

# 9.1 Meter Ka-Band Broadband Gateway Earth Station Antenna Model VA-9.1-KA

## Technical Manual *Original Instructions*

Manual Part Number 1175568 Revision 001  
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## SAFETY SUMMARY

### Notice

**Any service, adjustment, maintenance, or repair of this product must be performed only by authorized technical service personnel.**

Prior to installation and use of this product review all safety markings and instructions. When safety precautions or important information is presented in this manual, the information will normally be presented just prior to the point where the hazard is likely to be encountered.

The following symbols are used throughout this manual to bring attention to practices, procedures, and conditions important to the safety of the operator and equipment or to obtaining desirable results from the equipment.



#### WARNING

This symbol warns of electrical shock hazards to personnel. Failure to comply with the instructions of such a warning may result in severe injury or death resulting from electrical shock.



#### WARNING

This symbol warns of non-electrical hazards to personnel. Failure to comply with the instructions of such a warning may result in severe injury or death.

#### WARNING

This symbol warns of inhalation hazard where toxic fumes or vapors, especially carbon monoxide, may be present. Failure to comply with the instructions of such a warning may result in severe injury or death resulting from inhaling toxic vapors or fumes.



#### CAUTION

This symbol warns of hazards to equipment. Failure to comply with the instructions of such a caution may result in damage or destruction of equipment.



#### CAUTION

This symbol warns of possible Electrostatic Discharge damage to equipment. Use a wrist grounding strap connected to the ground to prevent Electro Static Discharge damage to electronic components.



#### GROUNDING REQUIRED

This symbol is used to bring attention to installation grounding requirements.

#### NOTE

Notes are used to provide clarification, or to alert the reader of possible erroneous results, which may occur if a procedure is not followed as written.

## ABBREVIATIONS

The following list defines symbols and abbreviations used in this manual.

Symbol or Abbreviation	Definition
°	Degrees
AZ	Azimuth
BOM	Bill of Material
C	Celsius
CW	Clockwise
dB	Decibel
EIRP	Effective Isotropic Radiated Power
EL	Elevation
G/T	Gain-to-noise Temperature
GHz	Gigahertz
HPA	High Power Amplifier
ITU-R	International Telecommunication Union - Radiocommunication Sector
km/h	Kilometers per hour
LHC	Left Hand Circular
LHCP	Left Hand Circular Polarization
LNA	Low Noise Amplifier
m	Meter
M&C	Monitor and Control
Mph	Miles per hour
PSIG	Pound-force per Square Inch Gauge
RF	Radio Frequency
RHC	Right Hand Circular
RHCP	Right Hand Circular Polarization
RMS	Root mean square
RX	Receive
TX	Transmit

## Chapter 1

# General Information

### 1.1 Introduction

This manual provides information about the 9.1 Meter Ka-Band Broadband Gateway Earth Station Antenna.

### 1.2 Contents of the Manual

This manual consists of the following chapters:

Chapter 1 - General Information

Chapter 2 - Drawings and Parts

### 1.3 Change Recommendations

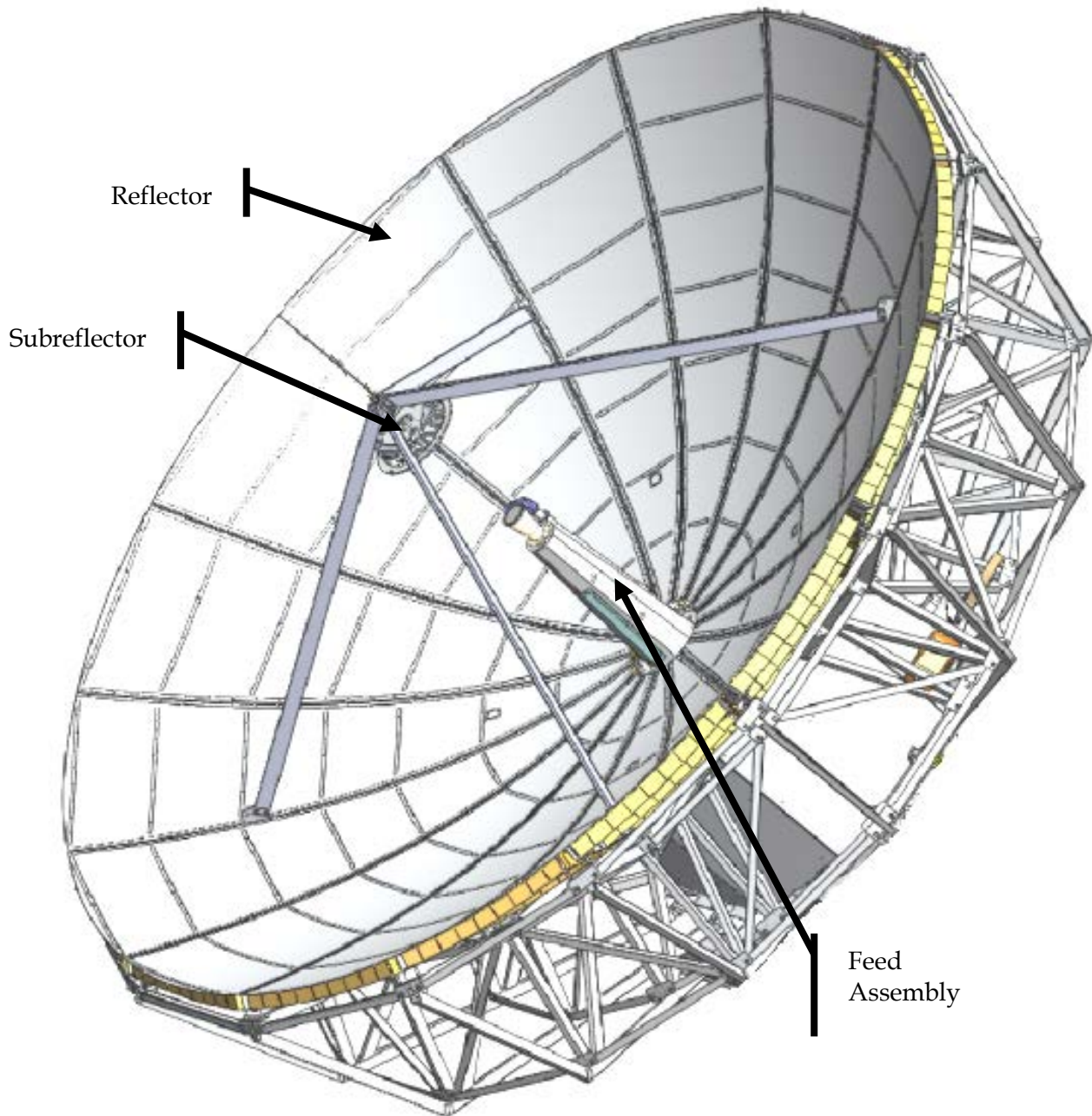
Submit recommendations concerning changes to Technical Publications Manager, ViaSat, Antenna Systems, 1725 Breckinridge Plaza, Duluth, Georgia 30096.

### 1.4 Antenna Description

The antenna consists of a 9.1m reflector with a Cassegrain subreflector, Ka-band feed, 4-port diplexer, and on Autotrack systems, a TE21 coupler. The antenna provides Right Hand Circular Polarized (RHCP) and Left Hand Circular Polarized (LHCP) ports for the simultaneous transmission and reception with the satellite. On Autotrack antennas, there are two additional output ports from a TE21 mode coupler supplying automatic tracking capability in RHCP and LHCP modes. Tracking polarization is selectable.

The antenna includes the following main components:

- Reflector
- Subreflector
- Feed Assembly



**Figure 1-1. 9.1 Meter Ka-Band Broadband Gateway Earth Station Antenna**

#### **1.4.1 Reflector**

A 9.1m Ka-band reflector provides the requirements of the satellite link. This reflector is a field proven ViaSat product designed specifically for Ka-band applications, and provides excellent RF and mechanical performance. This reflector utilizes a high-efficient, dual-shaped surface profile derived using performance maximizing RF design techniques.



The reflector consists of a large hub, trusses, and panels. The all-aluminum construction eliminates the stresses and distortions due to unequal thermal expansion of different metals. These aluminum parts are treated, primed, and then painted with light-diffusive white paint to minimize the solar furnace effect. The interior of the hub is spacious and is designed specifically for mounting Ka-band RF electronics near the feed while still providing access to components for routine maintenance and replacement. The reflector panels are manufactured using high-precision stretch-form tooling and assembly techniques.

The mechanical structure provides the stiffness required to operate at Ka-band. Since all large aperture Ka-band reflectors require accurate field alignment, ViaSat has developed proprietary photogrammetric techniques to accurately field align the reflector surface to better than 0.2 mm RMS at the operating elevation angle.

### **1.4.2 Subreflector**

The subreflector assembly consists of a machined aluminum subreflector and mount, optimized for high efficiency and antenna performance. The subreflector is supported by four sturdy aluminum spars of rectangular cross sections that are attached to reinforced points on the reflector structure.

### **1.4.3 Feed Assembly**

ViaSat's standard Ka-band Cassegrain four-port circular polarized feed provides optimum performance in the 9.1m reflector to maximize the Gain-to-noise Temperature (G/T) and Effective Isotropic Radiated Power (EIRP).

Key features of the feed assembly include:

- Wideband corrugated horn radiator for optimum gain and sidelobe performance
- 4-port circular polarization transmit/receive diplexer for excellent cross-pol isolation
- Feed interface ports at hub interface to minimize waveguide length to LNAs and HPAs

The wideband corrugated horn operates over the entire Ka-band, and features a symmetrical primary radiation pattern that efficiently illuminates the reflector optics. The horn provides excellent return loss and cross-polarization performance over the entire band. The received signal exits the horn in circular waveguide and passes to the four-port polarization network.

The four-port polarization network separates transmit and receive band signals, and generates both right hand circular (RHC) and left hand circular (LHC) signals for each band. The phase and amplitude characteristics of the four-port network are precisely controlled to produce an axial ratio of less than 0.5 dB (30 dB cross-pol isolation).

The feed horn utilizes a high performance Teflon window material. The Teflon material is mechanically stronger than Mylar to better resist damage from hail and other debris, and the inherent hydrophobic properties of Teflon enable the window to shed water better than Mylar.

High frequency band signals are particularly sensitive to attenuation by water, so it is important to minimize the accumulation of water on the feed aperture. A highly reliable, long-life blower assembly mounted in the reflector back structure area directs air to the feed aperture through an air duct external to the feed assembly. The feed blower assembly, a separate assembly from the antenna, minimizes the effects of precipitation on antenna performance by constantly directing a stream of air across the feed horn aperture to remove rain as well as other debris.

All waveguide and feed components must be pressurized with dry air at a regulated air pressure set to 0.5 PSIG typical. This prevents moisture from entering the waveguides, protects the sensitive Ka-band components from corrosion, and prevents insertion loss degradation.

## 1.5 Specifications

<b>Table 1-1. Antenna Specifications</b>	
Characteristics	Specification
Model	VA-9.1-KA
Antenna diameter	9.1 meters
Antenna type	Shaped dual reflector
Polarization	Right Hand Circular Polarization (RHCP) & Left Hand Circular Polarization (LHCP) for both Tx & Rx
Tracking	Options for Autotrack or Program Track
Operating frequency	Rx: 17.7-21.2 GHz Tx: 27.0-31.0 GHz
3 dB beamwidth	Rx: 0.11° nominal Tx: 0.07° nominal
Axial ratio	0.5 dB maximum
Radiation patterns	Compliant with ITU-R Rec. S.580-6 and FCC 25.209
Power handling per Tx port	500 watts CW
Survival wind	200 km/h in stow position, no icing
Temperature	-40°C to +55°C

## 1.6 Safety Guidelines

Before operating the pedestal, read these safety warnings and perform the following checks.



### **WARNING**

One of the emergency stop switches should always be pressed before working on or near the antenna mount. Failure to comply with this warning can result in serious injury or death.



### **WARNING**

Failure to comply with these instructions may result in damage or destruction of equipment, and severe personnel injury or death.

### 1.6.1 Emergency Plan

Have an emergency plan. Know the procedures for obtaining first-aid and fire-fighting assistance. Plan your work and maintain good housekeeping.

### 1.6.2 Resuscitation

Personnel working with or near hazardous chemicals or voltages should be familiar with modern methods of resuscitation.

### 1.6.3 General Mechanical Safety

The following are general mechanical safety precautions not related to any specific procedure.



**WARNING**

These are recommended precautions that personnel must understand and apply. Death or severe injury may result if personnel fail to observe safety precautions.

- Installation or maintenance of antennas may require persons to work at elevated work stations. Whenever persons are working at eight or more feet above ground and are not on a guarded platform, they should wear safety belts with at least one, and preferably two, lanyards. The exception is trained and qualified persons that may work up to 25 feet (7.6 meters) if on an approved ladder. Approved ladder usually means that the ladder is tied off once the person has climbed but before work begins.
- Never stand underneath anything while it is being hoisted.
- Always wear a hard hat if someone is above you.
- Ensure that all electrical tools and equipment are properly grounded.

### 1.6.4 General Electrical Safety

The following are general electrical safety precautions not related to any specific procedure. They are recommended precautions that personnel must understand and apply.



**WARNING**

These are recommended precautions that personnel must understand and apply. Death or severe injury may result if personnel fail to observe safety precautions.

- Electrical shock from voltages can cause injury or death. Prior to making any electrical connections or performing maintenance and repair, ensure power is removed. Electrical connections should be made only by qualified personnel in accordance with local regulation.
- Avoid shorting circuits when using metal tools. Some circuits have high current capability that, when shorted, will flash and may cause burns and/or eye injury.
- Remove all jewelry and exposed metal objects from body and clothing before performing maintenance, adjustments, and/or trouble-shooting. Before working inside the equipment, remove all power, unless power is required to perform the procedure. Do not replace parts with power on.

- Replacement of fuses or other parts must be done using identical types and ratings. Substitution of non-identical parts may cause safety and fire hazards.
- Servicing the equipment may require working with protective covers removed and AC power connected. Extreme caution must be exercised during these procedures.

## 1.7 Operation

Operation of the antenna is integrated into the M&C system.

## 1.8 Maintenance

Perform the following inspections monthly and repair any noted defects as listed in Table 1-2.

<b>Table 1-2. Routine Inspections</b>	
Inspection Item	Instruction
Feed blower	Verify feed blower is operating. Check blower's air filter and replace if dirty.
Feed pressurization	Verify dehydrators are operating and duty cycle is acceptable. From the ground, observe the feed window. It should have a convex shape when pressurized. Also observe the pressure gauge inside the antenna hub. The regulated air pressure should be set to 0.5 PSIG.
Galvanized surfaces	<p>Inspect for dirty, blemished, worn, or deeply scratched protective finish. Repair blemished area as follows.</p> <ol style="list-style-type: none"> <li>1. Use a wire brush to remove all paint, corrosion, and/or rust from the blemished area.</li> <li>2. Clean area with solvents to remove all oils and grease. Wipe dry with a clean cloth.</li> <li>3. Apply "cold-galvanize" paint with a brush to the prepared surface areas. Apply a sufficient quantity to cover and seal repaired surface area.</li> </ol> <p>Cold galvanize paint, ViaSat part number 1109690, is supplied as part of ViaSat Paint Touch-Up and Lubrication, Bill of Material 1109398.</p>
Exposed threaded fasteners and hardware	<p>Inspect for dirt, rust, and/or corrosion. If rusted or corroded, repair blemished area as follows.</p> <ol style="list-style-type: none"> <li>1. Use a wire brush to remove all paint, corrosion, and/or rust from the blemished area.</li> <li>2. Clean area with solvents to remove all oils and grease. Wipe dry with a clean cloth.</li> <li>3. Apply "cold-galvanize" paint with a brush to the prepared surfaces areas. Apply a sufficient quantity to cover and seal repaired surface area.</li> </ol> <p>Cold galvanize paint, ViaSat part number 1109690, is supplied as part of ViaSat Paint Touch-Up and Lubrication, Bill of Material 1109398.</p>

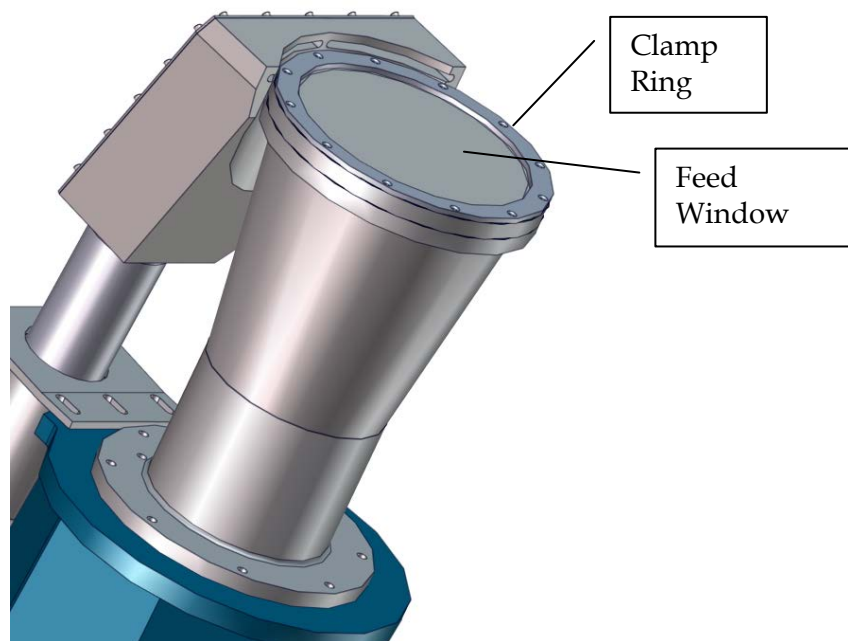
<b>Table 1-2. Routine Inspections</b>	
Painted surfaces	Inspect for dirty, blemished, worn, or deeply scratched protective finish. Repair blemished area as follows. <ol style="list-style-type: none"> <li>1. Sand or wire brush to remove rust and/or corrosion.</li> <li>2. Apply paint per manufacturer's instructions to prevent rust or corrosion.</li> <li>3. Use paint touch-up kit provided with the antenna.</li> </ol>
Water drain holes (if applicable)	Inspect drain holes on the bottom reflector panel. Ensure water can drain freely through the openings. If an opening is blocked with debris, use a wooden dowel or rod to clear.

## 1.9 Repairs

### 1.9.1 Feed Window Replacement

It is recommended that the feed window be replaced every 3 to 5 years. Materials required are ViaSat kit PN 442460 and silicon rubber sealant (RTV 3145).

1. Position the antenna to a convenient maintenance position.
2. Press EMERGENCY STOP switch on antenna pedestal. This prevents the antenna pedestal from moving the antenna during the maintenance.
3. Use an aerial lift to access the feed. Be very careful not to allow the lift to collide with the antenna.



**Figure 1-2. Feed Window**

4. Remove 10-32 screws, lock washers, flat washers and clamp ring shown in Figure 1-2.
5. Remove old feed window fabric and film.
6. Temporarily cover the open feed horn with a clean lint-free cloth to ensure debris does not enter feed aperture. Carefully remove old silicon sealant from mounting surfaces. Do not scrape or cut away silicon using metal tools that may create metal filings.
7. Prepare a new feed window. The window consists of two materials, a polyester film and a hydrophobic fabric. Both are supplied in sheet form in the kit. Use the clamp ring as a template to prepare the film and fabric materials.
8. Remove the temporary cover from the feed.
9. Carefully apply a small amount of silicon evenly about the entire diameter of the feed cover and place the new polyester film on feed cover.
10. Place the new hydrophobic fabric over the polyester film with the white side facing away from the feed.
11. Place clamp ring on feed window and secure with sixteen ½ inch long 10-32 screws, flat washers and split lock washers.
12. Tighten all screws evenly to compress the lock washers. Do not over-tighten.
13. Trim any excess materials and clean excess silicon from the exterior surfaces.
14. Restore and check pressurization.

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## Chapter 2

# Drawings and Parts

### 2.1 Introduction

Table 2-1 provides a list of drawing and parts applicable to the 9.1 Meter Ka-Band Broadband Gateway Earth Station Antenna. If part information is not on the drawing, a Bill of Material (BOM) report immediately follows the drawing to identify component parts of the assembly.

The following information is included on each Bill of Material report.

Title Block	The title block contains the BOM part number, revision number, and description.
Level	Multi-level bill of material reports are formatted to show the relationship of assemblies, subassemblies, and component parts. The Level column of the report lists the numerical level of each line item. Level 1 identifies components of the assembly. Level 2 identifies sub-assemblies of the assembly, and level 3 identifies components of the sub-assemblies. Additional levels may be used to indicate subordination as needed.
Ref Des	The Ref Des column of the report lists the reference designator used to identify components on the assembly drawing or schematics.
Part Description	The Part Description column of the report provides a brief description of the item.
Qty	The Qty column of the report lists the number of items used in the assembly.

## 2.2 Drawing and Parts Index

Table 2-1. Drawings and Parts Index		
Number_Revision	Description	Page
1093523_003	Assembly/Installation Drawing, Reflector 9.1m KA, Common Hub (Parts list on drawing)	2-3
1094227_001	Assembly/Installation Drawing, Subreflector/Spars 9.1m Ka (Parts list on drawing)	2-9
1091781_003	Autotrack Feed Assembly Drawing	2-12
1093281_006	Bill of Material, Autotrack Feed	2-18



NOTES:

- 1. INTERPRET DIMENSIONING AND TOLERANCES PER ASME Y14.5M-1994.
- 2. THE PARTS LIST ON THIS DRAWING IS PROVIDED TO FACILITATE ASSEMBLY AND INSTALLATION, NOT FOR PACKING OR SHIPPING. THE FIND NUMBERS AND QUANTITIES ON THE PARTS LIST ARE INTENDED TO MATCH EXACTLY THE BALLOONED ITEMS ON THE DRAWING. THE ITEMS ON THE PARTS LIST MAY BE SHIPPED IN MULTIPLE CRATES OR KITS, EACH WITH THEIR OWN BILL OF MATERIAL (BOM). SOME QUANTITIES ON THE BOMS MAY EXCEED THOSE IN THE PARTS LIST, TO PROVIDE FOR EXCESS, ESPECIALLY OF SMALL FASTENERS.
- 3. THIS ASSEMBLY DOES NOT INCLUDE A HUB; IT IS SHOWN FOR REFERENCE. THE HUB IS SHIPPED AS A SEPARATE SYSTEM LEVEL ITEM. ATTACHMENT OF ITEMS TO THE HUB IS DESCRIBED, AS WELL AS ATTACHMENT OF THE HUB TO THE MOUNT.
- 4. THE VIEWS SHOWN ON SHEET 2 ARE INTENDED TO ASSIST IDENTIFICATION OF PARTS.
- 5. PERFORM PANEL ALIGNMENT ACCORDING TO PROCEDURE 1094131.
- 6. FASTENER TORQUE SPECIFICATION FOR THIS ASSEMBLY:

SIZE	STAINLESS	GALVANIZED
1/2-13	55 LBF FT [75 N M]	83 LBF FT [113 N M]
3/4-10	195 LBF FT [264 N M]	293 LBF FT [397 N M]

7. WHEN INSTALLING TRUSSES TO HUB, SHIMMING MAY BE NECESSARY TO ADJUST GAPS. FASTENERS HOLDING THE TRUSS TO THE UPPER FLANGE OF THE HUB SHOULD BE ATTACHED SNUG FIRST, LEAVING ANY GAP BETWEEN THE TRUSS AND THE LOWER HUB FLANGE. FILL THE GAP WITH A COMBINATION OF SHIMS (ITEM 12, .06 INCH THK, AND ITEM 13, .03 INCH THK) TO MINIMIZE THE REMAINING GAP. AFTER SHIMMING EACH TRUSS ATTACHMENT, THE FASTENERS MAY BE TORQUED.

8. REFER TO STUD DIMENSION CHART, SHEET 5, FOR PRESETTING STUD DIMENSIONS PRIOR TO INSTALLING PANELS.

9. DEPENDING ON THE ELECTRONICS IN THE HUB, THE ANTENNA WEIGHT WILL BE UP TO ABOUT 7000 LB [3175 KG] WITHOUT DE-ICING, AND UP TO ABOUT 9000 LB [4082 KG] WITH DE-ICING. THE WEIGHTS OF INDIVIDUAL COMPONENTS AND SUBASSEMBLIES ARE:

COMPONENT	WEIGHT
HUB ASSEMBLY	UP TO 2100 LB [950 KG]
FEED ASSEMBLY	90 LB [41 KG]
SPAR/SUBREFLECTOR ASSY	310 LB [141 KG]
TRUSS, NON-SPAR	73 LB [33 KG]
TRUSS, SPAR	80 LB [36 KG]
TORSION BRACE	12 LB [5.5 KG]
INTERCOSTAL	2-4 LB [.9-1.8 KG]
PANEL, INNER	31 LB [14 KG]
PANEL, OUTER	52 LB [23.6 KG]

- 10. TO LIFT THE REFLECTOR ONTO THE MOUNT:
  - THE REFLECTOR MAY BE LIFTED WITH OR WITHOUT THE SPARS AND SUBREFLECTOR INSTALLED. IF THE SUBREFLECTOR ASSEMBLY IS INSTALLED, THE STRAPS MUST BE SPREAD, OR MUST BE LONG ENOUGH TO AVOID CONTACT WITH THE EDGE OF THE SUBREFLECTOR.
  - REMOVE THE 4 EQUALLY SPACED INNER PANELS. ITEM 10 AT THE CORNERS OF THE HUB, WHICH LIE DIRECTLY ABOVE THE TORSION BRACES, ITEM 4, AS SHOWN ON SHEET 6, EXPOSING THE LIFTING TABS.
  - ATTACH A SHACKLE AND STRAP TO EACH LIFTING TAB EXPOSED BY REMOVING A PANEL.
  - POSITION THE MOUNT ADAPTER FRAME AT 90° ELEVATION, SO THE HUB ATTACHMENT SURFACE IS LEVEL FOR RECEIVING THE REFLECTOR.
  - LIFT THE REFLECTOR ONTO THE ADAPTER FRAME, ALIGN THE MOUNTING HOLES BETWEEN THE FRAME AND THE HUB, AND FASTEN WITH THE HARDWARE SHOWN.

52	85839	NUT	3/4-10 UNC-2B HVY HEX HI-STR GALV	320
960	356513	NUT	1/2-13 HEX SST	311
204	85838	NUT	1/2-13 UNC-2B HVY HEX HI-STR GALV	310
26	177079	WASHER	3/4 .812 1.469 .134 SST	221
104	85843	WASHER	3/4 .812 1.469 .134 HRDN GALV	220
960	177193	WASHER	1/2- .531 1.062 .095 AUS SST	211
432	85842	WASHER	1/2- .531 1.062 .109 HRDN GALV	210
4	86315	BOLT	3/4-10 X 4.0 HEX HD, GALVANIZED	122
26	1094230	SCREW	3/4-10 X 2 3/4 HEX HD, SST	121
48	85831	BOLT	3/4-10 X 2 1/4 HEX HD, GALVANIZED	120
4	89736	BOLT	1/2-13 X 3 1/2 HEX HD, GALVANIZED	114
4	281930	BOLT	1/2-13X2 1/4 HEXHD GALV	113
100	89865	BOLT	1/2-13 X 1 3/4 HEX HD, GALVANIZED	112
96	85827	BOLT	1/2-13 X 1 1/2 HEX HD, GALVANIZED	111
24	1094229	SCREW	1/2-13 X 1.0 HEX GALV	110
QTY REQD.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	FIND NO.

PARTS LIST

240	530308-024	ROD	1/2-13 X 6.0 SST	14
AR	1094255-030	SHIM	HORSESHOE, 3 X 3 X .03 THK	13
AR	1094255-060	SHIM	HORSESHOE, 3 X 3 X .06 THK	12
24	1000322	PANEL, OUTER	9.1M KA	11
24	1000321	PANEL, INNER	9.1M KA	10
24	1000333	INTERCOSTAL	#2 DIAG- 9.1M KA	9
72	1000330	INTERCOSTAL	#2 UPPER- 9.1M KA	8
24	1000328	INTERCOSTAL	#1 LOWER- 9.1M KA	7
24	1000326	INTERCOSTAL	#1 UPPER- 9.1M KA	6
4	1093384	BRACE	RH TORSION, 9.1M KA (CHUB)	5
4	1093383	BRACE	LH TORSION, 9.1M KA (CHUB)	4
4	1092899	TRUSS	SPAR, 9.1M KA (CHUB)	3
12	1092898	TRUSS	CORNER,, 9.1M KA (CHUB)	2
8	1092897	TRUSS	SIDE,, 9.1M KA (CHUB)	1
QTY REQD.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	FIND NO.

PARTS LIST

PROPRIETARY NOTICE THESE DRAWINGS, LISTS OR SPECIFICATIONS ARE THE CONFIDENTIAL INFORMATION AND/OR TRADE SECRETS OF VIASAT, INC., AND ISSUED IN STRICT CONFIDENCE. EXCEPT AS AUTHORIZED BY VIASAT IN WRITING, THESE DRAWINGS, LISTS OR SPECIFICATIONS SHALL NOT BE REPRODUCED, RETRANSMITTED, USED FOR THE DESIGN, MANUFACTURE OR SALE OF EQUIPMENT OR USED FOR ANY OTHER PURPOSE OTHER THAN EVALUATION.	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND APPLY AFTER FINISH OR PLATING. TOLERANCES ARE: <table border="1"> <tr> <th></th> <th>X</th> <th>XX</th> <th>XXX</th> <th>ANGULAR</th> </tr> <tr> <td></td> <td>±.1</td> <td>±.02</td> <td>±.005</td> <td>±.5</td> </tr> </table>		X	XX	XXX	ANGULAR		±.1	±.02	±.005	±.5	CONTRACT NO. OWNER: DGFuller DATE: 2009/06/09	1725 BRECKINRIDGE PLAZA DULUTH, GA 30096
			X	XX	XXX	ANGULAR							
	±.1	±.02	±.005	±.5									
THIRD ANGLE PROJECTION 	DO NOT SCALE DRAWING MAX SURFACE ROUGHNESS 125 ON ALL MACHINED SURFACES EXCEPT AS NOTED. BREAK SHARP EDGES AND CORNERS .010 MAX. FINISH	ELECTRONIC APPROVALS ON FILE IN AGILE	TITLE <b>DWG ASSY/INSTR REFLECTOR 9.1 M (ON COMMON HUB)</b>										
REF DES/FIND NO. QUANTITY		CAD GENERATED DRAWING: SOLIDWORKS TEMPLATE P/N: 1055619 REV 001	SIZE: D 1Q601 CAGE CODE: 1093523 DRAWING NO.: 003 SCALE: NONE WT: 9 LBS SHEET 1 OF 6										

8

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5

4

3

2

1

D

D

C

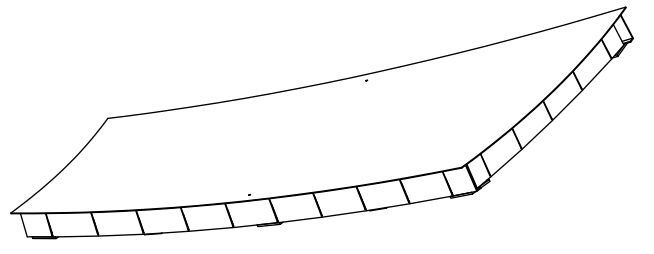
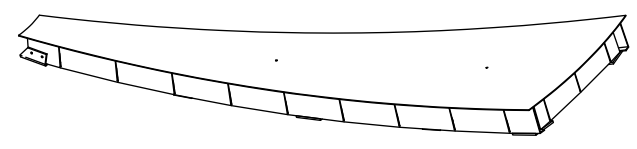
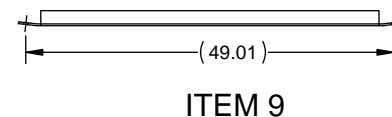
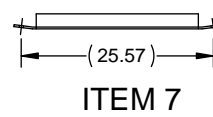
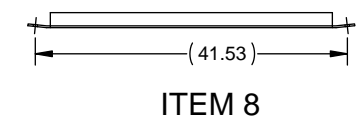
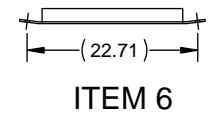
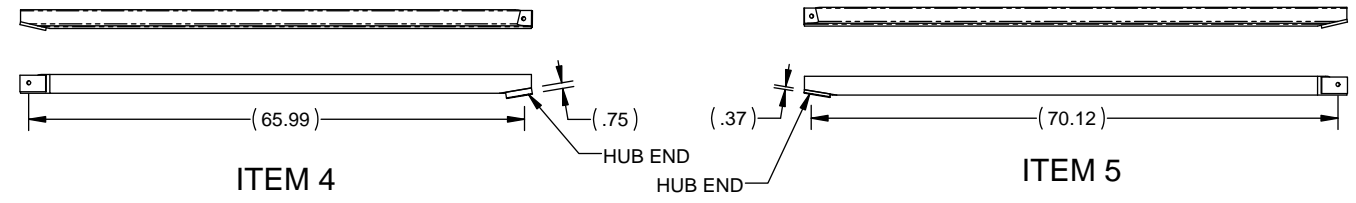
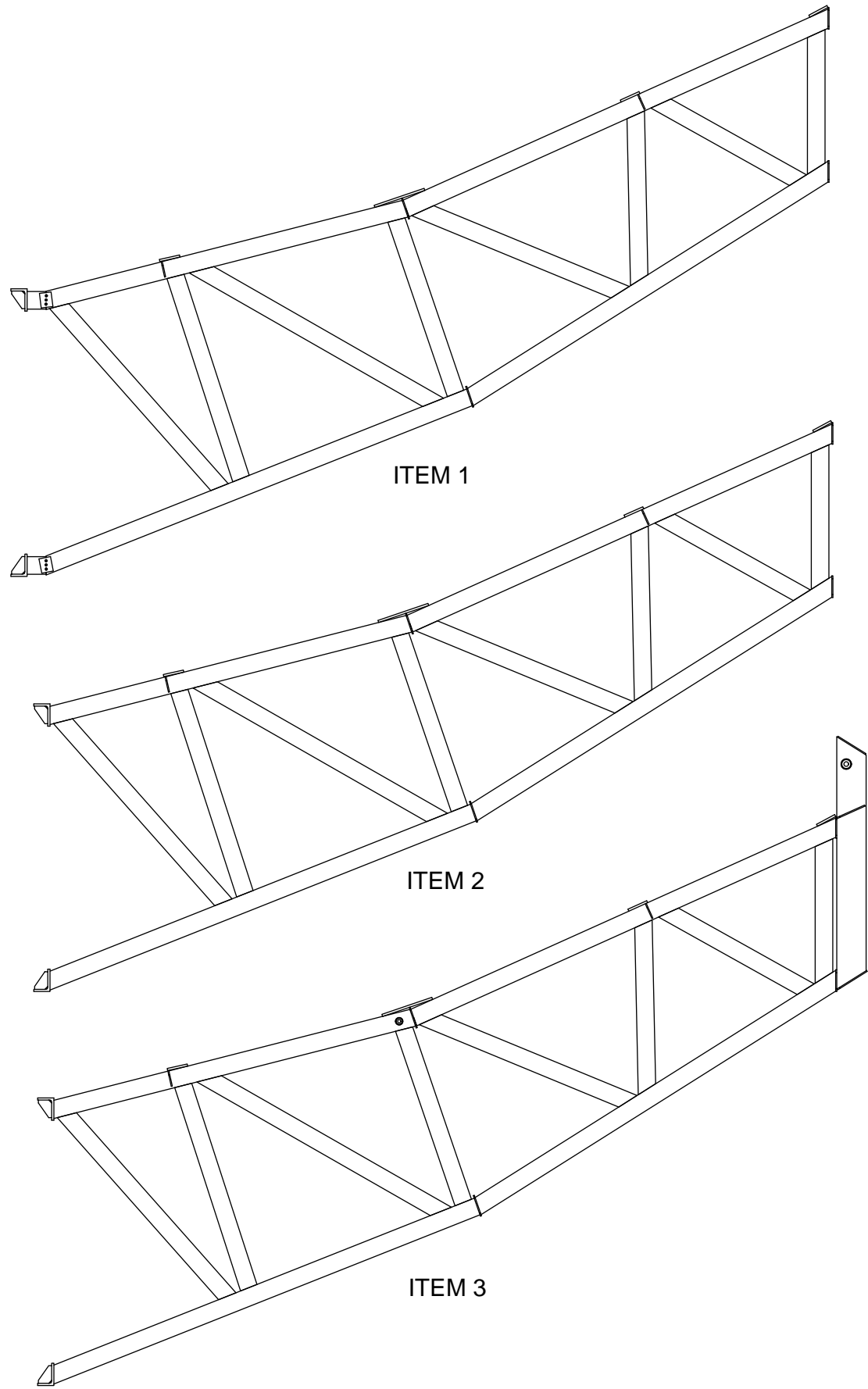
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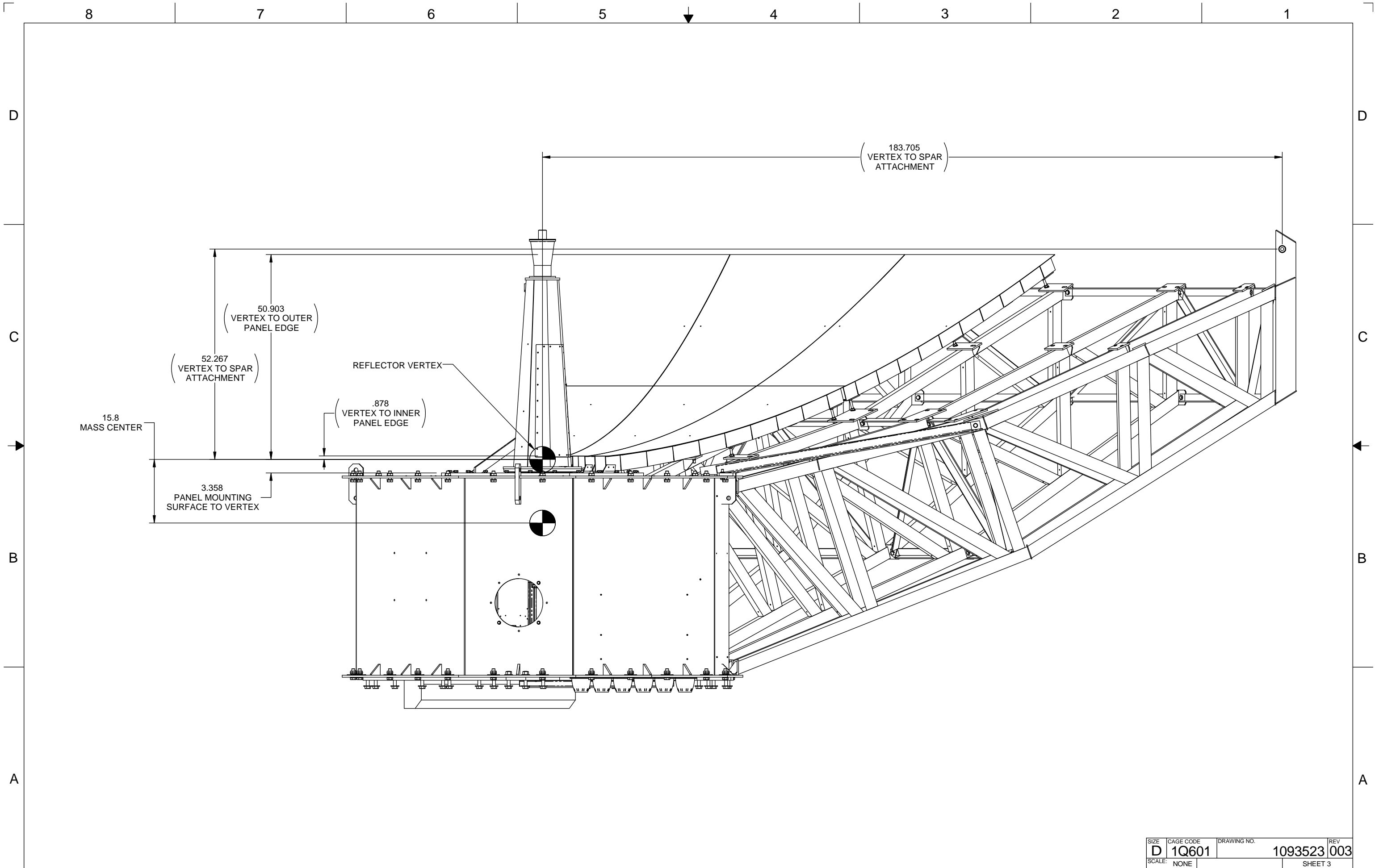
B

A

A



SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1093523	003
SCALE:	NONE		SHEET 2



SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1093523	003
SCALE:	NONE	SHEET 3	

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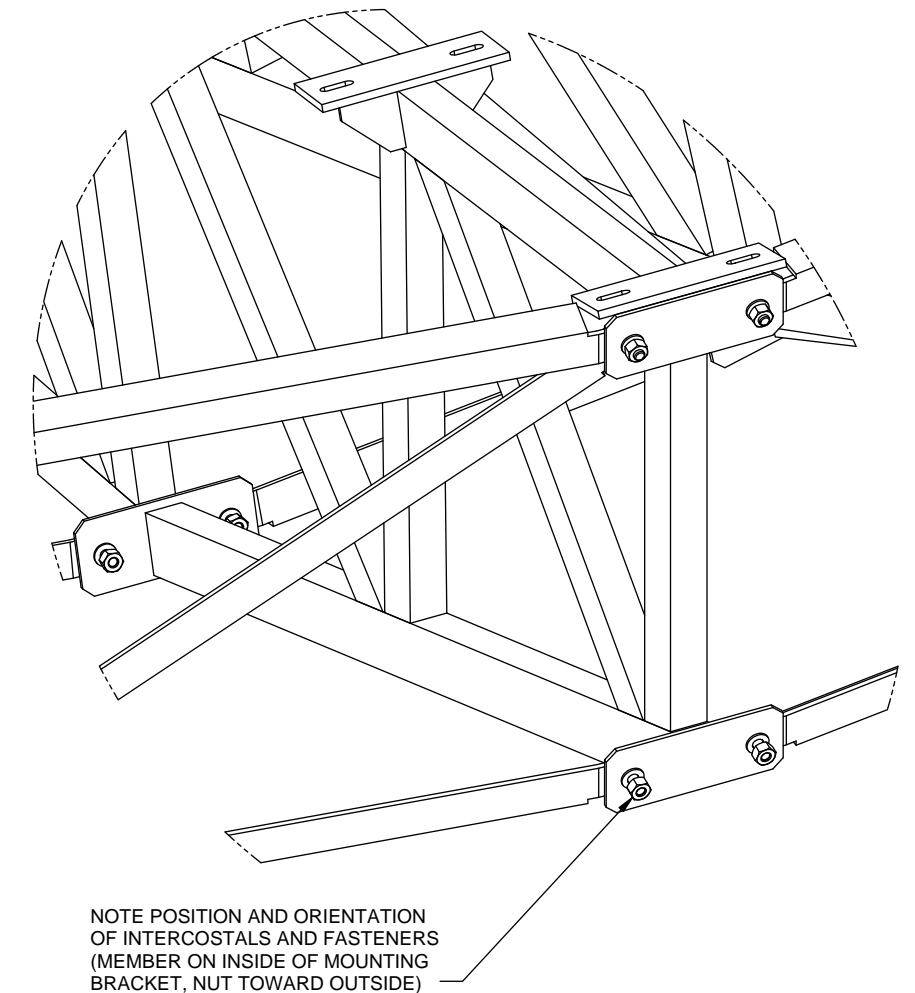
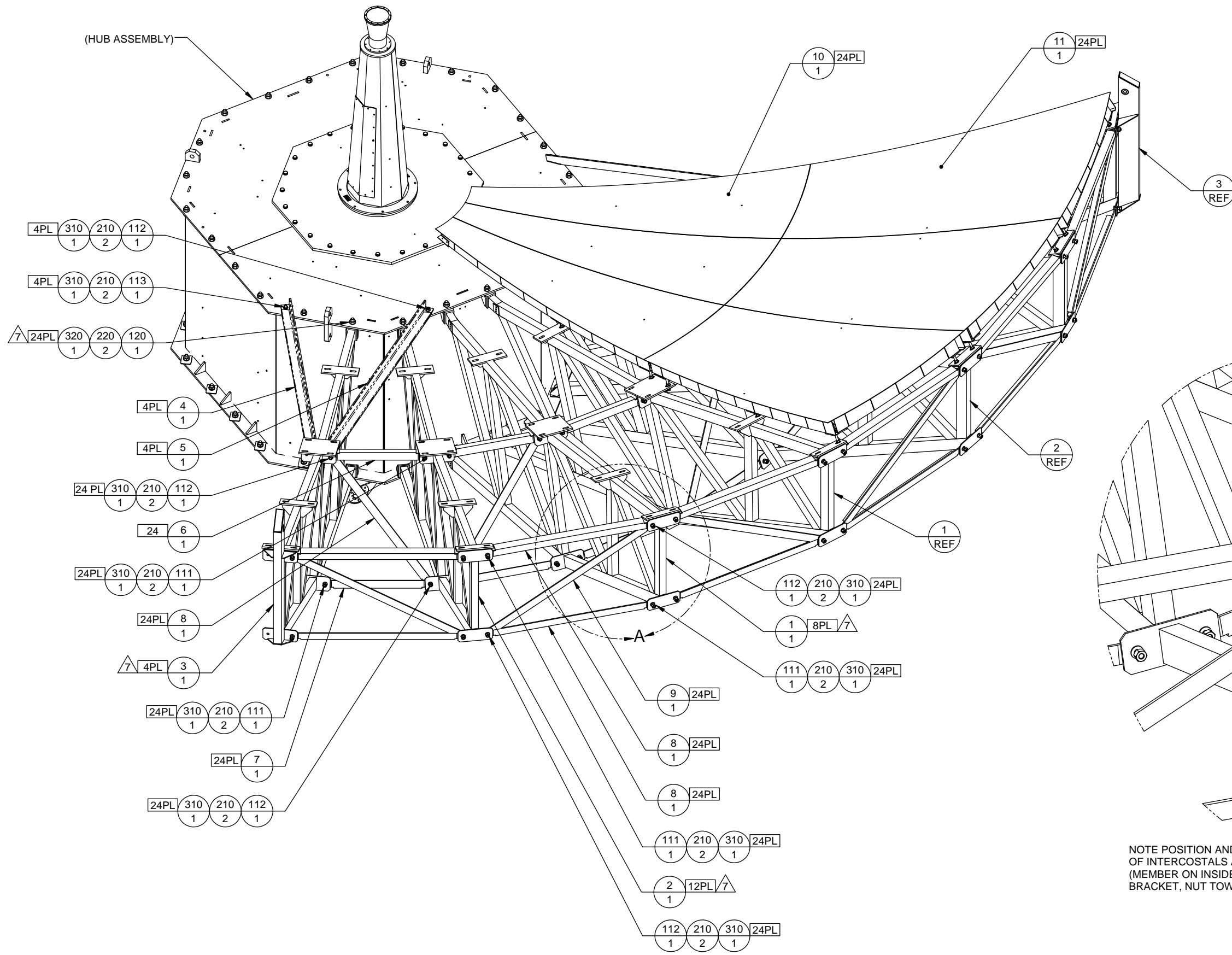
C

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DETAIL A

SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1093523	003
SCALE	NONE	SHEET 4	

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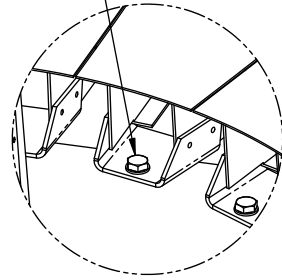
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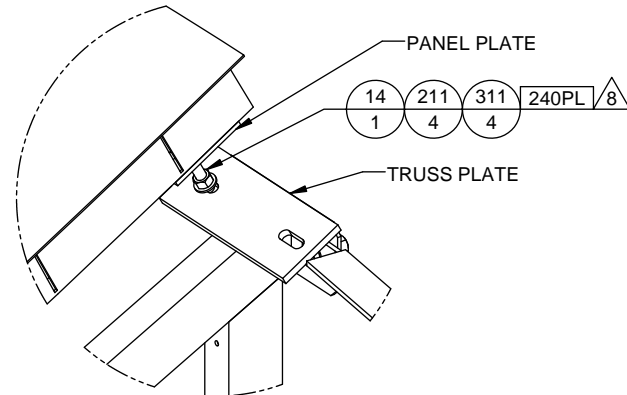
1

24PL 210 110  
1 1

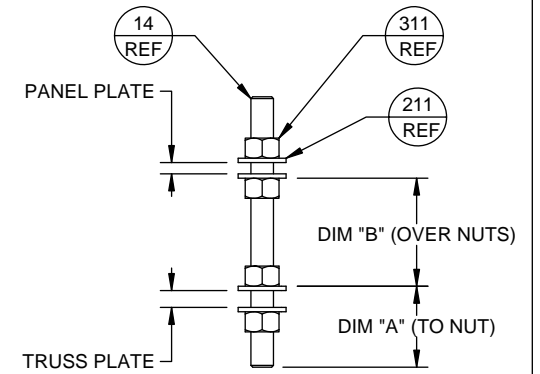


DETAIL B

8 STUD POSITION 1  
8 STUD POSITION 2  
8 STUD POSITION 3  
8 STUD POSITION 4  
8 STUD POSITION 5



DETAIL D



Stud Preset Dimensions / 8			
Stud Position	Dim "A"	Dim "B"	Qty
1	1.80	2.40	48
2	1.46	3.08	48
3	1.46	3.08	48
4	2.20	1.60	48
5	1.20	2.69	48

10 (LIFT LUG)

7 24PL 320 220 120  
1 2 1

114 210 310 4PL  
1 2 1

NOTE POSITION AND ORIENTATION OF TRUSS FASTENERS (NUT ON TOP)

12 13 24PL / 7  
AR AR

DETAIL C

SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1093523	003
SCALE:	NONE	SHEET 5	

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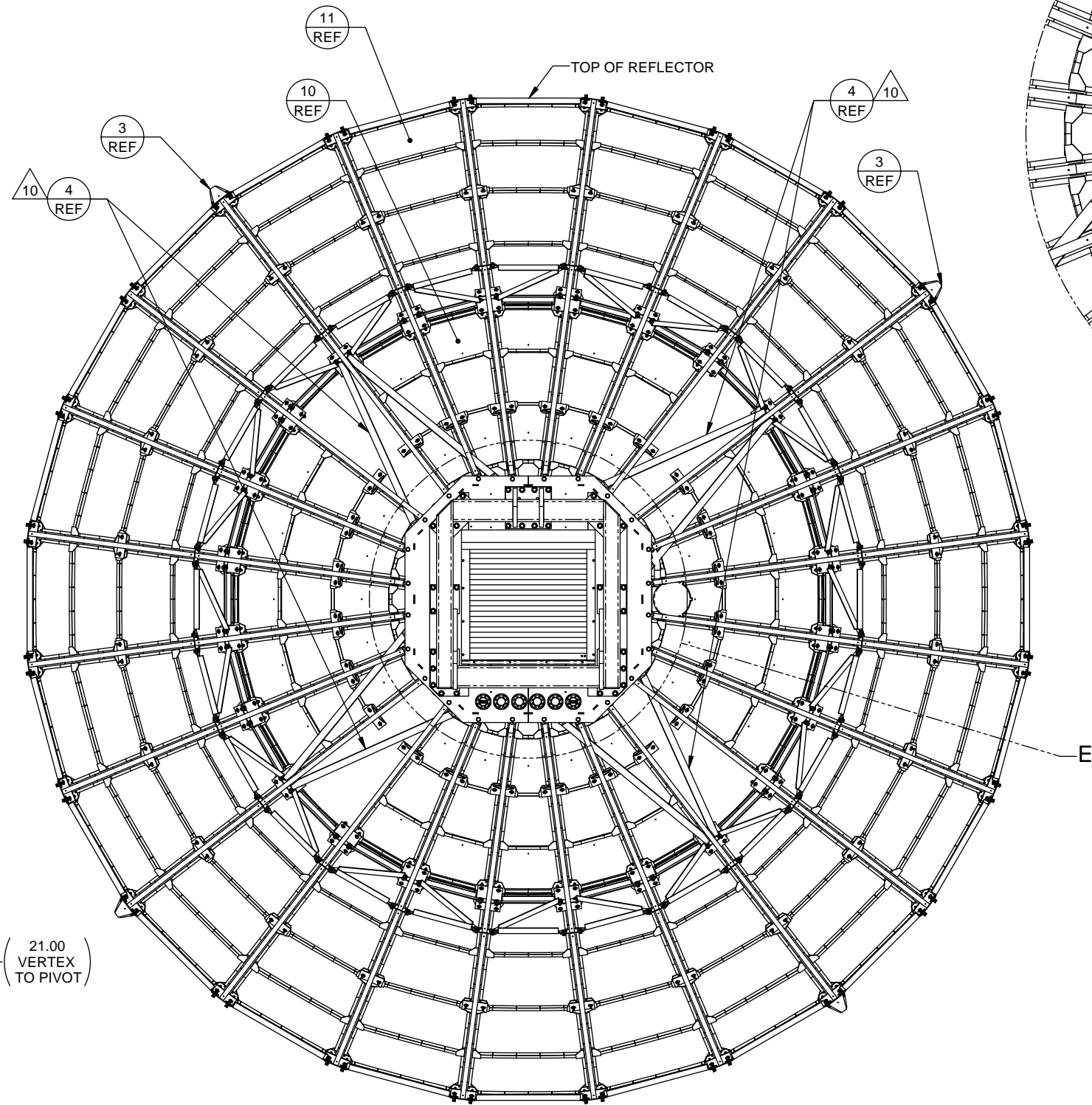
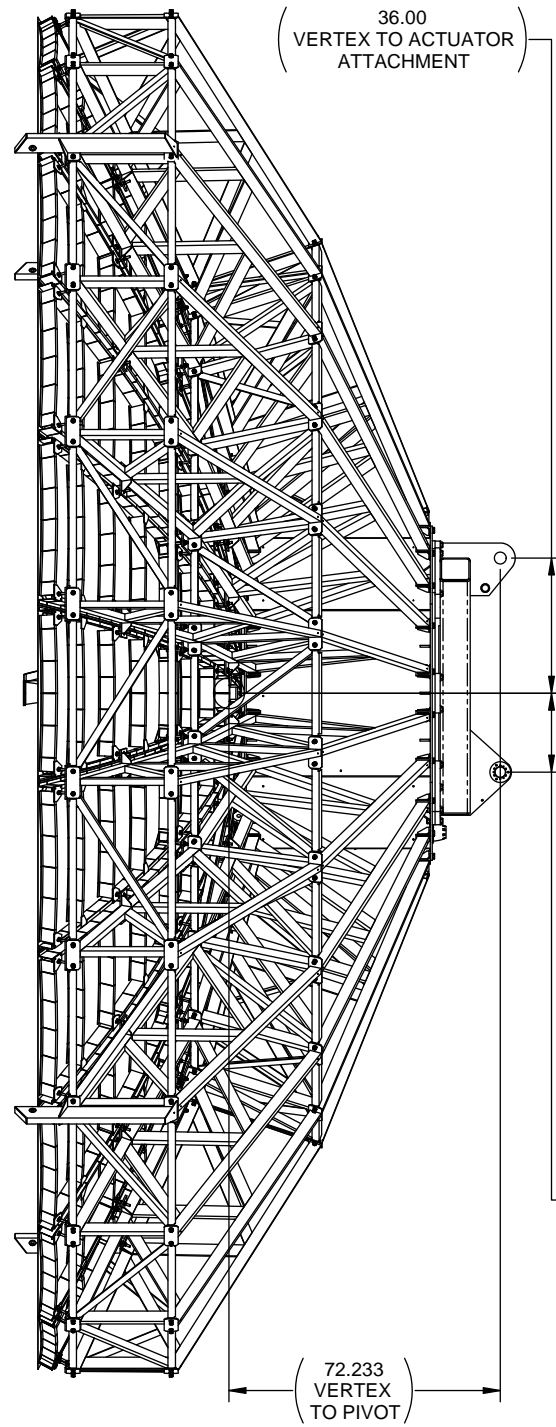
C

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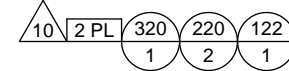
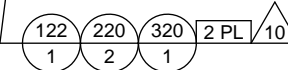
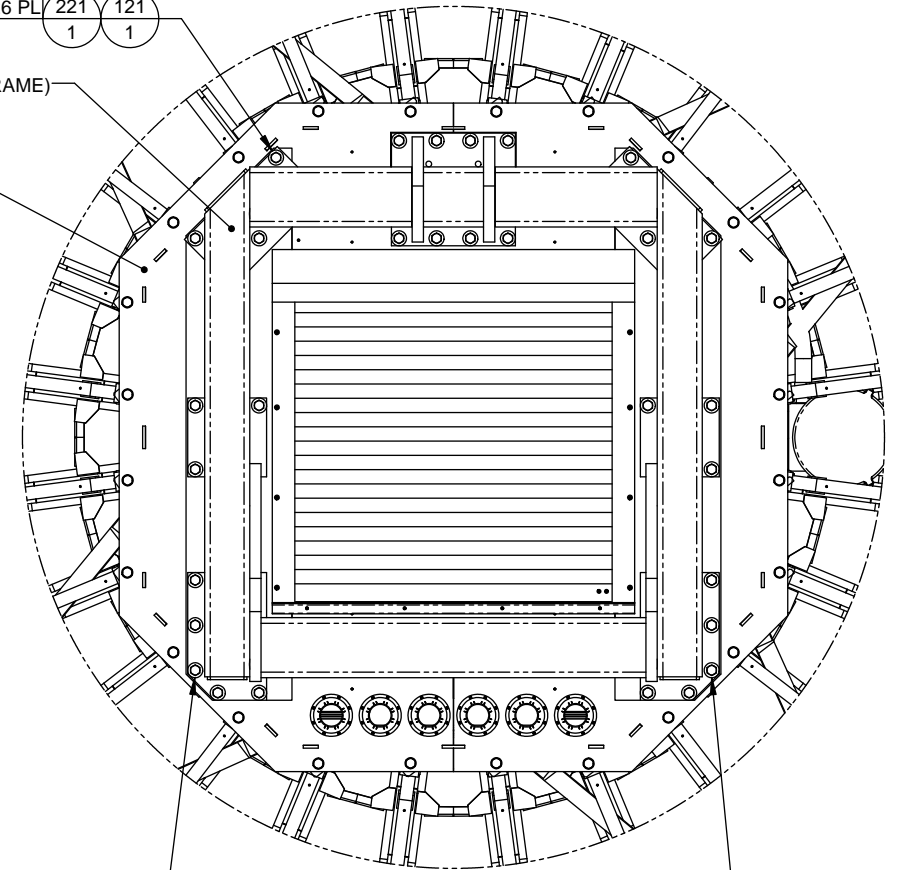
A

A



(ANTENNA MOUNTING FRAME)

(HUB)



DETAIL E

E

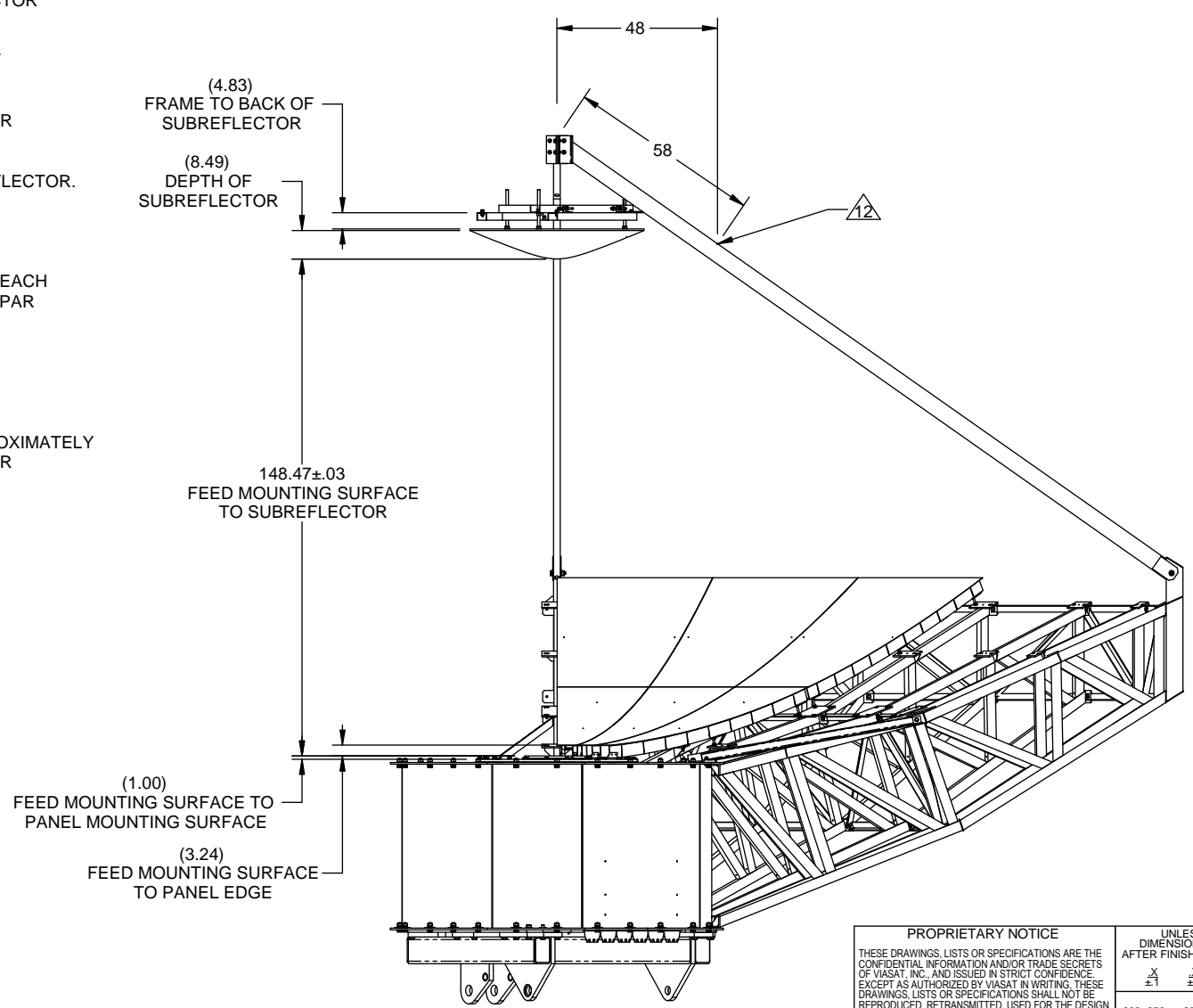
SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1093523	003
SCALE:	NONE		SHEET 6

REVISION HISTORY IN AGILE (ALL SHEETS AT SAME REVISION)		
REV	DESCRIPTION	ELECTRONIC SIGNATURES ON FILE IN AGILE
001	SEE ECO CO-056491	

NOTES:

- INTERPRET DIMENSIONING AND TOLERANCES PER ASME Y14.5M-1994.
- THE PARTS LIST ON THIS DRAWING IS PROVIDED TO FACILITATE ASSEMBLY AND INSTALLATION, NOT FOR PACKING OR SHIPPING. THE FIND NUMBERS AND QUANTITIES ON THE PARTS LIST ARE INTENDED TO MATCH EXACTLY THE BALLOONED ITEMS ON THE DRAWING. THE ITEMS ON THE PARTS LIST MAY BE SHIPPED IN MULTIPLE CRATES OR KITS, EACH WITH THEIR OWN BILL OF MATERIAL (BOM). SOME QUANTITIES ON THE BOMS MAY EXCEED THOSE IN THE PARTS LIST, TO PROVIDE FOR EXCESS, ESPECIALLY OF SMALL FASTENERS.
- THIS ASSEMBLY DOES NOT INCLUDE THE REFLECTOR; IT IS SHOWN FOR REFERENCE FOR ATTACHMENT OF THE SPARS AND LOCATION OF THE SUBREFLECTOR. THE REFLECTOR IS SHIPPED AS A SEPARATE SYSTEM LEVEL ITEM.
- THE VIEWS SHOWN ON SHEET 2 ARE INTENDED TO ASSIST IDENTIFICATION OF PARTS.
- INSTALL PLUG, ITEM 6, INTO HOLE IN APEX OF SUBREFLECTOR, ITEM 1.
- NOTE ORIENTATION OF FITTING, ITEM 5, RELATIVE TO SPARS, ITEM 4.
- APPLY LUBRICANT, ITEM 9, TO THE INTERFACES BETWEEN ITEMS 2 AND 3 TO FACILITATE LATERAL (X/Y) ADJUSTMENT DURING SUBREFLECTOR ALIGNMENT.
- LOOSEN THESE FASTENERS SLIGHTLY FOR X/Y ADJUSTMENT OF SUBREFLECTOR.
- THESE RODS PROVIDE X/Y FINE ADJUSTMENT OF SUBREFLECTOR POSITION.
- THESE RODS PROVIDE AXIAL AND TILT ADJUSTMENT OF SUBREFLECTOR.
- ALIGN SUBREFLECTOR WITH MAIN REFLECTOR ACCORDING TO PROCEDURE 1094131.
- ATTACH LIFTING STRAP APPROXIMATELY AT THIS LOCATION ON EACH SPAR TO BALANCE LOAD AND MAINTAIN PROPER SPREAD FOR SPAR ATTACHMENT TO REFLECTOR.
- FASTENER TORQUE SPECIFICATION FOR THIS ASSEMBLY:  
1/2-13: 55 LBF FT [ 75 N M]  
3/4-10: 150 LBF FT [203 N M]
- THE TOTAL WEIGHT OF THE ASSEMBLED COMPONENTS IS APPROXIMATELY 310 LB [141 KG]. THE TABLE LISTS INDIVIDUAL WEIGHTS OF MAJOR COMPONENTS.

COMPONENT	WEIGHT
SUBREFLECTOR	106 LB [48 KG]
FRAME, ITEM 2	20 LB [9 KG]
FRAME, ITEM 3	11 LB [5 KG]
SPAR (EACH)	40 LB [18 KG]



4	85839	NUT	3/4-10 UNC-2B HVY HEX HI-STR GALV	321
9	179919	NUT	3/4-10 PLAIN-HEX SST	320
39	179925	NUT	1/2-13 PLAIN-HEX SST	310
8	85843	WASHER	3/4- .812 1.469 .134 HRDN GALV	221
9	177079	WASHER	3/4-.812 1.469 .134 SST	220
54	177193	WASHER	1/2 .531 1.062 .095 SST	210
4	86315	BOLT	3/4-10 X 4 HX HD GALV	121
15	179923	SCREW	1/2-13 X 1 1/2 CAP,HEX,SST	110
AR	86689	LUBRICANT	FISHING REEL,3/8 OZ.	9
3	514525	ROD	1/2-13 X 15.0 SST	8
3	339836	ROD	3/4-10 X 13.0 SST	7
1	514526	PLUG	DOMED, SUBREFLECTOR	6
1	339890	FITTING	SPAR TOP	5
4	1050475	SPAR	SUBREFLECTOR, 9.1M KA	4
1	514366	FRAME	SUPPORT, SUBREFLECTOR	3
1	514365	FRAME	MOUNTING, SUBREFLECTOR	2
1	521015	SUBREFLECTOR	KU-BAND, HEATED-9.1 METER	1
QTY REQD.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	FIND NO.

PARTS LIST

**PROPRIETARY NOTICE**  
THESE DRAWINGS, LISTS OR SPECIFICATIONS ARE THE CONFIDENTIAL INFORMATION AND/OR TRADE SECRETS OF VIASAT, INC., AND ISSUED IN STRICT CONFIDENCE. EXCEPT AS AUTHORIZED BY VIASAT IN WRITING, THESE DRAWINGS, LISTS OR SPECIFICATIONS SHALL NOT BE REPRODUCED, RETRANSMITTED, USED FOR THE DESIGN, MANUFACTURE OR SALE OF EQUIPMENT OR USED FOR ANY OTHER PURPOSE OTHER THAN EVALUATION.

**THIRD ANGLE PROJECTION**

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND APPLY AFTER FINISH OR PLATING. TOLERANCES ARE:

	X	XX	XXX	ANGULAR
	±.1	±.02	±.005	±.5
HOLE DIAMETER	.000-.250	.251-.500	.501-1.000	1.001-1.500
	+0.004	+0.006	+0.007	+0.010
	-.001	-.001	-.001	-.001

DO NOT SCALE DRAWING  
MAX SURFACE ROUGHNESS 125 ON ALL MACHINED SURFACES EXCEPT AS NOTED. BREAK SHARP EDGES AND CORNERS .010 MAX. FINISH

CONTRACT NO. \_\_\_\_\_  
OWNER: DGFuller DATE: 2009/06/16

**ELECTRONIC APPROVALS ON FILE IN AGILE**

CAD GENERATED DRAWING: SOLIDWORKS TEMPLATE P/N: 1055619 REV 001

**ViaSat** 1725 BRECKINRIDGE PLAZA DULUTH, GA 30096

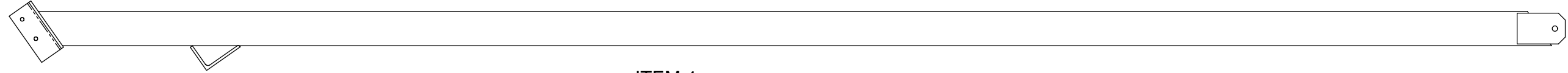
TITLE: **DWG ASSY/INSTR SUBREFL/SPARS 9.1M KA**

SIZE: D	CAGE CODE: 1Q601	DRAWING NO.: 1094227	REV: 001
SCALE: NONE	WT: 309 LBS	SHEET 1 OF 3	

8 7 6 5 4 3 2 1

D

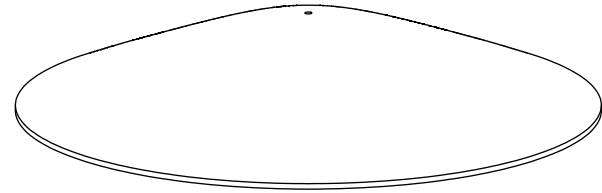
D



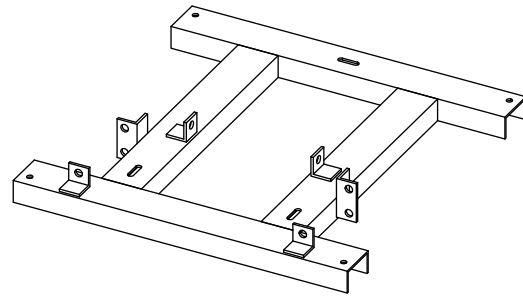
ITEM 4

C

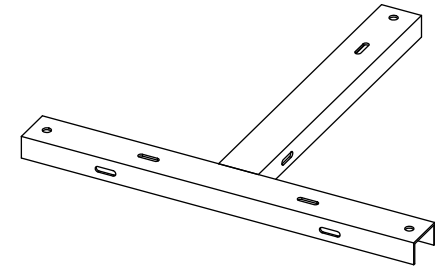
C



ITEM 1



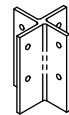
ITEM 2



ITEM 3

B

B



ITEM 5



ITEM 6

B

B

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A

SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1094227	001
SCALE:	NONE	SHEET 2	



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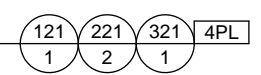
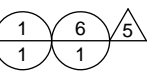
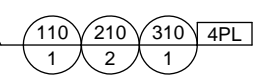
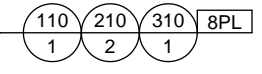
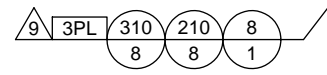
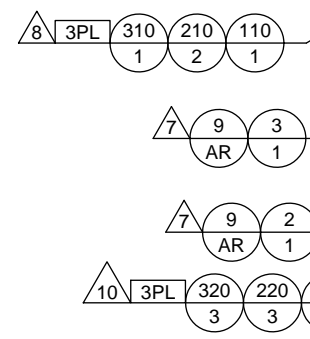
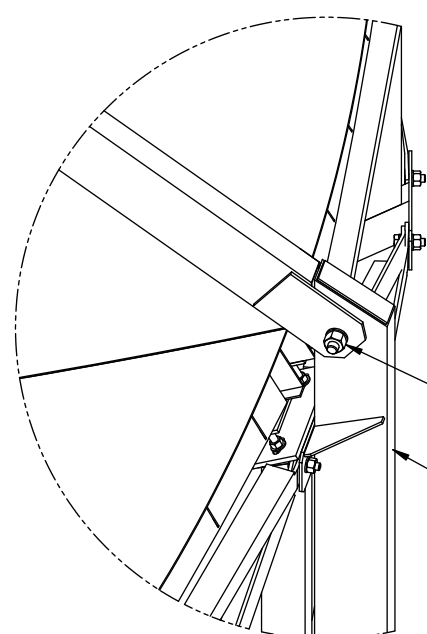
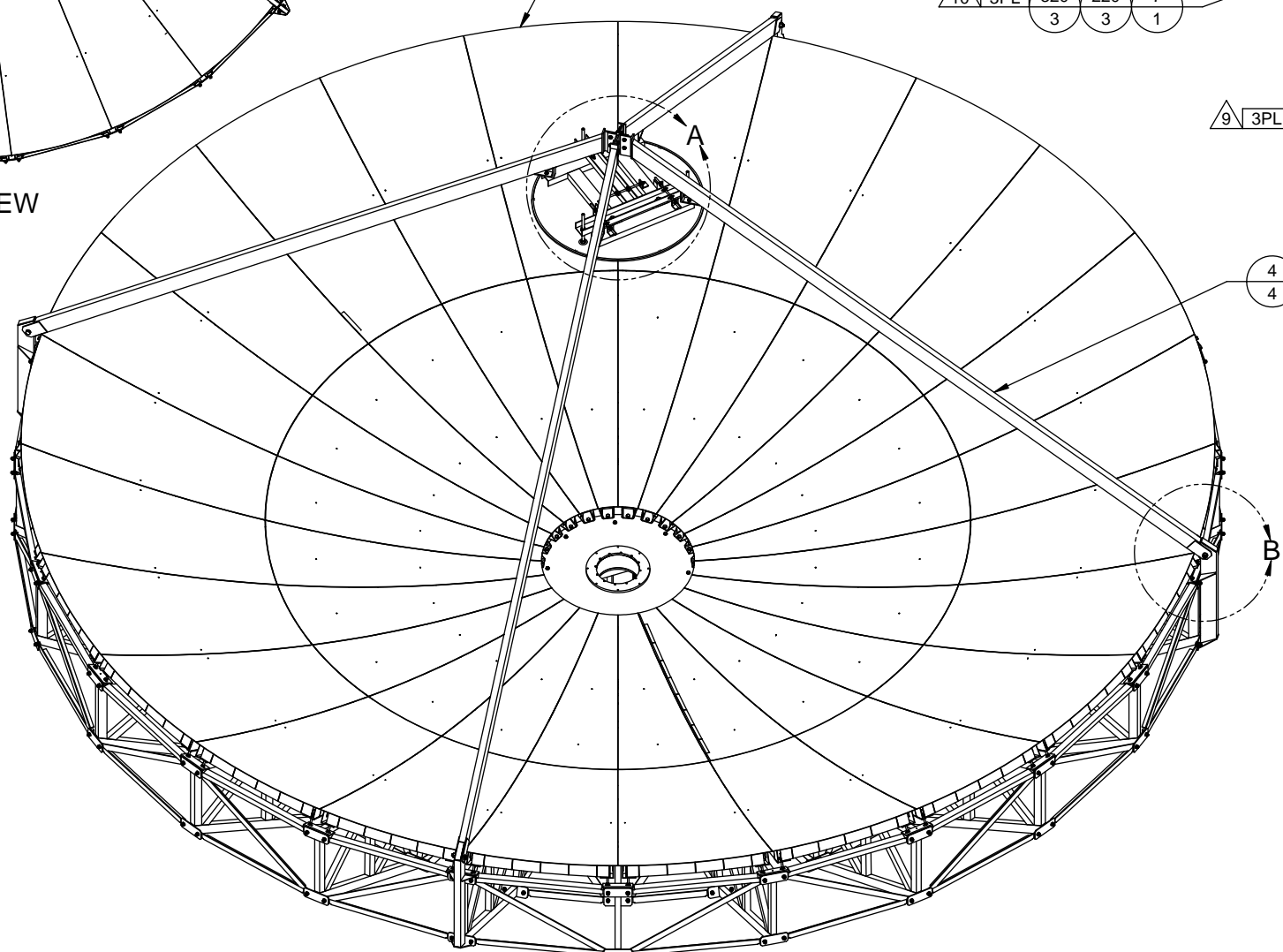
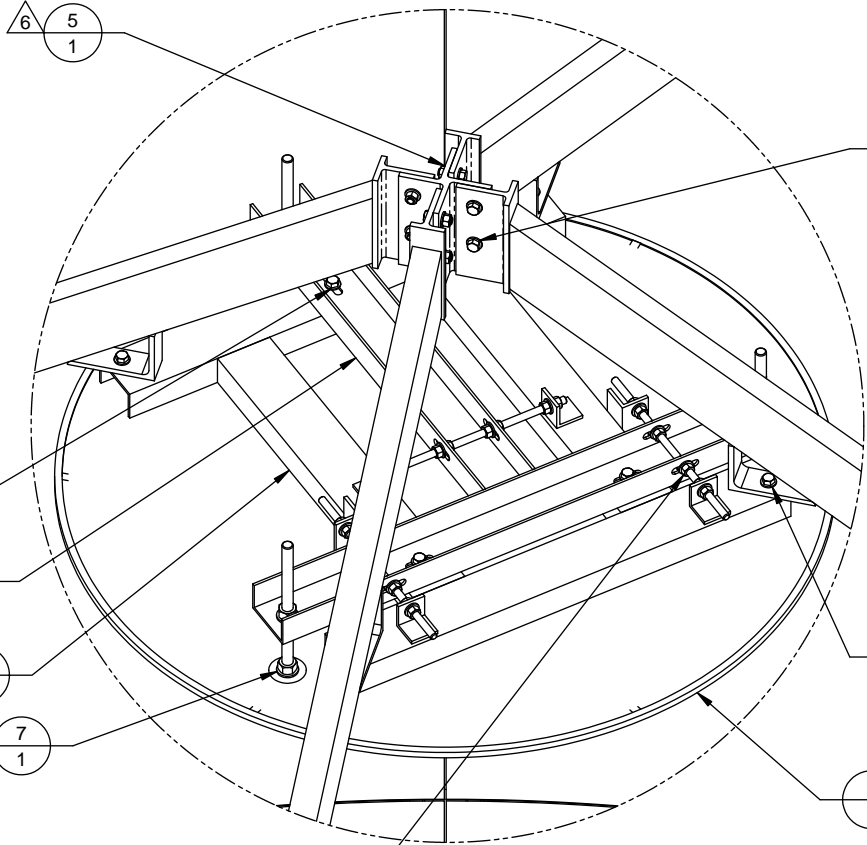
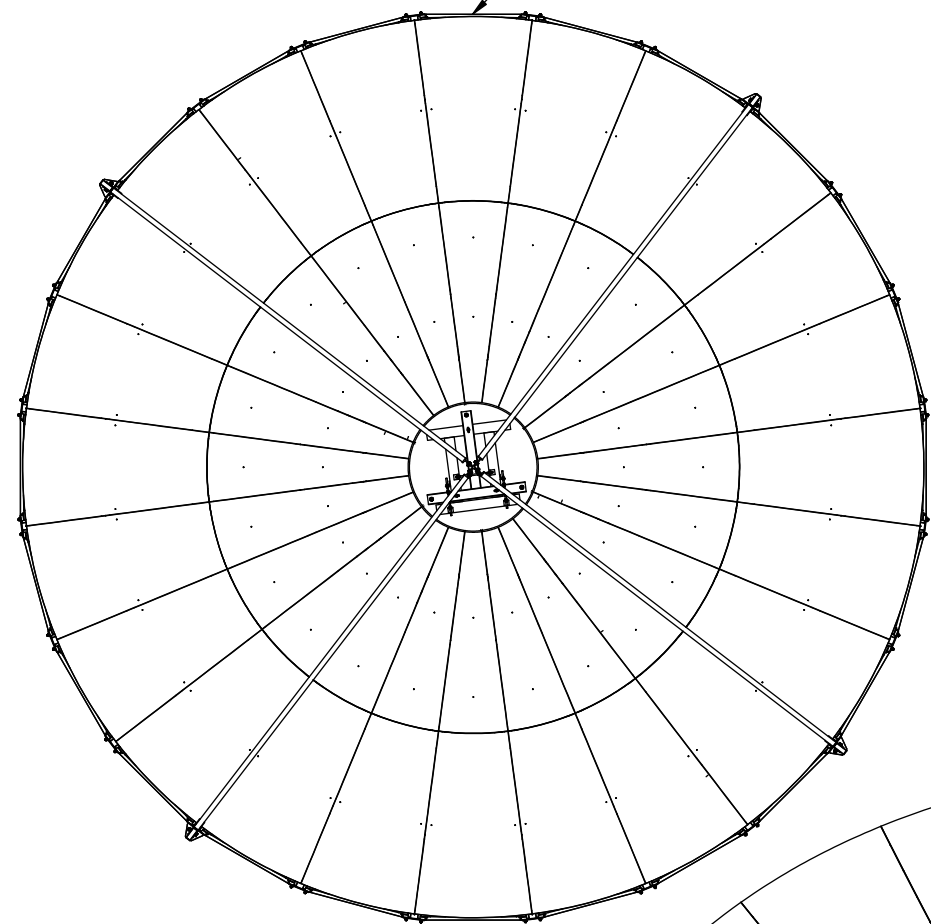
4

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TOP OF REFLECTOR



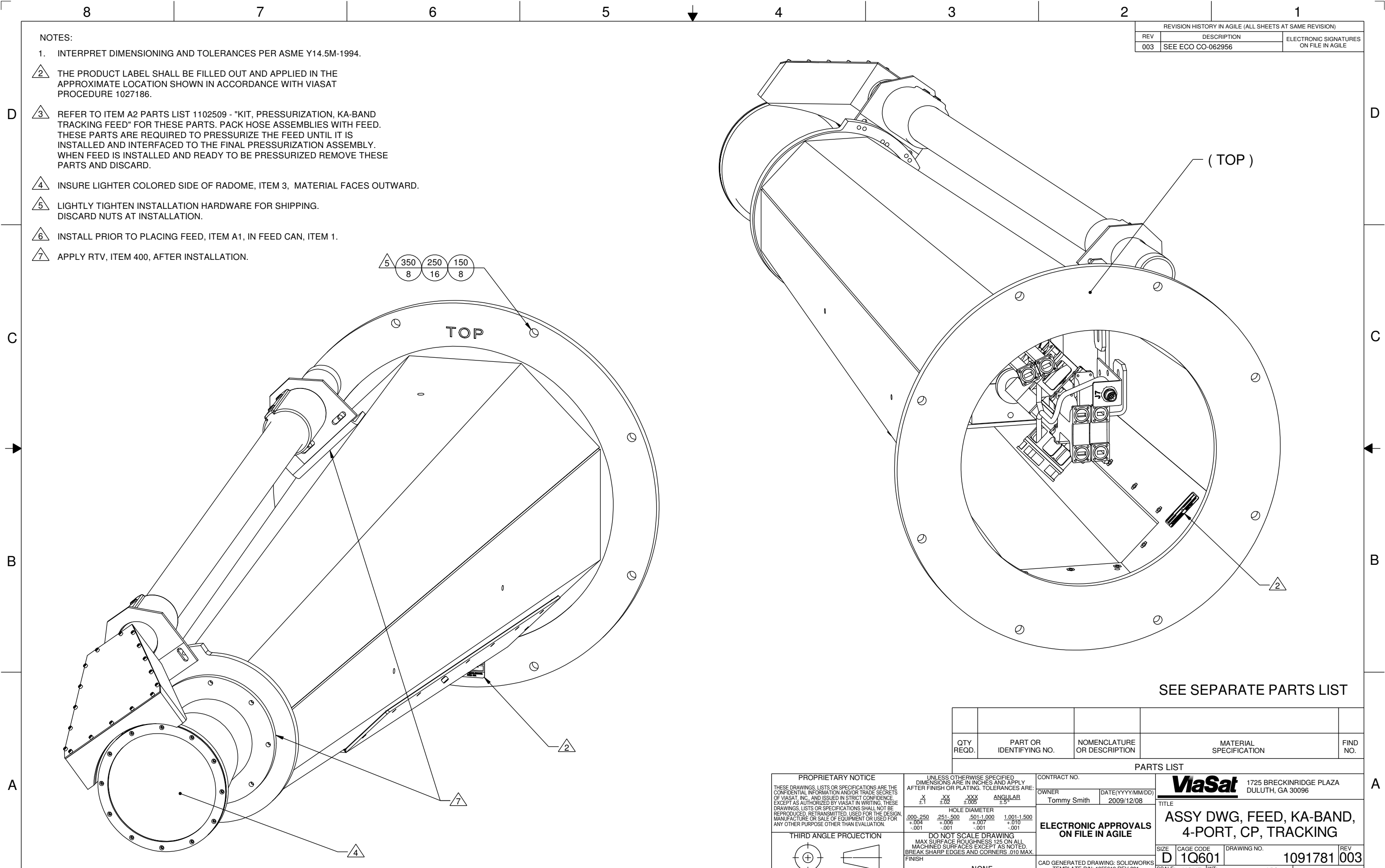
(REFLECTOR SPAR TRUSS)

SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1094227	001
SCALE:	NONE		SHEET 3

REVISION HISTORY IN AGILE (ALL SHEETS AT SAME REVISION)		
REV	DESCRIPTION	ELECTRONIC SIGNATURES ON FILE IN AGILE
003	SEE ECO CO-062956	

- NOTES:
1. INTERPRET DIMENSIONING AND TOLERANCES PER ASME Y14.5M-1994.
  2. THE PRODUCT LABEL SHALL BE FILLED OUT AND APPLIED IN THE APPROXIMATE LOCATION SHOWN IN ACCORDANCE WITH VIASAT PROCEDURE 1027186.
  3. REFER TO ITEM A2 PARTS LIST 1102509 - "KIT, PRESSURIZATION, KA-BAND TRACKING FEED" FOR THESE PARTS. PACK HOSE ASSEMBLIES WITH FEED. THESE PARTS ARE REQUIRED TO PRESSURIZE THE FEED UNTIL IT IS INSTALLED AND INTERFACED TO THE FINAL PRESSURIZATION ASSEMBLY. WHEN FEED IS INSTALLED AND READY TO BE PRESSURIZED REMOVE THESE PARTS AND DISCARD.
  4. INSURE LIGHTER COLORED SIDE OF RADOME, ITEM 3, MATERIAL FACES OUTWARD.
  5. LIGHTLY TIGHTEN INSTALLATION HARDWARE FOR SHIPPING. DISCARD NUTS AT INSTALLATION.
  6. INSTALL PRIOR TO PLACING FEED, ITEM A1, IN FEED CAN, ITEM 1.
  7. APPLY RTV, ITEM 400, AFTER INSTALLATION.

5	350	250	150
	8	16	8



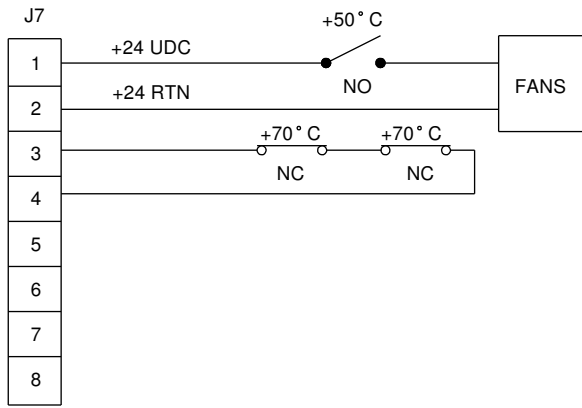
SEE SEPARATE PARTS LIST

QTY REQD.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	FIND NO.
PARTS LIST				

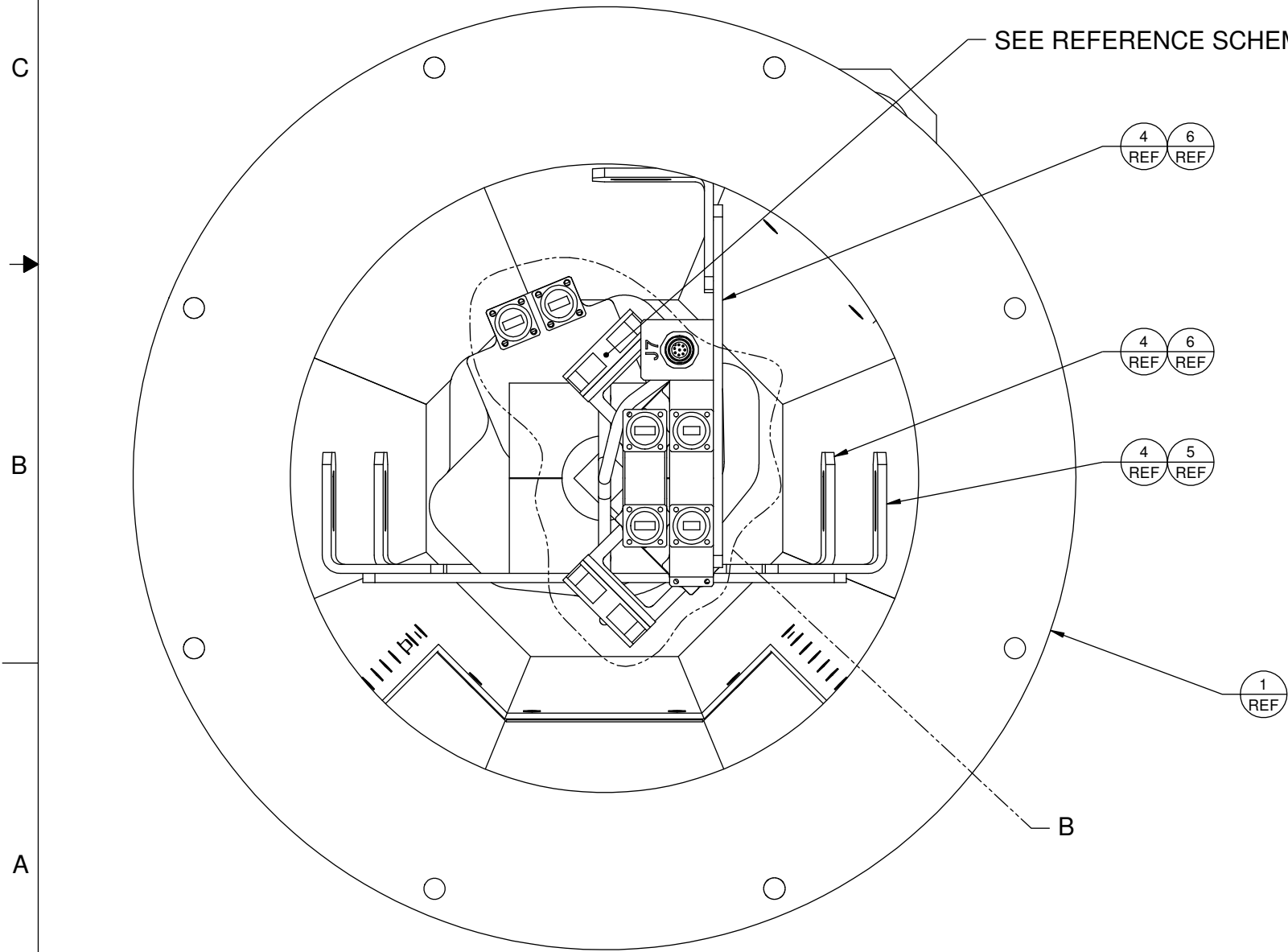
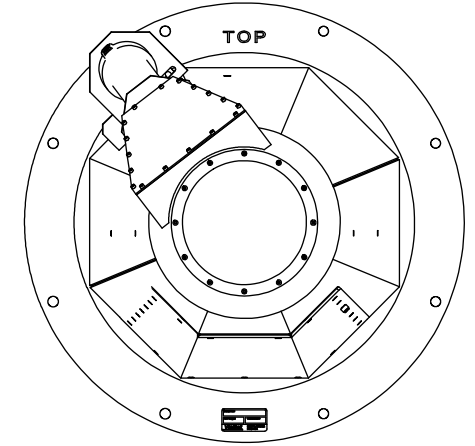
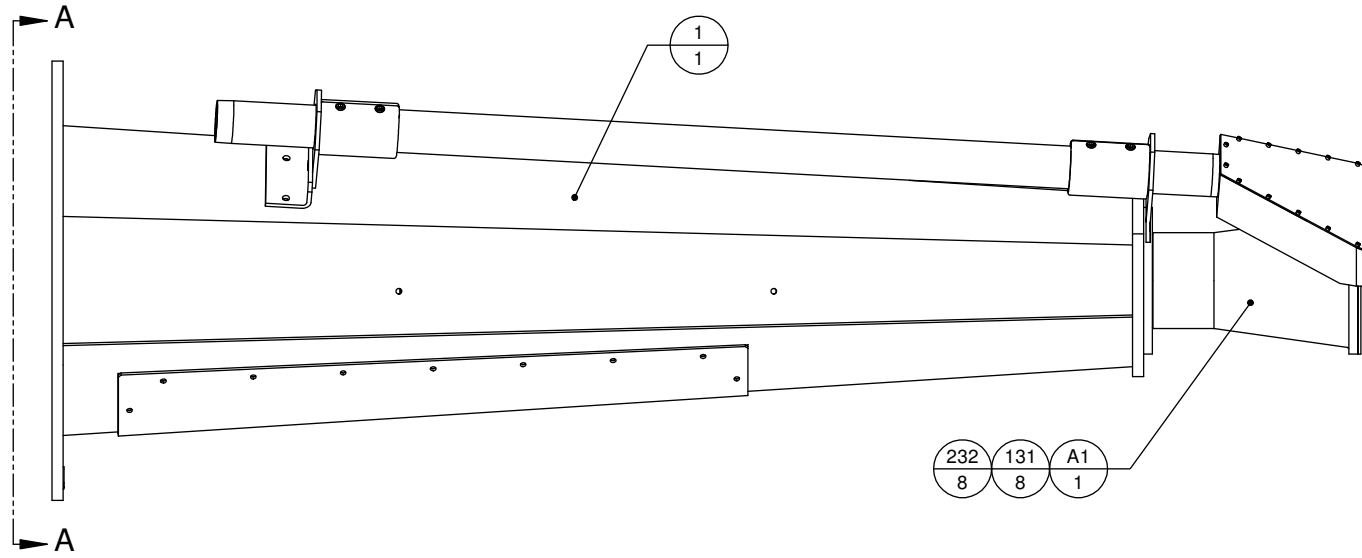
<b>PROPRIETARY NOTICE</b> <small>THESE DRAWINGS, LISTS OR SPECIFICATIONS ARE THE CONFIDENTIAL INFORMATION AND/OR TRADE SECRETS OF VIASAT, INC. AND ISSUED IN STRICT CONFIDENCE. EXCEPT AS AUTHORIZED BY VIASAT IN WRITING, THESE DRAWINGS, LISTS OR SPECIFICATIONS SHALL NOT BE REPRODUCED, RETRANSMITTED, USED FOR THE DESIGN, MANUFACTURE OR SALE OF EQUIPMENT OR USED FOR ANY OTHER PURPOSE OTHER THAN EVALUATION.</small>	<small>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND APPLY AFTER FINISH OR PLATING. TOLERANCES ARE:</small> <table border="1"> <tr> <th>X</th> <th>XX</th> <th>XXX</th> <th>ANGULAR</th> </tr> <tr> <td>±.1</td> <td>±.02</td> <td>±.005</td> <td>±.5</td> </tr> </table>	X	XX	XXX	ANGULAR	±.1	±.02	±.005	±.5	<small>CONTRACT NO.</small> OWNER: Tommy Smith    DATE: 2009/12/08	1725 BRECKINRIDGE PLAZA DULUTH, GA 30096
		X	XX	XXX	ANGULAR						
±.1	±.02	±.005	±.5								
<small>THIRD ANGLE PROJECTION</small> 	<small>DO NOT SCALE DRAWING</small> <small>MAX SURFACE POLISHNESS: 125 ON ALL MACHINED SURFACES EXCEPT AS NOTED. BREAK SHARP EDGES AND CORNERS .010 MAX. FINISH</small> NONE	<b>ELECTRONIC APPROVALS ON FILE IN AGILE</b>	<b>ASSY DWG, FEED, KA-BAND, 4-PORT, CP, TRACKING</b>								
<small>CAD GENERATED DRAWING: SOLIDWORKS TEMPLATE P/N: 1055619 REV 001</small>		<small>SIZE</small> D <small>CAGE CODE</small> 1Q601 <small>DRAWING NO.</small> 1091781 <small>REV</small> 003	<small>SCALE</small> : NONE <small>WT</small> : <small>LBS</small> <small>SHEET 1 OF 6</small>								

8 7 6 5 4 3 2 1

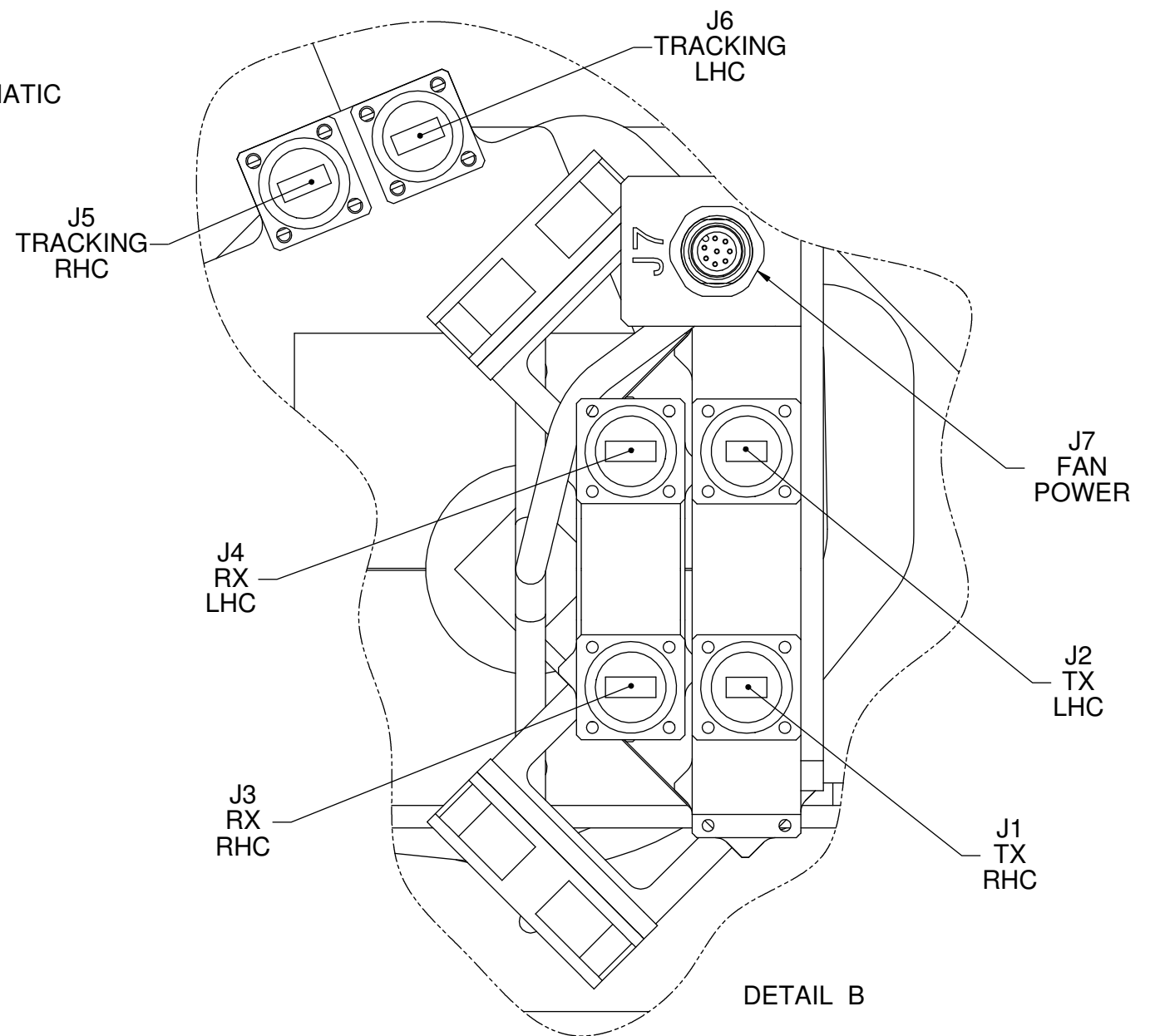
### REFERENCE SCHEMATIC



(TURCK FSFD 8 - 0.5)



VIEW A - A



DETAIL B

SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1091781	003
SCALE:	NONE	SHEET 2	

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D

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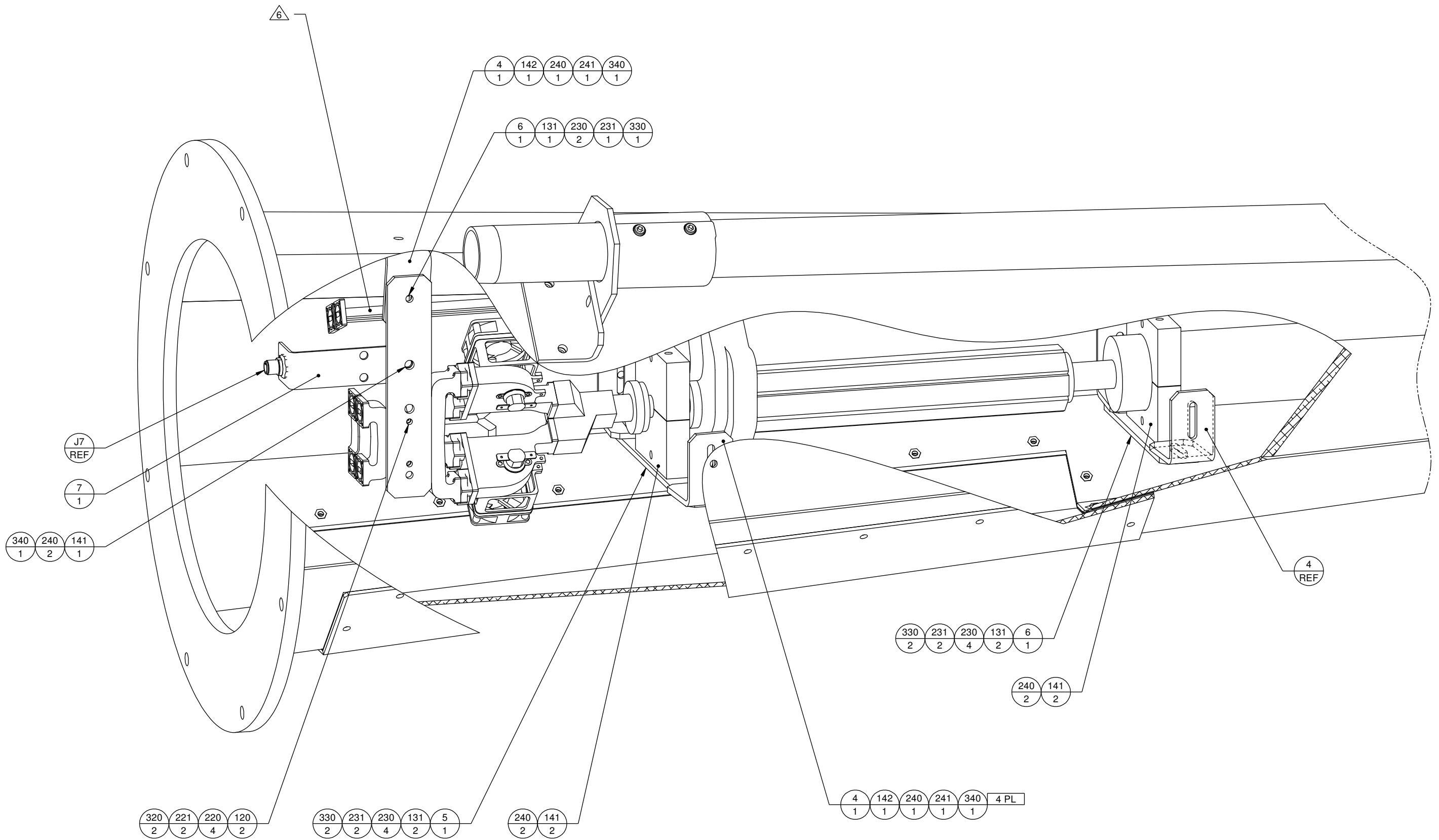
C

B

B

A

A



SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1091781	003
SCALE:	NONE	SHEET 3	

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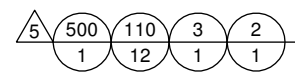
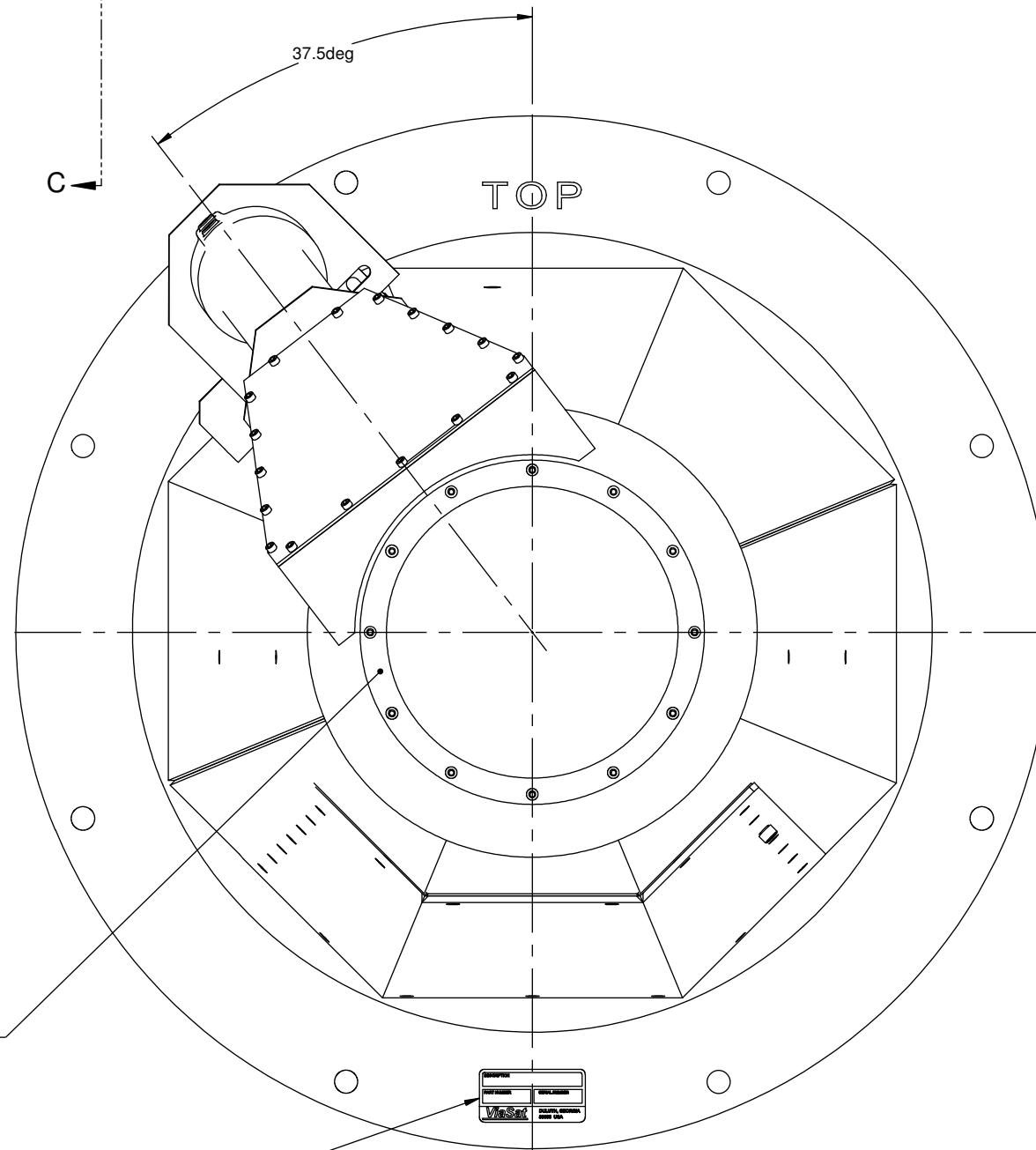
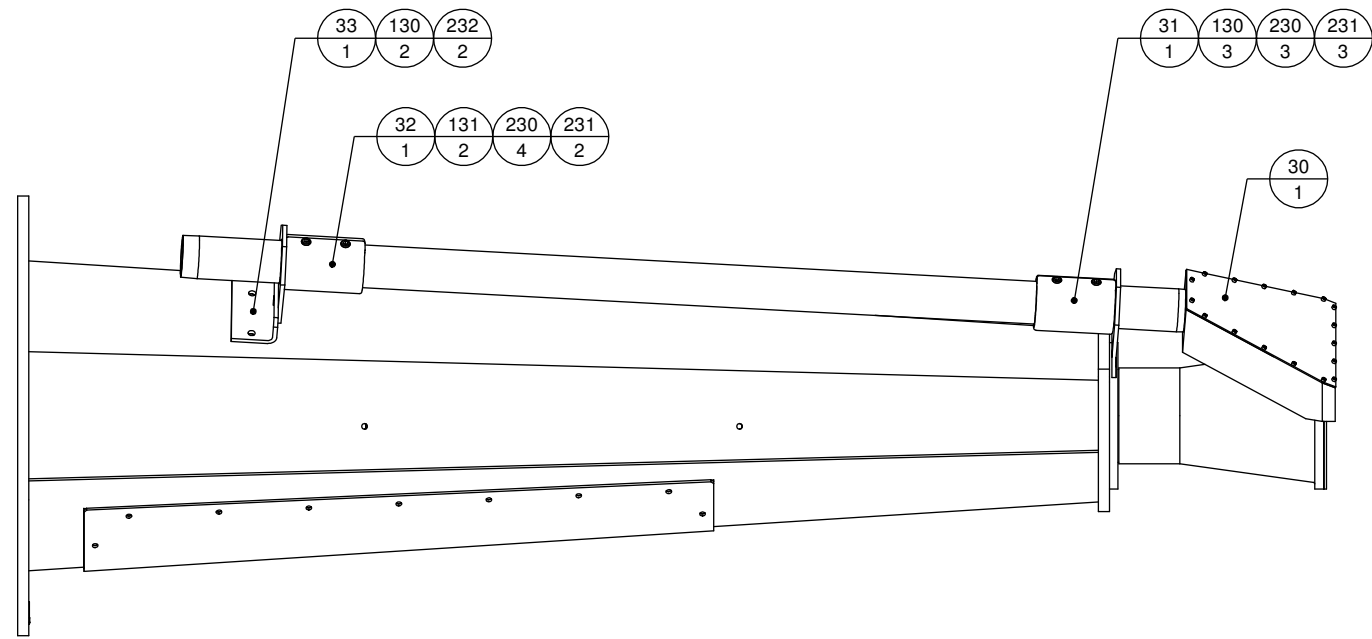
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VIEW C-C

SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1091781	003
SCALE: NONE			SHEET 4

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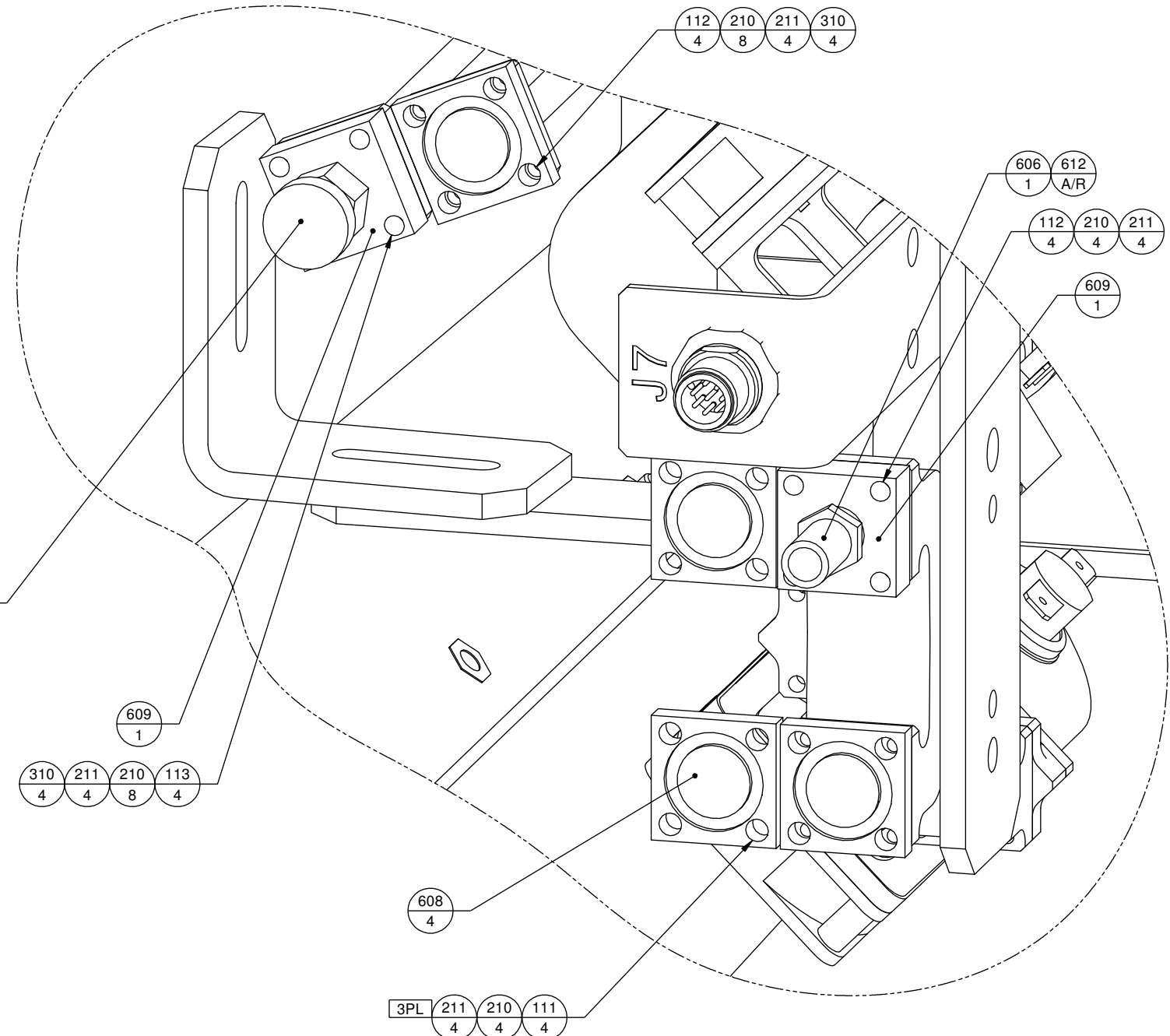
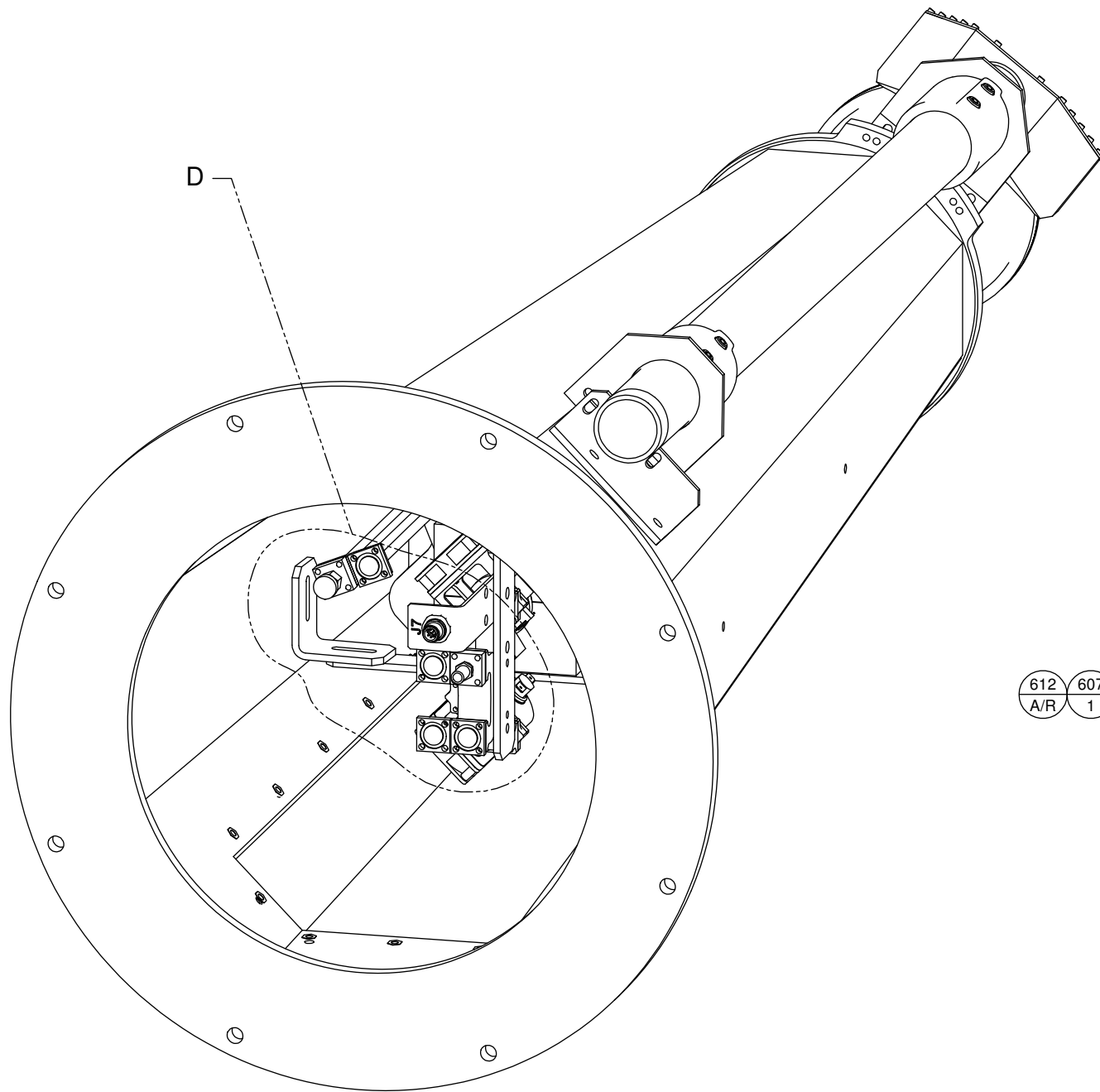
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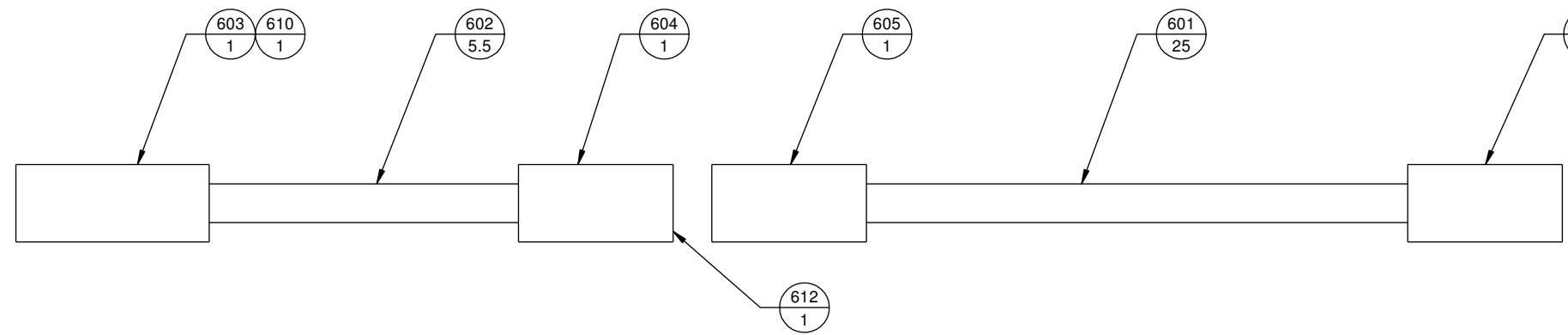
B

A

A



DETAIL D



3  
1102509  
KIT, PRESSURIZATION,  
KA-BAND TRACKING FEED

SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1091781	003
SCALE:	NONE	SHEET 5	

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D

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( HUB )

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7

221  
8 220  
8 121  
8

4.450in [113.034mm]

( 53.499in [1358.875mm] )

(.315in [8.001mm] )

( 57.949in [1471.905mm] )  
HUB TO FEED HORN  
NOT INCLUDING BEZEL

SIZE	CAGE CODE	DRAWING NO.	REV
D	1Q601	1091781	003
SCALE:	NONE	SHEET 6	

Multiple Level Bill of Material Report				
ASSY, FEED, KA-BAND, 4-PORT, CP, TRACKING				
1093281 Rev006				
Level	Ref Des	Part Description	Qty	Part Number
_1	000	ASSY DWG, FEED, KA-BAND, 4-PORT, CP, TRACKING	0	1091781
_1	000	TEST PROCEDURE, FEED ASSY, KA-BAND, CP	0	1100589
_1	001	ENCLOSURE, CIRCULAR FEED, KA-BAND	1	1099839
_1	002	BEZEL, 9M KA-BAND	1	1001504
_1	003	RADOME, 6.50 OD, REGAL, .005 THK, PTFE VIRGIN ETCHED TEFLON	1	1099974
_2		REGAL .005 X 24" X 24" PTFE VIRGIN ETCHED TEFLON	1	1050532
_1	004	BRACKET, FEED MOUNT, KA-BAND, 4-PORT, CP, TRACKING	5	1098927
_1	005	PLATE # 1, FEED MOUNT, KA-BAND, 4-PORT, CP, TRACKING	1	1098928
_1	006	PLATE # 2, FEED MOUNT, KA-BAND, 4-PORT, CP, TRACKING	2	1098929
_1	007	BRACKET, POWER CONNECTOR, KA-BAND FEED	1	1110653
_1	030	NOZZLE, FEED BLOWER	1	1093581
_1	031	BRACKET, FITTING, TOP, NOZZLE	1	1098548
_1	032	BRACKET, FITTING, BOTTOM, NOZZLE	1	1098549
_1	033	BRACKET, BOTTOM, NOZZLE	1	1099846
_1	110	SCREW 4-40 X 3/8 F HD,82 DEG,SST	12	72321
_1	111	SCREW,4-40 X 7/16,SKT HD,SS, PASSIVATED	12	1033033
_1	112	SCREW 4-40 X 5/8 PAN HD,SST	8	72334
_1	113	SCREW 4-40 X 3/4 SOC CAP SST	4	72335
_1	120	SCREW 6-32 X 5/8 SOC CAP SST	2	72377
_1	121	SCREW 6-32 X 3/4 SOC CAP SST	8	72380
_1	130	SCREW 10-32 X 5/8 HEX SOC HD CAP SST	5	72428
_1	131	SCREW 10-32 X 3/4 HEX SOC HD CAP SST	15	72432
_1	141	SCREW 1/4-20 X 5/8 CAP HEX SST	5	171511
_1	142	SCREW 1/4-20 X 7/8 CAP,HEX HD,AUS SST	5	88422
_1	150	BOLT 3/8-16X1 1/4 HEXHD GALV	8	281932
_1	210	WASHER-# 4- .125 .250 .022 AUS SST	32	73266
_1	211	WASHER # 4 LOCK, SPLIT, SST	24	174554
_1	220	WASHER-# 6- .156 .312 .035 AUS SST	12	73270
_1	221	WASHER # 6 LOCK, SPLIT, SST	10	174555
_1	230	WASHER-#10- .219 .500 .049 AUS SST	17	73275
_1	231	WASHER # 10 LOCK, SPLIT,SST	10	174557
_1	232	WASHER # 10 SEALING .200 ID 1/2 OD SST	38	725337-0001
_1	240	WASHER,1/4 FLAT,.281 .625 .065 AUS SST,ROHS	11	76917
_1	241	WASHER, SEALING, .26 ID X 1/2 OD SST	5	1013435
_1	250	WASHER- 3/8- .438 1.000 .083 HRDN GALV	16	85841
_1	310	NUT 4-40 UNC-2B,PLAIN-HEX,SST	8	71494

Multiple Level Bill of Material Report				
ASSY, FEED, KA-BAND, 4-PORT, CP, TRACKING				
1093281 Rev006				
Level	Ref Des	Part Description	Qty	Part Number
_1	320	NUT 6-32 UNC-2B,PLAIN-HEX,SST	2	75446
_1	330	NUT,10-32 UNF-2B,PLAIN-HEX,SST,ROHS	5	71503
_1	340	NUT 1/4-20 UNC-2B PLAIN-HEX SST	6	86374
_1	350	NUT 3/8-16 UNC-2B HVY HEX HI-STR GALV	8	85837
_1	400	SEALANT SILIC RUB RTV NON-CRSV,WHTE,3 OZ	1	86520
_1	500	RING O 5.737 ID X 5.943 OD X .103W SILICONE	1	1002364
_1	A001	ASSY, FEED RF, 9.1 M TRKG, CP	1	1094186
_2		CONFIGURATION, FEED RF, 9.1M TRKG, CP	0	1095070
_2		SPEC, FEED NETWORK, 4-PORT CP, TRACKING, KA-BAND	0	1095072
_2		CORRUGATED HORN, TRACKING, 9M KA	0	727212-0001
_2		INTFC DWG, FEED NETWORK, 4-PORT CP, TRACKING, KA-BAND	0	1095067
_1	A002	KIT, PRESSURIZATION, KA-BAND TRACKING FEED	1	1102509
_2	601	HOSE, LOW TEMP, ETHER-BASE, 0.25 ID, 1/32 WALL	25.5	1013460
_2	602	HOSE, LOW TEMP, ETHER-BASED, 5/16 ID, 1/16 WALL	5.5	1013461
_2	603	COUPLING 1/8" SOCKET W/SHUT OFF VALVE	2	719640-0001
_2	604	FITTING, 5/16 HOSE BARB, 1/8 PIPE	1	1013854
_2	605	FTG,1/4 HOSE,BARB,1/8 F,PIPE	1	1016738
_2	606	CLPG PLUG 1/8" NPT MALE QCK DISCNCT W/SHUTOFF	1	1005537
_2	607	VLVE PRESSURE RELIEF 0.6 PSI 1/8 NPT BRS	1	719613-0001
_2	608	PLATE, COVER, WR34/42 FLANGE	4	1047267
_2	609	FAB PART, PLATE # 2, WG PRESSURIZATION	2	1016699
_2	610	CLAMP HOSE ADJ 7/32 - 5/8 DIA ALL SST	1	1049822
_2	611	WAVEGUIDE GASKET WR42 PRESSURE SILICONE	6	420410
_2	612	TAPE,TEFLON,ANTISEIZE,.0035 THK,1/2 IN W X 520 IN L	0.1	86369