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The FT Story

50 years of F-units

The Warbonnet Returns

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Electro-Motive's FT Celebrates 50 Years

by Preston Cook

The concept that the Electro-Motive Corporation introduced to railroading with the completion of FT Demonstrator 103 in late 1939 was so bold that most industry officials of the time were skeptical that even the powerful General Motors organization could realize their objective. The goal was to challenge the long-established superiority of the steam locomotive in handling heavy tonnage freight trains on every major railroad in the United States in every type of service and on every track profile. The machine which had been developed to accomplish that task was a sleek, streamlined, four-unit diesel-electric locomotive styled along the lines of the company's previous passenger locomotives. The potential prize was the enormous market for the replacement of almost 50,000 steam locomotives of all sizes and ages which were then in freight service.

Fifty years later we take for granted the impressive results of Electro-Motive's 1939 undertaking which led to the wholesale dieselization of America's railroads, and FT Demonstrator 103 is now recognized as the first commercially successful mass-produced diesel-electric road freight locomotive.

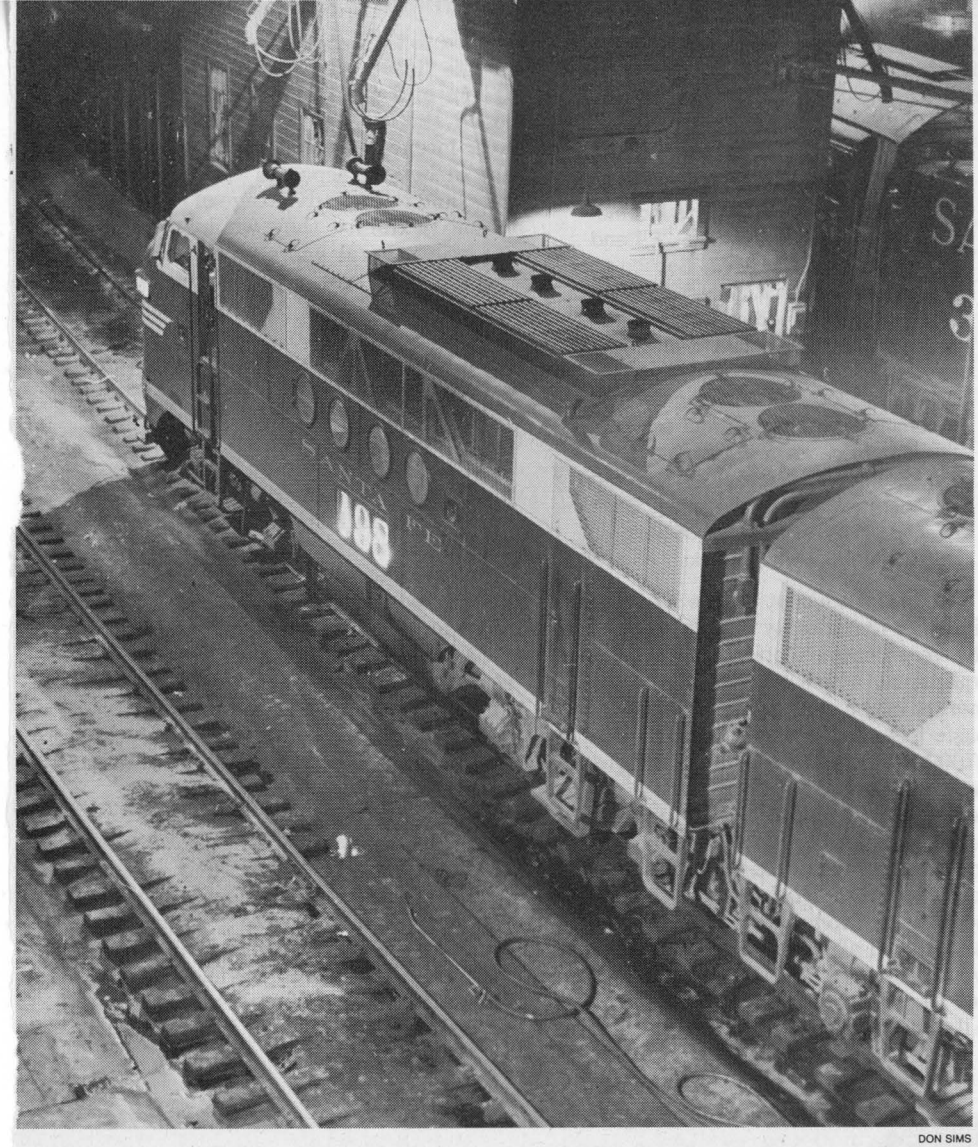
The long string of qualifying adjectives is necessary in fairness to the other companies which also contributed to the development of road freight diesel locomotives, as the FT was not the first such project undertaken. In 1925 Baldwin had produced their 1000-h.p. Demonstrator 58501, which resembled a boxcab electric with massive fabricated A1A trucks and was powered by a pair of Knudsen inverted-V two-cycle engines. In 1935 Westinghouse had produced a twin-engined 1600-h.p. pseudo-roadswitcher demonstrator which became Northampton & Bath 1601. Neither of these pioneering designs was duplicated.

Electro-Motive had produced an enormous center-cab transfer unit powered by a pair of Winton twelve-cylinder 201A engines for the Illinois Central in 1936, and General Electric had also tested the market that same year with a pair of IC transfer units, one powered by two 900-h.p. Ingersoll-Rand engines and the other by a single 2000-h.p. Busch-Sulzer. It is interesting to note that most of the pre-FT attempts at building a road freight diesel reflected


General Motors Diesel Freight Locomotive
A New Milestone in Transportation Progress
ELECTRO-MOTIVE CORPORATION, LA GRANGE, ILLINOIS, U. S. A.

THE SANTA FE posed the first production FT set, its 100, below Blue Cut in Cajon Pass for photos in early 1940; Electro-Motive had the scene rendered as artwork for the 1941 *Locomotive Cyclopedia* (**left**). FT 198 shows its dynamic brakes at San Bernardino (**right**) in December 1950. The 103 demonstrators (**bottom right**) were posed at La Grange in 1939.

SANTA FE RAILWAY



DON SIMS

the carbody and machinery concepts of the straight electric locomotives of that era. The idea of a freight diesel resembling a passenger streamliner was unique to the FT project at that time.

Selling the concept

Trying to visualize the conceptual and marketing concerns that EMC must have had in the late 1930s is quite difficult in the diesel-dominated world that exists today, but a number of major factors are evident. Despite the fact that Electro-Motive and GM Research had good confidence in the new Model 567 diesel prime mover, many railroads had little or no experience with diesels and were skeptical of the feasibility of a diesel-electric which was intended to compete with the finest steam locomotive technology of the era.

On many railroads, EMC had to sell its product to customers who had little or no diesel experience or knowledge, or (perhaps more difficult) to customers whose previous diesel usage was confined to very limited and special applications of developmental equipment, such as articulated streamliners. After a century of custom-designed steam locomotives, EMC had to convince railroad managers that one model of diesel locomotive, which might differ only in its paint job from railroad to railroad, could meet the operating requirements of each railroad under all circumstances.

Most of the railroads which did have limited diesel experience had operated only low horsepower switching locomotives, many of which had been acquired mainly to satisfy local smoke ordinances in large cities. In some cases these diesels were not being operated to their full potential to demonstrate their capability to compete economically with steam switchers, much less with road locomotives. A few of the railroads had their first diesel experience not with locomotives, but rather with tugboats, where diesel power had been applied mainly to improve the availability of the vessels by eliminating dirty and time-consuming coaling and ash removal operations.

In addition to the natural customer skepticism that went along with trying to market a new technology, EMC had to contend with the fears of possible job displacements that a diesel locomotive could generate. The FT had to be politically acceptable to both the union workers who would operate it (the fireman's job was obviously threatened, along with shop and servicing personnel) and to management and engineering staffs whose very existence was dependent upon perpetuating custom-designed steam power.

If the production of the FT had extended entirely through a period of peacetime, it is likely that this factor would have been more of a problem than it eventually was. However, the entry of the U.S. into World War II in December 1941 and the absolute sense of urgency and national purpose which immediately developed, prevented local job politics from adversely influencing the acceptance of freight diesels on most railroads.

EMD

The FT locomotive

The Electro-Motive Corporation was in a good position to develop and produce a road freight locomotive. It had already produced very successful passenger diesels and had a tremendous manufacturing capacity available in its new factory at La Grange, Illinois (actually located in the adjoining community of McCook), which had been opened up in 1935. EMC had gotten its start in Cleveland, Ohio, in 1922 building gas-electric motor cars and was bought by General Motors in 1930. The FT was conceived and built at La Grange by EMC, which at the time was a GM subsidiary. On January 1, 1941, however, EMC was formally merged into the General Motors Corporation, becoming its Electro-Motive Division (EMD).

The concept of the FT as a two-unit 2700-h.p. package in a streamlined carbody capable of being paired up with another set to produce a four-unit 5400-h.p. locomotive is generally credited to Electro-Motive's Chief Engineer Richard M. Dilworth. Knowing he had the 1350-h.p. 16-cylinder 567 diesel available, he simply began adding them together until he came up with a potential locomotive that would equal the biggest steam engine in performance. Although none of his legendary wrapping-paper sketches remains in the company files, the oldest piece of paper relating to the FT there today is a single-page project release dated February 1, 1939, authorizing the development of the "2700 H.P. Freight Loco. (Model F)." Its wording reflects the early level of road locomotive terminology:

> "This release file is being set up to enable the Engineering Dept. to release drawings for the construction of a 2700 H.P. Freight Locomotive. This locomotive will be known as Model "F" and will consist of two sections - Section #1 (Front) and Section #2 (Rear). Each release will specify under "Section" that section of the locomotive to which the release applies. It is, however, essential that this locomotive be regarded as a complete unit made up of two sections and *not* as two separate units particularly since neither section can be operated without the other. Each section will have one (1) 16-567 engine and two (2) four-wheel trucks."

The initial concept for the FT locomotive was remarkably simple in light of the very complex offerings of optional equipment which came into the diesel market in the years which followed. The basic locomotive was intended to be a 2700-h.p., streamlined cab-and-booster set connected by a drawbar. Two such sets could be coupled back-to-back to produce a double-ended 5400-h.p. locomotive that would be the equal of any modern 4-8-4. Both the cab and the booster "sections" would be of four-axle design (will all axles powered), and each would use a single 16-cylinder Model 567 engine rated at 1350 horsepower. All of the early paperwork on the design referred to the cab and booster as being a single "locomotive" (like a steam locomotive and tender, as initially envisioned the FT cab and booster were never intended to be split up). The concept of having separate "A" and "B" units, and taking advantage of the operational flexibility they would provide, was still several years away in 1939. The multiple unit control which was used between the paired cabs and boosters was initially intended simply to tie their controls together and connect them with another cab-and-booster set to make up the 5400 h.p. locomotive. Of course, this did not present any operational disadvantage because there was virtually nothing out there in 1939 to m.u. with an FT locomotive anyway. The very few existing Electro-Motive "E" series passenger locomotives were the only equipment using a similar arrangement. The very idea of lashing together an FT and an "E-unit" with the resulting mix of aesthetics would have been quite offensive, and to connect your m.u. cable to some other manufacturer's equipment was almost unthinkable in 1939!

From "Sections" to "Units"

The original concept of the FT locomotive treated the cab and booster "sections" as if they were a single locomotive, with a rigid drawbar installed between them and no provision for operating the booster in any control mode other than directly from its matching

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cab. A 1943 FT instruction manual provides an interesting insight into the terminology and operating practice of the era:

> "The freight locomotive is rated at 5400 horsepower and includes four sections, each having one sixteen cylinder diesel engine and direct current generator. From each power plant current is wired to the two four-wheel trucks under each respective section. The sections are electrically independent of each other except for certain low voltage wires. The sections with cabs will be known as 1st Sections, and those without as 2nd Sections. The two 1st Sections are similar to each other, as are the two 2nd Sections in between."

Once the initial resistance of the operating personnel to the idea of having separate units make up a single diesel locomotive had subsided, the drawbacks inherent in this arrangement rapidly became apparent. Having the A and B units permanently tied together meant that any failure which required shop time for one unit also put the other out of service. By June 1944, the FT operators manuals had been changed, and the terminology of "A" units and "B" units took the place of 1st Sections and 2nd Sections. It should be noted, however, that even the last FTs produced in 1945 were drawbar-linked A-B and A-B-A sets.

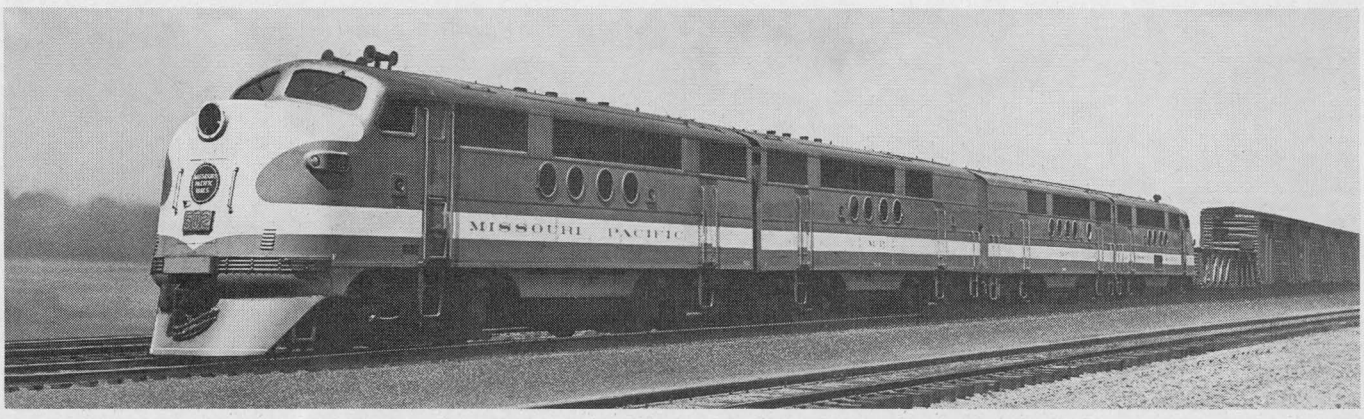
The matter of the booster being dependent upon the cab "section" was much more than mere terminology. The standard booster had no batteries and was totally dependent upon the cab unit for low voltage control power. When separated from the cab unit, it simply could not run by itself. This is the way the vast majority of the FTs was produced.

On the very first production order for FTs, however, the Santa Fe in October 1940 specified couplers between all units in its A-B-B-A sets, and batteries and hostler controls were added to the boosters. Units with hostler controls are identifiable from the outside by an additional porthole on the engineer's side of the booster in the A-B set. Intended strictly for movement around the shop or engine terminal, these controls required the operator to open the porthole window and stick his head out for visibility.

Within its production lifetime, the FT witnessed the concept change from "single locomotive" to the idea of fully independent cab and booster units. As noted, the desire to freely intermix the A and B units had resulted in the substitution of couplers for drawbars on some production FTs (Santa Fe, Milwaukee, D&RGW and MP). This feature was strictly a customer-requested option, however. Researching individual

MISSOURI PACIFIC had variations among its three FT orders; the 502AB has a drawbar, while the trailing set has hostler controls (note fifth porthole on booster) and a side number panel. The Milwaukee Road's A-B-B-As had all couplers but no hostler controls. NP's 5407ABCD, at Livingston, Mont., in 1953, had all drawbars.

MISSOURI PACIFIC



MINNEAPOLIS & ST. LOUIS / DON HOFSOMMER COLLECTION

THE ARTISTS in Electro-Motive's Styling Section produced these splendid green, yellow and orange liveries for the Minneapolis & St. Louis' two A-B-A sets and the Western Pacific's A-B-B-A fleet (**below**). The M&StL units had the drawbar-linked "FTSB" short booster, while the WP's were drawbar linked only in A-B sets with standard boosters.

FT orders is difficult because the matters of drawbars versus couplers, batteries and hostler controls do not usually show up in roster data. Complicating the issue is the fact that some roads (MP, Southern) ordered both drawbar and coupler equipped sets, and some roads added batteries and couplers to their B-units later in their service life.

The original inflexible cab-and-booster arrangement allowed the operation of only a 2700-h.p. (single cab and booster) or 5400-h.p. (two sets) consist. The desire by several railroads to operate a 4050-horsepower three-unit set resulted in the development of the FTSB (a railfan-originated term for FT "Short Booster") which subtracted several feet from the original booster design, producing a more symmetrical carbody and eliminating the "overhang" of the non-existent cab. As produced (for GN, RI, DL&W and M&StL), however, the FTSBs were all incorporated in drawbar-linked A-B-A sets with no batteries or hostler controls in the B-units.

It is likely that the attitude of the local unions on the railroads had a great deal of influence in the decision whether to build an FT set with couplers or not. FTs with drawbars were still being ordered by some railroads long after others had gone to couplers on all of their units. The Northern Pacific was sufficiently concerned about the labor unions' reaction to multiple-unit sets that it bought its A-B-B-A "locomotives" with drawbars throughout.

This "locomotive" versus "unit" concept and the labor troubles it might stir up also resulted in the complex numbering schemes that show up on the majority of the FTs. The very first customer for production units, the Santa Fe, set the pace by numbering its A-B-B-A locomotives (drawbar-linked A-B pairs) 100L (for *L*ead), 100A, 100B and 100C, and operating the entire set as simply locomotive Number 100. The other roads adopting this system, however, generally went with 000A,B,C,D instead of the 000L,A,B,C. In later years, many FT sets were equipped with couplers, broken up into individual units and renumbered into simpler systems.

Steam generators

Although conceived and produced as a freight locomotive, the FT could be used in passenger service. A variety of gear ratios was offered that would permit efficient operation ranging from

EMD

"drag" work to full passenger speeds. Some FTs were equipped at the customer's request with full capacity steam generators for trainline heating; these carried a 600-gallon boiler water supply. Some FTs, including the 103 demonstrator set, were equipped with the "Stand-By" steam generator, which had a 300-gallon water supply and could be used to keep the locomotives warm if they were shut down in cold weather. Though the 103 set had steam trainlines on the rear of the boosters, they had no provision for steam lines through the pilots of the cab units. Some passenger equipped FTs (Santa Fe, for example) had doors in the pilots for steam trainlines.

Dynamic brakes

In 1939, "regenerative braking" was a well accepted technology on electric railroads. It used the locomotive's traction motors as generators to retard the train going downgrade and fed the current generated by them back into the catenary. It was a great advantage in smooth train-handling and substantially reduced brake shoe wear on rugged railroads. While a diesel-electric had the same capability with its traction motors, the question was what to do with the generated current, since there was no power system to feed it back into. The solution was a set of resistor grids and cooling fans which would convert the current into heat and dissipate it into the atmosphere.

Though the original 103 demonstrator set did not have it, dynamic braking became an early and popular option on the FTs. With the addition of the roof grids and fans, however, the internal arrangement of the carbody started to get very crowded. It involved a rather large resistance grid and air duct assembly in a long and narrow housing mounted in just about the only available space left in the carbody, in the roof above the walkways on the left and right sides. The air blower motor to cool the grids was mounted crosswise in the carbody, with a blower wheel at either end of the motor shaft to cool the grid bank on the left and right sides of the locomotive, respectively. The entire arrangement consumed some space which could have been used for other purposes, and the permanently installed grid air ducting took away some of the overhead room which was desirable as working space for pulling the cylinder assemblies out of the diesel engine. However, the value of dynamic braking in train handling made the mechanical inconvenience worthwhile.

There is no question that some of the features of the FT left a bit to be desired, but since the locomotive was a first effort at penetrating the road

RIO GRANDE 5484 was on the Ogden connection for the *California Zephyr* at Ogden in December 1951. Santa Fe 415 had been retro-fitted for passenger service (note pilot door for steam line) but was on freight at Santa Fe Springs, Cal., in 1952.

TWO PHOTOS: DON SIMS

WARREN R. McGEE / EMD

THE 103 DEMONSTRATOR SET put on an impressive show for the Northern Pacific on March 18, 1940, when it took a 17-car *North Coast Limited* west up the 1.8% of Bozeman Hill out of Livingston, Montana. A dynamometer car is right behind the diesels.

freight market there was no way to determine this without the practical experience gained in actual service. Electro-Motive learned quickly from the problems and addressed the principal shortcomings of the FT with the subsequent development of the highly successful F2 and the now-legendary family of F-units which followed.

The demonstration tour

From an engineering file dated February 1, 1939, the FT was designed and manufactured within less than ten months. The locomotive completed in November 1939 was a pair of 2700-h.p. cab and booster sets, builder's numbers 1030 and 1031 (one number for each A-B set). For brief periods within the plant they were photographed with road numbers 1030 and 1031 before they were changed to 103 and 103A for the tour. The units were painted Pullman green with duluxe gold (yellow) striping (page 74).

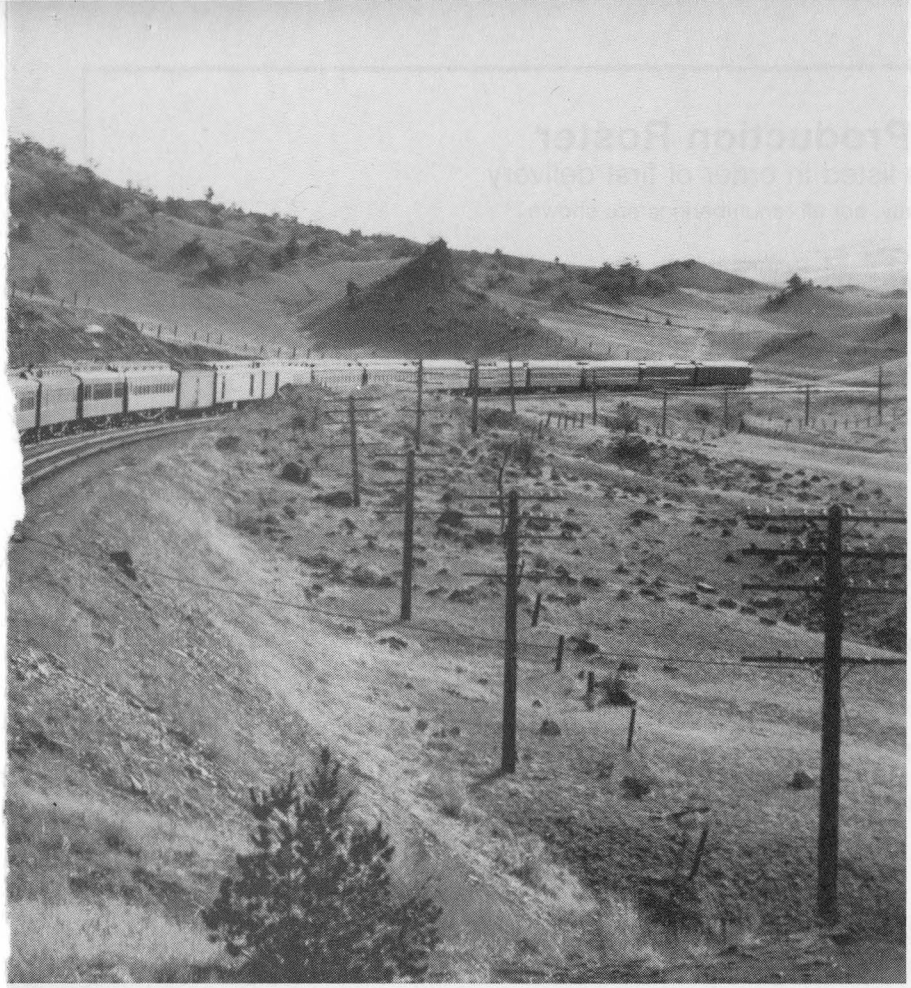
Electro-Motive chose to simultaneously test and demonstrate the 103 set in an ambitious and highly publicized eleven-month tour between November 1939 and October 1940, during which it accumulated 83,764 miles traveling through 35 states as it demonstrated on 20 Class One railroads, In the East, the 103 operated on the Erie, B&M, B&O and NYC, all of which eventually purchased FTs. In the South, the 103 piled up mileage on the Southern Railway, which later purchased the demonstrator set as well as production FTs. In the Midwest, it made an extensive tour which included the KCS, Frisco, Rock Island, CGW, M&StL, MP, CB&Q and Monon. The trips into the far West involved the Milwaukee Road, GN, NP, SP&S, D&RGW, WP and Santa Fe.

The demonstration tour on the Santa Fe, mostly in January 1940, gave the railroad a particularly impressive display of the advantages of diesels in long distance service and resulted in the first production order for the FT being placed on October 1, 1940. The Santa Fe eventually rostered the largest fleet of FTs, 155 cabs and 165 boosters, a reflection of their advantages in operating through the "bad water country" of the Western desert.

Diesel versus steam

Some of the comparisons which were made on the demonstration tour are difficult to equate directly to the existing operating practice with the largest steam locomotives on the railroad at the time. The reason for this is that the diesels were frequently called upon to cover particular profiles without helpers (in order to determine the limits of their capability) whereas the accepted operating practices with steam power on the same route normally required one or two helpers on the steepest grades. However, there were a few direct comparisons made with steam during the tour where both the diesels and the steam locomotives ran the same route under the same tonnage and helper conditions.

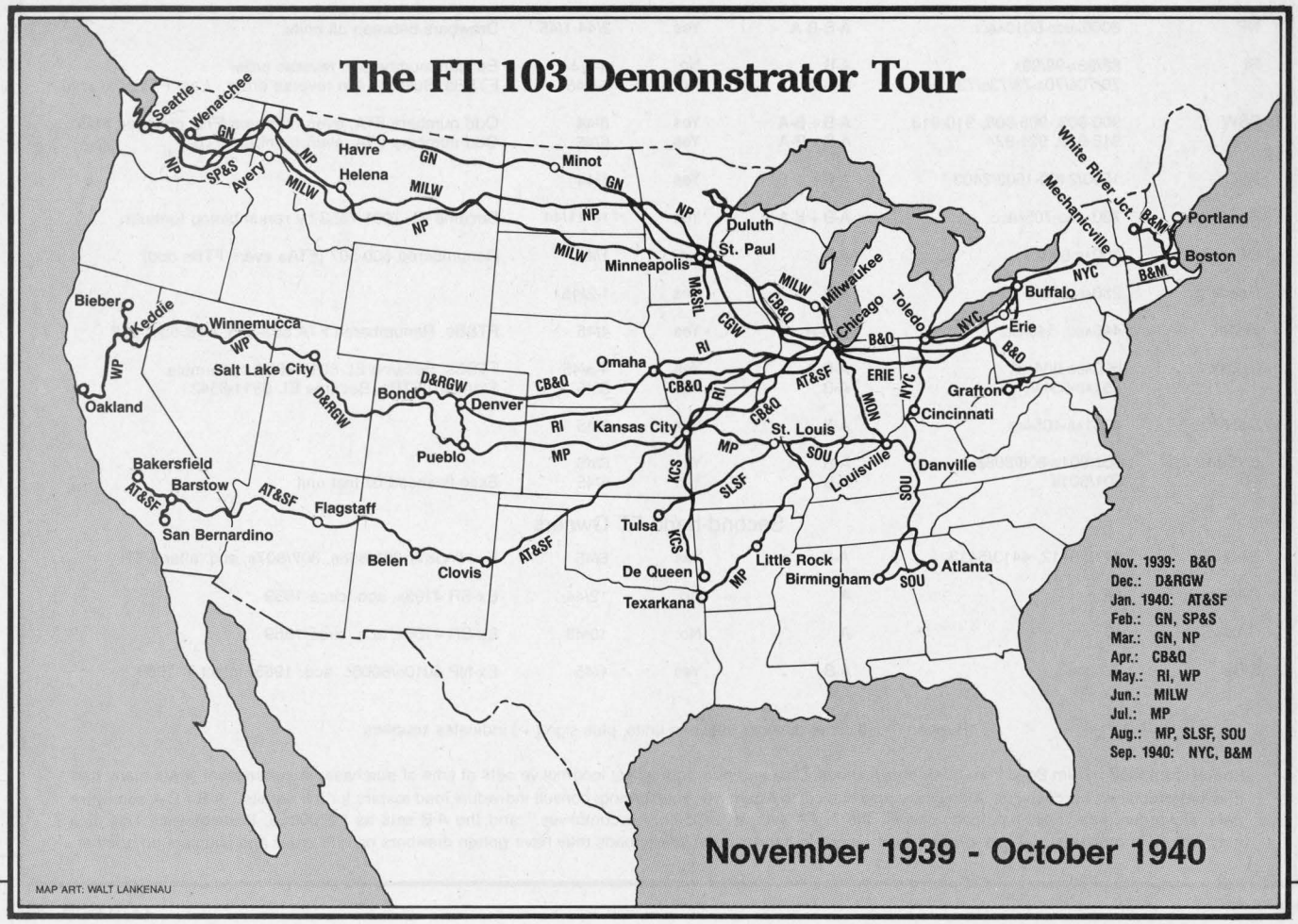
One such comparison was developed on the Boston & Maine, where the demonstrator set achieved a 95% tonnage increase over the ratings for a 4-8-2 running westbound from Boston to East Deerfield against a 1.1% ruling grade and managed a 75% increase in tonnage



from East Deerfield to Mechanicville running against a 1% ruling grade. On the return route, the demonstrator posted a 48% tonnage increase on the eastbound segment from Mechanicville to East Deerfield with a 0.8% ruling grade and a 112% tonnage increase from East Deerfield to Boston.

A comparison which involved the use of identical steam helpers for both the demonstrators and a steam locomotive occurred on the Western Pacific between Keddie and Bieber. In this test, the 5400-horsepower 103 was compared with a compound 2-6-6-2 and managed a 70% tonnage increase from Keddie to Bieber while trimming 9% off the running time. The ruling grade on this track profile was 2.2%. In the opposite direction, from Bieber to Keddie, the FTs handled a train with 19% more tonnage against the 1.8% ruling grade while trimming 17% off the running time.

Similar results were reported from the other tests conducted throughout the country. On the Erie's gently rolling profile between Marion, Ohio, and Meadville, Pennsylvania, the FT demonstrator was compared with the railroad's modern 2-8-4s. The FTs proved capable of handling 79% more tonnage from Marion to Kent, Ohio, and 84% more tonnage from Kent to Meadville while taking about the same running



FT Production Roster

Railroads listed in order of first delivery

For clarity, not all renumberings are shown

Railroad	Road Number	Consist*	Dynamic Brake	Built	Notes
EMC	103ABCD	A-B + B-A	No	11/39	Became CNO&TP 6100/6150/6151/6104 in 5/41
AT&SF	100LABC-199LABC	A + B + B + A	Yes	2/41-?/45	Couplers between all units, hostler controls on boosters
	400LABC-430LABC		Yes		Total 155 FTA, 165 FTB
GN	5700AB-5701AB, 5600AB	A-B	No	5/41	Re# 250AB-251AB, 253AB
	5900ABC	A-B-A	No	10/41	First "FTSB" Short Booster. Re# 300ABC
	400ABCD-428ABCD (even #s only)	A-B + B-A	Yes	12/43-4/45	
	301ABC-305ABC	A-B-A	Yes	3/45	FTSBs
	300A (II), 255B	A, B	No	10/45	Replacement units
	252AB-258AB	A-B	No	10/45	Some earlier units re# into 250 series
CNO&TP (SR)	6100/6150-6105-6155	A-B + B-A	No	7/41-12/43	6100/6150/6151/6104 are EMC 103 demo set, acq. 5/41
MILW	35ABCD-47ABCD	A + B + B + A	Yes	10/41-7/45	Couplers between all units, but no hostler controls
WP	901ABCD-912ABCD	A-B + B-A	Yes	11/41-11/44	
D&RGW	540ABCD-551ABCD	A + B + B + A	Yes	1/42-10/44	Couplers between all units
SAL	4000/4100-4021/4121	A-B	No	6/42-10/44	
NO&NE (SR)	6800/6825-6803/6828	A-B	No	7/42	
B&O	1-11 (odd #s only)	A-B + B-A	Yes	8/42-10/43	Re# 1948: 101/101x/101Ax/101A-111/etc.
B&M	4200AB-4223AB	A-B	Yes	9/43-11/44	
ACL	300/300B-323/323B	A-B	No	9/43-12/44	
SR	4100ABCD-4104ABCD	A-B + B-A	No	10/43-12/44	4100-4108ABCD Re# A's 4100-4127, B's 4300-4315
	4105ABCD	A + A + A + A	No	12/44	All FTAs; 4105A became GaNor 14 circa 1959
	4106ABCD-4108ABCD	A-B + B-A	No	12/44-2/45	
MP	501/501B-512/512B	A + B	No	12/43-3/45	501-504 drawbars, 505-512 couplers & hostler controls
CB&Q	100ABCD-115ABCD	A-B + B-A	Yes	1-9/44	100ABCD-104ABCD re# 1946-47 into 150 series
NP	6000ABCD-6010ABCD	A-B-B-A	Yes	2/44-1/45	Drawbars between all units
RI	88/88A-99/99A	A-B	No	4-9/44	Builders numbers in reverse order
	70/70B/70A-73/73B/73A	A-B-A	No	11/45	FTSBs. Builders # in reverse order. Last FTs produced
SSW	900-903, 905-908, 910-913	A-B + B-A	Yes	6/44	Odd numbers FTA, even numbers FTB; changed 6/45
	916-919, 921-924	A-B + B-A	Yes	6/45	Odd numbers FTA, even numbers FTB
NYC	1600/2400-1603/2403	A-B	Yes	6/44	
Erie	700ABCD-705ABCD	A-B + B-A	Yes	10-11/44	Became EL 7001-7052 by renumbering formula
LV	500AB-503AB	A-B	No	1/45	Renumbered 500-507 (FTAs even, FTBs odd)
Reading	250AB-259AB	A-B	Yes	1-2/45	
M&StL	445ABC, 545ABC	A-B-A	Yes	4/45	FTSBs. Renumbered FTA 502-505, FTB 551, 552
DL&W	600ABC-604ABC	A-B-A	Yes	4-5/45	FTSBs. Became EL 6011-6044 by formula
	651AB-654AB	A-B	Yes	5/45	Standard FTBs. Became EL 6511-6542
C&NW	4051AB-4054AB	A-B	Yes	5/45	
NYO&W	801/801B-808/808B	A-B	Yes	6/45	
	601/601B	A-B	Yes	6/45	Esso-financed oil test unit
Second-hand FT Owners					
B&O	4412/5412, 4413/5413	A-B	Yes	6/45	Ex-NYO&W 806/806B, 807/807B, acq. after 6/57
GaNor	14	A	No	12/44	Ex-SR 4105A, acq. circa 1959
GAS&C	16	A	No	10/43	Ex-SR 4100A, acq. circa 1959
S-BC	2203AB	A-B	Yes	1/45	Ex-NP 6010D/6006C, acq. 1965. Intact in 1989.

*Hyphen (-) indicates drawbar between units, plus sign (+) indicates couplers.

Roster compiled by Jim Boyd from numerous sources. Data and numbers reflect locomotive sets at time of purchase; in subsequent years many had drawbars replaced by couplers. Many were also subject to extensive renumbering; consult individual road rosters for full details. A-B + B-A sets were generally ordered as "5400-h.p. locomotives," the A-B-A sets as "4050-h.p. locomotives," and the A-B sets as "2700-h.p. locomotives." This data may not be complete but is based upon best available information. Some roads may have gotten drawbars on one order and couplers on another.

RICHARD H. KINDIG / JAY POTTER COLLECTION

ON APRIL 27, 1940, the 103 set arrived in Denver after bringing a freight up from Pueblo on the D&RGW. In their eleven months on the road, the demonstrators proved that they could out perform any steam locomotives that were pitted against them.

time over the road as the steam locomotive. On the Santa Fe run from Barstow to Bakersfield, California, which included Tehachapi Loop, the FT demonstrators were able (without any helpers) to handle approximately the same tonnage westbound as a Santa Fe 2-10-4 operating with helpers, while trimming nearly an hour off of the normal six-hour running time for steam. In the reverse direction, the FTs handled slightly more tonnage than the 2-10-4 with helpers, while trimming an hour and 45 minutes off the running time.

War and competition

The demonstration tour was concluded in October 1940 and had been a great success, with no major road failures and no delay or down time chargeable against the demonstrators on any railroad. That month the first production order came in for two 5400-h.p. sets for the Santa Fe. Two months after the tour concluded, on January 1, 1941, the Electro-Motive Corporation became the Electro-Motive Division of General Motors.

In the battle to win over railroad management to diesel-electric locomotives, however, the new "EMD" had only just begun to fight. The tour results were highly publicized in the trade press and in an extensive advertising campaign. This not only drew interest from a number of railroads that had not been a part of the original demonstration tour but also probably influenced Electro-Motive's competitors to accelerate their diesel locomotive development programs to meet the challenge posed by the FT. The American Locomotive Company had introduced their DL103b passenger locomotive intended to compete with the EMC E-units in January 1940 and quickly progressed through the DL105 and DL107 designs to the relatively successful DL109. Alco began actively working on designs for its own road freight locomotive shortly after the FT demonstrator set began its tour, but their engine design efforts were delayed by the redirection of their resources as America became involved in World War II and Alco became an active builder of defense supplies.

Over the years a number of stories have developed regarding the role of the War Production Board in apportioning manufacturing capacity and influencing locomotive designs during the wartime years. Many of the tales relating to Alco have been addressed and dispelled in recent writings, but the perception that the success of the FT locomotive was due to war production restrictions has persisted and needs to be addressed here.

There are three essential facts which provide a detailed picture of EMD's market situation with the FT and the influence of World War II on the company's locomotive business: (1) In December 1941, when the United States entered the Second World War, EMD had already received orders from the U.S. railroads for a total of 57 of the four-unit 5400 horsepower FT locomotives. This represents nearly one-quarter of all of the FTs which were ever built, that were either on order or delivered before the U.S. got involved in World War II. (2) EMD had *three* extremely critical national defense contracts in process which were accelerated to highest priority status once the war started. These were considered far more important than locomotive production and pushed the FTs back into fourth place in the company's list of priorities very early in the war. (3) By late in 1942 the three defense projects had brought locomotive production at EMD virtually to a stop. This situation continued into early 1943.

The projects which took a higher priority than locomotives at La Grange during the critical early war years were: (1) The Model 184A "pancake" diesel engine with its related gearbox, propeller shafting and controllable pitch propellers, all of which were manufactured by EMD. These were turned out by the hundreds early in the war to power the 110-foot subchasers which were used for coastal patrol and escort duty throughout the U.S. seacoasts and in the Caribbean. (2) The Model 567 ATL engine program which involved the manufacture of matched sets of port and starboard main engines for the U.S. Navy tank landing ships (LSTs). This program became EMD's number one priority as the Navy prepared for the amphibious operations in Africa, Europe and the South Pacific. EMD eventually built more than 2000 engines for

this program. (3) The quad Detroit Diesel main propulsion set which was used in the Navy's LCI (Landing Craft Infantry) vessels. EMD was a prime assembly contractor for this program, and the need for the engine sets increased in urgency along with the parallel LST engine program as the U.S. undertook amphibious operations around the world.

The effect of these critical defense programs on EMD's locomotive production has previously been largely ignored by a generation of rail historians who tend to view EMD only as a builder of locomotives. It would not be unreasonable to assume that if the United States had not been forced into the Second World War, and EMD had been able to concentrate solely on the marketing and construction of the FT, it might have built and sold *more* FTs between 1940 and 1945 than it was actually able to produce under the wartime conditions.

Customer support services

Despite the strain which wartime production programs put on its manpower and resources, EMD provided an impressive array of supporting services for their locomotives which were a prominently-featured part of their sales effort for many years afterwards. The division established a group of "field instructors" whose primary job responsibility was to accompany the products as they were delivered, attend to any immediate problems which might develop and provide local instruction and technical support to assist the customer's personnel during their early operation of the equipment.

EMD also had a large group of employees involved in publication support for the FTs, and despite the wartime conditions, EMD provided extremely comprehensive operators manuals and instruction bulletins which were, in most cases, custom tailored to the customer's equipment. The degree of customizing included individual wiring or piping diagrams to point out differences involving special options, even if they were installed on only one locomotive in an order for several equipment sets. Nearly all of the FT manuals which were printed after 1940 featured multi-color covers either printed or embossed with the railroads' herald and fitted with individual insert pages with photos of the locomotives on that particular order.

And even in a wartime environment when the railroads had little time to think about their public image, EMD provided the services of its Styling Section to develop attractive paint schemes to be applied to the new freight units. At this time, the concept of a "paint scheme" was still a novel idea to many railroads whose previous experience had been black boilers, graphite smokebox, red cab roof, white lettering, Pullman green coaches and red cabooses.

FTs were sold to 25 different railroads (counting the two SR subsidiaries) in 2700-h.p., 4050-h.p. and 5400-h.p. sets. The New York, Ontario & Western was the last railroad to place an initial order, taking delivery of nine A-B sets in June 1945 (at which time, the standard A-B set with dynamic brakes sold for $232,500). Production continued through November 1945, with the four Rock Island A-B-A sets 70-73 being the last FTs delivered. A total of 555 of the cab units and 541 boosters were produced. The practical experience gained with the FT led to the vastly improved model F2 being introduced in 1946, and the closely related series of F-unit designs which would follow went on to achieve tremendous commercial success and accelerate the dieselization of the railroads' freight operations which the FT had started.

The FT as a roadswitcher

JIM BOYD

ICRR 1351 AT EAST ST. LOUIS, ILL., SUMMER 1965

What would the FT have looked like if it had been designed as a roadswitcher instead of a cab unit? Such a locomotive actually did exist in the form of the TR1 "cow and calf" heavy transfer locomotives, two of which were built for the Illinois Central in 1941 as their 9250AB and 9251AB (later renumbered 1350AB and 1351AB). The 1350-h.p. 16-cylinder 567 engines, D8 main generators and many of the principal mechanical components of the TR1s were an adaptation of the FT equipment, although the machinery was squeezed into an end-cab switcher-style carbody. Another overgrown switcher, the NW3, riding on Blomberg road trucks and carrying a steam generator, had been introduced in November 1939 along with the FT, but it had only a twelve-cylinder 567 engine for 1000 horsepower.

While the cab unit of the 1941 TR1 was similar in appearance to the NW3, it stretched the carbody even more for the 16-cylinder engine and had to add additional cooling radiators. Riding on Blomberg road trucks, the TR1 was very similar to the FT in electrical systems and had the transition and field shunting to permit operation at road speeds. The TR1 was composed of a drawbar-linked cab and booster set (also referred to in the FT terminology of "1st Section" and "2nd Section"). And like the drawbar-linked FT A-B sets, the two units were electrically dependent upon one another, as the only batteries were on the booster (the FTs had the batteries in the cab unit).

Where the TR1 differed from most switchers was that the big 16-cylinder engine required greater cooling radiator capacity. Like the FT, the TR1 had radiators fore and aft of the diesel engine; the booster unit had intake grilles on both ends, while the cab unit had the rear intake grilles under both sides of the cab. The TR1, incidentally, also had dual controls with control stands on both sides of the cab.

The TR1s put in a long and useful life on the IC, finding a home on the East St. Louis, Ill., hump (page 74) before being traded in on GP40s in 1967—PRESTON COOK.

DARWIN COOPER / ROBERT A. JANZ COLLECTION

CHICAGO & NORTH WESTERN FT set 5401 passed CB&Q 4-6-2 2837 at Clinton, Iowa, in 1946. The C&NW units were green on top, yellow in the middle and black on the bottom. Seaboard Air Line 4011 was photographed at West Lake Wales, Fla., in the late 1950s.

SEABOARD AIR LINE

The last FTs

By the late 1950s the FT fleets on most major railroads were being considered for retirement and trade-in on newer equipment. The Boston & Maine was one of the first roads to make the move, using its large FT fleet as trade-in for a similar-sized order of GP9s. During the early 1960s the retirement of FTs accelerated, and as the 1970s arrived the days of the FT as a main line freight locomotive had departed.

Very few FTs were sold to second-hand buyers. Around 1959 the Southern handed over a pair of A-units to its short line subsidiaries, the Georgia Northern and Georgia, Ashburn, Sylvester & Camilla, and a Northern Pacific A-B set which had been traded to GE was resold via Hyman-Michaels to Mexico's Sonora-Baja California in 1965. The only transaction between "major" railroads was in 1957 when a dealer sold two A-B sets from the recently-abandoned New York, Ontario & Western to the Baltimore & Ohio. The rest of the O&W fleet rusted away in New Jersey while a deal to "sell them to Mexico" stalled indefinitely.

The last FTs to work in the United States were those of the Northern Pacific, and the last operable A-B set, 5409D,C, was traded to EMD in June 1970 after having been tentatively assigned Burlington Northern numbers 798 and 799. The FT had revolutionized railroading in the United States, but the technology of locomotive design had advanced so rapidly that they were not very adaptable to the all-diesel motive power world that they had been a key element in creating.

"Service Sells"

The successful introduction of the FT to America's railroads and its rapid acceptance in the urgent days of the Second World War paved the way for a long period of domination of the diesel locomotive market by EMD during the postwar years. While it is evident that the development of the FT was an outstanding example of a thoughtfully engineered product being introduced at almost precisely the right time to initiate major changes in its industry, the support that EMD provided for the new product also played a major part in its success. Electro-Motive's management philosophy in the 1940s contributed extensively to its penetration of the railroad motive power market. Some of the principal elements that enhanced the marketing effort were as follows:

(1) The Division was led by a progressive and open-minded upper management team in which many top managers had as much or more technical expertise in virtually all areas of the equipment as did most of the project engineers who worked on specific items of the locomotive. Due to the rapid growth of the Division, there had been relatively little time for management

RONALD F. AMBERGER

AN FT WITH A TENDER BEHIND was laid up at Tobyhanna, Pa., in August 1956 after washouts caused by Hurricane Hazel. The tender is a drawbar adaptor used by DL&W when one of the cabs of an A-B-A set was in the shop. See PHOTO LINE for more FTs.

cliques to be established. Consequently, personal effort was recognized and rewarded, and EMD employees of the 1940s were highly motivated to work hard at their jobs.

(2) There was an almost immediate recognition by EMD that training for the railroaders was an essential support element and a valuable sales tool. Most of the railroad management personnel would never get to walk into the GM Building in Detroit, but a major portion of them would sit in EMD classrooms or the roving EMD training cars. The La Grange Training Center and its instructors became the public representatives of the Division in many activities, and EMD devoted considerable time and money to the effort.

(3) The Division set up a technical support organization to react quickly to customer problems, assemble the right talent to deal with the problem, and seek a proper solution which could be expeditiously presented to the customer. This was a major factor in limiting "down" time on the customer's equipment and giving the customer the best possible return on the investment he had made in EMD products. The concept that "Service Sells" was widely supported within the Division.

(4) The EMD Parts Department carried an inventory selection which was second to none in the industry, with stock levels designed to provide rapid support for customers who needed parts to keep their equipment in operation. The most critical pieces were scheduled for production far in advance of the anticipated requirements, rather than waiting for the supply to run out before building more inventory.

(5) The EMD management philosophy of the 1940s was based on making decisions at the lowest managerial level authorized to deal with the problem, rather than passing decisions "up the line" to higher management. This commitment to getting problems solved quickly kept EMD in the fast lane, providing better customer support than most of its major competitors.

In light of the declining market share and production difficulties which EMD has encountered during the 1980s, it is interesting to note that the Division's new General Manager John W. Jarrell has reaffirmed a commitment to the business basics which have traditionally been an important part of EMD's way of producing and selling their products since the era of the FT. EMD's biggest challenge in the next decade may be to find practical ways to reincorporate the concepts which it used to generate its impressive commercial successes of the 1940s into the business environment of the 1990s.

The FTs today

Although it had been 19 years since an FT has produced revenue mileage in the United States, its story is not quite over. The last working set on any railroad, Sonora-Baja California 2203AB, was last reported still baking in the desert sun in the dead line at Benjamin Hill, Sonora, Mexico. The Southern Railway donated the very first FT, the 1030 cab unit of the 103 demonstrator set, to the National Museum of Transport in St. Louis, where it has resided as CNO&TP 6100 since 1960. The unit returned to La Grange in 1972 for the 50th Anniversary of EMD, and at that time it was given a cosmetic facelift (including older-style number boards in place of the modern F7 "bug-eyes") and fresh Southern black and gold paint.

JIM SINGER

LA GRANGE, ILL., SEPTEMBER 1972

As the 50th Anniversary of the FT approaches in November 1989, EMD is again ready for a public celebration at La Grange on Sunday, September 17. The centerpiece of the equipment display will be the 6100. Only this time it will be mated up up with an appropriate FT B-unit (ex-SR heater car 960601, nee-SR 4103C, from the Virginia Museum of Transportation in Roanoke) and painted in the 1939 demonstrator colors.

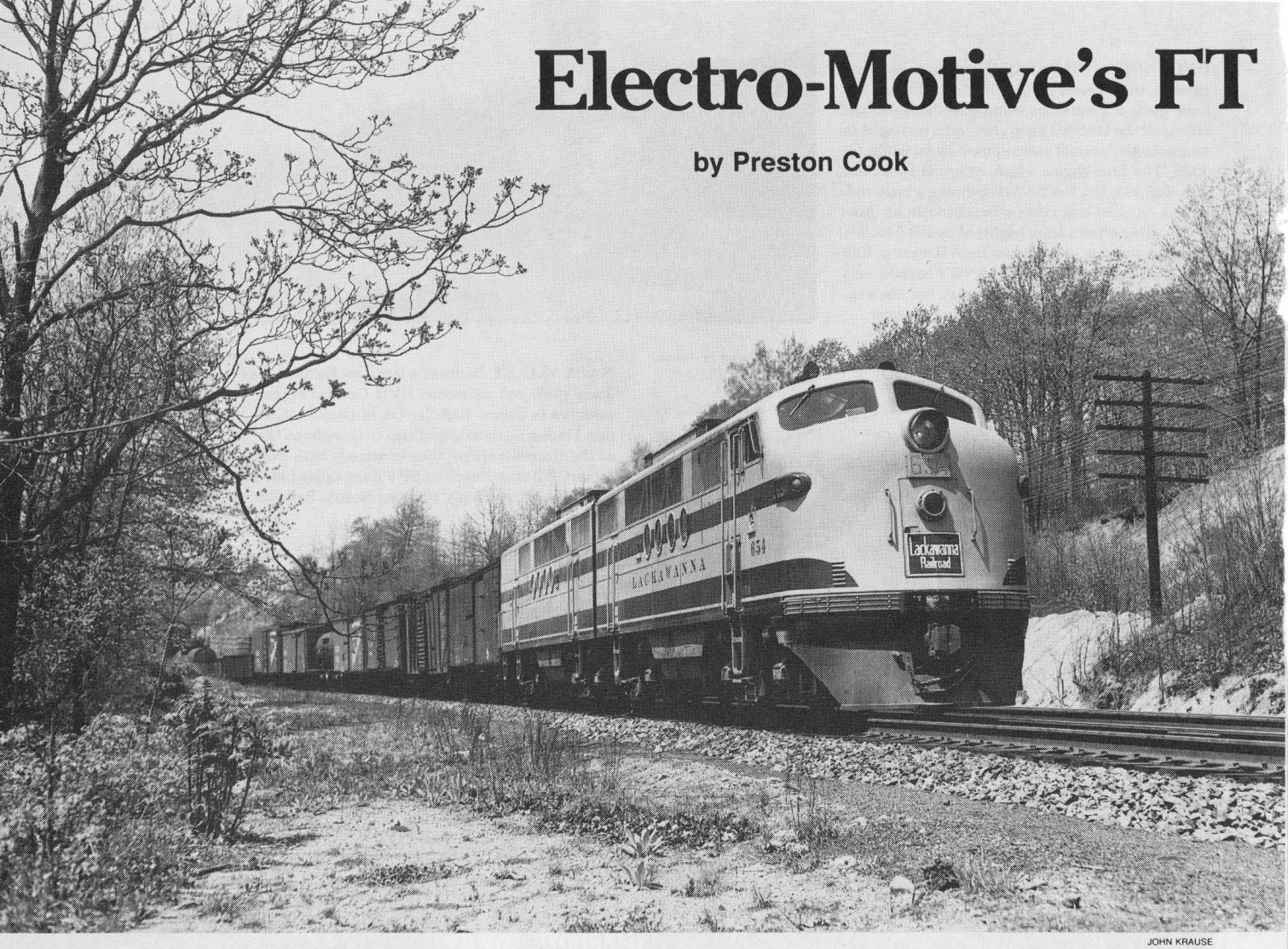
America's most significant diesel locomotive will again be in the spotlight, and this time it will be a celebration of 50 years of proven success.

Next month

In the November 1989 issue we will take a closer look at the diesel engine and unique machinery layout of the FT and see why it was not a likely candidate for upgrading or rebuilding.

Electro-Motive's FT

by Preston Cook



JOHN KRAUSE

History will record without question that it was the Electro-Motive 103 demonstrator of November 1939 and the 1092 production FTs built between 1940 and 1945 that sealed the doom of steam power on North American rails. The streamlined freight units not only proved that the multiple-unit diesel was a match for any operational assignment but also set the style and format for the entire "first generation" of diesel power from EMD and its field of competitors that followed. It is interesting to note, however, from the historic perspective of today, that the FT had a considerable number of shortcomings that would have made it a less impressive performer had it been going up against other diesels rather than steam locomotives. The fact that it was first contributed in no small way to its success.

The FT had some unique features that were rather quickly discarded in subsequent models. A key to Electro-Motive's long-term success was its ability to learn from mechanical misadventures and capitalize on its basic strengths. And, of course, there was no strength more basic than the 567 diesel engine, developed as a successor to the two-cycle Winton Model 201A prime mover that had put the *Pioneer Zephyr* on the road in 1934.

The 567 diesel engine

More than any other component, the Electro-Motive 16-cylinder Model 567 diesel engine made the concept of the FT locomotive feasible. The 567 engine (the number referring to its cubic inch displacement per cylinder) was developed as a replacement for the Winton 201A engines which had been used in the early EMC switchers and passenger units through the E2. The Winton 201A was developed by a design team under the direction of the legendary Charles F. "Boss" Kettering, head of General Motors Research in Detroit. It was a two-cycle engine that pioneered the use of the "unit" injector which measures the fuel and inserts it right at the cylinder head, avoiding the the separate pumps and injectors and the long and leak-prone fuel lines typical of four-cycle engines. While the two-cycle 201A had been good enough to establish EMC in the diesel locomotive market, it had been designed as a compromise between the requirements of railroad, marine and stationary engine service. In an attempt to meet the needs of all of these applications, it turned out to have particular drawbacks in each type of service. For example, in order to meet the size and weight requirements for submarine service, the 201A had been trimmed down at the expense of the strength and durability needed for railroad service, where such weight and size were no problem.

Eugene W. Kettering, the son of GM Vice President of Research Charles Kettering, had joined the Winton Engine Experimental Engineering Department in 1930 and was involved in much of the development of the 201A engine. He later worked with GM Research on the development of the 567 engine, joining the EMC organization and ultimately succeeding Dick Dilworth as Chief Engineer in 1950. He authored a paper for the American Society of Mechanical

Celebrates 50 Years

Part Two: The FT's Machinery

Engineers in 1951 that sheds some interesting light on the decision to develop the 567 engine:

> "In time, most of the early bugs (in the 201A) were cleared up, but it was becoming more evident that to make a substantial gain in the durability of the engine a major redesign would be in order. The diesel locomotive was rapidly proving itself, and to the more optimistic it looked like it was going to be a good business, so it was decided that the engine would be redesigned for railroad use only. The design would not be handicapped by requirements for marine, Navy or stationary application. Most of the Winton experimental design group moved to Detroit where the redesign was to be made. After settling in Detroit, we took a large sheet of paper and on one side wrote down all the troubles that were known with the 201A engine at that time. On the other side we were going to write down all the parts of the engine which had been satisfactory. It did not take long to fill one side of the sheet.
>
> "In fact, the more we looked into what we could salvage of the 201A design to correct all of these troubles, the more apparent it became that we should start with a clean piece of paper and forget the 201A. Of course, it is much more fun to start fresh than to try to correct troubles in an old design, even though you know you are headed into new troubles.
>
> "We did believe we could understand what a two-cycle diesel engine was trying to tell us, so with the optimism of youth we barged into the design that ultimately turned out to be the 567. It may seem that I am unnecessarily running down the 201A engine. Whereas we believed this engine was not good enough for railroad service, in all due respect it should be said that it was good enough to prove the diesel locomotive and to thoroughly launch the revolution of American railroad operation."

Like the Winton 201A, the EMC 567 was a two-cycle engine with unit injectors. While the Winton was produced in three versions (an inline eight cylinder, a 60-degree vee twelve cylinder and a 67-degree vee 16 cylinder) with many non-interchangeable accessories among them, the 567 has always been a 45-degree vee engine with parts standardization and interchangeability that became legendary.

The initial production version of the 567 was the twelve-cylinder 1000 h.p. engine for the E-units and NW2 switchers. An eight-cylinder version was also produced but not applied to locomotives at that time; it was sold to the Coast Guard as a propulsion engine for a class of seagoing tugs by Cleveland Diesel (formerly Winton Engine, which became the Cleveland Diesel Division of GM in 1938 and then did all of the GM marine marketing). In 1938, Cleveland Diesel also sold a dozen of the twelve-cylinder 567s to the U.S. Navy to equip three new fleet tugs, one of which, now the U.S. Coast Guard Cutter *Cherokee*, is still operating in 1989 with the oldest active 567 engines in existence. So right from the time of its commercial introduction, the success of the 567 engine opened up many opportunities for it to be used in the marine market, which blurred the distinction of its original "rail engine" identity and had a massive influence on Electro-Motive during the emergency production programs in World War II.

A six-cylinder 600-h.p. 567 was introduced in 1939 for the SW1 switcher and was also used with limited success as a power-generating engine for some smaller power plants. The 16-cylinder 567 was actually the last version of the engine to be developed, in part because it involved breaking into a new commercial area with the FT locomotive. There had been 16-cylinder (1200 h.p.) versions of the 201A, but they had been used primarily as submarine power plants, and their railroad use had been confined to a few streamlined trains. The introduction of the 16-567 brought with it a higher horsepower range than was generally available, and the FT would be its proving ground.

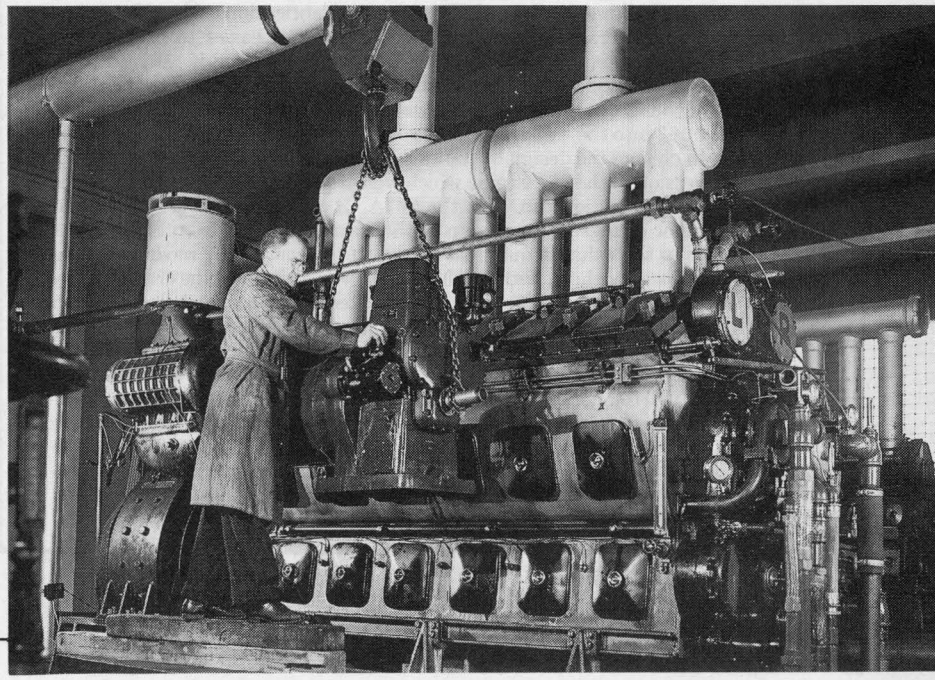
Carbody and machinery

The design and structure of the FT carbody and the details of its auxiliary systems were contemporary with the features of the E-units which had been produced prior to 1939 and of the Rock Island TA locomotive (built in 1937), which had been the FT's closest predecessor in size and layout. The FT carbody incorporated a truss framework in the side panels which was tied into the central underframe by lateral supports and by the main body bolsters. Consequently, the side panel truss network formed a part of the load-supporting structure of the body and underframe (by contrast, today's GPs, SDs and cowl-carbody units concentrate all their load-bearing strength in the frame, with the hood being merely a shell to keep everything out of the weather).

The styling for the cab of the FT was quite similar to that used in the E-units and the TA. This took advantage of some of the shop jigs and fixtures for the passenger units and involved similar assembly and finishing techniques. The shortened nose was desirable in order to keep the pulling face of the cou-

A PROTOTYPE 567 twelve-cylinder engine formed a backdrop for a technician with a one-cylinder Detroit Diesel 71 on a chain hoist in the GM Research lab in 1937 or '38. The DL&W 654AB **(opposite)** was eastbound at Little Falls, N.J. on April 30, 1949.

GENERAL MOTORS / PRESTON COOK COLLECTION



plers as close in towards the truck bolsters as possible. A long end-overhang would have made coupler alignment difficult on the tight curvatures encountered in yards where freight locomotives had to work. Besides, the four-unit 5400-horsepower road locomotive already had a tremendous overall length (by 1939 standards) without adding to it the extended nose styling of the E-units.

The engine, the main generator, the traction motor blowers, the cooling fan drives and the air compressor were all positioned centrally in the engine room with the auxiliary equipment grouped around either end of the engine where it would be driven by power take-off shafts and belt drives. The 16-cylinder 567 diesel engine was mounted with the "front" of the engine (the governor end) toward the rear of the locomotive. This resulted in the EMC model D8 main generator, on the rear end of the diesel engine, being toward the locomotive cab and in close proximity to the main electrical cabinet (which was positioned in the front of the left side walkway, as was the practice in the early E-units).

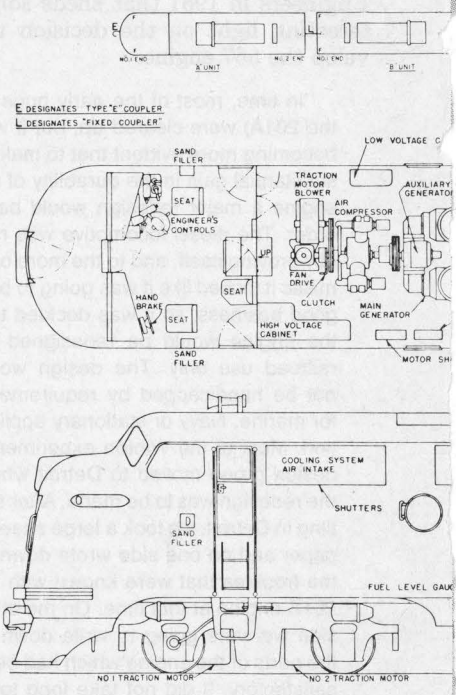
It is interesting to note that on the FTs equipped with rigid drawbars between the cab and booster unit, the booster was oriented in the opposite direction from the cab unit, i.e. with what would have been its "cab" end trailing. The standard FT booster had an asymmetrical truck spacing similar to the cab unit, with the longer blunt end simply projecting straight out where the cab would otherwise have been. Oddly, even though the end overhangs were the same (11′-9″ on the "cab" end and 8′-6″ on the drawbar end), the cab and booster frames were not identical, as the cab unit was nine inches longer (27′-3″ versus 26′-6″ between truck centers) than the booster.

The engine cooling radiators were installed in two groups of cores, one forward and one aft of the engine. The provisions for temperature control on the FTs were rather crude and consisted of manually-set air flow shutters which were used to do the "fine" adjustments and manually-operated disconnect clutches on the cooling fan drive which could be used to selectively drop out the forward or aft cooling fans if the weather was so cold that the engine could not be brought up to proper tem-

2700-h.p. FT Locomotive

From EMD Operator's Manual

Delaware, Lackawanna & Western 1945



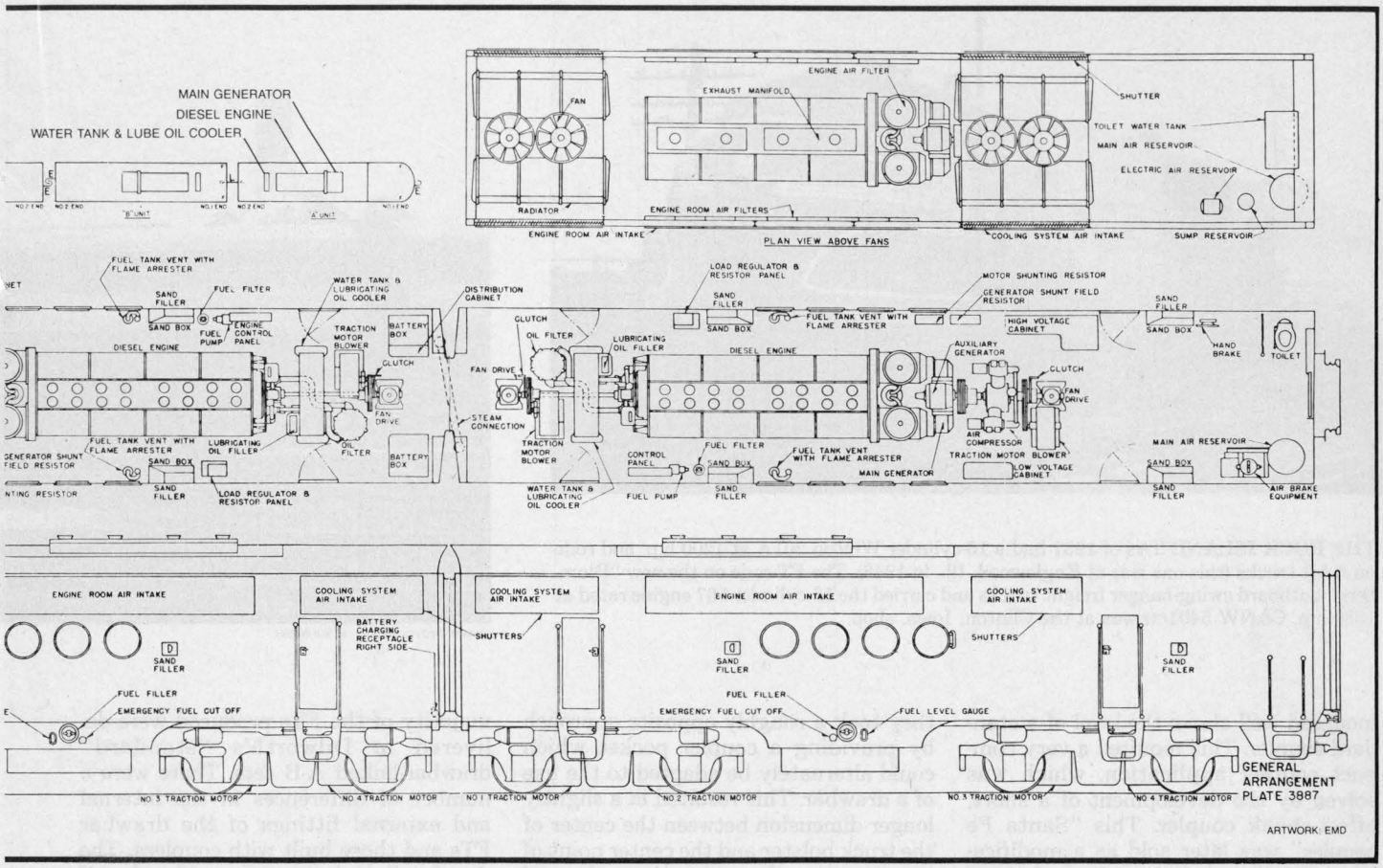
The 567 engine in the FT

Three distinct variations of the highly successful 16-cylinder 567 engine, all rated at 1350 horsepower output for traction, were used during the production run of the FT between 1939 and 1945. The earliest variation applied to the FTs is generally referred to as the "cast" or "U-deck" engine. The nomenclature refers to the construction of the cylinder head retainer structure of the engine, which was a casting in the earliest models, and to the shape of the central portion of the top deck of the engine, which was in the form of a "U" channel in this variation. The "U-deck" engine was first applied commercially in 1938 (in twelve-cylinder locomotive engines and eight-cylinder marine engines), just before the development of the FT, and continued in production into 1940.

The "U-deck" engine ran into two problems which limited its potential for further applications and resulted in the first of the Electro-Motive field repair campaigns on engines. The cast cylinder head retainer structure proved to be a difficult item both to cast accurately and to weld into the engine structure without generating stress risers and weld defects. Part of the reason for the latter problem was that the cast sections usually had some residue of casting sand present which reacted in the welding process to form voids and stress risers in the weld. Sometimes these defects were visually undetectable until a crankcase failed in operation. A total of about 600 "U-deck" 567s (of all configurations) were built, but only twelve of them were the 16-cylinder version. Only four of the 16-cylinder engines were applied to locomotives: the FT demonstrator set. The problems were most severe on the 16-cylinder version, and many of the early "U-deck" engines were later changed out in favor of the crankcase designs which were developed as replacements. As a result of these programs, an intact 16-cylinder "U-deck" 567 would probably be the rarest of all the EMC/EMD 567 engine models. It should be noted that virtually all of the other diesel engine manufacturers who were dealing with welded crankcase structures were having similar problems to those encountered by Electro-Motive during that same period of time.

To address the problems encountered with the "U-deck" engine, EMD redesigned the 567 during 1940, replacing the troublesome head retainer casting with a complex weldment of forgings and plate fabrications which helped in reducing the stress cracking problems while making it easier to produce the individual components. The version of the 567 which resulted is referred to as the "fabricated" or "V-deck" engine, the latter description referring to the shape of the central channel in the upper deck, which was changed from the "U" shape of the earlier 567 into the "V" shape. The redesign of the crankcase also resulted in the need to change the design of the exhaust risers and the exhaust manifold.

The final version of the 567 engine which was produced during and used in the FT locomotive production run, was the 567A. It was introduced in 1943 and featured a major change in the design of the exhaust outlets from the cylinder head retainer to the exhaust manifold risers. In the earlier 567 models, the exhaust outlet was very short, and the riser had been clamped to the crankcase by wedges and toggle retainers. This system resulted in the exhaust risers (which were not water cooled in railroad engines) running very hot and baking out the gaskets in the top deck area, which could generate oil leaks and fires. In the 567A design, the exhaust outlet was built into the upper coolant water manifold, resulting in a flat top deck on the crankcase. The sections of the exhaust manifold, built with large horizontal mounting flanges, were bolted to the crankcase on gaskets. This successfully solved the high temperature problems on the top deck and is a feature which was retained in EMD engine designs through the 645 and 710 series—PRESTON COOK.



perature. (Nearly all subsequent units used thermal sensors to operate air-actuated shutters and electrically-driven fans.)

The FT cooling fan drive arrangement was a masterpiece of drive shaft, clutch, belt and pulley technology. It was a far more involved arrangement than had been used on the E-units and was so complex that it was not repeated on any other Electro-Motive model. The cooling fans were installed in pairs, recessed into the carbody in the center of the "V" formed by the radiator cores forward and aft of the engine. The fans toward the cab end of the carbody were driven from a power take-off on the air compressor (which was directly driven from a through shaft on the armature of the main generator), while the fans on the end away from the cab were powered by a direct power take-off shaft from the governor end of the engine. Belt and pulley arrangements on these shafts also powered the front and rear traction motor blowers.

The cooling fan drive mechanism after the power take-off shaft consisted of a disconnect clutch, a speed increaser, a right-angle-drive gearbox, a vertical fan drive pedestal with enclosed drive shaft and another set of belts and pulleys inside the space between the radiator cores which connected the two cooling fans in each radiator section together. This drive arrangement got the job done adequately but was always one of the weak points in the FT design.

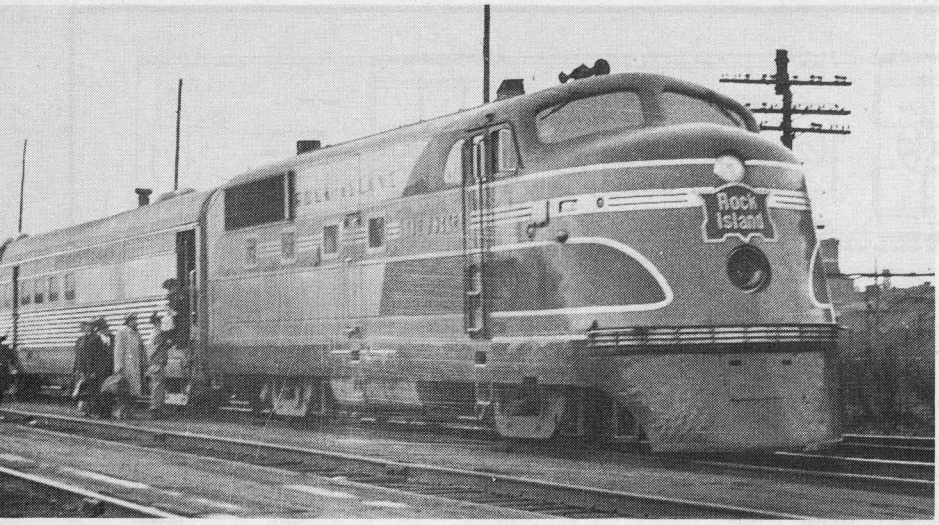
The complex string of cooling fan drive components required regular maintenance and inspections and consumed a great deal of space inside the carbody. They had the additional disadvantage that a number of the components required alignment checks on installation or when they were removed for servicing or rebuilding. This consumed valuable time in the construction of the locomotive, which was available when EMD was building only one locomotive a day in the early 1940s but would not have been affordable a few years later when the production rates increased to five or more locomotives a day. The fan drive system also involved time and effort by the customer's personnel to maintain the equipment in the field. The practical experience gained with the cooling system on the FT was one of the principal factors in the decision to develop the F2 locomotive (introduced in 1946) which had electric cooling fans in place of the mechanical drive fans of the FT.

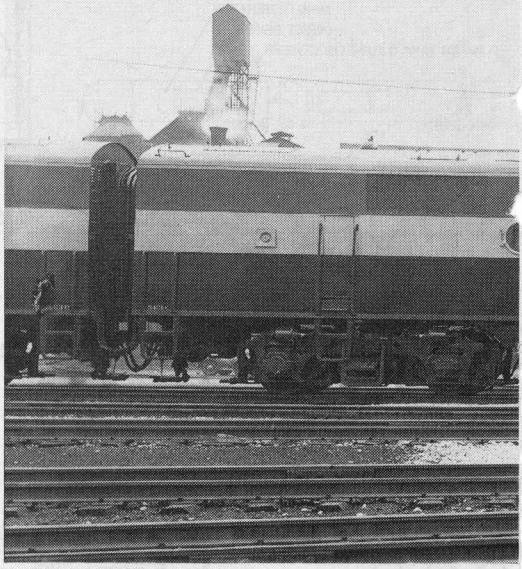
Drawbars and couplers

Because of concerns over how the labor unions might regard multiple unit freight locomotives (i.e., requiring a fireman for each booster) Electro-Motive's original design for the FT was engineered strictly for the use of a drawbar between the cab and booster units. This connection system did have some operational advantages, despite the very obvious disadvantage of inconveniently tying the two units together semi-permanently. The drawbar provided better slack control (virtually no slack) and was also better able to maintain the connection geometry between units when working as a pusher or when operating in dynamic braking.

The Santa Fe upset this planning in October 1940 with the very first order for production FTs. Its famous Number 100 and all subsequent Santa Fe orders were delivered with couplers instead of drawbars between all units (still referred to as "sections" at that time). Since it had been designed for a drawbar with no draft gear, the space between the truck and the carbody end sill on the "drawbar end" of both the cab and booster units was very short, and since it did not have to mate up with anything but itself, the drawbar was

RUSS PORTER





C&NW PHOTO / COURTESY I.M. KULBERSH

THE ROCK ISLAND TAs of 1937 had a 16-cylinder Winton 201A at 1200 h.p. and rode on AAR trucks (this one was at Englewood, Ill., in 1946). The FT rode on the new "Blomberg" outboard swing-hanger freight trucks and carried the 16-cylinder 567 engine rated at 1350 h.p. C&NW 5401CD was at the Clinton, Iowa, shop.

mounted well above the level of a standard coupler. This required a very compact coupler application, which was solved by the development of a short, offset-shank coupler. This "Santa Fe coupler" was later sold as a modification kit during the late 1940s and 1950s to allow many railroads to convert their drawbar-equipped FTs to couplers with minimal modification to the drawbar pocket and support. These were later installed by the Southern Railway on the original FT demonstrators. The short offset-shank coupler had some operational problems, however, in that it generated high shock loadings during slack runout due to the lack of a full draft gear and was prone to jackknifing the units when pushing or operating in dynamic brake.

When EMD designed the F2 in 1946, they took a roughly opposite approach by providing a coupler pocket which could alternately be adapted to the use of a drawbar. This resulted in a slightly longer dimension between the center of the truck bolster and the center point of the drawbar (between the units) of 10'3/8" compared to 8'6" for the drawbar-equipped FT. A few railroads ordered F2 sets with drawbars, although by 1946 the trend was rapidly turning in favor of couplers.

Doors and ladders

Although the Santa Fe was well ahead of its time by specifying couplers on the first production FTs, the vast majority of the FTs produced were delivered in Dilworth's "standard" drawbar-linked A-B sets. There were a number of differences in the internal and external fittings of the drawbar FTs and those built with couplers. The drawbar-linked sets were outfitted as if they were, in all respects, a single unit which was simply articulated into two sections. (Incidentally, the term "section" was deliberately applied to the FT, even though the terms "A-unit" and "B-unit" were well established by that time for the cabs and boosters of the EA, E1 and E2 passenger locomotives.)

In addition to the fact that the stan-

BALTIMORE & OHIO rostered twelve A-B FT sets originally numbered 1-11, odd only. The renumbered 109 was eastbound in the Cumberland Narrows on August 6, 1949. B&O was the only major U.S. road to get second-hand FTs, buying two sets from the NYO&W.

HAL CARSTENS

dard FT booster had no batteries and was completely dependent on the cab unit for low voltage control electrical power, further proof of this "articulated locomotive" concept is that there were no internal doors in the carbody crossover walkway between the drawbar-equipped cab and booster units. The diaphragm over the walkway was one piece affixed to the bulkhead of each unit, whereas the diaphragm at the coupler end was the conventional "half" type with the center striker plate. The coupler end doorway of the FT booster had a sliding door which ran on a track at the top and a set of glides at the bottom. This door was unique to the FT and some early E-units, as all of the later EMD booster units would have hinged rear carbody doors. FTs like those for that Santa Fe that were manufactured with couplers got hinged doors on the "drawbar end" and the standard sliding door on the rear of the booster. The FTSB (Short Booster) units, which were all manufactured as part of drawbar-equipped A-B-A sets, had no crossover doors on either end.

While it is often difficult to determine from available roster data and the chronology of modifications whether an FT set has couplers or not, one good clue is visible on the outside of most units. As manufactured, neither the cabs nor boosters had ladders or grab irons on the drawbar-equipped ends. These safety appliances were installed, however, adjacent to any coupler end. The only place this rule does not apply is with the all-drawbar A-B-B-A sets for the Northern Pacific which have the end ladders and grabs on what would otherwise have been the coupler ends of the drawbar-linked boosters.

Although the cab units in a coupler-equipped set technically had the ability to operate independently, it must have been quite inconvenient to do so, since leaving the booster unit at the shop deprived the locomotive of its only toilet.

The Blomberg truck

The FT and the 1000-h.p. NW3 light roadswitcher (built in November 1939, the same month as the FT demonstrator) were the first locomotives to make use of the now-familiar "Blomberg" four-wheel freight truck. Designed under the supervision of EMC Engineer Martin Blomberg, it shared a number of features with the A1A passenger truck that had entered production in 1937.

Prior to the Blomberg design, most diesel power trucks had closely followed the basics of passenger car trucks, with suitable reinforcement of the main frame and the provision for center transoms to mount the nose supporting packs of the traction motors. Most had only a single stage suspension, generally using leaf springs or a combination of leaf and coil springs.

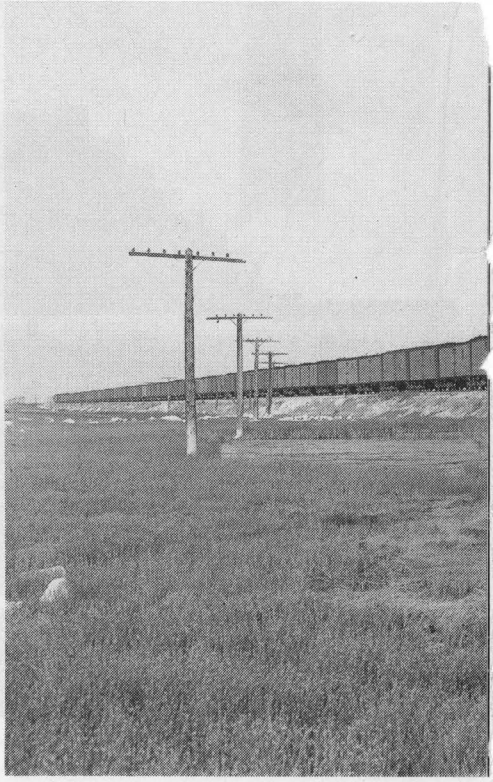
The need for a four-wheel truck capable of high speed freight and passenger operation led the EMC designers into a two-stage suspension which used both coil and elliptical springs. The first stage of suspension was a set of coil springs in pockets of the main truck frame directly above the journal boxes. The key to the truck's enduring success was its use of outboard swing hangers to support the weight of the carbody through a second suspension system. Suspended between the swing hangers was a spring plank which carried a set of elliptical springs that cushioned the carbody through the center bolster. The elliptical spring set allows for a reasonable amount of damping in the system, since the friction of adjacent leaves in the pack and the differing lengths of the individual spring leaves tend to absorb and damp the springs' movement. Since the low suspension of the swing hangers gives excellent ride characteristics, the Blomberg truck proved tremendously successful in service. It continues to be used today with only minor modifications and is the by far the most common truck on American railroads.

It is interesting to note that some of the early FT manuals, as well as the operator's manual for the Illinois Central TR1 transfer locomotives, contain a clearance and wear allowance diagram for the Blomberg truck which is labeled "Wear Limits—4 Wheel Freight and Road Switching Locomotive Truck." This diagram apparently originated with the introduction of the truck in 1939 for the FT and NW3 models. It would imply that EMC was actively using the term "road switcher" at least two years before the creation of the "first" road switcher, Alco RS1 of 1941.

The "electric brake"

Two types of dynamic brake (referred to in the early manuals as an "electric brake") were applied as optional equipment to FTs during their six year production span. Although both systems used the traction motors as generators and dissipated the power which was produced through the roof-mounted re-

D&RGW PHOTO



THE RIO GRANDE had an unusual FT fleet, buying its first A-B-B-A sets 540-547 with couplers on all units and its last batch 548-551 set up as passenger units in drawbar-linked A-B pairs. The 540-542, built in 1942, had the "curved-side" dynamic brake boxes as shown on 542 **(below)** nearing Arena on March 14, 1942. The 545 **(left)** got the square boxes. While testing on the Western Pacific in 1940, the 103 demonstrator set posed for photos **(above)** at Garfield, Utah.

J.W. MAXWELL

sistance grids, their control logic and their usage differed so widely that it is worthwhile to comment on the two systems and the advance in technology which the latter represented.

The first system, the "holding brake," was applied to only very early FT orders during 1940 and 1941. The name referred to its usage to "hold" the train speed to a desired range on a downgrade. It was controlled by a small four-position switch unit mounted beneath the instrument panel, directly in front of the engineer, which allowed him to select "POWER", "OFF," "BRAKE 1" or "BRAKE 2." The brake could be engaged only through a very limited speed

EMD PHOTO

range, up to about 21 miles per hour, and with only two fixed braking settings, the control of the train was at best imprecise. The two brake positions corresponded to two different levels of current for exciting the traction motor fields. This gave the engineer the choice of two levels of braking, but the braking current generated was a function of train speed. The BRAKE 1 position used lower field excitation for an operating range up to 21 m.p.h. The BRAKE 2 position applied more excitation, which resulted in greater braking effort at lower train speeds with a maximum of 13 m.p.h. The two top speeds corresponded to the points at which the braking current in each position reached the maximum level allowed through the rooftop resistance grids. The operator's manual commented: "Exact control of speed to keep the braking load on the motors within their rating must be accomplished by applying air brakes in addition to the electric brake."

The second system represented a great advance in the technology and involved the first use of the term "dynamic braking," since it was truly capable of infinite adjustment and could be used throughout the service speed range of the locomotive. The secret to its flexibility was the use of a loop circuit which allowed a rheostat controller in the lead cab to adjust the field strength being applied to the traction motors. This would regulate their braking output, from zero to maximum effort, in a continuous stepless sweep of the controller. The operator would set a selector switch corresponding to the number of units in the consist, and the loop circuit was jumpered from unit to unit, with a set of spring-loaded shorting bars in the jumper receptacles automatically closed the last link in the circuit where a jumper was not applied to the final trailing unit. In this manner, all of the units in a consist would see an identical control signal applied to regulate their braking output. The field loop regulation system was quite successful and continued to be used with some modifications up through the final years of the use of d.c. main generators on road locomotives (the alternator-equipped units today use a simpler "potential wire" control circuit).

In early FT production there were two different types of carbody roof "boxes" used for dynamic brakes. These bear absolutely no relationship to the two-step versus field loop dynamics. The first production units, Santa Fe 100, had the sharp-edged square boxes, while some subsequent units had the edges curved inward in an effort to make the appearance of the boxes less obtrusive. This had an adverse effect on air flow and performance, however, and the square boxes returned for the remainder of FT production.

Incidentally, the FT manuals observed that the dynamic brake was not a "stopping brake." This is true of even the most modern dynamic brakes, because as the rotation of the motors decreases, their effectiveness as generators diminishes and the braking action fades out. "Extended Range" dynamics of today use circuitry to lower the effective speed of fade-out but still do not produce a stopping brake.

Transition

Operating an FT was essentially the same as any modern diesel with one important exception. Like all road locomotives of its era, the FT had manual "transition," the electrical connections between the generator and traction motors and the field shunting that permitted the locomotive to perform with maximum effectiveness over its full speed range. As the speed of the locomotive increased, the engineer had to work his way through the transition steps according guidelines indicated on the face of the ammeter. This was necessary to keep the voltages and amperages within the limits of the generator/traction motor system. Over the years, the process was made more and more automatic, but fully automatic transition did not become standard until the F7 of 1949.

Next month

In the December '89 issue we will conclude our study of the FT as Preston Cook looks at the successors to the FT and the characteristics which made it an impractical candidate for rebuilding. Also in the issue will be coverage of the restoration of the 103 demonstrator and the EMD 50th Anniversary celebration at La Grange as well as Jim Shaughnessy's superb photos of FTs in action on the Boston & Maine.

Electro-Motive's FT

by Preston Cook

KODACHROME: MAX ZIMMERLEIN, SR.

On November 25, 1939, Electro-Motive Corporation sent its 5400-h.p. A-B-B-A model FT demonstrator 103 out of La Grange, Illinois, to show that the diesel-electric was a match for any steam locomotive. It traveled the country from coast to coast for eleven months, proved its point, and was sold to the Southern Railway as Chicago, New Orleans & Texas Pacific 6100ABCD in May 1941. The cab unit of the lead A-B set (builder's number 1030) was donated by the Southern to the National Museum of Transport in St. Louis in 1960, while the two boosters and other cab unit had been put through an upgrade program in the early 1950s and worked until retirement in the mid-1960s.

On August 9, 1989, the Southern 6100 returned to that same La Grange factory and on September 17 was unveiled to the public in the Pullman green and Dulux gold 1939 demonstrator livery, the star of a celebration honoring 50 years of freight diesel locomotive production by the Electro-Motive Division of General Motors (see page 73). The deceptively contemporary appearance of the 103 is a testimony to the impact that it had on America's railroads, as its "bulldog" nose and well-proportioned carbody can still be found

RESTORED TO ITS 1939 LIVERY, FT demonstrator 103A from St. Louis and companion booster (ex-SR 4103C) from Roanoke posed for company photos behind the EMD plant at La Grange, Ill., on September 16, 1989. The pair will be used through 1990 to celebrate the 50th Anniversary of the 1939-'40 demonstration tour. Back on a sunny October 19, 1958, FT 111AB (**top**) was eastbound on the Chicago, Burlington & Quincy main line through Sandwich, Ill., with a Geep and leased Great Northern FT 408AB trailing.

KODACHROME: JIM BOYD

Celebrates 50 Years

Part Three: The legacy of the FT

in revenue service in a few places today. And there is no longer any doubt that the diesel was more than a match for the steam locomotive.

As we have noted in this series of articles in the October and November issues, the FT was a unique machine in many ways. While it laid out the pattern for the next half century of diesel locomotive development, it also incorporated a few features which were almost immediately abandoned in subsequent models, including the concept of drawbar-linked A-B unit sets, manual cooling system controls and mechanically-driven cooling fans. But its basic proportions and carbody layout have stood the test of time and proven to be adaptable to continuing evolution. Open up an FT and an SD60, and you will find a lot of similarities and recognizable components.

The "FT" model designation

One confusing aspect of the FT development was the rather unconventional choice of model designation for the locomotive and the disparity between the engineering (Model F) and sales (Model FT) designations. This situation was not unique within Electro-Motive's history, as there have been numerous instances of locomotives being developed under one engineering designation and marketed under another (such as the "GP22" which became the GP30).

In its original intent, the numbering system for the EMC models of the late 1930s was tied to horsepower. The initial 600-h.p. switchers were the SC (*S*ix hundred h.p., *C*ast frame) and the SW (*S*ix hundred h.p., *W*elded frame). The switchers with an "N" designation were *N*ine hundred h.p., while the "E" units were *E*ighteen hundred h.p. As the horsepower of each type of unit progressed upwards through the years, most of the related designs retained the early letter designations, and some were subsequently modified in ways not originally intended (like "SW" becoming the general term for *sw*itcher and "E" the term for all twin-engine A1A-trucked passenger units).

The FT model designation is explained partly by the opening engineering release which authorized the development of the "Model F" locomotive, and partly by the horsepower-based system which preceded it. The Model F obviously referred to *F*reight, while the "T" was taken from the horsepower rating system. Curiously, the widespread belief that the "T" stands for *T*hirteen Fifty is likely in error, as all EMC/EMD documentation of the period treats the basic FT an an A-B set with the total horsepower of *T*wenty seven hundred). Further complicating the issue is the fact that some of the engineering drawings relating to specific components for the locomotive call it an "F1" or "F2," but this refers to Model F Section 1 (cab unit) or Model F Section 2 (booster).

The model designation "FT" was applied to the locomotive at the time of its sales introduction and was not, as some historians have speculated, an "after thought" applied when the F2 was introduced. The sales specification book, which was distributed to potential customers, clearly identifies the locomotive as the "Model FT" on the title page and in performance charts.

The units which followed

The FT had proven to be a reliable performer on its demonstration and in revenue service, but the design had a few inherent drawbacks which made it unnecessarily complex to produce and maintain. This contributed to the need for a redesign following the end of the war. The FT's successor was the F2, which set the basic design parameters for the models which followed through

SOUTHERN RAILWAY

SOUTHERN RAILWAY 6100, formerly the EMC 103 demonstrator set, posed for this classic publicity photo on the Cumberland River bridge at Burnside, Ky., on the infamous "Rat Hole" Division. The bridge was bypassed in a 1950 line relocation.

the end of F-unit production with the FL9 in 1960. In view of the many upgrade programs that EMD subsequently offered for the F2, F3, F5 and F7 models to bring them up to F9 standards, it is worthwhile to take a comparison look at the features of the later F-units to see why the FT was not generally adaptable to these programs.

The successor to the FT was intended to be a 1500-h.p. unit equipped with the new D12 main generator — it was the D8 generator and not the 567A engine which had limited the FT to 1350 h.p. This locomotive would likely have been known as the "F2" and was abuilding at La Grange in July 1945 alongside the last production FTs. The original intent of EMD was to have this 1500-h.p. unit in production in early 1946 to replace the FT, but as the prototype set was being tested it became apparent that there were some serious design-related problems with the D12 main generator.

At this point EMD reportedly had two dozen of the D12s completed and awaiting installation, but they could not be put in locomotives until the problems had been remedied. The company had already committed to the tooling and material to make the changeover from the FT to the successor which would include a companion D14 alternator to power the auxiliaries and eliminate the belt-driven cooling and traction motor fans. Also, the trucks of the new unit were repositioned to allow for a standard draft gear and coupler between the cab and booster (although a drawbar was still an option) and to better balance the new machinery weight distribution. Thus, EMD could not simply continue building more FTs, and in order to keep the production line going the engineers worked up an interim unit which would include the new truck arrangement along with the alternator and new auxiliaries while retaining the original D8 main generator and 1350-h.p. rating. The new unit picked up the "F2" designation and went into production in July 1946, following the completion of the last FTs (for the Rock Island) in November 1945. The F2 would be a temporary model produced for only five months, totaling 74 A-units and 30 Bs. The 1500-h.p. unit, now dubbed the "F3," would be ready for production at that time; this explains why the production period of the F3 shown in rosters predates the F2, as the first 1500-h.p. units were built in July 1945 but not marketed until after November 1946.

Although the F2 had the same 1350-h.p. rating and much of the same principal machinery as the later versions of the FT, the interior arrangement of the F2 was extensively revised both to improve maintenance accessibility and to reduce the initial production expense. The 16-cylinder 567 diesel was retained (though upgraded to a 567B) in approximately the same relative position in the cab carbody, with the governor end of the engine toward the rear of the locomotive and the main generator toward the cab. The air compressor in the F2 was mounted forward of the main generator and driven by a shaft from the generator armature as it had been in the FT. However, all of the power take-off shafts, idlers, pulleys and belt drives for the cooling fans and traction motor blowers on the FT were eliminated in the F2.

Their replacement was a companion alternator mounted between the diesel engine and the main generator, with its rotor mounted to part of the drive coupling connecting the engine to the main generator and its stator supported by the main generator frame. The adoption of the companion alternator allowed EMD to use a number of a.c. motor-driven accessories which were virtual "drop in" components in the F2 construction process—items which required only to be bolted down and plugged in, rather than requiring the complex and time-consuming alignment that was needed in the FT. The auxiliary equipment which was changed to electric drive in the F2 included all of the cooling fans and all of the traction motor blowers.

Along with the changeover to electrically-driven cooling fans, the entire cooling system arrangement was redesigned for the F2. Where the FT had radiators in two sections at either end of the locomotive, which required extensive connecting piping, the F2 had all of the cores concentrated centrally above the engine. This shortened up the piping runs considerably. While it could have taken away some of the much-needed overhead space (for pulling the cylinder assemblies out of the diesel engine), EMD was able to get around this problem by keeping the core mountings angled in a shallow "V" with the cooling fans in the center and providing lift-out panels in the lower floor of the cooling air duct which could be taken out completely when it was necessary to work on the diesel engine. This provided another foot or two of overhead working space.

Four electrically-driven traction motor blowers were substituted for the two mechanical blowers which had been used in the FT. The F2 arrangement located the two blowers for the front traction motors under the cab floor, while the two blowers for the rear motors were neatly positioned directly under the accessory rack at the governor end of the diesel engine.

The main electrical switchgear and its mounting cabinet were also extensively changed in the F2. In the FT, the main electrical cabinet had been mounted in the left side walkway adjacent to the main generator. In the F2, the main electrical cabinet was built into the back wall of the cab, along the centerline of the carbody. This allowed the F2 to have a pair of access doors from the cab into the engine room, one for the walkway on either side of the locomotive, and eliminated the need for a couple feet of interior space to be tied up in providing a crossover from a central access door to the side walkways as had been done in the FT.

The overall result of the electrical cabinet repositioning and the elimination of the crossover area was more compact engine room arrangement which provided substantial improvements in access to the equipment. The F2 layout was so efficient that it was possible for the A unit to mount a steam generator at the rear of the carbody, a feature which had not been possible with the FT. The steam generator option was an attractive feature that made true "dual purpose" operation possible, but the space available for tank capacity (both fuel and water) in the F2 was still quite limited compared with the E-units, and many railroads elected to stay with the traditional passenger design for their long distance passenger train operations (the most notable exception to this, the Santa Fe, had boilers only in the boosters of its F-units).

The final system which underwent an extensive redesign for the F2 was the dynamic brake package. The FT layout, occupying the roof area above the walkways inside both sides, was completely discarded in favor of a compact "drop-in" hatch which was built as a complete sub-assembly mounting the resistance grids and blower motors. Located between the diesel engine and the cab, the portion of the hatch which extended down inside the carbody occupied the space above the air compressor and the main generator. This package represented a great improvement in manufacturing convenience, as well as allowing the customer some maintenance flexibility since the entire assembly could be removed easily for repairs.

The use of the "drop-in" auxiliary equipment beginning with the F2 and extending through the F3, F5, F7 and F9 made these locomotives particularly adaptable for upgrade programs as EMD developed improved components. EMD recognized this potential, and during the 1950s they offered a catalog of upgrade proposals from which a customer could select individual components or entire packages which would bring the older F-units up to the then-current F9 standards. Unfortunately,

TWO PHOTOS: EMD

THE COTTON BELT bought ten FT A-B sets in gray and yellow with red trim; a reflectorized number plate will go beneath the herald. The F2, typified by NdeM 6200, had electric cooling fans and the "modern" truck positioning retained through the F9.

almost all of these product improvements which dealt nearly exclusively with the auxiliary equipment were not economically feasible for application on the FT, since they would have required a complete re-design of the interior of the carbody and supporting structures (just as EMD had done in designing the F2). The cost of doing this upgrade on an elderly FT exceeded their value as a trade-in unit on new locomotives.

The F2 and F3

While it incorporated many changes, the F2 was still a close kin to the FT in a couple of important areas. The F2 retained the FT's 1350-h.p. rating because it utilized the D8 main generator, and it also had the FT's electropneumatic governor system, which suffered from a degree of "lag" in the air signal. The F3 introduced the electrohydraulic governor that has been standard ever since. To quote the F3 manual:

> "The engine speed is controlled by an electro-hydraulic governor which is operated from the engineer's throttle. This governor replaces the electropneumatic governor control used on FT and F2 locomotives. In this way, all engines in locomotives of two or more units are controlled simultaneously."

During this period of time, in the mid-1940s, there was considerable concern over how various models of EMD locomotives would perform when coupled together in multiple-unit sets (they wouldn't even think of mixing in units of an alien builder yet). An early F3 operators manual, which included insert pages for the just-introduced automatic transition option, presented this fascinating entry:

> "Operation of F3 units with FT or F2 units: In many instances it may be desirable to operate combinations of FT, F2 and F3 units as a locomotive. This is an acceptable practice providing gear ratios are the same, and will be entirely successful if the instructions below are followed. No change in operating technique is necessary except for the conditions listed:
> 1. Manual Transition must be used.
> 2. Throttle must be reduced to No.6 position for 2-3 or 3-2 transition.
> 3. Starting trains should be done according to instructions for FT units if they are in the locomotive consist.
> Locomotives with different gear ratios may be operated together only if a study is first made by Electro-Motive and special instructions issued."

By November 1946 the problems with the D12 generator application were resolved and the new "F3" replaced the F2 in the EMD production line. The original 1500-h.p. units of July 1945 have been recorded by historians as F3s, explaining why F3 "production" completely covers the production period of the obviously inferior F2. With the F3, the EMD freight unit came of age, and the changes in the F-series model line over the next decade were more evolutionary than revolutionary.

FT art and memorabelia

The demonstration tour of EMC 103 and the production of the FT during the war years generated a tremendous vari-

ARTWORK: EMD

EMD STYLING SECTION artists produced full-color renderings of customers' units, like these Lehigh Valley FTs, that touched off the "artwork war" with Alco when they were distributed in wall print and postcard sizes to customers and the public.

ety of company publicity publications, operators manuals and railroad art which are now highly sought-after collectors' items. The celebration of the 50th Anniversary of this historic locomotive has already resulted in the production of a number of items which will likely be the collectors' pieces of the future.

Almost immediately after the completion of the demonstrator tour, Electro-Motive produced a lavish ring-bound book which told the story of the demonstration runs while extolling the virtues of diesel-electric locomotives for freight service on the major railroads. The company also distributed to the prospective customers copies of their specification books for the various configurations in which the FT could be built. As FT locomotives were built and delivered, Electro-Motive printed substantial quantities of operators manuals for the new product, since on most railroads the FT was the first diesel motive power to operate in freight service and there was a great deal of crew training which had to be handled. It seems as if EMD printed a completely customized manual for nearly every order of FTs it built, and some railroads which received several orders of FTs over a period of time were supplied with a large variety of the customized manuals. Many of these manuals included the railroad's herald or other appropriate artwork on the cover and a photo of the specific locomotive inside.

While the FTs may not have started the railroad art competition that existed for many years between Electro-Motive and Alco, the impressive paint schemes developed for them by EMD's Styling Section certainly contributed a great variety of colorful images which the company used widely for sales promotion. The final styling paintings for many of the FT orders ended up being printed in color on heavy grade paper and widely distributed to the customers' offices. In the years since, the 17″×26″ color prints have become popular pieces of railroad memorabelia. Some of them, like the Boston & Maine and the Lehigh Valley FT renderings, convey the conservative gracefulness of the handsome EMD multi-stripe paint schemes, while others like the Chicago & North Western provide an impressive statement of the bold flowing color masses which the EMD designers used so effectively. And the smaller $3\frac{3}{8}$″×$7\frac{1}{2}$″ cards have almost become the "baseball cards" of the rail collectors' arena.

The popularity of the EMD prints was quickly challenged by Alco as early as the delivery of their first twin-engined passenger diesel, Rock Island DL103b 624, in 1940. The postwar Alco prints done from original paintings by Howard Fogg were just as widely distributed as the EMD publicity prints and have also become a popular collectors' items.

What the FT proved

Back in 1939 when Dick Dilworth and the team at La Grange were putting together the first FT, there was a general feeling in the railroad industry that the diesel was fine for switchers or glitzy lightweight streamliners, but that it was not rugged enough for day-in and day-out freight work. "They're fast, but don't overload 'em," was the prevailing attitude.

This seems strange from today's perspective where we know what the diesel-electric is capable of doing, but back then the diesel carried with it an aura of unreliability. Like a steam engine in today's environment where everybody keeps their fingers crossed that nothing goes wrong, the diesel was viewed with a mix of hope and skepticism.

It was the 103 demonstrator that got rid of the skepticism. On its legendary tour from November 1939 through October 1940 it covered 83,764 miles on 20 railroads in conditions ranging from sea level to the 10,200-foot Tennessee Pass and 110° deserts to mountain winters at 40° below zero. And on the entire trip it never missed a call for mechanical reasons. It showed the industry for the first time what we have since come to know as typical diesel performance.

Accustomed to the characteristics of steam locomotives, the assigned engineers had a lot to learn about how a diesel handles a train. A "trail of broken couplers" was evidence of the diesel's tremendous starting power, as engineers ignored instruction and took slack like they would do on a steam engine. Today everybody knows that you stretch the train gently and then notch out; back then everybody "knew" you had to take slack and give 'em a yank.

Dick Dilworth summed up the FT's performance in one sentence: "It pulled a lot of trains in two and others uphill."

In the 1948 book *On Time*, a corporate history commissioned by EMD, author Franklin Reck described a dramatic example of the FT's ability to pull. On a Western run, the 103 demonstrator was coasting downgrade into a small town when the conductor in the caboose detected a hotbox. Nobody on the head end, however, saw his signal to stop. As the train approached town and slowed to about twelve miles per hour, the conductor saw his opportunity to stop. He dumped the air from the caboose just as the engineer widened out on the A-B-B-A FTs. Coupled between the engine and train was the dynamometer car, with an operator watching over the automatic pens that were recording the performance on a moving scroll of paper. As the diesel dug in and the brakes began to drag, the dynamometer jiggled and bounced as it recorded the strain. The pen swung upward, registering 270,000 pounds of drawbar pull before continuing right off the scale.

A moment later the dynamometer's drawbar broke and the engines leapt ahead. As Reck described it, "The apparatus on the work table, strained beyond its limits, shattered into pieces, with ink, steel rollers and miscellaneous parts flying all over the car." The ink-splattered but otherwise uninjured dynamometer operator was an early victim of the diesel era.

The builders of steam locomotives would soon share his dismay.

Don't overload 'em, indeed.

KODACHROME: MIKE DEL VECCHIO / LIGHTING: PRESTON COOK, JOHN GIESKE, LEROY CARPENTER and JACK WHEELIHAN

The return of FT 103

by Jim Boyd

ON THE AFTERNOON of September 16, 1989, Southern Railway 6100 from the National Museum of Transport in St. Louis and heater car 960601, former Southern FT booster 4103C from the Virginia Museum of Transportation in Roanoke, were mated together to recreate half of the 1939 EMC 103 FT demonstrator set, cosmetically restored by energetic volunteers at the Electro-Motive Division of General Motors plant in La Grange, Illinois. That evening they posed for EMD and R&R photographers (**above**). On September 14, the 103A had posed with Union Pacific DDA40X 6936 and brand new SD60M 6200.

KODACHROME: JIM BOYD / LIGHTING: PRESTON COOK, JIM BOYD, MIKE DEL VECCHIO, GLEN MONHART, BILL GARDNER and JACK WHEELIHAN

TWO KODACHROMES: JIM BOYD

KODACHROME: MIKE DEL VECCHIO

IN THE EMD PAINT SHOP on September 11, 1989, painters were tracing the nose striping pattern (**top right**) onto the 103A. For the video crew, EMD test mechanic Charlie Schaefer interviewed "Bondo Billy" Tregler (**above**), who had smoothed the nose sheet metal. Painter Bill Vileikis (**right**) helped remove the masking.

KODACHROME: CRAIG WILLETT

TWO KODACHROMES: JIM BOYD

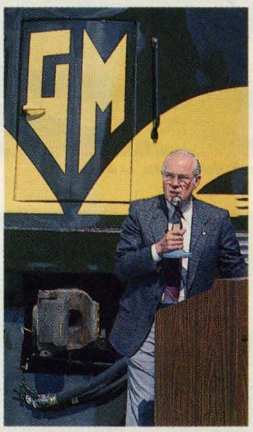
KODACHROME: MAX R WALLACE

ON FRIDAY MORNING the UP night photo line-up was still in place as Santa Fe FP45 101 was moved to the paint shop for a wash job. Later that day GN "Hustle Muscle" 400, the first production SD45 from the Lake Superior Museum of Transportation in Duluth was moved past BN SD40-2 7111 containing the 645 engine representing EMD's 100-millionth horsepower and Conrail 3000, believed at that time to be the first production GP40 (see MARKERS). The FT 103A was posed with Monon BL2 32 from the Kentucky Railway Museum and the first GP7, C&NW 1518 from the Illinois Railway Museum. That evening, the 103A posed for night photos with Canadian National SD60F 5535 and Santa Fe warbonnet FP45 101.

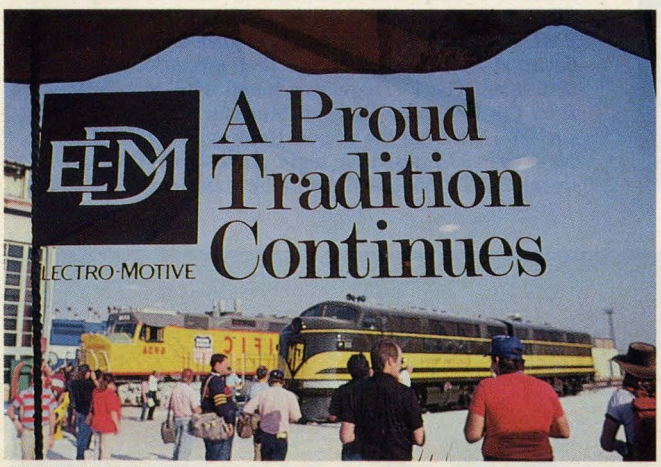
KODACHROME: JIM BOYD / LIGHTING: PRESTON COOK, JIM BOYD, JOHN GIESKE and JACK WHEELIHAN

THE SUNDAY CELEBRATION was open to the public but focused on employees and their families. Nearly 30,000 people attended. The CN SD60F was a popular "walk-through" exhibit. Railfans with patience could get good roster views (**bottom**) of the FT 103 set.

LOCOMOTIVES FOR DISPLAY were being lined up Saturday afternoon. In addition to Santa Fe FP45 101, BN SD40-2 7111, Conrail GP40 3000, CN SD60F 5535, UP DDA40X 6936 and IHB SW9 9006, museums sent C&NW GP7 1518, Monon BL2 32 and GN SD45 400. Reading Technical & Historical Society sent the first production GP30, Reading 5513. EMD displayed UP SD60M 6200, GP60 EMD-5, lease fleet GP38-2 837, SD45X 5740, ex-SDP40F a.c. test bed 268 and SW1001 117. EMD General Manager John Jarrell (**right**) made a speech Sunday, and UP SD60M 6205 was "trucked" every half hour.



KODACHROME: MIKE DEL VECCHIO



FOUR KODACHROMES: JIM BOYD

KODACHROME: MIKE DEL VECCHIO

A Proud Tradition Continues

Fanmail

FT Addendums

Sorry, Jim, but I had to write to correct an error and an omission in Preston Cook's otherwise fine feature on the FTs in the October issue. In the text regarding the second-hand owners, the Georgia Northern and the Gas Line are referred to as Southern subsidiaries. T'aint so, as they were very much independents under Pidcock Family control at the time the FTs were acquired. Southern control came a bit later, in the mid- 1960s as the Southern established the Atlanta bypass using parts of the old G&F Moultrie branch and the Georgia Northern.

The omission was that of the sale, by Southern, of 6105 (6101D) to the G&F as their 801. I will concede that when sold in 1961, it more resembled an F3 with the large, angled number boards, side grilles, fans and no portholes. But the builder's plate proudly stated "EMD 1337," builder's date 7/24/41, and that makes it an FT no matter what it looks like. The engine disappeared from G&F use shortly after the Southern obtained control in 1963 and was traded by the Southern to EMD in October 1964. The G&F's other used engines also disappeared after takeover, an SW and NW1 from EJ&E with builder's plates 693 and 771 respectively.

JACK PARKER
Aiken, S.C.

The steam-conscious IC *did* use the FT-engined TR1s in road service. They were used for a very short period of time in the early 1950s on the Peoria-Mattoon, Illinois, locals 291 and 292. I remember them coming through Delavan with the cow operating as head-end one direction and on the return trip the calf operating as head-end.

It was a strange sight, and I have often regretted I did not photograph them, but at that time, yard switchers on road freight provided little or no interest to me. I was too busy recording the last of steam.

WAYNE BRIDGES
Delavan, Illinois

I enjoyed Preston Cook's FT article in October R&R but would like to offer a correction to one of the captions. The Rio Grande unit pictured at Ogden (page 51) would not be on a *California Zephyr* connection but would be handling the through coaches for Denver via the Royal Gorge. My timetables from that era show that for Trains 1 and 2 there were a "Vista Dome Chair Car and Chair Car between Denver and Ogden." The 1950 timetables also show the sleeper running all the way to Ogden, although by summer 1952 it had been cut back to Salt Lake. These same timetables show no Ogden connection for the *Zephyr*. In the photo, one can spot two head end cars and a dome. I'm not quite sure if there's another car following the dome.

THOMAS KOPRIVA
Memphis, Tennessee

EMD's *Other* Battle With U-Boats

It never ceases to amaze me how one can read about the same subject, many times, from different sources, yet continue to learn more about that subject each time. The FT article was probably the most informative thing I have ever read about that legendary diesel. However, there is one part of this arti-

cle which leaves me perplexed concerning EMD's high-priority projects during the war. You mentioned, in order of priority: (1) The 184A-Sub-Chaser project; (2) Model 567ATL-LSTs; and (3) Detroit Diesel Quad LCIs. Either something's wrong here, or I have been completely misled all these years. As I understand it, one of the very highest priority defense projects in this nation during World War II was the highly successful and top secret fleet submarine program, and of the 225 "Fleet Boats" launched during the war, 120 of them were each equipped with four GM 16-cylinder 278A diesel generators. Now, if these engines weren't built by EMD at La Grange as their number one priority, where were they built — Cleveland? I'm scratching a hole right through my skull on this one. Please clarify.

RON GILLIS
Plymouth, Mass.

Yes, the WWII 278A's were built at Cleveland, and only few stainless steel non-magnetic 278A's for mine sweepers were built at La Grange after Cleveland was shut down in the early 1960s. However, many 567, 645 and 710 marine engines were built and continue to be built in Illinois — J.B.

KODACHROME: JOE WOLLNER COLLECTION

THE ELECTRO-MOTIVE FT freight diesel first hit the road in 1939 when steam was supreme and withdrew 30 years later with steam totally vanquished and dieseldom well into its second generation. A proud old warrior was CB&Q 112A in this undated and unidentified but typically Burlington photo. In the summer of 1958, Delaware, Lackawanna & Western 601 led a "5400-h.p. locomotive" A-B-B-A set through the Lake Hopatcong, N.J., passenger station, headed west toward Scranton and Buffalo.

EKTACOLOR: JACK WHEELIHAN

Photo Line

EKTACHROME: JOE WOLLNER COLLECTION

EKTACHROME: JIM BOYD

THE 103 DEMONSTRATOR set was rarely photographed in color, but this unidentified and undated photo shows it in a setting that appears to be on the Northern Pacific during 1940. But few photographers document their photos as well as Bob Malinoski who shot this incredible set **(below)** on the Erie's Mill Rift bridge over the Delaware River just north of Port Jervis, N.Y., at 1:15 p.m. on November 12, 1960, shortly after the Erie Lackawanna merger. The EL-renumbered FTs 7024, 7023, 7033 and 7034 led Erie-numbered F3s 706DC and FTs 701CD on 116 cars of westbound XC-91 with caboose C307. An FT disguised as a roadswitcher? That's certainly what Illinois Central TR1 1350 **(left)** appears to be as it works the East St. Louis hump in 1963. The drawbar-linked cab and booster set carried the FT's 1350-h.p. 16-567 engines, had shunting and transition and rode on Blomberg trucks. But the steam-conscious IC never used it as a road unit.

KODACHROME: BOB MALINOSKI

EKTACHROME: MAX S. ROBIN COLLECTION

IN A PERFECT A-B-B-A "5400-h.p. locomotive" set, the Reading's 259 heads up a freight in this unidentified action photo dating to the late 1950s. Because the FTs were getting rare by the mid-1960s, they were not as well photographed as the later F-units, and they were often spurned in their heyday as the killers of the beloved steam locomotives.

EKTACHROME: JOE WOLLNER COLLECTION

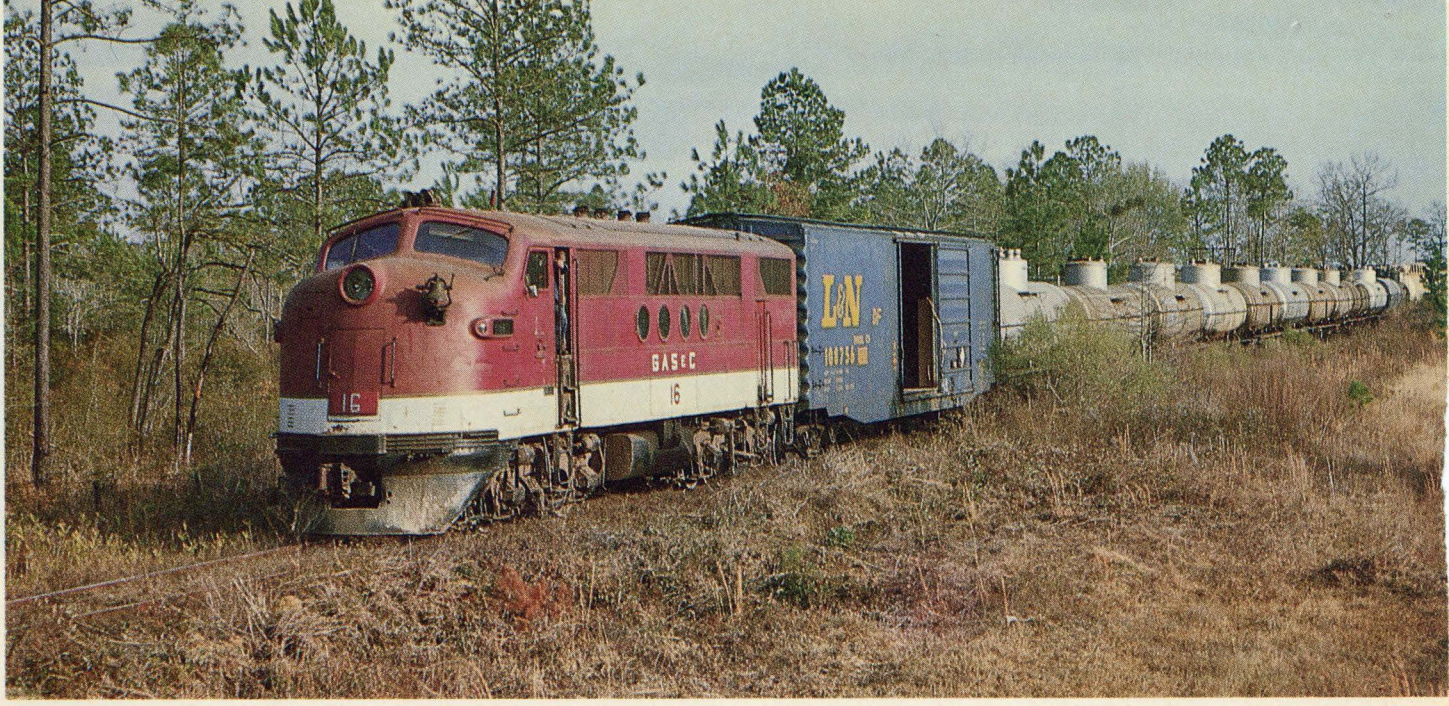
THE MISSOURI PACIFIC bought a dozen A-B sets in this handsome livery with hostler controls on the boosters and couplers between the units. The 503 was here in an A-B-A set at North Little Rock, Arkansas. The handsome Boston & Maine 4208 was leading an A-B-B-A set near Mechanicville, N.Y.

KODACHROME: H.F. CAVANAUGH / MAX S. ROBIN COLLECTION

HALF OF NEW YORK CENTRAL'S entire FT fleet (four A-B sets) was at Collinwood, Ohio, in October 1963; these units were delivered in a much simpler black livery. One of the Rock Island's twelve A-B sets in the dazzling "Rocket Freight" scheme was at Council Bluffs, Iowa, in December 1952.

KODACHROME: JOHN BARTLEY / AUDIO-VISUAL DESIGNS

EKTACHROME: JOE WOLLNER COLLECTION



THREE EKTACHROMES: JIM BOYD

VERY FEW FTS worked into the late 1960s; Georgia, Ashburn, Sylvester & Camilla 16 (ex-SR 4100) was northbound on the Georgia Northern (**above**) in February 1968. The Rock Island's last active FTs (**left**) were crossing the Des Plaines River bridge at Joliet in 1964. Going out with dignity, Western Pacific 908D (**below**) had worked its way to the CB&Q's Clyde Shop on May 29, 1966, to be traded to EMD. The legendary survivors, Sonora-Baja California 2203AB were at Benjamin Hill, Sonora, Mexico, (**bottom**) on January 15, 1975.

KODACHROME: PAUL HUNNELL / PRESTON COOK COLLECTION

FT COVERAGE continues on page 82.

Photo Line

KODACHROME: MARVIN H. COHEN

ALTHOUGH THE FT was designed as a freight engine, it was occasionally used in passenger service. The 806 had a passenger train ready to depart the New York, Ontario & Western's big station at Middletown, N.Y., sometime in the late 1940s. The Santa Fe equipped some of its FTs with boilers, gave them the red warbonnet livery and put them to work on the streamliners, such as the 158 at the old Highway 138 crossing at Mormon Rocks on Cajon Pass on June 18, 1947. The Great Northern 251A at Skykomish had been modified with a modern set of air intake grilles.

KODACHROME: BOB McVAY / TOM GILDERSLEEVE COLLECTION / JOE WOLLNER COLLECTION

KODACHROME: JOE WOLLNER COLLECTION

Photo Line

KODACHROME: ROBERT R. MALINOSKI

THE LAST RAILROAD in the U.S. to operate FTs was the Northern Pacific, which retired its last in 1970. Here on May 1, 1954, however, 4-6-6-4 5100 had 2nd/603 working uphill west of Livingston, Montana, at 10:25 a.m. with 54 loads, two cabooses and FT set 5406DCBA shoving on the rear. Two other long-lived FTs were the ex-Southern units that went to work on the Pidcock short lines in Georgia around 1959. Georgia Northern 14 (ex-SR 4105A) was nursing its derailed train (**left**) just north of Bridgeboro in January 1969. Sister unit Georgia, Ashburn, Sylvester & Camilla 16 (ex-SR 4100A) was switching covered hoppers at a fertilizer plant on the north side of Moultrie later that same day, providing an unusual look at the "drawbar" end of an FT cab unit. While the 14, delivered in a batch of four A-units, was likely built with a rear coupler, the 16, from an A-B-B-A set, was probably a later conversion.

TWO EKTACHROMES: JIM BOYD

Photo Line

ARTWORK: EMD / KODACHROME: PRESTON COOK

THE "ARTWORK WAR" between EMD and Alco began with the wide distribution of lithographs like this one of a Chicago & North Western FT set rendered by the EMD Styling Section. Note the similarities in the factory-designed liveries of the C&NW and the New York, Ontario & Western, as shown on the 803 at Middletown, N.Y., in the late 1940s. Although delivered as a 100-series unit in freight blue, Santa Fe 415 (**bottom**) was repainted into the passenger warbonnet.

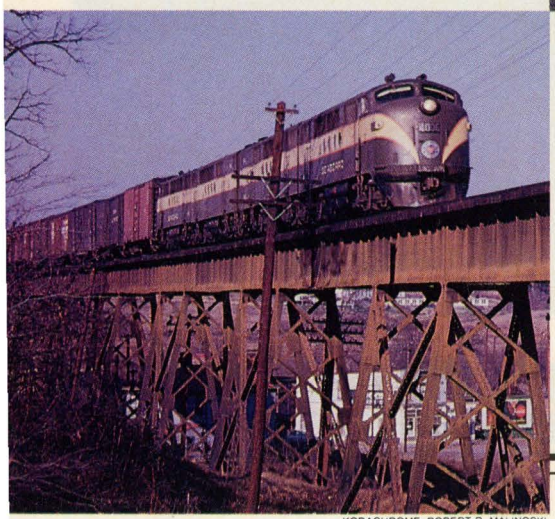
KODACHROME: MARVIN H. COHEN

R.P. MIDDLEBROOK / COLLECTION SOUTHERN CALIFORNIA CHAPTER R&LHS / COURTESY TOM GILDERSLEEVE

KODACHROME: ROBERT F. COLLINS

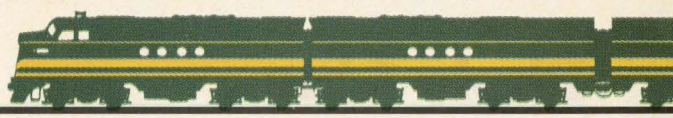
KODACHROME: RICHARD STEINBRENNER

THE ERIE RAILROAD'S magnificent Moodna Viaduct on the Graham freight line between Suffern and Port Jervis, N.Y., was carrying a perfect four-unit FT set, led by the 701, on eastbound 1st/98 on January 29, 1961. The Erie's FTs were originally delivered in a Spartan black livery with only the yellow nose wings. The nose pattern and sweep of color over the cab windows came along later. On another bridge on another winter day, Seaboard Air Line 4006, 4106, 4112 and 4012 had freight No.27 rolling over a long trestle at Petersburg, Va., at 3:07 p.m. on February 5, 1953. The Seaboard FTs were delivered in the colorful "Citrus" passenger livery but were soon repainted into the workaday freight Pullman green and yellow introduced on Baldwin Centipede 4501 in March 1947.



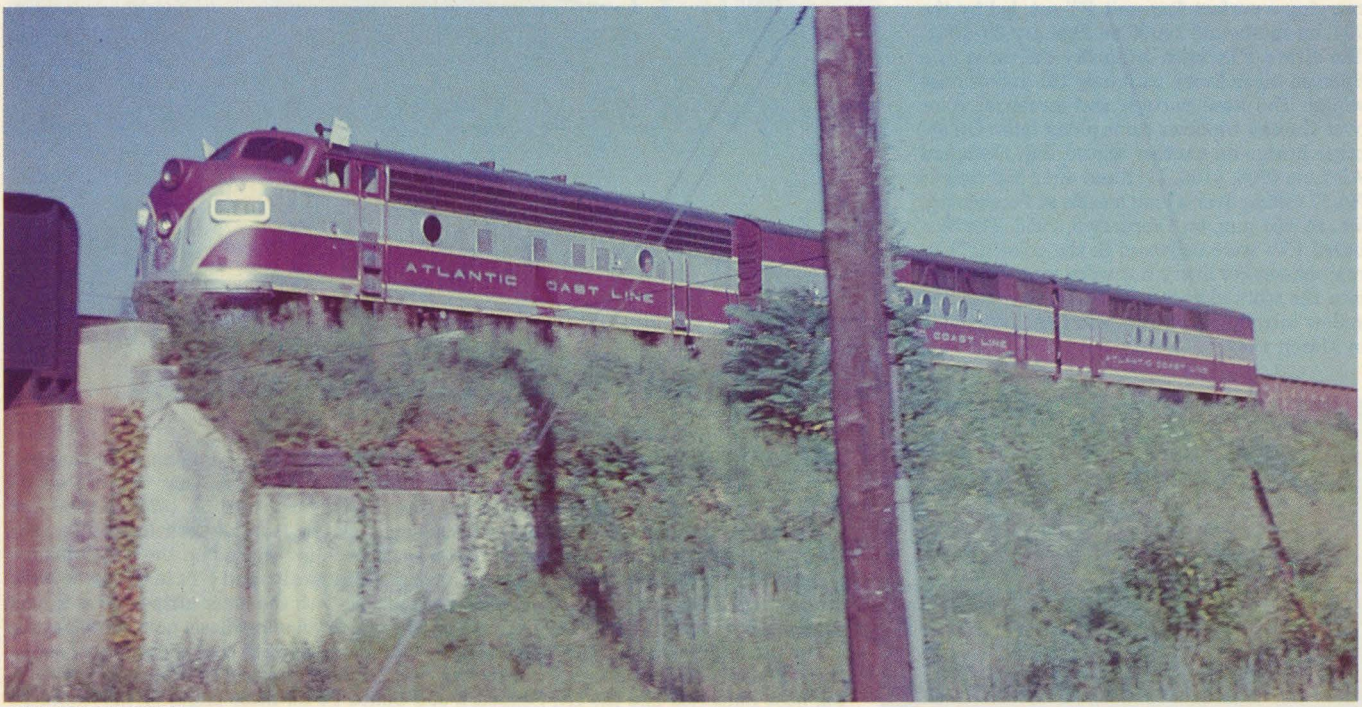
KODACHROME: ROBERT R. MALINOSKI

THE LEHIGH VALLEY had four A-B FT sets that soon found a home in pusher service out of Coxton, Pa., between Scranton and Wilkes-Barre, shoving freights southward up through Laurel Run to Mountain Top. On a dreary April 18, 1959, the 500 was in the engine terminal adjacent to the backshop at Sayre, Pa. The Cornell red FTs wear their black stripes in the same basic pattern that was introduced on the EMC demonstrator 103 in 1939; the Rio Grande and Boston & Maine also had FTs in the same basic stripes, while the Rock Island had a similar pattern with the inner stripes filled in—all evidence of the EMC/EMD Styling Section at work developing diesel paint schemes for steam-oriented railroads. The Valley 500 has been modified with that snowplow pilot. As their original nose side number boards were hard to read, many FTs were delivered with big nose numerals like the LV, Seaboard and Santa Fe on these pages or the Santa Fe carbody side number boards.



EKTACHROME: JIM BOYD

THE CHICAGO, BURLINGTON & QUINCY created A-B-A sets by buying ten F2As to mate with ten FT A-B sets and numbering them all into the 150-series. The 153ABC, here eastbound at La Grange, Ill., on May 20, 1964, is comprised of F2A 153A and FTB/FTA 153BC, formerly 102BA. The Atlantic Coast Line made an unusual use of the FT drawbar by linking two boosters together with couplers outward, as shown by this set with an F7A at Petersburg, Va., on September 10, 1951.



ANSCOCHROME: DICK TOWNLEY

BY JIM BOYD

Studying the FTs

The Electro-Motive FTs are turning out to be a fascinating project, and we're picking up all sorts of new information about the 50-year-old units as we go along. First, however, let's clear up a bit of errata that got into the 50th Anniversary feature in the October issue. There were two mistakes in the roster that we've caught so far. In translating the roster notes on the Southern Railway I somewhere in the process dropped out the entire August 1945 order for four A-B-A sets with the FTAs numbered 4120-4127 and FTBs 4316-4319. In the Santa Fe listing, there were no units delivered new in the 400-430 series, as these were later renumberings.

At least three of the bigger rosters need more detailed explanations than we were able to attempt in our feature. The Rio Grande fleet is rather well documented in Joe Strapac's *Rio Grande Diesels—Volume 1* (1983, Shade Tree Books, P.O. Box 2268, Huntington Beach, CA 92647, $19.95). Joe points out that the Rio Grande's first A-B-B-A sets 540-547 had couplers throughout, while the later units, 548-551, were in drawbar linked A-B pairs numbered in four-unit sets and geared for passenger service.

The Southern Railway FT roster is complex and deserving of considerable research; if the energetic SR Historical Society has already done it, the work has escaped our attention—if they haven't, they should. The Southern apparently bought mostly drawbar-linked A-B pairs, but the 4105ABCD set was four A-units, obviously with couplers (which could be added behind any A-B set to make an A-B-A). There have been some reports, which we cannot confirm or deny, that some SR units were bought in A-B-B-A sets with drawbars throughout.

Probably the most complex roster was that of the Santa Fe, and we won't even attempt to explain the strange goings-on in Topeka except to note that many of the early units were bought in A-B sets with couplers (that "100" A-B-B-A set in the publicity photos is actually the 100 and 101) and that some later sets were bought in coupler-equipped A-B-B-B configuration! This roster deserves a book on it, and that is just what Wallace W. Abbey is presently completing. Entitled *A Class By Itself*, his book studies the FT and its effect on the Santa Fe. Abbey was very helpful in exchanging data with Preston Cook and R&R which should benefit both his book and our articles. We'll let you know when to expect the book.

At least one technical detail was revealed in EMD's research on the 103 demonstrator while preparing its restoration. We noted that the units had no steam trainline hoses or pilot doors for them; we were only half right. There are no doors, but there was a steam trainline with a flexible hose and standard Barco connector to the left of the couplers on the pilots. "Standard" rigid Barco trainlines with ball-joint articulation required the pilot doors beneath the couplers, but the lack of those doors do not necessarily mean the lack of a steam line. Incidentally, while the hose is missing, that steam line piping is still on the 103/6100 today.

The FTs were unique among diesel locomotives in their quirks of dynamic brakes, steam generators and drawbar-versus-coupler configurations. These are all topics that need to be addressed by any historical societies or authors who are studying individual railroad fleets.

And lastly, slide dealer Al Chione recognized most of the Wollner collection slides used in the October FT PHOTO LINE as being from his sets and was able to identify the photographers and locations for us. That color photo of the FT demonstrator set was taken by none other than Dick Kindig at Burnham in Denver on April 28, 1940 (a similar view is shown in black & white in Strapac's D&RGW book). The CB&Q night photo was taken at Peoria, Ill., by Monty Powell, who also got the GN set at Skykomish and the Katy E8 on page 58 of our July '89 issue (incidentally, Chione also noted that both Katy PAs on that page were by Roger Plummer). The Rock Island FT at Council Bluffs was by Ray Lowry, and the Max Robin collection photo of the Reading FTs was by Bill Price. Thanks again to Al Chione for making it possible to give credit where it is due to these photographers.

BY JIM BOYD

R&LHS PHOTO: BRUCE KLEINSCHMIDT

THE 1990 R&LHS Railroad History Award winners honored at the Denver banquet on June 9, 1990, included (r to l) Preston Cook for the Article Award, George Krambles for the Senior Achievement Award and Jackson C. Thode for the Photography Award. John H. White of the Smithsonian (at left) was presented with a special Society Appreciation Award for his years of service to the R&LHS. The Book Award winner, Professor Keith Bryant, was unable to attend.

The Ninth Annual R&LHS Awards

Denver, Colorado, was the setting for the Railway & Locomotive Historical Society's 1990 convention and Railroad History Awards presentation on June 9. We're very proud to announce that Preston Cook's three-part feature "Electro-Motive's FT Celebrates 50 Years," published in the October, November and December 1989 issues of RAILFAN & RAILROAD, received the David P. Morgan Article Award, recognizing "an outstanding article or paper of lasting significance to the interpretation of North America's railroading history" published during 1988 or 1989. In the words of the awards committee, "Preston's article is a first-rate engineering history. Personalities and design theories, railroad biases and changing conceptions, operating successes and failures — the whole intricate story of the FT's unique genesis and use is told. Formerly an employee of EMD, Preston knows the theory, design concepts and history of General Motors diesel locomotives as well as anyone in the world." Indeed, the wealth of history and data that Preston revealed about the FT model vastly expanded the general knowledge about these historic units and debunked some long-standing myths. In addition, in the process of his research, he made EMD aware of the significance and possibilities of the historic anniversary that was approaching in 1989.

As a direct result of his article, a receptive management at La Grange and some energetic groundwork within the railfan community, EMD was able to retrieve an A-unit from the original 1939 FT 103 demonstrator set from the National Museum of Transport in St. Louis and match it with an appropriate B-unit from the Virginia Museum of Transportation in Roanoke to recreate one half of the A-B-B-A demonstrator set that had made history in 1939 and 1940 by proving that diesel power could outperform steam in freight service. It was a truly rare situation where a research project and magazine article resulted in the restoration of its subject locomotive and encouraged a public display of historic diesels at La Grange on September 16, 1989. Thanks to Preston's efforts, the 50th Anniversary of the FT was considerably more than an HO model and a press release.

FUJICHROME: JACK WHEELIHAN

ELECTRO-MOTIVE'S RESTORED FT demonstrator set 103 made its first public appearance outside of the La Grange plant at the Galesburg (Ill.) Railroad Days celebration on June 2-3, 1990. Shown here on the evening of June 1 as the westbound *California Zephyr* arrived, the 103 was posed with BN SD60M 9200 at the Galesburg depot. The 103 did not attend the NRHS St. Louis national convention because the GMDD locomotive plant at London, Ontario, had put in an earlier request to have the 103 on display for its 40th Anniversary open house on June 16.