9054

[redacted]

26 June 1963

PRELIMINARY FLIGHT SUMMARY REPORT

FTV 1161 CM 21

Prepared by: [redacted]

Approved by: [redacted]
Requirements & Analysis

[redacted]

[redacted] [redacted]

26 June 1963

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[redacted]

I. SUMMARY

This report constitutes a preliminary flight performance evaluation of FTV 1161-CM21 based on an analysis of telemetry data. FTV 1161 consisted of a thrust augmented Thor booster (TAT) and an Agena D orbital vehicle.

The primary payload was camera system CM21 consisting of panoramic cameras 112 and 113 and stellar index camera D9/9/9. A four day payload operational mission and a vehicle deactivate-reactivate experiment was programmed.

Launch occurred at VAFB at 4:59 PM PDT on 12 June 1963. Telemetry data generally indicated proper vehicle and payload operation. The primary mission covered the programmed 4 days and terminated in a successful air catch recovery on orbit 65. Vehicle deactivation and reactivation were successfully commanded by the [redacted] tracking station on orbits 85 and 117 respectively. Anomalies noted in the payload telemetry data are discussed in the following sections of this report.

II. LAUNCH PERFORMANCE

Launch and ascent resulted in a near nominal orbit. Table I presents a comparison of the predicted and attained orbital parameters based on tracking data through recovery. As shown by these data, perigee latitude is the only parameter at considerable variance from the predicted value.

A high control gas consumption rate was experienced during Agena boost and injection apparently due to engine alignment and the venting of a large amount of propellants following engine cut-off. However, the on orbit consumption of control gas was very low resulting in a surplus of on board control gas following recovery.

TABLE I

Orbital Parameters

Parameter	Predicted	Actual
Period (Min)	90.9	90.79
Perigee (NM)	110.1	106.68
Apogee (NM)	237.9	240.39
Eccentricity	0.0177	0.018
Inclination (Deg)	81.8	81.83
Perigee Latitude (Deg N)	30	41.6

III. COMMANDING PERFORMANCE

Payload commanding on this flight was not carried out as smoothly as on previous flights, primarily due to tracking station problems. On orbit 39 the tracking station at [redacted] was instructed to issue one command 11 to switch the payload to the on mode. This command was issued but not verified. The tracking station at [redacted] backed up [redacted] and issued the command which was verified, thus preventing the payload from being off on orbit 39. No explanation for this anomaly is available. On orbit 47, the tracking station at [redacted] was to issue command 9 six times. This series of commands were issued three times but no verified. Near the end of the acquisition a console switch was found to be in an incorrect position. Upon correction of the switch position, 3 of the six commands were issued and verified before vehicle fade. This resulted in a monoscopic payload operation on the following orbit. Problems were also evident in the vehicle commanding at recovery initiation.

These problems indicated a possible failure in the vehicle secure command system. On orbit 63, the re-entry enable command was issued but not verified. Therefore, on orbit 64, a lifeboat "D timer next orbit" command was issued at both the [redacted] tracking stations. These commands were not verified. As a result of not verifying the above commands, a lifeboat "real-time" command was issued at the time of acquisition at [redacted] on the recovery orbit. From the time sequence of the re-entry events, it is evident that recovery was initiated by the "D"timer and not by the lifeboat "realtime" command, indicating one of the unverified commands had been received by the vehicle. As a result of the sequence of commands issued to enable recovery, the timer used for setting up the lifeboat "D timer next orbit" re-entry enable was restarted. This effected a second recovery sequence on orbit 66 disabling the recovery sequence experiment programmed to occur after the de-active portion of the flight. As a result of the second recovery sequence exercised on orbit 66, which left the vehicle in a pitched attitude, the tumbling rate of the vehicle during the inactive portion of the flight was approximately .38 degrees per second instead of the desired 4 degrees per second.

IV. PANORAMIC INSTRUMENT PERFORMANCE

Operation of the panoramic instruments appeared satisfactory with no dynamic problems evident in the telemetry data. The cycling periods of both instruments were very near nominal on all engineering operations observed on telemetry. Plots of the pre-flight and inflight cycle rates are included in the appendix.

Each panoramic instrument had a slit width of 0.200 inches and used a Wratten 21 (orange) filter with SO 132 film. The horizon lenses were set at F 6.8 with a 1/100th second exposure time and Wratten 25 (red) filters.

[redacted]

A V/h match within 2% was obtained throughout most of the flight using V/h ramp 2.

Four engineering operations, orbits 9, 24, 40, and 56 were monitored by telemetry, all within 600 seconds of the bottom of ramp 2. The telemetered lens rotation monitor indicated the lens rotated past the home or stowed position by approximately 10 to 15 degrees on all four operations. The maximum cycle rate possible at the bottom of a ramp was on ramp 10. The cycle rate at the bottom of ramp 10 corresponds to the cycle rate on ramp 2 at a time of 660 seconds after programmer start (see cycle rate data in Appendix). By extrapolation it appears that the lens would have been in a safe position (10 degrees before home to 20 degrees past home) for protection during retro rocket ignition at the end of an operation run at the bottom of any ramp.

Telemetry data for instrument operation after reactivation are not available at this time.

V. STELLAR INDEX

Stellar index camera operation was normal on the engineering operations on orbits 9, 40, and 56. On orbit 24 the stellar metering commutator indicated attempted metering or creeping after the normal metering cycle and on orbit 77 (after recovery) two exposures were noted without a metering cycle between. The relay used to switch the telemetry data between the stellar index monitors and ring A of the payload instrumentation commutator was intermittent on orbit 79, indicating possible failure of the relay. No other anomalies were evident in the telemetry data.

The index camera was loaded with SO 130 film. The index lens was set at F 4.5 and 1/500th second exposure time with a Wratten 21 filter.

The stellar camera had a split roll of SO 130 and SO 102 film. The lens was set at F 1.9 with an exposure time variable from 2 to approximately 6 seconds, depending on the cycle period of the master panoramic camera. No filter was used.

VI. CLOCK PERFORMANCE

The clock accuracy as determined from telemetry data was well within the reading accuracy of data used for preliminary evaluation. Therefore, good time correlation should be possible.

VII. LIGHT DETECTOR EXPERIMENT

Four light detectors were installed in the payload, 1 in each panoramic door well and 1 in each horizon camera door well of the master camera, to determine if any residue is deposited by the retro rocket blast. Anotated analog traces of telemetry data taken at [redacted] on all programmed recovery passes and a calibration plot for the light sensors are included in the Appendix. This data does not indicate a decrease in the amount of light sensed after recovery.

VIII TEMPERATURE ENVIRONMENT

The temperature control objective of this flight was to maintain a time average instrument temperature of 80 degrees F. The thermal control mosaic was designed to achieve the desired temperatures based on a launch date of 26 April 1963. The beta angle on this date was 40 degrees. The beta angle on the day of launch, 12 June 1963, had increased to 51.5 degrees. This increase in beta angle accounts for an approximate 8 degree increase in the orbit 1 mean temperatures and 4 degree increase in the orbit 65 mean temperatures. The predicted mean temperatures based on the beta angle increase was 85 degrees for the master instrument and 86 degrees for the slave instrument. The actual average temperature was 87 degrees for the master instrument and 93 degrees for the slave instrument with the stovepipes being very near the average temperature of the instrument. On-orbit temperature data are included in the Appendix. The deviation from the predicted average temperatures for this flight is within the known uncertainties of a passive thermal control system.

IX. RECOVERY SYSTEM PERFORMANCE

Recovery was successfully achieved by air catch on orbit 65 on 16 June 1963. Table II is a tabulation of the recovery sequence of events. The recovery system performance was nominal with the exception of an apparent malfunction at the time of programmed thrust cone separation indicated by telemetry channels 7 and 9. Two switches in series monitor thrust cone separation. These switches are held closed by the thrust cone and open at the time of thrust cone separation allowing a relay to switch telemetry channels 7 and 9 from the retro to the parachute events. At the time of programmed thrust cone separation channel 9 dropped from full bandwidth to 0% of bandwidth and remained at this level for 1.2 seconds. Channel 7 remained at full bandwidth during this time. At the end of this 1.2 second period, the normal thrust cone off signature was observed on both channels 7 and 9. It appears that voltage was interrupted to channel 9 for 1.2 seconds and that thrust cone separation occurred out of tolerance. No explanation of this malfunction is available and the system schematics do not indicate any possible way for this anomaly to occur. However, it appears that this is a problem inherent to the system as this malfunction has been noted on another recovery monitored on telemetry. Analog traces for the thrust cone separation for both of these recovery systems are included in the Appendix.

[redacted]

The recovered capsule (serial No. USE 616 blossom serial No. 68) showed no signs of damage due to re-entry or air catch. Diagrams showing the location of temp-plates and the temperatures encountered during re-entry and a plot of the re-entry trajectory are presented in the Appendix.

The spin rate as derived from telemetry data was 64 RPM during retro. The spin rate after de-spin was 9.9 RPM and the retro velocity was approximately 930 ft./sec.

[redacted]

TABLE II

Recovery Event Times

Event	System Time	Time From Transfer
Transfer	8116.11	0
Electrical disconnect	8117.05	.94
Separation	8118.1	1.99
Spin	8120.49	4.38
Retro	8121.75	5.64
De-Spin	8132.57	16.46
Less of excitation (ch 9)	8134.04	17.93
Thrust Cone Separation	8135.25	19.14
Voltage Monitor Closed	8224.19	108.08
"G" Switch Open	8684.21	568.10
Parachute Cover Off	8716.95	600.84
Drogue Chute Deployed	8717.50	601.39
Drogue Chute Off	8728.5	612.39
Main Chute Disreefed	8732.9	616.79

* Programmed time of thrust cone ejection.

** Dependent on deceleration below 3 G's.

[redacted] [redacted] 26 June 1963

X. APPENDIX

List of Figures

[redacted] [redacted]

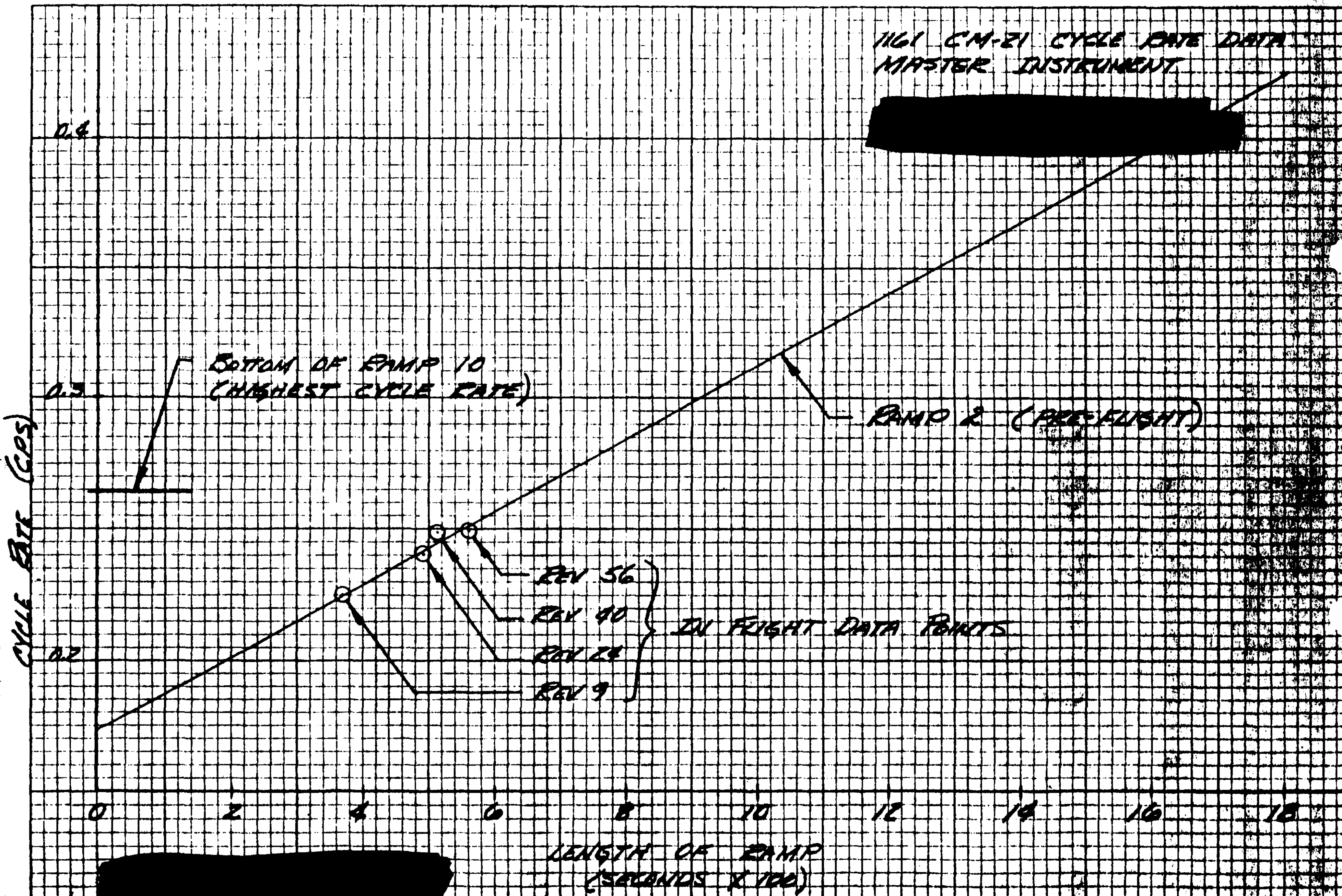
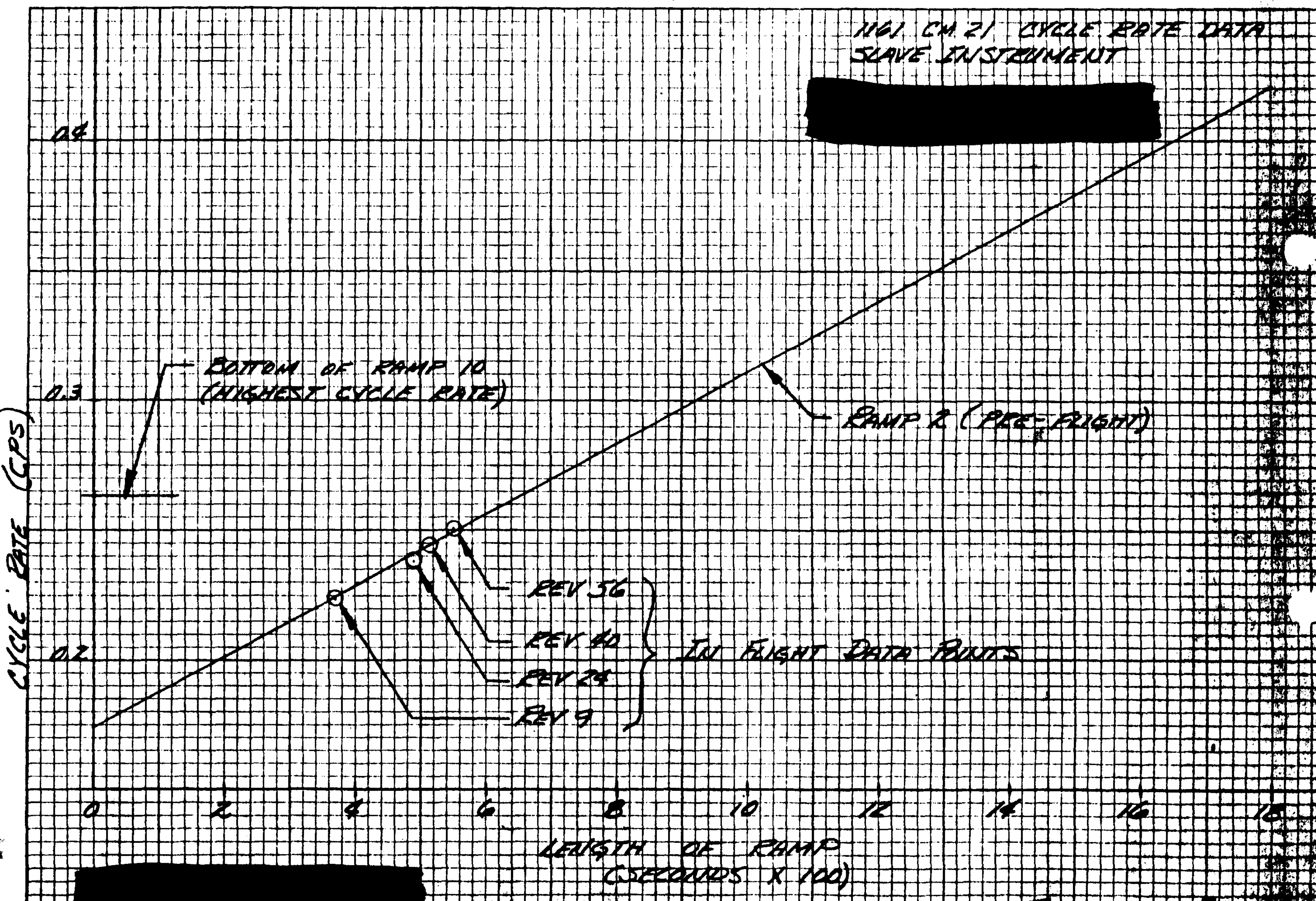

1161 CM-21 CYCLE RATE DATA
MASTER INSTRUMENT
[redacted]
0.4
0.3
0.2
CYCLE RATE (CPS)
BOTTOM OF RAMP 10
(HIGHEST CYCLE RATE)
RAMP 2 (PRE-FLIGHT)
REV 56
REV 40
REV 24
REV 9
IN FLIGHT DATA POINTS
0
2
4
6
8
10
12
14
16
18
LENGTH OF RAMP
(SECONDS X 100)
[redacted]

FIGURE 1

[redacted]



[redacted]

FIGURE 2

340R-L310 DIETZGEN GRAPH PAPER
LOGARITHMIC · 3 CYCLES X 10 DIVISIONS

EUGENE DIETZGEN CO.
PRINTED IN U.S.A.

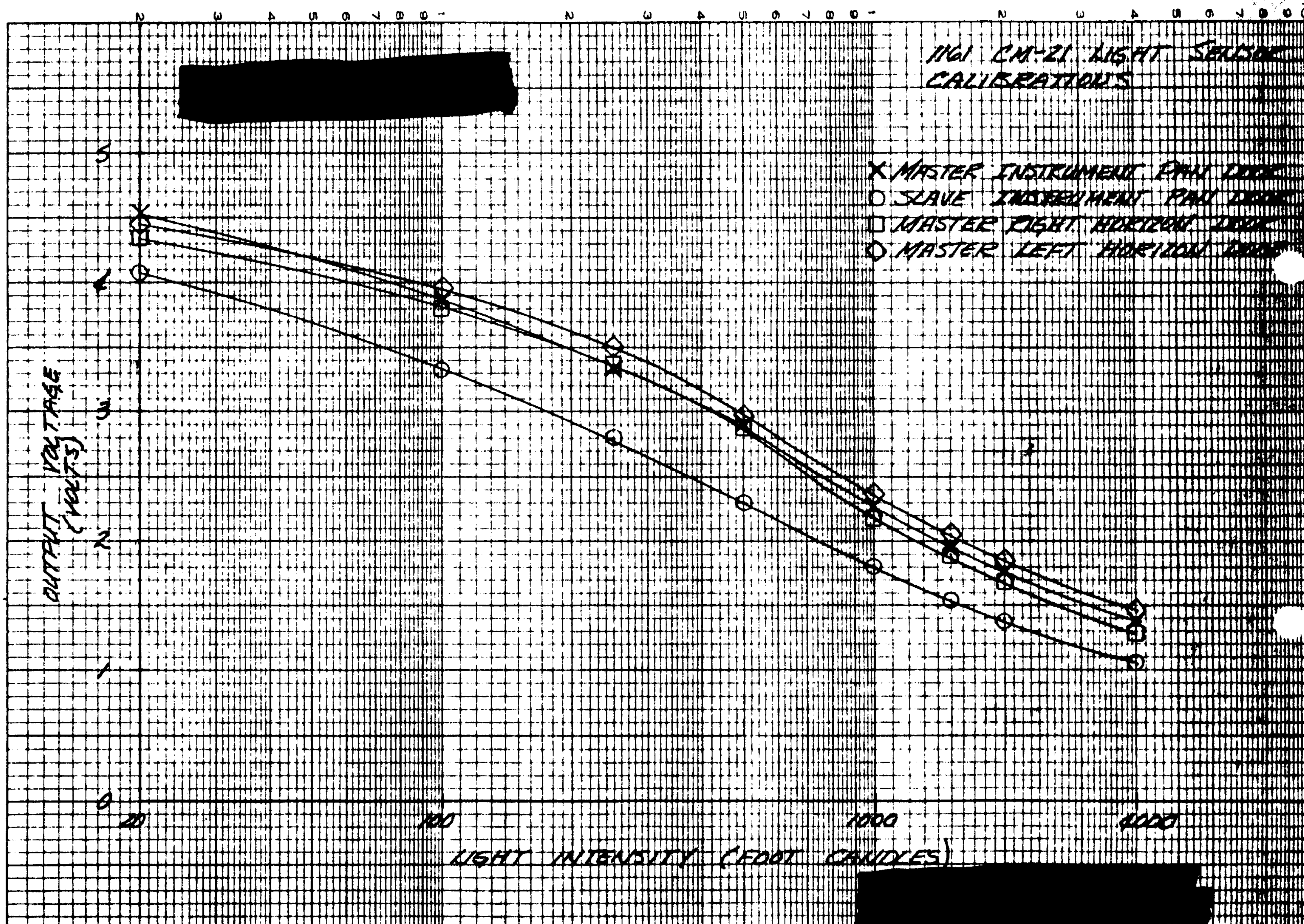
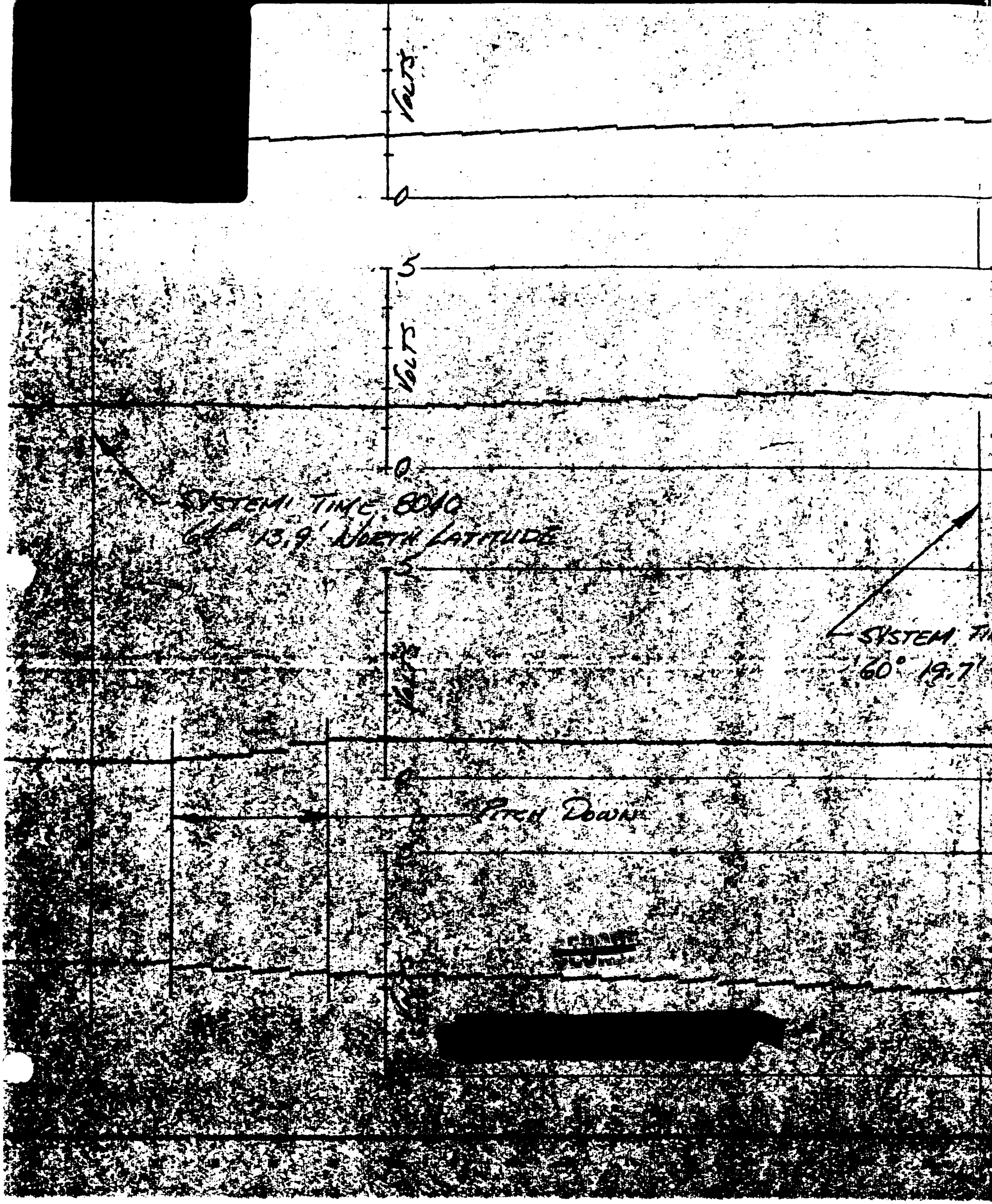


FIGURE 3

[redacted]

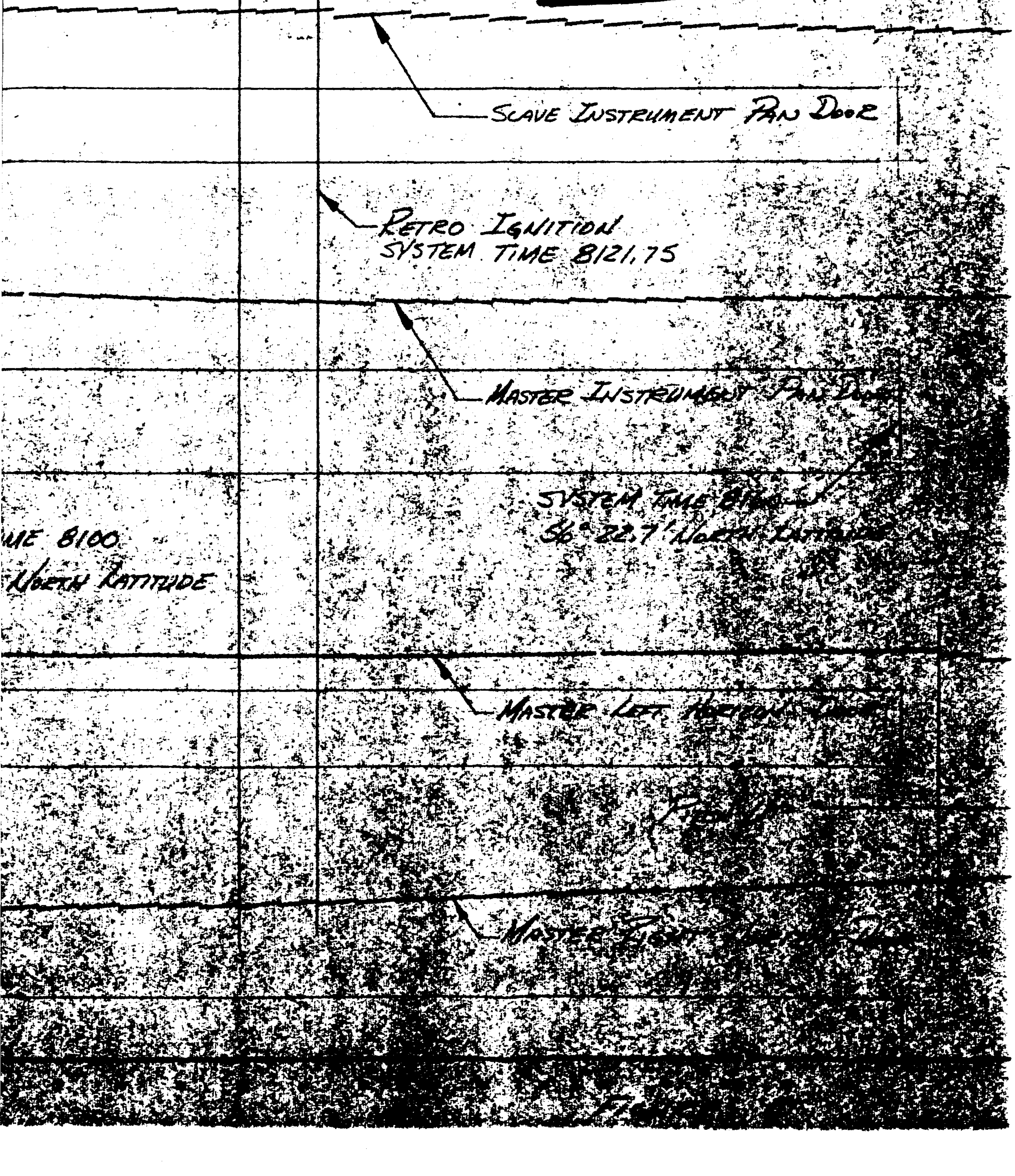


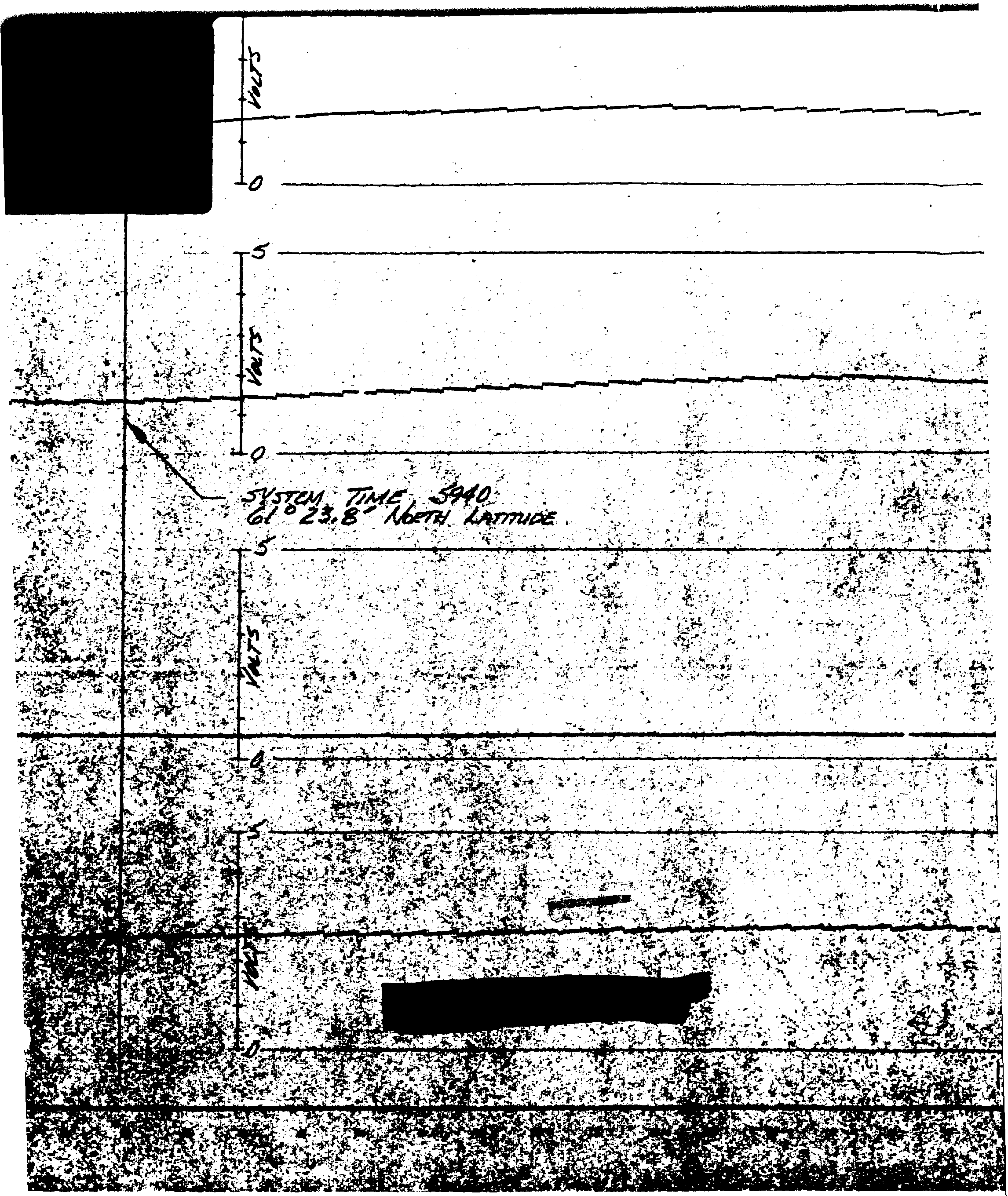
[redacted]

[redacted]

EXPERIMENT ORBIT 65

SECRET [redacted]





[redacted]

[redacted]

[redacted]

EXPERIMENT. ORBIT 17.

[redacted]

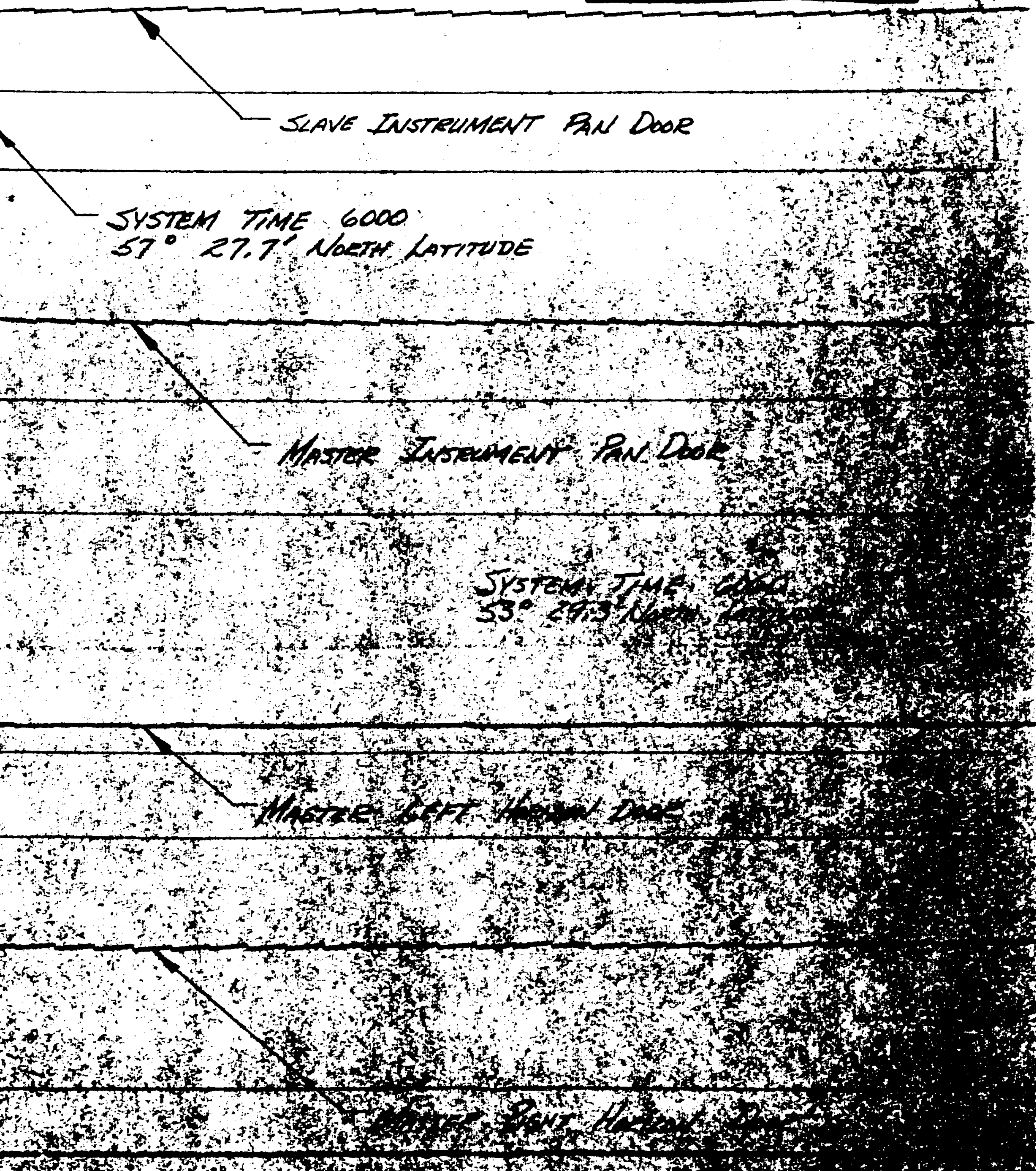
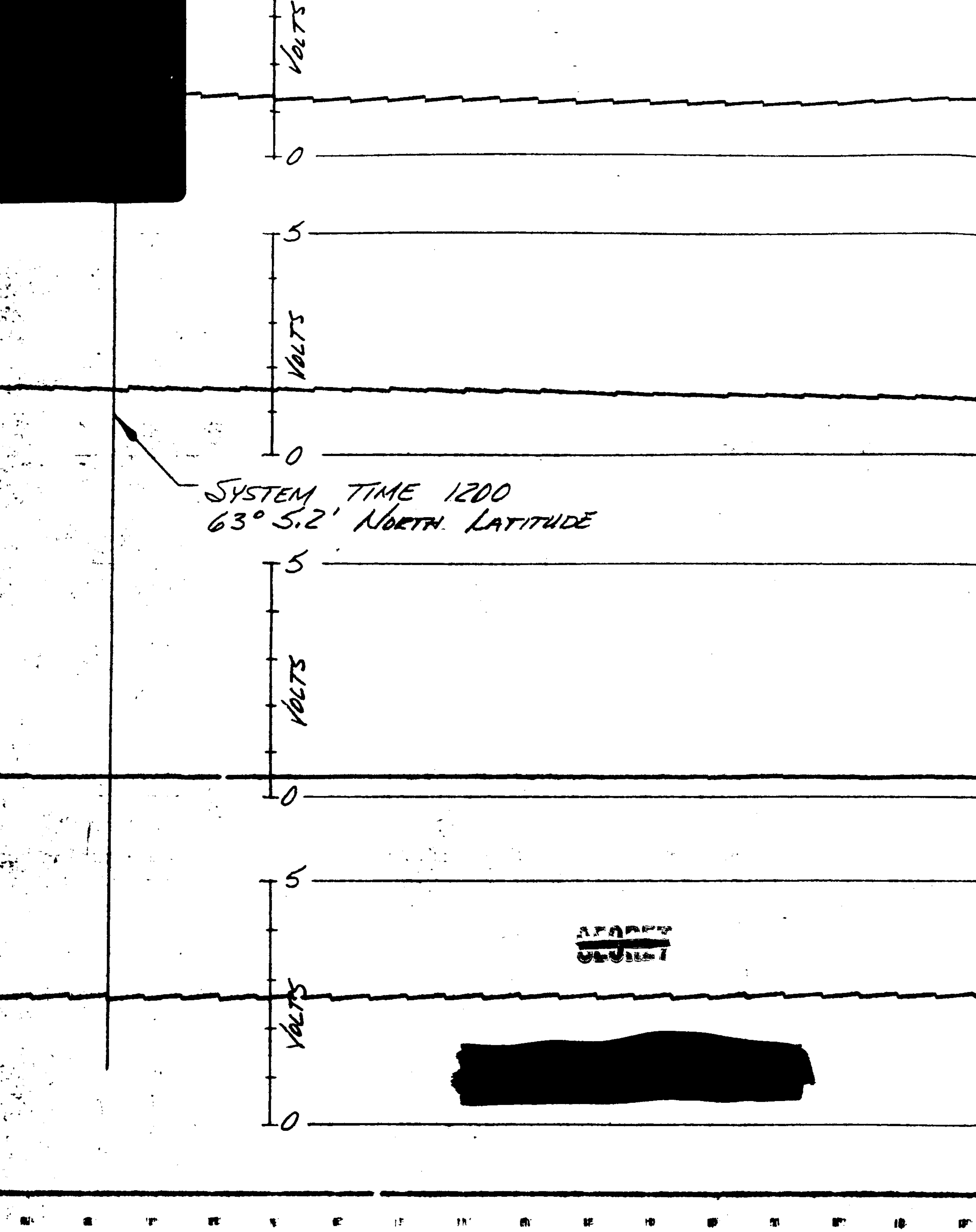


FIGURE [illegible]

[redacted]



[redacted]

[redacted]

1161 CM-21 LIGHT SENSOR
EXPERIMENT ORBIT 32

[redacted]

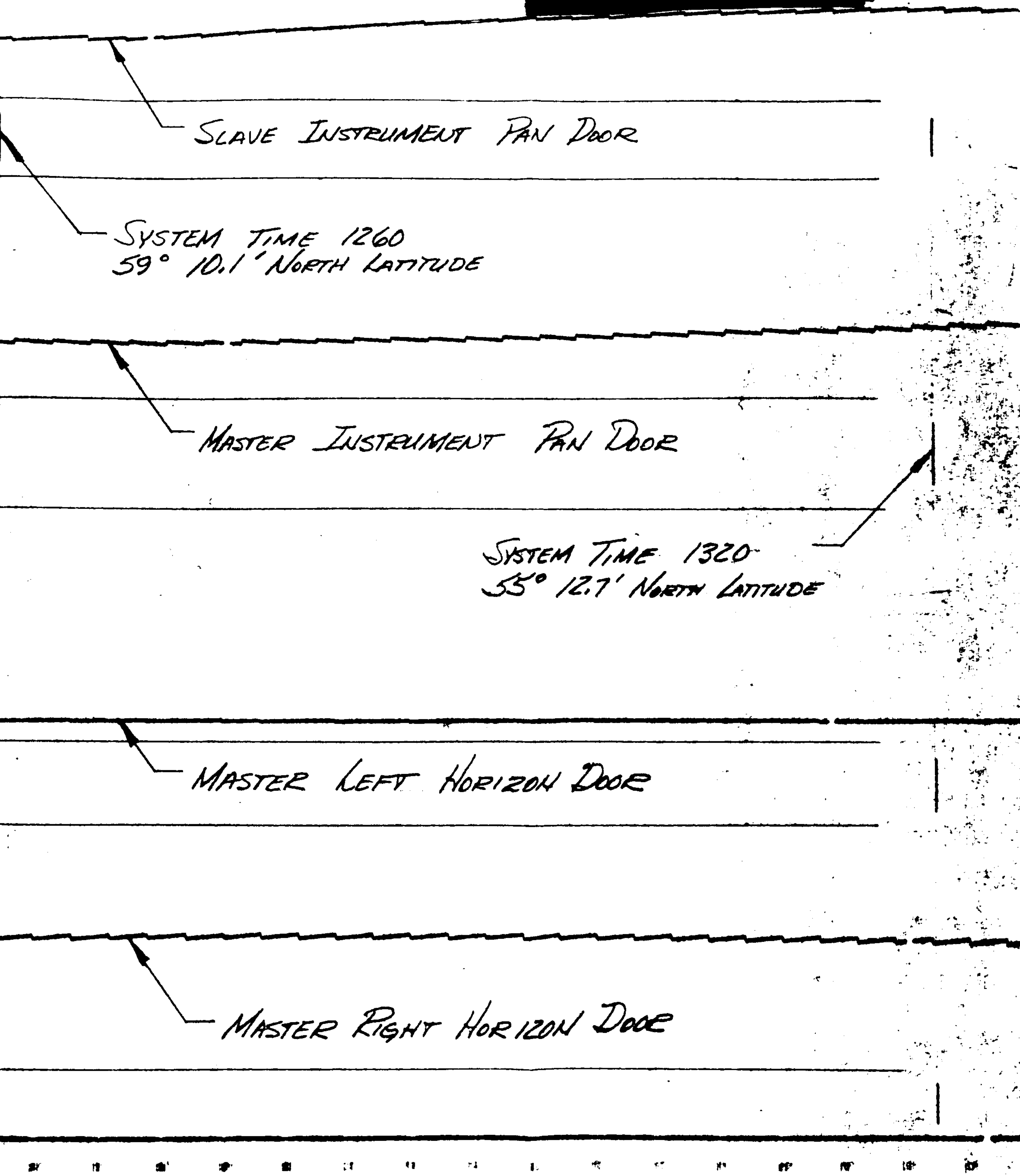
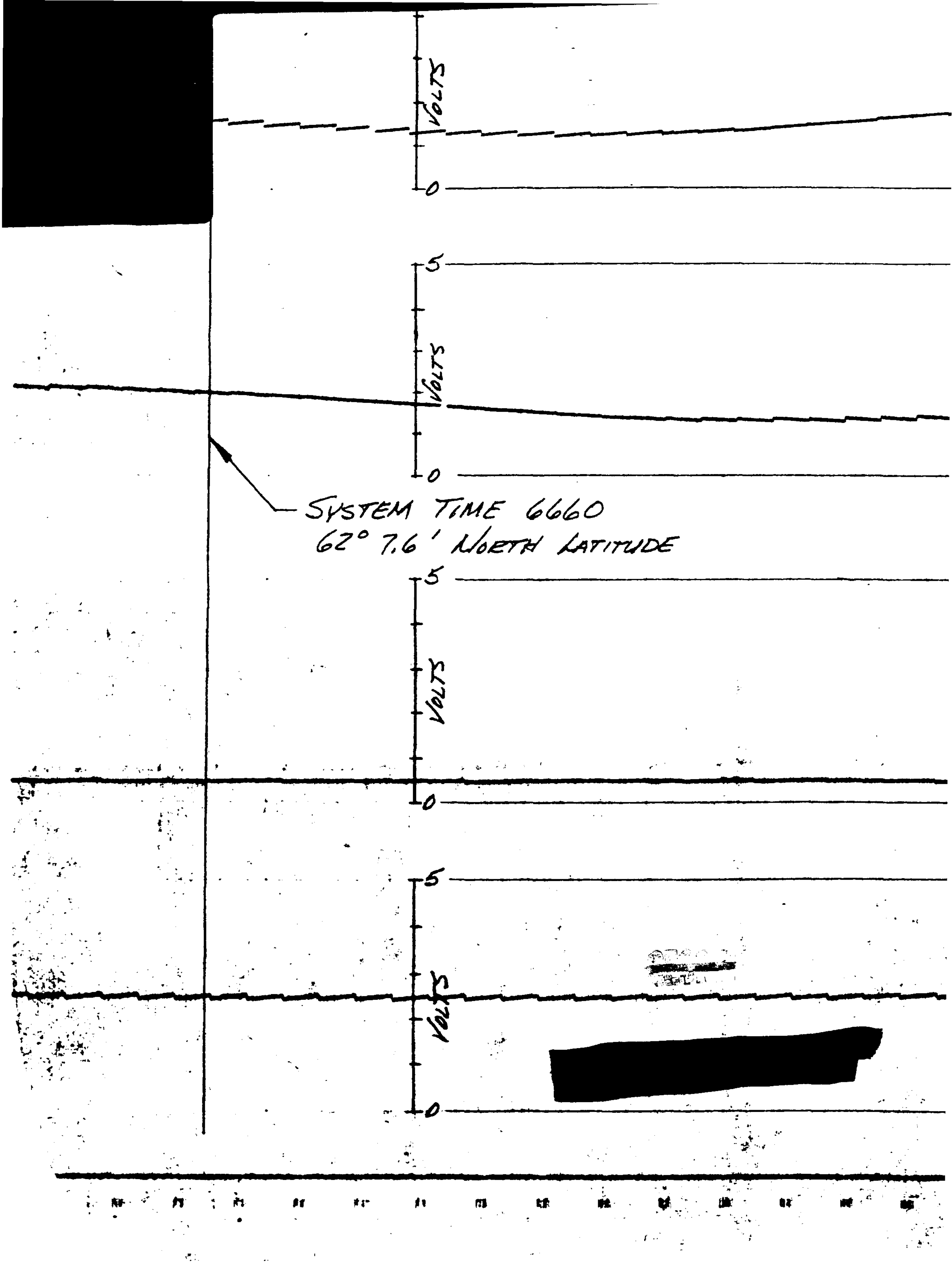


FIGURE 5


VOLTS
0
5
VOLTS
0
SYSTEM TIME 6660
62° 7.6' NORTH LATITUDE
5
VOLTS
0
5
VOLTS
0
[redacted]

1161 CM 21 LIGHT SENSOR
EXPERIMENT ORBIT 33

[redacted]

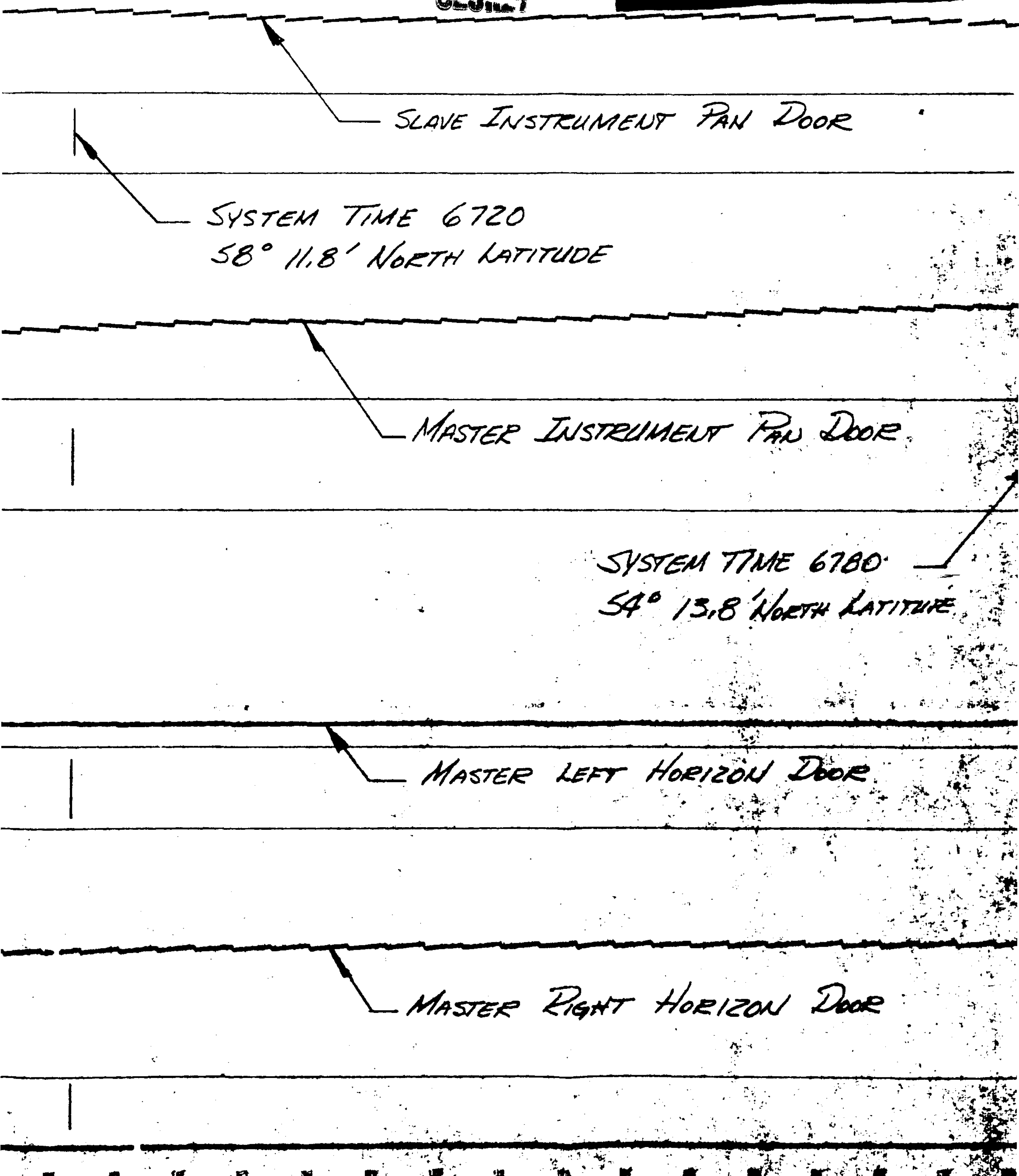
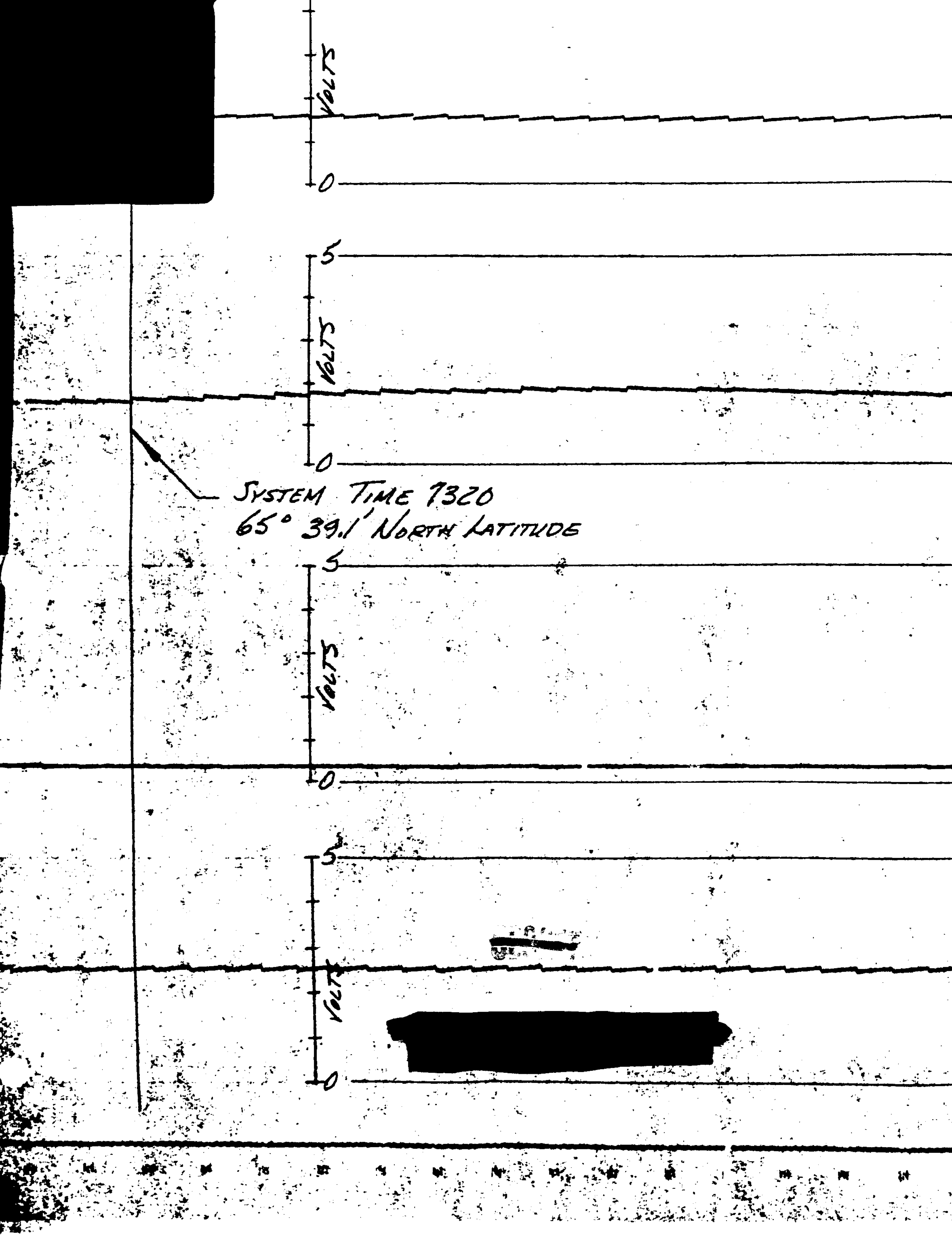


FIGURE 6



[redacted]

[redacted]

[redacted]

1161 CM-21 LIGHT SENSOR
EXPERIMENT ORBIT 49

[redacted]

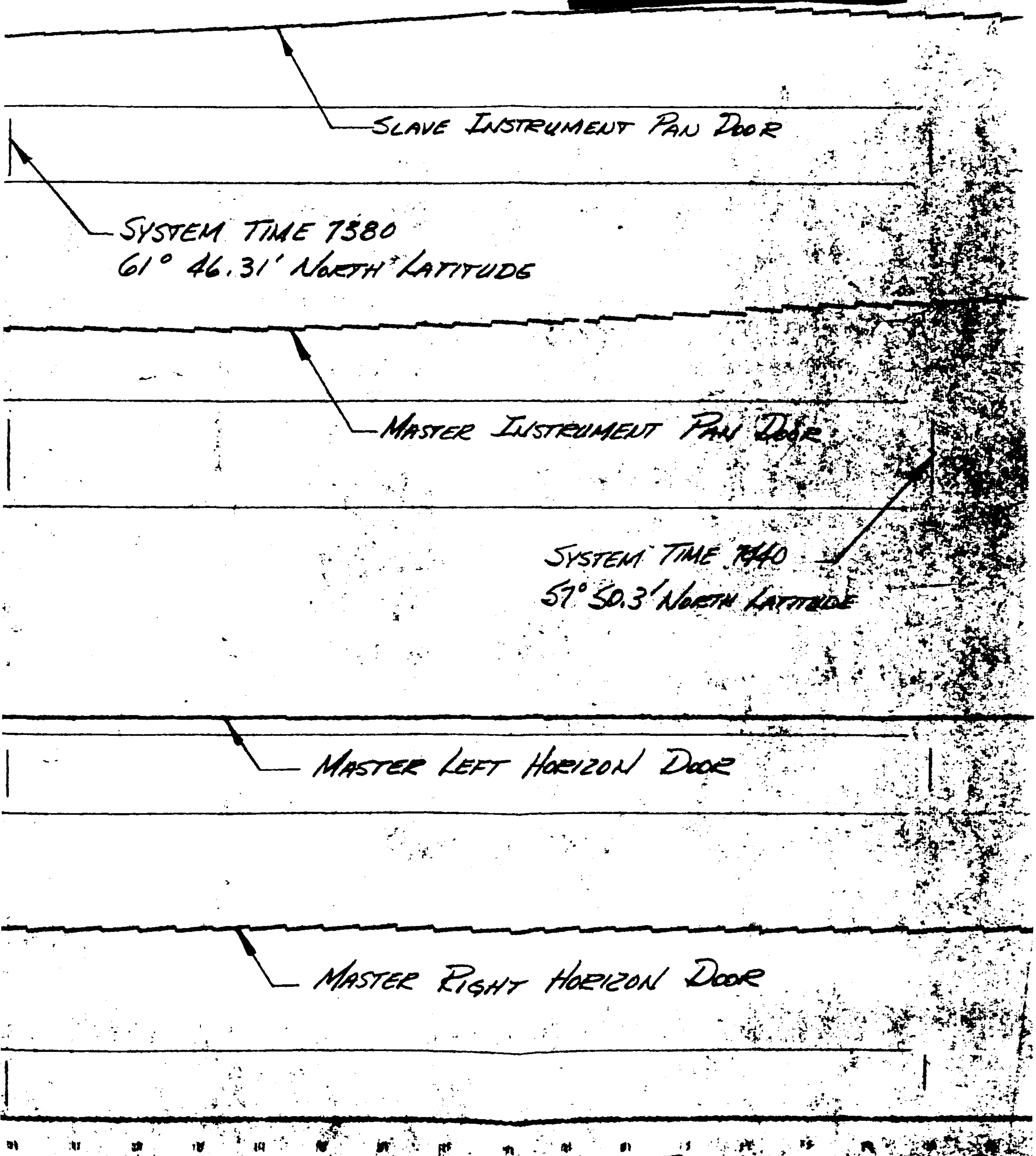
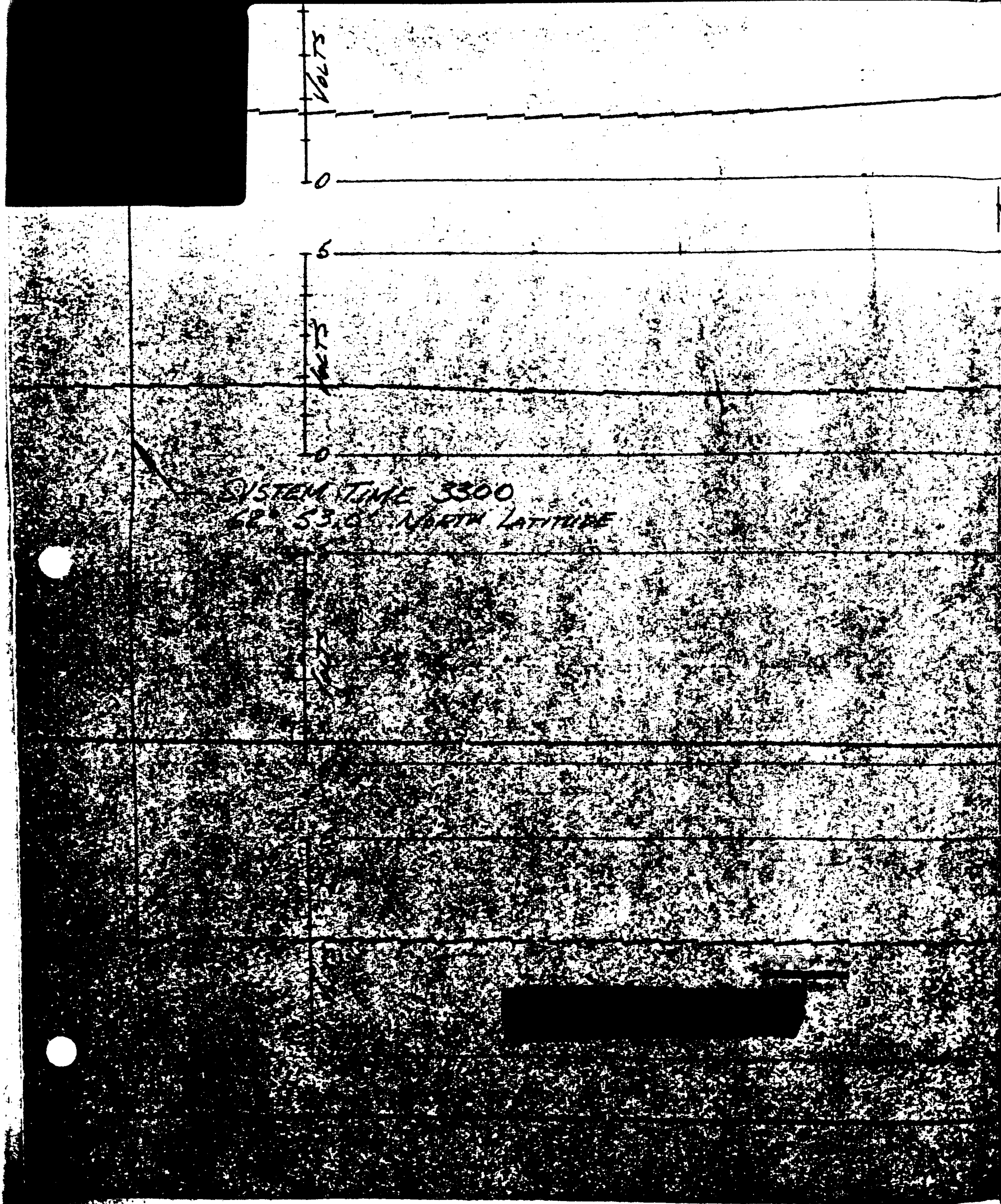


FIGURE 7

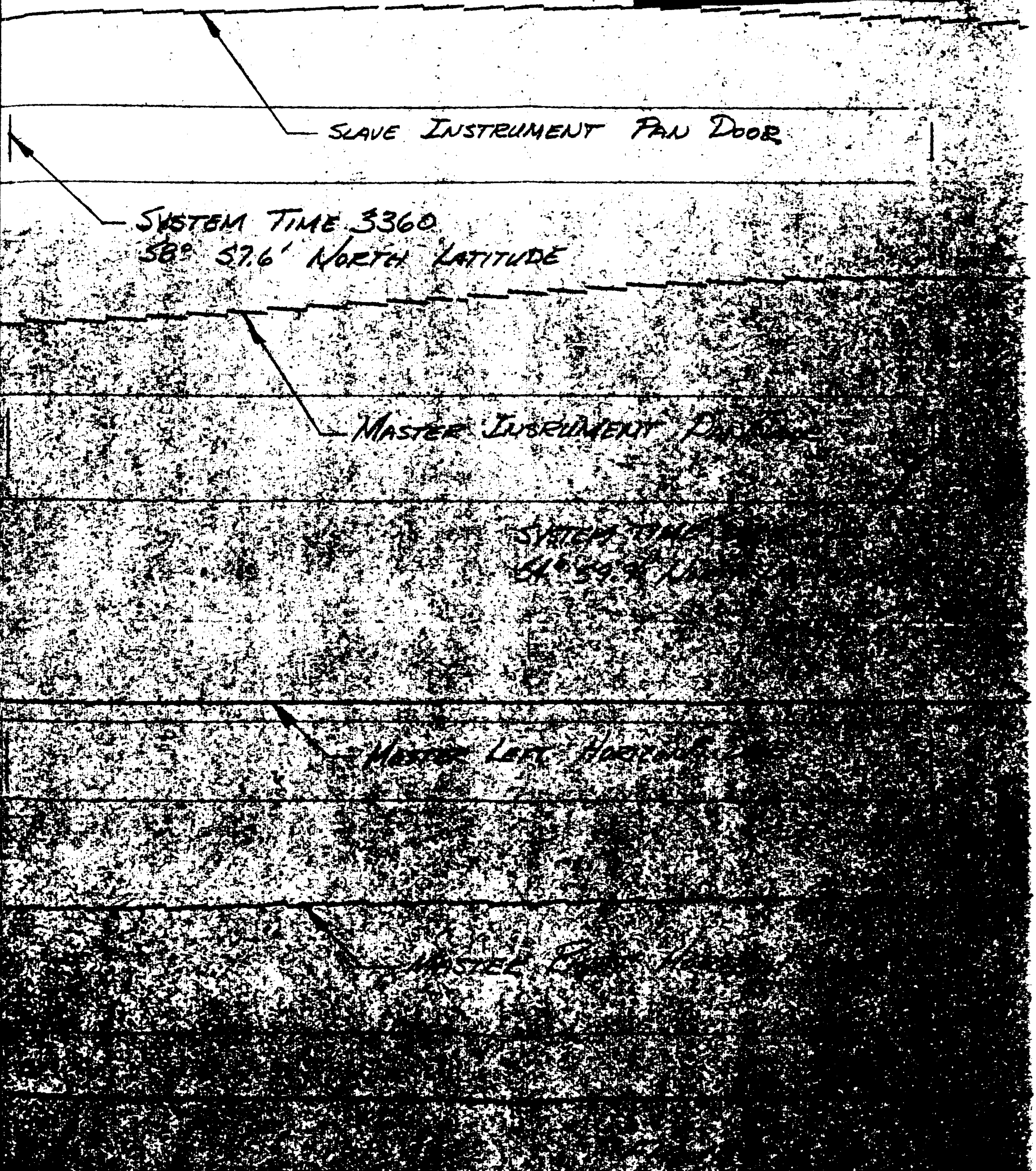
[redacted]



[redacted]

EXPERIMENT [illegible]

~~SECRET~~ [redacted]



[redacted]

TEMPERATURE DATA 1161 CM 21
ORBIT & STATION

Temp Sensor	Lau.	01	02	09	14	16	17	17	18	24	30
[redacted]											
Inst. #1											
2	60	86	93	90	89	89	87	88	89	89	88
5	76	87	88	86	84	86	83	84	86	86	85
7	70	88	96	93	93	92	90	93	93	90	91
11	100	98	98	88	93	86	85	86	93	87	86
12	90	90	83	76	74	76	73	74	78	77	75
13	64	93	93	88	88	86	85	85	87	87	86
Inst. #2											
2	71	88	97	98	96	98	95	98	99	98	98
4	74	94	100	98	98	98	95	98	103	98	99
6	71	89	92	90	88	88	87	88	90	90	89
7	74	91	100	98	98	98	97	98	100	98	98
11	81	96	98	93	92	101	101	102	95	90	96
12	78	96	103	98	101	101	99	101	105	98	100
13	62	88	93	93	91	93	94	95	93	92	93
Clock											
1	98	113	100	86	84	84	83	83	84	86	83
2	105	105	92	78	76	75	75	75	76	77	74
Thrust Cone											
1	96	101	102	88	96	96	91	96	96	96	93
2	-	101	97	95	88	89	81	85	87	85	83
Cassette											
2	110	103	97	69	64	63	60	62	64	63	62
Fairing											
4	-	125	124	94	109	105	99	109	113	94	106

[redacted]

[redacted]

FIGURE 10

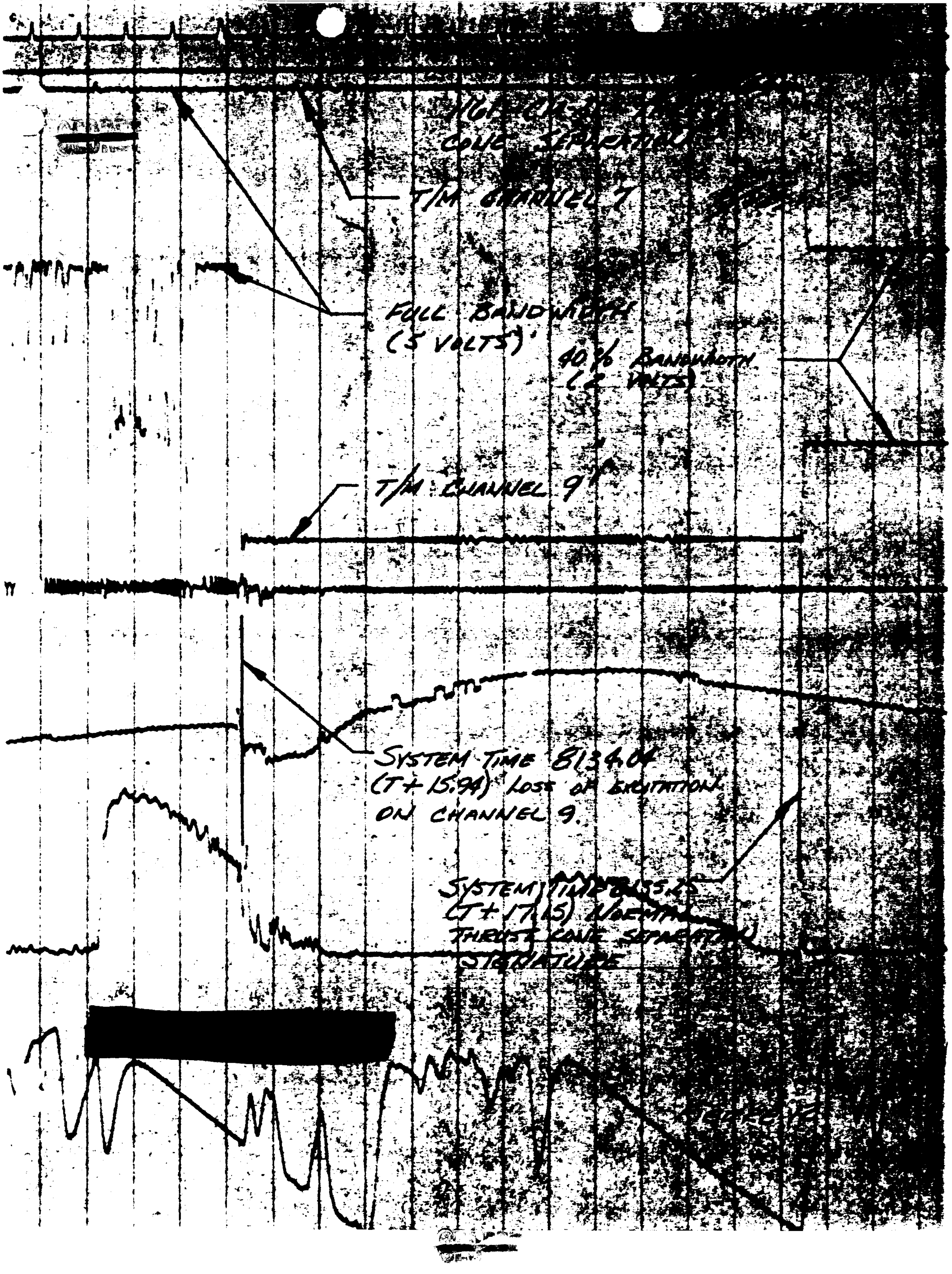
TEMPERATURE ATA 1161 CM 21
ORBIT & STATION

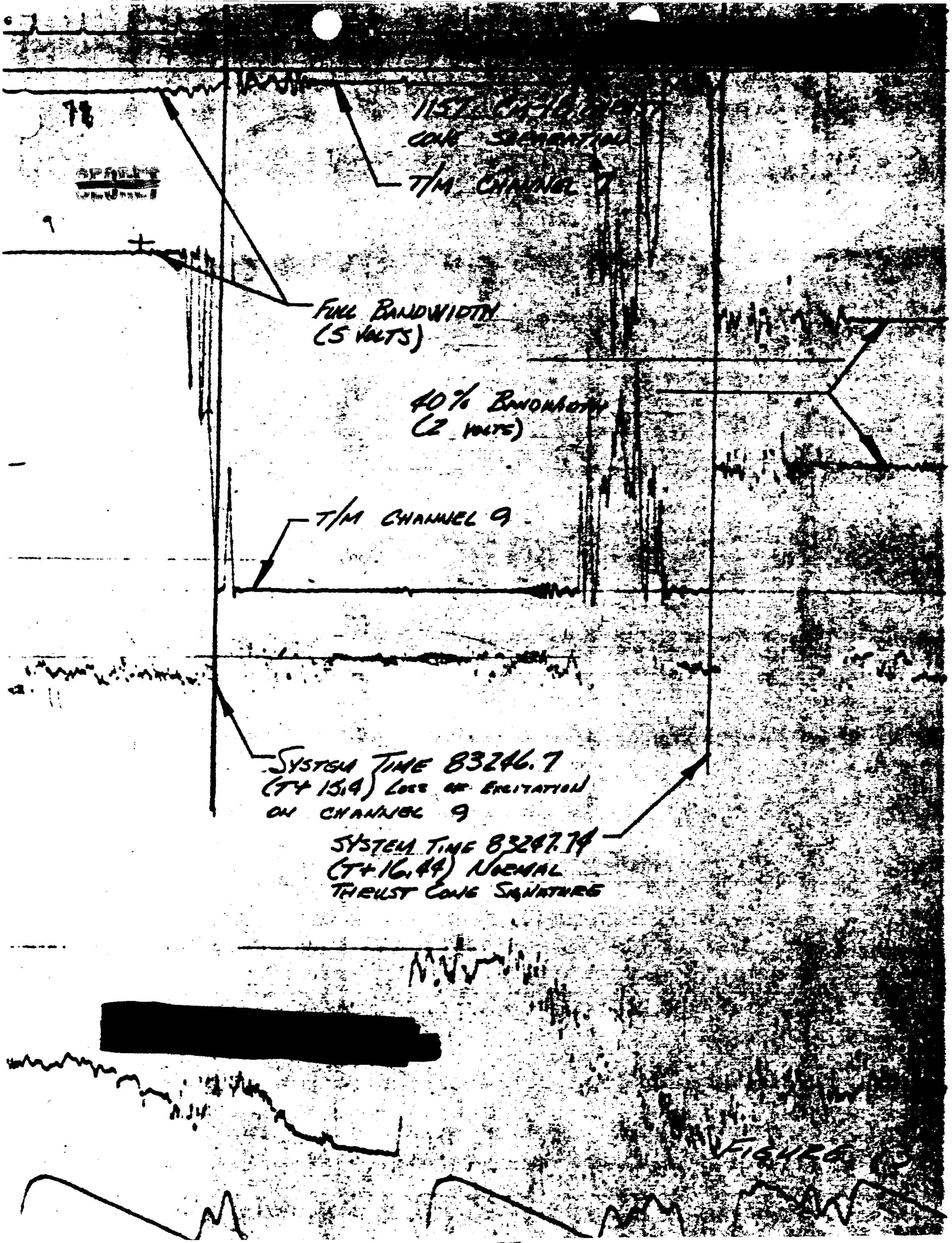
Temp Sensor	31	32	33	33	40	47	56	61	63	65
Inst. #1	[redacted]									
2	90	88	88	90	90	87	89	[redacted]	[redacted]	88
5	86	83	84	86	86	84	86	83	83	84
7	93	90	91	93	93	92	92	90	90	89
11	86	83	86	90	86	87	86	83	86	84
12	76	72	74	76	76	75	76	72	74	72
13	86	83	84	86	88	84	87	84	84	85
Inst. #2										
2	98	95	98	99	98	97	97	95	95	95
4	98	95	99	103	98	99	99	94	98	93
6	88	88	89	90	93	89	90	87	88	88
7	98	96	98	100	98	99	97	95	97	95
11	100	100	97	99	93	99	90	97	96	93
12	100	98	100	105	100	103	98	95	100	94
13	93	93	93	94	93	94	90	91	87	92
Clock										
1	83	83	83	84	86	83	86	85	84	85
2	75	74	75	76	78	75	76	75	74	76
Thrust Cone										
1	97	90	95	98	96	95	95	89	94	90
2	88	80	84	90	86	87	85	77	88	79
Cassette										
2	62	60	63	64	62	65	65	61	61	61
Fairing										
4	104	102	104	108	94	106	89	102	115	102

[redacted]

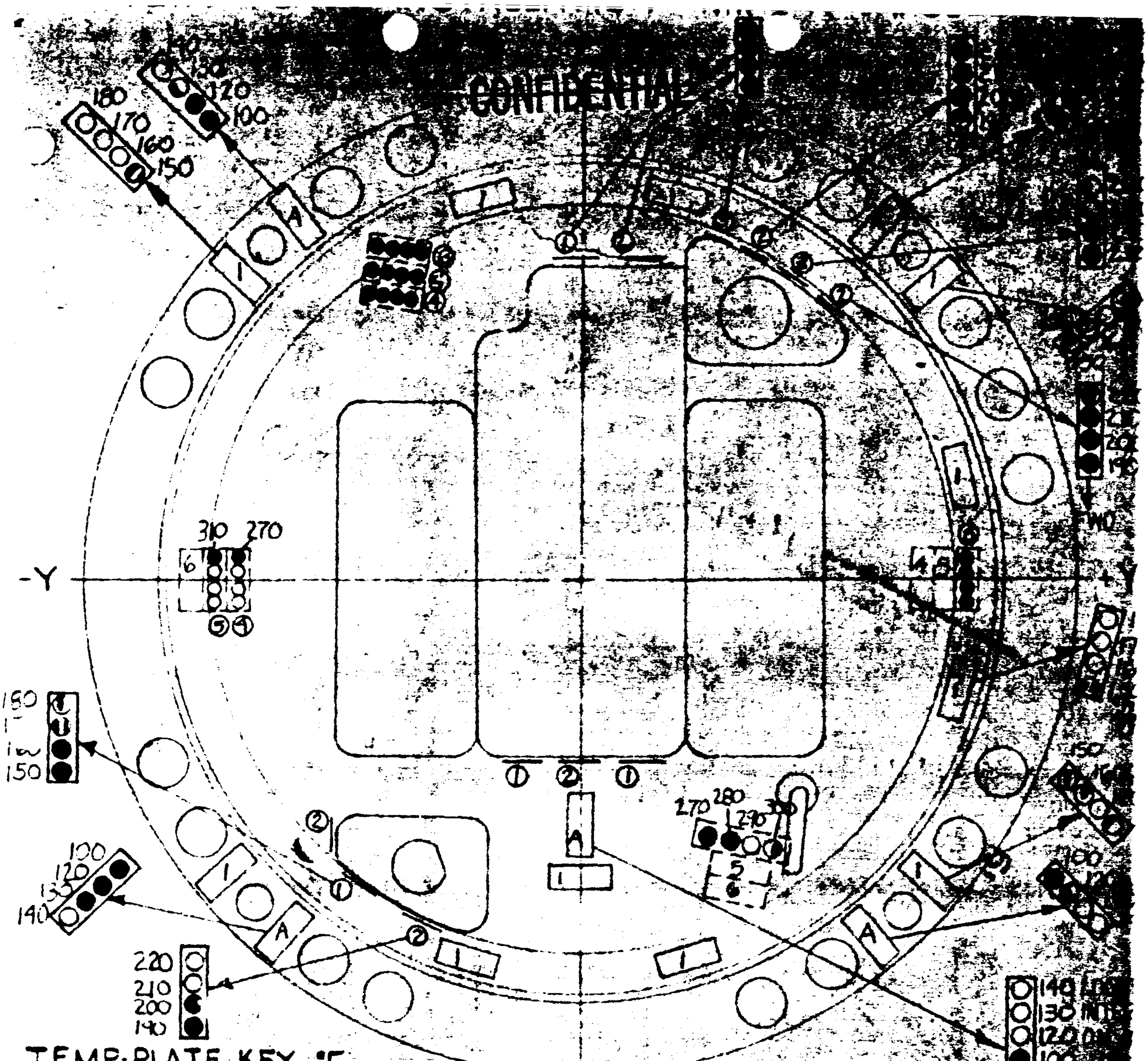
[redacted]

FIGURE 11


T/M CHANNEL 7
FULL BANDWIDTH (5 VOLTS)
40% BANDWIDTH (2 VOLTS)
T/M CHANNEL 9
SYSTEM TIME 8134.04 (T+15.94) LOSS OF EXCITATION ON CHANNEL 9.
SYSTEM TIME
(T+17.15)
SIGNATURE
[redacted]


SECRET
T/M CHANNEL 7
FULL BANDWIDTH (5 VOLTS)
40% BANDWIDTH (2 VOLTS)
T/M CHANNEL 9
SYSTEM TIME 83246.7 (T+15.4) LOSS OF EXCITATION ON CHANNEL 9
SYSTEM TIME 83247.74 (T+16.44) NORMAL THRUST CONE SIGNATURE
[redacted]

SECRET



TEMP-PLATE KEY °F

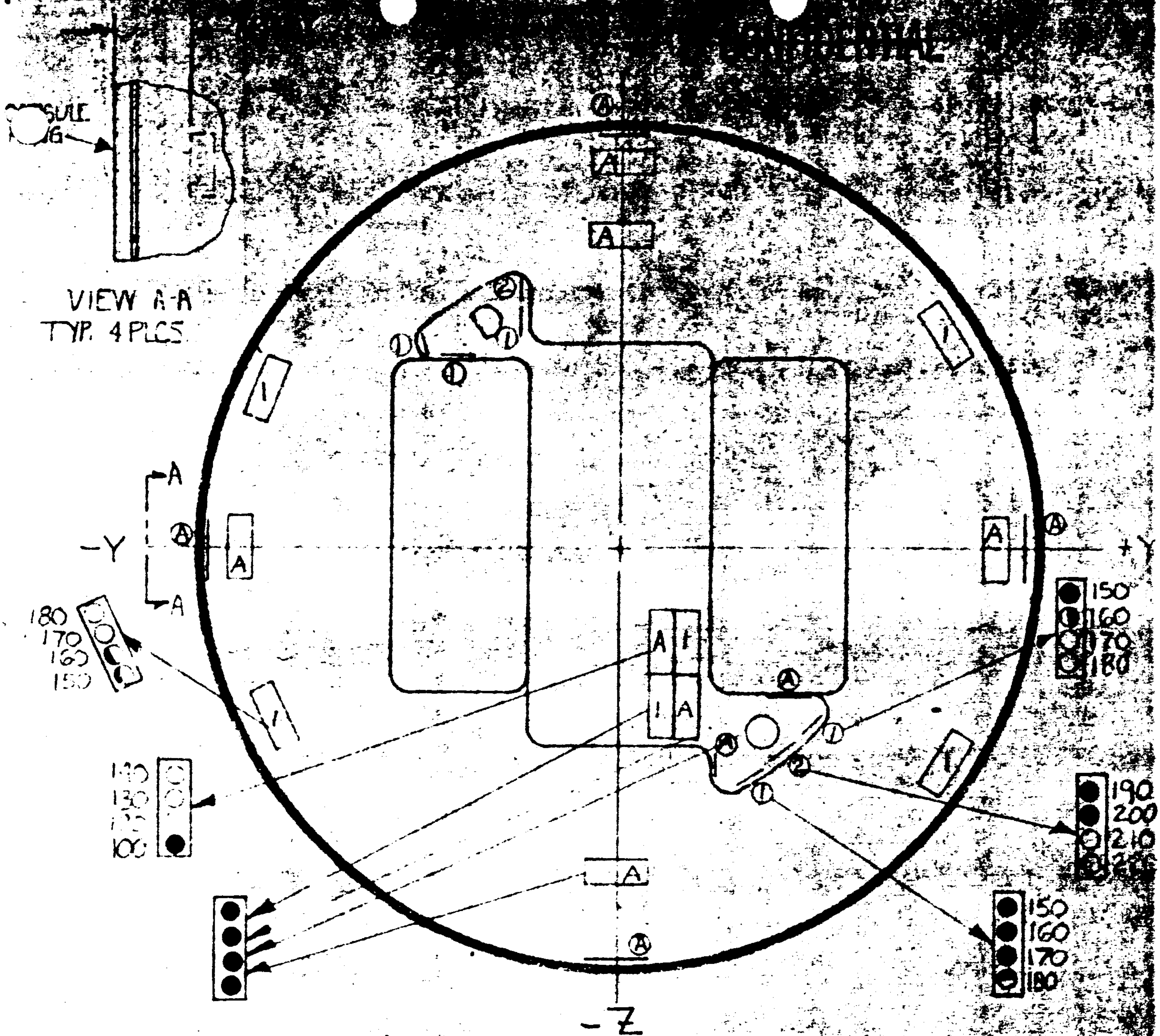
A - 100·120·130·140
1 - 150·160·170·180
2 - 190·200·210 220
3 - 230 240·250·260
4 - 270 280 290·300
5 - 310·320 330 340
6 - 350 360 370 380
7 - 390 410·435·450

LOOKING FORWARD
VEHICLE 1161
(16TH USE OF TEMP-PLATES)

● INDICATOR TURNED BLACK TEMP. REACHED OR EXCEEDED INDICATED LEVEL

TEMP-PLATE LOCATED ON PARACHUTE RISER

FIGURE 14



LOOKING AFT (INTERNAL CAPSULE)
VEHICLE 1161
(16TH USE OF TEMP-PLATES)

TEMP PLATE KEY °F

A- 110 · 120 · 130 · 140
1 - 150 · 160 · 170 · 180
2-190 · 200 · 210 · 220
3-230 · 240 · 250 · 260
4 - 270 · 280 · 290 · 300
5 - 310 · 320 · 330 · 340
6 - 350 · 360 · 370 · 380
7 - 390 · 410 · 435 · 450

● INDICATOR TURNED BL[illegible]
TEMP. REACHED OR EX[illegible]
CEEDED INDICATED LE[illegible]

~~CONFIDENTIAL~~

FIGURE 15

K&E 10 X 10 TO THE ½ INCH 359-11
KEUFFEL & ESSER CO. MADE IN U.S.A.