

**Motorcycle ABS  
Rider's Manual  
Supplement**



**BMW of North America,  
Inc. Montvale, New Jersey  
07645**

**Dear BMW Owner,**

BMW has always pursued a consistent and far-sighted design policy, with the goal of producing motorcycles with features that exhibit both useful and balanced levels of performance.

Because of its commitment to safety, BMW pioneered the development and introduction of anti-lock braking systems for its automobiles. Now BMW introduces the first production motorcycle equipped with an anti-lock braking system. The ABS system was commissioned by BMW and developed in cooperation with FAG Kugelfischer, a Bavarian manufacturer of hydraulic brake systems.

With an anti-lock braking system, or ABS, both wheels are afforded effective protection against locking. When the motorcycle is traveling straight ahead, ABS can in certain situations, shorten stopping distances with full brakes applied. ABS is particularly effective when braking on roads with changing surfaces, where tire adhesion rates may vary significantly.

**However, you should never allow the presence of motorcycle ABS to stimulate you into driving faster or with less caution. BMW regards the system as a safety reserve for emergency situations.**

Please read this Rider's Manual Supplement thoroughly before operating your motorcycle. We feel you will find it's contents both useful and interesting, and at the same time, enhancing your safety and riding pleasure.

In conclusion, may we wish you and those who ride with you, many pleasant journeys on your BMW motorcycle.

Yours sincerely,

BMW of North America, Inc.

**Table of Contents**

	Page
INTRODUCTION .....	1
TABLE OF CONTENTS .....	2
BMW AND ABS.....	3
HOW DOES ABS WORK .....	4
WHAT DOES ABS MEAN ON THE ROAD.....	6
GENERAL OPERATION .....	8
FAULT MONITORING - CANCEL SWITCH .....	9
CHANGING WHEELS WITH .....	10
ROUTINE MAINTENANCE.....	11
ELECTRONIC ABS CONTROL UNIT .....	11
CLEANING INSTRUCTIONS .....	12
SPECIFICATIONS .....	12
WIRING DIAGRAM .....	13

## **BMW and ABS**

Motorcycle technology today includes concepts virtually inconceivable just a few years ago. In performance, engine design, electronic control systems and suspensions, engineers have made remarkable progress toward creating the ideal riding machine.

In its commitment to safety, BMW's motorcycle engineers began studying ABS for motorcycles as far back as 1978. During years of development it became clear that ABS for motorcycles had to confront different demands than a similar system for cars. The reason for this is that motorcycles have different characteristics of stability and behave quite differently when applying the brakes. This is particularly evident when cornering, where motorcycle ABS is of little value due to the physical laws affecting motorcycle stability.

After exhaustive testing of several systems, the anti-lock device developed by FAG Kugelfischer in 1983 for BMW motorcycles, proved to be the most promising. The electronic/hydraulic control unit, conceived by the Bavarian manufacturer of hydraulic brake systems, offered ideal characteristics for a motorcycle.

### **How Does ABS Work?**

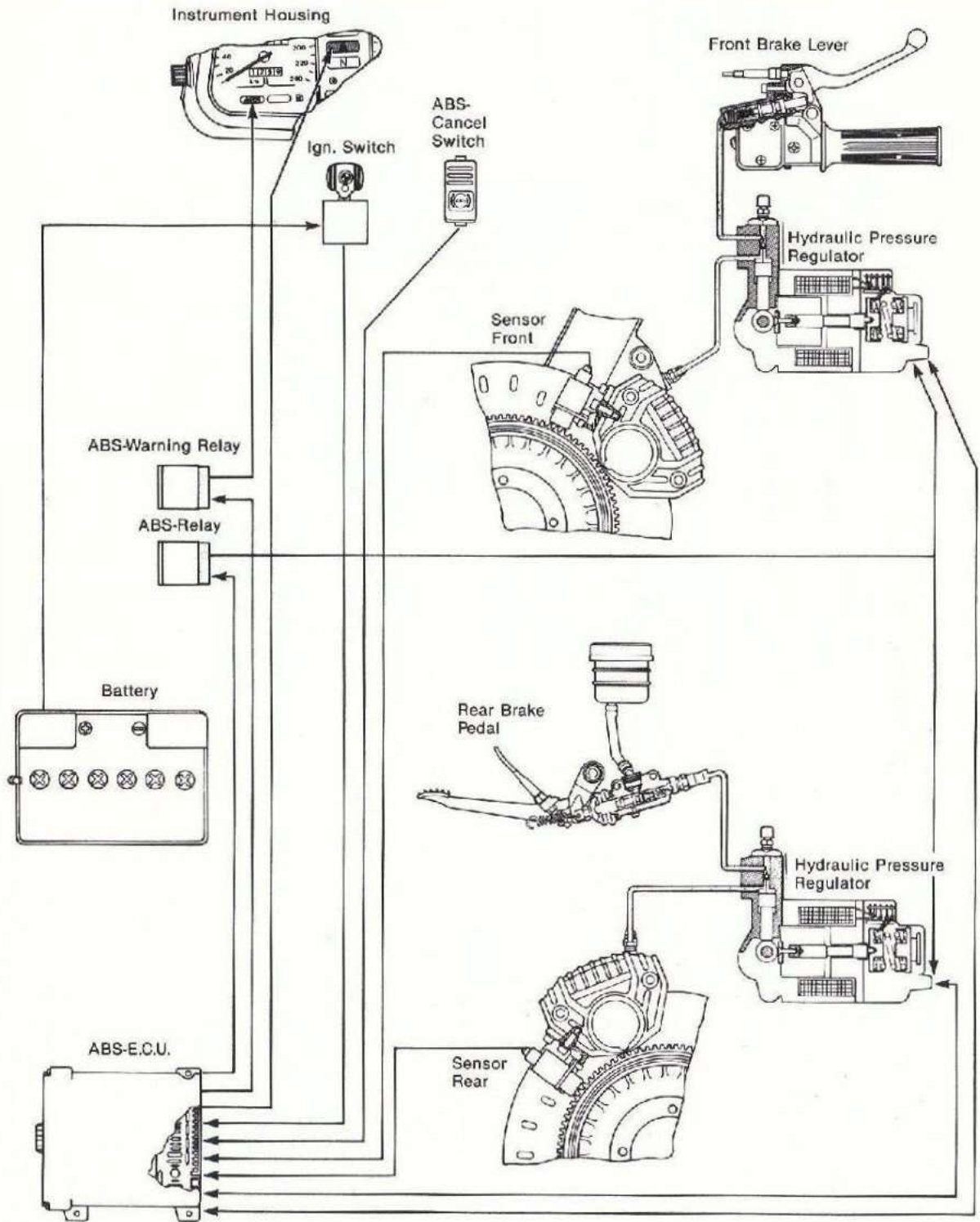
ABS is controlled by an electronic control unit (ECU) tailored especially for BMW. The ECU constantly monitors and controls the entire braking process with a pressure monitor and a speed sensor at each wheel.

The electronic control unit is housed in the rear storage space behind the seat. It features two separate control circuits, one each for the front wheel and the back wheel. These circuits operate alternately in intervals of ten seconds. While one control circuit is working, checking or controlling the brakes, the other is monitored by a central processor unit. This supervision also includes the electronic system voltage, sensors and pressure modulators.

The sensor informs the control unit when the wheel is about to lock. Within fractions of a second, the electronic unit activates the pressure modulator, continuously reducing the hydraulic pressure in the wheel brake cylinder until the risk of lock has been eliminated. This process is repeated up to seven times a second, as long as the rider generates enough brake pressure through the pedal or brake lever, and road speed does not drop below 2.5 mph. In controlling the rear brake circuit, the system also evaluates data provided by the front wheel. This ensures that any slowing of the rear wheel caused by reducing throttle or shifting gears is not interpreted by the computer as braking action.

The two pressure modulators — one for the front wheel, one for the rear wheel — are located at each side above the footrests near the motorcycle's center of gravity, a good position for optimum riding characteristics.

**ABS cannot add or distribute pressure from front to rear, it can only interrupt excessive pressure. Therefore, the rider must use both front and rear brake for full effect.**



## **What ABS Means on the Road**

### **Man and Technology: Both Have Their Limits**

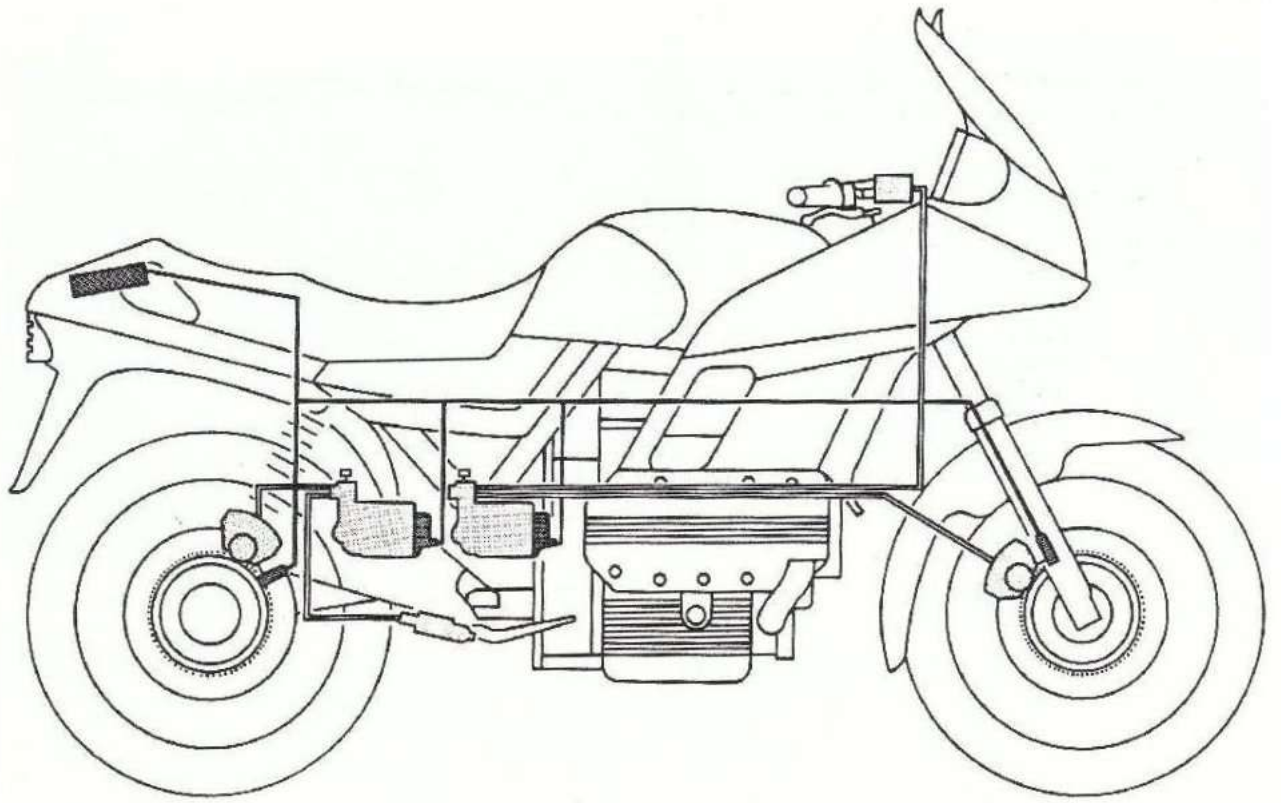
Every BMW has a brake system designed for the motorcycle's performance capabilities. However, the efficiency of any brake system depends not only on its technical capabilities, but also on the rider.

While an experienced rider might be able to apply the brakes with the same efficiency on dry asphalt, ABS can effectively cope with road surfaces which vary rapidly in their frictional coefficient, controlling the brakes at a speed superior to human reflexes. Even if puddles, gravel, sand or oil unexpectedly appear on a hard and dry surface and the rider must brake suddenly, ABS will respond quickly and do it faster and with more precision. As long as one is riding in a straight line, the rider can apply the brakes in full without fear of wheel locking.

Through its very concept, the motorcycle also limits the potential of an anti-lock braking system. Applying the brakes forcefully while cornering will make the motorcycle straighten from its inclined position, thereby reducing lateral stability. Not even ABS can change this. For physical reasons, even a motorcycle with ABS loses its steering and directional potential when applying the brakes in a corner.

### **Conclusion**

BMW motorcycle ABS adds a dimension to riding never before available. However, every rider, no matter what the level of experience, should know and understand how ABS works. Even a motorcycle equipped with anti-lock brakes requires a proper style of riding and skillful application of the brakes. Please remember that, as remarkable as ABS is, there is no substitute for safe riding practices.





## General Operation

The ABS is energized automatically when the motorcycle ignition is turned "on", observing the following sequence:

- When the ignition is turned on, the ABS warning light (1) flashes
- The rear light monitor (2) has the double function of a second ABS warning light and will remain constantly illuminated when the ignition switch is initially turned on. Once the operation of the brake light is verified by actuating the front brake lever and rear brake pedal, the light monitor will flash in parallel with the ABS warning light.
- The ABS system will run through an automatic check, once the motorcycle is driven away. When all functions are confirmed, both warning lights go out when the motorcycle reaches a speed of 2.5 mph (this will seem almost immediate).
- The ABS cancel switch (3) is not used during normal operation and only serves to cancel the flashing of indicators when a fault emerges. See page 9 for fault monitoring.



### Does ABS change the way the motorcycle feels when braking?

When braking hard enough for ABS to be activated, a mild "spongy" feel may be noticeable in the brake lever or pedal, as the system is interrupting your braking input. During maximum braking, the suspension of the motorcycle will react to the sudden changes in tire adhesion, creating a suspension reaction. Depending on the road surface, the reaction most typically will feel like a slow, cyclical "bucking" as the motorcycle nears a stop. This is normal, but riders should practice braking in controlled conditions to acquaint themselves with this sensation so as not to be surprised.

### **ABS Fault Monitoring - Cancel Switch**

The ABS system checks itself for faults automatically as you ride:

- If the ABS should detect a fault for any reason, both warning lights will flash in parallel. Once a fault is detected, you will no longer be operating with the benefit of ABS.
- The flashing warning lights can be changed to constant illumination by depressing the cancel switch (3). This will make the indicator lights less annoying, especially at night. The warning lights will resume flashing after approximately 10 minutes to emphasize that you are no longer operating with the benefit of ABS. As before, you can change them from flashing to constant illumination for (approximately) 10 minute intervals by depressing the cancel switch (3). This can be repeated as many times as necessary.

**Note:** However, please remember the difference in braking effectiveness when you are without the benefits of ABS. If the ABS fails, the conventional brake system will still remain operational.



### **What happens if I spin the rear wheel during acceleration?**

Spinning the rear wheel may cause the ABS system to lose programmed coordination, as the front wheel is no longer synchronized with the rear wheel. This loss of coordination will cause the ABS unit to register a fault. Faults registered from wheel spins will usually cancel themselves when the ignition is turned "off". If not, you must visit your authorized BMW Dealer to have the control unit "reset". Until the "reset" is performed, you will not be operating with the benefits of ABS.

**Important:** In the event of a fault in the ABS system, please see your authorized BMW Dealer as soon as possible for repair.

**Caution:** While it is well protected, the electronic control unit can only withstand a certain electromagnetic load. Avoid static discharges. You are advised against using high performance radio equipment on the motorcycle, as the ABS may otherwise suffer from interference. Extreme interference could cause the system to indicate a fault, requiring the electronic control unit to be "reset" by an authorized BMW Dealer.

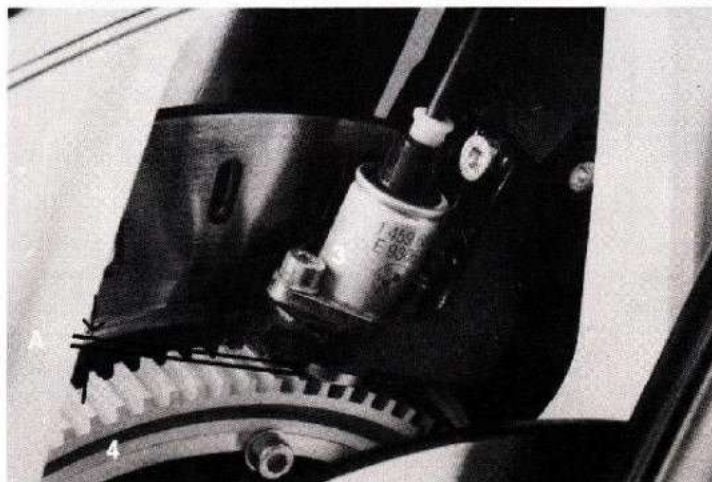
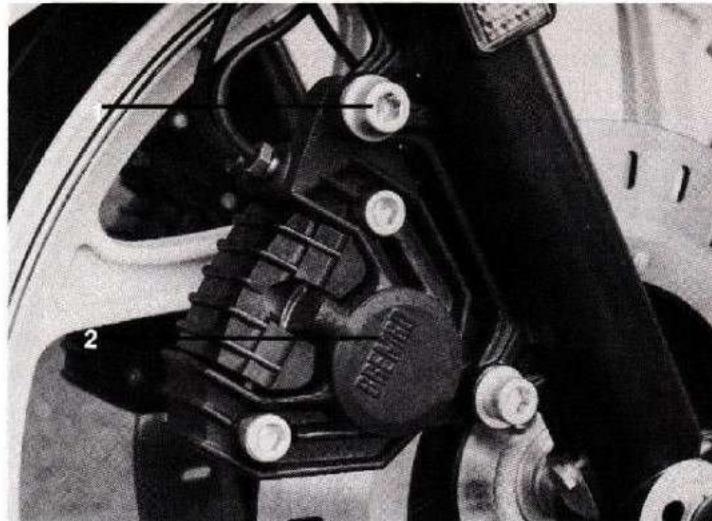
## Changing Wheels With ABS - Special Cautions

### Changing the front wheel:

Follow the instruction printed in the Rider's Manual. It is necessary to remove the brake caliper mounting bolts, moving both calipers out from the wheel discs to safely remove the front wheel. Both calipers are connected to each other by a "U" shaped supply line; do not twist calipers.

**Note:** An electronic sensor is attached to the right hand caliper. The upper mounting bolt on this caliper (1) contains a special shoulder, which precisely locates the caliper (2), retaining the sensor gap. Ensure that this bolt is reinstalled in the upper mounting hole when remounting the caliper.

Take care not to alter the precisely defined gap (A) between sensor (3) and pulse generator wheel (4) when changing the wheel, as system faults may otherwise develop.



### Changing the rear wheel:

The pulse generator wheel (4) is mounted to the rear brake disc (which is attached to the rear drive) and not the actual rear wheel, so remove and replace the rear wheel as prescribed in the Rider's Manual. Take care not to apply any force to the sensor when maneuvering the wheel in or out of position, as the preset sensor gap could be altered.

### **Routine Maintenance**

Sensor gap range must be checked at each prescribed service interval. Gap Range (Sensor to pulse generator wheel) 0.35 - 0.65 mm

Radial Runout 0.0 - 0.2 mm

Note: Gap range measurement should be checked at six points along the periphery of the generator wheel, using a feeler gauge (resetting wheel position 60° each time). Sensor gap is adjusted with special shims. We recommend that this work only be performed by an authorized BMW Dealer.

Caution: When working on the electrical system, always disconnect the battery ground connection.



### **Electronic ABS Control Unit**

The electronic control unit (ECU) is located in the rear storage space, behind the seat. It is protected against vibration, shock and environmental influences by a vibration isolating support bracket, which holds the ECU in the upper portion of the storage space.

When storing other items (tool kit, tire inflators, etc.), ensure that clearance (A) exists between these items and the ECU to prevent damage to the electronic components. Damage could occur from items contacting the support bracket, transmitting vibration and shock into the ECU.

### **Cleaning Instructions**

Please refer to the Rider's Manual (page 80 and 81) for cleaning information. Exercise special caution when cleaning around electrical components. Never direct a high pressure washer at electrical components or connections.

Use only cleaning products approved by BMW of North America, Inc. When removing tar or road oil stains, exercise care not to damage seals or wire insulation on electrical components.

### **Specifications for K100RS "Special"**

Weight:	534 lbs. (dry); 596 lbs. (wet); 1058 lbs. (GVWR)
Tires:	Pirelli low-profile radial tires; front: 100/90 VR 18MP 7R rear: 140/80 VR 17MP 7R
Tire Pressure:	Refer to VR-tire chart on page 69 in Rider's Manual
Sensor to Pulse Generator Wheel Gap:	0.35 - 0.65 mm
Radial Runout of Generator Wheel:	0.0 - 0.2 mm

