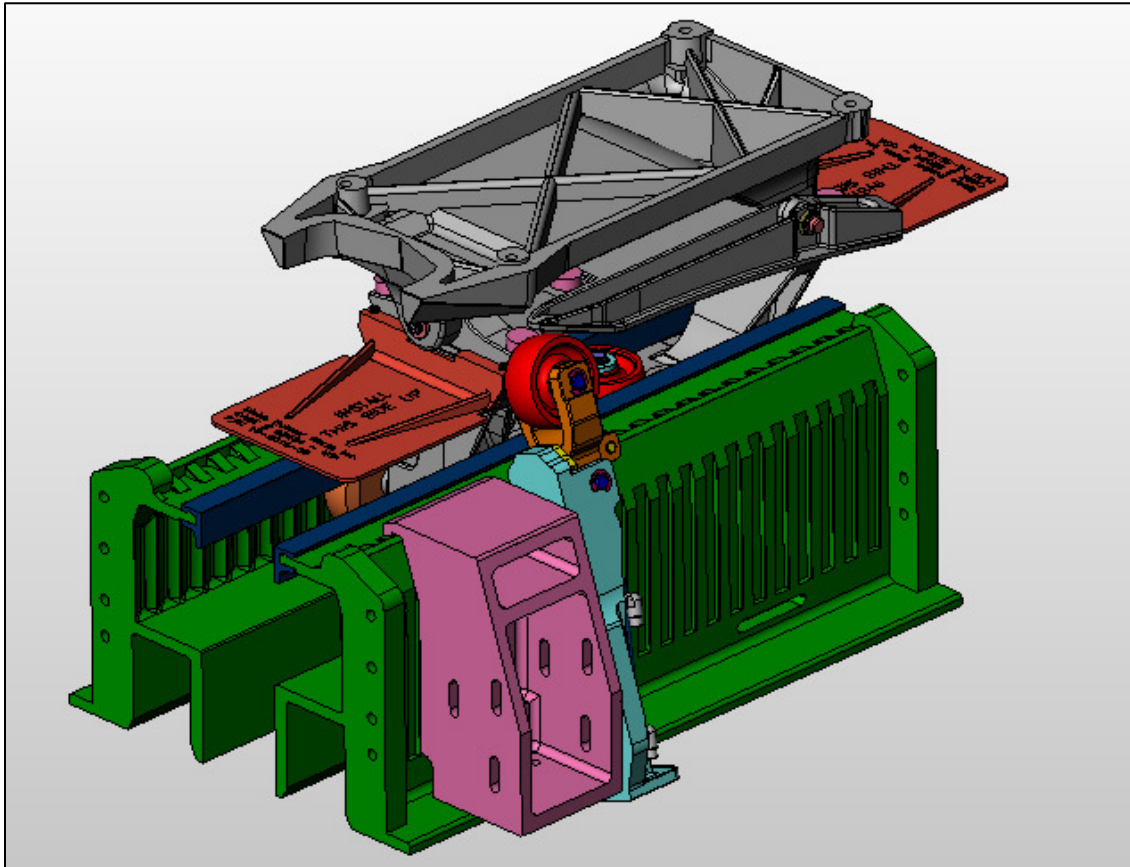


# COMPOSITE UPGRADE - CAROUSEL SORTERS MECHANICAL MAINTENANCE MANUAL

**Prepared For:**  
**United States Postal Service Material Handling Deployment**



**Project Location:** USPS NDC's

**Project Description:** Composite Upgrade Project – Tilt Tray Sorter  
(Upgrade to Rohr-Plessey Corporation, high speed, tilt tray type,  
carousel, parcel sorting machine)

**Prepared By;** Globe Composite Solutions, LLC

Volume 1 of 1

Release Date: April 12, 2012

Revision Level: 1

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Prepared by: Globe Composite Solutions

Globe Composite Solutions  
200 Shuman Ave  
Stoughton, MA 02072

Volume 1 of 1

Release Date: April 12, 2012

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## **EXPLANATION**

This maintenance handbook supports field and shop maintenance of chain driven composite component carousel package and sack sorters. Updated versions or change packages will be issued as future needs demand.

This manual is specifically developed to assist the USPS Official in charge at the mail handling facility, covered under this contract, in maintaining the mail processing equipment. It is not intended as a replacement of, or substitute for, existing USPS developed criteria. Manufacturer's recommendations set forth for certain components must be followed during the complete warranty period for that equipment.

**DISTRIBUTION:** As Per USPS M-6000

**TESTS/ACCEPTANCE PROCEDURES:**

**EIGHT HOUR TEST:**

Eight Hour Test inspection procedures are defined in USPS-M- 6000, (version 1.0, April 2, 2004) and as modified by USPS project specific requirements.

**FORTY-FIVE DAY TEST:**

Forty-five Day Test inspection procedures are defined in USPS-M-6000, (version 1.0, April 2, 2004) and as modified by USPS project specific requirements.

## **Revision Log**

**Rev -: Draft Release August 1, 2011**

**Rev 1: April 12, 2012: Updated Rub Strip Installation Drawing on Page 7-17**

# Table of Contents

1.	INTRODUCTION .....	1-1
1.1.	HOW TO USE THIS HANDBOOK.....	1-1
1.1.1.	Contents .....	1-1
1.1.2.	Access Aids .....	1-1
1.2.	ABBREVIATIONS AND ACRONYMS.....	1-2
1.3.	SCOPE.....	1-3
1.4.	CAROUSEL SORTER OPERATION .....	1-3
1.4.1.	General Operation Narrative .....	1-3
2.	GLOSSARY OF TERMS.....	2-1
2.1.	Induction Stations.....	2-1
2.2.	Carriage Assemblies .....	2-1
2.3.	Tip Up Assemblies .....	2-1
2.4.	Tray Straightening Cams .....	2-1
2.5.	Parcel Centering Device .....	2-1
2.6.	Track.....	2-1
2.7.	Bull Gear.....	2-1
2.8.	Chain.....	2-1
3.	PREVENTATIVE MAINTENANCE.....	3-1
3.1.	GENERAL.....	3-1
3.2.	CLEANING AND INSPECTION.....	3-1
3.2.1.	Debris .....	3-1
3.2.2.	Damage .....	3-1
3.2.3.	Wear.....	3-1
3.2.4.	Deformity .....	3-2
3.2.5.	Structural Integrity.....	3-2
3.3.	LUBRICATION AND CLEANING SCHEDULES.....	3-2
3.4.	GENERAL MAINTENANCE PRODECURES.....	3-2
3.4.1.	Carriage Replacement.....	3-2
3.4.2.	Tip Up Replacement .....	3-3
3.4.3.	Track Replacement .....	3-4
3.4.3.1.	Straight Section (each side).....	3-4
3.4.3.2.	Curved Section (each side).....	3-5
3.4.3.3.	Access Track Section (each side) .....	3-6
3.4.4.	Chain Link Replacement.....	3-8
3.4.5.	Chain Slack Compensation Procedure (inlet and outlet) .....	3-10
4.	TROUBLE SHOOTING GUIDE .....	4-1
4.1.	INTRODUCTION.....	4-1
4.2.	TROUBLESHOOTING PROCEDURES .....	4-1
4.2.1.	Carriage Troubleshooting Procedures .....	4-1
4.2.2.	Tip up Troubleshooting Procedures.....	4-4
4.2.3.	Track Trouble Shooting Procedures .....	4-6
4.2.4.	Chain Trouble Shooting Procedures.....	4-7
5.	SAFETY PRECAUTIONS.....	5-1
5.1.	INTRODUCTION.....	5-1
5.2.	IDENTIFICATION OF SAFETY STATEMENTS.....	5-1
5.3.	SAFETY PRECAUTIONS.....	5-2
5.4.	SAFETY DEVICE DEFINITION.....	5-3
5.4.1.	Lockouts.....	5-3

5.4.2.	Tagouts.....	5-3
6.	TOOL LIST .....	6-1
6.1.	INTRODUCTION.....	6-1
6.2.	TIP UP LOCATING FIXTURE # 07-11-1000.....	6-1
7.	GCS PRODUCT BULLETINS .....	7-1
7.1.	COMPOSITE MATERIAL DESCRIPTION .....	7-1
7.2.	COMPOSITE COMPONENT EQUIPMENT DESCRIPTION .....	7-1
7.2.1.	Carriage Assembly (Fig 7.1, 7.2, 7.3, 7.4) .....	7-1
7.2.1.1.	Introduction .....	7-1
7.2.1.2.	Specifications/Characteristics .....	7-2
7.2.1.3.	Assembly (See Fig 7.1).....	7-2
7.2.2.	Tip Up Assembly (Fig 7.5, 7.6, 7.7).....	7-8
7.2.2.1.	Introduction .....	7-8
7.2.2.2.	Specifications/Characteristics .....	7-9
7.2.2.3.	Assembly of Tip-Up Mechanism (See fig 7.5) .....	7-9
7.2.2.4.	Assembly of Index Mount to Track and Tip-Up to Index Mount (See fig 7.6) .....	7-10
7.2.3.	Track Assembly .....	7-14
7.2.3.1.	Introduction .....	7-14
7.2.3.2.	Specifications/Characteristics .....	7-15
7.2.3.3.	Assembly .....	7-25
7.2.4.	Chain Assembly (Fig 7.16) .....	7-26
7.2.4.1.	Introduction .....	7-26
7.2.4.2.	Specifications/Characteristics .....	7-26
7.2.4.3.	Assembly (See fig 7.16).....	7-27
7.2.4.4.	Chain Installation.....	7-27
7.2.4.5.	Carriage Assembly to Chain.....	7-28
7.2.4.6.	Adjusting Chain Slack (Static Method) .....	7-28
7.2.4.7.	Adjusting Chain Slack using a Strobe/Tachometer .....	7-28
7.2.4.8.	Replacing Chain Link Installed on Sorter.....	7-30
7.2.5.	Static Dissipation – Grounding (Fig 7.18) .....	7-33
7.2.5.1.	Introduction .....	7-33
8.	GCS PRODUCT WARRANTY .....	8-1
8.1.	INTRODUCTION.....	8-1
8.2.	WARRANTY.....	8-1
8.3.	WARRANTY AND GUARANTEE EXCLUSIONS .....	8-1
8.4.	HANDLING OF DEFECTIVE PARTS .....	8-2
9.	PARTS INFORMATION.....	9-1
9.1.	COMPOSITE SORTER ASSEMBLY (FIGURE AND TABLE) .....	9-1
9.2.	HORIZONTAL CAROUSEL ASSEMBLY (FIGURE AND TABLE).....	9-2
9.3.	COMPOSITE CHAIN ASSEMBLY (FIGURE AND TABLE).....	9-3
9.4.	TIP-UP ASSEMBLY AND (9.5) MOUNT ASSEMBLY (FIGURES & TABLES).....	9-4
9.6.	EXPANSION JOINT ASSEMBLY (FIGURE AND TABLE).....	9-5
9.7.	ACCESS DOOR ASS'Y WITH 6FT DOOR (FIGURE AND TABLE).....	9-6
9.8.	STRAIGHT TRACK BOLT-UP ASSEMBLY (FIGURE AND TABLE).....	9-7
9.9.	INSIDE CURVE TRACK ASSEMBLY (FIGURE AND TABLE).....	9-8
9.10.	OUTSIDE CURVE TRACK ASSEMBLY (FIGURE AND TABLE).....	9-9
9.11.	CUSTOM END FLANGE WITH SHIM (FIGURE AND TABLE).....	9-10
9.12.	STATIC DISSIPATION KIT ASSEMBLY (FIGURE AND TABLE).....	9-11

## List of Tables

Table 2-1	Glossary of Terms .....	2-1
Table 4-1	Carriage Assembly Troubleshooting Guide.....	4-1
Table 4-2	Tip up Assembly Troubleshooting Guide.....	4-4
Table 4-3	Track Assembly Troubleshooting Guide.....	4-6
Table 4-4	Chain Assembly Troubleshooting Guide.....	4-7
Table 7-1	Carriage Assembly Specifications/Characteristics.....	7-2
Table 7-2	Tip up Assembly Specifications/Characteristics.....	7-9
Table 7-3	Track Assembly Specifications/Characteristics .....	7-15
Table 7-4	Track Assembly Hardware Specifications .....	7-20
Table 7-5	Straight to Curved Track Assembly Hardware Specifications .....	7-21
Table 7-6	Chain Assembly Specifications/Characteristics.....	7-26
Table 9-1	Composite Sorter Assembly.....	9-1
Table 9-2	Horizontal Carousel Carriage Assembly .....	9-2
Table 9-3	Composite Chain Assembly .....	9-3
Table 9-4,5	Tip up Assembly and Mount.....	9-4
Table 9-6	Expansion Joint Assembly .....	9-5
Table 9-7	Access Door with 6ft Door .....	9-6
Table 9-8	Straight Track Bolt-up Assembly.....	9-7
Table 9-9	Inside Curve Track Assembly .....	9-8
Table 9-10	Outside Curve Track Assembly .....	9-9
Table 9-11	Custom End Flange with Shim.....	9-10
Table 9-12	Static Dissipation Kit assembly.....	9-11

## List of Figures

Figure 6.1	Tip Up Alignment Fixture.....	6-2
Figure 7.1	Carriage Assembly .....	7-6
Figure 7.2	Horizontal Carousel Carriage Assembly to Chain .....	7-7
Figure 7.5	Tip Up Assembly.....	7-11
Figure 7.6	Tip Up Assembly to Index Mount.....	7-12
Figure 7.7	Tip Up Installation Location .....	7-13
Figure 7.8	Straight Track Component .....	7-17
Figure 7.9	Inside Curve Track Component .....	7-18
Figure 7.10	Outside Curve Track Component.....	7-19
Figure 7.11	Straight Track Assembly Hardware Specification .....	7-20
Figure 7.12	Straight Track to Curve Track Assembly Hardware Specification .....	7-21
Figure 7.13	Access Door Assembly .....	7-22
Figure 7.14	Expansion Joint Assembly .....	7-23
Figure 7.15	Custom Length Straight Track Assembly.....	7-24
Figure 7.16	Chain Assembly .....	7-31
Figure 7.17	Adjusting Chain Slack .....	7-32
Figure 7.18	Static Dissipation - Grounding .....	7-34
Figure 9-1	Composite Sorter Assembly.....	9-1
Figure 9-2	Horizontal Carousel Carriage Assembly .....	9-2
Figure 9-3	Composite Chain Assembly .....	9-3
Figure 9-4,5	Tip up Assembly and Mount.....	9-4

Figure 9-6	Expansion Joint Assembly .....	9-5
Figure 9-7	Access Door with 6ft Door .....	9-6
Figure 9-8	Straight Track Bolt-up Assembly .....	9-7
Figure 9-9	Inside Curve Track Assembly .....	9-8
Figure 9-10	Outside Curve Track Assembly .....	9-9
Figure 9-11	Custom End Flange with Shim.....	9-10
Figure 9-12	Static Dissipation Kit assembly.....	9-11

# **SECTION 1 INTRODUCTION**

## **1. INTRODUCTION**

This section contains information on how to use this handbook, a description of the scope of this handbook, a list of abbreviations and acronyms with their meanings, and a safety summary containing general and specific warnings peculiar to composite component equipped carousel sorters.

This manual is specifically developed to assist the USPS Official in charge at the mail handling facility, covered under this contract, in maintaining the mail processing equipment. It is not intended as a replacement of, or substitute for, existing USPS developed criteria. Manufacturer's recommendations set fourth for certain components must be followed during the complete warranty period for that equipment.

### **1.1. HOW TO USE THIS HANDBOOK**

#### **1.1.1. Contents**

This handbook contains all the information necessary to identify, operate, and maintain composite component equipped carousel sorter assemblies.

Section 1: Contains general introductory information, which applies throughout the handbook.

Section 2: Contains a glossary of terms used throughout the handbook.

Section 3: Contains general maintenance information including servicing procedures, preventative maintenance procedures, removal and replacement procedures, and bench repair procedures.

Section 4: Contains a fault and troubleshooting guide.

Section 5: Contains Safety Precautions to be used when maintaining or servicing the sorting system for any reason.

Section 6: Contains a listing of tools needed or used to set up or re-verify any parameters of the composite system.

Section 7: Contains GCS product bulletins and specifications.

Section 8: Contains Warranty information including the handling of replaced components.

#### **1.1.2. Access Aids**

This handbook contains several aids to assist in locating information. The table of contents contains all major topic titles in the order found in the handbook. There is also a list of tables and a list of figures following Section 4. At the back of the handbook is an alphabetical index of all composite elements and/or their operational task.



## **1.2. ABBREVIATIONS AND ACRONYMS**

NDC	National Distribution Center
GCS	Globe Composite Solutions, Ltd.
USPS	United States Postal Service

### **1.3. SCOPE**

The scope of this handbook is limited to the description, maintenance processes, and operation of the composite components within carousel sorters. Those composite components are: carriage assemblies, tip up assemblies, track assemblies, and chain assemblies only. Please refer to appropriate publications for descriptions, maintenance procedures, and operation of all other elements comprising carousel sorters.

### **1.4. CAROUSEL SORTER OPERATION**

#### **1.4.1. General Operation Narrative**

A carousel sorter is a chain driven series of joined but independently operating carriage assemblies moving within a track system elevated above designated sorting locations. Mail (parcels or sacks) is individually coded and distributed to the carriages at induction stations via a series of variable speed conveyors. The coded mail is transported via the now similarly coded carriage assembly around the track circuit until arrival at its particular sorting station where a tip up assembly activates to tip the mail from the carriage assembly's tray and into the predetermined container. The carriage assembly continues empty on the track circuit where its carrier tray is righted and the carriage assembly is readied to accept another mail item at the induction station.

## SECTION 2

### GLOSSARY OF TERMS

## 2. GLOSSARY OF TERMS

**TABLE 2-1**  
**Glossary of Terms**

<b>Item</b>	<b>Description</b>
<b>2.1. INDUCTION STATIONS</b>	Mail enters a carousel sorter through induction stations located usually at the ends loops of the sorter's track circuit. Each induction station electronically code each mail item and, through a system of variable speed conveyors, places the coded mail item on a carriage assembly for transport to the desired sorting location (i.e. zip code or area collection container) for transshipment.
<b>2.2. CARRIAGE ASSEMBLIES</b>	The carriage assembly transports the coded mail items from the induction station to the desired sorting location. The carriage assembly is a four-wheeled vehicle, mounted to a moving chain/track system, which in turn transports the carriage assembly throughout the carousel sorter's track circuit of sorting locations.
<b>2.3. TIP UP ASSEMBLIES</b>	A tip up assembly is an air operated, electrically controlled actuator. The function of the tip up assembly is to place its roller into the path of an on-coming carriage assembly so as to cause the assembly's tray to tip up and deposit the mail item into the predetermined, desired sort location. Tip up actuation timing is determined by the mail items coding assigned at the induction station.
<b>2.4. TRAY STRAIGHTENING CAMS</b>	The tray re-establishing cams are designed to engage a tilted tray at the correct angle and guide it smoothly to a horizontal position where it can be re-latched.
<b>2.5. PARCEL CENTERING DEVICE</b>	The parcel centering device is specifically designed to move parcels from the sides of the carrier trays to a point on the tray which will center the load directly over the carriage pivot pins.
<b>2.6. TRACK</b>	The carousel sorter track provides the operating surface for carriage assembly movement. The track also retains the carriage assembly and houses the moving chain.
<b>2.7. BULL GEAR</b>	The bull gear is an electrically operated, large, toothed, simple gear operating around a vertical axis. Its purpose is to move the sorter chain around the track circuit.
<b>2.8. CHAIN</b>	The sorter chain is a series of interlocked links each with specially designed link openings to accommodate the bull gear teeth and each with carriage assembly attachment points.

## **SECTION 3 PREVENTATIVE MAINTENANCE**

### **3. PREVENTATIVE MAINTENANCE**

#### **3.1. GENERAL**

Composite preventive maintenance procedures tend to be more inspection/remedy driven in contrast to the traditional continuous servicing activities required of metallic components. Composite components are self-lubricating and resistant to wear and will provide years of trouble free operation requiring only minor maintenance activity. However, with any complex machine containing thousands of moving parts and especially with composite components, preventative maintenance is the component toward assuring continued operational status.

**It is vitally important that maintenance personnel conduct frequent inspections for debris, damage, wear, deformity, and structural integrity.**

#### **3.2. CLEANING AND INSPECTION**

It is anticipated that each USPS installation supporting composite equipped carousel sorters will detail their own inspection schedule based on their installation's work cycles and mail volume. However, it is recommended that, until the composite component sorters have been in service for an extended length of time that inspection frequencies remain high until otherwise operationally warranted.

The following sections **recommend minimum inspection intervals.**

##### **3.2.1. Debris**

Debris within the track structure, lodged between the carriages assemblies, or within the bull gear environment is detrimental to sorter operation and may damage sorter components. It is recommended that debris inspections be conducted and the debris removed each working day.

##### **3.2.2. Damage**

Any damage, no matter how seemingly insignificant, to any composite component indicates a symptom of a greater problem within the sorter, which should be investigated and remedied immediately. It is recommended that general visual inspections be an integral part of the daily debris inspection.

##### **3.2.3. Wear**

Visible wear, scratches, or discoloration of any kind on a composite component also indicates a systemic problem requiring immediate investigation and remedy. Irregular wheel wear (carriage and tip up assemblies or chain rollers), scratches or wear marks on carriage assemblies or track sections all indicate unanticipated wear. It is recommended that comprehensive wear inspections be conducted weekly immediately after composite installation and monthly as warranted thereafter.

### **3.2.4. Deformity**

Deformity is defined as any distortion of the composite component or its alignment. Maintenance personnel should incorporate a general deformity check in their daily debris/damage inspection.

The major source of deformity is the composite chain, which should be inspected at the bull gear exit during startup for “chain whip” which, if present, would indicate that the chain has stretched (deformed) and compensation is required. The chain should be inspected daily, especially within the first sixty (60) days following composite component installation.

### **3.2.5. Structural Integrity**

Maintenance personnel should always be watchful of loose or vibrating composite track sections. Of special concern are the curved sections and those sections forming the inlet, radius, and outlet of the bull gear. Maintenance personnel should also inspect the security of the tip up mounts, tip ups, and track access panels. General structural integrity concerns should be an integral component to the daily debris/damage inspections.

The composite chain is made of a light colored material so as to aid the inspector to more readily see potential cracks or flaws as the inevitable environmental dirt fills these potential cracks and shows up as a dark line. It is recommended that these chain inspections be conducted weekly until warranted otherwise.

## **3.3. LUBRICATION AND CLEANING SCHEDULES**

The various components of the composite sorting system do not require periodic lubrication. GCS has designed the components and selected materials that are self-lubricating without the need for any external lubricants such as oils, grease, etc.

Any component lubrication that may be needed for assembly of carriages, etc. is done by GCS prior to shipment. Any lubrication used by GCS during the assembly process is noted in section 3.4 below.

## **3.4. GENERAL MAINTENANCE PRODECURES**

### **3.4.1. Carriage Replacement**

1. Engage and secure sorter cutoff switch.

<b>WARNING</b>
----------------

Failure to engage sorter shutoff switch may allow inadvertent sorter restart and possible personal injury.

2. Move effected carriage assembly to one of the track access panels.
3. Open access panel and remove two chain attachment bolts.
4. Remove any hammock or debris catcher from ends of carriage yoke module.
5. Remove carriage assembly.
6. Set new carriage assembly in place and secure with two chain attachment bolts.
7. Attach hammocks or debris catchers to ends of carriage yoke module.
8. Check all for secure fit
9. Replace track access panel.
10. Disengage sorter cutoff switch if appropriate.

**WARNING**

Do not disengage sorter cutoff switch until certain all personnel and equipment are clear of the area.

### **3.4.2. Tip Up Replacement**

1. Engage and secure sorter shutoff switch.

**WARNING**

Failure to engage sorter shutoff switch may allow inadvertent sorter restart and possible personal injury.

2. Disconnect electric controller from tip up assembly.
3. Disconnect air line from tip up assembly.
4. Retract tip up actuator if extended
5. Remove three bolts from tip up body.
6. Remove tip up assembly from tip up mounting block.
7. Install new tip up assembly with three attachment bolts.

8. Check for proper alignment and adjust as necessary.
9. Check for secure fit.
10. Install air line to tip up assembly.
11. Install electric controller contacts to tip up assembly.
12. Check all for secure fit.
13. Check for proper activation and freedom of motion.
14. Disengage sorter shutoff switch.

**WARNING**

Do not disengage sorter cutoff switch until certain all personnel and equipment are clear of the area.

### **3.4.3. Track Replacement**

#### **3.4.3.1. Straight Section (each side)**

This procedure holds true for all straight track components including custom length tracks and expansion joints.

1. Engage and secure sorter shutoff switch.

**WARNING**

Failure to engage sorter shutoff switch may allow inadvertent sorter restart and possible personal injury.

2. Remove carriage assemblies from effected area.
3. Remove centering wheel rub strip from top of effected track section
4. Remove flange bolts from each end of effected track section.
5. Remove box beam attachment bolts from effected track section.
6. Lift track section off box beam and away from area.

**WARNING**

Track sections, especially curve track sections, are very heavy and awkward to maneuver in cramped work areas.

7. Place appropriate new track section on to box beam.
8. Secure with attachment bolts.
9. Secure each track section end flange with attachment bolts.
10. Replace centering wheel rub strip to top of track section using a soft mallet to assist in seating.
11. Check and remove all debris from track channel and work area.
12. Check all for form and secure fit.
13. Replace carriage assemblies
14. Disengage sorter shutoff switch.

**WARNING**

Do not disengage sorter cutoff switch until certain all personnel and equipment are clear of the area.

**3.4.3.2. Curved Section (each side)**

1. Engage and secure starter cutoff switch.

**WARNING**

Failure to engage sorter shutoff switch may allow inadvertent sorter restart and possible personal injury.

2. Remove carriage assemblies from effected area
3. Remove centering wheel rub strip.
4. Remove flange bolts from each end of effected curve section
5. Remove “strong back” mounting bolts



6. Remove old curve section.

**WARNING**

Track sections, especially curve track sections, are very heavy and awkward to maneuver in cramped work areas.

7. Place new curve section into position.
8. Attach flange bolts to both ends of new curve section
9. Attach “strong back” bolts to new curve section
10. Attach centering wheel rub strip using a soft mallet to assist seating.

**CAUTION**

Do not allow gaps or breaks in the centering wheel race strip.  
Such gaps will subject the centering wheel and other components to unnecessary vibration

11. Check all for secure attachment.
12. Disengage sorter shutoff switch.

**WARNING**

Do not disengage sorter cutoff switch until certain all personnel and equipment are clear of the area.

**3.4.3.3. Access Track Section (each side)**

1. Engage and secure sorter shutoff switch.

**WARNING**

Failure to engage sorter shutoff switch may allow inadvertent sorter restart and possible personal injury.

2. Remove carriage assemblies from effected area.

3. Remove flange bolts from each end of the access track section.
4. Remove box beam attachment bolts from access track section.
5. Lift access track section off box beam and away from area.

**WARNING**

Composite track components are heavy and awkward to maneuver in cramped work areas.

6. Place appropriate new access track section on to box beam.
7. Secure with attachment bolts.
8. Secure each access track section end flange with attachment bolts.
9. Install centering wheel rub strip to top of access track if required using a soft mallet to aid in seating.

**CAUTION**

Do not allow gaps or breaks in the centering wheel strip. Such gaps subject will subject the centering wheel and other components to unnecessary vibrations.

10. Check and remove all debris from track channel and work area.
11. Check for freedom of movement
12. Check all for form and secure fit.
13. Replace carriage assemblies
14. Disengage sorter shutoff switch.

**WARNING**

Do not disengage sorter cutoff switch until certain all personnel and equipment are clear of the area.

### 3.4.4. Chain Link Replacement

1. Secure sorter by implementing appropriate LOCKOUT and/or TAGOUT procedures (see Sections 5.4.1 and 5.4.2).

#### **WARNING**

Failure to implement appropriate LOCKOUT and/or TAGOUT procedures may allow inadvertent sorter restart and possible personal injury.

#### **NOTE**

Attempt to move the chain link to be replaced to one of the track access panel locations to gain better access to chain links.

2. Remove carriage assemblies from effected chain link(s).

#### **NOTE**

It is usually necessary to remove a minimum of three (3) carriage assemblies to gain proper access to the chain link to be removed. Additional carriage assemblies may be removed if required.

3. Remove chain wheel cotter pins from the effected chain link or series of links to be replaced wrench.

#### **NOTE**

On those occasions where the chain is still taught, it may be necessary to relieve this pressure to aid in chain disassembly. Use of a “come along” secured between the two end-most carriage assemblies usually provides sufficient relief. Use of the bull gear compensating mechanism to relieve chain tension should only be used as a last resort.

As an aid to wheel retaining pin removal, it is recommended that the adjoining links' chain wheel retaining pins be loosened but not removed. This action has proven to provide a greater degree of chain link movement and free up the effected chain links wheel pins making for easier removal.

4. Separate the end links by manually pulling the links apart at the pivot of each link or link series.

**CAUTION**

Do not force the links apart by prying or using a sharp instrument as permanent damage to the link pinion and race may occur. If links do not separate freely, use a blunt punch in the center of the pinion to separate the links.

5. Remove chain wheels from effected links.
6. Remove the old link or link series from work area.
7. Position new link or link series in track chain channel.

**NOTE**

If replacing a link series, it is recommended that the chain series be assembled before placing in track chain channel to aid in the ease of assembly.

8. Place chain wheels on pinions
9. If required, use a blunt mallet to press the pinion (with chain wheel) into adjacent link pinion race.
10. Secure with cotter pin.
11. Repeat for each chain pivot required.
12. Check all for security of fit and freedom of movement.
13. Replace all removed carriage assemblies.
14. Check all for security of fit.
15. Reactivate sorter by implementing appropriate LOCKOUT and/or TAGOUT procedures.

**WARNING**

Do not reactivate sorter until certain all personnel and equipment are clear of the area.

### **3.4.5. Chain Slack Compensation Procedure (inlet and outlet)**

1. Secure sorter by implementing appropriate LOCKOUT and/or TAGOUT procedures (see Sections 5.4.1 and 5.4.2).

#### **WARNING**

Failure to implement appropriate LOCKOUT and/or TAGOUT procedures may allow inadvertent sorter restart and possible personal injury.

2. Loosen bolts on the metal expansion tracks that are adjacent to bull wheel
3. Rotate bull gear position adjustment slide bolts to take out chain slack, following the procedure outlined in section 7.2.4.6 and/or 7.2.4.7 below.

#### **NOTE**

(Alternate movement of bull gear slide bolts to assure equal openings in the inlet and outlet chain adjustment track openings.)

4. Check for form and secure fit.
5. Reactivate sorter by implementing appropriate LOCKOUT and/or TAGOUT procedures.

#### **WARNING**

Do not reactivate sorter until certain all personnel and equipment are clear of the area.

## SECTION 4 TROUBLE SHOOTING GUIDE

### 4. TROUBLE SHOOTING GUIDE

#### 4.1. INTRODUCTION

Trouble shooting is always a function of problem recognition, determination of cause, and then taking appropriate remedial action. Composite equipped carousel sorters should efficiently operate at optimal speed with minimal noise and without erratic movements such as vibration or snap movements. Any deviation from these operational norms indicates a problem within the sorter composite mechanisms and should be investigated immediately.

#### 4.2. TROUBLESHOOTING PROCEDURES

##### 4.2.1. Carriage Troubleshooting Procedures

**TABLE 4-1**  
**Carriage Assembly Troubleshooting Guide**

TROUBLE	PROBABLE CAUSE	CORRECTION
Carriage Assemblies are moving erratically exiting the bull gear.	Loose chain	Inspect for chain whip by viewing moving chain from under the chain channel exiting the bull gear. If chain links are buckling exiting the bull gear then tighten chain slack.
	Debris lodged in track	Inspect bull gear exit track section and remove debris.
	Track damage	Inspect track for damage or misalignment. Repair or replace as appropriate.
Carriage Assemblies are moving erratically entering the bull gear.	Poor bull gear teeth and chain alignment	Check for excessive bull gear tooth wear.  Check for proper chain bull gear tooth alignment.
Carriage Assembly is not tipping.	Misalignment or damage of entrance track.	Check track condition and alignment. Readjust, repair or replace as appropriate.
	Carriage Assembly is damaged.	Check for index lever and tray assembly freedom of

	<p>Tip up assembly is damaged.</p> <p>Tip up assembly is not correctly activating.</p> <p>Tip up assembly is out of proper alignment.</p>	<p>movement.</p> <p>Check for damaged Carriage Assembly index lever(s)</p> <p>Check for missing index lever spring.</p> <p>Check for damaged tip up assembly. Repair or replace as required.</p> <p>Check for damaged or clogged airlines.</p> <p>Check for proper tip up control inputs.</p> <p>Check for proper alignment and readjust as required.</p>
Carriage Assembly index lever and carrier tray do not exhibit freedom of movement.	<p>Index lever pivot pin is not rotating.</p> <p>Carrier tray pivot pins are not rotating.</p>	<p>Check pivot pin for damage, dirt, or distortion. Clean or replace as required.</p> <p>Check carrier tray pivot pins for damage, dirt, or distortion. Clean or replace as required.</p>
Carriage Assembly is not resetting after index pin release.	<p>Index pin is not resetting in index plate seat.</p> <p>Index pin is missing.</p> <p>Damaged index lever pin seat.</p> <p>Tray re-establishers are out of alignment, damaged or missing.</p>	<p>Check for damaged or missing index pin.</p> <p>If index pin is present and undamaged, and the index plate seat is undamaged grease index pin and return to service.</p> <p>Replace index pin.</p> <p>Inspect index lever plate seat for damage and replace index lever if damaged.</p> <p>Repair and/or realign tray re-establishers.</p>

Carriage Assembly is not aligned with the track.	Broken carriage assembly attachment pin.	Inspect for broken or missing alignment pin(s) and replace as required.
	Damage carriage assembly centering wheel.	Inspect carriage wheel centering wheel for damage and replace as required.
	Carriage assembly installed incorrectly.	Realign carriage assembly.
	Track obstruction.	Inspect track and remove obstruction.
Carriage Assembly shows scarring.	Track obstruction.	Inspect track for debris or obstructions.
	Track damage.	Inspect track for visible damage and replace as necessary.
Carriage Assembly rocks back and forth while transversing the sorter.	Worn or damaged carriage assembly wheels.	Inspect carriage assembly wheels and replace as required.
Carriage Assembly vibrates while transversing the sorter.	Track debris.	Inspect track and remove debris.
	Damaged carriage assembly wheels.	Inspect carriage assembly wheels and replace as necessary.



**4.2.2. Tip up Troubleshooting Procedures**

**TABLE 4-2**  
**Tip up Assembly Troubleshooting Guide**

<b>TROUBLE</b>	<b>PROBABLE CAUSE</b>	<b>CORRECTION</b>
Tip up Assembly is not operating.	<p>No power.</p> <p>Tip up assembly not receiving activation signal.</p> <p>No air supply.</p>	<p>Check for loose or disconnect power connections and repair as required.</p> <p>Check I/O signal.</p> <p>If I/O signal is operating normally, check for available cylinder air pressure.</p> <p>Check for air pressure at Tip-Up connection.</p> <p>If air pressure is present replace air cylinder.</p> <p>If air pressure is not present, check compressed air source for proper operation.</p> <p>If compressed source is operating normally, check for loose or obstructed air lines.</p>
Tip up Assembly is not tripping the Carriage Assembly.	<p>Tip up Assembly is striking the index lever too late to initiate index lever movement.</p> <p>Tip up Assembly is out of alignment.</p> <p>Tip-Up Assembly is inoperable.</p> <p>Tip-Up Assembly is not fully deploying.</p>	<p>Check and reset I/O signal as necessary.</p> <p>Check for proper alignment and adjust as necessary.</p> <p>See Tip-Up Assembly in op procedures above.</p> <p>Check for obstruction in path of Tip-Up Assembly deployment path.</p>

		Check for specified air pressure available at cylinder actuator.
Tip up Assembly roller is damaged.	Carriage assembly index lever(s) are inappropriate striking the tip up roller.	<p>Check Tip-Up Assembly for proper alignment and replace roller as required.</p> <p>Inspect remaining Tip-Up Assemblies for similar damage. If similar damage exists, inspect carriage assembly index levers for damage and replace as required.</p>
Tip up Assembly housing is fractured.	Carriage assembly(s) or mail debris impacted tip up.	<p>Replace Tip-Up Assembly.</p> <p>Inspect remaining Tip-Up Assemblies for similar damage. If similar damage exists, attempt to locate cause of damage and repair/replace as necessary.</p>

**4.2.3. Track Trouble Shooting Procedures**

**TABLE 4-3**  
**Track Assembly Troubleshooting Guide**

<b>TROUBLE</b>	<b>PROBABLE CAUSE</b>	<b>CORRECTION</b>
Accumulation of green dust or shavings.	Chain, carriage assemblies or a foreign object is rubbing or scrapping the track.	<p>Attempt to locate source of green dust by location (inspect track system for beginning and ending traces of green dust.</p> <p>If wear source can be located, repair, remove and replace wear source as required.</p> <p>Check for foreign objects lodged within track, chain, or carriage assemblies and remove same.</p>
Track is scarred or worn.	<p>Chain, carriage assembly or foreign object is rubbing or scrapping the track.</p> <p>Track is loose or has become misaligned.</p>	<p>If scarring is within the chain channel, check for damaged chain or an obstruction or foreign object lodged in chain links.</p> <p>Also inspect carriage assemblies for foreign objects lodged either on the carriage assembly mounting assembly or lodged within the carriage assembly chassis.</p> <p>Check for proper alignment and re-secure track components to mounting box beam.</p>
Track is loose.	Track attachments bolts have loosened.	Inspect and tighten all loose attachment bolts. Be sure to also inspect the track flange attachment bolts for security.

**4.2.4. Chain Trouble Shooting Procedures**

**TABLE 4-4**  
**Chain Assembly Troubleshooting Guide**

<b>TROUBLE</b>	<b>PROBABLE CAUSE</b>	<b>CORRECTION</b>
Dark line on chain link.	Indicates chain link crack.	Replace chain link.  Inspect remaining chain links for cracking.
White dust or shavings found at bull gear entrance and/or exit.	Deterioration of bull gear teeth or chain links.	Inspect bull gear teeth for wear and replace as required.  Inspect chain links for wear and replace as required.
Chain has fractured.	Track obstruction.  Excessive wear.	Inspect entire track system and remove any obstructions.  Inspect and remove any chain link exhibiting excessive wear to the point of potentially fracturing.  Inspect track system to find potential sources of chain wear. Repair, replace, or remove any items or components suspected of contributing to chain wear or damage.  If excessive wear is prevalent, replace entire chain.

## **SECTION 5 SAFETY PRECAUTIONS**

### **5. SAFETY PRECAUTIONS**

#### **5.1. INTRODUCTION**

Safety is everyone's responsibility. There is no excuse for compromising safety and risking personal injury. This handbook contains a listing of general safety precautions as well as equipment-specific safety warnings, cautions, and notes. All of these safety precautions are provided not only to protect operating and maintenance personnel but also to provide safe and efficient equipment operation.

#### **5.2. IDENTIFICATION OF SAFETY STATEMENTS**

##### **WARNING**

Identifies a hazard or procedure that could cause bodily injury or loss of life.

##### **CAUTION**

Identifies a hazard or procedure that could result in equipment damage or destruction.

##### **NOTE**

Identifies a condition or task that requires special attention.

### 5.3. SAFETY PRECAUTIONS

- Do not wear loose fitting clothing, jewelry, ties, etc.
- Always sound warning horn before starting sorter.
- Do not work on equipment that is still in motion.
- Always stop sorter before attempting to remove debris.
- Follow all safety precautions.
- Use all appropriate safety devices/procedures (see 5.3 and 5.4).
- Do not negate LOCKOUT and/or TAGOUT devices and procedures.
- Wear appropriate protective equipment at all times.
- Keep your work area free of debris.
- Keep mentally and physically alert.
- Always use the correct tools for the job.
- Common sense is your best defense against injury.
- Avoid all hazardous conditions and report them to your immediate supervisor.
- If you don't know or are unsure, ask your supervisor.
- Don't take chances you may lose.

**UNDER NO CIRCUMSTANCES SHALL ANY PERSON STEP ON, WALK ON, STAND ON OR CROSS OVER ANY PORTION OF THE MECHANIZATION UNLESS POWER TO THE EQUIPMENT IS LOCKED OUT.**

**UNDER NO CIRCUMSTANCES SHALL ANY PERSON LEAN ON, SIT ON, KNEEL ON LAY ON, CLIMB ON, STEP ON, WALK ON, OR STAND ON A PARCEL TRAY MODULE. BI-DIRECTIONAL TIP COMPOSITE CARRIAGE MODULES ARE DESIGNED ONLY TO SUPPORT THE WEIGHT OF THE PARCEL TRAY MODULE AND THE PARCEL BEING TRANSPORTED. PARCEL TRAY MODULES MAY TIP WHEN FORCE IS APPLIED.**

**MAINTENANCE PERSONNEL MUST BE THOROUGHLY FAMILIAR WITH USPS HANDBOOK EL-803; MAINTENANCE EMPLOYEES GUIDE TO SAFETY. ALL EMPLOYEES MUST USE USPS LOCKOUT PROCEDURES.**

## **5.4. SAFETY DEVICE DEFINITION**

Working on or near exposed electrical equipment can be a hazard. Effective hazardous energy control procedures protect employees during machine and equipment servicing and maintenance in any situation where the unexpected energizing, startup, or release of stored energy could occur and cause injury to employees. While an employee is exposed or potentially come in contact with exposed electrical components or circuits; such equipment must be secured in accordance with the requirement of 29 CFR 1910 233(b)(2).

### **5.4.1. Lockouts**

Most electrical equipment utilized by the USPS, have embedded circuitry, isolating switches called “LOCKOUTS.” Such locking out mechanisms must be activated before the start of servicing or maintenance on such equipment.

### **5.4.2. Tagouts**

Where an embedded lockout switch, or other energy isolating device is incapable of being locked out as described above, a TAGOUT system must be utilized. Tagout procedures require that a safety alert tag be padlocked to the energizing element of any machine or piece of equipment undergoing servicing or maintenance. One padlock from each person working on the machine **MUST** be placed on the energy isolating element of the machine or piece of equipment.

A tag without a lock, can be employed if supplemented by at least one additional safety measure that provides a level of safety equivalent to that obtained by the use of a lock such as opening an additional disconnecting device, removal or isolating the circuit energizing element, blocking the controlling switch or the removal of a valve handle to reduce the likelihood of inadvertent energization.

## **SECTION 6 TOOL LIST**

### **6. TOOL LIST**

#### **6.1. INTRODUCTION**

This section contains information regarding special tools or fixtures that are used to locate composite components at assembly.

#### **6.2. TIP UP LOCATING FIXTURE # 07-11-1000**

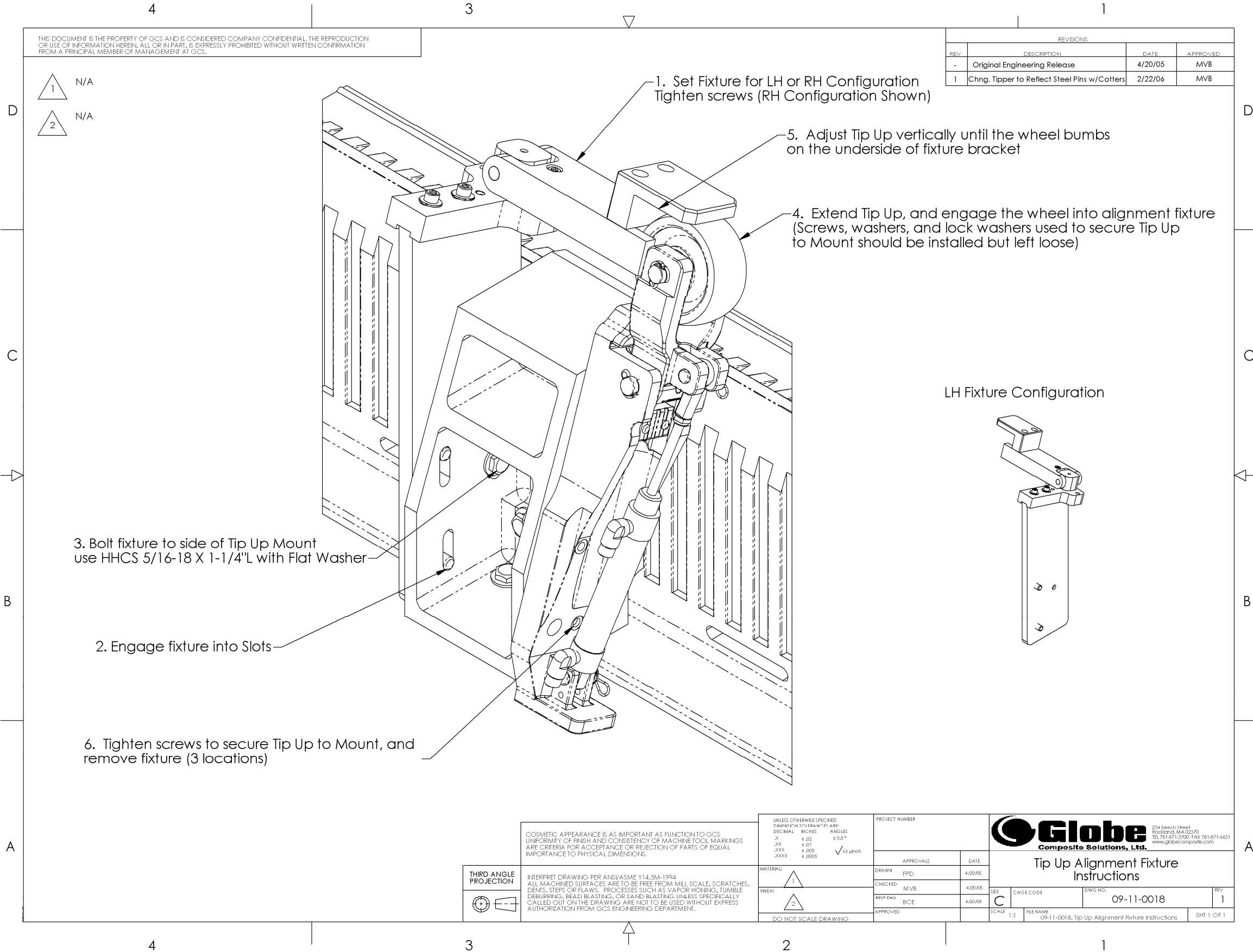
See Figure 6.1 for Instructions on how to use Tip Up locating fixture to set Tip up wheel position as illustrated in Figure 7.7. Please note that this fixture is designed to work for Tip Up Assemblies that are mounted to either side of the Tip Up Mount.

The fixture can be configured for RH or LH use as noted.



Tip Up Alignment Fixture  
Fig 6.1

GCS Document # 09-11-0115



## **SECTION 7**

# **GCS PRODUCT BULLETINS**

## **7. GCS PRODUCT BULLETINS**

### **7.1. COMPOSITE MATERIAL DESCRIPTION**

A composite is the joining together of dissimilar chemical compounds, either through a thermoplastic or thermoset process, which produces a new, unique molecular structured material. By varying the composition and ratios of these chemical compounds, a composite material can be tailored to perform very specific functions and operate in almost any environment.

The major benefit of composite materials is the reduction of emanating and reverberating noise. Composite materials are also shock resistant and thus offer greater performance flexibility, fewer repairs, and longer life cycles. Composite materials often weigh less than their steel and aluminum counterparts and subsequently exact less wear and tear on sorter system components.

Composite materials require little maintenance and are often self-lubricating, however, care should be taken to prevent composite materials from coming into contact with high strength caustic solutions or extreme heat.

The composite components detailed in this manual are actually from a family of materials called polyuremides. Each item, whether a chain link or carriage assembly yoke, is a uniquely modified polyuremide designed to perform specific tasks within a defined environment.

### **7.2. COMPOSITE COMPONENT EQUIPMENT DESCRIPTION**

#### **7.2.1. Carriage Assembly (Fig 7.1, 7.2, 7.3, 7.4)**

##### **7.2.1.1.Introduction**

##### **7.2.1.1.1. Description**

The carriage assembly is a four wheeled, mechanically operated transport vehicle. The carriage is bolted to the sorter chain, which moves the carriage around the sorter's track circuit. The carriage assembly consists of three principle components: yoke, index lever and carrier tray modules. The yoke module contains the wheel assemblies, index pin, carrier tray pivot pins, and supports the remaining carriage assembly modules. The index lever module contains the index pin seat and is the mechanical surface used for striking by the tip up assembly. The carrier tray module contains the attachment point for the index lever and the pivot pins for carrier tray tipping activation. The carrier tray module is attached to the yoke module through these pivots pins. The carrier tray module supports and is the attachment point for the carrier tray, which carries the mail item.

### 7.2.1.1.2. Theory of Operation

The carriage assembly mechanically transports mail items from the induction station to any of the sorter's coded sorting locations. Upon approaching the desired location, the appropriate tip up activates and places its roller into the path of the on-coming carriage assembly. The carriage assembly's index lever strikes and rises up onto the tip up roller. This action releases the carrier tray index pin and allows the carrier tray to pivot along the axis of the carriage assembly, allowing the mail item to slide off into the designated mail chute location and subsequent collection container.

After discharge, the carriage assembly continues on the track circuit, passes through the tray straightening device, which rights the carrier tray, reseating the index pin and locking the carrier tray back into place. The carriage assembly completes the track circuit returning to the induction station for another sortation assignment.

### 7.2.1.2. Specifications/Characteristics

**Table 7-1**  
**Carriage Assembly Characteristics**

SPECIFICATIONS/CHARACTERISTICS	DESCRIPTION
<b>Carriage Assembly</b> (fully assembled)	(Not including Tray or Mail Catchers)
Outside Dimensions:	
Height	12-1/2 inches
Width	10-1/2 inches
Length	20 inches
Weight	21.25 pounds (approximate)

### 7.2.1.3. Assembly (See Fig 7.1)

Composite carriages are normally fully assembled before shipment. When disassembly is required for component replacement or carriage re-build, reverse the assembly steps outlined below. Be sure to follow these assembly steps in their entirety when re-assembling the carriage. **Failure to follow these assembly steps may result in premature failure of carriages and/or its components.**

### **WARNING**

**Eye protection should be used for all assembly steps (below) to prevent injury.**

### **7.2.1.3.1. Yoke Assembly**

#### **Wheels**

1. To prevent bearings from rusting to the axle, wipe each axle with an oily rag prior to wheel installation.
2. Position Yoke body (P/N 02-22-0320) on its side and place a wheel (P/N 02-22-0300) on to the axle stub.
3. Place a washer (P/N 03-80-1052) on and axle bolt (P/N 03-80-1060) and thread the axle bolt into the axle stub until finger tight. Make certain that the washer is seated against the wheel bearing race, and using an appropriate torque wrench, tighten the axle bolt to 35-40 ft-lbs.
4. Repeat the above procedure for the remaining three wheels.

#### **Roller Shaft, Centering Roller**

1. Position the yoke body (P/N 02-22-0320) upright on the four wheels.
2. Put the retaining ring (P/N 03-80-1047) into the narrow groove of the roller shaft (P/N 02-30-0030)
3. Place roller (P/N 02-24-0359) onto the roller shaft with a spacer (P/N 02-30-0061) both above and below the roller on the shaft.
4. Insert the roller shaft into the center vertical hole in the yoke body.
5. Apply a drop of oil to each of two set screws (P/N 03-80-1048) and thread them into the yoke body, just shy of engaging the roller shaft.
6. Slide a .020 flat feeler gauge between the roller and the upper most spacer.
7. Press the roller shaft firmly down trapping the feeler gauge, and torque the pair set screws to between 30-35 in-lbs against the roller shaft.
8. Remove the feeler gauge and check to see that the roller turns freely. (Note: There should not be more than .020 of axial float in the roller.)

## **Bumpers**

1. Insert the four bumpers (P/N 02-24-0330) into the four mating holes in the yoke body. Pull the small ends of the bumpers down until the bumper heads are seated against the yoke body. Cut off the stems, leaving no more than ½" of stem protruding through the yoke body.

### **7.2.1.3.2. Carrier Tray Assembly**

#### **Carrier Tray Installation**

1. Apply a drop of oil to the set screw (P/N 03-80-1048) and thread the set screw into the bottom of the carrier tray (P/N 02-22-0330) to a position just shy of the pivot hole.
2. Pre-assemble the front pivot pin (P/N 02-24-0300) into the front yoke body pivot hole (from inside out) so that the pin is engaged in the hole but not protruding out the front of the yoke body.
3. Place the carrier tray on top of the yoke body (P/N 02-22-0320) with the pivots of the carrier tray forward of their corresponding pivot holes on the yoke body.
4. Align the pivot holes and:
  - a. Slide the front pivot pin out to engage the pivot hole on the carrier tray.
  - b. Insert the rear pivot pin (P/N 02-24-0310) (from inside out) through the pivot hole in the carrier tray and into the pivot hole of the yoke body.
  - c. Note: the rear pivot pin is longer than the front pivot pin, and when installed properly the pin heads should be facing each other.
5. Push the head of the rear pivot pin out to remove all clearance between the carrier tray and yoke body, and then tighten the set screw (P/N 03-80-1048) to between 30-35 in-lbs of torque.
6. Place screw (P/N 03-80-1055) through plastic washer (P/N 02-24-0353), and thread the screw into the outward facing hole in the center of the front pivot pin, until it is snug. (Do not over tighten or you will strip out the hole in the pivot pin.)

### **7.2.1.3.3. Index Lever Assembly**

#### **Bumpers**

1. Insert Pad (P/N 02-24-0340) into the lock notch in the index lever (P/N 02-22-0340)
2. Insert two bumpers (P/N 02-24-0330) into the corresponding holes in the index lever, and pull the small ends of the bumpers through until the bumper heads are seated. (It's not necessary to cut off the stems.)

#### **Index Lever Installation into Overall Assembly**

1. Place the Index Lever (P/N 02-22-0340) inside the Yoke/Carrier Tray assembly, by moving its rear arms around the narrow lower portion of the Yoke body and then rotating the Index Lever into rough forward alignment.
2. Place Spring (P/N 03-80-1062) on its locating stub on the forward part of the index lever.
3. Raise the index lever into position so that the spring seats on the corresponding stub on the underside of the Carrier Tray (P/N 02-22-0330) and so that the pivot holes for the index lever align with the corresponding holes in the carrier tray.
4. Insert the Index Lever Bolt (P/N 03-80-1061) through the Index Lever, and Carrier Tray and engage Locknut (P/N 03-80-1049) on the opposite end.
5. Tighten the locknut until all the clearance between the Index Lever and Carrier Tray is removed, but so that the Index Lever is free to rotate up/down without drag.

#### **Note**

Over tightening of the locknut will prevent the proper operation of the carrier tray pivot pin.

#### **Index Lock-pin**

1. Slide the Index Lock-pin (P/N 02-24-0357) through the corresponding hole in the front of the Yoke Body (P/N 02-22-0320). (The cross drilled hole in the Lock-pin should be closest to your hand as you install it in the Yoke Body.)
2. Raise the Index Lever against spring pressure and slide the Index Lock-pin into the notch of the index lever, and then release the Index Lever allowing it to drop onto the Index Lock-pin.
3. Align the cross drilled hole in the Index Lock-pin with the mating hole in the Yoke body, and insert Spring Pin (P/N 03-80-1063) to secure the Index Lock-pin to the Yoke Body.

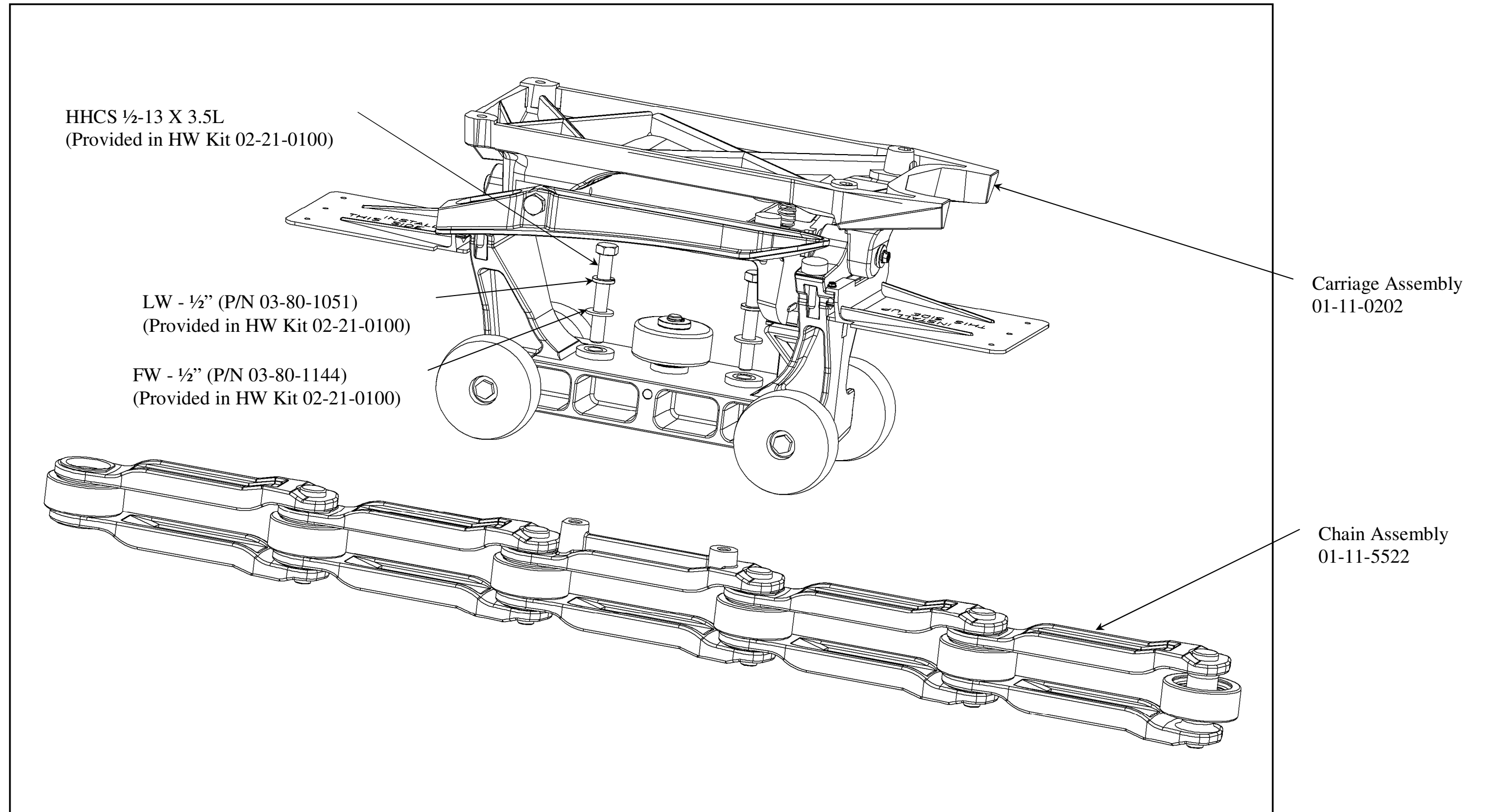
**Fig 7.1**



# Carriage Assembly to Composite Chain

GCS Document # 09-11-0115

Fig 7.2





## **7.2.2. Tip Up Assembly (Fig 7.5, 7.6, 7.7)**

### **7.2.2.1.Introduction**

#### **7.2.2.1.1. Description**

The tip-up assembly is an air operated, electrically controlled actuator. The tip-up assembly is attached to the track wall by means of a variable location composite mounting block available from GCS.

#### **7.2.2.1.2. Theory of Operation**

The tip-up assembly, when electrically actuated, places a roller into the path of a carriage assembly's index lever. The index lever rides up on the tip-up assembly's roller and unlatches the carriage tray to tip the mail item off the tray and into the desired sort location. After actuation, the tip up assembly roller and actuator arm, retract out of the carriage assemblies' line of travel.



#### **7.2.2.4.Assembly of Index Mount to Track and Tip-Up to Index Mount (See fig 7.6)**

##### **Index Mount to Track**

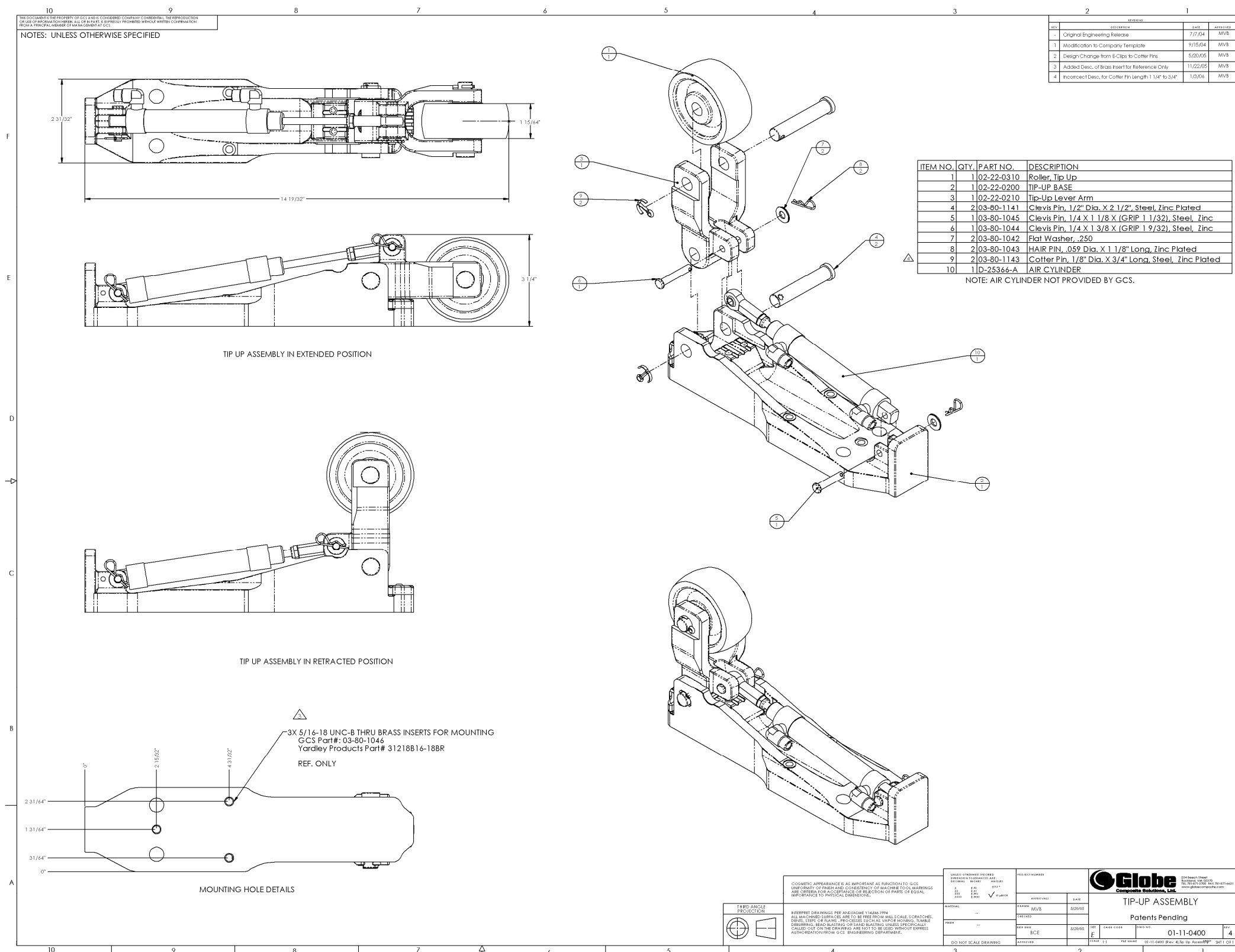
1. The Tip-Up indexing Mount (P/N 02-22-0220) is designed to lock into any straight track section (on either side) except where adjoining tracks are bolted together. (This gives the end user a great deal of flexibility as to where to position the Tip-Up mechanism for optimum performance.)
2. The notch features on the top and outside of the track section engage mating features of the indexing mount with a slight amount of resistance so that they lock together. A soft mallet may be required to fully seat the Indexing mount both vertically and horizontally.
3. After the Indexing mount is seated into the track section, it is necessary to transfer drill the bottom flange of the track so that you can bolt through the bottom of the Index mount, and through the track flange using 2" long 5/16-18 Hex Head Bolts with washers and lock washers, as illustrated. (You will need to Mark the Holes and then remove the Indexing Mount to drill the holes.)
4. Fasten the Tip-Up Index Mount also to the box channel that supports the track. In this case you will need to drill and tap 5/16-18 through the wall of the Steel box channel in-line with the holes in the Index Mount. The 2" long Hex head bolts can be used in this case as well. The lock-washer should be re-positioned between the head of the bolt and the washer.

##### **Mounting the Tip-Up Mechanism to the Index Mount**

1. The Tip-Up mechanism can be installed on either side of the Indexing Mount but the preferred orientation is to mount the Tip-Up on the side of the mount that faces the direction of carriage travel. In this orientation the yellow bumper on the Tip-Up base helps to support the Lever Arm, when the carriage engages the Tip-Up roller.
2. The Indexing Mount and Tip-Up assembly will mount in locations both on the inside and outside of the straight track section. To maintain the preferred orientation of the Tip-Up mechanism to the direction of carriage travel, install the Tip-Up assembly accordingly, to one side of the Indexing Mount or the other.
3. Bolt through the slots provided in the Indexing Mount (P/N 02-22-0220) and into the three (3) 5/16-18 tapped holes provided in the base of the Tip-Up assembly.
4. The slots provide a vertical position adjustment for the entire Tip-Up assembly.
5. The Tip Up location should be adjusted to the dimensions shown in Fig 7.7. Use the Tip Up Alignment fixture illustrated in Fig 6.1, and follow the instructions noted.

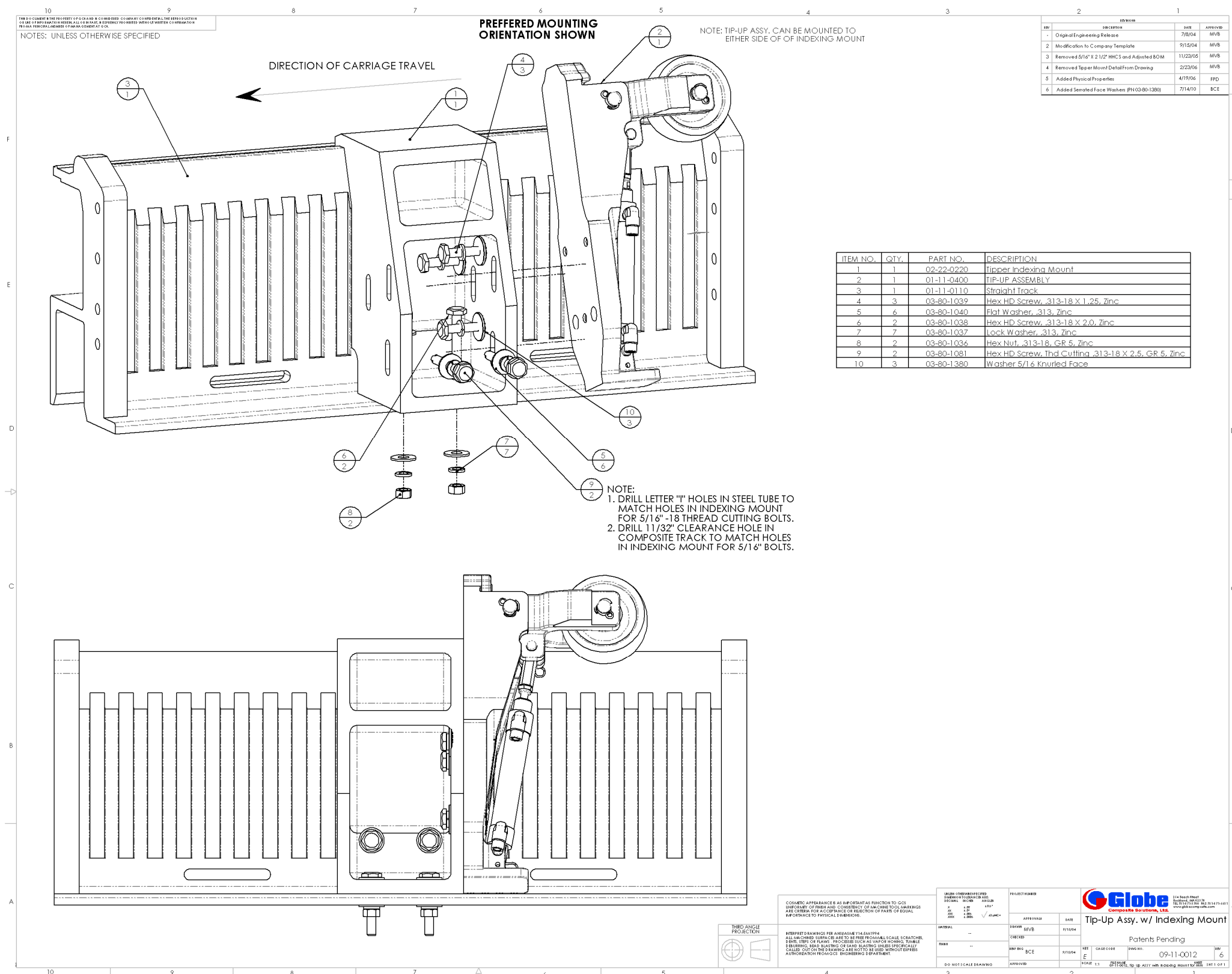
### Tip Up Assembly

#### Fig 7.5



### Figure 7.6

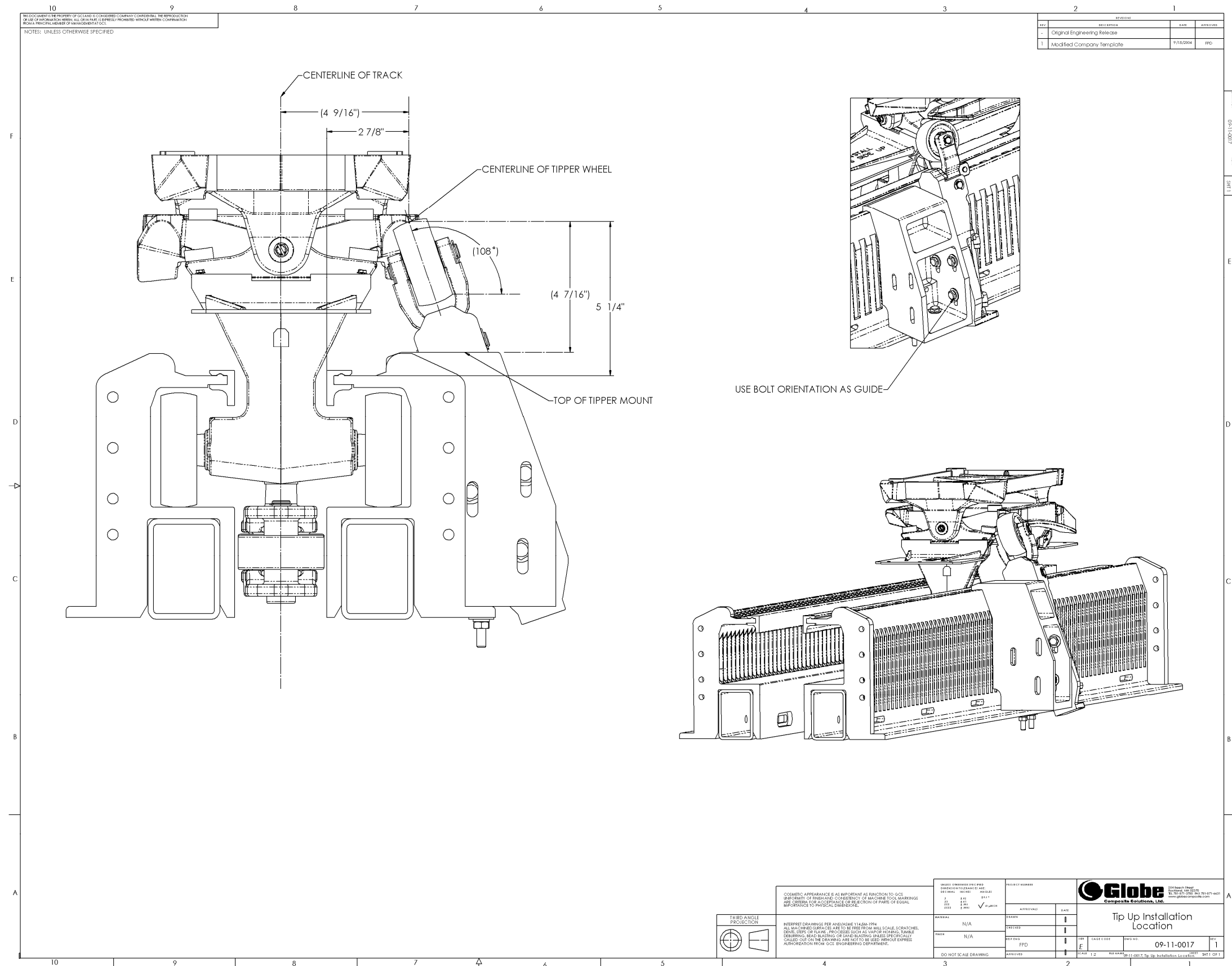
#### Tip-up to Mount & Track Assembly



## Tip Up Installation Location

**Fig 7.7**

*GCS Document # 09-11-0115*



### 7.2.3. Track Assembly

#### 7.2.3.1. Introduction

##### 7.2.3.1.1. Description

The composite track sections consist of: straights, curves, custom length straights, expansion joints, and access door sections. The **Straight Track Sections** are bolted on twelve-inch centers onto steel box beams and are bolted to each other through end flanges. The straight track sections also provide mounting and alignment for the tip up assemblies. (See fig 7.11)

The **Curve Sections** are similarly bolted to each other and straight sections through end section flanges. The curve sections are held in place by steel “holdbacks” mounted on the interior and exterior surfaces of each curve. (See fig 7.12)

The **Custom Length Straight Track** sections are cut to size for either chain stretch requirements or to complete a track circuit, which does not correspond to a nominal track length. When possible custom length straight tracks are pre-cut at GCS and are ready to install on site. In some cases special length tracks must be cut on site at assembly. Special Snap on flanges can be secured to the cut end of the track in 1” increments to make any length of track desired, and to allow the cut end of the track to be bolted in like a standard track length. (See fig 7.15)

**Access Door Track Sections** open to allow carriages to be removed or replaced on the chain. (See fig 7.13)

Note: PSM-3 and PSM-4 in Seattle each had one set of access doors installed. They are located on the east end of the Line adjacent to the 90 degree curve away from the Bull Gear. Location was pre-determined by USPS personnel in the Seattle NDC. Both Sides of the track open at these locations to allow easy access to install/remove/maintain carriages.

**Expansion Joint Track Sections** allow for building expansion and provide a sliding joint for the track to expand and contract over time. (See fig 7.14)

**Track Spacers** P/N 01-11-0114, (which are the same profile as straight track, and ¼” thick) can be used to take-up spaces or gaps in track sections.

##### 7.2.3.1.2. Theory of Operation

The sorter composite track provides for the running surface and support of carriage assemblies, houses the chain seat channel and race, provides the tip up mounting structure, and retains the carriage assemblies and attached moving chain.

**7.2.3.2.Specifications/Characteristics**

**Table 7-3**  
**Track Assembly Characteristics**

SPECIFICATIONS/CHARACTERICS	DESCRIPTION
<b>Track Assembly</b>  <b>7.2.3.2.1. Straight Sections</b> <b>P/N 01-11-0110</b> Outside Dimensions: Lengths Height Width Weight	12 ft 9 inches 6 Inches 5 pounds per linear foot
<b>7.2.3.2.2. Curve Sections (inside radius)</b> <b>P/N 01-11-0120</b> Outside Dimensions: Height Width Weight Arc Radius	9 inches 6 inches 5 pounds per linear foot 22.5 degrees 10 ft measured to CL of carriage travel
<b>7.2.3.2.3. Curve Sections (outside radius)</b> <b>P/N 01-11-0130</b> Outside Dimensions: Height Width Weight Arc Radius	9 inches 6 inches 5 pounds per linear foot 22.5 degrees 10 ft measured to CL of carriage travel
<b>7.2.3.2.4. Access Door Sections</b> 2 standard configurations <b>P/N 01-11-0140</b> <b>P/N 01-11-0141</b> Outside Dimensions: Height Width Weight	Note: (KC used special Access Doors) 4ft Door (Set in 6 ft track length) 6ft Door (Set in 8 ft track length)  9 inches 6 inches 5 pounds per linear foot

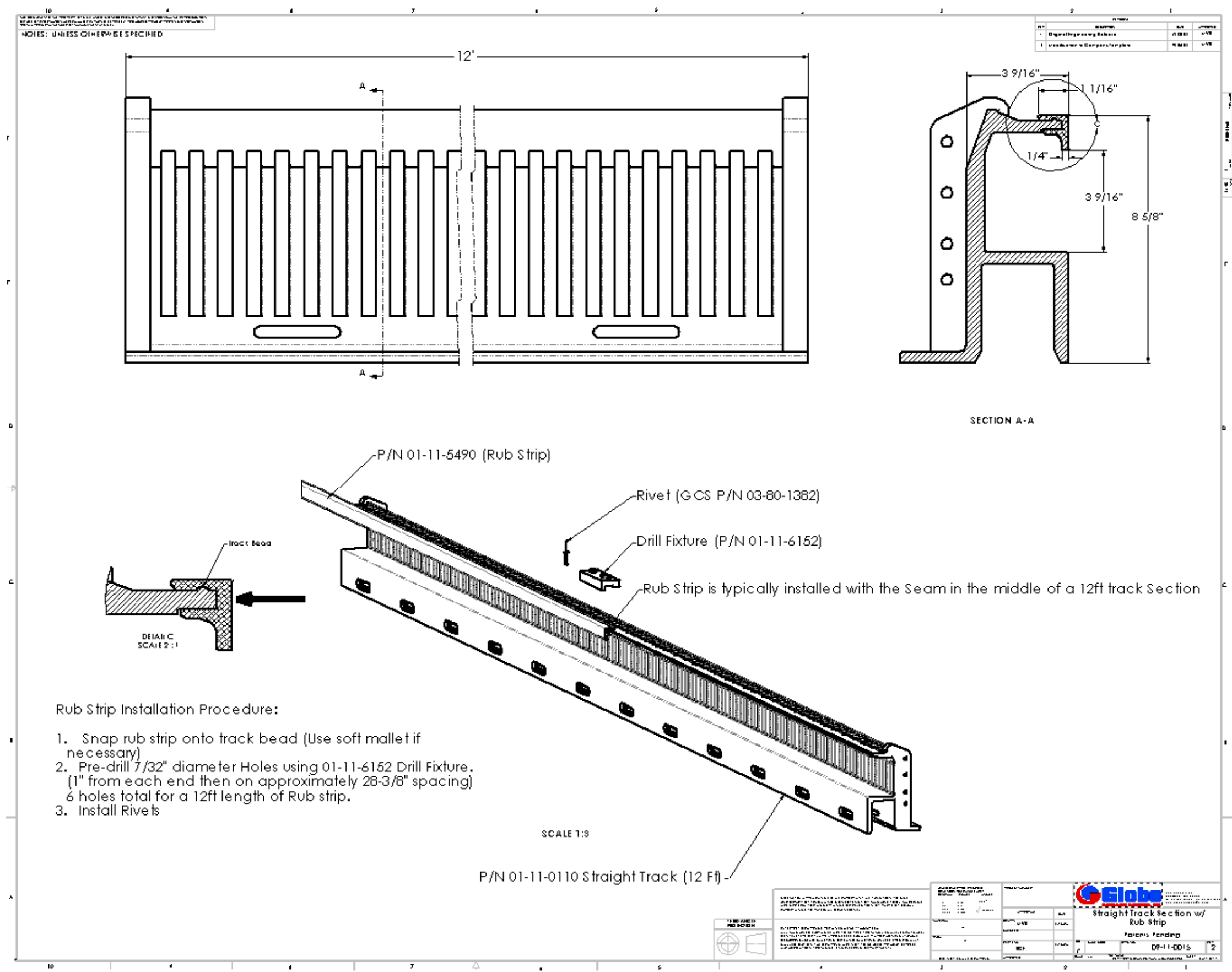


<b>7.2.3.2.5. Expansion Joint</b> <b>P/N 01-11-5491 (Generic, Used in KC)</b> Lengths KC PSM 3 & 4 Height Width Weight	3 Feet Long 9 inches 6 inches 5 pounds per linear ft
<b>7.2.3.2.6. Custom Lgth Track Sections</b> <b>P/N 09-11-0039 (Generic)</b> Outside Dimensions: Length Height Width Weight	Variable (Cut to length needed) 9 inches 6 inches 5 pounds per linear foot

# Straight Track Component

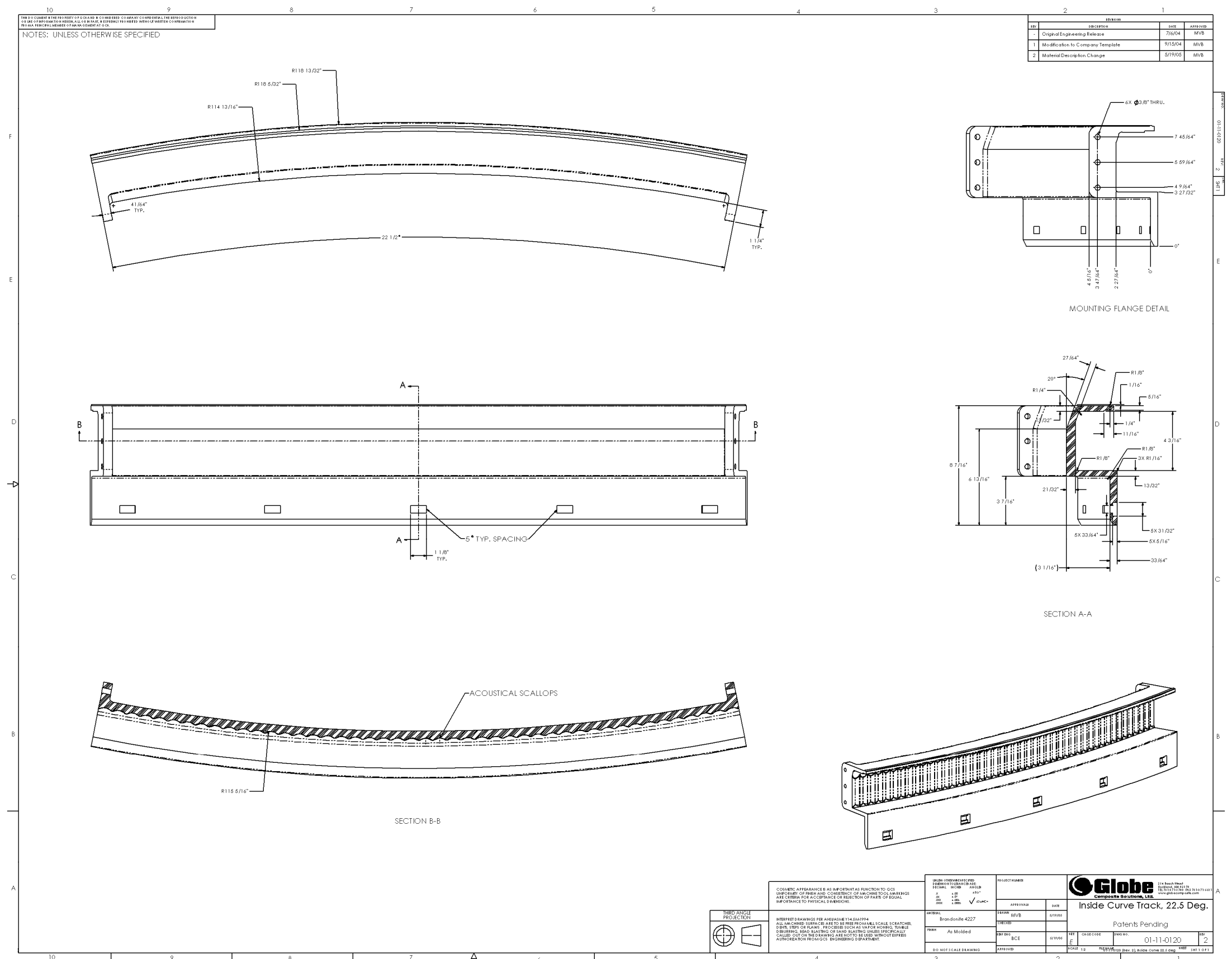
## Fig 7.8

GCS Document # 09-11-0115



### Inside Curve Track Component

*GCS Document # 09-11-0115*

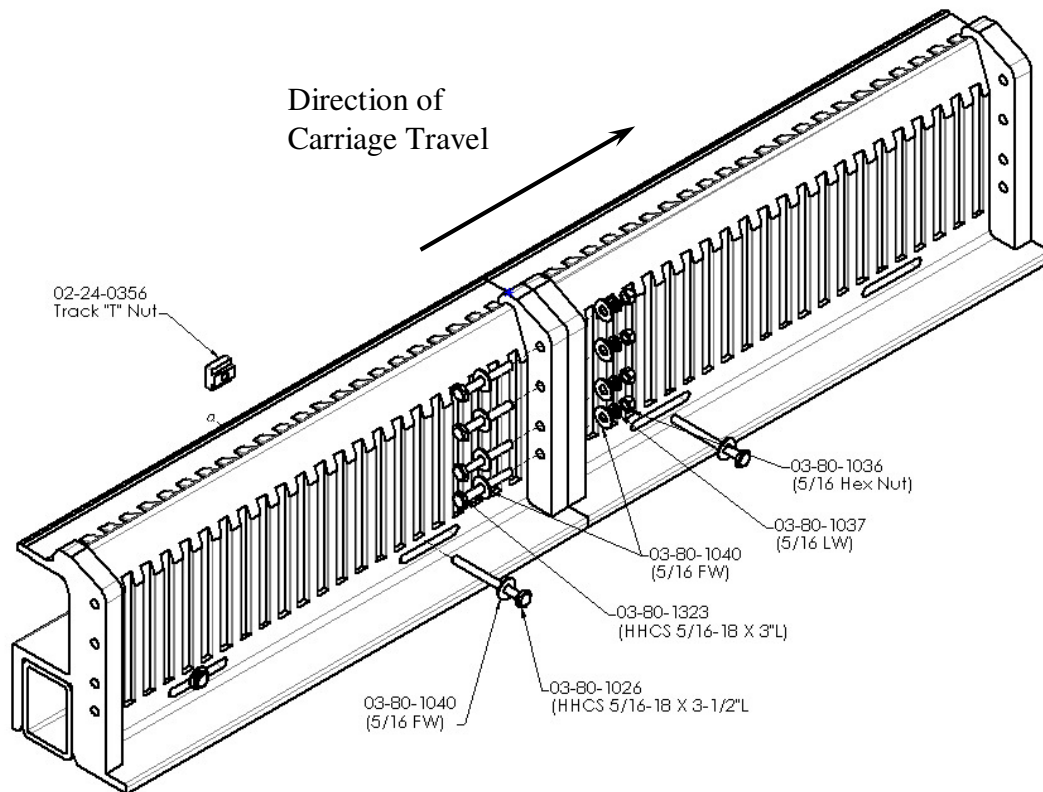


*GCS Document # 09-11-0115*



## Straight Track Assembly Hardware Specification

**Fig 7.11**



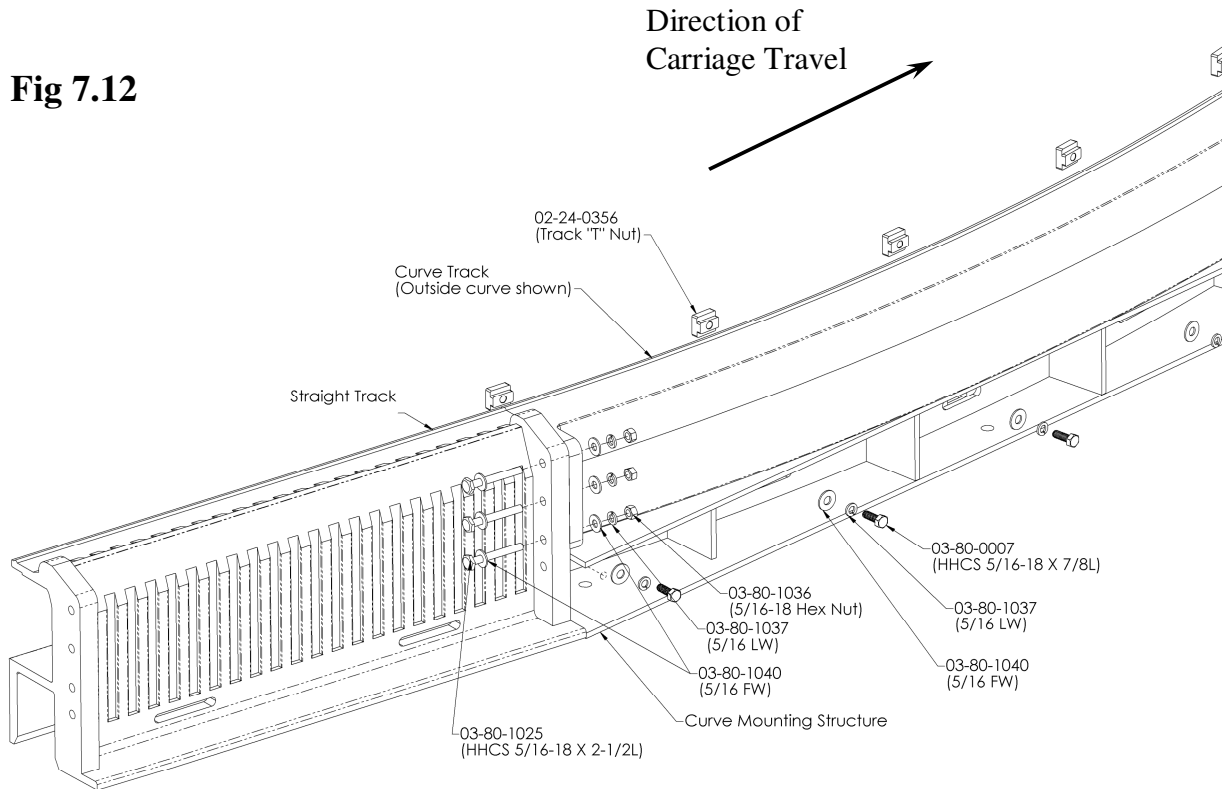
**Table 7-4  
Track Assembly Hardware Specification**

Part No.	Part Description	Qty Req'd
03-80-1026	Bolt, Hex Head, 5/16-18 X 3.5L, Zinc Plate	12/Track
03-80-1040	Washer, Flat, USS 5/16, Zinc Plate	20/Track
03-80-1036	Hex Nut, 5/16-18, Zinc Plate	16/Track
03-80-1323	Bolt, Hex Head, 5/16-18 X 3L, Zinc Plate	4/Track
03-80-1037	Lock Washer, 5/16, Spring Type, Zinc Plate	4/Track
02-24-0356	Track "T" Nut	12/Track

**Note:**

When possible the bolts should be installed so that they "Point" in the direction of carriage travel. (This minimizes catch points for strings or strapping that might hang off packages between carriages.)

## Straight Track to Curve Assembly Hardware Specification

**Fig 7.12**

**Table 7-5**  
**Straight to Curved Track Assembly Hardware Specification**

Part No.	Part Description	Qty Req'd
02-24-0356	T-Nut	5/Curve
03-80-0007	Bolt, Hex Head, 5/16-18 X 7/8L, Zinc Plate	5/Curve
03-80-1025	Bolt, Hex Head, 5/16-18 X 2.5L, Zinc Plate	3/Curve
03-80-1037	Lock Washer, 5/16, Spring Type, Zinc Plate	8/Curve
03-80-1040	Washer, Flat, USS 5/16, Zinc Plate	11/Curve
03-80-1036	Hex Nut, 5/16-18, Zinc Plate	3/Curve

**Notes:**

1. The bolt scheme shown is used not only straight to curve, but also curve to curve for both inside and outside curved track sections, as well as bull gear track curves.
2. When possible the bolts should be installed so that they "Point" in the direction of carriage travel. (This minimizes catch points for strings or strapping that might hang off packages between carriages.)

**Fig 7.13**

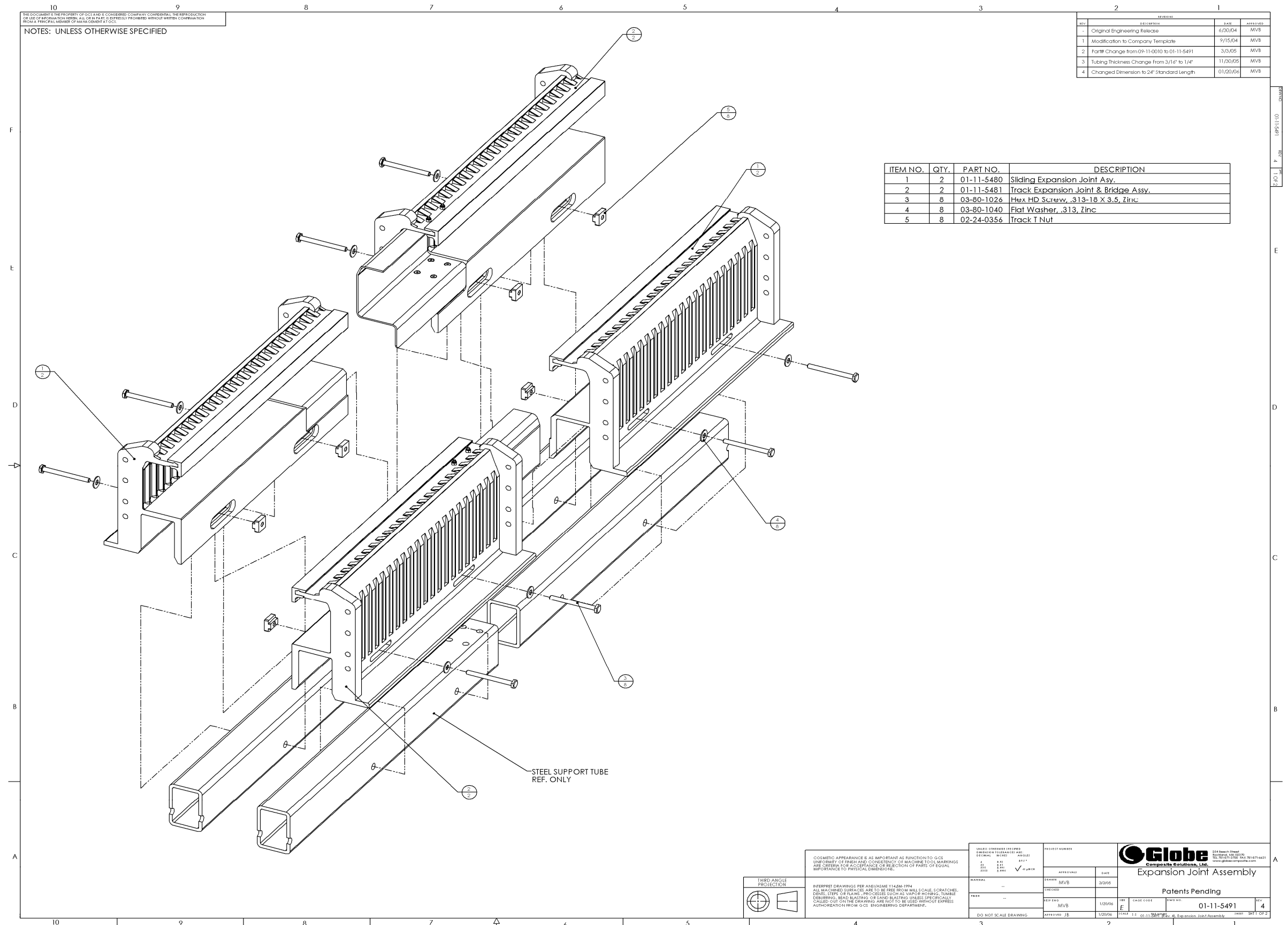
*GCS Document # 09-11-0115*



### Expansion Joint Assembly

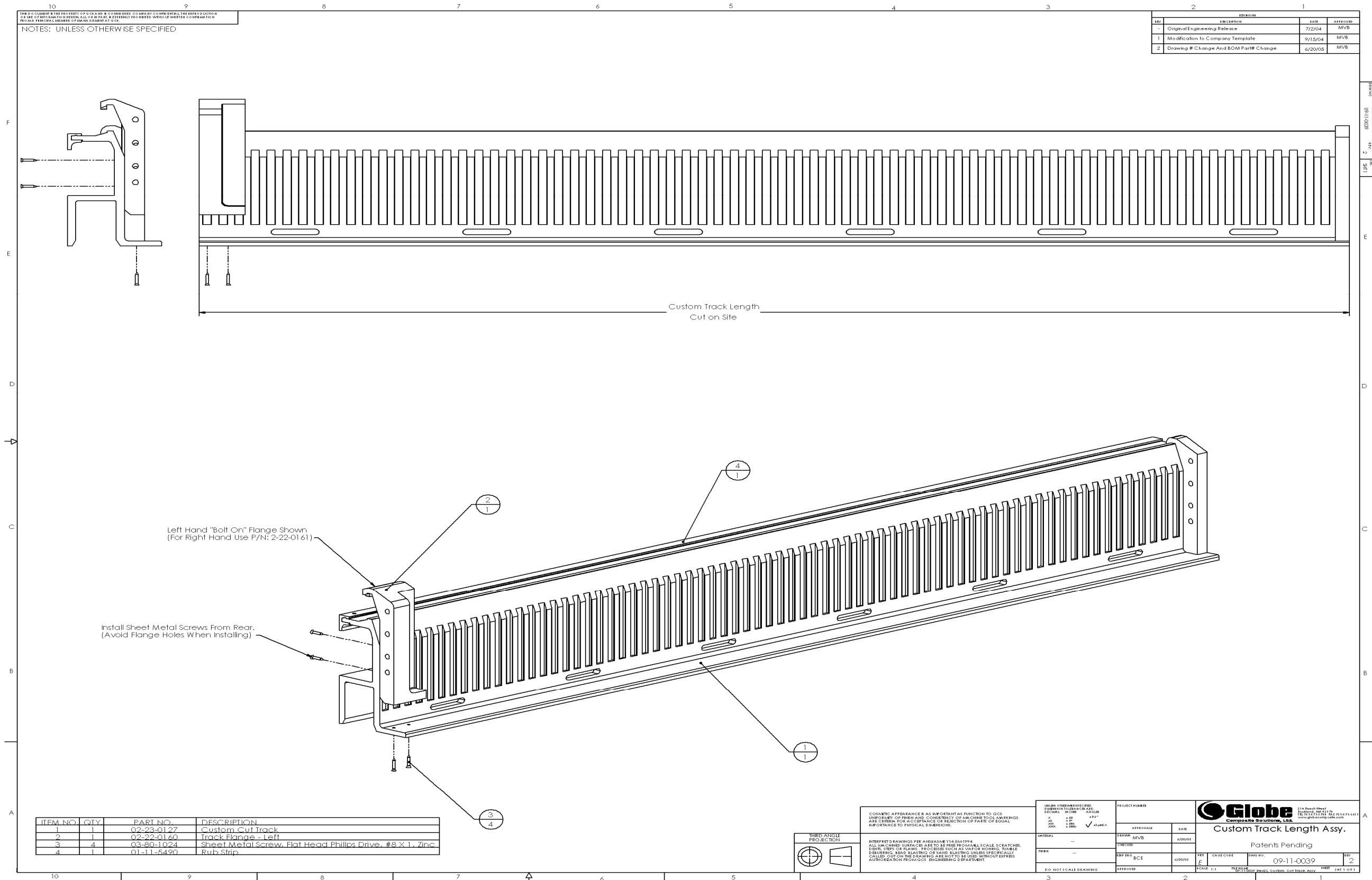
Fig 7.14

*GCS Document # 09-11-0115*





Custom Length Straight Track Assembly  
Fig 7.15



### **7.2.3.3.Assembly**

#### **7.2.3.3.1. Straight Sections (Fig 7.11)**

Individual straight track sections are modular and require no assembly. Straight track sections are interchangeable, left and right. For installation instructions, see: TRACK REPLACEMENT, Section 3.4.3.1, Straight Track Section.

#### **7.2.3.3.2. Curve Sections (Fig 7.9, 7.10, 7.12)**

Individual curve track sections are modular and require no assembly. For installation instructions, see: TRACK REPLACEMENT, Section 3.4.3.2, Curve Track Section.

#### **7.2.3.3.3. Access Door Sections (Fig 7.13)**

Access sections are those track sections used to gain easy access to the chain and carriage assembly attachment bolts. Access sections are pre-assembled at GCS. For installation instructions, see: TRACK REPLACEMENT, Section 3.4.3.3 Access Track Section. Standard “centered door” access track sections are interchangeable, left and right. Access door locations and sizes can be customized by GCS to fit most any installation requirement.

#### **7.2.3.3.4. Expansion Joint (Fig 7.14)**

To bridge USPS facility expansion joints GCS has developed a sliding track joint which is a composite assembly of non-metallic track and sheet metal. This expansion joint track allows for  $\pm$  a few inches of expansion/contraction over time.

#### **7.2.3.3.5. Custom Length Track Sections (Fig 7.15)**

Custom Length track sections are those track sections used to complete a track circuit when standard modular track lengths are not of the exact length to complete the last section of a track circuit. When possible these custom length tracks can be pre-made at GCS, and assembled to supporting structure on site like any other length of straight track.

It is also very easy to make a custom length track on site when needed. Special Snap on flanges can be secured to the cut end of the track in 1” increments to make any length of track desired, and to allow the cut end of the track to be bolted in like a standard track length.

## 7.2.4. Chain Assembly (Fig 7.16)

### 7.2.4.1. Introduction

#### 7.2.4.1.1. Description

The composite chain is comprised of a series of alternating mated composite links. Each chain link is attached to adjoining links by mated pinions, and flange bearings. Selected chain links possess two threaded modules for carriage assembly attachment. The chain is moved along with the aid of composite wheels located at each link pivot.

#### 7.2.4.1.2. Theory of Operation

The composite chain's purpose is to move the carriage assemblies around the sorter track circuit. The carriage assemblies are attached to the chain by two bolts extending down through the carriage assembly yoke into threaded modules within the track links. The track is propelled by a toothed bull gear mounted on a vertical axis, usually located at one end of the sorter track circuit.

### 7.2.4.2. Specifications/Characteristics

**Table 7-6**  
**Chain Assembly Characteristics**

SPECIFICATIONS/CHARACTERISTICS	DESCRIPTION
<b>Chain Assembly (P/N 01-11-0600)</b>  Outside Dimensions: Height Length Width (Over Wheel) Wheel Diameter Weight	       4-1/4 inches 18ft 3 inches 3 inches 63 pounds per 18ft length (3.5 pounds/ft)

**7.2.4.3.Assembly (See fig 7.16)**

1. Install Flange bearings (P/N 02-24-0140) into corresponding hole in chain link. Make sure that the anti-rotation feature on the underside of the bearing flange engages in the corresponding hole location on the chain link.
2. Loosely assemble a pair of chain links around a wheel bearing (P/N 02-24-0120). Use the larger diameter but shorter length bosses on the chain link facing one another on both sides of the bearing.
3. With another pair of chain links assemble the smaller diameter, but longer end of the chain link, through the flange bearings and into the wheel bearing loosely assembled in step 2. (The chain links should be flush with the face of the flange bearings.) (Use a blunt mallet to assist in assembly in required.)
4. Install Chain pin (P/N 02-24-0361) through connected links, and once through, install washer P/N (03-80-1170) and cotter pin (P/N 03-80-1169). Flare out cotter pin so that it lays flush with the face of the washer. The chain pins should be installed such that the pin heads are on the same side of the chain as the boss link (P/N 02-24-0100).
5. Continue assembly in this manner until you have assembled the desired length of chain. For 27" pitch carriage mounting, use a Chain Link with Bosses (P/N 02-24-0100) every third link facing up. All other links are the same (P/N 02-24-0110).

**CAUTION**

Do not force the links together by using a sharp instrument as permanent damage to the link pinion and race may occur.

**WARNING**

Proper eye protection should be worn as the snap ring may slip off the wrench and cause personal injury.

6. Check to make sure that all washers and cotter pins are installed properly and that the cotter pin is flared out and resting against the face of the washer.

**7.2.4.4.Chain Installation**

1. GCS manufactures chain in 18 ft lengths. To assemble chain on site it is necessary to couple the tail end of one chain to the head of the next. All the components needed, are pre-attached or banded to the very ends of the chain.
2. Remove the Chain Pin by first removing the cotter pin, and washer. Cut the wire tie that holds the wheel to the end of the chain.
3. Assemble the components at the connected joint as described above.
4. Re-install the Chain Pin, washer and cotter pin, flaring the cotter pin up against the face of the washer.

#### 7.2.4.5.Carriage Assembly to Chain

1. The chain must be lifted to a height matching the carriage installation height during the installation process, so that the chain is not stressed in the vertical plane, and is free to pivot in the horizontal plane.
2. Carriages are attached to the chain with two Hex Head bolts, ½-13 X 3-1/2L with lock washers under the head, and tightened to a torque of approximately 25 ft-lbs.
3. Carriages should be bolted to the chain so that the carriage wheels run straight in the track after the bolts are tightened and slack is removed from the chain. Carriages that are not bolted on straight will have pre-mature wheel wear.

#### 7.2.4.6.Adjusting Chain Slack (Static Method)

After completing assembly of chain to carriages and connecting leading/trailing ends of chain.

1. Adjust Bull gear position to take out gross chain slack, being sure not to stretch or tension chain.
2. Jog bull gear at slow speed and look for chain slack or whip on the exit side of the bull gear.
3. Stop the line and adjust the bull gear out in a small increment as needed.
4. Jog the bull gear at slow speed again while observing the chain slack or whip on the exit side of the bull gear.
5. Check the chain slack using the procedure illustrated in Figure 7.17 and as follows:
  - a. Make sure the line is stopped and locked out/tagged out.
  - b. Use a 100lb dynamometer
  - c. Measure chain slack at the exit side of the bull gears slip joint, about 5 teeth back. This position ensures that the chain is in contact with the sprocket teeth and tension is present.
  - d. Place the hook from the pull scale as close as possible to the centerline of the pivot pin on the chain (how the hook is placed on the chain is installers option).
  - e. Pull until a 45 to 50lb force is obtained. This force should move the chain wheel 3/16" to ¼" away from the sprocket tooth once the chain is adjusted properly.
  - f. Run the sorter for 8 hours and repeat steps 5a through 5e.

**Warning: Tensioning the chain, beyond taking out the running slack, could damaged the chain or reduce overall chain performance and life expectancy**

#### 7.2.4.7.Adjusting Chain Slack using a Strobe/Tachometer

This procedure is an alternative to step 5 outlined in section 7.2.4.6 (above) and accomplished by observing the chain engagement to the sprocket teeth by standing under the bull-gear and aiming the strobe at a particular sprocket tooth while running the sorter at line speed.

It is first necessary to take out the gross chain slack using steps 1 through 4 outlined in section 7.2.4.6 above. The strobe is then utilized to fine tune the running chain slack as follows.

Adjust the strobe speed to give several pulses of the same sprocket tooth. The strobe speed should be set to 3 to 5 times the actual speed of the passing sprocket teeth. *(Each individual may prefer different speeds in order to get the best stop action of the chain engagement.)*

The first 3 to 4 teeth at the entrance side will be in full engagement as they are the main load carrying teeth.

If any chain slack is present, several of the sprocket teeth/chain wheel engagement points will show a gap of approximately 1/4" to 3/8" space.

Move the strobe to different positions around the bull-gear to get an average reading. *(The same tooth will not have a gap present each time due to small variations of the chain pitch or sprocket pitch.)*

A properly adjusted chain should show some space at various locations. If no space is observed, then this is an indication of excessive chain tension.

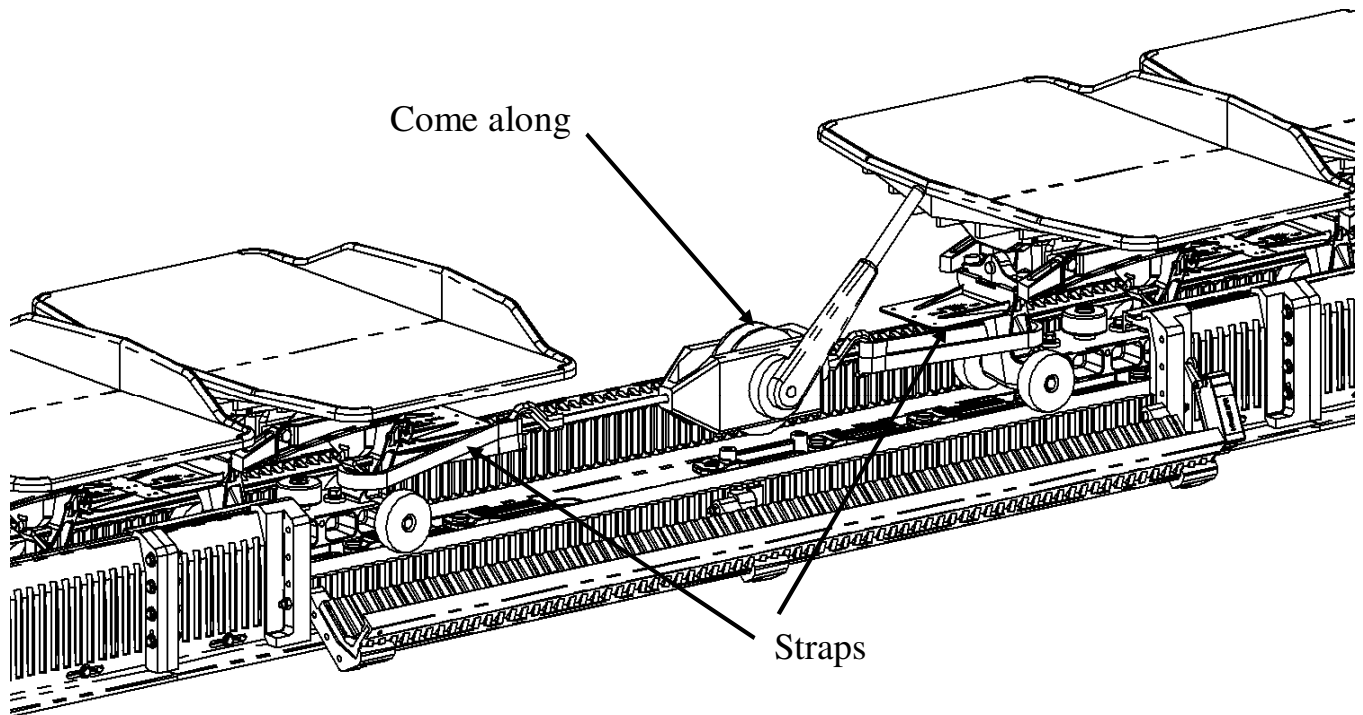
At no time should the sprocket tooth/ chain wheel gap exceed 1/2".

If excessive gap is present, the drive should be moved in not more than 1/2' increments until the proper chain slack is accomplished.

**Warnings:**

- 1. Tensioning the chain, beyond taking out the running slack, could damaged the chain or reduce overall chain performance and life expectancy.**
- 2. Before using the strobe and running at line speed the chain slack must not be excessive. (This process is reserved for fine tuning the chain slack not for identifying gross slack.)**
- 3. All adjustments must be made with the line stopped and locked out.**

### 7.2.4.8 Chain Link Replacement Installed on Sorter



#### Chain Replacement Procedure with Chain Installed on Sorter

1. Jog broken chain section to maintenance door installed in the sorter system.
2. For safety, lock and tag out sorter system so that it cannot be accidentally activated.
3. Remove access door retaining bolts and open access door to perform chain repair.
4. Remove the necessary number of carriages to repair broken chain.
5. Remove the cotter pins and chain pins from the broken chain links as needed.  
(Note: If necessary the use of a come along and nylon straps as shown above can be used to relieve tension on chain link joints.)
6. Separate upper and lower chain links until the male boss end clears the female end of the other link.
7. Install new chain links as needed and reinstall all chain pins, washers and cotter pins.  
(Note: Refer to sorter system maintenance manual for chain assembly details.) Ref Fig 7.16
8. Remove come along and nylon straps if used.
9. Install removed carriages to chain and ensure carriages are straight and parallel to conveyor centerline when attachment bolts are tightened.
10. Torque carriage to chain attachment bolts to 35 ft-lbs.
11. Close maintenance access door and reinstall access door retaining bolts.
12. Remove lock and tag from sorter drive unit.

**Fig 7.16**

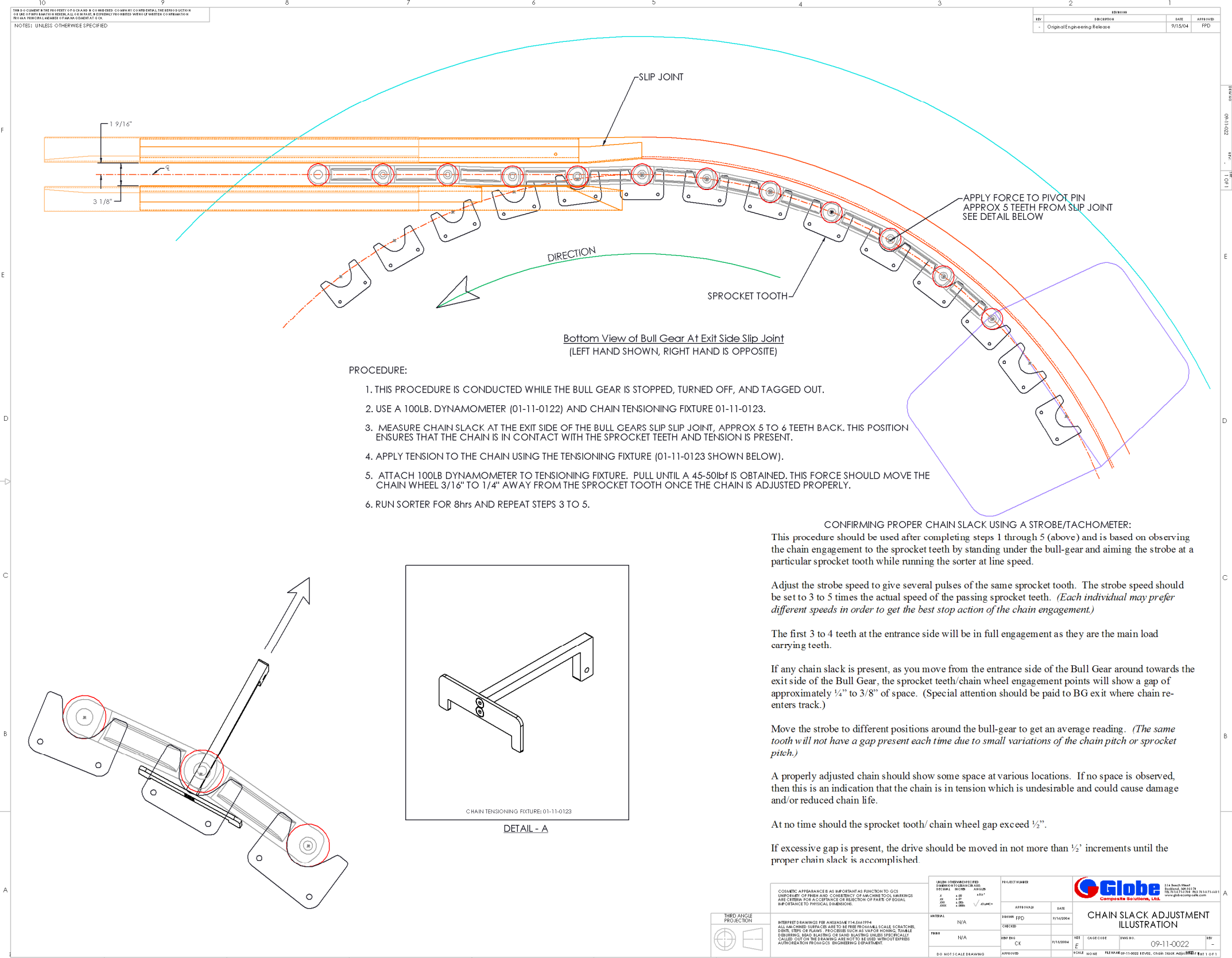
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## Adjusting Chain Slack

*GCS Document # 09-11-0115*



## **7.2.5. Static Dissipation – Grounding (Fig 7.18)**

### **7.2.5.1.Introduction**

#### **7.2.5.1.1. Description**

Static charge can accumulate on any system components where is relative motion between parts. To dissipate this static it is necessary to ground the accumulated charge in the components as the system runs.

Static dissipation on the composite system can be accomplished by using a low impedance braided ground strap to “scrub” the carriages and the chain at several locations (about every 100 ft) along the system length.

See figure 7.18 for complete static grounding instructions.

Static Dissipation – Grounding  
Fig 7.18

GCS Document # 09-11-0115

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
-	Original Engineering Release	11/30/05	MVB
1	Added 17 Ga. Music Wire to Dissp. Kit	4/26/06	MVB
2	Remvd. Carriage Dissp./ Redesign of Lwr	5/13/06	MVB

1  
2

FIGURE 1

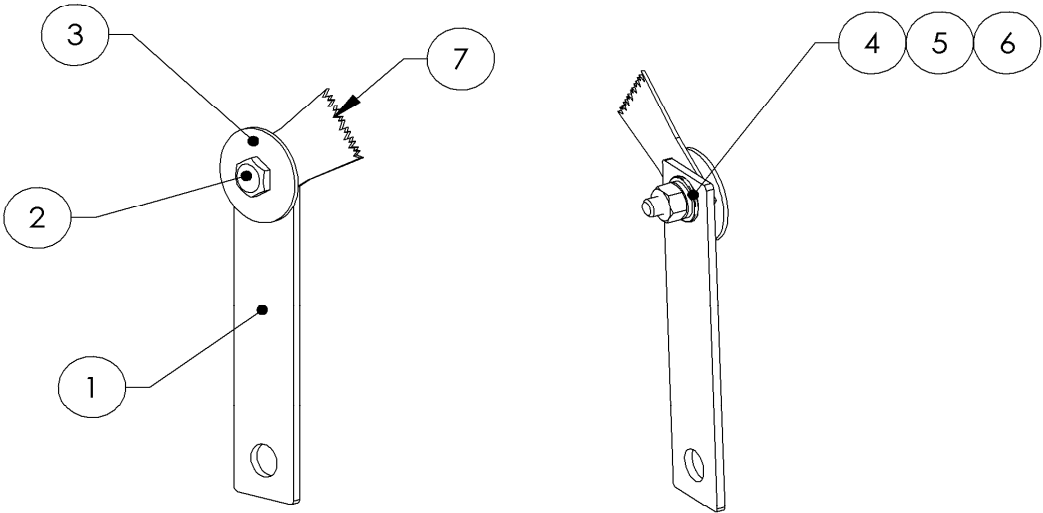
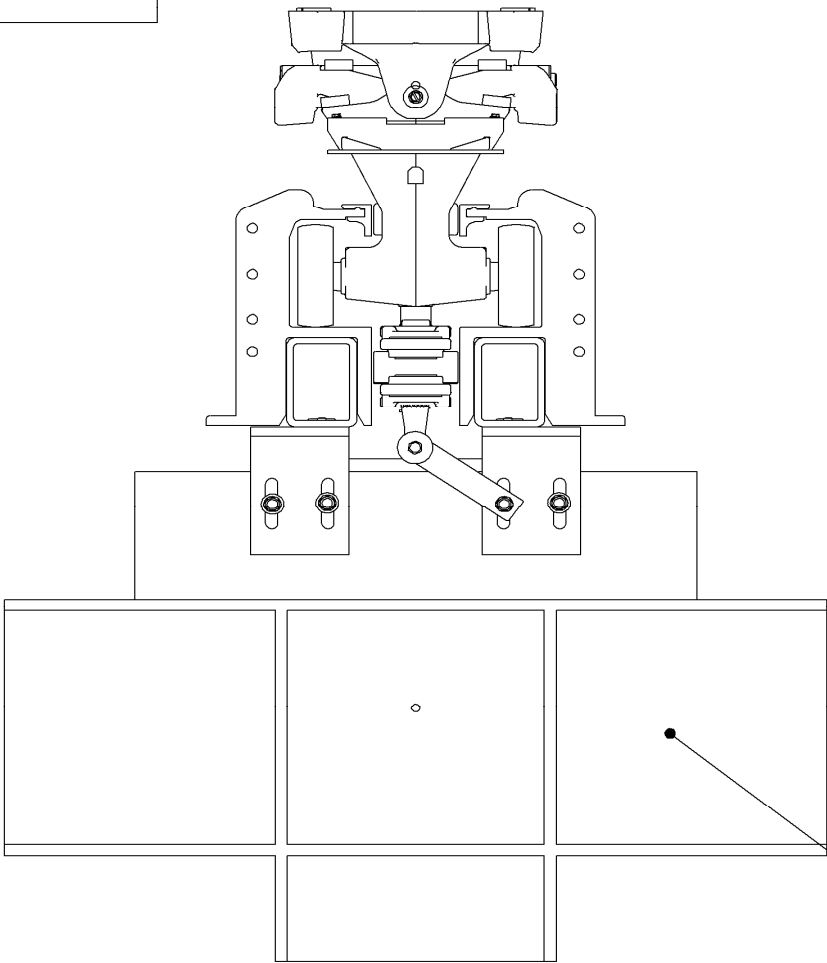


FIGURE 2

STATIC DISSIPATER INSTALLATION NOTES:

1. CUT AND ATTACH A 2" LENGTH OF BRAIDED GROUND STRAP (P/N: 03-85-9007) TO THE SOLID STEEL STATIC GROUNDING BAR (P/N: 02-30-0113). USING THE 1/4" HARDWARE NOTED ABOVE, TRAP THE BRAIDED GROUND STRAP BETWEEN THE SOLID STEEL GROUND STRAP AND THE FENDER WASHER. (SEE FIGURE 2)
2. FLARE THE END OF THE BRAIDED GROUND STRAP THAT WILL BE IN CONTACT WITH THE CHAIN TO INCREASE SURFACE AREA CONTACT.
3. ATTACH THE STATIC DISSIPATION ASSEMBLY TO THE CROSSTIE AS ILLUSTRATED ABOVE USING THE CROSSTIE CLIP HARDWARE.
4. ORIENTATE THE STATIC DISSIPATION ASSEMBLY TO ENSURE THE BRAIDED GROUND STRAP TOUCHES THE LOWER SIDE OF THE CHAIN. (SEE FIGURE 1)

NOTE: ENSURE THAT THE SOLID STEEL GROUNDING STRAP WILL NOT COME IN CONTACT WITH THE CHAIN.

4. STATIC DISSIPATION ASSEMBLIES WILL BE FASTENED EVERY 100FT.

ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	02-30-0113	Static Grounding Bar
2	1	03-80-1320	Hex Head Cap Screw, 1/4-20 X .75, GR 5, Steel, Zinc Plate
3	1	03-80-1321	Flat Washer, 1/4" Fender, Steel, Zinc Plated
4	1	03-80-1042	Flat Washer, 1/4", Steel, Zinc Plated, USS
5	1	03-80-1178	Hex Nut, 1/4-20, GR5, Steel, Zinc Plated
6	1	03-80-1322	Lock Washer, 1/4", Steel, Zinc Plated
7	1	03-85-9007	Braided Ground Strap

COSMETIC APPEARANCE IS AS IMPORTANT AS FUNCTION TO GCS  
UNIFORMITY OF FINISH AND CONSISTENCY OF MACHINE TOOL MARKINGS ARE  
CRITERIA FOR ACCEPTANCE OR REJECTION OF PARTS OF EQUAL IMPORTANCE  
TO PHYSICAL DIMENSIONS.

INTERPRET DRAWING PER ANSI/ASME Y14.5M-1994  
ALL MACHINED SURFACES ARE TO BE FREE FROM MILL SCALE, SCRATCHES,  
DENTS, STEPS, OR FLAWS. PROCESSES SUCH AS VAPOR HONING, TUMBLE  
DEBURRING, BEAD BLASTING, OR SAND BLASTING UNLESS SPECIFICALLY  
CALLED OUT ON THE DRAWING ARE NOT TO BE USED WITHOUT EXPRESS  
AUTHORIZATION FROM GCS ENGINEERING DEPT.

UNLESS OTHERWISE SPECIFIED  
DIMENSION TOLERANCES ARE:  
DECIMAL INCHES ANGLES  
X ±.02 ±0.5°  
XX ±.01  
XXX ±.005  
XXXX ±.0005

MATERIAL 1

FINISH 2

DO NOT SCALE DRAWING

PROJECT NUMBER

APPROVALS

DRAWN MVB

CHECKED

RESP ENG MVB

APPROVED JB



254 Beech Street  
Rockland, MA 02370  
TEL 781-871-3700 FAX 781-871-6631  
www.globecomposite.com

Static Dissipation Grounding Kit  
USPS

SIZE

B

SCALE

1:1

FILE NAME

01-11-0118, Static Dissipation Grounding Kit\_USPS

DWG NO.

01-11-0118

REV

2

SHT 1 OF 1

## **SECTION 8**

### **GCS PRODUCT WARRANTY**

#### **8. GCS PRODUCT WARRANTY**

##### **8.1. INTRODUCTION**

This section contains information regarding product warranty, warranty exclusions and the handling of defective parts.

##### **8.2. WARRANTY**

Globe Composite Solutions, Ltd. (GCS) agrees that all products and/or equipment delivered under this project shall be fully warranted and such warranty shall include the following minimum requirements:

- GCS warrants that all products delivered hereunder shall be free from defects or failures in design, material, and workmanship.
- The warranties provided hereunder shall be applicable to those defects or failures becoming apparent to the Owner within the first twelve (12) months of Beneficial Use/Occupancy or Final Acceptance, whichever occurs first.
- GCS will provide all labor and materials necessary to correct or replace defective or non-conforming articles or parts thereof; to satisfactorily correct all damage to the subject equipment, the site, the building, or its contents that is a direct result of such unsatisfactory work; and to satisfactorily correct any work, materials, or equipment disturbed in fulfilling the warranty.
- Should GCS fail to proceed promptly within sixty (60) days to correct warranted items, the US Postal Service may have the work performed at GCS's expense.

##### **8.3. WARRANTY AND GUARANTEE EXCLUSIONS**

GCS shall not warrant any products and/or equipment that are defective as a result of:

- The owner's failure to maintain and/or operate the equipment as specified in the maintenance manuals.
- Damage due to neglect, jams, impacts, crashes, or any other such incident that is caused by mail, parcels, debris, or any other type of foreign object becoming lodged in the system.

Minor blemishes such as, but not limited to, bubbles, voids, and surface imperfections are not considered defects or failures.

GCS does not warrant overall system through-put and efficiency specifications or requirements.

GCS acknowledges that the sorter speed can be run at a line speed of 360 feet per minute without any adverse affect to its system components. GCS does not warrant any damage as a result of re-configuring, re-adjusting, and/or re-setting the tip-up modules to match increased speed.

#### **8.4. HANDLING OF DEFECTIVE PARTS**

If during the warranty period it is necessary to replace defective parts, the owner will ship the defective parts to GCS who in turn will repair and/or replace the defective parts and ship them back to the owner.

Figure 9-1  
Composite Sorter Assembly

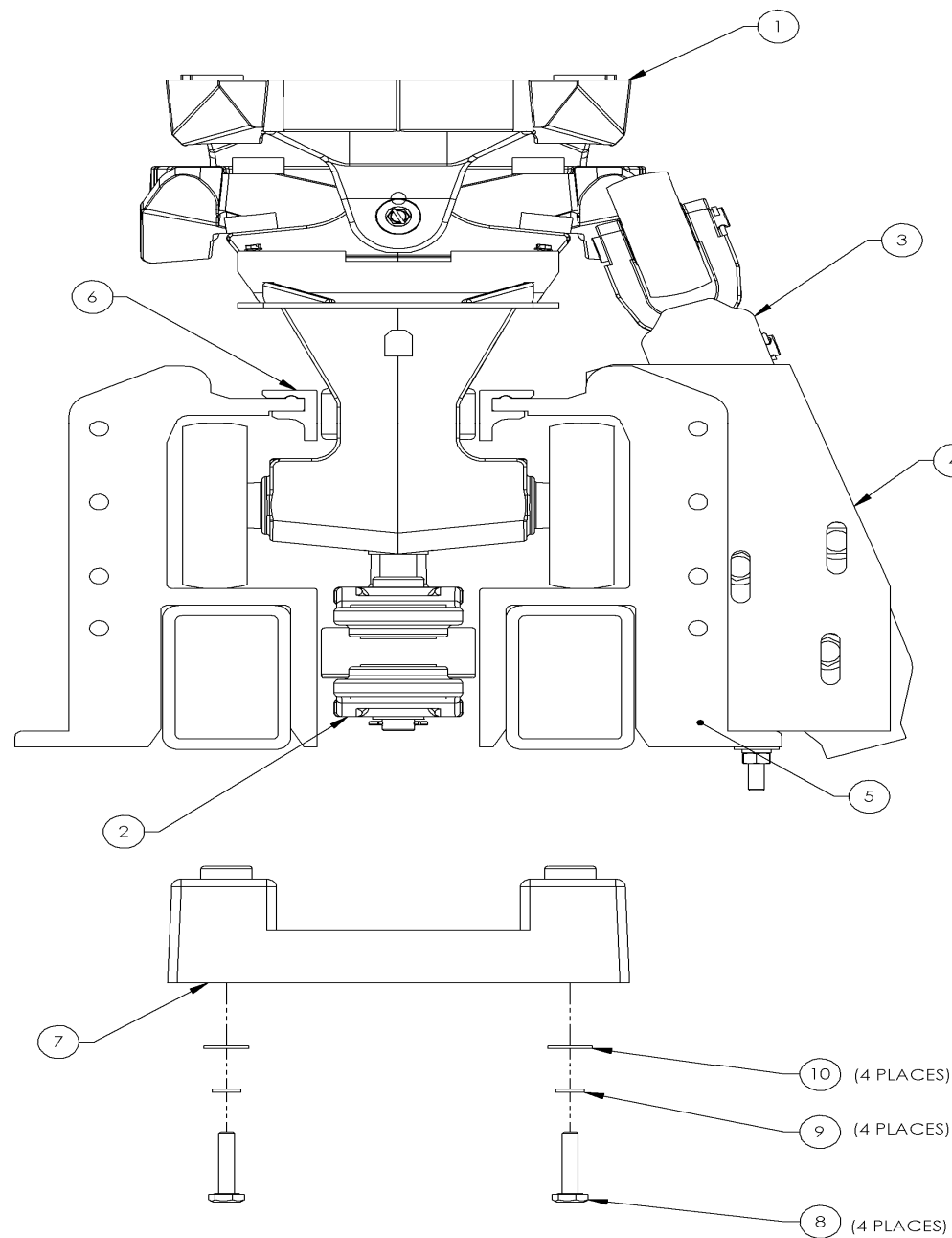


Table 9-1  
Composite Sorter Assembly

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	<b>Composite Sorter Assembly</b>		<b>N/a</b>	<b>82094</b>
1	Horizontal Carrousel Carriage Assembly		01-11-0202	82094
2	Composite Chain Assy. 18ft.		01-11-5522	82094
3	Tip-Up Assembly		01-11-0400	82094
4	Tip-Up Mount		02-22-0220	82094
5	Straight Track		01-11-0110	82094
6	Wear Strip		01-11-5490	82094
7	Track Spreader		01-11-0113	82094
8	Hex Head Cap Srew, 5/16-18 X 1 1/2, Grade 5, Zinc Plated		03-80-1128	82094
9	Lock Washer, 5/16, Steel, Zinc Plated		03-80-1037	82094
10	Flat Washer, 5/16, Steel, Zinc Plated, USS		03-80-1040	82094

Figure 9-2  
Composite Sorter Assembly

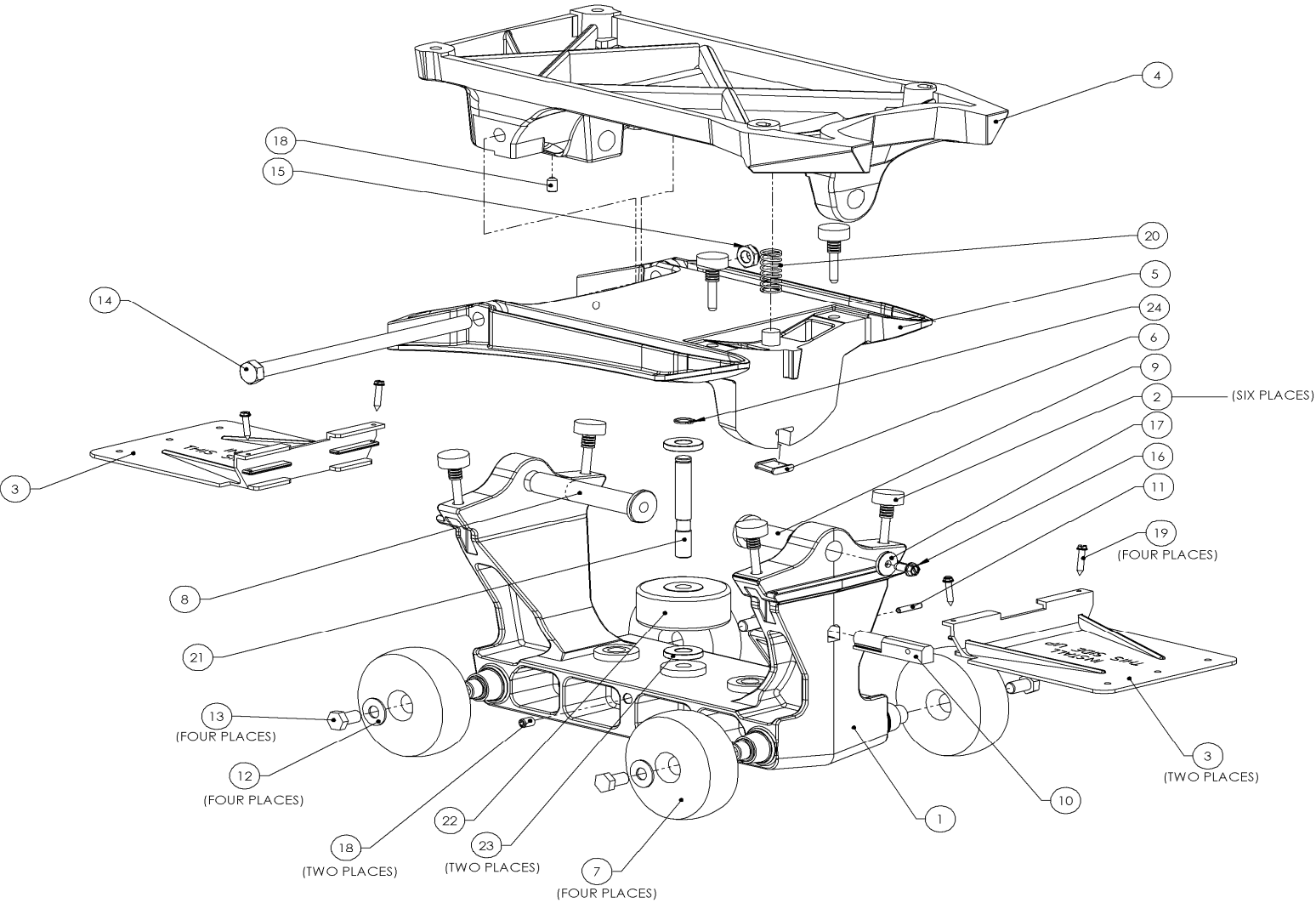
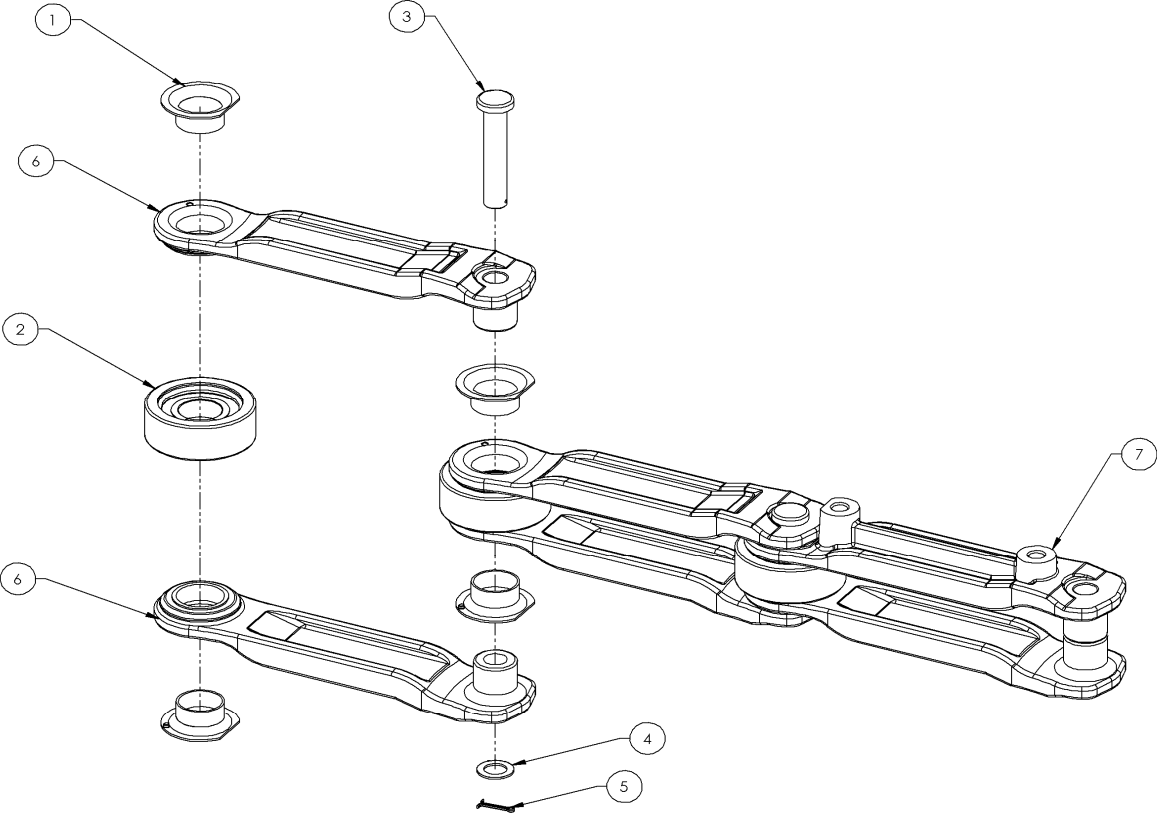


Table 9-2  
Composite Sorter Assembly

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	Horizontal Carrousel Carriage Assembly		01-11-0202	82094
1	Carriage Yoke		02-22-0320	82094
2	Carriage Bumper		02-24-0330	82094
3	Mail Catcher		01-11-5483	82094
4	Carriage Tray Carrier		02-22-0330	82094
5	Carriage Index Lever		02-22-0340	82094
6	Bumper, Index Plate		02-24-0340	82094
7	Carriage Wheel		02-22-0300	82094
8	Carriage Pivot Pin - Rear		02-24-0310	82094
9	Carriage Forward Pivot Pin		02-24-0300	82094
10	Carriage Index Lever Lock Pin, Round		02-24-0357	82094
11	Pin, Spring 3/16" O.D. X 1.0L		03-80-1063	82094
12	Flat Washer, 12mm		03-80-1052	82094
13	Hex HD Screw, 1/2-13 X 3/4, Zinc Plated, Nylock		03-80-1060	82094
14	Hex HD Screw, 1/2-13 X 9 1/2, Zinc Plated		03-80-1061	82094
15	Locknut, .500-13, Zinc Plated		03-80-1049	82094
16	Self-Tapping Screw, 1/4-20 X 5/8		03-80-1055	82094
17	Washer, Pivot Pin		02-24-0353	82094
18	Set Screw, SKT-CUP-PNT, 5/16-18 X 1/2		03-80-1048	82094
19	Sheet Metal Screw, Hex HD, Slotted, #10 X 1		03-80-0080	82094
20	Compression Spring, 23/32" O.D. X 2.0L .065 Music Wire		03-80-1062	82094
21	Roller Shaft, Short		02-30-0030	82094
22	Carriage Centering Wheel		02-24-0359	82094
23	Spacer, .20 Long		02-30-0061	82094
24	External Retaining Ring, 1/2"		03-80-1047	82094

Figure 9-3  
Composite Chain Assembly



Chain Specification:

9” Chain Pitch  
27” Pitch Between Boss Links  
18ft Long (24 sets of links)

Table 9-3  
Composite Chain Assembly

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	Composite Chain Assembly		01-11-5522	82094
1	Flange Bearing		02-24-0364	82094
2	Wheel Bearing Assembly		02-24-0120	82094
3	Chain Pin		02-24-0361	82094
4	Flat Washer, .632 I.D. X 1.00 O.D. X .063 Thk		03-80-1170	82094
5	Cotter Pin, 3/32 X 1.0, Steel, Zinc Plated		03-80-1169	82094
6	Chain Link, Gen 2, Without Bosses		02-24-0363	82094
7	Chain Link, Gen 2, With Bosses		02-24-0362	82094



Figure 9-4  
Tip-Up Assembly

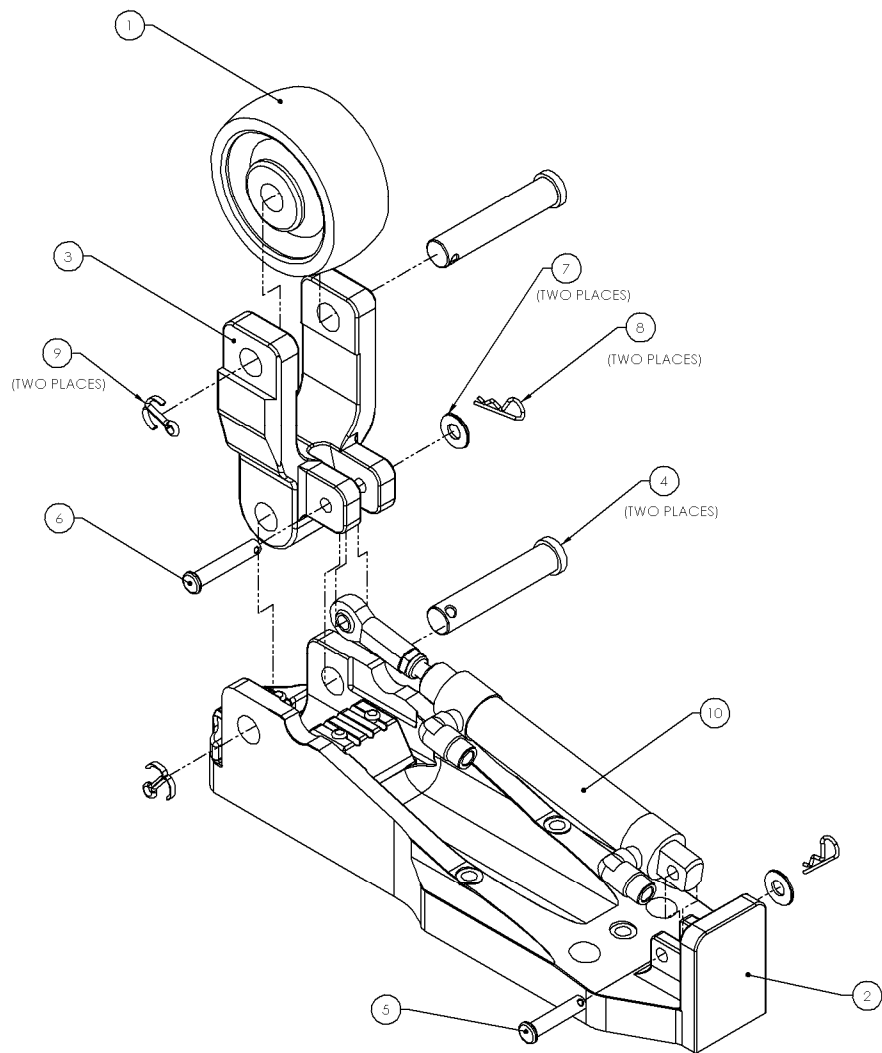


Table 9-4 Tip-Up Assembly

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	Tip-Up Assembly		01-11-0400	82094
1	Roller, Tip-Up		02-22-0310	82094
2	Tip-Up Base		02-22-0200	82094
3	Tip-Up Lever Arm		02-22-0210	82094
4	Clevis Pin, 1/2" Dia. X 2 1/2", Steel, Zinc Plated		03-80-1141	82094
5	Clevis Pin, 1/4" X 1 1/8" X (GRIP 1 1/32"), Steel, Zinc Plated		03-80-1045	82094
6	Clevis Pin, 1/4" X 1 3/8" X (GRIP 1 9/32"), Steel, Zinc Plated		03-80-1044	82094
7	Flat Washer, 1/4"		03-80-1042	82094
8	Hair Pin, .059 Dia. X 1 1/8" Long, Zinc Plated		03-80-1043	82094
9	Cotter Pin, 1/8" Dia. X 3/4" Long, Steel, Zinc Plated		03-80-1143	82094
10	Air Cylinder (Not Supplied by GCS)		D-25366-A	82094

Figure 9-5  
Tip-Up Mount Assembly

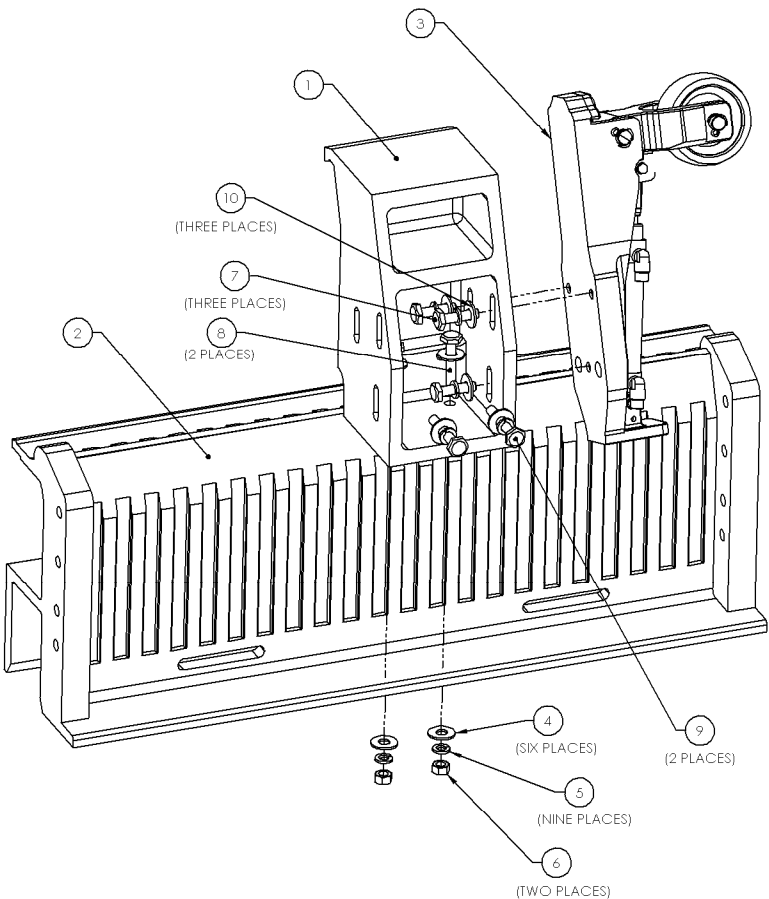


Table 9-5 Tip-Up Mount Assembly

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	Tip-Up Mount Assembly		N/A	82094
1	Tip-Up Indexing Mount		02-22-0220	82094
2	Straight Track		01-11-0110	82094
3	Tip-Up Assembly		01-11-0400	82094
4	Flat Washer, 5/16", Zinc Plated		03-80-1040	82094
5	Lock Washer, 5/16", Zinc Plated		03-80-1037	82094
6	Hex Nut, 5/16-18, GR 5, Zinc Plated		03-80-1036	82094
7	Hex Head Cap Screw, 5/16-18 X 1 1/4", Zinc Plated		03-80-1039	82094
8	Hex Head Cap Screw, 5/16-18 X 2.0, Zinc Plated		03-80-1038	82094
9	Hex Head Flange Screw, 5/16-18 X 2.5, Zinc Plated, Thd Cutting		03-80-1081	82094
10	Washer, 5/16" Knurled Face		03-80-1380	82094

Figure 9-6  
Expansion Joint Assembly

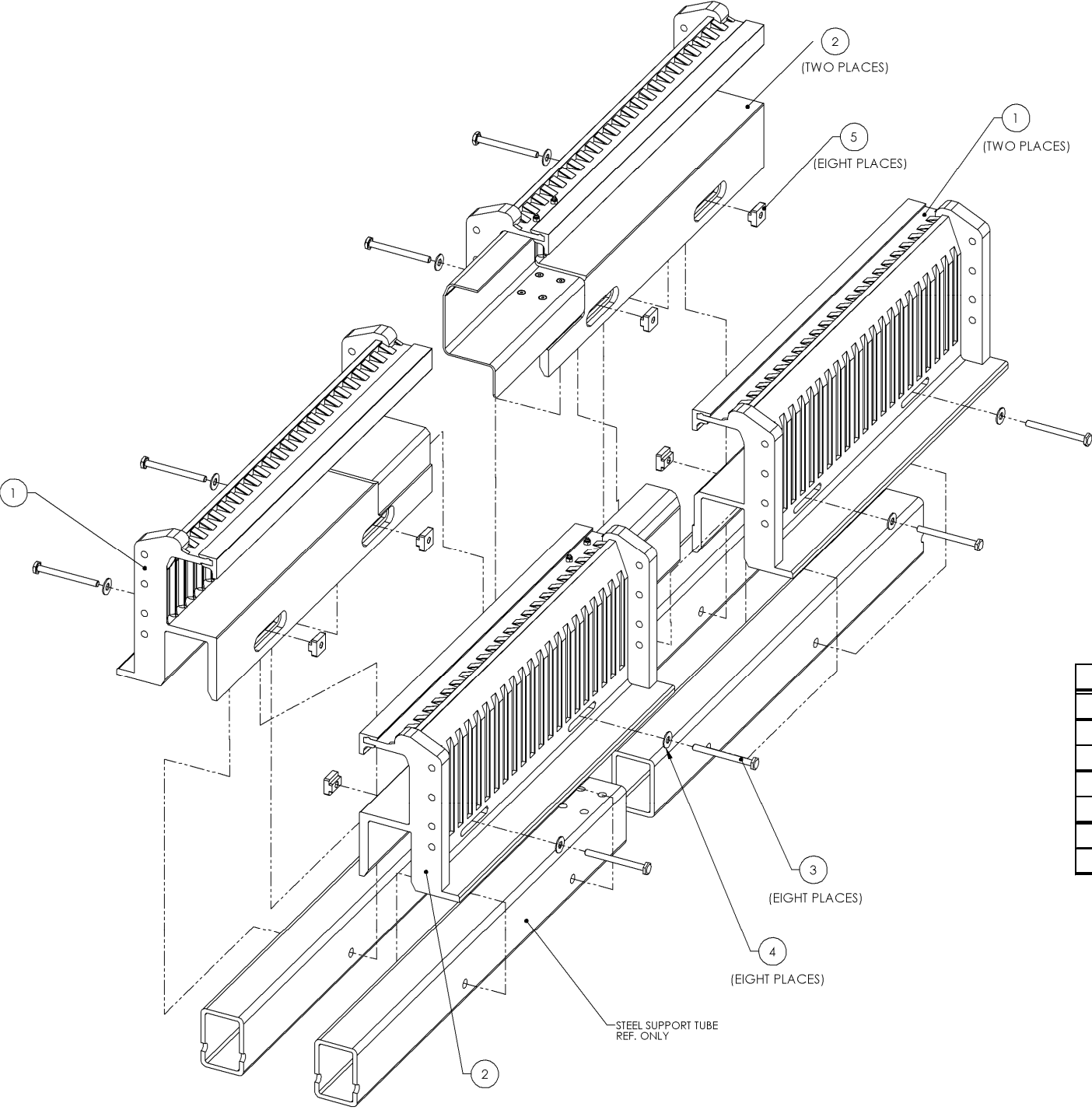


Table 9-6 Expansion Joint Assembly

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	Expansion Joint Assembly		01-11-5491	82094
1	Sliding Expansion Joint Assembly		01-11-5480	82094
2	Track Expansion Joint & Bridge Assembly		01-11-5481	82094
3	Hex HD Screw, 5/16-18 X 3 1/2", Zinc Plated		03-80-1026	82094
4	Flat Washer, 5/16", Zinc Plated		03-80-1040	82094
5	Track T Nut		02-24-0356	82094

Figure 9-7  
Access Door Assembly  
(6ft door)

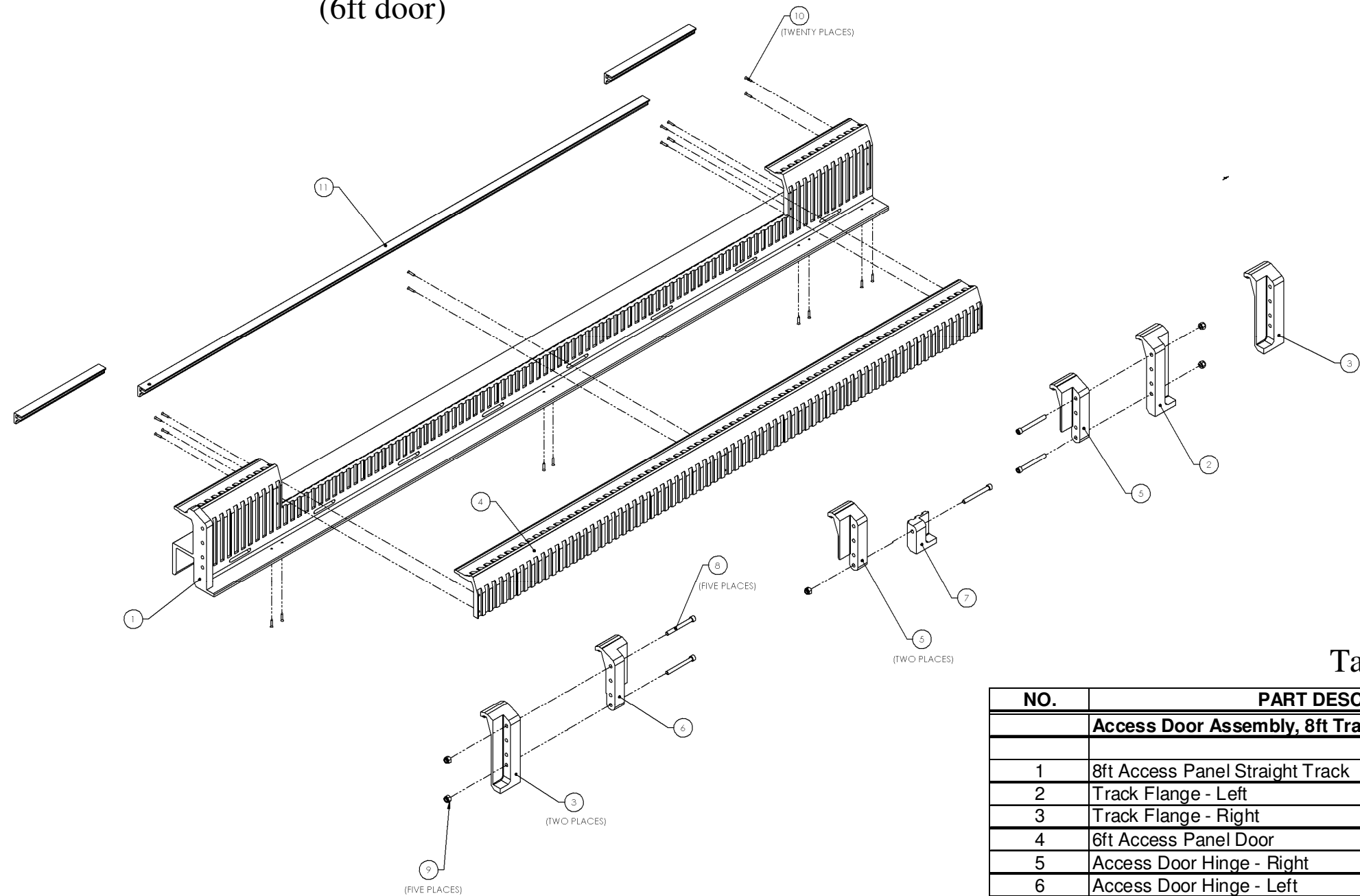


Table 9-7 Access Door Assembly

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	Access Door Assembly, 8ft Track with 6ft Door		01-11-0141	82094
1	8ft Access Panel Straight Track		02-22-0364	82094
2	Track Flange - Left		02-22-0160	82094
3	Track Flange - Right		02-22-0161	82094
4	6ft Access Panel Door		02-22-0363	82094
5	Access Door Hinge - Right		02-22-0165	82094
6	Access Door Hinge - Left		02-22-0164	82094
7	Center Pivot Support		02-22-0180	82094
8	Socket HD Cap Screw, 3/8-16 X 3 1/2", Zinc Plated		03-80-1028	82094
9	Lock Nut, Nylock, 3/8-16, Zinc Plated		03-80-1027	82094
10	Sheet Metal Screw, FH Philips Drive, #8 X 1, Zinc Plated		03-80-1024	82094
11	Rub Strip		01-11-5490	82094

Figure 9-8  
Straight Track Bolt Up  
Assembly

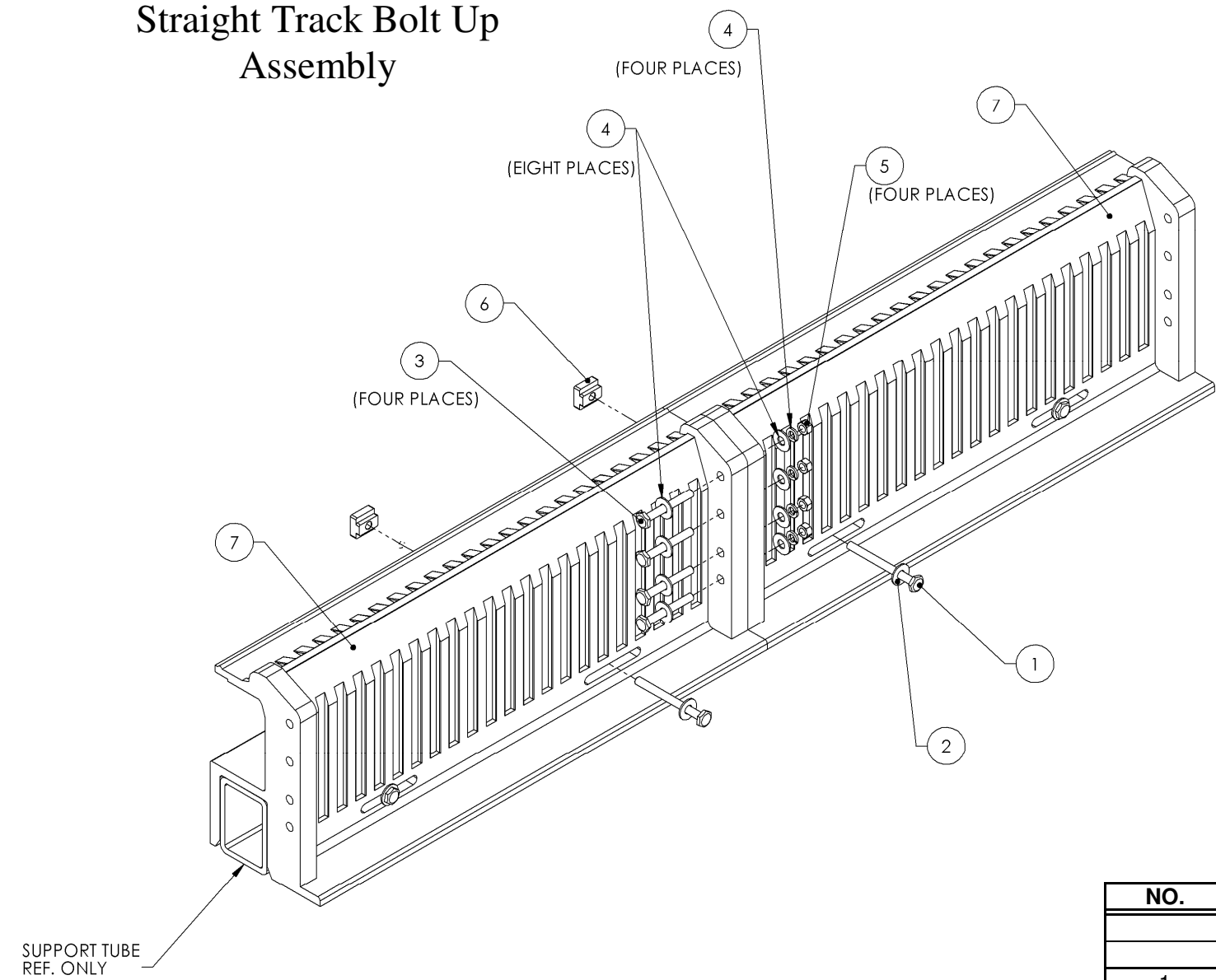


Table 9-8 Straight Track Bolt Up Assembly

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	<b>Straight Track Bolt-Up Assembly</b>		<b>09-11-0057</b>	<b>82094</b>
1	Hex HD Cap Screw, 5/16-18 X 3 1/2, Gr 5, Zinc Plated		03-80-1026	82094
2	Flat Washer, 5/16", Zinc Plated		03-80-1040	82094
3	Hex HD Cap Screw, 5/16-18 X 3"L, Gr 5, Zinc Plated		03-80-1323	82094
4	Lock Washer, 5/16", Zinc Plated		03-80-1037	82094
5	Hex Nut, 5/16-18, Zinc Plated		03-80-1036	82094
6	Track T nut		02-24-0356	82094
7	Straight Track, 12ft Sections		01-11-0110	82094

Figure 9-9  
Inside Curved Track Assembly

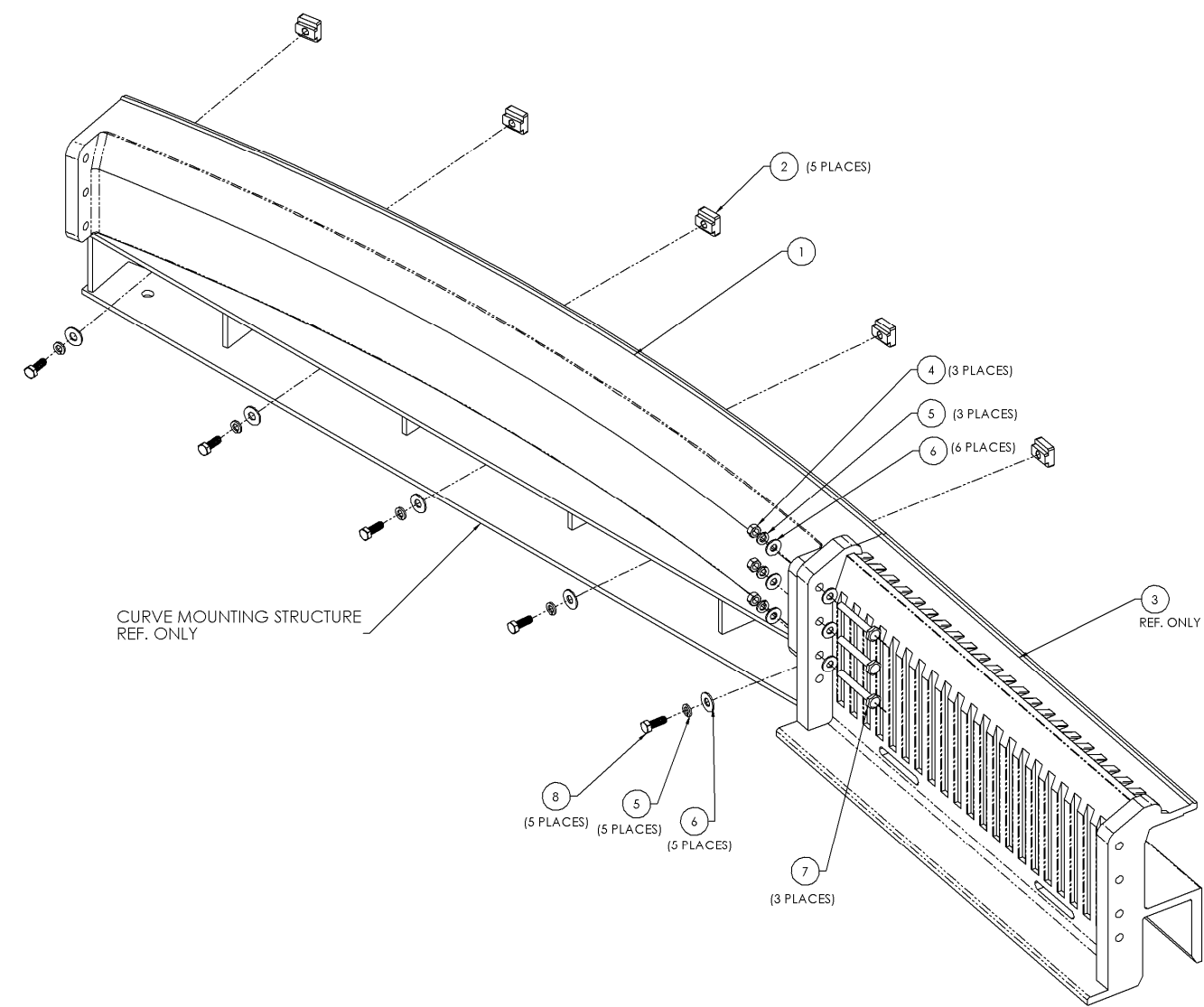


Table 9-9 Inside Curved Track Assembly

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	Inside Curve Track Assembly			82094
1	Inside Curve Track, 22 1/2 deg		01-11-0120	82094
2	Track T Nut		02-24-0356	82094
3	Straight Track		01-11-0110	82094
4	Hex Nut, 5/16-18, Zinc Plated		03-80-1036	82094
5	Lock Washer, 5/16", Zinc Plated		03-80-1037	82094
6	Flat Washer, 5/16", Zinc Plated		03-80-1040	82094
7	Hex HD Screw, 5/16-18 X 2 1/2L, Zinc Plated		03-80-1025	82094
8	Hex HD Screw, 5/16-18 X 7/8L, Zinc Plated		03-80-0007	82094

Figure 9-10  
Outside Curved Track Assembly

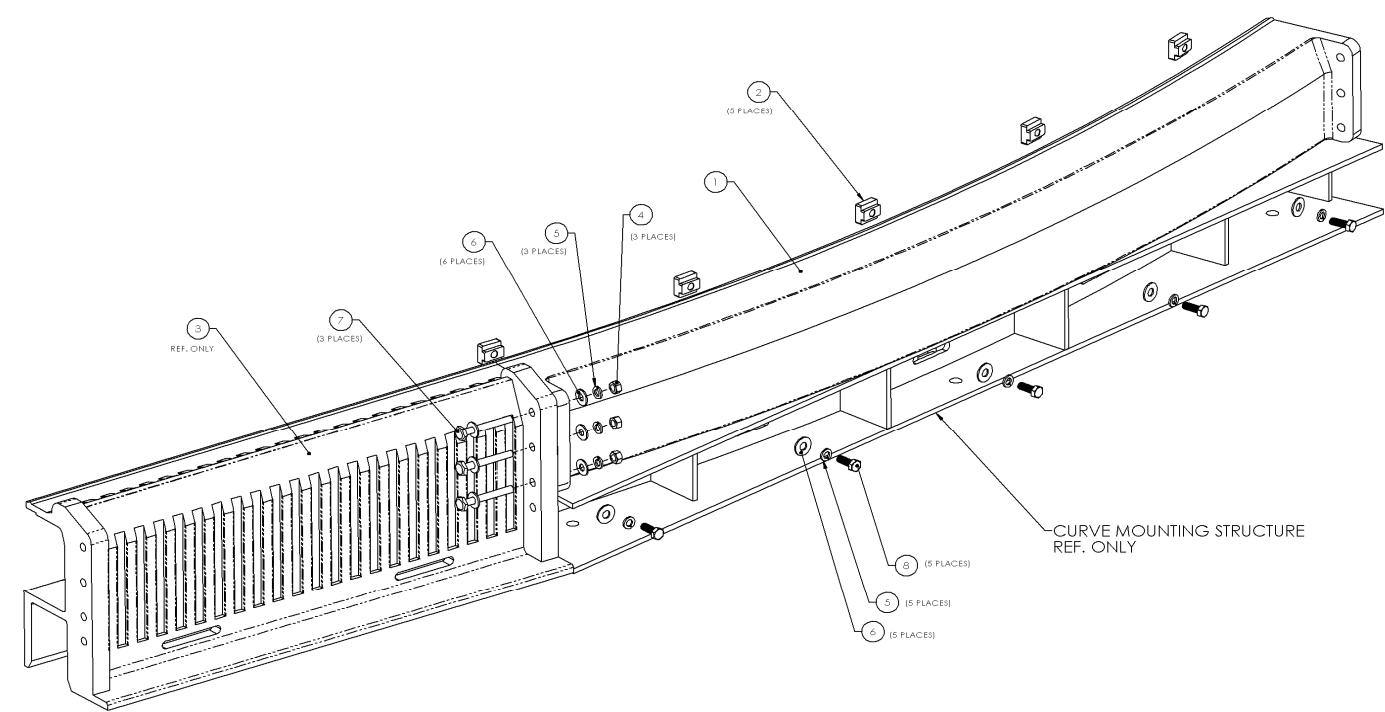


Table 9-10 Outside Curved Track Assembly

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	Outside Curve Track Assembly			82094
1	Outside Curve Track, 22 1/2 deg		01-11-0130	82094
2	Track T Nut		02-24-0356	82094
3	Straight Track		01-11-0110	82094
4	Hex Nut, 5/16-18, Zinc Plated		03-80-1036	82094
5	Lock Washer, 5/16", Zinc Plated		03-80-1037	82094
6	Flat Washer, 5/16", Zinc Plated		03-80-1040	82094
7	Hex HD Screw, 5/16-18 X 2 1/2L, Zinc Plated		03-80-1025	82094
8	Hex HD Screw, 5/16-18 X 7/8L, Zinc Plated		03-80-0007	82094

Figure 9-11  
Custom End Flanges with Shim

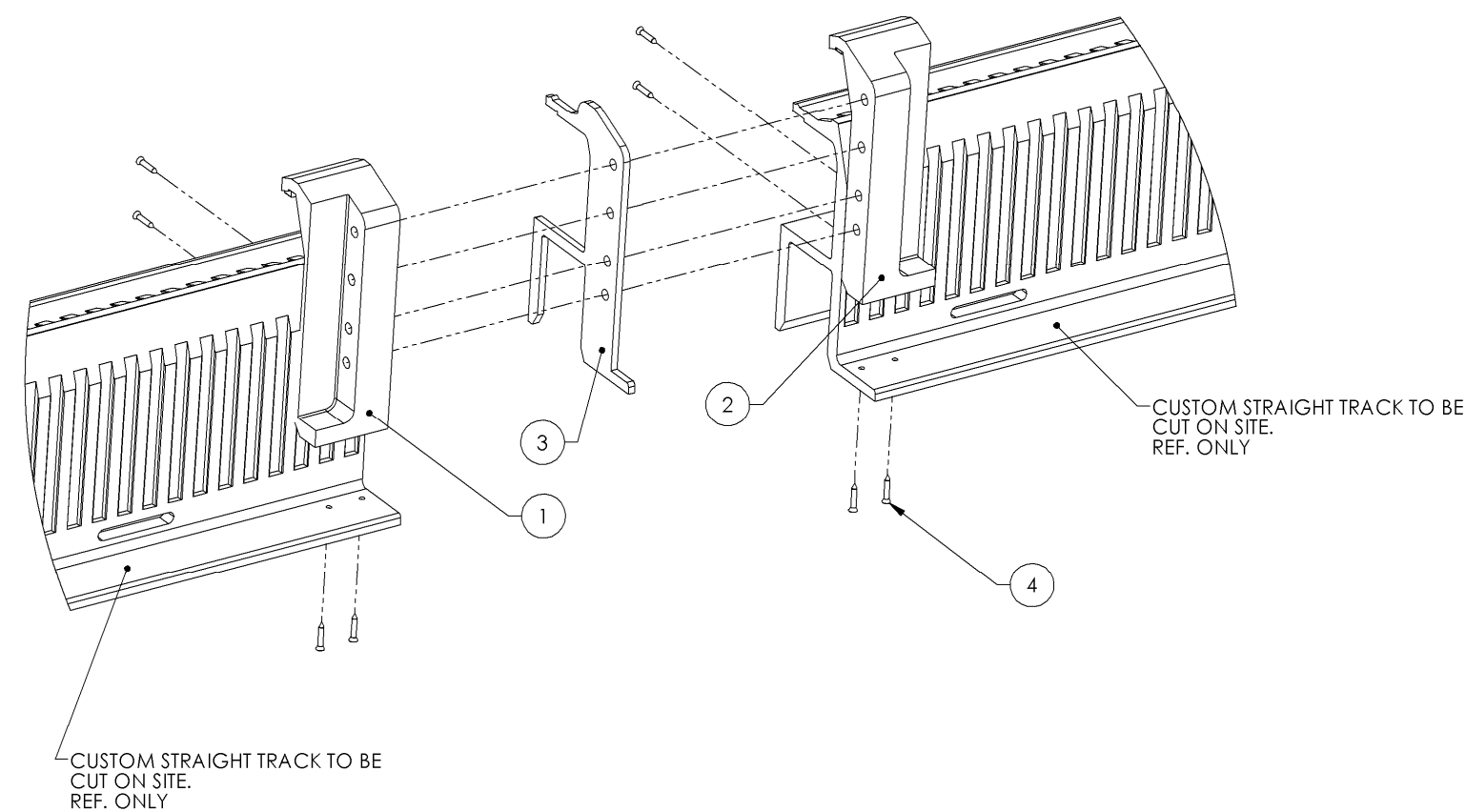


Table 9-11 Custom End Flanges with Shim

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	Custom End Flanges with Shim			82094
1	Track Flange, Right		02-22-0161	82094
2	Track Flange, Left		02-22-0160	82094
3	1/4" Track Shim		01-11-0114	82094
4	Sheet Metal Screw, #8 X 1, Flat HD, Pan HD, Zinc Plated		03-80-1024	82094

Figure 9-12  
Static Dissipation Kit Assembly

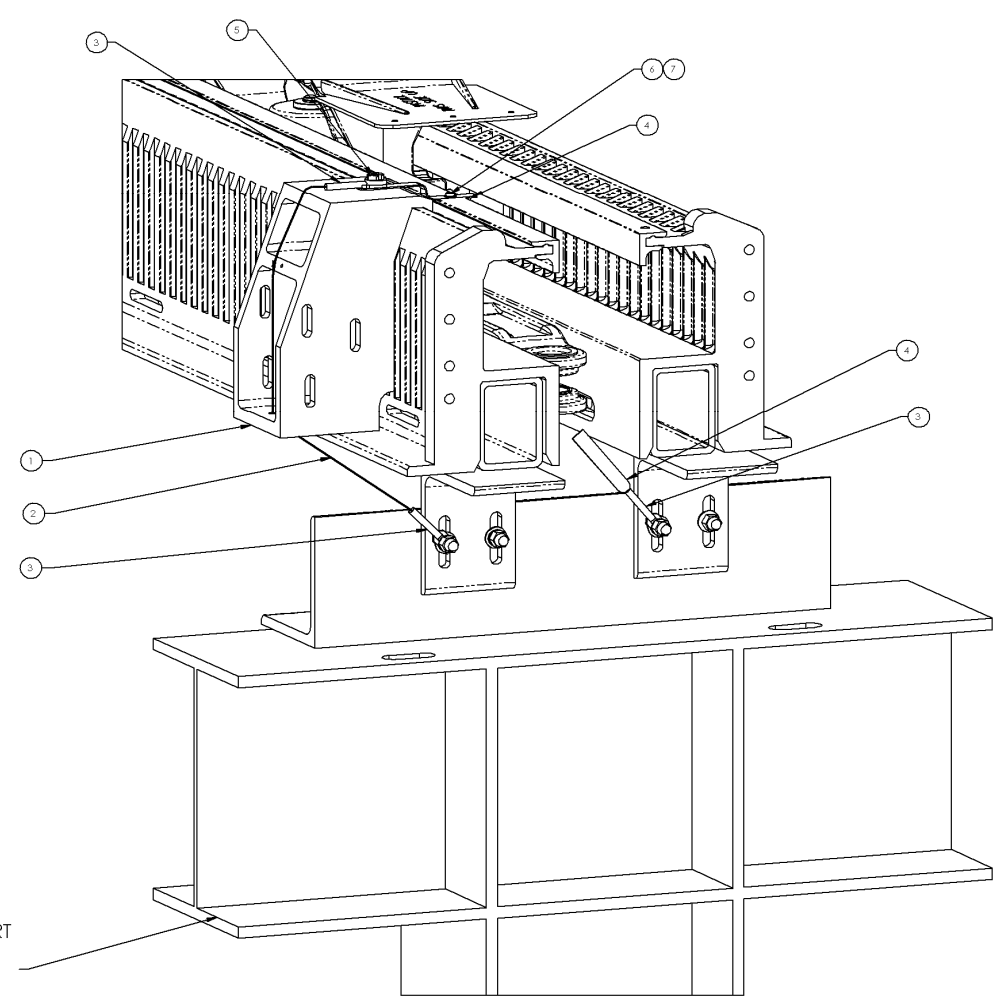


Table 9-12 Static Dissipation Kit Assembly

NO.	PART DESCRIPTION	STOCK NO.	PART NO.	CAGE CODE
	Static Dissipation Kit Assembly		01-11-0118	82094
1	Tip-Up Indexing Mount		02-22-0220	82094
2	10 AWG Stranded Copper Wire		03-85-9006	82094
3	Compression Lug for 3/8" Stud		03-80-1131	82094
4	Flat Braided Grounding Wire, 1/2" Wide, 1Ft Long		03-85-9007	82094
5	Sheet Metal Screw, Hex Head Slotted Drive, 3/8" X 1" Steel, Zinc Plated		03-80-1217	82094
6	Sheet Metal Screw, Pan Head Phillips Drive, #8 X 5/8" Steel, Zinc Plated		03-80-0083	82094
7	Flat Washer, #8, Steel, Zinc Plated, SAE		03-80-0103	82094