SURVEYOR VI
TELEVISION DATA PACKAGE
1968

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ACKNOWLEDGEMENTS

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TELEVISION DATA PACKAGE DESCRIPTION

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INTRODUCTION

The information included in this document contains supporting material to assist scientific analysis of the Surveyor VI television data. The contents are arranged to provide the following:

a) The calibration section explains and contains the calibration data available for the image and TV Identification data. Included are the light transfer functions delineating the transfer characteristic from input lunar luminance to the film density of the duplicate negative. Additional calibration is provided to show the shading response of the camera and film recorder system and to show the extent and location of vidicon blemishes.

b) The operations information section includes a brief description of camera performance, the Surveyor VI landing location and spacecraft attitude, and the ephemeris of the stars and earth when viewed by the Surveyor VI television camera. Also, the mission sequence log, listing the type and period of science operations, is enclosed.

c) The image data description section describes the image format of the duplicate negative and the format of the mosaics included, in addition to listing these mosaics. A description of the digital computer processing used to prepare the digitally enhanced pictures contained in the mission data package is given.

Introduction (cont.)

d) The television identification data description section gives the human and machine readable portions of the duplicate negative and identifies the parameters on the film and summary listing. By providing a blank computer magnetic tape to the

National Space Science Data Center
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a user may obtain an IBM 7094 Fortran II or Fortran IV (user specified) compatible recording of the time sorted television identification data. The format of this recording is described in this section.

e) During lunar sunset, some of the pictures were taken in the integrate mode. These sunset time exposure frames with their iris settings, azimuths and elevations are listed.

Surveyor VI carried a single fixed mounted television camera using a movable mirror to scan the lunar surface. Two modes of vidicon or electronic scanning were included, 200 line and 600 line. The scanning raster used for both modes was 11 mm by 11 mm. The sequence of lunar operations included both, but the latter was emphasized. Of the close to 30,000 frames taken during the Surveyor VI mission, only 18 were in 200 line mode.

JPL PROJECT DOCUMENT 602-49

SURVEYOR VI SPACECRAFT
SURVEY CAMERA
SCIENCE CALIBRATION REPORT

602-49 1 November 1967

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INTRODUCTION

On 18-21 September 1967, the television camera system of the Surveyor VI Spacecraft (SC-6) was calibrated by a JPL team. The calibration was conducted according to JPL Test Procedure ETP-SUR-001-F and utilized JPL calibration equipment -- including a light source, slide transparencies, and a video tape recorder.

The test collected accurate data for verification of the Television Ground Data Handling System (TV-GDHS) for use by the Space Science Analysis and Command (SSAC) group during Surveyor Mission F operations, and in postflight data processing.

CALIBRATION CONTENT

Procedures for this scientific calibration were based on past Ranger calibration experience and experience gained from Surveyor SC-1 through SC-5 calibrations. The main parameters were light transfer characteristics, sine wave response, geometric linearity, polarimetric constants, and erasure characteristics.

Calibration was performed in both 200- and 600-line TV scan modes and in both normal-shutter and open-shutter exposure modes for the narrow-angle field of view. In the 600-line scan mode, the polarizing filter light transfer characteristics were taken and automatic-iris and commanded-iris position repeatability measurements were made.

All of the above calibrations were performed via spacecraft Transmitter A. Brief tests were made on Transmitter B and for the wide angle field of view.

Calibration data on the constants for reduction of video data were obtained. (Photometric charts on the spacecraft were calibrated at JPL previously.) Photogrammetry calibration was also performed.

Data were recorded on a modified Ampex VR 1560 portable video recorder, and selected single-line scans at the center (vertically) of the TV frame were recorded on Polaroid film by using an A-scan oscilloscope presentation.

EQUIPMENT AND DATA RECORDING

A special light source and calibration slides were developed by JPL to permit continuous luminance level changes and monitoring, coupled with rapid slide interchangeability. The light source has xenon lamps in conjunction with an integrating hemisphere. Resulting performance includes a field uniformity of 3 percent with a luminance range of 4 foot-lamberts to 2500 foot-lamberts, continuously adjustable by means of an iris control. Calibration slides are constructed of appropriate 8-inch-square film negatives mounted between glass plates, which in turn are mounted and retained in the light source. The slides individually consist of a 10-level grey wedge for erasure determination, low-contrast sine wave slides for sine wave response measurements, and accurately-measured grid pattern for geometric distortion calibration. A rotatable polarizing target is used to determine polarization constants. In addition, two scan slides are used to provide a visual indication of frequency response.

The recording/playback configuration and equipment are depicted by a block diagram (Figure 1). The predetection signal is recorded, providing calibration information free from unknown factors and nonlinearities associated with the normal video test equipment. The tape recorder consists of an Ampex VR 1560 rotating-head, helical-scan machine modified to a VR-660 configuration. Other modifications allow direct-level recording as well as recorder-servo control when applying non-standard (slow-scan) video information. Video information is obtained from the first IF stage of the receiver in the System Test Equipment Assembly (STEA), at which point the carrier frequency is 50 Mc. This 50-Mc signal is amplified in the JPL equipment and then converted to 4 megacycles. In the 600-line scan mode, this 4-Mc signal is hard limited and applied to the predetection input (direct record) of the recorder. In the 200-line scan mode, the 4-Mc signal is further converted to 500 kc and then applied FM-FM to the recording machine.

The 600-line scan mode playback is accomplished by demodulating the 4-Mc carrier through a carefully calibrated pulse-averaging type demodulator to obtain the baseband video signal. The 200-line scan mode playback required another frequency conversion to 70 kc for demodulation through an existing 70-kc demodulator.

Resultant calibration tapes were played into the GDHS system at Goldstone on 11 October, 1967. Consequent data at Station TV-11 (Goldstone) and Station TV-1 (Pasadena) is in the form of 35- and 70-mm film and tape recordings on Ampex FR 1400 and FR 800 recorders. These tapes represent an overall S/C camera-GDHS system calibration and are the principal calibrations which will be used in processing the Mission F lunar pictures. The analysis presented in this report is obtained principally from the examination of the single-line Polaroids obtained during the ETR calibration.

Introduction (cont. 2)

Accompanying each image transmission were 13 camera parameters, the television identification (TVID) data. The Surveyor VI camera system was nominally identical to the Surveyor I camera system. Therefore, a detailed engineering description of the Surveyor VI camera system can be found in JPL Technical Report No. 32-1023, Surveyor I Mission Report, Part III Television Data, Section II Television Subsystem, by Donald R. Montgomery, pages 3 to 17.

The television data transmitted by the Surveyor VI was received by the world-wide Deep Space Stations (DSS) of the JPL managed and operated tracking network, the Deep Space Net (DSN). Control of the mission was exercised from the Space Flight Operations Facility (SFOF) at JPL in Pasadena. The primary recording facilities for television data were at Goldstone, California, and at the SFOF facilities connected to the Goldstone DSS via a 6 mc microwave link.

Image and TVID data were recorded on film and magnetic tape during Goldstone (Station 11) view periods both at Goldstone and the SFOF. Overseas data were recorded only on magnetic tape and then replayed through the SFOF film recorder. The source of the image data for each frame is identified by the process code which is described in Section 5. TVID data were validated and reconstructed by reference to the command logs, engineering assessments of camera response, and comparison with mosaics.

USE OF CALIBRATION DATA

Data from the calibration have several uses. Principally, the entire calibration tape will be utilized in digital data reduction of pictures received during the mission, as previously mentioned. Geometric distortions can be removed, vidicon shading corrected, camera frequency response fall-off restored, and possibly the transfer characteristic data can be used to convert video output to absolute luminance units. In addition to the recording heretofore mentioned, an abbreviated tape from selected portions of the prime calibration tape was made on 12 October at TV-1 and will be used to calibrate, for each operating day, the Goldstone-SFOF Ground Data Handling System--thus providing a complete end-to-end calibration of the camera system.

Finally, the Polaroid data are used to make camera-characteristic plots for real-time mission operations. From this data, estimates of iris settings for a given sun position and each camera viewing direction can be made. Recommendations as to nonstandard procedures and camera operations take into account such calibration data.

DATA REDUCTION

Luminance Corrections

Since the light source does not have exactly the same energy spectrum as sun light, corrections must be made to the luminance levels of the source so that the data are valid for lunar operations. Surveyor spectral measurements have indicated that the lunar reflection spectrum is essentially identical to the solar spectrum. A correction factor is calculated to give the ratio of source luminance to lunar luminance for equal response from the camera. The light source for SC-6 utilized xenon lamps in special reflectors. The source emission spectrum simulates the solar spectrum rather closely. A comparison of the source with the solar distribution is given by Figures 2 and 3. The correction factor calculation involves the spectra of the camera, the standard eye, the measuring photometer, the light source, the Sun, and the calibration light standard.

During the SC-6 calibration, measurements were made on two light standards -- namely, Gamma Scientific Working Standard Models 200 and 220. Luminance correction factors were calculated using the Model 200 readings. Detailed procedures for the calculation are outlined in JPL Technical Memorandum 32-665. Resultant factors were:

$\frac{\text{Source Luminance}}{\text{Lunar Luminance}}$	Type Filter
1.1459	vidicon + clear filter
1.1292	vidicon + P filter
1.1245	vidicon + N filter
1.1249	vidicon + S filter

Corrections were also made for photometer nonlinearities.

Polaroid Data Graphs

Data for the characteristic curves in this report were obtained by measurement on Polaroid prints, each representing one scan line of video signal. Figure 4 is an idealized drawing of a typical print. The amplitude is scaled by appropriate calibration to the frequency deviation of the spacecraft transmitter carrier. In each curve, the scale is arbitrarily displaced so that sync tip deviation frequency falls on its nominal value of 5 kc and 1.25 Mc for 200- and 600-line scan modes, respectively.

The scan line photographed is selected at the approximate center of the frame, vertically. Response is measured on each print at the same point (the nominal center) on the time scale. Therefore, curves drawn from such data represent response at one point in the frame. Where significant shading exists (Figure 10), transfer characteristics will change accordingly. Variation of data due to incomplete erasure is avoided by recording the first frame after exposure and by allowing ample erasure time after completion of a series of exposures at one illumination level.

Telemetry data representing a readout of camera functional setting is recorded on the back of each print. The data are in numerical units termed BCD (binary coded decimal) and include the full-scale value and measured value for each frame. Figure 6 is a calibration curve for iris position, showing the f-stop as a function of BCD ratio.

The 600-line scan mode transfer characteristic data (i.e., camera response to flat scenes at various light levels) are shown in Figure 7. The procedure utilized in obtaining such data was changed somewhat from those used in SC-1 and SC-2 calibrations, where luminance levels were varied at a fixed iris position. The method used on SC-3, SC-4, SC-5, and SC-6 involved setting a light level and cycling through all iris positions, since this was faster and provided data for each iris position. The amount of data collected allows the construction of an accurate three-dimensional computer surface with axes of iris BCD, lunar luminance, and output video level-- thus permitting a more accurate computer reduction of the video data. This revised method was also used in the 200-line scan mode.

In the iris repeatability calibration, the iris was forced to several different conditions--for example, by stepping the iris to f/22 and then to f/8; or by stepping the iris to f/16, then f/5.6 and f/8. In these two cases, the iris potentiometer may give different readings--indicating that the lens iris varies around the nominal f/8 position. For iris positions around f/8, the luminance level of the source is known and the polaroid of the video level is obtained at the second frame of exposure. This procedure was conducted three times for the f/8 and f/11 iris positions. Resultant deviations were found to be small in terms of observed video levels (Figure 15), while no error at all was indicated in the iris BCD data. Exposure reciprocity is evaluated by measuring the luminance level required to produce approximately the same video deviation for the several iris positions. These data are presented in Figure 16. By comparing Figures 15 and 16, it can be seen that the small data scatter shown in the reciprocity plot correlates with errors in video level adjustment, i.e., the video level was not exactly constant for all iris positions.

Figure 8 gives the light transfer curve in the 600-line scan mode. All data presented were obtained with the iris set to f/4.

Figure 9 shows the black level (or dark current) buildup for the 600-line scan mode as a result of integrating zero light intensity for various lengths of time. In this test, the camera is completely covered with a black cloth, the shutter is kept open, and no scanning is allowed for "x" minutes. After "x" minutes, the camera is allowed to read out and the dark current level is obtained. These data are useful in judging exposure levels for night operations or star sighting.

Figure 10 shows the shading which the camera exhibits near saturation in the 600-line scan mode. This figure is a depiction of composite frames taken from the A-scope display.

Figure 11 shows results of sine wave response tests. As the slides used have sine waves, not square waves, the data enable a true Fourier representation of the camera system. The 200-line scan mode light transfer, integrate exposure mode, and frequency response data are shown in Figures 22, 23, and 11, respectively. As in the other camera systems, the 200-line scan mode data shows a response well past 200 lines/pic width in the horizontal direction.

Geometric Distortion and Erasure

The geometric distortion and erasure data are principally used in computer reduction of the pictures and will not be analyzed in this report. Full frame and line scan polaroids are shown in Figure 21 and Figure 24 for qualatative evaluation.

Polarization Filter Nulls

The polarization nulls for the N, P, and S filters are depicted in Figures 17, 18 and 19. The light transmission for near-null polarizer angles was determined by measuring the video output signal from the television camera, with a constant light source brightness. The measurements were made in the open shutter mode of operation, with the iris set to f/4. This camera configuration assured maximum sensitivity for near-null measurements.

Automatic Iris

The operation of the automatic iris is shown in Figure 14. The curve reflects the operation in the clear filter position, and is also applicable to the polarizing

filter positions since the attenuation characteristics are approximately the same. The iris appears to be functioning well and maintains the video level at about 71 percent of full black to white deviation for luminance inputs of up to 2000 foot-lamberts.

Photogrammetric Tests

The photogrammetric data require computer reduction, and are not presented in this document.

Deviations for TV-GDHS and SFO TV-GDHS Tape Playback

From the calibration data, settings denoting the characteristic deviations and timing rates were derived and supplied to the GDHS. These settings are:

Modulation* characteristics (Δf)	XMTR A 600 line	XMTR B 600 line	XMTR A 200 line	XMTR B 200 line
Sync to porch	442 kc	444 kc	1.94 kc	1.97 kc
Porch to black	125 kc	125 kc	0.89 kc	0.84 kc
Porch to PCM '0'	1.793 Mc	1.900 Mc	7.86 kc	7.70 kc
Porch to PCM '1'	1.335 Mc	1.395 Mc	5.82 kc	5.75 kc
Porch to white**	1.500 Mc	1.510 Mc	6.60 kc	6.62 kc
Carrier to sync tip	1.135 Mc	1.115 Mc		
Carrier to porch	693 kc	671 kc		
Carrier to black	568 kc	546 kc		
Carrier to PCM "0"	1.100 Mc	1.229 Mc		
Carrier to PCM "1"	642 kc	724 kc		
Carrier to white**	0.807 Mc	0.839 Mc		

*The Survey Camera installed on SC-6 uses reversed vertical scan, i.e., the vertical scan direction is from bottom to top. Additionally, this camera incorporates a 10 percent horizontal overscan in the direction of the large corner reference mark.

**Note: Average for full active TV frame

Timing characteristics	600-Line Scan Mode	200-Line Scan Mode
Sync pulse time	139.0 μs	8.20 ms
Porch time	130.0 μs	7.42 ms
Vertical blanking time	205.0 ms	618.0 ms
PCM	201.0 ms	600.0 ms
Active line time	1.40 ms	86.0 ms
Total line time	1.67 ms	102.0 ms
Total frame time	1.409 sec	21.24 sec

Foregoing deviation values are measured directly on the polaroid frames. Average white deviations are approximately 1.2 Mc lower than was measured for SC-5. This lower deviation is a result of a reduced camera gain adjustment intended to prevent possible adjacent channel interference.

The VR 1560 tape recorded at Cape Kennedy during the SC-6 Survey Camera Calibration was played back at DSS-11 on 11 October 1967. Recordings of this playback were made by DSS-11/TV-11 on FR-1400 and FR-800 magnetic tapes.

The SC-6 TV Survey Camera Calibration Tape Playback is being performed in two phases. Phase I was completed 11 October 1967 at DSS-11.

Phase II will be performed prior to SC-6 launch with the total TV-GDHS in a SC-6 mission configuration. The time of this playback is estimated to be the latter part of October or first of November 1967.

Due to an oversight, the DSS-11 FR-1400 Tapes do not contain a 1 Mc signal on the tape. Therefore, these tapes will be recorded again during the Phase II playback.

Phase II will use the FR-800 tapes made at DSS-11 during the Phase I period.

SC-6 VR-1560/660 Calibration Tape Playback

Table 1. Phase I Playback

DSS-11/TV-11 recorded 70 mm film during the entire playback

Test Step Number	DSS-11 FR-1400 Reel No.	DSS-11 FR-800 Reel No.	TV-1 HW-7600 Reel No.	TV-1 FR-700 Reel No.
Test 10 Iris Light Transfer				
10.6 thru 10.25	1	1	1	1
10.26 thru 10.36	2	1	2	1
Test 11 Light Transfer - Open Shutter				
11.6 thru 11.15	2	1	2	1
11.16 thru 11.16B	3	2	3	2
Test 12 Light Transfer Characteristic - Filters				
12.2 thru 12.9	3	2	3	2
12.6A	3	2	3	2
12.17	3	2	3	2
12.27	3	2	3	2
Test 13 Auto Iris Tracking				
13.2 and 13.3	3	2	3	2
13.7	3	2	3	2
13.12	3	2	3	2
13.17	3	2	3	2
13.22	3	2	3	2
13.27	3	2	3	2
Test 14 Iris Repeatability and Exposure Reciprocity				
14.4 thru 14.38	3	2	3	2
Test 15 Linearity and Distortion				
15.7 thru 15.18	3	2	3	2
Test 16 Erasure				
16.5 thru 16.12	3	2	3	2
Test 17 Frequency Response				
17.7 thru 17.9	3	2	3	2
17.11 thru 17.24	4	2	4	2
17.22A	4	2	4	2
17.26	4	2	4	2
Test 18 Transmitter B Levels				
18.5 thru 18.13	4	2	4	2
Test 19 Integrate Mode				
19.7 thru 19.15	4	2	4	2
Test 20A Polarmetric Constants				
20A.11 thru 20A.66	5	3	5	3
Test 21 W/A Zoom				
21.4 thru 21.11	5	3	5	3

Table 1. Phase I Playback (contd)

Test Step Number	DSS-11 FR-1400 Reel No.	DSS-11 FR-800 Reel No.	TV-1 HW-7600 Reel No.	TV-1 FR-700 Reel No.
Test S-1, S-2, and S-3 Special Test - Iris Light Transfer				
S-1.6 thru S-1.14	5	3	5	3
S-2.4	6	3	6	3
S-2.7	6	3	6	3
S-3.5	6	3	6	3
S-1.14A	6	3	6	3
Test - TSS 6.6.19 - Transfer Characteristics - 1/2 Iris Steps				
6.6.19	6	3	6	3
Test 22 Photometric Chart Calibration				
22.6 thru 22.20	6	3	6	3
Part II - Test 2.0 Photogrammetric Calibration				
2.4 thru 2.79	6	3	6	3
2.82 thru 2.185	7	4	7	4
Special Sequence - Footpad Viewing	-	4	-	4
Post Cleaning - Photogrammetric	-	4	-	4
Auxiliary Mirror Sequence		4		4

Table 2. DSS-11 SC-6 Post-Pass Calibration Playback

The following data is on an FR-800 Tape at DSS-11

Test Step	GMT Start	Source Bright ft lamberts	Total Frames	f/4	f/5.6	f/8	f/11	f/16	f/22
				----------		Iris BCD Readings (Cal 977)			
TEST NO. 10 - IRIS Light Transfer - Flat Field - 600 line - Xmtr A									
10.6	261-2032	0	4			Black Level			952
10.20	261-2108	50	24	043	240	403	563	723	875
10.22	261-2143	100	24	043	240	403	563	723	874
10.24	261-2155	200	24	043	240	403	563	723	874
10.26	261-2204	400	24	043	240	403	563	723	875
10.27	261-2209	560	25	043	240	404	563	723	875
				(f/4 is at Saturation)					
10.28	261-2214	800	24	043	240	403	563	723	875
10.31	261-2232	12	8	043	240	-	-	-	-
10.35	261-2246	25	12	043	240	403	-	-	-
TEST No. 15 - Linearity and Distortion (Cal. 975)									
15.7	262-0142	200	6	043	-	-	-	-	-
15.15	262-0145	800	6	-	-	403	-	-	-
15.18	262-0148	2350	6	-	-	-	-	-	873
TEST NO. 17 - Frequency Response (Cal. 976)									
17.7	262-0350	800	8	-(24 TVL Freq)			-	722	-
17.8	262-0353	800	8	-(50 TVL Freq)			-	722	-
17.9	262-0354	800	8	-(75 TVL Freq)			-	722	-
17.11	262-0356	800	8	-(100 TVL Freq)			-	722	-
17.12	262-0357	800	8	-(150 TVL Freq)			-	722	-
17.13	262-0359	800	8	-(225 TVL Freq)			-	722	-
17.14	262-0407	800	8	-(300 TVL Freq)			-	722	-
17.15	262-0409	800	8	-(450 TVL Freq)			-	722	-
17.16	262-0410	800	8	-(600 TVL Freq)			-	722	-

VIDICON SCAN FORMAT

The SC-6 Survey Camera employs a reversed vertical scan, i.e., the vertical scan direction is from the bottom of the scene format to the top. Additionally, the horizontal sweep has been enlarged by 10 percent in the direction of the top right (TR) reference mark. Horizontal sweep direction is from left to right as referenced to the vidicon target format (see Appendix G).

The effect of the 10 percent horizontal overscan is to insure a suitable black corner reference mark under expected worst-case operating conditions. Analysis reveals that the TR reference corner mark will always yield a suitable black reference, whereas it is possible to loose the TL and BL reference corner marks. The BR corner mark becomes marginal in the worst case. The calculated worst-case corner scan penetration is tabulated below.

Condition	Horizontal Penetration	Vertical Penetration	Condition
TR	73 lines	59 lines	Usable
TL	0 lines	18 lines	lost
BR	73 lines	18 lines	Marginal
BL	0 lines	18 lines	lost

The above tabulation is based upon a measured horizontal and vertical penetration of 30 lines for an adequate black reference.

CALIBRATION CONCLUSIONS

1) The 600-line scan mode frequency response (Figure 11) shows a gradual roll-off out to 600 TVL/PH width. The approximate response at 600 TVL/PH width is reduced by 75 percent over its low spatial-frequency value. The frequency response of the SC-6 camera appears to be slightly lower than the SC-5 camera, but the difference is not significant. In the 600 line scan mode, the half-response point is approximately 270 TVL/PH width. There is no observable degredation due to the 10 percent horizontal overscan.

2) The 200-line scan mode frequency response (Figure 11) shows a gradual roll-off that extends well beyond 200 TVL/PH width. The 200-line frequency response is also lower than that measured in SC-5 but the difference does not appear to be significatn. The half-response point is located at approximately 175 TVL/PH width, creating a nearly symmetrical resolution picture in the 200-line scan mode.

3) Vidicon shading appears to be significantly less than was experienced with the SC-5 camera. With the exception of the first 10 percent of scan lines, the frame shading is quite small (Figure 10). Also the horizontal line shading is significantly less than that observed on the SC-5 camera system.

4) The SC-6 camera does not deviate beyond established nominal limits for saturated-white signal excursions. No adjacent-band interference should be experienced, and no special ground station configurations will be required. The SC-6 camera incorporates a lower gain video amplifier than previous cameras.

5) The auto iris mode performs well over the full range of luminance inputs. Since the attenuation characteristics of the clear filter and polaroid filters are approximately the same, the auto iris mode should perform well in any filter position.

6) The rate of dark current buildup in the 600 line scan mode significantly lower than was measured for SC-5. Over a 20 minute integration, the recorded video level was 69 percent of full black to white deviation. This may be compared to previous measured values of 95, 83, and 50 percent for SC-5, SC-3, and SC-4 respectively. In the 200 line scan mode, video

deviation of 48 percent of full black to white deviation was recorded. This compares closely with the 52 percent measured for SC-5.

7) The 600 line scan mode light transfer characteristic indicates a useful dynamic range of 15.5 which is slightly greater than that measured for SC-5 (14.4).

8) A usable black reference will be available under expected worst case operating conditions. The black reference mark appears in the top-right of the picture format, and allows less than 1 percent light transmission.

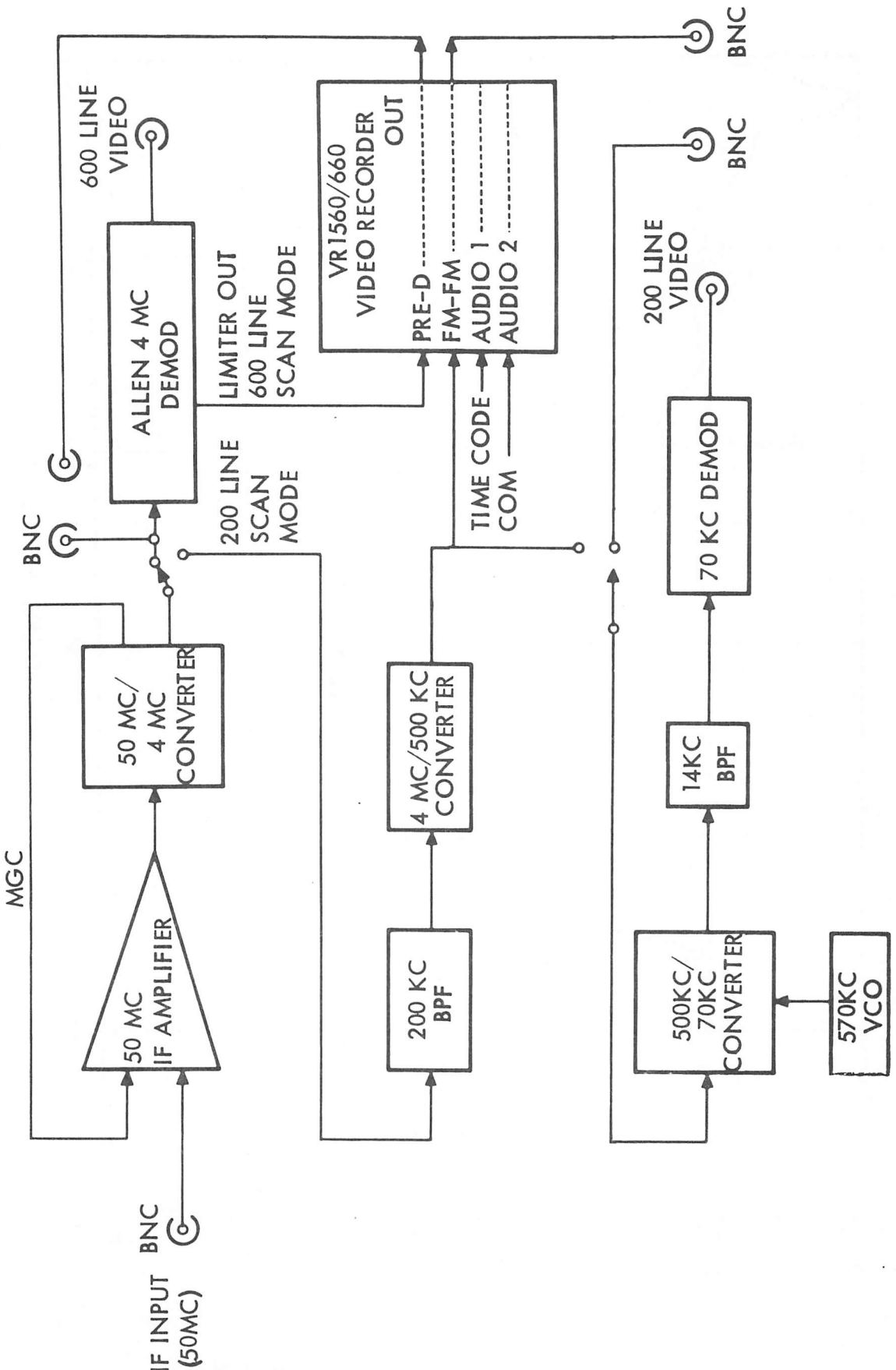


Figure 1. Video Recording System Block Diagram

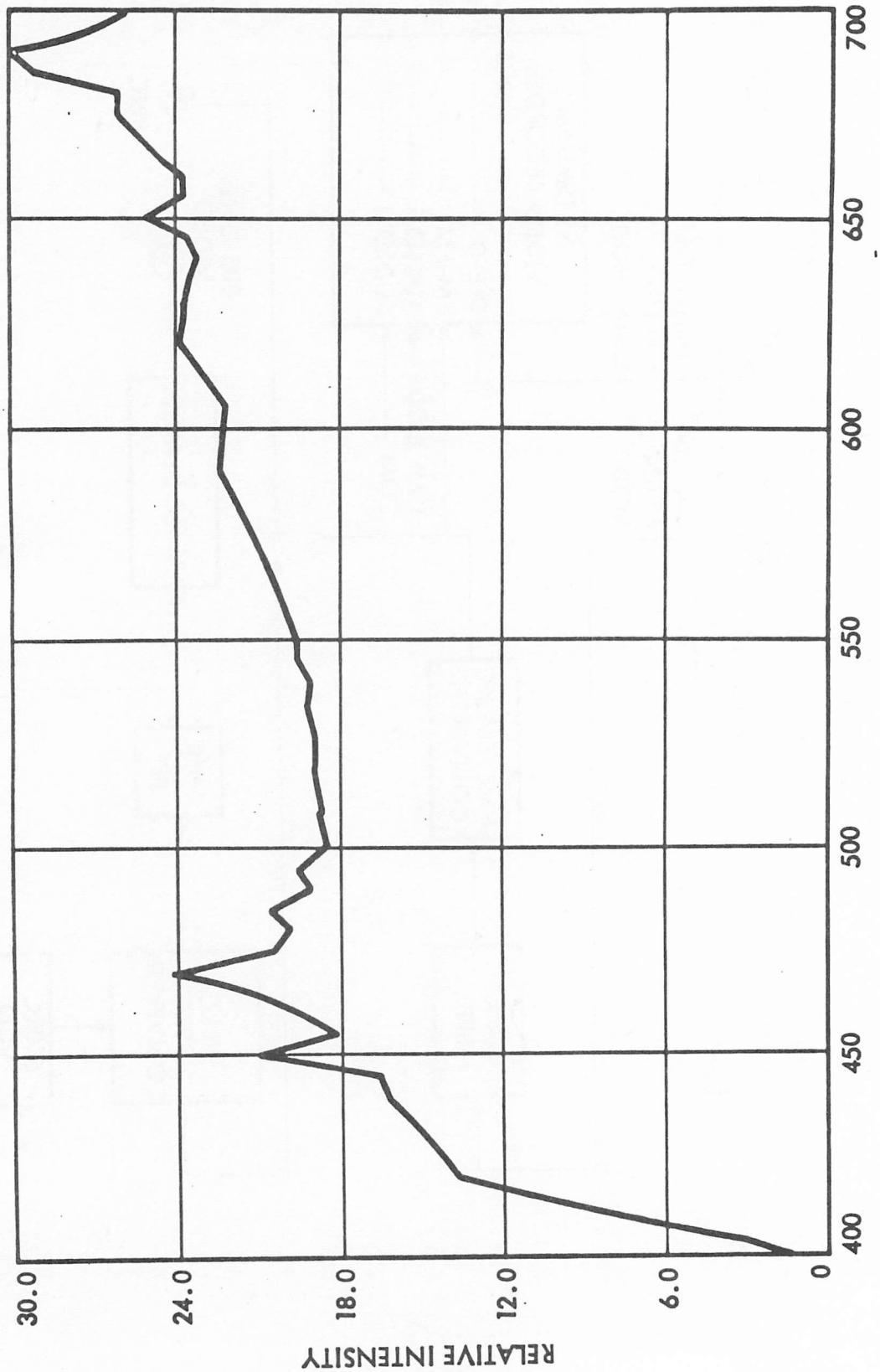


Figure 2. Spectrum of Surveyor TV Calibration Light Source

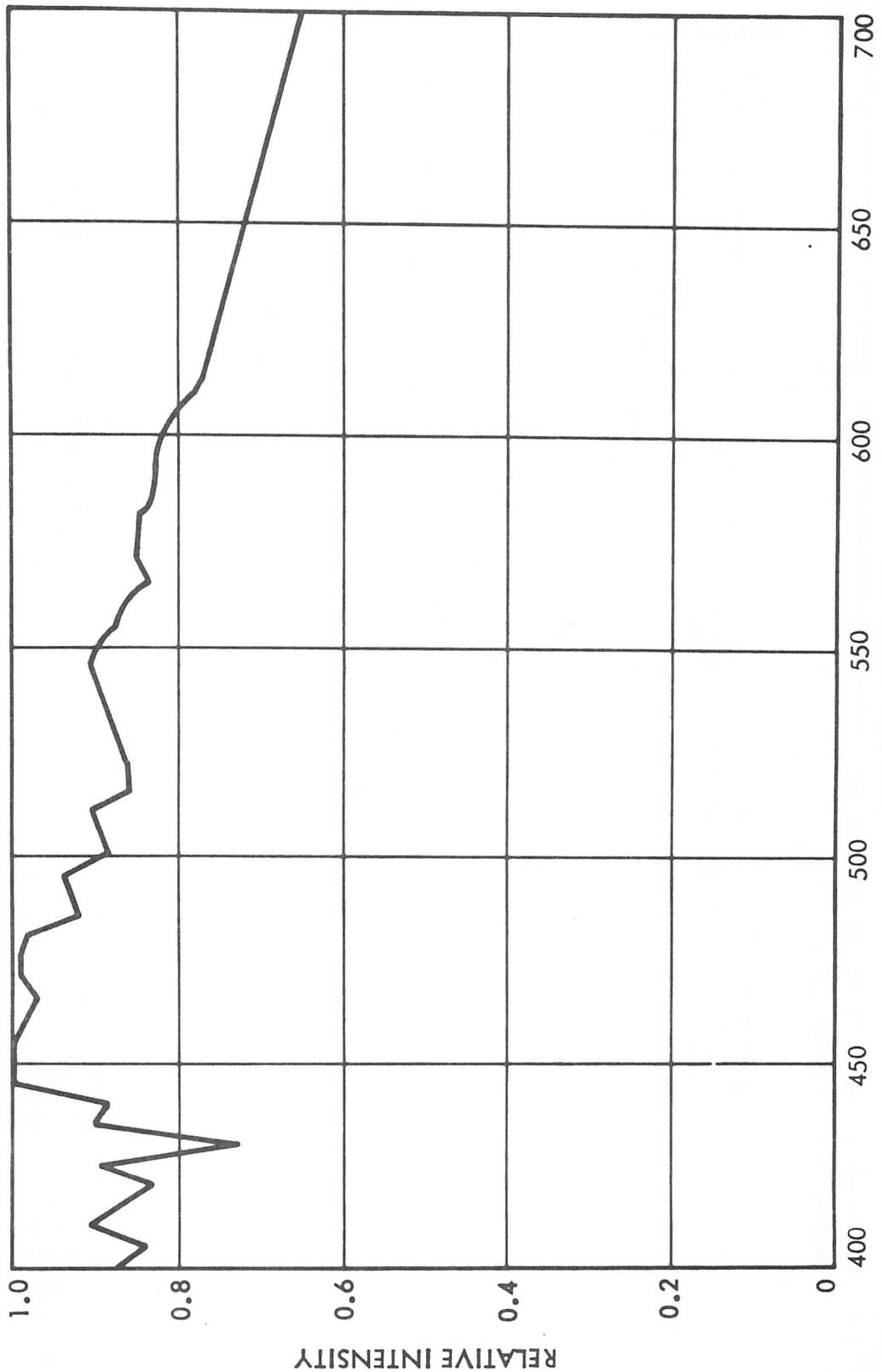


Figure 3. Solar Spectrum

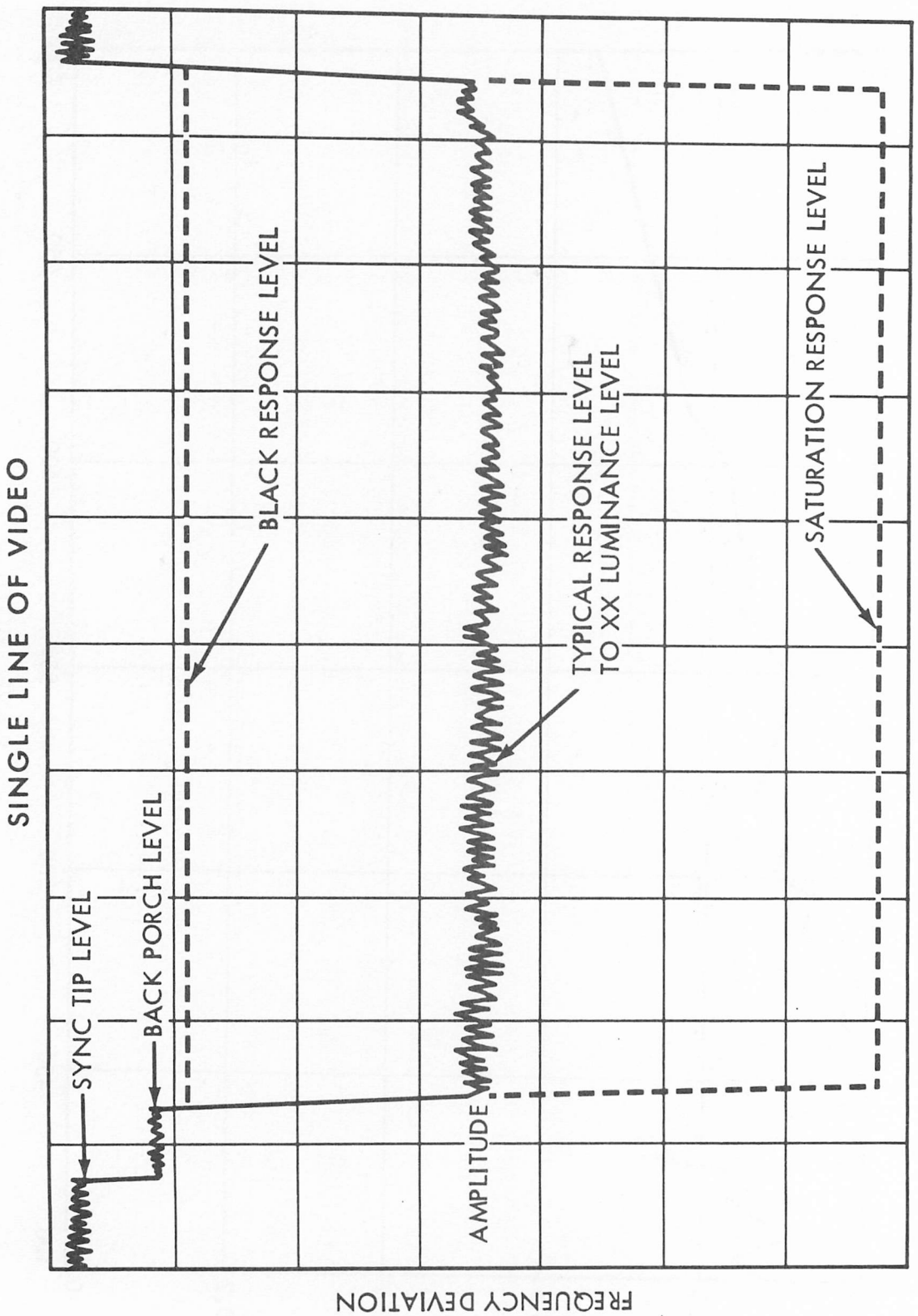


Figure 4. Drawing of Typical Polaroid Data

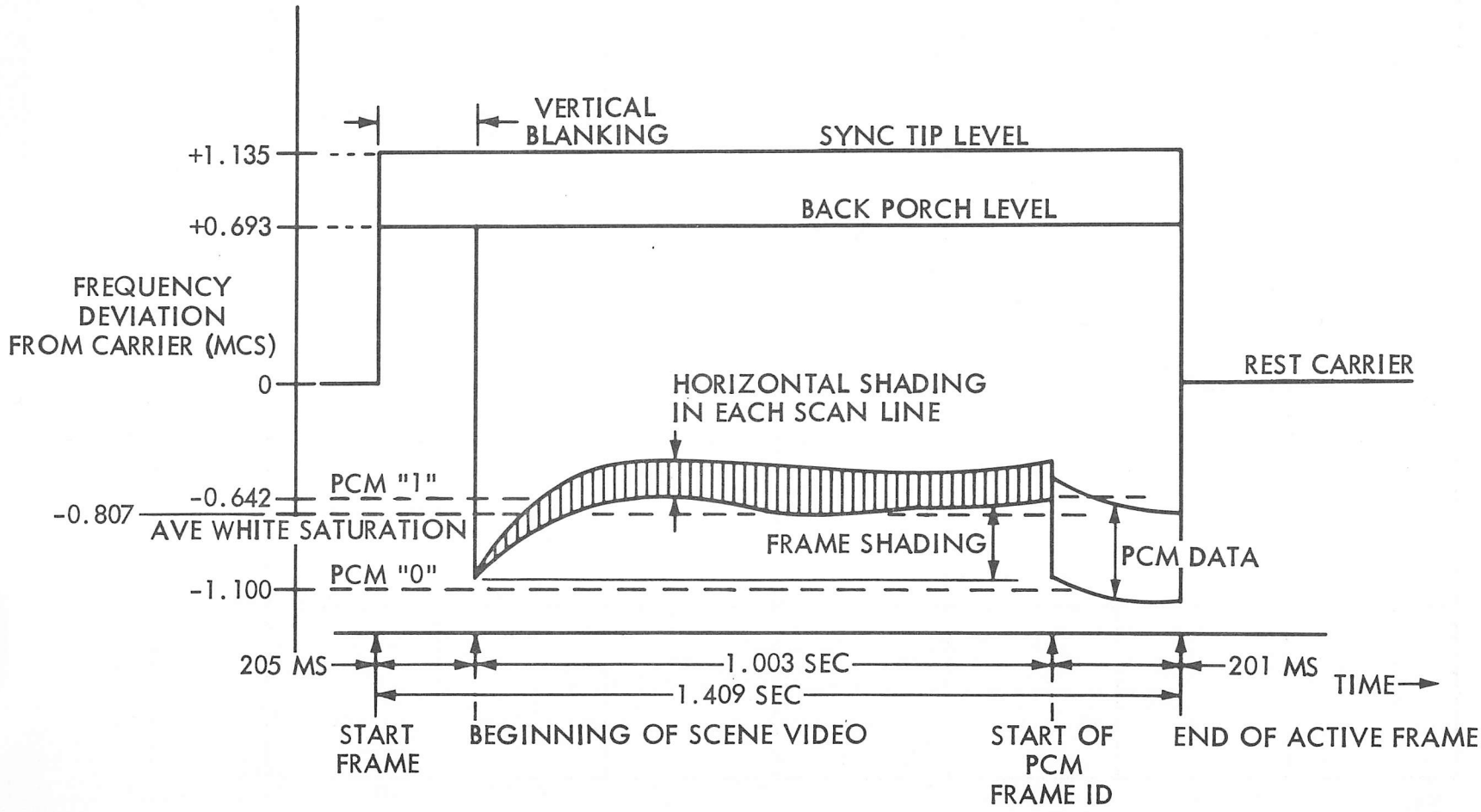


Figure 5. SC-6 Typical Full-Frame Video Output, 600-Line Scan Mode, Transmitter A

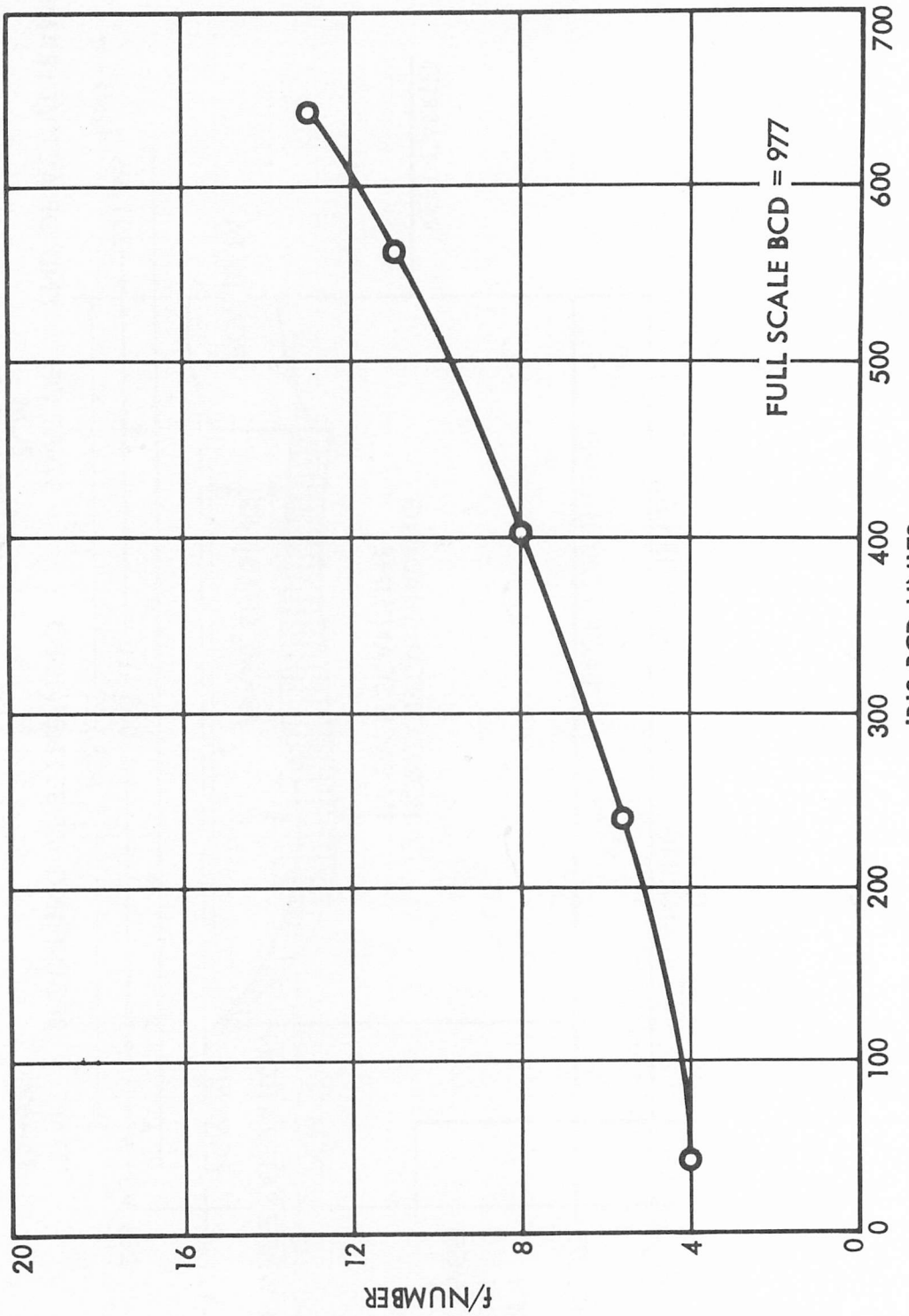


Figure 6. SC-6 Camera f/No. Versus Iris BCD Units

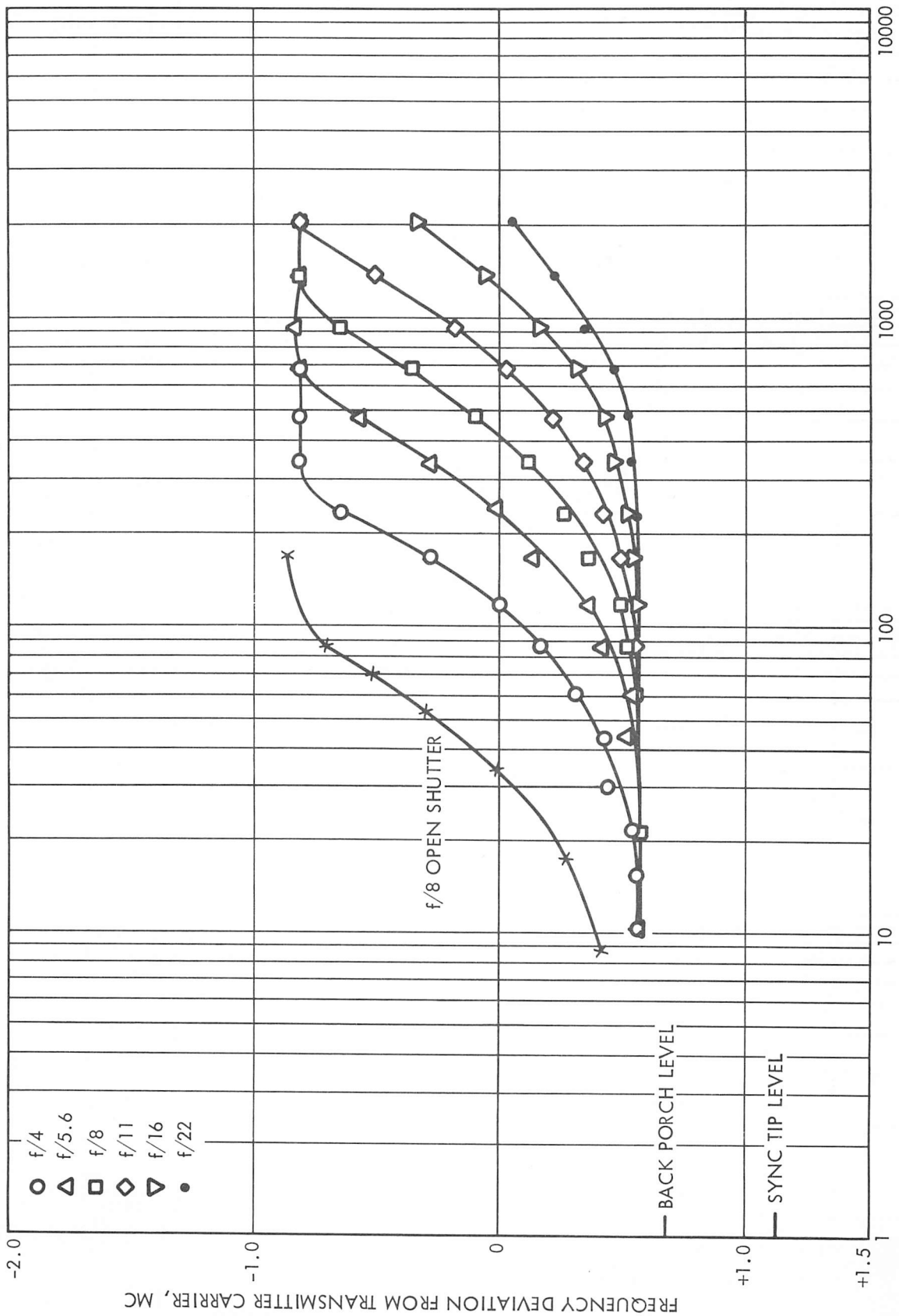


Figure 7. SC-6 Light Transfer Characteristic, 600-Line Scan Mode, Transmitter A

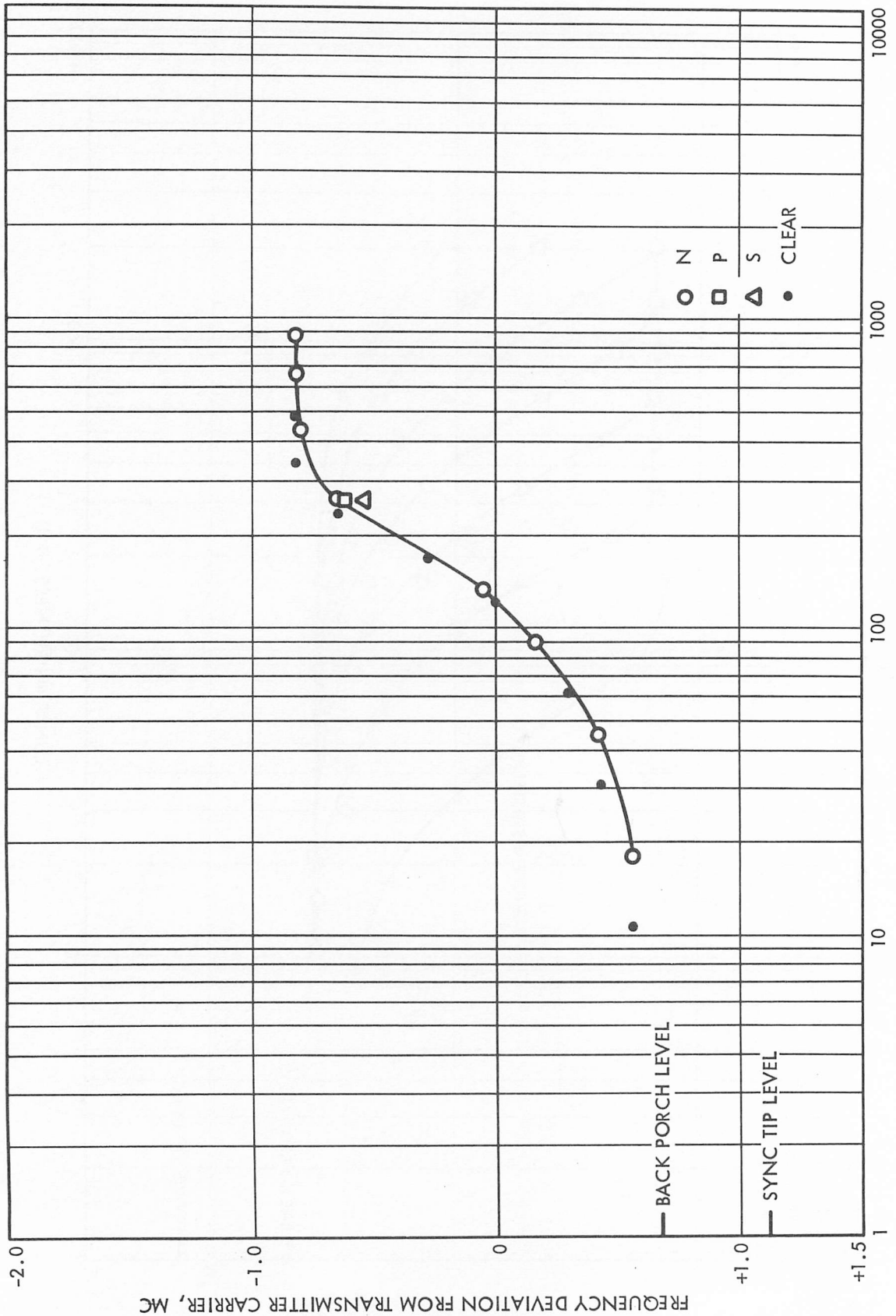


Figure 8. SC-6 f/4 Polarizing Filter Light Transfer Characteristics, 600-Line Scan Mode, Transmitter A

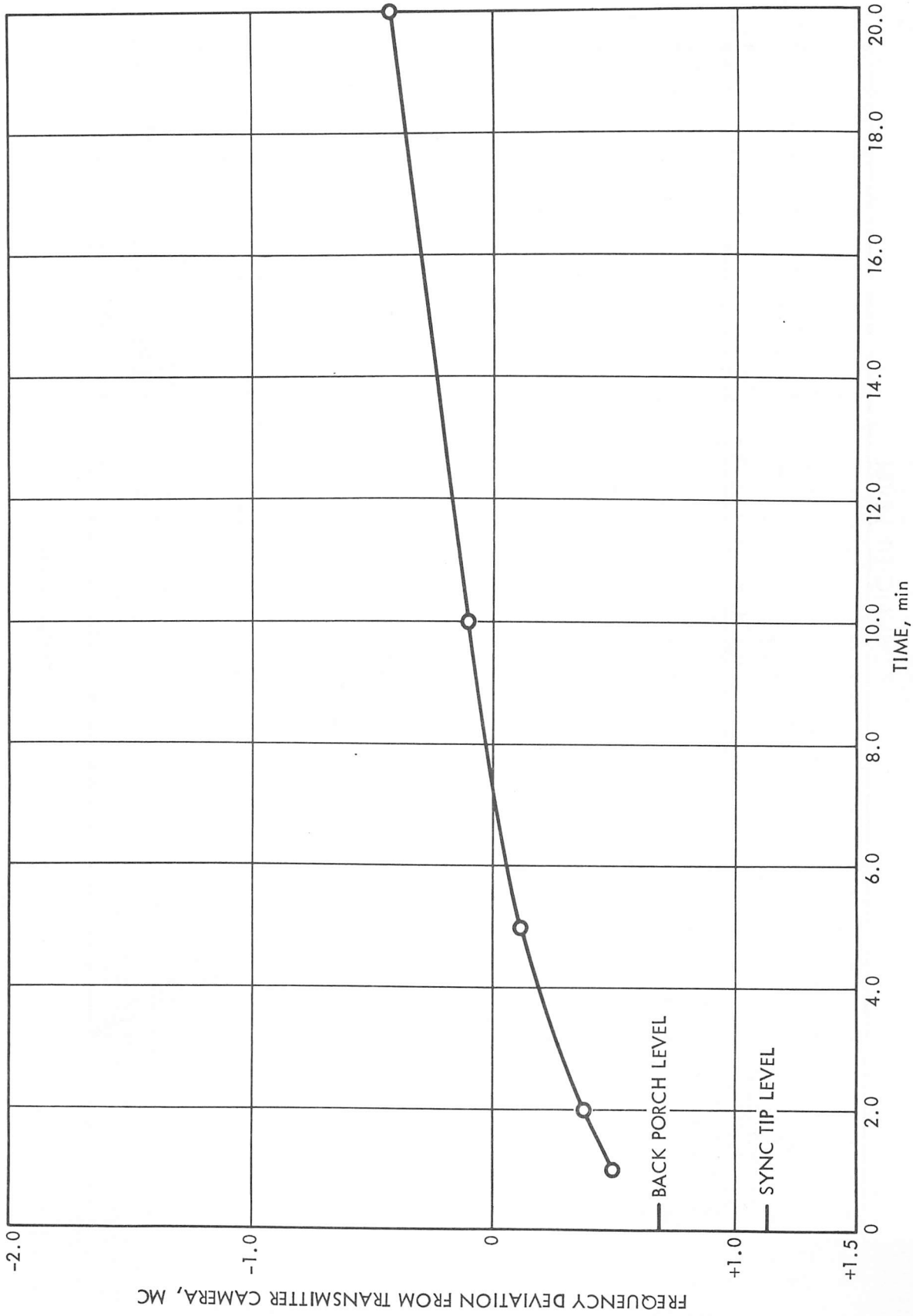


Figure 9. SC-6 Integrate Mode, Dark Current Buildup 600-Line Mode, Transmitter A

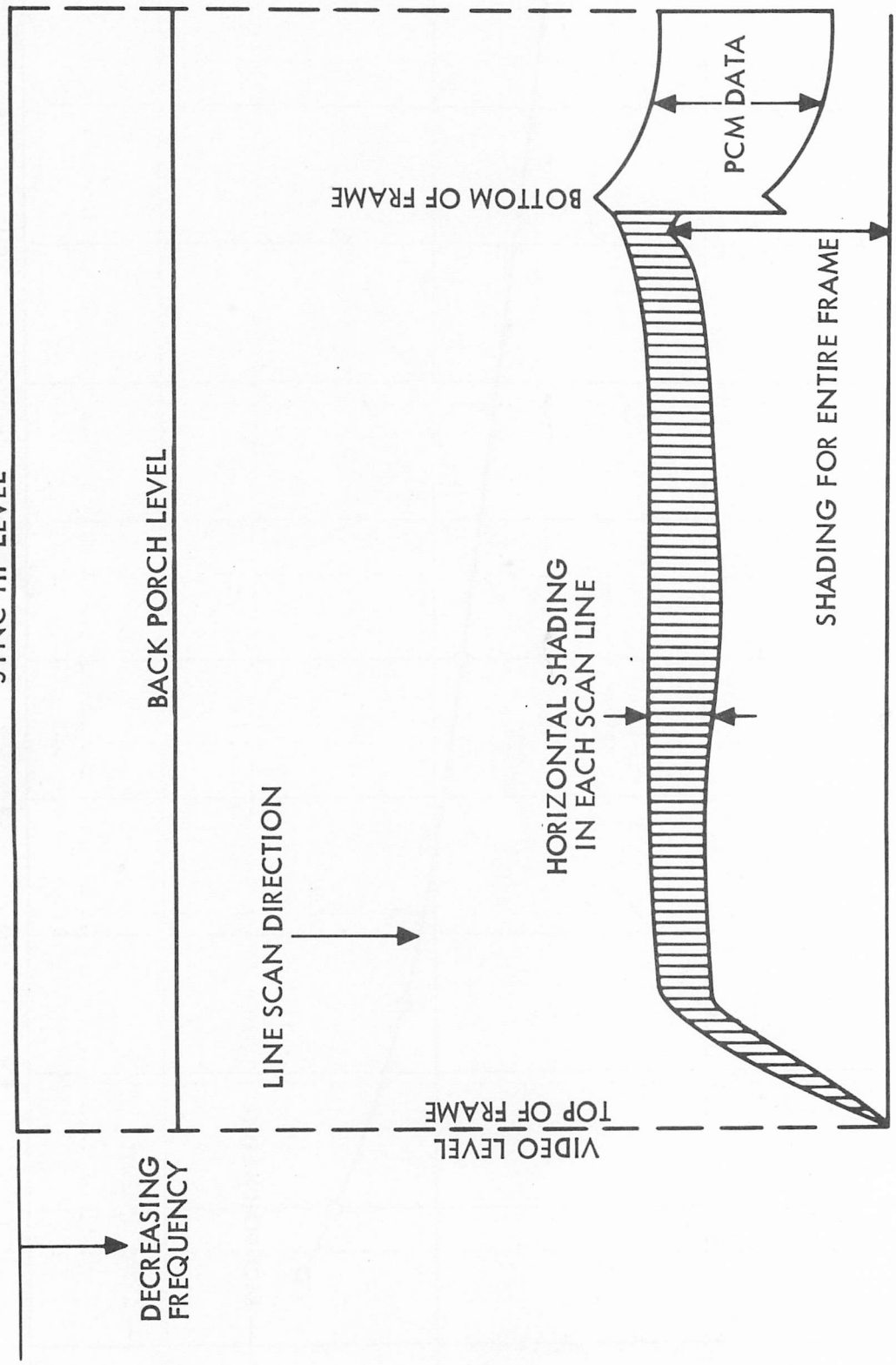


Figure 10. SC-6 Camera Shading Near Saturation
(Diagram Measured From Polaroid Of Composite Frame), 600-Line Scan Mode, Transmitter A

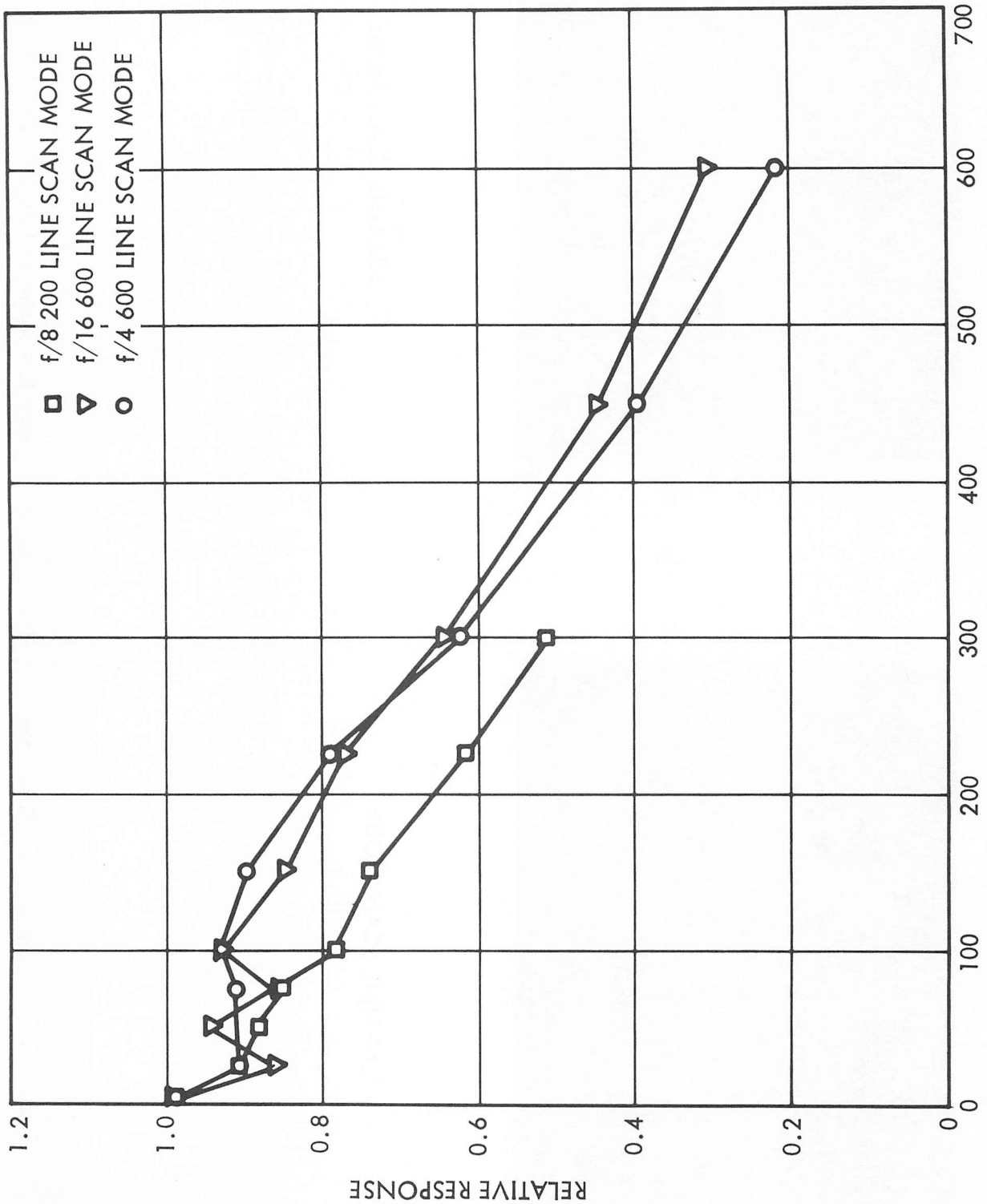
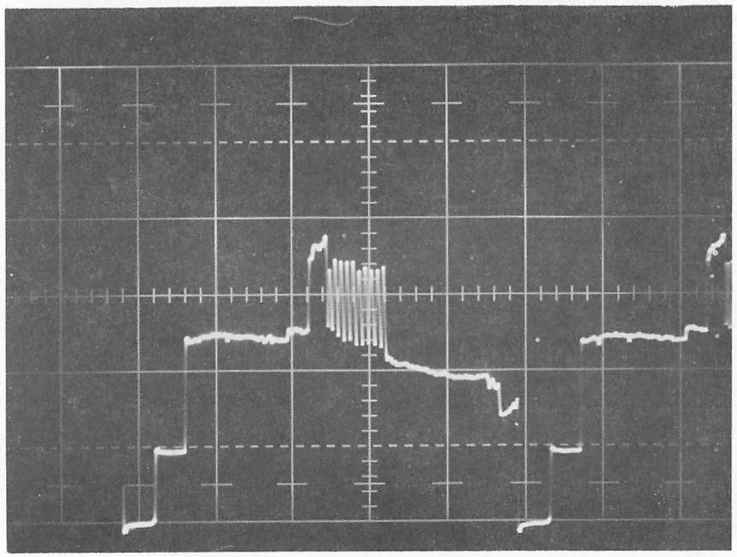
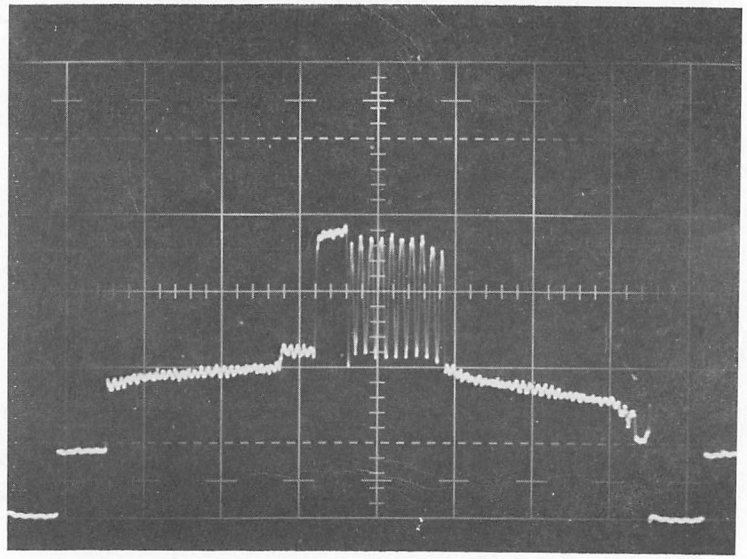


Figure 11. SC-6 Frequency Response 200 and 600-Line Scan Modes, Transmitter A



200 LINE SCAN MODE



600 LINE SCAN MODE

Figure 12. Typical Line Scans Showing Horizontal Frequency Response at 100 TV Lines/PH Width

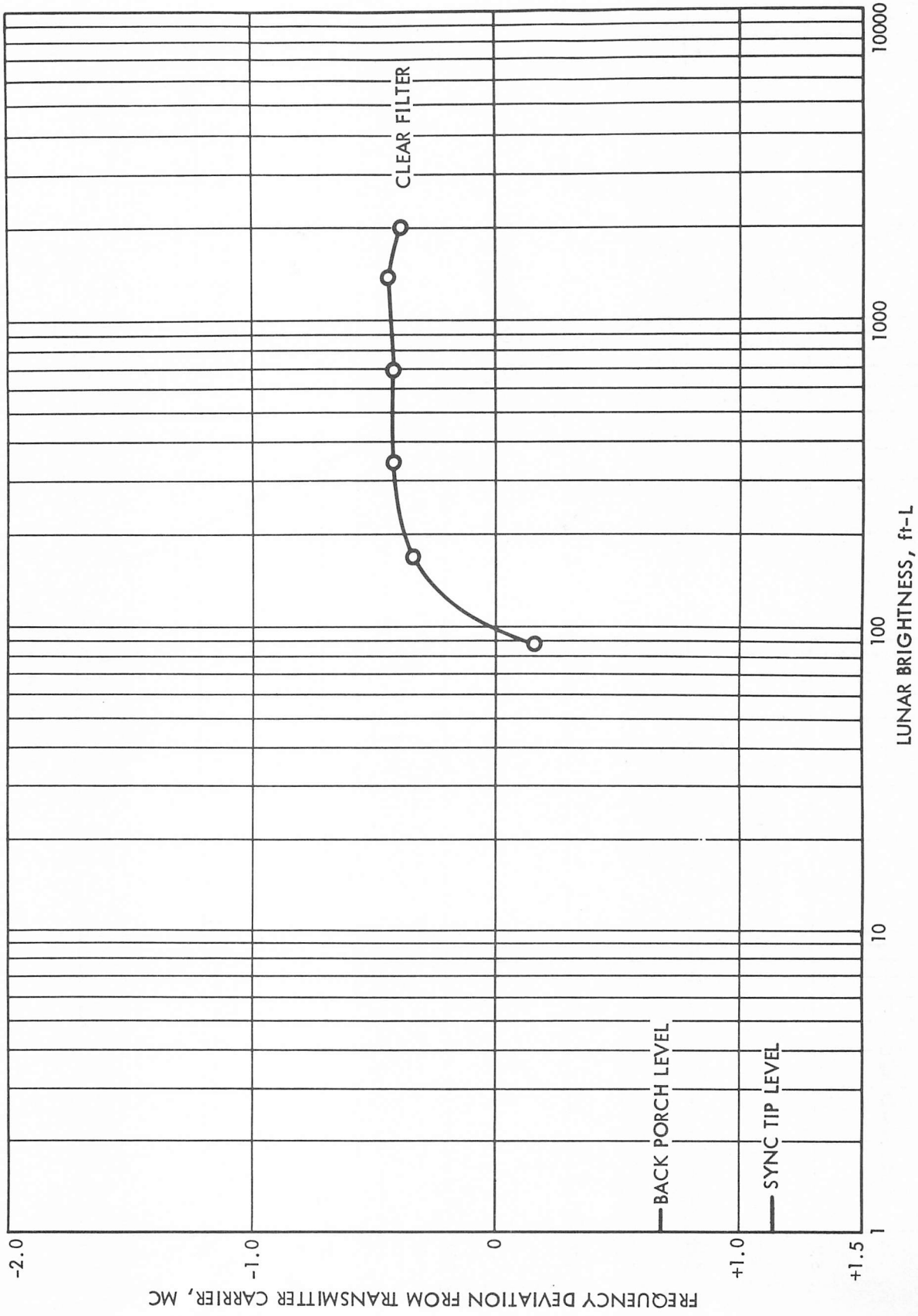


Figure 13. SC-6 Auto Iris Tracking, 600-Line Scan Mode, Transmitter A

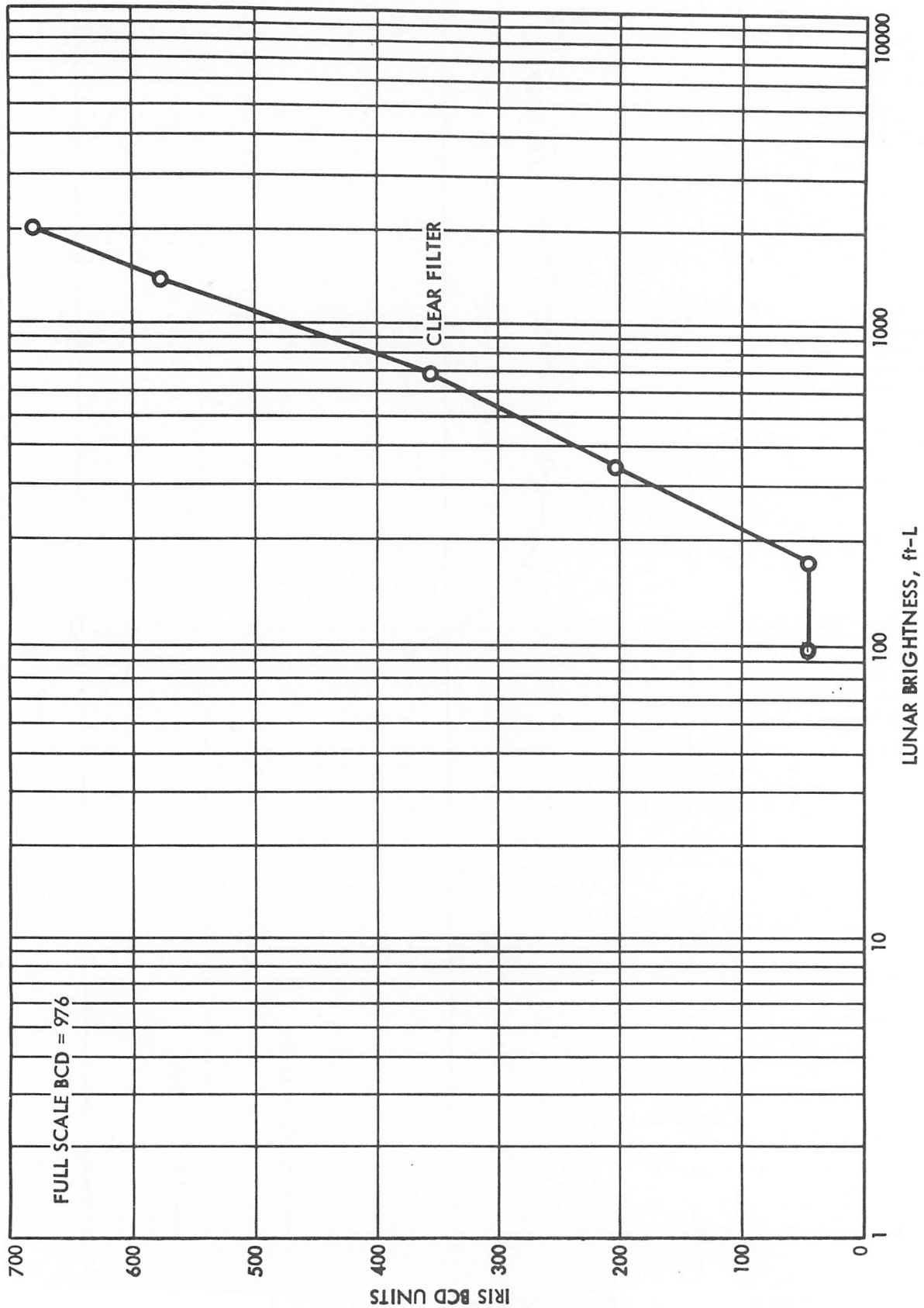


Figure 14. SC-6 Auto Iris Tracking, 600-Line Scan Mode, Transmitter A

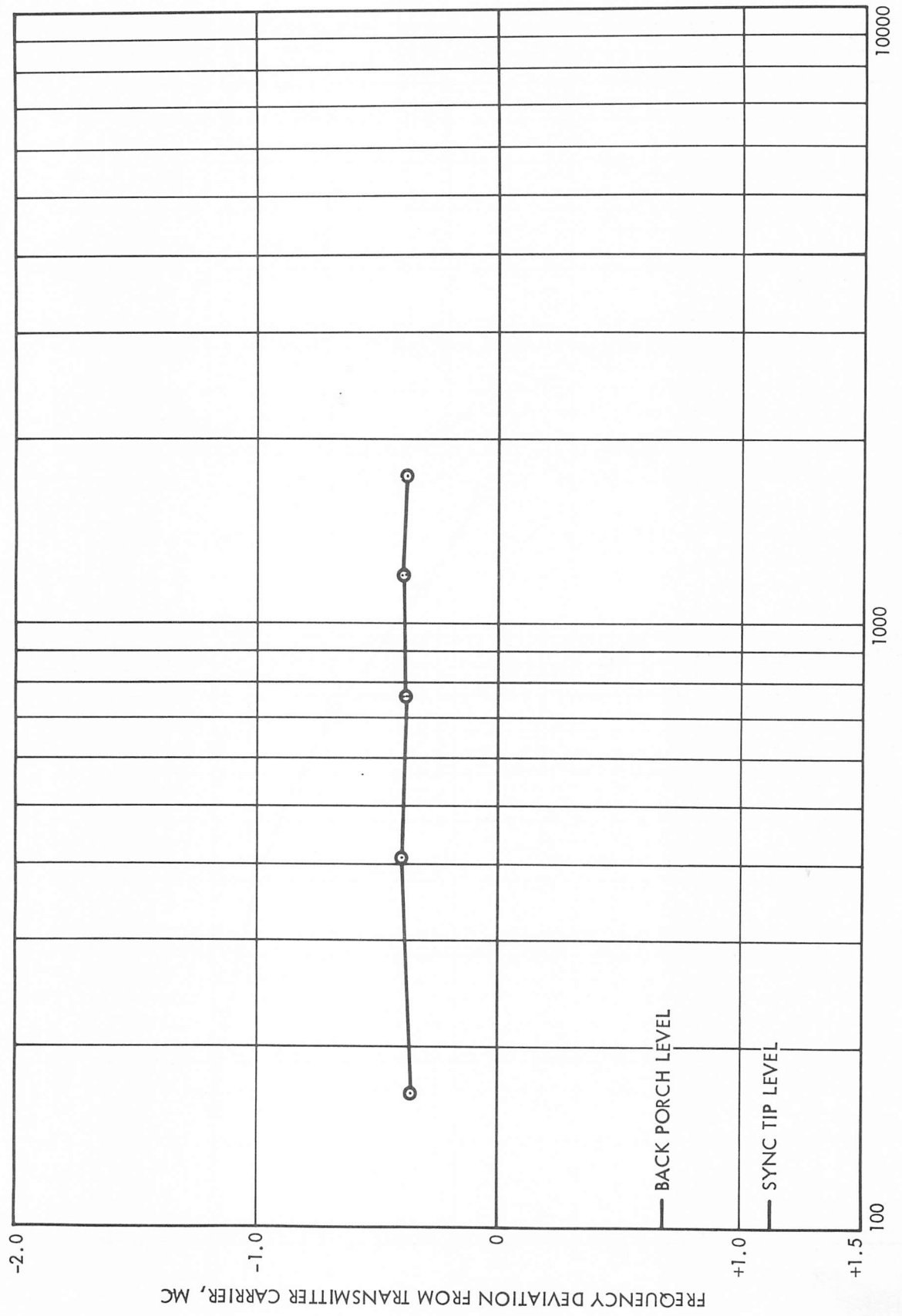


Figure 15. SC-6 Iris Repeatability, 600-Line Scan Mode, Transmitter A

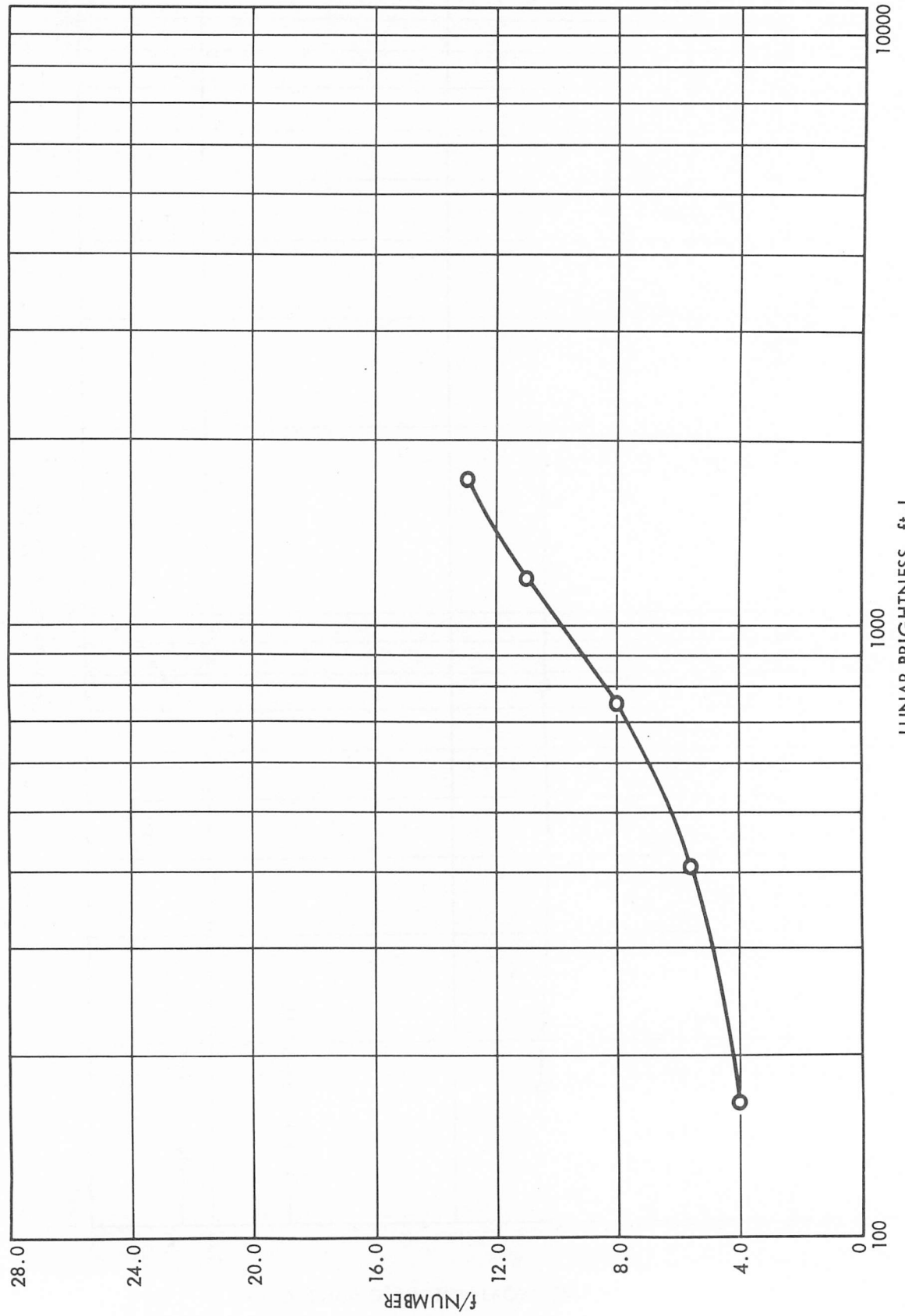


Figure 16. SC-6 Exposure Reciprocity, 600-Line Scan Mode, Transmitter A

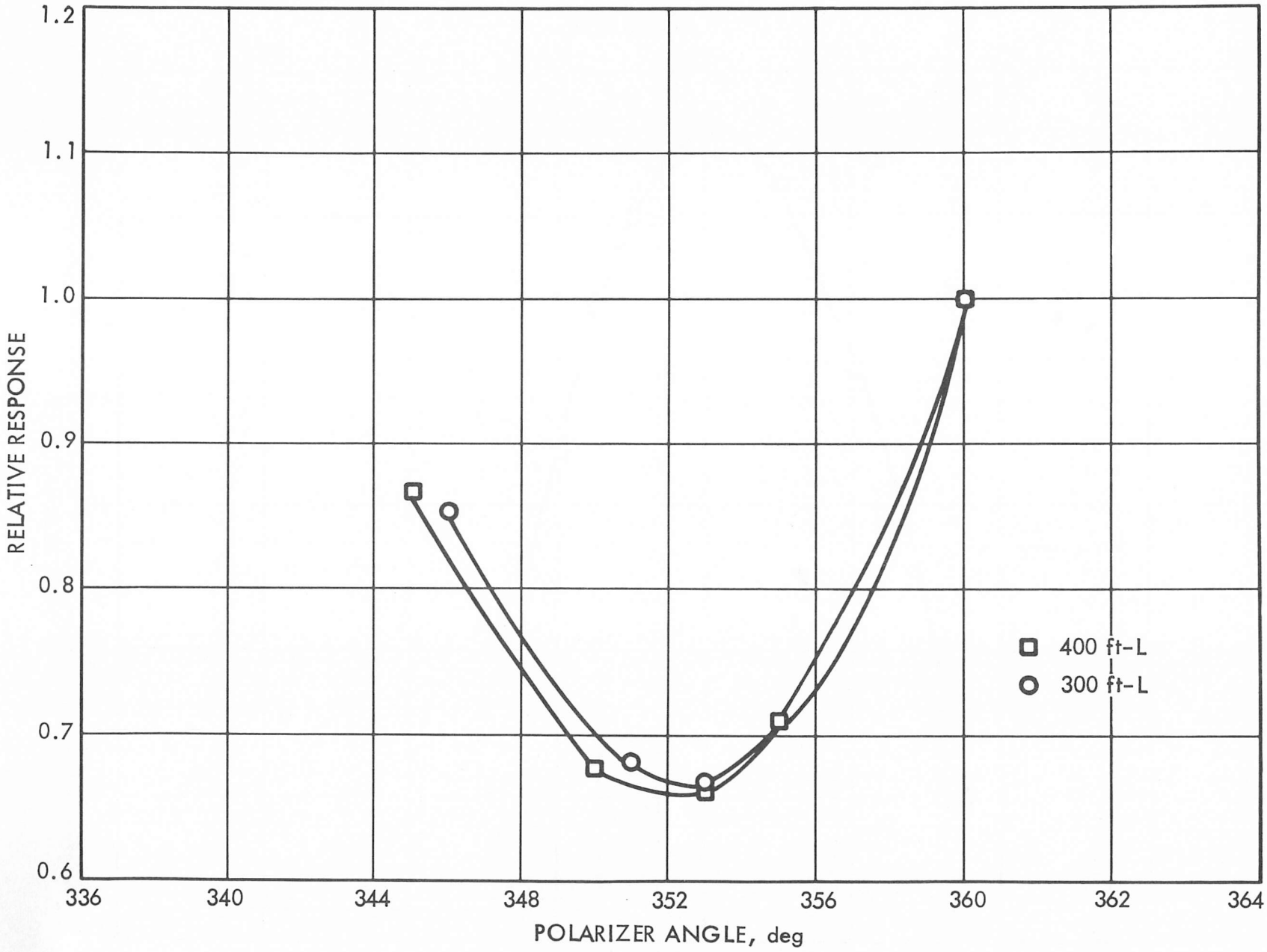


Figure 17. Polarization Null P-Filter, f/4, Open Shutter 600-Line Scan Mode, Transmitter A

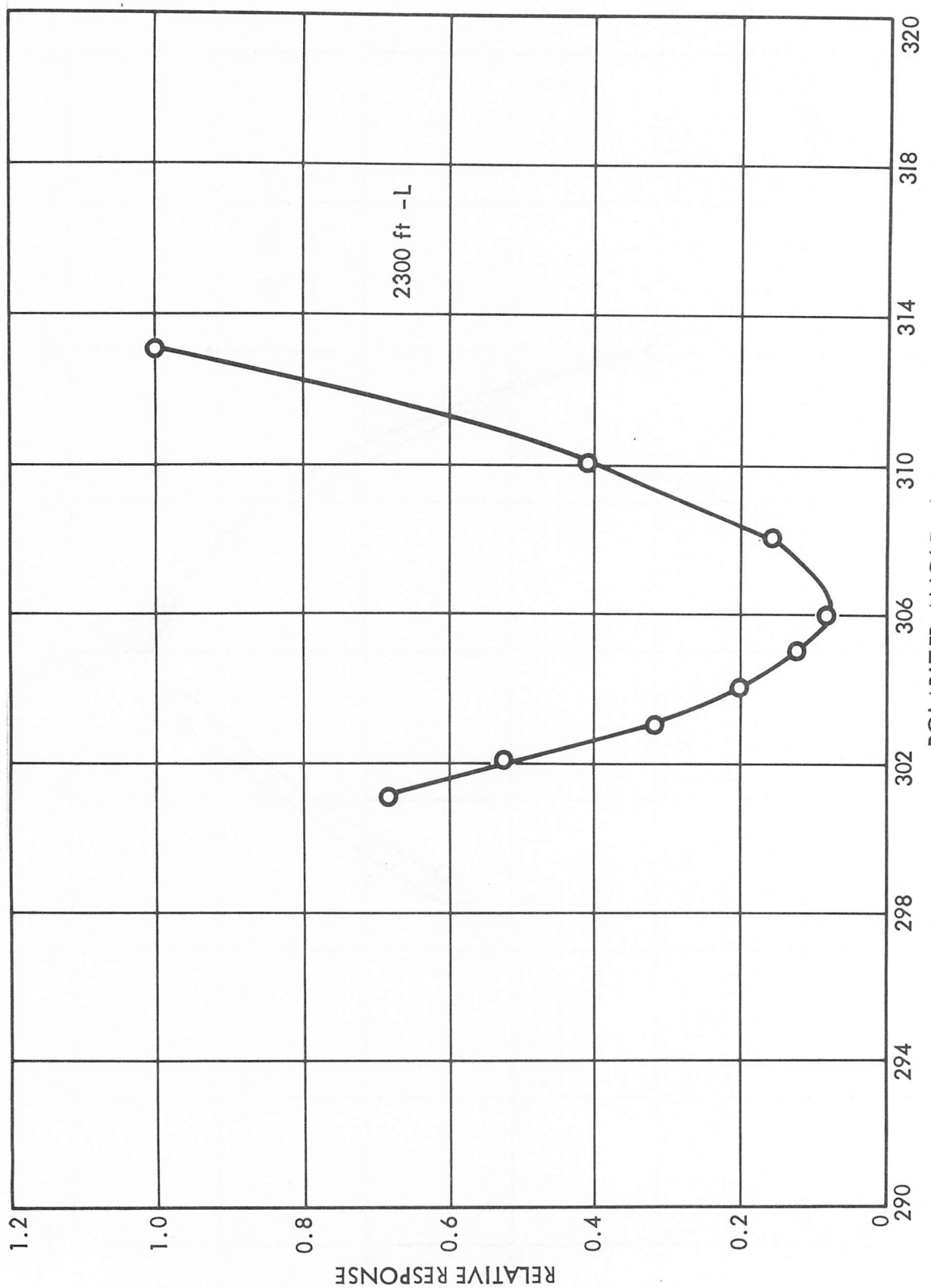


Figure 18. Polarization Null S-Filter, f/4, Open Shutter 600-Line Scan Mode, Transmitter A

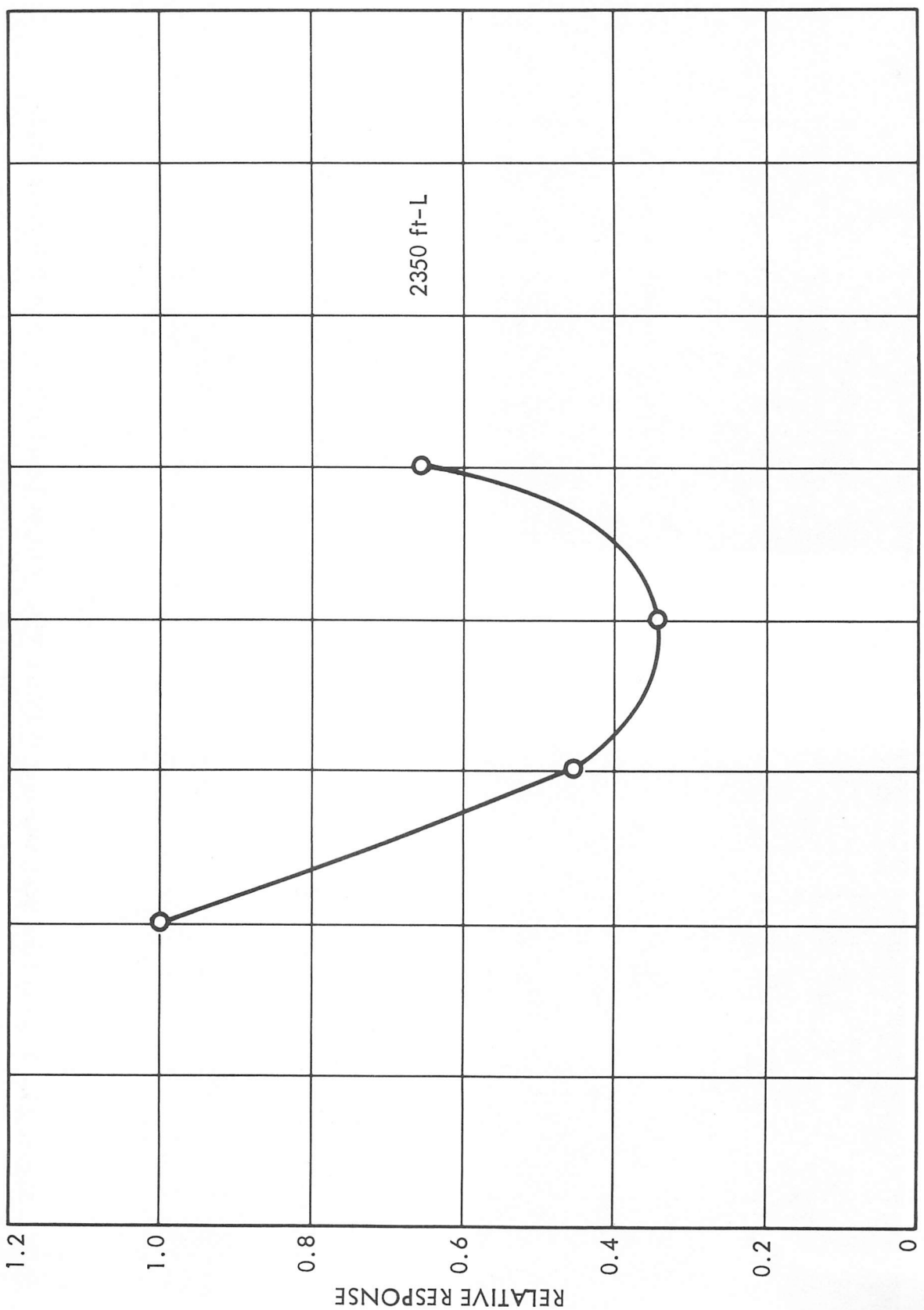
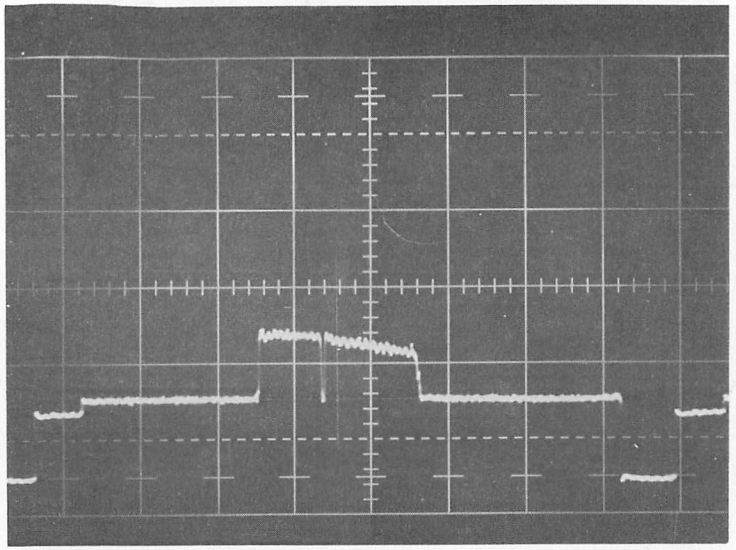
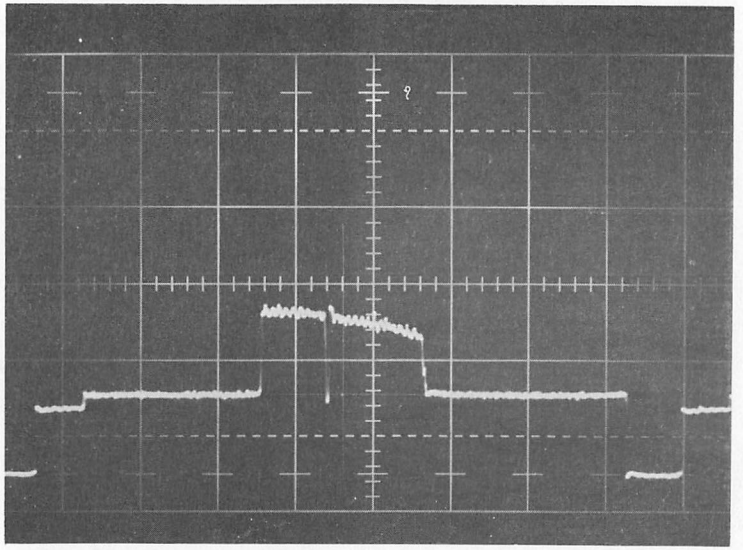


Figure 19. Polarization Null N-Filter, f/4, Open Shutter 600-Line Scan Mode, Transmitter A

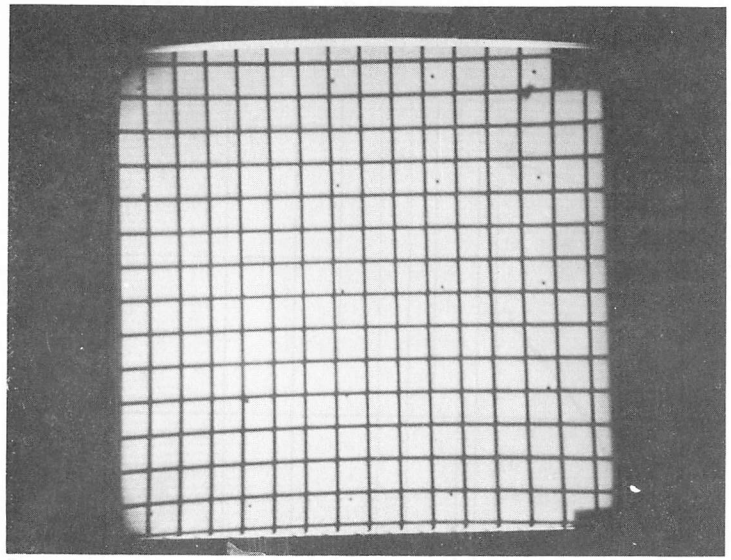


VIDEO OUTPUT AT 353 DEGREES (NULL)
WITH 300 ft-L AND f/4 IRIS.
(600-LINE SCAN MODE) TRANSMITTER A

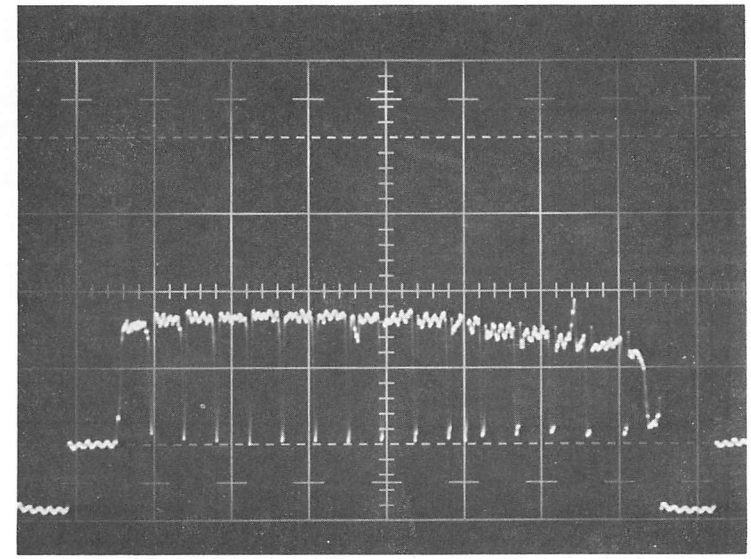


VIDEO OUTPUT AT 345 DEGREES
WITH 300 ft-L AND f/4 IRIS.
(600-LINE SCAN MODE) TRANSMITTER A

Figure 20. Typical Line Scan Showing P-Filter Video Output Level at Different Polarizer Angles. Sharp Spike is Vidicon Reseau Mark.



FULL FRAME REPRODUCTION
(NOTE CORNER REFERENCE MARKS)



TYPICAL LINE SCAN

Figure 21. Geometric Linearity, 600-Line Scan Mode, f/11, 150 ft-L, Clear Filter

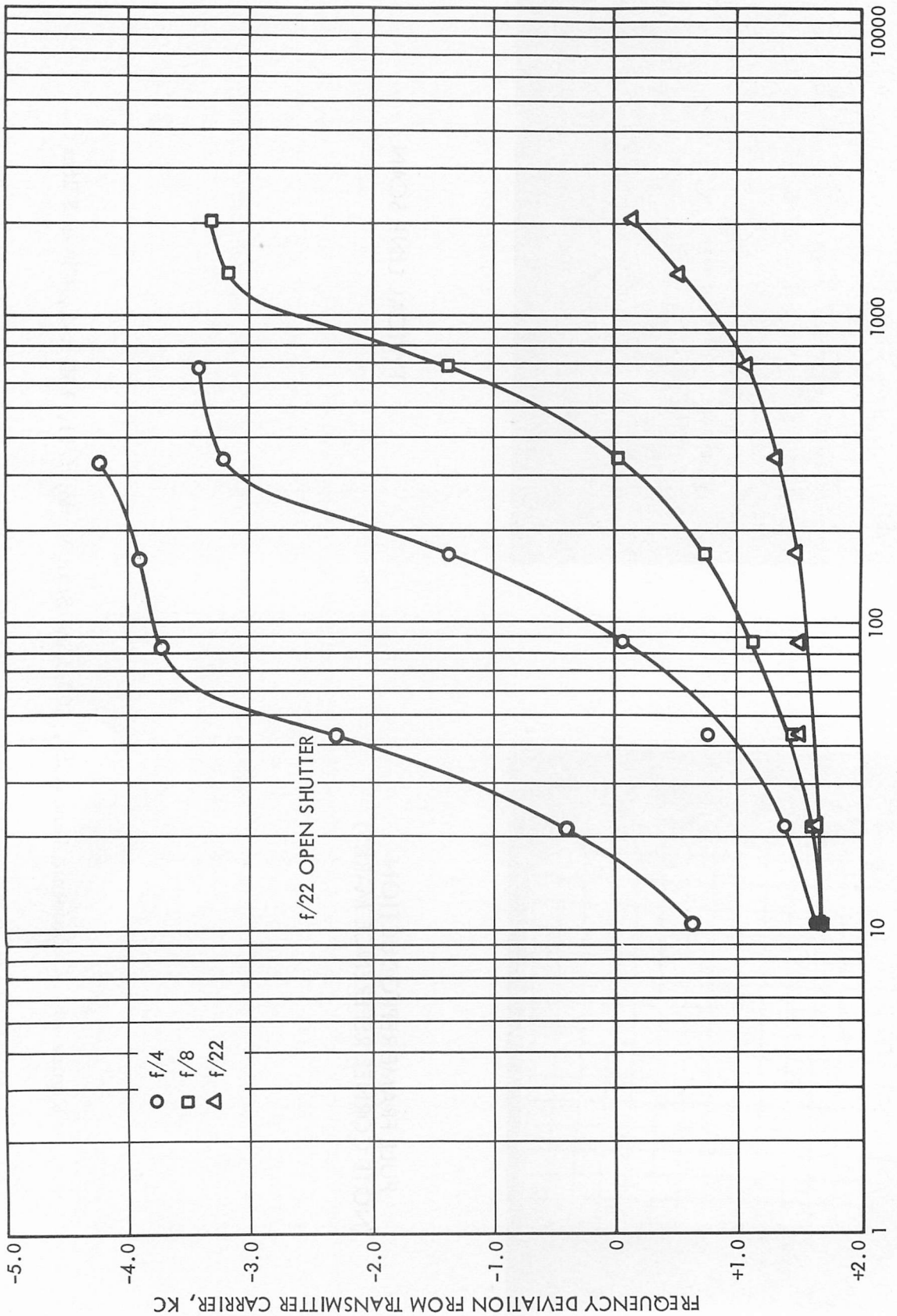


Figure 22. SC-6 Light Transfer Characteristic, 200-Line Scan Mode, Transmitter A

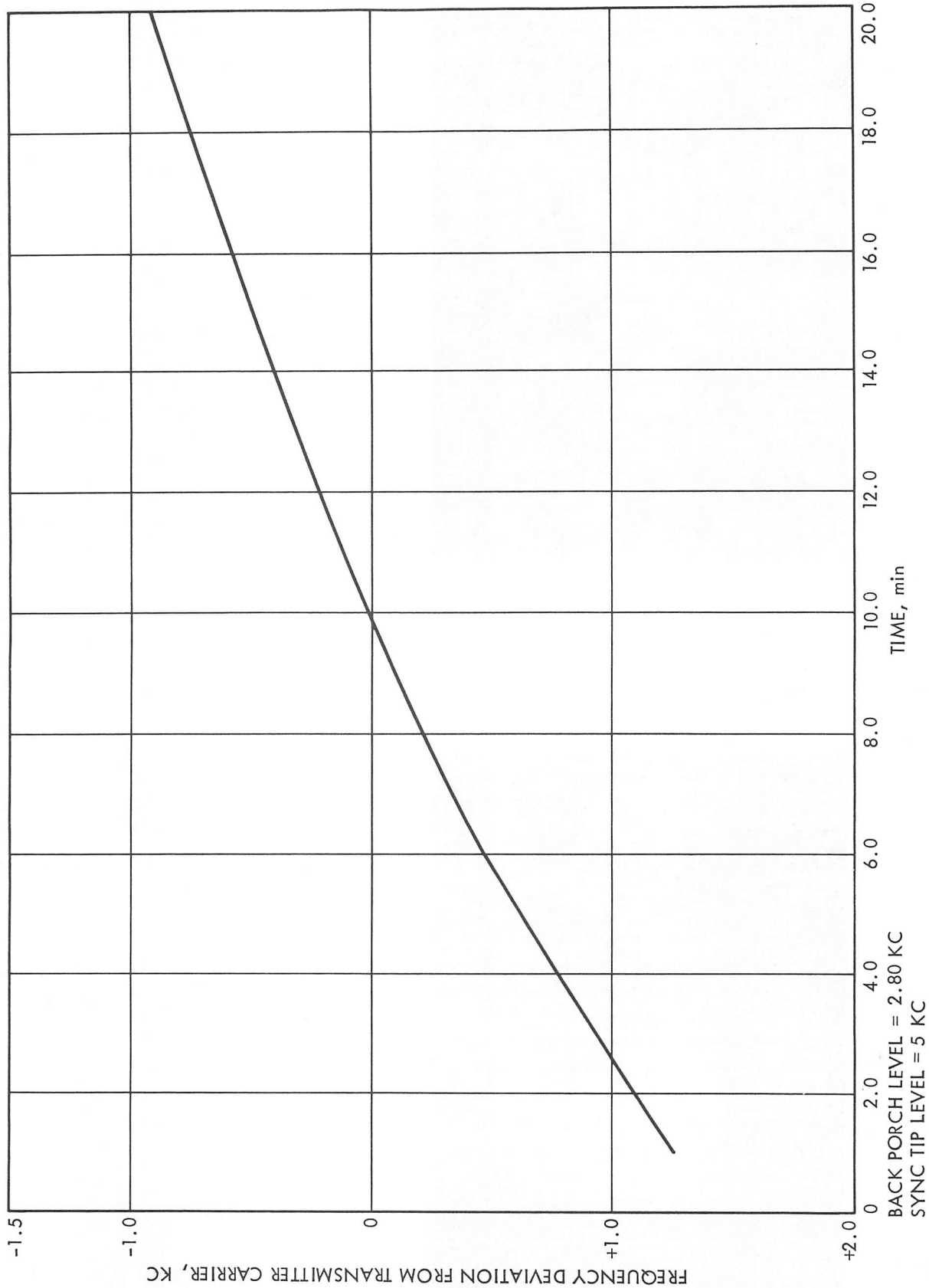
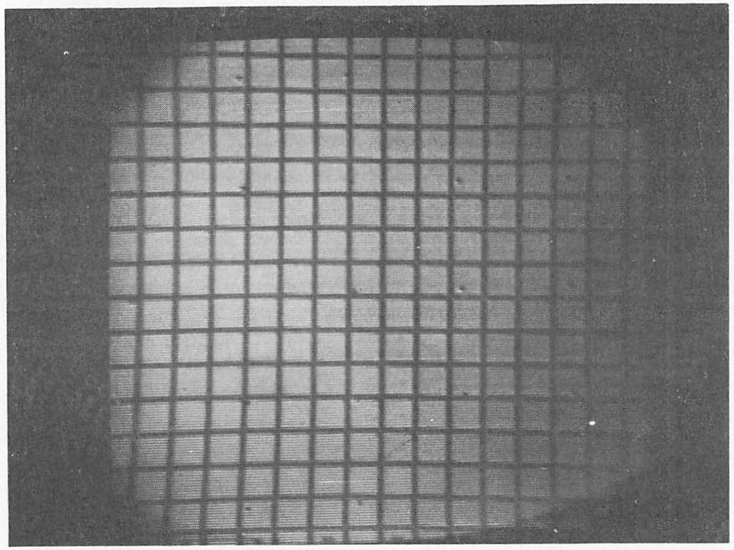
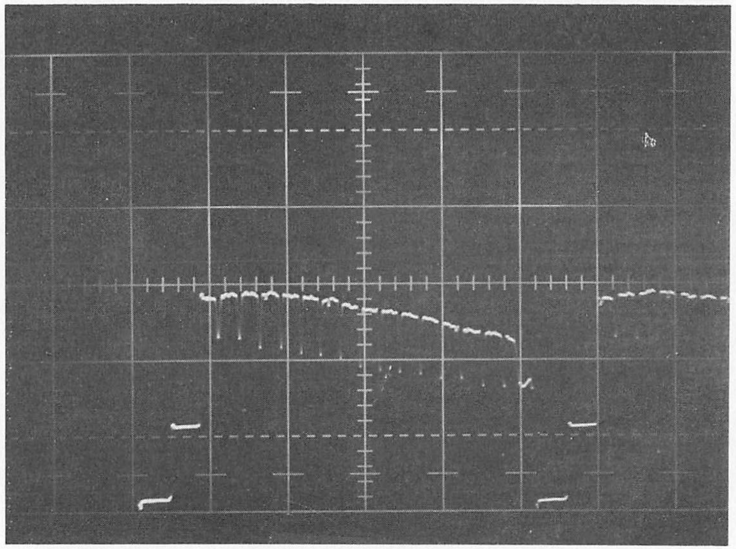


Figure 23. SC-6 Integrate Mode Dark Current Buildup, 200-Line Scan Mode, Transmitter A



FULL FRAME REPRODUCTION



TYPICAL LINE SCAN

Figure 24. Geometric Linearity, 200-Line Scan Mode, f/4, 200 ft-L, Clear Filter

SURVEYOR MISSION F

TV-GDHS CALIBRATION DATA

DERIVING VIDEO CALIBRATION FROM DUPLICATE NEGATIVES

Photometric video calibration is directed to the objective of having the ability to determine Lunar Scene brightness from the recorded density of an image on film. Several aids have been designed into the film product to facilitate the meeting of this objective. These aids, the associated data, the restrictions and the tolerances for the use of these aids and data, are given below.

The Calibration Process and Data Flow

During the calibration of the TV-GDHS, the FM demodulator is set for a given voltage output at various discreet frequencies. The calibration results in a conversion ratio of a nominal 3 volts per 1.25 MHz. After demodulation, the video signal is processed by clamping the backporch to an adjustable reference voltage and normalizing the resultant video signal such that black level occurs at 0 volts and white level occurs at 1 volt. The black level and white level frequencies are determined from a calibration tape recording made at Cape Kennedy prior to launch. Only the delta frequencies, referenced to backporch, are required for the calibration of the ground equipment (absolute frequencies are required for operational reasons). See Reference (1).

An analog exposure computer operates on the normalized video signal to achieve the following functions.

1) To introduce a recording gamma to match the film processing gamma such that a desired system gamma may be achieved.

$\gamma_S = \gamma_R \gamma_A$

γ_S = System Gamma

γ_R = Recording Gamma

γ_A = Film Processing Gamma

Generally, the goal is a γ_S of 1.0 on the original archival negative.

2) To set a contrast ratio (CR) to be achieved on the original negative independent of γ_S. This is generally set for a contrast ratio of 25:1 or delta density of 1.4 between black and white when γ_S = 1.0.

3) To compensate for such things as CRT writing speeds, light filters, etc.

4) To supply a constant intensity signal which represents a flat white level field or a flat black level field for recording "calibrate" frames.

The Film Recorder then takes the video signal from the exposure computer and exposes the film with light from a CRT which is linearly related to its input signal. After a frame of video information is recorded, an electrically generated gray scale is exposed along the left side of the video frame. The Film Recorder also position modulates the recording electron beam, in the vertical direction, to fill in the gaps between recording lines. This is known as dither.

The film is wet processed to obtain an original negative. The negatives distributed in this data package are duplicates which are made from the original negative via a master positive.

During the mission, it is the practice to expose film during the countdown procedures with graybar and white line grid patterns generated by the Video Data Simulator, and the flat white and flat black levels generated by the exposure computer to provide standard reference frames. At the conclusion of the pass, a dub of portions of the Calibration Tape made at Cape Kennedy is played through the system, and likewise recorded on film.

Sources of Density Variation From Pass to Pass

It is obvious that there are many steps between the Spacecraft and

the final duplicate negative, each one of which can cause day to day density variation in the final product.

These sources of variation are listed here:

a) Variations of the output voltage versus input light intensity in the spacecraft camera itself.

b) Variations in the sensitivity of the modulator in the spacecraft.

c) Variation in the set up of the test equipment used to perform the countdown calibration.

d) Variations in the ground equipment demodulator and associated video amplifiers.

e) Variation in the video processor and the normalization process and calibration.

f) Variations in the exposure computer.

g) Variations in the day-to-day set up of the light versus input voltage to the Film Recorder.

h) Variations in day-to-day processing of the original negative.

i) Variations in the exposure and processing of the master positive and duplicate negatives.

Calibration Aids

1) The Electrical Gray Scale (EGS)

An Electrical Gray Scale (EGS) is exposed along the left edge of every frame. The EGS is generated internally by the exposure computer independent of any input signal. The intent of this gray scale is to provide a series of gray steps, the black and white steps of which are equivalent to the normalized input voltages corresponding to the calibrated black and white levels of the input signal. The gray scale is a series of eight equal voltage steps

from 0 volts to 1 volt. 0 volts corresponds to black level, and 1 volt corresponds to white level. A ninth step is included which is a repeat step of white level.

For Surveyor Mission F, the voltage steps have the following correspondences. See reference (1).

	Step	Voltage	Representing A Frequency (From Back Porch)
Black Level	8	0.000 ± .001 Volts	125 KHz
	7	0.143 ± .001 Volts	321 KHz
	6	0.286 ± .001 Volts	518 KHz
	5	0.429 ± .001 Volts	714 KHz
	4	0.571 ± .001 Volts	911 KHz
	3	0.714 ± .001 Volts	1.107 MHz
	2	0.857 ± .001 Volts	1.304 MHz
White Level	1	1.000 ± .001 Volts	1.500 MHz

A recent modification to all film recorders has eliminated to a large extent a problem noted in previous reports for the 8 step EGS. The 9 step version utilizes the same dither and line spacing as is used in the video image. Also the EGS steps follow an up-scan series, that is the white level (Step 1) is located at the bottom side of the film and the black level (Step 8) is near the top of the film and followed by Step 9.

2) The Video Gray Bar

The Video Gray Bar (VGB) is generated by the Video Data Simulator (VDS). During countdown, the VDS is set according to published S/C Video Calibration parameters. See reference (1). The back porch is set to nominal frequency; sync tip, black level and white level are then set to produce

the published difference frequencies, all relative to back porch. Eight equal step voltage levels are generated between the black level and the white level in two series of staircases. The first series starts at midscale and goes to black level. The second series starts at white level and goes to black level immediately after the black level of the first series.

The following table lists the correspondences.

	Step	Demod Output	Representing a Δ Frequency	Processed Video (To Film Recorder Exposure Computer)
Black Level	8	-1.500 ± .03 Volts	125 KHz	0.000 ± .02 Volts
	7	-1.030 ± .03 Volts	321 KHz	0.143 ± .02 Volts
	6	- .557 ± .03 Volts	518 KHz	0.286 ± .02 Volts
	5	- .086 ± .03 Volts	714 KHz	0.429 ± .02 Volts
	4	+ .386 ± .03 Volts	911 KHz	0.571 ± .02 Volts
	3	+ .857 ± .03 Volts	1.107 MHz	0.714 ± .02 Volts
	2	+1.330 ± .03 Volts	1.304 MHz	0.857 ± .02 Volts
White Level	1	+1.800 ± .03 Volts	1.500 MHz	1.000 ± .02 Volts
Back Porch		-1.800 ± .03 Volts	0.000 MHz	---
Sync Tip		-2.861 ± .03 Volts	442 KHz	---

3) White Level and Black Level Calibrate Frames

During countdown and at the conclusion of the Video operating pass, the Film Recorder is put into a calibrate mode in which the exposure computer

puts out a signal corresponding to white level (1 volt input to the exposure computer), and a few frames are exposed on film. Similarly, a black level (0 volts input to the exposure computer) is recorded on film. Any shading introduced by the Film Recorder, or subsequent processing, can be measured from these frames.

4) The Optical Gray Wedge

The optical gray wedge is exposed onto the film by an independent light source. The film is exposed by this gray wedge during the countdown and subsequent to the video operating pass as well as automatically at 50 frame intervals during the pass. This provides a reference which will vary only because of film processing variation independent of changes in the Film Recorder.

5) Playback of the Dub of the S/C Calibration Tape

Subsequent to the end of a view period, a dub of selected frames from the S/C Calibration Tape is played back through the system. The tape playback originates at DSS-11. The entire system records the signal just as if it were a true real-time signal. See Reference (2) for a description of the data content of this playback.

Additional Remarks

To the eye used to viewing negatives intended for rapid production printing, the negatives in the data package may well appear relatively dense. The reason is that the toe of the H & D Curve extends up to approximately .3 to .4 density units. It is highly desirable from a photometric standpoint to place the image on the most linear part of the H & D Curve, hence black level is set to the minimum density possible, but still on the linear portion of the curve.

The Recording Function

All functions in the exposure computer are normalized with respect to an input voltage of 1.0 volts. The relationship of the exposure computer output to its input is:

$$V_{out} \approx (K_1 V_{in} + K_2)^{\gamma_R}$$

Where: $K_1 + K_2 = 1$

$0 \leq V_{in} \leq 1.0$

γ_R = Recording γ

$\frac{K_1 + K_2}{K_2}$ = Contrast Ratio

The density on the film, as measured by an averaging densitometer, is:

$$D \approx \log (K_1 V_{in} + K_2)^{\gamma_R \gamma_A}$$

Where: $\gamma_R \gamma_A = \gamma_S$

γ_A = Film Development γ

γ_S = System γ

A further refinement is:

$$D \approx \log (K_1 V_{in} + K_2)^{\gamma_S} + f \text{ (Beam Current i.e., spot size and shape)}$$

$$+ f \text{ (Line Spacing)} + f \text{ (Dither)}$$

The effect of the last three terms is known to exist, but no quantitative data is available at this time.

By plotting D versus $\log (K_1 V_{in} + K_2)$ of the EGS or VGB, it is possible to derive V_{in} from density measurements in a video frame, and hence, spacecraft delta frequency which can then be related to the camera output voltage and Scene Brightness. The slope of the curve represents $-\gamma_S$.

For the EGS or VGB and a Contrast Ratio setting of 25, the following relationships hold:

$$\frac{K_1 + K_2}{K_2} = 25, \quad K_1 + K_2 = 1 \therefore K_1 = .96, \quad K_2 = .04$$

	Step	V_{in}	$K_1 V_{in} + K_2$
Black	8	0.000 ± .02 Volts	0.040 ± .023 Volts
	7	0.143 ± .02 Volts	0.177 ± .027 Volts
	6	0.286 ± .02 Volts	0.315 ± .031 Volts
	5	0.429 ± .02 Volts	0.452 ± .035 Volts
	4	0.571 ± .02 Volts	0.588 ± .039 Volts
	3	0.714 ± .02 Volts	0.725 ± .042 Volts
	2	0.857 ± .02 Volts	0.863 ± .046 Volts
White	1	1.000 ± .02 Volts	1.000 ± .050 Volts

If correctly adjusted, the error in the light intensity from the CRT in the Film Recorder is less than 1% compared to the output of the exposure computer. By measuring the densities over a white or black Calibrate frame the characteristic shading introduced by the film recorder can be measured.

References:

1) Surveyor VI Spacecraft Survey Camera Science Calibration Report 1 November 1967, Project Document No. 602-49, Page 9.

2) Ibid, Page 13.

TELEVISION IDENTIFICATION DATA CALIBRATION

The television identification parameters transmitted back from the spacecraft were calibrated prior to launch by Hughes Aircraft Company personnel. Essentially, tables of each parameter function in engineering units vs. the binary coded decimal equivalent were delivered for each parameter. Fifth-degree polynomials were fit to these by JPL personnel for operational use, with the calculated functions plotted and visually examined for goodness of fit to the calibration data. These ploynomials were then used in the TVGDHS computing system to obtain the engineering units in the TVID contained in this data package.

Polynomials were fit to the vidicon faceplate and electronics temperatures, mirror azimuth and elevation, lens faces and iris positions, and the filter wheel positions. The lens iris servo, multistep focus, focal length and time exposure words are transmitted as full binary words, but actually can be in only one of two states, hence were handled merely by level detection.

Mission Data Package Film Generation

Section 2-d gives measurements and plots using data obtained from the original negatives (recorded on Optics I), master positives, and EDR duplicate negatives. Also included is the method of generating the transfer function for a duplicate negative film roll.

Measured Data, Plotting Methods and Examples

Shading Characteristics

The EDR and the Duplicate Negatives in this Data Package were produced from Optics I of the Film Recorder in the SFOF, Pasadena. Figure B-1 shows average density patterns of the shading characteristics of a white calibration frame of this optics. Figure B-2 shows a family of orthogonal microdensitometer traces at approximate equal spacing across and down a white calibration frame. The frame used to make these measurements was made as part of the calibrate frames exposed for the first video pass of the mission. Figures B-3 and B-4 show similar data for a black calibration frame.

An examination of the films show some mottling which appears to account at least partially for the apparent differences between the patterns. Generally, however, there is a negative density gradient from both the left edge and the right edge of the frame to the center of the frame.

System Gamma Plots

Figure B-5 shows typical System Gamma Plots for three film products. Figure B-5a shows the EGS and VGB step densities of an original negative film product. Also shown as a dashed line is the EGS curve which has been normalized to the average density of a white calibration frame and also corrected for left edge shading taken from Figure B-1. It is noted that the deviations of the VGB step densities from the EGS step densities are due to the relative differences in the respective shading curves. The left edge shading curve pertaining to the EGS has smaller density variations than that shading curve pertaining to the VGB as respectively evidenced by the left edge of Figure B-1 and the boxed-in area of Figure B-2.

Figure B-5b shows typical system gamma plots for the master positive film and the EDR duplicate negative film.

H & D Plots

From sensitometric data, an H & D plot can be constructed for any film product. Figure B-6 shows typical H & D plots for original negatives, master positives, and EDR duplicate negatives.

Demodulator Curve

Figure B-7 shows the output voltage of the FM Demodulator vs. input frequency at a point prior to final amplification.

Density vs. Delta Frequency

Figure B-8 shows the upper and lower limits of EGS density vs. delta frequency from back porch for the original negatives recorded on Optics I, SFOF, Pasadena. These original negatives are the sources for the duplicate negatives in the data package and for the EDR.

In using Figure B-8, it must be understood that the range of density vs. delta frequency describes the envelope for a family of curves, each curve falling essentially parallel to the boundaries of the envelope.

The slope of density vs. delta frequency curve for a film roll may differ from the average slope of the upper and lower limit curves. The resulting deviation of the density vs. delta frequency curve from the average slope of the upper and lower limit curves can be measured in density units. For all the film rolls measured, the maximum density deviation obtained is ± 0.06 density units, and the average deviation is about ± 0.04 density units. Since these are measured on the original negatives, a similar set of curves should be generated from measurements made on the duplicate negative.

Original Film Measurements

Table B-1 gives the measurements of the output of the exposure computer, typical EGS and VGB step densities for three film products, OGW step number 10 density at the beginning, middle, and end of an original negative film roll, and a 25 density profile of a white calibration frame. Also shown in table B-1 for all the film rolls exposed on Optics I per pass are the maximum and minimum EGS density measurements pertaining to black level and white level of an original negative, and the system gamma values for the three film products.

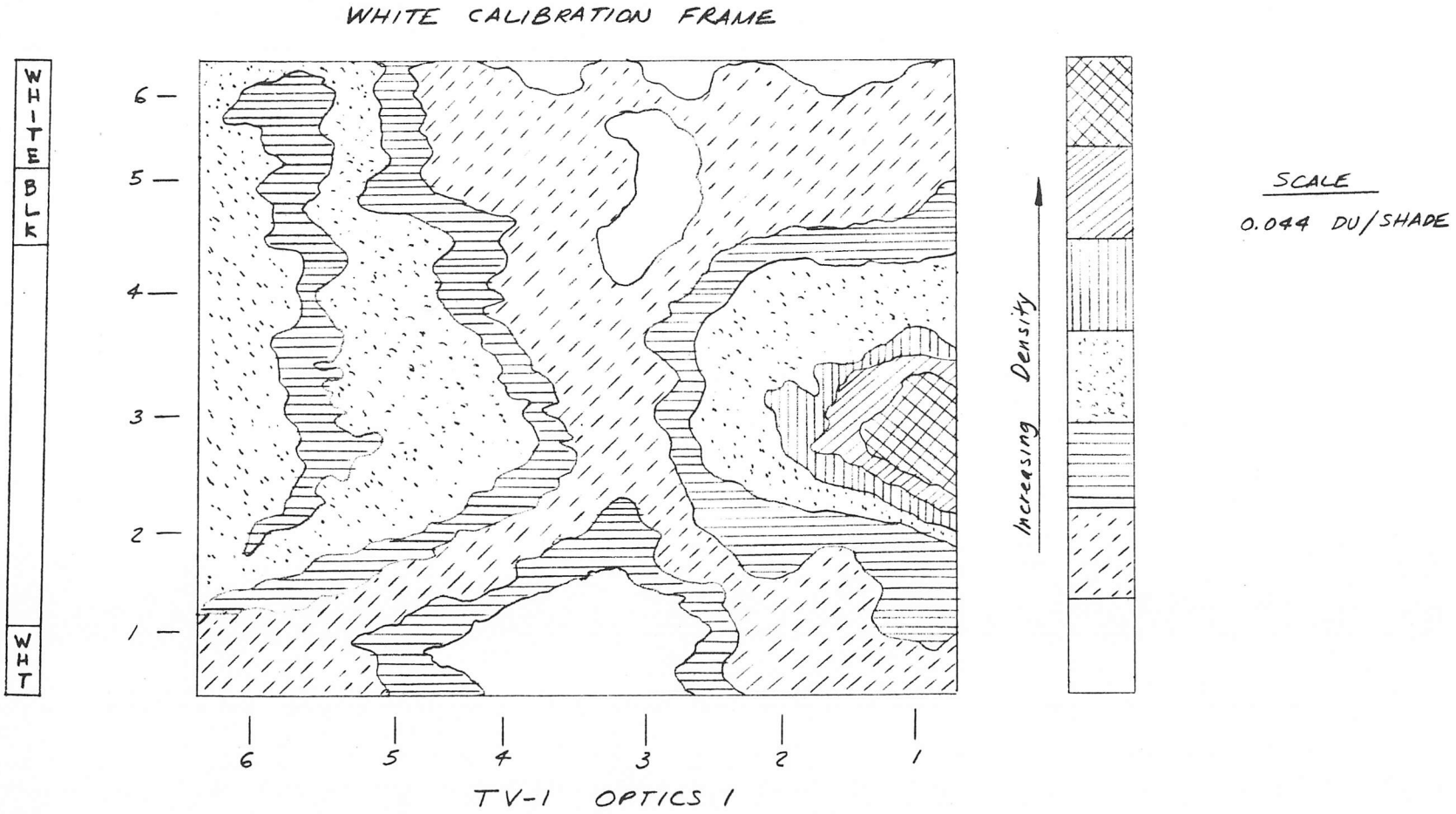
The relationship between the input to the exposure computer to its output is:

$$V_{out} = K_3 (K_1 V_{in} + K_2)^{\gamma_R}$$

For Mission F, the values for the parameters were:

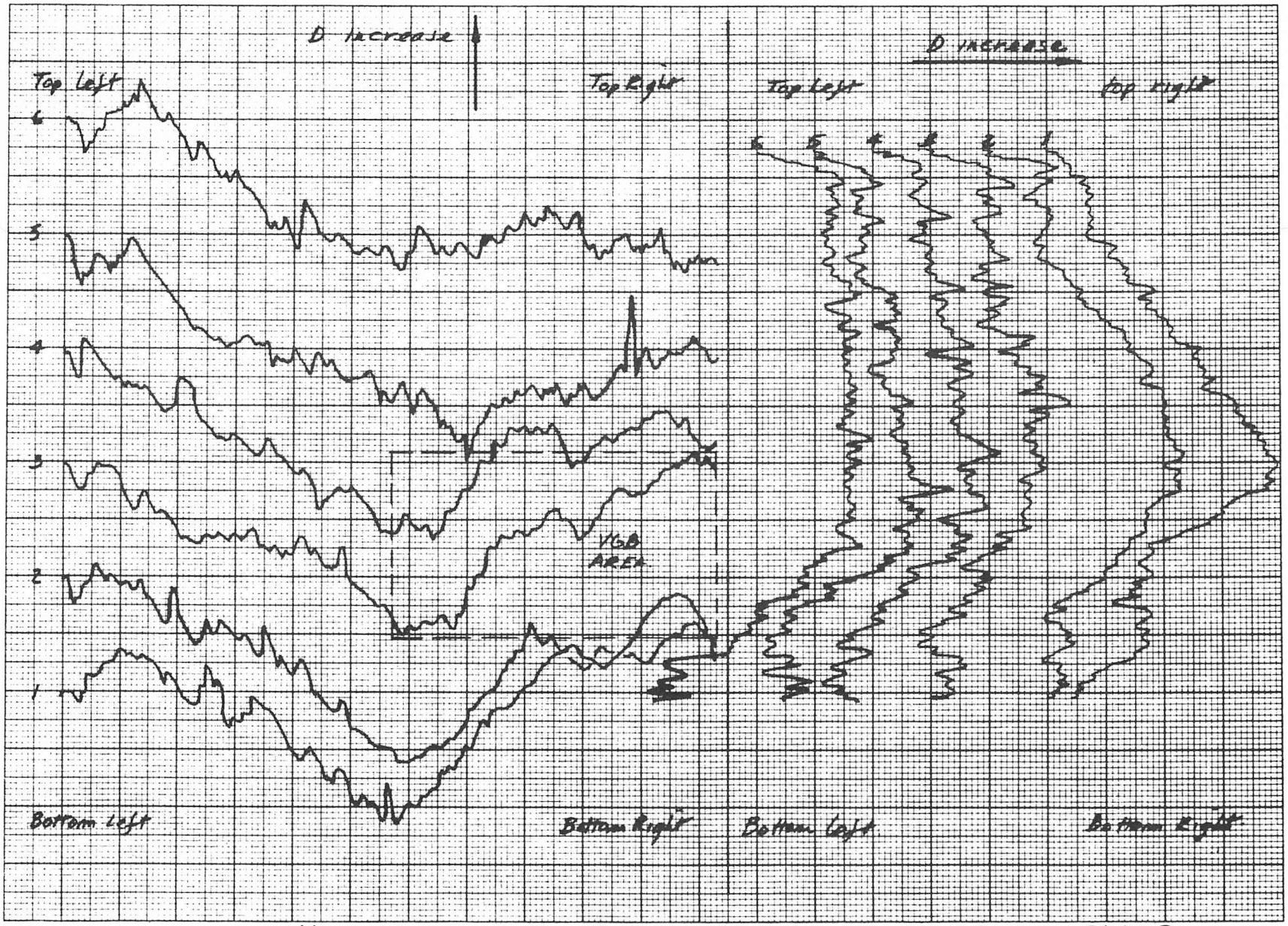
$K_1 = 0.96$, $K_2 = 0.04$ (as discussed in Section A), $\gamma_R = 0.574$, and the average $K_3 = 23.2107$.

The light output of the film recorder optics is directly proportional to the exposure computer output voltage except for any shading characteristics.



SHADING CHARACTERISTICS

FIGURE B-1



MICRODENSITOMETER TRACES OF A WHITE CALIBRATION FRAME

figure B-2

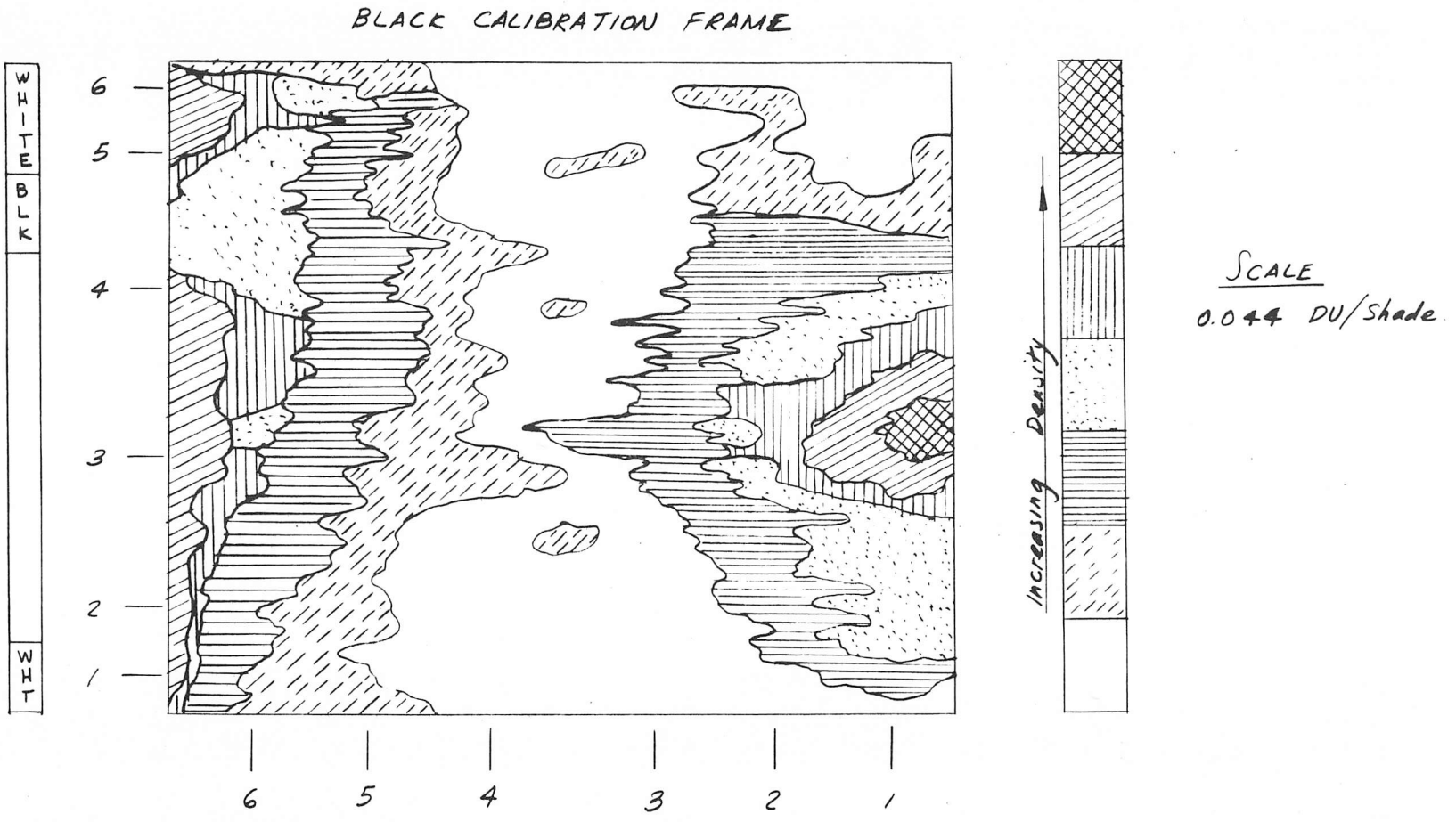
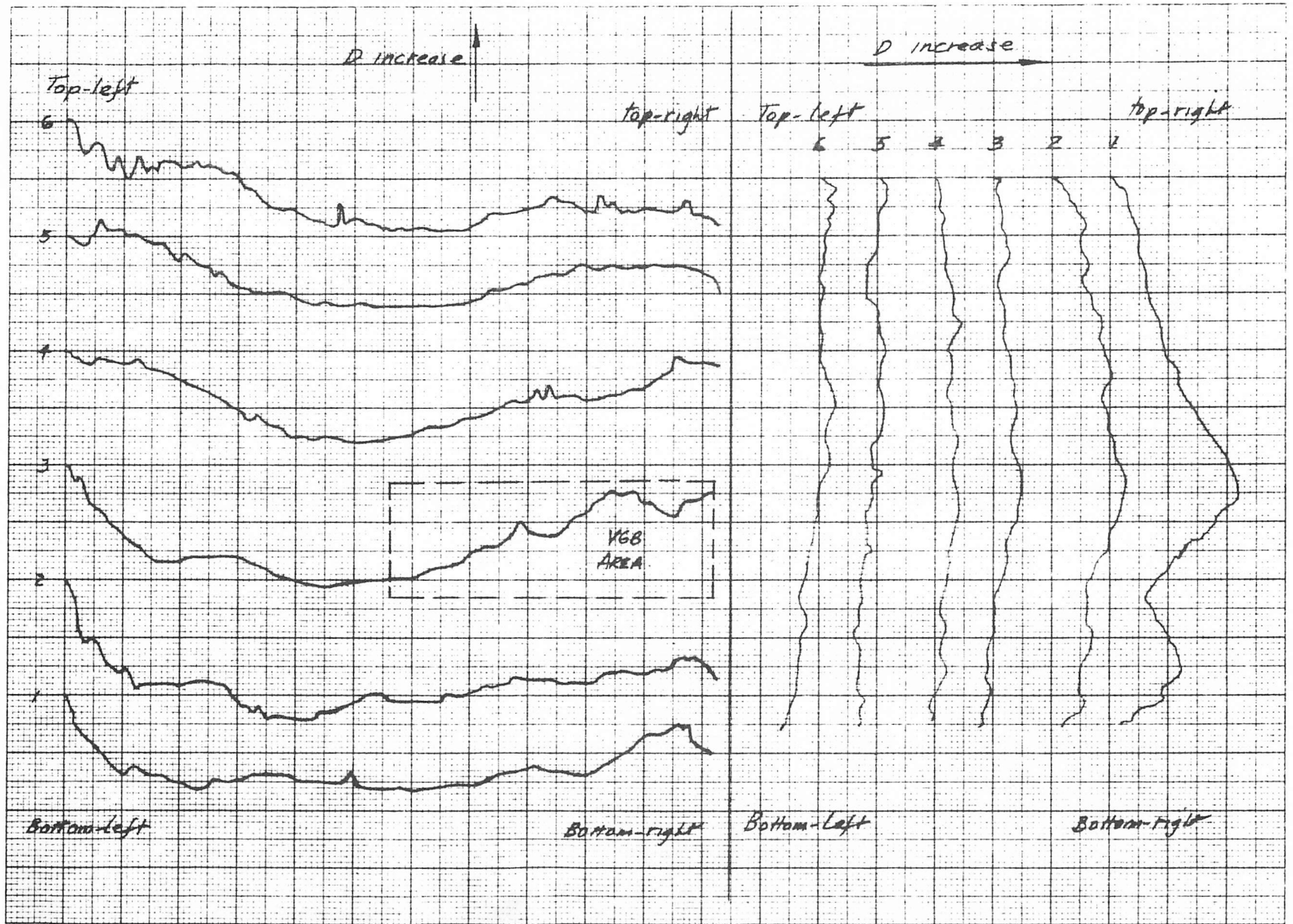

BLACK CALIBRATION FRAME
WHITE
BLK
WHT
6
5
4
3
2
1
INCREASING DENSITY
SCALE
0.044 DU/Shade
6 5 4 3 2 1
TV-1 OPTICS I
SHADING CHARACTERISTICS

Figure B-3



MICRODENSITOMETER TRACES OF A BLACK CALIBRATION FRAME.

figure 8-4

ORIGINAL NEGATIVE

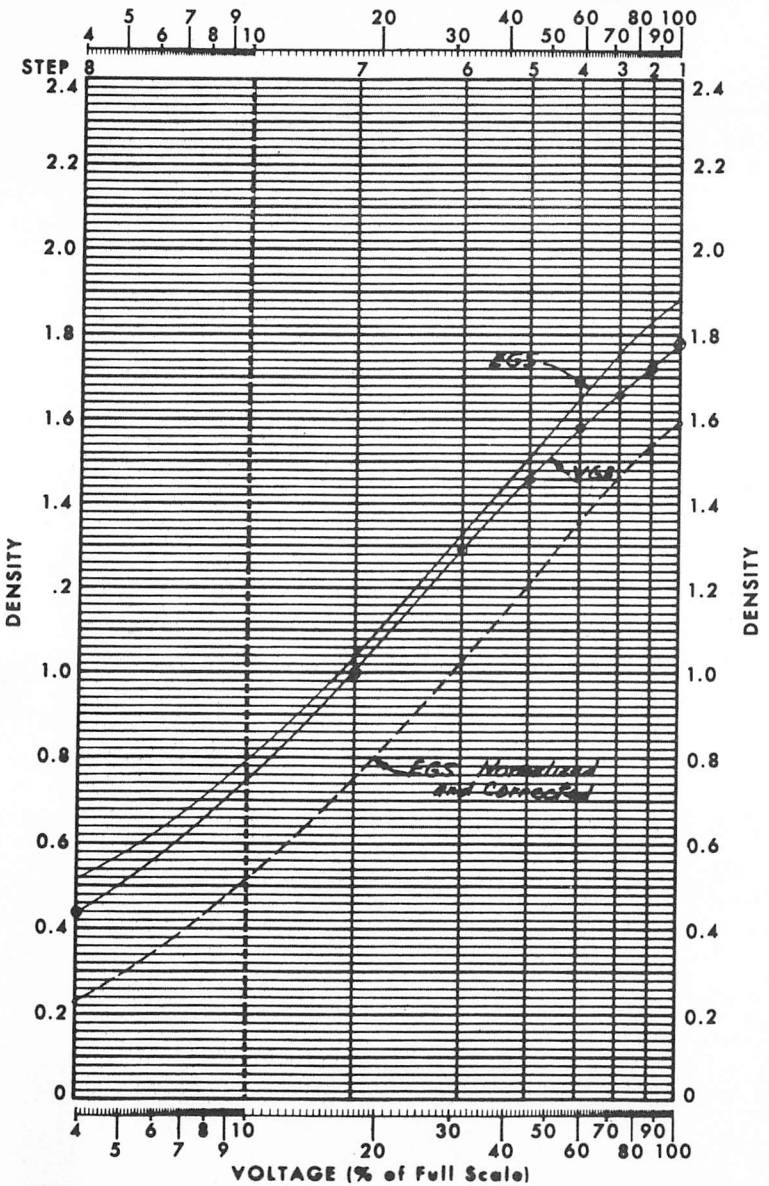


Fig. B-5a

MASTER POSITIVE and EDR

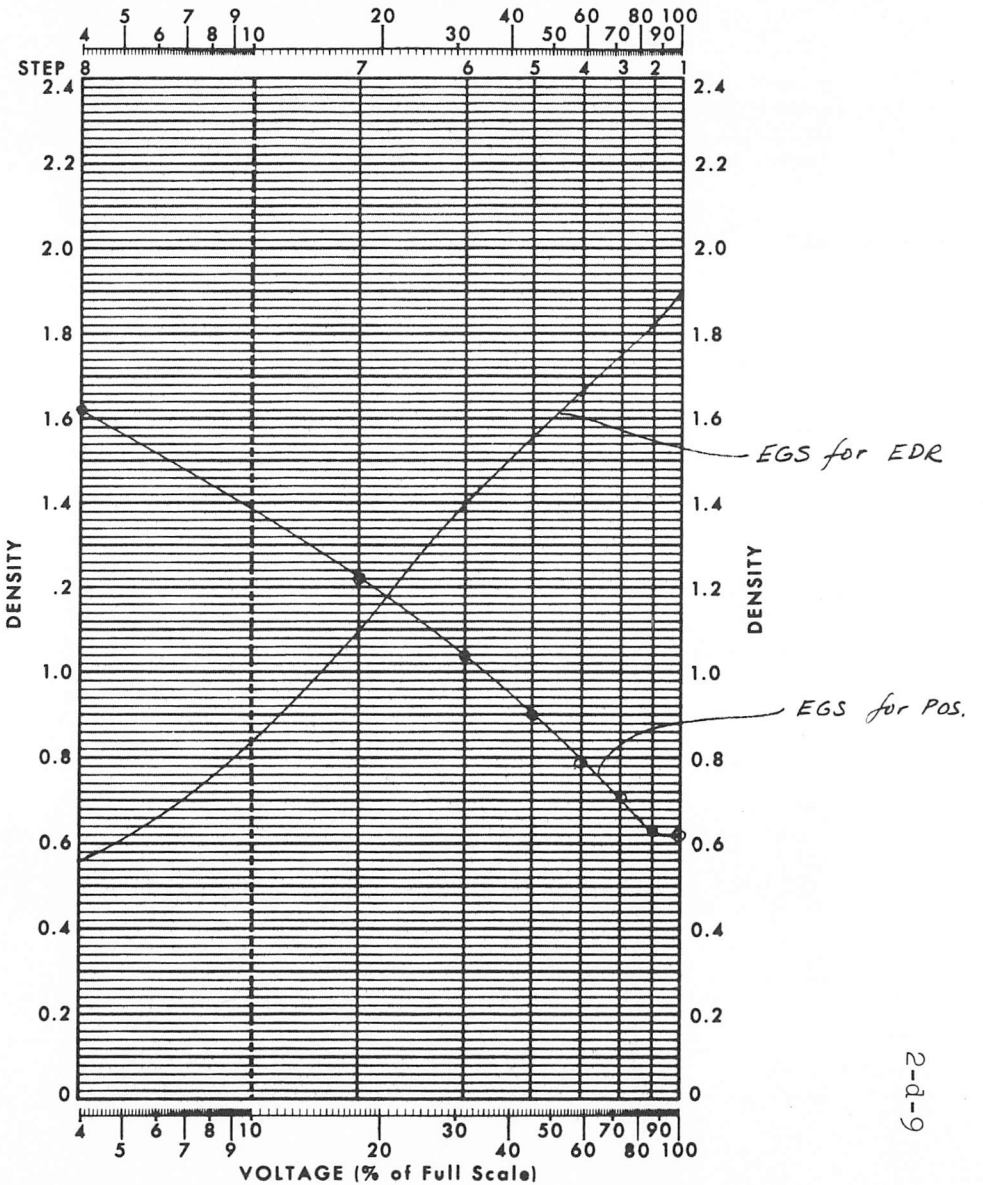


Fig. B-5b

Fig. B-5 - Typical System Gamma Plot for Original Negative, Master Positive, and EDR Duplicate Negative

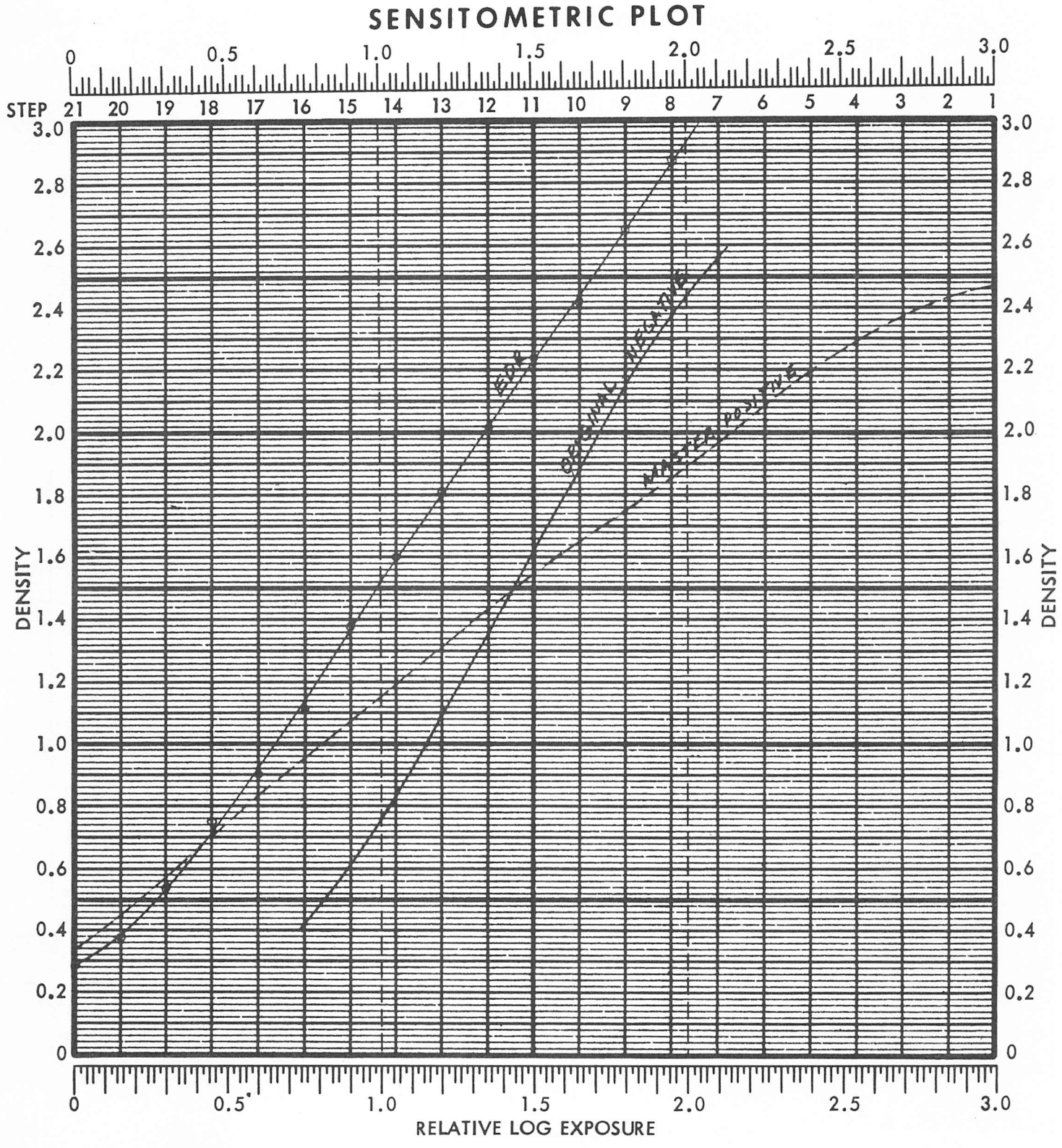
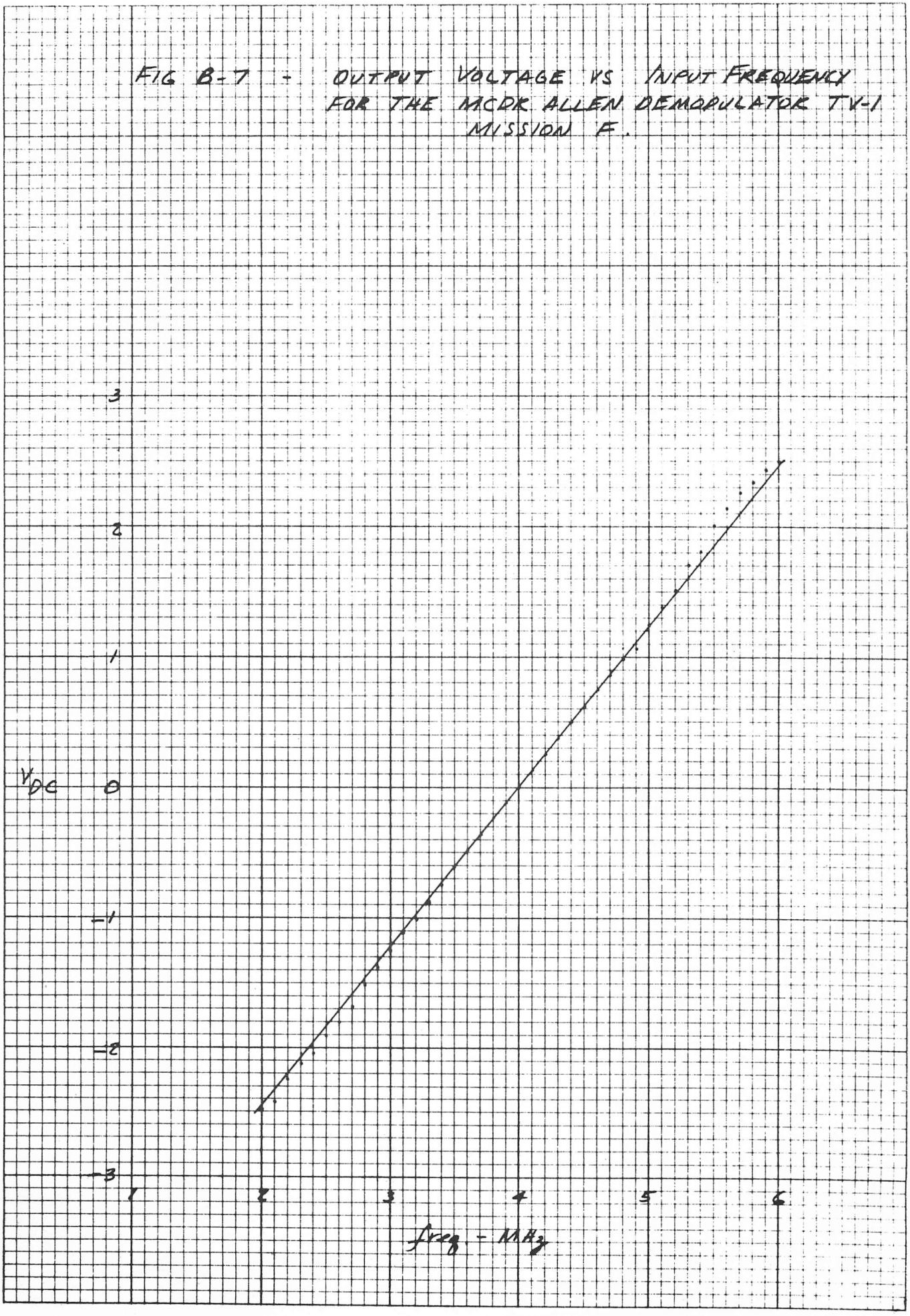


Fig. B-6 Typical H & D Plot for Original Negative, Master Positive, and EDR Duplicate Negative

FIG B-7 - OUTPUT VOLTAGE VS INPUT FREQUENCY FOR THE MCDR ALLEN DEMODULATOR TV-1 MISSION F.



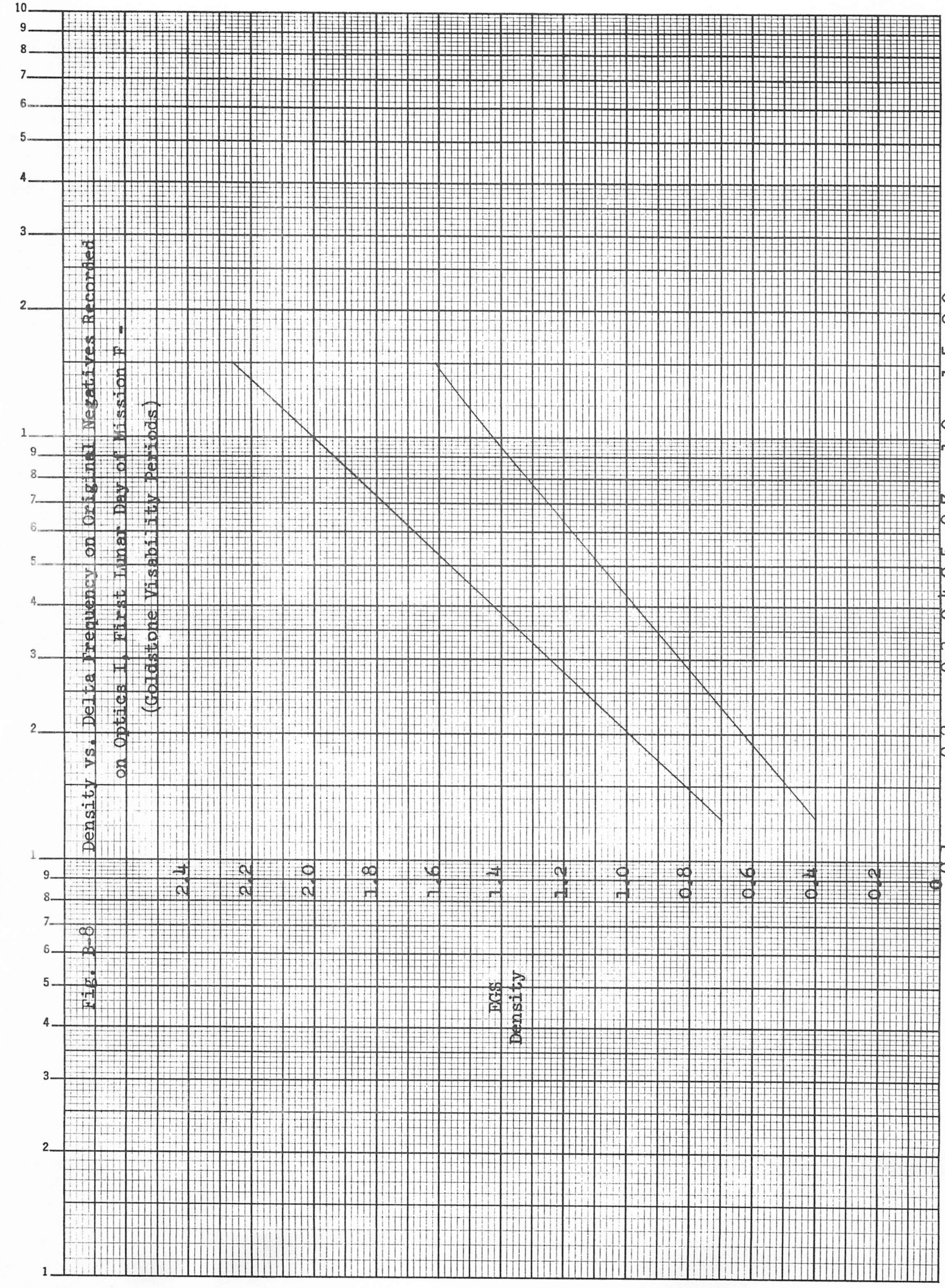


Fig. B-8
Density vs. Delta Frequency on Original Negatives Recorded on Optics I, First Lunar Day of Mission # -
(Goldstone Visability Periods)
EGS Density
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.1
0.2
0.3
0.4
0.5
0.7
1.0
1.5
2.0
DELTA FREQUENCY FROM BACK PORCH - MHz

Fig. B-8

TABLE B-1

The following pages cover measurements pertaining to film products for Surveyor Mission F.

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 313:00-314:07

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0660					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.08	1.90				1.84	
2	21.22	1.83				1.72	
3	19.24	1.83				1.70	
4	16.93	1.74				1.67	
5	14.46	1.62				1.49	
6	11.625	1.42				1.28	
7	8.462	1.13				1.00	
8	3.665	0.57				0.46	
9							
File/Frame No.		62				62	

OGW Step No. 10

Original Negative Roll No.____

Location	Density	Adj. Frame No.
Start		
Middle		
End		

Calibrate White

Orig. Neg.; Frame No.____, Roll No.____

Average:

Film	Roll No.	W0656	W0660	W0661
Orig. Neg.	EGS D_{Max} wht D_{Min}	1.81 / 1.77	1.93 / 1.86	1.94 / 1.84
	EGS D_{Max} blk D_{Min}	.51 / .50	.59 / .53	.62 / .53
	γ_{s_1}	1.03	1.03	1.15
Pos	γ_{s_2}			
EDR	γ_{s_3}	1.00	1.10	1.16

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 314:22-315:08

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0668					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1		1.88	1.81	0.70		2.02	
2		1.83	1.75	0.72		1.89	
3		1.76	1.69	0.76		1.80	
4		1.65	1.63	0.86		1.66	
5		1.53	1.52	0.92		1.54	
6		1.36	1.31	1.00		1.35	
7		1.10	1.04	1.16		1.05	
8		0.56	0.45	1.60		0.54	
9							
File/Frame No.		723	501	01175		501	

OGW Step No. 10 Original Negative Roll No. W-0668		
Location	Density	Adj. Frame No.
Start	.47	0003
Middle	.52	177
End	.60	397

Calibrate White
Orig. Neg.; Frame No. 20, Roll No. W-0668

1.79	1.65	1.63	1.63	1.63
1.69	1.64	1.60	1.66	1.68
1.65	1.62	1.59	1.71	1.73
1.59	1.58	1.58	1.67	1.68
1.57	1.59	1.59	1.62	1.67

Average: 1.642

Film	Roll No.	W0669	W0671	W0668	W0694	W0703	W0713	W0714
Orig. Neg.	EGS D_{Max} wht D_{Min}	2.07 / 1.78	1.99 / 1.91	2.04 / 1.88			1.98 / 1.95	
	EGS D_{Max} blk D_{Min}	.59 / .47	.58 / .54	.65 / .54			.57 / .54	
	γ_{s_1}	1.08	1.06	1.06			1.11	
Pos	γ_{s_2}	0.61		0.61	0.82	0.71	0.79	0.66
EDR	γ_{s_3}	1.20		1.21	1.10		1.16	

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 315:22-316:09

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0676					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.080	1.79		0.62		1.88	
2	22.85	1.75		0.65		1.82	
3	19.355	1.70		0.69		1.73	
4	17.05	1.66		0.74		1.62	
5	14.56	1.52		0.79		1.47	
6	11.74	1.38		0.89		1.29	
7	8.510	0.96		1.04		1.02	
8	3.645	0.44		1.46		0.51	
9				0.60			
File/Frame No.				5013		5177	

OGW Step No. 10

Original Negative Roll No. W-0674

Location	Density	Adj. Frame No.
Start	.39	003
Middle		
End	.50	515

Calibrate White

Orig. Neg.; Frame No.____, Roll No.____

Average:

Film	Roll No.	W0674	W0676	W0675	W0677	W0680	W0682	W0712	W0730	W0731							
Orig. Neg.	EGS wht D_{Max}	1.75	1.79	1.74	1.80	1.77	1.84										
	EGS wht D_{Min}	1.61	1.70	1.64	1.79	1.72	1.74										
	EGS blk D_{Max}	.51	.48	.50	.57	.54	.59										
	EGS blk D_{Min}	.45	.44	.48	.50	.48	.51										
	γ_{s_1}	1.06	1.12	1.26	1.08	1.05	0.99										
Pos	γ_{s_2}	0.61	0.57		0.61		0.72										
EDR	γ_{s_3}	1.13	1.18	1.09	1.06		1.02		1.15								

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 316:23-317:10

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. 0683					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.12	1.83	1.83	0.66		1.66	
2	21.26	1.86	1.77	0.66		1.61	
3	19.29	1.87	1.66	0.70		1.58	
4	16.90	1.77	1.57	0.76		1.50	
5	14.38	1.68	1.46	0.84		1.38	
6	11.65	1.58	1.25	0.96		1.24	
7	8.69	1.20	0.96	1.10		1.00	
8	3.69	0.62	0.42	1.54		0.51	
9				0.50			
File/Frame No.		6577	0006	0002		6577	

OGW Step No. 10		
Original Negative Roll No. W-0683		
Location	Density	Adj. Frame No.
Start	0.57	20
Middle		
End		

Calibrate White				
Orig. Neg.; Frame No. 0006, Roll No W0683				
1.99	1.94	1.85	1.88	1.92
2.00	1.95	1.86	1.95	2.02
1.94	1.90	1.86	1.94	2.03
1.88	1.88	1.84	1.92	1.92
1.79	1.84	1.80	1.82	1.94
Average: 1.905				

Film	Roll No.	A0683	W0684	W0685	W0686	W0687	W0688	W0689	W0692	W0716	W0716	W0732	W0731	W0745			
Orig. Neg.	EGS wht D_{Max}	1.83	1.91	1.90	1.85	1.85		1.94	1.97	2.26	2.14						
	wht D_{Min}	1.74	1.77	1.79	1.76	1.74		1.90	1.90	2.08	2.02						
	EGS blk D_{Max}	.62	.66	.63	.60	.56		.57	.60	.66	.60						
	blk D_{Min}	.55	.62	.57	.54	.52		.56	.52	.55	.59						
	γ_{s_1}	1.06	0.98	1.18	1.08	1.07		1.14	1.16	1.22	1.13						
Pos	γ_{s_2}	0.61	0.76	0.79	0.71	0.71	0.75	0.74		0.82	0.82						
EDR	γ_{s_3}	0.94		1.08	1.05	1.12	1.04	1.11				1.05					

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 317:23-318:11

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0700					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.340	2.00	1.84	0.62		1.92	
2	21.455	1.86	1.75	0.68		1.80	
3	19.47	1.77	1.67	0.74		1.73	
4	17.105	1.67	1.56	0.82		1.63	
5	14.61	1.53	1.47	0.88		1.49	
6	11.83	1.34	1.26	1.02		1.30	
7	8.500	1.06	0.97	1.23		0.99	
8	3.655	0.54	0.43	1.64		0.46	
9				0.56			
File/Frame No.		13211	0009	183		13430	

OGW Step No. 10 Original Negative Roll No. W-0700		
Location	Density	Adj. Frame No.
Start	0.42	0004
Middle		
End	0.48	326

Calibrate White
Orig. Neg.; Frame No. 0005, Roll No. W-0700

1.94	1.93	1.86	1.91	1.91
1.92	1.91	1.82	1.90	1.91
1.88.	1.86	1.82	1.89	1.95
1.85	1.85	1.82	1.89	2.02
1.86	1.87	1.90	1.88	1.90

Average: 1.890

Film	Roll No.	W0685	W0688	W0692	W0700	W0703	W0706	W0707	W0709	W0710	W0807						
Orig. Neg.	EGS D_{Max}		1.89		2.02	2.15	1.96	2.02	2.02	2.05							
	wht D_{Min}		1.86		1.90	2.01	1.93	1.95	1.88	1.84							
	EGS D_{Max}		.60		.57	.59	.56	.57	.55	.61							
	blk D_{Min}		.56		.53	.58	.51	.54	.50	.50							
	γ_{s_1}		1.10		1.14	1.16	1.09	1.21	0.87	1.10							
Pos	γ_{s_2}				0.79	0.71	0.71	0.70	0.70								
EDR	γ_{s_3}				1.23		1.03	1.18	1.23		1.15						

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 319:00-319:12

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0721					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.18	2.14	1.98	0.88		1.90	
2	21.19	2.05	1.91	0.94		1.74	
3	19.24	1.97	1.84	0.96		1.64	
4	16.93	1.85	1.72	1.02		1.52	
5	18.35	1.69	1.61	1.10		1.40	
6	11.60	1.49	1.40	1.20		1.18	
7	8.315	1.19	1.09	1.37		0.90	
8	3.700	0.60	0.50	1.74		0.45	
9				0.81			
File/Frame No.		17572		20167		20562	

OGW Step No. 10 Original Negative Roll No. W-0721		
Location	Density	Adj. Frame No.
Start	0.56	0018
Middle		
End	0.58	0535

Calibrate White
Orig. Neg.; Frame No. 0001, Roll No. W-0721

2.14	2.08	1.96	1.98	1.94
2.09	2.03	1.94	2.00	2.02
2.04	2.00	1.92	2.02	2.09
2.02	1.99	1.94	1.98	2.10
2.09	2.05	2.04	2.02	2.05

Average: 2.021

Film	Roll No.	W0721	W0722	W0723	W0724	W0726	W0727	W0880
Orig. Neg.	EGS D_{Max}	2.17	2.09	1.96	2.06	2.13	1.93	
	wht D_{Min}	2.07	2.04	1.90	2.02	2.04	1.89	
	EGS D_{Max}	.68	.69	.64	.58	.68	.58	
	blk D_{Min}	.60	.62	.58	.55	.64	.54	
	γ_{s_1}	1.27	1.04	1.05	1.18	1.00	1.07	
Pos	γ_{s_2}	0.85	0.65	0.85	0.72	0.65		0.74
EDR	γ_{s_3}	1.23	1.14	1.06	1.33	1.30		

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 320:00-320:12

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0734					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.635	1.85	1.63	.56		1.86	
2	21.83	1.72	1.57	.66		1.74	
3	19.72	1.64	1.50	.73		1.66	
4	17.345	1.56	1.44	.80		1.58	
5	14.70	1.43	1.36	.88		1.44	
6	11.80	1.28	1.18	.96		1.34	
7	8.455	1.00	.93	1.12		1.06	
8	3.560	.50	.40	1.55		.54	
9							
File/Frame No.		25615		25615		25615	

OGW Step No. 10

Original Negative Roll No. W-0734

Location	Density	Adj. Frame No.
Start	.44	0009
Middle		
End	.49	0380

Calibrate White

Orig. Neg.; Frame No. ____, Roll No. W-0734

1.74	1.74	1.68	1.72	1.74
1.86	1.87	1.77	1.78	1.85
1.94	1.88	1.76	1.78	1.83
1.85	1.87	1.78	1.79	1.80
1.88	1.88	1.82	1.82	1.79

Average: 1.809

Film	Roll No.	W0734	W0735	W0738	W0740	W0741	W0743										
Orig. Neg.	EGS D_{Max}	1.86	1.96	2.00	1.96	1.92	2.04										
	wht D_{Min}	1.79	1.94	1.88	1.88	1.88	1.90										
	EGS D_{Max}	0.51	.58	0.62	.54	.53	.56										
	blk D_{Min}	0.50	.52	0.54	.52	.52	.52										
	γ_{s_1}	1.06	1.16	1.17	1.17	1.07	1.20										
Pos	γ_{s_2}	0.62					.82										
EDR	γ_{s_3}	1.02	1.21	1.20	1.28												

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 321:01-321:13

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0749					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.39	1.89	1.79	.58		1.86	
2	21.51	1.82	1.76	.63		1.76	
3	19.55	1.79	1.66	.68		1.71	
4	17.18	1.72	1.57	.76		1.64	
5	14.695	1.58	1.48	.90		1.50	
6	11.840	1.42	1.27	1.02		1.30	
7	8.550	1.13	1.04	1.20		1.03	
8	3.720	.56	.50	1.60		.49	
9							
File/Frame No.		31757	0010	31757		31757	

OGW Step No. 10

Original Negative Roll No. W-0749

Location	Density	Adj. Frame No.
Start	.36	0003
Middle		
End	.48	400

Calibrate White

Orig. Neg.; Frame No. ____, Roll No. ____

1.77	1.78	1.72	1.83	1.86
1.92	1.92	1.85	1.89	1.95
1.97	1.92	1.83	1.88	1.92
1.94	1.92	1.84	1.87	1.91
1.87	1.87	1.81	1.84	1.87

Average: 1.870

Film	Roll No.	W0749	W0750	W0751	W0752	W0754	W0755	W0878	W0879								
Orig. Neg.	EGS D_{Max}	1.89	1.90	1.86	2.03	1.86	1.90										
	wrt D_{Min}	1.72	1.86	1.80	1.85	1.84	1.86										
	EGS D_{Max}	.56	.56	.51	.56	.53	.55										
	blk D_{Min}	.48	.53	.48	.50	.50	.52										
	γ_{s_1}	1.08	1.04	1.08	1.23	1.13	1.09										
Pos	γ_{s_2}	.92	.79					1.04	.72								
EDR	γ_{s_3}	1.10	1.11	1.13	1.17	1.25											

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 322:02-322:14

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0762					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.35	1.84	1.78	.56		1.74	
2	21.54	1.80	1.70	.58		1.70	
3	19.57	1.76	1.60	.62		1.67	
4	17.21	1.67	1.50	.72		1.57	
5	14.71	1.53	1.40	.84		1.42	
6	11.86	1.34	1.20	.98		1.23	
7	8.350	1.06	.94	1.20		.94	
8	3.620	.52	.39	1.63		.44	
9							
File/Frame No.		35171	0024	36136		35171	

OGW Step No. 10

Original Negative Roll No. W-0762

Location	Density	Adj. Frame No.
Start	.42	0003
Middle		
End	.50	36011

Calibrate White

Orig. Neg.; Frame No. 0024, Roll No. W-0762

1.70	1.58	1.55	1.58	1.54
1.71	1.62	1.62	1.69	1.65
1.71	1.64	1.64	1.71	1.72
1.68	1.62	1.62	1.68	1.68
1.56	1.50	1.51	1.54	1.61

Average: 1.558

Film	Roll No.	W0762	W0763	W0764	W0765	W0766	W0767	W0769	W0770	W0771	W0778	W0868					
Orig. Neg.	EGS D_{Max}	1.90	1.92	1.92	1.94	1.88	1.98		2.00	1.90	1.94	2.08					
	wht D_{Min}	1.84	1.88	1.89	1.88	1.84	1.89		1.67	1.80	1.88	2.04					
	EGS D_{Max}	.54	.54	.52	.58	.52	.56		.55	.58	.59	.70					
	blk D_{Min}	.50	.52	.50	.52	.48	.52		.41	.50	.56	.68					
	γ_{s_1}	1.20	1.22	1.19	1.14	1.15	1.30		1.12	1.06	1.14	1.03					
Pos	γ_{s_2}	.88															
EDR	γ_{s_3}	1.30	1.46	1.20	1.29	1.28	1.34			1.13	1.15	1.03					

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 323:03-323:15

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0772					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.155	1.86				1.76	
2	21.40	1.80				1.76	
3	19.43	1.74				1.72	
4	17.07	1.68				1.64	
5	14.55	1.54				1.48	
6	11.75	1.36				1.28	
7	8.53	1.07				.98	
8	3.780	0.56				.50	
9							
File/Frame No.		42752				42752	

OGW Step No. 10

Original Negative Roll No.____

Location	Density	Adj. Frame No.
Start		
Middle		
End		

Calibrate White

Orig. Neg.; Frame No.____, Roll No.____

Average:

Film	Roll No.	W0770	W0771	W0772	W0775
Orig. Neg.	EGS D_{Max} wht D_{Min}			1.90	1.94
				1.86	1.88
	EGS D_{Max} blk D_{Min}			.56	.54
				.48	.51
	γ_{s_1}			1.15	1.07
Pos	γ_{s_2}	.83			
EDR	γ_{s_3}	1.38		1.27	

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 324:04-324:16

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0777					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.125	1.88		0.66		1.90	
2	21.255	1.76		.76		1.72	
3	19.395	1.68		.80		1.64	
4	17.050	1.54		.90		1.56	
5	14.550	1.41		1.00		1.41	
6	11.800	1.24		1.10		1.21	
7	8.410	.99		1.26		.96	
8	3.705	.50		1.58		.51	
9							
File/Frame No.		44731		44731		45252	

OGW Step No. 10

Original Negative Roll No. W-0777

Location	Density	Adj. Frame No.
Start	.51	0718
Middle		
End	.59	1169

Calibrate White

Orig. Neg.; Frame No.____, Roll No.____

Average:

Film	Roll No.	W0776	W0777	W0779	W0781
Orig. Neg.	EGS wht D_{Max}	1.95	1.95	2.01	2.03
	EGS wht D_{Min}	1.80	1.88	1.94	1.94
	EGS blk D_{Max}	.52	.54	.55	.60
	EGS blk D_{Min}	.48	.45	.47	.50
	γ_{s_1}	1.11	1.04	1.22	1.28
Pos	γ_{s_2}		.64		
EDR	γ_{s_3}	1.06	1.15	1.36	

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 325:04-325:17

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0795					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.045	1.88				1.78	
2	21.09	1.92				1.88	
3	19.20	1.87				1.84	
4	16.870	1.78				1.72	
5	14.390	1.66				1.58	
6	11.625	1.48				1.40	
7	8.180	1.20				1.10	
8	3.450	.58				.52	
9		2.78					
File/Frame No.		0350				0250	

OGW Step No. 10

Original Negative Roll No. W-0795

Location	Density	Adj. Frame No.
Start	.44	0011
Middle		
End	.59	0539

Calibrate White

Orig. Neg.; Frame No. 0011, Roll No. W-0795

1.83	1.80	1.75	1.78	1.75
1.86	1.78	1.72	1.80	1.81
1.85	1.81	1.74	1.86	1.93
1.76	1.74	1.70	1.84	1.76
1.61	1.67	1.66	1.73	1.75

Average: 1.772

Film	Roll No.	W0779	W0795	W0796	W0799	W0800	W0801	W0802	W0804	W0809							
Orig. Neg.	EGS wht D_{Max}		1.99	1.78	2.02	2.00	2.04		1.94								
	EGS wht D_{Min}		1.83	1.71	1.96	1.89	2.01		1.84								
	EGS blk D_{Max}		.62	.44	.67	.62	.66		.54								
	EGS blk D_{Min}		.56	.40	.62	.56	.61		.48								
	γ_{s_1}		1.10	1.24	1.08	1.09	1.05		1.13								
Pos	γ_{s_2}																
EDR	γ_{s_3}		1.21	1.09	1.41	1.38	1.12	1.02									

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 326:05-326:17

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0809					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.08	1.88	1.75	.70		1.76	
2	21.285	1.83	1.68	.79		1.60	
3	19.33	1.76	1.60	.82		1.55	
4	16.95	1.66	1.54	.91		1.48	
5	14.45	1.53	1.46	1.01		1.32	
6	11.72	1.35	1.27	1.12		1.17	
7	8.353	1.06	1.00	1.29		.95	
8	3.555	.51	.46	1.70		.46	
9		1.96					
File/Frame No.		04534	0012	04756		04756	

OGW Step No. 10 Original Negative Roll No. W-0809		
Location	Density	Adj. Frame No.
Start	.54	0022
Middle		
End	.65	0324

Calibrate White
Orig. Neg.; Frame No. 0009, Roll No. W-0809

1.60	1.49	1.47	1.53	1.52
1.64	1.52	1.50	1.60	1.58
1.60	1.54	1.51	1.61	1.62
1.58	1.55	1.54	1.60	1.59
1.53	1.52	1.51	1.51	1.54

Average: 1.488

Film	Roll No.	W0807	W0809	W0810	W0811	W0812	W0813	W0814	W0816	W0831							
Orig. Neg.	EGS wht D_{Max}		2.02	1.88	1.92	1.86	1.89	2.00	1.96	1.94							
	EGS wht D_{Min}		1.87	1.81	1.79	1.80	1.81	1.91	1.83	1.83							
	EGS blk D_{Max}		.63	.54	.58	.50	.54	.62	.56	.56							
	EGS blk D_{Min}		.51	.50	.52	.47	.50	.56	.53	.45							
	γ_{s_1}		1.07	1.08	1.02	1.07	1.09	1.11	1.14	1.16							
Pos	γ_{s_2}		.94														
EDR	γ_{s_3}		1.15	1.10	1.23	1.22	1.08	1.14	1.23								

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 327:06-327:18

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0825					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.22	1.88	1.78	.62		1.90	
2	21.38	1.82	1.72	.63		1.82	
3	19.45	1.76	1.66	.71		1.76	
4	17.17	1.65	1.58	.79		1.66	
5	14.585	1.50	1.46	.90		1.56	
6	11.75	1.33	1.29	1.04		1.40	
7	8.300	1.04	1.00	1.22		1.10	
8	3.520	.52	.44	1.62		.56	
9							
File/Frame No.		10701	0014	11006		10573	

OGW Step No. 10 Original Negative Roll No. W-0825		
Location	Density	Adj. Frame No.
Start	.50	0003
Middle		
End	---	---

Calibrate White
Orig. Neg.; Frame No. 0015, Roll No. W-0825

1.69	1.65	1.58	1.61	1.59
1.69	1.62	1.60	1.68	1.68
1.64	1.60	1.60	1.70	1.72
1.64	1.60	1.60	1.68	1.62
1.54	1.58	1.59	1.60	1.59

Average: 1.628

Film	Roll No.	W0825	W0826	W0828	W0827	W0829	W0830	W0856									
Orig. Neg.	EGS D_{Max} wht D_{Min}	1.96	2.01	1.96	1.96	1.97	1.97	2.00									
		1.87	1.90	1.72	1.92	1.91	1.83	1.83									
	EGS D_{Max} blk D_{Min}	.56	.62	.52	.57	.58	.56	.68									
		.50	.51	.47	.54	.54	.50	.56									
	γ_{s_1}	1.22	1.07	1.09	1.04	1.06	1.10	1.04									
Pos	γ_{s_2}	0.77					.83										
EDR	γ_{s_3}	1.04	1.08	1.20	1.24	1.12	1.24										

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.: DSS-11

Visability Period : 328:07-328:19

Step	Pre-acquisition Exposure Computer Output EGS (Volts)	Density Measurements for Roll No. W-0834					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	23.15	1.84	1.73			1.92	
2	21.34	1.78	1.65			1.83	
3	19.30	1.72	1.54			1.80	
4	16.96	1.62	1.44			1.72	
5	14.47	1.49	1.34			1.57	
6	11.67	1.30	1.16			1.38	
7	8.270	1.00	.88			1.06	
8	3.520	.46	.36			.52	
9		1.96					
File/Frame No.		14605	0019			15166	

OGW Step No. 10 Original Negative Roll No. W-0834		
Location	Density	Adj. Frame No.
Start	.41	0017
Middle		
End	.48	0279

Calibrate White Orig. Neg.; Frame No. 0002, Roll No. W-0834				
1.83	1.81	1.72	1.75	1.70
1.87	1.84	1.78	1.78	1.80
1.86	1.83	1.80	1.84	1.91
1.84	1.83	1.80	1.80	1.78
1.69	1.80	1.80	1.73	1.80
Average: 1.800				

Film	Roll No.	W0833	W0834	W0835	W0836	W0838	W0839	W0840									
Orig. Neg.	EGS wht D_{Max}	1.92	1.88	1.88	1.92	1.92	1.92										
	EGS wht D_{Min}	1.84	1.84	1.83	1.87	1.84	1.86										
	EGS blk D_{Max}	.54	.50	.54	.59	.56	.56										
	EGS blk D_{Min}	.50	.45	.51	.54	.50	.54										
	γ_{s_1}	1.14	1.17	1.12	1.16	1.12	1.06										
Pos	γ_{s_2}																
EDR	γ_{s_3}	1.31	1.22	1.05	1.01	1.23	1.00	1.24									

SUPPLEMENT TO TV-GDHS CALIBRATION REPORT, MISSION F

The following pages give measurements and data obtained from film products recorded on Optics I and received from receiving stations DSS 42 and DSS 61 during Mission F.

TABLE 1

The exposure computer output voltages corresponding to film rolls received by Stations DSS 42 and DSS 61 are listed below.

Mission GMT Day No. which film roll was exposed	318	319	320	321	333	335	339	341
Film roll no.	W-0693	W-0712	W-0730	W-0745	W-0867	W-0877	W-0899	W-0907
		W-0714	W-0731		(35 mm)	W-0878	W-0900	
			W-0732			W-0879	W-0902	
						W-0880	W-0903	
						W-0881	W-0905	
							W-0906	
Corresponding exposure computer output EGS voltage (volts)								
Step								
1	23.340	23.30	23.635	23.39		22.925		
2	21.455	21.45	21.83	21.51		21.10		
3	19.47	19.70	19.72	19.55		19.15		
4	17.105	17.33	17.345	17.18		16.82		
5	14.61	14.900	14.70	14.695		14.38		
6	11.83	12.070	11.80	11.840		11.68		
7	8.500	8.710	8.455	8.550		8.298		
8	3.655	3.855	3.560	3.720		3.510		

TABLE 2

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.	DSS-11	DSS-42	DSS-61
Visibility Period		314:03 - 314:15	314:14 - 314:00

Step	Pre-acquisition Exposure Computer Output (EGS Voltage)	Density Measurements for Roll No._____					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	see Table 1						
2							
3							
4							
5							
6							
7							
8							
9							
File/Frame No.							

OGW Step No. 10

Original Negative Roll No._____

Location	Density	Adj. Frame No.
Start		
Middle		
End		

White Calibration Frame No._____

Original Negative Roll No._____

Average:

Film	Roll No.	W0693	W0712	W0714
Orig. Neg.	EGS D_{Max} Wht D_{Min}	1.83	2.00	2.01
		1.79	1.99	1.91
	EGS D_{Max} Blk D_{Min}	.53	.65	.62
		.52	.55	.53
	γ_{s_1}	1.15	1.14	1.10
Pos	γ_{s_2}	.77	.78	
EDR	γ_{s_3}	1.13	1.10	
Receiving DSS		42	42	61

TABLE 3

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.	DSS-11	DSS-42	DSS-61
Visibility Period		315:04 - 315:15	315:15 - 316:01

Step	Pre-acquisition Exposure Computer Output (EGS Voltage)	Density Measurements for Roll No._____					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	see Table 1						
2							
3							
4							
5							
6							
7							
8							
9							
File/Frame No.							

OGW Step No. 10

Original Negative Roll No._____

Location	Density	Adj. Frame No.
Start		
Middle		
End		

White Calibration Frame No._____

Original Negative Roll No._____

Average:

Film	Roll No.	W0730	W0731														
Orig. Neg.	EGS D_{Max} Wht D_{Min}	1.98															
		1.89															
	EGS D_{Max} Blk D_{Min}	.59															
		.54															
	γ_{s_1}	1.02															
Pos	γ_{s_2}	.87	.66														
EDR	γ_{s_3}		1.07														
Receiving DSS		61	61														

TABLE 4

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.	DSS-11	DSS-42	DSS-61
Visibility Period		317:05 - 317:16	317:15 - 318:03

Step	Pre-acquisition Exposure Computer Output (EGS Voltage)	Density Measurements for Roll No.____					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	see Table 1						
2							
3							
4							
5							
6							
7							
8							
9							
File/Frame No.							

OGW Step No. 10 Original Negative Roll No.____		
Location	Density	Adj. Frame No.
Start		
Middle		
End		

White Calibration Frame No.____ Original Negative Roll No.____				
Average:				

Film	Roll No.	W0732	W0745															
Orig. Neg.	EGS D_{Max} Wht D_{Min}		1.96															
			1.92															
	EGS D_{Max} Blk D_{Min}		.64															
			.56															
	γ_{s_1}		1.04															
Pos	γ_{s_2}		.72															
EDR	γ_{s_3}		1.12															
Receiving DSS		61	42															

TABLE 5

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.	DSS-11	DSS-42	DSS-61
Visibility Period		319:07 - 319:17	319:16 - 320:05

Step	Pre-acquisition Exposure Computer Output (EGS Voltage)	Density Measurements for Roll No._____					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	see Table 1						
2							
3							
4							
5							
6							
7							
8							
9							
File/Frame No.							

OGW Step No. 10

Original Negative Roll No._____

Location	Density	Adj. Frame No.
Start		
Middle		
End		

White Calibration Frame No._____

Original Negative Roll No._____

Average:

Film	Roll No.	W0880
Orig. Neg.	EGS D_{Max} Wht D_{Min}	2.07
		2.06
	EGS D_{Max} Blk D_{Min}	.58
		.54
	γ_{s_1}	1.12
Pos	γ_{s_2}	
EDR	γ_{s_3}	1.11
Receiving DSS		42

TABLE 6

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.	DSS-11	DSS-42	DSS-61
Visibility Period		321:10 - 321:18	321:17 - 322:07

Step	Pre-acquisition Exposure Computer Output (EGS Voltage)	Density Measurements for Roll No._____					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	see Table 1						
2							
3							
4							
5							
6							
7							
8							
9							
File/Frame No.							

OGW Step No. 10

Original Negative Roll No._____

Location	Density	Adj. Frame No.
Start		
Middle		
End		

White Calibration Frame No._____

Original Negative Roll No._____

Average:

Film	Roll No.	W0877	W0878	W0879	W0899	W0900	W0902	W0903
Orig. Neg.	EGS D_{Max} Wht D_{Min}	2.05 / 1.98	2.08 / 1.97	2.00 / 1.98	1.97 / 1.87	1.88 / 1.79	1.84 / 1.81	1.77 / 1.70
	EGS D_{Max} Blk D_{Min}	.60 / .54	.58 / .52	.59 / .54	.56 / .51	.54 / .52	.55 / .49	.51 / .48
	γ_{s_1}	1.17	1.24	1.22	1.27	1.12	1.13	1.00
Pos	γ_{s_2}	.75			.82	.77	.80	
EDR	γ_{s_3}	1.16	1.18	1.18	1.13	1.24	1.13	1.16
Receiving DSS		42	42	42	61	61	61	61

TABLE 7

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.	DSS-11	DSS-42	DSS-61
Visibility Period		322:11 - 322:19	322:18 - 323:08

Step	Pre-acquisition Exposure Computer Output (EGS Voltage)	Density Measurements for Roll No.____					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	see Table 1						
2							
3							
4							
5							
6							
7							
8							
9							
File/Frame No.							

OGW Step No. 10

Original Negative Roll No.____

Location	Density	Adj. Frame No.
Start		
Middle		
End		

White Calibration Frame No.____

Original Negative Roll No.____

Average:

Film	Roll No.	W0867	W0881														
Orig. Neg.	EGS D_{Max} Wht D_{Min}		2.04 / 1.97														
	EGS D_{Max} Blk D_{Min}		.57 / .52														
	γ_{s_1}		1.20														
Pos	γ_{s_2}		.80														
EDR	γ_{s_3}		1.11														
Receiving DSS		61	42														

TABLE 8

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.	DSS-11	DSS-42	DSS-61
Visibility Period		326:14 - 326:22	326:20 - 327:11

Step	Pre-acquisition Exposure Computer Output (EGS Voltage)	Density Measurements for Roll No._____					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	see Table 1						
2							
3							
4							
5							
6							
7							
8							
9							
File/Frame No.							

OGW Step No. 10

Original Negative Roll No._____

Location	Density	Adj. Frame No.
Start		
Middle		
End		

White Calibration Frame No._____

Original Negative Roll No._____

Average:

Film	Roll No.	W0905																
Orig. Neg.	EGS D_{Max} Wht D_{Min}	1.79																
		1.76																
	EGS D_{Max} Blk D_{Min}	.37																
		.36																
	γ_{s_1}	1.30																
Pos	γ_{s_2}																	
EDR	γ_{s_3}	1.26																
Receiving DSS		42																

TABLE 9

MEASURED DATA ON ORIGINAL AND DUPLICATE FILMS

ORIGINAL NEGATIVE EXPOSED ON OPTICS I, SFOF, PASADENA

Receiving Station No.	DSS-11	DSS-42	DSS-61
Visibility Period		327:15 - 328:00	327:23 - 328:12

Step	Pre-acquisition Exposure Computer Output (EGS Voltage)	Density Measurements for Roll No._____					
		Original Negative		Positive		EDR	
		EGS	VGB	EGS	VGB	EGS	VGB
1	see Table 1						
2							
3							
4							
5							
6							
7							
8							
9							
File/Frame No.							

OGW Step No. 10

Original Negative Roll No._____

Location	Density	Adj. Frame No.
Start		
Middle		
End		

White Calibration Frame No._____

Original Negative Roll No._____

Average:

Film	Roll No.	W0906	W0907														
Orig. Neg.	EGS D_{Max} Wht D_{Min}	1.94	1.87														
		1.92	1.84														
	EGS D_{Max} Blk D_{Min}	.52	.44														
		.50	.43														
	γ_{s_1}	1.20	1.23														
Pos	γ_{s_2}	.69															
EDR	γ_{s_3}	1.08															
Receiving DSS		42	42														

CAMERA PERFORMANCE

The Surveyor VI spacecraft camera performed normally. The operationally significant differences between the last two Surveyors were:

Item	Surveyor V	Surveyor VI
Filters	1 clear and 3 color	1 clear & 3 polarization
Scan	top to bottom	bottom to top
Overdeviation	Yes	None
Overscan	None	Yes
Nominal Elevation Angle Increments	4.96 degrees	5.00 degrees

The most significant change is the change from a color study to a polarization study. The other changes are not significant from a TV picture analysis point of view. The overscan results in a rectangular picture with black corners, but there is no stretching or distortion of the picture as a result of the overscan.

As shown in the above list, the frequency deviation of the transmitters used on SC-6 was within the tolerance of the design limits. It was therefore not required to detune the DSS receivers for the purpose of centering the video in the passband of the ground equipment. Figure 1 shows both the design and measured SC-6 video frequency deviations as well as the composite bandpass filter responses of the ground equipment.

There were no TV pictures taken by Surveyor VI on any lunar days subsequent to the first lunar day.

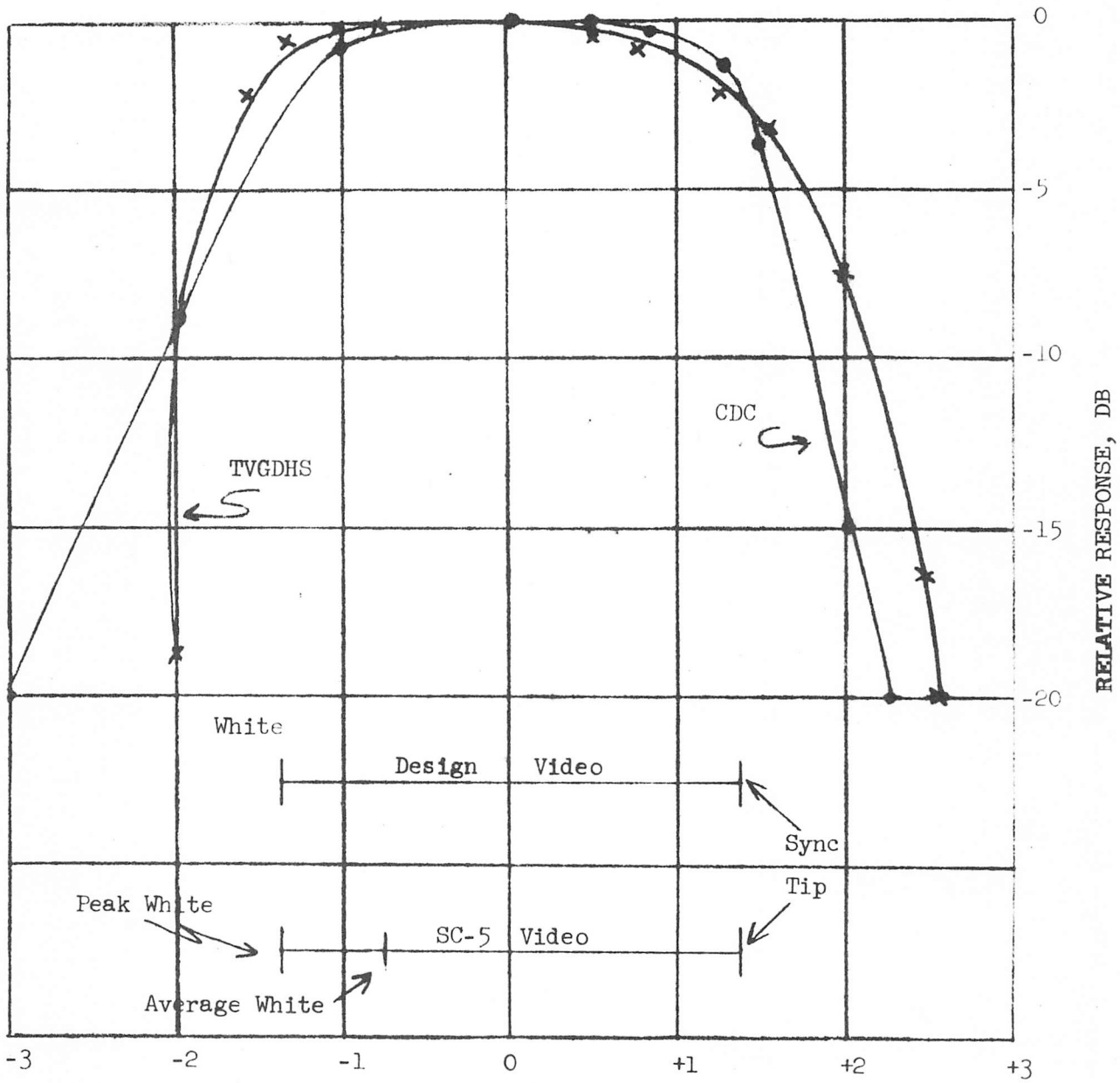


FIGURE I

Ground System Filter Response And
Video Frequency Deviations

SURVEYOR VI ORIENTATION AND LOCATION

The selenographic coordinates of Surveyor VI were determined by carefully plotting the landing site location onto Orbiter IV frame H108 and reading off the pin-pointed Surveyor position. The coordinates are $0^{o}.49N$, $1^{o}.40W$, about 3 km NW of the pre-landing tracking position estimate. This position is about 60 km north of the southern border of Sinus Medii and 40 km east of the western border. Sinus Medii, the target area for Surveyor VI, is a relatively small mare plain, about 170 km across. It is bounded by highlands to the north and to the south, and to the northeast by another plain with a higher albedo and with a larger number of craters than is typical for the maria. The surface of the Sinus Medii is broken by numerous small craters and by a system of mare ridges, the largest of which can be easily observed at the telescope.

The orientation of the spacecraft was determined from position measurements on a few stars, together with orientation data derived from pointing of the solar panel and planar array antenna and from the attitude gyros. Prior to the hop, the spacecraft was tilted 2.3 degrees at an azimuth of 243 degrees from north and the -y axis of the spacecraft was oriented 115 degrees from north. After the hop, the spacecraft was tilted 3.85 degrees at an azimuth 260 degree from north and the -y axis was oriented 112 degrees from north. Each of the estimated components of orientation may have an error of as much as 1 degree.

CELESTIAL EPHEMERIS

The following pages contain the lunicentric positions of the following celestial bodies:

AERI (Achernar)

ACMA (Sirius)

ASCO (Antares)

ALYR (Vega)

ACYG (Deneb)

BORI (Rigel)

ACAR (Canopus)

Jupiter

Sun

Earth

SURVEYOR 6 STELLAR PREDICTION
FIRST LUNAR DAY

AERI	DAY	LATITUDE	LONGITUDE	AZIMUTH	ZENITH
	313	-60.36	219.21	200.42	-67.54
	314	-60.37	206.04	194.78	-63.54
	315	-60.37	192.87	188.06	-60.91
	316	-60.37	179.69	180.67	-59.91
	317	-60.37	166.52	173.22	-60.61
	318	-60.38	153.34	166.34	-62.97
	319	-60.38	140.17	160.49	-66.75
	320	-60.38	126.99	155.93	-71.66
	321	-60.38	113.81	152.74	-77.39
	322	-60.38	100.63	150.90	-83.63
	323	-60.39	87.45	150.38	89.88
	324	-60.39	74.27	151.17	83.42
	325	-60.39	61.08	153.27	77.26
	326	-60.39	47.90	156.72	71.66
	327	-60.38	34.71	161.50	66.94
	328	-60.38	21.53	167.51	63.40
	329	-60.37	8.35	174.47	61.32
	330	-60.37	355.17	181.89	60.89

ACMA	DAY	LATITUDE	LONGITUDE	AZIMUTH	ZENITH
	313	-38.09	336.24	205.59	43.68
	314	-38.09	323.06	216.27	50.50
	315	-38.09	309.89	223.56	58.99
	316	-38.08	296.71	228.22	68.48
	317	-38.08	283.53	230.87	78.52
	318	-38.08	270.36	231.90	88.83
	319	-38.08	257.18	231.43	-80.81
	320	-38.08	244.01	229.39	-70.63
	321	-38.08	230.83	225.47	-60.90
	322	-38.08	217.66	219.09	-52.00
	323	-38.08	204.48	209.43	-44.54
	324	-38.08	191.31	195.93	-39.41
	325	-38.08	178.13	179.50	-37.62
	326	-38.09	164.96	163.18	-39.63
	327	-38.09	151.78	149.91	-44.93
	328	-38.10	138.60	140.47	-52.51
	329	-38.10	125.42	134.25	-61.47
	330	-38.11	112.24	130.46	-71.23

Surveyor 6 Stellar Prediction, First Lunar Day
(Continued)

ASCO	DAY	LATITUDE	LONGITUDE	AZIMUTH	ZENITH
	313	-5.61	121.55	96.38	-57.08
	314	-5.62	108.37	95.80	-70.19
	315	-5.62	95.20	95.60	-83.30
	316	-5.62	82.02	95.70	83.58
	317	-5.62	68.84	96.13	70.47
	318	-5.62	55.66	96.98	57.38
	319	-5.62	42.49	98.54	44.32
	320	-5.62	29.31	101.64	31.34
	321	-5.62	16.13	109.34	18.61
	322	-5.62	2.95	144.00	7.53
	323	-5.61	349.78	234.98	10.63
	324	-5.61	336.60	254.16	22.71
	325	-5.61	323.42	259.65	35.56
	326	-5.60	297.07	263.37	61.64
	327	-5.60	297.07	263.37	61.64
	328	-5.60	283.89	264.06	74.74
	329	-5.59	270.72	264.38	87.85
	330	-5.59	257.54	264.39	-79.03

ALYR	DAY	LATITUDE	LONGITUDE	AZIMUTH	ZENITH
	313	60.22	157.73	11.43	-62.79
	314	60.22	144.55	17.66	-66.12
	315	60.22	131.38	22.69	-70.68
	316	60.21	118.20	26.39	-76.17
	317	60.21	105.03	28.73	-82.29
	318	60.21	91.85	29.74	-88.75
	319	60.21	78.68	29.45	84.72
	320	60.21	65.50	27.83	78.38
	321	60.21	52.33	24.86	72.51
	322	60.21	39.16	20.52	67.41
	323	60.21	25.99	14.85	63.39
	324	60.21	12.81	8.08	60.76
	325	60.21	359.64	.64	59.75
	326	60.22	346.47	353.15	60.47
	327	60.22	333.29	346.23	62.85
	328	60.23	320.11	340.36	66.66
	329	60.23	306.93	335.79	71.60
	330	60.24	293.74	332.59	77.36

Surveyor 6 Stellar Prediction, First Lunar Day
(Continued)

ACYG	DAY	LATITUDE	LONGITUDE	AZIMUTH	ZENITH
	313	58.69	205.63	344.56	-62.90
	314	58.69	192.45	351.70	-60.17
	315	58.69	179.27	359.54	-59.16
	316	58.68	166.09	7.42	-59.96
	317	58.68	152.91	14.66	-62.50
	318	58.68	139.74	20.79	-66.53
	319	58.68	126.56	25.54	-71.74
	320	58.68	113.38	28.85	-77.78
	321	58.67	100.21	30.77	-84.35
	322	58.67	87.03	31.32	88.82
	323	58.67	73.86	30.53	82.03
	324	58.67	60.69	28.35	75.54
	325	58.67	47.52	24.74	69.63
	326	58.67	34.35	19.68	64.63
	327	58.68	21.18	13.25	60.87
	328	58.68	8.01	5.75	58.69
	329	58.69	354.83	357.75	58.29
	330	58.69	341.66	349.94	59.72

BORI	DAY	LATITUDE	LONGITUDE	AZIMUTH	ZENITH
	313	-29.94	309.29	232.49	55.81
	314	-29.93	296.12	236.81	66.58
	315	-29.93	282.94	239.18	77.77
	316	-29.93	269.77	240.06	89.15
	317	-29.93	256.59	239.60	-79.44
	318	-29.93	243.41	237.71	-68.17
	319	-29.93	230.24	233.99	-57.25
	320	-29.93	217.06	227.59	-47.01
	321	-29.93	203.89	217.02	-38.08
	322	-29.93	190.71	200.41	-31.66
	323	-29.93	177.53	178.27	-29.48
	324	-29.93	164.36	156.69	-32.40
	325	-29.94	151.18	141.07	-39.30
	326	-29.94	138.00	131.24	-48.48
	327	-29.95	124.83	125.32	-58.85
	328	-29.95	111.65	121.92	-69.85
	329	-29.95	98.47	120.26	-81.15
	330	-29.96	85.29	120.01	87.44

Surveyor 6 Stellar Prediction, First Lunar Day
(Continued)

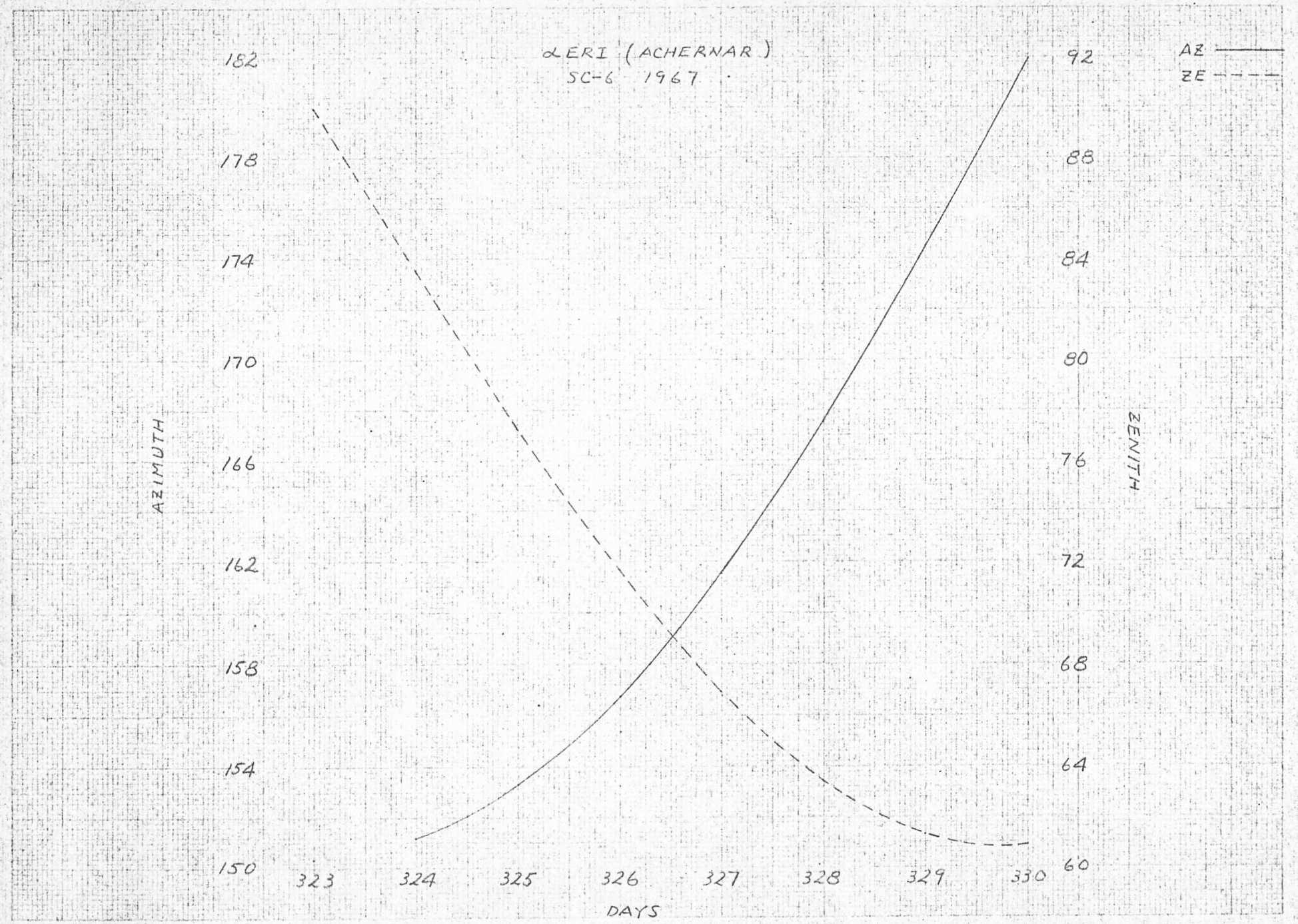
ACAR	DAY	LATITUDE	LONGITUDE	AZIMUTH	ZENITH
	313	-74.32	337.95	185.62	75.81
	314	-74.31	324.78	188.84	77.47
	315	-74.31	311.61	191.57	79.81
	316	-74.31	298.43	193.67	82.70
	317	-74.30	285.26	195.05	85.98
	318	-74.30	272.09	195.66	89.48
	319	-74.30	258.92	195.49	-86.96
	320	-74.30	245.75	194.54	-83.53
	321	-74.30	232.58	192.83	-80.40
	322	-74.30	219.41	190.44	-77.73
	323	-74.30	206.24	187.46	-75.68
	324	-74.30	193.08	184.05	-74.35
	325	-74.31	179.91	180.39	-73.84
	326	-74.31	166.73	176.71	-74.18
	327	-74.32	153.56	173.22	-75.35
	328	-74.32	140.37	170.14	-77.26
	329	-74.33	127.19	167.62	-79.82
	330	-74.33	113.99	165.77	-82.87

Jupiter	DAY	LATITUDE	LONGITUDE	AZIMUTH	ZENITH
	313	2.08	25.35	86.31	26.87
	314	2.08	12.30	83.18	13.88
	315	2.09	359.25	24.43	1.78
	316	2.09	346.20	277.62	12.41
	317	2.09	333.14	273.90	25.41
	318	2.10	320.09	272.78	38.45
	319	2.10	307.02	272.31	51.50
	320	2.11	293.96	272.11	64.55
	321	2.11	280.89	272.06	77.61
	322	2.11	267.81	272.12	-89:31
	323	2.12	254.74	272.30	-76.24
	324	2.12	241.66	272.61	-63.18
	325	2.12	228.57	273.16	-50.11
	326	2.12	215.49	274.15	-37.05
	327	2.12	202.39	276.28	-24.01
	328	2.12	189.30	283.54	-11.09
	329	2.12	176.20	41.74	-3.47
	330	2.11	163.10	80.42	-15.62

Surveyor 6 Stellar Prediction, First Lunar Day
(Continued)

Sun	DAY	LATITUDE	LONGITUDE	AZIMUTH	ZENITH
	313	-.50	98.09	90.42	-80.42
	314	-.53	85.92	90.55	87.40
	315	-.56	73.76	90.70	75.24
	316	-.59	61.60	90.89	63.08
	317	-.62	49.44	91.17	50.93
	318	-.64	37.29	91.60	38.78
	319	-.67	25.15	92.42	26.65
	320	-.70	13.01	94.60	14.53
	321	-.73	.87	117.03	2.63
	322	-.75	348.73	262.90	9.86
	323	-.77	336.58	266.77	21.97
	324	-.80	324.44	267.87	34.10
	325	-.82	312.30	268.41	46.23
	326	-.84	300.15	268.72	58.38
	327	-.86	288.00	268.92	70.53
	328	-.88	275.84	269.05	82.68
	329	-.90	263.68	269.13	-85.15
	330	-.92	251.51	269.18	-72.98

Earth	DAY	LATITUDE	LONGITUDE	AZIMUTH	ZENITH
	313	6.48	7.82	56.87	11.05
	314	5.87	7.33	58.28	10.32
	315	4.99	6.52	60.37	9.18
	316	3.91	5.45	63.49	7.73
	317	2.67	4.19	68.73	6.08
	318	1.33	2.82	78.66	4.38
	319	0.07	1.39	100.64	2.92
	320	-1.46	359.97	143.08	2.41
	321	-2.79	358.61	178.42	3.26
	322	-4.00	357.33	194.89	4.62
	323	-5.05	356.18	202.93	5.99
	324	-5.88	355.18	207.66	7.17
	325	-6.46	354.36	210.86	8.07
	326	-6.73	353.74	213.45	8.63
	327	-6.68	353.36	215.68	8.81
	328	-6.29	353.24	217.86	8.57
	329	-5.55	353.42	220.17	7.88
	330	-4.48	353.92	222.83	6.75


α ERI (ACHERNAR)
SC-6 1967
AZ
ZE
AZIMUTH
ZENITH
182
178
174
170
166
162
158
154
150
92
88
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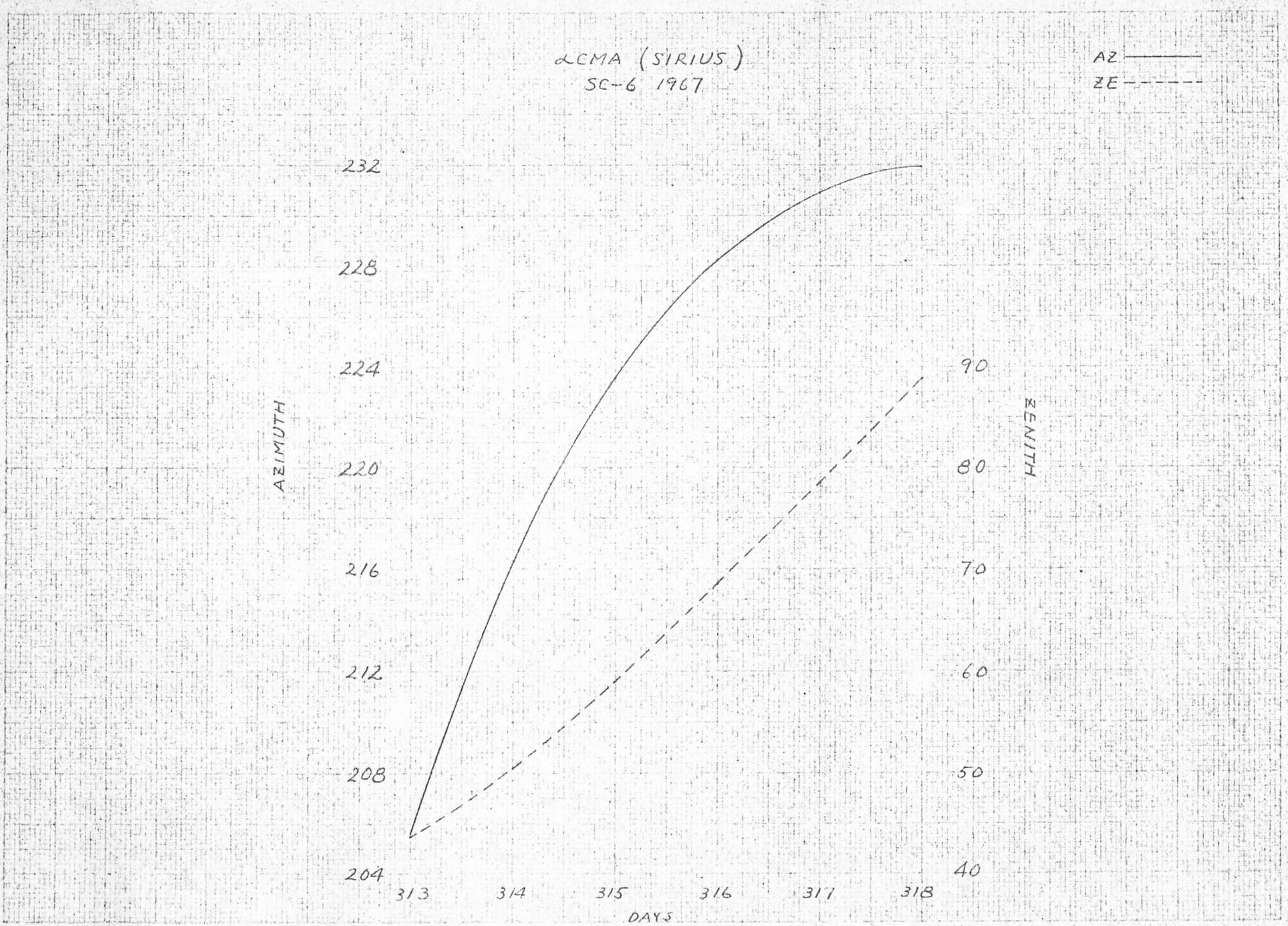
330
DAYS

3-c-7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SC-6 1967
AZ
ZE
232
228
224
220
216
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ZENITH
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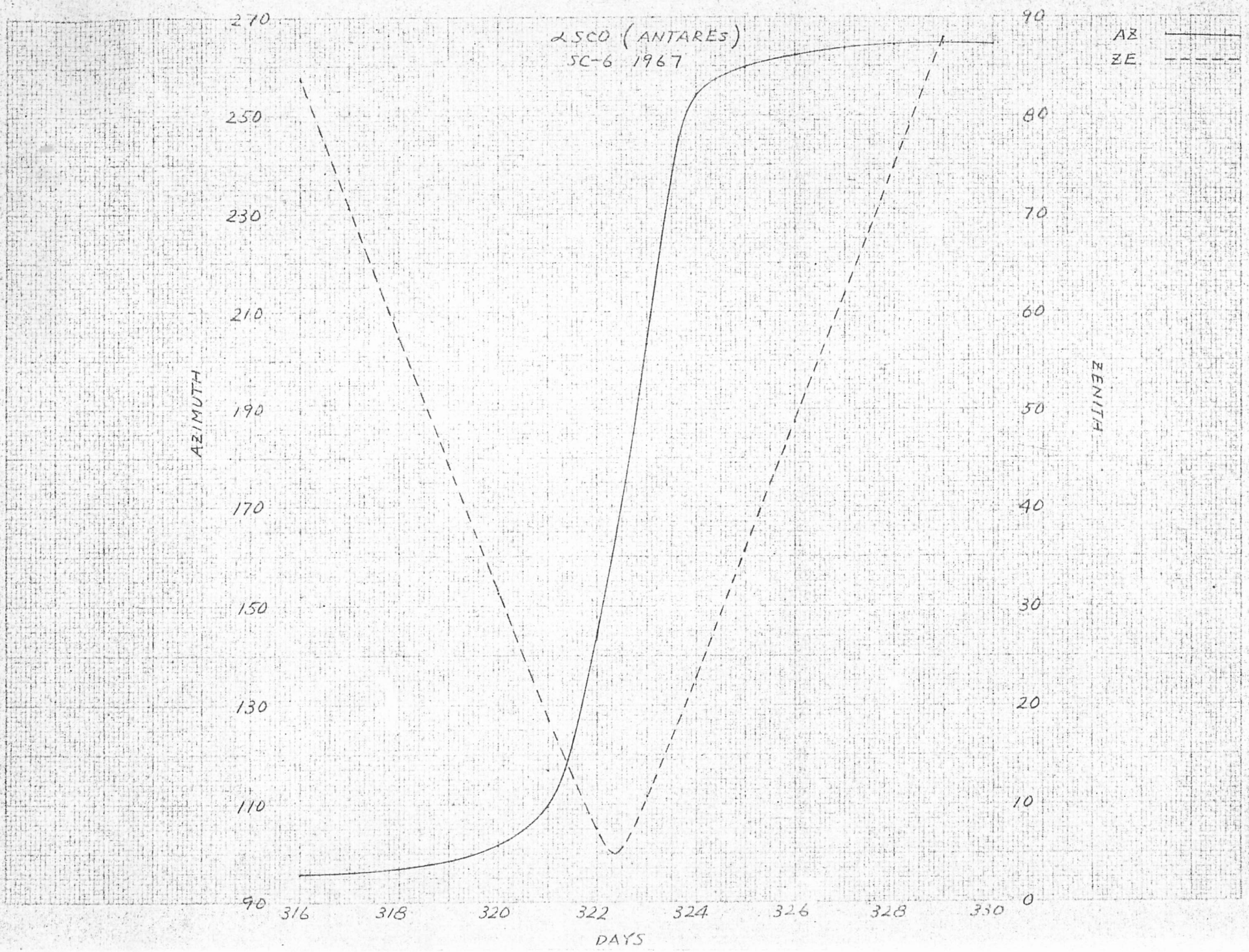
DAYS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SC-6 1967
AZ
ZE
AZIMUTH
ZENITH
DAYS
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250
230
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150
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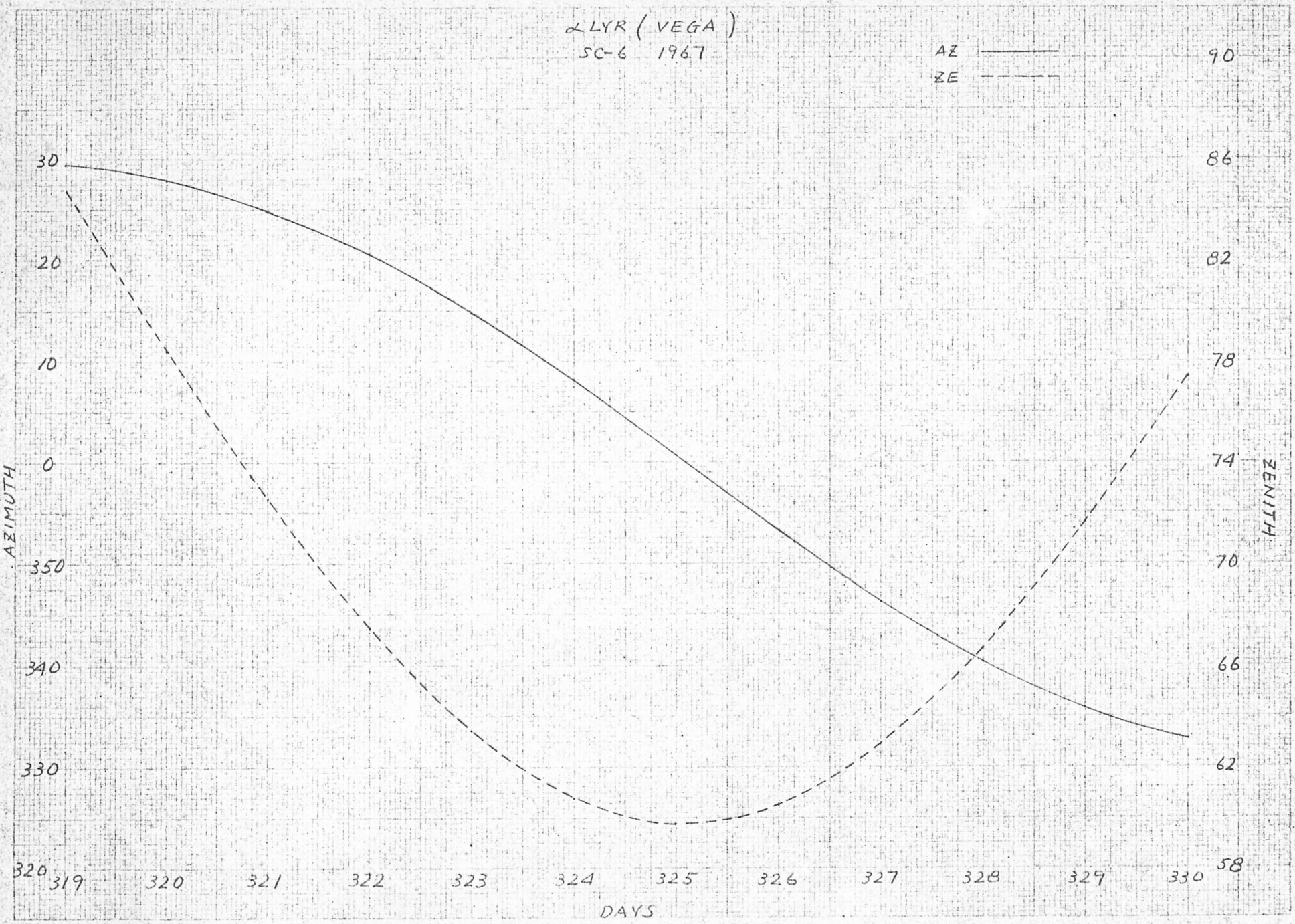
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ZE
AZIMUTH
ZENITH
DAYS
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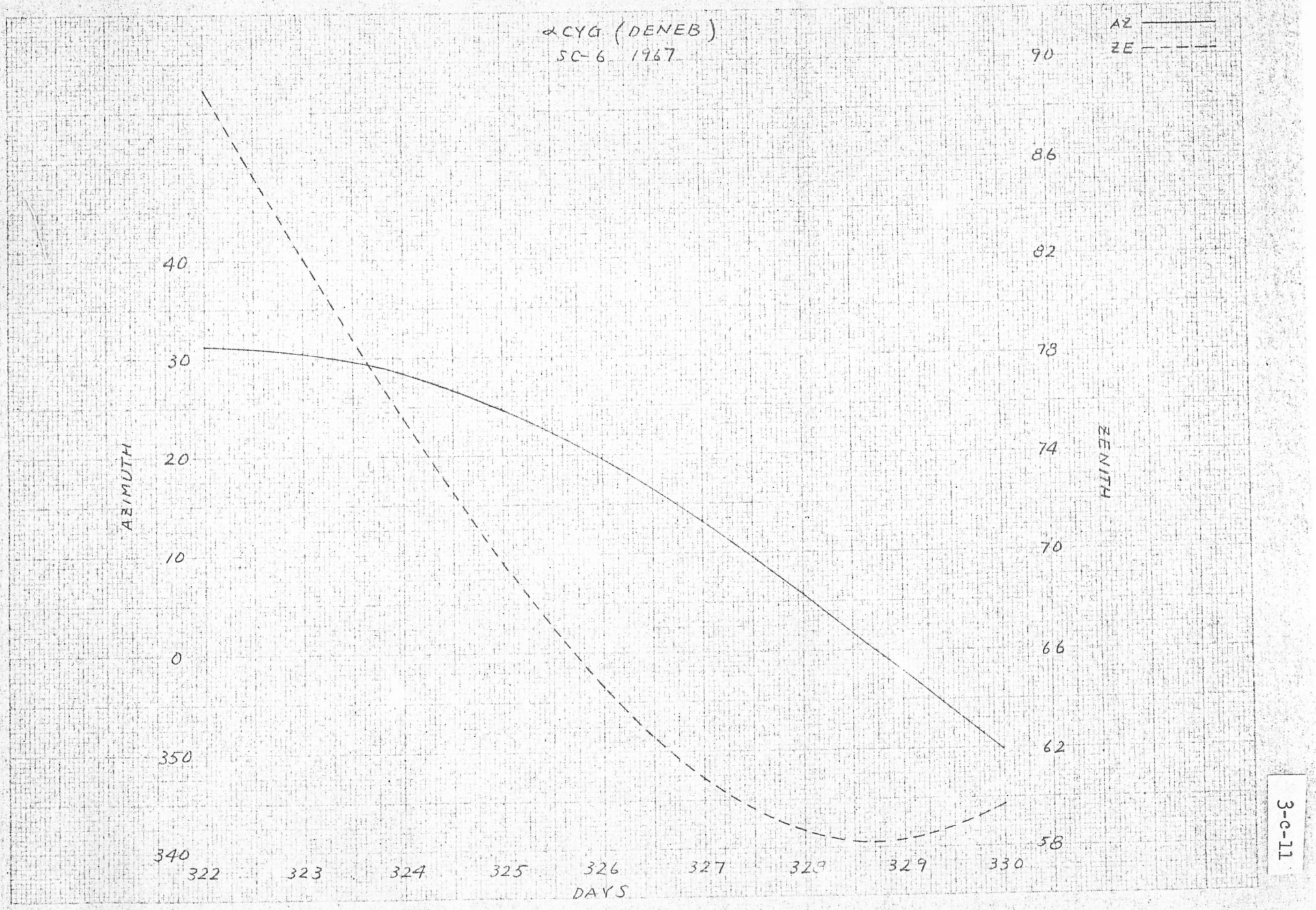
α CYG (DENEB)
SC-6 1967
AZ
ZE
AZIMUTH
ZENITH
DAYS
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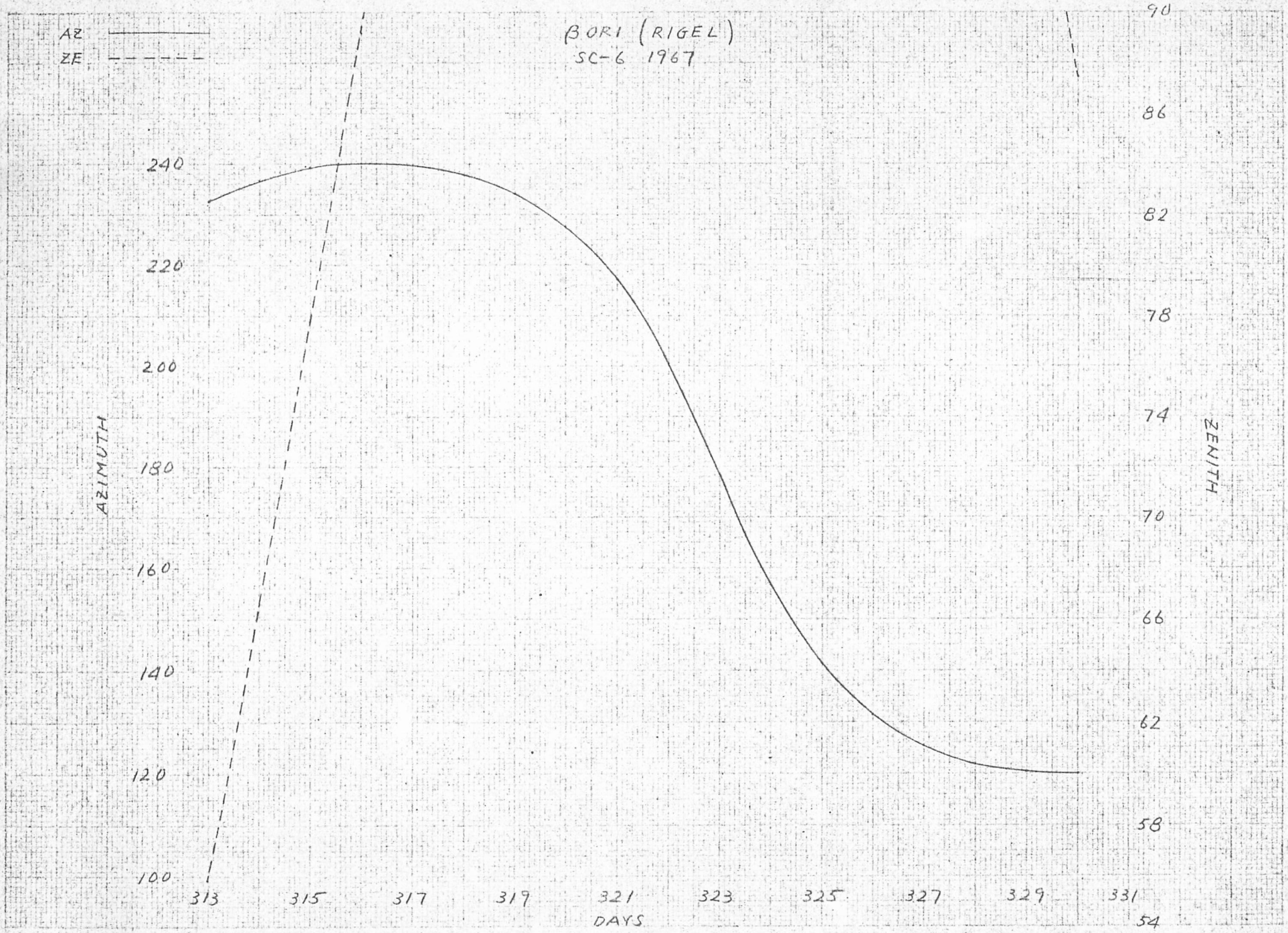
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ZE
BORI (RIGEL)
SC-6 1967
AZIMUTH
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120
100
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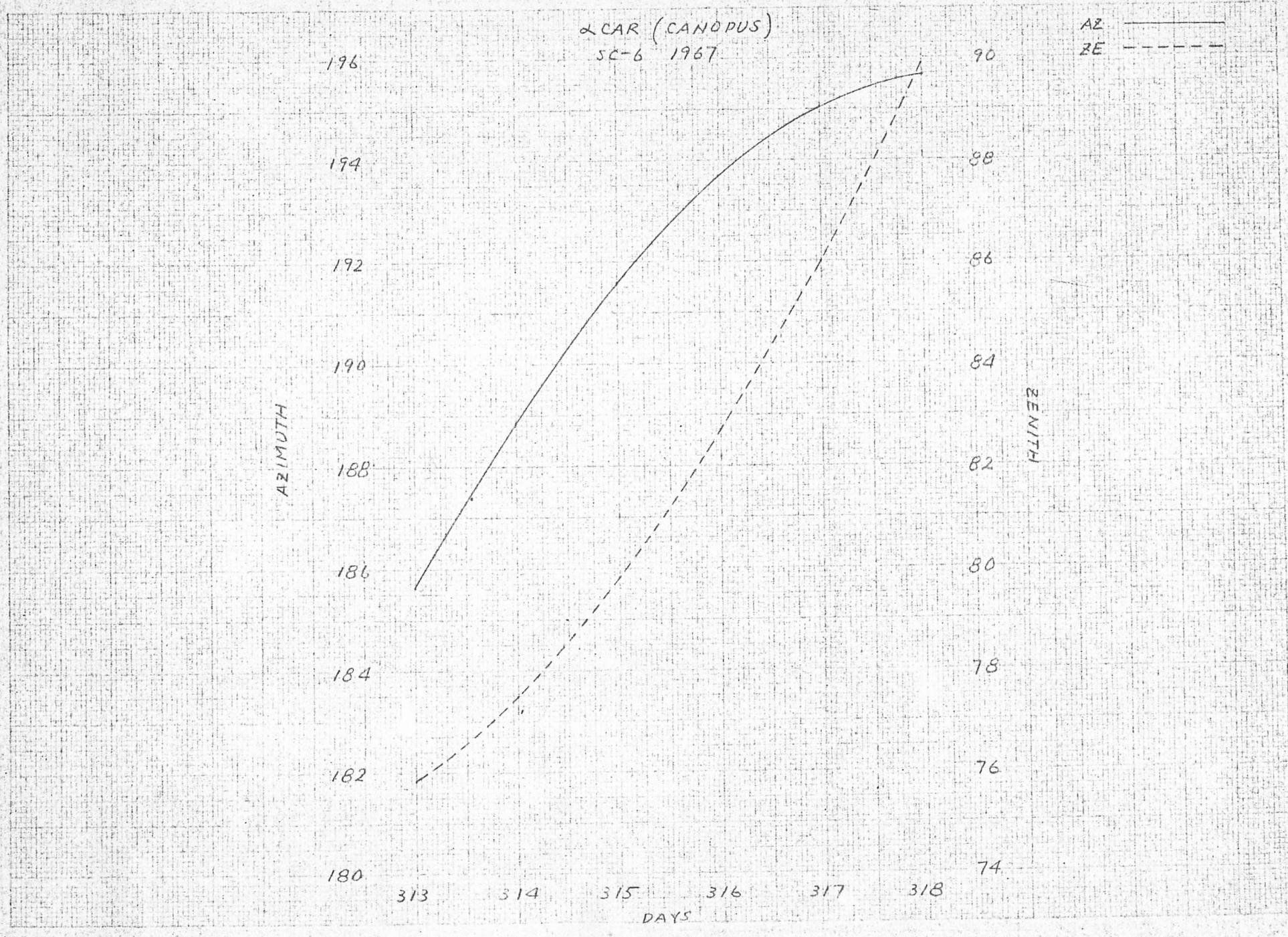
DAYS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AZ
ZE
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AZIMUTH
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82
80
78
76
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ZENITH
313
314
315
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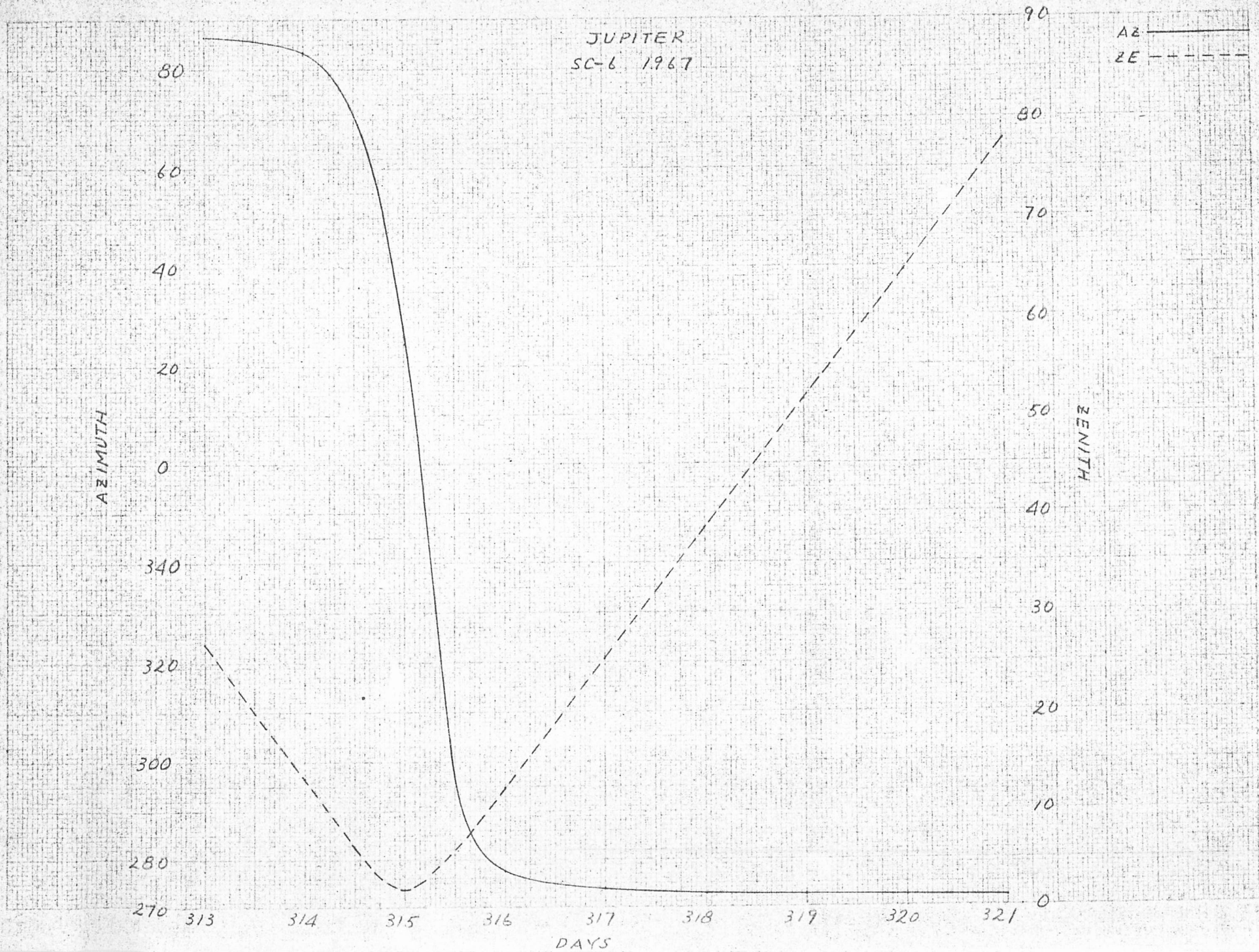
317
318
DAYS


JUPITER
SC-6 1967
AZ
ZE
AZIMUTH
ZENITH
DAYS
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40
20
0
340
320
300
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270
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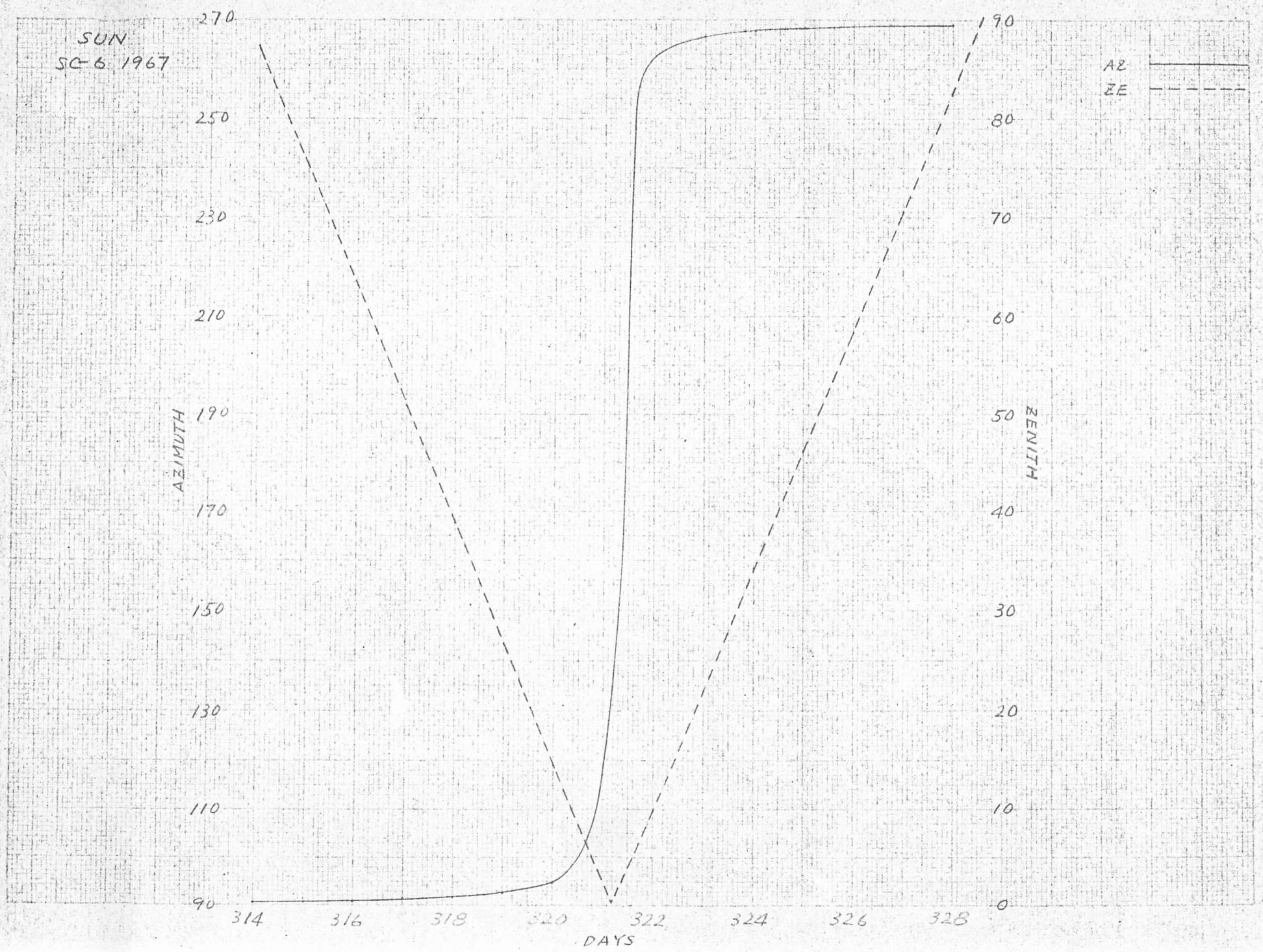
SUN
SC-6 1967
AZ
ZE
AZIMUTH
ZENITH
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250
230
210
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170
150
130
110
90
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80
70
60
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40
30
20
10
0
314
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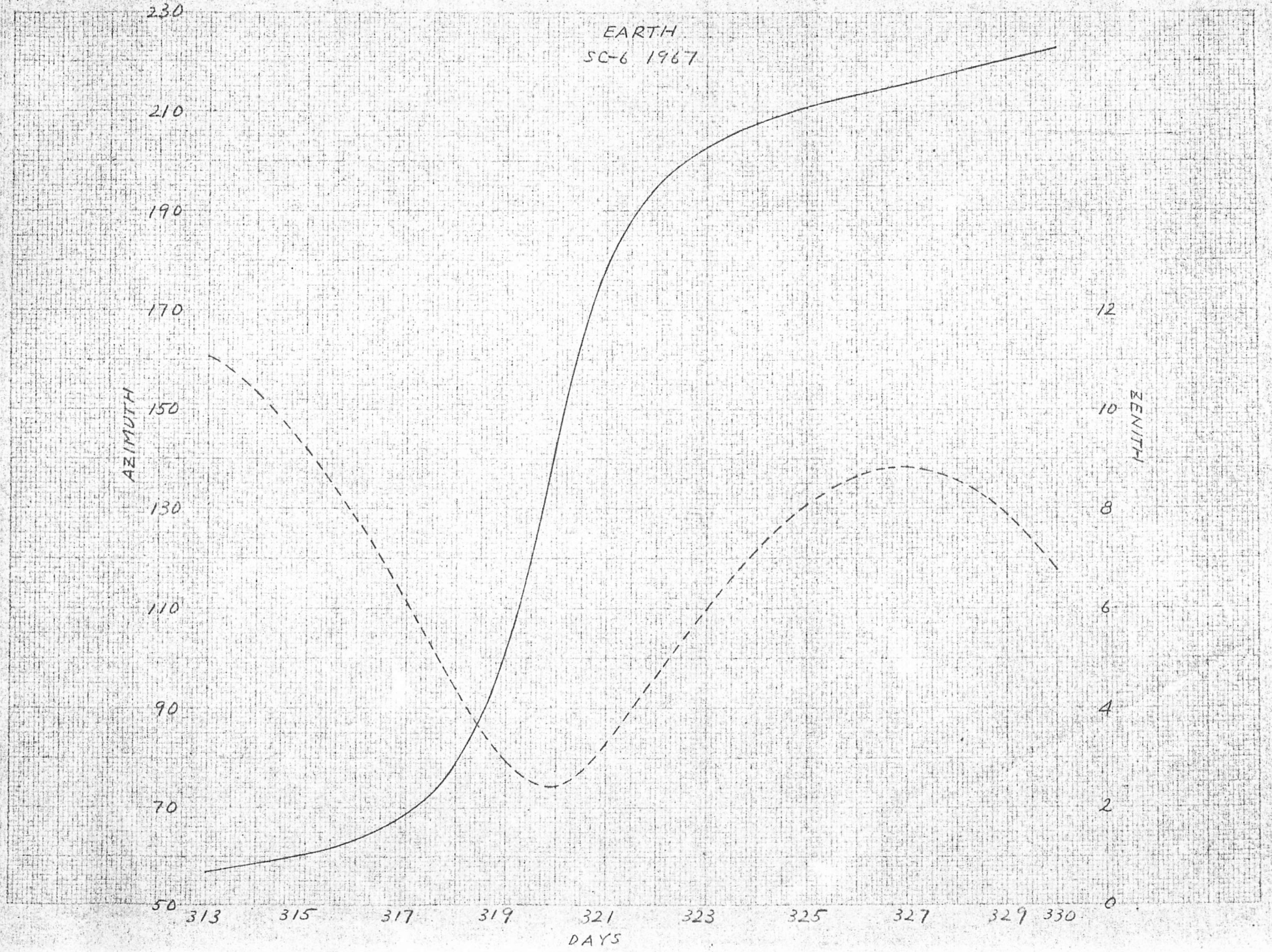
324
326
328
DAYS


EARTH
SC-6 1967
AZIMUTH
ZENITH
DAYS
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210
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170
150
130
110
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12
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8
6
4
2
0
313
315
317
319
321
323
325
327
329
330

SSAC OPERATIONS REPORT - SURVEYOR VI

I. General

1. The science payload for Mission VI remained the same as for Mission V; Television and Alpha Scattering. There were no significant changes in SSAC operations. Manning and operating procedures remained essentially the same as for the preceding mission.

2. The overall performance of SSAC was excellent. Operations were carried out on a continuous basis for either TV or the Alpha Scattering Instrument (ASI) except when temperature of the ASI or miscellaneous spacecraft experiments restricted payload operations. All daily operational objectives were accomplished with a few minor exceptions. Interfaces with Mission Control, Project Scientist Representatives, SPAC and DSIF were smooth and effective.

Total Data Acquisition

Television: 30,065 video frames

Alpha Scattering: surface data - 30H 36M
post translation data - 13H 5M

3. TV operations were conducted from DSS-42 and DSS-61 much as before with well defined tape and manual surveys, but more use was made of this capability than before.

II. Payload

1. Technical performance of both instruments was excellent except for the fact that the ASI proton detector 3 became noisy on an intermittent basis at high head temperatures, but cleared up when temperatures became lower. Noisy data invalidated some three hours of the surface data. The presence of the bad data was detected by the DSIF computer data accumulatron program (OSAS) and the bad detector was then turned off. After spacecraft translation, the ASI was found to be positioned upside down and further data accumulation could not contribute to analysis of the lunar surface. Additional data was collected however on a non-interference basis with other spacecraft activity as a measure of proton activity from space and to assist in training new SOC controllers for Mission VII. The TV camera performed with no discrepancies in spite of the great increase in requirements placed upon it as evidenced by the total video frames.

2. TVID telemetry data display on both the TVGDHS Wallboard and the 3070 bulk printer from the 7044 computer was consistently good and greatly improved over the last mission.

III. SSAC SURVEYOR VI TELEVISION OPERATIONS

FIRST LUNAR DAY

Post TD Pass	Station CMDG	Survey Number	Activity	Time GMT Start	- End
1	DSS-11	010	Post TD 200 Line Mode	314-0150	314-0235
		020	W/A 360 Pan (600 Line Mode)	-0402	-0500
		030	Special Area (CT-801B)	-0502	-0749
	DSS-42	Started CMDG oven DSS-42 at 0741			
		040	Aux. Mirrors	-0754	-0807
		-	Special Area	-0812	-0824
		-	Magnets, N/A	-0831	-0835
		-	Polarmetric - Pad 2 P.T.	-0840	-0843
		-	N/A - Segment 3	-0851	-0910
		-	N/A - Segment 2	-0925	-1027
		-	N/A - Segment 2, ?	-1029	-1042
		-	P.A. and S.P.	-1044	-1048
		-	Polarmetric	-1049	-1053
		-	N/A Segment	-1054	-1134
		-	Alpha Scat.	-1135	-1140
	DSS-61	-	Alpha Scat. TV Support	-2100	-2130
2	DSS-11	010	Polarimetric Survey	314-2247	314-2328
		020	Special Area and Aux. Mirrors	-2328	-2358
		010	Polarmetric Survey (cont.)	-2358	315-0029
		020	Special Area	315-0029	-0118
		021	Aux. Mirrors	-0118	-0130
		030	N/A Segment 3	-0130	-0150
		031	N/A Segment 5	-0150	-0213
		032	N/A Segment 2	-0213	-0229
		040	Magnets, N/A	-0229	-0238
		050	A/C Jet Exp. - TV Support	-0240	-0356
		060	W/A 360 Pan.	-0412	-0431
		070	Star Survey - Sirius, Canopus, Capella	-0431	-0443
3	DSS-11	010	Filter Interrogation	315-2319	315-2337
		020	Polarimetric Survey	-2337	316-0100
		030	Focus Ranging, AZ=0	316-0102	-0201
		031	Focus Ranging, AZ=36	-0202	-0229
		032	Focus Ranging, AZ=72	-0230	-0300
		033	Focus Ranging, AZ= -72	-0300	-0337
		040	W/A 360 Pan.	-0340	-0433
		050	N/A Segment 4	-0437	-0524
		060	Special Area	-0525	-0646
		061	Aux. Mirrors	-0649	-0710
		070	N/A Segment 3	-0710	-0738

Post TD Pass	Station CMDG	Survey Number	Activity	Time GMT Start	End
4	DSS-11	010	Polarimetric Survey	317-0002	317-0115
		020	Special Area and Magnets	-0115	-0226
		021	Aux. Mirrirs	-0227	-0244
		030	Focus Ranging, Az= -36	-0246	-0333
		031	Focus Ranging, Az= 90	-0333	-0354
		032	Focus Ranging, Az= 108	-0355	-0411
		040	N/A Segment 5	-0411	-0500
		041	N/A Segment 2	-0500	-0528
		042	N/A Segment 1	-0544	-0600
		050	W/A 360 Pan.	-0603	-0651
		060	Star Survey - Alpha Cm-1	-0652	-0712
		070	N/A Segment 1, Supplement on Stop	-0715	-0732
		080	N/A Segment 3	-0732	-0758
		081	N/A Segment 4	-0829	-0855
		071	N/A Segment 5, Supplement on Stop	-0858	-0917
		071	Aux. Mirror - Surface Focus Range	-0917	-0920
		071	Earth View Test	-0925	-0928
	DSS-42	-	Special Area	-1209	-1246
		-	Aux. Mirrors	-1253	-1311
5	DSS-11	010	Iris Interrogation	318-0033	318-0103
		020	Polarimetric Survey	-0103	-0254
		030	Special Area and Magnets	-0256	-0332
		031	Aux. Mirrors	-0431	-0442
		040	W/A 360 Pan.	-0443	-0512
		050	N/A Segment 1 and Supplement	-0515	-0601
		051	N/A Segment 2	-0601	-0625
		051	N/A Segment 3	-0630	-0648
		052	N/A Segment 4	-0648	-0713
		053	N/A Segment 5 and Supplement	-0737	-0807
		060	Star Survey, Jupiter (neg), Vega (neg)	-0808	-0846
		070	Selected Polarimetric	-0851	-0916
		080	He Check and Relief Valve	-0920	-0939
	DSS-42	-	Special Area	-1306	-1343
		-	Aux. Mirrors	-1348	-1359
6	DSS-11	010	Filter Interrogation	319-0053	319-0117
		020	Polarimetric Survey	-0117	-0227
		030	W/A 360 Pan.	-0228	-0244
		040	Special Area	-0324	-0343
		041	Aux. Mirrors	-0344	-0347
		050	Aux. Mirror-Focus Range	-0348	-0351
		041	Aux. Mirrors (cont.)	-0351	-0354
		050	Aux. Mirror - Focus Range	-0355	-0358
		041	Aux. Mirrors (completion)	-0359	-0402
		060	N/A Segment 1 and Supplement	-0408	-0443
		061	N/A Segment 2	-0444	-0500
		062	N/A Segment 3	-0502	-0523
		063	N/A Segment 4	-0539	-0600
		064	N/A Segment 5 and Supplement	-0600	-0625

Post TD Pass	Station CMDG	Survey Number	Activity	Time GMT Start	Time GMT End
6	DSS-11	070	Star Survey, Vega (neg.)	-0625	-0628
	(con.)	071	Star Survey, Jupiter	-0628	-0633
		080	Selected Polarimetric	-0633	-1002
		090	He Check and Relief Valve	-1002	-1010
		100	Star Survey, Vega	-1010	-1020
		110	Magnets	-1020	-1029
		081	Polarimetric, Pad 2 Chart	-1029	-1033
	DSS-42	-	Special Area	-1303	-1336
7	DSS-11	010	He Check and Relief Valve	320-0125	320-0129
		020	Polarimetric Survey	-0129	-0240
		030	Earth Picture	-0240	-0246
		040	Special Area 2nd	-0246	-
		041	Magnets	-	-0357
		042	Aux. Mirrors	-0357	-0410
		050	W/A 360 Pan.	-0414	-0428
		060	N/A Segment 1 and Supplement	-0429	-0457
		061	N/A Segment 2	-0458	-0513
		062	N/A Segment 3	-0514	-0553
		063	N/A Segment 4	-0556	-0614
		064	N/A Segment 5 and Supplement	-0618	-0700
		070	Selected Polarimetric	-0700	-0734
		080	Earth Picture	-0735	-0751
		090	Iris Calib. Interrogation	-0818	-0900
		100	Alpha Scat. Survey	-0900	-0915
		-	Earth Picture (Approx.)	-1200	-
8	DSS-11	010	Video Test on Omni and Planar Ant.	321-0428	321-0438
		020	Selected Polarimetric in Seg. 3	-0440	-0525
		021	Selected Polarimetric in Seg. 4	-0525	-0643
		022	Selected Polarimetric in Seg. 5	-0643	-0714
		023	Selected Polarimetric in Seg. 2	-0714	-0921
		030	Special Area - Selected	-0921	-0925
		031	Aux. Mirrors	-0925	-0940
		040	W/A 360 Pan. (Post Translation)	-1107	-1122
		050	N/A Segment 4	-1122	-1153
		060	Special Area	-1154	-1245
	DSS-42	070	Aux. Mirrors	321-1323	321-1333
		-	Aux. Mirrors	-1437	-1441
		-	N/A Segment 3, Filter 2	-1521	-1543
		-	N/A Segment 3, Filter 3	-1657	-1714
		-	N/A Segment 3, Filter 4	-1716	-1749
	DSS-61	-	N/A Segments, 4 and 5 in Filter 2,3,&4	-1835	-2307
9	DSS-11	010	Polarimetric Survey	322-0250	322-0407
		020	W/A 360 Pan.	-0409	-0425
		030	Special Area and Magnets	-0427	-0601
		031	Aux. Mirrors	-0602	-0611

Post TD Pass	Station CMDG	Survey Number	Activity	Time GMT Start	Time GMT End
9	DSS-11 (con.)	040	Inside ASI	-0633	-0700
		050	N/A Segment 1	-0748	-0822
		051	N/A Segment 2	-0824	-0840
		060	Solar Corona Calib. Seg.	-0840	-1011
		070	Polarimetric, Pad 3 Area	-1012	-1103
		080	Star Survey, Venus	-1104	-1121
		090	N/A Segment 3, not complete	-1122	-1137
	DSS-42	090	N/A Segment 3 (cont.)	-1231	-1247
		091	N/A Segment 4	-1247	-1308
		092	N/A Segment 5	-1308	-1340
		100	Shadow Progression A	-1341	-1344
		-	Special Area	-1606	-1626
		-	Aux. Mirrors	-1628	-1655
		-	Shadow Progression A	-1759	-1805
	DSS-61	-	Shadow Progression A, 5 Times (Each hour)	- 322-2003	- 323-0242
10	DSS-11	010	Polarimetric Survey	323-0337	323-0443
		020	Special Area and Magnets	-0447	-0524
		021	Aux. Mirrors	-0524	-0532
		030	360 W/A Pan.	-0532	-0608
		040	N/A Segment 1	-0608	-0639
		041	N/A Segment 2	-0642	-0709
		042	N/A Segment 3	-0815	-0918
		050	Star Survey, Venus, Alpha ERI	-0920	-0946
11	DSS-11	010	Polarimetric Survey	324-0430	324-0542
		020	W/A 360 Pan.	-0548	-0606
		030	N/A Segment 3 W/Polarimetric	-0608	-0714
		031	N/A Segment 4 W/Polarimetric	-0718	-0803
		040	Star Survey, α Cent., α ERI, Vega	-0917	-0958
		050	N/A Segment 1	-1000	-1026
		051	N/A Segment 2 W/Polarimetric	-1027	-1056
		060	Shadow Progression	-1119	-1124
		052	N/A Segment 5	-1124	-1148
		070	Special Area	-1148	-1212
		071	Aux. Mirrors	-1213	-1221
	DSS-42	-	Shadow Progression, 4 times	-1415	-1931
	DSS-61	-	Shadow Progression	-2333	-2344
12	DSS-11	010	W/A 360 Pan.	325-0530	325-0542
		020	Shadow Progression	-0543	-0553
		030	Focus Ranging Az = -90	-0556	-0618
		031	" " Az = -108	-0621	-0645
		032	" " Az = -126	-0645	-0709
		033	" " Az = -144	-0712	-0805
		021	Shadow Progression	-0807	-0818

Post TD Pass	Station CMDG	Survey Number	Activity	Time GMT Start	End
12	DSS-11 (con.)	040	Polarimetric Survey and Selected	-0821	-0931
		022	Shadow Progression	-1025	-1039
		040	Polarimetric Survey (cont.)	-1041	-1059
		050	Special Area	-1102	-1125
		051	Aux. Mirrors	-1125	-1131
		060	N/A Segment 3	-1133	-1159
		061	N/A Segment 4	-1221	-1238
		062	N/A Segment 5	-1238	-1306
		063	N/A Segment 2	-1307	-1325
	DSS-42	070	Star Survey, Saturn	-1435	-1501
		023	Shadow Progression	-1501	-1507
	DSS-11	080	Selected Polarimetric	-1529	-1626
	DSS-42	-	Shadow Progression	-1728	-1735
	DSS-61	-	Shadow Progression- 2 times	325-2119	326-0225
13	DSS-11	010	Polarimetric Survey	326-0644	326-0821
		020	W/A 360 Pan.	-0826	-0841
		030	N/A Segment 3 and Polarimetric	-0842	-0944
		031	N/A Segment 4 " "	-0946	-1048
		040	Focus Ranging, Az= -72	-1052	-1127
		041	" " Az= -54	-1144	-1212
		050	Shadow Progression	-1213	-1218
		042	Focus Ranging, Az= -36	-1220	-1240
		043	" " Az= 108	-1241	-1336
		060	Aux. Mirror	-1339	-1344
		070	Selected Polarimetric	-1345	-1417
		051	Shadow Progression	-1418	-1422
		080	Special Area (not complete)	-1424	-1431
	DSS-42	080	Special Area (cont.)	-1532	-1600
		090	Star Survey, α Cent., α ERI, α LVR	-1615	-1651
		052	Shadow Progression	-1652	-1659
		100	N/A Segment 5	-1700	-1747
		101	N/A Segment 2	-1751	-1811
			- DSS-11 Set -		
		-	Shadow Progression	-1909	-1914
		-	Shadow Progression	-2104	-2109
	DSS-61	-	Shadow Progression, 4 times	-2300	327-0509
14	DSS-11	010	Polarimetric Survey	327-0721	-0837
		020	W/A 360 Pan.	-0839	-0857
		030	N/A Segment 3 and Polarimetric	-0906	-1036
		031	N/A Segment 4 " "	-1038	-1131
		040	Focus Ranging, Az = 90	-1136	-1149
		041	" " Az = 72	-1220	-1238
		042	" " Az = 0	-1240	-1325
		043	" " Az = -18	-1329	-1359

Post TD Pass	Station CMDG	Survey Number	Activity	Time GMT Start	Time GMT End
14	DSS-11 (con.)	050	Shadow Progression A	-1423	-1428
		060	" " B	-1428	-1444
		070	Special Area	-1448	-1508
		071	Aux. Mirrors	-1510	-1514
		080	Star Survey, α ERI, α Cent., α LYR	-1516	-1521
	DSS-42	080	Star Survey (Cont.)	-1621	-1639
		090	N/A Segment 5	-1642	-1659
		051	Shadow Progression A	-1701	-1709
		091	N/A Segment 2 and Polarimetric	-1709	-1811
		100	Filter Interrogation	-1812	-1820
		-	Shadow Progression	-1826	-1901
		-	" "	-2106	-2204
		-	" "	-2305	-2312
		-	" "	-2312	-2333
	DSS-61	-	Shadow Progression	328-0131	328-0138
		-	" "	-0328	-0336
		-	" " , A	-0607	-
		-	Special Area	-	-
		-	Aux. Mirrors	-	-
		-	Shadow Progression, B	-	-0714
15	DSS-11	010	W/A 360 Pan.	-0757	-0818
		020	N/A Segment 3 and Polarimetric	-0821	-0914
		021	N/A Segment 4	-0915	-0956
		022	N/A Segment 5	-1020	-1041
		023	N/A Segment 2	-1043	-1104
		011	W/A 360 Pan.	-1110	-1130
		030	Shadow Progression B	-1132	-1139
		040	N/A Horizon Scan	-1143	-1207
		012	W/A 360 Pan.	-1233	-1244
		041	N/A Horizon Scan	-1245	-1310
		013	W/A 360 Pan.	-1314	-1323
		042	N/A Horizon Scan (sunset)	-1324	-1352
		050	Solar Corona	-1411	-1426
		060	W/A Eastern Horizon	-1426	-1434
		070	Solar Corona	-1436	-1520
		080	Star Survey, Anterus	-1520	-1534
		071	Solar Corona	-1536	-1622
		090	Earth Shine, Pad 2	-1623	-1650
		100	Solar Corona	-1651	-1806
		081	Star Survey, α LYR	-1808	-1826
		110	Solar Corona	-1828	-1904
		091	Earth Shine, Pad 2	-1905	-1928
		111	Solar Corona, 20 min, integrate, "Lost in Low Power"	-1929	-2004

End of First Lunar Day SC-6

IV SSAC SURVEYOR VI ALPHA SCATTERING OPERATIONS

FIRST LUNAR DAY

Y	DSS	CALIBRATION TIME	ACCUMULATION TIME	POSITION
4	11	16M	20M	Stowed
	42	15M	2H 18M	
	61	15M	2H 40M	
		DEPLOYED TO BACKGROUND POSITION GMT 211745		
	61	15M	33M	Background
5	11	16M	3H 3M	
	42	—	2H 38M	
		DEPLOYED TO LUNAR SURFACE GMT 120752		
	42	31M	1H 47M	Surface
	61	16M	6H 8M	
6	11	16M	1H 18M	
	42	16M	5H 50M	
	61	—	3H 32M	
0	42	43M	3H 20M	
	61	18M	5H 35M	
1	61	—	1H 26M	
	11	—	1H 40M	
		SPACECRAFT TRANSLATION GMT 103200		
	42	—	2M	Post Translation
2	61	16M	1H 5M	
	42	15M	2H	
4	61	16M	55M	
6	61	16M	40M	
	42	13M	1H 58M	
	61	—	40M	
7	61	15M	3H 5M	
8	61	17M	2H 40M	
		5H 25M Total	55H 13M Total	

Time Exposure Frames

During lunar sunset, some of the pictures were taken in the integrate mode. These sunset time exposure frames are as follows:

Day 328

GMT Start	GMT End	Iris	Exposure	Az	El
	14-13-28	3.8	1.2 sec.	-153	-9
	14-14-31	3.8	5 sec.	-153	-9
	14-15-26	3.8	5 sec.	-153	-9
	14-17-05	3.8	5 sec.	-153	-9
	14-17-56	3.8	5 sec.	-153	-9
	14-18-30	3.8	5 sec.	-153	-9
	14-19-36	3.8	5 sec.	-153	-9
	14-20-07	3.8	5 sec.	-153	-9
	14-20-39	3.8	5 sec.	-153	-9
	14-21-07	3.8	5 sec.	-153	-9
	14-21-49	3.8	10 sec.	-153	-9
	14-22-34	3.8	10 sec.	-153	-9
	14-23-03	3.8	10 sec.	-153	-9
	14-23-24	3.8	10 sec.	-153	-9
	14-25-25	3.8	62 sec.	-153	-9
	14-36-01	3.8	1.2 sec.	-150	-10
	14-36-40	3.8	1.2 sec.	-153	-10
	14-38-05	3.8	60 sec.	-153	-10
	14-39-35	3.8	60 sec.	-153	-10
	14-41-03	3.8	60 sec.	-153	-10
	14-42-21	3.8	60 sec.	-153	-10
14-45-58	14-55-58	12.4	10 min.	-153	-10
	14-58-51	3.8	60 sec.	-153	-9
	15-00-08	3.8	60 sec.	-153	-9
	15-01-25	3.8	60 sec.	-153	-9
	15-02-39	3.8	60 sec.	-153	-9
	15-04-08	3.8	60 sec.	-153	-4
	15-06-54	3.8	60 sec.	-153	-4
	15-08-08	3.8	60 sec.	-153	-4

Time Exposure Frames (Cont.)

Day 328

GMT Start	GMT End	Iris	Exposure	Az	El
15-09-39	15-19-43	12.6	10 min.	-153	-4
	15-37-14	3.8	3 min.	-153	-4
	15-40-49	3.8	3 min.	-153	-4
	14-44-04	3.8	3 min.	-153	-4
	15-47-18	3.8	3 min.	-153	-4
15-51-31	16-01-34	3.8	10 min.	-153	up
	16-07-37	3.8	3 min.	-153	-5
	16-17-01	3.8	3 min.	-153	-5
	16-20-36	3.8	1 min.	-153	-5
	17-04-03	f/22	10 min.	-153	-5
17-08-45	17-18-46	f/4	10 min.	-153	-5
17-21-47	17-31-48	f/4	10 min.	-153	-5
17-38-04	17-48-04	f/4	10 min.	-153	-5
17-56-27	18-06-27	f/22	10 min.	-99	+20
18-26-57	18-36-58	3.8	10 min.	-153	-5
18-53-35	19-03-35	3.8	10 min.	-153	-5
19-30-18	19-33-19	3.8	3 min.	-153	-5

FRAME IMAGES

The frames contain fairly complete identification data which appears from left to right on each frame. This data is described below:

1. The vertical electrical gray scale. For an explanation of this, and its use, see the section on TVGDHS calibration.
2. The 48 mm by 48 mm image.
3. Identification information, taken either from returned television identification or added on ground receipt. Here is provided only a decoding of the TVID abbreviations. For more information please refer to the section on television identification data.
   a. Octal file number
   b. Greenwich mean time of receipt
   c. Mission code and receiving station code
   d. Mission — the letter designating the mission
   e. STA — receiving station; DSS 11 is Goldstone, California; DSS 42 is Canberra, Australia; DSS 61 is Madrid, Spain
   f. CAM — camera number 3
   g. AZ — azimuth angle of the camera mirror
   h. EL — elevation angle of the camera mirror
   i. FOC — computed distance to the plane of principal focus, in meters
   j. FL — focal length of the camera in millimeters
   k. IRIS — f number of the iris
   l. FLTR — polarization filter wheel position
   m. SHTR — camera shutter mode
   n. IS — state of the iris servo

o. MSF state of the camera multiple step focus

p. ELEC electronics temperature in degrees centigrade

q. VID vidicon faceplate temperature in degrees centigrade

r. CAL calibration voltage

s. EREC computed erection angle in degrees to bring the horizon to a horizontal position

t. ALARMS alarms or errors detected in the transmitted TVID

u. WDS number of transmitted TVID frames processed to provide the above data

4. A process code above the television identification data recorded as a machine readable dot pattern.

5. A frame of film roll number above a machine readable bar pattern containing the mission, receiving station, process and frame of roll number codes, and GMT.

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MOSAICS

A number of USGS prepared mosaics have been included to aid in the interpretation of individual frames and to provide an integrated view of the Surveyor and the landing site. The following is a list of the mosaics which have been selected for the data package.

Day	Title	Catalog Number
314	W/A Panorama	2 SI
315	N/A Seg. 3	13 SI
315	N/A Seg. 3	14 SI
315	N/A Seg. 5	16 SI
315	N/A Seg. 2	19 SI
315	W/A Panorama	23 SI
316	W/A Panorama	25 SI
319	Seg. 5 & Spec. Area	71 SI
319	N/A Seg. 1	72 SI
319	N/A Seg. 4	79 SI
319	Seg. 5 & Spec. N/A Sec.	81 SI
322	N/A Seg. 1	118 SI
322	N/A Seg. 1	119 SI
323	N/A Seg. 1	135 SI
323	N/A Seg. 2	136 SI
324	W/A Panorama	140 SI
324	N/A Seg. 3	142 SI
314	Seg. 2 DSS 42	161 SI
314	Seg. 2 DSS 42	162 SI

N/A = Narrow
W = Wide

MECHANICAL PROPERTIES WORKING GROUP
SURVEYOR MISSION F MOSAIC PHOTOS

Catalog Number	JPL Photo Lab Negative Number	GMT Day	Description
6-SE-6	211-2146A		Horizon
6-SE-6*	211-2146AA		Section of above
6-SE-7	211-2145	321	NA-Panorama-AZ, 0° to +6°
6-SE-8	211-2473B	321	WA-Panorama-AZ, -180° to +126°, flat horizon.
6-SE-9	211-2473A	321	Same as above, curved horizon.
6-SE-9*	211-2473AA	321	Section of above
6-SE-10	211-2464A	324	Partial WA panorama-AZ, +72° to -18°.
6-SE-11	211-2464B	328	Partial WA panorama-low sun angle-AZ, +72° to -18°.
6-SE-11*	211-2464BB	328	Section of above
6-SE-12	211-2465A	326	NA imprint from Block 3, Pad 3-AZ, +33° to +45°.
6-SE-13	211-2465B	326	Camera Shadow, disturbed surface-AZ, +15° to +30°.
6-SE-14	211-2466A	327	Crush Block 1 imprint-AZ, +3° to +15°.
6-SE-15	211-2466B	327	Crush Block 1 imprint-AZ, +6° to +15°.
6-SE-16	211-2467A	327	Crush Block 1 imprint-AZ, +6° to +15°.
6-SE-17	211-2467B	327	Footpad 2 imprint-AZ, 0° to -18°.
6-SE-18	211-2468A	321	Footpad 3 NA mosaic- AZ +75° to +87°, post-hop.
6-SE-19	211-2468B	319	Same as above- AZ +69° to +93°, pre-hop.
6-SE-20	211-2481	326	Footpad 2 throw-out area WA mosaic - AZ -36° to -90°, post-hop.
6-SE-21	211-2469A	314	Footpad 3 throw-out area NA mosaic- AZ +75° to +87°, low-sun, early lunar day - pre-hop.

MECHANICAL PROPERTIES WORKING GROUP
SURVEYOR MISSION F MOSAIC PHOTOS

Catalog Number	JPL Photo Lab. Negative Number	GMT Day	Description
6-SE-22	211-2444A	321, 322	NA mosaic, post-hop-looking back on first landing site-AZ, +60° to -27°.
6-SE-22*	211-2444B	321, 322	Left-hand section of mosaic
6-SE-22*	211-2445A	321, 322	Crush block 2 imprint
6-SE-22*	211-2445B	321, 322	Close-up of throw-out material
6-SE-22*	211-2446A	321	Footpad 3 imprint
6-SE-22*	211-2446B	322	Footpad 2 imprint
6-SE-22*	211-2447A	321, 322	Block 2 imprint
6-SE-22*	211-2447B	321	Block 1 imprint
6-SE-22*	211-2448A	321	Pad 3, Block 3, Vernier 3 area
6-SE-22*	211-2448B	321	Crush Block 1 and Vernier Engine 1 area
6-SE-22*	211-2449A	322	Pad 2, Block 2, Vernier 2 area
6-SE-22*	211-2449B	321, 322	Right-hand section of mosaic
6-SE-23	211-2474A	321, 322	NA panorama-AZ, +60° to -27°-EL, -45° to -3°
6-SE-23*	211-2474B	321, 322	Section of above, footpad mark
6-SE-24	211-2469B	322	Leg 3-Pad-3-NA mosaic-post-hop, AZ, +63° to +93°
6-SE-25	211-2470	319	WA Footpad 2 mosaic-pre-hop, AZ, -51° to -90°
6-SE-26	211-2472	320	NA-panorama-AZ, +60° to -105°, pre-hop
6-SE-26*	211-2471A	320	Left-hand section of mosaic
6-SE-26*	211-2471B	320	Right-hand section of mosaic

MECHANICAL PROPERTIES WORKING GROUP
SURVEYOR MISSION F MOSAIC PHOTOS

Catalog Number	JPL Photo Lab. Negative Number	GMT Day	Description
6-SE-31	211-2482A	326	Footpad post-hop 3 imprint, AZ +39° to +40°
6-SE-32	211-2482B	323	Footpad post-hop 2 imprint, AZ -9° to -15°
6-SE-33	211-2483A	326	Footpad post-hop 2 imprint, AZ -12° to -18°
6-SE-34	211-2483B	321	Footpad 2 imprint-post-hop, AZ -69° to -72°
6-SE-35	211-2484A	326	Footpad 2 imprint-post-hop-low-sun, AZ -72°
6-SE-36	211-2484B	324	Footpad 2 imprint-AZ -63° to -72°, post-hop
6-SE-37	211-2517A	323	Footpad 2 imprint-AZ -66° to -69°, post-hop
6-SE-38	211-2517B	326	Footpad 3 imprint, AZ +39° to +45°
6-SE-39	211-2518A	323	Footpad 2 imprint, AZ -9° to -15°
6-SE-40	211-2518B	326	Footpad 2 imprint, AZ -12° to -18°
6-SE-41	211-2532A	321	Footpad 2 imprint-AZ -63° to -72°-post-hop
6-SE-42	211-2532B	324	Footpad 2 imprint-AZ -63° to -75°-post-hop

*Close-up detail views

DIGITALLY PROCESSED DATA

The following pictures have been processed digitally in the JPL Image Processing Laboratory. After being digitized, the pictures were processed by the IBM 360-44 computer using the Sine Wave Response Filter (SWRF) program. This program restores high frequency data (fine details in the picture) in both the horizontal direction along the camera scan lines and in the vertical direction. The amount of enhancement necessary is obtained from pre-launch calibration where optical sine wave targets of known frequency are scanned by the spacecraft camera. Any noise present is also enhanced by the SWRF program; therefore pictures which have been SWRF processed will appear more noisy than the original but will be much sharper and will show more detail. The maximum amount of enhancement is controlled to minimize the increase in noise. Since the SWRF program uses a 15 x 15 element matrix to apply the filter to a picture, the processed pictures are labeled "FILTERED 15 x 15". Each frame is identified with the GMT and TVGDHS File Number.

DAY	HOUR	MINUTE	SECOND	FRAME NO.	PHOTO NO.	DESCRIPTION
314	04	08	26	75	211-2186A	WA of Footpad 2
314	04	18	05	101	211-2186B	Horizon
314	04	22	53	120	211-2187A	Texture of Lunar Surface
314	04	23	02	121	211-2187B	Texture of Lunar Surface
314	04	40	03	177	211-2188A	Texture of Lunar Surface
314	04	43	41	212	211-2188B	Alpha Scattering Stowed
314	04	49	36	223	211-2189A	Texture of Lunar Surface
314	04	49	47	224	211-2189B	Horizon
314	04	50	18	227	211-2190A	Horizon
314	04	50	28	230	211-2190B	Texture of Lunar Surface
314	04	53	21	241	211-2191A	Texture of Lunar Surface
314	04	59	34	272	211-2191B	Texture of Lunar Surface
314	05	05	29	277	211-2192A	NA of Footpad 2
314	05	05	34	300	211-2192B	NA of Footpad 2

DAY	HOUR	MINUTE	SECOND	FRAME NO.	PHOTO NO.	DESCRIPTION
314	05	07	29	304	211-2193A	WA of Footpad 2
314	05	07	34	305	211-2193B	WA of Footpad 2
314	06	58	26	425	211-2194B	Lunar Surface Texture
314	06	58	54	426	211-2194A	Lunar Surface Texture
314	06	58	59	427	211-2195A	Lunar Surface Texture
314	06	59	03	430	211-2195B	Lunar Surface Texture
314	06	59	08	431	211-2196A	Lunar Surface Texture
314	06	59	13	432	211-2196B	NA of Footpad 3
314	06	59	44	441	211-2197A	NA of Footpad 3
314	06	59	49	442	211-2197B	Lunar Surface Texture
314	07	00	41	443	211-2198A	NA of Footpad 3
314	07	06	33	445	211-2198B	NA of Footpad 3
314	07	45	53	454	211-2199A	Top of Compartment A
315	02	34	59	2400	211-2463	NA of Footpad 2
315	02	36	57	2403	211-2462A	NA of Footpad 2
315	02	37	59	2404	211-2462B	NA of Footpad 2
317	06	51	22	11014	211-2461A	WA of Footpad 2
318	01	31	41	13174	211-2461B	Lunar Surface Texture
318	01	57	14	13342	211-2460A	Lunar Surface Texture
318	01	57	22	13343	211-2460B	Lunar Surface Texture
321	11	07	03	33540	211-2199B	WA of Footpad 2
321	11	09	05	33541	211-2200A	WA of Footpad 2
321	11	09	11	33542	211-2200B	WA of Footpad 2 & Texture
321	11	09	52	33553	211-2201A	WA of Pad 2 & Texture
321	11	09	58	33554	211-2201B	WA of Pad 2 & Texture
321	11	10	30	33563	211-2202A	Pad 2 Imprint, WA
321	11	17	25	33656	211-2202B	WA of Footpad 2
321	11	50	58	34207	211-2203A	Rock and Texture
321	11	58	07	34245	211-2203B	NA of Footpad 2
321	11	58	16	34247	211-2204A	NA of Footpad 2
321	12	09	08	34325	211-2204B	Lunar Surface Texture
321	12	31	56	34420	211-2452A	Dust on Omni-Photo Chart

DAY	HOUR	MINUTE	SECOND	FRAME NO.	PHOTO NO.	DESCRIPTION
328	14	15	26	20007	211-2452B	Solar Corona
328	14	21	49	20017	211-2451A	Solar Corona
328	14	25	25	20023	211-2451B	Solar Corona
328	14	36	40	20033	211-2453A	Solar Corona
328	14	38	05	20034	211-2453B	Solar Corona
328	14	42	21	20037	211-2450A	Solar Corona
328	14	56	02	20040	211-2450B	Solar Corona

SPECIAL DIGITAL PRODUCTS

In addition to the frames which have been SWRF processed, a number of frames were digitized to provide only the unprocessed digital data. This data has been used in photometric measurements, and special studies (i.e., solar corona). It was used also to determine the required correction for frequency response, shading, and geometric distortion from the pre-launch calibration. A summary appears below:

Calibration Data

Description	No. of Frames
Light Transfer - Clear Filter (6f stops)	78
Light Transfer - Filters	11
Sine Wave Response	18
Linearity Grid	3
Light Transfer - Open Shutter	8

Mission Data

Description	No. of Frames
Photometric Charts	47
Solar Corona	8

DIGITIZED MOSAIC

The intensity correction (ICOR) program was applied to the frames listed on the following pages. These frames will be used in an enhancement of Mechanical Properties Working Group Mosaic 6-SE-22.

WORK ORDER #43A-1

FILE #	ID#	GMT	PHOTO LAB #
1	33732	321-11-23-34	211-3154A
2	33733	321-11-25-10	211-3154B
3	33734	321-11-27-07	211-3155A
4	33735	321-11-29-50	211-3155B
5	33736	321-11- 30-18	211-3156A
6	33737	321-11-30-21	211-3156B
7	33740	321-11-30-26	211-3157A
8	33741	321-11-30-31	211-3157B
9	33742	321-11-30-36	211-3158A
10	33743	321-11-30-39	211-3158B
11	33744	321-11-30-44	211-3159A
12	33745	321-11-30-49	211-3159B
13	33746	321-11-30-54	211-3160A
14	33747	321-11-30-57	211-3160B
15	33750	321-11-31-02	211-3161A
16	33751	321-11-31-07	211-3161B
17	33752	321-11-31-11	211-3162A
18	33753	321-11-31-15	211-3162B
19	33754	321-11-31-20	211-3163A
20	33755	321-11-31-25	211-3163B
21	33756	321-11-31-29	211-3164A
22	33757	321-11-31-33	211-3164B
23	33760	321-11-31-38	211-3165A
24	33761	321-11-31-43	211-3165B
25	33762	321-11-31-47	211-3166A
26	33763	321-11-31-51	211-3166B
27	33764	321-11-31-56	211-3167A

WORK ORDER #43A-2

FILE #	ID#	GMT	PHOTO LAB #
1	33765	321-11-32-01	211-3167B
2	33766	321-11-32-05	211-3168A
3	33767	321-11-32-09	211-3168B
4	33770	321-11-32-14	211-3169A
5	33771	321-11-32-19	211-3169B
6	33772	321-11-32-23	211-3170A
7	33773	321-11-32-29	211-3170B
8	33774	321-11-32-34	211-3171A
9	33775	321-11-32-39	211-3171B
10	33776	321-11-32-43	211-3172A
11	33777	321-11-32-47	211-3172B
12	34000	321-11-32-52	211-3173A
13	34001	321-11-32-57	211-3173B
14	34002	321-11-33-01	211-3174A
15	34003	321-11-33-05	211-3174B
16	34004	321-11-33-10	211-3175A
17	34005	321-11-33-15	211-3175B
18	34006	321-11-33-19	211-3176A
19	34007	321-11-33-23	211-3176B
20	34010	321-11-33-28	211-3177A
21	34011	321-11-33-33	211-3177B
22	34012	321-11-33-37	211-3178A
23	34013	321-11-33-41	211-3178B
24	34014	321-11-33-46	211-3179A
25	34015	321-11-33-51	211-3179B
26	34016	321-11-33-54	211-3180A
27	34017	321-11-34-00	211-3180B

WORK ORDER #43A-3

FILE #	ID#	GMT	PHOTO LAB #
1	34020	321-11-34-04	211-3181A
2	34021	321-11-34-09	211-3181B
3	34022	321-11-34-14	211-3182A
4	34023	321-11-34-18	211-3182B
5	34024	321-11-34-22	211-3183A
6	34025	321-11-34-27	211-3183B
7	34026	321-11-34-32	211-3184A
8	34027	321-11-34-36	211-3184B
9	34030	321-11-34-40	211-3185A
10	34031	321-11-34-47	211-3185B
11	34032	321-11-34-52	211-3186A
12	34033	321-11-34-57	211-3186B
13	34034	321-11-35-00	211-3187A
14	34035	321-11-35-05	211-3187B
15	34036	321-11-37-24	211-3188A
16	34037	321-11-37-29	211-3188B
17	34040	321-11-37-34	211-3189A
18	34041	321-11-37-37	211-3189B
19	34042	321-11-37-42	211-3190A
20	34043	321-11-37-47	211-3190B
21	34044	321-11-37-52	211-3191A
22	34045	321-11-37-57	211-3191B
23	34046	321-11-38-01	211-3192A
24	34047	321-11-38-05	211-3192B
25	34050	321-11-38-10	211-3193A
26	34051	321-11-38-15	211-3193B
27	34052	321-11-38-19	211-3194A

WORK ORDER #43A-4

FILE #	ID#	GMT	PHOTO LAB #
1	34053	321-11-38-23	211-3194B
2	34054	321-11-38-28	211-3195A
3	34055	321-11-38-33	211-3195B
4	34056	321-11-38-37	211-3196A
5	34057	321-11-38-41	211-3196B
6	34060	321-11-38-46	211-3197A
7	34061	321-11-38-51	211-3197B
8	34062	321-11-38-55	211-3198A
9	34063	321-11-38-59	211-3198B
10	34064	321-11-39-04	211-3199A
11	34065	321-11-39-09	211-3199B
12	34066	321-11-39-13	211-3200A
13	34067	321-11-39-17	211-3200B
14	34070	321-11-39-22	211-3201A
15	34071	321-11-39-27	211-3201B
16	34072	321-11-39-31	211-3202A
17	34073	321-11-39-35	211-3202B
18	34074	321-11-40-12	211-3203A
19	34075	321-11-41-05	211-3203B
20	34076	321-11-41-10	211-3204A
21	34077	321-11-41-14	211-3204B
22	34100	321-11-41-19	211-3205A
23	34101	321-11-41-53	211-3205B
24	34102	321-11-42-31	211-3206A
25	34103	321-11-43-14	211-3206B
26	34104	321-11-43-37	211-3207A
27	34105	321-11-43-42	211-3207B

WORK ORDER #43A-5

FILE #	ID#	GMT	PHOTO LAB #
1	34106	321-11-43-47	211-3233A
2	34107	321-11-43-51	211-3233B
3	34110	321-11-43-55	211-3234A
4	34111	321-11-44-00	211-3234B
5	34112	321-11-44-05	211-3235A
6	34113	321-11-44-09	211-3235B
7	34114	321-11-44-13	211-3236A
8	34115	321-11-44-18	211-3236B
9	34116	321-11-44-23	211-3237A
10	34117	321-11-44-27	211-3237B
11	34120	321-11-44-31	211-3238A
12	34121	321-11-44-36	211-3238B
13	34122	321-11-44-41	211-3239A
14	34123	321-11-44-45	211-3239B
15	34124	321-11-44-49	211-3240A
16	34125	321-11-44-54	211-3240B
17	34126	321-11-44-58	211-3241A
18	34127	321-11-46-58	211-3241B
19	34130	321-11-47-03	211-3242A
20	34131	321-11-47-08	211-3242B
21	34132	321-11-47-13	211-3243A
22	34133	321-11-47-16	211-3243B
23	34134	321-11-47-21	211-3244A
24	34135	321-11-47-26	211-3244B
25	34136	321-11-47-32	211-3245A
26	34137	321-11-47-37	211-3245B
27	34140	321-11-47-40	211-3246A

WORK ORDER #43A-6

FILE #	ID#	GMT	PHOTO LAB #
1	34141	321-11-47-45	211-3246B
2	34142	321-11-47-50	211-3247A
3	34143	321-11-47-55	211-3247B
4	34144	321-11-47-58	211-3248A
5	34145	321-11-48-03	211-3248B
6	34146	321-11-48-08	211-3249A
7	34147	321-11-48-13	211-3249B
8	34150	321-11-48-16	211-3250A
9	34151	321-11-48-21	211-3250B
10	34152	321-11-48-26	211-3251A
11	34153	321-11-48-31	211-3251B
12	34154	321-11-48-35	211-3252A
13	34155	321-11-48-39	211-3252B
14	34156	321-11-48-44	211-3253A
15	34157	321-11-48-49	211-3253B
16	34160	321-11-48-53	211-3254A
17	34161	321-11-48-57	211-3254B
18	34162	321-11-49-02	211-3255A
19	34163	321-11-49-07	211-3255B
20	34164	321-11-49-11	211-3256A
21	34165	321-11-49-15	211-3256B
22	34166	321-11-49-20	211-3257A
23	34167	321-11-49-25	211-3257B
24	34170	321-11-49-29	211-3258A
25	34171	321-11-49-33	211-3258B
26	34172	321-11-49-38	211-3259A
27	34173	321-11-49-43	211-3259B

WORK ORDER #43A-7

FILE #	ID#	GMT	PHOTO LAB #
1	34174	321-11-49-49	211-3260A
2	34175	321-11-49-53	211-3260B
3	34176	321-11-49-58	211-3261A
4	34177	321-11-50-03	211-3261B
5	34200	321-11-50-07	211-3262A
6	34201	321-11-50-11	211-3262B
7	34202	321-11-50-16	211-3263A
8	34203	321-11-50-21	211-3263B
9	34204	321-11-50-25	211-3264A
10	34205	321-11-50-29	211-3264B
11	34206	321-11-50-34	211-3265A
12	34207	321-11-50-58	211-3265B
13	34210	321-11-51-17	211-3266A
14	34211	321-11-51-22	211-3266B
15	34212	321-11-51-27	211-3267A
16	34213	321-11-51-32	211-3267B
17	34214	321-11-51-36	211-3268A
18	34215	321-11-51-41	211-3268B
19	34216	321-11-51-46	211-3269A
20	34217	321-11-51-51	211-3269B
21	34220	321-11-51-54	211-3270A
22	34221	321-11-51-59	211-3270B
23	34222	321-11-52-04	211-3271A
24	34223	321-11-52-09	211-3271B
25	34224	321-11-52-12	211-3272A
26	34225	321-11-52-17	211-3272B

WORK ORDER #43B-1

File #	ID #	GMT	PHOTO LAB #
1	37555	322-12-39-54	211-3273A
2	37556	322-12-39-59	211-3273B
3	37557	322-12-40-04	211-3274A
4	37560	322-12-40-08	211-3274B
5	37561	322-12-40-12	211-3275A
6	37562	322-12-40-17	211-3275B
7	37563	322-12-40-22	211-3276A
8	37564	322-12-40-26	211-3276B
9	37565	322-12-40-30	211-3277A
10	37566	322-12-40-35	211-3277B
11	37567	322-12-40-40	211-3278A
12	37570	322-12-40-44	211-3278B
13	37571	322-12-40-48	211-3279A
14	37572	322-12-40-53	211-3279B
15	37573	322-12-40-58	211-3280A
16	37574	322-12-41-02	211-3280B
17	37575	322-12-41-06	211-3281A
18	37576	322-12-41-11	211-3281B
19	37577	322-12-41-16	211-3282A
20	37600	322-12-41-20	211-3282B
21	37601	322-14-41-24	211-3283A
22	37602	322-12-41-29	211-3283B
23	37603	322-12-41-34	211-3284A
24	37604	322-12-41-38	211-3284B
25	37605	322-12-41-42	211-3285A
26	37606	322-12-41-47	211-3285B
27	37607	322-12-41-52	211-3286

WORK ORDER #43B-2

File #	ID #	GMT	PHOTO LAB #
1	37610	322-12-41-56	211-3208A
2	37611	322-12-42-00	211-3208B
3	37612	322-12-42-05	211-3209A
4	37613	322-12-42-14	211-3209B
5	37614	322-12-42-19	211-3210A
6	37615	322-12-42-24	211-3210B
7	37616	322-12-42-28	211-3211A
8	37617	322-12-42-32	211-3211B
9	37620	322-12-42-37	211-3212A
10	37621	322012-42-42	211-3212B
11	37622	322-12-42-46	211-3213A
12	37623	322-12-42-51	211-3213B
13	37624	322-12-42-55	211-3214A
14	37625	322-12-43-00	211-3214B
15	37626	322-12-43-04	211-3215A
16	37627	322-12-43-09	211-3215B
17	37630	322-12-43-13	211-3216A
18	37631	322-12-43-18	211-3216B
19	37632	322-12-43-22	211-3217A
20	37633	322-12-43-27	211-3217B
21	37634	322-12-43-31	211-3218A
22	37635	322-12-43-36	211-3218B
23	37636	322-12-43-40	211-3219A
24	37637	322-12-43-45	211-3219B
25	37640	322-12-43-49	211-3220A
26	37641	322-12-43-54	211-3220B
27	37642	322-12-43-59	211-3221A

WORK ORDER #43B-3

File #	ID #	GMT	PHOTO LAB #
1	37643	322-12-44-03	211-3221B
2	37644	322-12-44-10	211-3222A
3	37645	322-12-44-15	211-3222B
4	37646	322-12-44-18	211-3223A
5	37647	322-12-44-23	211-3223B
6	37650	322-12-44-28	211-3224A
7	37651	322-12-44-33	211-3224B
8	37652	322-12-44-37	211-3225A
9	37653	322-12-44-42	211-3225B
10	37654	322-12-44-47	211-3226A
11	37655	322-12-44-51	211-3226B
12	37656	322-12-44-55	211-3227A
13	37657	322-12-45-00	211-3227B
14	37660	322-12-45-05	211-3228A
15	37661	322-12-45-09	211-3228B
16	37662	322-12-45-13	211-3229A
17	37663	322-12-45-18	211-3229B
18	37664	322-12-45-23	211-3230A
19	37665	322-12-45-27	211-3230B
20	37666	322-12-45-31	211-3231A
21	37667	322-12-45-36	211-3231B
22	37670	322-12-45-41	211-3232A
23	37671	322-12-45-45	211-3232B

TELEVISION IDENTIFICATION DATA DESCRIPTION

Source of Frame Data

Television Identification (TVID) data is generated and transmitted between each television frame. On ground receipt, the TVID is decommutated, converted to engineering units, time tagged, assigned a file number, and stored in TVGDHS computer systems disc storage unit. The data thus accumulated in real time during the mission or by tape playback of overseas data has been manually examined and all observed anomalies corrected to their most likely value. This correction has been accomplished by comparison of the image data associated with each TVID theoretically to be expected in response to the command stream sent to the camera. Final production of the TVID catalog included with this data package has been by a computer program which selects and prints a subset of the corrected TVID as stored on the disc file. As such it represents out best estimate of correct TVID to be associated, through GMT correlation, with each image frame taken during the mission.

Summary Listing

The catalog presents a time sorted listing of the TVID. A list of abbreviations, their meaning, allowable ranges and least significant units (LSU) follows:

Abbreviations	Meaning	Range	LSU
DAY	Day of Year	0-366	1
HR	Hour of Day	0-23	1
MIN	Minute of Hour	0-59	1
SC	Second of Minute	0-59	1
FILE NO	Octal File Number	1-20000	1
AZ	Azimuth angle of camera mirror	-222 to +132	1 rounded, not truncated from ±0.1 values
EL	Elevation angle of camera mirror	-90.0 to +90.0	0.1
FCS ST	Focus Step	0-49	1
FCS DIST	Distance in meters to plane of principal focus	0.00 to 9.99	0.1
IRIS	Camera iris setting in f stop numbers	4.0 to 22.0	0.1
FILTER	Filter wheel position	CLR 1 VER 2 45 3 HOR 4 CLR 5	
F/L	Camera focal length	Wide or Narrow	

FORTRAN COMPATIBLE TAPE FORMAT DESCRIPTION

An ancillary output of the TVID processing programs is an IBM 7094 Fortran IV compatible magnetic tape record of all TVID. A copy of this tape is available from the National Space Science Data Center, Greenbelt, Maryland . The tape is written (and can be read) in Fortran IV binary mode, using the statement WRITE (i) List, where "i" and "List" are described in the Fortran IV manuals.

Following is the format of this tape:

BCD = A format

Floating = F format

Fixed = I format

Octal = O format

b = Hollerith blanks

* = Hollerith asterisk

RECORD	LOGICAL LENGTH	WORD	MODE	DESCRIPTION
1	1	1	BCD	Date the tape was generated, month, day, & year
2, 3 ..., Last-1	63	1	Floating	Azimuth corrected. (bbbbb* if no entry, "b" meaning "blank")
		2	Floating	Azimuth
		3	Fixed	Azimuth T/M Word Count
		4	BCD	Camera number alarm (ALARMb or OKbbbb)
		5	Fixed	Camera number
		6	BCD	Calibration voltage alarm (ALARMb or OKbbbb)
		7	Floating	Calibration voltage corrected (bbbbb* if no entry)
		8	Floating	Calibration voltage
		9	Fixed	Calibration voltage T/M word count
		10	Fixed	Days
		11	Fixed	DSIF Code
		12	Fixed	Erection angle
		13	Fixed	Erection angle option
		14	Floating	Elevation angle corrected (bbbbb* if no entry)
		15	Floating	Elevation
		16	Fixed	Elevation T/M word count
		17	Floating	Electronic tamperature corrected (bbbbb* if no entry)
		18	Floating	Electronic tamperature
		19	BCD	Focal length angle corrected. (bbWIDE or NARROW) (bbbbb* if no entry)
		20	BCD	Focal length angle. (bbWIDE or NARROW)

RECORD	LOGICAL LENGTH	WORD	MODE	DESCRIPTION
		21	Floating	Focus corrected (bbbbb* if no entry)
		22	Floating	Focus
		23	Fixed	Focus T/M word count
		24	BCD	Filter position alarm (ALARMb or OKbbbb)
		25	Fixed	Filter position corrected (bbbbb* if no entry)
		26	Fixed	Filter position
		27	Fixed	Filter position T/M word count
		28	BCD	Focal length alarm (ALARMb or OKbbbb)
		29	Floating	Focal length corrected (bbbbb* if no entry)
		30	Floating	Focal length
		31	Fixed	Format number
		32	Octal	File number
		33	Fixed	Frame number
		34	Fixed	Focus step corrected (bbbbb* if no entry)
		35	Fixed	Focus step
		36	Fixed	Hours
		37	Fixed	ID quality
		38	Floating	Iris setting corrected (bbbbb* if no entry)
		39	Floating	Iris setting
		40	Fixed	Iris T/M word count
		41	BCD	Iris servo corrected (bbONbb or bbOFFb) (bbbbb* if no entry)

RECORD	LOGICAL LENGTH	WORD	MODE	DESCRIPTION
		42	BCD	Iris servo (bbONbb or bbOFFb)
		43	BCD	Multiple step focus corrected (bbONbb or bbOFFb) (bbbbb* if no entry)
		44	BCD	Multiple step focus, (bbONbb or bbOFFb)
		45	Fixed	Milliseconds
		46	Fixed	Minutes
		47	Fixed	Mission number code
		48	Fixed	Process code
		49	Floating	Sun Azimuth (bbbbb* if no entry)
		50	Fixed	Seconds
		51	Floating	Sun elevation (bbbbb* if no entry)
		52	BCD	Shutter mode alarm (ALARMb or OKbbbb)
		53	BCD	Shutter mode corrected (NORMAL or bbOPEN) (bbbbb* if no entry)
		54	BCD	Shutter mode (NORMAL or bbOPEN)
		55	Fixed	Stereo mate's file number (bbbbb* if no entry)
		56	Fixed	Survey number
		57	Fixed	Camera axis tilt angle
		58	Floating	Camera axis tilt direction
		59	Floating	Vidicon temperature corrected (bbbbb* if no entry)
		60	Floating	Vidicon temperature
		61,62 & 63	BCD	Searchable subjective data
Last	63	1, 2,	BCD	ENDbOFbDATAb
		3-63	BCD	"blanks"

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