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(NASA-CR-170870) LOW CONCENTRATION RATIO SOLAR ARRAY FOR LOW EARTH ORBIT MULTI-100kW APPLICATION. VOLUME 2: DRAWINGS Final Report (Rockwell International Corp.) 175 p HC A08/MF A01 CSCL 22B G3/18

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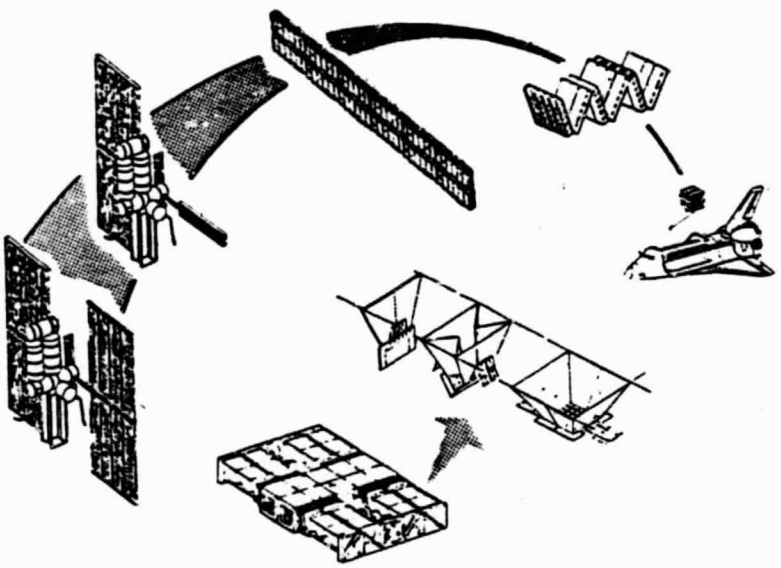
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LOW CONCENTRATION RATIO SOLAR ARRAY FOR LOW EARTH ORBIT MULTI-100 kW APPLICATION

VOLUME 2—DRAWINGS

FINAL REPORT
JULY 1983



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Prepared for:

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
Marshall Space Flight Center, AL 35812

Contract NAS8-34214

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Shuttle Integration & Satellite Systems Division

Rockwell International

SSD83-0075-2

LOW CONCENTRATION RATIO SOLAR ARRAY FOR LOW EARTH ORBIT MULTI-100 kW APPLICATION FINAL REPORT

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AL 35812

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Shuttle Integration &
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12214 Lakewood Boulevard
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TECHNICAL REPORT INDEX/ABSTRACT

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Low Concentration Ratio Solar Array for Low Earth Orbit Multi-100 kW Application, Final Report, Vol. 2 - Drawings

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AUTHOR(S)

Nalbandian, S. J., French, E. P., et al

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DESCRIPTIVE TERMS

Concentrators, Solar Arrays, Concentrator Arrays, Concentrating Silicon Solar Cells, Concentrating Gallium Arsenide Cells, Low Earth Orbit Multi-100 kW Solar Array Design

ABSTRACT

This report describes a preliminary design effort directed toward a low-concentration-ratio photovoltaic array system based on 1984 technology and capable of delivering multi-hundred kilowatts (300 kW to 1000 kW range) in low earth orbit. The array system consists of two or more array modules each capable of delivering between 113 kW to 175 kW using silicon solar cells or gallium arsenide solar cells, respectively.

The array module deployed area is 1320 square meters and consists of 4356 pyramidal concentrator elements. The module, when stowed in the Space Shuttle's payload bay, has a stowage volume of a cube with 3.24 meters on a side. The concentrator elements are sized for a geometric concentration ratio (GCR) of six with an aperture area of 0.5 meters x 0.5 meters.

Volume 1 discusses the structural analysis and design trades leading to the baseline design. It describes the configuration, as well as optical, thermal and electrical performance analyses that support the design and overall performance estimates for the array. Experimental results are also presented for a concentrator element using both silicon and gallium arsenide solar panels. They confirm the preliminary design analysis and performance estimates. Recommendations are provided for future development effort for low earth orbit application. Volume 2 provides drawings for the preliminary design configuration and for the test hardware that was fabricated for design evaluation and test.

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FOREWORD

This report describes the effort performed for the preliminary design of low-cost concentrator multi-hundred kilowatt solar arrays. The Volume 1 report summarizes activities performed between June 18, 1981 and July 1983, as required by Contract NAS8-34214 Statement of Work. Volume 2 contains drawings prepared describing the preliminary design configuration, test hardware and manufacturing flow concept. The report was prepared by the Shuttle Integration and Satellite Systems Division of Rockwell International Corporation for the NASA George C. Marshall Space Flight Center (MSFC), Huntsville, Alabama. The NASA technical Contractor Officer Representative for the activity is Mr. W. L. Crabtree. The contents of this document are not necessarily endorsed by the NASA-MSFC.

Mr. S. J. Nalbandian is the project supervisor. Dr. E. P. French is the assistant project supervisor. Principal contributors to the project were:

J. B. Adkins	Mechanism Design
H. C. Ayers	Reflector Design
Z. Backovsky	Testing and Thermal Analysis
R. A. Bellgardt	Electrical Test Equipment
M. S. Biss	Overall Preliminary Design
J. L. Edwards	Structural Analysis
J. D. Eliot	Mechanical Test Equipment
Dr. E. P. French	Optical and Thermal Analysis
G. C. Frey	Materials
R. V. Frost	Reflector Panel Fabrication
H. S. Greenberg	Initial Structural Design and Analysis
K. M. Hicks	Manufacturing Planning
Dr. L. Hsu	Solar Cell Technology
R. L. Long	Materials
M. W. Mills	Electrical Testing and Analysis
Dr. T. S. Nishimoto	Structural Analysis
F. A. Perry	Structural Analysis
A. M. Pope	Development Plans
D. A. Reed	Initial Preliminary Design
A. A. Sileski	Test Planning
L. Vega	Test Hardware

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ILLUSTRATIONS

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1.0 PRELIMINARY DESIGN DRAWINGS

1.1 DISCUSSION

The solar array preliminary design developed under this program is described in a set of 30 level-one drawings. These drawings and their relationships are depicted in the drawing tree shown in Figure 1. Together with their associated callouts and specifications, the drawings provide a physical description of two variants of a 1320 m^2 solar array module (deployed area), one fitted with silicon solar cells and the other with gallium arsenide solar cells. The requirements, trades and analytical studies leading to the design are fully described in Volume 1 of this report.

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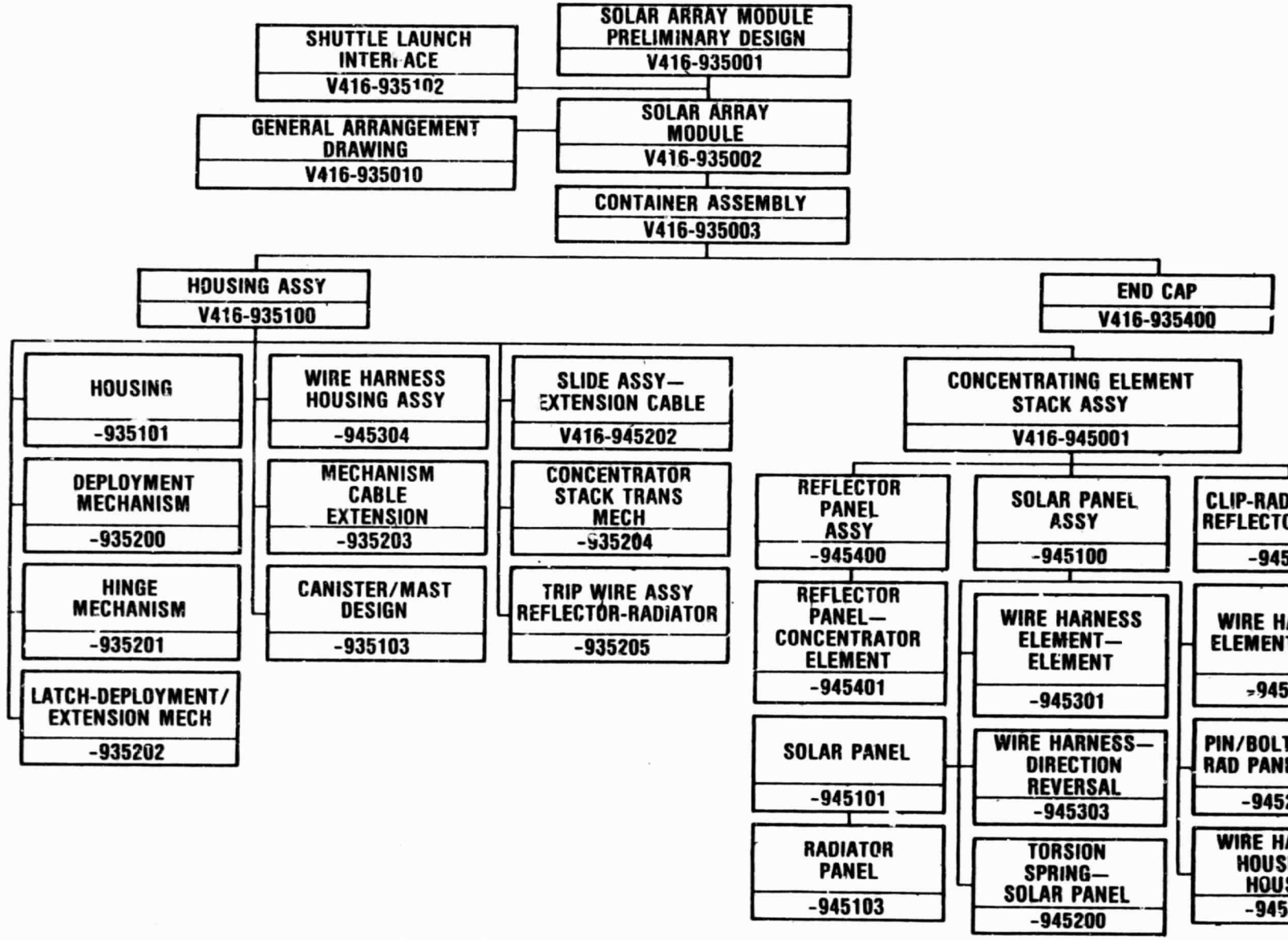


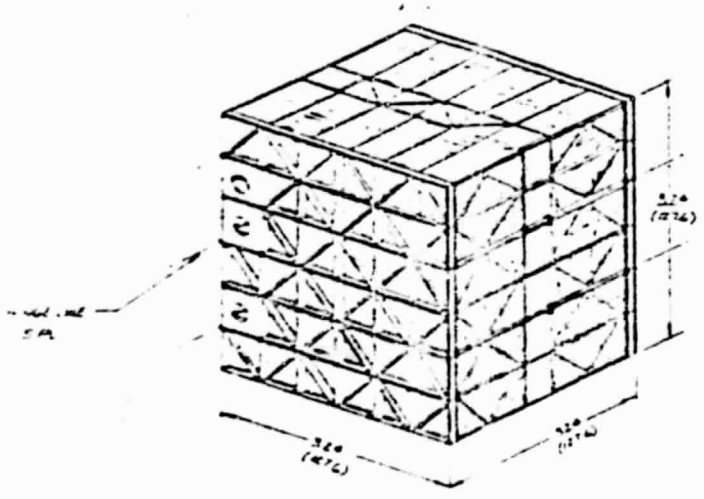
Figure 1. Preliminary Design Drawing Tree (Updated)

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1.2 DESIGN DRAWINGS

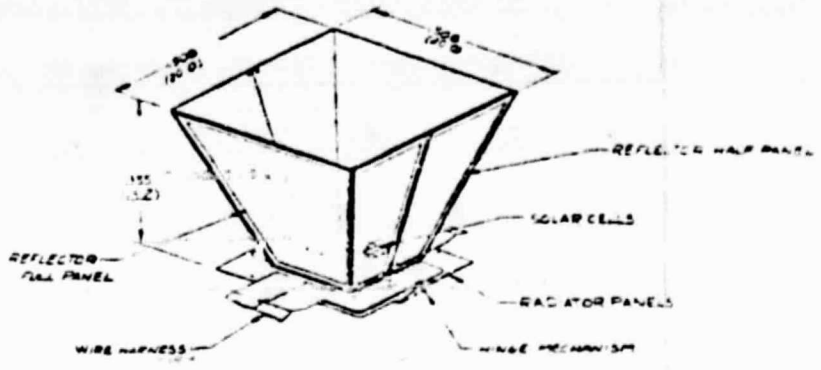
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3. V416-935003
4. V416-935010
5. V416-935100, sheets 1 of 2 and 2 of 2
6. V416-935101, sheets 1 of 3, 2 of 3, and 3 of 3
7. V416-935102
8. V416-935103
9. V416-935200
10. V416-935201
11. V416-935202
12. V416-935203
13. V416-935204
14. V416-935205
15. V416-935400
16. V416-945001
17. V416-945100
18. V416-945101
19. V416-945103
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21. V416-945202
22. V416-945203
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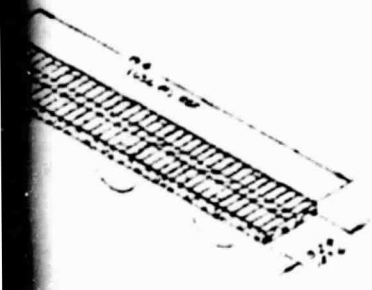
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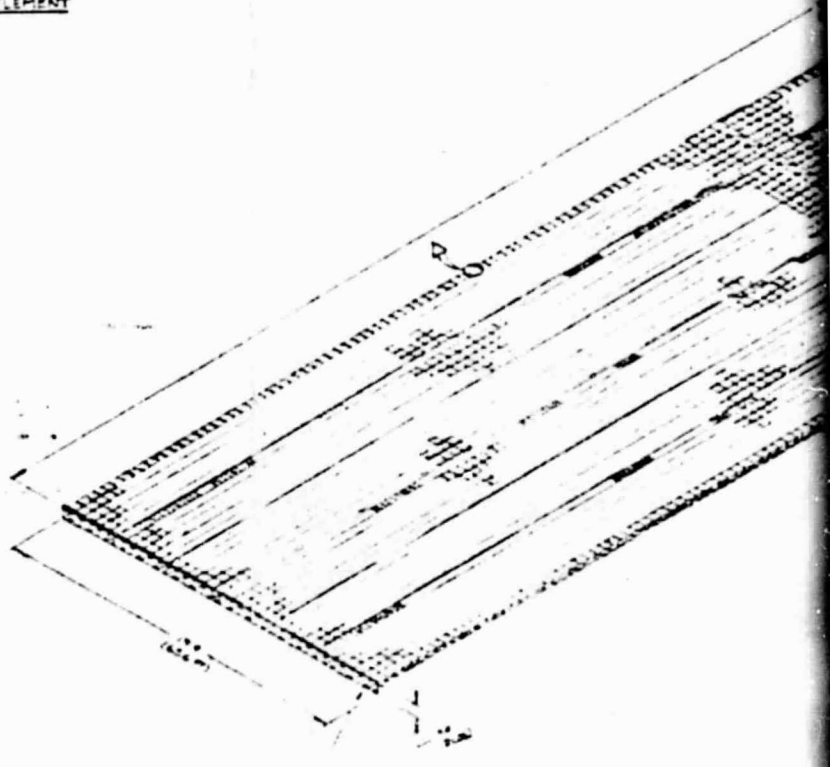


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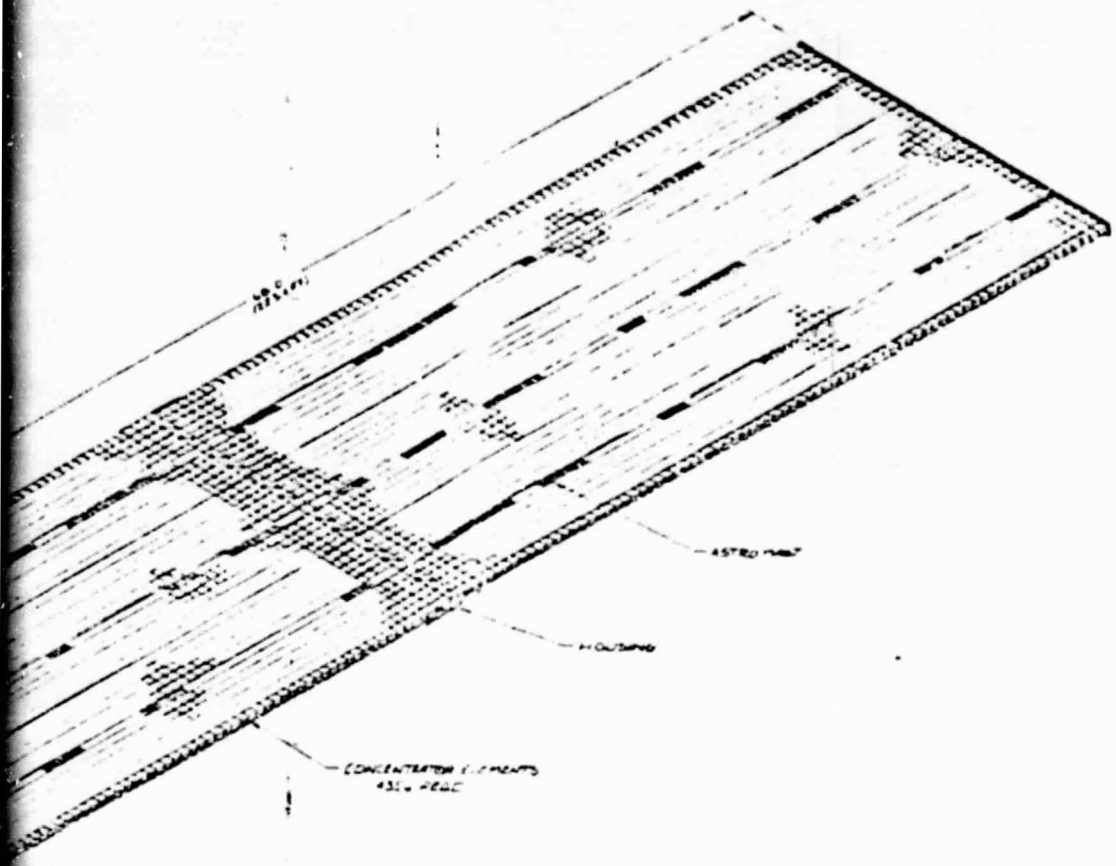
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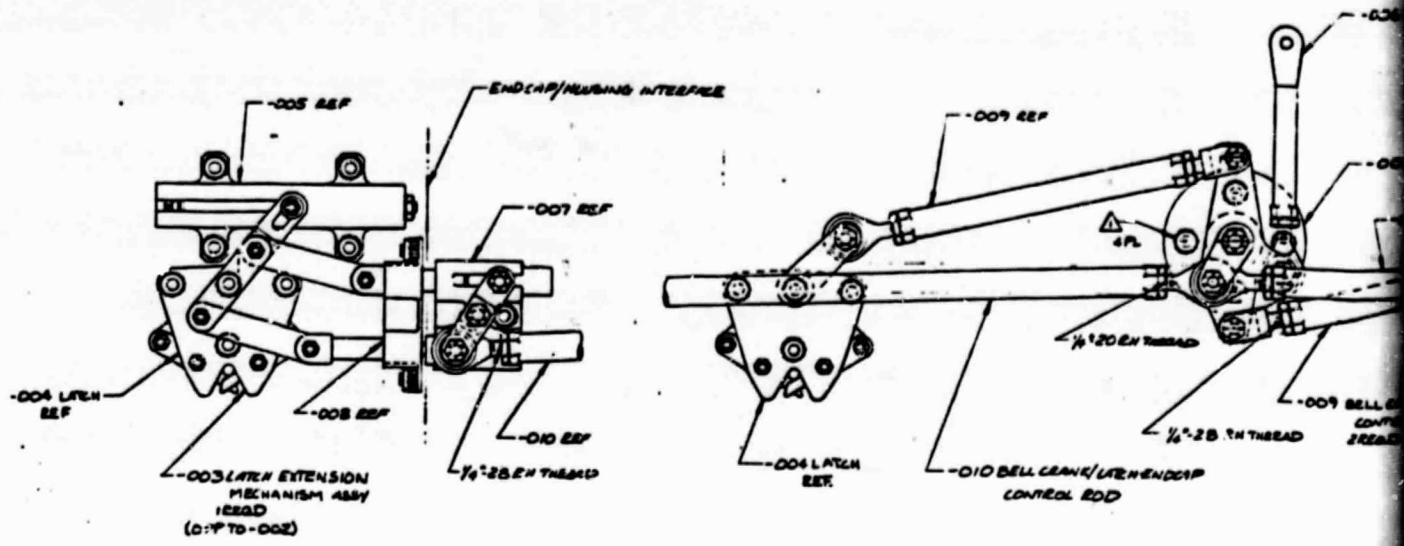
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LOW CONCENTRATION RATIO
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PRELIMINARY DESIGN

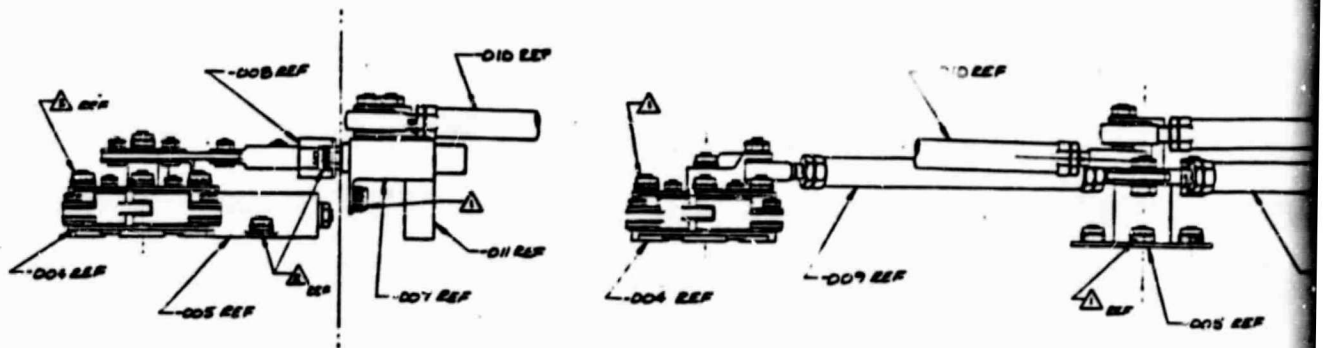
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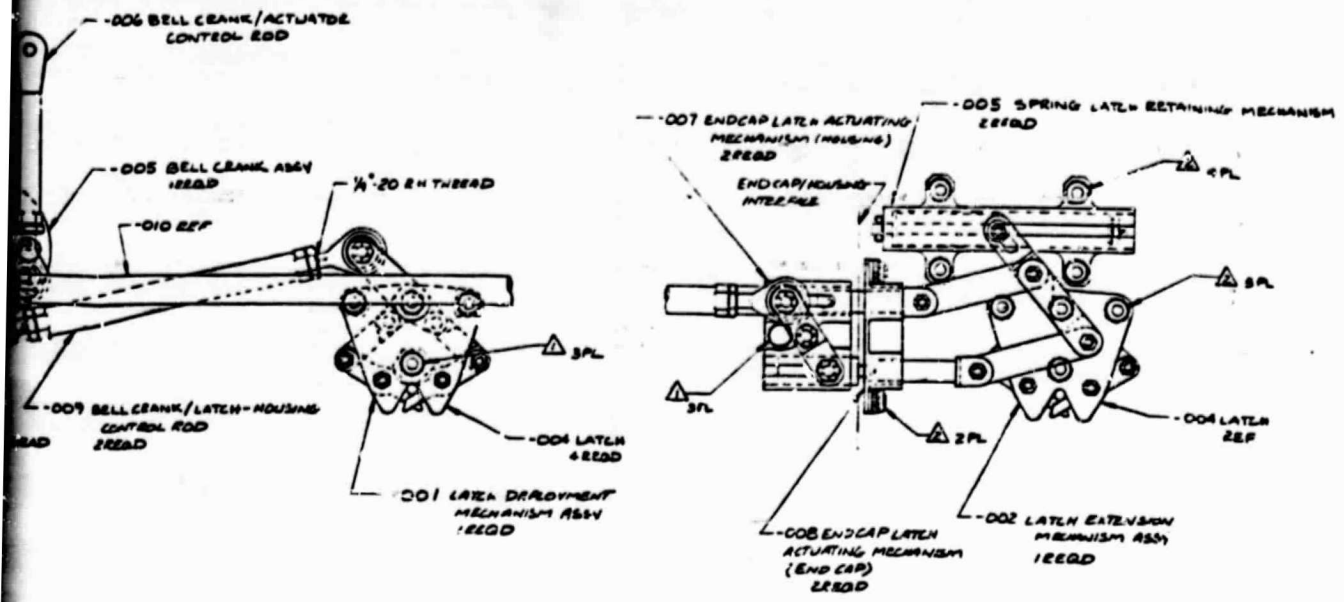
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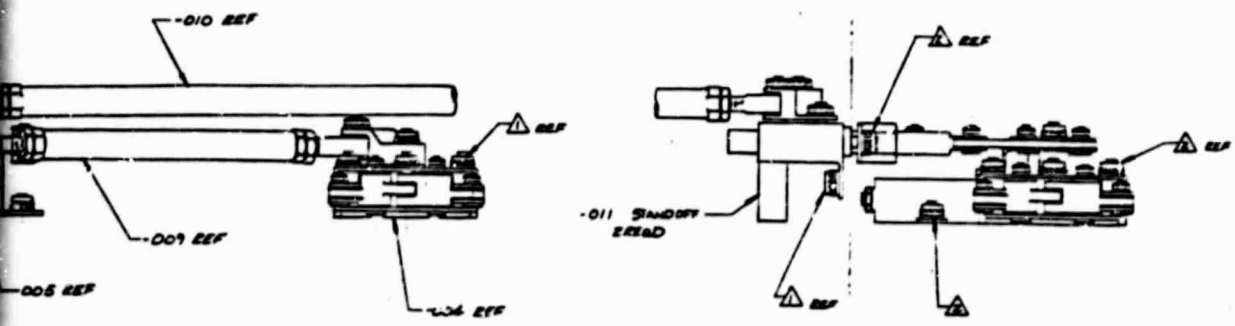


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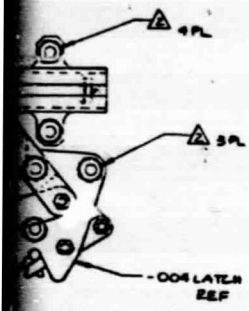


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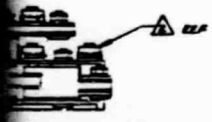
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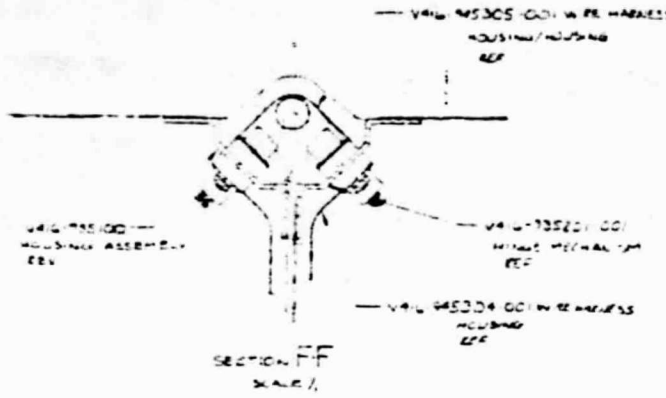
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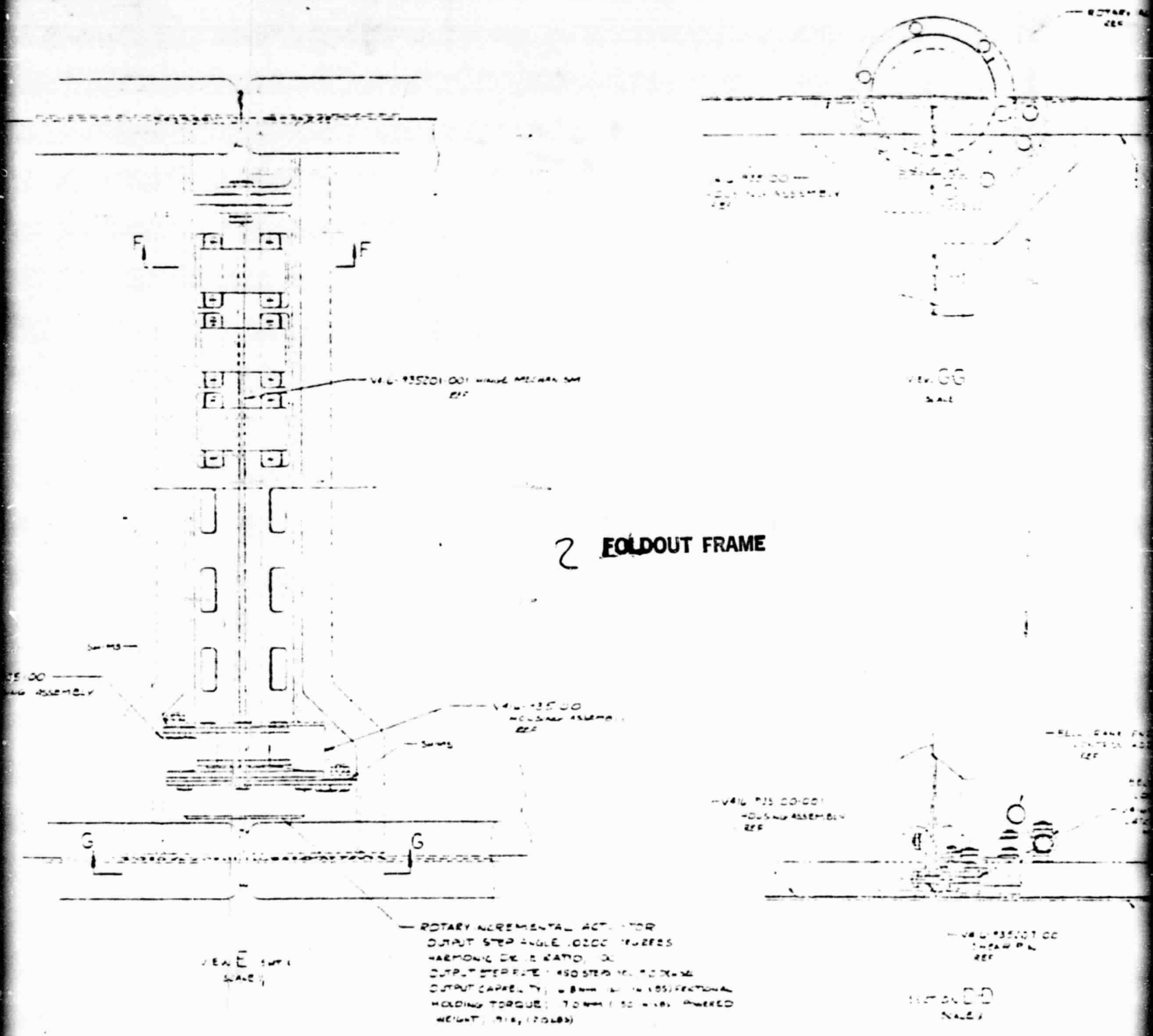
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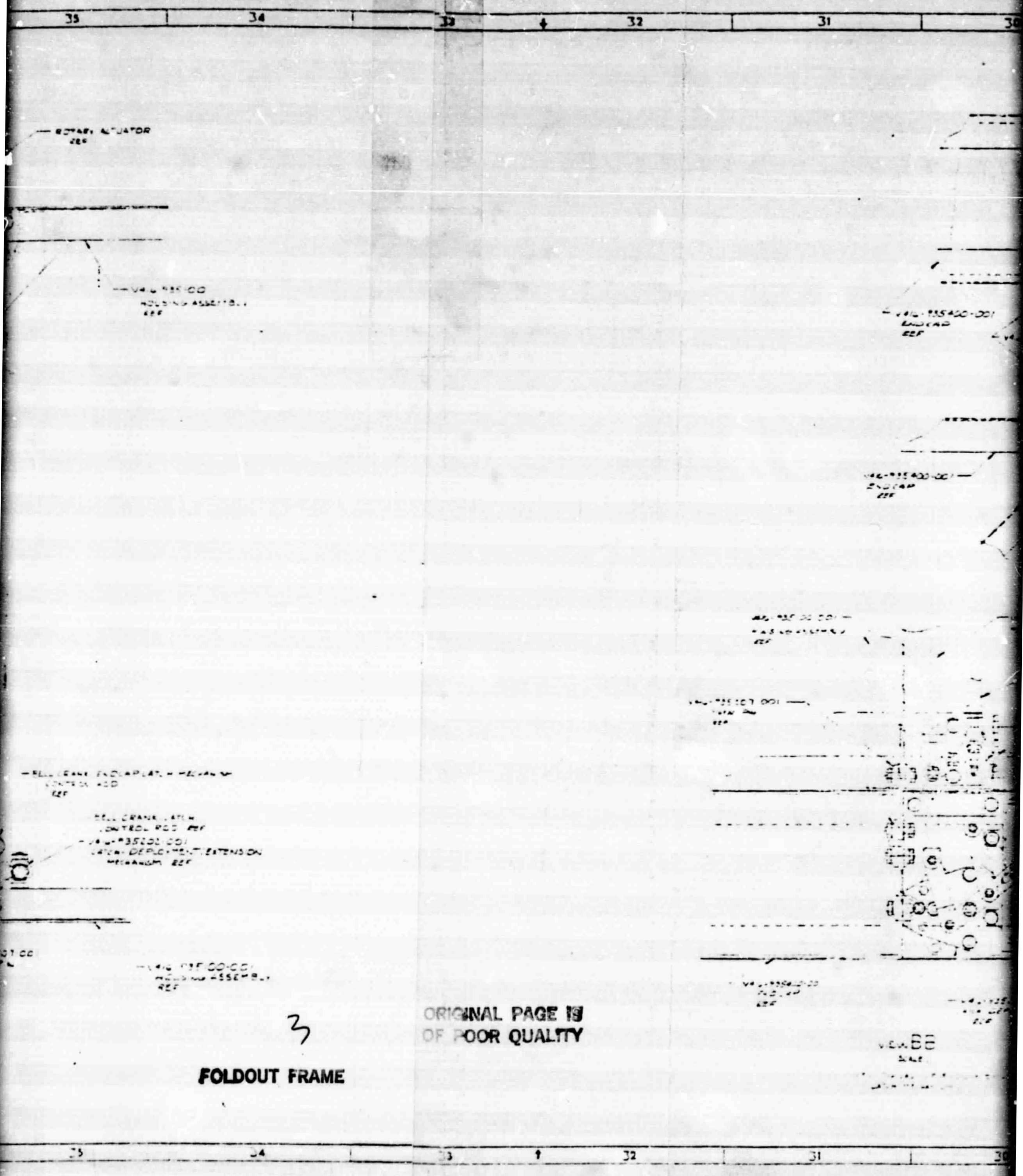
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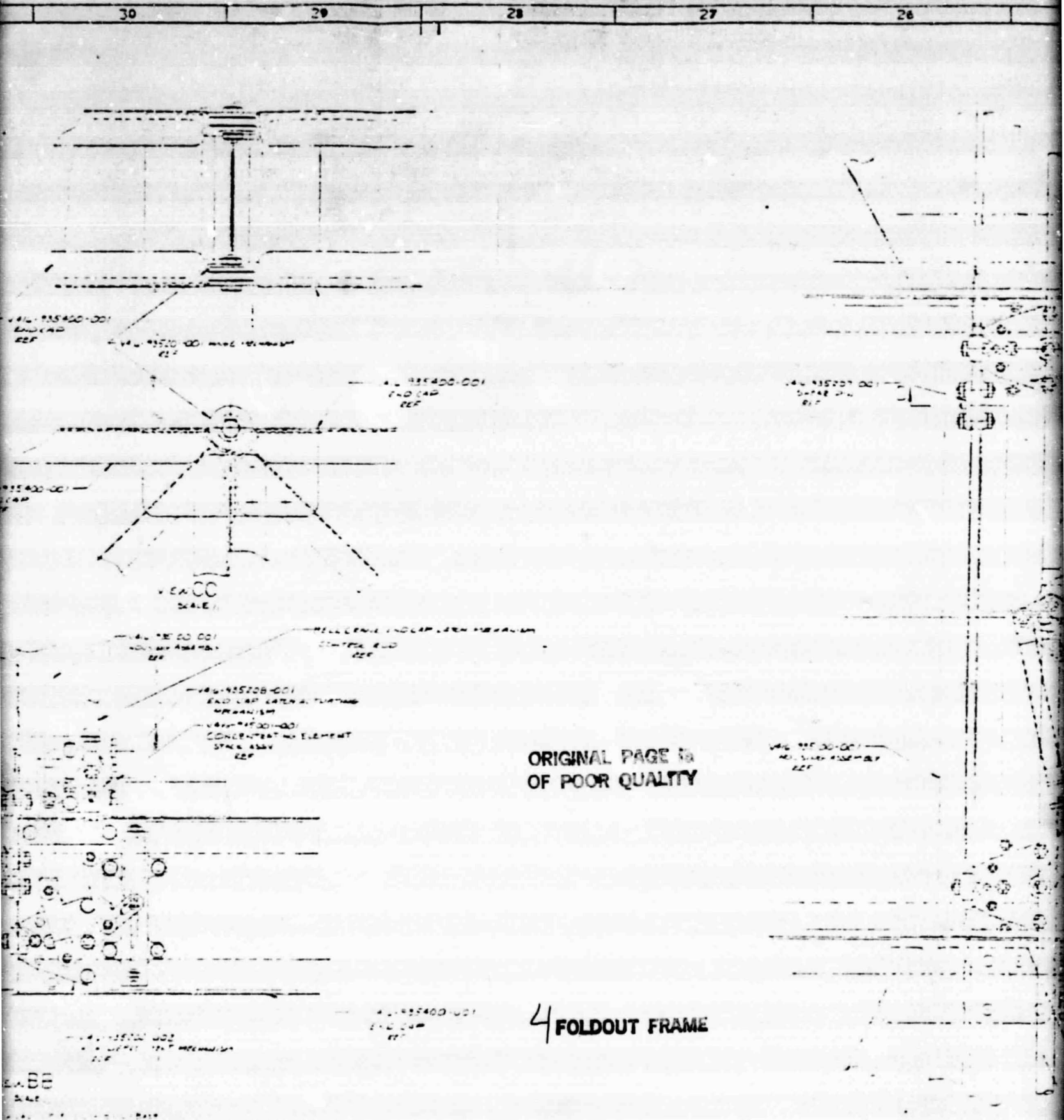
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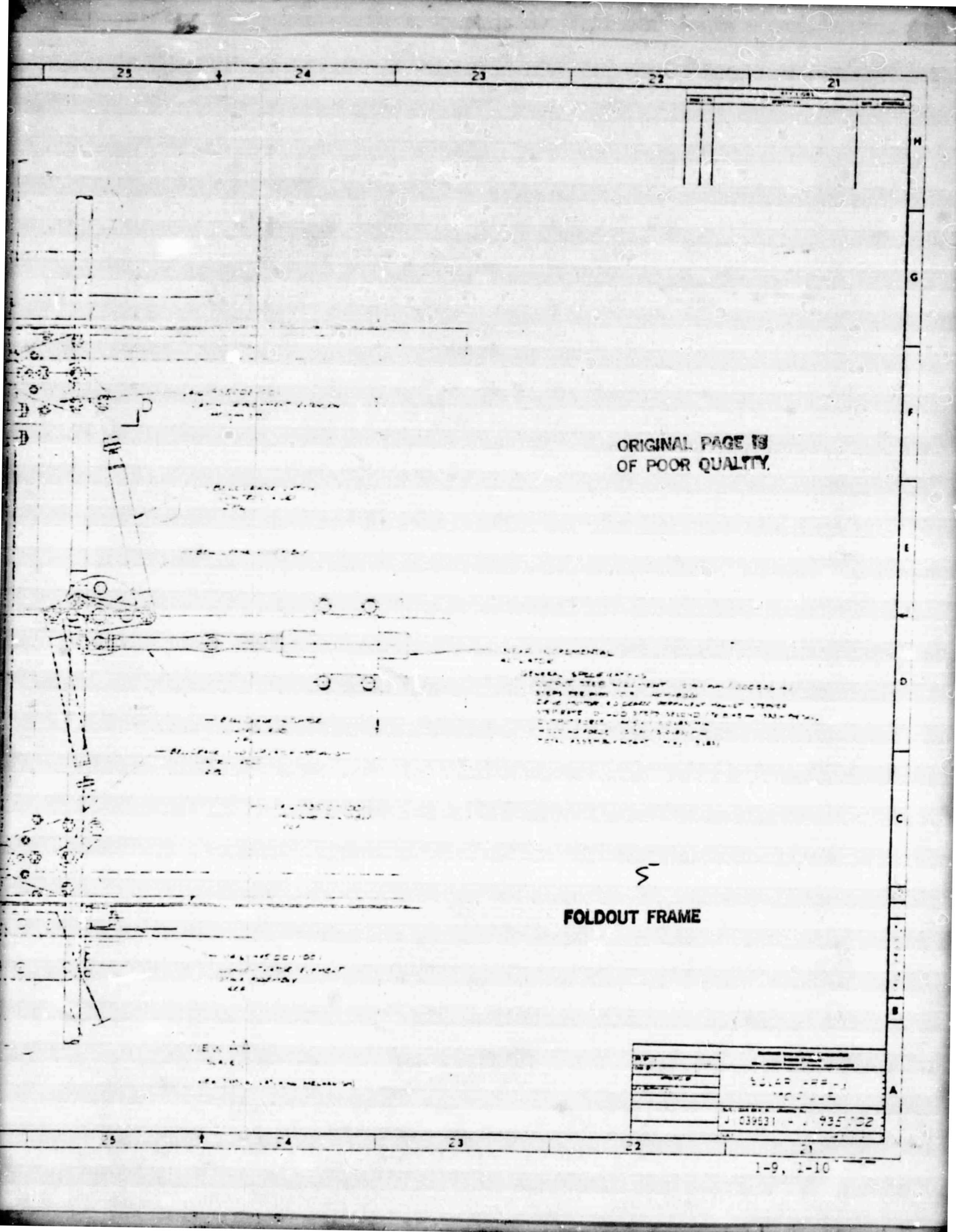
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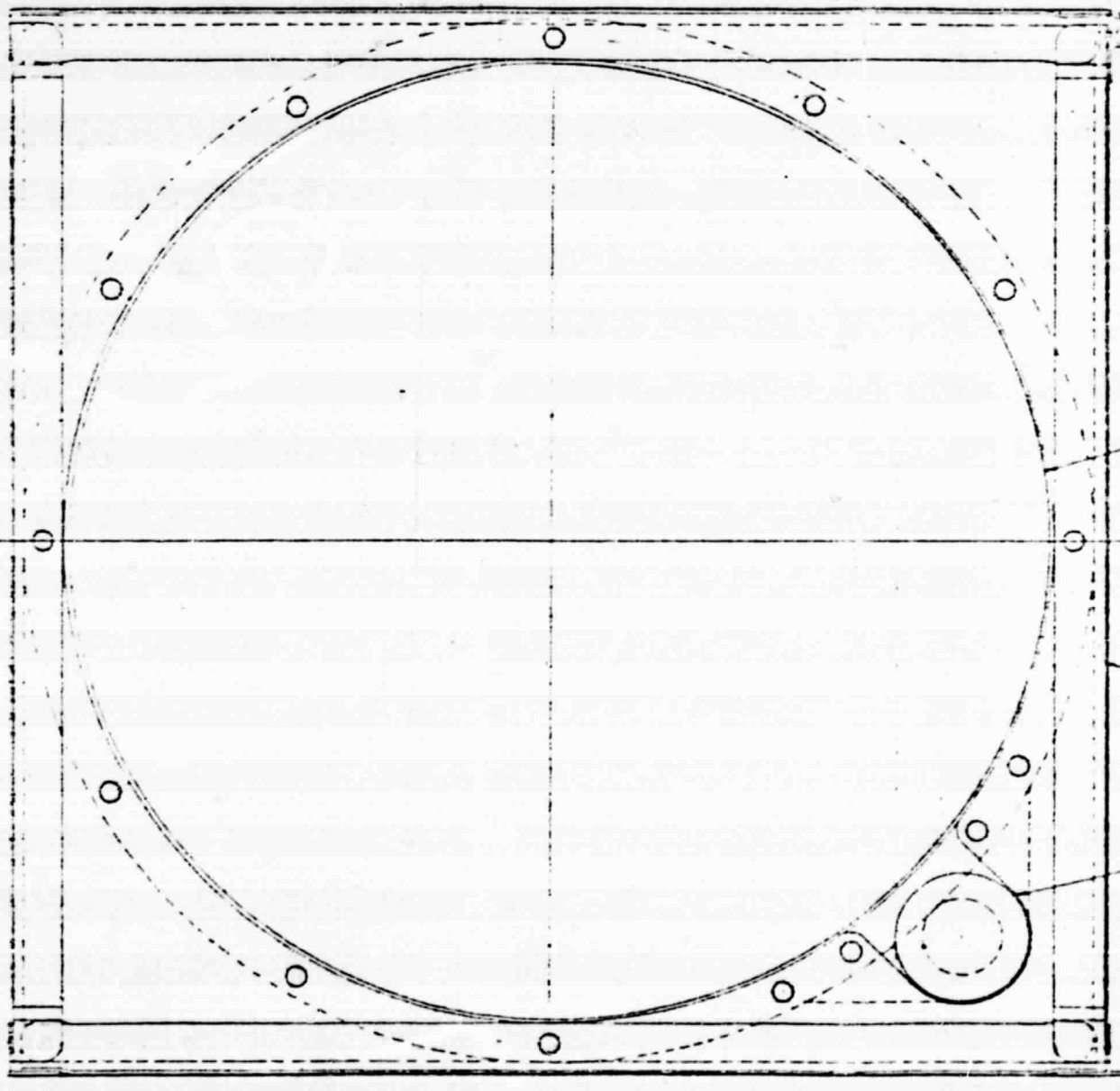
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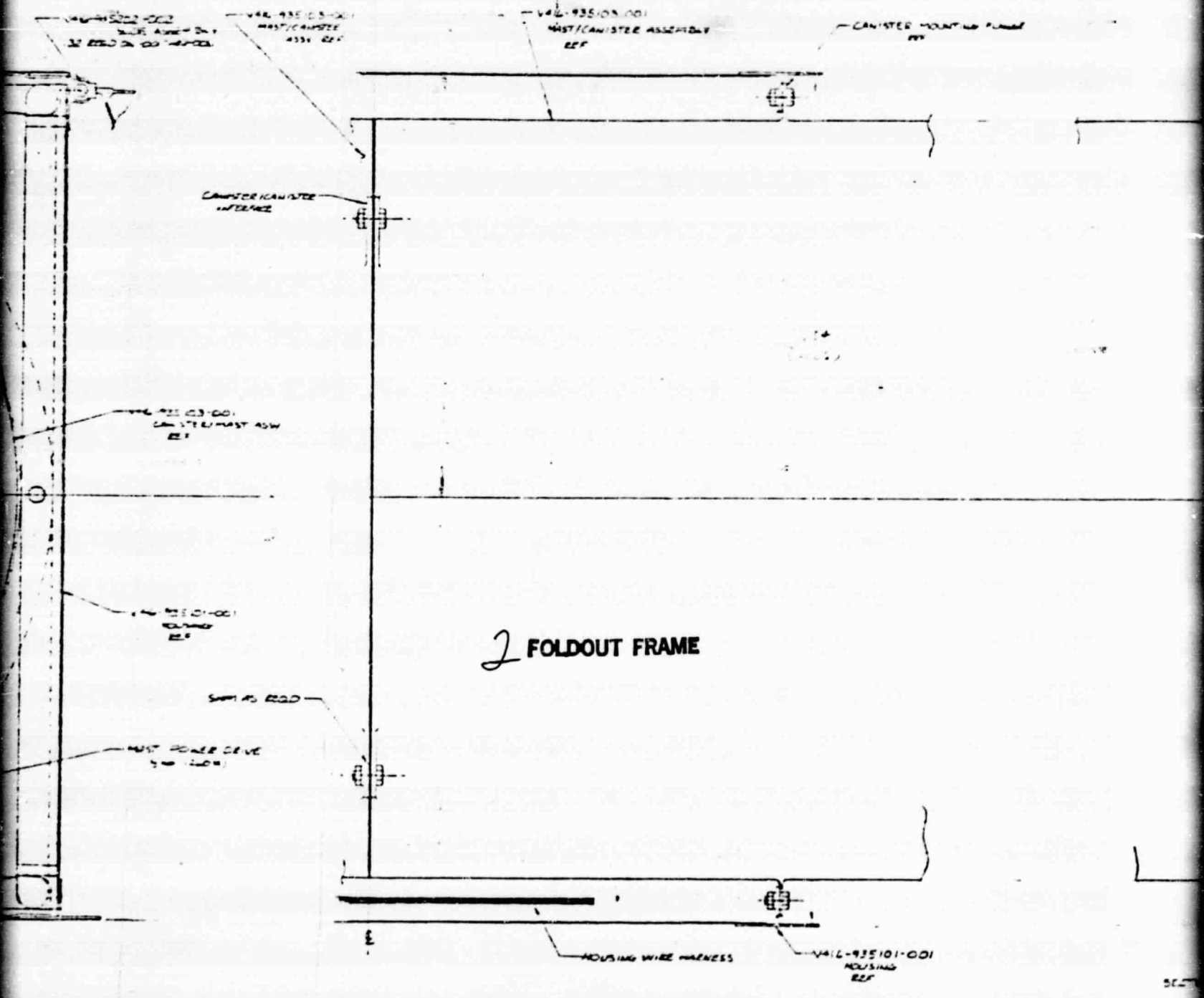
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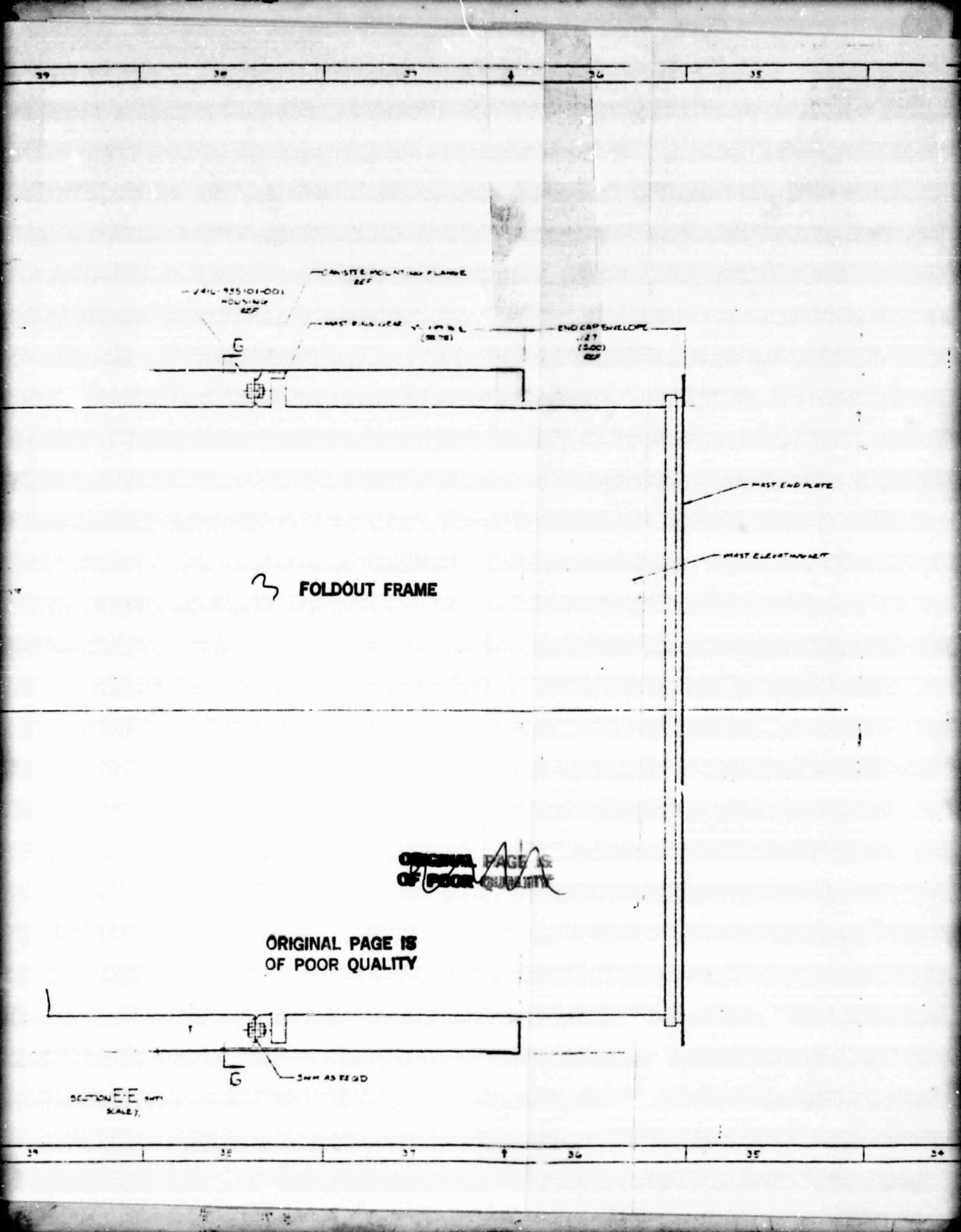


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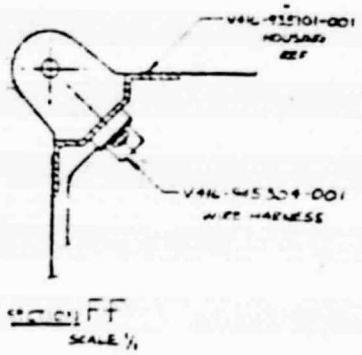
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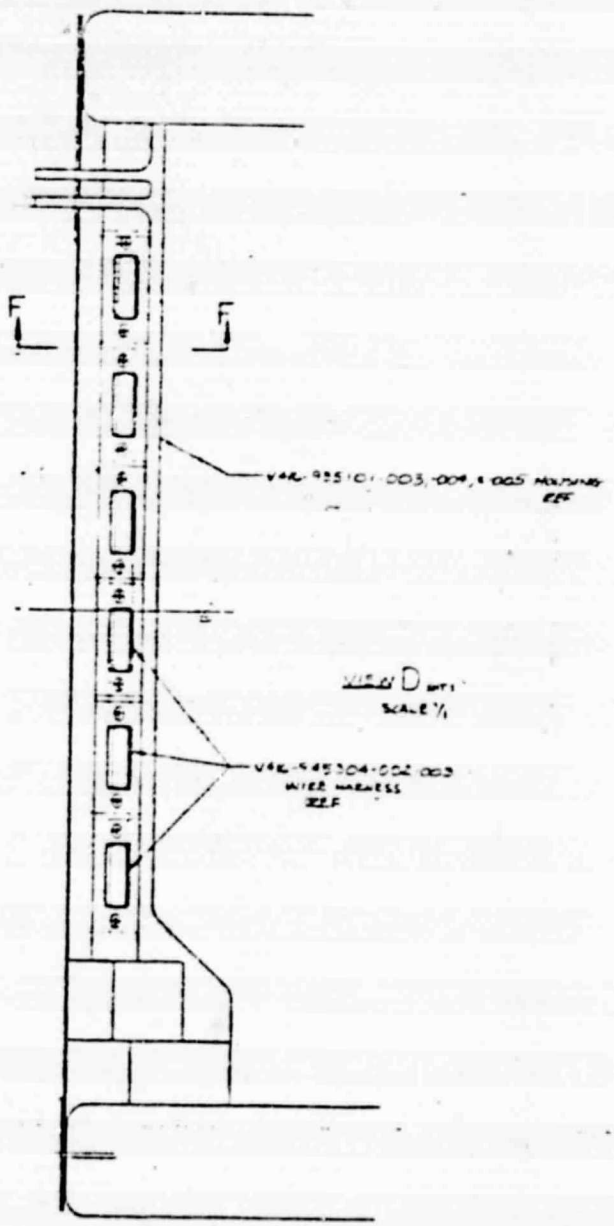
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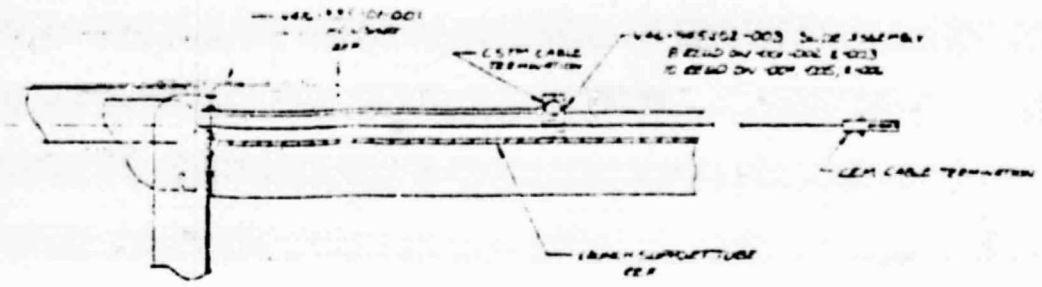


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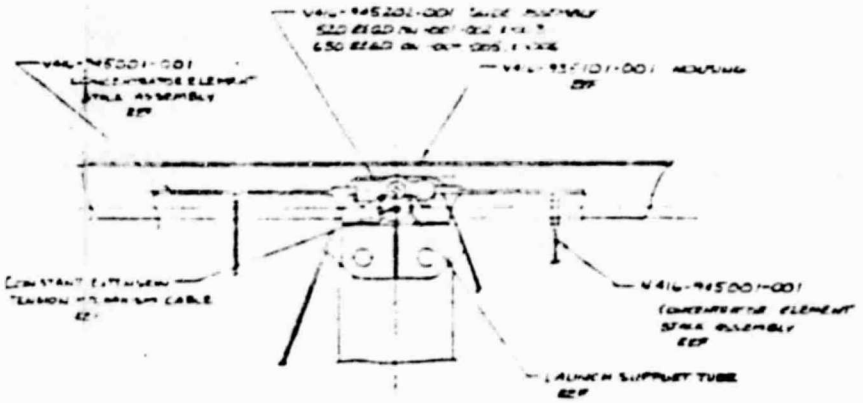
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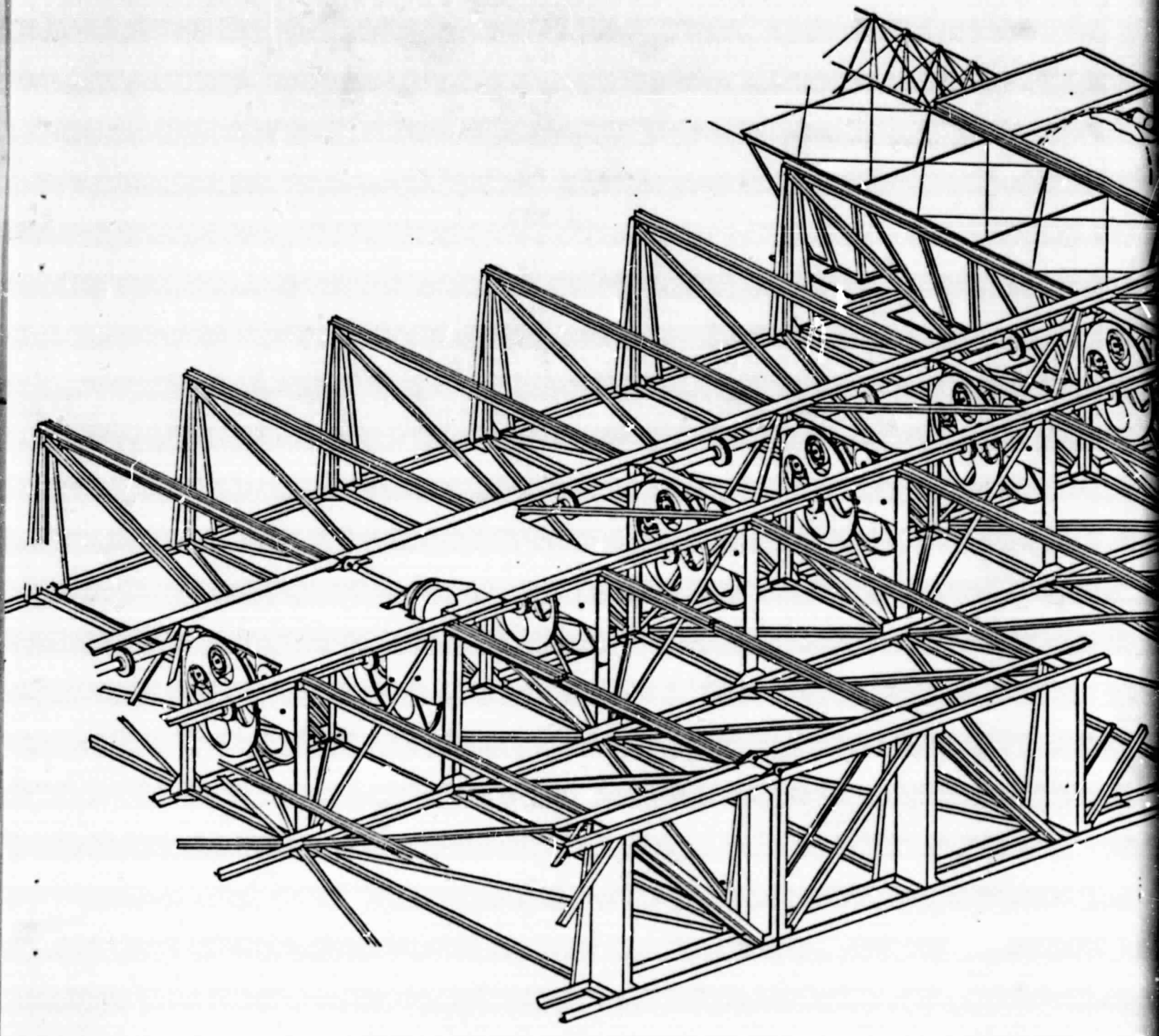


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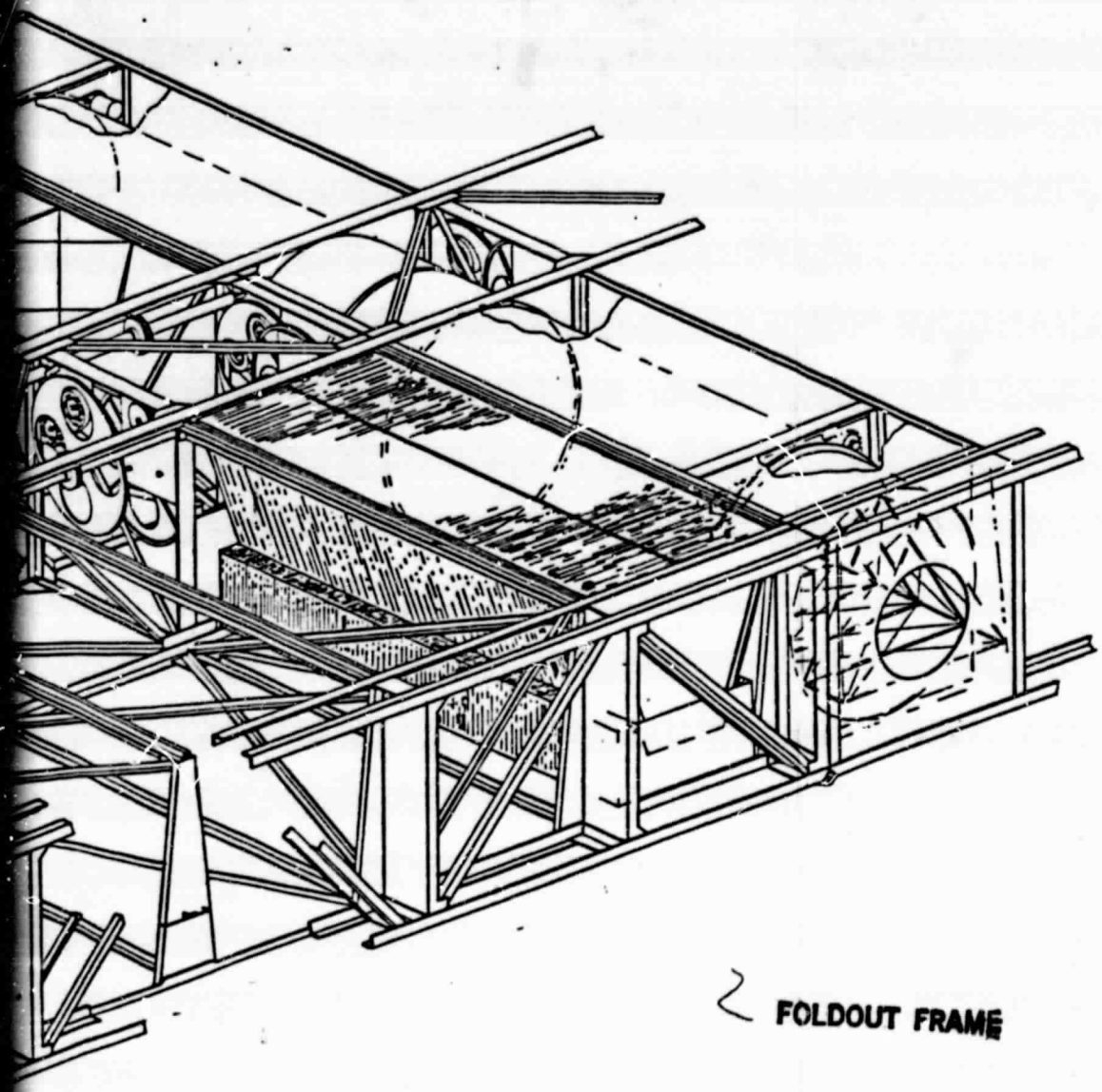
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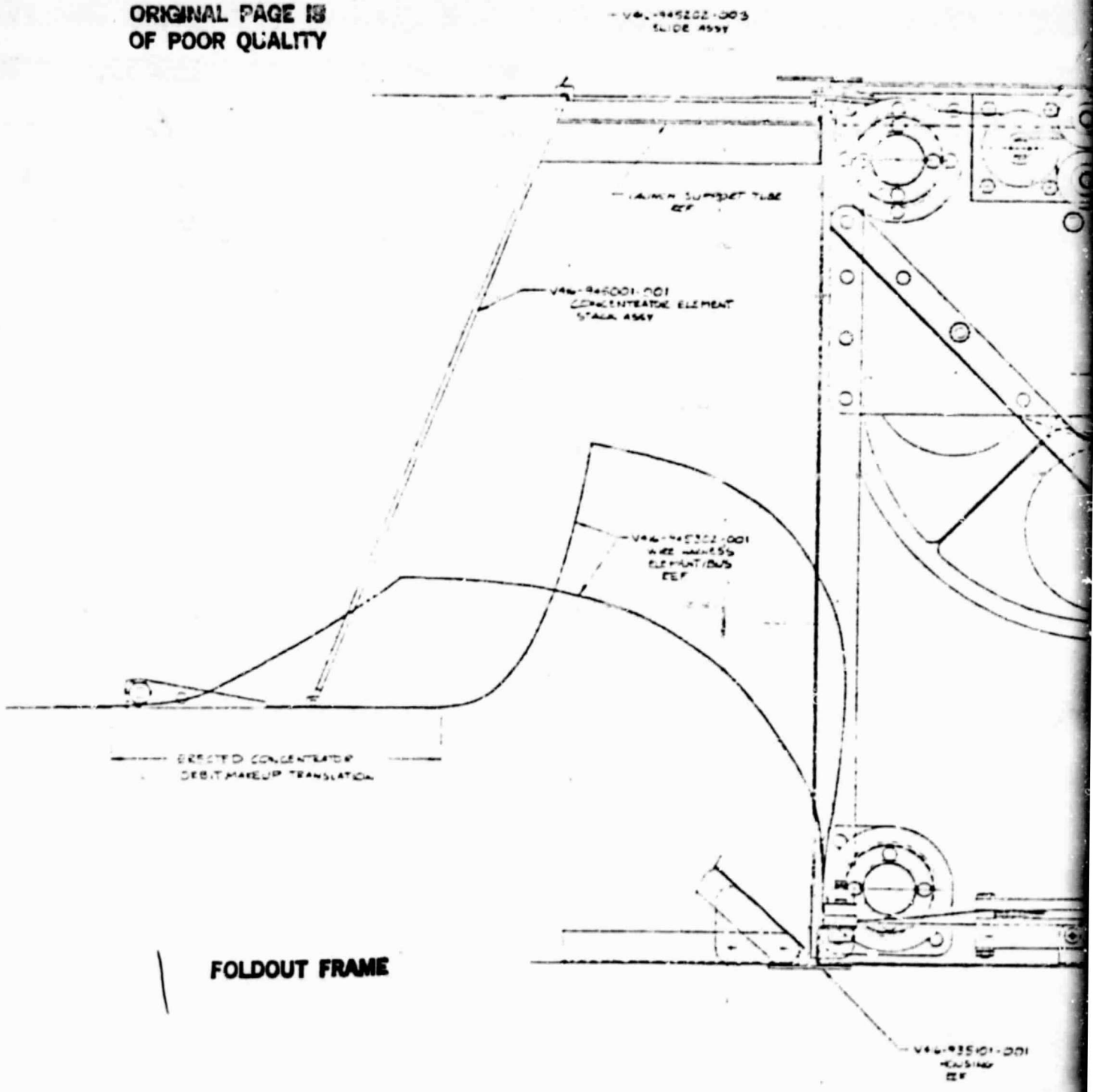
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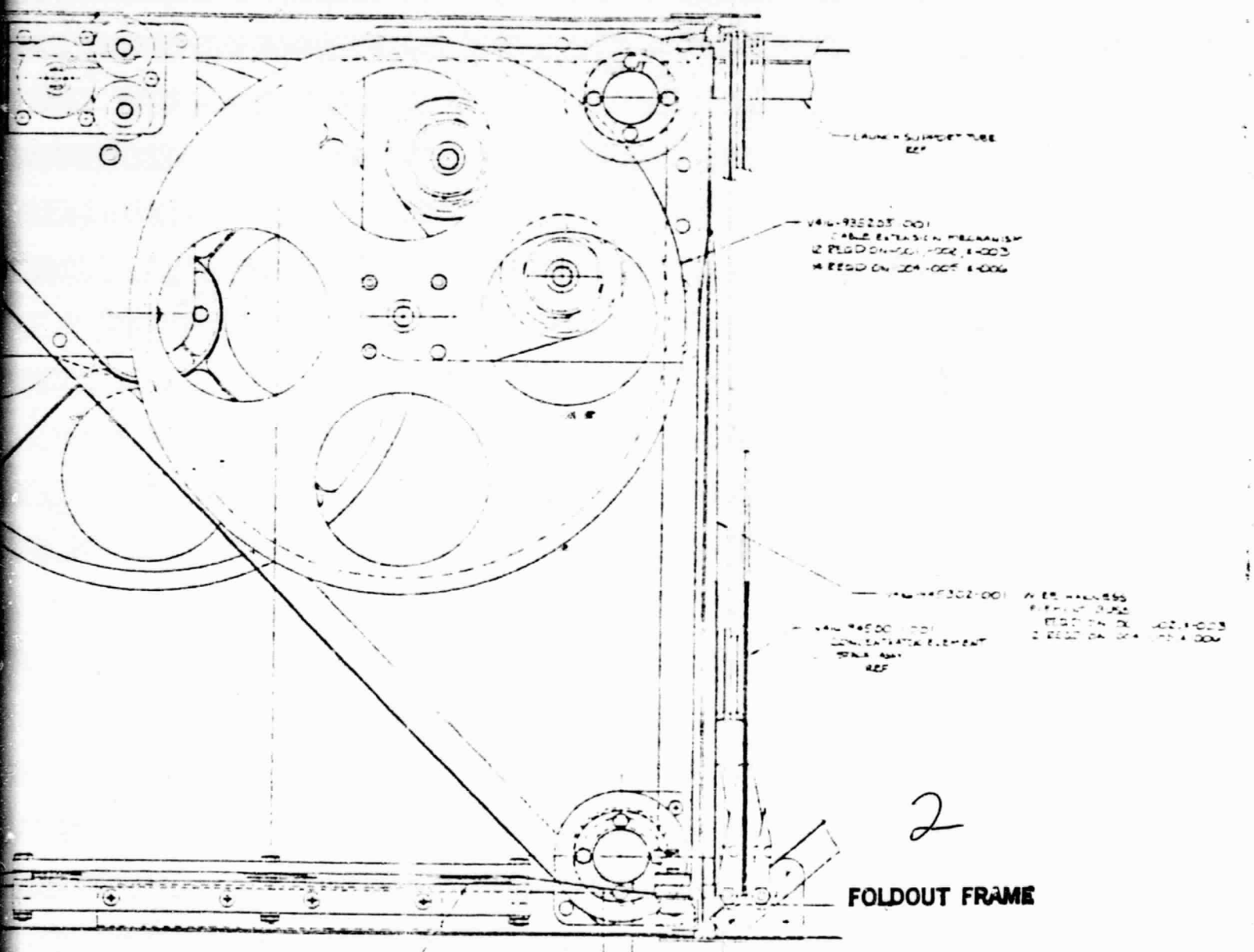
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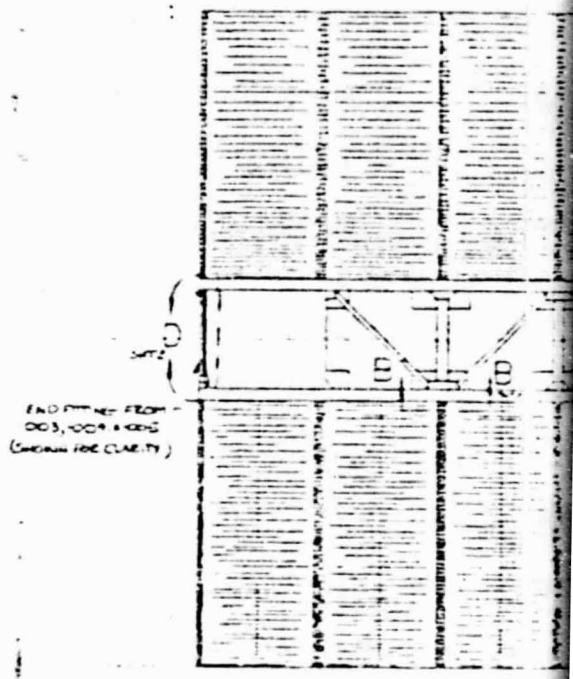
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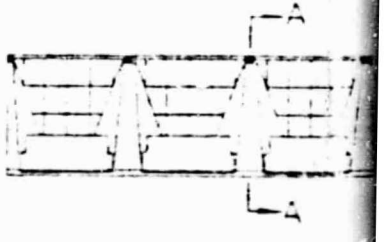
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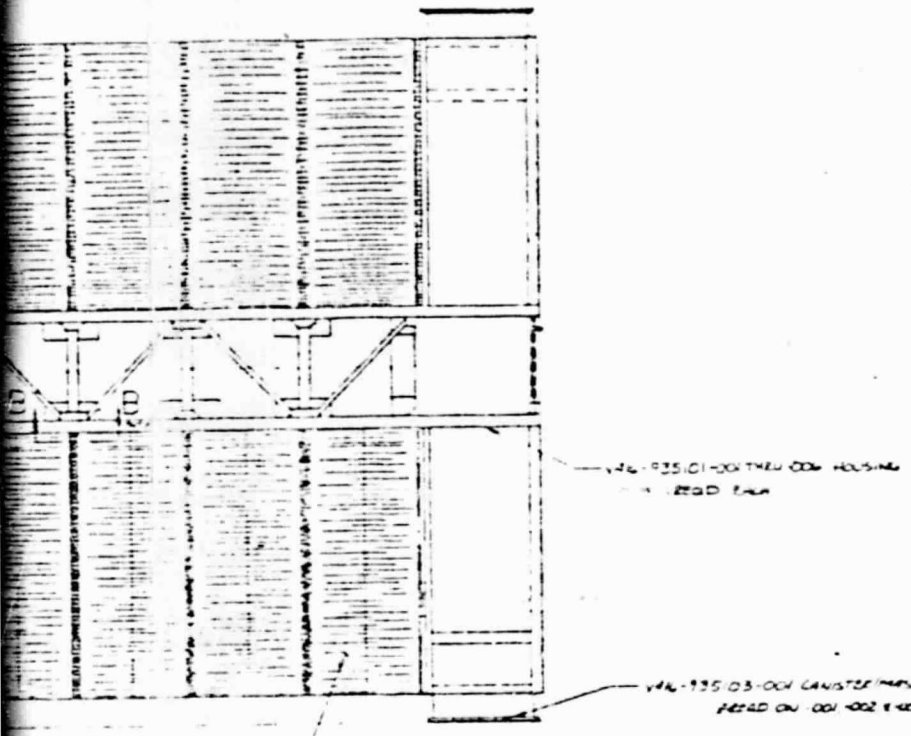
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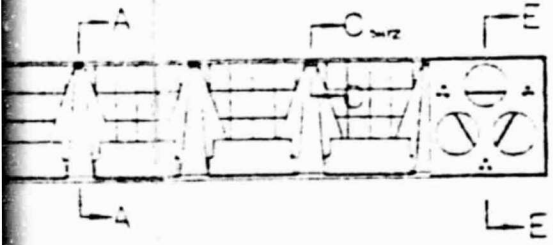


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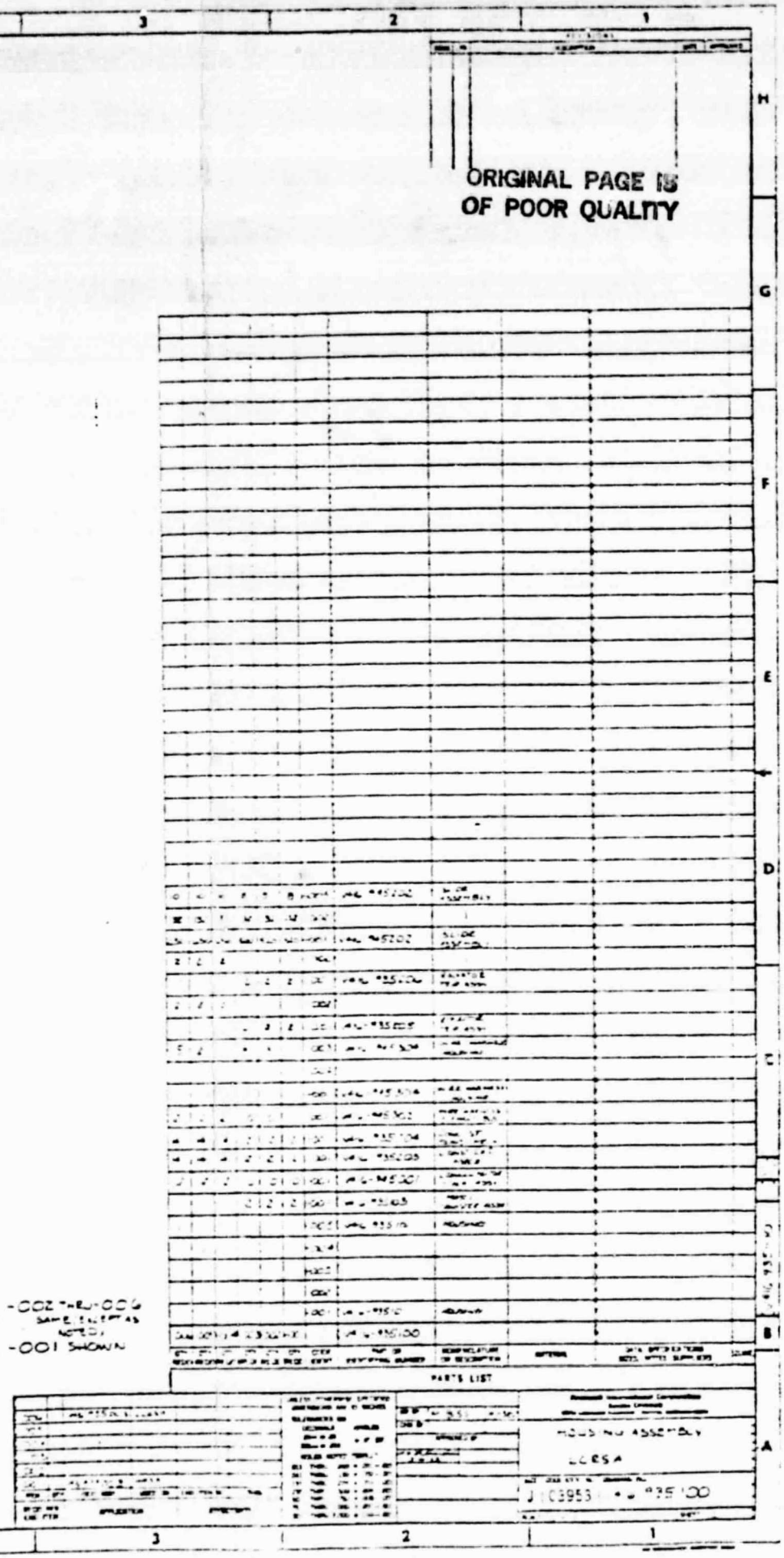
FOLDOUT FRAME

-002
-001

1-15, 1-16

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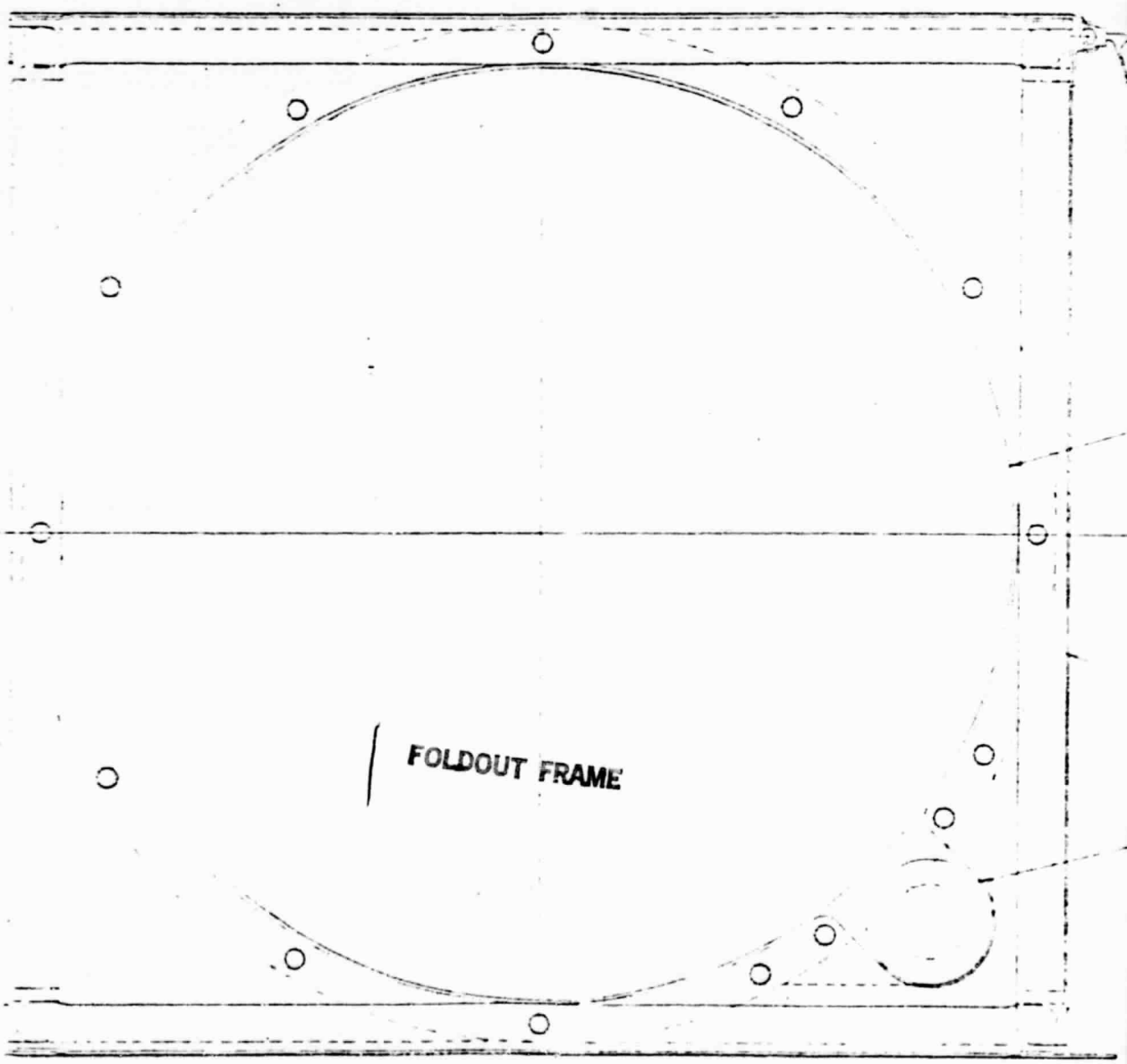
PAGE IS
QUALITY



-002 THRU-006
SAME EXCEPT AS
NOTED
-001 SHOWN

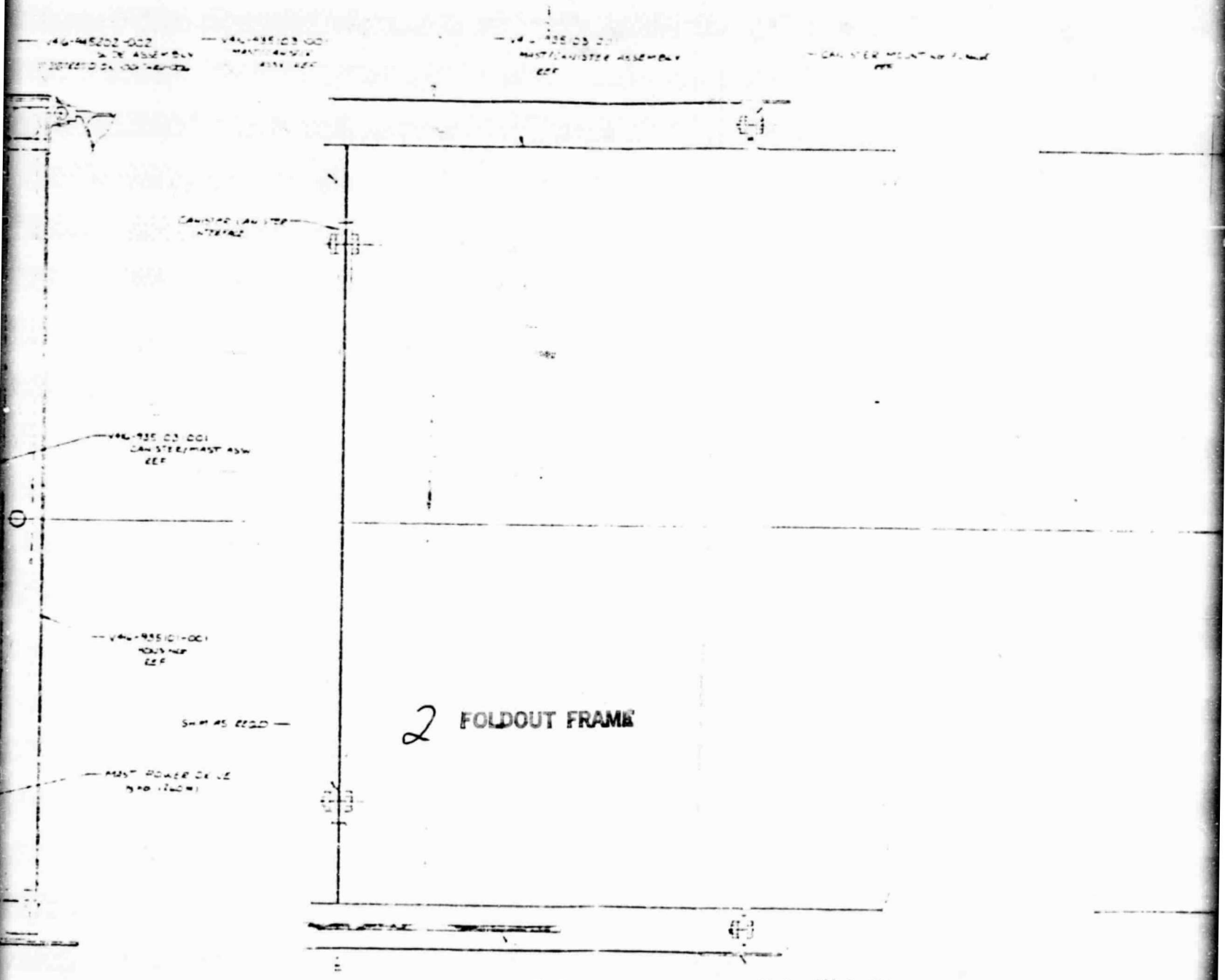
1-15, 1-16

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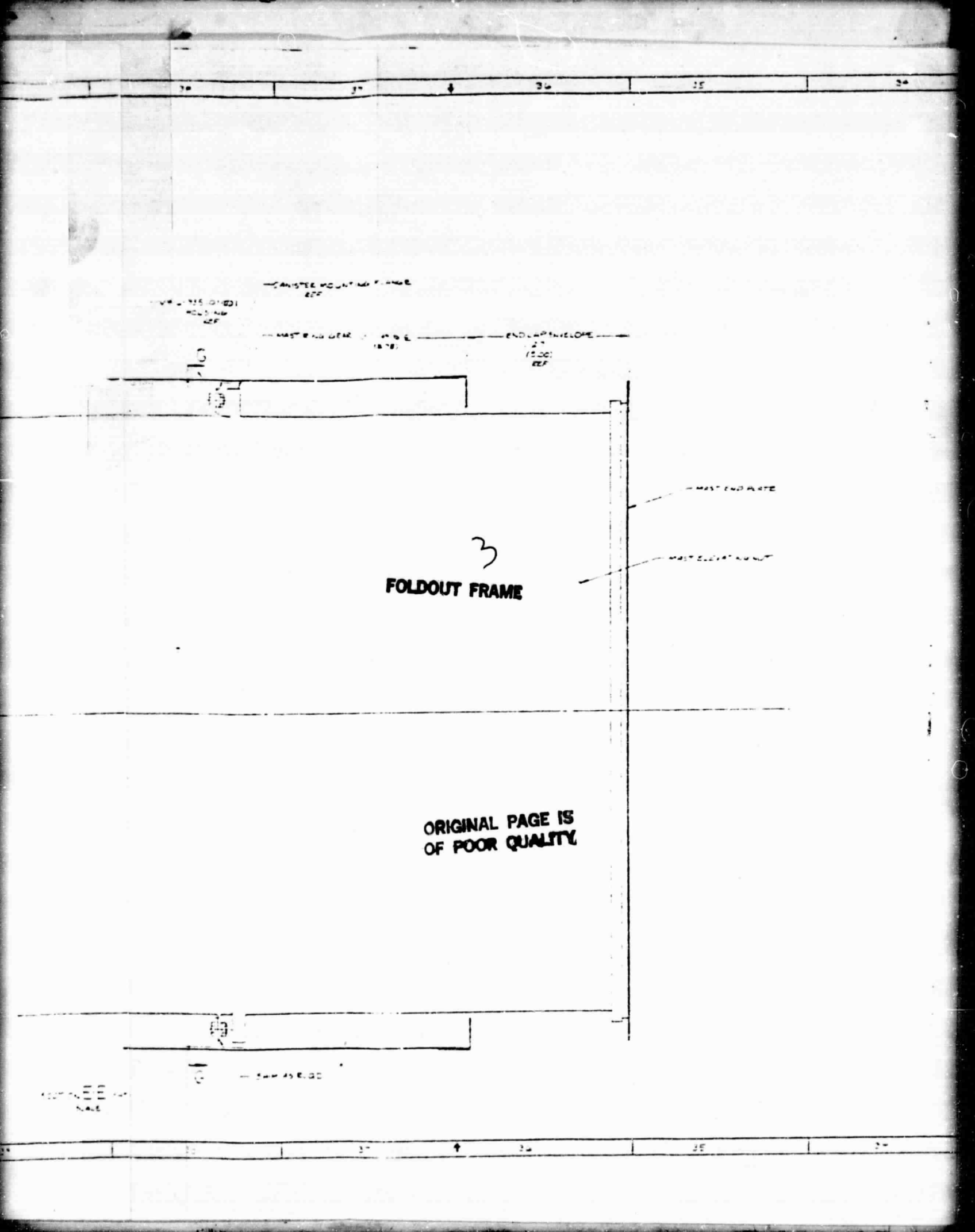


SECTION G G
SCALE

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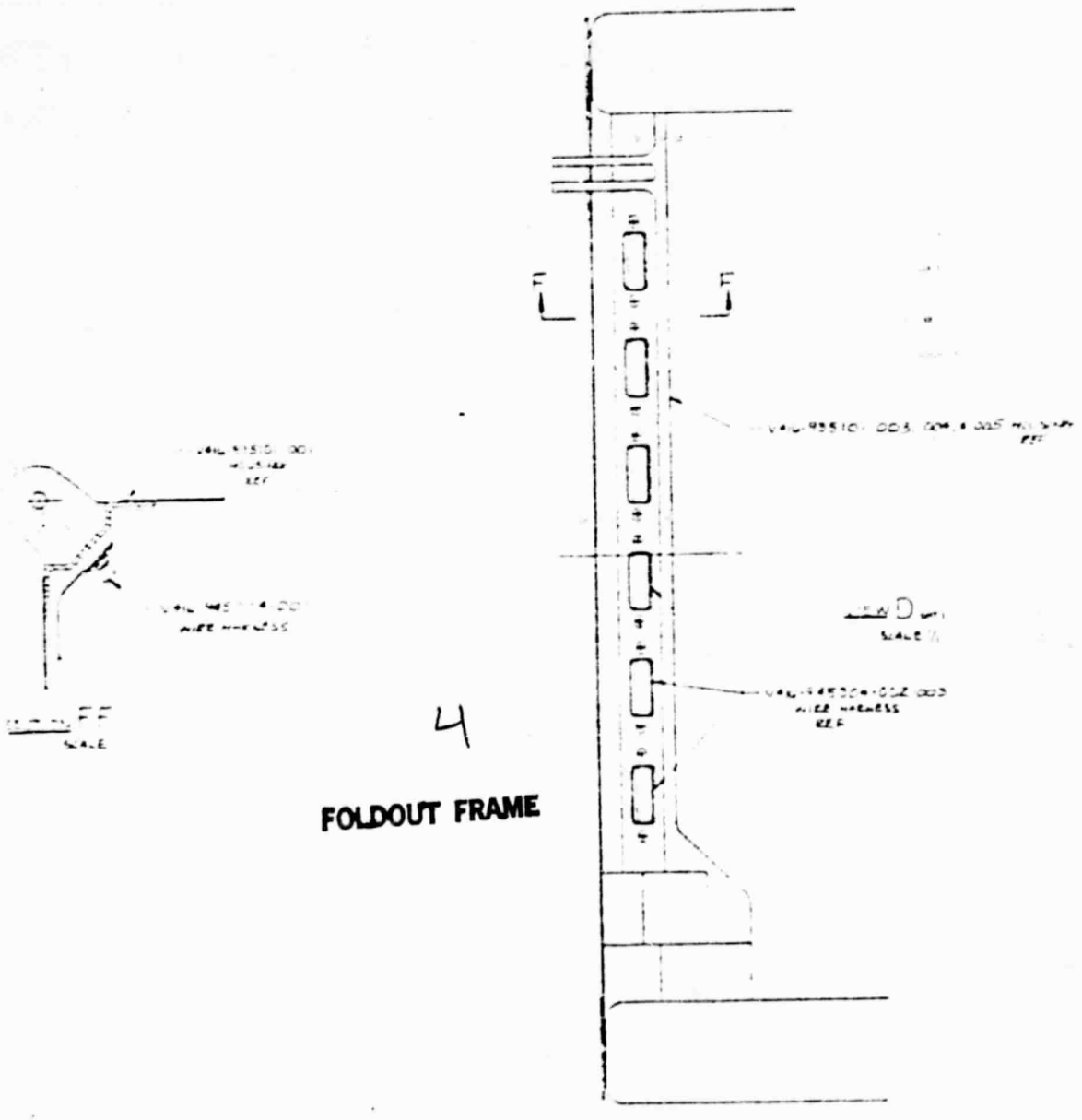


2 FOLDOUT FRAME



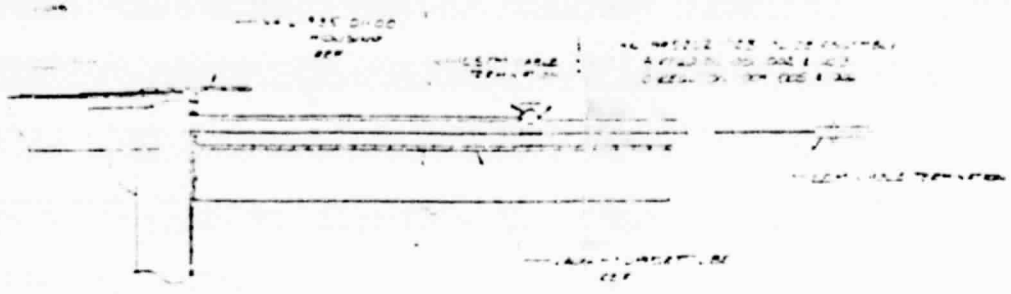
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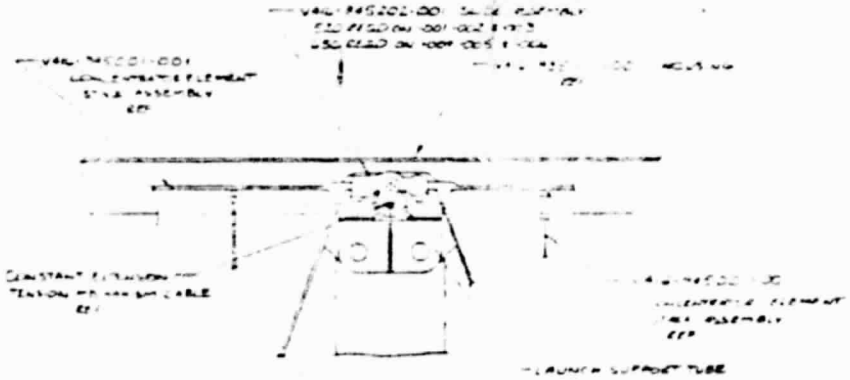


4

FOLDOUT FRAME



SECTION CC



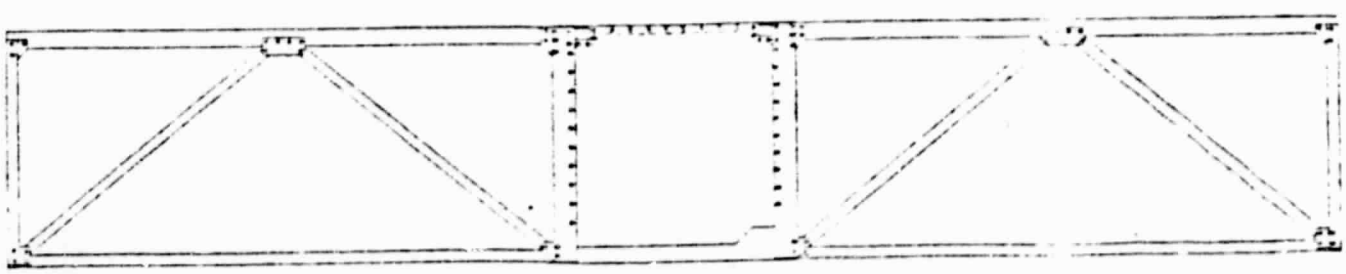
SECTION BB

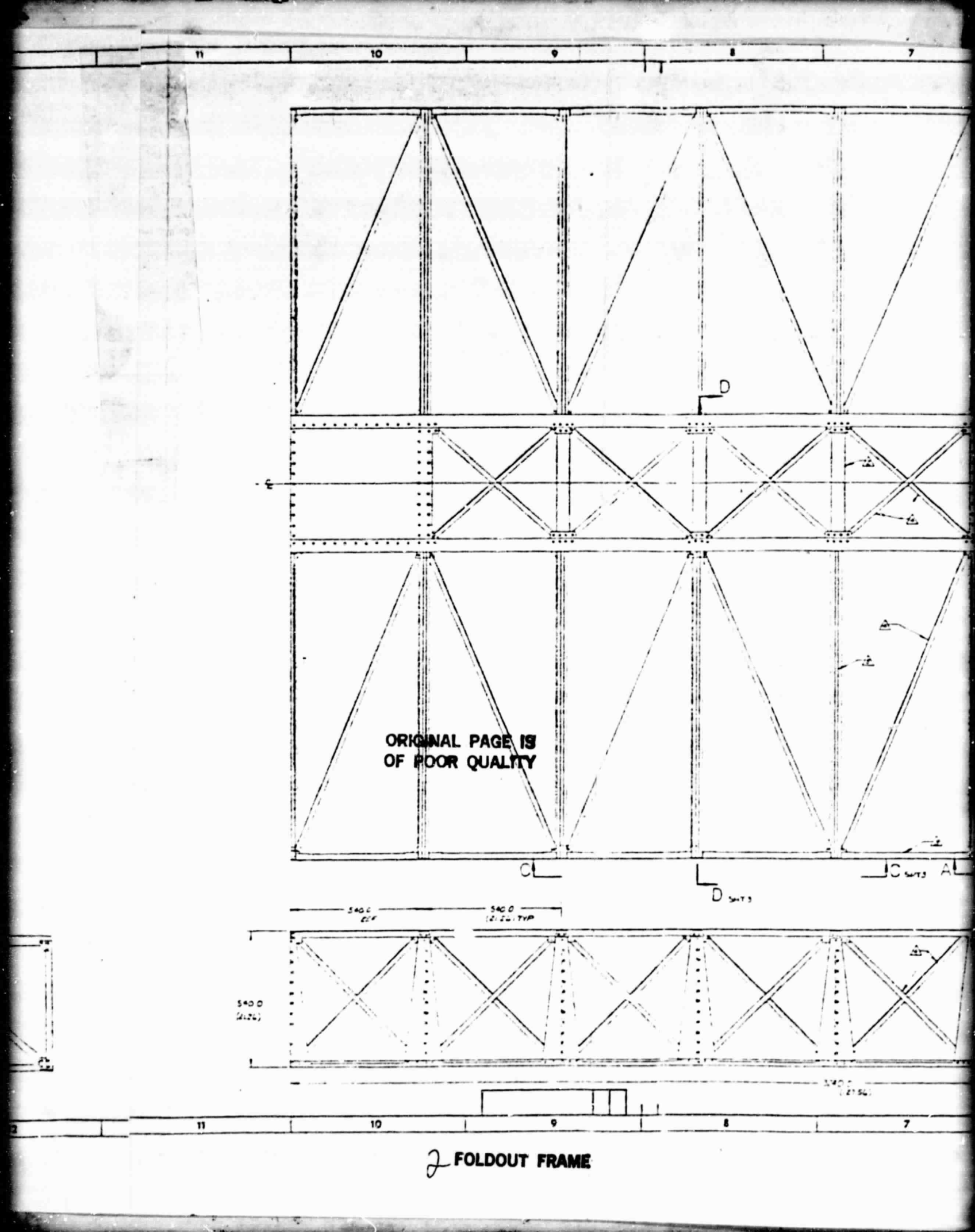
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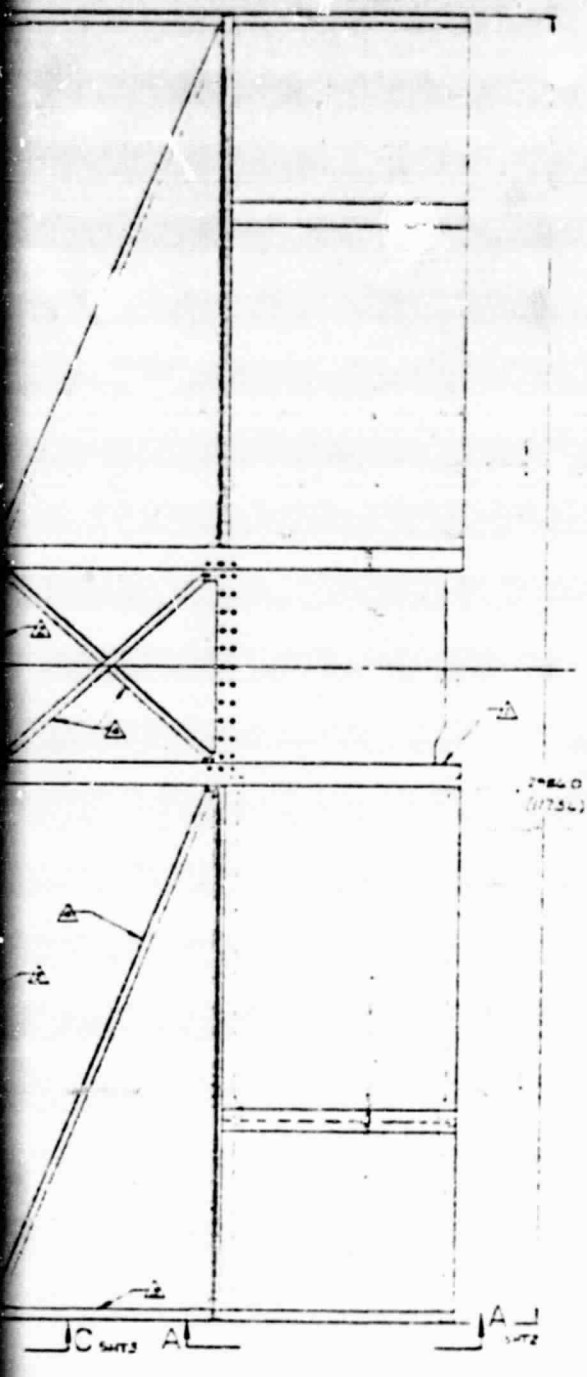
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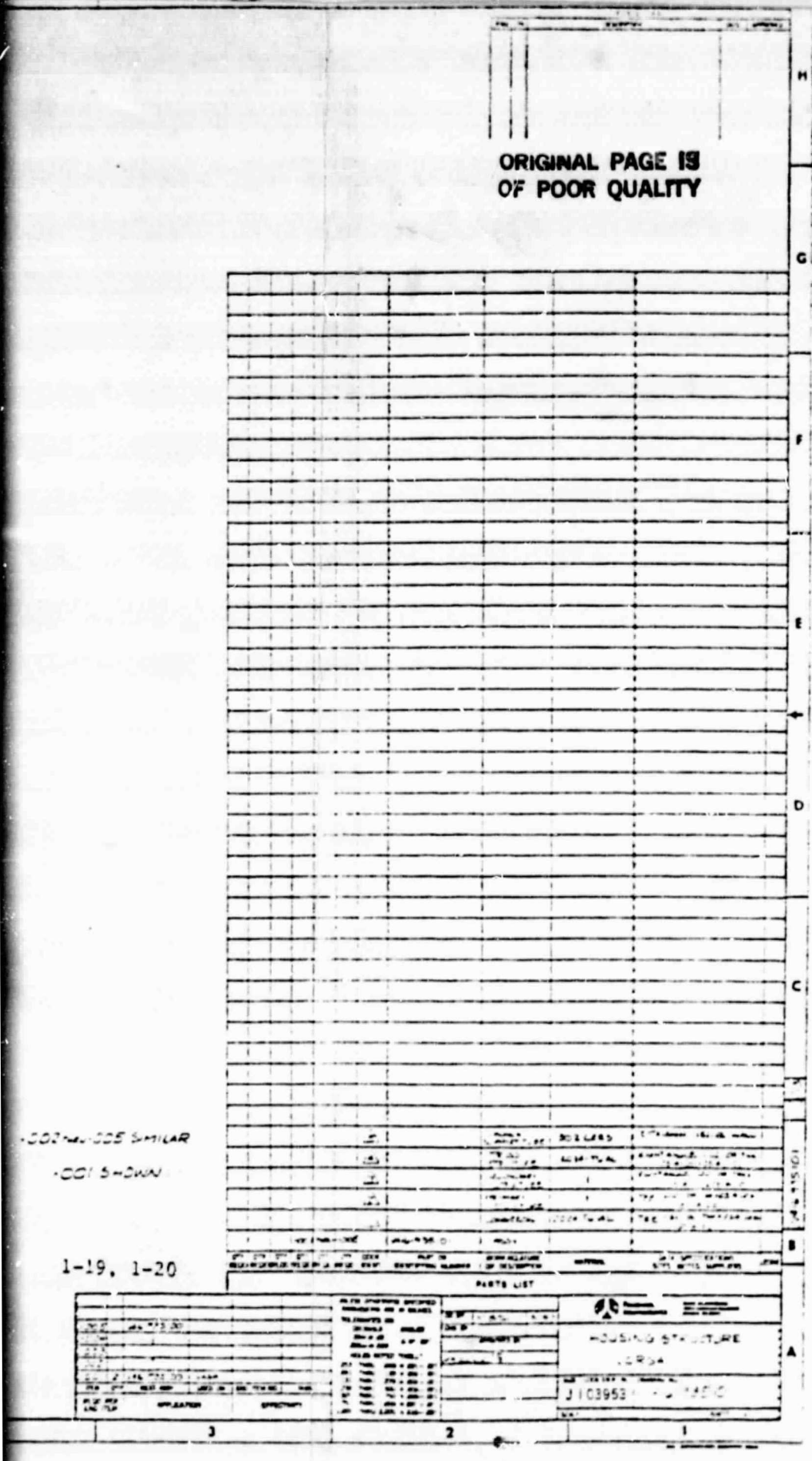
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-002 THRU -005 SIMILAR

-001 SHOWN

1-19, 1-20

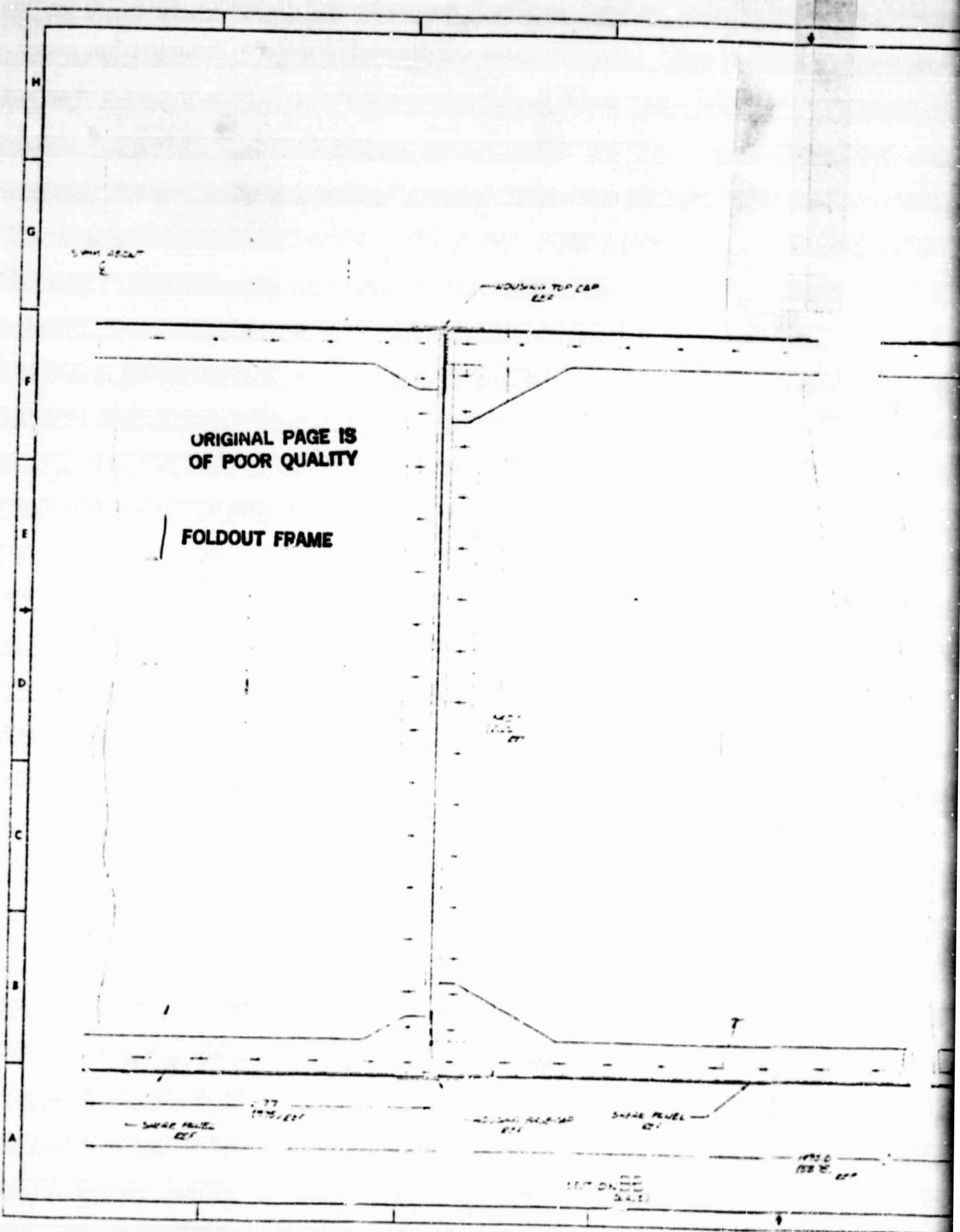


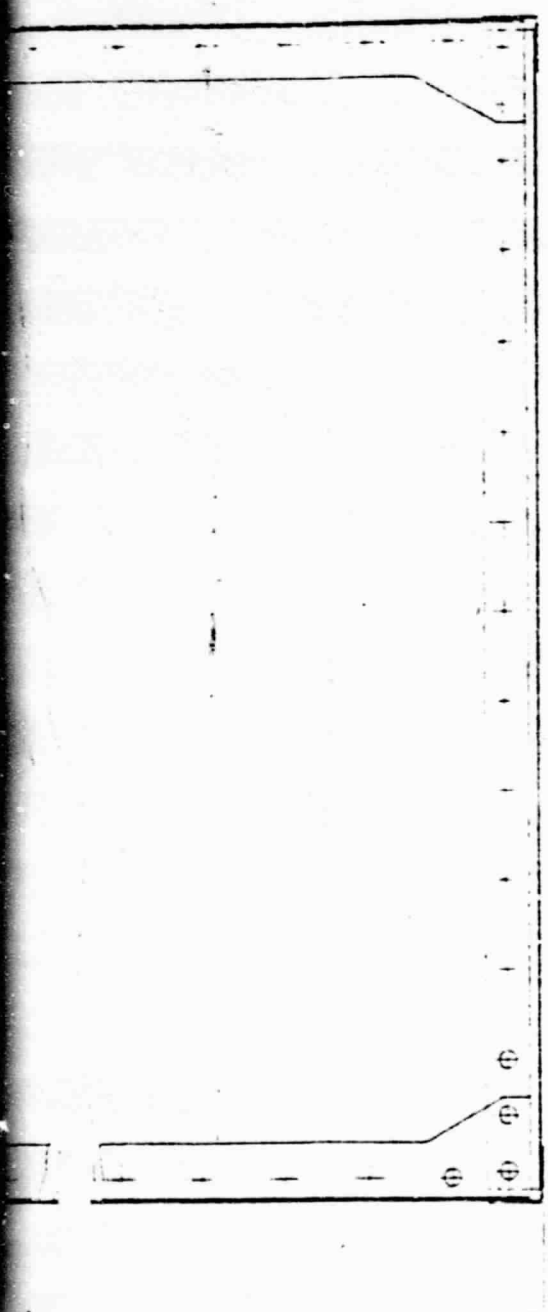
-002 thru -005 SIMILAR

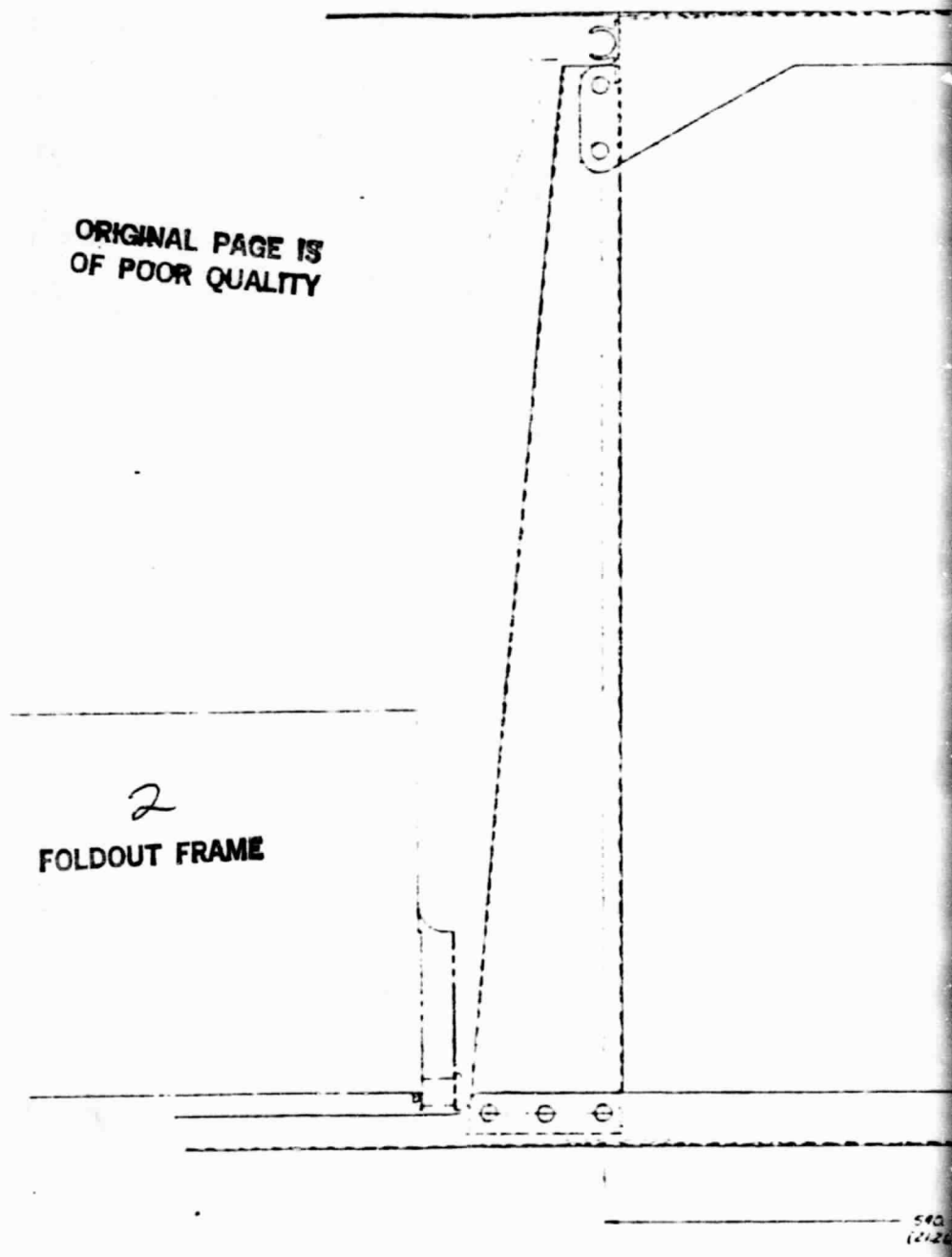
-001 SHOWN

1-19, 1-20

4 FOLDOUT FRAME


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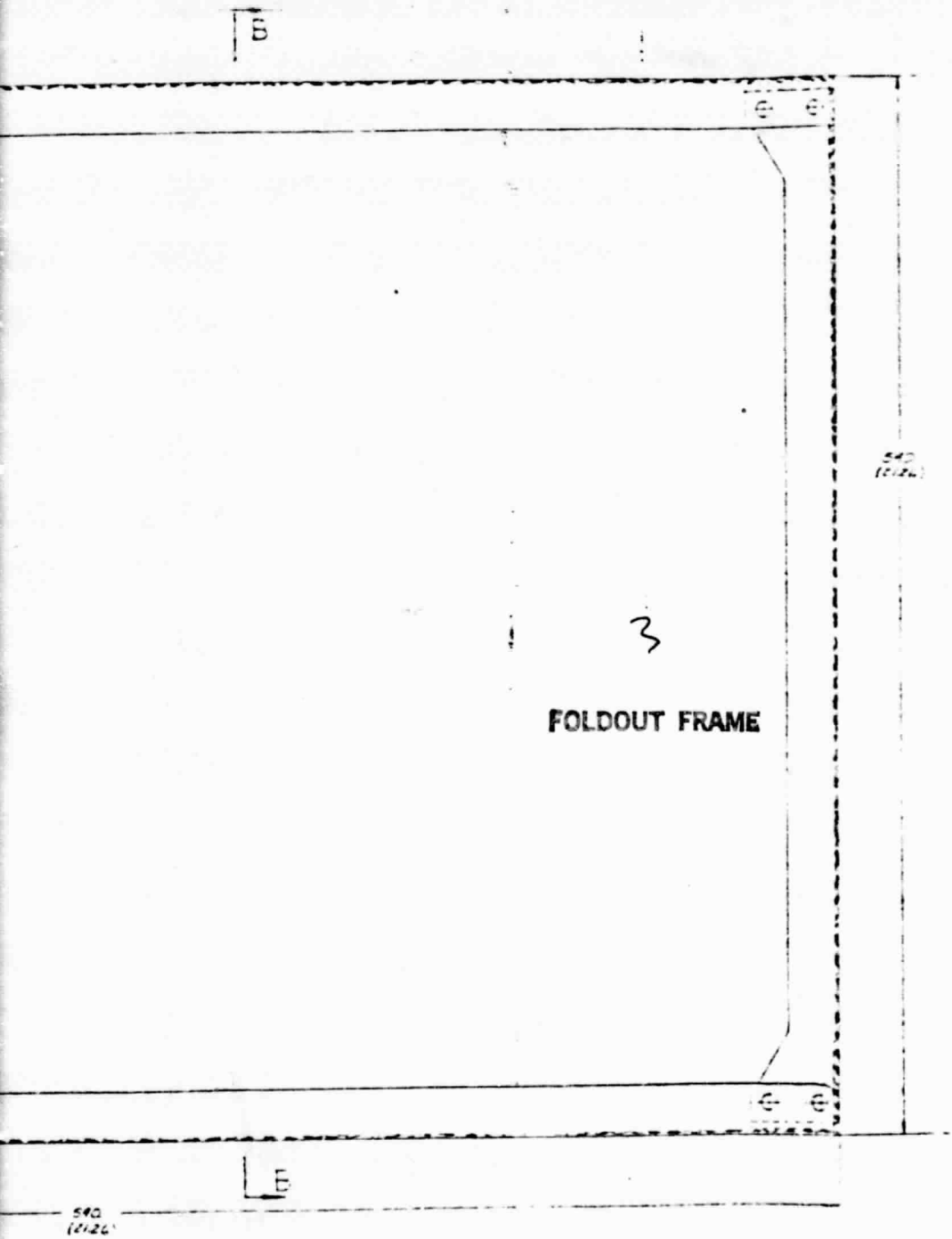


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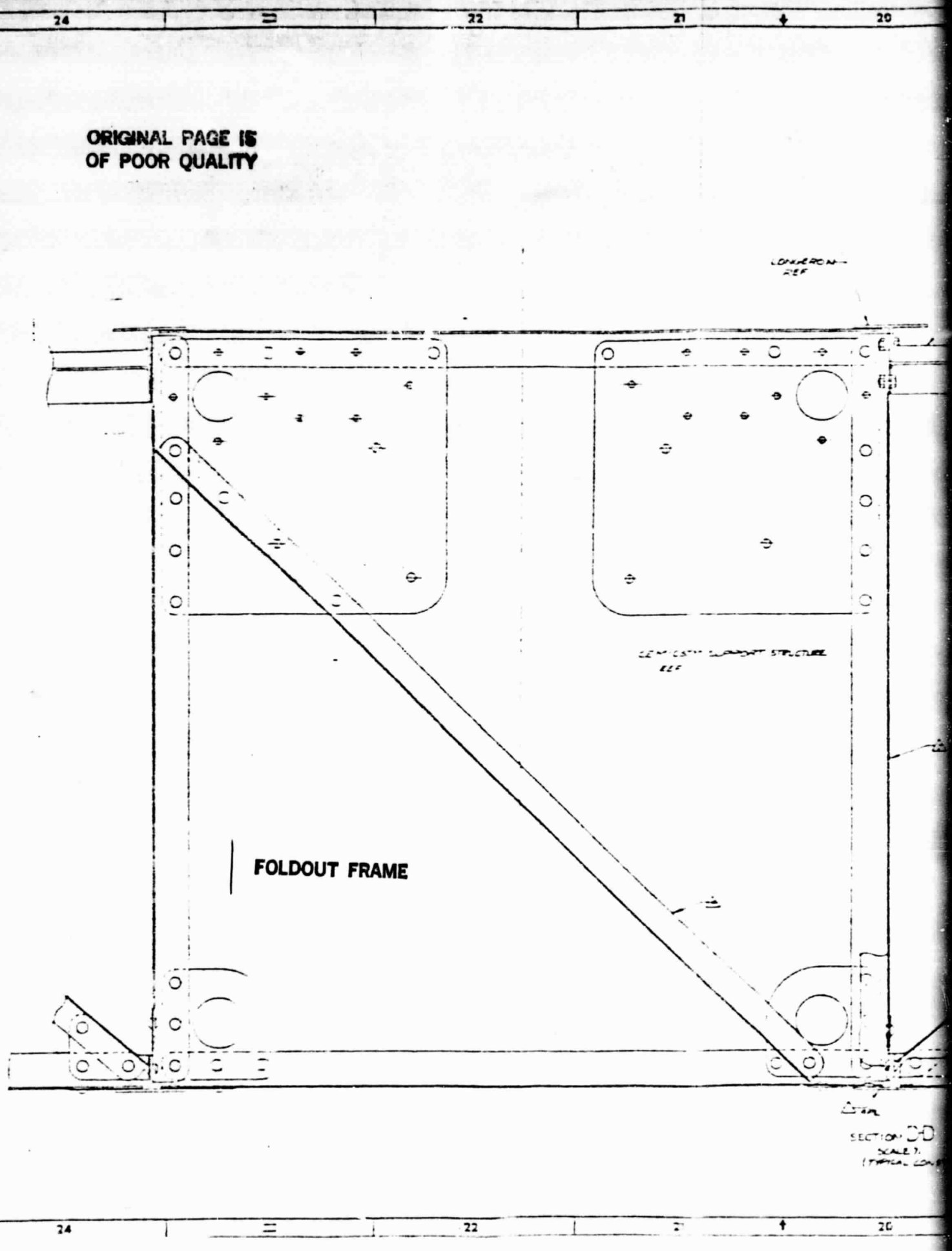
GE IS
ALITY

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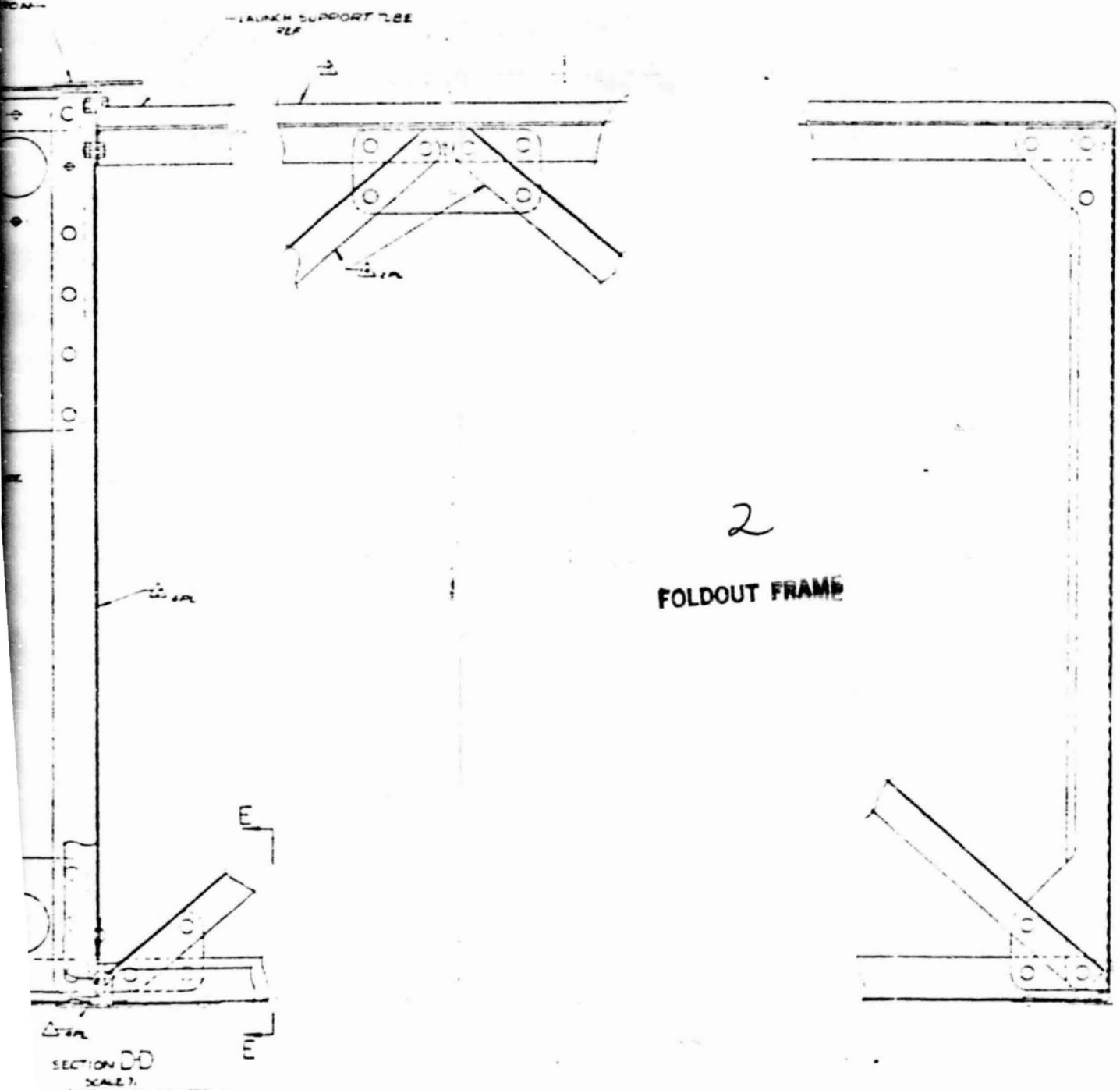
4 FOLDOUT FRAME

1-21, 1-22

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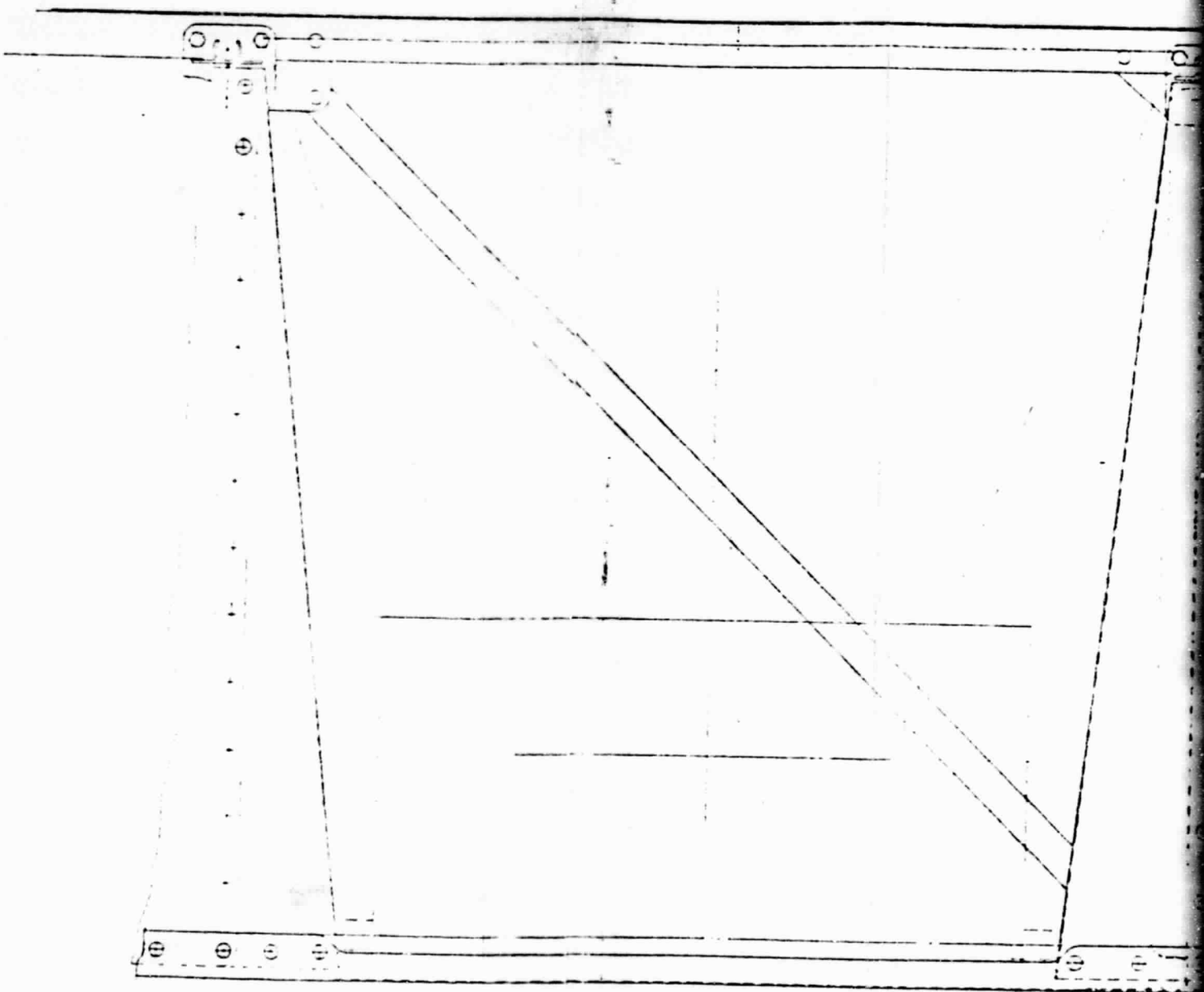


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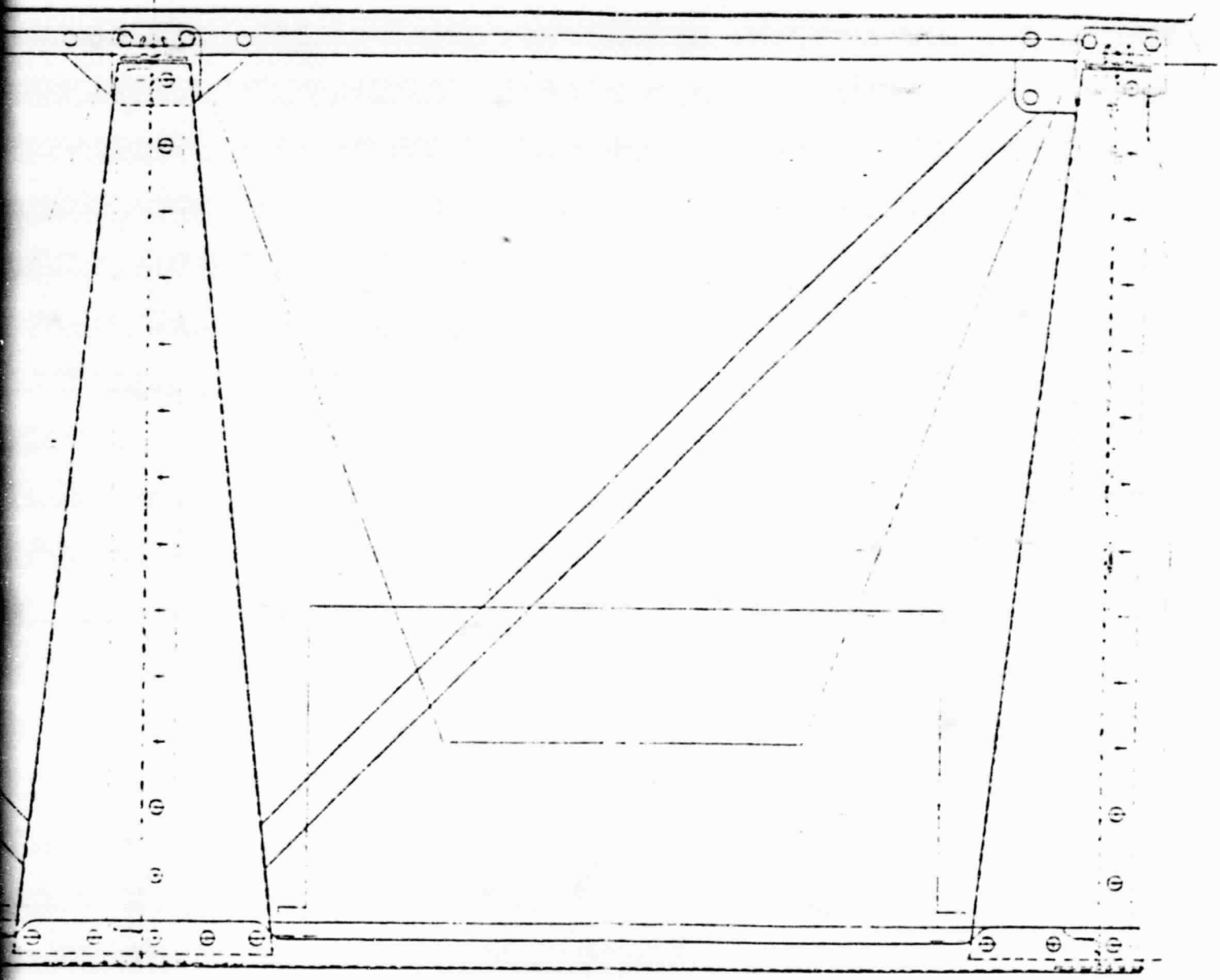
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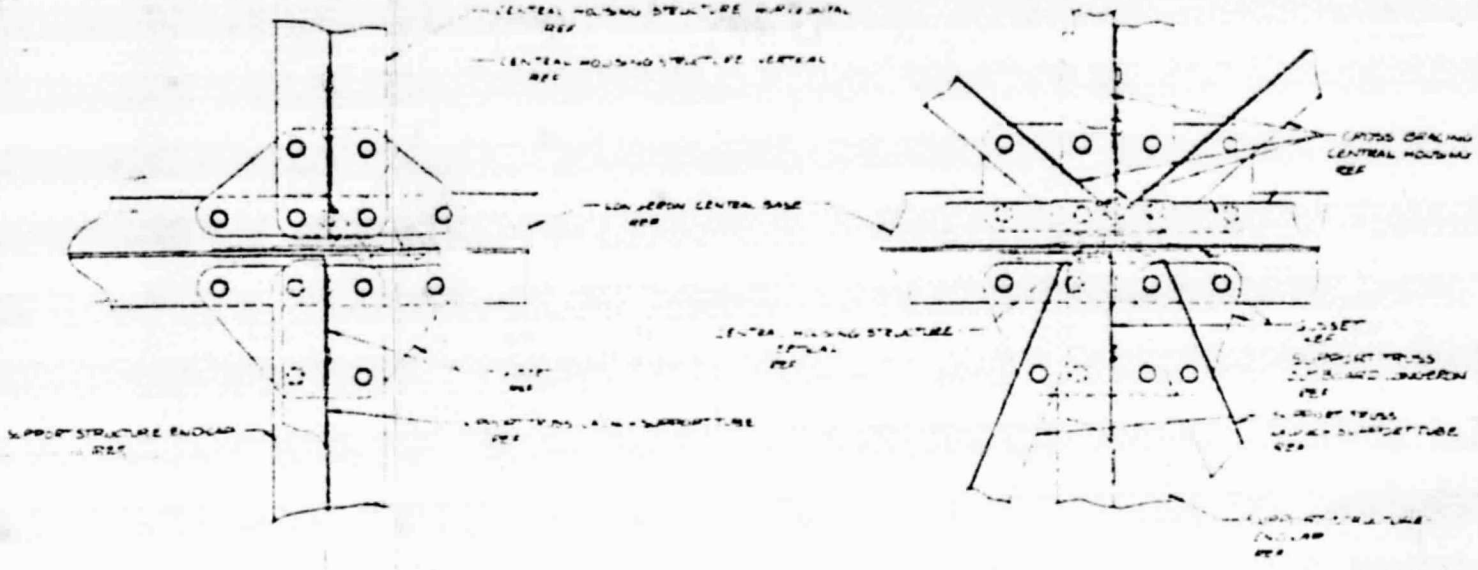
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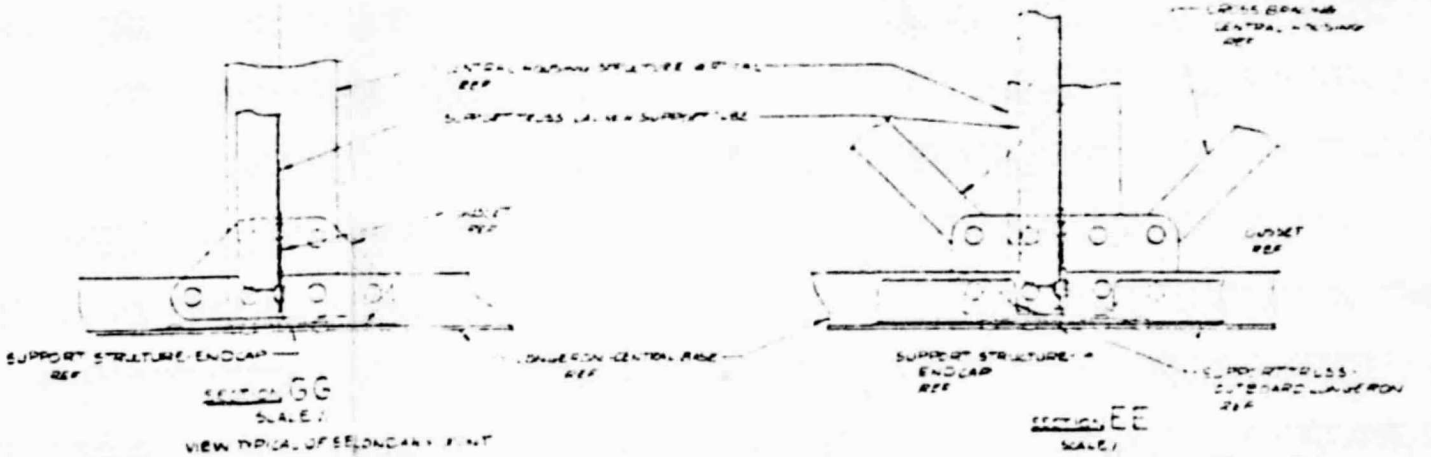


SECTION C-C
SCALE ½
TYPICAL STRUCTURE

5" FOLDOUT FRAME

ORIGINAL PAGE IS
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SECTION GG
SCALE 1
VIEW TYPICAL OF SECONDARY JOINT

SECTION EE
SCALE 1
VIEW TYPICAL OF PRIMARY JOINT

HOUSING STRUCTURE

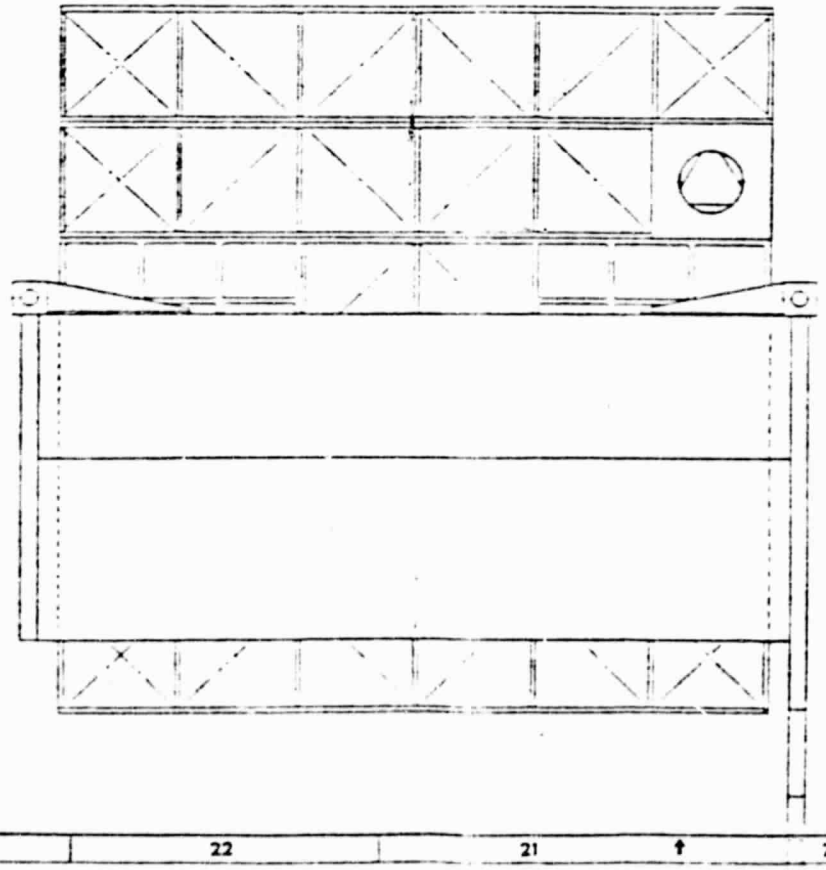
1-23, 1-24

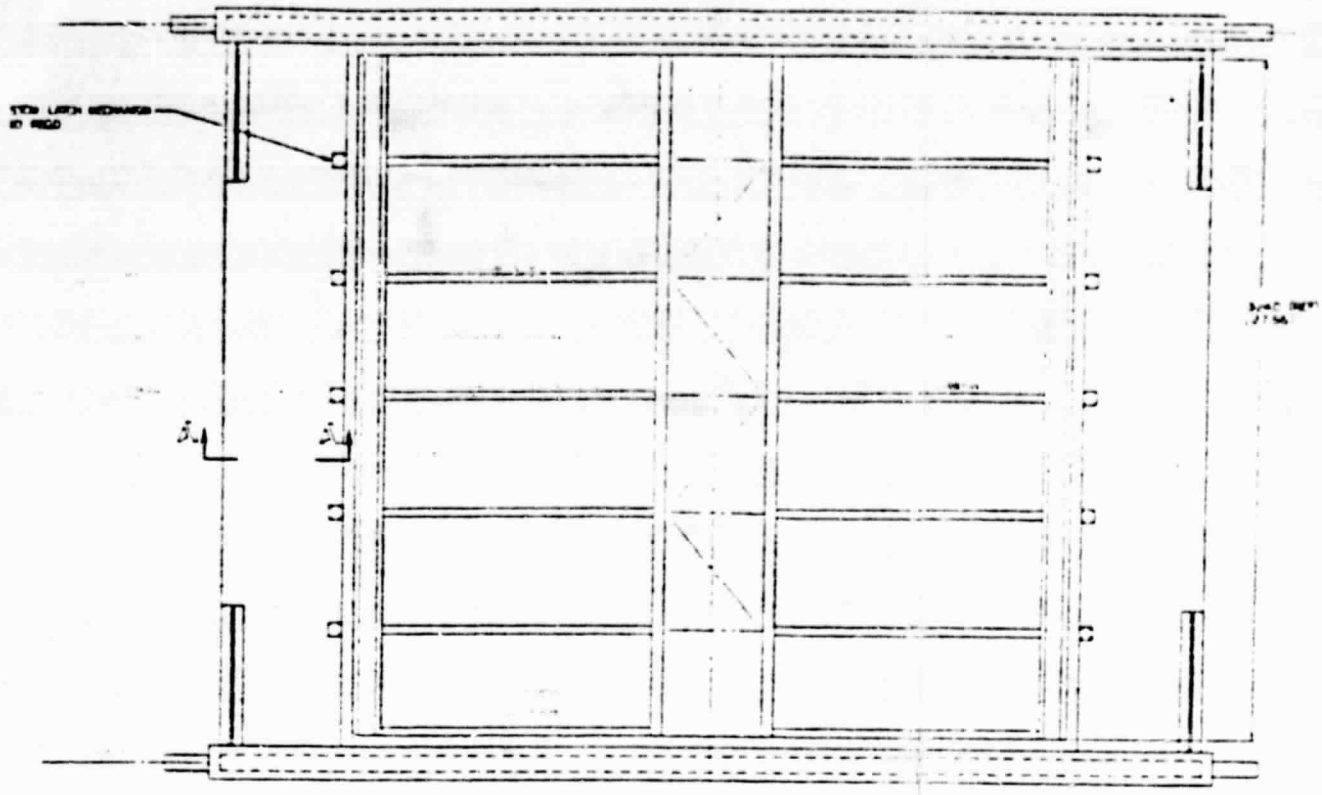
FOLDOUT FRAME



SECTION A-A

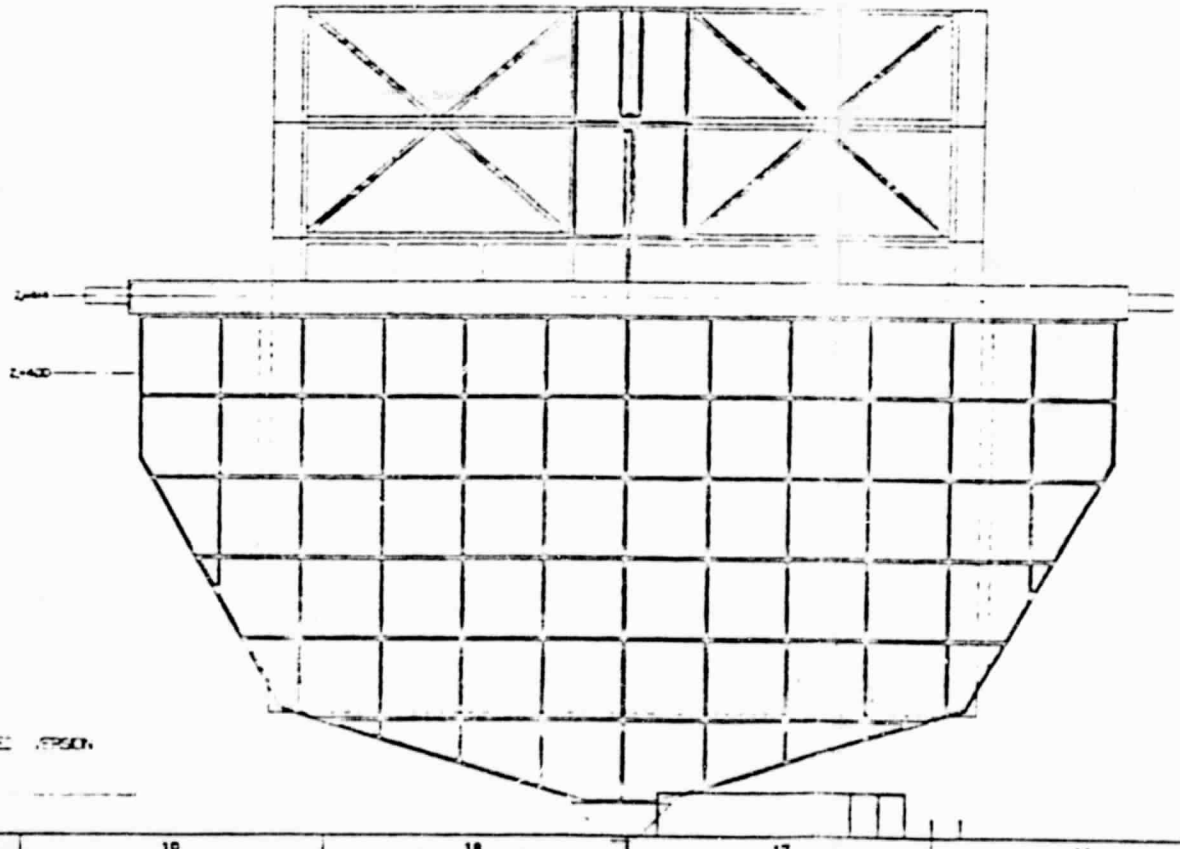
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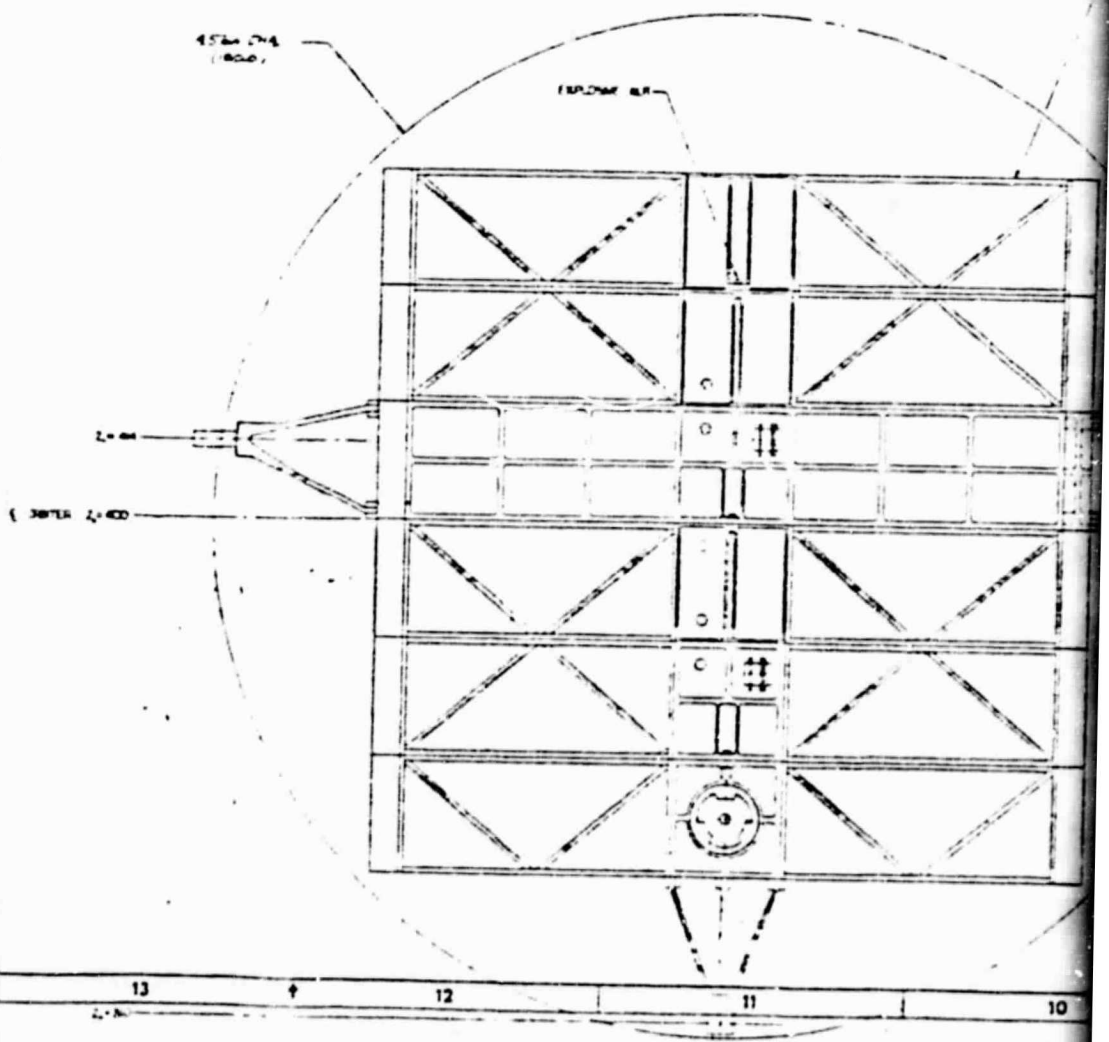
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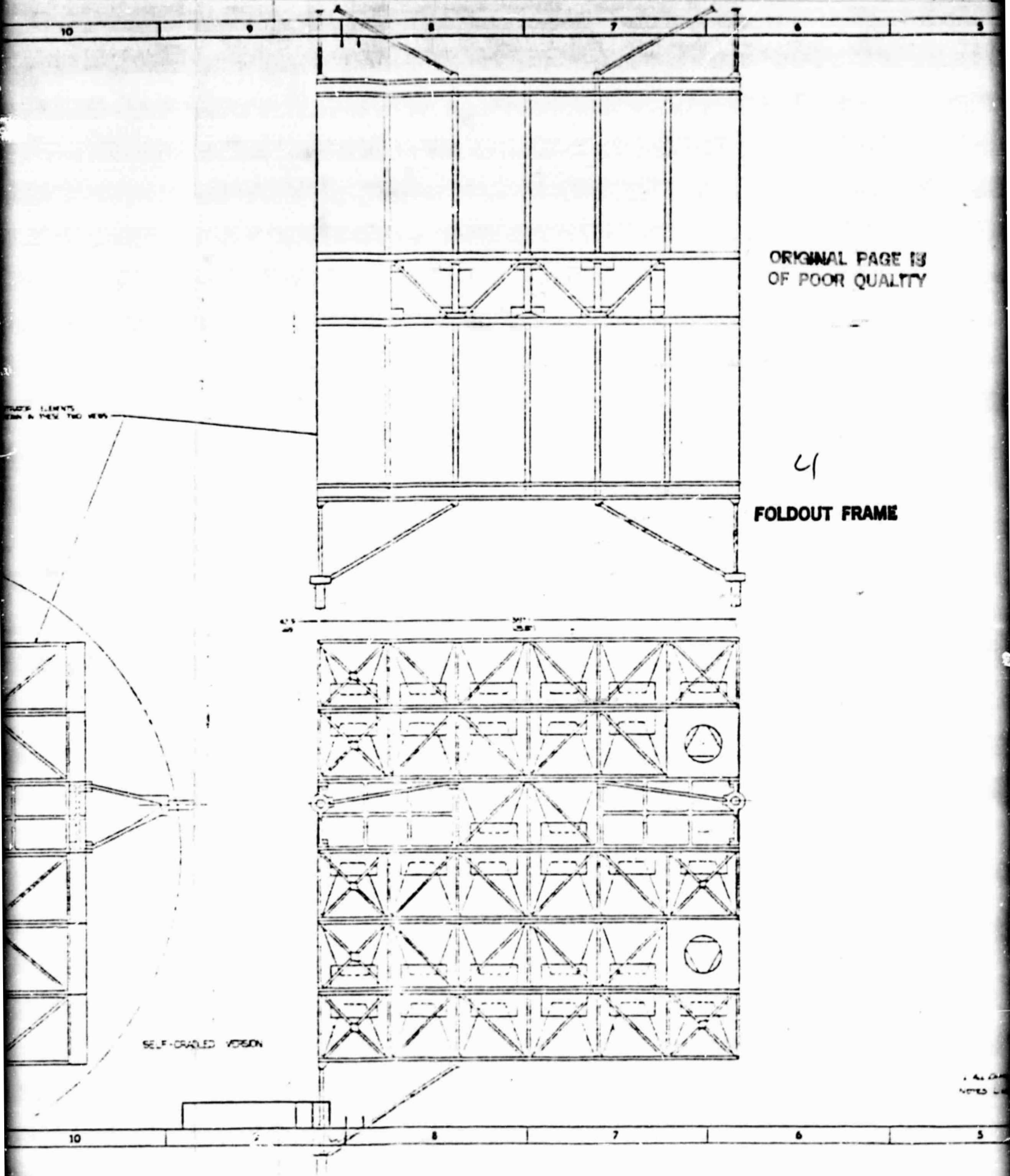
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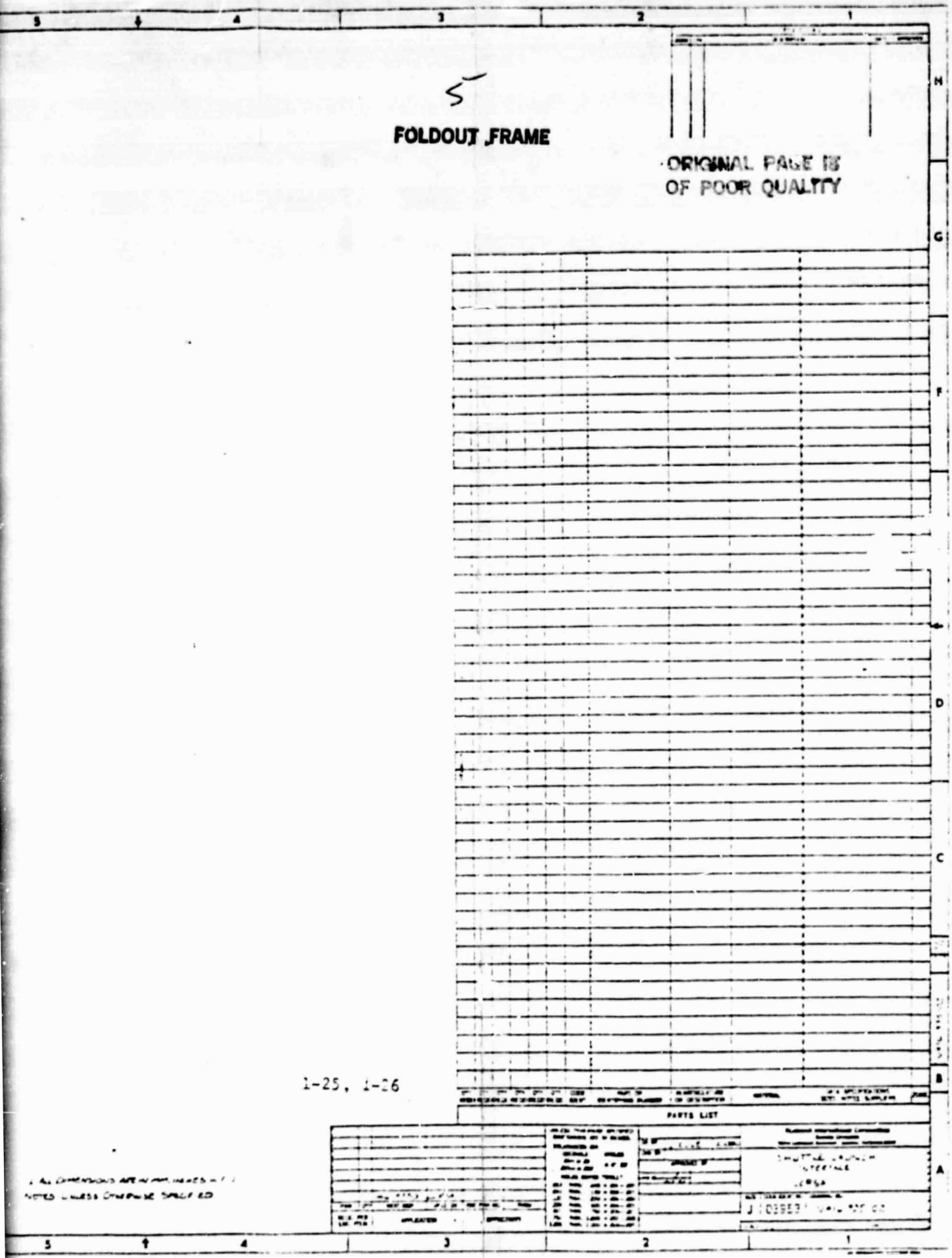
4

FOLDOUT FRAME

5

FOLDOUT FRAME

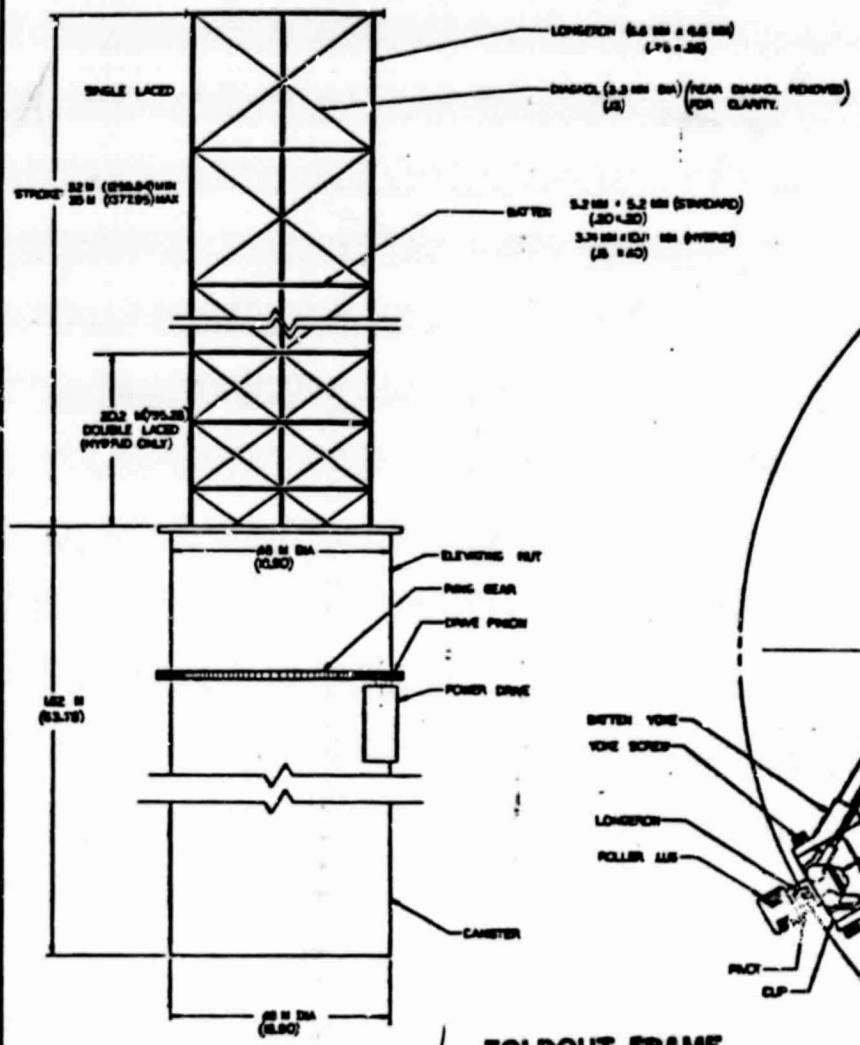
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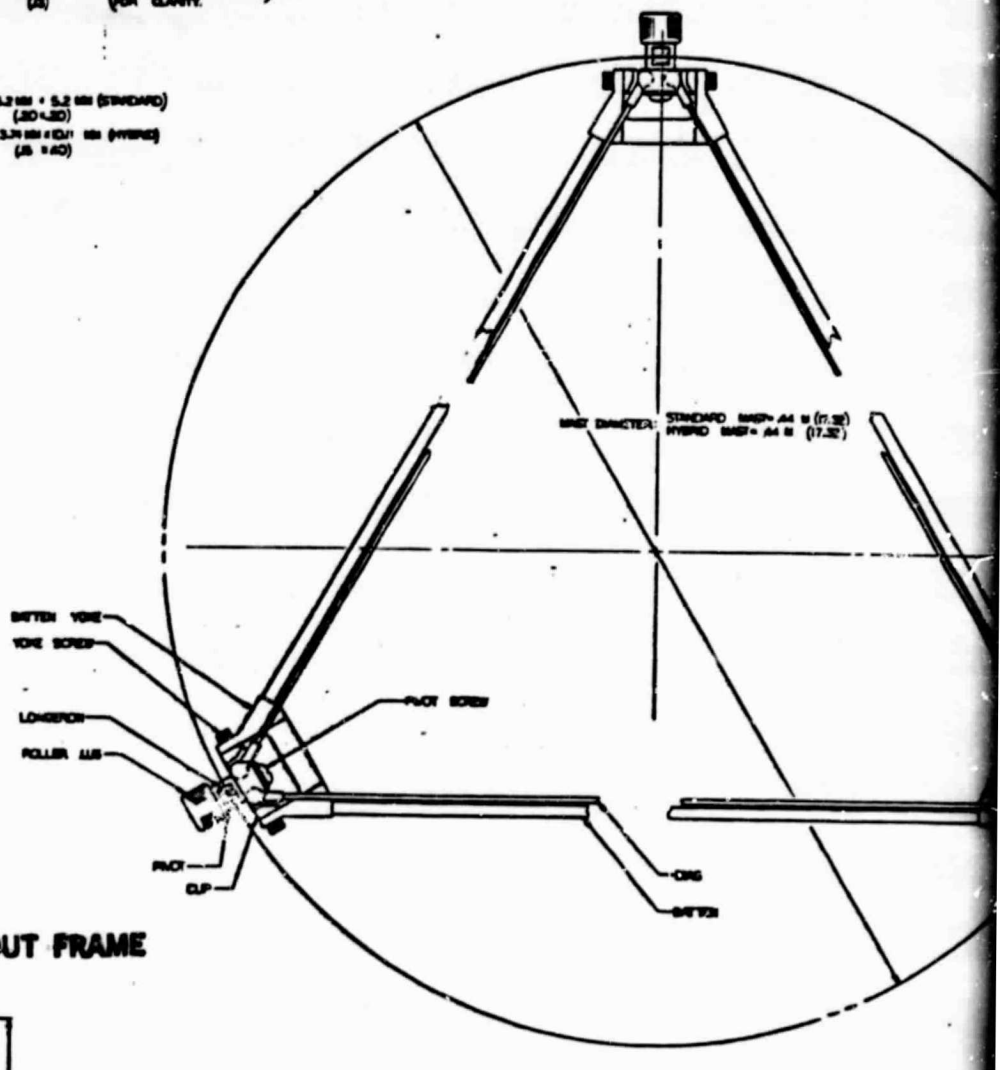


1-25, 1-26

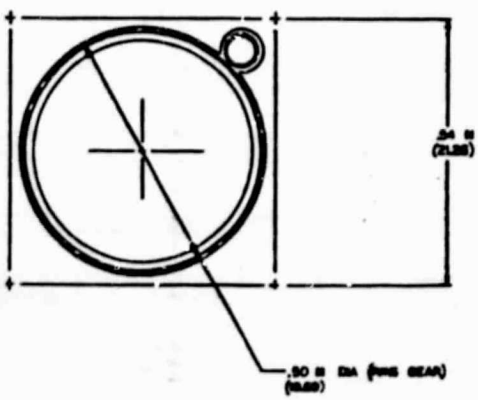
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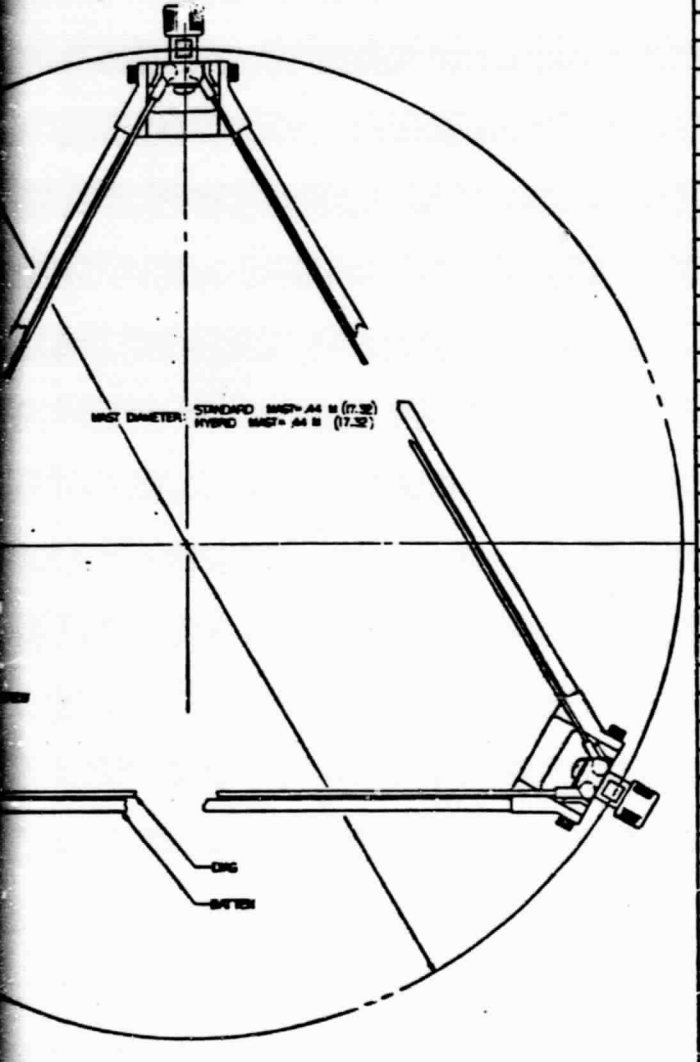
FOLDOUT FRAME



(ALL DIM IN METERS, INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED

FOLDOUT FRAME 2

ORIGINAL PAGE IS
OF POOR QUALITY



1-27, 1-28

PARTS LIST

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA SPECIFICATIONS MODS. NOTES. SUPPLIERS	ZONE

-001	6	V416-935100	LERSA
ITEM	QTY	NEXT ASSY	USED ON

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

USED ON	APPLICATION	DO NOT USE ON	EFFECTIVITY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS .XX ± .01 .XXX ± .005
FRACTIONS ± 1/64
ANGLES ± 0° 30'
HOLES NOTED "WELL"
.063 THRU .250 + .003 − .001
.251 THRU .375 + .004 − .001
.376 THRU .500 + .005 − .001
.501 THRU .750 + .005 − .001
.751 THRU 1.000 + .005 − .001
1.001 THRU 2.000 + .010 − .001

DRAWN BY: JAN CULE 12-7-82
CHECKED BY:
APPROVED BY:
MATERIAL:

Rockwell International

CANISTER/MAST DESIGN
LERSA

SIZE	CAGE IDENT NO.	DRAWING NO.
E	03953	V416-935103

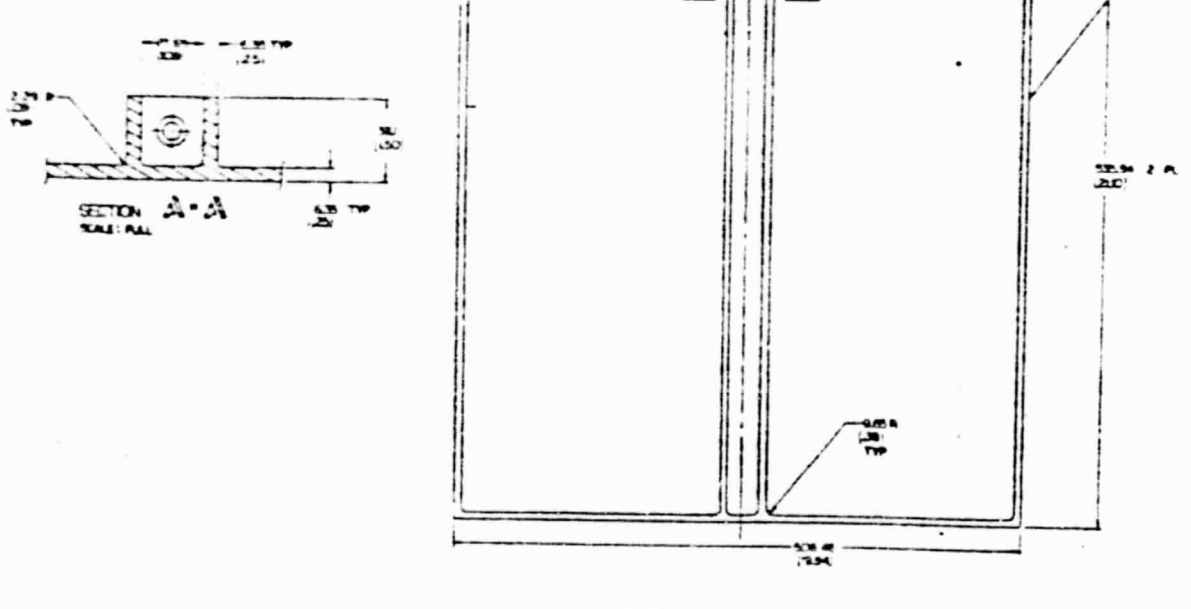
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NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL DIM IN METERS, INCHES IN ( ).

V416-935103 1/1

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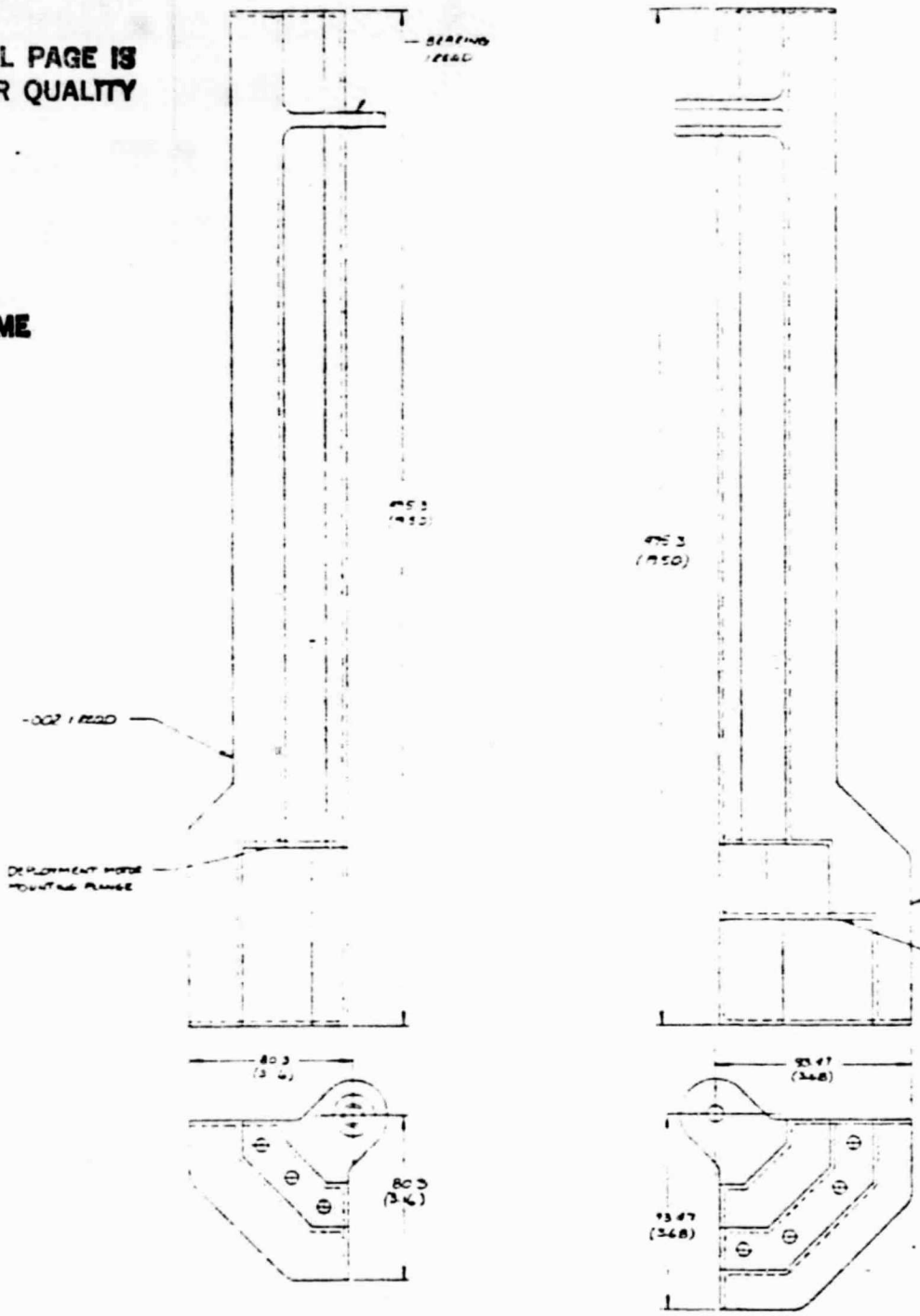
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LAUNCH LOCKDOWN FITTINGS
SCALE 1/2

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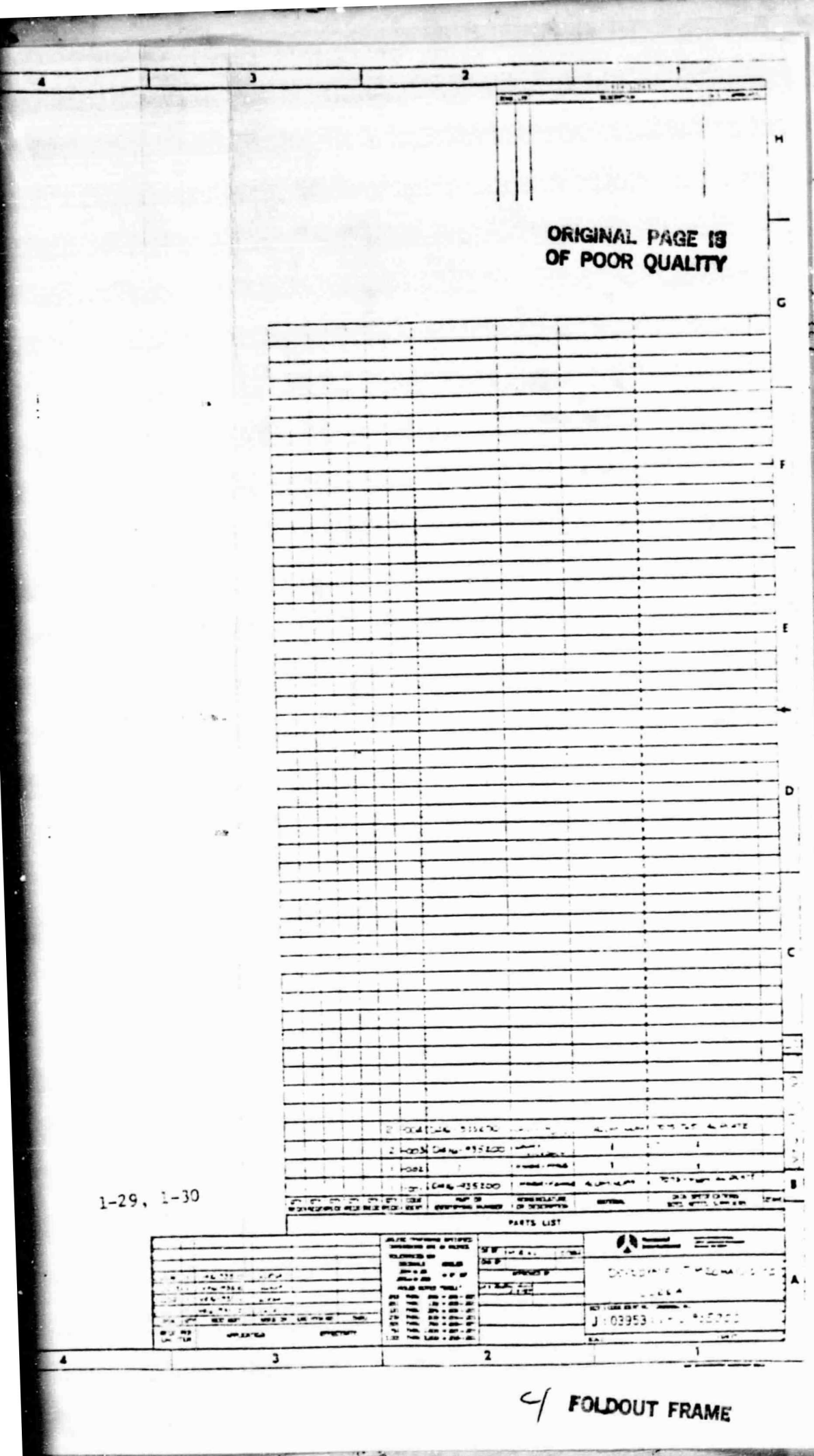
2 FOLDOUT FRAME



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ORIGINAL PAGE IS
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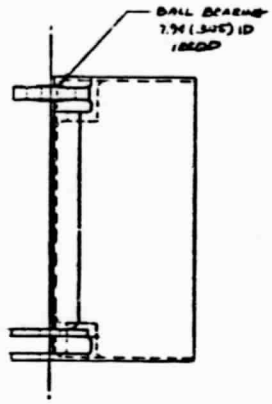
1-29, 1-30

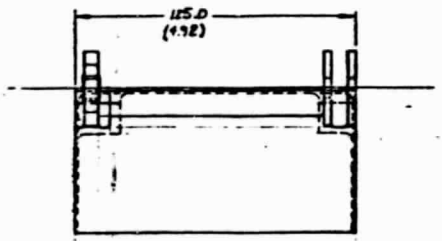


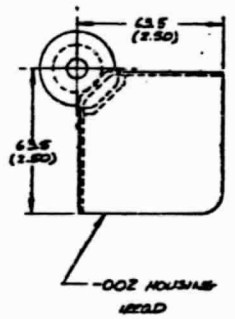
1-29, 1-30

FOLDOUT FRAME

ORIGINAL PAGE IS
OF POOR QUALITY







FOLDOUT FRAME

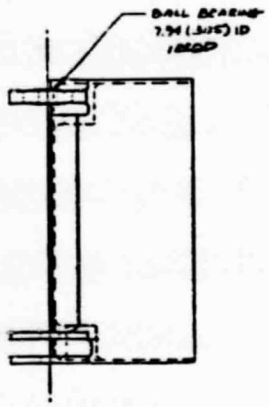
1-31

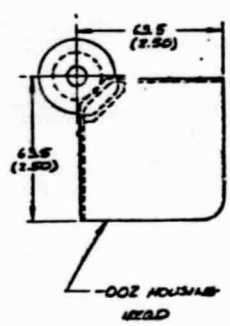
-00

1. ALL DIMENSIONS ARE IN mm, INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED

FOLDOUT FRAME

ORIGINAL PAGE IS OF POOR QUALITY





1-31, 1-32

-001 SHOWN

ITEM	QTY	QTY	QTY	QTY	QTY	QTY	QTY	DASH NO.	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA SPEC. EXCEPTIONS SPEC. NOTES, SUPPLIERS	ZONE
						2	-001	V41G-935201	4554	BEARING HOUSING	ALUMINUM	2015-T651 AL PLATE	

PARTS LIST

1. ALL DIMENSIONS ARE IN MM, INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED

-001	2	V41G-935400			
ITEM	QTY	USED ON			
USED ON DASH NUMBER		APPLICATION		SPECIFICATION	

DRAWN	M Bliss	11/15/82
CHECKED		
APPROVED		

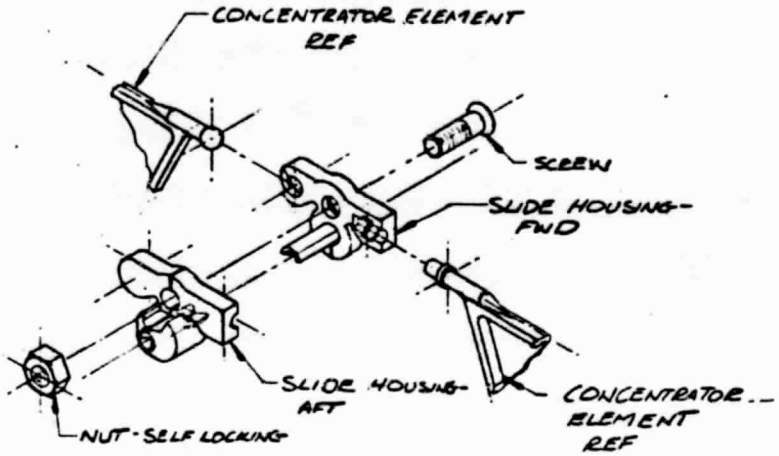
HINGE MECHANISM
LCRSA

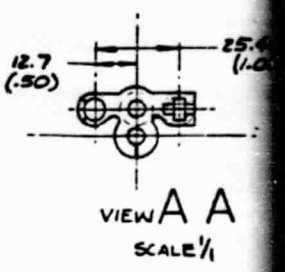
SIZE	CAGE CODE NO.	DRAWING NO.
E	03953	V41G-935201

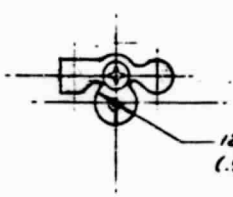
SCALE 1/1 SHEET 1/1

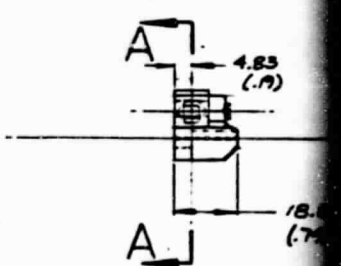
V41G-935201

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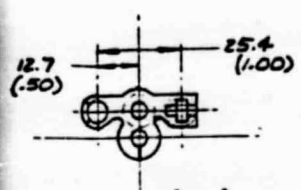


FOLDOUT FRAME

2. FAB FI
1. ALL DIM
NOTES: UN

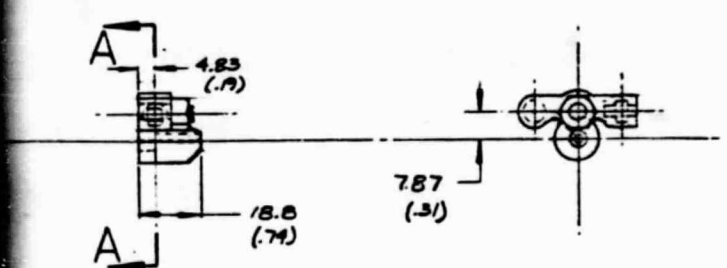
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

2 - FOLDOUT FRAME



VIEW A A
SCALE 1/1

ORIGINAL PAGE IS
OF POpoor QUALITY



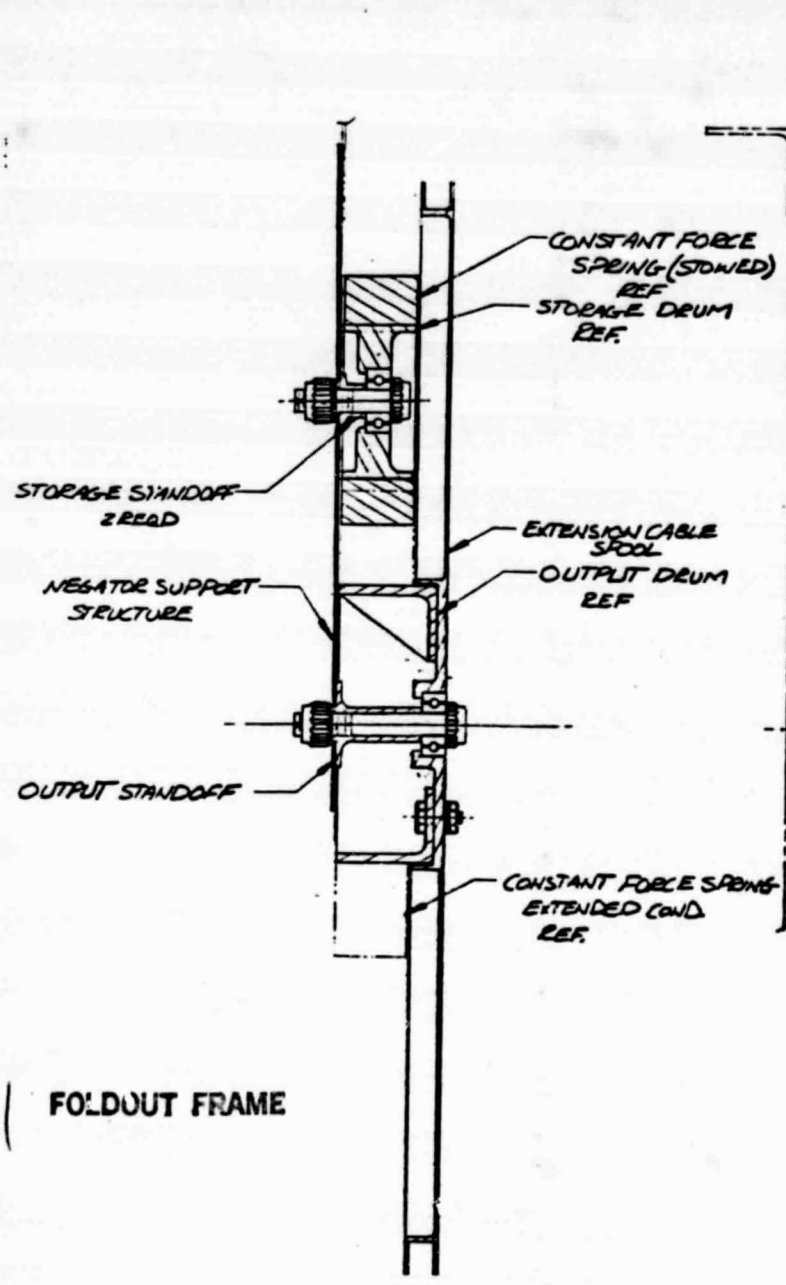
-001 SHOWN

DR BY M. BISS 3/15/82	Rockwell International Corporation Space Division 12214 Lakewood Boulevard • Downey, California 90241	
CHK BY		
APPROVED BY	SLIDE ASSEMBLY - EXTENSION CABLE LCRSA	
N/A V41-935002	SIZE D / CODE IDENT NO. 03953 / V41-915202	
	SCALE FULL	SHEET 1/1

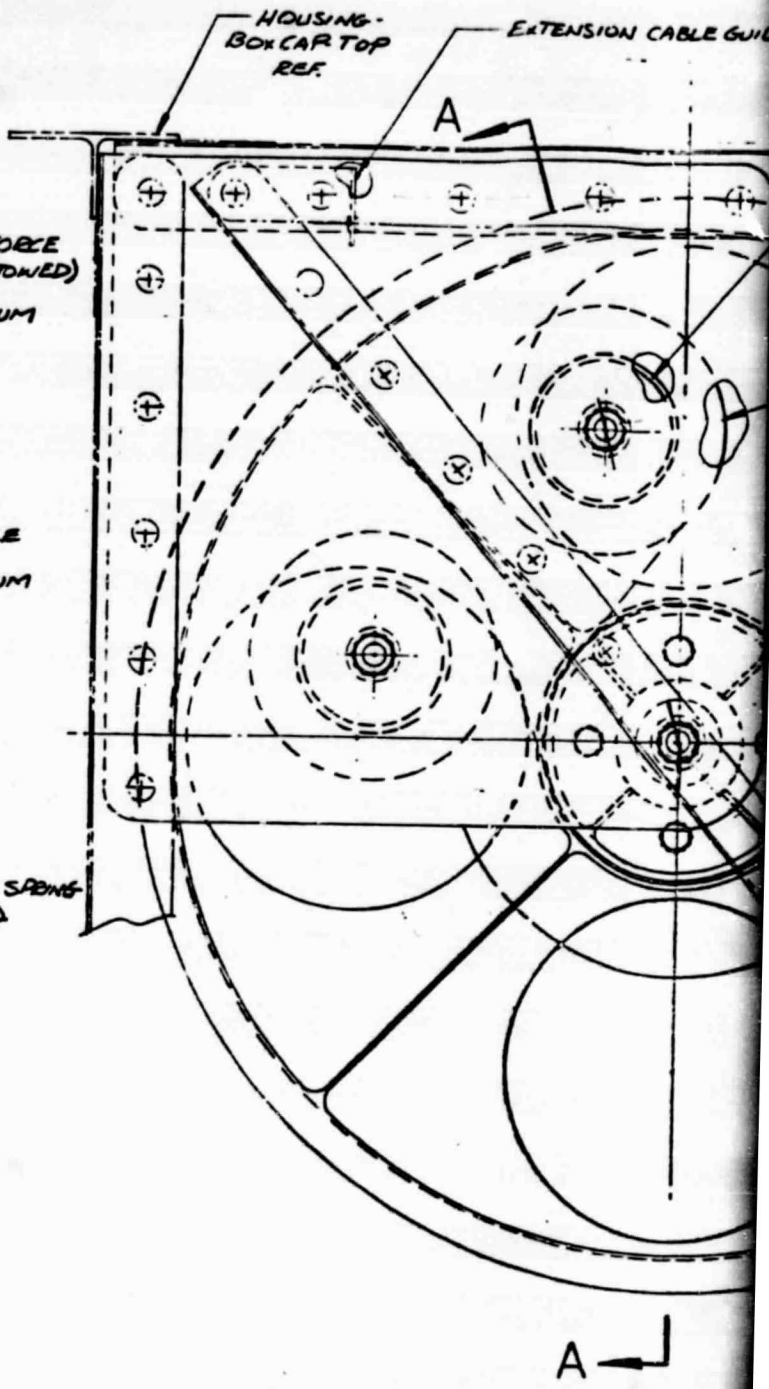
2. FAB FROM GRAPHITE IMPREGNATED POLYSULFONE
1. ALL DIMENSIONS ARE IN mm, INCHES ARE IN ( ).
NOTES: UNLESS OTHERWISE SPECIFIED

V41-915202

ORIGINAL PAGE IS
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SECTION A-A

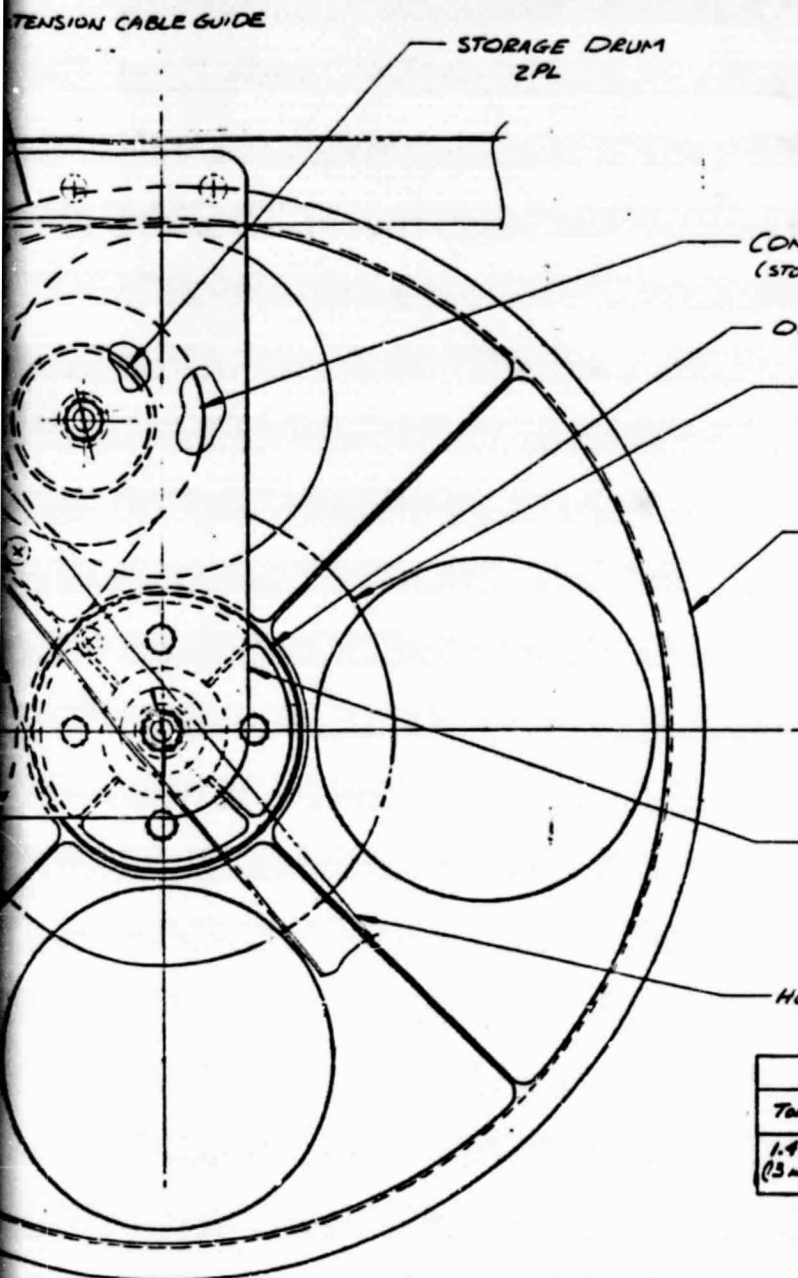


FOLDOUT FRAME

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

ORIGINAL PAGE IS
OF POOR QUALITY

FOLDOUT FRAME 2



NEGATOR SPRING DETAILS						
TORQUE	STORAGE DRUM DIA	OUTPUT DRUM DIA.	THICKNESS	WIDTH	LENGTH	MAT'L
1.47 NM (13 IN-LBS)	46.5 (1.83)	81.3 (3.20)	.36 (.014)	22.3 (.88)	12.95 M (50')	302 SST

2. ALL DIM'S ARE IN MM, INCHES IN ( )
1. ALL PARTS MOLDED FROM GRAPHITE IMPREGNATED POLYSULFONE
NOTES: UNLESS OTHERWISE SPECIFIED

DR BY	M BISS	3/22/82
CHK BY		
APPROVED BY		
N/A	V416-935100	

Rockwell International Corporation
Space Division
12214 Lakewood Boulevard • Downey, California 90241

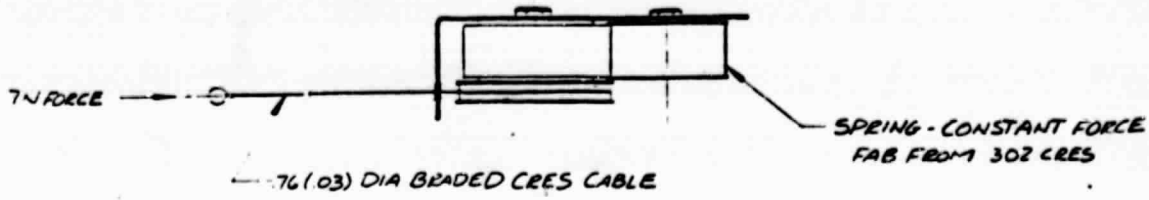
MECHANISM - CABLE EXTENSION LCRSA

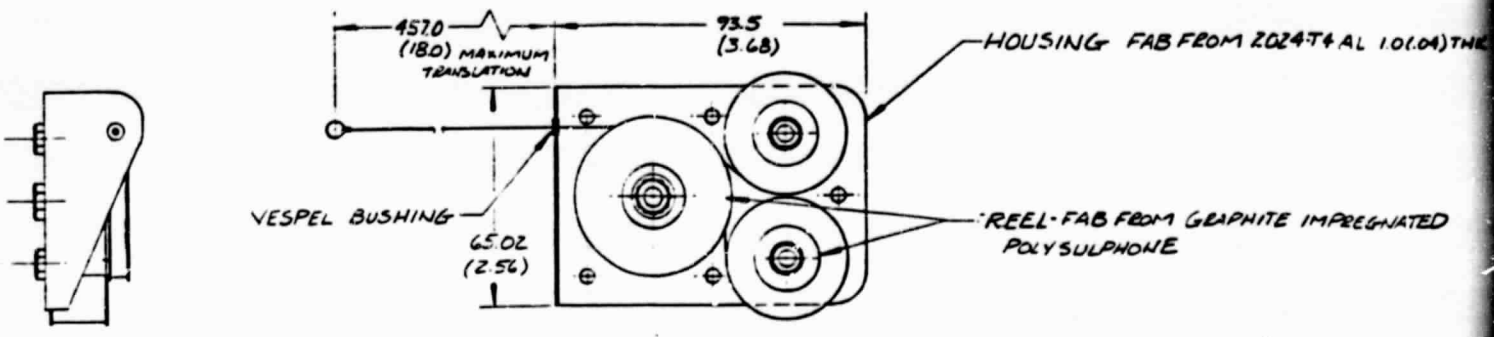
SIZE	CODE IDENT NO.	
D	03953	V416-935203

SCALE FULL SHEET 1/1

V416-935203

ORIGINAL PAGE IS
OF POOR QUALITY





FOLDOUT FRAME

1. ALL DIMENSIONS ARE IN MM, INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED

001	14	VE
001	12	VE
ITEM	QTY.	
REQD PER END ITEM		

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

ORIGINAL PAGE IS
OF POOR QUALITY

2 FOLDOUT FRAME

2024-T4 AL 1.01(.04) THK

TE IMPREGNATED

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA: SPECIFICATIONS SIZES: NOTES, SUPPLIERS	ZONE

PARTS LIST

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO	THRU
001	16	V416-935100	LCESA	-004,005,006	
001	12	V416-935100	LCESA	-001,002,003	

REQ'D PER END ITEM | APPLICATION | EFFECTIVITY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: XX = ± .03, XXX = ± .010; ANGLES: ± 0° 30'
HOLES NOTED "DRILL"

.013	THRU	.040	+ .001 − .001
.041	THRU	.130	+ .002 − .001
.131	THRU	.229	+ .003 − .001
.230	THRU	.500	+ .004 − .001
.501	THRU	.750	+ .005 − .001
.751	THRU	1.000	+ .007 − .001
1.001	THRU	2.000	+ .010 − .001

DR BY	M BISS	3/16/83
CHK BY		
APPROVED BY	C T Thompson 3-16-83	

Rockwell International

CONCENTRATOR STACK TRANSLATOR MECHANISM LCESA

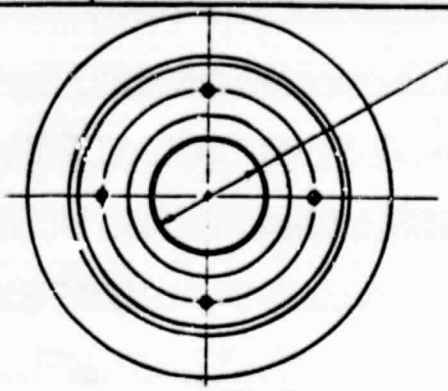
SIZE	CODE IDENT NO	DRAWING NO
D	03953	V416-935204

SCALE FULL | SHEET 1/1

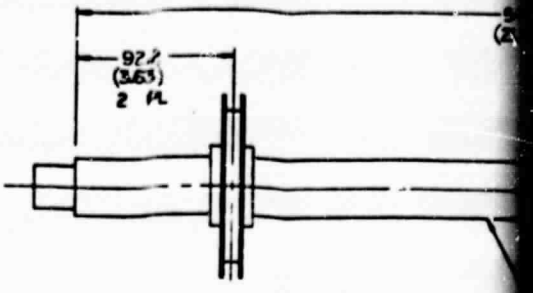
V416-935204

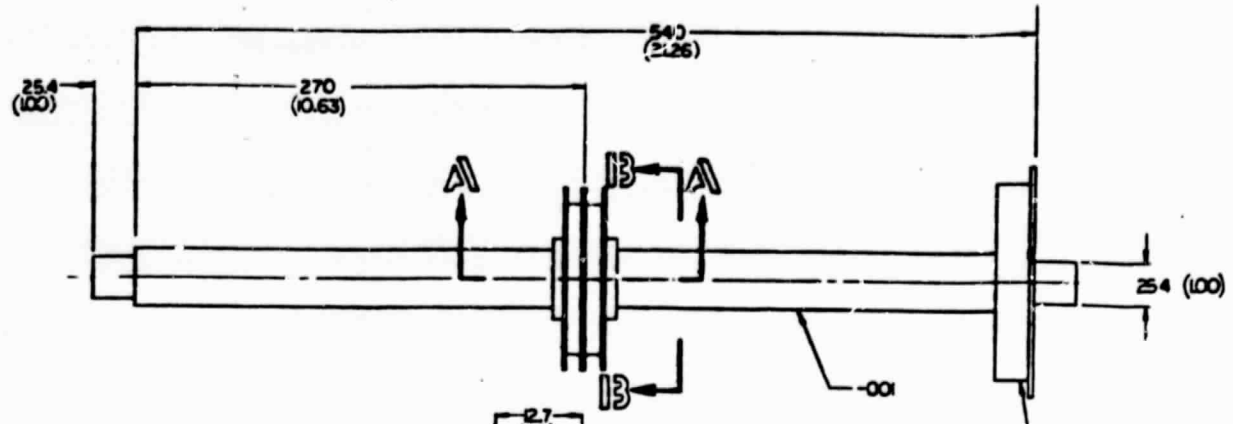
FOLDOUT FRAME

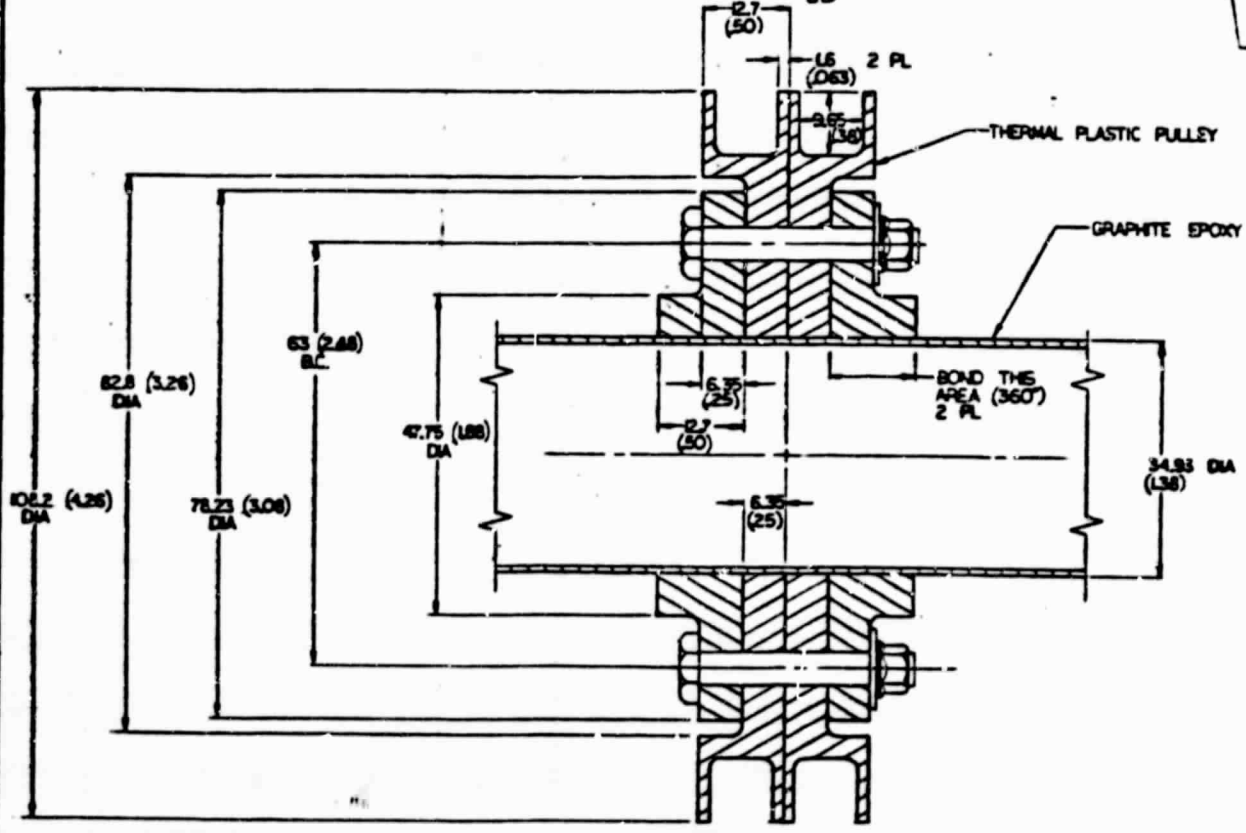
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OF POOR QUALITY



SECTION 13-13
SCALE: FULL





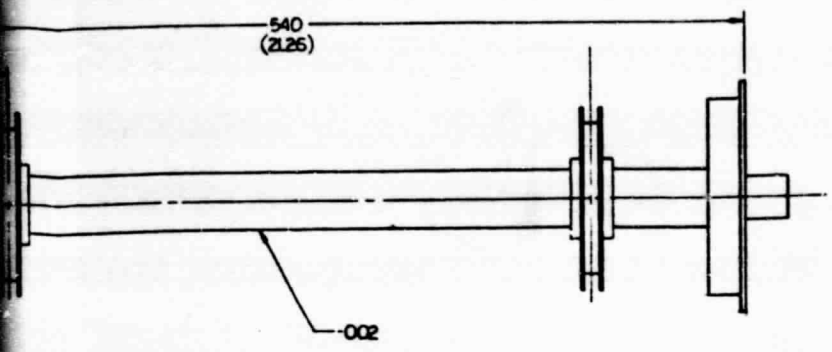


SECTION A-A (TYP)
SCALE: 2/1

1. ALL DIMS. IN MM, INCHES IN

NOTES: UNLESS OTHERWISE SPECI

ITEM	QTY	NEXT AS
-002		V414-93
-001		V414-93
REQD PER END ITEM		AP



REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED

ORIGINAL PAGE IS
OF POOR QUALITY

FOLDOUT FRAME

254 (.00)

FULL ROTATION BRUSHLESS DC TORQUE MOTOR

TORQUE TUBE

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA: SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
							-002	TRIP WIRE ASSY RADIATOR			
							V416 935205-001	TRIP WIRE ASSY REFLECTOR			

PARTS LIST

1. ALL DIMS. IN MM, INCHES IN ( )
2. NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO	THRU
-002		V416-935100	LCRSA		
-001		V416-935100	LCRSA		

REQD PER END ITEM — APPLICATION — EFFECTIVITY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES ON:

DECIMALS	ANGLES
XX = ± .03	± 0° 30'
XXX = ± .010	

HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

DR BY JIM CULE 11-30-82
CHK BY
APPROVED BY
2-11-83

Rockwell International

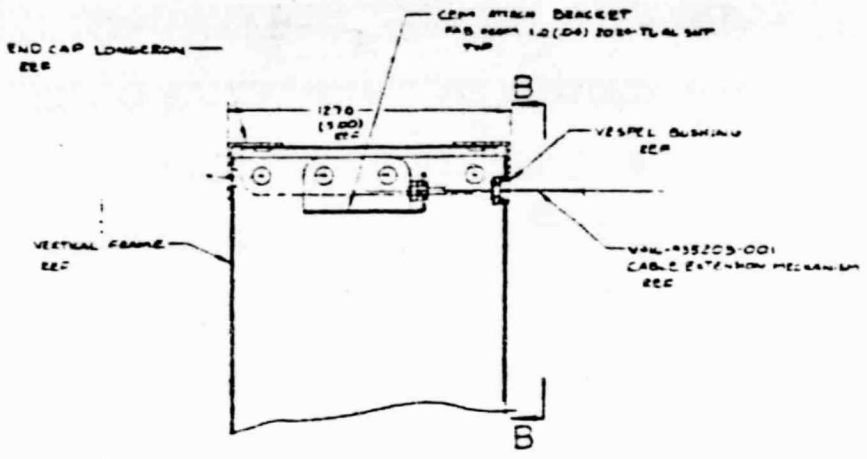
TRIP WIRE ASSY
REFLECTOR – RADIATOR

SIZE	CODE IDENT NO	DRAWING NO.
D	03953	V416-935205

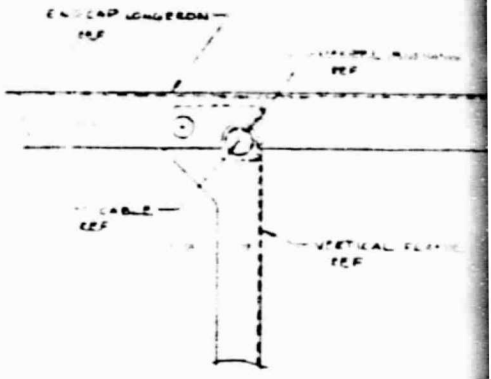
SCALE 1/2 & NOTED SHEET

1-39, 1-40

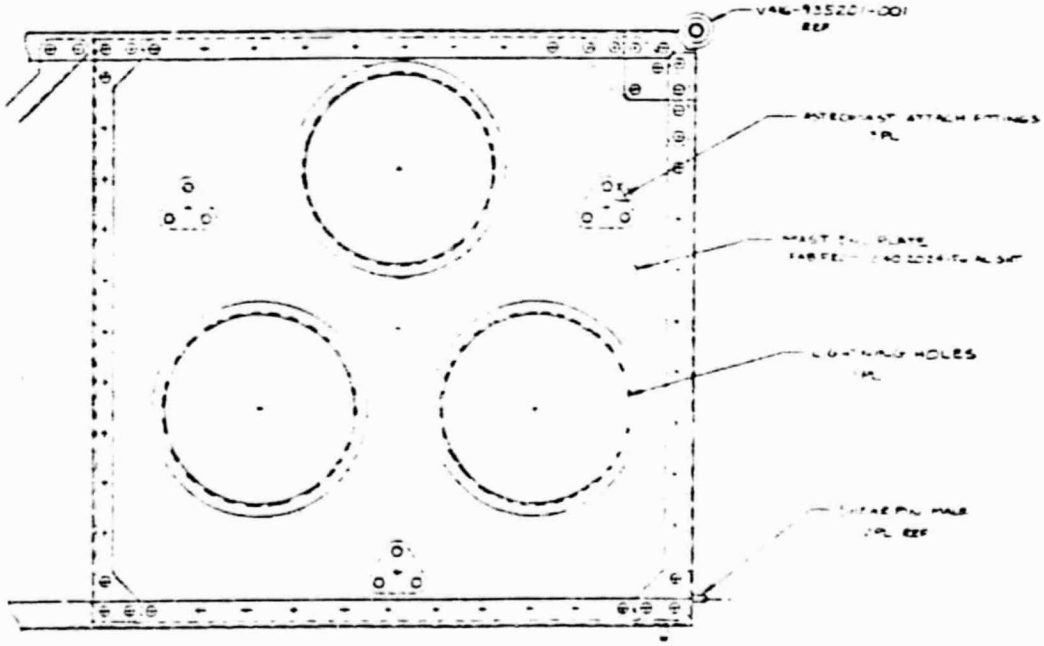
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SECTION A-A
SCALE 1/4
(TYPICAL CONSTRUCTION)

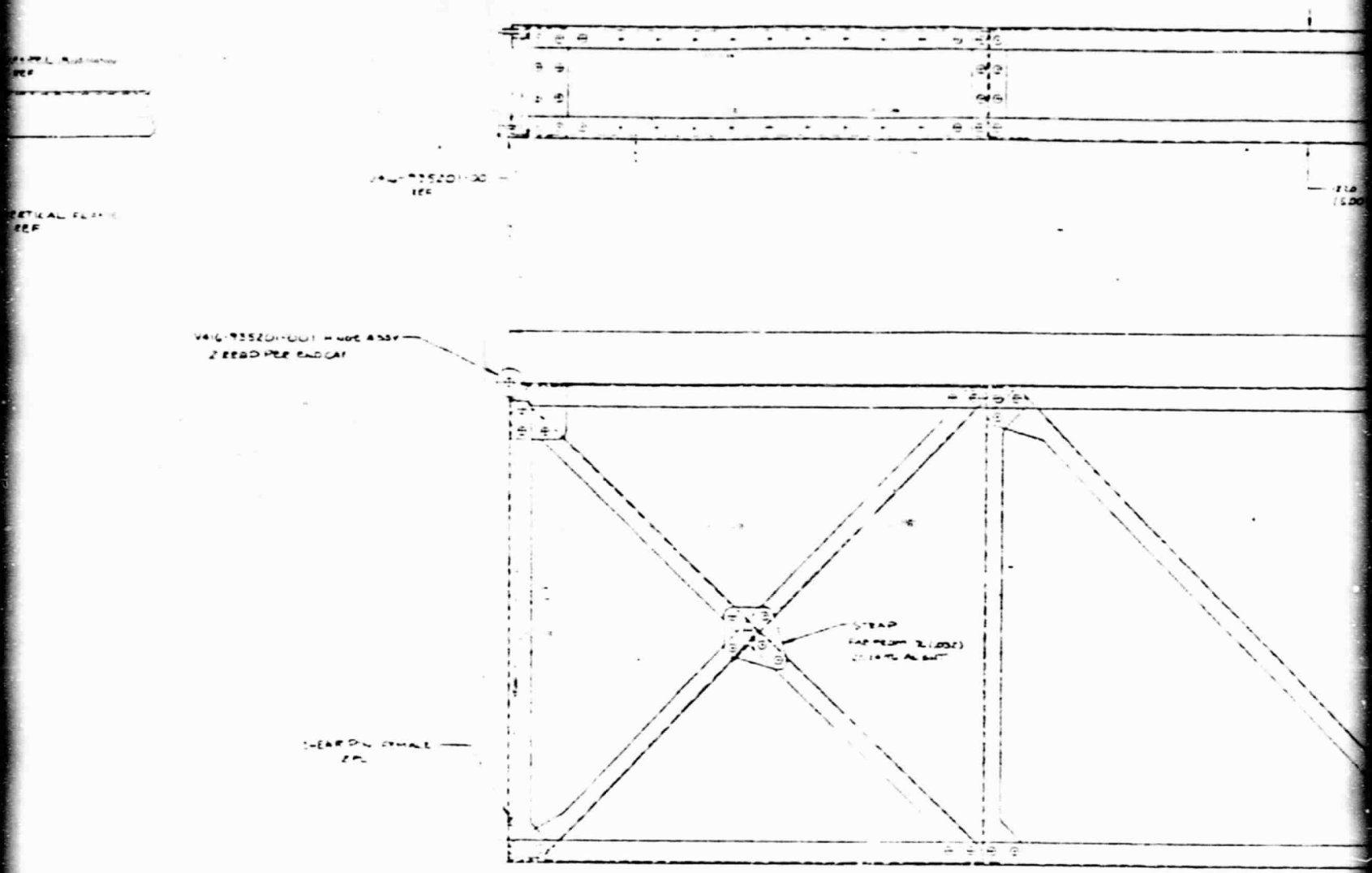


VIEW BB
SCALE 1/4



FOLDOUT FRAME

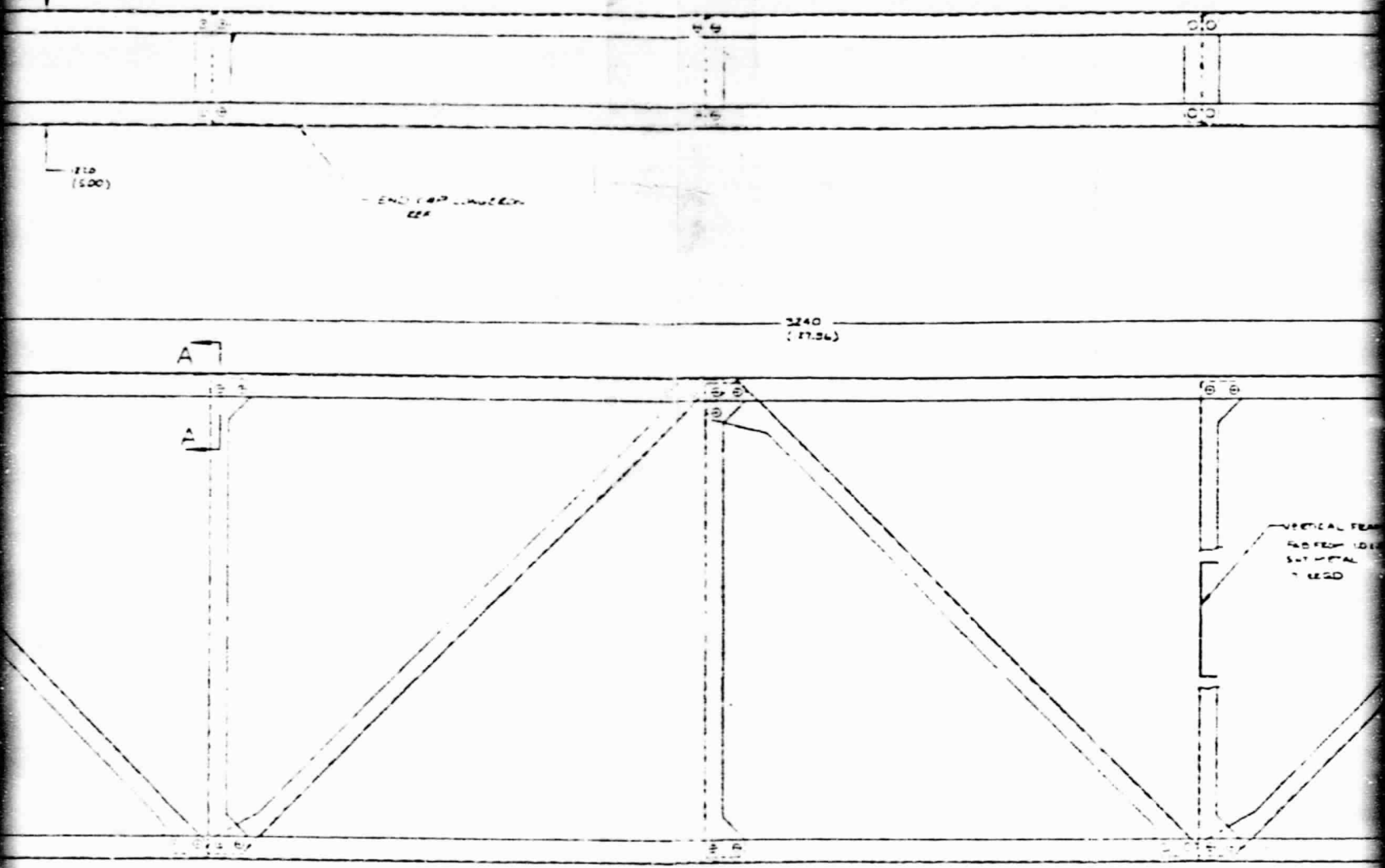
-001 END CAP END SHOWN
CONSTRUCTION TYPICAL



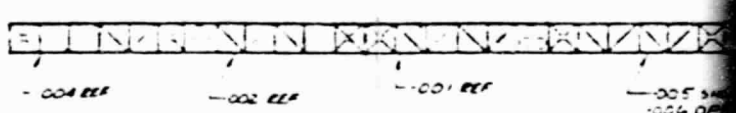
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2 FOLDOUT FRAME

3 FOLDOUT FRAME

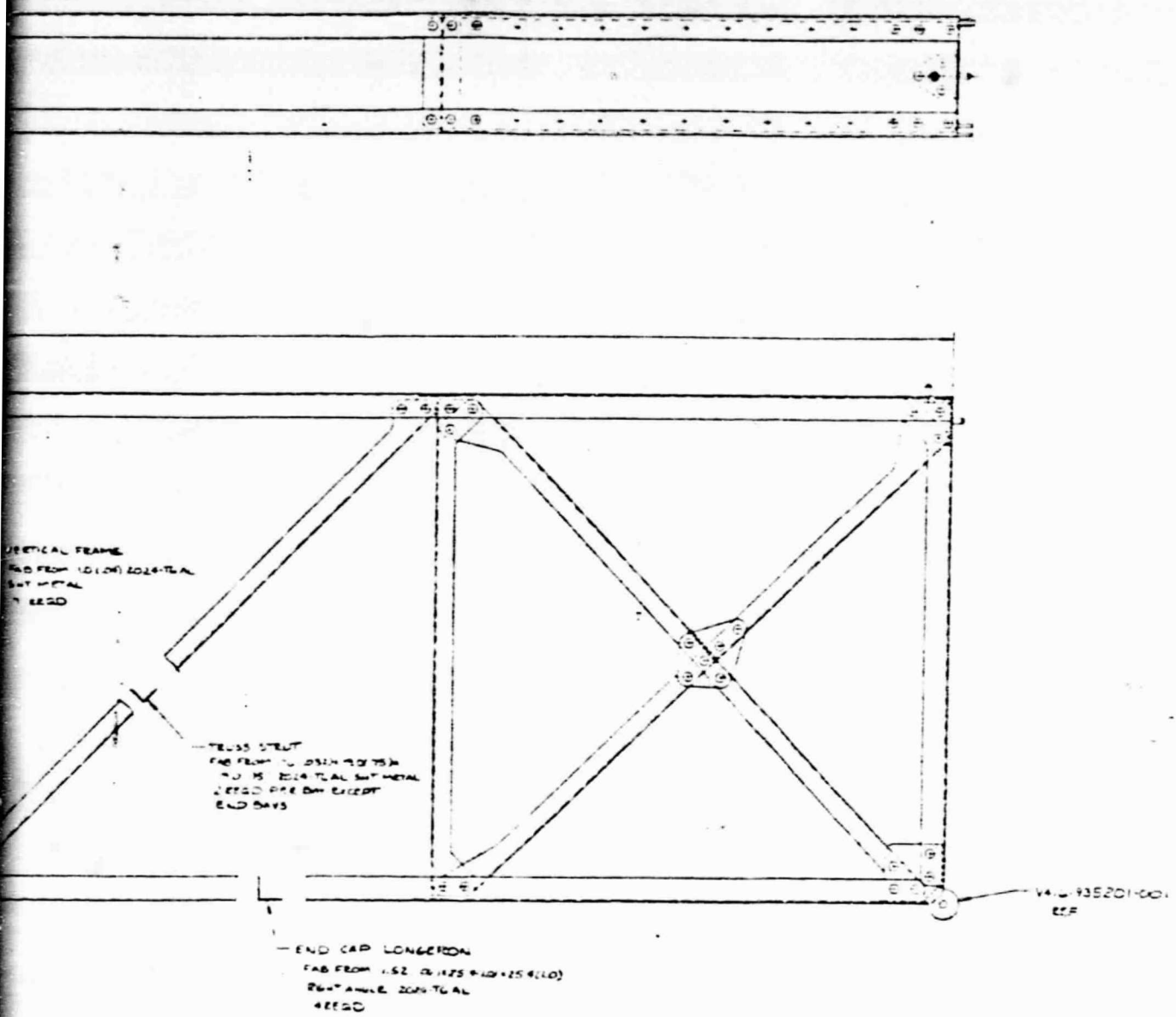


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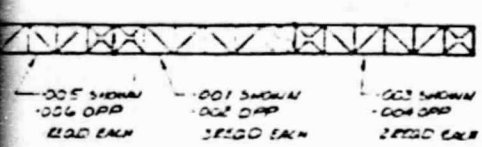
END CAPS SHOWN ASSEMBLED
SCALE 1/60

ORIGINAL PAGE IS
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4

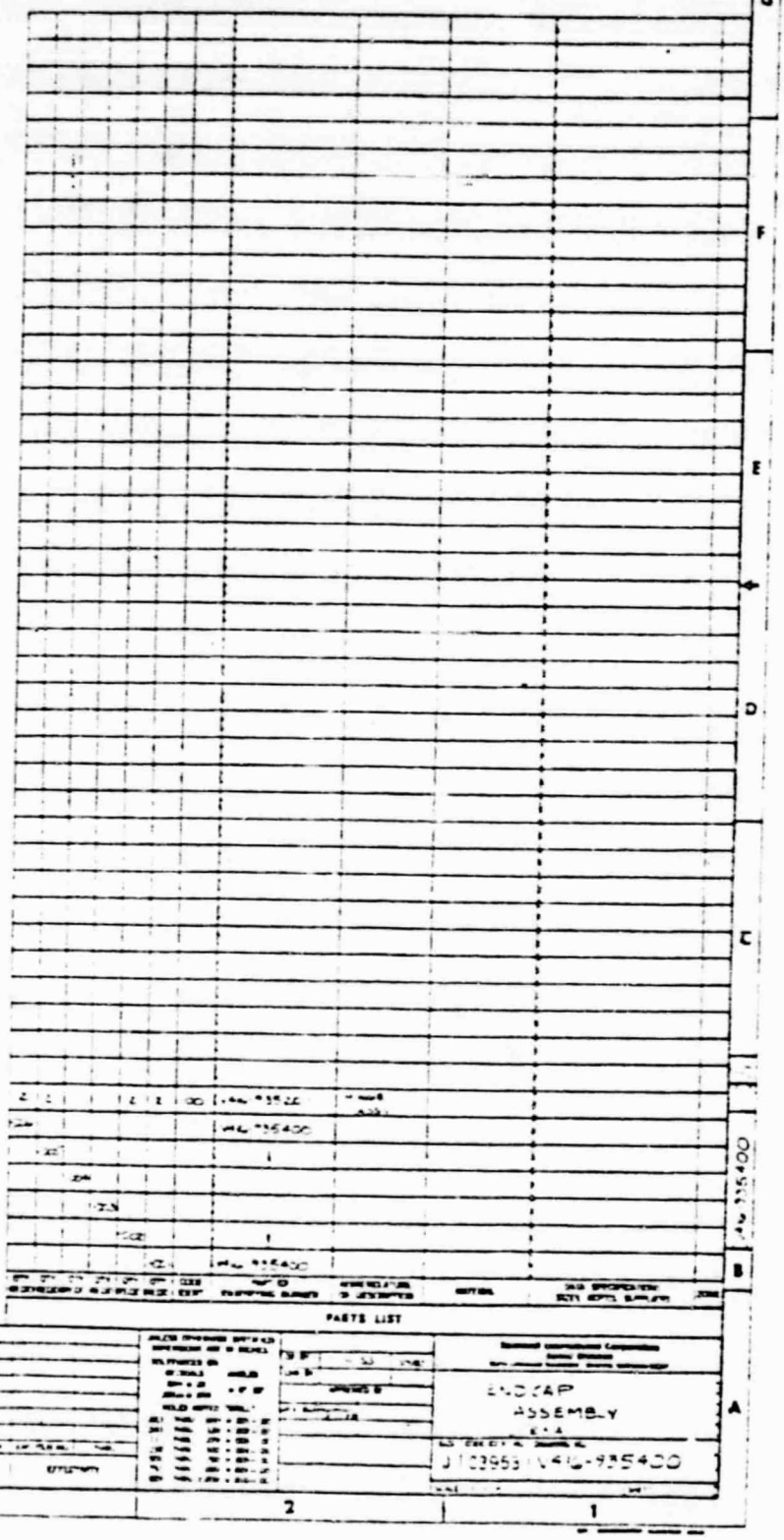
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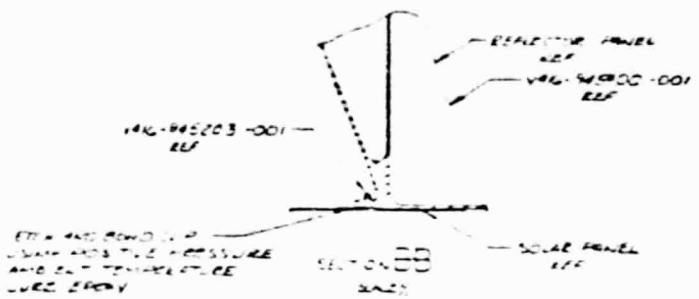
5

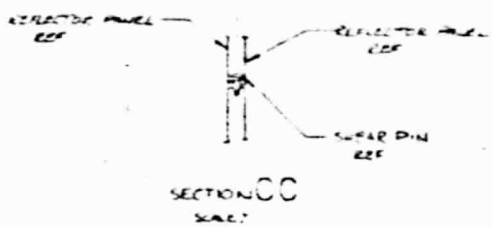
FOLDOUT FRAME

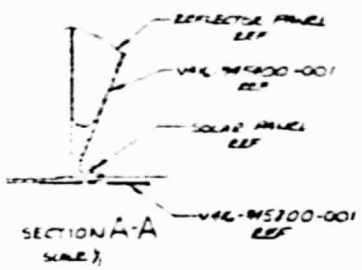
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ORIGINAL PAGE IS
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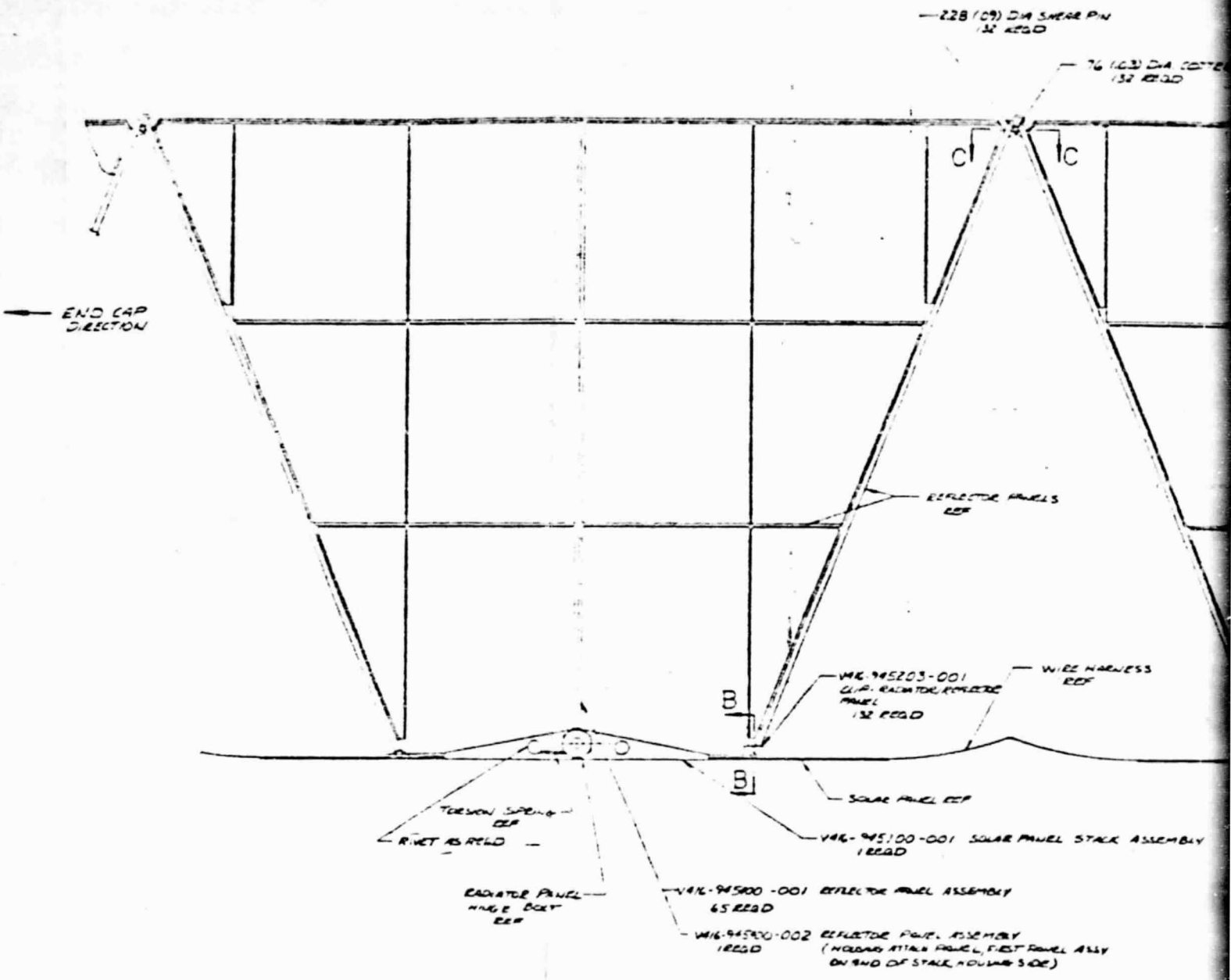






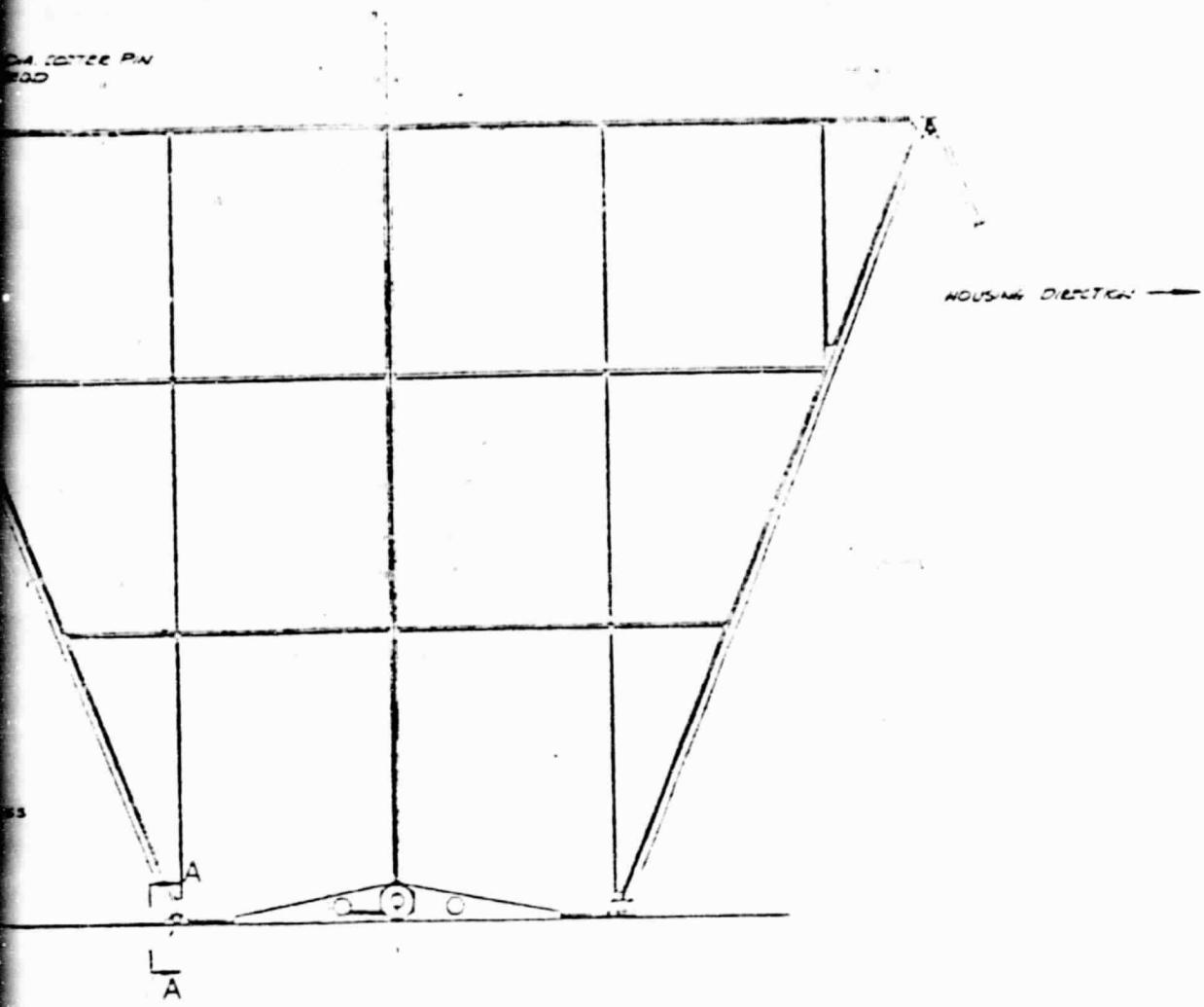
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2 FOLDOUT FRAME

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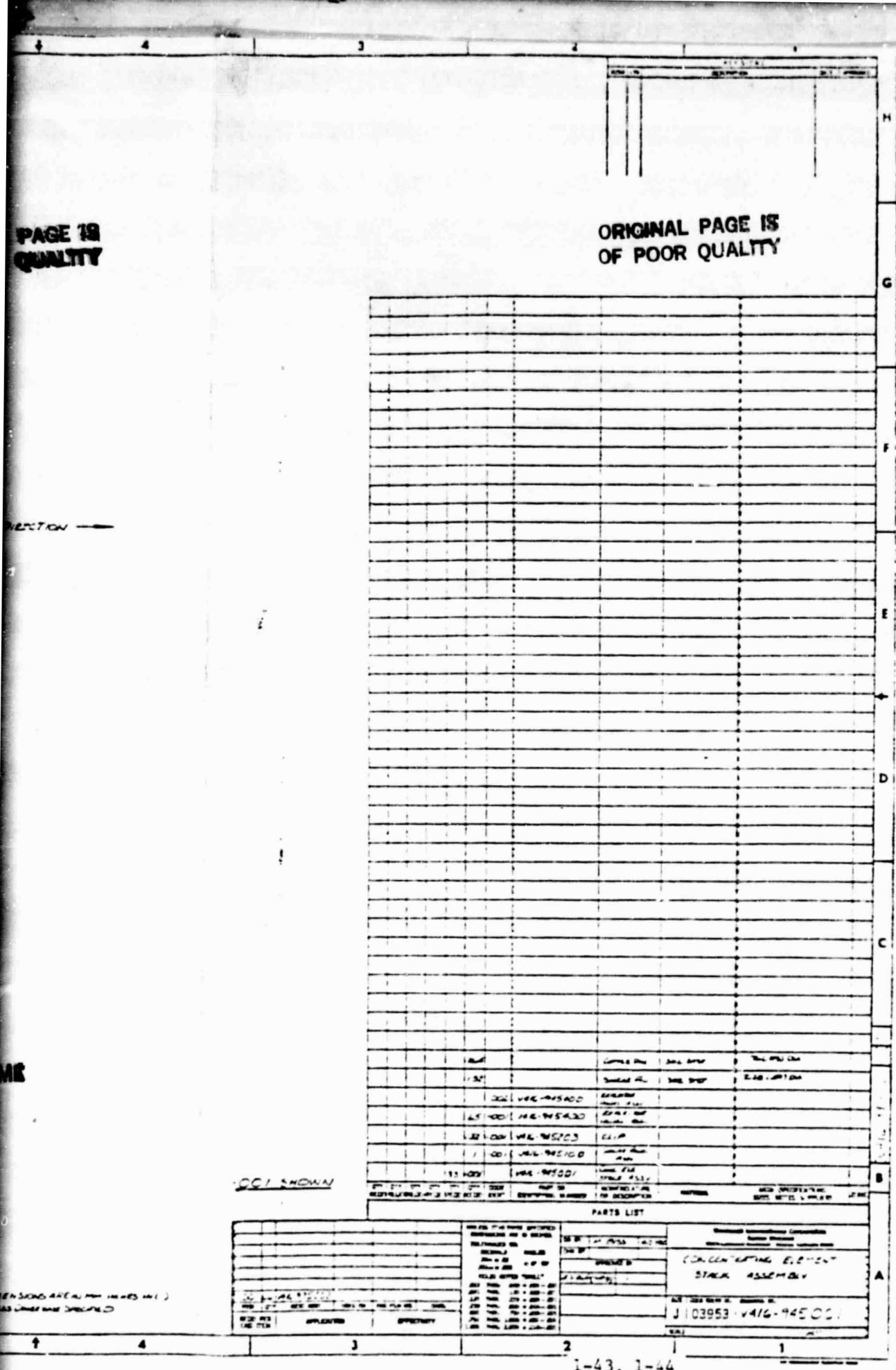


3 FOLDOUT FRAME

ALL DIMENSIONS ARE IN
NOTES: UNLESS

PAGE 19
QUALITY

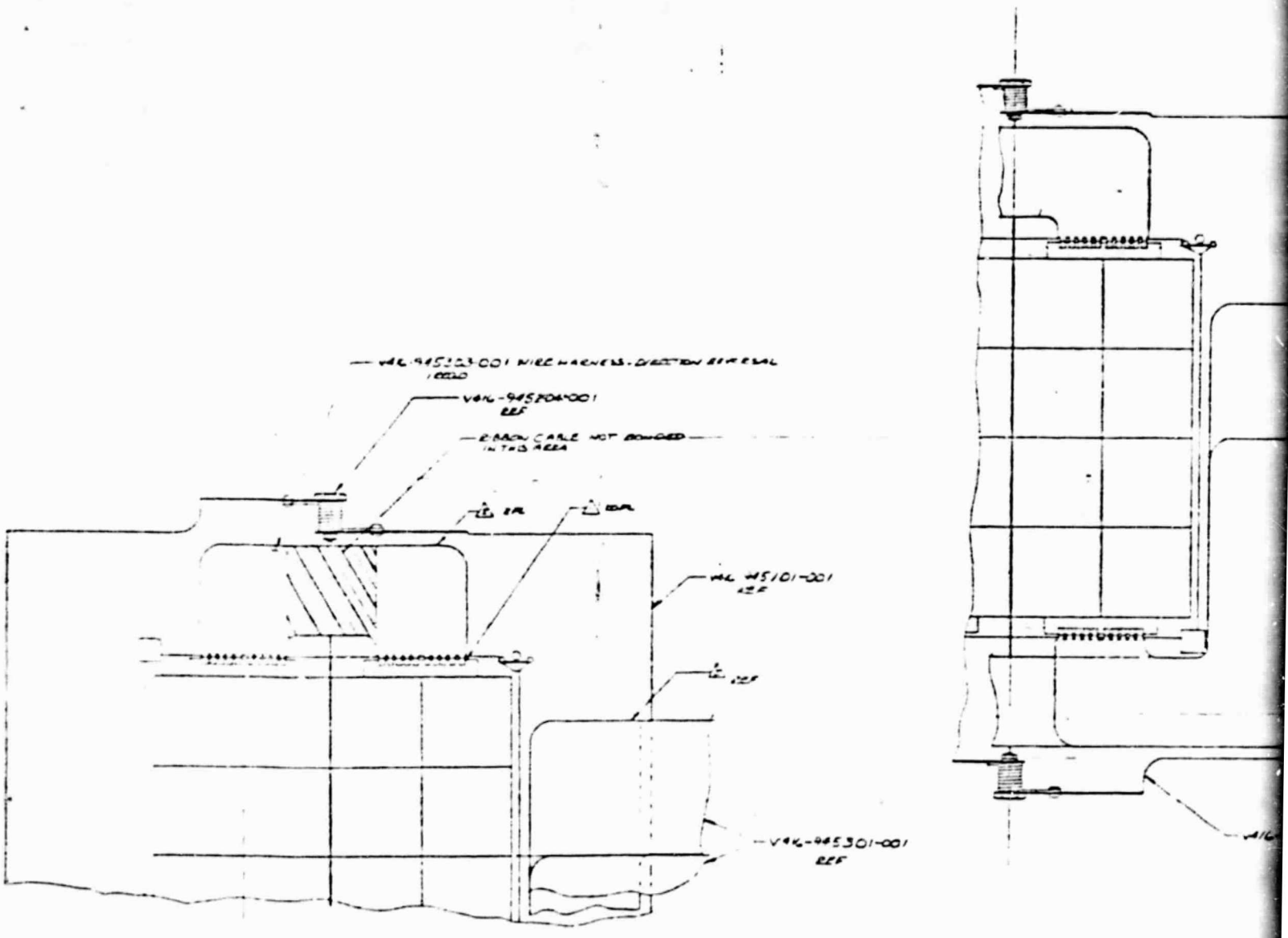
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1-43, 1-44

4 FOLDOUT FRAME

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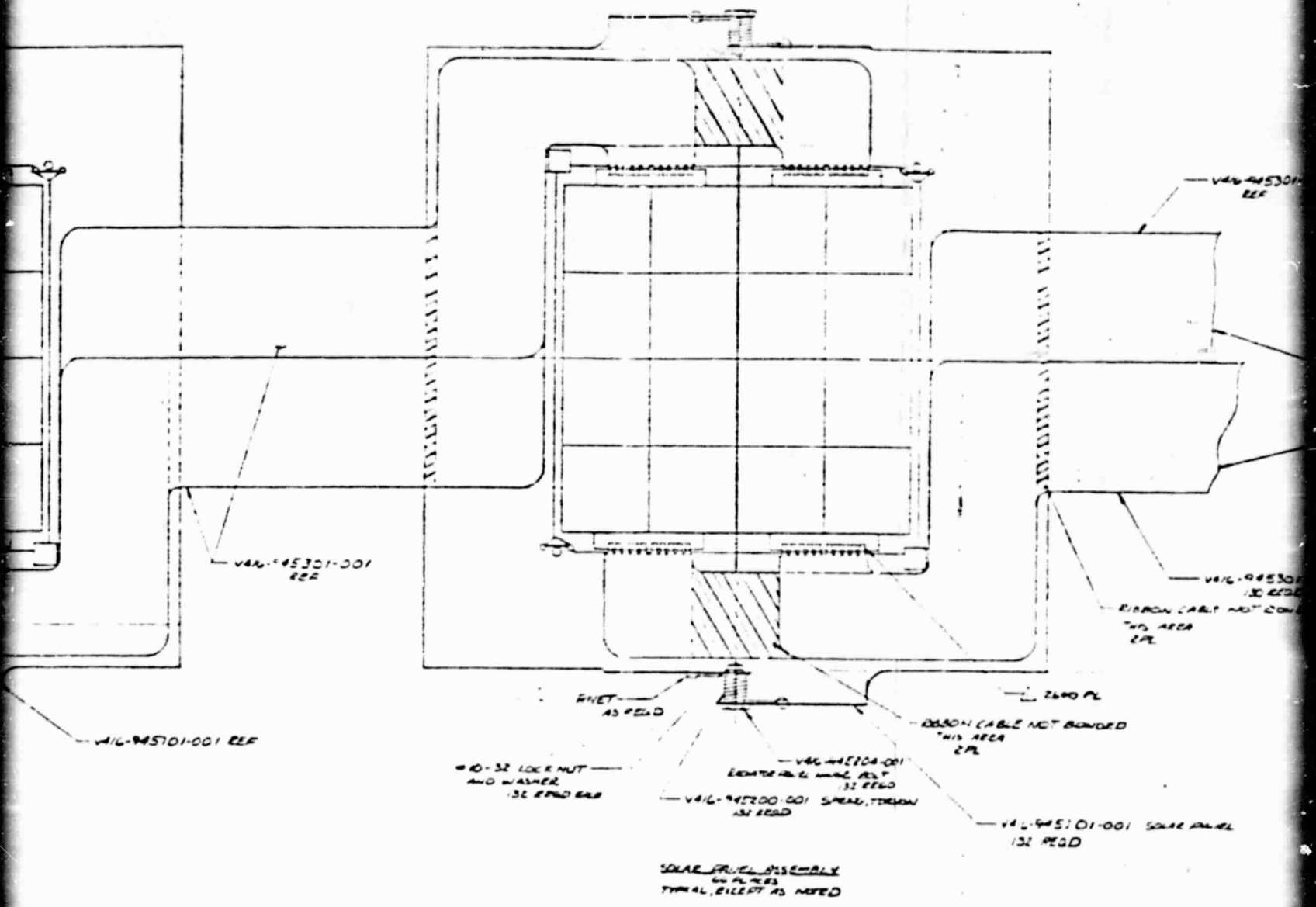


VIEW OF LAST SOLAR PANEL IN RAIL (END CAP SIDE)
SCALE A

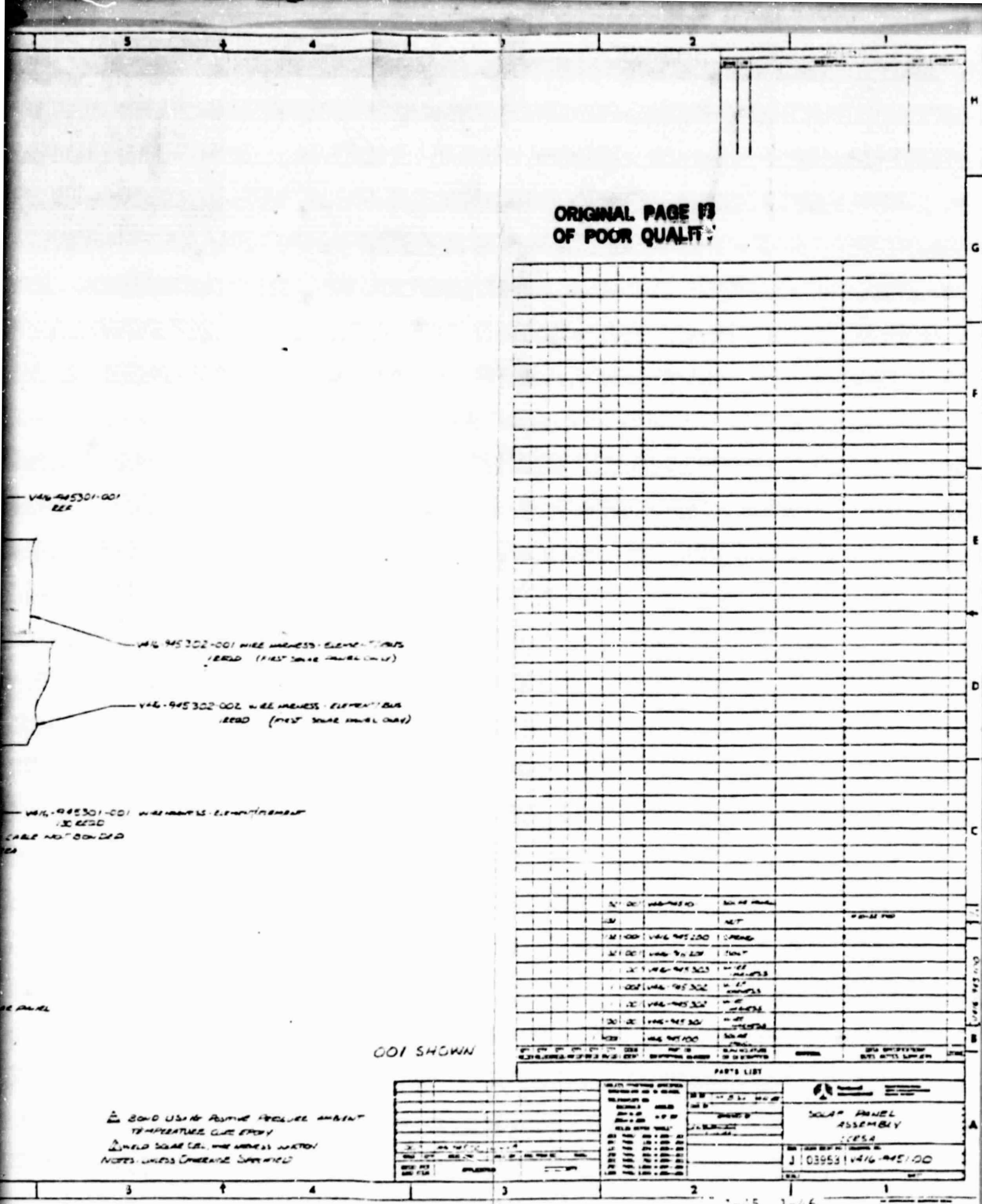
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2 FOLDOUT FRAME



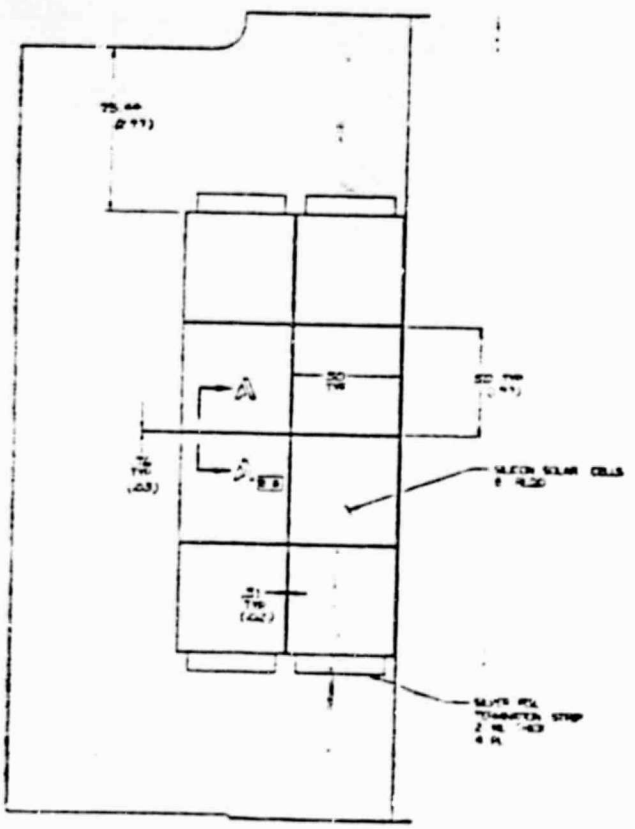
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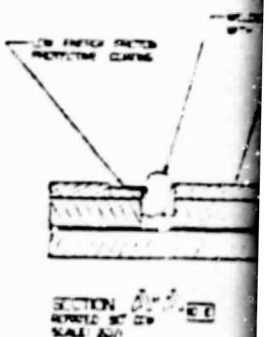


1-45, 1-46

3 FOLDOUT FRAME

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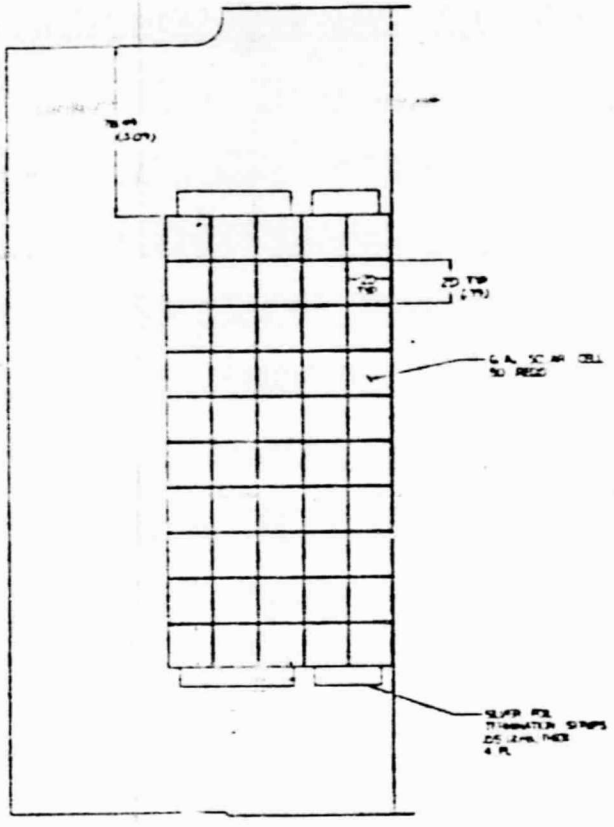


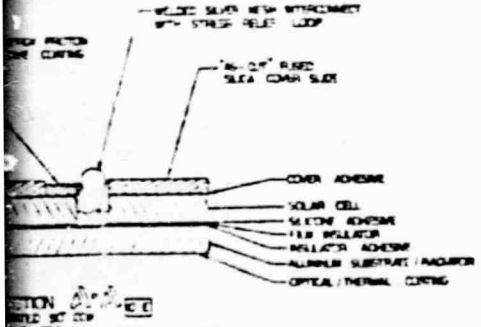


SILICON SOLAR PANEL ASSY
-002 SHOWN

FOLDOUT FRAME

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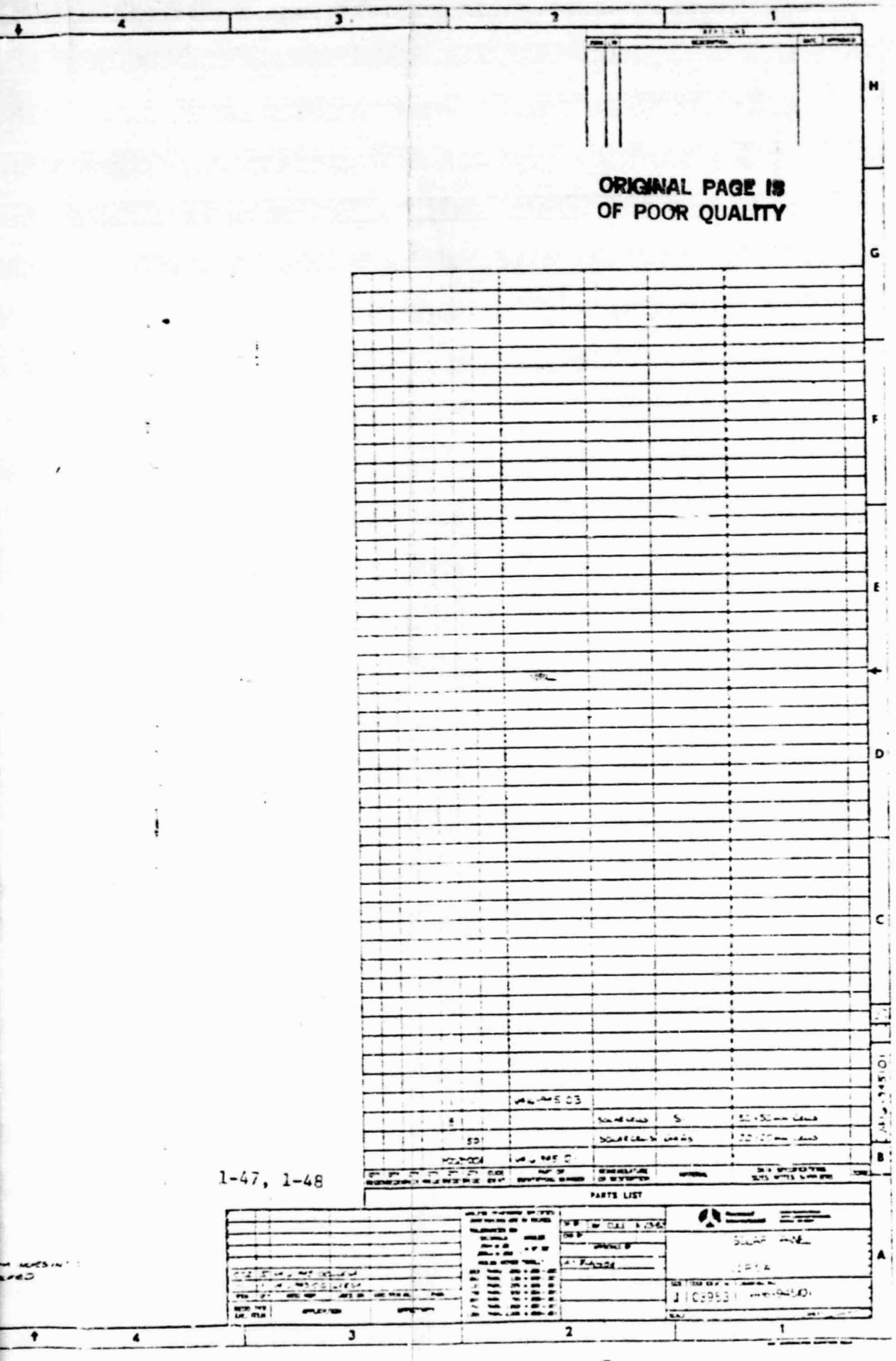
GaAs SOLAR PANEL ASSY
-001 SHOWN

2

FOLDOUT FRAME

1-

1. ALL DIMENSIONS ARE IN MILLIMETERS [INCHES] UNLESS OTHERWISE SPECIFIED

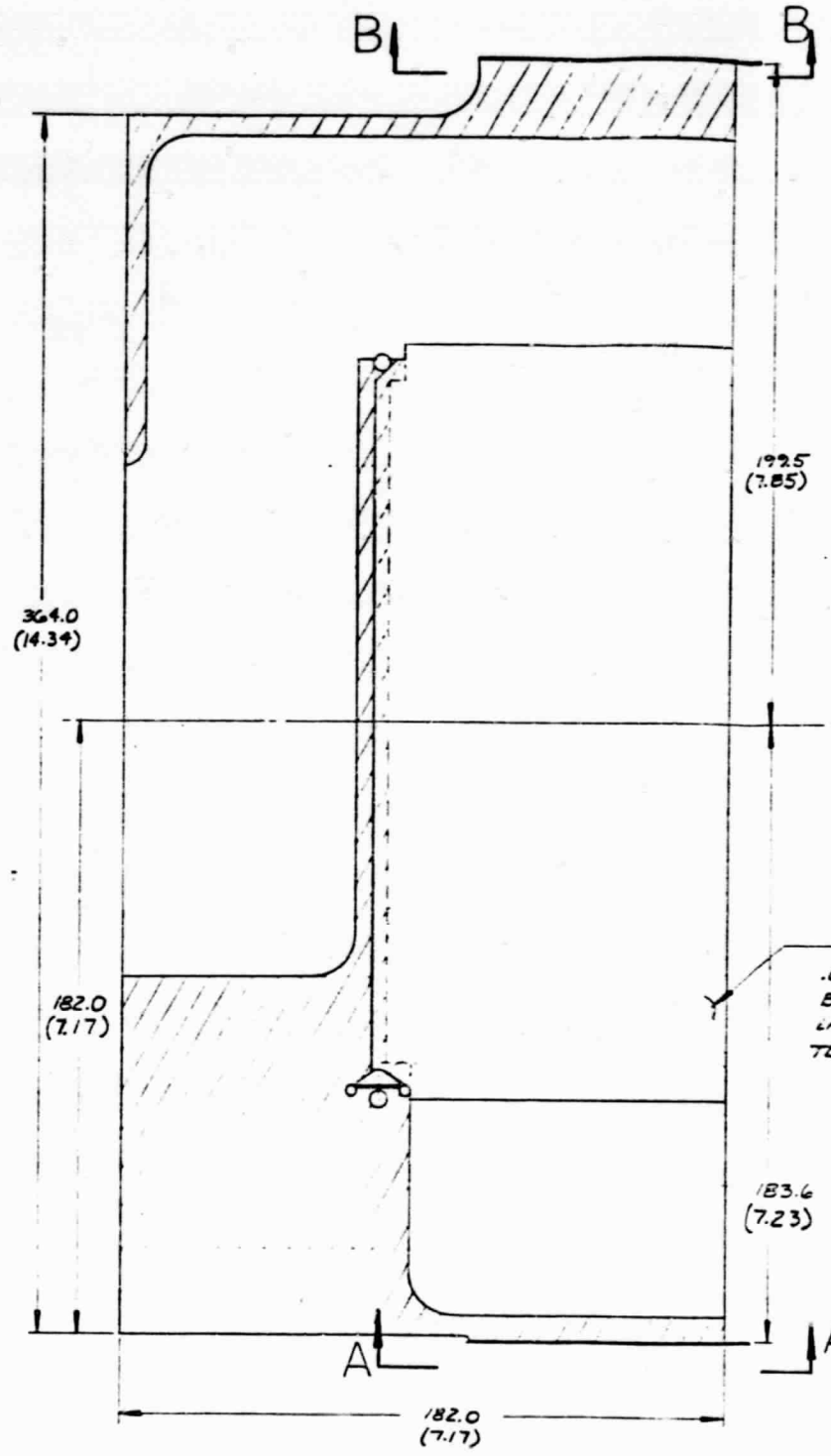


1-47, 1-48

3 FOLDOUT FRAME

ORIGINAL PAGE IS
OF POOR QUALITY

FOLDOUT FRAME



TOP OF PANEL SHOWN
REF



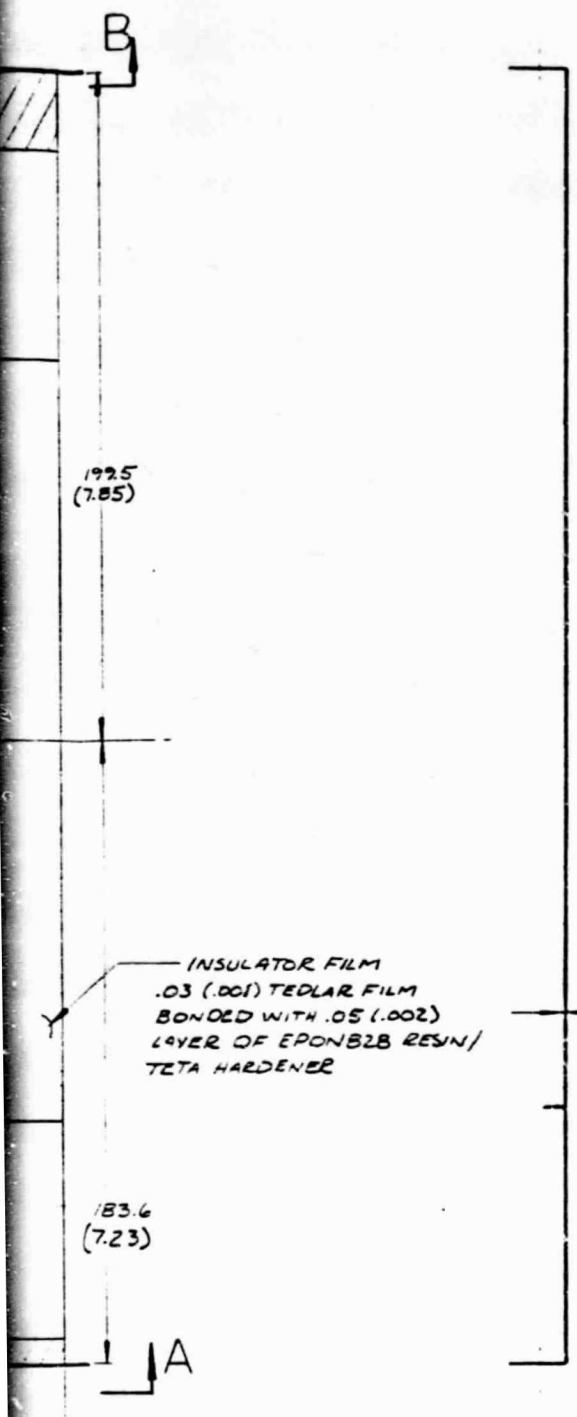
VIEW B-B
SCALE 1/1



VIEW A-A
SCALE 1/1

3. FINISH BOTT
(92.25, E2.8
2. FAB FROM
1. ALL DIMENSI
NOTES: UNLESS C

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



ORIGINAL PAGE IS
OF POOR QUALITY

2 FOLDOUT FRAME

-001 SHOWN

3. FINISH BOTTOM, FLANGES, & HASHED AREA PER MF004-001, III-2 (92.25 E2.84, MAX SERVICE TEMP = 200°C)
2. FAB FROM 6061-0 AL, HEAT TREAT TO-T6 CONDITION
1. ALL DIMENSIONS ARE IN MM., INCHES IN ( )

NOTES: UNLESS OTHERWISE SPECIFIED

1-49, 1-50

DR BY	M BESS	4/14/82
CHK BY		
APPROVED BY		
N/A	V416-945101	

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Space Division
12214 Lakewood Boulevard • Downey, California, 90241

PANEL - RADIATOR

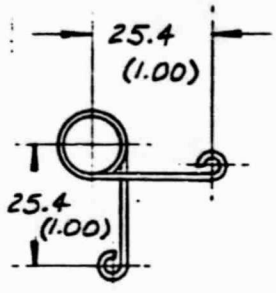
LCRSA

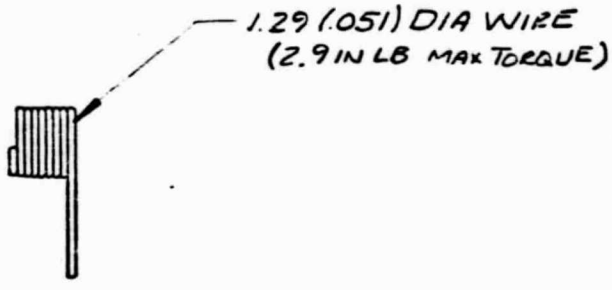
SIZE	CODE IDENT NO.	
D	03953	V416-945103

SCALE 1/1 SHEET 1/1

V416-945103

ORIGINAL PAGE IS
OF POOR QUALITY





FOLDOUT FRAME

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART IDENTIFYING
							V416-9452

1. ALL DIMENSIONS ARE IN MM, INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO.	THRU
-001	132	V416-945100	LCRSA		
REQD PER END ITEM		APPLICATION		EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:

DECIMALS	ANGLES
XX= ± .03	± 0° 30'
XXX= ± .010	

HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

1.29 (.051) DIA WIRE
(2.9 IN LB MAX TORQUE)

ORIGINAL PAGE IS
OF POOR QUALITY

2 FOLDOUT FRAME

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA: SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
						V416-945200-001	SPRING TORSION	CRES	QQ-W-423 COMP FS302, AMS-5688	

PARTS LIST

V416-945200

ITEM NO. THRU

EFFECTIVITY

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:

DECIMALS	ANGLES
XX= ± .03	± 0° 30'
XXX= ± .010	

HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

DR BY	MBISS	3/16/83
CHK BY		
APPROVED BY		
A.G. Hallenbeck	3/16/83	

Rockwell International Corporation
Space Division
12214 Lakewood Boulevard • Downey, California 90241

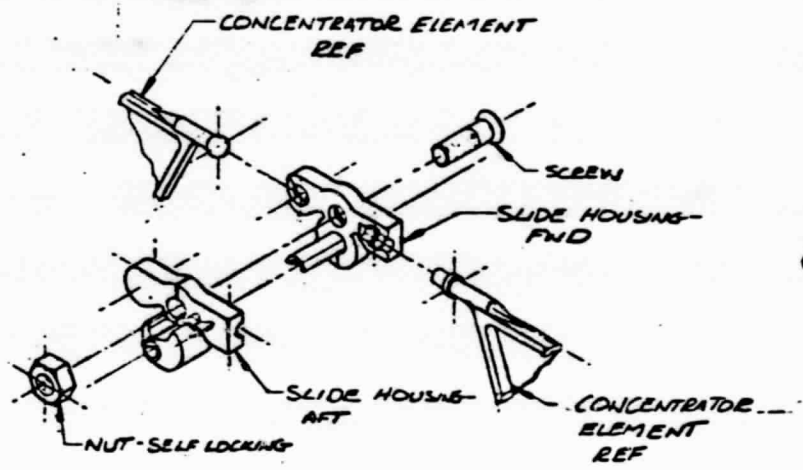
TORSION SPRING
SOLAR PANEL
LCRSA

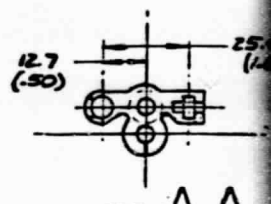
SIZE	CODE IDENT NO.	DRAWING NO.
C	03953	V416-945200

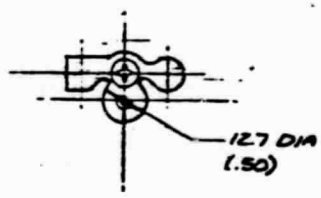
SCALE FULL SHEET 1/1

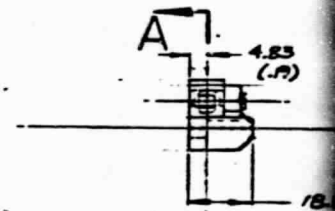
1-51, 1-52

ORIGINAL PAGE IS
OF POOR QUALITY







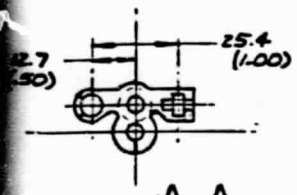


FOLDOUT FRAME

2. FAB F
1. ALL DI
NOTES: U

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

ORIGINAL PAGE IS
OF POOR QUALITY



VIEW A A
SCALE 1/1

ORIGINAL PAGE IS
OF POOR QUALITY



2

FOLDOUT FRAME

-001 SHOWN

2. FAB FROM GRAPHITE IMPREGNATED POLYSULFONE
1. ALL DIMENSIONS ARE IN mm, INCHES ARE IN ( ).
NOTES: UNLESS OTHERWISE SPECIFIED

DR BY	M.B/SS	3/15/82
CHK. BY		
APPROVED BY		
		3-11-83

Rockwell International Corporation
Space Division

SLIDE ASSEMBLY-
EXTENSION CABLE
LCRSA

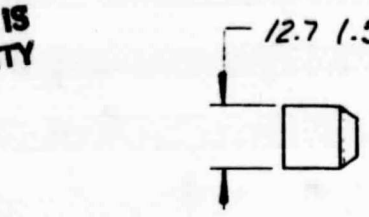
SIZE	CODE IDENT NO.	
D	03953	V416-945202

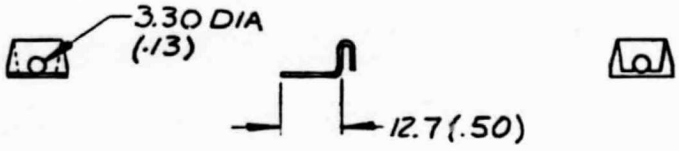
N/A
V416-935002

SCALE FULL SHEET 1/1

V416-945202

ORIGINAL PAGE IS
OF POOR QUALITY





FOLDOUT FRAME

3. FINISH PER MF004-001, III-2 (WHITE SILICONE PAINT
$\alpha \geq .25, \varepsilon \geq .84$ MAX SERVICE TEMP 200°C)
2. FAB FROM .032 AL HEAT TREAT TO T-6 COND
1. ALL DIMENSIONS ARE IN MM, INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART IDENTIFYING
					132		V416-945

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO.	THRU
-001	132	V416-945001	LCRSA		

REQD PER END ITEM | APPLICATION | EFFECTIVITY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: .XX = ± .03, .XXX = ± .010
ANGLES: ± 0° 30'
HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.0
.041	THRU	.130	+.002 −.0
.131	THRU	.229	+.003 −.0
.230	THRU	.500	+.004 −.0
.501	THRU	.750	+.005 −.0
.751	THRU	1.000	+.007 −.0
1.001	THRU	2.000	+.010 −.0

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

ORIGINAL PAGE IS
OF POOR QUALITY

50)

2 FOLDOUT FRAME

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA: SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
				132		V416-945203-001	CLIP	AL SHT	6061-0 AL PER QQ-A-250/11 .81 x 12.7 x 38.1	

PARTS LIST

ITEM NO.	THRU
EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:

DECIMALS	ANGLES
XX = ± .03	± 0° 30'
XXX = ± .010	

HOLES NOTED "DRILL"

.013	THRU	.040:	+.001 −.001
.041	THRU	.130:	+.002 −.001
.131	THRU	.229:	+.003 −.001
.230	THRU	.500:	+.004 −.001
.501	THRU	.750:	+.005 −.001
.751	THRU	1.000:	+.007 −.001
1.001	THRU	2.000:	+.010 −.001

DR BY	M. BISS	4/13/82
CHK BY		
APPROVED BY		

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Space Division
12214 Lakewood Boulevard • Downey, California 90241

CLIP-RADIATOR PANEL/
REFLECTOR PANEL
LCRSA

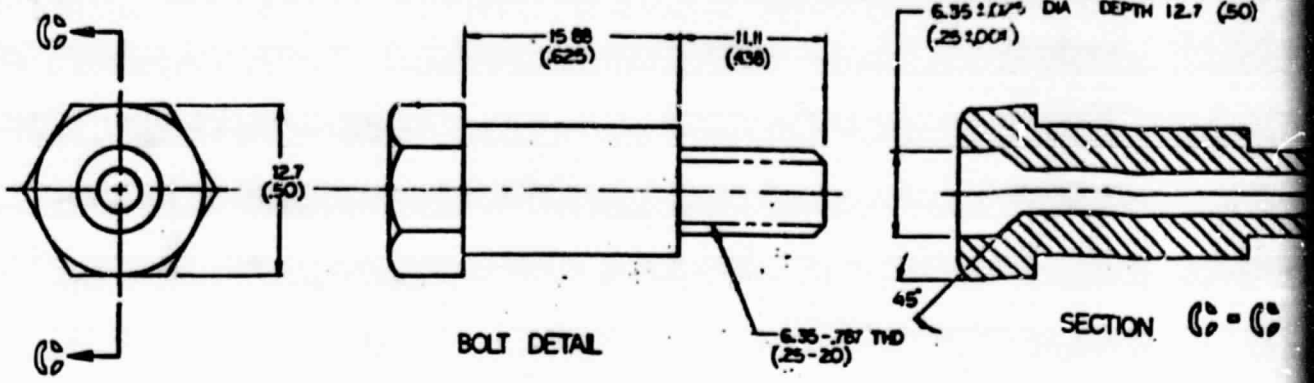
SIZE	CODE IDENT NO.	DRAWING NO.
C	03953	V416-945203

SCALE 1/1 SHEET 1/1

1-55, 1-56

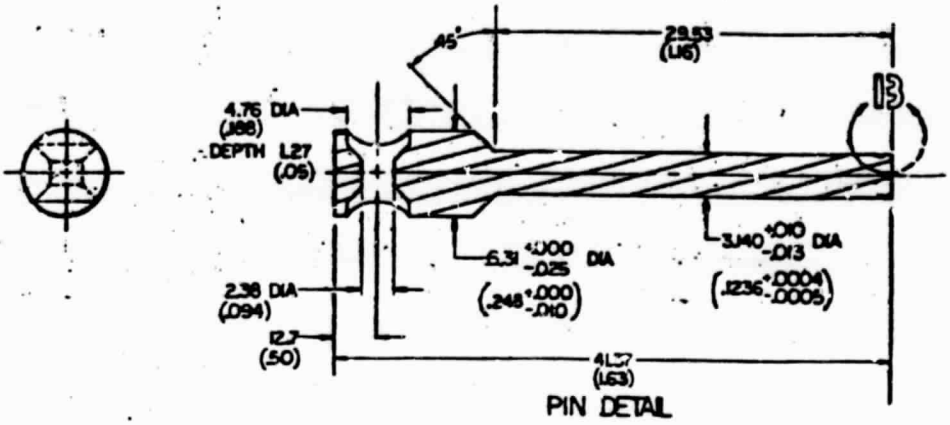
D C B A

2 1

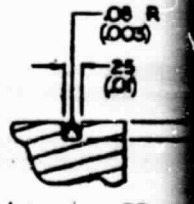


BOLT DETAIL

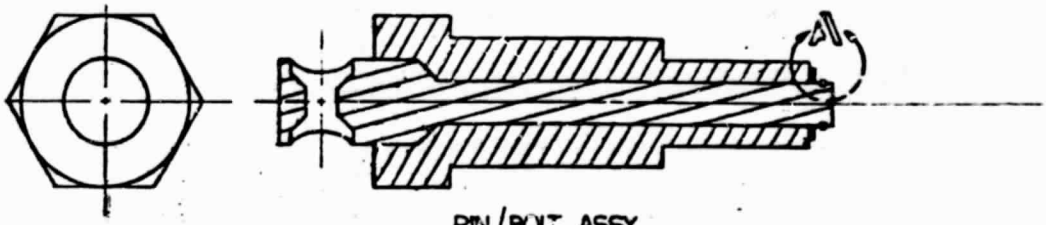
SECTION C - C



PIN DETAIL

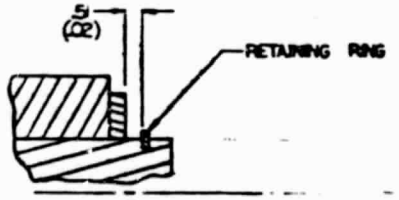


DETAIL B
SCALE: 20/1



PIN/BOLT ASSY

FOLDOUT FRAME



DETAIL A
SCALE: 10/1

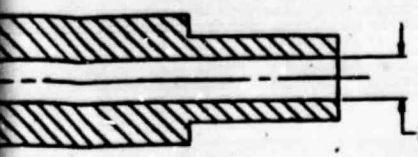
1. ALL DIM. IN MM, INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED

ORIGINAL PAGE IS
OF POOR QUALITY

-001	132	M4S-94
ITEM	QTY	NEXT
REQD PER END ITEM		

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	REVISED & REDRAWN	12/6/82	[illegible]

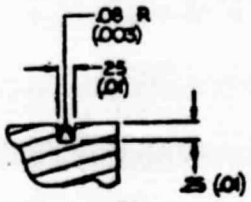
DEPTH 12.7 (50)



SECTION C - C

FOLDOUT FRAME

ORIGINAL PAGE IS
OF POOR QUALITY



DETAIL B
SCALE: 20/1

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA: SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
					132	-001	V416-945204	PIN/BOLT ASSY			

PARTS LIST

IN MM, INCHES IN ( )
OTHERWISE SPECIFIED

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO.	THRU
-001	132	V416-945100	LCRSA		

REQD PER END ITEM | APPLICATION | EFFECTIVITY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .XX = ± .03, .XXX = ± .010; ANGLES: ± 0° 30'
HOLES NOTED "DRILL"

.013	THRU	.040	+.001 -.001
.041	THRU	.130	+.002 -.001
.131	THRU	.229	+.003 -.001
.230	THRU	.500	+.004 -.001
.501	THRU	.750	+.005 -.001
.751	THRU	1.000	+.007 -.001
1.001	THRU	2.000	+.010 -.001

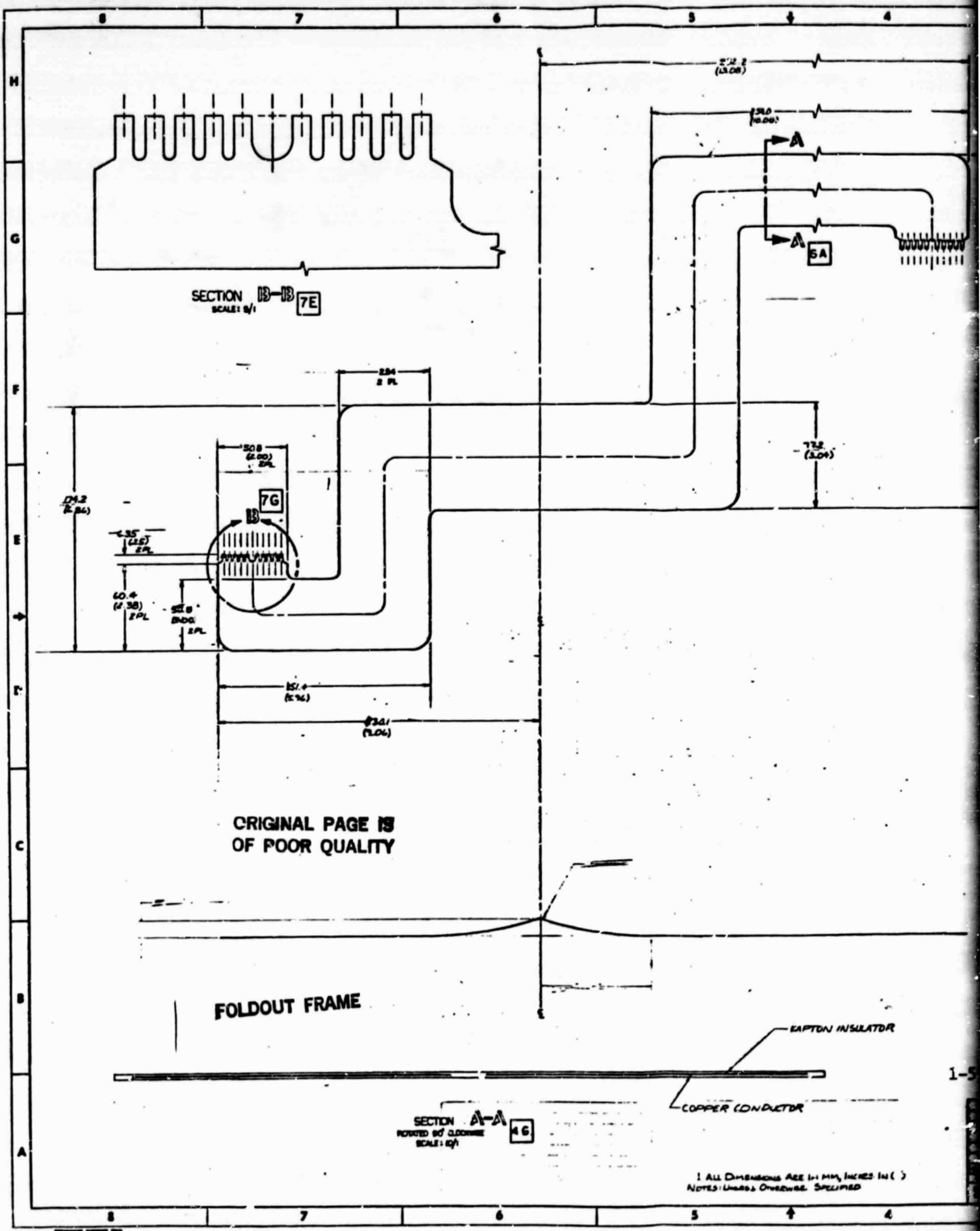
DR BY: JM CULE 2-6-82
CHK BY:
APPROVED BY:

Rockwell International

PIN/BOLT ASSY-
RADIATOR PANEL HINGE
LCRSA

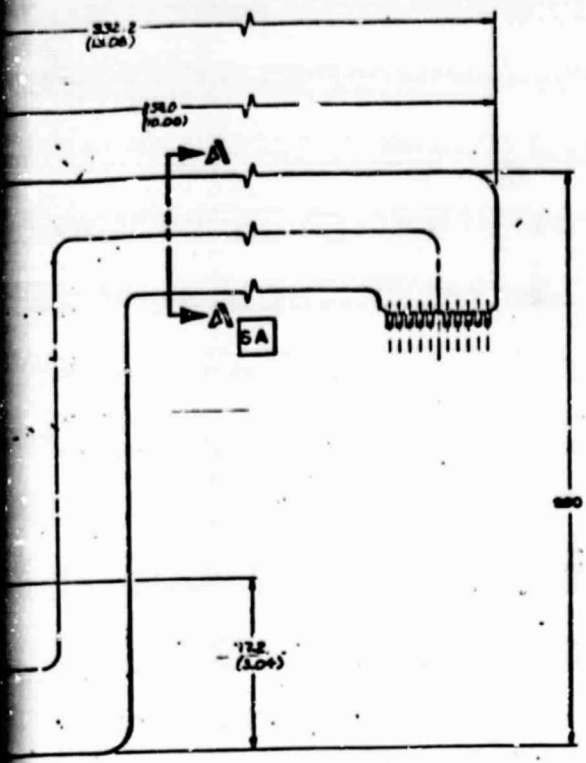
SIZE	CODE IDENT NO	DRAWING NO.
D	03953	V416-945204 A

SCALE 4/1 & NOTED | SHEET



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1-5



FOLDOUT FRAME

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KAPTON INSULATOR

COPPER CONDUCTOR

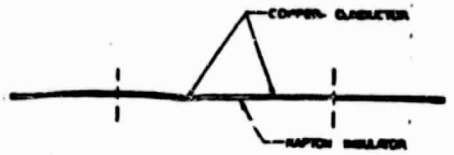
1-59, 1-60

PARTS LIST

WIRE HARNESS
ELEMENT - ELEMENT
LCR5A

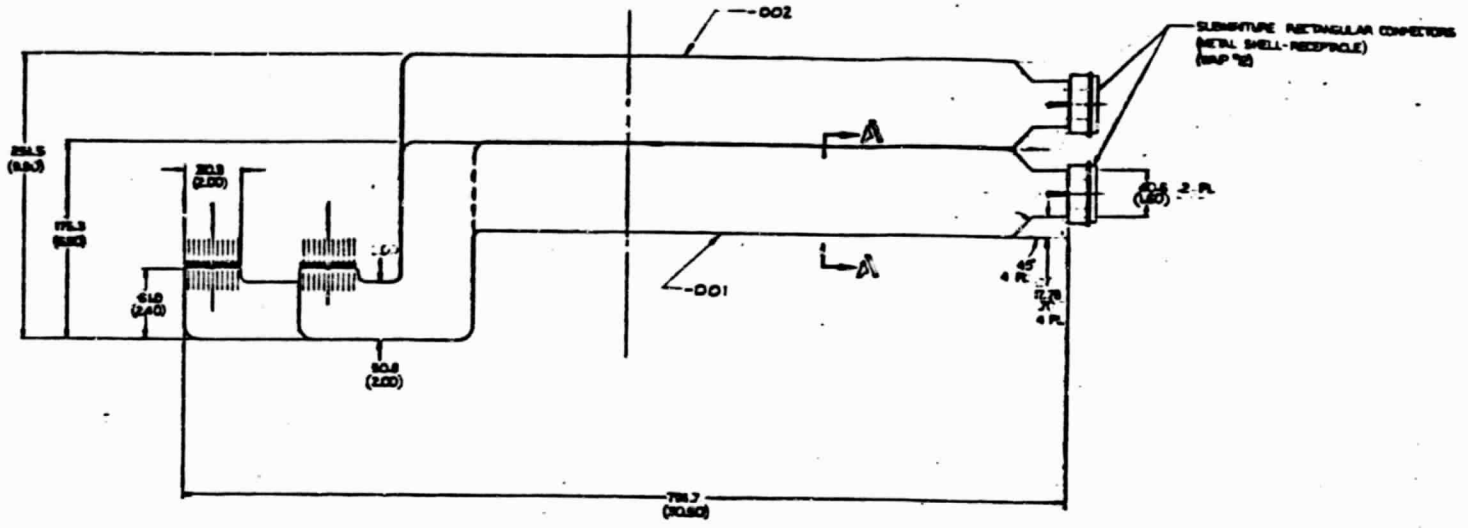
E | 03953 | V416-945301

NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL DIMENSIONS ARE IN MM, INCHES IN ( )

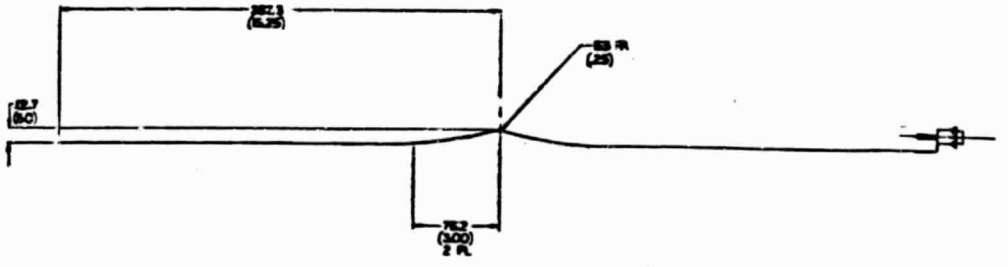


SECTION A-A
SCALE: 6/1

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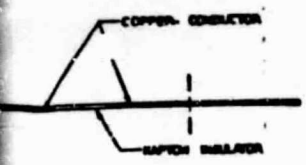
FOLDOUT FRAME



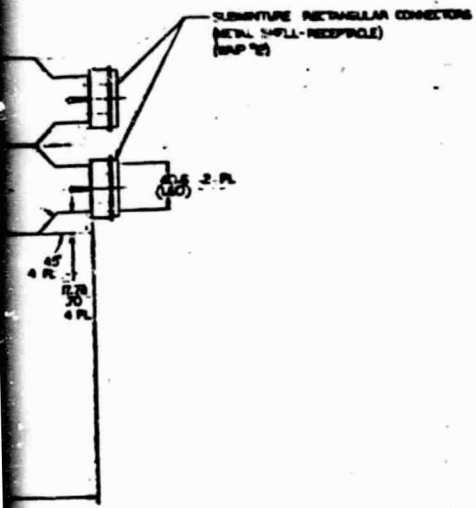
1-6

C-2

1. ALL DIMENSIONS ARE IN MM, INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED



SECTION A-A





ORIGINAL PAGE IS
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2 FOLDOUT FRAME

1-61, 1-62

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA SPECIFICATIONS SIZES NOTES SUPPLIERS	REF
						-001	V416-945302	WIRE HARNESS			

PARTS LIST

-002	V416-935100	LCRSA			
-001	V416-935400	LCRSA			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS ANGLES
.XX ± .02 ± .5°
.XXX ± .010
HOLES NOTED "SHALL"

DR BY	JIM CULE	9-11-82
CHK BY		
APPROVED BY		

Rockwell International

WIRE HARNESS
ELEMENT - BUSS
LCRSA

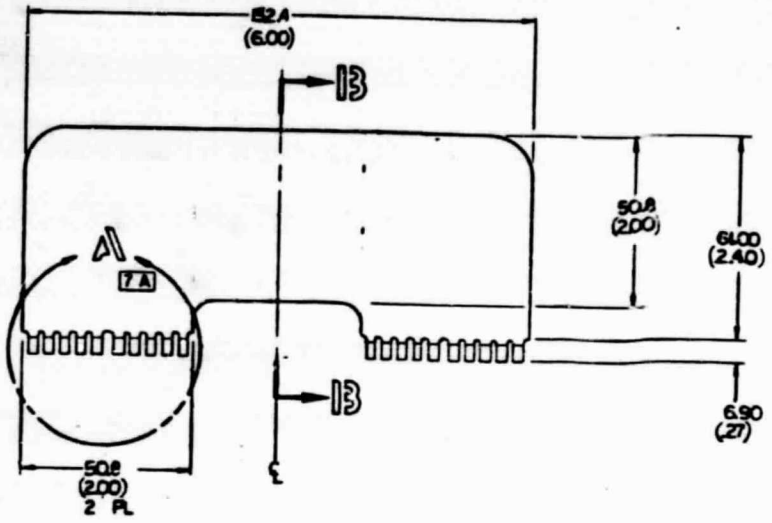
SIZE	CODE IDENT NO	DRAWING NO
E	03953	V416-945302

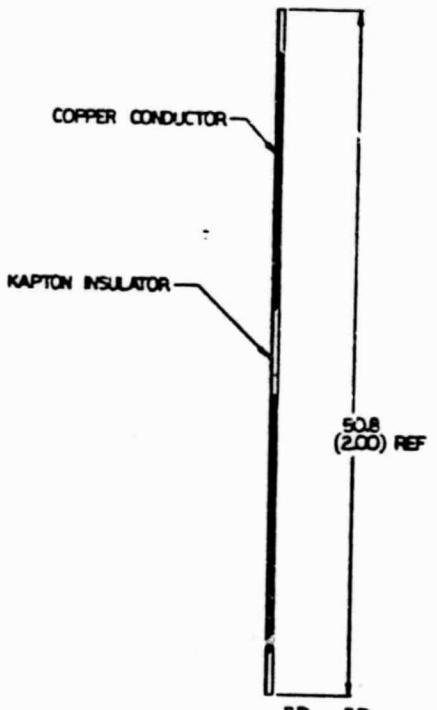
SCALE 1/2 SHEET 1/1

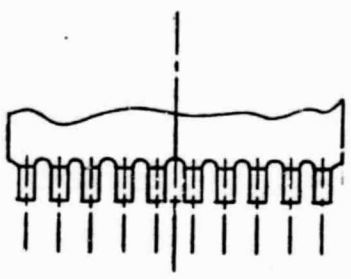
V416-945302

NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL DIMENSIONS ARE IN MM, (INCHES IN ( )

ORIGINAL PAGE IS
OF POOR QUALITY







DETAIL A1 = A1
SCALE: 2/1
6 C

SECTION B = B
SCALE: 5/1

FOLDOUT FRAME

1. ALL DIMENSIONS IN MM, INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	QTY	
001	1	V416-945
REQD PER END ITEM		NEXT

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

ORIGINAL PAGE IS
OF POOR QUALITY

2 FOLDOUT FRAME

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA: SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
					1	-001	V416-945303	WIRE HARNESS DIRECTION REV.			

PARTS LIST

ITEM	QTY	NEXT ASSY	USED ON	ENG ITEM NO.	THRU
001	1	V416-945100	LCRSA		
REQD PER END ITEM		APPLICATION		EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES ON DECIMALS: XX = ± .03, XXX = ± .010; ANGLES = ± 0° 30'

HOLES NOTED "DRILL"

.013	THRU	.040	+ .001 − .001
.041	THRU	.130	+ .002 − .001
.131	THRU	.229	+ .003 − .001
.230	THRU	.500	+ .004 − .001
.501	THRU	.750	+ .005 − .001
.751	THRU	1.000	+ .007 − .001
1.001	THRU	2.000	+ .010 − .001

DR BY	JIM CULE	11-5-62
CHK BY		
APPROVED BY		

Rockwell International

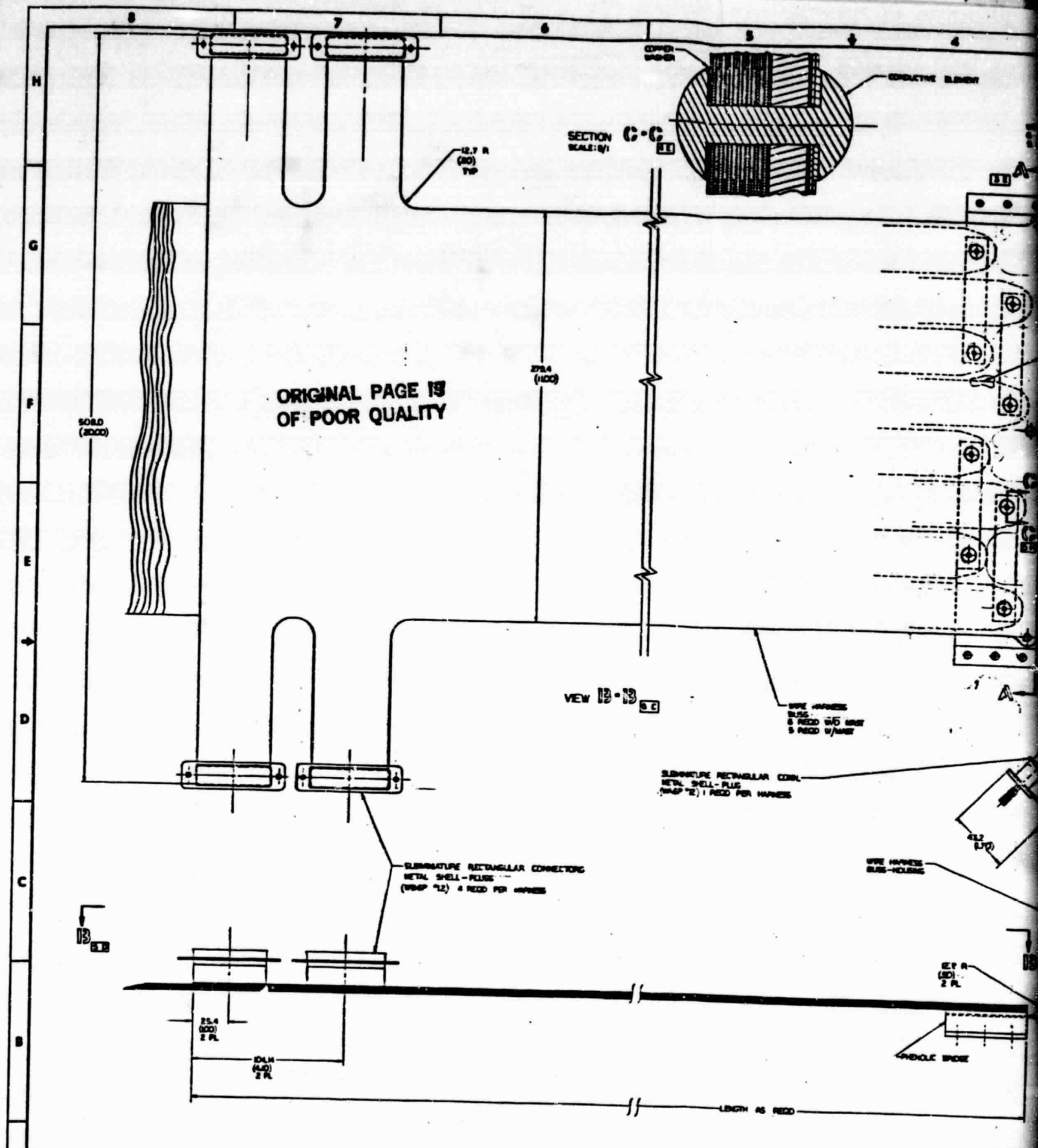
WIRE HARNESS - DIRECTION REVERSAL LCRSA

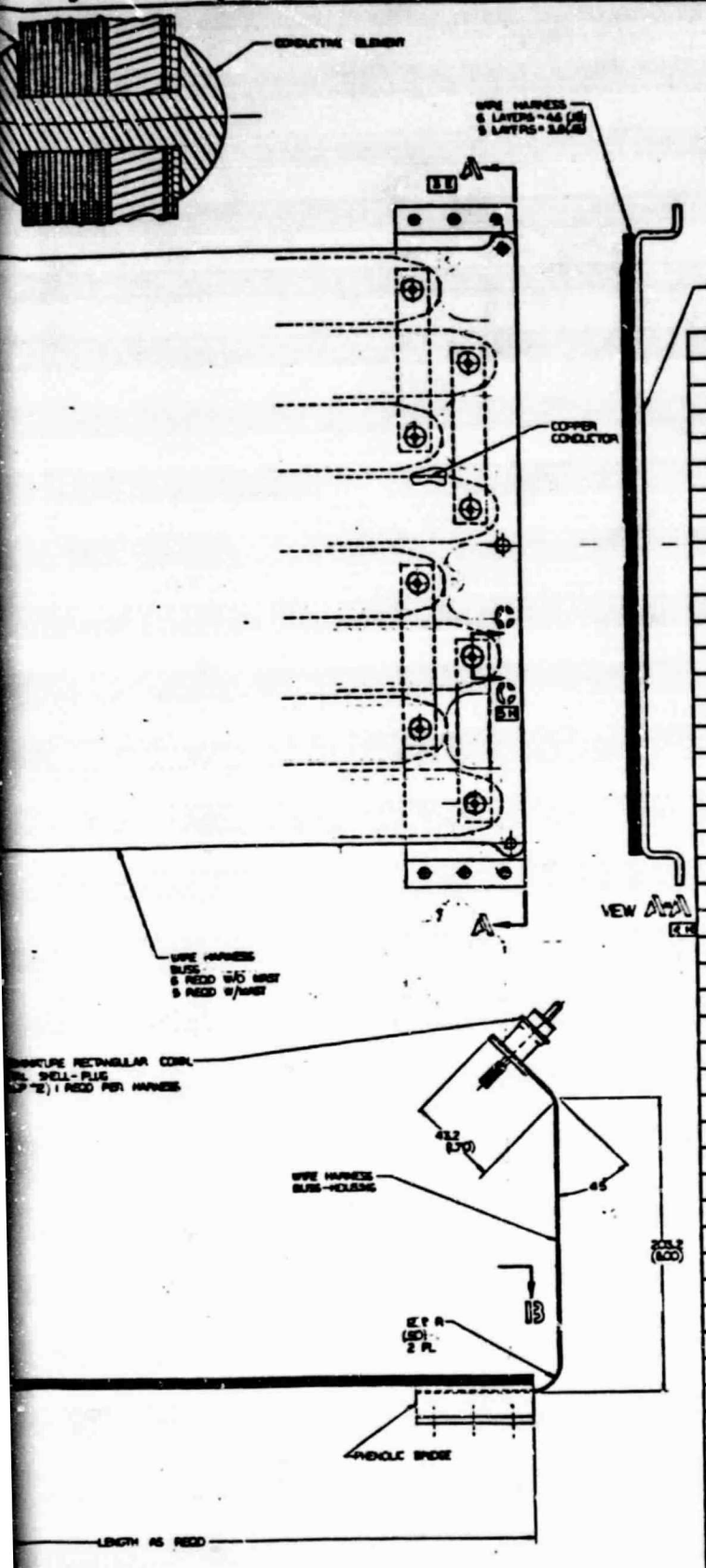
SIZE	CODE IDENT NO	DRAWING NO.
D	03953	V416-945303

SCALE: FULL SHEET

V416-942302

1-63, 1-64


SECTION C-C
SCALE: 8/1
VIEW B-B
ORIGINAL PAGE IS
OF POOR QUALITY
FOLDOUT FRAME
1-65



2

FOLDOUT FRAME

ORIGINAL PAGE IS
OF POOR QUALITY

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA SPECIFICATIONS SIZES NOTES SUPPLIERS	ZONE
						-001	V416-945304	WIRE HARNESS			

PARTS LIST

1-65, 1-66

V416-945304

-001	V416-945304	LCRSA									
ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO	(SAE)						
NEXT HIGHER ASSY		APPLICATION		EFFECTIVITY							

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS .XX ±.01 .XXX ±.005
ANGLES ± 0° 30'
FRACTIONS ± 1/64
HOLES NOTED "DRILL" .242 THRU .250 +.004 -.000 .251 THRU .257 +.006 -.000 .258 THRU .266 +.008 -.000 .267 THRU .281 +.010 -.000 .282 THRU .296 +.012 -.000 .297 THRU .312 +.014 -.000 .313 THRU .343 +.016 -.000 .344 THRU .375 +.018 -.000 .376 THRU .406 +.020 -.000 .407 THRU .437 +.022 -.000 .438 THRU .468 +.024 -.000 .469 THRU .500 +.026 -.000

DR BY JAN CALE 8-8-82
CHK BY
APVD BY
QUALITY ASSURANCE

Rockwell International

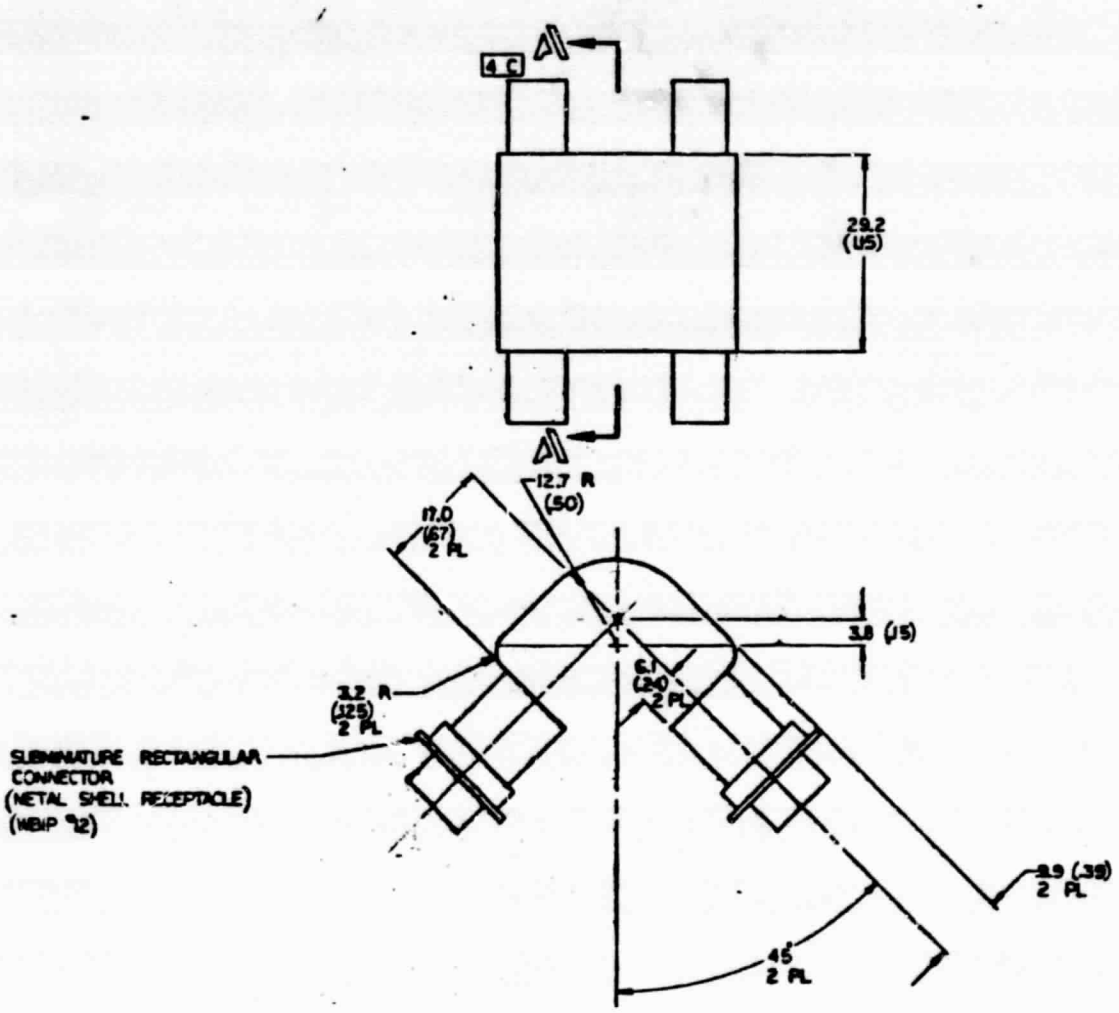
WIRE HARNESS
HOUSING ASSY
LCRSA

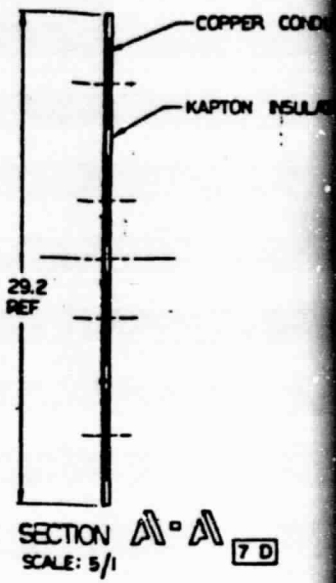
SIZE E | CAGE CODE 03953 | V416-945304

SCALE FULL | SHEET

1. ALL DIMENSIONS IN MM INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED

ORIGINAL PAGE IS
OF POOR QUALITY





SECTION A-A 7 D
SCALE: 5/1

FOLDOUT FRAME

1. ALL DIMENSIONS IN MM, INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED

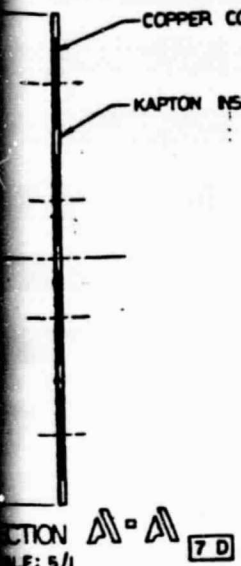
-001		V4U6-93
ITEM	QTY	NEXT A
REQD PER END ITEM		A

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

ORIGINAL PAGE IS
OF POOR QUALITY

2

BLOWOUT FRAME



CTION A-A 7D
LE: 5/1

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA, SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
						-001	V416-945305-001	WIRE HARNESS			

PARTS LIST

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO.	THRU
-001		V416-935100	LCRSA		
REQD PER END ITEM		APPLICATION		EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX = ± .03; .XXX = ± .010
ANGLES: ± 0° 30'
HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

DR BY	JIM CULE	1-16-82
CHK BY		
APPROVED BY		

Rockwell International

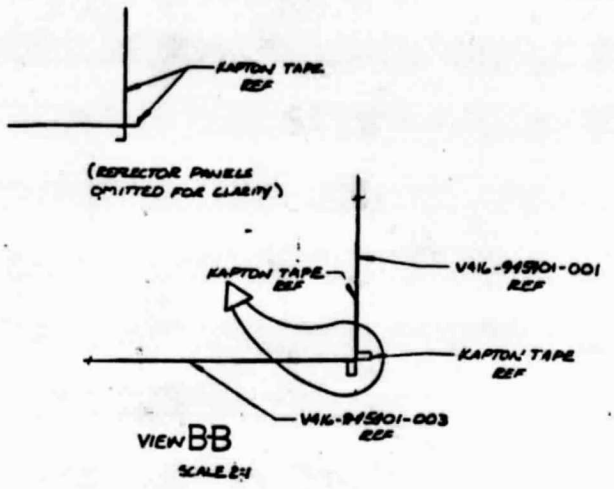
WIRE HARNESS
HOUSING - HOUSING
LCRSA

SIZE	CODE IDENT NO	DRAWING NO.
D	03953	V416-945305

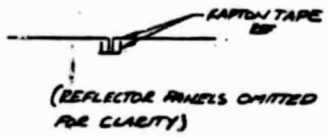
SCALE: 2/1 & NOTED SHEET

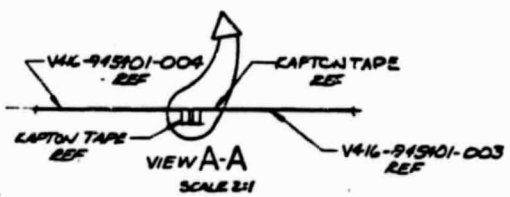
1-67, 1-68

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OF POOR QUALITY



V416-945901-002 (REF) RADIATOR PANEL

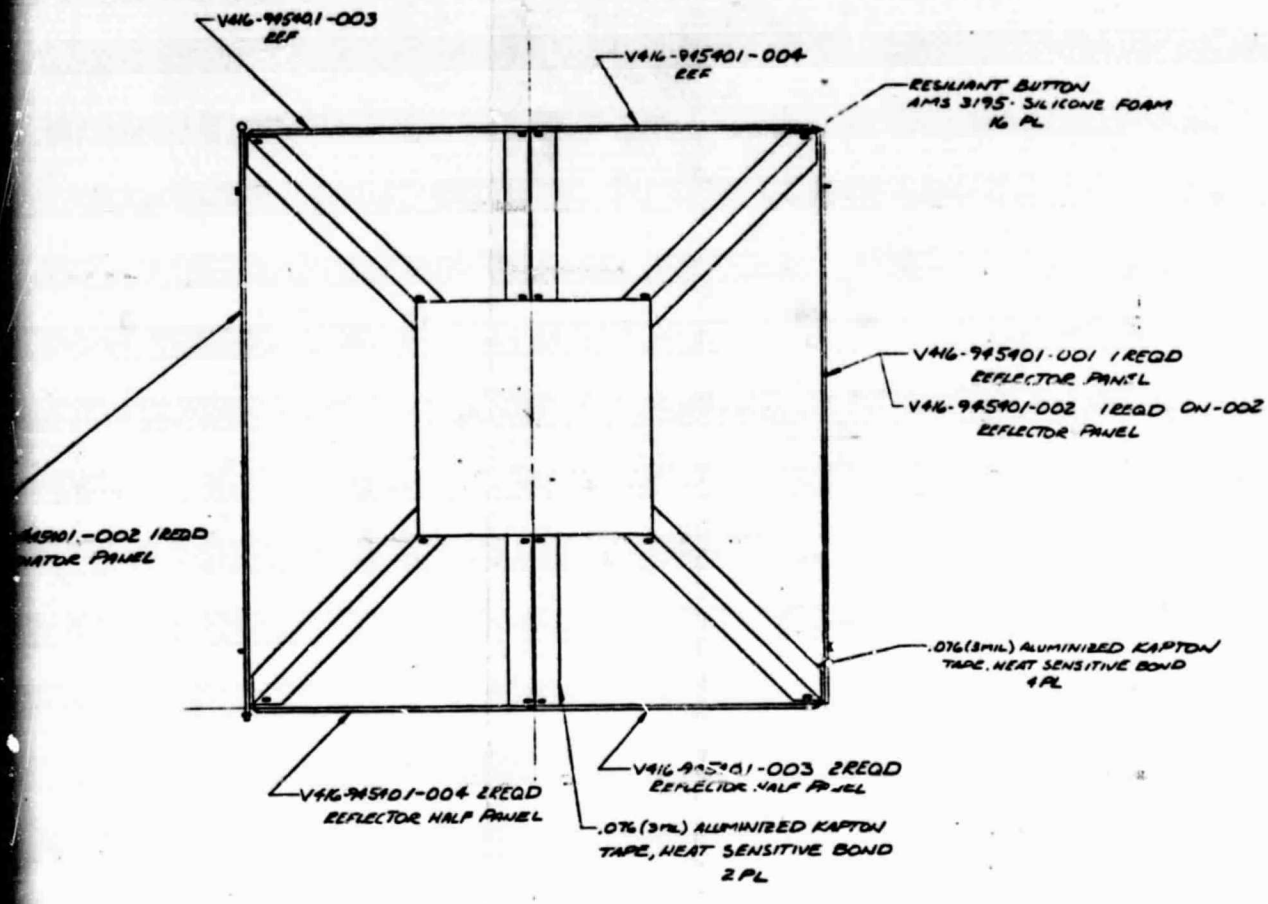


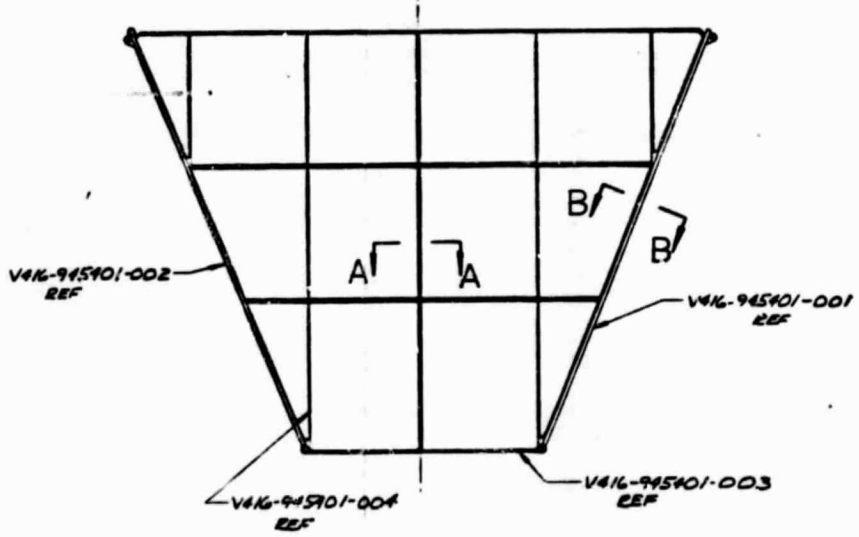


V416-945901 REF

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OF POOR QUALITY





2
FOLDOUT FRAME

-001 SHOWN
-002 SAME EXCEPT AS NOTED

1-69, 1-70

ALL DIMENSIONS ARE IN MM, INCHES IN ( )
NOTES: UNLESS OTHERWISE SPECIFIED

-002	1	V416-945401
-001	1	V416-945401
ITEM	QTY	NEXT ASSY
NEXT ASSY USED ON		APPLICATION

ORIGINAL PAGE IS
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3

ITEM	QTY REQUIRED	QTY NEEDED	QTY PER ASSY	QTY PER END ITEM	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA SPECIFICATIONS, GRADES, NOTES, SUPPLIERS	ZONE
							BOLT BUTTON	SILICONE FOAM	AMS 3195 (W/B) TYPE 3.5oz(B)Dia	
							HINGE	AL KAPTON TAPE	.01(3mm) x 500(LG)	
			2	2	-004	V416-945401	REFLECTOR PANEL			
			2	2	-003					
			2	1	-002					
				1	-001	V416-945401	REFLECTOR PANEL ASSY			
		1	-001			V416-945400	REFLECTOR PANEL ASSY			
			LS	-001		V416-945400	REFLECTOR PANEL ASSY			

PARTS LIST

-001 SHOWN
-002 SAME EXCEPT AS NOTED

1-69, 1-70

ITEM	QTY	NEXT ASSY	NEED ON	END ITEM NO.	THRU
-002	1	V416-945001	LCRSA		
-001	LS	V416-945001	LCRSA		

NEED FOR END ITEM | APPLICATION | EFFECTIVITY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ON DECIMALS .XX = ± .03, .XXX = ± .010, ANGLES ± 0° 30'. MACHINED SURFACES "SHALL" [illegible]

DRN BY M Bass 4/19/82
CHKD BY
APPROVED BY

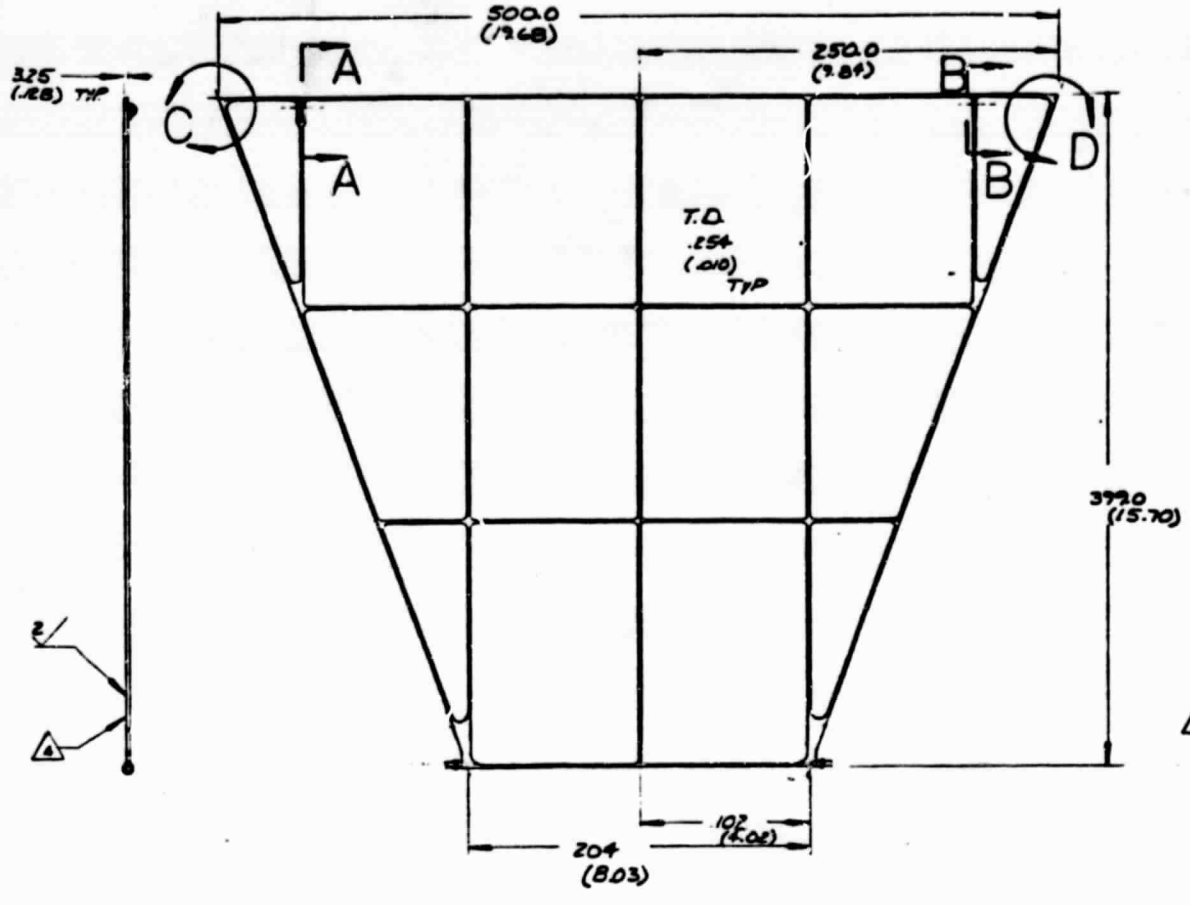
Rockwell International

REFLECTOR PANEL ASSEMBLY
LCRSA

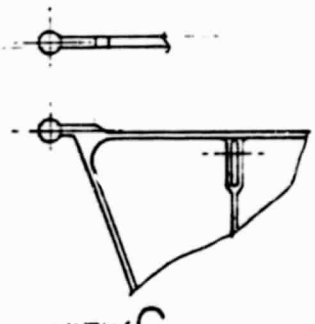
SIZE J | CODE IDENT NO. 03953 | DRAWING NO. V416-945400

SCALE 3/4 SHT 1/1

4 3 2 1



-001 SHOWN
-002 SIMILAR EXCEPT AS SHOWN



VIEW C
SCALE 1/1
(-002 ONLY)



SECTION A A
SCALE 1/1
(FEMALE LUG REF)

SECTION B B
SCALE 1/1
(MALE LUG REF)

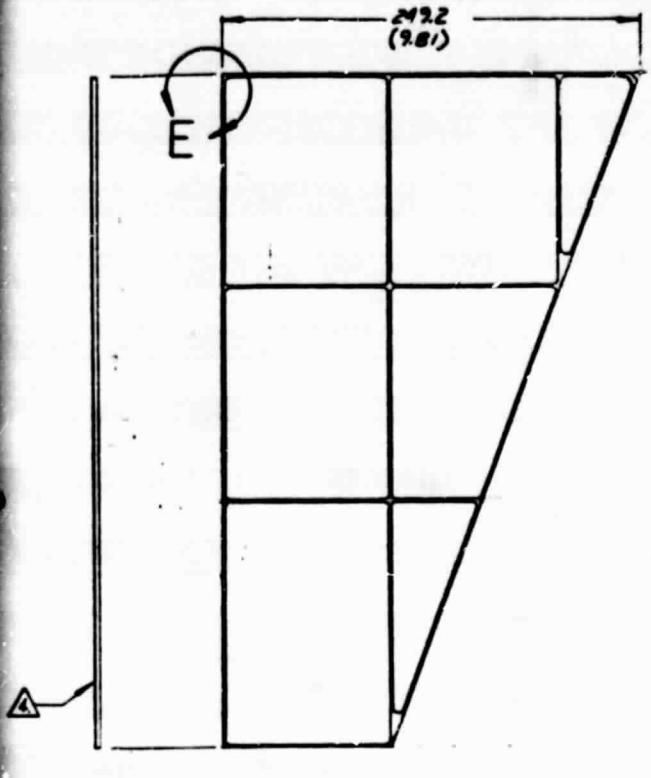
4. ALUMI
SPEC
EMIS
3. FLATNE
AT A
2. ALL DI
1. FAB AL
NOTES: UNL

ORIGINAL PAGE IS
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FOLDOUT FRAME

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

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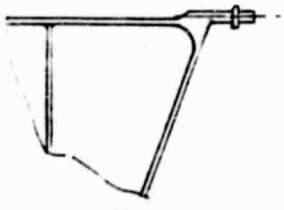
-003 SHOWN
-004 OPP. EXCEPT AS SHOWN



2
FOLDOUT FRAME

VIEW E
SCALE 1/1
(-004 ONLY)





VIEW D
SCALE 1/1
(-002 ONLY)

ON BB
1/1
LUG)

4. ALUMINIZE SURFACE TO 500A THICKNESS, SPECULAR REFLECTIVITY OF .90 AND AN EMISSIVITY OF .05
3. FLATNESS AND WAVINESS MAY DEVIATE AT A RATE OF .0005 mm PER mm (.0005 in. PER INCH)
2. ALL DIMENSIONS ARE IN mm, INCHES IN ( )
1. FAB ALL PARTS FROM GRAPHITE IMPREGNATED POLYSULFONE

NOTES: UNLESS OTHERWISE SPECIFIED

DR BY	M BISS	4/12/82	Rockwell International Corporation, Space Division, 12214 Lakewood Boulevard • Downey, California 90241
CHK BY			
APPROVED BY			REFLECTOR PANEL - CONCENTRATOR ELEMENT LCRSA
N/A	V416-945400		SIZE D · CODE IDENT NO. 03953 · V416-945401
			SCALE 1/2 · SHEET 1/1

V416-945401

2.0 TEST HARDWARE DRAWINGS

2.1 DISCUSSION

The hardware required to carry out experimental activities under this program are listed in the drawing tree depicted in Figure 2. There are a total of 21 drawings, of several types. Some provide information for subcontractors; others were used to construct Rockwell-fabricated components. The tests and experiments performed using the resulting hardware are fully described in Vol. 1 of this report.

2.2 TEST HARDWARE DRAWINGS

1. D416-340010
2. D416-340020
3. D416-450000
4. D416-450001
5. D416-451000
6. D416-451001
7. D416-451002
8. D416-451003
9. D416-451004
10. D416-451005
11. D416-451006
12. D416-451007
13. D416-452000
14. D416-452001
15. D416-453000
16. D416-454000
17. D416-454001
18. D416-454002
19. D416-454003
20. D416-454004
21. D416-455000

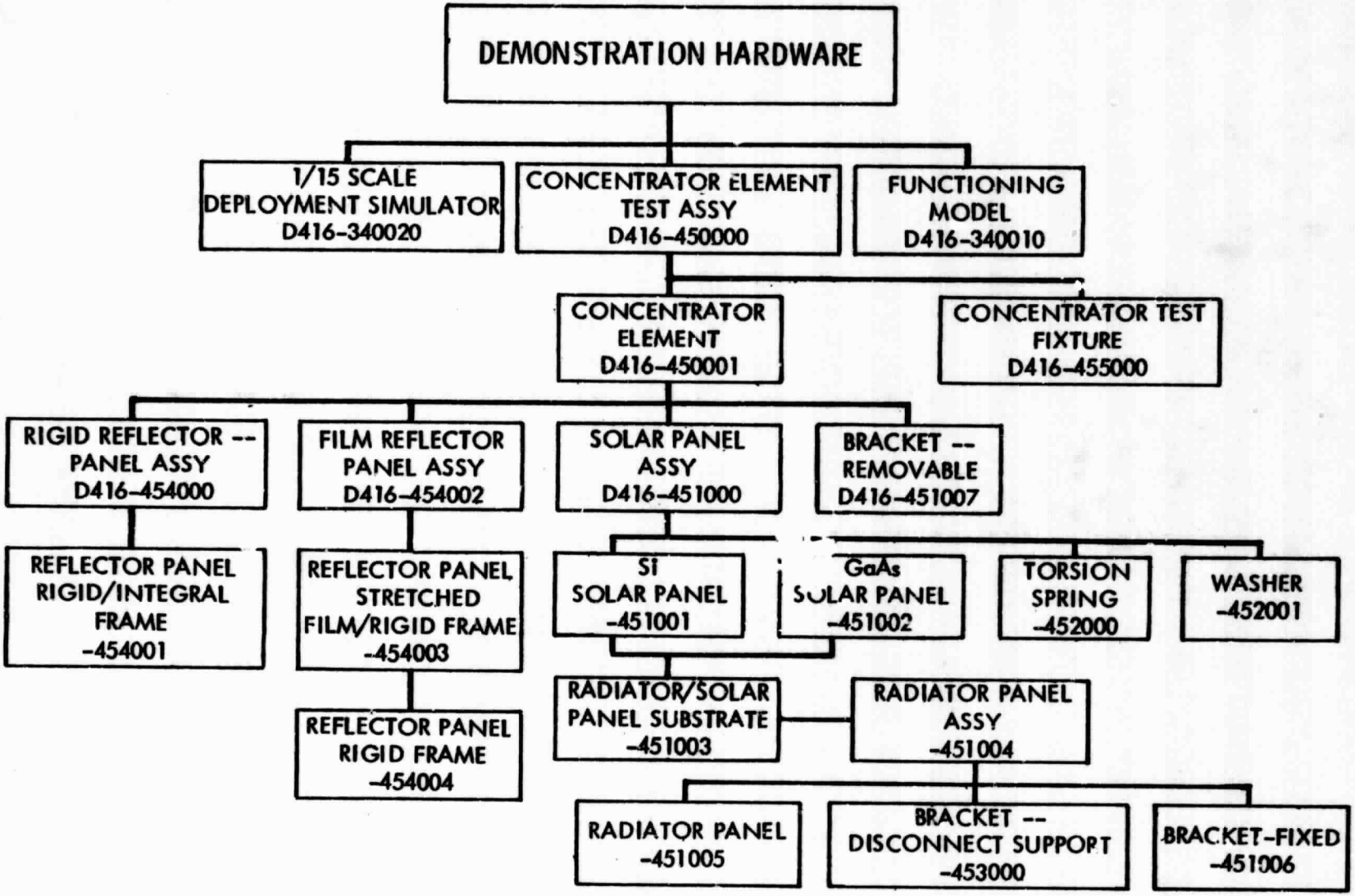
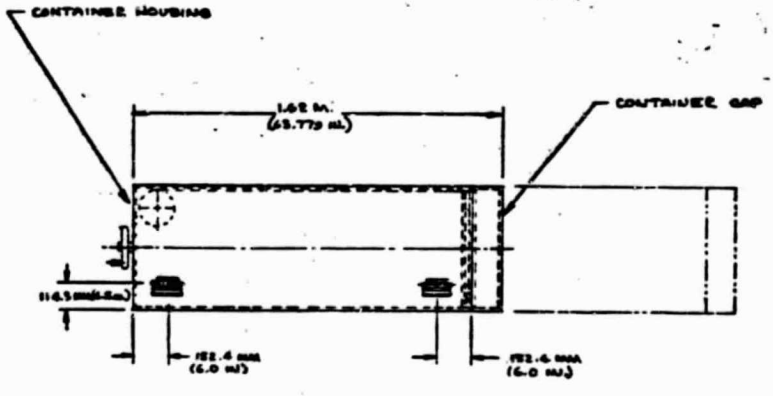


Figure 2. Test Hardware Drawing Tree

Shuttle Integration & Satellite Systems Division
Rockwell International

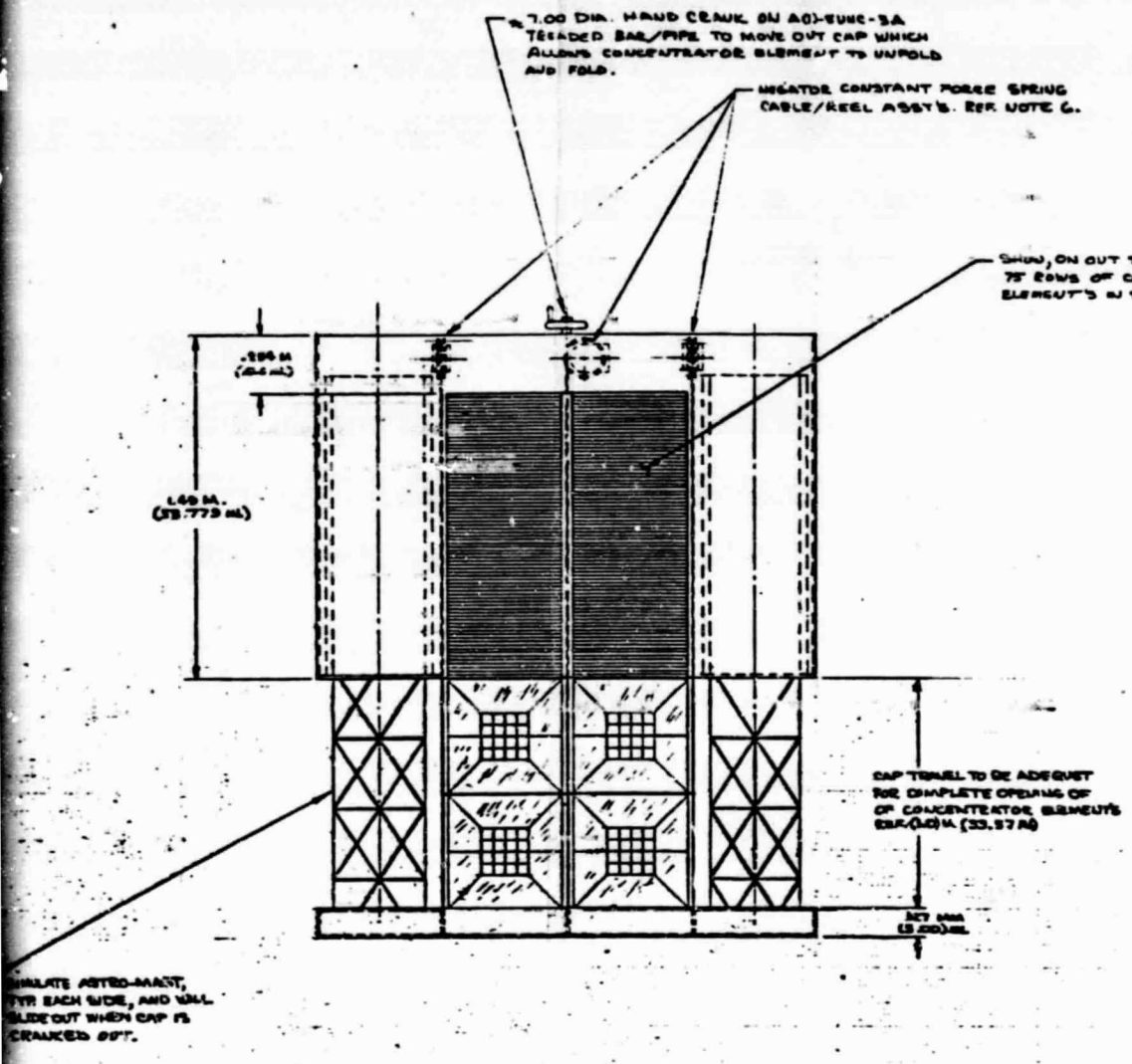
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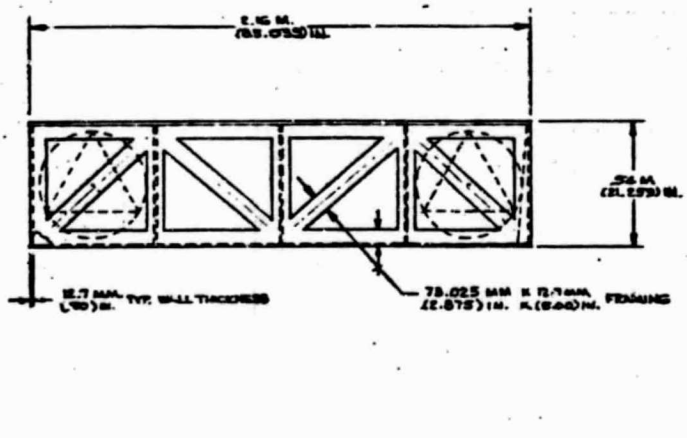


2

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NOTE:
1. FABRICA... PER ACC... VERBAL...
2. CONTAINE... TO BE OF... STRUCTU... AND TRA... APPEARAN... MODELS... CAN BE ... PROVIDE... CONCEAL...

8	7	6	5	4	4

FRAME

3 FOLDOUT FRAME

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E IS
LITY

NOTE:
1. FABRICATE PER BEST MODEL SHOP PRACTICES, PER ACCOMPANING NOTE SHEETS AND VERBAL DISCUSSIONS.
2. CONTAINER HOUSING AND CAP ASSEMBLIES TO BE OF LIGHTEST WEIGHT MATERIALS BUT STRUCTURALLY SOUND FOR DEMONSTRATION AND TRANSPORTING. MAINTAIN THE EXTERNAL APPEARANCE DIMENSIONS TO SHOW ACTUAL MODULE SIZE. THE INTERNAL STRUCTURE CAN BE MADE TO ANY CONFIGURATION SO AS TO PROVIDE THE OPENING AND CLOSING OF THE CONCENTRATOR ELEMENTS.

2-3, 2-4

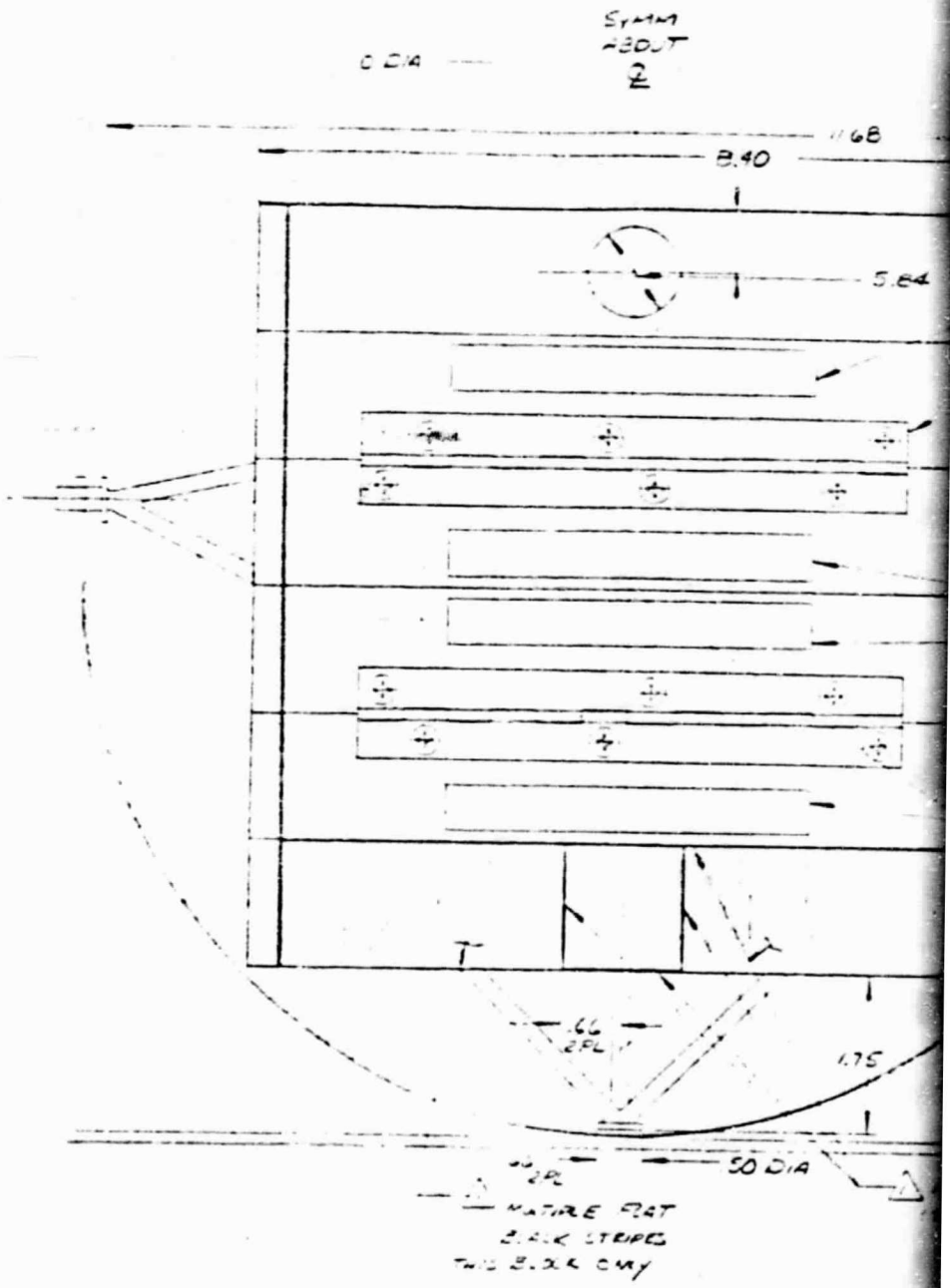
LOW CONCENTRATION RATIO
SOLAR ARRAY N=6, GCR=6
FUNCTIONING MODEL

J | 03953 | D416-34000

SCALE 1:1

4 | 3 | 2 | 1

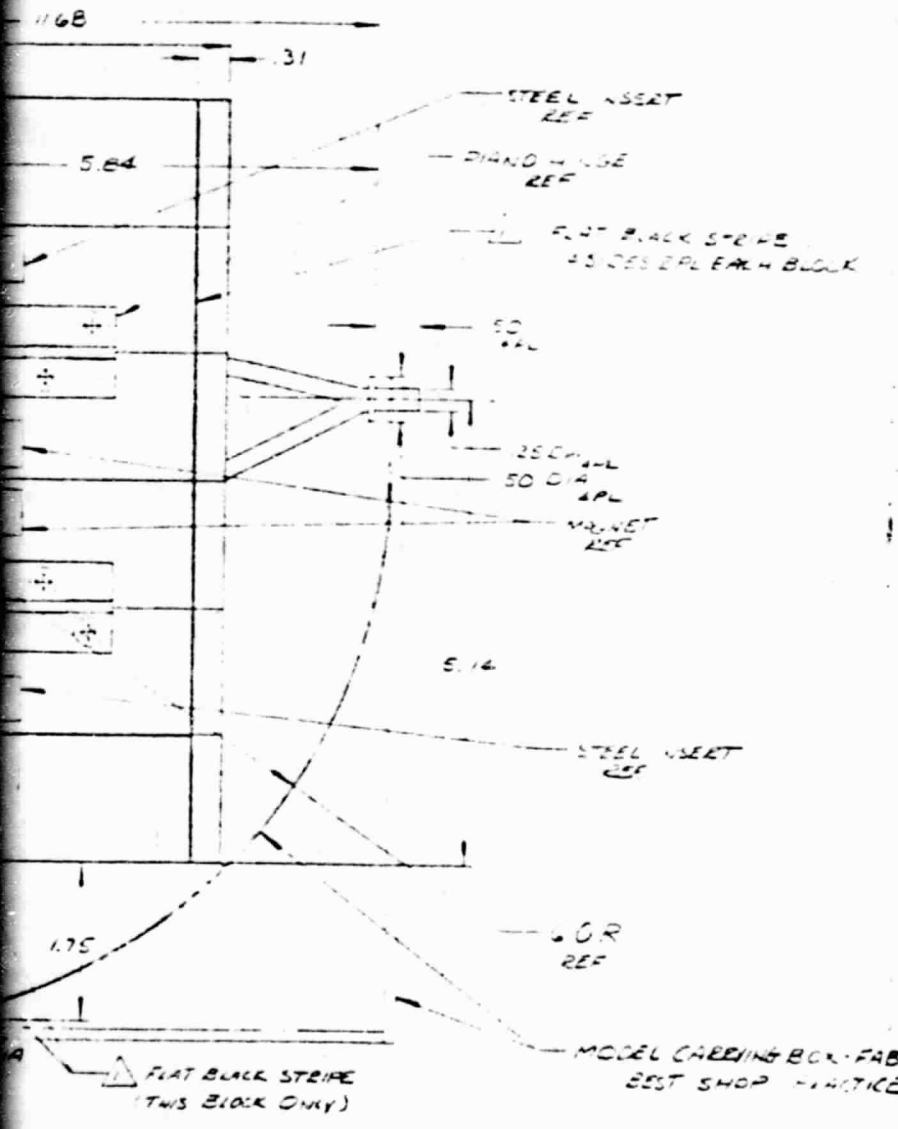
FOLDOUT FRAME

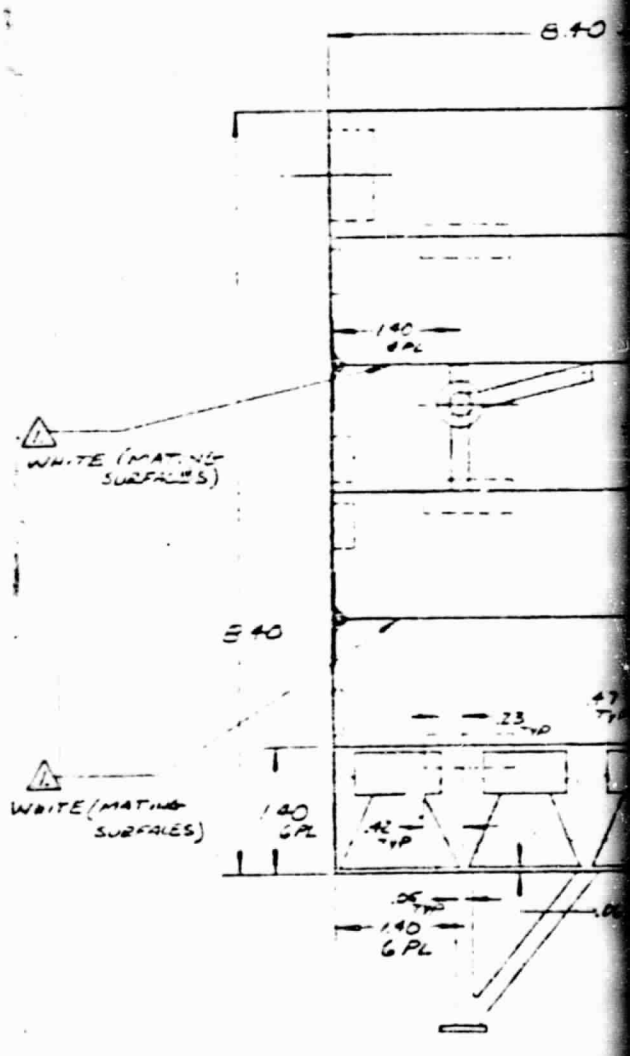


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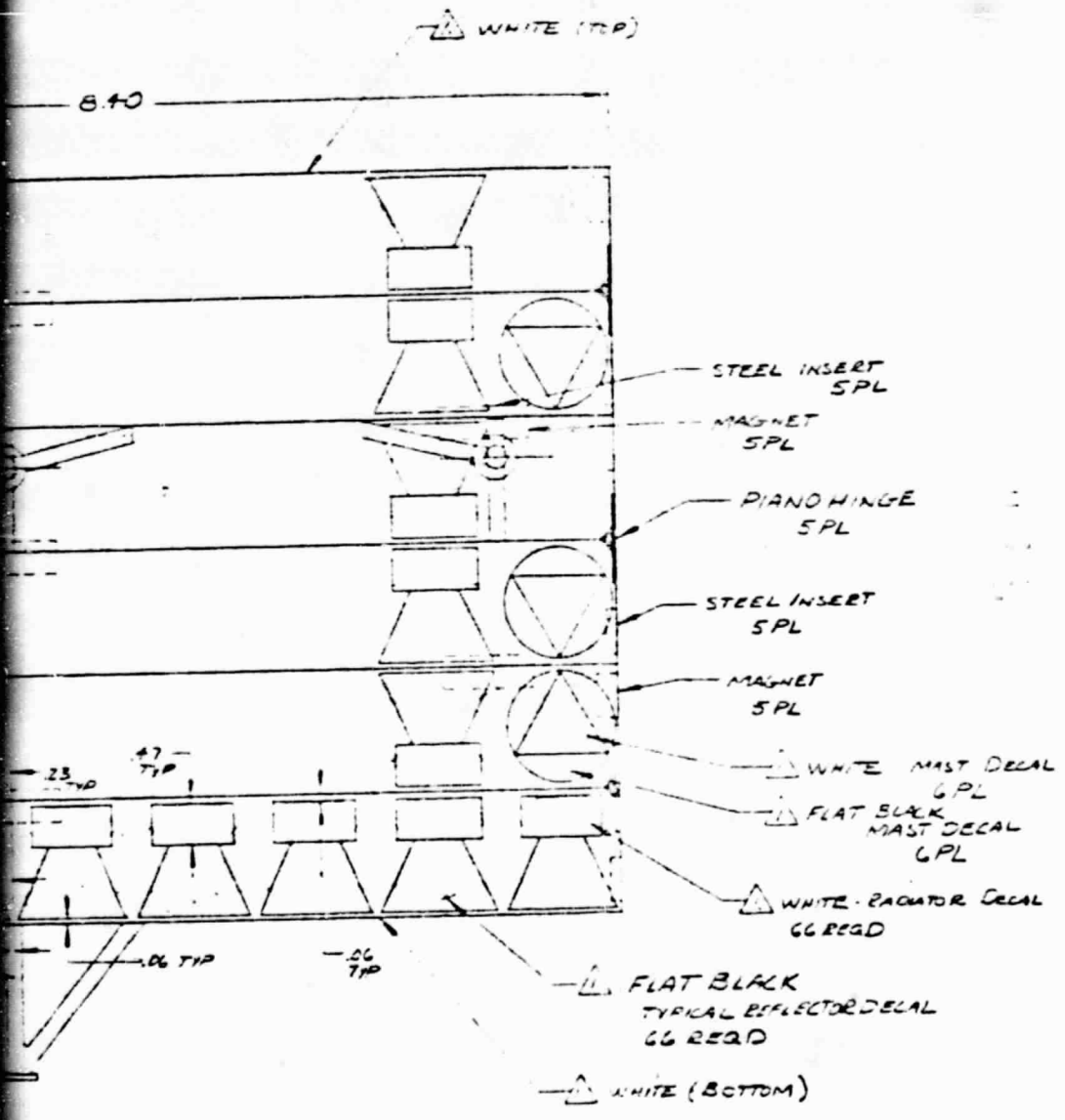
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2 FOLDOUT FRAME





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5. REMOVABLE - SMALL
4. MATERIALS - METAL
MODEL MAKING M
STAND ABOUSE OF R
3. SCALE FOR MISSION
2. NAIL, SCREW, OR GLUE
1. PAINT ALL SURFACES
NOTES: UNLESS OTHERWI

2 FOLDOUT FRAME

6 5 4

	2	REVISED DETAILS 100 - DIA HOLE	3 3/82

24 FOLDOUT FRAME

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MOVEABLE - SHAPE CARRIER CASE TO BE ... MED
MATERIALS. METAL, PLASTIC WOOD OR OTHER
MODEL MAKING MATERIAL THAT CAN BE ...
STAND HOUSE OF REPEATED HANDLING
SCALE FOR MISSION DIMS
NAIL, SCREW, OR GLUE. AS BEST SHOP PRACTICE
PAINT ALL SURFACES SILVER (ALUMINUM)
UNLESS OTHERWISE SPECIFIED

DR BY	APPROVED
CHK BY	
APPROVED BY	

Rockwell International Corporation
Space Division
12214 Lakewood Boulevard, Downey, California 90241

LUNAR HEAVY MODULE DEMONSTRATOR
MODEL SATTLE STRUDEROY
SCALE 1/4"=1'-0"

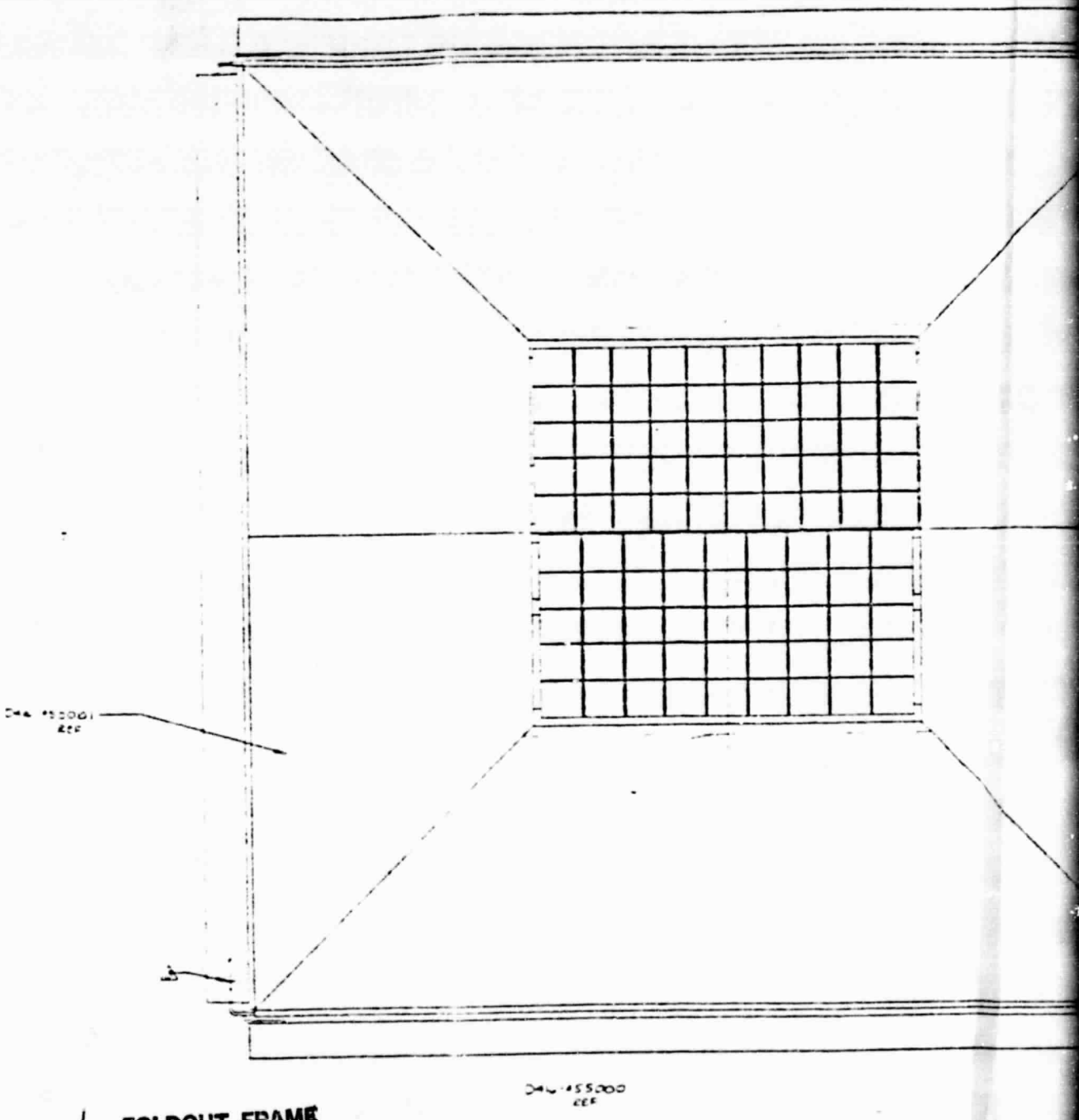
SIZE | CODE IDENT NO. | DRAWING NO.
L | 03953 | D4 2-34000-0

SCALE | WEIGHT | SHEET

2-5, 2-6

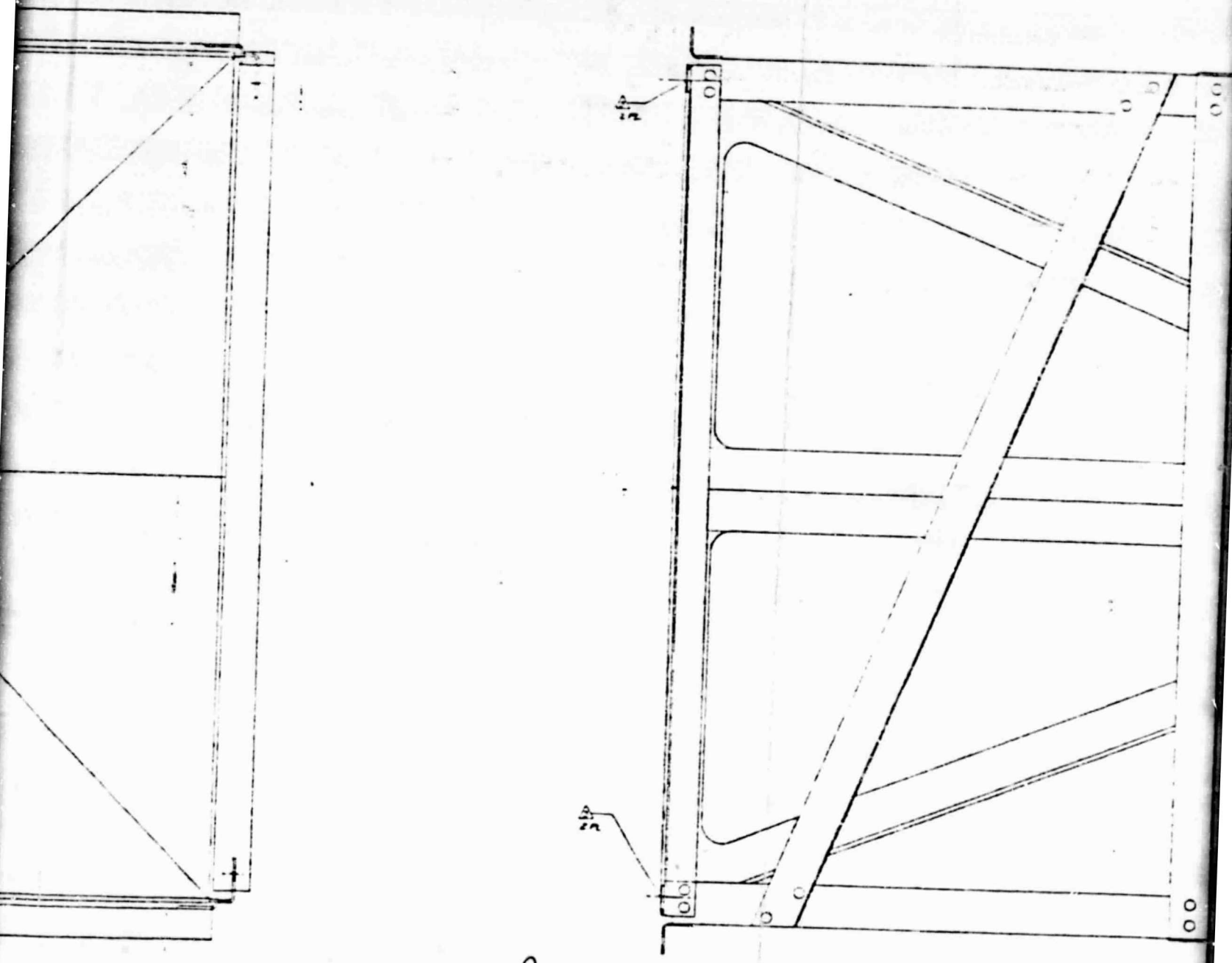
3 2 1

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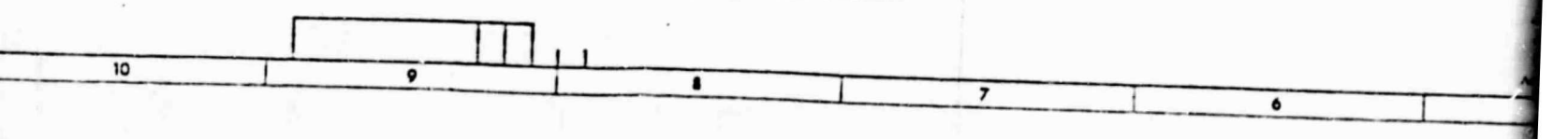
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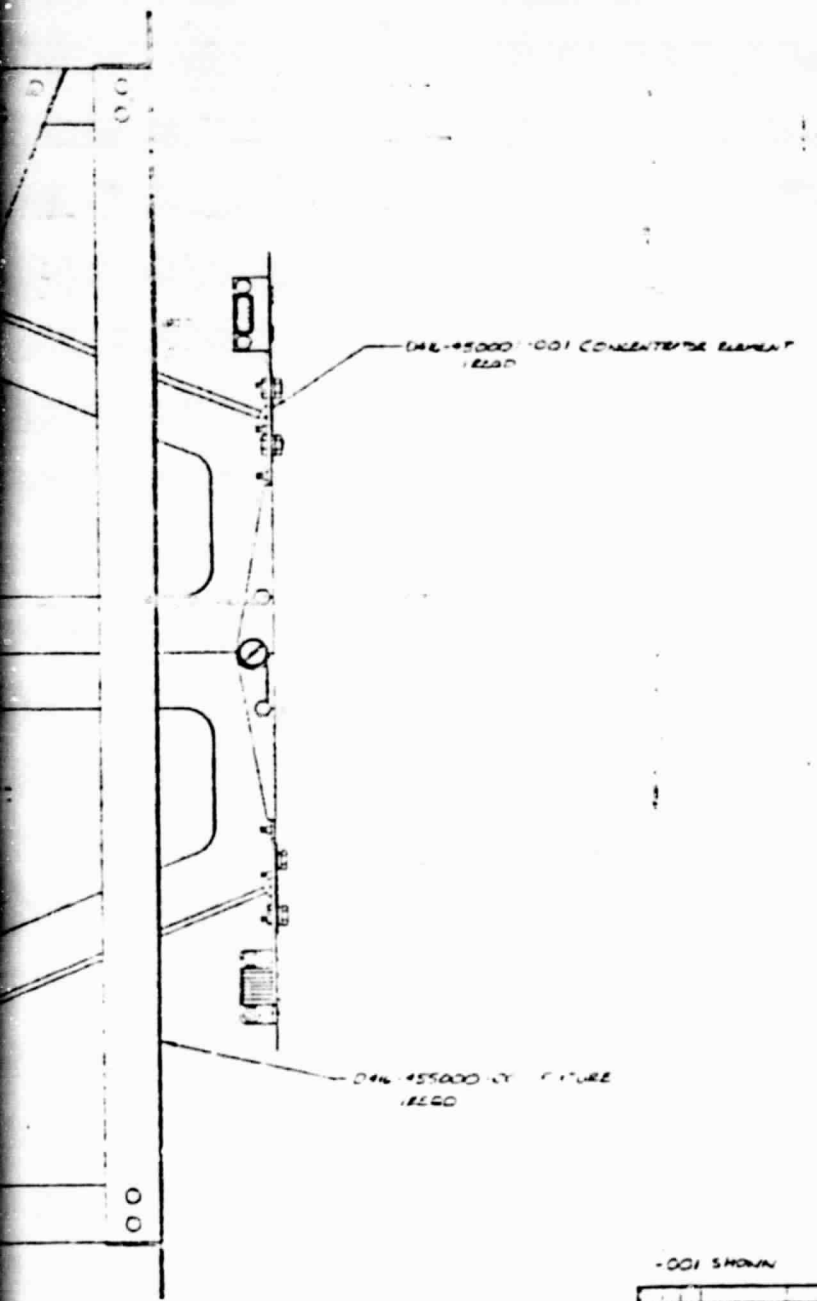


2.

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-001 SHOWN

PARTS LIST

A		C CLAMP		
2	D46-45300	FIXTURE		
1 REQD	D46-45000	CONCENTRATOR ELEMENT ASSY		
REF	D46-45000	ASSY		

CONCENTRATOR ELEMENT TEST ASSEMBLY -LEVEL A

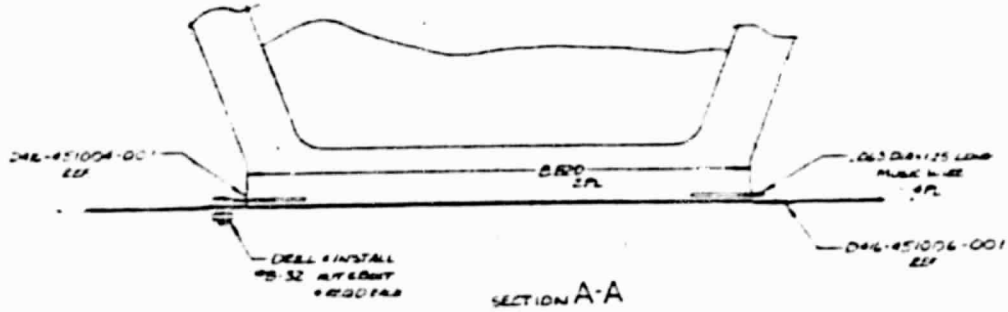
J103953 | D46-45000C

A CLAMP AT LOCATION SHOWN
2 SAFETY WIRE C CLAMPS TO FIXTURE (SHOWN)
1 CONTACT WATER COOLING TEE REQD
NOTE: UNLESS OTHERWISE SPECIFIED

2-7, 2-8

3 FOLDOUT FRAME

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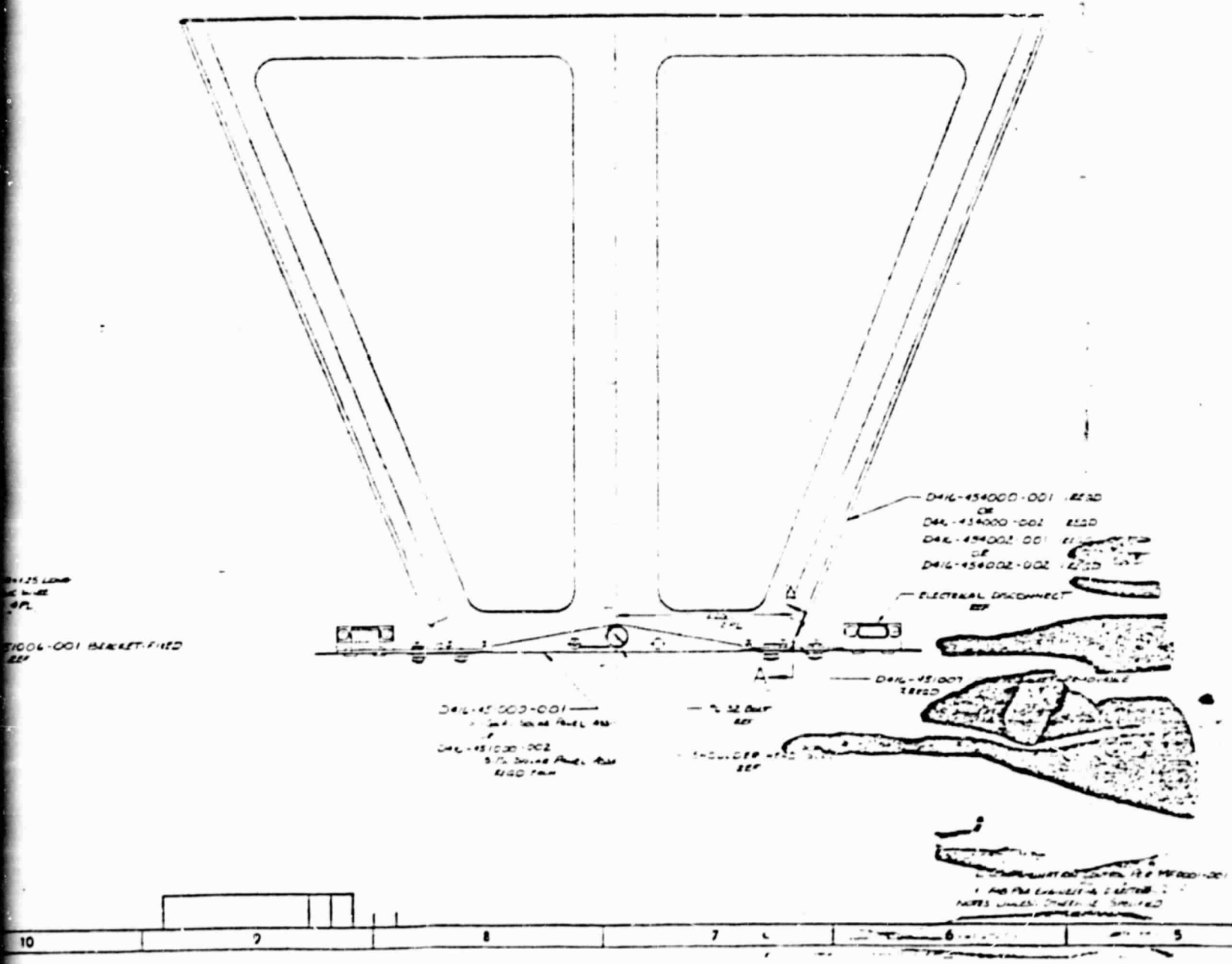
SECTION A-A
SCALE 2/1

FOLDOUT FRAME

2

FOLDOUT FRAME

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PARTS LIST

CONCENTRATOR
ELEMENT ASSEMBLY
LERSA TEST

J 039531 | AN-45000 1

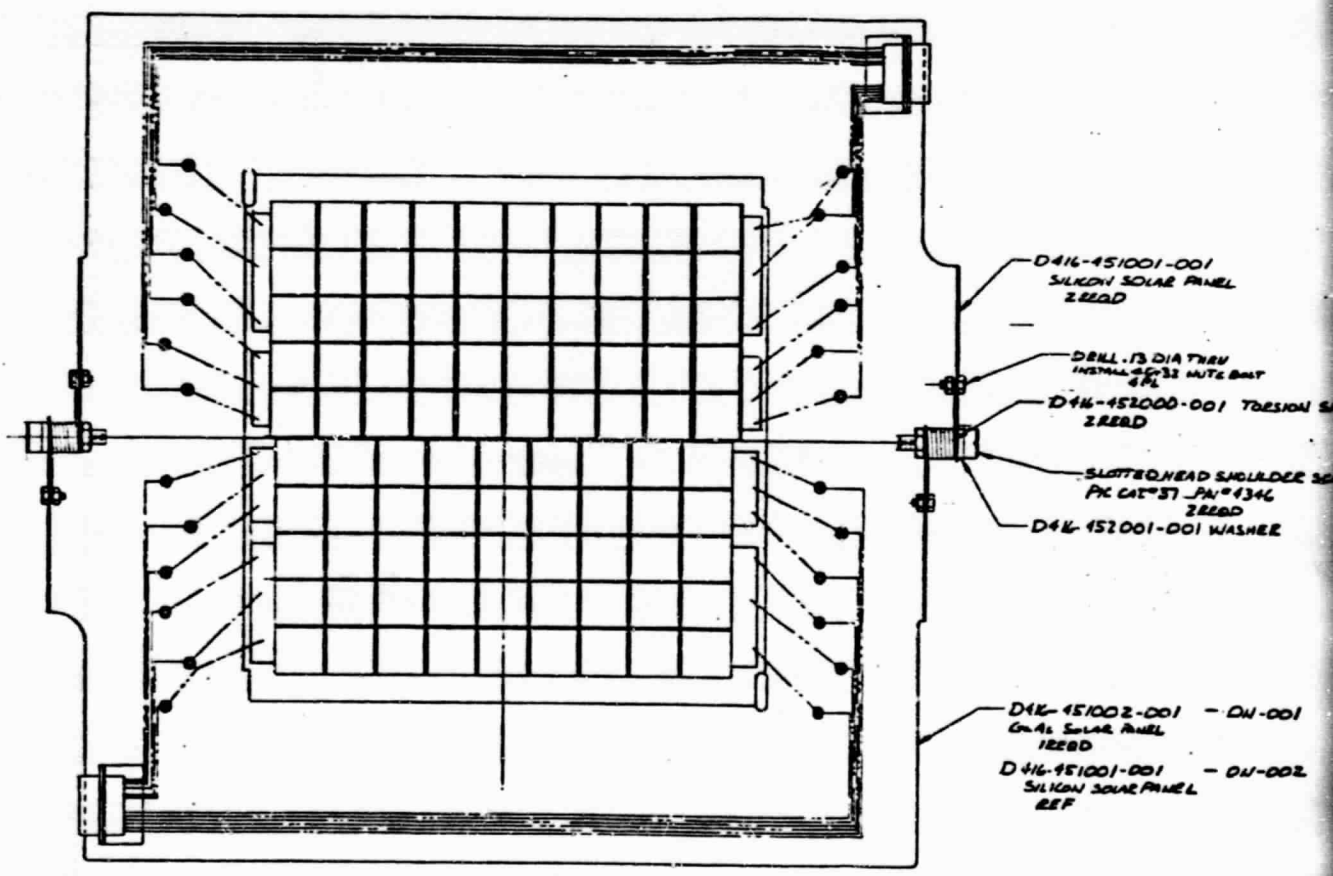
2-9, 2-10

-001 SHOWN

3

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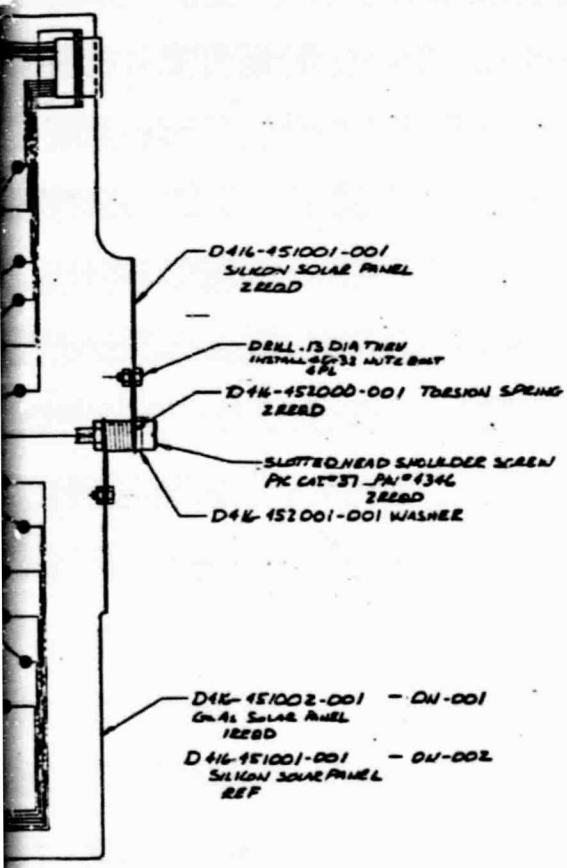


FOLDOUT FRAME

2. IDENTIFY PART PER MA0104-301
CONTAMINATION CONTROL PER MA0001-301
NOTES: UNLESS OTHERWISE SPECIFIED

FOLDOUT FRAME 2

ORIGINAL PAGE IS
OF POOR QUALITY



-002 SAME (EXCEPT AS NOTED)

-001 SHOWN

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	SIZE SPECIFICATIONS SPEED, NOTES, SUPPLIERS	ZONE
				6			4-32	BOLT	CRES		
				4			6-32	SCREW	CRES		
				2			4346	SHOULDER SCREW	303 CRES	PIC CATALOG # 37 P. 57	
				2		-001	D416-452001	WASHER			
				2		-001	D416-452000	TORSION SPRING			
				1		-001	D416-451002	GaAs Solar Panel			
			2	1		-001	D416-451001	SILICON SOLAR PANEL			
			1		-002		D416-451000				
			1		-001		D416-451000				

PARTS LIST

REV	ZONE	DESCRIPTION	DATE	APPROVED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ANGLES
.XX = ±.01 ± 0° 30'
.XXX = ±.005
MACH. SURFS "RMS"

DRAWN M 8/85 9/26/85
CHECKED
APPROVED

Rockwell International

SOLAR PANEL ASSEMBLY LCRSA TEST

SIZE E | CODE IDENT NO. 03053 | DRAWING NO. D416-451000

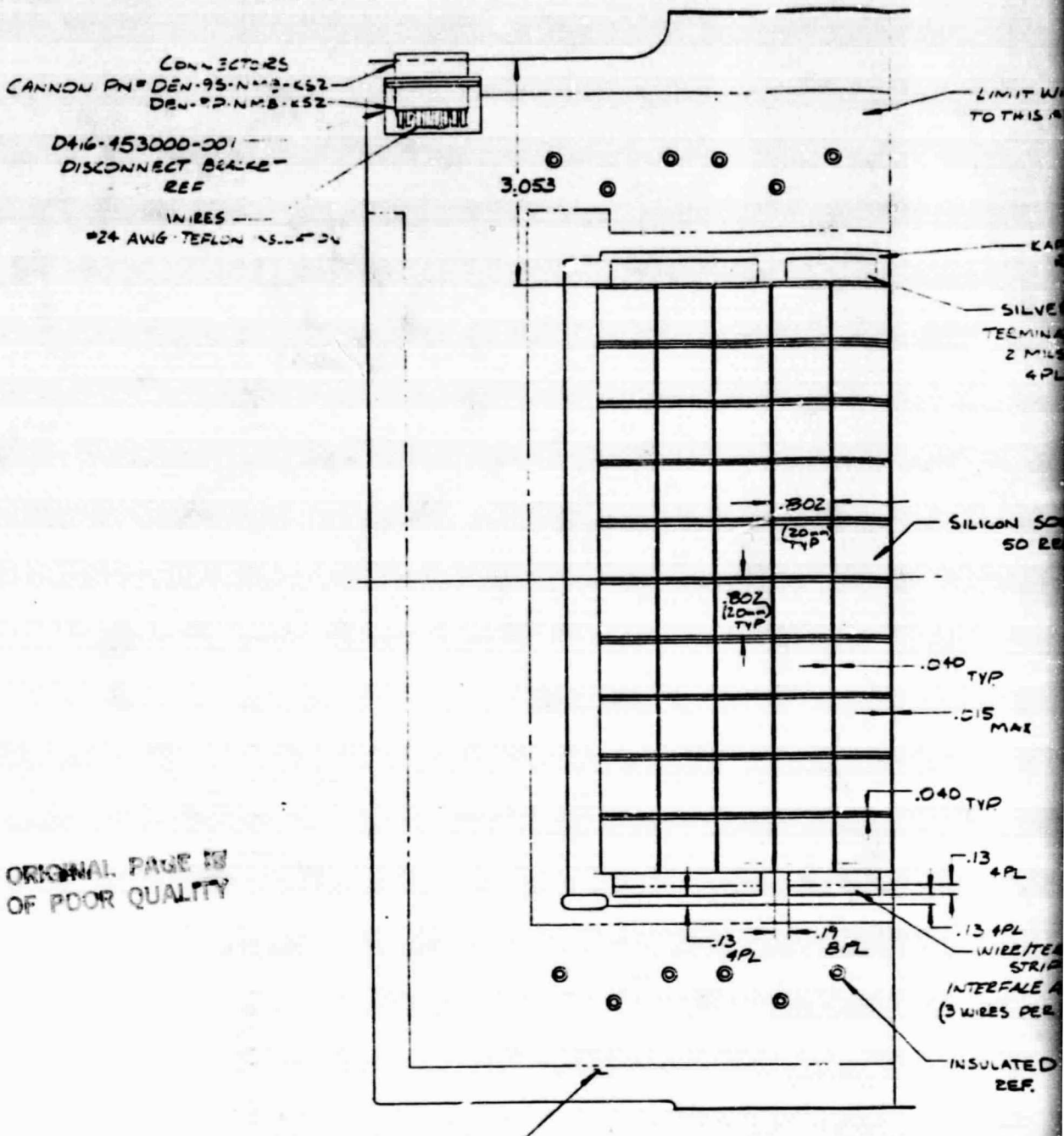
SCALE | SHEET

REV LTR	ZONE	DESCRIPTION	DATE	APPROVED
-002	1	D416-451001	9/26/85	
-001	1	D416-451001	9/26/85	

ITEM	QTY	PART NUMBER	MATL SPEC	END ITEM NO.	MODEL
REVISED PER ENG MOD		APPLICATION		EFFECTIVITY	

F PER MA0104-301
CONTROL PER MS0001-001
UNLESS SPECIFIED

2-11, 2-12



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-001 SI

5. CONTAMINATION CONTROL PER MF0001-001
4 IDENTIFY PART PER MA0104-301
3. INTERCONNECT SHALL BE SILVER 'EXMET'
2. BOND CELLS USING RTV577 ADHESIVE
1 FAB PER STATEMENT OF WORK SOLAR PANEL LCRSA SYSTEM SILICON

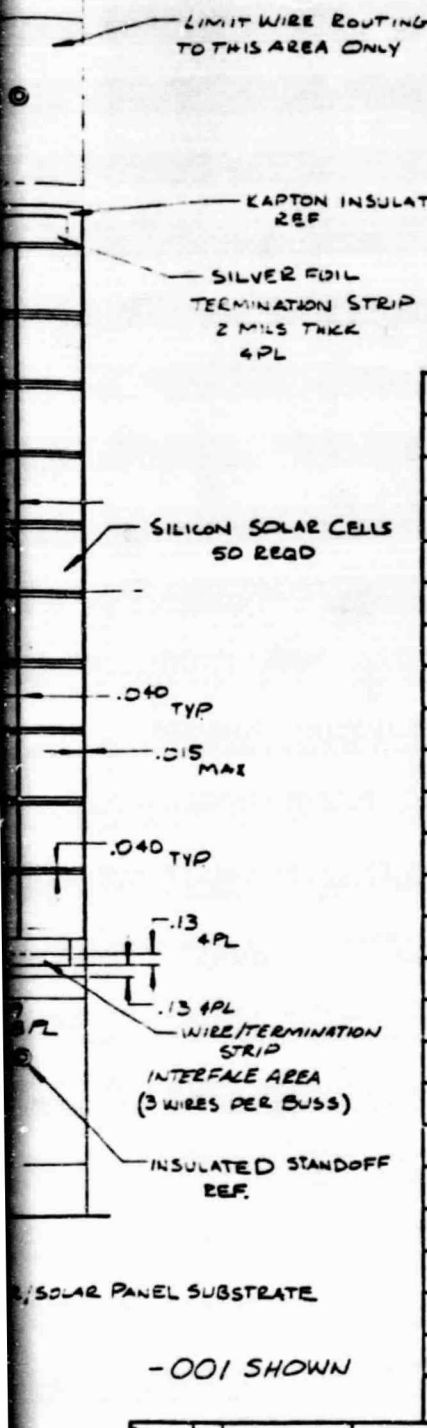
NOTES: UNLESS OTHERWISE SPECIFIED

-001	2	D416
ITEM	QTY	
REQD PER END ITEM		

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

2 FOLDOUT FRAME

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QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA SPECIFICATIONS SIZES NOTES SUPPLIERS	ZONE
					4			BUSS	TERMINATION STRIP	2 MIL THICK	
					1		DEM-9P-NMB-K52	CONNECTORS		CANNON	
					1		DEM-9S-NMB-K52	CONNECTORS		CANNON	
					50			SOLAR CELLS	SILICON		
					6		IN-6081	DIODES		SEMTECH	
					2		D416-451003	RADIATOR/ SOLAR PANEL			
				2	-001		D416-451001				

PARTS LIST

D416-451001

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO	THRU
-001	2	D416-451000	LCRSA TEST		
REQD PER END ITEM		APPLICATION		EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES ON
DECIMALS: XX = ± .03, .XXX = ± .010
ANGLES: ± 0° 30'

HOLES NOTED "DRILL"

.013	THRU	.040	+ .001 − .001
.041	THRU	130	+ .002 − .001
131	THRU	.229	+ .003 − .001
230	THRU	500	+ .004 − .001
501	THRU	750	+ .005 − .001
751	THRU 1 000		+ .007 − .001
1 001	THRU 2 000		+ .010 − .001

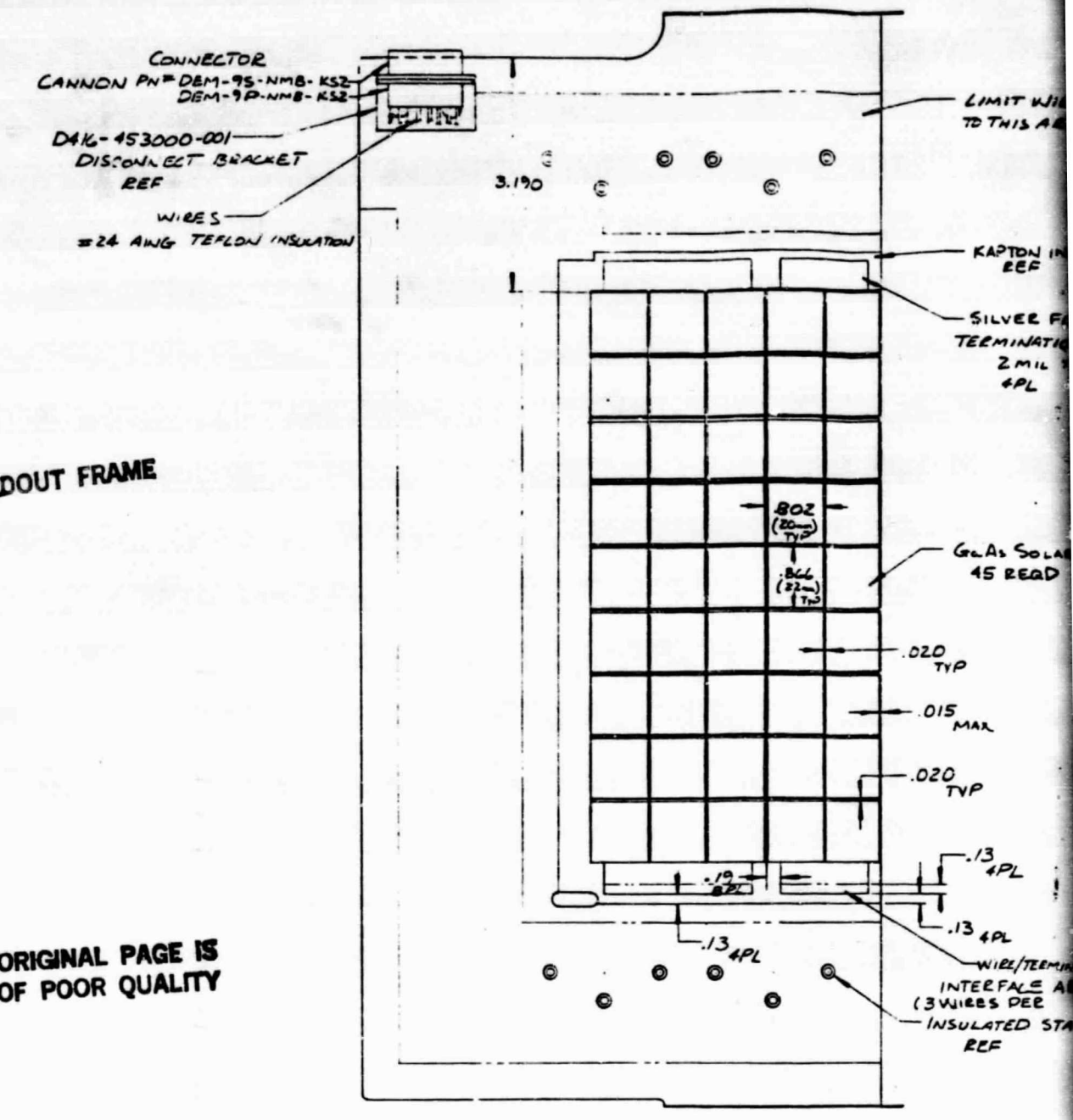
DR BY	M BISS	8/24/82
CHK BY		
APPROVED BY		

Rockwell International

SILICON SOLAR PANEL ASSEMBLY
LCRSA - TEST

SIZE	CODE IDENT NO	DRAWING NO
D	03953	D416-451001

SCALE FULL | SHEET 1/1



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-001 SHO

5. CONTAMINATION CONTROL PER MF0001-001
4. IDENTIFY PART PER MA0104-301
3. INTERCONNECT SHALL BE KOVAR 'SOLAREX'
2. BOND CELLS USING DC 93-500 ADHESIVE
1. FAB PER STATEMENT OF WORK SOLAR PANEL LCRSA SYSTEM GaAs

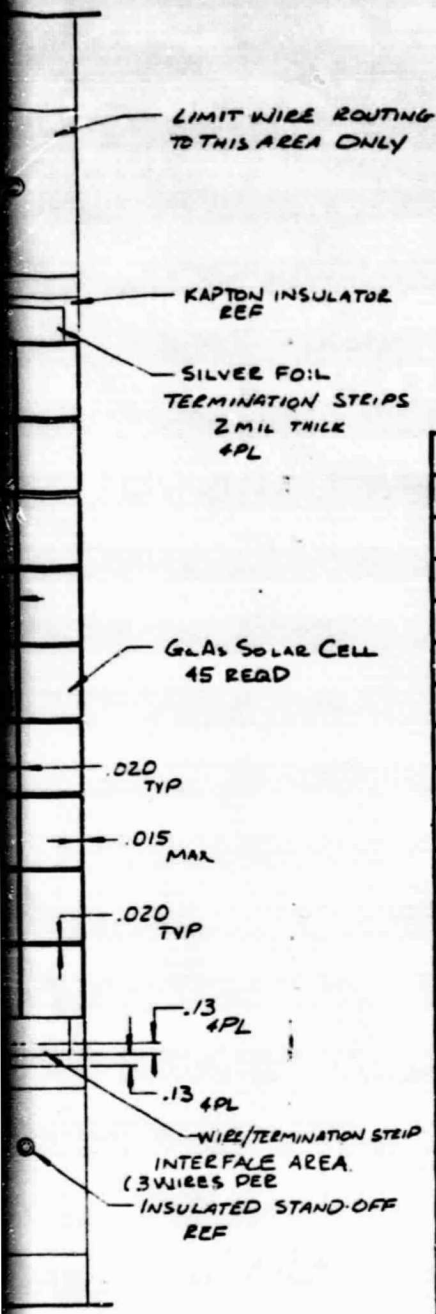
NOTES: UNLESS OTHERWISE SPECIFIED

-001	1	D4K-45
ITEM	QTY	NEXT A
REQD PER END ITEM		

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

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2 FOLDOUT FRAME



QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA: SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
					4			TERMINATION STRIPS	SILVER FOIL	2 MIL THICK	
					1		DEM-9P-NMB-K52	CONNECTORS		CANNON	
					1		DEM-9S-NMB-K52	CONNECTORS		CANNON	
					45			SOLAR CELLS	GaAs		
					6		IN-6081	DIODES		SEMTECH	
					1	-001	D416-451003	RADIATOR/ SOLAR PANEL			
					-001						

PARTS LIST

-001 SHOWN

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO.	THRU
-001	1	D416-451000	LCRSA TEST		
REQD PER END ITEM		APPLICATION		EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: XX = ± .03, XXX = ± .010
ANGLES: ± 0° 30'
HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

DR BY M. Bliss 8/26/82
CHK BY
APPROVED BY

Rockwell International

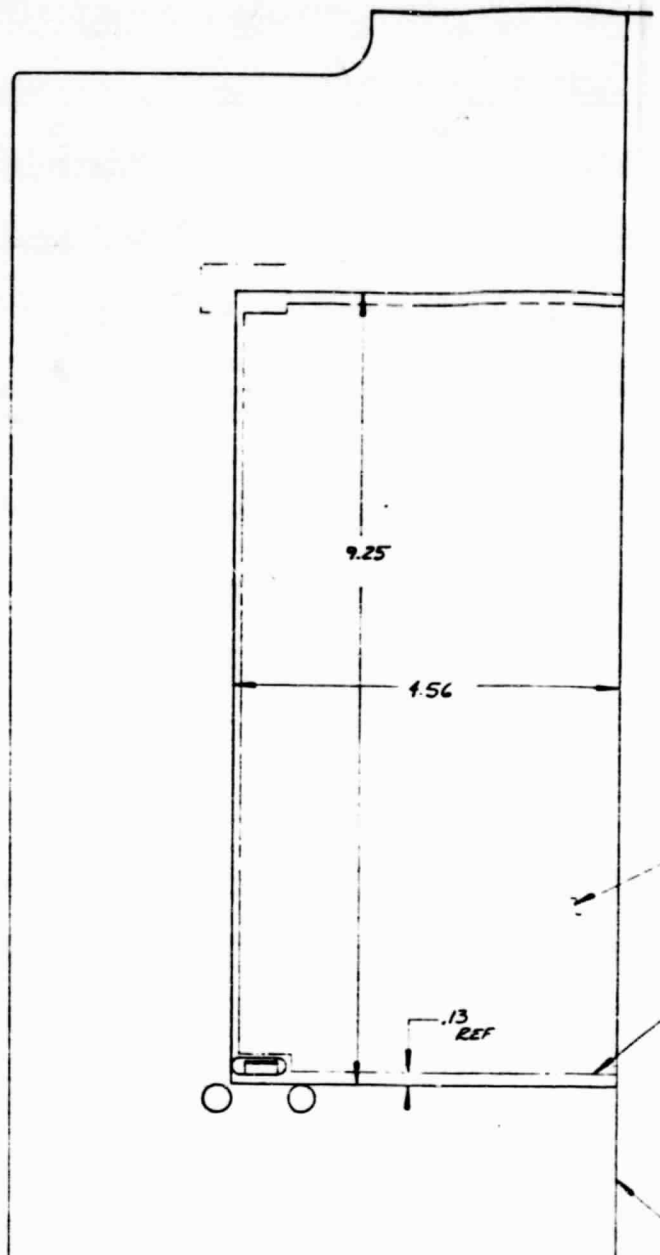
GaAs SOLAR PANEL ASSEMBLY LCRSA TEST

SIZE	CODE IDENT NO	DRAWING NO.
D	03953	D416-451002

SCALE 1/1 SHEET 1/1

D416-451002

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-001 SA

-001	1	SPARE
-001	1	D41-9
-001	2	D41-9
ITEM	QTY	NEXT
REQD PER END ITEM		

3. CONTAMINATION CONTROL PER ME0001-001
2 BOND WITH AB0120-003 TYPE I, PER AA0106-044
1. MARK PART NO PER MA0104-301, CODE-BL-08-NG-16
NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

ORIGINAL PAGE IS
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2 FOLDOUT FRAME

-002 INSULATOR
1 REQD
△2 2 MIL. THKK
ADHESIVE MAX.

PAINT LINE
REF.

D416-451004-001
RADIATOR PANEL
1 REQD

-001 SHOWN

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA, SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
					1	-001	D416-451004	RADIATOR PANEL ASSY			
					1	-002	D416-451003	INSULATOR	TEDLAR FILM	.001 x 4.75 x 9.38 PER MFR RQMTS	
				4	-001		D416-451003	RAD/SOLAR PANEL ASSY			

PARTS LIST

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO	THRU
-001	1	SPARE			
-001	1	D416-451002	LCRSA TEST		
-001	2	D416-451001	LCRSA TEST		

REQD PER END ITEM | APPLICATION | EFFECTIVITY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS XX= ± 03, XXX= ± 010; ANGLES ± 0° 30'
HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

DR BY M BISS 5/14/82
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ELECTRICAL

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RADIATOR/SOLAR PANEL
SUBSTRATE
LCRSA TEST

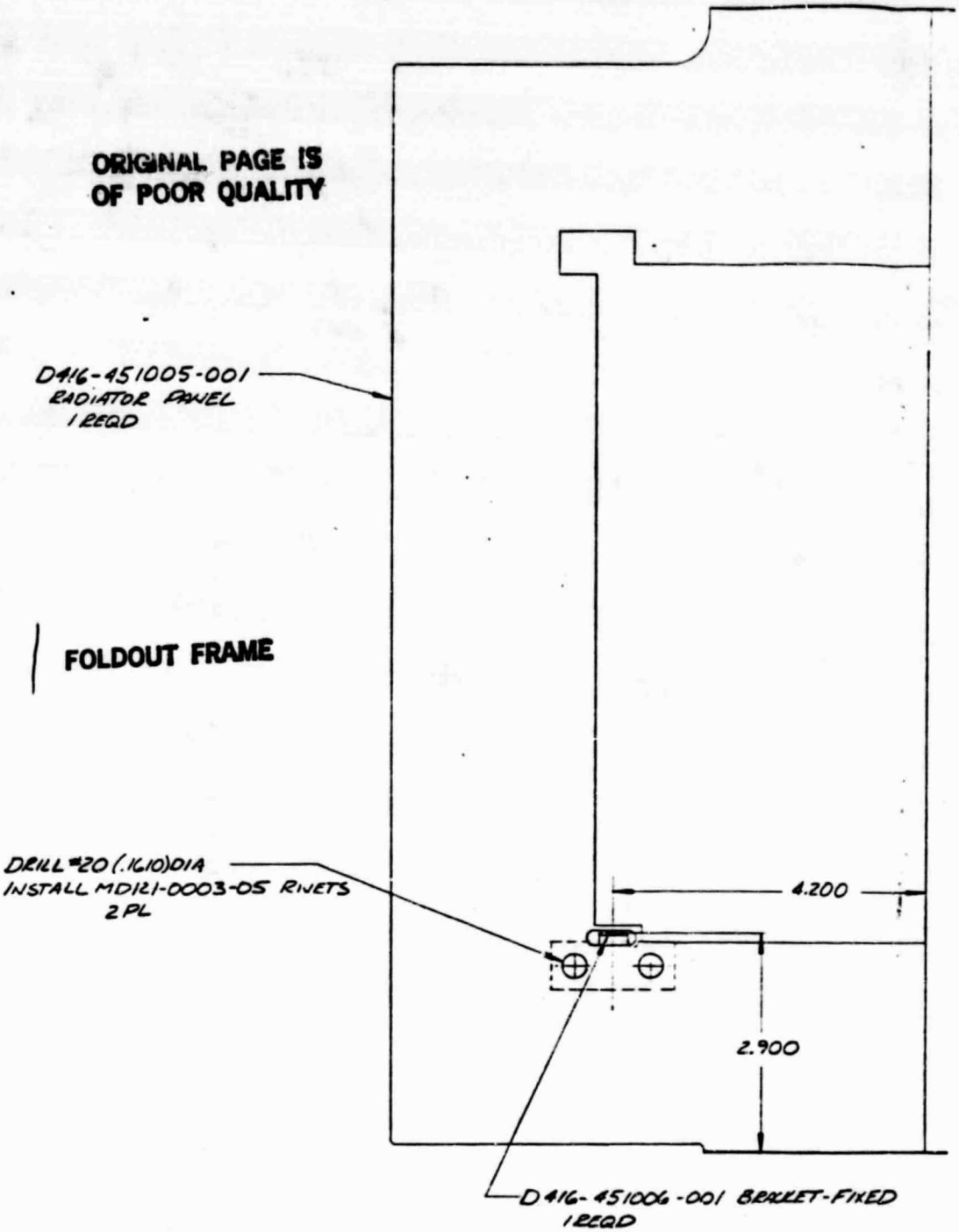
SIZE	CODE IDENT NO	DRAWING NO.
D	03953	D416-451003

SCALE 1/1 SHEET 1/1

D416-451003

2-17, 2-18

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-001 S

-001	4	D4
ITEM	QTY	
REQD PER END ITEM		

3. INSTALL RIVETS PER MA0101-302,
   FINISH PER MF0004-001 ITEM I-9
2. MARK PART NO PER MA0104-301, CODE BL-08-NG-16
1. CONTAMINATION CONTROL PER MF0001-001

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

FOLDOUT FRAME

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QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDEN NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA, SPECIFICATIONS SIZES, NOTES, SUPPLIES	ZONE
					1	-001	D416-451005	RADIATOR PANEL			
					2		MDRI-0003-05	RIVET	2219 AL	RIVET-UNIVERSAL HEAD 2219-T62 AL ALLOY	
					1	-001	D416-451006	BRACKET FIELD			
				4	-001		D416-451004	PANEL ASSY			

PARTS LIST

D416-451004

-001 SHOWN

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO	THRU
-001	4	D416-451003	LCRSA TEST		
REQD PER END ITEM		APPLICATION		EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: XX = ± .03; XXX = ± .010
ANGLES: ± 0° 30'
HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

DR BY M BISS 5/20/8_
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RADIATOR PANEL ASSEMBLY LCRSA-TEST

SIZE	CODE IDENT NO	DRAWING NO.
D	03953	D416-451004

SCALE 1/1 SHEET 1/1

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6. MARK PART PER MA0104-301 CODE BC-08-N6-16
5. CONTAMINATION CONTROL PER MF0001-001
4. FINISH PANEL (EXCEPT HASHED AREA) PER MF0004-001, ITEM III-3
3. STD DETAIL PER MA0102-305
2. CORNER RADIUS .06
1. BEND RADIUS .060 MAX

NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	QTY	DASH NO.
-001	4	

REQD PER END ITEM

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

2

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-001 SHOWN

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA, SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
					4	-001	D416-451005	RADIATOR PANEL	AL SHT	LOC-76 AL SHT QQ-A-250/11 .040 x 7.75 x 16.75	

PARTS LIST

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO	THRU
-001	4	D416-451004	LCRSA		
REQD PER END ITEM		APPLICATION		EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: XX = ± .03; XXX = ± .010
ANGLES = 0° 30'
HOLES NOTED "DRILL"

.013	THRU	.040 + .001 − .001
.041	THRU	.130 + .002 − .001
.131	THRU	.229 + .003 − .001
.230	THRU	.500 + .004 − .001
.501	THRU	.750 + .005 − .001
.751	THRU	1.000 + .007 − .001
1.001	THRU	2.000 + .010 − .001

DR BY M. BASS 5/7/82
CK BY
APPROVED BY
5-17-82

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RADIATOR PANEL
LCRSA TEST

SIZE	CODE IDENT NO	DRAWING NO
D	03953	D416-451005

SCALE 1/1 SHEET 1/1

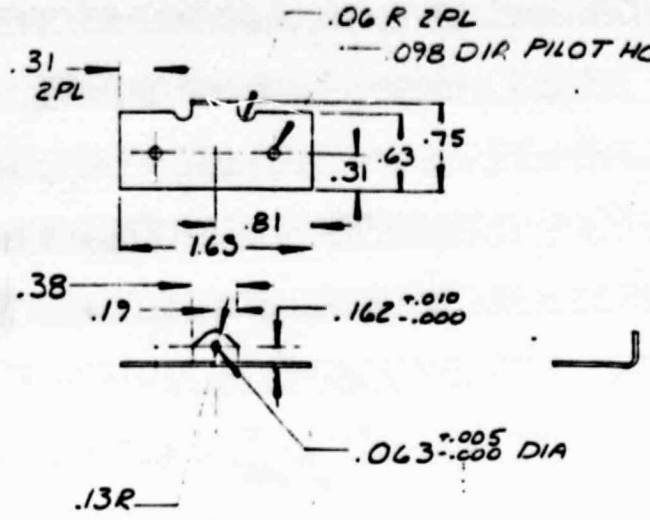
D416-451005

0104-301

ONTROL

T HASHED
TEM III-3
2-305

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-001 SHOWN

7. FINISH PER MF0004-001, ITEM I-1
6. MARK PART NO. PER MA0104-301 CODE BL-08-NG-16
5. CONTAMINATION CONTROL PER MF0001-001
4. INSPECT PER MT0501-508 CLASS 2
3. STD DETAIL PER MA0102-305
2. BREAK SHARP CORNERS & EDGES
1. BEND RADIUS .060 MAX

NOTES: UNLESS OTHERWISE SPECIFIED

					4	-001	D416-451
QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART O IDENTIFYING N

FOLDOUT FRAME

-001	4	D416-451004	LCESA EST		
ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO.	THRU
REQD PER END ITEM		APPLICATION		EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:

DECIMALS	ANGLES
XX= ± .03	± 0° 30'
XXX= ± .010	

HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

FORM [illegible] REV. 6-66 DIETERICH-POST CLEARPRINT [illegible]

2 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

HOLE

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D

C

B

A

D416-451006

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA: SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
				4	-001	D416-451006	BRACKET	AL-SHT	6061-T6 AL QQ-A-250/11 .032 x 1.12 x 1.75	

PARTS LIST

END ITEM NO.	THRU
EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:

DECIMALS	ANGLES
XX = ± .03	± 0° 30'
XXX = ± .010	

HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

DR BY	MS BISS	5/19/82
CHK BY		

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MSFC [illegible] 5-20 [illegible] GTM/TE
[illegible] 5/19 ALEC [illegible] 5-20

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Space Division
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BRACKET-FIXED

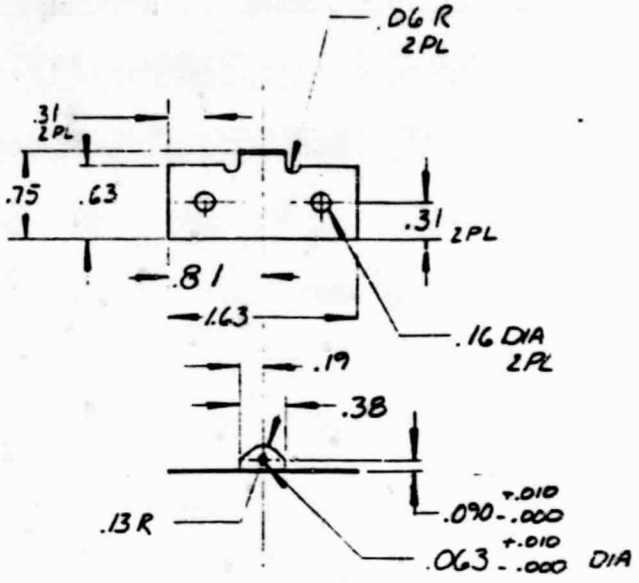
LCESA TEST

SIZE	CODE IDENT NO.	DRAWING NO.
C	03953	D416-451006

SCALE 1/1 SHEET 1/1

2 2-23, 2-24 1

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6. FINISH PANEL PER MF0004-001, ITEM III-3
5. MARK PART NO. PER MA0104-301 CODE BL-08-N6-16
4. CONTAMINATION CONTROL PER MF0001-001
3. STD DETAIL PER MA0102-305
2. BREAK SHARP CORNERS & EDGES
1. BEND RADIUS .060 MAX

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NU
					4	-001	D416-451

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO.	THRU
-001	4	D416-45000	LCESA TEST		
REQD PER END ITEM		APPLICATION		EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:

DECIMALS	ANGLES
.XX = ± .03	± 0° 30'
.XXX = ± .010	

HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

FORM MIL-STD-9-2 REV. 6-74 SWETZER-POST CLEARPRINT 2MIL-STD

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

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				4	-001	D416-451007	BRACKET	AL SHT	6061-T6 AL QQ-A-250/11 .032 x 1.12 x 1.75	B

D416-451007

PARTS LIST

ID ITEM NO.	THRU
EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:

DECIMALS	ANGLES
XX = ± .03	± 0° 30'
XXX = ± .010	

HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

DR BY	M BISS	6/14/82
CHK BY		
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Space Division
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BRACKET - REMOVABLE

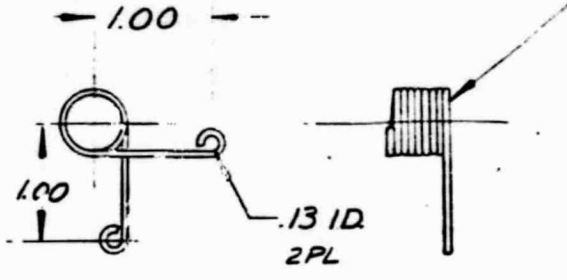
LCRSA - TEST

SIZE	CODE IDENT NO.	DRAWING NO.
C	03953	D416-451007

SCALE 1/1 SHEET 1/1

2-25, 2-26

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-001 SHOWN

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					3	-001	D416-4520

6. STD DETAIL PER MA0102-305
5. INSPECT PER MT0501-508 CLASS 2
4. CONTAMINATION CONTROL PER MF0001-001
3. FINISH PER MF0004-001, ITEM I-23
2. IDENTIFY PER MA0104-301
1. FAB TORSION SPRING FROM PART No. T051-270-359-R ASSOCIATED SPRING CATALOG PG. 60, OR EQUIV

NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	QTY	NEXT ASSY	USED ON
-001	1	SPARE	LCRSA TEST
-001	2	D416-451000	LCRSA TEST

REQD PER END ITEM | APPLICATION | EFFECTIVITY (END ITEM NO. | THRU)

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
DECIMALS: XX = ± .03; XXX = ± .010
ANGLES: ± 0° 30'
HOLES NOTED "DRILL"

.013	THRU	.040: +.001 −.001
.041	THRU	.130: +.002 −.001
.131	THRU	.229: +.003 −.001
.230	THRU	.500: +.004 −.001
.501	THRU	.750: +.005 −.001
.751	THRU	1.000: +.007 −.001
1.001	THRU	2.000: +.010 −.001

FORM MEL50-R-2 REV. 8-74 DIETZGEN-POST CLEARPRINT 3000H-20

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

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.051 DIA, 2.9 IN-LB TORQUE
x.52 AXIAL LENGTH, RIGHT HAND HELIX

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QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA: SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
				3	-001	D416-452000	SPRING TORSION	ST. ST.	QQ-W-423 Comp FS 302, AMS 5688	B

PARTS LIST

END ITEM NO.	THRU
EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:

DECIMALS	ANGLES
.XX = ± .03	± 0° 30'
.XXX = ± .010	

HOLES NOTED "DRILL"

.013	THRU	.040	+.001 −.001
.041	THRU	.130	+.002 −.001
.131	THRU	.229	+.003 −.001
.230	THRU	.500	+.004 −.001
.501	THRU	.750	+.005 −.001
.751	THRU	1.000	+.007 −.001
1.001	THRU	2.000	+.010 −.001

DR BY	M BISS	5/6/82
CHK BY		
APPROVED BY		

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TORSION SPRING-
SOLAR PANEL
LCRSA

SIZE	CODE IDENT NO.	DRAWING NO.
C	03953	D416-452000

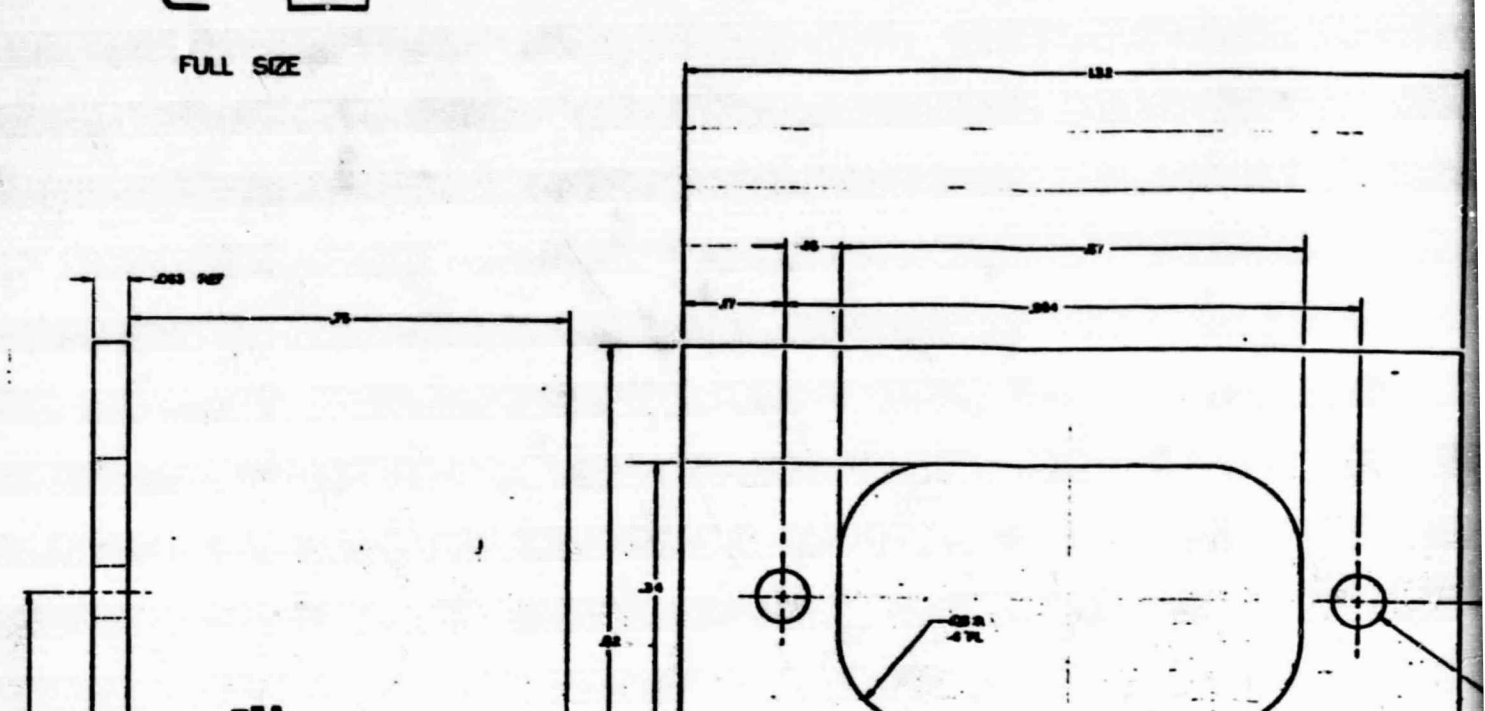
SCALE 1/1 SHEET 1/1

D416-452000

2-27, 2-28



FULL SIZE



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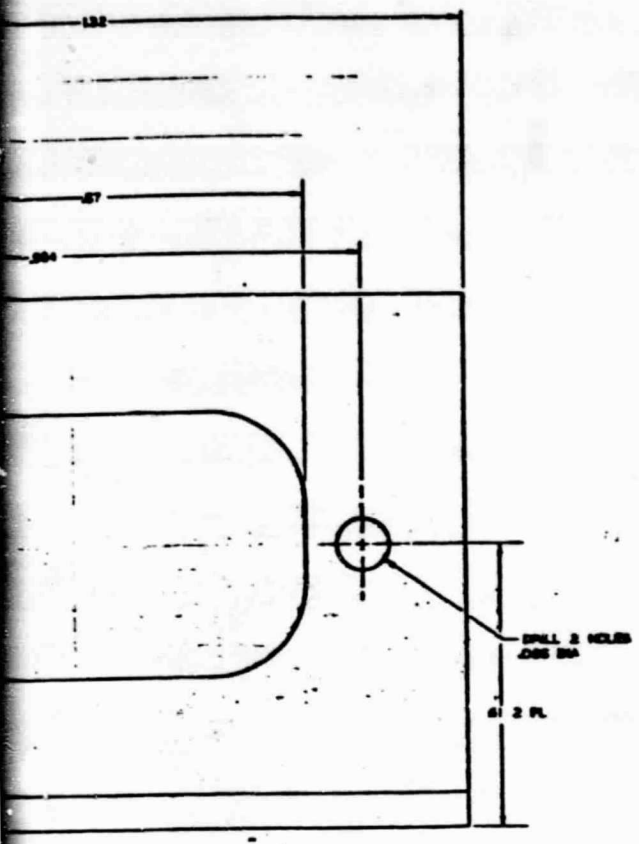
FOLDOUT FRAME

2. FINISH PER MF0004-001, ITEM 3-4
3. MARK PART NO. PER MA0004 301 - CODE 81-09-05-15
5. CONFIGURATION CONTROL PER MF0009-001
4. INSPECT PER MT0501-508 CLASS 2
3. STD DETAIL PER MA0002-305
2. BREAK SHARP CORNERS & EDGES
1. RADII RADIUS .060 MAX

NOTES:UNLESS OTHERWISE SPECIFIED

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2-29, 2-30

2-31, 2-32

QTY	QTY	QTY	QTY	QTY	QTY	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA SPECIFICATIONS, SIZES, NOTES, SUPPLIERS
					4	-001	D416-453000	BRACKET	AL SHT	6061-T6 AL QQ-A-250/8 .063 x LWD x LWD

PARTS LIST

-001	4	D416-453004				

DRN	CHK	APP	DATE
	LM	CLE	7/6/82

BRACKET - DISCONNECT SUPPORT LCRSA TEST

SIZE	CAGE IDENT NO	DRAWING NO
E	03953	D416-453000

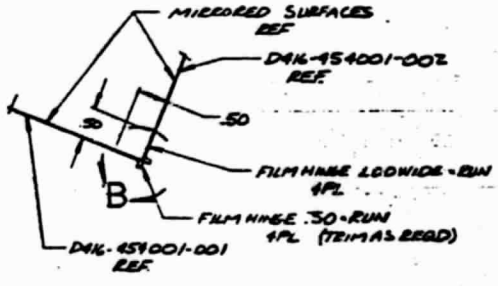
SCALE 1/1 WT

D416-453000

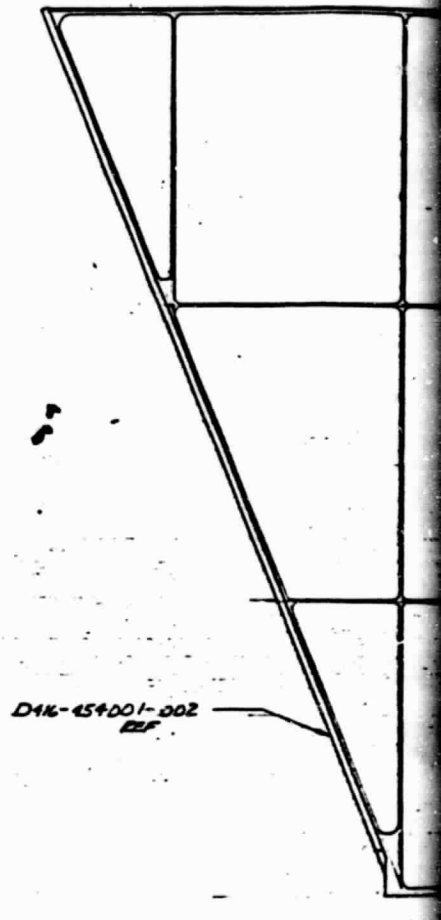
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VIEW B
SCALE 3/1
(PANELS OMITTED FOR CLARITY)

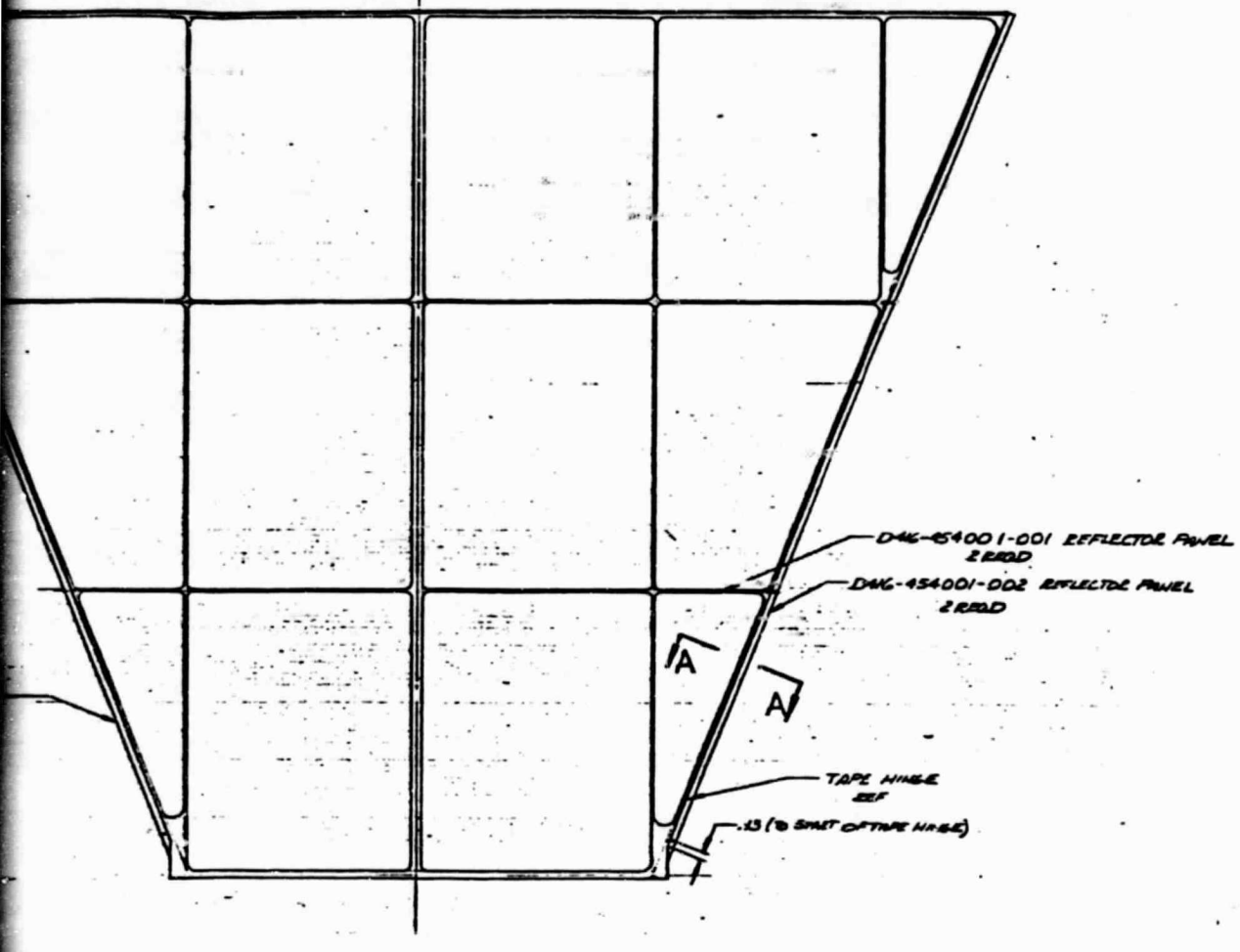


SECTION A A
SCALE 3/1
(TYPICAL ALL 4 CORNERS)



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2 FOLDOUT FRAME

5. HANDLE KAPTON TAPE PER MF0004-001 TABLE III-B
4. CONTAMINATION CONTROL PER MF0001-001
3. PEEL BACK MYLAR COVER PRIOR TO TAPING
2. APPLY TAPE HINGE PER ENGINEERING INSTRUCTION
1. MARK PART NO. PER MA0104-301, CODE BL-08-NG-16

NOTES: UNLESS WISE SPECIFIED

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QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
					2	-002	D416-454001	TAPE REFLECTOR PANEL	ALUMINIZED KAPTON	MBD175-067, TYPE I 1000 Å THICK ±200 Å	
					2	-001	D416-454001	REFLECTOR PANEL			
					1	-001	D416-454000				

PARTS LIST

2-33, 2-34

-001 SHOWN

TAPE PER MF0004-001 TABLE III-B
CONTROL PER MF0001-001
COVER FIBER TO TAPING
PER ENGINEERING INSTRUCTION
PER MA0104-301, CODE BL-08-NG-16
SPECIFIED

-001	1	D416-454001	-002			
ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO.	SERIAL	
RECOMP PER END ITEM		APPLICATION		EFFECTIVITY		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS ANGLES
.XX ± .02 ± 0° 30'
.XXX ± .010
MACH. SURFS "RMS"

DR BY M. Bass 4/30/82
DATE
ENGRG
CHK'D
APPD
MFG

National Semiconductor

RIGID REFLECTOR PANEL ASSY
LCRSAT-TEST

SIZE J | CAGE SHEET NO. 03953 | DRAWING NO. D416-454000
SCALE
SHEET

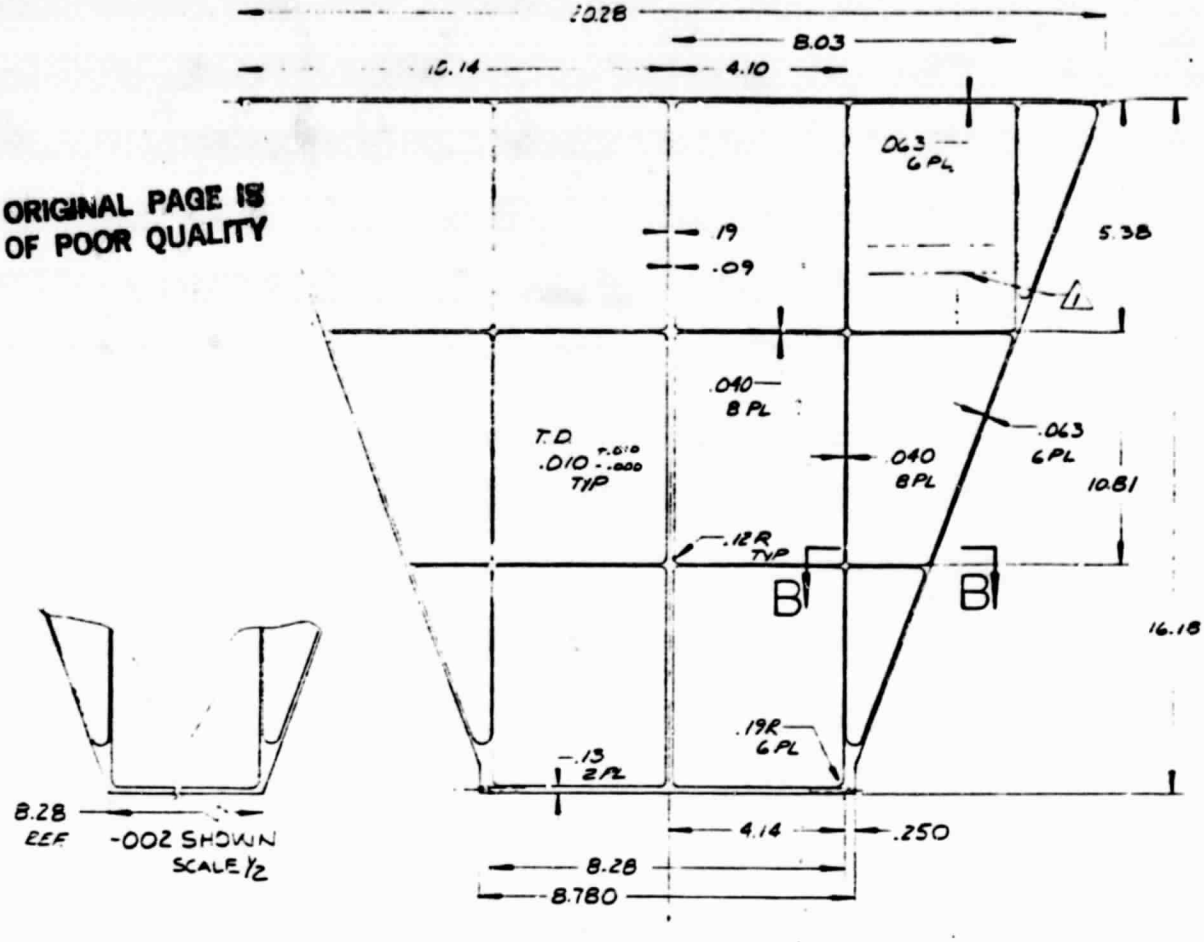
5 4 4 3 2 1

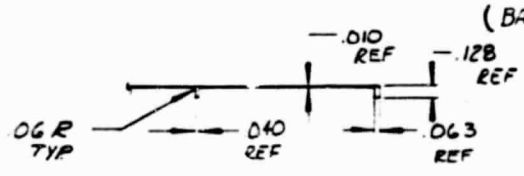
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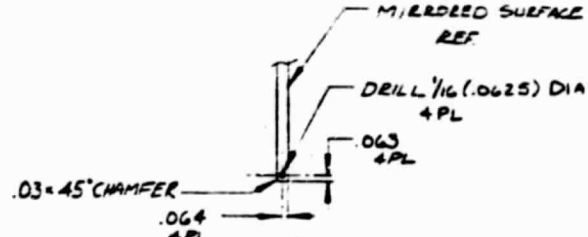
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SECTION BB
SCALE 1/1



VIEW A
SCALE 1/1

5 ALUMINIZE BACKSIDE TO AN EMISSIVITY OF ≤.15 PER M&P REQMTS

4 ALUMINIZE SURFACE TO 500 Å THICKNESS, SPECULAR REFLECTIVITY OF ≥.90, AND EMISSIVITY OF .05, PER M&P REQMTS

3 T.D. DENOTES THICKNESS DIMENSION

2. CONTAMINATION CONTROL PER MF0001-001, COVER MIRROR WITH LABEL CRAFT LPCM 320 BLUE, OR EQU

1 MARK PART NO PER MA0104-301 CODE BL-08-NG-16

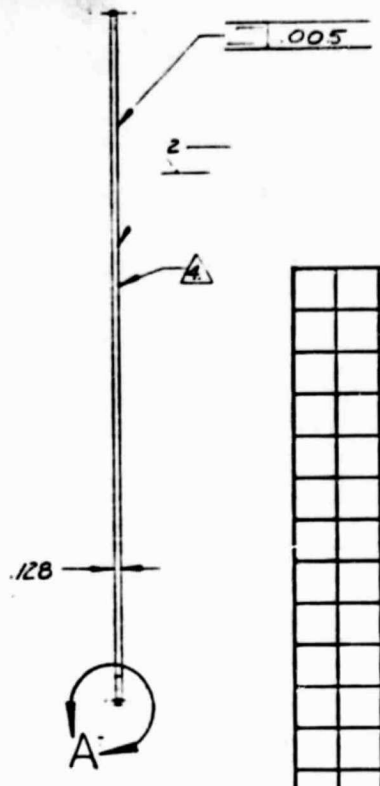
NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	QTY	REQD PER END ITEM
-002	2	
-001	1	
-001	2	

REVISIONS				
ZONE	NO.	DESCRIPTION	DATE	APPROVED

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2 FOLDOUT FRAME



QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA, SPECIFICATIONS SIZES, NOTES, SUPPLIERS	ZONE
					2	-002	D416-454001	REFLECTOR PANEL	POLYSULFONE/ GRAPHITE	MIXTURE PER MRP RQMTS	
					3	-001	D416-454001	REFLECTOR PANEL	POLYSULFONE/ GRAPHITE	MIXTURE PER MRP RQMTS	

PARTS LIST

O SURFACE

.0625) DIA ×1.0 DEEP MIN

-001 SHOWN
-002 SAME, EXCEPT AS NOTED

ITEM	QTY	NEXT ASSY	USED ON
-002	2	D416-454000	LCRSA TEST
-001	1	SPARE	1
-001	2	D416-454000	LCRSA TEST

REQD PER END ITEM | APPLICATION | EFFECTIVITY: END ITEM NO. | THRU

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX = ± .03; .XXX = ± .010
ANGLES: ± 0° 30'
HOLES NOTED "DRILL"

.013 THRU	.040	+ .001 − .001
.041 THRU	.130	+ .002 − .001
.131 THRU	.229	+ .003 − .001
.230 THRU	.500	+ .004 − .001
.501 THRU	.750	+ .005 − .001
.751 THRU	1.000	+ .007 − .001
1.001 THRU	2.000	+ .010 − .001

DR BY: M.S. BISS 5/18/82
CHK BY:
APPROVED BY

Rockwell International

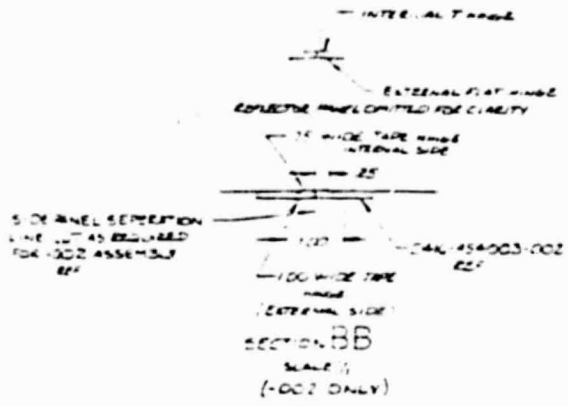
REFLECTOR PANEL
RIGID/INTEGRAL FRAME
LCRSA-TEST

SIZE	CODE IDENT NO	DRAWING NO.
D	03953	D416-454001

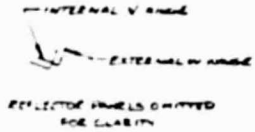
SCALE 1/2 ENLRGD | SHEET 1/1

D416-454001

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SECTION BB
SCALE 1/1
(-002 ONLY)

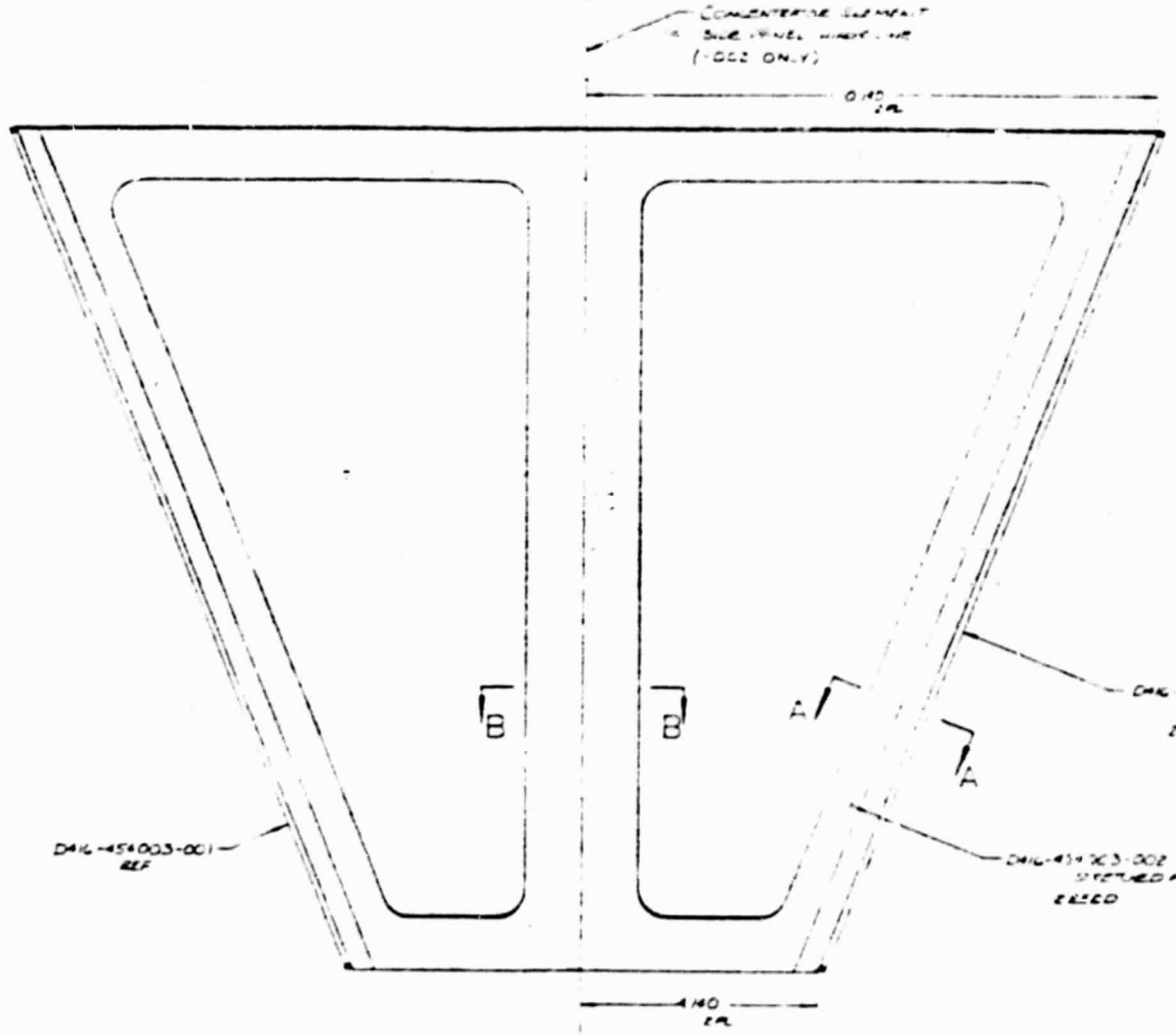




SECTION AA
SCALE 1/1
(SECTION TYP (AL ALL 4 CORNERS)

FOLDOUT FRAME

2 FOLDOUT FRAME



ORIGINAL PAGE IS
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3 FOLDOUT FRAME

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454003-001 REFLECTOR PANEL
STEERABLE 11.4M RIGID FRAME
-002 SIMILAR (MADE FROM 001 AFTER FINAL TESTS)
-001 SHOWN

2-37, 2-38

REFLECTOR PANEL
11.4M RIGID FRAME

PARTS LIST

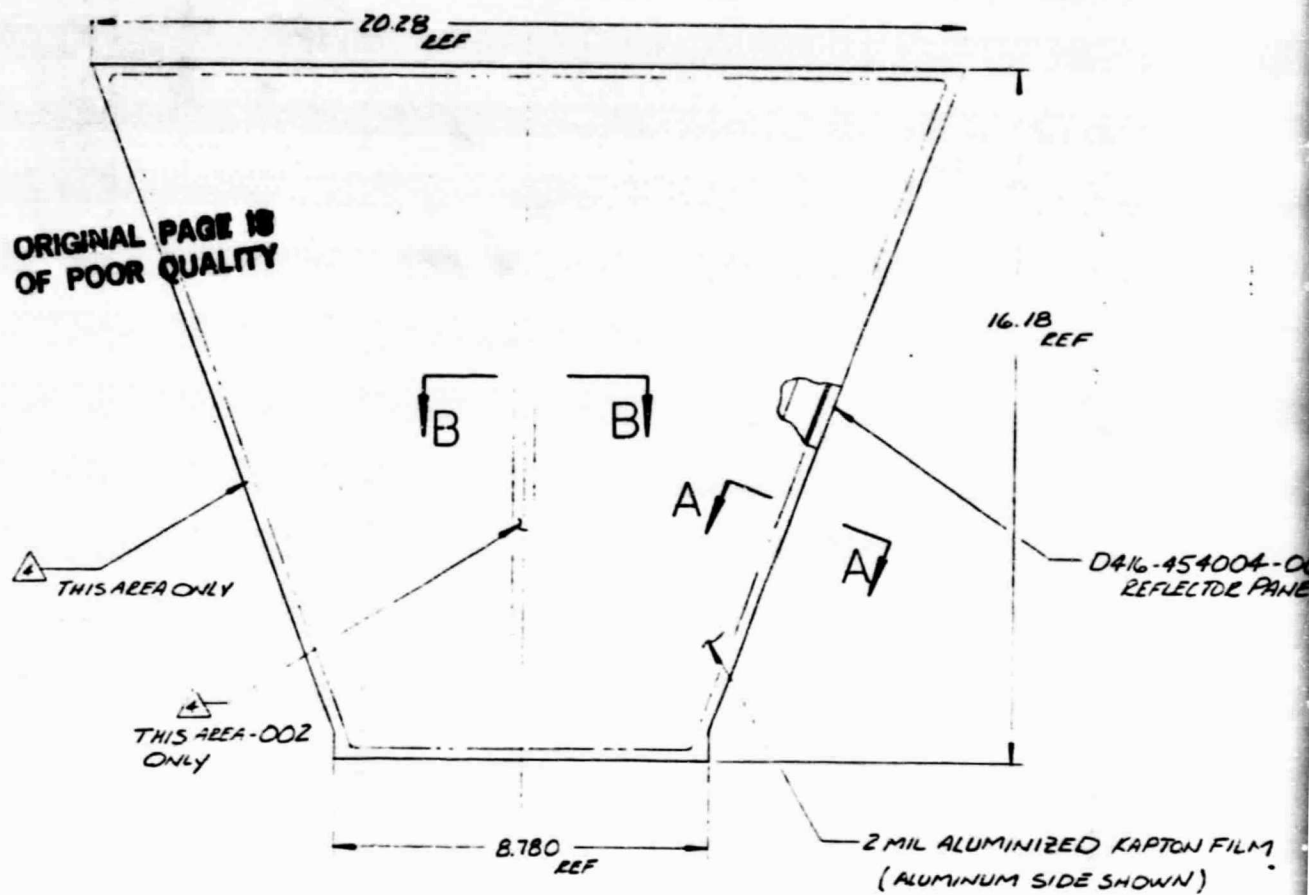
E.L.M. REFLECTOR
PANEL ASSEMBLY

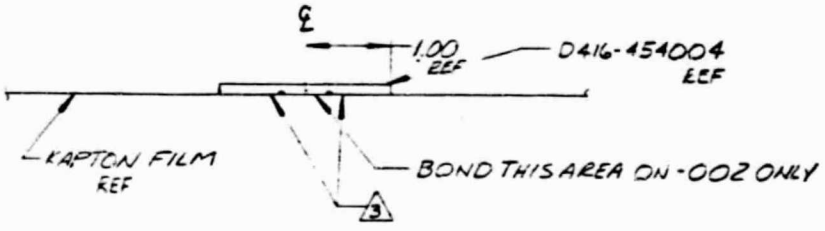
J 103953 | 454002

PER MIL-STD-100A-001 TABLE III-P
PER MIL-STD-001-001
PER MIL-STD-16
ENGINEERING INSPECTION
MIL-STD-16
SPECIFIED

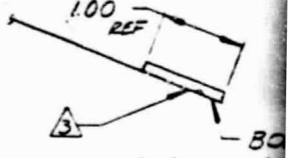
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SECTION BB
SCALE 1/1



SECTION AA
SCALE 1/1

-001 SHO
-002 SAM
AS NOTE

4 BOND THIS AREA PER M&P RQMTS 3M JETMELT ADHESIVE 3779
3 DO NOT BOND THIS AREA
2. CONTAMINATION CONTROL PER MF0001-001, COVER MIRROR WITH LABEL CRAFT LPCM 320 BLUE, OR EQIV.
1. MARK PART NO PER MA0104-301, CODE BL-08-NG-16
NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	QTY	
-001	1	SA
-002	2	D41
001	2	D41
REQD PER END ITEM		

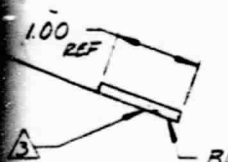
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

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2 FOLDOUT FRAME

D416-454004-001 (SHOWN)
REFLECTOR PANEL

...D KAPTON FILM
...E SHOWN)



...CTION AA
SCALE 1/1

-001 SHOWN
-002 SAME (EXCEPT AS NOTED)

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA SPECIFICATIONS SIZES NOTES SUPPLIERS	ZONE
								MIRROR	ALUMINUMIZED KAPTON	MB0125-066 2 MIL	
				1		-002	D416-454004	REFLECTOR PANEL RIGID FRAME			
					1	-001	D416-454004	REFLECTOR PANEL RIGID FRAME			
			2	-002		-	D416-454003				
				3	-001	-	D416-454003				

PARTS LIST

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO.	THRU
-001	1	SPARE	LCCSA TEST		
-002	2	D416-454002	LCCSA TEST		
001	2	D416-454002	LCCSA TEST		
REQD PER END ITEM		APPLICATION		EFFECTIVITY	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX = ± .03; .XXX = ± .010
ANGLES: ± 0° 30'
HOLES NOTED "DRILL"
.013 THRU .040 + .001 − .001
.041 THRU .130 + .002 − .001
.131 THRU .229 + .003 − .001
.230 THRU .500 + .004 − .001
.501 THRU .750 + .005 − .001
.751 THRU 1.000 + .007 − .001
1.001 THRU 2.000 + .010 − .001

DR BY: M BISS 6/4/82
CHK BY:
APPROVED BY

Rockwell International

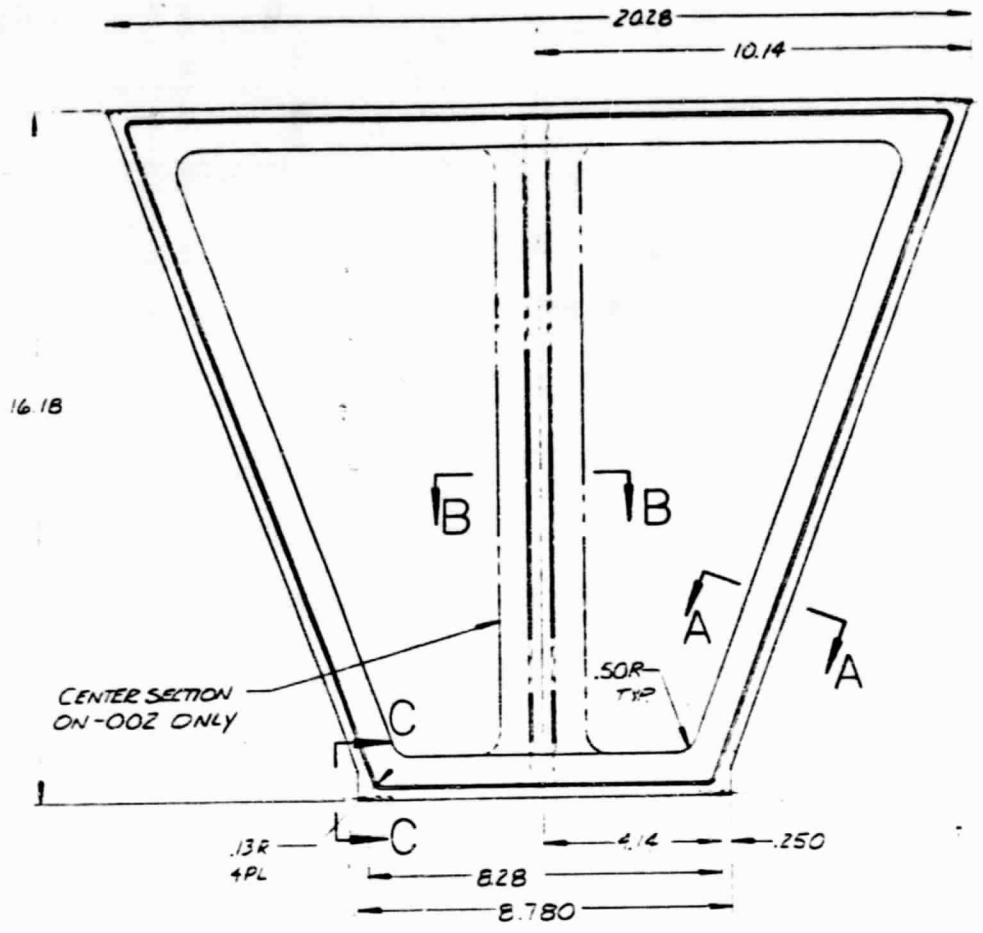
REFLECTOR PANEL - STRETCHED FILM / RIGID FRAME
LCCSA - TEST

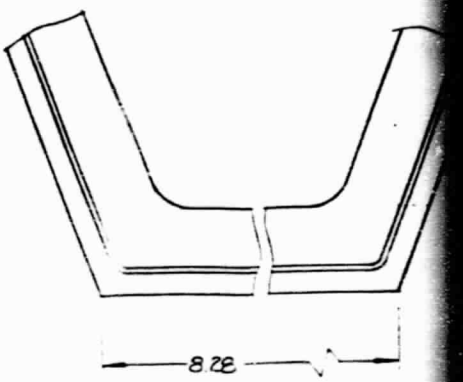
SIZE	CODE IDENT NO	DRAWING NO.
D	03953	D416-454003

SCALE 1/2 & NOTED | SHEET 1/1

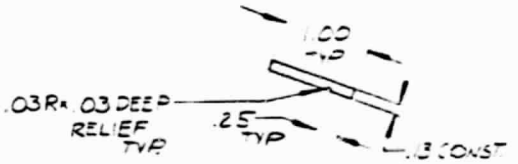
D416-454003

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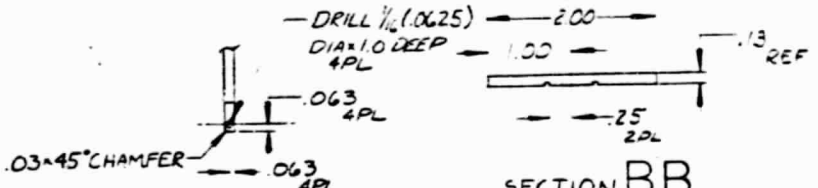




-002 SHOWN
SCALE 1/1



SECTION AA
SCALE 1/1



VIEW CC
SCALE 1/1

SECTION BB
SCALE 1/1
(-002 ONLY REF)

-002 SAME (
AS NO
-001 SHOWN

FOLDOUT FRAME

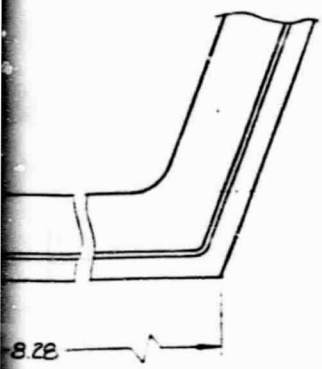
2. CONTAMINATION CONTROL PER MF0001-001
1. MARK PART NO PER MA0104-301, CODE BL-08-NG-16
NOTES: UNLESS OTHERWISE SPECIFIED

ITEM	QTY	REQD PER END ITEM
-002	2	0416
-001	3	0416-

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

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8.28

002 SHOWN
SCALE 1/1

.3 CONST

A

E 1/1

-002 SAME (EXCEPT AS NOTED)
-001 SHOWN

QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	CODE IDENT	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL	DATA, SPECIFICATIONS SIZES NOTES SUPPLIERS	ZONE
					2	-002	D416-454004	REFLECTOR PANEL	POLYSULFONE/ GRAPHITE	PER MLP RQMTS	
					3	-001	D416-454004	REFLECTOR PANEL	POLYSULFONE/ GRAPHITE	PER MLP RQMTS	

D416-454004

PARTS LIST

ITEM	QTY	NEXT ASSY	USED ON	END ITEM NO	THRU
002	2	D416-454003	LLRSA TEST		
001	3	D416-454003	LLRSA TEST		

REQD PER END ITEM | APPLICATION | EFFECTIVITY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: XX = ± 03, XXX = ± 010
ANGLES: ± 0° 30'
HOLES NOTED "DRILL"

013	THRU	040	+ 001 − 001
041	THRU	130	+ 002 − 001
131	THRU	229	+ 003 − 001
230	THRU	500	+ 004 − 001
501	THRU	750	+ 005 − 001
751	THRU	1 000	+ 017 − 001
1 001	THRU	2 000	+ 010 − 001

DR BY M. BISS 5/12/82
CHK BY
APPROVED BY

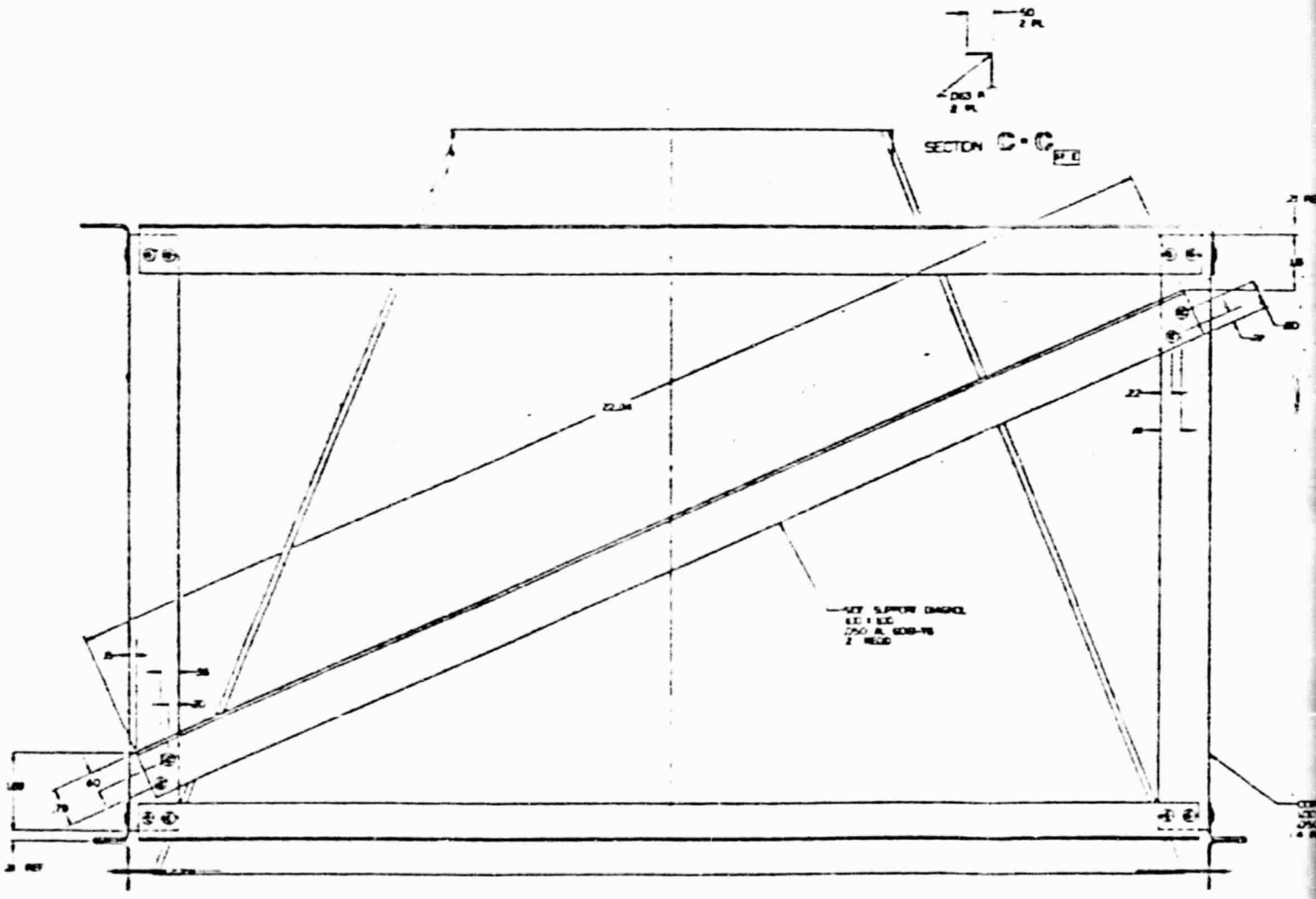
Rockwell International

REFLECTOR PANEL
RIGID FRAME
LLRSA TEST

SIZE	CODE IDENT NO	DRAWING NO
D	03953	D416-454004

SCALE | SHEET 1/1

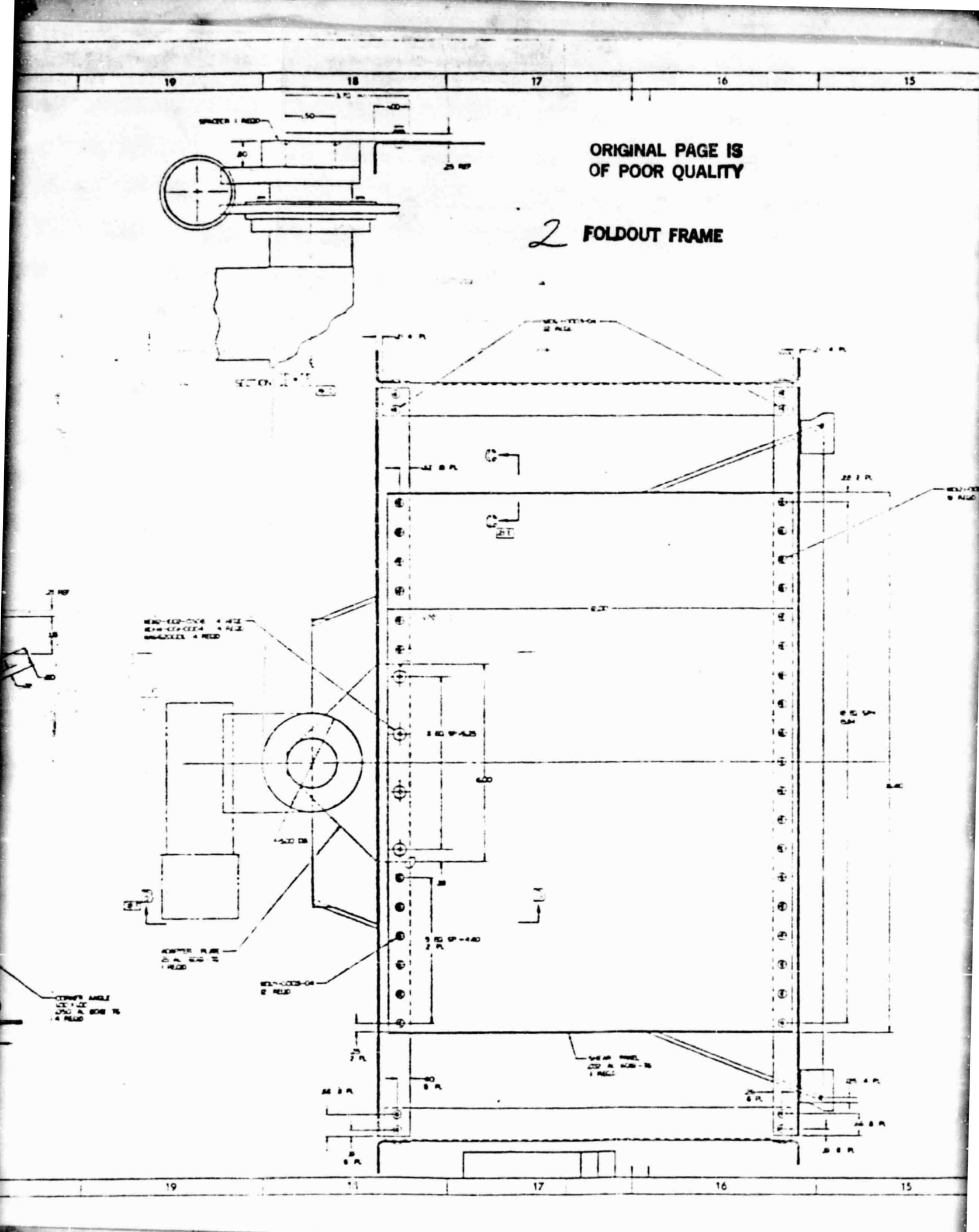
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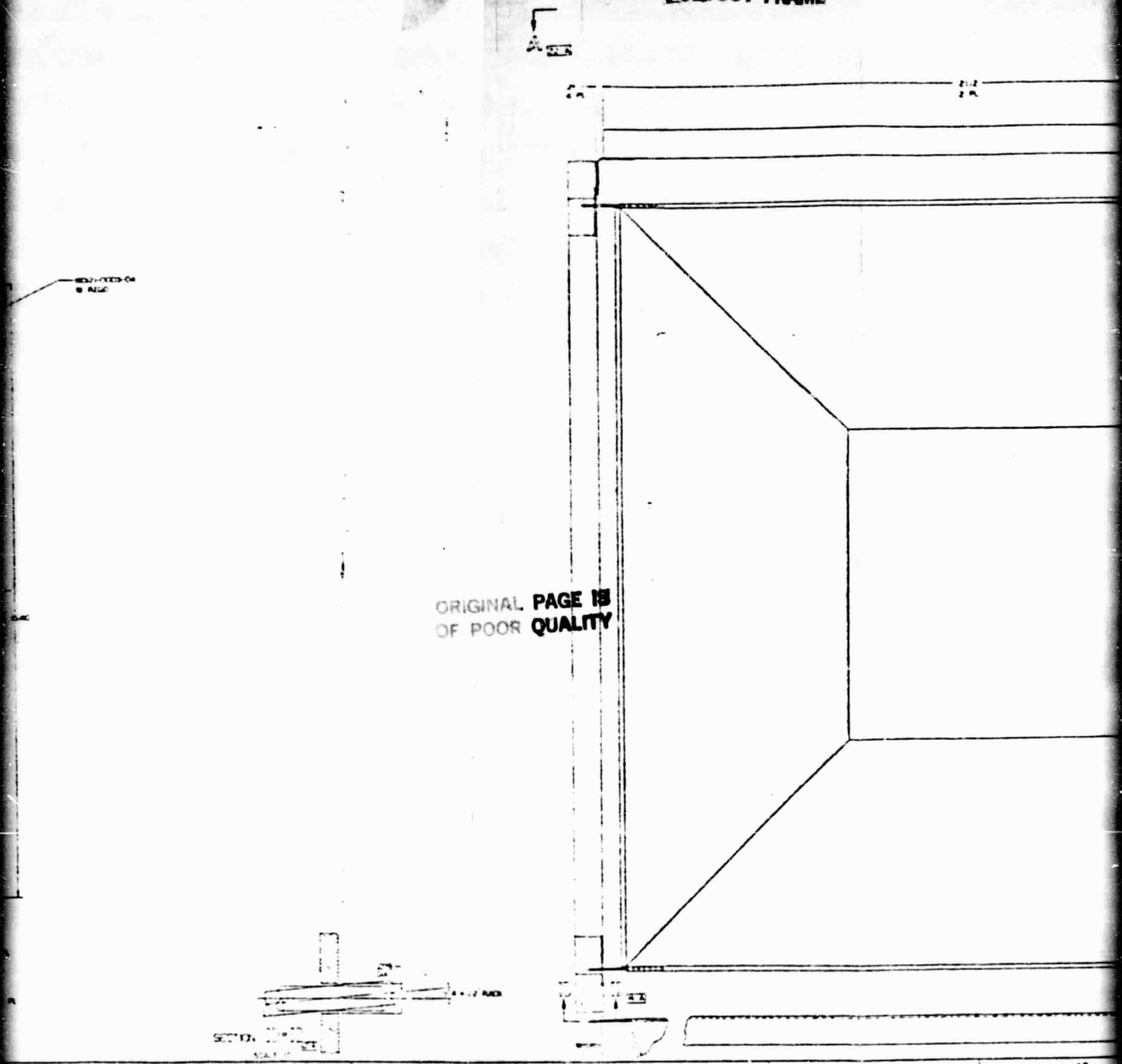
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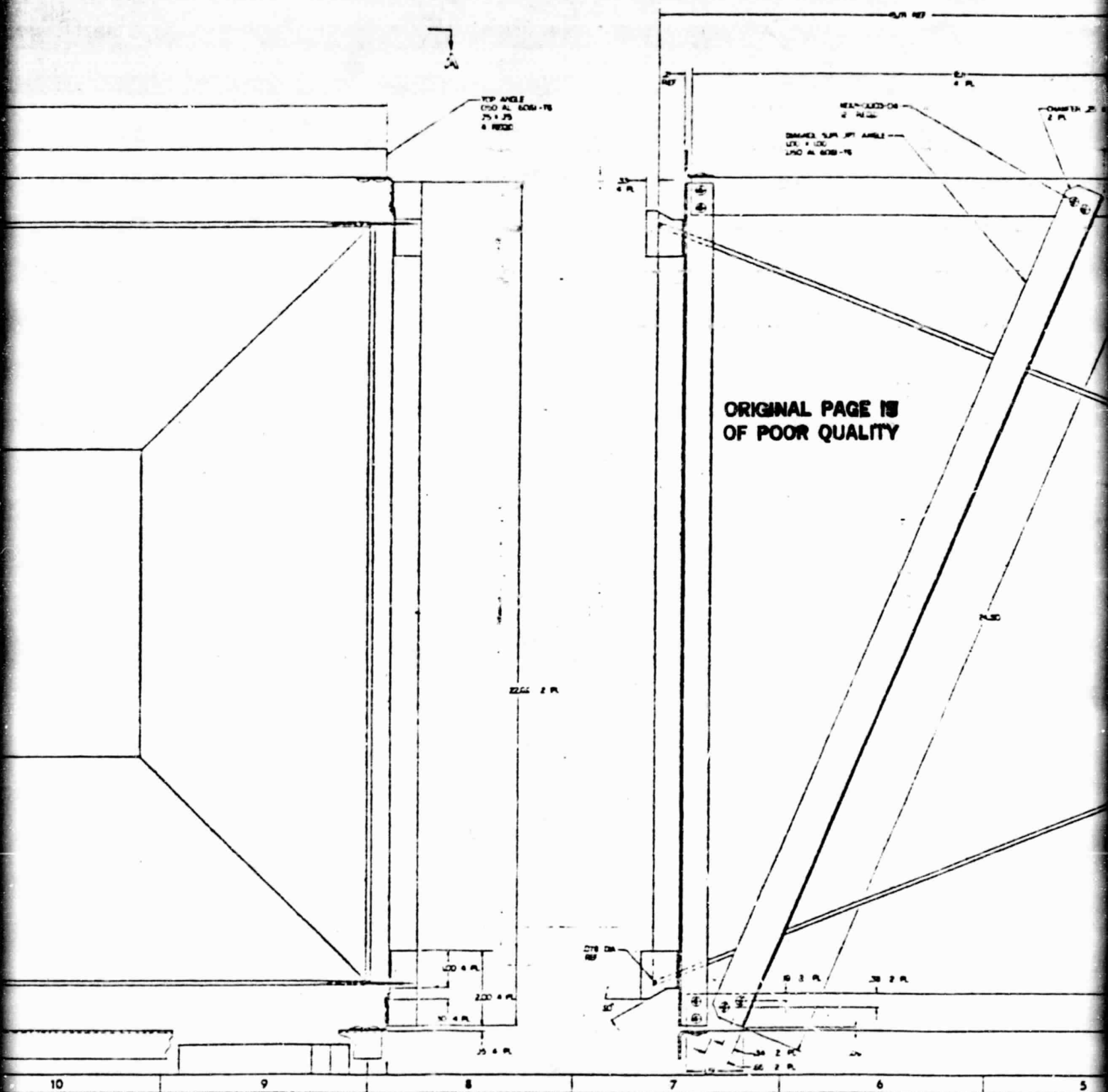
3.

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5 FOLDOUT FRAME



2-43, 2-44

PARTS LIST

CONCENTRATOR-TEST FIXTURE

3.0 PRELIMINARY MANUFACTURING FLOW AND BUILD PLAN

3.1 DISCUSSION

In Section 8.3 of Volume 1 a test plan is described for a ground and flight demonstration array. The following two diagrams show the fabrication sequence for assembling the basic unit of such an array (see Section 4.0 of Volume 1), consisting of one pair of canister-mast assemblies and eight rows of concentrators. The first diagram shows assembly of concentrator rows and solar panels. The second diagram describes construction of the structural elements and their integration with the rows of concentrator elements.

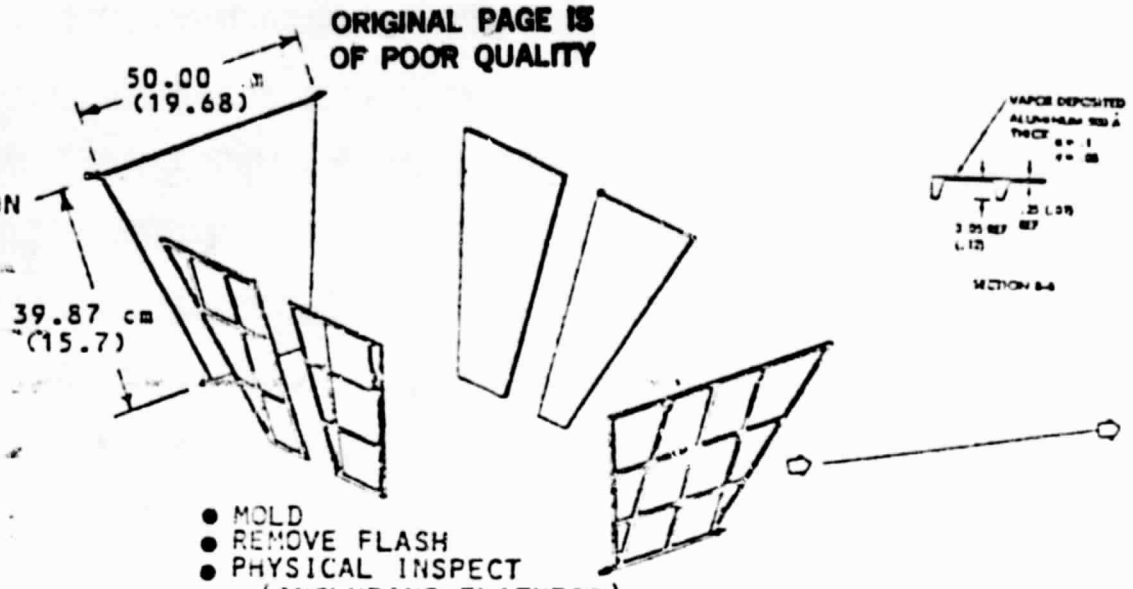
3.2 FLOW AND BUILD DIAGRAMS

1. Assembly of Concentrator Elements
2. Assembly Sequence for Flight Test Configuration

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ALTERNATE REFLECTOR PANELS

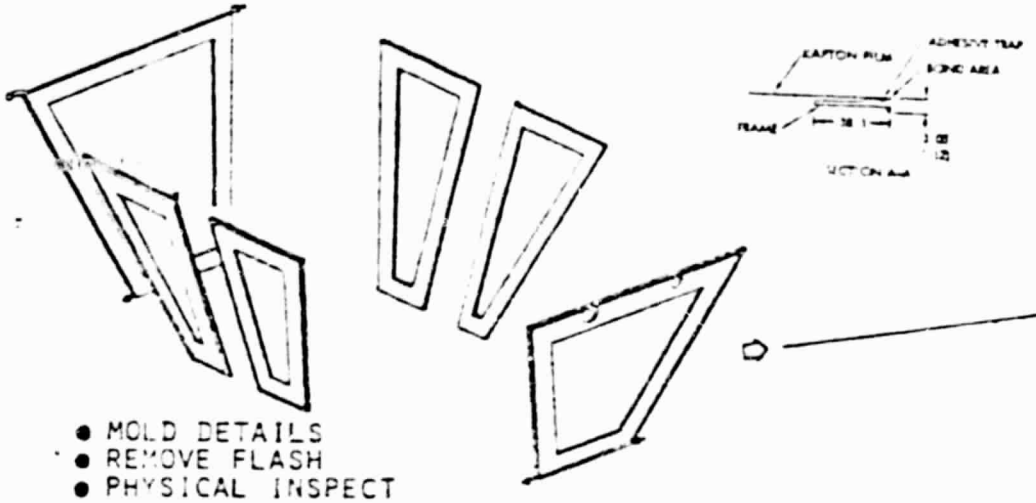
RIGID PANEL - VAPOR DEPOSITED ALUMINUM ON MOLDED POLYSULFONE GRAPHITE



- MOLD
- REMOVE FLASH
- PHYSICAL INSPECT (INCLUDING FLATNESS)

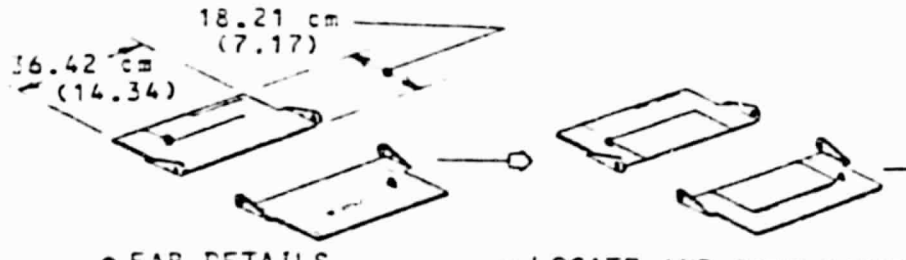
BASELINE REFLECTOR PANELS V416-945401

STRETCHED FILM ON RIGID FRAME



- MOLD DETAILS
- REMOVE FLASH
- PHYSICAL INSPECT

PANEL-RADIATOR V416-945103

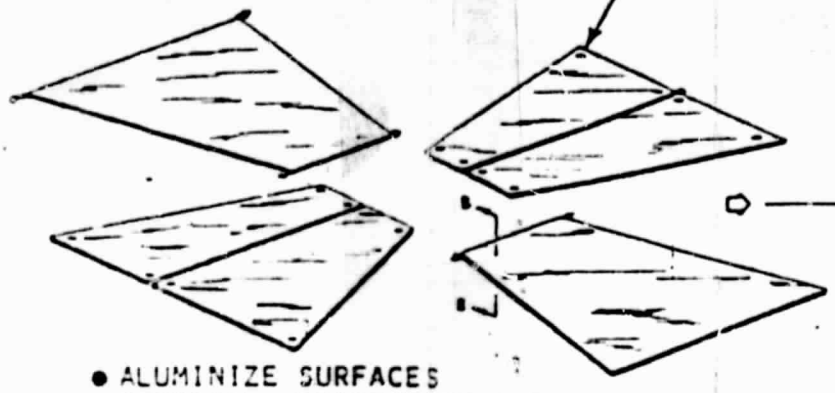


- FAB DETAILS
- MASK AND PAINT PER MF004-001-111-2
- LOCATE AND BOND KAPTON FILM TO PANELS

FOLDOUT FRAME

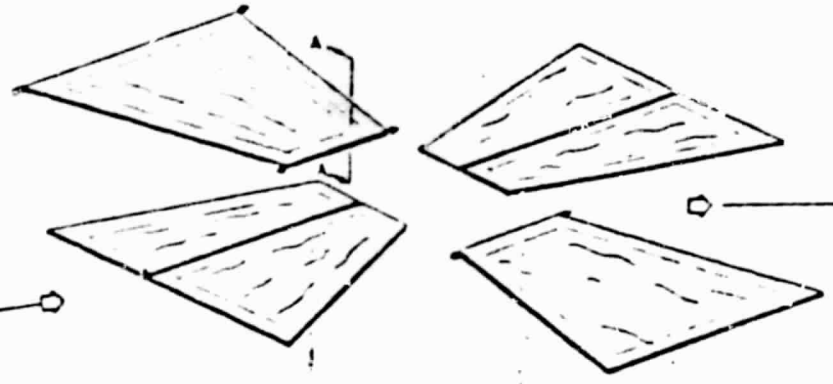
REFLECTOR PANEL ASSEMBL
V416-945400

RESILIENT BUTTONS



- ALUMINIZE SURFACES
- PHYSICAL, EMISSIVITY AND REFLECTIVITY INSPECT
- BOND RESILIENT BUTTONS ON -003 AND -004

OR



- APPLY METALIZED FILM

ASSEMBLY AND TAPING SEQUENCES

SEQUENCE #1

TAPE #1

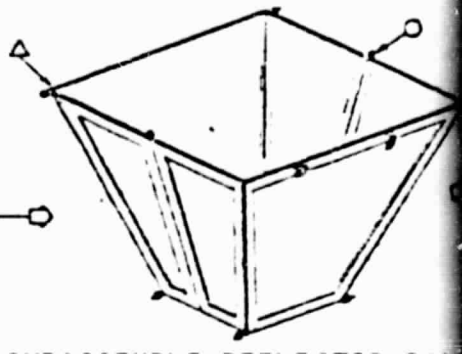


SEQUENCE #2

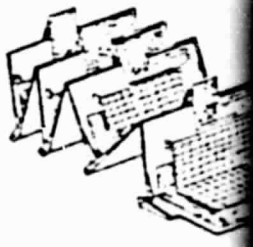


TAPE

NOTE:
△ TAPE IN SEQUENC
○ REVERSE TAPING
TWO PLACES

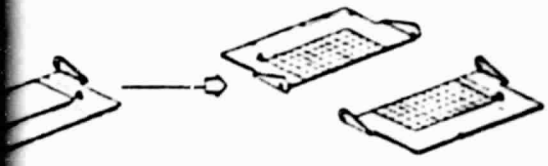


- SUBASSEMBLE REFLECTOR PAN WITH TAPE



PANEL-RADIATOR
V416-945101

SOLAR PANEL ASSEMBLY
V416-945100



ND KAPTON
ANELS

- BOND SOLAR CELLS TO PANELS

- ASSEMBLE PANEL SUBASSEMBLIES WITH SPRINGS, BOLTS, WASHERS AND NUTS

- ASSEMBLE
- INSTALL D

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OF POOR QUALITY

2 FOLDOUT FRAME

EL ASSEMBLY
5400
ICES
2
——TAPE #1 REF.
——TAPE #2
IN SEQUENCE SHOWN, 4 PLCS
RSE TAPING SEQUENCES,
TWO PLACES

CONCENTRATOR TO CONCENTRATOR INTERFACE
(TYPICAL, TWO PLACES, EACH PANEL JOINT)

PIN

CONCENTRATING
V

● ASSEMBLE PANEL SUBASSEMBLIES

FLECTOR PANELS

WIRE HARNESS ASSEMBLIES

V416-945301

V416-945302

● ASSEMBLE REFLECTOR
INSTALL AND BO

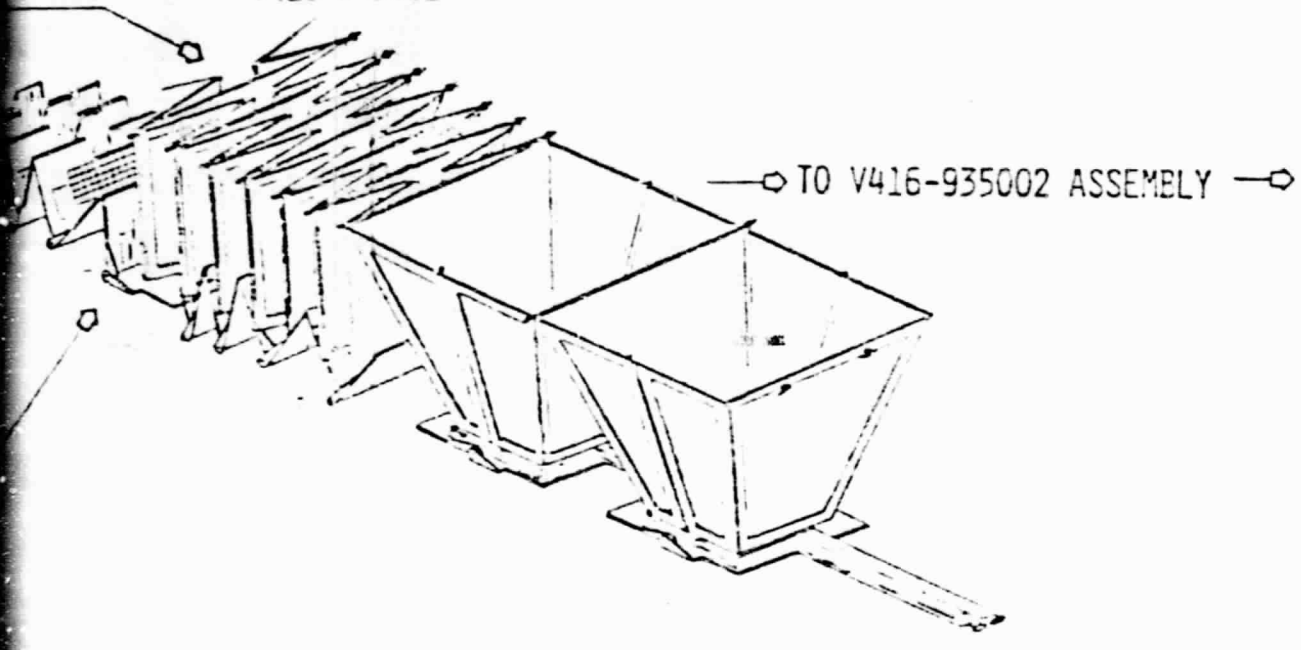
● ASSEMBLE AND BOND SOLAR PANEL ASSEMBLIES AND WIRE HARNESSES
● INSTALL DIODES

3

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CONCENTRATING ELEMENT STACK ASSEMBLY
V416-945001



MBLE REFLECTOR PANEL ASSEMBLY AND SOLAR PANEL ASSEMBLY,
INSTALL AND BOND CLIPS

ASSEMBLY OF
CONCENTRATOR
ELEMENTS

PRELIMINARY MANUFACTURING FLOW AND BUILD PLAN
LOW CONCENTRATION RATIO SOLAR ARRAY

PREPARED BY: K.M HICKS DEPT.: 761 EXT.: 3618
DATE: JAN 19, 1983 REVISED: FEB. 22, 1983

3-3, 3-4

4 FOLDOUT FRAME

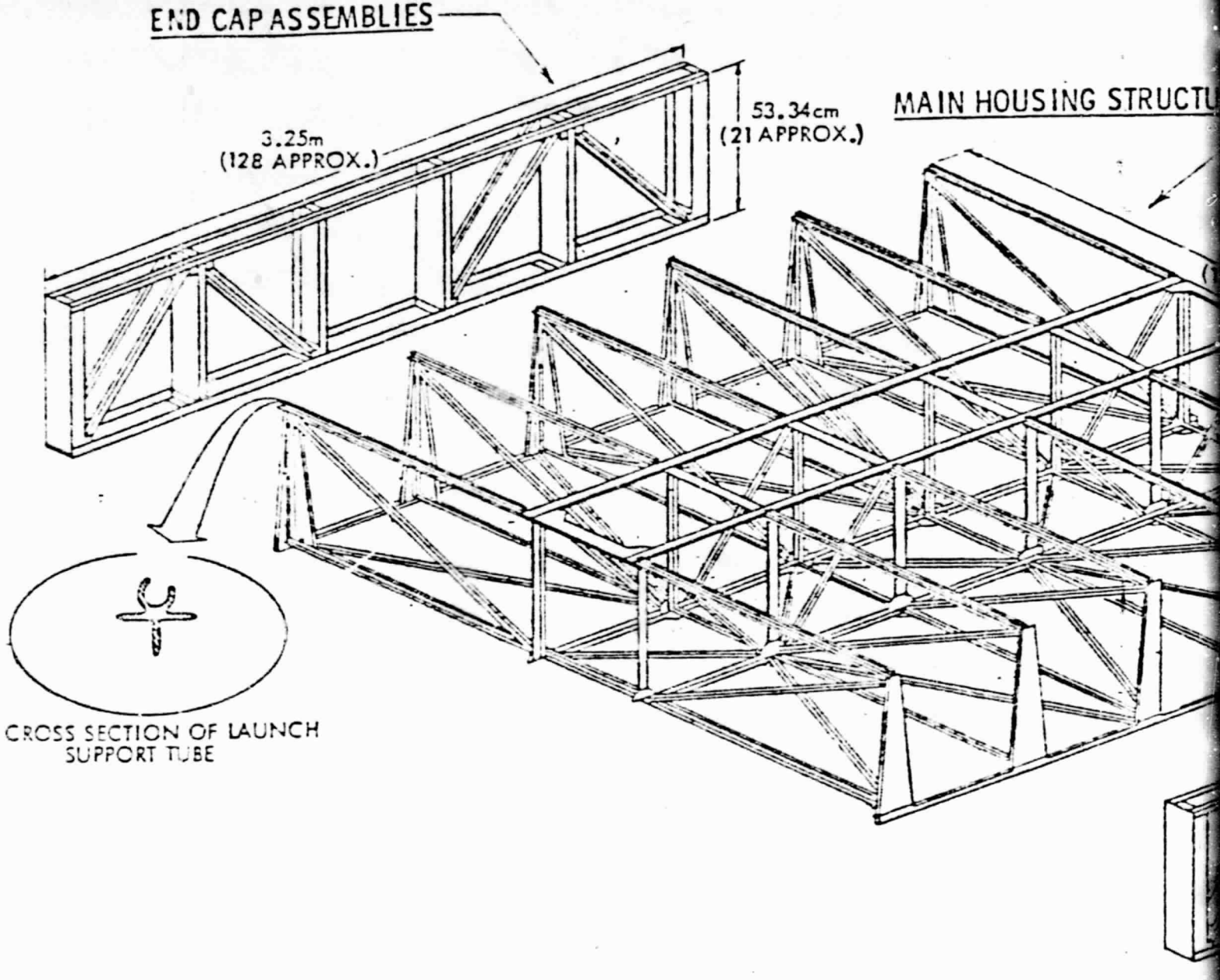
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HOUSING ASSEMBLY

V416-935101

REPRESENT



CROSS SECTION OF LAUNCH
SUPPORT TUBE

- FABRICATE DETAILS
- ASSEMBLE STRUCTURE AND INSTALL LAUNCH SUPPO

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REPRESENTATIVE RIVETED JOINT CONFIGURATION

REFLECTO

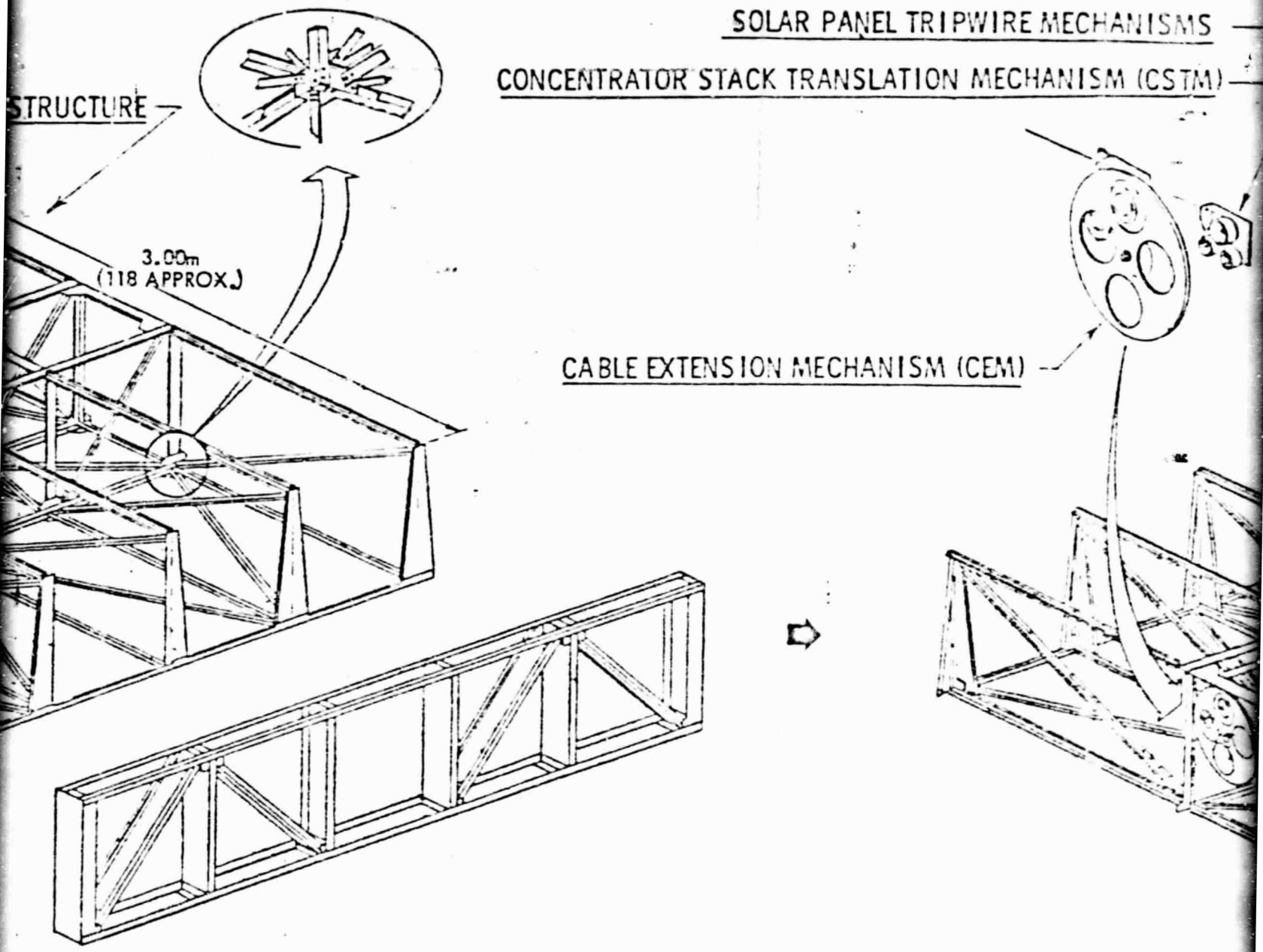
SOLAR PANEL TRIPWIRE MECHANISMS

CONCENTRATOR STACK TRANSLATION MECHANISM (CSTM)

STRUCTURE

3.00m
(118 APPROX.)

CABLE EXTENSION MECHANISM (CEM)



CH SUPPORT TUBES

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REFLECTOR PANEL TRIPWIRE MECHANISMS

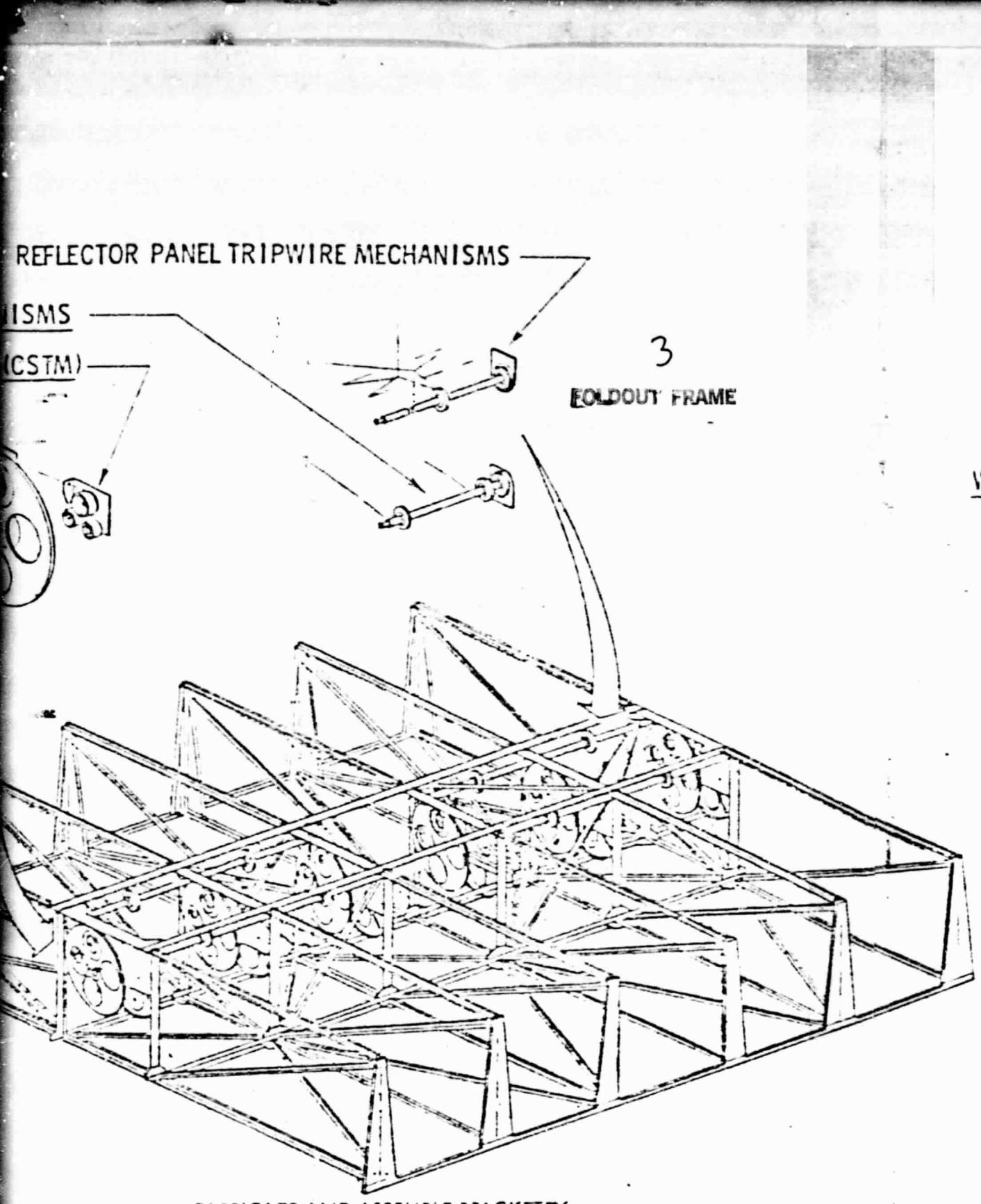
ISMS

(CSTM)

3

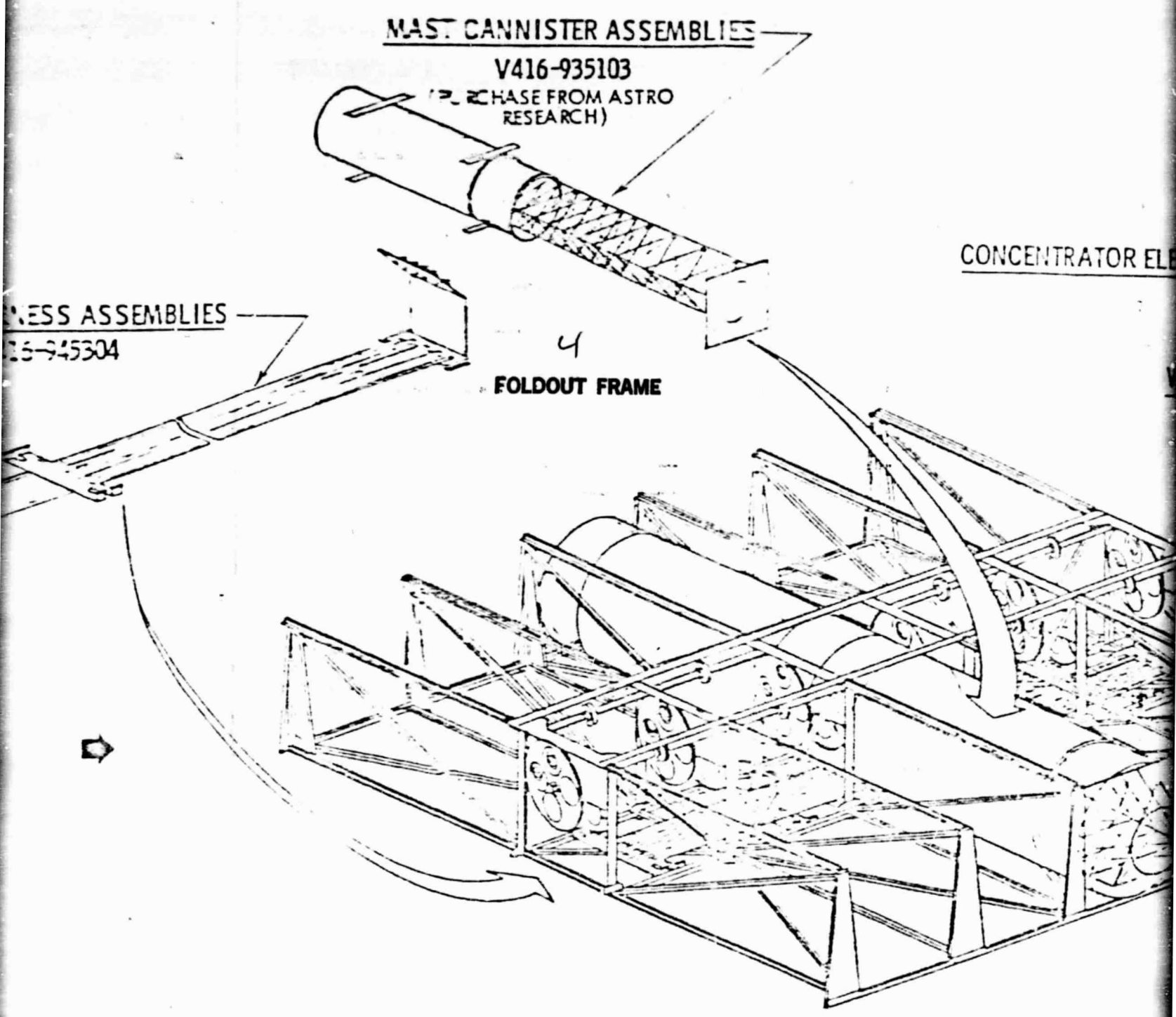
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WIRE HARNESS



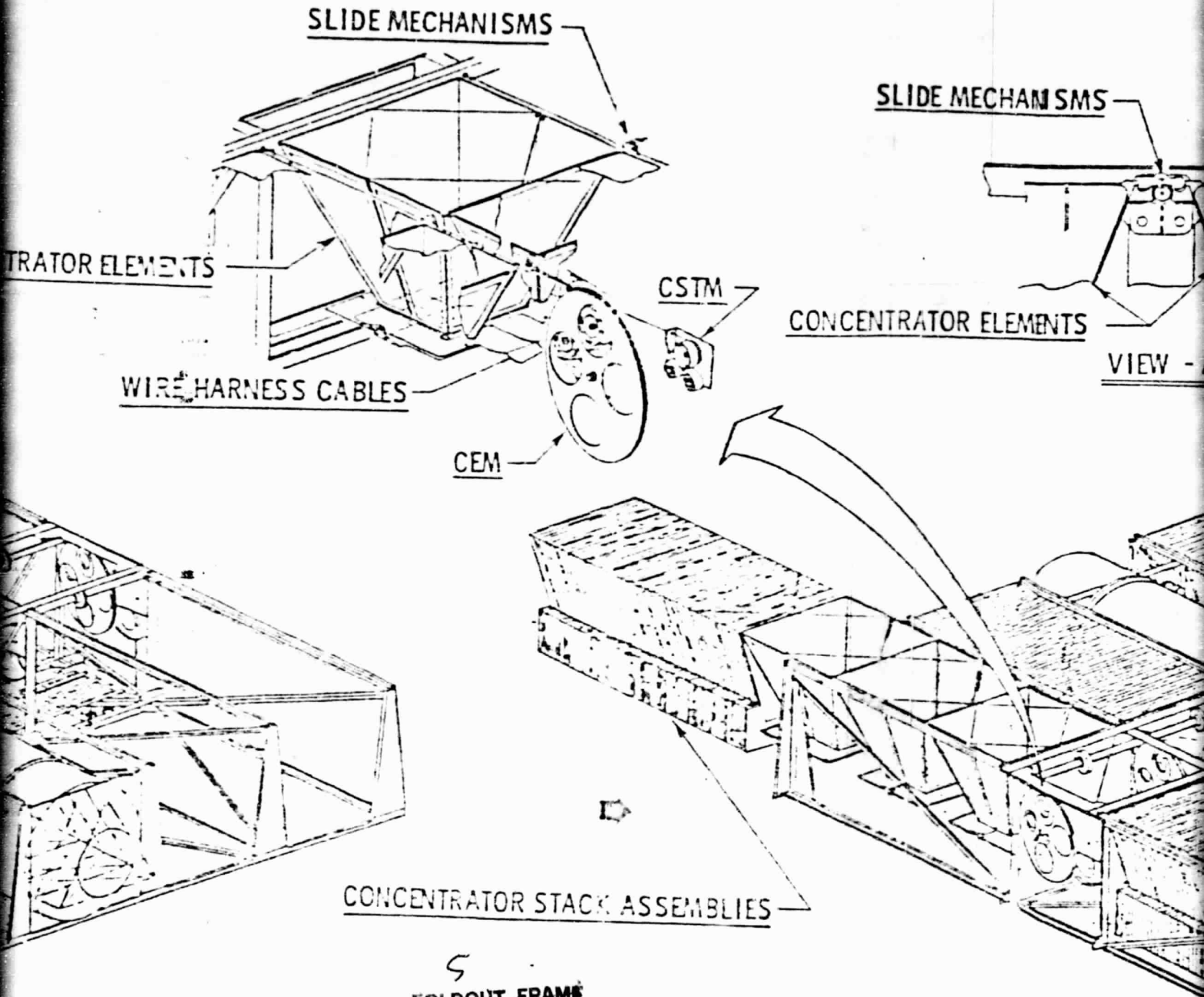
- FABRICATE AND ASSEMBLE BRACKETRY
- INSTALL BRACKETRY
- FABRICATE AND ASSEMBLE MECHANISMS
- INSTALL MECHANISMS

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- INSTALL WIRE HARNESS ASSEMBLIES
- INSTALL MAST/CANNISTER ASSEMBLIES

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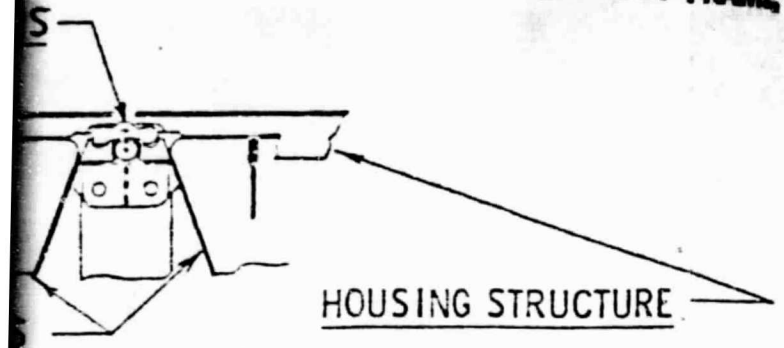
LIES
MBLIES

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- INSTALL C
  CONC
- PERFORM

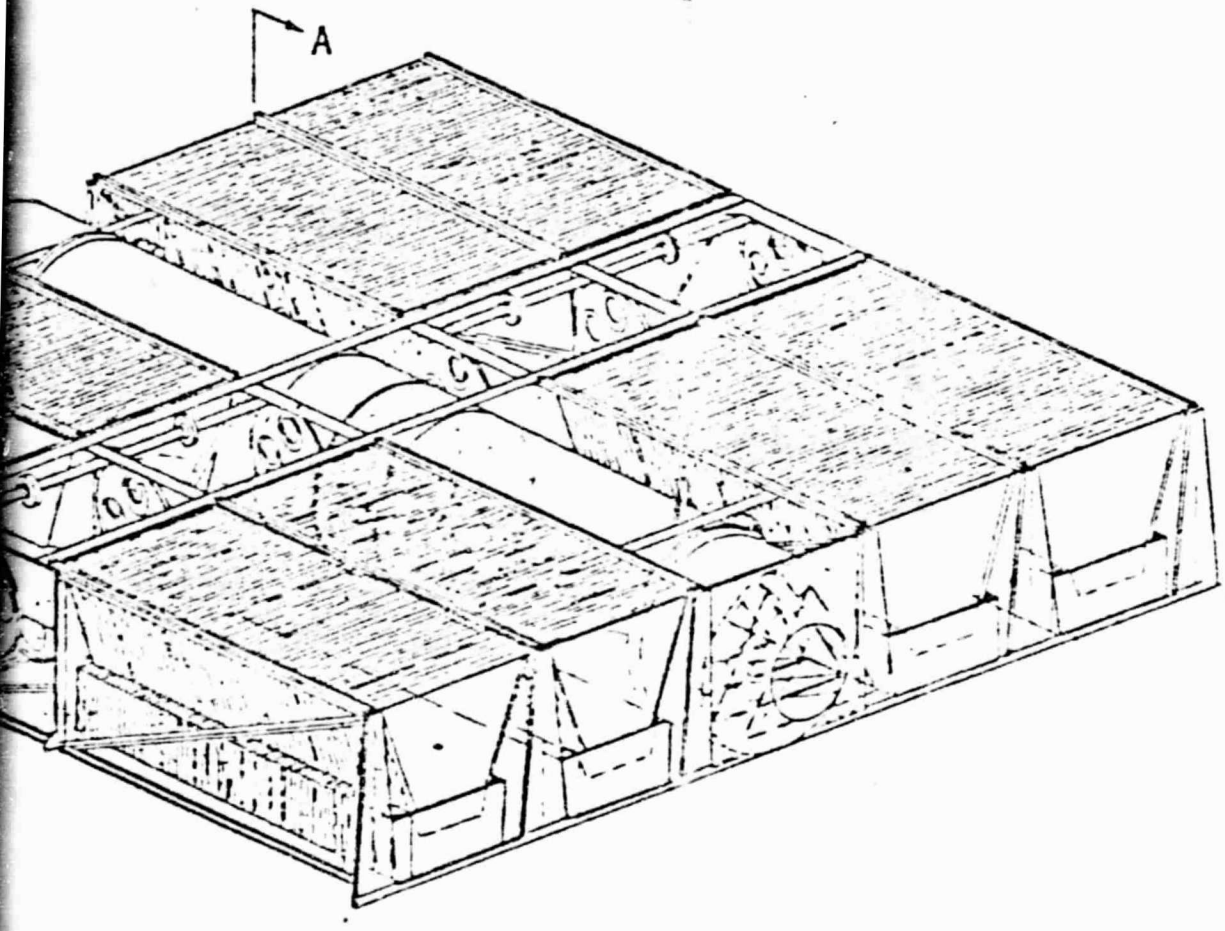
6

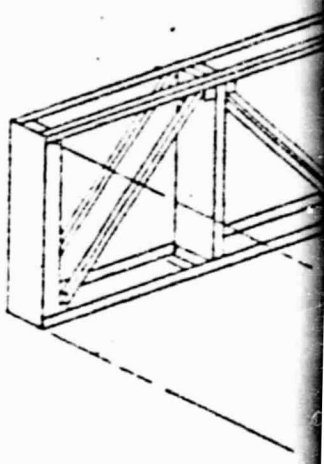
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VIEW - A

END CAP ASSEMBLIES

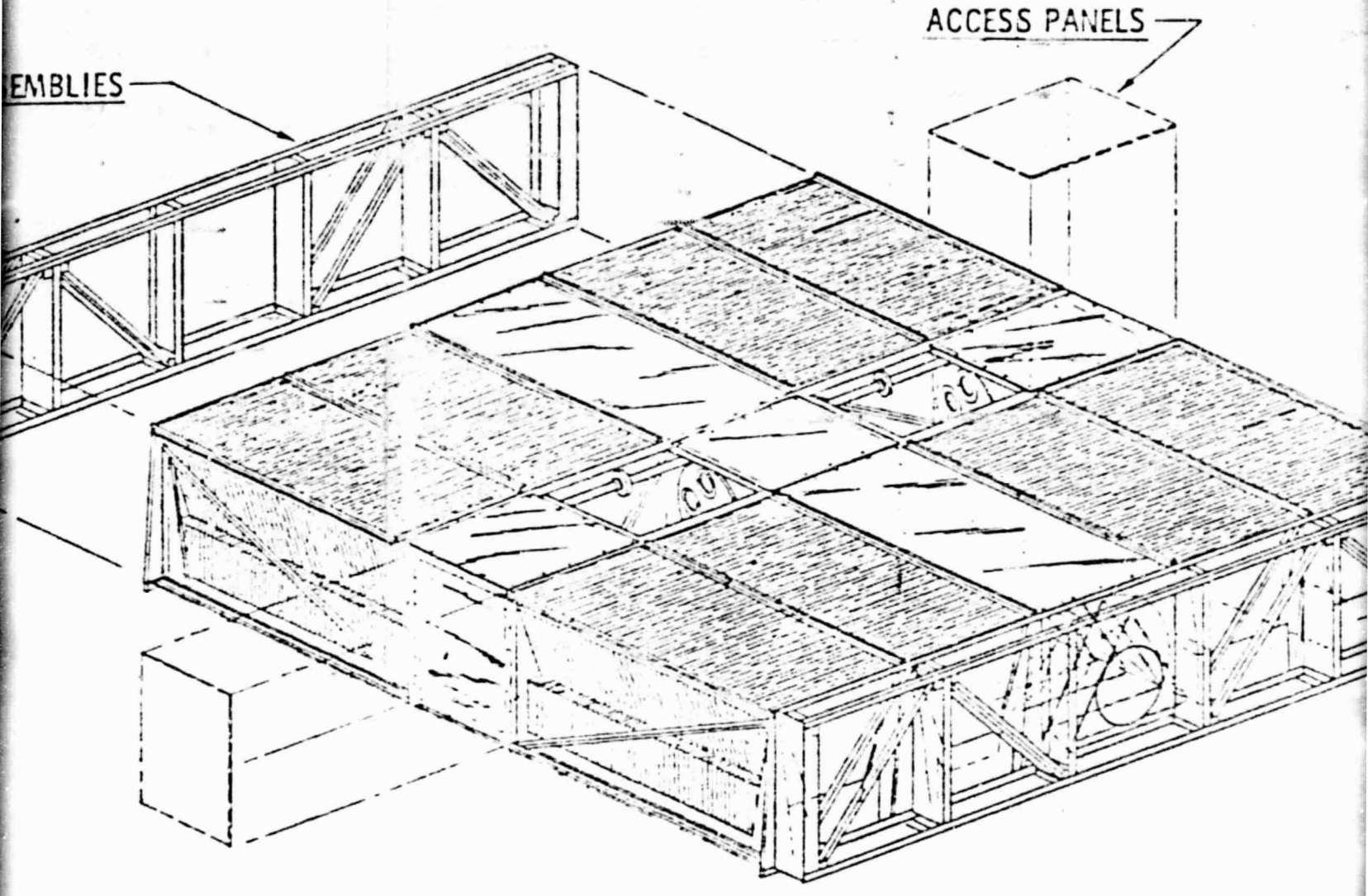




- INSTALL CONCENTRATOR STACK ASSEMBLIES AND SLIDE ASSEMBLIES CONCURRENTLY
- PERFORM ELECTRICAL HOOKUP AND CHECKOUT

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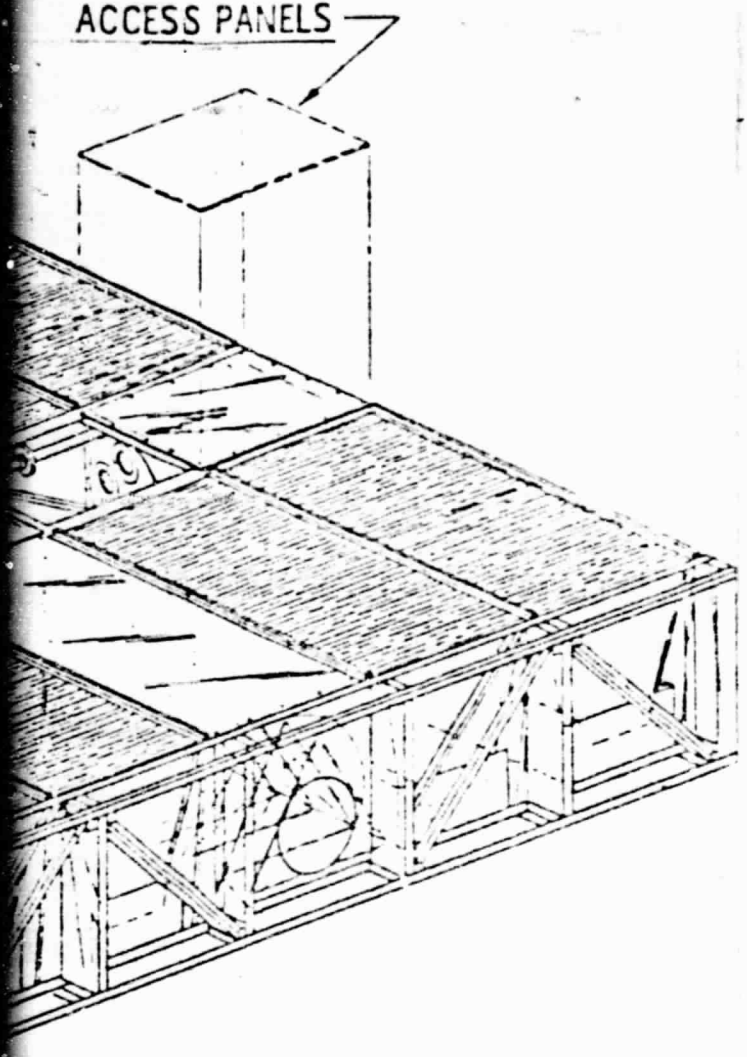
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- INSTALL END CAP ASSEMBLIES - SECURE TO MAST/CANNISTER ASSEMBLIES
- SECURE CABLES TO END CAP ASSEMBLIES
- INSTALL ACCESS PANELS (TOP, BOTTOM AND ENDS, AS SHOWN)
- INSPECT COMPLETE

7

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TO TEST

ASSEMBLY SEQUENCE
FOR FLIGHT TEST
CONFIGURATION

...IPE TO MAST/CANNISTER ASSEMBLIES
...S
...TTOM AND ENDS, AS SHOWN)

MANUFACTURING FLOW AND BUILD PLAN
LOW CONCENTRATION RATIO SOLAR COLLECTOR

PREPARED BY: K.M. HICKS DEPT: 761
EXT: 3618 DATE: JAN. 25, 1983 REVISED: FEB 4, 1983

3-5, 3-6