[redacted]

RS 7267/14 1630
March 24, 1966
T-11634

UNCLASSIFIED

DATA REDUCTION REPORT

THUNDERTUBE TEST NO. 232 T-11634

TEST DATE: 10 MARCH, 1966

TEST TIME: 14:00 MST

TEST SITE: CTF AREA Y

CODED

RECEIVED
JUL 19 1967
CENTRAL TECH FIL

Prepared by S. Alexander 7267

Approved by Thomas R. Stevenson 7343

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4/7A - J. T. Risse, 1542
Attn: W. A. Sebrell
5/7A - P. F. Jones, 5622
Attn: H. A. Mullin
6/7A - Elmer White, 7331
Attn: R. E. Howell
7/7A - F. H. Mathews, 7343
Attn: L. E. Jones

CENTRAL TECHNICAL FILE	
ACCOUNTABILITY CARD	
FILE NO. T-	3
	alpha

10/20/98
Wlayne
10/22/98
RB Craner
OK for Opemet

TCG-NNT-1

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Carmela Gallegos 10/27/98	RECORD ID: 99SN0167
PERSON CHANGING MARKING & DATE	
WC Layne 10/28/98	DATED: 10/22/98
PERSON VERIFYING MARKING & DATE	

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THIS DOCUMENT CONSISTS OF 41 PAGE(

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RS 7267/14
March 24, 1966

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March 24, 1966

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THUNDERWELL HALF-SCALE TEST

Introduction

This test was conducted to determine the response of the half-scale vehicle and the pressure distribution over the vehicle, when subjected to an explosive environment. The test facilities in CTF, Area Y, were utilized in acquiring the information contained herein.

This test was received on 9 February, 1966, from H. A. Mullin, 5622. T. R. Stevenson, 7343, was the Test Project Engineer. The vehicle and associated hardware were received on 11 February, 1966, and the test completed on 10 March, 1966.

Summary

The test vehicle, field installation and general procedures consisted of the following.

FACILITIES:

The shock tube was constructed of standard 6'x6'x3/4" plywood, 108' long. The interior corners were modified to give the octagonal shape of the interior. See page number 4. Windows were installed in the shock tube to enable camera coverage of the initial shock planarity at the H.E., half way down the tube, and as it progressed over the vehicle.

The test vehicle was installed at 96'1" from the face of the high explosive. A 20° angle of attack was acquired by placing an inclinometer on the top surface of the 11°46'42" vehicle shape, calibrated on 8°13'18". This position was maintained by two 1/8" support cables located 17 1/4" and 25 1/4" respectively from the nose of the vehicle. The center of the vehicle mass was located 36" from the floor and wall of the shock tube. The support cables were attached through the plexiglass upper window to 6"x6" cross support timbers. See page number 9.

The instrumentation cabling from the unit was protected by a 1/8" thick, 2 1/2" OD aluminum tubing, 36' long. Coupling from the unit to the stinger was accomplished by a 12" long, 2 1/2" ID, 3" OD steel reinforced high pressure suction hose. Additional protection against electro-magnetic interference was made by the application of .003" foil coated zipper tubing, grounded to common ground. This extended over the remaining exposed cabling to the subterranean junction box. See page number 8.

Along the inside wall of the shock tube, piezo-electric shock arrival crystals were installed. The first crystal was located 3/4" from the face of the H.E. The remaining crystals were located at 2' intervals from the first, for a total of 54 crystals. The 49th crystal was even with the nose of the vehicle. See page number 4.

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Located 6" from the top of the shock tube and even with the nose of the vehicle was suspended a pressure transducer mount. This consisted of a 10 lb. 2" diameter x 12" long brass transducer holder with a 6' stinger to read static and reflected pressure. See page number 6.

Two wedge mounts, of the 10° and 20° shape, were located on the floor of the shock tube. Each wedge face and top was instrumented with pressure transducers. A tail extension was attached to each wedge employing one additional static pressure transducer. See page number 9.

VEHICLE INSTRUMENTATION: See page number 5 & 12.

Type	Total Gages
1. Pressure vs. Time	37
2. Velocity vs. Time	2 (True Horiz. & Vert.)
3. Acceleration vs. Time	4
4. Strain vs. Time	2
5. Strain Aft. Cover Bolts	3
6. Temperature	8

NOTE: The bolts on the aft. cover were pre-loaded with 200 ft./lbs. torque. Each bolt has a small variation in lb./load as shown.

Bolt #	Load Pounds
21	26000.
19	28750.
16	21750.

VEHICLE MOMENT OF INERTIA DATA:

1. Weight: 686 lbs.

2. Center of Gravity: 32.75" from Nose Point.

3. Slug Ft^2 = 17.9.

4. Yaw "MI" unobtainablee, reference to T-11250 as: 82,900.00 Lbs. in^2 at C.G. (T-11634 weighs 5 lbs. more than T-11250).

[redacted]

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HIGH EXPLOSIVE:

The H.E. charge consisted of integrated type 68.7" x 68.7" x 8", 1862 lb. cyclotol charge. The installation required shaping the charge to conform with the octagonal interior of the shock tube. Inert material was used to fill the modified corners. The thickness of the charge was maintained to ±.005".

Forty-eight SE-1 detonators were installed in 1/2" diameter x 1/2" long tetryl pellet firing points located on a 9.5" triangular pattern. The energy to excite the detonators was emitted from a modified MC-134A - "X" unit. See page number 7.

NOTE: Surface deformatives may be observed by reference to page number 11.

Test Results

The test vehicle was blown 250 feet from its original position in a line parallel to the axis of the shock tube. A photo of the impact point, (see page number 10), and a view of the explosive test area may be seen in the background. Complete instrumentation coverage was obtained and the results are presented in the form of graphs and annotated oscillographs.

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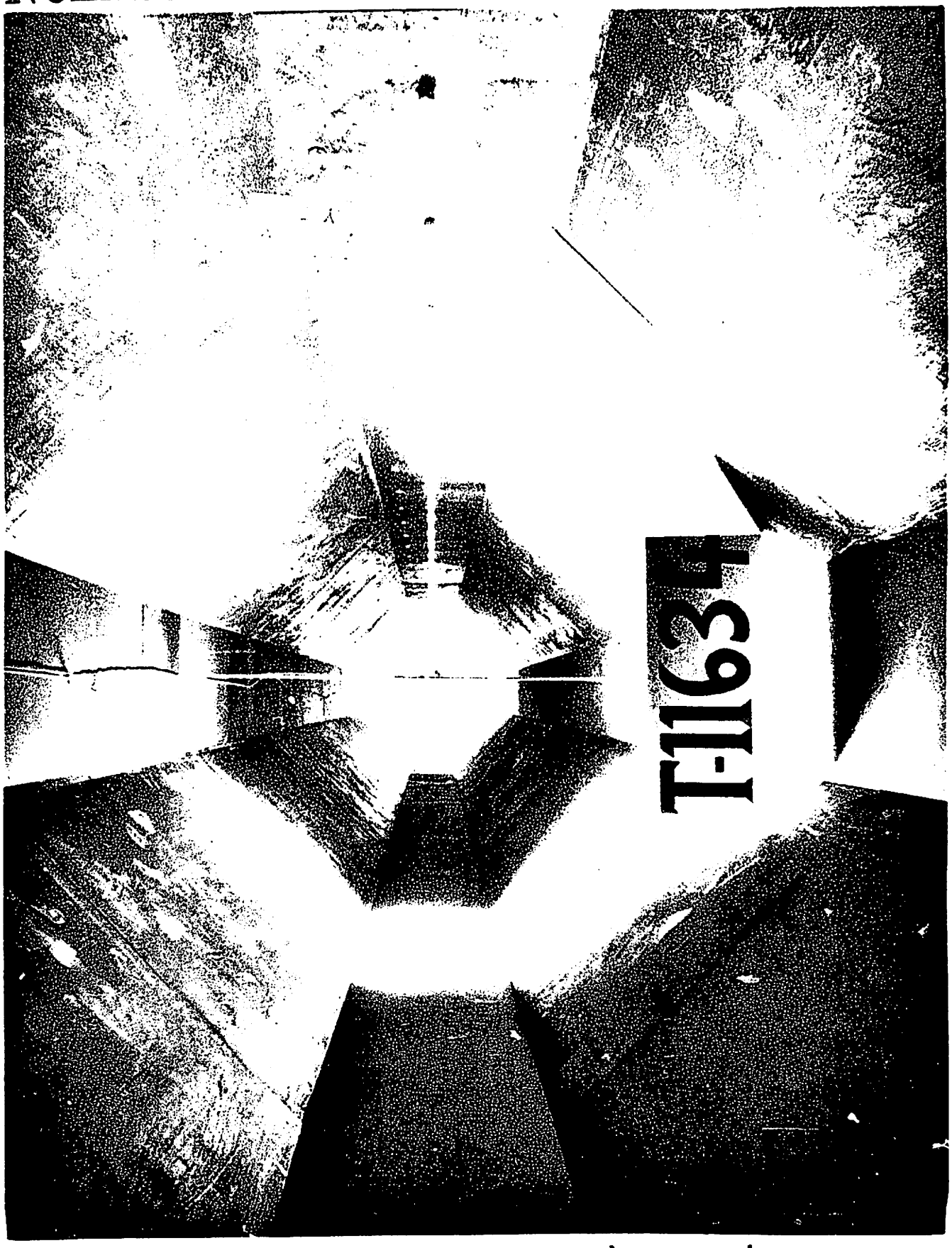

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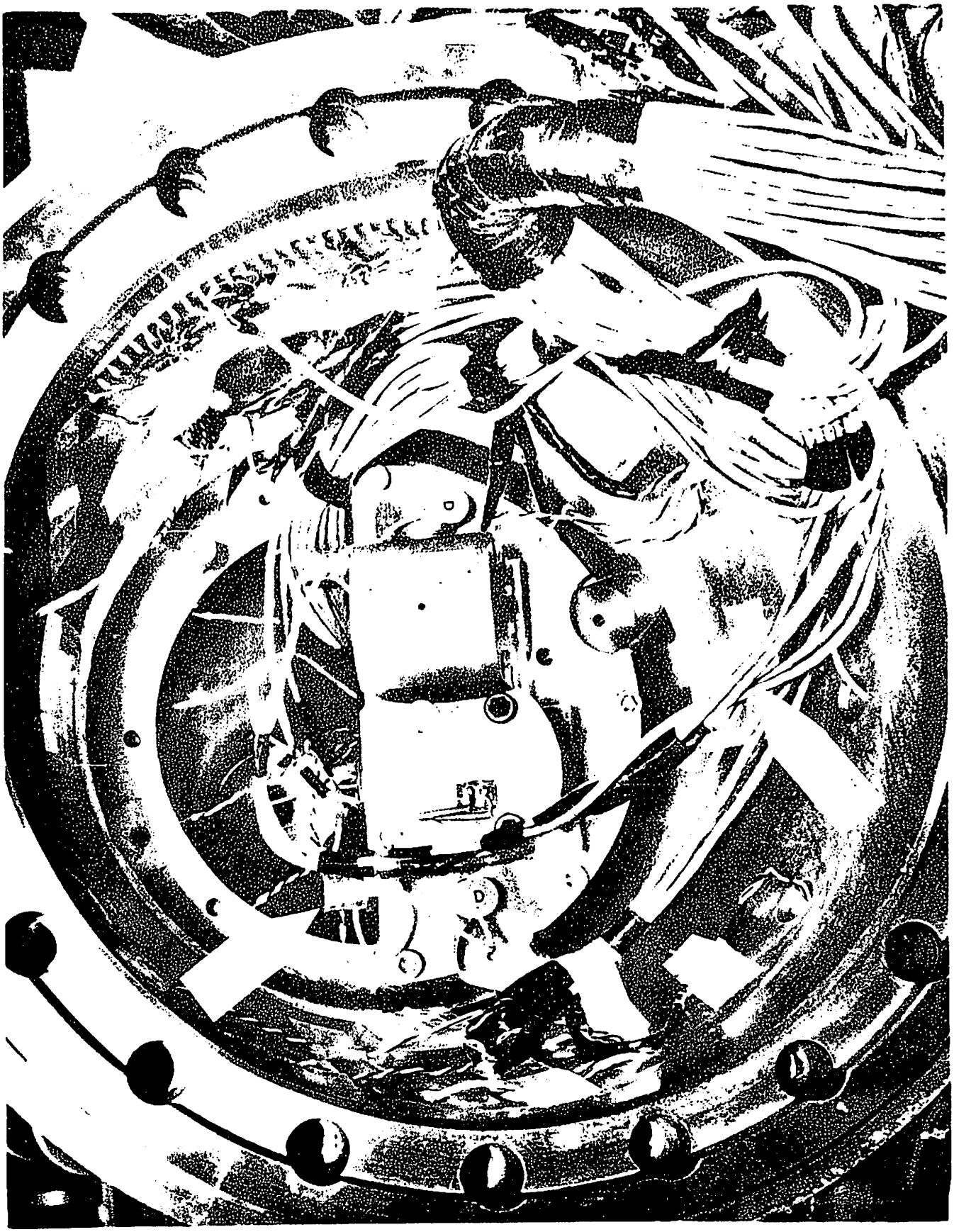

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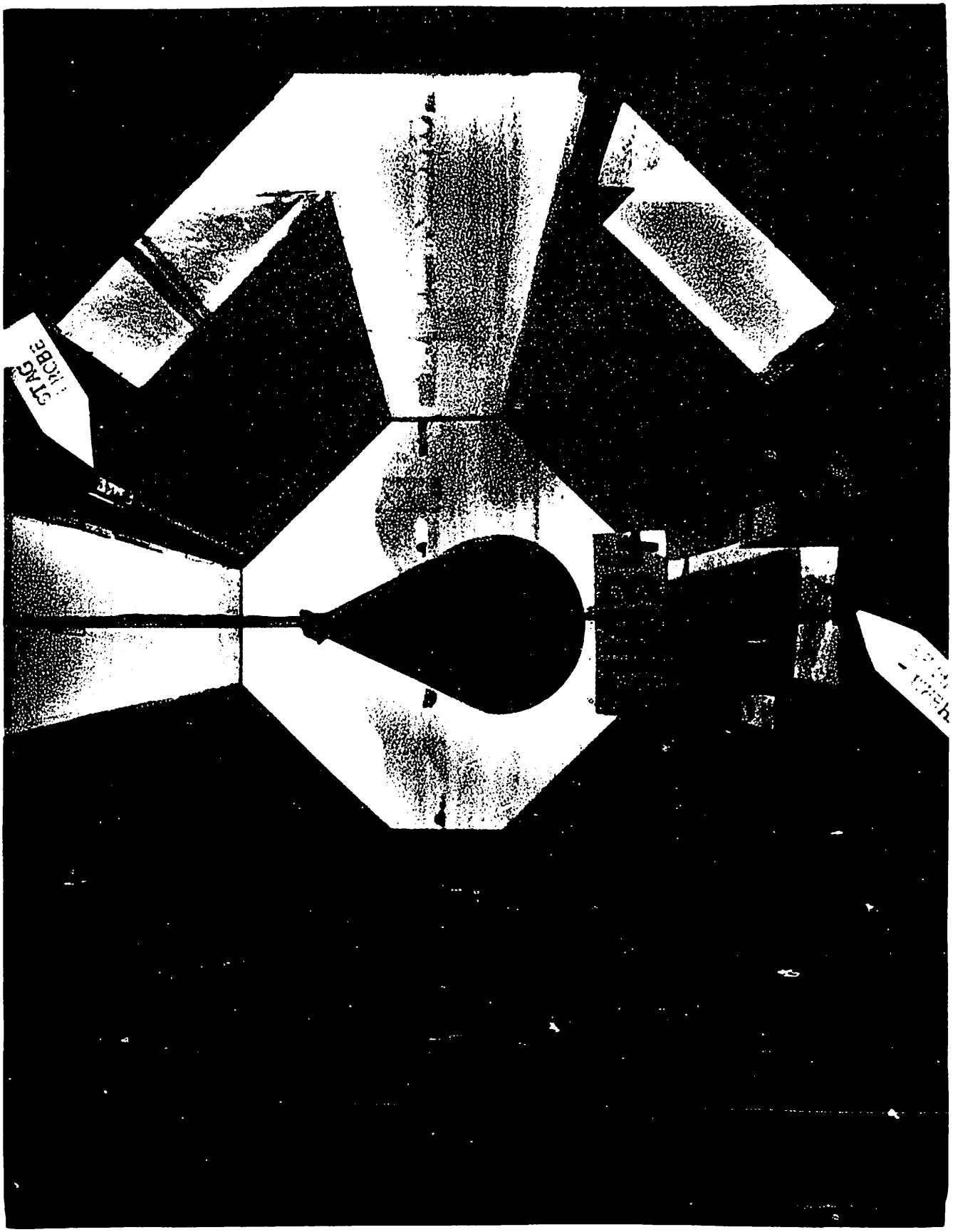
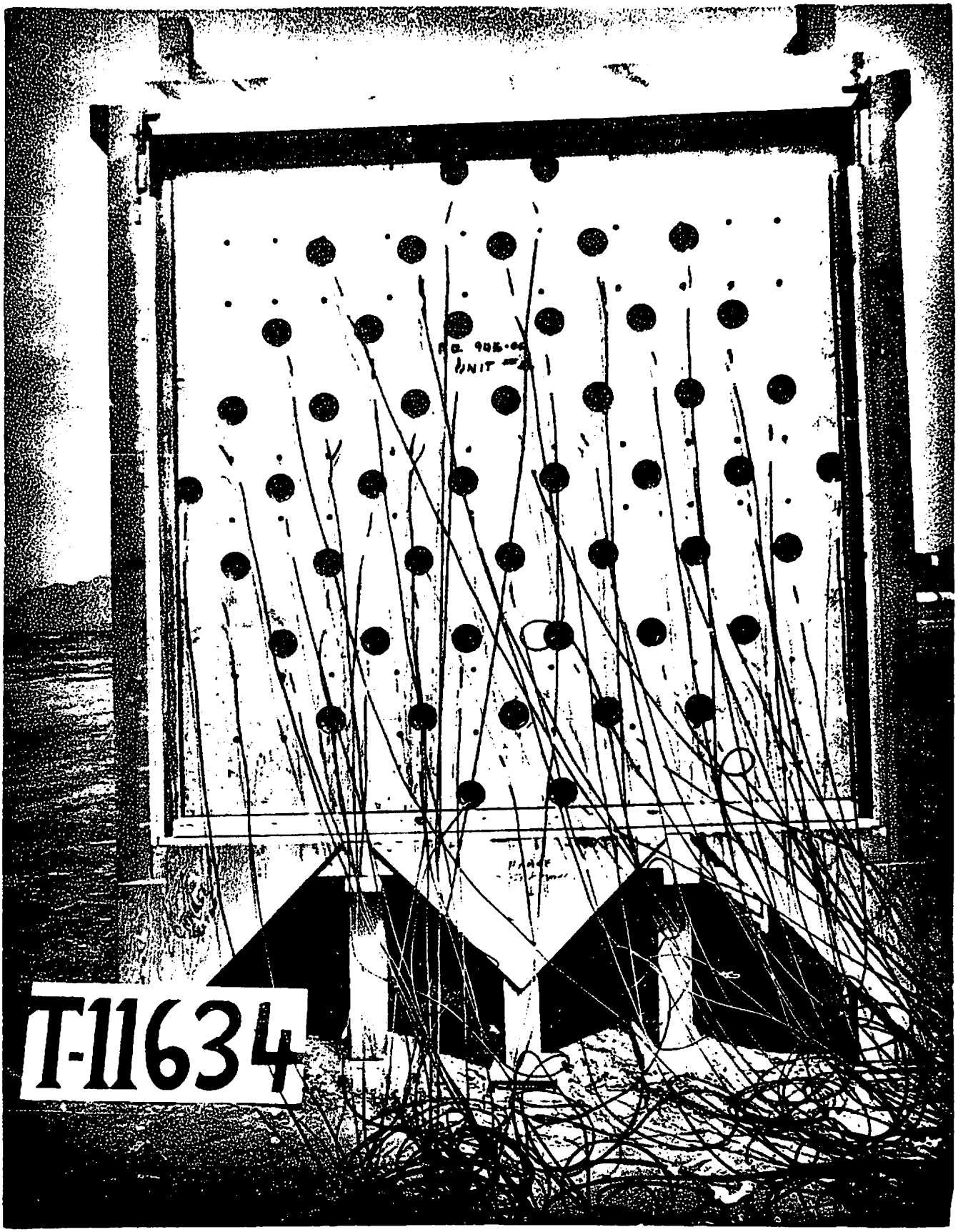
7267/ #1637
March 24, 1966




T-11634

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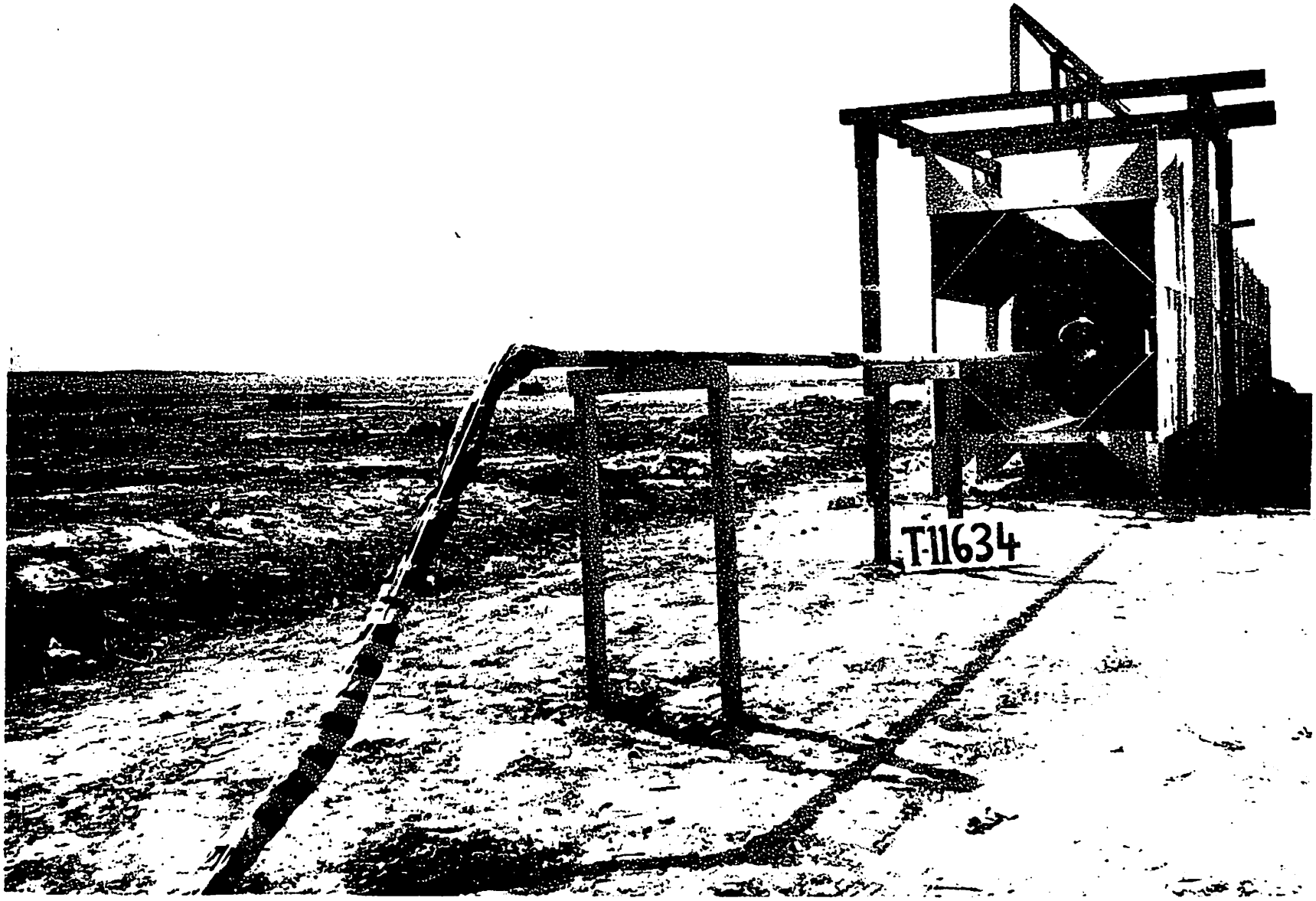

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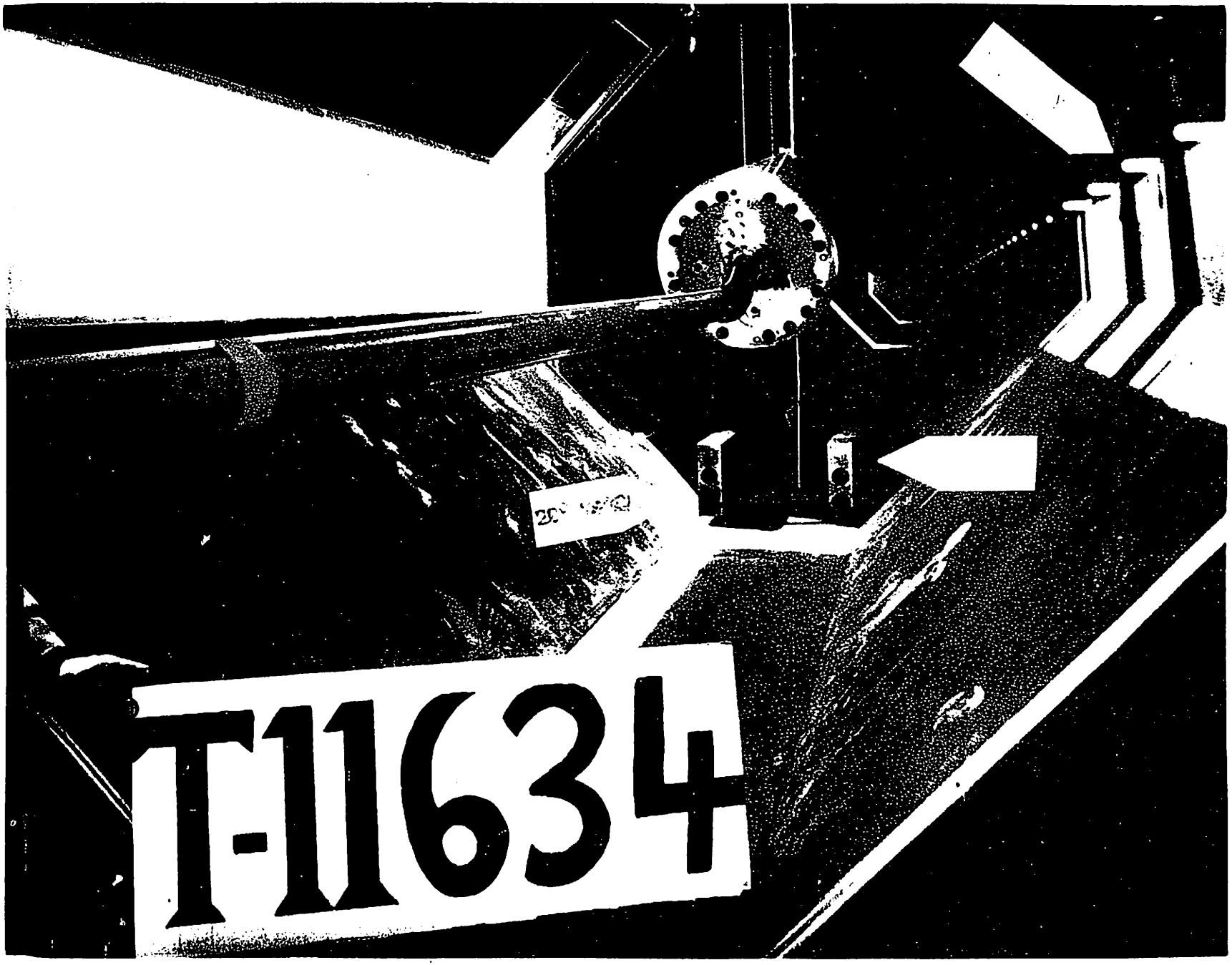
D#66-2577

#1639

UNCLASSIFIED



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9

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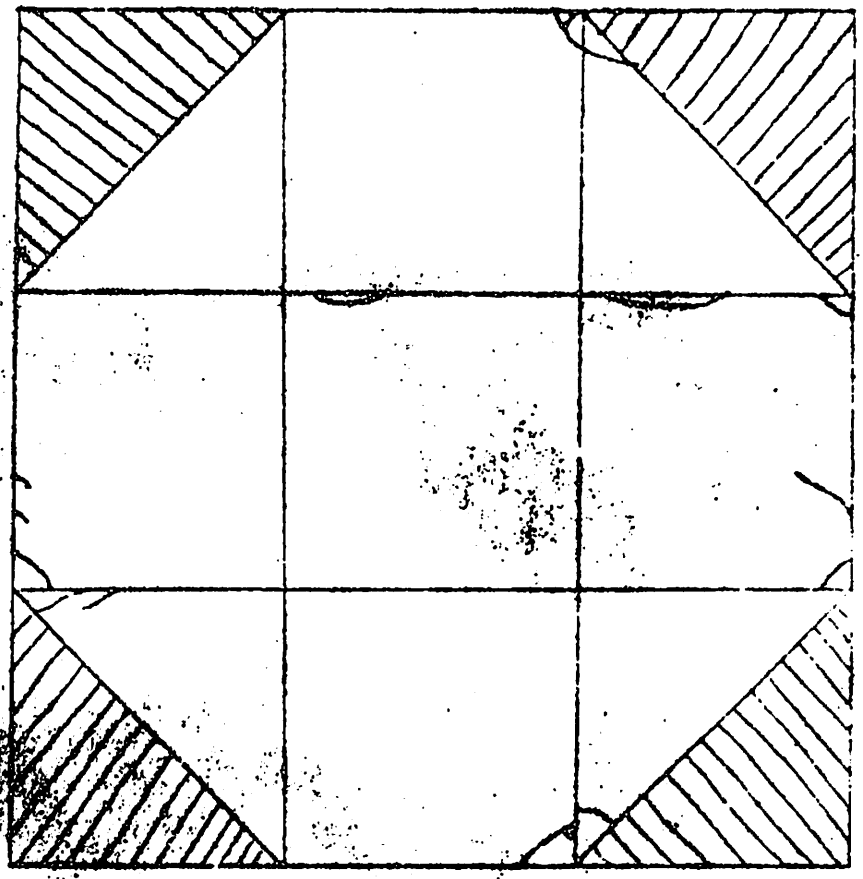
THUNDERTUBE TEST NO. 232 T-11634

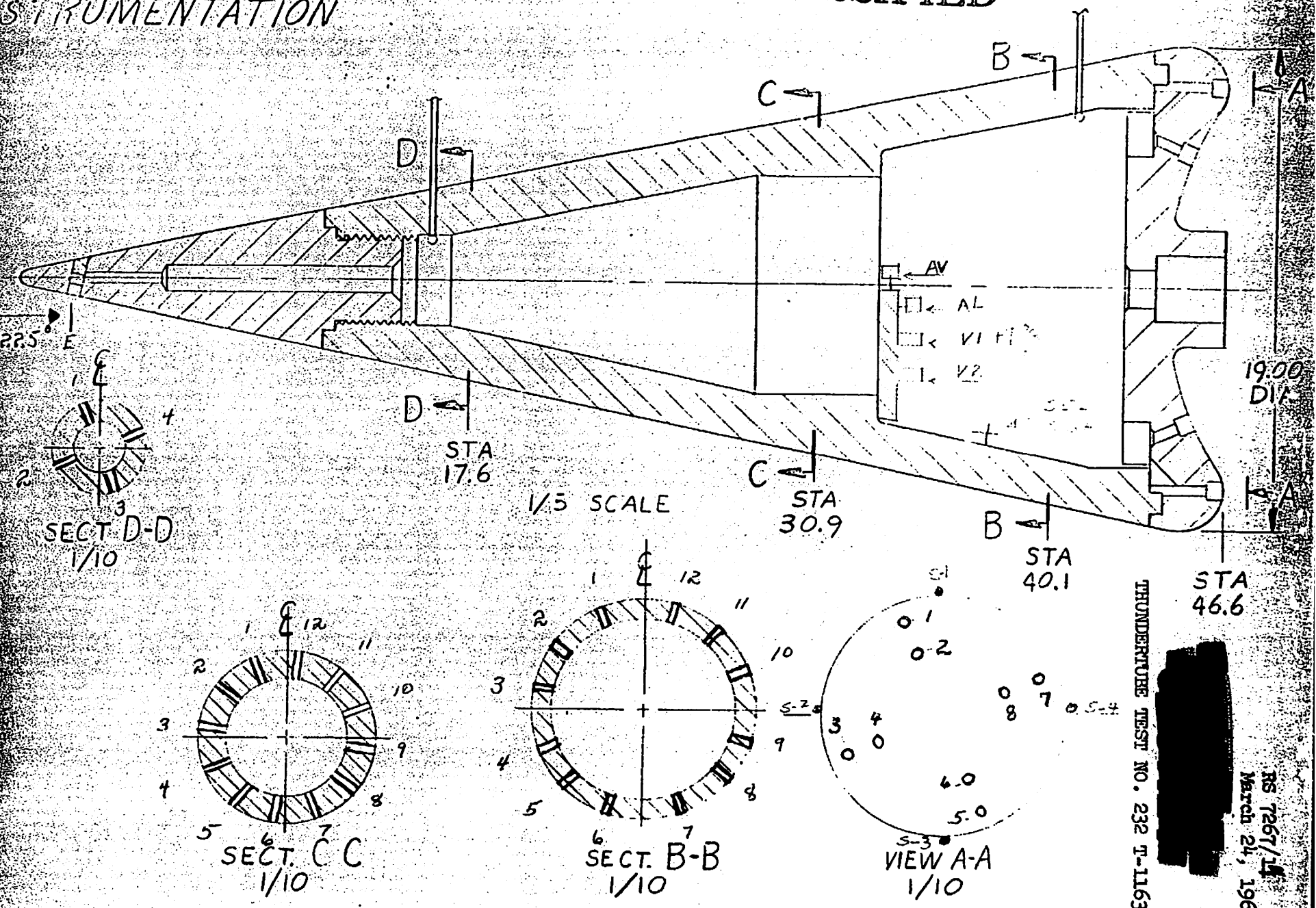


NOTE: Black - when set-up
Red - when fired

Open crack
Closed crack

HALF SCALE THV
INSTRUMENTATION

TEST NO. UNCLASSIFIED



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THUNDERTUBE TEST NO. 232 T-11634

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RS 7267/14
March 24, 1966

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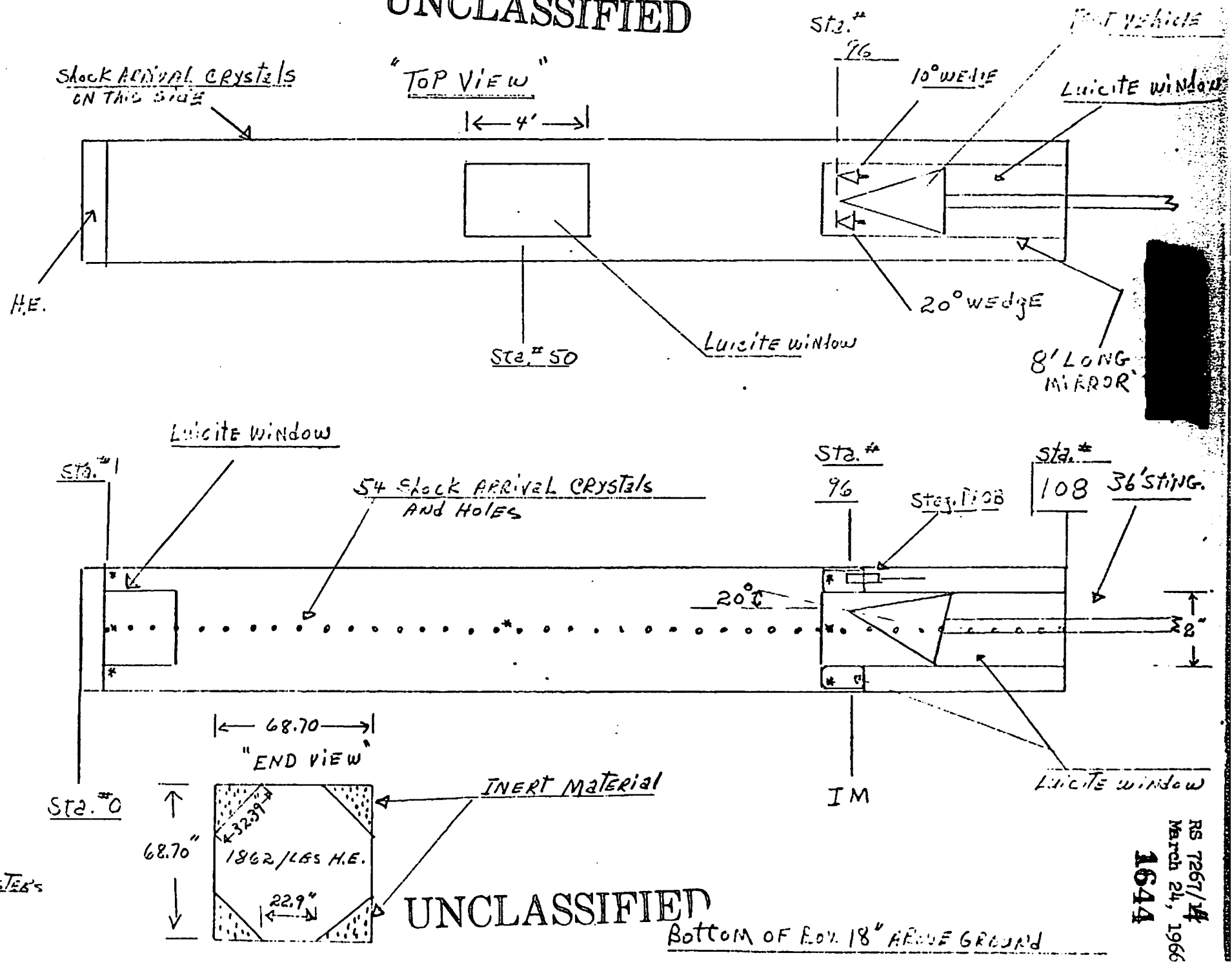
12


"TOP VIEW"
Shock Arrival Crystals ON THIS SIDE
4'
Sta. # 96
10° WEDGE
Test vehicle
Lucite window
H.E.
Sta. # 50
Lucite window
20° wedge
8' LONG MIRROR
Lucite window
Sta. # 1
54 Shock Arrival Crystals And Holes
Sta. # 96
Sta. Pt 108
Sta. # 108
36' STING.
20°
8"
IDE VIEW
68.70
"END VIEW"
Sta. # 0
68.70"
32.39"
1862 LBS H.E.
22.9"
INERT Material
IM
Lucite window
Bottom of Box 18" ABOVE GROUND
*=THERMISTER'S

TAPE CHANNEL NUMBER	GAGE LOCATION NUMBER	GAGE TYPE AND S N	GAGE CALIB.	CHANNEL TYPE	CHANNEL NOISE	GAGE DAMAGE	Oscil. #	C[illegible]
3-1	PA-1	BYTREX - 7595	557	216 KC	Above Norm	None	22	
3-2	PA-2	" 8044	500	"	Normal	"	22	
3-3	PA-3	" 8047	554	"	Normal	"	22	
3-4	PA-4	" 7200	545	"	Normal	"	22	
3-5	PA-5	" 8397	536	"	Above Norm	"	23	
3-6	PA-6	" 7443	529	"	Normal	"	23	
3-7	PA-7	" 7410	546	"	Normal	"	23	
3-8	PA-8	" 7427	531	"	Normal	"	23	
3-9	PB-1	" 8347	5316	"	Above Norm	"	24	
3-10	PB-2	" 8343	5375	"	Above Norm	"	24	
3-11	PB-3	" 8336	5567	"	Normal	"	24	
3-12	PB-4	" 8348	5794	"	Normal	"	24	
4-1	PB-5	" 5984	5346	"	Normal	"	25	
4-2	PB-6	" 8341	5402	"	Normal	"	25	
4-3	PB-7	" 8332	5289	"	Above Norm	"	25	
4-4	PB-8	" 8358	5295	"	Normal	"	25	
4-5	PB-9	" 8352	5378	"	Normal	"	26	
4-6	PB-10	" 8337	5325	"	Above Norm	"	26	
4-7	PB-11	" 5992	5589	"	Above Norm	"	26	
4-8	PB-12	" 8356	5253	"	Above Norm	"	26	
8-5	V-1	3K - AH	94.35F/S	70 KC	Normal	"	39	Calib. Temp° = 76°F (calib. [illegible] .285)
8-6	V-2	3K - AV	93.38F/S	70 KC	Normal	"	39	Calib. Temp° = 78°F (calib. [illegible] 1.02)
4-11	PC-1	BYTREX - 8334	5353		Above Norm	"	27	
4-12	PC-2	" 3344	5326		Normal	"	27	
5-1	PC-3	" 8354	5330		Above Norm	"	28	
5-2	PC-4	" 8345	5301		Above Norm	"	28	

[redacted]

[redacted]

TAPE CHANNEL NUMBER	GAGE LOCATION NUMBER	GAGE TYPE AND S N	GAGE CALIB.	CHANNEL TYPE	CHANNEL NOISE	GAGE DAMAGE	oscil. #	COMMENTS
5-3	PC-5	BYTREX 8331	5277	216 KC	Normal	None	28	
5-4	PC-6	" 8349	5324	"	Normal	"	28	
5-5	PC-7	" 8350	5298	"	Normal	"	29	
5-6	PC-8	" 8333	5314	"	Normal	"	29	
5-7	PC-9	" 8353	5379	"	Normal	"	29	
5-8	PC-10	" 5983	5265	"	Normal	"	29	
5-9	PC-11	" 8338	5334	"	noise Spikes	"	30	Crystal Interference
5-10	PC-12	" 6000	5287	"	" " "	"	30	" "
5-11	PD-1	" 5985	5431	"	Poor	Ablative Gone	30	
5-12	PD-2	" 8355	5270	"	Poor	None	30	
6-1	PD-3	" 8340	5405	"	Poor	"	31	
6-2	PD-4	" 5998	5520	"	Excessive	"	31	Data not usable (noise)
6-3	PE-225°	" 8342	5374	"	Normal	"	31	Vehicle Nose Tip
6-4	AV-1	BYTREX "D" 7714	10,944 "G"	"	Normal	"	32	
6-5	AL-1	" " 7716	10,688 "G"	"	Normal	"	32	
6-6	AV-2	" " 7717	10,309 "G"	"	Normal	"	32	
6-7	AL-2	" " 7718	10,600 "G"	"	Normal	"	32	
6-9	S^2-90°	Bolt #16	57207	"	Above Norm	"	34	Strainsert Bolt (cover)
6-10	S^3-180°	Bolt #19	57468	"	Above Norm	"	34	Strainsert Bolt (cover)
6-11	S^4-270°	Bolt #21	57692	"	Excessive	"	34	Strainsert Bolt (cover)
6-8			200°F	70 KC	Normal	"	33	Box and Vehicle Temp°F
7-1	S^5L-180°	DB-112	724 U/S	216 KC	Normal	"	35	Toward Blast
7-2	S^6H-180°	DB-112	750 U/S	"	Normal	"	35	Toward Blast

[redacted]

[redacted]

TAPE CHANNEL NUMBER	GAGE LOCATION NUMBER	GAGE TYPE AND S/N	GAGE CALIB.	CHANNEL TYPE	CHANNEL NOISE	GAGE DAMAGE	Oscil. #	COMMENTS
7-3	$P^{1}10°$-LR	BYTREX 4886	5274	216 KC	Noise Spikes		35	Crystal pulses
7-4	$P^{2}10°$-UR	" 6263	5237	"	Above Norm		35	
7-5	$P^{3}10°$-TF	" 4897	4889	"	Above Norm		36	Electronics Oscillation
7-6	$P^{4}10°$-UL	" 4887	5106	"	Noise Spikes		36	Electronics Oscillation
7-7	$P^{5}10°$-LL	" 4893	5019	"	Noise Spikes		36	Electronics Oscillation
7-8	$P^{6}10°$-BT	" 4890	5120	"	Normal		36	
7-9	$P^{7}20°$-LR	" 1	5043	"	Normal		37	
7-10	$P^{8}20°$-UR	" 4891	5039	"	Normal		37	
7-11	$P^{9}20°$-TF	" 5262	5025	"	Noise Spikes		37	Crystal pulses
7-12	$P^{10}20°$-UL	" 4877	5021	"	" "		37	" "
8-1	$P^{11}20°$-LL	" 4901	5205	"	Normal		38	
8-2	$P^{12}20°$-BT	" 4898	5143	"	Normal		38	
1-1	Group 1-28	Velocity Xtals		Direct				
1-3	Group 29-54	" "		Direct				
1-8	1 thru 54	" "		Direct				"OR" Gate
1-11	Stag Probe	Endevco 617A	40,500 P/P	900 KC			21	
Key:	lower.right upper.front top.left back.top							CH. #13 - Zero Fidu CH. #14 - Irig A 200 KC Irig B 40 KC 25 KC Voice 100 KC

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RB 7267/14
March 24, 1966
16647

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RS 7267/14
March 24, 1966

UNCLASSIFIED

THUNDERTUBE TEST NO. T-11634

TEST DATE: 10 MARCH, 1966

TEST SITE: CTF AREA Y

METRO INFORMATION

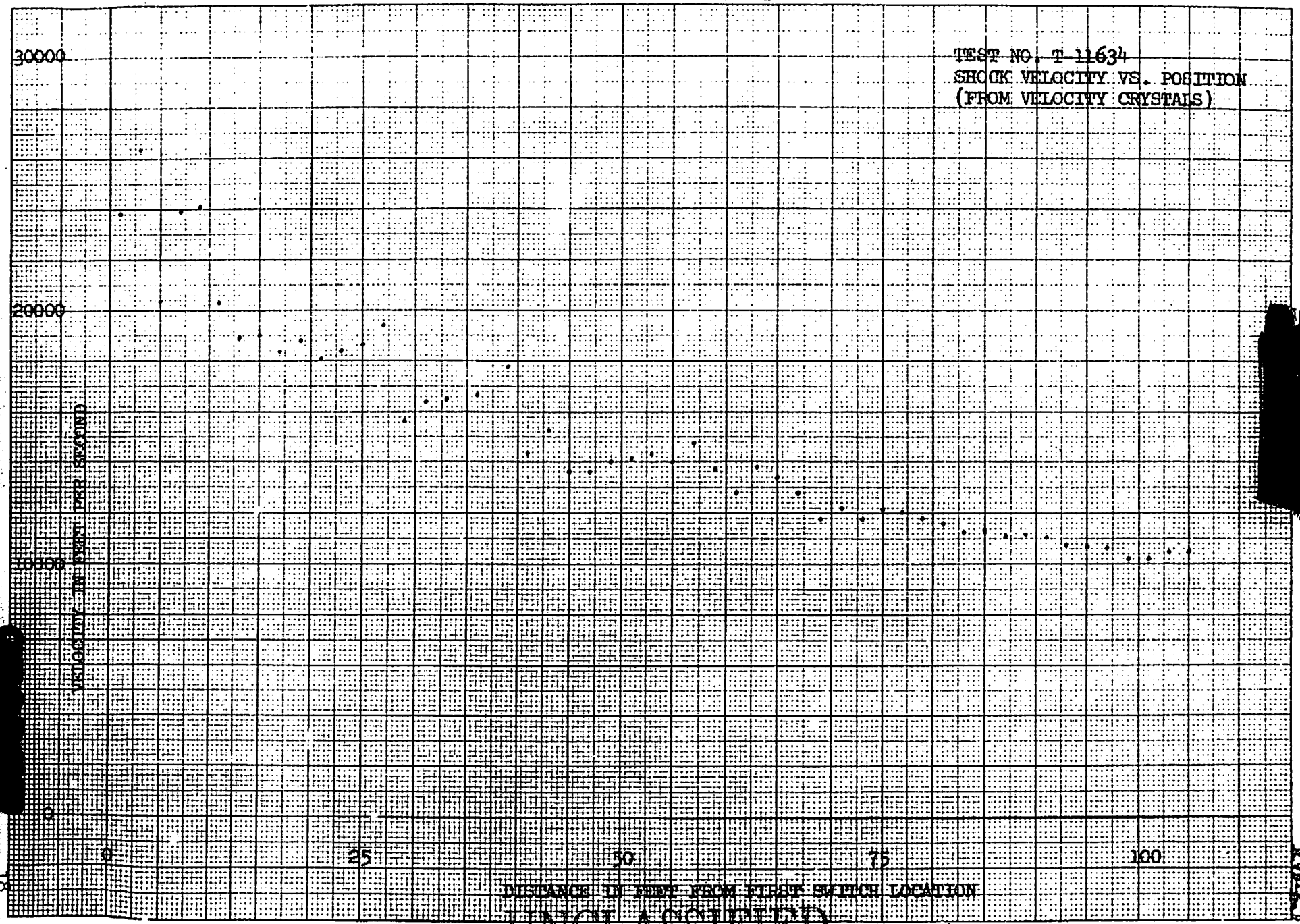
PRESSURE: 831.5 mb

TEMPERATURE: 16°C

[redacted]

10 X 10 TO THE CENTIMETER 46 1513
KEUFFEL & ESSER CO.

UNCLASSIFIED



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RS 7267/14
March 24, 1966

1649

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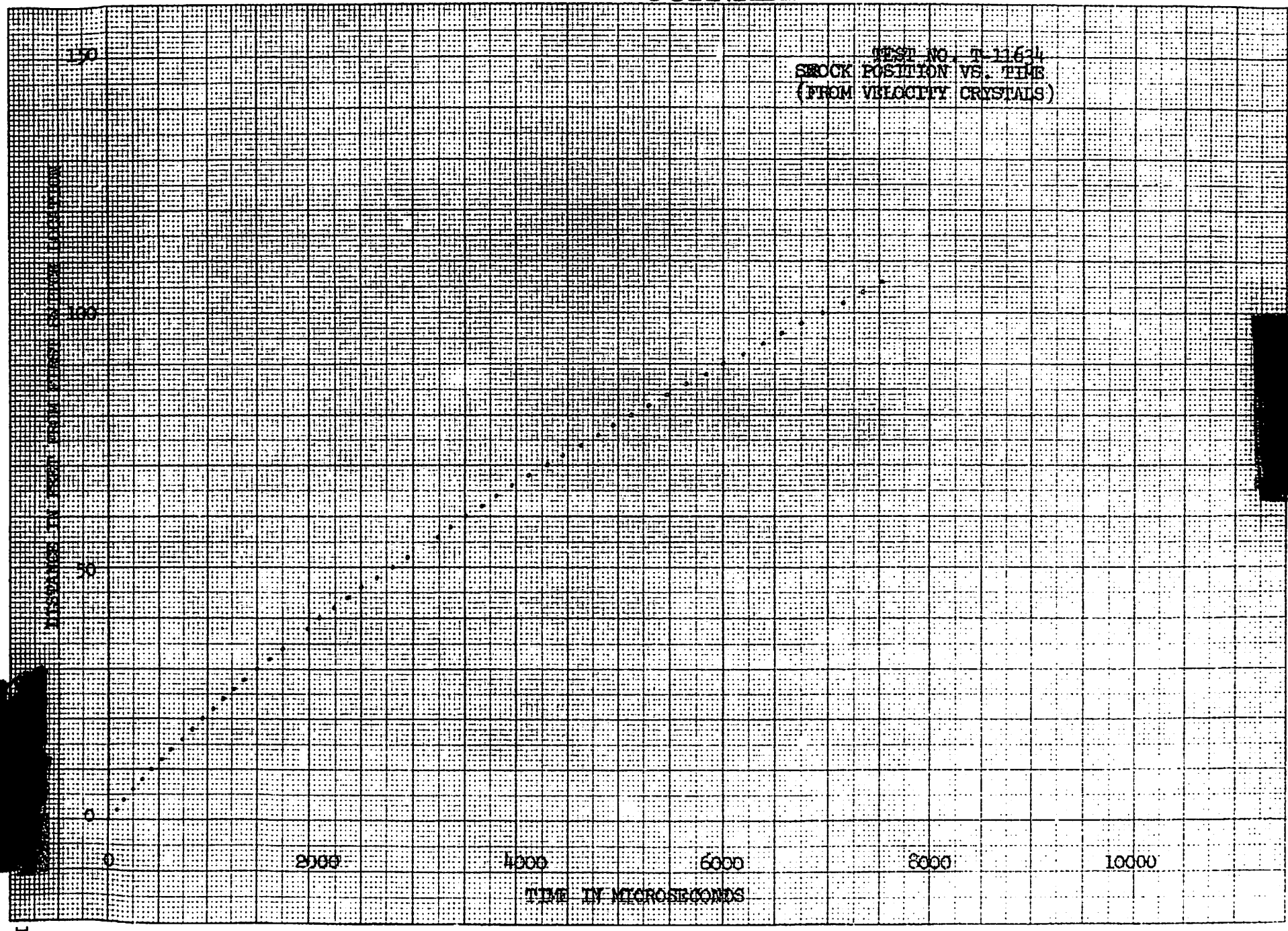
K+E 10 X 10 TO THE CENTIMETER 46 1513
18 X 25 CM MADE IN U.S.A.
KEUFFEL & ESSER CO.



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RE 7267/HH
March 24, 1966
16550

THUNDERTUBE TEST NO. T-11634

TEST DATE: 10 MARCH, 1966

TEST SITE: CTF AREA Y

LISTING OF SHOCK POSITION VS. TIME

(FROM VELOCITY CRYSTALS)

SHOCK POSITION* (FEET)	TIME (μ SEC.)	SHOCK POSITION* (FEET)	TIME (μ SEC.)
0	0.0	54	3089.8
2	83.8	56	3232.8
4	159.7	58	3368.4
6	257.9	60	3514.4
8	341.6	62	3670.8
10	424.5	64	3815.9
12	522.9	66	3965.5
14	628.7	68	4121.4
16	734.1	70	4291.3
18	843.0	72	4455.6
20	949.4	74	4625.5
22	1060.0	76	4790.3
24	1168.7	78	4956.3
26	1275.9	80	5125.4
28	1378.8	82	5297.7
30	1506.4	84	5475.6
32	1628.2	86	5652.4
34	1749.3	88	5832.7
36	------	90	6012.2
38	1988.9	92	6193.2
40	2101.4	94	6379.0
42	2240.7	96	6565.7
44	2371.9	98	6753.3
46	2518.8	100	6949.1
48	2665.8	102	7144.7
50	2808.4	104	7335.7
52	2949.9	106	7525.6

* FROM THE FIRST SWITCH LOCATION (3/4" FROM THE FACE OF THE H.E.)

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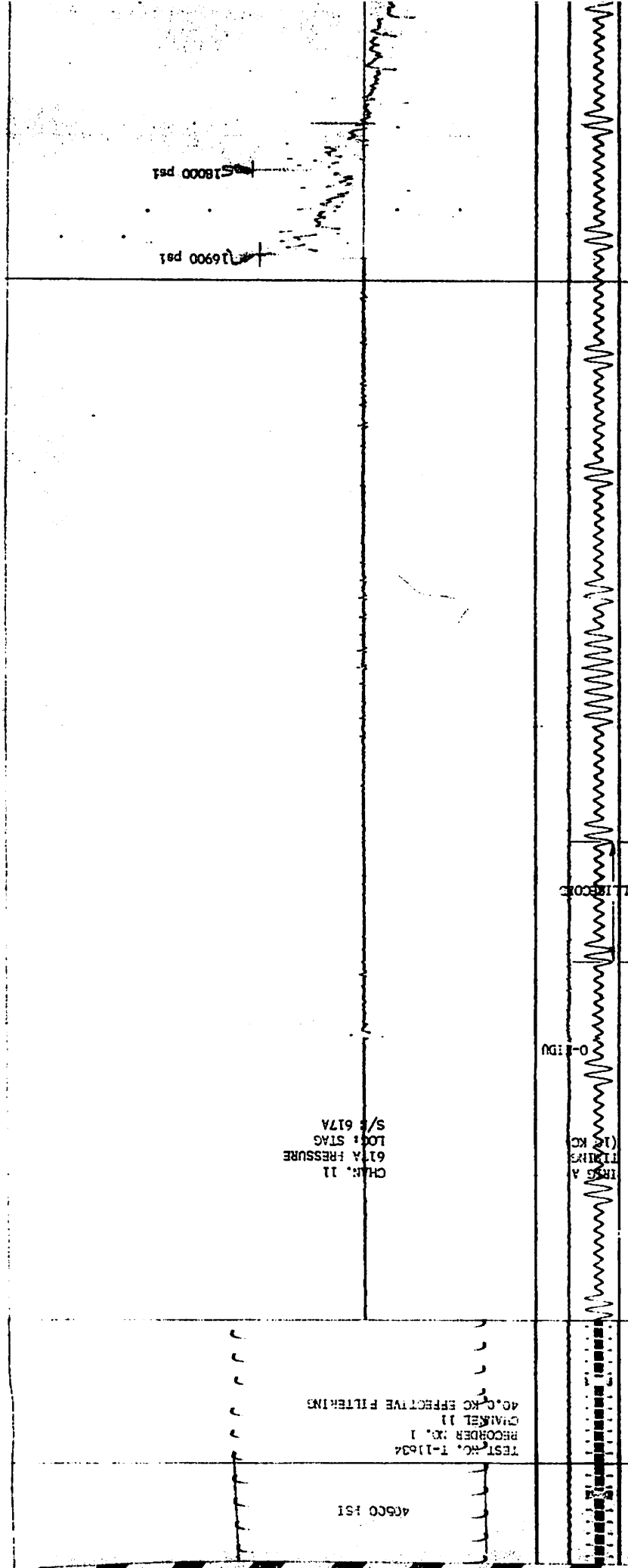

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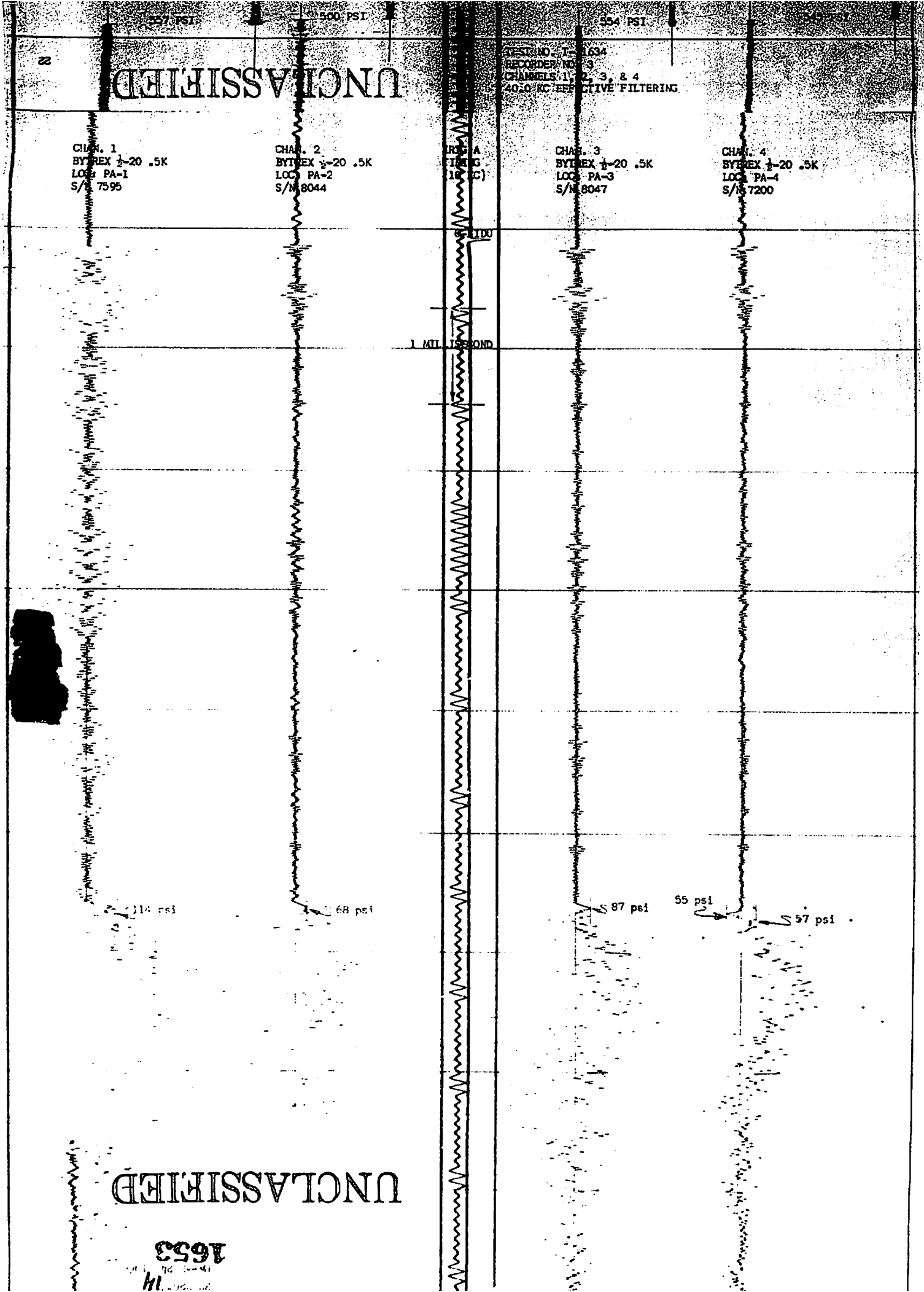

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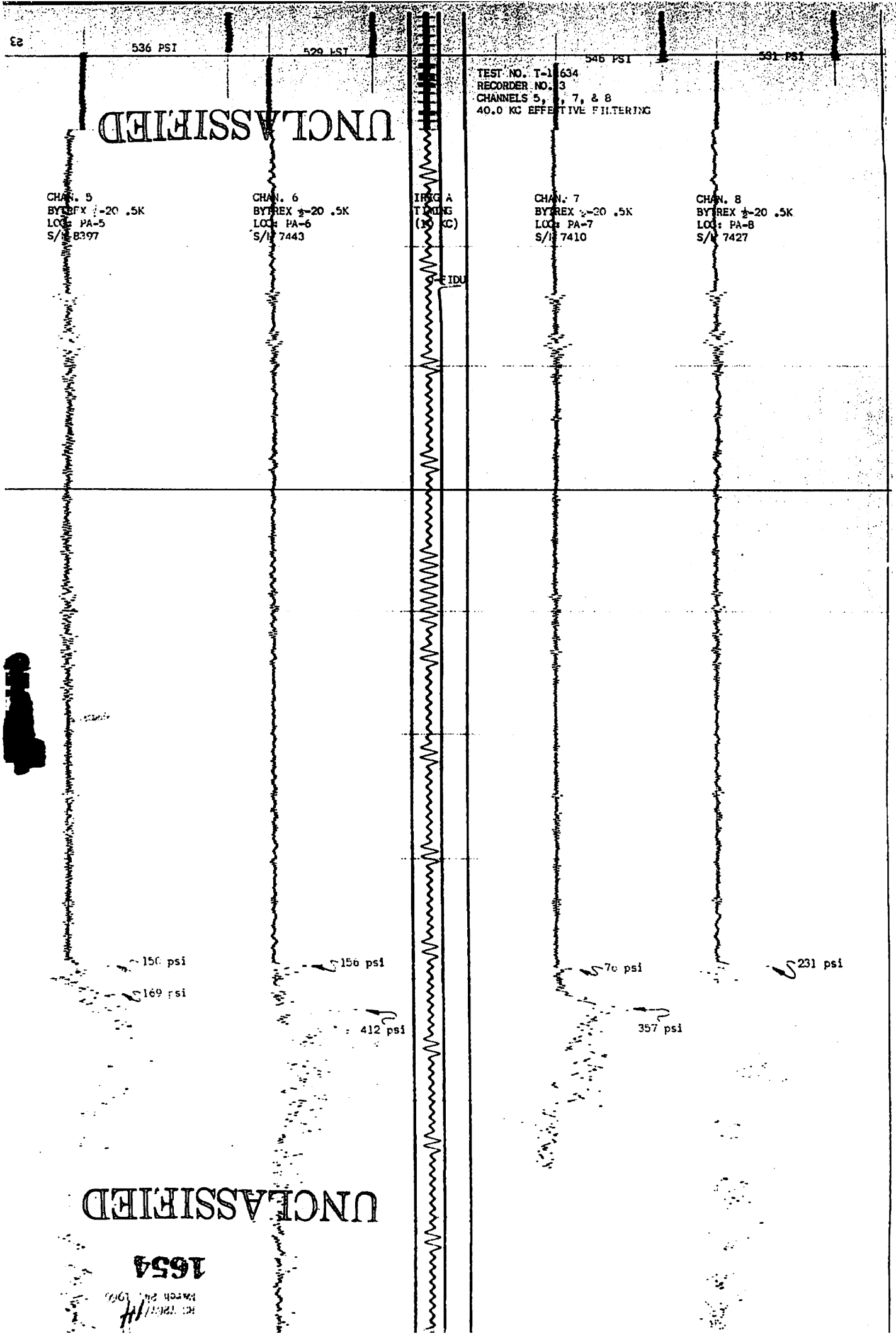
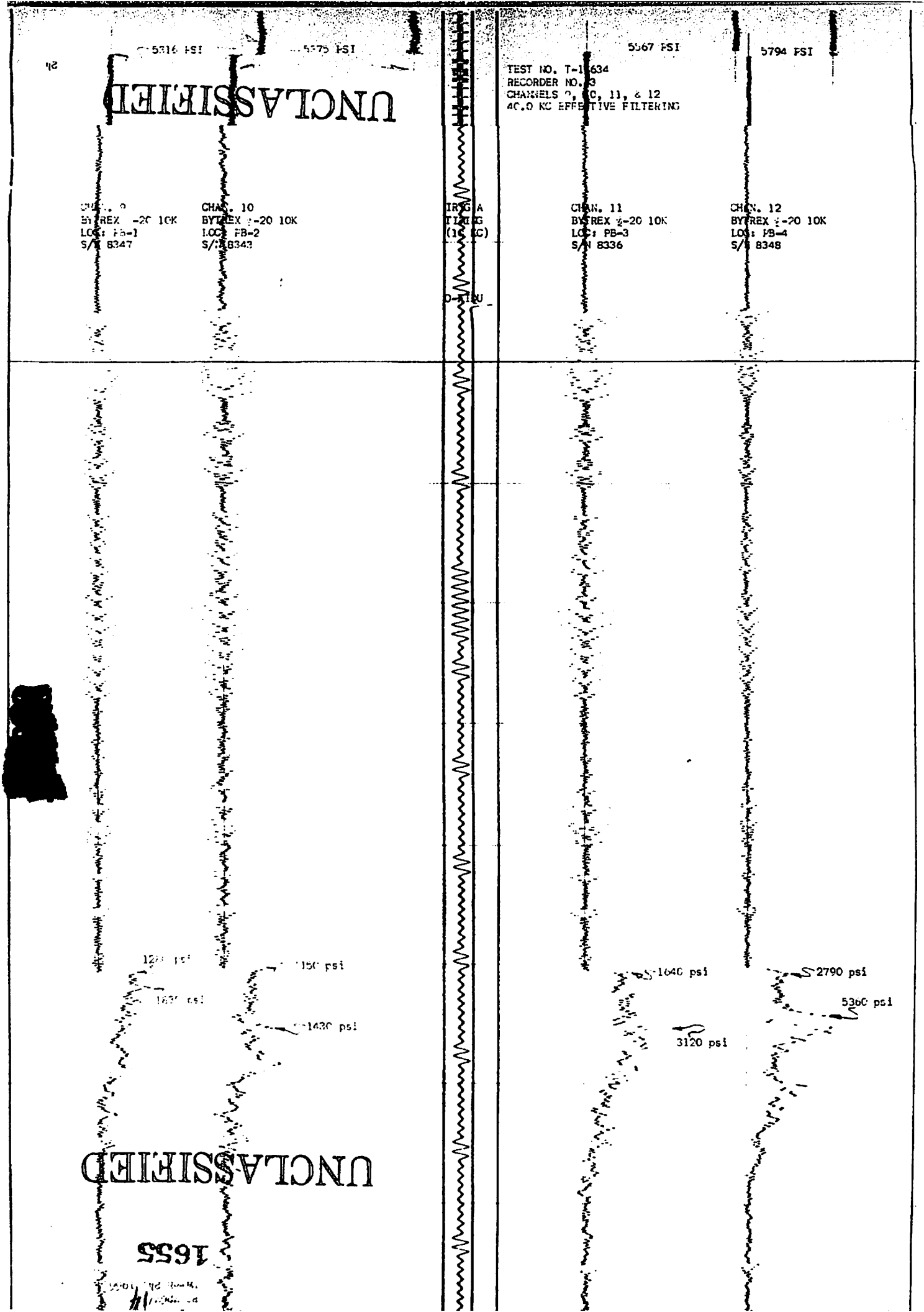
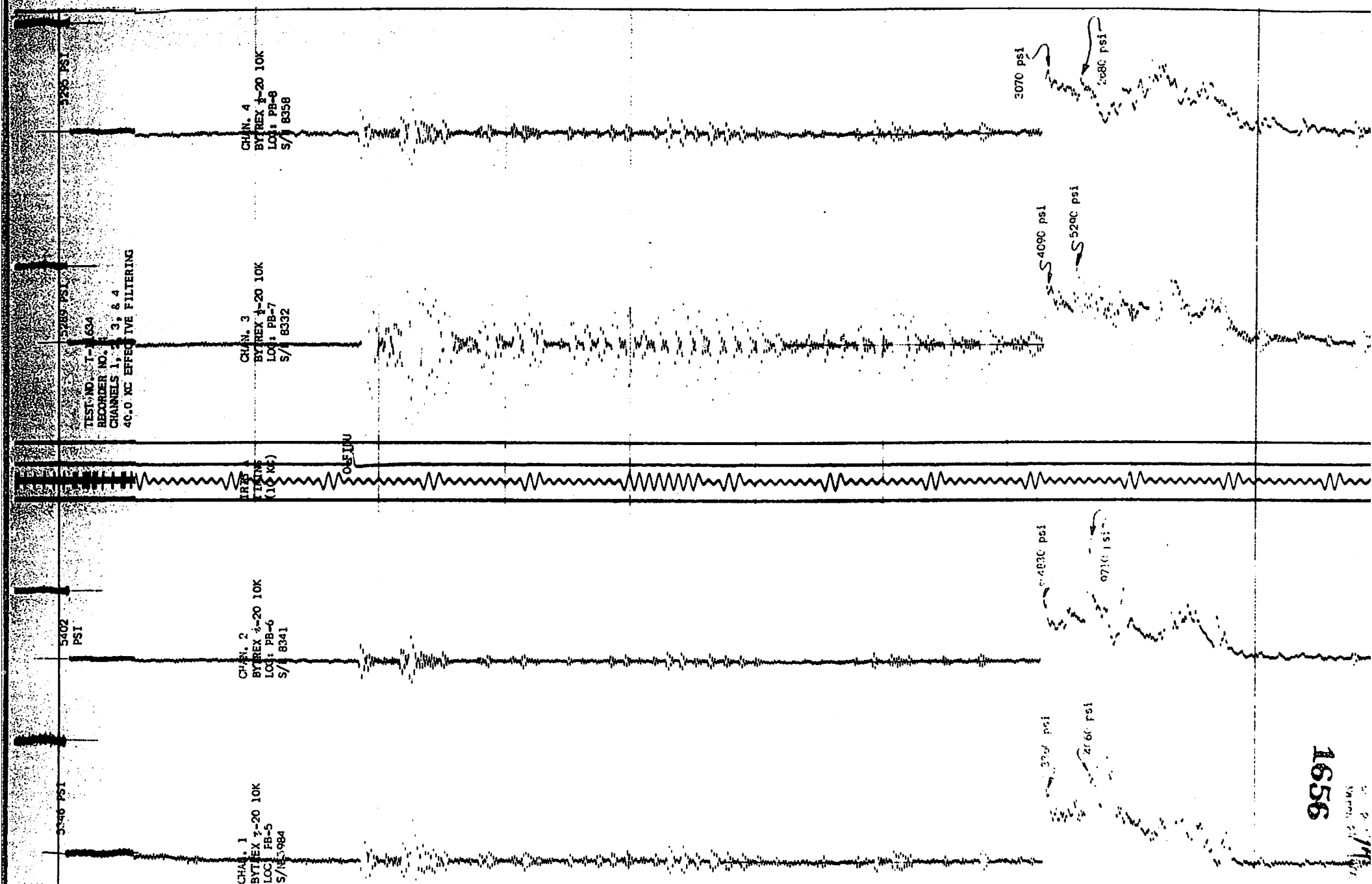

536 PSI
529 PSI
546 PSI
531 PSI
TEST NO. T-1634
RECORDER NO. 3
CHANNELS 5, 6, 7, & 8
40.0 KC EFFECTIVE FILTERING
UNCLASSIFIED
CHAN. 5
BYREX ½-20 .5K
LOC: PA-5
S/N 8397
CHAN. 6
BYREX ½-20 .5K
LOC: PA-6
S/N 7443
IRIG A
TIMING
(10 KC)
CHAN. 7
BYREX ½-20 .5K
LOC: PA-7
S/N 7410
CHAN. 8
BYREX ½-20 .5K
LOC: PA-8
S/N 7427
IDU
150 psi
169 psi
156 psi
412 psi
70 psi
357 psi
231 psi
UNCLASSIFIED
1654


5316 PSI
5575 PSI
5567 PSI
5794 PSI
TEST NO. T-1634
RECORDER NO. 3
CHANNELS 9, 10, 11, & 12
40.0 KC EFFECTIVE FILTERING
CHAN. 9
BYTREX -20 10K
LOC: PB-1
S/N 8347
CHAN. 10
BYTREX -20 10K
LOC: PB-2
S/N 8343
IRIG A
TIMING
(10 SC)
CHAN. 11
BYTREX -20 10K
LOC: PB-3
S/N 8336
CHAN. 12
BYTREX -20 10K
LOC: PB-4
S/N 8348
1430 psi
1640 psi
2790 psi
5360 psi
3120 psi
UNCLASSIFIED
UNCLASSIFIED
1655


5295 PSI
CHAN. 4
BYTREX ½-20 10K
LOC: PB-8
S/N 8358
3070 psi
2680 psi
5289 PSI
TEST NO. T-1634
RECORDER NO.
CHANNELS 1, 2, 3, & 4
40.0 KC EFFECTIVE FILTERING
CHAN. 3
BYTREX ½-20 10K
LOC: PB-7
S/N 8332
4090 psi
5290 psi
OLFIDU
5402 PSI
CHAN. 2
BYTREX ½-20 10K
LOC: PB-6
S/N 8341
4830 psi
9710 psi
3346 PSI
CHAN. 1
BYTREX ½-20 10K
LOC: PB-5
S/N 5984
4060 psi

1656

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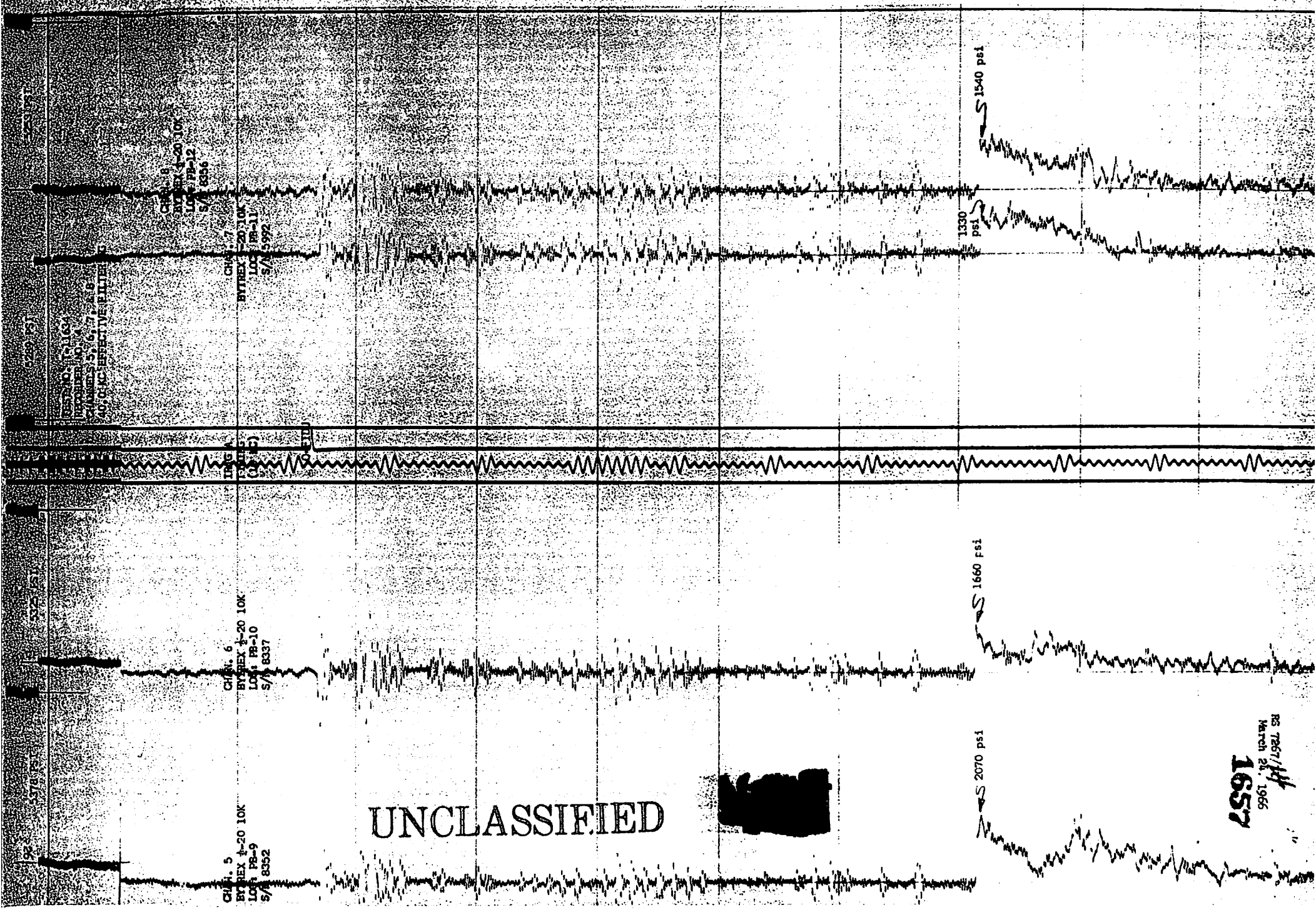

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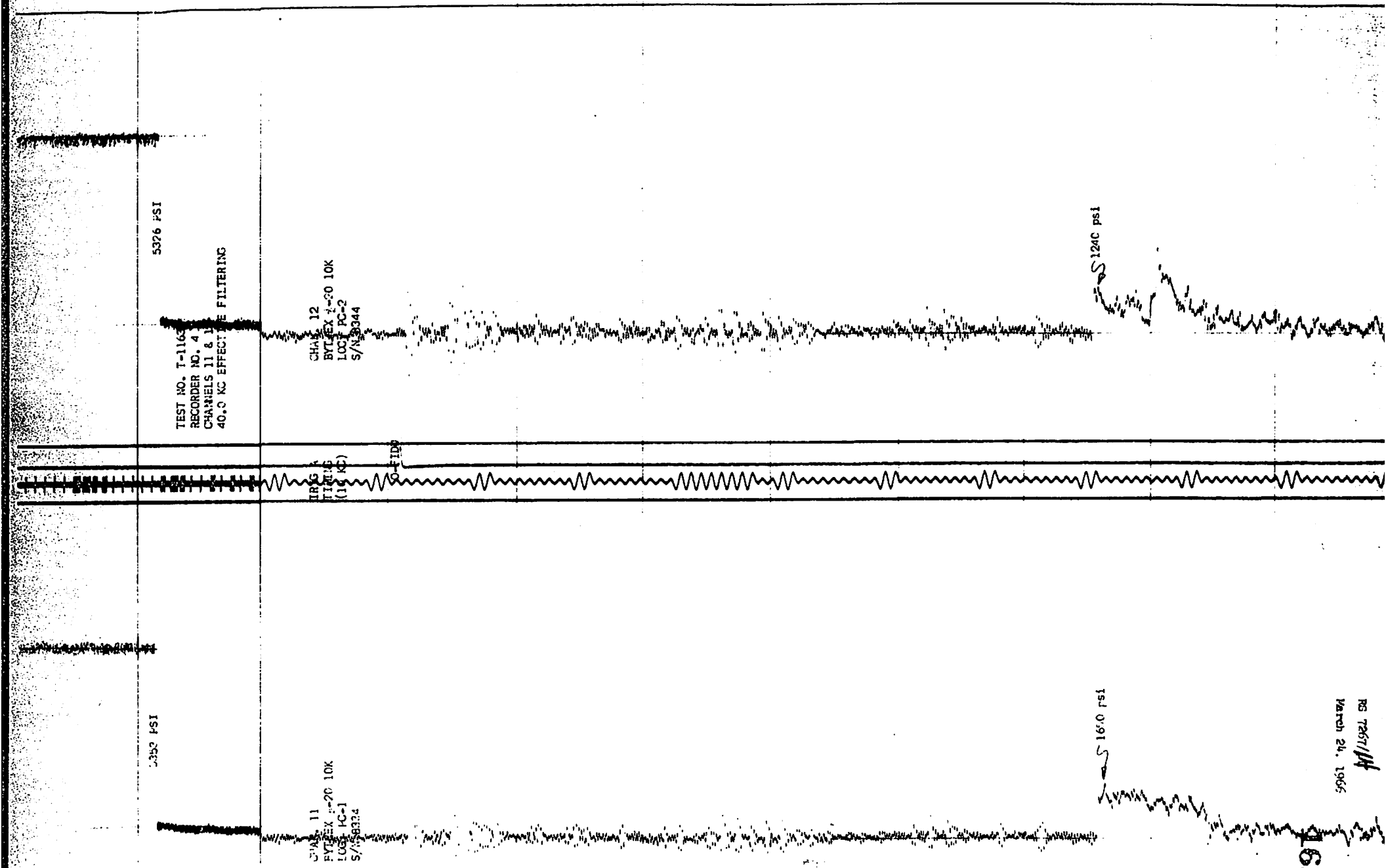
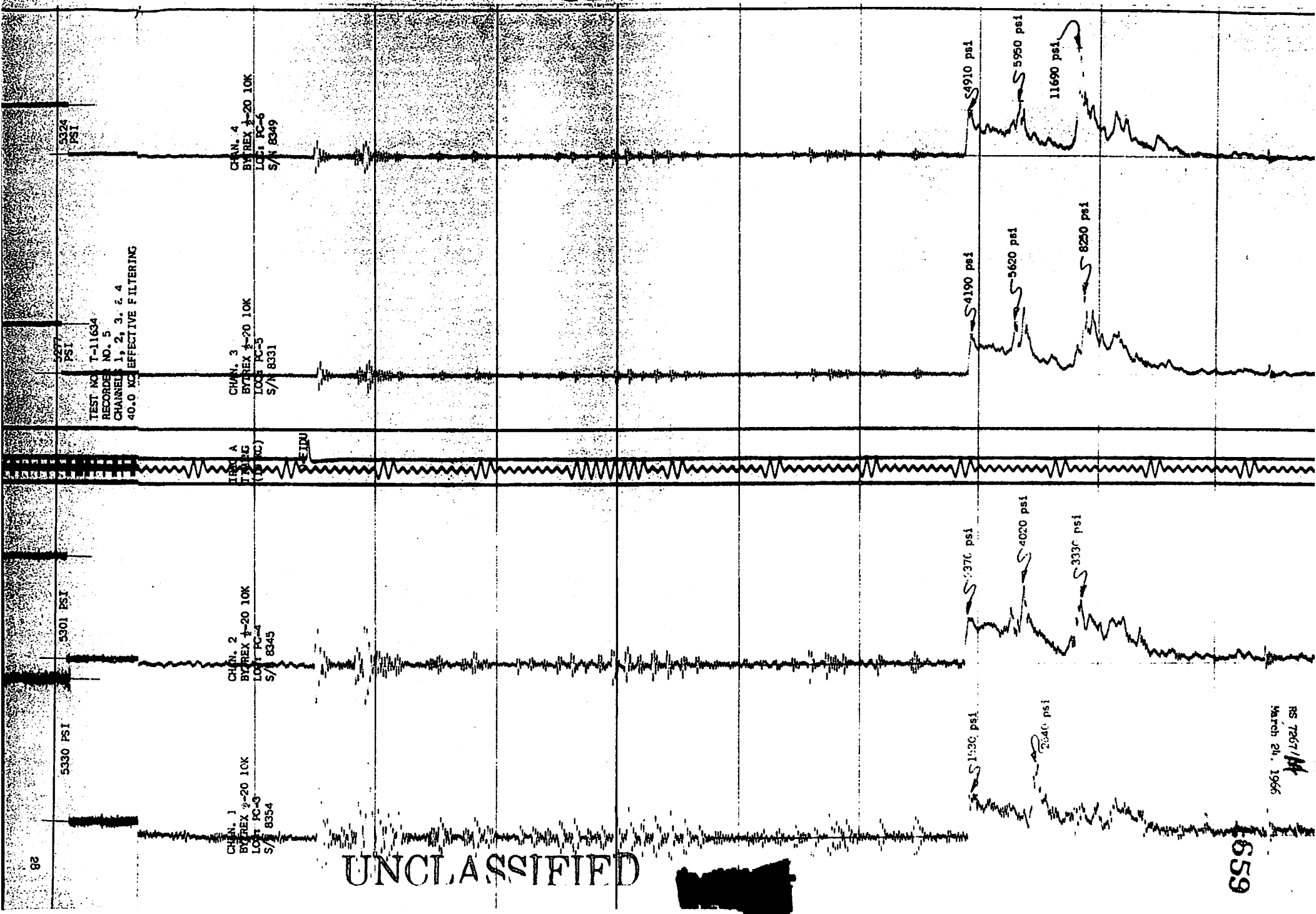
1657



1658

[redacted]

UNCLASSIFIED



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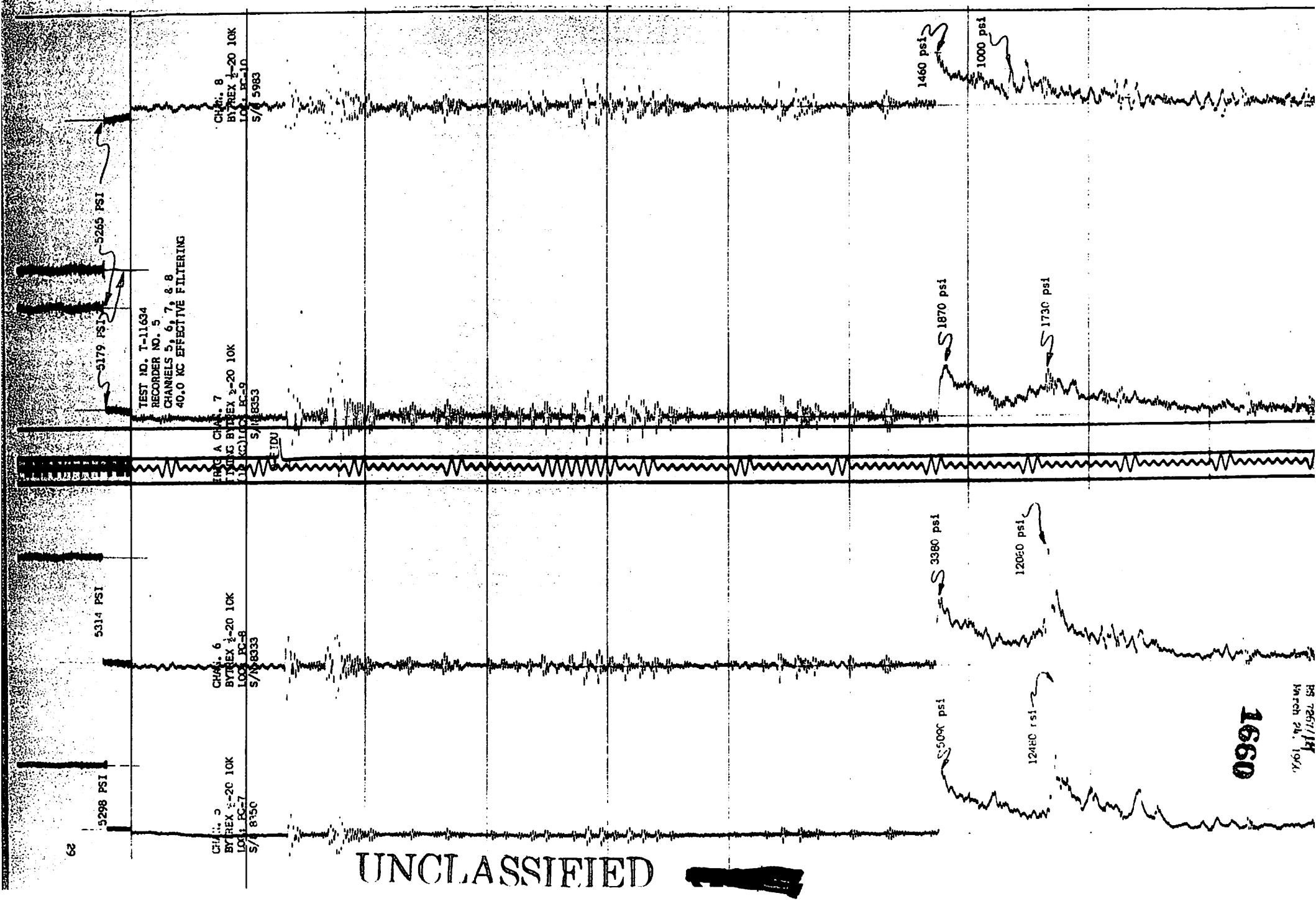
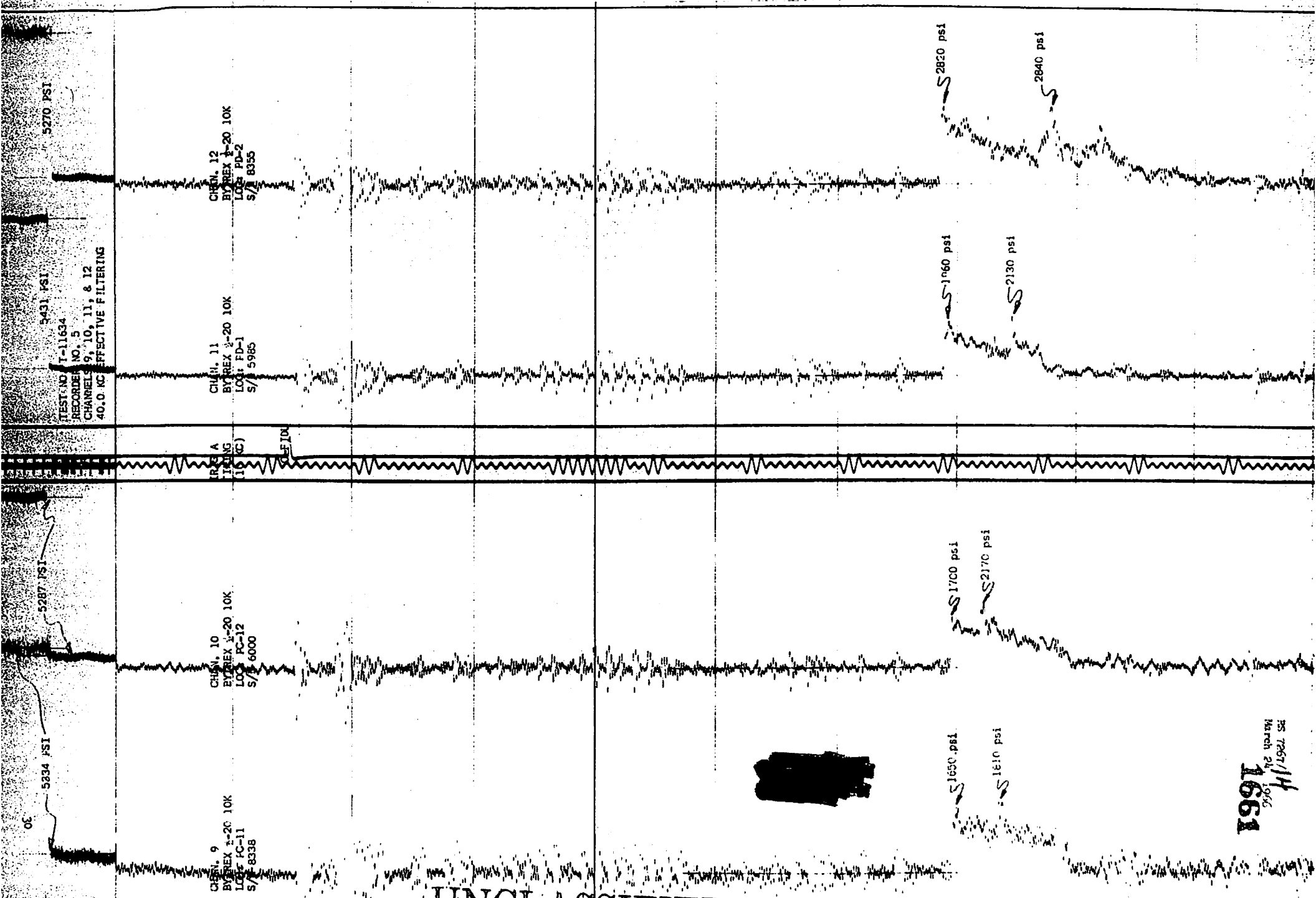

TEST NO. T-11634
RECORDER NO. 5
CHANNELS 5, 6, 7, & 8
40.0 KC EFFECTIVE FILTERING
5265 PSI
5179 PSI
5314 PSI
5298 PSI
1460 psi
1000 psi
1870 psi
1730 psi
3380 psi
12060 psi
5090 psi
12480 psi
1660


5270 PSI
5431 PSI
TEST NO. T-11634
RECORDER NO. 5
CHANNELS 9, 10, 11, & 12
40.0 KC EFFECTIVE FILTERING
CHAN. 12
BYTREX ½-20 10K
LOC: PD-2
S/N 8355
2820 psi
2840 psi
CHAN. 11
BYTREX ½-20 10K
LOC: PD-1
S/N 5985
1960 psi
2130 psi
5287 PSI
CHAN. 10
BYTREX ½-20 10K
LOC: PC-12
S/N 6000
1700 psi
2170 psi
5334 PSI
CHAN. 9
BYTREX ½-20 10K
LOC: PC-11
S/N 8338
1650 psi
1810 psi
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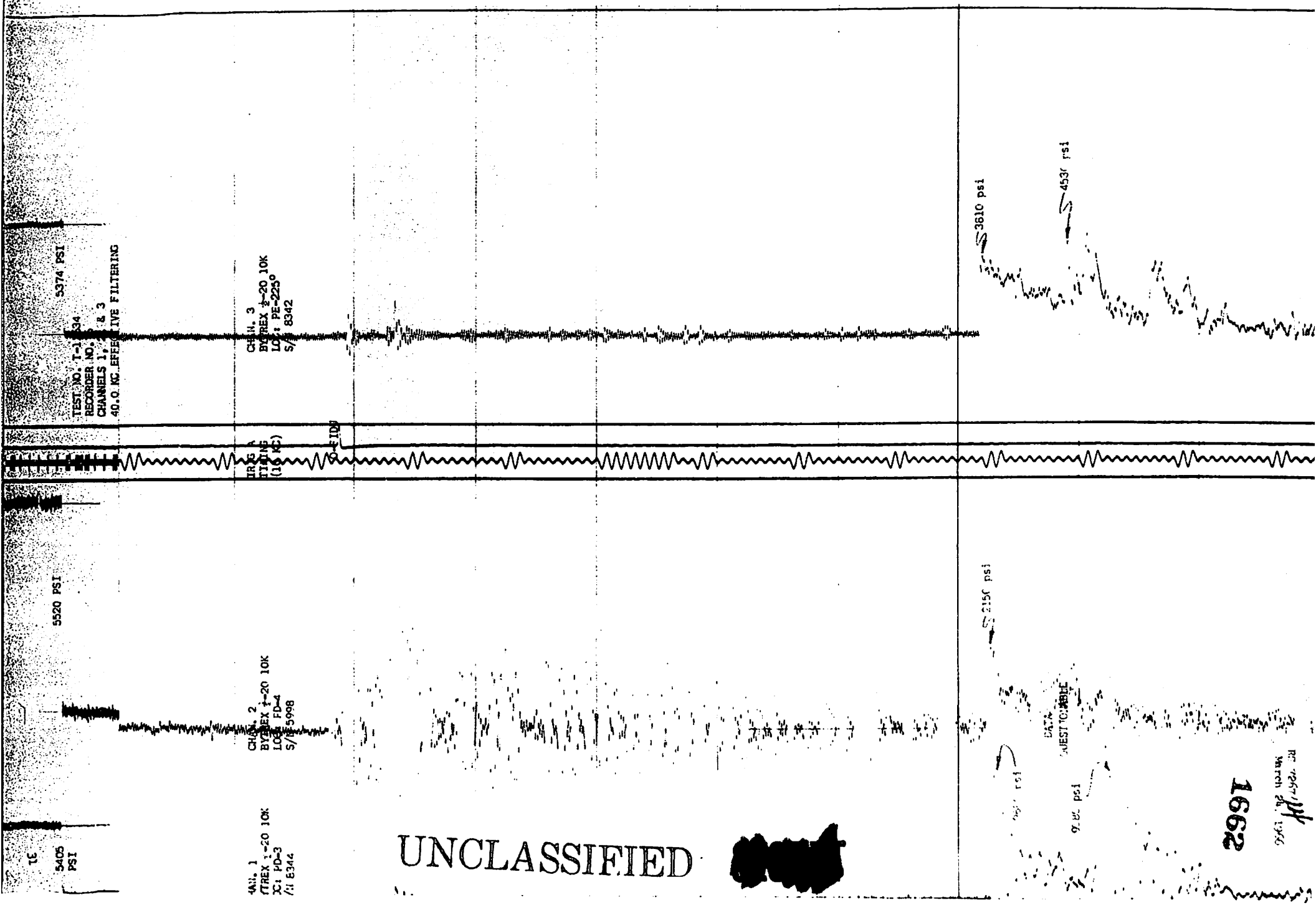
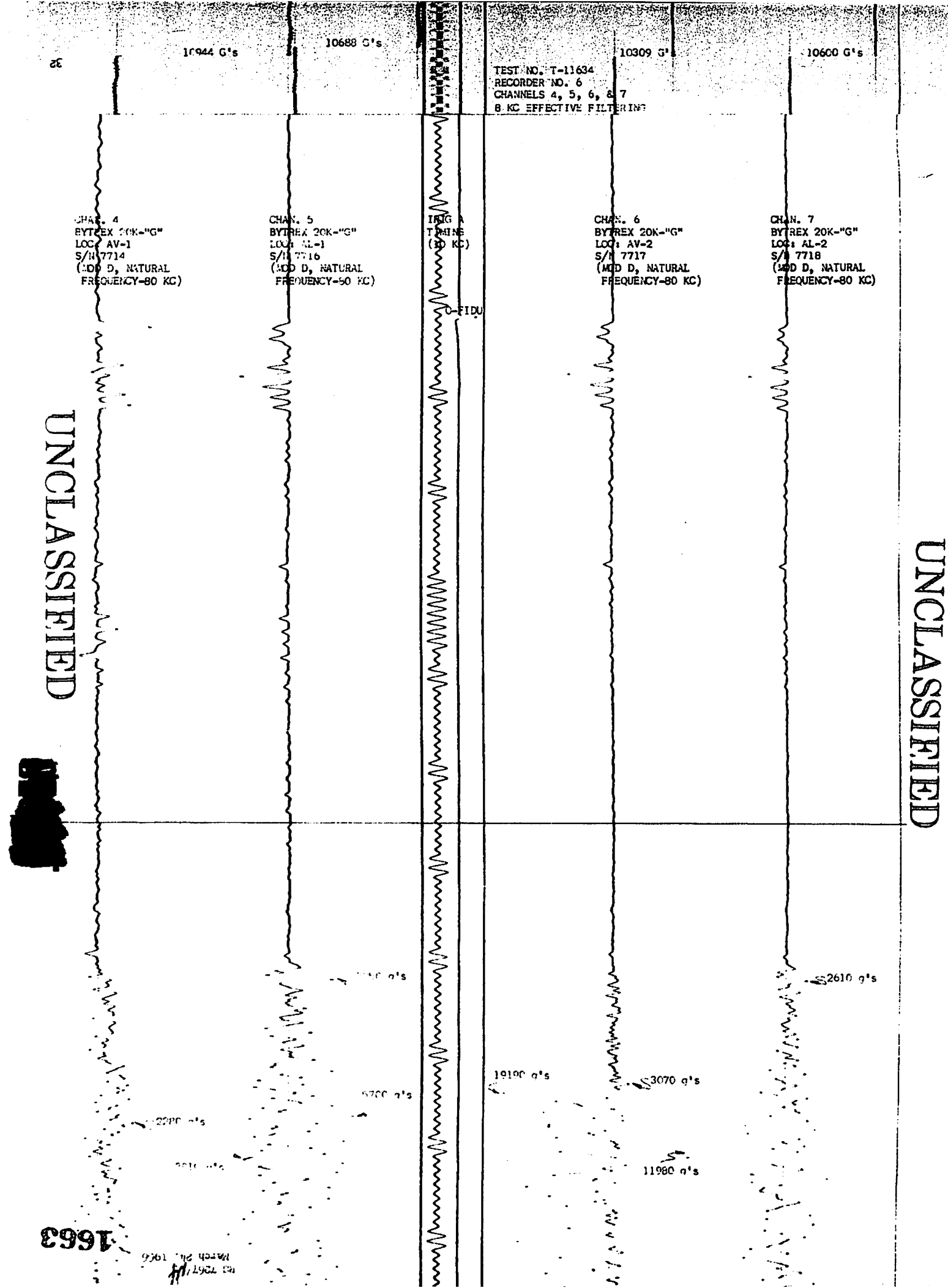
1661


5374 PSI
TEST NO. T-1
RECORDER NO.
CHANNELS 1, 2 & 3
40.0 KC EFFECTIVE FILTERING
CHAN. 3
BYTREX ½-20 10K
LOC: PE-225°
S/N 8342
3810 psi
4530 psi
5520 PSI
CHAN. 2
BYTREX ½-20 10K
LOC: FD-4
S/N 5998
2150 psi
DATA
QUESTIONABLE
5405 PSI
CHAN. 1
BYTREX ½-20 10K
LOC: PD-3
S/N 8344
1662



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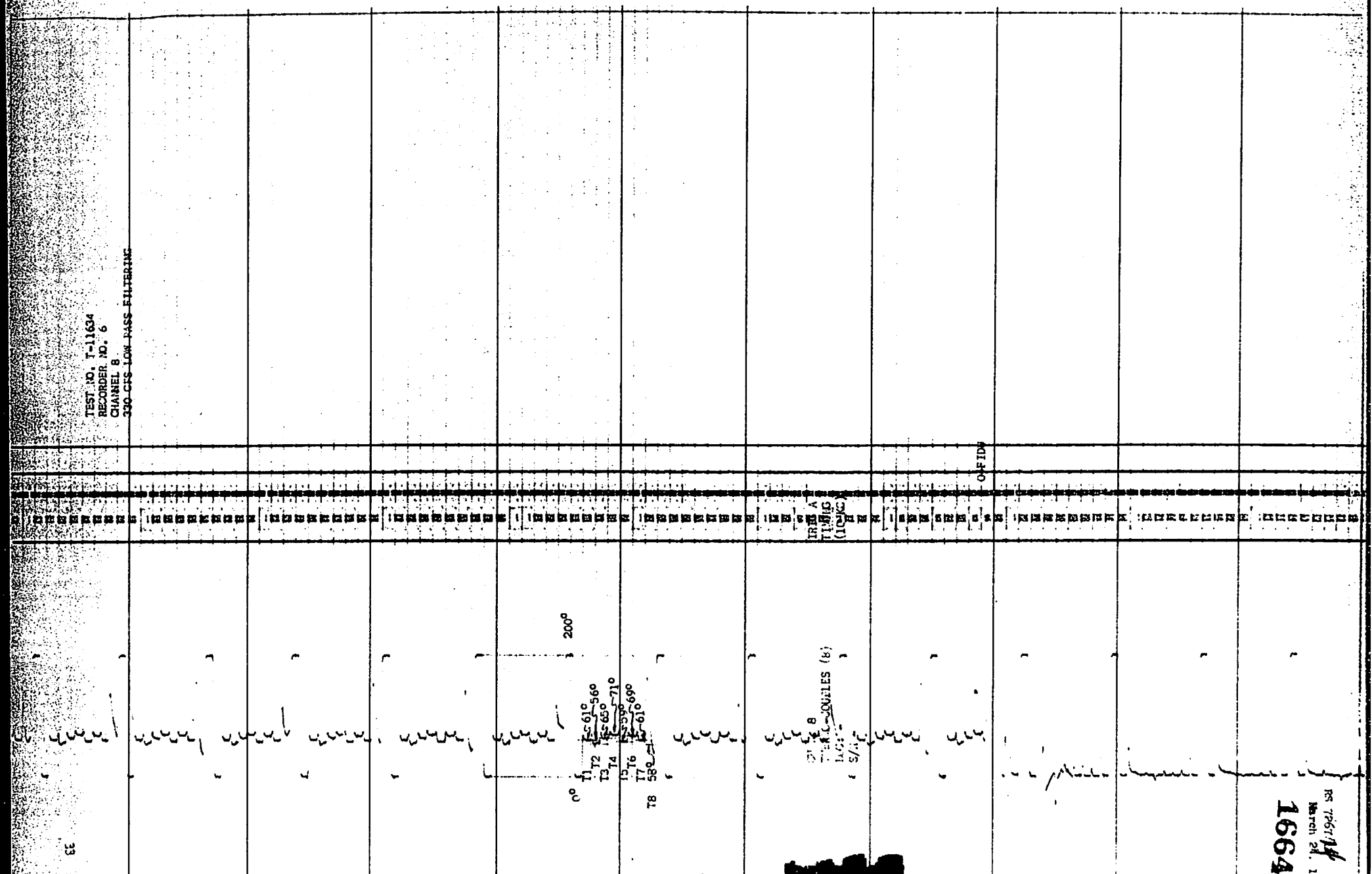
UNCLASSIFIED

[redacted]


TEST NO. T-11634
RECORDER NO. 6
CHANNEL 8
330 CPS LOW PASS FILTERING
O-FIDU
200°
0°
T1
T2
T3
T4
T5
T6
T7
T8
61°
56°
65°
71°
59°
69°
61°
58°
8
COUPLES (8)
S/N
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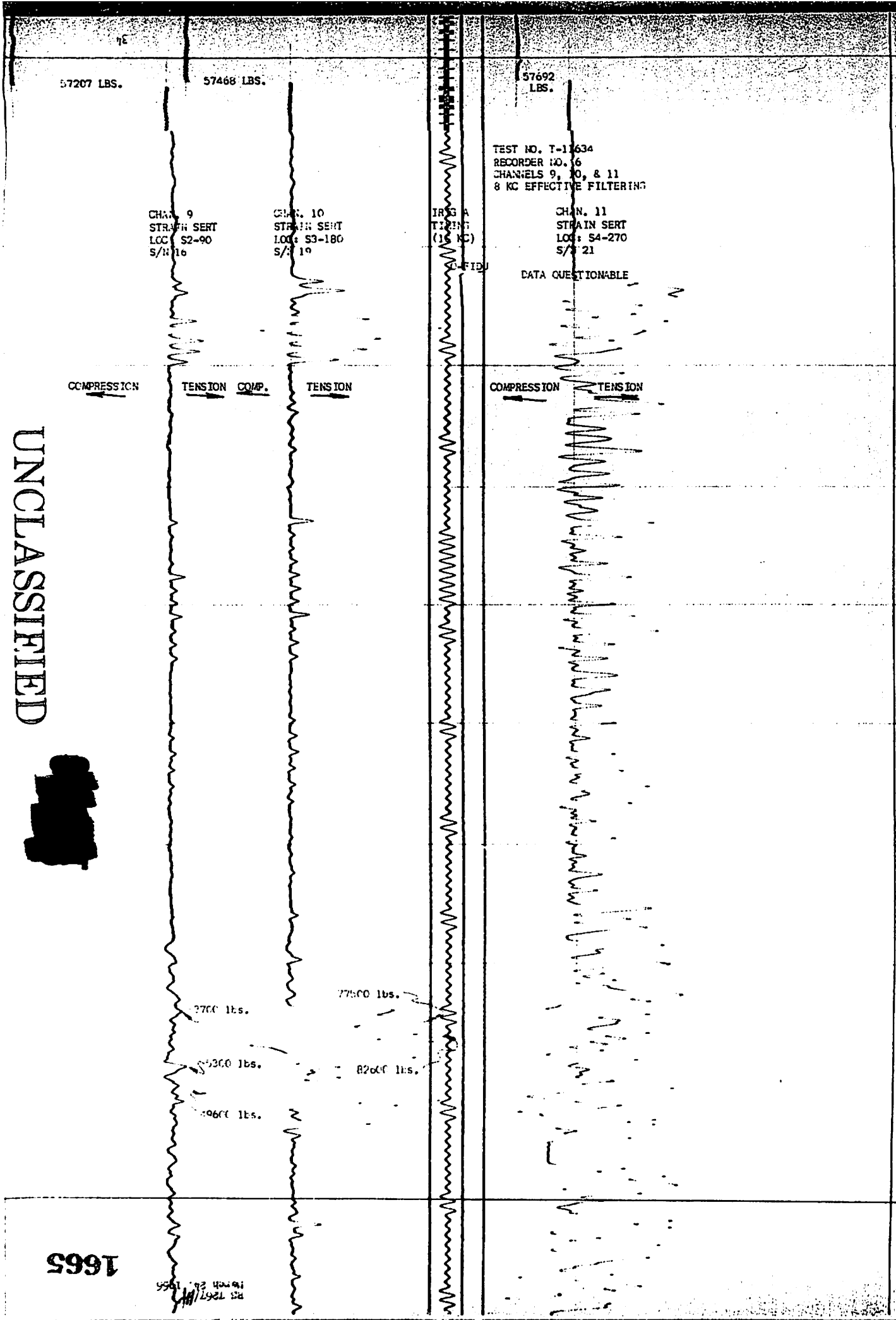

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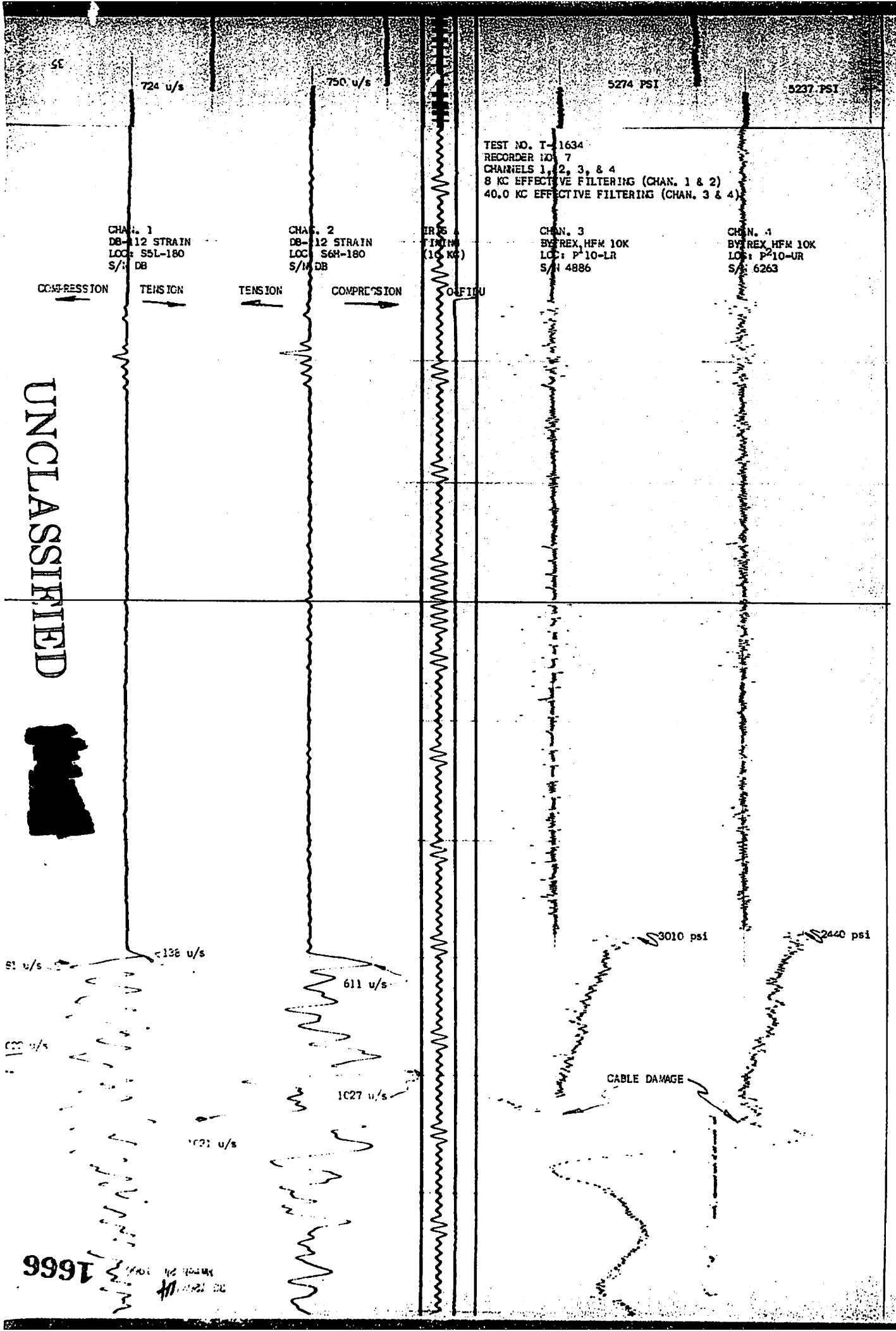
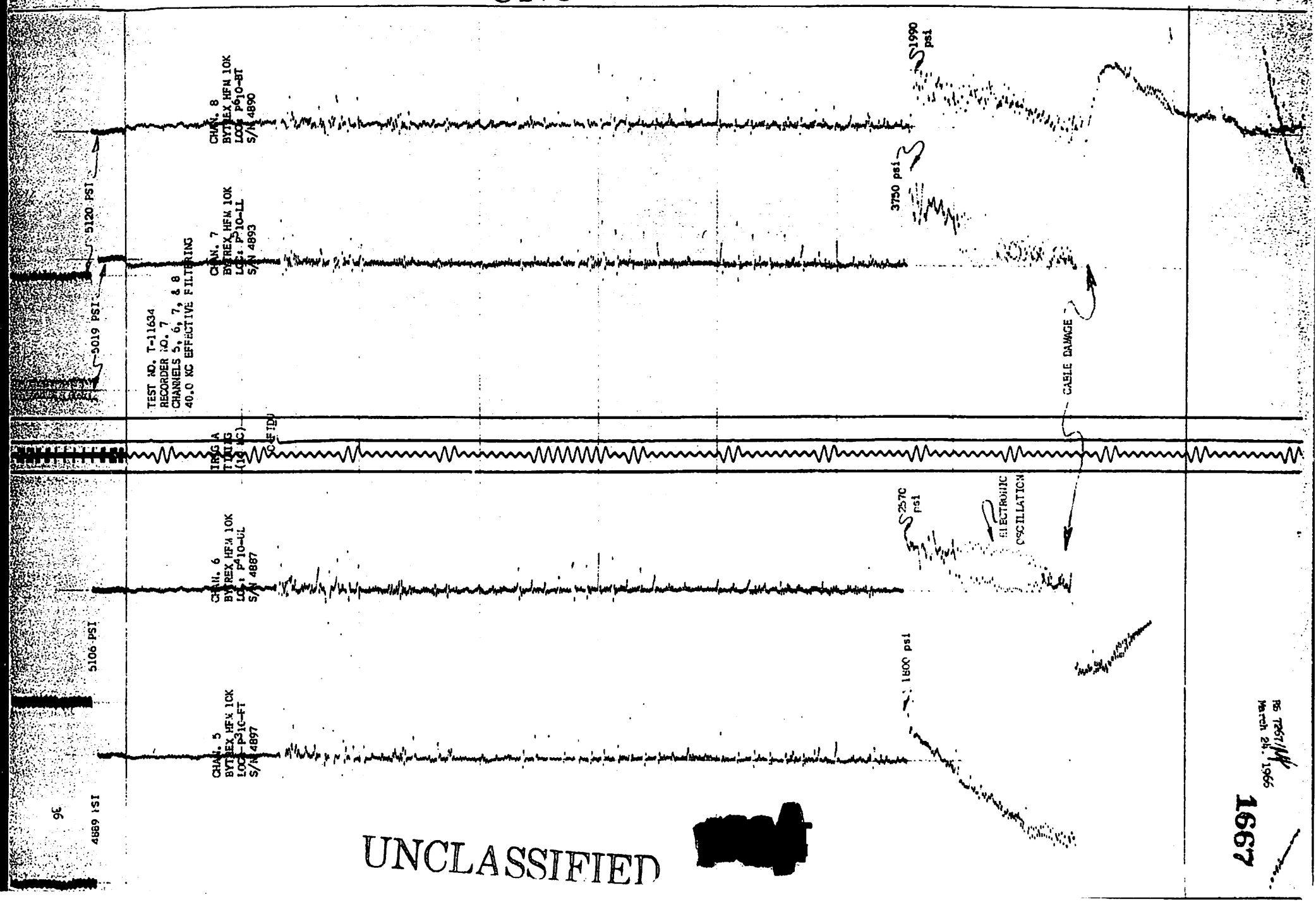

724 u/s
750 u/s
5274 PSI
5237 PSI
TEST NO. T-1634
RECORDER NO. 7
CHANNELS 1, 2, 3, & 4
8 KC EFFECTIVE FILTERING (CHAN. 1 & 2)
40.0 KC EFFECTIVE FILTERING (CHAN. 3 & 4)
CHAN. 1
DB-112 STRAIN
LOC: S5L-180
S/N DB
CHAN. 2
DB-112 STRAIN
LOC: S6H-180
S/N DB
CHAN. 3
BYTREX HFM 10K
LOC: P1 10-LR
S/N 4886
CHAN. 4
BYTREX HFM 10K
LOC: P2 10-UR
S/N 6263
COMPRESSION
TENSION
TENSION
COMPRESSION
OUTPUT
UNCLASSIFIED
UNCLASSIFIED
138 u/s
611 u/s
1027 u/s
3010 psi
2440 psi
CABLE DAMAGE
1666


TEST NO. T-11634
RECORDER NO. 7
CHANNELS 5, 6, 7, & 8
40.0 KC EFFECTIVE FILTERING
CHAN. 8
BYTREX HFM 10K
LOC: P610-BT
S/N 4890
CHAN. 7
BYTREX HFM 10K
LOC: P510-LL
S/N 4893
CHAN. 6
BYTREX HFM 10K
LOC: P410-UL
S/N 4887
CHAN. 5
BYTREX HFM 10K
LOC: P310-FT
S/N 4897
5120 PSI
5019 PSI
5106 PSI
4889 PSI
1990 psi
3750 psi
2570 psi
1800 psi
CABLE DAMAGE
ELECTRONIC OSCILLATION
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[redacted]

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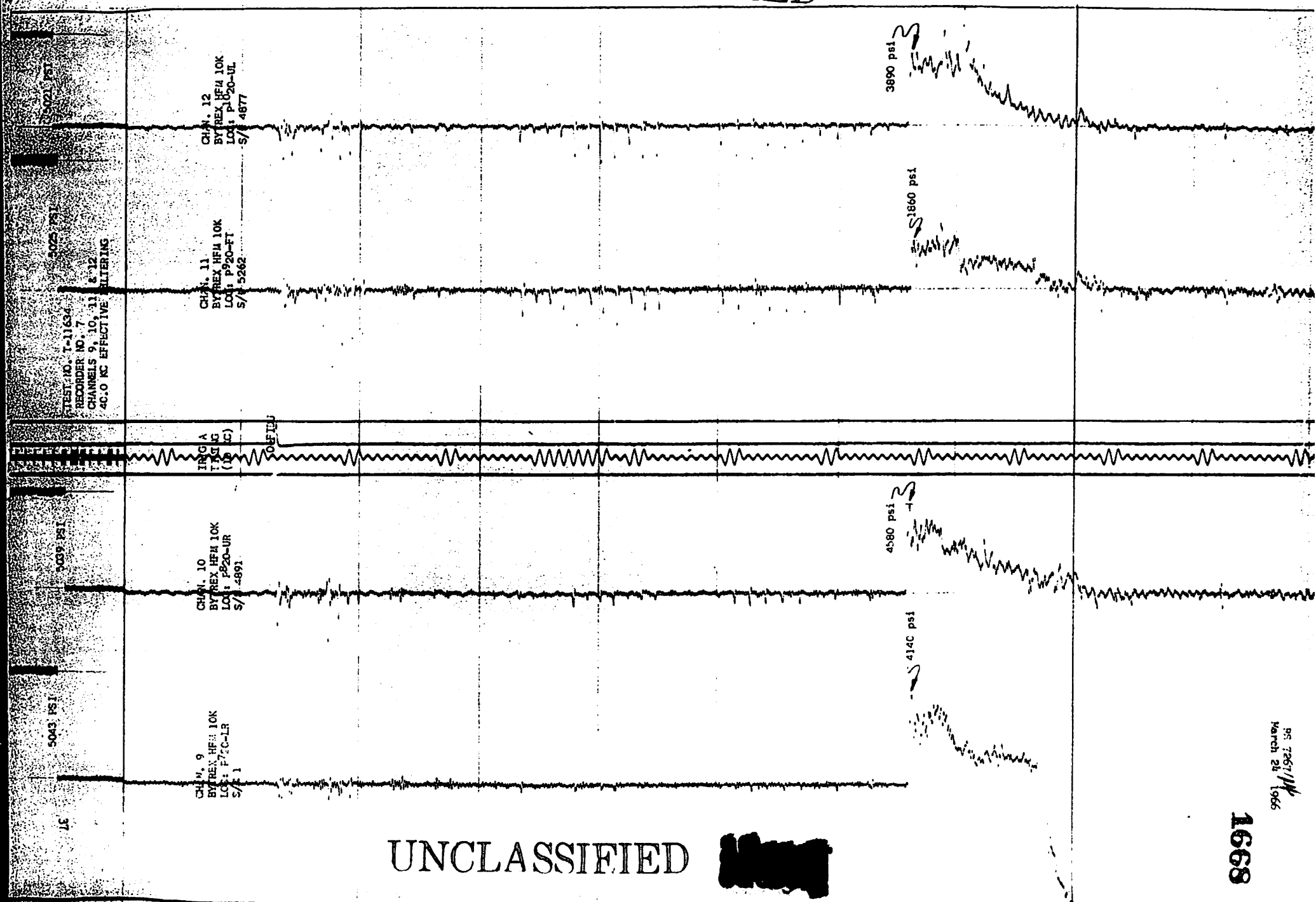

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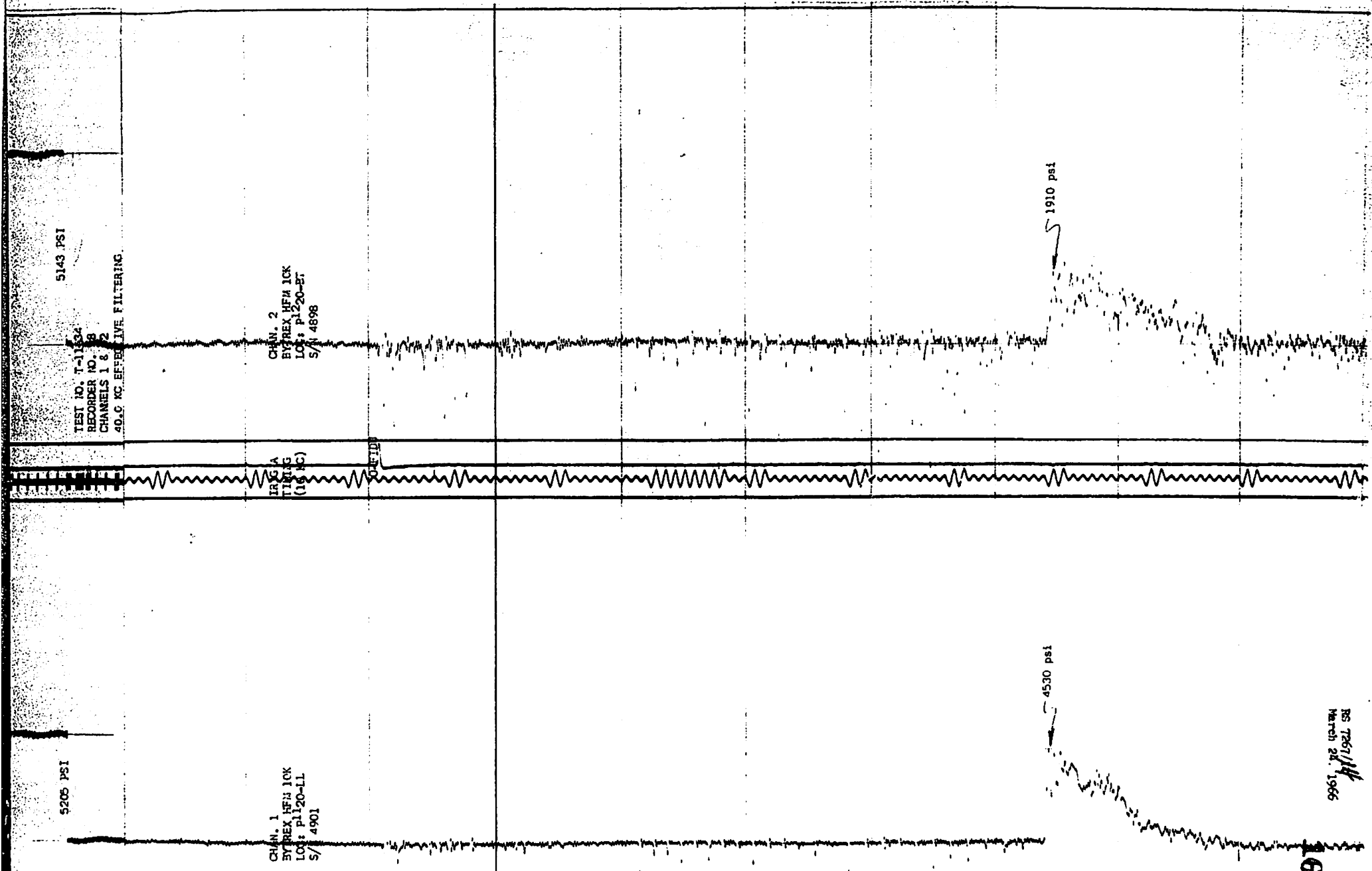
5143 PSI
TEST NO. T-11534
RECORDER NO. 8
CHANNELS 1 & 2
40.0 KC EFFECTIVE FILTERING
CHAN. 2
BYTREX HFM 10K
LOC: p1220-BT
S/N 4898
1910 psi
IRIG A
TIMING
(16 KC)
5205 PSI
CHAN. 1
BYTREX HFM 10K
LOC: p1120-LL
S/N 4901
4530 psi
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1669

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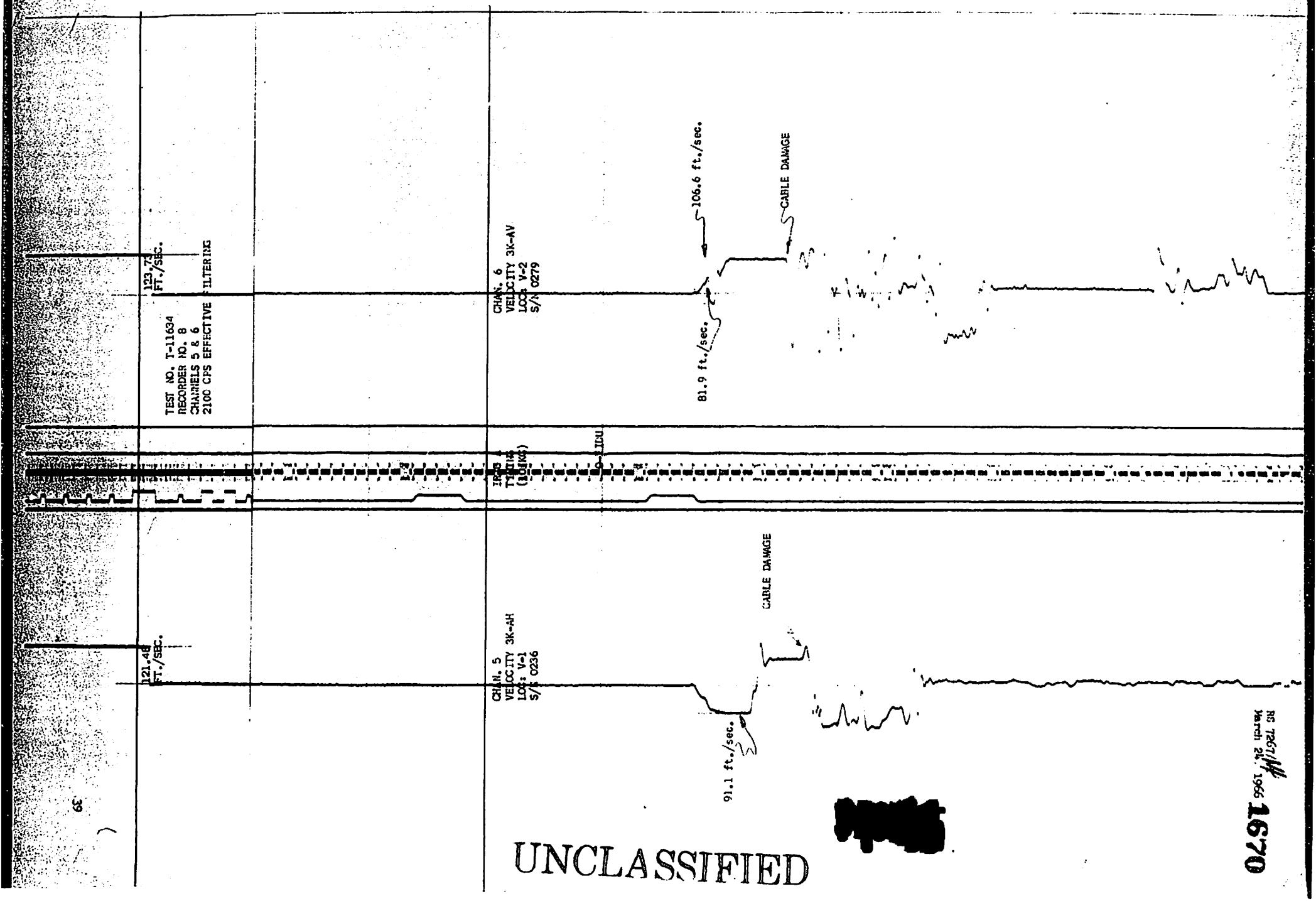

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