
BOEING

ALTHOUGH MOST RAMP EQUIPMENT FOR THE 767 AND 777 WILL SERVICE THE 787-8, OPERATORS SHOULD BE AWARE OF EXCEPTIONS.

Preparing Ramp Operations for the 787-8

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Planning for the introduction of a new airplane requires the participation and cooperation of personnel in virtually all areas of an airline. Though Boeing strives for commonalities with existing airplanes, each new model has its own special requirements for equipment and tools needed for ramp operations. The Boeing 787 Dreamliner is no exception. Management and maintenance personnel can ensure a smooth transition to this new airplane by understanding what it has in common with existing airplanes in the airline's fleet, as well as what is unique, and plan accordingly.

787-8 COMPARED TO OTHER BOEING AIRPLANES

Figure 1

The Boeing 787-8 is similar in size to the 767-300ER. However, the 787-8 has a longer wing span.

AIRPLANE	777-300ER	787-8	767-300ER
			
LENGTH	242 ft 4 in (73.8 m)	186 ft 1 in (56.7 m)	177 ft 9 in (54.2 m)
WING SPAN	212 ft 7 in (64.8 m)	197 ft 3 in (60.1 m)	156 ft 1 in (47.6 m)
TAIL HEIGHT	61 ft 10 in (18.8 m)	55 ft 6 in (16.9 m)	52 ft 7 in (16.0 m)

Preparing for new equipment ahead of time will help guarantee a smooth transition to the 787. This article provides a preliminary assessment of general 787-8 ramp equipment requirements.

787-8 RAMP SERVICING

To prepare to service the 787 at the ramp, operators need to have basic information about the airplane's dimensions (see fig. 1), servicing locations (see fig. 2), and typical servicing arrangement (see fig. 3).

Boeing estimates that a 787-8 dual-class airplane with 275 passengers deplaning and boarding through a single door and taking on a full load of fuel can be turned around at the gate in approximately 44 minutes (see fig. 4).

TOWING REQUIREMENTS

The 787-8 shares a common towbar nose tow fitting with the 767 and 777. As with Boeing airplanes, the 787-8 towbar has a unique shear pin. Boeing towbar specification drawing K09001 provides data on towing loads, which can be accessed through the Web portal MyBoeingFleet.com.

The 787-8 can use the same tow tractor as the 777. With a maximum taxi weight of 486,000 pounds (220,446 kilograms), the tow tractor should have a design weight of 75,600 pounds (34,291 kilograms) and a drawbar pull of 34,020 pounds (15,431 kilograms). The coefficient of friction between the tractor tire and pavement used is 0.45. The 787-8 is also compatible with towbarless vehicles. As with the 777, the amount that a towbarless vehicle is used for dispatching a 787-8 for flight is limited to 25 percent. The Service Letter 787-SL-09-001 contains details on towbarless towing and has been updated to include the 787.

ELECTRICAL POWER

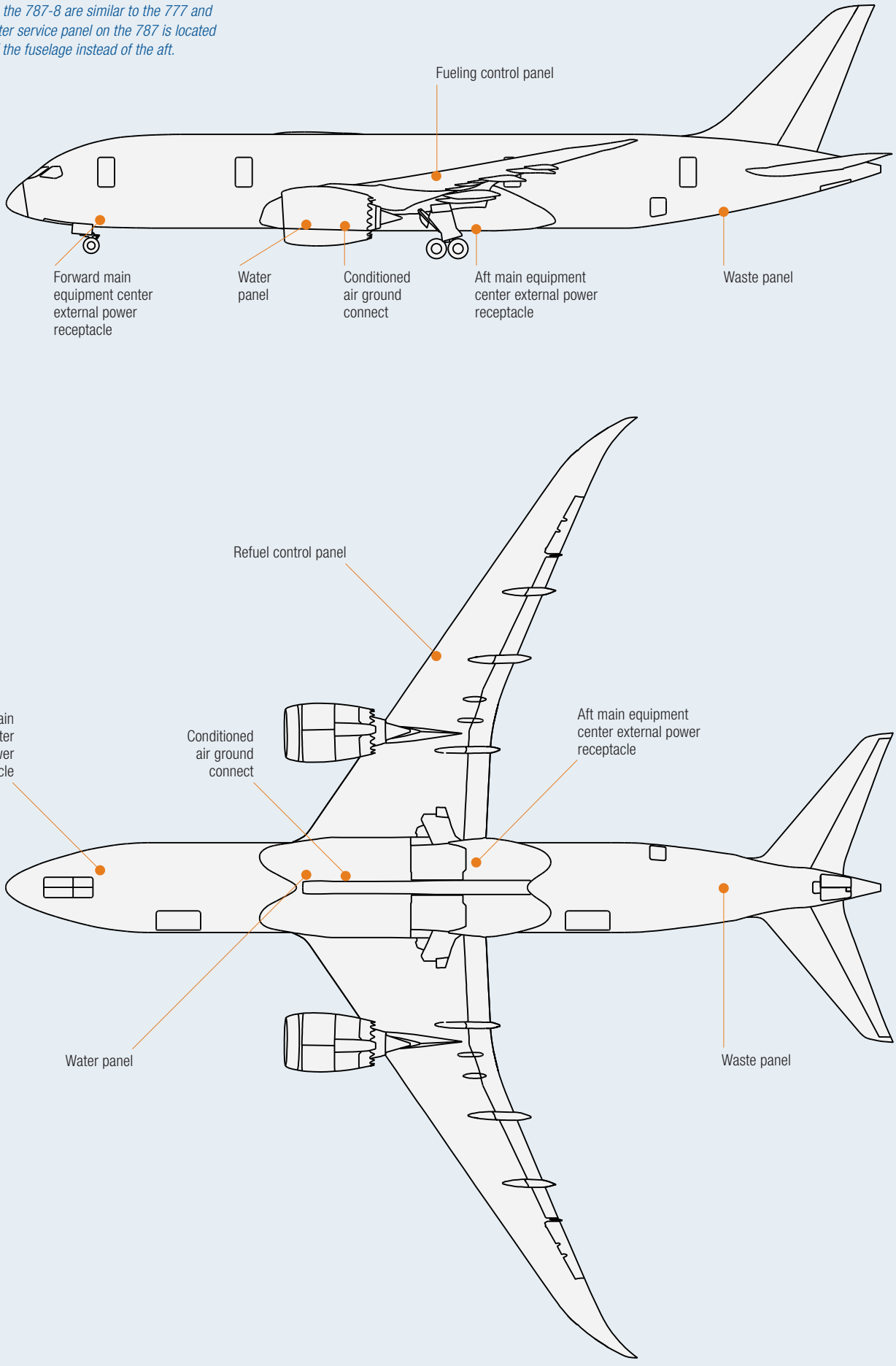
The 787-8 airplane utilizes two forward ground power receptacles and one mid-aft ground power receptacle. Receptacle ground heights are minimum 81 inches (206 centimeters) and maximum 108 inches (274 centimeters). Each receptacle is rated at 90 kilovolt amperes (KVA), the same as other Boeing twin-aisle production airplanes.

Similar to existing airplanes, the 787 utilizes power from the auxiliary power unit (APU) for engine start. The 787 is different in that it uses electrical power for engine start rather than the pneumatic power used on existing airplanes.

787-8 AIRPLANE SERVICING LOCATIONS

Figure 2

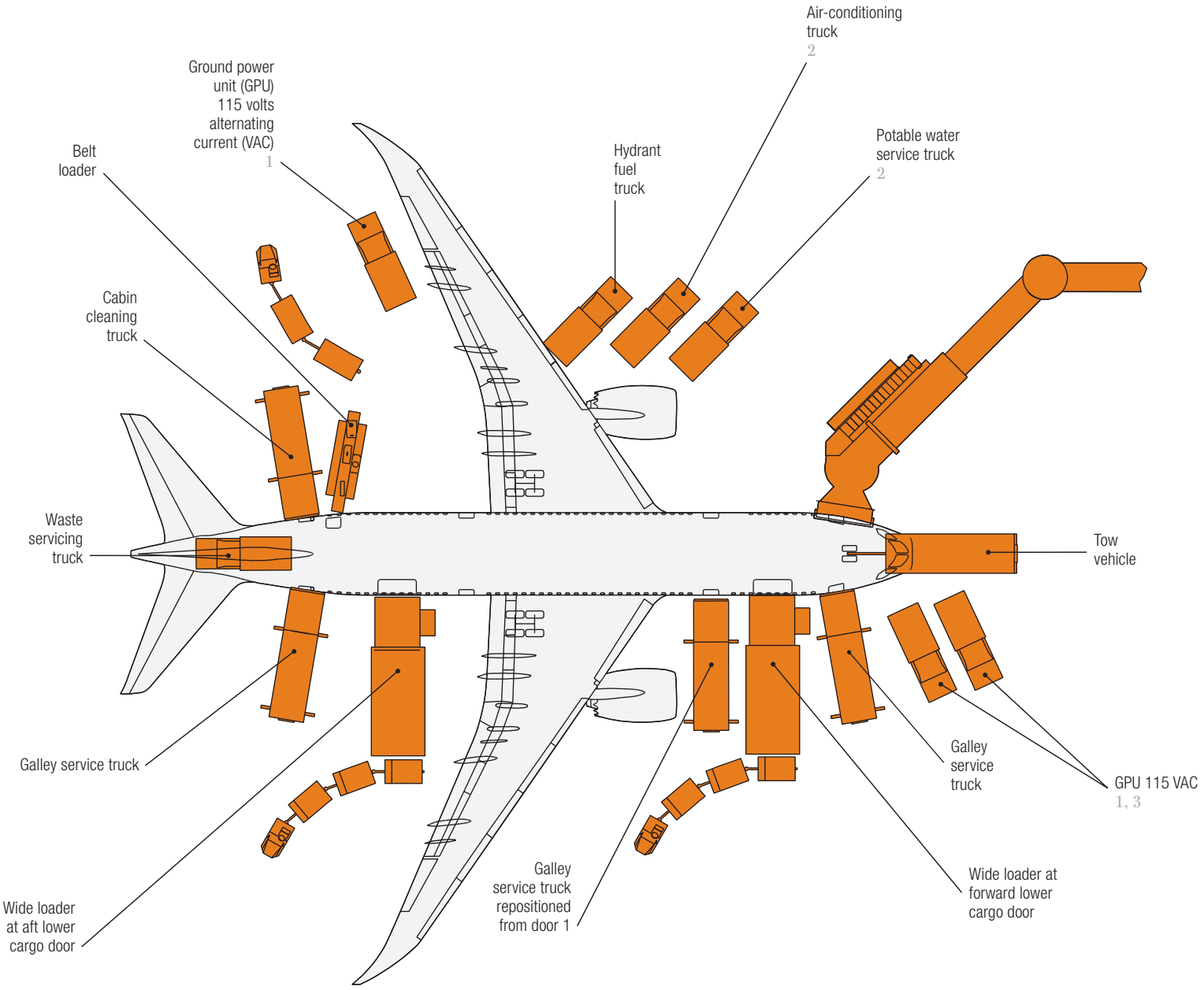
Servicing locations on the 787-8 are similar to the 777 and 767. However, the water service panel on the 787 is located on the forward part of the fuselage instead of the aft.



787-8 AIRPLANE SERVICING ARRANGEMENT

Figure 3

This figure shows a typical ground servicing arrangement for a 787-8 airplane. Note that three ground power sources are used when the APU is inoperative.



1 Not necessary for APU-assisted engine start.

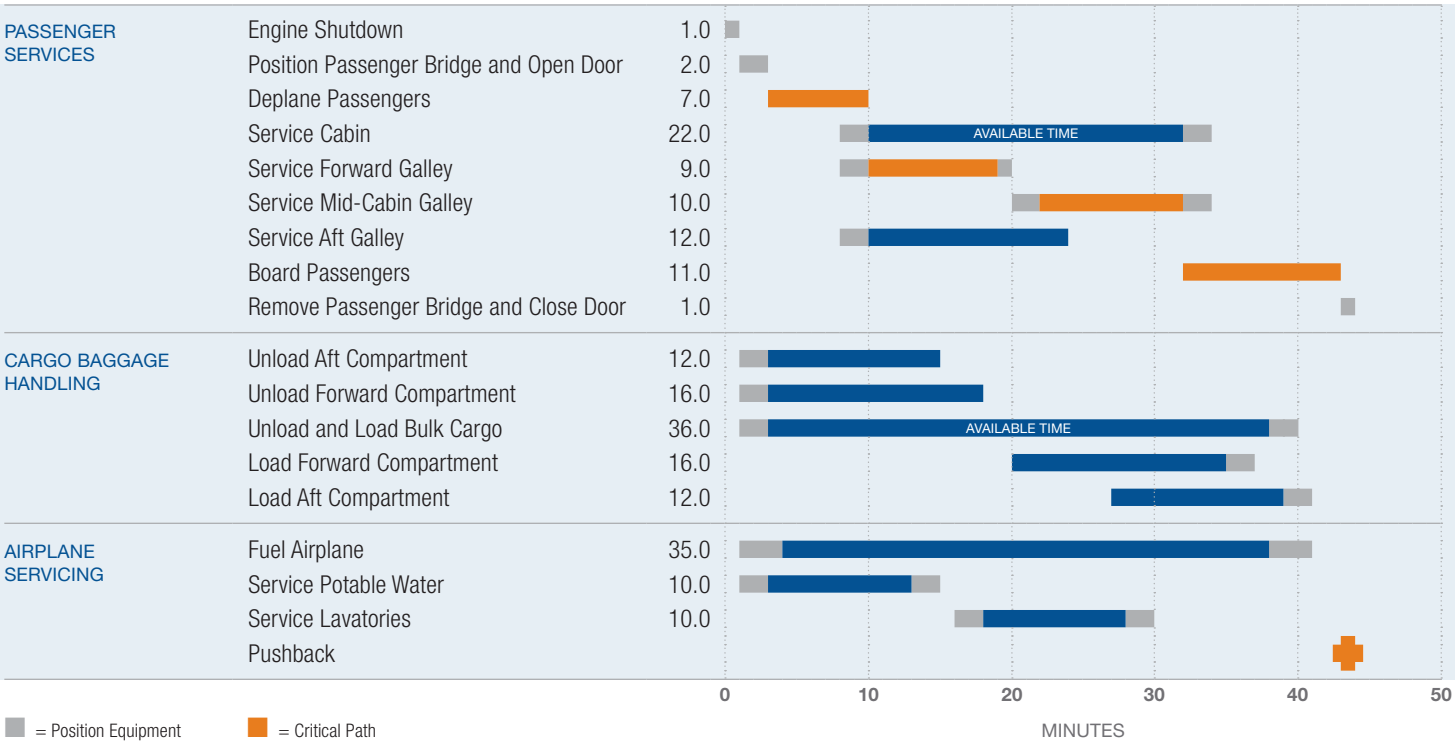
2 Potable water, ground power, and/or air-conditioning may be supplied from the passenger bridge if so equipped.

3 Airplane electrical receptacles are located on the left side of the airplane. (The GPUs are shown on the right side mainly due to congestion around passenger bridge at the left forward door.)

787-8 SERVICING ESTIMATE

Figure 4

Boeing estimates that a 787-8 airplane with 275 passengers can be turned around at the gate in less than 45 minutes.



PARAMETERS

- *100% passenger and cargo exchange*
- *275 passengers, 2 classes, 1 door*
- *2 galley service trucks*
- *1 lavatory service truck*
- *Passenger deplane rate is 40 per minute*
- *Passenger boarding rate is 25 per minute*
- *Unload and load bulk cargo is available time*
- *Cabin service is available time*
- *12 containers aft*
- *16 containers forward*
- *29,798 U.S. gallons fuel loaded, 3,730-U.S. gallon (14,120-liter) reserve 2 nozzle hydrant fueling at 50 psi*
- *Bulk cargo in bulk compartment at 75% utilization and 8.5 pounds per cubic foot*

If the APU is inoperative, an engine start can be performed using a minimum of two 90 KVA external ground power units (GPUs). Boeing recommends the use of three 90 KVA ground power sources to decrease engine start times and minimize ramp impact during ground operations. Same as the 777 and other twin-aisle airplanes, the ground power requirements must conform to the electrical power quality requirements specified in figure 5.

DOOR LOCATIONS AND DIMENSIONS

The 787-8 is equipped with eight passenger entry doors — four on each side of the airplane — two cargo doors on the right side, and one bulk cargo door on the left side (see fig. 6). Passenger stairs and bridges are common with 767 and 777 airplanes.

FUELING

The total fuel capacity for the 787-8 is 33,528 U.S. gallons (126,917 liters). A fueling control panel is installed in the left wing only. The left wing has a fueling panel with two receptacles, each rated for 500 U.S. gallons per minute (1,893 liters per minute) at 55 pounds per square inch (psi) gauge (379 kilopascal).

Any standard fuel truck (i.e., hydrant/tanker) with the appropriate length fuel line that can reach the 787-8 receptacles can be used. Fuel receptacle ground height for the 787-8 and other Boeing airplanes is shown in figure 7.

Assuming a 3,730-U.S. gallon (14,120-liter) reserve, the 787-8 can be refueled to capacity in 35 to 60 minutes, depending on the fuel pressure.

CARGO SYSTEM

The 787-8 has forward- and aft-powered cargo compartments (see fig. 8), as well as a compartment for bulk cargo.

GROUND POWER REQUIREMENTS

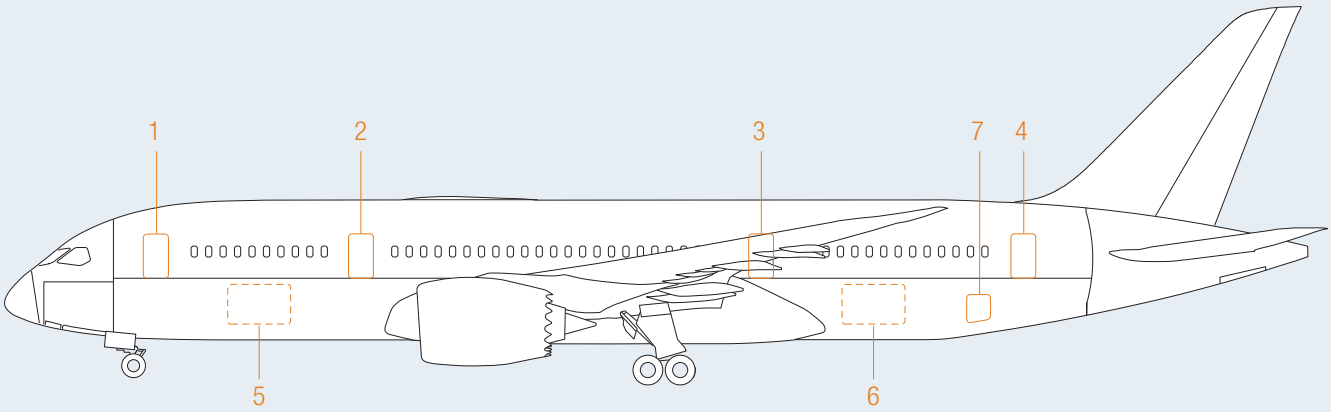
Figure 5

	PARAMETER	787 GROUND POWER EQUIPMENT REQUIREMENTS (EXTERNAL POWER BUS PROTECTION)
POWER CONSUMPTION	Maximum power consumption (per receptacle)	90 kilovolt amperes (KVA) (continuous)
	Peak power consumption (per receptacle)	112.5 KVA, 0.75–1.0 pico-farad per receptacle (5 minutes)
VOLTAGE REQUIREMENTS	Normal voltage range	115/200 +/– 2 volts alternating current (VAC)
	Allowable voltage range	115 +/– 5 VAC L–N root mean square (RMS)
FREQUENCY REQUIREMENTS	Normal frequency	400 +/– 5 Hertz (Hz)
	Allowable frequency range	400 +18/–15 Hz
MAXIMUM DISTORTION FACTOR	Total harmonic content	3% of fundamental
	Individual harmonic content	2% of fundamental
	Crest factor	1.414 +/– 0.07
	Maximum voltage modulation factor	2.5 V peak to valley (0.5%)
EXTERNAL POWER BUS PROTECTION (ON AIRPLANE)	115 V bus, overvoltage	Above 182 VRMS (2.5 +/– .5 second [sec]) = “trip” 132 VRMS – 129 VRMS (2.5 +/– 0.25 sec) = “may trip”
	115 V bus, undervoltage	Below 103 VRMS (0.5 +/– 0.25 sec) = “trip” 103 VRMS – 106 VRMS (0.5 +/– 0.25 sec) = “may trip” * Undervoltage trip inhibited during fault conditions when over current is present
	Overfrequency	Above 430 Hz (1.0 +/– 0.2 sec) = “trip” 425 Hz – 430 Hz (1.0 +/– 0.2 sec) = “may trip”
	Underfrequency	Below 370 Hz (1.0 +/– 0.2 sec) = “trip” 370 Hz – 375 Hz (1.0 +/– 0.2 sec) = “may trip”

787-8 DOOR LOCATIONS AND DIMENSIONS

Figure 6

LOCATION	1	2	3	4	5	6	7
DOOR	Passenger entry door 1 (left side)	Passenger entry door 2 (left side)	Passenger entry door 3 (left side)	Passenger entry door 4 (left side)	Forward cargo door (right side)	Aft cargo door (right side)	Bulk cargo door (left side)
MAXIMUM GROUND HEIGHTS	185.5 in (471.2 cm)	185.2 in (470.4 cm)	188.4 in (478.5 cm)	194.2 in (493.3 cm)	108.2 in (274.8 cm)	114.4 in (290.4 cm)	118.9 in (302.0 cm)



FUEL RECEPTACLE GROUND HEIGHT
Figure 7

AIRPLANE	777-300ER	787-8	767-300ER
FUEL RECEPTACLE (MAXIMUM GROUND HEIGHT)	215 in (547 cm)	210 in (533 cm)	176 in (447 cm)

Standard lower lobe loaders can be used with pallets loaded with the 96-inch (244-centimeter) side through the door, similar to 777 airplanes. In order to properly align the last two containers on the loader, Boeing recommends the use of loaders with side-shift capability on the loader front platform (e.g., bridge).

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The bulk cargo compartment has a volume of 402 cubic feet (11.38 cubic meters). Standard belt loaders with the capability to reach the cargo door sill height (see fig. 9) can be used on 787-8 airplanes.

WASTE SYSTEM

The 787-8 uses a vacuum waste system similar to the 767 and 777. A single aft servicing panel with standard connections is used to service the system. Servicing heights are minimum 107 inches (272 centimeters) and maximum 119 inches (302 centimeters).

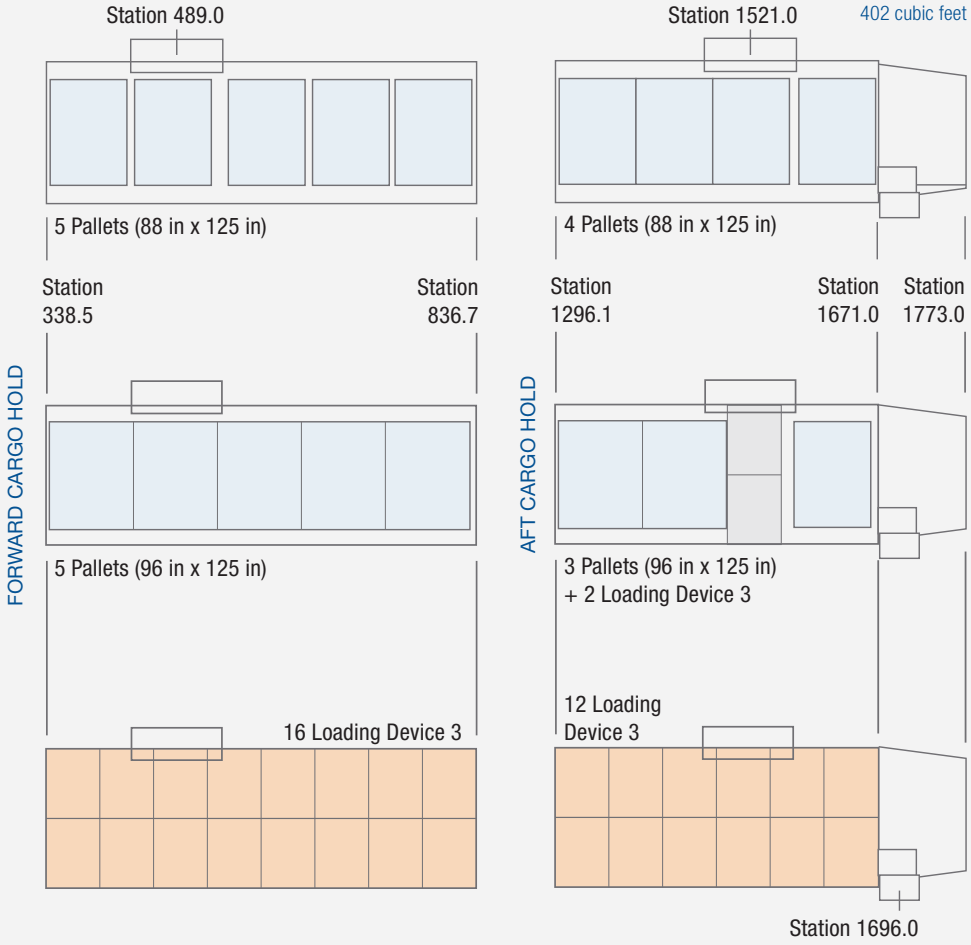
At 430 U.S. gallons (1,628 liters), the 787 has a greater waste tank capacity than any other Boeing airplane because the drain masts have been deleted from the 787. All gray water drains into the waste tanks.

As a result, the service truck needs to accommodate the 430 U.S. gallons (1,628 liters) of waste and 100 U.S. gallons (379 liters) of flush water used to rinse waste tanks. (Some 10 to 50 U.S. gallons [38 to 189 liters] of water is used to rinse each tank during servicing.) If the tanks are full, a 530-U.S. gallon (2,006-liter) service truck is recommended. A lavatory service truck common to the 767 and 777 may be used.

POTABLE WATER SYSTEM

Potable water on the 787-8 is stored in unpressurized tanks located behind the bulk cargo compartment. Two 135-U.S. gallon (511-liter) tanks provide a total capacity of 270 U.S. gallons (1,020 liters). An ultraviolet water treatment system is provided in the water tank fill line. Water treatment takes place during upload of water into the airplane. Electric pumps provide water pressure.

787-8 CARGO CONFIGURATIONS
Figure 8



The basic configuration has a single servicing panel located just forward of the wing.

Potable water servicing trucks should have a tank capacity of 270 U.S. gallons (1,020 liters) with a water pressure of 30 psi. Servicing heights are minimum 76 inches (193 centimeters) and maximum 77 inches (196 centimeters). Trucks common with the 767 and 777 may be used.

AIR-CONDITIONING

To provide air-conditioning to the airplane from an external source, a 90-ton air-conditioning/heater unit is recommended. The 787-8 has one standard air-conditioning servicing connection with a minimum ground height of 71 inches (180 centimeters) and maximum ground height of 79 inches (201 centimeters). Trucks used to provide conditioned air to the 787-8 are common with the 767 and 777 airplanes.

SUMMARY

The majority of current ramp equipment for the 767 and 777 will service the 787-8. However, operators should be aware of these possible ground service equipment requirements:

- Additional GPUs may be needed for ground power and engine start.
- The 787-8 has a unique towbar shear pin.
- Newer cargo loaders with side-shift capability on the loader front platform (e.g., bridge) are recommended.
- Lavatory service truck capacity for 787 operations should be evaluated.

For more information, please contact Jo Fossen at jeonalyn.c.fossen@boeing.com.

RAMP SERVICING EQUIPMENT COMPARISON

Figure 9

AIRPLANE	777–300ER	787-8	767–300ER
			
RAMP EQUIPMENT			
MAXIMUM DESIGNED TAXI WEIGHT	777,000 lb (352,441 kg)	486,000 lb (220,446 kg)	413,000 lb (187,334 kg)
TOW TRACTOR	54,390 lb (24,671 kg) drawbar pull	34,020 lb (15,431 kg) drawbar pull	24,780 lb (11,240 kg) drawbar pull
TOWBAR*	■ Nose tow fitting common with 767 and 787 ■ Unique 777 shear pin diameter	■ Nose tow fitting common with 767 and 777 ■ Unique 787 shear pin diameter	■ Nose tow fitting common with 777 and 787 ■ Unique 767 shear pin diameter
ELECTRICAL POWER	Two 90 KVA sources (two external receptacles) ■ Maximum ground height: 118 in (300 cm)	Three 90 KVA sources (four external receptacles) ■ Maximum ground height: 108 in (274 cm)	One 90 KVA source ■ Maximum ground height: 97 in (246 cm)
LOWER LOBE CARGO LOADER WITH SIDE SHIFT CAPABILITY	Standard width loader (96 in + between guides) ■ Maximum door ground height: 141 in (358 cm)	Standard width loader (96 in + between guides) ■ Maximum door ground height: 114 in (290 cm)	Wide loader (125 in between guides) ■ Maximum door ground height: 101 in (257 cm)
BULK CARGO LOADER	Standard belt loader ■ Maximum door ground height: 148 in (376 cm)	Standard belt loader ■ Maximum door ground height: 114 in (290 cm)	Standard belt loader ■ Maximum door ground height: 102 in (259 cm)
CONTAINERS (BASIC)	Fwd lower lobe: 24 loading device 3, or 8 pallets (96 in x 125 in) Aft lower lobe: 20 loading device 3, or 6 pallets (96 in x 125 in)	Fwd lower lobe: 16 loading device 3, or 5 pallets (96 in x 125 in) Aft lower lobe: 12 loading device 3, or 4 pallets (96 in x 125 in)	Fwd lower lobe: 16 loading device 2, or 4 pallets (96 in x 125 in) Aft lower lobe: 14 loading device 2
FUEL TRUCK	Total airplane fuel capacity: 47,890 U.S. gal (181,283 l) ■ Maximum fuel receptacle height: 215 in (546 cm)	Total airplane fuel capacity: 33,528 U.S. gal (126,917 l) ■ Maximum fuel receptacle height: 210 in (533 cm)	Total airplane fuel capacity: 24,140 U.S. gal (91,380 l) ■ Maximum fuel receptacle height: 175 in (445 cm)
AIR-CONDITIONING TRUCK **	Two standard 8-in connector ■ Maximum ground height: 103 in (262 cm)	One standard 8-in connector ■ Maximum ground height: 79 in (201 cm)	One standard 8-in connector ■ Maximum ground height: 90 in (229 cm)
AIR START CART ***	Three standard 3.5-in diameter connectors ■ Maximum ground height: 102 in (259 cm)	N/A	Two standard 3.5-in diameter connectors ■ Maximum ground height: 84 in (213 cm)
POTABLE WATER TRUCK	One service panel ■ Total airplane capacity: 327 U.S. gal (1,238 l) ■ Maximum ground height: 129 in (328 cm)	One service panel ■ Total airplane capacity: 270 U.S. gal (1,022 l) ■ Maximum ground height: 77 in (196 cm)	Two service panels ■ Total airplane capacity: 149 U.S. gal (564 l) ■ Maximum ground height: 81 in (206 cm)
LAVATORY WASTE TRUCK	One aft service panel ■ Total waste tank capacity: 249 U.S. gal (943 l) ■ Maximum ground height: 132 in (335 cm)	One aft service panel ■ Total waste tank capacity: 430 U.S. gal (1,628 l) ■ Maximum ground height: 119 in (302 cm)	One aft service panel ■ Total waste tank capacity: 116 U.S. gal (439 l) ■ Maximum ground height: 114 in (290 cm)

* Towbar designs vary among manufacturers.

** The size of the air-conditioning truck is dependent upon outside temperature, humidity, and cabin conditions, (i.e., number of passengers, electrical load).

*** Air start requirements are dependent on ambient temperature and altitude. Please refer to the airplane's Maintenance Facility and Equipment Planning Document (777 [D626W001] and 767 [D6-48646]).