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Excerpts From Monorail Manufacturer's Maintenance Requirements

MONORAILS

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MANUFACTURER'S REQUIREMENTS

Document No. WLLMONOTP0001

Revision *L*

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DESCRIPTION

The WALT DISNEY WORLD® Resort monorail system consists of three beamway loops, 12 monorail trains and the associated support facilities (roundhouse and spur lines). The *Epcot*® beam provides transportation between *Epcot*® and the Transportation and Ticket Center (TTC). The Express beam links the MAGIC KINGDOM® and TTC, and the Lagoon beam connects the three monorail resorts (Disney's Polynesian Village Resort, Disney's Contemporary Resort, and the Grand Floridian Resort and Spa) with the MAGIC KINGDOM®, TTC and with one other. See Attraction Layout – Express and Lagoon Beams and Spur, and Attraction Layout – Epcot® Beam.

The 12 monorails of the Walt Disney World Monorail system are denoted by their color stripe: red, black, gold, silver, coral, lime, yellow, green, orange, purple, pink, and blue. During normal operation, up to four trains can operate at one time on each of the three beamway loops, depending on desired capacity based on park attendance.

The Mark VI Monorails are electrically powered and operate on 600 volts of direct current transmitted along a pair of stainless steel capped aluminum bus bars. Each of the 12 monorails is powered by eight direct current traction motors with a maximum of 113 horsepower each. Top speed is 40 miles per hour.

Each train consists of a six cars, with each end car containing an operator cab. The middle four cars are electrically powered and contain propulsion and braking for the entire train.

The monorails are designed and engineered to operate in either direction (i.e., they can be operated with Car 1 or Car 6 as the operating cab). Their normal direction of travel is determined by the beam on which they are operating: Cab 1 is the operating cab on the Express and *Epcot*® beams, and Cab 6 is the operating cab on the Lagoon beam.

The monorails can accommodate 316 Guests in a normal load and 364 Guests in a peak capacity load. The two center cars can accommodate two wheelchairs each for a total of four wheelchair spaces per train.

PROCESS CONTROL SYSTEM

Each beam typically has up to four trains operating at one time depending on required capacity. The monorail system uses a floating blocklight system known as MAPO. There are a series of wayside transmitters distributed along each beamway. The spacing between transmitters varies to reflect safe braking distances at the authorized speed limits for each section.

The transmitters are positioned cyclically along the beamway so that every third transmitter issues the same frequency (i.e., f1, f2, f3, f1, f2, f3, etc.). The monorail vehicle onboard computer (VOBC) receives the MAPO signal frequencies via the leading MAPO antenna, which is selected based on the monorail direction of travel (Cab 1 or Cab 6 controlling). Capacitors are installed across four sets of power collector shoes to shunt the MAPO transmitter frequencies. The number of frequencies received by a VOBC provides the information on the number of clear blocks ahead of the train — 3 = green aspect; 2 = yellow; and 1 or 0 = red.

When a red zone is entered, the VOBC initiates emergency braking, which is irrevocable until all of the following conditions are met.

- Train is stationary
- Master controller is in braking position B4
- Two or more MAPO frequencies are received.

RIDE VEHICLE

All of the Mark VI monorails were built by Bombardier, Inc. of Quebec, Canada. The six-car monorails are 203 feet, 6 inches in length. They can accommodate 316 Guests in a normal load and 364 Guests in a peak capacity load, including up to four Guests in the operating cab.

Each fiber-reinforced composite body is mounted on a steel chassis that is supported above the monorail beam by load tires. Each train consists of six cars (see Ride Vehicle). The trains are physically identical and identified by 12 different color stripes (red, black, gold, silver, coral, lime, yellow, green, orange, purple, pink, and blue).

Collector shoes mounted to the frame make contact with the bus bars, transferring power to the drive system. Ride suspension and steering is achieved through the use of load and guide tires. Above each car's floor is the passenger compartment with seats bolted to the floor. The electrical and mechanical equipment [including air conditioning, Propulsion Control System (PCS), audio, and pneumatics] is underneath the floor and behind the skirts. The brakes, motors, and drive trains are located between the cars and covered with a flexible bellows.

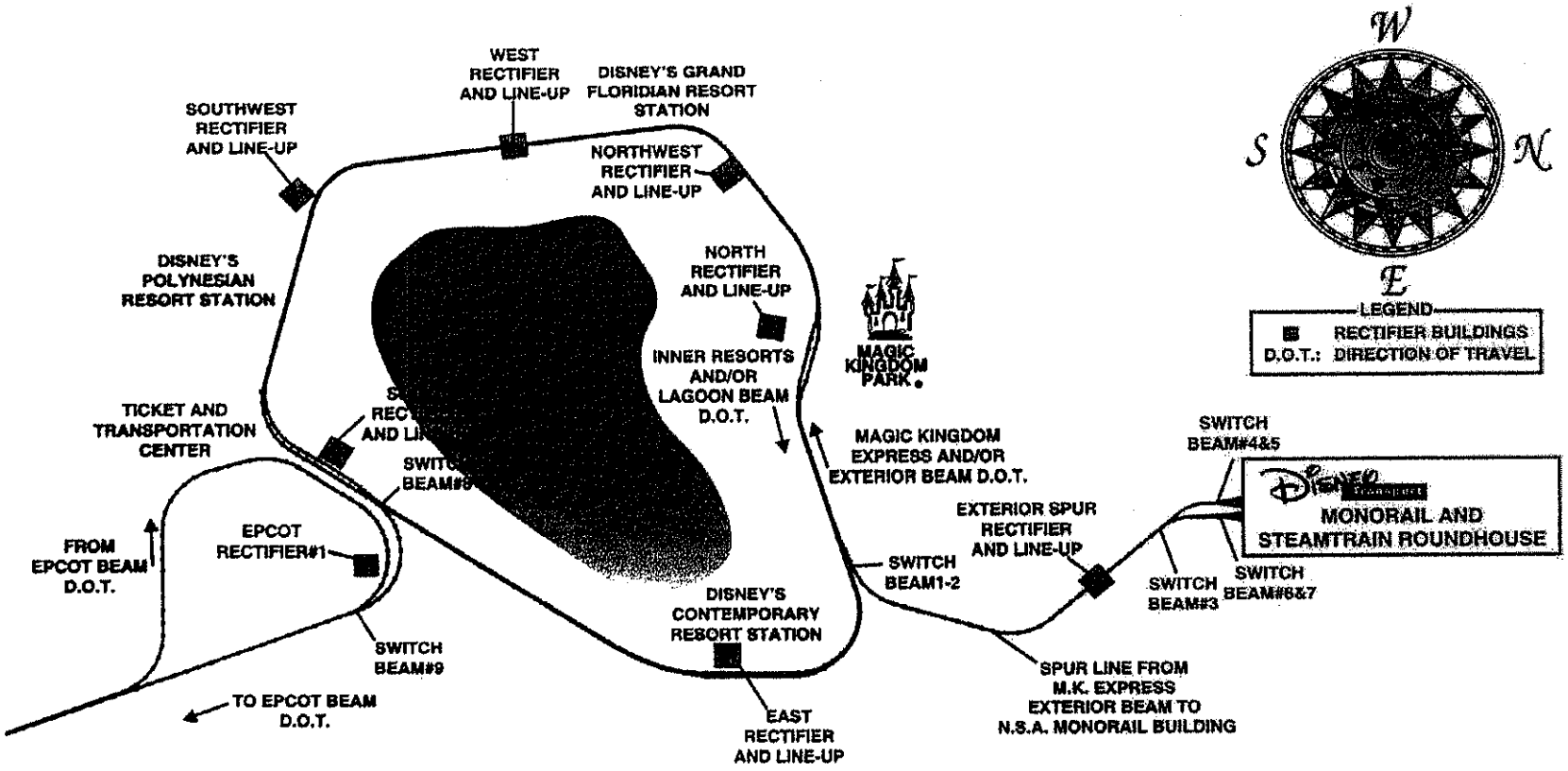
TRACK/GUIDEWAY/FLUME

The monorail system beamway is constructed of precast steel-reinforced concrete beams that are mounted on top either precast pylons or the structure of the building in the stations. A spur track between the Contemporary Resort and Magic Kingdom station connects the Express beamway to the roundhouse in the North Service Area. This spur branches out into 10 storage tracks above the yard leading to the roundhouse. This arrangement provides storage and maintenance facilities for the monorails and for work tractors that ride the rails for inspection and maintenance purposes.

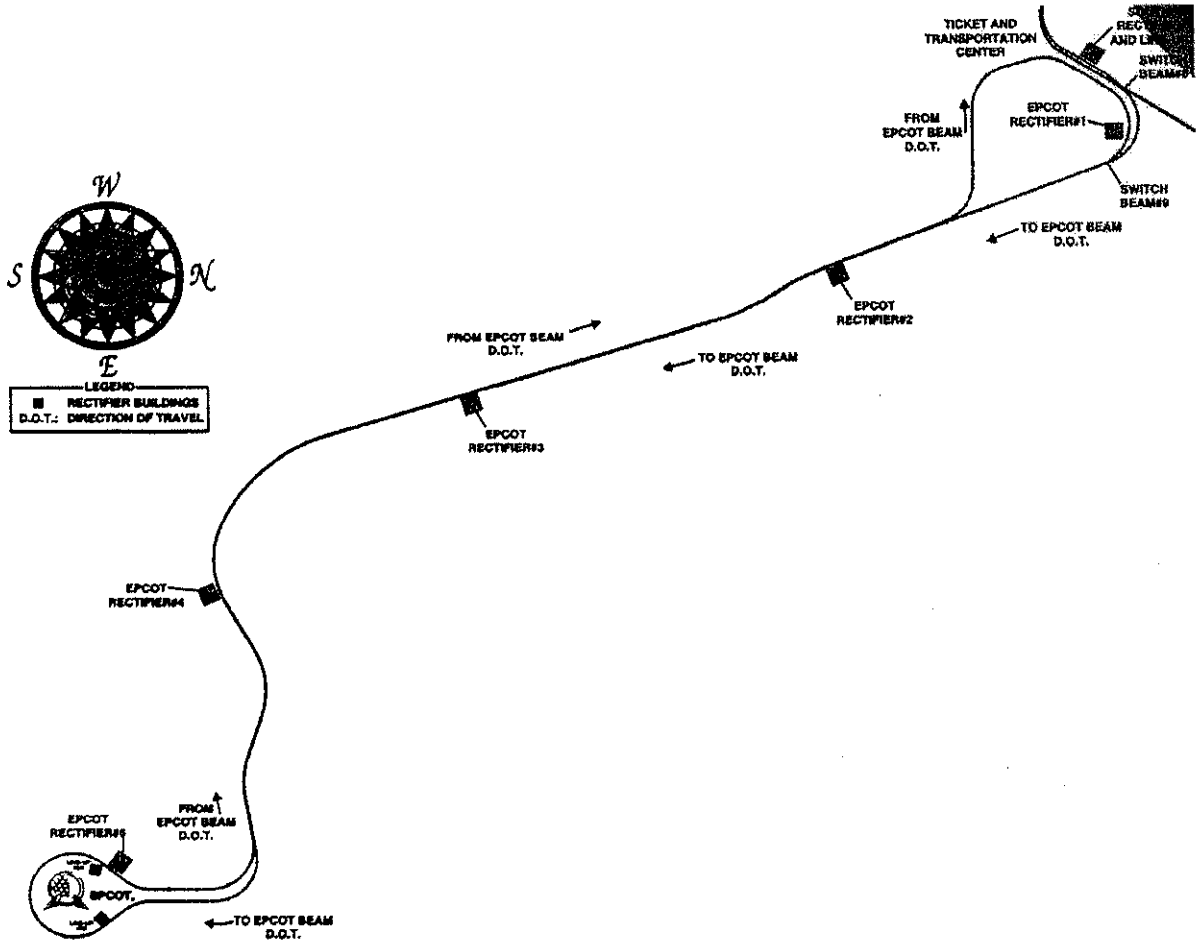
There are 9 switch beams on the beamway system. Main line switches 1 and 2 are located adjacent to the MAGIC KINGDOM® station to direct vehicles between the Lagoon route and the Exterior route, supporting the area resorts and theme park. Switch 2 also diverts vehicles to the roundhouse spur. Service yard switches 3-7, located in the North Service Area, direct vehicles between the individual beams of the monorail shop. Main line switches 8 and 9, which are adjacent to the Ticket and Transportation Center, enable vehicle crossover between the Express and *Epcot*® beamways.

FACILITY STATION GATES

Station gates are controlled barriers that separate the station Load and Unload areas from the vehicle. Gates are controlled by the operator to allow Guests to board or exit the vehicle.



Attraction Layout — Express and Lagoon Beams and Spur



Attraction Layout — Epcot® Beam

FACT SHEET

Ride Name: Walt Disney World® Monorail System

Model Number: Walt Disney World® Monorail System

Ride Serial Number: Walt Disney World® Monorail System

Manufacturer: Walt Disney World® Co.

Sub-Manufacturer: Bombardier

Date of Manufacture:

Monorail trains: 1989 (Mark VI fleet)

Rail system: 1971 Express, Lagoon, Spur & Roundhouse
1974 Roundhouse expansion
1981 Epcot Beam

Ride Speed:

Maximum: 40 mph
Minimum: 0

Direction of Travel: See Attraction Layout

Maximum Total Passenger Weight by Carrier Unit: 62,050 lb

Maximum Number of Passengers by Carrier Unit:

364 per train including space for four wheelchairs

NOTE: Includes seated and standing passengers.

Ride Duration (trip time): Not applicable

Recommended Balance of Passenger Loading and Unloading:

Not applicable

Environmental Restrictions: Not applicable

Recommended Passenger Restrictions: Not applicable

Electrical Power Requirements:

Ride Power Requirements: 600 Vdc supplied by bus bar

Mechanical Power Requirements: 113 HP per motor

Pneumatic Power Requirements:

Operating Pressure: 60 psi (service braking)
80 psi (emergency braking)

Maximum Pressure: 150 psi (main reservoir)

Hydraulic Power Requirements: Not applicable

Water Flow: Not applicable

Physical Information:

Height: Not applicable
Width: Not applicable
Diameter: Not applicable
Weight: Not applicable

Required Operator Positions:

Total Number: 1 per train; 1 per platform at Resort Stations, Epcot, Concourse, TTC and Magic Kingdom, 1 at Central

NOTE: These are the minimum number of required positions to operate the system. Additional positions are generally required from an operational standpoint.

ADDITIONAL INFORMATION

Warning and Instructional Signage:

Attraction Warning Sign:

There are no health or height restrictions.

Rider Instructions On-Board (In-Vehicle) sign:

Do Not Lean Against Door (sign located on car door)
Pull for Emergency Exit (sign located on access door to roof hatch, and window handles)

Rider Instructions Wayside (Facility) sign:

There are no rider instructions signs.

Latest Major Modification: Mark VI vehicle replaced Mark IV, 1989

Number of Vehicles:

Maximum in Operation: 12 – 4 on Epcot, 4 on Express, 4 on Lagoon for normal operation

NOTE: Up to 5 monorails may be placed on any beam if the other beams are not at full capacity. This is not part of normal operation but allows flexibility for special events.

Total: 12

Operating Hours: Approximately 6152 hours annually

Dispatch Interval: Not applicable

Top Assembly Drawings:

Vehicle Assembly: FM-12000
Beam: A-100
Ride Control: Block Light System — CONT-160598
MAPO System

Vehicle

Type: Monorail
Dimensions:
Length: 28 feet, 2 inches – T-Car
40 feet, 5 inches – C-Car
2 feet, 0 inches – Intercar space
203 feet, 6 inches – Train overall
Width: 8 feet, 4-1/2 inches
Height: 10 feet, 5-1/2 inches
Restraints: None

Weight (without passengers): Approximately 122,914 lbs (per train)

Track/Guideway:

Type: Elevated beamway of precast, prestressed concrete supported by precast, prestressed concrete pylons and/or the building structure in the stations.

Dimensions:
Length:
Express & Lagoon Loops: 2.7 miles
Epcot Loop: 7.6 miles
Roundhouse Spur: 0.7 miles

Turntables or Switches: 1 switchbeam connecting Express and spur, 1 switchbeam connecting Express and Lagoon, 2 switchbeams connecting Express and Epcot, spur line has 5 switchbeams leading into 11 roundhouse lines (10 for monorails, one for work tractors)

Drive System:

Onboard: DC electric motors
Wayside: Not applicable

Brake System:

Onboard: Pneumatic full-service braking system (60 psi) and emergency braking system (80psi) in passenger cars; air supplied by onboard electrically powered compressor.
Wayside: Not applicable