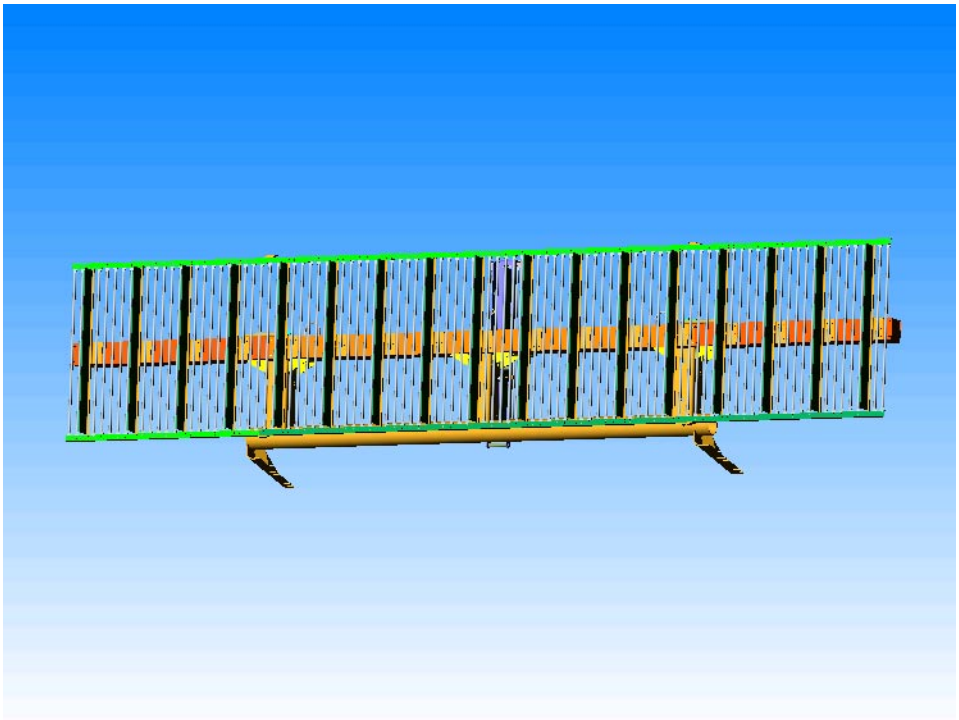
FAI-54M3 Antenna



Technical Manual

Antenna Associates, Inc.
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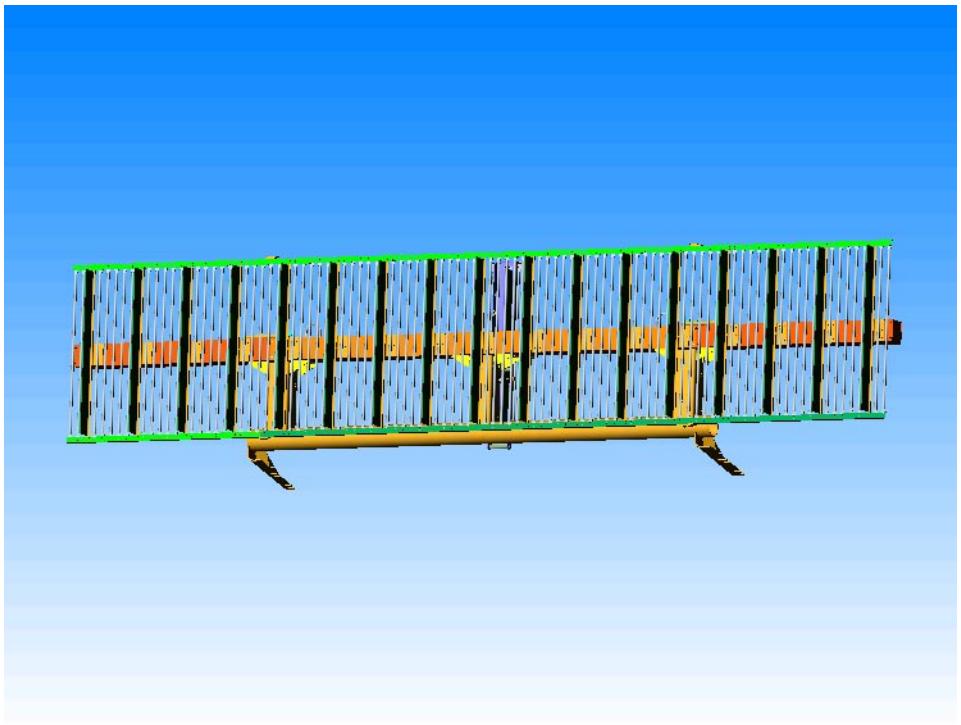
FAI-54M3 Antenna



Technical Manual

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Preface

This technical manual describes the characteristics of the FAI-54M3 antenna. It also explains how to assemble the fixed site and transportable site versions of the antenna.

Audience

The manual is intended for people who are responsible for maintaining and operating the three-piece FAI-54M3 antenna. The reader should have a general knowledge of antenna systems and how to assemble them in the field.

Revision Information

The first version of the *FAI-54M3 Antenna Technical Manual* accompanies the initial release of the product.

Reference Documents

The documents listed in Appendix C "Standards and Requirements" contain additional information related to antenna systems.

Document Overview

The manual comprises four chapters and four appendices.

- Chapter 1 "Overview" contains background material on the physical and electronic characteristics of the antenna.
- Chapter 2 "Fixed Site Configuration" explains how to assemble the fixed site version of the FAI-54M3 antenna.
- Chapter 3 "Transportable Configuration" explains how to assemble and disassemble the transportable version of the antenna.
- Chapter 4 "Maintenance and Troubleshooting" contains maintenance procedures and a troubleshooting guide.
- Appendix A "Technical Specifications" specifies the electrical characteristics and the RF interface for the antenna.
- Appendix B "Typical Radiation Patterns" contains illustrations that show the antenna's radiation patterns.
- Appendix C "Standards and Requirements" lists documents related to the construction and performance of the antenna.
- Appendix D "Parts List" lists the antenna's line replaceable units.

Request for Comments

Please direct your comments and suggestions concerning the antenna to:

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1. Overview

The Antenna Associates FAI-54 Antenna is a secondary surveillance radar antenna. It provides identification and position detection data for civil air traffic control and military Identification Friend or Foe applications. The FAI-54 antenna can be utilized in a standalone configuration or in combination with a primary surveillance radar.

The FAI-54 antenna less mount is approximately 14 feet long by 3 feet high by 2 feet deep. It weighs 110 pounds. It is available in two electrical configurations: the two-channel FAI-54S antenna and the monopulse-capable three-channel FAI-54M antenna described in this manual.

The FAI-54M is also available in two different physical configurations: the one-piece FAI-54M and the three-piece FAI-54M3. This manual covers the three-piece FAI-54M3 configuration.

Physical Makeup

The FAI-54M3 is an open planar array antenna (Figure 1). It consists of:

- Eighteen radiating columns
- Eighty-eight ground plane rods
- One backfill radiating column
- A support beam
- Multiple cabling and printed wiring board assemblies located inside the antenna's support beam
- A fixed site or transportable site mount

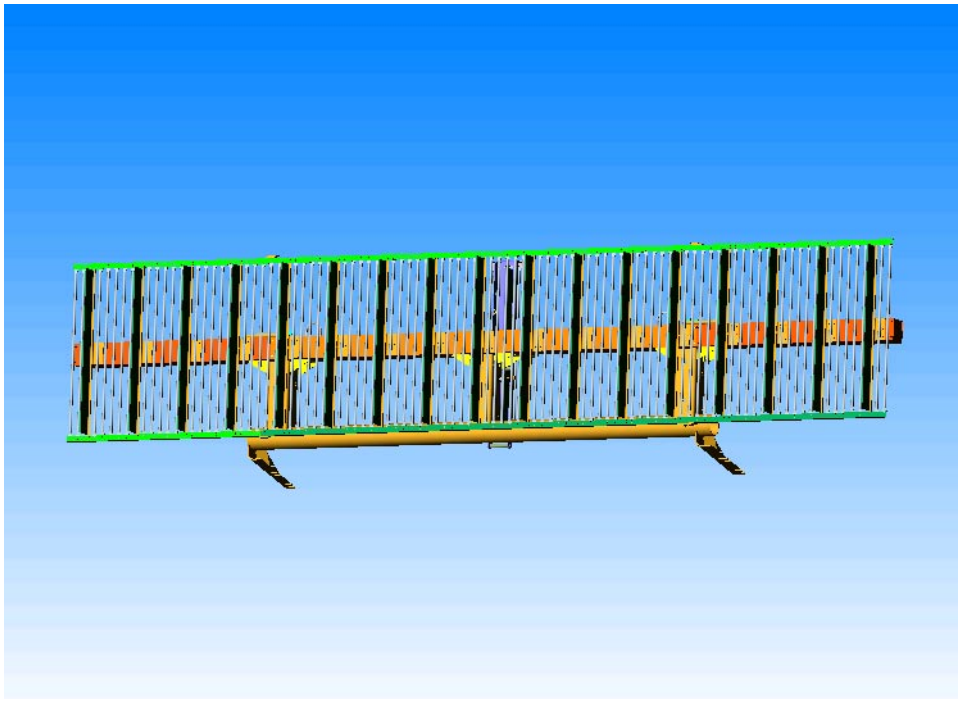

Figure 1: The FAI-54M3 Antenna

Each radiating column consists of high-strength composites vacuum-sealed to a printed circuit board. These radiating columns, combined with the antenna's other printed wiring boards and cabling, produce the antenna's Sum, Difference, and Side-Lobe Suppression (SLS) radiation patterns.

Radiation Patterns

The FAI-54M3 Antenna radiates three separate beams: the Sum, Difference or Monopulse, and Side-Lobe Suppression beams (see Figure 52 through Figure 56 in "Typical Radiation Patterns" on page 55):

- The Sum beam is highly directional in azimuth, with low side-lobe levels and optimized in elevation for maximum coverage.
- The Difference or Monopulse beam has a deep null centered on the Sum peak, giving increased azimuth accuracy.
- The Side-Lobe Suppression (SLS) beam's function is to reduce false targets. To do so, it exceeds the Sum pattern's radiation in all areas except at the Sum beam's primary focus area.

RF Input Requirements

The FAI-54M3 uses three RF cables, one for each channel. Use the three connectors on the center section beam to connect the RF cables (Figure 2):

- Connector J1, labeled SUM, is for the Sum channel.
- Connector J2, labeled DIF, is for the Difference channel.
- Connector J3, labeled SLS, is for the Side-Lobe Suppression channel.

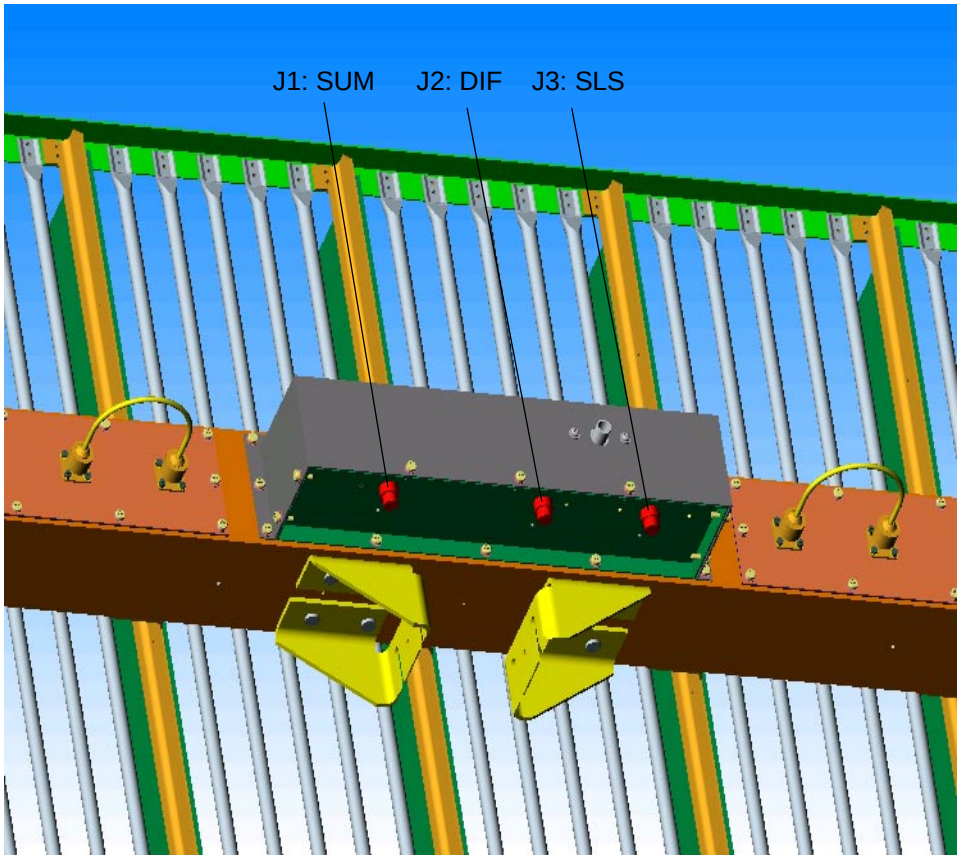

Figure 2: RF Cable Connectors

Each RF cable connector is an "N" female connector per MIL-PRF-39012. Use dust caps to protect the connectors when they are not in use.

Check each RF cable connection to make sure it is tight before you continue with the installation of the antenna. No separate electrical hookup for the antenna is necessary.

2. Fixed Site Configuration

Chapter 2 explains how to assemble the fixed site version of the FAI-54M3 antenna. In the fixed site configuration of the FAI-54M3, the center section of the antenna is already attached to the antenna mount. In addition to the center section, the antenna is shipped with two detached wing sections. Figure 3 shows how the antenna looks after assembly.

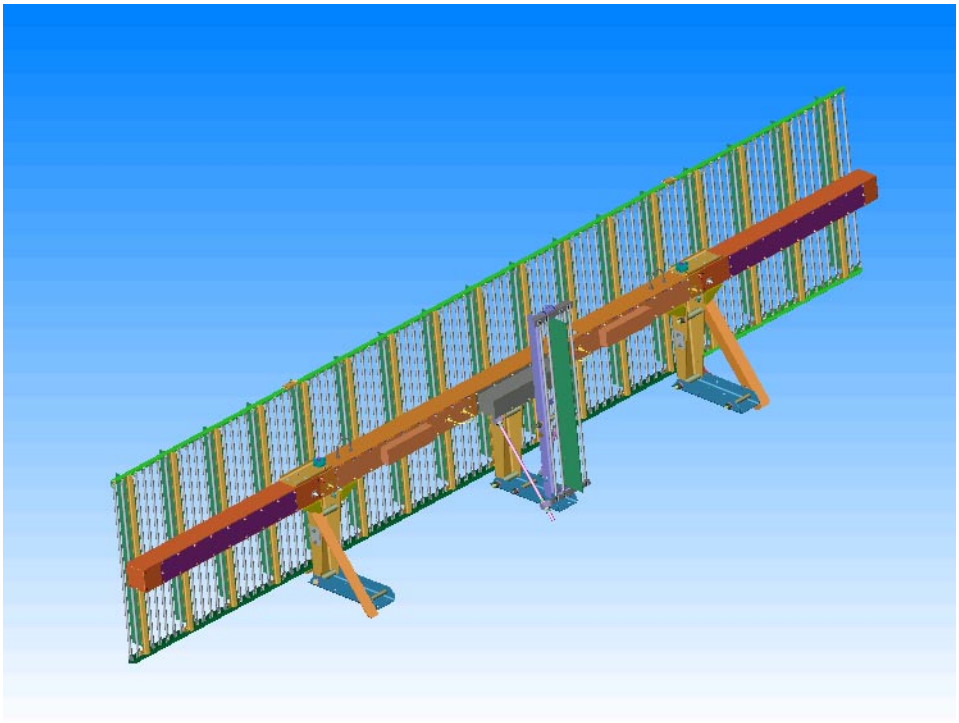

Figure 3: Fixed Site Configuration

To begin the assembly procedure, remove the top, back, front, and sides of the shipping crate. Remove the fasteners marked with a red circle to disassemble the crate. Leave the antenna mount secured to the bottom of the crate during the assembly.

To assemble the antenna, you need a 9/16" socket wrench.

The steps required to attach the left wing section are identical to the steps required to attach the right wing section. The assembly procedure for both the right and left wing sections include these major steps:

- Align the wing section and drop it into place.
- Tighten the hand knob in the support plate.
- Close the top and bottom latches on the antenna frame.
- Tighten the two captive bolts underneath the support plate.
- Install the jumper cable.

Figure 4 identifies the parts required to attach a wing section.

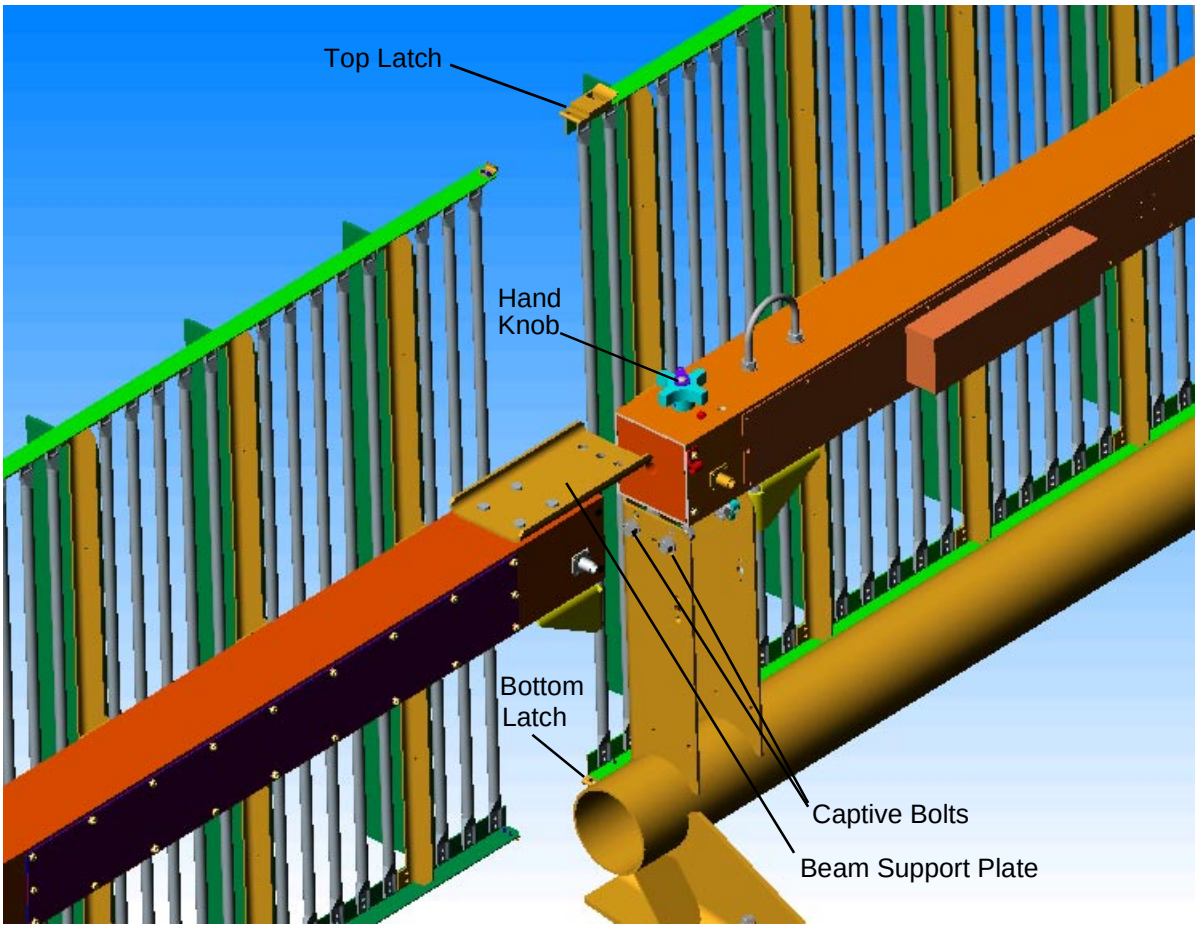

Figure 4: Parts Required to Attach a Wing Section

Attach the Left Wing Section

Figure 5 illustrates the placement of the left wing section when you attach it to the center section.

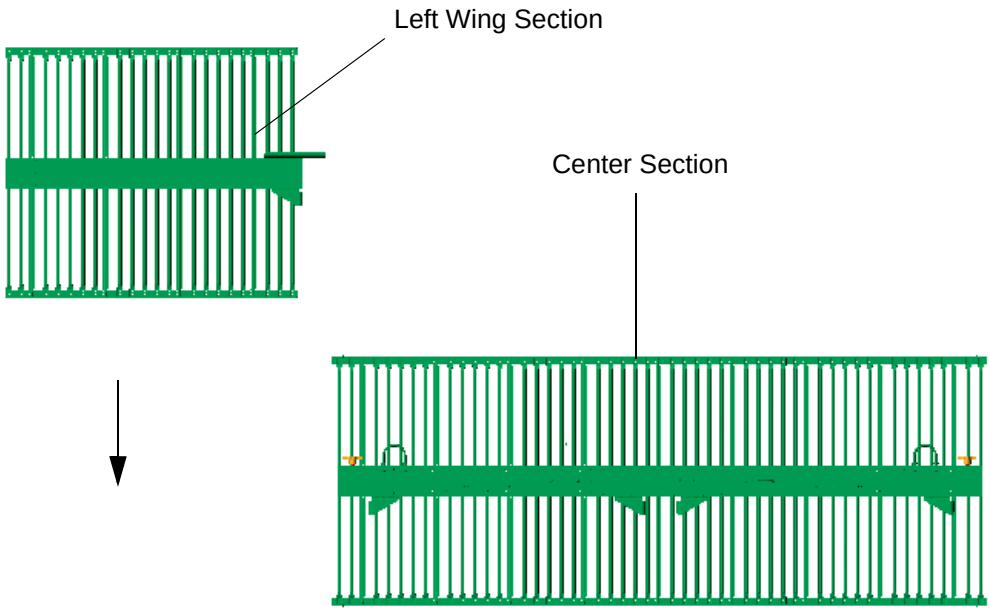

Figure 5: Placement of the Left Wing Section

Attach the left wing section of the antenna to the center section:

1. Remove the left hand knob from the center section beam. Let it hang from its lanyard.
2. Align the guide holes in the beam support plate with the two guide pins on top of the center section beam (Figure 6).

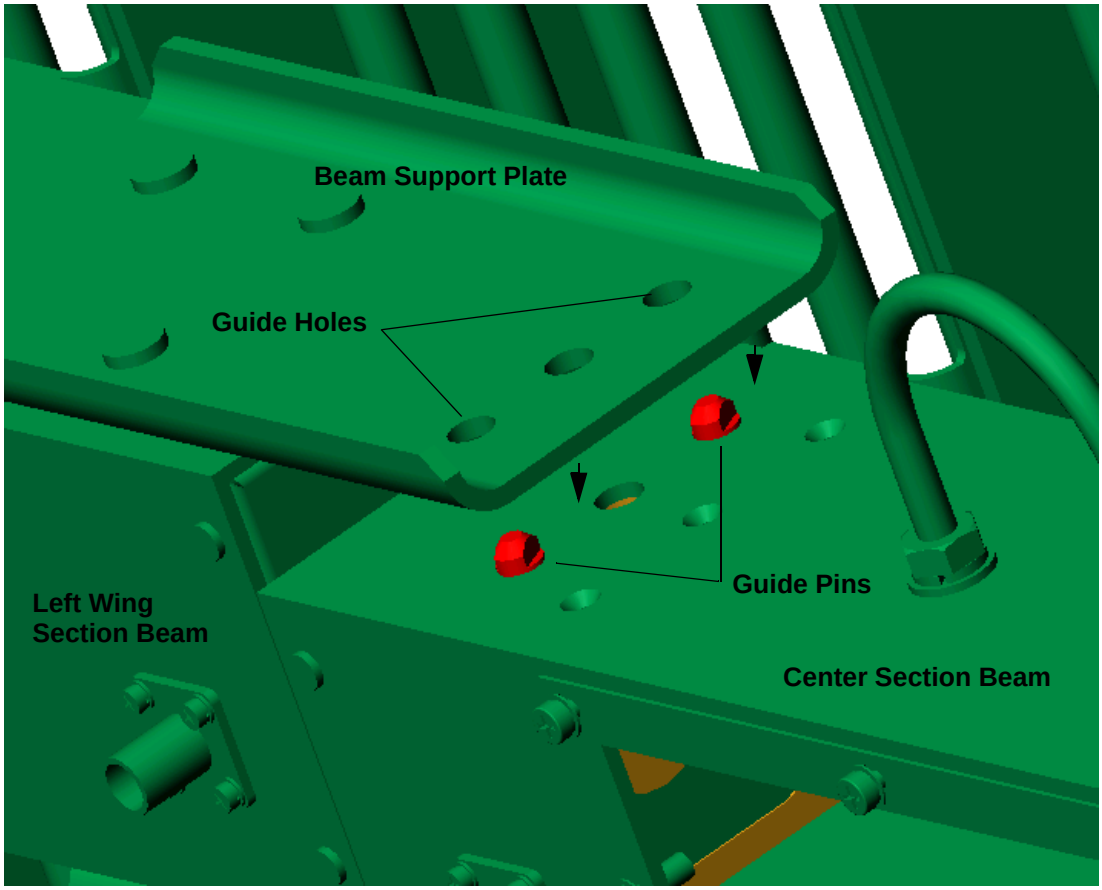

Figure 6: Align the Support Plate Guide Holes with the Guide Pins

3. Align the two slots underneath the beam support plate with the two captive bolts attached to the mount (see Figure 10 on page 11).
4. When you have the beam support plate and the slots for the captive bolts aligned properly, drop the wing section into place.

5. Insert the hand knob in the hole in the center of the support plate. Turn it clockwise until it is tight (Figure 7).

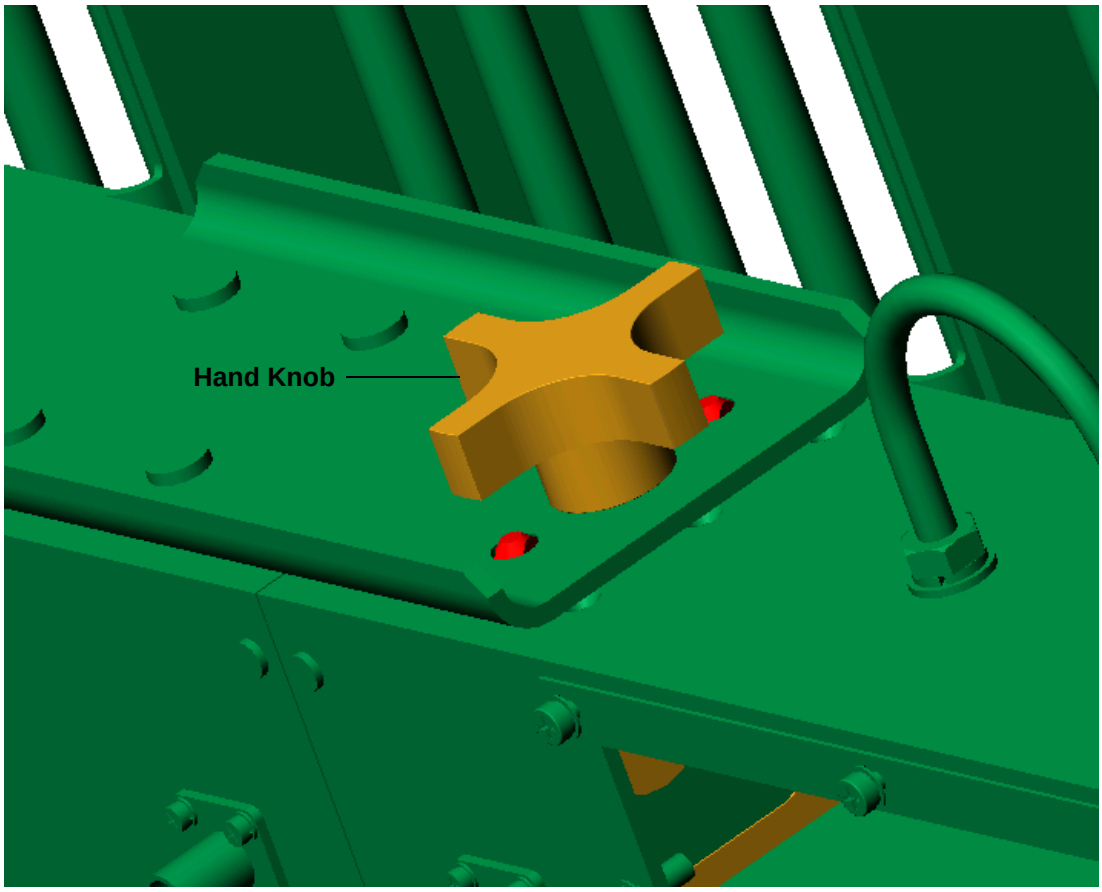

Figure 7: Tighten the Hand Knob in the Support Plate

6. Close the latch on the top frame of the antenna (Figure 8).

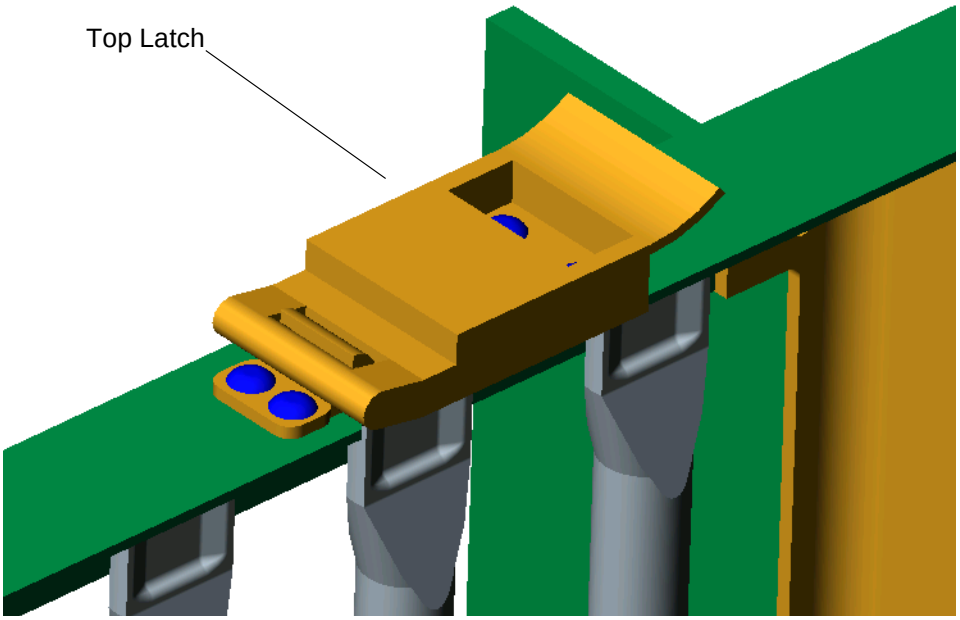

Figure 8: Close the Top Latch

7. Close the latch on the bottom frame of the antenna (Figure 9).

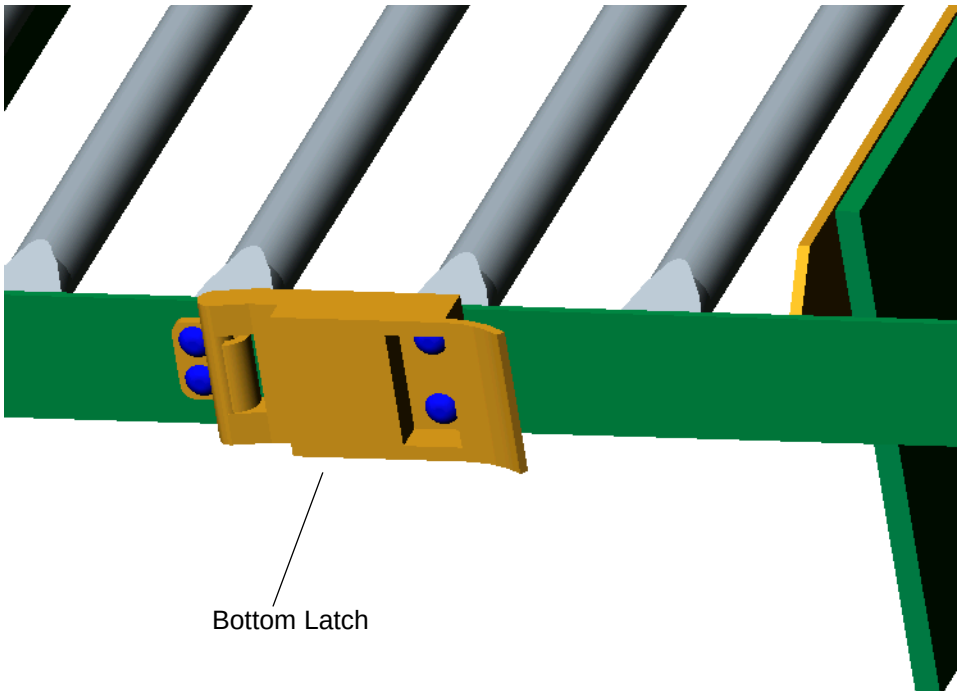

Figure 9: Close the Bottom Latch

8. Use a 9/16″ socket wrench to tighten the two captive bolts that attach the wing section to the mount. The captive bolts are located underneath the beam (Figure 10).

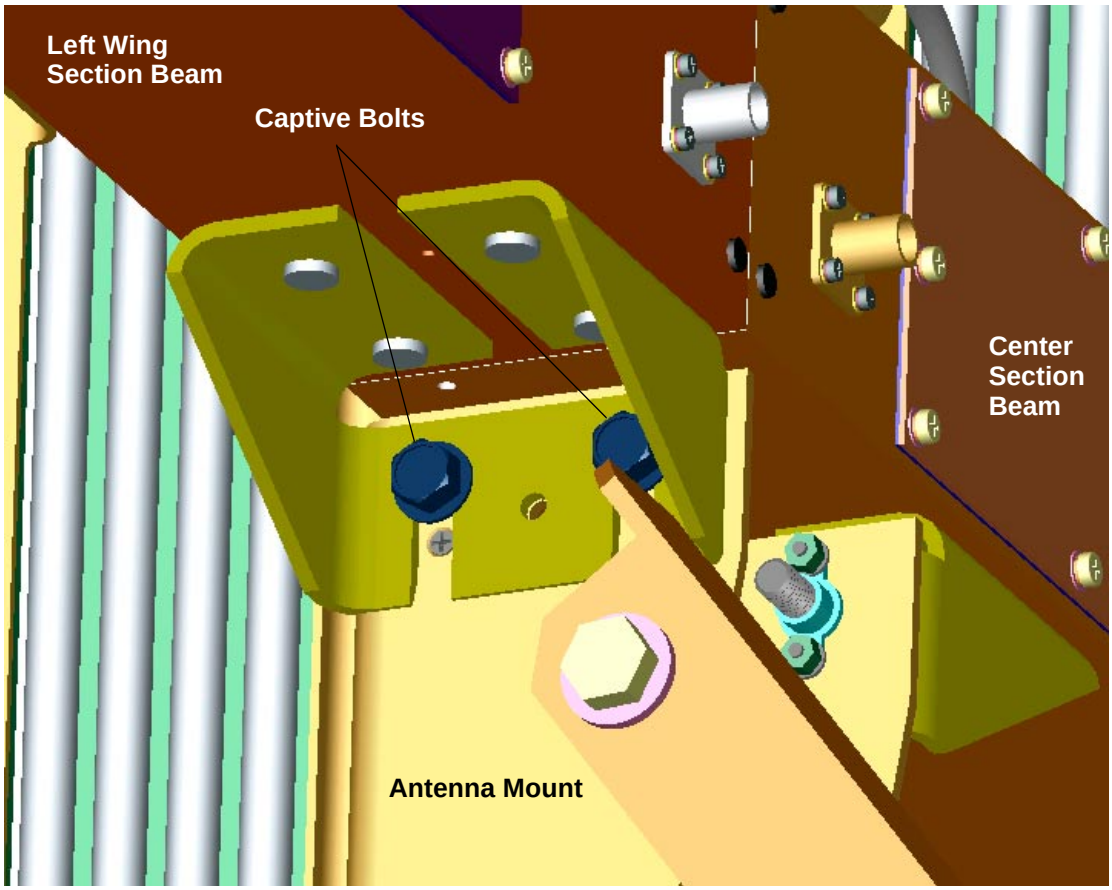

Figure 10: Tighten the Captive Bolts Underneath the Support Plate

9. Remove the left jumper cable from its storage location on the center section (Figure 11).

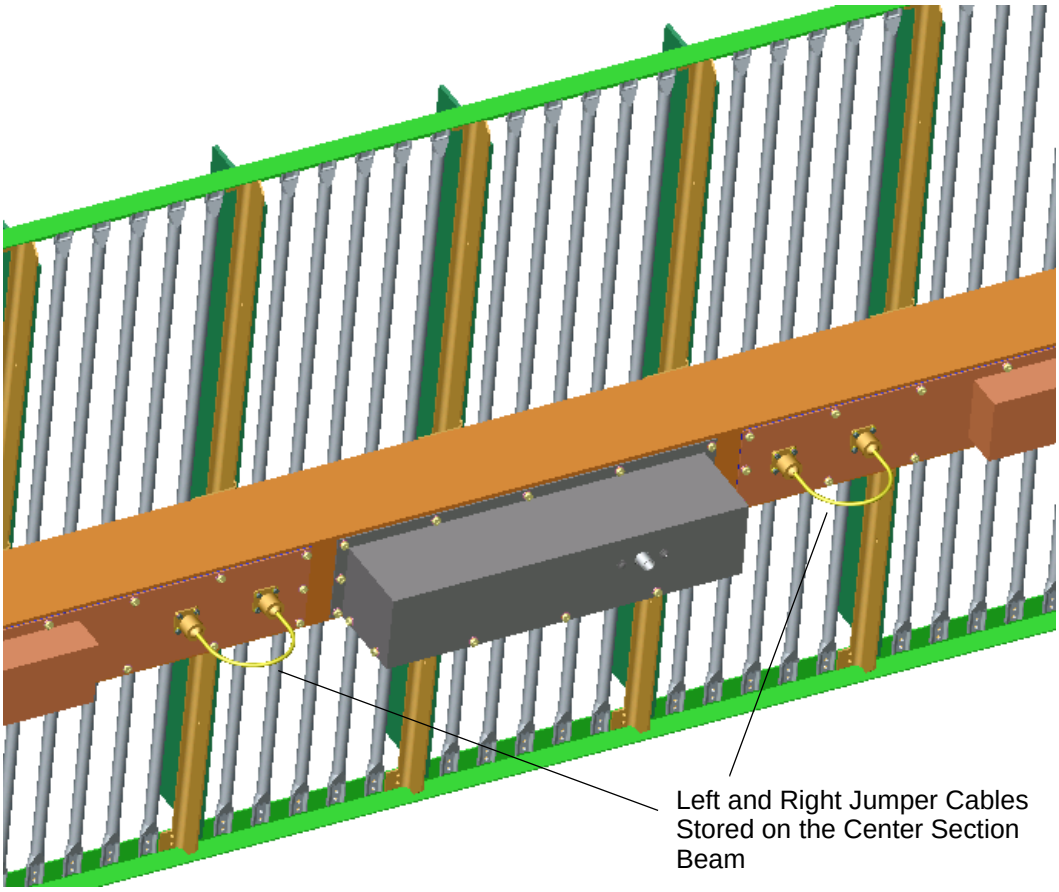

Figure 11: Remove the Jumper Cable from Its Storage Location

10. Remove the dust caps from the jumper cable connectors at the joint between the wing section and the center section.
11. Attach the jumper cable to the connectors at the joint between the wing section and the center section (Figure 12).

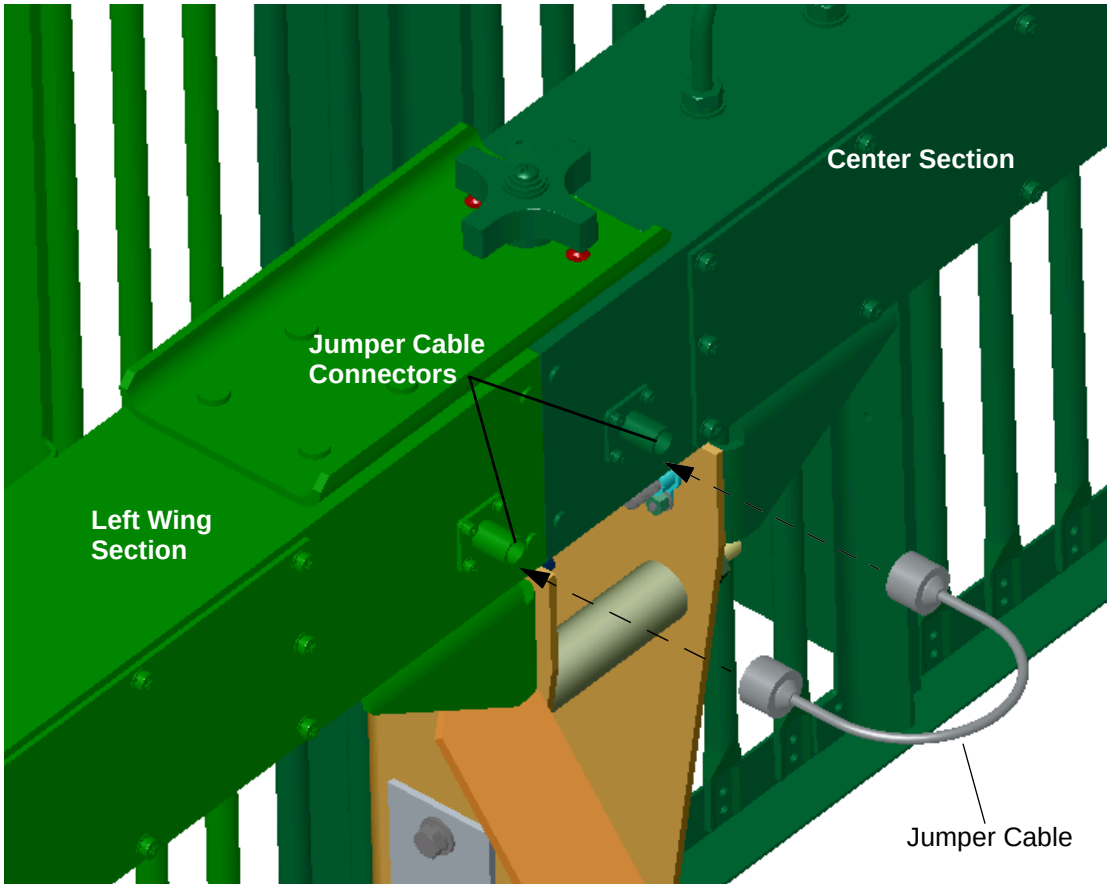

Figure 12: Attach the Jumper Cable

12. Make a visual check of the hand knob, captive bolts, and latches to see that the left wing section is aligned properly and is securely attached to the center section.

    Figure 13 shows the completed assembly for the left wing section.

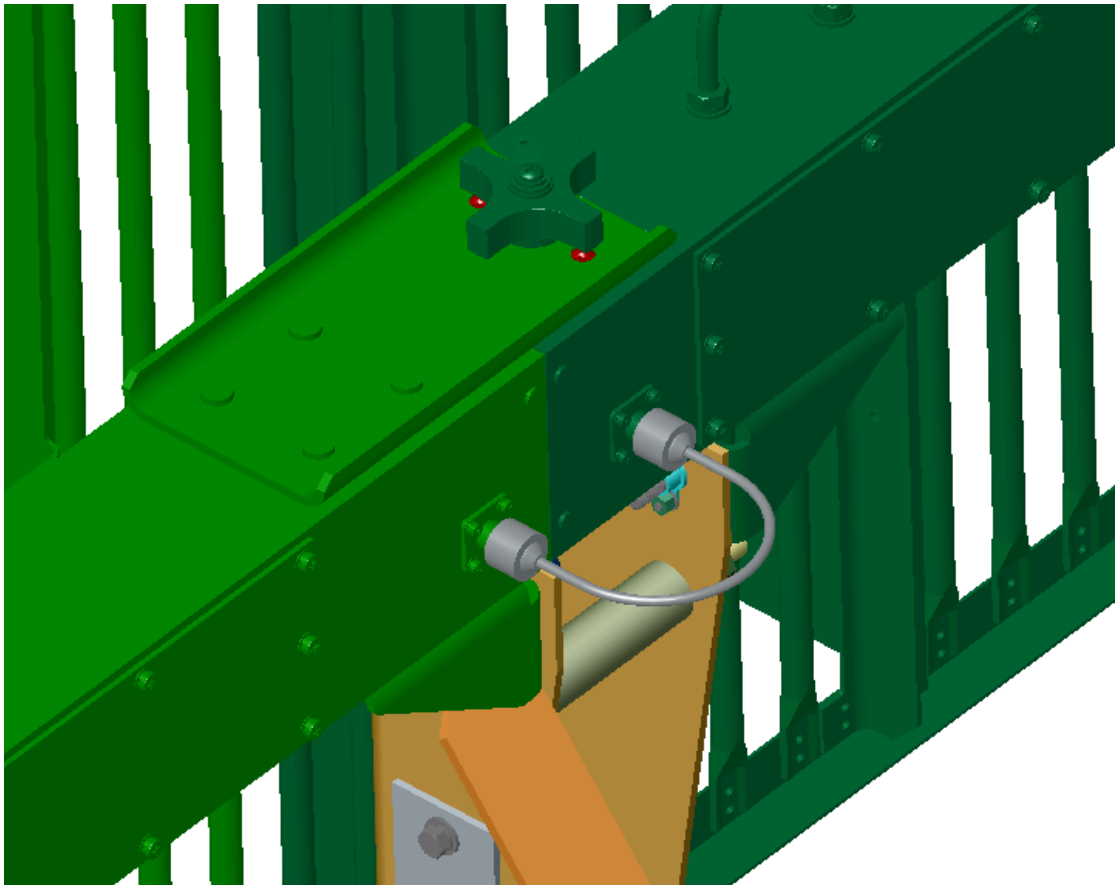

Figure 13: Left Wing Assembly Complete

Attach the Right Wing Section

Attach the right wing section of the antenna to the center section in the same way you attached the left wing section (Figure 14).

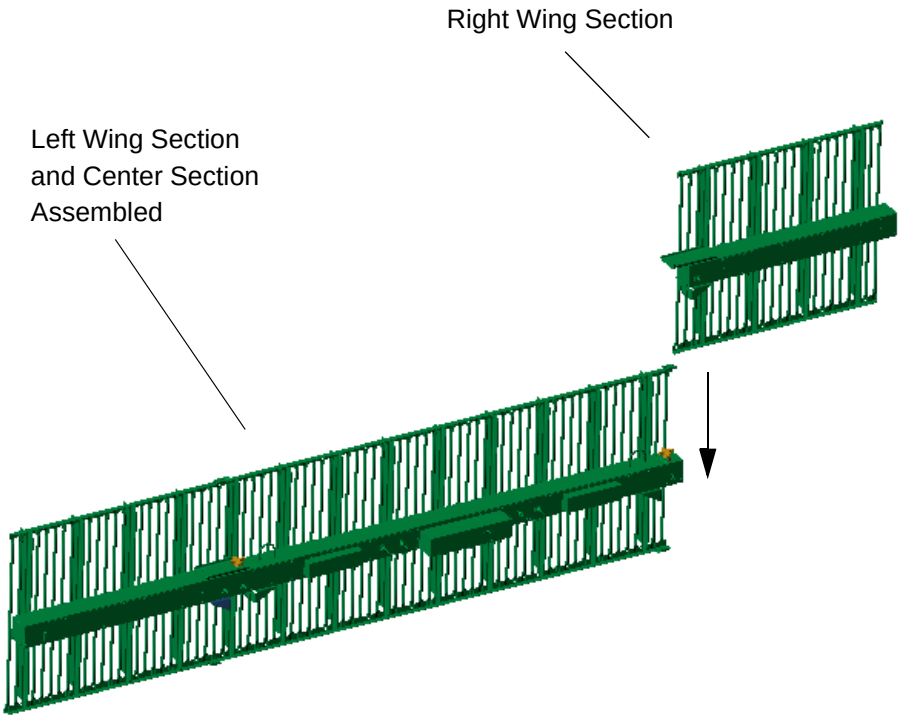

Figure 14: Placement of the Right Wing Section

To attach the right wing section to the center section:

1. Remove the right hand knob from the beam of the center section. Let it hang from its lanyard.
2. Align the beam support plate with the two guide pins at the top of the center section (Figure 6 on page 8).
3. Align the two slots underneath the beam support plate with the two captive bolts attached to the mount (see Figure 10 on page 11).
4. When you have the beam support plate and the slots for the captive bolts aligned properly, drop the wing section into place.
5. Insert the hand knob in the hole in the center of the support plate. Turn it clockwise until it is tight (Figure 7 on page 9).
6. Close the latch on the top frame of the antenna (Figure 8 on page 10).
7. Close the latch on the bottom frame of the antenna (Figure 9 on page 10).

8. Use a 9/16″ socket wrench to tighten the two captive bolts that attach the wing section to the mount (Figure 10 on page 11).
9. Remove the jumper cable from its storage location on the center section (Figure 11 on page 12).
10. Remove the dust caps from the jumper cable connectors at the joint between the wing section and the center section.
11. Attach the jumper cable to the connectors at the joint between the wing section and the center section (Figure 12 on page 13).
12. Check to make sure the wing section is securely attached to the center section.

Attach the Backfill Jumper Cable

To attach the backfill jumper cable:

1. Remove the dust cap from the backfill jumper cable connector on the center section beam.
2. Disconnect the backfill jumper cable from its storage connector on the backfill reflector.
3. Connect the backfill jumper cable to the connector on the center section beam (Figure 15).

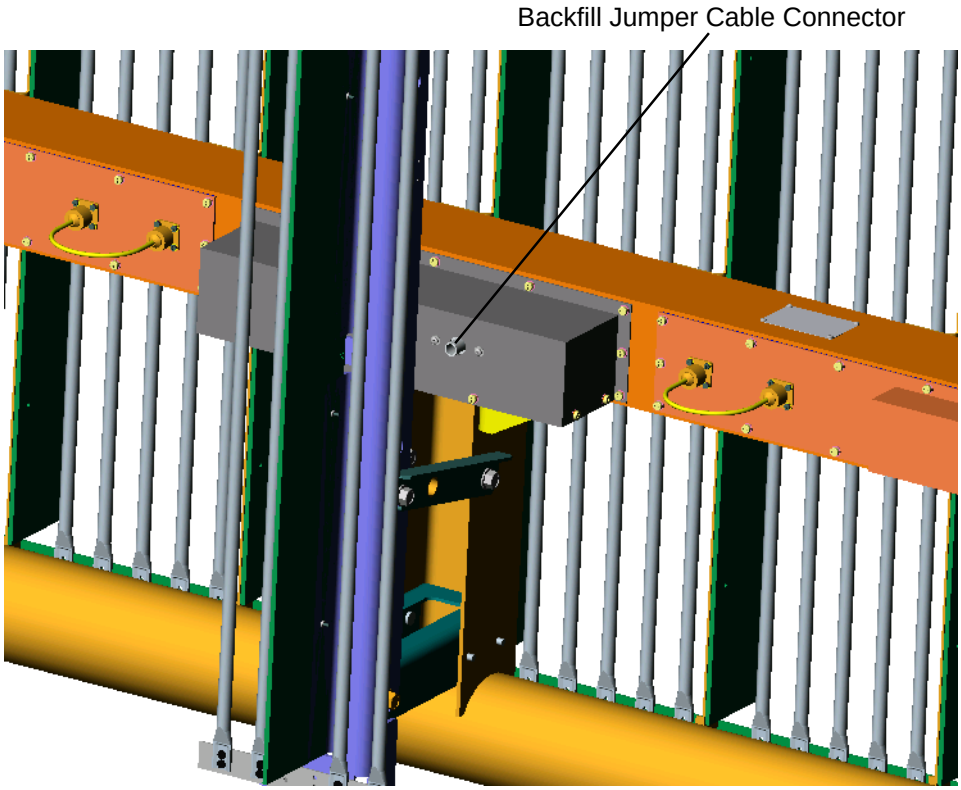

Figure 15: Backfill Jumper Cable Connection

Hoist the Antenna

You are ready to hoist the FAI-54M3 antenna and attach the antenna mount to the top of the primary search antenna's central enclosure:

1. Attach a sling to the U-bolts on the left and right ends of the center section. Attach the sling to the U-bolts on top of the center section beam, *not* the jumper cables.
2. Place some tension on the sling, but do not lift the antenna and crate off the ground.
3. Remove the fasteners circled in red from the wooden block that secures the left foot of the antenna mount to the bottom of the shipping crate. Lift the wooden block out of the crate.
4. Remove the fasteners circled in red from the wooden block that secures the right foot of the antenna mount to the bottom of the shipping crate. Lift the wooden block out of the crate.
5. Hoist the assembled antenna out of its shipping crate and onto the top of the primary search antenna's central enclosure (Figure 16).

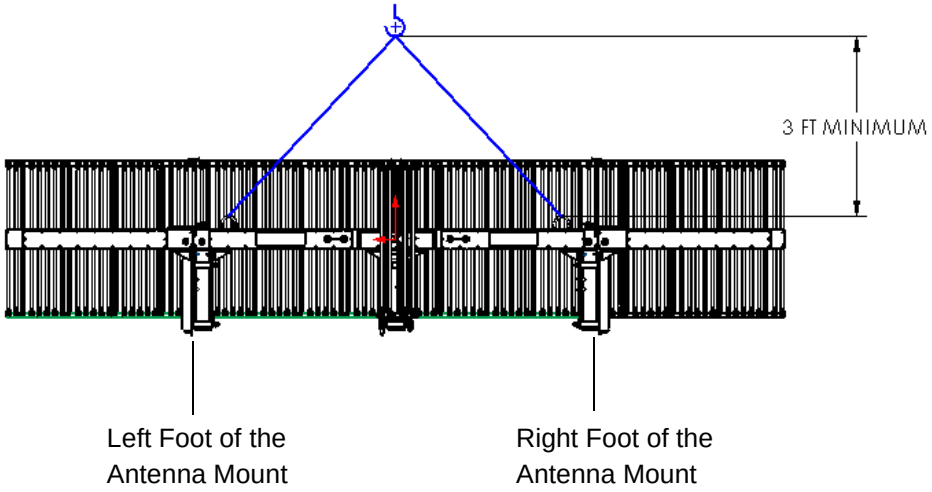

Figure 16: Hoist the Antenna Out of the Crate

WARNING

Do not use short slings when you lift the antenna. The distance between the hoisting hook and the center of the antenna should be at least 3 feet. Failure to maintain this minimum distance can irreparably damage the antenna.

3. Transportable Configuration

The transportable TPS mount (Figure 19 on page 22) enables you to assemble and disassemble the FAI-54M3 antenna in the field. This chapter explains how to accomplish the following tasks with the transportable version of the antenna:

- Remove the antenna components from storage.
- Attach the antenna components to the mount.
- Detach the antenna components from the mount.
- Store the antenna components.

Figure 17 shows the components of the transportable version.

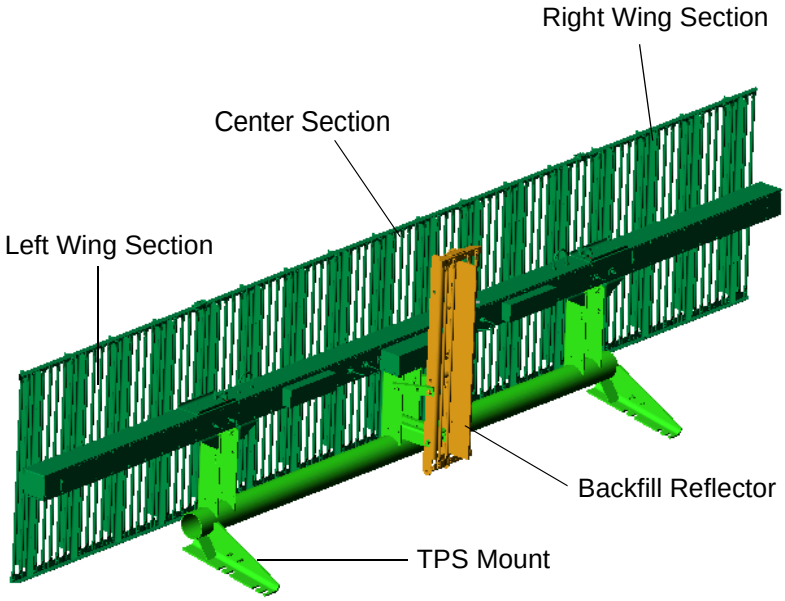

Figure 17: Major Components of the FAI-54M3 Antenna

You can assemble the main antenna with 12 bolts, two hand knobs, and four latches. The backfill reflector requires four additional bolts. The procedures in this chapter require only a 9/16″ socket wrench to tighten and loosen the captive bolts.

The storage hardware for the transportable version has three components:

- The center section storage kit
- The wing section storage kit
- The backfill reflector storage kit

Each part of the storage kit uses simple captive hardware to fasten the antenna components in place:

- Four locking pins on the wing section storage kit
- Two locking clips on the backfill reflector storage kit
- Two hand knobs on the center section beam

Assemble the Antenna

The assembly procedure has these parts:

- Remove the center section from storage and attach it to the mount (page 21 and page 22).
- Remove the wing sections from storage (page 27).
- Attach the wing sections to the center section and to the mount (page 29).
- Remove the backfill reflector from storage and attach it to the mount (page 31 and page 33).

Caution

When you detach each wing section and the backfill reflector, remove the jumper cable first. You can damage the jumper cable if you leave it connected.

Remove the Center Section from Storage

To remove the center section from storage:

1. Turn the hand knob on each end of the center section storage kit counter-clockwise until it is loose (Figure 18). Remove each hand knob and let it hang from its lanyard.

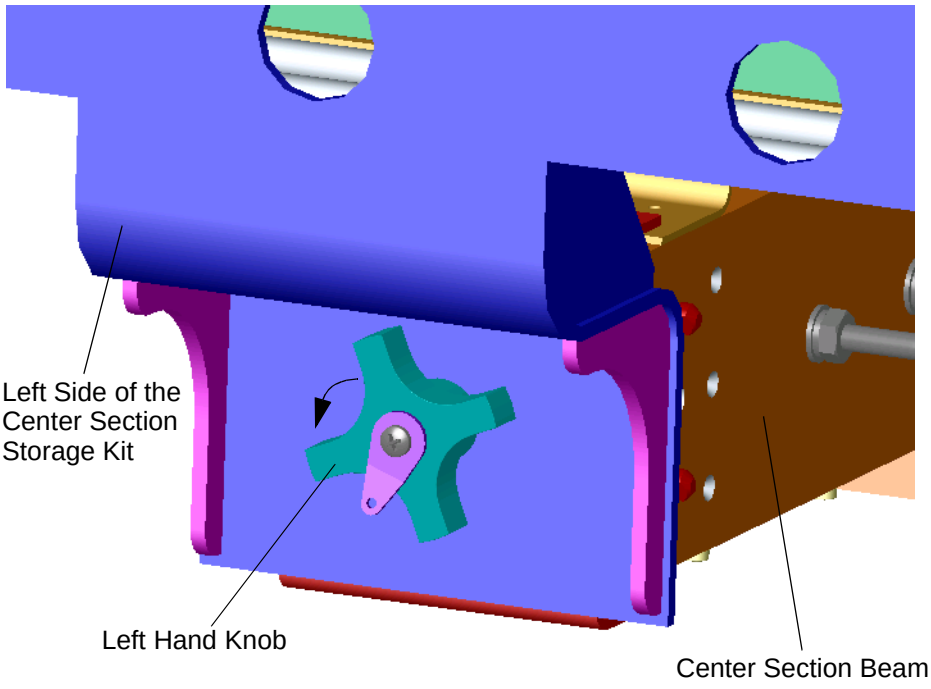

Figure 18: Loosen the Hand Knob at Each End of the Center Section Storage Kit

WARNING

Whenever you handle the center section of the antenna, have someone assist you. You can damage the antenna or injure yourself if you work with the center section alone.

2. With help from an assistant, slide the center section out of the center section storage kit and away from the central enclosure.

Attach the Center Section to the TPS Mount

The TPS mount uses eight captive bolts in three uprights to attach the center antenna section (Figure 19). (The left and right uprights each have two additional bolts to attach the wing sections.)

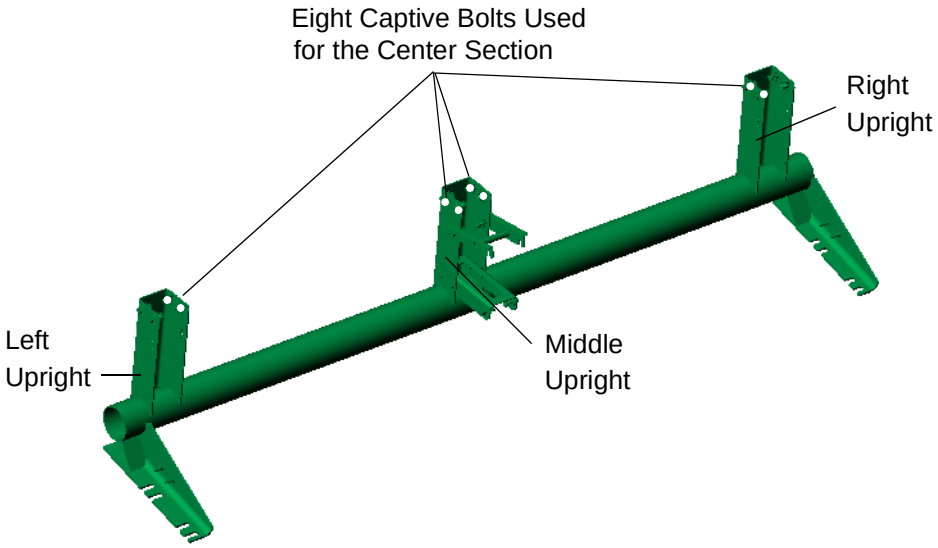

Figure 19: TPS Mount

To attach the center section to the transportable mount:

1. Grasp one end of the center section. Have your assistant grasp the other end.

Caution

Do not attach the center section to the mount by yourself. Two people, one at each end of the center section beam, should lift the center section and align it with the TPS mount.

2. Lift the center section to the mount.

3. Tilt the ground plane of the antenna to match the angle of the mount.
4. Align the slots on the left and right sides of the center section with the captive bolts in the mount (Figure 20).

Figure 20: Center Section Aligned with the TPS Mount

5. Slide the center section slots over the bolts.

   If the slots on both ends of the center section are aligned properly, the four slots in the middle of the center section will slide over the four bolts in the middle upright of the TPS mount.

6. Use a 9/16″ socket wrench to tighten the two bolts on the left side of the middle upright of the antenna mount (Figure 21).

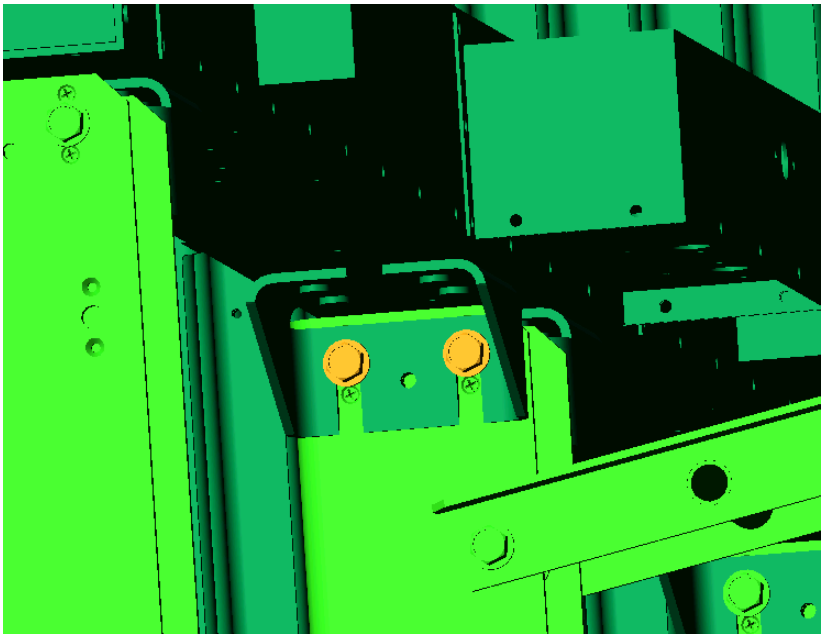

Figure 21: Captive Bolts on the Left Side of the Middle Upright

7. Tighten the two bolts on the right side of the middle upright of the antenna mount (Figure 22).

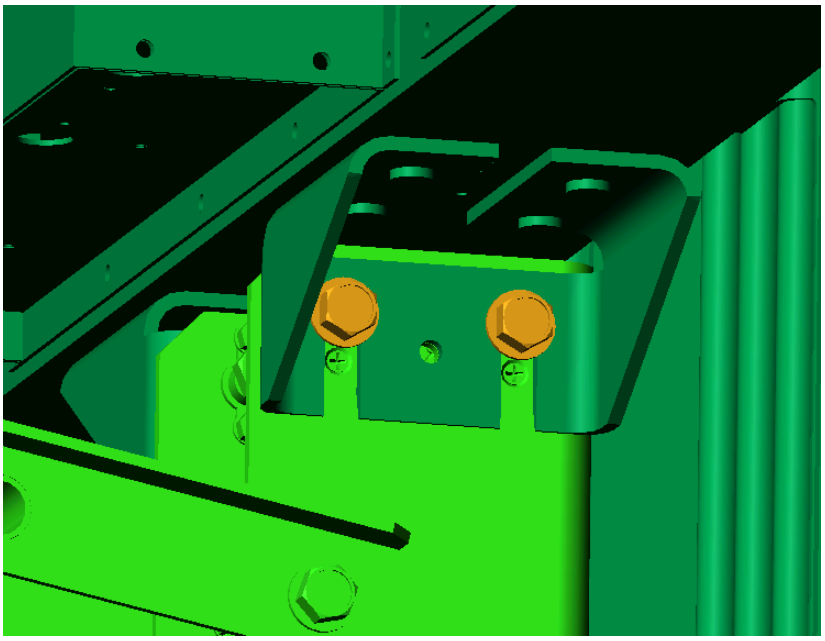

Figure 22: Captive Bolts on the Right Side of the Middle Upright

8. Tighten the two bolts in the left upright of the antenna mount (Figure 23).

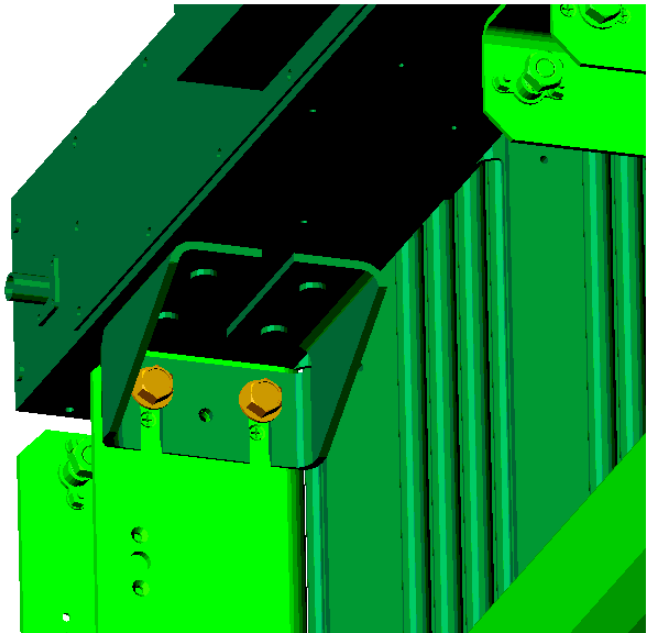

Figure 23: Captive Bolts in the Left Upright of the Mount

9. Tighten the two bolts in the right upright of the antenna mount (Figure 24).

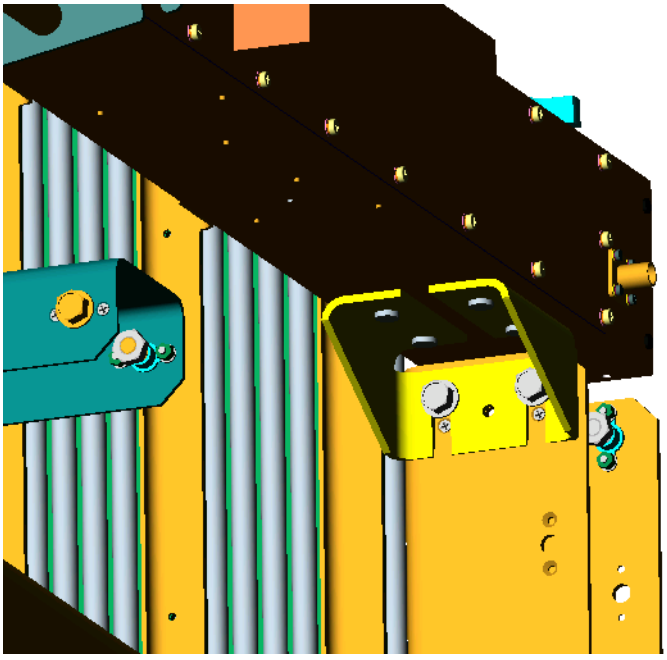

Figure 24: Captive Bolts in the Right Upright of the Mount

10. Check to make sure the center section is securely attached to the TPS mount (Figure 25).

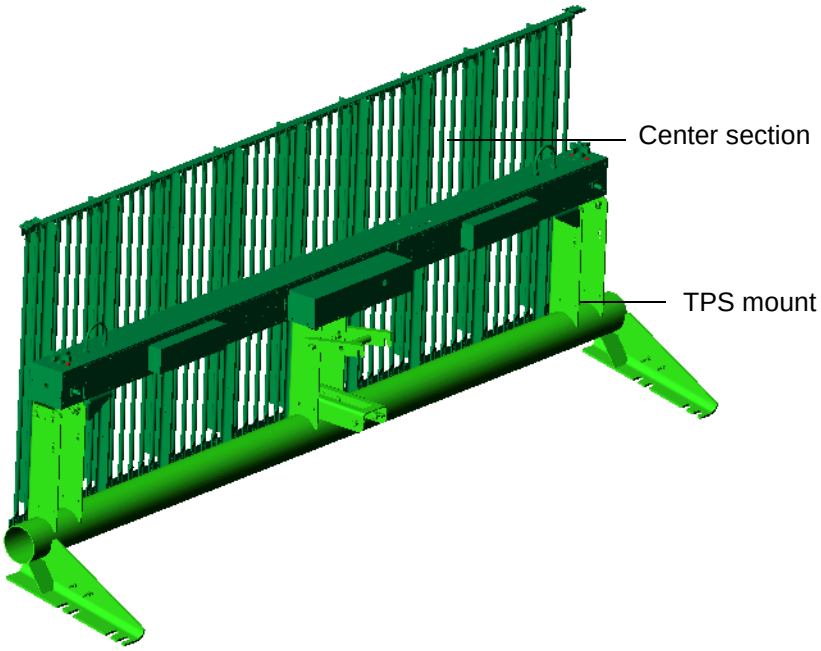

Figure 25: Center Section Attached to the TPS Mount

Remove the Wing Sections from Storage

To remove the wing sections from the wing section storage kit:

1. Remove the two locking pins that hold the hinged locking plate in place (Figure 26).

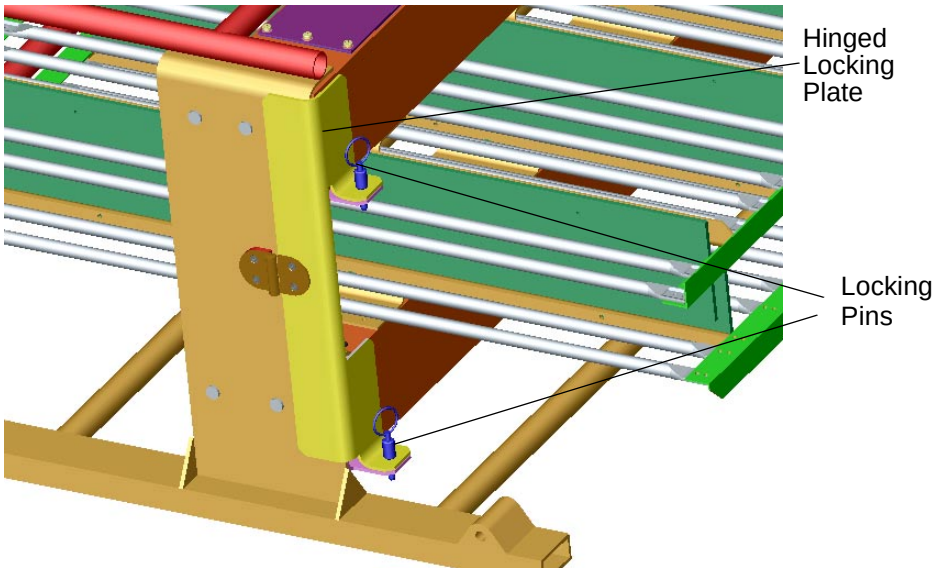

Figure 26: Hinged Locking Plate Secured by Two Locking Pins

2. Open the locking plate.
3. Remove the two locking pins that hold the wing section beams in place. These locking pins are located under the beam support plates (Figure 27).

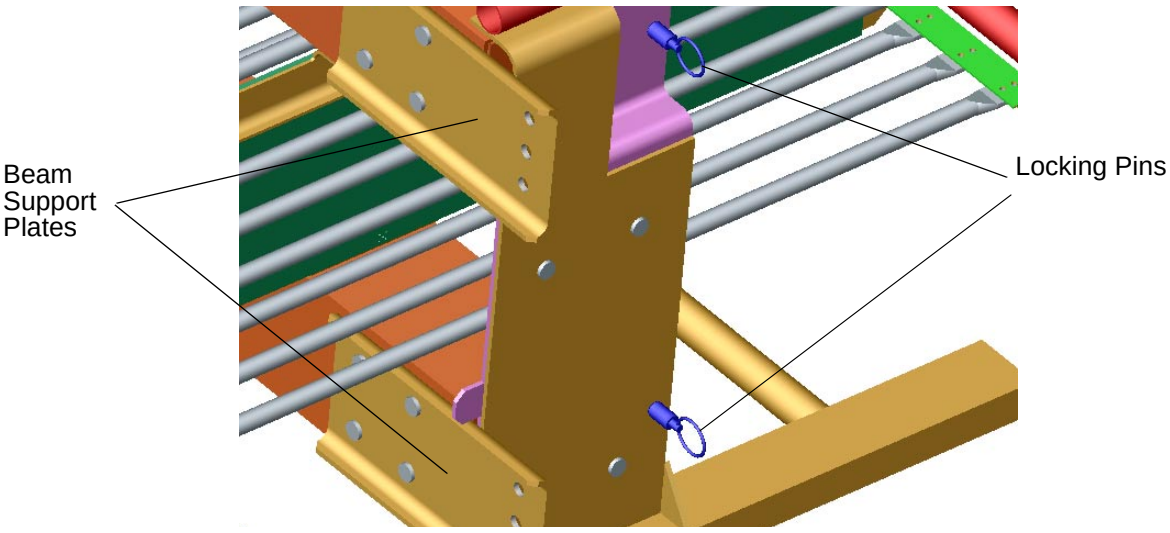

Figure 27: Locking Pins Below the Beam Support Plates

4. Lift the right wing section out of the wing section storage kit. The right wing section is located at the front of the wing section storage kit (Figure 28).

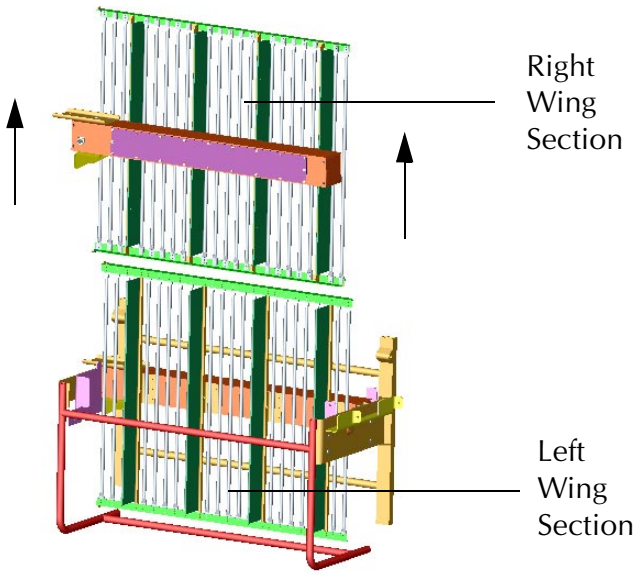

Figure 28: Lift the Right Wing Section Out of the Storage Kit

Leave the left wing section in the storage kit until you are ready to attach it to the center section of the mount.

Attach the Wing Sections

The procedure below explains how to attach the wing sections to the center section and to the TPS mount. Attach one section at a time. The assembly procedure is identical for both the left and the right wing sections:

1. Align the beam support plate with the two guide pins at the top of the center section (Figure 29).

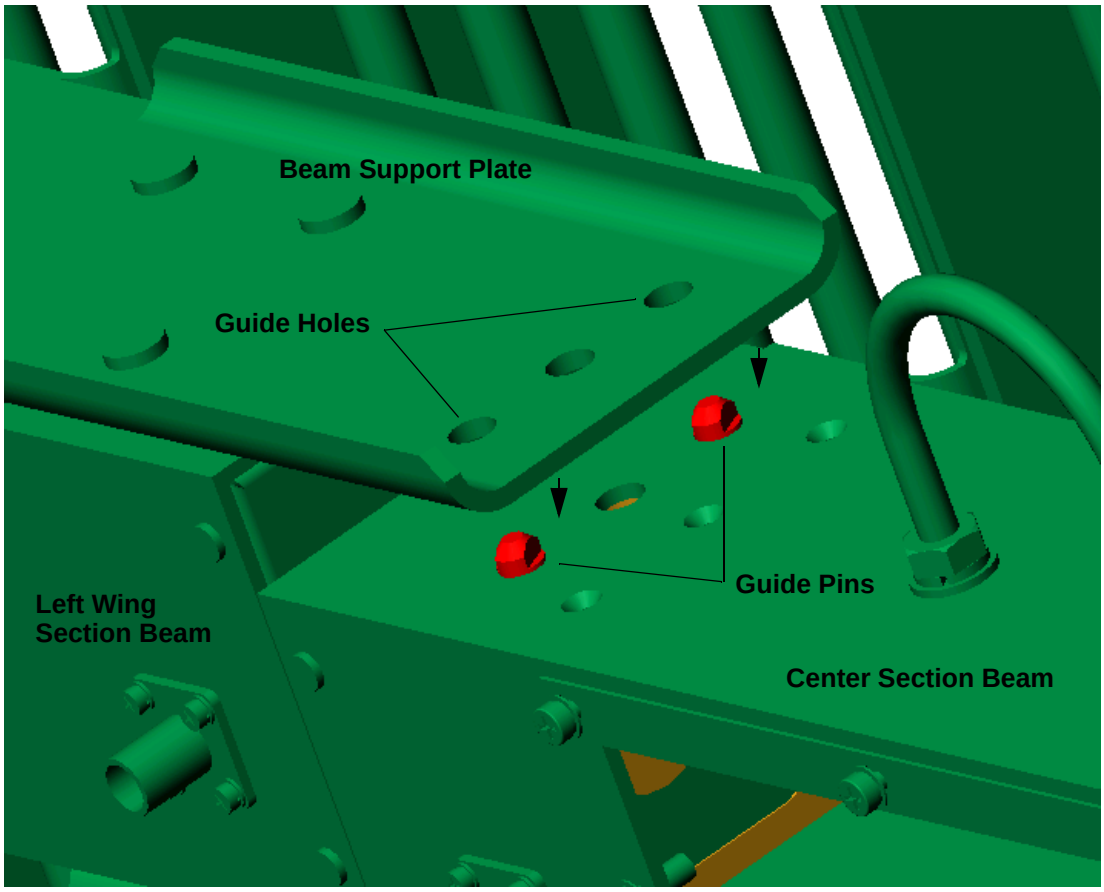

Figure 29: Align the Support Plate Guide Holes with the Guide Pins

2. Align the two slots underneath the beam support plate with the two captive bolts attached to the mount (see Figure 10 on page 11).
3. When you have the beam support plate and the slots for the captive bolts aligned properly, drop the wing section into place.
4. Insert the hand knob in the hole in the center of the beam support plate. Turn it clockwise until it is tight (Figure 7 on page 9).

5. Align the top rail of the center section with the top rail of the wing section, then close the latch on the top frame of the antenna (Figure 8 on page 10).
6. Align the bottom rail of the center section with the bottom rail of the wing section, then close the latch on the bottom frame of the antenna (Figure 9 on page 10).
7. Use a 9/16″ socket wrench to tighten the two captive bolts that attach the wing section to the mount (Figure 10 on page 11).
8. Remove the jumper cable from its storage location on the center section beam (Figure 11 on page 12).
9. Remove the dust caps from the jumper cable connectors at the joint between the wing section and the center section.
10. Attach the jumper cable to the connectors at the joint between the wing section and the center section (Figure 12 on page 13).

When you are finished, check to make sure each wing section is securely attached to the center section and to the TPS mount.

Remove the Backfill Reflector from Storage

To remove the backfill reflector from storage:

1. Remove the locking clips from the left and right rods of the backfill reflector storage kit (Figure 30). Let the locking clips hang from their lanyards.

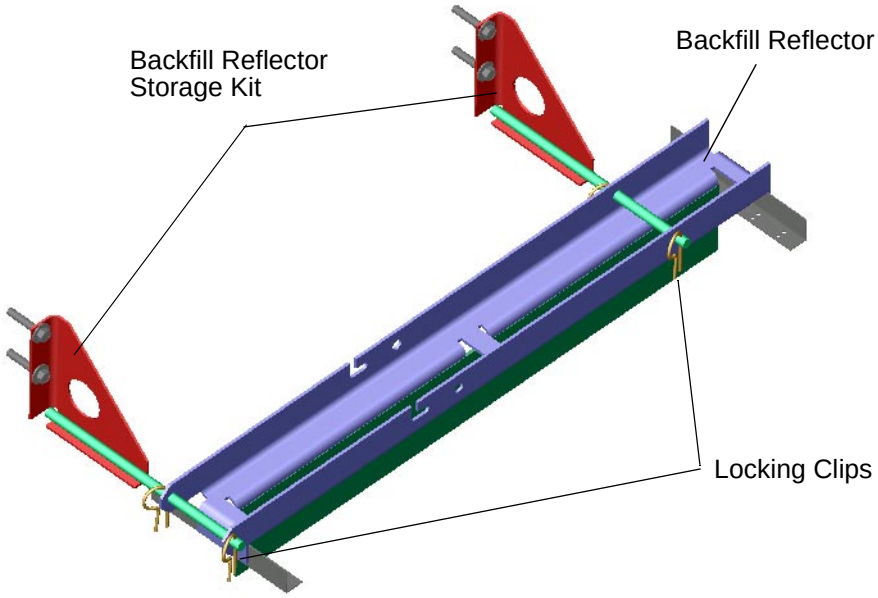

Figure 30: Remove the Locking Clips that Secure the Backfill Reflector

2. Grasp the backfill reflector with both hands. Pull it toward you and slide the backfill reflector off of the left and right rods of the backfill reflector storage kit (Figure 31).

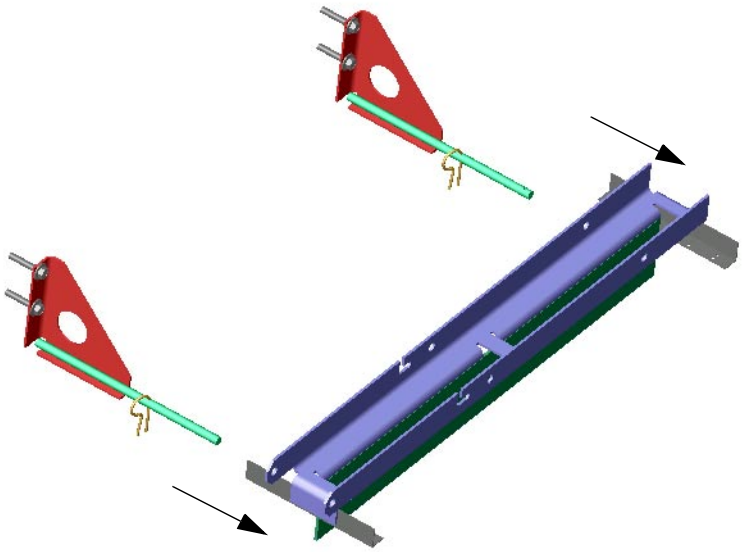

Figure 31: Slide the Backfill Reflector Off the Storage Kit

Attach the Backfill Reflector

To attach the backfill reflector:

1. Grasp the backfill reflector with both hands. The column should face toward you.
2. Align the L-shaped slot at the bottom of the backfill reflector with the bolts at the bottom of the backfill mount (Figure 32).

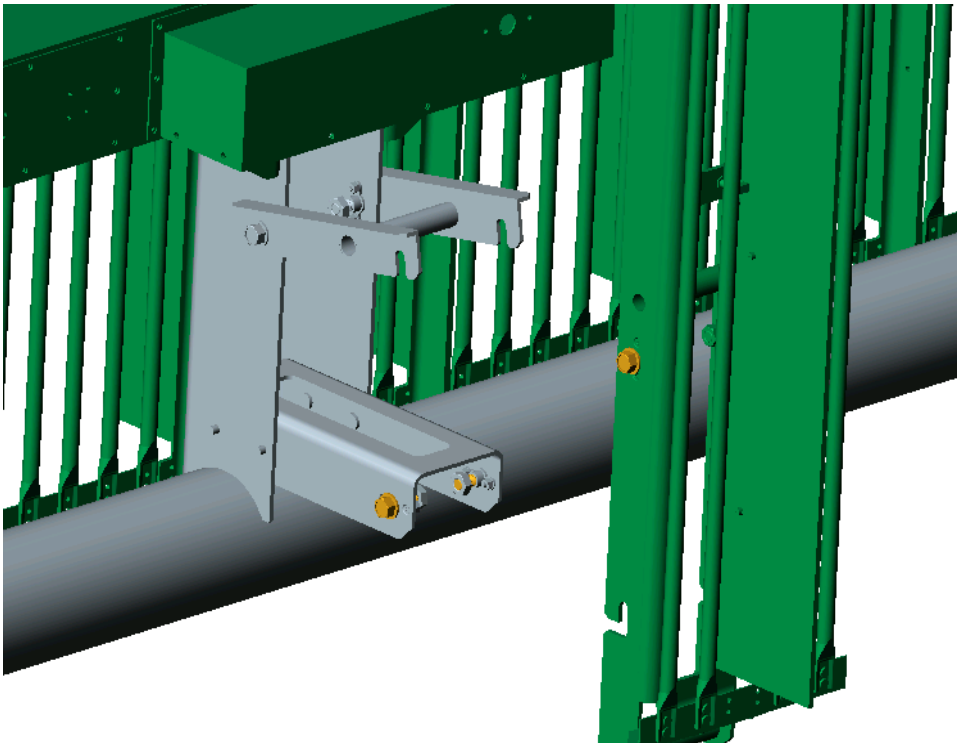

Figure 32: Backfill Reflector and Backfill Reflector Mount (Exploded View)

3. Push the L-shaped slot up onto the bolt, and then slide the backfill reflector forward until the bolts sit at the top of the L-shaped slots.
4. Tilt the top of the backfill reflector down several inches. Swing the top bracket of the backfill reflector mount forward.
5. Tilt the top of the backfill reflector back up. Align the bolts in the backfill reflector with the slots on the top mounting bracket.
6. Swing the top mounting bracket back down until the bolts are seated in the bracket slots.

7. Tighten the two bolts in the bottom bracket of the backfill reflector mount with a 9/16″ socket wrench (Figure 33).
8. Use the socket wrench to tighten the four remaining bolts in the top bracket of the backfill reflector mount (Figure 33).

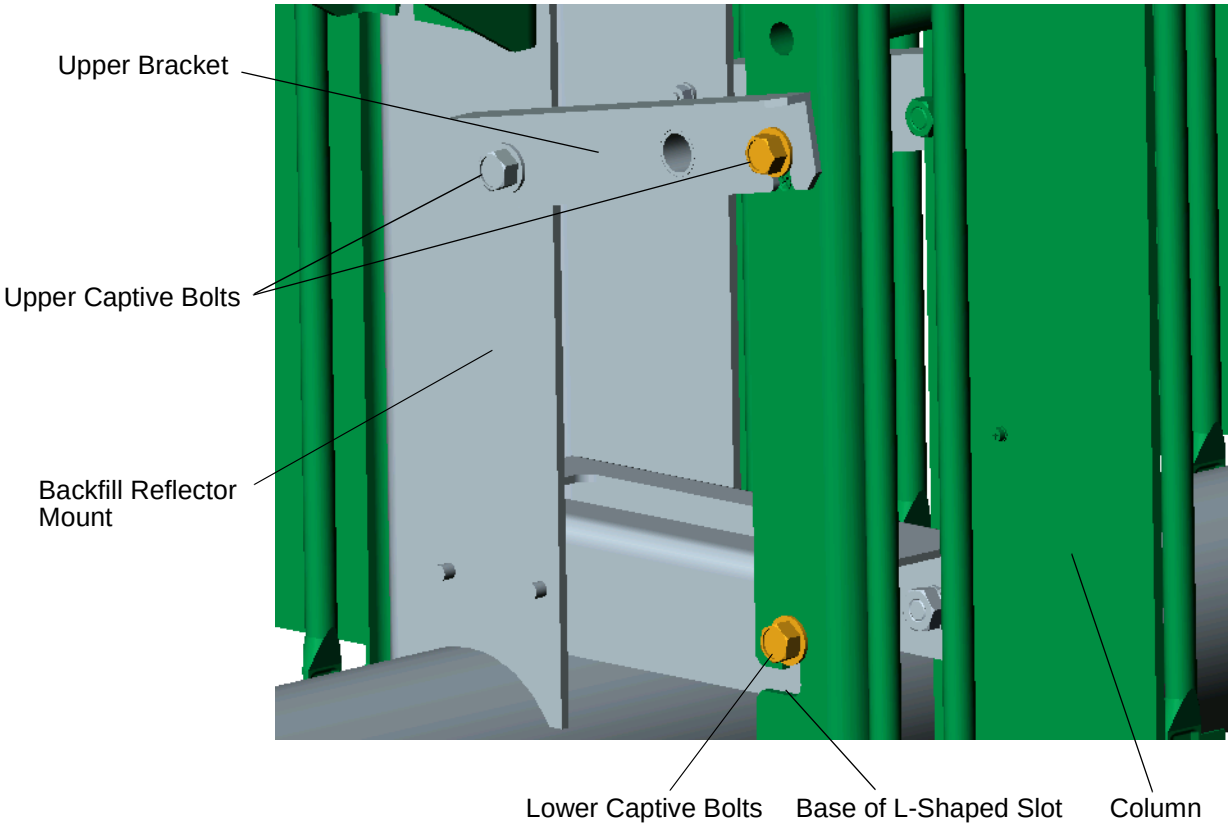

Figure 33: Backfill Reflector Attachment Points

9. Disconnect the upper portion of the backfill jumper cable from the backfill reflector.
10. Connect the backfill jumper cable to the connector on the beam of the center section (Figure 34).

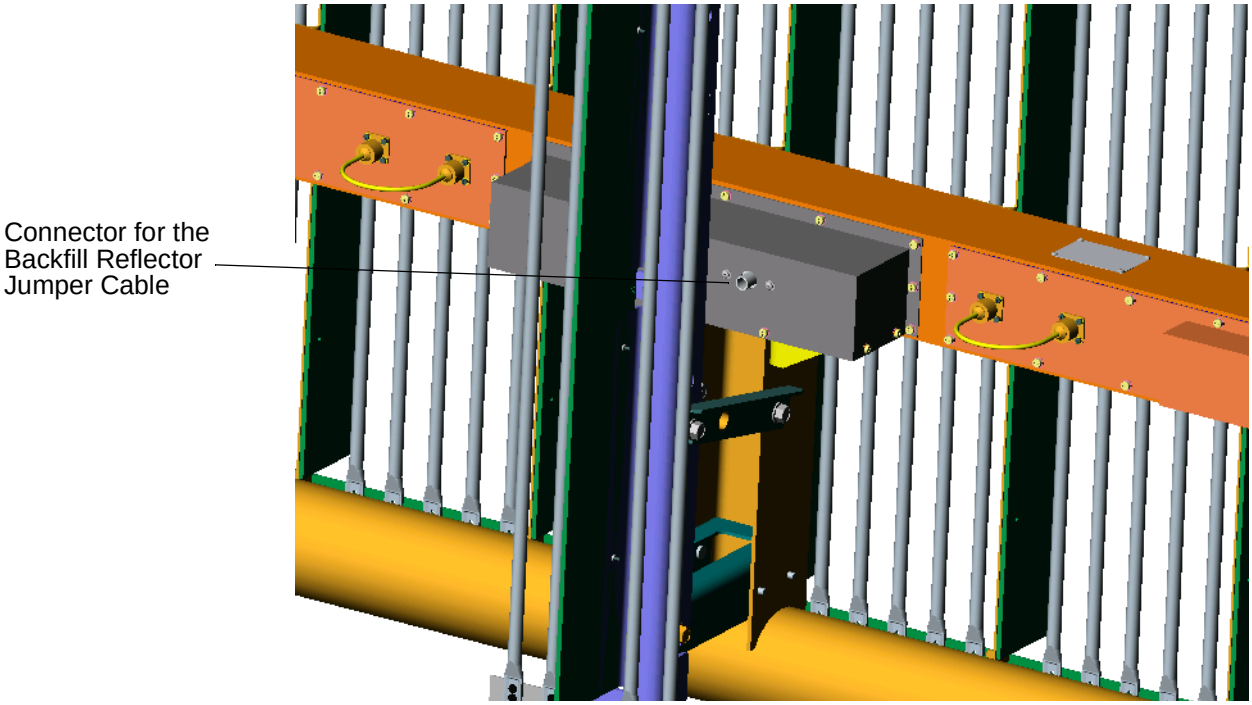

Figure 34: Connection Point for the Backfill Reflector Jumper Cable

When the backfill reflector is attached to the mount, the antenna assembly procedure is complete (Figure 35).

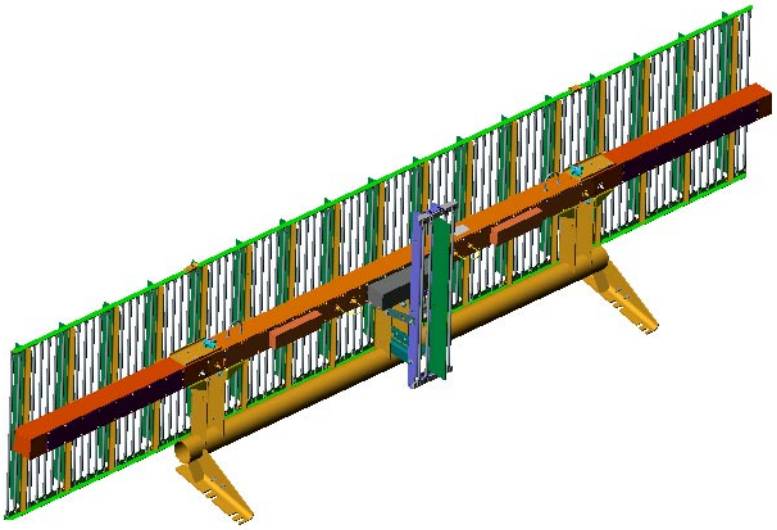

Figure 35: Assembled Antenna

Disassemble the Antenna

Disassembly of the FAI-54M3 antenna reverses the assembly procedure:

- Detach the backfill reflector from the mount and store it (page 37 and page 38).
- Detach the wing sections from the center section and mount (page 39).
- Store the wing sections in the wing section storage kit (page 40).
- Detach the center section from the mount and store it (page 44 and page 45).

Detach the Backfill Reflector

To detach the backfill reflector (Figure 36):

1. Disconnect the backfill reflector jumper cable from the center section beam.
2. Connect the backfill jumper cable to the storage connector on the backfill reflector.
3. Loosen the four captive bolts that secure the backfill reflector to the upper brackets of the backfill reflector mount.
4. Swing the upper brackets up and away from the backfill reflector.
5. Loosen the two captive bolts that secure the backfill reflector to the lower bracket of the backfill reflector mount. Hold the backfill reflector in place as you loosen the bolts.
6. Using both hands, lift the backfill reflector up, and then pull it out from the backfill reflector mount.

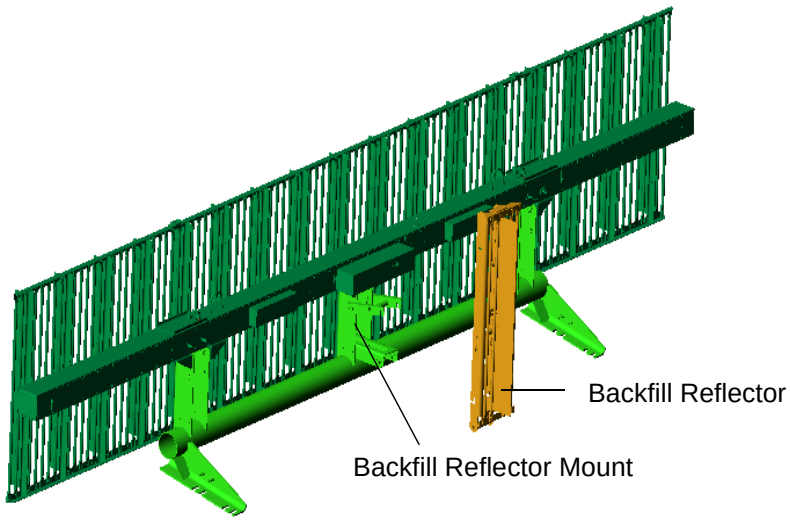

Figure 36: Antenna with the Backfill Reflector Detached

Store the Backfill Reflector

To store the backfill reflector:

1. Grasp the backfill reflector with both hands. Slide the backfill reflector onto the left and right rods of the backfill reflector storage kit (Figure 37).

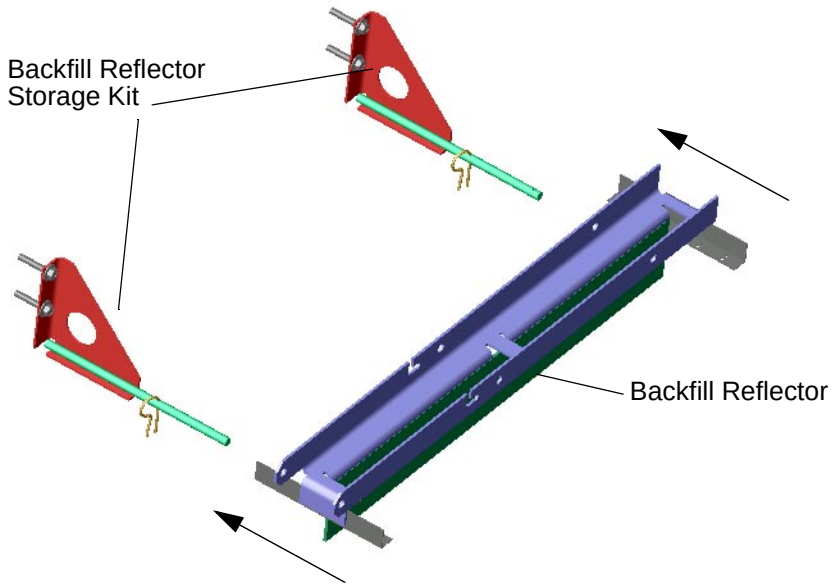

Figure 37: Slide the Backfill Reflector onto the Storage Kit

2. Replace the locking clip at the end of each storage kit rod (Figure 38).

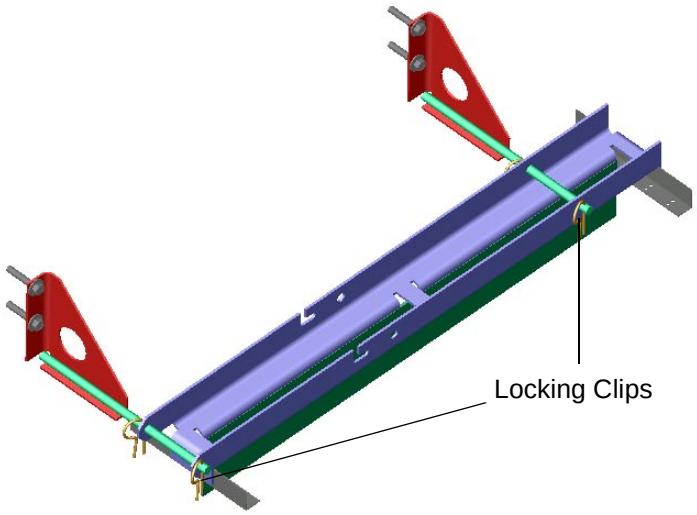

Figure 38: Backfill Reflector Stored in the Backfill Reflector Storage Kit

Figure 39 illustrates the backfill reflector when it is properly secured under the central enclosure.

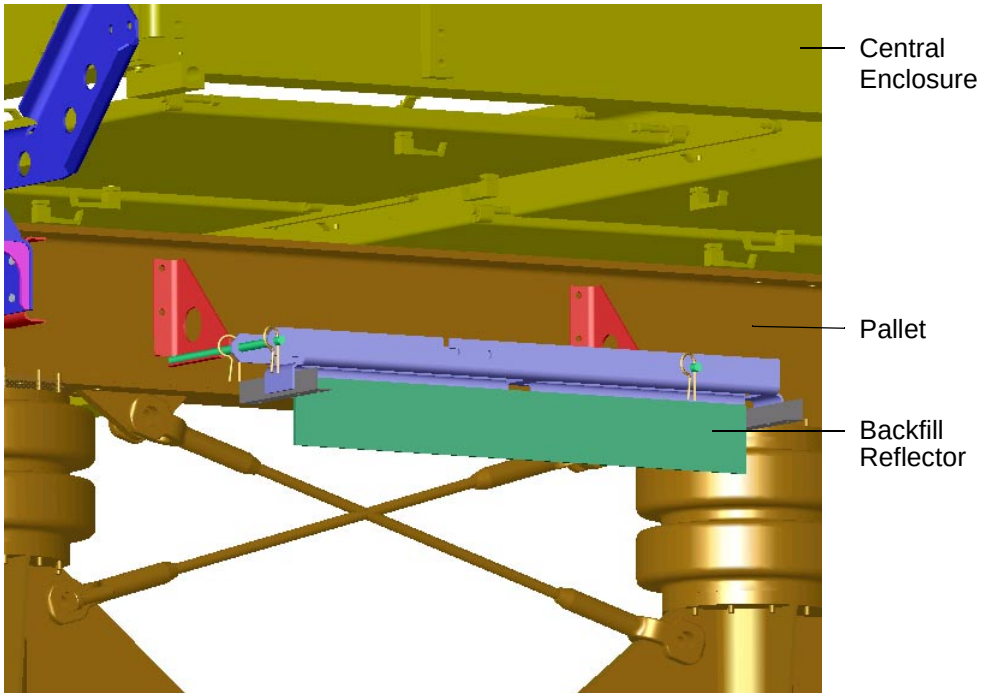

Figure 39: Backfill Reflector Secured Under the Central Enclosure

Detach the Wing Sections

The procedure below explains how to detach the wing sections from the center section and the TPS mount. Work with one section at a time. The procedure is identical for both the left and the right wing sections:

1. Remove the jumper cable from the connectors at the joint between the wing section and the center section. Replace the dust caps on the connectors.
2. Attach the jumper cable to the jumper cable storage connectors on the center section beam.
3. Use a 9/16″ socket wrench to loosen the two captive bolts that secure the wing section to the mount.
4. Open the latch on the top frame of the antenna.
5. Open the latch on the bottom frame of the antenna.
6. Turn the hand knob in the center of the beam support plate counter-clockwise until it is completely loose. Lift the hand knob out of the beam support plate.
7. Lift the wing section up until the two slots underneath the beam support plate clear the two captive bolts on the mount.

Store the Wing Sections

To store the wing sections:

1. Stand the wing section storage kit upright with the base toward you (Figure 40).

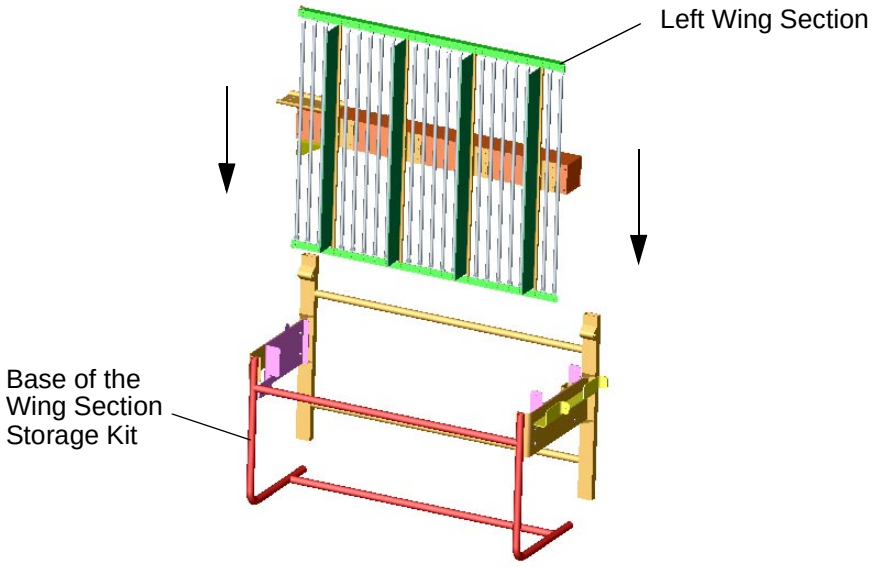

Figure 40: Lower the Left Wing Section into the Storage Kit

2. Use both hands to grasp the top rail of the left wing section. The columns should face toward you, and the beam support plate should be on the left.
3. Align the left and right ends of the wing section beam with the slots located at the back of the storage kit.
4. Lower the left wing section into the storage kit. Make sure the bottom rail of the wing section clears the slot on the right side of the storage kit.
5. Use both hands to grasp the top rail of the right wing section. The columns should face away from you, and the beam support plate should be on your left.
6. Align the left and right ends of the wing section beam with the slots located at the front of the storage kit.

7. Lower the wing section into the front of the storage kit (Figure 41 and Figure 42).

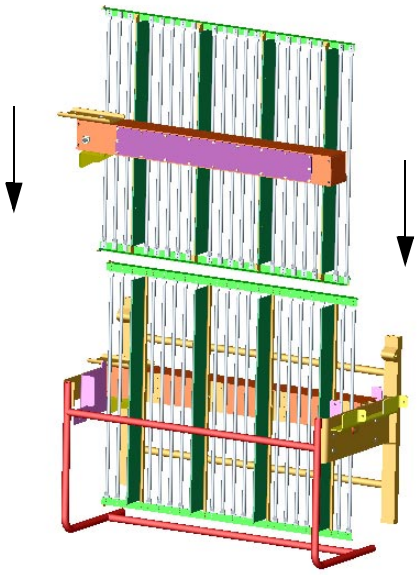

Figure 41: Lower the Right Wing Section into the Storage Kit

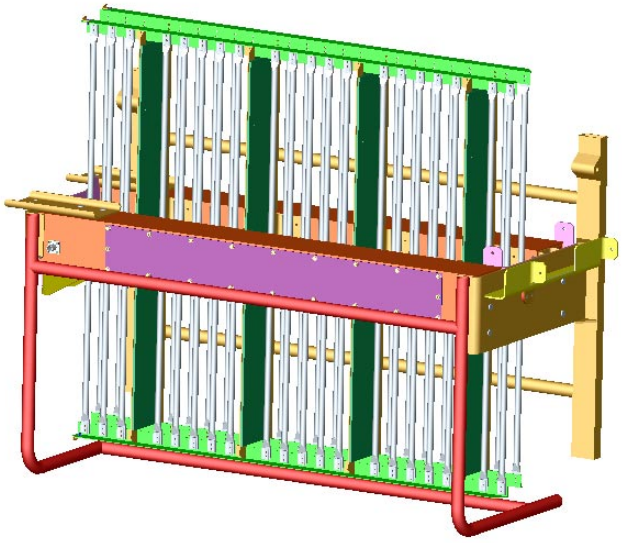

Figure 42: Left and Right Wing Sections in Place in the Storage Kit

8. Flip the hinged locking bracket on the right side of the storage kit up until it holds the right ends of the wing section beams in place.
9. Secure the hinged locking bracket with locking pins at the front and back of the bracket (Figure 43).

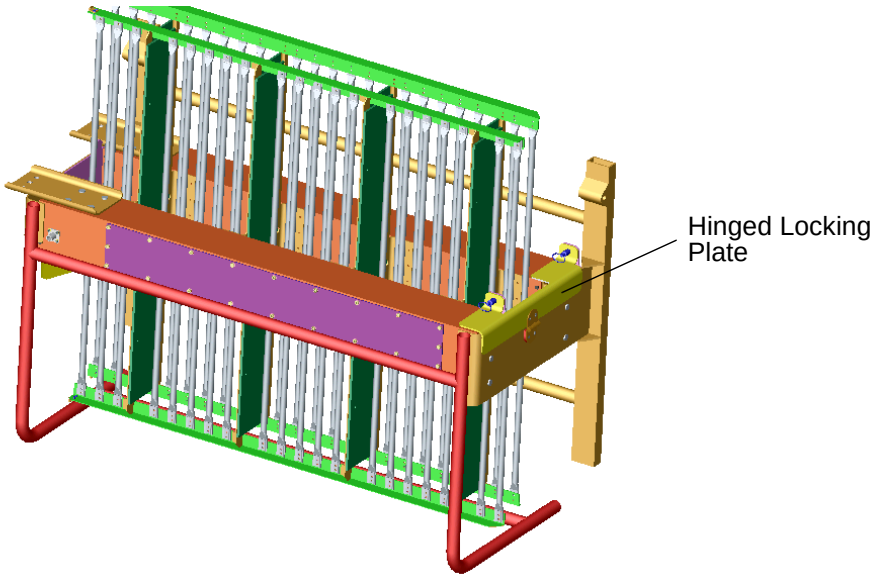

Figure 43: Flip the Hinged Locking Plate Up and Insert the Locking Pins

10. Secure the left ends of the wing section beams with two locking pins on the left side of the storage kit (Figure 44).

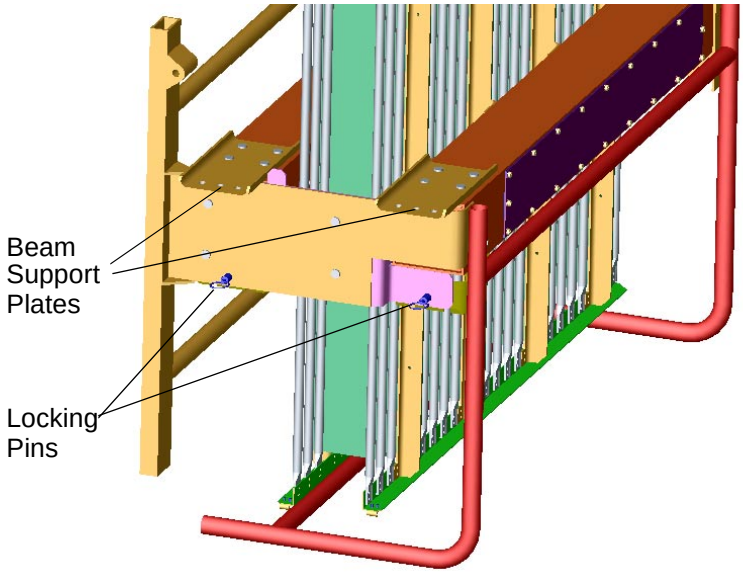

Figure 44: Insert the Locking Pins Below the Beam Support Plates

11. When the wing section storage kit is ready, secure it to the rotator base (Figure 45 and Figure 46).

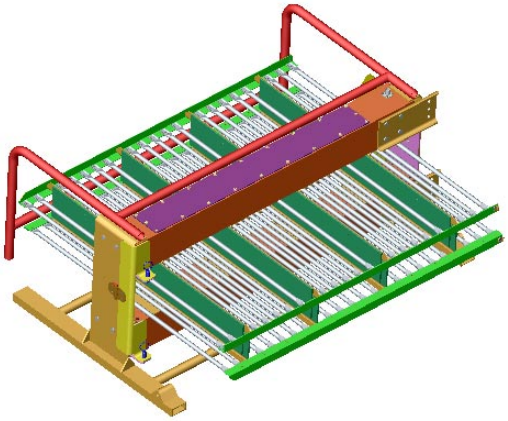

Figure 45: Wing Section Storage Kit Ready to Store on the Rotator Base

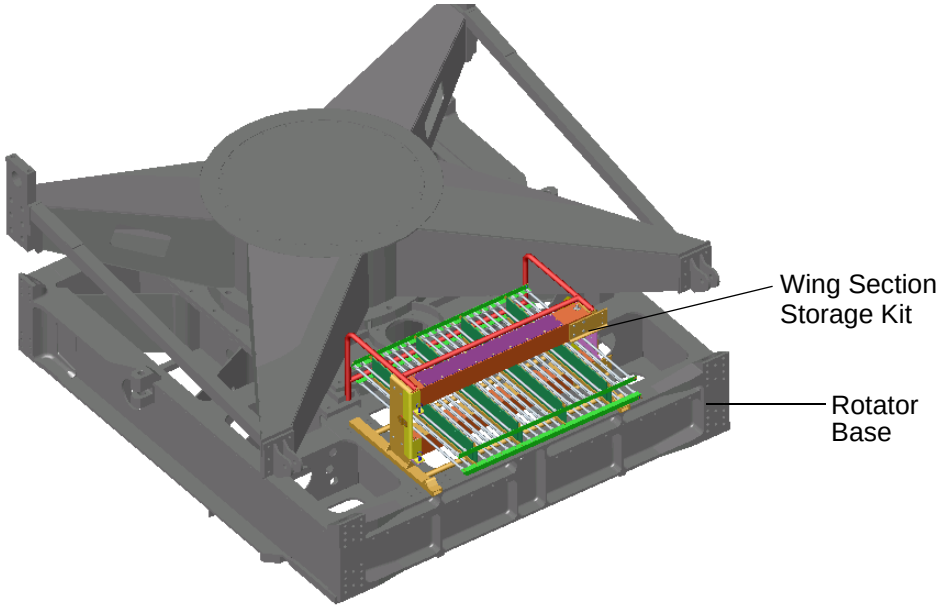

Figure 46: Wing Section Storage Kit Stored on the Rotator Base

Detach the Center Section from the Mount

To detach the center section from the mount:

1. Check to make sure the backfill reflector and both wing sections are fully clear of the center section and the TPS mount.
2. Use a 9/16″ socket wrench to loosen the four bolts that hold the center section to the middle upright of the TPS mount.
3. Use the socket wrench to loosen the two bolts that hold the center section to the left upright of the TPS mount.
4. Use the socket wrench to loosen the two bolts that hold the center section to the right upright of the TPS mount. Make sure someone holds the center section in place as you loosen the last bolt.
5. With one person on each end of the center section beam, slide the center section away from the TPS mount (Figure 47).

Figure 47: Slide the Center Section Away from the TPS Mount

WARNING

Do not detach the center section from the mount by yourself. One person should hold the center section in place while a second person loosens the bolts. When the bolts are loose, two people, one at each end of the center section beam, should lift the center section away from the TPS mount.

Store the Center Section

To store the center section:

1. Lift the center section up to the center section storage kit attached to the central enclosure. The center section columns face up.
2. Align the left end of the center section beam with the left pocket of the center section storage kit (Figure 48).
3. Align the right end of the center section beam with the right pocket of the center section storage kit.

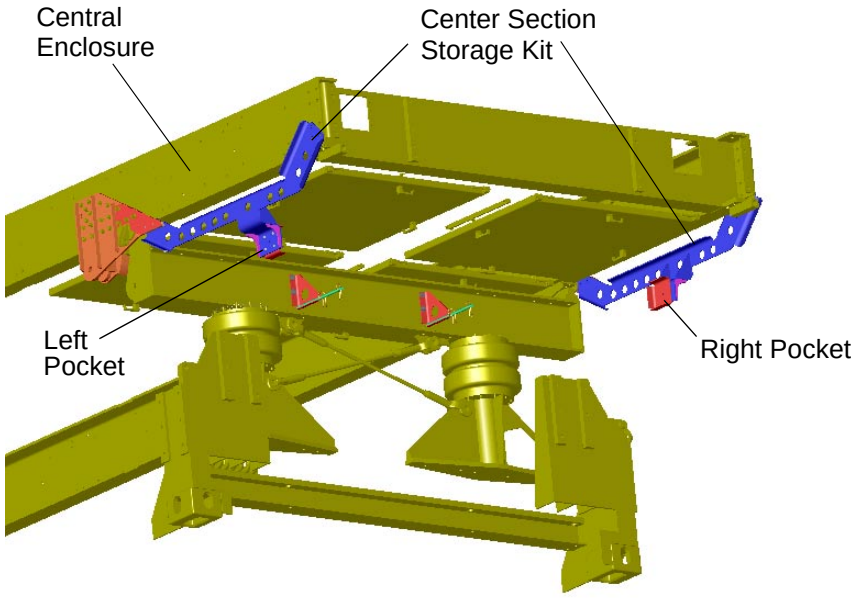

Figure 48: Center Section Storage Kit Under the Central Enclosure

4. Slide the two ends of the center section beam into the left and right pockets of the storage kit (Figure 49).

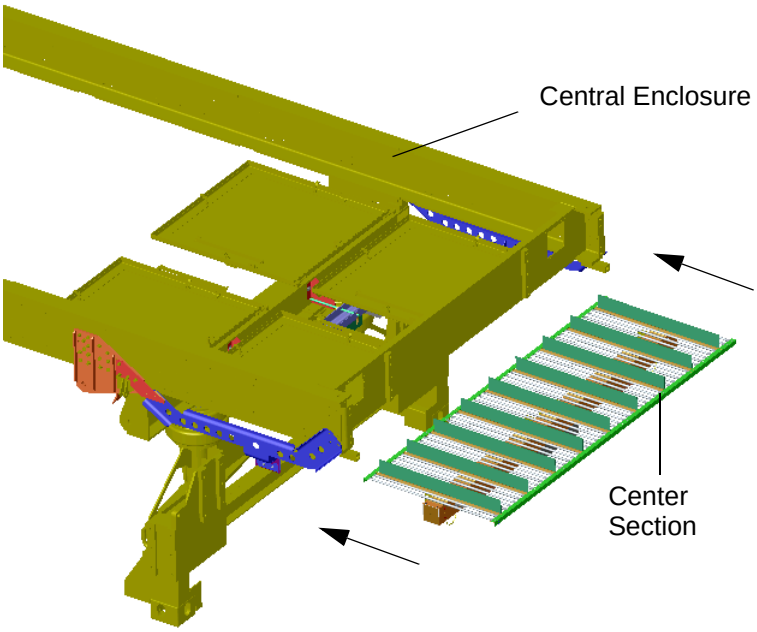

Figure 49: Slide the Center Section into the Center Section Storage Kit

5. Insert the hand knob at each end of the center section beam into the hole on the outside of the center section storage kit bracket. Turn the hand knob clockwise until it is tight (Figure 50).

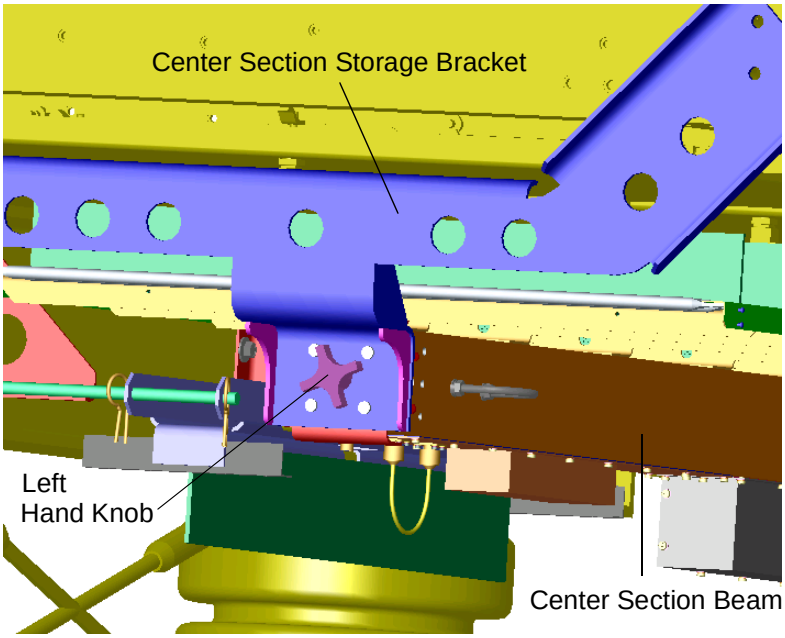

Figure 50: Use the Hand Knobs to Secure the Center Section in the Storage Kit

6. Check to make sure the center section is securely stored in the center section storage kit (Figure 51).

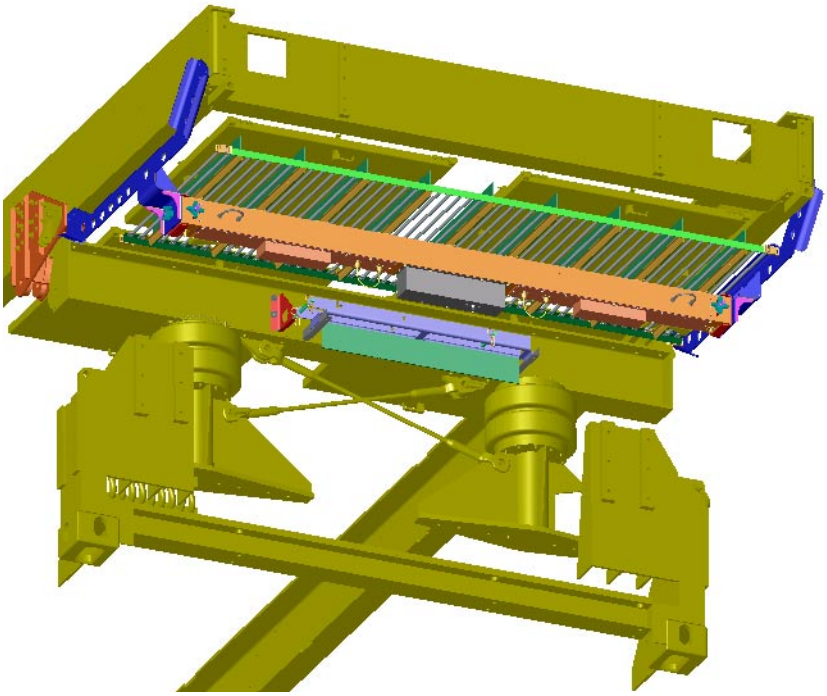

Figure 51: Center Section Secured in the Center Section Storage Kit

4. Maintenance and Troubleshooting

At least every six months, check to make sure there is no visible wear to the antenna or its components. Pay special attention to the radiating columns and cable connectors.

The troubleshooting guide in Table 1 lists symptoms that might appear as you operate, test, and maintain the antenna. If the remedies listed do not correct the problem, contact Antenna Associates, Inc., for the next course of action.

Table 1: RF Troubleshooting

Symptom	Diagnosis	Remedy
Loss of interrogator range	Measure VSWR of antenna at the sum port	If VSWR exceeds 1.5:1.0, contact Antenna Associates, Inc.
	Measure VSWR of the sum port cable	If VSWR exceeds spec limit, replace the sum cable
Side-Lobe Punch Through	Measure VSWR of the antenna SLS port	If VSWR exceeds 1.5:1.0, contact Antenna Associates, Inc.
	Measure VSWR of the SLS port cable	If VSWR exceeds spec limit, replace the SLS cable
	Measure VSWR of the backfill reflector at the column input	If VSWR exceeds 1.5:1, replace the backfill column
	Measure VSWR of the backfill Jumper cable	If VSWR exceeds 1.25:1.0, replace the backfill jumper cable
Loss of monopulse bearing accuracy at 1090 MHz	Measure VSWR of the antenna at the difference port	If VSWR exceeds 1.5:1.0, contact Antenna Associates, Inc.
	Measure VSWR of the difference port cable	If VSWR exceeds spec limits, replace the difference cable

The troubleshooting guide in Table 2 lists mechanical problems that might occur as you assemble and disassemble the antenna.

Table 2: Mechanical Troubleshooting

Symptom	Diagnosis	Remedy
The antenna center section does not mate with the mount.	Do the captive bolts prevent the center section from sliding over them?	Loosen the captive bolts to allow the center section to slide over them. Retighten the bolts after the center section slots are completely seated.
	Do the vertical supports from the mount align with the support brackets?	If you cannot align with the support brackets, replace the mount.
	Are the support brackets damaged so that insufficient clearance causes interference at assembly?	Return the antenna to Antenna Associates, Inc., for replacement.
An antenna wing section does not mate with the center section.	Does the vertical support for the wing section in question align with the support bracket?	If you cannot align the vertical support with the support bracket, replace the mount.
	Is the support bracket on the wing section damaged so that insufficient clearance causes interference at assembly?	Return the antenna to Antenna Associates, Inc., for replacement.
An antenna wing section does not fit in the storage slot.	Is the wing section in the correct slot?	See Chapter 3 to determine the correct slot.
	Does the wing section have the correct orientation?	See Chapter 3 to determine the correct orientation.
In the FPS configuration, the antenna does not tilt.	Are the nuts at all the pivot bolts and pivot pins loose? Are all the nuts on the tilt-adjust rods and tilt-adjust brace loose?	Loosen the nuts and then retighten them after the tilt angle is set.
The jumper cables do not seat properly.	Is one of the connectors already tightened?	Loosen the connector and then retighten both connectors simultaneously.
The hand knob does not fully seat in the center section when the antenna is assembled.	Visually inspect the thread on the knob and the insert in the clamping block.	Remove any debris from the threaded portions of the hand knob or the insert. Replace one or both parts if damage is excessive.

Table 2: Mechanical Troubleshooting

Symptom	Diagnosis	Remedy
The hand knob does not fully seat in the center section when the antenna is stored.	Visually inspect the thread on the knob and the insert in the clamping block.	Remove any debris from the threaded portions of the hand knob or the insert. Replace one or both parts if damage is excessive.

A. Technical Specifications

This appendix contains a set of tables detailing the electrical characteristics and RF interference of the antenna.

Table 3: Electrical Characteristics

Para.	Description	Limits
1.1.1	**Operating Frequency:** Transmit Receive	 1030 ± 5 MHz 1090 ± 10 MHz
1.1.2	**Input Impedance:** Sum Port Difference Port SLS Port	 50 Ohms nominal 50 Ohms nominal 50 Ohms nominal
1.1.3	**VSWR: (referenced to 50 Ohms)** Sum Port Difference Port SLS Port	 1.5:1 Maximum 1.5:1 Maximum 1.5:1 Maximum
1.1.4	**Power Handling:** Sum Port SLS Port	 10 KWp; 100 Watts Avg 10 KWp; 100 Watts Avg
1.1.5	**Polarization:** Sum Port Difference Port SLS Port	 Vertical Vertical Vertical
1.1.6	**Cross Polarization:** Sum Port	 > 20.0 dB
1.1.7	**Gain:** Sum Port	 21.0 dBi Minimum

Table 3: Electrical Characteristics (Continued)

Para.	Description	Limits
1.1.8	**Sum Pattern Horizontal:** -3dB BW (Below Main Beam Peak) SLL (Below Main Beam Peak) Squint 1027 to 1095 MHz	 4.5° ± 0.5 Nominal > 25.0 dB 0.25°
1.1.9	**Difference Pattern Horizontal (1090 MHz Only):** Crossover Points Relative to Sum Pattern Peak Side-Lobe Level below Main Beam Peak Squint Sum to Difference Null Depth Difference Peaks	 -3dB ± 0.5 dB > 24.0 dB ≤ 0.25° ≥ 30.0 dB ≤ 1.0 dB
1.1.10	**SLS Pattern Horizontal** Crossover Points Relative to Sum Pattern Peak Coverage of Sum SLL Squint Sum to SLS	 Between -15.0 and -21.0 dB > 4.0 dB above -12 dBi ≤ 0.25°
1.1.11	**Sum Pattern Vertical** Peak Elevation -3dB Beamwidth Side-Lobe Levels dB Level @ 45° Elevation	 8.0° ± 3.0° 25.5° ± 3.0° ≥ 18.0 dBi > 0 dBi

Table 4: RF Interface

Para.	Description	Limits
1.4.1	Sum Port Connector Type	N-Female per MIL-C-39012
1.4.2	Difference Port Connector Type	N-Female per MIL-C-39012
1.4.3	SLS Port Connector	N-Female per MIL-C-39012

B. Typical Radiation Patterns

Figure 52 to Figure 56 illustrate typical radiation patterns for the antenna.

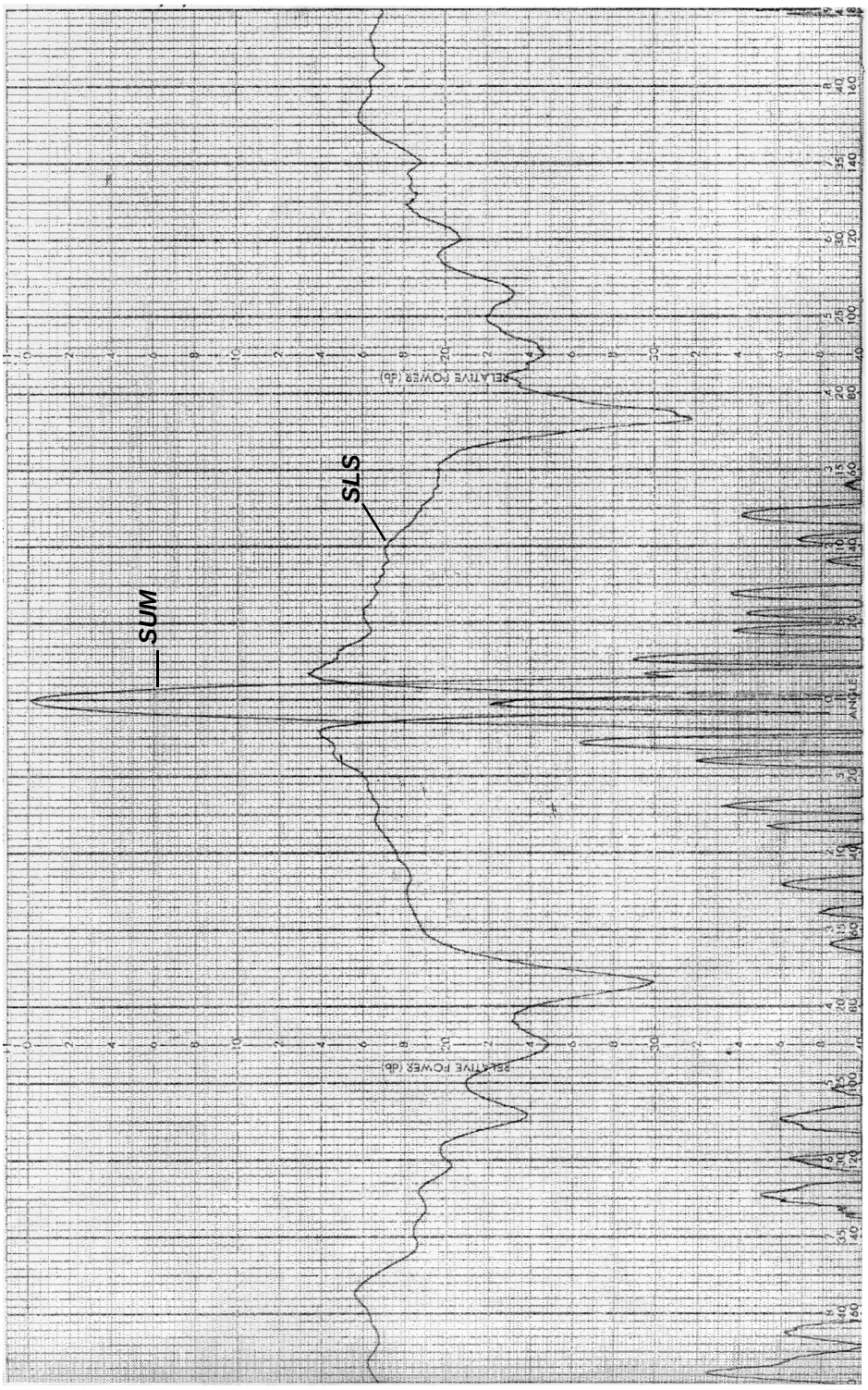

Figure 52: Typical Azimuth Sum and SLS Pattern ±180°

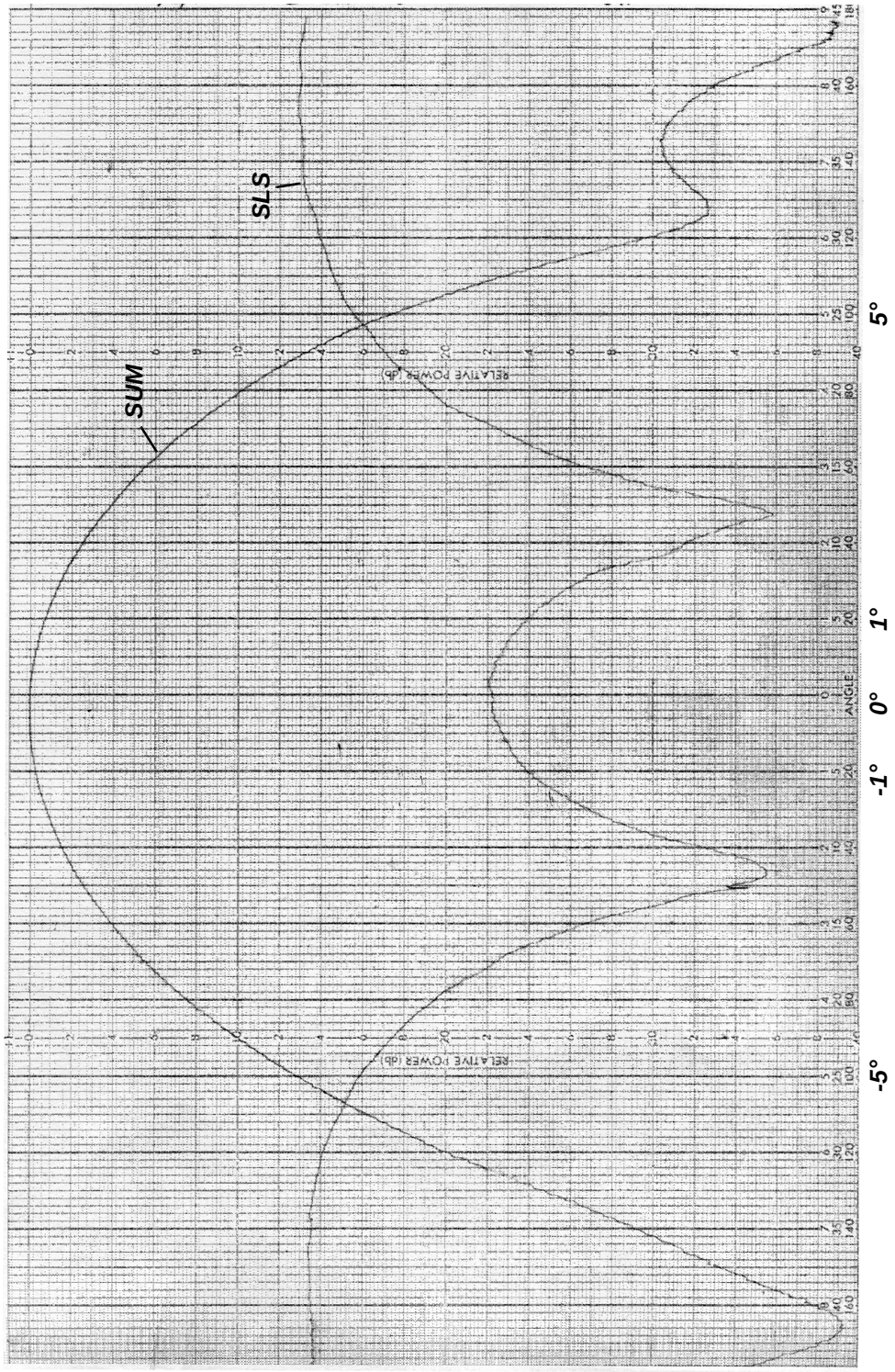

Figure 53: Typical Azimuth Pattern Sum and SLS ±9°

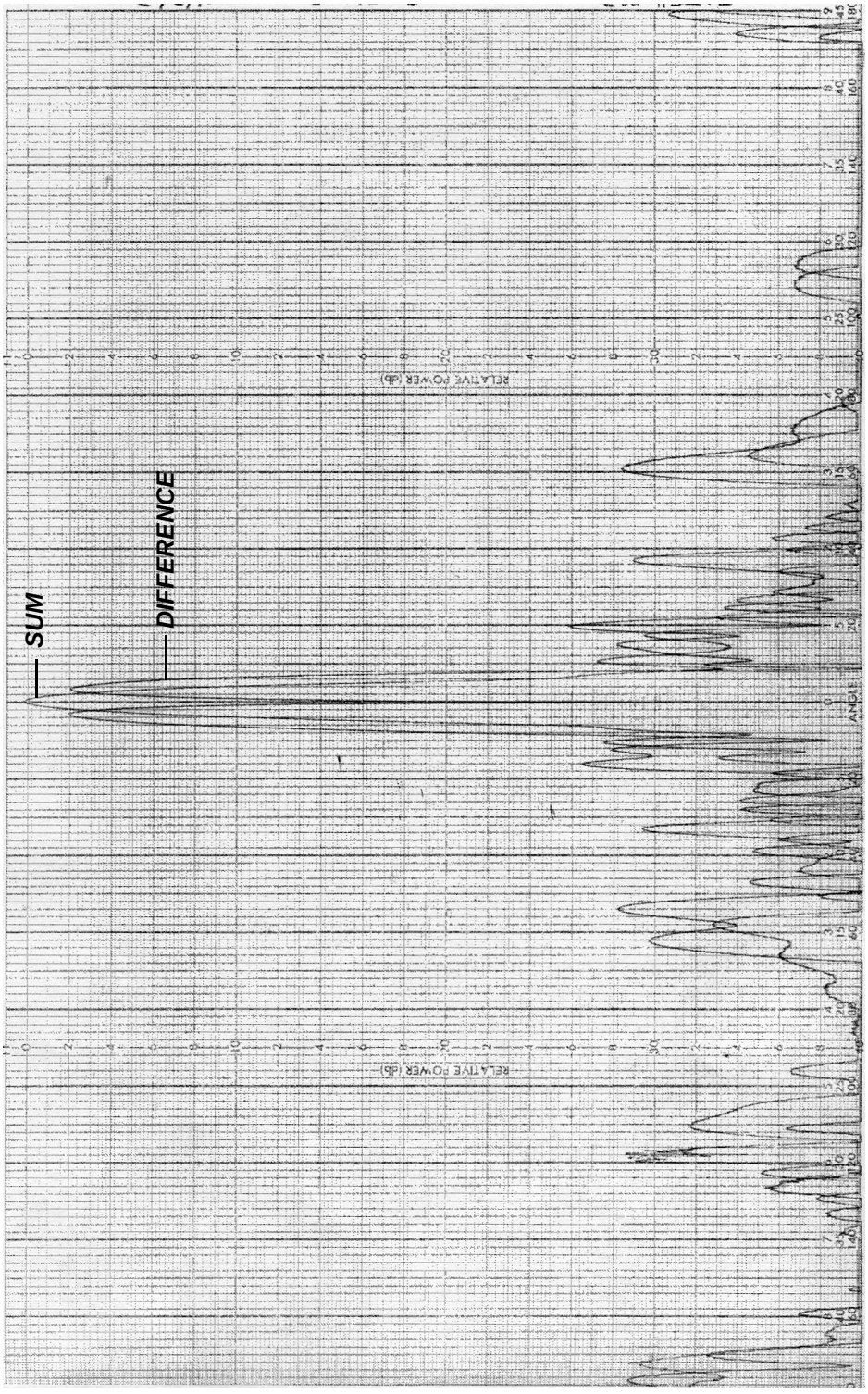

Figure 54: Typical Azimuth Sum and Difference Patterns ±180°

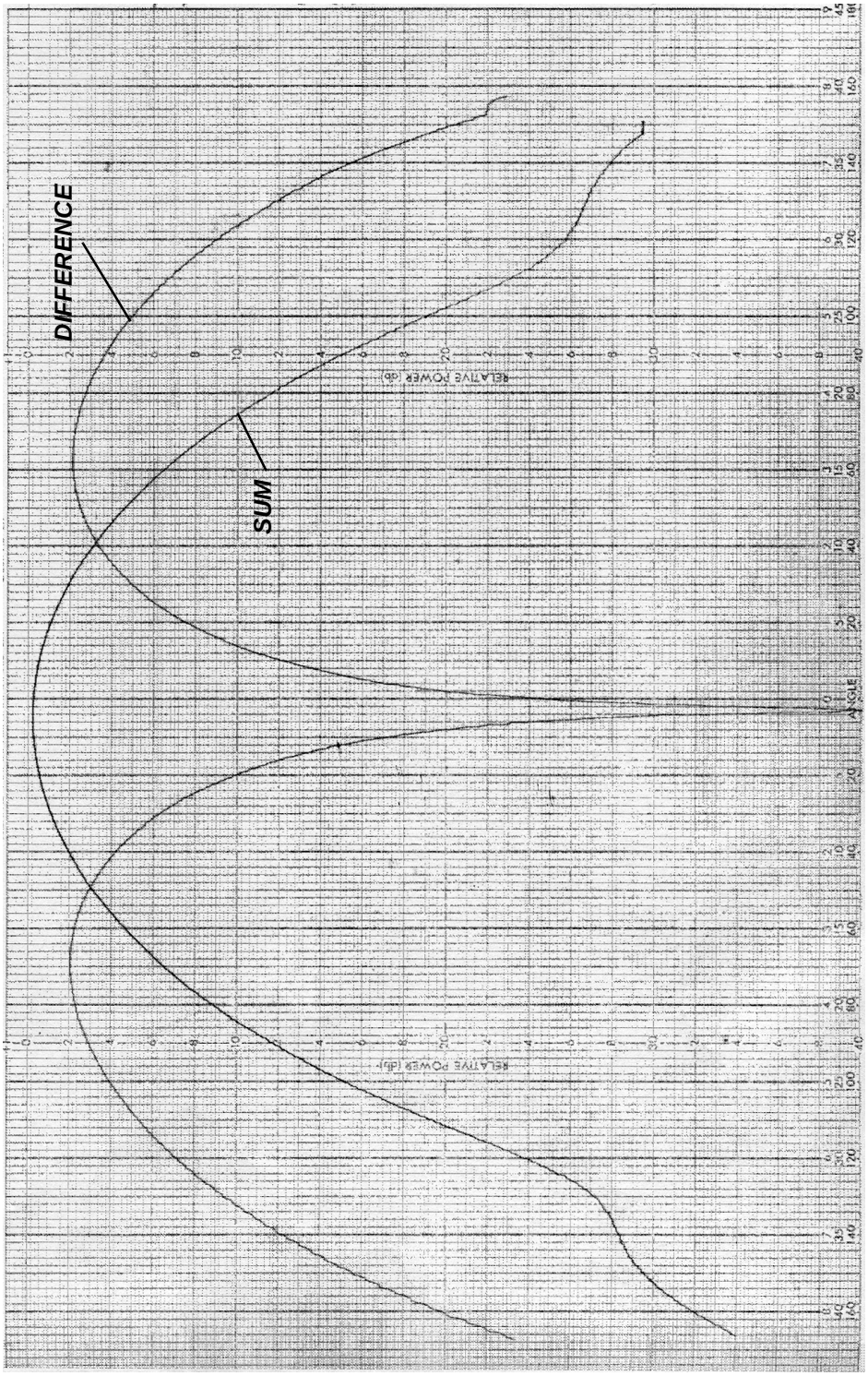

Figure 55: Typical Azimuth Sum and Difference Patterns ±9°

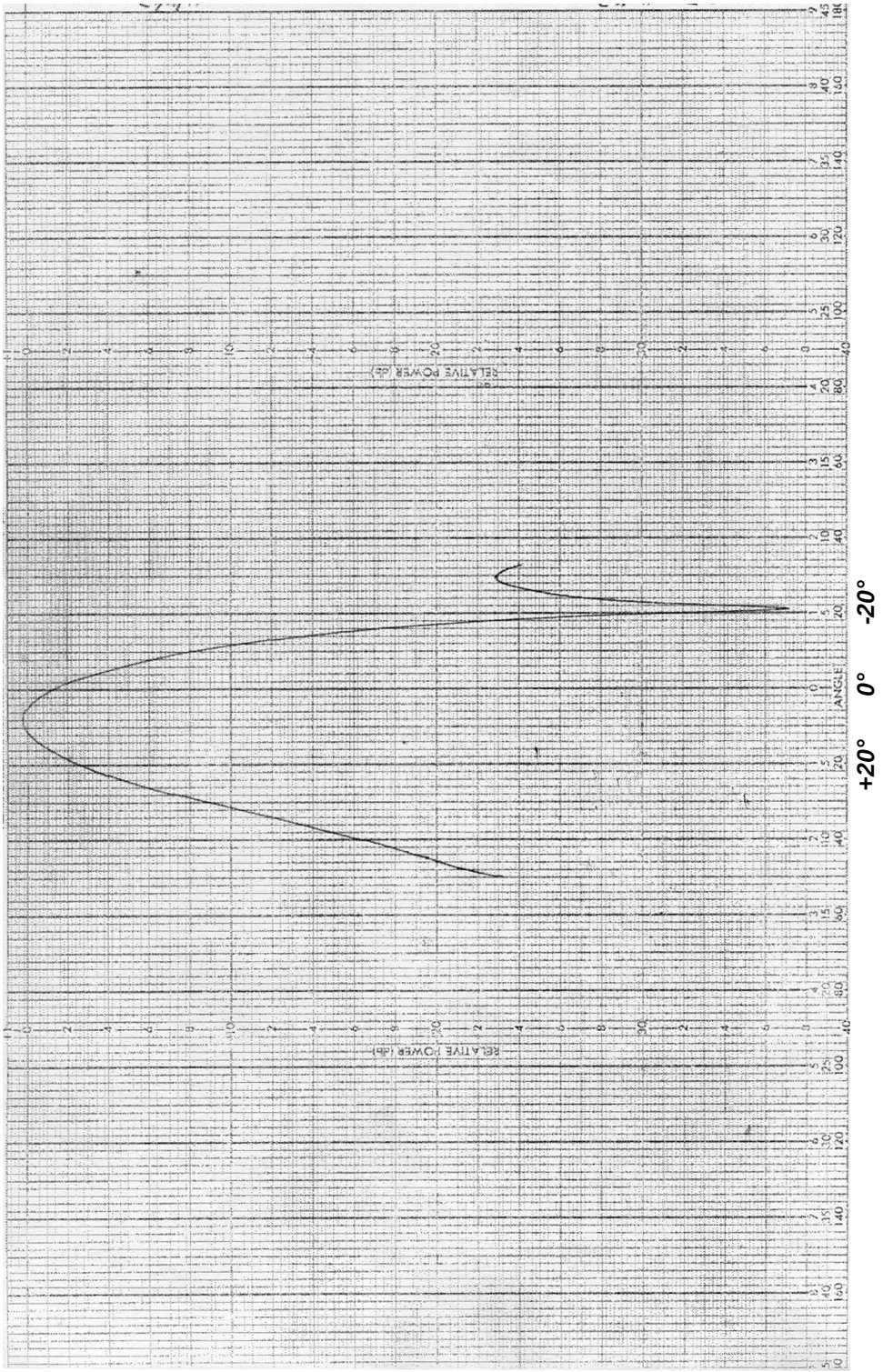

Figure 56: Typical Elevation Sum Pattern

C. Standards and Requirements

Table 5 lists documents applicable to this antenna.

Table 5: Specifications

Specification	Description
ISO 9000	Inspection System Requirements
MIL-STD-167-1	Mechanical Vibration of Shipboard Equipment
MIL-STD-454 M	Electronic Equipment, Standard General Requirements for
MIL-STD-470 A	Maintainability Program Requirements
MIL-STD-810 D	Environmental Test Method and Engineering Guidelines
MIL-STD-973	Configuration Management
MIL-STD-1472 D	Human Engineering Design Criteria for Military Systems, Equipment and Facilities
MIL-S-901 D	Shock test, H.I., Shipboard Machinery, Equipment and Systems, Requirements for
MIL-E-16400 H	Electronic, Interior Communication and Navigation Equipment Naval Ship and Shore
MIL-HDBK-217 F	Reliability Prediction for Electronic Equipment
MIL-HDBK-472 (notice 1)	Maintainability Prediction

D. Parts List

Table 6 lists the Line Replaceable Units (LRUs) for the FAI-54M3 in both the FPS and TPS mounting configurations.

Table 6: Parts List

Part Number*	Description	Quantity
399001GXX	FAI-54M3 Antenna	1
399022GXX	Center Section	1
399024GXX	Right Wing Section	1
399026GXX	Left Wing Section	1
399029GXX	Backfill Reflector	1
399035GXX	Jumper Cable, Center Section	2
399072GXX	Jumper Cable, Backfill Reflector	1
399069GXX	Clamping Hand Knob	2
3991100GXX	FPS Mount	1
3991200GXX	TPS Mount	1
3991201GXX	Storage Kit	1
3991212GXX	Backfill Reflector Storage**	2
3991217GXX	Center Section Storage, Left**	1
3991218GXX	Center Section Storage, Right**	1
3991220GXX	Wing Section Storage**	1

* The suffix *GXX* identifies the antenna's paint color. For instance, *G01* may define Olive Drab 24084 (per Fed Std 595). The suffix is located on the FAI-54M3's nameplate after the main assembly's part number 399001.

** This assembly is included as part of the Storage Kit (PN 3991201).

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