APSD System
DWS, Storage Bay, and Tower
--
RFID Tag, RFID Bracket and Fine Position Flag Replacement
--
Preventive Maintenance Procedure

P/N 1000018-PM-01- Rev C

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1. Introduction

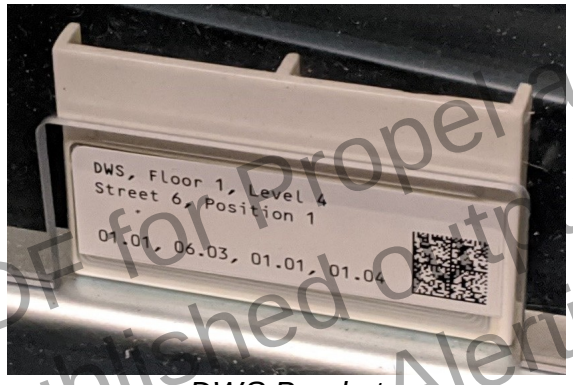
This procedure details preventive maintenance for RFID Brackets, Fine Position Flags, and RFID Tags. Use this procedure to replace brackets, flags, and tags or put them back into position location specification.

Alphabot® APSD systems (Automated, Pick, Storage, and Dispense) rely extensively on RFID and position flags to generate critical Alphabot (bot) navigation instructions.

Brackets, tags, and flags are located throughout an APSD systems in storage bays, towers, and Dynamic Work Stations.

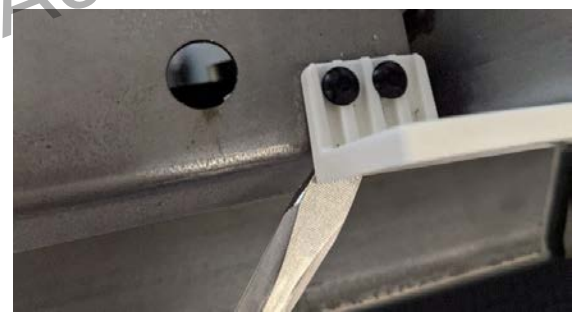
Bot material handling is the primary reason why brackets, flags, and tags become damaged, or out of specification, causing bots to go out of service.

RFID Brackets by Alphabot System Location

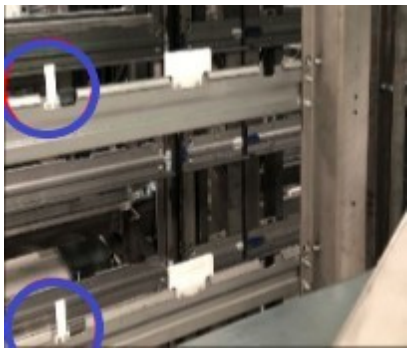


DWS Bracket

Tower Bracket



Storage Bay Bracket



Tower Narrow Fine Position Flag

2. Safety & PPE

Hazards

PPE Required

Required Personal Protective Equipment (PPE)
Knee Pads
Bump Hat
Safety Shoes

Warning Labels

⚠ WARNING

HAZARDOUS VOLTAGE

Contact may cause electrical shock or burn. Turn off and lockout system power before servicing. Service of electrical equipment must be performed by qualified and trained personnel only.

Use only insulated tools and required PPE for work on electrical equipment.

Failure to follow these guidelines could result in serious injury or death.

⚠ WARNING

MAGNETIC FIELD

Can be harmful to pacemaker wearers.

Pacemaker wearers approaching bots during troubleshooting or servicing must stay a minimum of 30 cm (12 in.) away from traction wheels and electronic assemblies.

Failure to follow these guidelines could result in serious injury or death.

⚠ WARNING

HAZARDOUS EQUIPMENT INSIDE

Access limited only to authorized personnel.

Radio communication required.

- Have a designated attendant with a second radio that can call for assistance as needed.
- Test the radios for volume and connection before entering the structure.

Failure to follow these guidelines could result in serious injury or death.

⚠ CAUTION

BUMP HAT AREA

Low head clearances and sharp edges exist inside the Alphabot structure.

Wear a bump hat while performing routine maintenance inside the structure.

Failure to do so may result in minor or moderate injury.

⚠ CAUTION

HEAVY OBJECT

May cause strain or back injury.

Do not attempt to lift a bot. Bots weigh up to 95 kg (210lbs.) when loaded. Do not lift the driving wheels to push or pull a disabled Bot.

Use the provided power pack to release the bot brakes, then use standard lifting techniques to push or pull the disabled bot.

Failure to do so may result in minor to moderate injury.

⚠ CAUTION

SAFETY-TOED SHOES

Safety-toed shoes must be worn when working inside the structure. Objects may fall down in the system.

A falling object can result in minor to moderate injury.

⚠ CAUTION

KNEE PROTECTION

Wear protective knee pads when working on catwalk or deck surfaces.

Catwalk and deck surfaces have uneven and/or have sharp edges that may cause minor to moderate injury.

NOTICE

Operators / Authorized employees who perform operation activities on the Alphabot System shall be qualified and trained on proper handling of the equipment and safe entry procedures into the system.

3. Required Tools & Materials

Tools

Tool	Part Number
Tool, Torque wrench	7000008-00-01
Tool, 4 mm Hex T Handle	7000018-00-01
Tool, 2.5 mm Socket Bit, Electronic Torque Wrench	7000011-00-01
Tool, 7 mm Combination Wrench	7000022-00-01
Brake Box	1000709-01-01
Tool, 3/32 in Hex wrench	N/A
RFID Tag Reader or Cell phone	N/A
Tape measure	N/A
Flat head screwdriver	N/A
Ruler Straight Edge	N/A

Materials

Material	Part Number
Tower RFID Tag bracket: Bracket, RFID, Tower	1002397-00-01
DWS (Dynamic Workstation) RFID tag Back Plate: Back Plate, RFID Tag, DWS	1001626-00-01
Bay RFID tag bracket: Bracket, RFID, Module, Storage	1002405-00-01
Bay Bracket Screw: 2X Screw, FCHS, M4 X 0.7 X 10 mm LG., 18-8 SS screw	1-04007-0103
Bay Bracket Nut: 2X Hex Nut, M4 X 0.7, Stainless Steel	1-04007-0064
2X Rivet, Plastic, Push-in	1003045-00-01
Replacement RFID tag: RFID Tag 88X33 mm	1001693-00-01
Narrow/ Channel Flag: Flag, Fine Position, Channel, Tower	1002398-00-01
Wide/ Buffer Flag: Flag, Fine Position, Buffer, Tower	1002399-00-01
DWS Narrow / Tower, Fine Position Flag	1002415-00-01
DWS Wide / Buffer, Fine Position Flag	1002416-00-01

4. Reference Documents

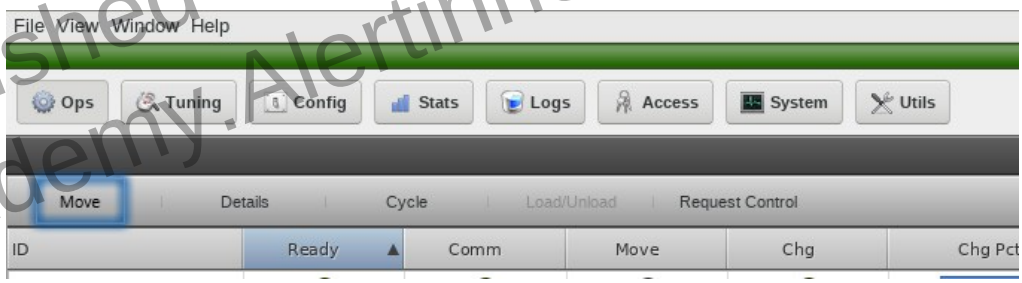
Resource	Link / Part Number
Alert Academy	https://academy.alertinnovation.com/
Maintenance Technician Safety Manual	1000011-MN-01
Alphabot APSD System Lockout Tagout Procedure Safety Manual	1000035-SF-01
Alphabot System DWS, Storage Bay, and Tower RFID Bracket, Tag, Fine Position Flag Replacement Procedure	1000038- SR-01
Alphabot User Manual	1000004-MN-01
MCS User Manual	1000016-MN-01

5. Pre-Procedures

Perform the following pre-procedures before starting the core procedures.

5.1 Fine Position Flag Replacement - Move Bot to Inspection Location

Use the Master Control System (MCS) to move Alphabots (bots) to inspection locations near bays, DWS, towers, or transit planes when replacing narrow or wide fine position flags.

Step	Action
1.	Open MCS. For more information see MCS User Manual (P/N 1000016-MN-01)
2.	Navigate to the **Ops** page and select the **Robots** tab.
3.	Select a bot working in the aisle repair is to be performed.
4.	Right-click on the bot and select **Request Control**.
5.	Below the tab selection, select **Move** to open a pop-up window. 
6.	Select Alphabot System inspection locations near bays, DWS, transit planes, or towers.
7.	Select **OK** to move bot to inspection location.

5.2 DWS Request to Enter

⚠ DANGER

CONFINED SPACE HAZARD

Read and follow all regulations and completely fill out the form in the Alert Innovation Inc. Confined Space Program (PN 1000011-SF-01).

Known confined space areas:

- Freezers
- Structures when catwalks are open
- Dynamic Workstations (DWS)

Minimum PPE required:

- Hard Hat
- Safety Glasses
- Safety Harness
- Safety Shoes

Failure to comply will result in serious injury or death.

⚠ CAUTION

HEAVY OBJECT

May cause strain or back injury.

Do not attempt to lift a bot. Bots weigh up to 95 kg (210lbs.) when loaded. Do not lift the driving wheels to push or pull a disabled Bot.

Use the provided brake release tool to release the brakes on the bot, then use standard lifting techniques to push or pull the disabled bot.

Failure to do so may result in minor to moderate injury.

Dynamic Work Station (DWS) Request to Enter

Step	Action
1.	Perform a DWS request to enter depending on if maintenance: 1. Can be completed quickly OR there are multiple types of incidents to repair. • See System Request to Enter procedure to lockout the door and power off the APSD system. 2. Will require a significant amount of time AND involves one incident type. • See Single Aisle/Deck Safety Zone Creation procedure to lockout the door and return power to system areas not being worked in. **Note:** task is referencing the Alphabot APSD System Lockout/Tagout Procedure Safety Manual (PN 1000035-SF-01).

Step	Action
2.	Perform work near a door by opening slide bolt and swinging door open. 

Step	Action
3.	**⚠ CAUTION** **HEAVY OBJECT** May cause strain or back injury. Do not attempt to lift a bot. Bots weigh up to 95 kg (210lbs.) when loaded. Do not lift the driving wheels to push or pull a disabled Bot. Use the provided brake release tool to release the brakes on the bot, then use standard lifting techniques to push or pull the disabled bot. Failure to do so may result in minor to moderate injury. Perform work inside the DWS by taking off the door. Open the slide bolt, grab the black handles, and pull the door *up and outwards*.

Step	Action
	
4.	Set door(s) in a safe location.

Step	Action
5.	Insert a lock and tag into the access door slide lock of the removed door(s).  ***Note**: Lockout/Tagout ensures a door is not re-installed while working inside a DWS.* ***Note**: Keep the key on your person at all times.*

5.3 Storage Bay and Tower Request to Enter

⚠ DANGER

HAZARDOUS VOLTAGE

Contact may cause electrical shock or burn. Turn off and lockout system power before servicing. Service of electrical equipment must be performed by qualified and trained personnel only.

Use only insulated tools and required PPE for work on electrical equipment.

Failure to comply will result in serious injury or death.

See RtE (Request to Enter) procedure in the Alphabot APSD Lockout/Tagout Procedure (P/N 1000035-SF-01).

If using an override key, see System Entry with Override Key procedure Alphabot APSD Lockout/Tagout Procedure (P/N 1000035-SF-01).

6. Core Procedures

The following section details the core maintenance steps for this procedure.

6.1 DWS RFID Bracket and Fine Position Flag Replacement

DWS RFID brackets are pressed into place and should not require tools (P/N 1001626-00-01).

DANGER

CONFINED SPACE HAZARD

Read and follow all regulations and completely fill out the form in the Alert Innovation, Inc. Confined Space Program (PN 1000011-SF-01).

Known confined space areas:
- Freezers
- Structures when catwalks are open
- Dynamic Workstations (DWS)

Minimum PPE required:
- Hard Hat
- Safety Glasses
- Safety Harness
- Safety Shoes

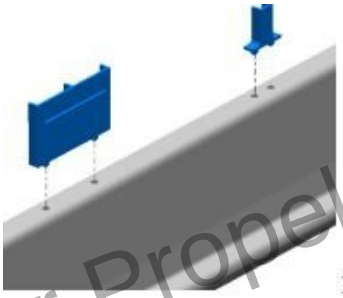
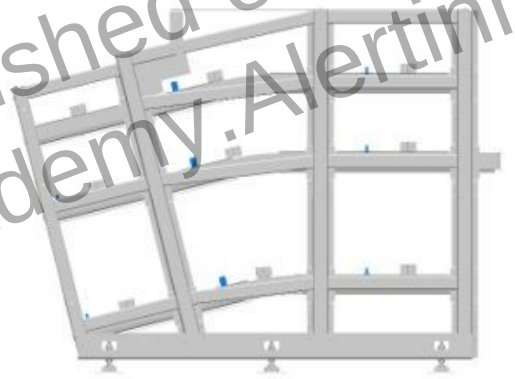
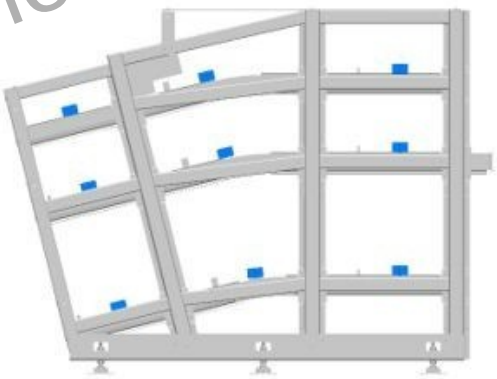
Failure to comply will result in serious injury or death.

DWS RFID Bracket Procedure

Step	Action
1.	By hand, firmly pull up on the RFID bracket releasing it from the structure. 
2.	Test the RFID Tag's signal with a cell phone and/or RFID Tag reader. When re-using, carefully peel it off the old RFID bracket (P/N 1001693-00-01). If there are any issues, program and use a new RFID Tag. See RFID Programming (P/N 100039-SR-01).

Step	Action
3.	Adhere the RFID Tag on a new bracket with its microchip (blue rectangle) seated in the bracket's small rectangular recessed area. The recessed area protects the chip from breaking. 
4.	Install a new RFID Tag bracket by firmly pressing the plastic rivets into the structure's drill holes.
5.	Repeat for other damaged brackets.

Perform DWS Fine Position Flag Replacement Procedure

Step	Action
1.	By hand, firmly pull up on a damaged DWS fine position flag. Tools should not be needed.
2.	Replace narrow or wide fine position flags with a new one (P/N 1002415-00-01, 1002416-00-01). Firmly press bracket down into the drill holes.  Parts mount with snap fits  Fine position flag locations (8 plcs)  RFID tag mount locations (9 plcs)
3.	Repeat as necessary.

6.2 Storage Bay RFID Bracket Replacement

⚠ CAUTION

KNEE PROTECTION

Wear protective knee pads when working on catwalk or deck surfaces.

Catwalk and deck surfaces have uneven and/or have sharp edges that may cause minor to moderate injury.

Storage bay RFID brackets are secured into railings with plastic press-in rivets (P/N 1002405-01, 1003045-00-01).

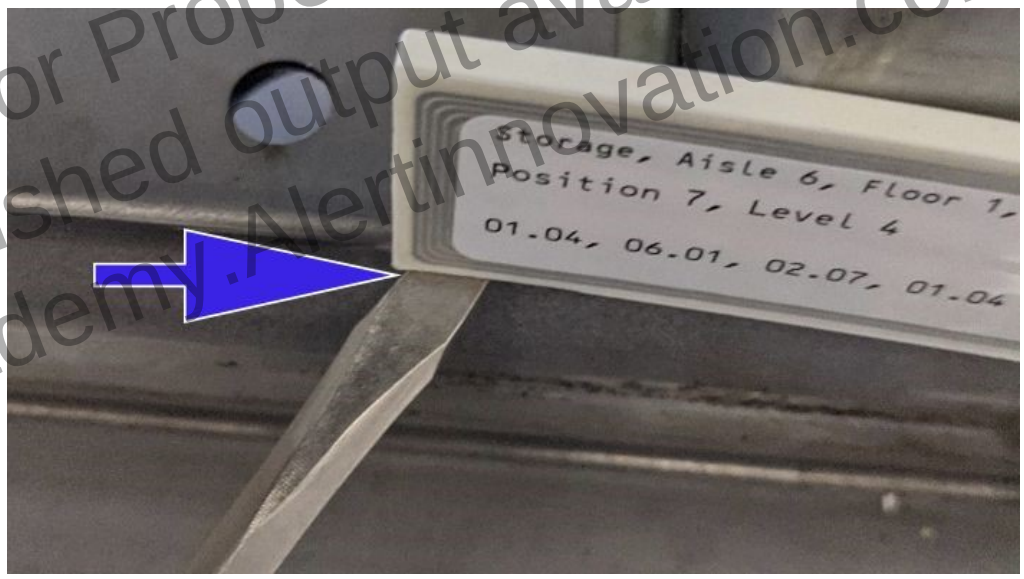
Step	Action
1.	Walk to the repair location.

⚠ CAUTION

KNEE PROTECTION

Wear protective knee pads when working on catwalk or deck surfaces.

Catwalk and deck surfaces have uneven and/or have sharp edges that may cause minor to moderate injury.

Step	Action
2.	Insert a flat head screwdriver under a damaged RFID bracket.  

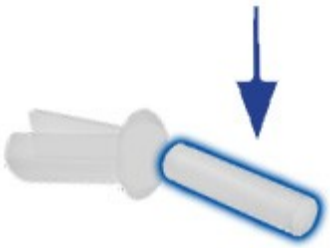
Step	Action
3.	Pry the RFID bracket up until it releases from the rivets. 

Step	Action
4.	Push any remaining plastic pins down through the holes with a screwdriver and pickup any debris.

Step	Action
	

Step	Action
	
5.	Test the RFID Tag's signal with a cell phone and/or RFID Tag reader. When re-using, carefully peel it off the old RFID bracket. If there are any issues, program and use a new RFID Tag. See RFID Programming (P/N 100039-SR-01).

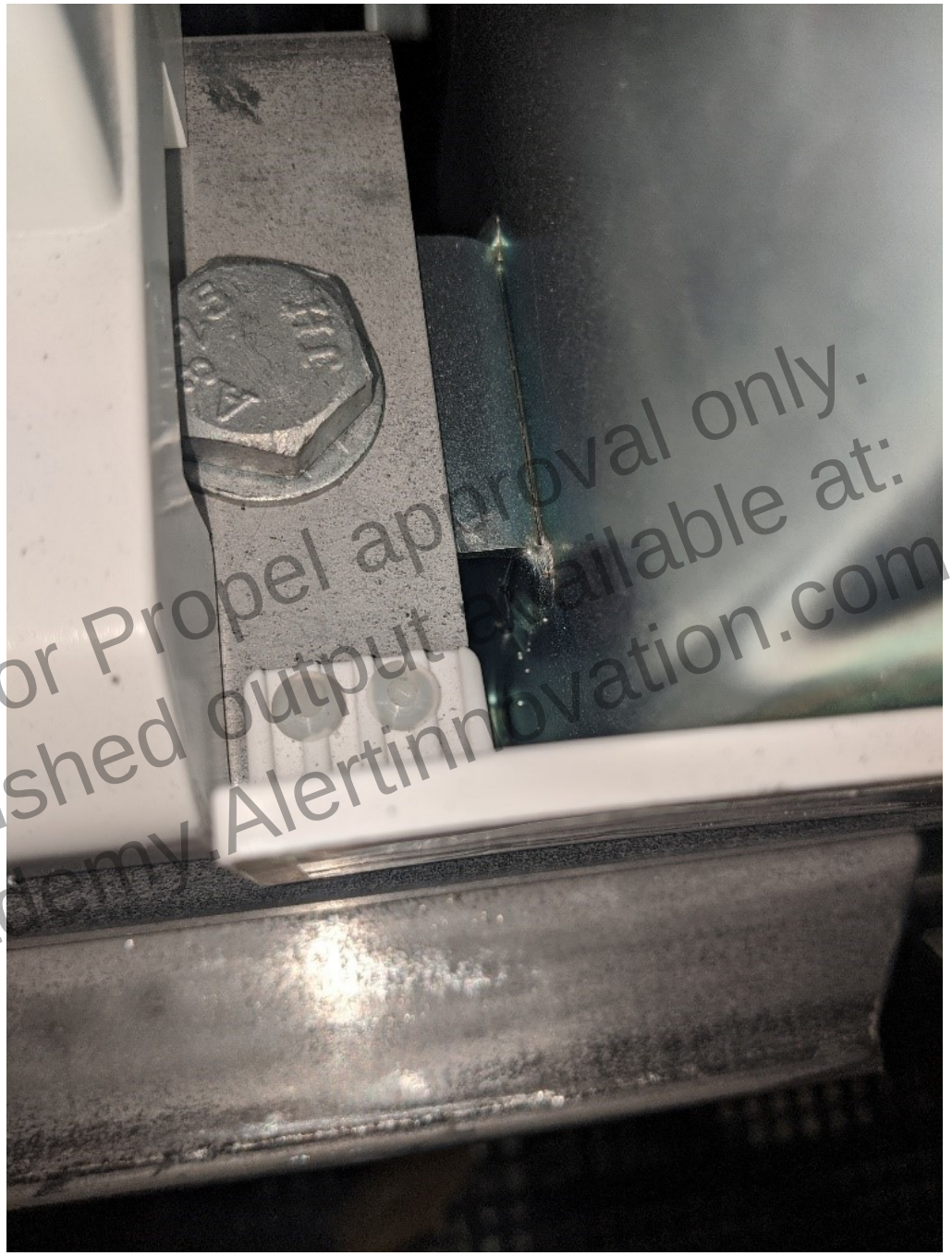
Step	Action
6.	Adhere an RFID Tag on a new bracket with its microchip (blue rectangle) seated in the bracket's small rectangular recessed area (P/N 1002405-00-01). The recessed area protects the chip from breaking. 

Step	Action
7.	By hand, snap off the top of a new rivet and feed it into the top of the rivet hole (P/N 1003045-00-01). Removing the rivet top is to help prevent damage to an installer's hands during fastening.  
8.	Align storage bay RFID bracket over bay railing screw holes. Alternatively, place a snapped rivet top in one of the two drill holes to align and hold bracket while riveting other drill hole.

Step	Action
9.	Use a flat head screwdriver to press rivet heads flush to the structure surface. When there is any issue firmly seating a rivet, remove it and insert a new one.

Step	Action
	

Step	Action
	

Step	Action
	

Step	Action
10.	Verify the bracket is tight with the structure and make any necessary adjustments.
11.	Repeat as needed for other damaged brackets.

6.3 Tower RFID Bracket Replacement

⚠ CAUTION

KNEE PROTECTION

Wear protective knee pads when working on catwalk or deck surfaces.

Catwalk and deck surfaces have uneven and/or have sharp edges that may cause minor to moderate injury.

Tower RFID brackets are located alongside the rails Alphabots (bots) travel on.

Step	Action
1.	**⚠ CAUTION**  **KNEE PROTECTION** Wear protective knee pads when working on catwalk or deck surfaces. Catwalk and deck surfaces have uneven and/or have sharp edges that may cause minor to moderate injury. Go to a repair location.

Step	Action
2.	Loosen tower RFID bracket removing 2 screws and hex bolts with a 2.5 mm drive hex bit socket and 7 mm combination wrench (P/N 7000011-00-01, 7000022-00-01). Save fasteners for re-installation or replace with new ones. **Note:** *Brackets are secured with M4 X 0.7 X 10 mm screws and M4 X 0.7 nuts (P/N 1-04007-0103, 01-04007-0064).*

Step	Action
	

Step	Action
	
3.	Test the RFID Tag's signal with a cell phone and/or RFID Tag reader. When re-using, carefully peel it off the old RFID bracket. If there are any issues, program and use a new RFID Tag. See RFID Programming (P/N 100039-SR-01).

Step	Action
4.	Adhere the RFID Tag on a new bracket with its microchip (blue rectangle) seated in the bracket's small rectangular recessed area (P/N 1002397-00-01). The recessed area protects the chip from breaking. 

Step	Action
5.	Hand-tighten 10 mm screws with nuts securing the bracket to a rail.

Step	Action
	

Step	Action
	
6.	Hold a screw in place with the 2.5 mm socket hex bit. Tighten the nut with 7 mm combination wrench to 19.5 in-lb (2.2 Nm). Repeat for other fastener.
7.	Repeat for other damaged brackets.

6.4 Tower Fine Position Flag Measure and Replacement

⚠ CAUTION

HEAVY OBJECT

May cause strain or back injury.

Do not attempt to lift a bot. Bots weigh up to 95 kg (210lbs.) when loaded. Do not lift the driving wheels to push or pull a disabled Bot.

Use the provided brake release tool to release the brakes on the bot, then use standard lifting techniques to push or pull the disabled bot.

Failure to do so may result in minor to moderate injury.

⚠ CAUTION

KNEE PROTECTION

Wear protective knee pads when working on catwalk or deck surfaces.

Catwalk and deck surfaces have uneven and/or have sharp edges that may cause minor to moderate injury.

The Alphabot APSD system has narrow and wide fine position flags alongside bot travel rails (P/N 1002398-00-01, 1002399-00-01). Narrow flags are located in structure tower channel locations and wide flags in tower buffer locations.
The following procedure includes, replace damaged fine position flags, verify fine position flag measurements, and bot laser alignment verification with a fine position flag.

Secure Alphabots (bots)

Step	Action
1.	Verify the Move Bots to Inspection Location[13] pre-procedure is completed. For more information on Alphabot (bot) E-stop processing see E-stop and Safe Torque Off (STO) in the Product Safety chapter of Alphabot User Manual (P/N 1000004-MN-01).
2.	Enter the system through the access door and locate a bot at an inspection location.
3.	Toggle the bot breaker switch to the OFF position. **Note:** *This does not de-energize the bot.*
4.	Turn the break box to the ON position to disengage the bot's brakes.
5.	Disengage the pinions on the bot.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>6.</td><td>
⚠ CAUTION
<table>
<tr><td>  </td><td>
HEAVY OBJECT

May cause strain or back injury.

Do not attempt to lift a bot. Bots weigh up to 95 kg (210lbs.) when loaded. Do not lift the driving wheels to push or pull a disabled Bot.

Use the provided brake release tool to release the brakes on the bot, then use standard lifting techniques to push or pull the disabled bot.

Failure to do so may result in minor to moderate injury.
</td></tr>
</table>
Verify the bot's pinions are disengaged and roll it out of the way.
</td></tr>
<tr><td>7.</td><td>Switch the bot's brake box to the OFF position engaging the bot's brakes.</td></tr>
</table>

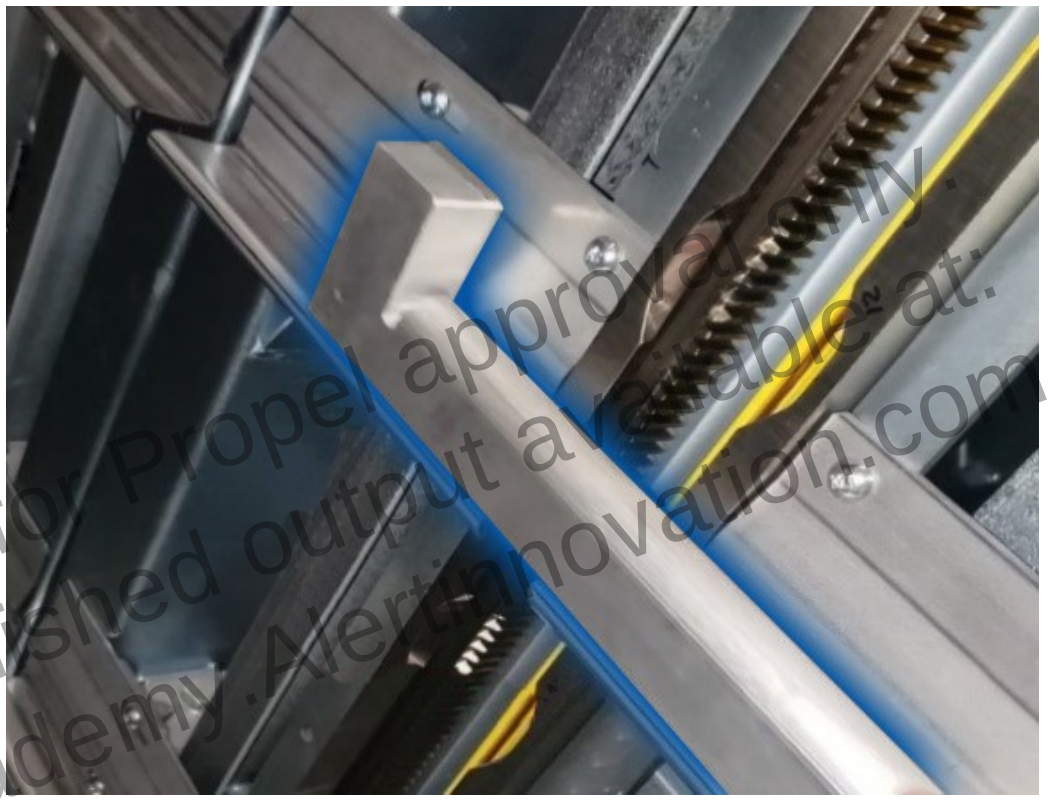
Replace Damaged Fine Position Flags

⚠ CAUTION	
	**KNEE PROTECTION** Wear protective knee pads when working on catwalk or deck surfaces. Catwalk and deck surfaces have uneven and/or have sharp edges that may cause minor to moderate injury.

This sub-procedure can be skipped when only verifying fine position flag measurements.

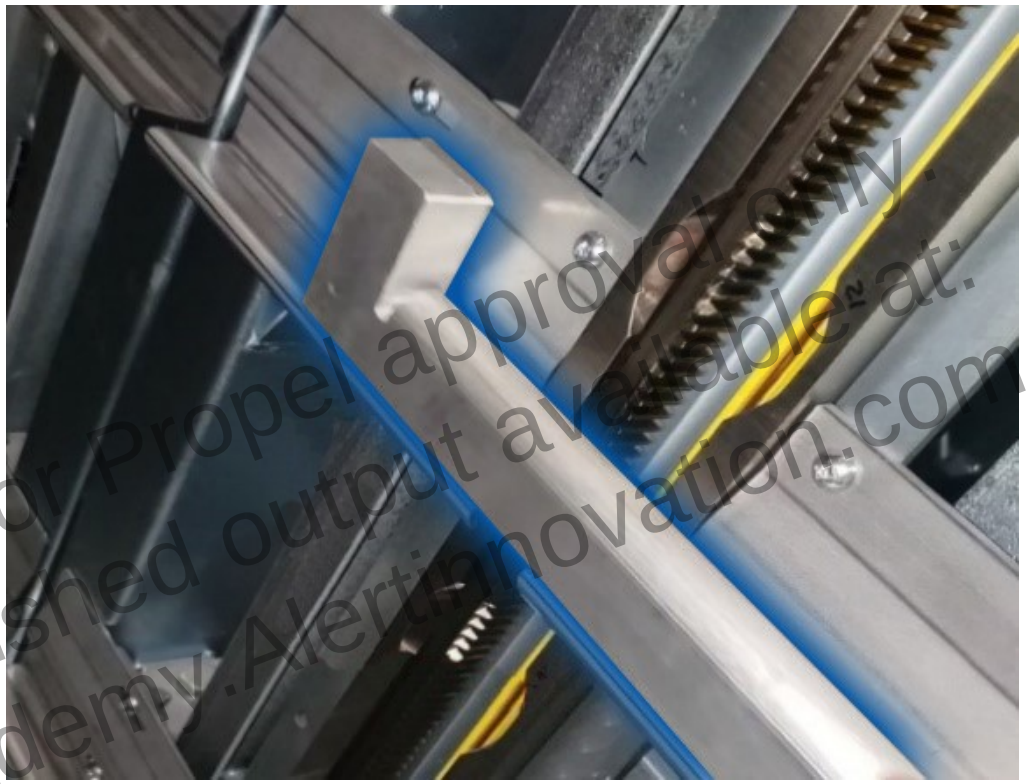
Step	Action
1.	Locate damaged fine position flag(s).

Step	Action
2.	**⚠ CAUTION**  **KNEE PROTECTION** Wear protective knee pads when working on catwalk or deck surfaces. Catwalk and deck surfaces have uneven and/or have sharp edges that may cause minor to moderate injury. Using a 3/32 inch hex wrench and 4 mm Hex T Handle, loosen and remove 2 countersink screws that secure a fine position flag to railing (P/N (tools) 7000018-00-01, 7000008-00-01). **Note**: *this structure drill hole is a 0.281 inch outside diameter and a screw P/N was not available in Propel.*
3.	Replace damaged or missing fine position flags with a matching narrow or wide flag (P/N 1002398-00-01, 1002399-00-01).

Step	Action
4.	Before tightening, measure its distance from an engagement point. Place a straight edge on the rail near the engagement point. Slide the straight edge along the rail through the engagement point ensuring it slides freely. 

Step	Action
5.	Measure a total distance of 2 ft from the channel end to the fine position flag end. 
6.	Attach the flag by holding steady the countersink screw with 4 mm Hex T Handle (P/N-tool, 7000018-00-01). Tighten the nut with a 3/32 hex wrench to 19.5 in-lb (2.2 Nm) (P/N-tools, 7000008-00-01).

Verify Fine Position Flag Measurements

Step	Action
1.	Place a straight edge on the rail near the engagement point. Slide the straight edge along the rail through the engagement point ensuring it slides freely. 

Step	Action
2.	Measure a total distance of 2 ft. from the channel end to the flag's end. 
3.	When the measurement is not 2 ft, loosen the flag from railing with a 3/32 inch hex wrench and 4 mm Hex T Handle (P/N 7000018-00-01, 7000008-00-01). Repeat steps 2 and 3 correctly measuring and positioning a flag. Tighten the nut with a 3/32 hex wrench to 19.5 in-lb (2.2 Nm).
4.	Repeat for other fine position flags.

Bot Laser Alignment Verification with Fine Position Flag

⚠ WARNING

MAGNETIC FIELD

Can be harmful to pacemaker wearers.

Pacemaker wearers approaching bots during troubleshooting or servicing must stay a minimum of 30 cm (12 in.) away from traction wheels and electronic assemblies.

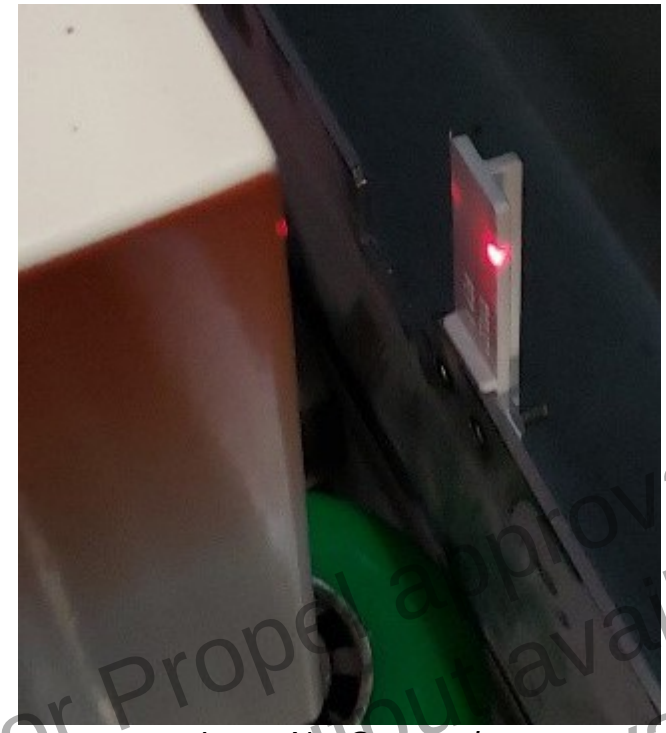
Failure to follow these guidelines could result in serious injury or death.

Perform a bot sensor alignment anytime a fine position flag was repaired or adjusted.

Step	Action
1.	Return to a bot.
2.	Switch the brake box tool to the ON position releasing the bot's brakes.
3.	Roll the bot to the fine position flag and position it in the tower's engagement location. The engagement location's y-axis is 0.2 or 0.4.

Step	Action
4.	**⚠ WARNING**  **MAGNETIC FIELD** Can be harmful to pacemaker wearers. Pacemaker wearers approaching bots during troubleshooting or servicing must stay a minimum of 30 cm (12 in.) away from traction wheels and electronic assemblies. Failure to follow these guidelines could result in serious injury or death. Turn a bot's main power ON and wait for the red laser sensor. DO NOT engage the bot's pinions.

Step	Action
5.	Verify the bot's red laser dot is positioned at the center of the fine position flag. If the laser dot is not centered, contact a supervisor to complete repair.

Step	Action
	 *Laser Not Centered*

Step	Action
	 *Laser Centered*
6.	When a laser red dot is successfully centered, extend the bot's pinions into the inspection location rails. Make note of any difficulty.
7.	Turn the brake box to the OFF position to engage the bot's brakes.
8.	Remove bot from local E-Stop condition.

Step	Action
9.	Notify manager of any difficulty or findings.

7. Post Procedures

Perform post-procedures.

7.1 Return DWS to Normal Operation

⚠ DANGER

CONFINED SPACE HAZARD

Read and follow all regulations and completely fill out the form in the Alert Innovation Inc. Confined Space Program (PN 1000011-SF-01).

Known confined space areas:

- Freezers
- Structures when catwalks are open
- Dynamic Workstations (DWS)

Minimum PPE required:

- Hard Hat
- Safety Glasses
- Safety Harness
- Safety Shoes

Failure to comply will result in serious injury or death.

⚠ CAUTION

HEAVY OBJECT

May cause strain or back injury.

Do not attempt to lift a bot. Bots weigh up to 95 kg (210lbs.) when loaded. Do not lift the driving wheels to push or pull a disabled Bot.

Use the provided brake release tool to release the brakes on the bot, then use standard lifting techniques to push or pull the disabled bot.

Failure to do so may result in minor to moderate injury.

Perform DWS System Exit & Lockout/Tagout

Step	Action
1.	Remove the lock and tag from the side door lock(s). 

Step	Action
2.	**⚠ CAUTION** **HEAVY OBJECT** May cause strain or back injury. Do not attempt to lift a bot. Bots weigh up to 95 kg (210lbs.) when loaded. Do not lift the driving wheels to push or pull a disabled Bot. Use the provided brake release tool to release the brakes on the bot, then use standard lifting techniques to push or pull the disabled bot. Failure to do so may result in minor to moderate injury. Grab the black handles and install the DWS door(s).

Step	Action
	

Step	Action
3.	Lock the side door(s) pushing the door pin inwards. 
4.	Clear the area of tools and ensure no personnel are on the decks or standing around the DWS before re-starting operation.

7.2 Return APSD to Normal Operation

See Recovering System Request to Enter (RtE) section in Alphabot APSD Lockout/Tagout Procedure (P/N 1000035-SF-01).

If using an override key, see Recovering System Entry with Override Key procedure Alphabot APSD Lockout/Tagout Procedure (P/N 1000035-SF-01).

8. Revision History

Revision	Change Number	Date	Author	Change Description
A	ECO-001010	08/21/2020	A. Kleen, Z. Howey	Initial Release
B	ECO-100427	8/31/2021	A. Kleen, Z. Howey	• Updated formatting. • "deck" is now "transit plane" • Removed PM interval. This procedure will only be used as needed. • Removed step to inspect fine position sensors and RFID tags and added to 1000013-PM-01 and 1000009-PM-01.
C	DCO-300126	03/30/2022	B. Hogan. Z. Howey	• Updated to new LTD formats. • Separated DWS and Storage repair tasks