CHALLENGER 4-6-6-4

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HISTORY

The Challenger 4-6-6-4 simple articulated locomotive was born into an era of contradictions. The railroad industry was suffering through the massive economic downturns of the early 1930s, with most railroads barely remaining solvent. Yet, a movement arose that resulted in the development of the pinnacle of steam locomotive design.

New locomotive orders with the major erection shops of Alco, Baldwin and Lima were almost non - existent in the years between 1930 and 1933. Most railroads opted to rebuild and refurbish existing equipment in their own shops. In addition, motive power rendered obsolete or surplus by the downturn in traffic found its way to the scrap line. In an effort to capture what little business existed, experimentation reached a fever pitch. These efforts manifested themselves in the introduction of streamlining, the development of diesel-powered, dedicated consist passenger trains and super-power steam locomotives. Super-power steam was the evolution in steam locomotion brought about by a marriage of high tractive effort with high-speed performance. Previously, railroads had either greyhound swift locomotives with limited pulling power or massive, complex locomotives capable of high tractive effort at speeds of around 20 miles per hour. By combining the latest technology with improved understanding of the dynamics of steam power, new classes of locomotives reached the rails. These machines featured large fireboxes supported by either four or six wheel trailing trucks, massive boiler girths that pressed clearance limits, higher boiler operating pressures and the latest in appliances that improved the roadworthiness and thermal efficiencies of the power plant.

The Union Pacific Railroad had a unique operational dilemma: The majority of its traffic was moved over long distances between the West Coast and the Midwest through daunting terrain. Almost at the midpoint of the system is Cheyenne, Wyoming and the Sherman Hill grade. Geographically, Cheyenne is located at the juncture between the plains of the Midwest and the foothills of the Rocky Mountain ranges. While not as dramatic as the Allegheny or Sierra grades, the line west of Cheyenne had long runs of 1.2% or better grades. The Union Pacific sought to operate long high-speed service through this challenging geography. For this reason, their best and most modern motive power was allocated to this division. Beginning with double-headed 2-8-0 Consolidations in the early twentieth century, heavier and more powerful locomotives were used, culminating with the signature Union Pacific three-cylinder 4-12-2. While they provided stellar service on the Sherman Hill route, these twelve-coupled locomotives had reached the maximum size for a rigid wheelbase locomotive and required the Union Pacific to look for additional horsepower to increase over-the-road speed.

Arthur M. Fetters, general mechanical engineer for the UP, suggested redesigning the successful wheel arrangement of the 4-12-2 as a simple articulated. By splitting the wheelbase between two smaller frames, an advantage would be gained by the ability to add larger drivers to a shorter rigid wheelbase. This resulted in more speed with the added benefit of lighter side rods. These lighter side rods would minimize track damage at higher speeds since the entire mechanism would be easier to balance dynamically. The final complement to this concept would be the ability to add a larger firebox supported by a four wheel trailing truck, further enhancing steaming capabilities. Mr. Fetters and the designers from American Locomotive Company

Challenger Locomotive Weights and Dimensions	
Tractive force	97,350 Lbs.
Cylinders, diameter and stroke (4)	21 in. x 32 in.
Drivers, diameter	69 in.
Total weight of engine	634.500 Lbs.
Weight of tender (2/3 loaded)	348,000 Lbs
Boiler diameter, first ring inside	94-11/16 in.
Length over tube sheets	20 ft. 0 in.
Driving wheel base, each	12 ft. 0 in.
Total engine wheel base	60 ft. 4 in.
Fuel	Soft coal/Oil
Grate area	132.2 sq. ft.
Steam pressure	280 Lbs.
Evaporative heating surface, firebox total	554 sq. ft.
Evaporative heating surface, tubes and flues	4,038 sq. ft.
Superheating surface, type A	1,741 sq. ft.
Tender Capacity, centipede	25,000 gal., 28 tons

(Alco) finalized the design of what was to become one of the most widely recognized locomotives in the world. In 1936, the first group of locomotives with the 4-6-6-4 wheel arrangement was delivered to the Union Pacific Railroad. They were an immediate success and their roster grew to number 105 locomotives on the Union Pacific alone. This new wheel arrangement was given the name **"CHALLENGER"**. While the origin of the name is unclear, it proved to be an apt moniker.

The Challenger type of locomotive would serve until the end of mainline steam service. They were assigned to railroads across the nation and under all operating conditions gave a good accounting of themselves. Two examples escaped dismantling. UP 3985 has been restored and joins UP 4-8-4 844 as the only two steam locomotives operated by a class 1 railroad today. The other, UP 3977, has been on display in North Platte, Nebraska since 1968 and has recently been refurbished by a group of dedicated railfan volunteers.

In 1936, the Union Pacific Railroad and Alco met the needs of increased speeds and tractive effort with the design of the Challenger. Today, the Genesis^{TM} Challenger meets the needs of modelers and collectors by providing an HO scale model that captures all nuances of the prototype, taking model steam realism to the next level.

THE MODELS

UNION PACIFIC

Union Pacific received its fourth order of Challengers in 1943, and its fifth order in 1944. These were improved from the earlier design based upon experience gained from the Big Boy 4-8-8-4 locomotive received in 1941. These locomotives featured double smoke stacks, centipede tenders and many parts common to the Big Boys. In 1952 engines from both orders were converted to burn oil and were renumbered in the 3700 series. They were commonly assigned to both passenger and freight movements on the system. Two examples survived the replacement of steam by diesels, with 3985 receiving a restoration by volunteer UP employees following years on display adjacent to the Cheyenne depot. The 3985 returned to special service during the early 1980s, with an oil conversion for the tender occurring in 1990.

Road Specific Features:

G9122 CHALLENGER UP #3985 (FAN TRIP VERSION)
G9125 CHALLENGER UP #3943 COAL & SMOKE DEFLECTORS
G9126 CHALLENGER UP #3977 TWO TONE GRAY W/OIL TENDER
G9128 CHALLENGER UNDECORATED UNION PACIFIC LATE
G9130 CHALLENGER UP #3964 ALL BLACK, COAL
G9131 CHALLENGER UP #3975 TWO TONE GRAY W/OIL TENDER
G9132 CHALLENGER UP #3958 ALL BLACK, COAL
G9133 CHALLENGER UP #3983 TWO TONE GRAY W/OIL TENDER

Rio Grande

In 1943, to meet the demands of increased war-time traffic, Rio Grande requested more Baldwin 4-6-6-4s similar to those previously received from this builder. Instead, the War Production Board diverted six Alco locomotives from an order then in production for the Union Pacific. These locomotives were in turn leased from the Defense Plant Corporation by the D&RGW. Classified as L-97 locomotives, and assigned numbers 3800 through 3805, these engines spent the duration of World War II lifting heavy ferrying freight trains over the Rocky Mountains. When the war ended in 1945 and rail traffic levels returned to normal, the half-dozen L-97s were deemed surplus and, in 1946, returned to the War Assets Administration. The following year, these workhorses were sold to the Clinchfield Railroad.

Road Specific Features:

G9121 CHALLENGER UNDECORATED UP/RIO GRANDE VERSION
G9123 CHALLENGER DENVER & RIO GRANDE WESTERN #3802
G9129 CHALLENGER DENVER & RIO GRANDE WESTERN #3804

CLINCHFIELD

The Carolina, Clinchfield & Ohio was a latecomer to the railroad scene. Completed in 1909, it was built for the purpose of hauling Kentucky and West Virginia coal. As a coal hauler it would at first appear that the high stepping 4-6-6-4s would be out of place in this environment. However, in 1942, the Clinchfield received an order of eight Alco Challengers to handle increased wartime traffic. This first order proved very successful so, in 1947 when six more locomotives became available through the War Assets Administration, Clinchfield acquired them. Originally assigned to the Rio Grande, these engines were numbered 670-675. They are unique in that, shortly after delivery, their double smoke stacks were replaced by large single stacks .

Road Specific Features:

G9120 CHALLENGER UNDECORATED CLINCHFIELD VERSION
G9124 CHALLENGER CLINCHFIELD #670 WITH SINGLE STACK
G9127 CHALLENGER CLINCHFIELD #672 WITH SINGLE STACK

Model Features

The Genesis™ 4-6-6-4 Challenger is the culmination of the art of design and tooling integrating the latest innovations in electronic technology. The Challenger model has been developed from its inception as the finest three dimensional operating miniature representation of the prototype available.

Enclosed in the premium quality box are the following items:

1. History and Instruction Book that includes a warranty and instruction card
2. HO scale 4-6-6-4 Challenger Locomotive
3. HO scale tender with full electronics package installed
4. Hand Held Wireless DC Controller

Upon inspecting the locomotive and tender note the many details that have been incorporated in its construction.

Locomotive and tender features

- Boiler backhead with full details and printed manual controls.
- Individually applied detail parts such as piping, valves, generators, etc.
- Blackened metal RP25 wheels.
- Eccentric cranks operating on both sides in correct direction.
- Minimal compromise on wheel diameter (about 1" only).
- Front and rear engines (cylinders and coupled drive wheel sets) both pivot in order to manage 18" radius curves.
- Pilot has open/closed positions. Coupler pocket can be inserted to mount coupler.
- Adjustable cab windows.
- Headlights and tender lights have directional light change, while the number boards are permanently illuminated.
- Five-pole, skewed armature motor with two flywheels with very smooth-running features.
- Cab hatches can be either closed or open.
- See-through running boards.
- Each undecorated version includes all parts for that specific version.
- Locomotive is smoke-unit-ready. No soldering needed.
- 6-pin connector plug between loco and tender.
- Current pick-up on all 12 driver wheels and 8 tender wheels.
- Consumer-friendly disassembly features for spare part replacement.
- Detailed instruction sheets with exploded view drawings and history booklet.
- Cabin is closed with opening door feature, or model has open cabin.

Prototype Specific Features

- Single or twin smoke stacks.
- Coal load or oil bunkers.
- Coal rack for additional coal storage.
- Wood tender deck.
- Smoke deflectors.
- Ashpans applied to coal fueled versions only.
- Closed cab with opening door feature, or open cab.

Sound and DCC Features

The installation of sound in a locomotive adds a new dimension to operation. Sound makes a technically perfect static model come alive and enhances the experience of operation. You will find that you will no longer 'run' the engine but, rather, operate it in the context of your layout. Whether you are using conventional DC control or a DCC system, the incorporation of advanced electronic technology will provide the ultimate railroading experience.

The Genesis^{TM} Challenger Locomotive includes a factory installed DCC and sound board with speakers. The board is mounted in the tender. The DCC decoder automatically senses the power supply type (either DC or NMRA compliant DCC system) that is being used and will operate without intervention from the user.

Hand-Held Wireless Controller

Included with the Challenger locomotive is a hand-held wireless controller. When operating on conventional DC, this control unit is designed specifically to allow control of the speed and direction of the locomotive as well as these six individual sound functions:

- Bell
- Water Injector
- Blower Hiss
- Whistle
- Air Release
- Fire Box Door

These are more sound features than have been previously available to the conventional DC sound user in any format. The Genesis^{TM} Challenger Locomotive will operate on DC without the use of this hand held, however, only the steam chuff sounds will be available in this operational mode.

The 12-volt transmitter battery # A23-12, is available at any electronics or office supply store.

DCC Features:

The decoder provided with the Genesis^{TM} Challenger Locomotive will operate with any NMRA compatible DCC system. The default setting is address 3. The decoder is rated at 2 amps and will support either 2 or 4 digit addresses. The decoder functions are fully programmable by the adjustment of CVs. A CV table is included in the operating instructions. Either 14 speed steps or 28/128 speed steps are supported by this system. Available accessory and sound functions are as follows:

- Directional Lighting
- Whistle
- Coupling
- Conductor's Voice
- Sound On/Off
- Water Injector
- Cylinder Cock/Flange squeal
- Bell
- Air Release
- Brake Squeal
- Fire Box Door
- Sand Release
- Blower Hiss

In addition to Function Ø (Directional lighting) there are twelve additional sound functions to allow the operator to capture the full range of unique sounds found on an operating steam locomotive. You can now fully immerse yourself in the complexities of prototype operation and add a new level of realism to your railroading experience.

Dual-Function decoder is made by Model Rectifier Corporation for Athearn, Inc.

OPERATION

Your new Genesis™ Challenger Locomotive comes factory equipped with a state-of-the-art Dual Function decoder. This means your locomotive will run on any NMRA compatible DCC system or on any regular DC Train Control (HO power pack).

Caution: Do not run your new Genesis™ Challenger Locomotive on any G scale power pack. You may damage the locomotive circuitry.

When running on a DC power pack, this locomotive features a wireless radio control. This makes accessing the sound functions and running the locomotive more convenient when following your train around the layout.

The transmitter (battery not included) that comes with your locomotive has the following functions:

1. Button 1 will start or stop the bell sounds.
2. Button 2 will operate the steam whistle.
3. Button STP will bring the locomotive to a gradual stop. This is a built in safety feature. Press Button STP while the locomotive is stopped and you will hear the water injector sound.
4. Button 4 will accelerate the locomotive. When the locomotive has reached its maximum speed, pressing Button 4 will activate the sound of the fire box door opening and closing.
5. Button 3 will decelerate the locomotive. Press Button 3 when the locomotive is stopped and you will hear an air release sound.
6. Button 5 (pressed while the locomotive is moving) will slow the locomotive down, change its direction and speed it up. This is also a built in safety feature. Press Button 5 when the locomotive is in idle (25%–35% throttle setting) to activate the blower hiss sound.

Note: There are two idle settings that enable various sounds to be controlled while the engine is standing still. To activate "Idle #1" set the power pack's throttle setting at the 25%–35% position, being sure to keep the transmitter's speed regulator setting off. In "Idle #1" the following sounds can be activated: bell, whistle, water injector, air release, blower hiss and fire box door. To access the "Idle #2" setting, set the power pack's throttle to 100% (again, keeping the transmitter's speed regulator off). While in "Idle #2" the same sounds can be activated with the transmitter, with the exception of the fire box door.

DC Operation-Analog Mode

To set up your Hand Held Controller and operate you locomotive with a DC power pack, follow these easy directions:

1. Install the battery in the transmitter.
2. Connect the wires from your DC power pack's "variable track terminals" to your track.
3. Place the locomotive on the track making sure all wheels are aligned correctly to avoid short circuits, which can possibly damage your locomotive circuitry and power pack.
4. Turn the switch on the power pack to ON.
5. Slowly adjust the throttle until you hear the locomotive begin to idle. Only during idle can you use the direction switch on the power pack to change the locomotive's direction. Either the headlight or back-up light will illuminate to indicate the locomotive's direction. Once the locomotive begins moving, you cannot use the direction switch on the power pack to change direction. You can only use transmitter to change the locomotive direction while it is moving. This feature allows you to control another analog locomotive on the same track.
6. Your new Genesis™ Challenger Locomotive will always remember its last direction of operation regardless of the position of the direction switch on the power pack.
7. When you use the power pack's throttle to control the locomotive's speed, the top speed will be limited by the transmitter's speed setting.
8. When you use the transmitter to control the locomotive's speed, the top speed will be limited by the power pack's throttle setting.
9. If the locomotive's top speed is too low, do not set the power pack's throttle to maximum. We recommend you set the throttle to 60%-70% and use the transmitter to control the locomotive speed. This will give you the best operation range.
10. Never exceed 18 volts D.C. to the track in analog operation. Excessive track voltage may damage the locomotive's circuitry. Never try to operate the locomotive on A.C. power.
11. If the transmitter's range begins to decrease, the battery needs to be replaced.
12. We recommend you always use the power pack's throttle to control the locomotive speed. Not only will you get a smoother speed control, but the battery life will be extended.
13. Whenever you feel that the locomotive is not operating properly you should move the throttle to zero or 25%-35% throttle setting (depending on your power pack) and slowly move the throttle up again to control the locomotive.

Programming in Analog Mode

While in analog mode, you can program the chuff rate and the sound volume.

1. Place the locomotive on track
2. Turn the power switch on the power pack to ON.

3. Slowly turn the throttle until sounds come on. Once sounds begin you have 20 seconds to enter the program mode.
4. Enter the program mode by pressing the Button STP three (3) times. The locomotive will say "program" after each press. After the third "program," you will be in program mode.
5. Press Button 4 or Button 3 to speed up or reduce the chuff rate, respectively. Each press of the button adjusts the chuff rate up or down by one unit. Each time you will hear the locomotive say "program".
6. Press Button W to toggle between volume settings. You will hear the locomotive say "program" with the new volume setting.
7. Once finished programming, turn the power switch on the power pack to OFF. This will reset the locomotive and lock in your programming. To resume operation, follow the steps under "DC Operation".

TIPS for Analog Operation

1. Turn up the throttle until sounds start and locomotive idles.
2. Select the locomotive's direction either by the direction switch on the power pack or by the transmitter.
3. Slowly start your locomotive moving by using the power pack's throttle to set desired top voltage setting.
4. Once underway, use the transmitter Button 4 to speed up or Button 3 to slow down. Hold down the button until you reach the desired speed.
5. If the top voltage setting at maximum speed is too low, use the power packs throttle to adjust the top voltage setting.
6. To conserve battery, use the throttle to control locomotive speed and use the transmitter to activate sounds.
7. When finished running your locomotive, turn your power pack throttle to OFF and turn off the power pack's power switch. Any programming changes made in DC analog mode will affect any prior DCC mode settings.

Manual Volume Control

Located on the top of the tender towards the rear, there are 3 oval hatches. Remove the middle hatch and use a small flat-bladed jeweler's screwdriver to adjust the volume.

Remove this hatch to adjust sound

DCC Operation- Digital Mode

Your new Genesis™ Challenger Locomotive will operate on any NMRA compatible DCC system. The dual-function decoder has the following features:

- Synchronized steam chuff with random sounds
- 1.5 amp capacity
- Programmable for either 2 digit, (1-127) or 4 digit, (1-9,999) addresses
- Programmable start voltage
- Programmable acceleration rate
- Programmable deceleration rate
- Programmable top voltage
- Programmable chuff rate
- Programmable volume
- Programmable 14-28/128 speed steps
- Directional lighting (FØ)
- 12 accessory sound functions, (F1-F12)
- Advanced consisting (CV19)
- OPS mode programming
- Compatible with NMRA D.C.C. standard
- Complies with Part 15 of F.C.C.Rules

Operation

The Genesis™ Challenger Locomotive can be operated with the steam sounds on or off. Double clicking your headlight button (FØ) will turn the steam sounds on or off. When the steam sounds are turned off, all associated sounds are also turned off.

Programming for DCC Operation - Digital Mode

This decoder supports all program methods including register mode, paged mode, CV programming, direct mode and programming on the main (OPS mode programming).
Program the locomotive the same way you would program any other NMRA compatible decoder with your DCC system.

Additional Information

The dual-function decoder installed in this locomotive should perform well when used with any NMRA compatible DCC system. See your DCC manual on how to program and operate the decoder. For more information about Register/CV's and their functions, please refer to the NMRA DCC standards and recommended practices, RP-9.2.2. This is available directly from NMRA or on their website at www.nmra.org.

FCC Compliance

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions; 1) This device may not cause harmful interference, and 2) This device must accept any interference received, including interference that may cause undesirable operation.

Battery Type # A23 12 volt

STEAM SOUNDS CHART	
FUNCTION	IDLE/MOVING
Double click FØ	Sounds ON/OFF
F1	Bell ON/OFF
F2	Whistle
F3	Air release
F4	Coupling
F5	Brake Squeal
F6	Conductor
F7	Fire Box Door OPEN/CLOSE
F8	Sand Release
F9	Cylinder Cock/Flange Squeal
F10	Water Injector
F11	Blower Hiss
F12	Sounds ON/OFF

CV CHART				
CV	REGISTER	DESCRIPTION	RANGE	FACTORY VALUE
CV1	R1	Short address	1–127	3
CV2	R2	Start voltage	0–32	0
CV3	R3	Acceleration	0–32	0
CV4	R4	Deceleration	0–32	0
CV5	---	Top voltage	0–32	32
CV29	R5	Basic Configuration	---	2
CV7	R7	Manufacturer Version #	---	32
CV8	R8	Manufacturer I.D.	---	143
CV17	---	Long address upper byte	192–231	192
CV18	---	Long address lower byte	0–255	3
CV19	---	Advanced consist address	1–127	0
CV52	---	Sound volume MIN/MAX	0 or 1	1
CV64	---	Chuff rate	0–10	5
CV105	---	User identifier number	0–255	0
CV106	---	User identifier number	0–255	0
---	R6	Page number	0-31	1

LUBRICATION & MAINTENANCE

Lubrication and Maintenance of the Genesis™ 4-6-6-4 Challenger

The Genesis™ Challenger Locomotive has been carefully engineered to provide years of trouble free operation. However, as with all things mechanical, a small amount of care and maintenance is required to insure the flawless operation of this fine model. These simple procedures will provide the necessary information to give you years of trouble-free enjoyment.

Care and Cleaning

Dust and debris are among the leading contributors to poor operation of any miniature mechanism. To maintain the quality performance of your locomotive, inspection and cleaning should be performed on a regular basis. A soft bristle brush should be used to remove dust from the superstructure. The use of soaps, solvents or detergents is not recommended for this purpose as they will have a tendency to mar the finish.

When not in use it is recommended that the locomotive and tender be stored in the protective sleeve in which it was packed. Also, store the wireless controller in the locomotive box with the battery removed.

When inspecting the underframe, make sure that all lint and dust are removed from the back of all wheel sets. Dirt build up in this area will foul the pick-up wipers and not allow proper electrical contact, negatively impacting performance.

Wheel Cleaning

The Genesis™ Challenger Locomotive receives electric power from all drivers as well as eight of the tender wheels from both rails. This, coupled with the long overall wheelbase, provides for excellent electrical contact. There should be few cases of erratic performance due to poor contact. However, over time, dirt from the rails will accumulate on the wheel surfaces and will need to be removed to assure peak operation. The use of a cotton swab to apply either alcohol or a good quality track cleaning solution is recommended. Carefully apply the solvents, taking care not to spill any on the painted surfaces. Alternatively, either an ink eraser or 'Bright Boy' abrasive block can be used to remove dirt deposits by carefully burnishing the wheel surfaces. When cleaning the wheels, also remove any dirt build up from the metal surfaces on the back rims of the wheels. This will assure that the wiper contacts will maintain good contact with the wheels.

Lubrication

This locomotive will arrive pre-lubricated from the factory and will not need additional lubrication until it has been run for quite some time. When it comes time to lubricate the locomotive, use only light weight oil and gear grease that is plastic compatible. Use a minimum amount. The plastics used for many of the components, such as the gears and drive lines, make them inherently self lubricating. Remember that too much lubrication can be more detrimental to the locomotive than too little.

The main points of lubrication, and type of lubricant are as follows:

- Axle bearings on the drivers — light oil
- Armature bearings on the motors — light oil
- Oil light bearings on the worm gear shafts — light oil
- Bearings on the centipede tender wheels — light oil
- Side rods at the crank pins — light oil
- Gear towers — light gear grease

By following the exploded drawings, access to each of these areas should be easily accomplished. If you are not comfortable with disassembling this locomotive for lubrication take it to one of the many Model Railroad hobby shops that can provide this service.

Smoke Unit Installation

The Genesis™ Challenger Locomotive is designed to accept Seuthe #9 or #10 smoke generator units. These are not provided with the locomotive and may be added by the purchaser at their discretion. If it is decided that smoke units will be installed, carefully follow the installation and operating instructions provided by the smoke unit manufacturer. Genesis does not warranty any defects in these smoke units or damage that may occur to the locomotive through their use.

Depending upon the number of smoke stacks on the locomotive, either one or two smoke units will be needed to complete installation. Installation is very easily accomplished: Slide the smoke unit down the smoke stack until it engages the electric contacts inside the boiler. Add a minimal amount of smoke fluid to the unit and operate the locomotive normally. It may take a short amount of time when running to heat up the smoke unit before smoke is produced. This is normal.

Coupler Installation

The Athearn Genesis Challenger model comes with the swivel coupler installed on the pilot. As on the prototype engines, you can have the coupler exposed on the pilot, or swing it around so that the pilot has no coupler in use. The "coupler" on this part is a dummy (non-operating) coupler.

An operating coupler can be installed on the pilot. Simply unscrew and remove this dummy coupler. Once removed, you will note that there are two threaded nuts.

An operating coupler should fit in the rearmost hole with no clearance problems, and the coupler and it's box can be attached using screw #212 (supplied, see drawing). If, however, your choice of coupler does have clearance problems when mounted in the rear threaded nut, simply mount it to the threaded nut further forward.

Replacing the Traction Tire or Replacing the Traction Tire Equipped Driver

To provide tractive effort that rivals the prototype, two traction tires are factory installed on last set of drivers of the rear engine.

To replace a worn or loose traction tire:

- Remove the crank pin nuts from the traction tire equipped driver.
- Loosen the remaining crank pin screws from the other drivers.
- Remove the eccentric crank, main rods, bushing and drive rod from the crank pin on the traction tire equipped driver.
- Slide off the traction tire and replace with a new tire.
- Reverse the procedure of disassembly.

Replacement traction tires are available from your local hobby retailer.

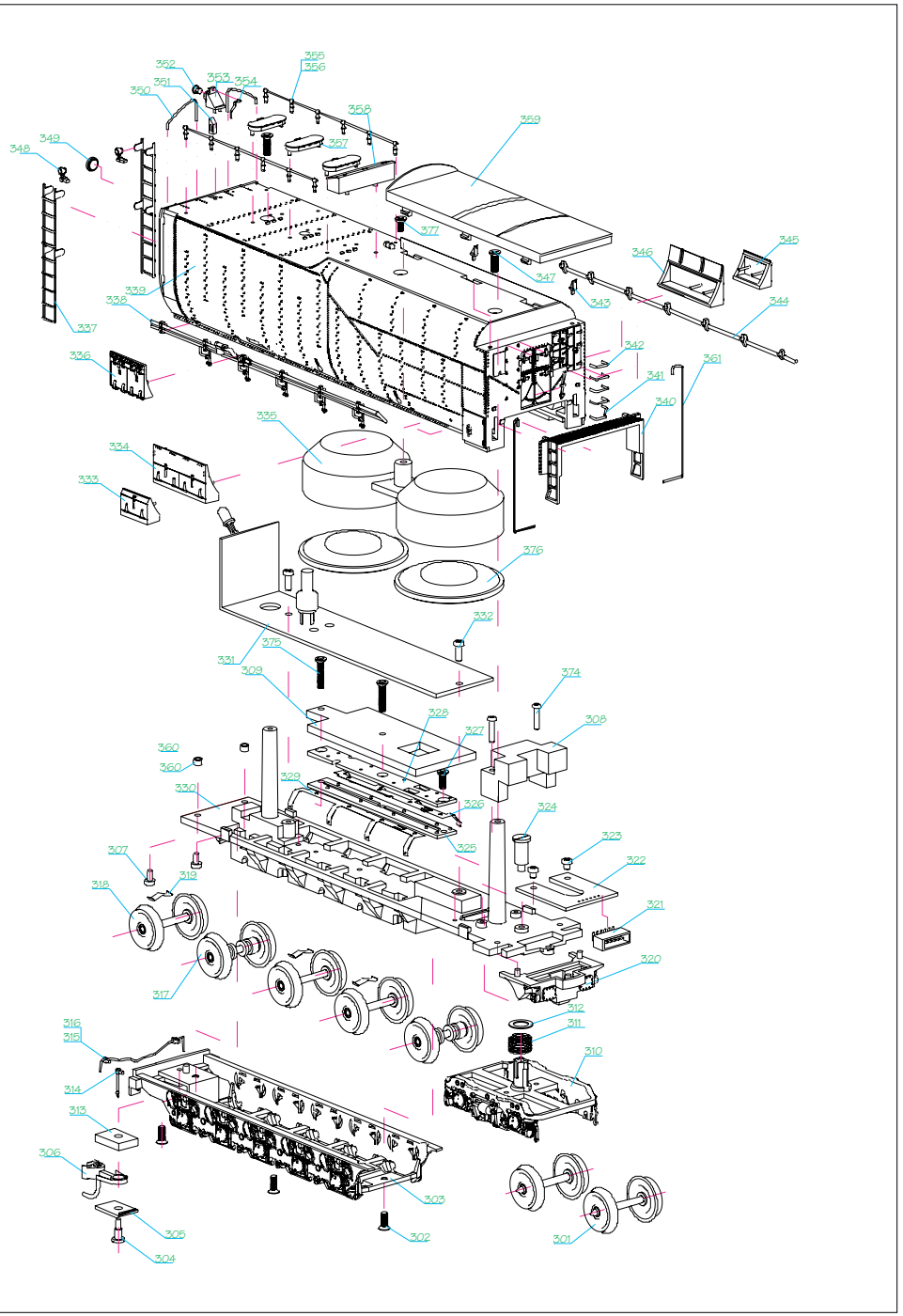
To replace a driver:

- Remove the crank pin screw and nuts from the side rods.
- Remove the side rods and eccentric cranks.
- Remove the retaining plate from the bottom of the engine by removing the three retaining plate screws.
- Remove the wiper assembly.
- Remove the driver assembly.
- Replace with new driver assembly making sure that the quartering matches the other drivers on the engine.
- Assemble in the reverse order that was used in the disassembly.

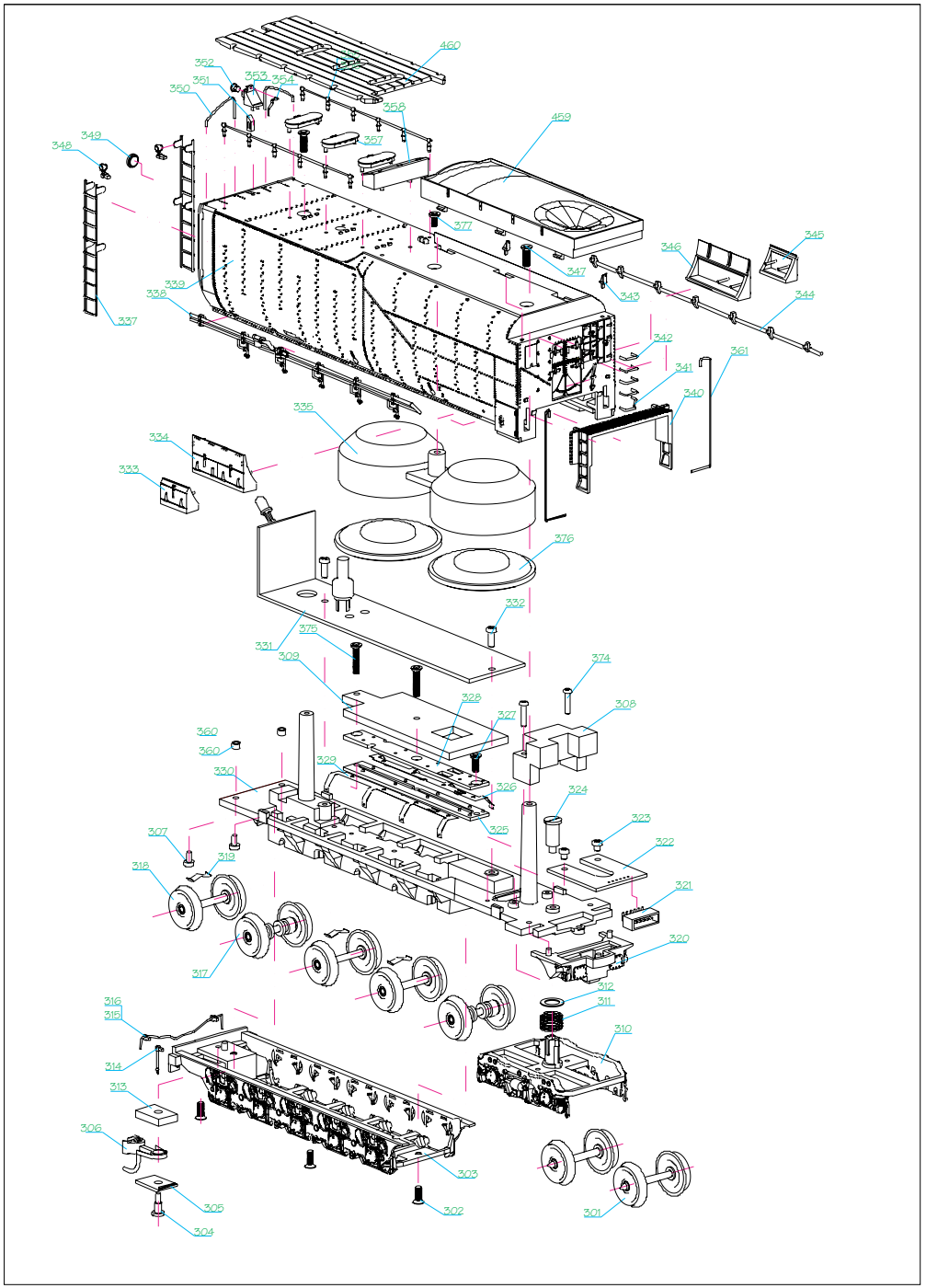
Use of the exploded drawings in this booklet will greatly assist in the above listed procedures.

Replacement parts are available from Athearn Trains to the original purchaser for warranty repairs only. A warranty registration form must be on file at Athearn Trains to honor any parts requests.

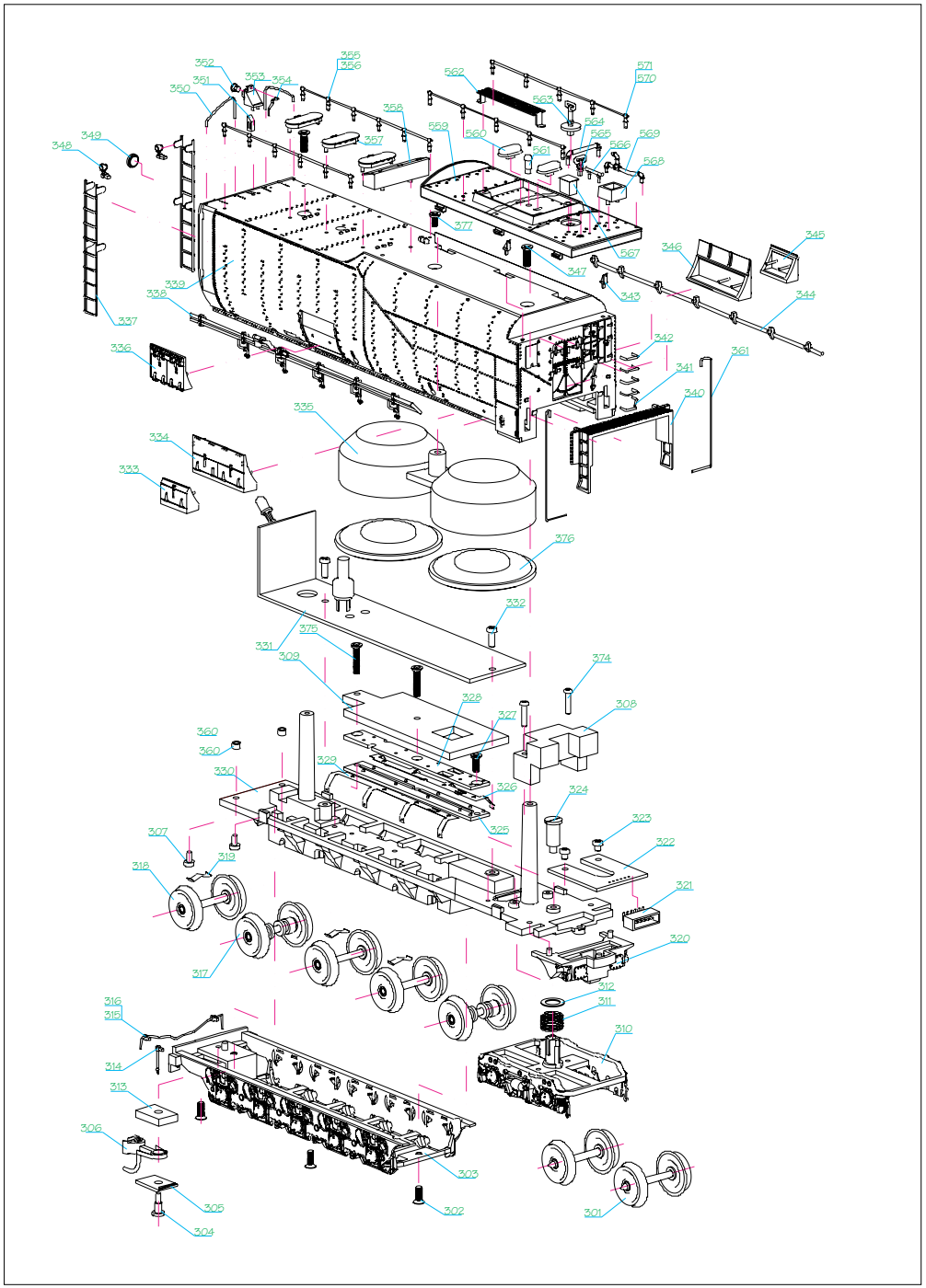
COAL TENDER



COAL TENDER with WOOD DECK



OIL TENDER



Item #	Description	QTY
301	Tender lead truck wheel and axle assm.	2
302	Centipede side frame mounting screw	3
303	Centipede side frame	1
304	Tender coupler screw	1
305	Tender coupler box cover	1
306	Rear coupler	1
307	Screw	2
308	Front Tender Weight	1
309	Rear Tender Weight	1
310	Tender lead truck side frame	1
311	Tender lead truck spring	1
312	Tender lead truck washer	1
313	Tender coupler box	1
314	Tender air hose	1
315	Coupler cut lever assm.	1
316	Coupler cut lever wire	1
317	Centipede wheel with bearings assm.	2
318	Centipede wheel assm.	3
319	Equalizing spring	3
320	Tender end chassis detail	1
321	Tender plug socket	1
322	Tender plug-in PCB	1
323	Tender plug-in PCB mounting screws	2
324	Tender draw bar attachment post	1
325	Centipede pick-up bottom insulator	1
326	Centipede pick-up wipers-right	1
327	Centipede pick-up mounting screw-short	1
328	Centipede pick-up top insulator	1
329	Centipede pick-up wipers-left	1
330	Tender bottom	1
331	DCC circuit board	1
332	DCC board mounting screw	2
333	Left tool box-short	1
334	Left tool box-long	1
335	Speaker Housing	1
336	Left tool box-medium	1
337	Rear tender ladder	2
338	Side pipe-left	1
339	Tender body for Engine #3985	1
340	Tender apron	1
341	Tender front grab irons-type 2	1

Item #	Description	QTY
342	Tender front grab irons-type 1	4
343	Tender front detail	2
344	Side pipe-right	1
345	Right tool box-short	1
346	Right tool box-long	1
347	Tender hold down screw	2
348	Tender marker lamps	2
349	Tender rear light lens (clear)	1
350	Tender deck rear handrail	2
351	Tender light bar (clear)	1
352	Back-up light lens (clear)	1
353	Back-up light base	1
354	Back-up light conduit	1
355	Tender deck handrail wire	2
356	Tender deck handrail	2
357	Water fill hatches	3
358	Tender deck tool box	1
359	Coal bunker (full)	1
360	Brass sleeve	2
361	Tender side handrail	2
362	Tender Body	1
374	Front Tender Weight Screws	2
375	Centipede pick-up mounting screw-Long	2
376	Speaker	2
377	Speaker Housing Mounting Screw	1
459	Coal bunker (partially full)	1
460	Wood tender deck	1
	Parts specific to Tender with Oil Bunker	
559	Oil bunker	1
560	Oil filler hatches	2
561	Oil filler vents	1
562	Oil bunker walk way	1
563	Oil dip stick	1
564	Oil pipe #1	1
565	Oil bunker detail #1	1
566	Oil bunker detail #2	1
567	Sand box	1
568	Oil bunker detail #3	1
569	Oil pipe #2	1
570	Oil bunker hand rail wire	2
571	Oil bunker hand rail assm.	2

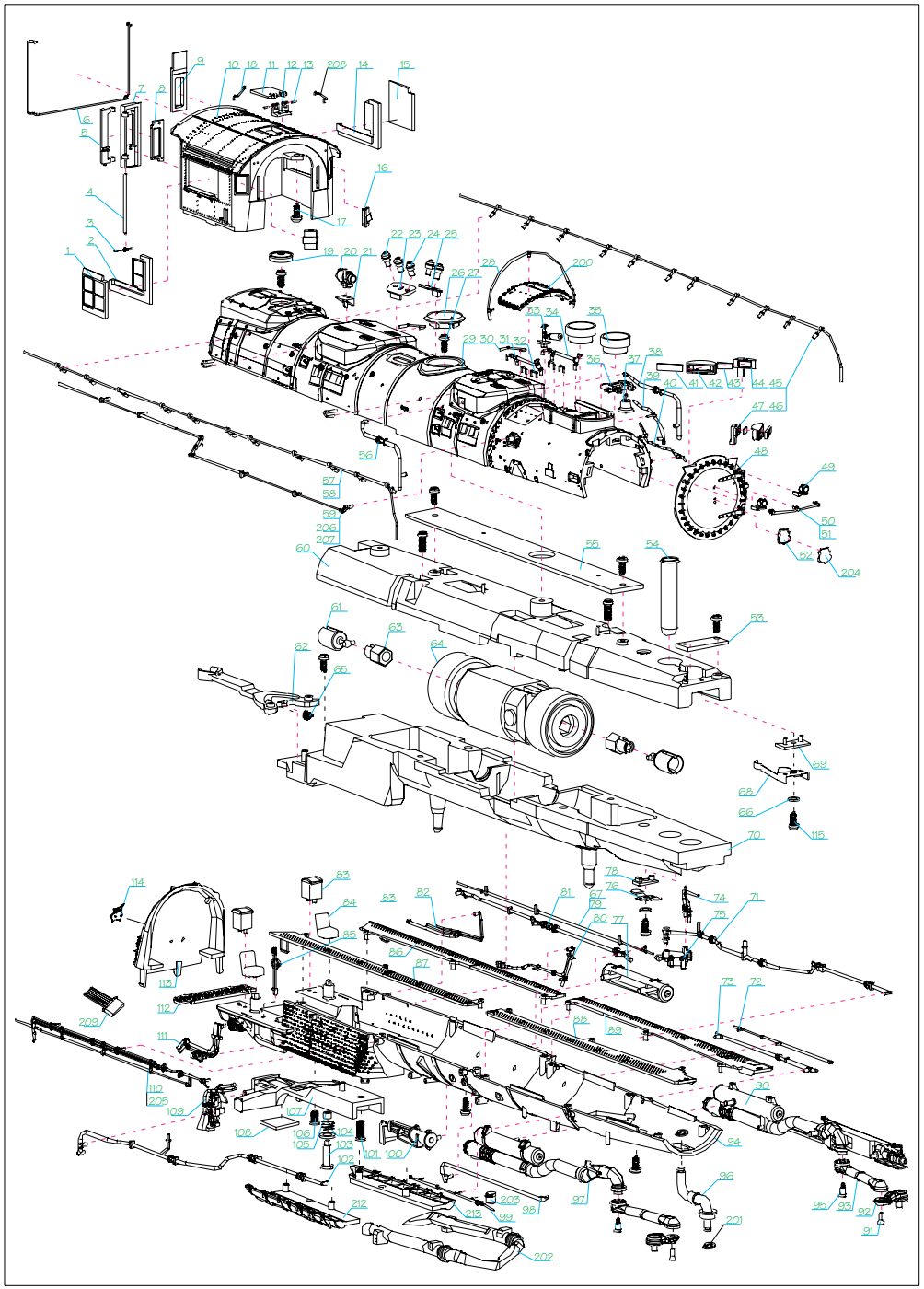
SUPERSTRUCTURE PARTS LIST

Item #	Description	QTY
1	Cab side sliding window glazing-right	1
2	Cab side fixed window glazing-right	1
3	Cab door spring	1
4	Cab door hinge pin	1
5	Cab door support	1
6	Cab rear hand rail	1
7	Cab door	1
8	Cab door glazing-left	1
9	Cab door glazing-right	1
10	Cab	1
11	Roof hatch	1
12	Roof hatch hinge	1
13	Roof hatch hinge pins	2
14	Cab side fixed window glazing-left	1
15	Cab side sliding window glazing-left	1
16	Cab front window glazing (clear)	2
17	Screw	1
18	Cab grab iron-right	1
19	Boiler Half-top	1
20	Generators	2
21	Generator base	1
22	Safety valves	4
23	Safety valve base (3 valve)	1
24	Safety valve	1
25	Safety valve base (2 valve)	1
26	Steam Dome cover	1
27	Boiler screw	1
28	Piping	1
29	Boiler top-dual stack	1
30	Sand dome grab iron	4
31	Piping	1
32	Small hand rail	4
33	Whistle	1
34	Piping	1
35	Smoke Stack	2
36	Bell Bracket	1
37	Bell	1
38	Piping	1
39	Piping	1
40	Piping	1
41	Number board lens (clear)	2
42	Number board front housing	2
43	Number board PCB	2

Item #	Description	QTY
44	Number board mounting bracket-right	1
45	Drop hand rail-left	1
46	Wire hand rail assm.-left	1
47	Number board mounting bracket-left	1
48	Smoke box door	1
49	Marker light	2
50	Stantions for smoke box hand rail	1
51	Wire for smoke box hand rail	1
52	Smoke box number board	1
53	Smoke unit PCB	1
54	Smoke unit (not supplied)	2
55	Locomotive PCB	1
56	Piping	1
57	Drop hand rail-right	1
58	Wire hand rail assm.-right	1
59	Head end throttle lever	1
60	Die-Cast boiler insert-top	1
61	Drive shaft coupler	2
62	Tender draw bar	1
63	Hex coupling shaft	2
64	Motor/Flywheel assm.	1
65	Draw bar centering spring	1
66	Washer	2
67	Metal wire for piping	1
68	Smoke unit contact strip	1
69	Insulator plate for smoke unit	1
70	Die-Cast boiler insert-bottom	1
71	Piping	1
72	Piping	1
73	Piping	1
74	Reservior	1
75	Piping under cab	1
76	Smoke unit plug	1
77	Air tank	1
78	Insulator plate	1
79	Piping	1
80	Piping under cab	1
81	Piping	1
82	Piping under cab	1
83	Cab jump seats	2
84	Cab seat (engineer and fireman)	2
85	Johnson Bar	1
86	Walk way-rear right side	1

Item #	Description	QTY
87	Walk way-rear left side	1
88	Walk way-front right side	1
89	Walk way-front left side	1
90	Piping for rear cylinder-left	1
91	Ball head shaft	2
92	Piping for front cylinder	2
93	Link Pipe for front cylinder	2
94	Boiler bottom half	1
95	Screw for piping	2
96	Piping under smoke box	1
97	Piping for rear cylinder	1
98	Piping	1
99	Piping	1
100	Power reverse cylinder	1
101	Screw	8
102	Piping	1
103	Screw	2
104	Trailing truck spring	2
105	Brass sleeve	3
106	Rear frame screw-rear	1
107	Rear frame	1
108	Frame cover	1
109	Blow down piping under cab	1
110	Piping	1
111	Feed water piping under cab	1
112	Drop plate	1
113	Backhead	1
114	Fire box door	1
175	Coupler support for dummy swivel coupler	1
200	Boiler top part	1
201	E-ring	2
202	Boiler bottom piping	1
203	Boiler side part	1
204	UP plaque	1
205	Metal wire for piping #1	1
206	Metal wire for piping #3	1
207	Metal wire for piping #4	1
208	Cab grab iron-left	1
209	Plug	1
212	Ash pan-right	1
213	Ash pan-left	1
214	Smoke box number board-rectangular	1
215	Single smoke stack	1
216	Boiler top part-single stack	1

UNION PACIFIC



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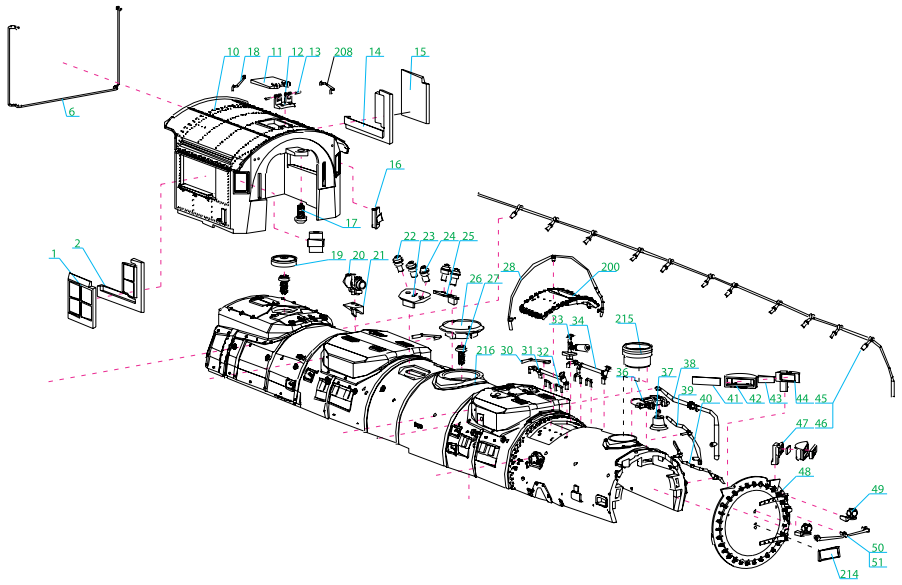
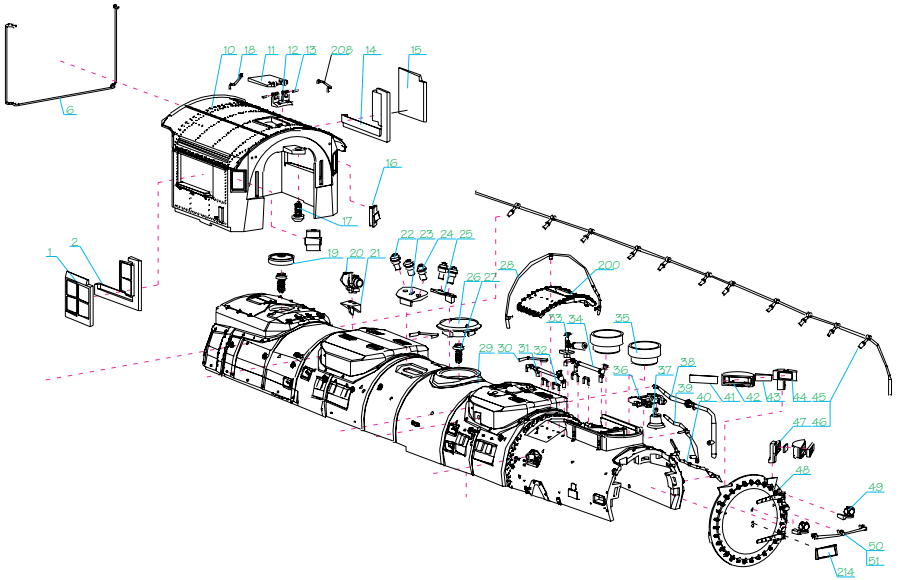
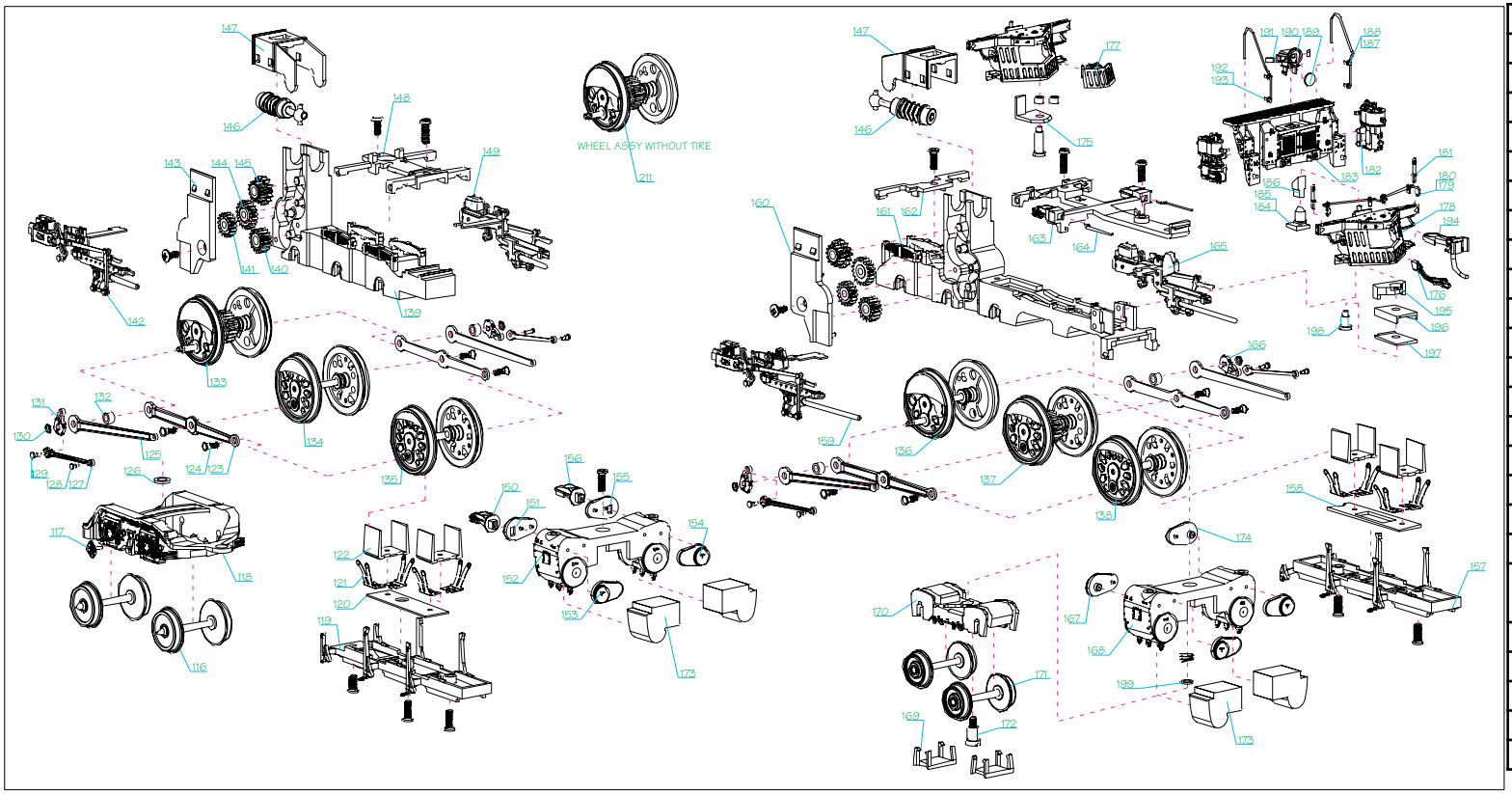


RIO GRANDE



RUNNING GEAR



Item #	Description	QTY
115	Screw	1
116	Trailing truck wheel and axle assm.	2
117	Trailing truck hand-wheel	1
118	Trailing truck frame	1
119	Rear engine bottom retaining plate	1
120	Rear engine pick-up wiper assm.	1
121	Pick-up wiper	8
122	Pick up insulators	4
123	Main rod	4
124	Crank pin screw	8
125	Drive rod	4
126	Trailing truck washer	2
127	Eccentric rod	4
128	Eccentric rod rivet	4
129	Eccentric crank rivet	4
130	Crank pin nut	4
131	Eccentric crank-right	2
132	Drive rod bushing	4
133	Rear engine wheel assm. #1 (geared) with traction tires	1
134	Rear engine wheel assm. #2	1
135	Rear engine wheel assm. #3	1
136	Front engine wheel assm. #1	1
137	Front engine wheel assm. #2 (geared)	1
138	Front engine wheel assm. #3	1

Item #	Description	QTY
139	Rear engine frame and gear tower	1
140	Idler gear #3	2
141	Idler gear #2	2
142	Rear engine valve gear assm.-right	1
143	Rear engine gear tower cover	1
144	Idler gear #1	2
145	Compound gear	2
146	Worm gear assembly	2
147	Worm gear assembly retainer	2
148	Rear engine valve gear hanger	1
149	Rear engine valve gear assm.-left	1
150	Rear engine piston valve quides-right	1
151	Rear engine cylinder part-right	1
152	Rear cylinder casting	1
153	Front and rear engine cylinder part 2	2
154	Front and rear engine cylinder part 1	2
155	Rear engine cylinder part-left	1
156	Rear engine piston valve quides-left	1
157	Front engine bottom retaining plate	1

Item #	Description	QTY
158	Front engine pick-up wiper assm.	1
159	Front engine valve gear assm.-right	1
160	Front engine gear tower cover	1
161	Front engine frame and gear tower	1
162	Front engine valve gear hanger-rear	1
163	Front engine valve gear hanger-front	1
164	Piston valve shaft	2
165	Front engine valve gear assm.-left	1
166	Eccentric crank-left	2
167	cylinder parts	1
168	Front cylinder casting	1
169	Pilot truck axle retainers	2
170	Pilot truck frame	1
171	Pilot truck wheels and axles	2
172	Screw for pilot truck	1
173	Cylinder weight	4
174	Cylinder part	1
176	Pilot Air Hose	1
177	Dummy swivel coupler	1

Item #	Description	QTY
178	Pilot	1
179	Coupler lift bar assm.	1
180	Coupler lift bar wire	1
181	Flag Holder	2
182	Air compressor	2
183	Pilot Shield	1
184	LED access plug	1
185	Head light LED	1
186	Head light light bar (Clear)	1
187	Pilot hand rail-left	1
188	Wire for pilot hand rail-left	1
189	Head light lens (Clear)	1
190	Head light	1
191	Head light number board lens (clear)	2
192	Pilot hand rail-right	1
193	Wire for pilot hand rail-right	1
194	Coupler	1
195	Coupler support	1
196	Front coupler box	1

Item #	Description	QTY
197	Front coupler box cover	1
198	Pilot coupler box screw	1
199	Pilot truck washer and spring	1
210	Traction tires	2
211	Wheel assm. With out traction tires	1

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