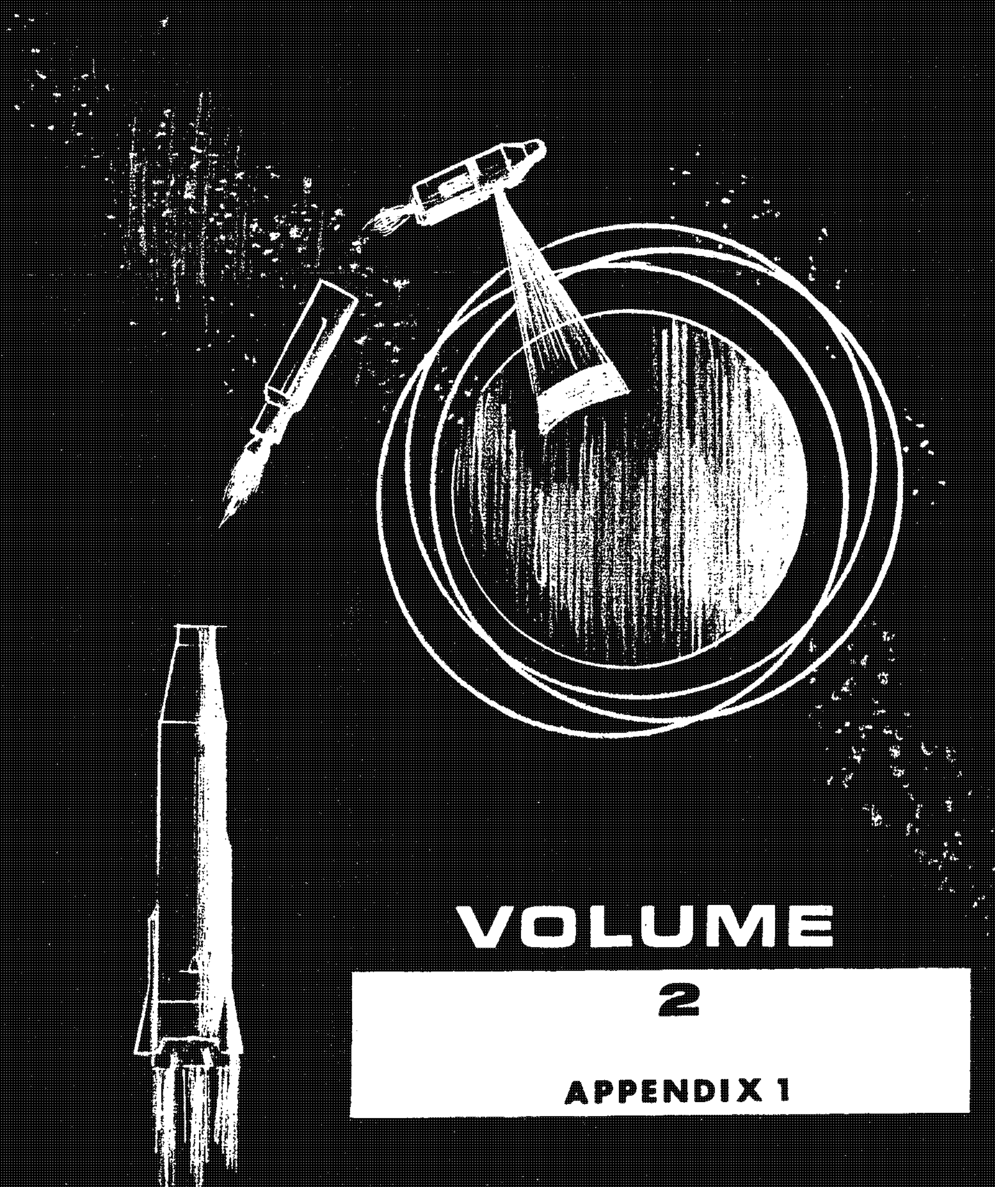
206

PROGRAM REPORT



VOLUME

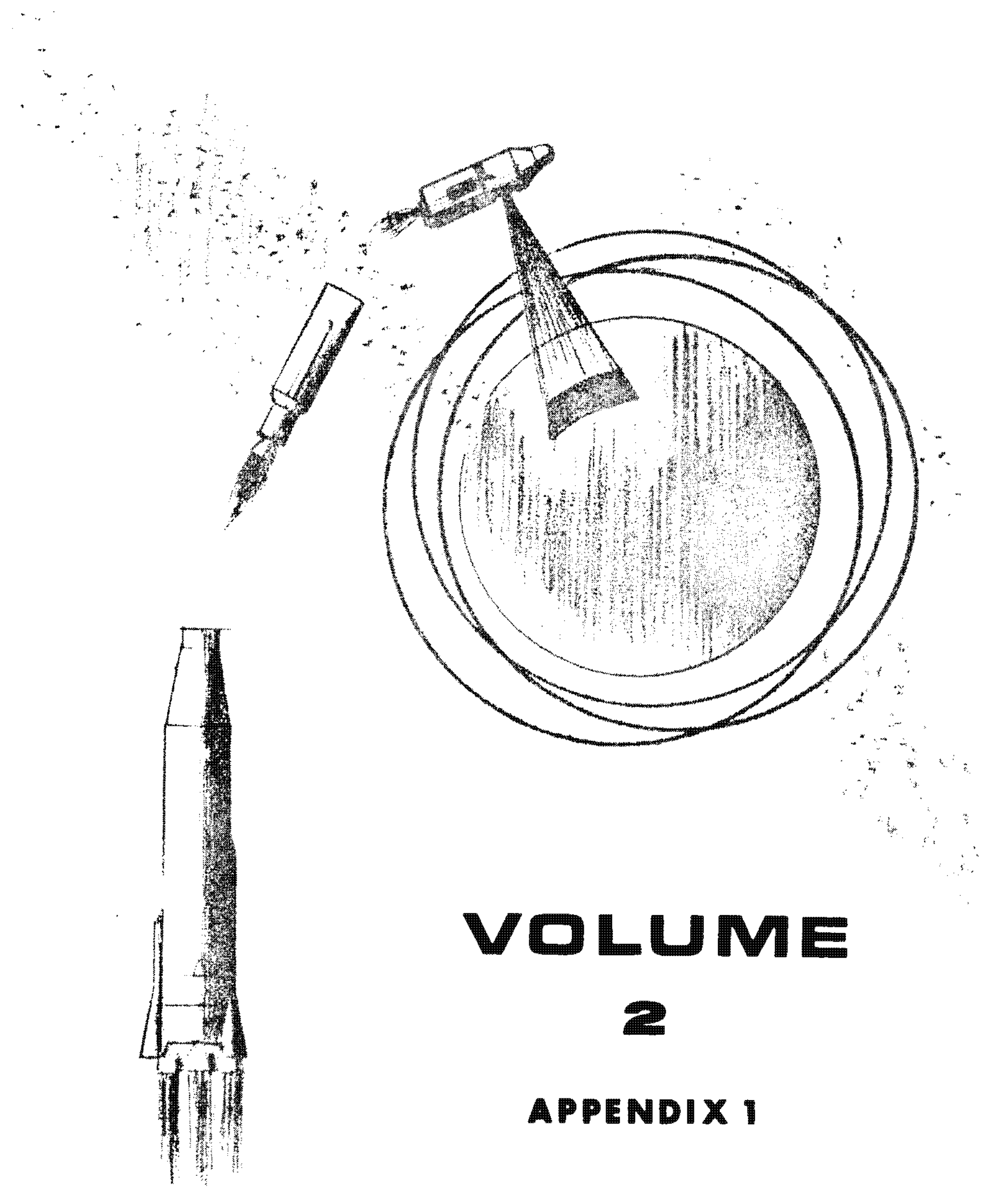
2

APPENDIX 1

THIS DOCUMENT CONTAINS 135 PAGES
NOVEMBER 1967

206

PROGRAM REPORT



VOLUME
2

APPENDIX 1

CONTENTS

APPENDIX 1

SPACE CHAMBER SPECIFICATION

Copy No. ____________

Sheets 133

PHASE II

Space Chamber

Specification No. 802-153

Prepared by
EASTMAN KODAK COMPANY
Advanced Development Projects Group
Apparatus and Optical Division
Rochester, New York

Original signed by:
Prepared by J. C. Kopec/tmh 7-17-62

Reviewed by Ted M. Holtz 7-17-62 L. P. Mitchell/cs 7-17-62

Approved by H. F. Hicks/maf 7-18-62

Release Date 7-18-62

Revision	Pages Affected	Date	Approved by
V	DCO's T-1 thru T-3 inc. Retyped cover, Shts, 19,25,38. Revised Shts. 24,31b,33aw 33bn. Added Shts. 33bn-1,33aw-1. Total Shts. now 133 P/R pd/mz	4-6-67	[illegible]

TABLE OF CONTENTS

			Page
1.	SCOPE AND MISSION		2
	1.1	Scope	2
	1.2	Mission	2
2.	APPLICABLE DOCUMENTS		3
3.	REQUIREMENTS		6
	3.1	Operating Requirements	7
	3.1.1	Camera	8
	3.1.1.1	Film Drive	8
	3.1.1.2	Slit Aperature Plate Positioning and Adjusting	8
	3.1.1.2.1	Programmable Slit Mechanism Assembly	9
	3.1.1.2.1.1	Position Instrumentation	9
	3.1.1.2.1.2	Repositioning Capability	10
	3.1.1.2.1.3	Slit Transition Time	10
	3.1.1.3	Focus Control	10
	3.1.1.3.1	Instrumentation Output	10
	3.1.1.4	Focus Detector Assembly	11
	3.1.1.5	Interframe Marker	11
	3.1.2	Optical Assembly	11
	3.1.2.1	Requirements	11
	3.1.3	Film Handling System	12
	3.1.3.1	Film Supply Cassette	12
	3.1.3.1.1	Film Supply	12
	3.1.3.1.2	Supply Reel Brake	12
	3.1.3.1.3	Outputs	12

TABLE OF CONTENTS (CONT'D)

		Page
3.1.3.2	Forward Record Storage (Film Take-up)	13
3.1.3.2.1	Forward Record Storage Capability	13
3.1.3.2.2	Take-up Drive Torque	13
3.1.3.2.3	Film Transport	13
3.1.3.2.4	Outputs	13
3.1.3.3	Starting and Stopping Transients	14
3.1.4	Servos	14
3.1.4.1	Elevation (Stereo) Servo	14
3.1.4.1.1	Shaft Positioning	14
3.1.4.1.2	Repositioning and Capability	15
3.1.4.1.3	Overshooting and Hunting	15
3.1.4.1.4	Transition Time	15
3.1.4.1.5	Instrumentation Output	15
3.1.4.2	Azimuth (Crabbing) Servo	16
3.1.4.2.1	Shaft Positioning	16
3.1.4.2.2	Repositioning Capability	17
3.1.4.2.3	Overshooting and Hunting	17
3.1.4.2.4	Transition Time	17
3.1.4.2.5	Instrumentation Output	17
3.1.5	Structure	17
3.1.6	Film Drive Electronics	17
3.1.6.1	Command Code	18
3.1.6.2	Outputs	18
3.1.6.2.1	Motor Power	18

TABLE OF CONTENTS (CONT'D)

		Page
3.1.6.2.2	Data Signals	18
3.1.6.3	Test Points	18
3.1.6.3.1	Motor Power and Data Signal Test Point	19
3.1.6.3.2	Oscillator Test Point	19
3.1.7	Focus Control Component	19
3.1.7.1	Optical Input	19
3.1.7.1.1	Spectrum	20
3.1.7.1.2	Luminance Range	20
3.1.7.1.3	Scene Content	20
3.1.7.1.4	Scene Content Motion	20
3.1.7.2	Reticle	20
3.1.7.3	Output Requirements	20
3.1.7.3.1	Output Signals	21
3.1.7.3.2	Manual Mode Operation	21
3.1.7.3.3	Automatic Mode Operation	21
3.1.8	Temperature Control	21
3.1.9	Electrical Distribution Component	22
3.1.9.1	Junction Box Assembly	22
3.1.9.2	Test Box Assembly	22
3.1.9.3	Distribution Box Assembly	23
3.1.9.3.1	Record Transport Control Circuit	23
3.1.9.3.2	Differential Temperature Amplifiers	24

TABLE OF CONTENTS (CONT'D)

		Page
3.1.9.3.2.1	Lens Barrel Unit	24
3.1.9.3.2.2	Stereo Mirror Unit	24
3.1.9.3.3	Motor Current Instrumentation Circuit	24
3.1.9.3.4	Instrumentation Assembly	25
3.1.10	Cables	25
3.1.11	Port Open Tell-tale	25
3.1.12	Temperature Instrumentation Amplifier Assembly	26
3.1.12.1	Coarse Differential Temperature Amplifier	26
3.1.12.2	Fine Differential Temperature Amplifier	27
3.1.12.3	Ambient Temperature Amplifier	27
3.2	Photographic Requirements	27
3.2.1	Film	27
3.2.1.1	Base and/or Fog Density	27
3.2.1.2	Gamma	27
3.2.1.3	Resolution	28
3.2.1.4	Exposure	28
3.2.1.5	Data Marks	29
3.2.1.6	Orientation of Image	29
3.2.1.7	Film Abrasion	29
3.2.1.8	Film Damage	29
3.2.1.9	Film Velocity Variations	29
3.2.1.10	Interframe Marks	29
3.2.2	Slit Plate Streaking	29

S

TABLE OF CONTENTS (CONT'D)

		Page
3.3	Mechanical Requirements	30
3.3.1	Size	30
3.3.2	Weight and Center of Gravity	30
3.3.2.1	Weight	30
3.3.2.2	Center of Gravity	30
3.3.3	Materials and Finishes	31
3.3.4	Identification	31
3.3.5	Reference Axes	31
3.3.6	Pressure and Leak Rate	31
3.3.7	Proof Pressure	31
3.4	Electrical Requirements	32
3.4.1	Payload Power	32
3.4.1.1	Operational Supply	32
3.4.1.2	Environmental Supply	32
3.4.1.3	Instrumentation Supply	32
3.4.2	Commands	32
3.4.3	Instrumentation	33
3.4.4	Test Point Outputs	33
3.4.4.1	Test Point and Umbilical Payload Information	33
3.4.5	General	34
3.4.5.1	Leakage Resistance	34
3.4.5.2	Electromagnetic Interference	34
3.5	Environmental Requirements	34
3.6	General Requirements	34
3.6.1	Service Life	34

Ⓢ

TABLE OF CONTENTS (CONT'D)

			Page
	3.6.2	Reliability	35
	3.6.3	Calibration and Gauges	35
	3.7	Documentary Requirements	35
	3.7.1	Drawings	35
	3.7.2	Specifications	36
	3.7.3	Inspection Reports	36
	3.7.4	Certification of Items	36
	3.7.5	Alignment and Calibration	36
	3.7.6	Test Procedures	36
	3.7.7	Performance Record	36
4.	QUALITY ASSURANCE PROVISIONS		36
	4.1	Classification of Tests	36
	4.2	Qualification Tests	36
	4.2.1	Visual Inspection	37
	4.2.2	Drawing Conformance	37
	4.2.3	Performance Tests	37
	4.2.4	Environmental Qualification Tests	37
	4.2.5	Diagnosis Report	37
	4.2.6	Life Test	37
	4.3	Acceptance Tests	38
	4.3.1	Environmental Acceptance Tests	38
	4.4	Test Conditions	38
	4.4.1	Alignment and Calibration	38
	4.5	Documentation	38

(S)

TABLE OF CONTENTS (CONT'D)

			Page
5.	PREPARATION FOR DELIVERY		38
	5.1	Packing and Packaging	38
6.	NOTES		38

S

Phase II Specification	Space Chamber
Specification No. 802-153	Release Date: 7-18-62

1. SCOPE AND MISSION

1.1 Scope - This specification defines the Space Chamber hereinafter referred to as the payload. It includes the performance and environmental requirements, and defines the quality assurance provisions required to determine compliance of the payload with these requirements.

1.2 Mission - The payload shall be composed of hardware of flight configuration for the airborne portion of a recoverable satellite reconanissance system capable of photographing areas of interest from the following altitudes: S/N 201 through S/N 203, 116 ± 20 nautical miles; S/N 204 through S/N 206, 95 ± 12 nautical miles; S/N 207 through S/N 210, 72 ± 9 nautical miles; and S/N 211 on, 80 ± 10 nautical miles. The payload shall be capable of exposing film in orbit upon receipt of command from an associated subsystem, storing the unexposed film from launch until time of exposure; delivering the exposed film to the forward record storage for the recovery phase of flight and storing the film in the forward storage until retrieval; the payload shall include the structures and mechanisms required for orbital use of the equipment except those which are the responsibilities of other subsystems as defined in Eastman Kodak Company interface specification 502-146. The payload shall be capable of producing stereo pairs, lateral pairs or continuous strip photography.

(M)

2. APPLICABLE DOCUMENTS

The following specifications, standards, drawings and publications of latest issue in effect form a part of this specification. Applicability of the listed documents shall depend on their specific reference in this specification. In the event of conflict between listed documents and this specification, the higher document in the specification tree shall determine precedence.

SPECIFICATIONS

Military

MIL-Q-9858	Quality Control Systems Requirements
MIL-I-26600	Interference Control Requirements, Aeronautical Equipment

Eastman Kodak Company

401-110	Quality Control System Requirements for Vendors and Contractors
502-115	Cabling Assembly
502-118	Environmental Design Criteria Including Qualification and Acceptance Test Levels for RSRS Payload
SVS105Z/502-146	GE-EK Program 206 Interface Specification
502-154	Focus Control Electronics Assembly
602-100	Elevation Servo Assembly
602-101	Azimuth Servo Assembly
602-128	Electrical Distribution Component

G

602-144	Package Shipping Container (Payload Shipping Container)
702-102	Motor Speed Drive (Film Drive Electronics Assembly)
702-135	Forward Record Storage
702-139	Film Supply Cassette
702-145	Photographic Subsystem
702-184	Final Product Specification
802-122	Camera Assembly
802-125	Lens and Flat Mirror Assemblies
802-129	Structure Assembly
802-133	Fixed Target Assembly, Target Slides
802-134	Target for Moving Target Assembly
802-203	Gain Detector Assembly (Focus Detector Assembly)

STANDARDS

Military

MIL-STD-150A	Photographic Lenses

Eastman Kodak Company

401-100	Drafting Manual
401-104-2	Attaining Reliable Manufacture

DRAWINGS

Eastman Kodak Company

510-105	Gain Control Assembly
516-100	Thermistor Probe Assembly, Thermal Control

G P

516-125,516-259*	Space Chamber Schematic Diagram
516-218	Temperature Probe, Diffierential Pair, Air Heater
516-223	Thermistor Probes, Matched Set
516-224	Thermistor Probes, Selected Pair
516-249	Amplifier, Differential Temperature
516-254	Probe Assembly, Thermistor
516-255	Instrumentation Assembly, Temperature
614-100	Servo Assembly, Elevation
614-101	Servo Assembly, Azimuth
617-101	Schematic Diagram Junction Box
617-106	Junction Box Assembly
617-109,617-259*	Test Box Schematic Diagram
617-114	Distribution Box
617-151,617-255*	Test Box Assembly
617-213	Amplifier Assembly, No. 3
709-200	Motor Speed Drive Assembly
711-185	Air Supply Assembly
712-100	Record Storage Schematic Diagram
712-479	Forward Record, Storage Assembly "D"
801-106	Command Information Camera Payload
801-108	Command Code, Film Speed - Camera
801-111	Umbilical Information, Camera Payload
801-112	Test Point Information, Camera Payload
805-101,805-164*	Space Chamber Assembly
805-125,805-165*	Temperature Instrumentation and Thermal Control
808-103	Film Format "B"

* Applicable drawing numbers for CCN-14, effective on S/N 233, 234 and 235.

T

808-188	Test Requirements for Camera Assembly
808-750	Camera Assembly
813-445	Acceptance Inspection and Test Requirements-Door Tell-tale Assembly
833-966	Target, Moving

GE-EK Interface Drawings

75R012/501-113	GE-EK Electrical Interface Program Z
74E005/501-114	Instrumentation Information Payload Program Z
30S2000/801-116	GE-EK Mechanical Interface

OTHER PUBLICATIONS

Eastman Kodak Company

554-104	Shipping Container Manual

3. REQUIREMENTS

The detailed requirements contained in referenced component specifications shall be used as component hardware acceptance criteria. The components shall function compatibly and shall meet the requirements of this specification when integrated in the payload assembly. The payload shall comply with the requirements of this specification. The payload assembly, as a system, shall be capable of producing high resolution photographic information.

The payload shall provide film handling facilities to supply, transport, and collect the film.

The combined effects of external or internal contaminants due to external environment or film transport enclosure shall not alter the film characteristics beyond the following values on those areas of the film containing photographs of significance to the camera payload (C/P) mission:

(P)

Photographic speed ± 0.04

Gamma ± 0.05

Minimum Density ± 0.03

The accumulated stray light fogging of any portion of the film speed from external or internal light sources shall not exceed 0.01 meter-candle-second during transport or storage in the payload. Stray light fogging is allowable within 2 inches of a positioned slit in the aperture plate between periods of photography.

The physical characteristics of the film shall not be degraded by mottling, scratches, digs, film layer adherence, static discharge or water streaks. Where effects in the above area are noted, Eastman Kodak Company shall make final judgement on design adequacy.

The payload shall provide instrumentation to indicate quantity of film on the take-up reel, focus system output, platen position, looper position, stereo mirror position, crabbing position, C/P temperatures, and slit plate position.

M

Eastman Kodak Company specification 502-146, defines the interfaces which exist between EK and GE.

3.1 Operating Requirements - The payload consists of the following major assemblies: camera, lens assembly, film handling system, crab and stereo servos, structure, focus control electronics assembly, film drive electronics, electrical distribution component, thermal control system and cables required to electrically connect the components.

G

3.1.1 Camera - The camera shall have control payload photography by maintaining the film in the image plane and controlling exposure time and recording data signals from external sources on the edge of the film. The camera shall move film past a slit opening in an aperture plate to produce latent images on the film either in stereo or continuous photographic modes of operation. A detailed description of the camera assembly and its operational requirements is contained in Performance Requirements for Camera Assembly, Eastman Kodak Company specification 808-188, and drawings 808-750 and 808-1075. The camera includes the following principal assemblies:

(a) Film Drive Mechanism Assembly

(b) Slit Aperture Plate Assembly

(c) Focus Detector Assembly

(d) Focus Control Assembly

(e) Programmable Slit Mechanism Assembly

3.1.1.1 Film Drive - The film drive roller is driven by a hysteresis synchronous motor through a gear train. The film velocity is determined by the frequency of the power input to the motor. This power comes from the film drive electronics assembly (see section 3.1.6) and provides drive power at 64 selectable frequencies having 1% increments and ranging from 290.92 to 544.53 cycles per second. The film drive shall move the film in synchronism with the ground image with sufficient accuracy to prevent image degradation, due to banding and smear, as specified in section 3.2.1.2 of this document. At the camera payload level the average film velocities shall be within 0.2% of the values given in the following Eastman Kodak drawings: 801-108 for all payloads through S/N 206; 801-108-1 for S/N 207 through S/N 210; and 801-108-2 for S/N 211 and on.

3.1.1.2 Slit Aperture Plate Positioning and Adjusting - For all payloads

(N)

through S/N 212, the slit aperture plate shall be capable of being manually positioned to any of three available photographic slits, giving nominal exposures of 1/100, 1/200, and 1/400 of a second, plus two additional slits provided for ground testing. The adjustment shall be accomplished externally when the camera is assembled into the complete package, and adjustment shall not require removal of pressure shell cover or removing threaded film from camera. The camera shall include a visual indicator to designate which slit is in position.

3.1.1.2.1 Programmable Slit Mechanism Assembly - Beginning with S/N 213, and for all subsequent payloads, the slit aperture plate shall be capable of being commanded through the OCV to any of four operational positions by means of digital signals supplied in parallel form. Each command word shall contain two binary bits. The command code shall be as follows:

Slit Position	Most Sig. Bit	Least Sig. Bit
1	0	0
2	0	1
3	1	0
4	1	1

Slit width shall progress from the narrowest at position 1 to the widest at position 4.

A third command bit available only through the use of the Camera Test Set, the Test Console, or the Portable Test Set shall be provided to drive the slit plate to a 5th slit position designated for ground test use only. A detailed description of the Slit Positioner is contained in Performance Requirements for Camera Assembly, Eastman Kodak Company specification 808-188.

3.1.1.2.1.1 Position Instrumentation - An electrical analog output (CPL 12) shall be provided to indicate the position of the slit plate. The output voltage shall vary linearly with the slit plate motion and shall conform to the voltage v.s. Slit Position chart in 3.4.3.

(N)

3.1.1.2.1.2 **Repositioning** Capability - Should any mechanical disturbance cause the slit plate to reach a position beyond the outer dead bands in the positioner encoder, the slit positioner shall relocate the slit plate correctly when power is applied. The slit positioner shall locate any one of the four operational slit positions as commanded to conform to the requirements of Film Format drawing 808-103.

3.1.1.2.1.3 Slit Transition Time - The slit positioner shall move the slit plate from one slit to an adjacent slit in less than 4 seconds upon receipt of a command.

3.1.1.3 Focus Control - The focus control assembly shall provide continuous, bi-directional focus adjustment for the camera. Nominal focus for the camera shall be as defined in paragraph 3.1.2.1. Focus direction conventions are as follows: the forward drive direction is away from the lens and in the plus Z axis direction, the reverse drive direction is toward the lens and in minus Z axis direction. The rate of adjustment shall be 0.00015 to 0.00036 inches per second. The maximum rate at 28 vdc shall be 0.00030 inches per second.

3.1.1.3.1 Instrumentation Output - Electrical stops shall be provided to limit platen motion to 0.010" ± 0.002" in either direction from nominal focus position. The activation of the electrical stop shall not prevent the platen from being operated in the opposite direction. Platen position instrumentation consists of two continuous rotation potentiometers. One degree of rotation of the coarse potentiometer is equivalent to five degrees of rotation of the fine potentiometer. The voltage versus platen position relationships of CPL 20 and CPL 27 shall be as defined in 3.4.3.

Film path temperature instrumentation (CPL 1) shall provide an output as indicated in 3.4.3 for S/N 201 through S/N 215. This instrumentation point was deleted effective on S/N 216.

3.1.1.4 Focus Detector Assembly - This assembly is part of the focus control component and is described in section 3.1.7.

3.1.1.5 Interframe Marker - On S/N 224 and after, the cmaera shall contain an interframe marking assembly and its associated electronics. The camera "on" command shall be used to initiate an output pulse from the electronics to illuminate the lamps. A detailed description of the Interframe Marker is contained in Performance Requirements for Camera Assembly, Eastman Kodak Company Specification 808-188.

3.1.2 Optical Assembly - The elements of the optical assembly include both mirrors and lenses. These elements are the stereo mirror, the meniscus lens, the primary mirror, the diagonal mirror and a group of lens elements known collectively as the field-flattener. The optical input to the camera is a visible image from the lens assembly. Illumination may be variable and actual exposure shall be determined by programming the appropriate slit in the aperture plate for the given illumination and film velocity. Two absolute temperature sensors shall be provided to monitor stereo mirror cell temperature at the points indicated in Eastman Kodak Company drawing 805-125 (on S/N 233, 234 and 235 use 805-165). The instrumentation output of one sensor, CPL 4, shall be as defined in 3.4.3. The instrumentation output of the other sensor, BBT 3, shall be as defined in Eastman Kodak Company drawing 801-111.

3.1.2.1 Requirements - The best photographic nominal focus of the optical system shall occur within ± 0.002 inch of the midpoint of the total focus range of the camera. This position shall be determined by dynamic photo tests using the 300-inch collimator. The target shall meet the requirements of Eastman Kodak Company specification 802-133 and shall have an apparent color temperature in the range of 5500° - 6000°K as seen from the exit port of the collimator.

3.1.3 Film Handling System - The film handling system components are the film supply cassette, camera (section 3.1.1), and forward storage assembly.

3.1.3.1 Film Supply Cassette - The supply cassette shall deliver film to and withdraw film from the camera. The film supply cassette shall also store and protect the film supply during all phases of operation. The supply cassette shall be capable of accepting film loaded on a flanged spool and contain provisions for maintaining constant tension on the film over the entire system film path. The housing shall act as a common enclosure for an integrated looper device capable of storing sufficient film both prior to and after camera exposure thus avioding the necessity of activating the supply or take-up spools during a burst of photography. A relief valve is located in housing skin to maintain internal pressure at required level. The supply cassette housing shall accommodate flexible light-tight gas-tight connection joints with other system components. A detailed description of the film supply cassette and its operational requirements are contained in Eastman Kodak Company specification 702-139 and drawing 711-185.

3.1.3.1.1 Film Supply - The supply cassette shall be capable of accepting 3,000 feet of Kodak High Definition Aerial Film (Estar Thin Base) Type 4404 film, 0.0030 ± 0.0003 inch thick, $9.460 \begin{smallmatrix} +0.010 \\ -0.005 \end{smallmatrix}$ inches wide.

3.1.3.1.2 Supply Reel Brake - The supply reel brake provides a means of maintaining film tension and providing a brake to the supply spool. For the purpose of test, its operation may be defined as follows: With the supply reel brake band tension manually released and the take-up motor de-engerized, the supply spool torque motor shall take up any deliberately induced film slack when CB 24 is applied.

3.1.3.1.3 Outputs - Voltages shall appear as information signals from temperature instrumentation (CPL 24) and looper film quantity (CPL 17). A loss of tension indication was added to CPL 17 effective on S/N 203 and on.

Two film quantity interval sensors, CPL 16 and CPL 28, were added effective on S/N 203 and on. The film quantity intervals of approximately 30 (CPL 16) and 300 (CPL 28) feet were effective on S/N 203 through S/N 218. On S/N 219 and on the intervals were changed to approximately 45 (CPL 16) and 282 (CPL 28) feet.

The temperature instrumentation was effective through S/N 215; it was removed on S/N 216. The CPL 24 instrumentation point was reused effective on S/N 219 to monitor servo command CB 10. The outputs shall be in accordance with 3.4.3.

3.1.3.2 Forward Record Storage (Film Take-up) - The forward record storage shall provide the drive mechanism for film take-up and shall store exposed record during all phases of operation. A detailed description of the forward record storage and its operational requirements are contained in Eastman Kodak Company specification 702-135 and drawing 712-479.

3.1.3.2.1 Forward Record Storage Capability - The take-up spool shall be capable of storing in the forward record storage 3000 feet of film 0.0030 ± 0.0003 inch thick, $9.460 \begin{smallmatrix} +0.010 \\ -0.005 \end{smallmatrix}$ inches wide.

3.1.3.2.2 Take-up Drive Torque - The take-up spool drive shall be capable of taking up film to meet the camera demands and maintaining film tension.

3.1.3.2.3 Film Transport - The forward record storage shall be capable of tracking film from the supply cassette at an angular deviation about the Z-axis of $\pm$ 9.0 milliradians, and angular deviation about the X-axis of $\pm$ 10.0 milliradians and a translational deviation along the Y-axis of $\pm$ 0.425 inch.

3.1.3.2.4 Outputs - Specific voltage levels shall appear as information signals from temperature instrumentation (CPL 2). The instrumentaion shall be in accordance with Figure III of 3.4.3.

Record take-up quantity (coarse) and take-up reel rotation shall appear as specific voltages on CPL 15 instrumentation as follows: CPL 15 shall indicate indicate take-up reel rotation at all times when the take-up motor is energized.

(K)

A reading of 0.5 volts or less shall indicate take-up reel is not rotating, A reading of 5.0 volts or more shall indicate take-up reel is rotating. When the take-up motor is not energized CPL 15 shall indicate record take-up quantity coarse as follows: For payloads S/N 205 through S/N 208, CPL 15 shall cycle every 300 ft., for S/N 209 through S/N 218, CPL 15 shall cycle every 254 ft. For S/N 219 and up, CPL 15 shall cycle every 1017 ft. The instrumentation and voltage levels shall be in accordance with 3.4.3.

Take-up motor current shall appear as specific voltages on CPL 29 instrumentation for payloads S/N 209 and up. The instrumentation shall be in accordance with Figure XXX of Section 3.4.3.

The record storage circuitry is shown on Eastman Kodak Company drawing 712-100.

3.1.3.3 Starting and Stopping Transients - Film velocity shall be within specification (section 3.1.1.1) 1.5 seconds after receipt of the camera "on" command (CB 7a). The total quantity of film advanced through the camera after receipt of the camera "off" command (CB 7b) shall be limited to 6 inches.

3.1.4 Servos

3.1.4.1 Elevation (Stereo) Servo - Stereo aiming of the camera is accomplished by rotating the stereo mirror about an axis parallel to the C/P pitch axis. A detailed description of the Elevation Servo with its operational requirements are contained in Eastman Kodak specification 602-100 and drawing 614-100.

3.1.4.1.1 Shaft Positioning - A two bit binary code input command shall cause the output shaft of the elevation servo assembly to travel to any one of three discrete positions. The mirror stereo positions shall be +7.5° and -7.5° with a nominal position of 0° for strip photograph. The 0° mirror position occurs when the mirror surface is at an angle of 45° to the optical axis. The mirror positions corresponding to the three input commands shall be as designated by the following table:

Input Command	Mirror Position
	Tol. ± 0.22° Root sum square (RSS)
00	+7.5°
01	0.0°
11	-7.5°

3.1.4.1.2 Repositioning and Capability - The servo shall return to a command position when power is applied if the mirror is positioned against any mechanical stops.

3.1.4.1.3 Overshooting and Hunting - There shall be no overshooting or hunting present in the operation of the elevation servo while it is operating in accordance with requirements of this specification.

3.1.4.1.4 Transition Time - The drive shall be capable of driving the load from either extreme position to the other extreme position within 4.0 seconds, when operating continuously. The time to move from a position to an adjacent position shall not exceed two seconds.

3.1.4.1.5 Instrumentation Output - The servo instrumentation output CPL 13 shall indicate servo position as defined in 3.4.3.

Effective S/N 221 and on, circuitry shall be contained in the servo to monitor the power control within the servo to assist in malfunction analysis. Output shall be as defined in section 3.4.3 (CPL 33). The meaning of each of the 5 output voltage levels shown in 3.4.3 is as follows:

level 1 - Power is on but there is no drive command output from the encoder. (Normal - Static)

level 2 - Encoder output drive command is present but overload relay contacts are open.

level 3 - Encoder output drive command is present and overload relay contacts are closed but there is no power on the motor.

level 4 - Encoder output drive command is present, overload contacts are closed, and one side of the motor is powered. (Normal - Dynamic)

Ⓡ

level 5 - Encoder is giving an output command to drive in both directions simultaneously.

3.1.4.2 Azimuth (Crabbing) Servo - Crab motion is a rotation of the mirror with respect to the payload about an axis parallel to the vehicle X axis. A detailed description of the azimuth servo and its operational requirements are contained in Eastman Kodak Company specification 602-101 and drawing 614-101. The crab servo is installed on the right or plus Y side of the OCV to obtain negative crab corrections for southbound orbits. The servo is installed on the left of minus Y side for positive crab or northbound orbits.

3.1.4.2.1 Shaft Positioning - A three bit binary code input shall cause the output shaft of the azimuth servo assembly, and hence the load, to travel to any one of eight discrete positions. The maximum mirror crab position shall be ± 3.5°. The resulting crab correction shall be positive or negative depending on the position in which the crabbing servo was installed on the structure. The output shaft mirror positions corresponding to the various input commands shall be as designated by the following table:

Input Command	Mirror Positions
	Tol. ± 0.15° Root Sum Square (RSS)
000	0.0° Note: 0° Mirror position is where a Y axis element of the mirror surface is perpendicular to the optical axis.
001	0.5°
010	1.0°
011	1.5°
100	2.0°
101	2.5°
110	3.0°
111	3.5°

At the final payload stage the azimuth servo need only be checked for its negative crab commands.

(R)

3.1.4.2.2 Repositioning Capability - The servo shall return to a command position when power is applied if the mirror is positioned against any mechanical stops.

3.1.4.2.3 Overshooting and Hunting - There shall be no overshooting or hunting present in the operation of the azimuth servo assembly while it is operating in accordance with the requirements of this specification.

3.1.4.2.4 Transition Time - The drive shall be capable of driving from either extreme position to the other extreme position within 8 seconds, when operating continuously. The time to move one position step shall not exceed one second.

3.1.4.2.5 Instrumentation Output - The servo instrumentation output CPL 14 shall indicate servo position as defined in 3.4.3. Effective on S/N 221 and on, circuitry shall be contained in the servo to monitor the power control within the servo to assit in malfunction analysis. Output shall be defined in section 3.4.3 (CPL 34). The meanihg of the 5 levels of output voltage are identical with that defined in section 3.1.4.1.5.

3.1.5 Structure - The camera payload structure positions and supports the major components of the payload such as lens, stereo mirror, camera, and film handling system. A detailed description of the structure and its requirements are found in Eastman Kodak Company specification 802-129. Absolute temperature sensors shall be provided to monitor structure temperature at the points indicated in Eastman Kodak Company drawing 805-125 (on S/N 233, 234, and 235 use 805-165). The instrumentation outputs of six of these sensors, CPL 4,6,7,8,9, and 11 shall be defined in 3.4.3. The instrumentation output of one sensor, BBT 4, shall be as defined in Eastman Kodak Company drawing 801-111.

3.1.6 Film Drive Electronics - The film drive electronics provides two phase power, at the specified voltage and frequency, to the film drive system, in response to binary coded commands. A detailed description of the film drive electronics and its operational requirements are contained in Eastman Kodak Company Specification 702-100 and drawing 709-200.

3.1.6.1 Command Code - The command code consists of 7 bits, 6 for speed control and one for power ON-OFF. The description of the camera film velocity and command codes is contained on Eastman Kodak Company drawing 801-108. The command code step number-frequency relationship shall be in accordance with Eastman Kodak Company specification 702-102.

3.1.6.2 Outputs

3.1.6.2.1 Motor Power - When power is commanded On by the power ON-OFF command bit, the assembly shall supply two phase power at the frequencies defined in 3.1.1.1.

3.1.6.2.2 Data Signals - When power is commanded ON by the power ON-OFF command bit, the assembly shall provide two sets of amplified data signals, in phase with their inputs. These data signals shall be exposed on the film by neon lamps located in the camera. Both sets of data marks shall coincide with the picture image produced at that instant as specified in Eastman Kodak Company drawing 808-103. The data signals shall be pulses of one millisecond duration and 5 volts amplitude supplied to the payload from an external source. On Space Chambers fabricated before S/N 207 the data signals shall have the following characteristics. The first data signal is a train of pulses having a repetition rate of 20 pulses per second. The second data signal is a train of pulses having a repetition rate of 10 pulses per second. Every 0.8 second a 22 bit time label shall be included in the data signals in compliance with Eastman Kodak Company drawing 502-146. The input data signals shall be recorded on the film as exposed marks. Two recording units are used to record the two sets of input data marks simultaneously on the film. On Space Chambers fabricated after S/N 206 the second data signal shall be a train of pulses having a repetition rate of 500 pulses per second except when signals are present on the first channel. The signal on the second channel shall be modified to contain the information on the first channel. The presence of a pulse on the first channel shall be represented by the absence of a pulse in the second channel.

3.1.6.3 Test Points - Two electrical outputs positive with respect to test point return shall indicate that presence or absence of the outputs.

3.1.6.3.1 Motor Power and Data Signal Test Point - The output voltage levels of the motor power circuitry test point (CPL 18) for normal power drive and for the failure of any portion of this output, that is, loss of one-half phase or more shall be as given in Figure XIX.

The data signal circuitry test point (CPL 19) of units manufactured prior to S/N 213 shall indicate the following: no power output, one amplifier operating, and both amplifiers operating. The voltage levels of CPL 19 for these conditions shall be as given in Figure XX.

For units S/N 213 thru S/N 237, CPL 19 shall indicate the following: operational power off, neither amplifier output present, amplifier B output present and no output for amplifier A, amplifier A output present and no output for amplifier B, and both amplifier outputs present. The voltage levels of CPL 19 for these conditions shall be as given in Figure XXa.

For units S/N 238 and on, the data signal test point shall be changed from CPL 19 to CPL 29. For these units, CPL 29 shall indicate the following: operational power off, neither amplifier output present, amplifier B output present and no output for amplifier A, amplifier A output present and no output for amplifier B, and both amplifier outputs present. The voltage levels of CPL 29 for these conditions shall be as given in Figure XXXa.

3.1.6.3.2 Oscillator Test Point - The test point shall monitor the oscillator output frequency only. The output shall have a d.c. level of 2.5 ± 0.5 volts and shall have a peak to peak amplitude not less than 1.0 volt. Under no circumstances shall the positive peak of the output voltage exceed a maximum of 5.0 volts or the negative peak be less than 0.25 volts positive with respect to d.c. return.

3.1.7 Focus Control Component - The focus control component shall consist of the focus control electronics assembly as defined by Eastman Kodak Company specification 502-154 and drawing 510-105 and the focus detector assembly as defined by Eastman Kodak Company specification 802-203 and drawing 808-750.

The focus control component determines the focus condition of the camera payload and develops analog output signals which describe that condition. Manual and automatic modes of focus operation are provided; the command requirements for mode selection and system operation shall be in accordance with Eastman Kodak Company drawing 801-106.

3.1.7.1 Optical Input - The optical input to the focus detector assembly

V

system shall be through the payload optical system. This optical input for the purpose of testing shall have the following characteristics:

3.1.7.1.1 Spectrum - The spectral content of the optical input shall conform to that of 6050°K black body radiator over the range of 0.5 to 0.7 microns.

3.1.7.1.2 Luminance Range - The maximum scene detail (highlight) luminance shall be defined as in the range of 6,620 - 8,410 foot-lamberts. The average minimum scene detail luminance shall be 2,000 - 2,060 foot-lamberts.

3.1.7.1.3 Scene Content - The optical input scene content shall be the random dot pattern generated by flashed sheet of film enlarged 15 times. The density range of the film shall be 0.70 ± 0.2 with D minimum of 0.1 ± 0.1.

3.1.7.1.4 Scene Content Motion - The image of the scene shall move across the reticle at a nominal velocity of 2.3433 inches per second for a lens-to-object distance of 132.5 nautical miles ± 5 per cent (FMT and S/N 201 through S/N 203) and of 2.9300 inches per second for a lens to object distance of 107.0 nautical miles ± 5 per cent (S/N 204 through S/N 216). For S/N 217 and on the image velocity shall be within the range of 2.6 to 4.6 inches per second for a lens-to-object distance range of 120 to 70 nautical miles respectively. Image motion shall be parallel to the X axis of the C/P.

3.1.7.2 Reticle - The focus detector assembly shall contain a rules reticle upon which the image is projected. For lens-to-object distance of 132.5 nautical miles (FMT and S/N 201 through S/N 203) a reticle having a 12.5 line per millimeter ruling shall be provided; for a lens-to-object distance of 107 nautical miles (S/N 204 and on) a reticle having a 10.0 line per millimeter ruling shall be provided.

3.1.7.3 Output Requirements - With the optical input defined by section 3.1.7.1, the output signals shall be as defined by sections 3.1.7.3.1 through 3.1.7.3.3. For S/N 223 and up when an inadequate input signal exists due to one or more of the conditions of section 3.1.7.1 not being fulfilled, CPL 22 and CPL 23 shall indicate 1.0 ± 0.25 volts d.c. and the automatic drive shall be inhibited.

3.1.7.3.1 Output Signals - For a given film plane displacement from the image plane, the nominal values of CPL 22 and CPL 23 and the focus output, CPL 21, are defined in Figures XXIII, XIV and XXII of 3.4.3. For any individual focus system, the value $e_B - e_A$ shall repeat within ± 0.15 VDC when the same optical focus conditions prevail. The value of e_T shall repeat within ± 0.500 VDC when the same optical focus condition prevail. Calibration curves for CPL's 21, 22 and 23 voltage versus film plane displacement from best focus shall be provided with each flight payload.

3.1.7.3.2 Manual Mode Operation - In the manual mode of operation the film plane position is changed by direct commands to the focus control assembly. In this mode the focus control component indicates the film plane displacement from best focus via CPL's 21, 22 and 23. When the film plane position is adjusted by use of direct commands such that CPL 21 reads a nominal 2.5 volts dc, the film plane shall be positioned to meet one of the following conditions with respect to the plane of best focus for the slant range of the input scene:

Condition 1 - The film plane shall be within ± 0.0005 inch of the plane of best focus for the slant range of the input scene.

Condition 2 - The film plane shall be positioned to provide a GM resolution greater than the minimum specified resolution.

3.1.7.3.3 Automatic Mode Operation - When placed in the automatic focus mode, the focus control component shall reposition the camera film plane to meet condition 1 or 2 as specified in paragraph 3.1.7.3.2.

3.1.8 Temperature Control - The temperature of the camera payload shall be controlled by thirteen independent heater assemblies. Each heater assembly consists of resistance heater elements which are connected to the environmental power supply

(R)

by heater controllers which are actuated by a temperature sensitive element. The approximate locations of heater assemblies and their power requirements are described in Eastman Kodak Company drawing 805-125 (on S/N 233, 234 and 235 use 805-165). The operating limits for these heater systems are as follows:

Heaters	Minimum Heater "ON" Temperature	Maximum Heater "OFF" Temperature	Effectivity
All	67.4°F	72.8°F	Up to S/N 206
All	69.5°F	71.5°F	S/N 207 and up

3.1.9 Electrical Distribution Component - The electrical distribution component consists of the following assemblies: junction box, test box and distribution box. A detailed description of the electrical distribution component and its operational requirements are contained in Eastman Kodak Company specification 602-128 and drawings 617-114, 617-151 (on S/N 233, 234, and 235 use 617-255) and 617-106. The distribution component provides a common enterance for electrical inputs and a common exit for electrical outputs, distributes, and fuses power, furnishes plus and minus 22± 0.1 volts d.c. , encloses instrumentation circuitry and provides a camera payload test plug and a verification test plug.

3.1.9.1 Junction Box Assembly - The junction box assembly consists of an enclosure housing a number of supply busses. Electrical continuity and isolation shall be in conformance with Eastman Kodak Company drawing 617-101.

3.1.9.2 Test Box Assembly - The test box assembly provides electrical continuity between test plug pins and camera payload inputs and outputs and on units fabricated after S/N 206 shall contain a diplexer circuit for the data signals and fuses in the data signal amplifier return lines from the motor speed drive. Electrical continuity, isolation and circuitry shall be in conformance with Eastman Kodak Company drawing 617-109 (on S/N 233, 234 and 235 use 617-259). The diplexer circuit shall alter the 500 pps signal B in accordance with the information present on data signal A. The presence of a pulse (mark) on data signal A shall result in the absence of a pulse (space) in the output signal B.

For S/N 219 and on the test box shall contain circuitry to monitor the status of the elevation and azimuth servo command relays (located external to the C/P). The output shall be as indicated in the curves of section 3.4.3. Instrumentation points CPL 30, 31, 24, 32, and 1 shall indicate the status of the CB 8, 9, 10, 11 and 12 command relays respectively. The meaning of the 4 levels shown in the output curves is as follows:

level 1 - Operational power is on but none of the relay contacts have voltage.

level 2 - The common contact of the relay has voltage but it is not transferred to either of the other two contacts.

level 3 - Indication of a binary "0".

level 4 - Indication of a binary "1".

For S/N 215R, 216R, and 221 and on the test box shall contain circuitry to monitor the voltage between the operational supply bus and the instrumentation return. The output shall be as shown in 3.4.3 (CPL 35).

3.1.9.3 Distribution Box Assembly - The distribution box assembly fuses and distributes power, controls record motion, provides regulated plus and minus 22 volts d.c., instruments take-up motor current and houses circuitry for the measurement of differential and absolute temperatures.

3.1.9.3.1 Record Transport Control Circuit - The circuit shall perform the following timing function: upon removal of power from the take-up motor, power shall be applied to the supply spool brake with a delay of less than 10 milliseconds. The power shall remain on the brake for $1 {}^{+0.75}_{-0.50}$ seconds, after which it shall be removed. Take-up motor actuations of less than one second duration need not be followed by brake actuations.

(R)

3.1.9.3.2 Differential Temperature Amplifiers

3.1.9.3.2.1 Lens Barrel Unit - The amplifier unit shall amplify, the voltage signal derived from the summing point of two thermistor probes located external to the amplifier. The probes are described by Eastman Kodak Company drawing 516-100 for FMT and by Eastman Kodak Company drawing 516-218 for S/N 201 and on. The voltage signal, and hence the thermistor temperature difference, shall be converted to a linear 0.5 to 5.0 vdc analog output.

The temperature range to be measured is ± 10°F with respect to the probe located on the aft end of the lens barrel. The lens barrel differential temperature (CPL 5) instrumentation output is defined in 3.4.3.

For S/N 213 and on the thermistor probe at the forward end of the lens barrel shall be replaced with a precision resistor. CPL 5 for these units shall indicate the absolute temperature of the aft end of the lens barrel as indicated in Figure VI (a) of section 3.4.3. The range of temperature measured shall be 62.2° to 82.2°F. For S/N 225 and on the measured range of temperature shall be 60 to 80 degrees F. The circuitry shall be contained in the instrumentation assembly. The lens barrel amplifier and the precision resistor shall be deleted.

3.1.9.3.2.2 Stereo Mirror Unit - The amplifier unit shall amplify the voltage signal derived from the summing point of two thermistor probes located external to the amplifier. The probes for FMT are described by Eastman Kodak Company drawing 516-223 and for S/N 201 and on, by Eastman Kodak Company drawing 516-224. The voltage signal, and hence the thermistor temperature difference, shall be converted to a linear 0.5 to 5.0 vdc analog output.

The temperature range to be measured is plus 3°F and minus 1°F with respect to the rear of the stereo mirror. The stereo mirror differential temperature instrumentation (CPL 3) is defined in 3.4.3.

3.1.9.3.3 Motor Current Instrumentation Circuit - **For units S/N 206 thru S/N 237, the circuit shall provide a linear instrumentation voltage output**

(R)

corresponding to the take-up motor current. The instrumentation voltage (CPL 29) versus take-up motor current shall be as given in Figure XXX.

For units S/N 238 and on, the instrumentation point shall be changed from CPL 29 to CPL 19. For these units, the instrumentation voltage (CPL 19) versus take-up motor and torque motor current shall be as given in Figure XX(b).

3.1.9.3.4 Instrumentation Assembly - Beginning on FMT, the instrumentation assembly shall contain resistors used in CPL 1, 4, 6, 7, 8, 9, 10, and 11 instrumentation circuits. Effective on S/N 216, the CPL 1 circuit shall be deleted from the instrumentation assembly. Effective on S/N 225, the instrumentation assembly shall contain modified circuitry for CPL 4, 5, 6, 7, 8, 9, and 10. This change provides increased resolution in these instrumentation points.

3.1.10 Cables - The cabling assemblies shall provide the appropriate connection to each electrical package and functional unit. The electrical requirements shall be in accordance with Eastman Kodak Company specification 502-115.

3.1.11 Port Open Tell-tale - The Port Open Tell-tale Module is located in the Stero Bay area. It is the purpose of this module to provide an instrumentation signal which indicates the state (open or closed) of the Port Door and also provide information relative to previous door operations.

The input signal for this unit is derived from a solar cell mounted on its housing. Whenever this cell is illuminated with 18 or more foot candles of light approximately the spectrum of reflected sunlight from 0.4 to 1.1 microns wavelengths, the output will assume a "door open" level. If the light falling on the cell is below 8 foot candles, the output will assume any one of four "door closed" levels. Each time the door is cycled, the "door closed" level advances one step. This scheme provides historical data as well as present status determination.

The instrumentation output CPL 25 shall be as defined in 3.4.3 and Eastman Kodak Company drawing 813-445.

V

3.1.12 Temperature Instrumentation Amplifier Assembly - The two temperature instrumentation amplifier assemblies shall consist of the following assemblies: a coarse differential temperature amplifier, described by Eastman Kodak Company drawing 617-213; a fine differential temperature amplifier, described by Eastman Kodak Company drawing 516-249; and, an ambient temperature amplifier, described by Eastman Kodak Company drawing 516-255. The two temperature instrumentation amplifier assemblies are enclosed in two individual housings, described by Eastman Kodak Company drawing 805-164, which are located on the primary structural ring. The temperature instrumentation amplifier assembly provides the necessary amplifiers to convert the ambient temperature and differential temperatures at selected points on the stereo mirror to voltage levels. These points are described by Eastman Kodak Company drawing 805-165. **This temperature instrumentation is effective on S/N 233, S/N 234 and S/N 235.**

(T)

3.1.12.1 Coarse Differential Temperature Amplifier - The amplifier unit shall amplify the voltage signal derived from the summing point of two thermistor probes located external to the amplifier. The probes are described by Eastman Kodak Company drawing 516-224. The voltage signal, therefore the thermistor temperature difference, shall be converted to a linear 0.5 vdc analog output to 5.0 vdc.

The temperature range to be measured is plus 3°F and minus 1°F with respect to the rear of the stereo mirror. The stereo mirror coarse differential temperature instrumentation (CPL-36, CPL-39) and CPL-41 are defined in 3.4.3. CPL-41 has the same temperature range as CPL-36 and CPL-39 but the temperature difference is

(S)

measured across the rear surface of the stereo mirror.

3.1.12.2 Fine Differential Temperature Amplifier - The amplifier unit shall amplify the voltage signal derived from the summing point of two thermistor probes located external to the amplifier. The probes are described by Eastman Kodak Company drawing 516-224. The voltage signal, therefore the thermistor temperature difference, shall be converted to a linear 0.5 to 5.0 vdc analog output.

The temperature range to be measured is plus 3/4°F to minus 1/4°F with respect to the back of the aluminized surface of the stereo mirror. The stereo mirror fine differential temperature instrumentation (CPL-37, CPL-38 and CPL-40) is defined in 3.4.3.

3.1.12.3 Ambient Temperature Amplifier - The amplifier unit shall amplify the voltage signal derived from the junction of a thermistor probe, resistor-potential divider. The thermistor probe is located external to the amplifier and is described by Eastman Kodak Company drawing 516-254. The voltage signal, therefore the ambient temperature, shall be converted to a linear 0.5 to 5.0 vdc analog output. The percent linearity shall be 2 percent.

The temperature range to be measured is from 60°F to 80°F. The stereo mirror ambient temperature instrumentation (CPL-42, CPL-43 and CPL-44) is defined in 3.4.3.

3.2 <u>Photographic Requirement</u>

3.2.1 Film - Measurable characteristics are:

3.2.1.1 Base and/or Fog Density - Shall be less than 0.2.

3.2.1.2 Gamma - Shall be 2.1 ± 0.2 (The gamma shall be measured on the straight line portion of the H and D curve).

(S)

3.2.1.3 Resolution - Best Photographic Focus shall be determined in pre-vibration testing by conducting a minimum of three focus tests at 0° and ± 0.5°. The geometric mean value of resolution shall be determined from the horizontal and vertical resolution values. The focus position resulting in the highest geometric mean common for all focus curves considered to be representative shall be defined as best photographic focus. The average geometric mean resolution shall be in accordance with the resolution requirements listed in the table below:

Payload S/N	Minimum Resolution in Lines per mm
201-216	104
217	110
218	115
219	120
220	125
221 and on	130

The average geometric mean resolution value to be compared with requirements in the above table shall be computed by averaging the results of tests run at the pre-determined Best Photographic Focus position under the following conditions.

Input Voltage	Field Angle
28.0	0°
28.0	+0.5°
28.0	-0.5°
27.0	0°
32.5	0°

Resolution shall be tested utilizing a 2:1 low contrast target as defined in 833-966. Conformance to this requirement shall be demonstrated at the following camera film velocities 3.325 inches/second for all payloads through S/N 206, 3.336 inches/second for S/N 207 through S/N 210 and 3.348 inches/second for S/N 211 and on.

3.2.1.4 Exposure - The exposure shall be adjusted by selection of a slit width

S

under the following conditions:

(a) Minimum scene brightness of 890 foot-lamberts.

(b) Film type 4404.

(c) Processing speed point of $\bar{1}.13 \pm .05$ log E

(d) Processing gamma 2.1 ± 0.2

(e) Slit width 0.0083 inches

All elements of a scene having a brightness of 890 foot-lamberts or greater shall produce densities equal to or greater than the density at the speed point.

3.2.1.5 Data Marks - Both sets of data marks shall coincide within 0.005 inch with the picture image produced at that instant. The data marks shall be discernible by eye on processed film and shall have an exposed density of no less than 0.5 at the fastest film velocity and Δ density range between mark and space of not less than 0.3 at the slowest film velocity, when film is processed to meet the requirements of Eastman Kodak Company specification 702-184, curve 2 in Figure 1.

3.2.1.6 Orientation of Image - The location of the image shall conform with the requirements of Eastman Kodak Company drawing 808-103. The slit aperture plate shall be so oriented that the centerline of the slit is perpendicular to the edge of the film within ± 0° 15'.

3.2.1.7 Film Abrasion - Film abrasion and degradation of film by the film handling system shall be limited by the requirements of 3.0.

3.2.1.8 Film Damage - The film shall suffer no damage during payload operation which would degrade the photographic quality of the image to a level lower than that specified in Eastman Kodak Company specification 702-145, section 3.7.4.

3.2.1.9 Film Velocity Variation - Oscillatory film velocity variations shall not exceed the 0.60% (RMS) and 1.2% two sigma limit. This requirement shall not apply during the start transient or during take-up motor operation.

3.2.1.10 Interframe Marks - The size, density and location of the interframe marks shall be in accordance with Film Format B, Eastman Kodak Company drawing 808-103. Interframe marks will appear on S/N 224 and after.

3.2.2 Slit Plate Streaking - On film having a background density of 1.0 approximate the total width of streaks found in processed film caused by imperfections in each operational slit in the slit aperture plate shall not exceed 0.5 per cent of the slit length, and no more than five streaks shall occur in any 0.100" width of film. No streak shall have a Δ D related to background density which exceeds that given by the equation Δ D = 0.51 -24.5 W where W is the width of the streak in inches. Only streaks having a Δ D greater than ± 0.03 shall be recorded as defects.

3.3 Mechanical Requirements

3.3.1 Size - The payload design configuration shall be capable of being totally enclosed within the space allocation as defined by Eastman Kodak Company mechanical interface drawing 801-106. The actual size and configuration of the payload shall be in conformance with dimensional requirements of Eastman Kodak Company drawing 805-101. The maximum diameter is 54 inches; length is 189.5 inches; (front of forward record storage to aft mounting plane).

3.3.2 Weight and Center of Gravity

3.3.2.1 Weight - The payload component assembly weight shall be as follows:

(S)

	FM-11 thru FM-16	F-17 thru F-18	F-19 thru F-25	F-26 and on
C/P Components in Satellite Vehicle (less film, but including supply spool)	1032 lbs. ± 2%	1023 lbs. ± 2%	1079.5 lbs. ± 2%	1109.5 lbs. ± 2%
C/P Components in Re-entry Vehicle (less film)	25.5 lbs. ± 2%	25.5 lbs. ± 2%	25.5 lbs. ± 2%	25.5 lbs. ± 2%
Film (3000 ft.)	52 lbs. ± 2%	52 lbs. ± 2%	52 lbs. ± 2%	52 lbs. ± 2%
(S) Total	1109.5 lbs. ± 2%	1100.5 lbs. ± 2%	1157 lbs. ± 2%	1187 lbs. ± 2%

3.3.2.2 Center of Gravity - The center of gravity of the payload, less recovery components, in the launch condition shall be located as follows with reference to station 0, 0, 0,:

	F-11 thru F-16	F-17 thru F-18	F-19 and on
$\bar{X}$	Forward of sta 140.0	Forward of sta 140.0	Forward of sta 140.0
$\bar{Y}$	0 ± 0.5 inches	0 ± 0.5 inches	0 ± 0.5 inches
$\bar{Z}$	0 ± 0.5 inches	0 ± 0.5 inches	0 ± 0.5 inches

The center of gravity of the forward record storage assembly "D", less film, located within the re-entry vehicle, shall be with reference to station 0, 0, 0, as follows:

		F-11 thru F-16	F-17 thru F-18	FM-11 and on
(S)	$\bar{X}$	28.95 ± 0.25 inches	28.95 ± 0.25 inches	28.87 ± 0.25 inches
(S)	$\bar{Y}$	-0.25 ± 0.15 inches	-0.25 ± 0.15 inches	-0.26 ± 0.1 inches
(S)	$\bar{Z}$	2.10 ± 0.15 inches	2.10 ± 0.15 inches	2.14 ± 0.1 inches

3.3.3 Materials and Finishes - Materials and finishes shall be in accordance with individual parts specifications and as expressed on the applicable parts drawings.

3.3.4 Identification - All components assemblies shall bear identification in serial form. Material and letter size shall be in conformance with individual component specifications.

3.3.5 Reference Axes - The reference axes of the payload shall be in conformance with Figure I.

3.3.6 Pressure and Leak Rate - The leak rate of the record transport enclosure shall be the maximum permissible consistent with retaining the required performance characteristics of parts internal to the enclosure.

Moisture release from the record during take-up cycles shall raise the internal pressure of the combined EK and GE record transport enclosure to a minimum of 0.01 psia under the system leak rate condition. The above conditions shall be demonstrated in the EK portion of the record transport enclosure by a pressure-time decay as follows:

With an air temperature of 69.5°F ± 1.0°F and the record enclosure charged to a pressure of 0.25 pounds per square inch over ambient atmospheric pressure, the pressure shall not decay to 0.025 pound per square inch over ambient pressure in less than 20 seconds.

3.3.7 Proof Pressure - The record transport with relief valves disabled shall withstand an internal pressure of 4.0 pounds per square inch over ambient atmospheric pressure for 10 minutes without causing the allowable pressure-time decay condition of 3.3.6 to be exceeded.

(R)

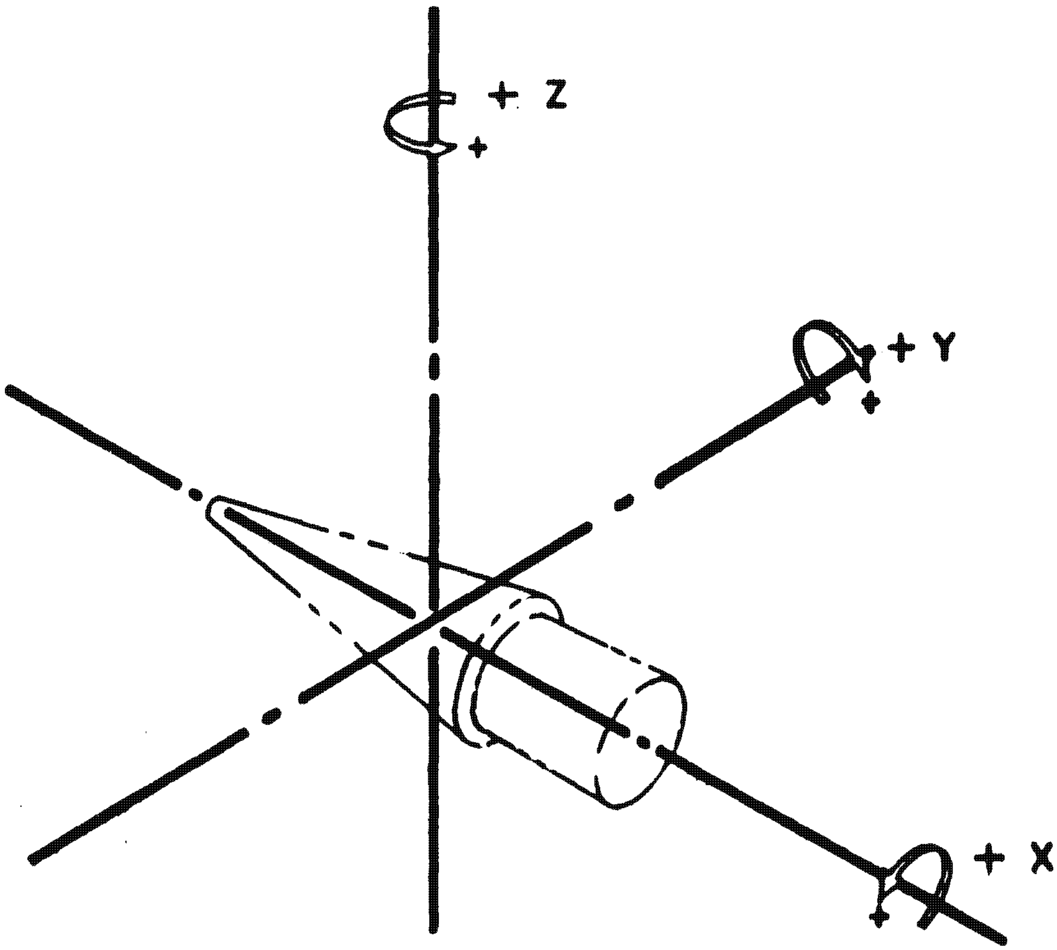


FIGURE I Reference Axes

(G)

TAB[illegible]

Maximum Component Currents
(Milliamperes)

Component Function	C/P Power on Only	Stero CB 8,9	Crab CB 10,11,12	Camera CB 7	Take-up	Torque Motor	Manual Focus Control CB 15,16	Automatic Focus Control CB 15,16	Programmable Slit CB 20,21
Stereo Servo	1.41	1180	----	----	----	----	----	----	----
Crab Servo	28.0	----	1000	----	----	----	----	----	----
Supply Cassette	0	----	----	----	----	500	----	----	----
Camera	32.0	----	----	----	----	----	87.5	175	----
Motor Speed Drive	1.25	----	----	1500	----	----	----	----	----
Forward Record Storage	0	----	----	----	850	----	----	----	----
Focus Control	0	----	----	----	----	----	49	49	----
Distribution Box	380	----	----	----	50	13.7	180	180	----
Test Box	8.0	----	----	----	----	----	----	----	----
Programmable Slit	29.0	----	----	----	----	----	----	----	277

NOTE:
1. With camera payload power on and no components operating, the current shall not exceed 480 milliamperes, except on S/N 233,234 and 235 the current shall not exceed 600 milliamperes. The maximum current for each function is to be added to this value.
2. Currents given are those drawn from the operational supply only and do not include currents in command lines.
3. Test Box current applies to space chambers fabricated after S/N 206.

T

31b

V

TABLE II

Maximum Surge Currents

	Function	Amplitude (Amperes)	Duration (Seconds)
	Operating Power turn-on	14.0	0.20
	Focus Control Power (CB 15)	0.8	0.10
	Focus Adjust Motor turn-on	0.6	0.05
J	Supply brake turn-on	0.75	0.05
	Motor speed drive turn-on	1.4	0.50
K	Stereo servo turn-on	3.0	0.40
K	Crab servo turn-on	3.0	0.40
	Take-up motor turn-on	1.8	0.20
M	Programmable Slit	1.5	0.05

NOTE:

1. Amplitude specified is peak current.
2. Duration specified is time to decay from peak to 37% of the difference between peak and steady state currents.

G

S 3.c

3.4 Electrical Requirements

3.4.1 Payload Power - Three separate power supplies are required for camera payload operation, environmental control, and instrumentation.

3.4.1.1 Operational Supply - The unregulated 27.0 - 32.5 volts dc operational supply is the primary source for the payload. This voltage is inverted, rectified, and regulated to provide plus and minus 22.0 ± 0.1 volts dc for various instrumentation circuits and the focus control electronics. The normal load current is determined by the components operating at any given instant. Maximum steady state component load currents are included in Table I. Under normal operating conditions the surge current shall not exceed 15 amperes and this transient shall decay to normal load current in less than 1/2 second. Maximum surge current amplitudes and durations for specific payload functions are included in Table II.

3.4.1.2 Environmental Supply - Environmental power of 26.0 - 33.4 volts unregulated power is used for all environmental heaters within the payload. The power consumption and operating schedule of the heater assemblies is dependent upon the orbital parameters and the OCV temperature control equipment's operation. The maximum current drains shall be less than 3.7 amperes.

3.4.1.3 Instrumentation Supply - Instrumentation power of regulated 5 ± 0.1 volts dc, is provided for some instrumentation within the camera payload. The current drain shall be no more than 10 milliamperes.

3.4.2 Commands - Camera payload commands are specified by the functions initiated by the commands. Commands are needed for the following functions:

Image Motion Compensation
Camera ON-OFF
Crab Position
Stereo Mirror Position
Supply-Spool Torque Motor
Focus Mode Selection
Focus Adjustment
Focus Control Power
Slit Plate Position

(N)

Command functions are described in the individual component requirement section and in Eastman Kodak Company drawing 801-106.

3.4.3 Instrumentation - Instrumentation provides information required for normal operation of the payload and for failure analysis. Included in this instrumentation shall be temperature transducers, stereo and crabbing position, monitoring devices, film handling monitors, focus information, platen position monitoring, and slit plate position monitoring.

The instrumentation points shall be as defined and described by Eastman Kodak Company drawing 5[illegible]1-114, specification 502-146 and in Figures II through XLIV. The output tolerances of Figures II through XLIV apply to C/P hardware only and do not include errors due to measurement equipment. They do include the effect of loading by the associate contractor's equipment per Eastman Kodak Company drawing 501-114.

3.4.4 Test Point Outputs - Test connectors J695 and J696 contain the input power and command verification and the instrumentation outputs. Since the test points are direct connections to command (3.4.2), instrumentation (3.4.3), and payload power (3.4.1), the paragraphs indicated define the test point output parameters.

3.4.4.1 Test Point and Umbilical Payload Information - Orbital payload information shall be made available during ground test and countdown by means of a test plug and umbilical circuits. The outputs shall be as defined by Eastman Kodak Company drawing 801-111 and section 3.4.4, and Eastman Kodak Company drawing 801-112 and Table III. Interface pin assignments for the test points and umbilical points shall be in accordance with GE-EK interface drawing 75R012/501-113.

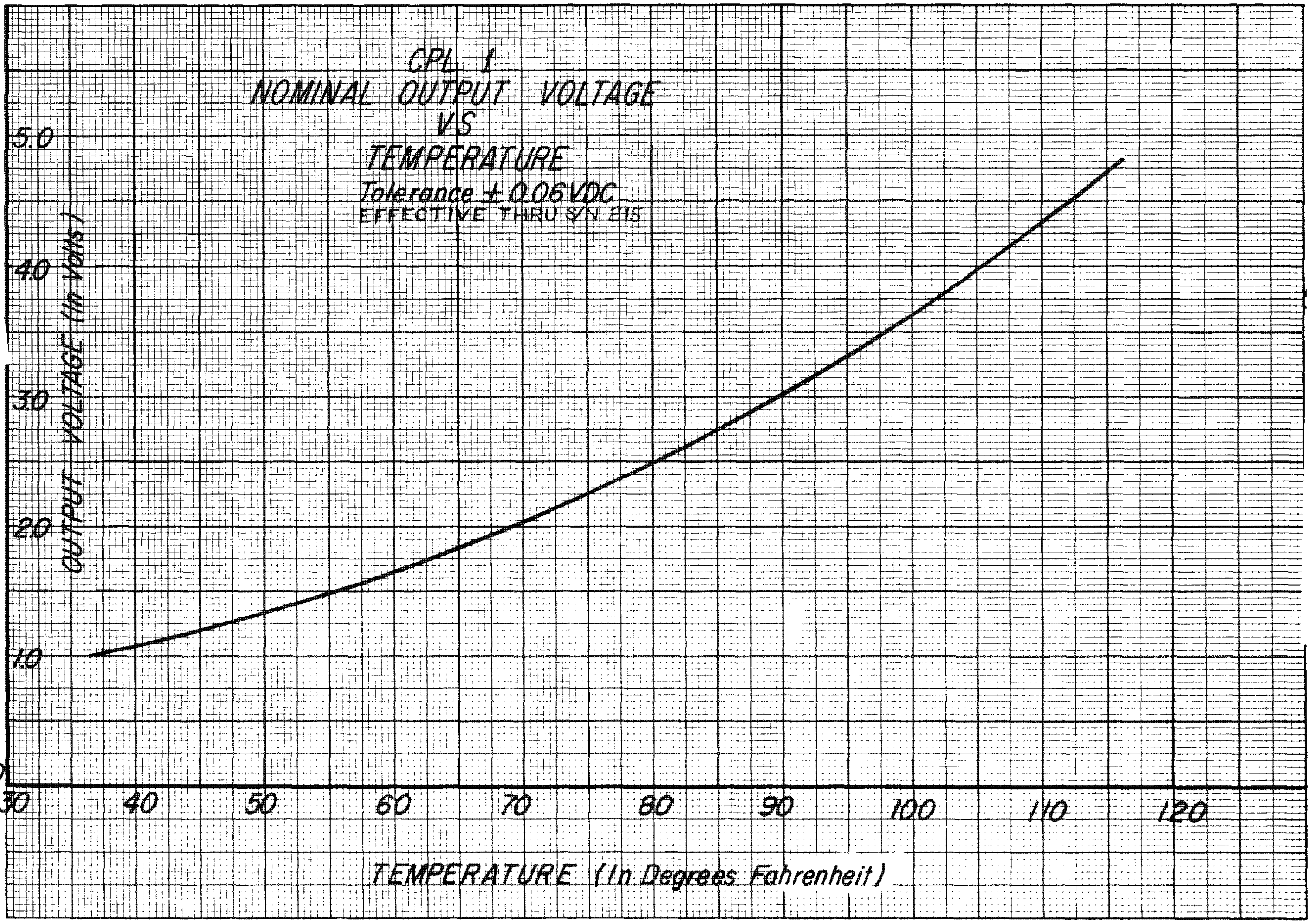


FIGURE II

33a

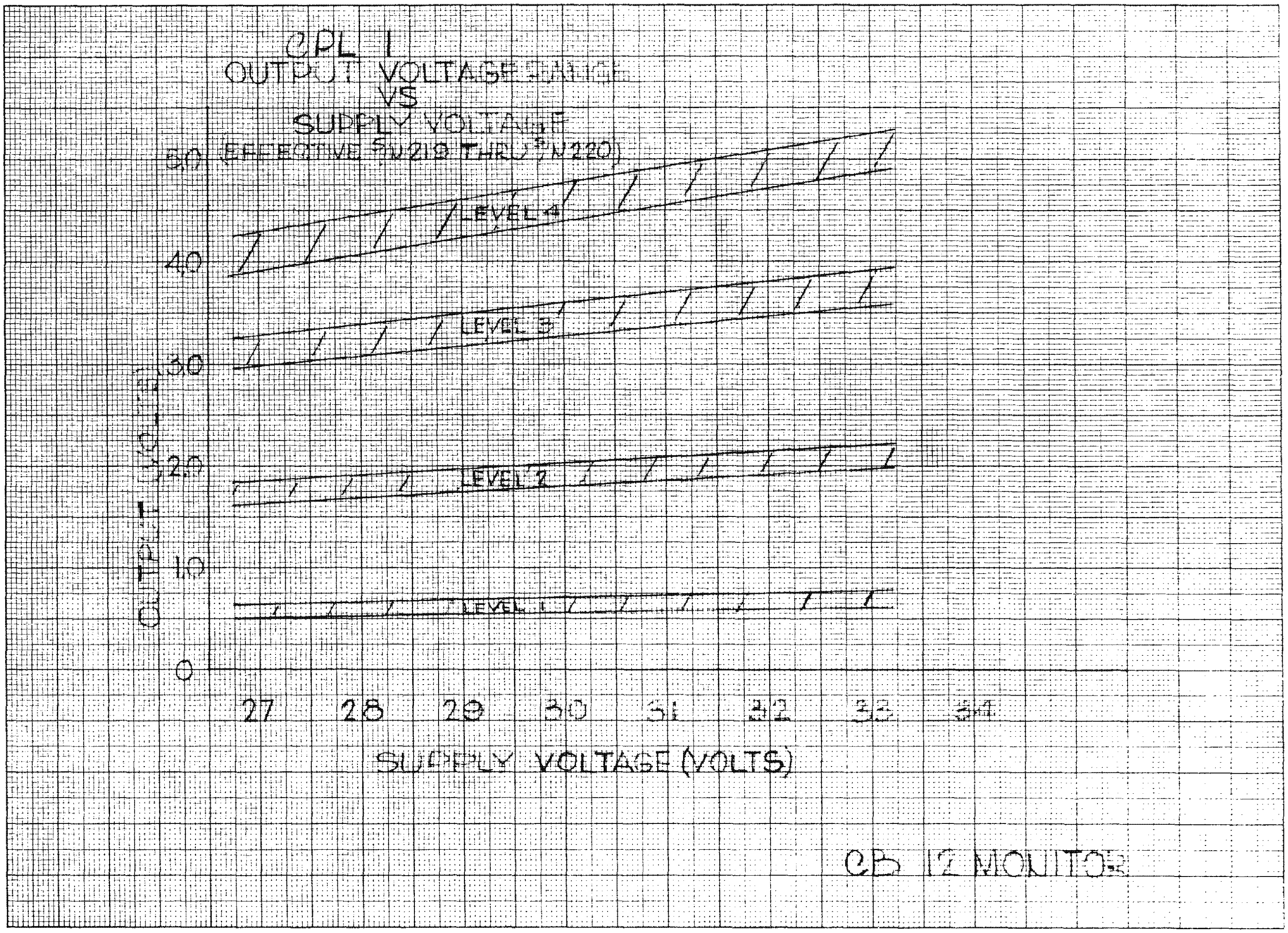

CPL 1
OUTPUT VOLTAGE
VS
SUPPLY VOLTAGE
(EFFECTIVE S/N 219 THRU S/N 220)
LEVEL 4
LEVEL 3
LEVEL 2
LEVEL 1
OUTPUT (VOLTS)
0
10
20
30
40
50
27
28
29
30
31
32
33
34
SUPPLY VOLTAGE (VOLTS)
CB 12 MONITOR

FIGURE II a

C05098937

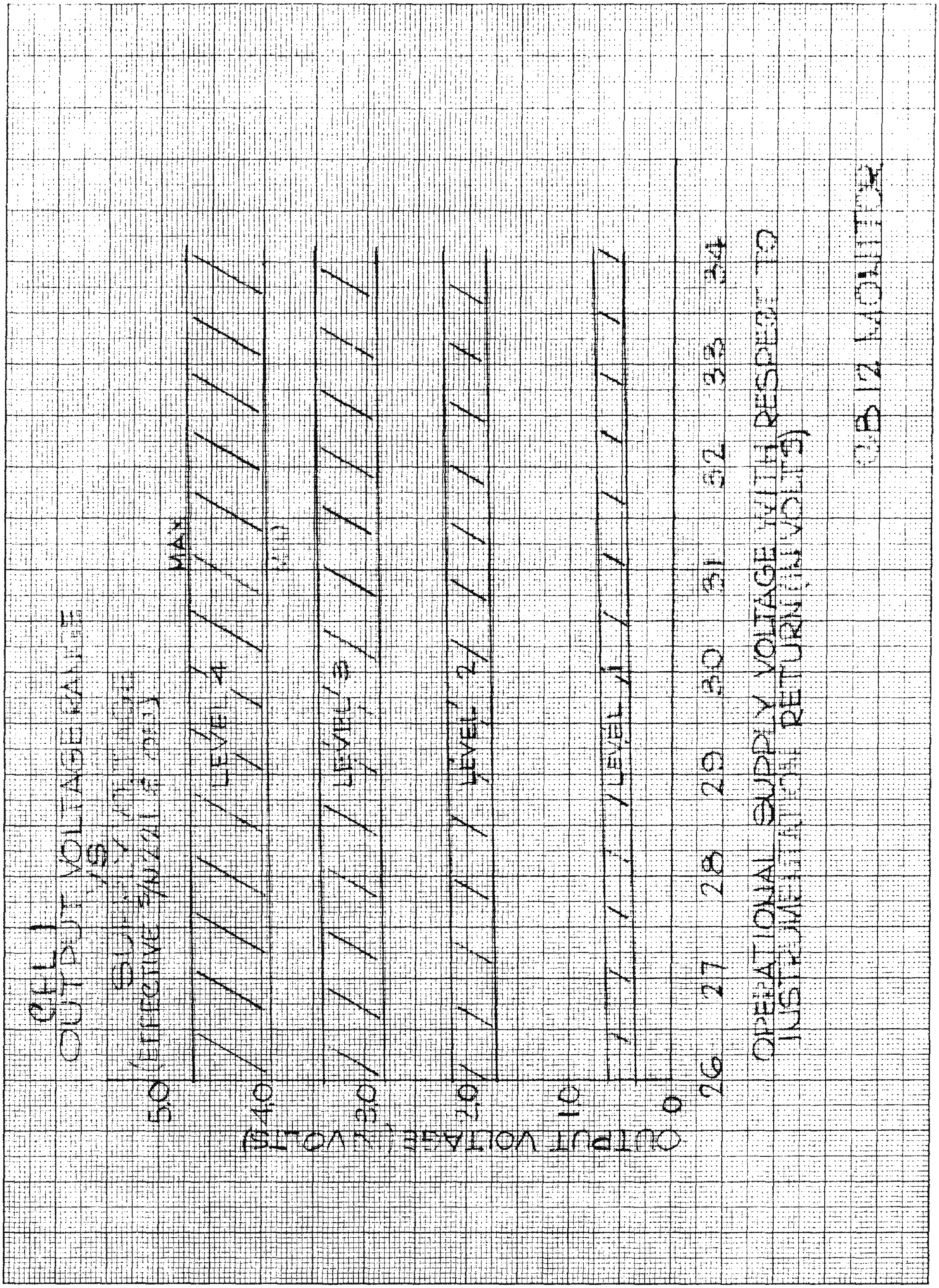


FIGURE II b

R

S 33

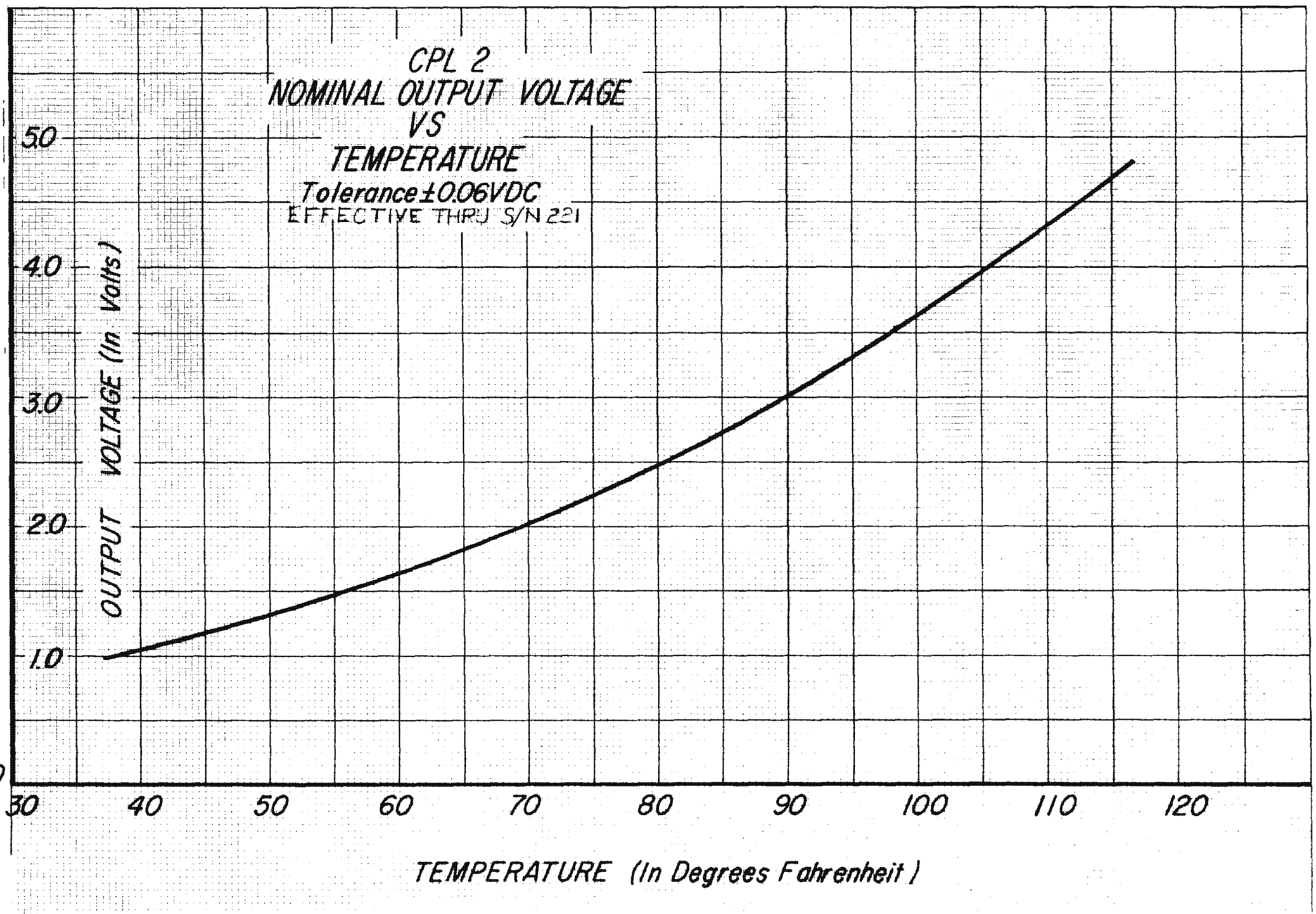


FIGURE III

002-153

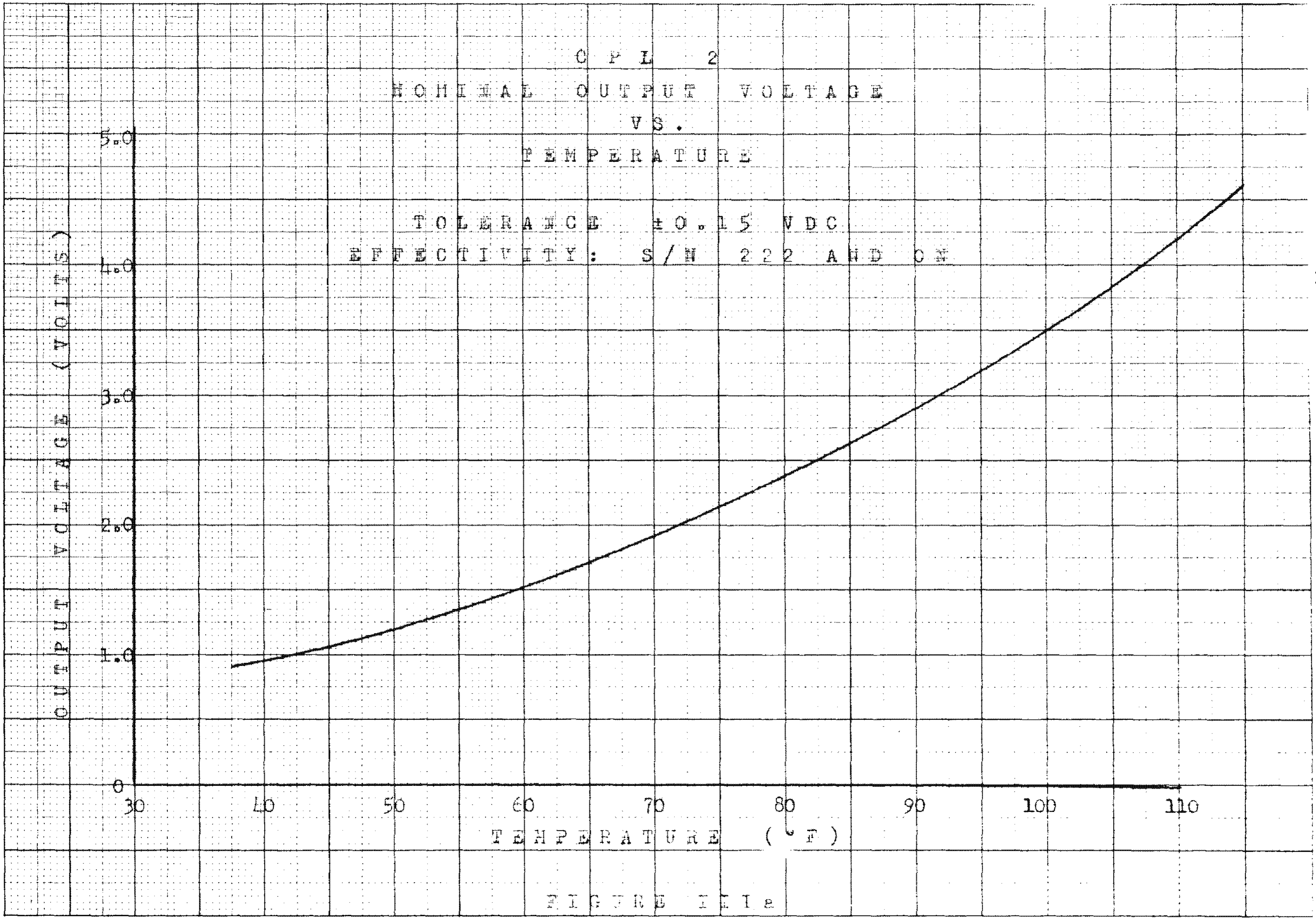
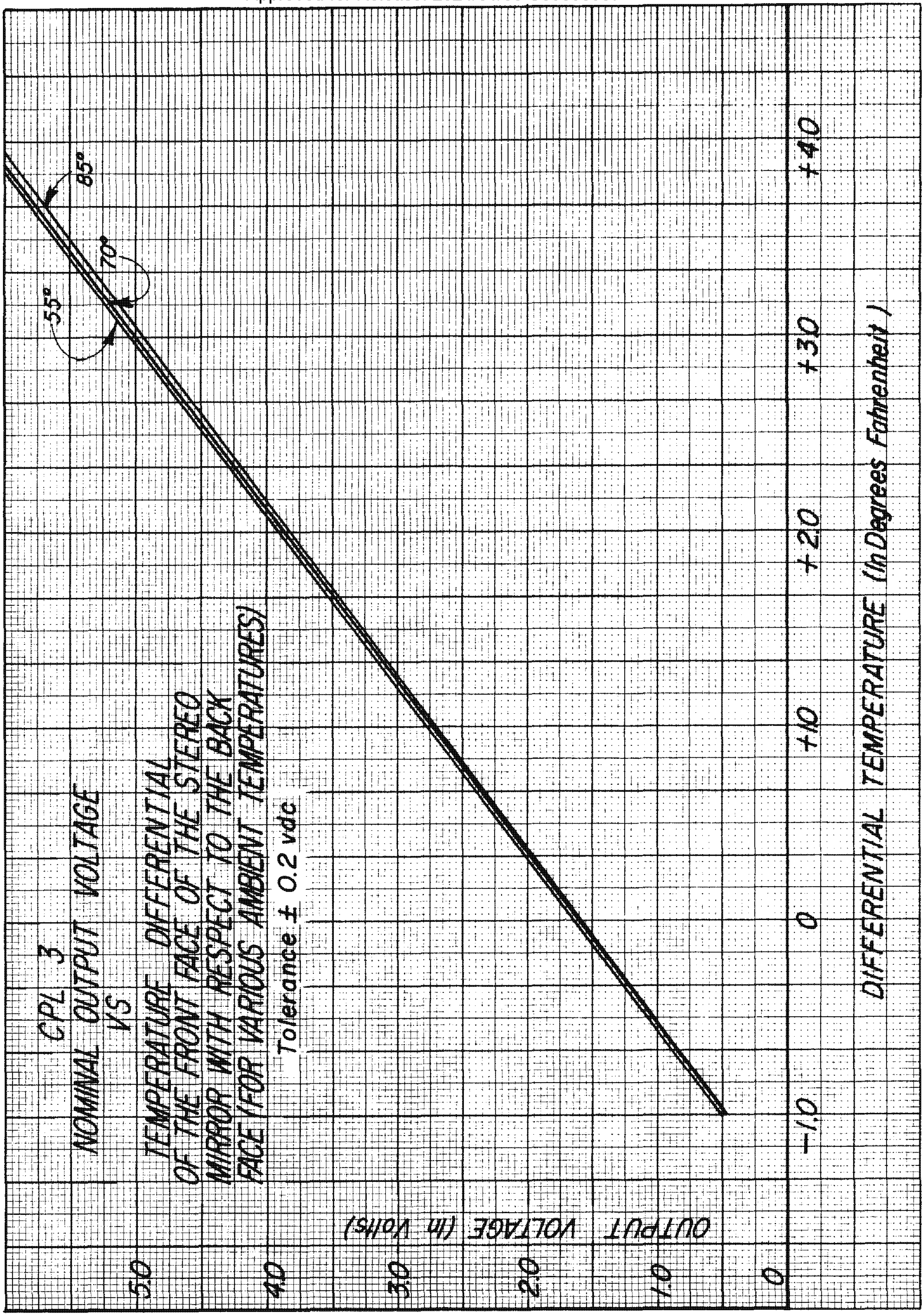


FIGURE III a

Approved for Release: 2024/01/30 C05098937



G

FIGURE IV

R N S 338

C05098937

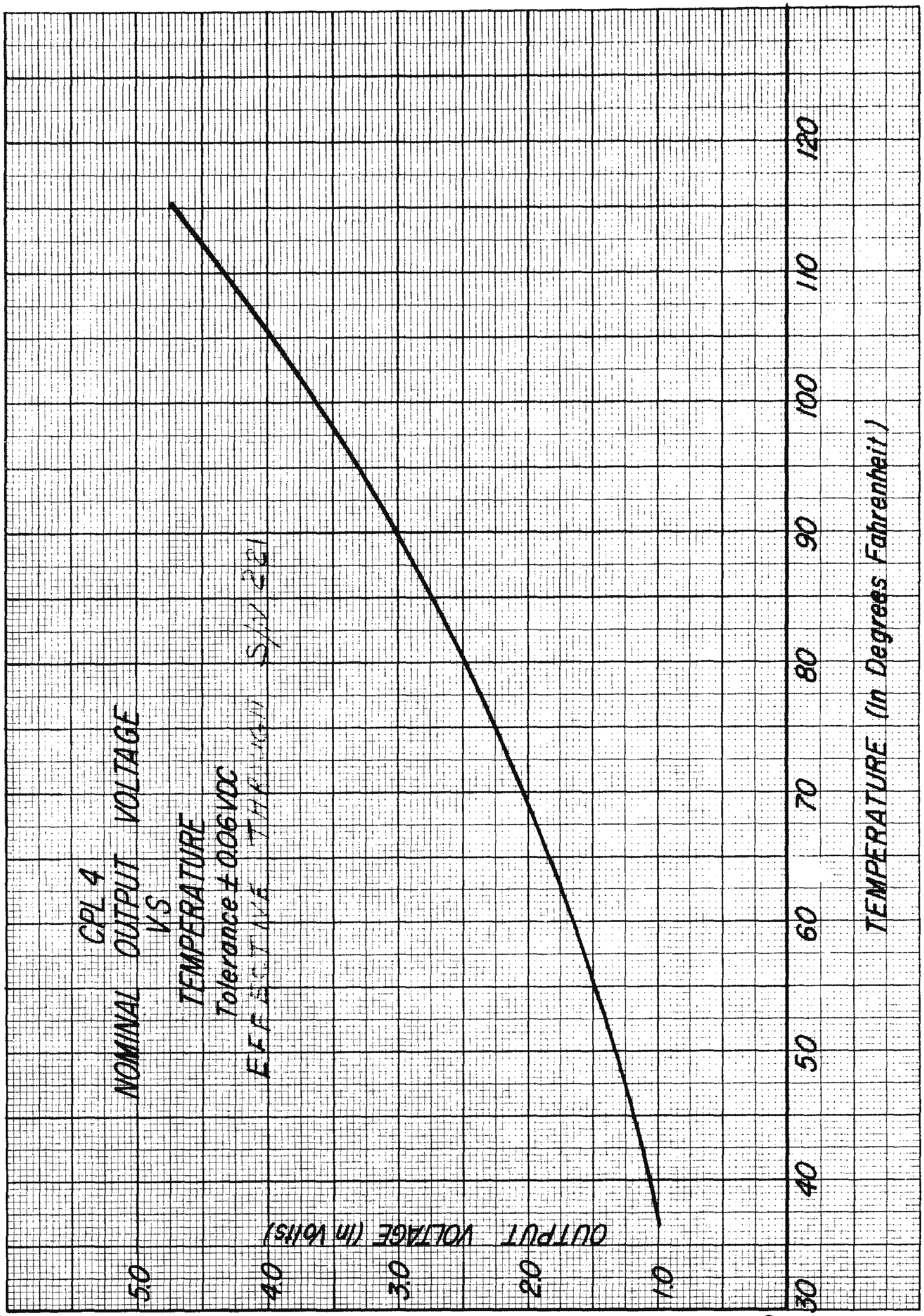


FIGURE V

(S) 33g

FIGURE V a

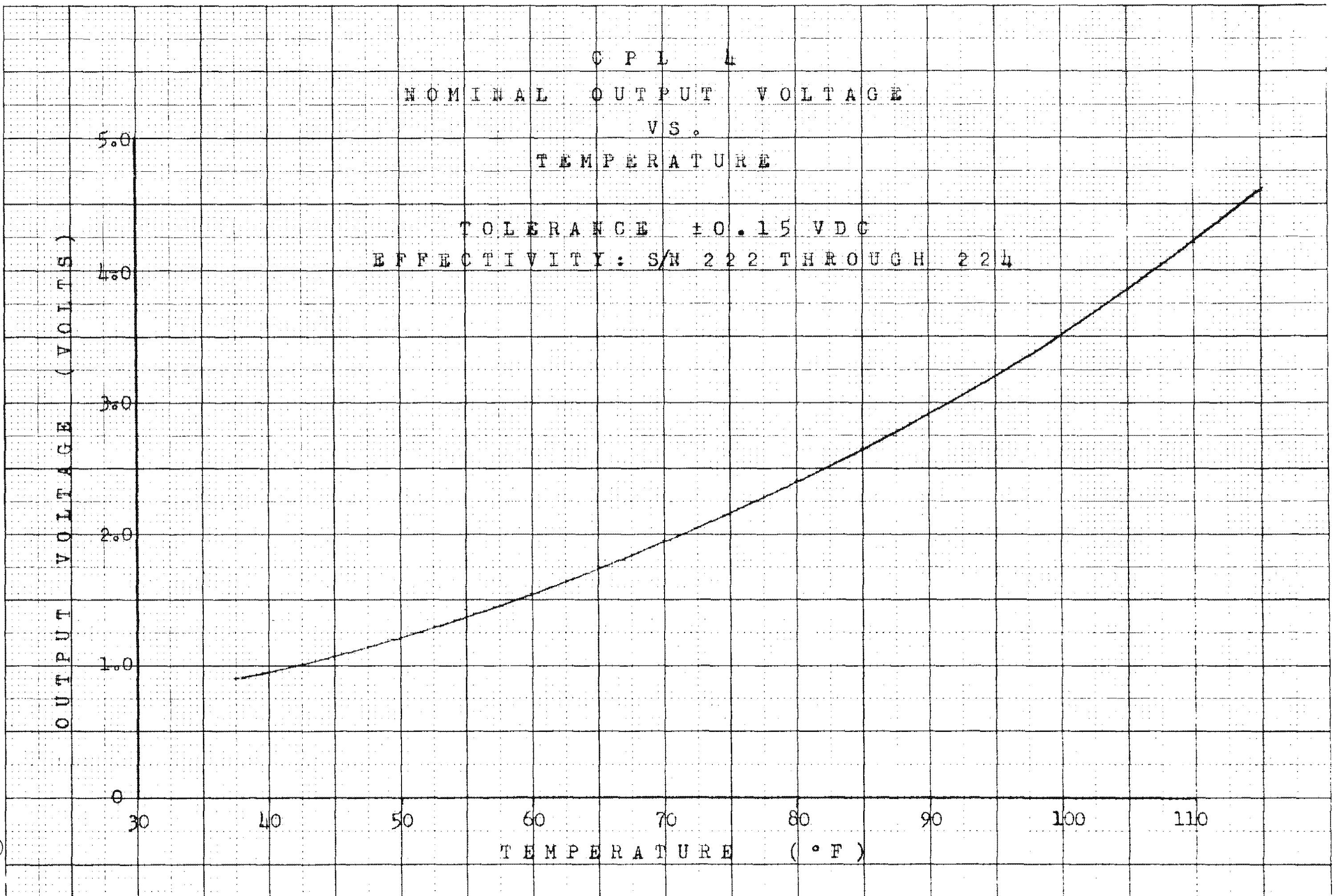


FIGURE Va

33b

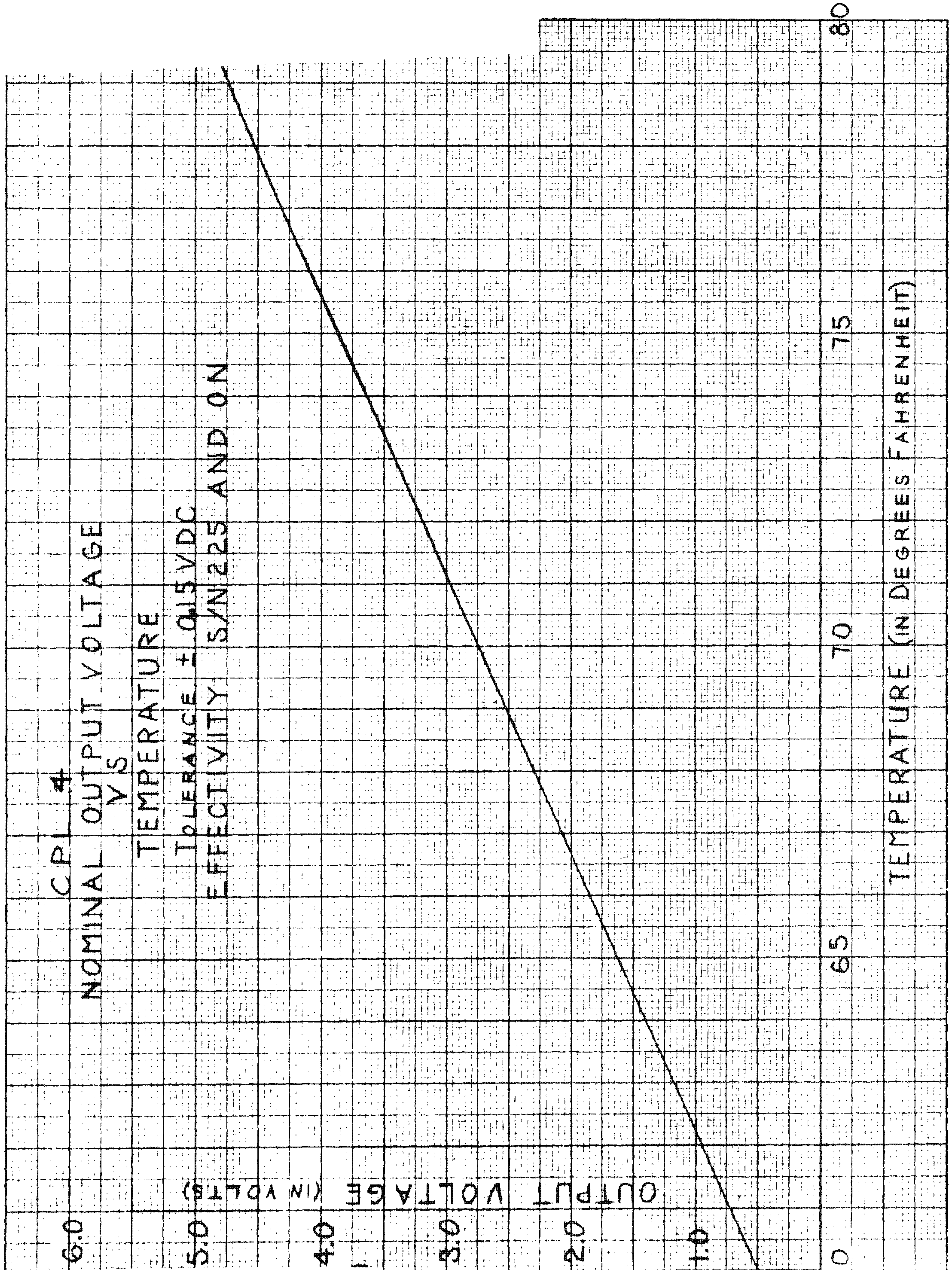

CPL 4
NOMINAL OUTPUT VOLTAGE
VS
TEMPERATURE
TOLERANCE ± 0.15 VDC
EFFECTIVITY S/N 225 AND ON
OUTPUT VOLTAGE (IN VOLTS)
6.0
5.0
4.0
3.0
2.0
1.0
0
TEMPERATURE (IN DEGREES FAHRENHEIT)
60
65
70
75
80

FIGURE V b

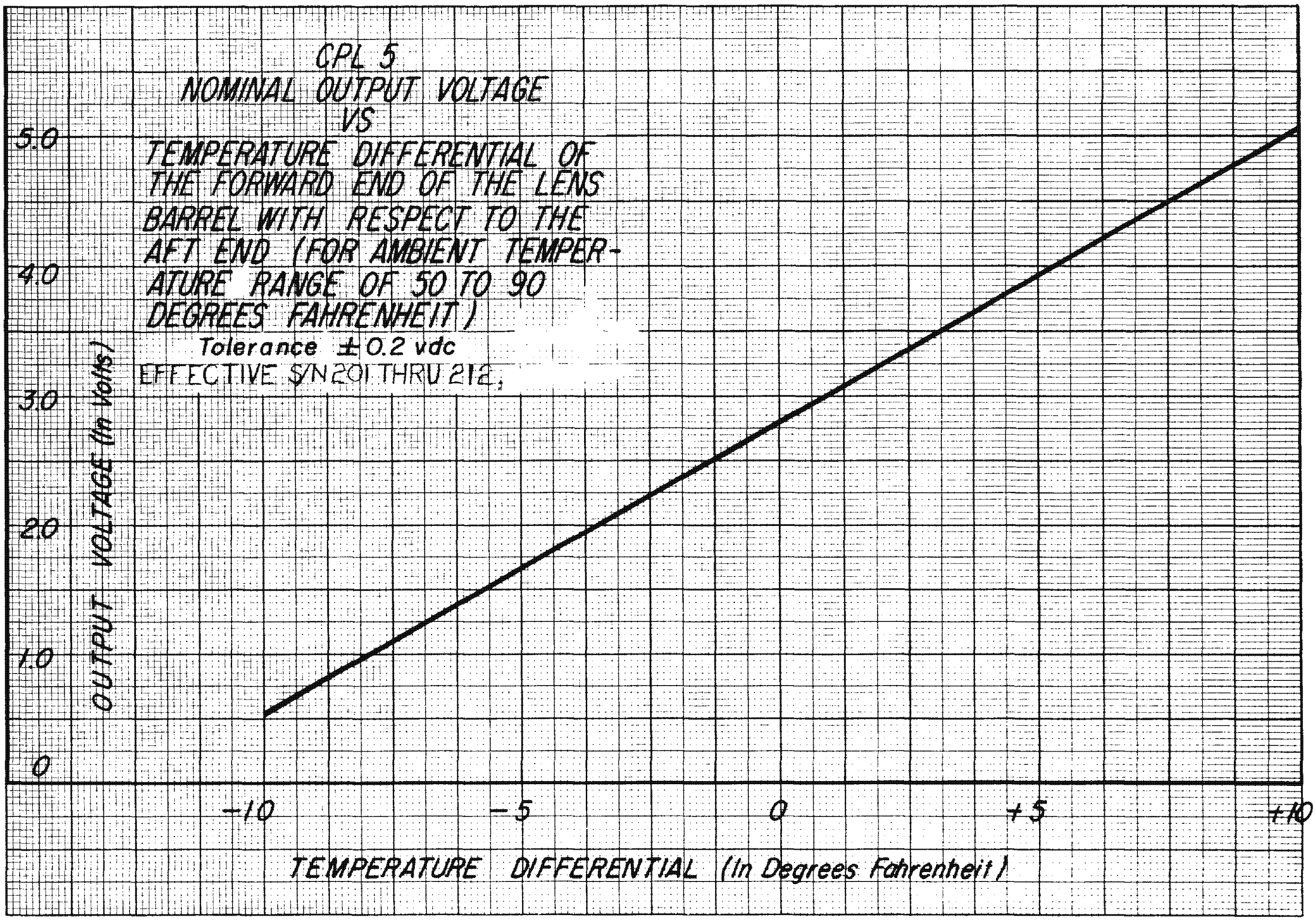

CPL 5
NOMINAL OUTPUT VOLTAGE
VS
TEMPERATURE DIFFERENTIAL OF THE FORWARD END OF THE LENS BARREL WITH RESPECT TO THE AFT END (FOR AMBIENT TEMPERATURE RANGE OF 50 TO 90 DEGREES FAHRENHEIT)
Tolerance ±0.2 vdc
EFFECTIVE S/N 201 THRU 212,
OUTPUT VOLTAGE (In Volts)
5.0
4.0
3.0
2.0
1.0
0
-10
-5
0
+5
+10
TEMPERATURE DIFFERENTIAL (In Degrees Fahrenheit)

FIGURE VI

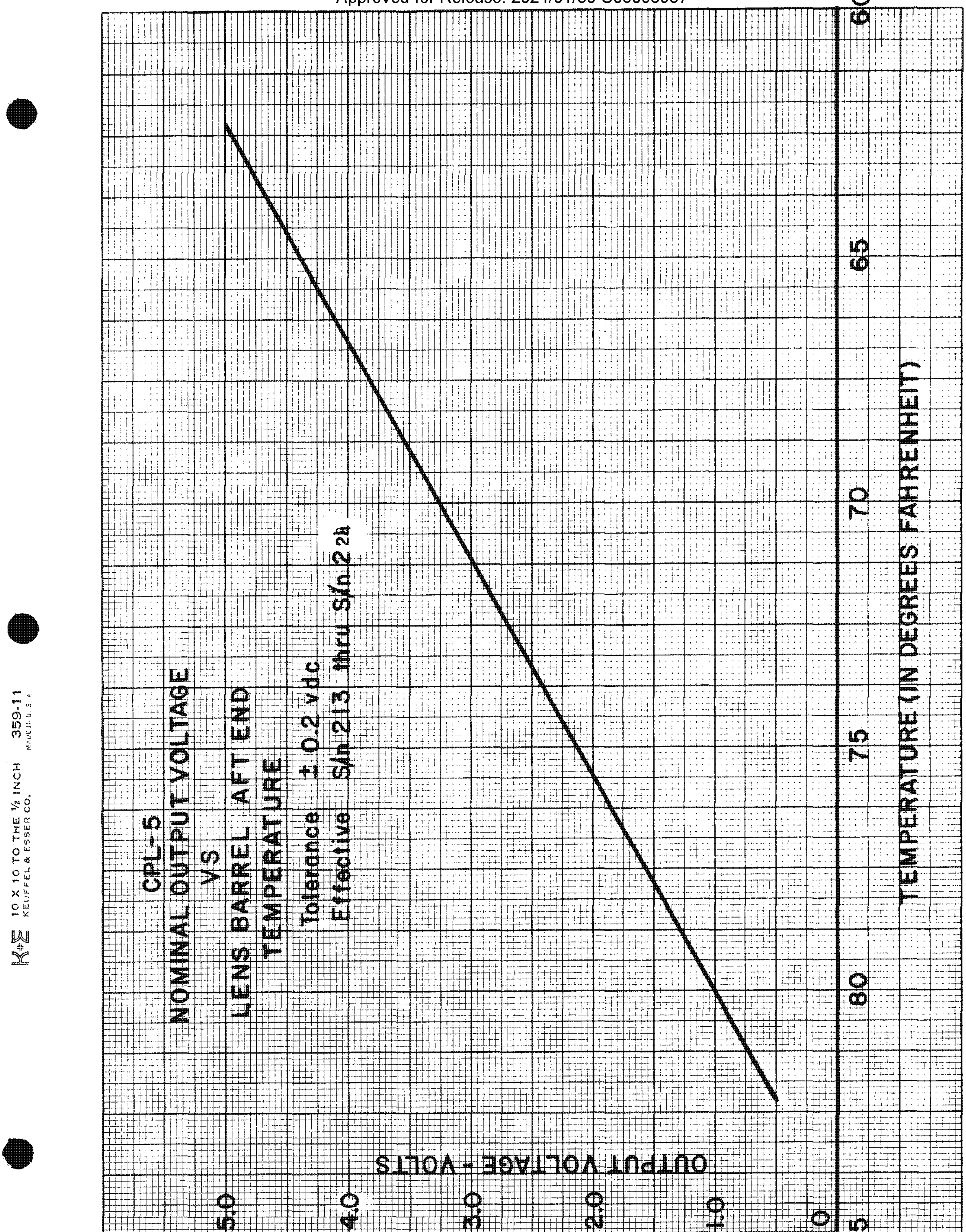


FIGURE VI(a)

33k

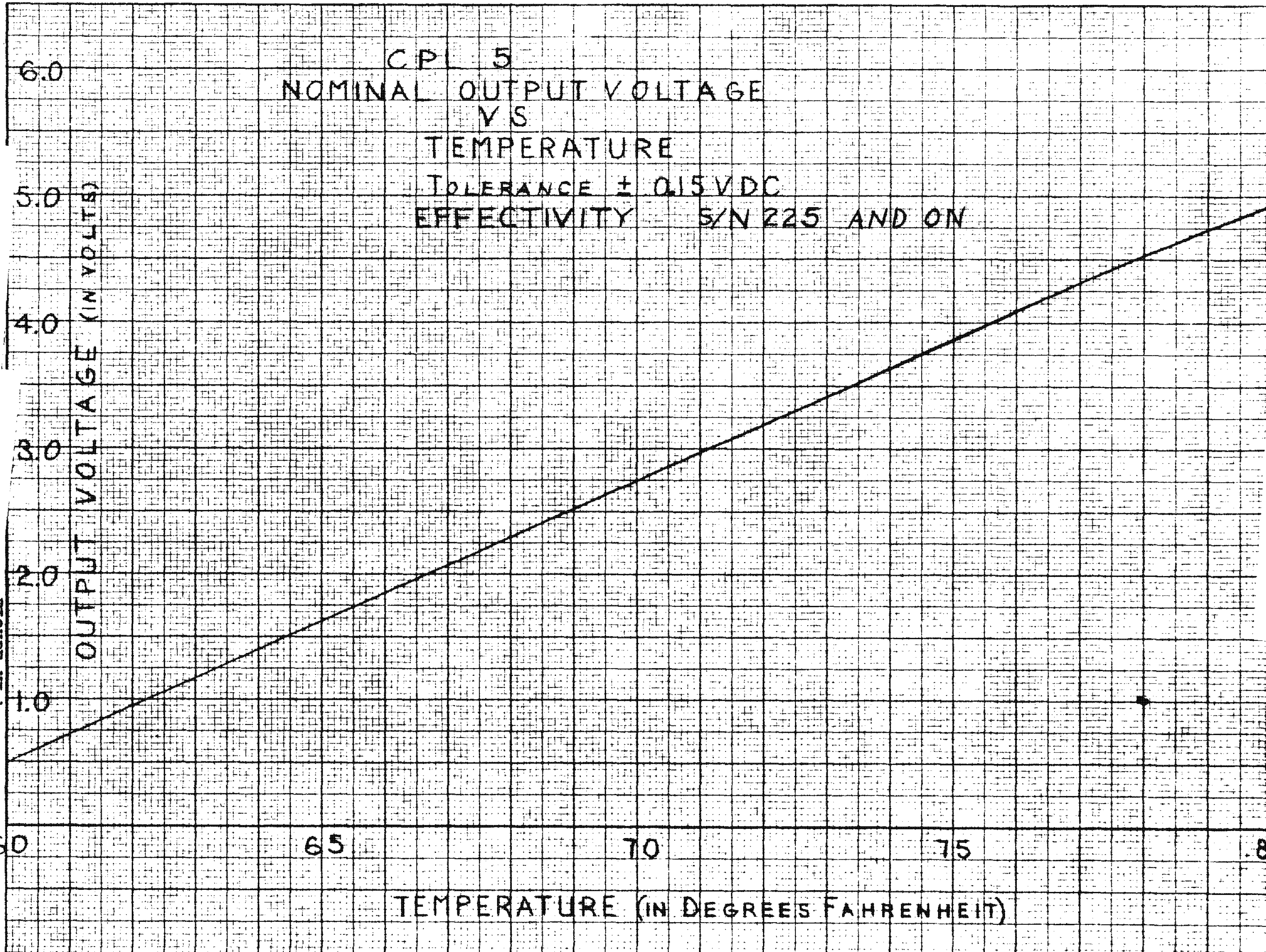


FIGURE VI b

Ⓡ Ⓢ 33L

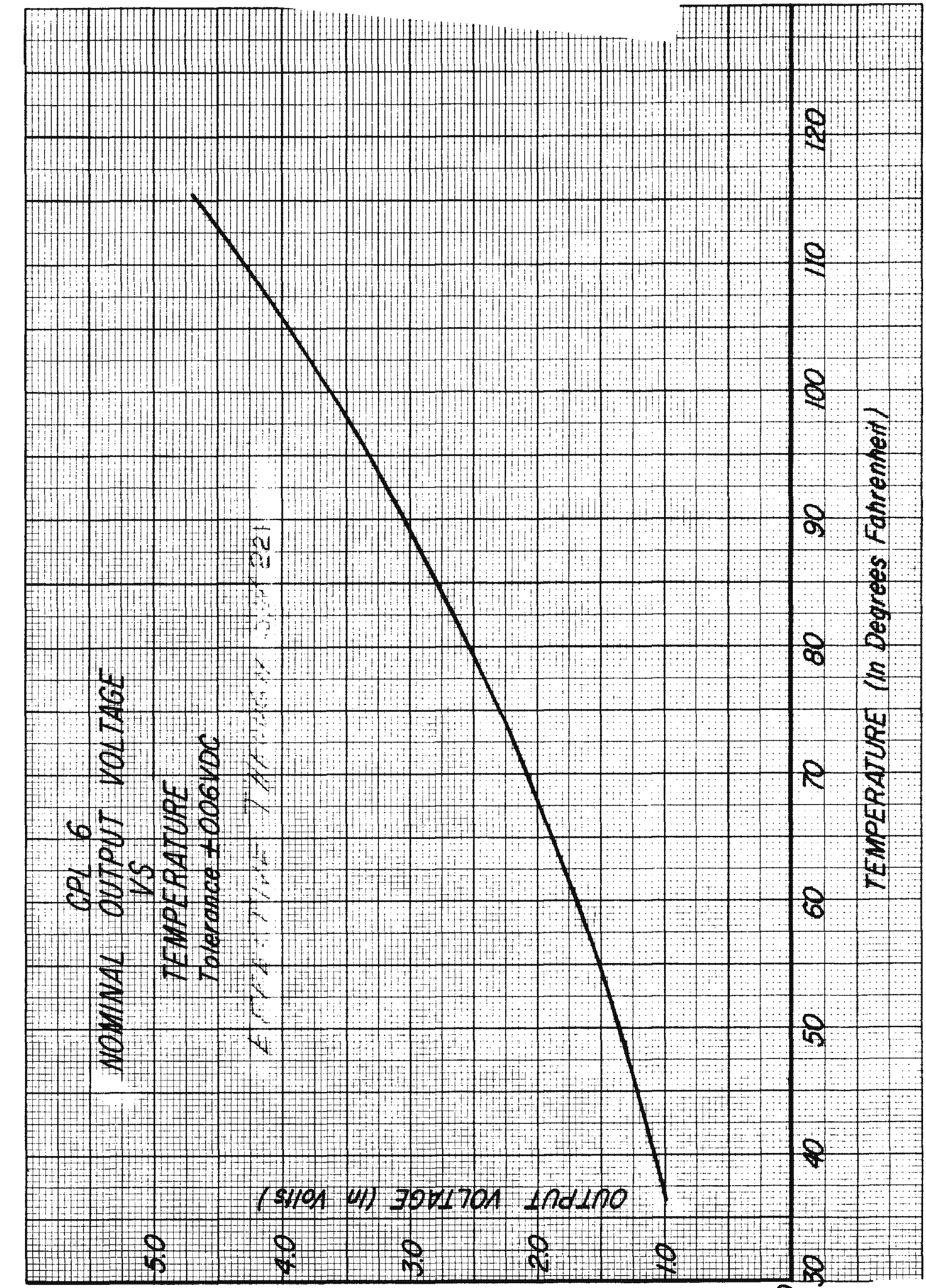


FIGURE VII

33m

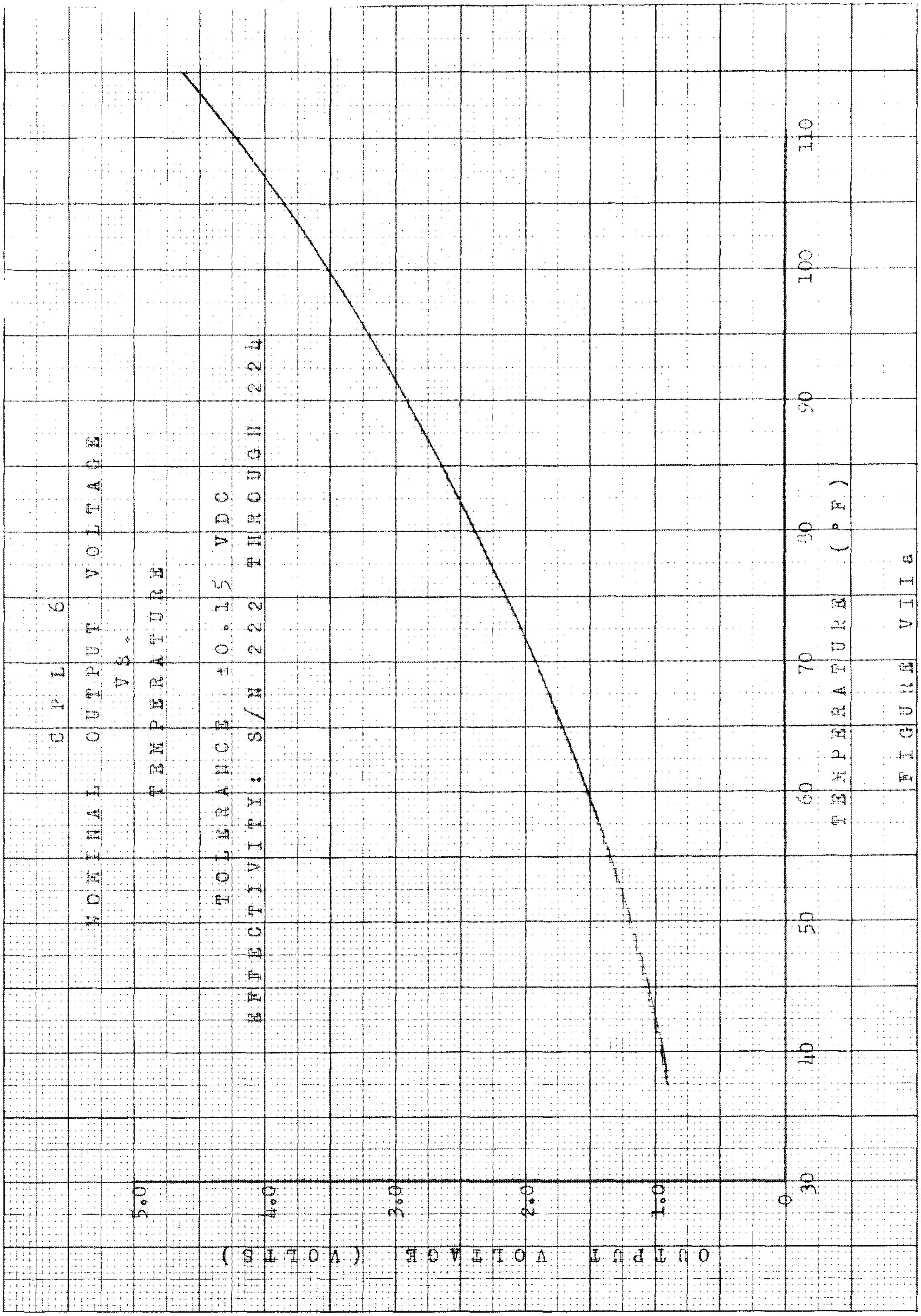

C P L 6
NOMINAL OUTPUT VOLTAGE
VS.
TEMPERATURE
TOLERANCE ±0.15 VDC
EFFECTIVITY: S/N 222 THROUGH 224
30
40
50
60
70
80
90
100
110
TEMPERATURE (°F)
FIGURE VII a
0
1.0
2.0
3.0
4.0
5.0
OUTPUT VOLTAGE (VOLTS)

FIGURE VII a

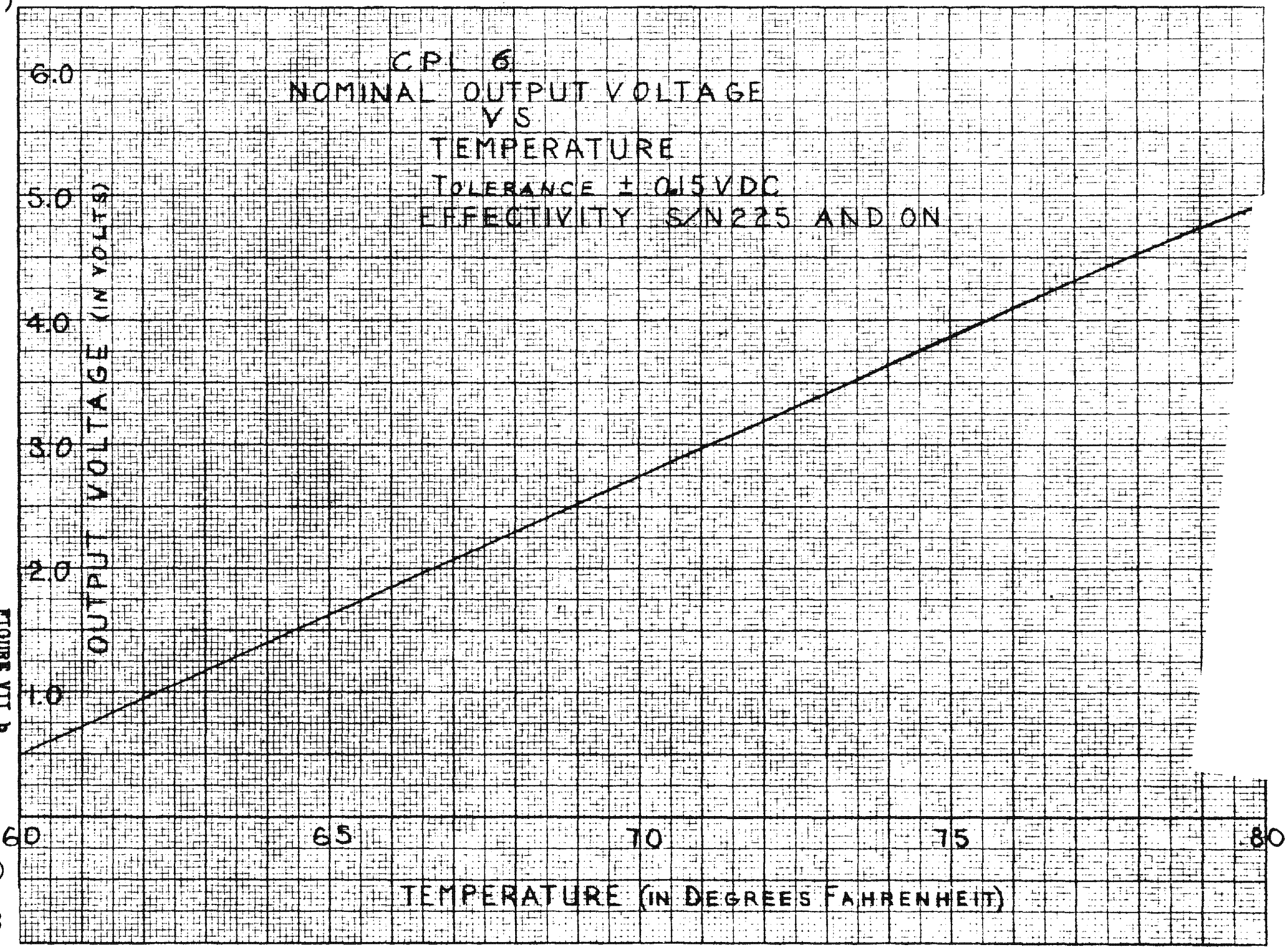


FIGURE VII b

(S)

33

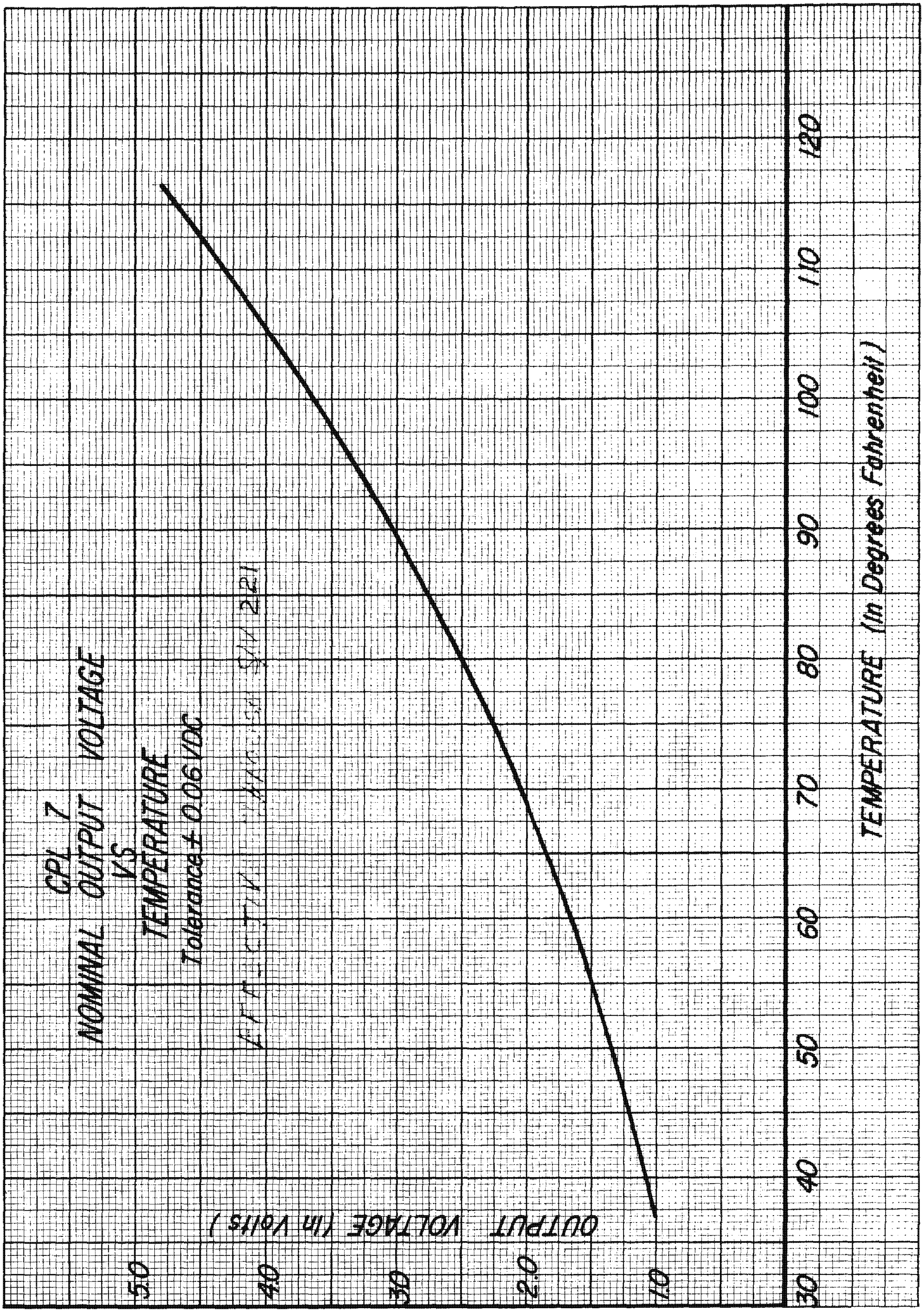

CPL 7
NOMINAL OUTPUT VOLTAGE
VS
TEMPERATURE
Tolerance ± 0.06 VDC
OUTPUT VOLTAGE (In Volts)
TEMPERATURE (In Degrees Fahrenheit)
5.0
4.0
3.0
2.0
1.0
0
30
40
50
60
70
80
90
100
110
120

FIGURE VIII

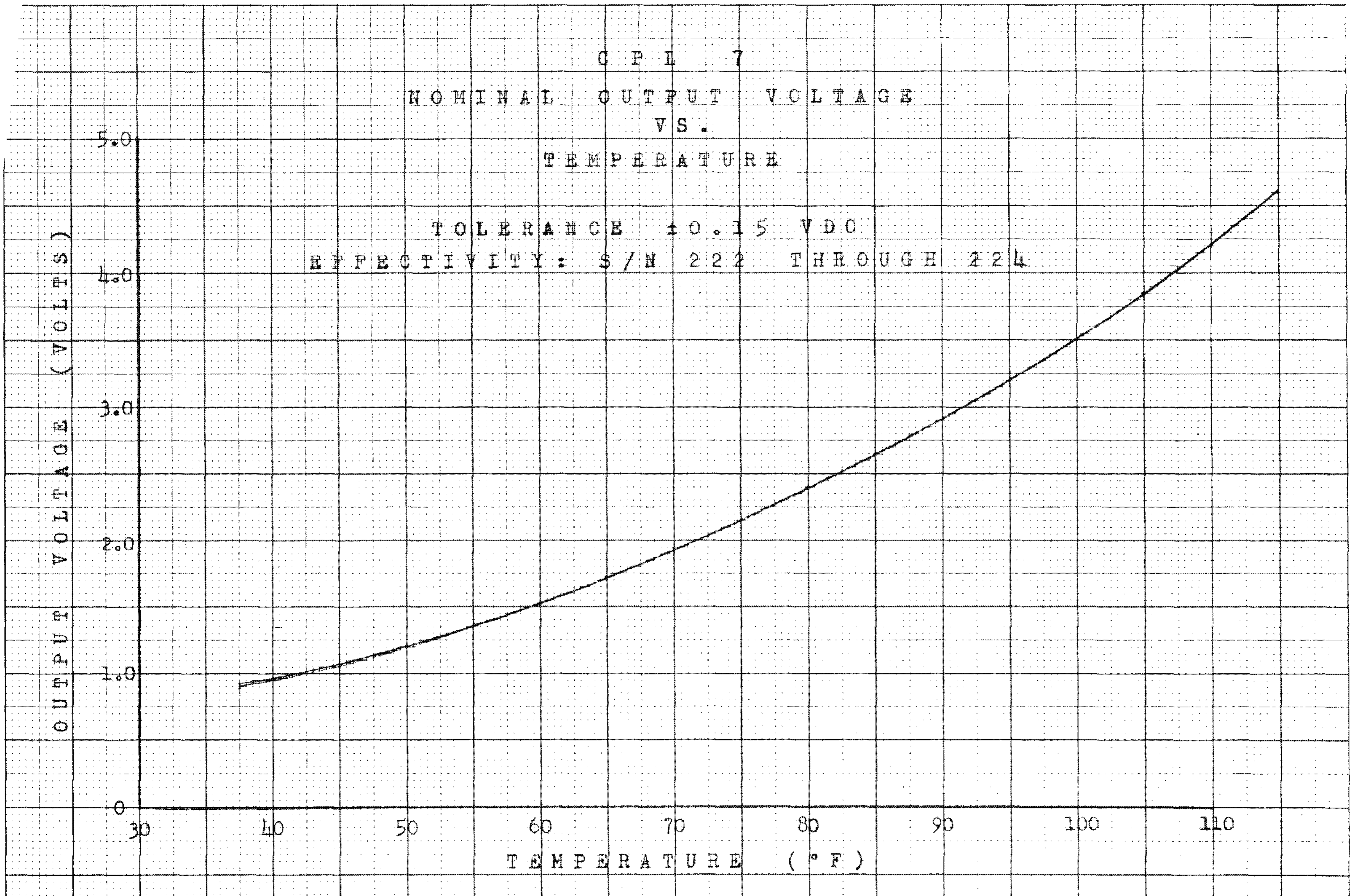


FIGURE VIII a

FIGURE VIII a

Approved for Release: 2024/01/30 C05098937

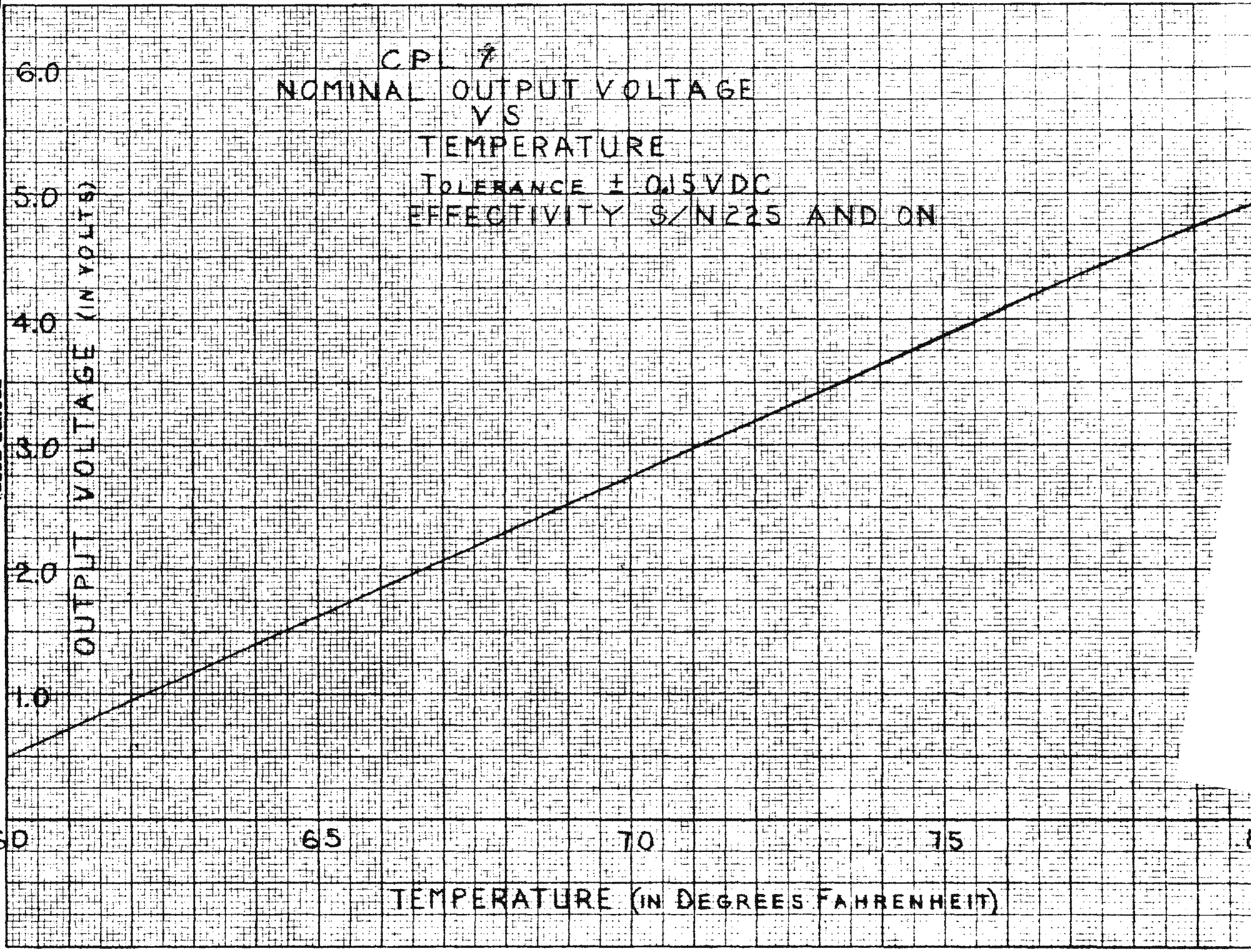


FIGURE VIIIb

Ⓡ

Ⓢ 33r

Approved for Release: 2024/01/30 C05098937

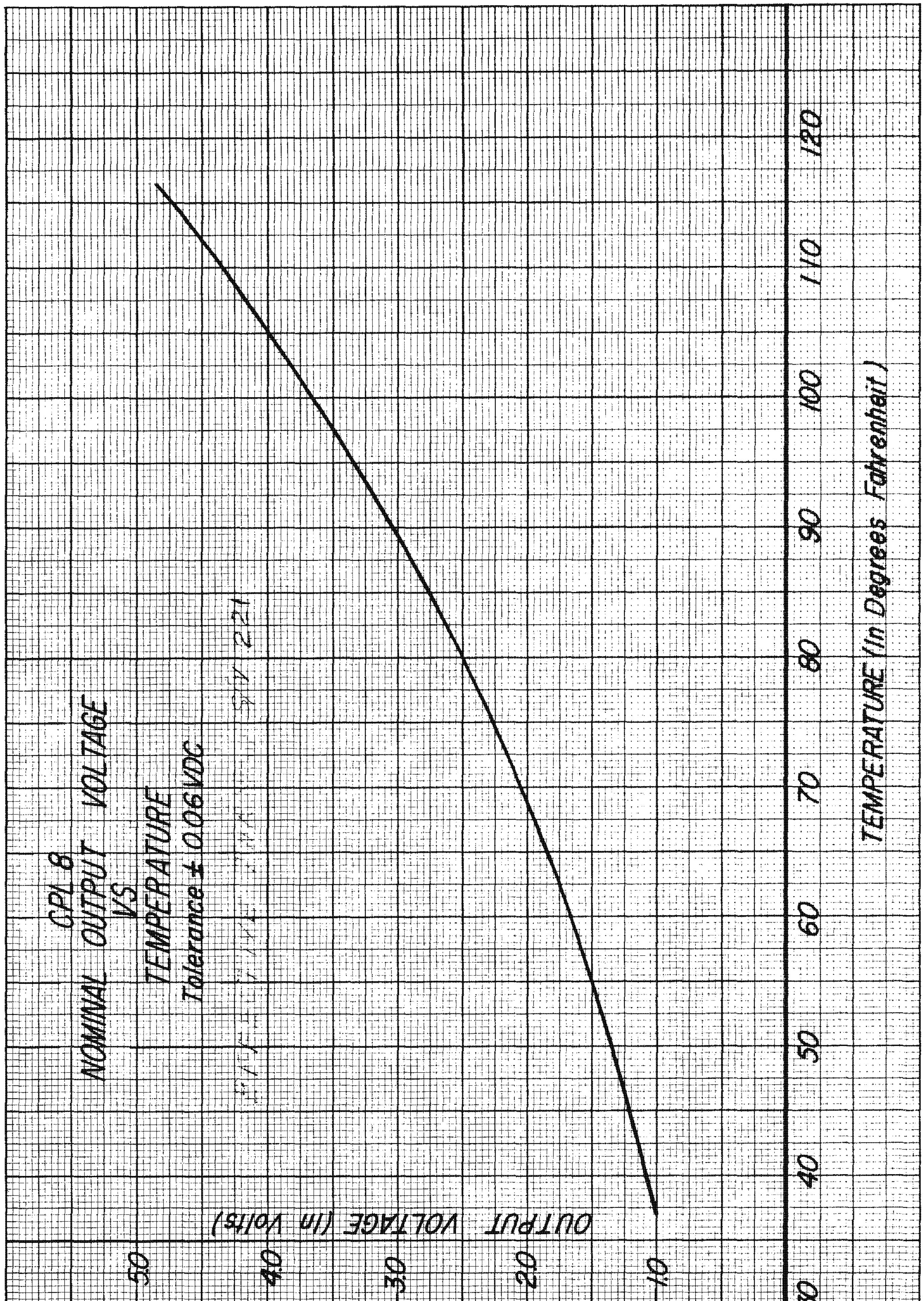

CPL 8
NOMINAL OUTPUT VOLTAGE
VS
TEMPERATURE
Tolerance ± 0.06 VDC
OUTPUT VOLTAGE (In Volts)
50
4.0
3.0
2.0
1.0
0
TEMPERATURE (In Degrees Fahrenheit)
30
40
50
60
70
80
90
100
110
120

FIGURE IX

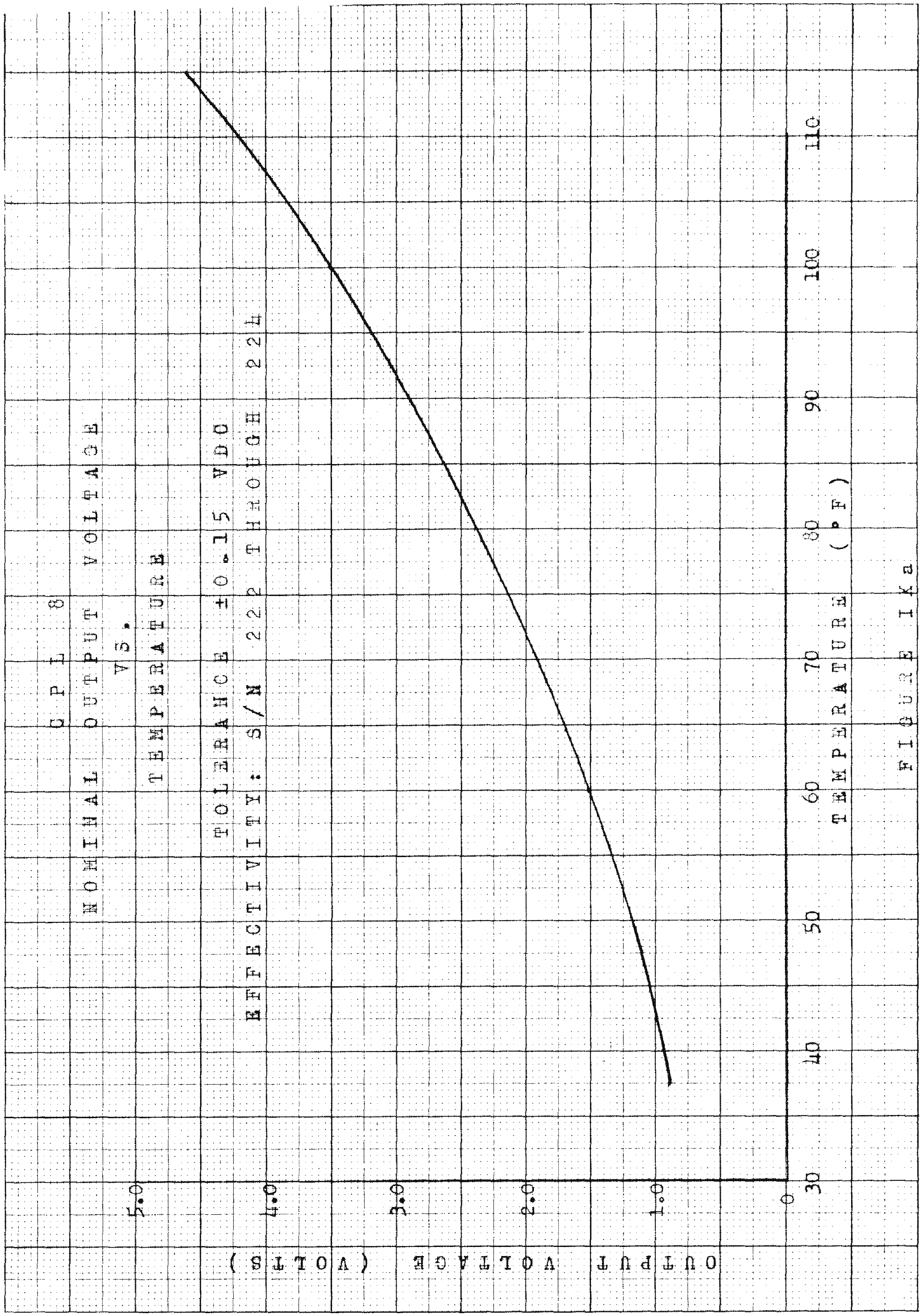

CPL 8
NOMINAL OUTPUT VOLTAGE
VS.
TEMPERATURE
TOLERANCE ±0.15 VDC
EFFECTIVITY: S/N 222 THROUGH 224
TEMPERATURE (°F)
30
40
50
60
70
80
90
100
110
OUTPUT VOLTAGE (VOLTS)
0
1.0
2.0
3.0
4.0
5.0
FIGURE IX a

FIGURE IX a

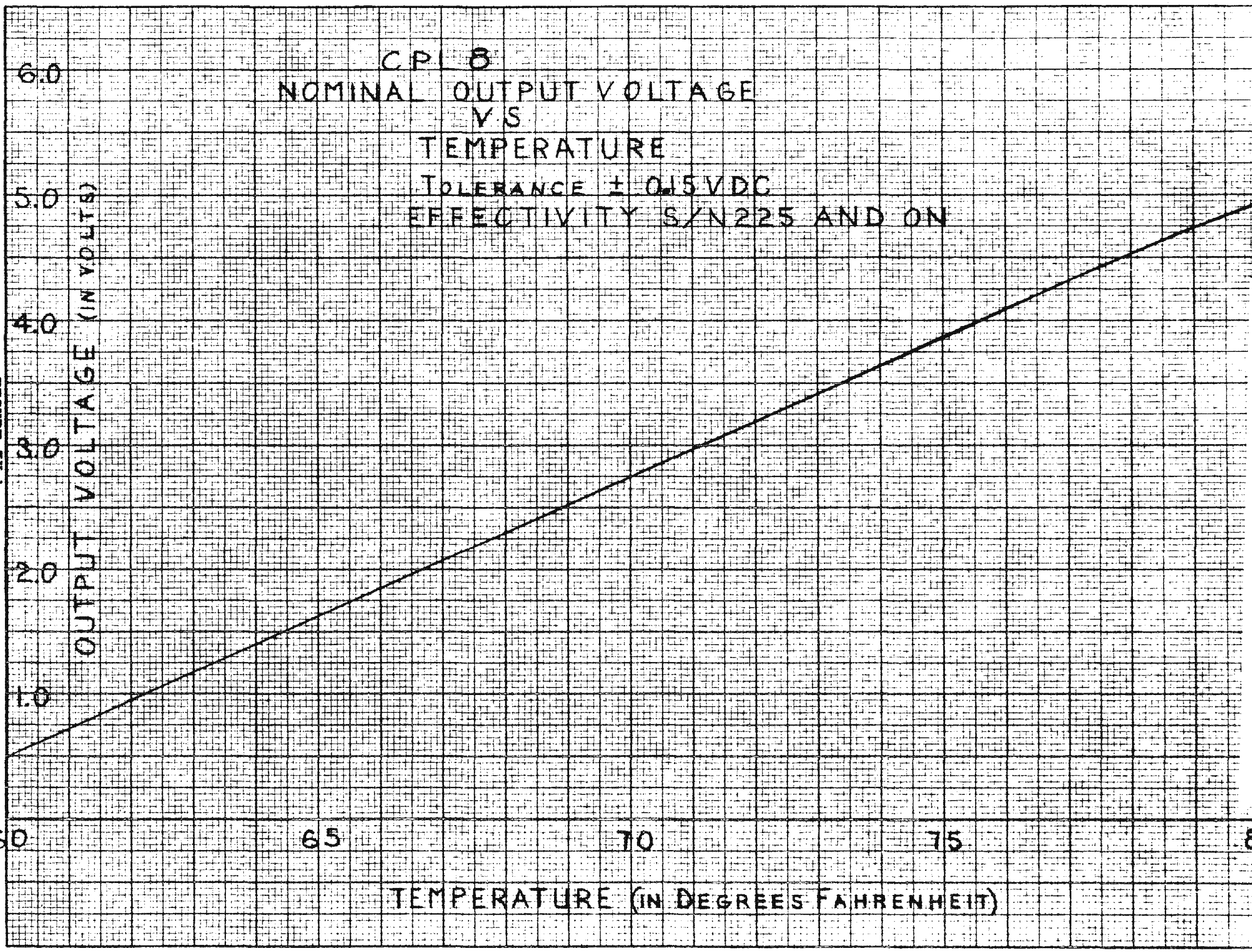


FIGURE IX b

K+E 10 X 10 TO 1/2 INCH 46 1473
7 1/2 X 10 INCHES
KEUFFEL & ESSER CO

33u

C05098937

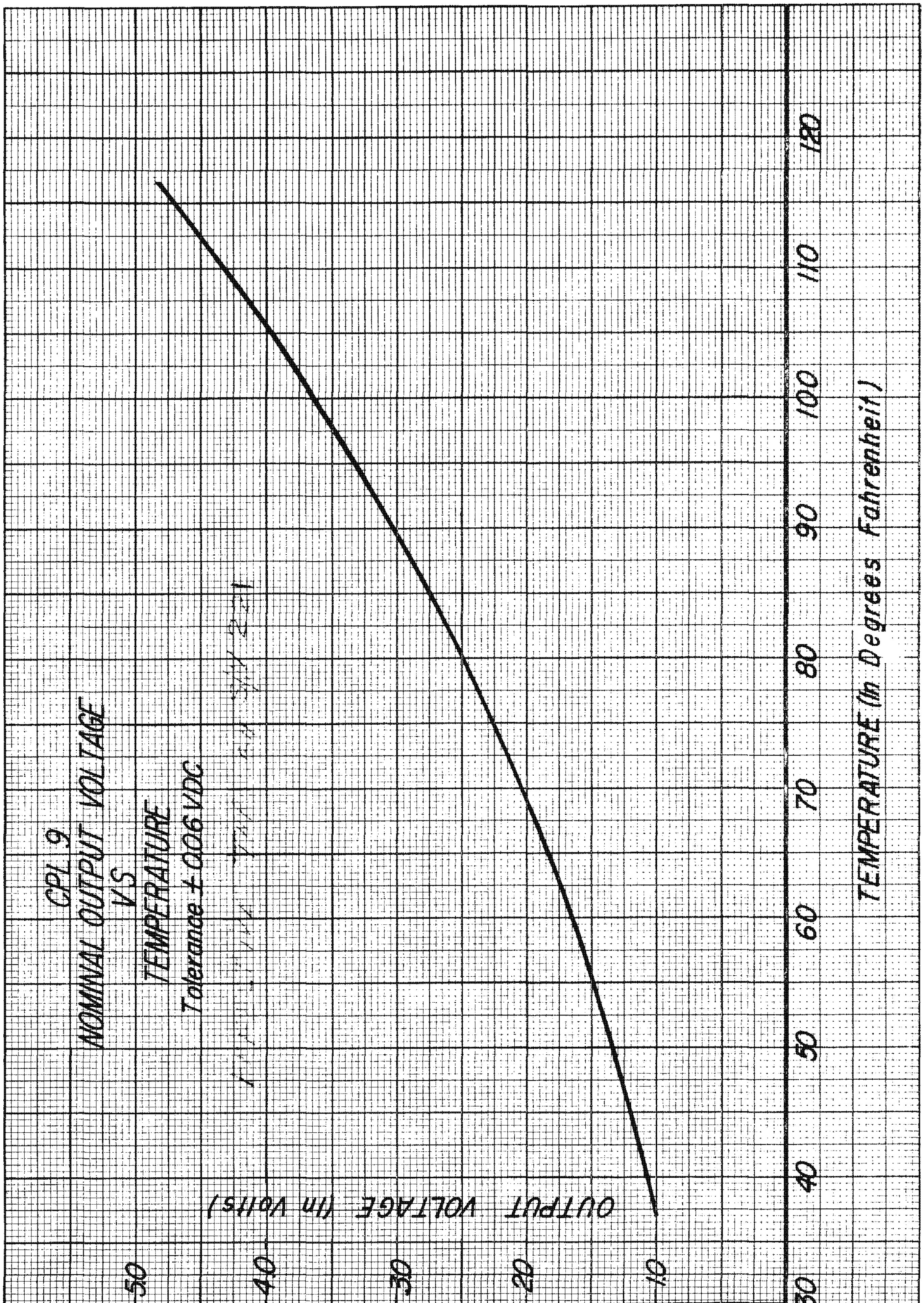


FIGURE X

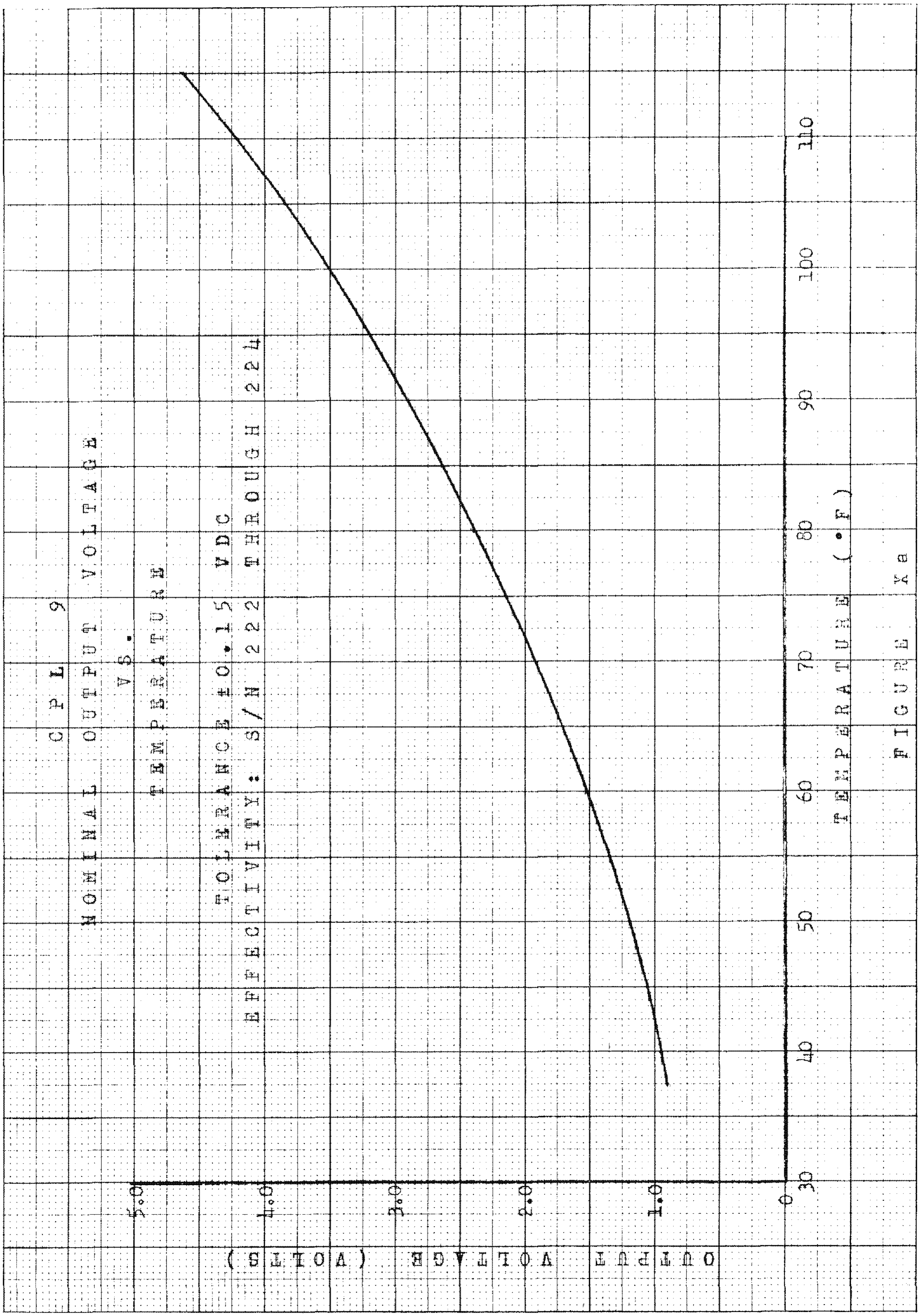


FIGURE X a

Ⓡ Ⓢ 33w

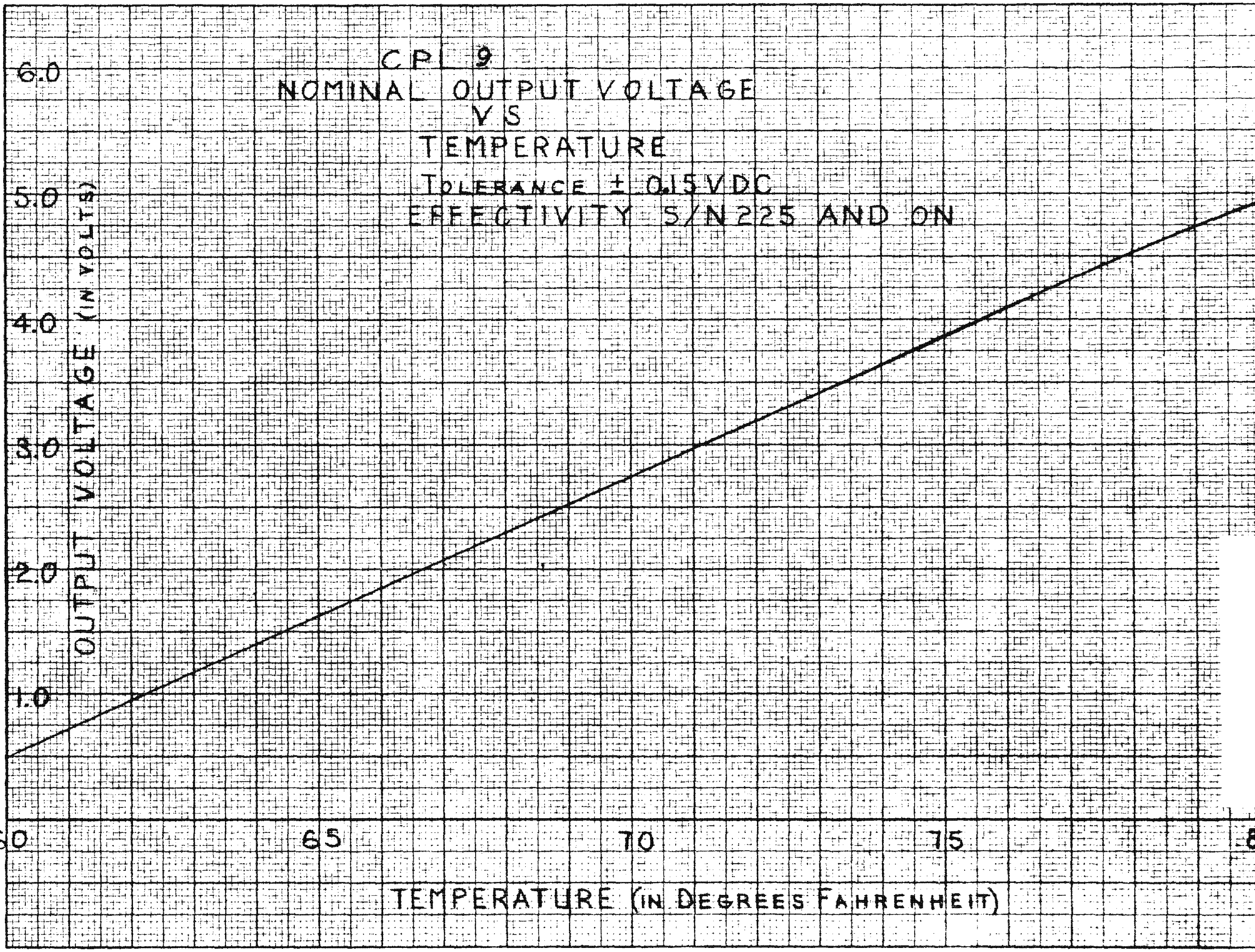
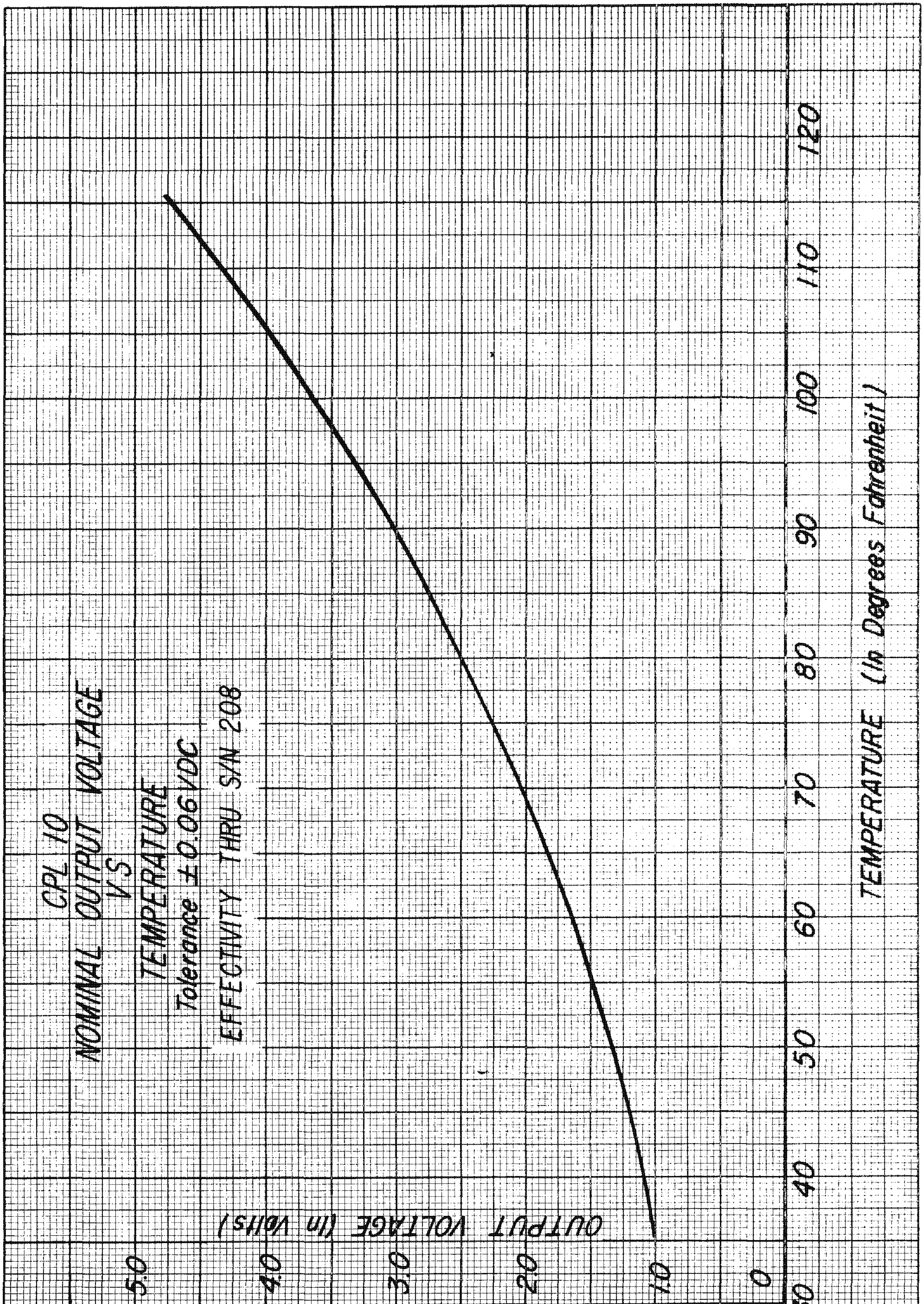


FIGURE X b

33x

Approved for Release: 2024/01/30 C05098937



CPL 10
NOMINAL OUTPUT VOLTAGE
VS
TEMPERATURE
Tolerance ±0.06VDC
EFFECTIVITY THRU S/N 208
OUTPUT VOLTAGE (In Volts)
5.0
4.0
3.0
2.0
1.0
0
TEMPERATURE (In Degrees Fahrenheit)
30
40
50
60
70
80
90
100
110
120

FIGURE XI

CPL 10

REFERENCE VOLTAGE

TOLERANCE ±.050 VDC
(EFFECTIVE S/N 209 THRU 221)

OUTPUT VOLTAGE 2.130
VDC

FIGURE XIa

(R)

(S) 33z

C P L 1 0

REFERENCE VOLTAGE

TOLERANCE ±0.13 VDC

(EFFECTIVE S/N 222 Through 224)

OUTPUT VOLTAGE 2.030 VDC

FIGURE XI b

F

CPL 10

REFERENCE VOLTAGE

TOLERANCE 0.15 VDC

EFFECTIVE S/N 225 AND ON

OUTPUT VOLTAGE 2.48 VDC

FIGURE XI (c)

Ⓡ

Ⓢ 33ab

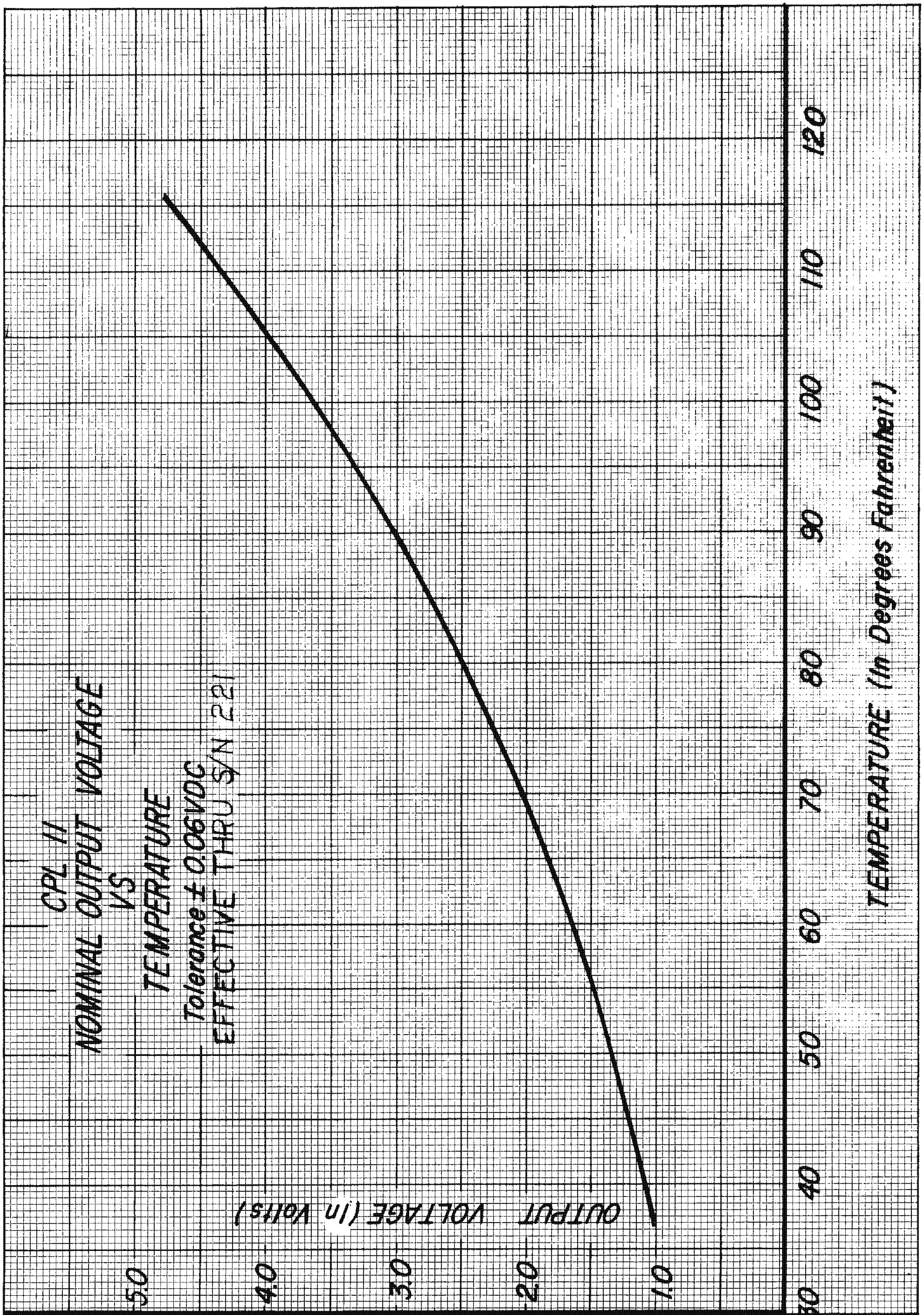


FIGURE XII

33

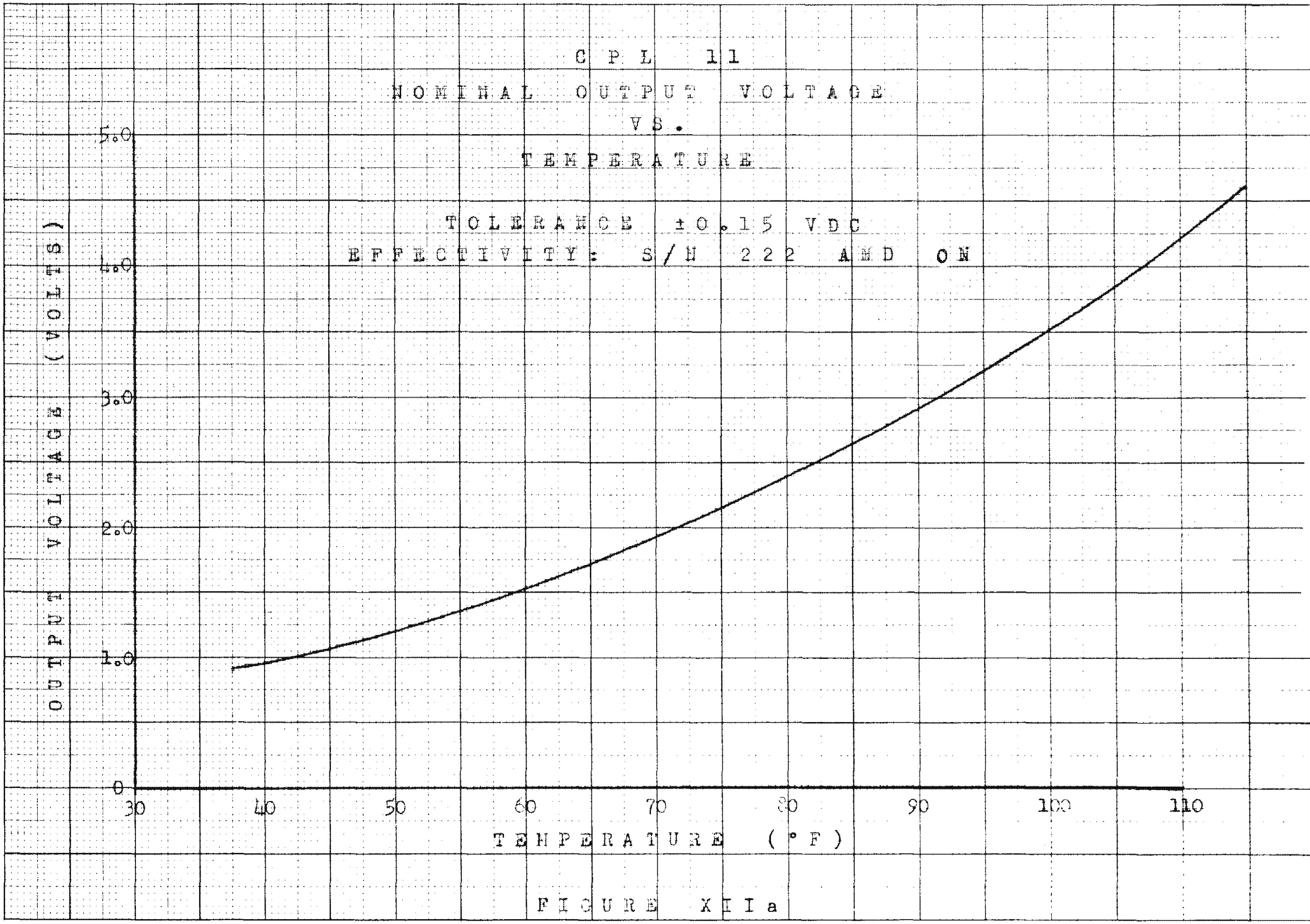

C P L 11
N O M I N A L O U T P U T V O L T A G E
V S.
T E M P E R A T U R E
T O L E R A N C E ±0.15 V D C
E F F E C T I V I T Y : S / N 2 2 2 A N D O N
O U T P U T V O L T A G E (V O L T S)
5.0
4.0
3.0
2.0
1.0
0
30
40
50
60
70
80
90
100
110
T E M P E R A T U R E (° F)
F I G U R E X I I a

FIGURE XII a

CPL 12

OUTPUT VOLTAGE VERSUS SLIT POSITION

Effective S/N 213 thru 221

SLIT POSITION NUMBER	TEST POINT OUTPUT VDC
1	.62
2	1.74
3	2.79
4	3.78
Test	4.78

TOLERANCE FOR VOLTAGE = ± 0.10 VDC

FIGURE XIII

CPL 12

OUTPUT VOLTAGE VERSUS SLIT POSITION

SLIT POSITION NO.	TEST POINT OUTPUT (VDC)
1	0.58
2	1.68
3	2.69
4	3.71
TEST	4.75

TOLERANCE FOR VOLTAGE = 0.18 VDC

EFFECTIVE S/N 222 AND ON

FIGURE XIII a

R

S 33af

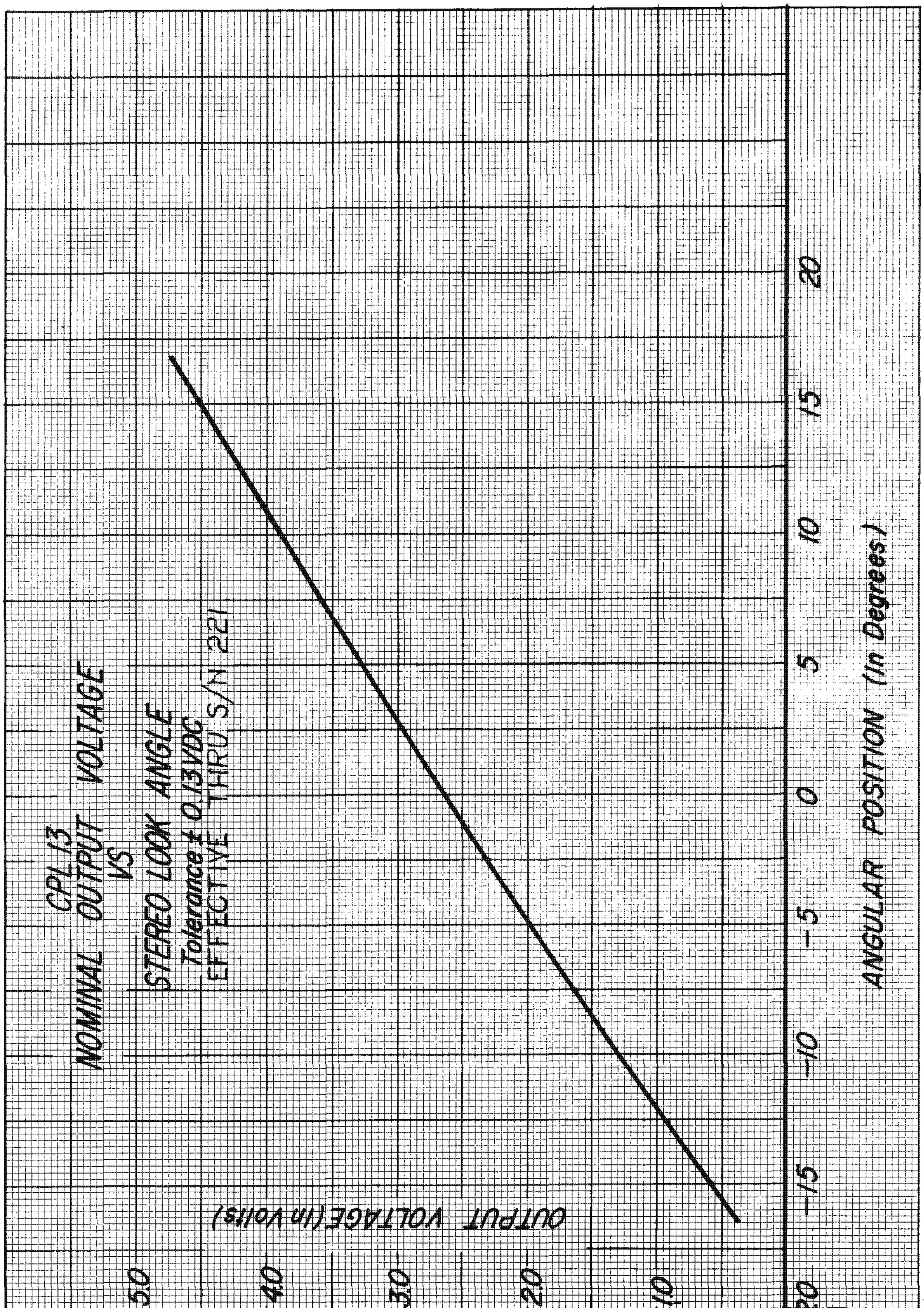


FIGURE XIV

S 33ag

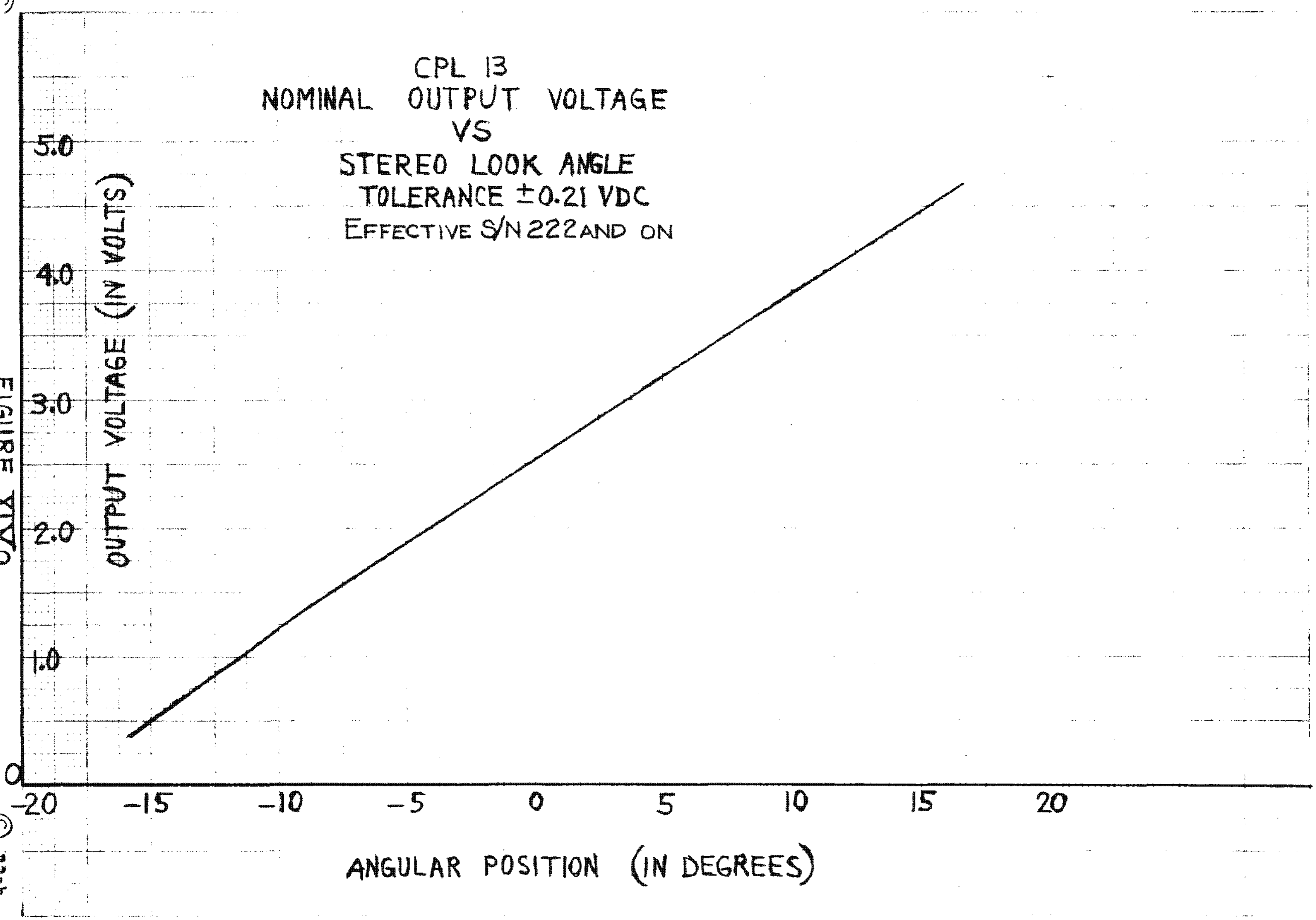


FIGURE XIVa

Ⓢ 33ah

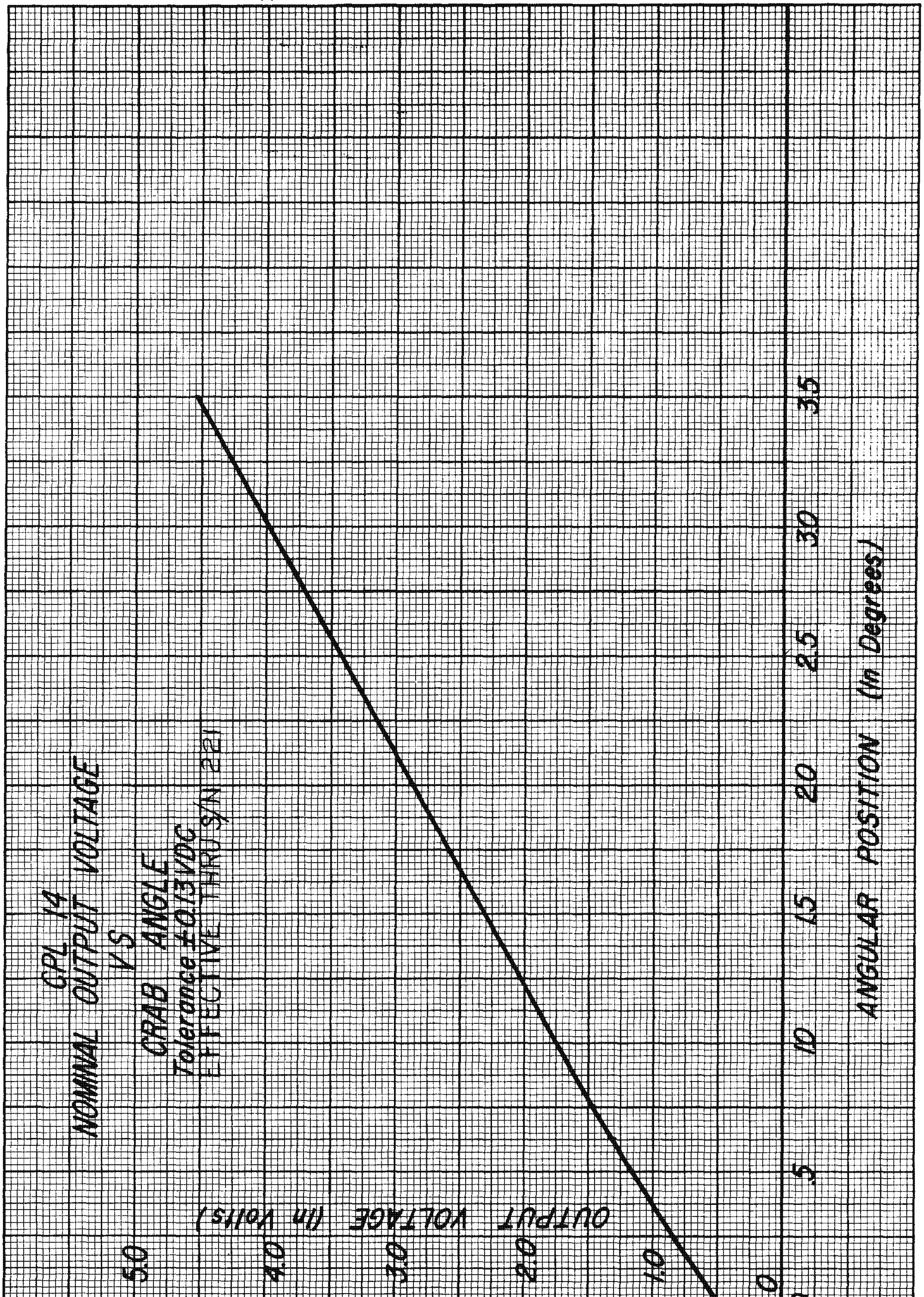
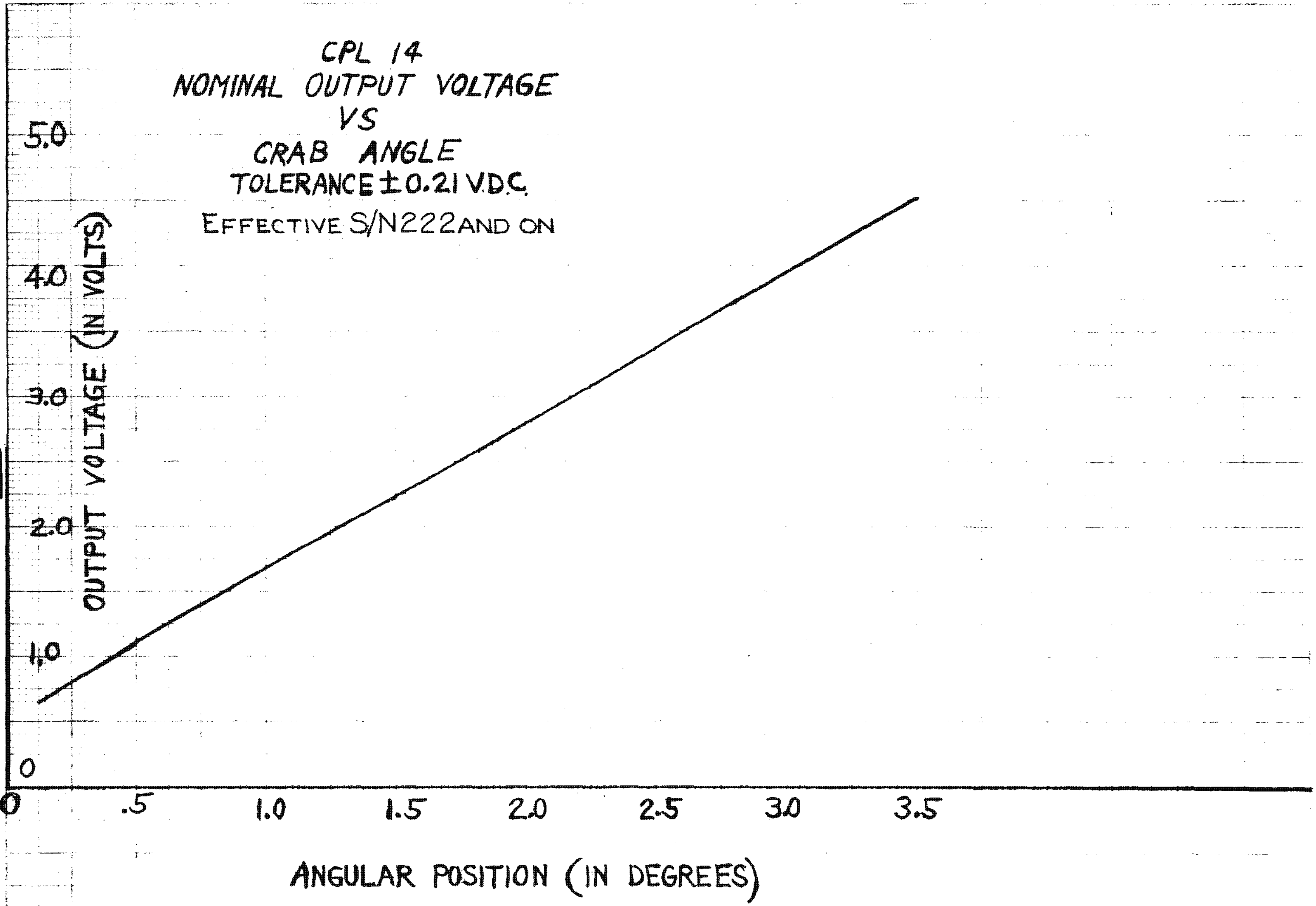


FIGURE XV

S 33ai


CPL 14
NOMINAL OUTPUT VOLTAGE
VS
CRAB ANGLE
TOLERANCE ±0.21 V.D.C.
EFFECTIVE S/N222 AND ON
OUTPUT VOLTAGE (IN VOLTS)
5.0
4.0
3.0
2.0
1.0
0
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
ANGULAR POSITION (IN DEGREES)

XVa

(S) 33 a j

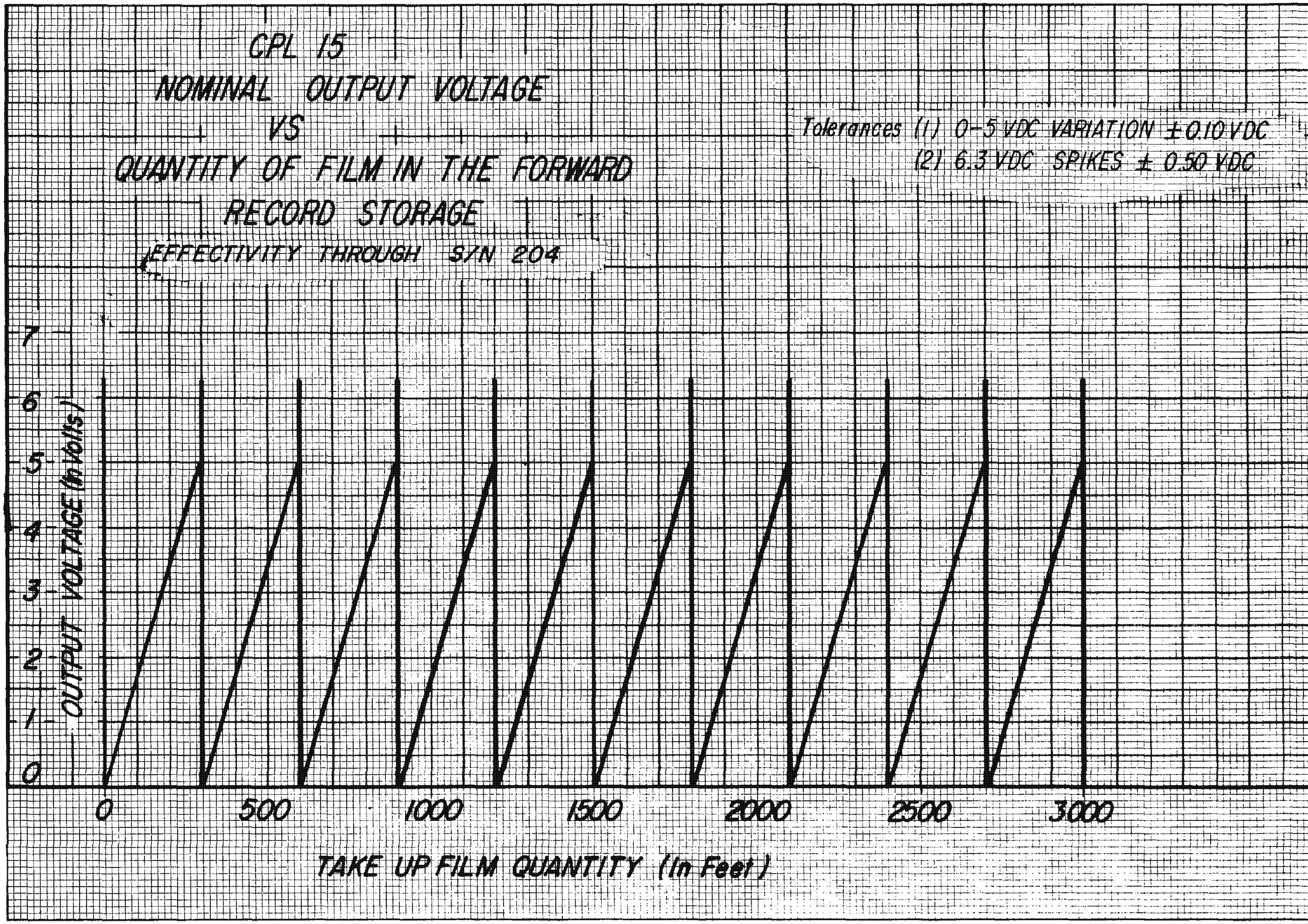


FIGURE XVI (M)

Ⓡ Ⓢ 33bk

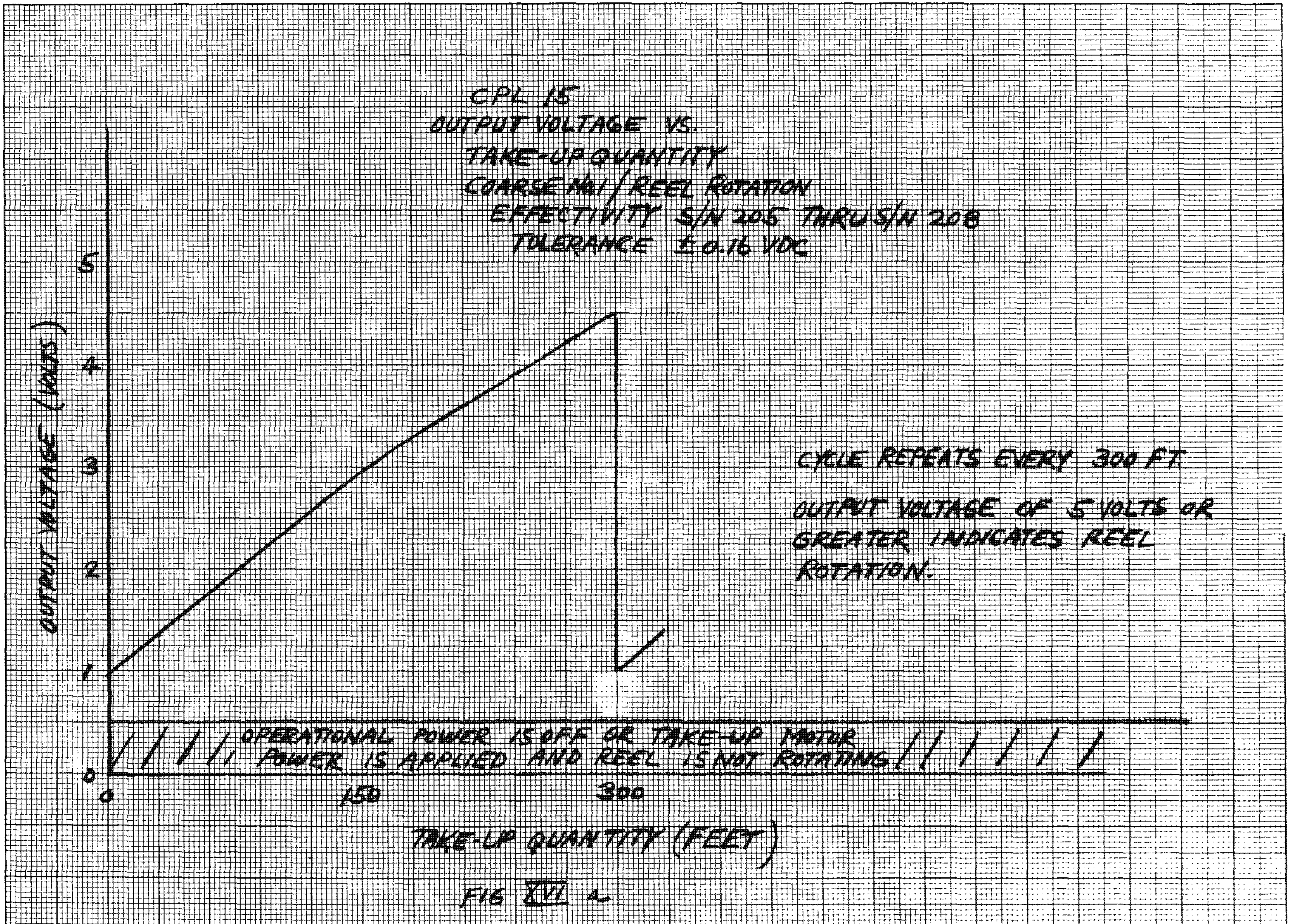


FIGURE XVI a

(S) 33a1

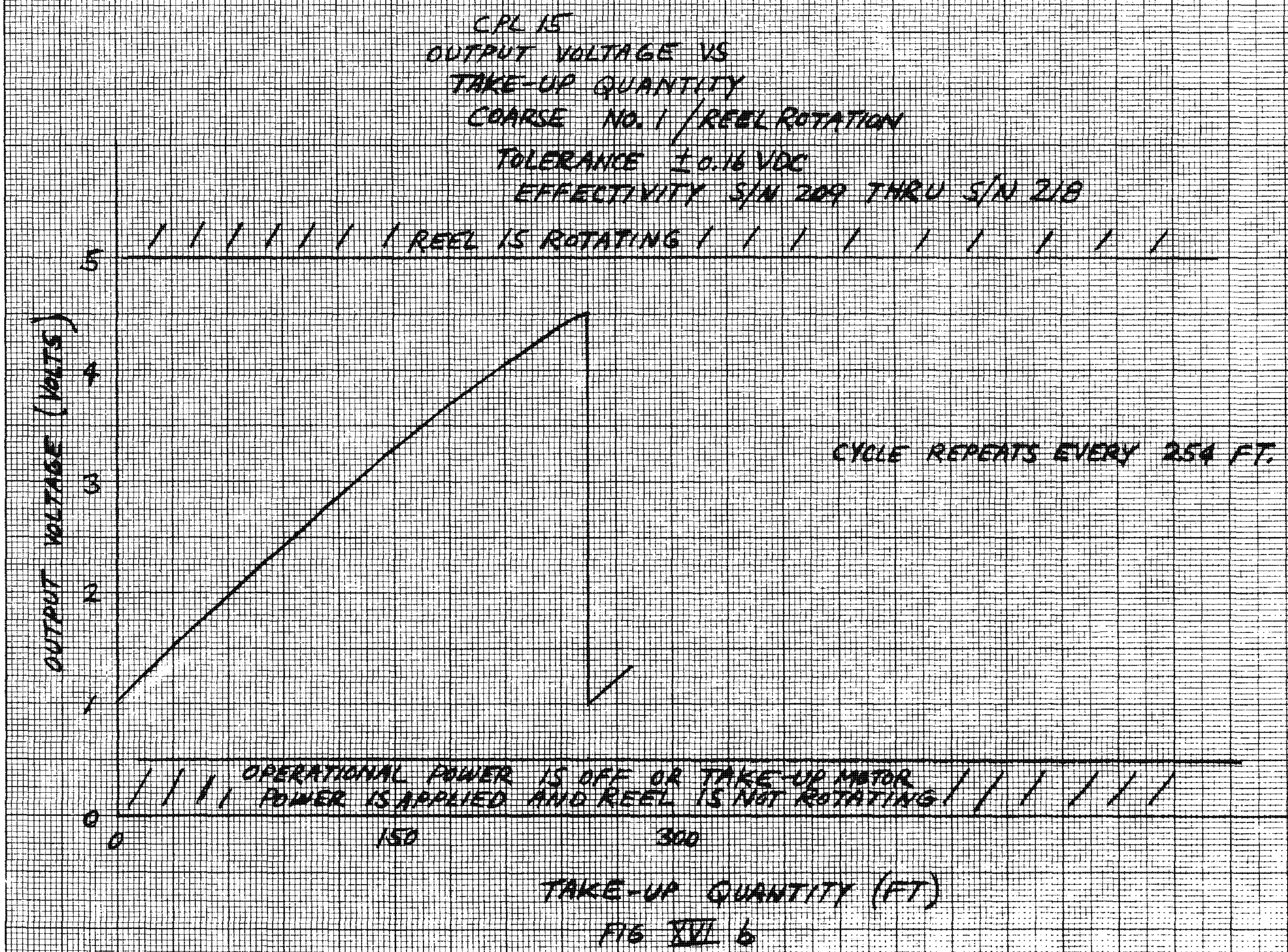


FIGURE XVI b

Approved for Release: 2024/01/30 C05098937

FIGURE XVI c

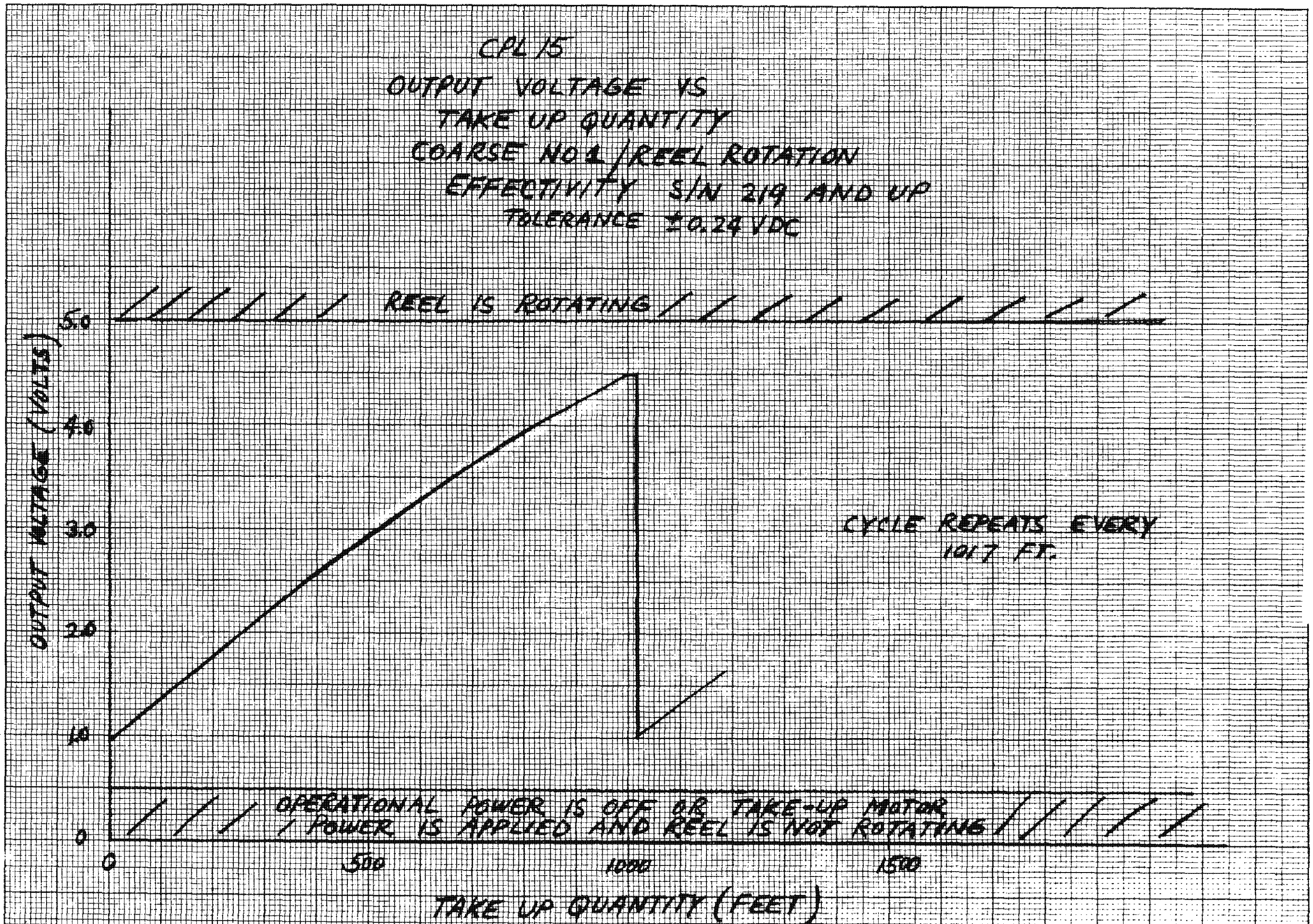


FIG XVI C

Ⓡ Ⓢ 33an

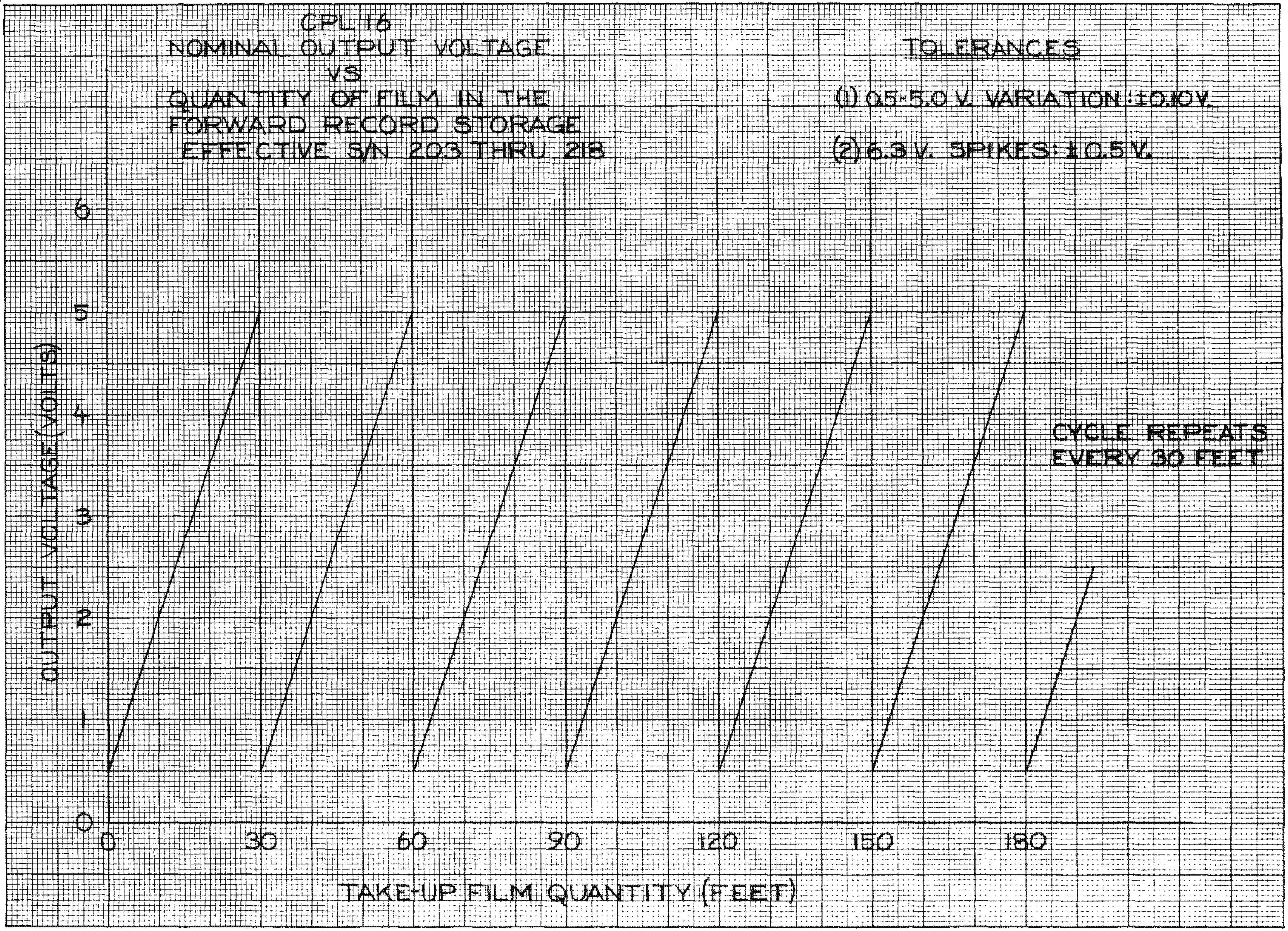


FIGURE XVII

(S) 3320

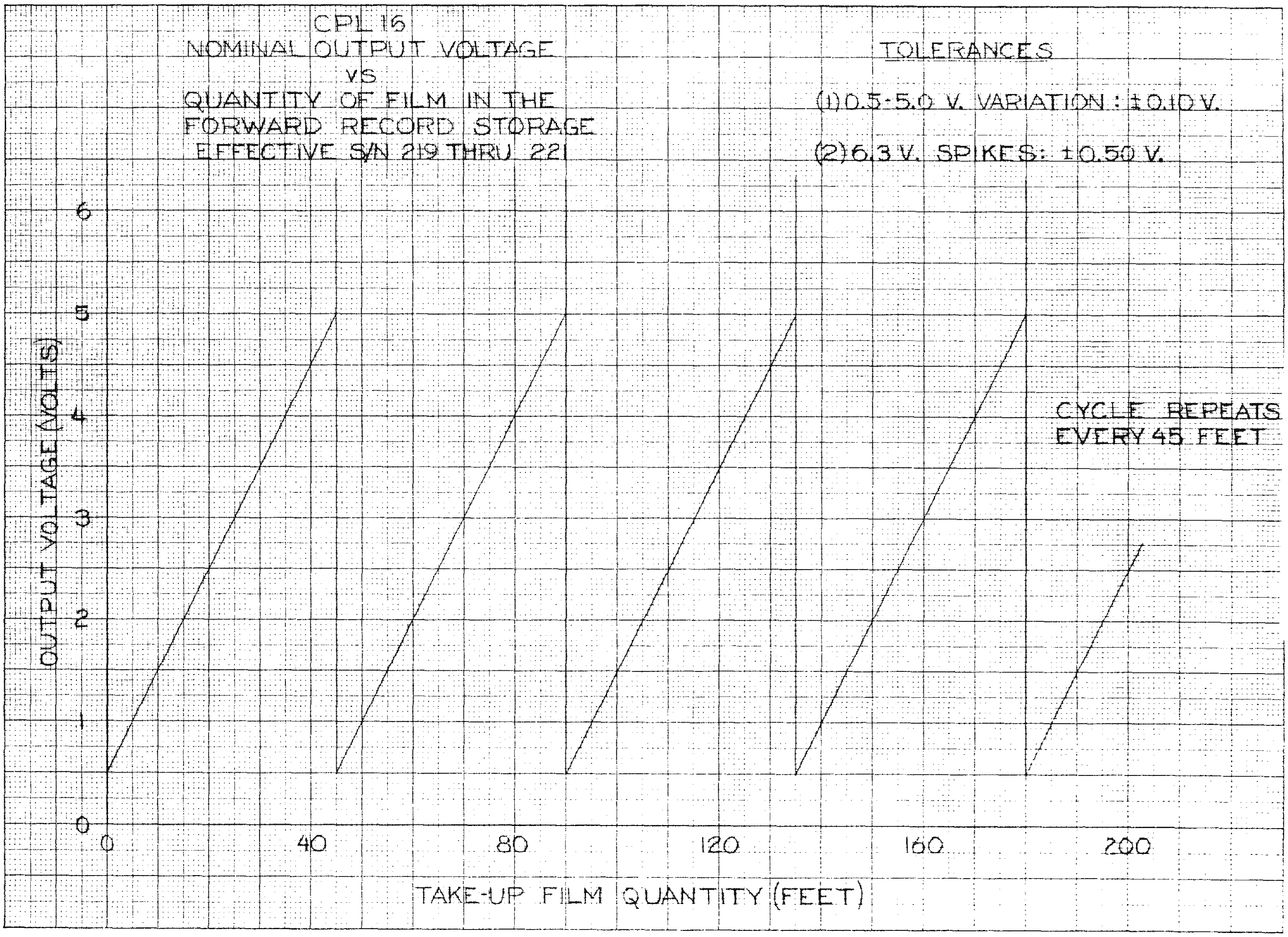


FIGURE XVII a

(S) 33ap

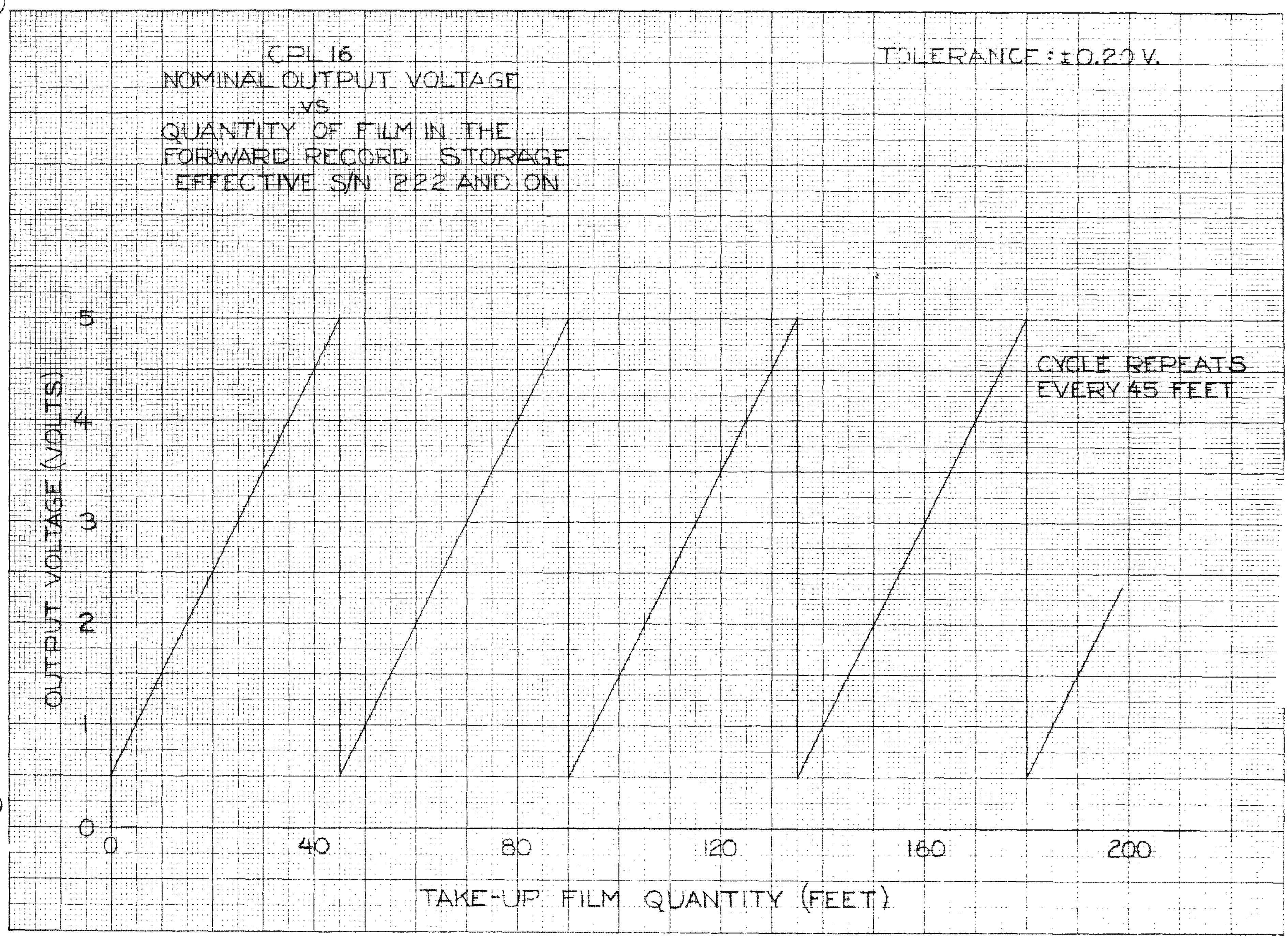


FIGURE XVII b

(S) 33aq

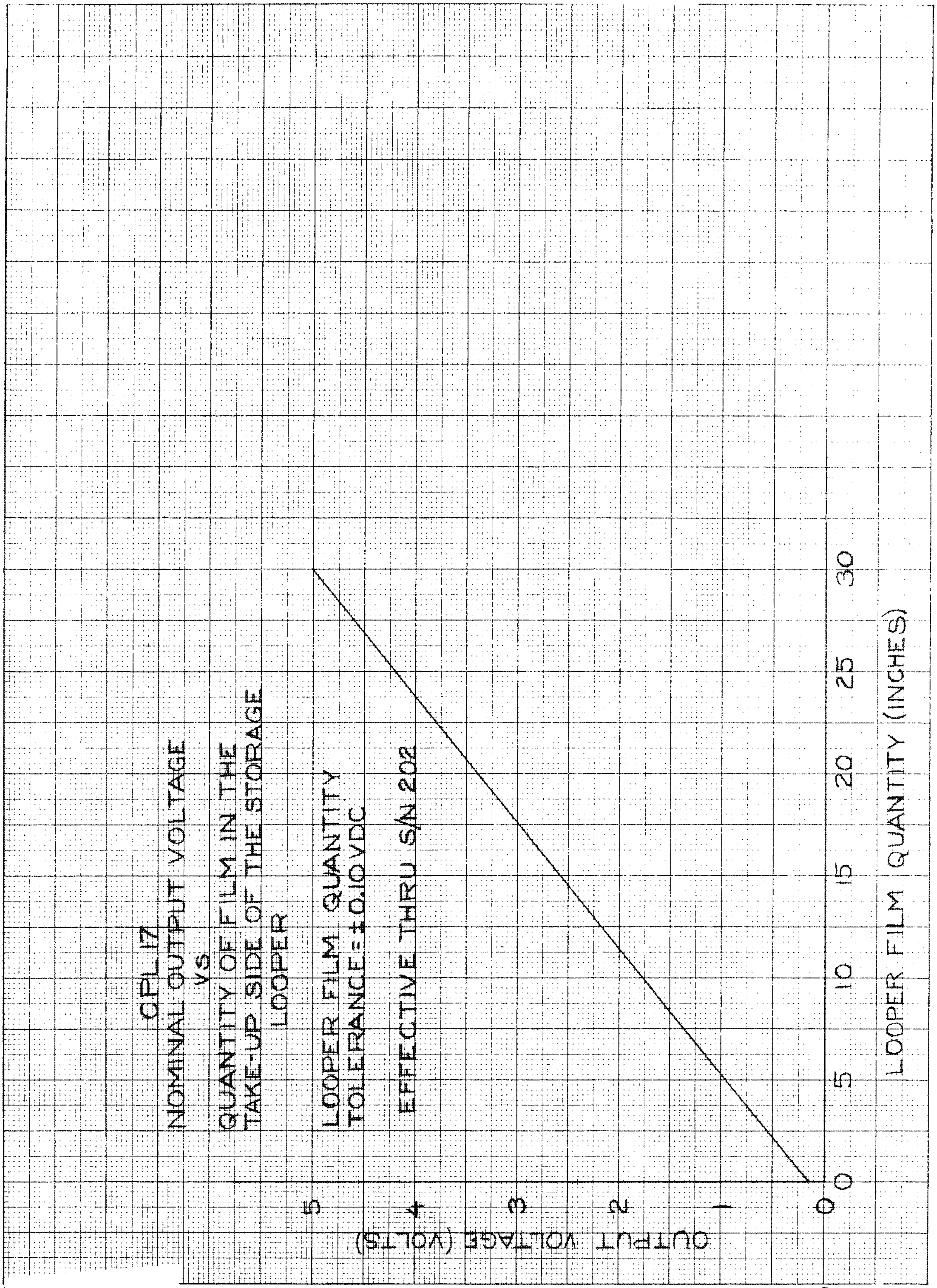


FIGURE · XVIII

(S) 33ar

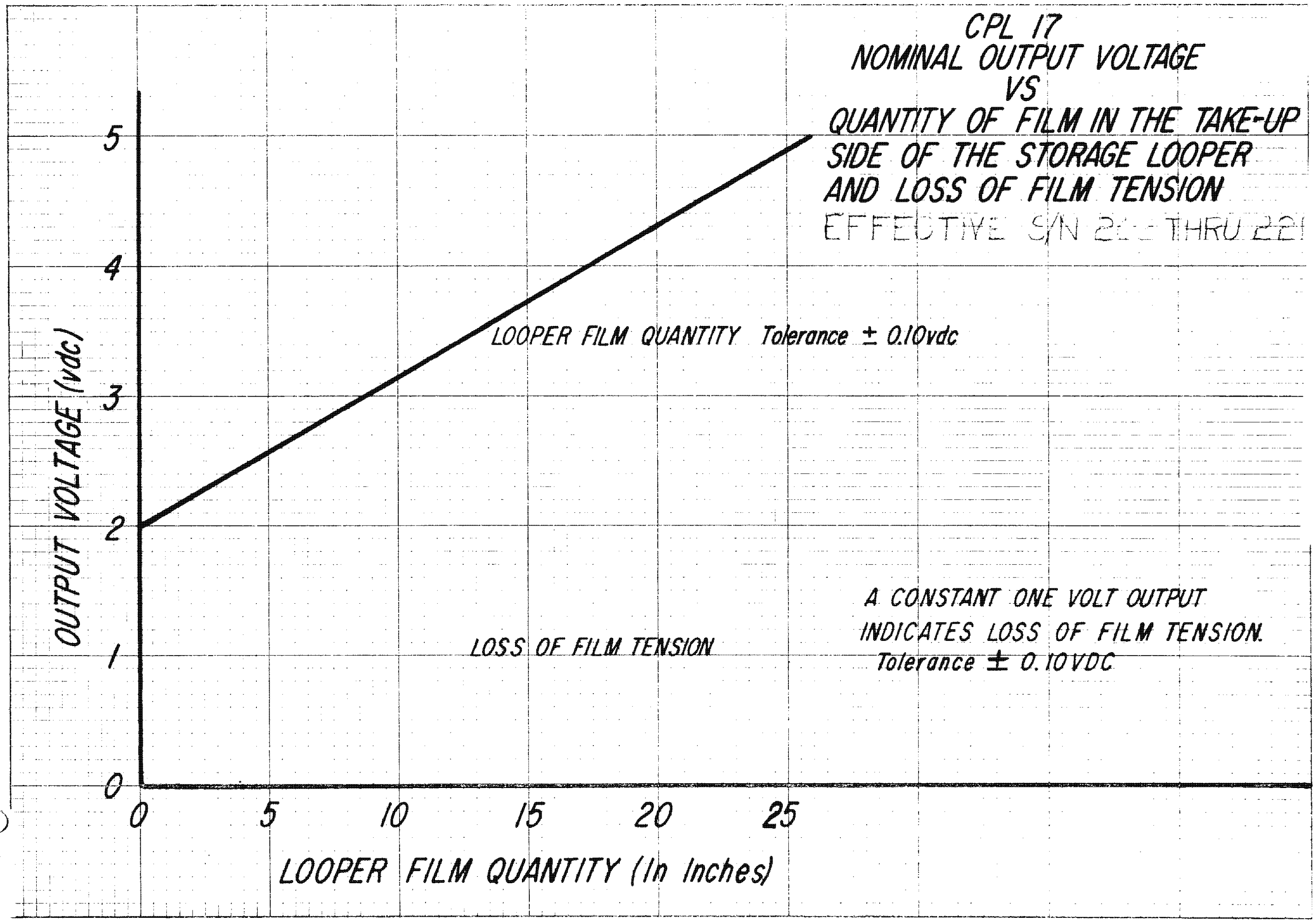


FIGURE XVIII a

802-153

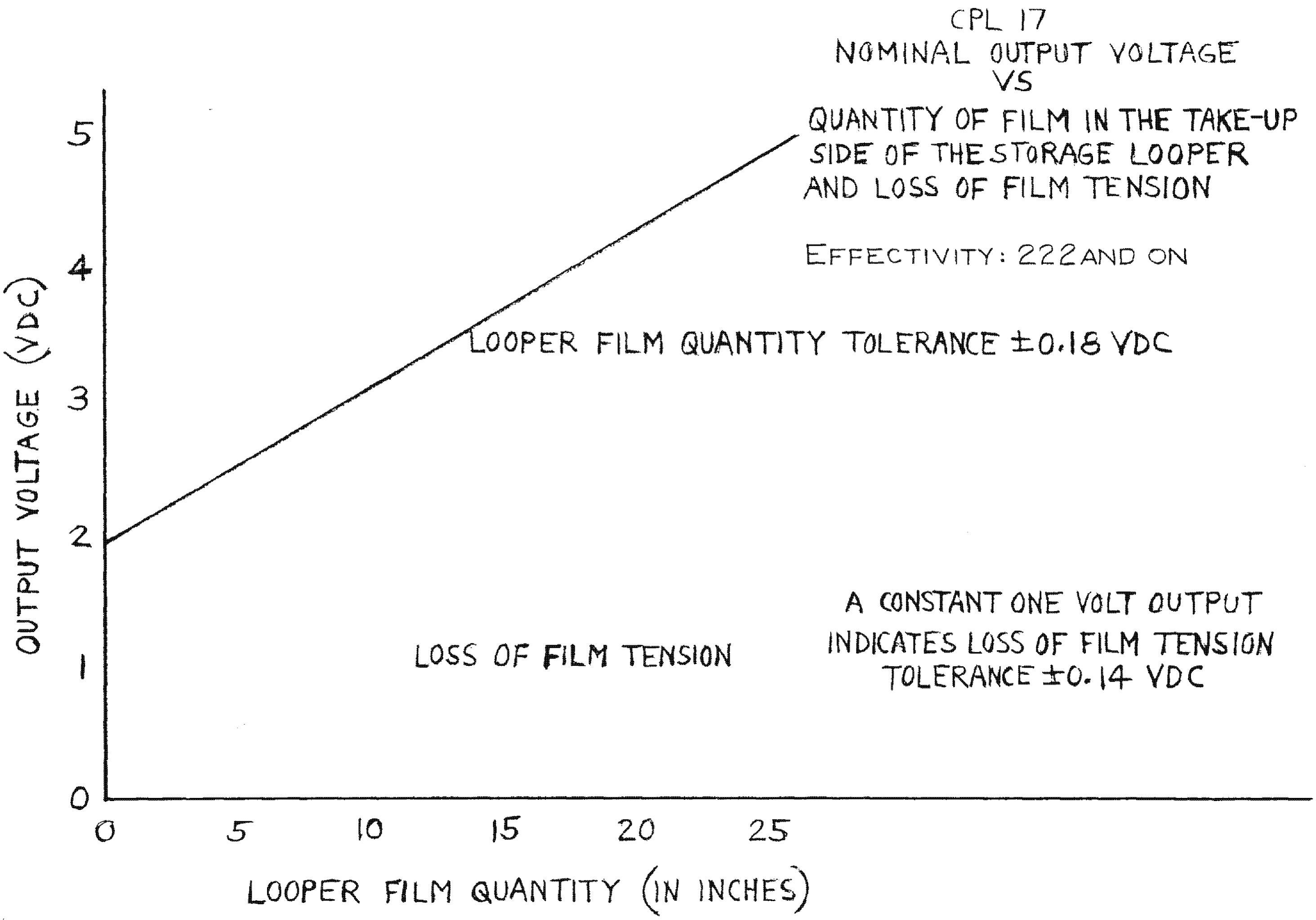
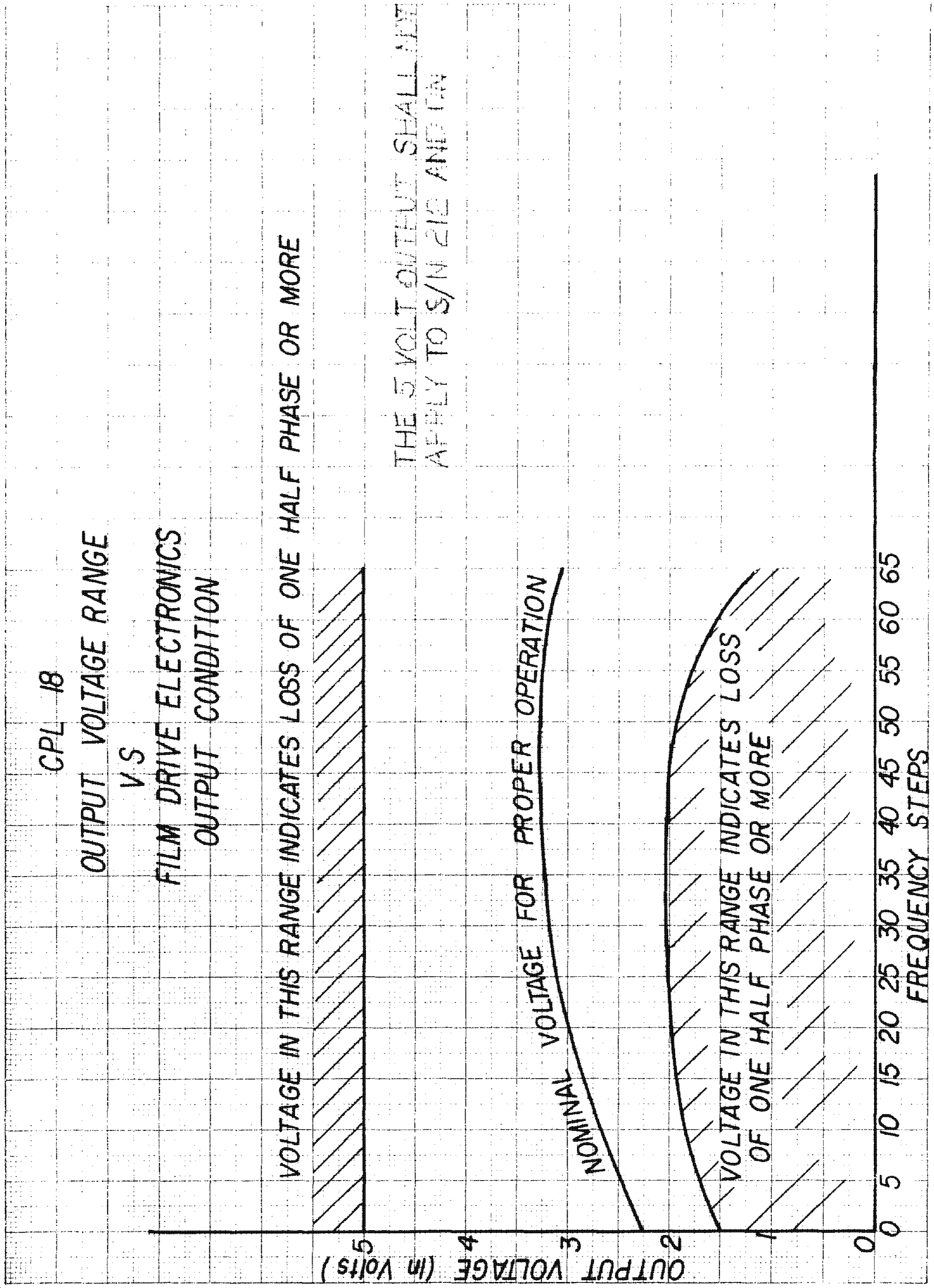


FIGURE XVIII (b)

(S) 33at

C05098937

302-153



R

FIGURE XIX

S

33au

C05098937

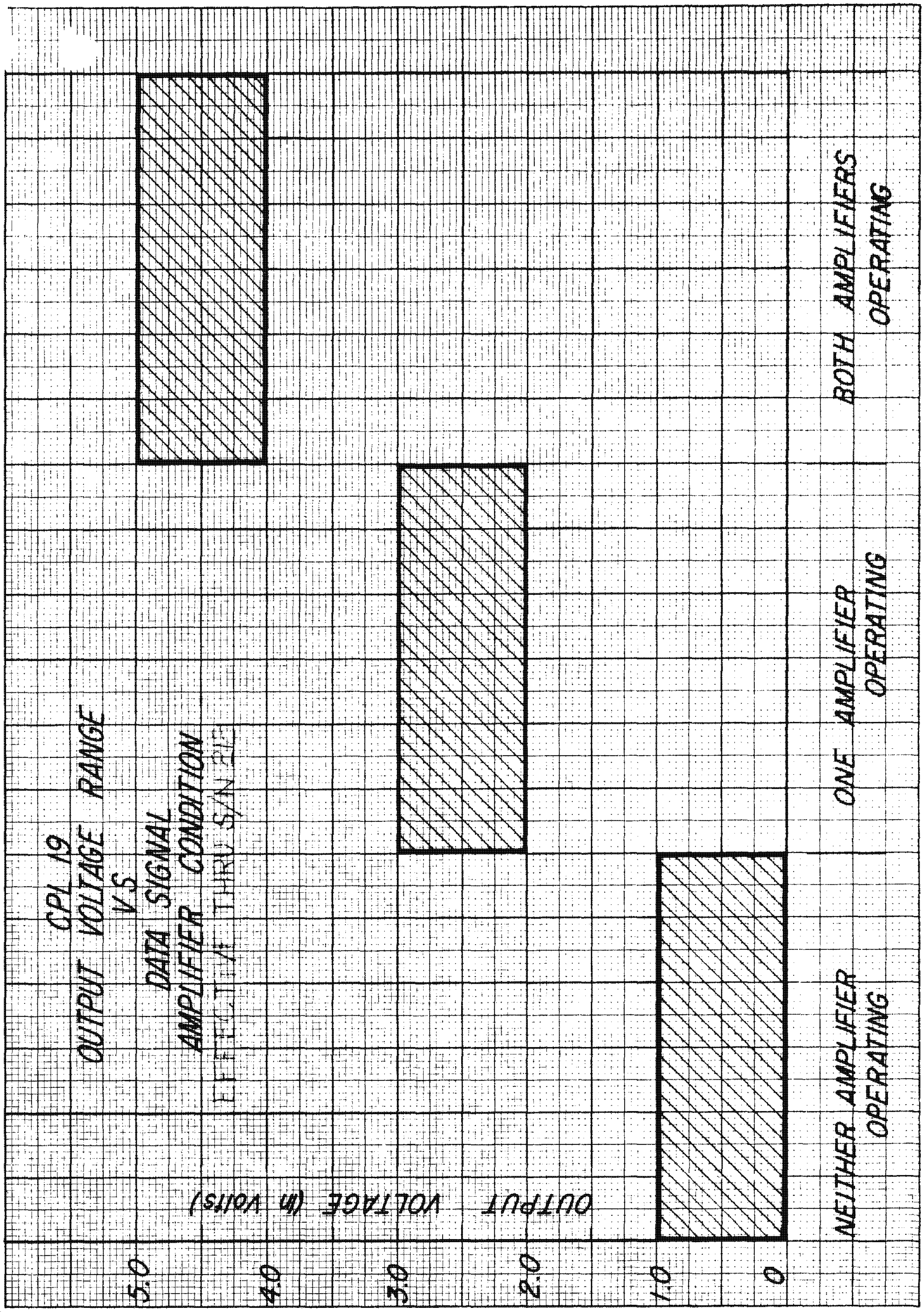


FIGURE XX

R S 33av

CPL 19

Data Signal Test Point Voltage

Effective S/N 213 thru S/N 237

Data Signal Output Status		Test Point Output
Amplifier "A"	Amplifier "B"	V.D.C.
Output Present	Output Present	4.4 - 5.0
Output Present	No Output	3.3 - 3.9
No Output	Output Present	2.4 - 3.0
No Output	No Output	1.0 - 1.6

When the operational voltage supply is off, the test point output shall be between 0 and 0.5 V.D.C.

FIGURE XX (a)

R

V

S 33aw

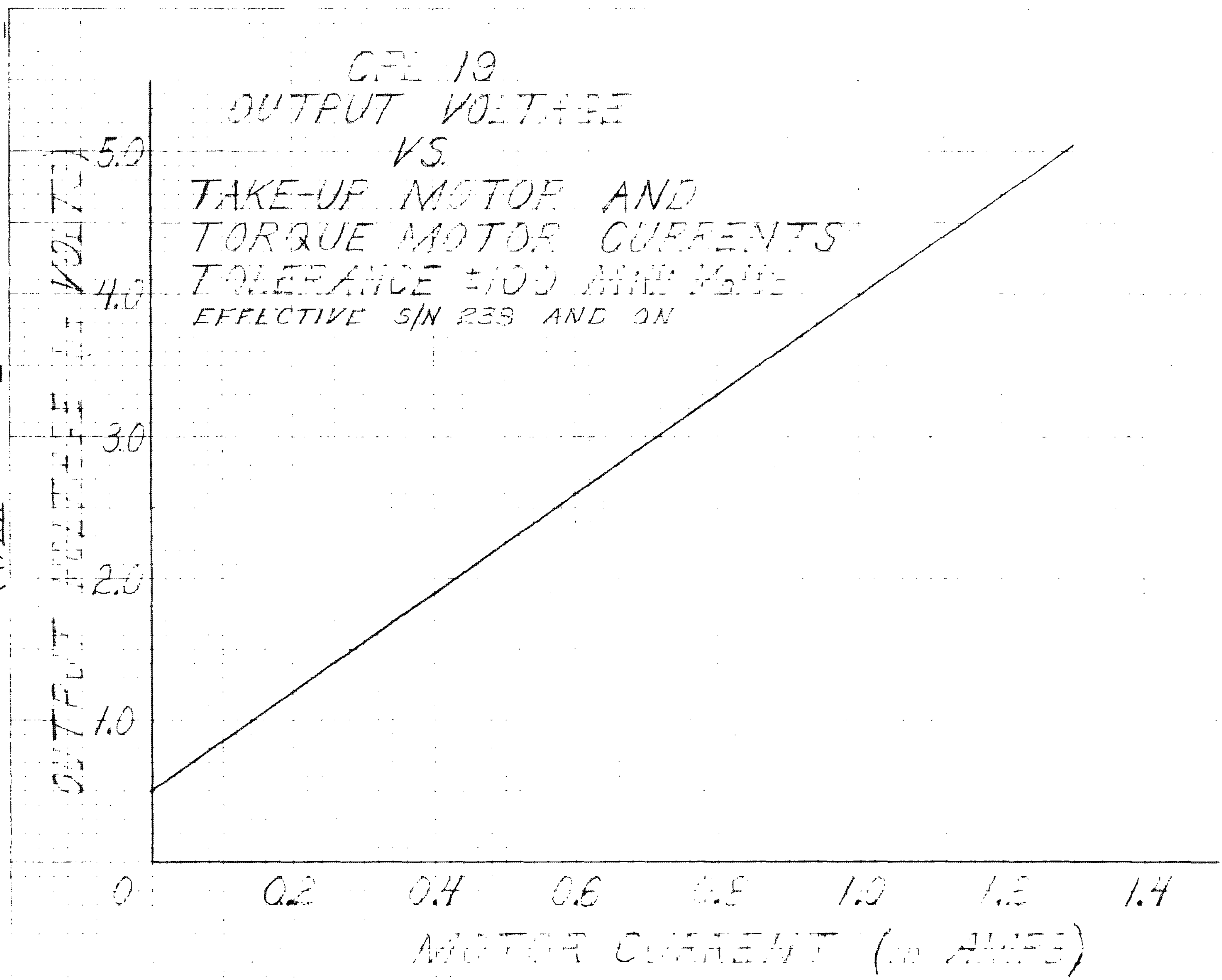

OUTPUT VOLTAGE
VS.
TAKE-UP MOTOR AND
TORQUE MOTOR CURRENTS
EFFECTIVE S/N 233 AND ON
5.0
4.0
3.0
2.0
1.0
0
0.2
0.4
0.6
1.0
1.4
MOTOR CURRENT

FIGURE XX(b)

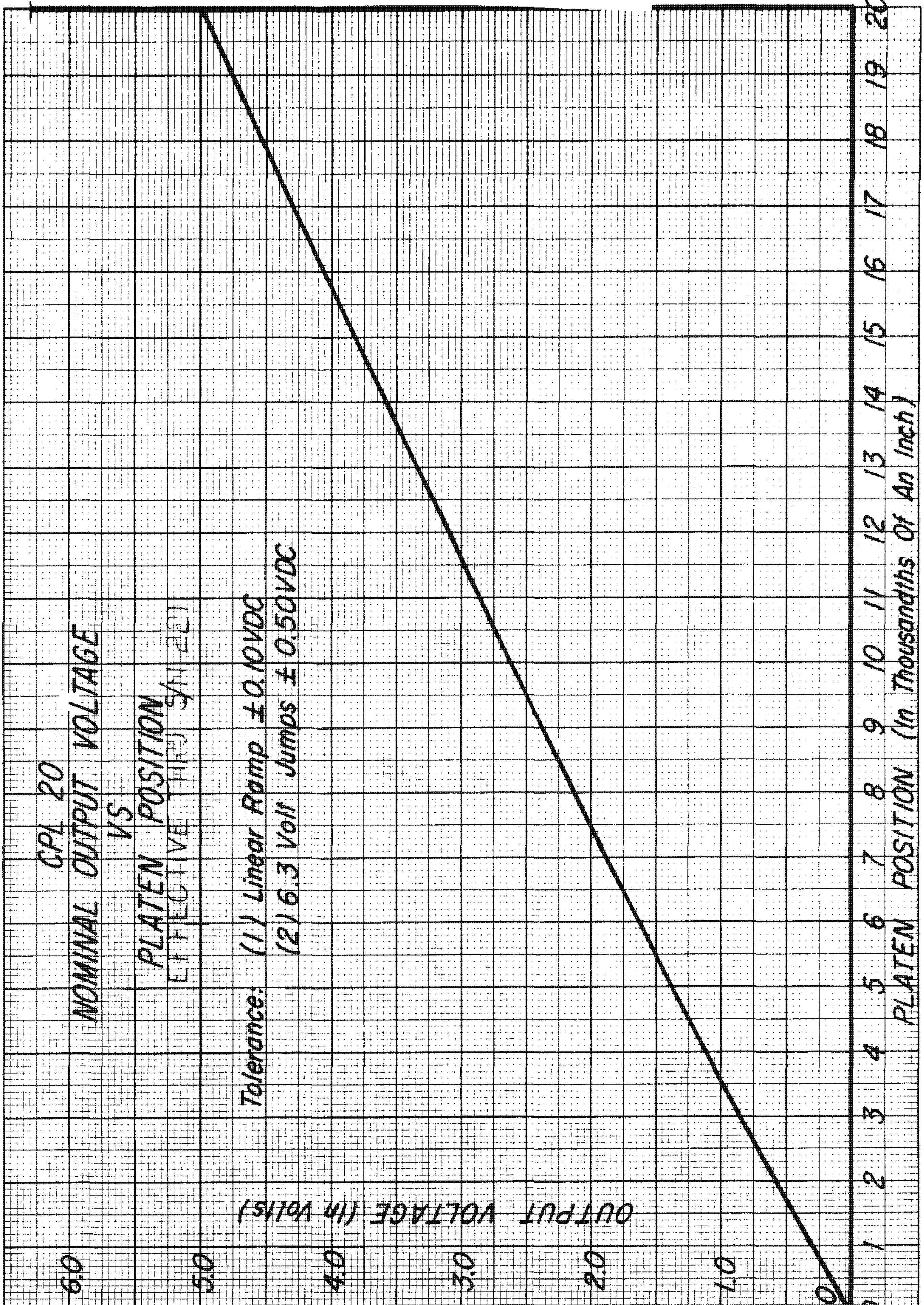


FIGURE XXI

(S) 33ax

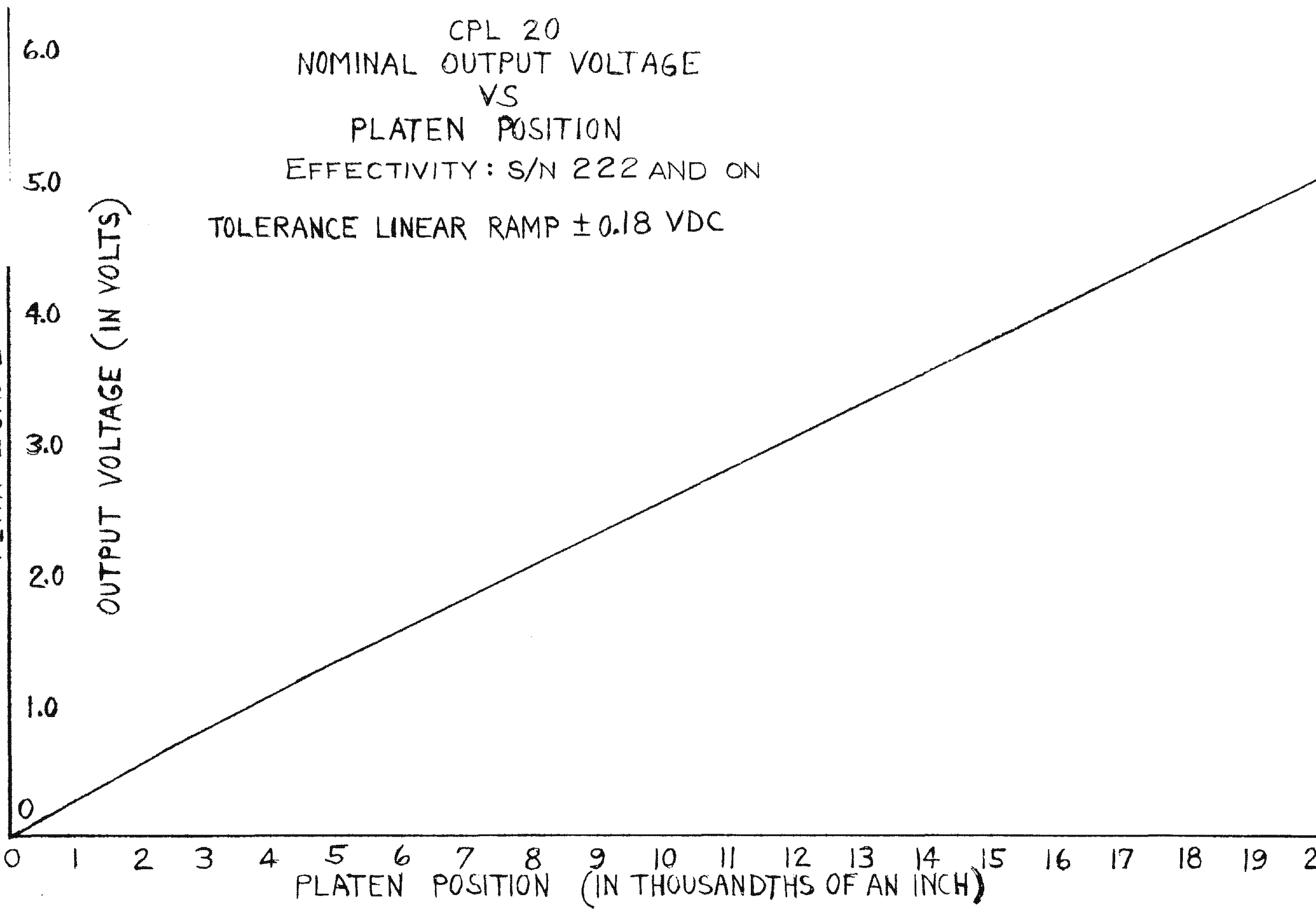


FIGURE XXI(a)

Ⓡ Ⓢ 33 ay

Approved for Release: 2024/01/30 C05098937

C05098937

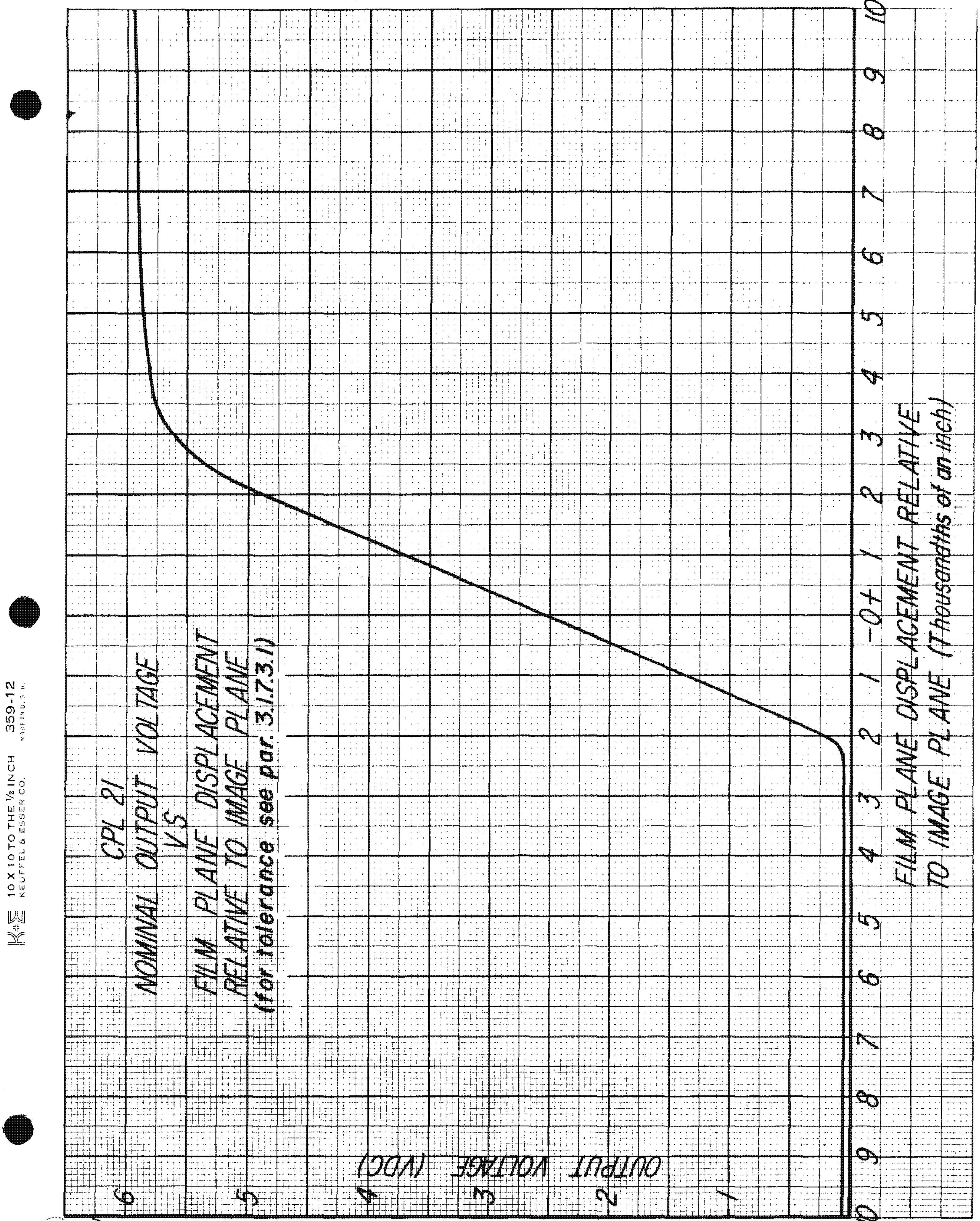


FIGURE XXII

33az

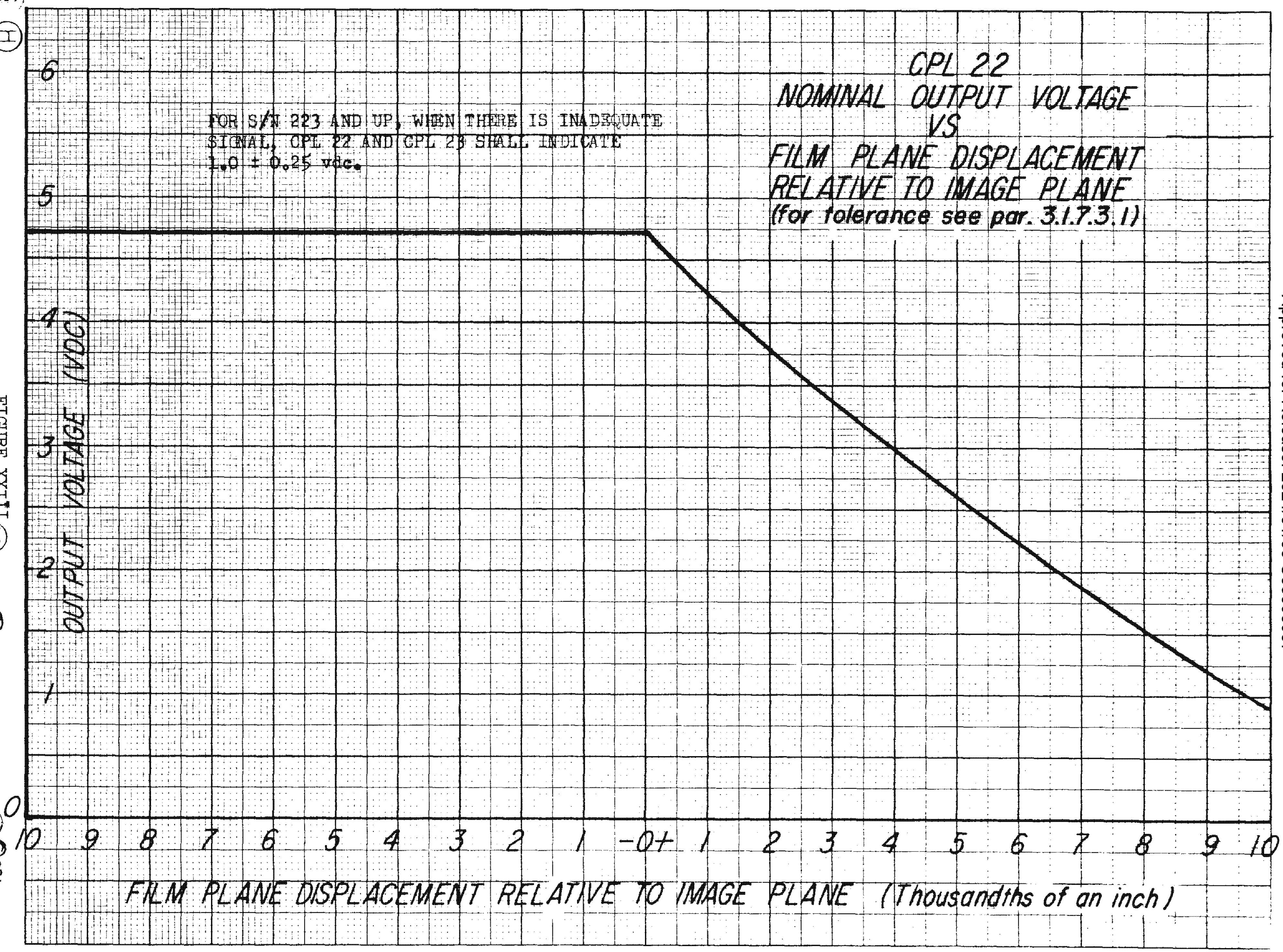


FIGURE XXIII

G H M P R S 33ba

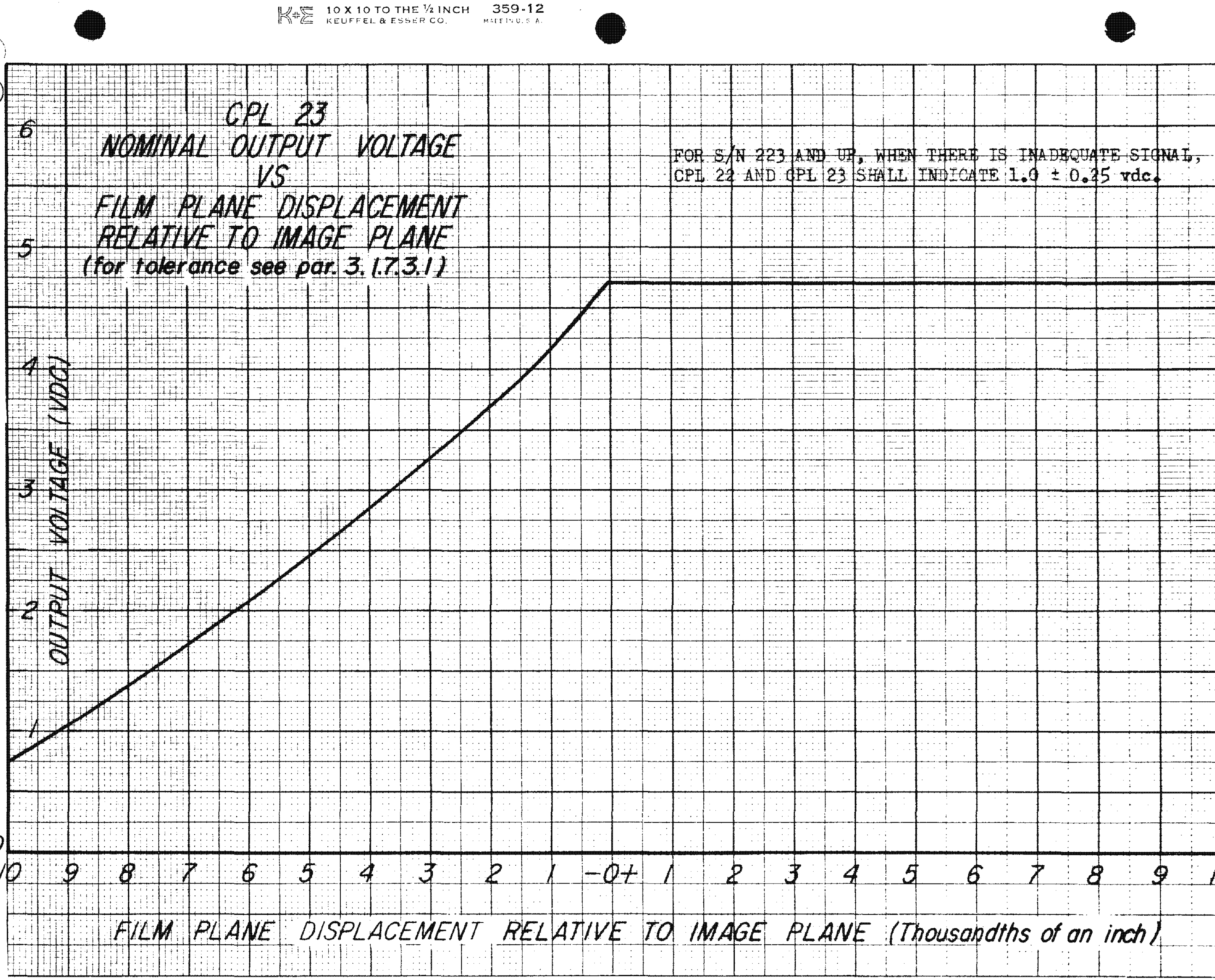

CPL 23
NOMINAL OUTPUT VOLTAGE
VS
FILM PLANE DISPLACEMENT
RELATIVE TO IMAGE PLANE
(for tolerance see par. 3.1.7.3.1)
FOR S/N 223 AND UP, WHEN THERE IS INADEQUATE SIGNAL,
CPL 22 AND CPL 23 SHALL INDICATE 1.0 ± 0.25 vdc.
OUTPUT VOLTAGE (VDC)
0
1
2
3
4
5
6
10 9 8 7 6 5 4 3 2 1 -0+ 1 2 3 4 5 6 7 8 9 10
FILM PLANE DISPLACEMENT RELATIVE TO IMAGE PLANE (Thousandths of an inch)
K+E 10 X 10 TO THE 1/2 INCH KEUFFEL & ESSER CO. 359-12

FIGURE XXIV

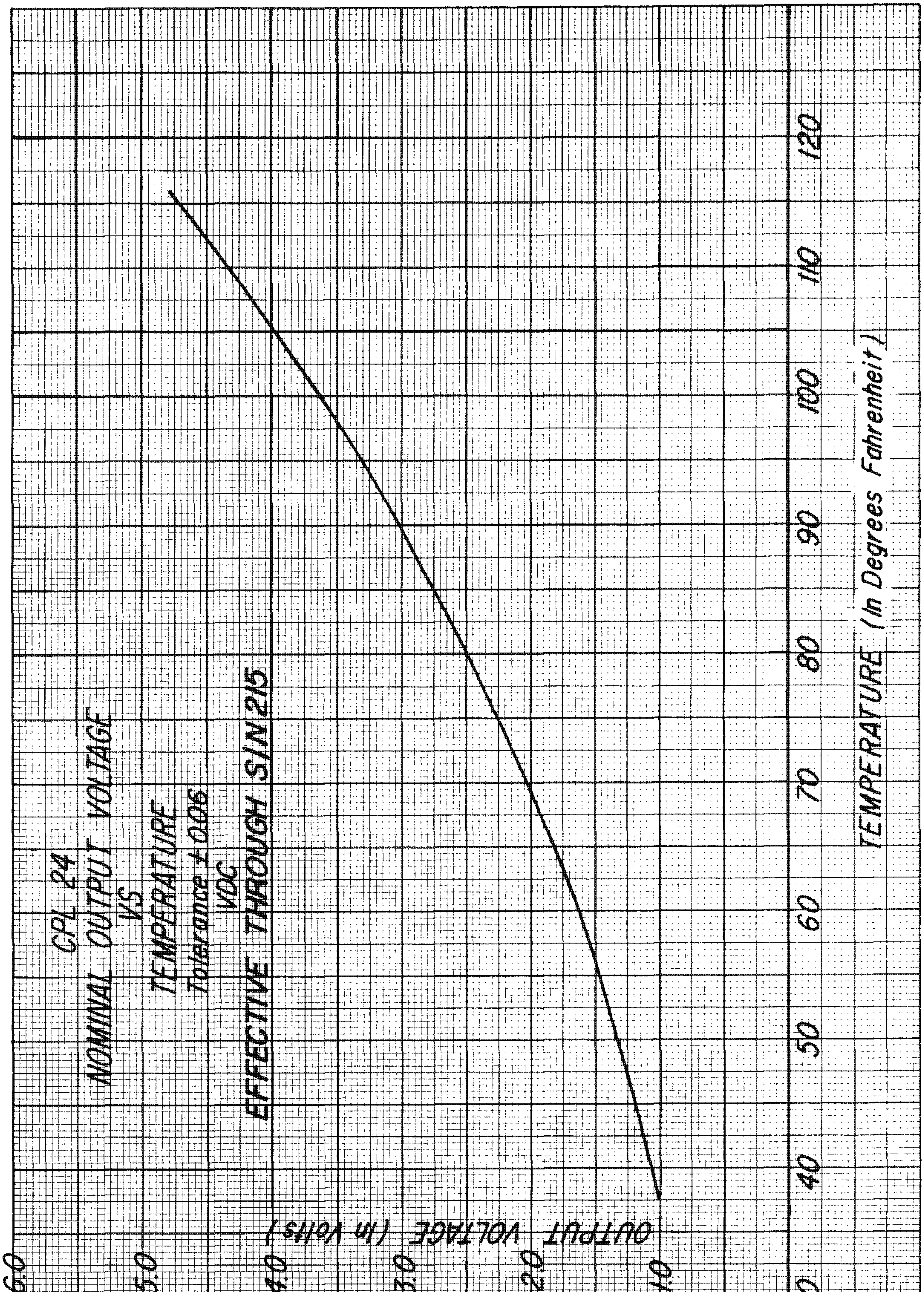

CPL 24
NOMINAL OUTPUT VOLTAGE
VS
TEMPERATURE
Tolerance ±0.06
VDC
EFFECTIVE THROUGH S/N 215
OUTPUT VOLTAGE (In Volts)
6.0
5.0
4.0
3.0
2.0
1.0
0
TEMPERATURE (In Degrees Fahrenheit)
30
40
50
60
70
80
90
100
110
120

FIGURE XXV

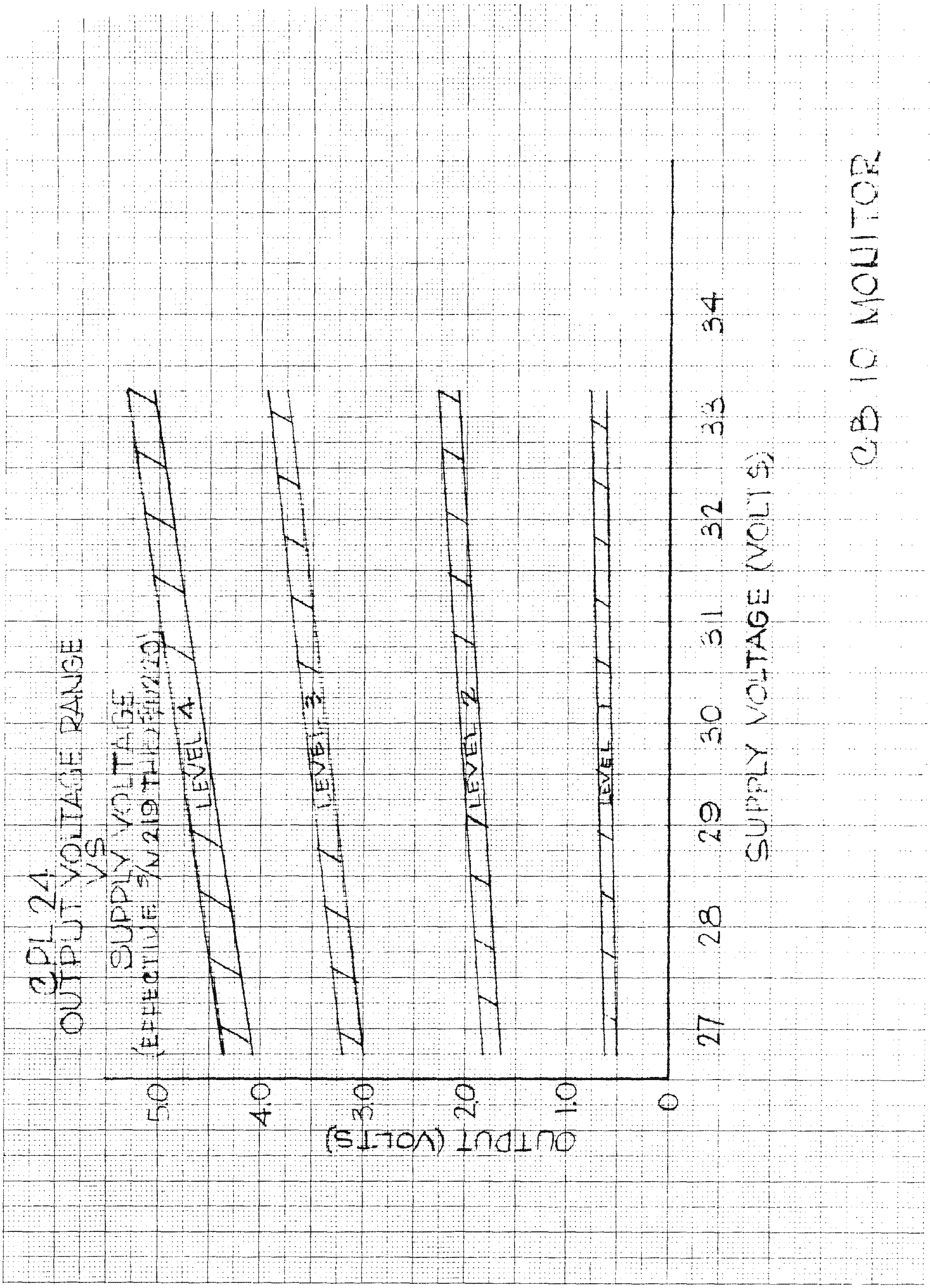


FIGURE XXV a

33bd

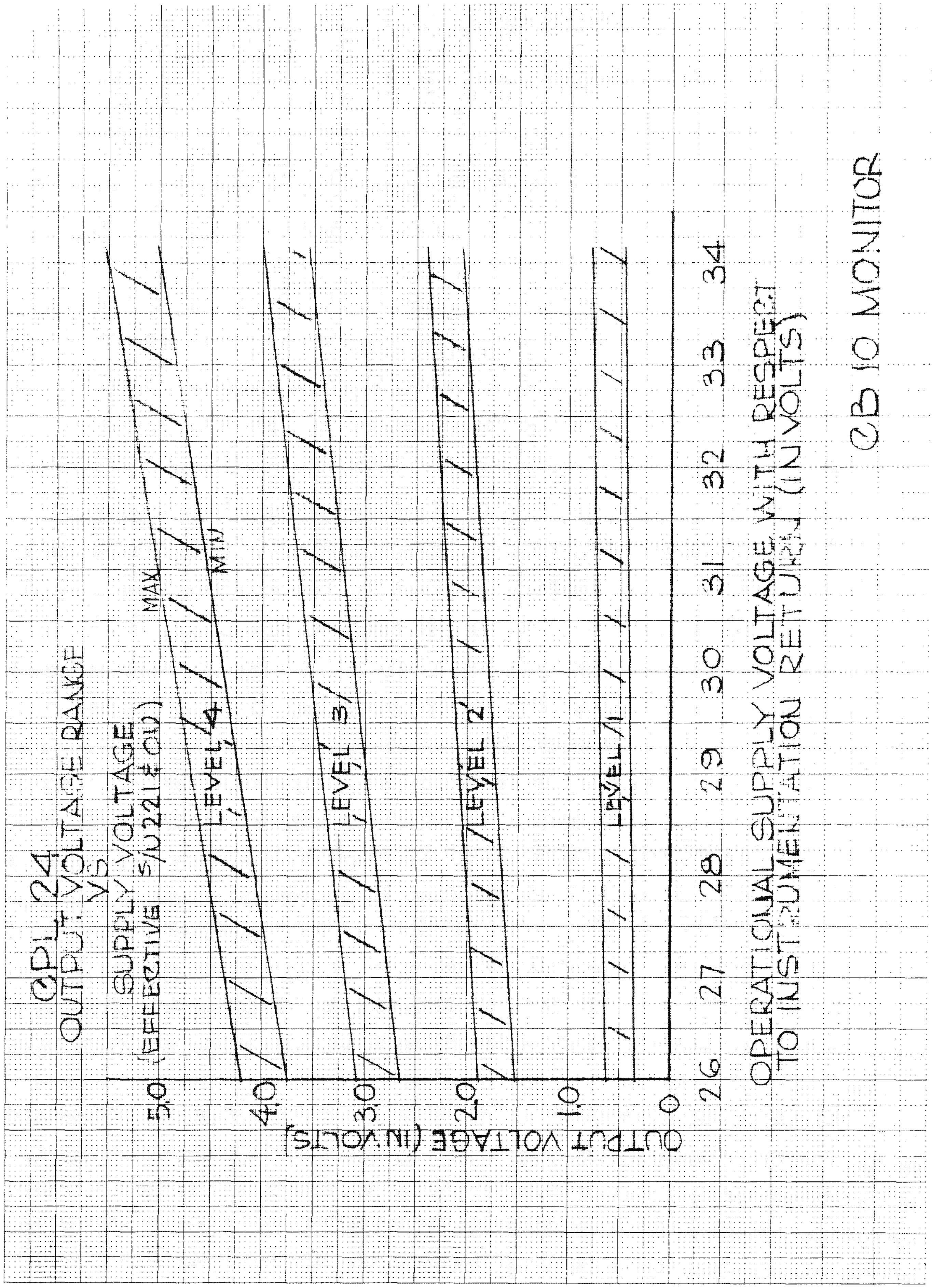
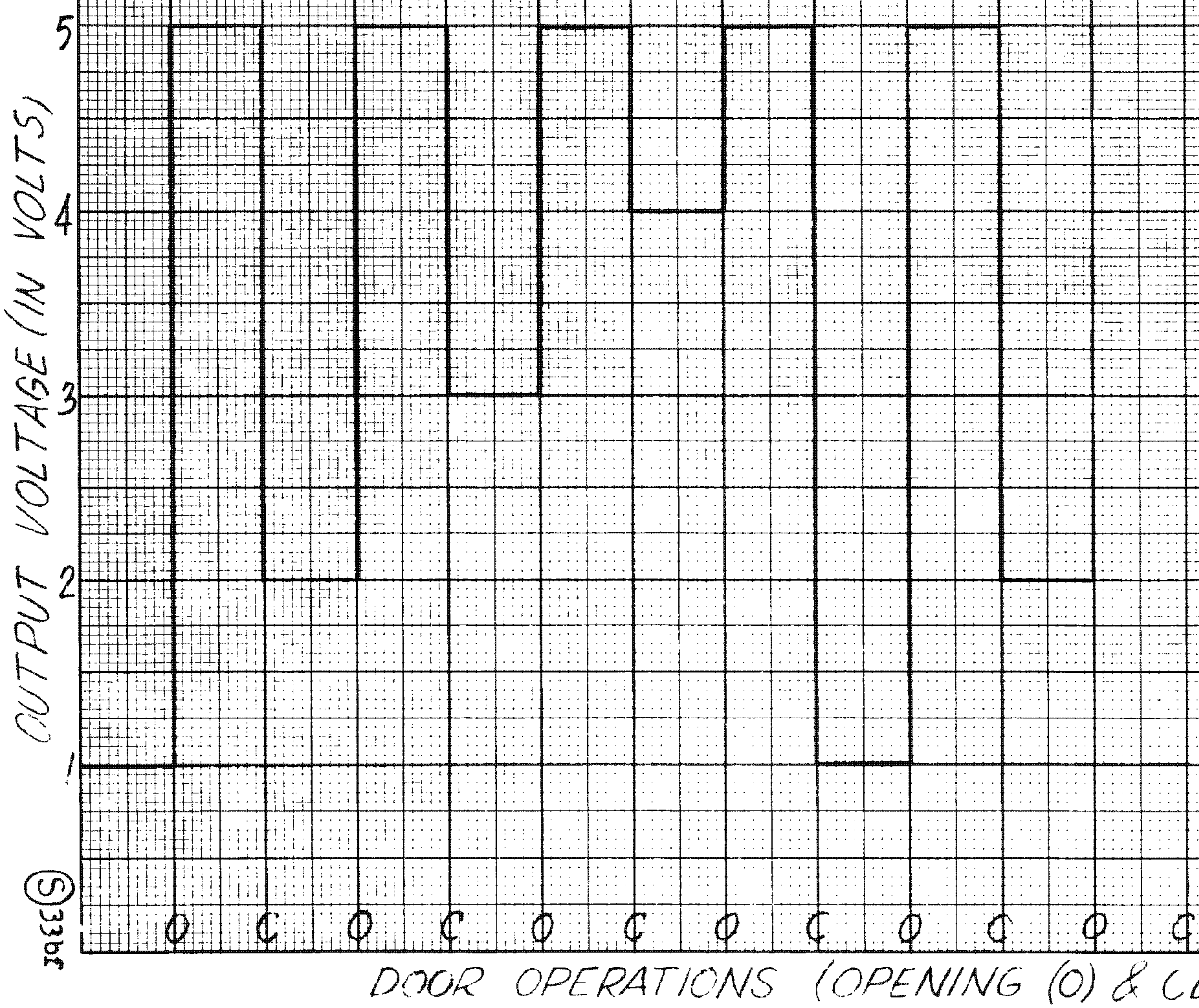


FIGURE XXV b

S 33be

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

CPL 25
NOMINAL OUTPUT VOLTAGE
VS
DOOR STATE (OPEN OR CLOSED)
EFFECTIVE S/N 206 AND ON



NOTES:

1. WHEN DOOR IS OPEN THE OUTPUT SHOULD ALWAYS BE 5 +0.5 -0.0 VOLTS.

2. EACH TIME DOOR IS CLOSED, THE OUTPUT VOLTAGE INCREASES, BY INCREMENTS OF 1 VOLT, UP TO 4 VOLTS. THE CYCLE THEN REPEATS STARTING AT THE 1 VOLT LEVEL. THE TOLERANCE ON THE 4 LEVELS IS ±0.1 VOLT.

FIGURE XXVI

33bf

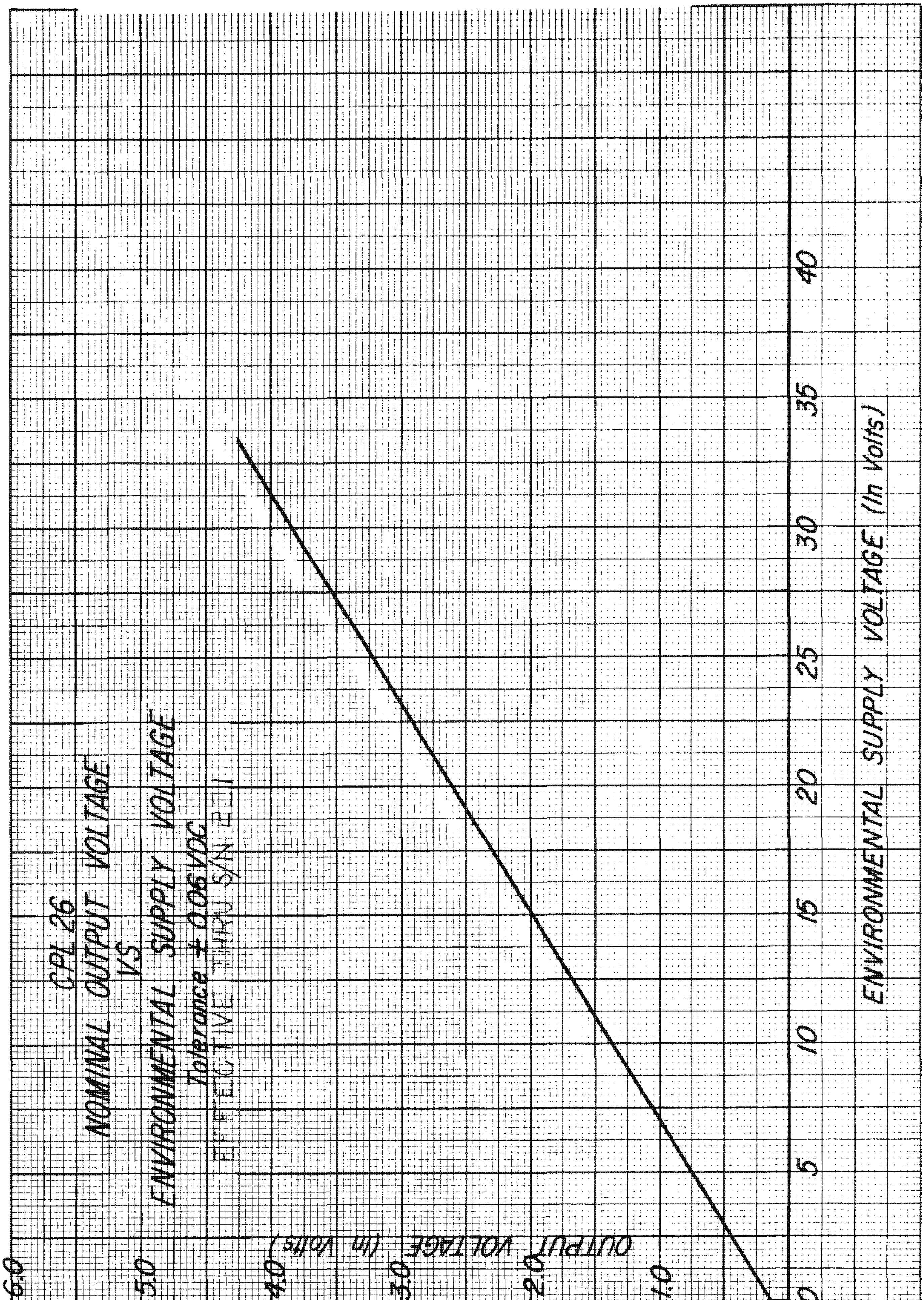


FIGURE XXVII

(S) 33bg

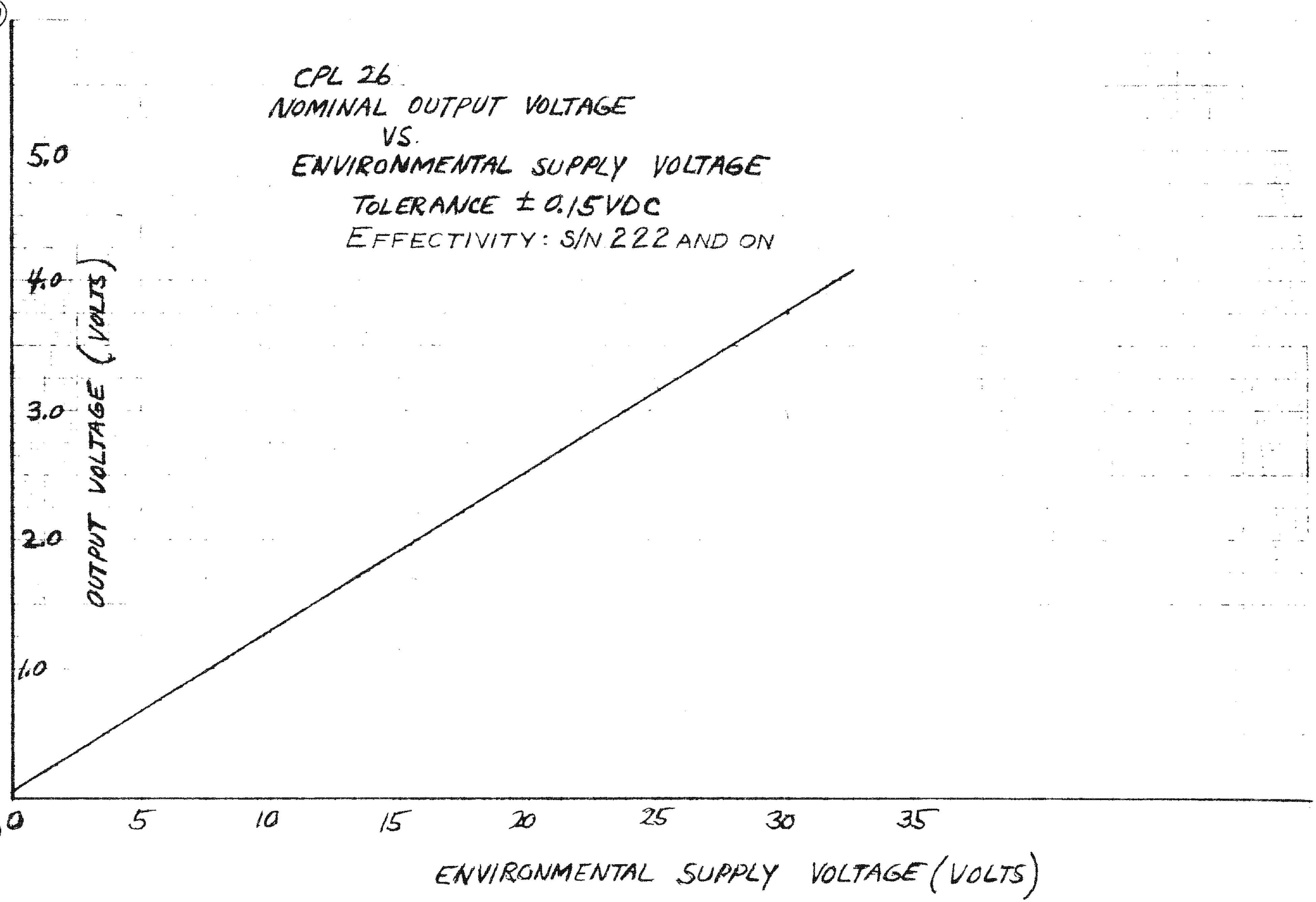


FIG XXVII (a)

Approved for Release: 2024/01/30 C05098937

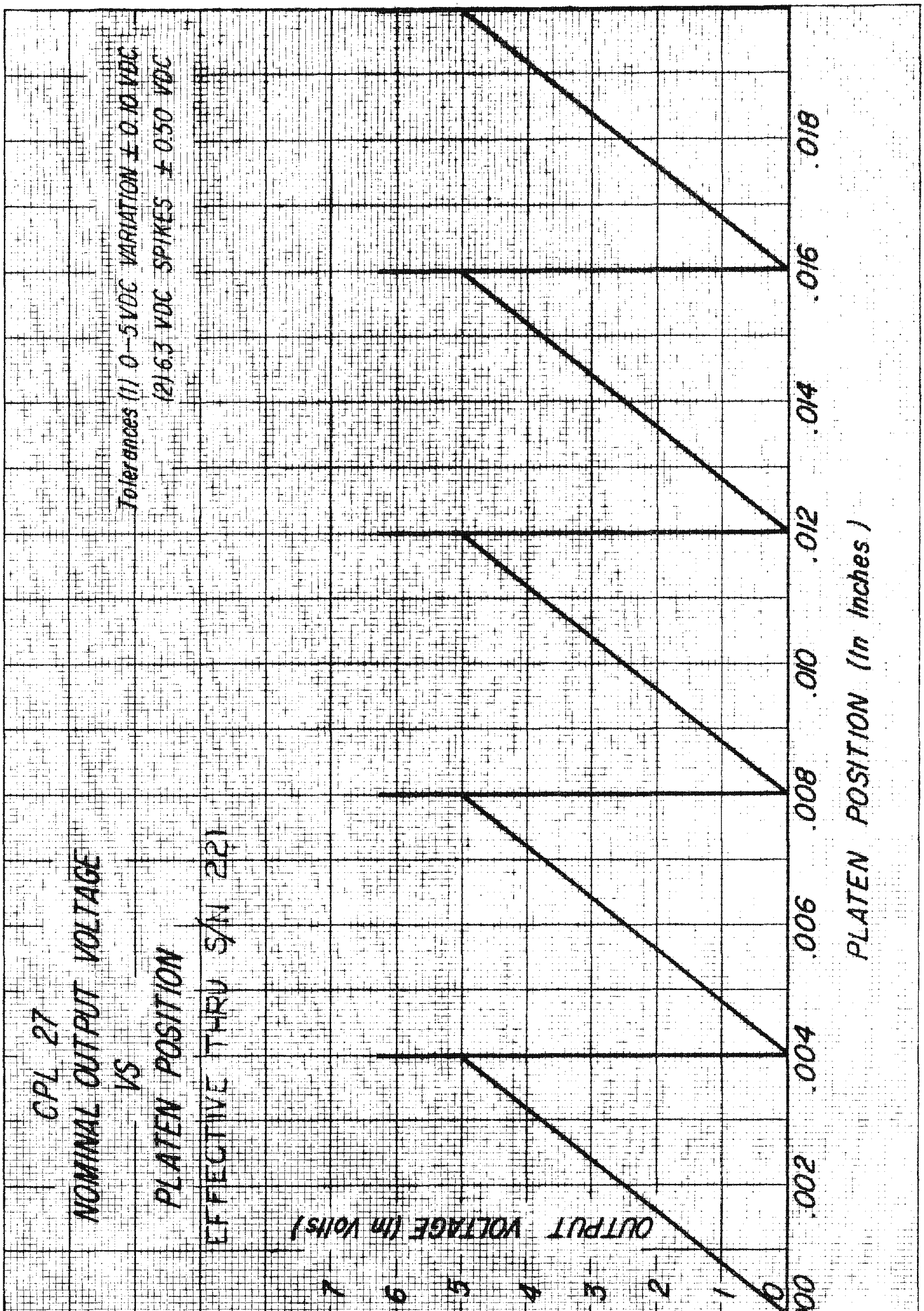


FIGURE XXVIII

Ⓢ 33bi

CPL 27
NOMINAL OUTPUT VOLTAGE
VS
PLATEN POSITION
TOLERANCE ±0.18 VDC
EFFECTIVITY: S/N 222 AND ON

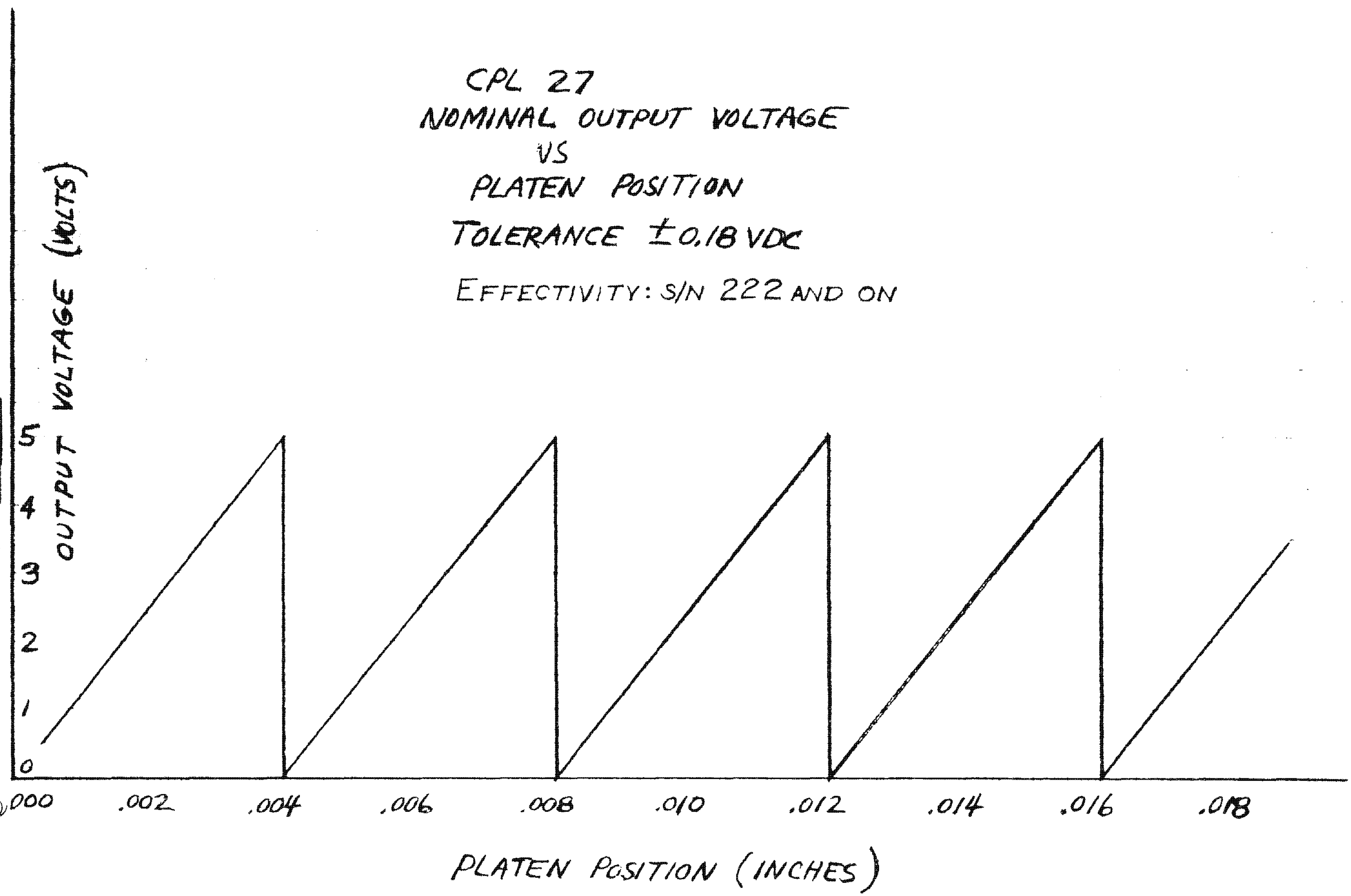


FIG XXVIII (a)

S 330

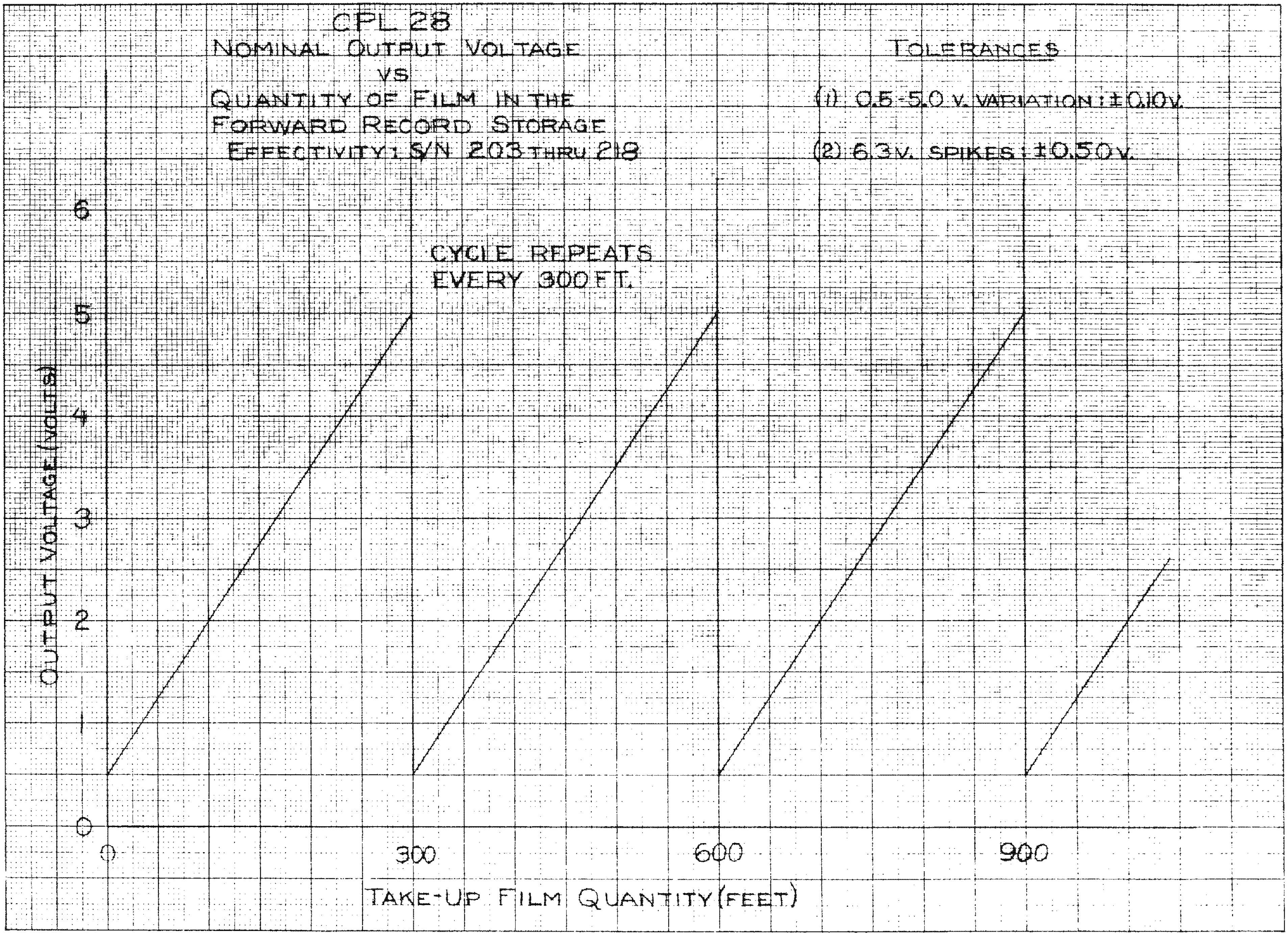


FIGURE XXIX

Approved for Release: 2024/01/30 C05098937

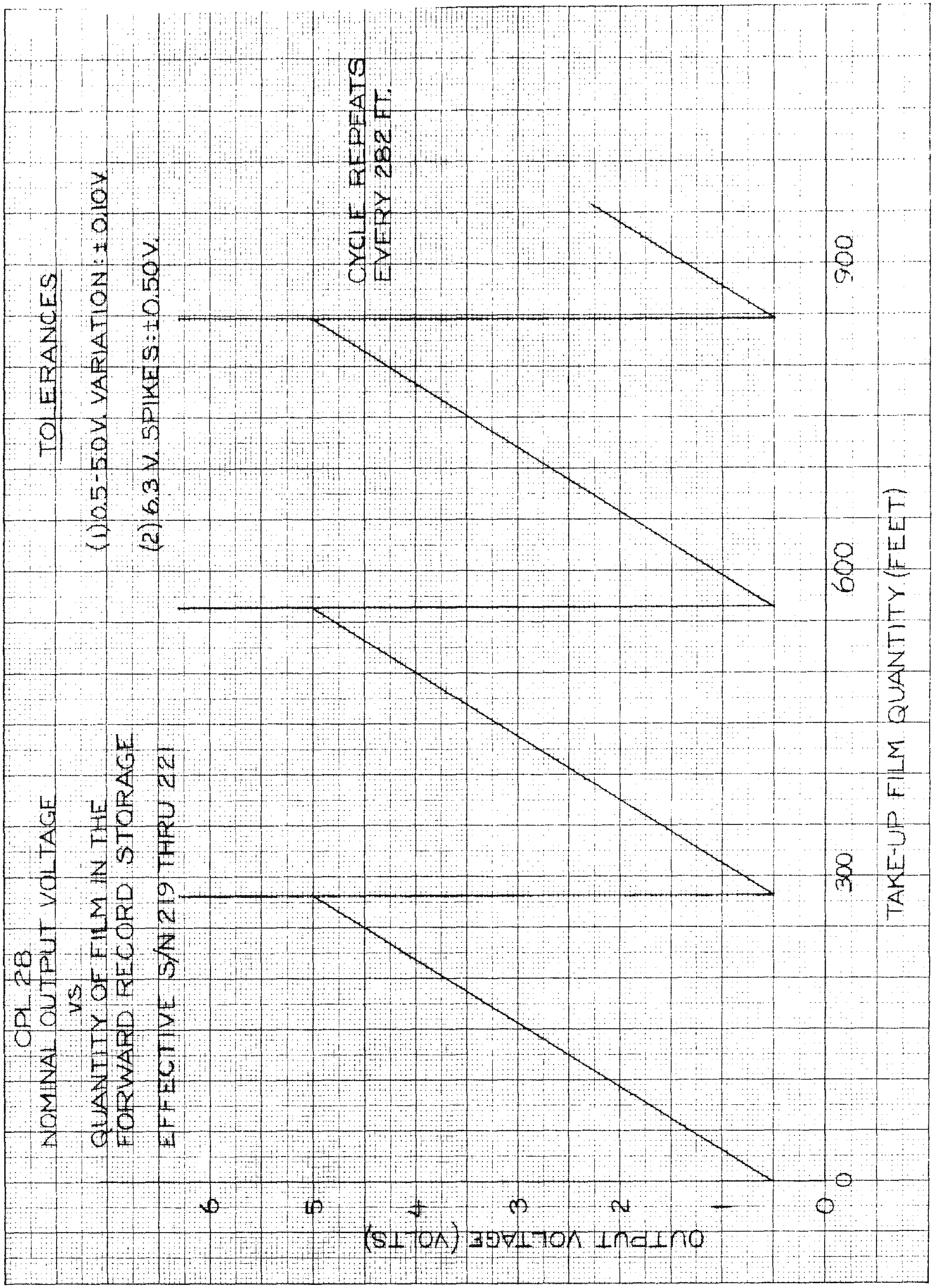


FIGURE XXIX a

(S) 336L

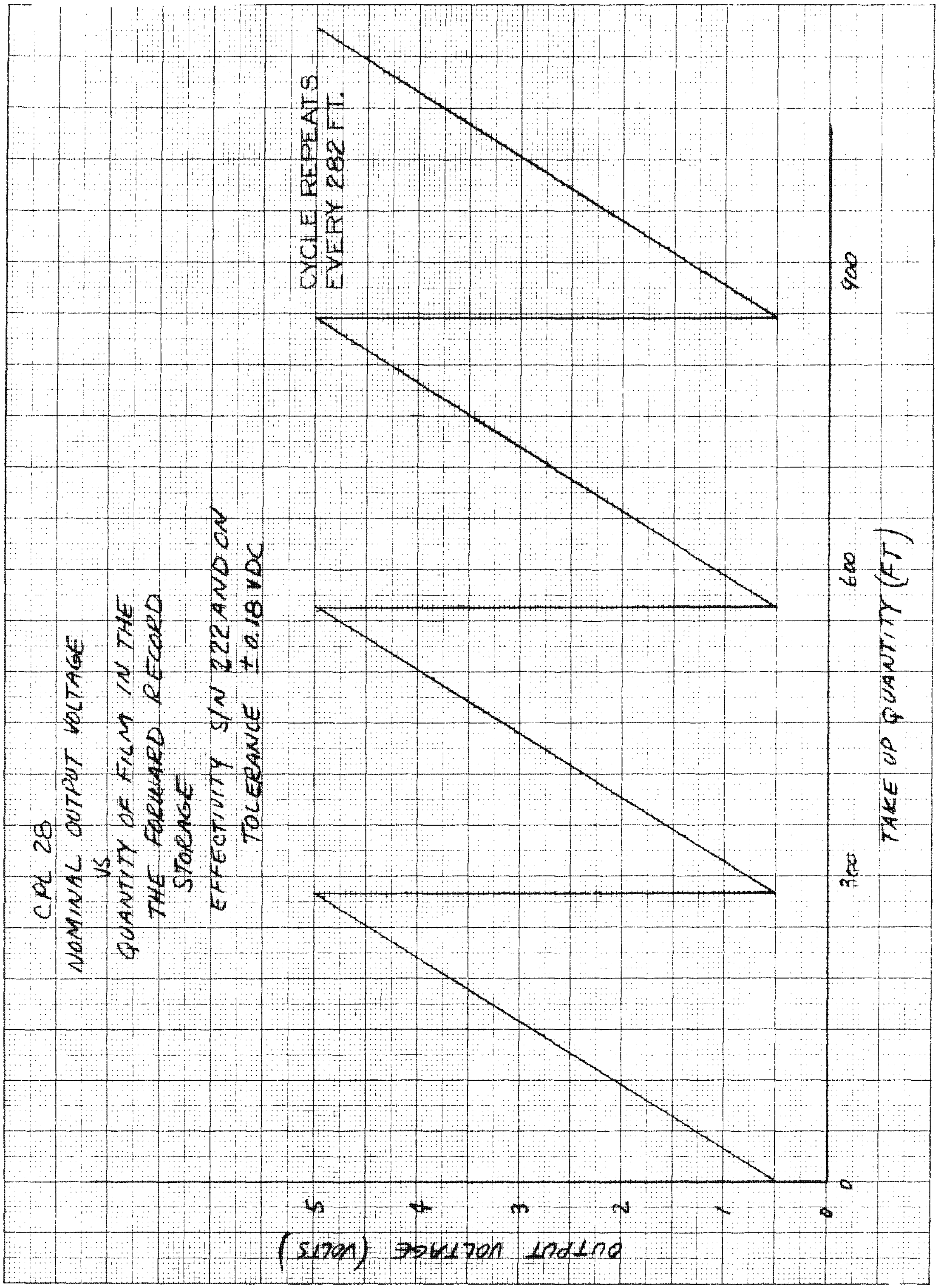
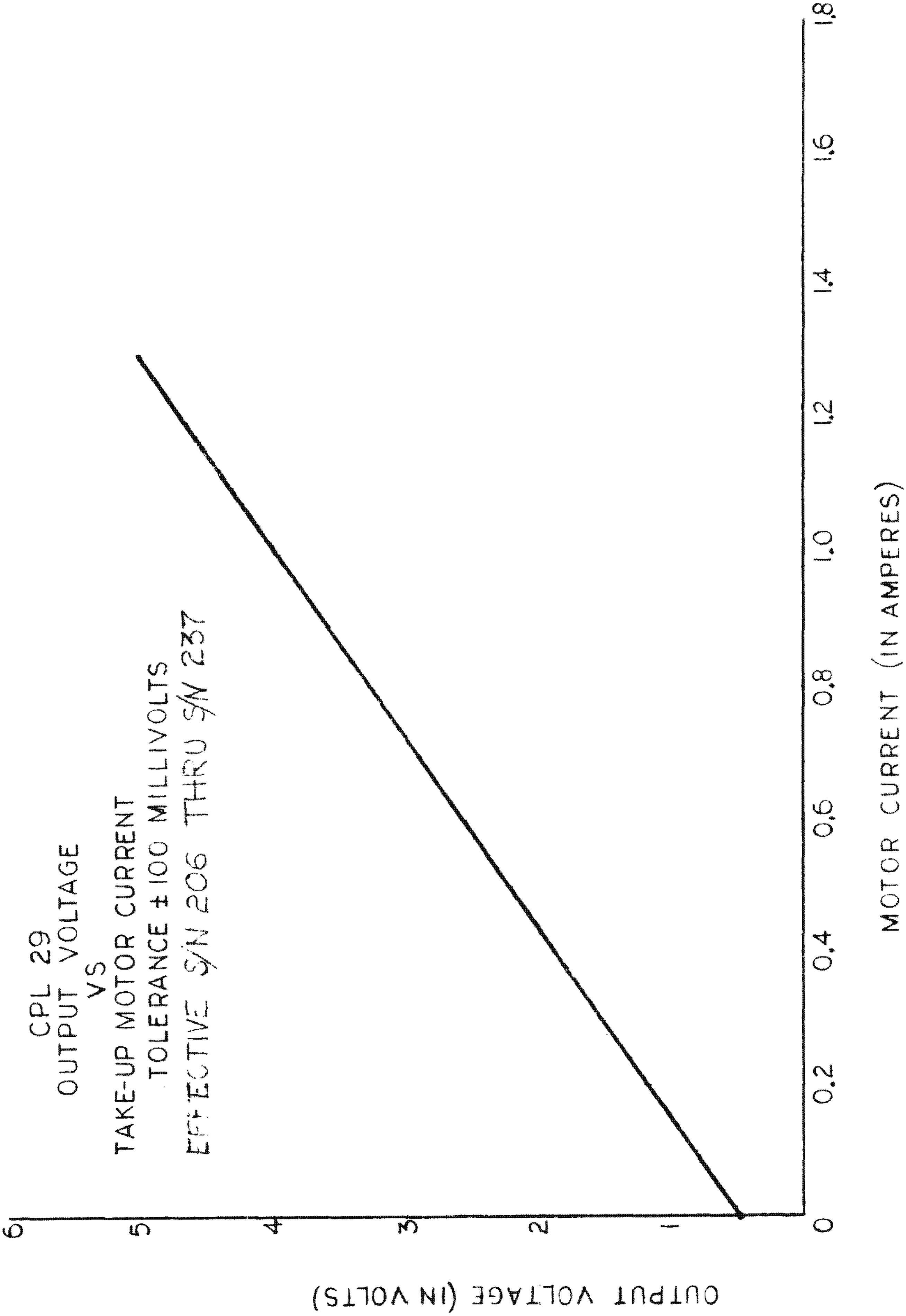


FIG XXIX (b)

S 33bm

802-153



(V) (R)

FIGURE XXX

(S) 33bn

CPL 29

DATA SIGNAL TEST POINT VOLTAGE

Effective S/N 238 and on

Data Signal Output Status: Amplifier A	Data Signal Output Status: Amplifier B	Test Point Output VDC
Output Present	Output Present	4.4 - 5.0
Output Present	No Output	3.3 - 3.9
No Output	Output Present	2.4 - 3.0
No Output	No Output	1.0 - 1.6

When the operational voltage supply is OFF, the test point output shall be between 0 and 0.5 VDC.

FIGURE XXX (a)

(V)

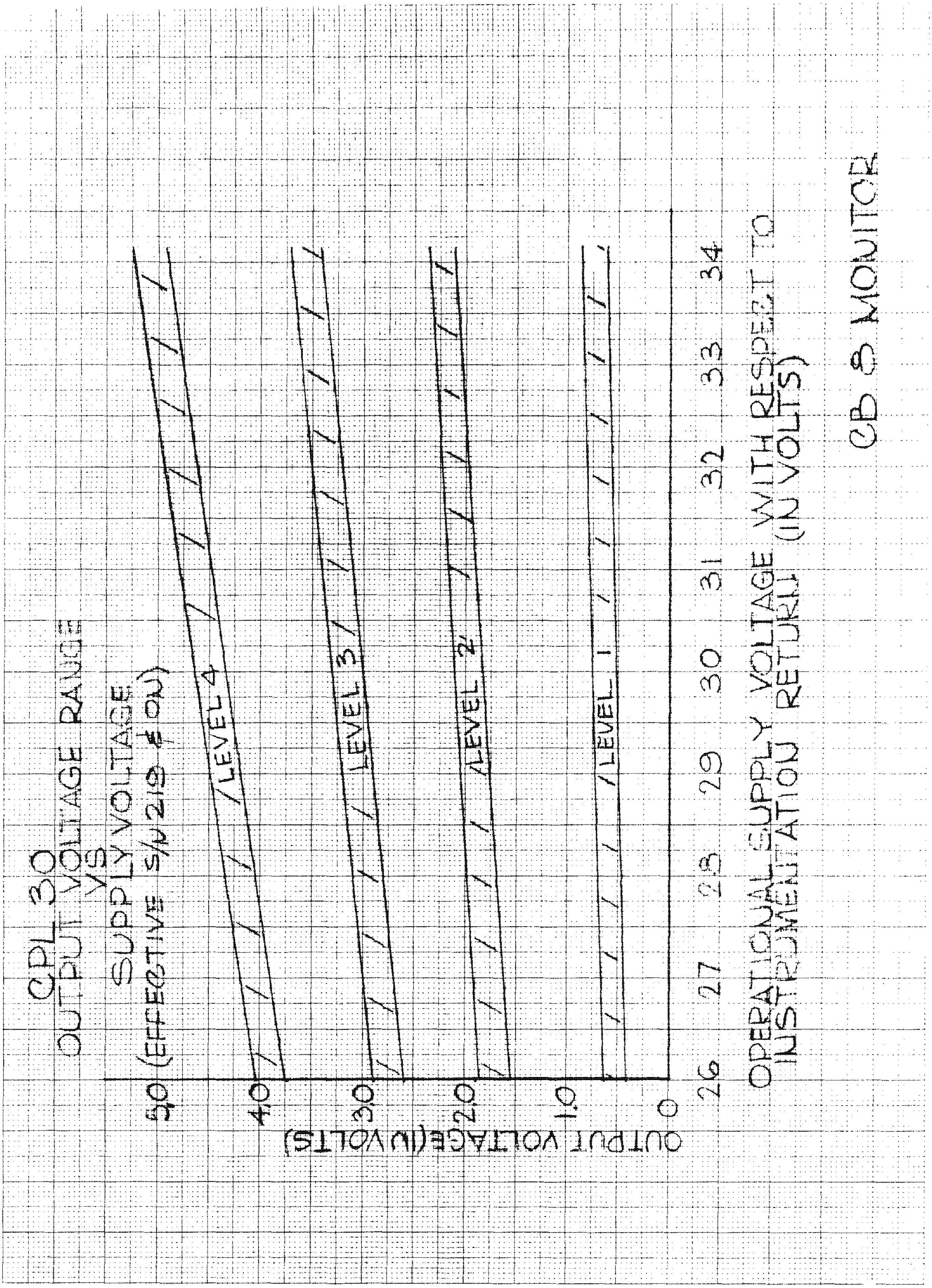
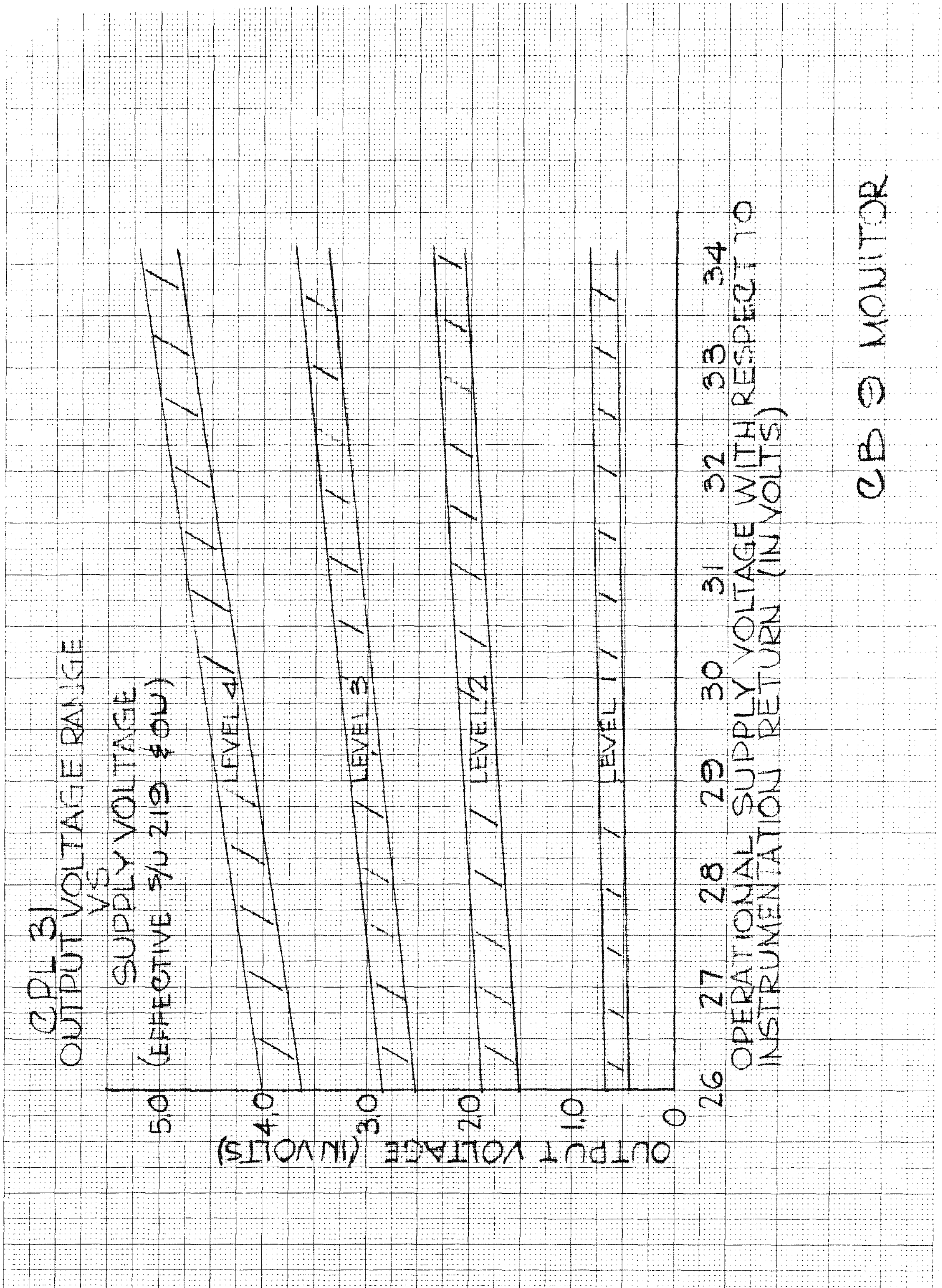


FIGURE XXXI

S 3350

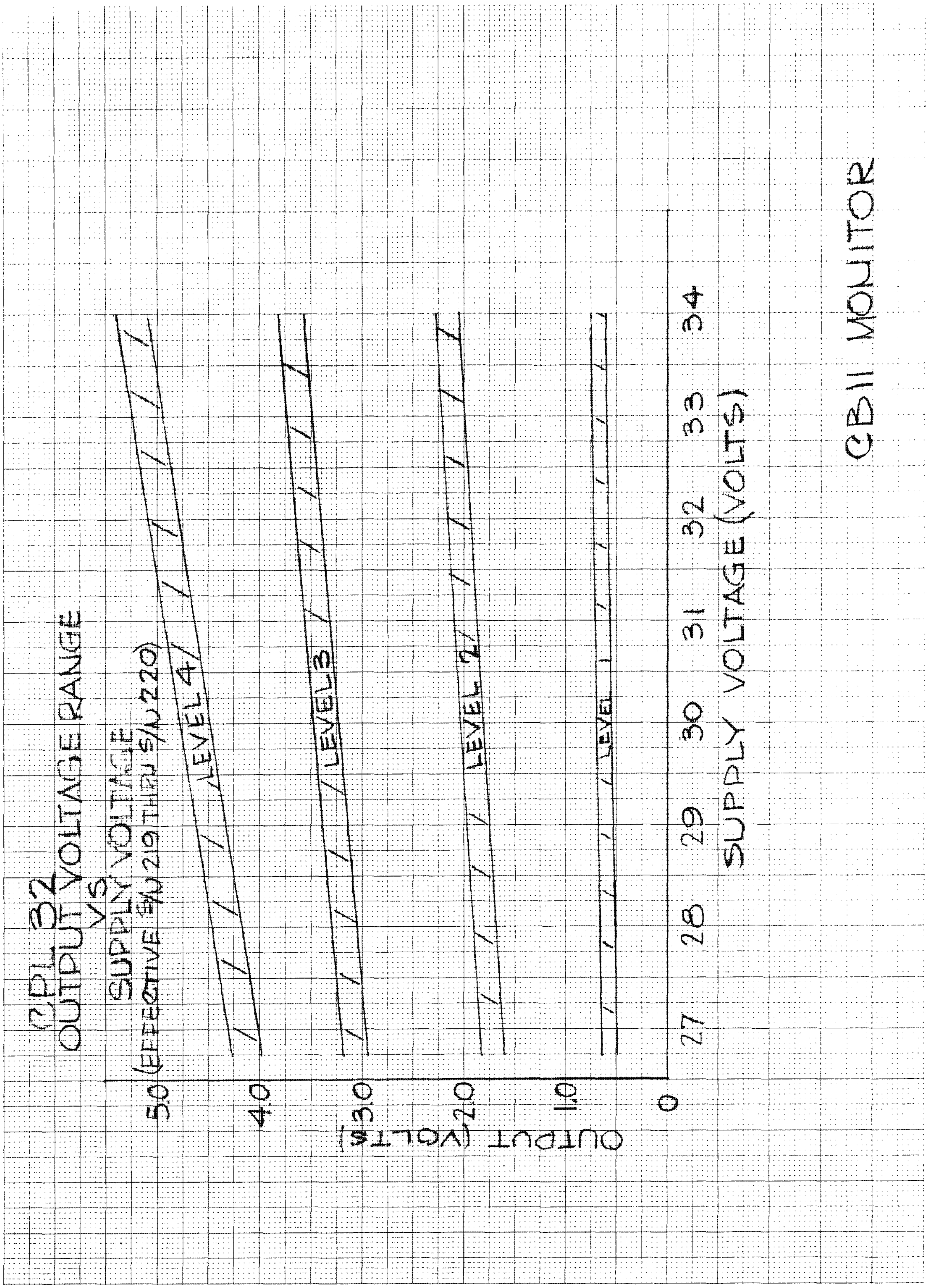


R

FIGURE XXXII

S

33bp



R

FIGURE XXXIII

S 33bq

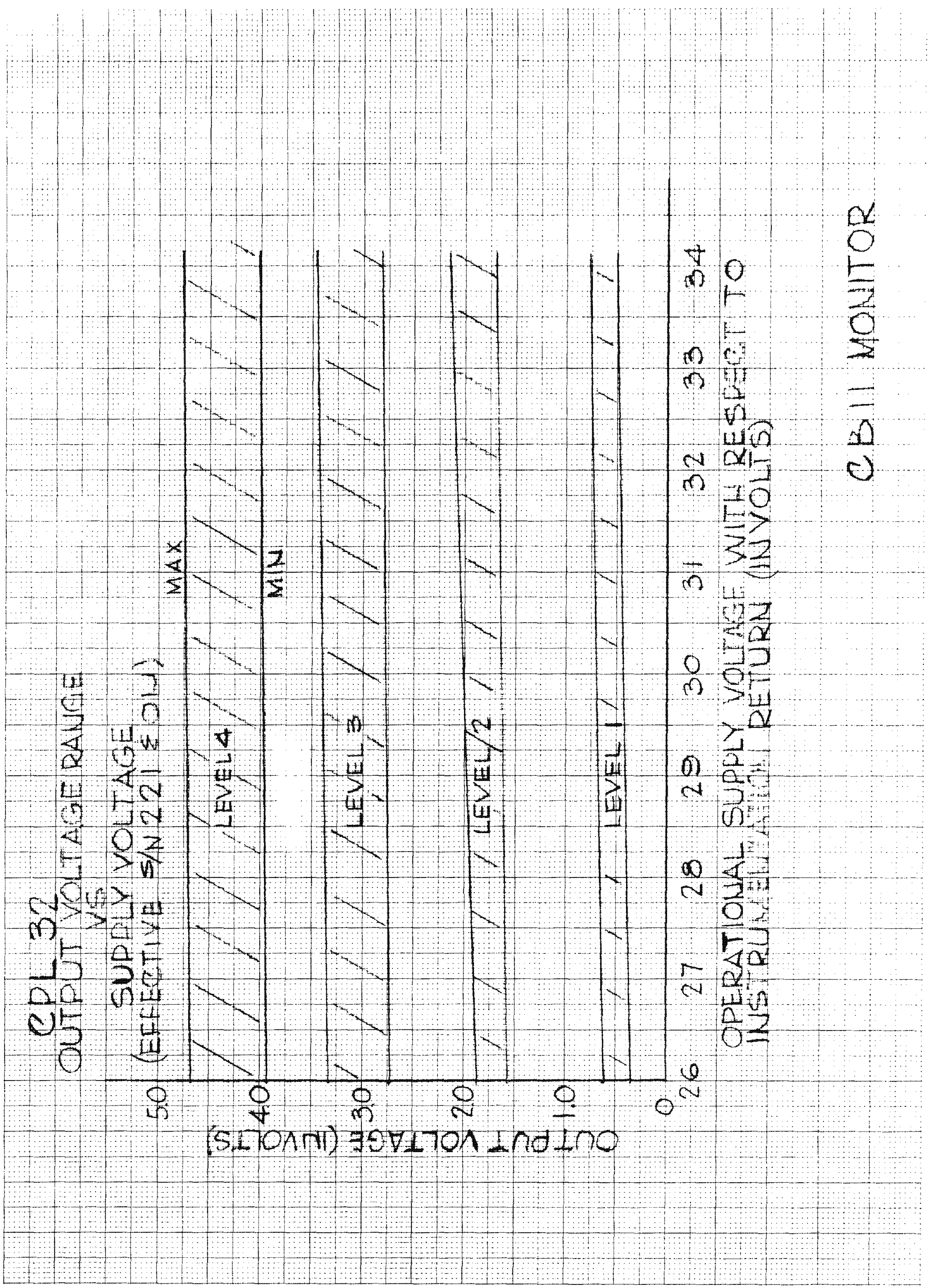


FIGURE XXXIII a

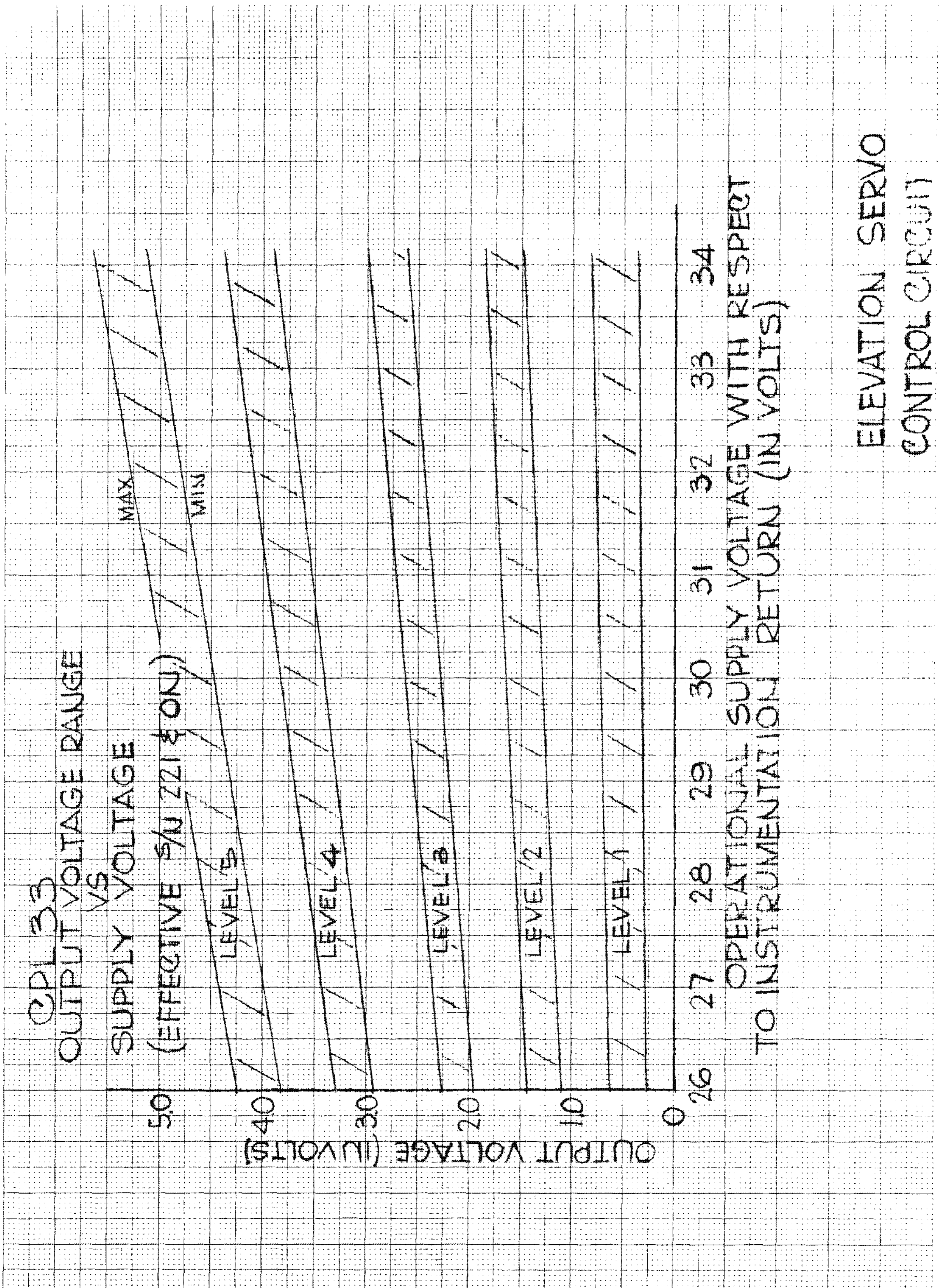
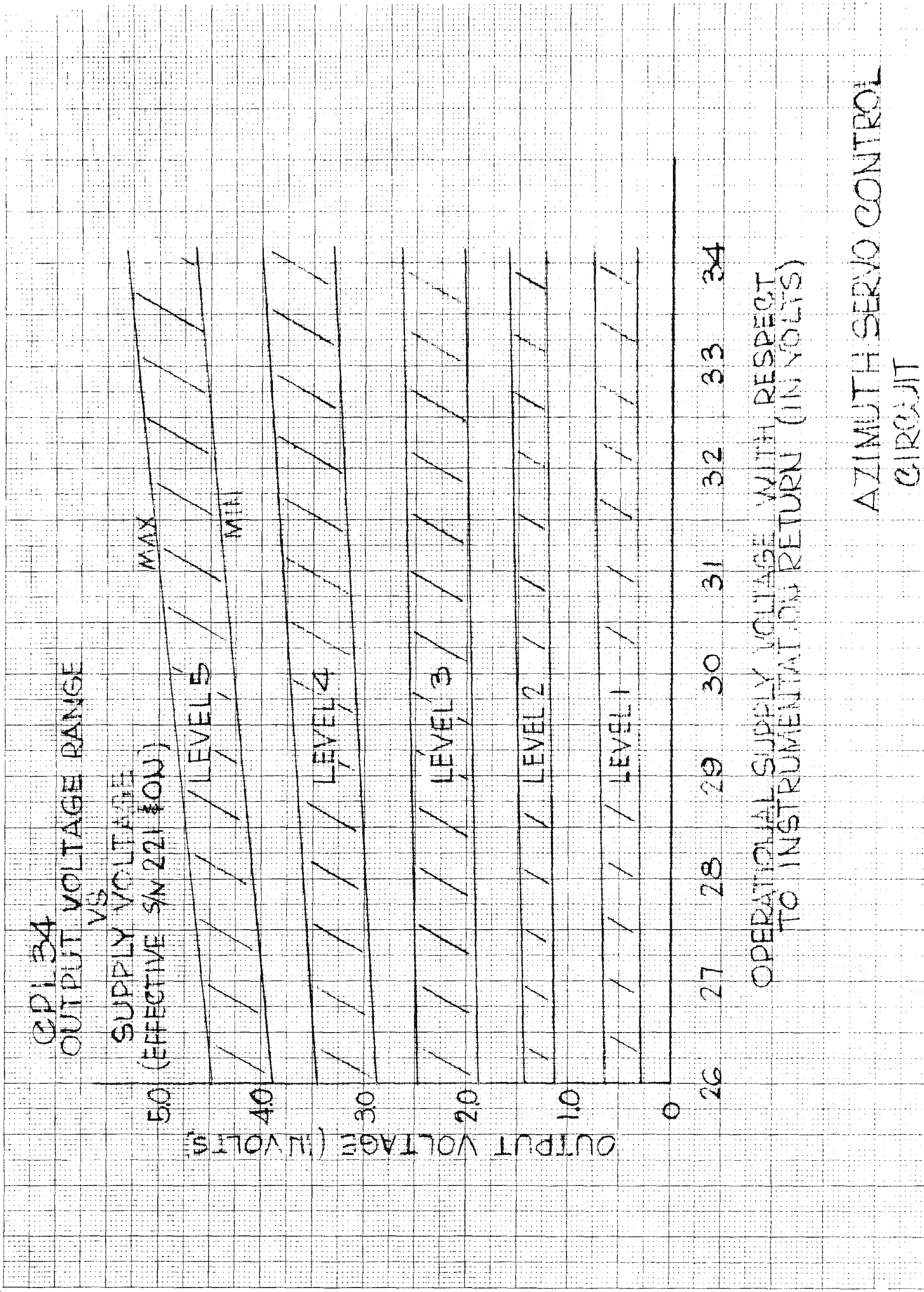


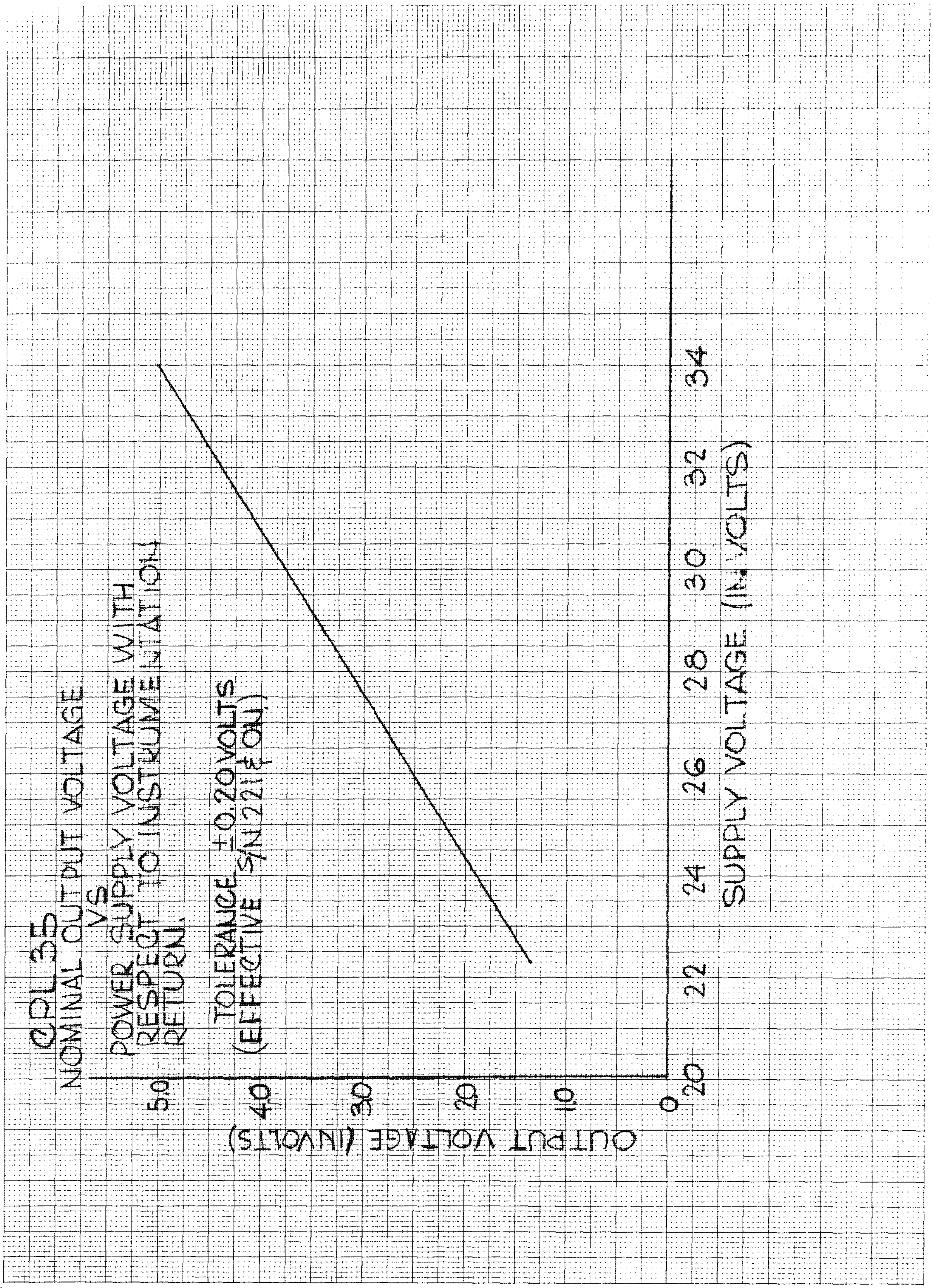
FIGURE XXXIV



R

FIGURE XXXV

S



(R)

FIGURE XXXVI

(S) 33 bu

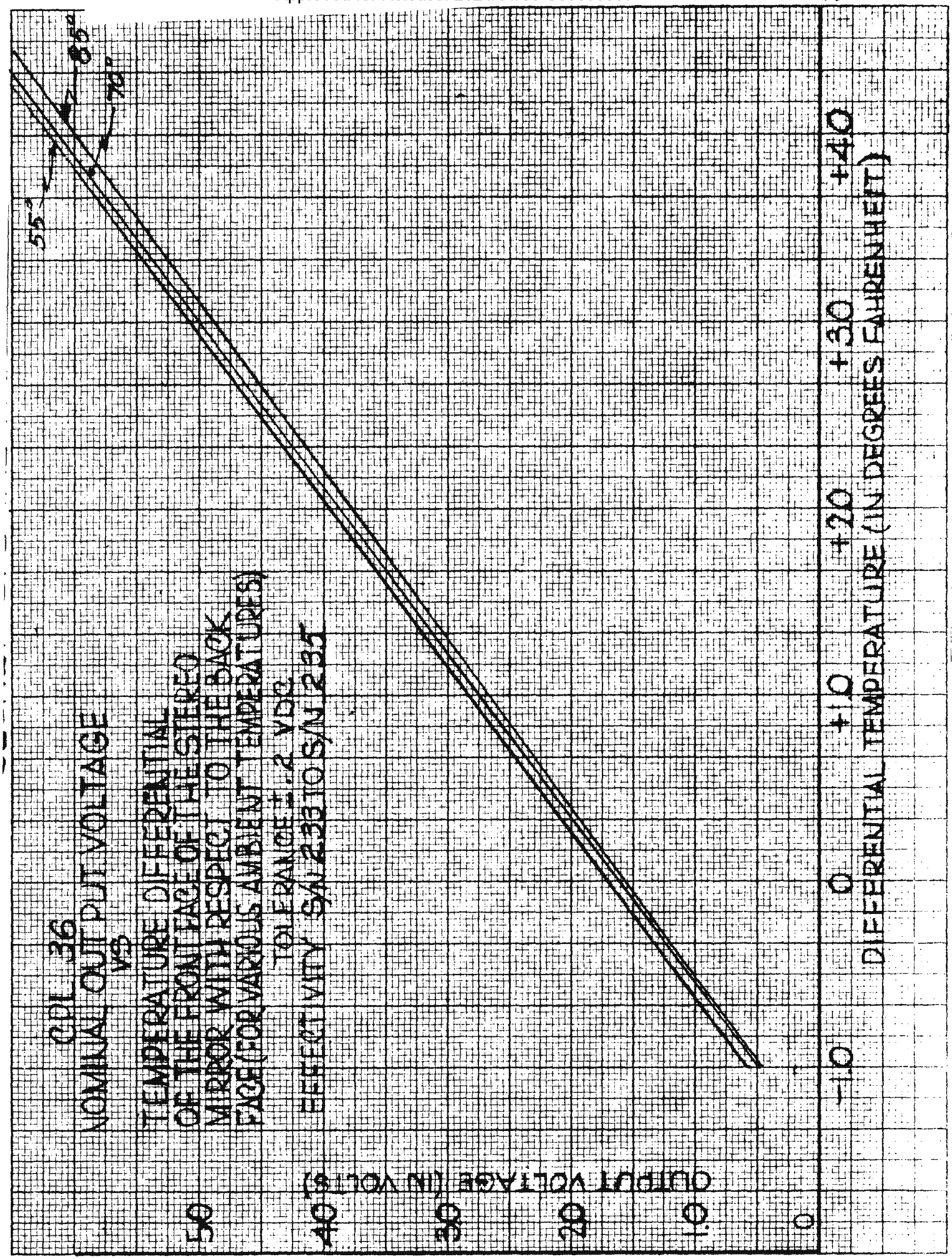


FIGURE XXXVII

002-153

K+E 10 X 10 TO ½ INCH
7½ X 10 INCHES
KEUFFEL & ESSER CO

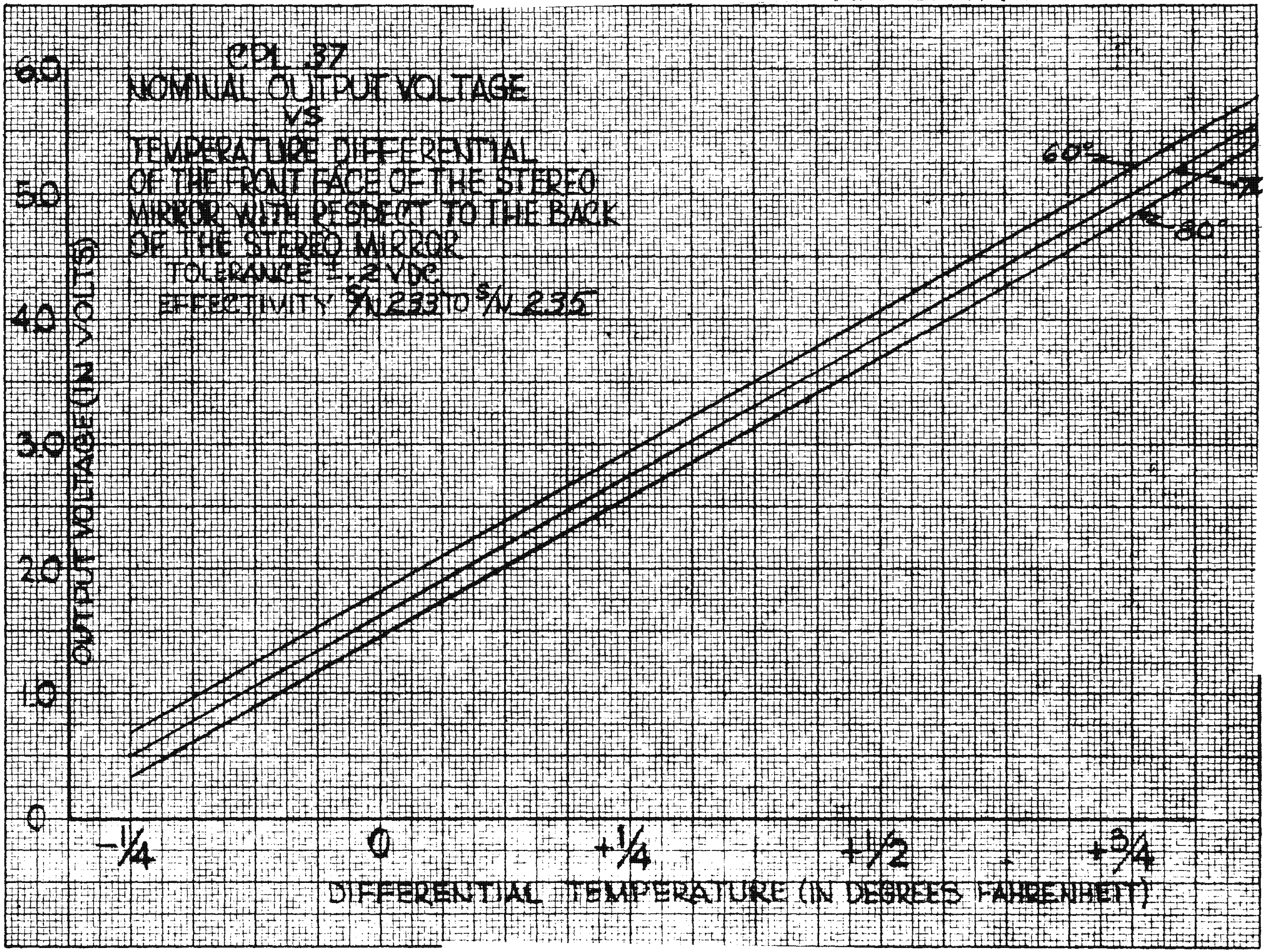
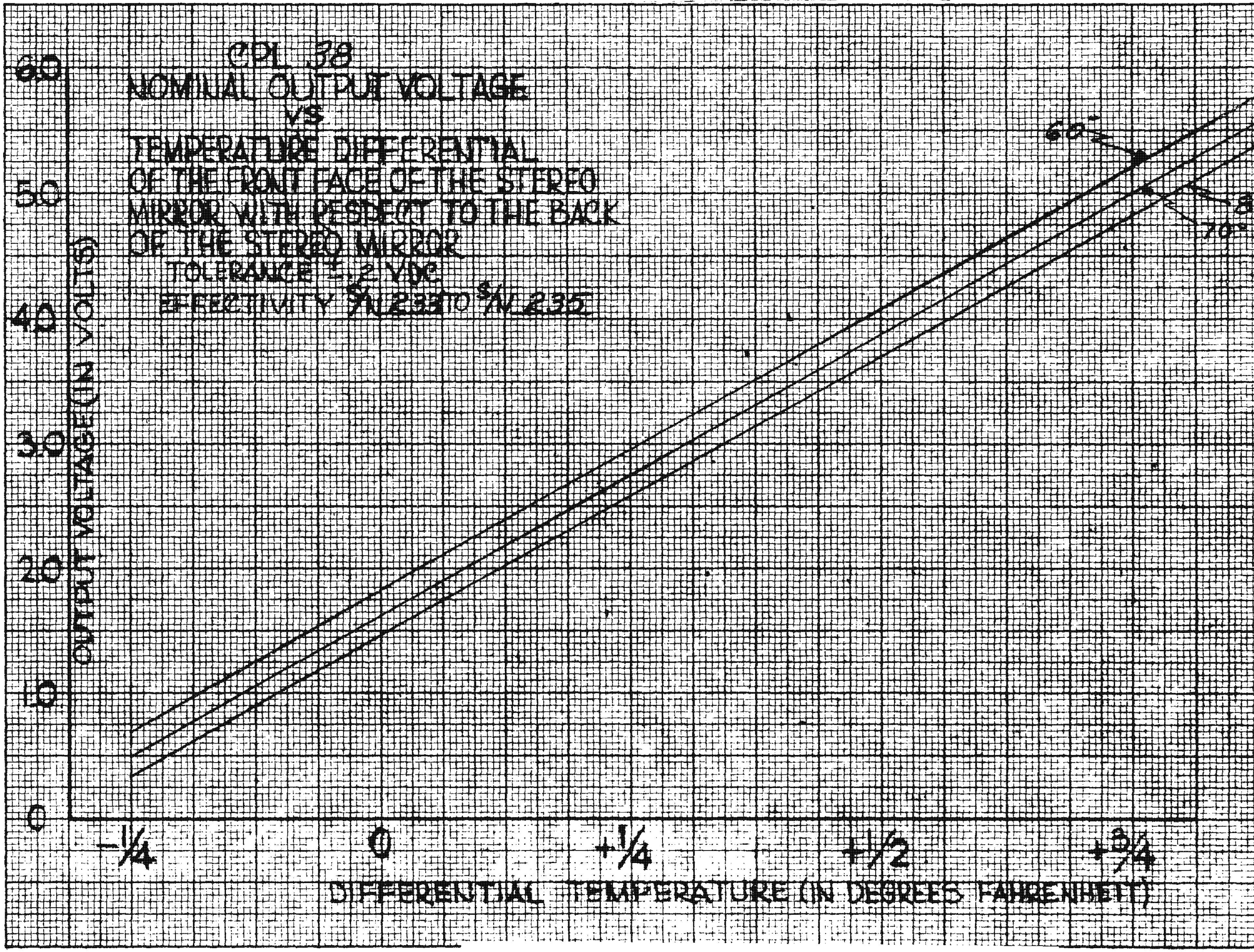


FIGURE XXXVIII

(S) 33bw



RE XXXIX

(S) 33bx

002-155

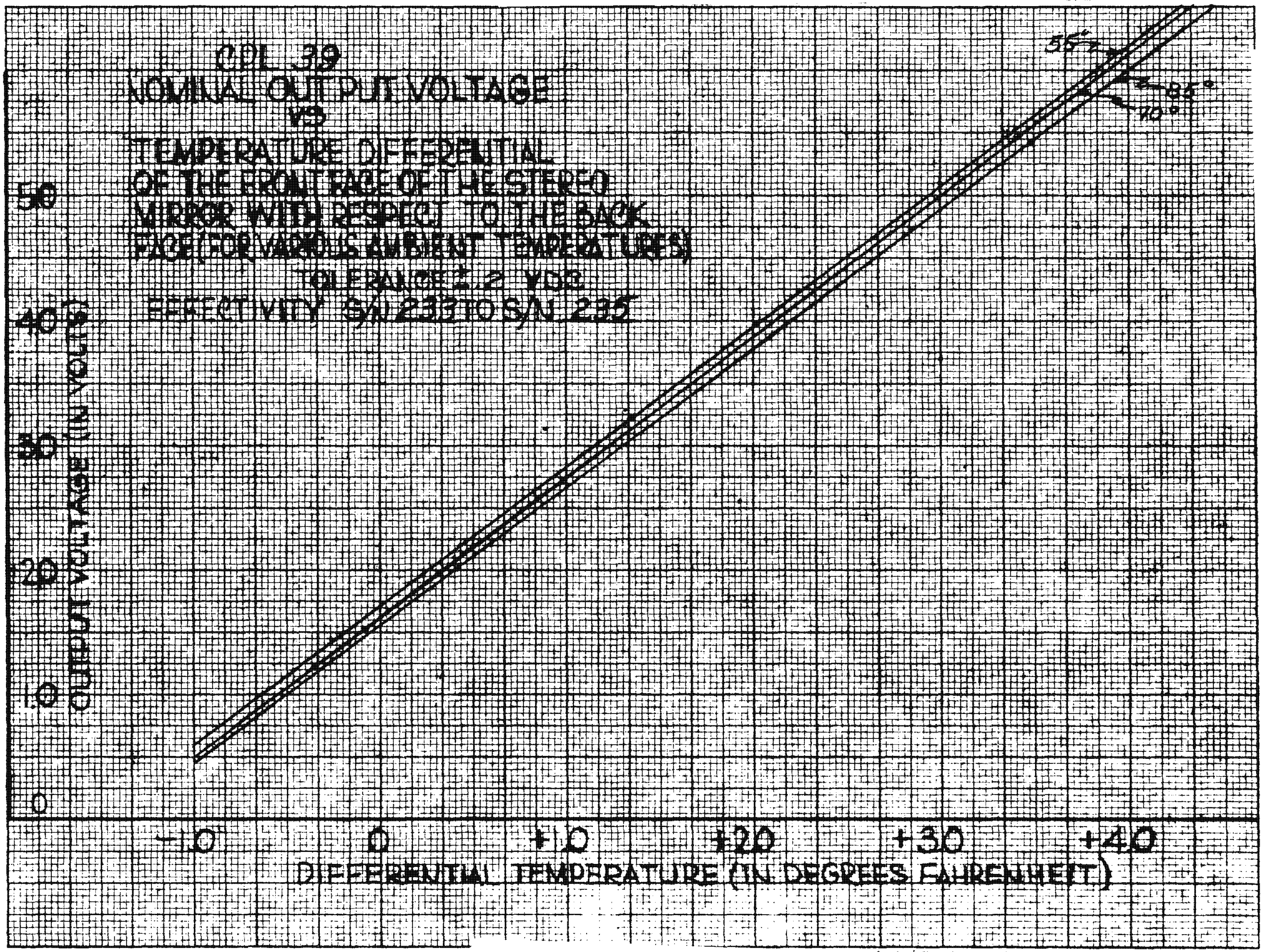


FIGURE XL

(S)

33by

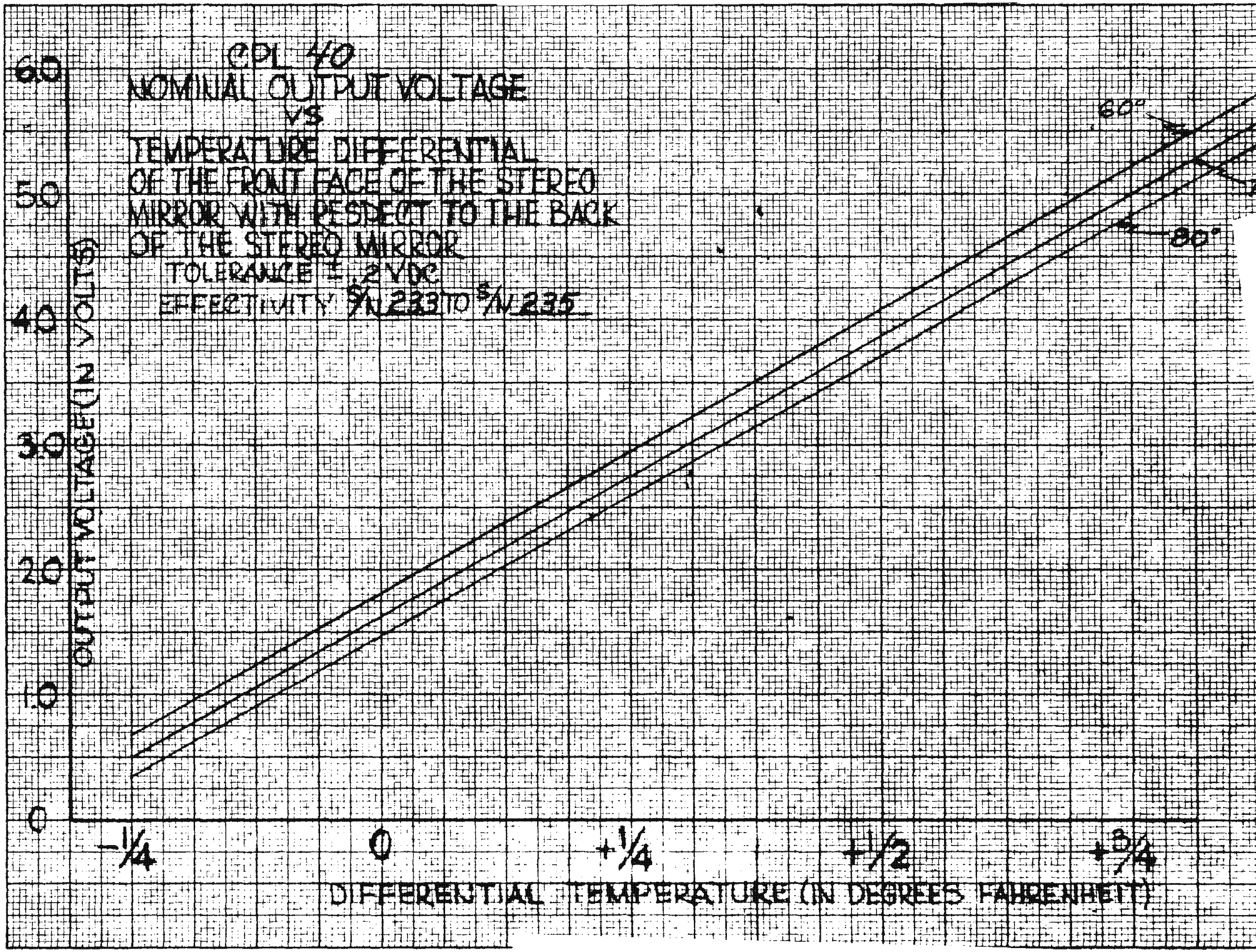


FIGURE XLI

Ⓢ 33bz

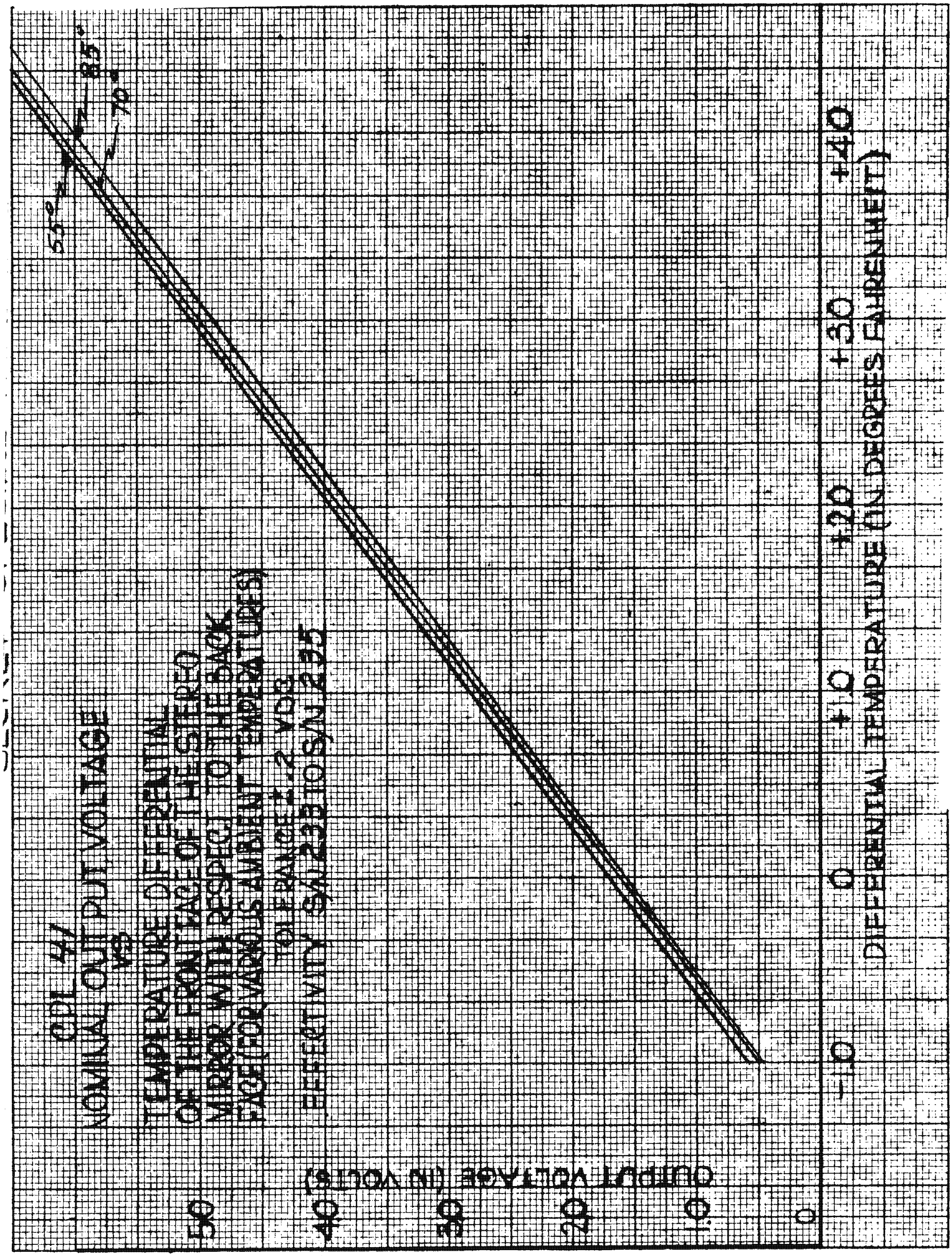


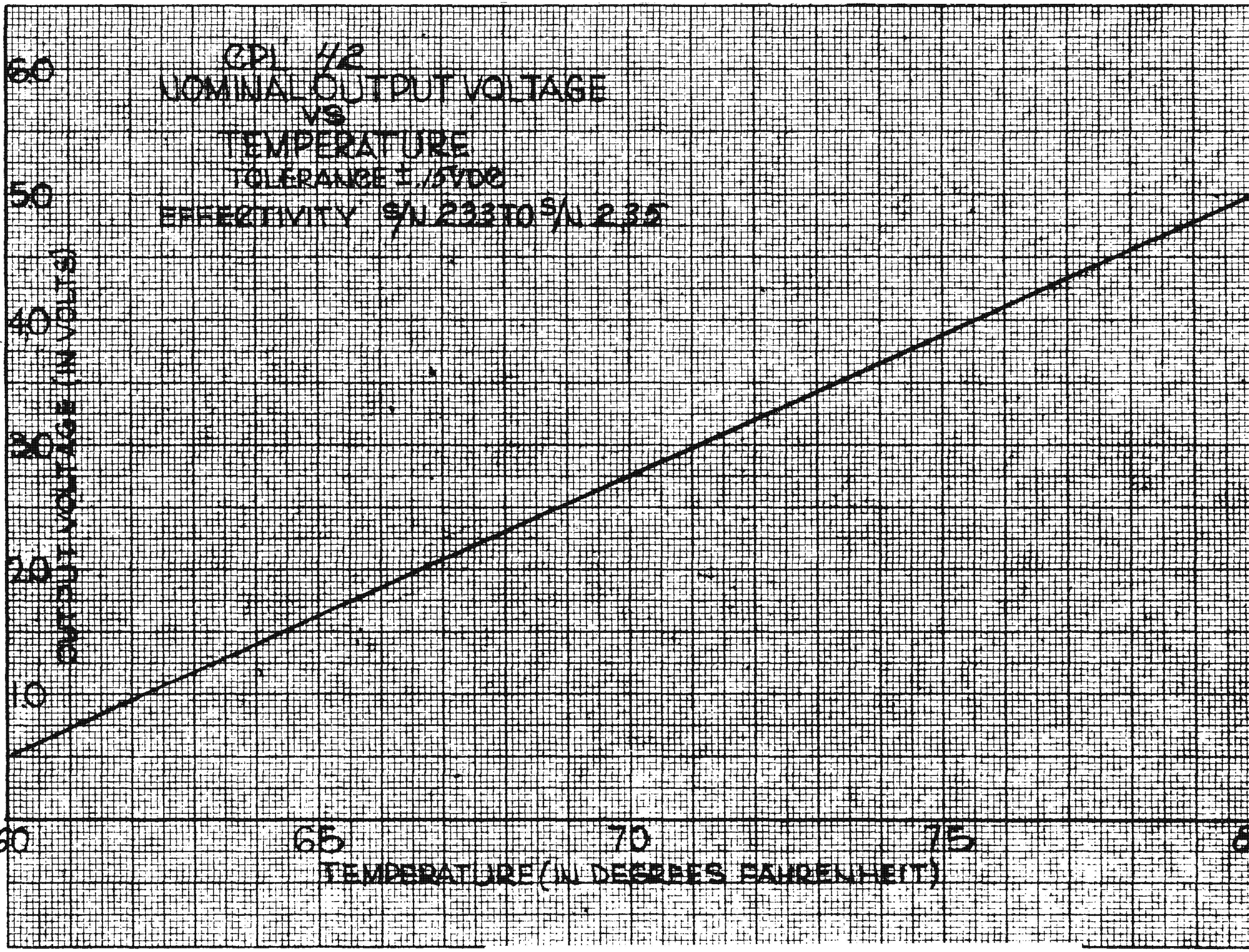
FIGURE XLII

(S)

33ca

33cb

K+E 10 X 10 TO ½ INCH
7½ X 10 INCHES
KEUFFEL & ESSER CO.



(S)

Approved for Release: 2024/01/30 C05098937

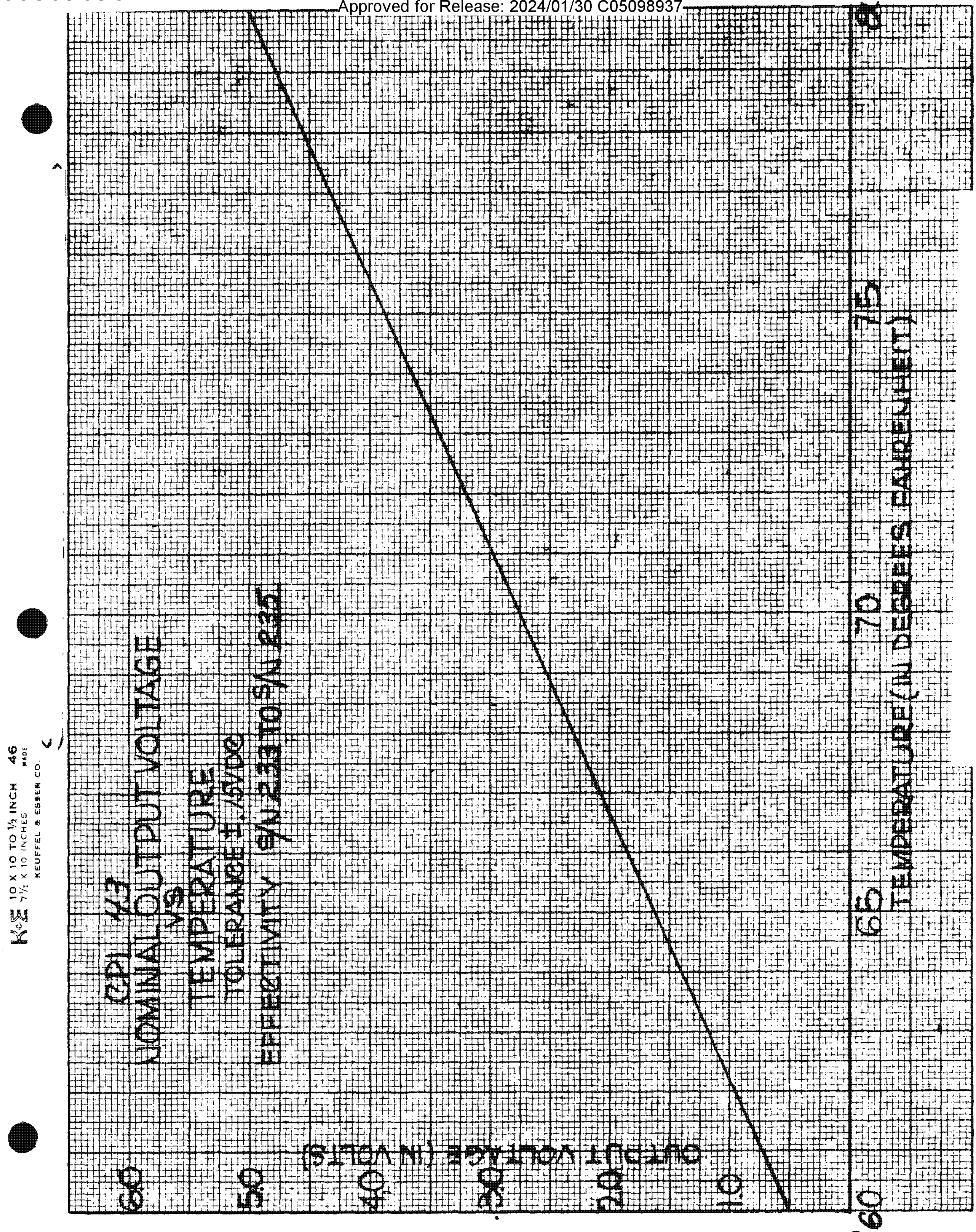

CPL #3
NOMINAL OUTPUT VOLTAGE
VS
TEMPERATURE
TOLERANCE ±.15VDC
EFFECTIVITY S/N 233 TO S/N 235
OUTPUT VOLTAGE (IN VOLTS)
TEMPERATURE (IN DEGREES FAHRENHEIT)
60
50
40
30
20
10
60
65
70
75
80
K+E 10 X 10 TO ½ INCH 46
7½ X 10 INCHES MADE
KEUFFEL & ESSER CO.

FIGURE XLIV

Ⓢ

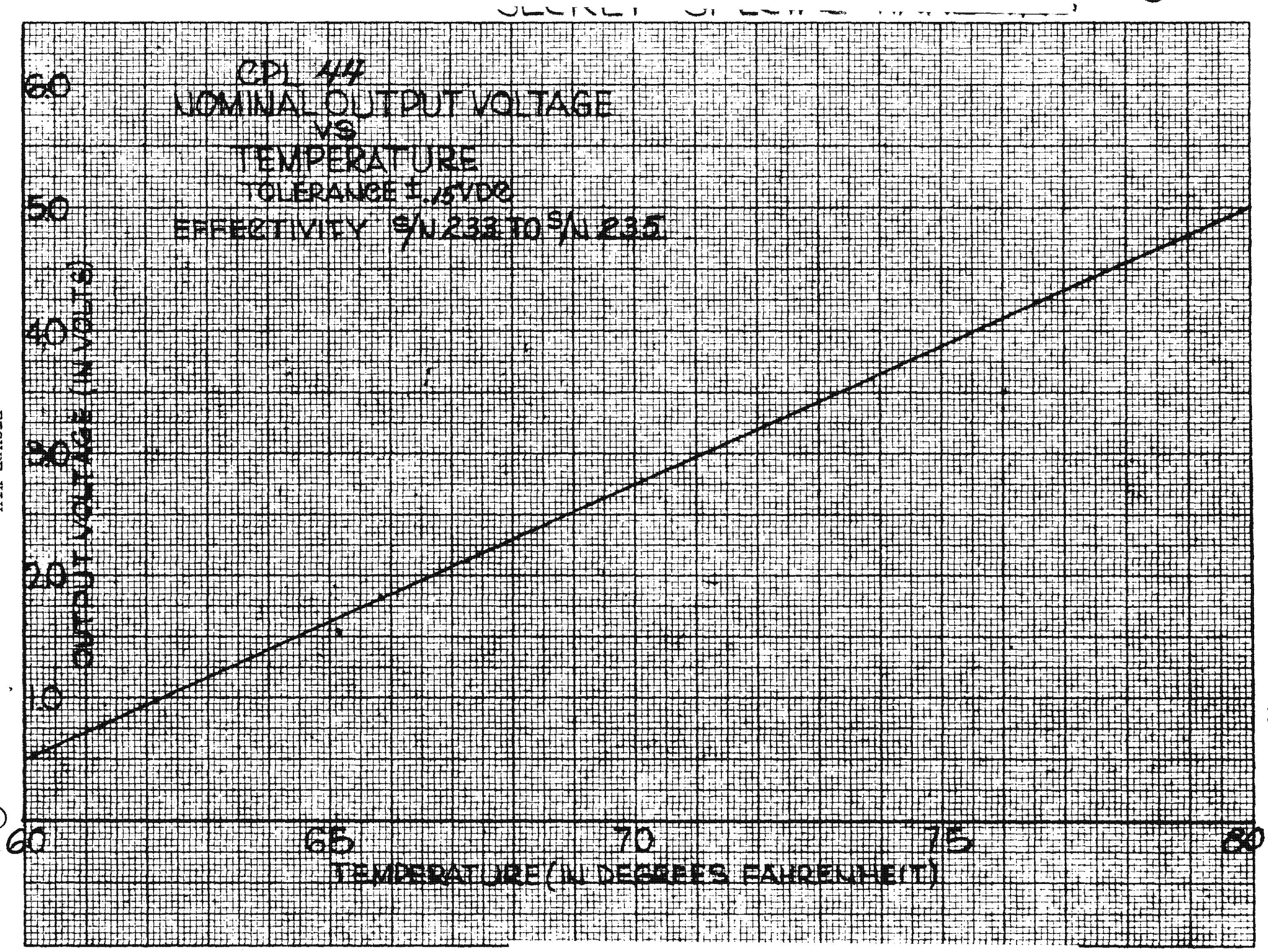


FIGURE XIV

Ⓢ

33cd

TABLE III

BBT	Output Value
1	Same as CPL 17. See figure XVII of section 3.4.3.
2	MSD frequency. See Eastman Kodak Company drawing 808-188 for step versus frequency requirements.
3	Thermistor calibration curve to be supplied with each flight payload.
4	Thermistor calibration curve to be supplied with each flight payload.
5	Within +0 -2.5 volts dc of voltage level of CB 24.
6	With 26 to 33.4 volts dc applied to CB 17 or CB 18 or both, BBT 6 shall be between 15 and 27 volts dc.

3.4.5 General

3.4.5.1 Leakage Resistance - The leakage resistance between any test box connector terminal, excepting those connected to shields, and the payload structure ground shall be 10 megohms minimum with an applied voltage of 10 volts d.c. ± 10 percent.

3.4.5.2 Electromagnetic Interference - The levels of conducted and radiated interference specified in MIL-I-26600 Class 1b, will be used as design goals. Compliance with these goals shall be demonstrated through qualification testing only.

3.5 Environmental Requirements - The payload shall meet the environmental requirements of Eastman Kodak Company specification 502-118.

3.6 General Requirements

3.6.1 Service Life - Service life is defined as operational or "weartime" from final payload assembly through the flight operational phase. This includes all performance at Eastman Kodak Company and Vandenberg Air Force Base as well as flight operation.

The complete payload shall be able to survive a service life of 2,400 stereo pairs utilizing 12,000 feet of film, or its equivalent. This equivalent shall be considered operation of the payload which does not cause any part of the payload to to be operated for an accumulated time or under a stress greater than would be employed in taking the above defined stereo pairs.

Although the duty cycles of individual components vary, the life of these individual components shall be adequate to allow the completion of the subsystem service life. The individual component service life shall be given in the applicable component specification.

3.6.2 Reliability - A primary objective of the design and manufacture of the photographic subsystem is to achieve high reliability. The reliability requirement shall be to achieve a 95 percent probability of obtaining a 60 percent information return for the performance requirements listed below:

(a) Capable of being launched into orbit and performing its functions in that environment.

(b) Subsystem resolution of 104 l/mm from a 95 nautical mile altitude for a MIL-STD-150A target at 2:1 contrast and at the center of the frame.

(c) Area Coverage - On command, and in a maximum of five days, be capable of exposing 3000 feet of film in modes of operation specified in this document.

(d) Capable, in conjunction with the associate contractor, of protecting the film during launch, orbit, deorbit, and recovery operations.

3.6.3 Calibration and Gauges - Verification of calibration of all measuring and test equipment shall be documented prior to payload testing.

3.7 Documentary Requirements - Procedures shall be prepared and documented by Eastman Kodak Company, defining a quality control system that shall fulfill the requirements of this specification. The documentary requirements shall include, but shall not be limited to the following:

3.7.1 Drawings - All engineering drawings and associated lists prepared for the purpose of defining those requirements of design, inspection and tests shall be prepared in accordance with Eastman Kodak Company standards 401-100 and 401-104-2.

S

N

3.7.2 Specifications - Material shall be generated to complete the performance requirements and description of the equipment contained in this specification.

3.7.3 Inspection Reports - Inspection reports shall be generated and maintained. These reports, as well as in-process inspection, shall be made available, by Eastman Kodak Company.

3.7.4 Certification of Items - Certification of items not manufactured or tested by Eastman Kodak Company, shall be documented and such documentation shall be made available by Eastman Kodak Company.

3.7.5 Alignment and Calibration - Record shall be generated, documented and made available by Eastman Kodak Company of the alignment and calibration of all measuring and test equipment.

3.7.6 Test Procedures - Qualification and acceptance test procedures for the payload that demonstrate conformance with the requirements of this specification shall be established and documented.

3.7.7 Performance Record - All data, including operating time and malfunction reports, generaged through tests, shall be recorded by serial number and preserved as a performance report.

4. QUALITY ASSURANCE PROVISIONS

The quality control system requirements of MIL-Q-9858 and Eastman Kodak Company specification 401-110 shall apply.

4.1 Classification of Tests - The inspection and testing of the payload shall be classified as follows:

(a) Qualification Tests

(b) Acceptance Tests

4.2 Qualification Tests - Qualification tests shall be conducted by the contractor on one payload equivalent to flight model payload design. The model tested

(N)

shall not be used as an operational unit following the qualification tests. Test procedures shall comply with 3.7.6 and shall include but not be limited to the following:

4.2.1 Visual Inspection - All parts, subassemblies and assemblies shall be inspected for conformance with the manufacturing standards, Eastman Kodak Company drawing 401-104-2.

4.2.2 Drawing Conformance - All parts, subassemblies and assemblies shall be inspected for conformance with their respective drawings.

4.2.3 Performance Tests - The payload shall be tested for its ability to comply with the performance requirements of section 3.

4.2.4 Environmental Qualification Tests - The payload shall be subjected to the environmental tests specified below. Following completion of each of these tests, the payload shall be visually inspected for damage, and the performance tests of 4.2.3 shall be repeated.

4.2.4.1 The payload shall be vibrated in accordance with paragraph 4.1.1 of Eastman Kodak Company specification 502-118.

4.2.4.2 The payload shall be subjected to the electromagnetic interference requirements in accordance with 3.4.5.2.

4.2.4.3 The payload shall be operated while in an ambient pressure equivalent to orbit conditions, in accordance with paragraph 4.1.5 of Eastman Kodak Company specification 502-118.

4.2.5 Diagnosis Report - Following the environmental qualification tests, diagnosis shall be made of any impairment of performance of the payload components, and a full report shall be written.

4.2.6 Life Test - The payload shall be operated for periods of time, in addition to the total of operating times for 4.2.3 and 4.2.4.3 sufficient to demonstrate compliance with requirements of 3.6.1.

4.3 Acceptance Tests - The payload shall be tested to determine its ability to comply with the performance requirements of section 3, and shall be inspected for conformance to the applicable assembly drawings. The acceptance procedures shall be in accordance with 3.7.6.

4.3.1 Environmental Acceptance Tests - Payload environmental acceptance testing for Space Chamber Assembly 805-101, when used on 606-100, shall be limited to vibration along the X-axis. The vibration test levels shall be in accordance with paragraph 5.1 of Eastman Kodak Company specification 502-118. No payload environmental acceptance testing shall be performed on Space Chamber Assembly 805-101 when used on 805-176.

4.4 Test Conditions

4.4.1 Alignment and Calibration - The alignment and calibration of the payload and instrumentation shall be in accordance with the requirements of 3.7.5.

4.5 Documentation - The documentation of the payload shall be in compliance with the requirements of section 3.7.

5. PREPARATION FOR DELIVERY

5.1 Packing and Packaging

5.1.1 The payload shall be enclosed and sealed in the Package Shipping Container as described in Eastman Kodak Company specification 602-144.

The packaging shall be done in accordance with the instructions supplied in the Shipping Container Manual 554-104.

6. NOTES

None required for compliance with this specification.

NOTICE

When Government drawings, specifications or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.