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AD311094

A PICTORIAL PRESENTATION OF SUBSYSTEM E SAMOS SATELLITE (U)

EASTMAN KODAK CO ROCHESTER NY

11 SEP 1959

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A PICTORIAL PRESENTATION
OF

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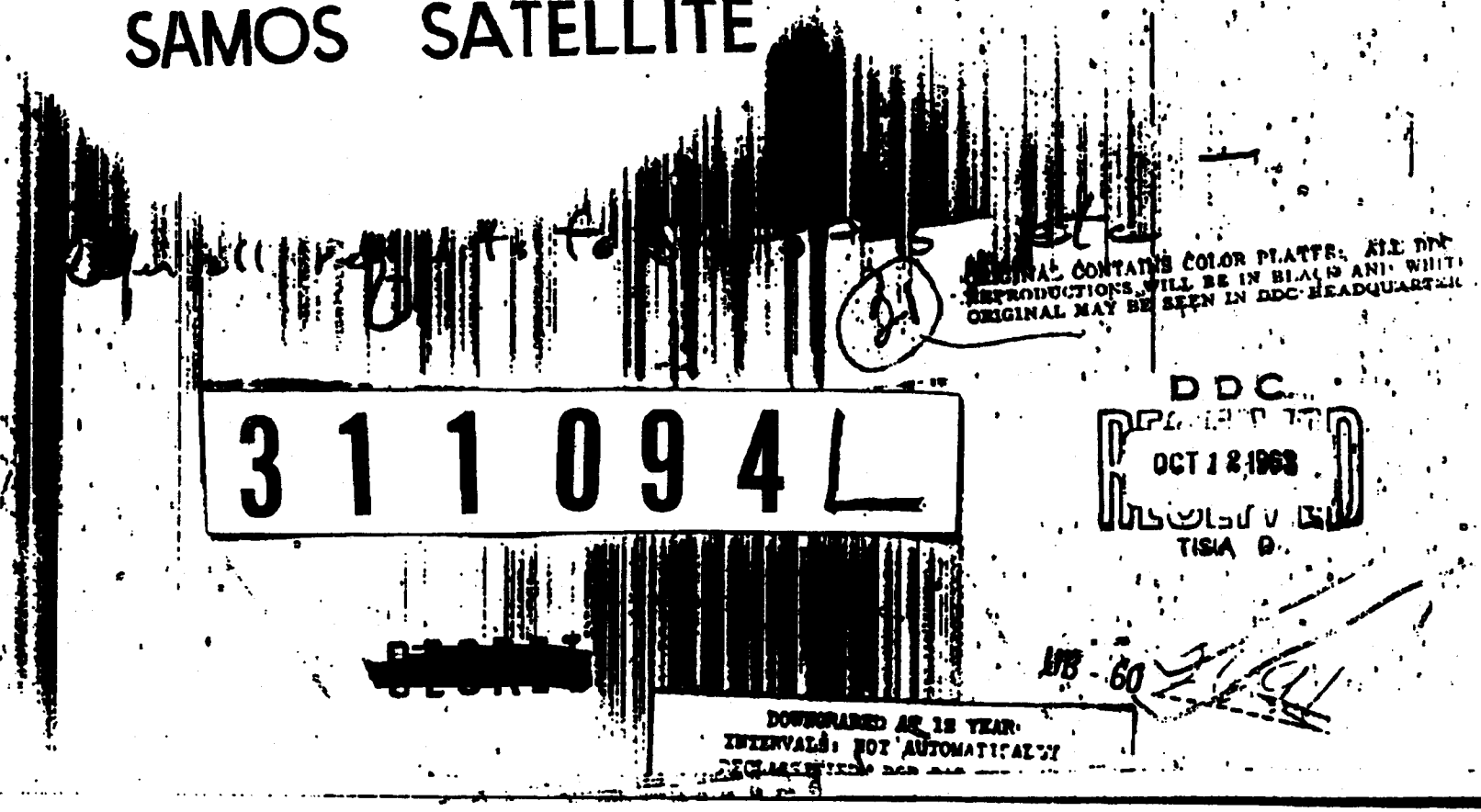
SUBSYSTEM J
SAMOS SATELLITE



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(14) Rpt. no. EK/LIT-20-2

This document consists of 31 pages.

(1) A PICTORIAL PRESENTATION

of

SUBSYSTEM E

SAMOS SATELLITE [U],

Prepared for

LOCKHEED MISSILES AND SPACE DIVISION
Sunnyvale, California

By

EASTMAN KODAK COMPANY
Apparatus and Optical Division
Rochester, New York

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Approved by: [redacted]

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Date: September 11, 1959

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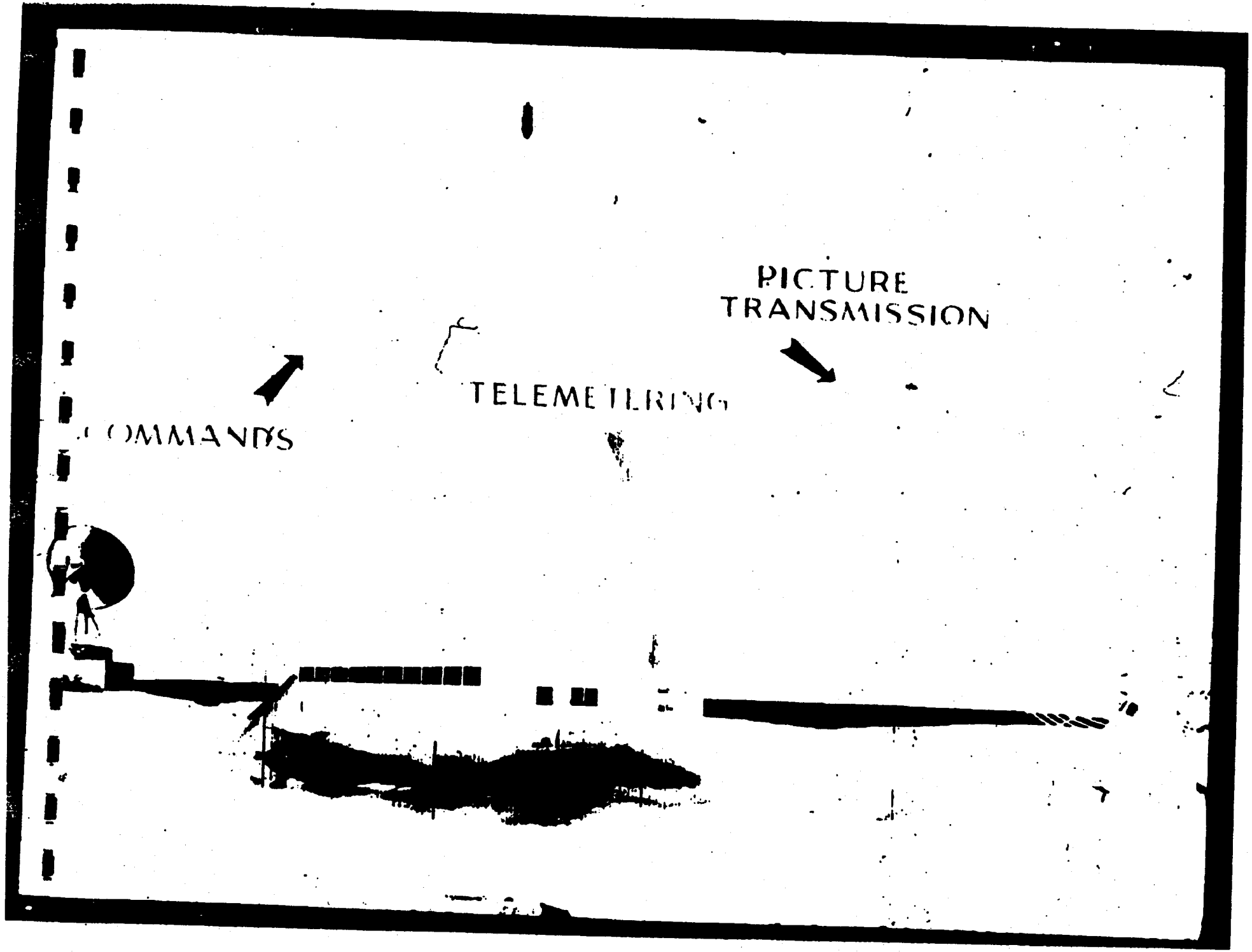
CONTENTS

FOREWORD

This booklet presents in concise form some of the major aspects of the Visual Reconnaissance Subsystem (Subsystem E) of the Samos satellite. The equipment shown is typical of the E-2 payload, which uses the Wide-Band Data Link of Subsystem H for satellite-to-ground transmission of pictures at 20-foot ground resolution.

The sketch opposite shows a symbolic Tracking and Acquisition Station to illustrate the various channels of communication between vehicle and ground during a readout contact. Such stations will be available at three localities in the United States.


PICTURE
TRANSMISSION
TELEMETERING
COMMANDS

E-2 PAYLOAD

Illustrated is a mockup of the payload with pressure shell removed. The lens aperture is at the top of the photo. The payload is shown tilted for oblique stereo photography.

FUNCTIONS:

1. Photographs ground from 300-mile altitude with Payload Camera
2. Processes photographic film in Processor
3. Converts information in photographic image to electrical signal in Readout Equipment
4. Provides data to Telemetry Link
5. Provides a pressurized housing with trunnions for oblique and stereo operation

CHARACTERISTICS:

Ground resolution	20 feet
Ground width coverage	17 miles
Maximum obliquity angle	26 degrees
Stereo convergence angle	34 degrees
Ground coverage per day	55,000 square miles
Film consumption per month	10 pounds
Operating life	4 months
Readout bandwidth	6 megacycles
Weight	950 pounds
Length	67 inches
Base diameter	55 inches
Average power consumption	50 watts

~~SECRET~~

Note to Users of ARPA Space Technology Program Review, 9, 14 and 15 September 1959, Documents:

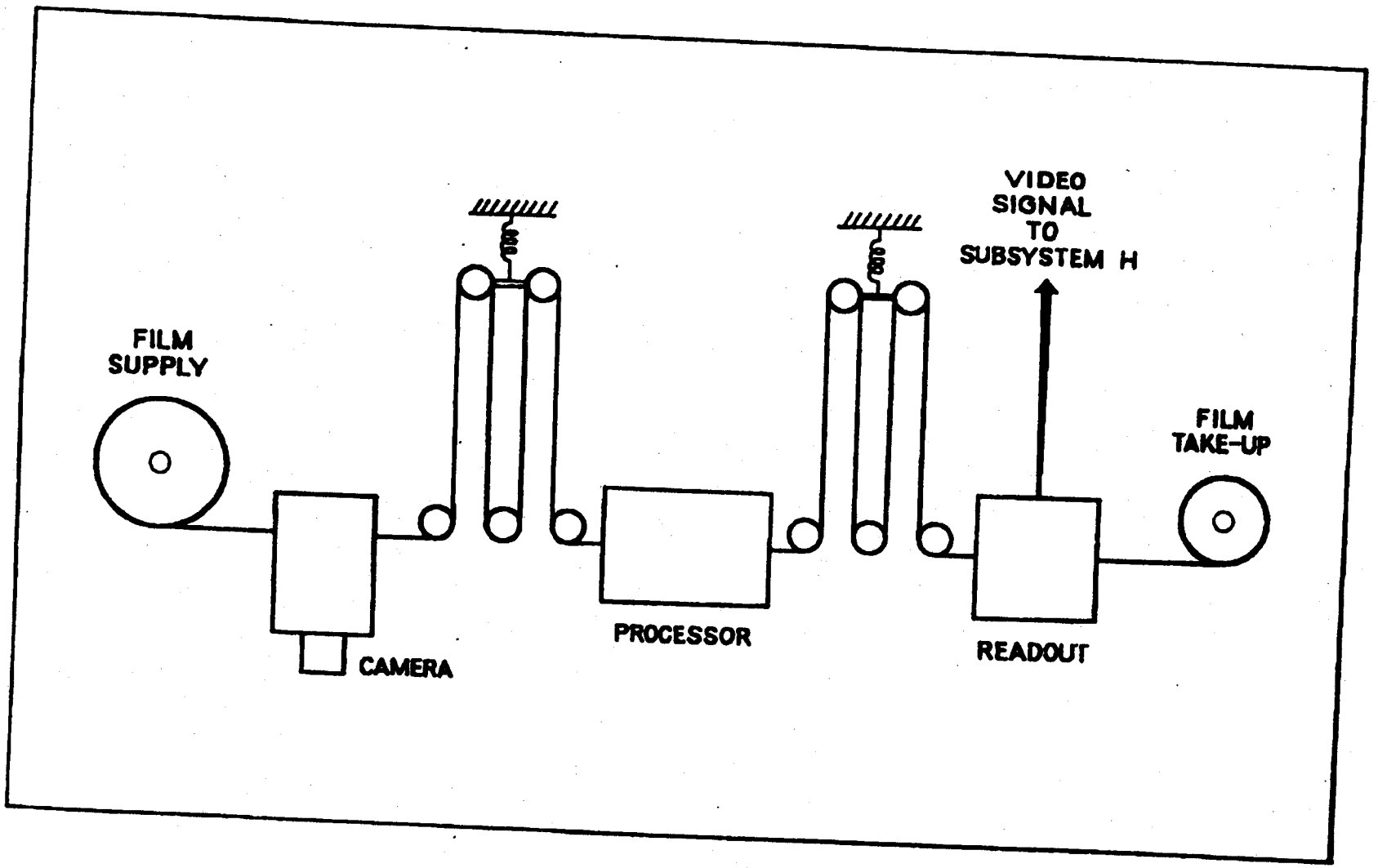
The attached Secret document -

> "A PICTORIAL PRESENTATION OF SUBSYSTEM E, SAMOS SATELLITE, EK/LIN-20-2, September 11, 1959, Prepared for LOCKHEED MISSILES AND SPACE DIVISION, Sunnyvale, California, by EASTMAN KODAK COMPANY, Apparatus and Optical Division, Rochester, New York" -

is a supplement to the presentation made by Col. King, Air Force Ballistic Missile Division, and Mr. Tyminski, Lockheed Missiles and Space Division, during the ARPA Space Technology Program Review, 14 September 1959, at 1015 hours.

PAYLOAD SCHEMATIC

This chart is a schematic view of the film path through the vehicle payload. Film tension is maintained throughout by the film supply and film take-up systems and by the camera and readout loopers located between the units. The loopers act also as film accumulators.


VIDEO
SIGNAL
TO
SUBSYSTEM H
FILM
SUPPLY
FILM
TAKE-UP
CAMERA
PROCESSOR
READOUT

FILM SUPPLY REEL

FUNCTION: Provides a reservoir for the payload film

CHARACTERISTICS:

Construction	Bonded honeycomb
Size	33 1/4 inch outer diameter
Capacity	4500 feet of 70mm film

CAMERA

FUNCTIONS:

1. Records information on 70mm film as follows:
   a) Ground scene
   b) Vehicle time
   c) Vehicle attitude data
   d) Payload orientation data
2. Provides for in-flight control of focus
3. Provides for in-flight control of exposure

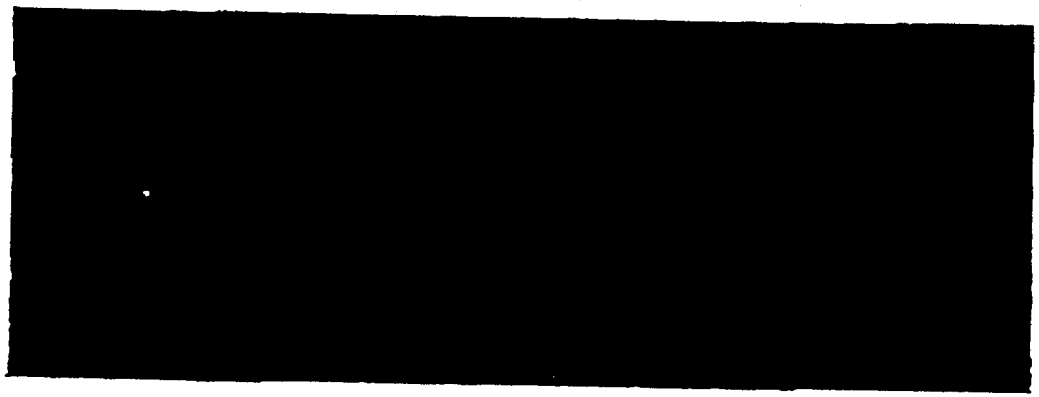
CHARACTERISTICS:

Type	Continuous strip
Focal length	36 inches
Film width	70mm
Picture width	2 inches
Limiting resolution	250 lines per mm
Aperture ratio	F/4
Aperture diameter	9 inches
Exposure time (nominal)	1/100 second
Spectral range	.500 to .720 microns
Slit width	.0027 to .085 inch
Weight	101 pounds

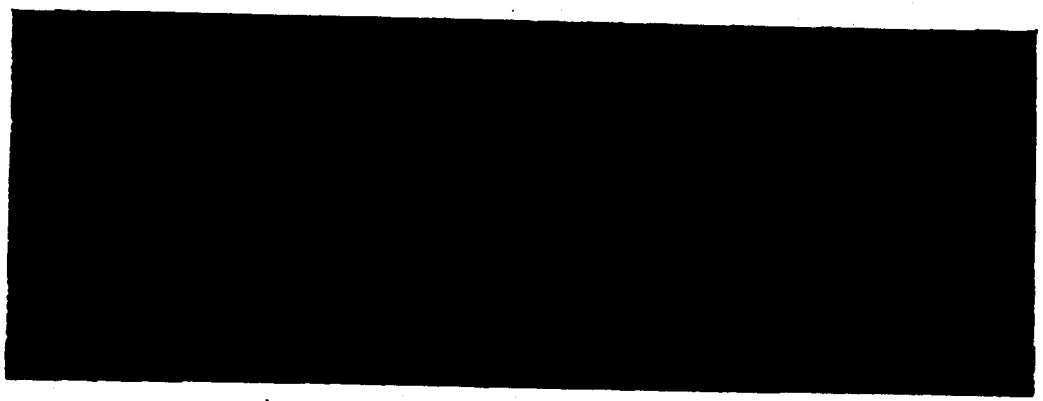
PAYLOAD FILM AND WEB

FILM FUNCTION: Stores a negative photographic image of the subject matter until the satellite comes within range of a Tracking and Acquisition Station

WEB FUNCTION: Contains all the moisture and chemicals required for processing the payload film. The photographic processing leaves a positive image on the web and a negative image on the film, as shown. Only the image on the film, however, is used for the readout process.



FILM



WEB

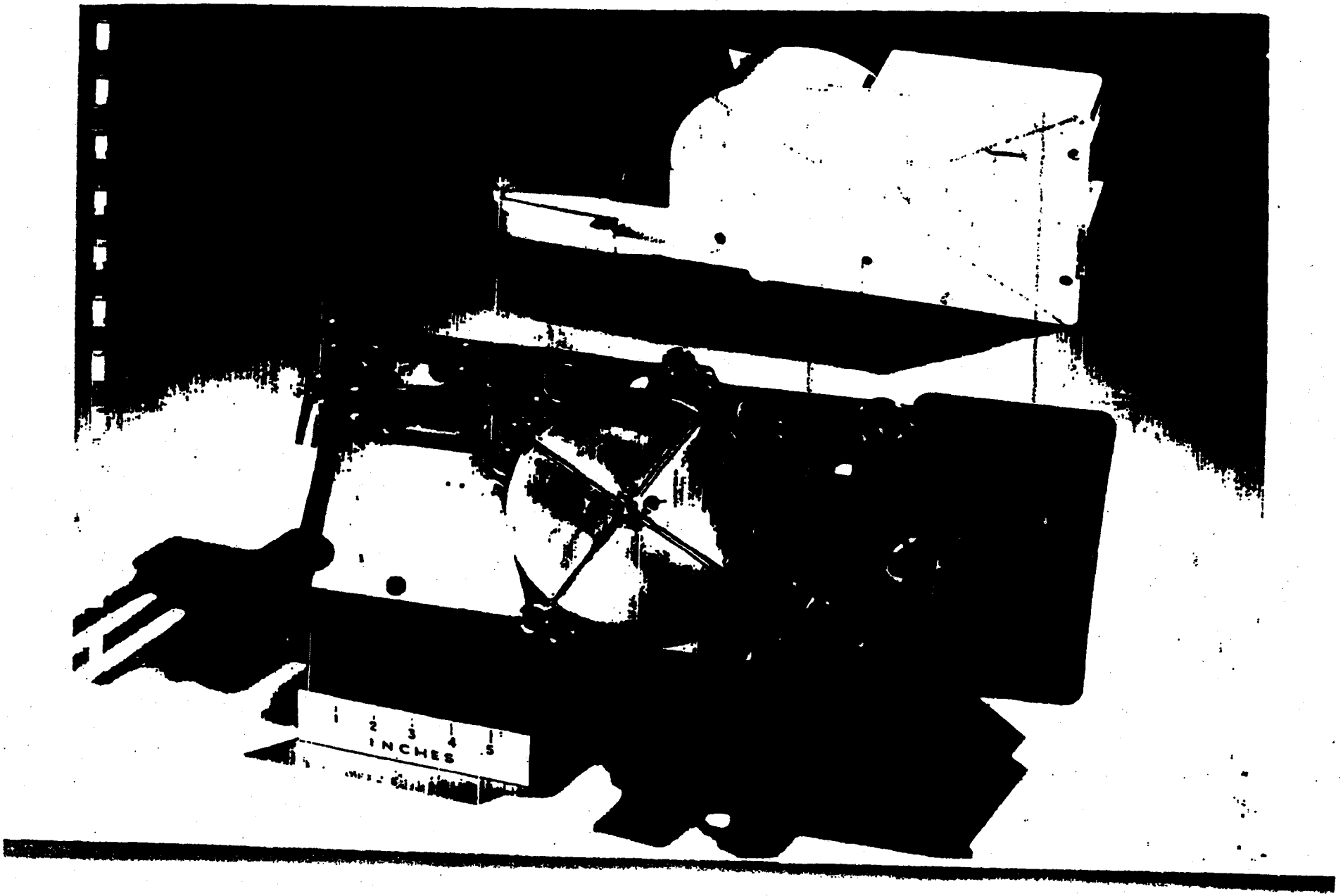
PROCESSOR

FUNCTIONS:

1. Brings the payload film and web into contact, allowing the web to process the film
2. Dries the film

CHARACTERISTICS:

Processing speeds	3.5 inches per minute (running) 0.04 inch per minute (idling)
Processing temperature	72° ± 3°F
Processing time	5 minutes
Drying time	4 minutes
Power consumption (average)	6 watts


1 2 3 4 5
INCHES

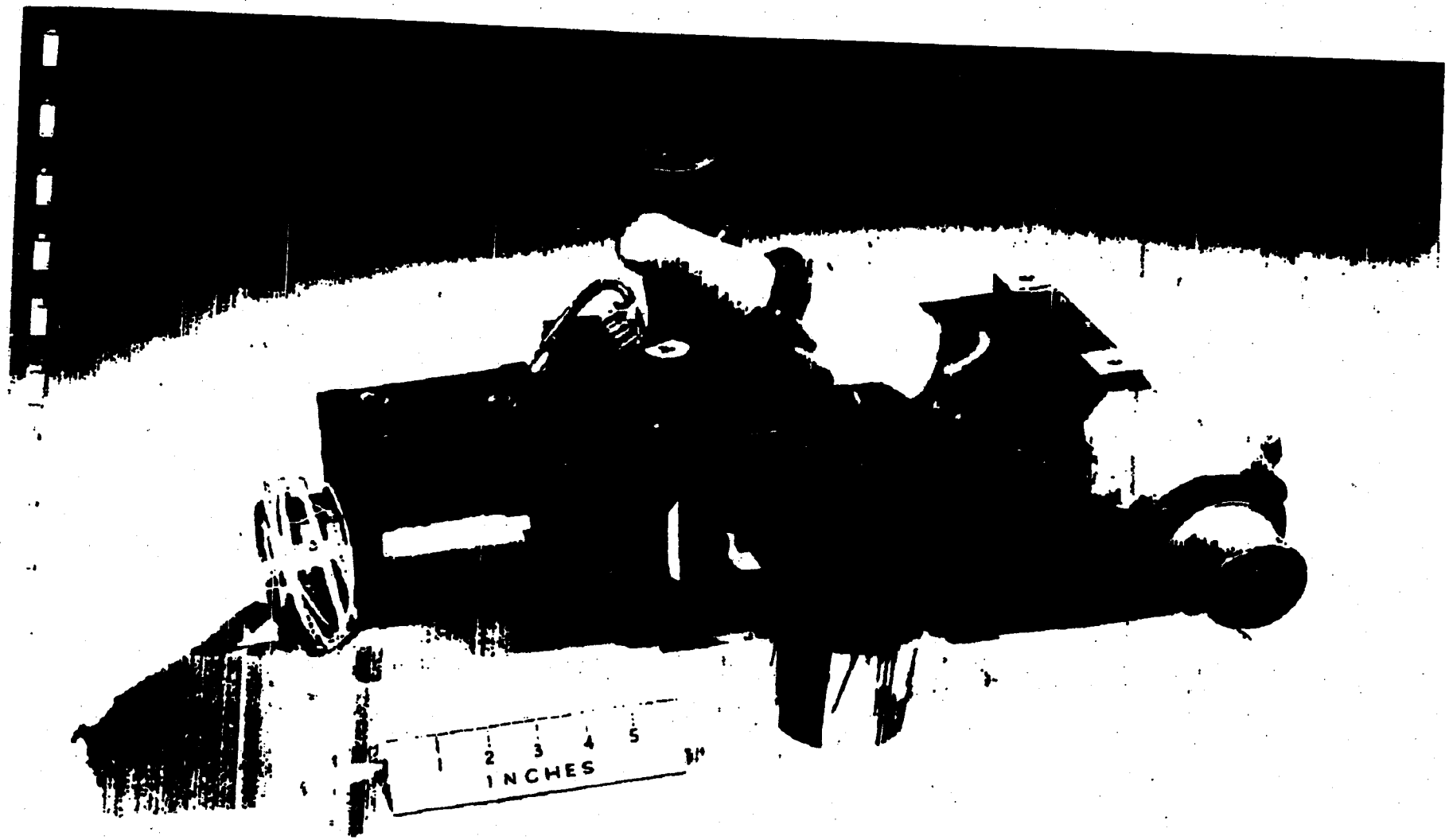
READOUT

FUNCTIONS:

1. Converts the photographic image on the payload film to a video signal, by scanning with an optical flying spot
2. Provides timing pulses to synchronize scanning in the Ground Reconstruction Electronics with scanning in the payload

CHARACTERISTICS:

Speed of operation	6 inches of film per minute
Frame size	2.25 inches x 0.1 inch
Horizontal scan frequency	18,000 lines per second
Vertical scan frequency	1 frame per second
Scan line density	286 lines per mm
Video bandwidth	6 megacycles
Average power consumption	4.5 watts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INCHES

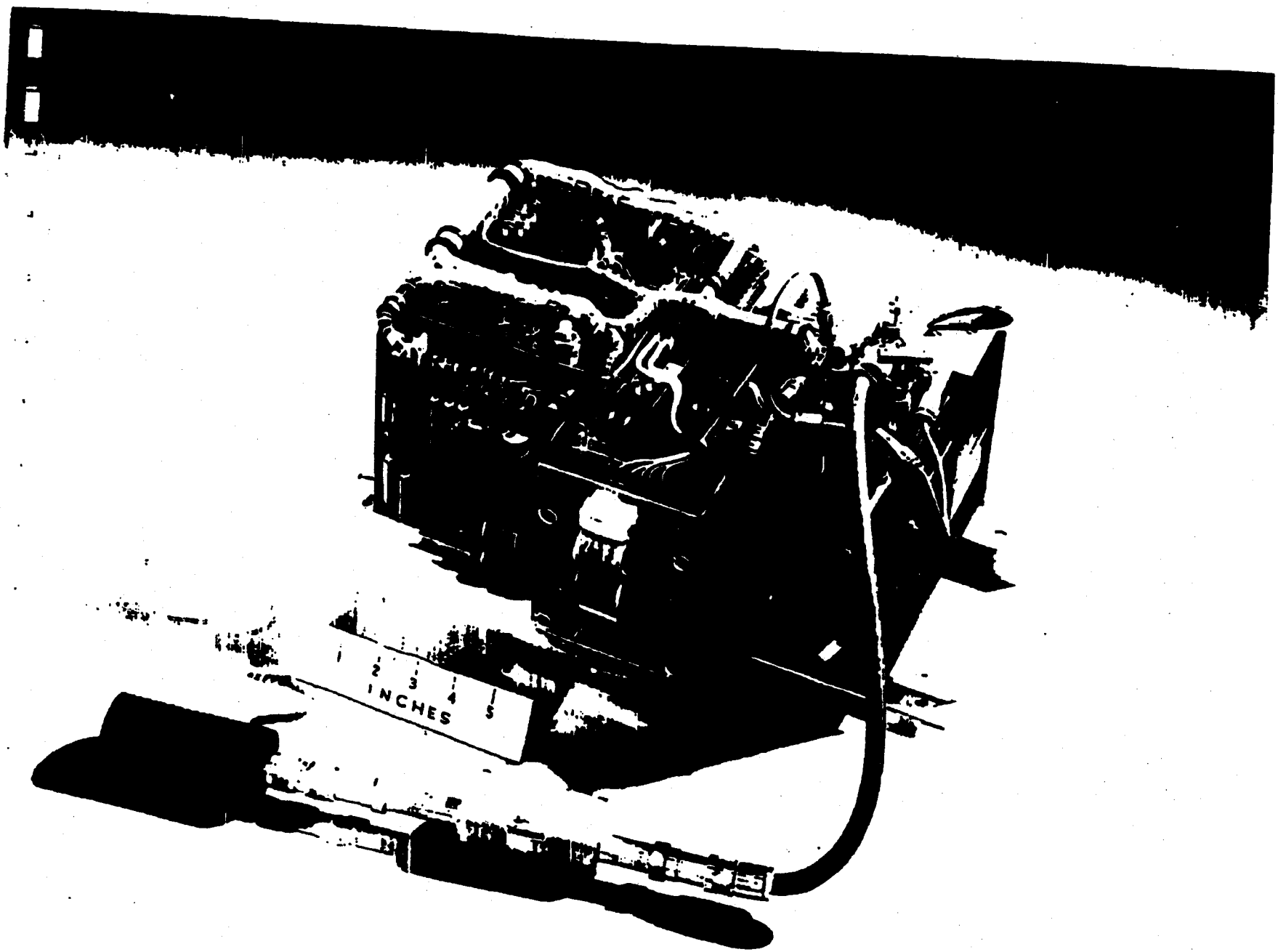
DATA LINK TRANSMITTER

The Wide-Band Data Link, comprising a vehicle-borne transmitter, a ground-based receiver, antennas, and associated equipment is a part of Subsystem E. A prototype model of the transmitter is shown here as an illustration of the vehicle-borne equipment associated with a Subsystem E payload.

FUNCTION: Transmits video signals and sync pulses from vehicle to Tracking and Acquisition Stations.

CHARACTERISTICS:

Carrier frequency	2200-2300 megacycles
Type of modulation	F.M.
Power input during readout	100 watts
Power output during readout	10 watts


1 2 3 4 5
INCHES

GROUND RECONSTRUCTION ELECTRONICS AND PRIMARY RECORD CAMERAS

LOCATIONS:

1. Tracking and Acquisition Stations
2. Subsystem Test Areas

FUNCTIONS:

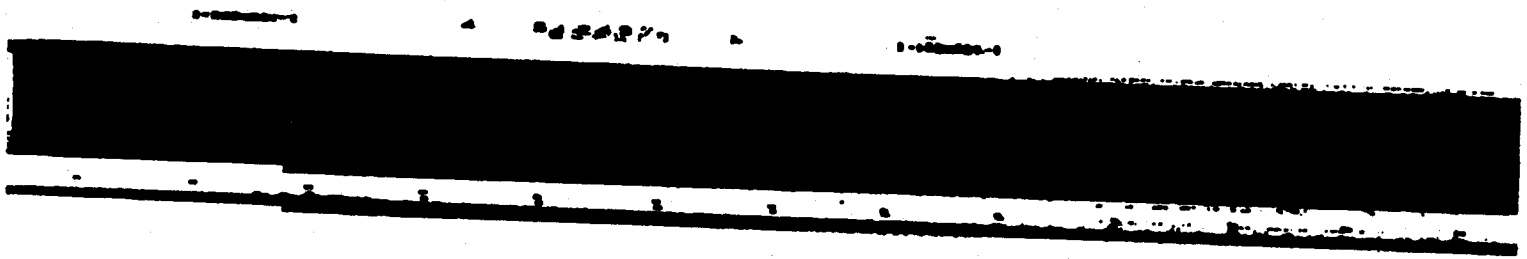
1. Processes video signal received from vehicle through Subsystem H
2. Converts video signal into line-by-line kinescope displays
3. Produces two photographic records of the kinescope displays (35mm Primary Record Films). Each Tracking and Acquisition Station will contain two sets of the equipment shown, producing a total of four Primary Record Films during each readout contact

PRIMARY RECORD FILM

FUNCTION: Provides a photographic reproduction, on the ground, of the image contained on the vehicle film

CHARACTERISTICS:

Size	35mm perforated
Image	7.5 times enlarged positive images of the 2.25 inch by 0.1 inch frames scanned in the vehicle
Average length of record per readout contact	700 feet



PRIMARY RECORD PROCESSOR

LOCATIONS:
1. Tracking and Acquisition Stations
2. Subsystem Test Areas

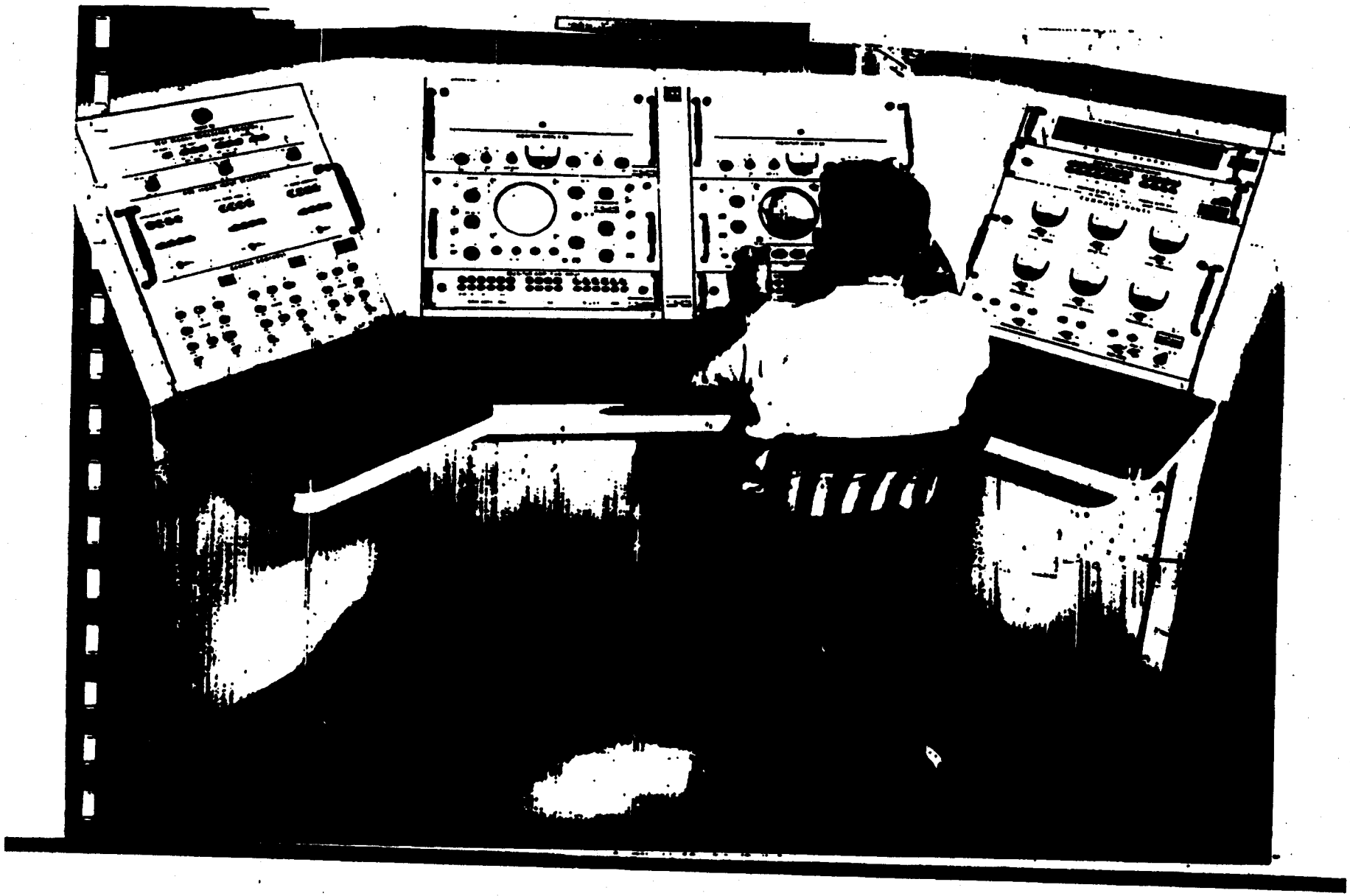
FUNCTION: Processes 35mm primary record films at 80 feet per minute

OPERATING CONSOLE

LOCATION: Tracking and Acquisition Stations

FUNCTIONS:

1. Initiates direct commands to satellite payload
2. Displays telemetered information from satellite payload
3. Controls operation of Ground Reconstruction Electronics and Primary Record Cameras
4. Monitors video signal



TEST CONSOLE

LOCATION: Subsystem Test Areas

FUNCTION: Tests and operates payload under simulated orbit conditions

ASSOCIATED EQUIPMENT:
1. Test Collimator
2. Simulated vehicle power supplies
3. Ground Reconstruction Electronics

REASSEMBLED RECORD PRINT

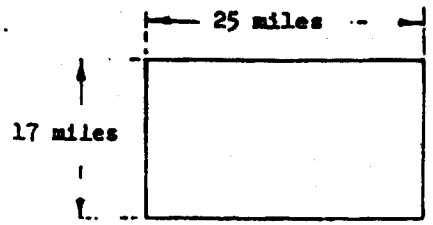
FUNCTION: Provides a basic print record for study of ground photography

CHARACTERISTICS:

Image	1:1 scale reassembly of Primary Record Film frames
Length of record shown	25 miles
Average length of record per readout contact	400 miles
Average length of record per day from one vehicle	3500 miles

The Reassembled Record for the operational system will be in a 9 1/2-inch format rather than the 18 1/2-inch format illustrated, but the scale of the photography will be approximately as shown.

The scene shown covers a strip of ground 17 miles wide corresponding to the width coverage of the E-2 camera. The original subject matter (a mosaic of conventional aerial photos) was photographed on 70mm payload film at the correct scale for the E-2 payload. The resulting image, similar to the one shown on page 12, was then passed through a chain of actual hardware components, including all of the hardware shown on pages 14 through 24, plus a reassembly printer and a contact printer. The picture shown here, therefore, accurately represents the image quality obtained from Subsystem 2 hardware as it exists at the date of this writing.



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