

**Table 1.5** Chronology of inventions in urban public transportation

Year	Location	Event
ca. 1600	London	"Hackney coaches"—taxicab services
1612	Paris	"Fiacre"—taxicab service
1662	Paris	First urban public coaches—common carriers, horse-drawn carriage
ca. 1765	England	Invention of steam engine (Watt)
1825	Stockton-Darlington, England	First railway opened (Stephenson)
1826	Nantes, France	First horse-drawn omnibuses
1832	New York	First horse-drawn streetcar line
1838	Boston	First commuter fares on a railway line
1838	London	First suburban railway service
1863	London	First underground rapid transit line
1868	New York	First elevated rapid transit
1873	San Francisco	Invention of cable car (Hallidie)
1876	Germany	Invention of internal combustion engine (Otto)
1879	Berlin	First application of electric motor for traction (Siemens)
1881	Berlin	First electric streetcar (Siemens)
1882	Hallensee, Germany	Demonstration of the first trolleybus (Siemens)
1883	Germany	First lightweight ICE (Daimler)
1886	Mannheim, Germany	First ICE-powered automobile built (Benz)
1886	Montgomery, Alabama	Invention of underrunning spring-loaded trolley pole for streetcars (Van Depoele)
1888	Richmond, Virginia	First successful major electric streetcar line (Sprague)
1890	London	First rapid transit with electric traction
1892	Germany	Invention of compression-ignition engine (Diesel)
1893	Ohio and Oregon	First interurban lines
1897	United States	Invention of multiple-unit train control (Sprague)
1897	Boston	First streetcar tunnel
1899	Great Britain	First motorbuses
1901	Wuppertal, Germany	First successful monorail
1901	Fontainebleau, France	First trolleybus line in operation (Lombard-Gerin)
1902	Bielatal, Germany	Practical overhead power pickup for trolleybus (Schiemann)
1904	New York	First four-track rapid transit subway line for local and express services
1914	United States	Introduction of jitneys
ca. 1920	United States	Use of pneumatic tires for buses
ca. 1927	Nottinghamshire, England	Introduction of diesel motors for bus propulsion
1936	Brooklyn, New York City	First PCC car in service
1955	Düsseldorf	First modern articulated streetcar, contributing to the development of LRT mode (DÜWAG)
1955	Cleveland	First extensive park-and-ride system (with rapid transit)
1956	Paris	First rubber-tired metro
1957	Hamburg	First rapid transit with one-person train crews
Late 1950s	West Germany	First modern articulated buses and trolleybuses
1962	New York	First fully automated rapid transit line (42nd Street shuttle)
1960s	Europe	Widespread use of self-service fare collection
1966	Hamburg	First Transit Federation ( <i>Verkehrsverbund</i> ) with integrated fares and services
1968	Victoria Line, London	First automated fare collection with graduated fare

**Table 1.5** (*continued*)

<i>Year</i>	<i>Location</i>	<i>Event</i>
Late 1960s	Western Europe, U.S.	Introduction of transit (LRT, bus) malls
1969	Shirley Highway, Washington	First exclusive busway for commuter transit (later converted into HOV roadway)
Early 1970s	Western Europe, U.S., Japan	First major use of thyristor chopper control of electric motors
1972	BART, San Francisco	First computer-controlled rapid transit system
1970s	United States	Widespread development of innovative types of paratransit services
1974	Dallas-Fort Worth Airport	First fully automated guided transit network with driverless vehicles (AGT) in airport
1975	Morgantown, West Virginia	First AGT system in public service
Late 1970s	Western Europe, United States	Testing of AC electric motors on transit vehicles
1977	San Diego	First wheelchair-lift-equipped bus on transit line
ca. 1978	West Germany	Dual-mode trolleybus with remote trolley pole control
1979	Hamburg	Low-floor bus tested; wide use from late 1980s
From 1980s	Sao Paulo, Curitiba, Ottawa, Pittsburgh	Bus lines on separated lanes and high-frequency service; first BRT systems
1983–88	Lille, Vancouver, London, Miami	First fully automated regular transit lines
1985	Geneva	First 60% low-floor LRT vehicles
1990	Bremen	First 100% low-floor LRT vehicles
1993–2002	Lyon, Paris, Singapore	Fully automated full-size metro lines
Since 1990	Western Europe, U.S.A., Japan, Singapore	Extensive applications of Intelligent Transportation Systems (ITS) technology in transit systems