

**SUBJECT:      Automatic Stability Control with Traction Control  
System (ASC+T) - E36 System**

**MODELS:**

325i/is/iC (E36)

**General Information:**

With the introduction of the 1994 model 3 Series (E36), BMW is pleased to announce a new Automatic Stability Control with Traction Control System (ASC+T) known as ASC+T (Teves). This system is available as optional equipment on all M50 engine equipped 1994 3 Series vehicles.

The Teves ASC+T system is a further development of the Teves ABS

Mark IV system. The Automatic Stability Control Plus Traction (ASC+T) system is incorporated into the Teves ABS Mark IV system with the addition of only a few additional components.

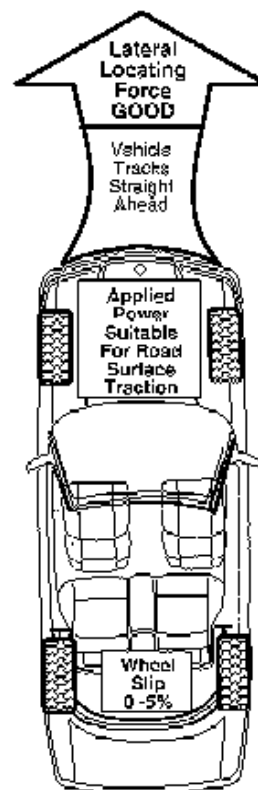
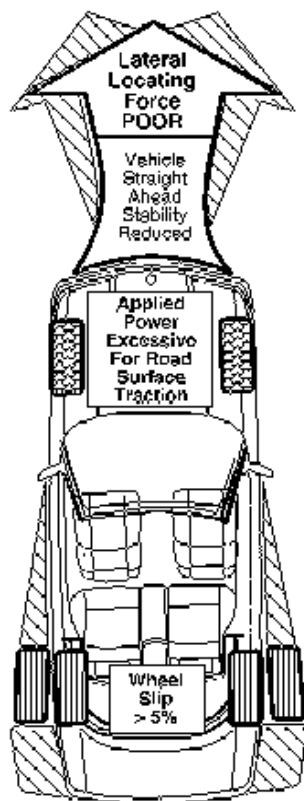
The technician is encouraged to review the following Technical Reference bulletins in order to review the concepts of wheel slip, lateral locating forces, braking coefficients, and features and limitations of previous ABS, ACS, and ASC+T systems:

34 04 83 (2035) Antilock Braking System

12 01 89 (2095) Automatic Stability Control

34 01 90 (2105) Automatic Stability Control with Traction Control System

The function of the Teves ASC+T system is similar to ASC systems installed in other BMW models, namely the control of wheel slip by providing traction control (while driving off and at slow speeds) and stability control (while driving at cruising speeds and while cornering). By controlling wheel slip, frictional contact is maximized between the tires and the road surfaces under a variety of driving conditions.



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## System Overview

The Teves ABS/ASC+T is a four channel, front/rear split system. Each rear brake caliper has its own hydraulic line from the hydraulic unit.

The ASC+T control determines the degree of slip based on the signals from the wheel speed sensors. The control module averages the speeds of the two front wheels to determine vehicle speed. The speeds of the front and rear wheels on each side are monitored to determine the degree of slip.

The programming of the control module will then activate ASC+T regulation using one of the following principles, based on various combinations of vehicle speed and traction conditions:

### Select High - Traction:

1. Rear Brake Control
2. Throttle Control
3. Ignition Control

### Select Low - Stability

1. Throttle Control
2. Ignition Control
3. Rear Brake Control

During ASC+T regulation the ASC Control Module has the ability to pulse the rear brakes individually or together. This depends on the degree of control required to restore traction as determined by the control module.

During ABS regulation the Control Module will pulse the rear brakes together as with previous anti-lock systems.

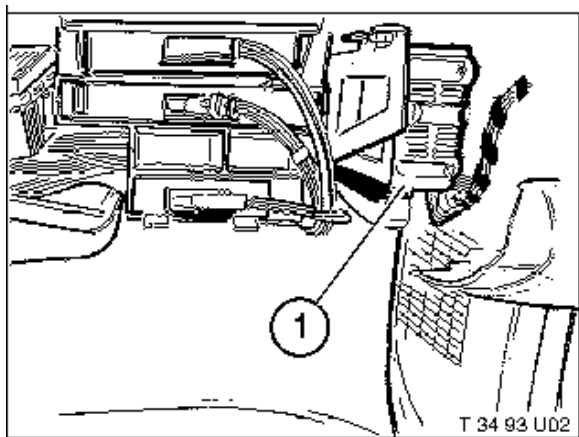
In addition to the traction control, the ASC+T Control Module interfaces with the DME control module. This will further reduce the engine's output torque. The total scope of engine control is the same as other ASC systems and includes:

- Engine Intake Air Regulation
- Ignition Timing Retard
- Ignition/Injection Fade Out

On vehicles equipped with automatic transmissions, the ASC+T system interfaces with the EGS control module. This will delay or inhibit shifts during ASC regulation to prevent instability.

## SYSTEM COMPONENTS

### Control Module



The Teves system uses one control module to house all of the electronics for ABS/ ASC+T and ADS regulation.

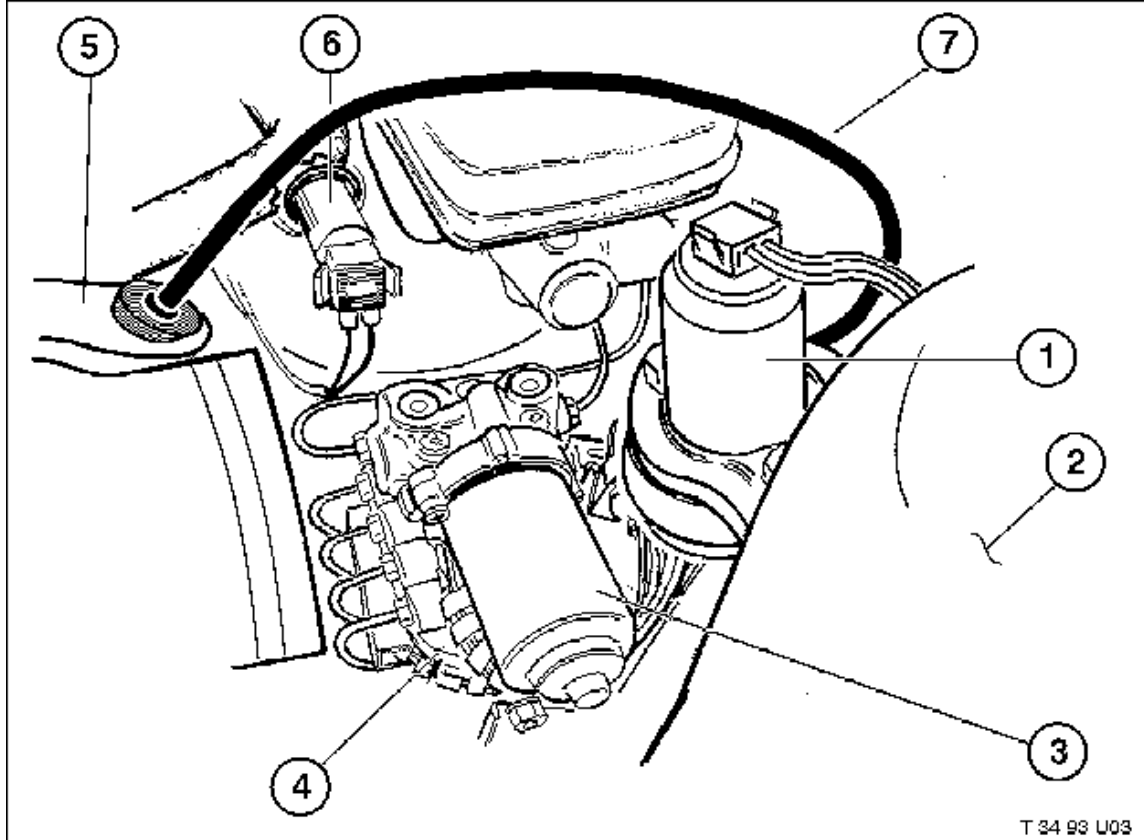
The control module (1) is mounted behind the glove box in the passenger compartment.

### Hydraulic Unit

The hydraulic unit is mounted under the brake booster. It contains the components as listed in the following illustration.

### ADS II Motor

The ADS II motor is located just above the hydraulic unit mounted to the left front shock tower. It is connected to the throttle valve through a bowden cable.



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- |   |                                  |
|---|----------------------------------|
| 1. ADS II Motor                           | 4. Hydraulic Unit                |
| 2. Left Front Shock Tower                 | 5. ADS II Actuator Cable Bracket |
| 3. Return Pump Motor with<br>Speed Sensor | 6. Brake Pedal Position Sensor   |
|   | 7. ADS II Actuator Cable         |

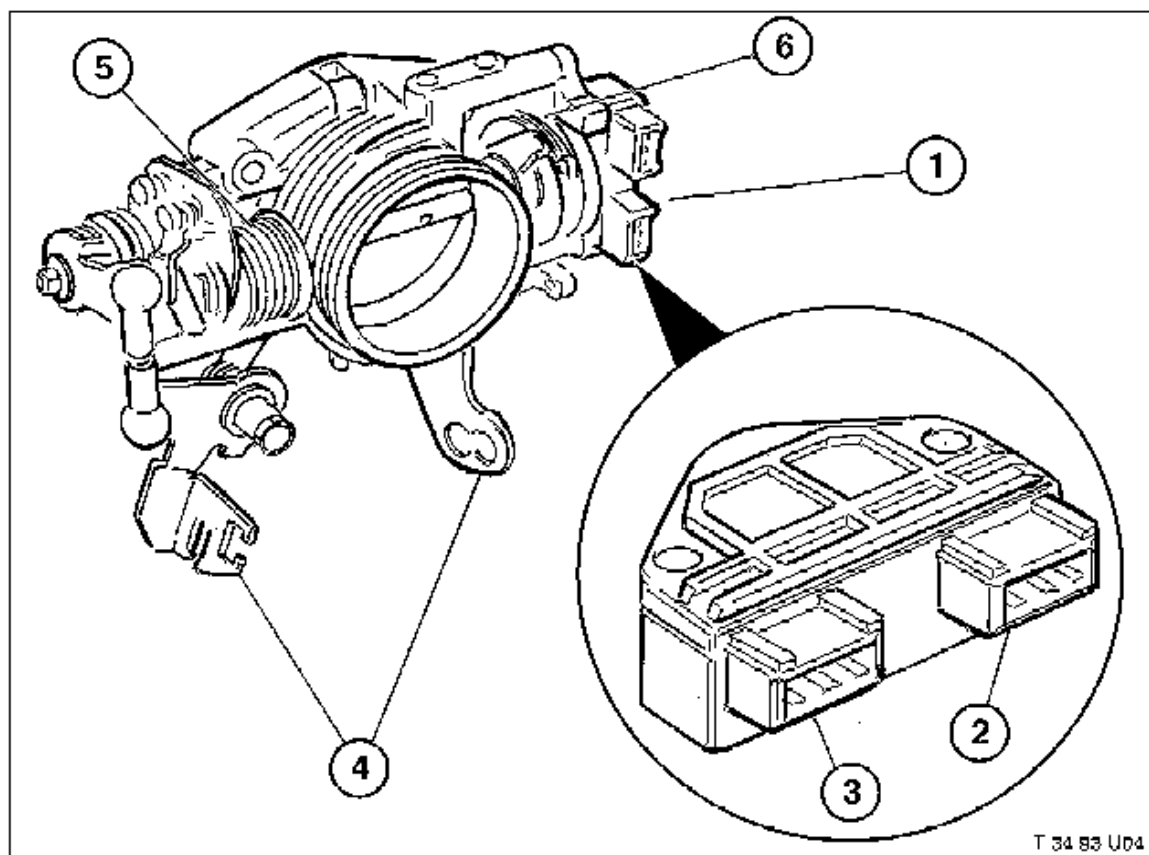
## THROTTLE VALVE WITH DUAL FEEDBACK POTENTIOMETER

### Throttle Valve

The throttle valve is operated via cable from the accelerator pedal as in the past. An additional tension spring allows the ADS motor to close the throttle valve regardless of how far the accelerator is being pressed.

### Dual Feedback Potentiometer

The throttle potentiometer is a dual potentiometer. One potentiometer is the throttle position input signal to the DME as in the past. The second potentiometer is the actual throttle valve position input to the ASC+T control module during ASC regulation.

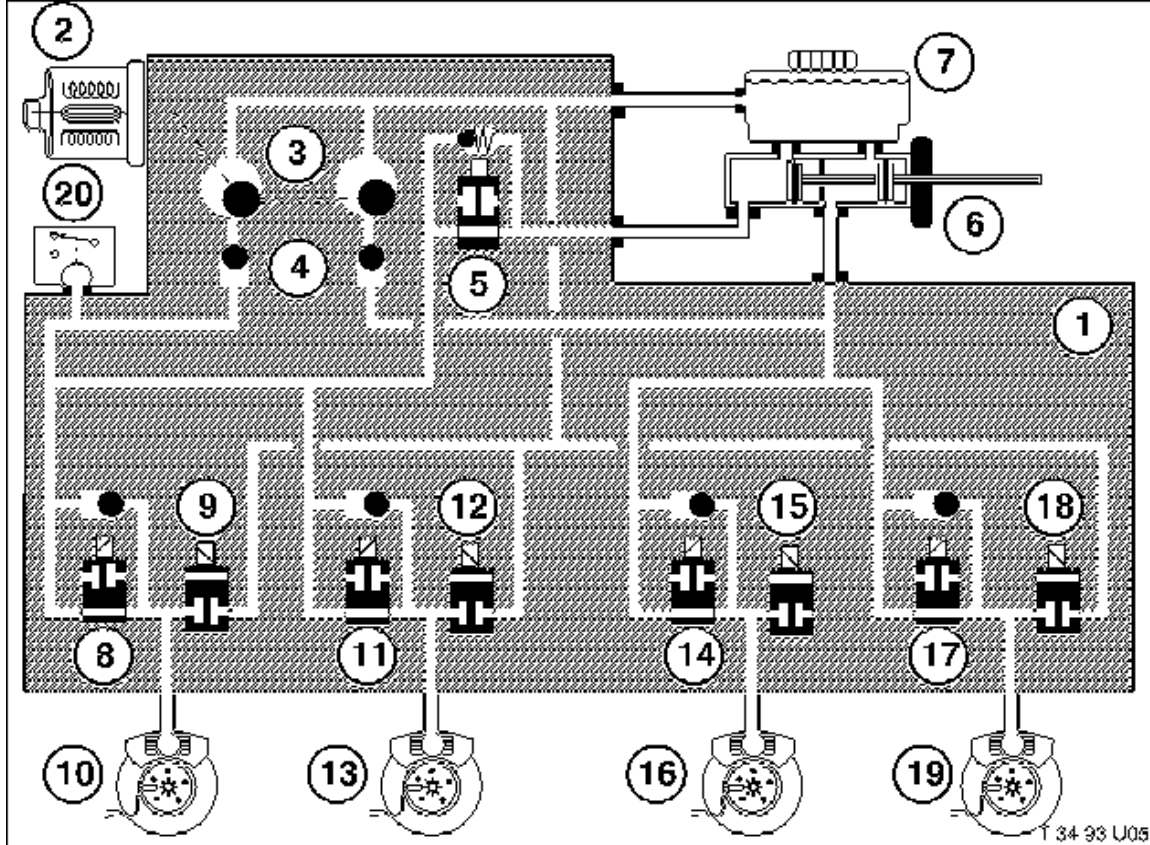


- 1. Dual Feedback Potentiometer Housing
- 2. & 3. Connectors for DME and ASC+T
- 4. Accelerator Cable Bracket and Linkage
- 5. Accelerator Tension Spring Assembly
- 6. ADS II Throttle Control Linkage

## HYDRAULIC SYSTEM OVERVIEW

### ASC+T Hydraulic Operation

The inclusion of the ASC+T function to the Teves Mark IV ABS system is done quite simply by modifying the existing ABS components and utilizing them to achieve stability control. One such modification of the system is the addition of a separator valve to the hydraulic unit. The separator valve isolates the brake master cylinder from the hydraulic unit when in ASC+T regulation.



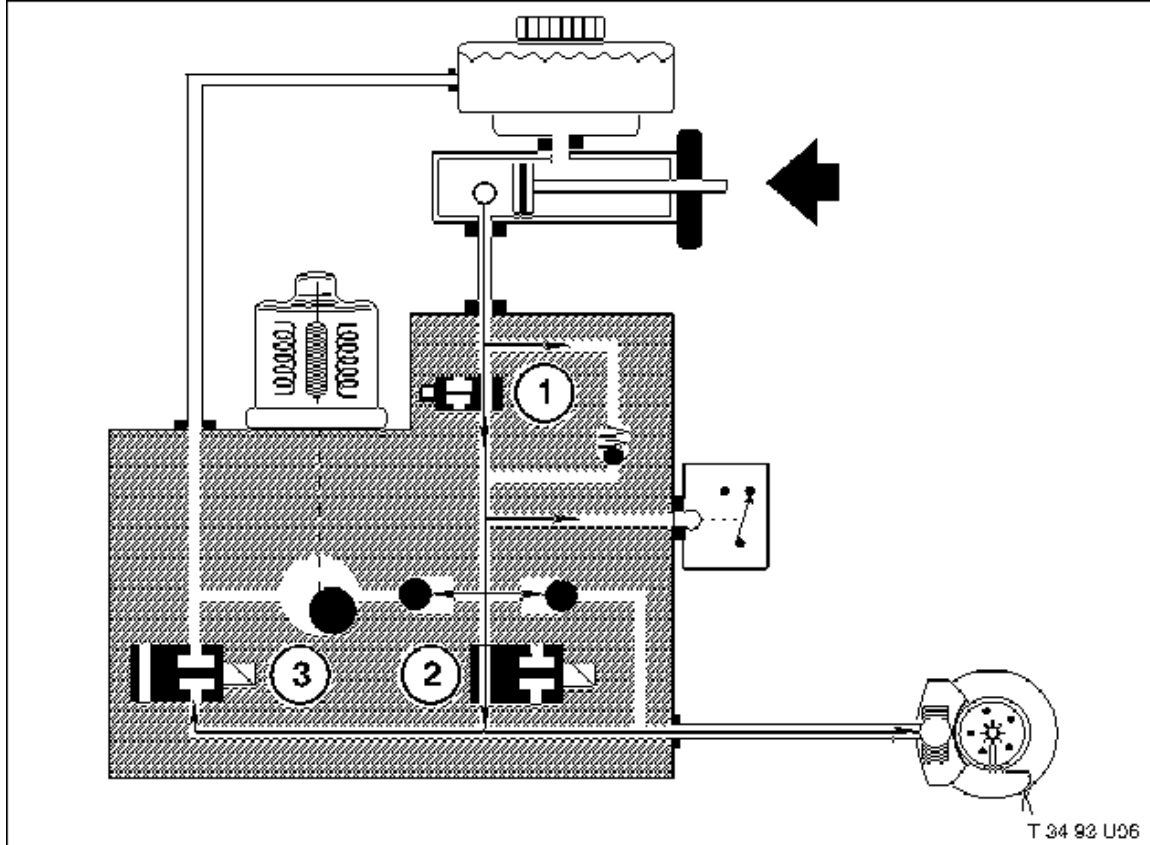
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|--------------------------|-----------------------|
| 1. Hydraulic Unit        | 11. R.R. Inlet Valve  |
| 2. Pump Motor            | 12. R.R. Outlet Valve |
| 3. Dual Pumps            | 13. R.R. Brake        |
| 4. Check Valves          | 14. L.F. Inlet Valve  |
| 5. Separator Valve       | 15. L.F. Outlet Valve |
| 6. Brake Master Cylinder | 16. L.F. Brake        |
| 7. Brake Fluid Reservoir | 17. R.F. Inlet Valve  |
| 8. L.R. Inlet Valve      | 18. R.F. Outlet Valve |
| 9. L.R. Outlet Valve     | 19. R.F. Brake        |
| 10. L.R. Brake           | 20. Pressure Switch   |

## HYDRAULIC OPERATION - TRACTION CONTROL PHASE

### Normal Operation (ASC+T Not Active)

As with the Teves ABS system, all solenoid valves are de-energized for normal braking operation. Normal vehicle braking can take place, as the inlet valves are normally open and the outlet valves are normally closed.

- |                                 |                                  |
|---------------------------------|----------------------------------|
| 1. The separator valve is open. | 3. The outlet valves are closed. |
| 2. The inlet valves are open.   |                                  |

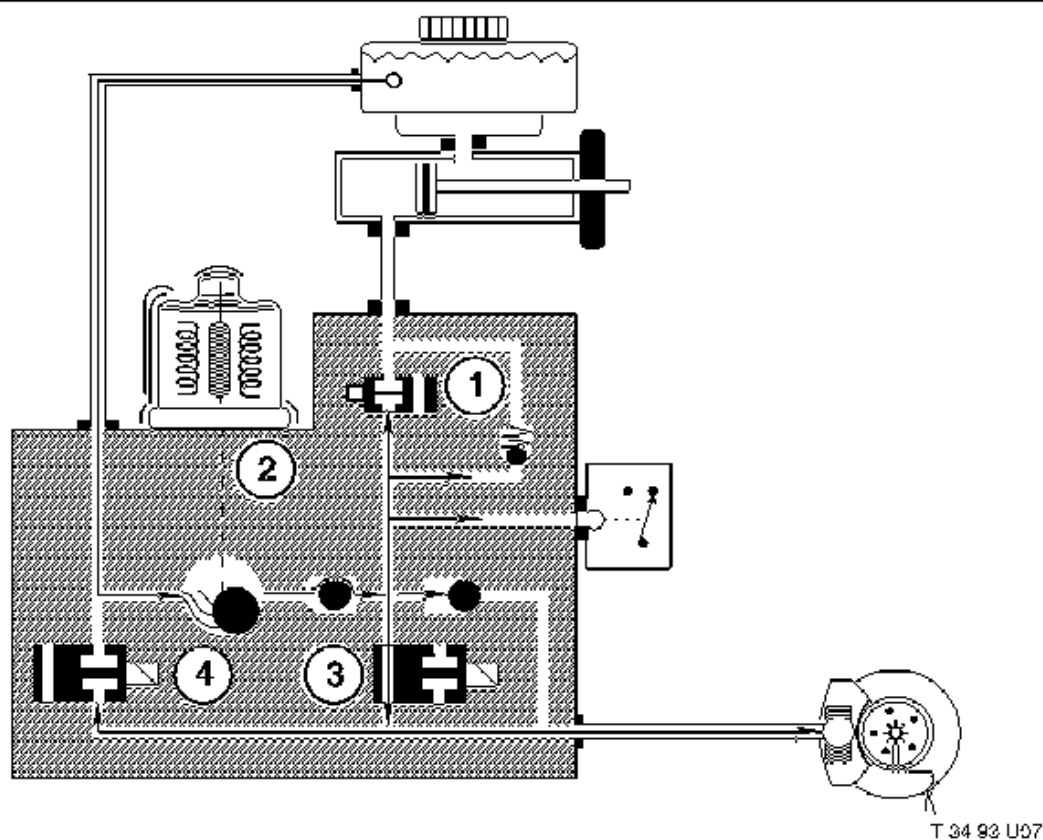


### **PRESSURE BUILD UP (ASC+T Regulation)**

If the ASC control module detects a spinning wheel (or wheels), and the control module determines that braking action is required to restore traction, a control phase is activated.

Pressure is built up in the rear brake circuit by:

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| 1. The Separator valve closing.  | 3. Inlet valve remaining open.    |
| 2. The return pump switching ON. | 4. Outlet valve remaining closed. |

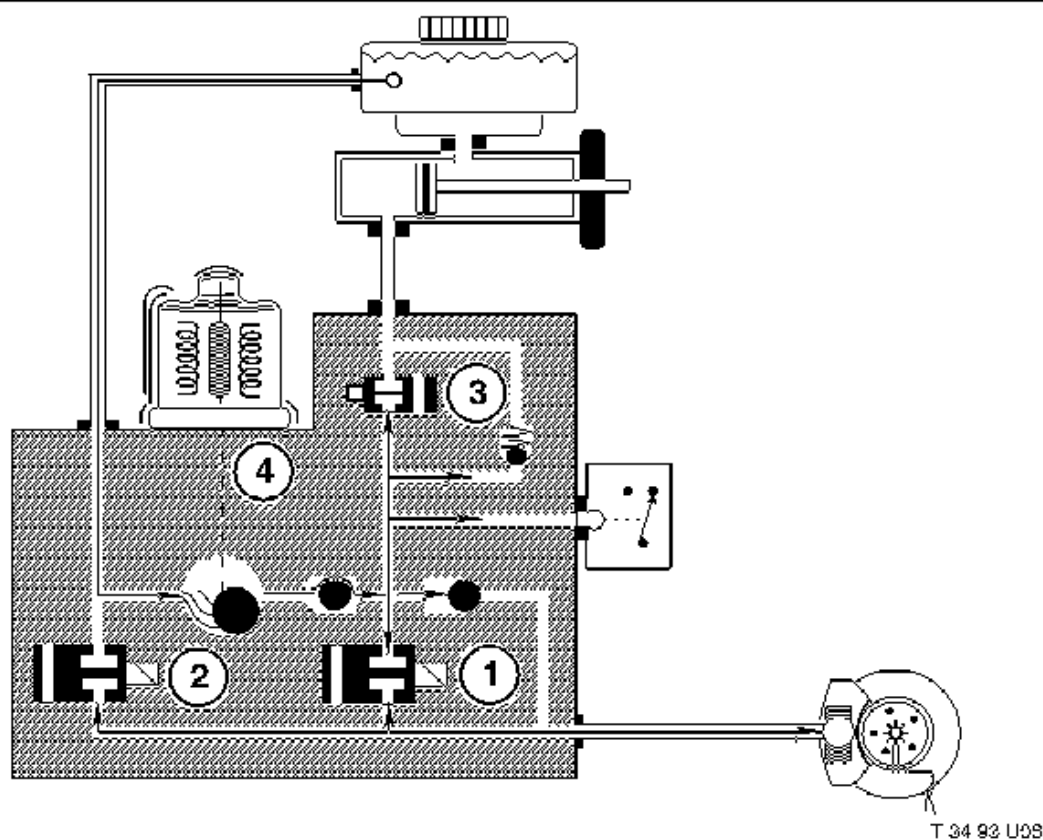


### Pressure Hold (ASC+T Regulation)

Pressure in the brake caliper is now held (or maintained).

- |                                     |  |
|-------------------------------------|--|
| 1. The inlet valve is closed.       | 3. The separator valve remains closed. |
| 2. The outlet valve remains closed. | 4. The Return pump continues to run.   |

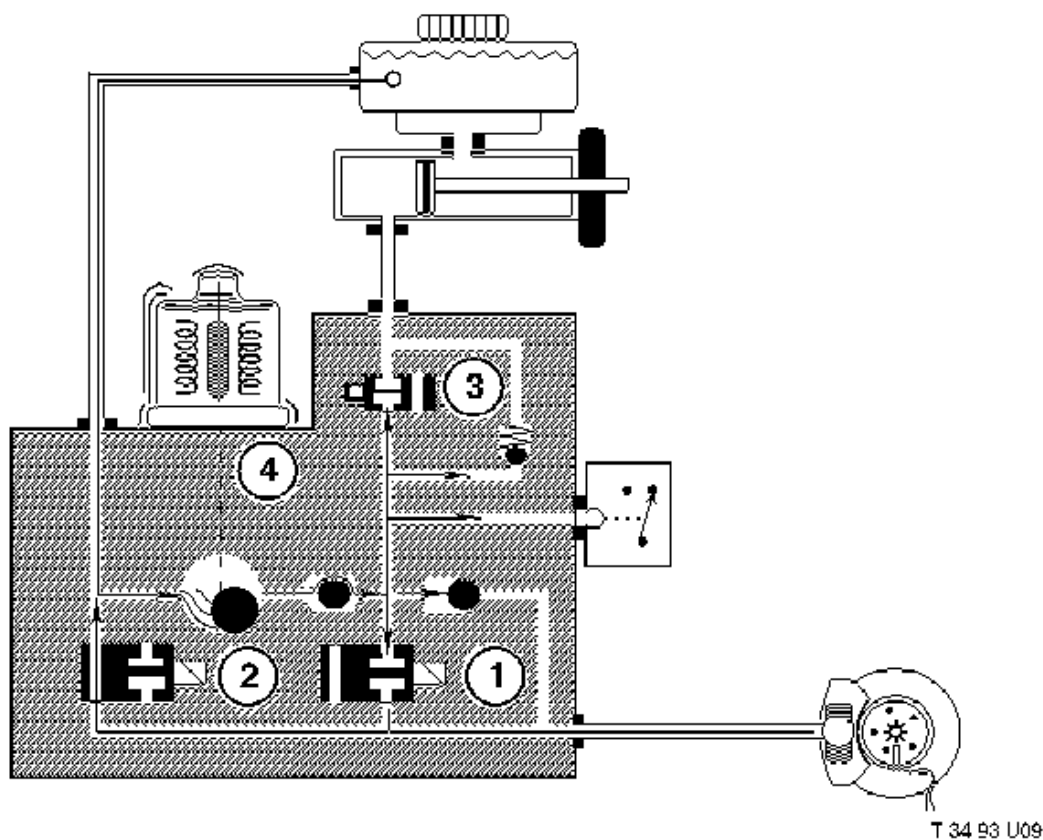




### Pressure Drop (Release)

Hydraulic pressure in the brake caliper is released by the outlet valve and returns to the inlet side of the pump/master cylinder reservoir.

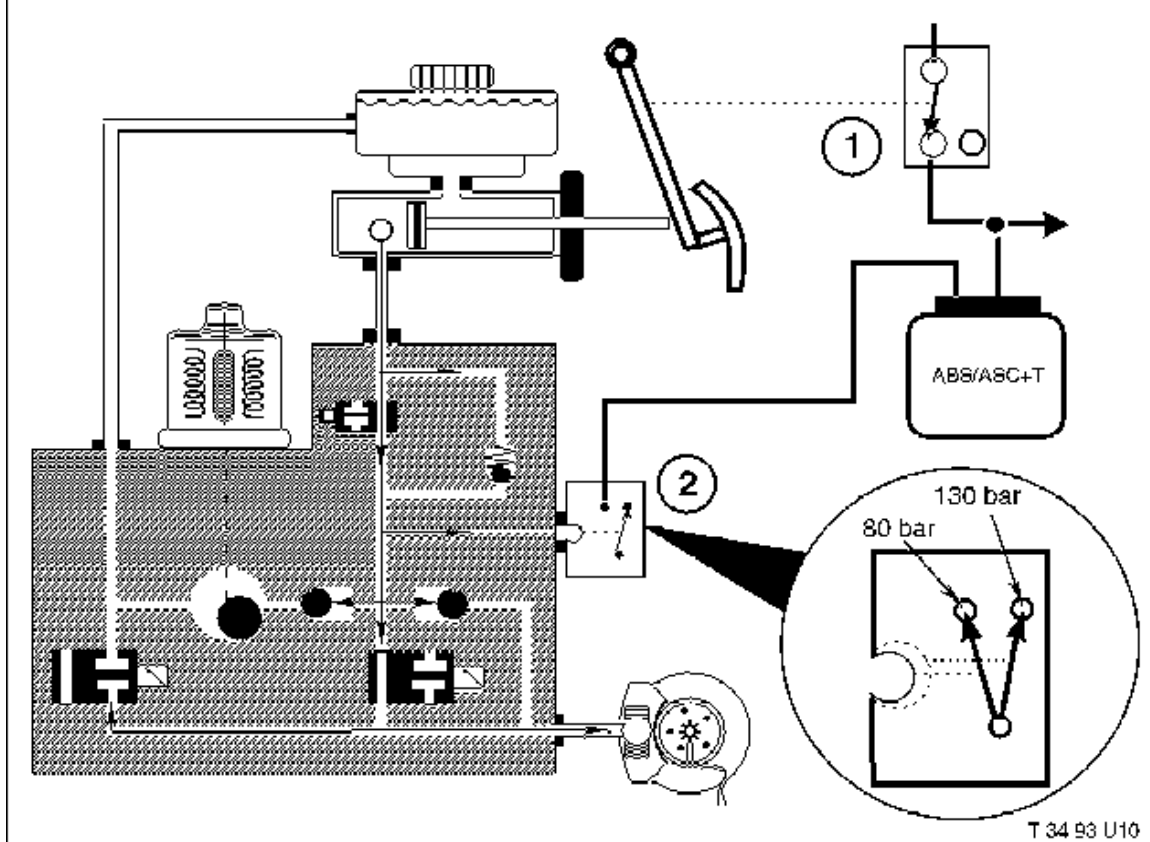
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| 1. The inlet valve remains closed. | 3. The separator valve remains closed. |
| 2. The outlet valve opens.         | 4. The pump continues to run.          |



### Regulation Intervention

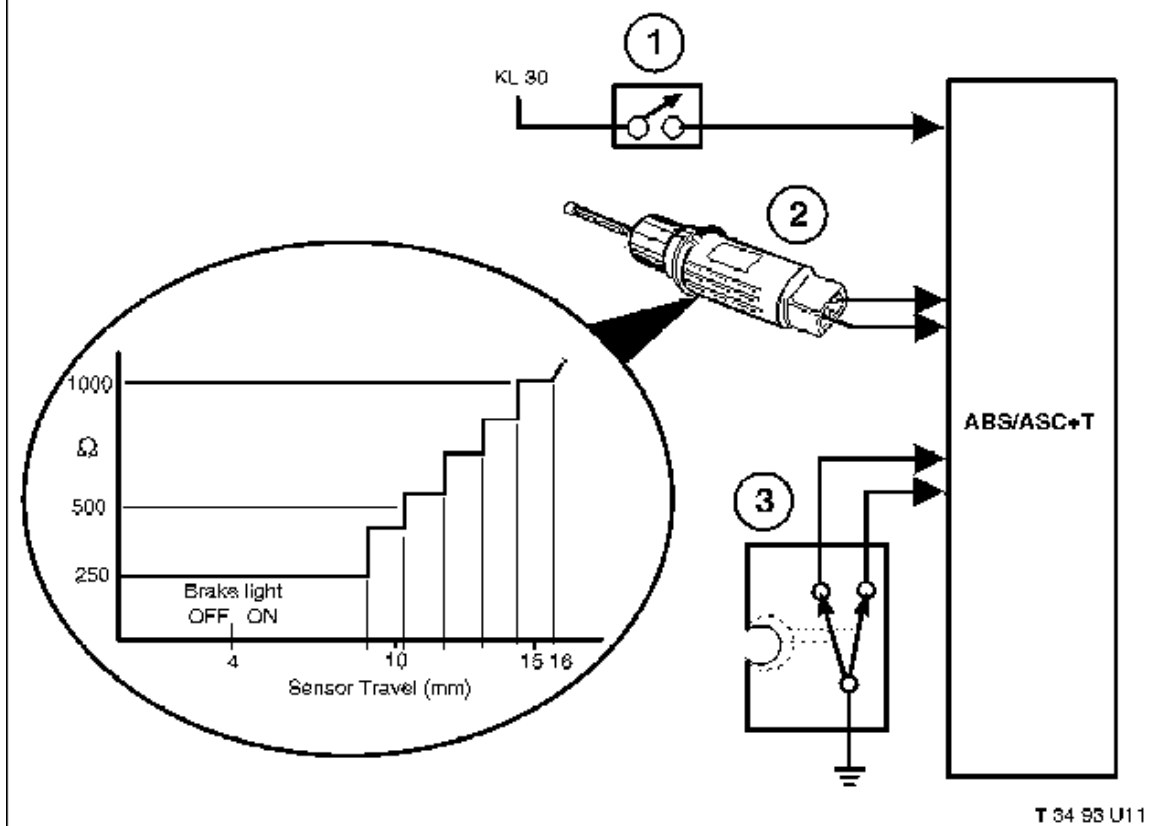
ASC+T Regulation will be switched off by:

1. Brake Application
2. Low system pressure. The pressure switch monitors system pressure and will switch ASC+T off if the low pressure threshold (80 BAR) is reached.



### BRAKE APPLICATION MONITORING

If the brakes are applied during traction control, the traction phase of ASC regulation is switched off immediately. The ASC+T control module monitors the brake light switch (1) and the pedal position sensor (2) for braking application. Either signal to the control module will cause traction control to switch off, as will low system pressure, monitored by the pressure switch (3).



## ASC+T ENGINE CONTROL OVERVIEW

The Teves ASC+T engine control is similar to the Bosch System in operation. This includes the features of engine power output reduction by:

1. Regulation of the intake air volume. This is carried out through the use of an ADS motor controlled by the ASC+T control module (S-EML).
2. Ignition timing retard. This is carried out by the DME control module by a signal request from the ASC+T control module (S-MSR).
3. Ignition/injection fade out. This is also carried out by the DME control module by a signal request from the ASC+T control module (S-ASC).

## ADS II THROTTLE CONTROL

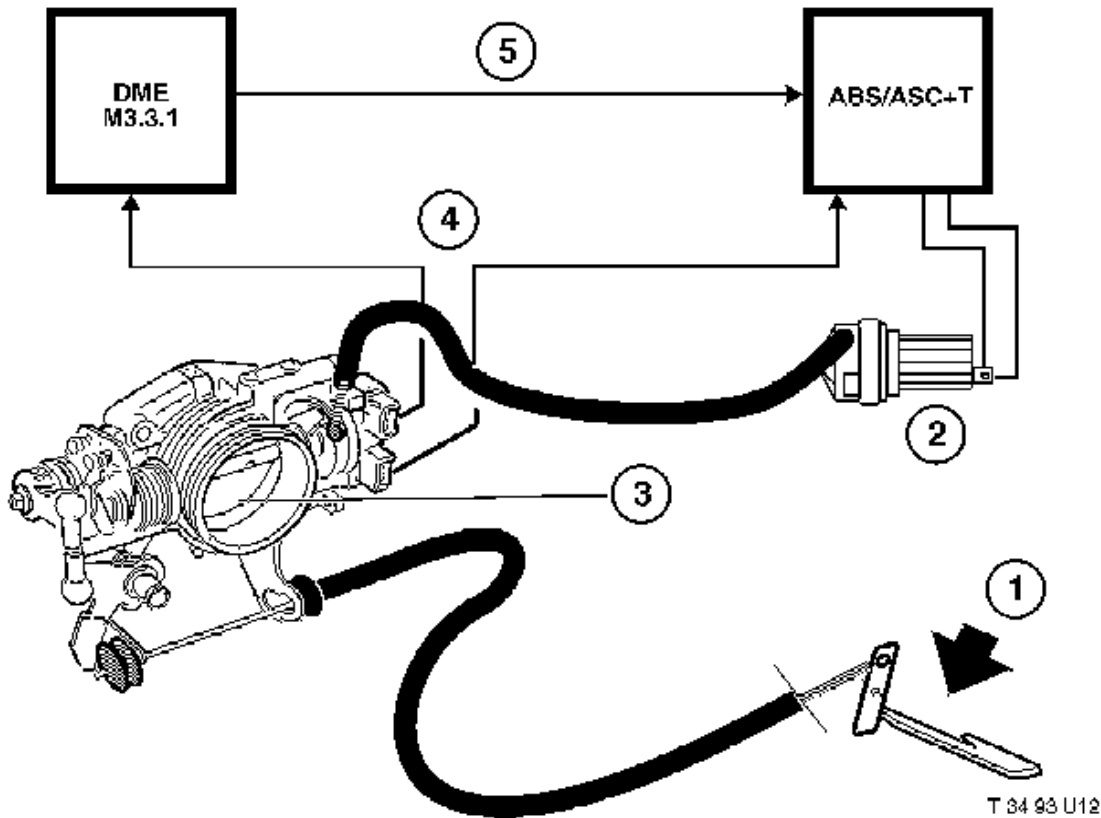
The ADS II motor is controlled by a modulated signal (PWM) from the ASC+T control module.

As the accelerator pedal (1) is depressed, power is applied to the rear wheels. If slip is detected by the ASC+T control module, ASC regulation commences.

The degree of closure is dependent on the degree of slip and the control module programming. The ADS motor (2) closes the throttle (3) through the bowden cable.

The ASC+T control module receives feedback acknowledgment (4) of ADS operation from the potentiometer mounted on the throttle housing.

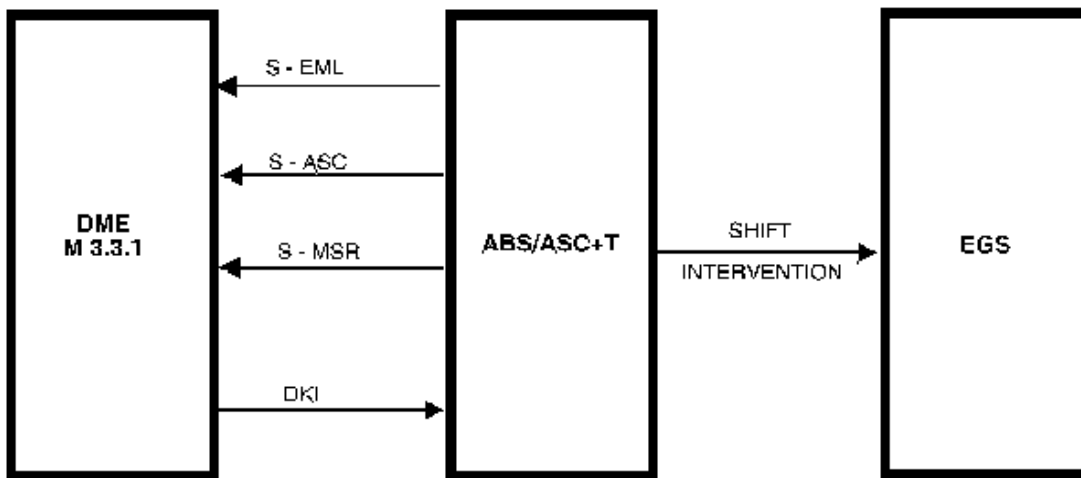
In addition to the ADS position of the throttle, the ASC+T control module also receives the DK1 signal (5) from the DME as a plausibility input.



## ASC+T - DME/EGS INTERFACES

The signals between the ASC+T control module and the DME control module for slip control regulation are switched high/low signals. In addition to the DK1 signal the ASC+T interfaces with the DME over three signal paths.

- S-EML - Signal to DME of ADS throttle regulation.
- S-MSR (ZWV) - During slip control regulation this is a signal to the DME to retard the ignition timing.
- S-ASC (ZA) - During slip control regulation, this is a signal to the DME to briefly fade out the ignition/injection.
- SHIFT INTERVENTION - This is a signal from the ASC+T control module to the EGS control module to suppress shifting during ASC regulation.



S-EML	S-ASC	S-MSR	FUNCTION
0	0	0	NORMAL
1	0	0	ASC CONTROL (Throttle Valve DK)
1	0	1	ASC CONTROL (DK + Ignition Timing Adjustment (ZVV))
1	1	0	ASC CONTROL (DK + Ignition Fade (ZA))

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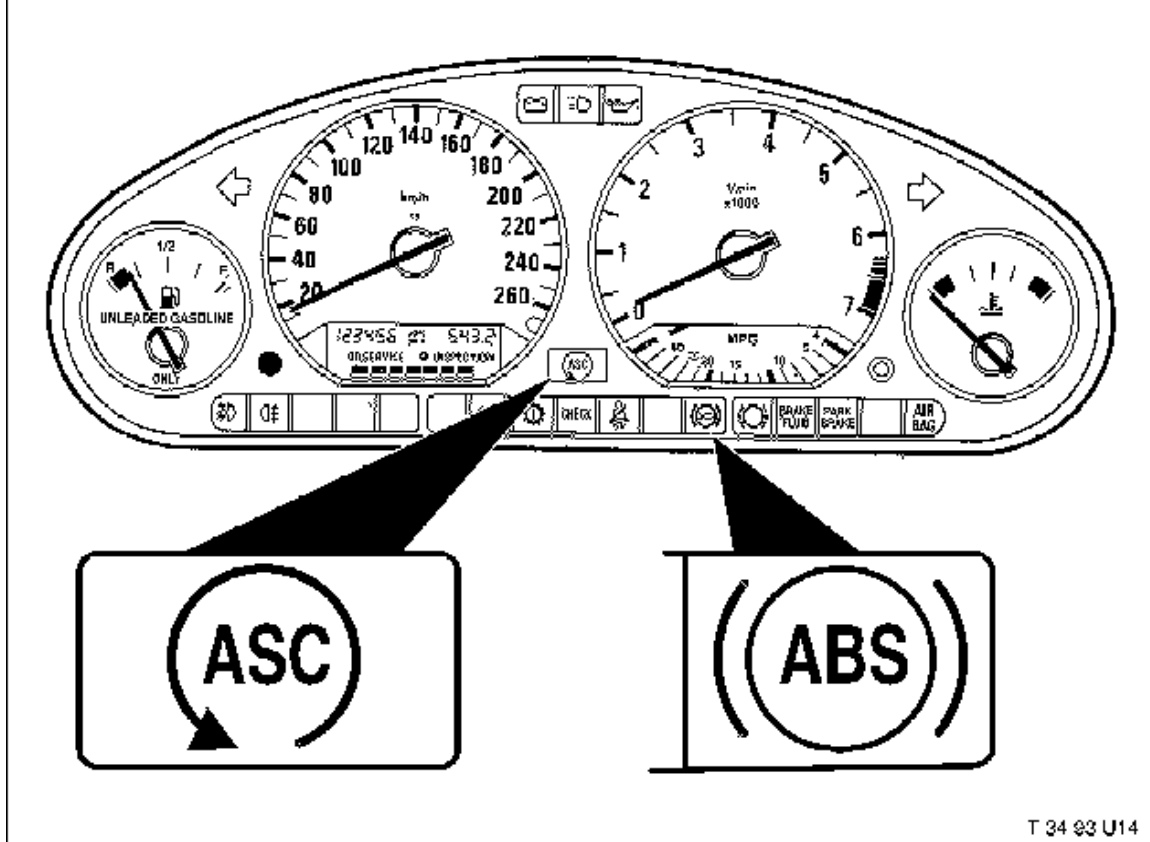
### ABS/ASC+T WARNING LAMPS

Both the ABS and ASC warning lamps illuminate when the ignition is switched on. The lamps go out after approximately 2 seconds (self test check).

The ASC lamp will flash during regulation.

The ASC lamp will be on permanently with a faulted system or if the ASC is manually switched off.

The ABS and ASC lamps will be on permanently with faults that affect the ABS system (both systems off line).



## DIAGNOSIS

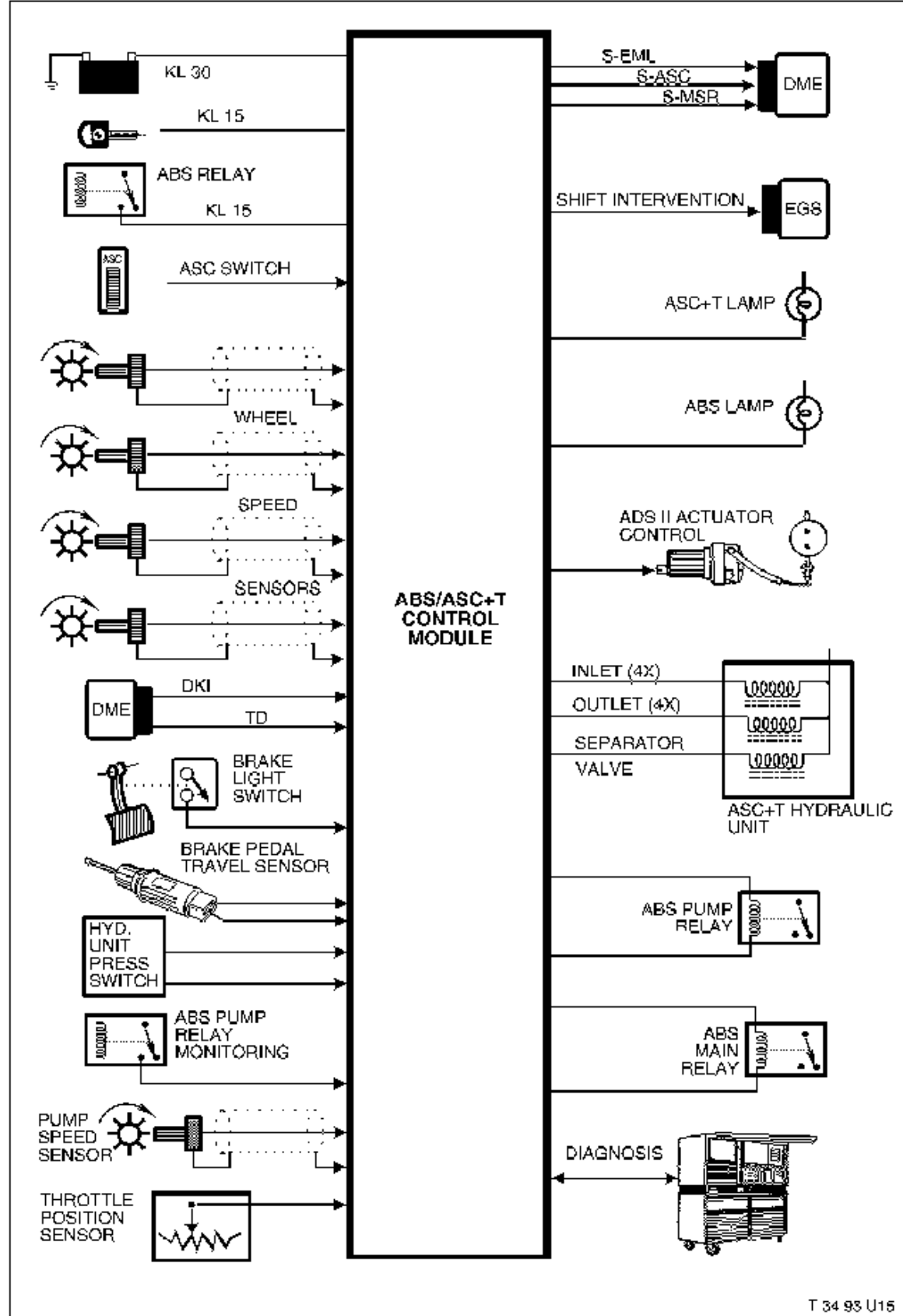
The Teves ABS/ASC+T control module contains extensive fault monitoring capabilities. The "+T" traction control as well as the ABS processing electronics are monitored by the dual (redundancy) processor principle. The control module performs a self test every time the ignition key is switched "ON." This includes activation of all the solenoids and the ADS II motor to check the working circuits. The return pump is checked after the engine is started and the vehicle is moving.

The ABS/ASC+T control module is coded for automatic or standard transmission. Always verify the control module with the identification page when testing or troubleshooting with the Service Tester/MoDiC.

Faults that affect ABS will also cause the ASC+T to go off line. However, some faults that affect ASC+T will not affect ABS operation, (i.e., DME interfaces).

Always use the latest diagnostic software available when testing or troubleshooting ABS/ASC problems.

### E36 TEVES ASC+T I.P.O.



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