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Dr. P. L. Ward and George Hade

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13. ABSTRACT

Five high-gain, broad-band, long period seismograph stations are being installed around the world. The instruments will probably have gains on the order of 100,000 or more at periods of 40 to 50 sec. This high sensitivity, some 50 to 100 times greater than previously attainable at these periods, should lead to a similar increase in the data now available in the long-period band. The purpose of this report is to describe the instruments, present a preliminary parts list, and present technical drawings of most of the newly designed components. The five sites are also briefly described. This report is written at a time when construction has begun at four sites.

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ARPA Order Number: 1513
Program Code Number: 3F10
Contractor: Columbia University
Effective date of contract: 1 February 1970
Contract expiration date: 31 January 1971
Amount of contract: $942,573.00
Contract Number: F44620-70-C-0038
Principal Investigator: Lynn R. Sykes, 914-359-2900
Project scientist: William Best, 202-OX4-5456
Title of work: Long-period Seismological Research Program

ABSTRACT

Five high-gain, broad-band, long-period seismograph stations are being installed around the world. The instruments will probably have gains on the order of 100,000 or more at periods of 40 to 50 sec. This high sensitivity, some 50 to 100 times greater than previously attainable at these periods, should lead to a similar increase in the data now available in the long-period band. The purpose of this report is to describe the instruments, present a preliminary parts list, and present technical drawings of most of the newly designed components. The five sites are also briefly described. This report is written at a time when construction has begun at four sites.

GENERAL DESCRIPTION OF THE INSTRUMENTS

The design of these instruments is based on that developed by Pomeroy and Hade (Pomeroy et al., 1969) in the Ogdensburg Mine in New Jersey. Both vertical and horizontal components have been operating successfully for nearly two years at Ogdensburg. A block diagram of the system is shown in Figure 1. The heart of the system is a Geotech seismometer with a natural frequency of 30 sec. This is coupled to a Kinemetrics galvanometer with a natural frequency of 100 sec. The signal from the galvanometer is amplified by a phototube amplifier and recorded digitally and photographically. Both high and low gain photographic records are available. The dynamic range of the digital recordings is over 70 db and is limited by the phototube amplifiers.

The high sensitivity of these instruments is achieved by electronically filtering out 6 second microseisms and by isolating

the seismometer from changes in barometric pressure. The isolation is achieved primarily by a hemispherical tank shown in Figure 2. This new design features a hemispherical top, shallow walls, and a metal to metal contact of top and base. Experiments at Ogdensburg show that tanks of this new design, unlike those used by Pomeroy and others, will perform nearly all of the necessary filtering of barometric changes. For added security, however, these tanks will be placed in an air-tight cement or stone vault with a bulkhead door.

High sensitivity is also achieved because the instrument passband has been shaped to correlate with a natural low in earth noise. This is shown by a plot of spectral amplitude density of noise during June, 1969 (Figure 3) together with a plot of the response of the vertical instrument (Savino, personal communication, 1970).

The background noise observed on the test instruments at Ogdensburg appears to be true ground motion and not instrumental noise. This is most directly shown by the following experiment carried out by Savino and Hade: two different types of seismometers were operated in two different parts of the Ogdensburg mine (Figure 4). A Sprengnether seismometer was placed in a chamber in the mine separated from the main tunnel by two bulkhead doors. A Geotech seismometer in a pressure tank was operated behind three good bulkhead doors about 500 feet from the Sprengnether instrument. The signals were recorded simultaneously on digital magnetic tape. A coherence between the two signals

was calculated digitally for a period of recording of 5 hours, 14 minutes. As can be seen in Figure 5, the coherence squared is exceptionally good and well above the 95% confidence limits in the passband of interest. This is one of the experiments that has convinced us that instrument noise does not contribute significantly to the observed seismic background.

Data will consist of 6 photographic records per day (3 components of high and low gain) on 70 mm microfilm distributed by the USCGS through the same channels as the WWSSN data. One digital tape will be filled every two weeks. The tapes will be combined by Texas Instruments into master tapes containing all stations. The digital tapes consist of header time data, outputs of the three velocity transducers digitized at a rate of one sample per second, and outputs of three displacement transducers digitized at rates of one sample per five seconds. The general theory of operation and tape format of the digital system are described in Appendix 1.

DETAILED DESCRIPTION OF THE INSTRUMENTS

Appendix 2 contains detailed drawings and a preliminary parts list of the system. The drawings and parts list are arranged by four digit part numbers. The first digit (thousands digit), signifies the location or overall classification of the part according to the following scheme:

1 Seismometer room
2 Preamplifier room
3 Control room
4 Photographic room
5 Pressure door assembly
6 Expendable supplies, general
7 Expendable supplies, used for installation
8 Special tools needed for installation

The parts list consists of major assemblies as purchased or built by or for Lamont. When an "X" appears in the column labeled "Detailed Drawing", a drawing is included and arranged in order of part number. These drawings contain subassembly parts lists. An "M" in the same column signifies that a manufacturer's instruction manual is available.

SUMMARY OF NEW STATION SITES

Station: Fairbanks, Alaska

Location Latitude 64.87°N

Longitude 148.07°W

Elevation About 305 meters

Principal contact:

John B. Townshend

Chief, College Observatory

Coast and Geodetic Survey

College, Alaska 99701

907-479-7626

Station type: Old Clipper Gold Mine with 130 meters overburden.

Owned by: Mr. Lloyd Loundsbury

Fairbanks, Alaska

907-456-5975

About 11.5 km southwest of WWSSN station.

Station: Charters Towers, Australia

Location: Latitude 20.09S

Longitude 146.25E

Elevation 357 meters

Principal contact:

Dr. John P. Webb

Dept. of Geology and Mineralogy

University of Queensland

St. Lucia, Queensland, 4067

Australia

Station type: Mine, 33 meters overburden.

Next to WWSSN station

Station: Eilat, Israel

Location: Latitude 29.6°N

Longitude 34.9°E

Elevation --

Principal contact:

Prof. C.L. Pekeris

Head of the Dept. of

Applied Mathematics

The Weizmann Institute of Science

Rehovot, Israel

Station type: Mine

Station: Toledo, Spain

Location: Latitude 39.87N

Longitude 4.05W

Elevation --

Principal contact:

Dr. Gonzalo Payo

Instituto Geografico y Catastral

Observatorio Central Geofisico

Apartado 46

Toledo, Spain

Station type: Shallow tunnel in granite proposed.

Station: Chengmai, Thailand

Location: Latitude 18.79N

Longitude 98.98E

Elevation 416 meters

Principal contact:

Adm. Sanit Vesa-rajananda

Meteorological Dept.

Office of the Prime Minister

Bangkapi, Bangkok 11

Thailand

Station type: Open quarry, no overburden, next to WWSSN station.

REFERENCES

Pomeroy, P.W., G. Hade, J. Savino, and R. Chander, Preliminary results from high-gain, wide-band, long-period electromagnetic seismograph systems, J. Geophys. Res., 74 (12), 3295, 1969.

FIGURE CAPTIONS

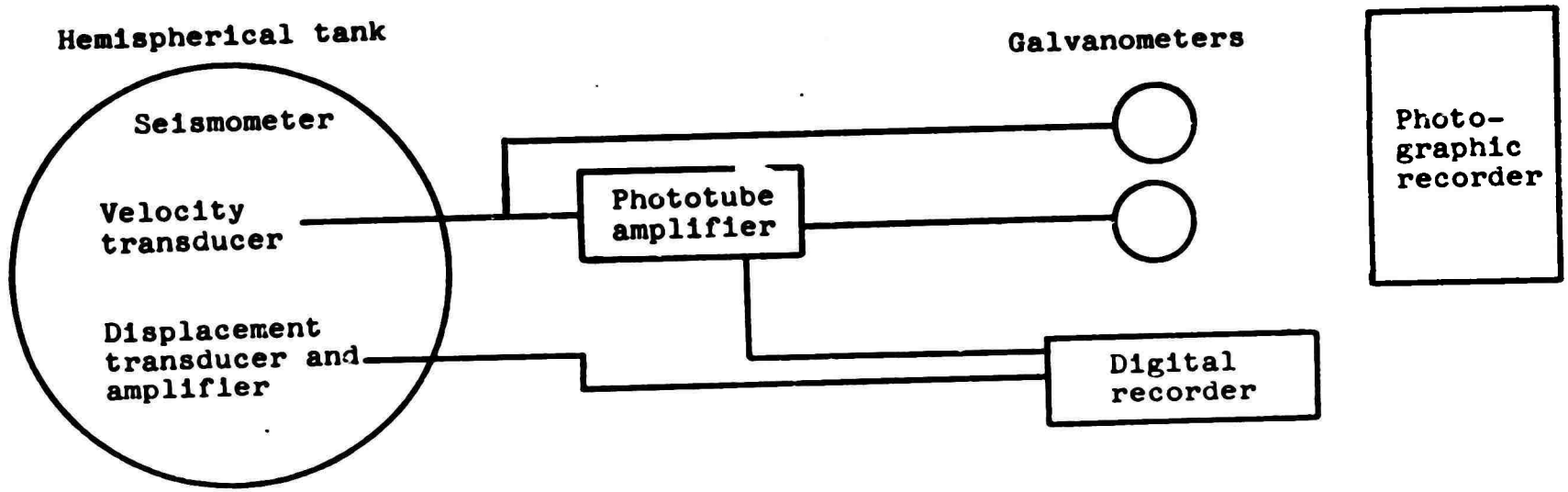
Figure 1. Block diagram of high-gain, long-period, broad-band seismic system.

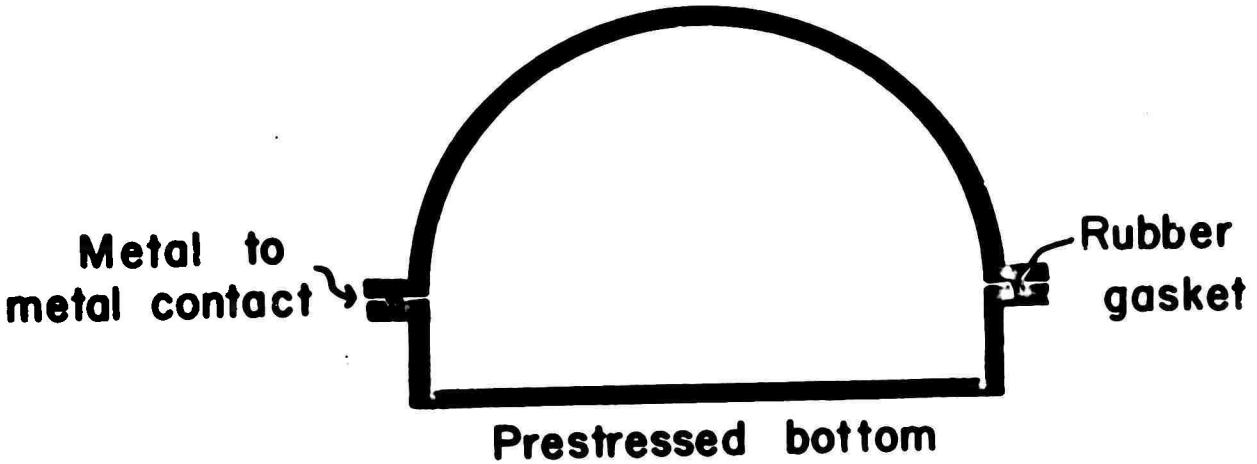
Figure 2. Schematic diagram of the pressure tank.

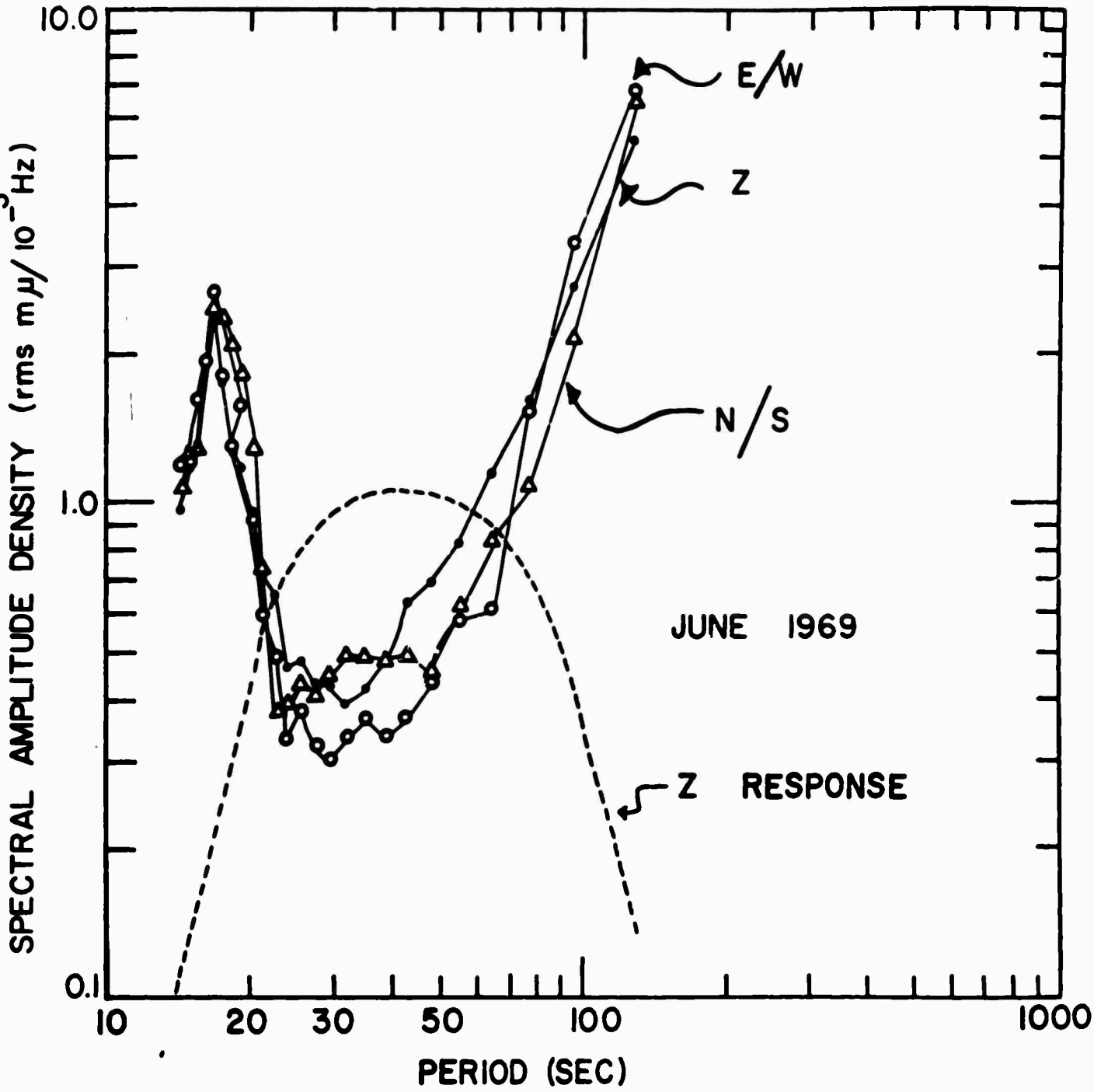
Figure 3. Spectral density of the noise on the Ogdensburg high-gain instruments during June, 1960. The response of the vertical instrument is shown by the dashed line.

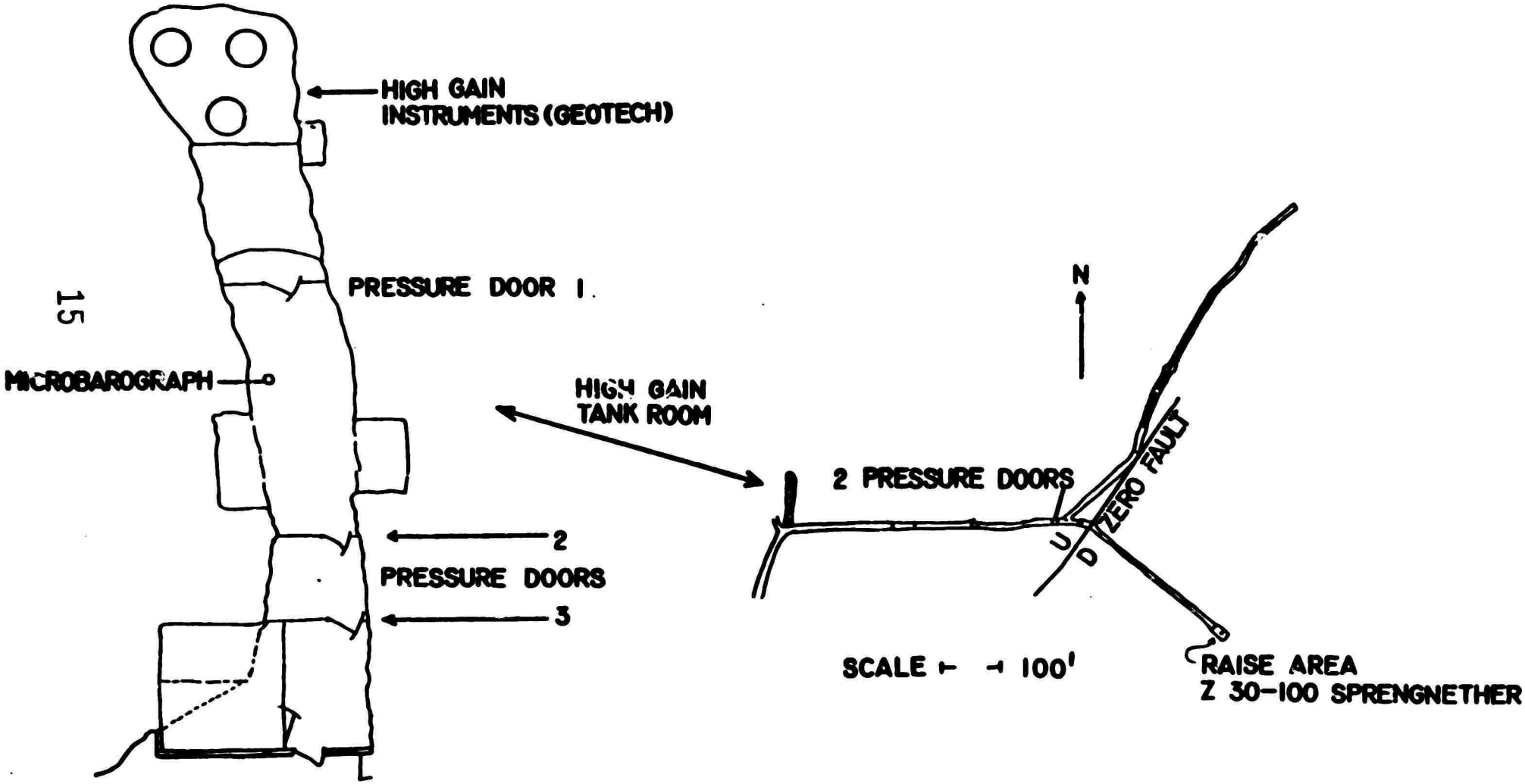
Figure 4. Map of Lamont's seismic observatory at Ogdensburg, New Jersey, 1850 feet below the surface.

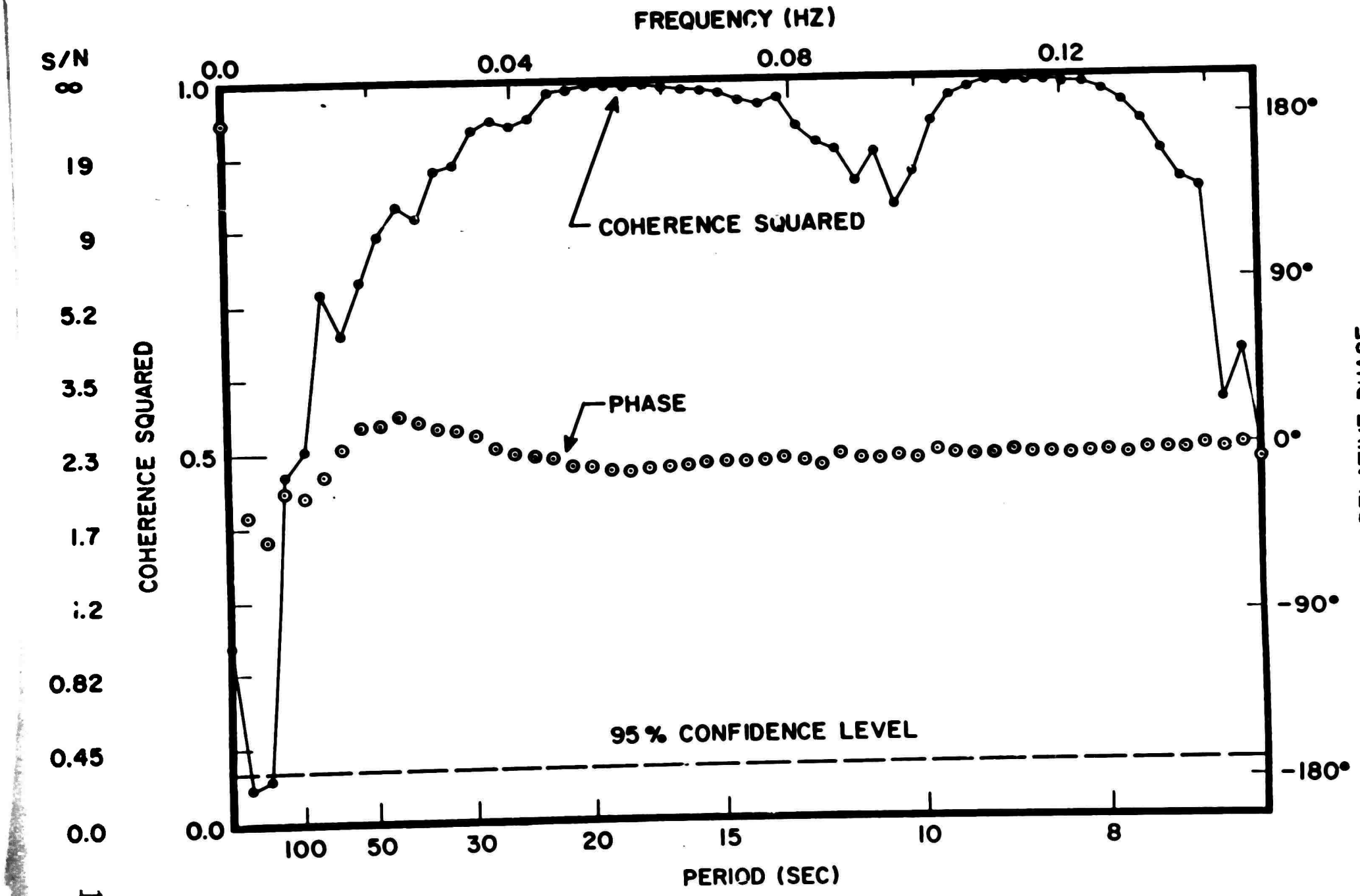
Figure 5. Coherence squared and phase relation for a 5 hour and 14 minute portion of background noise at a Sprengnether and a Geotech seismometer spaced 500 feet apart in different environments in the Ogdensburg Mine.


Hemispherical tank
Seismometer
Velocity transducer
Displacement transducer and amplifier
Phototube amplifier
Galvanometers
Photo-graphic recorder
Digital recorder


Metal to
metal contact
Rubber
gasket
Prestressed bottom


10.0
1.0
0.1
SPECTRAL AMPLITUDE DENSITY (rms mμ/10⁻³Hz)
E/W
Z
N/S
JUNE 1969
Z RESPONSE
10
20
30
50
100
1000
PERIOD (SEC)

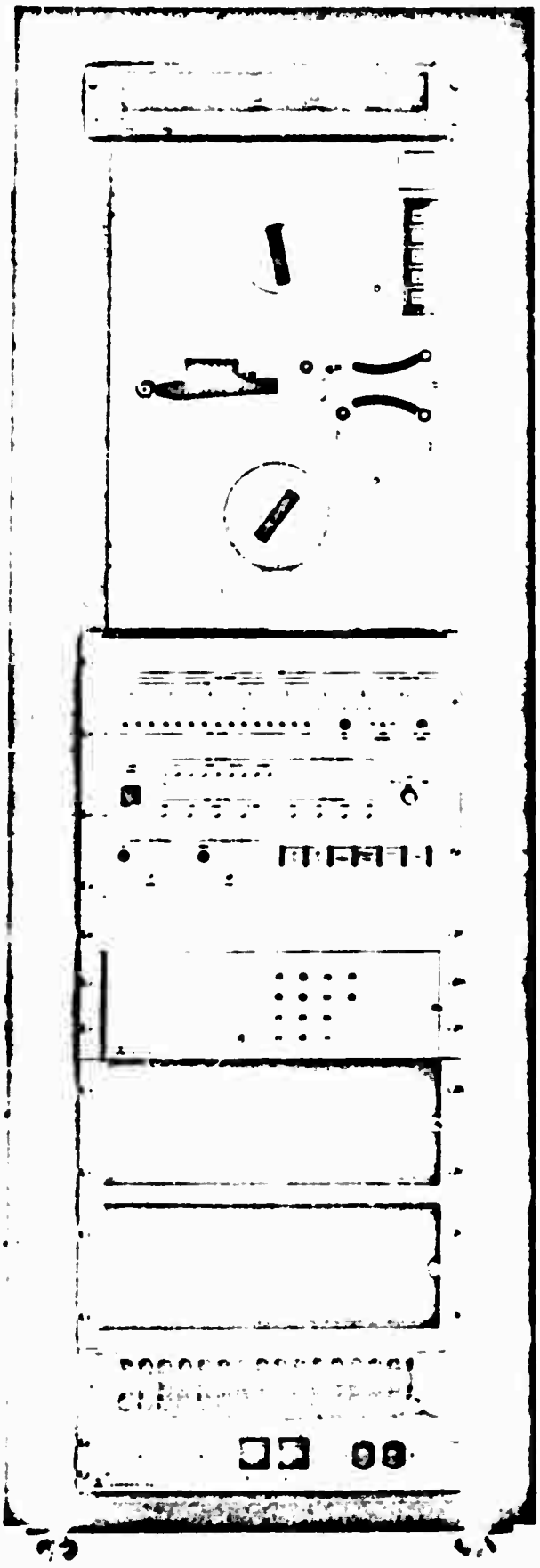

HIGH GAIN
INSTRUMENTS (GEOTECH)
PRESSURE DOOR 1
MICROBAROGRAPH
HIGH GAIN
TANK ROOM
2
PRESSURE DOORS
3
N
2 PRESSURE DOORS
U
D
ZERO FAULT
SCALE
100'
RAISE AREA
Z 30-100 SPRENGNETHER


FREQUENCY (HZ)
0.0
0.04
0.08
0.12
S/N
∞
19
9
5.2
3.5
2.3
1.7
1.2
0.82
0.45
0.0
1.0
0.5
0.0
COHERENCE SQUARED
COHERENCE SQUARED
PHASE
95 % CONFIDENCE LEVEL
180°
90°
0°
-90°
-180°
RELATIVE PHASE
100
50
30
20
15
10
8
PERIOD (SEC)

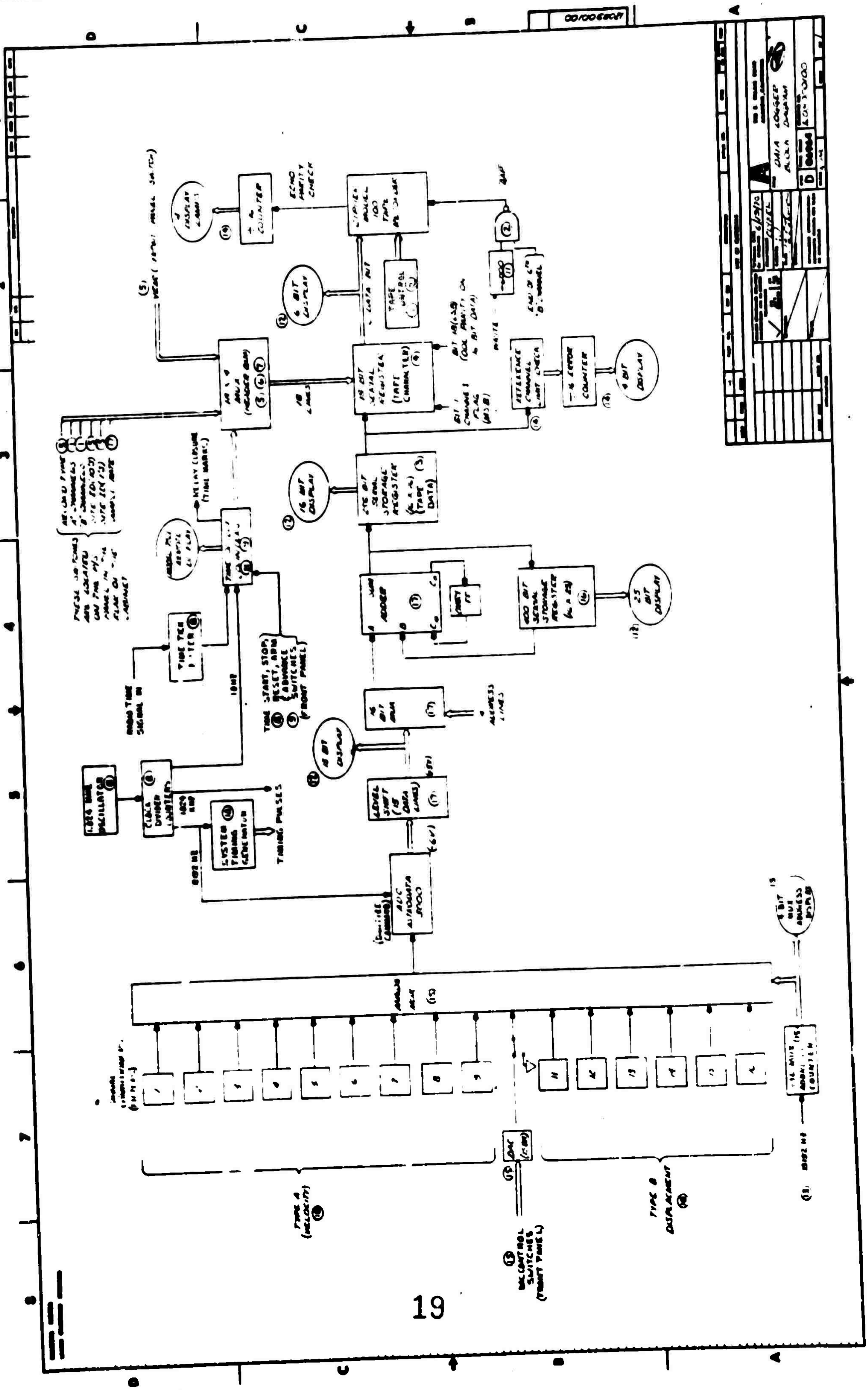
APPENDIX 1

Data Logger System

General Theory of Operation and Tape Format



DATA LOGGER, PART NO. 7104500100


DATA LOGGER BLOCK DIAGRAM
SYSTEM TIMING GENERATOR
TIMING PULSES
RADIO TIME SIGNAL IN
DAC CONTROL SWITCHES (FRONT PANEL)

4-2. GENERAL THEORY OF OPERATION

A block diagram of the Data Logger system is shown on drawing 1208900100. This block diagram illustrates the primary functions of the system and is used as a basis for the general description contained in the following paragraphs. The functional flow of data is shown from left-to-right wherever possible.

4-3. SIGNAL INPUTS

The inputs to the Data Logger are shown on the left hand side of the drawing. These inputs consist of 9 channels of analog velocity data (channels 1-9) 1 analog test channel supplied from a DAC or ground (channel 10), and 6 channels of analog displacement data (channels 11-16). Channels 1 through 9 are designated type A inputs, channels 11 through 16 are designated type B inputs, and channel 10 is designated as a test input. These inputs, with the exception of the test channel, are routed through signal conditioning filters to an analog multiplexer. Electrical characteristics for the input signals and conditioning filters are given in table 1-2.

Channel 10 (test input) receives inputs from a 15 bit DAC when local tests are conducted on the system. Fifteen DAC input switches on the control panel are used to set the analog output of this DAC. A switch is also provided on the control

panel to set the channel 10 input to ground when DAC tests are not being conducted.

The system, as supplied by the manufacturer, only contains enough signal conditioning filters to accept three type A inputs (channels 1, 2, and 3) and three type B inputs (channels 11, 12, and 13). However, the system is prewired to accept all fifteen input channels if expansion is desired.

4-4. SIGNAL MULTIPLEXING

The conditioned signals from the input filters are applied to a 16-input analog multiplexer that sequentially selects each of the 16 channels at an 8192 Hz rate. Since there are 16 input channels, each channel is selected 512 times per second or 1024 times every two seconds. Channel selection is always in order, with channel 1 being selected first and channel 16 being selected last. The multiplexer selects channels 1 through 16 repeatedly on a continuous basis.

The outputs of the multiplexer are fed into an Astrodata Model 3000 Analog-to-Digital Converter (ADC) where they are converted into a parallel, 14 bits plus sign bit, digital output. The ADC digitizes the multiplexer outputs at an 8192 Hz rate so that each channel is digitized as it is selected by the multiplexer. Theory of operation information for the ADC is contained in the Model 3000 Analog-to-Digital Converter manual supplied with the Data Logger equipment.

4-5. LEVEL SHIFTING

The logic levels for the digital outputs of the ADC are zero volts for a logic 1 and -6 volts for a logic 0. Since these logic levels are incompatible with the integrated circuit (IC) logic levels that are used throughout the remainder of the Data Logger logic, these outputs are routed through level shifter circuits that convert the levels to +5 volts for a logic 0 and zero volts for a logic 1. The 15 bit parallel outputs from these level shifters are supplied to a 15 bit indicator display on the control panel and inverted and supplied to a digital multiplexer for data integration.

4-6. DATA INTEGRATION

The data integration logic, as shown on the block diagram, consists of the adder, the carry flip-flop, and the 400 bit serial storage register or summing register. This logic performs the function of arranging the digital inputs from the level shifters into 16 channels of information containing 25 bits of summed data per channel. When the sum is completed, this 25 bits of data represents processed average data for a given channel.

The averaging process is accomplished by summing each of the channel inputs a selected number of times up to a maximum of 1024 summations. Since 1024 summations is equal to 2^{10}, 25 bits are required and allotted to each channel to prevent overflow. In other words 15 bits of data that has been summed 1024 times is left shifted by 10 bits. Therefore the 15 most significant bits of data in the 25 bit word represent the processed average data for that channel (although 16 rather than 15 bits are saved in order to reduce round-off error). Since 25 bits

are required for each channel, and there are 16 channels of data, a 400 bit summing register is provided to store the data for all of the channels.

As data for a given channel is serially fed into the adder by the 16 bit multiplexer, the previous value of that channel is also being serially routed into the adder from the summing register. The two values are then summed together and the new data is routed back into the summing register where it is stored until the next summation is performed for that channel. A given channel of 25 bits that is stored in the summing register can also be selected for display on the front panel indicators.

Although data from all 16 channels is routed into the multiplexer in order, the B type channels are only summed on every 5th cycle. Timing and control circuits in the system generate a disable term that is applied to the multiplexer four out of every five cycles when the B type channels are multiplexed. When this term is applied, the output of the multiplexer is inhibited and a string of logic 0's are routed into the adder for that particular channel. Therefore, after the summing reg-process the B channel sum will remain unchanged four out of five times.

After the selected number of summations are completed for a given channel, the resulting sum is divided by the number of summations to obtain an average data value. The averaged value is then shifted into the tape data register. The division is done by shifting the binary point since the divisions are binary multiples. This division is done as the number is being shifted into the tape register by selecting the appropriate 16 bits out of the 25 bit sum.

During the summation cycle which completes the sum for 1 or more channels, the 16 appropriate bits out of the 25 for each channel are routed into a 256 bit serial storage register, or tape data register as it is labeled on the front panel. At the same time, the 400 bit summing register is reset to zero (for those channels whose sum is complete) in order to initialize it for the next cycle. When the 256 bit serial storage register is completely filled it contains 16 bits of information for 16 channels. Of course, in 4 out of every 5 cycles only the A channel register positions contain significant information since the B channel sums were not completed.

The number of shift cycles per second from the summing register into the serial storage register is controlled by the SAMPLE RATE switch located on the power supply support assembly, drawing 2234000100. This switch also controls the number of summations that will be performed in a given cycle by the adder. When a sample rate of 0.5 is selected each channel will be summed 1024 times and will be shifted into the serial storage register once every 2 seconds. When a sample rate of 1.0 is selected, each channel is summed 512 times and shifted into the serial storage register once every second. In this case the most significant bit of the 25 data bits in the summing register is bypassed and the next most significant 16 bits are shifted into the serial storage register. When a sample rate of 2.0 is selected, each channel is summed 256 times, the first two most significant bits are bypassed and the remaining 16 most significant bits are shifted into the serial storage register once every 0.5 seconds. When a sample rate of 4.0 is selected, each channel is summed 128 times, the first three most significant bits are bypassed, and the remaining 16 most significant bits are shifted into the serial storage register once every 0.25 seconds.

4-7. DATA FORMATTING

When the 256 bit serial storage register is completely loaded, data averaging is complete and the data formatting process is begun. Data formatting is accomplished by the 18 bit serial register or tape character register as it is labeled on the front panel.

The 16 channels of 16 bit data are loaded serially into the tape character register from the tape data register one at a time. Each of these 16 bit words occupies in turn the middle 16 positions in the 18 bit tape character register. The most significant bit position is occupied by a channel 1 flag bit that is true only when channel 1 data is loaded. The least significant bit position is occupied by a parity bit that represents odd parity on the 16 data bits only.

In addition to channel data from the tape data register, tape record information (header data) is also loaded into the tape character register in parallel from the header data multiplexer. This information consists of four 18 bit words that are loaded into the tape character register and written on tape prior to loading and writing channel data. The contents and generation of header data words will be described later in this chapter. The emphasis here is that header data is loaded and written first followed by channel data to complete a tape record. The 18 bit header data words do not contain a channel 1 flag bit or a parity bit.

The header data and channel data words are transmitted to the tape, 6 bits at a time until the entire 18 bit word is written. To accomplish this, the 6 most significant bits of the tape character register are transmitted to the tape, the register is then right shifted 12 bit positions and looped back into itself, the next 6 most significant bits are transmitted out, the register is again right shifted 12 times and looped, and finally the last group of 6 bits is transmitted out. The 6 bit group of output data is available to a front panel display.

4-8. TAPE CONTROL

The tape control logic is provided to control the tape transport functions such as step/write, busy, ready, stop, and forward. In addition to these functions a divide by 6000 counter is provided to control the generation of a 0.75 inch gap on the tape after the record has ended. The divide by 6000 counter is used to count tape characters. Since each tape character contains 6 bits and there are 3 tape characters required for each 18 bit word, the counter actually functions as a divide by 2000 word counter. The reason for this divide by 2000 function is that a tape record is specified to consist of at least 2000 18 bit words, including the four header data words. After the record has been completed, the counter causes a gap command to be sent to the tape transport, which then generates a 0.75 inch gap on the tape. However, since the record is specified to consist of multiples of the 16 possible channels, the divide by 2000 counter output is gated with an "end of the last B channel" signal which delays the gap command until multiples of the 16 channels are contained in the tape record.

The "number of channels to be written" and "step/write" functions of the tape control logic provide the means to select the actual number of A type channels and B type channels that will be written on the tape. All 16 channels are processed up to this point regardless of how many are actually implemented. The test channel and those channels for which there is no hardware implementation are prevented from being written on tape by these circuits. In other words if only three A channels are selected, the 6 remaining A channels in a given cycle, starting with channel 4, will not be written on tape because the step/write command is inhibited. Any number of A channels and B channels can be selected with the exception that there must always be at least one A channel.

4-9. HEADER DATA

The header data is generated by the logic shown at the top of the block diagram. This logic consists of the 1.024 MHz oscillator, the clock divider counter, time tick filter, time of day counters, header data multiplexer, and front panel switches.

The oscillator and clock divider counters generate a 0.1 sec timing signal (10 Hz) that is applied to a time of day counter. The time of day counter supplies time of day information to the header data multiplexer.

In addition to the timing input from the clock divider counter, a timing input can also be supplied to the time of day counter from the external time tick filter. This filter receives a modulated carrier wave in the form of sine-wave bursts. This signal is transformed into a digital time tick that is supplied to the time of day counter in place of the internally

generated timing signal if desired. The time-of-day count is available on a display panel located on the front of the cabinet.

In addition to time-of-day information, the header data words also include record type, station identification, year identification, number of channels selected, and sample rate information. All of this information is generated by manually set switches located primarily on the Data Logger front panel. All of this information is routed to the multiplexer in parallel and multiplexed into the tape character register as 18 bit parallel digital words. A sample of four words of header data is shown in figure 4-1.

4-10. ERROR INDICATION

When the system is being operated in the test mode, an error indication is provided on the front panel display to verify the accuracy of test channel information that is being processed in the system. This error indication counts the number of errors processed and displays this count as a 4 bit BCD code.

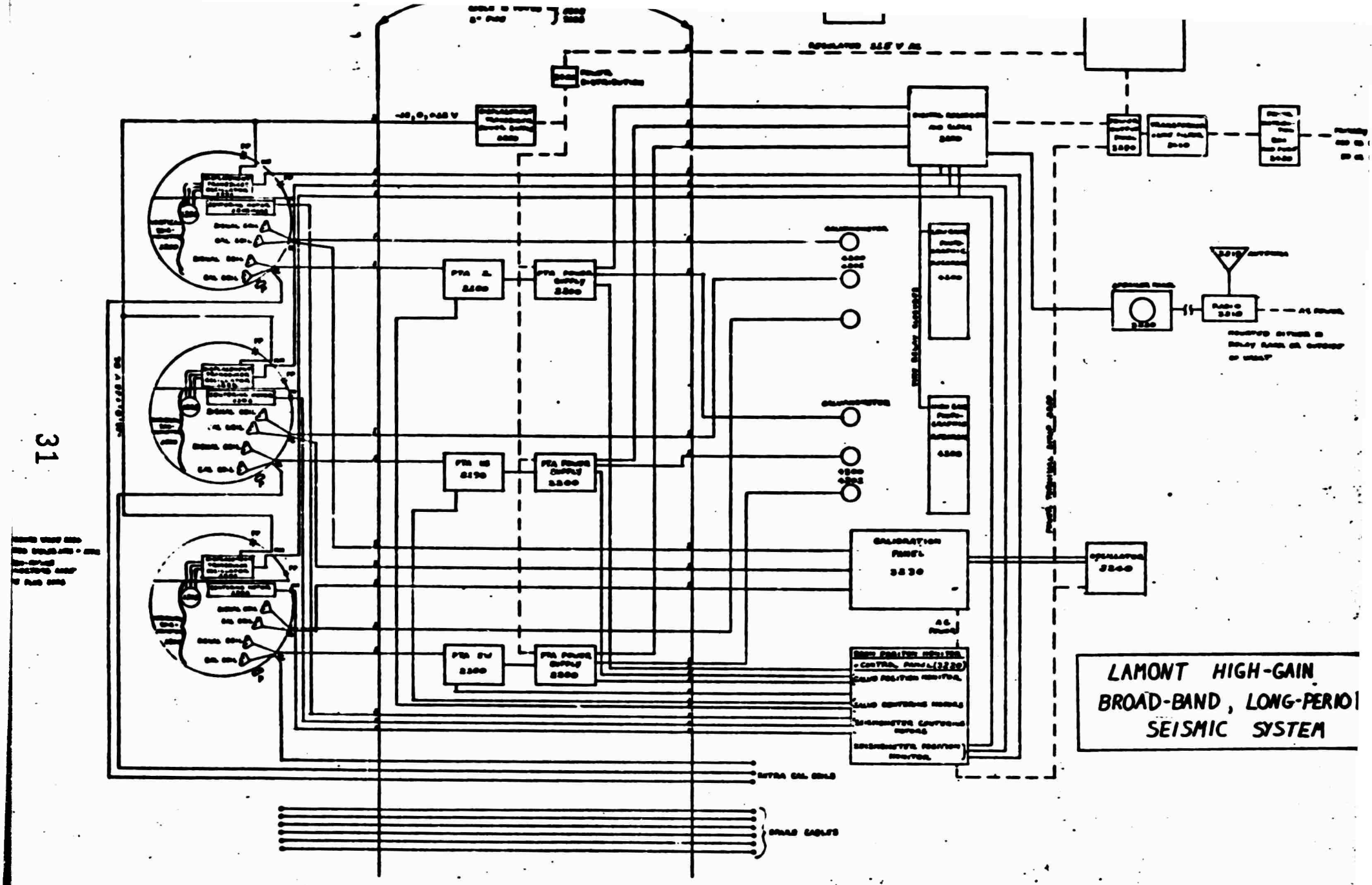
BIT		WORD 1	BIT DISPLAY	WORD 2	BIT DISPLAY	WORD 3	BIT DISPLAY	WORD 4	BIT DISPLAY
MSB	1	TYPE	1	100Day2	1	10Min4	1	GND	0
	2	GND	0	100Day1	0	10Min2	0	GND	0
	3	10ID8	1	10Day8	1	10Min1	1	S8	0
	4	10ID4	0	10Day4	0	1Min8	0	S4	1
	5	10ID2	1	10Day2	1	1Min4	1	S2	0
	6	10ID1	1	10Day1	0	1Min2	0	S1	0
	7	GND	0	1Day8	0	1Min1	0	GND	0
	8	GND	0	1Day4	1	10Sec4	1	GND	0
	9	1ID8	1	1Day2	0	10Sec2	0	GND	0
	10	1ID4	0	1Day1	1	10Sec1	1	BCHAN4	0
	11	1ID2	1	GND	0	1Sec8	0	BCHAN2	1
	12	1ID1	1	GND	0	1Sec4	1	BCHAN1	1
	13	GND	0	10HR2	1	1Sec2	0	SR0.5	1
	14	GND	0	10HR1	1	10HR1	0	SR1	0
	15	1YR8	0	1HR8	0	.1Sec8	1	SR2	0
	16	1YR4	1	1HR4	0	.1Sec4	1	SR4	0
	17	1YR2	0	1HR2	1	.1Sec2	0	GND	0
LSB	18	1YR1	1	1HR1	1	.1Sec1	0	GND	0

Figure 4-1. Sample Four-Word Header

APPENDIX 2

Detailed parts list and drawings

See text for description


CALIBRATION PANEL 3830
LAMONT HIGH-GAIN BROAD-BAND, LONG-PERIOD SEISMIC SYSTEM

PRELIMINARY PARTS LIST

LDGO PART NUMBER	DESCRIPTION	QUANTITY PER STATION	DETAILED DRAWING	MANUFACTURER	MANUFACTURER PART #
1100	PRESSURE TANK AND GASKET	3	Y	PHOENIX	1006-D-5386
1101	POTTING ASSEMBLY	1	X	LAMONT	
1102	PIPE ADAPTER FOR MARSH-MARINE CONNECTOR	6	X	LAMONT	
1104	PRESSURE VALVE	3	X	LAMONT	
1105-1	WATERTITE BULKHEAD CONNECTOR (INDIVIDUAL LEADS)	6		VECTOR	XSK 6 BCL-6P
1105-2	MATING BULKHEAD CONNECTOR	6		VECTOR	RM"S"GSPS
1105-3	PLASTIC LOCKING SLEEVE	6		VECTOR	71-090
1106	PIPE PLUG, 1"	2			
1107	3/4" ROOF BOLT ANCHORS	18			
1108	3/4" x 10 THREADED ROD, NORMAL 6" LENGTHS	18			
1109	3/4" x 10 NUTS	18			
1110	3/4" x WASHERS	18			
1111	"C" CLAMP	36		ARMSTRONG	1 1/2 HeavyDuty
1112	2"x2"x3/8" STEEL PLATES TO GO UNDER "C" CLAMPS	36		LAMONT	
1113	HANDWINCH	1		LUGALL	1000-15
1114	1" COMPRESSION FITTING	9		CROUSE-HINDS	CGB 397
		1 lb		C.V.C.	269-352-22

PRELIMINARY PARTS LIST

DGO PART NUMBER	DESCRIPTION	QUANTITY PER STAT	DETAILED DRAWING	MANUFACTURER	MANUFACTURER PART #	PRICE
1200	VERTICAL SEISMOMETER	1	M	GEOTECH	S-11	
1201	REMOTE CENTERING ASSEMBLY LESS MOTOR	1		GEOTECH	10075	
1202	COIL ASSEMBLY 25" LEADERS ON CAL & NGNAL COILS	6		GEOTECH	15940	
1203	10 RPM 12 VDC MOTOR	1		HAYDEN	K5331-P2-53	
1204	DISPLACEMENT TRANSDUCER	1	M	SPRENGNETHER	VCT202V	
1205	DISPL. TRANS. MOUNTING PLATE	1	X	LAMONT		
1206	DISPL. TRANS. OSCILLATOR DISCRIMINATOR	1	M	SPRENGNETHER	VCT201	
1207	TERMINAL BLOCK	1		LAMONT		
1208	CABLE HOLDER	1		LAMONT		
1300	HORIZONTAL SEISMOMETER	2	M	GEOTECH	S-12	
1301	LEG ADAPTER	2	X	LAMONT		
1302	REMOTE CENTERING ASSEMBLY	2	M	SPRENGNETHER	S-5018M	
1303	DISPLACEMENT TRANSDUCER	2	M	SPRENGNETHER	VCT202H	
1304	TERMINAL BLOCK	4		LAMONT		
1305	TERMINAL BASE PLATE	2	X	LAMONT		

PRELIMINARY PARTS LIST

LDGO PART NUMBER	DESCRIPTION	QUANTITY PER STATION	DETAILED DRAWING	MANUFACTURER	MANUFACTURER PART #	PRICE
2100	PHOTOTUBE AMPLIFIER, TURNTABLE BASE	3	M	GEOTECH	5240B	
2101	MOTOR FOR PTA, DC, 12V	3		HAYDEN	K5352PZ	
2102	MOUNTING PLATE FOR MOTOR	3	X	LAMONT		
2103	GALVANOMETER, 100 SEC, FIXED FOCUS, 500 OHM COIL CDRX 500-3000 OHMS	3	M	KINEMETRICS	LG-1	
2104	PTA MODIFICATION KIT (OPTIONAL, FOR GFE)	3		GEOTECH	28660	
2200	PTA POWER SUPPLY	3	M	GEOTECH	14486	
2201	FILTER, HIGH CUT 0.033 SEC	6		GEOTECH	6824-15	
2300	DISPLACEMENT POWER SUPPLY	1	M	POWERMATE	UN1-164	
2301	MOUNTING PLATE FOR 2300		X	LAMONT		
2302	MOUNTING CLAMP FOR 2301		X	LAMONT		
2303	POWER OUTPUT PLATE FOR 2300		X	LAMONT		
2400	QUAD BOX - 4" SQUARE	3		UNIVERSAL	52171	
2401	DUPLEX RECEPTACLES	6		BRYANT	5252	
				UNIVERSAL	RS8	

PRELIMINARY PARTS LIST

LDDO PART NUMBER	DESCRIPTION	QUANTITY PER STATI	DETAILED DRAWING	MANUFACTURER	MANUFACTURER PART #	PRICE
3100	DIGITAL DATA ACQUISITION SYSTEM	1	M	ASTRODATA		
3101	SIGNAL INPUT-OUTPUT CONNECTOR	12				
3102	AUXILARY SLAVE TIME RELAY	1	X	LAMONT		
3200	RELAY RACK, SOLID BOTTOM, TAPPED 10-32	1	X	PREMIER	PRXA-70-24	
3201	RACK SIDE PANEL, LIGHT GRA	2		PREMIER	FL-70-24	
3202	CASTORS, 3"	1 set		PREMIER	CA-5	
3203	BLOWER	1		PREMIER	PMB-5-150	
3204	DRAWER	1		PREMIER	D1916	
3205	SHELF	1		PREMIER	RDS-319-22	
3206	SIDE HINGED PANEL	1		PREMIER	SHP-819	
3207	REAR PANEL	1	X	PREMIER	FP-719	
3208	LOUVERED PANEL	1		PREMIER	FPL-2919	
3209	REAR DOOR	1		PREMIER	CD-33	
3210	CHASSIS SUPPORT	1 pr.		PREMIER	CSA-24	
3211	SHELF	1		PREMIER	S-22-24	
3212	PANEL, 7"	2		PREMIER	ARP-719	
		1	X	PREMIER	ARP-519	

PRELIMINARY PARTS LIST

LDGO PART NUMBER	DESCRIPTION	QUANTITY PER STATI	DETAILED DRAWING	MANUFACTURER	MANUFACTURER PART #	PRI
3214	PANEL, 5"	1		PREMIER	ARP-519	
3215	SPEAKER PANEL			PREMIER	SRP-819	
3216	SPEAKER	1		UTAH	V8 JCW	
3217	VOLUME CONTROL L-PAD ATTENUATOR. 4 OHM	1		CENTRALAB	WL4	
3218	RADIO RECEIVER		M	SPECIFIC PROD.	WVTR-A1	
3219	ANTENNA			SPECIFIC PRODUCTS	AK-8	
3220	BOOM POSITION MONITOR & CONTROL		X	OAS	70-026	
3230	CALIBRATION PANEL		X	OAS	70-026	
3240	OSCILLATOR, TRIGGERED VCG		M	WAVETEK	112B	
3250	NULL VOLTAMETER		M	HEWLETT PACKARD	419A	
3270	VOLTAGE REGULATOR	1	M	WANLASS	VVR-1500	
3271	SWITCH, DPDT, GAMP	1		ARROW HART	81024GB	
3272	SEGMENTAL VOLTMETER 100-130 VAC	1		SIMPSON	1349	
3273	FUSE HOLDER	2		BUSSMAN	HPC	
3274	FUSE , 10 AMP, 15 AMP	2		FUSETRON	FNM	
3275	TERMINAL BOARD	8		BUCHANAN		
				KEYSTONE	KEW412	

PRELIMINARY PARTS LIST

LOGO PART NUMBER	DESCRIPTION	QUANTITY PER STATION	DETAILED DRAWING	MANUFACTURER	MANUFACTURER PART #	PRICE
3277	4" x 4" CLOSING PLATES	2		KEYSTONE	KTCP40	
3278	3 WIRE TWIST LOCK RECEPTACLE	4		BRYANT	7328-G	
3279	3 WIRE TWIST LOCK PLUG	4		BRYANT	9965	
3280	COMPRESSION CABLE CONNECTOR, 3/4"	12		C-H	CGB296	
3281	GROUNDING LUGS			BURNDY	KPA 4C	
3299	POWER DISTRIBUTION STRIP	1		PREMIER	OB-170	
3410	TRANSFORMER #0511T25ST 60cps 120/120V		M	TOPAZ		
	or #051T25ST-8274 50 cps 240/120V	1	M	TOPAZ		
3411	LINE FILTER	2		SPRAGUE	FILTERALL 3	
3412	6" x 6" x 4" UTILITY BOX AND COVER	1				
3420	POWER DISTRIBUTION BOX AND SWITCH			WESTINGHOUSE	CFB	
3421	CIRCUIT BREAKER 20 amp					
3422	30 amp 3 PIN RECEPTACLE	1		C-H	ARE 3373	
3423	30 amp 3 PIN SOCKET	1		C-H	APJ 3373	

PRELIMINARY PARTS LIST

LOGO PART NUMBER	DESCRIPTION	QUANTITY PER STATION	DETAILED DRAWING	MANUFACTURER	MANUFACTURER PART #	PRICE
4100	PHOTOGRAPHIC RECORDER	2	M	SPRENGNETHER	HR-6007	
4101	BRACKETS FOR STACKING RECORDERS (OPTIONAL)	1		LAMONT		
4102	SPARE MOTOR FOR RECORDER	1		BODINE	B8122E1800T 767VEK45	
4103	AUTOCORDER, 3 COMPONENT (OPTIONAL IN PLACE OF 4100)	2	M	SPRENGNETHER	6101	
4200	LONG PERIOD GALVONOMETER BASE		X	LAMONT		
4201	LONG PERIOD GALVONOMETER, 100 sec, ADJUSTABLE FOCUS, CDRX 1000-3500 ohms		M	KINEMETRICS	LG-1	
4202	LP GALVO RESISTIVE NETWORK					
4300	SHORT PERIOD GALVANOMETER BASE		X	LAMONT		
4301	BASE FOR USE WITH STACKED PHOTO RECORDERS (OPTIONAL)	1		LAMONT		
4301	SHORT PERIOD GALVANOMETER			GEOTECH	G-10	
4302	SP GALVO RESISTIVE NETWORK					
4350	FILTER GALVANOMETERS (OPTIONAL) 7 SEC	3	M	KINEMETRICS	LG-1 MOD	
4400	DEHUMIDIFIER	1	M	GENERAL ELECTRIC	EHJ25	

PRELIMINARY PARTS LIST

LDGO PART NUMBER	DESCRIPTION	QUANTITY PER STATI	DETAILED DRAWING	MANUFACTURER	MANUFACTURER PART #	PRIC
5100	BULKHEAD DOOR		X	LAMONT		
5101	PIPE NIPPLES 24" x 2" ENDS THREADED	6		ANY		
5102	WIRE POTTING ASSEMBLY		X	LAMONT		
5103	WIRE POTTING MOLD		X	LAMONT		
5150	WIRE, 2x18 GAUGE SOLID, MYLAR FOIL SHIELD	2000'*		SAXTON		
5160	WIRE, 2x16 GAUGE STRANDED, MYLAR FOIL SHIELD	5000'*		SAXTON		
5170	WIRE, 3x16 GAUGE STRANDED, MYLAR FOIL SHIELD	500'*		SAXTON		
5180	#10-3 PLASTIC JACKET CABLE	350'*				

* QUANTITY MAY VARY TO FIT SPECIFIC INSTALLATION.

PRELIMINARY PARTS LIST

EXPENDABLE SUPPLIES

LOGO ART NUMBER	DESCRIPTION	QUANTITY PER STATION	DETAILED DRAWING	MANUFACTURER	MANUFACTURER PART #	PRICE
6001	DESSICANT - SILICA GEL	72		FISHER	1-952-7	
6002	ACID FIXER, ONE GALLON SIZE 24 pkg/case	10*		KODAK		
6003	DEKTOL DEVELOPER, 24 gal/case	5*		KODAK		
6004	LINOGRAPH PAPER SPEC. 1258, TYPE 480, 30x92 CM, 50 sheets/pkg.	25*		KODAK		
6005	LINOWRIT 4, SPEC 2, 11 1/2 x 150' (FOR AUTOCORDER; USED IN PLACE OF 6004)	24		DUPONT	LW4	
6006	DIGITAL TAPE, 1600BPI	26*		AMPEX	874-278652	

* PER YEAR.

PRELIMINARY PARTS LIST

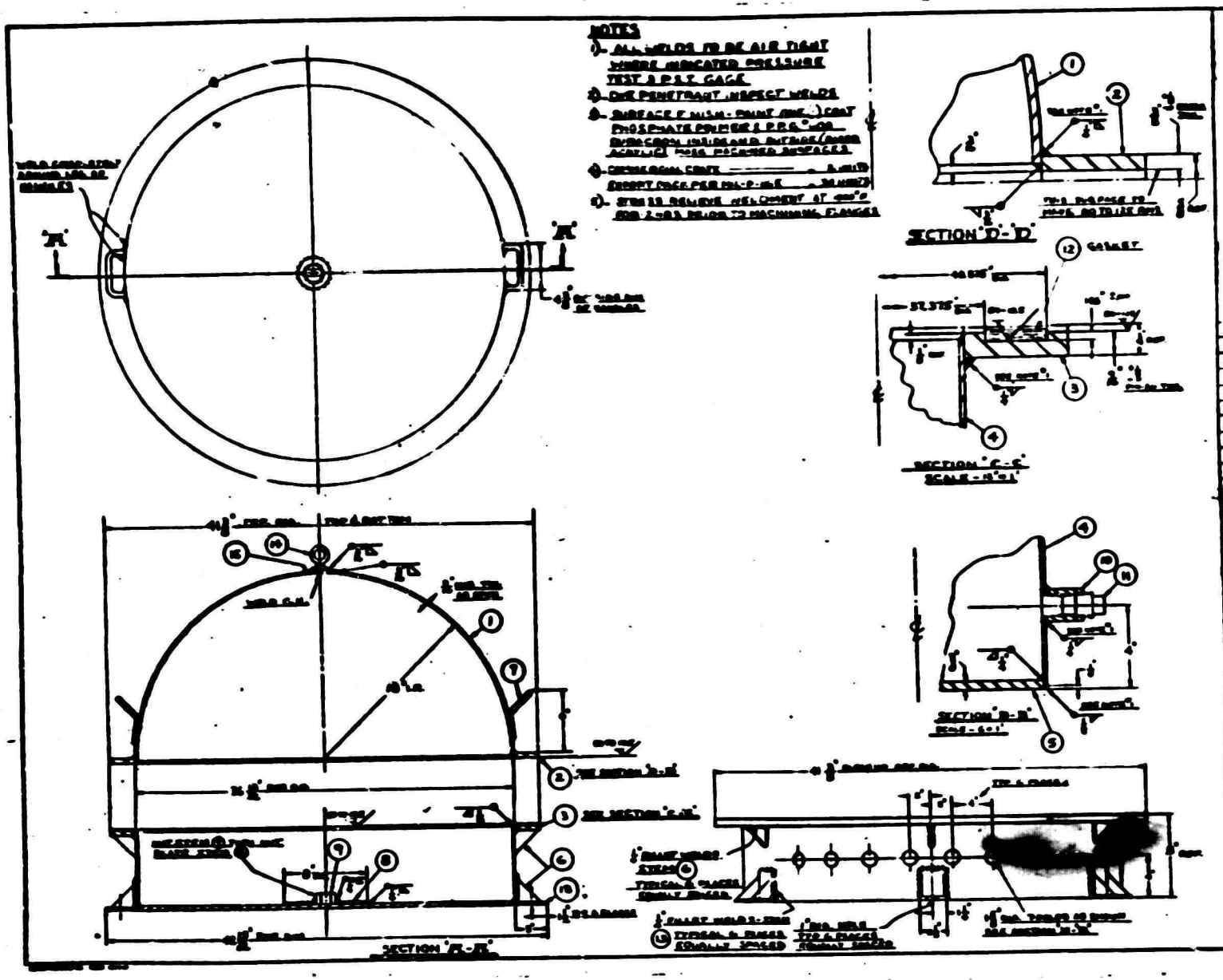
EXPENDABLE SUPPLIES, USED ONLY FOR INSTALLATION

LDGO PART NUMBER	DESCRIPTION	QUANTITY PER STAT.	DETAILED DRAWING	MANUFACTURER	MANUFACTURER PART #	PRICE
7001	MOLD RELEASE, RELEASE AGENT	2		KRYLON	1328	
7002	SCOTCH CAST, ELECTRIC RESIN #4, size A	30		3M		
7003	DUXSEAL	1 lb.		JOHNSMANVILLE		
7004	SILASTIC RTV			DOW CORNING	732-RTV	
7005	HYDRO-POX EPOXY PAINT	25 qt.		ENTERPRISE	396	
7006	WHITE LEAD 1#TIN	1				
7007	NEVER SEEZ	1				
7008	GLYPTAL	1 pt.		GENERAL ELECTRIC	7815 BLACK	
7009	RIBBON DOPE THREAD SEALANT, 1/2"	10		PERMACEL	P-412	

PRELIMINARY PARTS LIST

SPECIAL TOOLS FOR INSTALLATION

LDGO PART NUMBER	DESCRIPTION	QUANTITY PER STATION	DETAILED DRAWING	MANUFACTURER	MANUFACTURER PART #	PRICE
8001	GAUSSMETER	1		GENERAL ELECTRIC	416 X 33	
8002	GAUSSMETER HOLDER	1		LAMONT		
8003	CROSS TEST LEVEL	1		STARRETT	136	
8004	DECADE RESISTANCE BOX	2		HEATHKIT	IN-17	
8005	ROTARY HAMMER	1		BLACK & DECKER	5055	
8006	1 - 3/8 x 15 5/8 CARBIDE BIT FOR 8005	5		BLACK & DECKER	62673	
8007	STOP WATCH			MINERVA	135	
9008	TORQUE WRENCH 350 Ft. Lb. 1/2" DRIVE			SHAW JOBSON	STW3RCF	
8103	TANK PRESTRESSER	1	X	LAMONT		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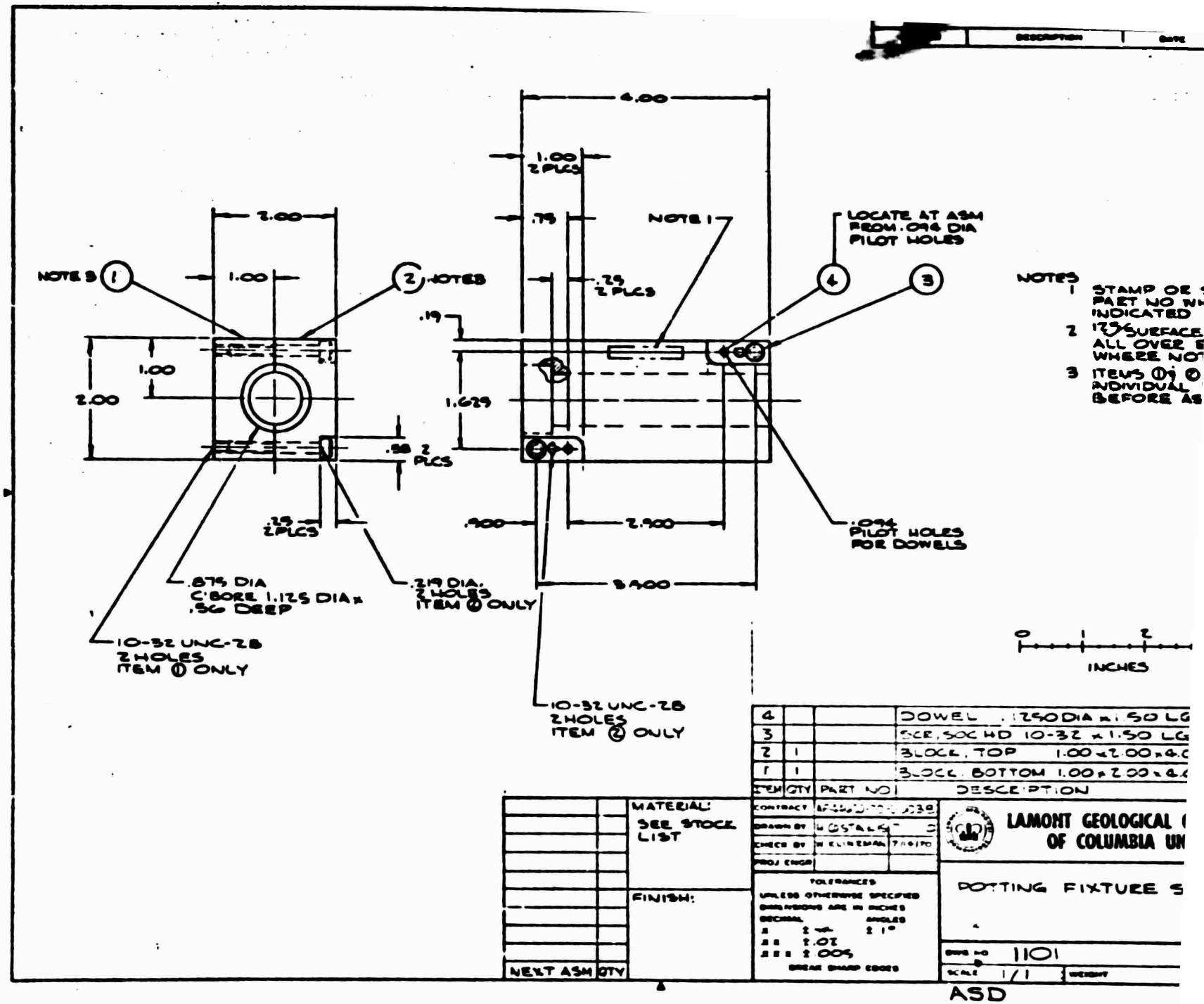
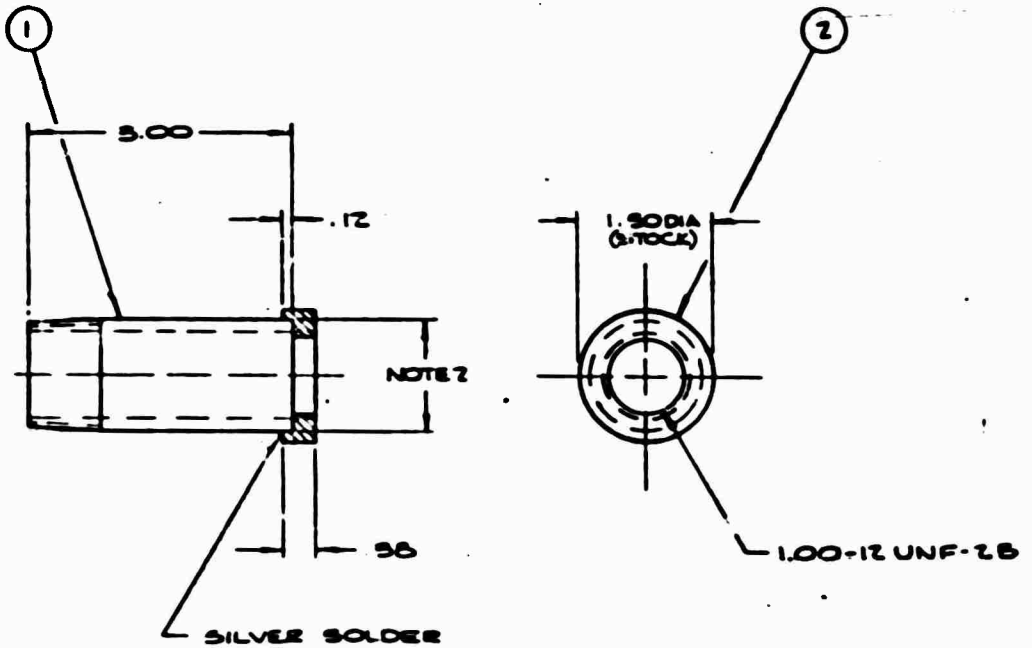
SECTION 'D-D'
SECTION 'C-C'
SECTION 'B-B'
SECTION 'A-A'
1100

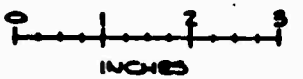

4.00
1.00
2 PLCS
.75
NOTE 1
2.00
NOTE 5
1
1.00
2
NOTE 6
.25
2 PLCS
.19
LOCATE AT ASM
FROM .094 DIA
PILOT HOLES
4
3
NOTES
1 STAMP OR
PART NO WH
INDICATED
2 125 SURFACE
ALL OVER E
WHERE NOT
3 ITEMS 1 & 2
INDIVIDUAL
BEFORE AS
1.00
2.00
1.629
.98
2 PLCS
.25
2 PLCS
.900
2.900
3.900
.094
PILOT HOLES
FOR DOWELS
.875 DIA
C'BORE 1.125 DIA x
.56 DEEP
.219 DIA.
2 HOLES
ITEM 2 ONLY
10-32 UNC-2B
2 HOLES
ITEM 1 ONLY
10-32 UNC-2B
2 HOLES
ITEM 2 ONLY
0
1
2
INCHES
4 DOWEL .1250 DIA x 1.50 LG
3 SCR, SOC HD 10-32 x 1.50 LG
2 1 BLOCK, TOP 1.00 x 2.00 x 4.0
1 1 BLOCK, BOTTOM 1.00 x 2.00 x 4.
ITEM QTY PART NO DESCRIPTION
MATERIAL:
SEE STOCK
LIST
FINISH:
NEXT ASM QTY
CONTRACT
DRAWN BY
CHECK BY
PROJ ENGR
TOLERANCES
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
± ± 1°
± .01
± .005
BREAK SHARP EDGES
LAMONT GEOLOGICAL
OF COLUMBIA UN
POTTING FIXTURE S
DWG NO 1101
SCALE 1/1
WEIGHT
ASD

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



NOTES
1. STAMP OR STENCIL PART NO WHERE INDICATED
2. FIT 1.00 PIPE NIPPLE TO SUIT AT ASM.

45



QUANTITY	PART NO	DESCRIPTION	REMARKS
1	1	BUSHING .38 x 1.50 DIA	BRASS, HARD
1	1	SCH 80 PIPE 1.00-D x 4.00 LG	STEEL

MATERIAL: SEE STOCK LIST

FINISH:

NEXT ASSY

CONTRACT	LF 44620-70 C-3034	
DRAWN BY	N. COSTAKIS	7/1/70
CHECK BY	M. KLEINMAN	7/10/70
PROJ. ENGR.		

TOLERANCES: UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL: ANGLES
X ± .1 ± 1°
XX ± .02
XXX ± .005
BREAK SHARP EDGES

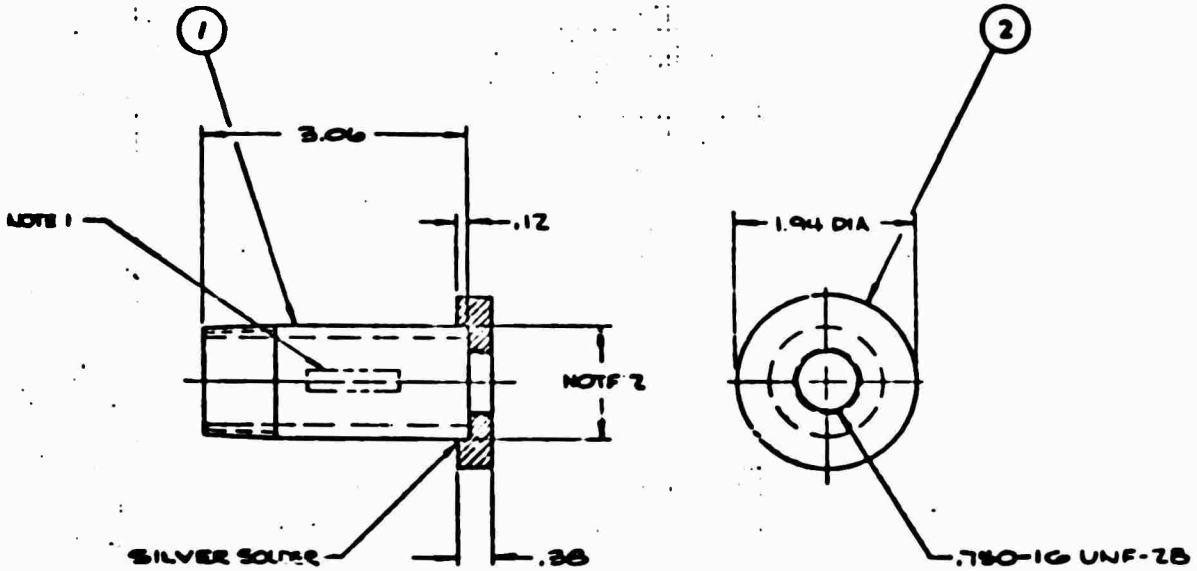
LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

ADAPTER, PIPE

DWG NO. 1102 REV

SCALE 1/1 WEIGHT SHEET 1 OF 1

ASD



NOTES
1 STAMP OR STENCIL PA
NO WHERE INDICATED
2 FIT 1.00 PIPE NIPPLE
SUIT AT ASM

0 1 2 3
INCHES

MATERIAL
SEE STOCK
LIST

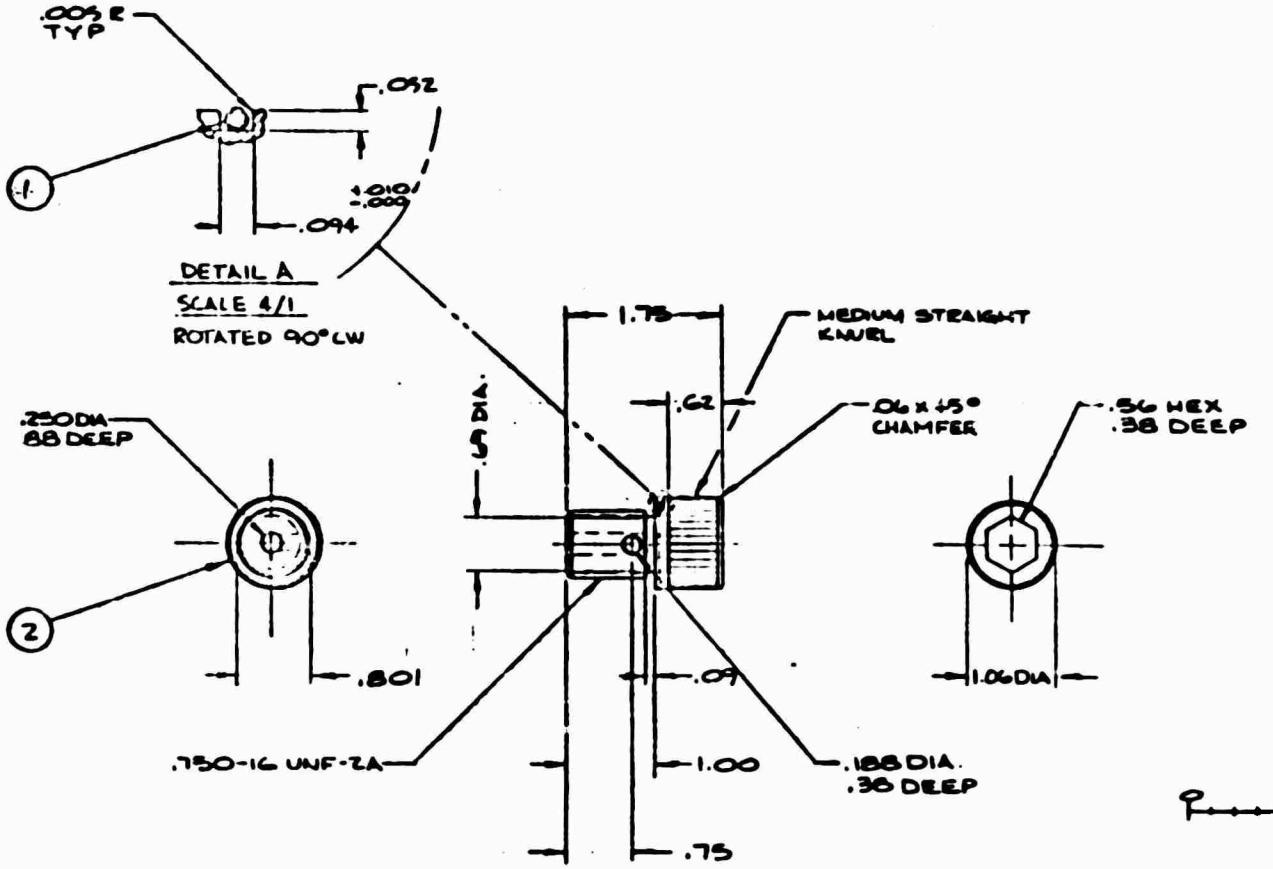
FINISH:

LAMONT GEOLOGICAL OBSERV
OF COLUMBIA UNIVERSI

PRESSURE VALVE
ADAPTER 1 PIPE

94

LETTER	DESCRIPTION	DATE	APPROVED



NOTES
1 125 SURFACE FINISH ALL OVER EXCEPT WHERE NOTED

QTY	PART NO	DESCRIPTION	REMARKS
2	1	SCR, SOC HD 1.06 DIA x 1.75 LG	S STEEL
1	1	2-ORN 2A-109	'O' RING	PARKER

MATERIAL: SEE STOCK LIST

FINISH

1104 NEXT ASM | 1 QTY

CONTRACT AF44-70 10-C-001

DRAWN BY	COSTAKIS	7-27-70
CHECK BY	J.K.	8-3-70
PROJ ENGR		

TOLERANCES
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ± .xx ± 1°
XX ± .02
XXX ± .005
BREAK SHARP EDGES

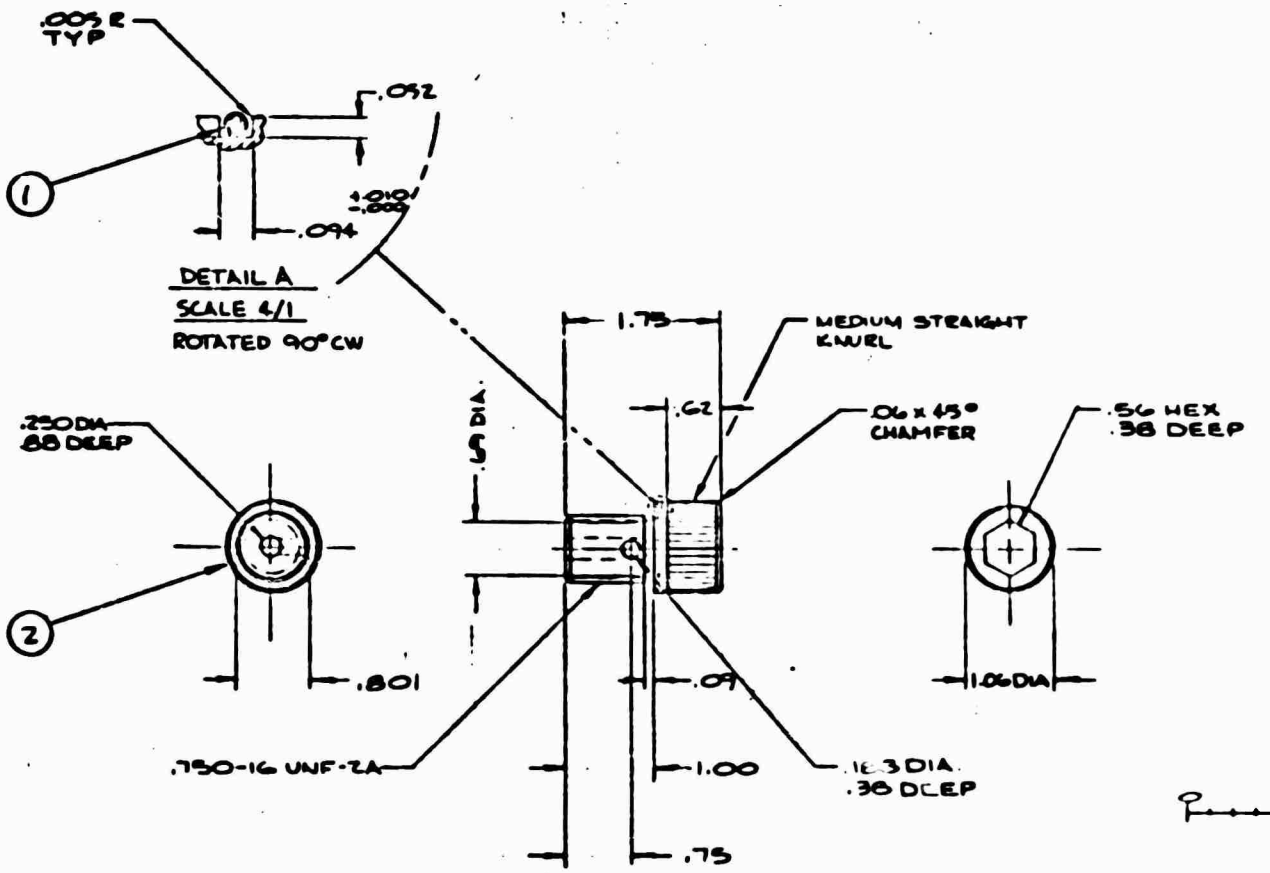
LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

SCREW, SOC HD
PRESSURE VALVE

DWG NO 1104-1 | REV

SCALE 1/1 | WEIGHT | SHEET 1 OF 1

LETTER	DESCRIPTION	DATE



NOTES
1 125 SURFACE
ALL OVER EX
WHERE NOTED

48

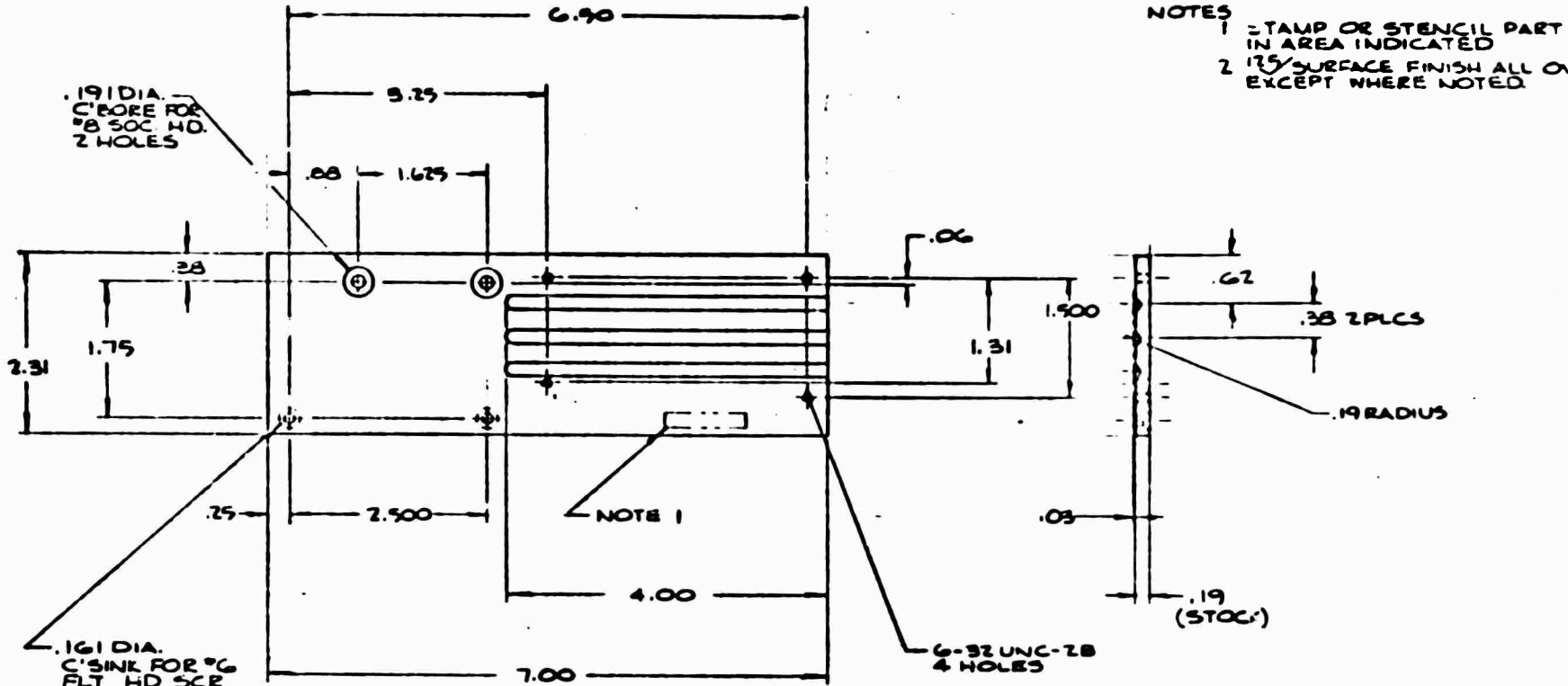
MATERIAL:
SEE STOCK LIST

FINISH:

LAMONT GEOLOGICAL OBSE
OF COLUMBIA UNIVER

SCREW, SOC HD
PRESSURE VALVE

DWG NO 1104-1



		MATERIAL: ALUMINIUM 2024-T4	
		FINISH:	
NEXT ASSY	QTY	1	

CONTRACT	DE-AC02-76ER 0038	
DRAWN BY	N. COSTALES	7/1/70
CHECK BY	G. KUKKASMAN	7/13/70
PROJ. ENGR		

TOLERANCES
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ± .1 ± 1°
XX ± .02
XXX ± .005
BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

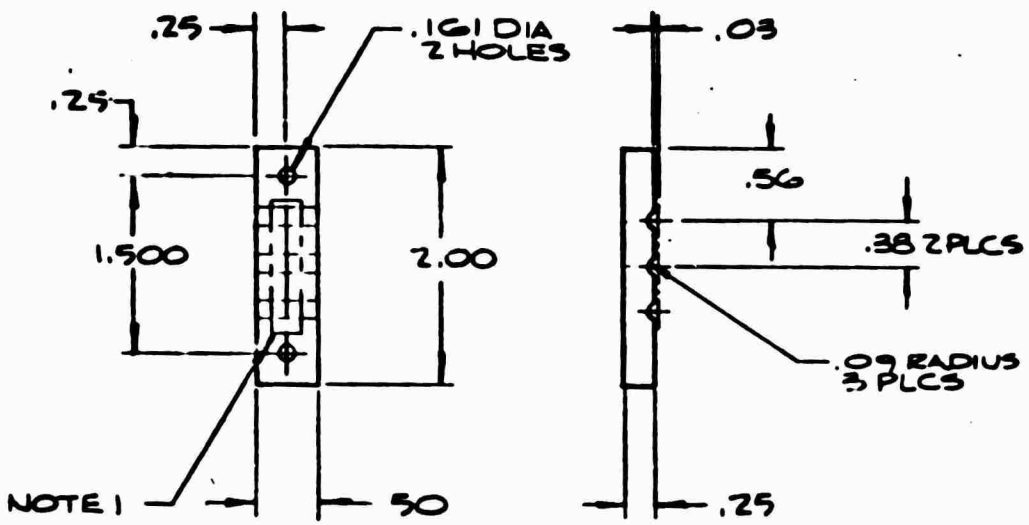
PLATE, MOUNTING
VERTICAL DISPLACEMENT
TRANSDUCER

DWG NO 1205 REV

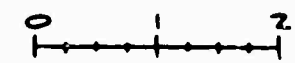
SCALE 1/1 DESIGN SHEET 1 OF 1

ASD

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



NOTES
1. STAMP OR STENCIL PART NO WHERE INDICATED
2. 125 SURFACE FINISH ALL OVER EXCEPT WHERE NOTED



NEXT ASM	QTY	MATERIAL: ALUMINUM 2024-T4	
	1	FINISH:	

CONTRACT	AF 44(20-70-C-0086	
DESIGN BY	M. COSTALES	7/1/70
CHECK BY	W. KLINEMAN	7/13/70
PROJ. ENGR.		

TOLERANCES
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ± .1 ± 1°
XX ± .02
XXX ± .005
BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

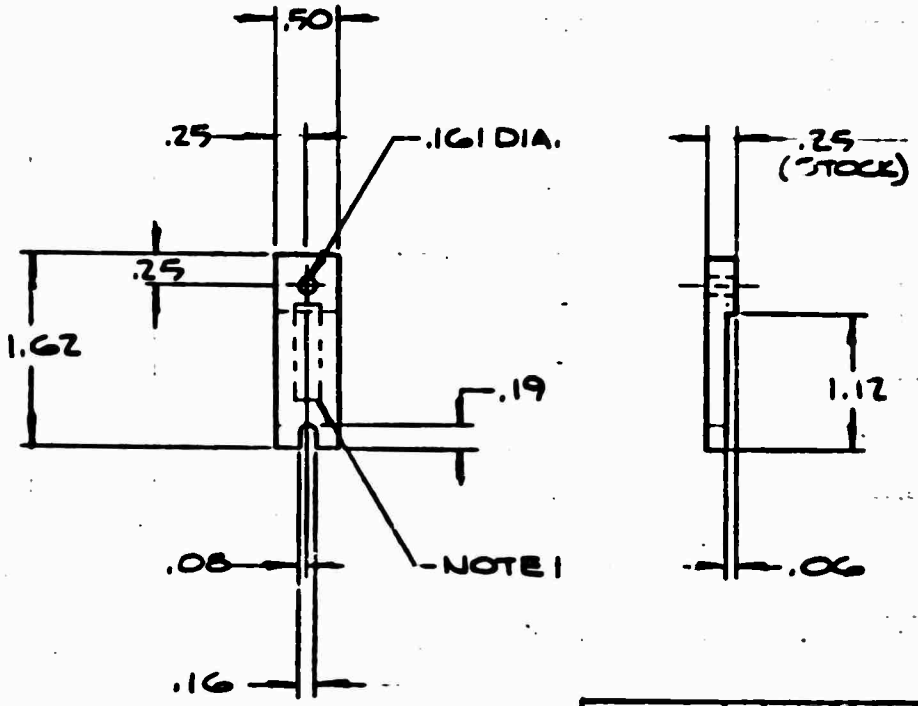
CLAMP, WIRE

DWG NO 1205-1 REV

SCALE 1/1 WEIGHT SHEET 1 OF 1

ASD

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



NOTES
1. STAMP OR STENCIL PART NO WHERE INDICATED
2. 125 SURFACE FINISH ALL OVER EXCEPT WHERE NOTED

0 1 2
INCHES

MATERIAL: ALUMINIUM 2024-T4	CONTRACT	AF-AFOSR-70-C-0036	
	DRAWN BY	H. COSTAKIS	7/1/70
	CHECK BY	M. KLINEMAN	7/21/70
	PROJ. ENGR.		
FINISH:	TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL ANGLES .x ±.1 ±1° .xx ±.02 .xxx ±.005 BREAK SHARP EDGES		
NEXT ASM 1 QTY			

LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY

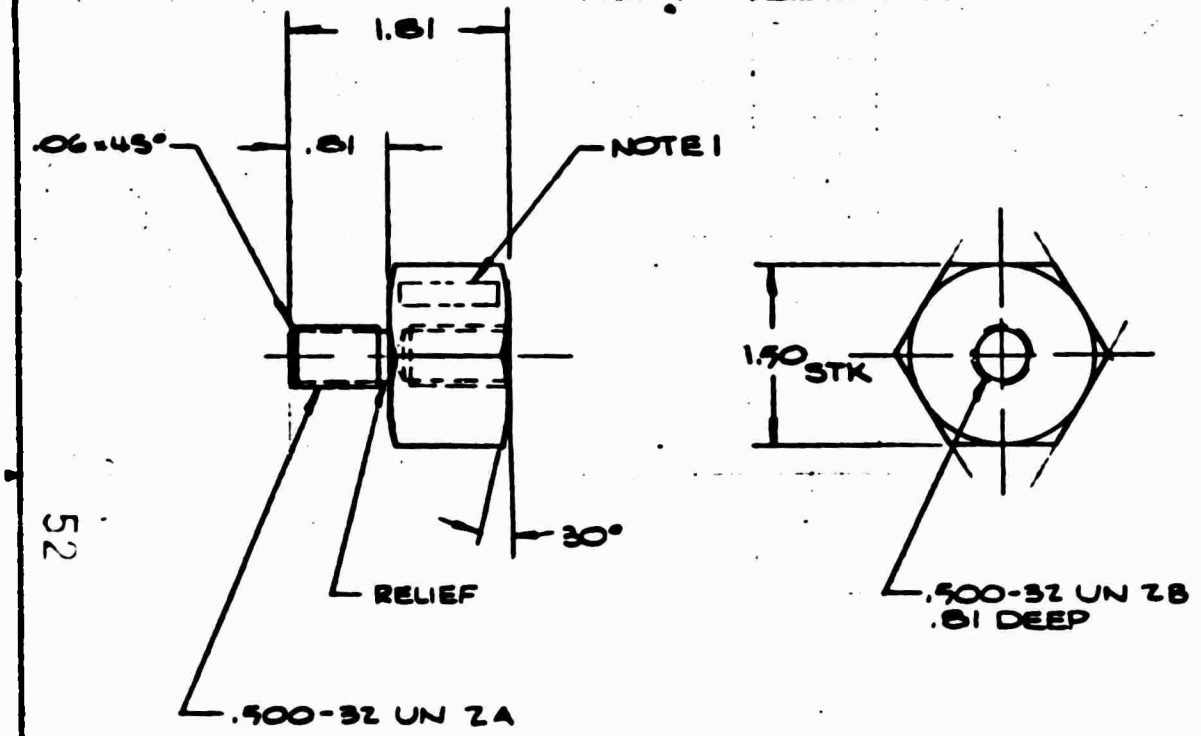
CLAMP, WIRE

DWG NO. 1205-2 REV

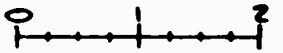
SCALE 1/1 WEIGHT SHEET 1 OF

ASD

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



NOTES
1 STAMP OR STENCIL PART NO IN AREA INDICATED



52

NEXT ASM	QTY	MATERIAL: BRASS 1/2 HARD FINISH:	CONTRACT AF 44(10-10 C-0038 DRAWN BY H. COSTA 12/5 7/1/70 CHECK BY W. ELLINGMAN 7/15/70 PROJ. ENGR. TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL ANGLES ± 1° .X ± .1 .XX ± .02 .XXX ± .005 BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

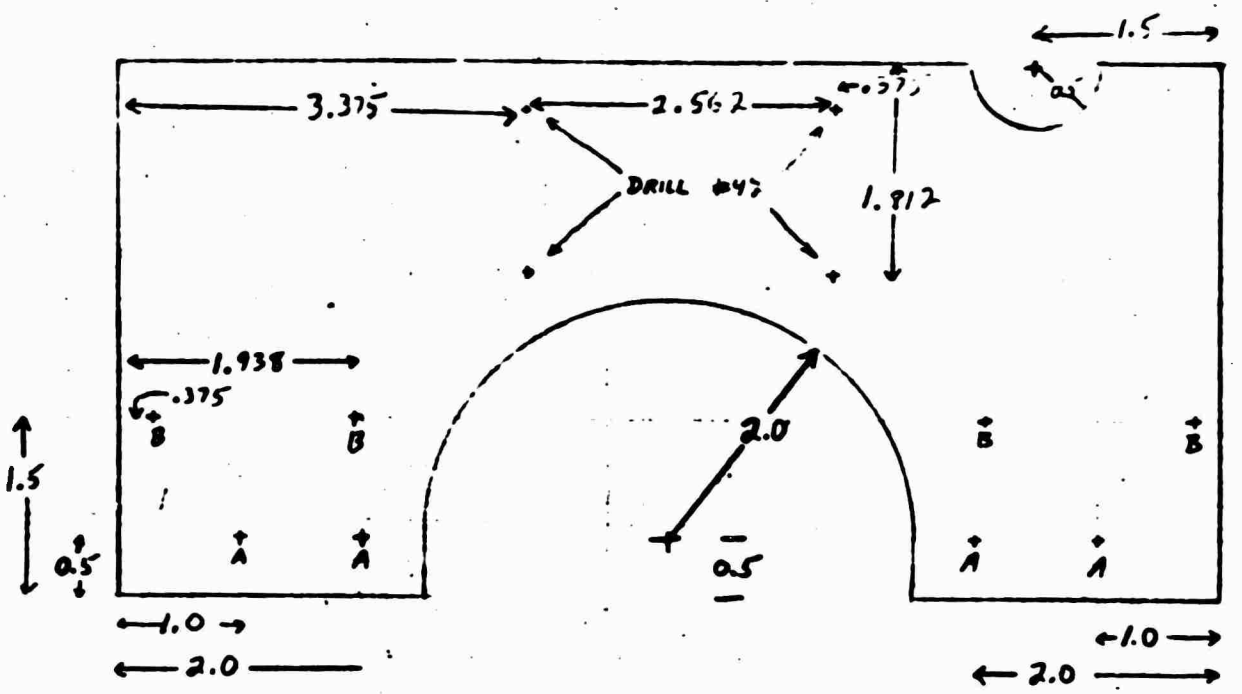
ADAPTER

DWG. NO. 1301 REV

SCALE 1/1 WEIGHT SHEET 1

ASD

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



PLEXIGLASS 0.25 THICK

A TAP 6-32
B DRILL #33, COUNTER SINK BOTTOM FOR FLATHEAD BOLT, MOUNT 1304

CONTRACT	F44620-72-C-0154
DRAWN BY	
CHECK BY	
PROJ. ENGR.	

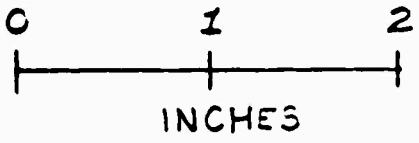
TOLERANCES
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ±
XX ±
XXX ±
BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

HORIZONTAL SEISMOMETER
TERMINAL STRIP BASE
PLATE

DWG. NO. 1305 REV
SCALE WEIGHT SHEET OF

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



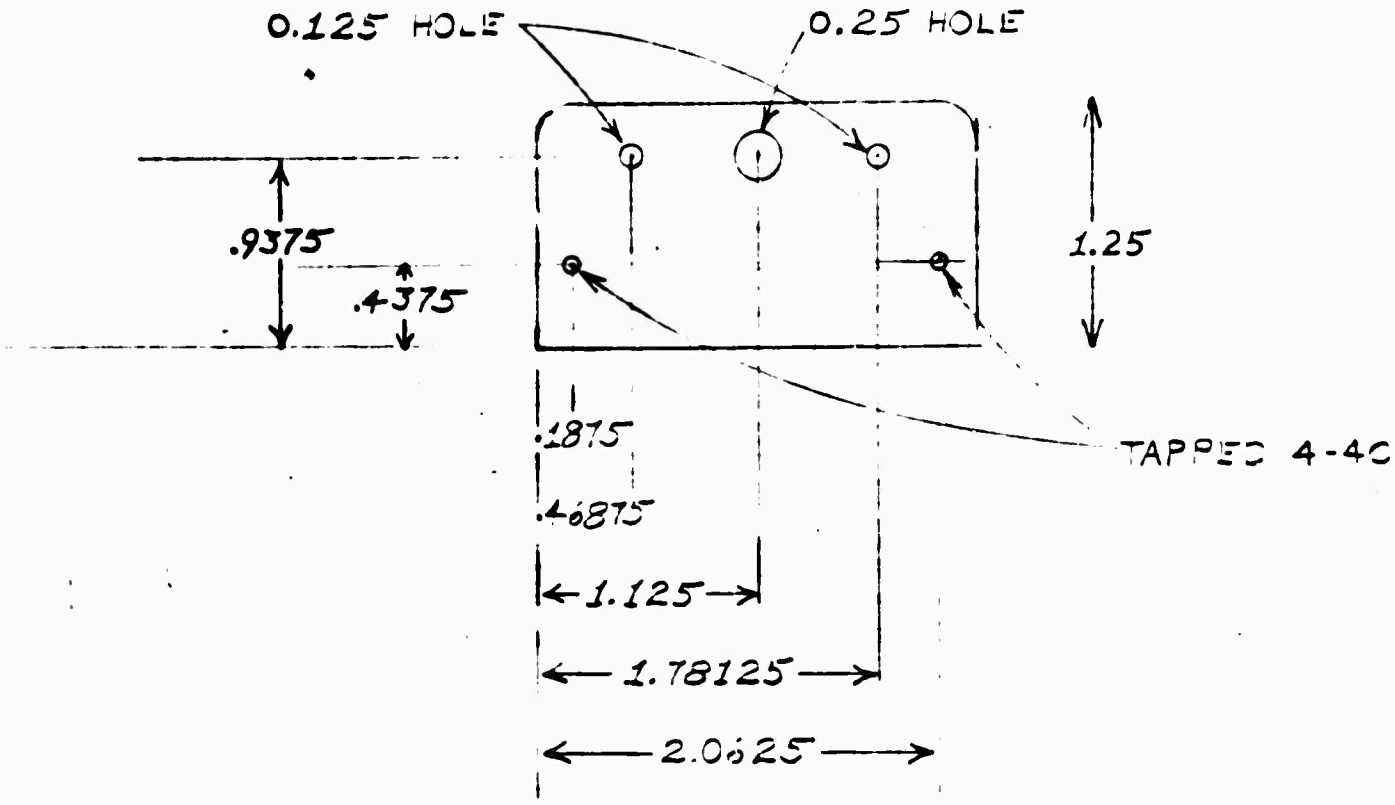


PLATE 1.25 X 2.25 X 0.125 ALUM

CONTRACT		
DRAWN BY		
CHECK. BY		
PROJ. ENGR.		

TOLERANCES:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES

DECIMAL	ANGLES
X ±	±
X X ±	
X X X ±	

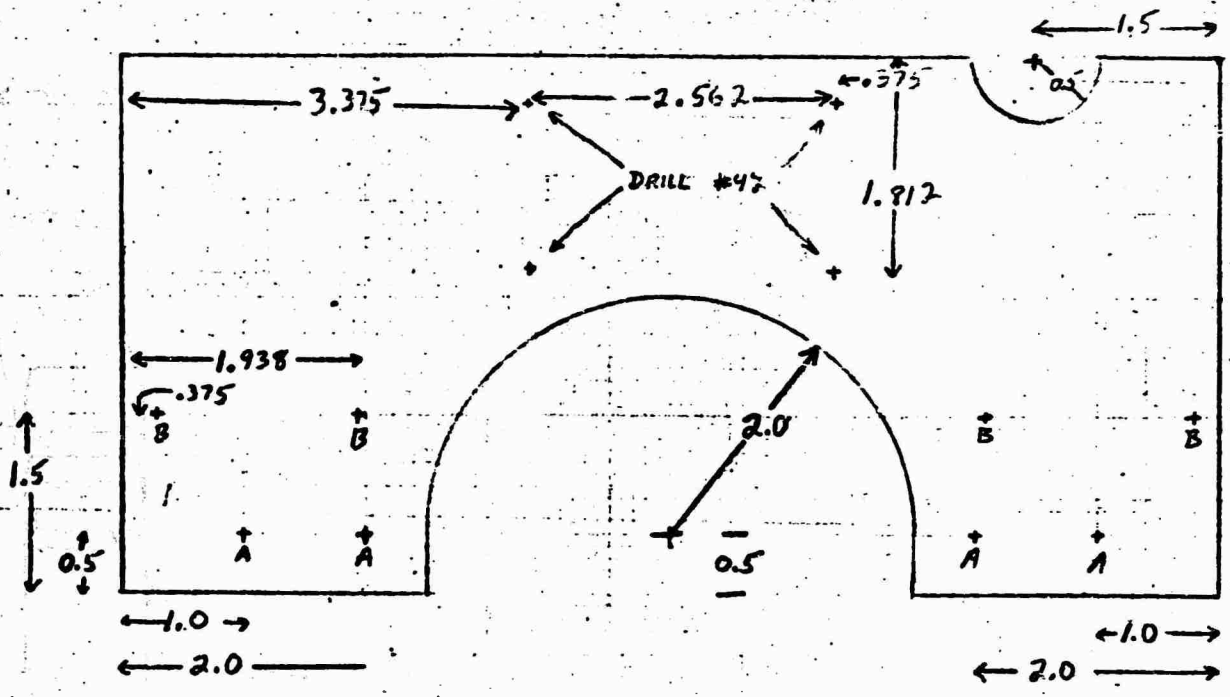
BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY

MOTOR MOUNTING PLATE PTA TURNTABLE

DWG. NO.	2102		REV
SCALE 1/1	WEIGHT	SHEET 1 OF 1	

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



PLEXIGLASS 0.25 THICK

A TAP 6-32
B DRILL #33, COUNTER SINK BOTTOM FOR FLATHEAD BOLT, MOUNT 1304

CONTRACT	F44620-73-C-0139
DRAWN BY	
CHECK. BY	
PROJ. ENGR.	

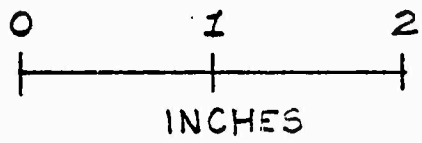
TOLERANCES:
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ±
X X ±
X X X ±
BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

HORIZONTAL SEISMOMETER TERMINAL STRIP BASE PLATE

DWG. NO. 1305 REV.
SCALE WEIGHT SHEET OF

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



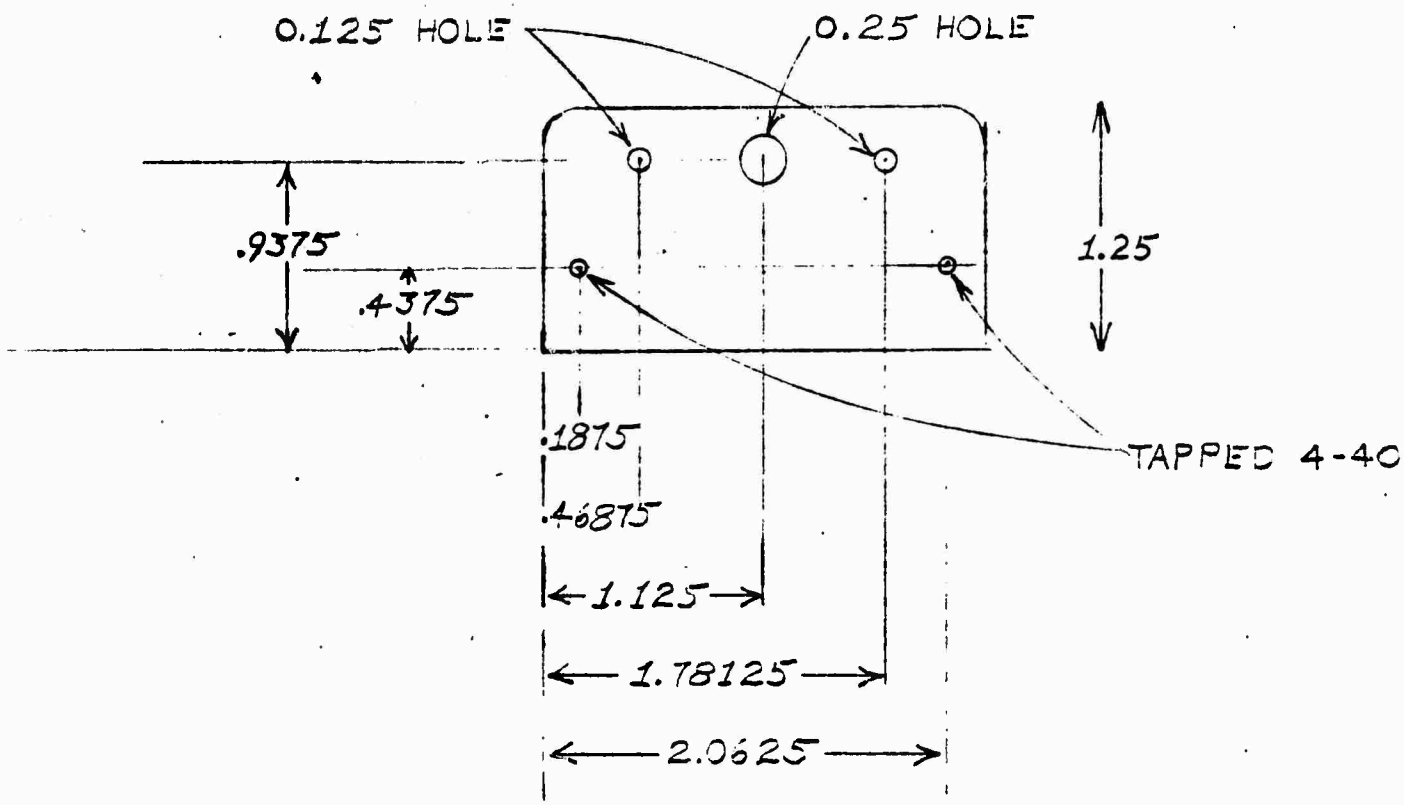


PLATE 1.25 X 2.25 X 0.125 ALUM

CONTRACT	AF[illegible]-[illegible]	
DRAWN BY		
CHECK. BY		
PROJ. ENGR.		

TOLERANCES:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES

DECIMAL	ANGLES
.X ±	±
.XX ±	
.XXX ±	

BREAK SHARP EDGES

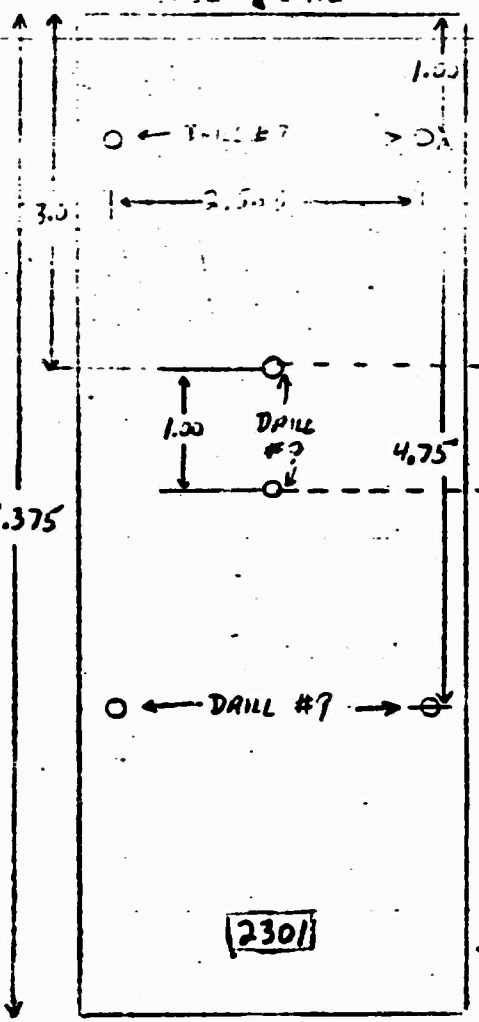
LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

MOTOR MOUNTING PLATE
PTA TURNTABLE

DWG. NO.	2102	REV.
SCALE 1/1	WEIGHT	SHEET 1 OF 1

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED

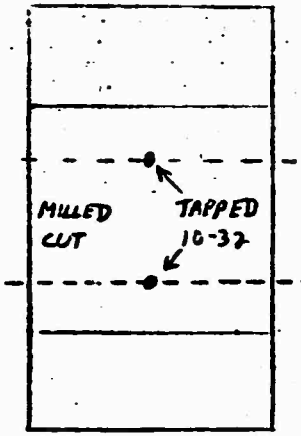
BASE PLATE



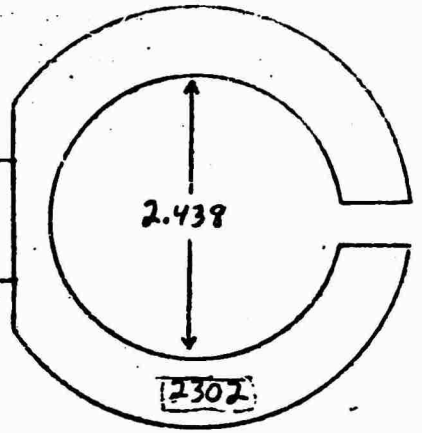
ALUMINUM PLATE 0.125 THICK

MOUNT ON POWER SUPPLY WITH 1/2" STANDOFFS

REAR



SIDE

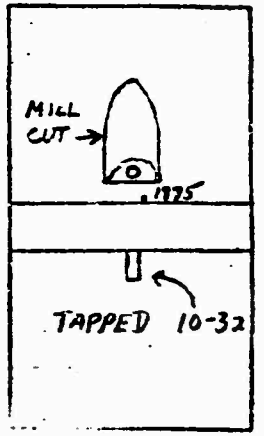


.375

3.5

ALUMINUM PIPE

FRONT



2.0

CLAMP MOUNTS ON 2" PIPE 5101

CONTRACT	AF4620-72-C-0037	
DRAWN BY		
CHECK BY		
PROJ. ENGR		

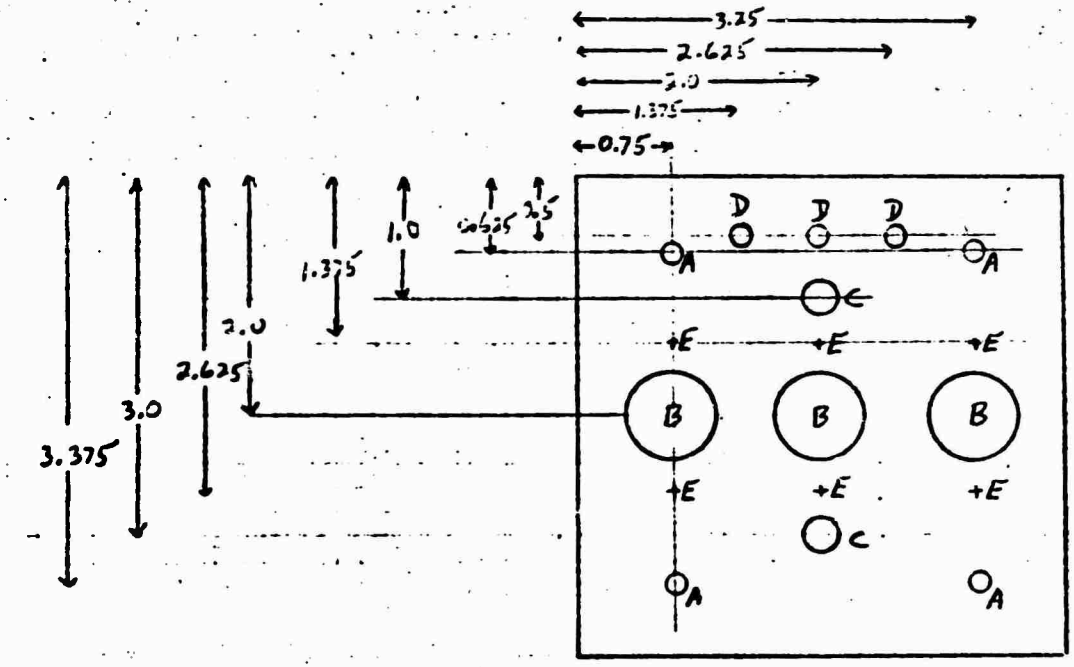
TOLERANCES:
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ± ±
.XX ±
.XXX ±
BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

MOUNTING CLAMP FOR DISPLACEMENT TRANS. POWER SUPPLY

DWG. NO.	2301 - 2302		REV
SCALE	1/1	WEIGHT	SHEET OF

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



A DRILL 0.7, MOUNT 25 PIN POWER SOCKET WITH 1.5" STANDOFFS

B DRILL 0.75, MOUNT AMPHENOL 78PCG3 SOCKET CONNECTOR, MATING PLUG AMPHENOL 91MPM3L

C DRILL 0.375

D DRILL 0.25, MOUNT E.F. JOHNSON TEST PIN SOCKETS MS-16108 REV F, YELLOW +, WHITE O, BLACK −.

E TAP 4-40.

ALUMINUM PLATE 4.0×4.0 X 0.125

INCHES
0 1 2

CONTRACT	F44620-72-C-0237
DRAWN BY	
CHECK BY	
PROJ. ENGR	

TOLERANCES:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
.X ± ±
.XX ±
.XXX ±
BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

DISPLACEMENT TRANS. POWER SUPPLY OUTPUT PLATE

DWG. NO. 2303 REV.

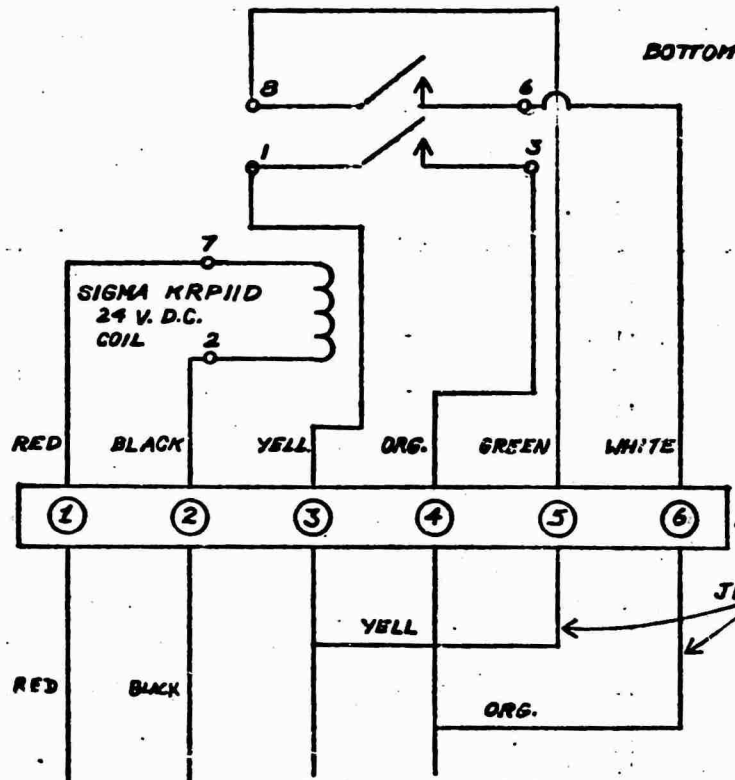
SCALE WEIGHT SHEET OF

55

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED

AUXILIARY TIME RELAY MOUNTED ON A BRACKET

BOTTOM RIGHT OF TAPE RECORDER



SEPARATE TIME SYSTEMS MAY BE ACTIVATED BY REMOVING THE YELLOW AND ORANGE JUMPERS BETWEEN 3 TO 5 AND 4 TO 6.

57

CONTRACT	
DRAWN BY	
CHECK BY	
PROJ. ENGR	

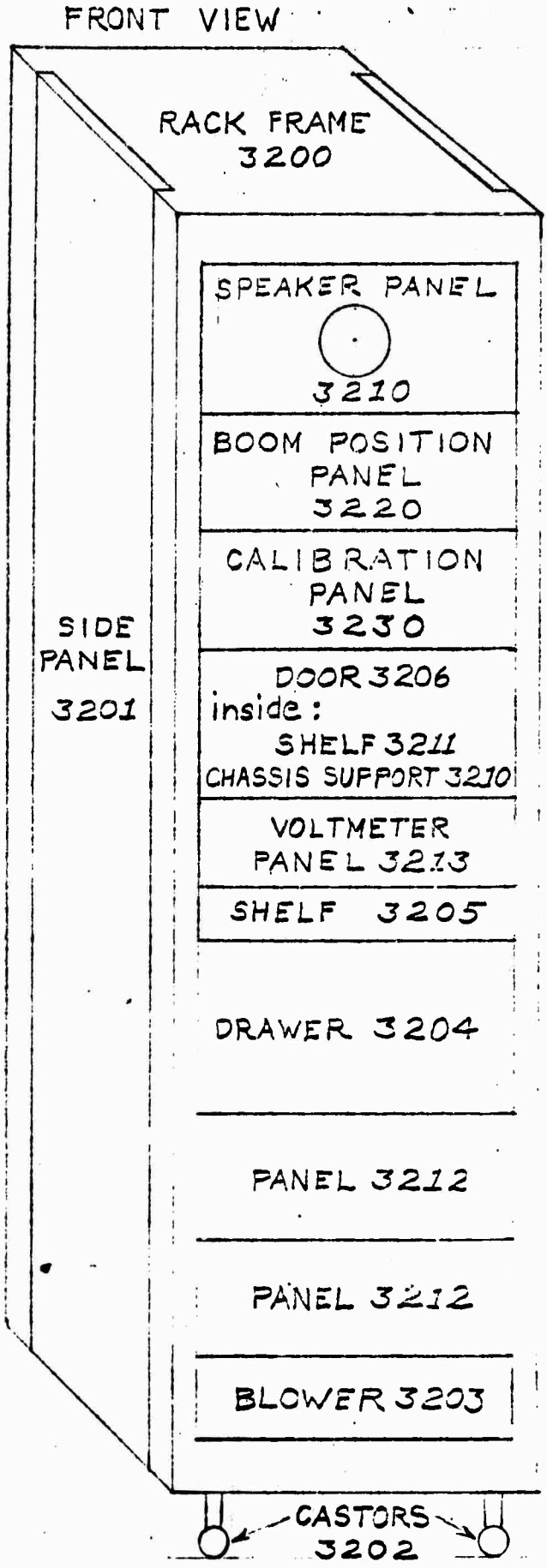
TOLERANCES:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ±
XX ±
XXX ±
BREAK SHARP EDGES

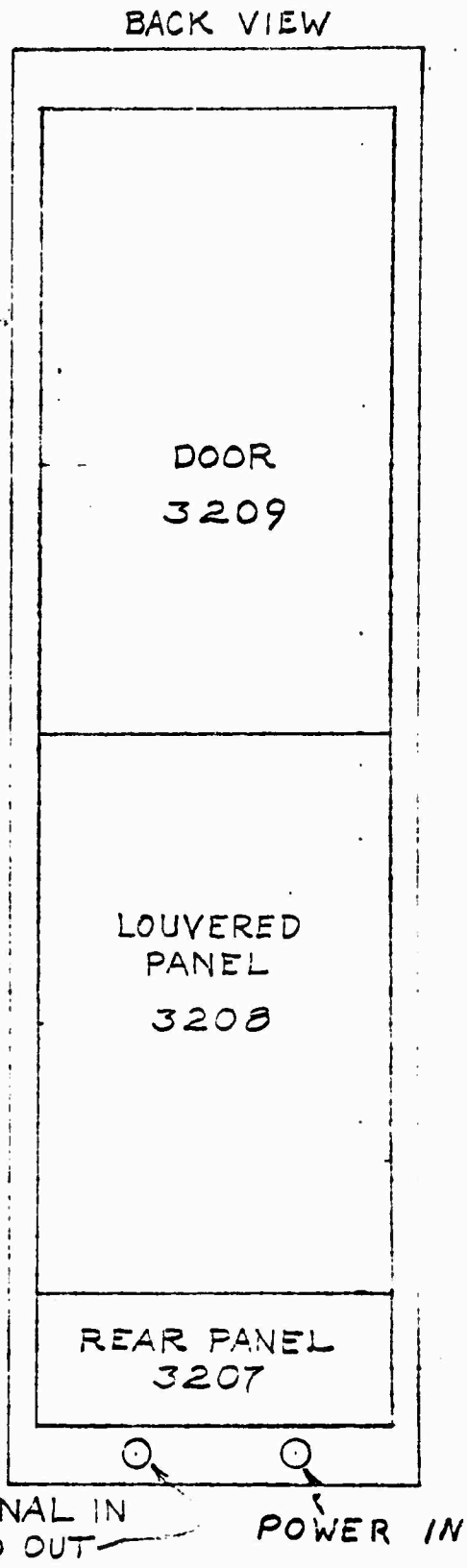
LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

AUXILIARY "SLAVE" TIME
RELAY — DIGITAL RECORDER

DWG. NO. 3102		REV.
SCALE	WEIGHT	SHEET 1 OF 1

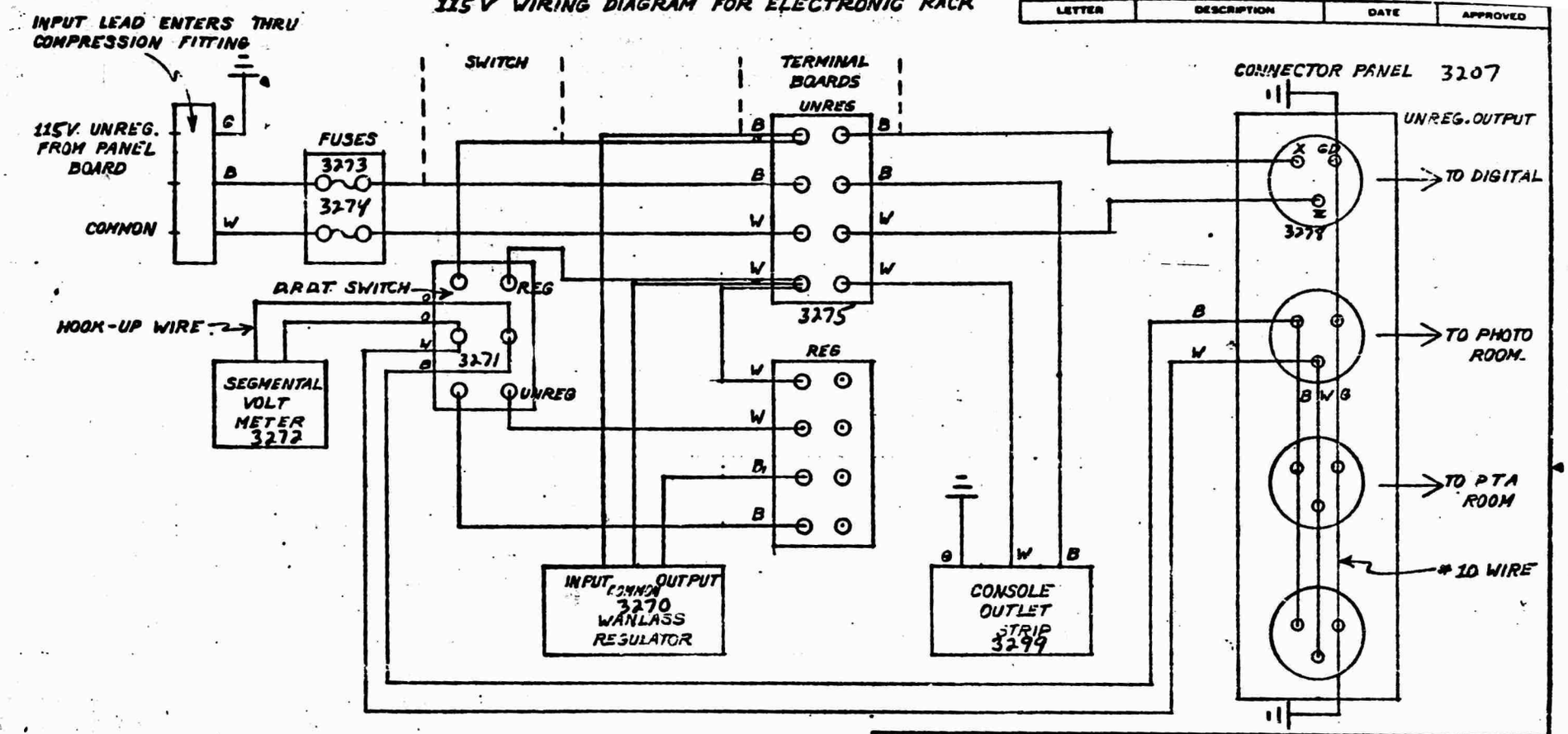
CONTROL PANEL 3200





115 V WIRING DIAGRAM FOR ELECTRONIC RACK

LETTER	DESCRIPTION	DATE	APPROVED



W - WHITE
B - BLACK
G - GREEN
B_1 - BLUE

⊣|| INDICATES GROUNDING AT SYSTEM EARTH-POST ON BASE OF CABINET.

LOCK-IN CONNECTORS
X - BLACK
Z - WHITE
GD - GREEN

ALL WIRING:
3-CONDUCTOR-14 EXCEPT WHERE INDICATED

CONTRACT	
DRAWN BY	
CHECK. BY	
PROJ. ENGR	

TOLERANCES:
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ±
XX ±
XXX ±
BREAK SHARP EDGES

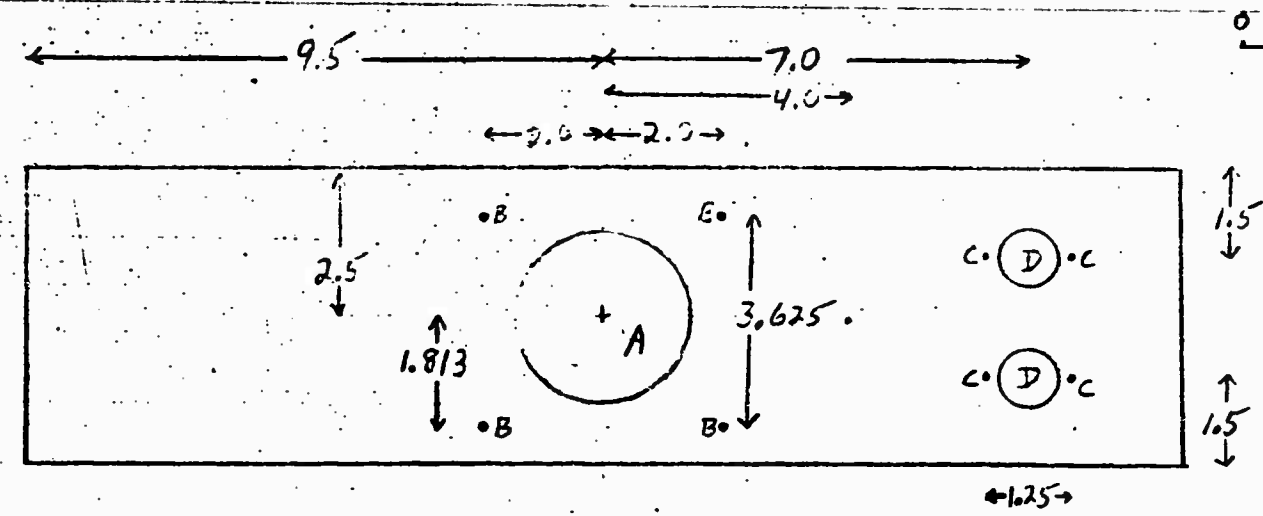
LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY

115 V WIRING DIAGRAM FOR ELECTRONIC RACK

DWG. NO. 3207		REV.
SCALE	WEIGHT	SHEET 1 OF 1

59

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



A HOLE 2.8 DIAMETER, MOUNT PART # 3272
B DRILL #28
C TAP 6-32
D HOLE 0.937, MOUNT PART # 3274

PANEL 5X19 PREMIER ARP-519

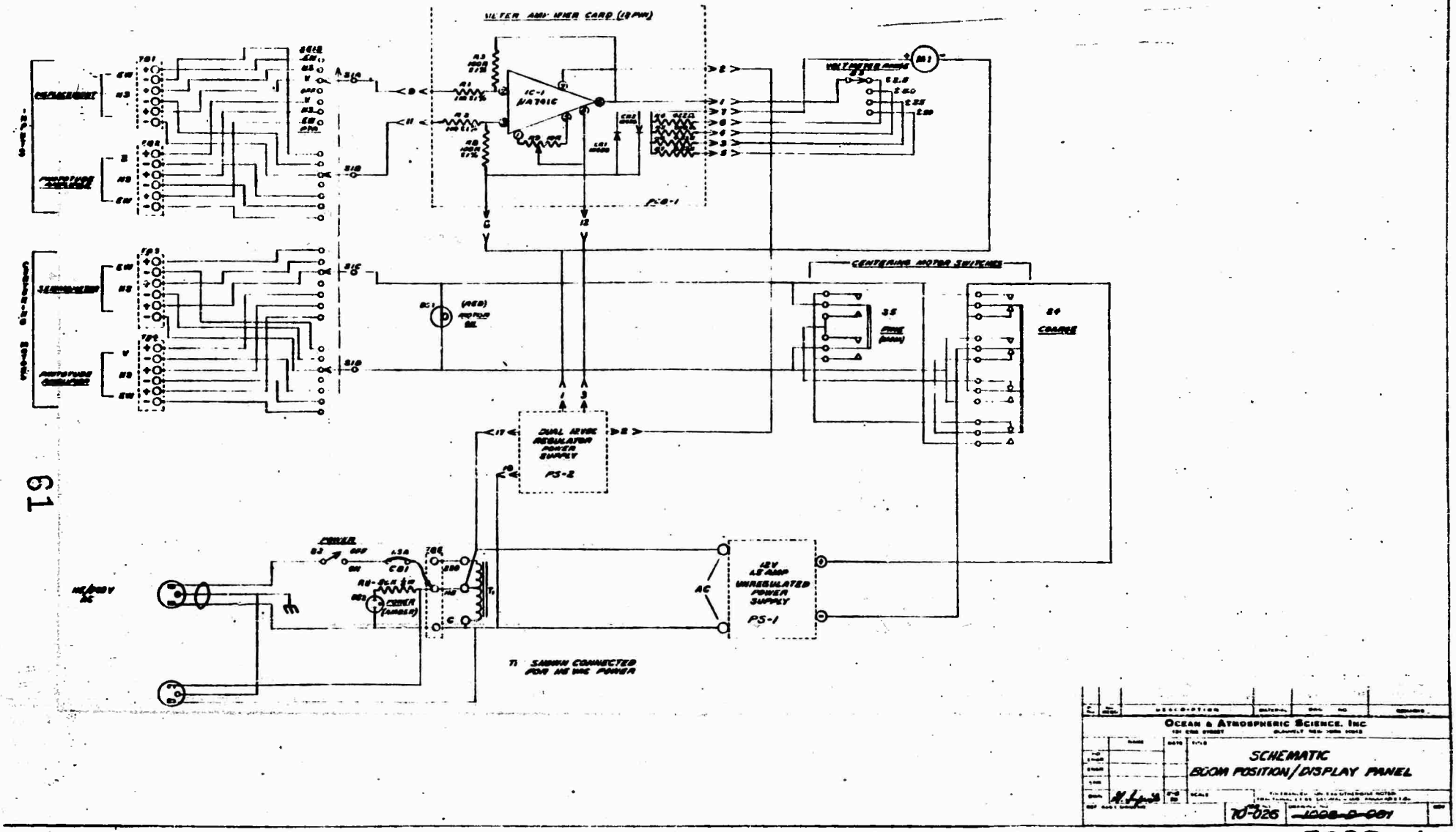
CONTRACT		
DRAWN BY		
CHECK BY		
PROJ. ENGR		

TOLERANCES:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ± ±
XX ±
XXX ±
BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

VOLTMETER PANEL

DWG. NO.	3213	REV	
SCALE	2/1	WEIGHT	SHEET 1 OF 1



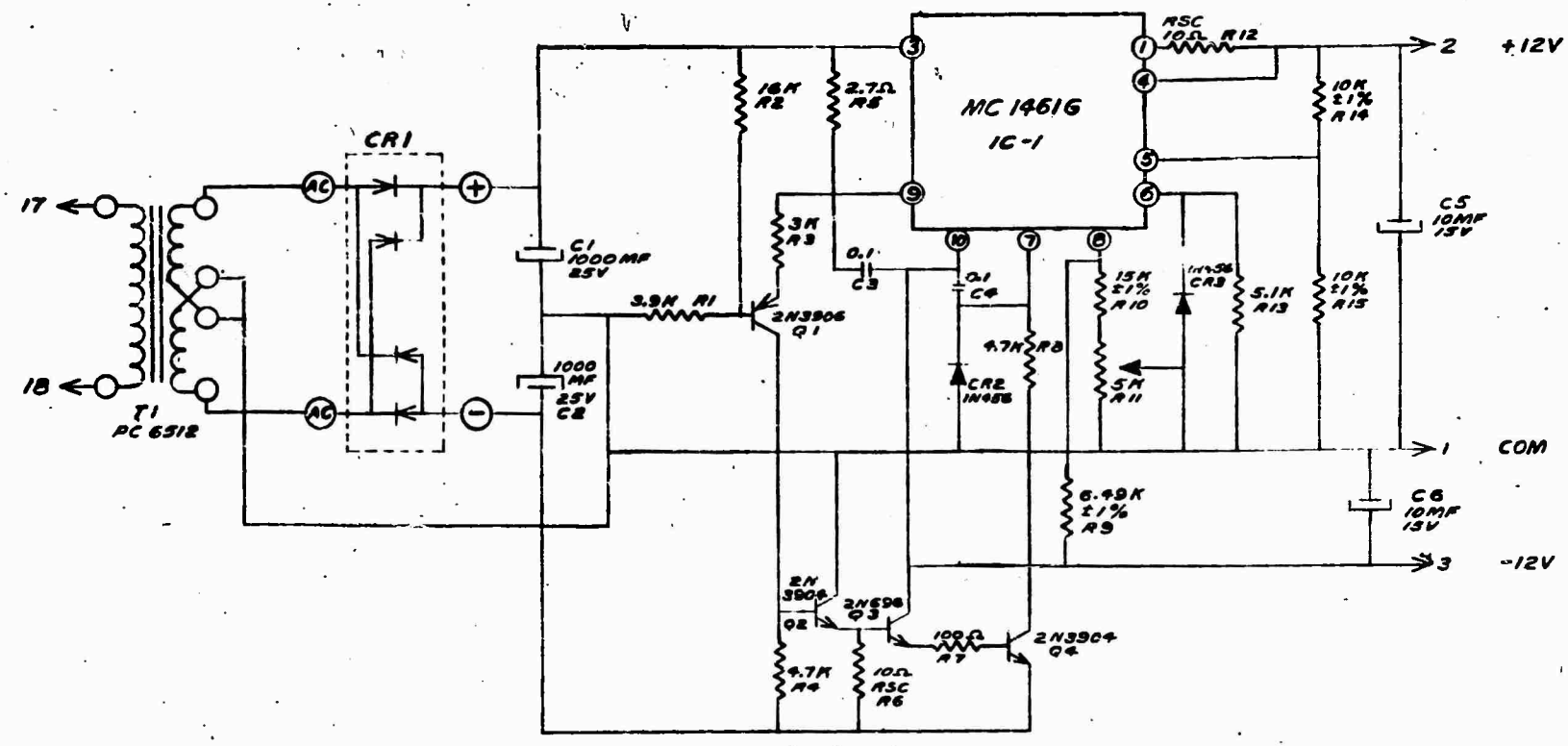
91

OCEAN & ATMOSPHERIC SCIENCE, INC

SCHEMATIC
BOOM POSITION/DISPLAY PANEL

70-026

3220-1



OCEAN & ATMOSPHERIC SCIENCE, INC

SCHEMATIC
POWER SUPPLY (DUAL REGULATED)

H. Spicer 4-7-70

JOB ~~1007-B-001~~

3220-2

OCEAN & ATMOSPHERIC SCIENCE, INC.
145 PALISADE STREET DOBBS FERRY, NEW YORK 10522

Dwg. #1008-D-001

PARTS LIST FOR PCB-1

Symbol	Description	Mfg. Number
CR 1	Diode, silicon	1N 456
CR 2	same as CR 1	
IC 1	Integrated Circuit	NA 741 C
	All fixed resistors are metal film type, RN60D, ± 1%	
R 1	1 megohm	
R 2	same as R 1	
R 3	100 K ohms	
R 4	422 ohms	
R 5	909 ohms	
R 6	4.53 K ohms	
R 7	9.53 K ohms	
R 8	same as R 3	
R 9	Resistor, adjustable, Cermet type 10 K ohms	Bourns 3069P-1-103

PARTS LIST FOR PS-2

C 1	Capacitor, Electrolytic, 1000 MFD @ 25 VDC	Sprague TL-1218
C 2	same as C 1	
C 3	Capacitor, Ceramic, .1 MFD at 50 VDC	Centralab CK-104
C 4	same as C 3	

OCEAN & ATMOSPHERIC SCIENCE, INC.
145 PALISADE STREET DOBBS FERRY, NEW YORK 10522

Dwg. #1008-D-001

BOOM POSITION DISPLAY PANEL

Symbol	Description	Mfg. Number
CB 1	Circuit Breaker, 1.5 A	Mallory CBB-150
DS 1	Bulb, incandescent, Miniature bayonet 14.4 Volts at 100 milliamperes	GE #1892
DS 2	Bulb, neon type, Miniature bayonet, without resistor	GE NE-51
M 1	Meter, Panel type, zero center, 500-0-500 microamperes, with special scale 2.5-0-2.5 & 5-0-5. Scale Accuracy 2%, Taut band construction	Honeywell Type M S 3T
PCB 1	Meter Amplifier Card - see separate parts list	
PS-1	Power Supply, modular, 12 VDC @ 1.5 amperes output regulated.	Ferrotran Model SU-12A
PS-2	Power Supply, Plug-In, dual regulated, tracking +12 VDC @ 100 MA and -12 VDC @ 100 MA. See Separate Parts List.	DAS Type Mod 12-0.1 Dwg. #100-B-001
R 11	Resistor, Composition, ½ watt, 56K ohms, ± 10%.	
S 1	Switch, Rotary, 4 poles, 7 position non-shorting type contacts.	CTS #1235
S 2	Switch, toggle, 1 PST	C-H
S 3	Switch, Rotary, 1 pole, 4 position non-shorting contacts	CTS #1205
S 4	Switch, lever type, 4 poles, 3 position latching, 3 amp contacts	Switchcraft #893121
S 5	Switch, lever type, 2 poles, 3 position non-locking, center off, 3 amp contacts	Switchcraft #1930
T 1	Transformer, Autoformer voltage changing. 115/230 VAC @ 60 cycles. 100 VA rating.	Signal #SU-100

OCEAN & ATMOSPHERIC SCIENCE, INC.
145 PALISADE STREET DOBBS FERRY, NEW YORK 10522

Dwg. #1008-D-001

BOOM POSITION DISPLAY PANEL (cont)

Symbol	Description	Mfg. Number
TB 1	Terminal board, Barrier type, screw connection, 6 terminals	Cinch-Jones #6-140
TB 2	same as TB 1	
TB 3	same as TB 1	
TB 4	same as TB 1	
TB 5	Terminal board, Barrier type, screw connection, 3 terminals	Cinch-Jones #3-140

Dwg. #1007-B-001

PARTS LIST FOR PS-2 (cont,

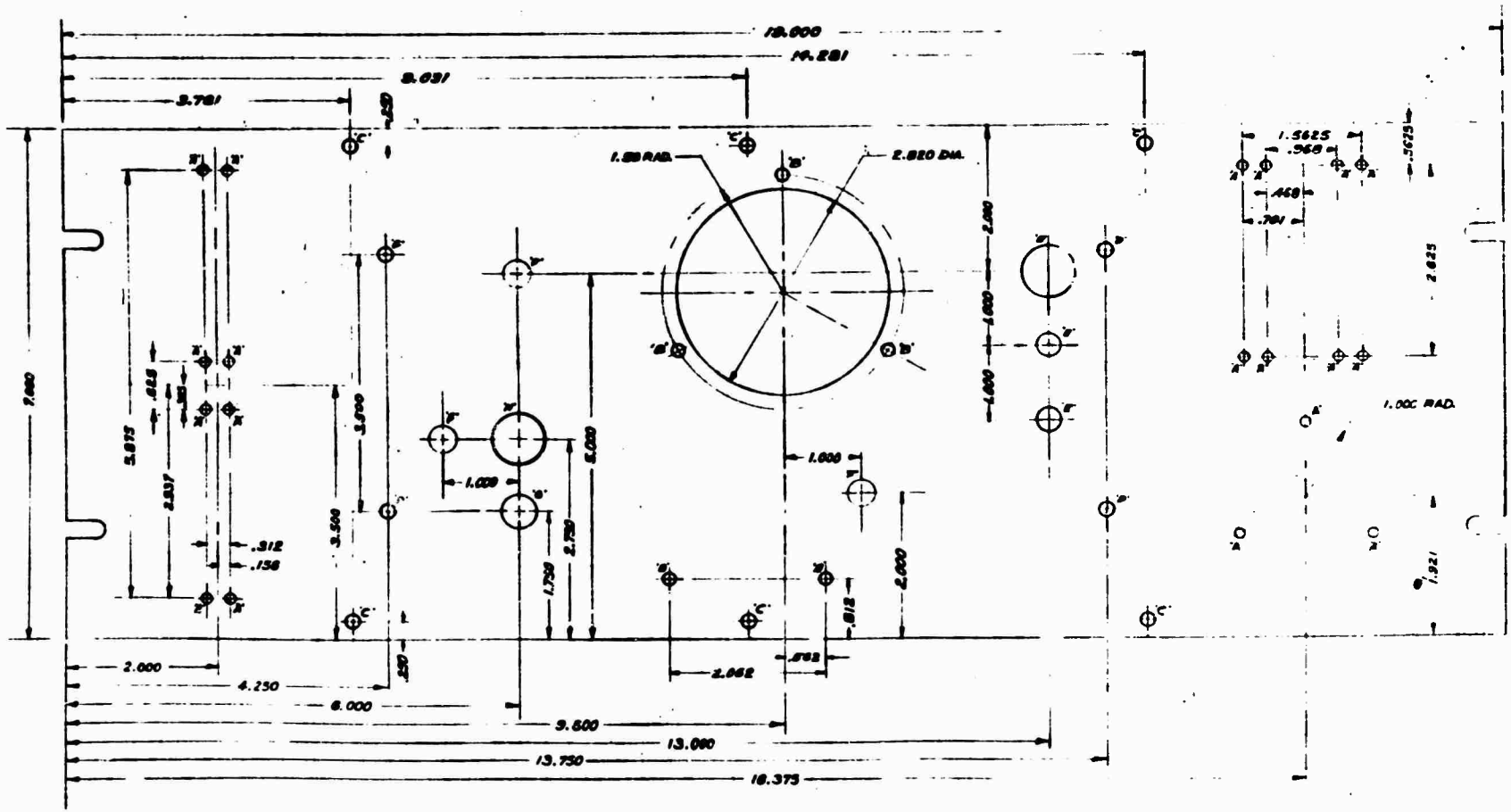
Symbol	Description	Mfg. Number
C 5	Capacitor, tantalum, 10 MFD @ 15 WDV	Sprague 196D106X0015EB
C 6	same as C 5	
CR 1	Rectifier Bridge, 1 amp @ 100 V PNS	International Rectifier #10BB1P
CR 2	Diode, silicon	1N 456
CR 3	same as CR 2	
IC 1	Integrated Circuit module	Motorola MC1466G
Q 1	Transistor, PNP, silicon	Motorola 2N 3906
Q 2	Transistor, NPN, silicon	Motorola 2N 3904
Q 3	Transistor, NPN, silicon	Motorola 2N 696
Q 4	same as Q 2	
R 1	Resistor, fixed composition, ¼ w, ± 1 %, 3.9 K	
R 2	Ditto - 16 K	
R 3	Ditto - 3 K	
R 4	Ditto - 4.7 K	
R 5	Ditto - 2.7 ohms	
R 6	Resistor, fixed wirewound, ½ w, ± 1%, 10 ohms	
R 7	Resistor, fixed composition, ¼ w, ± 1%, 100 ohms	
R 8	same as R 4	

OCEAN & ATMOSPHERIC SCIENCE, INC.
145 PALISADE STREET DOBBS FERRY, NEW YORK 10522

Dwg. #1007-B-001

PARTS LIST FOR PS-2 (cont)

Symbol	Description	Mfg. Number
R 9	Resistor, fixed metal film, RN60D, ± 1%, 6.49 K	
R 10	Ditto - 15.0 K	
R 11	Resistor, adjustable, Cermet type 5000 ohms	Bourns 3069P-1-502
R 12	Resistor, fixed wirewound, ½ w, ± 1%, 10 ohms	
R 13	Resistor, fixed composition, ¼ w, ± 10%, 5.1 K	
R 14	Resistor, fixed metal film, RN60D, ± 1%, 10 K ohms	
R 15	same as R 14	



LEGEND

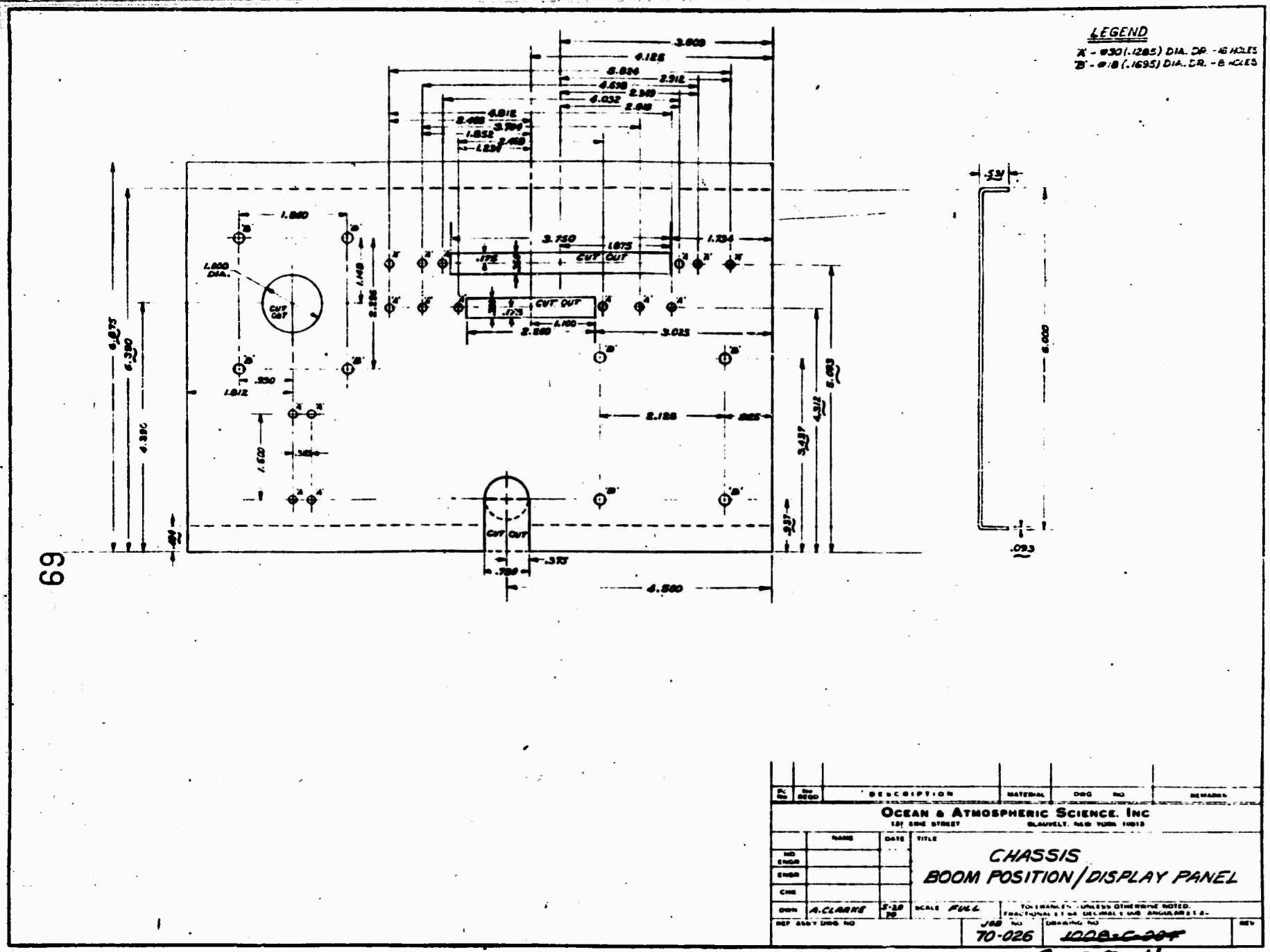
'A' – #31 (.120) DIA DR. – 19 HOLES
'B' – #25 (.149) DIA. DR. – 5 HOLES
'C' – #21 (.159) DIA. DR. – 6 HOLES
'D' – #17 (.173) DIA. DR. – 4 HOLES
'E' – 5/16 DIA. DR. – 2 HOLES
'F' – 3/8 – 16 NF – 3 HOLES
'G' – 1/2 DIA. DR. – 1 HOLE
'H' – 7/16 DIA. DR. – 2 HOLES

OCEAN & ATMOSPHERIC SCIENCE, INC
151 ERIC STREET PLAINVILLE NEW YORK 11803

BOOM POSITION/DISPLAY PANEL

DRWN A. CLARKE 8-21-70 SCALE FULL

JOB NO. 70-026



ECR	ECO	DESCRIPTION	MATERIAL	DRG NO	REMARKS

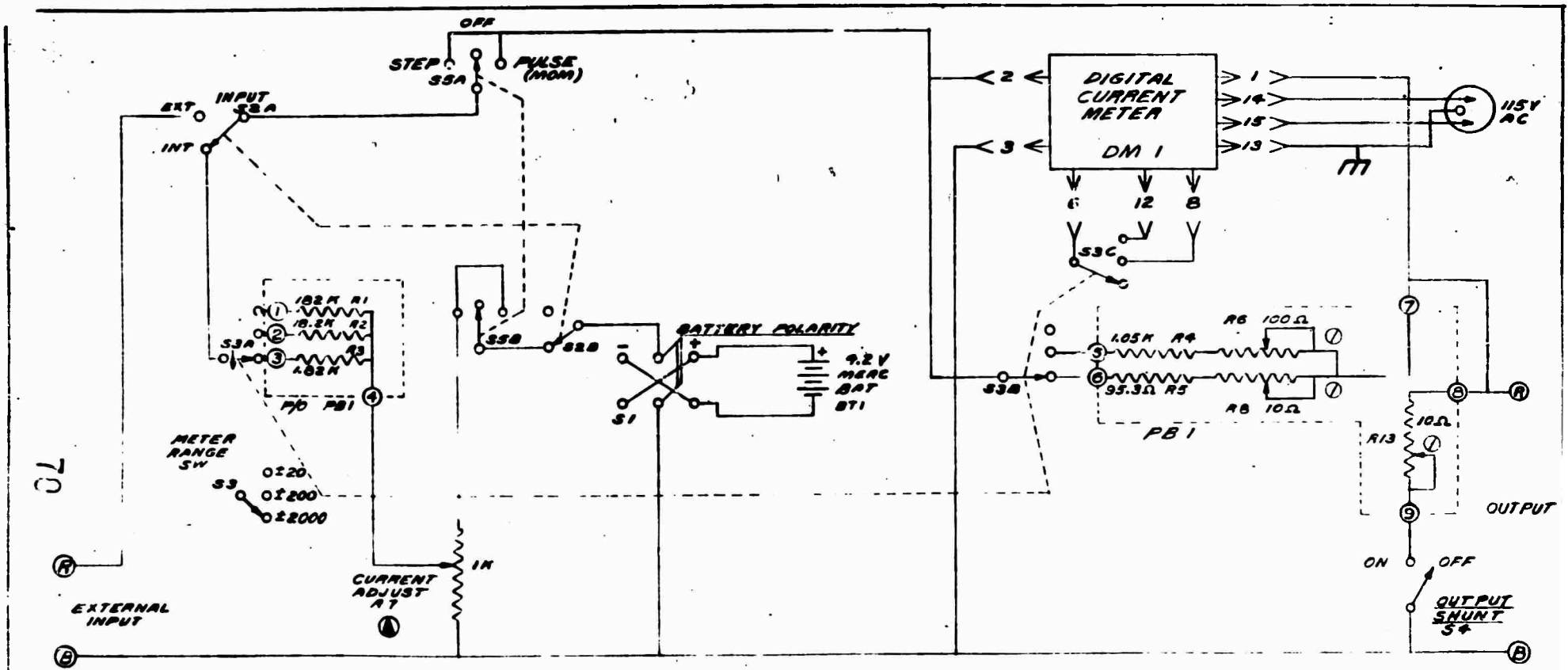
OCEAN & ATMOSPHERIC SCIENCE, INC
181 SUNE STREET GLASSVELT, NEW YORK 11810

	NAME	DATE
MFG ENGR		
ENGR		
CHK		
DWN	A. CLARKE	5-20 70

TITLE
CHASSIS
BOOM POSITION/DISPLAY PANEL

SCALE FULL
TOLERANCES UNLESS OTHERWISE NOTED.
FRACTIONAL ± DECIMALS ± ANGULAR ±
REF ASSY DRG NO
JOB NO 70-026
DRAWING NO 1008-C-004
REV

3220-4



OCEAN & ATMOSPHERIC SCIENCE INC

SCHEMATIC CALIBRATION PANEL

JOB 70-026 ~~1008-B-002~~

3230-1

OCEAN & ATMOSPHERIC SCIENCE. INC.
145 PALISADE STREET DOBBS FERRY, NEW YORK 10522

Dwg. #1008-B-002

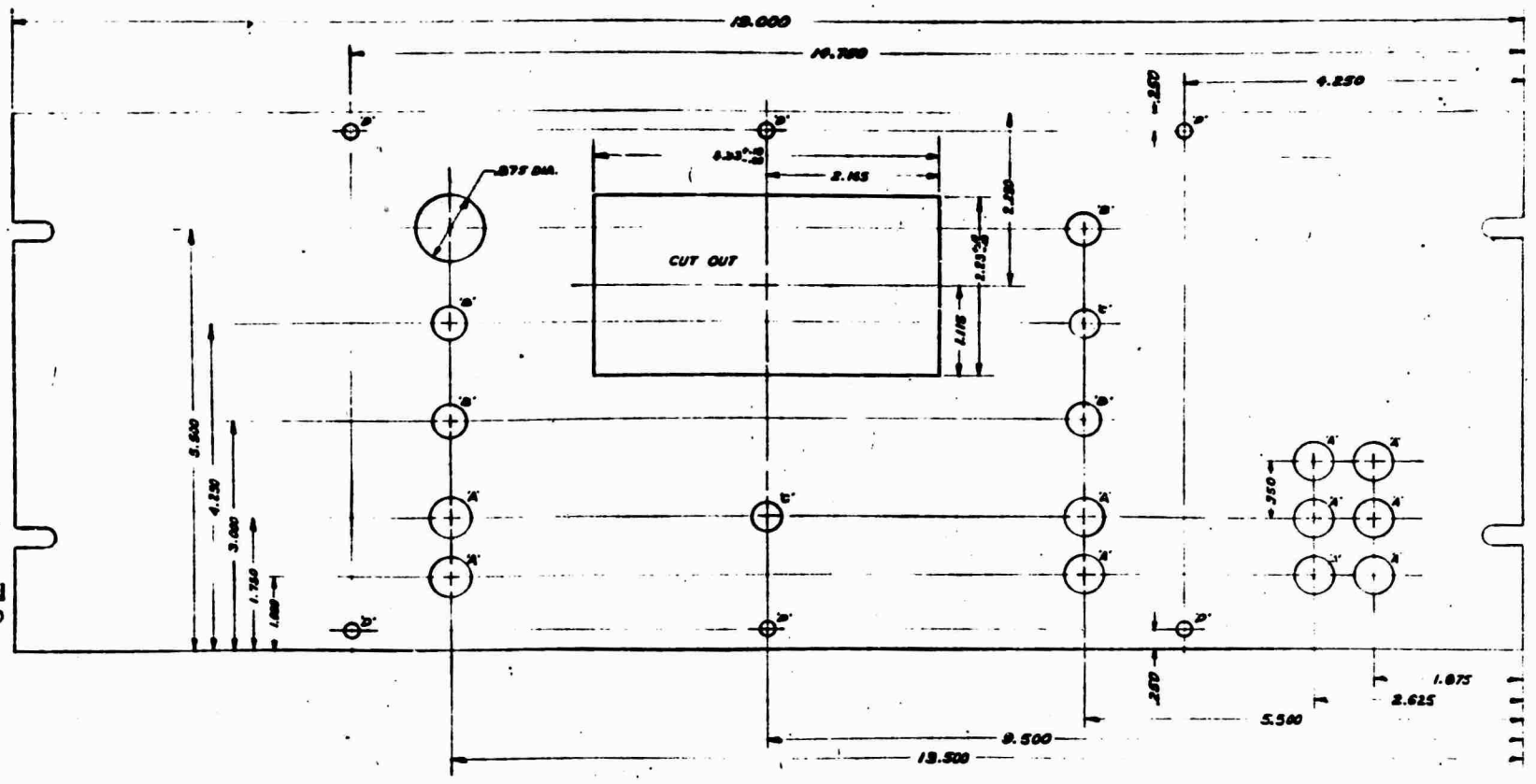
CALIBRATION PANEL

Symbol	Description	Mfg. Number
BT 1	Mercury Battery 4.2 VDC	Mallory #TR-133
DM 1	Digital Panel Meter, Bipolar, 19.99 microamperes full scale	Newport 210-2, Option E 2
R 1	Resistor, fixed, metal film type, RN60D, 182 K, ± 1% ohms	
R 2	Ditto R 1 - 18.2 K	
R 3	Ditto R 1 - 1.82 K	
R 4	Ditto R 1 - 1.05 K	
R 5	Ditto R 1 - 95.3 K	
R 6	Resistor, adjustable, Cermet type, 100 ohms	Bourns 3069-P-1-101
R 7	Potentiometer, Precision, conductive plastic type, 10 turns, bushing mount 1000 ohms	Bourns 3051-S-1-102
R 8	Resistor, adjustable, Cermet type, 10 ohms	Bourns 3069-P-1-100
R 9	Not used	
R 10	Not used	
R 11	Not used	
R 12	Not used	
R 13	same as R 8	

Dwg. #1008-B-002

CALIBRATION PANEL (cont)

Symbol	Description	Mfg. Number
S 1	Switch, Toggle, DPDT	Sutter-Hammer #8376K2
S 2	same as S 1	
S 3	Switch, Rotary type, 3 poles, 3 position, non-shorting contacts	CTS #1207
S 4	Switch, toggle, DPST	Sutter-Hammer #8374K1
S 5	Switch, toggle, DPDT, center off, one side momentary	Sutter-Hammer #8833K3



73

LEGEND

'A' - (.500) DIA. DR. - 10 HOLES
'B' - (.484) DIA. DR. - 4 HOLES
'C' - (.375) DIA. DR. - 2 HOLES
'D' - #21 (.159) DIA. DR. - 6 HOLES

DESCRIPTION	MATERIAL	DWG NO

OCEAN & ATMOSPHERIC SCIENCE, INC.
135 ERIE STREET BLAUVELT, NEW YORK 10913

	NAME	DATE
MD ENGR		
ENGR		
CHK		
DWN	A. CLARKE	4-27-70

TITLE: CALIBRATION PANEL

SCALE FULL

TOLERANCES - UNLESS OTHERWISE NOTED. FRACTIONAL ± 1/64 DECIMAL ± .010 ANGULAR ± 2°

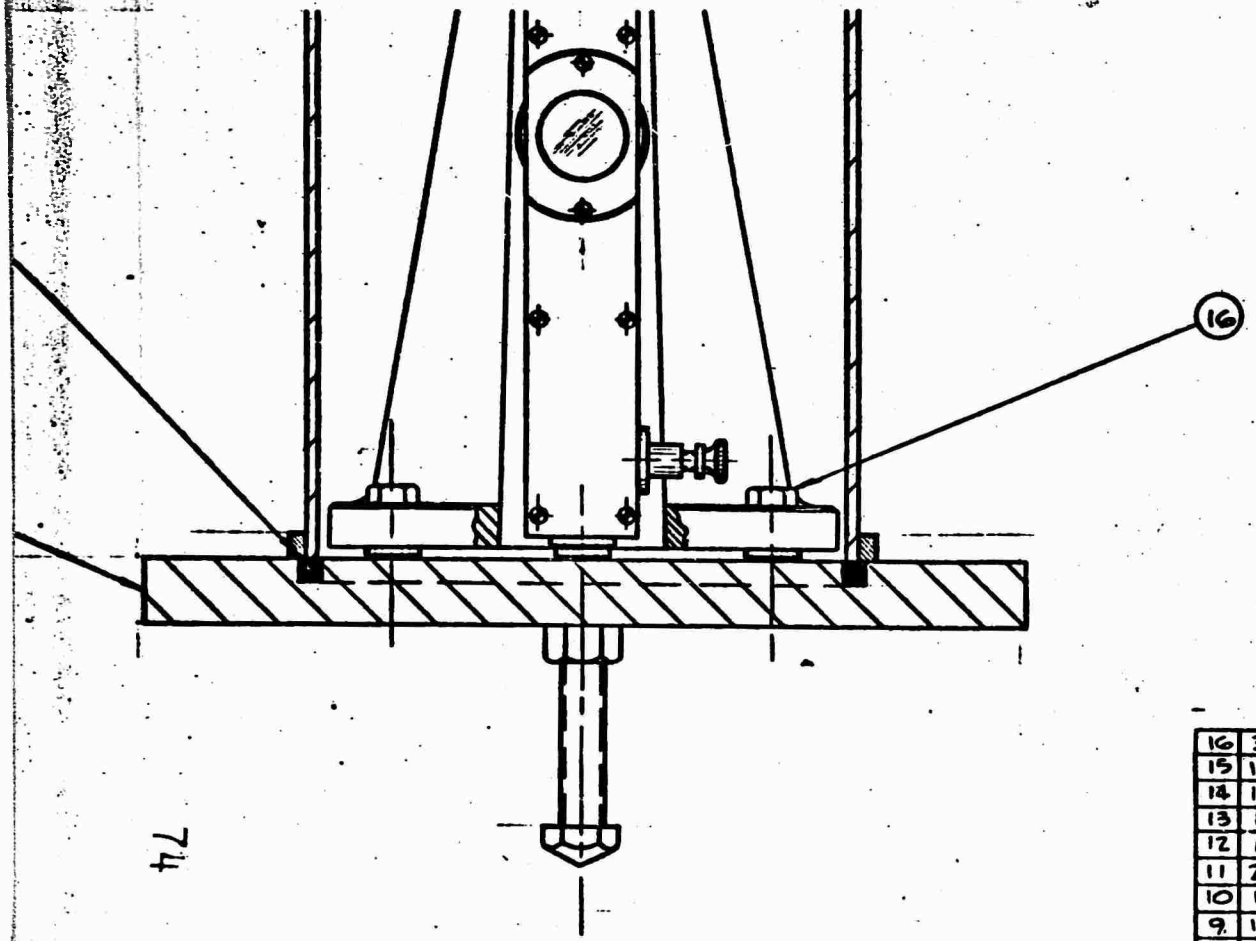
REF ASSY DWG NO

CONTRACT NO 70-026

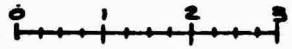
DRAWING NO 1008-C-005

REV

3230-2



SECTION A-A



DET	QTY	PART NO	DESCRIPTION	REMARKS
16	3		BOLT, HEX HD .312 x 1.00 LG	
15	1	4200-15	PLATE, BASE	
14	1		'O' RING 5.90 I.D.	PARKER
13	1	LG-1	GALVANOMETER	GINEMETRICS
12	1		DRYER, AIR	DAVISON
11	2		SCR, PAN HD 10-32 x .25	
10	1	4200-10	BRACKET, DRYING AGENT	
9	1		'O' RING 3.75 I.D.	PARKER
8	1		ELBO, ADAPTER 3/8 MALE x 3/8 FEM.	CONKLIN
7	1		CONNECTOR, INSULATED	RALCO
6	3		NUT, HEX .500-20	
5	3	4300-5	LEG, LEVELING	
4	3	2368	SCR, THUMB	W.H.SMITH
3	1	4200-3	ENCLOSURE, CYLINDRICAL	
2	1	4300-2	COVER, TOP	
1	3	2366	SCR, THUMB	W.H. SMITH

MATERIAL:

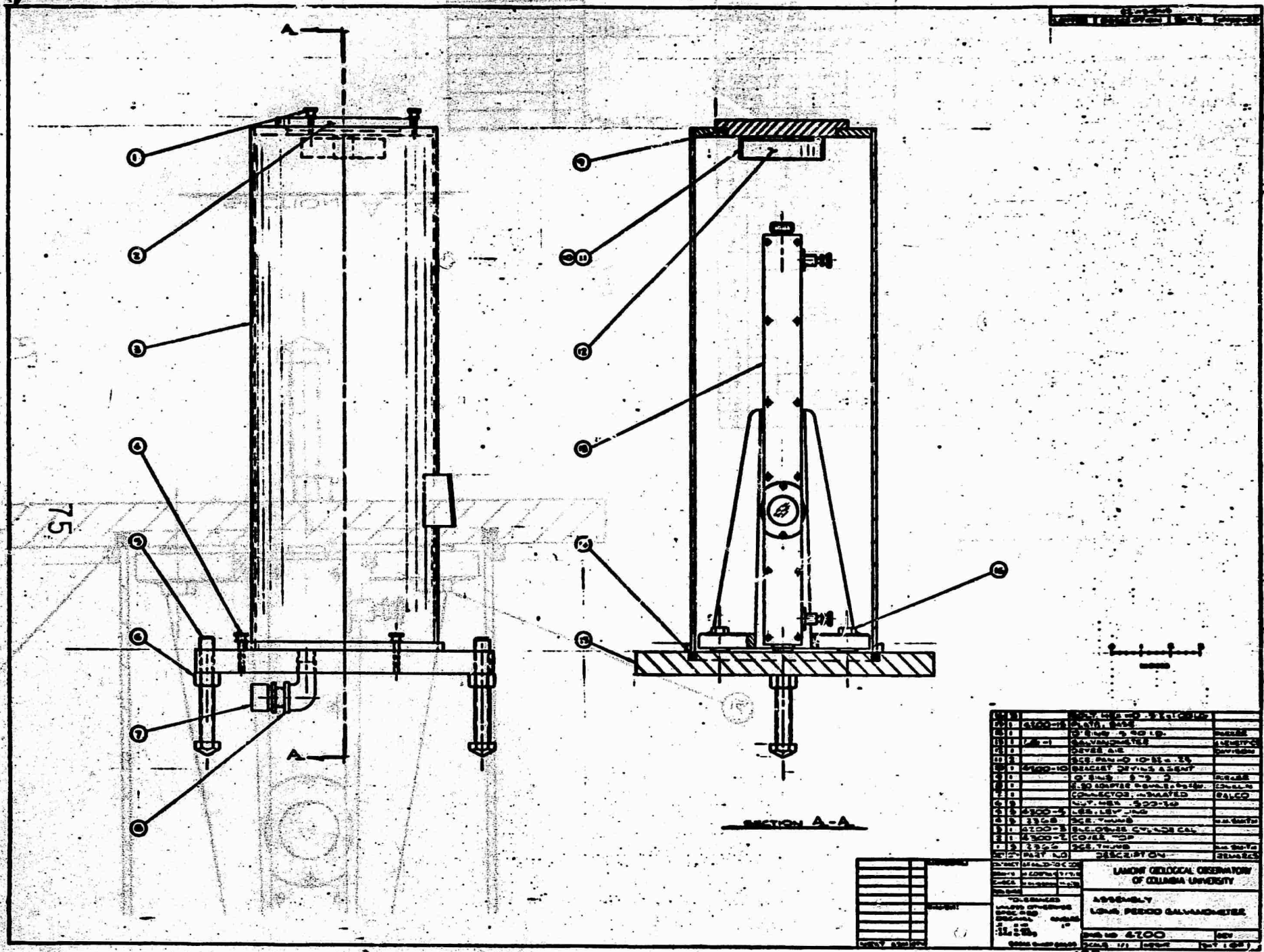
FINISH:

CONTRACT	AF 44(20-70-C-0035	
DRAWN	H. COSTAKIS	7/7/70
CHECK	W. KLINEMAN	7/14/70
PROJ ENGR		

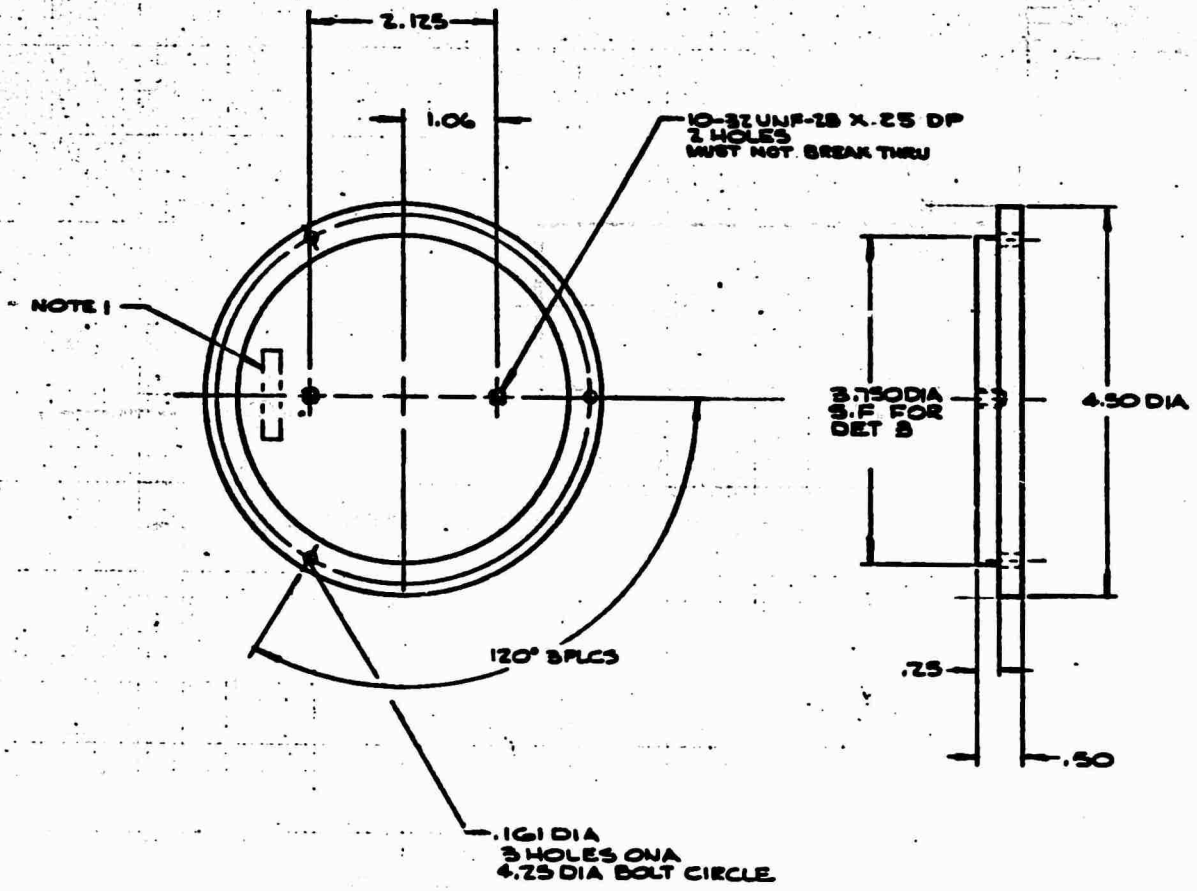
TOLERANCES
UNLESS OTHERWISE SPECIFIED
DECIMAL ANGLES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

ASSEMBLY
LONG PERIOD GALVANOMETER


A
A
SECTION A-A
LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY
ASSEMBLY
LONG PERIOD GALVANOMETER
ASD

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



NOTES
1. STAMP OR STENCIL PART WHERE INDICATED
2. 125 SURFACE FINISH ALL OVER EXCEPT WHERE NOTED

		MATERIAL: BRASS ½ HARD	
		FINISH: CHROMIC ACID DIP	
4200	1		
NEXT ASM	QTY		

CONTRACT	AT(26-1)-3038	
DRAWN BY	J. COSTAKIS	7/7/70
CHECK. BY	W. KUNZMAN	7/14/70
PROJ. ENGR.		

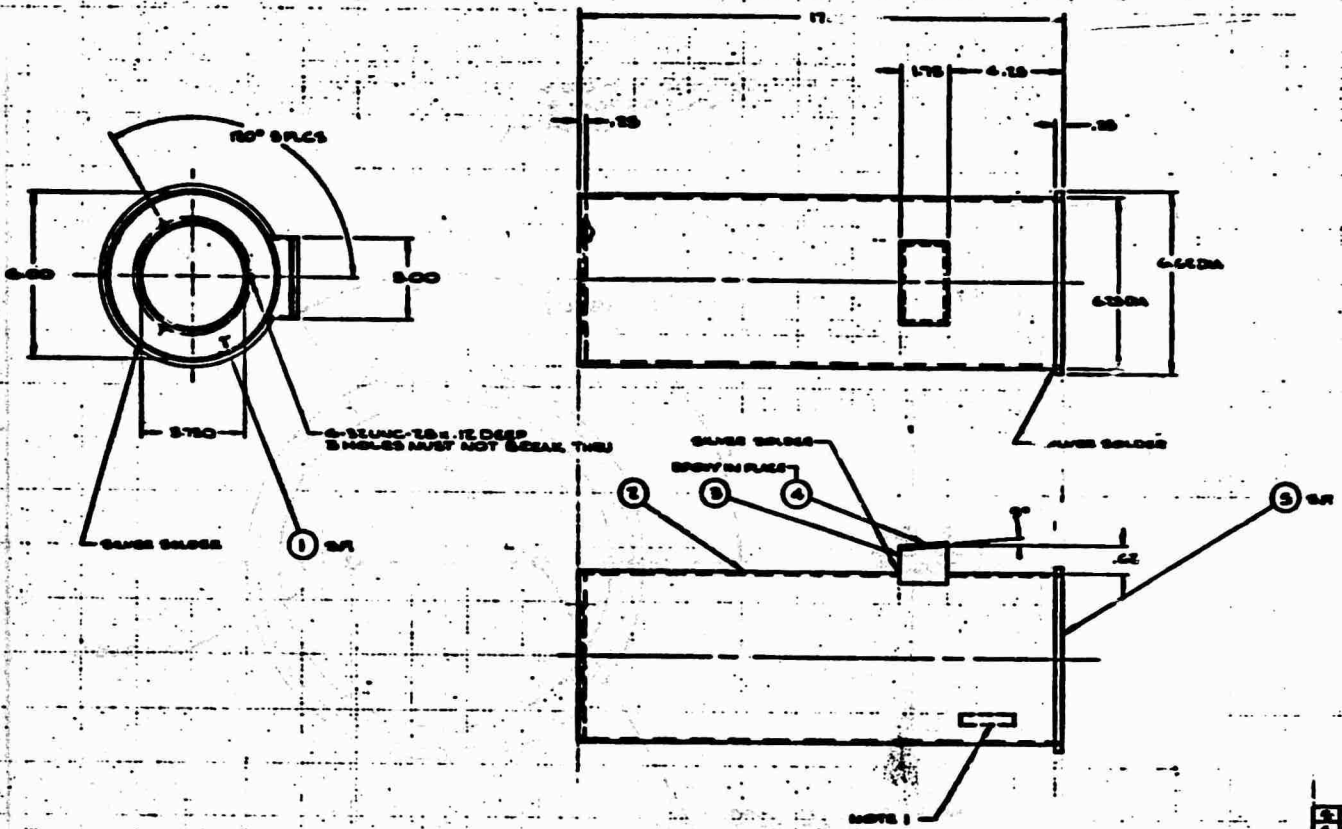
TOLERANCES:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ± .1 ± 1°
XX ± .02
XXX ± .005
BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

COVER, TOP -
LONG PERIOD GALVANOMETER

DWG. NO. 4200-2			REV.
SCALE 1/1	WEIGHT	SHEET 1	OF 1

ASD



NOTES:
1. STAMP OR STENCIL PART NO WHERE INDICATED.
2. 125 SURFACE FINISH ALL OVER EXCEPT WHERE NOTED.

INCHES

QTY	REQ	PART NO	DESCRIPTION	REMARKS
2	1		RING - 6.62 DIA x .25	BRASS
4	1		WINDOW - .12 x 1.75 x 3.00	COLD ROLLED STEEL
3	1		TUBING - .08 WALL x 1.75 x 3.00	BRASS
2	1		CYLINDER - 6.00 I.D. x 17.75 LG	BRASS
1	1		PLATE, TOP - 6.00 DIA x .25	BRASS

MATERIAL: MES STOCK LIST

FINISH: CHROMIC ACID DIP

LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY

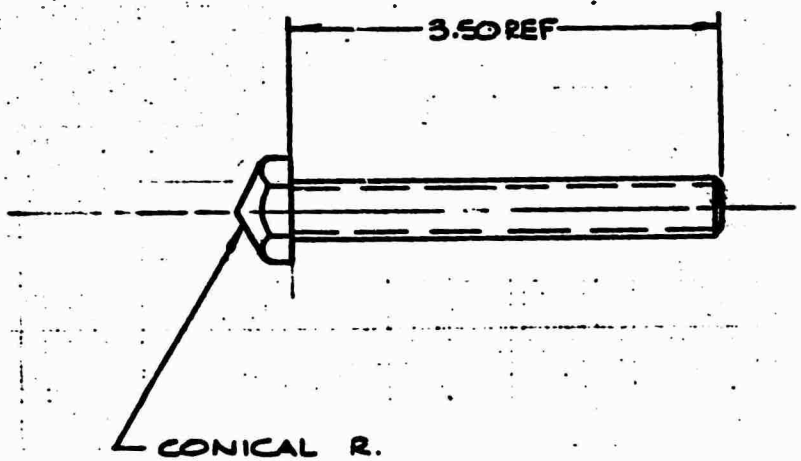
ENCLOSURE, LONG PERIOD GALVANOMETER

4700-3

SCALE 1/2

ASD

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



78

0 1 2

INCHES

		MATERIAL: MAKE FROM BRASS HEX HD SCR .500-20 x 3.50
		FINISH: CHROMIC ACID DIP
4200	3	
NEXT ASM	QTY	

CONTRACT	AF44620-70-C-0035	
DRAWN BY	H. COSTAKIS	7/7/70
CHECK. BY	W. KLINZMAN	7/13/70
PROJ. ENGR		

TOLERANCES:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMALS ANGLES
X ± .4 ± 1°
XX ± .02
XXX ± .005
BREAK SHARP EDGES

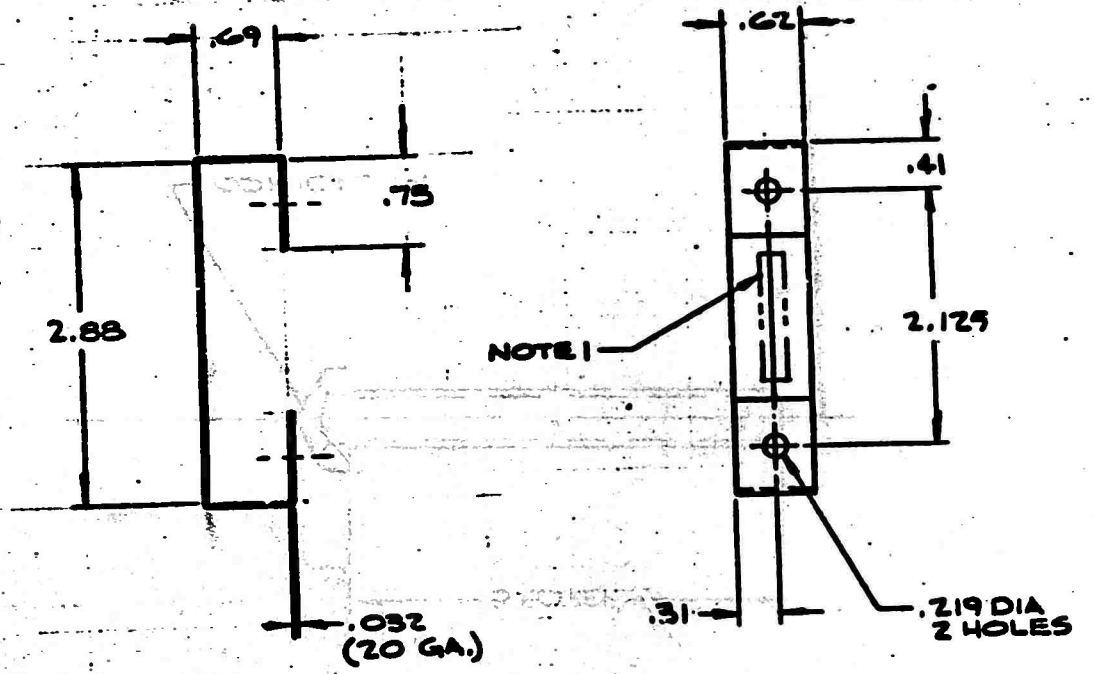
LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

LEG, LEVELING
LONG PERIOD GALVANOMETER

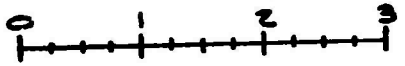
DWG. NO. 4200-5		REV.
SCALE 1/1	WEIGHT	SHEET 1 OF 1

ASD

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



NOTES
1 STAMP OR STENCIL PART NO WHERE INDICATED



79

4200	1	MATERIAL: BRASS 1/2 HARD	
NEXT ASM	QTY	FINISH: CHROMIC ACID DIP	

CONTRACT	AR4620-10-C-0035	
DRAWN BY	H. COSTANZO	7/7/70
CHECK BY	W. KUHLMAN	7/13/70
PROJ. ENGR		

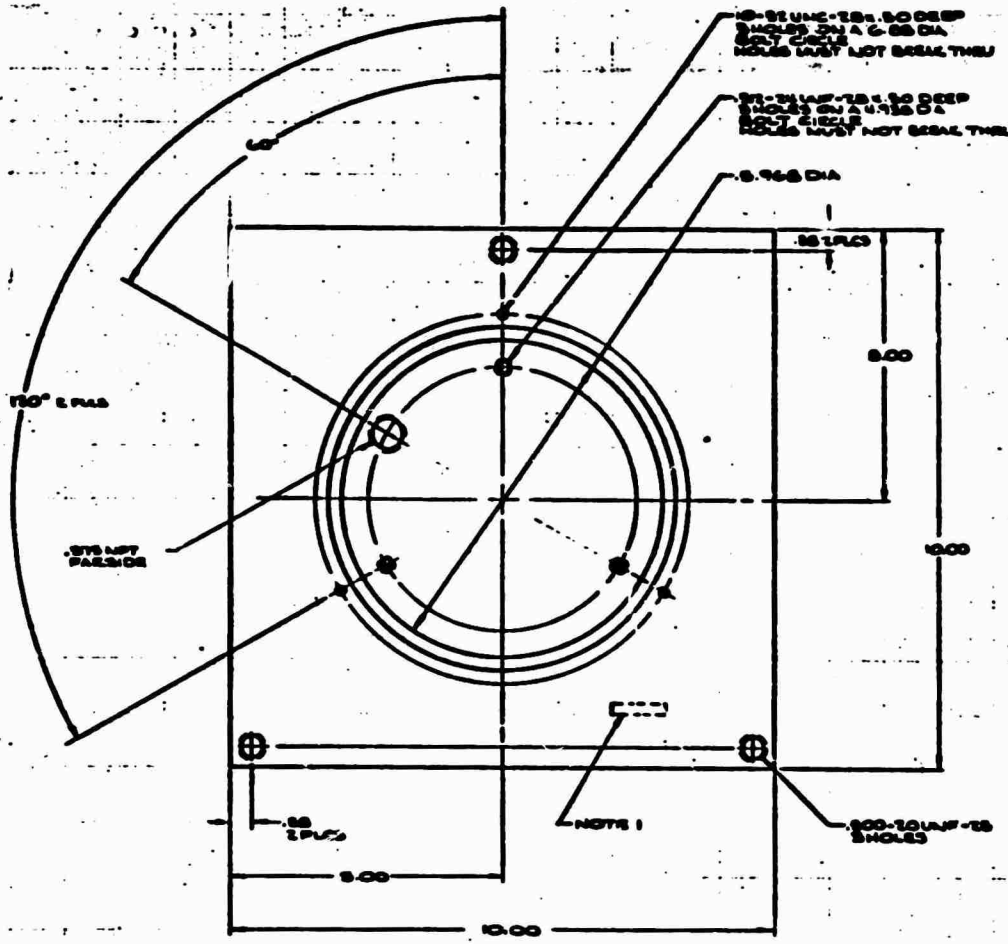
TOLERANCES
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ± .1 ± 1°
XX ± .02
XXX ± .005
BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

BRACKET, DRYING AGENT — LONG PERIOD GALVANOMETER

DWG. NO. 4200-10			REV.
SCALE 1/1	WEIGHT	SHEET 1 OF 1	

ASD



NOTES:
1. STAMP OR STENCIL PART NO WHERE INDICATED.
2. 125 SURFACE FINISH ALL OVER EXCEPT WHERE NOTED.

INCHES

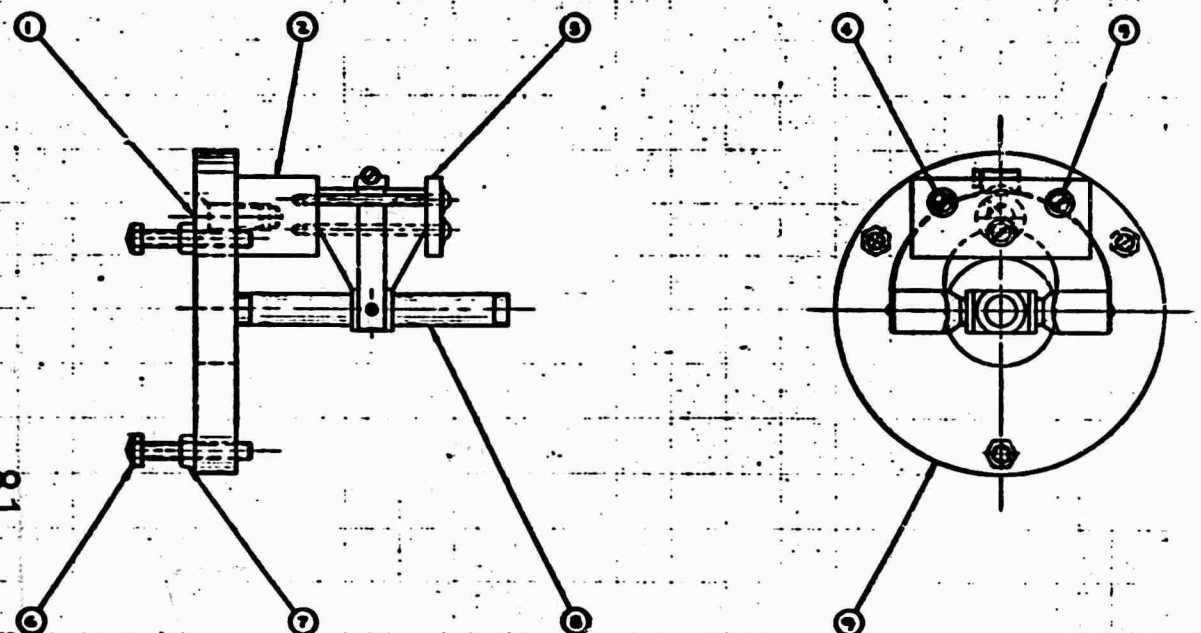
MATERIAL: ALUMINUM

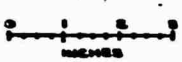
FINISH:

LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY

PLATE, BASE
LONG PERIOD GALVANOMETER

4200-15





9	1	4300-9	PLATE, BASE	
8	1		GALVANOMETER	GEOTECH
7	3		NUT, HEX - 3/7-24	
6	3	4300-6	LEG, LEVELING	
5	3		SCR, 2D HD - 0-32 x 2 SOLG	
4	3		WASHER, FLT - #0	
3	1	4300-3	PLATE, CLAMP	
2	1	4300-2	BLOCK, SUPPORT	
1	1		SCR FLT HD - 4-40 x 3/8 SOLG	
QUANTITY	PART NO	DESCRIPTION		REMARKS

MATERIAL:	
FINISH:	
NEXT ASSY	QTY

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

ASSEMBLY,
SHORT PERIOD GALVANOMETER

DWG NO 4300

SCALE 1/1

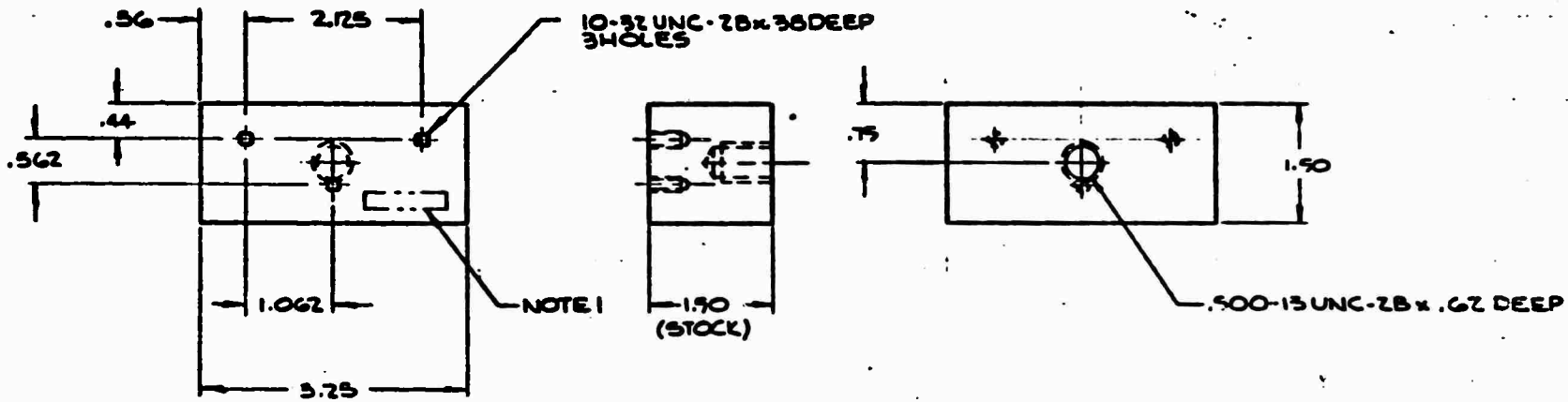
SHEET 1 OF 1

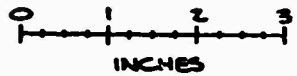
81

ASD

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED

NOTES:
1. STAMP OR STENCIL PART NO. WHERE INDICATED
2. 125 SURFACE FINISH ALL OVER EXCEPT WHERE NOTED.



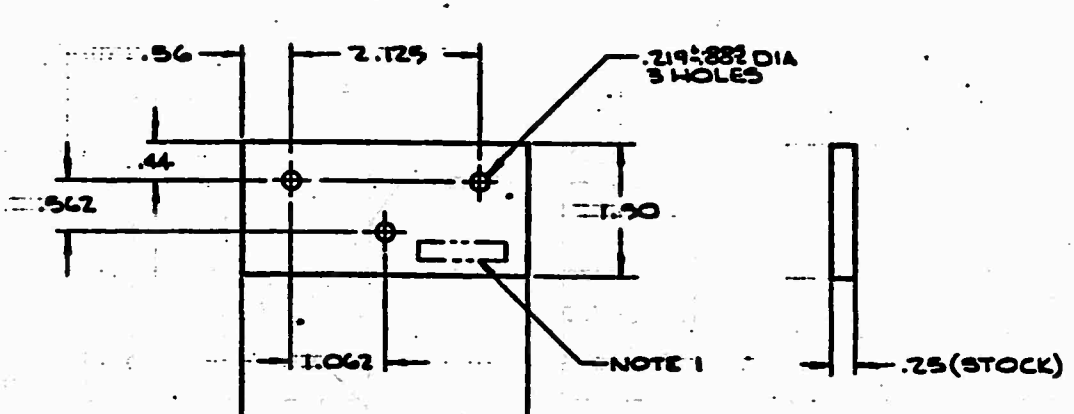


MATERIAL: BRASS 1/2 HARD	CONTRACT	AF 44(20-70-C-0038	
	DRAWN BY	H. COSTAKIS	4/27/70
	CHECK. BY	M. KLEINMAN	7/14/70
	PROJ. ENGR.		
FINISH: CHROMIC ACID DIP.	TOLERANCES: UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. DECIMAL: X ± .1, XX ± .02, XXX ± .005. ANGLES ± 1°. BREAK SHARP EDGES		
4300 / NEXT ASM / QTY	LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY		
	BLOCK, SUPPORT — SHORT PERIOD GALVANOMETER		
	DWG. NO. 4300-7	REV.	
	SCALE 1/1	WEIGHT	SHEET 1 OF 1

ASD

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED

NOTES:
1. STAMP OR STENCIL PART NO. WHERE INDICATED.
2. 125 SURFACE FINISH OVER EXCEPT WHERE NOTED.



MATERIAL: BRASS 1/2 HARD	CONTRACT	AF 44(620)-70-C-0035	
	DRAWN BY	W. COSTAKIS	6/22/70
	CHECK. BY	M. KLINEMAN	7/14/70
	PROJ. ENGR.		
FINISH: CHROMIC ACID DIP.	TOLERANCES: UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. DECIMAL ± .XX ± .02, .XXX ± .005; ANGLES ± 1°. BREAK SHARP EDGES		
4300 / NEXT ASM	1 / QTY		

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

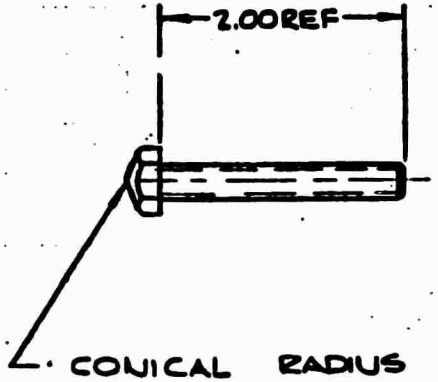
PLATE, CLAMPING — SHORT PERIOD GALVANOMETER

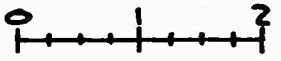
DWG. NO. 4300-3 REV.

SCALE 1/1 WEIGHT SHEET 1 OF 1

ASD

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED





4300 NEXT ASM	3 QTY

MATERIAL:
MAKE FROM .312-24 x 2.00 BRASS HEX HD BOLT

FINISH:
CHROMIC ACID DIP.

CONTRACT	AF-44620-70-C-0087	
DRAWN BY	B. COSTALIS	6/21/70
CHECK BY	M. KUBZMAN	7/13/70
PROJ. ENGR		

TOLERANCES
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ± ± 1°
.XX ± .02
.XXX ± .005
BREAK SHARP EDGES

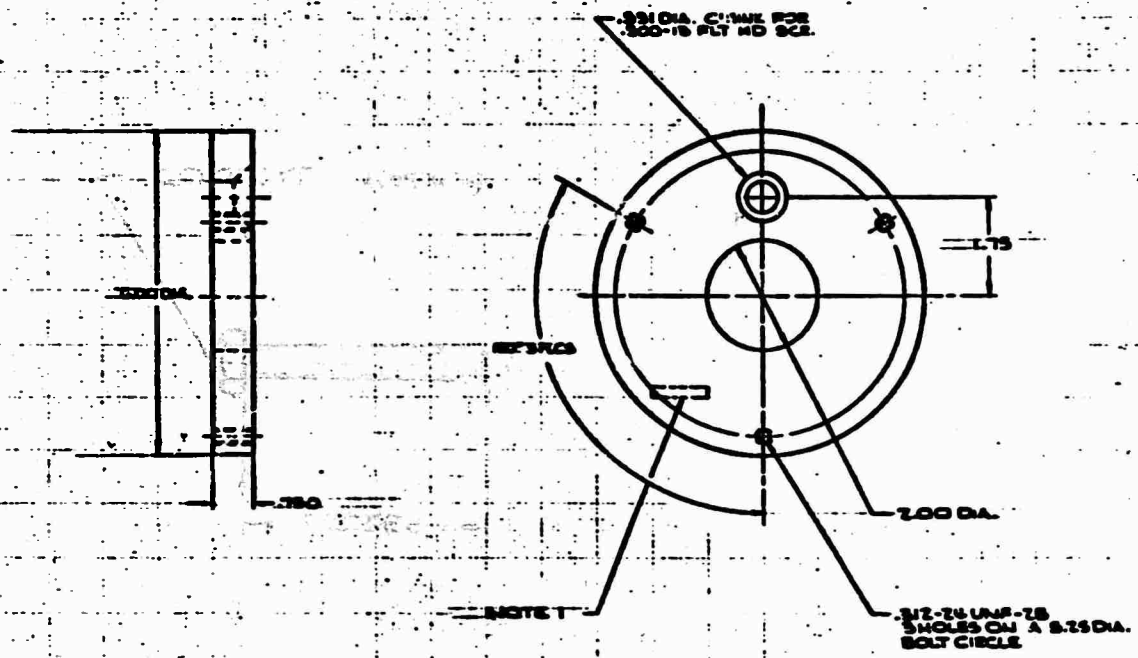
LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

LEG, LEVELING SHORT PERIOD GALVANOMETER

DWG. NO. 4300-6		REV.	
SCALE 1/1	WEIGHT	SHEET 1	OF 1

ASD

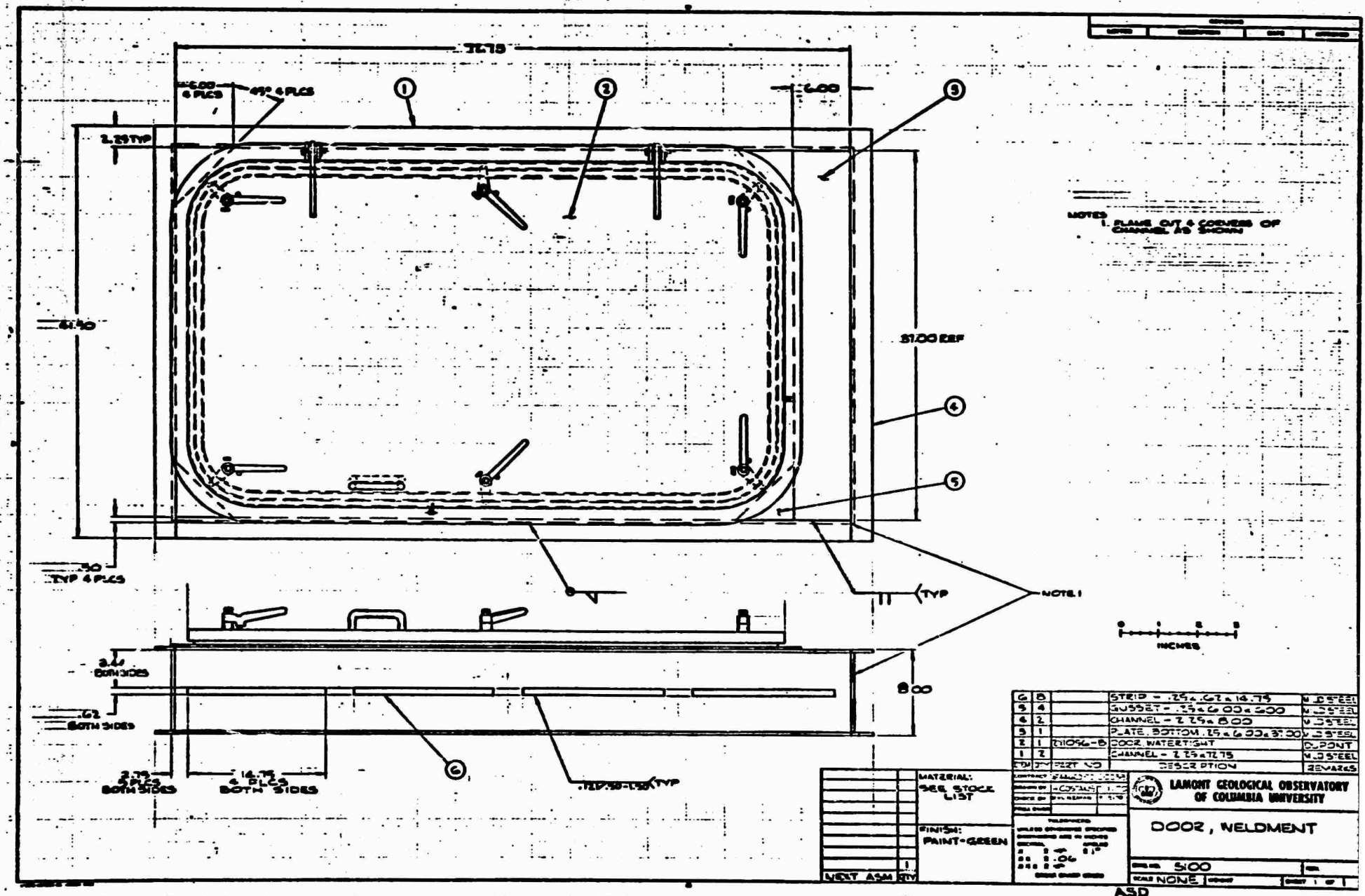
NOTES:
1. STAMP OR STENCIL PART NO. WHERE INDICATED.
2. 125 SURFACE FINISH ALL OVER EXCEPT WHERE NOTED.



INCHES

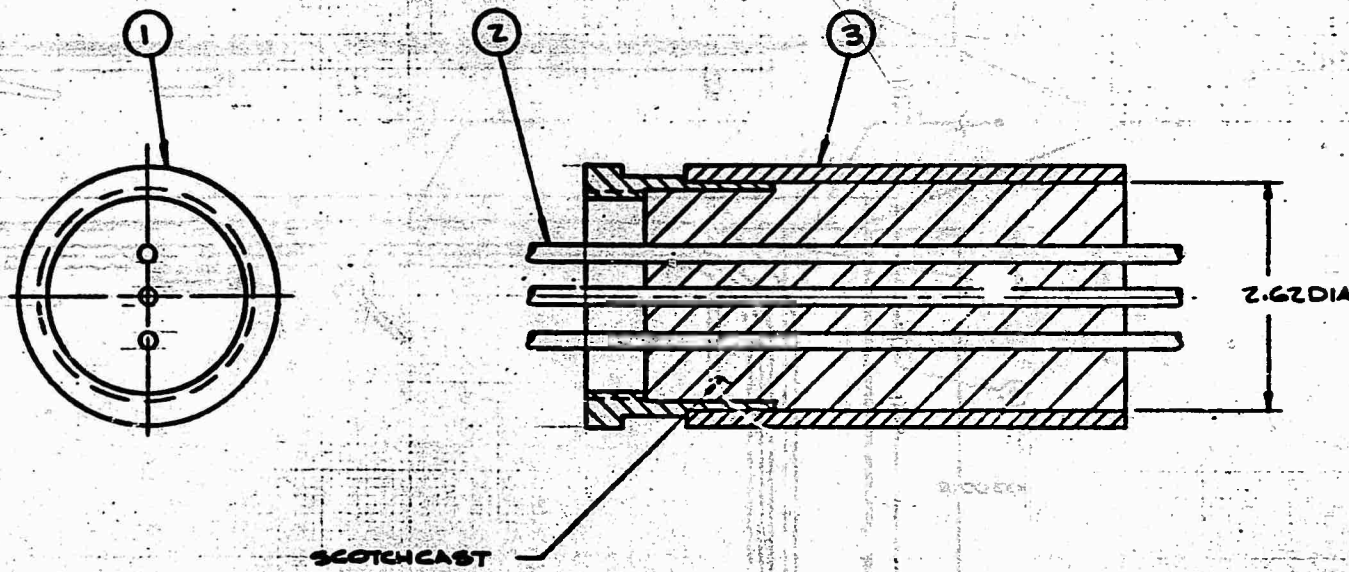
	MATERIAL: BRASS ½ HARD		LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY
	FINISH: CHROMIC ACID DIP.		PLATE, BASE SHORT PERIOD GALVANOMETER
9300	1		4300-9
NEXT ASSY	QTY		SCALE 1/1

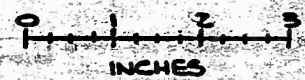
ASD



ITM	QTY	PART NO	DESCRIPTION	REMARKS
6	8		STRIP - .25 x .62 x 14.75	W.D STEEL
5	4		GUSSET - .25 x 6.00 x 6.00	W.D STEEL
4	2		CHANNEL - Z 25 x 8.00	W.D STEEL
3	1		PLATE, BOTTOM .25 x 6.00 x 31.00	W.D STEEL
2	1	7110%-8	DOOR, WATERTIGHT	DUPONT
1	2		CHANNEL - Z 25 x 12.75	W.D STEEL

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED





QTY	PART NO	DESCRIPTION	REMARKS
1		HOSE, RADIATOR 2.62 I.D. x	23" w/ STRIPE
2	5	WIRE, SHIELDED	ALPHA
1	1	ADAPTER MOD.	WHITEHEAD

CONTRACT	SF44620-70-C-0032
DRAWN BY	H. COSTAKIS 7/7/70
CHECK BY	B. KUNZMAN 7/5/70
PROJ. ENGR	

MATERIAL:

FINISH

NEXT ASSY | QTY

TOLERANCES:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
.X ± .1 ± 1°
.XX ± .02
.XXX ± .003
BREAK SHARP EDGES

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

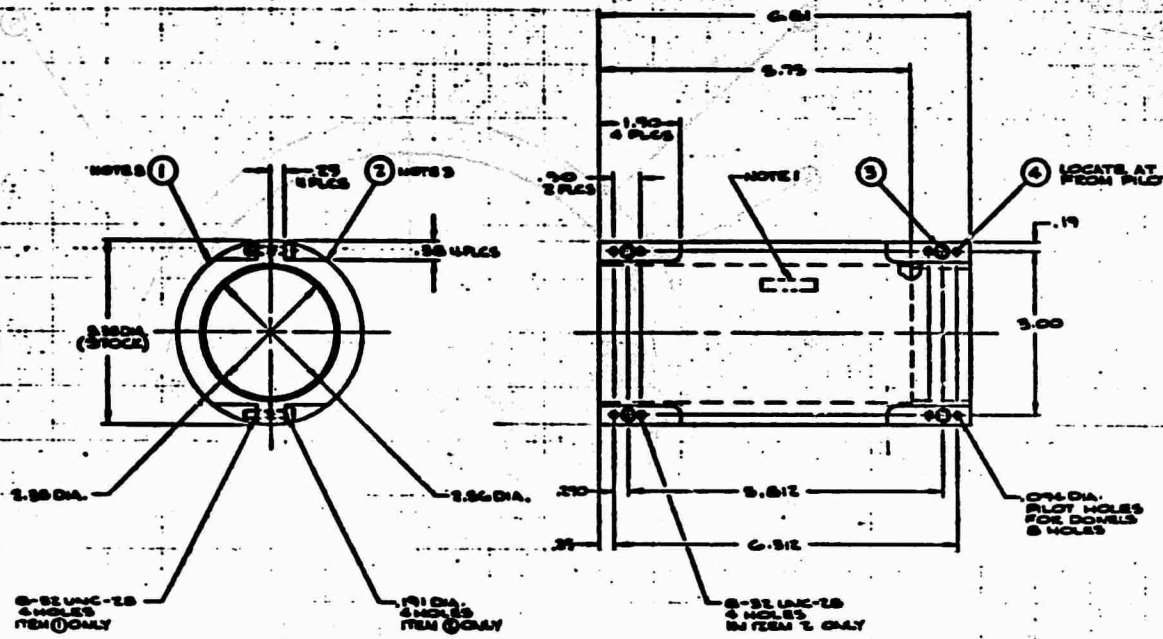
ASSEMBLY, WIRE INSULATOR

DWG. NO. 5102 | REV.

SCALE 1/1 | WEIGHT | SHEET 1 OF 1

ASD

87



NOTES:
1. STAMP OR STENCIL PART NO WHERE INDICATED.
2. 125 SURFACE FINISH ALL OVER EXCEPT WHERE NOTED
3. ITEMS 1 & 2 TO BE INDIVIDUAL PIECES BEFORE ASM

INCHES

ITEM	QTY	PART NO	DESCRIPTION	
4	4		DOWEL, .1562 x .50 LG	
3	6		SOC.SOC HD 8-32 x .75 LG	
2	1		SHELL, TOP 3.350 DIA x 6.81	ALUM.
1	1		SHELL, BOTTOM 3.350 DIA x 6.81	ALUM.

MATERIAL: SEE STOCK LIST

FINISH:

NEXT ASM QTY

LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY

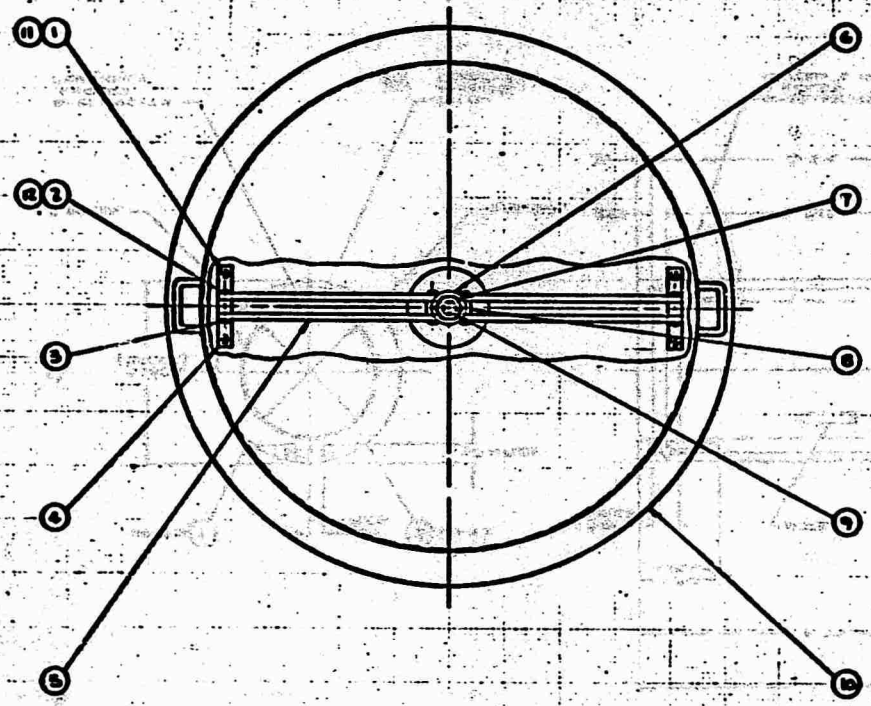
POTTING, FIXTURE

SIZE 5103

SCALE 1/1

ASD

88



ITEM	QTY	PART NO	DESCRIPTION	REMARKS
13	8		WASHER, LOCK .375	STEEL
11	4		WASHER, FLAT .375 I.D.	BRASS
10	1	006-0418	ENCLOSURE, SEISMOMETER	ALCOA N.Y.
9	1	1103-4	ROD, THREADED	
8	2	1103-3	BLOCK, SPACER	
7	1		NUT, HEX 1.00-8	STEEL
6	1		WASHER, FLAT 1.00 I.D.	STEEL
5	2	1103-2	PLATE	
4	2	1103-	SUPPORT	
3	8		NUT, HEX .375-16	STEEL
2	8		SCR. HEX HD .375-16 x 1.50	STEEL
1	4		SCR. HEX HD .375-16 x .50	BRASS

INCHES

MATERIAL:

FINISH:

NEXT ASSY

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

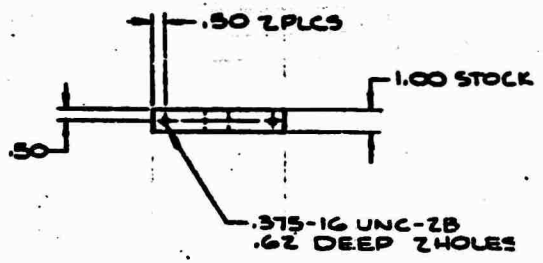
ASSEMBLY,
SEISMOMETER ENCLOSURE
PRESTRESSER

8103

SCALE 1/4

89

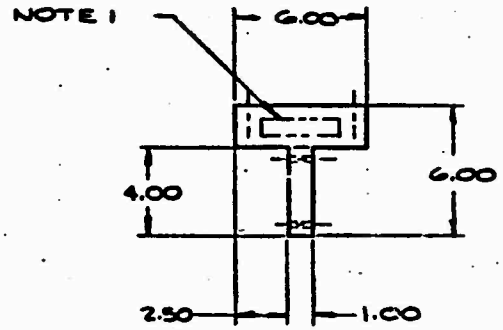
REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED

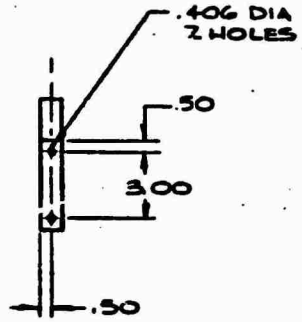


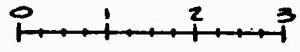
NOTES

1 STAMP OR STENCIL PART NO WHERE INDICATED

2 125/SURFACE FINISH ALL OVER EXCEPT WHERE NOTED







1103	2		
NEXT. ASM	QTY		

MATERIAL: ALUMINUM 2024-T4

FINISH:

CONTRACT	AF44620-70-C-0033	
DRAWN BY	COSTAKIS	7-29-70
CHECK BY	W.K.	9-3-70
PROJ ENGR		

TOLERANCES:
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
X ± .1 ± 1°
XX ± .02
XXX ± .005
BREAK SHARP EDGES

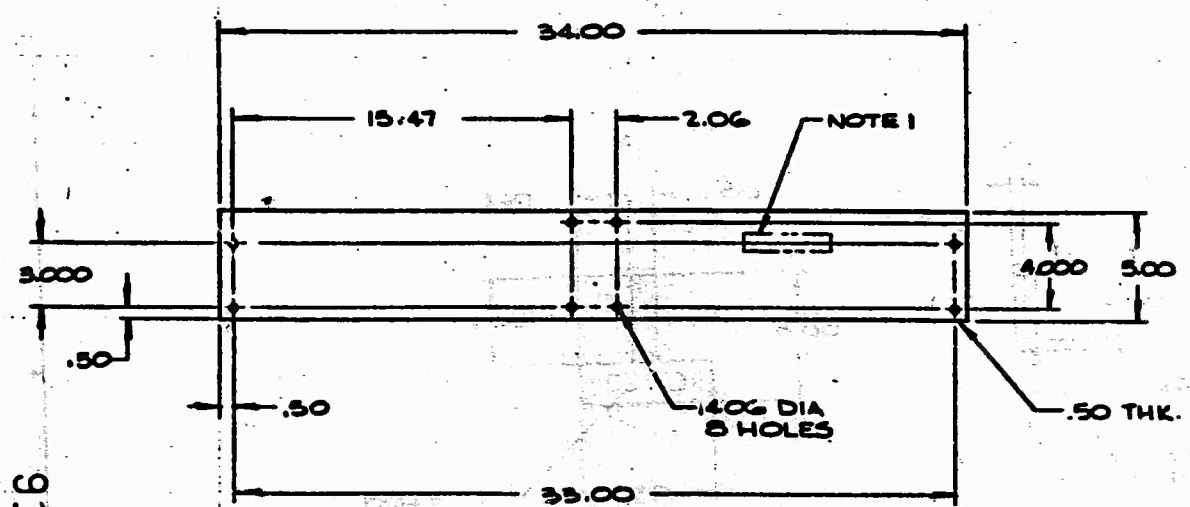
LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY

SUPPORT SEISMOMETER ENCLOSURE PRESTRESSER

DWG. NO.	8103-1	REV.	
SCALE	1/4	WEIGHT	SHEET 1 OF 1

06

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



NOTES

1 STAMP OR STENCIL PART NO WHERE INDICATED

2 125/ SURFACE FINISH ALL OVER EXCEPT WHERE NOTED

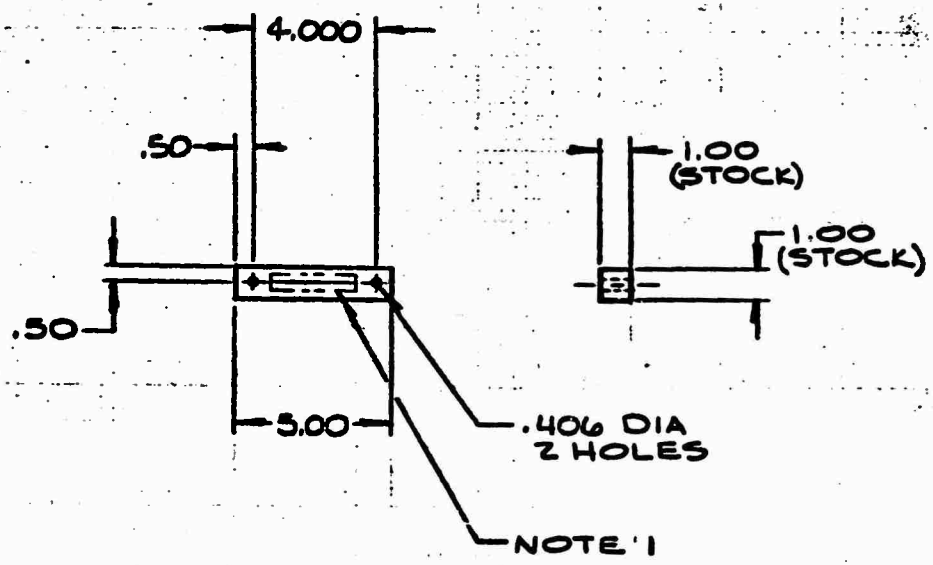
		MATERIAL MILD STEEL	CONTRACT	AF44(20-70-C-0038	
			DRAWN BY	COSTAKIS	7-23-70
			CHECK. BY	W.K.	8-3-70
			PROJ. ENGR		
		FINISH	TOLERANCES: UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMALS ANGLES .X ± .1 ± 1° .XX ± .02 .XXX ± .005 BREAK SHARP EDGES		
1103	2				
NEXT ASM	QTY				

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

PLATE-
SEISMOMETER ENCLOSURE
PRESTRESSER

DWG. NO. 8103-2	REV.
SCALE 1/4	WEIGHT
SHEET 1 OF 1	

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



NOTES

1. STAMP OR STENCIL PART NO WHERE INDICATED
2. 125 √ SURFACE FINISH ALL OVER EXCEPT WHERE NOTED

0 1 2
INCHES

92

		MATERIAL: ALUMINUM 2024-T4	CONTRACT	AF44620-70-C-0028
			DRAWN BY	COSTAKIS 7-29-70
			CHECK. BY	W.K. 8-3-70
			PROJ. ENGR	
		FINISH	TOLERANCES: UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. DECIMAL: X ± .1, XX ± .02, XXX ± .005. ANGLES ± 1°. BREAK SHARP EDGES	
1103	2			
NEXT ASM	QTY			

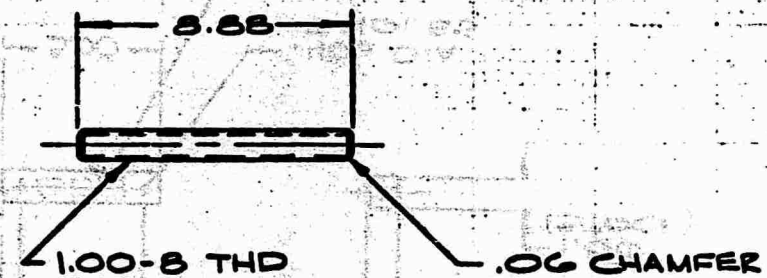
LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY

BLOCK, SPACER
SEISMOMETER ENCLOSURE
PRESTRESSER

DWG. NO. 8103-3 REV.

SCALE 1/4 WEIGHT SHEET 1 OF 1

REVISIONS			
LETTER	DESCRIPTION	DATE	APPROVED



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		MATERIAL: MAKE FROM 1.00-8 THD ROD-STEEL	CONTRACT	AF-AFOSR-70-C-0038	
			DRAWN BY	COSTALOS	7-29-70
			CHECK. BY	W.K.	8-3-70
			PROJ. ENGR.		
		FINISH:	TOLERANCES: UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. DECIMAL X ±.1 ANGLES ±1° XX ±.02 XXX ±.005 BREAK SHARP EDGES		
1103	1				
NEXT ASM	QTY				

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

ROD, THREADED — SEISMOMETER ENCLOSURE PRESTRESSOR

DWG. NO. 8103-4 REV.

SCALE 1/4 WEIGHT SHEET 1 OF 1