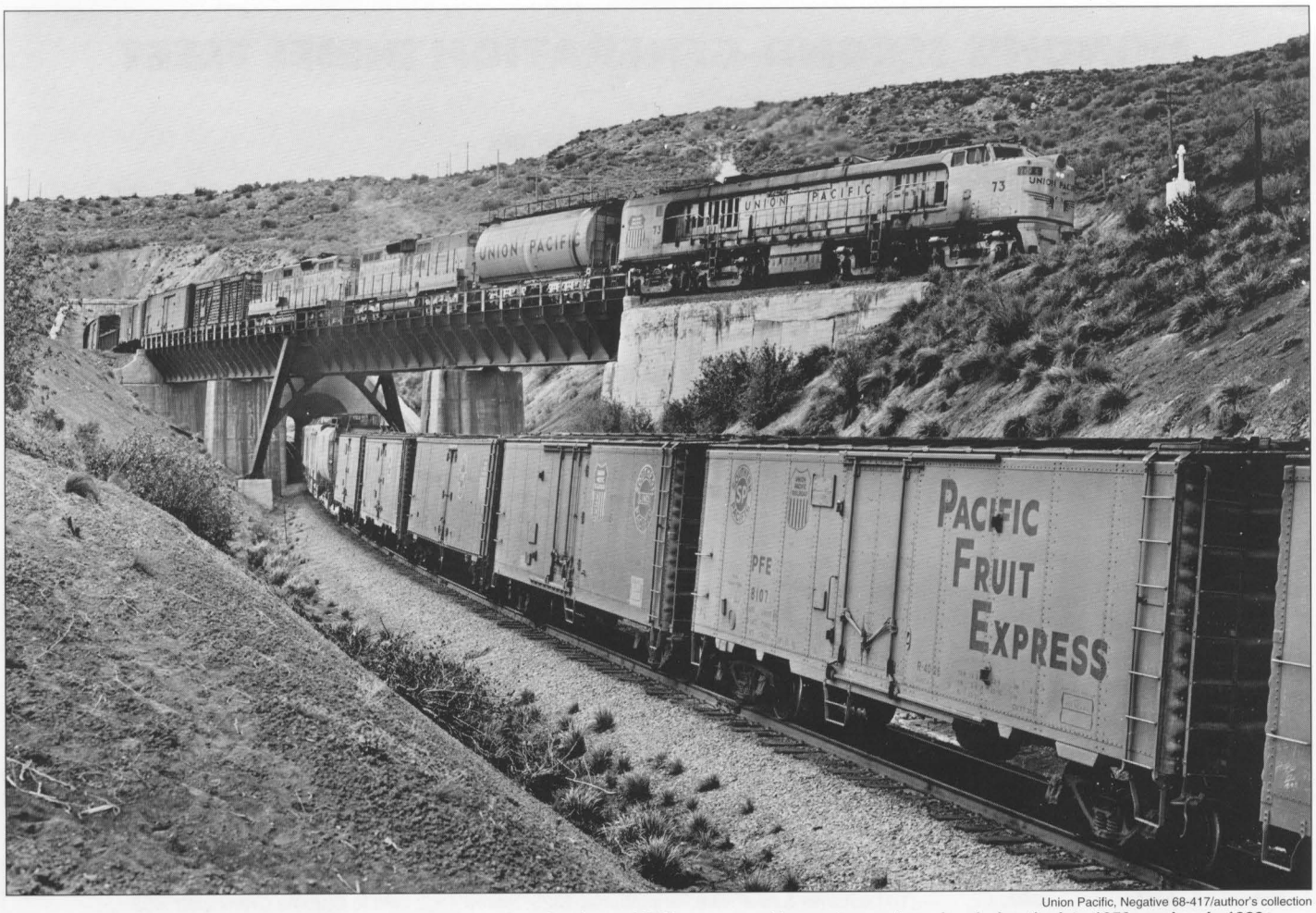


Union Pacific, Negative 68-417/author's collection

This classic Union Pacific calendar photo shows how the early turbocharged GP9s were used in regular road service during the late 1950s and early 1960s. Here Veranda turbine 73 leads Elliott-equipped 345B and AiResearch-equipped 313B over the bridge and dual tunnels at Curvo, Utah. The Elliott unit is distinguished by the grouping of air intake filters just ahead of the unit's dynamic braking bulge. Although hard to distinguish as reproduced here, a larger view of this same photo shows the second GP9B to be equipped with AiResearch turbochargers, distinguished by twin snow shields over the unit's air intakes on top.

OMAHA GP20s:

Union Pacific's GP9 Turbocharging Program

by Don Strack

This article first appeared in The Streamliner, *Volume 4, Number 3, published in July 1988 by the Union Pacific Historical Society, and is presented here with permission. That issue included drawings showing both the Elliott and AiResearch applications, which could not be included here.*

Beginning in the mid-1930s, the Union Pacific Railroad became well known for motive power innovation. First came the 4-12-2 Union Pacific-type steam engine, then the articulated, streamlined internal-combustion passenger trains of 1934 and 1935, then the modern 4-6-6-4, 4-8-8-4, and 4-8-4 steam designs. Other groundbreaking efforts were the railroad's gas-turbine locomotives during the 1950s, and large and unique diesel locomotives during the 1960s. However, during the mid- and late-1950s, UP was also involved in other efforts to improve some of the more common units in its locomotive fleet.

In one major program, 84 F3As and F3Bs were sent to Electro-Motive Division's factory at La Grange, Ill., to be upgraded to F9 standards. These units returned to UP rails as modern F9 locomotives, albeit in F3 carbodies. Another program of the 1950s put UP again on the leading edge of railroad technology. This notable program saw UP participating in the development of turbochargers that could be used on railroad-style two-cycle diesel engines, forcing the dominant builder to rush its own turbocharged design to market to capture potential business.

In 1952 and 1953, during a program to modernize its landing and other small craft, the Navy began testing turbocharger applications on General Motors Model 71 and 278A diesel engines. These tests were a catalyst for discussions and development within the diesel engine industry for turbocharging of large bore and stroke, high-speed (1,000 rpm) engines, such as EMD's 567 design. Through some of its own earlier tests, Union Pacific had discovered that the power of its EMD locomotives varied as much as 14 percent over its system, with altitudes from sea level along the Pacific coast to 8,000 feet in Wyoming, and summertime temperatures of as high as 120 degrees Fahrenheit while crossing the Mojave desert in July. These variations in available horse-

power naturally concerned David S. Neuhart, UP's superintendent of motive power and machinery. When he learned of the Navy tests in diesel engine turbocharging, he asked the railroad's own engineering staff to investigate turbocharging for UP's growing fleet of diesel locomotives.

Early in 1955, the Union Pacific engineering staff began working with the AiResearch Industrial Division of Garrett Corp. of Torrance, Calif., toward development of turbocharging for UP's EMD GP9 locomotives. (Turbocharging the F3s was also considered.) The first units to be modified were done at UP's East Los Angeles shops, using four AiResearch Model T-30 turbochargers. The first locomotive completed was GP9 281, in December 1955.

Stationary load testing for 281 was completed by mid-February 1956. Road tests in helper service on Cajon Pass during February and March were also successful, so a decision was made to increase the number of locomotives being tested. GP9B unit 185B was completed in April, and GP9 261 was completed in May. The tests on Cajon Pass showed that the units might benefit from additional quantities of cooler air to feed the intakes of the turbochargers. To furnish additional air, openings were cut in 261's carbody doors. A non-turbocharged GP9, 283, was also given the treatment to determine if a non-turbocharged locomotive could benefit from additional openings. The performance of the normal GP9 was not improved, at least enough to justify the expense of cutting openings in all of UP's then-245-unit fleet of GP9s and GP9Bs. The test openings on 261, however, did show that a better design for intake air was needed for the turbocharged units. A rooftop design was applied to this and later AiResearch-equipped units, along with snow shields similar to those applied to UP's large fleet of EMD E-units. Both 261 and 283 kept their additional carbody openings until their retirement and disposition 25 years later. UP 185B was not altered with additional openings.

After these and other modifications were completed, the three locomotives were again, for test purposes, placed in helper service on Cajon Pass, between San Bernardino and Barstow, Calif. They remained in helper service until September 1956, when the project was moved to Salt Lake City and the units were placed in regular road service between Salt Lake and Los Angeles. The head of the program, Lloyd Edson, lived in Salt Lake City and had been commuting to and from Los Angeles via UP's *City of Los Angeles* passenger train each weekend.

The original effort in the GP9 turbocharging project had been located at UP's East Los Angeles facility, to be close to AiResearch's own research and development facility in Torrance. With the success of the

Bruce D. Barrett/*Diesel Era* collection

Union Pacific GP9 284 was part of a 32-unit order for GP9s built by EMD in August and September 1954. Two units in this group, 281 and 283, were chosen to become part of the railroad's pioneering turbocharging program. Marysville, Kansas, June 15, 1972.

A. J. Wolff collection

GP9 281 was the first EMD locomotive on UP to be turbocharged in the railroad's experimental program. The unit was completed in December 1955; however this view shows the unit as it appeared later in its life. The large fuel tank was applied in the 1960s, possibly when the AiResearch turbochargers were removed. Shown at Ogden, Utah, on May 29, 1965.

H. E. Ranks/A. J. Wolff collection

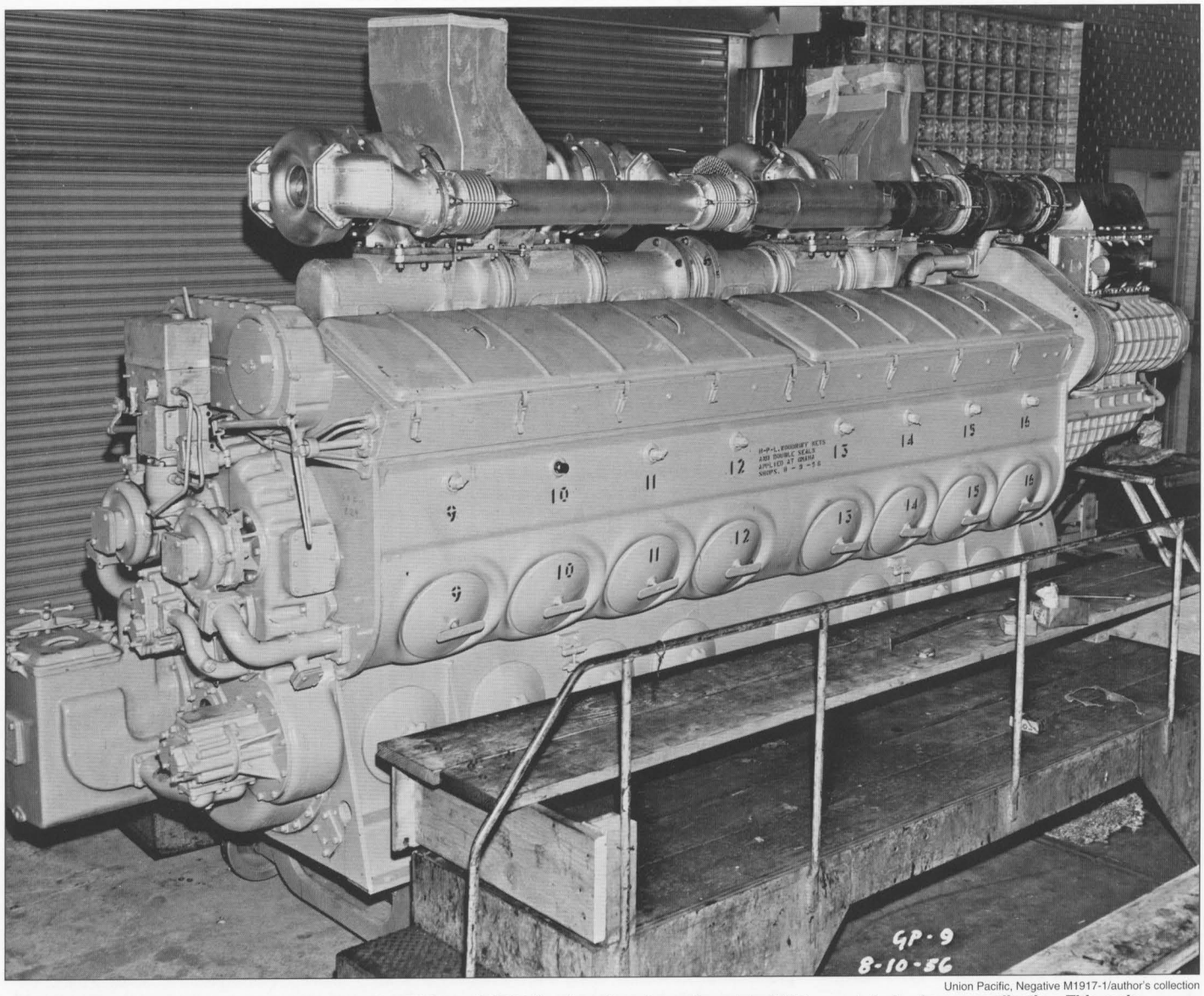
This view of AiResearch-equipped 261, taken in Council Bluffs in 1960, shows the rooftop air intakes and protective snow shields, along with the additional carbody openings that were cut to increase the volume of intake air available to the turbocharger. The rooftop air intakes were the final configuration of the AiResearch application, making the additional carbody openings an unneeded feature. The exhaust stacks on the AiResearch-equipped units were situated very close to where the stacks of a non-turbocharged GP9 were located. This view also shows the right-side features of the larger 2,400-gallon fuel tank for the heavy fuel modification.

Kenneth M. Ardinger

UP 261, formerly turbocharged, is at Denver & Rio Grande Western's Roper Yard in Salt Lake City on a transfer run from UP's yard three miles north. This August 15, 1972, photo shows all of the extra openings that remained from the unit's turbocharged days. The railroad's pipefitters didn't like to change all of those air filters, which were behind each and every one of those openings.

first stages of the project, the effort was moved to Salt Lake City because Salt Lake's new diesel shop had just been completed and was more modern and better suited for the project than was the former steam facility at East Los Angeles. By the end of 1958, the success of more than two years of regular road service had shown that the turbocharging concept was valid, and that the railroad should pursue it further. In early 1959, the entire effort was transferred to Omaha, the usual location for UP's locomotive design and development work. The move was a promotion for Edson, who remained in Omaha until his retirement in the late 1970s.

With this, the initial test portion of the turbocharging program came to an end. Now more improvements and test installations were begun. These included improved applications of additional AiResearch turbochargers, along with initial applications of a



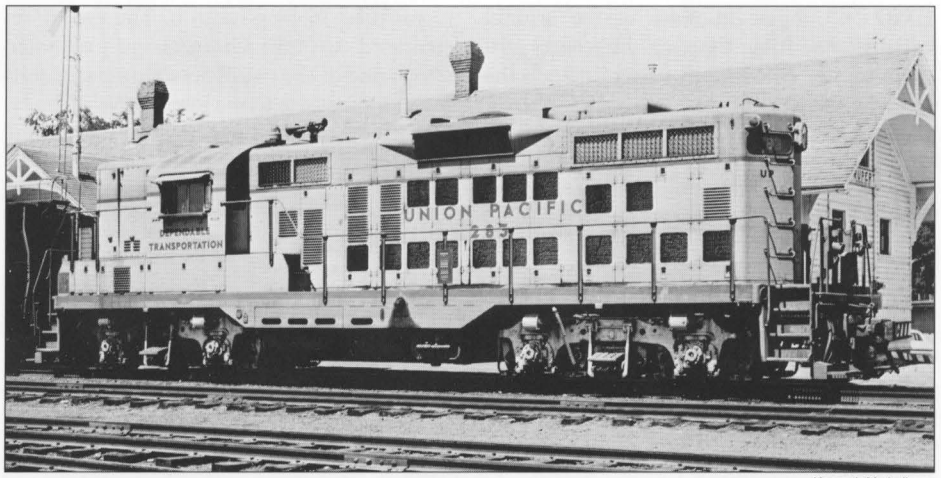
Union Pacific, Negative M1917-1/author's collection

This view, taken on August 10, 1956, at Omaha, of an EMD model 567 diesel engine, shows the original AiResearch turbocharger application. This early configuration received its intake air from the atmosphere within the locomotive's carbody. The extra openings cut in the carbody of UP 261 were added in response to the need for a greater volume of cooler intake air for the turbochargers. The four AiResearch T-30 turbochargers can be seen, along with the exhaust stacks between each pair, and the ductwork that passed the intake air from the turbos to the Roots blowers. The later rooftop air intakes were connected to the outboard ends of the row of turbochargers.

new turbocharger design from the Elliott Co. of Jeannette, Pa. It is interesting to note that a larger Elliott design was, and still is, used on General Electric's 7FDL engine.

Rather than continue to modify the earlier, 1954-built GP9s in the 130-299 class, the railroad decided to use its nearly new 300-class of 50 GP9s and 50 GP9Bs, built in 1957. The first 300-class unit to be modified with AiResearch turbochargers was 306B, in March 1959. During the remainder of that year, nine other 300-class GP9s acquired AiResearch turbochargers, with the last one, 312B, completed in November. These nine units gave UP a total of 13 GP9s (five A-units and eight B-units) modified with the AiResearch design: UP 261, 281, 302, 318, 331, 185B, 303B, 306B, 311B, 312B, 313B, 317B, and 348B.

The application of the AiResearch design, originally done in Los Angeles, consisted of four turbochargers mounted on the



Kenneth M. Ardinger

This view of normal GP9 283 in local service at Rupert, Idaho, on July 21, 1972, shows the extra openings that were cut in the unit's carbody to test if additional openings would improve the performance of a normally-aspirated, Roots-blower-equipped GP9. An earlier, undated photo, printed on page 676 of Volume Two of David F. Myrick's* Railroads of Nevada and Eastern California*, shows UP 283 with just the top middle two extra openings.

This view of two 300-class GP9s (333 and 318) shows the original appearance of the entire class, with the thin frame skirt, small 1,300-gallon fuel tank, and both air reservoirs mounted behind the fuel tank. Note also the air horns mounted atop the cab roof and the winterization hatch over the 48-inch radiator fan.

Union Pacific/author's collection

Lou Schmitz/A. J. Wolff collection

GP9 302, one of 13 GP9s retrofitted with the AiResearch designed turbocharger, is at Council Bluffs, Iowa, on September 16, 1961. Note the modifications made to the fuel tank to allow the unit to burn Bunker C, a low-grade heavy fuel.

EMD 567 engine in place of the normal exhaust manifold. Exterior differences notable on the AiResearch design include the large snow shields over the air intakes. Exhaust stacks were in the same location as those on a normal GP9, but were larger and rectangular in cross-section. The Elliott design used two turbochargers, each mounted above one of the two Roots blowers, requiring modifications to the locomotive carbody. The Elliott design is apparent by a grouping of three square filters at the roof line, forward of the dynamic brake grille, along with two side-by-side exhaust stacks on the roof forward of the dynamic brake fan.

Union Pacific also selected 300-class GP9s for mounting of Elliott-design turbochargers. Units 324 and 324B were the first, completed in June 1959. Eight others were modified with the Elliott design, with 306 and 310 being the last, done in October. The total Elliott program consisted, six GP9s and four GP9Bs: 306, 310, 314, 315, 324, 336, 307B, 323B, 324B, and 345B. (A photograph of UP 314 published in *The Diesel Spotter's Guide*, page EMD-32, was incorrectly captioned as an AiResearch-equipped unit. This was corrected in *The Second Diesel Spotter's Guide*, page EMD-64, showing it as an Elliott-equipped unit.)

Also in 1959, UP began a turbocharging project in cooperation with EMD, which had begun working on its own design in 1956, with the intent of offering a complete line of

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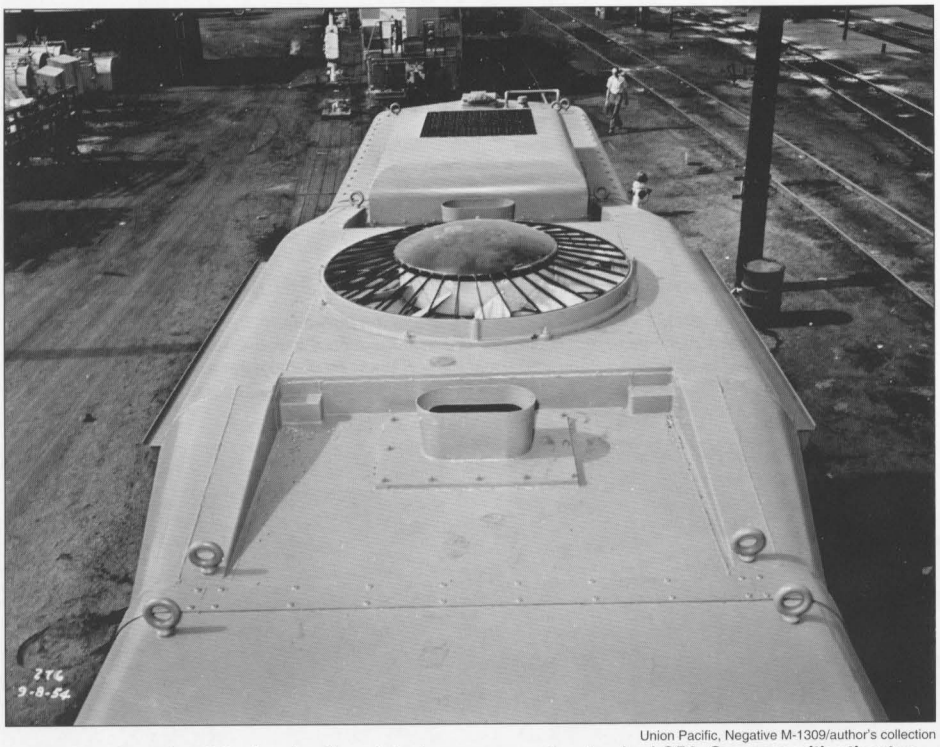
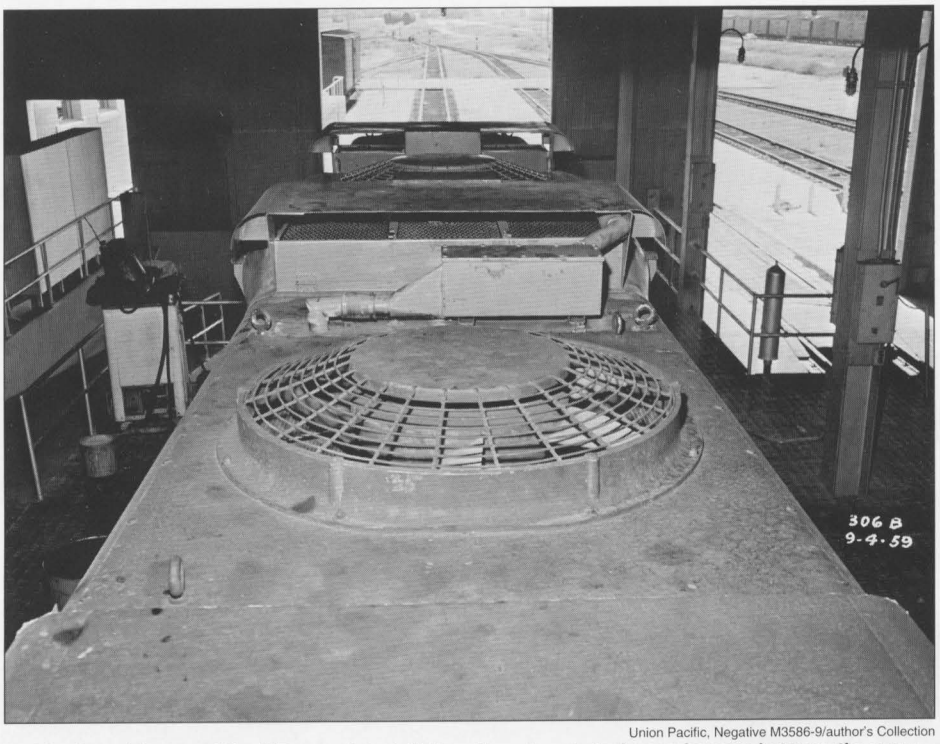


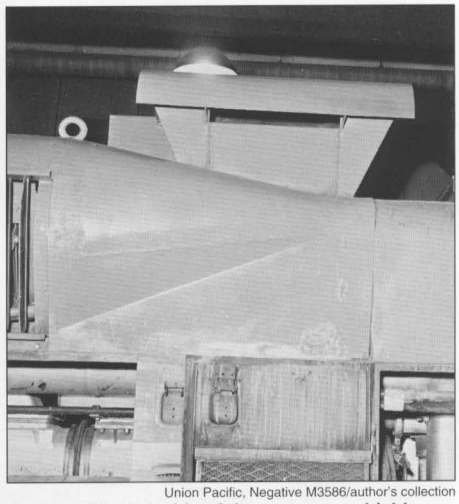
Union Pacific, Negative M-1309/author's collection

A top view of number 276, showing the original appearance of a standard GP9. Compare with other top views of turbocharged units: 306 with Elliott; 306B with AiResearch, and GP20 724 with EMD.



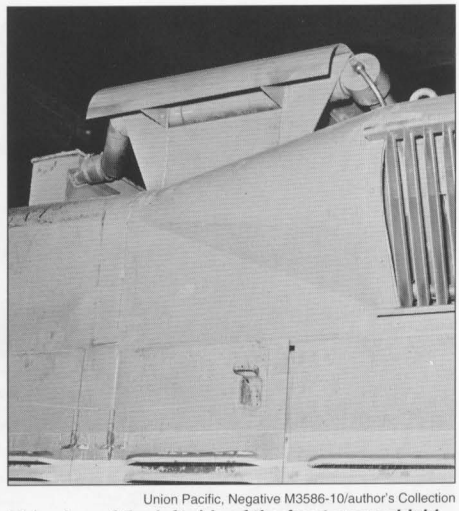
Union Pacific, Negative M3586-9/author's Collection

In this view of the top of the AiResearch installation, the exhaust stacks can be seen between the snow shields, with the top of the 48-inch dynamic braking fan visible between the exhaust stacks. The same view shows the crankcase breather (the box mounted on the roof, in front of the snow shield), which was displaced by the turbochargers from its original location inside the carbody, between the Roots blowers. Visible under the snow shield is the grouping of three standard 18-inch square air filters. As with the Elliott installation, each air filter group was made up of three sets of three filters, making for a total of nine air filters. The combined snow shield and air filter assembly was hinged away from the dynamic braking fan toward the ends of the locomotive to allow change-out of the air filters.



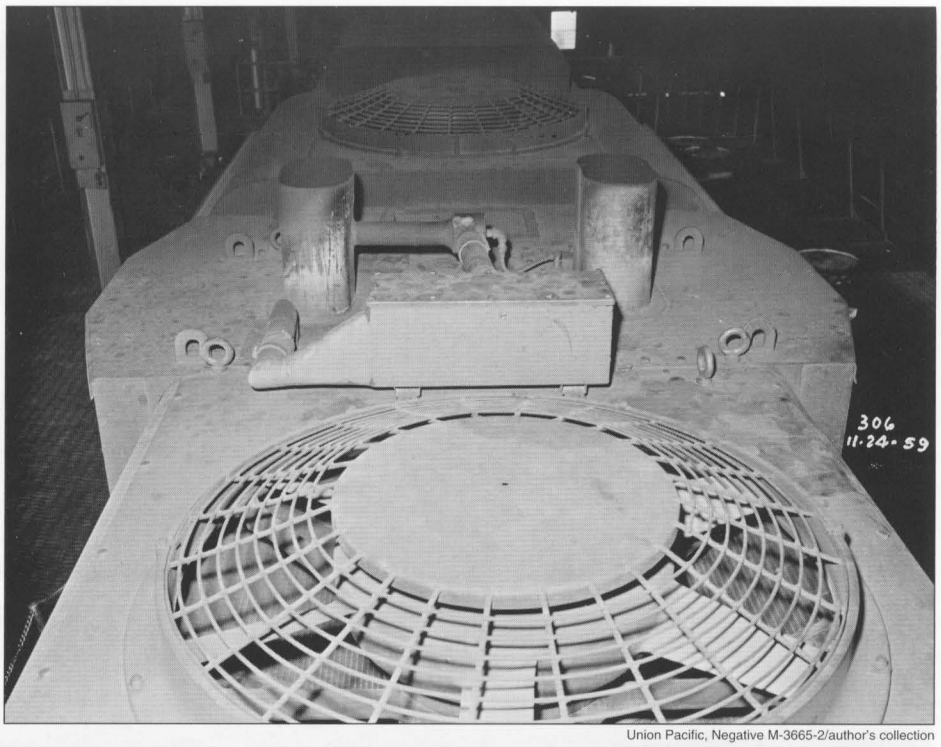
Union Pacific, Negative M3586/author's collection

A view of the left side of the rear snow shield above the AiResearch installation on UP 306B. The snow shields were 33.75 inches long with an overall 72-inch width, and included a six-inch radius turned-down outside edge.



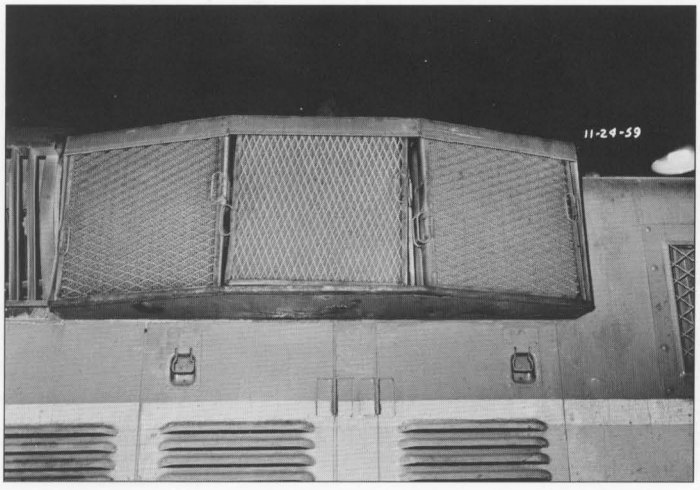
Union Pacific, Negative M3586-10/author's Collection

This view of the left side of the front snow shield of the AiResearch installation also shows the crankcase breathing apparatus from the walkway level.



This top view of Elliott-equipped 306 shows the placement of the twin exhaust stacks. The adjacent tube and box components are part of the crankcase breathing equipment. The box contains a filter to collect and accumulate oil vapors. Just visible over the box is the rectangular outline of the frame from the removed normal GP9 exhaust stack.

Union Pacific, Negative M-3665-2/author's collection



Union Pacific, Negatives M-3665 and M-3665-1/author's collection

These two exterior views show the air filter arrangement of the Elliot installation. The three filters visible on each side are standard Farr-brand 18-inch-square by two-inch thick air filters made up of a metal frame holding several layers of metal screening. These filters were used behind every louver set in this view, and on every louver set on all early EMD GP-, SD-, F- and E-type locomotives. At the larger railroads, the filters were cleaned in automated equipment that washed and reapplied a coating of oil (used to trap small dirt particles). Both the Elliott and AiResearch turbocharger installations used three layers (six inches thick) of these filters, making a total of nine filters at each location; left and right side for the Elliott installation, and front and rear on top of the locomotives with the AiResearch installation.

A left-side view of Elliott-equipped 306 shows the placement of the exhaust stacks and the air filter group. This side view also shows the single air reservoir that was located at the rear of the new 2,400-gallon fuel tank. The larger fuel tank forced the second air reservoir to be mounted crosswise in the carbody at the front of the locomotive. It was located behind the single latched, square door under the walkway, forward of the cab.

Union Pacific, Negative 43071/author's collection

Union Pacific, Negative 43073/author's collection

The conversion of UP 306 to an Elliott-equipped unit was completed in October 1959. It was one of 10 300-class GP9s, including six A-units, that were modified with the Elliott design. The date on which the Elliott turbochargers were removed from 306 is not known, but a photo taken on September 6, 1962, at Grand Island, Neb., shows the unit still equipped with the Elliott turbochargers. In the photo at left, visible is the left stack of the two exhaust stacks, which were located directly above the Roots blowers, as shown in the engine-only view of Elliott-equipped 324. Also visible in the photo is some of the piping required for the heavy fuel modification. The two elbows above the walkway, just below the fire extinguisher marking, were the inlet and outlet for the fuel filter that was located inside the carbody, adjacent to the air compressor.

Ed Fulcomer/A. J. Wolff collection

One of four GP9Bs equipped with an Elliott-designed turbocharger, 323B is at Laramie, Wyo., on June 2, 1964. Note the cooling coils mounted on the side of the larger 2,400-gallon fuel tank; the unit is equipped to burn Bunker C heavy oil.

R. H. Kindig/A. J. Wolff collection

This view of 336, 330B, and a 130-class GP9B, taken at Dale, Wyo., on September 1, 1963, shows the arrangement of the two exhaust stacks of the Elliott application. Note the installation of the air horns above the forward radiator fan on 336. Also visible is the only known spotting feature of a former heavy fuel modified unit (336) compared to a normal diesel-fueled unit (330B) with a 2,400-gallon fuel tank: the presence of an open grid walkway on 336, apparent from the darker walkway color. The open grid was needed to help dissipate excess heat from the electrically heated heavy-fuel 2,400-gallon fuel tank.

A. J. Wolff collection

Here is a view of the right (engineer's) side of UP 301 at Los Angeles on November 10, 1971, the first UP unit sent to La Grange to be rebuilt to pre-production GP20 standards. The conversion was completed in March 1959. Note the louver arrangement, the same as on a production GP20, and the extra deep doors under the forward radiator section. The additional depth, four inches on each side, was needed to make room for the auxiliary generator and air intake filters that were displaced by the turbocharger on all production GP20s, and on the UP "Omaha GP20s." The forced relocation of the auxiliary generator, and its associated main generator blower (and later traction motor blower) from its original center position to its new location on the left side of the main generator is the reason for the "blower bulge" on the left side of the carbody on all later EMD locomotives, from the GP30 in 1962 through to today's SD90s.

continued from page 26

turbocharged locomotives. The first actual use of the EMD design was on a stand-by, stationary power plant (known as a peaker unit) in early 1958 at EMD's LaGrange factory. By mid-1958, EMD's turbocharger design was ready for an installation on a locomotive for road tests in revenue service. A new six-axle locomotive was built for the purpose in July 1958, with road number 5579, which was also its EMD order number. (A photo of this locomotive, the first SD24, with the first railroad application of EMD's turbocharger, is shown on page 68 of Kalmbach's *Our GM Scrapbook*.)

Whether the railroad or the supplier initiated the contact for this cooperative effort is not known, but a guess would put EMD as concentrating on its own design, with UP approaching EMD, offering its locomotives as test units. In early 1959, UP sent three 300-class GP9s to LaGrange for modification with EMD's turbocharger design. EMD completed work on units 301, 305, and 308B in March, April, and May, respectively, at the same time it was finishing the first production SD24s, the Santa Fe 800 class, completed in May 1959. (UP also ordered SD24s, with units 400 and 400B being built and delivered in June 1959.) The three rebuilt Union Pacific GP9s essentially became pre-production versions of EMD's later GP20, and included soon-to-be standard GP20 features such as horizontal air reservoirs, openings in the frame side, a 2,350-gallon fuel tank, and an additional 36-inch radiator fan and small winterization hatch.

Three months later, UP sent six other 300-class GP9s (four A-units and two B-units) to LaGrange to be rebuilt with EMD's turbocharger. Units 300, 311, 313, 320, 300B, and 301B, were completed and returned to UP in June 1959. To hold down costs, these last six units were rebuilt only with EMD's turbocharger and not with the GP20-style

F. W. Guernsey/A. J. Wolff collection

GP9B 308B was one of three units that UP sent to EMD at La Grange in early 1959 to be modified with EMD's turbocharger, which the builder had tested in road service on its SD24 5579. The three units, 308B and GP9s 301 and 305, were rebuilt into pre-production GP20s. They were equipped with the (later) GP20 features – inspection holes in the frame, horizontal air reservoirs, 2,350-gallon fuel tank, and an additional three-foot radiator fan and small winterization hatch. Shown at Portland, Ore., on August 18, 1974.

A. J. Wolff

UP 311, shown with GP9 188 on an eastbound through Cheyenne, Wyo., on November 27, 1970, was one of six units that UP sent to La Grange in mid-1959 to have the EMD turbocharger applied. Visible on the trailing 188 is that unit's front exhaust stack, with UP-standard wire screen spark arrestor, which appears to be similar to the EMD turbocharger exhaust stack on the leading 311. This view also provides a comparison between hood-door louver patterns on the standard GP9 and the EMD-turbocharged GP9.

fuel tank and air reservoirs, as in the earlier work on 301, 305, and 308B, but all six units did gain an additional 36-inch radiator fan and winterization hatch.

The nine 300-class units rebuilt at La Grange gave UP's officials a means by which to compare the EMD turbocharger in a GP-type locomotive against the railroad's own AiResearch and Elliott applications. When EMD first offered the SD24 in early 1959, the company did not consider building a four-axle version of its 2,400-horsepower engine, because the EMD marketing and sales force felt that the additional cost of a turbocharger was not warranted to gain a mere 250 horsepower over the GP9's 1,750 horsepower – 2,000 horsepower being the limit of four D47 traction motors. However, the success of EMD's turbocharger in the UP GP9s led the builder to offer the GP20 model. The first GP20 built was Western Pacific 2001 in November 1959, six months after the UP units were completed. Union Pacific acquired its own production GP20 (number 700, later 470) in July 1960.

Throughout 1959 and 1960, UP kept the 31 turbocharged units (12 AiResearch, 10 Elliott, and nine EMD) in regular road service. Many photos show them in consists with the three-unit 1-30 and Standard and Veranda 51-75 gas turbines. Sometime during 1962, because of the success of the EMD design, with its low level of maintenance, UP decided to end the AiResearch and Elliott programs and continue its GP9 turbocharging program by using the EMD product. By late 1963, all of the AiResearch and Elliott turbochargers had been removed, with eight of the 300-class units being retrofitted with EMD turbochargers at the same time. The AiResearch turbochargers in the first three units, 261, 281, and 185B, were removed, and

A. J. Wolff

UP 320 as it appeared with the EMD turbocharger. This photo also shows the air cooling coils as they were after being moved because of the larger 2,400-gallon fuel tank. On an unmodified GP9, the cooling coils were mounted horizontally, under the walkways, not visible in typical photographs of standard GP9s. Cheyenne, Wyo., January 18, 1971.

J. L. Ehernberger/author's collection

A. J. Wolff

These two views of GP9 331 and GP9B 317B show the units' appearance after their AiResearch turbochargers were removed, leaving no visible evidence. Close inspection of both former AiResearch- and Elliott-equipped units revealed patches in the rooftop sheet metal and the remains of mounting bolts for the crankcase breather filters. Both units were at one time modified to burn heavy fuel, evidenced by the three-inch fuel return line located on the exterior, left side of the 2,400-gallon fuel tank. Also shown is the later position of the air horns on the A-unit, mounted over the radiator fan to prevent freezing during cold weather, along with the 3/8-inch copper air supply line from the horns' former cab roof position. UP 331 is at Cheyenne, Wyo., on May 29, 1977. UP 317B is also at Cheyenne on July 21, 1968.

Ed Fulcomer/A. J. Wolff collection

GP9B 303B with an EMD-design turbocharger. In March 1959, this unit had been equipped with the AiResearch design. No date is available for when UP removed the AiResearch turbochargers and converted the unit to EMD. Shown at Cheyenne on May 24, 1964.

Union Pacific/author's collection

The heavy fuel modification was applied to UP 300 about a year before it was sent to EMD to have an EMD turbocharger installed. This view at Omaha in April 1958 shows the larger 2,400-gallon fuel tank used for the heavy fuel conversion. Note the air cooling coils mounted on the side of the larger fuel tank. On a regular GP9, these coils are mounted horizontally under the walkway. Also note the double set of louvers immediately behind the cab. Compare with the same area in the later view of turbocharged number 300.

A. J. Wolff

UP 300 as it appeared with the EMD turbocharger installation done by EMD. The second group of six units that were sent to LaGrange to be rebuilt with the EMD design did not acquire the same regular GP20 features as the first three. They can be identified by the same arrangement of the louvers on the carbody doors in the center of the carbody, under the dynamic braking bulge and grille, along with the addition of a three-foot radiator fan and small winterization hatch, a feature that all nine LaGrange-modified units received. The units modified by UP at Omaha did not gain the extra louvers, which were the same on both sides. Laramie, Wyo., October 29, 1968.

the units were returned to their as-built normally aspirated configuration.

Between 1962 and 1965, as budget and operational limits allowed, Union Pacific continued to apply EMD turbochargers to 55 other 300-class GP9s and GP9Bs – 25 A-units and 30 B-units. All of this work was done at the railroad's Omaha Shops, giving rise to the units' "Omaha GP20" name.

Concurrent with the turbocharging project, UP modified many of the 300-class GP9s to burn low-grade heavy fuel, also known as Bunker C, or black oil. All of the gas turbines then on the railroad also used this type of fuel. In addition, the SD24s were purchased as heavy-fuel locomotives in 1959, to further make use of this inexpensive fuel. Modifications to the 300-class GP9s included the installation of larger 2,400-gallon fuel tanks with fuel and air piping mounted on the outside of the tank. The use of Bunker C required electric heaters in the fuel tanks to allow it to flow, so the modified units were equipped with open metal grating applied as walkways to dissipate excess heat. Also included was a two-stage fuel filter, located between the air compressor and the equipment rack in the rear of the carbody interior. Use of the larger fuel tank forced one of the twin GP9 air reservoirs to be mounted crosswise in the area just ahead of the battery boxes at the front of the locomotive.

By the late 1960s, oil refiners were finding other markets for heavy fuel, which brought about a subsequent raise in price. With the retirement of all the gas turbines at the same time, UP decided to end the use of heavy fuel. During the mid-1970s, all of the 300-class GP9 units were returned to using diesel fuel, allowing the removal of the large pipes from the left side of the fuel tanks. (The SD24s were converted during the early 1960s.) The large fuel tanks required that the air cooling pipes remain attached to the right side of the fuel tank, rather than under the walkway, as on a normal GP9.

An exact list of the units that were modified to burn heavy fuel is not known. Using photographs to identify spotting features is difficult, because at the same time as the heavy-fuel feature was removed, UP decided to increase the fuel capacity on many of the other GP9s by applying the same 2,400-gallon fuel tanks to GP9s that had never burned heavy fuel. A company roster dated September 1, 1968, shows 86 GP9 and GP9B locomotives with the larger 2,400-gallon fuel tank, including six units in the 130-299 series. Twenty of the 300-class GP9s and GP9Bs were never equipped with the

H. N. Proctor/*Diesel Era* collection

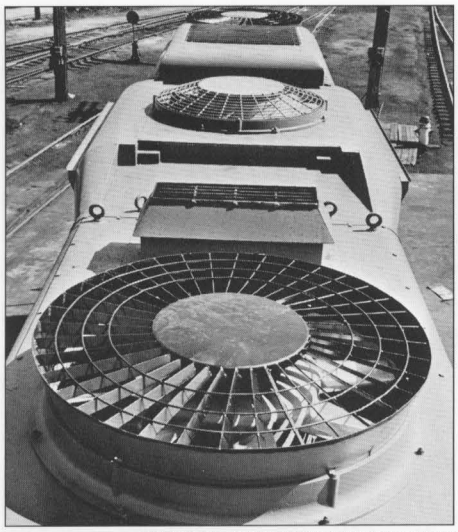
Two years after being retrofitted with an EMD-designed turbocharger at the road's Omaha shops, GP9 343 leads a freight through Pocatello, Idaho, on November 9, 1965. The unit is one of 25 cab-equipped GP9s designated as Omaha GP20s after the rebuilding.

F. W. Guernsey/A. J. Wolff collection

right, ***This view of EMD-turbocharged 310 at Centralia, Wash., on October 3, 1970, also shows the large, flat snowplow that UP installed on so many of its units, including GP9s. This unit was one of eight units on which either the Elliott or AiResearch turbochargers were replaced by the EMD design.***

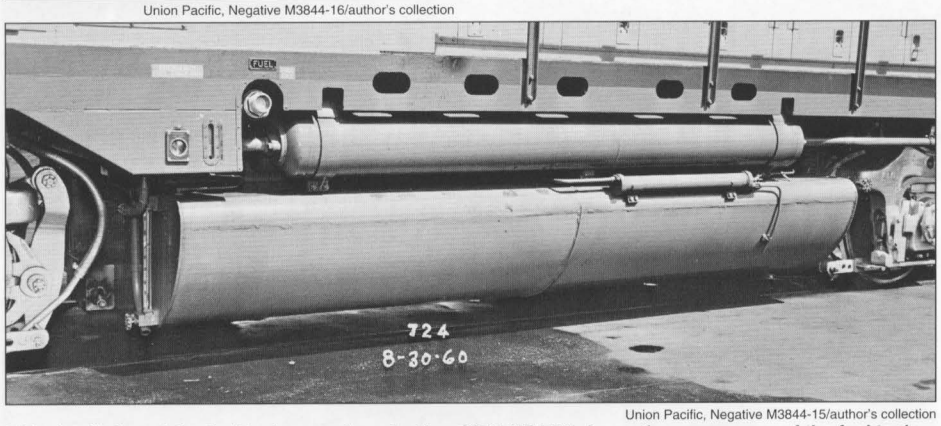
The Garys/*Diesel Era* collection

UP 309B at Denver on September 5, 1966, illustrates the appearance of the long hood of an Omaha GP20 conversion. Spotting features include the large EMD turbocharger exhaust stack and the GP20-like louver arrangement. None of the UP Omaha-modified units gained an additional three-foot radiator fan. The Omaha units instead retained the four-foot radiator fan, along with its large winterization hatch. Unlike the Pennsylvania Railroad GP9Bs, which carried hostler controls, UP's B units lacked this feature.



Union Pacific, Negative M3844-16/author's collection

This top view of a production GP20, UP 724 (later UP 494), shows the EMD turbocharger exhaust stack. The difference between a UP-modified "Omaha GP20" and a factory GP20 included the flared radiator fan guards visible in the foreground. The differences also include the winterization hatch over the three-foot radiator fan, behind the flat-topped dynamic braking fan. The "Omaha GP20s" had the standard late GP9 four-foot radiator fans, with the rear fan covered by a large winterization hatch.



Union Pacific, Negative M3844-15/author's collection

This detail view of the fuel tank area of production GP20 UP 724 shows the appearance of the fuel tank areas of UP 301, 305 and 308B after they were rebuilt to "pre-production" GP20s by EMD in March to May 1959, six months before regular GP20 production began in November 1959. Note the standard GP20 features: 2,350-gallon fuel tank, horizontal air reservoirs, and inspection openings in the frame side rails. The small cylinder and tube attached to the fuel tank below the air reservoir is a reservoir condensate drain, with its "Drain Daily" instruction.

larger fuel tank, either as heavy-fuel units or as regular fuel units. Also, 15 300-class B-units equipped with steam generators for passenger service were fitted with the same 2,400-gallon tank, split with 1,300 gallons of fuel and 1,100 gallons of water. When the steam generators were retired in place on these units, the plumbing was changed to allow the water tank to be used as a fuel tank. Of the 100 units in the 300 class, all but five A-units gained either turbochargers or larger fuel tanks. These five units – 312, 333, 341, 345, and 346 – retained their original, as-built appearance throughout their careers on UP. ★

Sources include:
Interviews from 1972 through 1978 with Lloyd Edson, UP's Supervisor of Diesel Maintenance.

Locomotive log books. Most of the actual dates, especially these for the removal of Elliott turbochargers, are taken from company log books kept for each locomotive. About 1976, Union Pacific stopped the practice of maintaining individual log books.

"Notes On Turbocharged Two-Stroke Cycle Diesel Engines," Technical Paper 799, Society of Automotive Engineers, August 1956

"Railroad Experience With A Turbocharged Two Cycle Diesel Engine," Technical Paper 800, Society of Automotive Engineers, August 1956

Union Pacific, Negative 68-397/author's collection

UP's SD24s were delivered new from EMD in June 1959, just one month after the last EMD-modified GP9 was completed. With UP's almost constant search for improved locomotive performance, it should be no surprise that the railroad ordered SD24s, in November 1958, as soon as EMD's SD24 demonstrator 5579 began proving the new higher-horsepower design of EMD's new turbocharger. The large group of louvers in the SD24's carbody illustrates the need for additional amounts of intake air required for a turbocharged locomotive. UP 414, 416, and a third SD24 pose for the company photographer just east of Echo, Utah, eastbound on the noted 1.15 percent Wasatch grade.

With a downturn in traffic, GP9B 336B is in storage at Council Bluffs, Iowa, on March 28, 1974. Note the three-inch fuel line along the side of the fuel tank left over from the unit's days of operating with heavy fuel. This line was for the return of unused fuel.

George R. Cockle/Arnold LeBowsky collection

"2-Stroke Diesel Locomotives Are Successfully Turbocharged," Hill, Ross C., and Werner T. von der Nuell, SAE Journal, March 1957, pages 53-55.

"Controlled Turbocharging Improves Performance," Diesel Power, September 1958, pages 30-31.

"Union Pacific Turbocharging Program," Diesel Power, May 1959, page 23.

Interviews with Jack Wheelihan, Jim Boyd, and Preston Cook, present and former employees of EMD who contributed to the completeness of this article.

UNION PACIFIC Turbocharged GP9s

ROAD NUMBER	BUILDER'S DATE	TURBOCHARGER TYPE	TURBOCHARGER APPLIED	DATE RETIRED	NOTES
261	Aug 1954	AiResearch	May 1956	Dec 1979	
281	Sep 1954	AiResearch	Dec 1955	Sep 1976	
300	Jul 1957	EMD	May 1959	Oct 1979	
301	Jul 1957	EMD	Mar 1959	Sep 1976	1
302	Jul 1957	AiResearch	Jun 1959	May 1978	
304	Jul 1957	EMD		Oct 1979	
305	Jul 1957	EMD	Apr 1959	Mar 1981	2
306	Jul 1957	Elliott/EMD	Oct 1959	Sep 1976	
307	Jul 1957	EMD	Feb 1964	May 1984	
308	Jul 1957	EMD		May 1979	
310	Jul 1957	Elliott/EMD	Oct 1959	Sep 1975	
311	Jul 1957	EMD	May 1959	May 1980	
313	Jul 1957	EMD	Jun 1959	May 1980	
314	Jul 1957	Elliott	Jul 1959	Jul 1981	3
315	Jul 1957	Elliott	Jul 1959		
316	Jul 1957	EMD	Sep 1965		
317	Jul 1957	EMD	May 1965	Jan 1981	
318	Jul 1957	AiResearch		Nov 1982	
320	Jul 1957	EMD	May 1959	Feb 1979	
322	Sep 1957	EMD		Sep 1976	
324	Sep 1957	Elliott	Jun 1959	Mar 1981	
325	Sep 1957	EMD	Feb 1966		
326	Sep 1957	EMD		Apr 1982	
328	Sep 1957	EMD		Oct 1979	
329	Sep 1957	EMD		May 1985	
330	Sep 1957	EMD	Aug 1963	Jan 1980	
331	Sep 1957	AiResearch		Aug 1978	
332	Sep 1957	EMD		Mar 1984	
334	Sep 1957	EMD		May 1978	
335	Sep 1957	EMD		Jun 1981	
336	Sep 1957	Elliott		Dec 1981	4
339	Sep 1957	EMD		Oct 1979	
340	Sep 1957	EMD			
342	Sep 1957	EMD	Mar 1963	Sep 1976	
343	Sep 1957	EMD		Nov 1982	
344	Sep 1957	EMD		Apr 1982	
347	Sep 1957	EMD	Mar 1965	Jan 1981	
348	Oct 1957	EMD	Jul 1963	May 1978	
185B	Apr 1954	AiResearch	Apr 1956	Jul 1976	
300B	Sep 1957	EMD	Jun 1959		5
301B	Sep 1957	EMD	Jun 1959		5
302B	Sep 1957	EMD	Jul 1962	Sep 1976	
303B	Sep 1957	AiResearch/EMD	Sep 1959	May 1979	
306B	Sep 1957	AiResearch	Mar 1959		6
307B	Sep 1957	Elliott/EMD	Aug 1959	Oct 1977	
308B	Sep 1957	EMD	May 1959	Sep 1976	7
309B	Sep 1957	EMD		Oct 1979	
311B	Sep 1957	AiResearch/EMD		Sep 1976	
312B	Sep 1957	AiResearch	Nov 1959	May 1978	8
313B	Sep 1957	AiResearch		Sep 1976	
314B	Sep 1957	EMD	Jul 1963		
315B	Sep 1957	EMD	Jul 1963	Sep 1976	
316B	Sep 1957	EMD	Oct 1962		
317B	Sep 1957	AiResearch	Sep 1959	Jul 1976	
318B	Sep 1957	EMD		May 1978	
319B	Sep 1957	EMD		Sep 1976	
321B	Sep 1957	EMD		Sep 1976	
322B	Sep 1957	EMD		Jun 1976	
323B	Sep 1957	Elliott	Jul 1959	Sep 1976	9
324B	Sep 1957	Elliott/EMD	Jun 1959	Dec 1974	
325B	Sep 1957	EMD	Oct 1965	May 1979	
326B	Sep 1957	EMD		Jun 1976	
327B	Sep 1957	EMD		Jun 1976	
328B	Sep 1957	EMD		Sep 1976	
332B	Sep 1957	EMD		Jun 1976	
333B	Sep 1957	EMD		Sep 1976	
334B	Sep 1957	EMD		May 1979	
335B	Sep 1957	EMD		Oct 1977	
336B	Sep 1957	EMD	Aug 1963	Oct 1977	
337B	Sep 1957	EMD	Dec 1963	May 1978	
339B	Sep 1957	EMD		Oct 1979	
340B	Sep 1957	EMD		May 1978	
342B	Oct 1957	EMD		Sep 1976	
343B	Oct 1957	EMD		Jun 1976	
344B	Oct 1957	EMD	Nov 1962	Sep 1976	
345B	Oct 1957	Elliott/EMD	Jul 1959	Jun 1976	
348B	Oct 1957	AiResearch/EMD	Jul 1959		

NOTES:

1. Rebuilt by EMD to pre-production GP20, March 1959.
2. Rebuilt by EMD to pre-production GP20, April 1959.
3. Elliott turbochargers removed in September 1963.
4. Elliott turbochargers removed in October 1963.
5. Turbocharger applied at EMD.
6. AiResearch turbochargers removed in July 1962.
7. Rebuilt by EMD to pre-production GP20, May 1959.
8. AiResearch turbochargers removed in September 1962.
9. Elliott turbochargers removed in 1963.

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contents

features

W. E. Harmon/*Diesel Era* collection

Southern Pacific found the SD9 model to be ideally suited for its operations and eventually acquired the largest fleet of the 1,750-horsepower road switcher, 150 units. A pair of the units, rebuilt and wearing 4300-series numbers, waits for its next assignment at El Centro, Calif., on December 2, 1978.

departments

Diesel Era

$5.95
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November/December 1996

Volume 7 Number 6

Monon's Second-Generation Diesel Fleet

EMD's SD9 - Part 2

Omaha GP20s

Huntington Century 415s

Locomotive Notes II