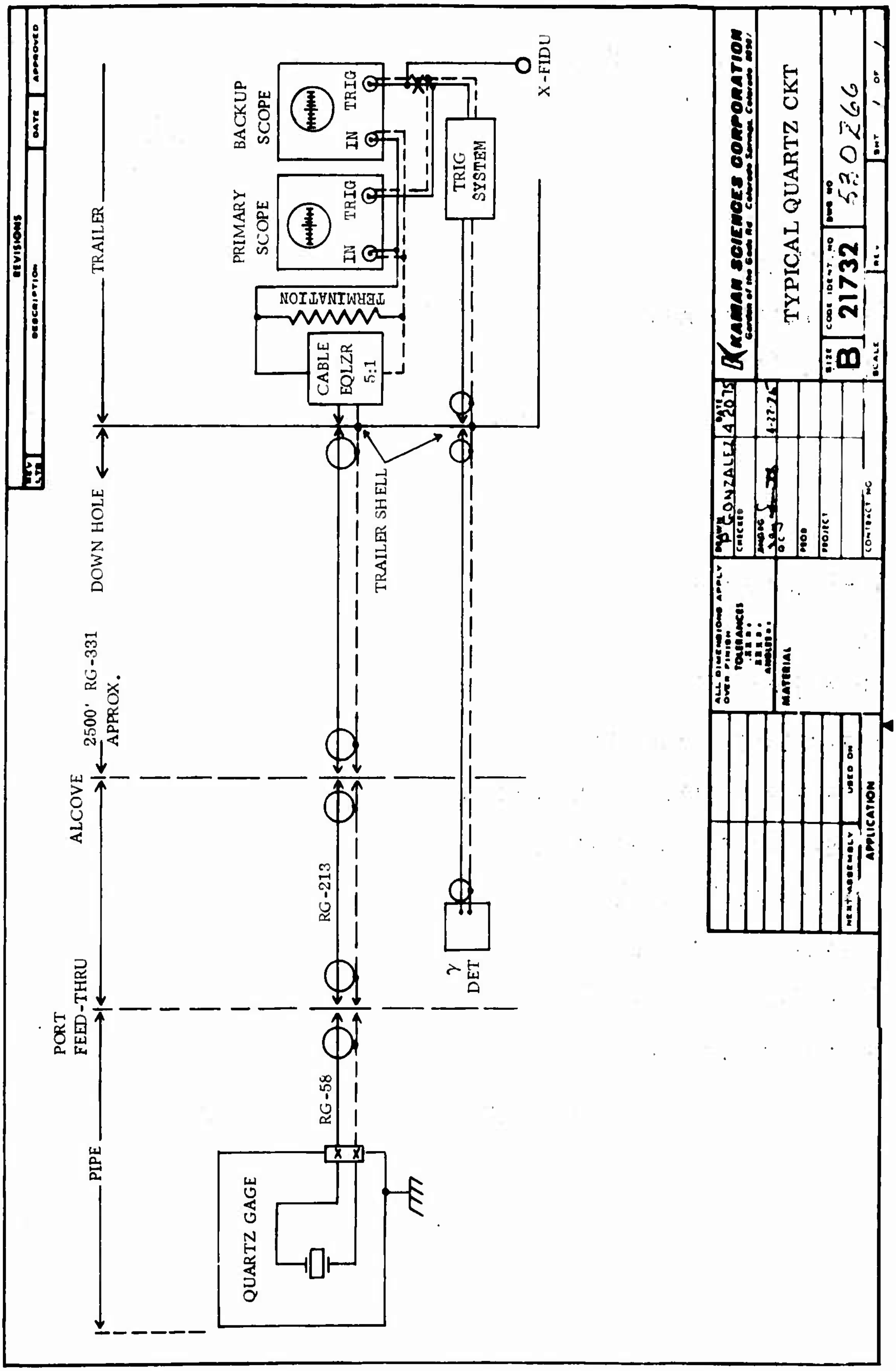
VIEWGRAPH 2: QUARTZ PRESSURE GAGE

The six quartz pressure gages we are fielding are the Sandia type. The gages are isolated from the LOS pipe and will be recorded on a primary and backup oscilloscope in a mesa recording van. The oscilloscopes will be triggered by a gamma signal and backups by X-FIDU signal.

VIEWGRAPH 3: Expected Channel Performance

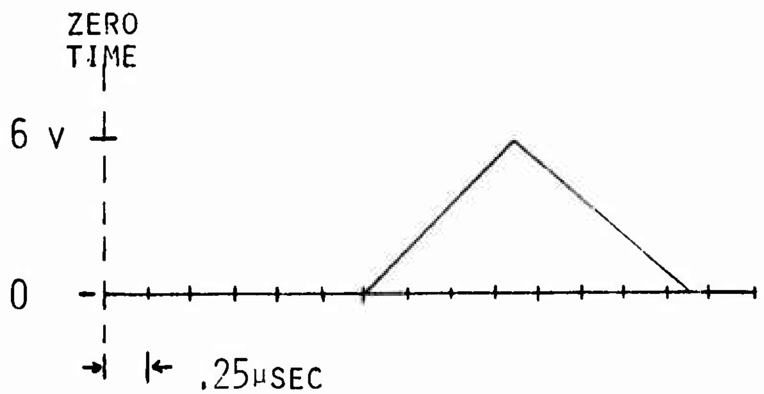
HUSKY PUP INSTRUMENTATION SUMMARY

	LEVEL 1A	1B	1C	F	TOTAL
SCOPE CHANNELS					
Fast Electromagnetic Gages (FEM)			4		4
Quartz Gage (Q)	2	3	1		6
Sub Total	2	3	5		10
F.M. TAPE CHANNELS					
FEM Gage			4		4
TRIM Gage (T)		2	4	4	10
Softspeaker Gage (CA)			2	1	3
Linear Velocity Transducer (B)	2	1	1		4
Linear Piston Commutator (P)			2		2
Continuity Gage (E)			7		7
Linear Velocity Commutator (K)	1		1		2
Foil Strain Gages (F)			16		16
Spinning Disk Tachometer				1	1
Sub Total	3	3	37	6	49
TOTAL	5	6	42	6	59


REVISIONS
DESCRIPTION
DATE
APPROVED
PIPE
PORT FEED-THRU
ALCOVE
2500' RG-331 APPROX.
DOWN HOLE
TRAILER
QUARTZ GAGE
RG-58
RG-213
γ DET
TRAILER SHELL
CABLE EQLZR 5:1
TERMINATION
PRIMARY SCOPE
BACKUP SCOPE
IN
TRIG
TRIG SYSTEM
X-FIDU
KAMAN SCIENCES CORPORATION
TYPICAL QUARTZ CKT
B
21732
ALL DIMENSIONS APPLY OVER FINISH
TOLERANCES
MATERIAL
NEXT ASSEMBLY
USED ON
APPLICATION
DRAWN
CHECKED
PROJECT
CONTRACT NO

EXPECTED CHANNEL PERFORMANCE - QUARTZ

FULL SCALE AMPLITUDE AT GAGE		30 V
FULL SCALE AMPLITUDE AT TRAILER		30 V
FULL SCALE AMPLITUDE AT SCOPE		6 V
BANDWIDTH		10 MHz
RISE TIME		35 NSEC
CABLE EQUALIZERS		5:1
SCOPE SETTINGS - A	5V/CM	3 μSEC
B	20V/CM	5 μSEC



IMPULSE GAGES

Time Resolved Momentum measurements are an attempt to: 1) directly observe the prompt and total components of the blow-off impulse generated by 3DQP, and 2) measure the amount and rate of momentum buildup of blow-off ejecta from 3DQP.

Time Resolved Momentum measurements are made using TRIM, softspeaker and FEM gages while "total momentum" measurements are made using the LVT, linear piston commutator and the linear velocity commutator gages.

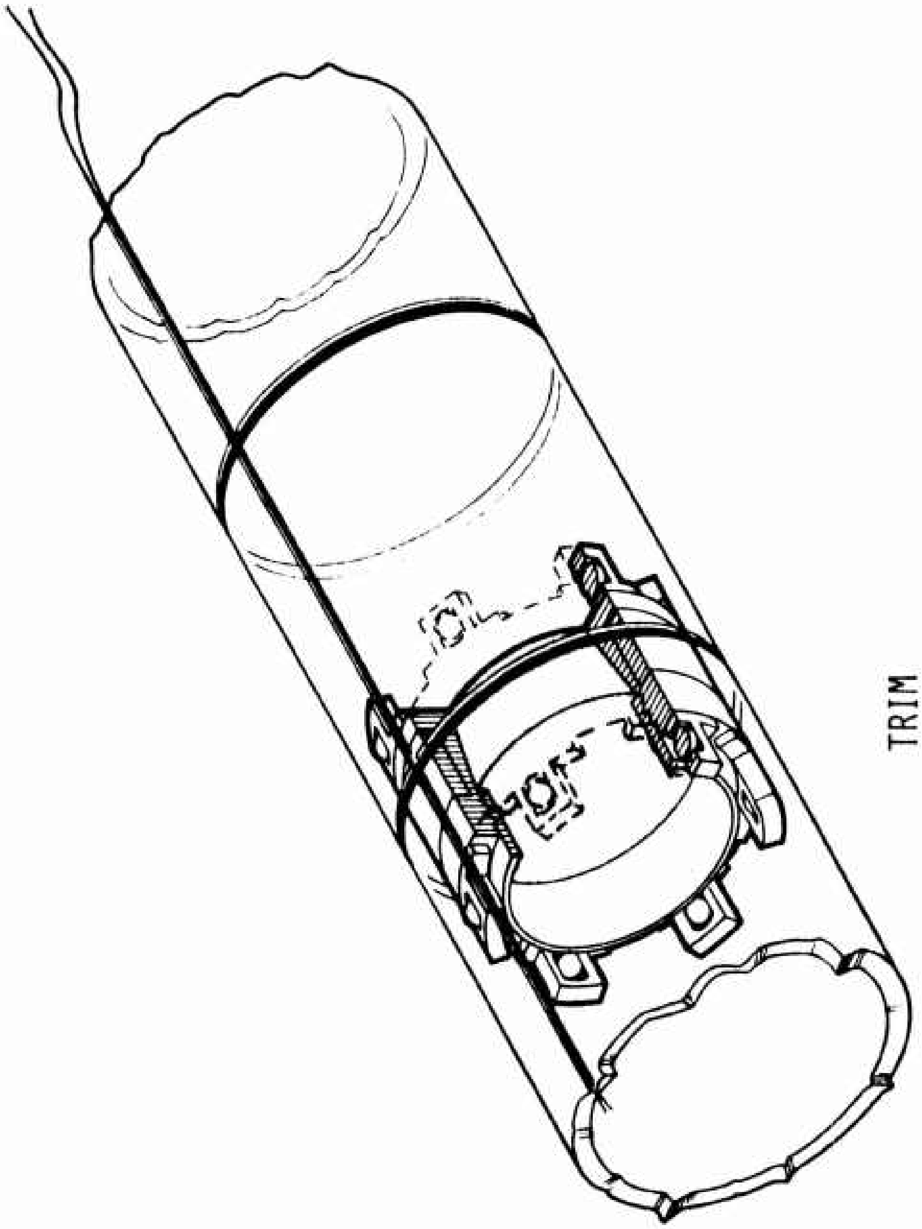
VIEWGRAPH 4: TRIM GAGES

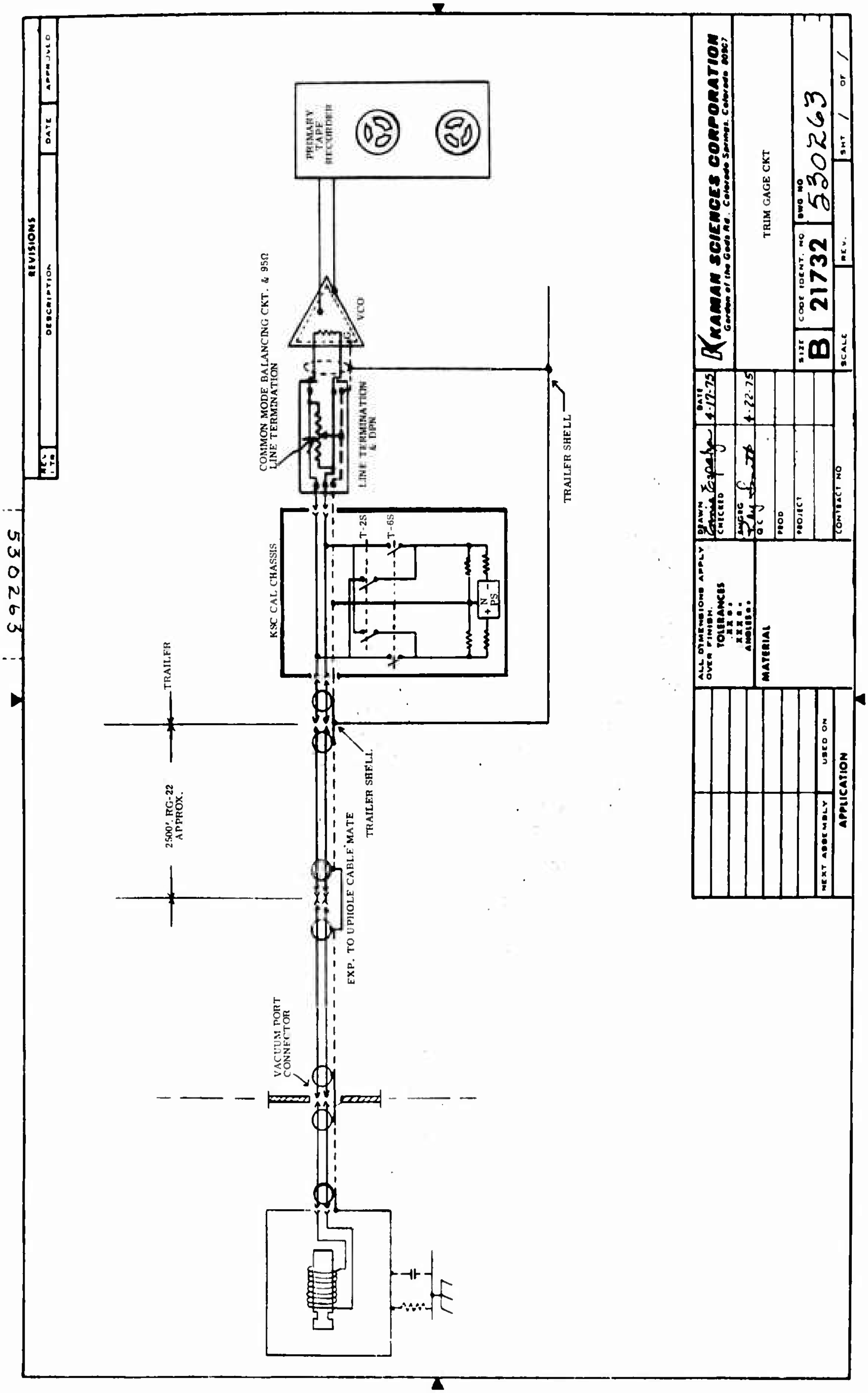
The active components of this gage are a sample/holder carrier assembly and a stationary tube assembly, through which the sample carrier translates. Voltage is induced by the movement of a permanent magnet on the carrier through a series of four equally spaced induction coils wound around the tube. Digital velocity data is yielded by the spacing between the coils. The gage response or rise times are between 40 to 50 microseconds.

VIEWGRAPH 5: Channel Schematic

We have 10 channels of these gages which will use RG-22B/U transmission cable and they will be recorded on FM channel per track tape recorders on the mesa.

VIEWGRAPH 6: Expected Channel Performance

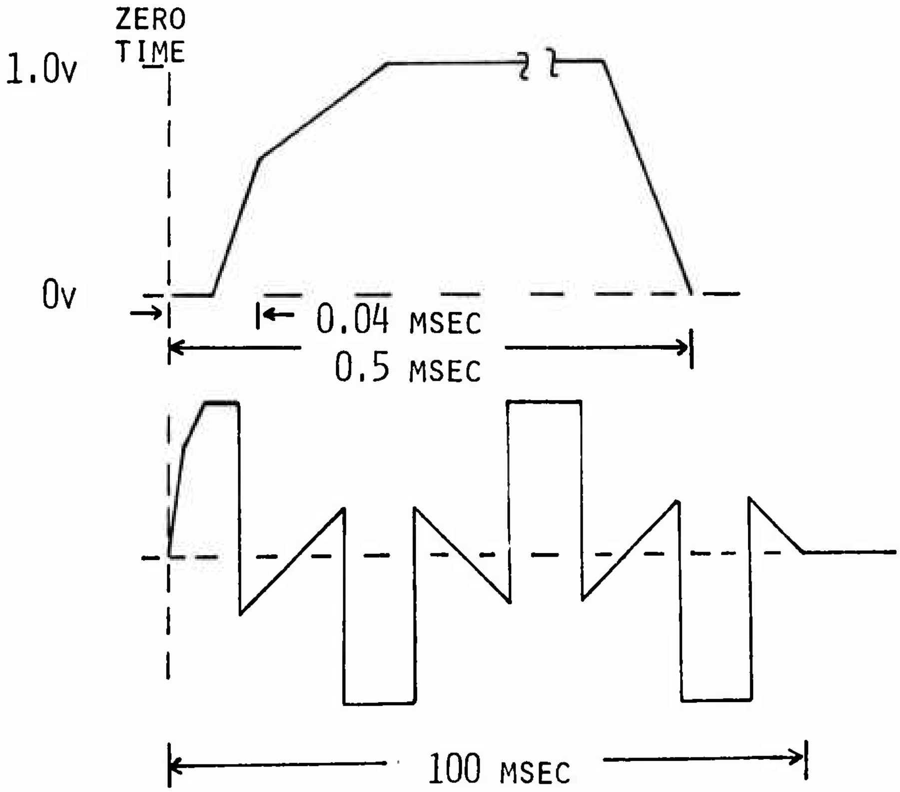

TRIM



REVISIONS
REV LTR
DESCRIPTION
DATE
APPROVED
530263
PRIMARY TAPE RECORDER
COMMON MODE BALANCING CKT. & 95Ω LINE TERMINATION
VCO
LINE TERMINATION & DPN
TRAILER SHELL
KSC CAL CHASSIS
T-2S
T-6S
N
PS
TRAILER
2500' RG-22 APPROX.
TRAILER SHELL
EXP. TO UPHOLE CABLE MATE
VACUUM PORT CONNECTOR
KAMAN SCIENCES CORPORATION
Garden of the Gods Rd., Colorado Springs, Colorado 80907
TRIM GAGE CKT
SIZE B
CODE IDENT. NO 21732
DWG NO 530263
SCALE
REV.
SHT 1 OF 1
DRAWN
CHECKED
ENGRG
Q C
PROD
PROJECT
CONTRACT NO
DATE 4-17-75
4-22-75
ALL DIMENSIONS APPLY OVER FINISH.
TOLERANCES
MATERIAL
NEXT ASSEMBLY
USED ON
APPLICATION

EXPECTED CHANNEL PERFORMANCE - TRIM

GAGE OPEN CIRCUIT OUTPUT AT GAGE	200MV/KTAP
CIRCUIT ATTENUATION (2000' TSP)	0.55
(2000' TWINAX)	0.80
AMPLITUDE INTO VCO (TRAILER)	110MV/KTAP 160MV/KTAP
BANDWIDTH	20KHz
RISETIME	40μSEC



VIEWGRAPH 7&8: FAST ELECTROMAGNETIC GAGES

The fast electromagnetic gages "FEM" and "Super TRIM" are designed for measuring rise times around 10 microseconds. The coil is wound directly around and bonded to the sample. This modification improves the mechanical coupling between the sample and coil thereby minimizing the response time of the gage.

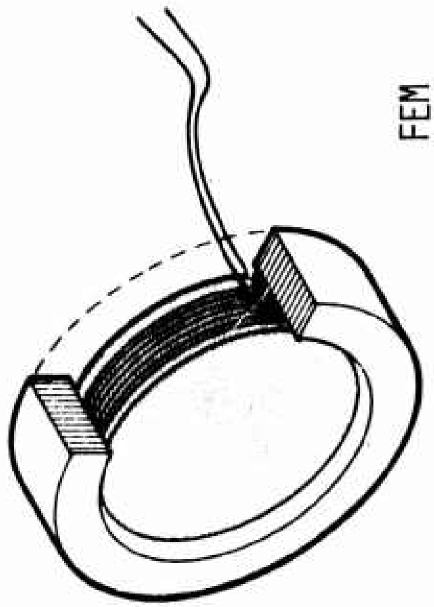
VIEWGRAPH 9: Channel Schematic

Four channels of these gages will use RG22 transmission cables. The rise time portion of the signal will be recorded on oscilloscope and the total momentum portion of the signal will be recorded on tape.

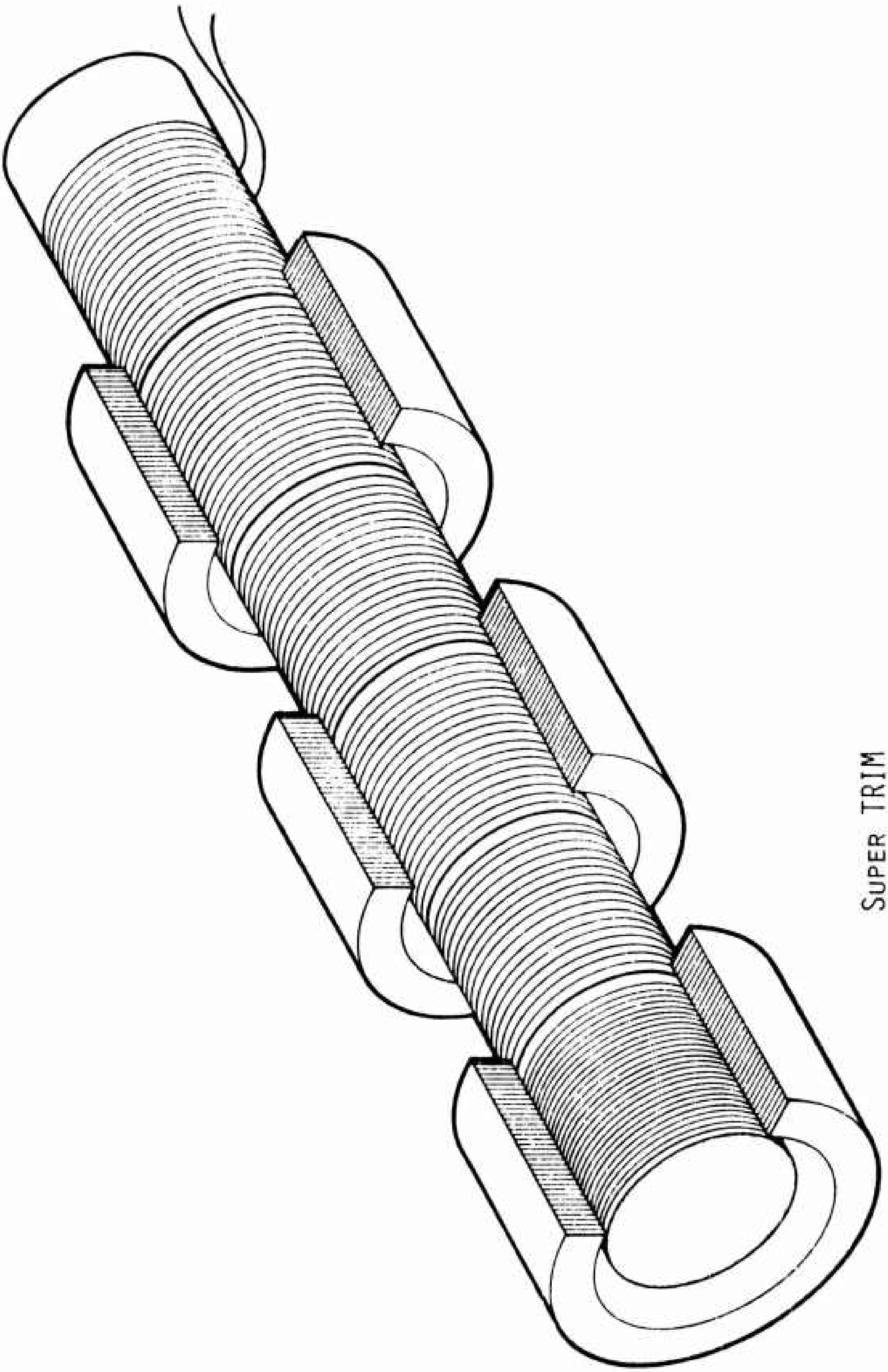
VIEWGRAPH 10: Expected Channel Performance

VIEWGRAPH 11: LINEAR PISTON COMMUTATOR GAGES

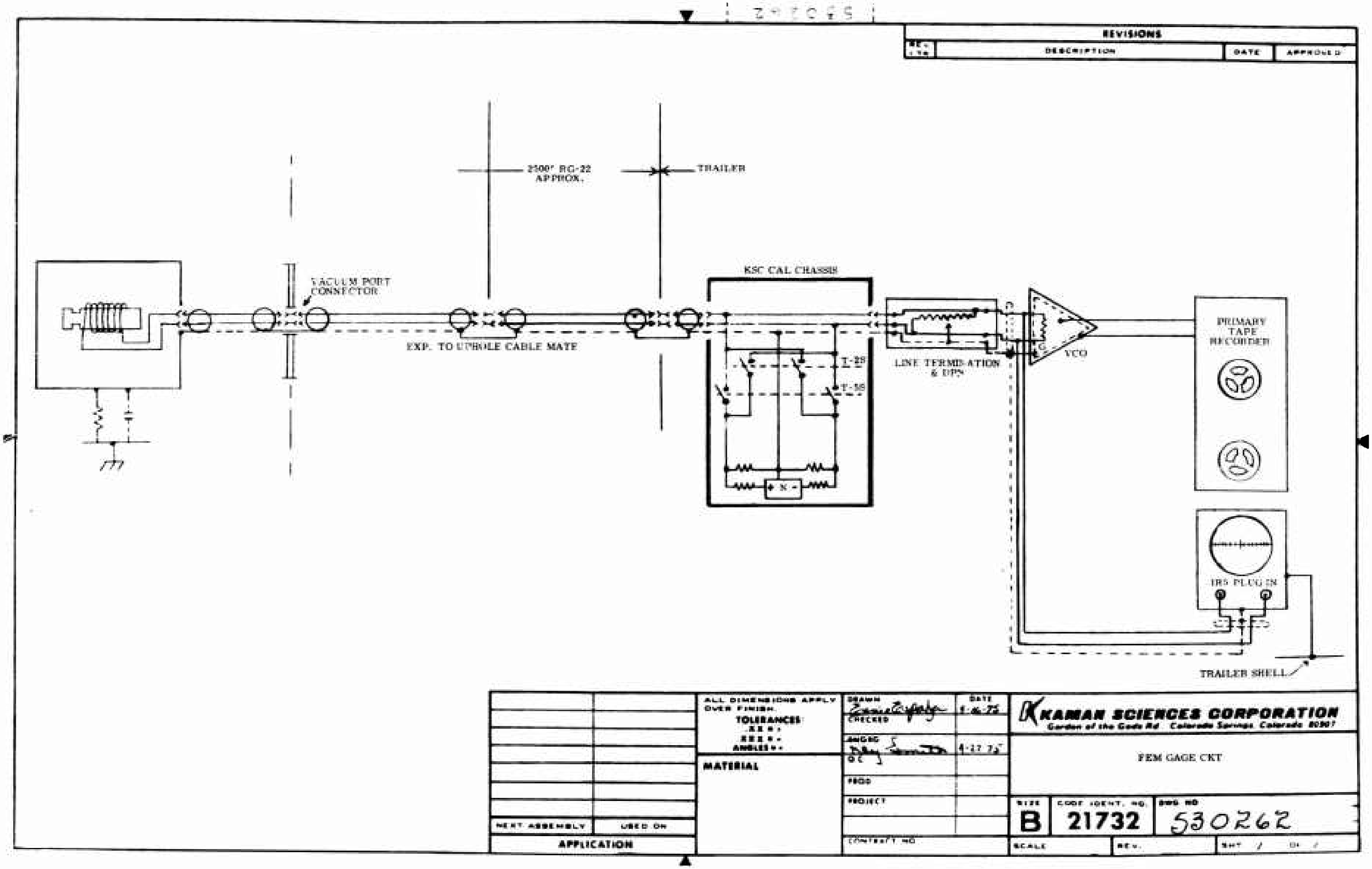
The disk sample is mounted on a piston-shaped sample holder assembly which has a series of commutator rings attached to its stem. The holder assembly recoils and slides along the inside of the canister with the four brushes making contact with the commutator rings on the holder stem.



FEM

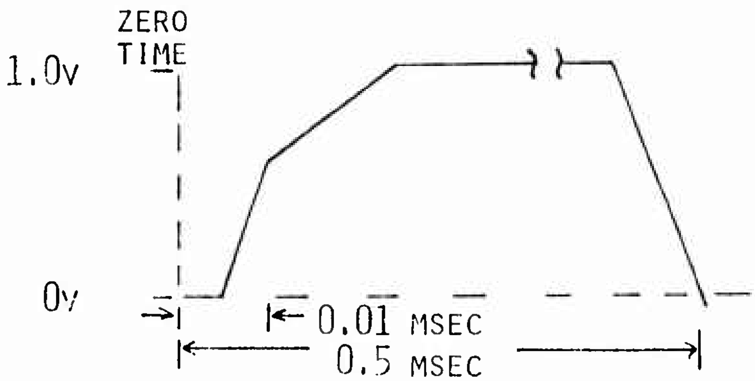


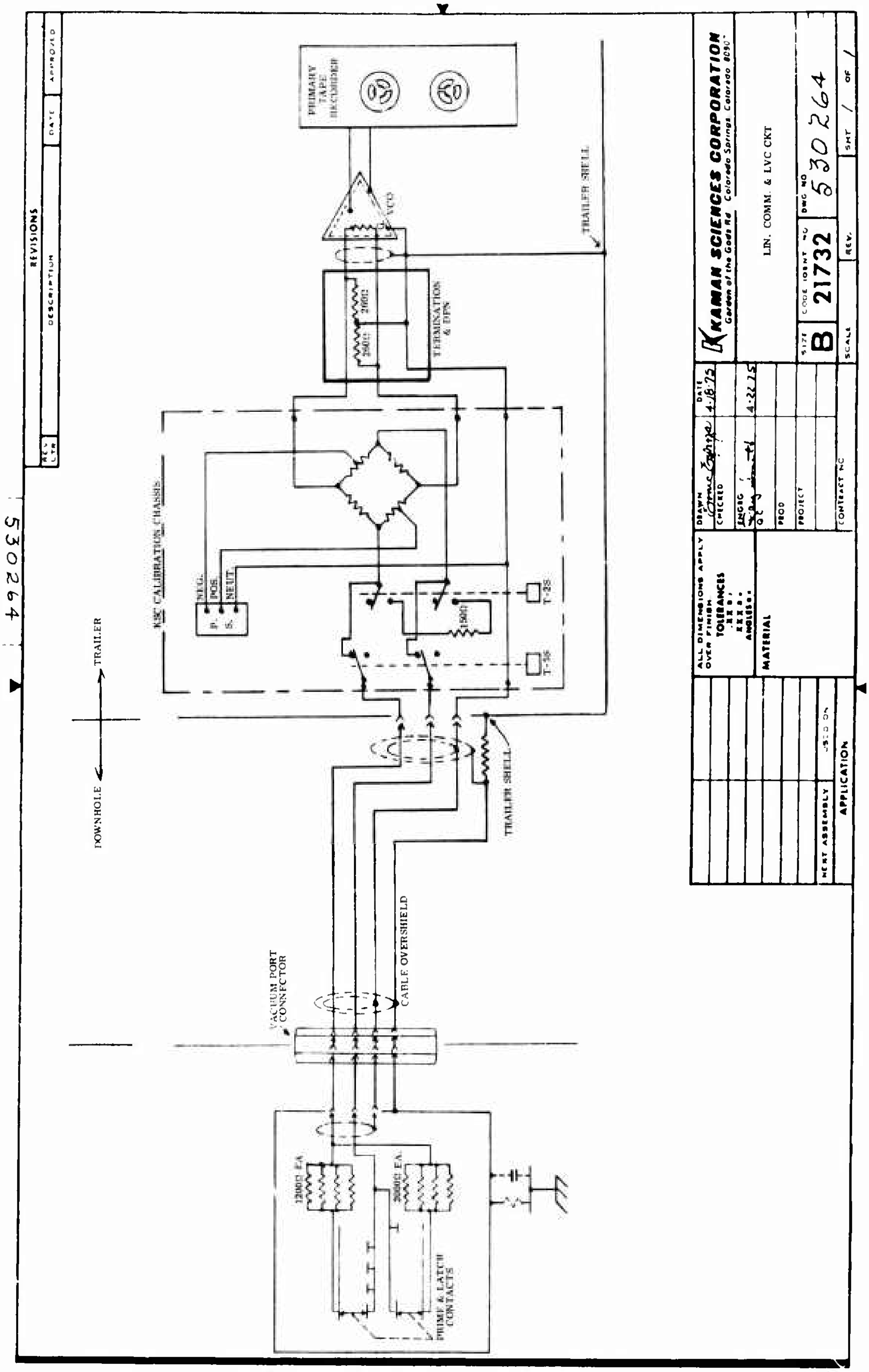
SUPER TRIM


530262
REVISIONS
DESCRIPTION
DATE
APPROVED
2500' RG-22 APPROX.
TRAILER
VACUUM PORT CONNECTOR
EXP. TO UPHOLE CABLE MATE
KSC CAL CHASSIS
T-28
T-38
LINE TERMINATION & DPS
VCO
PRIMARY TAPE RECORDER
IR5 PLUG IN
TRAILER SHELL
ALL DIMENSIONS APPLY OVER FINISH.
TOLERANCES:
MATERIAL
DRAWN
CHECKED
DATE
PROD
PROJECT
CONTRACT NO
NEXT ASSEMBLY
USED ON
APPLICATION
KAMAN SCIENCES CORPORATION
Garden of the Gods Rd Colorado Springs, Colorado 80907
FEM GAGE CKT
SIZE
B
CODE IDENT. NO.
21732
DWG NO
530262
SCALE
REV.
SHT 1 OF 1

EXPECTED CHANNEL PERFORMANCE - FEM, SUPER TRIM

GAGE OPEN CIRCUIT OUTPUT AT GAGE		
	FEM	1V/KTAP
	SUPER TRIM	100MV/KTAP
CIRCUIT ATTENUTATION (2000' TWINAX)		0.80
AMPLITUDE INTO VCO (TRAILER)		800MV/KTAP
		80MV/KTAP
BANDWIDTH		70KHZ
RISETIME		5μSEC

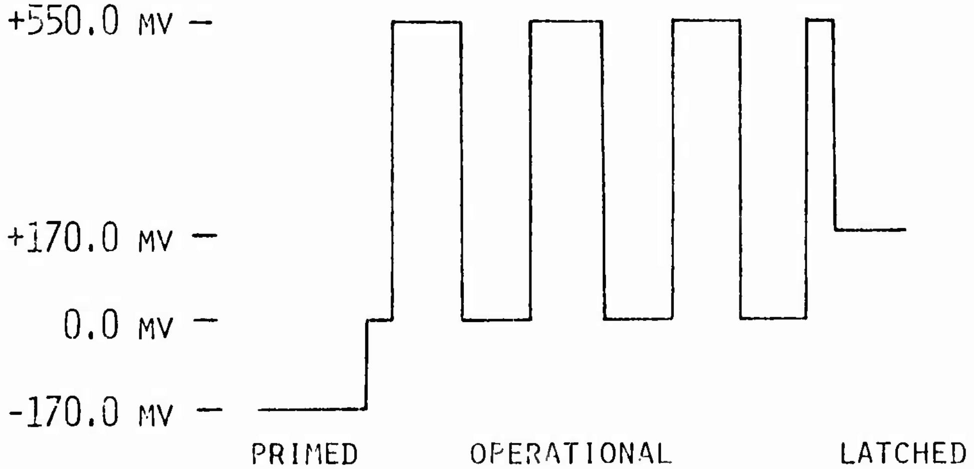




REVISIONS
REV LTR
DESCRIPTION
DATE
APPROVED
530264
PRIMARY TAPE RECORDER
VCO
TRAILER SHELL
TERMINATION & DPS
260Ω
KSC CALIBRATION CHASSIS
NEG.
POS.
NEUT.
P.
S.
150Ω
T-28
T-56
TRAILER
DOWNHOLE
TRAILER SHELL
CABLE OVERSHIELD
VACUUM PORT CONNECTOR
1200Ω EA.
2600Ω EA.
PRIME & LATCH CONTACTS
KAMAN SCIENCES CORPORATION
Garden of the Gods Rd Colorado Springs Colorado
LIN. COMM. & LVC CKT
ALL DIMENSIONS APPLY OVER FINISH
TOLERANCES
MATERIAL
DRAWN
CHECKED
ENGRG
QE
PROD
PROJECT
CONTRACT NO
DATE
4-18-75
4-22-75
SIZE
B
CODE IDENT NO
21732
DWG NO
530264
SCALE
REV.
SHT 1 OF 1
NEXT ASSEMBLY
USED ON
APPLICATION

EXPECTED CHANNEL PERFORMANCE

Full Scale Amplitude At Bridge Input	+25.10 to 29.25
Full Scale Amplitude After DPN	-170 to +550mv
Bridge Excitation Voltage	±15v, 200 ma
Bandwidth, Approximate	20 kHz
DPN Amplitude Bandpass	±1.8v



The recoil velocity, and hence the impulse, is determined by the frequency of the square wave signal generated by the commutator/brush contact system.

These 2 channels will be recorded on tape and transmitted over TSP cable.

VIEWGRAPH 12: Expected Channel Performance

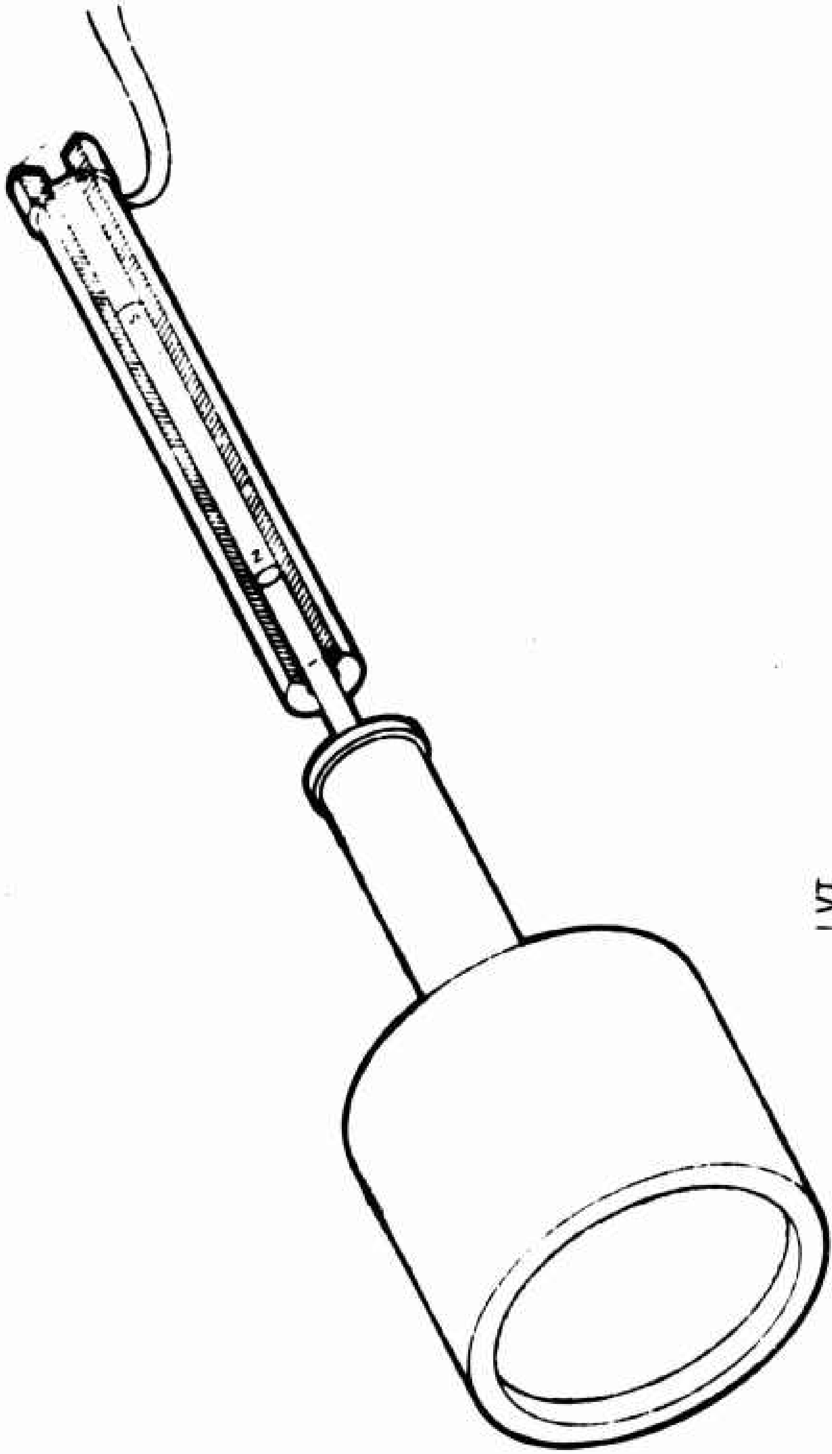
VIEWGRAPH 13&14: LVT GAGES

We are fielding four LVT gages on TSP transmission cable. Our calibration circuit is applied uphole in the trailer in which an insertion voltage is used with gage, cable and termination resistance still in the circuit.

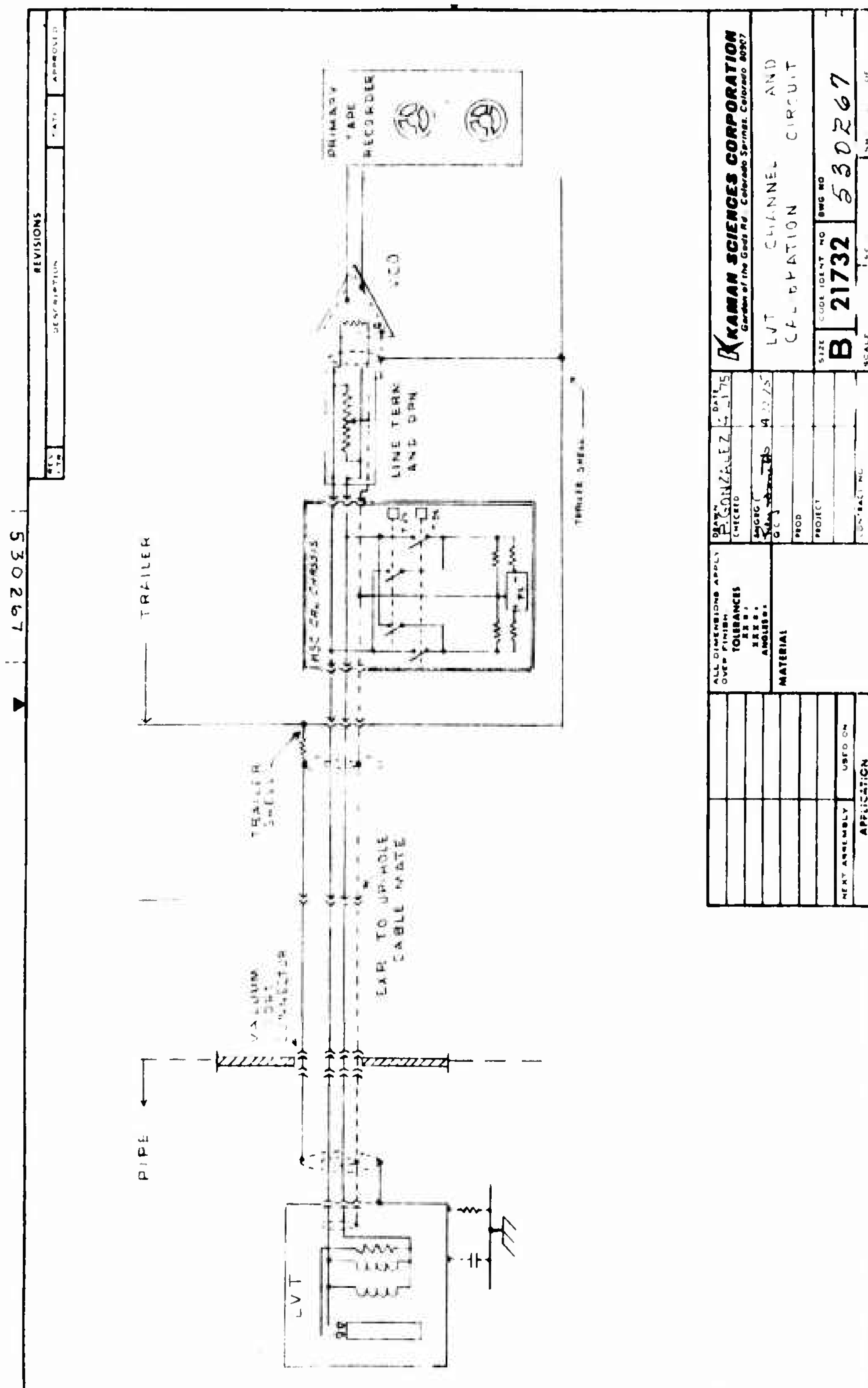
VIEWGRAPH 15: LINEAR VELOCITY COMMUTATOR GAGES

This linear velocity commutator gage is quite similar to the linear piston commutator gage in operation except this gage measures the whole body recoil velocity of structural response rings.

VIEWGRAPH 16: Expected Channel Performance



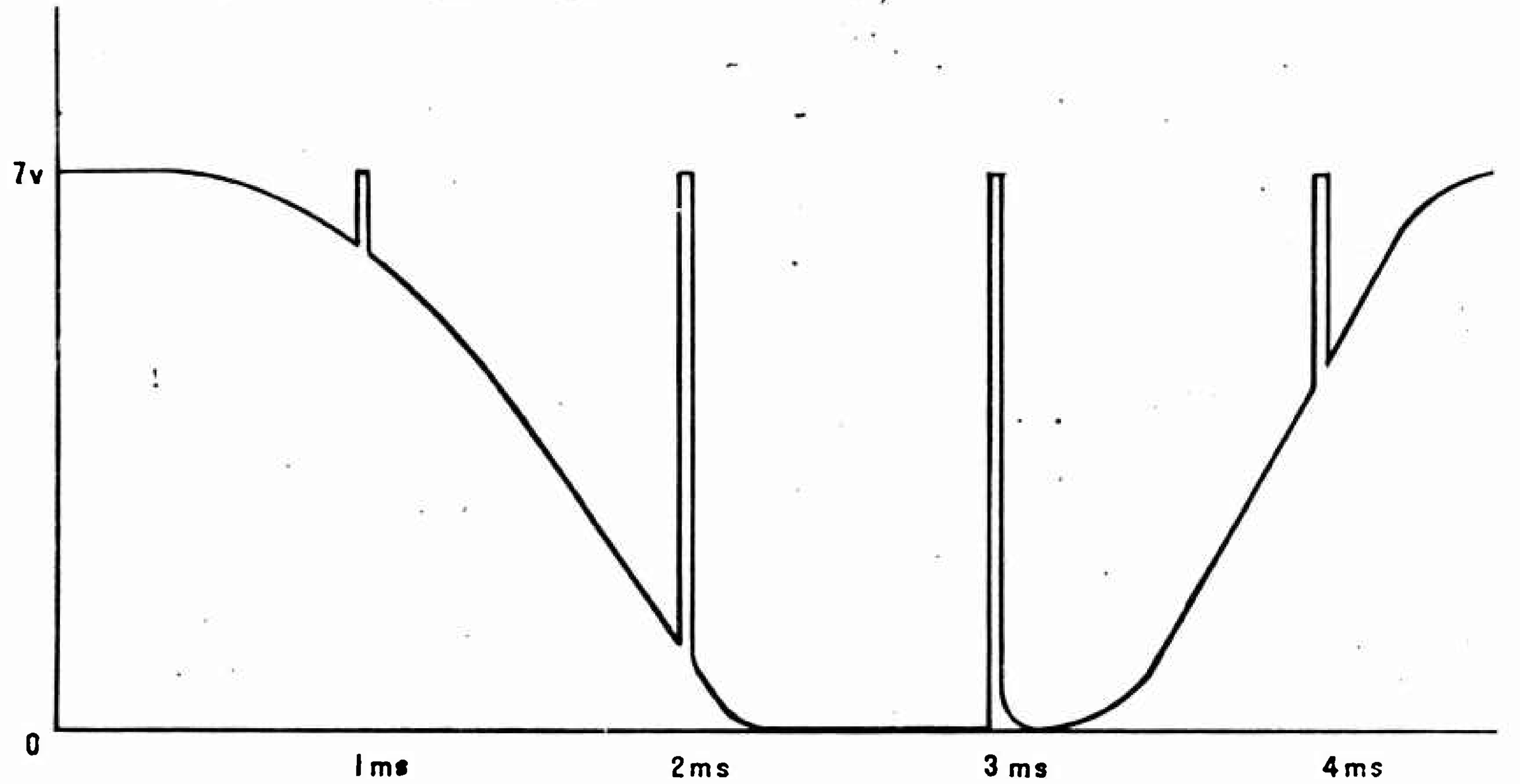
LVT



530267
REVISIONS
PRIMARY TAPE RECORDER
VCO
LINE TERM AND DRN
TRAILER
TRAILER SHIELD
EAR TO UPHOLE CABLE MATE
PIPE
LVT
KAMAN SCIENCES CORPORATION
LVT CHANNEL AND CALIBRATION CIRCUIT
B
21732
530267
MATERIAL

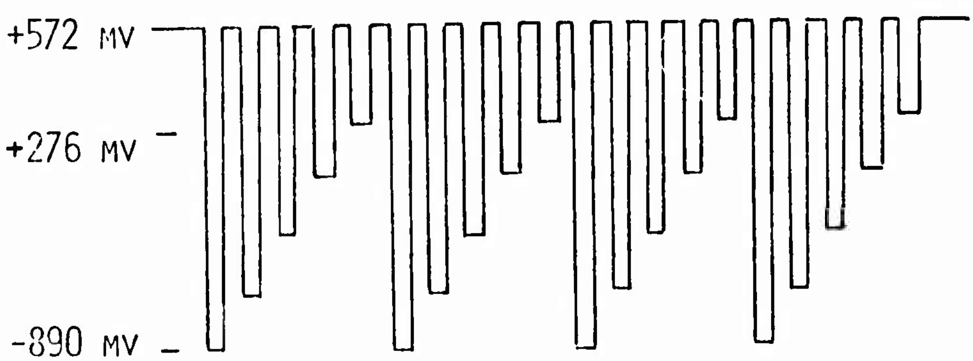
(9)

DETECTOR RESPONDING TO DEBRIS



EXPECTED CHANNEL PERFORMANCE

Full Scale Amplitude At Bridge Input	+27.3v to 20.3v
Full Scale Amplitude After DPN	+572mv To -890 mv
Bridge excitation Voltage	±15v, 200 ma
Bandwidth, Approximate	20 kHz
DPN Amplitude Bandpass	±1.8v



VIEWGRAPH 17: STRAIN GAGE

We will be fielding 16 strain gage channels associated with structural response rings. These gages will have downhole signal conditioning. The strain gage bridge power and calibration sequence will be provided by the B & F, 1-700 Signal Conditioner units. The signal will be amplified by Baylab, Model 5503, amplifier units.

VIEWGRAPH 18: CONTINUITY GAGE

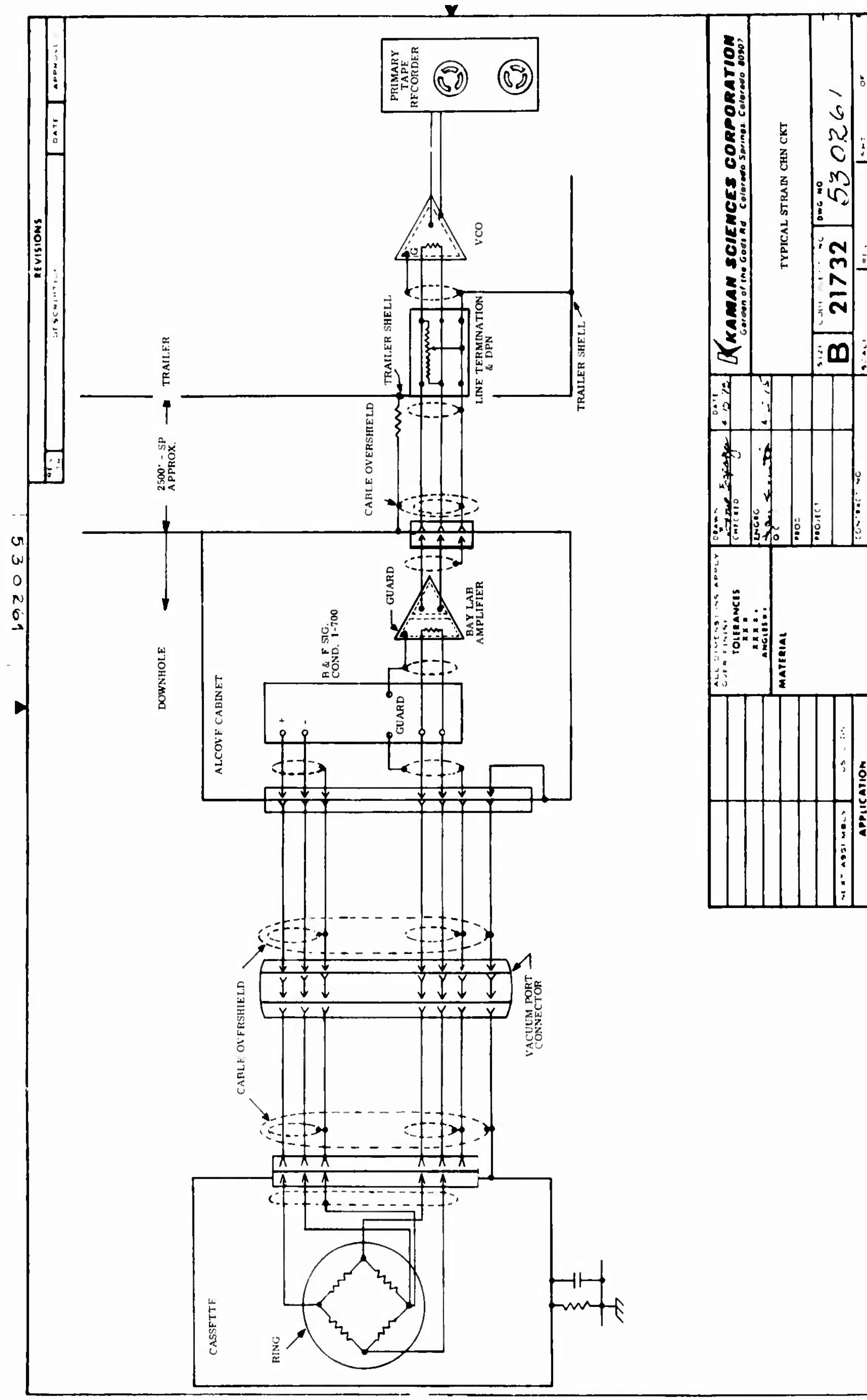
This experiment consists of exposing wire samples to low fluences and detecting the time of break through electrical means. The sequence of wire breakage is unknown and this will be determined by the various output steps associated with each wire. The seven continuity channels will use a constant current source. We are presently testing a B & F signal conditioner unit for this use.

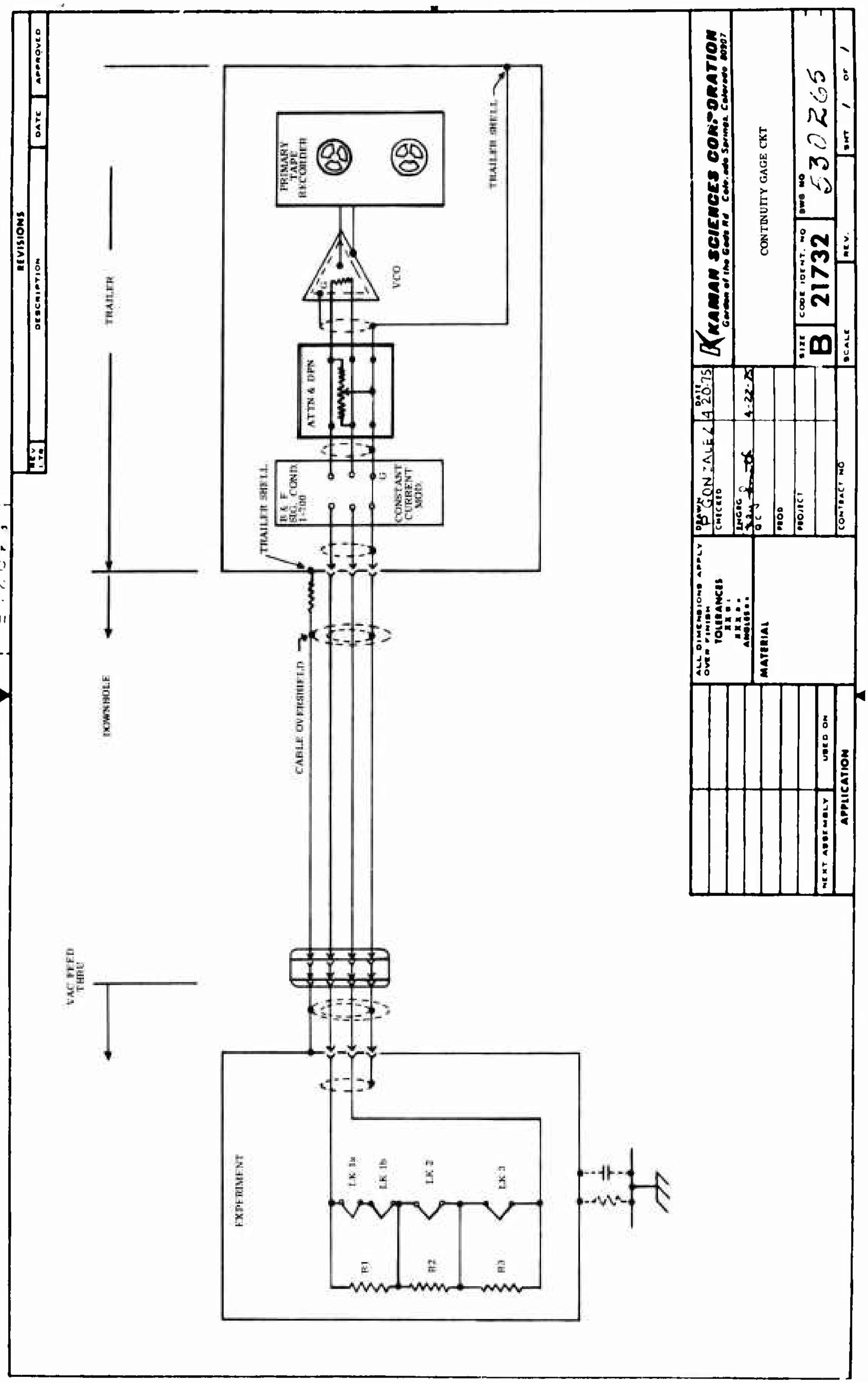
VIEWGRAPH 19: SPINNING DISK

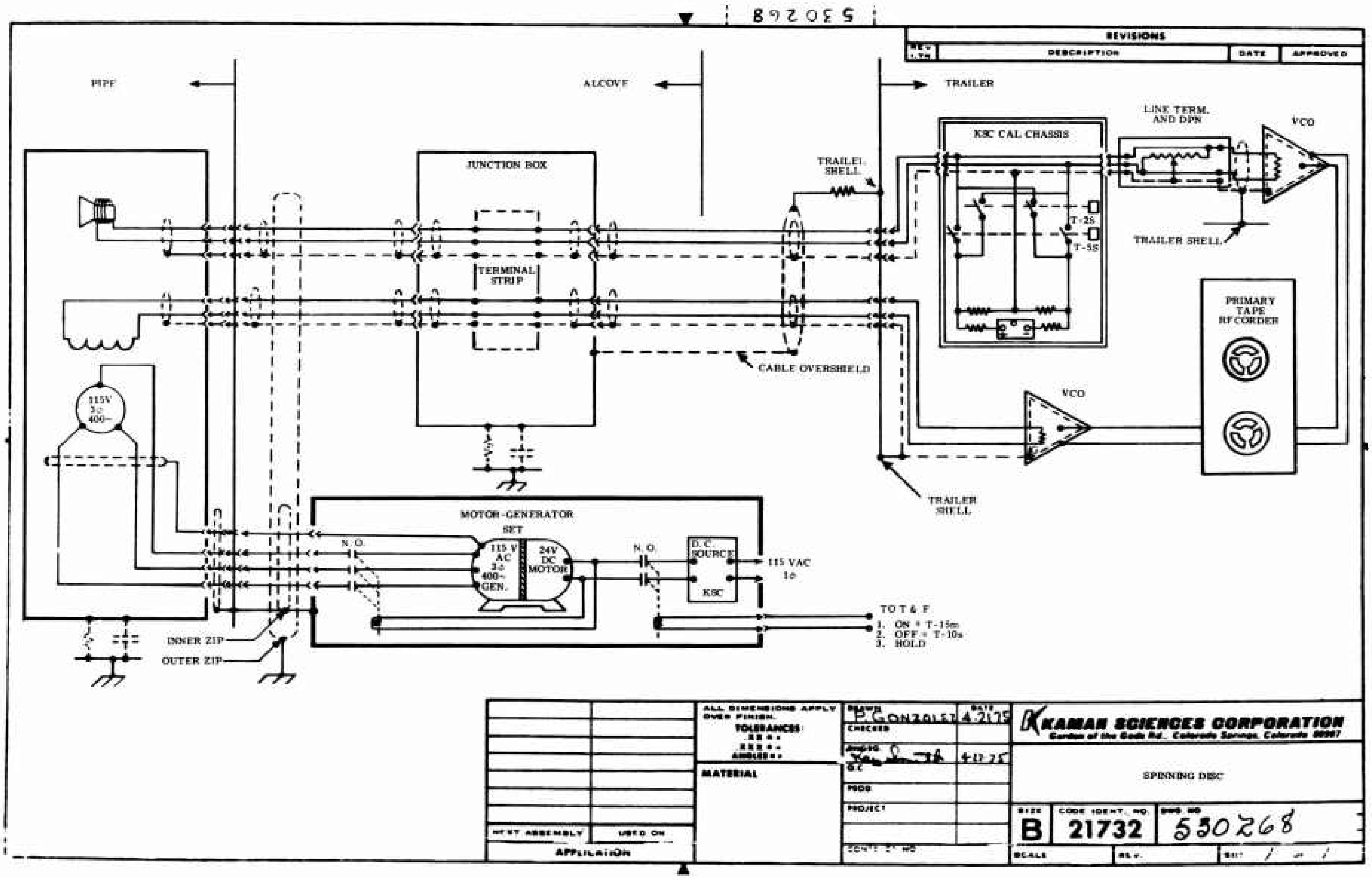
This experiment contains two channels of instrumentation. One is the speed monitor (tachometer) and the other is the softspeaker gage. The experiment is concerned with the collection of sample material blow-off.

The spinning disk deals with more electrical circuitry for the powering of the motor. The converter requires 24v DC to operate and its output is 115v AC, 400 HERTZ to drive the motor in the box. The DC power supply and converter will be in a cabinet located in an alcove.

The tachometer's output is around 100 mv.


REVISIONS
DATE
PRIMARY TAPE RECORDER
VCO
TRAILER
TRAILER SHELL
LINE TERMINATION & DPN
TRAILER SHELL
CABLE OVERSHIELD
2500' - SP APPROX.
DOWNHOLE
GUARD
BAY LAB AMPLIFIER
B & F SIG. COND. 1-700
GUARD
ALCOVE CABINET
CABLE OVERSHIELD
VACUUM PORT CONNECTOR
CASSETTE
RING
KAMAN SCIENCES CORPORATION
Garden of the Gods Rd Colorado Springs Colorado 80907
TYPICAL STRAIN CHN CKT
B
21732
530261
TOLERANCES
MATERIAL
APPLICATION
530261


REVISIONS
REV LTR
DESCRIPTION
DATE
APPROVED
TRAILER
DOWNHOLE
VAC FEED THRU
EXPERIMENT
PRIMARY TAPE RECORDER
VCO
ATTN & DPN
B & F SIG. COND. 1-200
CONSTANT CURRENT MOD
TRAILER SHELL
TRAILER SHELL
CABLE OVERSHIELD
LK 1a
LK 1b
LK 2
LK 3
R1
R2
R3
KAMAN SCIENCES CORPORATION
Garden of the Gods Rd Colorado Springs, Colorado 80907
CONTINUITY GAGE CKT
SIZE
B
CODE IDENT NO
21732
DWG NO
SHT 1 OF 1
SCALE
REV.
DRAWN
DATE
4-20-75
CHECKED
ENGRG
4-22-75
Q C
PROD
PROJECT
CONTRACT NO
ALL DIMENSIONS APPLY OVER FINISH
TOLERANCES
ANGLES
MATERIAL
NEXT ASSEMBLY
USED ON
APPLICATION

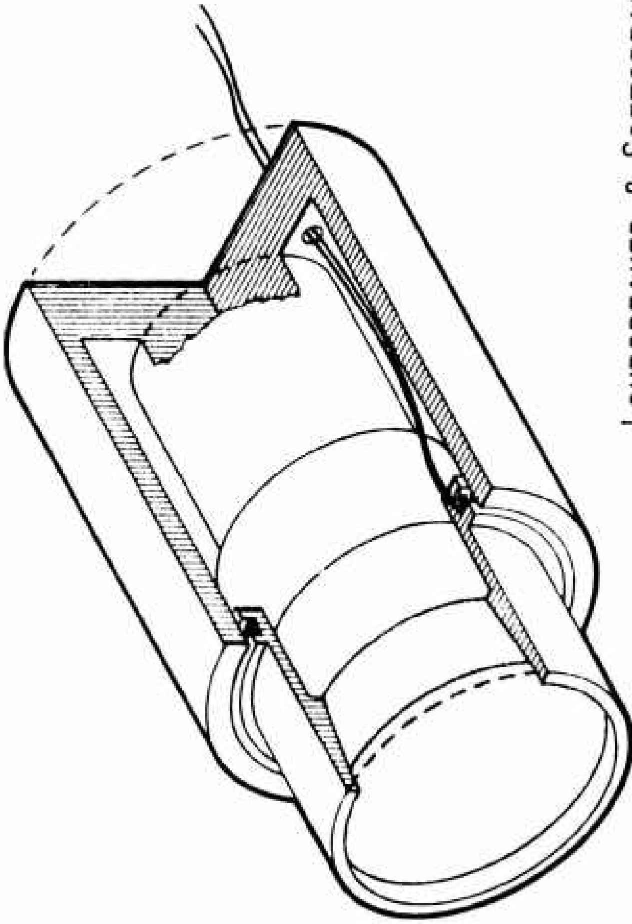


REVISIONS
REV. LTR
DESCRIPTION
DATE
APPROVED
PIPF
ALCOVE
TRAILER
LINE TERM. AND DPN
VCO
KSC CAL CHASSIS
JUNCTION BOX
TRAILER SHELL
T-2S
T-5S
TERMINAL STRIP
TRAILER SHELL
PRIMARY TAPE RECORDER
CABLE OVERSHIELD
VCO
115V 3φ 400~
TRAILER SHELL
MOTOR-GENERATOR SET
N.O.
115 V AC 3φ 400~ GEN.
24V DC MOTOR
N.O.
D.C. SOURCE
KSC
115 VAC 1φ
TO T & F
1. ON + T-15m
2. OFF + T-10s
3. HOLD
INNER ZIP
OUTER ZIP
NEXT ASSEMBLY
USED ON
APPLICATION
ALL DIMENSIONS APPLY OVER FINISH.
TOLERANCES:
ANGLES
MATERIAL
DRAWN P. GONZALEZ
DATE 4-21-75
CHECKED
APPROVED
4-17-75
QC
MOD
PROJECT
KAMAN SCIENCES CORPORATION
Garden of the Gods Rd., Colorado Springs, Colorado
SPINNING DISC
SIZE B
CODE IDENT. NO. 21732
DWG NO 530268
SCALE
REV.
SHT 1 of 1
530268

VIEWGRAPH 20: SOFTSPEAKER GAGE

The softspeaker gage yields an analog output from a coil, positioned on the rear of the sample carrier, moving through a stationary magnet. The coil/magnet geometry of the gage is, then, analogous to that of a typical loudspeaker. This gage will measure momentum with a short time resolution and yield an analog output for at least 500 μsecond.

There will be 3 channels of this type using TSP transmission cable and recorded on tape.



LOUDSPEAKER & SOFTSPEAKER

Lockheed
MISSILES
& SPACE
COMPANY,
INC.

In reply refer to:
LMSC/D430418
Dept. 58-10, Bldg. 528

18 April 1975

Commander
Field Command, DNA
Kirtland AFB, New Mexico 87115

Attn: Mr. Raymond H. Gann (FCTD-EI)

Subject: Contract DNA001-74-C-0133 (ENGINEERING SERVICES, WA9-75A)
Tunnel Environment and Closure Monitors

Enclosure: (a) 4 View Foils, Data Channel Summary, LMSC/D430417 (u)

1. Per your informal request, and our telecon of 11 April 1975, here are the view foils giving the data channel information for the TECM instrumentation.

Lockheed Missiles & Space Company, Inc.
Research and Development Division

for J. J. Neuer
Staff Engineer Sr.

Approved:

for A. B. Zainer, Manager
DNA Programs

JJN/bp
cc: Commander
Field Command, DNA
Kirtland AFB, New Mexico 87115
ATTN: Mr. R. C. Bivona (FCTD-E) (w/o encl)

A SUBSIDIARY OF LOCKHEED AIRCRAFT CORPORATION
SUNNYVALE, CALIFORNIA 94088

Inclosure 14

LMSC (PIPE)

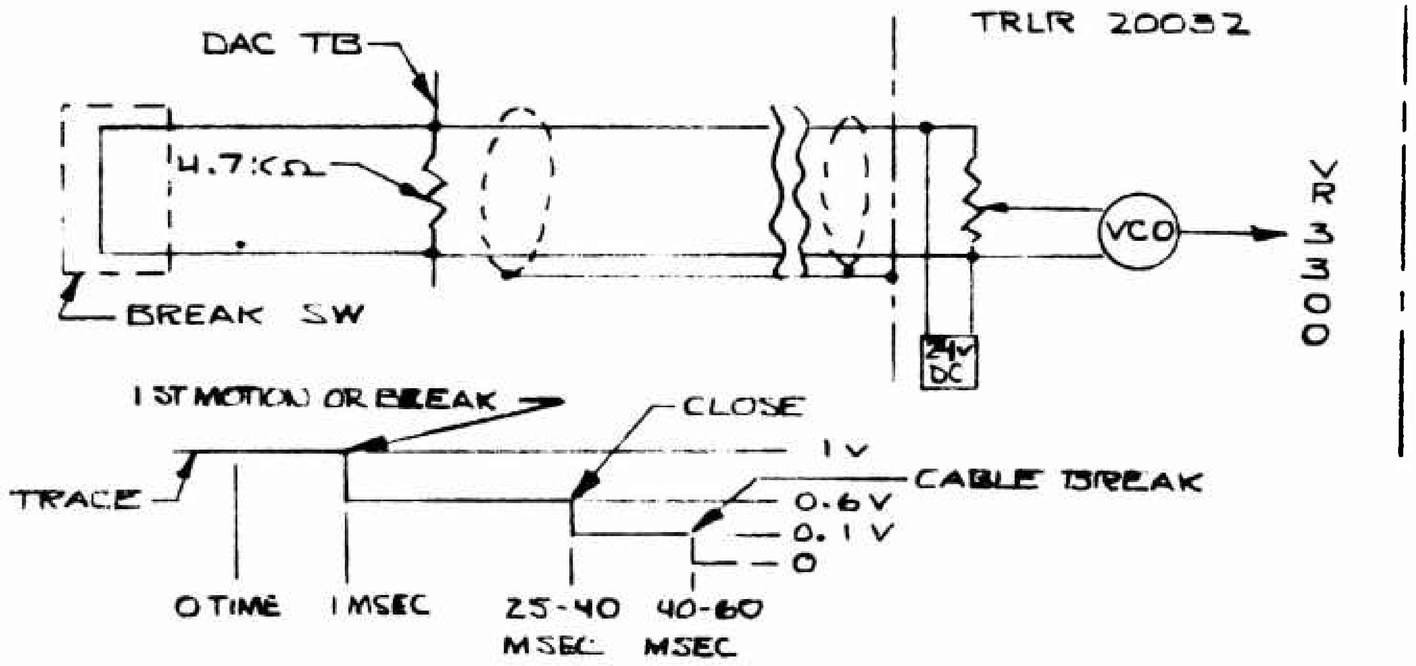
TUNNEL ENVIRONMENT & CLOSURE MONITORS

1. (a) This figure shows the DAC breakswitch configuration and expected output signal.

2. (a) Typical thermocouple measuring system.

3. (a) Typical pressure measuring system.

4. (a) DAC door magnetic pickup velocity circuit.



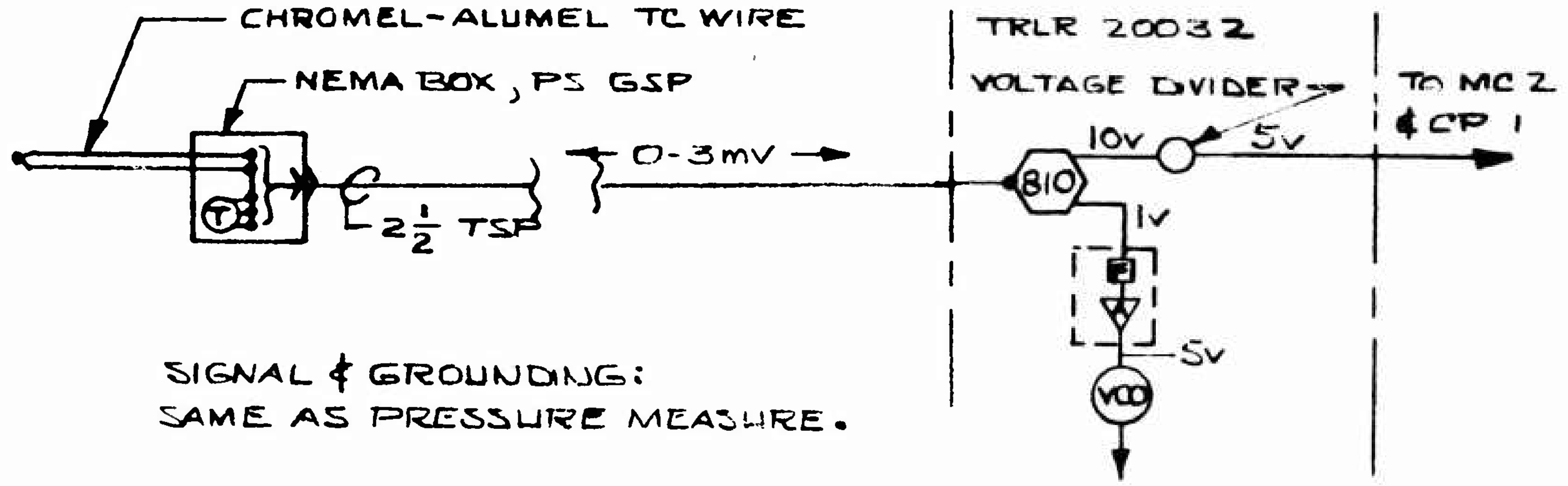
SIG	CABLE	PR	TRLR	TAPE 1 CHAN
2-10 SH	8023	17	20032	12
2-8 SH		16		11
2-4 SH		15		10
2-2 SH		14		9
2R CL		13		8
2R 1MOT		12		8
2L CL		10		6
2L 1MOT		9		6
1R CL		7		4
1R 1MOT		6		4
1L CL		4		2
1L 1MOT	8023	3	20032	2

LMSC TECM

BREAK SWS - DAC 1ST MOTION, CLOSURE (CL), & DOOR SHEAR OUT (SH)

15 APR 75

LMSC D430417



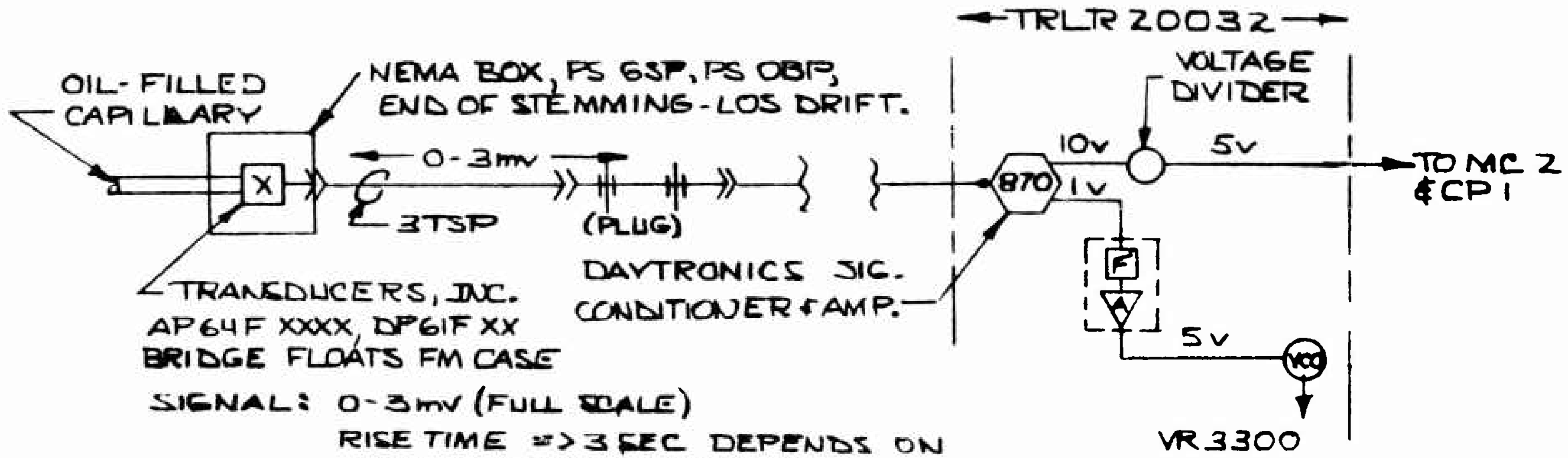
SIGNAL & GROUNDING:
SAME AS PRESSURE MEASURE.

LOC	°F	CABLE	PR	TRLR	TAPE 2
GSP	2300	8021	3-5	20032	VR 3300
OBP		8021	1-3		
TAPS		8007	14-16		
TC 1	2300	8007	16-18	20032	VR 3300

LMSC TECM
EXP. NO. 98601G6500
TUNNEL TEMPERATURES

15 APR 75

LMSC D430417



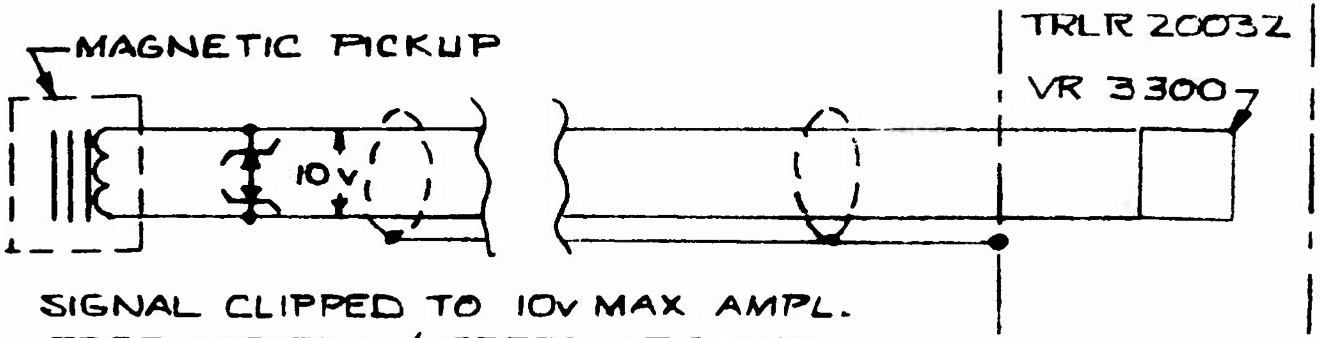
SIGNAL: 0-3mv (FULL SCALE)
RISE TIME ≈>3 SEC DEPENDS ON TUNNEL PRESSURIZATION

GROUNDING: SIGNAL LEADS FLOAT
INDIVIDUAL SHLDS FLOAT AT XDCR TIED TOGETHER AT TRLR.
OVER ALL SHLD GRND IN TUNNEL, FLOAT AT TRLR.
TRLR SHELL FLOAT.

LOC	PSI	CABLE	PR	TRLR	TAPE 2
GSP	1000	8007	5-7	20032	VR 3300
OBP	1000		2-4		
GSP	50		8-10		
GSP	Δ30	8007	11-13		
GSP	75	8021	6-8		
OBP	50	8022	8-10		
TC 1	300		5-7		
OBP	2000	8022	2-4		
TAPS	2000	8024	1-3	20032	VR 3300

LMSC TECM
EXP NO. 9860166500
TUNNEL PRESSURE MEASUREMENTS
15 APR 75

LMSC D 430417



SIGNAL CLIPPED TO 10V MAX AMPL.
FREQ. VARIES W/ SPEED OF DOOR
~4KHZ MAX.

LOC		CABLE	FR	TRLR	TAPE 1 CHAN
2R	VEL	8023	11	20032	7
2L			8		5
1R			5		3
1L	VEL	8023	2	20032	1

LMSC TECM
EXP NO 98601G6500
15 APR 75
DAC DOOR VELOCITY

LMSC D 430417

In reply refer to:
LMSC/D430418
Dept. 58-10, Bldg. 528

Chief
Site Development Directorate
Field Command, DNA
P.O. Box 208
Mercury, Nevada 89023
ATTN: Mr. Robert Shirky (FCTD-N)