

Santa Fe FTs

From *Santa Fe Diesel Locomotive Development*, book in work at Signature Press.

Perhaps some information I have found in researching *Santa Fe Diesel Locomotive Development* will be of interest to you. John McCall is a good friend and my mentor, and one of the most reliable authorities on Santa Fe Diesels around. He kindly reviewed the message here and agrees with me. *Santa Fe's Early Diesel Daze 1935-1953*, was written long before the Santa Fe files saved by Richard Scholz became available.

To answer one basic question: Despite the confusion of seeing photos in other publications of FTs from other railroads, sometimes confused with AT&SF information, I am convinced that **All** FTs delivered to the Santa Fe were separable and interchangeable units. All, starting with 100 and 100A built in 1940, were equipped at EMD at the Santa Fe's expense with couplers, diaphragms, end doors, end steps and end handrails. At the time of order and delivery, the Santa Fe did not use the "L" designator, that term came later, but since John McCall did so in his landmark publication *Santa Fe's Early Diesel Daze*, most people follow his lead. For this message I have not done so.

In 1938 the FT was conceived by Richard Dillworth at EMC,(in 1941 to be EMD), to be marketed as a single 2700-hp two segmented locomotive, one 1350-hp cab equipped segment without batteries and one 1350-hp booster segment without any cab controls, both segments not designed to work independently of one another and permanently drawbar attached. Dilworth meant to compete with the then standard 2-10-2 steam freight locomotive that generated approximately 2700-hp at its optimum operating speed. To achieve 5400-hp, two 2700-hp FT segments, with each booster at the rear equipped with conventional couplers, were to be operated back to back. To achieve the same horsepower, 2-10-2s would have to be operated in tandem.

After testing EMC 103 in 1939, the Santa Fe liked the horse power, especially as configured with 5400-hp. While briefly tested, the 2700-hp set did not offer any operating advantages to Santa Fe operations. The Santa Fe insisted that all FTs on the system be coupled conventionally, eliminating any hint of articulated segmentation and allowing what became unencumbered multiple unit operation. This concern went all the way back to 1934 when the Santa Fe rejected EMC's proposal to build Diesel-Electric Locomotive Number 1, Unit A and Unit B as drawbar connected.



EMC 103A

Courtesy of the Railroad & Heritage Museum, Dean Hale Collection, EMC Photo

The FT as tested by the Santa Fe was not an instant success. Initially two, locomotives 100 and 101, each of four units, were ordered in late 1940. Both included major Santa Fe demanded and paid for changes, including early dynamic brakes and couplers replacing drawbars between lead and booster unit. The FTs were initially scheduled to undergo a year or more of testing prior to a measured introduction to mainline service.

In 1940, EMC agreed to eliminate the drawbar connection on Santa Fe FTs. The change was implemented while FT 100 was in production, and EMC subsequently offered this option to other customers. The substitution of couplers for drawbars involved a considerable design change; the later application of the "Santa Fe" type coupler and centering device pocket to Southern Railway Diesel-electric units is shown on page 428 of the 1950-1952 edition of the *Locomotive Cyclopedia*.

That this configuration change was made after the order was placed is indicated by the wording of EMC's order confirmation. The detail description below, found intact in the Scholz files, was drawn up by the Santa Fe to accompany the payment voucher and describes the locomotives as built to conform to Santa Fe ordered modifications. The additional cost of adding doors and diaphragms is detailed. The cost of alteration from drawbar connected sections to separate units by installation of solid bulkheads in the original open-ended sections and addition of A.A.R. couplers, centering gear, air hoses, MU connections, etc. between sections is not detailed and was probably covered in the two Specification Supplements mentioned.

(1) 2700-Horsepower Diesel Freight Locomotive	
"A" AT&SF #100 (EMC #1198)	\$232,500.00
"B" AT&SF #100A (EMC #1202)	

The above locomotive built in accordance with Electro-Motive Corporation Specification #606, Supplement #1, dated September 6, 1940 and Supplement #2, dated September 12, 1940, with the following exceptions:

Train control will not be required.

Each unit to be equipped with speedometer and tape recorder.

Each unit to be equipped with one gallon Pyrene Fire Extinguisher and one Dugas Fire Extinguisher #30-T.

Locomotive to be equipped with extras as follows:

Electric holding brake A&B	\$10,000.00
Doors and diaphragms between "A" and "B" cabs	950.00
Extra battery and boxes, control cabinet and hostler's	
Control station in "B" unit	2,400.00
Air brake equipment on "B" cab to permit moving "B"	
Units independently or dead in train	775.00
Combination speedometer and tape recorder in "A" unit	175.00
Fire extinguishers "A" and "B" units	32.00
Illuminated number box "A" unit	<u>455.00</u>
	247,287.00
Prepaid Freight	<u>583.53</u>
	\$247,870.53

Before delivery in late 1940, Electro-Motive Division made the necessary and significant modifications in production and billed the Santa Fe for all accordingly. These included new couplers and modified draft gear, bulkheads, diaphragms between the cab and booster, battery installation, safety steps, hostler controls in the booster unit and extra porthole window in the "engineer" side of the booster, primitive dynamic brakes and another changes. Santa Fe FT 100, a cab unit, and 100A, a booster unit, was photographed with all changes at EMD before delivery in December 1940. By 1940, when the Santa Fe had placed customized orders for test FTs, the Santa Fe was working 5120-hp 5001 Class 2-10-4s in territory that would eventually be assigned to 5400-hp FTs.



100 and 100A at EMD

Courtesy of the Railroad & Heritage Museum, EMD Photo, Dean Hale Collection

Originally ordered, produced, tested and numbered as single unit cab and booster ABBA sets in 1940, FT 100, 101, 102, and 103 were reset in late 1941 to ABBB.

Records found in the Richard Scholz files at The Railroad & Heritage Museum in Temple, Texas contain Mechanical Department correspondence from February and March 1941, attached to and supplementing **Authorization For Expenditure 500-40**, (which even though a 1940 series number is itself dated January 17, 1941,) indicating that additional units were on order in February 1941. They would become EMD 1200 through EMD 1347. Only two, EMD 1200 and EMD 1201 were cab units. I have applied the EMD Serial Number as furnished by John McCall in *Early Diesel Daze*. John shows that on delivery in August, EMD 1340 became booster 100C, EMD 1341 became booster 101C, and the balance made up boosters assigned to new ABBA FT locomotives 102 and 103.

On April 17, 1941, John Purcell, by letter, directed H. H. Lanning to prepare a **Form 1576 Standard, Authority for Expenditure**. As a result Locomotive 104, the first FT ordered from EMD as an ABBB set, was confirmed on **AFE 317-41** as executed by Lanning and dated April 21, 1941. She may have been in production at EMD by that date, she most probably had already been ordered as **AFEs** often confirmed orders previously placed, sometimes well after the fact. Purcell's letter to Lanning documents the single cab, three booster configuration thoroughly.

The 104 was completed at La Grange, EMD 1406 cab, EMD 1407 booster, EMD 1408 booster, and EMD 1409 booster, and evidently moved dead in train from McCook, Illinois to Shopton, Iowa for set up in mid November 1941. The 222 miles at 20 cents per mile charge submitted for movement McCook to Shopton is unfortunately not dated. Saved in the Scholz files, the first Shopton work dates showing her set up labor costs are dated November 18 and 19 although other documents show that parts were being accumulated in late October 1941. None of the work or parts documents submitted by Shopton show any indication of structural or frame changes.

By the way, since we are talking here in the context of the sets of A-B-B-B FTs, I'll just state for purposes of this discussion that my mention of set 101 refers to the set containing second 101C, a booster, to try to avoid any confusion. The reader may want to note the fact that for a short time in early 1941, two 101Cs existed with the number board of original cab 101C blanked out as she was operated as ABBA 100-A-B-C. In August 1941, cab 100C and cab 101C went back to La Grange to become 102 and 103 (Some years ago, in an e-mail exchange, Wally Abbey confirmed this also).

Everyone in 1941, including the Santa Fe's Mechanical, Operating and Accounting Departments, was sometimes confused about the original and subsequent rearrangements. I have a rough sketch my Dad made in March 1941 while in the Mechanical Engineers Office showing how the units were probably then scheduled to be rearranged, yet actual changes in August to November probably differed.

No evidence exists that 100 did not operate after August in 1941 as ABBB. In August 1941 the configuration of FT 100 was changed from ABBA to ABBB after FT 100 and FT 101 were moved to Shopton where cab equipped units 100C and 101C were removed and the newly constructed booster units mentioned above were put on. An Operating Department advisory, dated July 25, 1941, directing the movement of FT 100 and FT 101 from Clovis-Argentine service to Shopton, stated clearly that following the removal of lead units 100C and 101C, FT 100 and FT 101 would receive new boosters and "there will be only one operating cab for each locomotive." Supervisor of Diesel Engines, System, H. V. Gill, on July 31, 1941, advised the Operating Department that the two new boosters for 100 and 101 "would have crank cases filled with the Texas Company's URSA #656 lubricating oil for test purposes and should be carefully monitored", indicating that FT 100 and FT 101 returned to Argentine-Clovis service. As noted, the two removed cab units, 100C and 101C were deadheaded to Corwith for delivery to Electro-Motive at La Grange to be renumbered and mated with and become lead units for additional new booster units.

Operating Department documents clearly show that cab units 100C and 101C, removed from 100 and 101, moved from Shopton to La Grange on or about August 1 with return of some units anticipated by August 15. All the Santa Fe Operating Department documents I have found state that new FT 102 was delivered as an ABBA at McCook on August 16, 1941. She was then assigned to Argentine-Clovis service with specific instructions to be operated as a single direction locomotive as only the trailing cab unit was equipped with a type E coupler, directing that only that end was to be connected to the train. I have found nothing to indicate that this did not happen. This indicates to me that between mid-August and early September 1941, FT locomotives 100 and 101 as ABBB and FT locomotive 102 as ABBA, operated in Argentine-Clovis freight service.

FT 102 was next reported in **Mechanical Department Test Report 87334-A**, dated October 11, 1941, as testing between September 4 and 11. The test report mentions removing armrests from the center seat in both cabs, indicating that she indeed had two cabs during testing. Testing began on September 4, 1941 as Run Number 1 from Clovis to San Bernardino. Testing ended with Run Number 6, between San Bernardino and Clovis, broken up into a series ending at Clovis on September 11, 1941.

Following the testing, 102 was then reported by Operating Department documents out of Clovis on GFX-I for Argentine on September 16. The big mystery is why 102 was delivered and tested as an ABBA and where, when, and with what unit did she revert to ABBB?

Nowhere in this record is there any indication that the heavy work that would have been entailed by converting any units from drawbar connected to couplers is mentioned. The original FTs on the Santa Fe were indeed coupler connected when delivered from EMD.

Compliance with several restrictive Arizona and California State and labor imposed work rules dictated the change from ABBA to ABBB. Actually starting with 104 in late 1941, by early 1942, all new FTs were scheduled to be delivered configured as ABBB sets. All were customized with all current modifications to dynamic brakes, gearing, and other operating concerns uncovered during early testing of FTs 100 to 103 on the Santa Fe in 1941. (During WWII, ICC rule changes allowed the Santa Fe to revert back to ordering and resetting FTs as ABBA sets, changes far too complex to discuss here.)

On average, (and these numbers are as usual in any discussion of this nature, subject to correction from other sources,) as used by the Santa Fe in the early forties, FT cab units weighed 232,900 pounds and were rated at 58,225 pounds tractive force, booster units weighed 230,200 pounds and generated 57,550 pounds tractive force. In 1938, a new single 5001 Class 2-10-4 weighed 545,260 pounds and was tested at 105,000 pounds tractive force. Four FT units generated 231,550 pounds TF at start and generated 4,890-hp at 60 mph. The 5001 output was 5,120-hp at 60 mph, thus a four unit FT had twice as much starting TF and almost the same hp at 60 mph versus the 5001 Class with half the starting TF and only slightly more hp at 60 mph. With 5400-hp distributed over four units at less than half the locomotive

weight of any of the 5001 Class, the wear and tear savings on track structures alone was a blessing. The obvious economical reduction of water use had been an early projection.

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