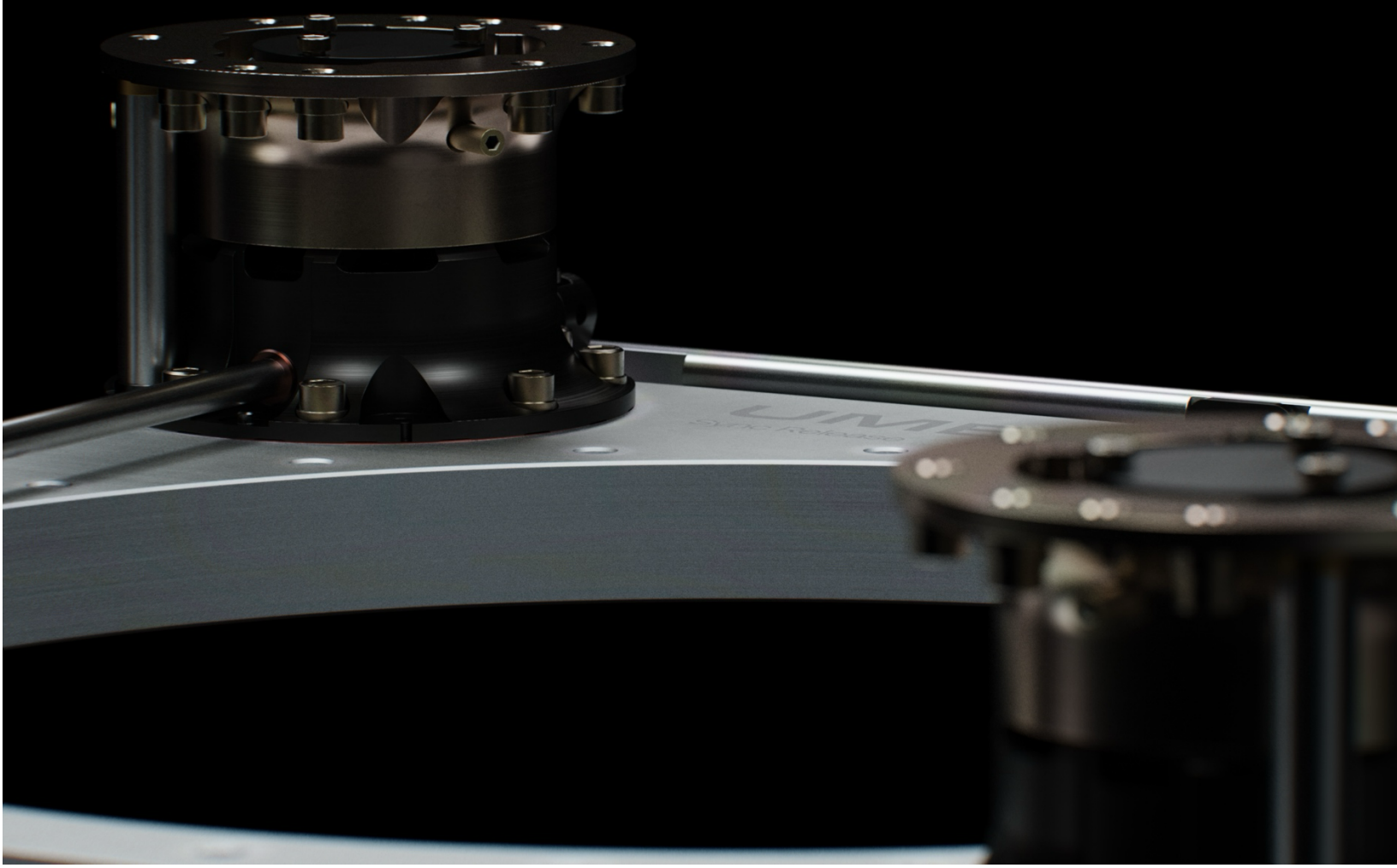


SyncRelease 4 User Guide

Distribution Statement

No Restrictions

Export Control

No US Export Control Information

Table of Contents

Figures

Tables

1.0 Objective

This document provides user guidance for the integration of the Umbra SyncRelease 4.

The Umbra SyncRelease 4 spacecraft separation system is engineered to provide debris-free, precision controlled spacecraft separation from a launch vehicle.

2.0 Document References

This section contains the document number and description for documents that are referenced herein.

2.1 Umbra Documents

5011H05000	SR4 MICD

2.2 Standard Documents

AS22759	WIRE, ELECTRICAL, FLUOROPOLYMER-INSULATED, COPPER or COPPER ALLOY
GSFC-STD-7000A	GENERAL ENVIRONMENTAL VERIFICATION STANDARD (GEVS)
MIL-STD-461	MILITARY STANDARD: ELECTROMAGNETIC INTERFERENCE CHARACTERISTICS REQUIREMENTS FOR EQUIPMENT
SAE-AS50881	WIRING, AEROSPACE VEHICLE

3.0 Document Authority

In the case of a conflict between any dimensional, mounting pattern, or pinout information defined within this document and other information sources, the released mechanical and electrical drawings in Appendix B shall supersede this document.

3.1 Revision Notes

This document is Version 1.0.

3.2 Document Disclaimer

DISCLAIMER: This User Guide is intended to provide a brief summary of our knowledge and guidance regarding the use of this item. The information contained herein has been compiled from sources considered by Umbra Lab, Inc. to be dependable and is accurate to the best of Umbra's knowledge. It is not meant to be an all-inclusive document on worldwide hazard communication regulations. This information is offered in good faith. Each user of this material needs to evaluate the conditions of use and design the appropriate protective mechanisms to prevent employee exposure, personal injury, property damage or release to the environment of any hazardous substances. Umbra assumes no responsibility for injury, damage, or loss sustained by the recipient or third persons or for any damage to any property resulting from misuse of the product. Purchase and use of the product(s) identified herein are governed by the terms of sale under which you purchase the product(s) from Umbra Lab, Inc.

4.0 Hardware Handling

Figure 1. SyncRelease 4

For receiving and unpacking information, refer to Section 4.1.3.

4.1 Mechanical Handling

Contact Umbra if any Umbra SyncRelease 4 fails any procedure as described in this document. Do not continue use of any Umbra SyncRelease 4 with a suspected failure.

Ensure that any transportation of the Umbra SyncRelease 4 occurs in an environment described in Section 4.5 Storage and Transport Environment.

Do not drop the Umbra SyncRelease 4.

Only lift the Umbra SyncRelease 4 by the chassis.

Do not disassemble the Umbra SyncRelease 4, other than via the actuation and reset steps detailed in Section 8.

4.1.1 Hazards

The Umbra SyncRelease 4 does not contain any hazardous materials subject to exposure during intended use.

Proper usage procedures per this document are required to prevent inadvertent release of the SR4, which may cause harm to hardware or personnel. When operating the SR4, ensure all usage procedures described in this user guide are met. Failure to do so may result in inadvertent release of the SR4, which may result in operator injury, damage to the SR4 or payload, damage to surroundings, and/or failure to deploy.

The SR4 utilizes compressed springs storing kinetic energy within the system. Operators should be trained to handle this hazardous energy and follow all stowing and operational instructions to avoid injury and damage.

4.1.2 ESD Sensitivity

The Umbra SyncRelease 4 is not ESD Sensitive.

4.1.3 Unpacking

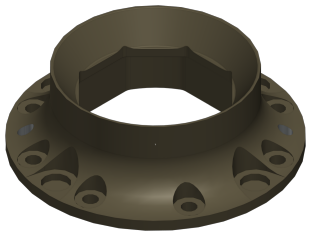
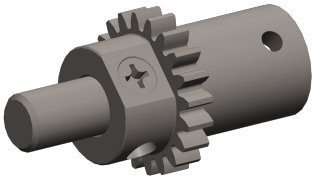
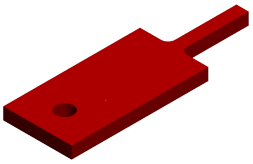
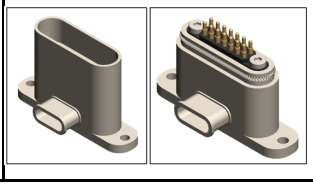
- If applicable, check shock detection stickers
- Remove assembly from transportation container
- Perform visual inspection for damage
- Take pictures as received
- Inspect connections then re-apply protective dust caps

4.1.3.1 Item Verification

Ensure the following items are present and not damaged.

Table 1. Itemized List

Item	Quantity	Notes	Image
Packing slip	1	NA	
SR4 Lower Assembly	1	Verify that the correct number of separation springs are installed per the PO	

Item	Quantity	Notes	Image
Release Cup	4	NA	
Stow Tool	1	NA	
Stow Flag	Same as the quantity of separation springs	NA	
Separation Connector Halves	Per PO	NA	

4.2 RBF/ Red Tag GSE

Item(s) listed in Table 2 must be removed before flight.

Table 2. RBF Items

Item	Critical/Optional	Notes
Connector Dust Cover	Critical	SyncRelease 4 J1 Dust Cover

See Appendix B for more information.

4.3 Electrical Mate/Demate

Table 3. Connector Information

Connector Designator	Assembly Connector	Mating Flight Connector	Mating Flight Connector
SyncRelease 4 J1	DEM9SF225	DEMA9PF225	DE9 Male

See Section 5.1 Connector Pinouts for more information.

4.4 Connector Strain

The Umbra SyncRelease 4 harnesses should be strain relieved to prevent damage to the system. It is recommended to secure all harnessing per the guidance found in SAE-AS50881 which describes guidance on the installation of wiring harnesses.

4.5 Storage and Transport Environment

Do not store the Umbra SyncRelease 4 in direct sunlight.

Do not store the Umbra SyncRelease 4 in such a way that damages part markings.

Ensure that critical RBF components are in place during all transport of the Umbra SyncRelease 4.

Keep the Umbra SyncRelease 4 in the storage container provided and only remove within a low FOD environment up to and throughout launch vehicle integration.

Table 4. Recommend Storage Environment

Parameter	Value
Storage Temperature	5℃ to 35℃
Storage Humidity	< 50% Relative Humidity

4.6 Operating Environment

Table 5. Operating Temperature

Property	Value
Operational Temperature	-30 °C to +70 °C

4.7 Survival Environment

See section 7.4 for details on the dynamics qualification load case.

Table 6. Survival Environment

Property	Value
Survival Temperature	-40 °C to +80 °C
Vibration	Qualified to 14.6 g RMS profile enveloping GEVS, Falcon 9, SpaceX Rideshare, and Electron levels. See section 7.4 for details on the dynamics qualification load case.
Shock	Qualified to 2000g peak profile
Quasi-Static Load	Qualified to 12.5g axial and 16.88g lateral sine burst
Minimum Survivable Total Ionizing Dose	Designed to withstand at least 30 krad TID

4.8 Mounting Information

See Appendix B for information on mounting the Umbra SyncRelease 4. Additional guidance may be found in section 8.2.

5.0 Electrical Properties

Table 7. Electrical Properties

Property	Typical Value	Notes
Operating Voltage Range	24V	Nominal +/-1V
Idle Power Draw	0 W	NA
Maximum Power Draw	3 W	NA

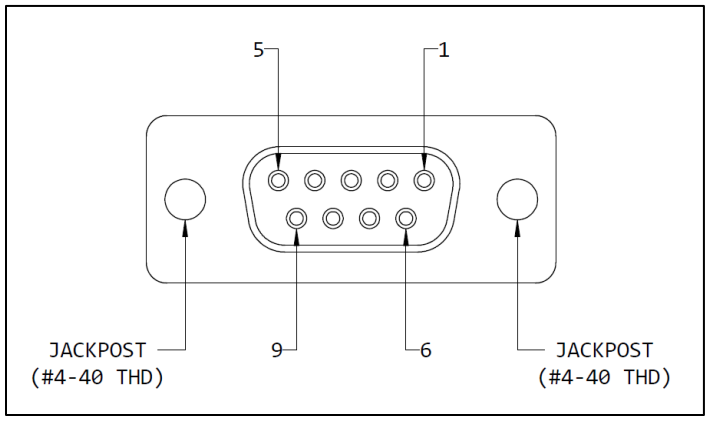
5.1 Connector Pinouts

The Umbra SyncRelease 4 J1 connector (DEM9SF225) is shown in Appendix B. Refer to Table 7 for pinout and Figure 2 for the mating face view.

Table 8. J1 Connector Pinout

PIN	SIGNAL
1	NC
2	NC
3	NC
4	NC
5	NC
6	ACTUATOR 2 +
7	ACTUATOR 2 -
8	ACTUATOR 1 +
9	ACTUATOR 1 -

Figure 2. DEM9SF225 Connector Mating Face View

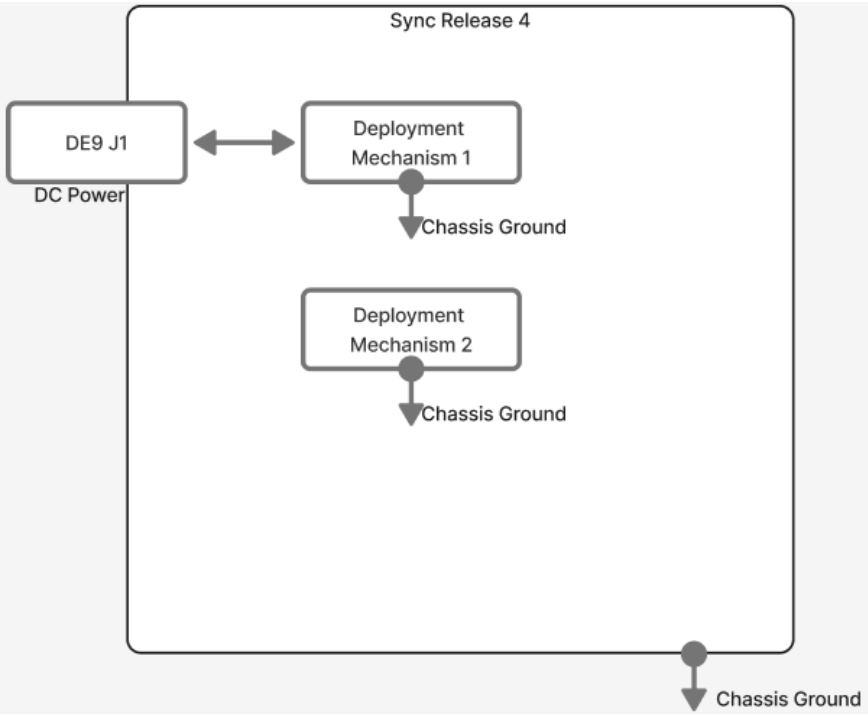


5.2 Harnessing Recommendations

Space-rated harnesses connecting to the Umbra SyncRelease 4 should use wire in accordance with the launch provider.

5.3 Grounding Block Diagram

Figure 3. Grounding Block Diagram



5.4 EMI/EMC Properties

The Umbra SyncRelease 4 is actuated electro-magnetically, hence it will emit an electromagnetic field during operation.

The Umbra SyncRelease 4 has not been tested for Electromagnetic Interference (EMI) / Electromagnetic Compatibility (EMC) per MIL-STD-461. Please contact Umbra with any unique requirements.

5.5 Material Properties

All Umbra products are manufactured from materials deemed space-rated based on low outgassing. See Appendix B for more information on material properties of the Umbra SyncRelease 4.

6.0 Software Properties

The Umbra SyncRelease 4 contains no user-accessible commanding software or telemetry packets.

7.0 Performance Specifications

7.1 Mass

The Umbra SyncRelease 4 mass is divided between a portion that stays attached to the Launch Vehicle and a Flyaway portion that becomes part of the Spacecraft mass, as specified in the table below.

Table 9. Mass

Property	Value
Lower Launch Vehicle Side	4.5 kg
Upper/Flyaway Vehicle Side	0.5 kg

7.2 Design Life

The Umbra SyncRelease 4 has a life of one launch and > Five Integration and Test cycles

7.3 Configuration

The Umbra SyncRelease 4 is available in a standard 4 actuator small sat configuration. Please contact Umbra to discuss alternative configurations.

7.4 Capacity

The Umbra SyncRelease 4 is planned for Qualification testing with a spacecraft mass mockup. Table 10 will be updated in future revisions of this document to include the mechanical properties of this mockup.

Table 10. Qualification

Property	Value
Equivalent spacecraft mass	TBR kg
Equivalent spacecraft CG height	TBR in
Equivalent spacecraft CG offset	TBR in

8.0 Operational Procedures

Follow all requirements and recommendations in Section 4.1 Mechanical Handling while carrying out any and all procedures in this section. Umbra SyncRelease 4 may be damaged by carrying out

any procedure listed in this section if mechanical handling requirements and recommendations are not followed.

8.1 Release and Reset Logbook

Umbra strongly recommends creating a record of each time the SyncRelease 4 has been reset/preloaded, and released. This logbook should principally be used to track the total number of actuations. Umbra also recommends that the logbook tracks the operator, the tooling, and notes about the actuation and reset procedures, such that it will become a valuable document in the event of an anomaly or for training new personnel.

8.2 Installation – Payload Side

The following procedure assumes that the payload-side mounting interface and substrate is as specified in the Appendix B. Alternate substrates – such as honeycomb panel with potted inserts – are acceptable assuming the user MICD positional and flatness tolerances are met, and assuming proper bolted joint design.

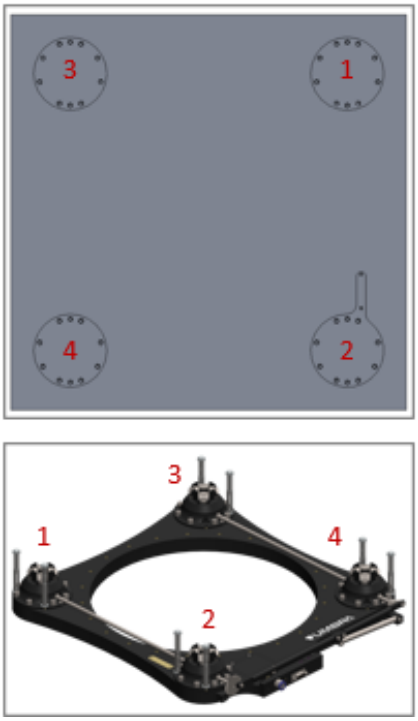
8.2.1 Mounting Surface Preparation

Ensure each Release Cup mounting face and the payload-side mounting faces are clean. Wipe with IPA if necessary.

8.2.2 Release Cup Placement

Each Release Cup is marked with a number, 1 to 4. Place each Release Cup in position on the payload as shown on the corresponding interfaces in the table below. See Appendix B for more information.
NOTE: The mounting holes on each Release Cup will only align to the payload mounting holes in one orientation.

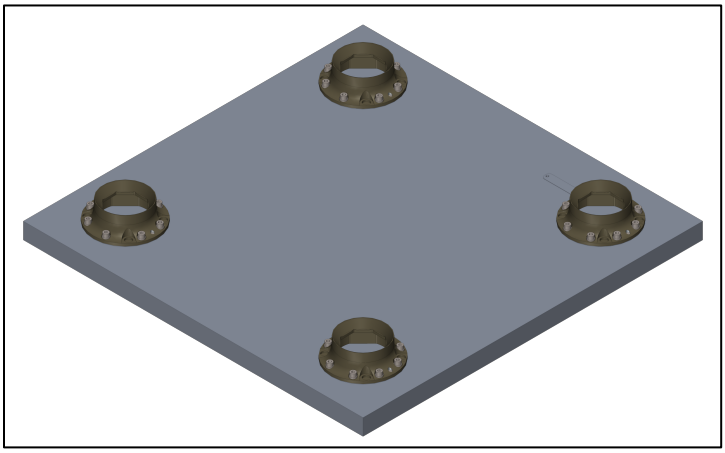
Figure 4. Release Cup Numbering



8.2.3 Release Cup Fastener Installation - Spacecraft Side

Fasten each Release Cup to the payload using Qty. 32 NAS1351N3-10 fasteners and NAS620C10 washers. Torque to 44 in-lb over prevailing torque. Apply torque stripes to each fastener.

Figure 5. Installed Release Cups on Notional Spacecraft deck



8.2.4 Installation – Launch Vehicle Side

The SR4 has a standard 15” bolt circle with 1/4-28 threaded inserts for interfacing to the launch vehicle. This interface can also be used to interface with GSE assemblies. Umbra recommends using NAS1351N4

fasteners and NAS620 washers. Choose fastener length such that the fastener engages the entire length of the insert. Umbra recommends a torque value of 107 in-lb over prevailing torque.

8.3 First Use Procedure

8.3.1 Assembly

Assembly should be accomplished per the steps documented in section 8.1.

8.3.2 Resistance Checkout

It is advised to take a resistance measurement with the complete system configured to verify proper continuity values. A breakout cable and breakout box with a multi-meter can be used to verify 384 ohms +/- 5% is present through each actuator on the J1 connector.

8.3.3 Initial Configuration

Not applicable.

8.4 Reset Procedure

TBD

8.5 On-Orbit Checkout

Not applicable.

Appendix A

Acronyms and Abbreviations

A.1 Acronyms and Abbreviations

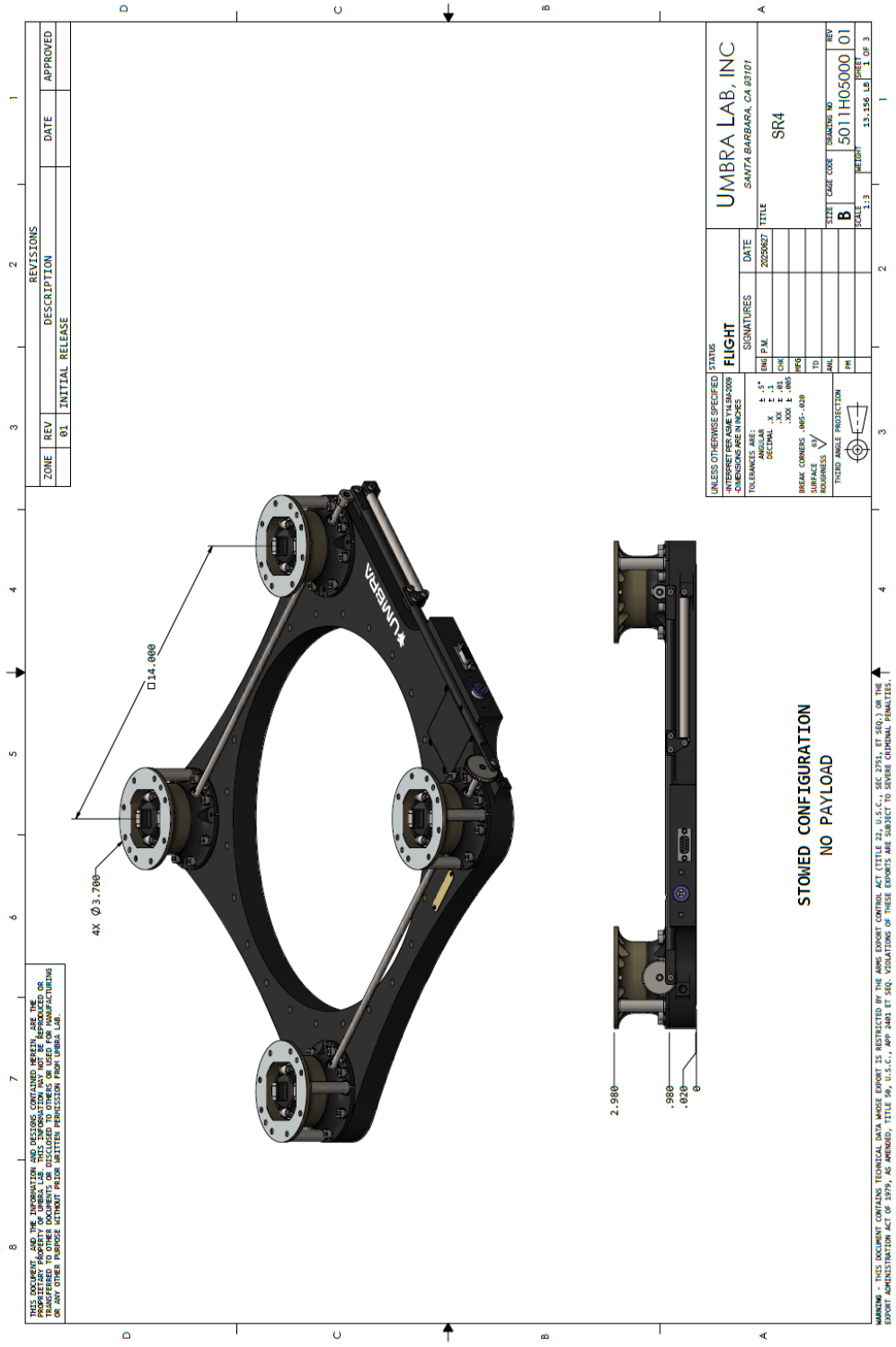
GSE	Ground Support Equipment
GEVS	General Environmental Verification Standard
RMS	Root Mean Square
TBD	To Be Determined
TBR	To Be Revised
TID	Total Ionizing Dose

A.2 Units

m^2	Square Meters

Appendix B

Mechanical Interface Control Documentation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