WHAT'S THE DIFF? MAZDA CX-5 UNLOCKS 'SECRET' OFF-ROAD MODE

LEARN HOW TO UNLOCK THIS HIDDEN LIGHT OFF-ROAD MODE

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What are "Easter eggs"? Besides the colored treat that comes along every April, they are those snippets at the end of a movie's credits when a scene previews next year's blockbuster. They're the bonus track at the end of an album if you just wait a few seconds longer. They're messages hidden in a piece of art.

And they're buried deep in the computer logic of Mazda CX-5, waiting for you to find them. What sort of Easter eggs, you might wonder? How about a new "off-road" mode in CX-5's i-Activ all-wheel-drive (AWD) system, designed especially for loose surfaces and deeply rutted trails off the beaten path. We're going to tell you how to find Mazda's latest Easter egg.

MAZDA'S MIND-READER OF AN AWD SYSTEM

The key challenge of an AWD system is figuring out exactly how much torque—rotational force—to send to the rear wheels at every instant.

Use too little when the conditions are slippery, and front tires lose grip, robbing the driver of control. Use too much when the conditions are grippy, and fuel economy and handling both suffer. The penalties for getting it wrong—and the rewards for getting it right—can change in an instant with both road conditions and the driver's intentions. For an AWD system to get it right all the time, it needs to be able to sense both the road and the driver and predict what torque split is required before the driver can feel a loss of traction.

That sensing comes from data the car already has. The electric power steering knows exactly how hard you're turning the steering wheel, for example, and since steering effort gets lighter on slippery surfaces, the CX-5 can use that information to measure the surface grip. The stability control system is already closely watching the speed of all four wheels, and if one tire starts going faster, the i-Activ AWD knows how slippery the surface must be to allow that slip and can correct it before the driver would even feel it.

The system uses indirect sensing, too, watching the outside temperature to see if it's cold enough that ice or snow are possible and watching the wipers to know if it's raining.

In total, Mazda's i-Activ AWD system samples 27 channels of data 200 times per second to paint a composite of what the road looks like, sending power forward or rearward before the driver and passengers sense any slip, whereas many vehicles with reactive systems allow a momentary feeling of uneasiness, sliding along on a slippery surface, before power is routed to the rear wheels.

The name i-Activ AWD was created to explain what the system does, with the "i" standing for "intelligent," also complementing Mazda's holistic suite of safety technologies called "i-Activsense."

TURN OFF TRACTION CONTROL TO UNLOCK OFF-ROAD MODE

While most of the time a crossover may never leave the pavement, it's not to say that it won't ever. Families go camping; sometimes, drivers just make turns down a road less traveled. A crossover SUV is capable, but our engineers are always looking to stretch that capability even further.

When all four wheels are on the ground, i-Activ AWD is so good at controlling front/rear torque split that it doesn't need a special off-road mode. If conditions are so slick that it needs to lock the torque coupling completely, it can do that, automatically, in a fraction of a second.

In rare cases on uneven paths when a wheel could leave the ground, i-Activ AWD will sense that wheelspin and lock the torque coupling so the front and rear wheels go the same speed.

But on especially rough terrain, this might not be enough. Imagine a wobbly restaurant table with a matchbook wedged under its short leg to keep it from rocking. If you take that matchbook out, the air under that table leg is like the air under your tire in that diagonal twist. Now, what happens when the table rocks, and that leg comes down? The opposite leg goes up. The same thing happens in a diagonal twist. If one tire

comes off the ground, the opposite tire also comes off the ground, or at least gets very light.

2019 Mazda CX-5 Signature Turbo crossover SUV

So even if the torque coupling that drives power to the axles forces the front and rear tires go to the same speed, if one front tire and one rear tire are in the air, those airborne tires can still spin freely. To stop them, we have to use the traction control system to apply the brakes to the spinning tires, forcing torque over to the tires that are on the ground.

In any other situation, we want the traction control system to apply the brakes as smoothly as possible, so there's no interruption in the driver's control of the car. But in situations where an abrupt power shift is necessary—like this diagonal twist off-road situation—pressing the "TCS OFF" button actually switches the CX-5 to a mode that simulates locking differentials via the brakes, sending power to the wheels on the ground.

Much as most every modern crossover SUV, a full off-road-style locking differential that equally transfers power at low speeds to all four wheels is heavy and inefficient. However, with its trick technology, the net effect of the CX-5's clever i-Activ AWD is that, like the rest of the vehicle, it helps the CX-5 punch far above its weight.

SIMPLE AS THAT

In constantly striving to make vehicles better to satisfy customer needs and wants, CX-5 has adopted an innovative solution that makes it just as athletic on rough roads as it is on the cleanest stretches of canyon curves.

And now you know how to unlock it. Just press a button.

EXPLORE THE MAZDA CX-5

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