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# EMD F40PH

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The **EMD F40PH** is a 4-axle 3,000 hp (2.2 MW) **B-B diesel-electric locomotive**, built by General Motors Electro-Motive Division in several variants from 1975 until 1992 and marketed to [Amtrak](#) and commuter railroads for passenger service.<sup>[1]</sup> F40PH variants were also manufactured by [MK Rail](#) and [MotivePower Industries](#) from 1991 until 2000.<sup>[1]</sup>

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## EMD F40PH series



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## History

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The F40PH series was originally intended to haul short to medium-length trains on Amtrak's shorter routes.<sup>[*citation needed*]</sup> Soon after it entered service

with Amtrak it also began to replace the long-distance [EMD SDP40F](#), Amtrak's first new

locomotive model, which was earning a troubled operational reputation after reports of rough riding and several derailments blamed on its specialized C-C arrangement that differed from EMD's freight C-C locomotives. The F40 concept was developed based on the proven [EMD GP40](#) series freight locomotives using a two axle truck of known reliability. (The term "F40" by itself can lead to confusion, because the first locomotive to bear that designation was the [F40C](#), a passenger C-C locomotive derived from the [SD40-2](#), similar to the SDP40F but with an [HEP](#) generator.)

Hundreds of F40PH units remain in service on passenger, tourist, and freight railroads, such as [CSX](#) (for use on business trains), the [Grand Canyon Railway](#) and the [Algoma Central Railway](#). The F40PH was purchased by many commuter railroads, such as [Metra](#), [MBTA](#), [Tri-Rail](#), [Caltrain](#), [NJ Transit](#) and [GO Transit](#); all except GO Transit still operate these locomotives. Amtrak's large F40PH fleet has been retired, with the locomotives stored, scrapped, sold, or converted into non-powered control units following the purchase of [GE Genesis](#) passenger locomotives in the early 1990s and early 2000s. The largest fleet of these locomotives now operates in the [Chicago metropolitan area](#) on the [Metra](#) system, and totals 117

[Amtrak F40PHR #315](#) leads the *California Zephyr* out of Tunnel #17 near [New castle, California](#) in 1995.

Power type	<b>Diesel-electric</b>
Builder	<a href="#">GM Electro-Motive Division</a> (EMD) <a href="#">General Motors Diesel</a> (GMD)
Build date	1975–1992 (EMD) 1991–2000 (MK / MPI)
AAR wheel arr.	B-B
Gauge	4 ft 8 1/2 in (1,435 mm)
Prime mover	EMD 645E3
Cylinders	V16
Top speed	110 mph (177 km/h)
Power output	3,000–3,200 hp (2.2–2.4 MW)
Nicknames	"screamer" "screaming thunderbox" "zephyr (F40PHM-2)"

units. Included in this fleet is the last F40PH built by EMD (as an F40PHM-2) in 1992, Metra #214. Metra's F40PHM-2s look similar to the [GE Genesis](#). After Metra, Via Rail Canada has the second largest fleet of F40PH-2s which totals 54 units. The [MBTA](#) in Boston has 18 of the original model F40PHs, all but one are in service. The [MBTA](#) also has several aftermarket F40PH-2C & F40PHM-2C locomotives in service built by EMD in 1987-88 and MK in 1991 & 1993.

Commuter agency [Metrolink](#) purchased four second hand from Amtrak with hopes to repower them with prime movers from second hand [EMD SD60s](#) bought from UP. Only one survived, as SCAX #800.

A handful were bought by shortline railways, and some continue to operate today, after receiving a front platform, made possible by shortening the nose.

## Equipment

[\[edit\]](#)

The F40PH is equipped with a [turbocharged EMD 645E3 V16](#) cylinder, two-stroke, water-cooled [diesel engine \(prime mover\)](#) that develops 3,000 hp (2.2 MW) at 916 rpm. The main (traction) [generator](#) converts mechanical energy from the prime mover into electricity that is distributed through a [high voltage](#) cabinet to the [traction motors](#). Each of the four traction motors is directly geared to a pair of [driving wheels](#). The gear ratio of the traction motors to wheel axle determines the maximum operating speed of the locomotive; a standard F40PH has a gear ratio of 57:20 allowing a top speed of 103 mph (166 km/h).

While Amtrak's initial order for thirty F40PH locomotives specified 3,000 horsepower (2.2 MW), the next order (from the [Chicago RTA](#), later to become known as [Metra](#)) increased that specification to 3,200 horsepower (2.4 MW). Amtrak's earlier units were later uprated to this specification as well. A notable exception are the units purchased and operated by [Via Rail Canada](#), which are rated at 3,000–3,200 horsepower (2.2–2.4 MW).

The F40PH has a fully enclosed carbody which provides a cleaner, somewhat more streamlined appearance than those of conventional [hood unit](#) type construction. While en route, all-weather access to components



[Metra](#) EMD F40PHM-2 locomotive #206  
near Stuart Field in Chicago



is possible; passage through the engine room (and to trailing units) normally is used only during maintenance at repair points.

To support passenger service, the F40PH has another electrical alternator known as the [head end generator](#). The HEP unit generates [three-phase AC](#) power at 480 [V AC](#), 750 [A](#) or about 500 kW to provide power to the passenger cars for lighting, heating, and air conditioning. Originally F40PHs all powered the HEP alternator from the 16-645E3 prime mover; head end power must be delivered to the train at a constant frequency, so the prime mover had to turn at a constant 900 RPM while supplying [head end power](#) (even if the locomotive was standing still with the throttle in Idle). Power to the traction motors was controlled by varying the field excitation of the main (traction) generator.

On some later versions of the F40PH (and on many rebuilt F40s) a second small diesel engine at the rear of the locomotive powers the HEP alternator. In these engines prime mover speed varies in the usual way, depending on the traction power needed; they can be identified by the small diesel exhaust at the rear end of the locomotive and by their quiet idle. Remaining F40s with the constant-RPM prime movers have been referred to as "screamers".

The MPI version of the F40PH was built by [Morrison-Knudsen](#).

## Current state

[\[edit\]](#)

### Amtrak NPCU Conversions

[\[edit\]](#)

In later years, as Amtrak's F40PH fleet was being replaced by the newer [GE Genesis](#)-series locomotives, Amtrak converted a number of the retired units—generally ones with major mechanical problems limiting their value in the resale or lease marketplace<sup>[\[citation needed\]](#)</sup>—into "Non-Power Control Unit" [cab cars](#). Commonly known as "Cabbages," a [portmanteau](#) of "cab" and "baggage," these units had their prime movers and traction motors removed, and a large roll-up door installed in the side, allowing the former engine compartment to be used for baggage.



Amtrak non-powered control unit (NPCU) No. 90219 leading the [Blue Water](#) into



The units were renumbered into Amtrak's car-series numbers by adding "90" before the former locomotive number; thus, the original F40PH, number 200, became NPCU number 90200.

Five NPCUs converted for [Amtrak Cascades](#) service in the Pacific Northwest were rebuilt without the roll-up doors found on the other conversions. The [Talgo](#) sets used on these trains have a dedicated baggage car, so these NPCUs are used as cab cars only. Three NPCUs are in use on Amtrak's Downeaster service between Boston, Massachusetts and Portland, Maine.

In 2010, Amtrak owned F40PH 406 was taken out of storage for refurbishing to be used on Amtrak's 40th anniversary exhibit train during 2011 and 2012. It was converted to an NPCU with the intention of enabling push-pull operation of the exhibit train, and an HEP generator prime mover was installed in the carbody to supply auxiliary electricity to the train. Externally 406 resembles an operational F40PH.

[Kalamazoo, Michigan.](#)



[MN F40PH-2CAT 4192](#) enters [Wayne-Route 23](#) in [Wayne, New Jersey](#).

## Extant former Amtrak examples

[\[edit\]](#)

There are currently a few ex-Amtrak locomotives that are in railroad museums, private owners and various commuter agencies; listed by Amtrak road number:

- AMTK 231, owned by Chris Fussell/Friends of [SP 4449](#) in Portland, OR.
- AMTK 237, In Daily Service on the Grand Canyon Railway (GCRX 237).
- AMTK 239, In Daily Service on the Grand Canyon Railway (GCRX 239).
- AMTK 242, Algoma Central (division of Canadian National) Agawa Canyon Tour Train CN 104(Formerly Denver Ski Train SKTX 242)
- AMTK 243, Agence métropolitaine de transport (AMT) 243
- AMTK 256, Metrolink LA (sold, unknown disposition)
- AMTK 258, Metra Chicago metropolitan rail METX 215
- AMTK 265, Maine Eastern Railroad 265, now Transport Ferroviaire Tshiuetin TSH600

- AMTK 269, Age of Steam Foundation, OHCR 460
- AMTK 270, Agence métropolitaine de transport (AMT) 270
- AMTK 280, CSXT 9998
- AMTK 281, Preserved at the California State Railroad Museum in Sacramento, CA.
- AMTK 283, Algoma Central (division of Canadian National) Agawa Canyon Tour Train CN 105 (Formerly Denver Ski Train SKTX 283)
- AMTK 287, Agence métropolitaine de transport (AMT) 287
- AMTK 288, CSXT 9999
- AMTK 289, Algoma Central (division of Canadian National) Agawa Canyon Tour Train CN 106 (Formerly Denver Ski Train SKTX 289)
- AMTK 291, Maine Eastern Railroad 291, now Transport Ferroviaire Tshiuetin TSH601
- AMTK 295, In Daily Service on the Grand Canyon Railway (GCRX 295).
- AMTK 307, Under restoration at the North Carolina Transportation Museum in Spencer, NC.
- AMTK 308, MNCR 4193 (converted to F40PH-2CAT)
- AMTK 310, MNCR 4194 (converted to F40PH-2CAT)
- AMTK 315, TANX 315, Acquired by NCDOT for use on passenger train service between [Raleigh](#) and [Charlotte](#) known as the Piedmont. Currently in storage due to not passing FRA inspection.
- AMTK 319, Agence métropolitaine de transport (AMT) 319
- AMTK 332, Nashville Music City Star / MCS 120
- AMTK 338, Metrolink LA (sold, unknown deposition)
- AMTK 348, Age of Steam Foundation, OHCR 452
- AMTK 363, Tri-Rail 810 (underwent conversion to add separate HEP generator)
- AMTK 365, VRE V33
- AMTK 372, Agence métropolitaine de transport (AMT) 372
- AMTK 375, Metra Chicago metropolitan rail METX 216
- AMTK 376, TANX 376, Acquired by NCDOT for use on passenger train service between [Raleigh](#) and [Charlotte](#) known as the Piedmont. Leased as a freight unit & currently in storage due to not passing FRA inspection.

- AMTK 379, Tri-Rail 811 (underwent conversion to add separate HEP generator)
- AMTK 381, Nashville Music City Star / NERR/MCS 381 (on lease from [NERR](#))<sup>[2][3]</sup>
- AMTK 390, CSXT 9992
- AMTK 395, CSXT 9993
- AMTK 396, Metrolink LA / SCAX 800
- AMTK 398, Nashville Music City Star / MCS 121
- AMTK 399, Nashville Music City Star / MCS 122
- AMTK 400, Agence métropolitaine de transport (AMT) 400
- AMTK 406, Amtrak 40th anniversary exhibit train NPCU
- AMTK 411, Agence métropolitaine de transport (AMT) 411, ex GO Transit 511

## Rebuilding

[\[edit\]](#)

In 2007, [Via Rail](#) awarded CAD Railway Industries a [CAD100 million](#) contract to rebuild its F40s.<sup>[4]</sup> The rebuild program, which is due to finish in 2012, includes HEP generators, new engines, [cruise control](#), cab air-conditioning, jump seat and microwave, sun screen and a new paint scheme.<sup>[5]</sup>

## Variants

[\[edit\]](#)

- EMD F40PH
- EMD F40PHR
- EMD F40PH-2
- CAD/VIA F40PH-2D
- EMD F40PH-2C
- EMD F40PH-2CAT
- EMD F40PHM-2
- M-K F40PHL-2



A rebuilt F40PH-2D leads while an original unit follows.



- M-K F40PHM-2C
- MPI F40PH-2C
- MPI F40PH-3C

## Notes

[edit]

The F40PH-2 does not have red lights above the cab. Instead, the lights are on the nose.

MBTA's F40PH-2Cs have their bells above and in between their two windshields.

VIA Rail's rebuilt F40PH-2Ds have a blister on the rear of the unit for a Head End Power generator.

## Gallery

[edit]



Three [Caltrain](#) F40PH units at [San Francisco](#).



[COASTER](#) F40PHM-2C #2103 at [Encinitas, California](#).



F40PH-2C #1056, operated by [MBTA Commuter Rail](#), enters the [Ruggles](#) station in [Boston, Massachusetts](#).





Via Corridor Train 73 arriving into Windsor, Ontario, August 5, 2007.



A non-powered control unit (NPCU or "cabbage") converted from a retired F40PH.



Tri-Rail F40PH-2C #807 stopped in the West Palm Beach station.



Altamont Commuter Express MPI F40PH-3C #3105 at Pleasanton.



New Jersey Transit F40PH-2CAT #4125 at Summit, NJ.



An M-K F40PHL-2 used for the Tri-Rail commuter rail system in South Florida.



Number 257 at Agnew in 1980, being followed by a pair of [EMD SDP40Fs](#).



Three F40PH locomotives used on Nashville's [Music City Star](#) commuter rail service. Note that the farthest right unit is painted in Amtrak's *Pacific Surfliner* scheme.





## See also

[[edit](#)]

- [List of GM-EMD locomotives](#)
- [List of GMD Locomotives](#)

## References

[[edit](#)]

1. <sup>^</sup> <sup>*a*</sup> <sup>*b*</sup> [McDonnell, Greg. \*Field Guide to Modern Diesel Locomotives\*. Kalmbach Books.](#)
2. <sup>^</sup> <http://www.railpictures.net/viewphoto.php?id=288497&nseq=0> 
3. <sup>^</sup> <http://www.railpictures.net/viewphoto.php?id=164070> 
4. <sup>^</sup> [VIA Rail Canada and CAD Railway Industries Ltd. Sign \\$100 Million, 5-year Contract to Rebuild 53 F-40 Locomotives](#) 
5. <sup>^</sup> [Backgrounder:The locomotive rebuild program](#) 

## External links

[[edit](#)]

- [F40PH Preservation Society](#) 
- [Amtrak Photo Archives](#) 
- [VIA Rail F40PH Photo Archives](#) 
- ["Diesels on the Northeast Corridor"](#) 



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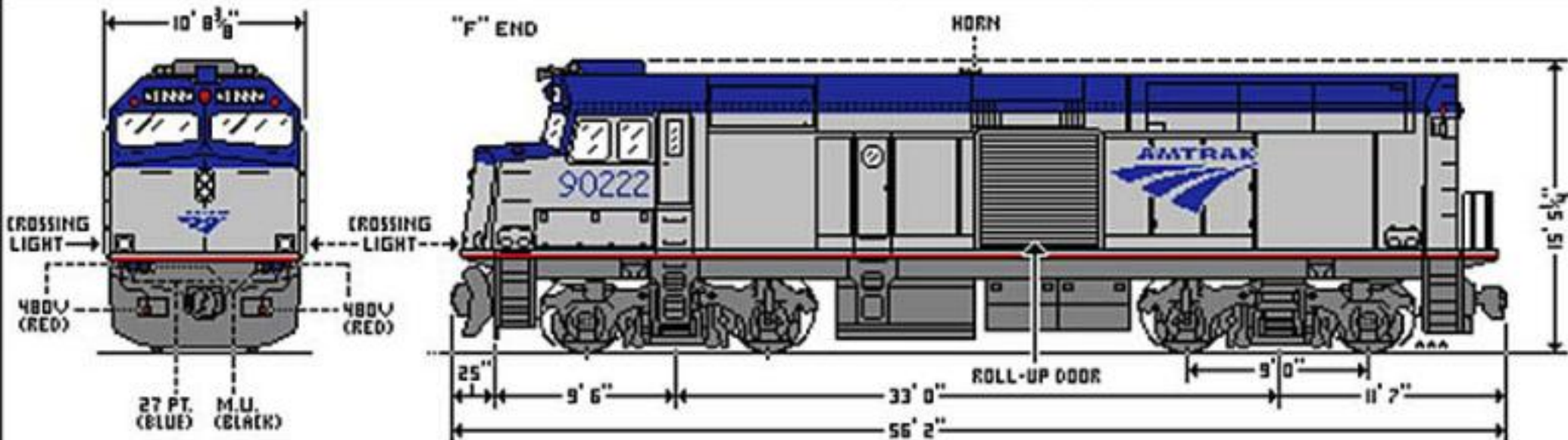
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NON-POWERED CONTROL UNIT.

