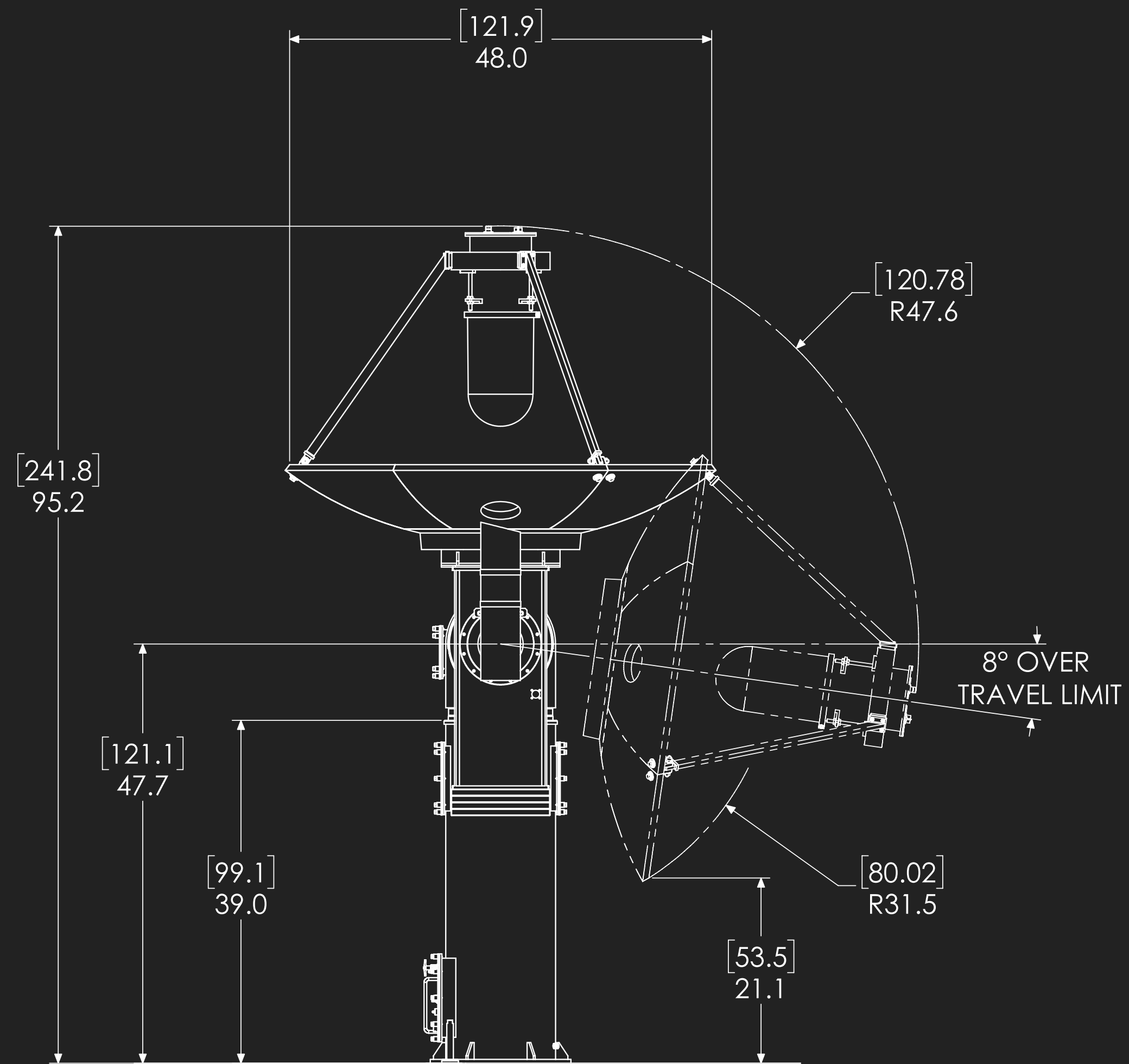




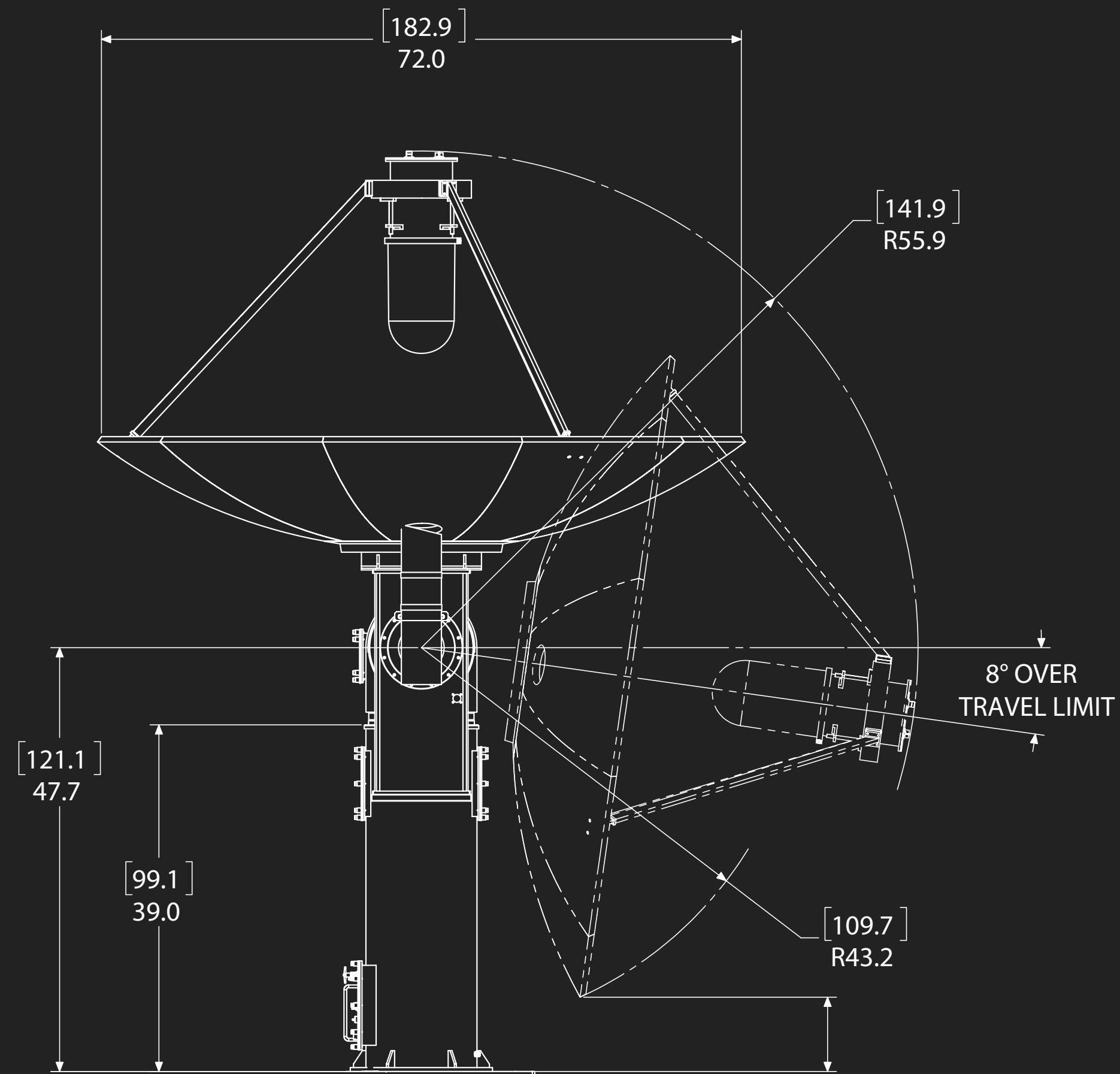
PRODUCT PORTFOLIO - ITC 2021, BALLY'S LAS VEGAS

**TELEMETRY & COMMUNICATIONS
SYSTEMS, INC.**

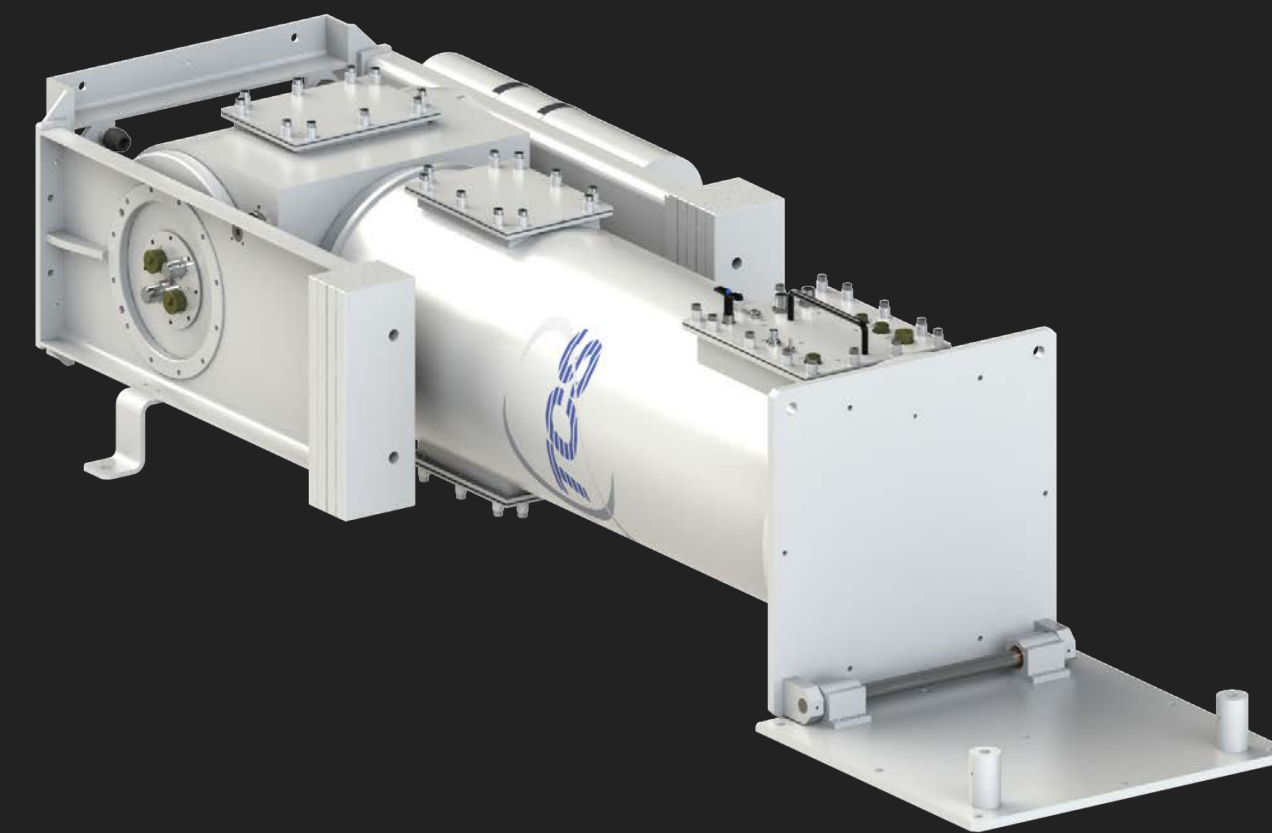
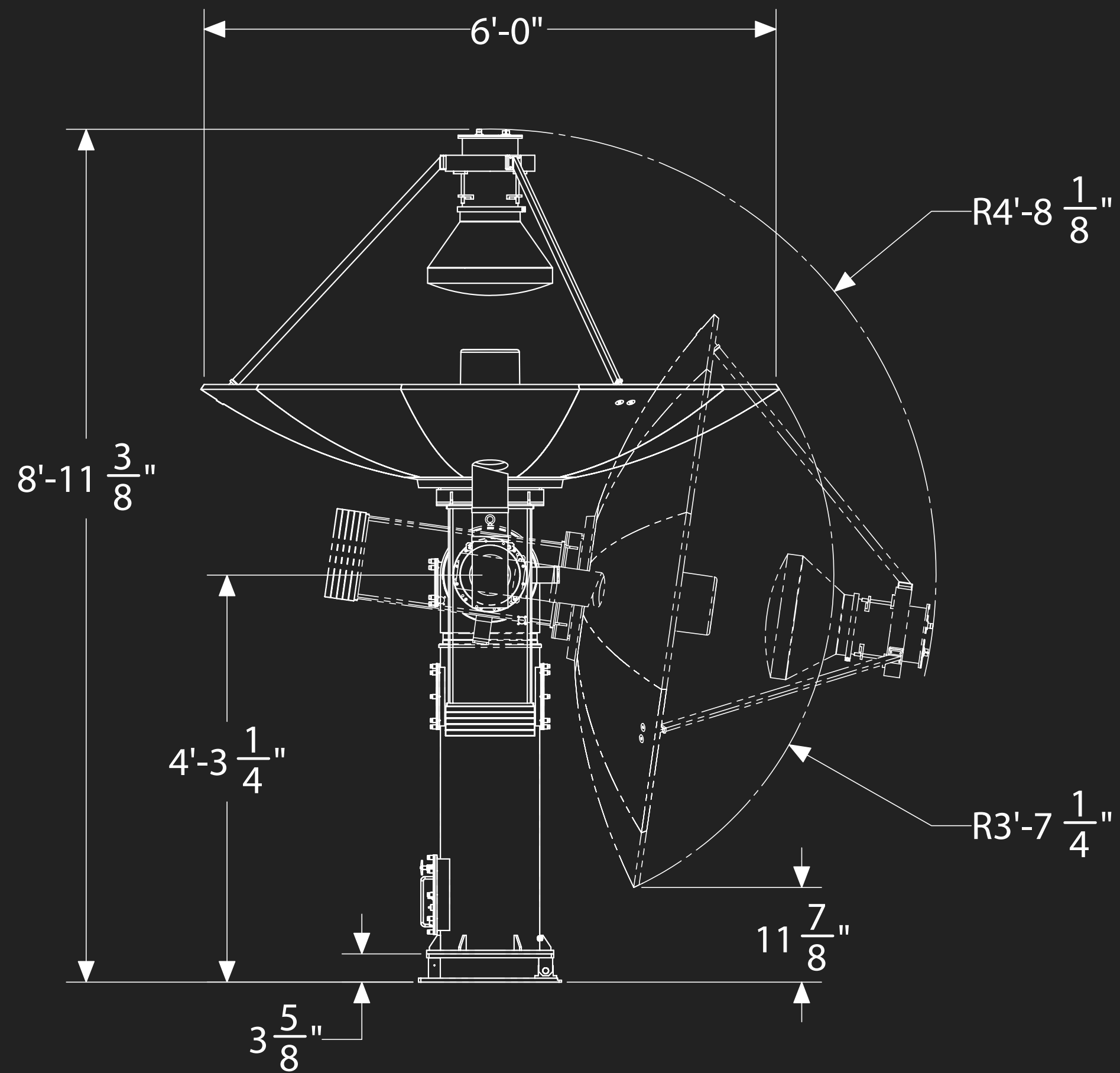
MODEL 1800-4



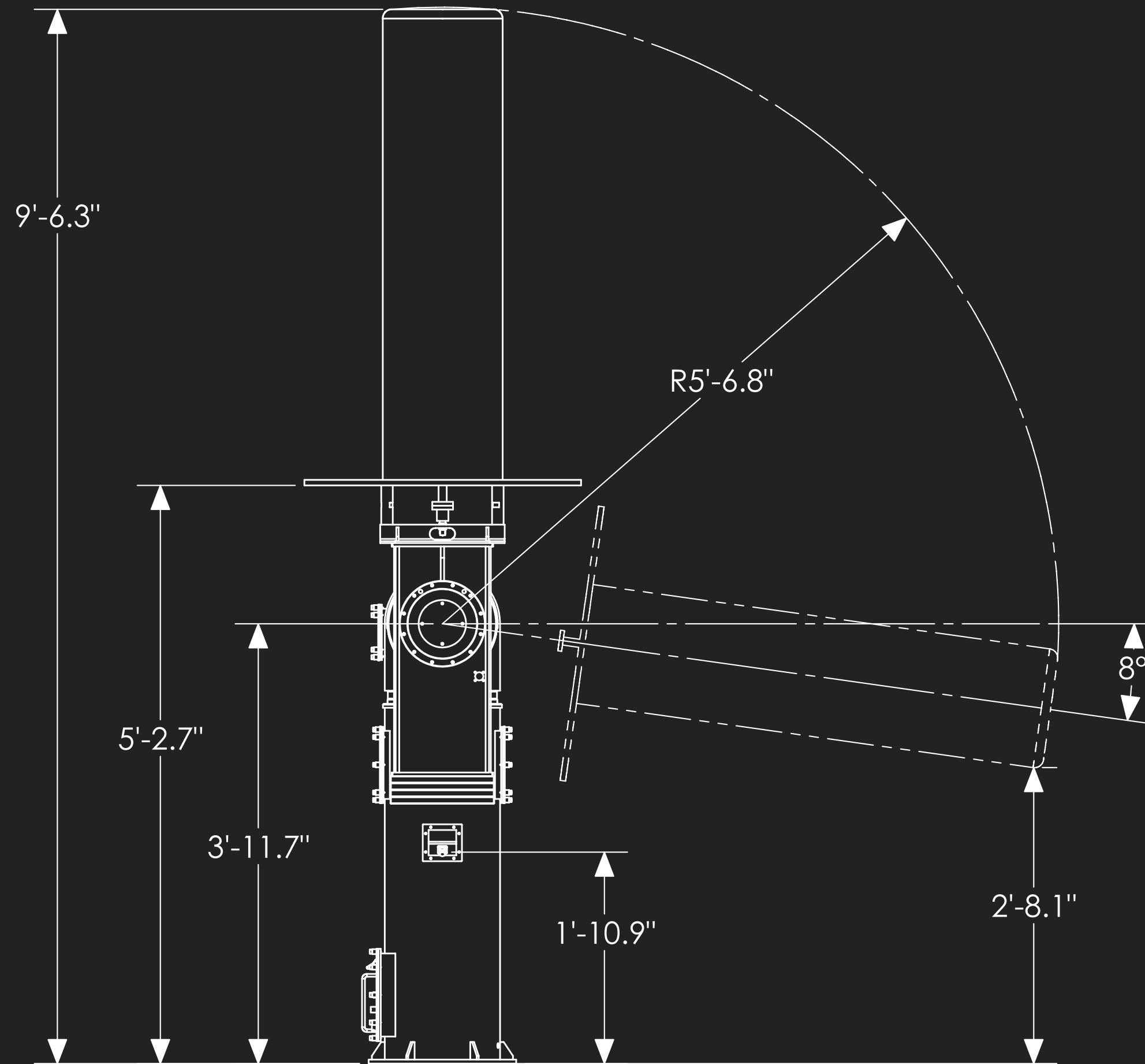
MODEL 1800-6



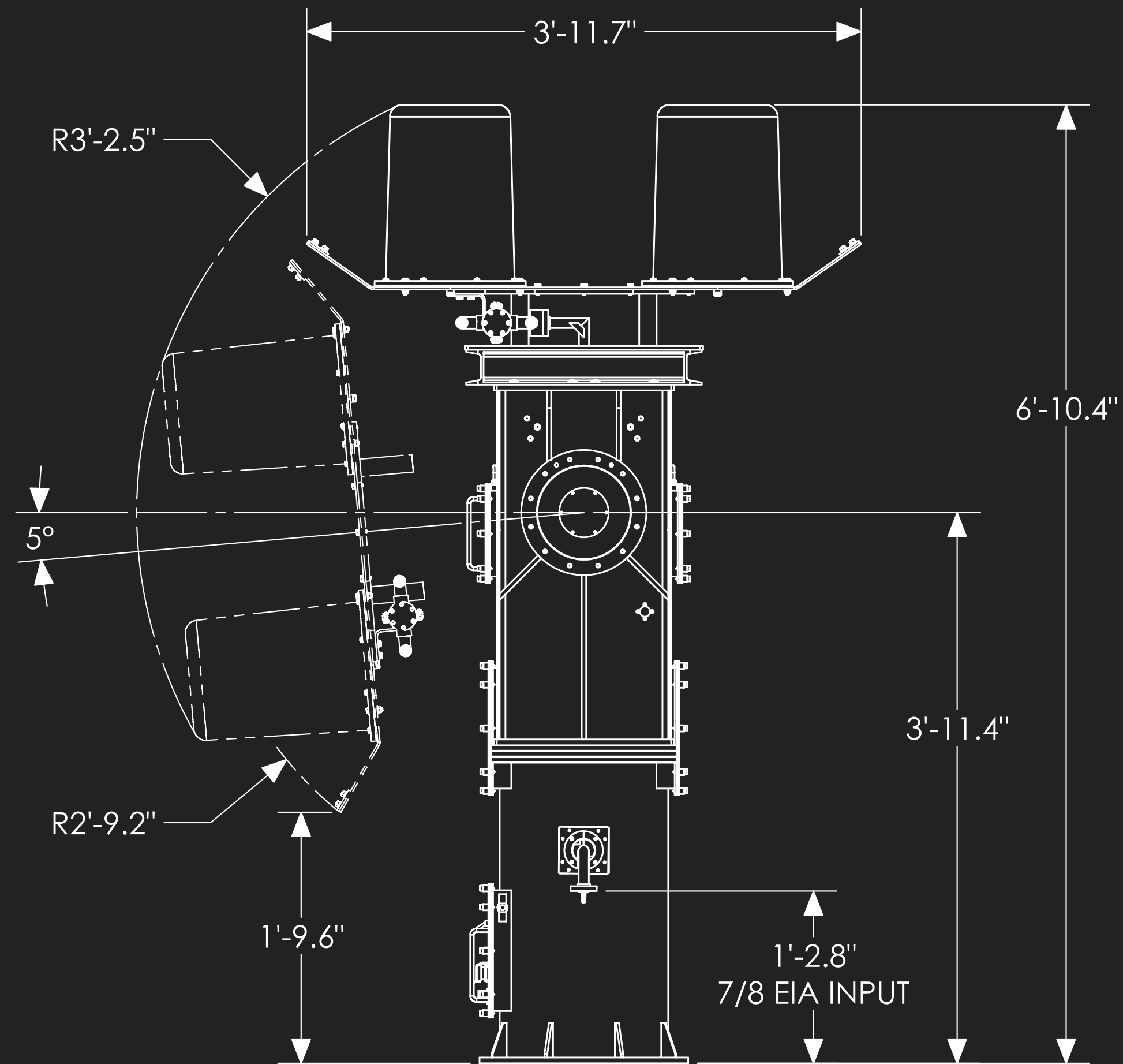
MODEL 1800-6 TILT BASE FOR TRAVEL



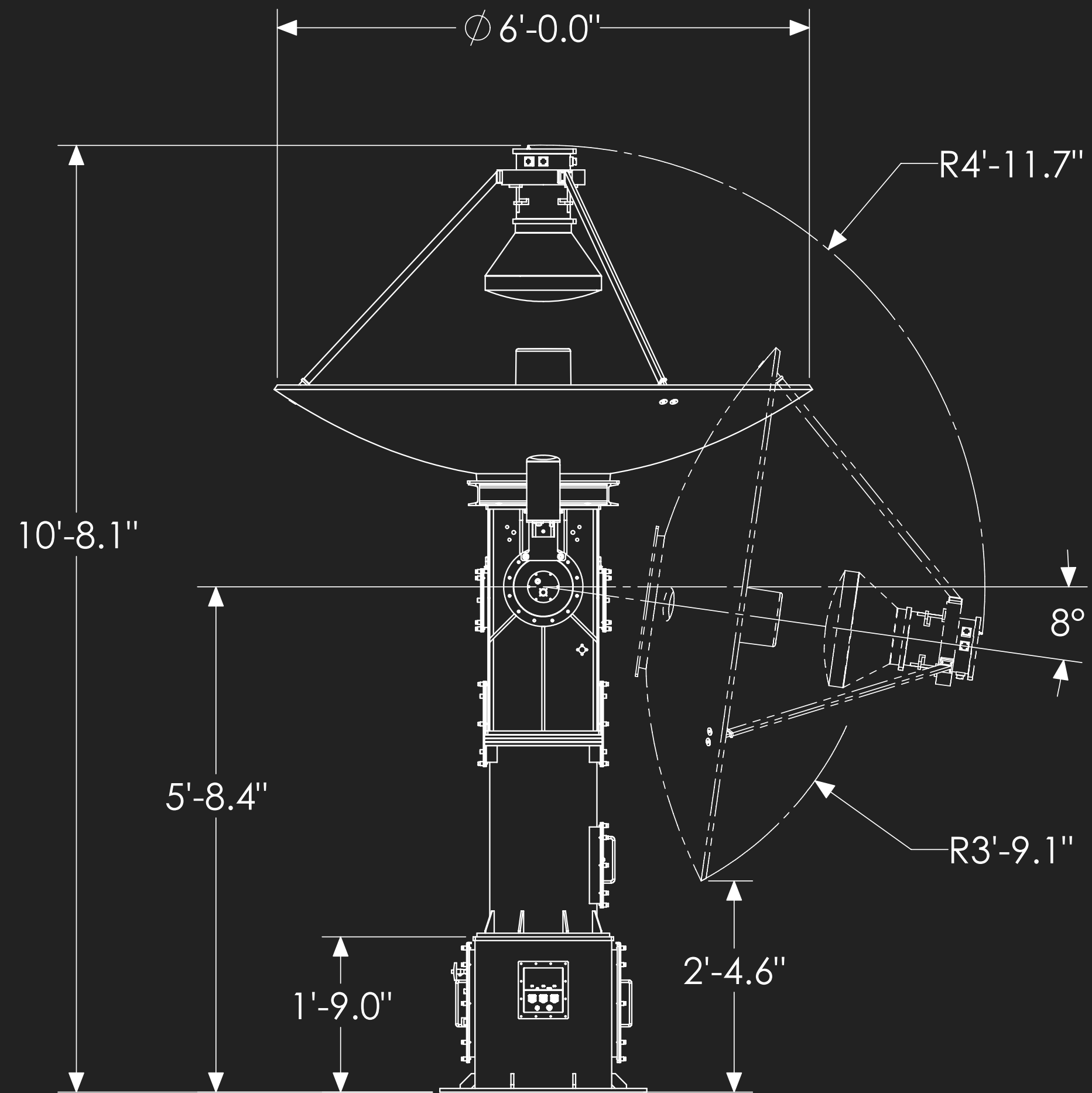
MODEL 1800 FTS



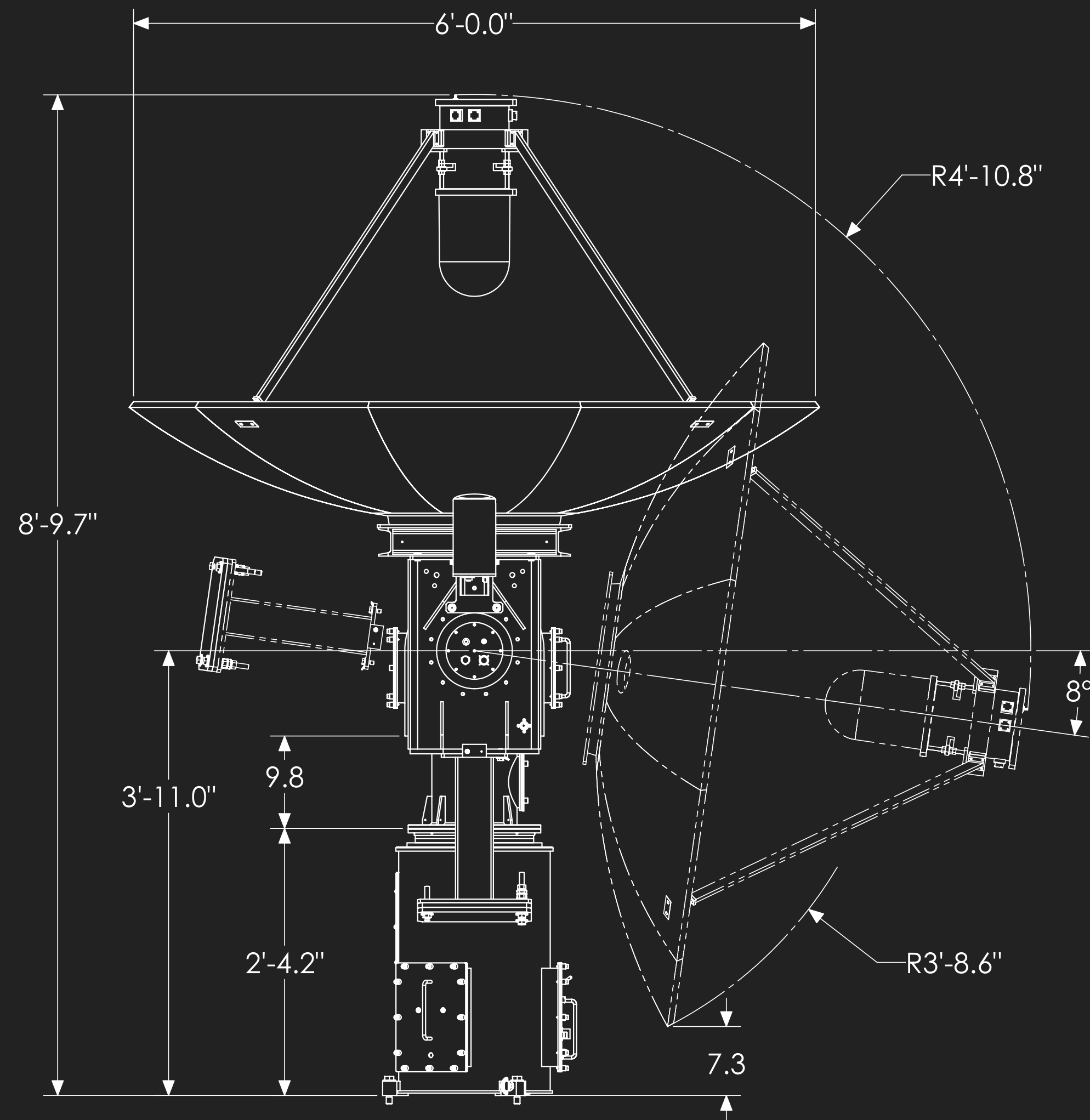
MODEL 2400 QUAD HELIX



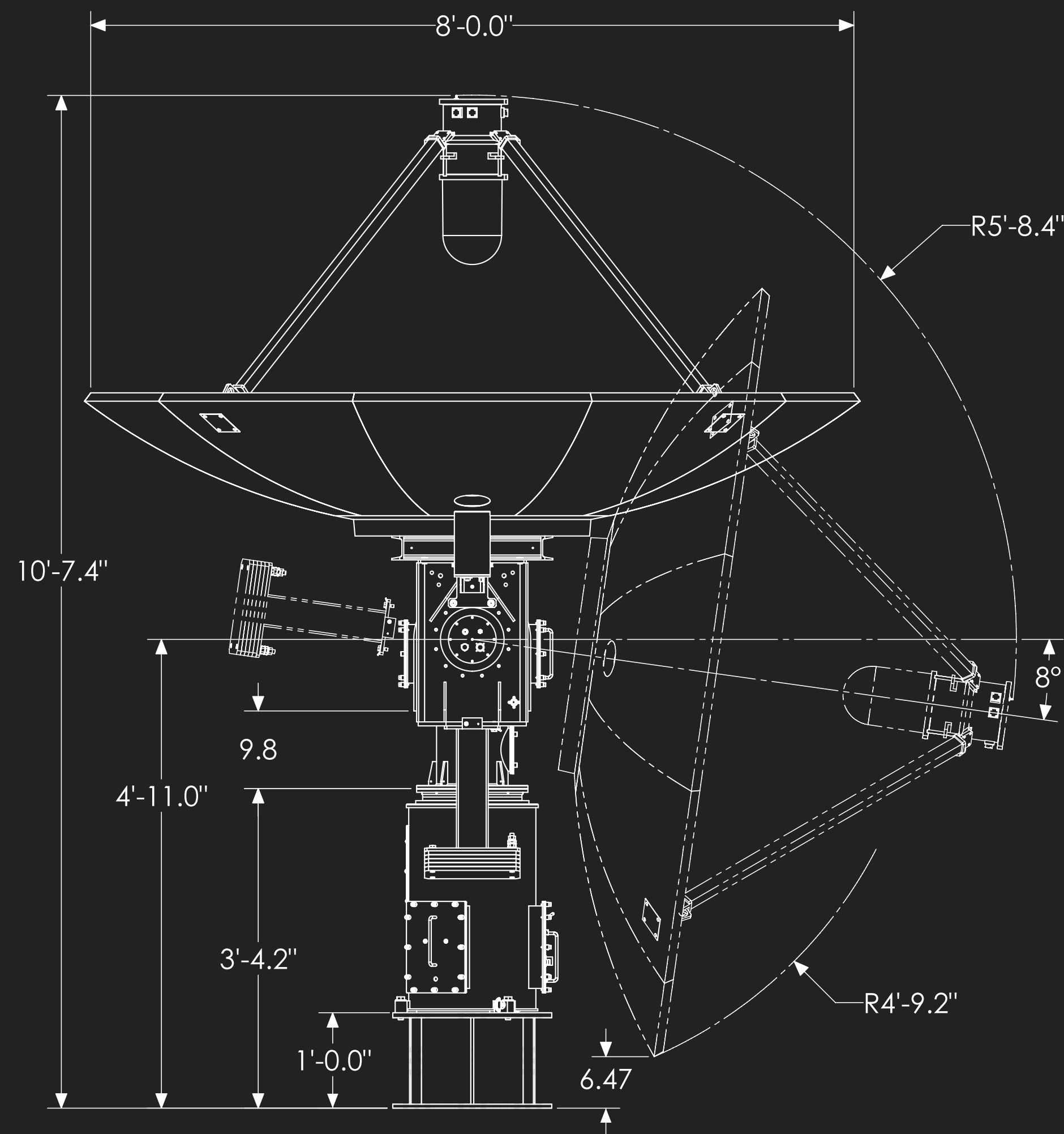
MODEL 2400 - 6 FT



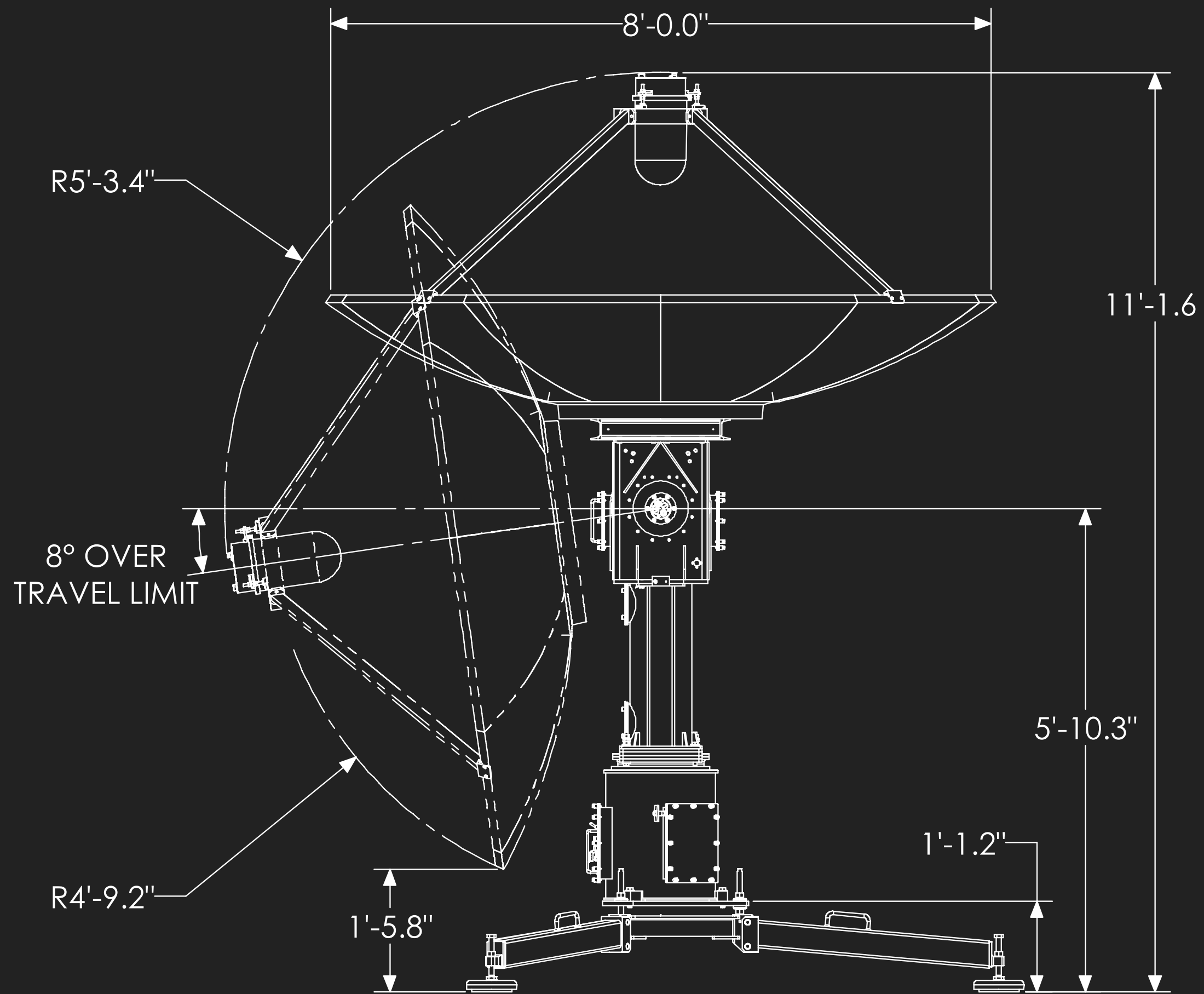
MODEL 2400M-6 MOBILE AUTOTRACK (TRANSIT CASE PACKED)



MODEL 2400M-8 MOBILE AUTOTRACK (TRANSIT CASE PACKED)



MODEL 2400M-8 FT MOBILE SATELLITE TRACK (TRANSIT CASE PACKED)



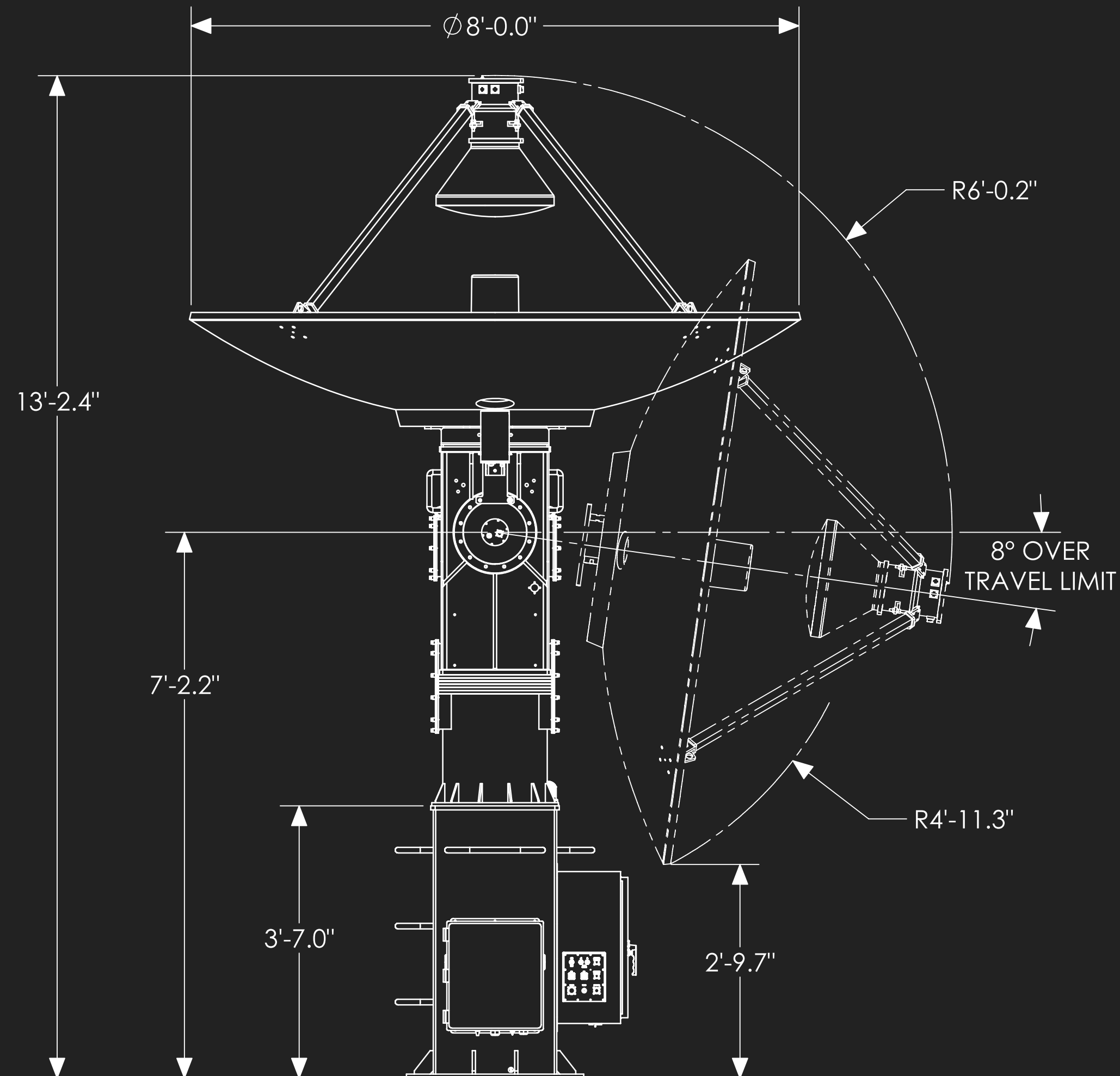
eLSX Feed

C/Ku Feed

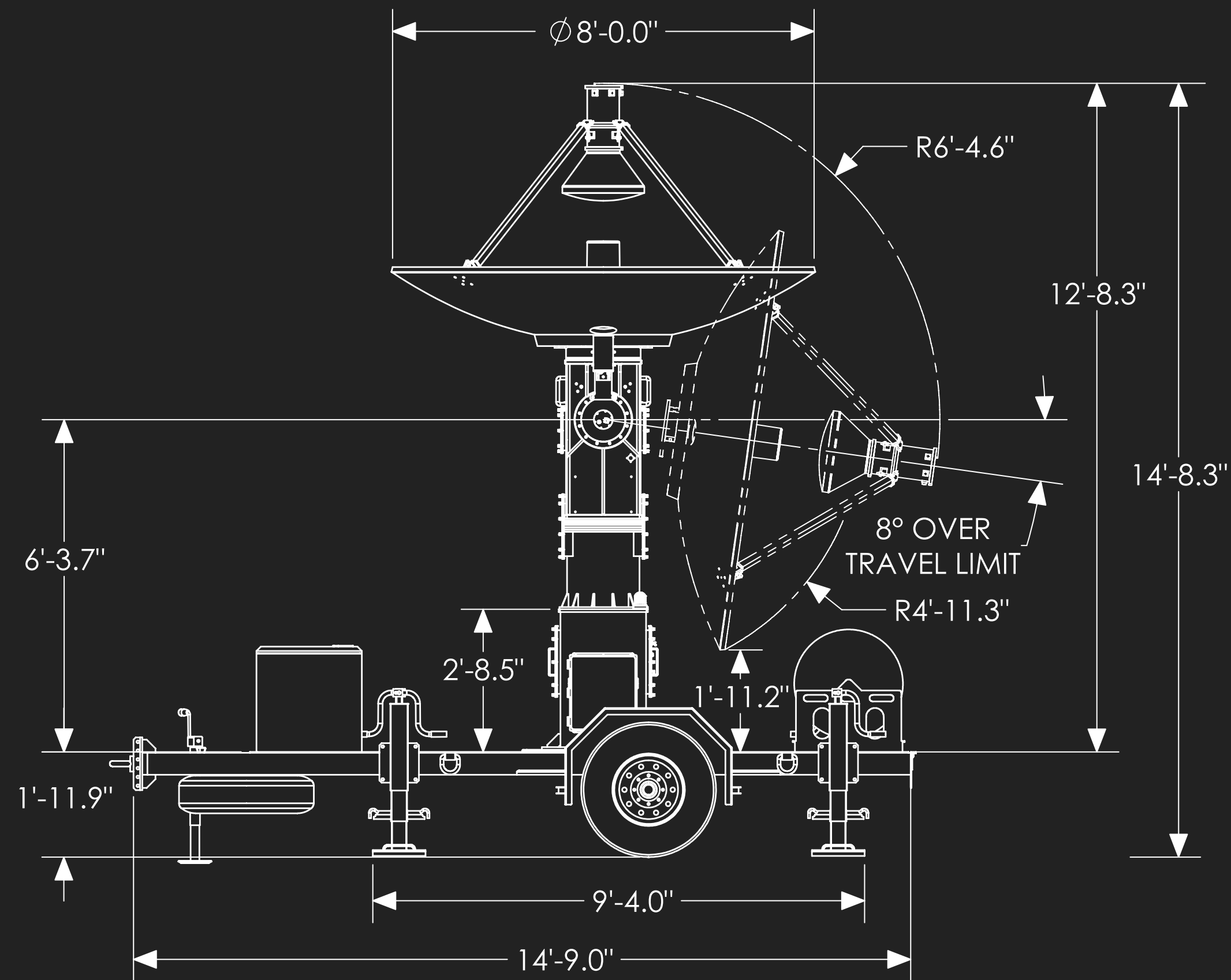
L/S Feed



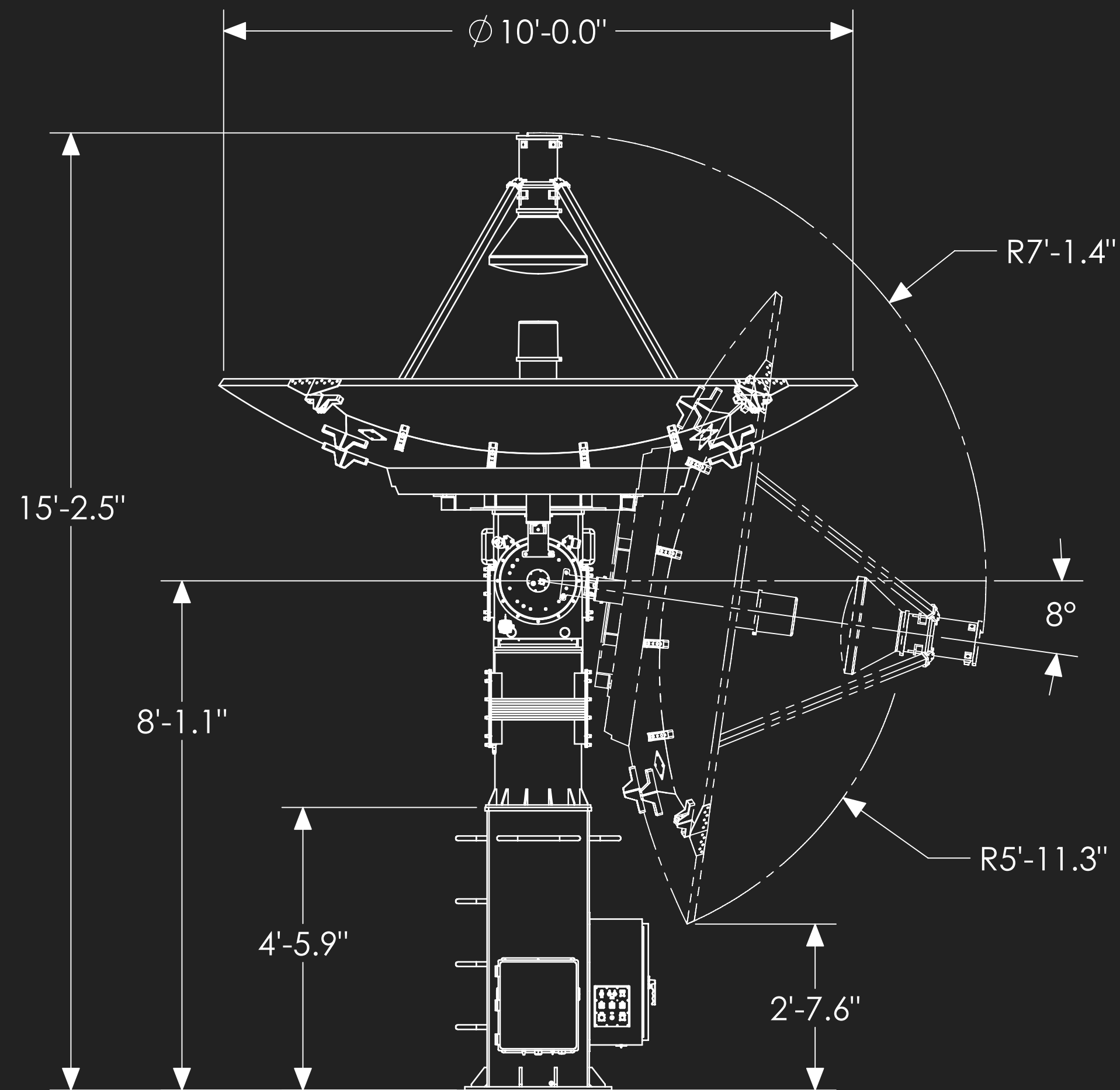
MODEL 3000-8 FT



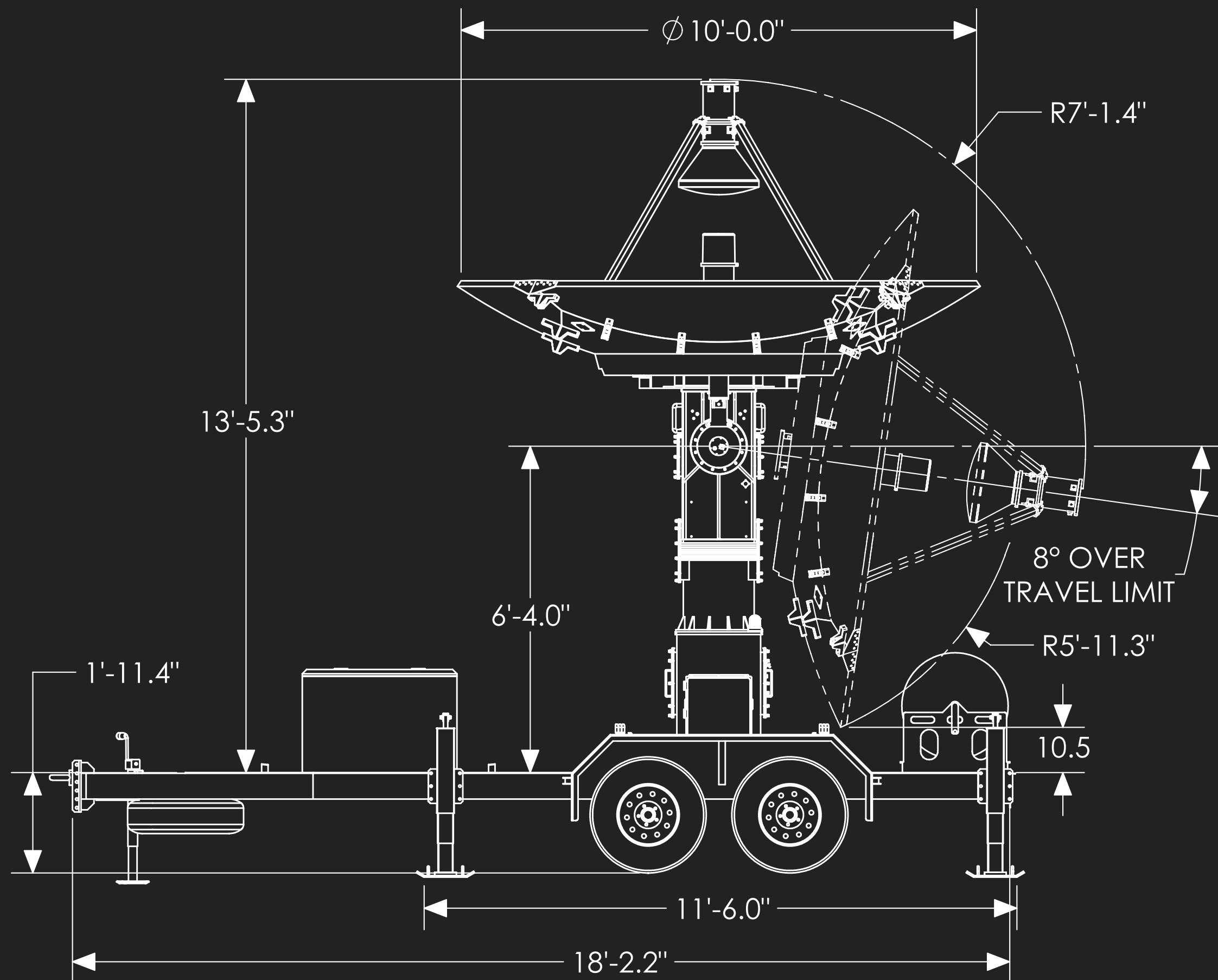
MODEL 3000M-8 FT TRAILER



MODEL 3000-10 FT



MODEL 3000M-10 FT TRAILER

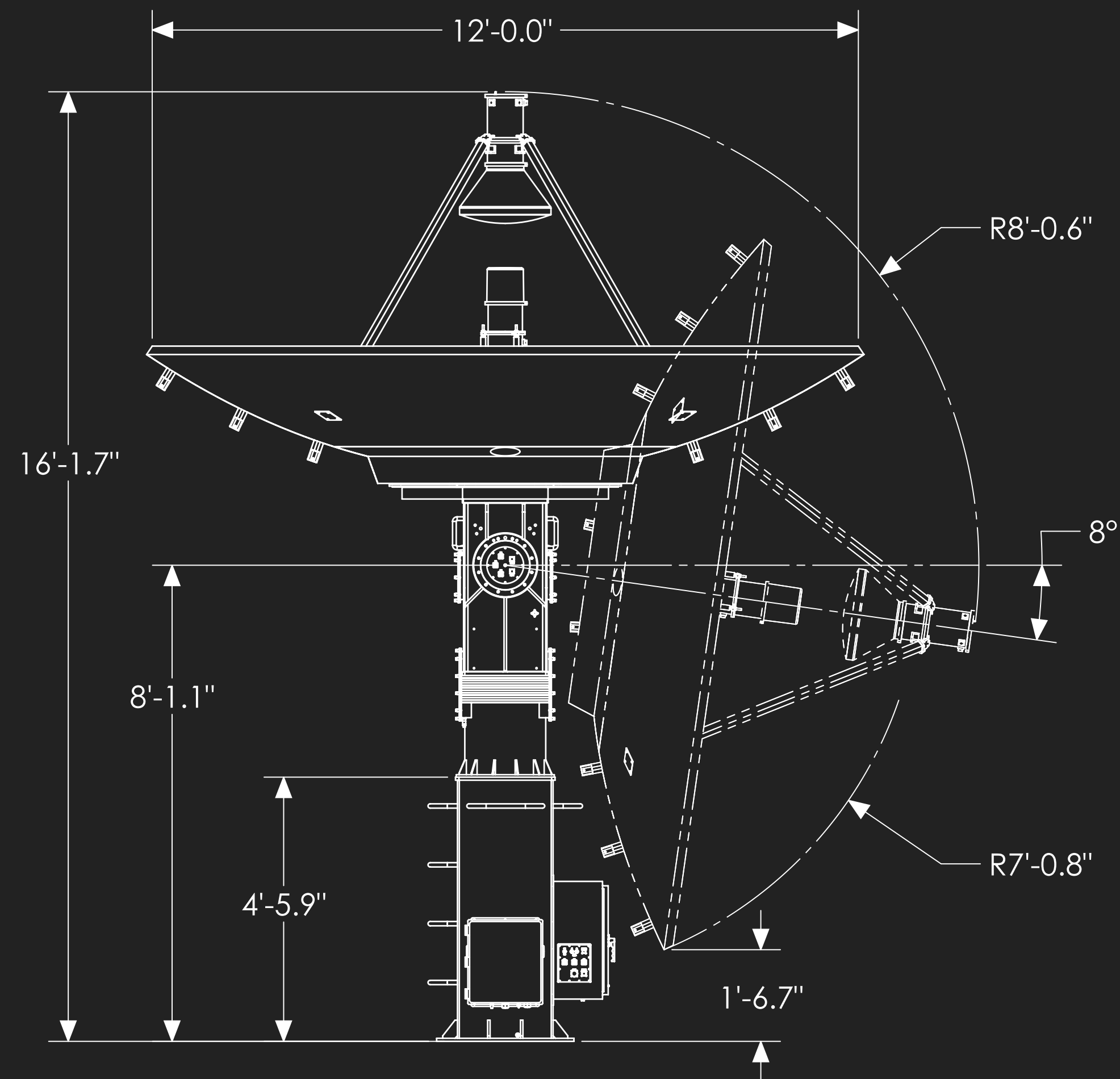


TCS, INC. PEDESTALS

MODEL 3000M-10 FT TRAILER (PACKED)



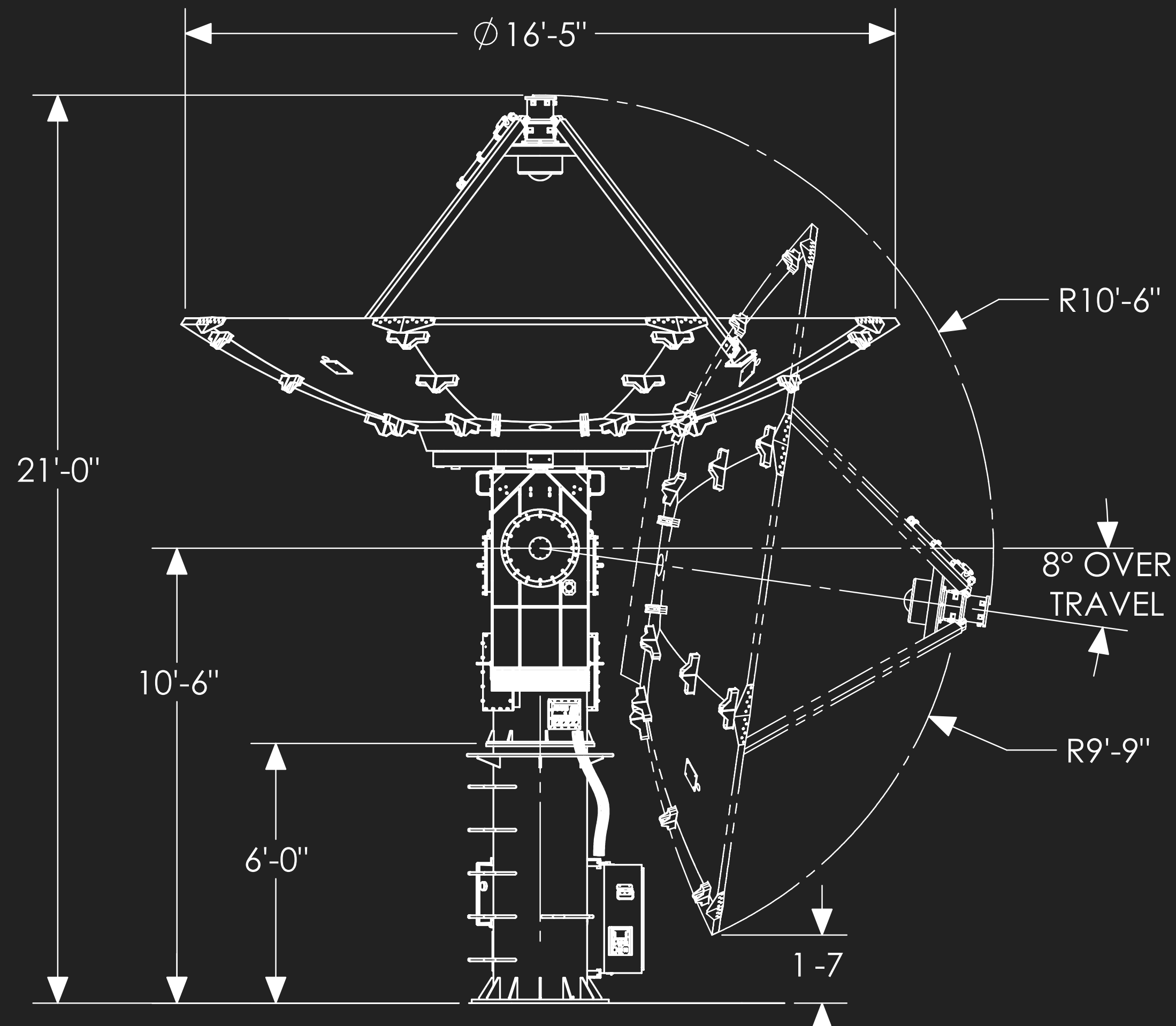
MODEL 3000D-12 FT



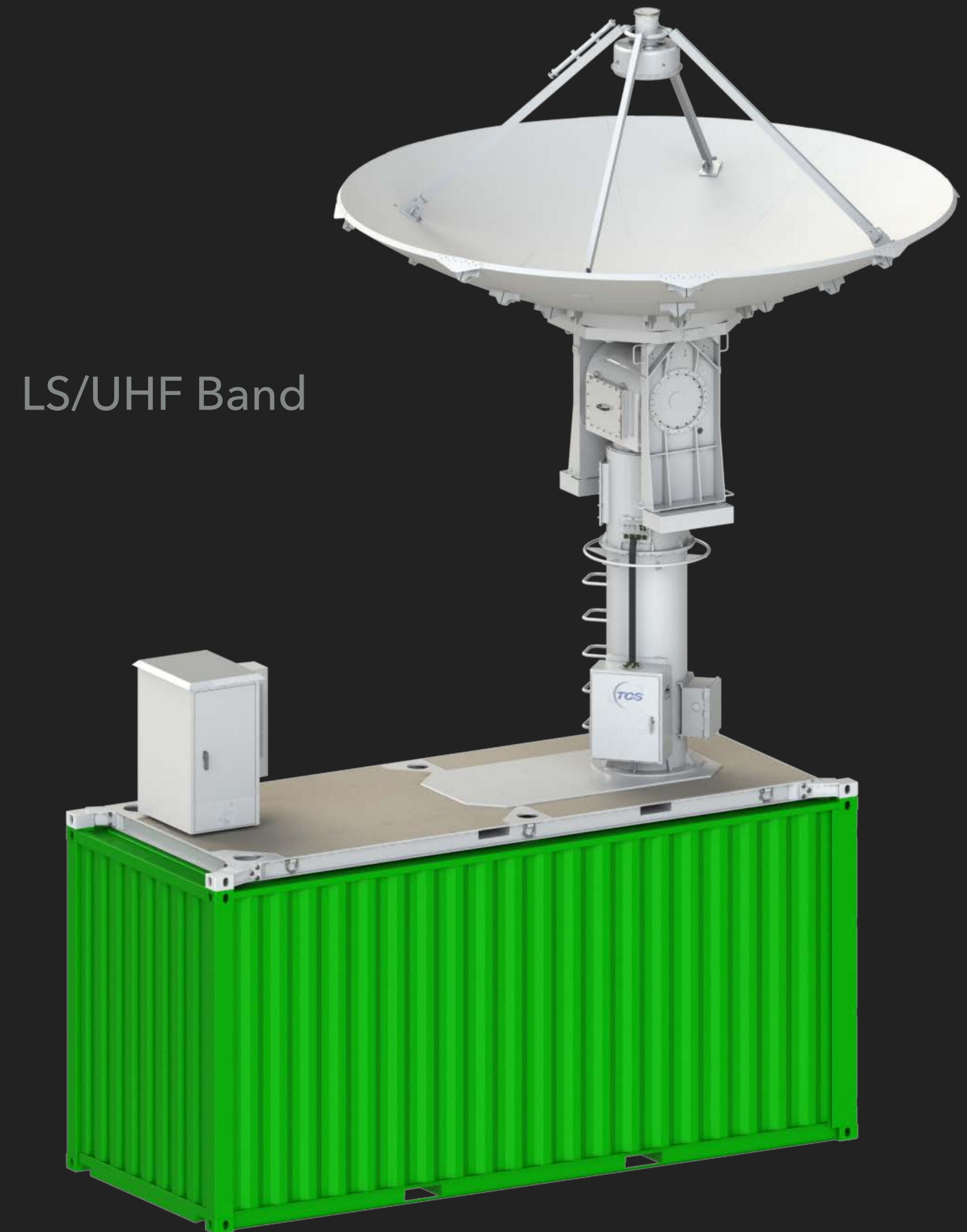
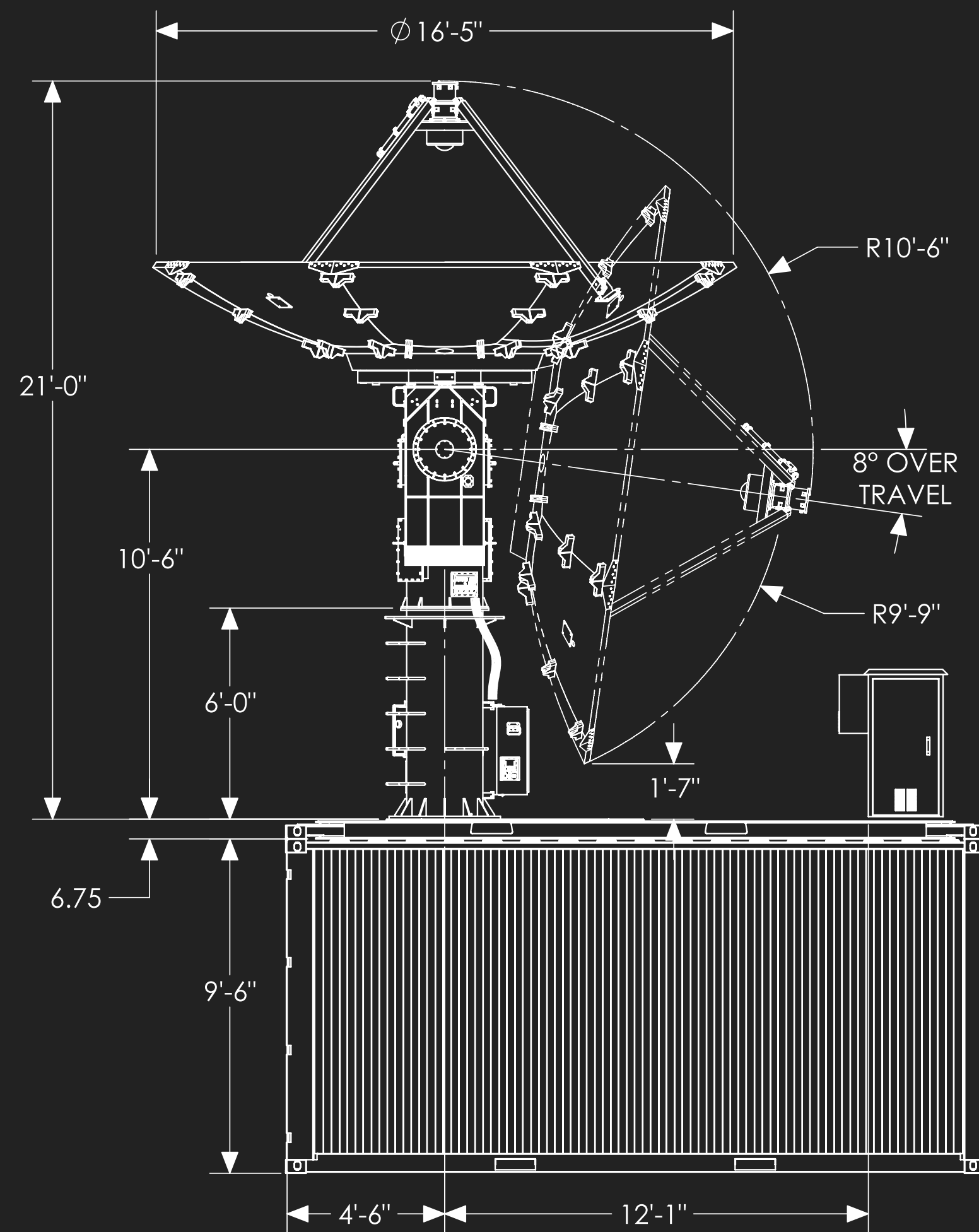
MODEL 3000DM-12 FT TRAILER



MODEL 5000-5M

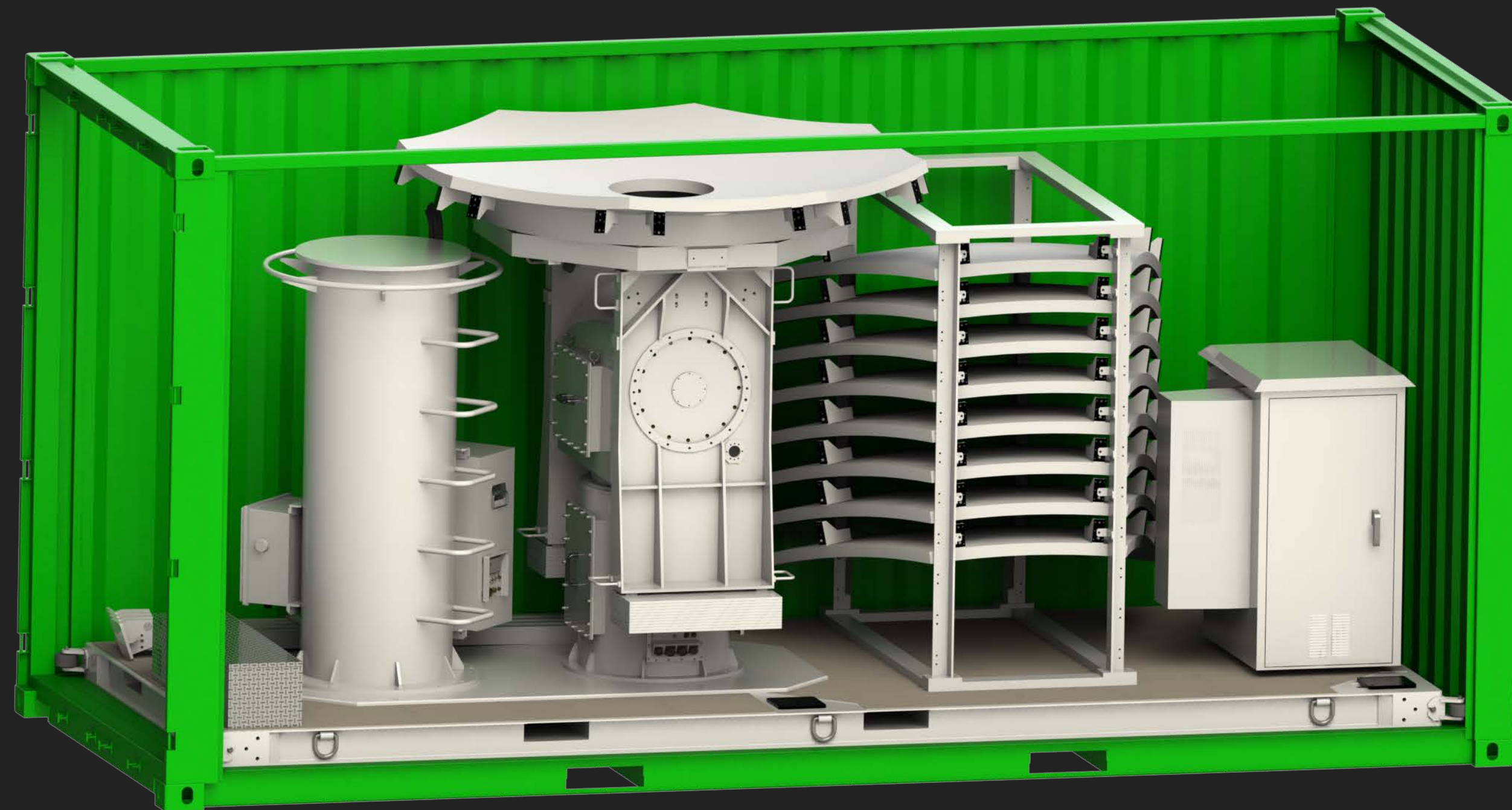


MODEL 5000-5M SEA CONTAINER

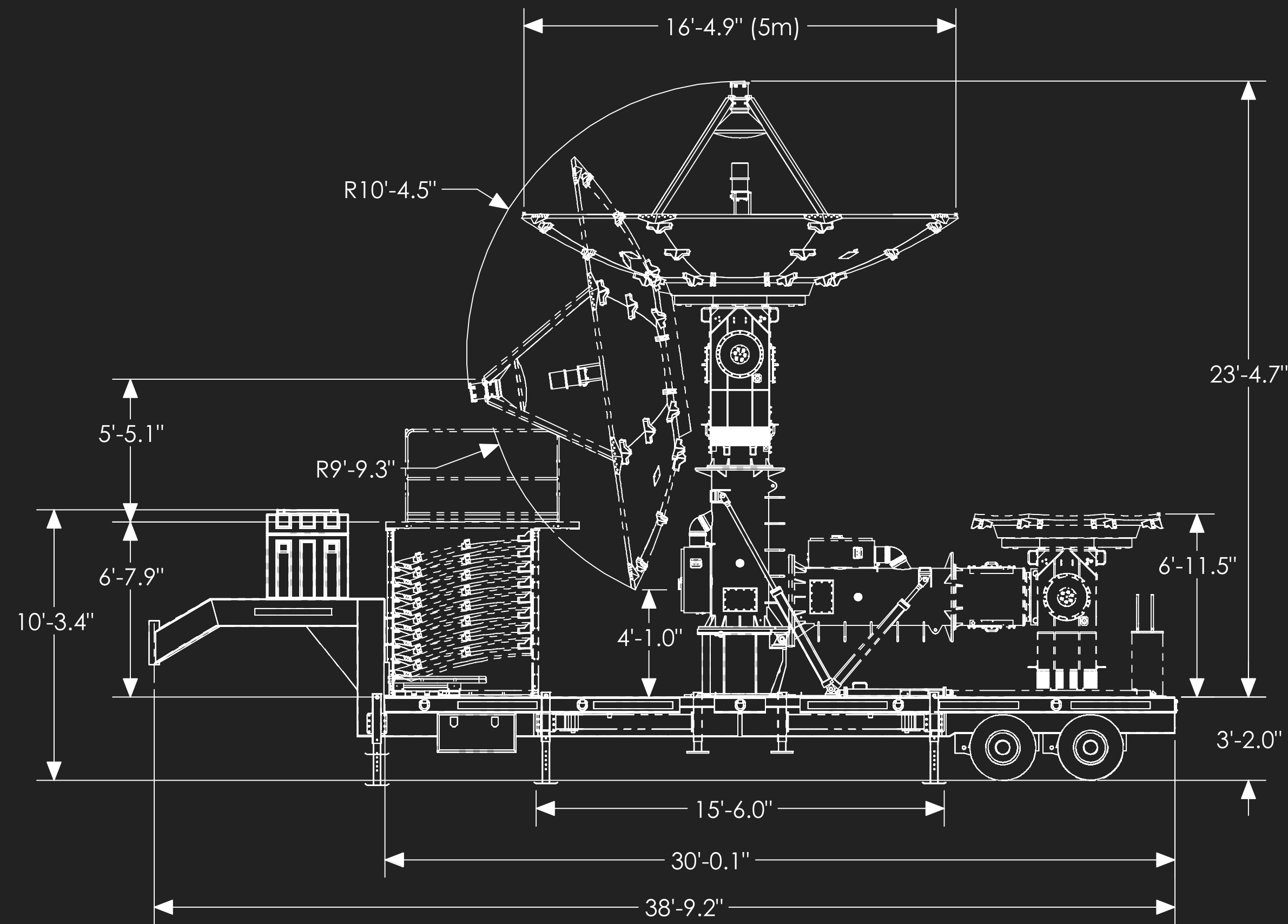


MODEL 5000-5M 20' SEA CONTAINER (PACKED)

Telemetry & Command Destruct All-In-One

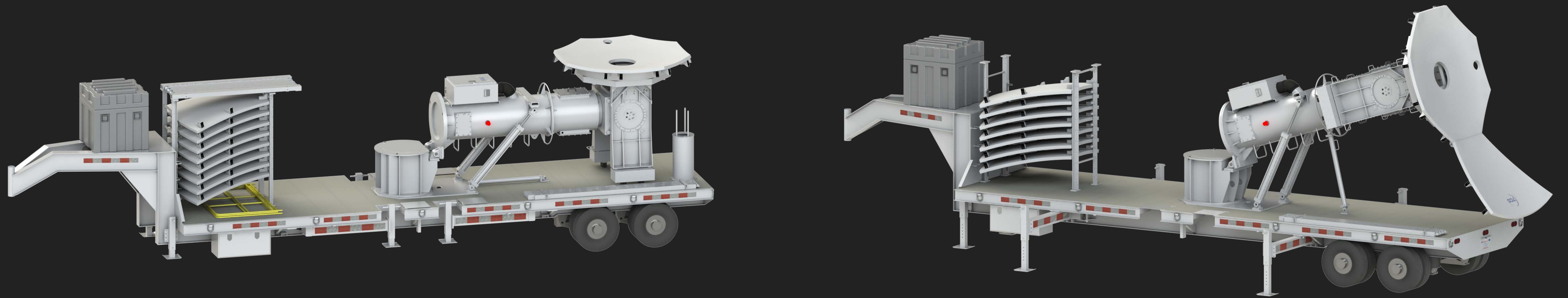


MODEL 5000M-5M/6M TRAILER

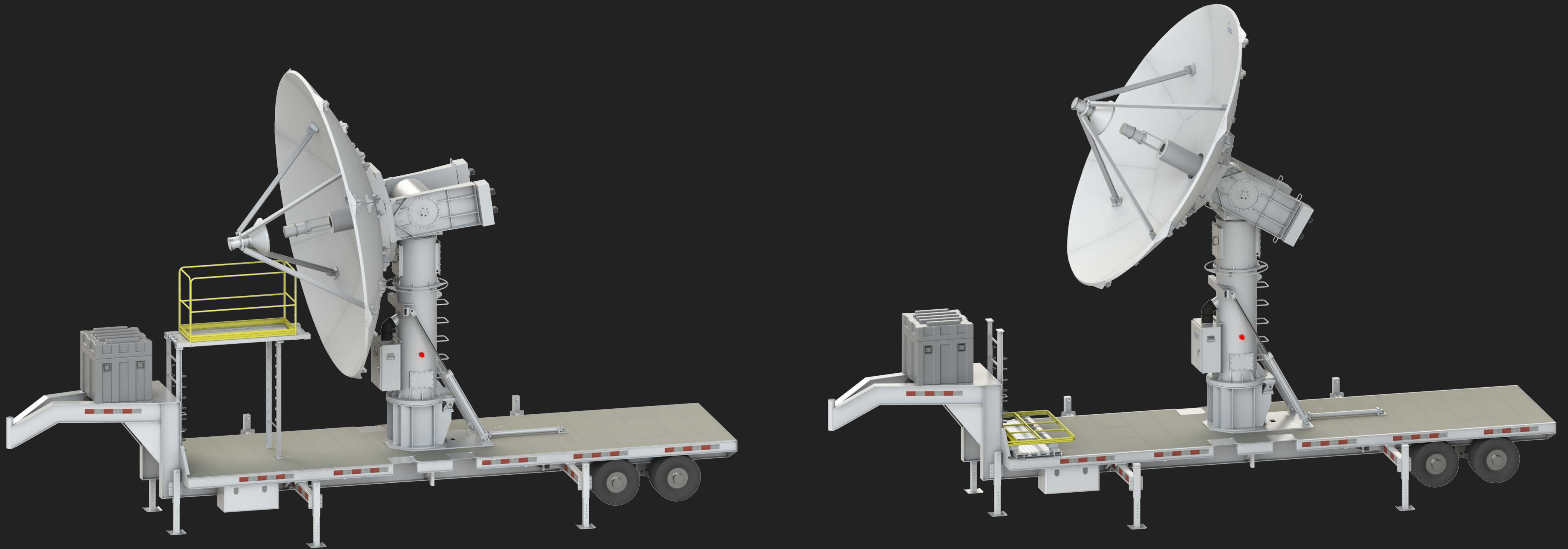


TCS, INC. PEDESTALS

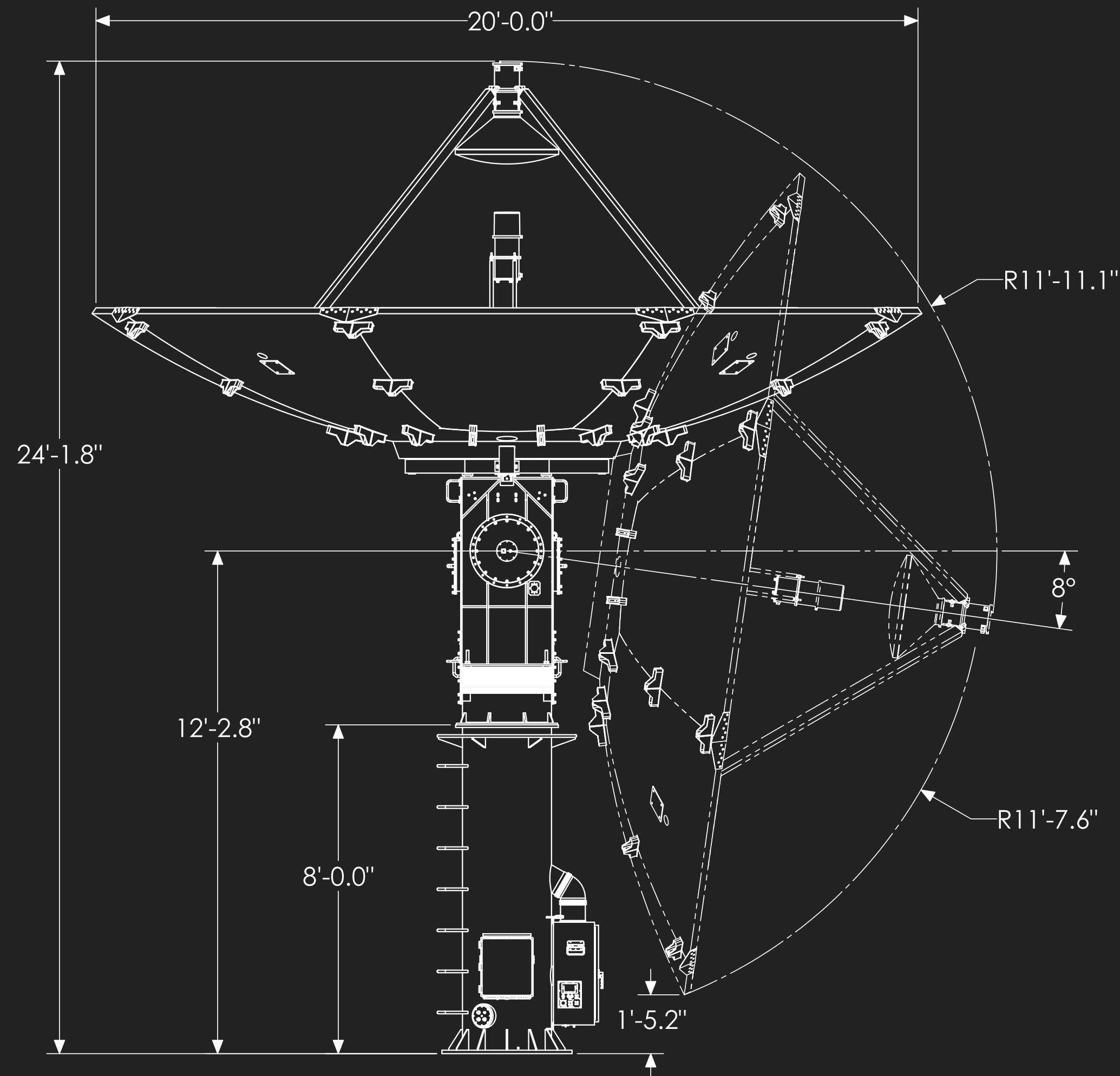
MODEL 5000M-5M/6M TRAILER (PACKED)



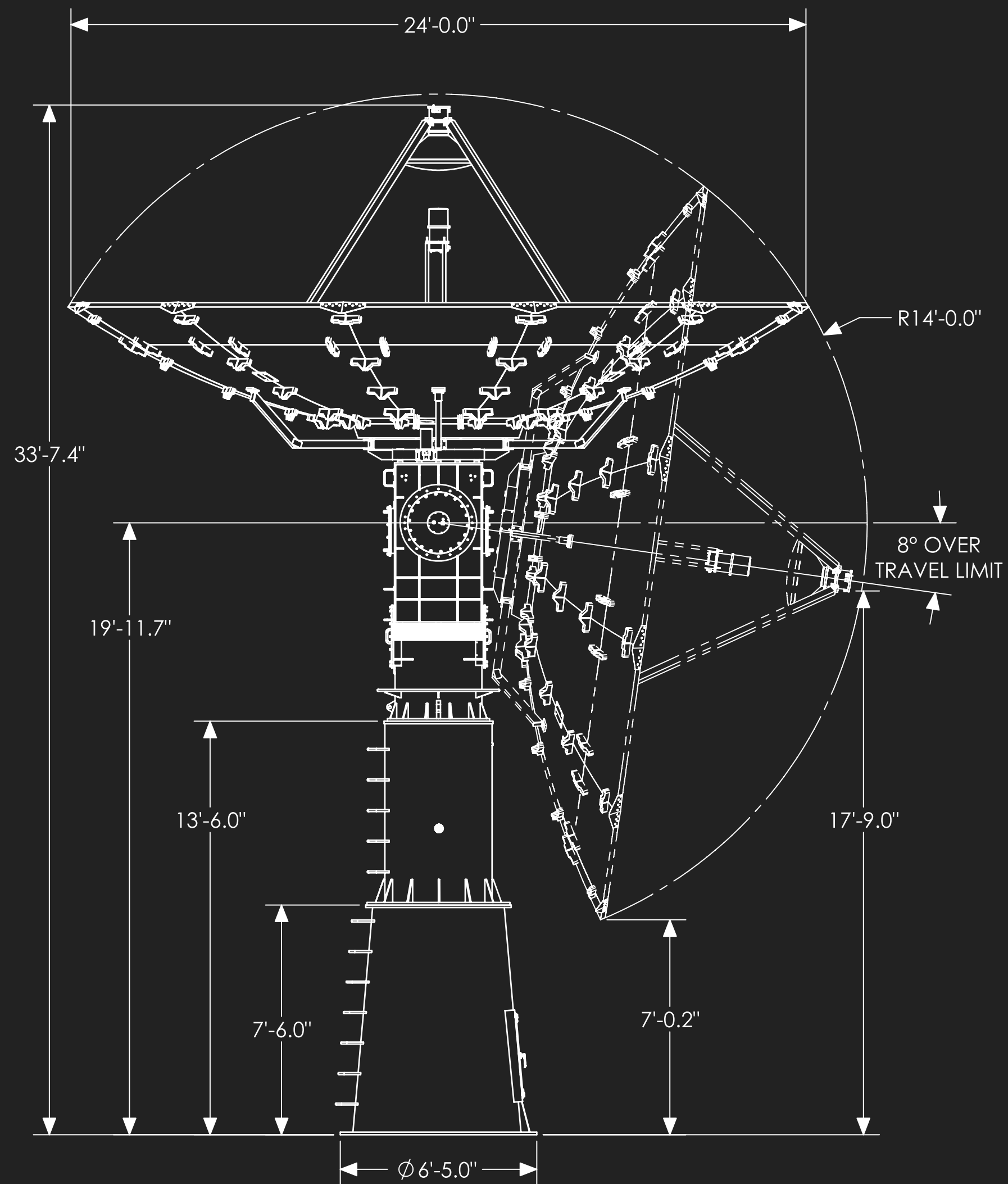
MODEL 5000M-5M/6M TRAILER (PACKED)



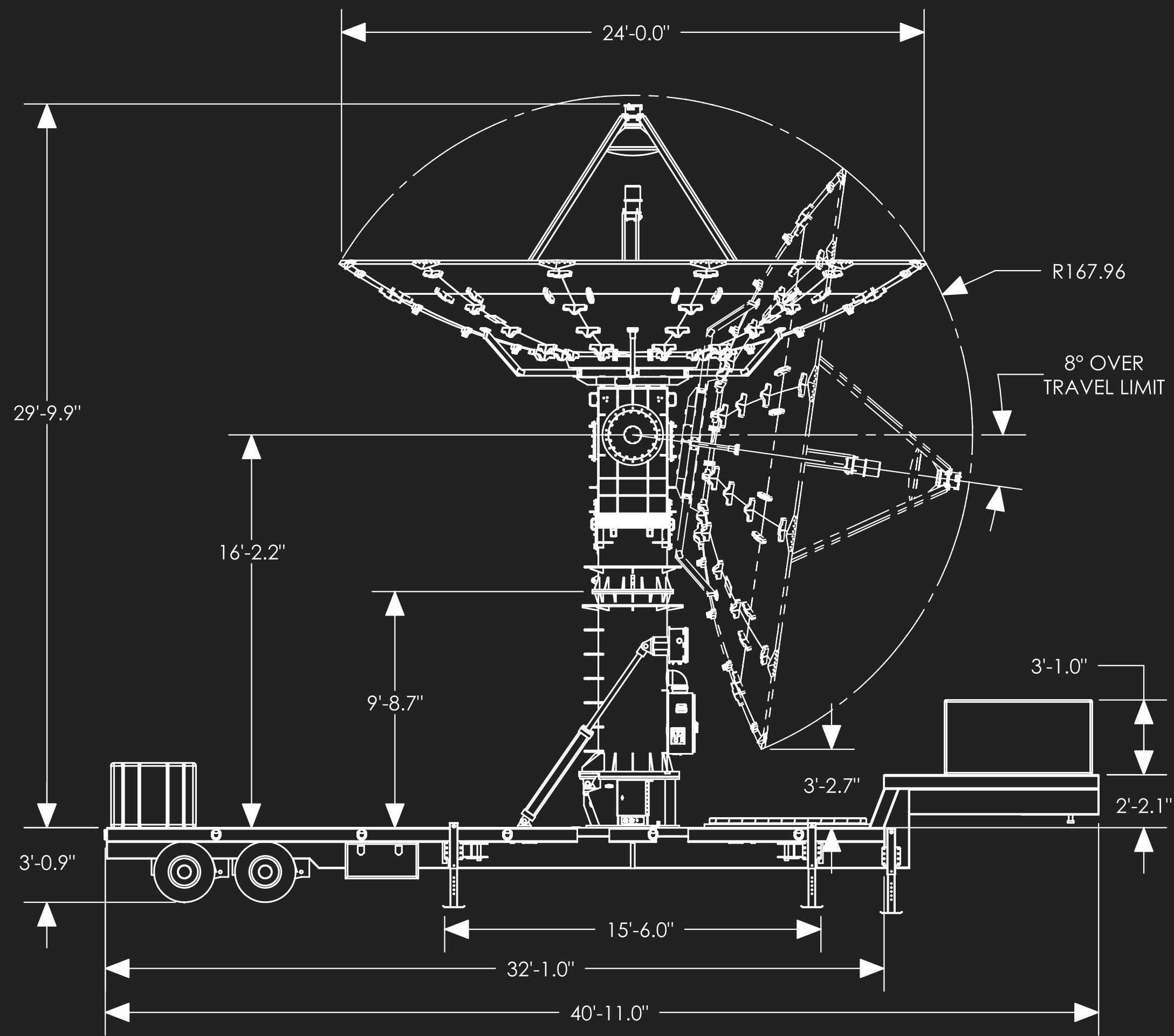
MODEL 5000-6M



MODEL 6000-7.3M



MODEL 6000M-7.3M MOBILE TRAILER



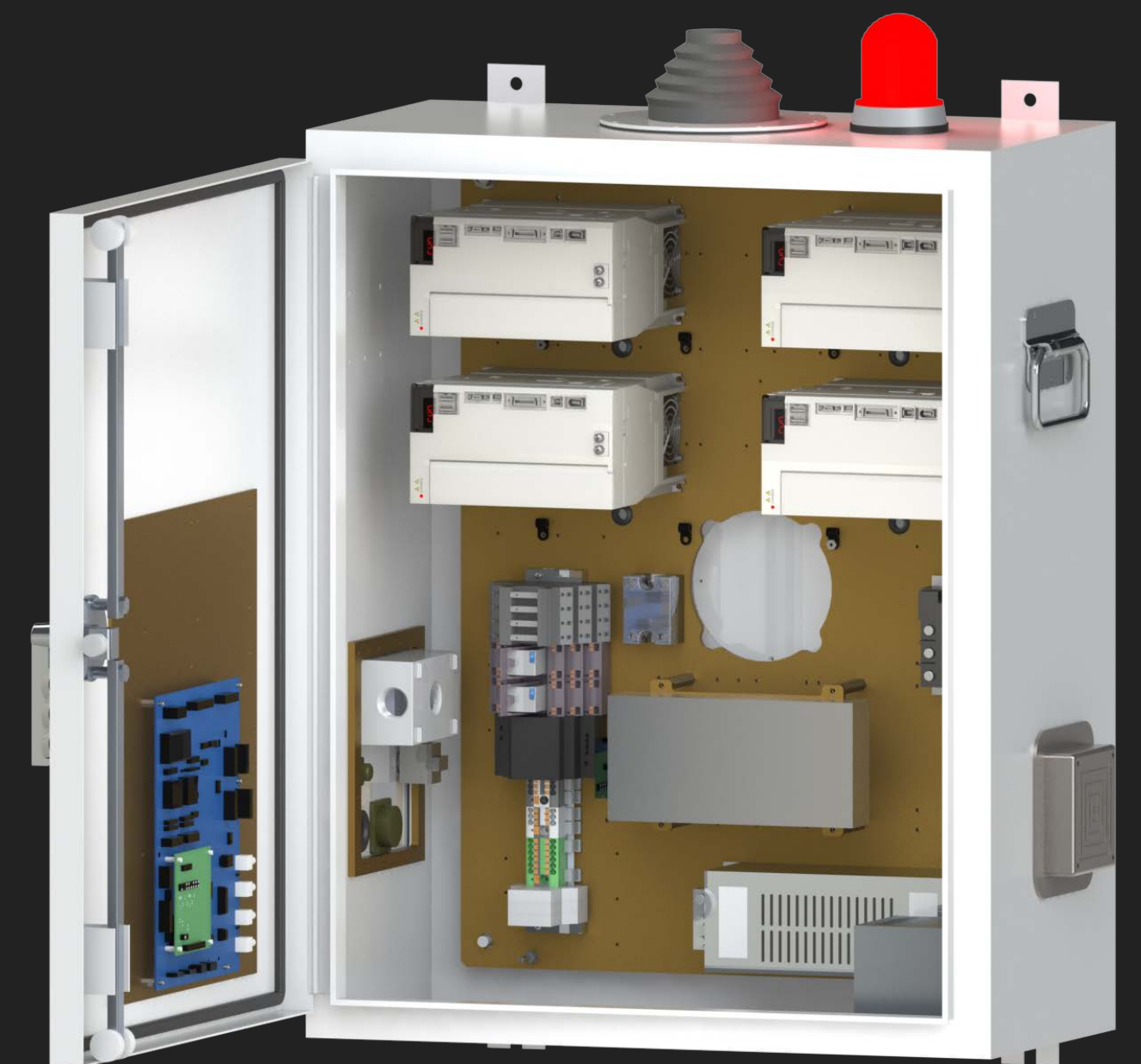
MODEL 6000M-7.3M MOBILE TRAILER (PACKED)



VIASAT 20' UPGRADES



T-Head View

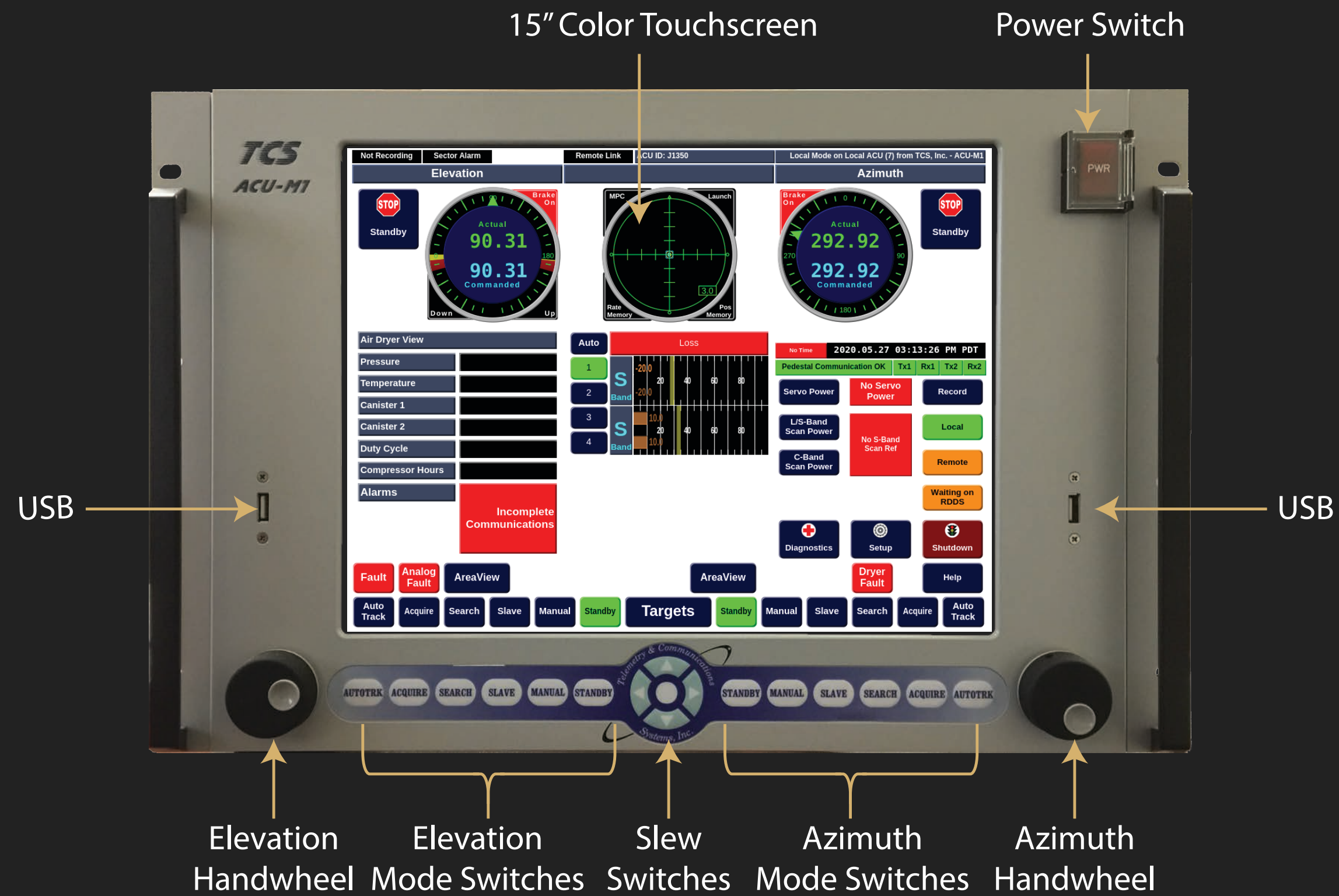


Pedestal Interface Unit

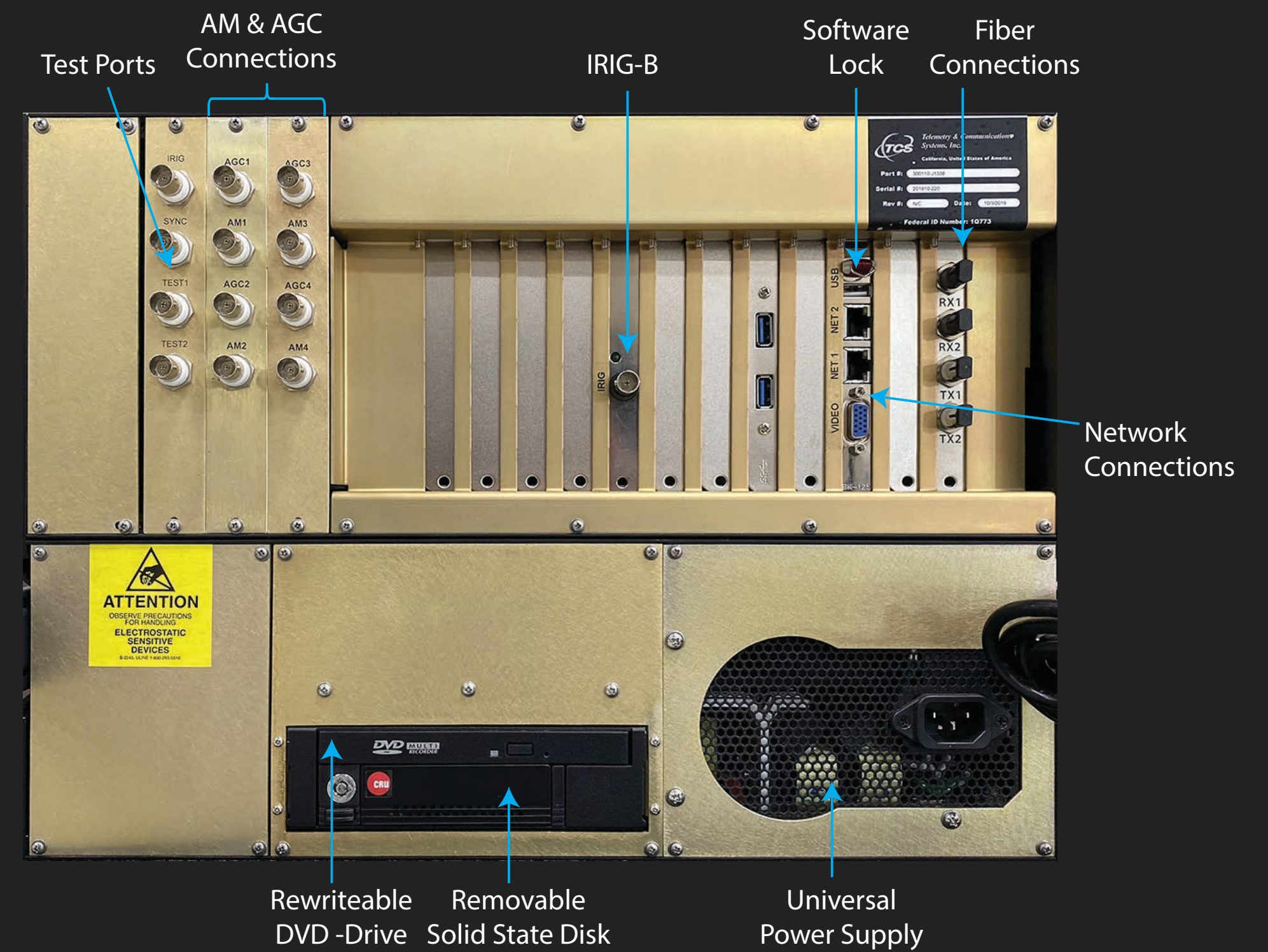
XY UPGRADES



ANTENNA CONTROL UNIT - M1L



FRONT VIEW



REAR VIEW

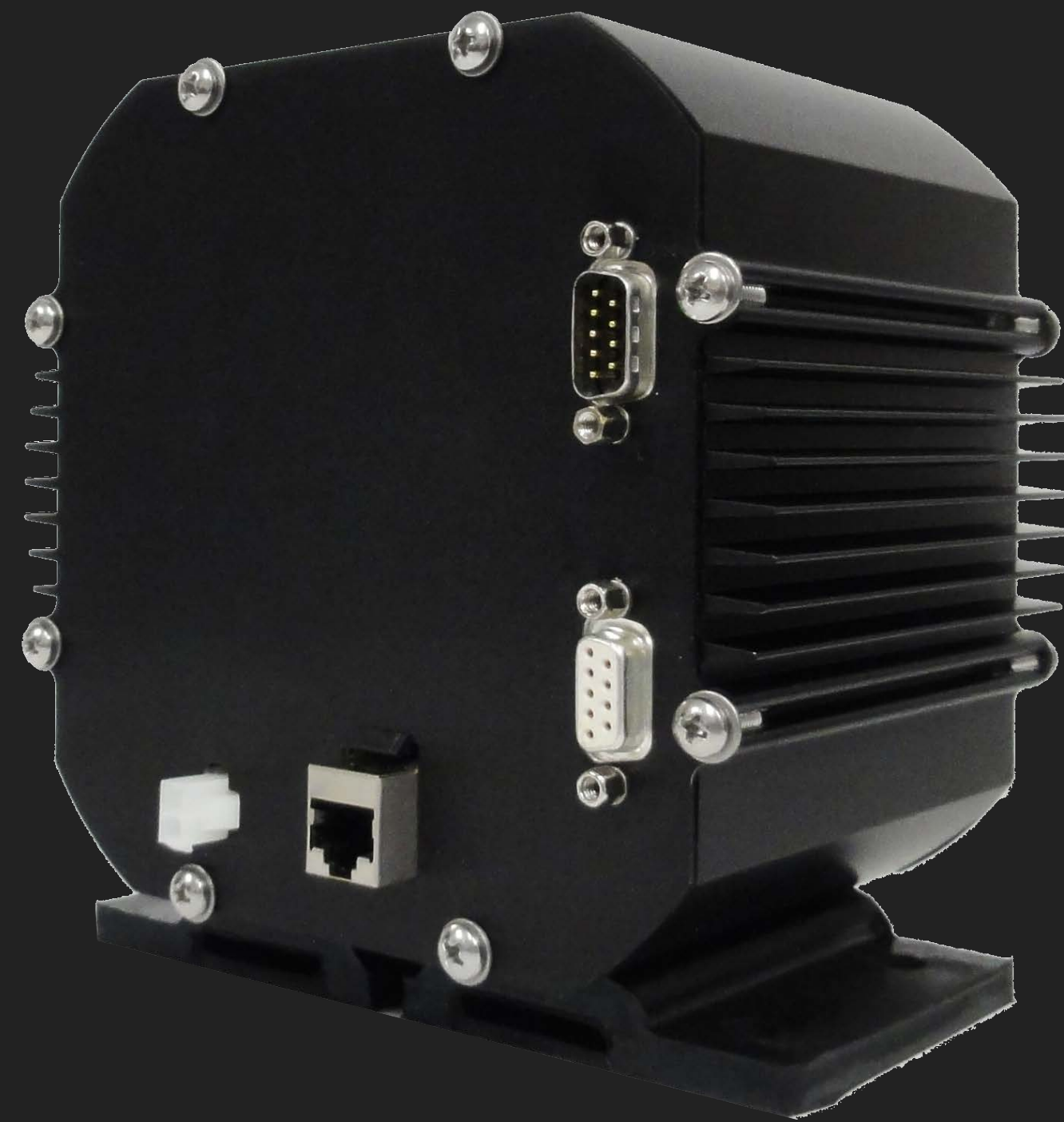
ANTENNA CONTROL UNIT - M2L

- ▶ 2U Version of the ACU-M1
- ▶ Control via KVM or Remote
- ▶ Designed for Constellations of Antennas with Limited Rack Space
- ▶ Full Autotrack Capable

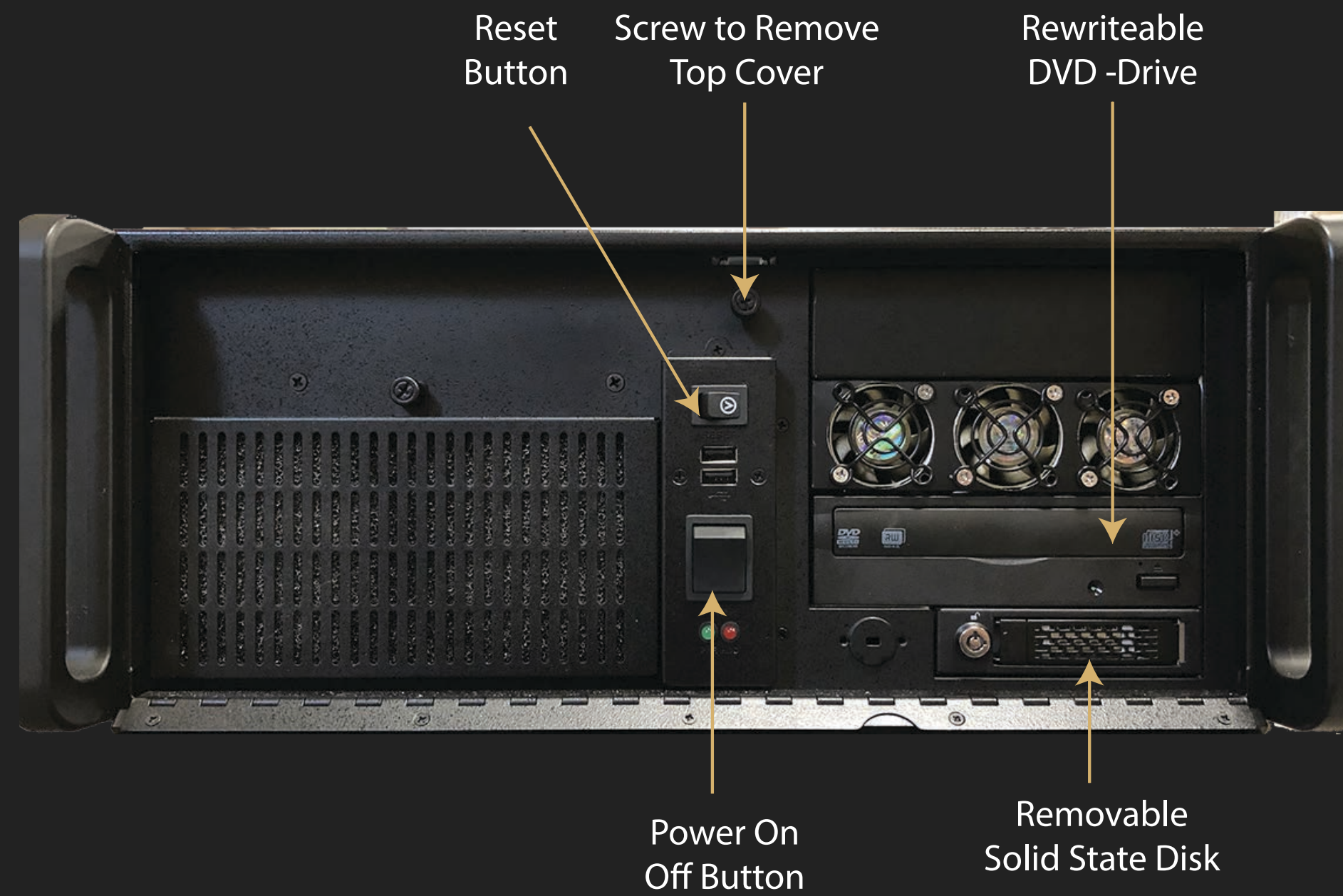


ANTENNA CONTROL UNIT - M3

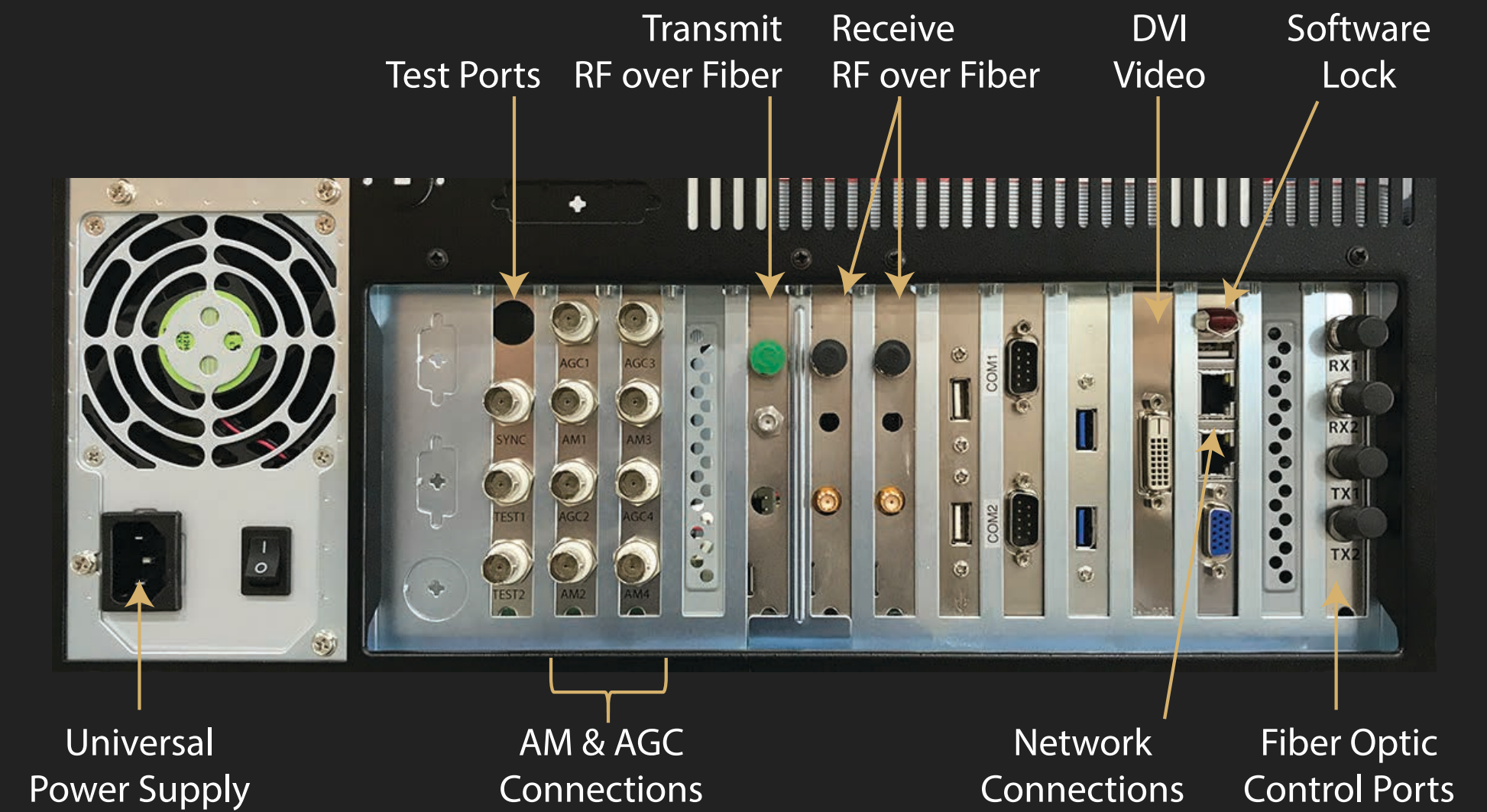
- ▶ Embedded Antenna Control Unit
- ▶ Extreme Temperatures (-40°C to +70°C)
- ▶ For Pointing Systems Only
- ▶ Propagates Satellite Trajectories
- ▶ Remote Control via Customer Software
- ▶ Remote Control via TCS Remote Control Software



ANTENNA CONTROL UNIT - M4



FRONT VIEW



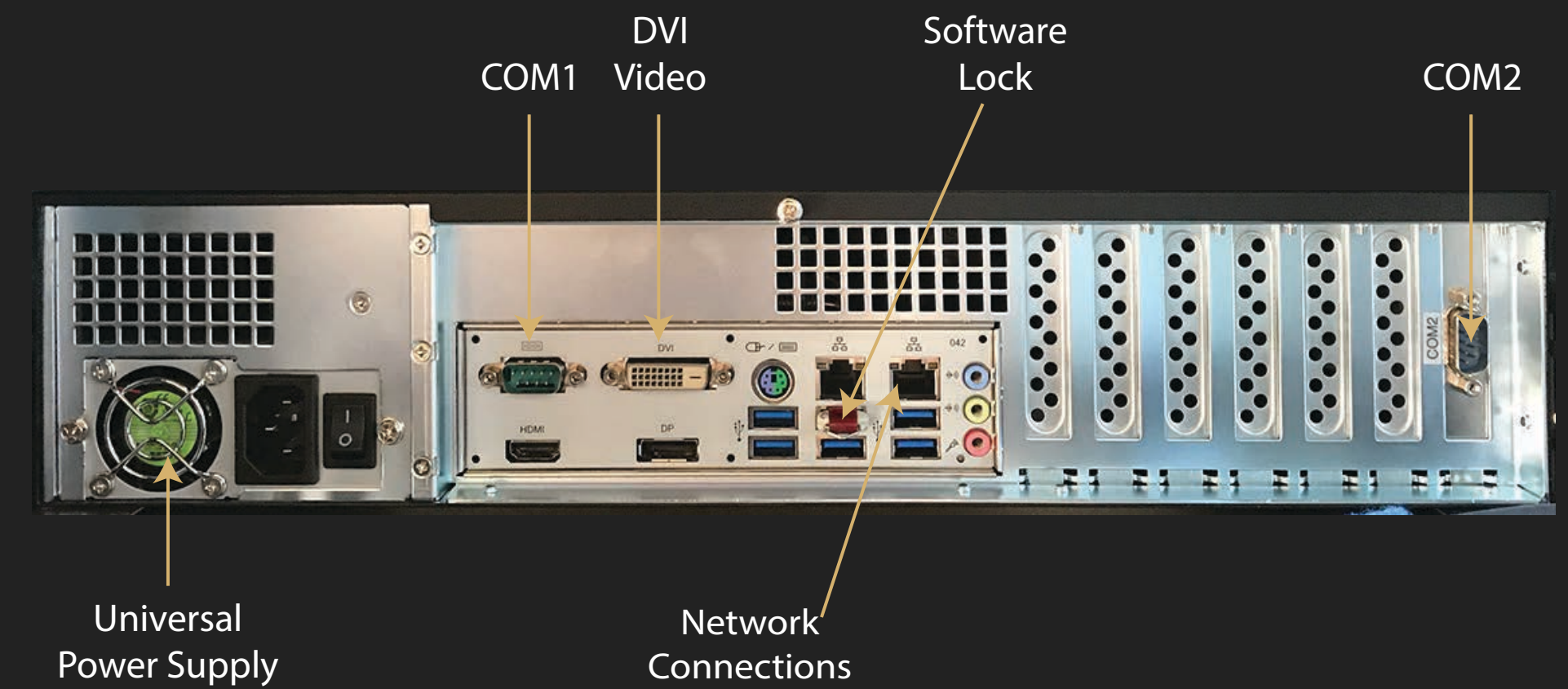
REAR VIEW

NON-STANDARD CONFIGURATION

REMOTE ANTENNA CONTROL UNIT - M2R



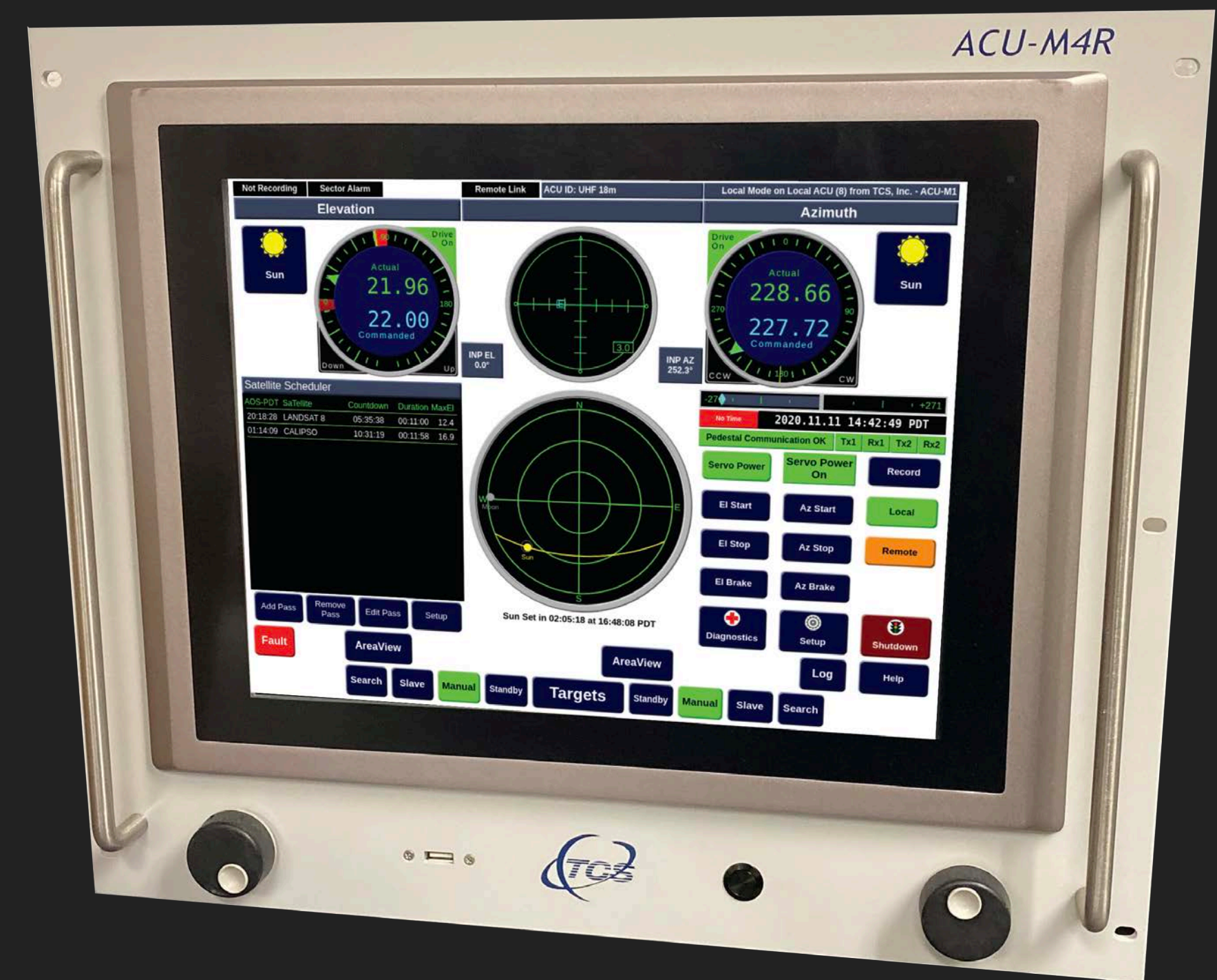
FRONT VIEW



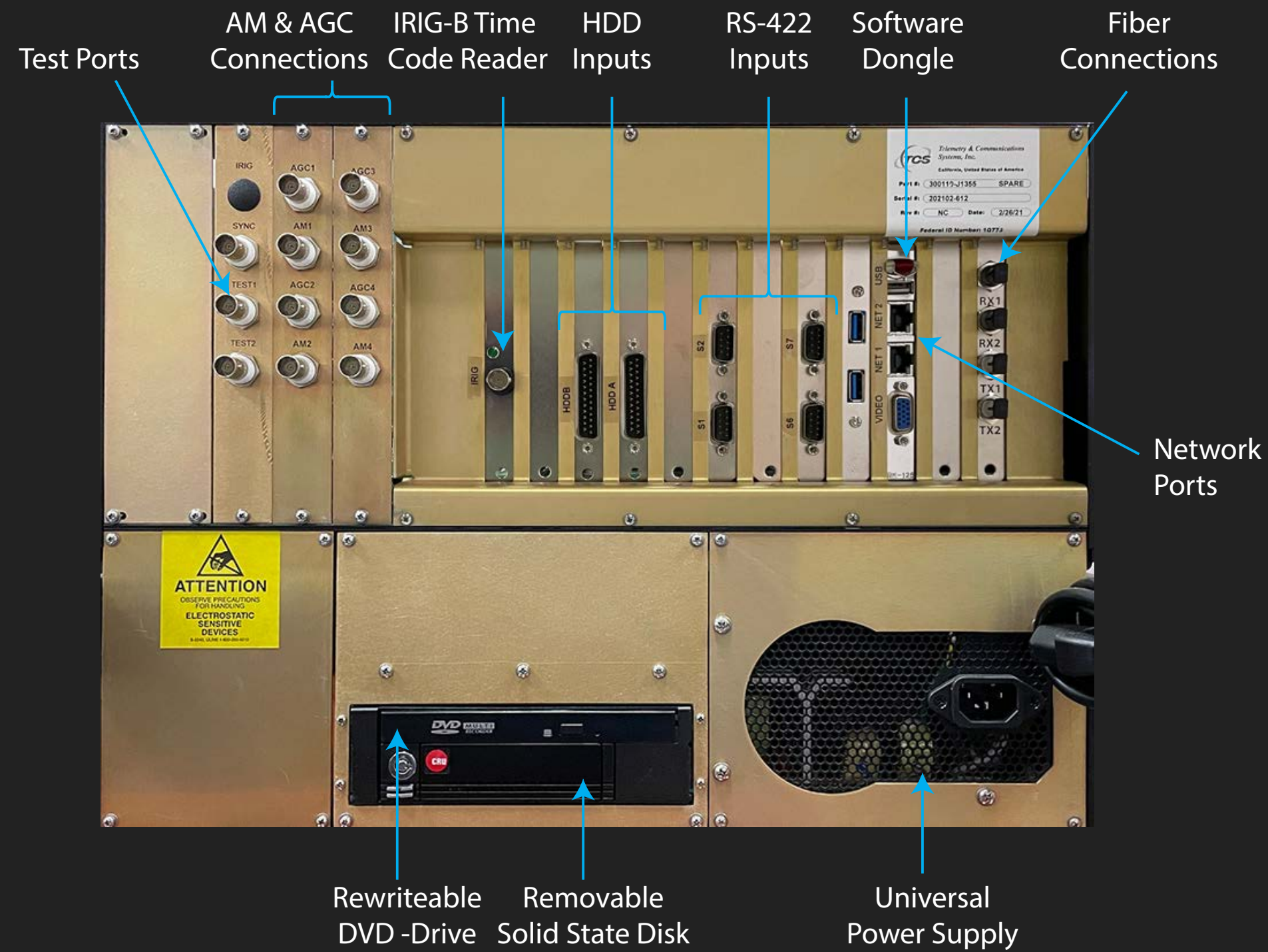
REAR VIEW

REMOTE ANTENNA CONTROL UNIT - M4R

- ▶ Thin Client Touchscreen PC
- ▶ Emulates Front Panel of Local ACU with Handwheels
- ▶ Controls Any TCS Local ACU over Ethernet



LAUNCH CONTROL SERVICES SOFTWARE



Nominal View

Current File: TestINP

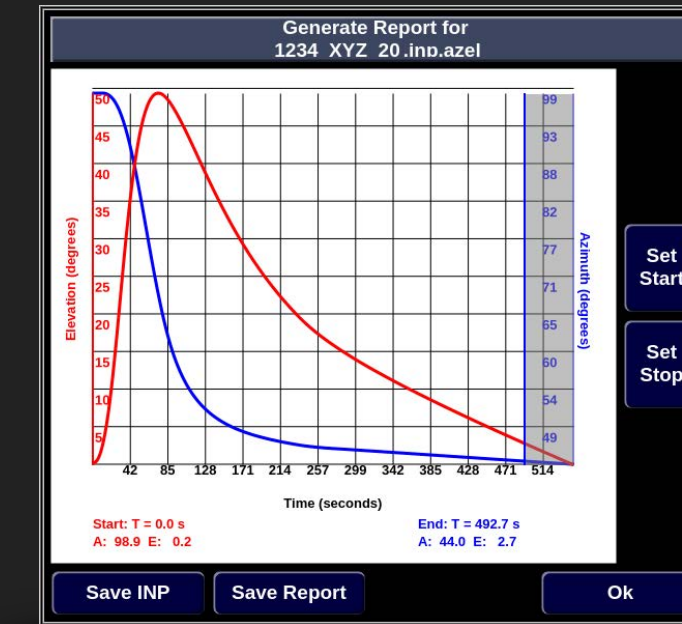
Import File Create Report Delete File

Stop Start on Time

Start Time 2021.238 22:36:40.0 UTC

Start [Progress Bar] End

Time: 00:13:49.8



Time	Message
235 22:07:18	SiteConfigData.xml loaded ...
235 22:07:18	DMNE Not Opened on ttyS2 ...
235 22:07:18	DMNE TCP open for listening ...

Open Circuit Close Circuit Send Quality Message Out Msg Counter: 1

Request Re-Tx Message Display Select Message Configure DMNE

CS5246 View - Channel 1 - No Data

ID: Predicted Launch Time

00:00:00

Use As Launch Time Configure

CS5246 View - Channel 2 - No Data

ID: Predicted Launch Time

00:00:00

Use As Launch Time Configure

Outbound Status View

HDDIP Out 1		Unclassified	
E: 911335	Az: 3.51	Q-Bit	
F: -5536702	El: -0.19	T-Bit	
G: 3022160	Rn: 500	SID: 24	
[Rec]			
HDDIP Out 2		Unclassified	
E: 911335	Az: 3.51	Q-Bit	
F: -5536702	El: -0.19	T-Bit	
G: 3022160	Rn: 500	SID: 17	
[Rec]			

Slave	EI	Az	T	Δ EI	Δ Az	SID	Linc
Autotrack	-0.2	3.5					
HDDA	No Data	No Data	Q	No Data	No Data	0	0
HDDB	No Data	No Data	T	No Data	No Data	0	0
HDDIP1	No Data	No Data	Q	No Data	No Data	0	
HDDIP2	No Data	No Data	T	No Data	No Data	0	
Nominal	0.2	26.6		-0.4	-23.0	Stop	0%

Sync Serial Inbound Display View

HDDA Unclassified [Edit] [Live] [PB]

E: No Data Az: No Data Q-Bit
F: No Data El: No Data T-Bit
G: No Data Rn: No Data SIC: ND

[Rec] [Play] [Reset]

HDDB Unclassified [Edit] [Live] [PB]

E: No Data Az: No Data Q-Bit
F: No Data El: No Data T-Bit
G: No Data Rn: No Data SIC: ND

[Rec] [Play] [Reset]

SATELLITE TRACKING SOFTWARE

Above Horizon						
PDT	AOS	Satellite	Elapsed	Remain	MEI	Az El
16:26:06	16:26:06	IRS 1C	00:00:03	00:06:41	2	246 0

Below Horizon						
PDT	AOS	Satellite	T-Minus	Duration	MEI	Az El
17:08:54	17:08:54	JASON 2	00:42:44	00:21:57	72	
17:22:01	17:22:01	RADARSAT 2	00:55:52	00:13:20	21	
18:21:15	18:21:15	HESSI	01:55:06	00:10:48	16	
21:00:27	21:00:27	LANDSAT 7	04:34:18	00:09:23	7	
21:47:24	21:47:24	LANDSAT 8	05:21:14	00:12:55	25	
01:32:48	01:32:48	AQUA	09:06:38	00:11:27	13	
01:37:41	01:37:41	AURA	09:11:32	00:11:06	11	

AOS-UTC	SaTelite	Countdown	Duration	MaxEI
18:44:09	JASON 3	00:47:50	00:20:22	32.2
02:35:45	LANDSAT 8	08:39:26	00:13:22	34.8
17:31:01	AURA	23:34:42	00:11:15	13.5

AOS-UTC	Satellite Name	Orbit	SatID/SIC	Duration	Max EI	Type
238-18:16:29	AQUA	2731	27424	00:13:49	56.9	TLE
238-18:24:20	AURA	91031	28376	00:13:49	55.6	TLE
238-18:44:09	JASON 3	26217	41240	00:20:22	32.2	TLE
238-20:39:12	JASON 3	26218	41240	00:21:32	44.4	TLE
239-02:35:45	LANDSAT 8	45413	39084	00:13:22	34.8	TLE
239-04:14:10	LANDSAT 8	45414	39084	00:12:01	16.5	TLE
239-04:41:50	JASON 3	26222	41240	00:20:45	32.0	TLE
239-06:22:56	AQUA	2738	27424	00:13:01	25.5	TLE
239-06:30:47	AURA	91038	28376	00:12:59	25.0	TLE
239-06:37:35	JASON 3	26223	41240	00:21:18	46.5	TLE
239-07:36:19	ISS (ZARYA)	29961	25544	00:10:40	42.4	TLE
239-08:00:40	AQUA	2739	27424	00:12:40	23.1	TLE
239-08:08:30	AURA	91039	28376	00:12:43	23.6	TLE

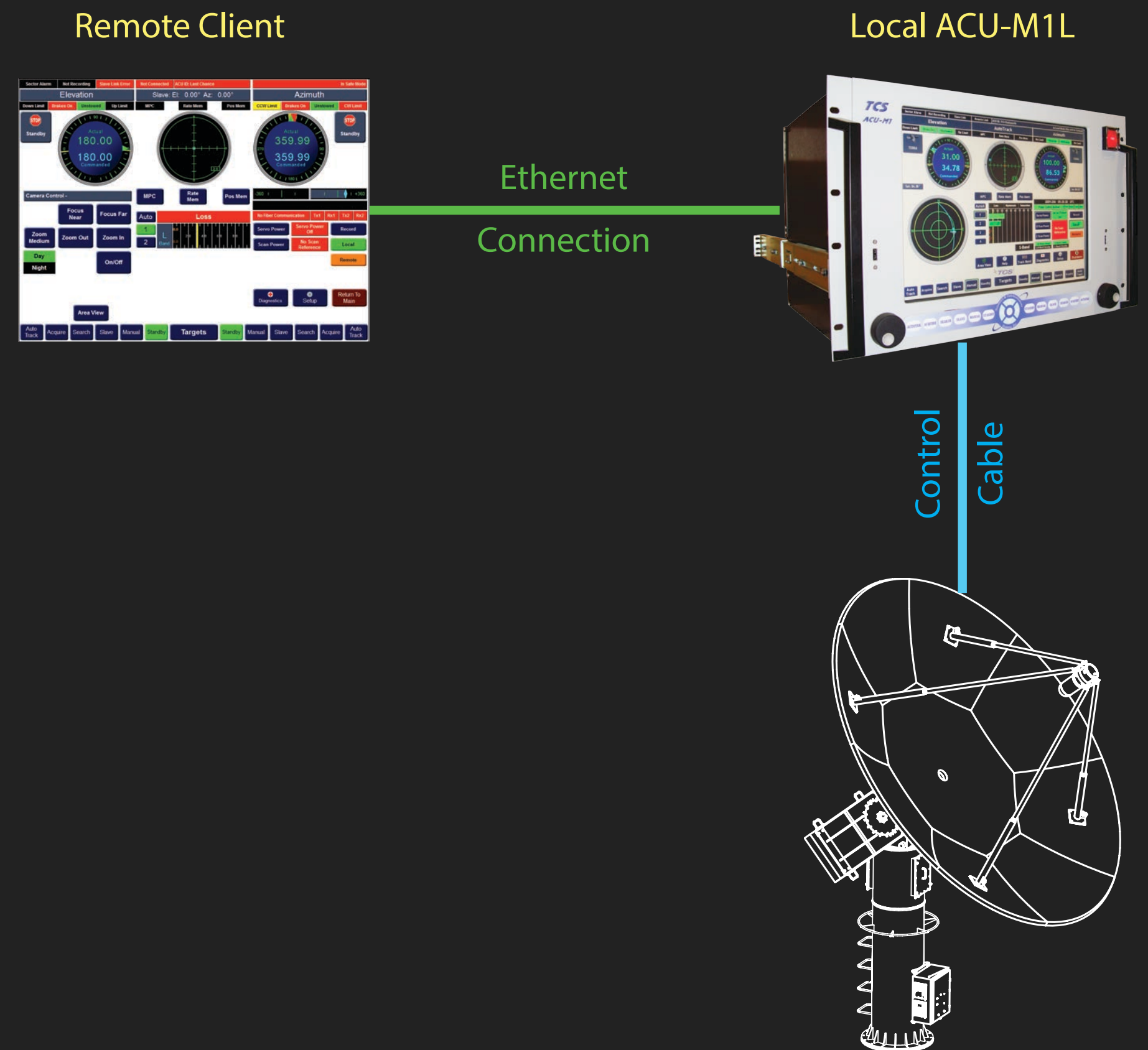
AOS-UTC	Satellite Name	Orbit	SatID/SIC	Duration	Max EI	Type
238-18:44:09	JASON 3	26217	41240	00:20:22	32.2	TLE
239-02:35:45	LANDSAT 8	45413	39084	00:13:22	34.8	TLE
239-17:31:01	AURA	91045	28376	00:11:15	13.5	TLE



Edit Pass for Satellite LANDSAT 8			
AOS Time	02:35:45	Earliest AOS Time	02:35:45
LOS Time	02:49:07	Latest LOS Time	02:49:07
Pass Duration	00:13:22		
Set LOS from Duration		<input type="button" value="Cancel"/>	<input type="button" value="Ok"/>

REMOTE CONTROL SOFTWARE - ONE TO ONE LOCAL CONTROL

- ▶ Software package to Remotely Control ACU (M1L/M2L/M3L/M4L)
- ▶ Runs on Windows/Linux Class PC
- ▶ Node Locked to Single PC
- ▶ Optional USB Handwheels Simulating Local ACU



REMOTE CONTROL SOFTWARE - SINGLE OPERATOR MULTIPLE ANTENNA (SOMA)

Pt Mugu SOMA Display

SOMA System Selection

SNI #1 (Antenna 1)	Antenna9
SNI #2	Last Chance (Antenna 2)
Santa Cruz East	
Santa Cruz West (Antenna 3)	
Antenna3	
Antenna7	

Cancel Ok

Not Recording | Sector Alarm | Remote Link | ACU ID: ANTENNA 1 | In Local Mode - TCS, Inc. - ACU-M1

Elevation

Standby

Actual: 11.00
Commanded: 11.00

Brake On

Down Up

Azimuth

Standby

Actual: 246.48
Commanded: 246.48

Brake On

Rate Memory | Launch | Pos Memory

ANTENNA 1

ELEVATION: 11.00
AZIMUTH: 246.48

Auto

1 C Band 53.0

2 Band 0.3

ANTENNA 2

ELEVATION: 4.35
AZIMUTH: 248.56

Auto

1 S Band 53.0

2 Band 0.3

Track Offset View

Normal Mode | Plunge Mode

Az Offset: 0.00°

EI Offset: 0.00°

Time Offset: 0.00s

EI HW Disabled | Az HW Disabled

EI Offset | Time Offset | Time Offset | Az Offset

Auto

1 C Band 53.0

2 L Band 52.4

3 Band

4 Band

PC Time: 2017.02.07 17:04:07 PDT

Pedestal Communication OK | Tx1 | Rx1 | Tx2 | Rx2

Servo Power: Servo Power On

L/S-Band Scan Power: No C-Band Scan Ref

C-Band Scan Power

Hi Gain | Lo Gain | Auto Gain

Diagnostics | Setup

ANTENNA 3

ELEVATION: 4.35
AZIMUTH: 248.56

Auto

1 S Band 53.0

2 Band 0.3

ANTENNA 4

ELEVATION: 4.35
AZIMUTH: 248.56

Auto

1 S Band 53.0

2 Band 0.3

ANTENNA 5

ELEVATION: 4.35
AZIMUTH: 248.56

Auto

1 S Band 53.0

2 Band 0.3

ANTENNA 6

ELEVATION: 4.35
AZIMUTH: 248.56

Auto

1 S Band 53.0

2 Band 0.3

Fault | Analog Fault | AreaView

Auto Track | Acquire | Search | Slave | Manual | Standby | Targets | Standby | Manual | Slave | Search | Acquire | Auto Track

LS LNA Pwr | C LNA Pwr

Handwheels Not Connected

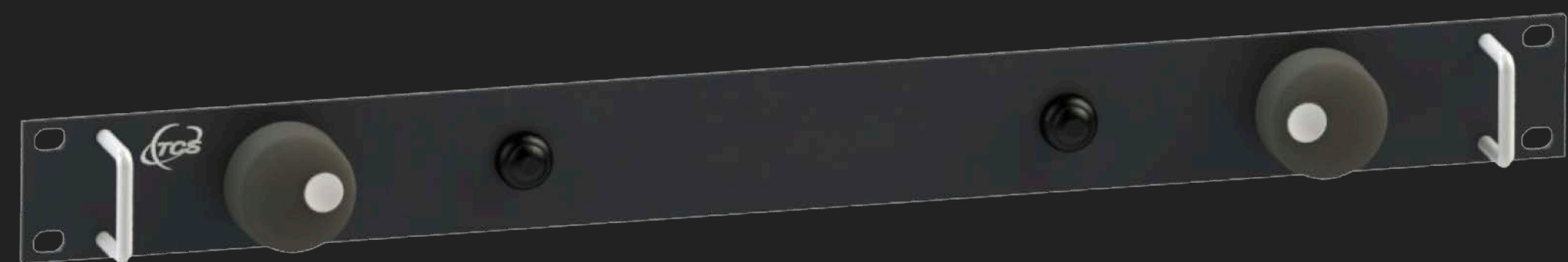
Help | Systems | Shutdown

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HAND WHEEL PERIPHERALS



USB DESKTOP HANDWHEELS



1U USB HANDWHEELS

RF OVER FIBER MODULES



RECEIVE MODULE



TRANSMIT MODULE

MULTICOUPLER

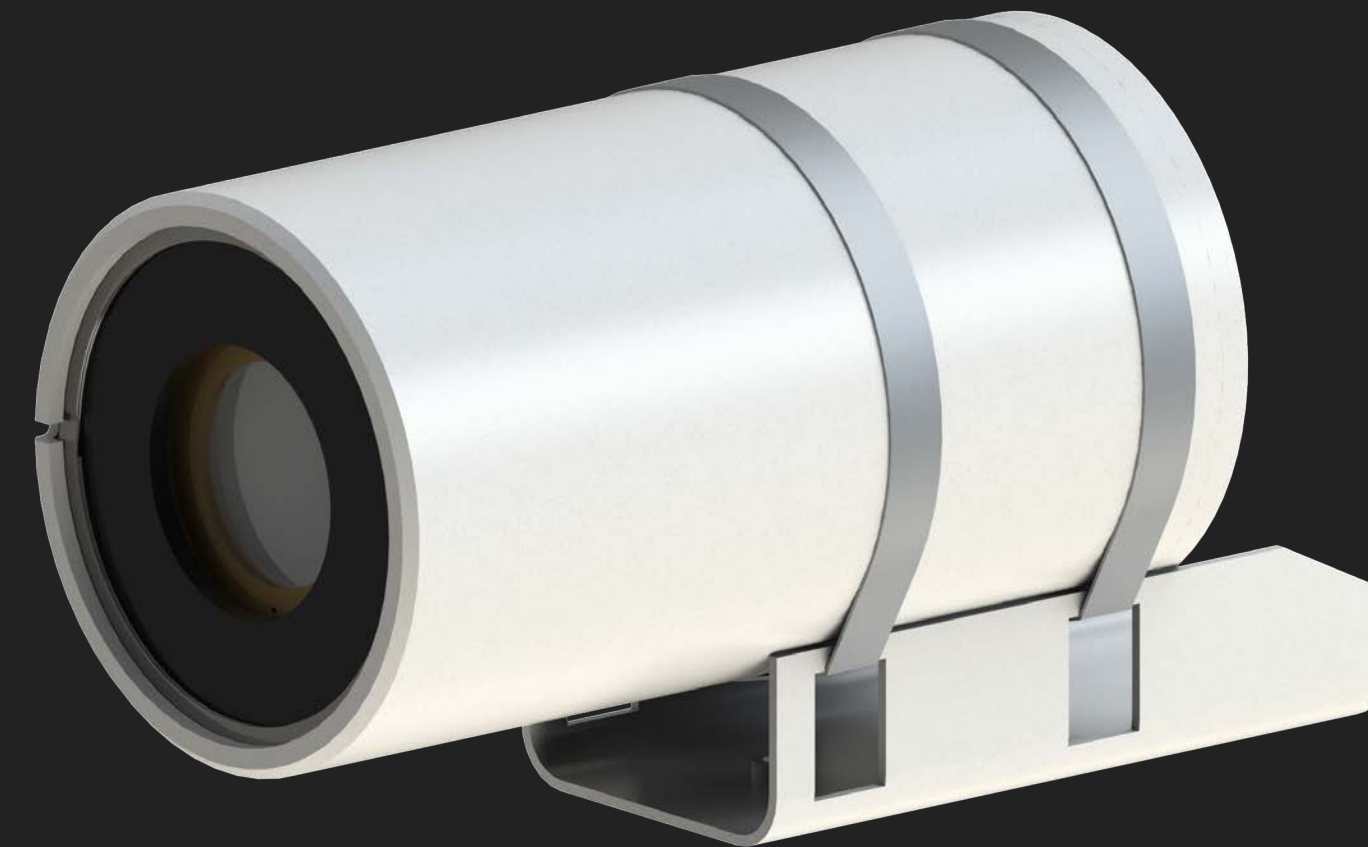


INLINE FILTERS

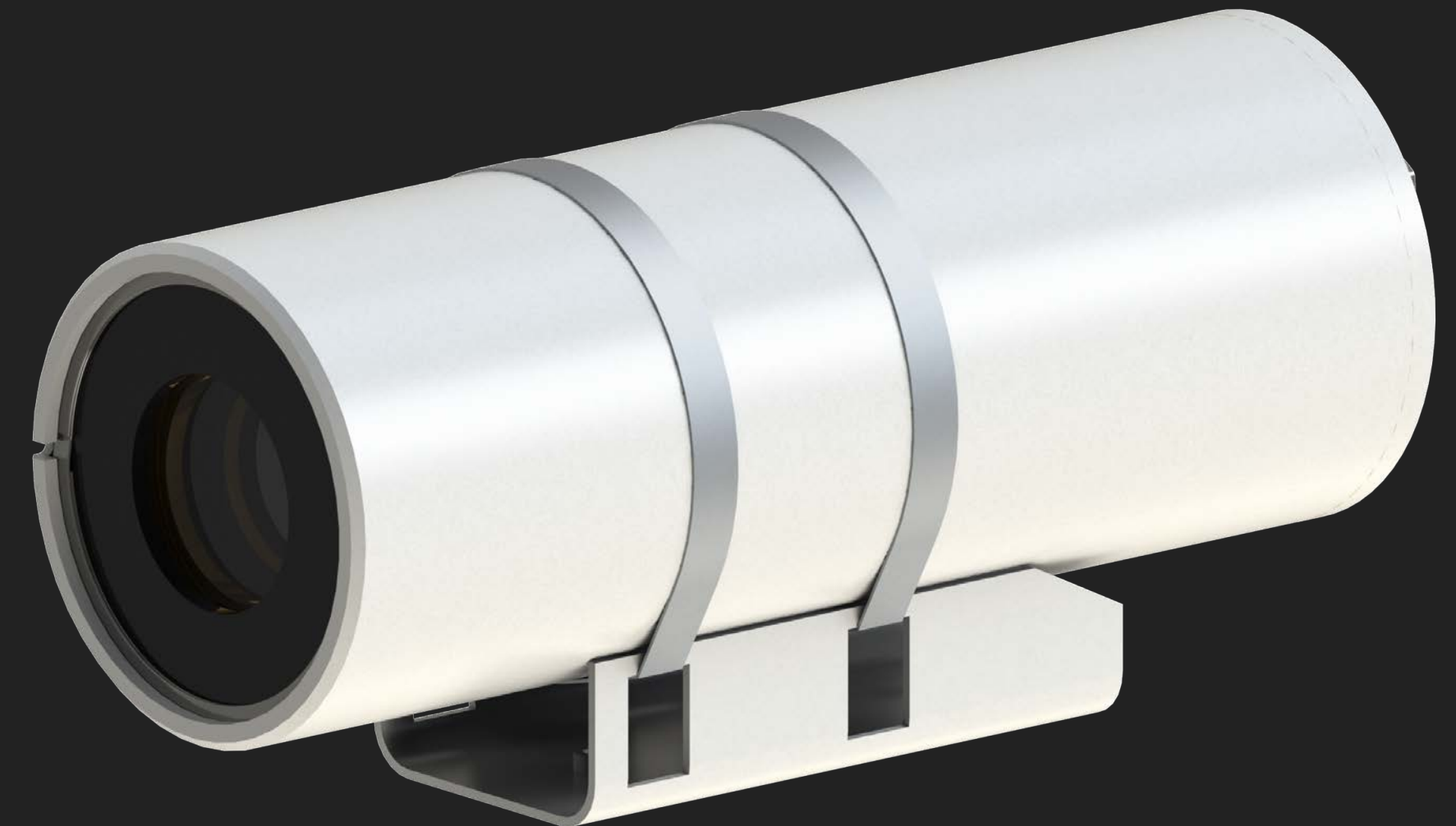


HD CAMERA

- ▶ HD-SDI Output
- ▶ UV/IR Filter
- ▶ RF Shielded
- ▶ 33X Optical Zoom
- ▶ Optional Optical Doubler



Standard HD Camera



HD Camera with
Doubler

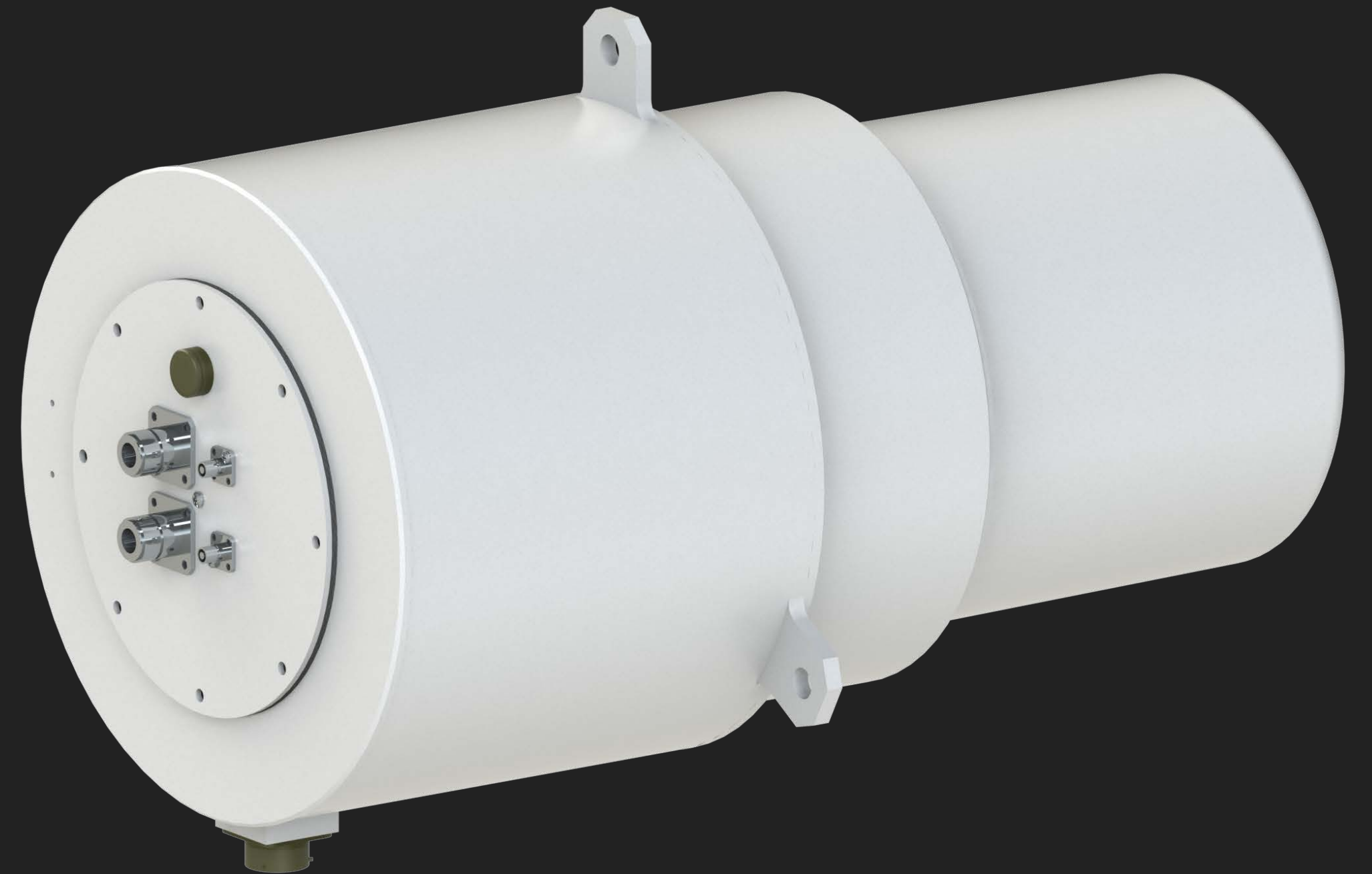
EXTENDED L/S/X-BAND FEED

- ▶ Extended L-Band: 1.0 - 1.75 GHz
- ▶ S-Band: 2.05 - 2.50 GHz
- ▶ X-Band: 7.8 - 9.0 GHz



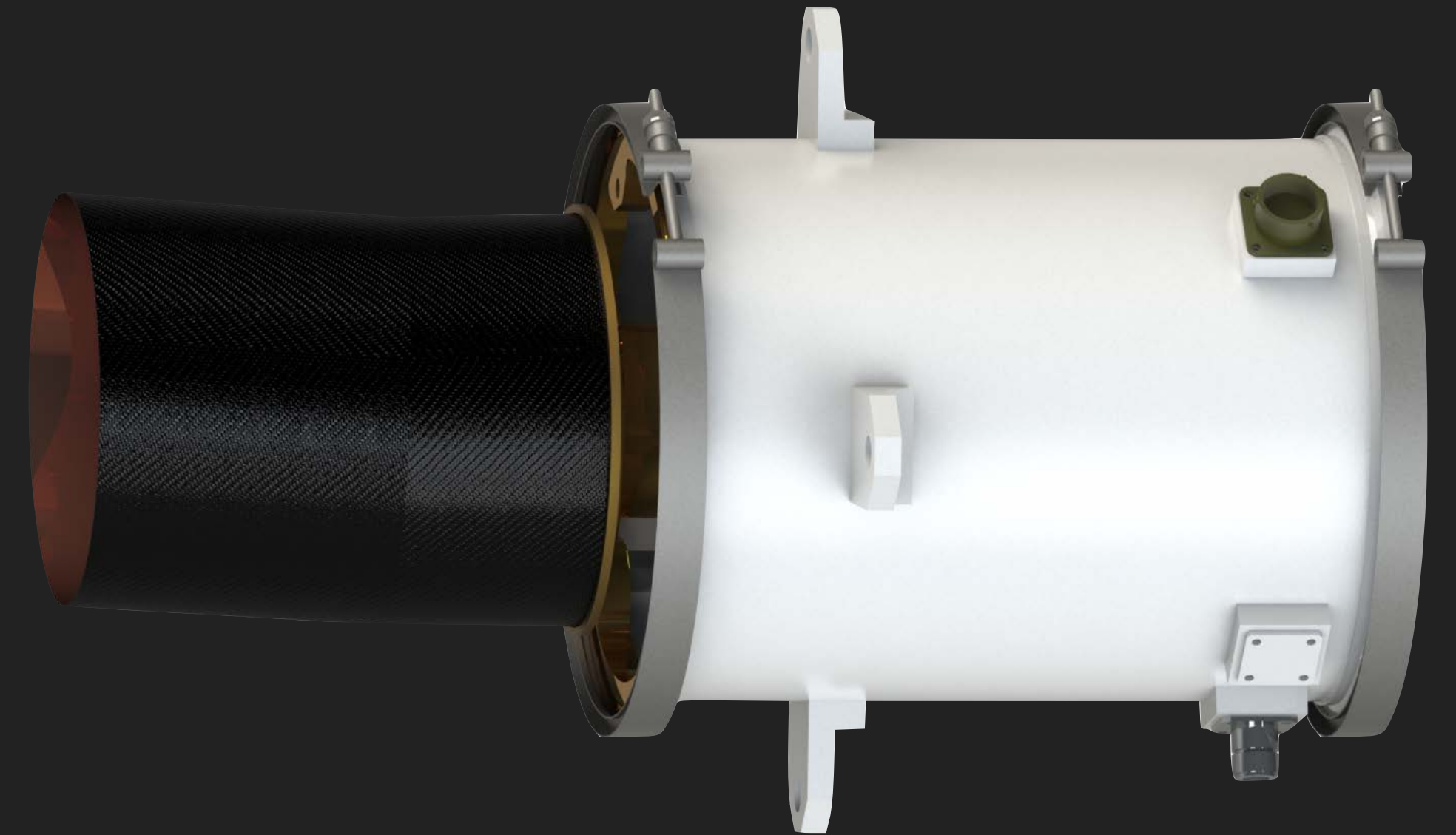
C/KU-BAND FEED

- ▶ C-Band (Linear/Circular): 3.4 - 4.2 GHz
- ▶ Ku-Band(Linear): 10.7 - 12.75 GHz
- ▶ Linear Portion Rotates to Optimize Gain



L/S-BAND FEED

- ▶ 1435 - 2400 MHz
- ▶ Cell Phone Reject Optional Filter
- ▶ Custom Filters on Request
- ▶ Takes Regular Radome or Sub-reflector in Cassegrain Configuration



S-BAND LINEAR FEED

- ▶ 2.6-3.9 GHz
- ▶ Vertical or Horizontal Polarization



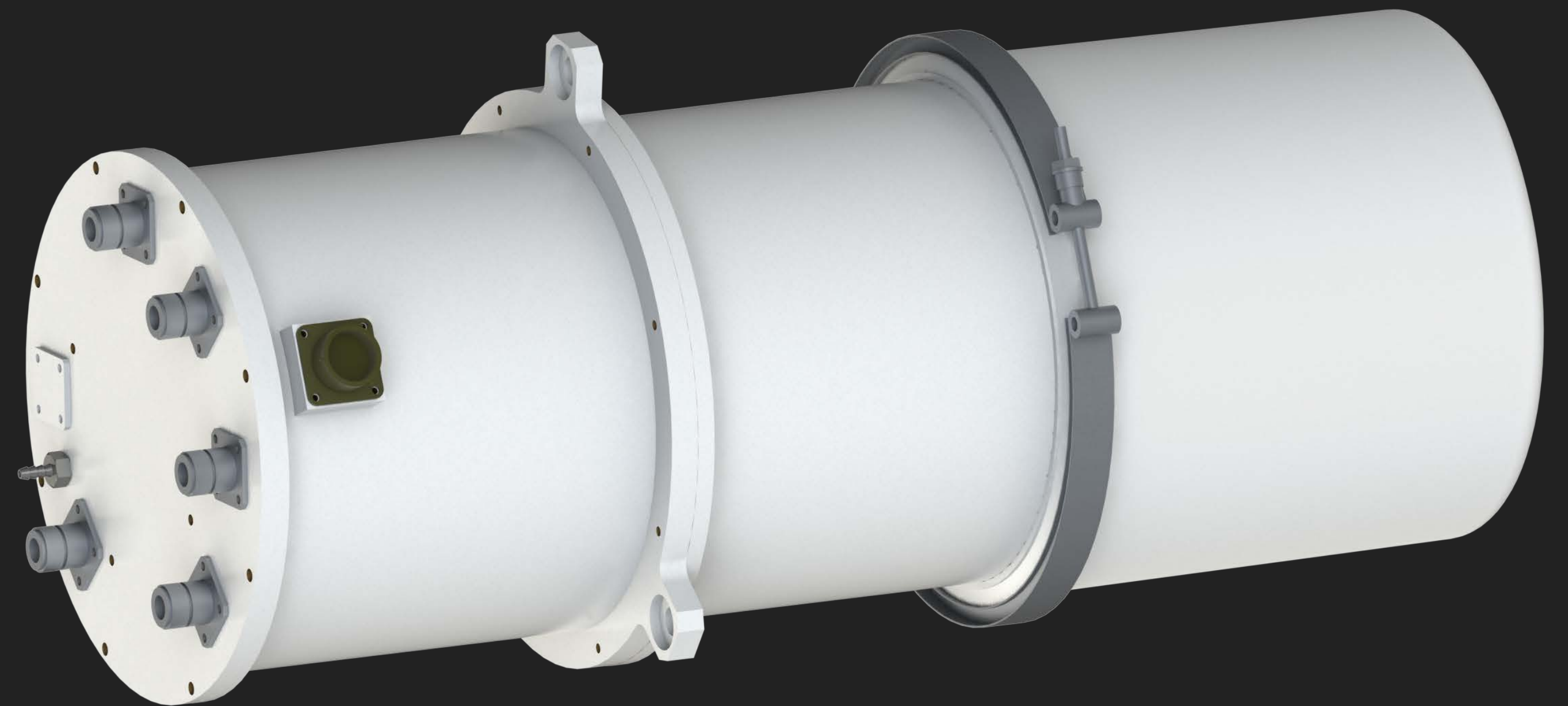
L/S-BAND FEED WITH TRANSMIT

- ▶ SGLS Uplink or SGLS & USB Uplink
- ▶ 350W Transmit Capability
- ▶ Receives: 2200 MHz to 2300 MHz



C-BAND WITH DOWNCONVERTER AND INET CAPABILITY

- ▶ Downconverts C-Band to 300MHz to 1150MHz
- ▶ Receives 4400 - 4800 MHz, 5091- 5150 MHz
- ▶ Transmits: 4880 - 4940 MHz



L/S/UHF-BAND FEED

- ▶ Uplink 370-450 MHz up to 1 KW
- ▶ Receives 1435 - 2400 MHz



ACQUISITION AID FEEDS

- ▶ Receives L/S & C-Band
- ▶ Downconverts C-Band to 300MHz to 1150MHz



AIR FORCE CUSTOMERS

- ▶ Edwards Air Force Base
- ▶ Eglin Air Force Base
- ▶ Hill Air Force Base
- ▶ Wright-Patterson Air Force Base
- ▶ JT3/JT4 Nevada



U.S. AIR FORCE

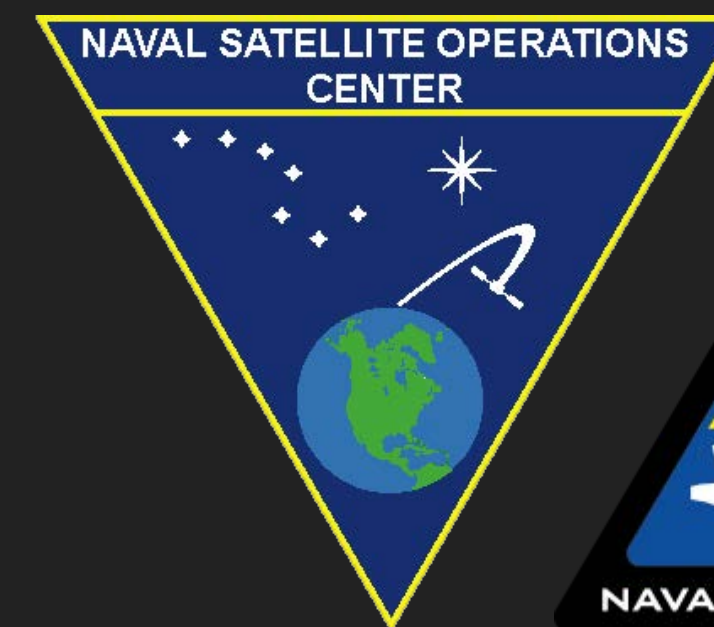
ARMY CUSTOMERS

- ▶ Redstone Arsenal
- ▶ Yuma Proving Grounds
- ▶ Reagan Test Range (Kwajalein)
- ▶ Ft. Rucker
- ▶ White Sands Missile Range



NAVY CUSTOMERS

- ▶ Pacific Missile Range Facility (Hawaii)
- ▶ Naval Satellite Operations Center (Guam/ Maine)
- ▶ Corona Naval Warfare Assessment Station
- ▶ Pt Mugu Sea Range, NAVAIR
- ▶ Patuxent River NAWC
- ▶ China Lake, NAVAIR



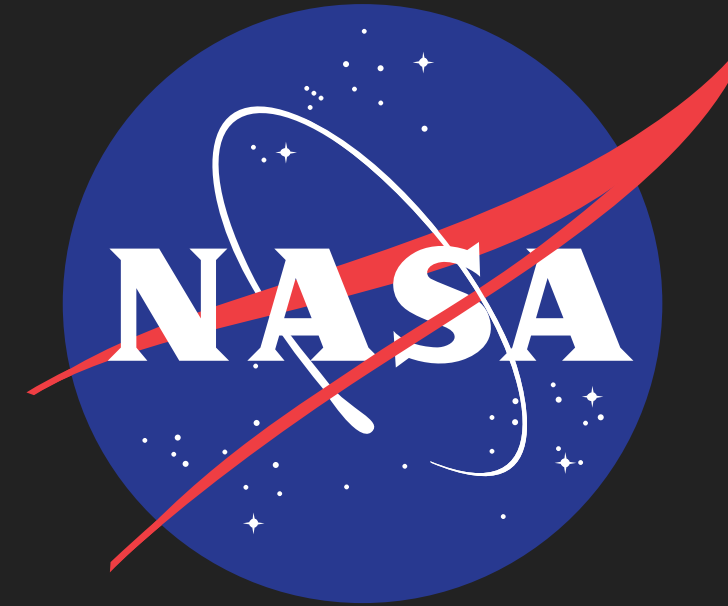
SPACE FORCE CUSTOMERS

- ▶ Patrick Space Force Base (RGNext)
- ▶ Vandenberg Space Force Base



NASA & GOVERNMENT CUSTOMERS

- ▶ NASA Armstrong
- ▶ NASA Langley
- ▶ NASA KUS/PDL (Peraton)
- ▶ NASA Wallops
- ▶ Sandia National Labs
 - ▶ Kauai Test Facility
 - ▶ Albuquerque
 - ▶ Tonopah, NV
- ▶ Physical Science Laboratory/NMSU



COMMERCIAL CUSTOMERS

- ▶ Alaska Aerospace
- ▶ BAE Systems
- ▶ Bombardier
- ▶ Boeing
- ▶ CACI
- ▶ L-3 Communications
- ▶ LeerJet
- ▶ Lockheed Martin
- ▶ Lumistar
- ▶ Northrop Grumman
- ▶ Secotec
- ▶ SEMCO
- ▶ Sikorsky Aircraft
- ▶ SpaceX
- ▶ Virgin Galactic
- ▶ WV Communication
- ▶ Zeta Associates

INTERNATIONAL CUSTOMERS

- ▶ Adex Aerospace, South Korea
- ▶ ADD, South Korea
- ▶ Alenia Systems, Italy
- ▶ Andøya Rocket Range, Norway
- ▶ DTSSO, Australia
- ▶ Esrange, Sweden
- ▶ Leonardo, Italy
- ▶ Milano Systems, Italy
- ▶ Oto Melara, Italy
- ▶ QinetiQ, UK