





**Premium customers expect options.**

Mazda North American Operations is excited to expand its powertrain offerings with the addition of the Skyactiv-D 2.2-liter diesel engine in the popular Mazda CX-5. It has been a journey to get here, but we have never wavered in our commitment to deliver this premium driving experience.

Diesel engines appeal to a unique customer base. This press kit was developed to demonstrate how Mazda aligned its Skyactiv-D engine with those premium diesel customers. Throughout these pages, you'll discover the impact Mazda's diesel engine has made globally, the product philosophy and intention to place it within the 2019 CX-5 Signature, and most of all, how this benefits those who matter most: our fans.



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# MAZDA

Mazda is on a journey to premium.

Mazda vehicles are more than a mode of transportation, they are created to be part of the journey and help enliven the adventure for all those who are part of the ride.

Sophisticated engineering and elegant design define Mazda vehicles. They captivate and uplift fans through craftsmanship, performance and refined beauty. Every component has a purpose, designed to enhance the driving experience. Fueled by an abiding thirst for challenge and uncompromising beliefs.

Mazda aims to create an emotional bond and enrich people's lives through a premium vehicle ownership experience that celebrates driving.





## WHY DIESEL?

The introduction of Mazda's Skyactiv-D 2.2-liter diesel engine to the U.S. powertrain lineup addresses the strong demand for a diesel option that offers a premium driving experience. With options for diesel customers reduced in recent years, Mazda is excited for the Skyactiv-D engine to help the brand expand to a new and unique customer base.

These developments lead to great success for Skyactiv-D globally. In Japan, Mazda pioneered the clean diesel market for passenger cars. From 2012 to 2015, diesel sales grew

from less than one percent to 5.7 percent of the industry and Mazda accounts for about 70 percent of those diesel sales. In Europe, Mazda has always acted well in advance to meet regulatory requirements in that region. Now, in North America, Mazda has worked closely with all proper federal and state agencies, such as CARB and EPA, to ensure the 2019 CX-5 Signature Skyactiv-D passes all appropriate regulations, while also retaining the direct and intuitive driving character of a Mazda.

Furthermore, Skyactiv-D played a role in Mazda's

motorsports history, with production-based engines racing in Grand-Am Road Racing and International Motor Sports Association. This experience helped Mazda demonstrate the durability and performance of its high-torque Skyactiv-D engine, while providing engineers with key learning to advance the production engine.

The 2019 CX-5 Signature Skyactiv-D provides a high torque driving experience and revs freely at high RPMs, making it an attractive crossover SUV for fans who care about performance and enjoy the outdoors.

SKYACTIV-D 2.2L





## LOW COMPRESSION DIESEL

Mazda's Skyactiv-D 2.2-liter diesel engine reflects the same innovative thinking as its gasoline-powered cousins, the Skyactiv-G engines. Mazda engineers took the same approach, conceptualizing the ideal state for a small passenger diesel engine, unconstrained by current technological limitations, and back casting from this ideal state to figure out how to advance the state of the art.

Until recently, the common approach to passenger diesel engines was to downsize large scale technologies used in commercial applications. This results in efficient but heavy, overbuilt engines with less than ideal combustion and responsiveness. These

characteristics may benefit powering commercial trucks and heavy hydraulic equipment but are typically unable to deliver a premium driving experience that Mazda vehicles are known for.

Mazda engineers realized that many of the obstacles in passenger diesel engine design could be overcome by taking a counterintuitive approach. Instead of seeking higher compression ratios and higher theoretical efficiencies, small diesel engines could be made to be cleaner and more exhilarating to drive by using a lower compression ratio. The Skyactiv-D separates itself from industry trends for small passenger diesel design and utilizes a very low 14.4:1 compression ratio.



## LIGHTWEIGHT BENEFITS

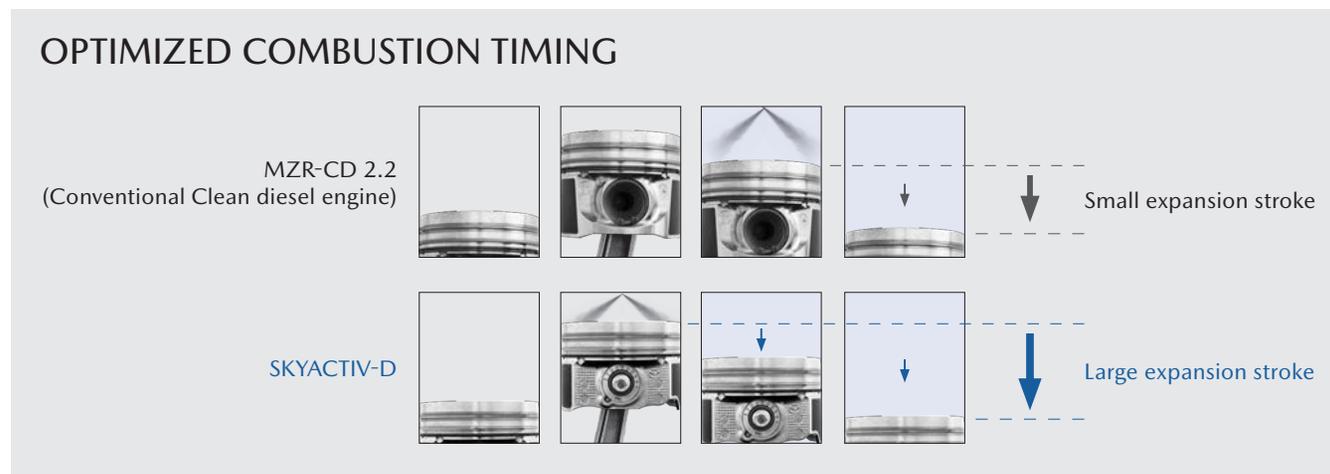
One obvious benefit of using a lower compression ratio is the reduction in overall weight, reciprocating mass and friction. Because a lower compression ratio results in lower peak cylinder pressures, the pistons, rods, block and combustion chamber do not have to be as overbuilt, resulting in less material weight. Lower combustion pressures also mean that piston rings that seal in the fire and heat of combustion don't have to be under as much ring tension to push against the cylinder walls to maintain a seal. Less ring tension results in less friction and drag.

Less overall weight and friction as well as lighter moving components result in a much freer-revving engine with a wider range of operating speeds and a 5500 RPM redline more akin to a gas engine. The Skyactiv-D's lower cylinder pressures allowed Mazda to develop an aluminum block instead of the traditional cast iron, which in results in a 10% reduction in weight over the previous-generation 2.2L passenger diesel (which was sold primarily in Europe).

On paper, the lower compression ratio of the Skyactiv-D should result in less efficiency and torque, but in the case of a modern diesel engine, that conventional wisdom is wrong. Diesel combustion works by first compressing a cylinder full of pure air, then injecting fuel at the top of the piston's stroke. In the intense heat of this compressed state, the fuel spray starts burning as soon as it contacts the compressed air. Combustion starts so quickly, in fact, that air and fuel don't have enough time to mix. Fuel-rich areas of the spray can form soot, and fuel lean areas can form oxides of nitrogen (NO<sub>x</sub>). To reduce these harmful byproducts, most high-compression diesels are calibrated to wait until after the piston has passed top dead center,

where air was compressed typically somewhere between 16:1 and 18:1, and instead inject fuel late, after the piston has started back down the bore and the remaining compression is around 14:1. Under these conditions, there is still enough heat to ignite the fuel, but it takes a little longer to get started, which gives crucial time for air and fuel to mix, reducing emissions.

Skyactiv-D's counterintuitive lower compression ratio simply creates these more efficient conditions without wasting energy over-compressing air. The work done on the expansion stroke is the same, but less energy is now lost to inertia and friction.





## SEQUENTIAL TWIN TURBO SYSTEM

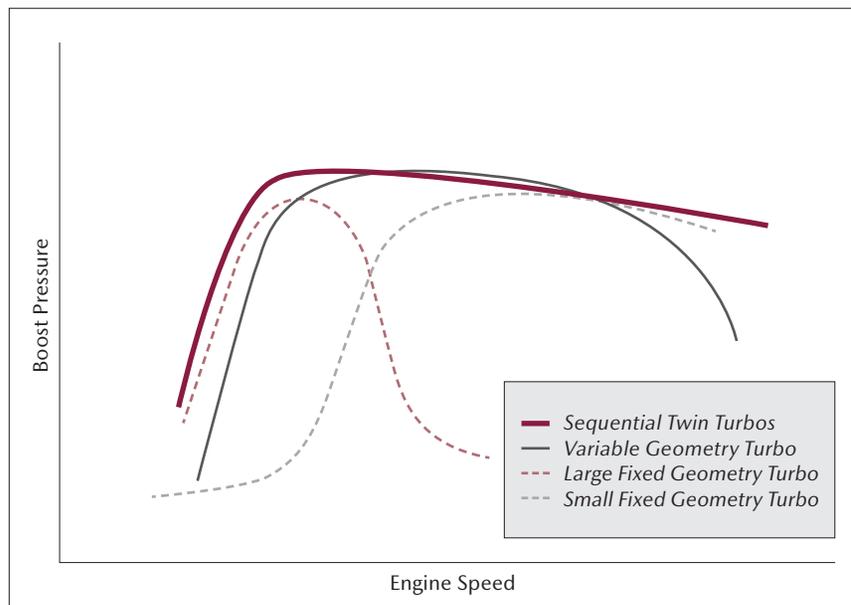
Modern diesel engines all use turbocharging to increase output, but most small passenger diesels use a single turbocharger, forcing them to make tradeoffs between low-RPM response and higher RPM performance.

To achieve the unique driving performance and response of a Mazda, Skyactiv-D is designed with a sequential twin turbo system. This incorporates a very small, highly responsive turbo for quick response just off idle, and a larger secondary turbo to supply the larger airflow needs

at higher revs. The unique operation of the Skyactiv-D sequential twin turbo system incorporates periods of single turbo operation, both turbos compressing in series and both operating in parallel. The result is linear acceleration and unmatched response compared to similar displacement turbo diesels.

With variations of Skyactiv-D successful in global markets, the North American version adopts unique features and improvements. The most significant change for the North

American versions is the inclusion of exhaust aftertreatment hardware that helps the Skyactiv-D meet stringent certification requirements and provide the driving exhilaration to go with the Mazda badge.





## PREMIUM DRIVING EXPERIENCE

Mazda designed the Skyactiv-D to excel in civility. Pioneering technologies were exclusively developed to offer a quieter driving experience and help change opinions toward diesel engines. Two unique systems were created to work together and combat the characteristic knocking noise of diesel combustion.

Rather than trying to block or absorb high-frequency combustion sounds as they travel through the car, Mazda developed a technique to cancel out certain combustion frequencies at the source. A mechanical mass damper called the Natural Sound Smoother is used inside each piston wrist pin. The precisely tuned metal dumbbell acts to reduce high frequency combustion sound at the source.

For lower frequency knock noise, Skyactiv-D uses a method of pressure wave cancelation to nullify the most severe combustion sounds. Named the Natural Sound Frequency Control, this software logic takes advantage of the multiple injection events used by modern diesels, and precisely times each injection in increments as short as 0.1 millisecond so that the audible pressure waves from combustion and pre-combustion events are timed to cancel each other out.





In addition to the premium driving benefits of Skyactiv-D, the 2019 CX-5 Signature composes elegant features such as Caturra Brown Nappa leather seats that appeals to mature sensibilities, genuine layered wood trim that gives a feeling of warmth and satin chrome accents that bring all the styling together. The leather-wrapped steering wheel features unique stitching, while ambient interior LED lighting, a black headliner and an auto-dimming rearview frameless mirror with Homelink® all play their part in creating a refined interior atmosphere.

CX-5 Signature also includes Apple CarPlay™ support and Android Auto™, windshield-projected heads-up Active Driving Display, ventilated front seats and 360° View Monitor with front and rear parking sensor, amongst many more features.



MAZDA'S PREMIUM DIESEL BUYER

Mazda saw a great opportunity to enter the marketplace and expand to a new unique, customer base. Diesel aficionados remain loyal to this type of alternative fuel and its benefits. Moreover, of the diesel loyalist in North America, there remains a strong skew towards premium diesel vehicles, particularly SUVs.

Since 2016, there continues to be a demand for diesel SUVs and sedans with over 60,000 sales. Specifically, for diesel SUVs, there have been approximately 40,000 sales in the past three years. With demand still evident in the U.S. market, Mazda turned to its fans to measure interest in a potential diesel-powered CX-5. That interest has remained consistent over the years, receiving over 26,000 handraisers for such a CX-5. By offering the Skyactiv-D 2.2L engine in the 2019 CX-5, Mazda continues to push boundaries in its powertrain innovations while also catering to those diesel enthusiasts. Many of which are seeking more options since the offerings for diesel SUVs have been reduced in recent years.



The 2019 Mazda CX-5 Signature Skyactiv-D supports Mazda's continuous pursuit of offering premium driving experiences that will attract premium buyers. Aligned with U.S. diesel interests focused around large metro areas, Mazda has designed this version of the CX-5 to attract young families that likely live in the city and occasionally enjoy vacations where they can venture into the outdoors. Remaining connected to the fast-paced digital world is important, but there is value in being able to escape from it. Whether taking their pet on outdoor activities, camping, or going on an adventure with the increased towing capacity, the diesel-powered CX-5 can help elevate such experiences.

The 2019 CX-5 Signature Skyactiv-D looks to fill a void for premium diesel buyers with an MSRP<sup>1</sup> of \$41,000, a price point lower than competitive diesel SUVs currently on the market. Prospective owners won't have to compromise, with a sophisticated set of standard features including Apple CarPlay™ support and Android Auto™, windshield-projected heads-up Active Driving Display, ventilated front seats, heated Nappa leather seats, heated steering wheel and LED headlights, amongst many others. The 2019 CX-5 Signature Skyactiv-D comes standard in Jet Black Mica and is available in Soul Red Crystal Metallic, Machine Gray Metallic and Snowflake White Pearl Mica.

The 2019 CX-5 Signature Skyactiv-D includes prepaid maintenance plan for two years or 30,000 miles. This is the first time Mazda is offering this included with the purchase price and finds itself comparable to offers from other premium automakers.

<sup>1</sup> MSRP does not include \$,1045 for destination and delivery (\$1,090 in Alaska) or additional taxes or fees. Dealers set actual sale prices.



# SPECIFICATION DECK

## SPECIFICATIONS & CAPACITIES

ENGINE		CHASSIS	
Engine Type	Skyactiv-D 2.2L Sequential Twin Turbo	Body Type	5 passenger, SUV, unibody with Ring Structure
Horsepower, SAE net	168hp @ 4,000 rpm	Front Suspension	Independent, MacPherson Strut type coil spring and stabilizer bar
Torque, SAE net	290 lb-ft @ 2,000 rpm	Rear Suspension	Independent, Multi-link type coil spring and stabilizer bar
Redline	5,500 RPM	Steering Type	Rack and Pinion
Displacement (cubic inches/cc)	133.7 / 2,191	Power Assist	Electric Power Assist Steering (EPAS)
Bore x Stroke (mm)	86.0 x 94.3	Overall Steering Ratio	15.5:1
Compression Ratio	14.4:1	Steering Wheel Turns	
Top speed (mph)	124	Lock-to-Lock	2.7 revolutions
Fuel System	Common Rail Direct injection	Turning Circle, Curb to Curb (Diameter - feet)	36.0
Recommended Fuel	44 cetane	Turning Circle, Wall to Wall (Diameter - feet)	38.7
Oil Type	OW-30	Braking System	Diagonal Hydraulic
Engine Block Material	Aluminum die casting	Front Brakes (inches/mm)	Ventilated disc (12.6/320)
Cylinder Head Material	Aluminum casting	Rear Brakes (inches/mm)	Solid disc (11.9/303) diameter
Emission Regulation (FED/CAL)	BIN160/LEV160	Parking Brake	Electronic Parking Brake
Alternator	12V-150A	Wheels	19 X 7J
Battery	80D26L	Tires	P225/55R19
Starter	12V, 1.8KW	Temporary Spare Tire	T155/90D17
		Total Curb Weight (lbs)	3,940
		Total Gross Vehicle Weight (lbs)	4,938
DRIVETRAIN		ESTIMATED FUEL ECONOMY	
Drive Wheel	AWD	EPA Mileage (City/Highway/Combined)	27/30/28
Transmission	6-Speed AT		
Ratios			
1st	3.487		
2nd	1.992		
3rd	1.449		
4th	1.000		
5th	0.707		
6th	0.600		
Reverse	3.990		
Final Drive	4.411		

## SPECIFICATIONS & CAPACITIES (cont'd)

### CAPACITIES

Engine Oil (U.S. quarts/L)	5.1/4.8
Engine Coolant (U.S. quarts/L)	9.2/8.7
Fuel Tank Capacity (gallons/L)	15.3 gal 58L (AWD)
EPA Passenger Volume w/o Moonroof (cubic ft/L)	103.6 / 2,933
EPA Passenger Volume w/Moonroof (cubic ft / L)	103.6 / 2,933
Cargo Volume (SAE) all seats upright (cubic ft / L)	30.9 / 875
Cargo Volume (SAE) 2nd row seats folded (cubic ft / L)	59.6 / 1,687
Towing Capacity (lbs.)	3,500

### EXTERIOR DIMENSIONS

Wheelbase (inches)	106.2
Track, Front (inches)	62.8
Track, Rear (inches)	62.8
Length w/ License Plate Holder (inches)	179.1
Length w/o License Plate Holder (inches)	179.1
Width (inches) without outer mirrors	72.5
Width (inches) mirror to mirror – opened	83.3
Height w/o Roof Rails up to roof panel (inches)	65.3
Height w/o Roof Rails up to shark-fin antenna (inches)	66.1
Minimum Ground clearance - Unladen (inches)	7.5

### INTERIOR DIMENSIONS

Headroom w/o Moonroof, Front (inches)	39.7
Headroom w/o Moonroof, Rear (inches)	39.0
Headroom w/ Moonroof, Front (inches)	39.3
Headroom w/ Moonroof, Rear (inches)	39.0
Leg Room, Front (inches)	41.0
Leg Room, Rear (inches)	39.6
Rear knee clearance, Rear (inches)	2.7
Shoulder Room, Front (inches)	57.1
Shoulder Room, Rear (inches)	54.8
Hip Room, Front (inches)	55.2
Hip Room, Rear (inches)	55.3

### CARGO AREA DIMENSIONS

Height from Floor to Roof (inches)	32.4
Lift over Height (inches)	29.4
Length w/ rear seats upright (inches)	38.0
Rear Tailgate Opening Height (inches)	30.7
Rear Tailgate Opening Width (inches)	44.3
Width at Floor (inches)	57.0
Width between Rear Tire House (inches)	41.3

## COLOR COMBINATIONS & PRICING

### EXTERIOR COLORS

Soul Red Crystal Metallic	\$595
Machine Gray Metallic	\$300
Snowflake White Pearl Mica	\$200
Jet Black Mica	Standard

### INTERIOR COLOR

Caturra Brown (Nappa Leather)	Standard
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### PRICING

Manufacturer's Suggested Retail Price <sup>2</sup>	\$41,000
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<sup>2</sup> MSRP does not include \$1,045 for destination and delivery (\$1,090 in Alaska) or additional taxes or fees. Dealers set actual sale prices.

# EQUIPMENT AND FEATURES

## MECHANICAL

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- Skyactiv-D® 2.2L Sequential Twin Turbo
- Skyactiv®-Drive 6-Speed AT with manual-shift mode
- i-ACTIV AWD All-Wheel Drive
- Anti-lock Brake System (ABS) with Electronic Brakeforce Distribution (EBD) and Brake Assist
- Dynamic Stability Control (DSC) with Traction Control System (TCS)
- Hill Launch Assist
- Independent front MacPherson strut suspension with stabilizer bar
- Independent rear multi-link suspension with stabilizer bar
- Power-assisted rack-and-pinion steering with engine-speed-sensing variable assist
- Power-assisted ventilated front disc/solid rear disc
- SKYACTIV-VEHICLE DYNAMICS: G-Vectoring Control Plus

## EXTERIOR

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- 19-inch aluminum alloy wheels with Dark Silver finish
- P225/55 R19 All Seasons tires
- Temporary Spare Tire
- Auto-fold door mirrors
- Auto-leveling headlights
- Automatic off headlights
- Center high-mount brake light
- Dual body-color power mirrors with LED turn signal indicators
- Dual heated exterior mirrors
- Single exhaust outlet with bright finish
- LED Daytime Running Lights (DRL)
- LED headlights
- LED front fog lights

## EXTERIOR (cont'd)

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- LED combination taillights
- LED license plate lamp
- Roof-mounted shark fin antenna
- Rear roof spoiler
- Two-speed variable-intermittent front windshield wipers
- Automatic rain-sensing front windshield wipers
- Rear intermittent windshield wiper
- Signature trim badging
- Skyactiv-D Technology Badge
- Windshield wiper de-icer

## COMFORT & CONVENIENCE

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- Ambient Cabin lighting: Front & Rear foot illumination
- Black color headliner
- Dual-zone automatic climate control with pollen filter
- Rear air conditioning vents
- Heater/defroster with rear heater ducts
- Rear window defogger
- Auto-dimming rearview frameless mirror with Homelink®
- Bright Silver finish on door switch panel, glovebox knob and power seat switch
- Dual covered illuminated LED visor vanity mirrors
- Cruise Control
- Cargo area LED light with On/Off switch
- Dome light
- Electronic Parking Brake (EPB)
- Exterior mirrors button (bright)
- Steering-wheel-mounted controls (audio, Bluetooth®, cruise)
- Tilt and telescopic steering column
- Leather-wrapped steering wheel with unique stitching

## COMFORT & CONVENIENCE (cont'd)

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- Leather-wrapped shift knob
- Heated steering wheel
- Mazda Advanced Keyless Entry
- Map lights
- One-touch-open power sliding-glass moonroof with interior sunshade
- Push Button Start
- Speed sensitive power door locks with 2-stage unlocking
- Power rear liftgate
- Power windows w/one-touch auto up/down feature (4)
- Rear privacy glass
- 12V power outlet(s) - 3
- Center console armrest with tray
- Rear seat center armrest
- Driver and passenger front seatback map pockets
- Glove compartment (Signature: with LED illumination)
- Overhead console with sunglass holder (Signature: Unique overhead console with LED Room lamp and down light)
- Remote fuel-filler-door release
- Remote hood release

## SEATING & TRIM

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- 5-passenger seating capacity
- 8-way power adjustable driver's seat with power lumbar support
- 2-position memory driver's seat
- 6-way power adjustable passenger seat
- 40/20/40 split one-touch fold-down reclining rear seats
- Adjustable front & rear headrests
- Genuine layered wood trim

## EQUIPMENT AND FEATURES (cont'd)

### SEATING & TRIM (cont'd)

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- Leather-trimmed seats- Caturra Brown Nappa Leather
- Heated driver and front passenger seats with 3 level adjustments
- Heated rear seats
- Ventilated front seats
- Whiplash-reducing front headrests
- Carpet floor mats

### INFOTAINMENT

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- 7-inch full-color touch-screen display
- AM/FM stereo sound system
- Android Auto™ / Apple CarPlay™ integration
- Audio menu voice-command
- Auxiliary-audio input jack
- Bose® 10-speaker audio sound system with Centerpoint®2 and AudioPilot®2
- Bluetooth® hands-free phone and audio capability
- HD Radio™
- Mazda Navigation System
- Mazda Connect™ Infotainment System
  - Aha™ internet radio integration
  - E911 automatic emergency notification
  - Infotainment system voice command
  - Pandora® internet radio integration
  - Radio Broadcast Data System program information
  - SMS text message audio delivery and reply
  - Stitcher™ internet radio integration
- Multi-function Commander control
- SiriusXM® satellite radio with 3-month trial subscription (n/a AK & HI)

### INFOTAINMENT (cont'd)

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- SiriusXM® 3 Yr. Traffic and Travel Link Subscription
- Current information for:
  - Traffic
  - Weather
  - Sports scores
  - Fuel prices
  - Nearby parking or parking by destination
- Speed-sensing automatic volume control (Automatic Level control)
- USB audio input port(s) - 4

### INSTRUMENTATION

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- Active Driving Display (windshield type) with Traffic Sign Recognition (TSR)
- Digital clock
- Fuel level gauge
- Gauges, black background with white lettering and silver surround
- 7 inch LCD Multi-Information Display (Speedometer, Odometer, Trip Meter, Outside Temperature, Distance-To-Empty, Average Fuel Economy, Current Fuel Economy, Maintenance Monitor, BSM display, Distance Recognition Support System Display, Mazda Radar Cruise Control System Display, Lane-Keep Assist System and Land Departure Warning System Display, Cruise Control Display, Compass Display, Door-Ajar/Trunk lid-Ajar Warning Indication, Warning Message Display)
- Warning lights: brake system, high-beam headlights, turn signals/hazard warning on, check engine, engine oil pressure, engine coolant "high" temp, engine coolant "low" temp, battery charge, defogger-on, air bag/front seat belt pretensioner system, door-ajar, low fuel, Anti-lock Brake System, cruise control on, tire pressure monitoring system

### INSTRUMENTATION (cont'd)

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- Outside ambient temperature
- Speedometer
- Tachometer
- Trip odometers

### SAFETY & SECURITY

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- 3-point safety belts for all seating positions
- 360° view monitor
- Blind Spot Monitoring with Rear Cross-Traffic Alert
- Dual front air bags (SRS)
- Engine immobilizer anti-theft system
- Front parking sensor
- Rear parking sensor
- Front safety-belt pretensioners with force limiters
- Front side-impact air bags and side air curtains (front and rear) with roll-over protection
- Side-impact door beams
- High Beam Control (HBC)
- High mount stop lamps
- Lane Departure Warning (LDW) with Lane Keep Assist (LKA)
- LATCH system - rear seat child safety seat lower anchors & upper tethers
- Rearview camera
- Mazda Radar Cruise Control (MRCC) with stop and go function
- Advanced Smart City Brake Support with pedestrian detection
- Smart Brake Support (SBS)
- Tire pressure monitoring system

## **ABOUT MAZDA NORTH AMERICAN OPERATIONS**

Mazda North American Operations is headquartered in Irvine, California, and oversees the sales, marketing, parts and customer service support of Mazda vehicles in the United States and Mexico through nearly 700 dealers. Operations in Mexico are managed by Mazda Motor de Mexico in Mexico City. For more information on Mazda vehicles, including photography and B-roll, please visit the online Mazda media center at [InsideMazda.MazdaUSA.com/Newsroom](https://www.insidemazda.com/newsroom).

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