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Produced by the NASA Center for Aerospace Information (CASI)
LOW CONCENTRATION RATIO
SOLAR ARRAY FOR LOW EARTH ORBIT MULTI-100 kW APPLICATION
VOLUME 2—DRAWINGS

FINAL REPORT
"JLY 1983"

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

Contract NAS8-34214

Original page is of poor quality
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.
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. Hau, 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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<td>1-2</td>
</tr>
<tr>
<td>2 Test Hardware Drawing Tree</td>
<td>2-2</td>
</tr>
</tbody>
</table>
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 m² 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.
1.2 DESIGN DRAWINGS

1. V416-935001
2. V416-935002, sheets 1 of 2 and 2 of 2
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. V416-945.001
17. V416-945100
18. V416-945101
19. V416-945103
20. V416-945200
21. V416-945202
22. V416-945203
23. V416-945204A
24. V416-945301
25. V416-945302
26. V416-945303
27. V416-945304
28. V416-945305
29. V416-945400
30. V416-945401
FOLDOUT FRAME

ORIGINAL PAGE IS
OF POOR QUALITY

-003 SHOWN
ORIGINAL PAGE 13
OF POOR QUALITY

2 FOLDOUT FRAME

NOTES: UNLESS OTHERWISE SPECIFIED

ENDCAP INTERIOR BOLTS
FOLD-UP INTEGRAL BOLTS
## FOLDOUT FRAME

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<table>
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<tr>
<th>PARTS LIST</th>
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<tr>
<td><strong>AUX-DEPLOYMENT</strong></td>
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<tr>
<td><strong>EXTENSION MECHANISM</strong></td>
</tr>
<tr>
<td><strong>LCSA</strong></td>
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<td>J 03953 V416-935202</td>
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**END CAP INTERMEDIATE BOLTS**

**INTERMEDIATE BOLTS**

**STAINLESS STEEL, OTHERWISE SPACED**

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1-7, 1-8
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FOLDOUT FRAME

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ORIGINAL PAGE 16
OF POOR QUALITY

4 FOLDOUT FRAME
FOLDOUT FRAME
ORIGINAL PAGE IS OF POOR QUALITY

3 FOLDOUT FRAME
FOLDOUT FRAME

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SECTION CC

5 FOLDOUT FRAME

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ORIGINAL PAGE IS OF POOR QUALITY

FOLDOUT FRAME
ORIGINAL PAGE IS OF POOR QUALITY

FOLDOUT FRAME
ORIGINAL PAGE IS
OF POOR QUALITY

4 FOLDOUT FRAME

1-21, 1-22
FOLDOUT FRAME

ORIGINAL PAGE IS OF POOR QUALITY
ORIGINAL PAGE IS OF POOR QUALITY

2 FOLDOUT FRAME
FOLDOUT FRAME
- 001 Shown

2. Fab from graphite/impregnated polysulfone
1. All dimensions are in mm; inches are in ( ).
Notes: Unless otherwise specified

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<tr>
<th>Tension Cable Guide</th>
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<tr>
<td>Storage Drum ZPL</td>
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<tr>
<td>Constant Force Spring (stowed condition) ZPL</td>
</tr>
<tr>
<td>Output Drum</td>
</tr>
<tr>
<td>Constant Force Spring (extended condition) REF</td>
</tr>
<tr>
<td>Extension Cable Spool</td>
</tr>
<tr>
<td>Negator Support Structure REF from 1004-T ALSAT</td>
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<tr>
<td>Housing Box Cross Brace</td>
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**Negator Spring Details**

<table>
<thead>
<tr>
<th>Tension</th>
<th>Storage Drum Dia</th>
<th>Outer Drum Dia</th>
<th>Tiel Vals</th>
<th>Width</th>
<th>Height</th>
<th>Note</th>
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<tr>
<td>1.47N/M</td>
<td>4.85 (1.85)</td>
<td>8.5 (3.20)</td>
<td>.36 (1.04)</td>
<td>22.3 (88)</td>
<td>12.75 (50)</td>
<td>30.25 (1.2)</td>
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*All data are in mm, inches in ( )*

1. All parts molded from granite imprinted Porslatrione.
2. Unless otherwise specified.

---

**Mechanism - Cable Extension**

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**Notes:**

- Original page 2 of poor quality
- Foldout frame

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1-35, 1-36
NOTE 5: LINE/BRK. SPALF/FRZ.

1. ALL DIMENSIONS ARE IN MM, INCHES IN ()

NOTES: UNLESS OTHERWISE SPECIFIED
OLE IMPELLATED

## Foldout Frame

### Parts List

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<th>IDENT</th>
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<th>MATERIAL</th>
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### CONCENTRATOR STACK

**TRANSLATOR MECHANISM**

**LC5A**

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<th>DRILL</th>
<th>HOLE</th>
<th>HOLE</th>
<th>THRU</th>
<th>001</th>
<th>002</th>
<th>003</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
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<td>010</td>
<td>011</td>
<td>012</td>
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**SCALE FULL**

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1-37, 1-38
<table>
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<th>QTY</th>
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<tr>
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<td>TRIP WIRE ASSY REFLECTOR</td>
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<tr>
<td>001</td>
<td></td>
<td>TRIP WIRE ASSY RADIATOR</td>
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<tr>
<td></td>
<td></td>
<td>PART 1: TRIP WIRE ASSY REFLECTOR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PART 2: TRIP WIRE ASSY RADIATOR</td>
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</tbody>
</table>

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMS. IN INCHES

2. TOLERANCES ON:
   - DECIMALS: +/0.005
   - ANGLES: ±5°
   - TOLERANCES: ±0.005

3. HOLES NOTED "DRILL"
ORIGINAL PAGE 13
OF POOR QUALITY
FOLDOUT FRAME
1. ALL DIMENSIONS ARE IN MM, INCHES IN ()

Notes: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.

TOLERANCES ON:
DECIMALS ANGLES
X = ±0.03  θ = 0° ± 30°
X = ±0.01
HOLDS 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 2.000 ± .007 ± 0°
1.001 THRU 2.000 ± .010 ± 0°

ITEM QTY NEXT ASSY USED ON END ITEM NO. THRU
-001 132 VA16.945100 LCRSA

QTY QTY QTY QTY QTY CODE PART
REQD REQD REQD REQD REQD IDENTifying
**REVISIONS**

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<th>NOMENCLATURE OR DESCRIPTION</th>
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<td>.040</td>
<td>SPRING TORSION</td>
<td>CRES</td>
<td>V416-945200</td>
</tr>
<tr>
<td>.041</td>
<td>.130</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.131</td>
<td>.228</td>
<td></td>
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<td>.230</td>
<td>.500</td>
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**DIMENSIONS ARE IN INCHES. TOLERANCES ON DECIMALS ANGLES**

- DECIMALS: ±0.001
- ANGLES: ±0° 30'

- HOLES NOTED "DRILL"

- SIZES, NOTES, SUPPLIERS ZONE

**Rockwell International Corporation**

**Space Division**

12214 Lakewood Boulevard - Downey, California 90241

**TORSION SPRING**

**SOLAR PANEL**

**LCRSA**

**SIZE**

<table>
<thead>
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<th>DRAWING NO.</th>
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<td>V416-945200</td>
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**SCALE FULL**

<table>
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<tr>
<th>SHEET 1/1</th>
</tr>
</thead>
</table>

- EFFECTIVITY

- 1.29 (0.05") DIA WIRE
  - (2.9 IN LB MAX TORQUE)
CONCENTRATOR ELEMENT REF

SCREW

SLIDE HOUSING

NUT SELF LOCKING

CONCENTRATOR

ELEMENT REF

12.7 (3.50)

4.83 (3.8)

12.7 (3.50)

FOLDOUT FRAME
2. Fab from graphite impregnated polysulfone

1. All dimensions are in mm, inches are in ( ).

Notes: Unless otherwise specified

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3. Finish Per MF004-001, III-2 (White Silicone Paint, \( k = 0.25, \sigma = 0.84 \) Max. Service Temp. 200°C)
2. Fab From 0.032 AL Heat Treat To T6 Cond
1. All Dimensions Are In mm, Inches In ( )

Notes: Unless Otherwise Specified

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<th>QTY REQD</th>
<th>QTY REQD</th>
<th>QTY REQD</th>
<th>QTY REQD</th>
<th>QTY REQD</th>
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<tbody>
<tr>
<td>132</td>
<td>V41G-94</td>
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<td></td>
<td>UNLESS OTHERWISE SPECIFIED</td>
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<td></td>
</tr>
</tbody>
</table>

Dimensions Are In Inches

Tolerances on:
- Decimals
- Angles \( \pm \theta \), \( \pm 0^\circ 30' \)
- Holes Noted "Drill"

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>NEXT ASSY</th>
<th>USED ON</th>
<th>END ITEM NO.</th>
<th>1 HRU</th>
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</thead>
<tbody>
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<td>V41G-945001</td>
<td>LCRSA</td>
<td></td>
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Reqd Per End Item

[Table with columns for Item, QTY, Next Assy, Used On, End Item No., 1 Hru]

Application

Effectivity
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<th>QTY</th>
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<tr>
<td>READ CODE IDENT PART OR IDENTIFYING NUMBER NOMENCLATURE OR DESCRIPTION MATERIAL DATA SPECIFICATIONS SIZES NOTES SUPPLIERS</td>
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</table>

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON:

- ANGLES: TOL = .005
- HOLES: TOL = .005

- DRILLED: TOL = .005

Rackwood InWorf *mW Corporsom Spew DMon

L.R.S.A. L.C.R.32-CL/P-1970

CLIP RADIATOR PANEL CLIP-REFLECTOR PANEL

V416-945203 03503

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FOLDOUT FRAME
FOLDOUT FRAME

NOTE: ALL DIMENSIONS IN MM. INCHES IN ( ). UNLESS OTHERWISE SPECIFIED.
FOLDOUT FRAME
-001 SHOWN
-002 SIMILAR EXCEPT AS SHOWN

VIEW C
SCALE 1/4
(-002 ONLY)

SECTION AA
SCALE 1/4
(FEMALE LUG REF)

SECTION BB
SCALE 1/4
(MALE LUG REF)

ORIGINAL PAGE 15
OF POOR QUALITY

FOLDOUT FRAME
-003 SHOWN

-004 OPP EXCEPT AS SHOWN

A) ALUMINIZE SURFACE TO 500A THICKNESS, SPECULAR REFLECTIVITY OF .90 AND AN
EMISSIVITY OF .05
3. FINISH AND VARIANCE MAY DEVIATE
   AT A RATE OF .005 IN. (10.005 IN. MAXIMUM)
   (10.005 IN. MAXIMUM)
2. ALL DIMENSIONS ARE IN INCHES, INCHES IN ( )
1. ALL ARE FROM GRANITE/IIR DESIGNATED PHYSICAL
NOTE: UNLESS OTHERWISE SPECIFIED

-003 SHOWN
-004 OPP EXCEPT AS SHOWN

VIEW E
SCALE: 1/4
(-004 ONLY)

VIEW D
SCALE: 1/4
(-002 ONLY)
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
FOLDOUT FRAME

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NOTE:
1. Fabrication
2. As per detail shown
3. Outlines to be used as reference
4. Additional nodules can be added to sections as required

E.3 M.
(10.83 ft)

E.3 M.
(10.83 ft)
FOLDOUT FRAME

NOTE:
1. FABRICATE PER BRIEF-MODEL SHOP REPAIRS, NOT ACCOMPANYING NOTE SHEETS AND REAL DIMENSIONS.
2. CONTINUE HINGE AND CAP ASSEMBLIES TO BE OF LIGHTWEIGHT MATERIAL BUT STRUCTURALLY SOUND FOR DEMONSTRATION AND TRANSPORT. MAINTAIN THE EXTERNAL APPEARANCE DIMENSIONS TO SHOW ACTUAL MODULE SIZE. THE EXTERNAL STRUCTURE CAN BE MADE TO ANY U-PARTITION NEED TO PROVIDE THE OPENING AND CLOSING OF THE CONCENTRATOR ELEMENTS.

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ORIGINAL PAGE IS OF POOR QUALITY

1. WHITE (TOP)

2. 3 FOLDOUT FRAME
ORIGINAL PAGE IS OF POOR QUALITY
**Foldout Frame**

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### Parts List

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<thead>
<tr>
<th>Code</th>
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<th>Material</th>
<th>Data Specifications</th>
<th>Notes</th>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

### Silicon Solar Cells

- 001 Shown

### Interface Area

- 0.040 Typ
- 0.05 Typ

### Insulated Standoff Ref.

### Solar Panel Substrate

---

**Limit Wire Routing to This Area Only**
3. INSTALL RHETS PER MA010-302.
   Finish Per MF0004-001 ITEM 2-9
2. Make Part No. Rez MA0104-301, CODE BL-08-N6-14
1. Contamination Control Per MF0001-001
Notes: Unless otherwise specified

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FOLDOUT FRAME

DRILL 9/20 (1/16) DIA
INSTALL MORI-1003-05 RHETS
2 PL

4200

2900

D416-451006-001 BBEET-FIXED

C416-451005-001 RADIATOR PANEL 1 REQD

DRILL 9/20 (1/16) DIA
INSTALL MORI-1003-05 RHETS
2 PL
### Parts List

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>CODE</th>
<th>MATERIAL</th>
<th>DATA SPECIFICATIONS</th>
<th>NOTES</th>
<th>SUPPLIES</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1001</td>
<td>DA46-451006</td>
<td>EXHIDE PANEL</td>
<td>22M AL</td>
<td>BUSH-UNIVERSAL HEAD ERG-45 ALLOY</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>MOD2-002-716</td>
<td>BUSH 22M AL</td>
<td>BUSH-UNIVERSAL HEAD ERG-45 ALLOY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>DA46-45100G</td>
<td>BASKET FIELD</td>
<td>4/001 DA46-451004</td>
<td>PANEL 4.5V</td>
<td></td>
</tr>
</tbody>
</table>

- 001 Shown
7. Finish per MFG001-001, Item I-1
6. Mark part No. per MFG04-301 (Doc. BL-08-NG-16)
5. Contamination control per MFG001-001
4. Inspect per MT0501-50B Class 2
3. Std. detail per MFG012-305
2. Break sharp corners & edges
1. Bend radius .060 max

Notes: Unless otherwise specified
**Original Page is of Poor Quality**

### Parts List

<table>
<thead>
<tr>
<th>QTY REQD</th>
<th>QTY REQD</th>
<th>QTY REQD</th>
<th>QTY REQD</th>
<th>QTY REQD</th>
<th>CODE</th>
<th>PART OR IDENTIFYING NUMBER</th>
<th>NOMENCLATURE OR DESCRIPTION</th>
<th>MATERIAL</th>
<th>DATA: SPECIFICATIONS, SIZES, NOTES, SUPPLIERS</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>0.001</td>
<td>D416-451006</td>
<td>BRACKET</td>
<td>AL-SHT</td>
<td>0.061-74 AL QQ-A-250/1 0.032x1.12x1.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tolerances on:**
- DECIMALS: XXX = .001
- ANGLES: XXX = .010 ± 0° 30' (0.5°)
- HOLES NOTED "DRILL":
  - 0.013 THRU: .040 ± .001
  - 0.041 THRU: .130 ± .002
  - 0.131 THRU: .229 ± .003
  - 0.230 THRU: .500 ± .004
  - 0.501 THRU: .750 ± .005
  - .751 THRU: 1.000 ± .007
  - 1.001 THRU: 2.000 ± .010

**Effective Date:**
- 4/1/82

**Revisions:**
- ZONE LTR
- DESCRIPTION
- DATE
- APPROVED

---

Rockwell International Corporation
Space Division

12314 Lamarwood Boulevard • Downey, California 90241

**Drawing No.:** D416-451006

**Approval:**
- DR BY: MS BIS
- CHG BY: APPR

**LCSA Test:**

---

**Scale:** 1/1

**Sheet:** 1/1

---

**Foldout Frame**
6. Finish Panel Per MFGD 4-001, Item III-3
5. Mark Part No. Per MFG-104-301 Code BL-08-X-16
4. Contamination Control Per MFGD 1-001
3. Std Detail Per MFGD-305
2. Break Sharp Corners & Edges
1. Bend Radius .060 Max

Notes: Unless Otherwise Specified

<table>
<thead>
<tr>
<th>QTY</th>
<th>QTY</th>
<th>QTY</th>
<th>QTY</th>
<th>QTY</th>
<th>CODE</th>
<th>IDENT</th>
<th>PART OR IDENTIFYING N.</th>
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UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES.

TOLERANCES ON:

<table>
<thead>
<tr>
<th>DECIMALS</th>
<th>ANGLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>J00 = ± .002</td>
<td>± 0° 30'</td>
</tr>
<tr>
<td>J000 = ± .002</td>
<td></td>
</tr>
</tbody>
</table>

Holes noted "Drill"

| .013 THRU .040 + .001 - .000 |
| .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 |

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>NEXT ASSY</th>
<th>USED ON</th>
<th>END ITEM NO.</th>
<th>THRU</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

REQD PER END ITEM | APPLICATION | EFFECTIVITY

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>NEXT ASSY</th>
<th>USED ON</th>
<th>END ITEM NO.</th>
<th>THRU</th>
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</tbody>
</table>
## Parts List

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<thead>
<tr>
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<th>QTY</th>
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<th>QTY</th>
<th>CODE</th>
<th>PART OR NOMENCLATURE</th>
<th>DATA/SPECIFICATIONS</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>4</td>
<td>.001</td>
<td>D416-451007</td>
<td>BRACKET</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>ALSHT</td>
<td></td>
</tr>
</tbody>
</table>

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### Dimensions

- **Materials:**
  - .032 x .12 x .75

- **Tolerances:**
  - **Decimals:**
    - .001
  - **Angles:**
    - ± 0° 30'

- **Holes Noted “Drill”**

- **Effectivity:**
  - 2-25, 2-26

---

**Rockwell International Corporation**

**Space Division**

19214 Lakeview Boulevard • Downer, California 90241

**BRACKET - REMOVABLE**

**LC.RSA - TEST**

**Size**

- Code Ident No.: C 03953
- Drawing No.: D416-451007

**Scale:**

- 1/1

**Sheet:**

- 1
.051 DIA., 2.9 IN.-LB TORSION
X .52 AXIAL LENGTH, RIGHT HAND HELIX

-001 SHOWN

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES.

TOLERANCES ON:
DECIMALS ANGLES
.001 = ±.001
.002 = ± 0° 30'
HOLES NOTED "DRILL".

QTY | QTY | QTY | QTY | QTY | CODE | PART OR IDENTIFYING NUMBER | NOMENCLATURE OR DESCRIPTION | MATERIAL | DATA: SPECIFICATIONS
---|---|---|---|---|---|---|---|---|---
3 | 001 | D416-452000 | SPRING TORSION | ST. ST. | QQ-W-423 Comp FFS 302, AMS 5688

Rockwell International Corporation
Space Division
12014 Laurelwood Boulevard • Downey, California 90241

TOPSISN SPRING-
SOLAR PANEL
LCRSA

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

SCALE 1:1
SHEET 1/1

2-27, 2-28
FOLDOUT FRAME

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NOTES:
1. PARTS PER WELDING-CLASS 2
2. HATCH PLAT NO. PER WELD-CLASS 2 - CODE 90-08-08-08
3. CONSTRUCTION DETAILS PER WELDING-CLASS 2
4. SOCKET PER WELDING-CLASS 2
5. STD DETAIL PER WELDING-305
6. DIN125A BOLT M5 X 20
7. INCH M5205B HEAD X 20

NOTE: ALL OTHER SPECIFIED
VIEW B
SCALE \( \frac{3}{4} \)
(F RAMES OMITTED FOR CLARITY)

SECTION AA
SCALE \( \frac{3}{4} \)
(TYPICAL ALL 4 CORNERS)

FOLDOUT FRAME
FOLDOUT FRAME

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BACKSIDE OF PANEL SHOWN

SECTION BB

SCALE 1/1

5. Aluminum backside to an emissivity of 0.15
   per M&P EDM's.

6. Aluminum surface to 500 A thickness,
   specular reflectivity of 0.80, and
   emissivity of 0.05, per M&P EDM's.

7. T.D. denotes thickness dimension.

8. Contamination controlled per MFC001-001.

9. Mirror polished with lapping compound DPC1200 blue G2.5 per

10. Mark part no. per machin. 501 code BL-08-AG-16

11. Notes: Unless otherwise specified.
2 FOLDOUT FRAME

OEM PAGE 18
OF POOR QUALITY

5 HANDLE AND APPL. TAP AS MEAS.
4 CONTAMINATION CONTROL SEE WEC
3 FEEL BACK IN CHARGE CONT.
2 I.D. THAT VIEW PERS. EXCH.-CENG
1 WEC APPL. MFG. PER DILE AU R. DL
NOTES UNLESS OTHERWISE SHOWN
ORIGINAL PAGE IS OF POOR QUALITY
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
ALTERNATE REFLECTOR PANELS
RIGID PANEL - VAPOR DEPOSITED ALUMINUM ON MOLDED POLYSULFONE GRAPHITE

50.00 m (19.68)
39.87 cm (15.7)

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

BASELINE REFLECTOR PANELS
V416-945401
STRETCHED FILM ON RIGID FRAME

18.21 cm (7.17)
16.42 cm (6.46)

- MOLD DETAILS
- REMOVE FLASH
- PHYSICAL INSPECT

FOLDOUT FRAME
REFLECTOR PANEL ASSEMBLY
V416-945400

ASSEMBLY AND TAPPING SEQUENCES

SEQUENCE #1

TAPE #1

TAPE #2

NOTE:
- TAPE IN SEQUENCE
- REVERSE TAPING TWO PLACES

SEQUENCE #2

OR

- SUBASSEMBLE REFLECTOR PANEL WITH TAPE

- APPLY METALIZED FILM

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

Panel-Radiator
V416-945101

Solar Panel Assembly
V416-945100

- HD KAPTON
- BOND SOLAR CELLS TO PANELS
- ASSEMBLE PANEL SUBASSEMBLIES WITH SPRINGS, BOLTS, WASHERS AND NUTS

- ASSEMBLE
- INSTALL

ORIGINAL PAGE IS OF POOR QUALITY

2 FOLDOUT FRAME
ASSEMBLY

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

ASSEMBLE PANEL SUBASSEMBLIES

CONCENTRATING V4

WIRE HARNESS ASSEMBLIES
V416-945301
V416-945302

ASSEMBLE REFLECTOR INSTALL AND ECT

ASSEMBLE AND BOND SOLAR PANEL ASSEMBLIES AND WIRE HARNESS AND INSTALL DIODES

FOLDOUT FRAME

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CONCENTRATING ELEMENT STACK ASSEMBLY
V416-945001

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 18, 1983  REVISED: FEB. 22, 1983

3-3, 3-4  FOLDOUT FRAME

PRECEDING-PAGE BLANK NOT FILMED
END CAP ASSEMBLIES

3.25m
(128 APPROX.)

53.34 cm
(21 APPROX.)

MAIN HOUSING STRUCTURE

CROSS SECTION OF LAUNCH SUPPORT TUBE

FOLDOUT FRAME

- FABRICATE DETAILS
- ASSEMBLE STRUCTURE AND INSTALL LAUNCH SUPPORT
REPRESENTATIVE RIVETED JOINT CONFIGURATION

SOLAR PANEL TRIPWIRE MECHANISMS

CONCENTRATOR STACK TRANSLATION MECHANISM (CSTM)

CABLE EXTENSION MECHANISM (CEM)

CH SUPPORT TUBES

2 FOLDOUT FRAME
• FABRICATE AND ASSEMBLE BRACKETRY
• INSTALL BRACKETRY
• FABRICATE AND ASSEMBLE MECHANISMS
• INSTALL MECHANISMS

ORIGINAL PAGE
OF POOR QUALITY
INSTALL CONCENTRATOR STACK ASSEMBLIES AND SLIDE ASSEMBLIES CONCURRENTLY
PERFORM ELECTRICAL HOOKUP AND CHECKOUT

ORIGINAL PAGE IS OF POOR QUALITY
- 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

Foldout frame
ASSEMBLY SEQUENCE
FOR FLIGHT TEST
CONFIGURATION

MANUFACTURING FLOW AND BUILD PLAN
LOW CONCENTRATION RATIO SOLAR COLLECTOR

PREPARED BY: M. M. HICKS  DEPT: 761