TS2470EN

Troubleshooting Manual

Allison Transmission

MD/HD/B Series Transmissions
WTEC II Controls
(Pre-TransID and TID 1)

MD 3060/MD 3066/MD 3560(P)(R)
MD 3070PT
HD 4060/HD 4560(P)(R)
B 300/B 400/ B 500(P)(R)

May 1998
Revision 1, 199910

Allison Transmission
Division of General Motors Corporation
P.O. Box 894 Indianapolis, Indiana 46206-0894

Printed in the U.S.A.
Copyright © 1998 General Motors Corp.

FOREWORD — How to Use This Manual

This manual provides troubleshooting information for Allison Transmission Division, MD/HD/B Series Transmissions. Service Manuals SM2148EN and SM2457EN, and Parts Catalogs PC2150EN and PC2456EN may be used in conjunction with this manual.

This manual includes:

- Description of the WTEC II electronic control system.
- Description of the electronic control system components.
- Description of diagnostic codes, system responses to faults, and troubleshooting.
- Wire, terminal, and connector repair information.

Specific instructions for using many of the available or required service tools and equipment are not included in this manual. The service tool manufacturer will furnish instructions for using the tools or equipment.

Additional information may be published from time to time in Service Information Letters (SIL) and will be included in future revisions of this and other manuals. Please use these SILs to obtain up-to-date information concerning Allison Transmission products.

This publication is revised periodically to include improvements, new models, special tools, and procedures. A revision is indicated by a letter suffix added to the publication number. Check with your Allison Transmission service outlet for the currently applicable publication. Additional copies of this publication may be purchased from authorized Allison Transmission service outlets. Look in your telephone directory under the heading of Transmissions — Truck, Tractor, etc.

Take time to review the Table of Contents and the manual. Reviewing the Table of Contents will aid you in quickly locating information.

NOTE: Allison Transmission is providing for service of WTEC II wiring harnesses and wiring harness components as follows: (See Service Information Letter 1-WT-97 for further information.)

- Repair parts for the internal wiring harness and for wiring harness components attached to the shift selector will be available through the Allison Transmission Parts Distribution Center (PDC). Use the P/N from your appropriate parts catalog or from Appendix E in this manual. Allison Transmission is responsible for warranty on these parts.
- Since January, 1998, all WTEC II external harnesses and external harness components must be obtained from St. Clair Technologies Inc. (SCTI). SCTI provides parts to any Allison customer or OEM and is responsible for warranty on these parts. SCTI recognizes ATD, manufacturers, and SCTI part numbers. SCTI provides a technical HELPLINE at 519-627-1673 (Wallaceburg). SCTI has parts catalogs available. The SCTI addresses and phone numbers for parts outlets are:

St. Clair Technologies, Inc.
1050 Old Glass Road
Wallaceburg, Ontario, Canada, N8A 3T2
Phone: (519) 627-1673
Fax: (519) 627-4227

St. Clair Technologies, Inc.
1111 Mikesell Street
Charlotte, Michigan 48813
Phone: (517) 541-8166
Fax: (517) 541-8167

St. Clair Technologies, Inc.
c/o Mequilas Tetakawi
Carr. Internationale KM 1969
Guadalajara – Nogales, KM2
Empalme, Sonora, Mexico
Phone: 011-52-622-34661
Fax: 011-52-622-34662

Copyright © 1998 General Motors Corp.

IMPORTANT SAFETY NOTICE

IT IS YOUR RESPONSIBILITY to be completely familiar with the warnings and cautions used in this manual. These warnings and cautions advise against using specific service procedures that can result in personal injury, equipment damage, or cause the equipment to become unsafe. These warnings and cautions are not exhaustive. Allison Transmission could not possibly know, evaluate, or advise the service trade of all conceivable procedures by which service might be performed or of the possible hazardous consequences of each procedure. Consequently, Allison Transmission has not undertaken any such broad evaluation. Accordingly, ANYONE WHO USES A SERVICE PROCEDURE OR TOOL WHICH IS NOT RECOMMENDED BY ALLISON TRANSMISSION MUST first be thoroughly satisfied that neither personal safety nor equipment safety will be jeopardized by the service procedures used.

Also, be sure to review and observe WARNINGS, CAUTIONS, and NOTES provided by the vehicle manufacturer and/or body builder before servicing the Allison transmission in that vehicle.

Proper service and repair is important to the safe and reliable operation of the equipment. The service procedures recommended by Allison Transmission and described in this manual are effective methods for performing troubleshooting operations. Some procedures require using specially designed tools. Use special tools when and in the manner recommended.

The WARNINGS, CAUTIONS, and NOTES in this manual apply only to the Allison transmission and not to other vehicle systems which may interact with the transmission. Be sure to review and observe any vehicle system information provided by the vehicle manufacturer and/or body builder at all times the Allison transmission is being serviced.

WARNINGS, CAUTIONS, AND NOTES

Three types of headings are used in this manual to attract your attention:

WARNING!	**Is used when an operating procedure, practice, etc., which, if not correctly followed, could result in injury or loss of life.**

CAUTION:	Is used when an operating procedure, practice, etc., which, if not strictly observed, could result in damage to or destruction of equipment.

NOTE: Is used when an operating procedure, practice, etc., is essential to highlight.

Copyright © 1998 General Motors Corp.

TRADEMARKS USED IN THIS MANUAL

The following trademarks are the property of the companies indicated:

- LPS® Cleaner is a registered trademark of LPS Laboratories.
- VCI #10® is the registered trademark for a vapor phase rust preventive manufactured by Daubert Chemical Company, Chicago, Illinois. VCI #10 is covered by Military Specifications MIL-L-46002 (ORD) and MIL-I-23310 (WEP) under the designation of Nucle Oil.
- Biobor JF® is the registered trademark for a biological inhibitor manufactured by Hammonds Fuel Additives Corporation.
- Loctite® is a registered trademark of the Loctite Corporation.
- Teflon® is a registered trademark of the DuPont Corporation.
- Pro-Link® is a registered trademark of MicroProcessor Systems, Inc.

SHIFT SELECTOR TERMS AND DISPLAY INDICATIONS

Shift selector terms and displays are represented in this manual as follows:

- Button Names — ⇑ ⇓, **DISPLAY MODE, MONITOR, SELECT, etc.**
- Transmission Ranges — **D** (Drive), **N** (Neutral), **1** (First), **R** (Reverse), etc.
- Displays — "**OL**", "**OK**", etc.

Copyright © 1998 General Motors Corp.

TABLE OF CONTENTS

Page

Foreword i

SAFETY INFORMATION

Important Safety Notice iii
Warnings, Cautions, and Notes iii
Trademarks Used in This Manual iv
Shift Selector Terms and Display Indications iv

SECTION 1. GENERAL DESCRIPTION

1–1. TRANSMISSION 1–1
1–2. ELECTRONIC CONTROL UNIT (ECU) 1–3
1–3. SHIFT SELECTOR 1–3
A. Pushbutton Shift Selector 1–3
B. Lever Shift Selector 1–4
1–4. THROTTLE POSITION SENSOR 1–4
1–5. SPEED SENSORS 1–5
1–6. CONTROL MODULE 1–6
1–7. WIRING HARNESSES 1–7
A. External Wiring Harness 1–7
B. Internal Wiring Harness 1–8
1–8. VEHICLE INTERFACE MODULE 1–10
1-9. TRANSID FEATURE 1-10

SECTION 2. DEFINITIONS AND ABBREVIATIONS

2–1. DO NOT SHIFT LIGHT 2–1
2–2. DIAGNOSTIC DATA READER 2–1
2–3. ABBREVIATIONS 2–2

SECTION 3. BASIC KNOWLEDGE

3–1. BASIC KNOWLEDGE REQUIRED 3–1
3–2. USING THE TROUBLESHOOTING MANUAL 3–1
3–3. SYSTEM OVERVIEW 3–2
3–4. IMPORTANT INFORMATION IN THE TROUBLESHOOTING PROCESS 3–2
3–5. BEGINNING THE TROUBLESHOOTING PROCESS 3–3

SECTION 4. WIRE CHECK PROCEDURES

4–1. CHECKING OPENS, SHORTS BETWEEN WIRES, AND SHORTS-TO-GROUND 4–1
4–2. CHECKING AT TRANSMISSION CONNECTOR AND THE INTERNAL HARNESS FOR OPENS, SHORTS BETWEEN WIRES, AND SHORTS-TO-GROUND 4–2

Copyright © 1998 General Motors Corp.

SECTION 5. OIL LEVEL SENSOR **Page**

5–1. ELECTRONIC FLUID LEVEL CHECK (SHIFT SELECTOR) 5–1
A. Fluid Level Check Procedure 5–1
5–2. ELECTRONIC FLUID LEVEL CHECK (PRO-LINK® 9000) 5–4
A. Fluid Level Check Procedure 5–4

SECTION 6. DIAGNOSTIC CODES

6–1. DIAGNOSTIC CODE MEMORY 6–1
6–2. CODE READING AND CODE CLEARING 6–1
6–3. DIAGNOSTIC CODE RESPONSE 6–3
6–4. SHIFT SELECTOR DISPLAYS RELATED TO ACTIVE CODES 6–3
6–5. DIAGNOSTIC CODE LIST AND DESCRIPTION 6–4
6–6. DIAGNOSTIC CODE TROUBLESHOOTING 6–17
A. Beginning the Troubleshooting Process 6–17
B. Solenoid Locations 6–17
C. Diagnostic Code Schematics 6–18
D. Diagnostic Code 13 and 35 Schematics 6–18

SECTION 7. INPUT AND OUTPUT FUNCTIONS

7–1. INPUT FUNCTIONS 7–1
7–2. OUTPUT FUNCTIONS 7–3

SECTION 8. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

8–1. GENERAL NOTES 8–1
8–2. TROUBLESHOOTING PERFORMANCE COMPLAINTS 8–2

APPENDICES

A. IDENTIFICATION OF POTENTIAL CIRCUIT PROBLEMS A–1
B. CHECKING CLUTCH PRESSURES B–1
C. SOLENOID AND CLUTCH CHART C–1
D. WIRE/CONNECTOR CHART D–1
E. CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS E–1
F. THROTTLE POSITION SENSOR ADJUSTMENT F–1
G. MISCELLANEOUS ITEMS G–1
H. HYDRAULIC SCHEMATICS H–1
J. WT WIRING SCHEMATICS J–1
K. SOLENOID AND TEMPERATURE CHARTS K–1
L. EXTERNALLY-GENERATED ELECTRONIC INTERFERENCE L–1
M. DIAGNOSTIC TREE — WT SERIES HYDRAULIC SYSTEM M–1
N. PRO-LINK® 9000 DIAGNOSTIC DATA READER INFORMATION N–1
P. INPUT/OUTPUT FUNCTION WIRING SCHEMATICS P–1

Copyright © 1998 General Motors Corp.

SECTION 1 — GENERAL DESCRIPTION

1–1. TRANSMISSION

The World Transmission Electronic Controls WTEC II system features closed-loop clutch control to provide superior shift quality over a wide range of operating conditions. MD 3000 (except 3070), HD 4000, and B Series configurations can be programmed to have up to six forward ranges, neutral, and one reverse range. The MD 3070 has seven forward ranges and one reverse range. Figures 1–1 and 1–2 show electronic control unit components.

WTEC II Electronic Controls consist of the following components:

- Basic or Max Feature Electronic Control Unit (ECU)
- Pushbutton or Lever Shift Selectors (remote or integral to the ECU)
- Optional Secondary Shift Selector
- Engine, Turbine and Output Speed Sensors
- Throttle Position Sensor (TPS) (or electronic engine throttle signal or PWM signal)
- Control Module (Electro-Hydraulic Valve Body)
- Wiring Harnesses
- Vehicle Interface Module (VIM)
- Optional Retarder Controls
- TransID Feature

NOTE: ***Model Year '94 and earlier WT Series Electronic Controls operate on 12VDC. Vehicles with a 24VDC system require a voltage equalizer or converter to supply 12V to the electronic control system. Model Year '95 and later transmissions operating on 24VDC require a 24V VIM and a 24V wiring harness which includes shielding for the turbine and output speed sensors.***

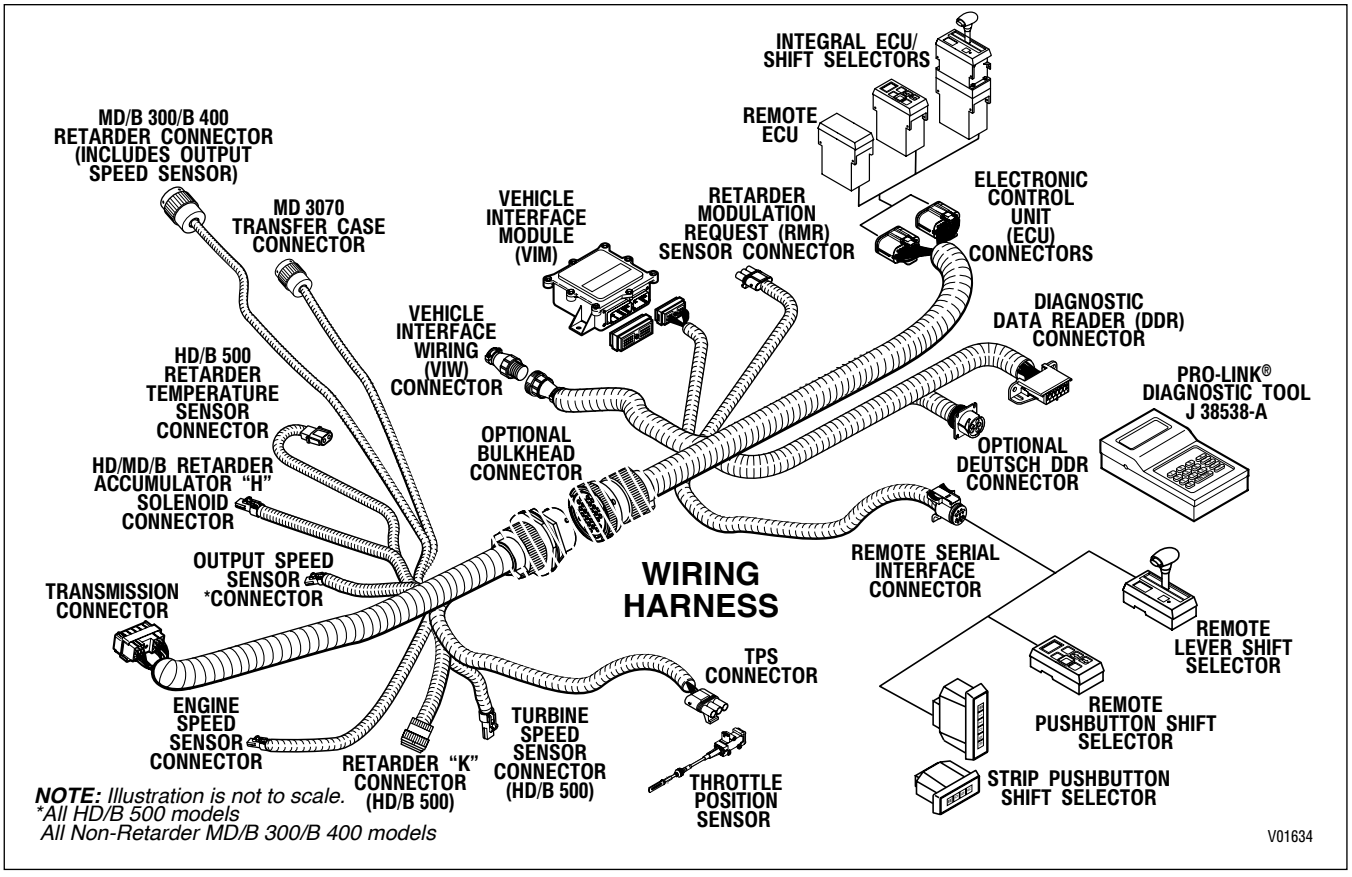


Figure 1–1. WTEC II Electronic Control Components (Units Produced Before 9/94)

Copyright © 1998 General Motors Corp.

GENERAL DESCRIPTION

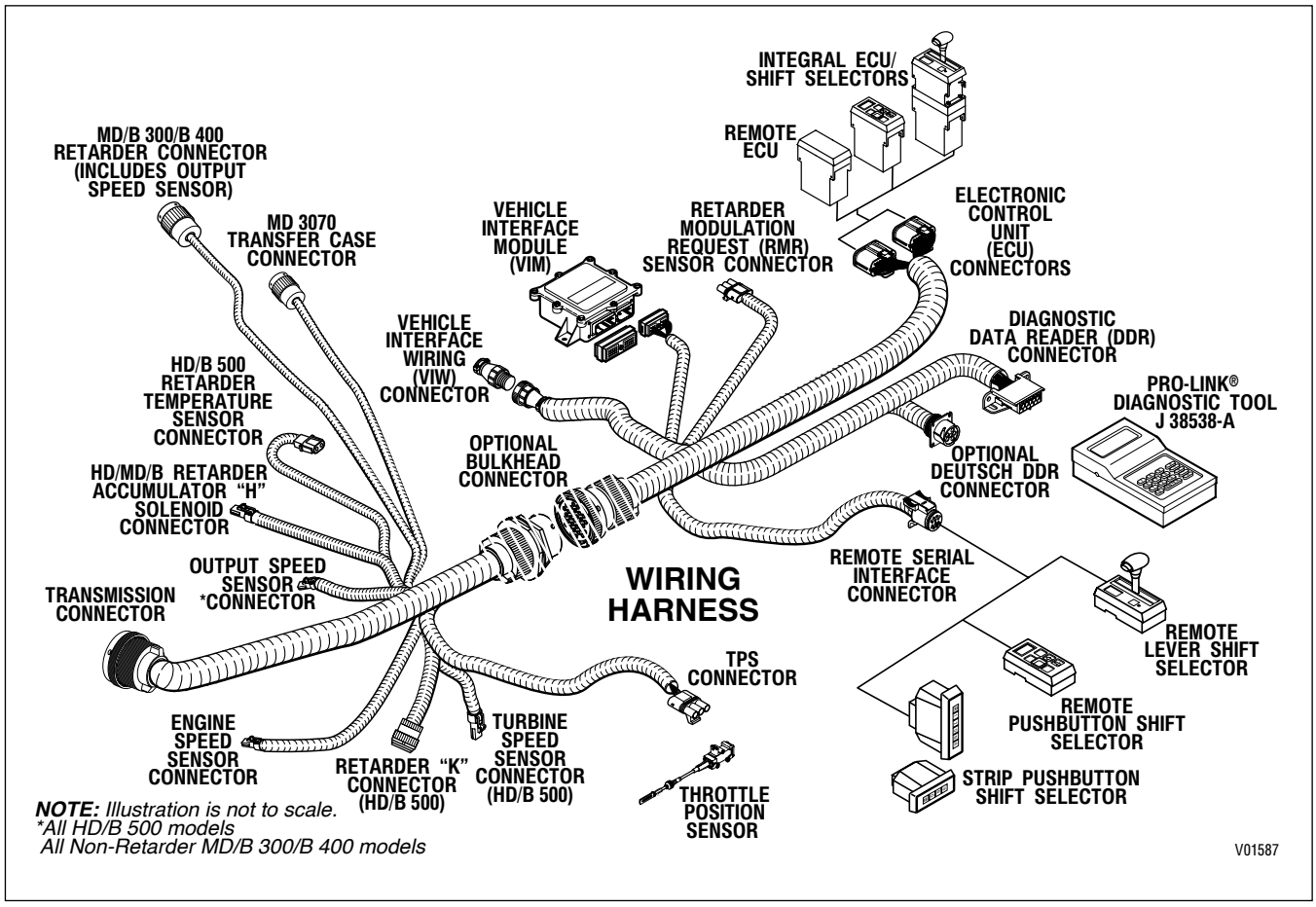


Figure 1–2. WT Electronic Control Unit Components (Units Produced 9/94–12/97)

Figure 1–3 is a block diagram of the basic system's inputs and outputs.

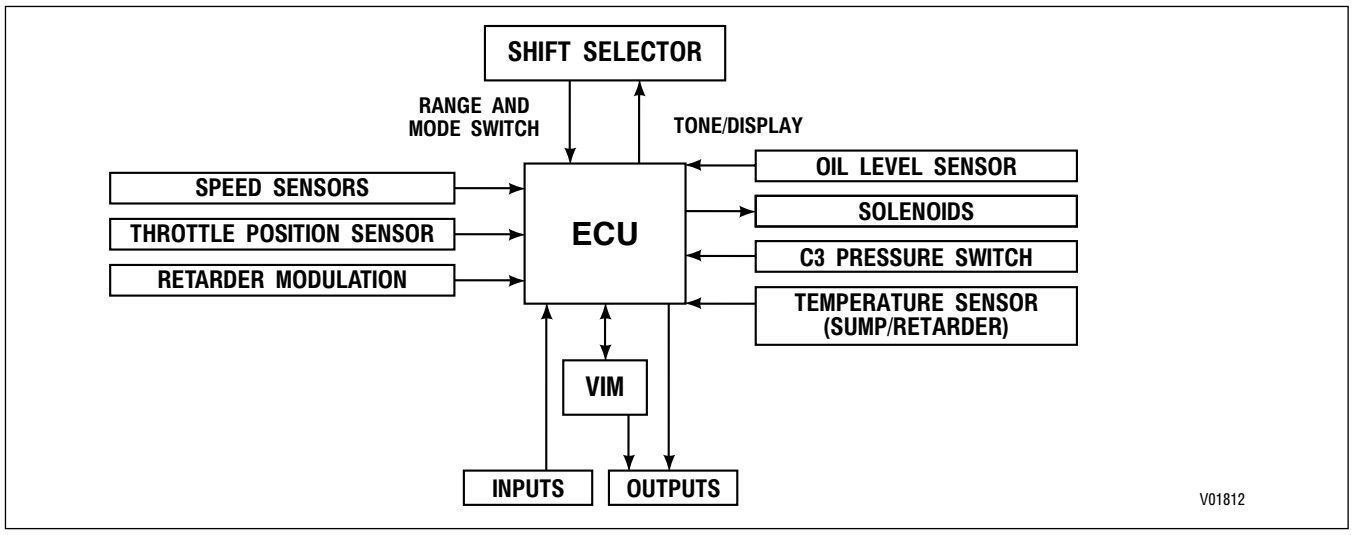


Figure 1–3. Electronic Control Unit Block Diagram

Copyright © 1998 General Motors Corp.

GENERAL DESCRIPTION

1–2. ELECTRONIC CONTROL UNIT (ECU)

The ECU (Figure 1–4) contains the microcomputer which is the brain of the control system. The ECU receives and processes information defining: shift selector position, throttle position, sump/retarder temperature, engine speed, turbine speed, and transmission output speed. The ECU uses the information to control transmission solenoids and valves, supply system status, and provide diagnostic information.

The ECU contains an Electronically Erasable Programmable Read Only Memory (EEPROM) which is programmed with the shift calibration and other data for a specific transmission assembly, engine, and vehicle vocation.

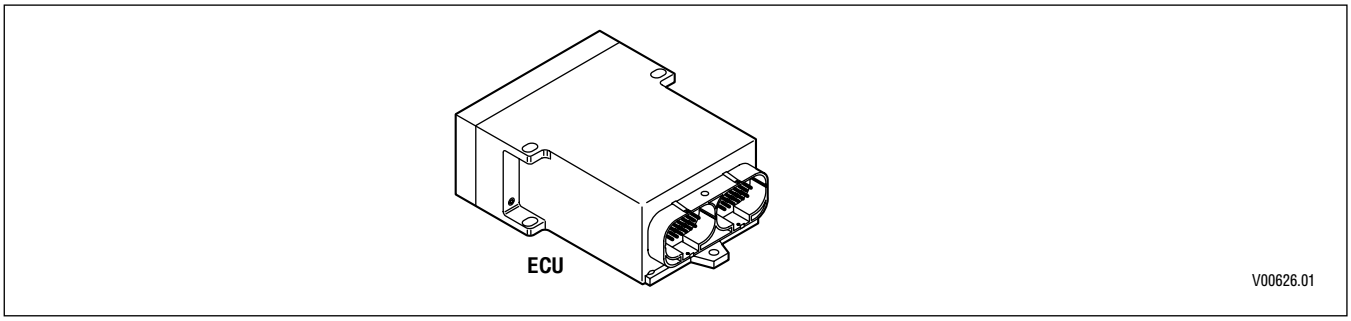


Figure 1–4. Electronic Control Unit (ECU)

1–3. SHIFT SELECTOR

Pushbutton and lever shift selectors are available for the WT Series. Either shift selector may be ordered attached to (integral with), or remote from, the ECU. Both shift selectors are equipped with a digital display. However, the strip pushbutton shift selector does not have a digital display.

On the shift selectors, between the range selected and the range monitored (attained) digits, is a **MODE ON** indicator position. During normal transmission operation **MODE ON** indicates that a secondary or special operating condition has been selected by pressing the **MODE** button. In diagnostic display mode, **MODE ON** indicates the displayed diagnostic code is active. There is a **SERVICE** indicator icon under the **MODE ON** indicator. It is illuminated when codes 21 XX, 63 00, and 66 00 are active (for ECUs programmed after 9/26/94). When a transmission fault occurs that causes the **DO NOT SHIFT** light to turn on, the shift selector sounds a tone to indicate transmission shifting is restricted.

A. Pushbutton Shift Selector *(Figure 1–5)*

The full-function pushbutton shift selector has six (6) buttons and a digital display. The six buttons are: **R** (Reverse), **N** (Neutral), **D** (Drive), ⇑ (Up), ⇓ (Down), and **MODE**. Manual forward range downshifts; upshifts are made by pressing the ⇑ (Up) or ⇓ (Down) arrow buttons after selecting **D** (Drive). The **N** (Neutral) button has a raised lip to aid in finding it by touch. The digital display on the pushbutton selector indicates the range selected on the left side and the range monitored (attained) on the right side. The **MODE** button is pressed to select a secondary or special operating condition, such as ECONOMY shift schedule. The vehicle dimmer-control changes display brightness. Diagnostic information is obtained by pressing the ⇑ (Up) and ⇓ (Down) arrow buttons at the same time.

Copyright © 1998 General Motors Corp.

GENERAL DESCRIPTION

A strip pushbutton shift selector does not have a **MODE** button, **SERVICE** icon, or diagnostic display capability. The Pro-Link® 9000 or a customer-furnished remote display must be used for diagnostic purposes.

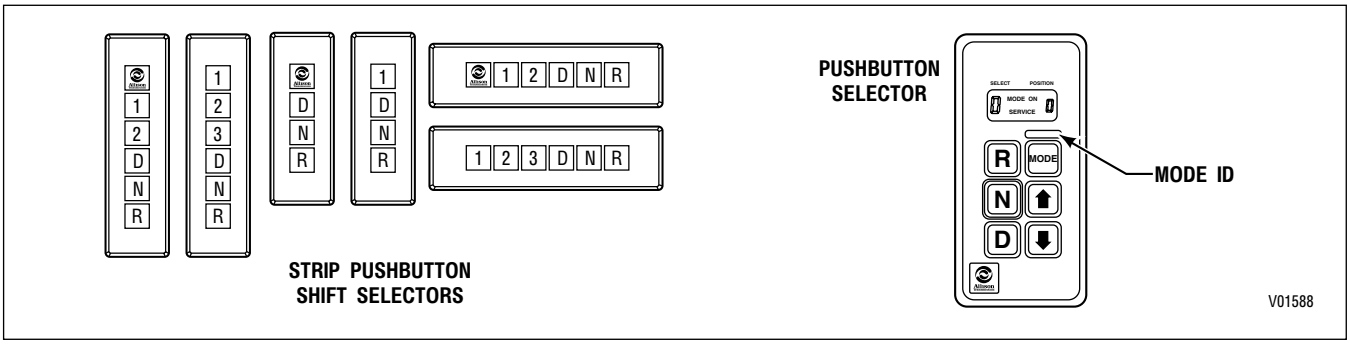


Figure 1–5. Pushbutton Shift Selectors

B. Lever Shift Selector *(Figure 1–6)*

The lever shift selector can only be ordered with as many as six forward range positions (seven for the MD 3070), as well as **R** (Reverse) and **N** (Neutral). The shift hold mechanism is released by pressing a button on the side of the shift handle. The range selector lever can be moved freely between numbered forward ranges. Press and hold the shift hold button to move into or out of the **D** (Drive) position or when moving into or out of **N** (Neutral) or **R** (Reverse).

The digital display on the lever selector indicates the selected range at the top and the range monitored (attained) at the bottom. A **MODE** button and a recessed **DISPLAY MODE** button are also on the face of the lever shift selector. The **MODE** button is pressed to select a secondary or special operating condition, such as ECONOMY shift schedule. Diagnostic information is obtained by pressing the **DISPLAY MODE** button. The vehicle dimmer-control changes display brightness.

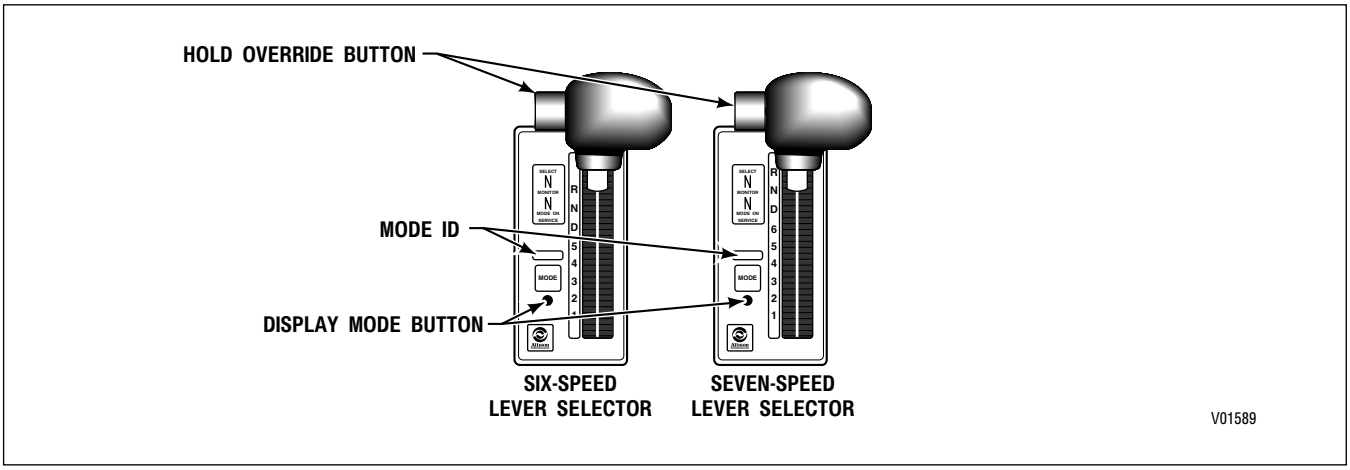


Figure 1–6. Six-Speed And Seven-Speed Lever Shift Selectors

Copyright © 1998 General Motors Corp.

GENERAL DESCRIPTION

1–4. THROTTLE POSITION SENSOR *(Figure 1–7)*

The Throttle Position Sensor (TPS) can be mounted to the engine, chassis, or transmission. The TPS contains a pull actuation cable and a potentiometer. One end of the cable is attached to the engine fuel lever and the other, inside a protective housing, to the TPS potentiometer. Output voltage from the TPS is directed to the ECU through the external harness. The voltage signal indicates the throttle position and, in combination with other input data, determines shift timing.

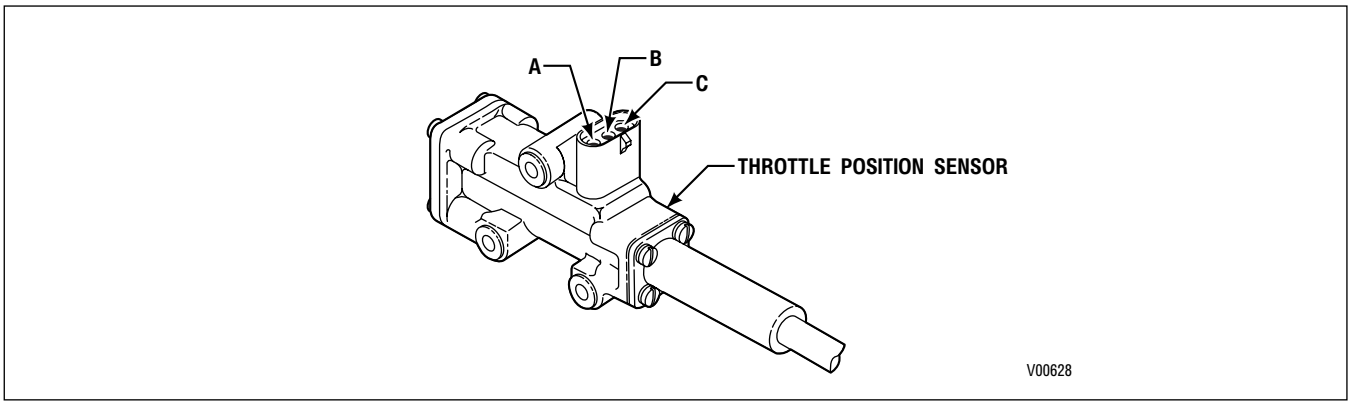


Figure 1–7. Throttle Position Sensor

1–5. SPEED SENSORS *(Figure 1–8)*

Three speed sensors — engine speed, turbine speed, and output speed — provide information to the ECU. The engine speed signal is generated by ribs on the shell of the torque converter pump. The turbine speed signal is generated by the rotating-clutch housing spline contours. The output speed signal is generated by a toothed member attached to the output shaft (except for the MD 3070, where the toothed member is the transfer case idler gear). The speed ratios between the various speed sensors allow the ECU to determine if the transmission is in the selected range. Speed sensor information is also used to control the timing of clutch apply pressures, resulting in the smoothest shifts possible. Hydraulic problems are detected by comparing the speed sensor information for the current range to that range's speed sensor information stored in the ECU memory.

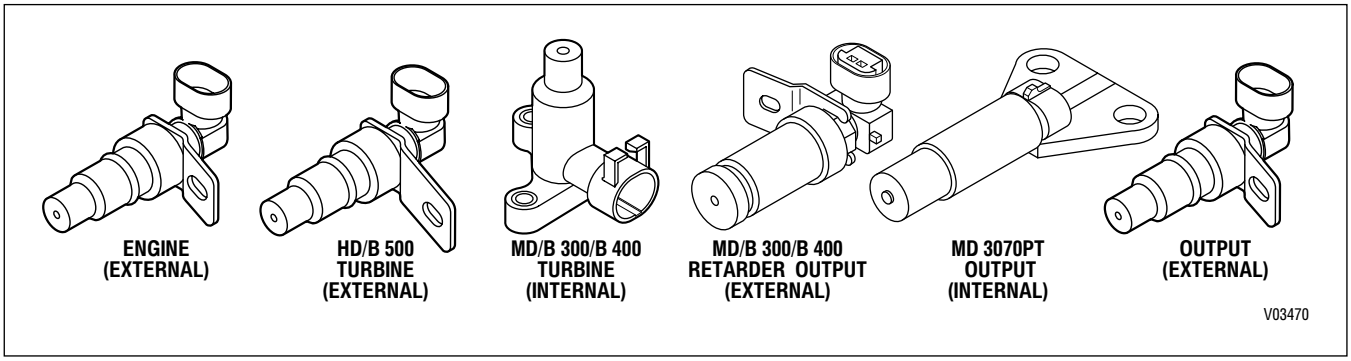


Figure 1–8. Speed Sensors

Copyright © 1998 General Motors Corp.

GENERAL DESCRIPTION

1–6. CONTROL MODULE *(Figure 1–9)*

The WT Series transmission control module contains a channel plate on which is mounted: the main valve body assembly, the stationary-clutch valve body assembly, and the rotating-clutch valve body assembly. For valve locations, refer to SIL 27-WT-93, Rev. A. Pulse width modulated solenoids are used in the valve bodies. The rotating-clutch valve body assembly contains A (C1), B (C2), and F (lockup) solenoids, solenoid regulator valves controlled by the solenoids, and the C3 pressure switch. The stationary-clutch valve body assembly contains C (C3), D (C4), and E (C5) solenoids and solenoid regulator valves controlled by the solenoids and the C3 accumulator relay valve. The main valve body assembly contains G solenoid and the C1 and C2 latch valves controlled by the solenoid, the main and lube regulator valves, the control main and converter regulator valves, and the converter flow valve and exhaust backfill valves.

A temperature sensor (thermistor) is located in the internal wiring harness. Changes in sump fluid temperature are indicated by changes in sensor resistance which changes the signal sent to the ECU (see chart in Section 6, Code 24).

The oil level sensor is required on all models with a shallow sump but is optional on other models. The oil level sensor is a float-type device, mounted on the control module channel plate, which senses transmission fluid level by electronically measuring the buoyancy forces on the float. The sensor operates on 5VDC supplied by the ECU.

The C3 pressure switch is mounted on the rotating-clutch valve body assembly and indicates when pressure exists in the C3 clutch-apply passage. An accumulator/relay valve is in-line ahead of the C3 pressure switch and prevents high frequency hydraulic pulses generated by the C3 solenoid from cycling the C3 pressure switch.

Also mounted in the control module is the turbine speed sensor for the MD/B 300/B 400 models. The turbine speed sensor is directed at the rotating-clutch housing. (The turbine speed sensor on the HD/B 500 models is located on the outside of the main housing.)

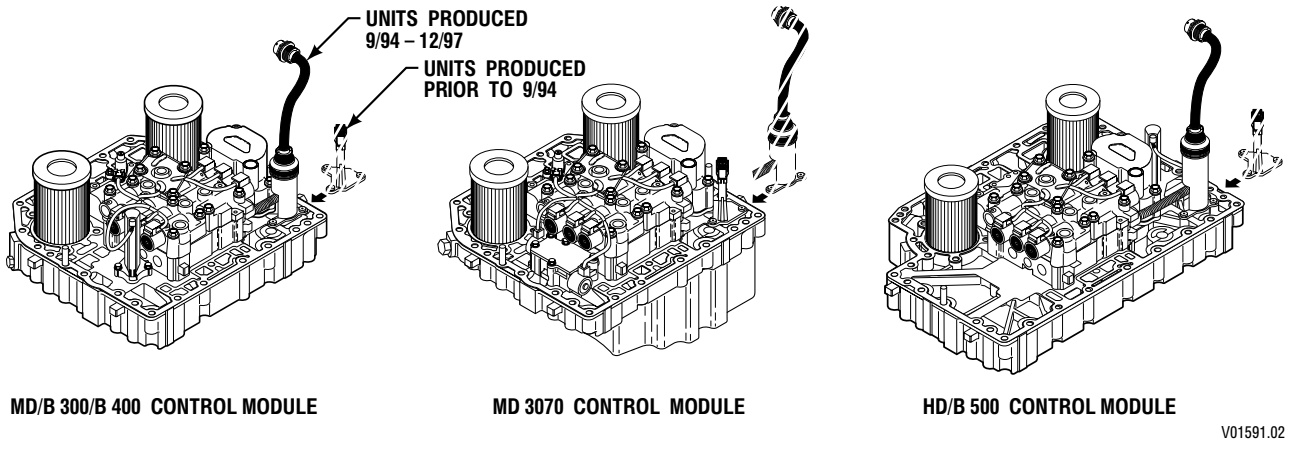


Figure 1–9. Control Module

Copyright © 1998 General Motors Corp.


BUY NOW
PayPal
VISA
MasterCard
DISCOVER
AMERICAN EXPRESS