TOP SECRET/C [redacted]

[redacted]
14 000384680

HANDLE VIA [redacted]
CONTROL SYSTEM ONLY

J-3 CAMERA SYSTEM

Design Status

18 APRIL 1967

[redacted]
HANDLE VIA
CONTROL SYSTEM ONLY

TOP SECRET/C [redacted]

[redacted]

[redacted]

[redacted]

Copy No. [redacted]

J-3 CAMERA SYSTEM

Design Status

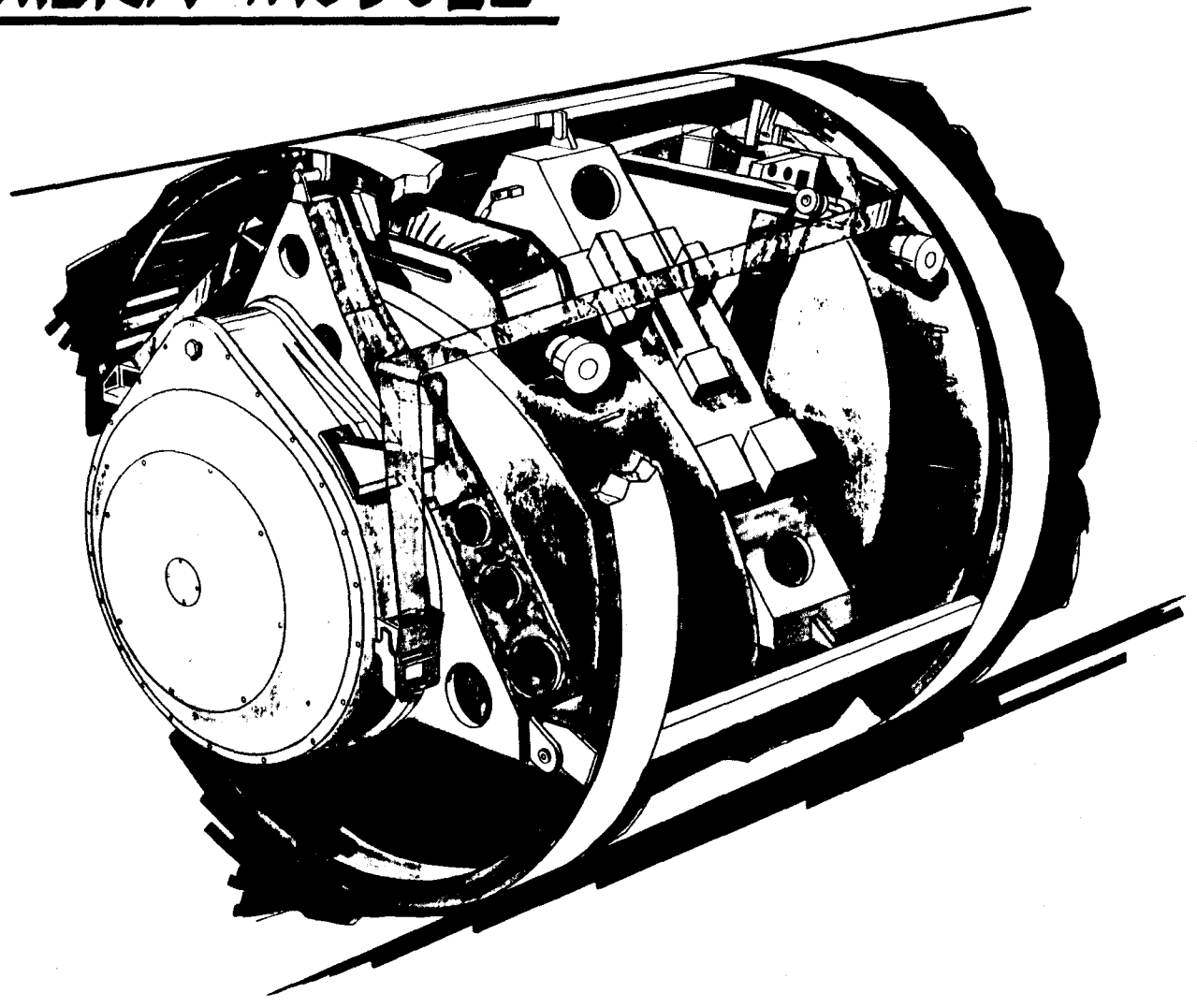
18 APRIL 1967

Itek

[redacted]

[redacted]

CAMERA MODULE



J-1, J-3 COMPARISON

	J-1	J-3
MIN. ALTITUDE	95 N M	80 N M
CAMERA RELATION	NON-MODULAR	MODULAR
IMC	LENS TRANSLATION	CAMERA ROTATION
SCAN	RECIPROCATING	CONTINUOUS ROTATION
LENS SYSTEM	TWO PART	SINGLE ASSEMBLY
EXPOSURE	FIXED SLIT	VARIABLE SLIT
FILTER	SINGLE	DUAL
FILM TYPES	SINGLE	MULTIPLE
PAN GEOM. CALIB.	CAM	NOD ANGLE

EQUIPMENT STATUS

AT A/P

QR-2 (300-301) READY FOR QUAL

CR-1 (302-303) COMPLETED A/P ACCEPTANCE
INSTALLED IN BARREL

AT BOSTON

CR-2 (304-305) IN FINAL ACCEPTANCE

CR-3 (306-307) IN DEBUG
FOLLOWING UNITS ON SCHEDULE

COMPLETED QUALIFICATION TESTS

CAMERA	VIB., VAC.
SUPPLY	ALL EXCEPT ACCEL.
TAKEUP	ALL TESTS
INTER. ROLLER	ALL TESTS
HIGH EFF. AMPS	ALL TESTS
THEODOSVN	THERM./VAC. PRELIM. 110° F, 35° F, 10^{-4} mm*

16 OTHER ASSEMBLIES AND COMPONENTS QUALIFIED

ALL DOCUMENTATION (31 REPORTS) COMPLETED

* 1 HR. 40 MIN. SOAK + 20 MIN OPER.

REMAINING QUALIFICATION TESTS

CAMERA & SUPPLY MODULE	ACCELERATION
4 MECHANICAL ASSEMBLIES	FULL QUAL
8 ELECTRONIC PACKAGES	FULL QUAL
THEODOSYN	VACUUM (96 HRS)
REWORKED AMP	TEMP AND VAC
8 ELEC COMPONENTS	TEMP ONLY

WEIGHT SUMMARY

	CR-1&2	CR-3 & UP
MAIN INST. MODULE	335.4	334.6
SUPPLY	69.5	69.5
TAKE UP "A"	16.8*	16.8
TAKE UP "B"	19.6	19.6
INTERMEDIATE ROLLER	2.8	2.8
	444.1	442.6

* INCLUDES HEATERS & THERMS.

ESTIMATED POWER REQUIREMENTS

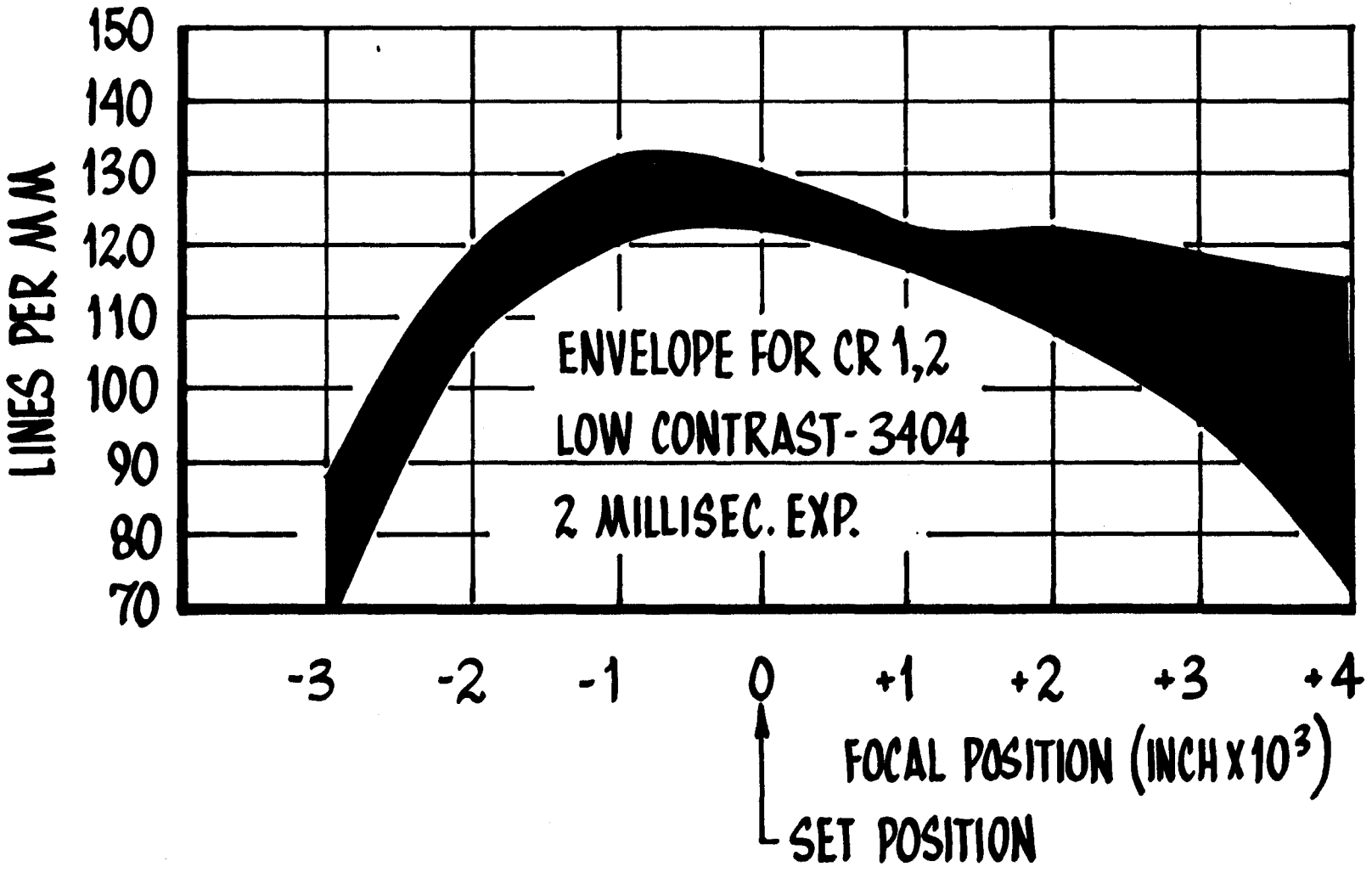
	WATT-HRS @ 3.75 $\frac{rad}{sec}$	WATT-HRS @ 2.5 $\frac{rad}{sec}$	WATT-HRS @ 1.4 $\frac{rad}{sec}$
24 VDC UNREG	1080	1620	2890
115 VAC	180	270	480
COMBINED	1260	1890	3370

WEIGHT SUMMARY

	CR-1&2	CR-3 & UP
MAIN INST. MODULE	335.4	334.6
SUPPLY	69.5	69.5
TAKE UP "A"	16.8*	16.8
TAKE UP "B"	19.6	19.6
INTERMEDIATE ROLLER	2.8	2.8
	444.1	443.3

* INCLUDES HEATERS & THERMS.

CAMERA DYNAMIC PERFORMANCE

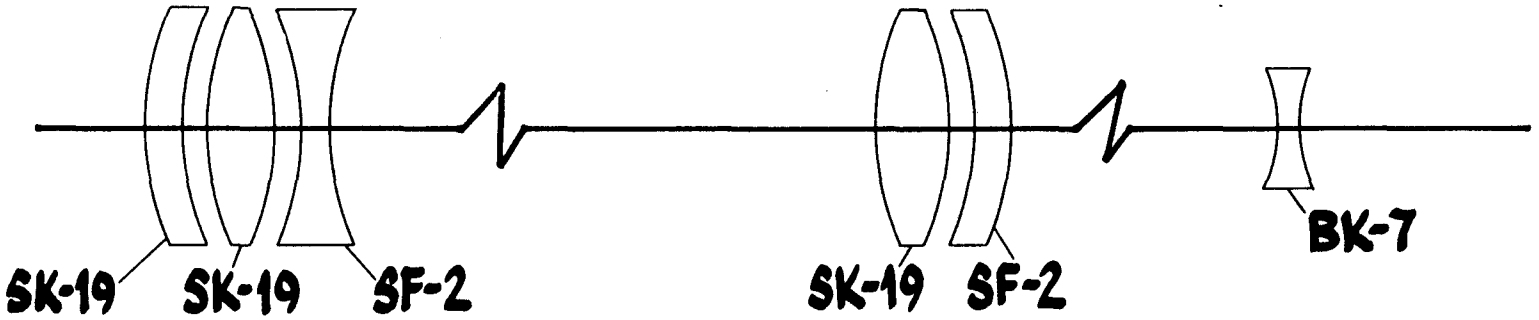


IMPROVED PETZVAL DESIGN

DESIGN NO. 66-036-03-E1

24 INCH FOCAL LENGTH
f/3.5
6° FIELD

GLASS WEIGHT ≈ 17
SPECTRAL RANGE 0.6000 - 0.7100
CENTRAL WAVE LENGTH - 0.6500



DISTORTION ≈ 5 MICRONS

- SAME GLASS TYPES AND QUALITY AS SECOND GENERATION DESIGN
- SAME ELEMENT THICKNESS
- SLIGHTLY DIFFERENT RADII, AIRSPACES
- CENTRAL WAVELENGTH RAISED TO 0.6500, TO MATCH WRATTEN 25 FILTER RESPONSE

IMPROVED PETZVAL PERFORMANCE

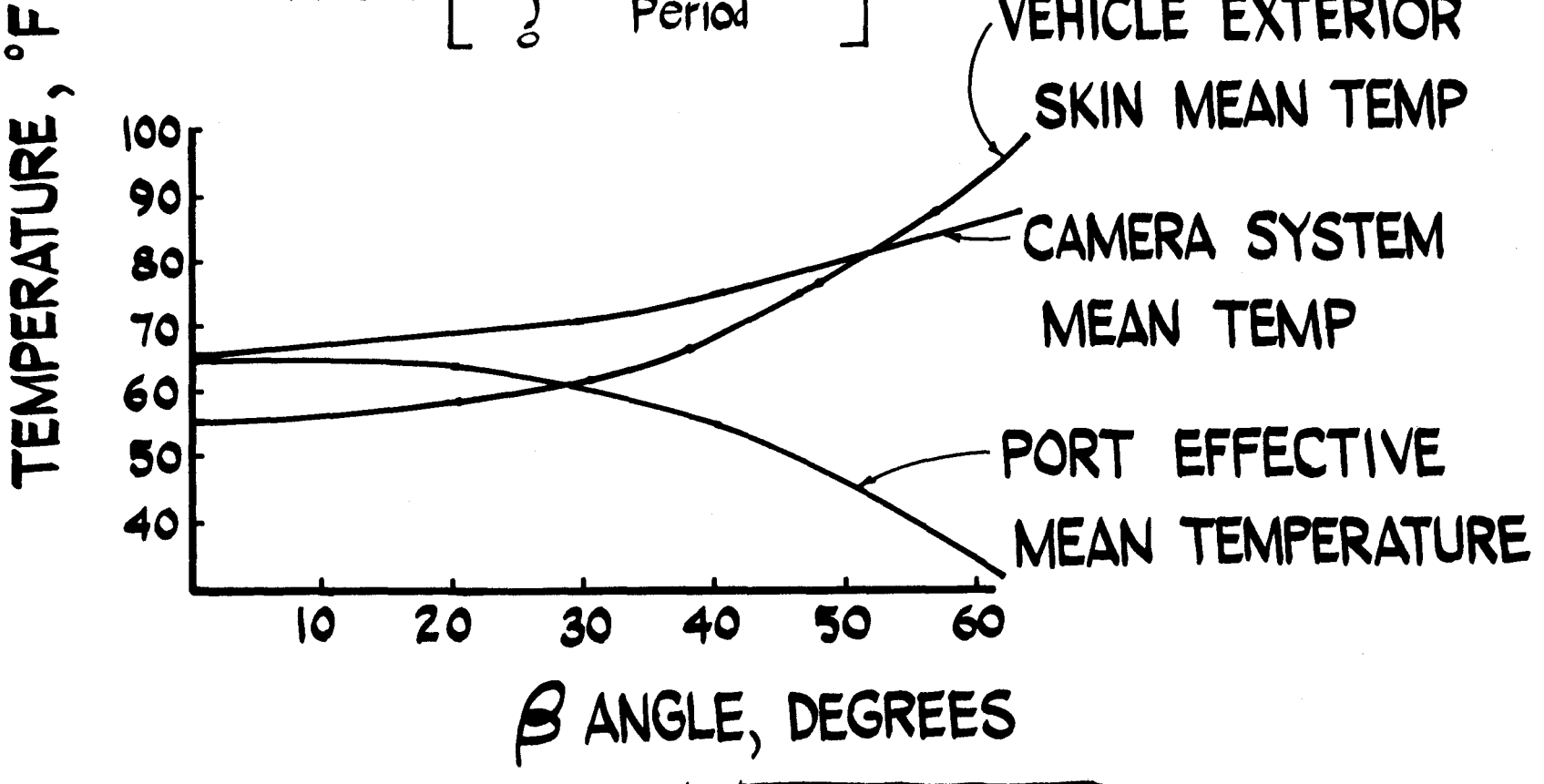
PREDICTED	ACTUAL (TO DATE)
168 ℓ/mm W21	154 ℓ/mm
190 ℓ/mm W25	180 ℓ/mm

NOTE - 3404 FILM

THERMAL ANALYSIS PHILOSOPHY & APPROACH

VARIATION OF TEMPERATURE WITH β ANGLE

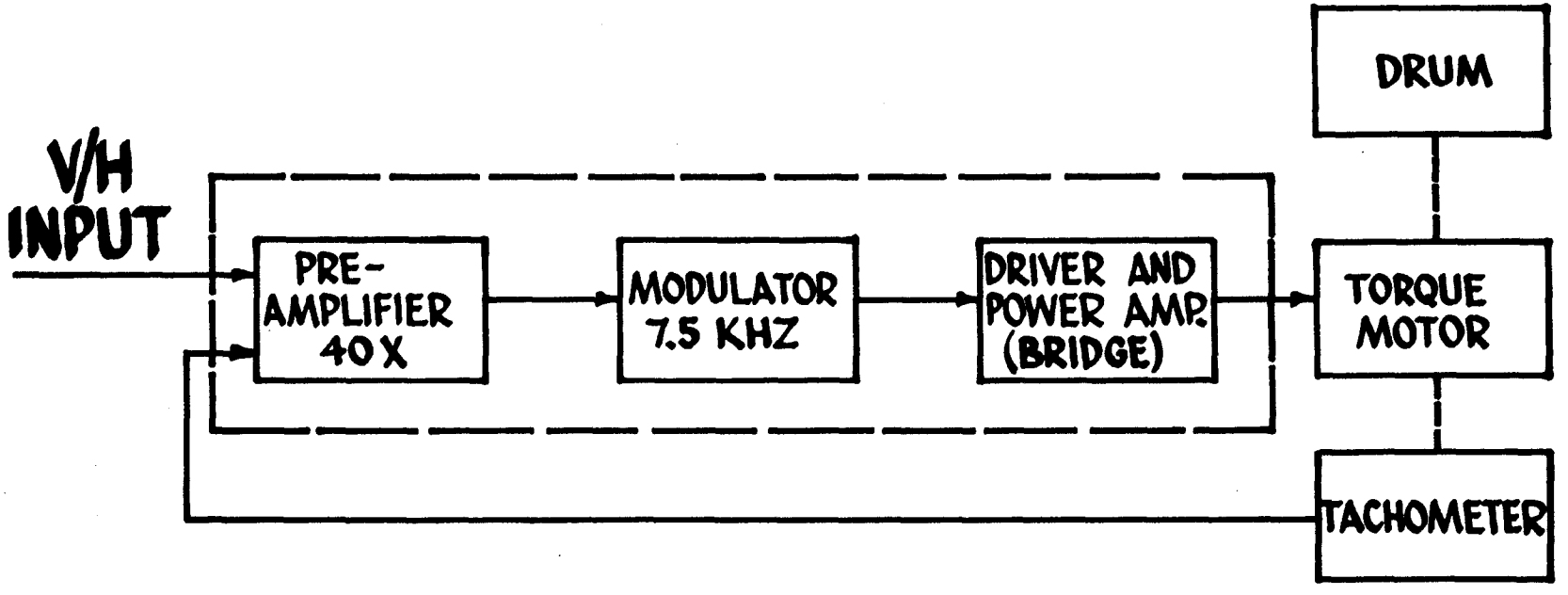
$$T_{mean} = \left[\int_{0}^{Period} \frac{[T(Time)]^4}{Period} dt \right]^{1/4}$$



THERMAL MATH MODEL

- THERMAL MATH MODEL DEVELOPED
  USES STANDARD NODAL HEAT BALANCE TECHNIQUES FOR DIGITAL COMPUTER SOLUTION
- SYSTEM REPRESENTED BY 180 NODES; LENS CELL BY 14 NODES
- TEMPERATURE-TIME RESPONSE PREDICTED FOR ORBITAL CONDITIONS
- PREDICTED LENS TEMPERATURES WITHIN ±10°F OF NOMINAL

HIGH EFFICIENCY SERVO AMPLIFIER



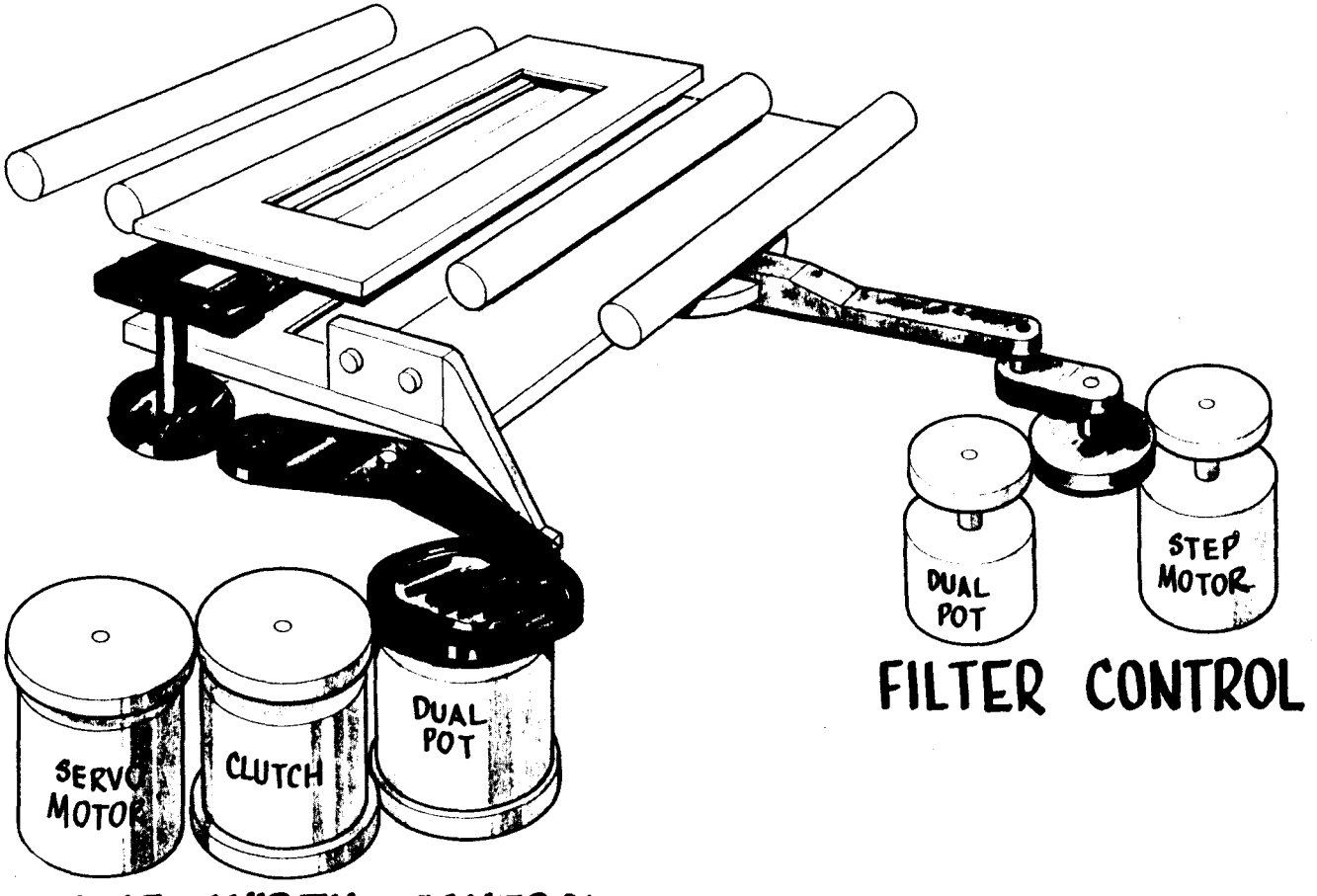
AMPLIFIER COMPARISON

	LOW	HIGH
AMPLIFIER POWER	57w(24v)	20w(24v)
	72w(29v)	25w(29v)
MOTOR POWER	15w(24v)	15w(24v)
POWER BUDGET	NO SURPLUS	45%SURPLUS *
THERMAL	VEHICLE HEATSINK	NO EXTERNAL HEATSINK
WEIGHT	7.5 lbs. EST ±	6.5 lbs.
COMPLEXITY	2 PKGS. / INSTR.	1 PKG / INSTR.

* 1.4 RAD/SEC, 3404

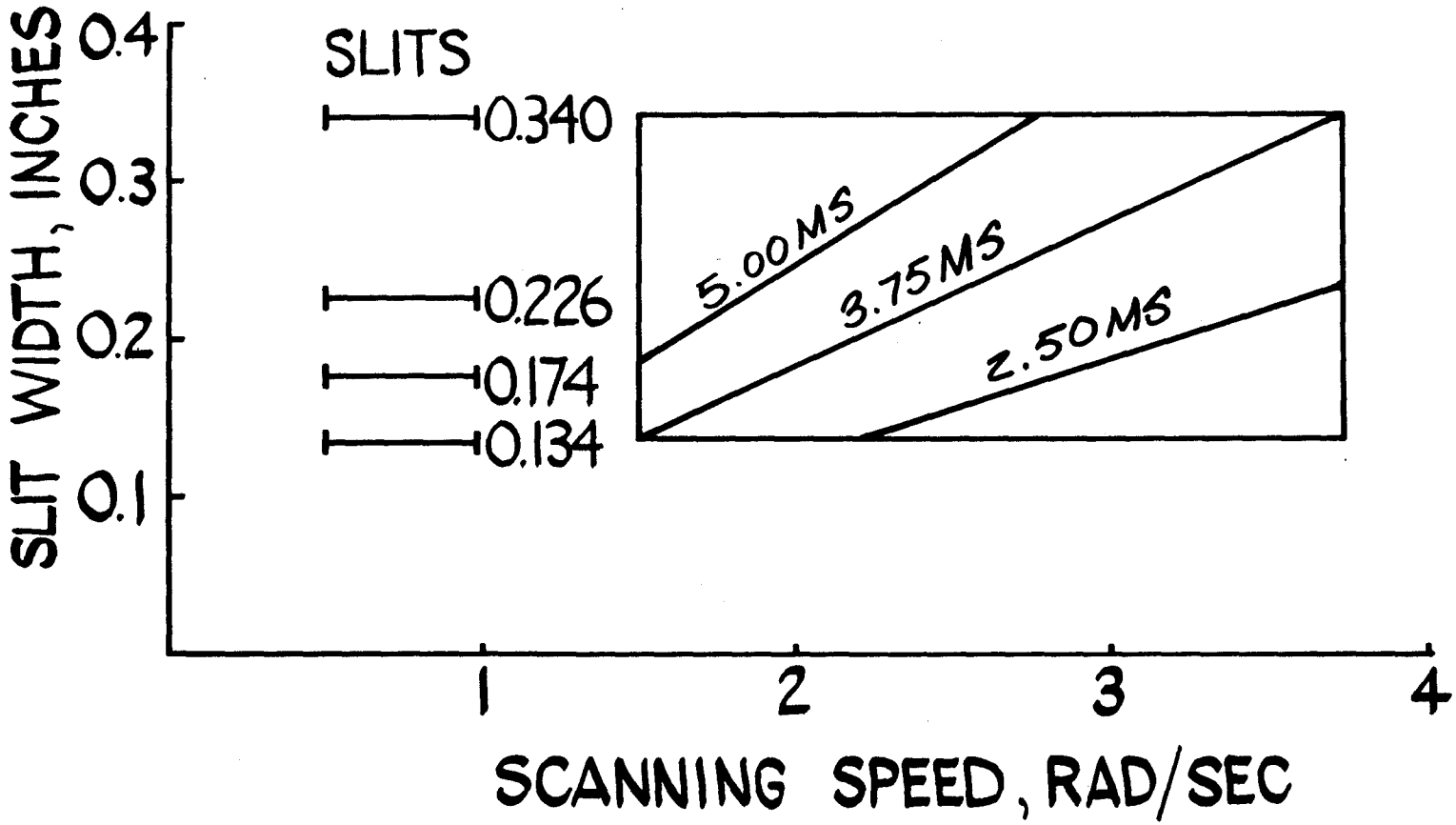
± INCLUDES HEATSINK

SLIT WIDTH CONTROL

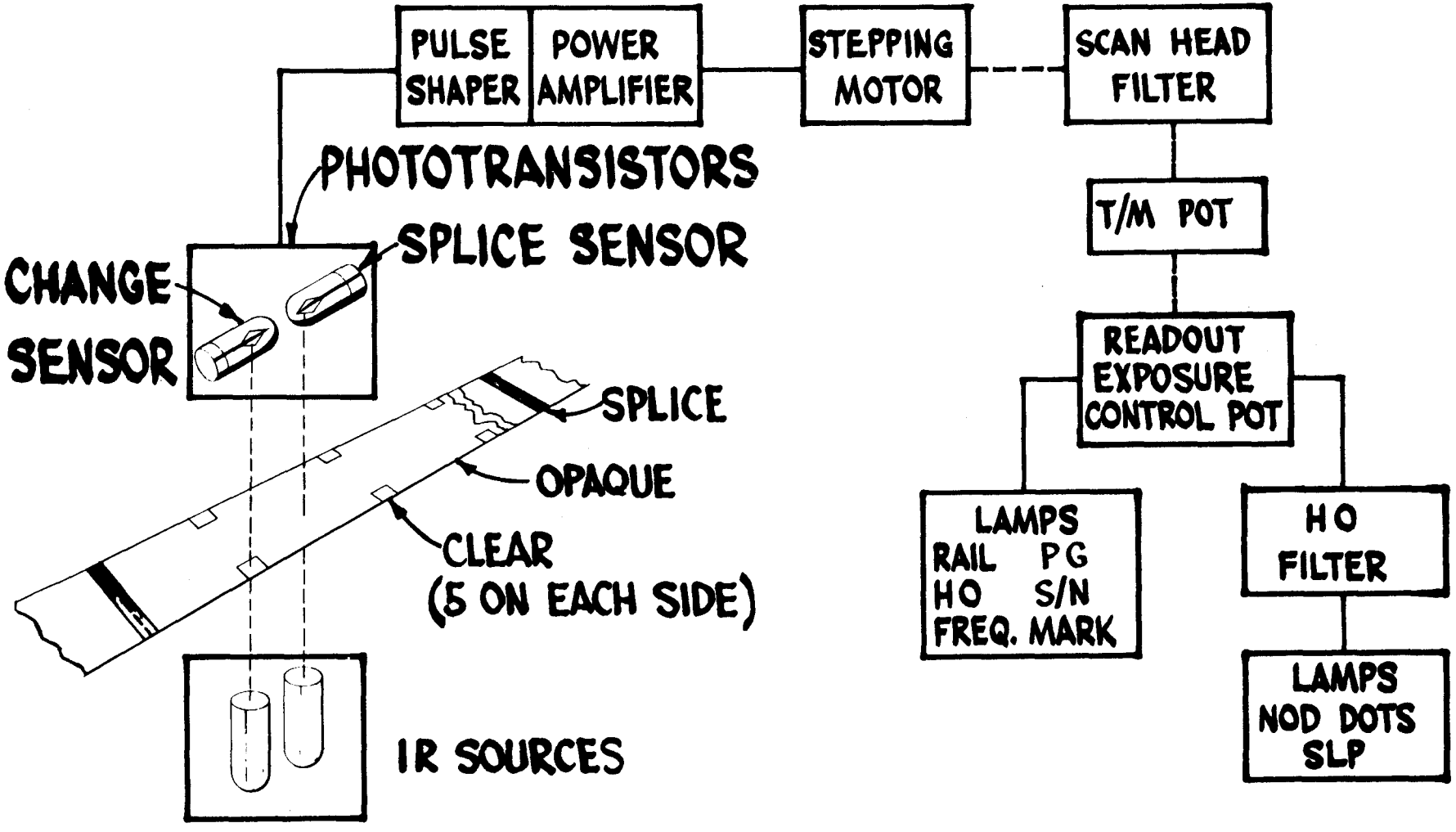


SLIT WIDTH VS SCANNING SPEED

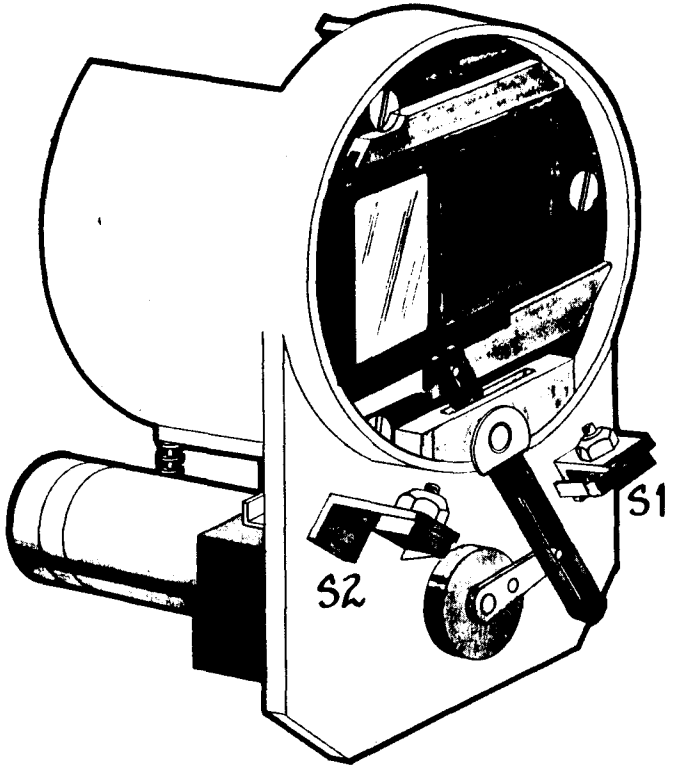
FOR VARIOUS EXPOSURE TIMES



MATERIAL CHANGE DETECTOR

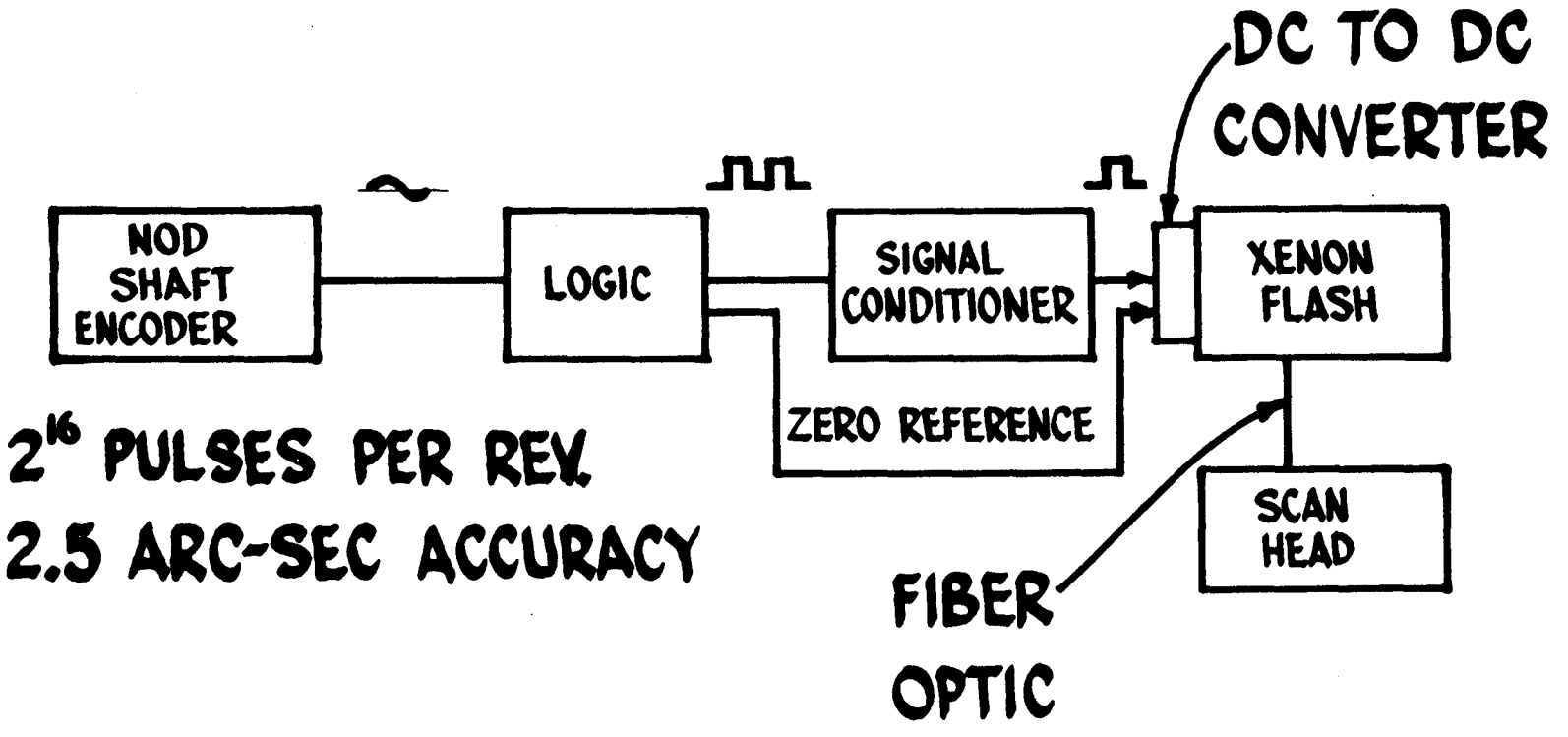


AUX. OPTICS FILTER CHANGER



S-1 NORMAL POSITION
W25 IN PLACE
S-2 ALTERNATE POSITION
W25 + NEUTRAL
DENSITY FILTER
S-2 ALSO CALLS FOR REDUCED
NOD DOT AND SLP INTENSITY

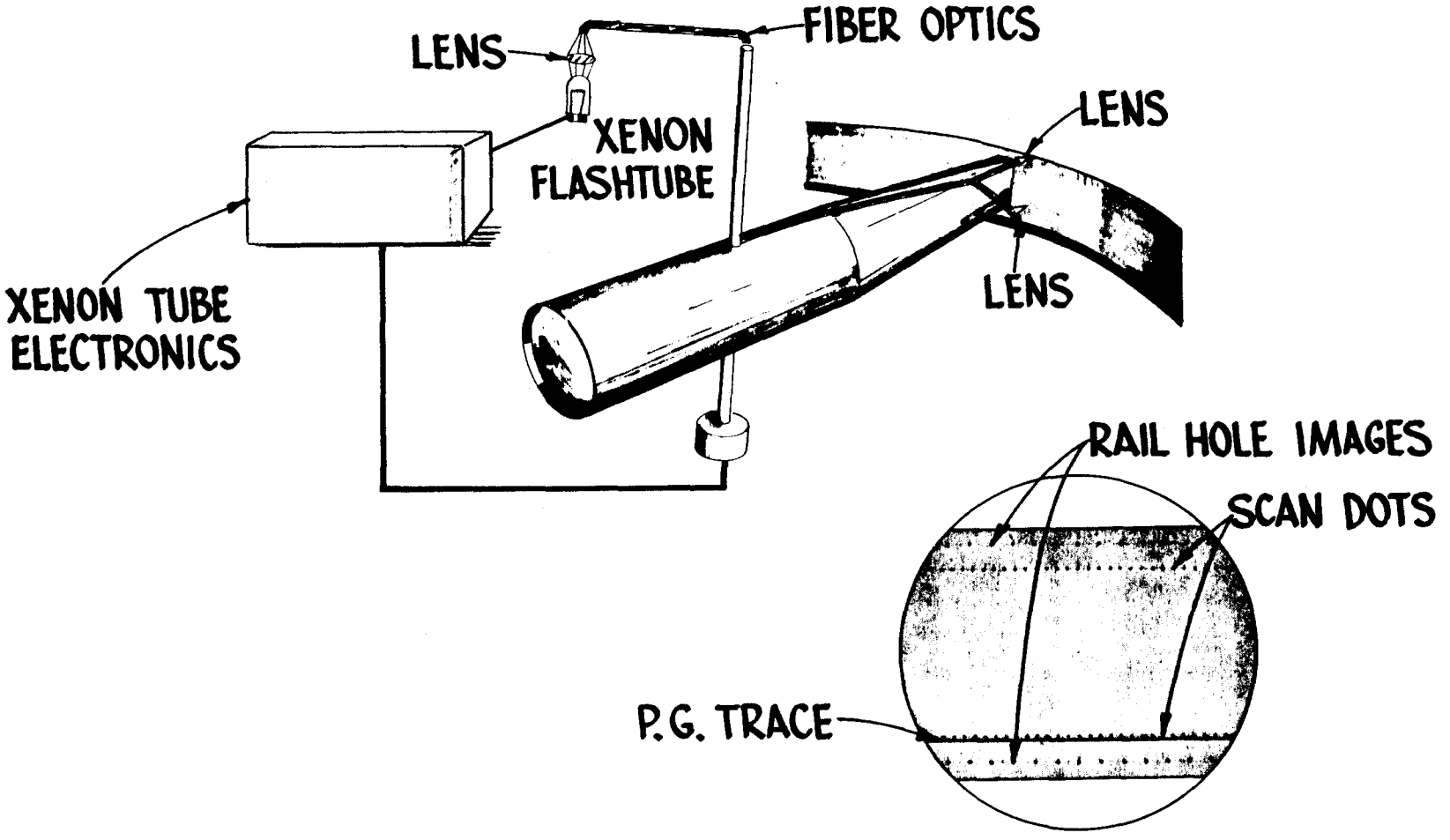
NOD TO SCAN CALIBRATION



2^{16} PULSES PER REV.

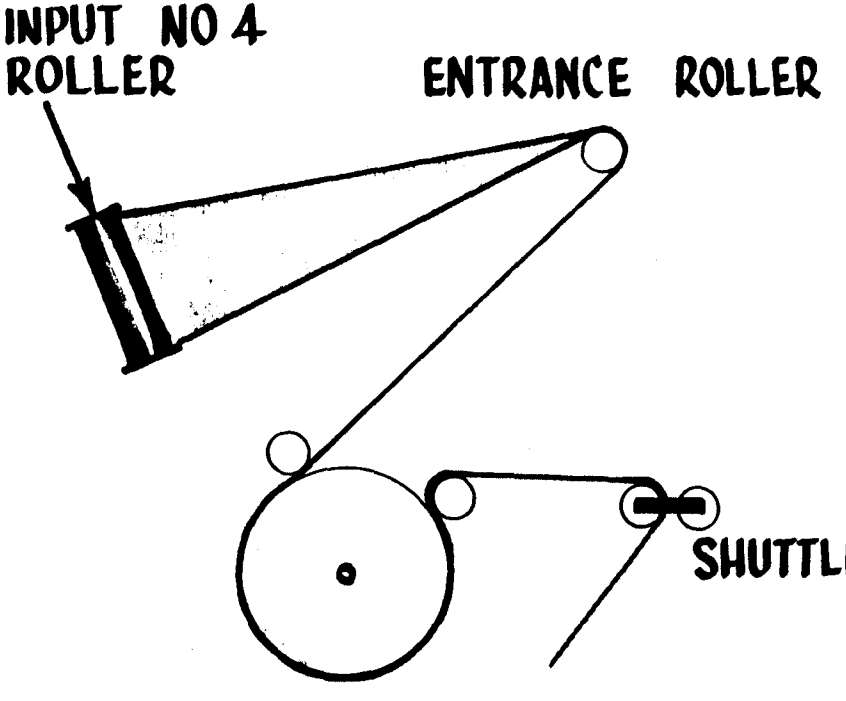
2.5 ARC-SEC ACCURACY

RAIL HOLE CALIBRATION

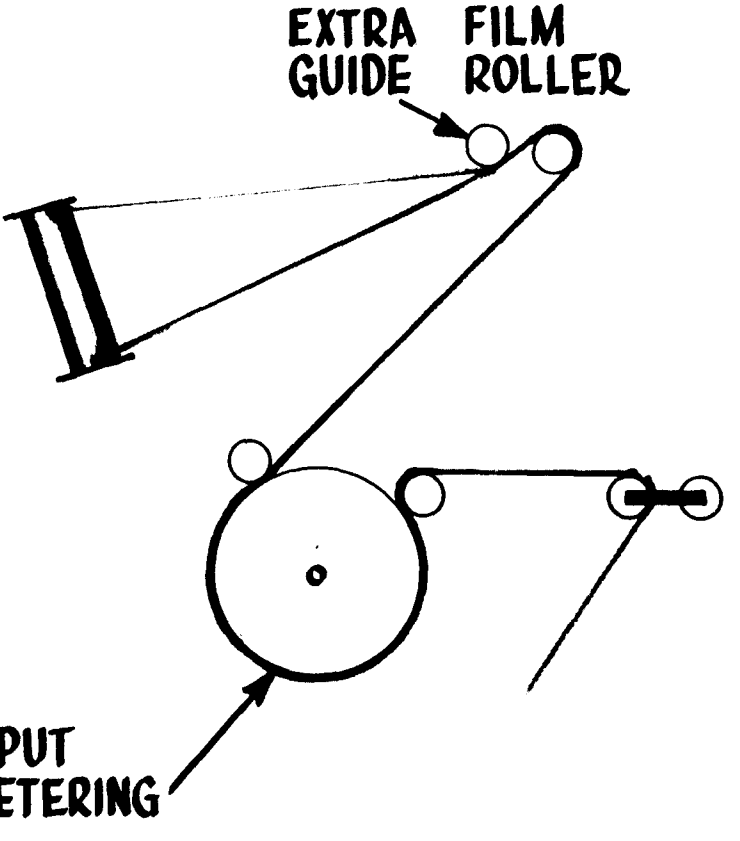


FILM PATH - UTB

299 THRU 305



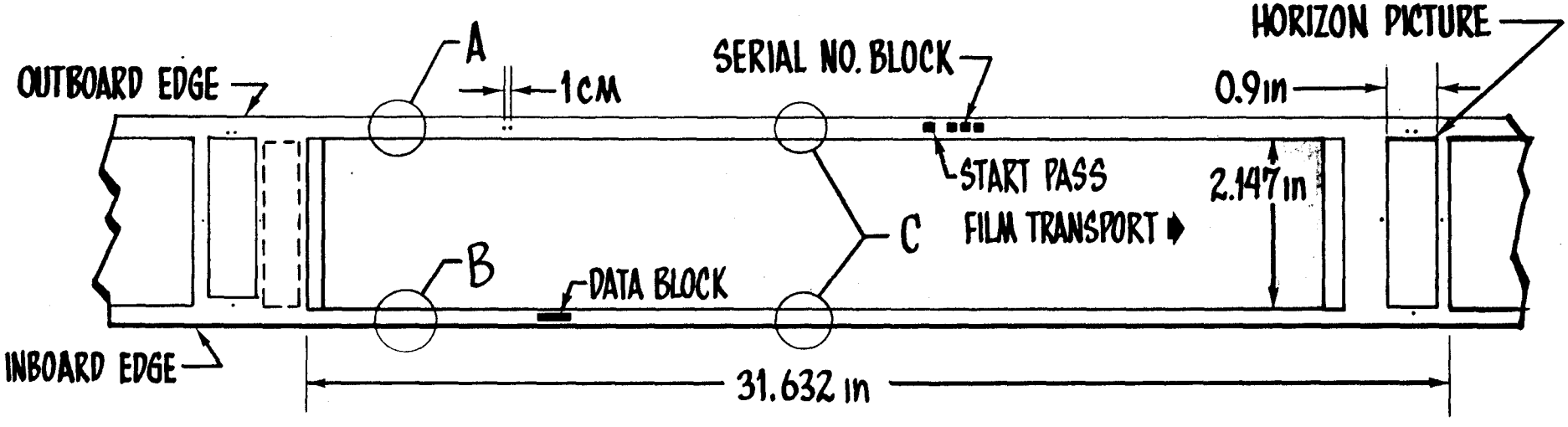
306 AND UP

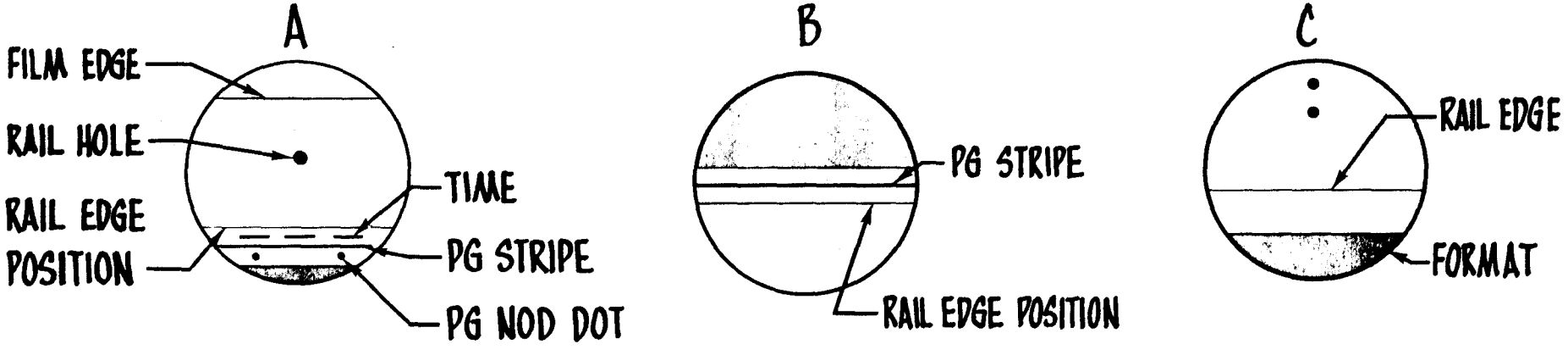


SHUTDOWN SEQUENCE

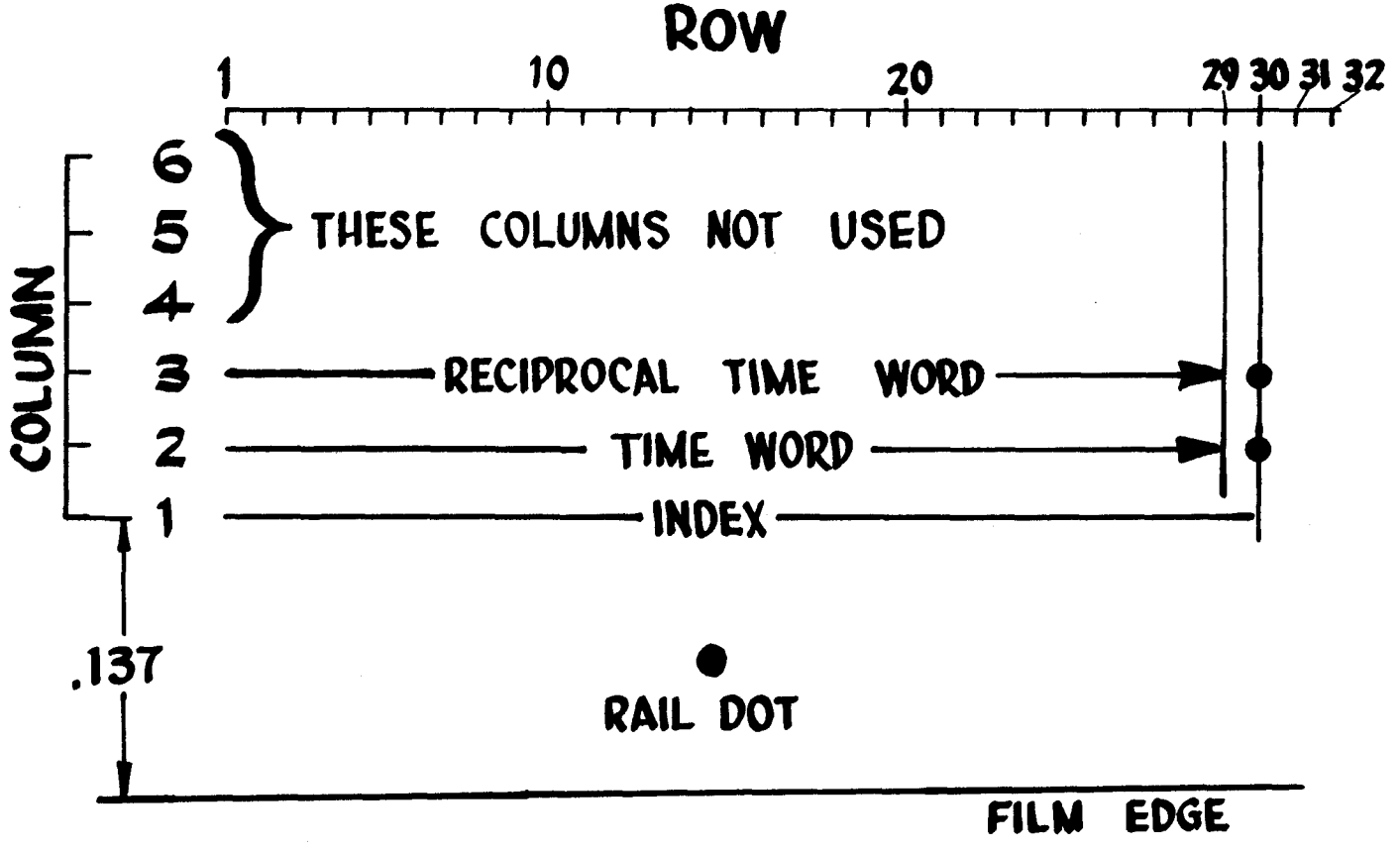
299 THRU 305	306 AND UP
OPERATE POWER OFF	OPERATE POWER OFF
SHUTDOWN STARTS AT END OF NEXT CYCLE	SHUTDOWN STARTS 100° BEFORE START OF NEXT SCAN
COMPLETES CYCLE AT CREEP	STOWS AT END OF SCAN
STOWS	

FILM FORMAT


OUTBOARD EDGE
A
1CM
SERIAL NO. BLOCK
HORIZON PICTURE
0.9in
START PASS
2.147in
FILM TRANSPORT
C
B
DATA BLOCK
INBOARD EDGE
31.632 in


A
FILM EDGE
RAIL HOLE
RAIL EDGE POSITION
TIME
PG STRIPE
PG NOD DOT
B
PG STRIPE
RAIL EDGE POSITION
C
RAIL EDGE
FORMAT

SLP BLOCK


ROW
1
10
20
29
30
31
32
COLUMN
6
5
4
THESE COLUMNS NOT USED
3
RECIPROCAL TIME WORD
2
TIME WORD
1
INDEX
.137
RAIL DOT
FILM EDGE

PROBLEM AREAS

NOISE PULSING OF XENON FLASH (NOT APPLICABLE TO CR-1)

FLIGHT READINESS

CR-1 CAMERA SYSTEM NOW READY FOR OPERATIONAL USE