

# CONTINENTAL RAILWORKS

INSTALLATION, OPERATION, PARTS, AND SERVICE MANUAL

MODEL G-20 HI-RAIL UNIT



**CONTINENTAL RAILWORKS**

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## **INTRODUCTION**

The following installation, operation, parts, and service manual has been prepared to be used with the Continental Railworks **model G-20** hi-rail unit.

All Continental Railworks hi-rail kits are designed to make operation and service as simple as possible. There is no adjustment required when varying loads are placed on a vehicle. The use of independent mounting plates provides for easy complete unit removal and re-installation when required, as well as a complete range of adjustment to tailor the hi-rail unit to the vehicle.

At any time technical assistance can be obtained from the hi-rail manufacturer. A simple phone call to Continental Railworks can eliminate many time consuming problems or questions. Technical assistance is available Monday to Friday, from 8:30 a.m. to 4:30 p.m., by calling **(514) 956-8081** or faxing **(514) 956-0737**. Support personnel are frequently available during off-peak hours as well, so please do not hesitate to call or fax outside the hours listed above, including nights and weekends. It is also possible to leave a message at any time, and your call will be returned as soon as possible.

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## **INSTALLATION**

For ease of installation, Continental Railworks hi-rail units are designed with independent mounting plates front and rear, driver and passenger sides. In general, the mounting plates are positioned in place, the holes marked and drilled, and then bolted in place.

### **Front Mounting Plates**

1. Remove the front bumper of the vehicle. Store the bumper in a safe location to avoid damage, as it will be re-installed on the vehicle after the hi-rail installation.
2. Install the frame reinforcements inside the front of the truck frame. Use existing holes to bolt the reinforcements in place. Please consult the APPENDICES for a sketch of how the front components should be installed.

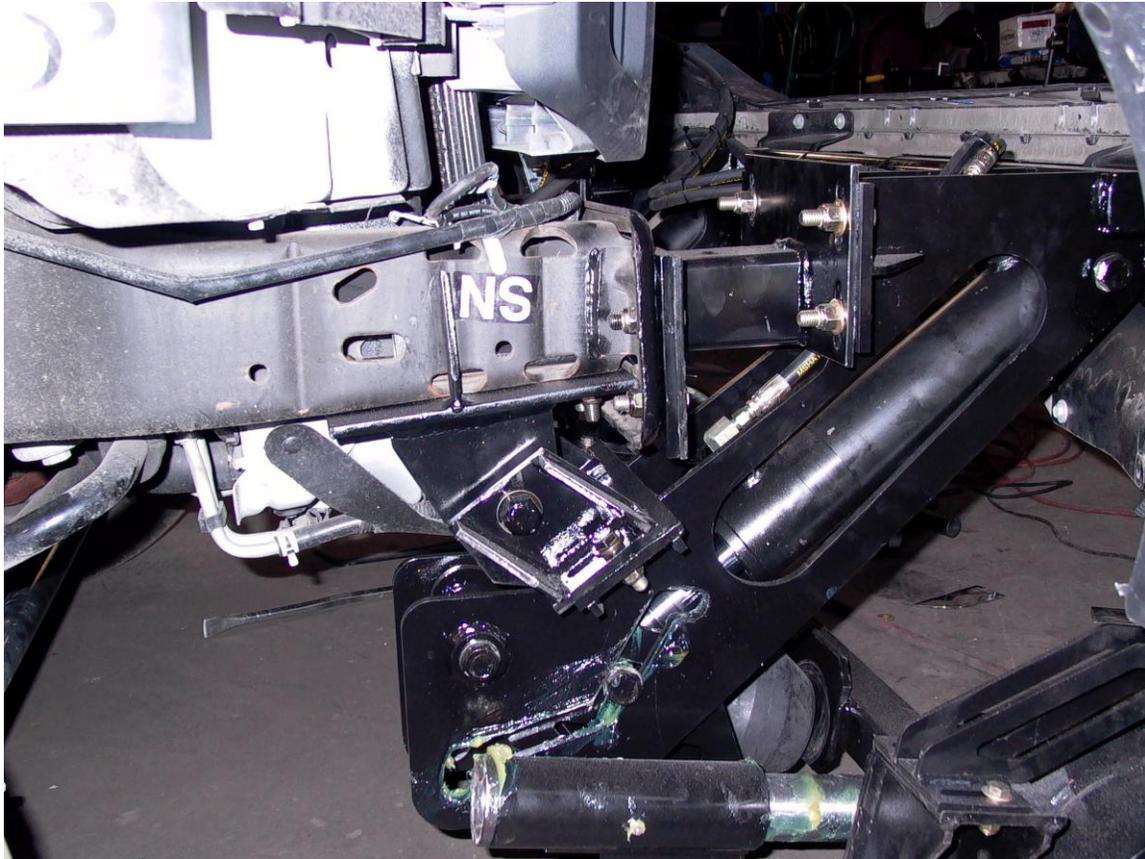


Figure 1. Installation of front hi-rail mounting angles

3. Position the two front mounting angles under the vehicle frame and the frame reinforcements. Bolt it in place.
4. Install the front mounting brackets on the ends of the vehicle frame and frame reinforcements the grade 8 bolts supplied, one on the driver's side and one on the passenger's side. Do not fully tighten the bolts at this point.



Figure 2. Installation of frame extensions

### **Front Hi-rail Unit**

1. Raise the hi-rail unit into position with the wheels pointing towards the front of the vehicle.
2. Align the holes in the hi-rail unit with the holes in the mounting plates and the holes on the mounting angles.
3. Bolt in position using grade 8 bolts, washers, and nylon insert lock nuts. Do not fully tighten the nuts at this time.
4. Re-install the front bumper on the front hi-rail unit, using the original bumper bolts. Trim the bumper as necessary to clear the hi-rail unit in the raised position.

### **Rear Mounting Plates**

1. Remove the rear bumper. Store the bumper in a safe location to avoid damage, as it will be re-installed on the vehicle after the hi-rail installation.

2. Place the rear mounting plate in position as shown in the figure below. Ensure the plate is butted up underneath the frame rail. Install the two frame extensions (supplied). Mark available holes. Remove plate and drill holes. Install plate with grade 8 bolts, washers, and nylon insert locknuts supplied.



Figure 3. Rear hi-rail unit installation

### **Rear Hi-rail Unit**

1. Install the rear suspension blocks in place on the rear hi-rail unit, if not already installed.
2. Place the spring guide plates on top of the rubbers. These will be tacked in place to the rear mounting plate after the hi-rail alignment has been performed.
3. Raise the hi-rail unit into position with the wheels pointing towards the front of the vehicle.
4. Align the holes in the hi-rail unit with the holes in the mounting plates.

**NOTE:** *It may be necessary to modify the location of the exhaust pipe to accommodate the hi-rail installation.*

5. Bolt in position using grade 8 bolts, washers, and nylon insert lock nuts supplied. Do not tighten the nuts at this time.
6. Re-install the rear bumper if applicable.

### **Hydraulics**

The hi-rail system requires a working pressure of 2500 p.s.i. and a flow rate of 3-5 gpm. The system will not function adequately at a pressure below 2500 p.s.i. The system will function at a lower flow rate, but will function more slowly.

In all cases, the minimum hydraulic hose to be used is a steel braided 1/4" diameter hose, with a minimum working pressure of 4000 p.s.i. Hoses run along the vehicle must be adequately secured to the body or frame of the vehicle.

### **Hydraulic Power Pack Installation**

1. Mount the hydraulic power pack in a convenient location. If mounted on the front of the vehicle, it is recommended to provide protection from road elements.
2. Connect hydraulic hoses from the power pack to the front and rear hi-rail units according to the hydraulics schematic in the APPENDICES.
3. If applicable, connect hydraulic hoses from the power pack to the front hydraulic brake cylinders, through the hydraulic brake valve, relief valve, and flow control valve.
4. Connect the power pack motor to the vehicle battery through the 150 amp circuit breaker and through the electric solenoid supplied. Consult the electrical schematic in the APPENDICES.
5. Power the electric solenoid through a double pole single throw dash mounted switch receiving only ignition power. Use the other side of the dash mounted switch to power the brake relay solenoid supplied.

### **PTO/Pump Installation**

Please refer to the hydraulic schematic detailed on following page.

1. Install the front and rear operating valves in a suitable location, preferably on the driver's side of the vehicle.
2. Run a 1/2" hydraulic hose from the pressure source (either p.t.o., electric/hydraulic pump, or from a diverter valve) to the front hydraulic valve and connect it to the pressure port of the valve to allow flow through the valve.

3. Run a ½” hydraulic hose from the discharge port of the front valve to the pressure port of the rear valve.
4. Run a ½” hydraulic hose from the discharge port of the rear valve to the return line to the tank.
5. Connect the two ports on the front hydraulic valve to the two “T” connectors going to the front hydraulic cylinders.
6. Connect the two ports on the rear hydraulic valve to the two “T” connectors going to the rear hydraulic cylinders.

### **Brake Pump Installation (if required)**

1. Install the brake hydraulic pump under the hood of the vehicle or in another protected location.
2. Run a ¼” hydraulic hose from the pressure source through the ¼” adjustable flow control valve to the brake cylinders.
3. Connect the main power from the battery to the pump solenoid through the 150 amp circuit breaker.
4. Connect the pump signal solenoid to a brake light signal.

## **Steering Wheel Lock**

1. Install one velcro tape on the steering column
2. Install one velcro tape on the steering wheel.
3. Install the smallest velcro tape on the dash to hold the velcro lock when not in use.

**NOTE: Ensure that the installation of the steering wheel lock does not interfere with the normal operation of the steering wheel, turn signal indicators, or any other function located on the steering column.**

## ALIGNMENT AND ADJUSTMENT

### **Alignment Procedure**

The simplest method of aligning the hi-rail unit to the vehicle is to use a set of parallel strings attached to heavy mobile objects on the floor, such as jack stands or pilons.

The goal is to achieve the following:

- The rear hi-rail unit is centered on the rear axle
- The center of the rear truck wheel is the same distance to the center of the rear hi-rail wheel on both sides of the vehicle
- The front hi-rail unit is centered on the **rear** axle
- The center of the rear truck wheel is the same distance to the center of the front hi-rail wheel on both sides of the vehicle

The directions for aligning the vehicle are as follows. Please refer to the alignment diagram attached.

1. Ensure the vehicle is on a hard flat surface with the front wheels pointing straight ahead
2. If not working on a track setup, place minimum 1-1/2" thick blocks or rails under the front hi-rail wheels where they will contact the floor, so as not to damage the shop floor when lowering the hi-rail unit. Lower the front hi-rail unit completely. Verify that the front axle lockup mechanism has engaged the axle locks. Measure the space between the floor and the underside of the front tires, and subtract the thickness of the blocks. Ensure this measurement is minimum 2", to allow for adequate clearance of the tires when the vehicle is operating on rail. If 2" minimum is not achieved, a shim spacer of the required additional thickness to achieve 2" must be inserted between the hi-rail mounting plates and the hi-rail mounting frame. This must be done before continuing with the vehicle alignment procedure.
3. Lower the rear hi-rail unit completely.
4. Set up pilons at the four corners of the vehicle
5. Attach 2 high tension strings of exactly equal length (dimension A) to the pilons, running them along the length of the vehicle. Attach 2 high tension strings of exactly equal length (dimension B) to the pilons, running them along the front and rear of the vehicle
6. Verify that the vehicle rear axle is centered on the vehicle frame. If the rear vehicle axle is more than 1/2" off-center, please be aware that it may not be possible to align the front hi-rail unit properly. In this case, the vehicle axle must be straightened on the frame before a correct alignment can be achieved. Also verify that the rear axle is

square on the vehicle frame, by ensuring the same distance is achieved at both the front and rear of the vehicle rim.

7. Position the pilons so that the strings are an equal distance from each rear rim (dimension C), an equal distance from the vehicle front frame (dimension F), and the pilons are an equal distance apart front and rear (dimension B). A tolerance of 1/32" is permitted for this measurement.
8. Install alignment magnets or wheel extensions on all four wheels. These extend the measurement surfaces to approximately 24", and allow a more accurate alignment. For units where a toe-in adjustment is available, adjust the rear hi-rail unit toe-in and toe-out so that the distance from the rear hi-rail wheel to the alignment string (dimension D) is equal on both the front and rear of each. A tolerance of 1/16" is permitted for this measurement.
9. Adjust the rear hi-rail unit gauge so that an inside distance of 53-1/2" between the flanges of the hi-rail wheels is obtained. A tolerance of 1/16" is permitted for this measurement. Tighten the gauge adjustment bolts on the front hi-rail unit, locking the wheel spindles in place.
10. Adjust the rear hi-rail unit side-to-side so that the unit is centered on the strings (dimension D). This is achieved by loosening the bolts that connect the hi-rail unit to the mounting plates that have been installed on the vehicle frame. It may be necessary to raise the hi-rail unit to achieve this adjustment. A tolerance of 1/16" is permitted for this measurement.
11. Repeat steps 8 and 9 for the front hi-rail unit.
12. Adjust the front hi-rail so that the distance from the front hi-rail wheel to the string is equal on both sides of the vehicle (dimension D).
13. Ensure all mounting plate adjustment bolts are properly tightened and torqued after adjusting the unit. Please see the bolt torque chart in the APPENDICES.
14. On front spring-mounted hi-rail, install shims (various thicknesses supplied) on the front main support pins to lock the Alignment Adjustment in place. The shims should be installed on the inside surface, towards the centerline of the vehicle, on both pins.
15. With the rear hi-rail unit lowered and the rubber springs fully compressed, determine the location where the spring centers should be located to ensure the rubber springs are vertical when in operation. Tack weld the spring centers to the mounting plates, ensuring the rubber spring will remain centered when the rear hi-rail suspension is active
16. Perform a track test on the unit ensuring there is no excessive flanging

## **Pressure Adjustment**

The rear unit may require adjustment to allow for the proper balance between traction and guidance. The following adjustment procedure is for an empty, unladen vehicle. As the vehicle is loaded, the additional weight will be distributed between the truck springs and the hi-rail suspension. It will be normal for the contact patch of the tires in that condition to increase beyond the maximum indicated below.

1. With the vehicle on track, measure the length of the tire contact patch of the rearmost axle with the rail head. The measurement should be between 8" and 10".
2. If less than 8", the traction of the vehicle must be increased. This is achieved by removing the ½" shims installed under the rear rubber springs, which will in effect raise the hi-rail unit and increase the vehicle traction. To remove the shim, do the following:
  - Remove the vehicle from the track
  - Lower the hi-rail unit completely
  - Remove the 2 stopper assemblies restricting the downward motion of the rear cam assembly
  - Raise the hi-rail unit, which will in effect lower the rear cam assemblies and make the rubber springs completely accessible
  - Remove the shim (or shims), and reverse the order to re-install.
3. If more than 10", the traction of the vehicle must be decreased. This is achieved by adding shims under the rubber spring for small adjustments, or adding shims between the rear hi-rail unit and the mounting plates for larger adjustments. Please contact the factory for assistance if more than 4 shims ½" thick are required.
4. If the vehicle is loaded, the tire contact patch measurement should be typically between 10" and 12". A fully loaded vehicle may have a tire contact patch as high as 14".

## **Track Test**

When putting the vehicle on track, first lower the rear unit and then lower the front unit after re-positioning the vehicle as required.

Verify the following items:

1. Ensure the units raise and lower easily, and that hydraulic hoses are all of adequate length and that hydraulic fittings have adequate clearance.
2. Ensure the hi-rail units deploy completely, forming a straight and linear connection from the top of the unit all the way to the wheel.

3. Adjust the railsweep brackets as necessary so that the rubber sweeps just contact the rail with the hi-rail in the lowered position.
4. Verify that there is 2" to 3" of clearance between the front tires and the rail head.
5. Verify that there is an 8" to 10" contact patch on the rearmost tires with the rail, with the vehicle empty. (This dimension will increase with a loaded vehicle).
6. Ensure the vehicle tracks properly down the track, and that there is no excessive flanging of the hi-rail wheels. Also ensure there is no excessive vibration of the vehicle when on track.

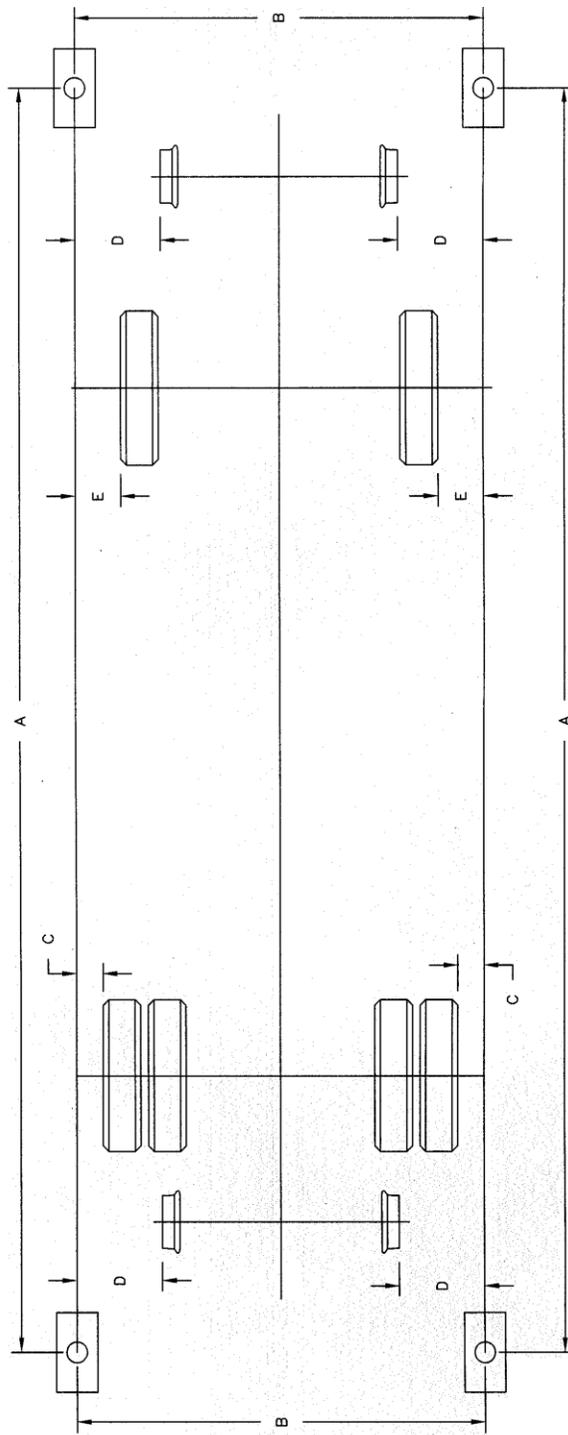


Figure 7 - Alignment Diagram

17. Adjust the front hi-rail unit toe-in and toe-out so that the distance from the front of the front hi-rail wheel to the string (dimension D) is equal to the distance from the rear of the front hi-rail wheel to the string, and is equal on both sides of the vehicle
18. Ensure all wheel assembly, mounting plate, mounting angle, bumper bolts, and all other fasteners are properly tightened after adjusting the unit.

### **Brake Pressure Adjustment**

If equipped with front hydraulic brakes, the pressure of application of the brakes may be adjusted. It is desirable to adjust the front brake pressure to a point where the brakes do not lock up the front wheels, but do apply the most pressure possible. This is typically in the 350 psi range.

1. Remove the protective cover at the front hi-rail unit.
2. Loosen the lock nut on the pressure adjustment of the hydraulic brake valve.
3. To increase the brake pressure, rotate the set screw clockwise. To reduce the brake pressure, rotate the set screw counter-clockwise. Re-tighten the lock nut.
4. Track test the vehicle. Re-adjust the pressure as necessary.

## **OPERATION**

To place the vehicle on track, the vehicle must be positioned parallel to the rails over a level crossing or a similar access point in a rail yard where the track is approximately level with the pavement. The vehicle must be placed on the track rear unit first, so that the front unit can be steered into position afterwards as required.

### **Rear Unit**

1. Position the vehicle so that the rear hi-rail wheels are directly over the track and aligned with the track rails.
2. Turn on the hi-rail “on” switch on the dash to energize the power pack.
3. Lower the hi-rail unit to engage the hi-rail wheels with the track. Adjust the position of the vehicle if necessary to ensure proper alignment.

**NOTE:** *The rear hi-rail unit has an automatic locking and unlocking mechanism. It is not necessary to manually disengage any hooks, pins, or levers.*

4. Lower the hi-rail unit completely and stroke the cylinders. Ensure the cylinders are completely stroked and the cylinder pins have moved into their locking slots.

### **Front Unit**

1. Adjust the position of the vehicle if necessary so that the front hi-rail wheels are directly over the track and aligned with the track rails. Turn the steering wheel of the vehicle so that the tires are pointed straight ahead.
2. Lower the hi-rail unit to engage the hi-rail wheels with the track. Adjust the position if necessary to ensure proper alignment with the track.

**NOTE:** *The front hi-rail unit has an automatic locking and unlocking mechanism. It is not necessary to manually disengage any hooks, pins, or levers.*

3. Lower the hi-rail unit completely to the ground and stroke the cylinders. Ensure the cylinders are completely stroked and the cylinder pins have moved to the end of their locking slots.
4. If equipped with front brakes, the brakes will actuate whenever the vehicle brake pedal is depressed. Ensure the switch in the vehicle cab is engaged to actuate the hi-rail brakes.

### **Steering Wheel Lock**

The steering wheel lock must be engaged when the unit operates on rail. The wheels are to be locked straight ahead to ensure proper operation of the vehicle on track.

1. After the vehicle has been placed on the track, position the steering wheel so that the wheels are pointing straight ahead.
2. Lock the steering wheel in position by first tilting the steering wheel down, then positioning the locking fork in position over the arms of the steering wheel, then tilting the steering wheel up to its maximum limit and engaging the locking fork with the top edge of the dash.

### **Speed Limit**

The maximum speed limit of a vehicle equipped with a model G-20 hi-rail unit is 40 kilometers per hour (25 miles per hour). This is the maximum speed limit of the unit in ideal conditions, and this speed limit must be reduced during poor weather conditions, reduced visibility, slippery track surfaces, or when being operated on poorly maintained rail.

Despite this speed limit, local railway dictated speed limits must also be observed, and if lower than 40 kilometers per hour must be followed.

**PLEASE DRIVE SAFELY !!!**

## PARTS

### Model G-20 Front Unit Parts List

Item no.	Part no.	Description	Quantity
1	F105BF00	front cam assembly	1
2	F005BF00	front frame assembly	1
3	P006B020	1" pin 4-7/8" long	4
4	V005A002	front rubber spring	2
5	V015A001	wear ring	4
6	B005B000	inner tube	2
7	D005CF00	front axle assembly	1
8	E085B000	spindle housing	2
9	E022A001	wheel spindle	2
9	E042A002	spindle isolating tube	2
9	E042A001	spindle insulator	2
9	E005B001	10" wheel	2
9	E122A001	hub cap	2
9	E172A001	hub cap gasket	2
10	P005A030	3/4" pin 3-1/8" long	2
11	P006B030	1" pin 5-3/8" long	2
13	H026A010	hydraulic cylinder	2
14	R006A000	rail sweep assembly	2
<b>PARTS NOT SHOWN ON DIAGRAM</b>			
	E062A001	slotted nut	2
		cotter pin	2
	E062A002	flat washer	2
	E032A002	press cup	4
	E032A001	bearing cone	4
	E112A001	grease seal	2
	G005F100	frame extension driver	1
	G005F150	frame extension passenger	1
	G005F120	inner mounting bracket driver	1
	G005F160	outer mounting bracket passenger	1
	F005F110	outer mounting bracket driver	1
	F005F170	Inner mounting bracket passenger	1
	G005CF00	front extension	2
	G035B004	3/4" pin 6-3/8" long	2
	H066BFD0	brake housing - driver	1
	H066BFP0	brake housing - passenger	1
	H18A0702	brake spacer	4

	H186E001	brake linkage	4
	H18B0402	brake yoke	2
	H025A000	brake cylinder	2
	H8A08000	brake shoe assembly	2

### Model G-20 Rear Unit Parts List

Item no.	Part no.	Description	Quantity
1	F005BB00	rear frame assembly	1
2	F105BB00	rear cam assembly	2
3	D005CB00	rear axle assembly	1
4	P005A010	1" pin 5-7/8" long	4
5	P005A020	1-1/4" pin 6-5/8" long	4
6	E085B000	spindle housing	2
7	E022A001	wheel spindle	2
7	E042A002	spindle isolating tube	2
7	E042A001	spindle insulator	2
7	E005B001	10" wheel	2
7	E122A001	hub cap	2
7	E172A001	hub cap gasket	2
8	F117BD00	stopper - driver	1
9	F117BP00	stopper - passenger	1
10	V005A002	rear rubber spring	2
11	H026A020	rear hydraulic cylinder	2
12	R005CD00	railsweep driver	1
13	R005CP00	railsweep passenger	1
<b>PARTS NOT SHOWN ON DIAGRAM</b>			
	E062A001	slotted nut	2
		cotter pin	2
	E062A002	flat washer	2
	E032A002	press cup	4
	E032A001	bearing cone	4
	E112A001	grease seal	2
	G005BP00	mounting bracket - passenger	1
	G005BD00	mounting bracket - driver	1
	F067C025	Spring spacer	
	F067A100	Spring guide plate	2

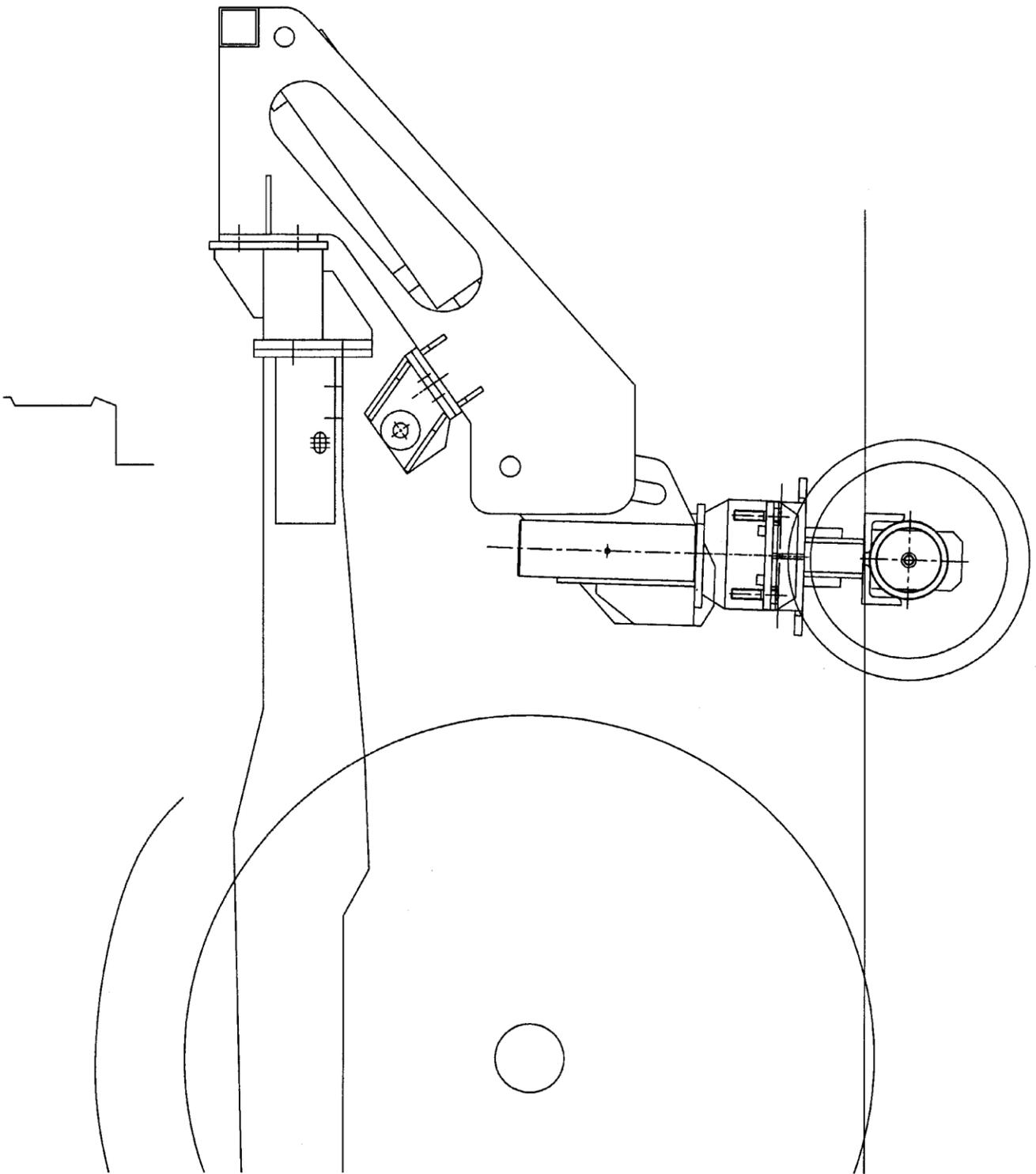
## SERVICE

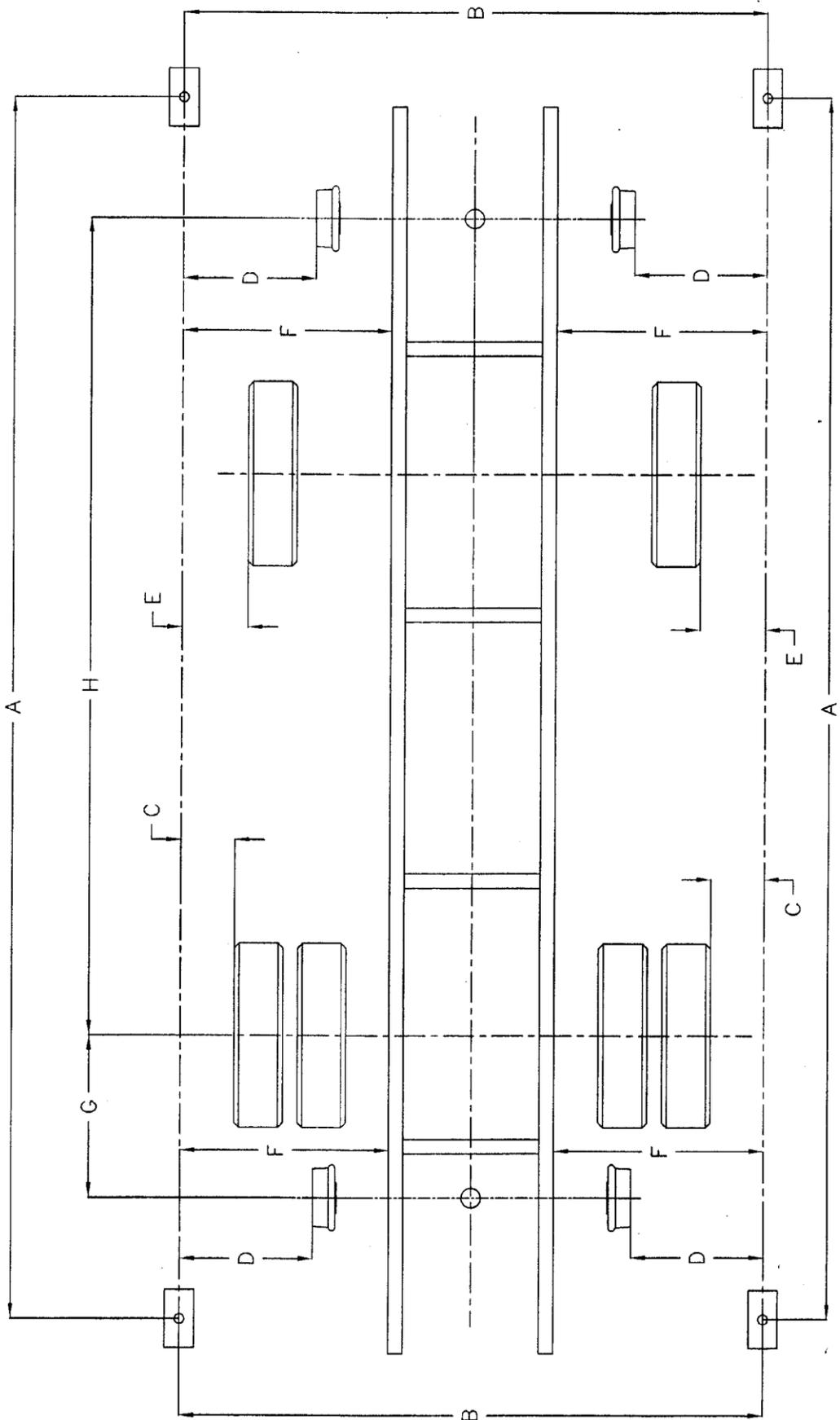
### Model G-20 Recommended Maintenance Interval Schedule

Item	Frequency	Description
Nuts and Bolts	Weekly	Inspect for loose fasteners. Tighten.
Wheel	Monthly	Inspect for excessive wear in tread or flange, cracking, or pitting. Replace as necessary.
Wheel Bearings	Monthly	Inspect for looseness. Inspect for excessive grease leakage from seals. Service as required.
	Every 6 Months	Remove wheels and bearings. Clean bearings and inspect for excessive wear, burning, pitting, or discoloration. Replace as necessary. Repack and re-install.
Wheel Spindle	Every 6 Months	Inspect surfaces for excessive wear, burning, pitting, or discoloration. Replace as necessary.
Axle and Frame Assemblies	Monthly	Visually inspect for damage, cracks, or broken welds. Repair as necessary.
	Every 2 Years	Inspect all pins for excessive wear. Replace as necessary. Inspect all holes and slots for excessive wear. Rebuild as necessary.

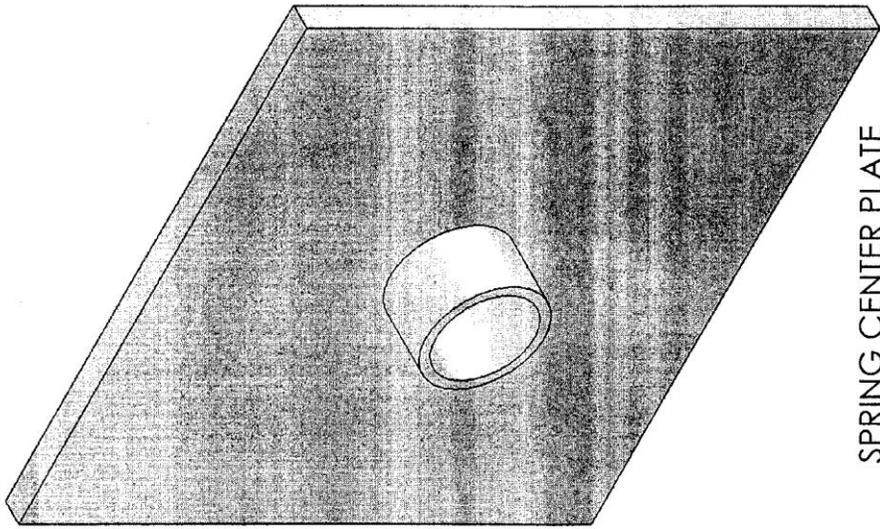
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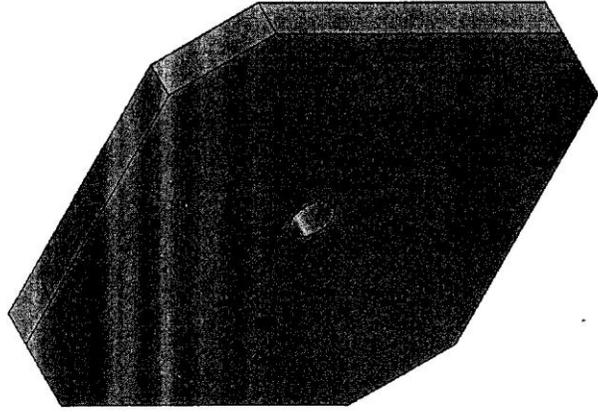




ALIGNMENT DIAGRAM



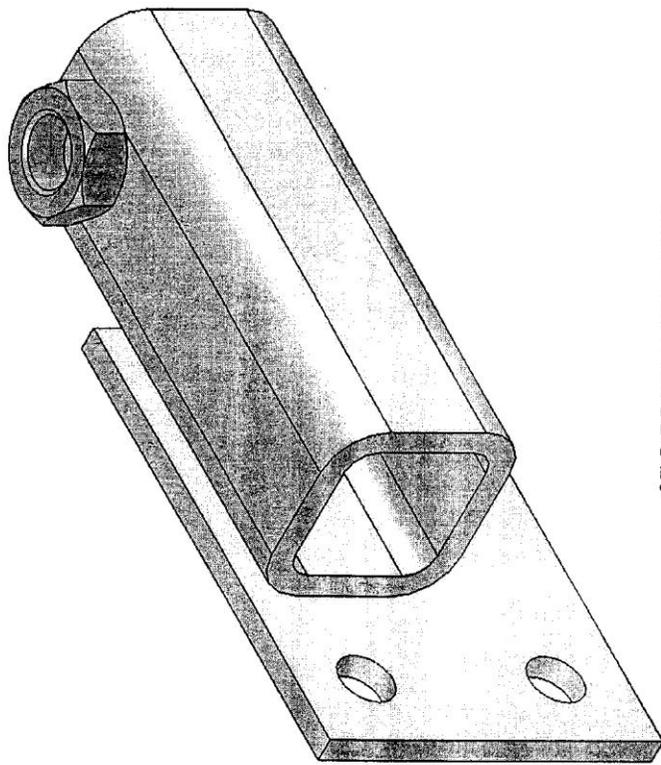
SPRING CENTER PLATE



1/2" PLASTIC SHIM

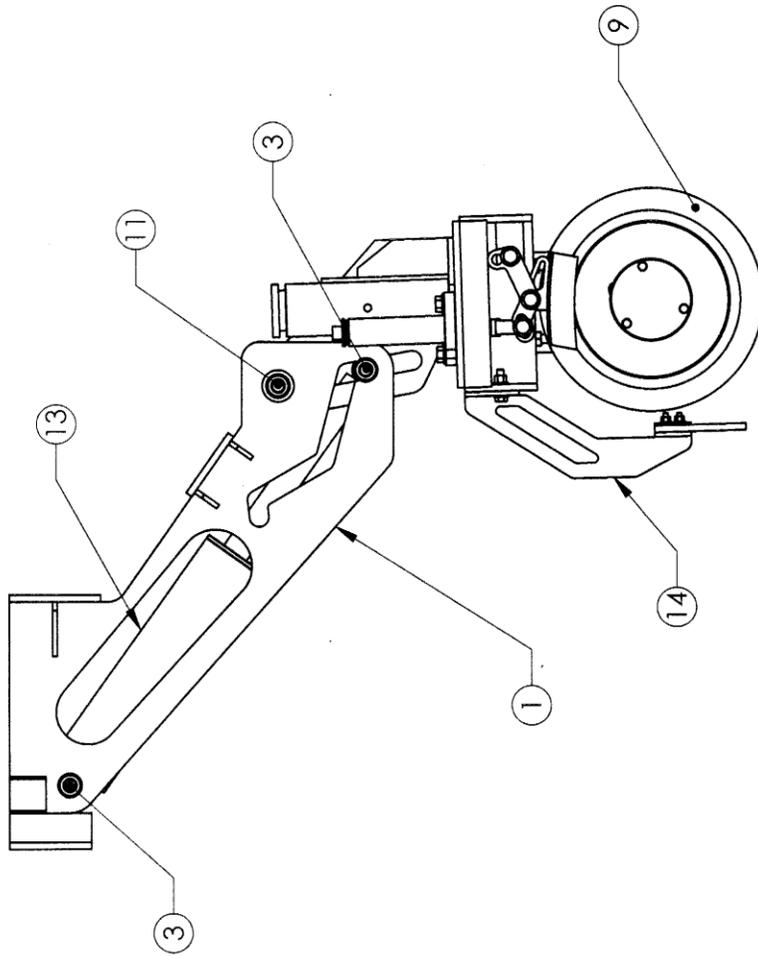
**Bolt Torque Requirements  
Grade 8 Fasteners**

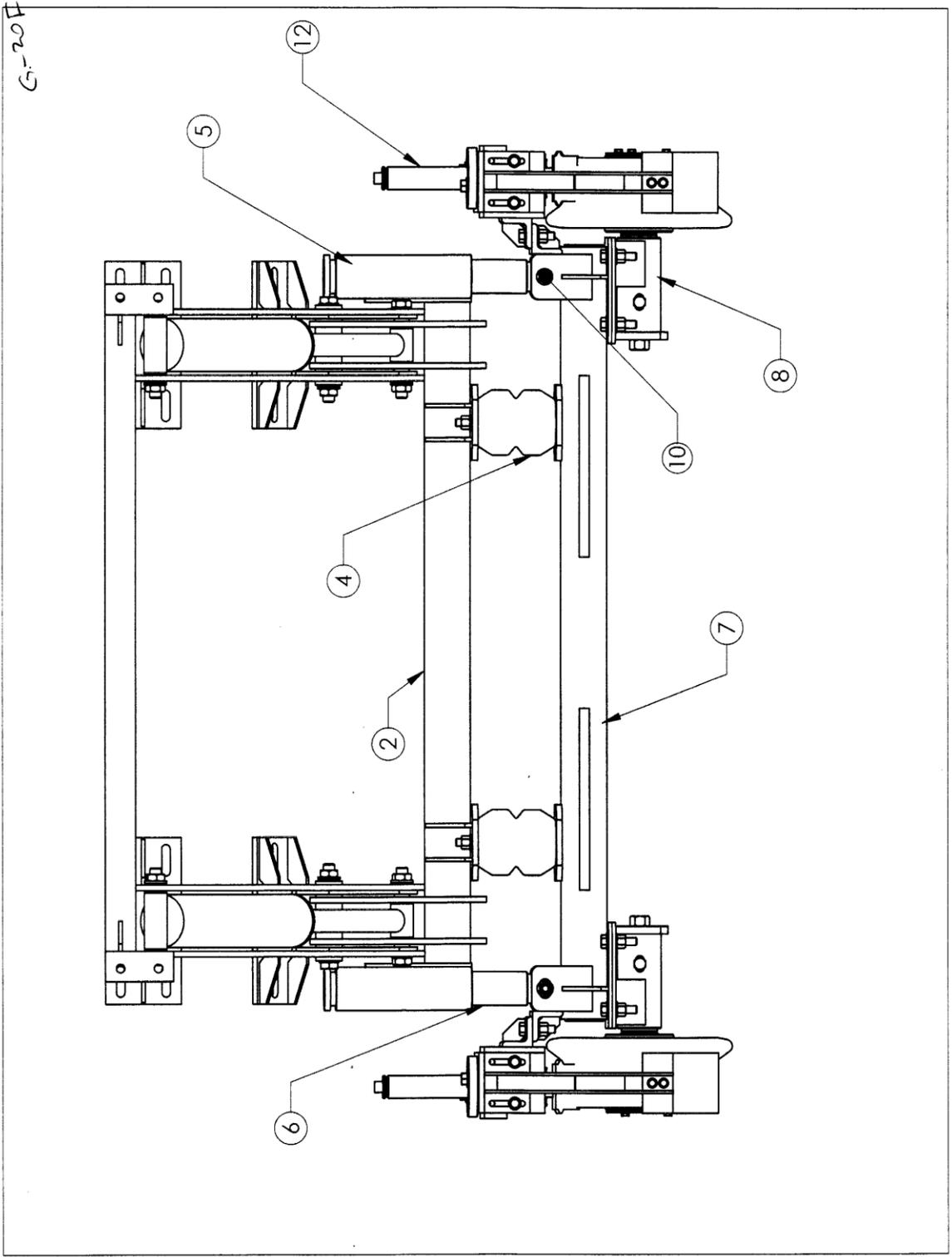
Bolt Dia.	Torque (ft-lbs)
1/2"	110
5/8"	210
3/4"	380
1"	910



STOPPER ASSEMBLY

G-20 F





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