APPENDICES

APPENDICES

NOTES

APPENDIX A — IDENTIFICATION OF POTENTIAL CIRCUIT PROBLEMS

Intermittent codes are a result of faults that are detected, logged and then disappear, only to recur later. If, when troubleshooting, a code is cleared in anticipation of it recurring and it does not, check the items in the following list for the source of the fault.

A. Circuit Inspection

1. Intermittent power/ground problems — can cause voltage problems during ECU diagnostic checks which can set various codes depending upon where the ECU was in the diagnostic process.
2. Damaged terminals.
3. Dirty or corroded terminals.
4. Terminals not fully seated in the connector. Check indicated wires by uncoupling connector and gently pulling on the wire at the rear of the connector and checking for excessive terminal movement.
5. Connectors not fully mated. (Check for missing or damaged locktabs.)
6. Screws or other sharp pointed objects pushed into or through one of the harnesses.
7. Harnesses which have rubbed through and may be allowing intermittent electrical contact between two wires or between wires and vehicle frame members.
8. Broken wires within the braiding and insulation.

B. Finding an Intermittent Fault Condition

To find a fault, like one of those listed, examine all connectors and the external wiring harness. Harness routing may make it difficult to see or feel the complete harness. However, it is important to check the entire harness for chafed or damaged areas. Road vibrations and bumps can damage a poorly installed harness by moving it against sharp edges and cause some of the faults. If a visual inspection does not identify a cause, move and wiggle the harness by hand until the fault is duplicated.

The next most probable cause of an intermittent code is an electronic part exposed to excessive vibration, heat, or moisture. Examples of this are:

1. Exposed harness wires subjected to moisture.
2. A defective connector seal allows moisture to enter the connector or part.
3. An electronic part (ECU, shift selector, solenoid, or throttle sensor) affected by vibration, heat, or moisture may cause abnormal electrical conditions within the part.

Before troubleshooting Item 3, eliminate all other possible causes before replacing any parts.

Another cause of intermittent codes is good parts in an abnormal environment. The abnormal environment will usually include excessive heat, moisture, or voltage. For example, an ECU that receives excessive voltage will generate a diagnostic code as it senses high voltage in a circuit. The code may not be repeated consistently because different circuits may have this condition on each check. The last step in finding an intermittent code is to observe if the code is set during sudden changes in the operating environment.

Troubleshooting an intermittent code requires looking for common conditions that are present whenever the code is diagnosed.

APPENDIX A — IDENTIFICATION OF POTENTIAL CIRCUIT PROBLEMS

C. Recurring Conditions

A recurring condition might be:

- Rain
- Outside temperature above or below a certain temperature
- Only on right-hand or left-hand turns
- When the vehicle hits a bump, etc.

If such a condition can be related to the code, it is easier to find the cause. If the time between code occurrences is very short, troubleshooting is easier than if it is several weeks or more between code occurrences.

APPENDIX B — CHECKING CLUTCH PRESSURES

Checking individual clutch pressures helps to determine if a transmission malfunction is due to a mechanical or an electrical problem. Properly making these pressure checks requires transmission and vehicle (or test stand) preparation, recording of data, and comparing recorded data against specifications provided. These instructions are for all WT Series Transmissions.

NOTE: ***Check to see if there are diagnostic codes set which are related to the transmission difficulty you are evaluating. Proceed to make mechanical preparations for checking clutch pressures after codes have first been evaluated.***

A. Transmission and Vehicle Preparation

1. Remove the plugs from the pressure tap locations where measurement is desired (refer to Figure B–1).

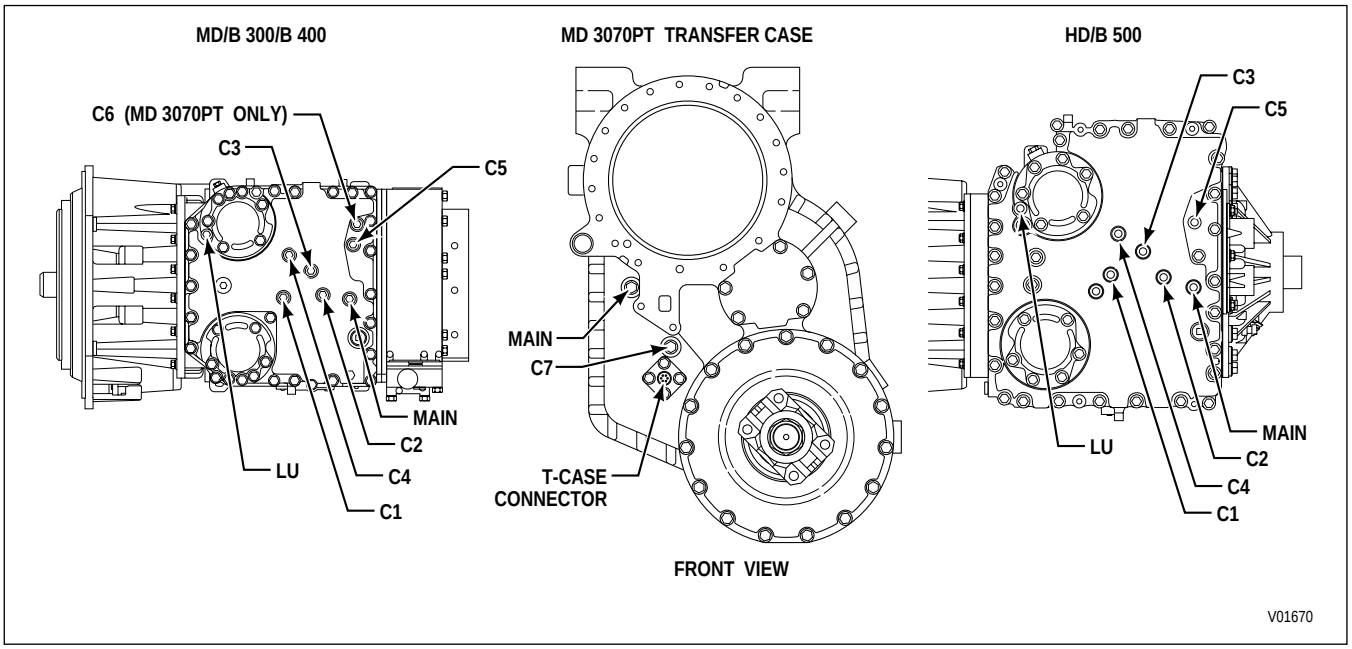


Figure B–1. Clutch Pressure Check Points

CAUTION:	Be sure that the hydraulic fittings have the same thread as the plugs removed (7⁄16-20 UNF-2A). Also please note that these fittings must be straight thread, O-ring style. Failure to do this will result in damage to the control module.

2. Install hydraulic fittings suitable for attaching pressure gauges or transducers.

3. Connect pressure gauges or transducers. Pressure gauge set J 26417-A is available for this purpose. See Table B–2 for pressure levels expected.

4. Check that engine speed can be monitored (Pro-Link® 9000 diagnostic tool may be used for this purpose).

5. Be sure that transmission sump fluid temperature can be measured. (Pro-Link® 9000 diagnostic tool may be used for this purpose.)

APPENDIX B — CHECKING CLUTCH PRESSURES

6. Be sure that the transmission has enough fluid for cold operation until an operating temperature fluid level can be set.

7. Bring the transmission to normal operating temperature of 71–93ºC (160–200ºF). Check for fluid leaks in the added pressure gauge/transducer lines. Repair leaks as needed. Be sure that fluid level is correct.

B. Recording Data

1. Use the Pro-Link® 9000 diagnostic tool, which allows checking of individual range clutch pressures, with the vehicle stationary. Consult Appendix N or the Pro-Link® 9000 operating instructions for Action Request and select Clutch Test Mode. Follow instructions to check clutch pressures in individual ranges.

NOTE: ***Check lockup clutch pressure by driving the vehicle in a range where lockup can be obtained. Record the pressure values at the engine speed and sump fluid temperature values shown in Table B–1. The lockup clutch is functioning correctly when engine speed and turbine speed values are equal as recorded from the Pro-Link® 9000.***

2. Consult Table B–1 and locate the transmission model that you are testing.

3. Operate the transmission at the conditions shown in Table B–1 and record engine speed, transmission sump fluid temperature, main hydraulic pressure, and clutch pressures in the ranges where a problem is suspected.

Table B–1. Clutch Pressure Test Conditions

Transmission Model/Test Type	Engine rpm	Sump Fluid Temp	Range	Clutches Pressurized
All (except MD 3070) — Idle Check	580–620	71–93ºC (160–200ºF)	Neutral	C5
			Reverse	C3 C5
			1C	C1 C5
			2C (2nd range start)	C1 C4
MD 3070 — Idle Check	580–620	71–93ºC (160–200ºF)	Neutral	C5
			Reverse	C3 C5
			LowC	C3 C6
			1C	C1 C5
MD (except 3070) B 300/B 400 — High Speed	2080–2120		Reverse	C3 C5
			Neutral	C5
			1C	C1 C5
			2C	C1 C4
			2L	C1 C4 LU
			3L	C1 C3 LU
			4L	C1 C2 LU
			5L	C2 C3 LU
			6L	C2 C4 LU

APPENDIX B — CHECKING CLUTCH PRESSURES

Table B–1. Clutch Pressure Test Conditions *(cont'd)*

Transmission Model/Test Type	Engine rpm	Sump Fluid Temp	Range	Clutches Pressurized
MD 3070 — High Speed	2080–2120		Reverse	C3 C5
			Neutral	C5
			LoC	C3 C6
			1C	C1 C5
			2C	C1 C4
			2L	C1 C4 LU
			3L	C1 C3 LU
			4L	C1 C2 LU
			5L	C2 C3 LU
			6L	C2 C4 LU
HD/B 500 — High Speed	1780–1820		Reverse	C3 C5
			Neutral	C5
			1C	C1 C5
			2C	C1 C4
			2L	C1 C4 LU
			3L	C1 C3 LU
			4L	C1 C2 LU
			5L	C2 C3 LU
			6L	C2 C4 LU

C. Comparing Recorded Data to Specifications

1. Be sure that engine speed and transmission sump fluid temperatures were within the values specified in Table B–1.
2. Compare the main pressure and clutch pressure data, recorded in Step B, with the specifications in Table B–2.
3. If clutch pressures are within specifications, return the transmission and vehicle to their original configuration and proceed with electrical troubleshooting.
4. If clutch pressures are not within specification, take corrective action to replace the internal parts of the transmission necessary to correct the problem. (Refer to the Transmission Service Manual for the model being checked.)
5. Recheck pressure values after the transmission has been repaired.
6. Return the transmission to its original configuration. (Remove instrumentation and reinstall any components removed for the pressure testing.)

APPENDIX B — CHECKING CLUTCH PRESSURES

Table B–2. Main Pressure and Clutch Pressure Specifications (Sump Fluid Temperature Same as in Table B–1)

Transmission Model/Test Type	Engine rpm	Range	Clutches Applied	Main Press. Spec kPa/[psi]	Range Clutch Press. Spec* kPa/[psi]	LU Clutch Press. Spec kPa/[psi]	D'BOX MAIN Press. Spec kPa/[psi]
MD — Idle (except 3070)	580–620	Neutral	C5	1500–1900 [218–276]			
		Reverse	C3 C5	1500–1900 [218–276]			
		1C	C1 C5	1300–1900 [189–276]			
		2C	C1 C4	1300–1900 [189–276]			
MD 3070 — Idle		Neutral	C5	1500–1900 [218–276]	1480–1900 [215–276]		
		Reverse	C3 C5	1500–1900 [218–276]	1480–1900 [215–276]		
		LowC	C3 C6	1500–1900 [218–276]	1480–1900 [215–276]		
		1C	C1 C5	1500–1900 [218–276]	1280–1900 [186–276]		
MD — High Speed (except 3070)	2080–2120	Neutral	C5	1500–2300 [218–334]	0–35 (C5) [0–5]		
		Reverse	C3 C5	1500–2300 [218–334]	0–35 (C3) [0–5] 0–35 (C5) [0–5]		
		1C	C1 C5	1500–2100 [218–305]	0–80 (C1) [0–11.6] 0–35 (C5) [0–5]		
		2C	C1 C4	1500–2100 [218–305]	0–80 (C1) [0–11.6] 0–35 (C4) [0–5]		
		2L	C1 C4 LU	1000–1400 [145–203]	0–80 (C1) [0–11.6] 0–35 (C4) [0–5]	950–1400 [138–203]	

* Subtract clutch pressure from main pressure; the difference must fall within the specifications given (unless a pressure range is supplied).

APPENDIX B — CHECKING CLUTCH PRESSURES

Table B–2. Main Pressure and Clutch Pressure Specifications (Sump Fluid Temperature Same as in Table B–1) *(cont'd)*

Transmission Model/Test Type	Engine rpm	Range	Clutches Applied	Main Press. Spec kPa/[psi]	Range Clutch Press. Spec* kPa/[psi]	LU Clutch Press. Spec kPa/[psi]	D'BOX MAIN Press. Spec kPa/[psi]
MD — High Speed (except 3070) *(cont'd)*		3C	C1 C3	1500–2100 [218–305]	0–80 (C1) [0–11.6] 0–35 (C3) [0–5]		
		3L	C1 C3 LU	1000–1400 [145–203]	0–80 (C1) [0–11.6] 0–35 (C3) [0–5]	950–1400 [138–203]	
		4C	C1 C2	1500–2100 [218–305]	0–80 (C1) [0–11.6] 0–80 (C2) [0–11.6]		
		4L	C1 C2 LU	1000–1400 [145–203]	0–80 (C1) [0–11.6] 0–80 (C2) [0–11.6]	950–1400 [138–203]	
		5C	C2 C3	1150–1650 [167–239]	0–80 (C2) [0–11.6] 0–35 (C3) [0–5]		
		5L	C2 C3 LU	900–1300 [131–189]	0–80 (C2) [0–11.6] 0–35 (C3) [0–5]	850–1300 [124–189]	
		6C	C2 C4	1150–1650 [167–239]	0–80 (C2) [0–11.6] 0–35 (C4) [0–5]		
		6L	C2 C4 LU	900–1300 [131–189]	0–80 (C2) [0–11.6] 0–35 (C4) [0–5]	850–1300 [124–189]	
MD 3070 — High Speed		Neutral	C5	1500–2300 [218–334]	1480–2300 [215–334]		1400–1600 [200–232]
		Reverse	C3 C5	1500–2300 [218–334]	1480–2300 [215–334]		1400–1600 [200–232]

* Subtract clutch pressure from main pressure; the difference must fall within the specifications given (unless a pressure range is supplied).

APPENDIX B — CHECKING CLUTCH PRESSURES

Table B–2. Main Pressure and Clutch Pressure Specifications (Sump Fluid Temperature Same as in Table B–1) *(cont'd)*

Transmission Model/Test Type	Engine rpm	Range	Clutches Applied	Main Press. Spec kPa/[psi]	Range Clutch Press. Spec* kPa/[psi]	LU Clutch Press. Spec kPa/[psi]	D'BOX MAIN Press. Spec kPa/[psi]
MD 3070 — High Speed *(cont'd)*		LowC	C3 C6	1500–2300 [218–334]	1480–2300 [215–334]		1400–1600 [200–232]
		1C	C1 C5	1500–2100 [218–305]	1480–2100 [215–305]		1400–1600 [200–232]
		2C	C1 C4	1500–2100 [218–305]	1480–2100 [215–305]		1400–1600 [200–232]
		2L	C1 C4 LU	1000–1400 [145–203]	980–1400 [142–203]	980–1400 [142–203]	1400–1600 [200–232]
		3C	C1 C3	1500–2100 [218–305]	1480–2100 [215–305]		1400–1600 [200–232]
		3L	C1 C3 LU	1000–1400 [145–203]	980–1400 [142–203]	980–1400 [142–203]	1400–1600 [200–232]
		4C	C1 C2	1500–2100 [218–305]	1480–2100 [215–305]		1400–1600 [200–232]
		4L	C1 C2 LU	1000–1400 [145–203]	980–1400 [142–203]	980–1400 [142–203]	1400–1600 [200–232]
		5C	C2 C3	1150–1650 [167–239]	1130–1650 [164–239]		1400–1600 [200–232]
		5L	C2 C3 LU	900–1300 [131–189]	880–1300 [128–189]	880–1300 [128–189]	1400–1600 [200–232]
		6C	C2 C4	1150–1650 [167–239]	1130–1650 [164–239]		1400–1600 [200–232]
		6L	C2 C4 LU	900–1300 [131–189]	880–1300 [128–189]	880–1300 [128–189]	1400–1600 [200–232]
HD — Idle	580–620	Neutral	C5	1500–2070 [218–300]			
		Reverse	C3 C5	1500–2070 [218–300]			
		1C	C1 C5	1300–1800 [189–260]			
		2C	C1 C4	1300–1800 [189–260]			

* Subtract clutch pressure from main pressure; the difference must fall within the specifications given (unless a pressure range is supplied).

APPENDIX B — CHECKING CLUTCH PRESSURES

Table B–2. Main Pressure and Clutch Pressure Specifications (Sump Fluid Temperature Same as in Table B–1) *(cont'd)*

Transmission Model/Test Type	Engine rpm	Range	Clutches Applied	Main Press. Spec kPa/[psi]	Range Clutch Press. Spec* kPa/[psi]	LU Clutch Press. Spec kPa/[psi]	D'BOX MAIN Press. Spec kPa/[psi]
HD — High Speed	1780–1820	Neutral	C5	1800–2100 [261–305]	0–70 (C5)/[0–10]		
		Reverse	C3 C5	1800–2100 [261–305]	0–70 (C3)/[0–10] 0–70 (C5)/[0–10]		
		1C	C1 C5	1550–1800 [225–261]	0–70 (C1)/[0–10] 0–50 (C5)/[0–7]		
		2C	C1 C4	1550–1800 [225–261]	0–70 (C1)/[0–10] 0–35 (C4)/[0–5]		
		2L	C1 C4 LU	1050–1400 [152–203]	0–70 (C1)/[0–10] 0–35 (C4)/[0–5]	950–1400 [138–203]	
		3C	C1 C3	1550–1800 [225–261]	0–70 (C1)/[0–10] 0–50(C3)/[0–7]		
		3L	C1 C3 LU	1050–1400 [152–203]	0–70 (C1)/[0–10] 0–50 (C3)/[0–7]	950–1400 [138–203]	
		4C	C1 C2	1550–1800 [225–261]	0–70 (C1)/[0–10] 0–70 (C2)/[0–10]		
		4L	C1 C2 LU	1050–1400 [152–203]	0–70 (C1)/[0–10] 0–70 (C2)/[0–10]	950–1400 [138–203]	
		5C	C2 C3	1190–1380 [173–200]	0–70 (C2)/[0–10] 0–70 (C3)/[0–10]		
		5L	C2 C3 LU	900–1250 [131–181]	0–70 (C2)/[0–10] 0–70 (C3)/[0–10]	850–1300 [124–189]	
		6C	C2 C4	1190–1830 [173–200]	0–70 (C2)/[0–10] 0–35 (C4)/[0–5]		
		6L	C2 C4 LU	900–1250 [131–181]	0–70 (C2)/[0–10] 0–35 (C4)/[0–5]	850–1300 [124–189]	

* Subtract clutch pressure from main pressure; the difference must fall within the specifications given (unless a pressure range is supplied).

APPENDIX B — CHECKING CLUTCH PRESSURES

NOTES

APPENDIX C — SOLENOID AND CLUTCH CHART

BASIC CONFIGURATION

Range	Solenoid Non-Latching Modulating							Clutches					
	A N/O	B N/O	C N/C	D N/C	E N/C	F N/C	G N/C	C1	C2	C3	C4	C5	LU
6	X			X		0			X		X		0
5	X		X			0	X		X	X			0
4						0	X	X	X				0
3		X	X			0	X	X		X			0
2		X		X		0	X	X			X		0
1		X			X	0		X				X	0
N1	X	X		*	X	0						X	0
N2	X	X		X							X		
N3	X	X	X							X			
N4	X	X		X							X		
R	X	X	X		X					X		X	

NOTE: See Page C–2 for legend.

7-SPEED (T-CASE) CONFIGURATION

Range	Solenoid Non-Latching Modulating										Clutches							
	N/O	N/O	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C								
	C1	C2	C3	C4	C5	LU	FWD	LOW	C6	DIF								
	A	B	C	D	E	F	G	N	J	H	C1	C2	C3	C4	C5	LU	C6	DIF
6	X			X		0				0		X		X		0		0
5	X		X			0	X			0		X	X			0		0
4						0	X			0	X	X				0		0
3		X	X			0	X			0	X		X			0		0
2		X		X		0	X			0	X			X		0		0
1		X			X	0				0	X				X	0		0
LO	X					0	X	X	X	0			X			0	X	0
N1	X	X		*	X					0					X			0
N2	X	X		X			X			0				X				0
N3	X	X	X				X			0			X					0
N4	X	X		X			X			0				X				0
R	X	X	X		X					0			X		X			0

NOTE: See Page C–2 for legend.

APPENDIX C — SOLENOID AND CLUTCH CHART

LEGEND

X	Electrically ON with respect to solenoids; hydraulically applied with respect to clutches.
(Blank)	Electrically OFF with respect to solenoids; hydraulically OFF with respect to clutches.
0	Optional ON or OFF.
*	If diagnostics indicate that turbine speed is below a calibration value (typically less than engine idle speed) when transmission input speed is greater than the minimum calculation value and **N1** (Neutral) has been selected and commanded, then Solenoid D must be turned ON. Otherwise, Solenoid D is turned OFF in **N1** (Neutral).

APPENDIX D — WIRE/CONNECTOR CHART

The connector information in this appendix is provided for the convenience of the servicing technician. The connector illustration and pin identifications for connection to Allison Transmission components will be accurate. Allison Transmission components are the ECU, speed sensors, retarder connectors, transmission connectors, and shift selectors. Other kinds of connectors for optional or customer-furnished components are provided based on typical past practice for an Allison-designed system. Wire number and color codes shown are for Allison-supplied harnesses. Harnesses supplied by OEMs and customers may use different wire numbers and colors.

Contact St. Clair Technologies, Inc. or your vehicle manufacturer for information on connectors not found in this appendix.

APPENDIX D — WIRE/CONNECTOR CHART

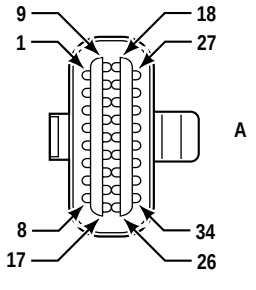


Figure D–1. ECU Connector "A"

ECU CONNECTOR "A" (BLACK/WHITE)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A1			Reserved	Trans Conn, H2
A2	Orange	102	Solenoid Ground 1 (A, D)	Trans Conn, A2
A3	Green	103	C (C3) Solenoid Hi	Trans Conn, C1
A4	White	104	G (Forward) Solenoid Hi	Trans Conn, F1
A5	Green	105	Output Function 5	VIW, 1
A6	White	106	Oil Level Sensor Power	Trans Conn, G3
A7	Green	107	F (Lockup) Solenoid Hi	Trans Conn, D3
A8	Yellow	108	Remote Power Wake Up	RSI Conn, 6
A9	Blue	109	K Solenoid Lo	Rtdr Conn, B
A10	White	110	F (Lockup) Solenoid Lo	Trans Conn, D2
A11			Reserved	
A12	Violet	112	Output Function 3	VIM Conn, D2
A13	White	113	Reverse Warning	VIM Conn, F2
A14	White	114	Output Function 1	VIM Conn, F3
A15	Green	115	"DO NOT SHIFT" Light	VIM Conn, A3
A16			Reserved	
A17	Green	117	Input Function 8 (–)	VIW, 16
A18	Blue	118	Input Function 3 (+)	VIW, 2
A19	Yellow	119	Input Function 4 (+)	VIW, 3
A20	White	120	A (C1) Solenoid Hi	Trans Conn, A1
A21	Violet	121	Solenoid Ground 2 (B, E)	Trans Conn, B2
A22	Violet	122	H (Accum.) Solenoid Ground	Accum. Conn, B
A23	Violet	123	Neutral Start	VIM Conn, D1
A24	Red	124	TPS Hi	TPS, C
A25	White	125	Output Function 4	VIM Conn, C2
A26	Yellow	126		VIW, 10
A27	White	127	H (Accum.) Solenoid Hi	Accum. Conn, A
A28	Orange	128	B (C2) Solenoid Hi	Trans Conn, B1
A29	Violet	129	E (C5) Solenoid Hi	Trans Conn, E1
A30	Yellow	130	Solenoid Ground 3 (C, G)	Trans Conn, C2
A31	Blue	131	D (C4) Solenoid Hi	Trans Conn, D1
A32	Orange	132	Output Function 2	VIM Conn, B1
A33	White	133	Rtdr. Mod. Hi	Rtdr Mod Sens Conn, C
A34	Yellow	134	K Sol Hi	Rtdr Conn, A

APPENDIX D — WIRE/CONNECTOR CHART

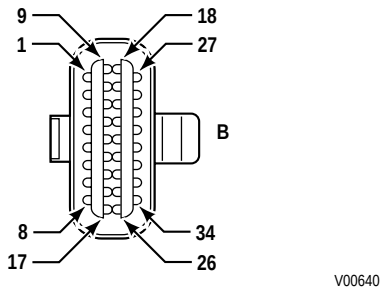


Figure D–2. ECU Connector "B"

ECU CONNECTOR "B" (BLACK)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
B1	Green	135	Analog Ground	TPS A, Trans Conn G2; RMR A
B2	Red	136A	Battery (+)	RSI, 1; VIM Conn, E1
B3	Orange	137	Input Function 7 (–)	VIW, 5
B4	Orange	138	Retarder Temperature	Rtdr Conn, E
B5	Yellow	139	Output Speed Sensor Hi	Output Speed Sensor, A; Rtdr Conn, C
B6	Blue	140	Turbine Speed Sensor Lo	Trans Conn, E2
B7	Violet	141	Engine Speed Sensor Hi	Engine Speed Sensor, A
B8	White	142	Serial Communication (+)	DDR Conn, J; VIW, 6
B9	Black	143A	Battery (–)	RSI, 7; VIM Conn, A1
B10	Black	144	Chassis Ground	Chassis
B11	Red	136C	Battery (+)	DDR H, VIM Conn, E2
B12	Yellow	146	Ignition Sense	VIM Conn, F1
B13	Violet	147	Sump Temp Signal	Trans Conn, F3
B14	Green	148	Output Speed Sensor Lo	Output Speed Sensor, B; Rtdr Conn, D
B15	Orange	149	Turbine Speed Sensor Hi	Trans Conn, E3
B16	Orange	150	Engine Speed Sensor Lo	Engine Speed Sensor, B
B17	Blue	151	Serial Communication (–)	DDR, K; VIW, 7
B18	Black	143C	Battery (–)	DDR, A; VIM Conn, A2
B19	Yellow	153	Input Function 2 (–)	VIW, 8
B20	White	154	Input Function 5 (–) ABS	VIW, 12
B21	Green	155	Input Function 1 (–)	VIW, 9
B22	Blue	156	Throttle Position Signal	TPS Conn, B
B23	Violet	157	Speedometer Signal	VIM Conn, B2
B24	Orange	158	Dimmer Input	VIM Conn, C3
B25	Violet	159	ISO Serial Communication Link	VIW, 4
B26	Violet	160	Remote Serial Interface (–)	RSI Conn, 5
B27	Yellow	161	Signal Ground	Trans Conn, F2; VIW, 13
B28	White	162	C3 Pressure Switch Power	Trans Conn, C3
B29	Blue	163	Input Function 6 (–)	VIW, 14
B30	Yellow	164	Retarder Modulator	Rtdr Mod Sens Conn, B
B31	Blue	165	Oil Level Sensor Signal	Trans Conn, B3
B32			Reserved	
B33			Reserved	
B34	Yellow	168	Remote Serial Interface (+)	RSI Conn, 4

APPENDIX D — WIRE/CONNECTOR CHART

NOTES

BULKHEAD CONNECTOR CROSS-REFERENCE CHART

Connector Description		Deutsch 31-Way ECD	Deutsch 31-Way IPD	FMTV 37-Way ITT/Cannon	Ford 31-Way 29515702 ++ (Deutsch ECD)		Navistar 31-Way 29516973 ++ (Deutsch ECD)		Ford 29515707&8 Bulkhead A	Ford 29515707&8 Bulkhead B
Wire #	Color	Bulkhead Term. ID	Bulkhead Term. ID	Bulkhead Term. ID	Term. ID	New Color	Term. ID	New Color	Bulkhead Term. ID*	Bulkhead Term. ID**
101	Blue			A						
102	Orange	A	1	B					2	
103	Green	B	2	C					3	
104	White	C	3	D					4	
106	White	D	4	E						1
107	Green	E	5	F					5	
109	Blue	f	30				323CM	Yellow		
110	White	F	6	H					6	
111	Green			J						
116	Yellow			K						
120	White	G	8	M					7	
121	Violet	H	9						8	
122	Violet	d	7	P	143C	Black				
124	Red	a	10	R	135B	Green				9
127	White	c	18	S	136B	Red	313CM	Yellow		
128	Orange	J	11	T					9	
129	Violet	K	12	U					10	
130	Yellow	L	13	V					11	
131	Blue	M	14	W					12	
134	Yellow	e	29		143B	Black	313NO	Blue		
135A	Green	N	15	Z						12
135B	Green		16	a						
136B	Red								13	
136C	Red								14	
138	Orange	g	31				323NO	Blue		
139	Yellow			n						2
140	Blue	U	24	r						6
141	Violet	T	23	m						10
143B	Black								15	
143C	Black								16	
147	Violet	P	17	d						4
148	Green	Q	20	g						3
149	Orange	V	25	p						7
150	Orange			s						11
156	Blue	b	19	f	136C	Red				13
161A	Yellow	W	26	h						14
162	White	X	27	j						15
165	Blue	Y	28	k						16
Drain 1		Z	16							
201	Orange			L						
202	Yellow			X						
203	Green			e						

++ Same as Deutsch ECD except as shown
* 15-Way (16-way spacing) — Cavity number 1 is molded closed
** 14-Way (16-way spacing) — Cavities 5 and 8 are molded closed

Foldout D–1. Bulkhead Connector Cross-Reference Chart

APPENDIX D — WIRE/CONNECTOR CHART

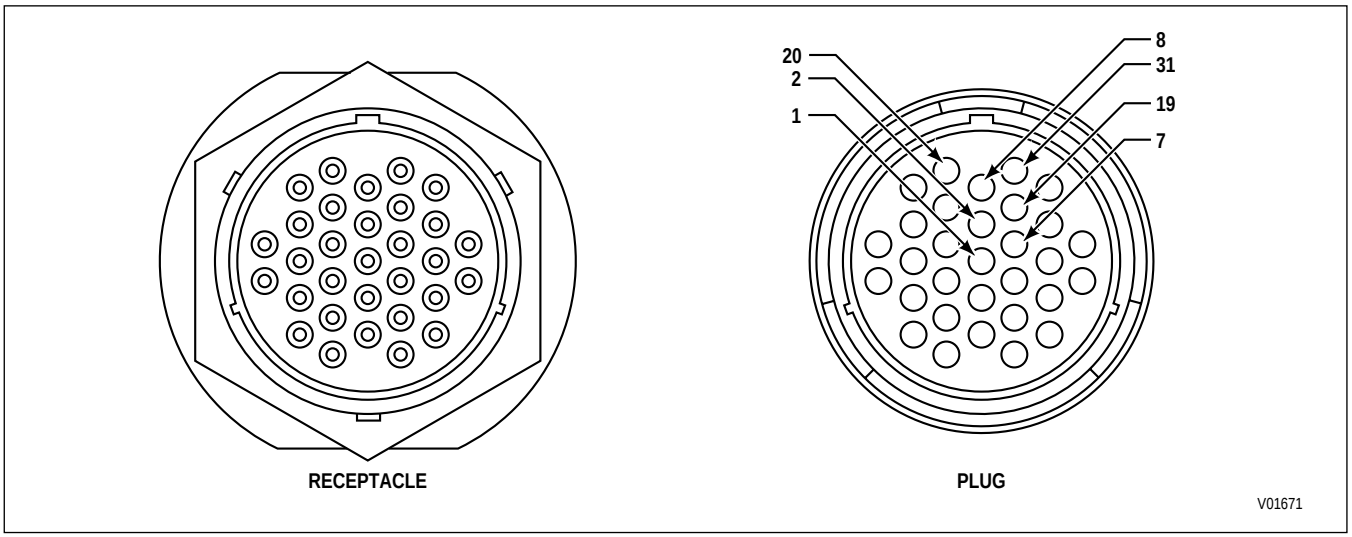


Figure D–3. 31-Way Deutsch IPD Bulkhead Connector

31-WAY DEUTSCH IPD BULKHEAD CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s) Transmission Side		Bulkhead Side
				Before MY '95	MY '95	
1	Orange	102	SG01	A–2	A	ECU, A2
2	Green	103	CSOL	C–1	B	ECU, A3
3	White	104	GSOL	F–1	C	ECU, A4
4	White	106	LOPR	G–3	D	ECU, A6
5	Green	107	FSHI	D–3	E	ECU, A7
6	White	110	FSOL	D–2	F	ECU, A10
7	Violet	122	SG04			ECU, A22
8	White	120	ASOL	A–1	G	ECU, A20
9	Violet	121	SG02	B–2	H	ECU, A21
10	Red	124	TPHI			ECU, A24
11	Orange	128	BSOL	B–1	J	ECU, A28
12	Violet	129	FSOL	E–1	K	ECU, A29
13	Yellow	130	SG03	C–2	L	ECU, A30
14	Blue	131	DSOL	D–1	M	ECU, A31
15	Green	135A	TPLO			ECU, B1
16	Green	135B	TPLO	G–2	N	Splice, 135A
17	Violet	147	OILT	F–3	P	ECU, B13
18	White	127	HSOL			ECU, A27
19	Blue	156	DSOL	D–1	M	ECU, A31
20	Green	148	NOLO			ECU
21	Orange	139	NOHI			ECU, B1
22	Orange	150	NELO			ECU, B16
23	Violet	141	NEHI			
24	Blue	140	NTLO			
25	Orange	149	NTHI			ECU, B13
26	Yellow	161A	SNGD	F–2	W	ECU, B27
27	White	162	C3PS	C–3	X	ECU, B22
28	Blue	165	LOIL			ECU, B14
29	Yellow	134	SNGD			ECU, A34
30	Blue	109	KSOL			ECU, B28
31	Orange	138	RETT			

APPENDIX D — WIRE/CONNECTOR CHART

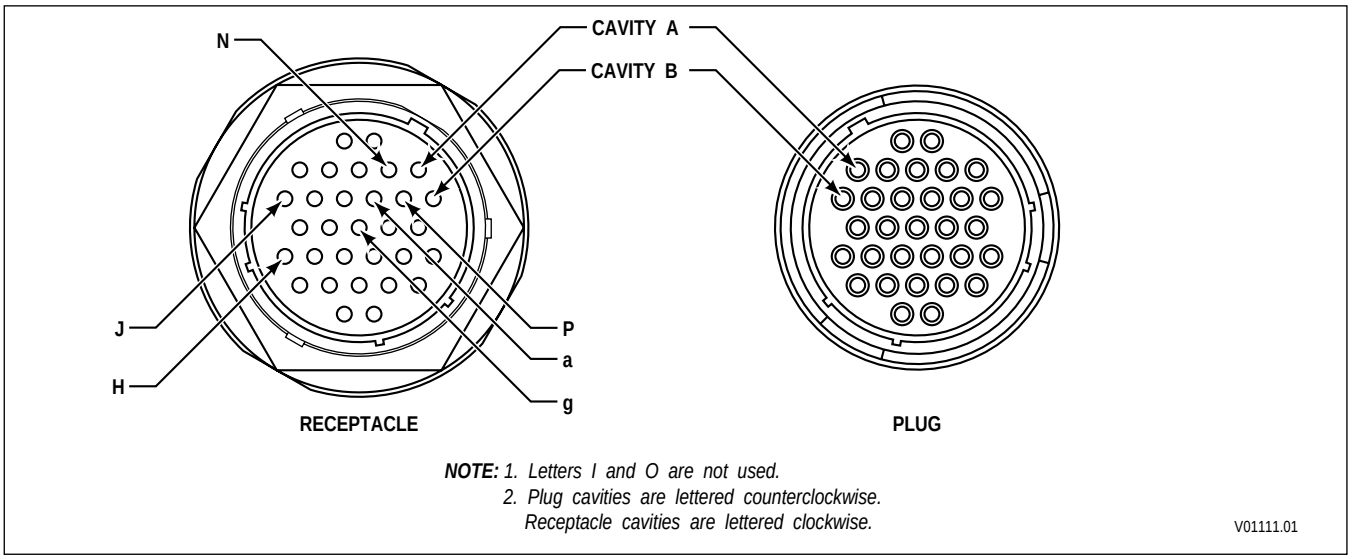


Figure D–4. Deutsch Bulkhead Connector, ECD (Male/Female)

DEUTSCH BULKHEAD CONNECTOR (MALE/FEMALE)

Terminal No.	Color		Wire No.		Description		Termination Point(s)	
	All But MY '95 3070	MY '95 3070	All But MY '95 3070	MY '95 3070	All But MY '95 3070	MY '95 3070	All But MY '95 3070	MY '95 3070
A	Orange		102		SGD1		ECU, A2	
B	Green		103		CSOL		ECU, A3	
C	White		104		GSOL		ECU, A4	
D	White		106		LOPR		ECU, A6	
E	Green		107		FSHI		ECU, A7	
f	Blue	Blue	109	101	KSOL	NSLO	ECU, A9	ECU, A1
F	White		110		FSOL		ECU, A10	
G	White		120		ASOL		ECU, A20	
H	Violet		121		SGD2		ECU, B21	
d	Violet		122		SGD4		ECU, A22	
a	Red		124		TPHI		ECU, A24	
c	White		127		HSOL		ECU, A27	
J	Orange		128		BSOL		ECU, A28	
K	Violet		129		FSOL		ECU, A29	
L	Yellow		130		SGD3		ECU, A30	
M	Blue		131		DSOL		ECU, A31	
e	Yellow	Green	134	111	KSHI	JSOL	ECU, A34	ECU, A11
N	Green		135A		TPLO		ECU, B1	
g	Orange	Yellow	138	116	RETT	NSHI	ECU, B4	ECU, A16
R	Yellow		139		NOHI		ECU, B5	
U	Blue		140		NTLO (MD Only)		ECU, B2	
T	Violet		141		NEHI		ECU, B7	
P	Violet		147		OILT		ECU, B13	
Q	Green		148		NOLO		ECU, B14	
V	Orange		149		NTHI (MD Only)		ECU, B15	
S	Orange		150		NELO		ECU, B16	
b	Blue		156		TPOT		ECU, B22	
W	Yellow		161A		SNGD		ECU, B27	
X	White		162		C3PS		ECU, B28	
Y	Blue		165		LOIL		ECU, B3	
Z	--------		Drain 1		NTDRN (24V Only)		Splice to 143D	
	Orange		201		Spare			
	Yellow		202		Spare			
	Green		203		Spare			

APPENDIX D — WIRE/CONNECTOR CHART

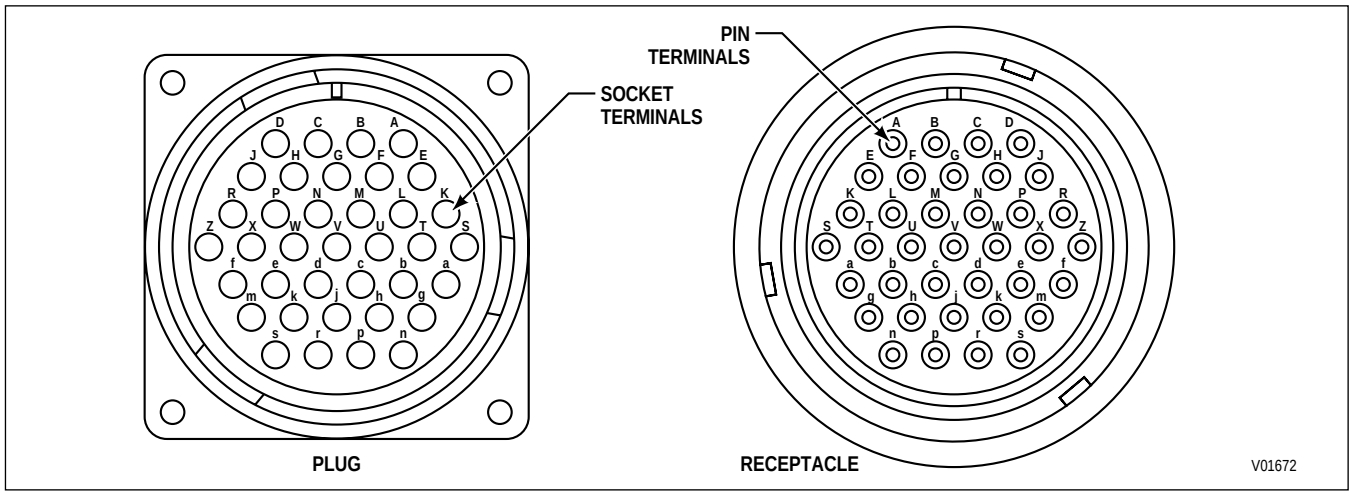
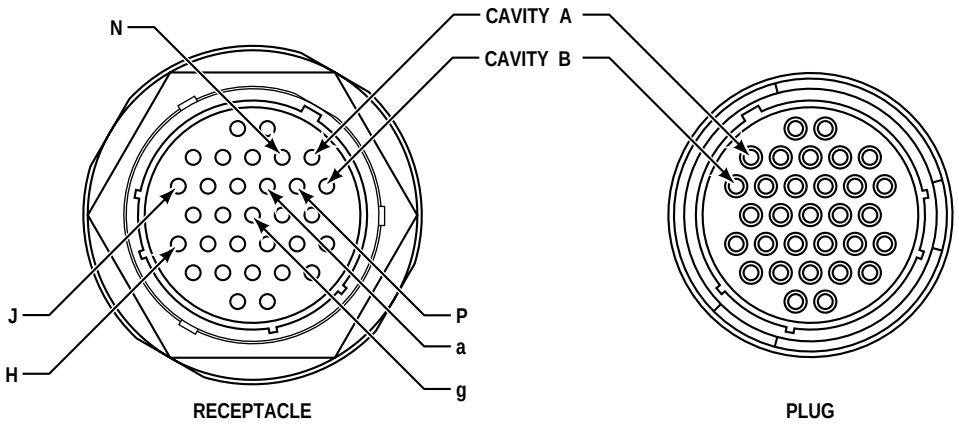


Figure D–5. Cannon 37-Way FMTV Bulkhead Connector

CANNON 37-WAY FMTV BULKHEAD CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s) Transmission Side Before MY '95	Transmission Side MY '95	Bulkhead Side
A	Blue	101	NSLO	H–2	f	ECU, A1
B	Orange	102	SG01	A–2	A	ECU, A2
C	Green	103	CSOL	C–1	B	ECU, A3
D	White	104	GSOL	F–1	C	ECU, A4
E	White	106	LOPR	G–3	D	ECU, A6
F	Green	107	FSHI	D–3	E	ECU, A7
H	White	110	FSLO	D–2	F	ECU, A10
J	Green	111	JSOL	H–1	e	ECU, A11
K	Yellow	116	NSHI	H–3	g	ECU, A16
L	Orange	201	SPARE			ECU
M	White	120	ASOL	A–1	G	ECU, A20
N	Violet	121	SG02	B–2	H	ECU, A21
P	Violet	122	SG04			ECU, A22
R	Red	124	TPHI			ECU, A24
S	White	127	HSOL			ECU, A27
T	Orange	128	BSOL	B–1	J	ECU, A28
U	Violet	129	ESOL	E–1	K	ECU, A29
V	Yellow	130	SG03	C–2	L	ECU, A30
W	Blue	131	DSOL	D–1	M	ECU, A31
X	Yellow	202	SPARE			ECU
Z	Green	135A	TPLO			ECU, B1
a	Green	135B	TPLO	G–2	N	Splice, 135A
b						
c						
d	Violet	147	OILT	F–3	P	ECU, B13
e	Green	203	SPARE			ECU
f	Blue	156	TPOT			ECU, B22
g	Green	148	NOLO			ECU, B14
h	Yellow	161A	SNGD	F–2	W	ECU, B27
j	White	162	C3PS	C–3	X	ECU, B28
k	Blue	165	LOIL	B–3	Y	ECU, B31
m	Violet	141	NEHI			ECU, B7
n	Yellow	139	NOHI			ECU, B5
p	Orange	149	NTHI	E–3	V	ECU, B15
r	Blue	140	NTLO	E–2	U	ECU, B6
s	Orange	150	NELO			ECU, B16

APPENDIX D — WIRE/CONNECTOR CHART



NOTE: *1. Letters I and O are not used.*
2. Plug cavities are lettered counterclockwise. Receptacle cavities are lettered clockwise.

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Figure D–6. Deutsch Transmission Connector, ECD (Male/Female)

DEUTSCH TRANSMISSION CONNECTOR (MALE/FEMALE)

Terminal No.	Color		Wire No.		Description		Termination Point(s)	
	All But MY '95 3070	MY '95 3070	All But MY '95 3070	MY '95 3070	All But MY '95 3070	MY '95 3070	All But MY '95 3070	MY '95 3070
A	Orange		102		SGD1		ECU, A2	
B	Green		103		CSOL		ECU, A3	
C	White		104		GSOL		ECU, A4	
D	White		106		OLS Power		ECU, A6	
E	Green		107		FSHI		ECU, A7	
f		Blue		101		NSLO		ECU, A1
F	White		110		FSOL		ECU, A10	
G	White		120		ASOL		ECU, A20	
H	Violet		121		SGD2		ECU, B21	
J	Orange		128		BSOL		ECU, A28	
K	Violet		129		ESOL		ECU, A29	
L	Yellow		130		SGD3		ECU, A30	
M	Blue		131		DSOL		ECU, A31	
e		Green		111		JSOL		ECU, A11
N	Green		135B		TPLO		ECU, B1	
g		Yellow		116		NSHI		ECU, A16
U	Blue		140		NTLO (MD Only)		ECU, B2	
P	Violet		147		OILT		ECU, B13	
V	Orange		149		NTHI (MD Only)		ECU, B15	
W	Yellow		161A		SNGD		ECU, B27	
X	White		162		C3PS		ECU, B28	
Y	Blue		165		LOIL		ECU, B3	
Spare	Orange		201					
Spare	Yellow		202					

APPENDIX D — WIRE/CONNECTOR CHART

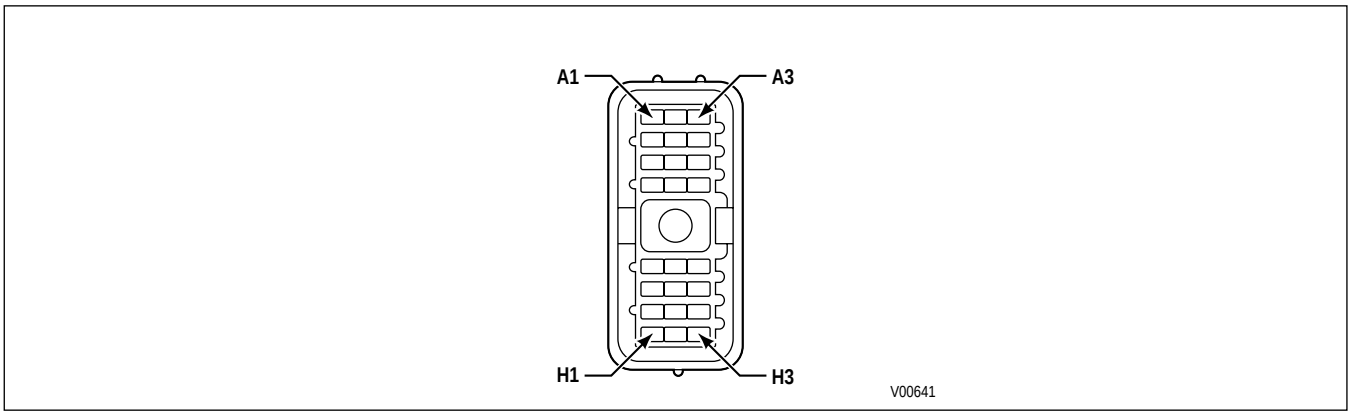


Figure D–7. Transmission Connector (Prior to Model Year '95)

TRANSMISSION CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A1	White	120	A (C1) Solenoid Hi	ECU, A20
A2	Orange	102	Solenoid Ground 1 (A, D)	ECU, A2
A3			Reserved	
B1	Orange	128	B (C2) Solenoid Hi	ECU, A28
B2	Violet	121	Solenoid Ground 2 (B, E)	ECU, A21
B3	Blue		Lo Oil Level	ECU, B31
C1	Green	103	C (C3) Solenoid Hi	ECU, A3
C2	Yellow	130	Solenoid Ground 3 (C, G)	ECU, A30
C3	White	162	C3 Pressure Switch Power	ECU, B28
D1	Blue	131	D (C4) Solenoid Hi	ECU, A31
D2	White	110	F (Lockup) Solenoid Lo	ECU, A10
D3	Green	107	F (Lockup) Solenoid Hi	ECU, A7
E1	Violet	129	E (C5) Solenoid	ECU, A29
E2			Reserved	
E3			Reserved	
F1	White	104	G (Forward) Solenoid Hi	ECU, A4
F2	Yellow	161	Signal Ground	ECU, B27; VIW (Amp), 13
F3	Violet	147	Sump Temp Signal	ECU, B13
G1			Reserved	
G2	Green	135	Analog Ground	ECU, B1; TPS A; RMR A
G3	White	106	Oil Level Power	ECU, A6
H1	Green	111	J (C6) Solenoid*	ECU, A11
H2	Blue	101	N (Signal) Solenoid Lo*	ECU, A1
H3	Yellow	116	N (Signal) Solenoid Hi*	ECU, A16

* Used with MD 3070 Models Only.

APPENDIX D — WIRE/CONNECTOR CHART

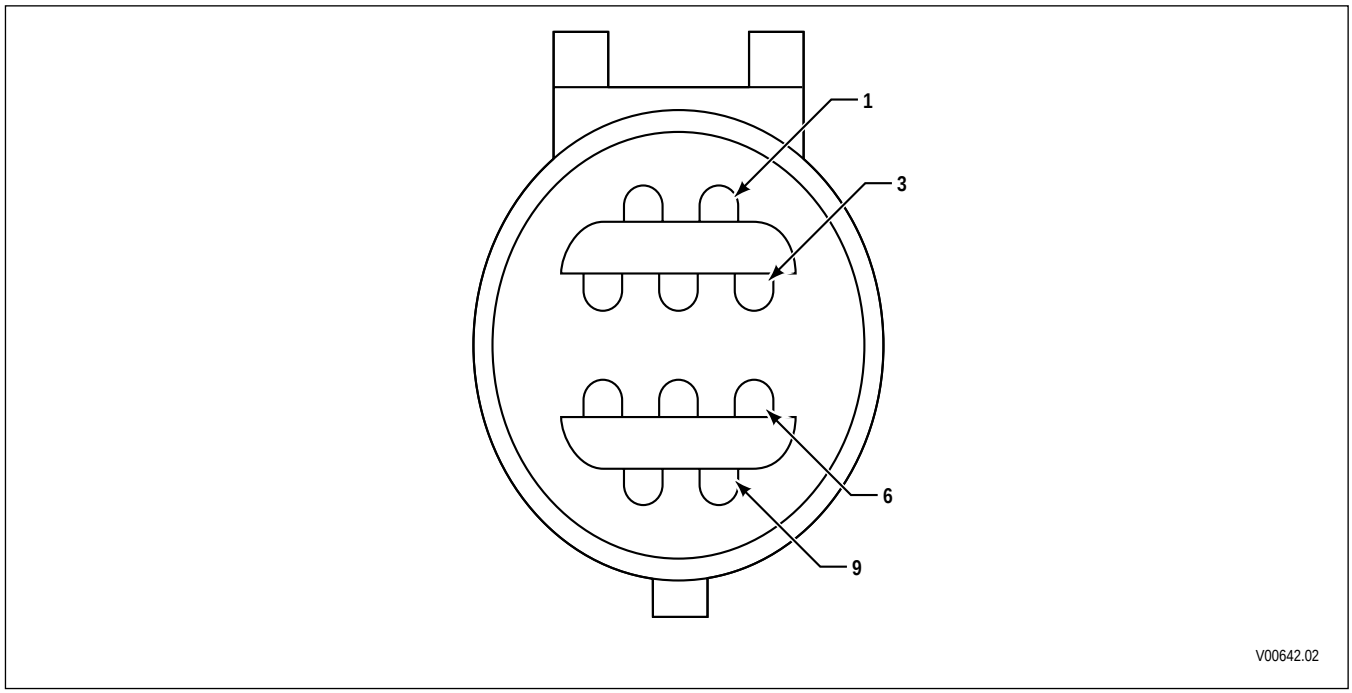


Figure D–8. RSI Connector

REMOTE SERIAL INTERFACE CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
1	Red	136	Battery (+)	ECU, B2; VIM Conn, E1
2	Orange		Jumper	RSI Conn, 3 (Clip Jumper Wire When Remote Selector is Primary)
3	Orange		Jumper	RSI Conn, 2
4	Yellow	168	Remote Serial Interface (+)	ECU, B34
5	Violet	160	Remote Serial Interface (–)	ECU, B26
6	Yellow	108	Remote Power Wakeup	ECU, A8
7	Black	143	Battery (–)	ECU, B9; VIM Conn, A1; Battery (–)
8			Reserved	
9			Reserved	
10			Reserved	

APPENDIX D — WIRE/CONNECTOR CHART

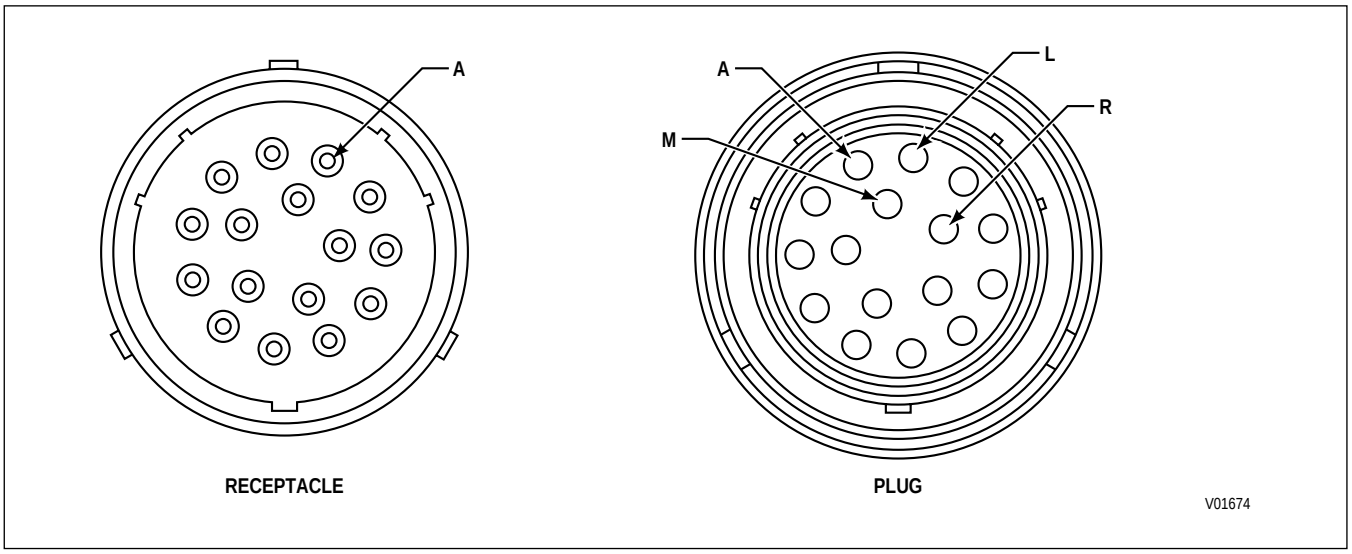


Figure D–9. Optional Deutsch Sensor Harness Connector

OPTIONAL DEUTSCH SENSOR HARNESS CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
C	Green	135C	TPLO	ECU, B1
D	Orange	138	RETT	ECU, B4
E	Blue	109	KSLO	ECU, A9
F	Yellow	134	KSHI	ECU, A34
G	Violet	122	SGD4	ECU, A22
H	White	127	HSOL	ECU, A27
L	Blue	140B	NTLO	ECU, B6
M	Orange	149B	NTHI	ECU, B15
N	Orange	150	NELO	ECU, B16
P	Violet	141	NEHI	ECU, B7
R	Green	148	NOLO	ECU, B14
S	Yellow	139	NOHI	ECU, B5

APPENDIX D — WIRE/CONNECTOR CHART

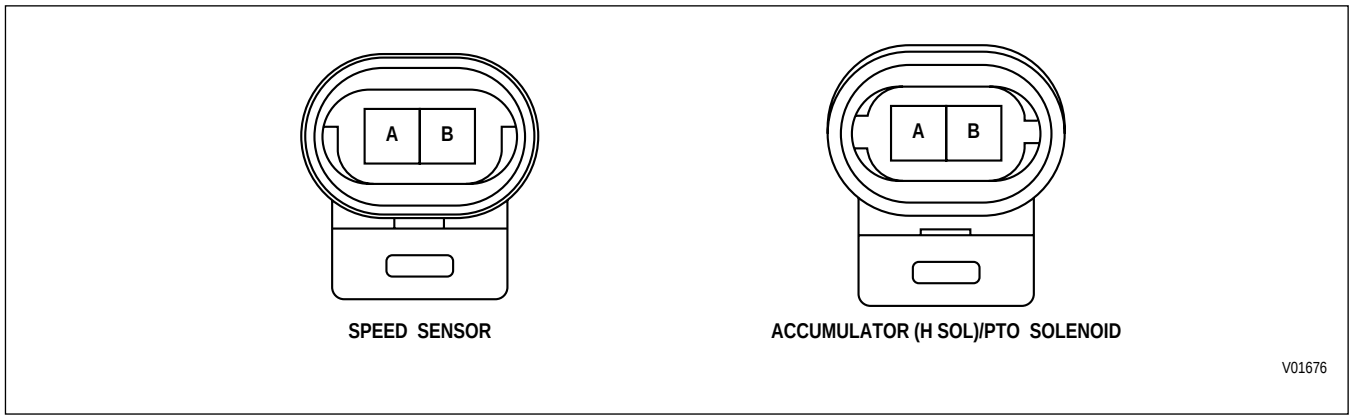


Figure D–10. Speed Sensor Connector

ENGINE SPEED SENSOR CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Violet	141	Engine Speed Sensor Hi	ECU, B7
B	Orange	150	Engine Speed Sensor Lo	ECU, B16

TURBINE SPEED SENSOR CONNECTOR (HD/B 500 ONLY)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Orange	149	Turbine Speed Sensor Hi	ECU, B15
B	Blue	140	Turbine Speed Sensor Lo	ECU, B6

OUTPUT SPEED SENSOR CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Yellow	139	Output Speed Sensor Hi	ECU, B5
B	Green	148	Output Speed Sensor Lo	ECU, B14

ACCUMULATOR (H) SOLENOID AND PTO SOLENOID CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	White	127	H Solenoid Hi	ECU, A27
B	Violet	122	Solenoid Ground 4	ECU, A22

APPENDIX D — WIRE/CONNECTOR CHART

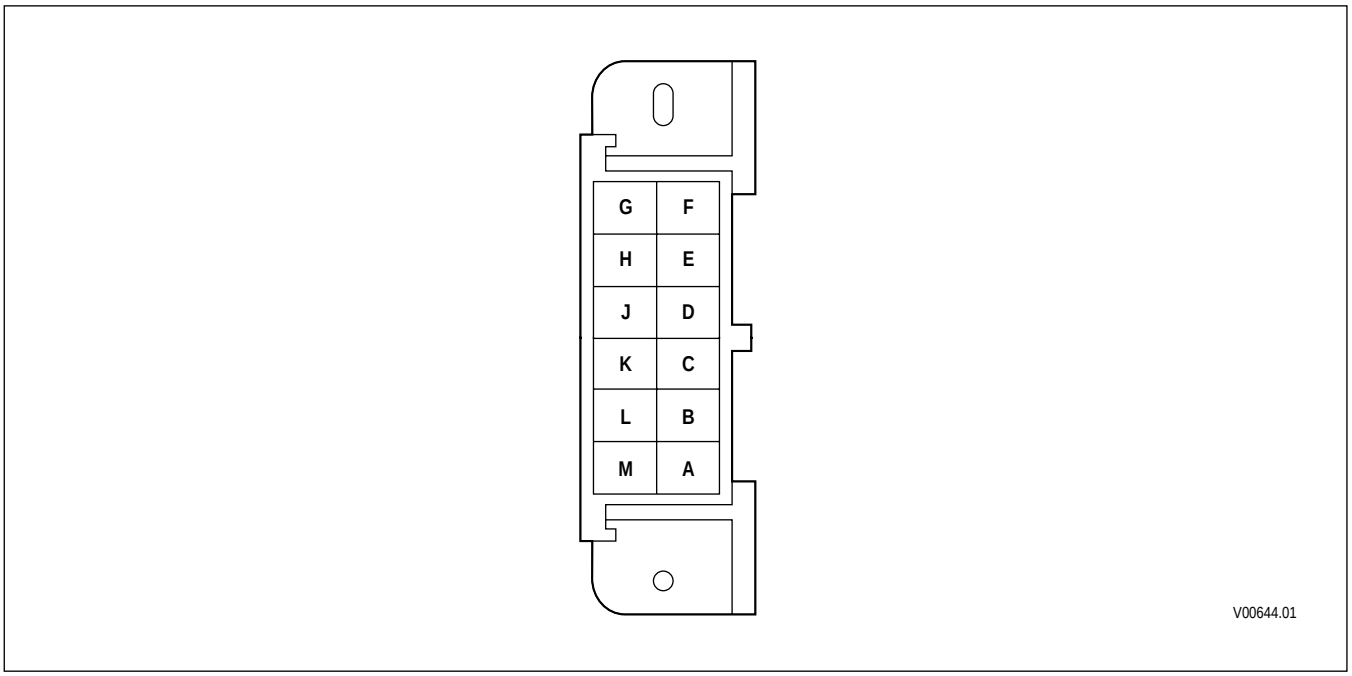


Figure D–11. Diagnostic Connector

DIAGNOSTIC CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Black	143	Battery (–)	ECU, B18; VIM Conn, A2
H*	Yellow	146B	Ignition Signal	ECU, B12; VIM Conn, F1
H**	Red	136D	Battery (+)	ECU, B12; VIM Conn, F1
J	White	142	Serial Communication (+)	ECU, B8; VIW (Amp), 6
K	Blue	151	Serial Communication (–)	ECU, B17; VIW (Amp), 7

* After 9/93
** Prior to 9/93

APPENDIX D — WIRE/CONNECTOR CHART

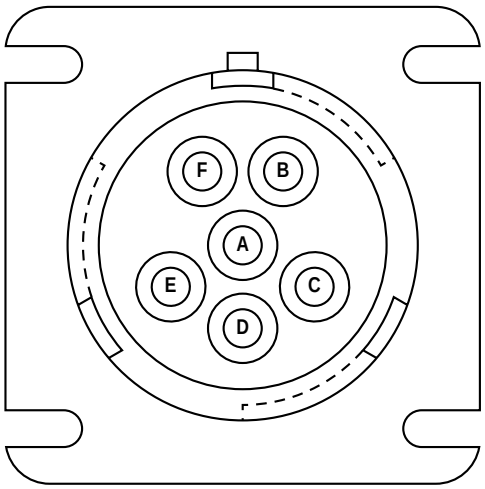


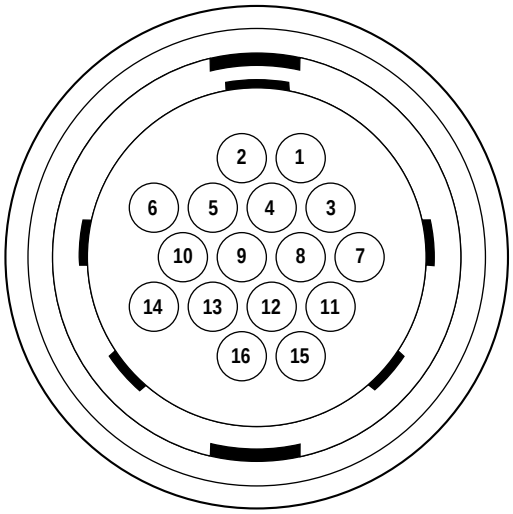
Figure D–12. Optional Deutsch DDR Connector

OPTIONAL DEUTSCH DDR CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	White	142A	Serial Communication (+)	ECU, B8; VIW, 6
B	Blue	151A	Serial Communication (–)	ECU, B17; VIW, 7
C*	Yellow	146B	Ignition Signal	ECU, B12; VIM Conn, F1
C**	Red	136D	Battery (+)	ECU, B12; VIM Conn, F1
D			Open	
E	Black	143	Battery (–)	ECU, B18; VIM Conn, A2
F			Open	

* After 9/93
** Prior to 9/93

APPENDIX D — WIRE/CONNECTOR CHART



LOOKING INTO END VIEW OF CONNECTOR ON EXTERNAL WIRING HARNESS

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Figure D–13. VIW (Amp) Connector

VIW (AMP) CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
1	Green	105	Spec Function Output 5 (–)	ECU, A5
2	Blue	118	Spec Function Input 3 (+)	ECU, A18
3	Yellow	119	Spec Function Input 4 (+)	ECU, A19
4			Reserved	
5	Orange	137	Spec Function Input 7 (–)	ECU, B3
6	White	142B	Serial Communication (+)	ECU, B8; DDR, J
7	Blue	151B	Serial Communication (–)	ECU, B17; DDR, K
8	Yellow	153	Spec Function Input 2 (–)	ECU, B19
9	Green	155	Spec Function Input 1 (–)	ECU, B21
10		157	Reserved	
11		158	Reserved	
12	White	154	Spec Function Input 5 (–) ABS	ECU, B20
13	Yellow	161B	Signal Ground	ECU, B27; Trans, F2
14	Blue	163	Spec Function Input 6 (–)	ECU, B29
15		143A	Reserved	
16	Green	117	Spec Function Input 8 (–)	ECU, A17

APPENDIX D — WIRE/CONNECTOR CHART

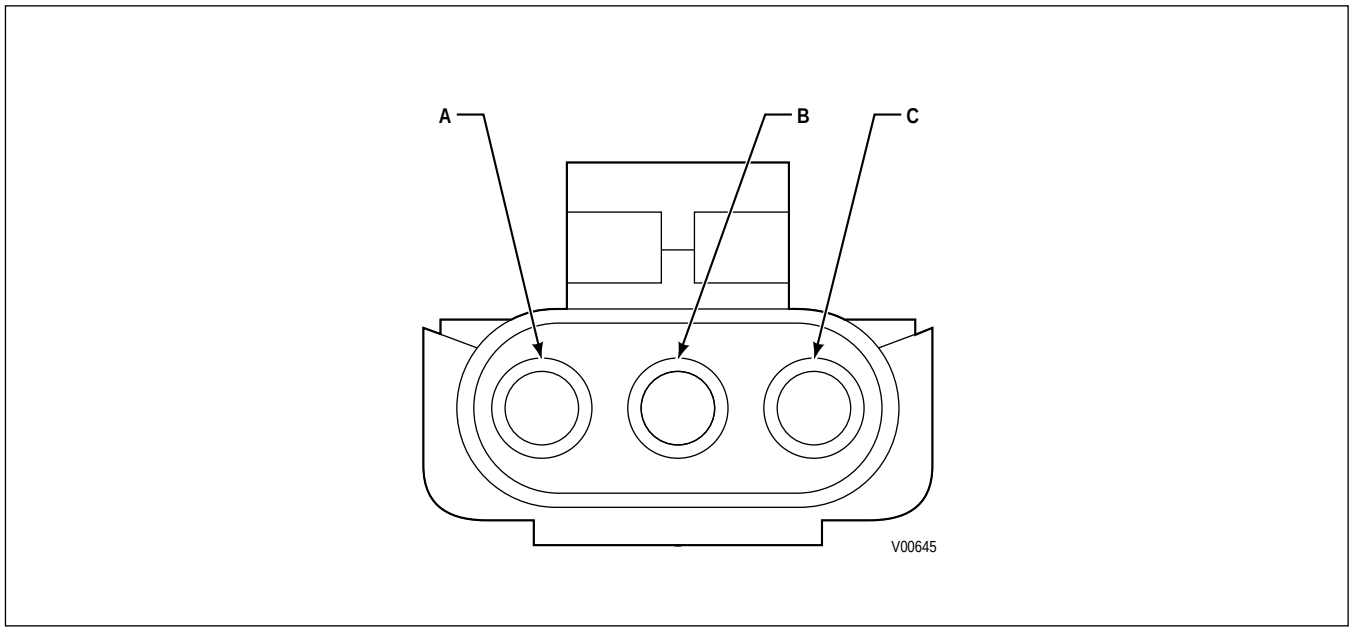

Figure D–14. TPS Connector

THROTTLE POSITION SENSOR CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Green	135A	Analog Ground	ECU, B1; Trans Conn, G2; RMR Conn, A
B	Blue	156	TPS Signal	ECU, B22
C	Red	124	TPS Hi	ECU, A24

APPENDIX D — WIRE/CONNECTOR CHART

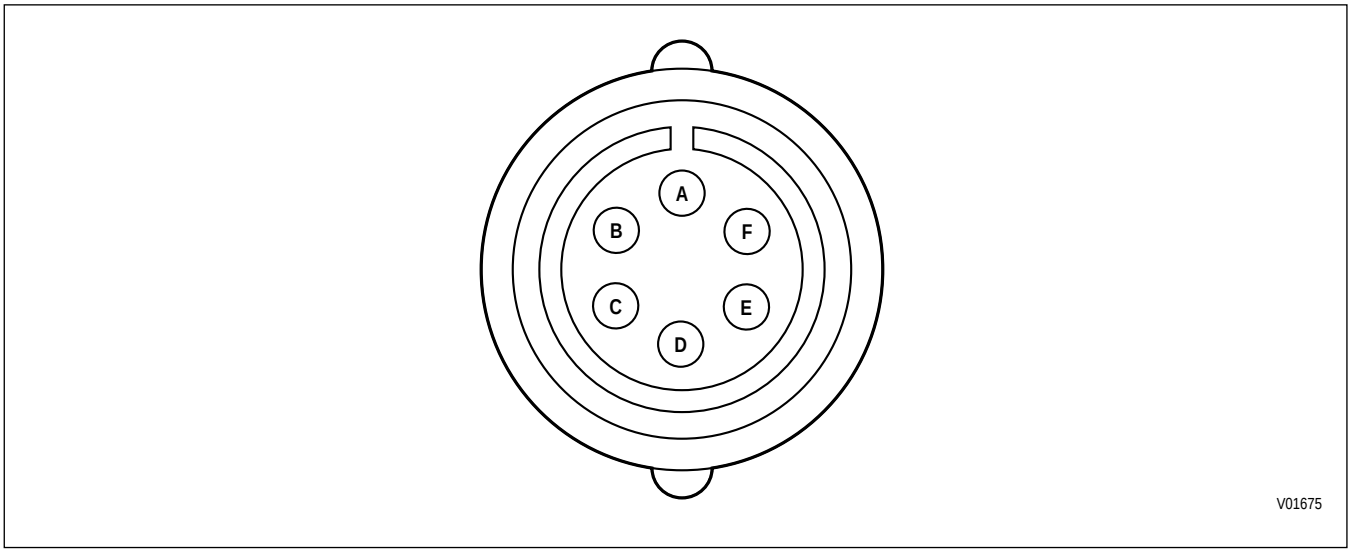

Figure D–15. Transfer Case Connector

TRANSFER CASE CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	White	127	H (Diff Lock) Solenoid Hi	ECU, A27
B	Violet	122	H (Diff Lock) Solenoid Lo	ECU, A22
C	Yellow	139	Output Speed Sensor Hi	ECU, B5
D	Green	148	Output Speed Sensor Lo	ECU, B14

APPENDIX D — WIRE/CONNECTOR CHART

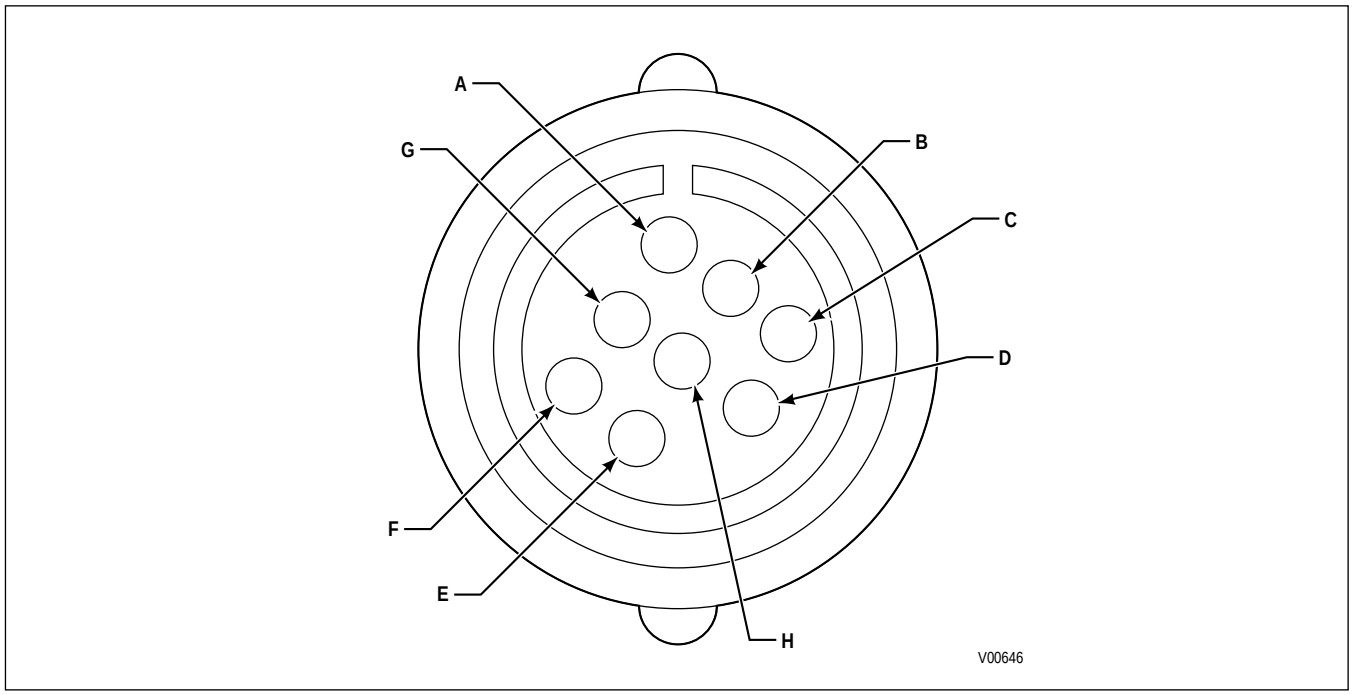

Figure D–16. Retarder Connector (MD/B 300/B 400)

RETARDER CONNECTOR — MD/B 300/B 400

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Yellow	134	K (Rtdr Enable) Solenoid Hi	ECU, A34
B	Blue	109	K (Rtdr Enable) Solenoid Lo	ECU, A9
C	Yellow	139	Output Speed Sensor Hi	ECU, B5
D	Green	148	Output Speed Sensor Lo	ECU, B14
E	Orange	138	Retarder Temperature	ECU, B4
F	Green	135C	Analog Ground	ECU, B1; Trans Conn, Term G2; TPS A

APPENDIX D — WIRE/CONNECTOR CHART

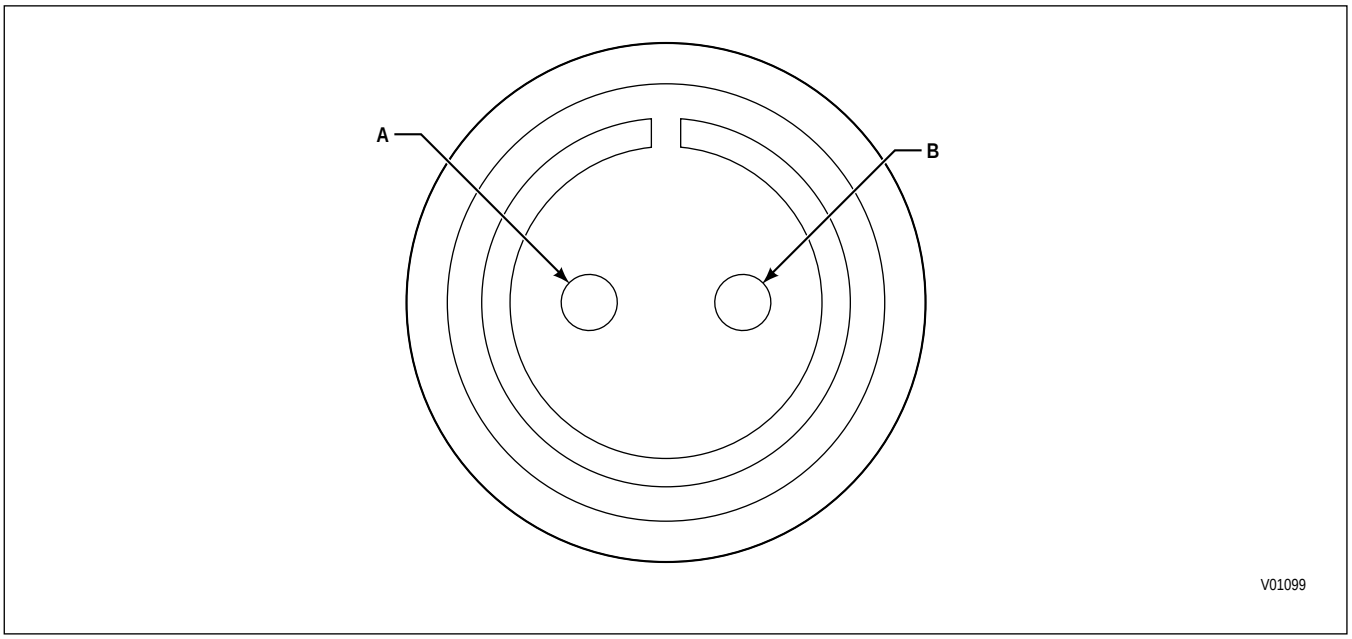

Figure D–17. Retarder Connector (HD/B 500)

RETARDER CONNECTOR — HD/B 500

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Yellow	134	K (Rtdr Enable) Solenoid Hi	ECU, A34
B	Blue	109	K (Rtdr Enable) Solenoid Lo	ECU, A9

APPENDIX D — WIRE/CONNECTOR CHART

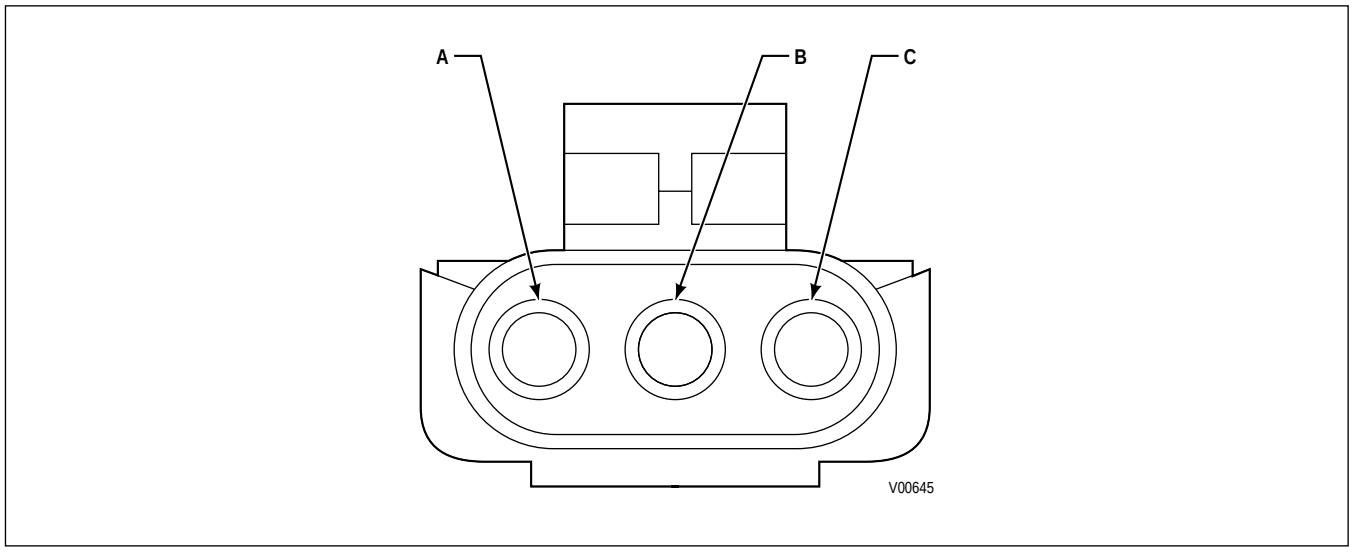

Figure D–18. Retarder Resistance Module/Interface Connector

RETARDER RESISTANCE MODULE / INTERFACE CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Green	135D	Analog Ground	ECU, B1; Trans Conn, G2; Rtdr Resist Module, A; TPS, A
B	Yellow	164	Retarder Mod.	ECU, B22; Rtdr Resist Module, B
C	White	133	Retarder Mod. Hi	ECU, A24; Rtdr Resist Module, C

APPENDIX D — WIRE/CONNECTOR CHART

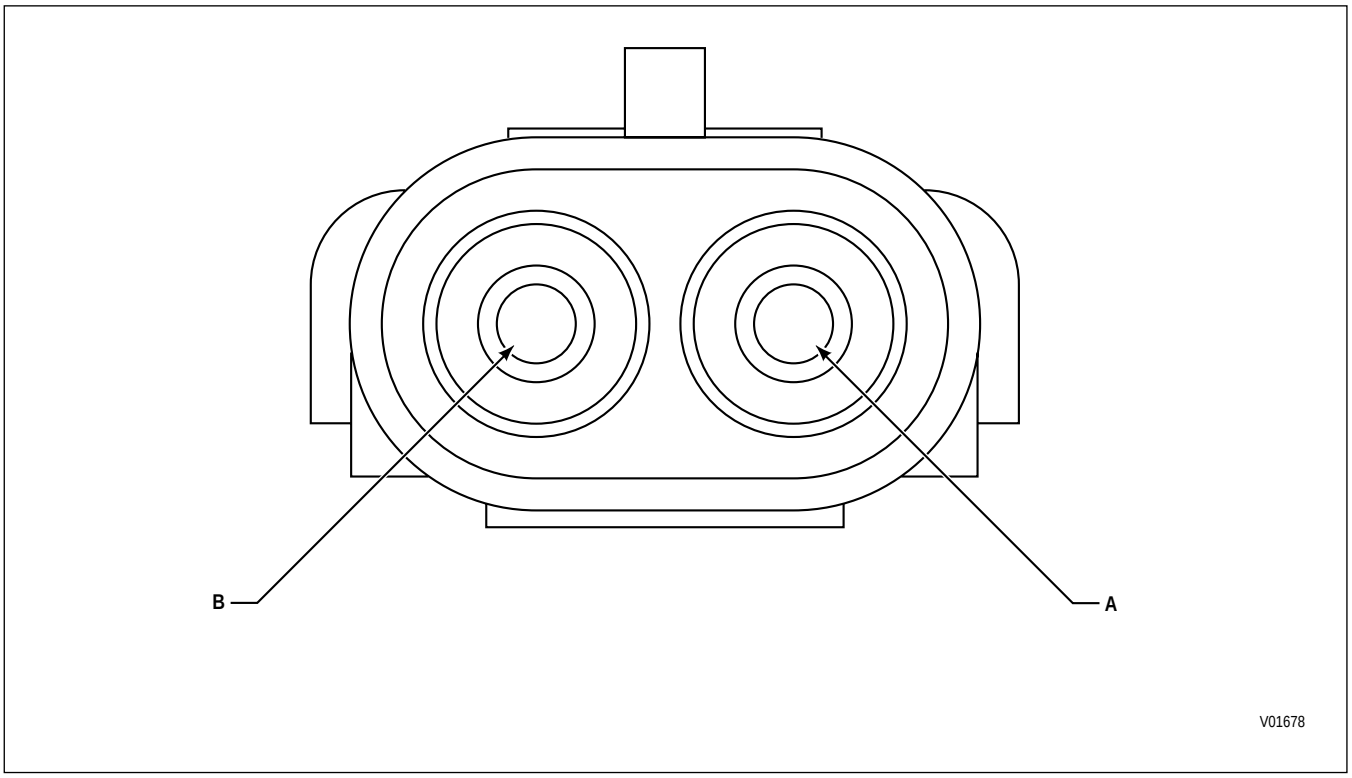

Figure D–19. Retarder Temperature Sensor Connector (HD/B 500)

RETARDER TEMPERATURE SENSOR CONNECTOR — HD/B 500

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Orange	138	Retarder Temperature	ECU, B4
B	Green	135	Analog Ground	ECU, B1; Trans Conn, G2; TPS, A; Rtdr Module Sens, A

APPENDIX D — WIRE/CONNECTOR CHART

NOTES

CUSTOMER-FURNISHED VIW/VIM CONNECTOR CROSS-REFERENCE CHART

Connector Description	Navistar 29516972 VIW A 29511372			Navistar 29516972 VIW B 29511373			Navistar 29516972 VIW C 29511374			Freightliner 29517161 VIM A 12066195			Freightliner 29517161 VIM B			Freightliner 29517161 VIW		
	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color
	105	9	Green	108	8	Yellow	117	3	Green	112	D	Violet	123	D	Violet	105	1	Green
	119	5	Yellow	136B	7	Red	118	5	Blue	113	E	White	136A	E	Red	117	16	Green
	137	12	Orange	142A	3	White	153	6	Yellow	114	F	White	136C	F	Red	118	2	Blue
	142B	11	White	143B	6	Black	155	2	Green	115	A	Green	143A	A	Black	119	3	Yellow
	151B	10	Blue	151A	4	Blue	161B	1	Yellow	125	C	White	143C	B	Black	137	5	Orange
	161C	1	Yellow	154	12	White	312CM	10	Yellow	132	B	Orange	146A	G	Yellow	142B	6	White
	163	2	Blue	160	10	Violet	312NO	12	Blue				157	C	Violet	151B	7	Blue
	325CM	3	Yellow	168	9	Yellow	312NC	11	Green				158	H	Orange	153	8	Yellow
	325NC	4	Green	315	5	White	314CM	7	Yellow							154	12	White
	332CM	6	Yellow	346	1	Orange	314NC	8	Green							155	9	Green
	332NC	7	Green	357UF	11	White	314NO	9	Blue							161B	13	Yellow
	332NO	8	Blue	358	2	White										163	14	Blue

Connector Description	Navistar 29516972 Rev. Warn/Neut Start 12084891			Navistar 29516972 Power/Ground 15300002			Ford 29515707&8 Fuse 12033769			Ford 29515704 Fuse 12033769			Gillig 29511644 6-Way Shroud #47 12010975			Gillig 29511644 6-Way Tower #51 12015799		
	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color
	313CM	A	Yellow	336B	A	Red	136E	A	Red	136D	A	Red	136A	A	Red	158	A	Red
	313NO	B	Blue	343B	B	Black	136F	B	Red	136E	B	Red	136C	B	Red		B	
	323NO	D	Blue										146A	C	Yellow	113	C	White
	323CM	E	Yellow											D		157	D	Violet
													143C	E	Black	123	E	Violet
													143F	F	Black	115	F	Green

Connector Description	Freightliner 29507731 2-Fuse Block 29509584			Freightliner 29507731 Relay Holder A 29509583			Freightliner 29507731 Relay Holder B 29509583			Freightliner 29507731 Relay Holder C 29509583			Freightliner 29520928 2-Fuse Block 29509584			Freightliner 29520928 Relay Holder A 29509583		
	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color	Wire #	Term. #	Color
	14	1A	White	GND	30	White		30		20C	30	White	14	1A	White	15E	30	Black
	136D	2A	Red	115	85	Green	GND	85	White	113	85	White	136D	1B	Red	GND	85	White
	146A	2B	Yellow		86		123	86	Violet	20B	86	White		2A		123A	86	Violet
					87			87		20A	87	White	146A	2B	Yellow	15	87	Black
					87A			87A			87A			87A				

Connector Description	Freightliner 29520928 Relay Holder B 29509583		
	Wire #	Term. #	Color
	20B	30	White
	113	85	White
	20A	86	White
	304	87	White
		87A	

Foldout D–2. Customer-Furnished VIW/VIM Connector Cross-Reference Chart

APPENDIX D — WIRE/CONNECTOR CHART

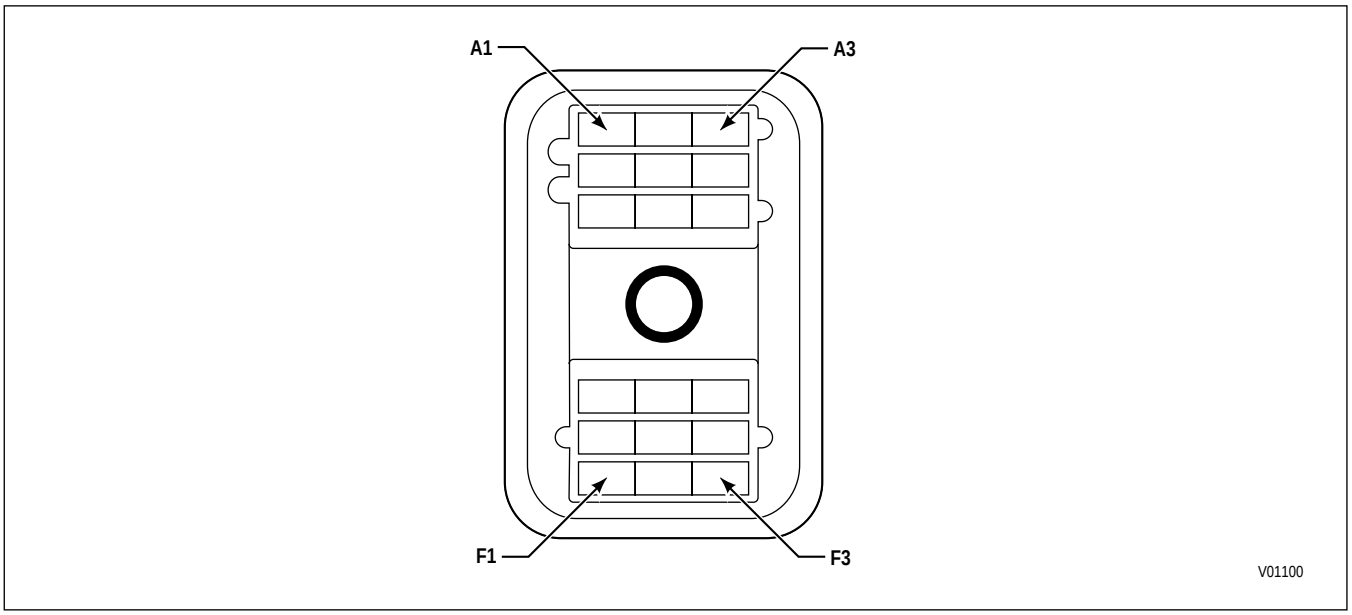

Figure D–20. VIM Connector (Harness)

VIM CONNECTOR (HARNESS)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A1	Black	143A	Battery (–)	ECU, B9; RSI, 7
A2	Black	143C	Battery (–)	ECU, B18; DDR, A
A3	Green	115	“DO NOT SHIFT” Light	ECU, A15
B1	Orange	132	Output Function 2	ECU, A32
B2	Violet	157	Speedometer Signal	ECU, B23
B3			Reserved	
C1			Reserved	
C2	White	125	Output Function 4	ECU, A25
C3	Orange	158	Dimmer Input	ECU, B24
D1	Violet	123	Neutral Start	ECU, A23
D2	Violet	112	Output Function 3	ECU, 112
D3			Reserved	
E1	Red	136A	Battery (+)	ECU, B2; RSI, 1
E2	Red	136C	Battery (+)	ECU, B11; DDR, H
E3			Reserved	
F1	Yellow	146	Ignition Sense	ECU, B12; DDR Conn, H
F2	White	113	Reverse Warning	ECU, A13
F3	White	114	Output Function 1	ECU, A14

APPENDIX D — WIRE/CONNECTOR CHART

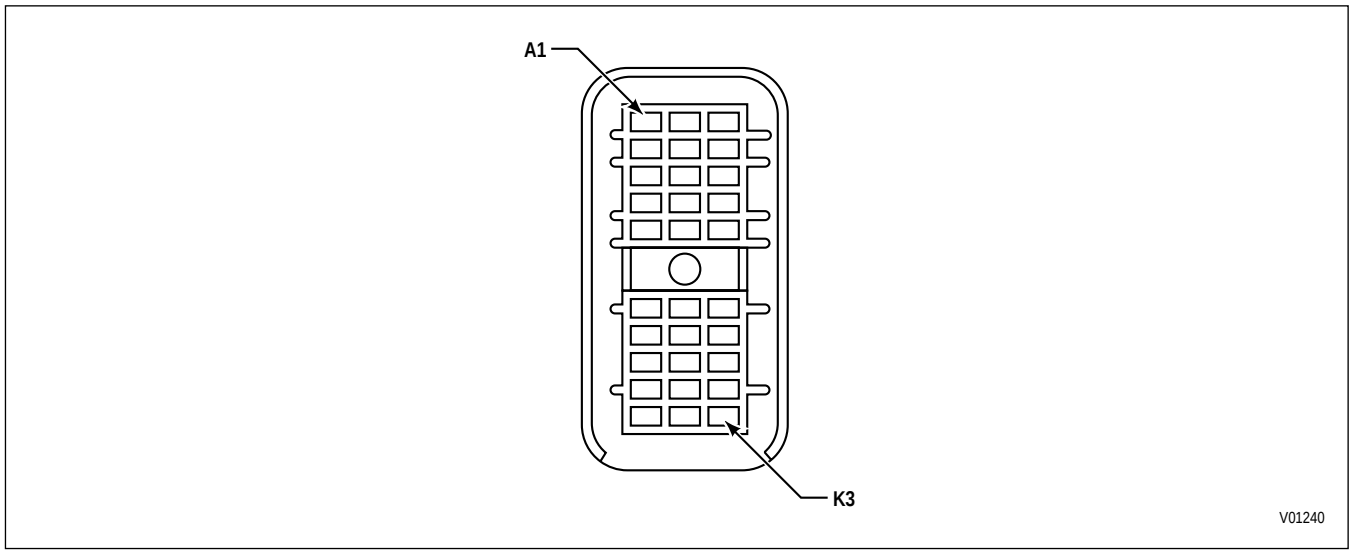

Figure D–21. VIM Connector (Harness)

VIM CONNECTOR (HARNESS 30-WAY)

Terminal No.	Color	Wire No.	Description	Termination Point(s)*
A1	Blue	313NO	Reverse Warning Relay — Normally Open	
A2	Yellow	314CM	Output Wire 114 Relay — Common	
A3	Blue	314NO	Output Wire 114 Relay — Normally Open	
B1	Yellow	313CM	Reverse Warning Relay — Common	
B2	Green	314NC	Output Wire 114 Relay — Normally Closed	
B3		Reserved		
C1	Orange	346	Ignition Power	
C2	Green	312NC	Output Wire 112 Relay — Normally Closed	
C3		Reserved		
D1	Green	325NC	Output Wire 125 Relay — Normally Closed	
D2	Green	332NC	Output Wire 132 Relay — Normally Closed	
D3		Reserved		
E1	Yellow	325CM	Output Wire 125 Relay — Common	
E2	Yellow	332CM	Output Wire 132 Relay — Common	
E3	Blue	332NO	Output Wire 132 Relay — Normally Open	
F1	Blue	323NO	Neutral Start Relay — Normally Open	
F2	Yellow	312CM	Output Wire 112 Relay — Common	
F3	Blue	312NO	Output Wire 112 Relay — Normally Open	
G1	Yellow	323CM	Neutral Start Relay — Common	
G2		Reserved		
G3		Reserved		
H1		Reserved		
H2	White	357UF	Speedometer — Unfiltered	
H3		Reserved		
J1	Red	336A	Battery Power	
J2	Red	336C	Battery Power	
J3	White	358	Dimmer	
K1	Black	343A	Battery Ground	
K2	Black	343C	Battery Ground	
K3	White	315	“DO NOT SHIFT” Light	

* Termination Points are determined by OEM electrical system design.

APPENDIX D — WIRE/CONNECTOR CHART

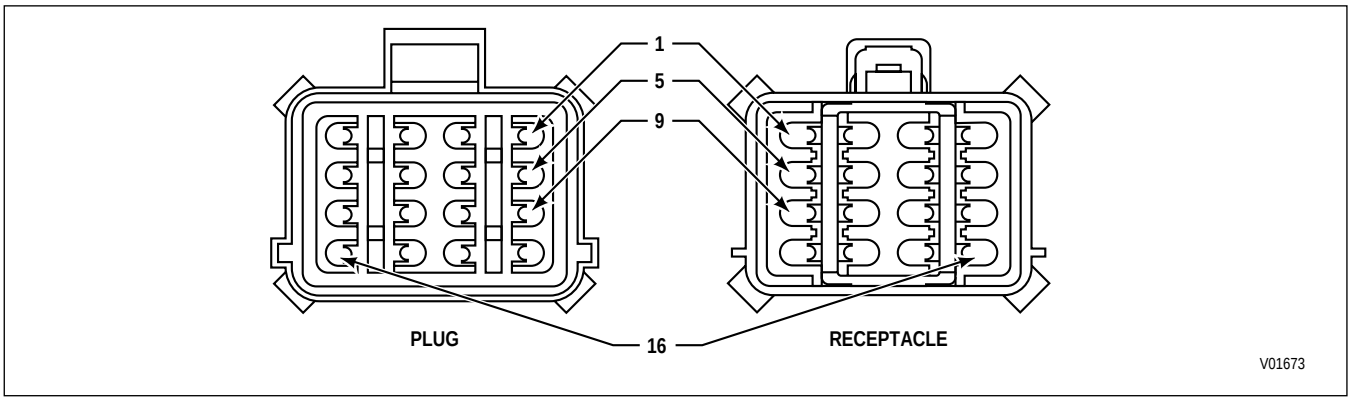

Figure D–22. Ford 16-Way Transmission Bulkhead Connector*

BULKHEAD A (GRAY)

				Termination Point(s)	
Terminal No.	**Color**	**Wire No.**	**Description**	**Transmission Side**	**Bulkhead Side**
1					Molded Closed
2	Orange	102	SGD1	A–2	ECU, A2
3	Green	103	CSOL	C–1	ECU, A3
4	White	104	GSOL	F–1	ECU, A4
5	Green	107	FSHI	D–3	ECU, A7
6	White	110	FSLO	D–2	ECU, A10
7	White	120	ASOL	A–1	ECU, A20
8	Violet	121	SGD2	B–2	ECU, A21
9	Orange	128	BSOL	B–1	ECU, A28
10	Violet	129	ESOL	E–1	ECU, A29
11	Yellow	130	SGD3	C–2	ECU, A30
12	Blue	131	DSOL	D–1	ECU, A31
13	Red	136B	12/24V	Splice to 136E	Splice to 136A
14	Red	136C	12/24V	Splice to 136E	ECU, B11
15	Black	143B	BTGD	Splice to 143F	Splice to 143A
16	Black	143C	BTGD	Splice to 143F	ECU, B18

BULKHEAD B (BLACK)

				Termination Point(s)	
Terminal No.	**Color**	**Wire No.**	**Description**	**Transmission Side**	**Bulkhead Side**
1	White	106	LOPR	G–3	ECU, A6
2	Yellow	139	NOHI	NO–A	ECU, B5
3	Green	148	NOLO	NO–B	ECU, B14
4	Violet	147	OILT	F–3	ECU, B4
5			Molded Closed		
6	Blue	140	NTLO	E–2	ECU, B6
7	Orange	149	NTHI	E–3	ECU, B15
8			Molded Closed		
9	Red	124	TPHI	TPS–C	ECU, A24
10	Violet	141	NEHI	NE–A	ECU, B7
11	Orange	150	NELO	NE–B	ECU, B16
12	Green	135A	TPLO	TPS–A	ECU, B1
13	Blue	156	TPOT	TPS–B	ECU, B22
14	Yellow	161A	SNGD	F–2	ECU, B27
15	White	162	C3PS	C–3	ECU, B28
16	Blue	165	LOIL	B–3	ECU, B31

* For Model Year 1995 and later units, consult the Ford Vehicle manual for terminal identification.

APPENDIX D — WIRE/CONNECTOR CHART

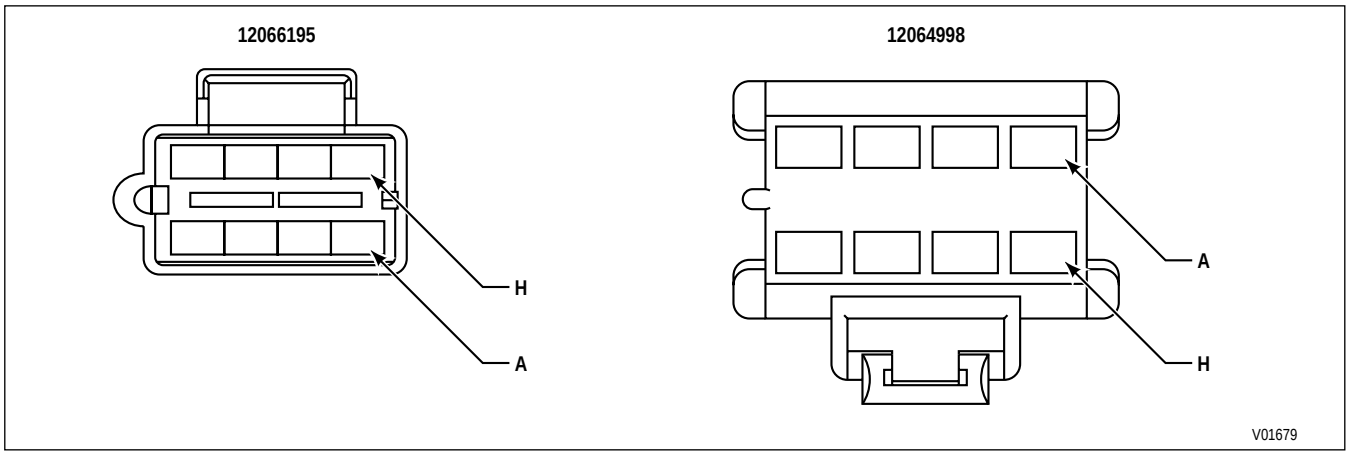

Figure D–23. Packard Metri-Pack VIM Connectors

VIM A: 8-WAY MALE P/N 12066195 (FREIGHTLINER HARNESS P/N 29517161)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Green	115	DNS	ECU, A15
B	Orange	132	SFO2	ECU, A32
C	White	125	SFO4	ECU, A25
D	Violet	112	SFO3	ECU, A12
E	White	113	RVWN	ECU, A13
F	White	114	SFO1	ECU, A14
G				
H				

VIM B: 8-WAY FEMALE P/N 12064998 (FREIGHTLINER HARNESS P/N 29517161)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Black	143A	BTGD	ECU, B9
B	Black	143C	BTGD	ECU, B18
C	Violet	157	VSPD	ECU, B23
D	Violet	123	NTST	ECU, A23
E	Red	136A	12/24V	ECU, B2
F	Red	136C	12/24V	ECU, B11
G	Yellow	146A	IGSN	ECU, B12
H	Orange	158	DIMR	ECU, B24

APPENDIX D — WIRE/CONNECTOR CHART

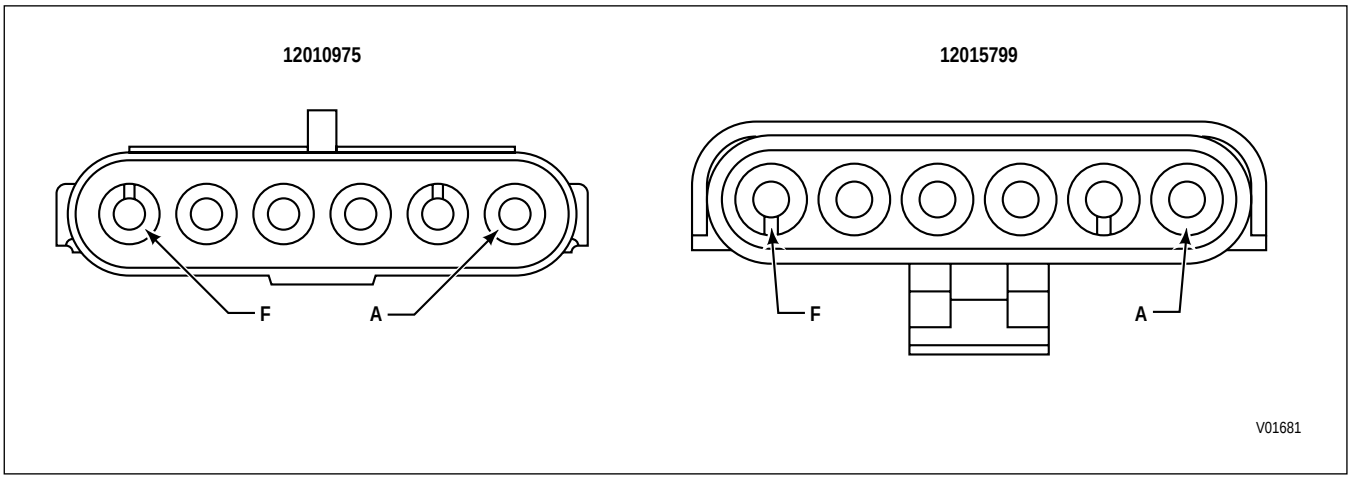

Figure D–24. Packard Weather Pack VIM Connectors

6-WAY SHROUD P/N 12010975 (GILLIG HARNESS P/N 29511644)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Red	136A	12/24V	ECU, B2
B	Red	136C	12/24V	ECU, B11
C	Yellow	146A	IGSN	ECU, B12
D				
E	Black	143C	BTGD	ECU, B18
F	Black	143A	BTGD	ECU, B9

6-WAY TOWER P/N 12015799 (GILLIG HARNESS P/N 29511644)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Orange	158	DIMR	ECU, B24
B				
C	White	113	RVWN	ECU, A13
D	Violet	157	VSPD	ECU, B23
E	Violet	123	NTST	ECU, A23
F	Green	115	DNS	ECU, A15

APPENDIX D — WIRE/CONNECTOR CHART

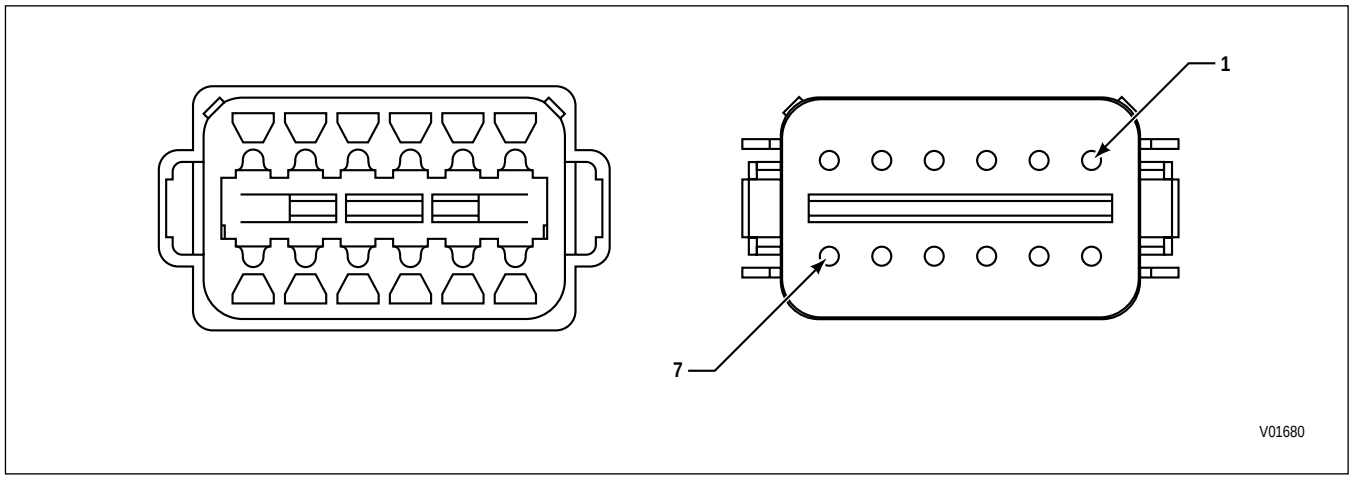

Figure D–25. Navistar Deutsch DT Series VIW Connector

VIW A (GRAY)

		Current Configuration		Former Configuration		
Terminal No.	**Color**	**Wire No.**	**Description**	**Wire No.**	**Description**	**Termination Point(s)**
1	Yellow	161C	Signal Ground	161B	Same as Current	Splice to 161A
2	Blue	163	SFI6	163	Same as Current	ECU, B29
3	Yellow	325CM	SFO4Com	320	Same as Current	VIM B, E1
4	Green	325NC	SFO4NC	321	Same as Current	VIM B, D1
5	Yellow	119	SFI4	153	SFI2	ECU, A19
6	Yellow	332CM	SFO2Com	315	SFO1Com	VIM B, E2
7	Green	332NC	SFO2NC	316	SFO1NC	VIM B, D2
8	Blue	332NO	SFO2NO	317	SFO1NO	VIM B, E3
9	Green	105	SFO5	105	Same as Current	ECU, A5
10	Blue	151B	SCI –	151B	Same as Current	Splice to 151A
11	White	142B	SCI +	142B	Same as Current	Splice to 142A
12	Orange	137	SF17	117	SFI8	ECU, B3

VIW B (BLACK)

		Current Configuration		Former Configuration		
Terminal No.	**Color**	**Wire No.**	**Description**	**Wire No.**	**Description**	**Termination Point(s)**
1	Orange	346	Ignition Signal	303	Same as Current	VIM B, C1
2	White	358	Dimmer	324	Same as Current	VIM B, J3
3	White	142A	SCI +	142A	Same as Current	ECU, B8
4	Blue	151A	SCI –	151A	Same as Current	ECU, B17
5	White	315	DNS	319	Same as Current	VIM B, K3
6	Black	143B	Battery Ground	143B	Same as Current	Splice to 143A

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APPENDIX D — WIRE/CONNECTOR CHART

VIW B (BLACK) *(cont'd)*

		Current Configuration		Former Configuration		
Terminal No.	**Color**	**Wire No.**	**Description**	**Wire No.**	**Description**	**Termination Point(s)**
7	Red	136B	12/24V	136B	Same as Current	Splice to 136A
8	Yellow	108	Remote Wakeup	108	Same as Current	ECU, A8
9	Yellow	168	RSI +	168	Same as Current	ECU, B34
10	Violet	160	RSI –	160	Same as Current	ECU, B26
11	White	357UF	Speedometer	313	Same as Current	VIM B, H2
12	White	154	SFI5	154	Same as Current	ECU, B20

No.

VIW C (BLACK)

		Current Configuration		Former Configuration		
Terminal No.	**Color**	**Wire No.**	**Description**	**Wire No.**	**Description**	**Termination Point(s)**
1	Yellow	161B	Signal Ground	161B	Same as Current	Splice to 161A
2	Green	155	SFI1	155	Same as Current	ECU, B21
3	Green	117	SFI	137	SFI7	ECU, A17
4						
5	Blue	118	SFI3	118	Same as Current	ECU, A18
6	Yellow	153	SFI2	119	SFI4	ECU, B19
7	Yellow	314CM	SFO1COM	305	SFO2COM	VIM B, A2
8	Green	314NC	SFO1NC	306	SFO2NC	VIM B, B2
9	Blue	314NO	SFO1NO	307	SFO2NO	VIM B, A3
10	Yellow	312CM	SFO3COM	310	Same as Current	VIM B, F2
11	Green	312NC	SFO3NC	311	Same as Current	VIM B, C2
12	Blue	312NO	SFO3NO	312	Same as Current	VIM B, F3

APPENDIX D — WIRE/CONNECTOR CHART

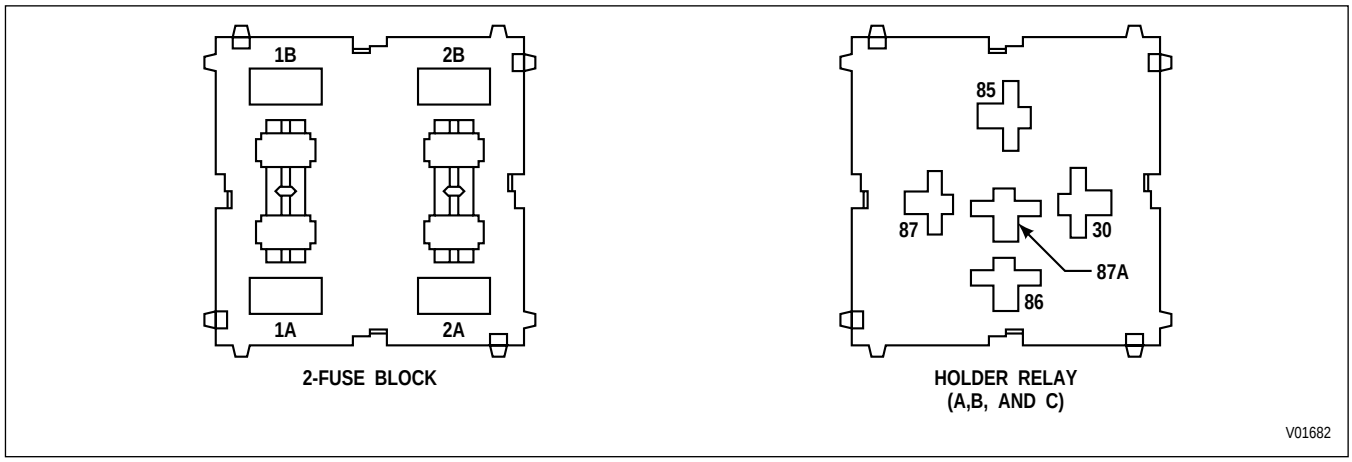

Figure D–26. Dill VIW Connectors

FREIGHTLINER HARNESS P/N 29507731 (PRIOR TO MODEL YEAR 1995)

2-Fuse Block — P/N 29509584

Terminal No.	Color	Wire No.	Description	Termination Point(s)
1A	White	14	Battery (+)	Battery Terminal
1B	White	306	Ignition Feed	CIW B, D
2A	Red	136D	12/24V	Splice A
2B	Yellow	146A	IGSN	ECU, B12

Relay Holder A — P/N 29509583

Terminal No.	Color	Wire No.	Description	Termination Point(s)
30	White	GND	GND SP	Splice Area C
85	Green	115	DNS	ECU, A15
86	White	305	ACC IGTN	CIW A, D
87	White	223	DNS LIGHT	CIW B, F
87A				

Relay Holder B — P/N 29509583

Terminal No.	Color	Wire No.	Description	Termination Point(s)
30	Black	15E	IG SRT	CIW A, A
85	White	GND	GND SP	Splice Area C
86	Violet	123	NTST	ECU, A23
87	Black	15	IG SRT	CIW A, F
87A				

Relay Holder C — P/N 29509583

Terminal No.	Color	Wire No.	Description	Termination Point(s)
30	White	20C	ACC PWR FD	CIW A, B
85	White	113	RVWN	ECU, A13
86	White	20B	ACC PWR FD	Splice Area E
87	White	20A	ACC PWR FD	CIW A, E
87A				

(continued on the next page)

APPENDIX D — WIRE/CONNECTOR CHART

FREIGHTLINER HARNESS P/N 29520928 (MODEL YEAR 1995)

2-Fuse Block — P/N 29509584

Terminal No.	Color	Wire No.	Description	Termination Point(s)
1A	White	14	Battery (+)	Battery Terminal
1B	Red	136D	12/24V	Splice Area A
2A	White	306	Ignition, Fused	CIW B, D
2B	Yellow	146A	IGSN	ECU, B12

Relay Holder A — P/N 29509583

Terminal No.	Color	Wire No.	Description	Termination Point(s)
30	Black	15E	IG SRT	CIW A, A
85	White	GND	RLYGND	CIW A, V
86	Violet	123A	NTST	ECU, A23
87	Black	15	IG SRT	CIW A, F
87A				

Relay Holder B — P/N 29509583

Terminal No.	Color	Wire No.	Description	Termination Point(s)
30	White	20B	ACC PWR FD	Relay B, 86
85	White	113	RVWN	ECU, A13
86	White	20A	ACC PWR FD	CIW A, E
87	White	304	REVWRN	CIW A, B
87A				

APPENDIX D — WIRE/CONNECTOR CHART

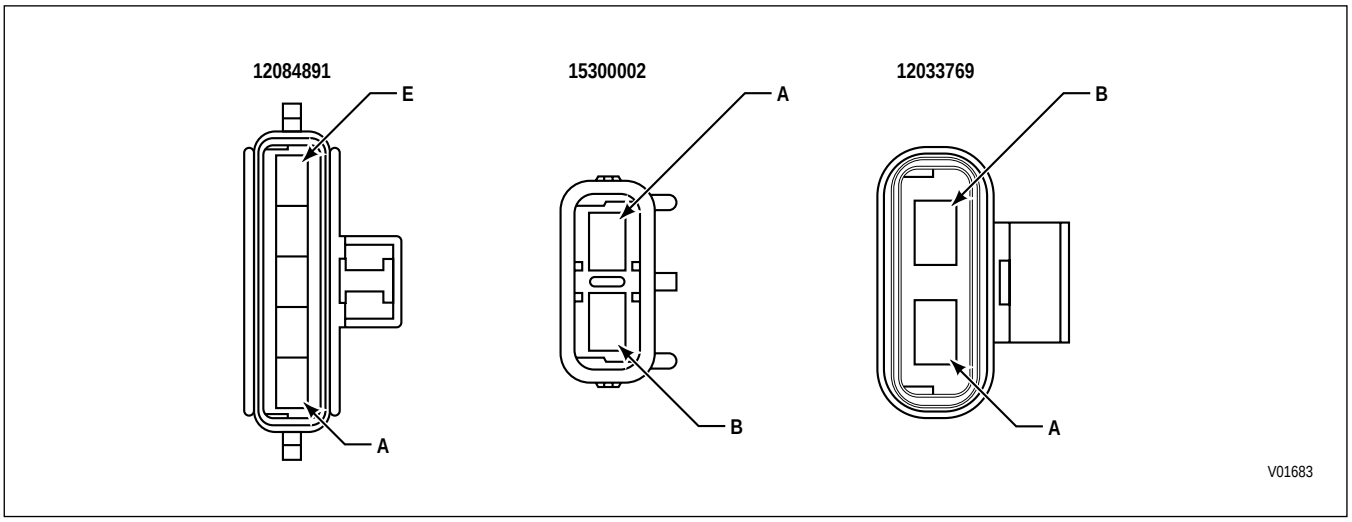

Figure D–27. Packard Metri-Pack Cab And Chassis Harness Connectors

REVERSE WARN / NEUTRAL START P/N 12084891 (NAVISTAR HARNESS P/N 29516972)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Yellow	313CM	RWCOM	VIM B, B1
B	Blue	313NO	RWNO	VIM B, A1
C				
D	Blue	323NO	NSNO	VIM B, F1
E	Yellow	323CM	NSCOM	VIM B, G1

POWER / GROUND P/N 15300002 (NAVISTAR HARNESS P/N 29516972)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Red	336B	12/24 UNF	Splice to 336A, C
B	Black	343B	BTGND	Splice to 343A, B

FUSE P/N 12033769 (FORD HARNESS P/N 29515708)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Red	136E	12/24V	Splice to 136B
B	Red	136F	12/24V	Battery Ring Terminal

FUSE P/N 12033769 (FORD HARNESS P/N 29515704)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Red	136D	12/24V	Splice to 136B
B	Red	136E	12/24V	Battery Ring Terminal

APPENDIX D — WIRE/CONNECTOR CHART

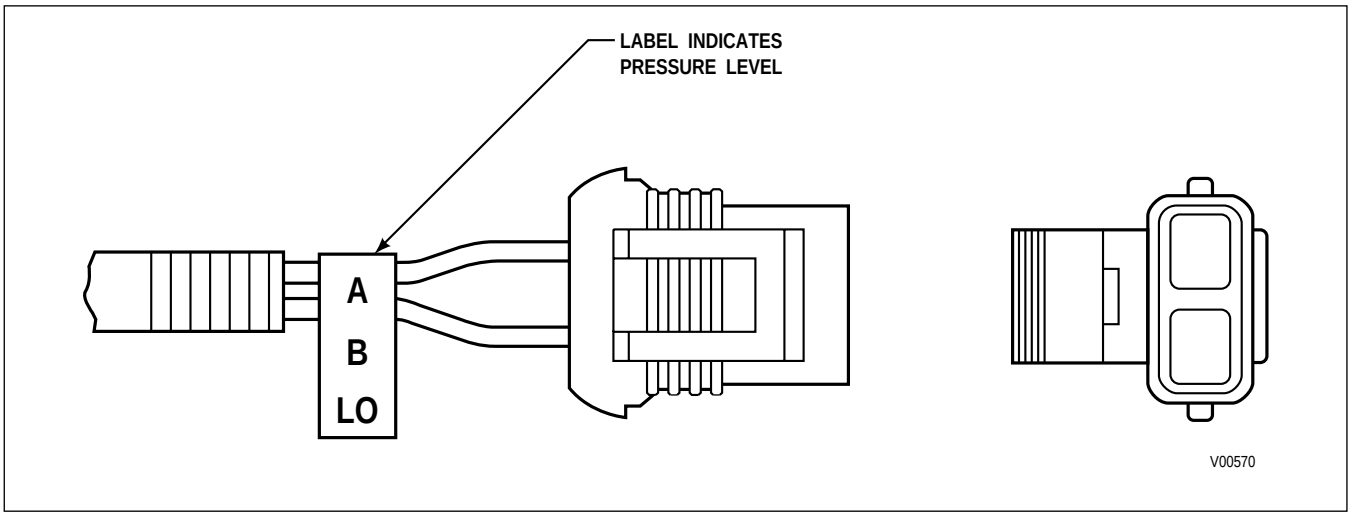

Figure D–28. Resistance Module Type 2 — Single Pressure Switch

RESISTANCE MODULE TYPE 2

Terminal No.	Color
A	White
B	Blue

APPENDIX D — WIRE/CONNECTOR CHART

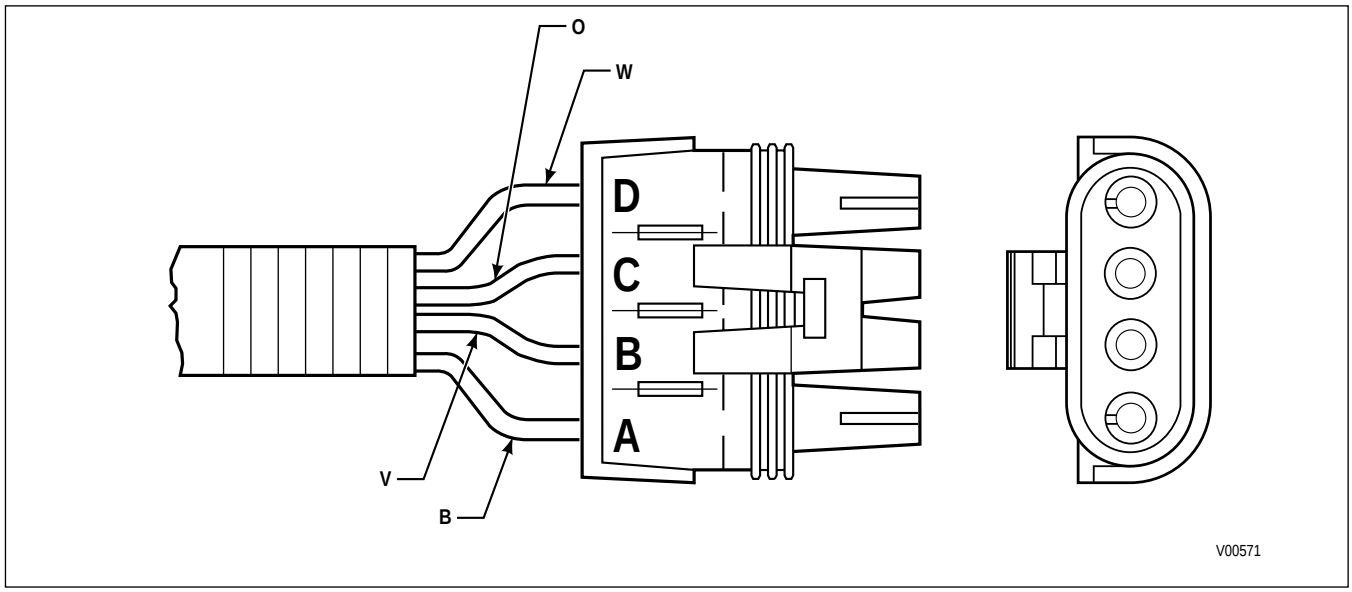

Figure D–29. Resistance Module Type 3 — Bendix E-10R Pedal

RESISTANCE MODULE TYPE 3

Terminal No.	Color
A	Blue
B	Violet
C	White
D	Orange

APPENDIX D — WIRE/CONNECTOR CHART

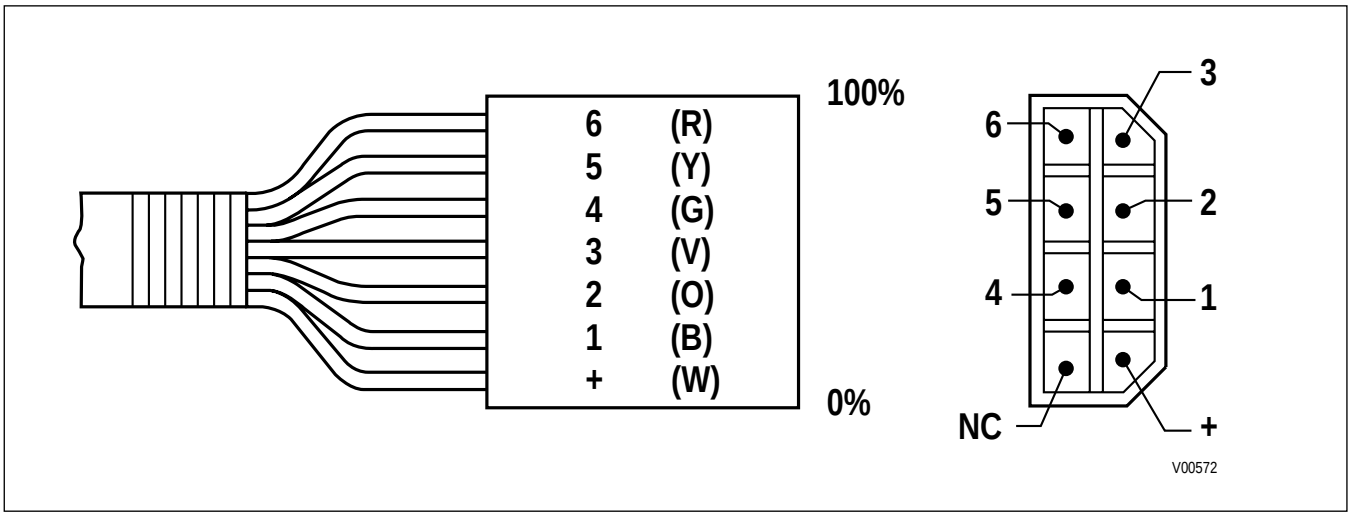

Figure D–30. Resistance Module Type 5 — Hand Lever

RESISTANCE MODULE TYPE 5

Terminal No.	Color
+	White
1	Blue
2	Orange
3	Violet
4	Green
5	Yellow
6	Red

APPENDIX D — WIRE/CONNECTOR CHART

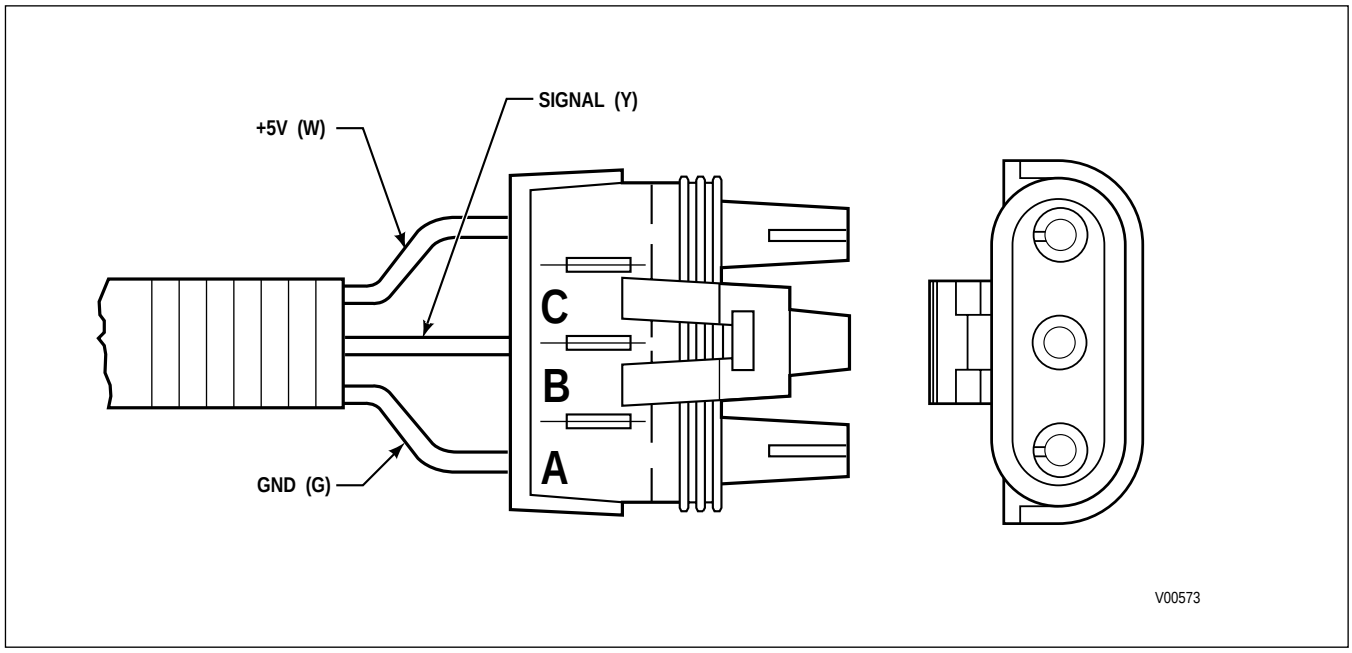

Figure D–31. Resistance Module Type 7 — Dedicated Pedal

RESISTANCE MODULE TYPE 7

Terminal No.	Color
A	Green
B	Yellow
C	White

APPENDIX D — WIRE/CONNECTOR CHART

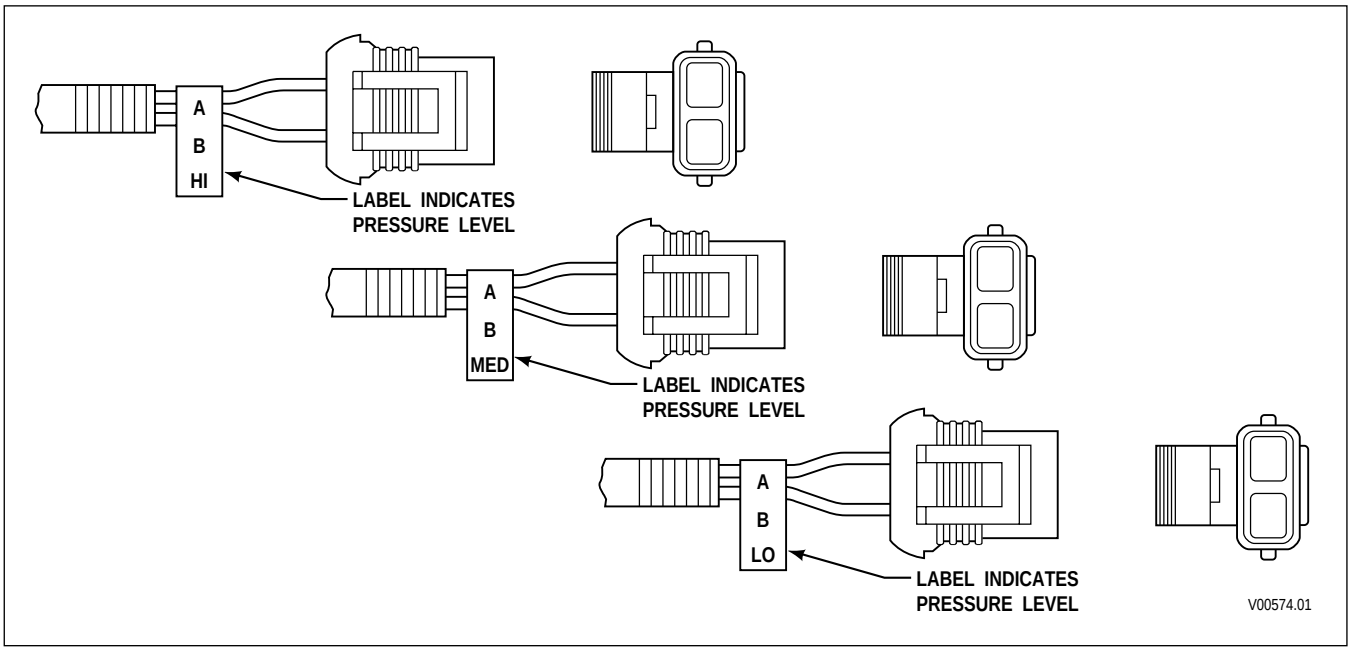

Figure D–32. Resistance Module Type 8 — Three Pressure Switch

RESISTANCE MODULE TYPE 8

LOW PRESSURE

Terminal No.	Color
A	White
B	Blue

MEDIUM PRESSURE

Terminal No.	Color
A	White
B	Orange

HIGH PRESSURE

Terminal No.	Color
A	White
B	Violet

APPENDIX D — WIRE/CONNECTOR CHART

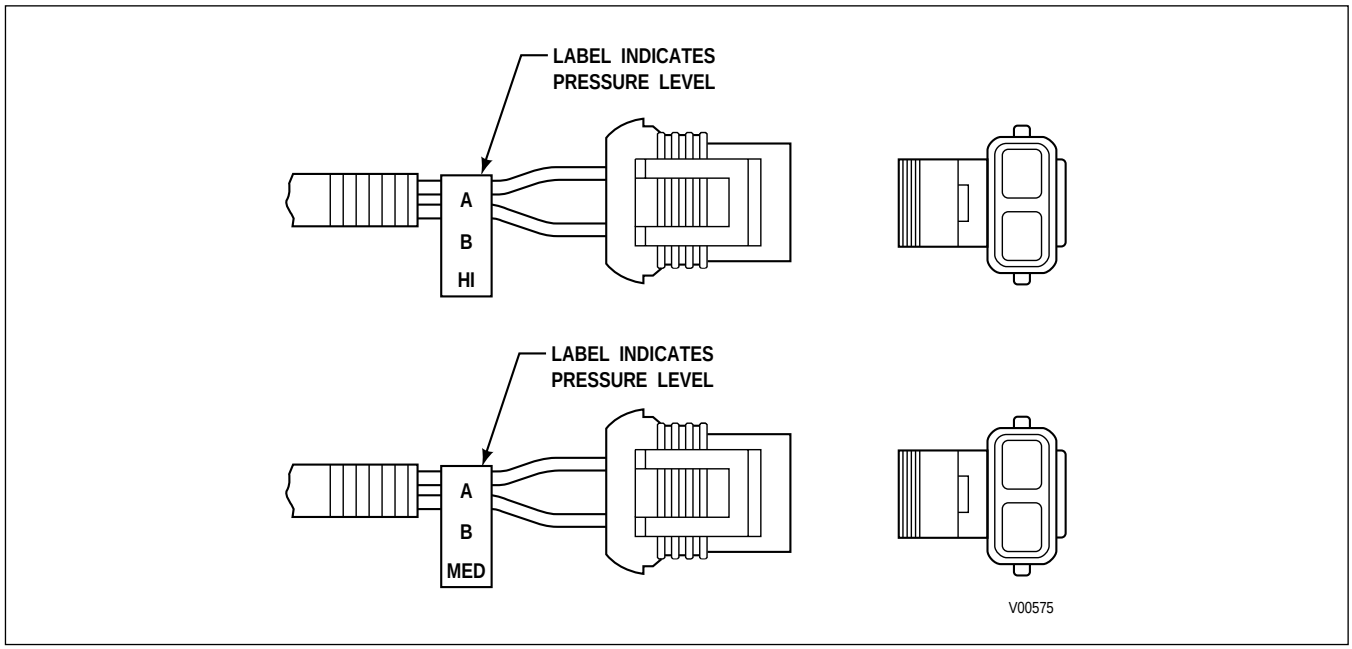

Figure D–33. Resistance Module Type 9 — Two Pressure Switch

RESISTANCE MODULE TYPE 9

MEDIUM PRESSURE

Terminal No.	Color
A	White
B	Orange

HIGH PRESSURE

Terminal No.	Color
A	White
B	Violet

APPENDIX D — WIRE/CONNECTOR CHART

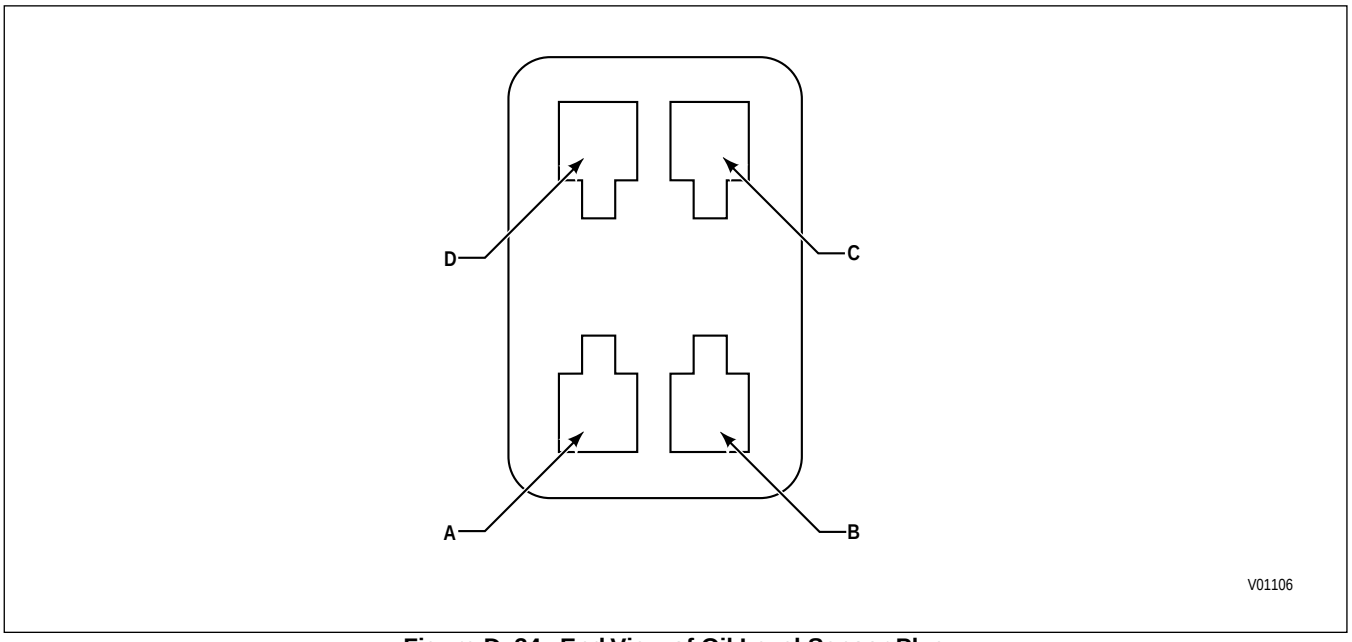

Figure D–34. End View of Oil Level Sensor Plug

OIL LEVEL SENSOR CONNECTOR

				Termination Point(s)	
				24-Way Transmission	31-Way Feedthrough
Terminal No.	**Color**	**Wire No.**	**Description**	**Connector**	**Harness Connector**
A	White	165	LOIL	B3	Y
B	Black	135B	TPLO	G2	N
C					
D	Red	106	LOPR	G3	D

APPENDIX D — WIRE/CONNECTOR CHART

SPARE WIRES

Color	Wire No.	From	To
Orange	201	ECU	Trans Connector
Yellow	202	ECU	Trans Connector
Green	203	ECU	TPS Connector
Violet	204	ECU	RSI Connector
Blue	205	ECU	VIM Connector
White	206	ECU	VIW Connector

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

Contents **Page**

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

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

LIST OF SPECIAL TOOLS REQUIRED TO SERVICE WTEC II WIRING HARNESSES

Tool Number	Tool Type	Paragraph Reference
23046604	Splice, Sealed (14–16 AWG)	1–14
23046605	Splice, Sealed (18–22 AWG)	1–14
J 25070	Heat Gun	1–14
J 34182	Crimper	1–8, 1–9, 1–11
J 34513	Remover	1–8
J 34823	Remover	1–7
J 35123	Crimper (alternate)	1–2, 1–3
J 35606	Crimper (alternate)	1–6
J 35615	Wire Stripper	1–14
J 35689-A	Remover	1–2, 1–3
J 38125-6	Crimper	1–5, 1–6
J 38125-7	Crimper	1–2, 1–3, 1–4, 1–5, 1–7, 1–12, 1–13
J 38125-8	Crimper	1–12
J 38125-10	Remover	1–6
J 38125-13	Remover	1–4, 1–5, 1–12, 1–13
J 38582-3	Remover	1–8
J38687	Crimper	1–1
J 38852	Crimper (alternate)	1–6
J 39227	Remover	1–1
J 39841	Terminal Remover/Installer (MD Retarder)	1–9
J 39842	Terminal Remover/Installer (MD 3070 T-case)	1–9
J 41193	Connector Repair Kit (FMTV)	1–9
J 41193-1	Guide Pin	1–9
J 41193-2	Insertion Tool	1–9
J 41193-3	Terminal Remover	1–9
J 41194	Extractor/Inserter	1–8
None	50–70 Percent Tin Resin Core Solder	1–10
None	Pen-Type Soldering Iron (Max OD = 3.175 mm)	1–10
None	Desoldering Braid	1–10

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

NOTES

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

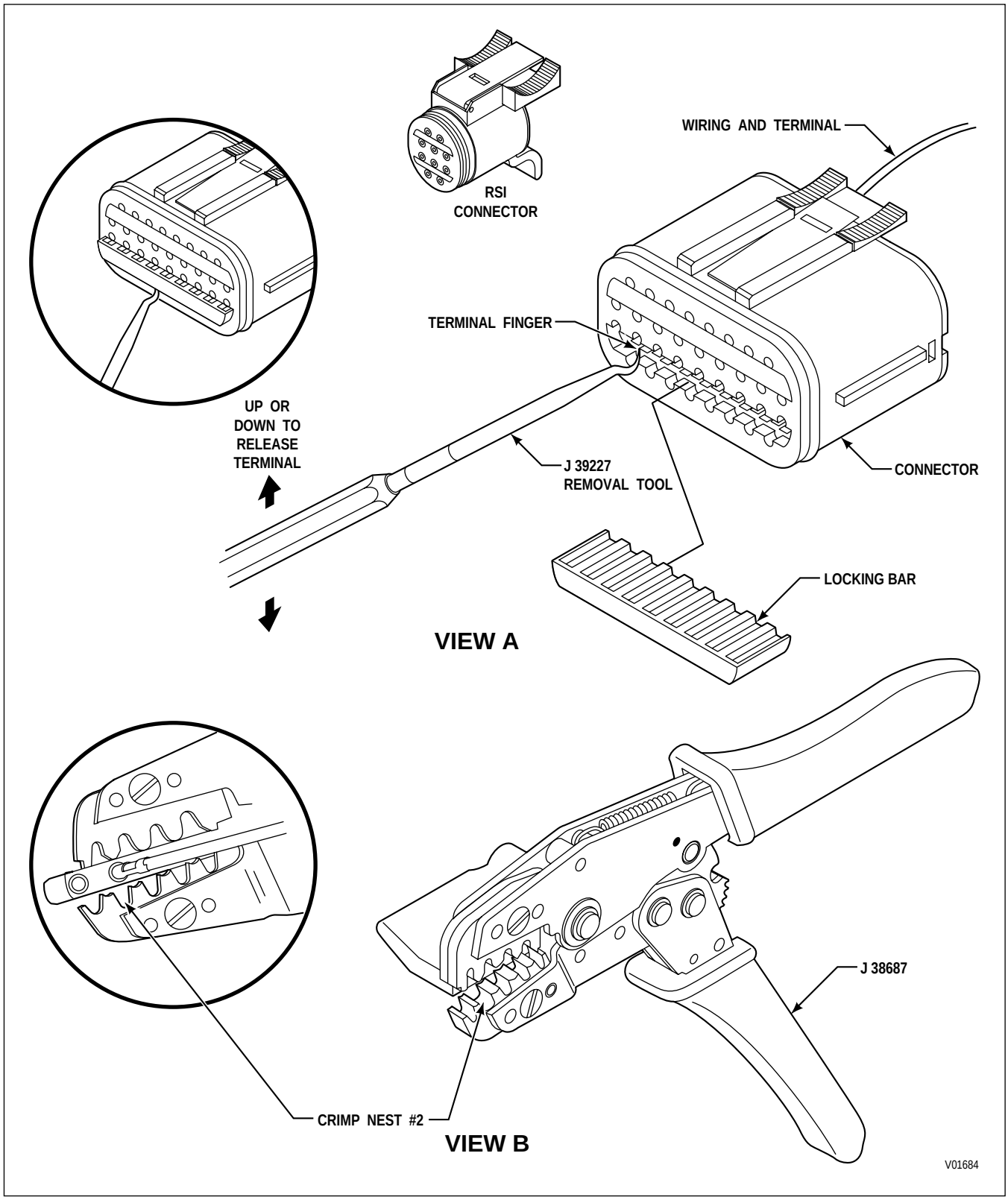

Figure E–1. Thomas & Betts ECU Connector, RSI Connector

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–1. THOMAS & BETTS CONNECTORS (ECU AND RSI)

A. Connector/Terminal Repairs

Crimping Tool	J 38687
Crimp Nest No. 2	
Remover Tool	J 39227

Use	Description	P/N
Electronic Control Unit	Connector “A” (Black/White)	29500915
	Connector “B” (Black)	29500914
	Terminal	29500917
	O-ring Seal	29503055
	Locking Bar	29503057
	Cavity Plug	29500919
Remote Serial Interface (RSI)	Connector	29500916
	Terminal	29500917
	O-ring Seal	29503054
	Locking Bar	29503056
	Cavity Plug	29500919

B. Terminal Removal

1. Remove the locking bar(s) from front of the connector (Figure E–1, View A).
2. Move the appropriate terminal finger slightly up or down to release the desired terminal and pull on the wire to remove the terminal from the back of the connector.
3. If replacing the terminal, cut the wire between the core and insulation crimp to minimize wire loss.

C. Terminal Crimping

1. Carefully strip insulation 4 mm ± 0.5 mm (0.16 ± 0.02 inch). Automatic Wire Stripper J 35615 will remove insulation and crimp from old terminal without damaging the wire, unless the insulation crimp is overtight.
2. Insert a terminal into Crimp Nest No. 2 of crimping tool J 38687 (Figure E–1, View B).
3. Properly position the stripped wire in the terminal and squeeze the handles of the crimping tool until the ratchet mechanism releases.
4. Insert the newly crimped terminal back into its cavity and push until the terminal finger “locks” into place.
5. Reinsert the locking bar(s) into the front of the connector.

D. Deletion of RSI Jumper Wire

1. Follow Steps 1 and 2 of Paragraph B (Terminal Removal) above.
2. Insert cavity plugs in cavities 2 and 3.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

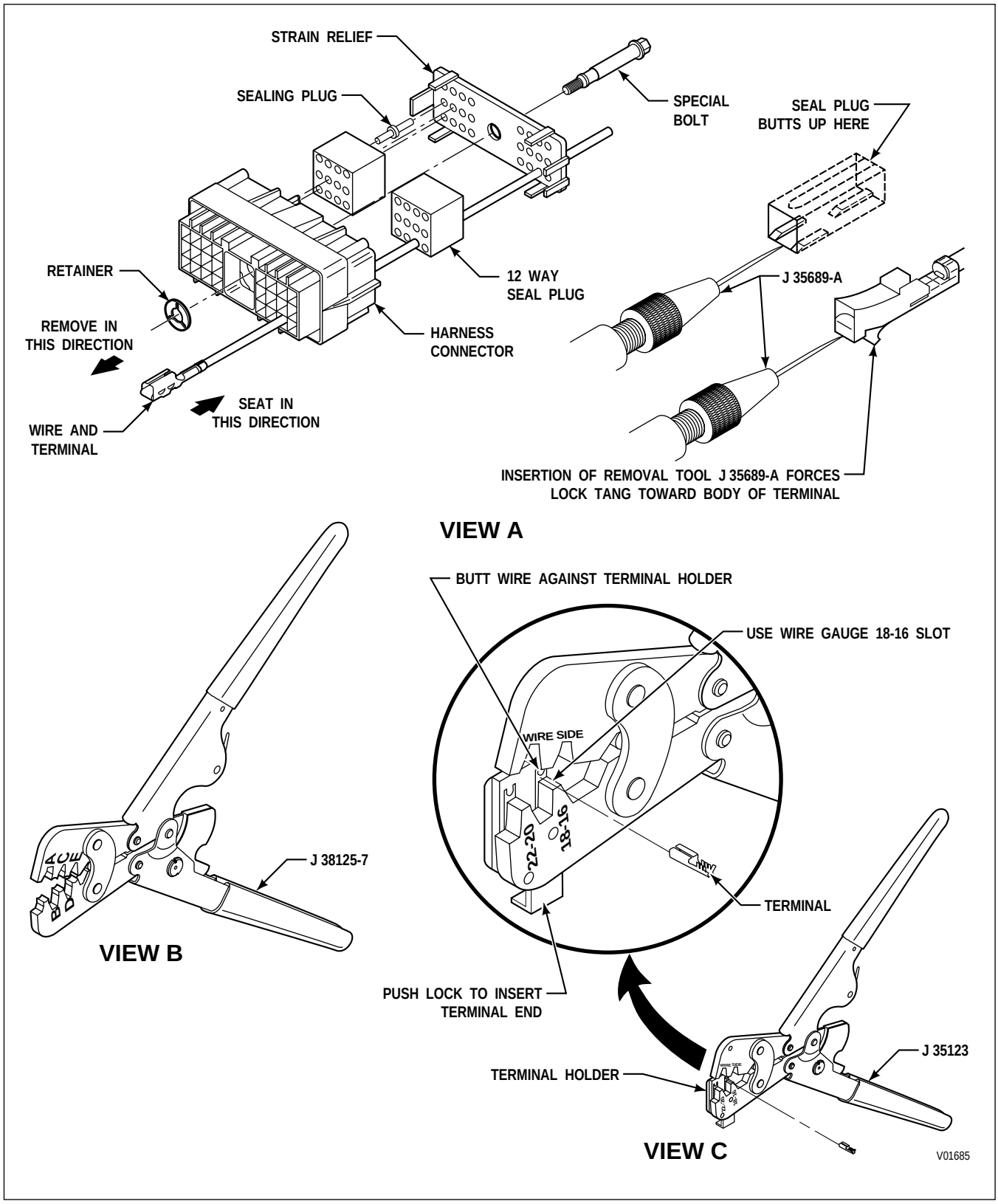

Figure E–2. Packard Metri-Pack 150 Series Connectors — Pull-to-Seat (Internal/External Harness to Transmission Feedthrough; Speed Sensor; Accumulator Solenoid; 30-Way and 18-Way VIM)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–2. PACKARD METRI-PACK 150 SERIES CONNECTORS — PULL-TO-SEAT (INTERNAL/EXTERNAL HARNESS TO TRANSMISSION FEEDTHROUGH; SPEED SENSOR; ACCUMULATOR SOLENOID; 30-WAY AND 18-WAY VIM)

A. Connector/Terminal Repairs

Crimping Tool	J 38125-7
Wire Crimp	Anvil “E”
Insulation Crimp	Anvil “C”
Alternate Crimping Tool	J 35123
Remover Tool	J 35689-A

Use	Description	P/N
External Harness to Transmission Feedthrough Connector	Connector Body	12092201
	12-Way Seal (x2)	12092200
	Special Bolt	12129426
	Retainer	12034236
	Strain Relief	12110234
	Terminal (Socket)	12110236
	Cavity Plug	12034413
Internal Harness to Transmission Feedthrough Connector	Connector Assembly	12092197
	Terminal	12110236
	12-Way Seal (x2) (Internal)	29514675
Turbine Speed (Nt) Sensor (MD/B 300/B 400)	Connector	12092419
	Terminal	12110236
Turbine Speed (Nt) Sensor (HD/B 500)	Connector	12162193
	Terminal	12103881
Engine/Output (All Models) (Ne/No) Speed Sensor	Connector	12162193
	Terminal	12103881
Accumulator (H Solenoid)	Connector	15326143
	Terminal	12103881
Vehicle Interface Module (VIM)	Connector (VIM)	
	Connector Body	12040920
	9-Way Seal (x2)	12040936
	18-Way Strain Relief	12110545
	Special Bolt	12129426
	Bolt Retainer	12034236
	Sealing Plug	12034413
	Terminal	12103881
Vehicle Interface Module (Vehicle)	Harness Connector (OEM)	29506606
	Connector Body	12034397
	15-Way Seal (x2)	12040879
	30-Way Strain Relief	12110546
	Special Bolt	12129426
	Bolt Retainer	12034236
	Sealing Plug	12034413
	Terminal	12103881

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

NOTE: Do not solder crimps.

B. Terminal Removal

1. Insert needle end of terminal remover J 35689-A into the small notch between the connector and the terminal to be removed (Figure E–2, View A). Push the lock tang toward the terminal.
2. Push the wire and terminal out of the connector (this is a "pull-to-seat" terminal).
3. Pull terminal as far as necessary from the connector. This will be limited by the number of other wires inserted into the connector and by the distance between the back side of the connector and the beginning of the harness covering.
4. If terminal is to be replaced, cut the terminal between the core and insulation crimp to minimize wire loss.

NOTE: If replacing the complete external harness to transmission connector assembly, a new connector should be assembled in the following order (see Figure E–2).

1. ***Insert the two 12-way seals in the back of the connector.***
2. ***Insert the cavity plugs in the openings which will not be used.***
3. ***Put the strain relief in place on the back of the connector.***
4. ***Insert the bolt into the back side of the strain relief and push it through the front of the connector.***
5. ***Install the retainer ring on the bolt.***
6. ***Insert the harness wires in the proper connector positions and pull out the front of the connector.***
7. ***Strip the wires and crimp the terminals as instructed.***

C. Terminal Crimping

Internal and external harness to feedthrough, VIM, and speed sensor terminals (standard crimping tool).

1. If a spare wire is used, the wire should be pushed through the proper hole in the strain relief (if used), through the green seal, and out the other side of the connector before stripping.
2. Carefully strip insulation 4.5 mm ± 0.5 mm (0.18 ± 0.02 inch). Unless insulation crimp is overtight, Automatic Wire Stripper J 35615 will remove insulation and crimp from old terminal without damaging wire.
3. Place core crimp portion of terminal on bed of anvil "E" and squeeze crimper enough to keep terminal from dropping (Figure E–2, View B).
4. Position wire core in terminal and squeeze crimper tool to complete the core crimp. **Be sure to orient the terminal so that it is properly aligned with the terminal cavity in the connector.** The terminal should be positioned so that the lock tang is on the side of the cavity which has the notch in the middle (for the remover tool).
5. Position insulation crimp of terminal on anvil "C" so that the entire insulation crimp area and a portion of the terminal between the core and insulation crimp areas are supported by the anvil. Complete the insulation crimp.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

C. Terminal Crimping *(cont'd)*

6. Be sure lock tang is lifted to allow proper reseating of the terminal.
7. Pull on the wire to pull the terminal completely into the cavity. (A click will be heard and the terminal should stay in place if the wire is pushed.)

D. Terminal Crimping Using Alternate Tool J 35123

1. If a spare wire is used, the wire should be pushed through the proper hole in the strain relief (if used) and the seal (green), and out the other side of the connector prior to stripping.
2. Insert remover tool in front side of connector to release lock tab and push terminal out front of connector. Pull the terminal and wire out the front of the connector to complete Steps 3 through 7.
3. Push open the terminal holder on the crimper tool J 35123 and insert a terminal into the opening marked 18–16 (Figure E–2, View C) so that the crimp ends point up. Release the terminal holder.
4. Slightly close the crimping tool (close until one click is heard) but do not start to crimp the terminal. Place the terminal on the wire so it is in the same position as it will be when pulled back into the connector. The terminal should be positioned so that the lock tang is on the side of the cavity which has the notch in the middle (for the remover tool).
5. Insert the wire into the terminal until the wire contacts the holder. (By doing this, the core and insulation should be properly positioned for the core and insulation crimp wings.)
6. Squeeze the crimper fully until it opens when released.
7. Open the terminal holder and remove the wire and terminal from the crimping tool.
8. Pull on the terminal to assure a tight crimp.
9. Be sure lock tang is lifted to allow proper reseating of the terminal.
10. Pull on the wire to pull the terminal completely into the cavity. (A click will be heard and the terminal should stay in place if the wire is pushed.)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

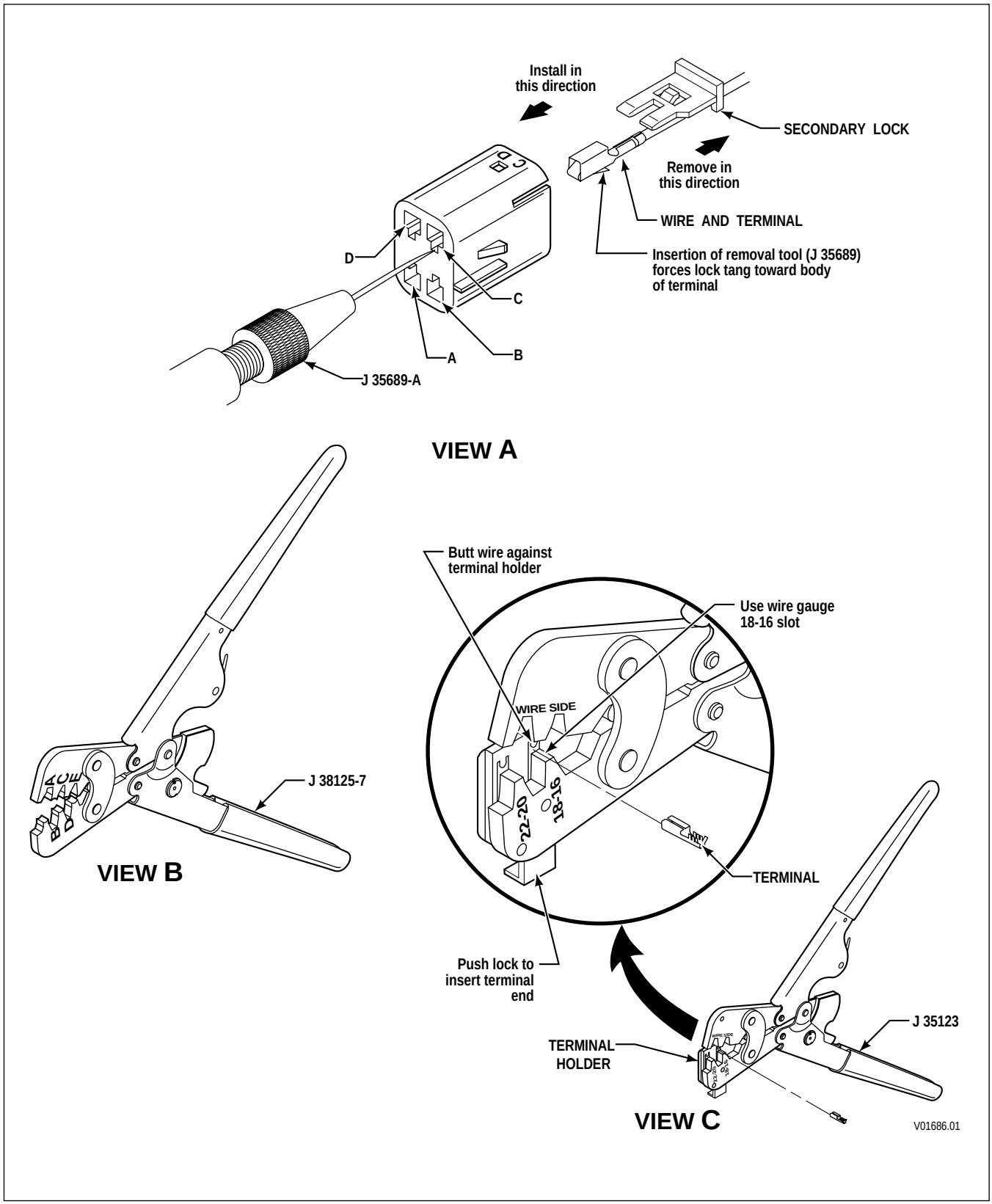

Figure E–3. Packard Metri-Pack 150 Series Connectors — Push-to-Seat (Oil Level Sensor)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–3. PACKARD METRI-PACK 150 SERIES CONNECTORS — PUSH-TO-SEAT (OIL LEVEL SENSOR)

A. Connector/Terminal Repairs

Crimping Tool	J 38125-7
Wire Crimp	Anvil "E"
Insulation Crimp	Anvil "C"
Alternate Crimping Tool	J 35123-7
Remover Tool	J 35689-A

Use	Description	P/N
Oil Level Sensor	4-Pin Plug	12047786
	Terminal (Pin)	12047581
	Secondary Lock	12047787
	4-Pin Receptacle	12047785
	Terminal (Socket)	12047767
	Secondary Lock	12047664

NOTE: Do not solder crimps.

B. Terminal Removal

1. Remove the secondary lock.
2. Insert needle end of terminal remover J 35689-A into the small notch between the connector and the terminal to be removed (Figure E–3, View A). Push the lock tang toward the terminal.
3. Pull the wire and terminal out the rear of the connector (this is a "push-to-seat" terminal).
4. Pull terminal as far as necessary from the connector. This will be limited by the number of other wires inserted into the connector and by the distance between the back side of the connector and the beginning of the harness covering.
5. If terminal is to be replaced, cut the terminal between the core and insulation crimp to minimize wire loss.

C. Terminal Crimping

1. Carefully strip insulation 4.5 mm ± 0.5 mm (0.18 ± 0.02 inch). Unless insulation crimp is overtight, Automatic Wire Stripper J 35615 will remove insulation and crimp from old terminal without damaging wire.
2. Place core crimp portion of terminal on bed of anvil "E" and squeeze crimper enough to keep terminal from dropping (Figure E–3, View B).
3. Position wire core in terminal and squeeze crimper tool to complete the core crimp. **Be sure to orient the terminal so that it is properly aligned with the terminal cavity in the connector.** The terminal should be positioned so that the lock tang is on the side of the cavity which has the notch in the middle (for the remover tool).
4. Position insulation crimp of terminal on anvil "C" so that the entire insulation crimp area and a portion of the terminal between the core and insulation crimp areas are supported by the anvil. Complete the insulation crimp.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

C. Terminal Crimping *(cont'd)*

5. Be sure lock tang is lifted to allow proper reseating of the terminal.
6. Push on the wire until the terminal is completely into the cavity. (A click will be heard and the terminal should stay in place when the wire is lightly pulled.)

D. Terminal Crimping Using Alternate Tool J 35123

1. Insert remover tool in front side of connector to release lock tab and pull terminal out rear of connector. Pull the terminal and wire out the rear of the connector to complete Steps 3 through 7.
2. Push open the terminal holder on the crimper tool J 35123 and insert a terminal into the opening marked 18–16 (Figure E–2, View C) so that the crimp ends point up. Release the terminal holder.
3. Slightly close the crimping tool (close until one click is heard) but do not start to crimp the terminal. Place the terminal on the wire so it is in the same position as it will be when pulled back into the connector. The terminal should be positioned so that the lock tang is on the side of the cavity which has the notch in the middle (for the remover tool).
4. Insert the wire into the terminal until the wire contacts the holder. (By doing this, the core and insulation should be properly positioned for the core and insulation crimp wings.)
5. Squeeze the crimper fully until it opens when released.
6. Open the terminal holder and remove the wire and terminal from the crimping tool.
7. Pull on the terminal to assure a tight crimp.
8. Be sure lock tang is lifted to allow proper reseating of the terminal.
9. Push on the wire until the terminal is completely into the cavity. (A click will be heard and the terminal should stay in place if the wire is lightly pulled.)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

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APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

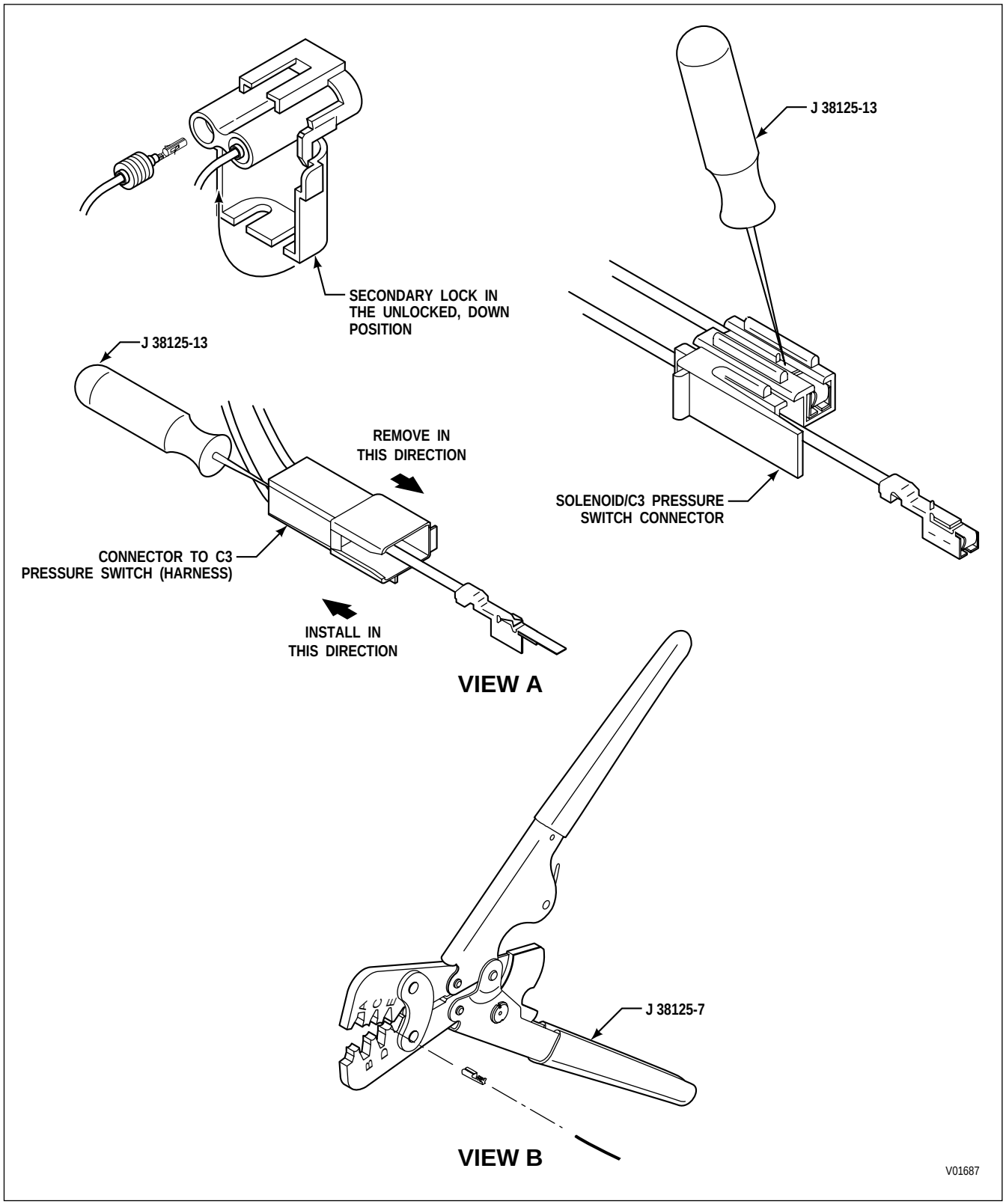

Figure E–4. Packard Metri-Pack 280 Series Connectors — Pull-to-Seat (8-Way Freightliner; 5-Way Navistar Cab Harness; 2-Way Navistar and Ford Cab Harness; Internal Harness Solenoid and C3 Pressure Switch)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–4. PACKARD METRI-PACK 280 SERIES CONNECTORS — PULL-TO-SEAT (8-WAY FREIGHTLINER; 5-WAY NAVISTAR CAB HARNESS; 2-WAY NAVISTAR AND FORD CAB HARNESS; INTERNAL HARNESS SOLENOID AND C3 PRESSURE SWITCH)

A. Connector/Terminal Repairs

Crimping Tool	J 38125-7

NOTE: ***Crimping anvils will be listed following the terminal part numbers for the various connectors in this section. The anvil for the core crimp is always listed first.***

Remover Tool	J 38125-13

Use	Description	P/N
8-Way Freightliner VIM	8-Pin Plug	12066195
	Terminal (Pin)	12034047
	(Use crimping anvils “C” and “A”)	
	Secondary Lock	12065141
	8-Pin Receptacle	12064998
	Terminal (Socket)	12034046
	(Use crimping anvils “2” and “A”)	
	Secondary Lock	12064999
5-Way Navistar Cab Harness	5-Pin Plug	12084891
	Terminal (Socket)	12077411
	(Use crimping anvils “2” and “5”)	
	Connector Seal	15300023
	Secondary Lock	15300017
	Wire Seal	12015323
2-Way Navistar Cab Harness	2-Pin Receptacle	15300002
	Terminal (Pin)	12040559
	(Use crimping anvils “C” and “5”)	
	Secondary Lock	15300014
	Wire Seal	12015360
2-Way Ford Cab Harness	2-Pin Plug	12033769
	Connector Seal	12077383
	Wire Seal	12040972
	Terminal (Socket–12 gauge wire)	12033997
	(Use crimping anvils “F” and “F”)	
	Terminal (Socket–18 gauge wire)	12020156
	(Use crimping anvils “2” and “A”)	
Solenoid/C3 Pressure Switch (Switch)	Connector	
C3 Pressure Switch (Harness)	Connector	
Solenoid/C3 Pressure Switch (Switch)	Terminal	
	(Use crimping anvils “C” and “D”)	
C3 Pressure Switch (Harness)	Terminal	
	(Use crimping anvils “C” and “D”)	
Solenoid (A, B, and G)	Terminal (2 Wire) B	
	(Use crimping anvils “A” and “B”)	

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

B. Terminal Removal

1. Remove secondary lock if one is present.
2. Depress lock tab on terminal (accessible in slot of connector) and push terminal out front of connector (Figure E–4, View A).
3. If replacing terminal, cut terminal between core and insulation crimp (to minimize wire loss).

C. Terminal Crimping

1. Carefully strip insulation 6.5 mm ± 0.5 (0.26 ± 0.02 inch). Unless insulation crimp is overtight, Automatic Wire Stripper J 35615 will remove insulation and crimp from old terminal without damaging wire.
2. Place core crimp portion of terminal on bed of anvil indicated and squeeze crimper enough to hold terminal from dropping (Figure E–7, View B).
3. Position wire core in terminal and squeeze crimper tool to complete the core crimp. Be sure to orient the terminal so that it is properly aligned with the terminal cavity in the connector. (When crimping two wires in terminal P/N 12015243, strip and twist cores together before inserting into the terminal.)
4. Position insulation crimp of terminal on anvil indicated so that the entire insulation crimp area and a portion of the terminal between the core and insulation crimp areas are supported by the anvil. Complete the insulation crimp.
5. Slip the wire through the slot in the connector and pull to fully seat the terminal(s).
6. Reinstall the secondary lock, if one is required.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

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APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

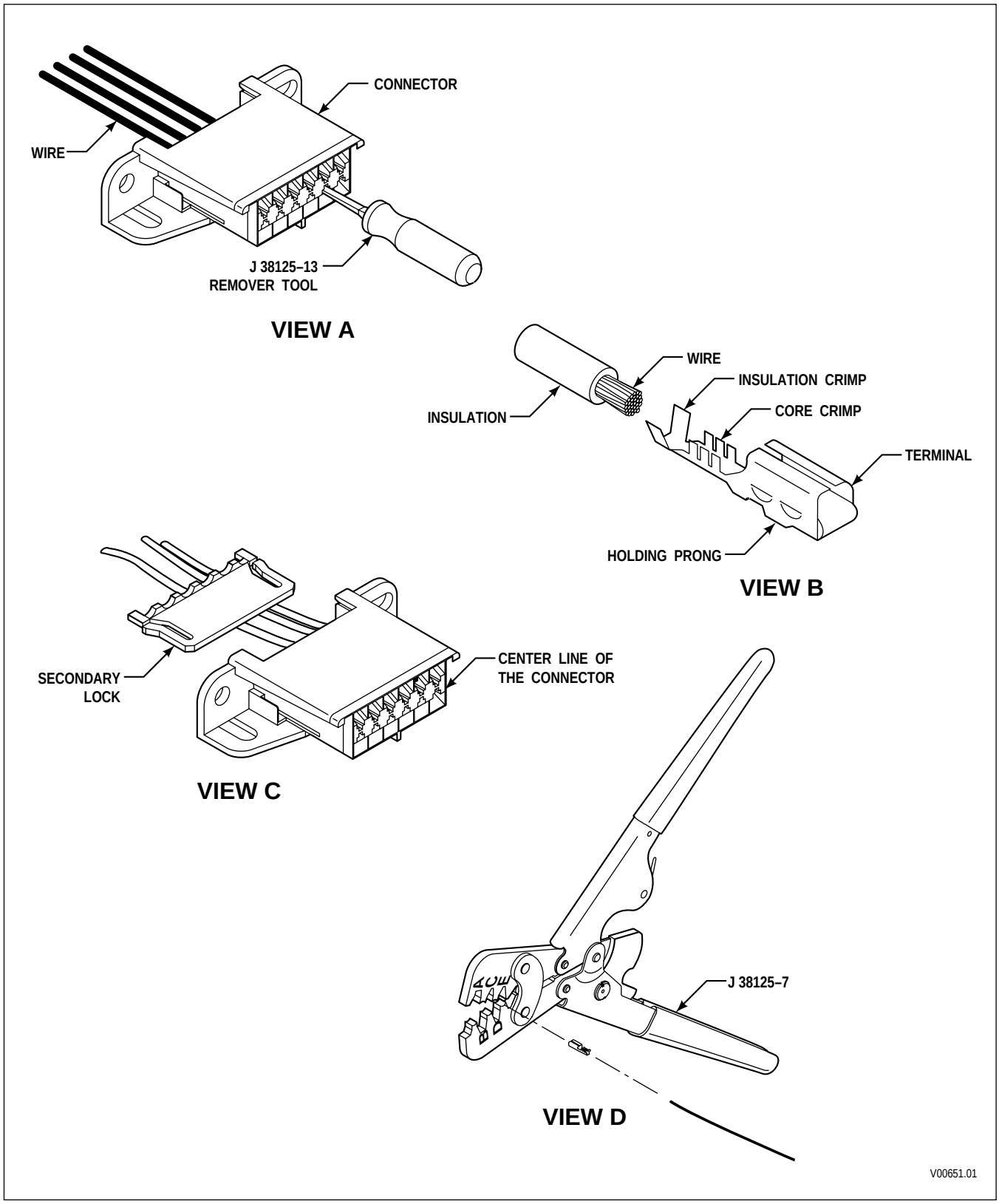

Figure E–5. Packard Metri-Pack 280 Series Connectors — Push-to-Seat (DDR)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–5. PACKARD METRI-PACK 280 SERIES CONNECTORS — PUSH-TO-SEAT (DDR)

A. Connector/Terminal Repairs

Crimping Tool	J 38125-7
Wire Crimp	Anvil "2"
Insulation Crimp	Anvil "A"
Remover Tool	J 38125-13

Use	Description	P/N
Diagnostic	Connector	12048105
Connector	Terminal	12034046
	Secondary Lock	12020219
	Cover	12048107

B. Terminal Removal

1. Remove secondary lock from back of connector (Figure E–5, View C). (Use a small screwdriver or pick in the slots on each side of the connector.)

2. Insert remover tool J 38125-13 into open (front) end of connector at terminal to be serviced (Figure E–3, View A).

3. Push the lock tang of the terminal straight and pull wire and terminal out the back of connector.

4. If the terminal is to be replaced, cut terminal between core and insulation crimp (this minimizes wire length loss).

C. Terminal Crimping

1. Strip wire to approximately 6.0 ± 0.25 mm (0.24 ± 0.01 inch).

2. Insert terminal into crimping tool (Figure E–5, View D), anvil "2."

3. Slightly close crimping tool to hold the terminal steady.

4. Align the terminal with its position in the connector and insert wire so that the stripped portion of the wire is in the core crimping area and the insulated portion of the wire is in the insulation crimping area (Figure E–5, View B).

5. Crimp the stripped section of the wire (Figure E–5, View D).

6. Remove the terminal from the crimping tool.

7. Use a pair of needle nose pliers, if necessary, to start the bend on the insulation crimp wings (Figure E–5, View D).

8. Crimp the insulated section of wire using anvil "A" of the crimpers shown (Figure E–5, View D).

9. Remove the terminal from the crimping tool.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

C. Terminal Crimping *(cont'd)*

10. Tug on terminal and assure the crimp is tight.
11. Insert terminal into connector with the lock tab toward the center line of the connector (Figure E–5, View C).
12. The terminal should "click" into place and you should not be able to pull the terminal out by hand.
13. Reinstall the secondary lock.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

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APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

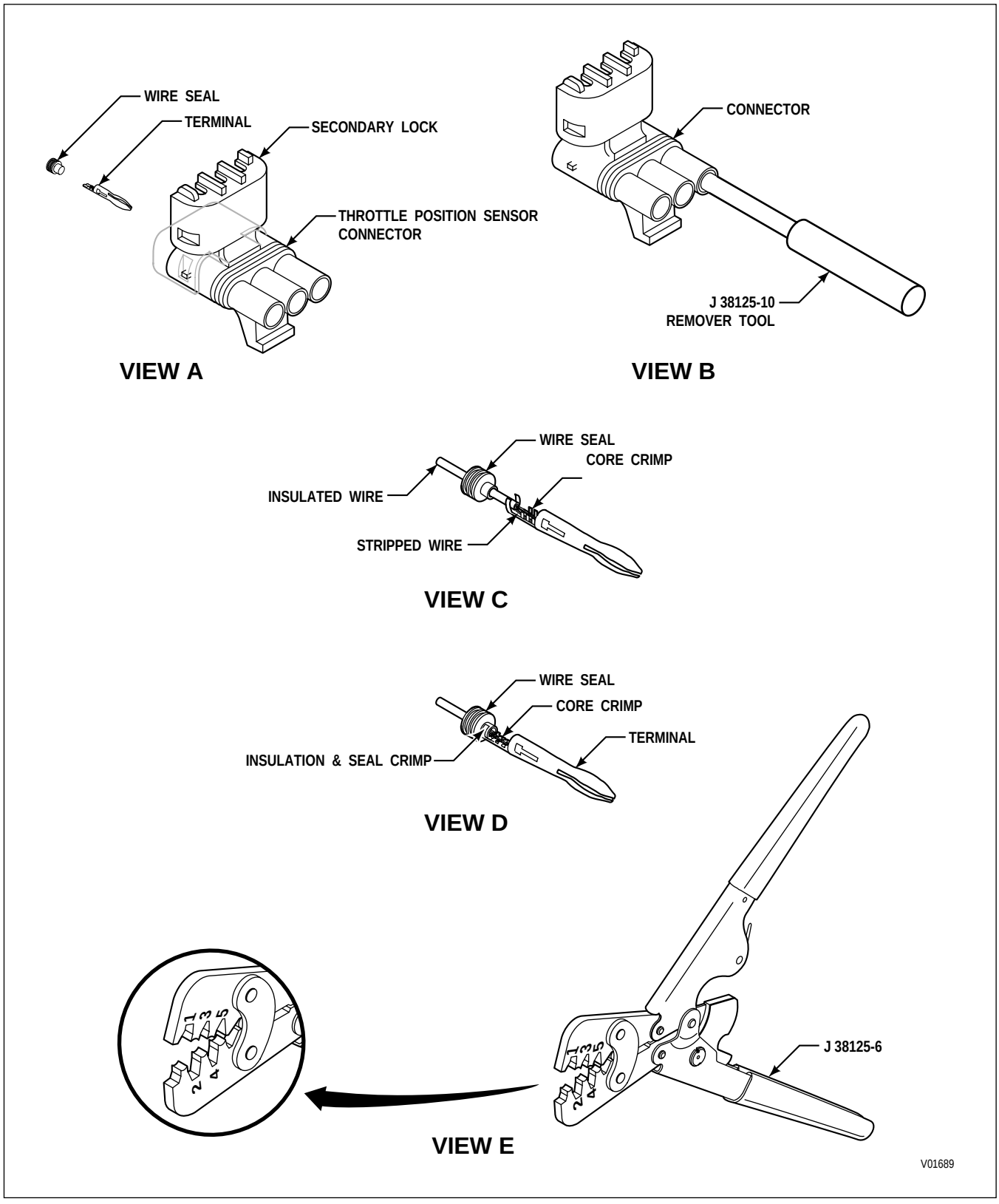

Figure E–6. Packard Weather Pack Connectors (TPS; 3-Way RMR Sensor; HD Retarder Temperature; 6-Way Gillig VIM; 4-Way RMR Device, Type 3; 3-Way RMR Device (Dedicated Pedal))

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–6. PACKARD WEATHER PACK CONNECTORS (TPS; 3-WAY RMR SENSOR; HD RETARDER TEMPERATURE; 6-WAY GILLIG VIM; 4-WAY RMR DEVICE, TYPE 3; 3-WAY RMR DEVICE (DEDICATED PEDAL))

A. Connector/Terminal Repairs

Crimping Tool	J 38125-6
Wire Crimp	Anvil “2”
Insulation Crimp	Anvil “5”
Alternate Crimping Tool	J 35606 or J 38852
Remover Tool	J 38125-10

Use	Description	P/N
Throttle Position Sensor (TPS)	Connector	12015793
	Terminal	12089040
	Wire Seal	12015284
RMR Device	Connector	12015795
	Terminal	12089040
	Wire Seal	12015284
Retarder Temperature Sensor	Connector	12015792
	Terminal	12089040
	Wire Seal	12015284
6-Way Gillig VIM (Towers)	6-Way Plug	12015799
	Connector Seal	12010227
	Terminal (Socket)	12089188
	Wire Seal	12015323
	Cavity Plug	12010300
6-Way Gillig VIM (Shrouds)	6-Way Receptacle	12010975
	Terminal (Pin)	12089188
	Wire Seal	12015323
	Cavity Plug	12010300

B. Terminal Removal

1. Unlatch and open the secondary lock on the connector (Figure E–4, View A).
2. On the front of the connector, insert remover tool J 38125-10 over the terminal. Push the tool over the terminal and pull the terminal out of the back end of the connector (Figure E–4, View B).
3. If terminal is to be replaced, cut terminal between core and insulation crimp (this minimizes wire loss).

NOTE: Two special tools are available for this operation: tool J 38125-6 (Paragraph C); tool J 35606 or J 38852 (Paragraph D).

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

C. Terminal Crimping Using Crimping Tool J 38125-6

1. Place the wire seal onto the wire before stripping the wire (Figure E–6, View C).
2. Strip wire to 6.0 ± 0.25 mm (0.24 ± 0.01 inch).
3. Place terminal onto crimping tool J 38125-6 (Figure E–6, View E), anvil "2."
4. Slightly close crimping tool to hold terminal steady.
5. Insert wire so that the stripped portion of wire is in the core crimp area and the insulated portion of the wire is in the insulation crimping area (Figure E–6, View C).
6. Crimp the stripped section of the wire.
7. Remove the terminal from the crimping tool.
8. Push the wire seal into the terminal (Figure E–6, View D). The second crimp will wrap around the wire seal. This will seal the insulated area of wire.
9. Use a pair of needle nose pliers, if necessary, to squeeze the terminal wings together to fit in anvil "5."
10. Crimp wire seal in anvil "5."
11. Tug on terminal and be sure the crimp is tight.
12. Insert the terminal into the connector. The terminal will "click" into place and should not pull out.
13. Secure the secondary lock. Both sides of the connector must be latched.

D. Terminal Crimping Using Alternate Crimper Pliers J 35606 or J 38852

1. Place the wire seal onto the wire before stripping the wire (Figure E–6, View C).
2. Strip wire to 6.0 ± 0.25 mm (0.24 ± 0.01 inch).
3. Insert terminal into crimping tool J 35606 (Figure E–7, View A), opening marked 18–20.
4. Position the terminal so the crimp wings are pointing up from the bottom jaw of the crimper and are properly positioned.
5. Slightly close the crimping tool to hold the terminal steady.
6. Slide the wire seal to the edge of the insulation and insert the wire and seal into the terminal (Figure E–7, View B).
7. Position the wire and seal and squeeze the crimping tool until it opens when released.
8. Tug on terminal and be sure the crimp is tight.
9. Insert terminal into connector. The terminal will "click" into place and should not pull out.
10. Relatch the secondary lock. Both sides of the connector must be latched.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

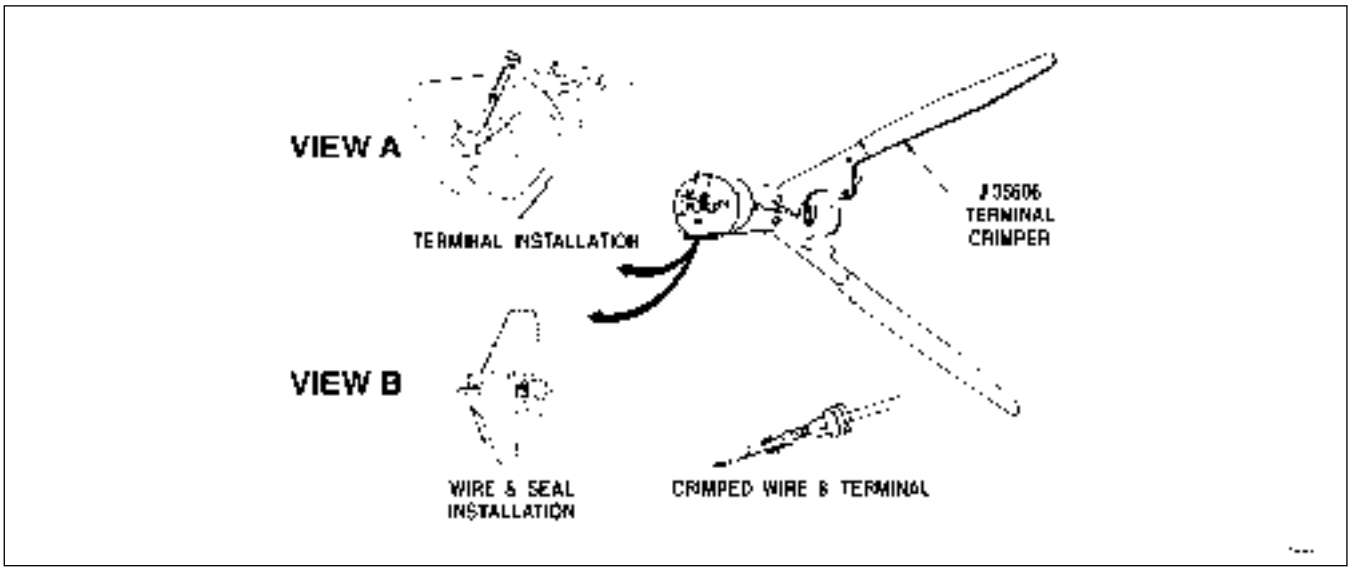

Figure E–7. Terminal Crimping With Tool J 35606

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

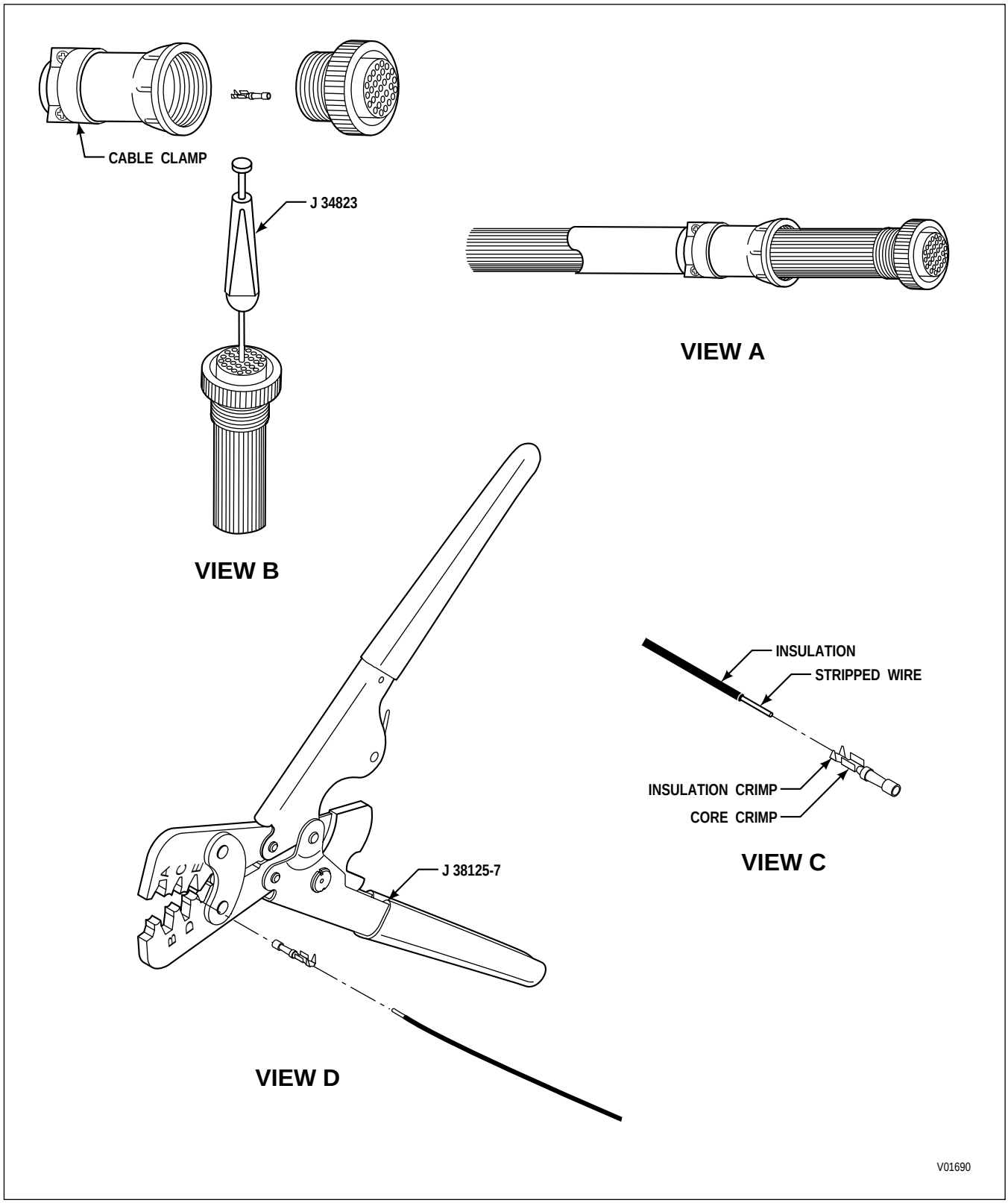

Figure E–8. Amp Products Connectors (16-Way VIW; 8-Way RMR Device (Hand Lever))

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–7. AMP PRODUCTS CONNECTORS (16-WAY VIW; 8-WAY RMR DEVICE (HAND LEVER))

A. Connector/Terminal Repairs

Crimping Tool	J 38125-7
Wire Crimp	Anvil “E”
Insulation Crimp	Anvil “A”
Remover Tool	J 34823

Use	Description	P/N
Vehicle Interface Wiring (VIW)	Connector (16-Way)	23016193
	Terminal (Socket)	23015204
	Shell (16-Way)	23016490
VIW (Vehicle)	Harness	29518142
	Connector	29501001
	Terminal (Pin)	23015205
	Shell (16-Way)	23016490
8-Way RMR Device (Hand Lever)	8-Way Receptacle	29518007
	Terminal (Socket)	29518008

B. Terminal Removal

1. Remove the cable clamp from the connector (Figure E–6, View A).
2. Fully insert removal tool J 34823 into the top of the connector, over the terminal to be removed (Figure E–6, View B).
3. Push down on the plunger to release the terminal.
4. Pull the terminal and wire out the bottom of the connector.
5. If replacing terminal, cut terminal between core and insulation crimp (this minimizes wire loss).

C. Terminal Crimping

1. Strip wire to approximately 4.0 ± 0.25 mm (0.16 ± 0.01 inch) (Figure E–6, View C).
2. Place new terminal onto crimping tool J 38125-7, anvil “E” (Figure E–6, View D).
3. Slightly close the crimping tool to hold the terminal steady.
4. Insert the wire so that the stripped portion of the wire is in the core crimp area and the insulated portion of the wire is in the insulation crimping area.
5. Crimp the stripped section of the wire (Figure E–6, View C).
6. Remove the terminal from the crimping tool.
7. Use a pair of needle nose pliers, if necessary, to start the bend on the insulation crimp wings.
8. Crimp the insulated section of the wire using anvil “A” of the crimpers (Figure E–6, View D).
9. Remove the terminal from the crimping tool.
10. Tug on the terminal and assure the crimp is tight.
11. Insert the terminal into the connector. The terminal will “click” into place and should not pull out.
12. Install the cable clamp using the two Phillips-head screws.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

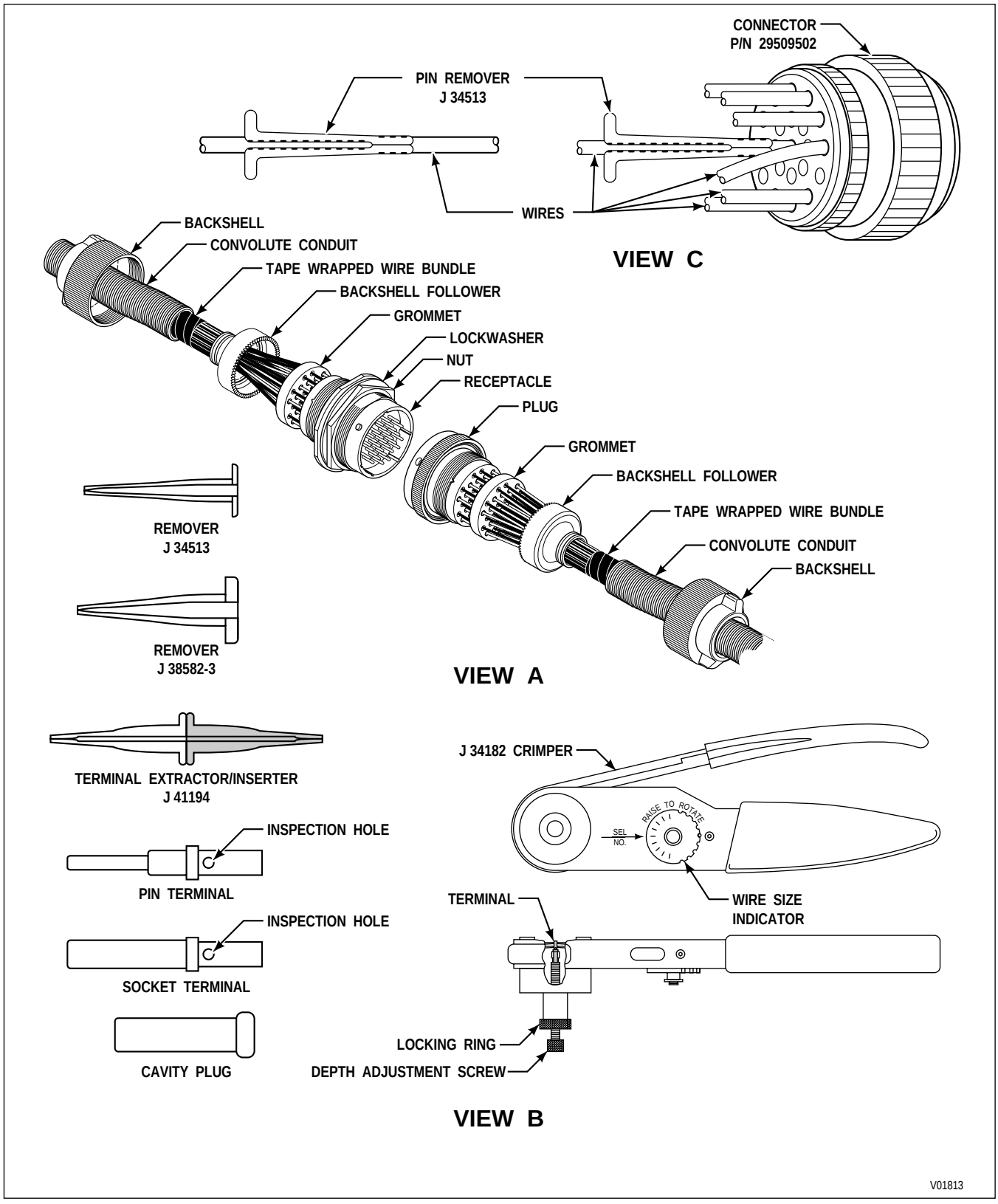

Figure E–9. Deutsch IPD/ECD Connectors (31-Way Bulkhead, 31-Way Feedthrough Harness; 16-Way Optional Sensor Harness; 6-Way Optional DDR)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–8. DEUTSCH IPD/ECD CONNECTORS (31-WAY BULKHEAD, 31-WAY FEEDTHROUGH HARNESS; 16-WAY OPTIONAL SENSOR HARNESS; 6-WAY OPTIONAL DDR)

A. Connector/Terminal Repairs

Crimping Tool	J 34182
Remover Tool	J 34513 (18 GA IPD Bulkhead)
Extractor/Inserter Tool	J 41194 (18 GA ECD Bulkhead)
Remover Tool (DDR Connector)	J 38582-3 (12–14 GA)

Use	Description	P/N
Bulkhead Connector — IPD	31-Way Plug (M/F)	29509617
	Terminal (Socket)	23016502
	Cavity Plug	23016504
	31-Way Receptacle (F/M)	29509616
	Terminal (Pin)	23018768
	Cavity Plug	23016504
	Panel Nut	23016302
	Lockwasher	23016303
	31-Way Plug (M/M)	29509617
	Terminal (Pin)	23018768
	Cavity Plug	23016504
	31-Way Receptacle (F/F)	29509616
	Terminal (Socket)	23016502
	Cavity Plug	23016504
	Panel Nut	23016302
	Lockwasher	23016303
Bulkhead Connector/ Transmission Connector — ECD	Connector Plug (31-Way)	(Male/Female)
	31-Pin Plug	29511854
	Terminal (Socket)	29511366
	Cavity Plug	29511371
	Backshell Assembly	29514040
	Backshell Housing	29514041
	Backshell Follower	29514042
	Backshell Grommet	29514043
Bulkhead Connector/Transmission Connector — ECD	Connector Receptacle (31-Way)	(Female/Male)
	31-Pin Receptacle	29511368
	Terminal (pin)	29511369
	Cavity Plug	29511371
	Panel Nut	29527000
	O-ring Seal	29512839
	Lockwasher	23016303
	Backshell Assembly	29514040
	Backshell Housing	29514041
	Backshell Follower	29514042
	Backshell Grommet	29514043

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

A. Connector/Terminal Repairs *(cont'd)*

Use	Description	P/N
Bulkhead Connector — ECD	Connector Plug (31-Way)	(Male/Male)
	31-Pin Plug	29511855
	Terminal (Pin)	29511369
	Cavity Plug	29511371
	Backshell Assembly	29514040
	Backshell Housing	29520050
	Backshell Follower	29520049
	Backshell Grommet	29514043
Bulkhead Connector — ECD	Connector Receptacle (31-Way)	(Female/Female)
	31-Pin Receptacle	29511854
	Terminal (socket)	29511366
	Cavity Plug	29511371
	Panel Nut	29527000
	O-ring Seal	29512839
	Lockwasher	23016303
	Backshell Assembly	29514040
	Backshell Housing	29520050
	Backshell Follower	29520049
	Backshell Grommet	29514043
16-Way Optional Sensor Harness	16-Way Plug	29516987
	Terminal (Socket)	29511366
	Cavity Plug	29511371
	Backshell Assembly	29516990
	Backshell Housing	29520394
	Backshell Follower	29520395
	Backshell Grommet	29516993
	16-Way Receptacle	29516988
	Terminal (Pin)	29511369
	Cavity Plug	29511371
	Panel Nut	29516989
	O-ring Seal	29516994
	Lockwasher	29519126
	Backshell Assembly	29516990
	Backshell Housing	29516991
	Backshell Follower	29516992
	Backshell Grommet	29516993
6-Way Optional DDR	6-Way Plug	29512133
	Terminal (Pin)	29514170
	Cavity Plug	23016504
	Backshell	29521260
	Cover	29521877

NOTE: ***If difficulty is encountered in removing or installing the plug backshell, insert the plug into the receptacle, do not lock it into place, and loosen the backshell.***

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

B. Terminal Removal (refer to Figure E–9, View A)

NOTE: ***When using remover/inserter tool J 41194, take care not to break the tip of the tool. Lay the wire in the widest part of the wire slot and work toward the tool tip.***

1. Loosen and slide the backshell along the convolute conduit.
2. Remove the convolute conduit from the base of the backshell follower. Peel enough conduit from the harness to allow working access.
3. Slide the backshell follower clear of the connector housing.
4. Remove as much tape wrap as necessary to allow working access.
5. Fully insert the proper remover/extractor tool into the back of the connector until it releases the terminal.
6. Pull the terminal, wire, and tool out the back of the connector.
7. If replacing the terminal, cut the wire through the middle of the terminal crimp (this minimizes wire loss).

C. Terminal Crimping (refer to Figure E–9, View B)

1. Strip approximately 6–8 mm (0.236–0.315 inch) of insulation from the wire.
2. Set the crimping tool wire size to number 18 for the ECD or IPD connector. For the optional DDR connector, set the wire size to number 12. To set the wire size, remove the retainer pin. Lift and rotate the indicator until the correct wire number is aligned with the SEL NO. arrow. Reinstall the retainer pin.
3. Insert the contact end of the terminal into crimping tool J 34182. Adjust the crimping tool depth by loosening the locking ring until the depth adjusting screw is free and turning the adjusting screw until the top of the terminal is just above flush with the crimping hole (the crimp jaws will contact the middle of the terminal barrel). Tighten the lock ring to retain the adjustment.
4. Fully insert the wire into the terminal so that the stripped portion of the wire is in the crimp area. A small section (0.5–1.0 mm (0.020–0.025 inch)) of wire will be visible above the terminal barrel.
5. Squeeze the crimping tool handle until it releases. The terminal is now crimped onto the wire.
6. Remove the terminal and wire from the crimping tool.
7. Tug on the terminal to ensure the crimp is tight.
8. For the optional DDR connector, apply a one inch long piece of heat shrink tubing over the wire insulation just behind the terminal. Apply heat to shrink and lock tubing to the insulation.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

D. Terminal Insertion (ECD Bulkhead)

NOTE: ***If replacing an outside grommet (refer to Figure E–9 showing the ECD bulkhead), ensure the grommet is correctly installed. Each grommet hole is marked with the terminal ID of the wire that passes through that hole. The grommet holes match the pattern of either the pins or sockets in the connector. One side of the grommet is marked "PIN" and the other "SKT" or "SOC." "PIN" indicates the pin (receptacle) side of the connector and "SKT" or "SOC" the socket (plug) side. When installing the outer grommet in the receptacle, ensure "PIN" is showing and positioned so that the "A" terminal ID on the outer grommet aligns with the "A" terminal ID on the inner grommet. When installing the outer grommet in the plug, "SKT" or "SOC" must be showing and positioned so that the "A" terminal ID on the outer grommet aligns with the "A" terminal ID on the inner grommet. Reversing "PIN" and "SKT" or "SOC" sides of the grommet will cause the grommet holes to be misaligned with the holes in either the receptacle or plug. Perform Steps 1 and 2 only if the outer grommet has been removed.***

1. Place the correct side of the grommet upwards with the inner and outer grommet "A" terminal ID aligned.
2. Insert two cavity plugs in unused cavities to retain the grommet.

NOTE: ***When using remover/inserter tool J 41194, take care not to break the tip of the tool. Lay the wire in the widest part of the wire slot and work toward the tool tip.***

1. Place the terminal and wire in the end of extractor/inserter tool J 41194.
2. Insert the tool through the grommet, into the back of the connector, and push until the terminal is seated. Remove the remover/inserter tool.
3. Insert cavity plugs into all unused cavities.
4. Wrap plastic electrical tape around the wire bundle.
5. Reassemble the connector in the reverse order of disassembly.

E. Terminal Insertion (all connectors except ECD bulkhead)

1. Insert wire with crimped terminal through the proper hole in the grommet.
2. Keep pushing on wire until the terminal "locks" into position.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

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APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

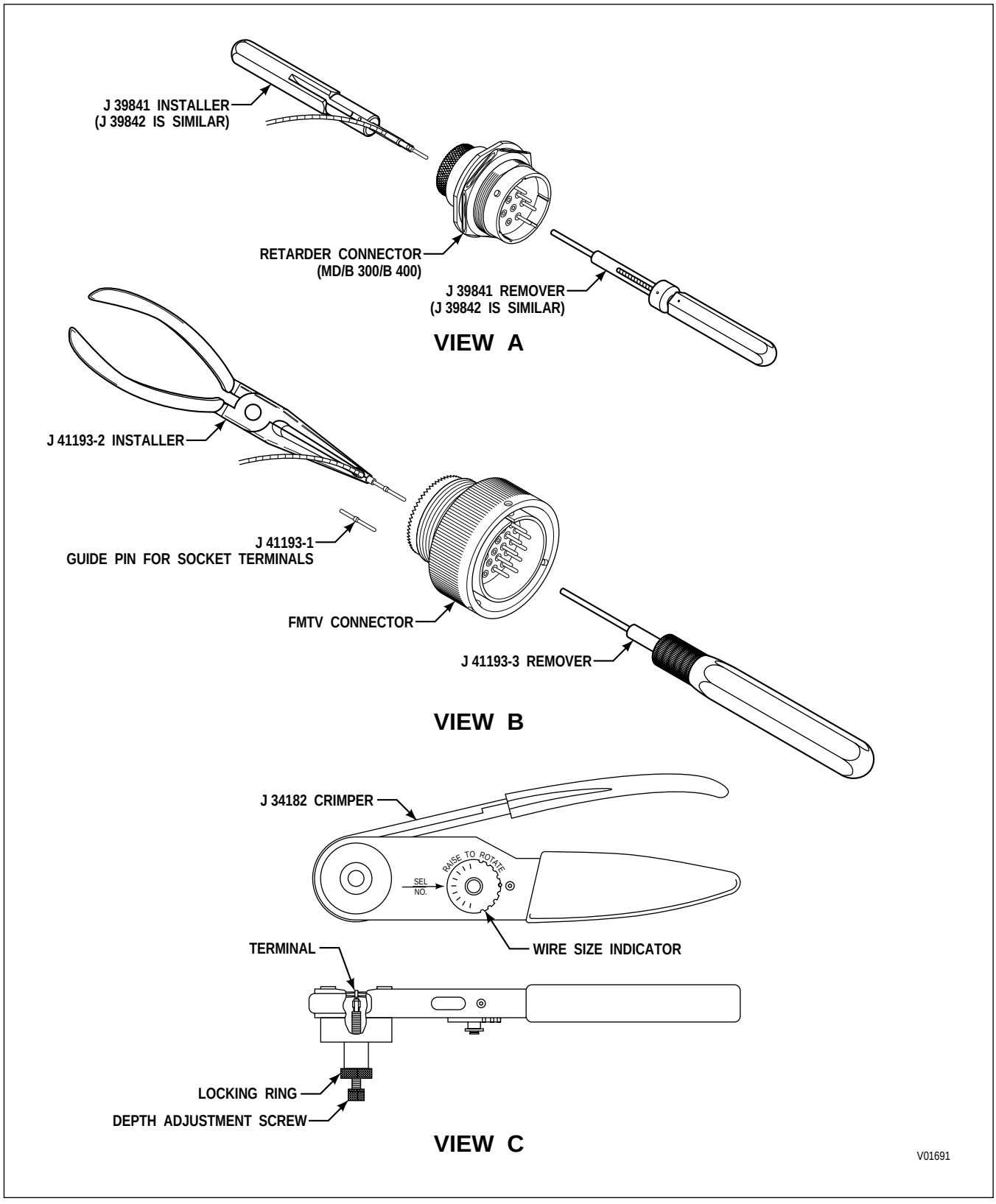

Figure E–10. ITT Cannon Connectors — Crimped (37-Way FMTV Bulkhead; 6-Way Transfer Case; 8-Way MD Retarder)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–9. ITT CANNON CONNECTORS — CRIMPED (37-WAY FMTV BULKHEAD; 6-WAY TRANSFER CASE; 8-WAY MD RETARDER)

A. Connector/Terminal Repair

Crimping Tool	J 34182
Connector Repair Kit (FMTV)	J 41193
Guide Pin	J 41193-1
Insertion Tool	J 41193-2
Terminal Remover	J 41193-3
Terminal Remover/Installer (MD Retarder)	J 39841
Terminal Remover/Installer (MD 3070 T-Case Connector)	J 39842

Use	Description	P/N
MD FMTV	37-Way Plug Assembly	29502375
	37-Way Receptacle Assembly	29502374
MD Transfer Case	6-Way Plug Assembly	29506418
	Terminal (Socket)	29517128
	Cavity Plug	29517132
	6-Way Receptacle Assembly	
	Terminal (Pin)	29517129
	Cavity Plug	29517132
MD Retarder	8-Way Plug	29506427
	Terminal, Socket	29517130
	Cavity Plug	29517133
	8-Way Receptacle	29505513
	Terminal, Pin	29517131
	Cavity Plug	29517133

B. Terminal Removal (refer to Figure E–10, Views A and B)

1. Select the remover tool for the plug or receptacle that is being repaired.
2. For the FMTV connector, choose either the pin or socket terminal remover tip and lock it into the handle.
3. Place the tip of the remover tool over the pin or into the socket and push the contact/terminal out the rear of the connector using slow, even pressure.
4. Pull the wire and terminal out the back of the connector.
5. If replacing the terminal, cut the wire through the middle of the terminal crimp to minimize wire loss.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

C. Terminal Crimping (refer to Figure E–10, View C)

1. Strip approximately 6–8 mm (0.236–0.315 inch) of insulation from the wire.
2. Set the crimping tool wire size to number 18. To set the wire size, remove the retainer pin. Lift and rotate the indicator until 18 is aligned with the SEL NO. arrow. Reinstall the retainer pin.
3. Insert the contact end of the terminal down into crimping tool J 34182. Adjust the crimping tool depth by loosening the locking ring until the depth adjusting screw is free and turning the adjusting screw until the wire end of the terminal is just above flush with the top of the crimping hole. The crimp jaws will now contact the middle of the terminal barrel. Tighten the lock ring to retain the adjustment.
4. Fully insert the wire into the terminal so that the stripped portion of the wire is in the crimp area. A small section (0.5–1.0 mm (0.020–0.040 inch)) of wire will be visible above the terminal barrel.
5. Squeeze the crimping tool handle until it releases. The terminal is now crimped onto the wire.
6. Remove the terminal and wire from the crimping tool.
7. Tug on the terminal to ensure the crimp is tight.

D. Terminal Insertion

1. Select the proper insertion tool for the connector or receptacle that is being reassembled.
2. Place the terminal and wire in the insertion tool (refer to Figure E–10, Views A and B).

NOTE: When installing a socket terminal for the FMTV plug, use the J 41193-1 guide pin.

3. Insert the terminal through the correct hole in the back of the connector and push until the terminal is seated. Remove the insertion tool. Check to see that the terminal is at the same height as other terminals. Tug on the wire at the rear of the connector to ensure that the terminal is locked in place.
4. Insert cavity plugs into all unused cavities.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

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APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

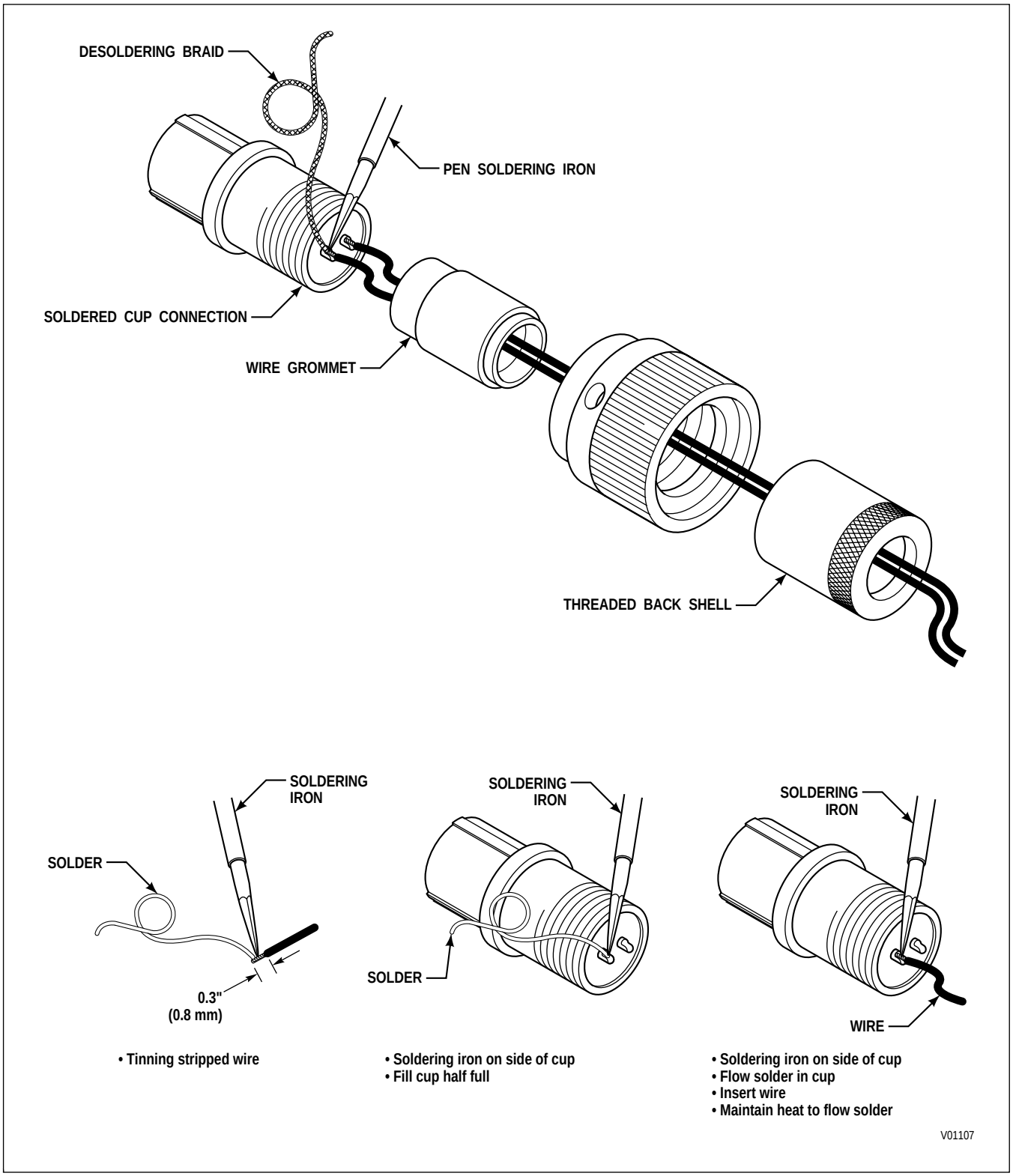

Figure E–11. ITT Cannon Connectors — Soldered (2-Way HD Retarder)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–10. ITT CANNON CONNECTORS — SOLDERED (2-WAY HD RETARDER)

A. Connector Terminal Repair (refer to Figure E–11)

Use	Description	P/N
Retarder Control (K Solenoid) (HD/B 500 Models)	Connector Plug (2-pin)	29505516
	Terminal (pin)	29511913
	Connector Receptacle	29505515

Use	Description	P/N
FMTV 37-Way Bulkhead	Plug Assembly	29502375
	Receptacle Assembly	29502374

B. Special Tools

- 50–70 percent tin resin core solder, 18–20 SWG (0.086–1.0 mm (0.036–0.040 inch))
- Pen-type soldering iron (60W maximum)— tip no larger than 3.175 mm (0.125 inch)
- Desoldering braid

NOTE: ***Proper solder, techniques, equipment, and cleanliness are important to achieve a good solder joint. Clean connector and terminals being soldered of all dirt, grease, and oil. Always heat the piece onto which solder is to flow. A cold solder joint can cause intermittent continuity problems. Avoid a cold joint by heating the piece(s) being soldered to melt the solder rather than merely heating the solder until it melts. Excess solder applied to a stranded wire travels up the wire, stiffening it and making it inflexible. The wire can break at the point where the solder stops. Do not use acid core solder.***

C. Wire Removal — Desoldering

1. Unscrew backshell and slide the backshell away from the connector.
2. Slide the grommet away from the connector. Slide the grommet far enough to allow access to the terminals and wire ends. If the grommet is hard to slide, lubricate the wires with isopropyl alcohol. If necessary, move some of the harness covering. If no solder is present, proceed as in Section 1–9 for crimped terminals.
3. Place the desoldering braid (wick) on top of the soldered terminal cup and wire. Place the hot soldering iron on the desoldering braid and wait until the solder wicks up the braid, remove the wire.
4. If the other terminal is being repaired, repeat the desoldering operation on that terminal. When solder is removed, proceed as in Section 1–9 for crimped terminals.

D. Soldering Wire Into Terminal

NOTE: ***If installing a new connector on a harness, ensure the backshell and grommet are in place before soldering the wires to the terminals. Clean wires and terminals of dirt or grease.***

1. Strip approximately 8 ± 0.8 mm (.31 ± .031 inch) of insulation from the wire.
2. Tin the stripped end of the wire.
3. Insert the wire through the proper hole in the grommet.

NOTE: ***Lubricate the wire(s) with isopropyl alcohol only if the wire(s) will not slide through the grommet. If installing a new connector on the harness, be sure the backshell is in place before inserting the wire(s) through the grommet.***

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

D. Soldering Wire Into Terminal *(cont'd)*

4. Mount the connector in a holding fixture at a 45 degree angle. Hold the solder in the terminal cup and apply heat to the side of the cup until the solder flows.

5. Slowly feed solder into the cup until it is half-full. When the cup is half-full, remove the solder supply before removing the soldering iron. Half-fill all cup terminals that are to have wires inserted.

NOTE: Feed solder slowly enough to prevent a flux gas pocket from forming. A gas pocket prevents sufficient solder from flowing into the cup — a false fill. Correct a false fill by re-heating the cup and adding solder.

6. Start at the lowest cup and apply heat to the side of the cup until the solder melts.

NOTE: Do not overheat the connector while soldering. If the connector gets too hot, stop work until it cools.

7. Carefully insert the stripped end of the wire into the cup until the wire bottoms in the cup. The wire's insulation should be approximately 1.59 mm (0.0625 inch) above the solder.

8. Maintain heat until the solder has flowed in the cup and onto the wire. Overheating can cause the solder to wick up the stranded wire.

NOTE: Indications of a good solder connection are:

- ***A minimum amount of solder showing***
- ***Wire strands are clearly outlined in the joint***
- ***The joint is completely covered with solder***
- ***Fillets have a smooth even contour***
- ***Edges are feathered***
- ***The joint is bright, smooth, and appears clean***

Too little solder is better than too much. If the solder wicks up the wire, the wire may break at the point at which the solder stops.

9. After soldering and inspecting all connections, remove flux residue with a contact cleaner.

10. Slide the grommet into place and screw on the backshell.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

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APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

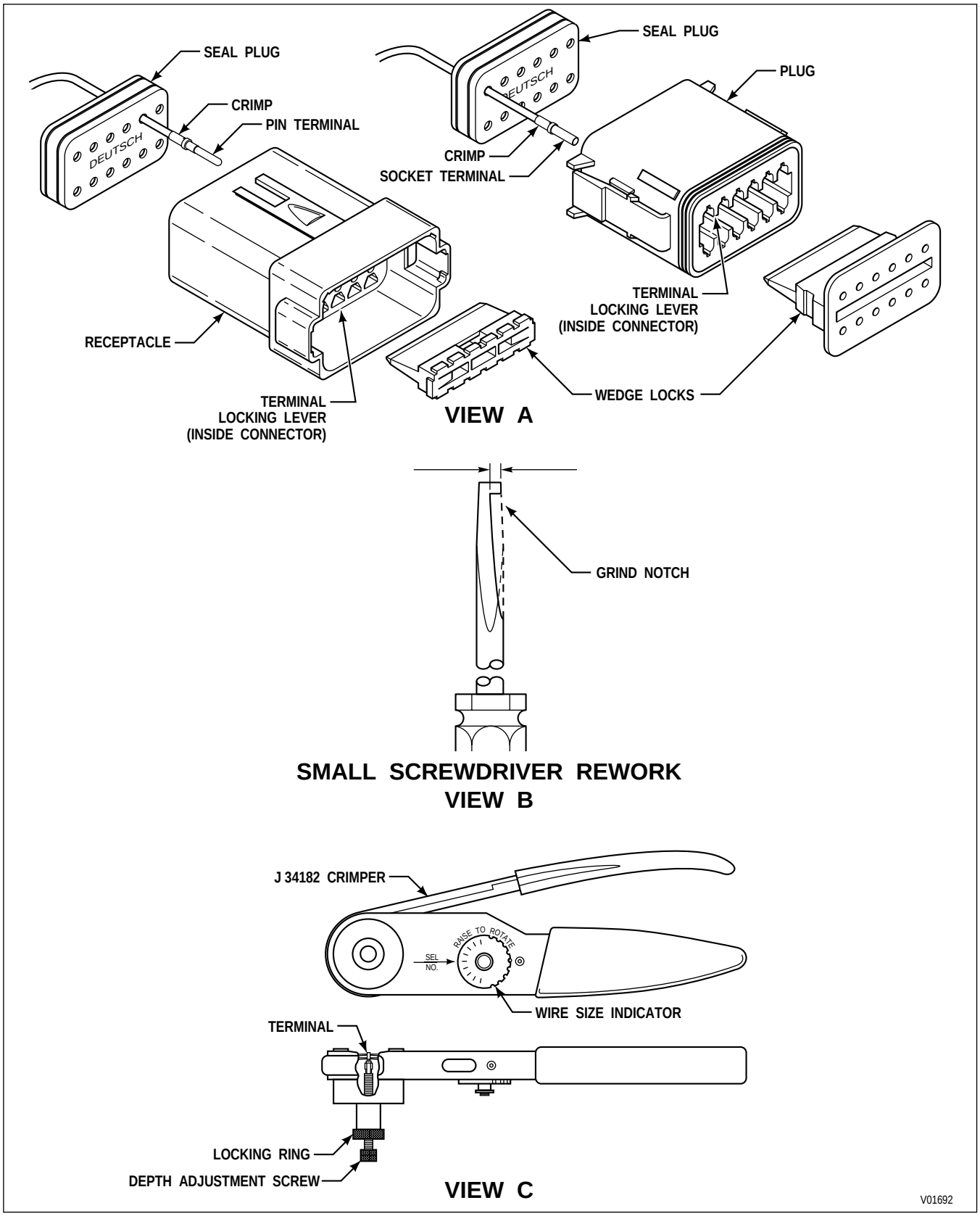

Figure E–12. Deutsch DT Series Connectors (12-Way Navistar VIW)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–11. DEUTSCH DT SERIES CONNECTORS (12-WAY NAVISTAR VIW)

A. Connector/Terminal Repair

Crimping Tool J 34182

Use	Description	P/N
Vehicle Interface	12-Way Plug (Gray)	29511372
	Terminal, Socket	29511366
	Wedge Lock	29511400
	Cavity Plug	23016504
	12-Way Receptacle (Gray)	29511754
	Terminal, Pin	23018768
	Wedge Lock	29511401
	Cavity Plug	23016504
	12-Way Plug (Black)	29511373
	Terminal, Socket	29511366
	Wedge Lock	29511400
	Cavity Plug	23016504
	12-Way Receptacle (Black)	29511755
	Terminal, Pin	23018768
	Wedge Lock	29511401
	Cavity Plug	23016504

B. Terminal Removal (refer to Figure E–12, Views A and B)

1. Use a small-bladed screwdriver with an added notch (as shown in View B) to remove the locking wedge that holds the terminals in place.

2. Use a small screwdriver to remove the 12-way seal plug from the rear of the connector plug or receptacle and slide the seal up the wires out of the way, temporarily.

3. Use a small screwdriver to release the locking lever for the individual terminals that need attention. Pull the wire and terminal out the rear of the connector.

4. If replacing the terminal, cut the wire through the middle of the terminal crimp to minimize wire loss.

C. Terminal Crimping (refer to Figure E–11, View C)

1. Strip approximately 6–8 mm (0.236–0.315 inch) of insulation from the wire.

2. Set the crimping tool wire size to number 18. To set the wire size, remove the retainer pin. Lift and rotate the indicator until 18 is aligned with the SEL NO. arrow. Reinstall the retainer pin.

3. Insert the contact end of the terminal down into crimping tool J 34182. Adjust the crimping tool depth by loosening the locking ring until the depth adjusting screw is free and turning the adjusting screw until the wire end of the terminal is just above flush with the top of the crimping hole. The crimp jaws will now contact the middle of the terminal barrel. Tighten the lock ring to retain the adjustment.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

C. Terminal Crimping (refer to Figure E–11, View C) *(cont'd)*

4. Fully insert the wire into the terminal so that the stripped portion of the wire is in the crimp area. A small section (0.5–1.0 mm (0.020–0.040 inch)) of wire will be visible above the terminal barrel.

5. Squeeze the crimping tool handle until it releases. The terminal is now crimped onto the wire.

6. Remove the terminal and wire from the crimping tool.

7. Tug on the terminal to ensure the crimp is tight.

D. Terminal Insertion

1. Slide the wire with crimped terminal attached into the rear of the connector.

2. Push the terminal and wire into the connector until it locks into position (refer to Figure E–11, View A). Check to see that the terminal is at the same height as other terminals. Tug on the wire at the rear of the connector to ensure that the terminal is locked in place.

3. Insert the wedge lock to hold the terminals in place. Slide the sealing plug back into place at the rear of the connector.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

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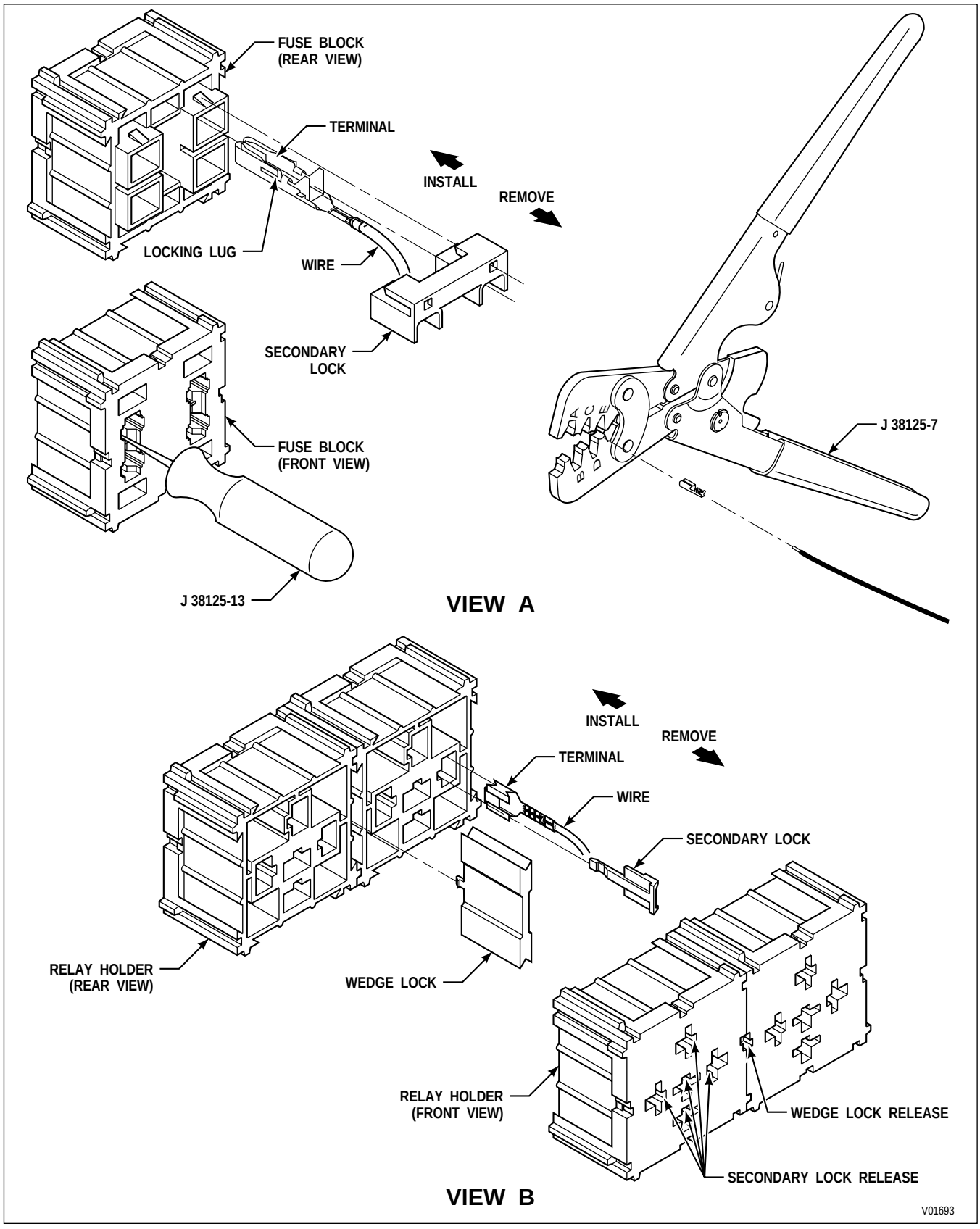

Figure E–13. Dill Connectors (Freightliner 4-Way Fuse and 5-Way Relay VIW)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–12. DILL CONNECTORS (FREIGHTLINER 4-WAY FUSE AND 5-WAY RELAY VIW)

A. Connector/Terminal Repairs

Crimping Tool	J 38125-7

NOTE: ***Crimping anvils recommended are listed after terminal P/Ns. The core crimp anvil is listed first and the insulation crimp anvil is listed second.***

Remover Tool	J 38125-13

Use	Description	P/N
Freightliner 4-Way Fuse Block	Fuse Block	29509584
	Terminal (Socket–12AWG)	29509589
	(Use crimping anvils “C” and “1”)	
	Terminal (Socket–10AWG)	29509588
	(Use crimping anvils “B” and “5”)	
	Secondary Lock	29509587
Freightliner 5-Way Relay Holder	Relay Holder	29509583
	Wedge Block	29509585
	Terminal (Socket–18 to 20 AWG)	29505869
	(Use crimping anvils “2” and “A”)	
	Terminal (Socket–14 to 16 AWG)	29505970
	(Use crimping anvils “C” and “B”)	
	Terminal (Socket–10 to 12 AWG)	29504590
	(Use crimping anvils “F” and “G”)	29509586
	Secondary Lock	

B. Terminal Removal (refer to Figure E–13, Views A and B)

1. Use Remover Tool J 38125-13 to release the secondary lock that is retaining the terminal that is being serviced.

2. Insert Remover Tool J 38125-13 in the notch beside the terminal and push the locking lug on the terminal toward the body of the terminal. Pull on the wire at the rear of the fuse block to remove the terminal.

NOTE: ***If servicing relay holders that are connected with a wedge lock, separate the relay blocks by using Remover Tool J 38125-13 to release the Wedge Lock and push it out the rear of the relay holders.***

3. If replacing the terminal, cut the terminal between the core and insulation crimps to minimize wire loss.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

C. Terminal Crimping

1. Carefully strip insulation 6.5 mm ± 0.5 (0.26 ± 0.02 inch). Unless insulation crimp is overtight, Automatic Wire Stripper J 35615 will remove insulation and crimp from old terminal without damaging wire.

2. Place the core crimp portion of the terminal on the bed of the designated crimping anvil and squeeze crimper enough to hold terminal from dropping (Figure E–13, View C).

3. Position wire core in terminal and squeeze the crimper tool to complete the core crimp. Be sure to orient the terminal so that it is properly aligned with the terminal cavity in the connector.

4. Position insulation crimp of terminal on proper anvil so that the entire insulation crimp area and a portion of the terminal between the core and insulation crimp areas are supported by the anvil. Complete the insulation crimp.

5. Push the wire through the slot in the connector until it clicks into position.

6. Reinstall the secondary lock by pushing it into the rear of the connector until it clicks into position.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

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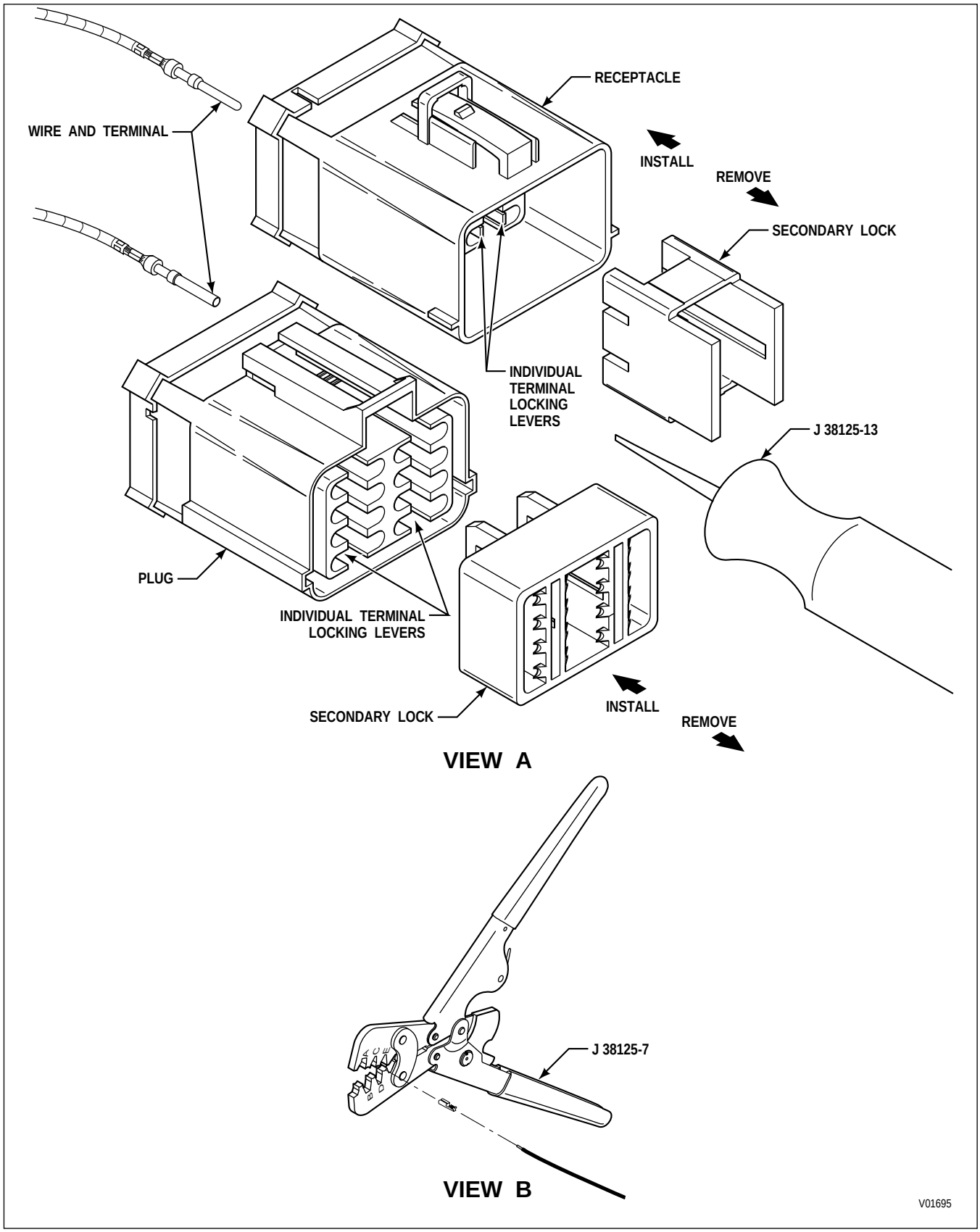


Figure E–14. EPC Connectors (Ford 16-Way Bulkhead)

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–13. EPC CONNECTORS (FORD 16-WAY BULKHEAD)

A. Connector/Terminal Repairs

Crimping Tool	J 38125-7
Anvil “E” (core crimp)	
Anvil “4” (insulation crimp)	
Remover Tool	J 38125-13

Use	Description	P/N
Ford 16-Way Bulkhead A (Gray)	16-Way Plug	29516613
	Terminal (Socket)	29516152
	Secondary Lock	29516151
	16-Way Receptacle	29516614
	Terminal (Socket)	29516155
	Secondary Lock	29516154
Ford 16-Way Bulkhead A (Black)	16-Way Plug	29516150
	Terminal (Socket)	29516152
	Secondary Lock	29516151
	16-Way Receptacle	29516614
	Terminal (Socket)	29516155
	Secondary Lock	29516154

B. Terminal Removal (refer to Figure E–14, View A)

1. Use Remover Tool J 38125-13 or needle nose pliers to remove the secondary lock that is retaining the terminals.

2. Insert Remover Tool J 38125-13 beside the terminal to release the locking lever for the individual terminal being serviced. Pull on the wire at the rear of the connector to remove it while keeping the locking lever disengaged.

3. If replacing the terminal, cut the terminal between the core and insulation crimps to minimize wire loss.

C. Terminal Crimping

1. Carefully strip insulation 6.5 mm ± 0.5 (0.26 ± 0.02 inch). Unless insulation crimp is overtight, Automatic Wire Stripper J 35615 will remove insulation and crimp from old terminal without damaging wire.

2. Place the core crimp portion of the terminal on the bed of the designated crimping anvil and squeeze crimper enough to hold terminal from dropping (Figure E–14, View B).

3. Position wire core in terminal and squeeze the crimper tool to complete the core crimp. Be sure to orient the terminal so that it is properly aligned with the terminal cavity in the connector.

4. Position insulation crimp of terminal on proper anvil so that the entire insulation crimp area and a portion of the terminal between the core and insulation crimp areas are supported by the anvil. Complete the insulation crimp.

5. Push the wire through the slot in the connector until it clicks into position.

6. Reinstall the secondary lock by pushing it into the front of the connector until it clicks into position.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

1–14. REPAIR OF A BROKEN WIRE WITH IN-LINE BUTT SPLICE

A. Connector Check Before Repair

NOTE: Before repairing or replacing wiring harness, sensor, solenoid, switch, or ECU as indicated for a diagnosed problem, follow the procedure below:

1. Disconnect the connector or connectors associated with the problem and inspect for:

   - Bent terminals
   - Broken terminals
   - Dirty terminals
   - Pushed back terminals
   - Missing terminals
   - Condition of mating tabs
   - Condition of mating terminals

   Ensure that terminals are secure in the connector. Clean, straighten, or replace parts as required.

2. Reconnect all previous unmated connectors. Ensure connectors are fully inserted or twisted until they lock in place. Connectors with locking tabs make an audible “click” when the lock is engaged.

3. If trouble recurs after starting the vehicle, follow proper repair procedures for trouble code or complaint.

4. If trouble does not recur, or if the correct repairs and/or replacements have been made, the problem should be corrected.

B. Special Tools

- Heat Gun, J 25070 or equivalent
- Crimping Tool for Pre-insulated Crimp J 38125-8 (refer to Figure E–15)

NOTE: Use crimping anvils “F” and “G.”

- Wire Strippers, J 35615
- Splices P/N 23046604 14–16 AWG
- Splices P/N 23046605 18–22 AWG

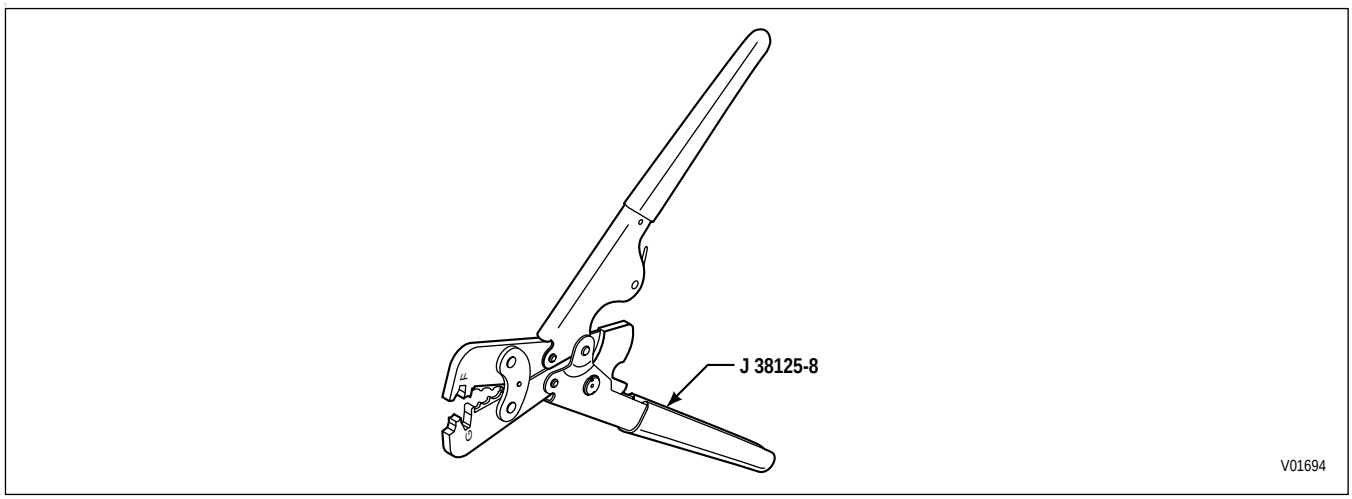


Figure E–15. Crimper J 38125-8

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

NOTE: ***Each splice must be properly crimped and then heated to shrink the covering to protect and insulate the splice. Insulation piercing splice clips should not be used.***

C. Straight Lead Repair Procedure

1. Locate damaged wire.
2. Remove insulation 8.0 mm (0.31 inch).
3. Insert one wire into crimp barrel and crimp.
4. Insert other wire into crimp barrel and crimp.
5. Pull on connection to ensure crimping integrity.
6. Heat splice with heat gun until covering shrinks and adhesive flows from under the covering.
7. The splice is now sealed and insulated. Electrical tape should not be used and is not necessary.

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

LIST OF WORLD TRANSMISSION CONNECTOR PARTS

The following list provides detailed information on nearly all of the commonly-used electrical connectors for the World Transmission family produced by Allison Transmission. The information is organized so that detail parts are listed by harness name or OEM name and then by connector name within the harness. Information on each detail part includes the description, Allison part number, manufacturer, and manufacturer part number.

EXTERNAL HARNESS

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
ECU			
34-Pin “A” Plug	29500915	Thomas & Betts	400134
Terminal (Socket)	29500917	Thomas & Betts	6D871-2-1-T
Locking Bar	29503057	Thomas & Betts	6D729-07
O-ring Seal	29503055	Thomas & Betts	750001
Cavity Plug	29500919	Thomas & Betts	7B282
34-Pin “B” Plug	29500914	Thomas & Betts	400133
Terminal (Socket)	29500917	Thomas & Betts	6D871-2-1-T
Locking Bar	29503057	Thomas & Betts	6D729-07
O-ring Seal	29503055	Thomas & Betts	750001
Cavity Plug	29500919	Thomas & Betts	7B282
RSI			
10-Pin Plug	29500916	Thomas & Betts	6D530-10-40
Terminal (Socket)	29500917	Thomas & Betts	6D871-2-1-T
Locking Bar	29503056	Thomas & Betts	6D729-01
O-ring Seal	29503054	Thomas & Betts	6D656-01
Cavity Plug	29500919	Thomas & Betts	7B282
VIM			
18-Pin Plug	12040920	Packard Electric	
Terminal (Socket)	12103881	Packard Electric	
Seal (2)	12040936	Packard Electric	
Cavity Plug	12034413	Packard Electric	
Strain Relief	12110545	Packard Electric	
Bolt	12129426	Packard Electric	
Bolt Retainer	12034236	Packard Electric	
30-Pin Plug	12034397	Packard Electric	
Terminal (Socket)	12103881	Packard Electric	
Seal (2)	12040879	Packard Electric	
Cavity Plug	12034413	Packard Electric	
Strain Relief	12110546	Packard Electric	
Bolt	12129426	Packard Electric	
Bolt Retainer	12034236	Packard Electric	

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

EXTERNAL HARNESS *(cont'd)*

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
VIW			
16-Pin Plug	23016193	Amp	206037-1
Terminal (Socket)	23015204	Amp	66101-2
Shell	23016490	Amp	206322-1
16-Pin Receptacle	29501001	Amp	206036-3
Terminal (Pin)	23015205	Amp	66099-2
Shell	23016490	Amp	206322-1
MAIN TRANSMISSION (8/15/94 AND LATER)			
31-Pin Plug	29511365	Deutsch ECD	WT06B24-31SN
Terminal (Socket)	29511366	Deutsch ECD	3662-204-1690
Cavity Plug	29511371	Deutsch ECD	0613-1-1601
Backshell Assembly	29514040	Deutsch ECD	WTA10-24-00
Backshell Housing	29514041	Deutsch ECD	WTA10-24-01
Backshell Follower	29514042	Deutsch ECD	WTA10-24-02
Backshell Grommet	29514043	Deutsch ECD	WTA10-24-03
MAIN TRANSMISSION (PRIOR TO 8/15/94)			
24-Pin Plug	12092201	Packard Electric	
Terminal (Socket) BeCu	12110236	Packard Electric	
Seal (2)	12092200	Packard Electric	
Cavity Plug	12034413	Packard Electric	
Strain Relief	12110234	Packard Electric	
Bolt	12129426	Packard Electric	
Bolt Retainer	12034236	Packard Electric	
DDR			
12-Pin Plug	12048105	Packard Electric	
Terminal (Socket)	12034046	Packard Electric	
Secondary Lock	12020219	Packard Electric	
Cover	12048107	Packard Electric	
6-Pin Plug	29512133	Deutsch	HD10-6-12P
Terminal (Pin)	29514170	Deutsch	0460-256-12233
Cavity Plug	23016504	Deutsch	114017
Backshell	29521260	Deutsch	HD18-006
Cover	29521877	Deutsch	HDC16-6
TPS			
3-Pin Plug/Seal	12015793	Packard Electric	
Connector Seal	12010718	Packard Electric	
Terminal (Pin)	12089040	Packard Electric	
Wire Seal	12015284	Packard Electric	

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

EXTERNAL HARNESS *(cont'd)*

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
SPEED SENSORS BRANCH (8/15/94 AND LATER — OPTIONAL)			
16-Pin Plug	29516987	Deutsch ECD	WT06B-20-16SN
Terminal (Socket)	29511366	Deutsch ECD	3662-204-1690
Cavity Plug	29511371	Deutsch ECD	0613-1-1601
Backshell Housing	29520394	Deutsch ECD	WTA10-20-01/19
Backshell Follower	29520395	Deutsch ECD	WTA10-20-02/19
Backshell Grommet	29516993	Deutsch ECD	WTA10-20-03
16-Pin Receptacle	29516988	Deutsch ECD	WT04BB20-16SN
Terminal (Pin)	29511369	Deutsch ECD	3660-201-1690
Cavity Plug	29511371	Deutsch ECD	0613-1-1601
Panel Nut	29516989	Deutsch ECD	0926-207-2087
O-ring Seal	29516994	Deutsch ECD	9013-3-0201
Lockwasher	29519126	Deutsch ECD	0914-212-2086
Backshell Housing	29520394	Deutsch ECD	WTA10-20-01/19
Backshell Follower	29520395	Deutsch ECD	WTA10-20-02/19
Backshell Grommet	29516993	Deutsch ECD	WTA10-20-03
SPEED SENSOR			
2-Pin Plug/Seals	12040753	Packard Electric	
Connector Seal	12040750	Packard Electric	
Terminal (Socket)	12103881	Packard Electric	
Terminal (Socket) BeCu	12110236	Packard Electric	
OUTPUT (NON-RETARDER AND HD RETARDER) AND ENGINE SPEED SENSOR			
Sensor Assembly	29509637		
O-ring	29503383		
Retainer	29503843		
MD OUTPUT SPEED SENSOR (RETARDER)			
Sensor Assembly	29508034		
O-ring	29503383		
Retainer	29503843		
OUTPUT SPEED SENSOR (T-CASE)			
Sensor	29505601		
HD TURBINE SPEED SENSOR			
Sensor Assembly	29512201		
O-ring	29503383		
Retainer	29511508		

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

EXTERNAL HARNESS *(cont'd)*

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
BULKHEAD			
31-Pin Plug	29509617	Deutsch IPD (M/F)	HD36-24-31ST
Terminal (Socket)	23016502	Deutsch IPD	0462-201-16141
Cavity Plug	23016504	Deutsch IPD	114017
31-Pin Receptacle	29509616	Deutsch IPD (F/M)	HD34-24-31PT
Terminal (Pin)	23018768	Deutsch IPD	0460-202-16141
Cavity Plug	23016504	Deutsch IPD	114017
Panel Nut	23016302	Deutsch IPD	112263-90
Lockwasher	23016303	Deutsch IPD	112264
31-Pin Plug	29509617	Deutsch IPD (M/M)	HD36-24-31ST
Terminal (Pin)	23018768	Deutsch IPD	0460-202-16141
Cavity Plug	23016504	Deutsch IPD	114017
31-Pin Receptacle	29509616	Deutsch IPD (F/F)	HD34-24-31PT
Terminal (Socket)	23016502	Deutsch IPD	0462-201-16141
Cavity Plug	23016504	Deutsch IPD	114017
Panel Nut	23016302	Deutsch IPD	112263-90
Lockwasher	23016303	Deutsch IPD	112264
37-Pin Plug Assembly	29502375	ITT Cannon (FMTV)	CA3106E28-21P-B
37-Pin Receptacle Assembly	29502374	ITT Cannon (FMTV)	CA3100E28-21S-B
31-Pin Plug	29511365	Deutsch ECD (M/F)	WT06B24-31SN
Terminal (Socket)	29511366	Deutsch ECD	3662-204-1690
Cavity Plug	29511371	Deutsch ECD	0613-1-1601
Backshell Housing	29520050	Deutsch ECD	WTA10-24-01/22
Backshell Follower	29520049	Deutsch ECD	WTA10-24-02/22
Backshell Grommet	29514043	Deutsch ECD	WTA10-24-03
31-Pin Receptacle	29511368	Deutsch ECD (F/M)	WT04B24-31PN
Terminal (Pin)	29511369	Deutsch ECD	3660-201-1690
Cavity Plug	29511371	Deutsch ECD	0613-1-1601
Panel Nut	29512842	Deutsch ECD	0025-264-542
O-ring Seal	29512839	Deutsch ECD	9013-3-0402
Lockwasher	23016303	Deutsch ECD	0914-212-2486
Backshell Housing	29520050	Deutsch ECD	WTA10-24-01/22
Backshell Follower	29520049	Deutsch ECD	WTA10-24-02/22
Backshell Grommet	29514043	Deutsch ECD	WTA10-24-03
31-Pin Plug	29511855	Deutsch ECD (M/M)	WT06B24-31PN
Terminal (Pin)	29511369	Deutsch ECD	3660-201-1690

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

EXTERNAL HARNESS *(cont'd)*

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
BULKHEAD (cont'd)			
Cavity Plug	29511371	Deutsch ECD	0613-1-1601
Backshell Housing	29520050	Deutsch ECD	WTA10-24-01/22
Backshell Follower	29520049	Deutsch ECD	WTA10-24-02/22
Backshell Grommet	29514043	Deutsch ECD	WTA10-24-03
31-Pin Receptacle	29511854	Deutsch ECD (F/F)	WT04B24-31SN
Terminal (Socket)	29511366	Deutsch ECD	3662-204-1690
Cavity Plug	29511371	Deutsch ECD	0613-1-1601
Panel Nut	29512842	Deutsch ECD	0025-264-542
O-ring Seal	29512839	Deutsch ECD	9013-3-0402
Lockwasher	23016303	Deutsch ECD	0914-212-2486
Backshell Housing	29520050	Deutsch ECD	WTA10-24-01/22
Backshell Follower	29520049	Deutsch ECD	WTA10-24-02/22
Backshell Grommet	29514043	Deutsch ECD	WTA10-24-03
TRANSFER CASE			
6-Pin Plug Assembly	29506418	ITT Cannon	KPSE06E10-6S
Terminal (Socket)		ITT Cannon	031-9174-004
Cavity Plug	29517132	ITT Cannon	225-0070-000
6-Pin Receptacle Assembly		ITT Cannon	KPSE07E10-6P
Terminal (Pin)		ITT Cannon	030-9173-006
Cavity Plug	29517132	ITT Cannon	225-0070-000
RETARDER — "H" SOLENOID ACCUMULATOR			
2-Pin Plug/Seals	12041411	Packard Electric	
Connector Seal	12040750	Packard Electric	
Terminal (Socket)	12103881	Packard Electric	
MD RETARDER BULKHEAD			
8-Pin Plug Assembly	29506427	ITT Cannon	KPSE06E16-8S
Terminal (Socket)	29517130	ITT Cannon	031-9206-006
Cavity Plug	29517133	ITT Cannon	225-0071-000
8-Pin Receptacle Assembly	29505513	ITT Cannon	KPSE07E16-8P
Terminal (Pin)	29517131	ITT Cannon	030-9205-007
Cavity Plug	29517133	ITT Cannon	225-0071-000
RETARDER — "K" SOLENOID			
2-Pin Plug Assembly	29505516	ITT Cannon	KPT06E8-2S
Terminal (Socket)	29511913	ITT Cannon	031-9074-002
2-Pin Receptacle Assembly	29505515	ITT Cannon	KPT07E8-2P

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

EXTERNAL HARNESS *(cont'd)*

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
HD RETARDER TEMPERATURE			
2-Pin Plug/Seal	12015792	Packard Electric	
Connector Seal	12010155	Packard Electric	
Terminal (Pin)	12089040	Packard Electric	
Wire Seal	12015284	Packard Electric	
2-Pin Receptacle	12010973	Packard Electric	
Terminal (Socket)	12089188	Packard Electric	
Wire Seal	12015284	Packard Electric	
HD RETARDER TEMPERATURE SENSOR			
Sensor	29511861	Philips Tech	
MD RETARDER TEMPERATURE SENSOR			
Sensor	29512616	Air Pax	
RETARDER MODULATION SENSOR (RMR)			
3-Pin Plug/Seal	12015795	Packard Electric	
Connector Seal	12010718	Packard Electric	
Terminal (Pin)	12089040	Packard Electric	
Wire Seal	12015284	Packard Electric	
3-Pin Receptacle	12015092	Packard Electric	
Terminal (Socket)	12089188	Packard Electric	
Wire Seal	12015284	Packard Electric	
RMR DEVICES			
3-Pin Receptacle	12015092	Packard Electric	
Terminal (Socket)	12089188	Packard Electric	
Wire Seal	12015284	Packard Electric	
2-Pin Plug/Seal	15300027	Packard Electric	
Connector Seal	15300020	Packard Electric	
Terminal (Socket)	12077411	Packard Electric	
Secondary Lock	15300014	Packard Electric	
Wire Seal	12015323	Packard Electric	
4-Pin Plug/Seal	12015797	Packard Electric	
Connector Seal	12010492	Packard Electric	
Terminal (Socket)	12089188	Packard Electric	
Wire Seal	12015284	Packard Electric	

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

EXTERNAL HARNESS *(cont'd)*

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
RMR DEVICES (cont'd)			
8-Pin Receptacle	29518007	Amp	163007-0
Terminal (Socket)	29518008	Amp	42100-2
3-Pin Plug/Seal	12015795	Packard Electric	
Connector Seal	12010718	Packard Electric	
Terminal (Pin)	12089040	Packard Electric	
Wire Seal	12015284	Packard Electric	
PTO — PRESSURE SWITCH			
2-Pin Plug/Seal	12015378	Packard Electric	
Connector Seal	12010155	Packard Electric	
Terminal (Pin)	12089040	Packard Electric	
2-Pin Receptacle	12034074	Packard Electric	
Terminal (Socket)	12089188	Packard Electric	
PTO — SOLENOID			
2-Pin Plug/Seals	12041411	Packard Electric	
Connector Seal	12040750	Packard Electric	
Terminal (Socket)	12103881	Packard Electric	

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

INTERNAL HARNESS

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
*** SOLENOID A, B, G, (D)**			
2-Pin Plug	12092420	Packard Electric	
Terminal (Socket) “A”	12124639	Packard Electric	
Terminal (Socket) “B”	12015243	Packard Electric	
*** SOLENOID C, (D), E, F, J, N**			
2-Pin Plug	12092420	Packard Electric	
Terminal (Socket)	12124639	Packard Electric	

*** (D) SOLENOID USES TERMINAL 12015243 ON MD 3070PT MODELS ONLY**
ALL OTHER MODELS USE TWO 12124639 TERMINALS FOR (D) SOLENOID

MD TURBINE SPEED SENSOR			
Sensor	29503531	Philips Tech	
2-Pin Plug	12092419	Packard Electric	
Terminal (Socket) Becu	12110236	Packard Electric	
C3 PRESSURE SWITCH			
2-Pin Plug	12092420	Packard Electric	
Terminal (Socket)	12110237	Packard Electric	
2-Pin Receptacle	12110139	Packard Electric	
Terminal (Pin)	12066337	Packard Electric	
OIL LEVEL SENSOR			
4-Pin Plug	12047786	Packard Electric	
Terminal (Pin)	12047581	Packard Electric	
Secondary Lock	12047787	Packard Electric	
4-Pin Receptacle	12047785	Packard Electric	
Terminal (Socket)	12047767	Packard Electric	
Secondary Lock	12047664	Packard Electric	
TEMPERATURE SENSOR			
Sensor	29501002	Air Pax	
MAIN TRANSMISSION CONNECTOR (8/15/94 AND LATER)			
31-Pin Receptacle	29511368	Deutsch ECD (F/M)	WT04B24-31PN
Terminal (Pin)	29511369	Deutsch ECD	3660-201-1690
Cavity Plug	29511371	Deutsch ECD	0613-1-1601
Panel Nut	29512842	Deutsch ECD	0025-264-542
O-ring Seal	29512839	Deutsch ECD	9013-3-0402
Lockwasher	23016303	Deutsch ECD	0914-212-2486

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

INTERNAL HARNESS *(cont'd)*

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
MAIN TRANSMISSION CONNECTOR (8/15/94 AND LATER) (Cont'd)			
Backshell Assembly	29514040	Deutsch ECD	WTA10-24-00
Backshell Housing	29514041	Deutsch ECD	WTA10-24-01
Backshell Follower	29514042	Deutsch ECD	WTA10-24-02
Backshell Grommet	29514043	Deutsch ECD	WTA10-24-03
MAIN TRANSMISSION STANDOFF (8/15/94 AND LATER)			
Standoff, MD/B 300/400	29516327		
Standoff, HD/B 500	29516328		
Grommet Assembly	29513212		
Cavity Plug	29511371		
O-ring Seal	12092195	Packard Electric	
Feedthrough Seal	29520396	Deutsch ECD	0810-205-0001
Backshell Assembly	29514040	Deutsch ECD	WTA10-24-00
Backshell Housing	29514041	Deutsch ECD	WTA10-24-01
Backshell Follower	29514042	Deutsch ECD	WTA10-24-02
Backshell Grommet	29514043	Deutsch ECD	WTA10-24-03
MD MAIN INTERNAL CONNECTOR (PRIOR TO 8/15/94)			
24-Pin Plug	12092197	Packard Electric	
Terminal (Socket) BeCu	12110236	Packard Electric	
Standoff	12092199	Packard Electric	
Bolt	12092458	Packard Electric	
Internal 12-Way Seal	29514675	Packard Electric	
HD MAIN INTERNAL CONNECTOR (PRIOR TO 8/15/94)			
24-Pin Plug	12092197	Packard Electric	
Terminal (Socket) BeCu	12110236	Packard Electric	
Standoff	12092199	Packard Electric	
Spacer	12129710	Packard Electric	
Bolt	12129717	Packard Electric	
Internal 12-Way Seal	29514675	Deutsch	WTA01-03
FEEDTHROUGH CONNECTOR (PRIOR TO 8/15/94)			
24-Pin Plug Assembly	12129810	Packard Electric	
O-ring Seal	12092195	Packard Electric	
"Green" Seal	29514674	Deutsch	WTA01-02
"Orange" Seal	12092194	Packard Electric	

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

R.V.I.

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
VIM			
21-Pin Plug	29516188	Deutsch IPD	HDP26-24-21SN
Terminal (Socket)	29511366	Deutsch	3662-204-1690
Cavity Plug	23016504	Deutsch	114017
21-Pin Receptacle	29516187	Deutsch IPD	HDP24-24-21PN
Terminal (Pin)	29511369	Deutsch	3660-201-1690
Cavity Plug	23016504	Deutsch	114017
BULKHEAD			
31-Pin Plug	29516184	Deutsch IPD	HDP26-24-31ST
Terminal (Socket)	29511366	Deutsch	3662-204-1690
Cavity Plug	23016504	Deutsch	114017
31-Pin Receptacle	29516183	Deutsch IPD	HDP24-24-31PT
Terminal (Pin)	29511369	Deutsch	3660-201-1690
Cavity Plug	23016504	Deutsch	114017
VIW			
13-Pin Receptacle	29521873	Amp	142176-2
Terminal (Socket)	29521874	Amp	142183-1

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

NEW FLYER

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
OTHER CONNECTORS			
4-Pin Plug/Seal	12015798	Packard Electric	
Connector Seal	12020220	Packard Electric	
Terminal (Socket)	12089188	Packard Electric	
Cavity Plug	12010300	Packard Electric	
Wire Seal	12015284	Packard Electric	
24-Pin Plug	29520051	Amp	206837-1
Terminal (Socket)	23015204	Amp	66100-7
Shell	29502021	Amp	206138-1

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

IVECO

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
19-Pin Plug “A”	29516947	Amp	281923-6
Terminal (Socket)	29516944	Amp	281938-1
Wire Seal	29516945	Amp	281934-2
19-Pin Receptacle “A”	29516949	Amp	281921-6
Terminal (Pin)	29516943	Amp	281937-1
19-Pin Plug “B”	29516948	Amp	281923-3
Terminal (Socket)	29516944	Amp	281938-1
Wire Seal	29516945	Amp	281934-2
Cavity Plug	29516946	Amp	282081-1
19-Pin Receptacle “B”	29516950	Amp	281921-3
Terminal (Pin)	29516943	Amp	281937-1

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

SCANIA

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
OTHER CONNECTORS			
9-Pin Plug	29520275	Amp	206708-1
Terminal (Socket)	23015204	Amp	66101-2
Backshell	29520277	Amp	207008
9-Pin Receptacle	29520276	Amp	206705-2
Terminal (Pin)	23015205	Amp	66099-2
Backshell	29520277	Amp	207008

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

GILLIG

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
OTHER CONNECTORS			
6-Pin Plug	12015799	Packard Electric	
Connector Seal	12010227	Packard Electric	
Terminal (Socket)	12089188	Packard Electric	
Wire Seal	12015323	Packard Electric	
Cavity Plug	12010300	Packard Electric	
6-Pin Receptacle	12010975	Packard Electric	
Terminal (Pin)	12089040	Packard Electric	
Wire Seal	12015323	Packard Electric	
Cavity Plug	12010300	Packard Electric	

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

FREIGHTLINER

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
VEHICLE INTERFACE			
8-Pin Plug	12066195	Packard Electric	
Terminal (Pin)	12034047	Packard Electric	
Secondary Lock	12065141	Packard Electric	
8-Pin Receptacle	12064998	Packard Electric	
Terminal (Socket)	12034046	Packard Electric	
Secondary Lock	12064999	Packard Electric	
OTHER CONNECTORS			
1-Pin Receptacle	12015987	Packard Electric	
Terminal (Pin)	12020119	Packard Electric	
6-Pin Plug	12015344	Packard Electric	
Terminal (Socket)	12034046	Packard Electric	
Terminal (Socket)	12066214	Packard Electric	
6-Pin Receptacle	12015345	Packard Electric	
Terminal (Pin)	12034047	Packard Electric	
Fuse Block	29509584	Dill	59105
Terminal (Socket)	29509589	Dill	23432
Terminal (Socket)	29509588	Dill	23434
Secondary Lock	29509587	Dill	59099
Relay Holder	29509583	Dill	59022
Wedge Block	29509585	Dill	59011
Terminal (Socket)	12015869	Packard Electric	
Terminal (Socket)	12015870	Packard Electric	
Terminal (Socket)	12084590	Packard Electric	
Secondary Lock	29509586	Dill	59056

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

FORD F-SERIES (FUSE-ALL)

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
GROMMET			
Pass-Through Grommet	29516010		
BULKHEAD (GRAY)			
16-Pin Plug	29516613	EPC	F2AB-14A464-RA
Terminal (Socket)	29516152	Cardell	E7EB-14487-AA
Connector Spacer	29516151	EPC	F2AB-14A468-CA
16-Pin Receptacle	29516614	EPC	F2AB-14A624-EA
Terminal (Pin)	29516155	Cardell	E7EB-14461-BA
Receptacle Spacer	29516154	EPC	F2AB-14A468-BA
BULKHEAD (BLACK)			
16-Pin Plug	29516150	EPC	F2AB-14A464-RA
Terminal (Socket)	29516152	Cardell	E7EB-14487-AA
Connector Spacer	29516151	EPC	F2AB-14A468-CA
16-Pin Receptacle	29516153	EPC	F2AB-14A624-EA
Terminal (Pin)	29516155	Cardell	E7EB-14461-BA
Receptacle Spacer	29516154	EPC	F2AB-14A468-BA
FUSE			
2-Pin Plug/Seals	12033769	Packard Electric	
Connector Seal	12077383	Packard Electric	
Wire Seal	12040972	Packard Electric	
Terminal (Socket)	12033997	Packard Electric	(12 Gauge Wire)
Terminal (Socket)	12020156	Packard Electric	(18 Gauge Wire)
Fuse (10 Amp)	12004007	Packard Electric	
Cover	12033731	Packard Electric	
TPS			
3-Pin Plug/Seal	12015793	Packard Electric	
Connector Seal	12010718	Packard Electric	
Terminal (Socket)	12089188	Packard Electric	
Wire Seal	12015284	Packard Electric	

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

NAVISTAR

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
BULKHEAD			
31-Pin Plug	29509617	Deutsch IPD	HD36-24-31ST
Terminal (Socket)	23016502	Deutsch	0462-201-16141
31-Pin Receptacle	29509616	Deutsch IPD	HD34-24-31PT
Terminal (Pin)	23018768	Deutsch	0460-202-16141
NEUTRAL START (NON-RETARDER)			
1-Pin Plug	12010996	Packard Electric	
Terminal (Pin)	12089040	Packard Electric	
Wire Seal	12015323	Packard Electric	
1-Pin Plug/Seal	12015791	Packard Electric	
Connector Seal	12010149	Packard Electric	
Terminal (Socket)	12089188	Packard Electric	
REVERSE WARNING (NON-RETARDER)			
2-Pin Plug/Seal	12015792	Packard Electric	
Connector Seal	12010155	Packard Electric	
Terminal (Socket)	12089188	Packard Electric	
Wire Seal	12015284	Packard Electric	
NEUTRAL START AND REVERSE WARNING (RETARDER)			
5-Pin Plug/Seal	12084891	Packard Electric	
Connector Seal	15300023	Packard Electric	
Terminal (Socket)	12077411	Packard Electric	
Secondary Lock	15300017	Packard Electric	
Wire Seal	12015323	Packard Electric	
OTHER CONNECTORS			
2-Pin Receptacle	15300002	Packard Electric	
Terminal (Pin)	12040559	Packard Electric	
Secondary Lock	15300014	Packard Electric	
Wire Seal	12015360	Packard Electric	
1-Pin Plug	12065171	Packard Electric	
Terminal (Pin)	12040559	Packard Electric	
Lock	12065249	Packard Electric	
1-Pin Receptacle	12065172	Packard Electric	
Cavity Plug	12010300	Packard Electric	
Lock	12065249	Packard Electric	

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

NAVISTAR *(cont'd)*

DESCRIPTION	ATD P/N	MANUFACTURER	MFR P/N
OTHER CONNECTORS (cont'd)			
12-Pin Plug (Black)	29511373	Deutsch	DT0612SB
Terminal (Socket)	23016502	Deutsch	0462-201-16141
Wedge Lock	29511400	Deutsch	W12S
Cavity Plug	23016504	Deutsch	114017
12-Pin Receptacle (Black)	29511755	Deutsch	DT0412PB
Terminal (Pin)	23018768	Deutsch	0460-202-16141
Wedge Lock	29511401	Deutsch	W12P
Cavity Plug	23016504	Deutsch	114017
12-Pin Plug (Gray)	29511372	Deutsch	DT0612SA
Terminal (Socket)	23016502	Deutsch	0462-201-16141
Wedge Lock	29511400	Deutsch	W12S
Cavity Plug	23016504	Deutsch	114017
12-Pin Receptacle (Gray)	29511754	Deutsch	DT0412PA
Wedge Lock	29511401	Deutsch	W12P
Cavity Plug	23016504	Deutsch	114017
6-Pin Plug	29511752	Deutsch	DT066SA
Terminal (Pin)	23018768	Deutsch	0460-202-16141
6-Pin Receptacle	29511753	Deutsch	DT046PA
Terminal (Socket)	23016502	Deutsch	0462-201-16141

APPENDIX E — CONNECTOR PART NUMBERS, TERMINAL PART NUMBERS, TOOL PART NUMBERS, AND REPAIR INSTRUCTIONS

NOTES

APPENDIX F — THROTTLE POSITION SENSOR ADJUSTMENT

A. Description of Operation *(Figure F–1)*

1. To properly communicate throttle position to the Electronic Control Unit (ECU), the throttle position sensor must convert its mechanical movement to an electrical form the ECU can understand. To accomplish this, contacts move across a resistive strip inside the sensor which translates position into voltage.

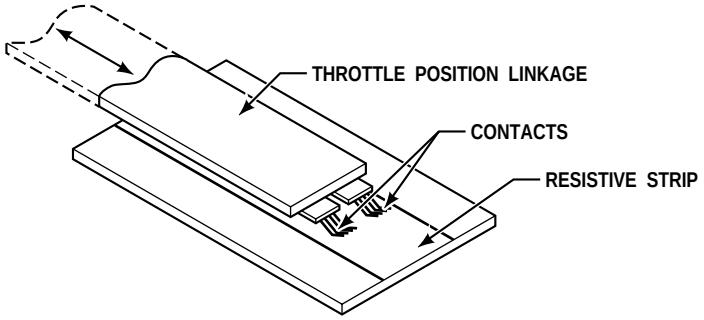


Figure F–1. Throttle Position to Voltage Conversion

2. Each position gives a different voltage. The ECU then converts the voltage to counts. Each count corresponds to approximately .179 mm (.007 inch) of throttle sensor movement. Figure F–2 diagrams the counts and throttle movement relationship.

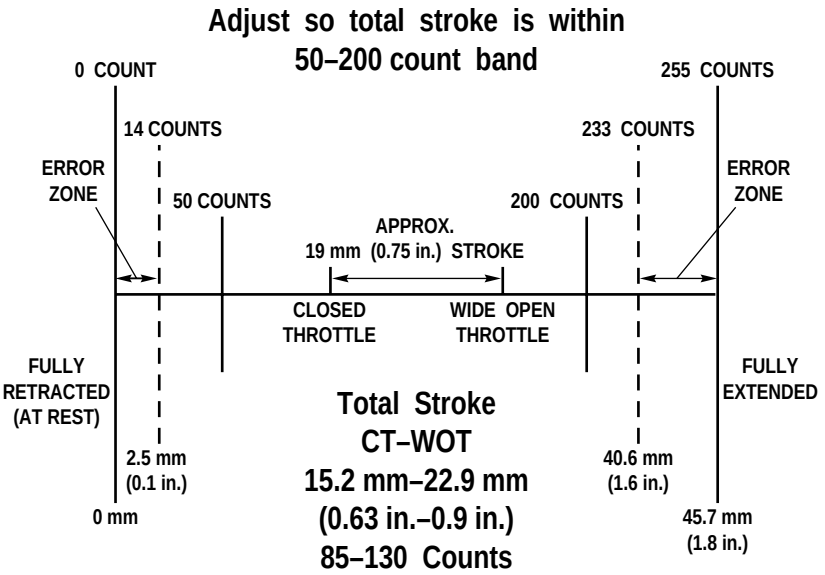


Figure F–2. Throttle Position Determination Diagram

APPENDIX F — THROTTLE POSITION SENSOR ADJUSTMENT

A. Description of Operation *(cont'd)*

3. Throttle percentage is proportional to counts; low counts correspond to low percent and high counts correspond to high percent (Table F–1, Page F–4).

4. The conversion from counts to percent throttle is performed easily once the idle and full throttle positions are set (see adjustment procedures below). The idle and full throttle positions correspond to counts which can be viewed with a diagnostic tool. The ECU determines percent throttle by the equation:

$$\% \text{ Throttle} = \frac{\text{Current Count — Idle Count}}{\text{Full Throttle Count — Idle Count}} \times 100$$

Where:

Idle Count = Count on diagnostic tool when engine is idling.

Current Count = Count on diagnostic tool at the present throttle position.

Full Throttle Count = Count on diagnostic tool at wide open throttle.

NOTE: Refer to Appendix N for DDR information.

5. The throttle position sensor is self-calibrating within its normal operating range. Each time the vehicle is started and the ECU is initialized, the idle counts that are used for closed throttle are increased by 15 counts from its previous lowest reading. Also, the wide open throttle counts are reduced by 15 counts from its previous highest reading. Once new counts are read from the current sensor position, the idle and wide open throttle count set points are continually readjusted to the lowest and highest counts, respectively. This compensates for fuel control system wear or previous mechanical adjustment. One area of particular concern is when the throttle sensor extends into the error zone. This indicates a TPS misadjustment to the ECU and 100 percent throttle is assumed until readjustment is performed. Simply clearing the Code 21 XX will not resolve the 100 percent (WOT) shifting situation.

NOTE: After replacing or adjusting the throttle position sensor linkage, the technician should use the diagnostic tool to clear the throttle calibration. Go to the DDR selection menu and locate ACTION REQUESTS. Select RESET THROTTLE CALIBRATION and ENTER to set the 0 percent throttle counts. After the idle counts are established, the throttle should be moved to the Full position to establish the full or Wide Open Throttle (WOT) position (100 percent). The full throttle counts will be the same as the idle counts until the throttle is moved. The full throttle counts are set when maximum travel is reached so stopping before actual full throttle will set the 100 percent point artificially low. Refer to Figure F–2 for proper counts and percentage. Refer to Figure F–3 for illustration of throttle position adjustment.

APPENDIX F — THROTTLE POSITION SENSOR ADJUSTMENT

B. Throttle Position Sensor (TPS) Adjustment

When properly installed by the equipment manufacturer, the TPS should not require adjustment. Confirm that the throttle sensor is installed to manufacturer specifications before adjusting the throttle position sensor. The idle count should be 50 or higher and full throttle count 200 or lower. The TPS is self-calibrating meaning there is no optimum closed throttle or wide open throttle count value. As long as the counts are within the 50 to 200 range, the TPS is set properly. Total stroke of 85–130 counts must be maintained. Watch the movement of the throttle sensor as the controls move it through its full stroke. Be sure there is no misalignment or obstruction to smooth movement through the full stroke. Make certain the idle and full throttle positions are not in the error zones (refer to Figure F–2). The error zones occur when the idle position is less than 14 counts, or when the full throttle position is more than 233 counts. When idle or wide open throttle positions are in the error zones, Codes 21 12 and 21 23 occur, respectively. These codes cause the transmission to shift as if the throttle is fully depressed (100 percent throttle) affecting shift quality and causing decreased fuel efficiency. Code 21 XX may be caused by a short or open circuit in the chassis harness or by incorrect voltages. If this occurs, refer to Code 21 XX chart.

NOTE: Use Test Harness J 41339 for measuring voltages.

APPENDIX F — THROTTLE POSITION SENSOR ADJUSTMENT

Table F–1. Volts Versus Count for Throttle Sensor Display Reading

Counts	Volts	Counts	Volts	Counts	Volts	Counts	Volts	Counts	Volts	Counts	Volts
0	0	41		81		121		161		201	
1	0.0196	42		82		122		162		202	
2		43		83		123		163		203	
3		44		84		124		164		204	
4		45	0.882	85	1.666	125	2.451	165	3.235	205	4.019
5	0.098	46		86		126		166		206	
6		47		87		127		167		207	
7		48		88		128		168		208	
8		49		89		129		169		209	
9		50	0.98	90	1.764	130	2.549	170	3.333	210	4.117
10	0.196	51		91		131		171		211	
11		52		92		132		172		212	
12		53		93		133		173		213	
13		54		94		134		174		214	
14		55	1.078	95	1.863	135	2.647	175	3.431	215	4.215
15	0.276	56		96		136		176		216	
16		57		97		137		177		217	
17		58		98		138		178		218	
18		59		99		139		179		219	
19		60	1.176	100	1.96	140	2.745	180	3.529	220	4.313
20	0.392	61		101		141		181		221	
21		62		102		142		182		222	
22		63		103		143		183		223	
23		64		104		144		184		224	
24		65	1.274	105	2.058	145	2.843	185	3.627	225	4.411
25	0.49	66		106		146		186		226	
26		67		107		147		187		227	
27		68		108		148		188		228	
28		69		109		149		189		229	
29		70	1.372	110	2.156	150	2.941	190	3.725	230	4.509
30	0.588	71		111		151		191		231	
31		72		112		152		192		232	
32		73		113		153		193		233	
33		74		114		154		194		234	
34		75	1.47	115	2.225	155	3.039	195	3.823	235	4.607
35	0.686	76		116		156		196		236	
36		77		117		157		197		237	
37		78		118		158		198		238	
38		79		119		159		199		239	
39		80	1.568	120	2.353	160	3.137	200	3.921	240	4.705
40	0.784										

APPENDIX F — THROTTLE POSITION SENSOR ADJUSTMENT

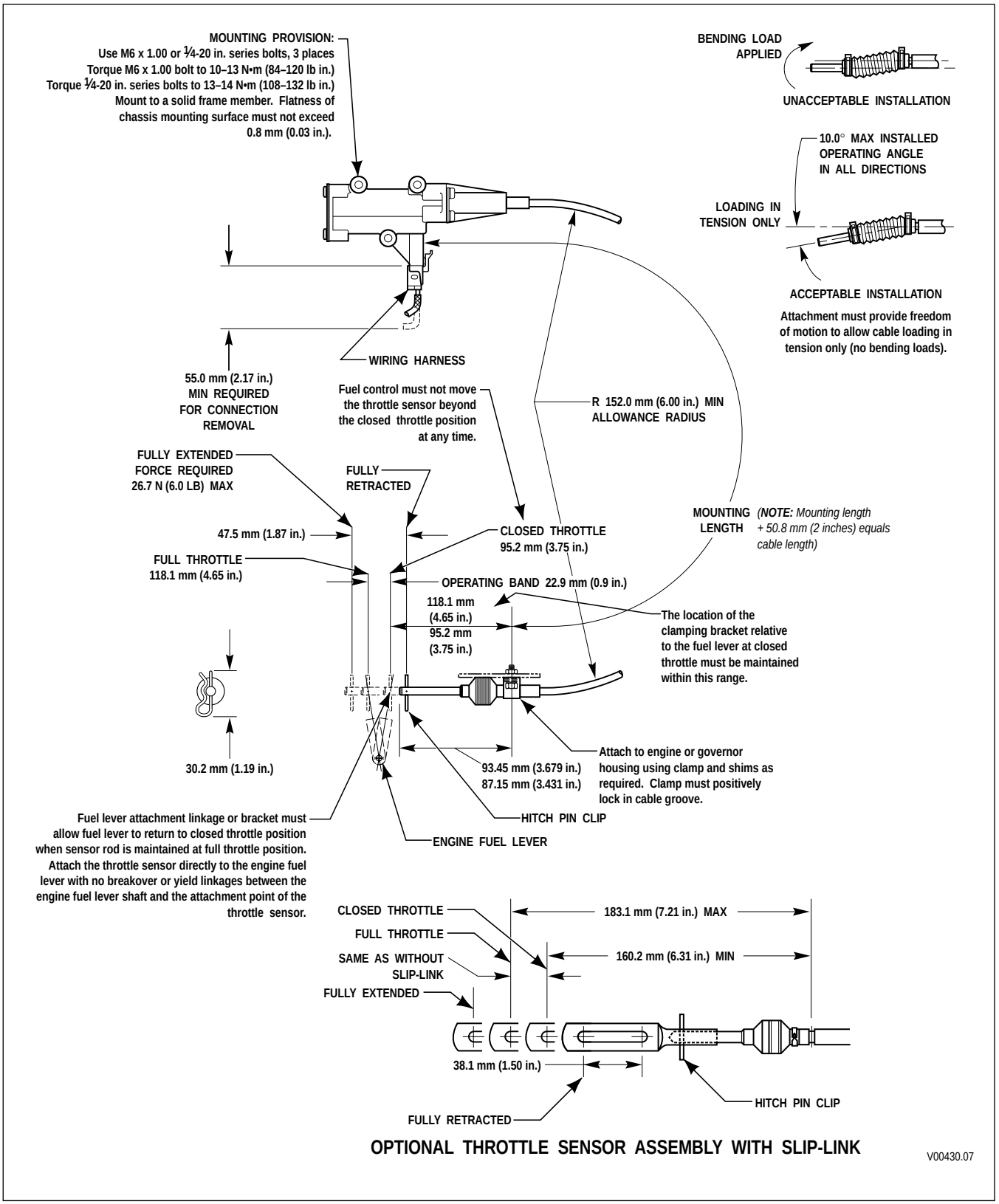


Figure F–3. Throttle Position Sensor Adjustment

APPENDIX F — THROTTLE POSITION SENSOR ADJUSTMENT

NOTES

APPENDIX G — MISCELLANEOUS ITEMS

1–1. WELDING ON VEHICLE

When frame or other welding is required on the vehicle, take the following precautions to protect the electronic control components:

1. Disconnect the wiring harness connectors at the transmission electronic control unit.
2. Disconnect the positive and negative battery connections, and any electronic control ground wires connected to the frame or chassis.
3. Cover electronic control components and wiring to protect them from hot sparks, etc.
4. Do not connect welding cables to electronic control components.

WARNING!	**Do not jump start a vehicle with arc welding equipment. Arc welding equipment's dangerously high currents and voltages cannot be reduced to safe levels.**

1–2. VEHICLE INTERFACE MODULE

The Allison Vehicle Interface Module (VIM) containing all Allison system relays and fuses must be used as the interface to all vehicle wiring. Refer to Figure G–2 for VIM component location and pin-out. To close an open VIM, tighten the bolts in the numerical order shown in Figure G–1 to provide a sealed, water-tight box. Torque to the bolts to 5–8 N·m (4–6 lb ft).

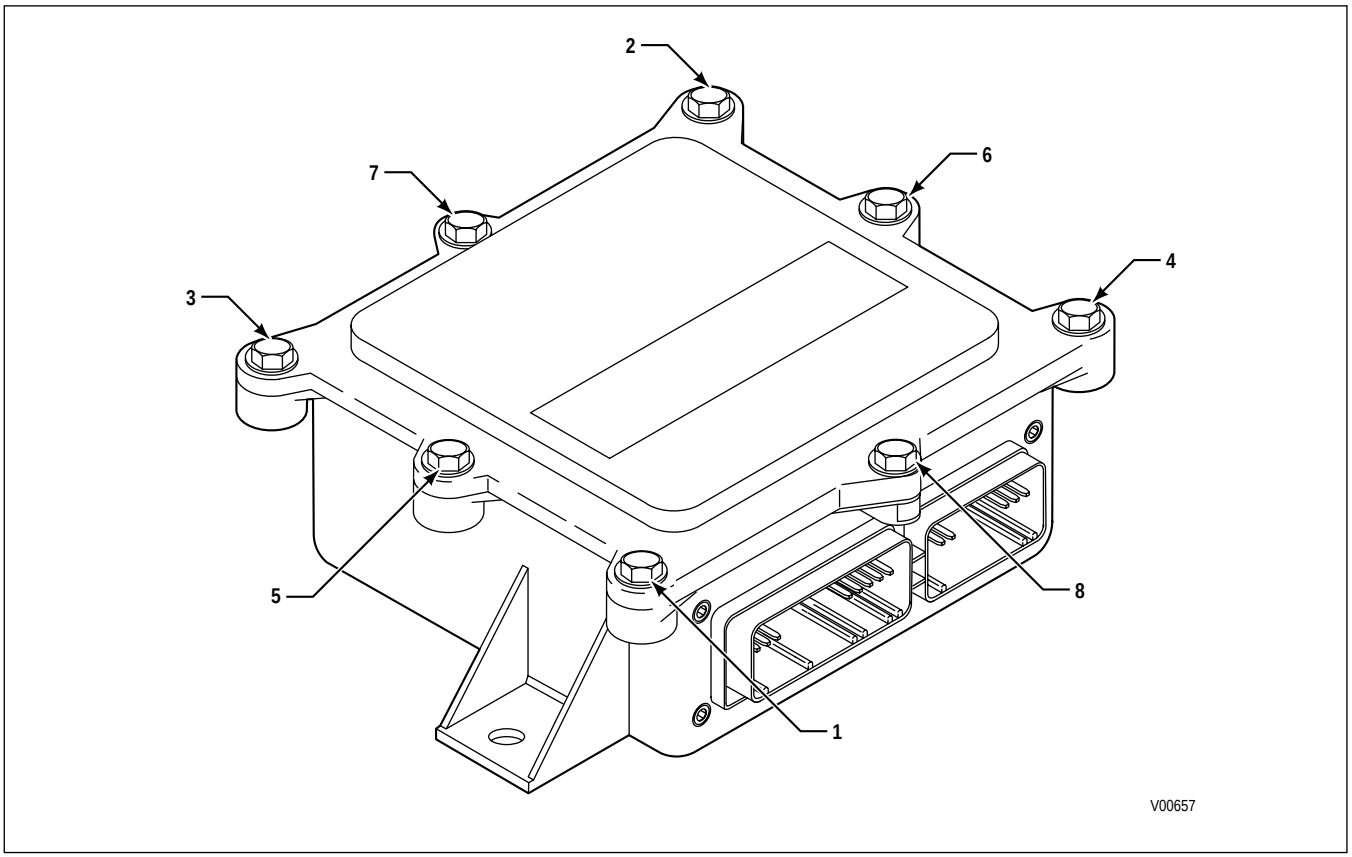


Figure G–1. Vehicle Interface Module (VIM)

APPENDIX G — MISCELLANEOUS ITEMS

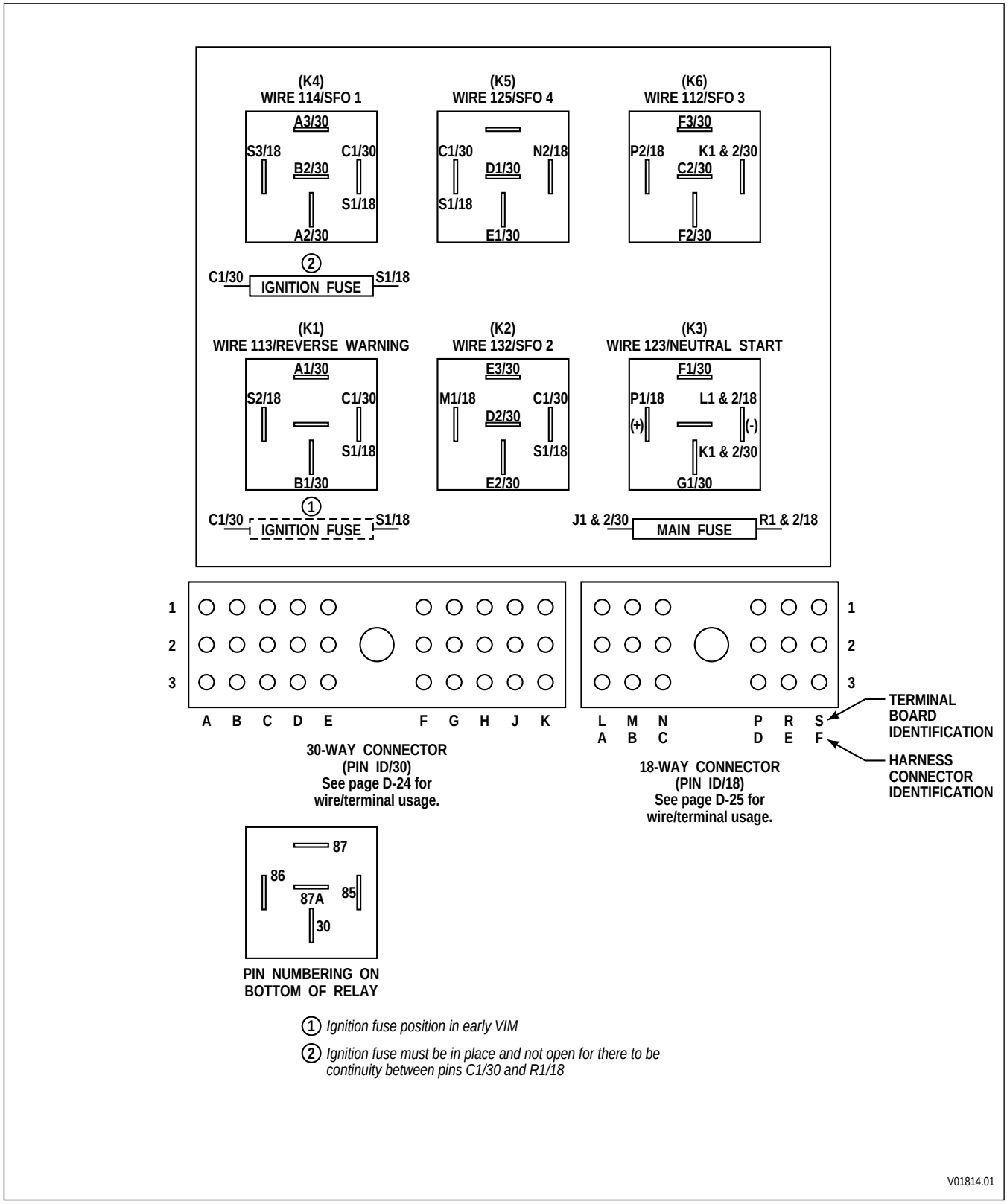


Figure G–2. VIM Components Location and Pin-Out Diagram

APPENDIX H — HYDRAULIC SCHEMATICS

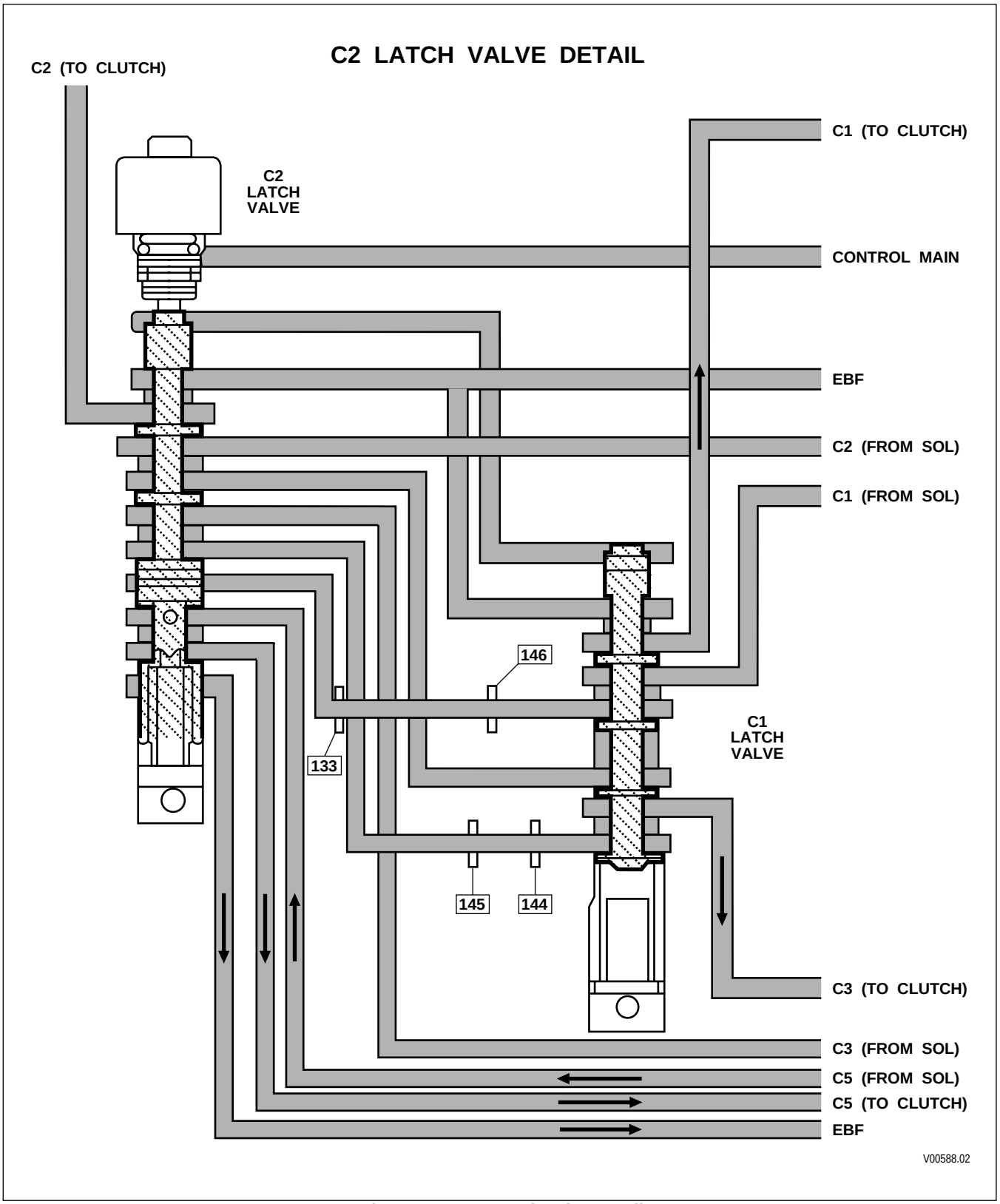


Figure H–1. C2 Latch Valve Detail

APPENDIX H — HYDRAULIC SCHEMATICS

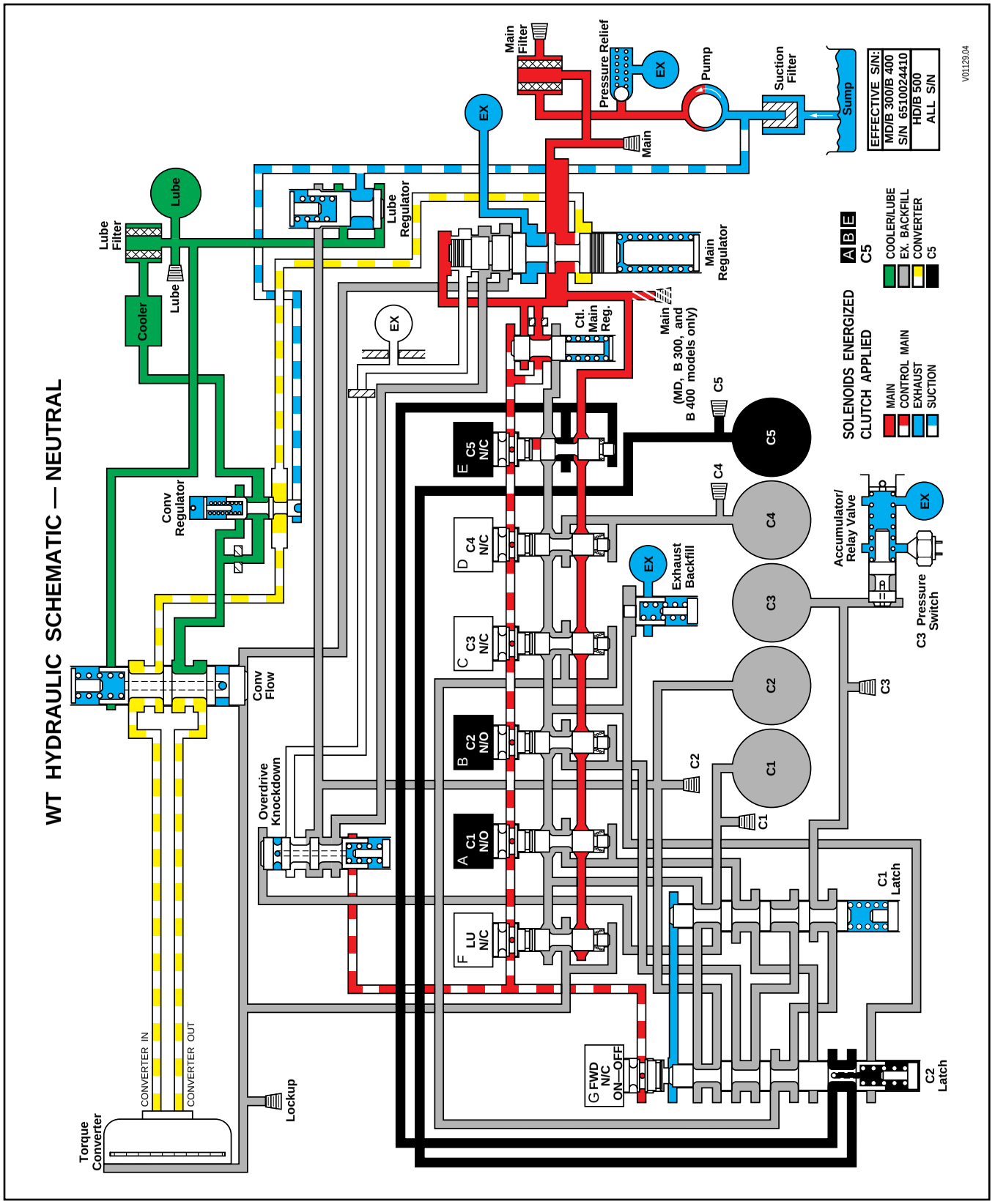


Figure H–2. WT Hydraulic Schematic — Neutral

APPENDIX H — HYDRAULIC SCHEMATICS

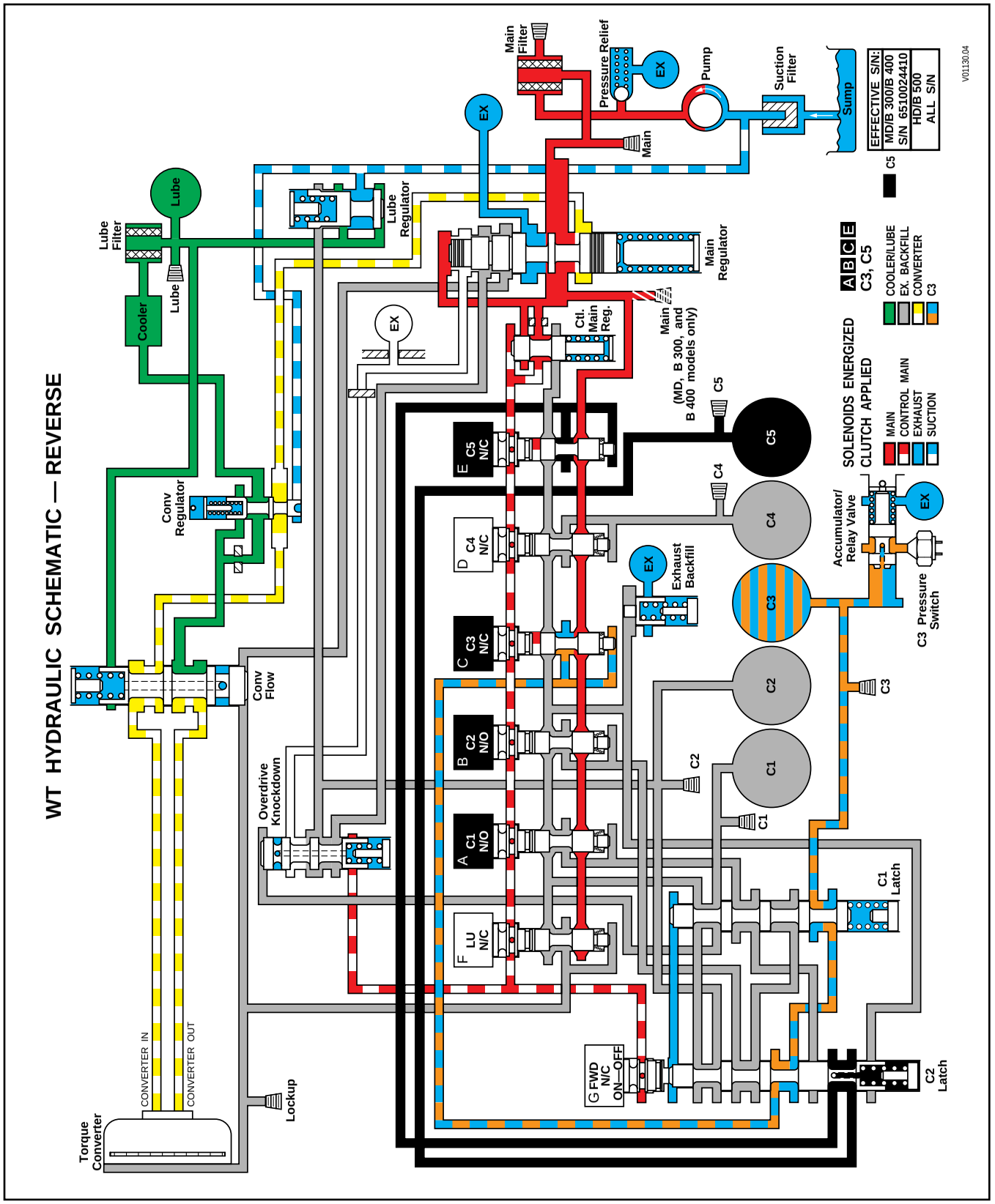


Figure H–3. WT Hydraulic Schematic — Reverse

APPENDIX H — HYDRAULIC SCHEMATICS

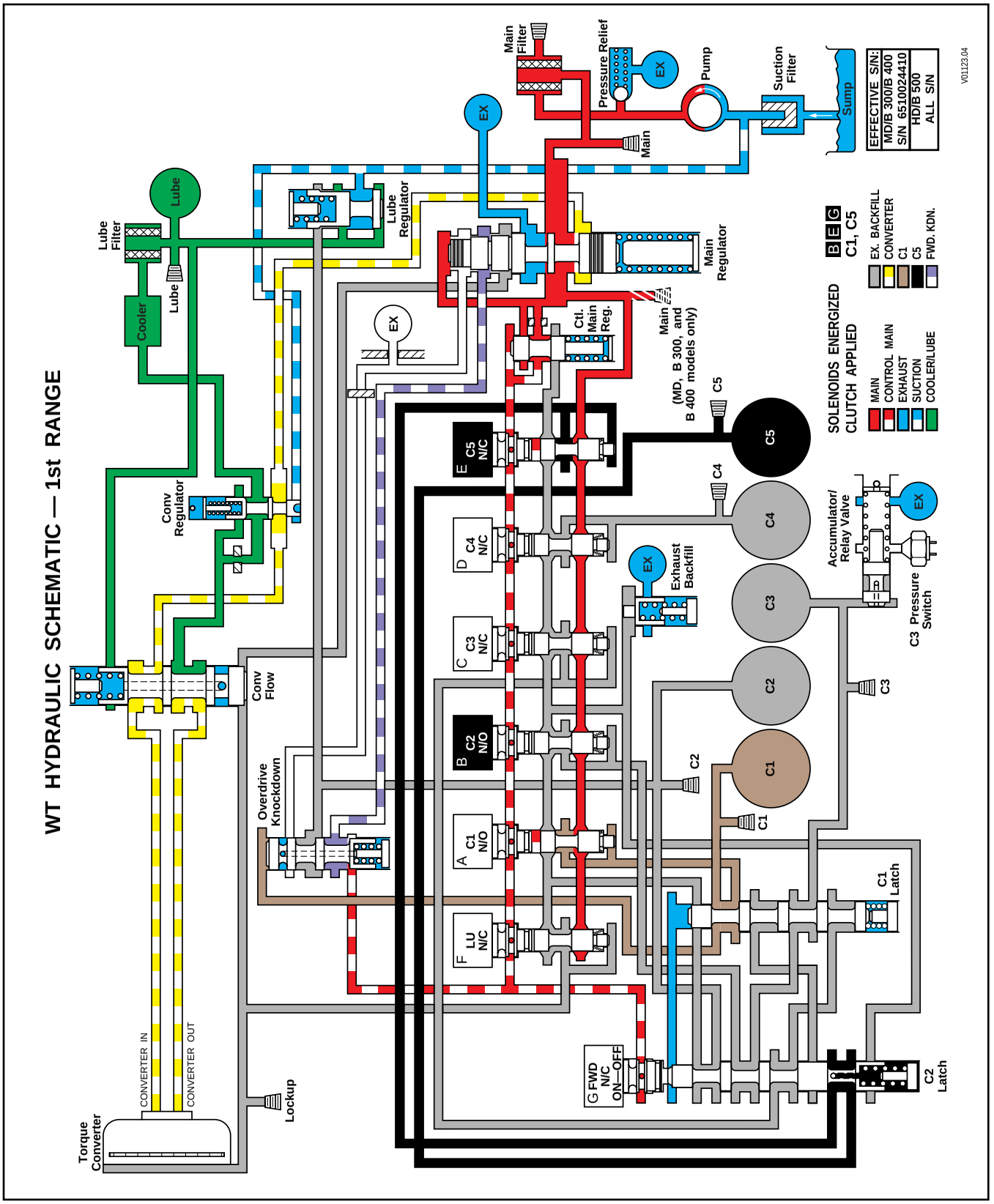


Figure H–4. WT Hydraulic Schematic —1st Range

APPENDIX H — HYDRAULIC SCHEMATICS

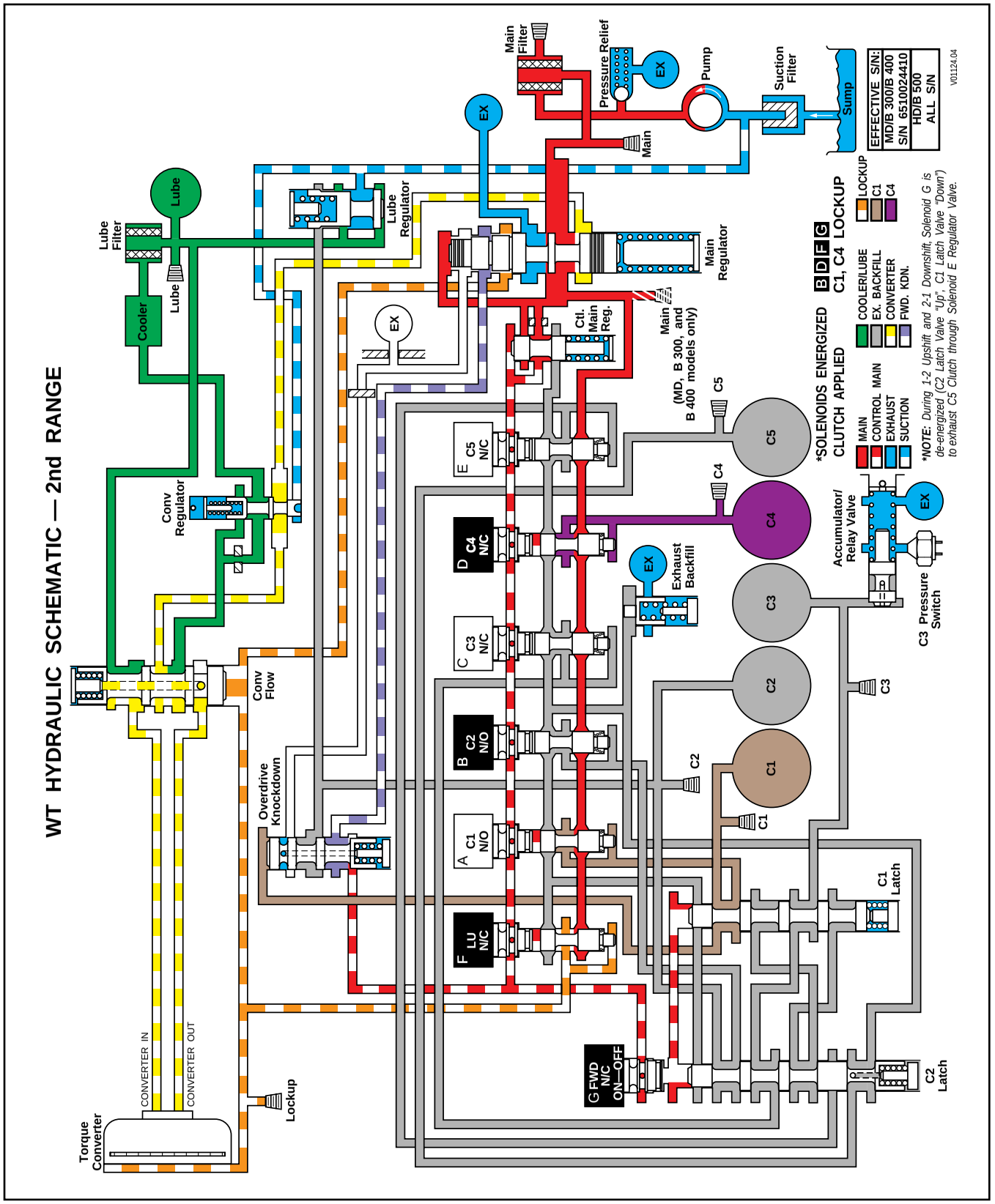


Figure H–5. WT Hydraulic Schematic — 2nd Range

APPENDIX H — HYDRAULIC SCHEMATICS

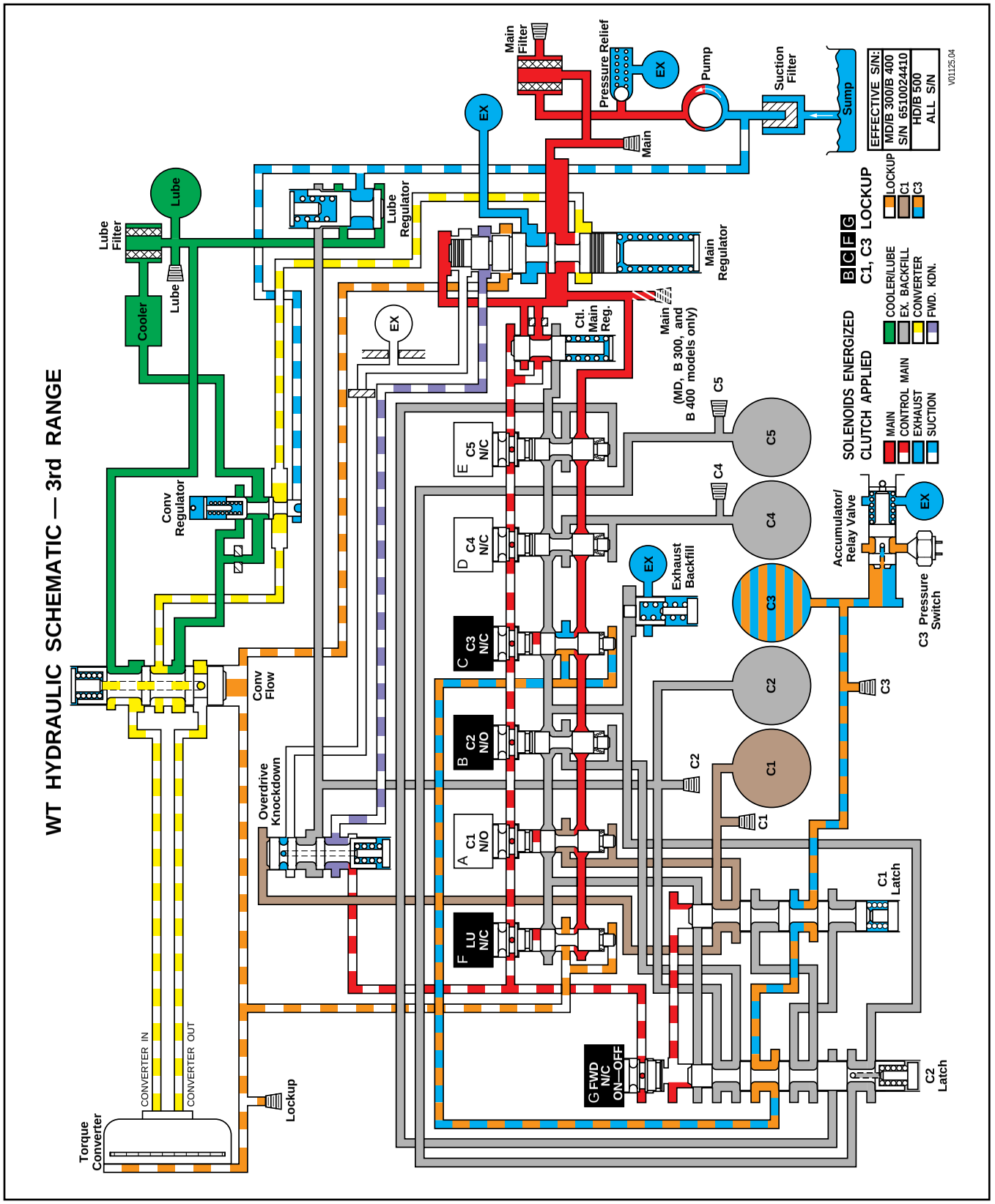


Figure H–6. WT Hydraulic Schematic — 3rd Range

APPENDIX H — HYDRAULIC SCHEMATICS

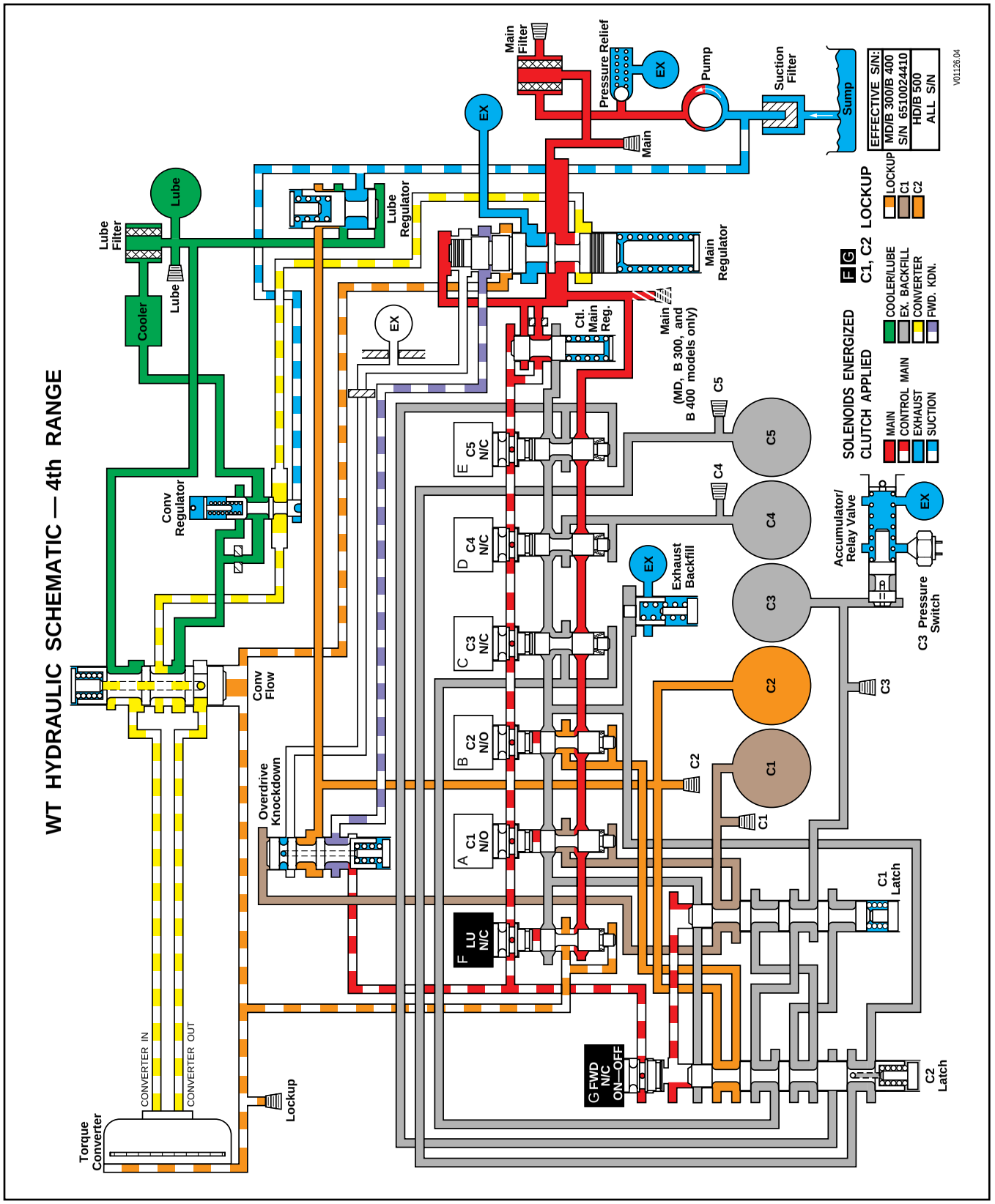


Figure H–7. WT Hydraulic Schematic — 4th Range

APPENDIX H — HYDRAULIC SCHEMATICS

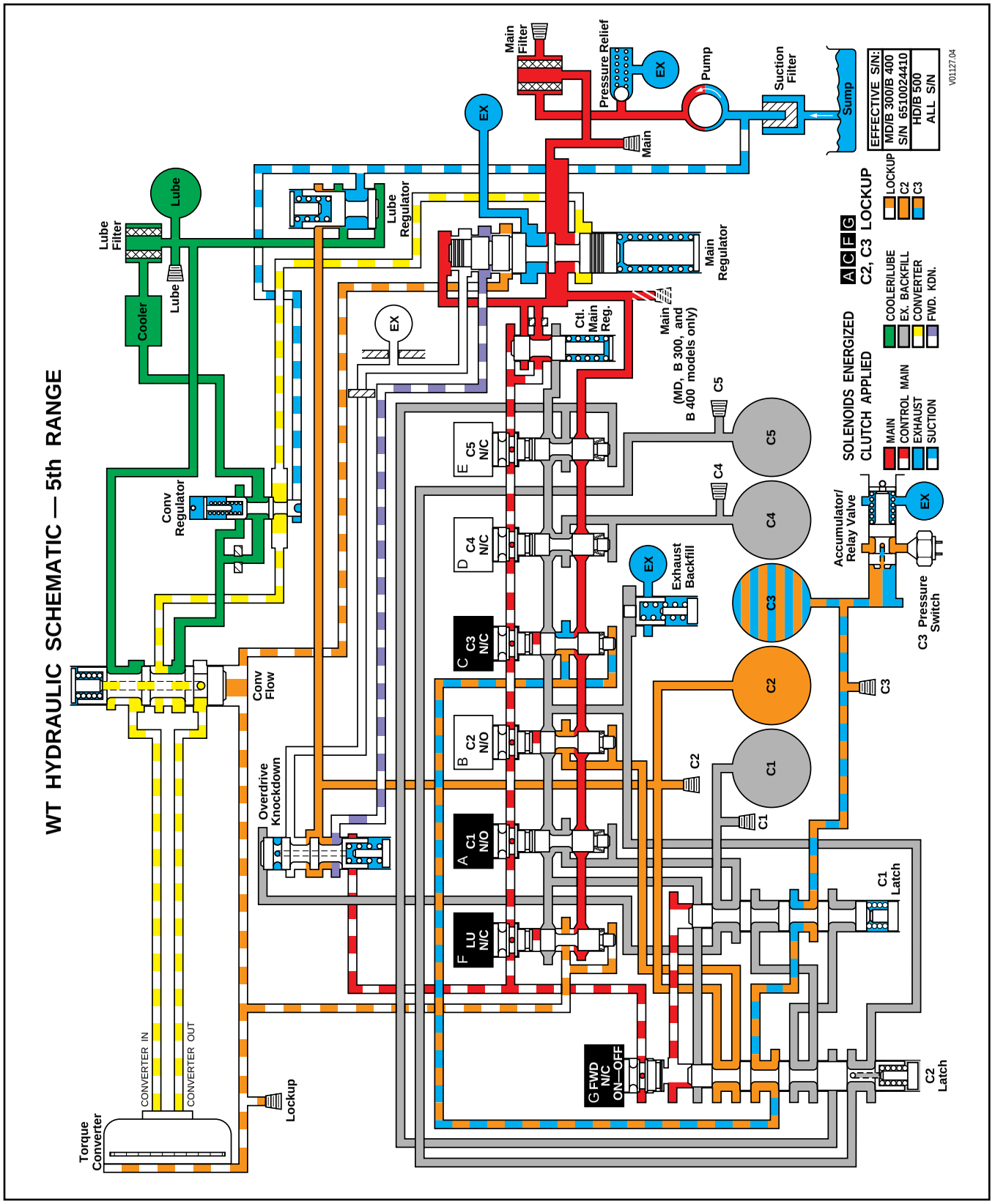


Figure H–8. WT Hydraulic Schematic — 5th Range

APPENDIX H — HYDRAULIC SCHEMATICS

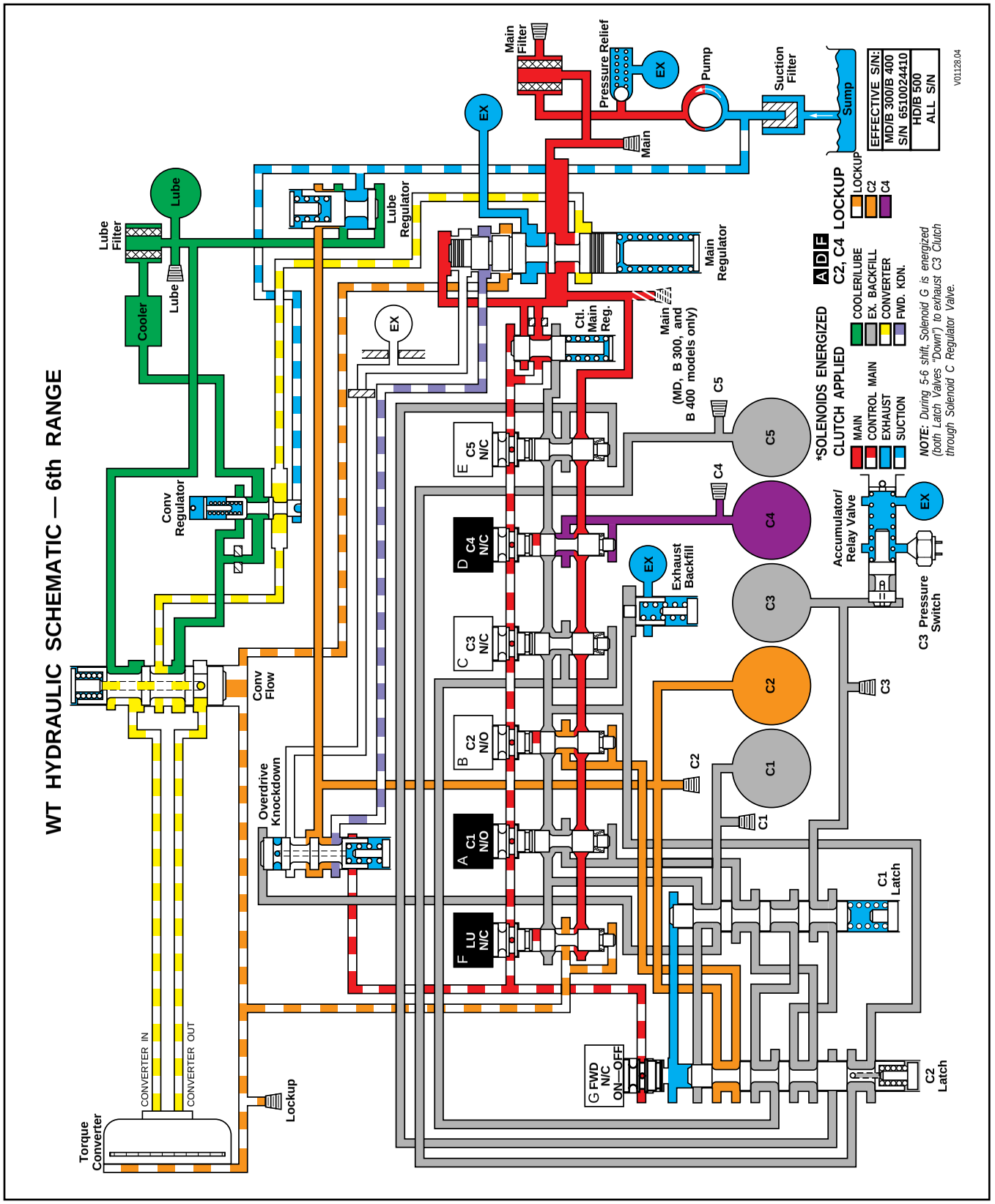


Figure H–9. WT Hydraulic Schematic — 6th Range

APPENDIX H — HYDRAULIC SCHEMATICS

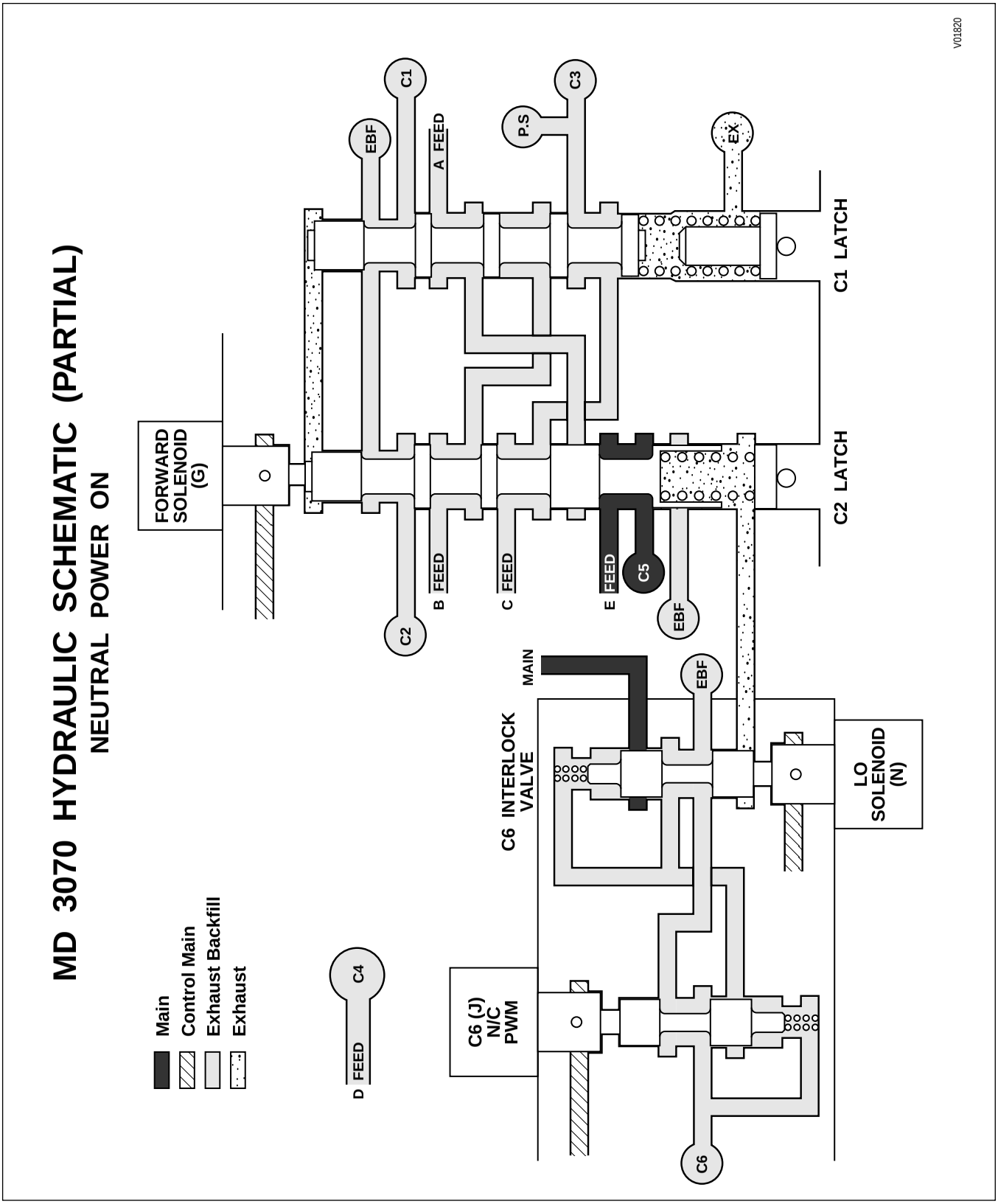


Figure H–10. MD 3070 Hydraulic Schematic — Neutral, Power On

APPENDIX H — HYDRAULIC SCHEMATICS

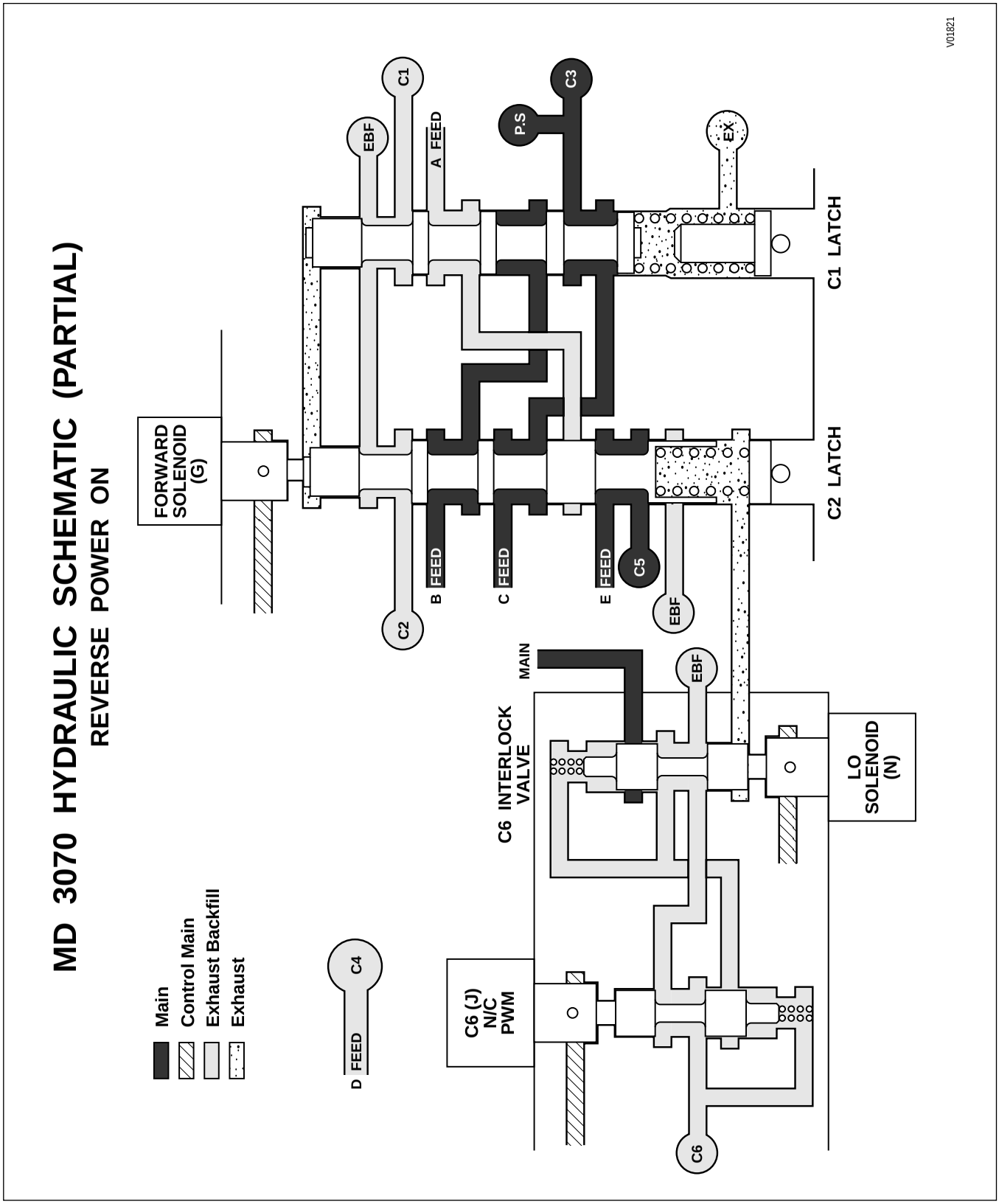


Figure H–11. MD 3070 Hydraulic Schematic — Reverse, Power On

APPENDIX H — HYDRAULIC SCHEMATICS

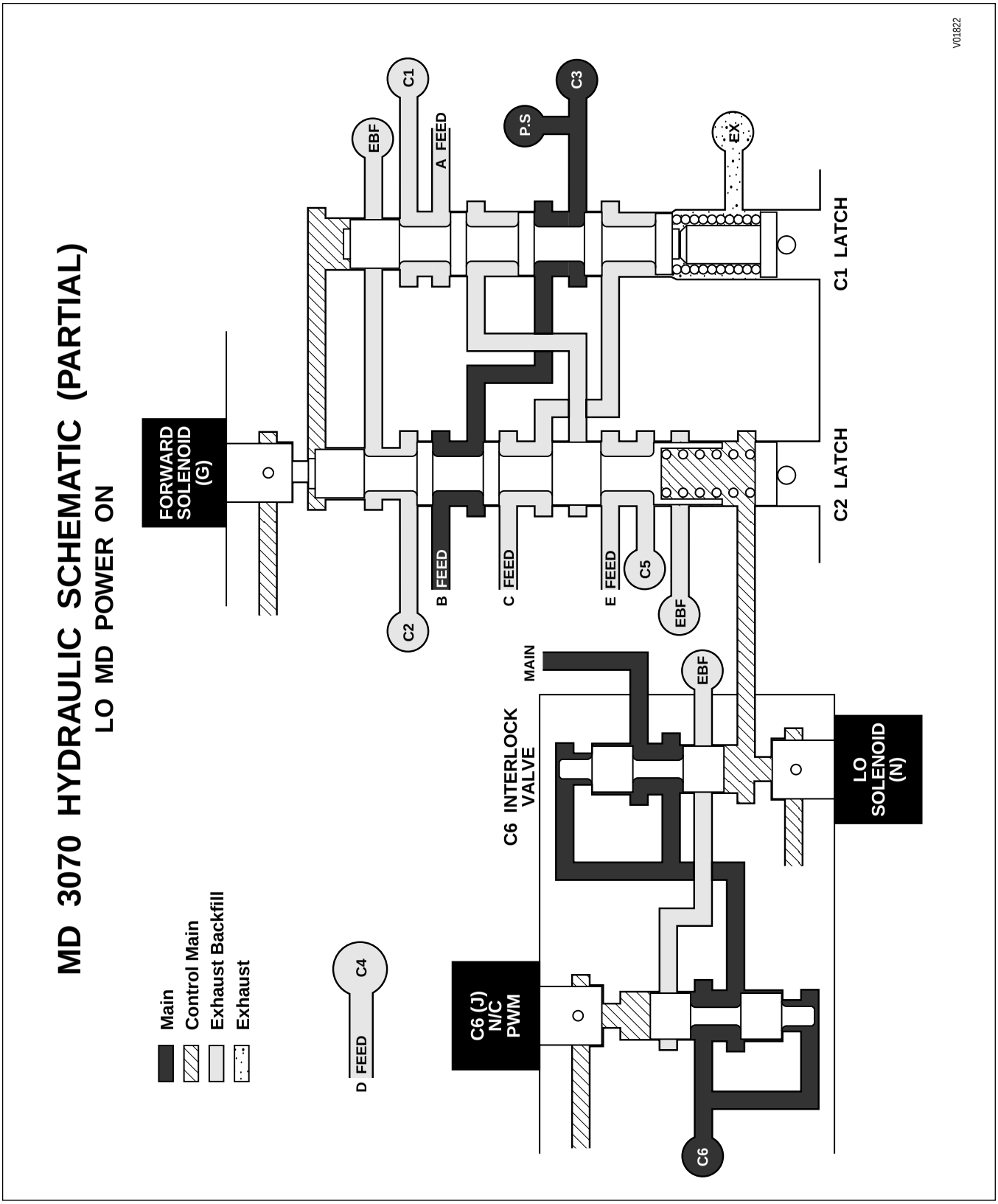


Figure H–12. MD 3070 Hydraulic Schematic — Lo MD, Power On

APPENDIX H — HYDRAULIC SCHEMATICS

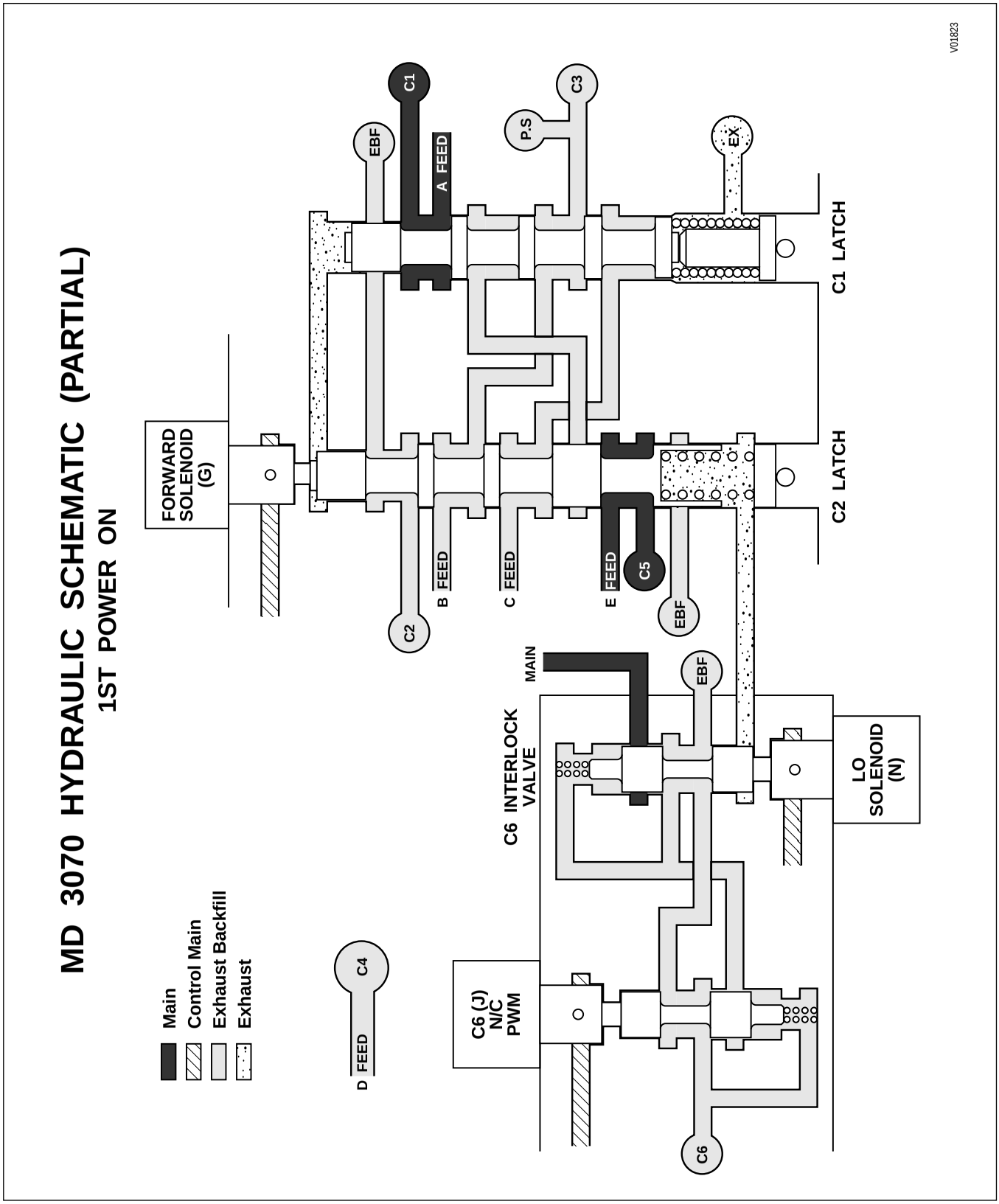


Figure H–13. MD 3070 Hydraulic Schematic — 1st, Power On

APPENDIX H — HYDRAULIC SCHEMATICS

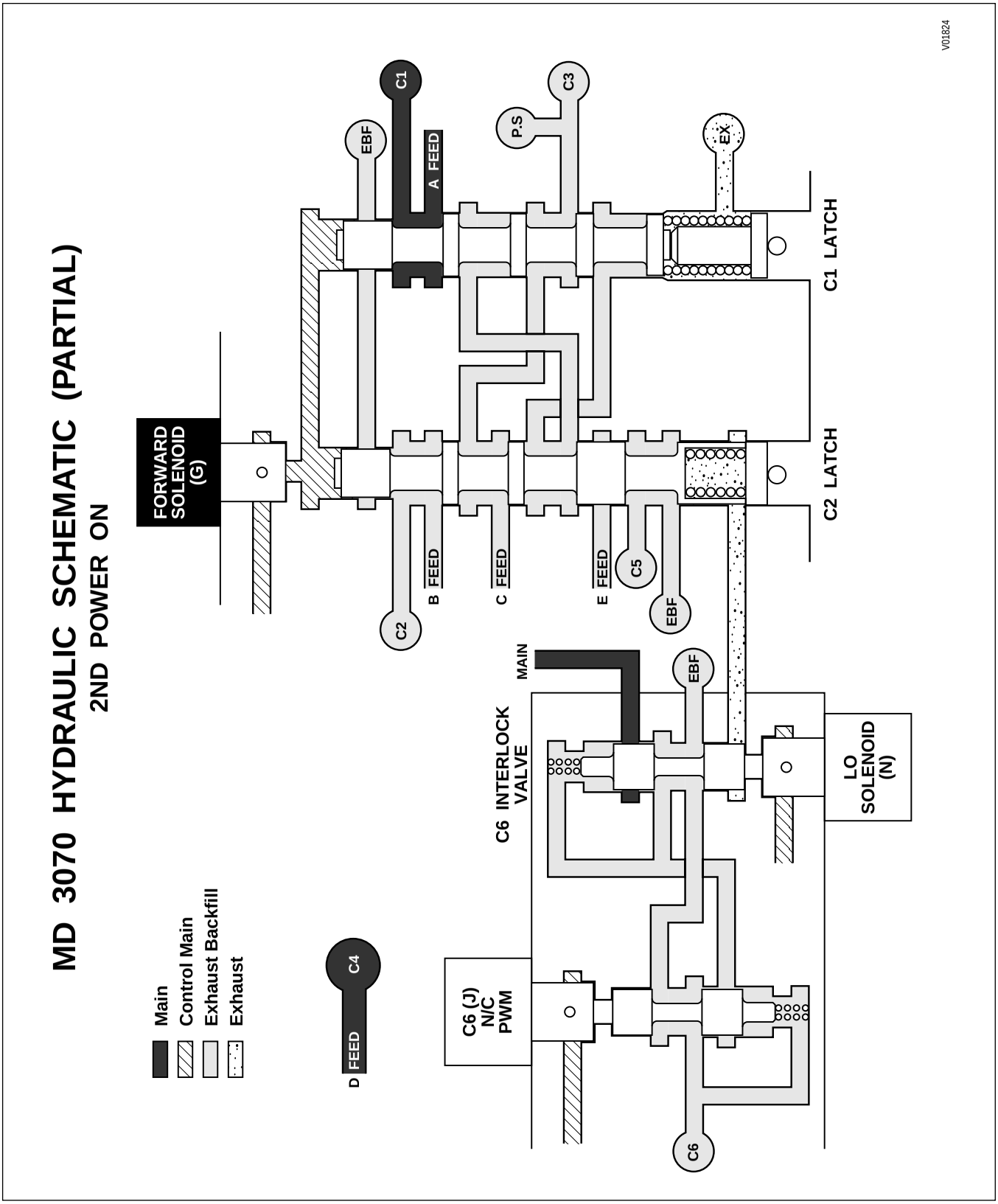


Figure H–14. MD 3070 Hydraulic Schematic — 2nd, Power On

APPENDIX H — HYDRAULIC SCHEMATICS

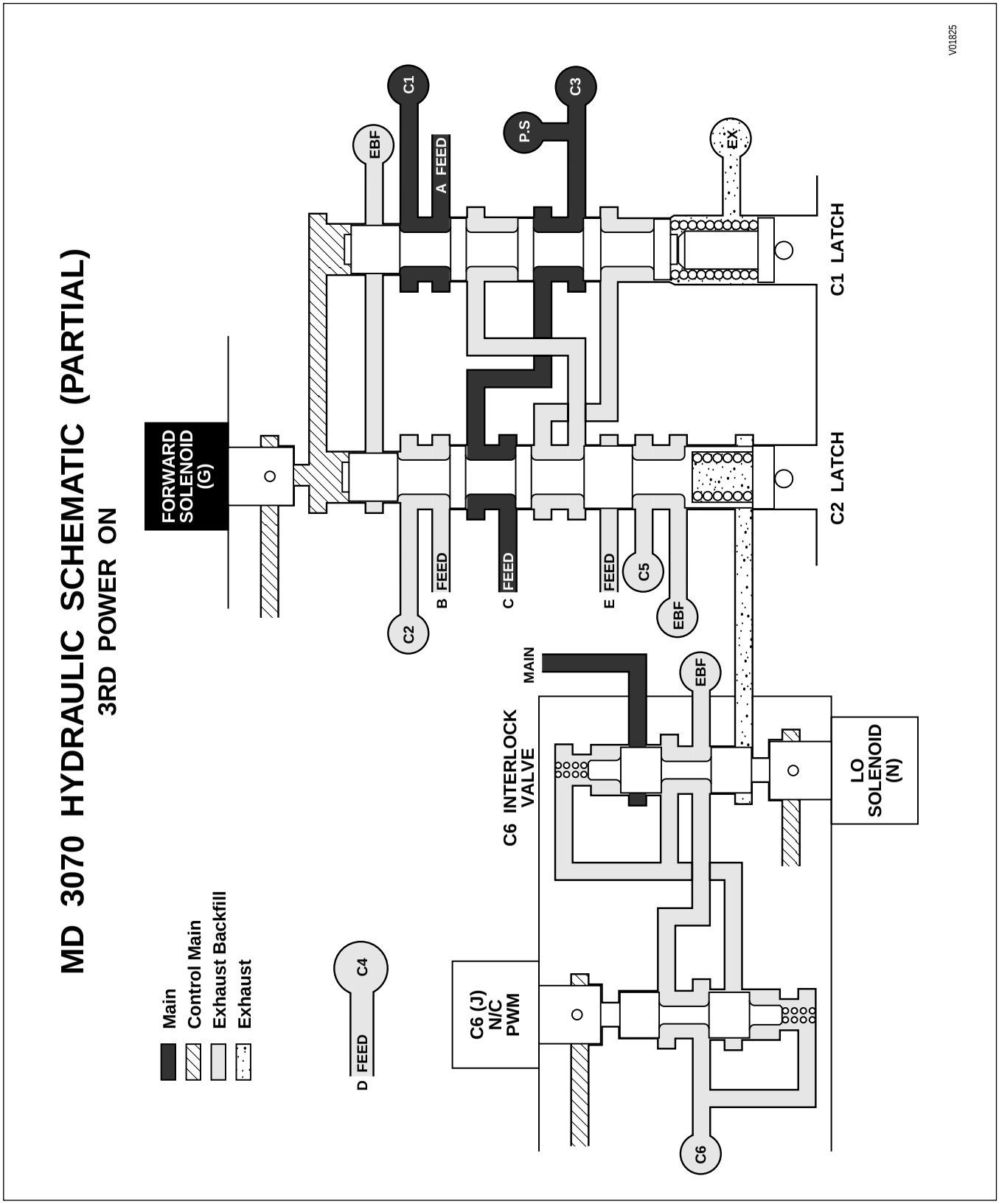


Figure H–15. MD 3070 Hydraulic Schematic — 3rd, Power On

APPENDIX H — HYDRAULIC SCHEMATICS

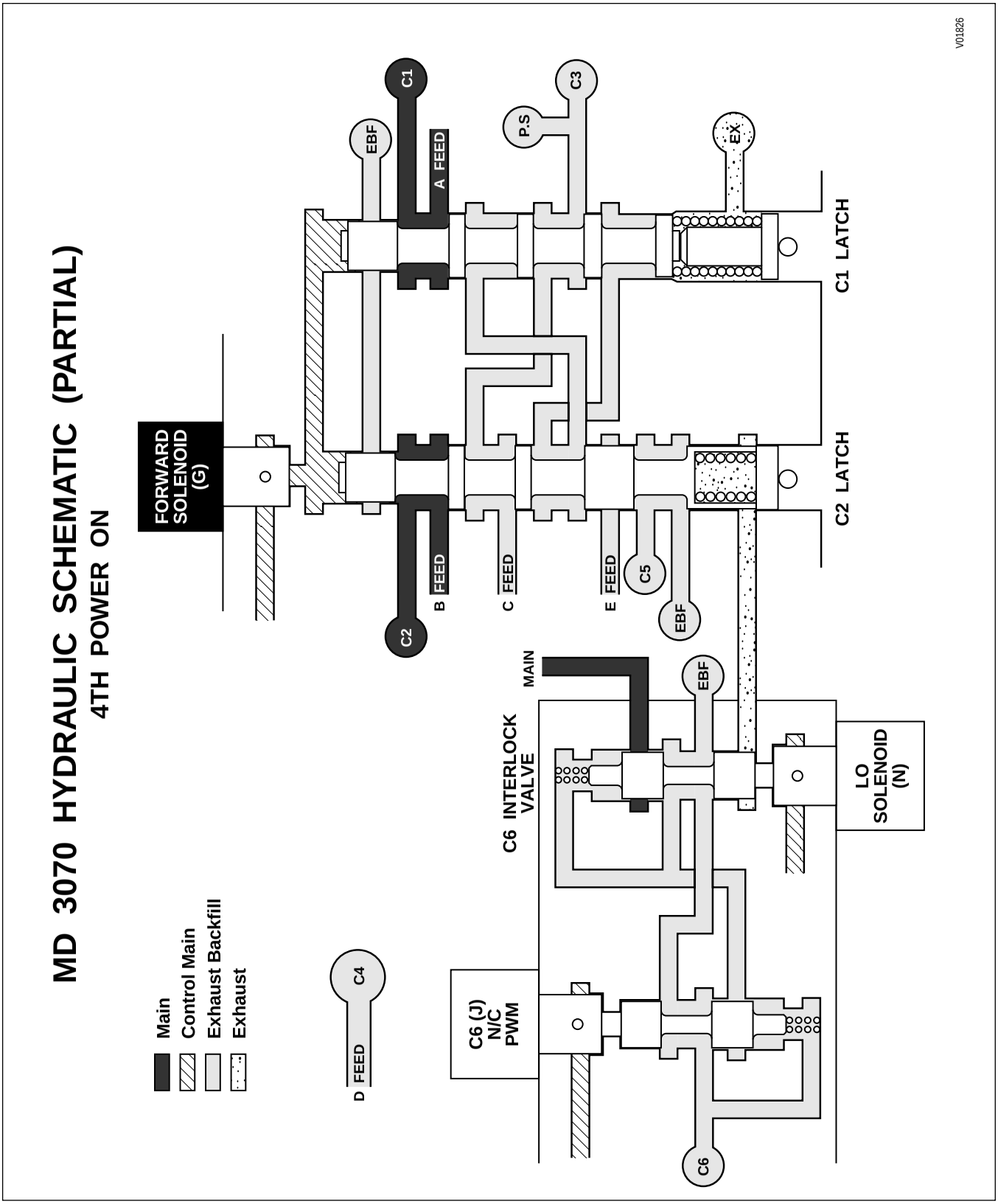


Figure H–16. MD 3070 Hydraulic Schematic — 4th, Power On

APPENDIX H — HYDRAULIC SCHEMATICS

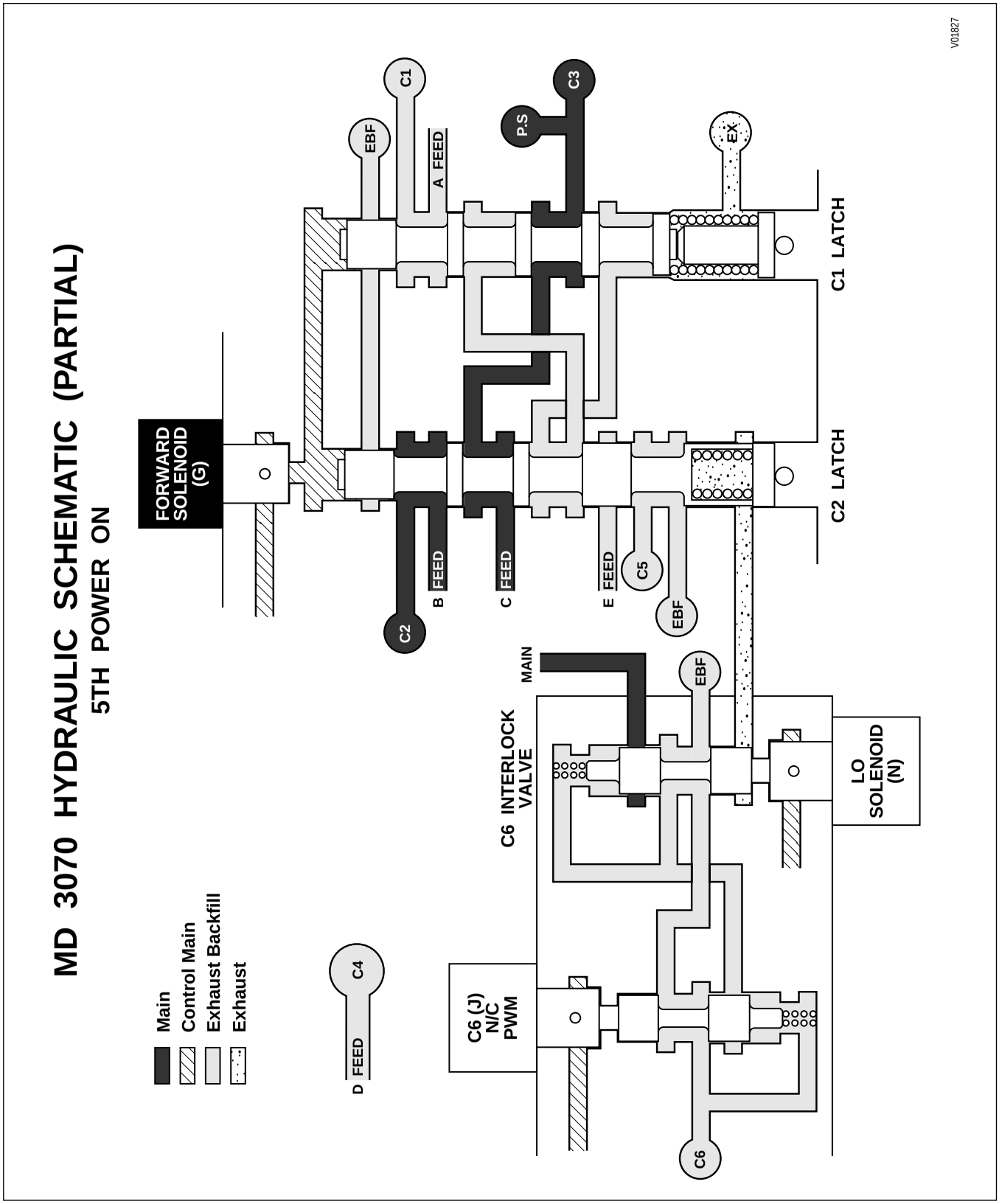


Figure H–17. MD 3070 Hydraulic Schematic — 5th, Power On

APPENDIX H — HYDRAULIC SCHEMATICS

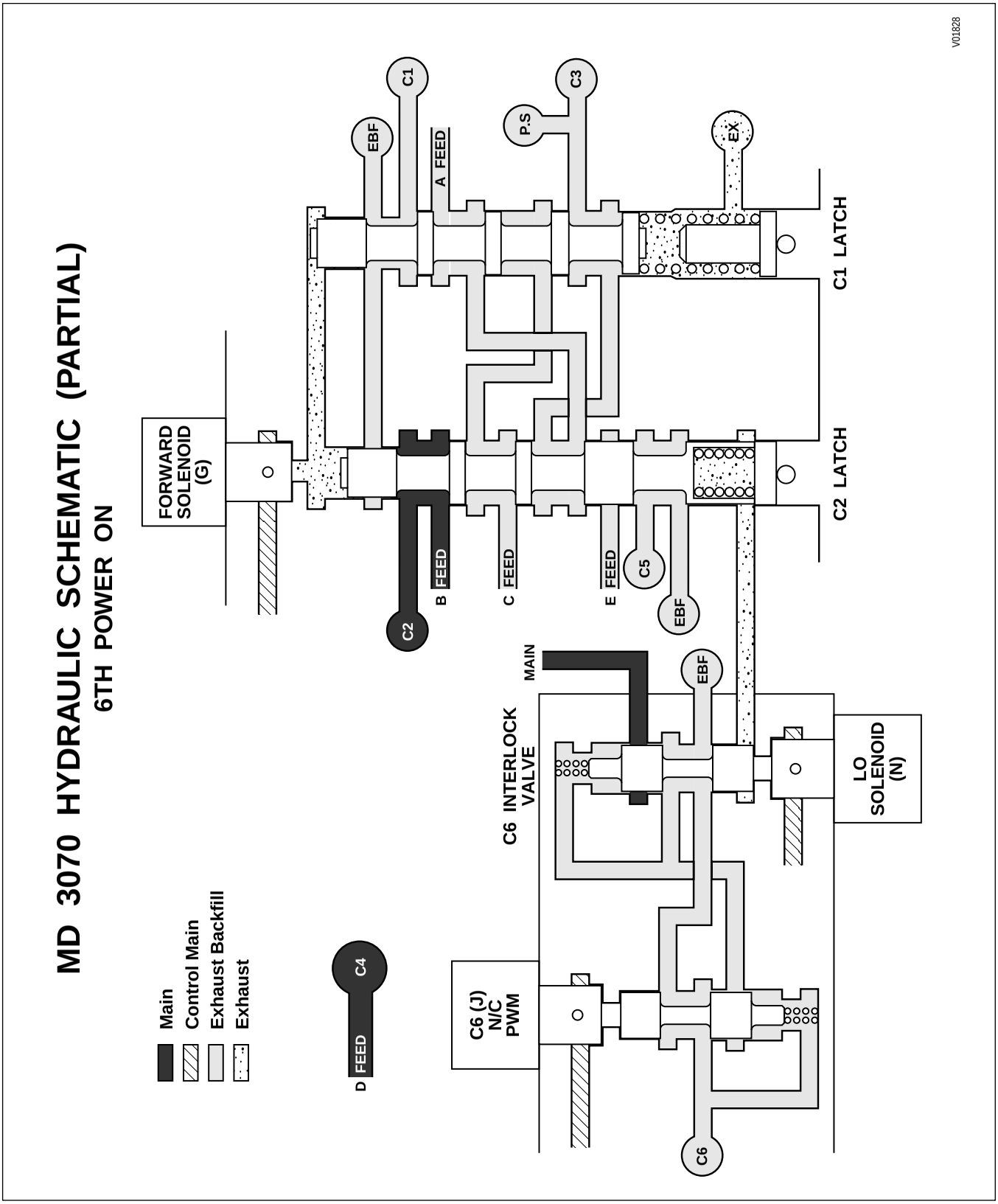


Figure H–18. MD 3070 Hydraulic Schematic — 6th, Power On

APPENDIX H — HYDRAULIC SCHEMATICS

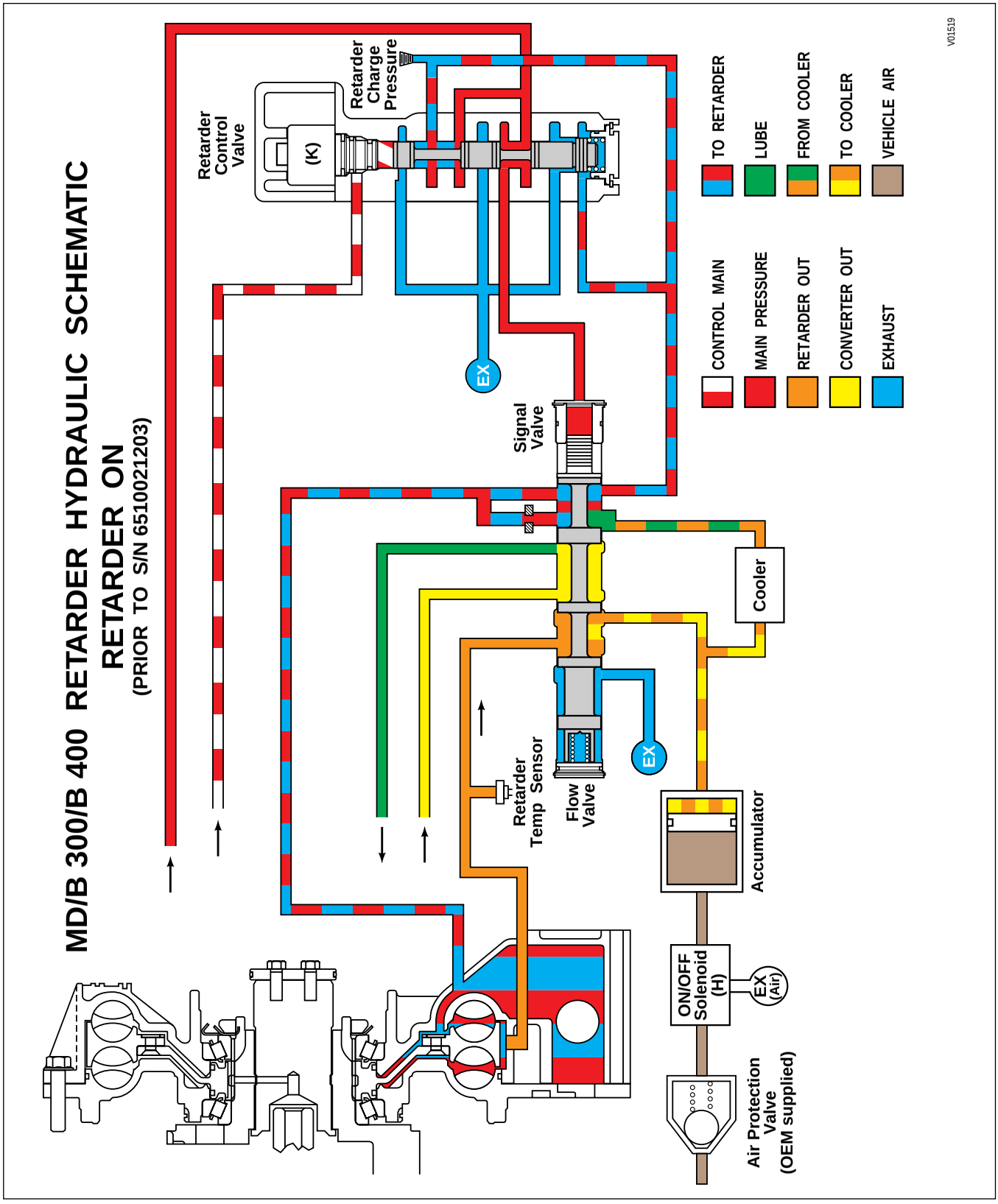


Figure H–19. MD/B 300/B 400 Retarder Hydraulic Schematic, Retarder On (Prior To S/N 6510021203)

APPENDIX H — HYDRAULIC SCHEMATICS

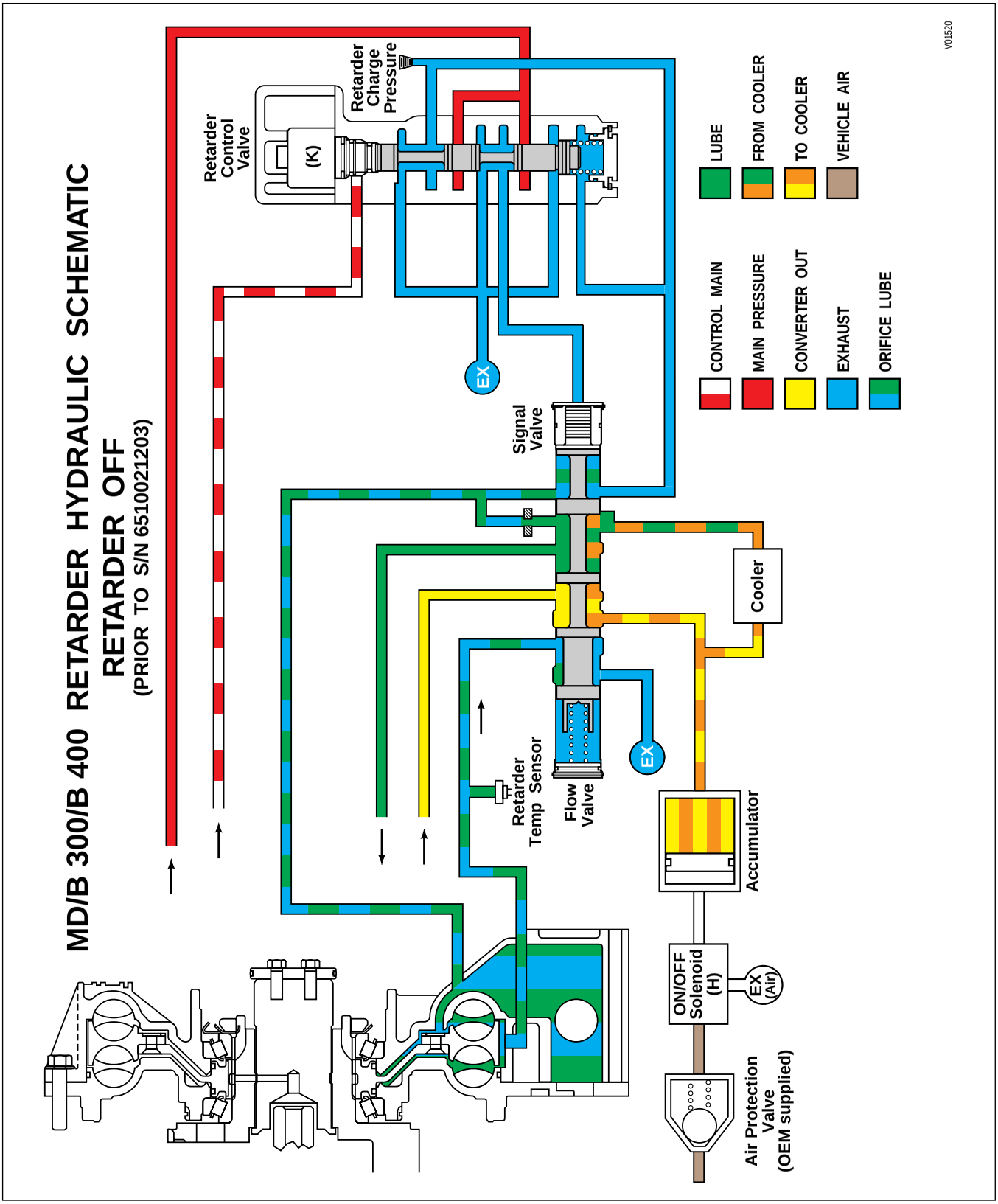


Figure H–20. MD/B 300/B 400 Retarder Hydraulic Schematic, Retarder Off (Prior To S/N 6510021203)

APPENDIX H — HYDRAULIC SCHEMATICS

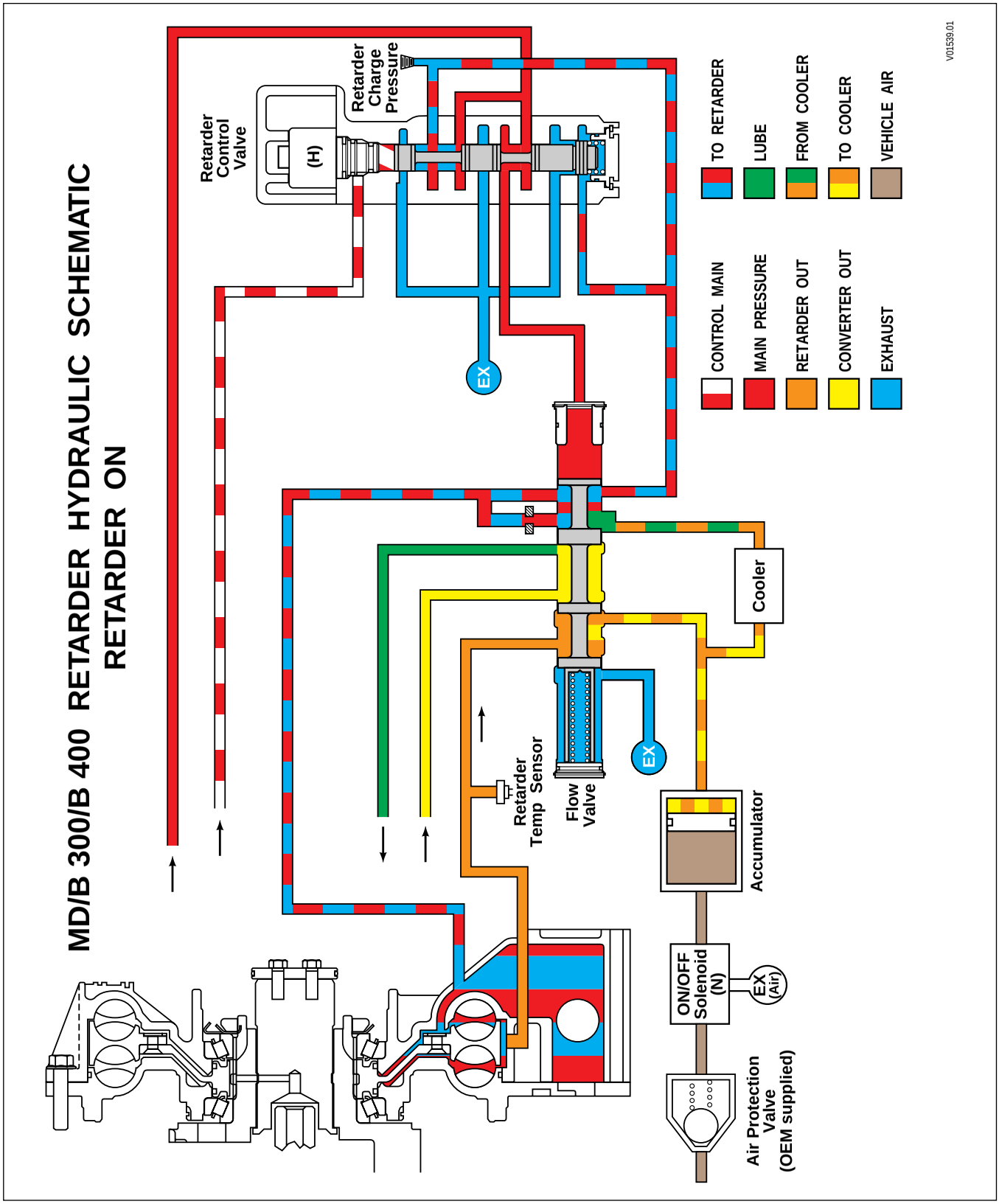


Figure H–21. MD/B 300/B 400 Retarder Hydraulic Schematic, Retarder On (From S/N 6510021203 to December 31, 1997)

APPENDIX H — HYDRAULIC SCHEMATICS

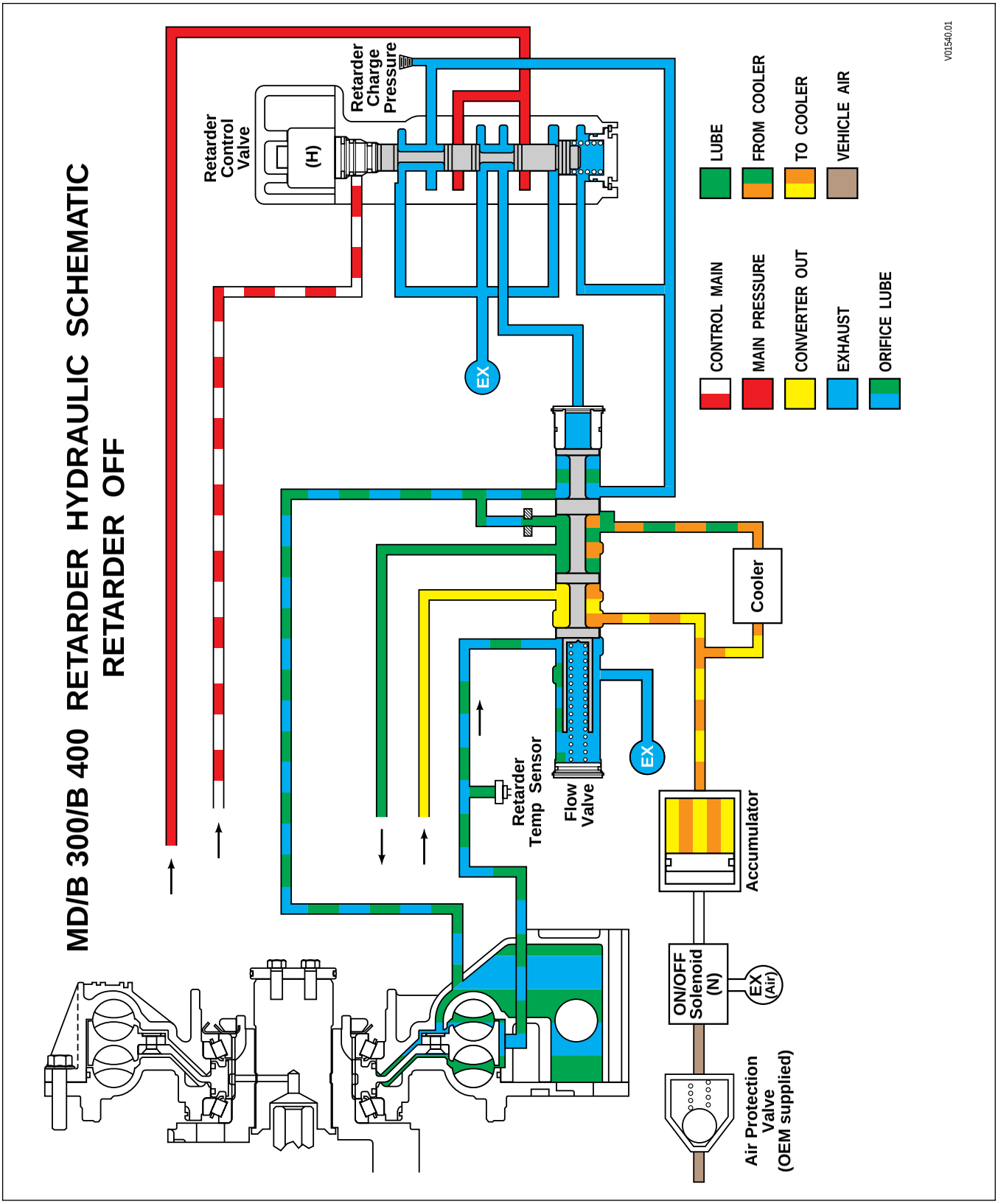
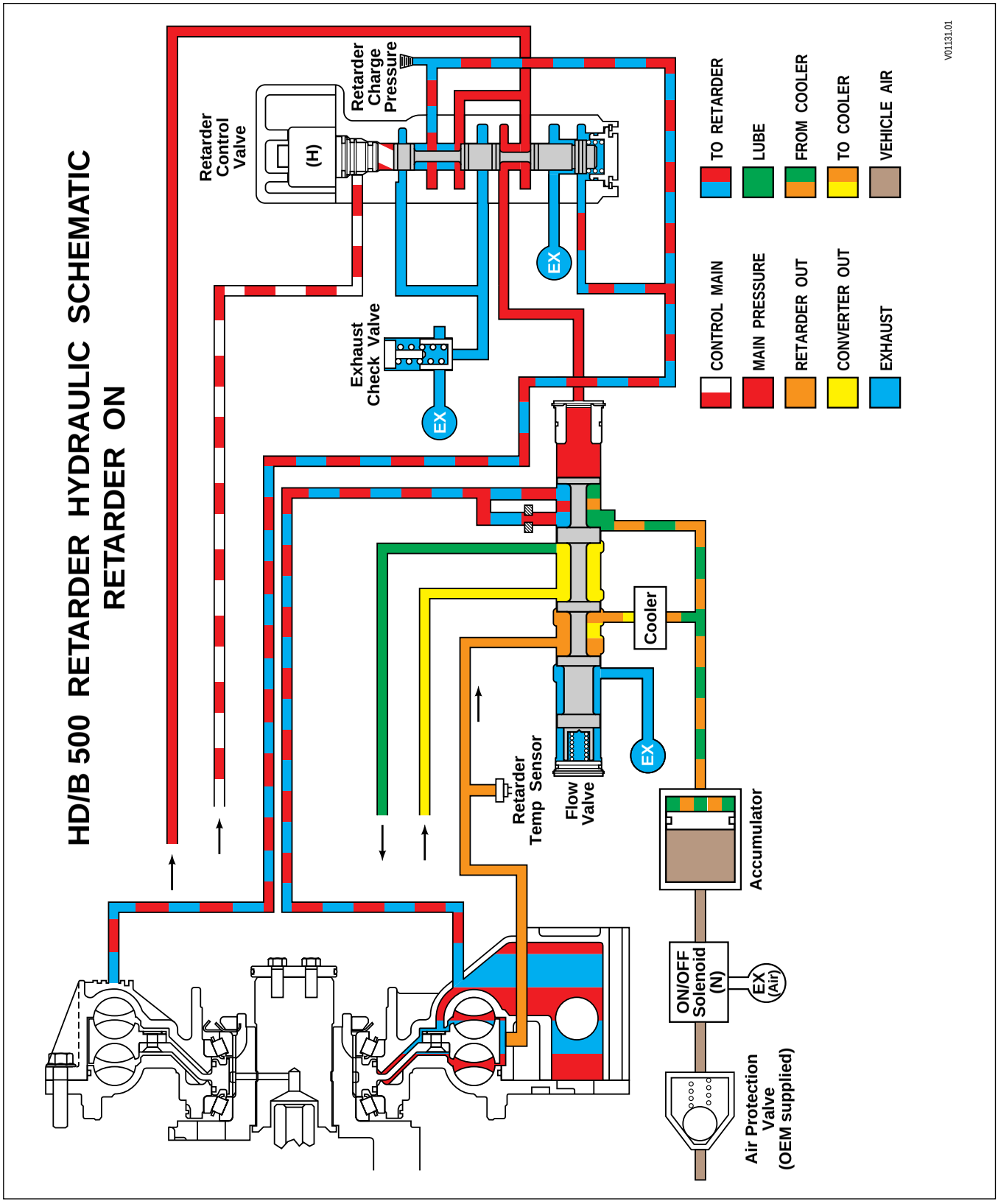


Figure H–22. MD/B 300/B 400 Retarder Hydraulic Schematic, Retarder Off (From S/N 6510021203 to December 31,

APPENDIX H — HYDRAULIC SCHEMATICS



1997)

APPENDIX H — HYDRAULIC SCHEMATICS

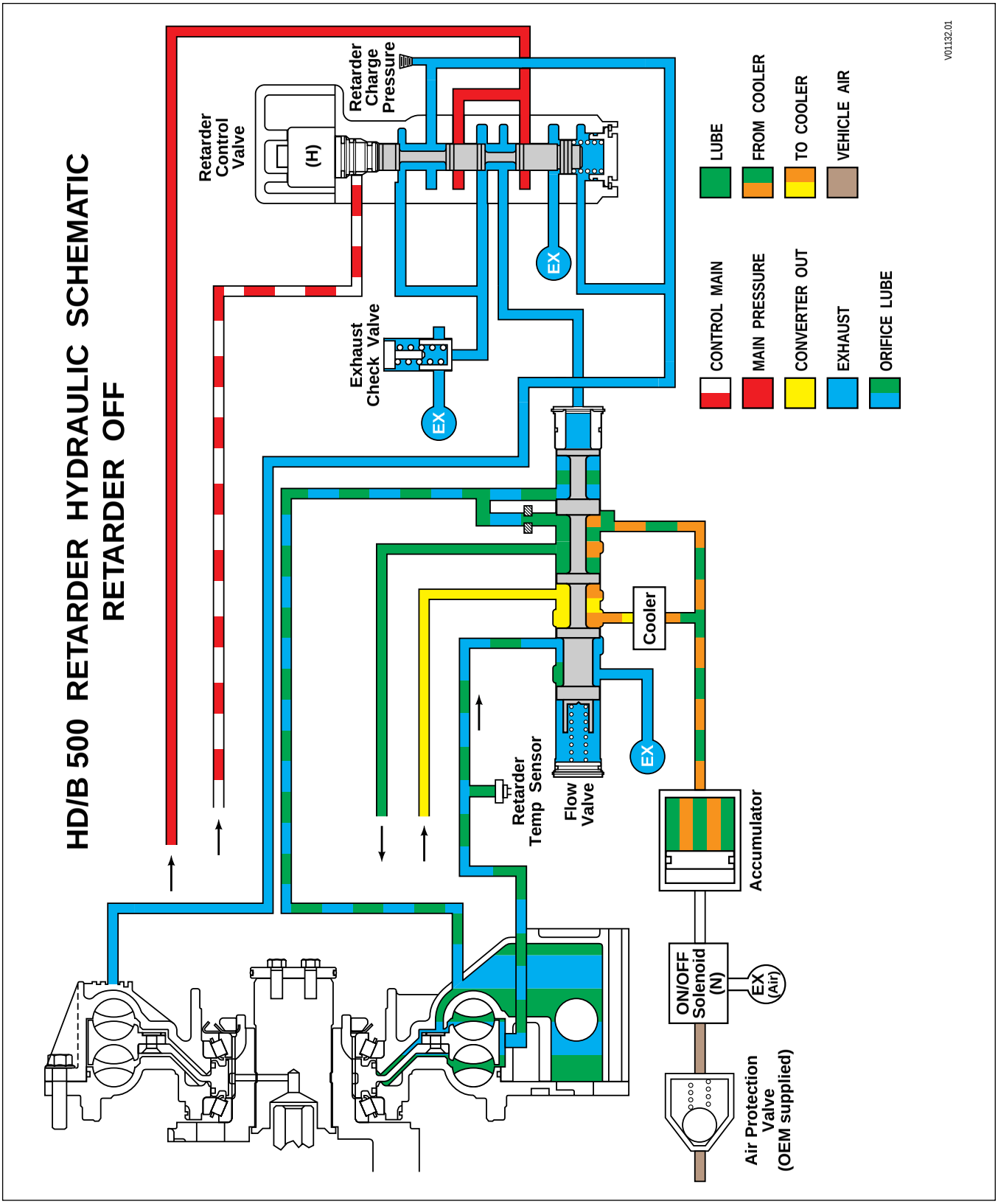
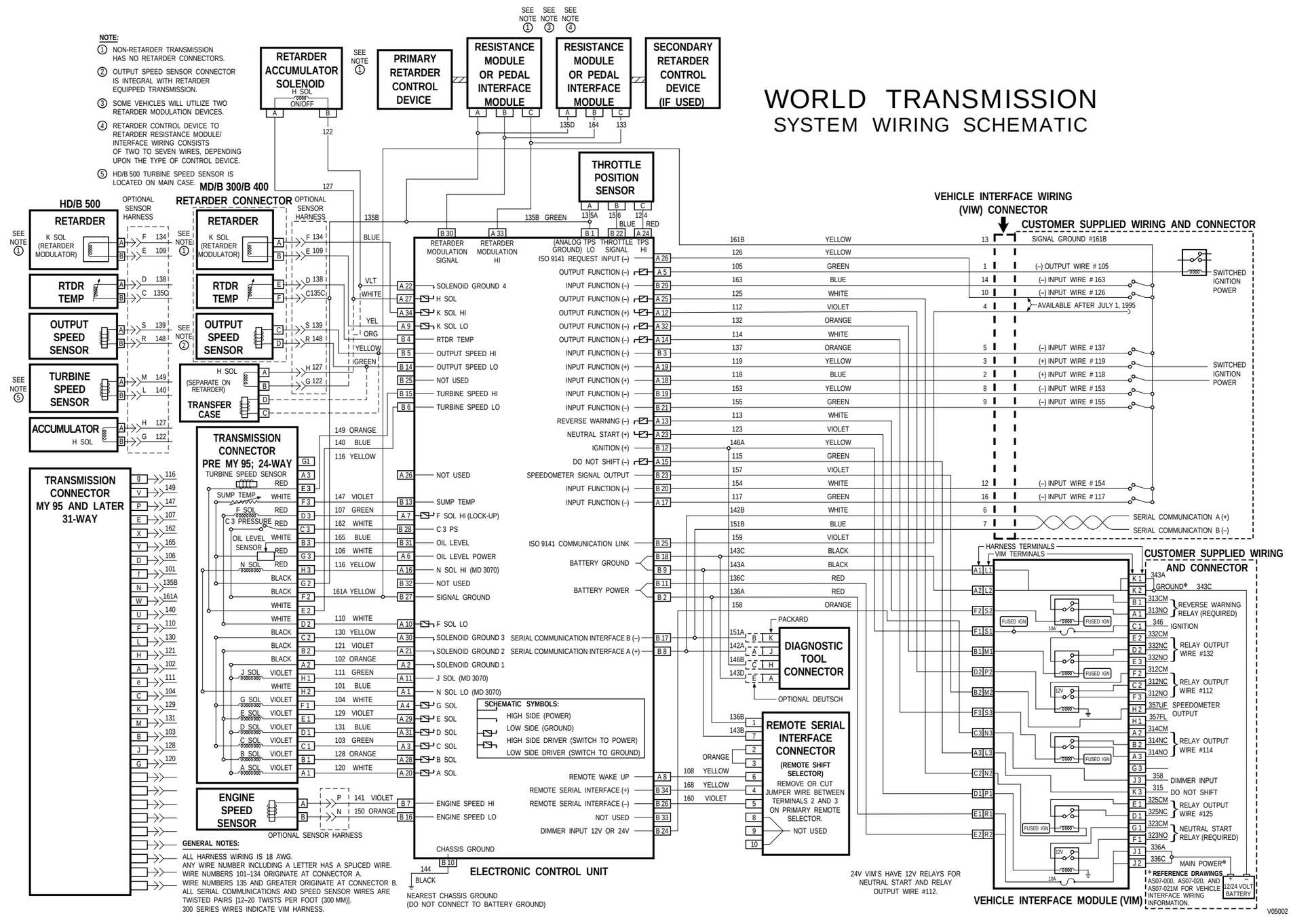


Figure H–23. HD/B 500 Retarder Hydraulic Schematic — Retarder On

APPENDIX H — HYDRAULIC SCHEMATICS

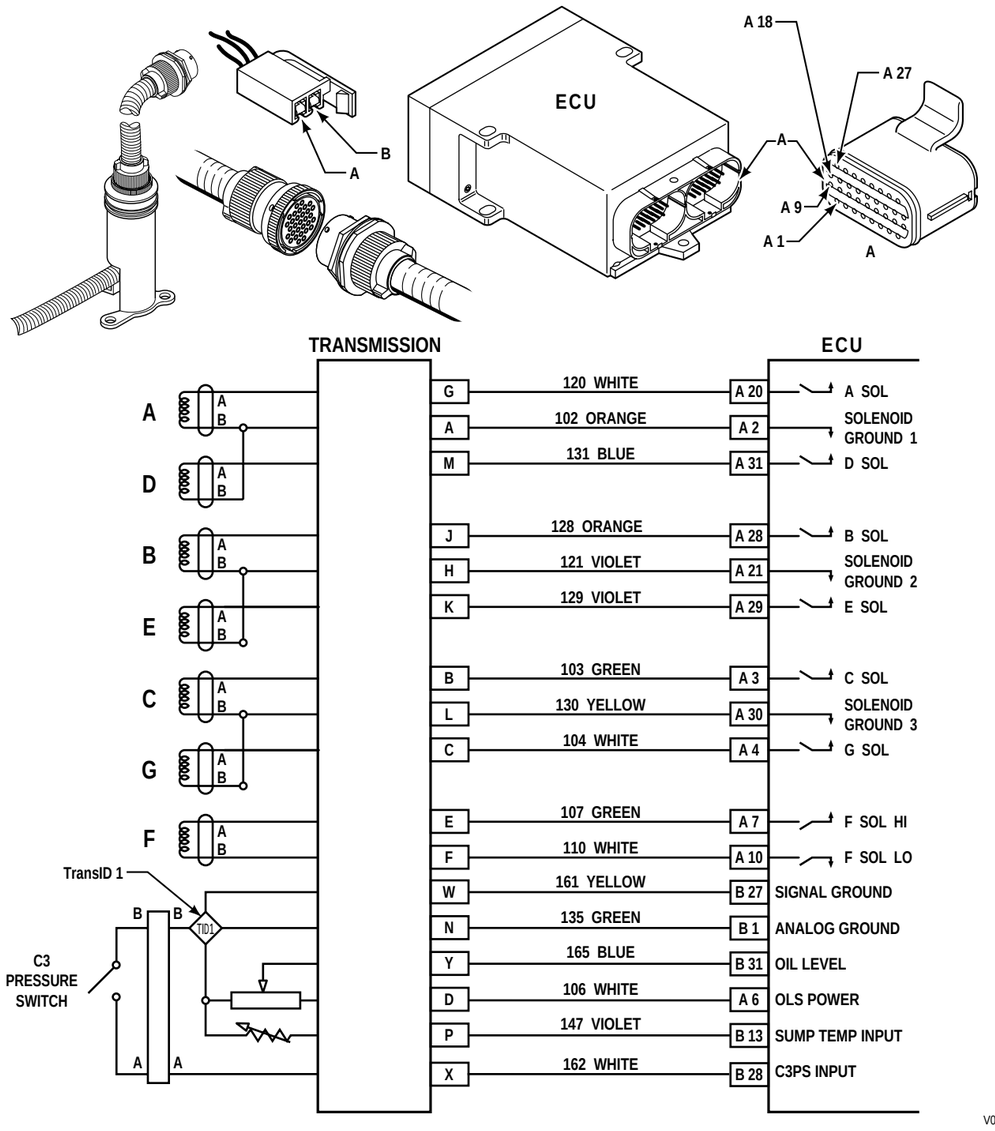
NOTES

APPENDIX J — WT WIRING SCHEMATICS



Foldout J–1. WT Wiring Schematic (Pre-TransID)

APPENDIX J — WT WIRING SCHEMATICS



Foldout J–2. WTEC II TransID 1 Wiring Schematic (Began September, 1996)

APPENDIX K — SOLENOID AND TEMPERATURE CHARTS

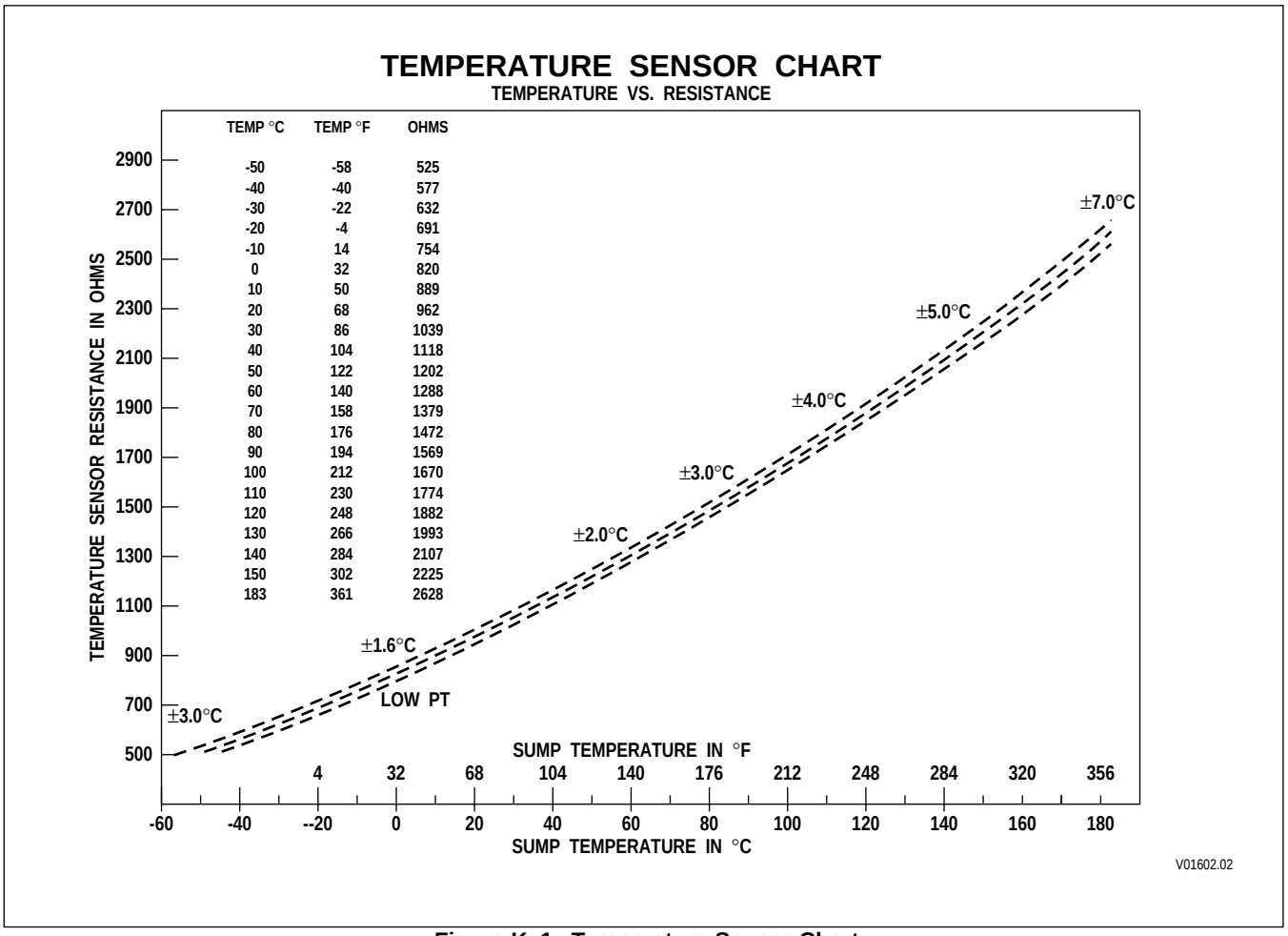


Figure K–1. Temperature Sensor Chart

APPENDIX K — SOLENOID AND TEMPERATURE CHARTS

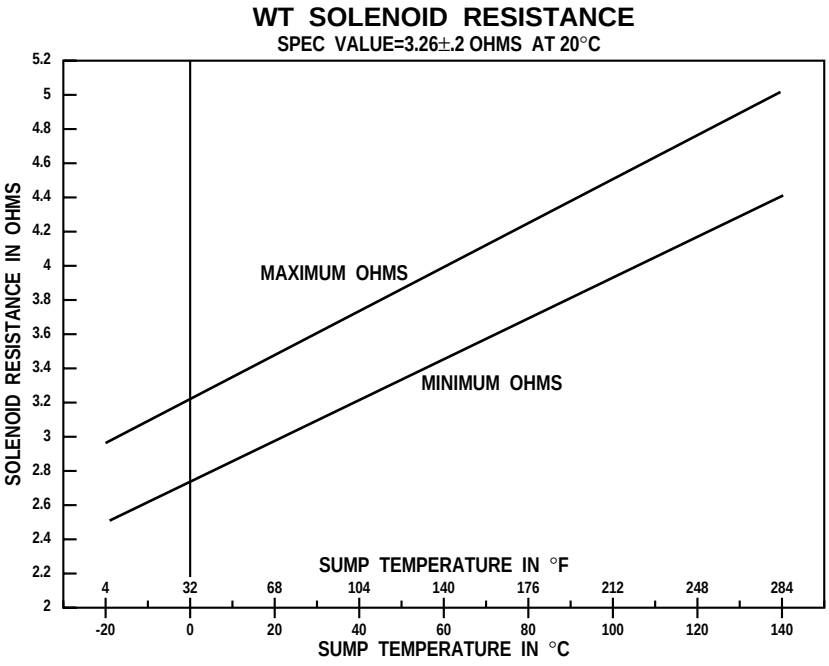


Figure K–2. Solenoid Resistance vs.Temperature Chart

APPENDIX L — EXTERNALLY-GENERATED ELECTRONIC INTERFERENCE

1–1. ELECTROMAGNETIC/RADIO FREQUENCY INTERFERENCE

All electrical and electronic systems generate electromagnetic fields that can interfere with other electronic systems. Allison Transmission electronic transmission controls comply with Federal Communications Commission (FCC) regulations and other guidelines concerning emitted radio frequency interference for transportation electronics. The position of Allison Transmission Division of General Motors is that manufacturers and installers of EMI/RFI emitting equipments are responsible for adhering to FCC regulations and other guidelines concerning emitted radio frequency interference for transportation electronics.

Some radio-telephone or two-way communication radios (land-mobile radio), or the manner in which they are installed, can adversely affect vehicle operation or be affected by other vehicle components. Expenses incurred to protect vehicle-related systems from EMI/RFI emissions by radio-telephone or two-way communications radios (land-mobile radio) or to integrate such devices into vehicles are not the responsibility of Allison Transmission.

1–2. GENERAL GUIDELINES FOR RADIO EQUIPMENT INSTALLATION

The following general guidelines for installing radio-telephone or two-way communications radios (land-mobile radio) in a vehicle supplement, but DO NOT replace, detailed instructions provided by the radio equipment manufacturer. Detailed installation instructions are the sole responsibility of the radio equipment manufacturer.

Experience has shown that most EMI/RFI problems can be prevented or eliminated by following the guidelines. If EMI/RFI problems persist after following the guidelines and after ensuring the installation conforms to the guidelines, contact the vehicle and radio equipment manufacturers for additional installation or equipment operation instructions.

A. Transmitter Installation

1. Locate remote radio transmitters as far away from other electronic devices and as near to the side of the vehicle body as possible.
2. Mount transceivers (transmitter and receiver in one box) under the dash so as not to interfere with vehicle controls or passenger movement.

B. Antenna Installation

Each vehicle and body style react differently to radio frequency energy. When dealing with an unfamiliar vehicle, test various antenna locations by using a magnetic mount antenna and checking for adverse effects. Antenna location is a major factor in EMI/RFI problems.

C. Antenna Cable Routing

1. Use high quality, 95 percent shield coverage, coaxial (coax) cable. Route the coax well away from any electronic components.
2. Route antenna cables as far away from vehicle wiring as possible to reduce the likelihood of the vehicle wiring acting as an antenna for interference.

D. Radio Wiring and Connector Location

1. Connect transmitter power leads directly to the battery.
2. For transceivers (transmitter and receiver in one box) with ignition control, place a 12V power contactor at the vehicle battery. Drive the contactor coil, through an appropriate in-line fuse, from an ignition circuit not powered during engine cranking.

APPENDIX L — EXTERNALLY-GENERATED ELECTRONIC INTERFERENCE

D. Radio Wiring and Connector Location *(cont'd)*

3. Any negative lead from a handset or control unit must return to battery negative.
4. Connect the positive lead from a handset or control unit directly to battery.
5. Fuse handset or control unit positive and negative leads separately from the transceiver negative and positive leads. Use correctly rated fuses.

E. Power and Ground Wire Routing

Route radio power and ground wires as far away as possible from electronic control modules.

F. Troubleshooting

The following are common causes of EMI/RFI problems:

- Power leads connected to points other than the battery
- Improper antenna location
- Poor shielding or connections to antenna cable
- Transmitter or transceiver wiring too close to vehicle electronics

1–3. EXTERNALLY-GENERATED SPEED SENSOR SIGNALS

A. Checking for Externally-Generated Speed Sensor Signals

Use the following procedures to determine if speed sensor signals generated by a source external to the transmission or wiring harness are present:

1. Turn ignition ON.
2. Keep engine OFF.
3. If the ECU is ON (shift selector display remains illuminated), connect the Pro-Link® Diagnostic tool.

NOTE: If false speed signals were present at the previous shutdown, the ECU might still be "on" even though the ignition is "off." The Pro-Link® is powered by ignition power so the ignition must be "on" to use the Pro-Link® to read the speed signals.

4. Read speed sensor signals.
5. If a speed sensor signal is other than one (1), then there is a short to another circuit that is carrying an AC signal.
6. Check the resistance of the sensor.
7. Check for shorts to other circuits within the harness or transmission connector.
8. Check to ensure there is no conductive material inside the connector.
9. Check to be sure speed sensor circuit wires are a twisted pair.
10. Check to ensure a properly grounded drain wire.
11. Check for the presence of a strong external AC signal.
12. Repair or replace parts as required.

APPENDIX M — DIAGNOSTIC TREE — WT HYDRAULIC SYSTEM

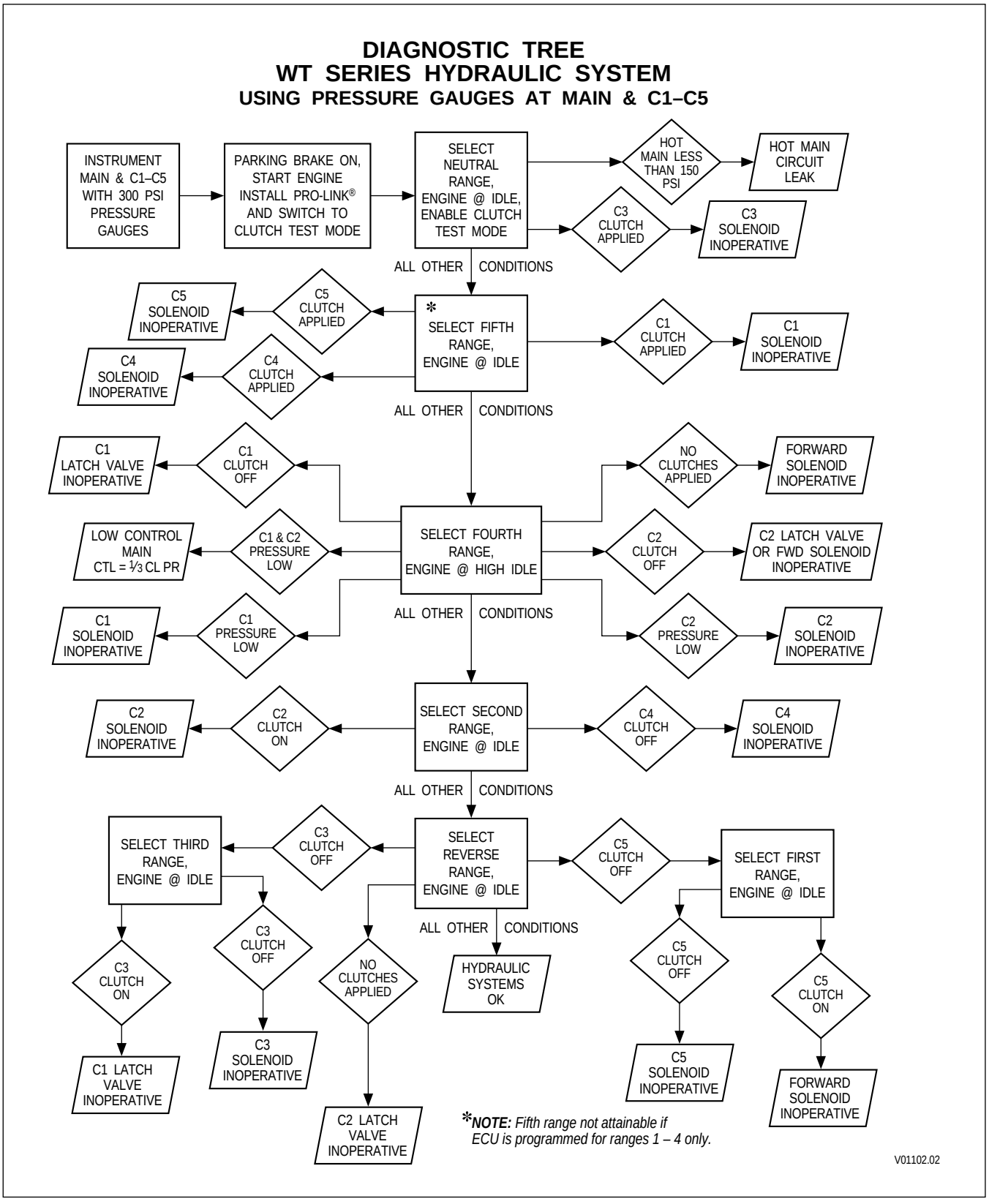


Figure M–1. Diagnostic Tree — WT Series Hydraulic System With Gauges

APPENDIX M — DIAGNOSTIC TREE — WT HYDRAULIC SYSTEM

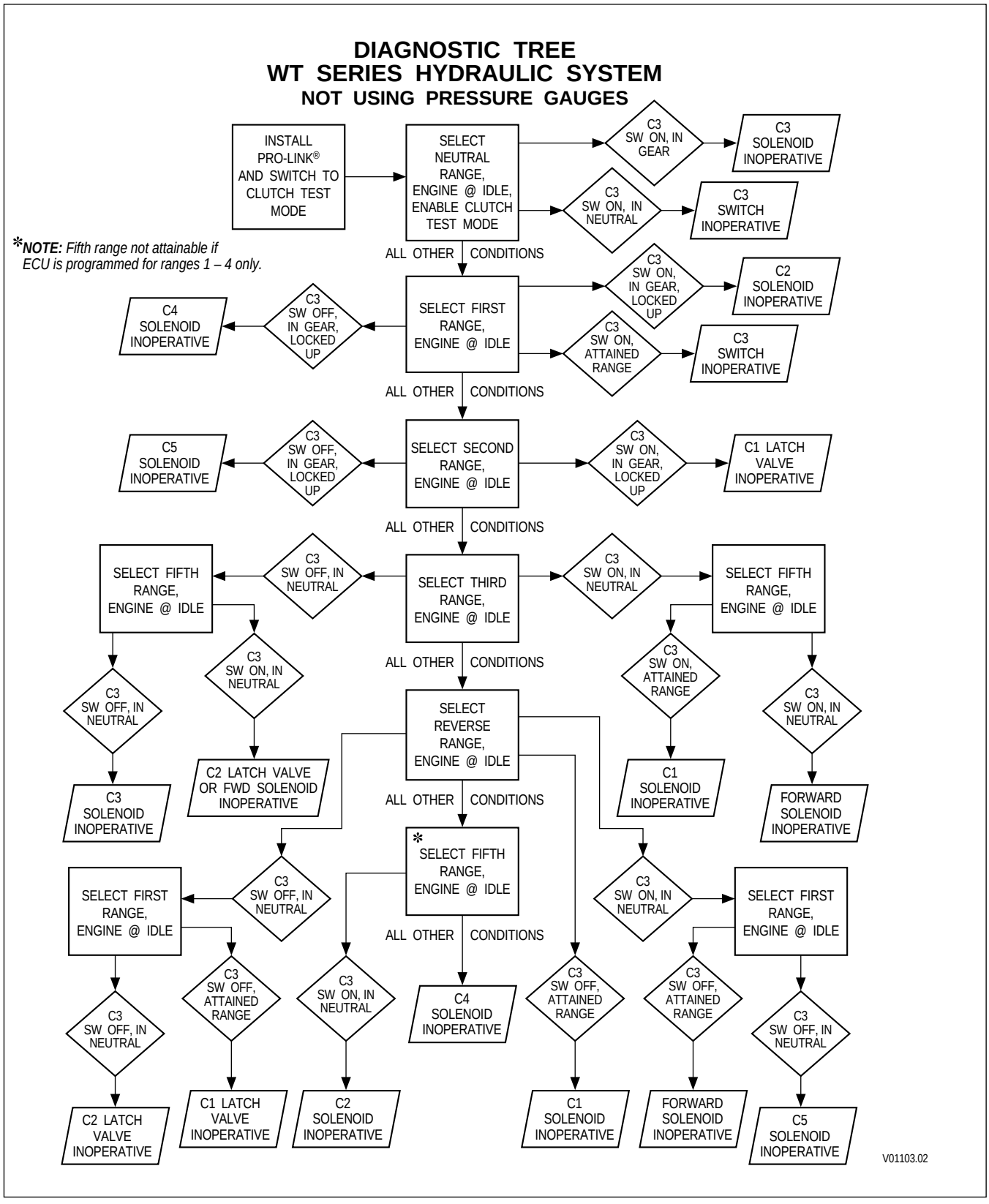


Figure M–2. Diagnostic Tree — WT Series Hydraulic System Without Gauges

APPENDIX N — PRO-LINK® 9000 DIAGNOSTIC DATA READER INFORMATION

This appendix is to assist the technician in the use of the Pro-Link® 9000 functions that are mentioned in this troubleshooting manual. For complete information on the Pro-Link® 9000, consult the manual that is furnished with each Pro-Link® 9000 (MPSI Manual No. 907005 and SW3085EN Pro-Link® Student Workbook).

A. Preparing to Use the Pro-Link® 9000 Diagnostic Data Reader

1. Connect the vehicle cable from the Pro-Link® 9000 to the diagnostic data reader connector on the Allison Transmission wiring harness. Refer to the vehicle manufacturer's manual for location of the connector.

2. Be sure that the vehicle ignition key is on. Check to see that the Pro-Link® 9000 has been energized. If power is not being supplied, turn off the vehicle ignition and recheck all cable connections.

3. Turn on ignition key and if power was still not supplied, turn off the ignition key and check the Pro-Link® 9000 cartridge installation. Carefully remove grease, oil, or other contaminants from the edgeboard using a soft cloth. Check the 2-amp fuse located in the cartridge. Replace the fuse, if necessary.

CAUTION: Never use anything but a 2-amp fuse for replacement.

4. Review the KEYPAD section of the Pro-Link® 9000 Manual.

5. Refer to Figure N–1 for a graphic representation of the Pro-Link® 9000 menu selections.

APPENDIX N — PRO-LINK® 9000 DIAGNOSTIC DATA READER INFORMATION

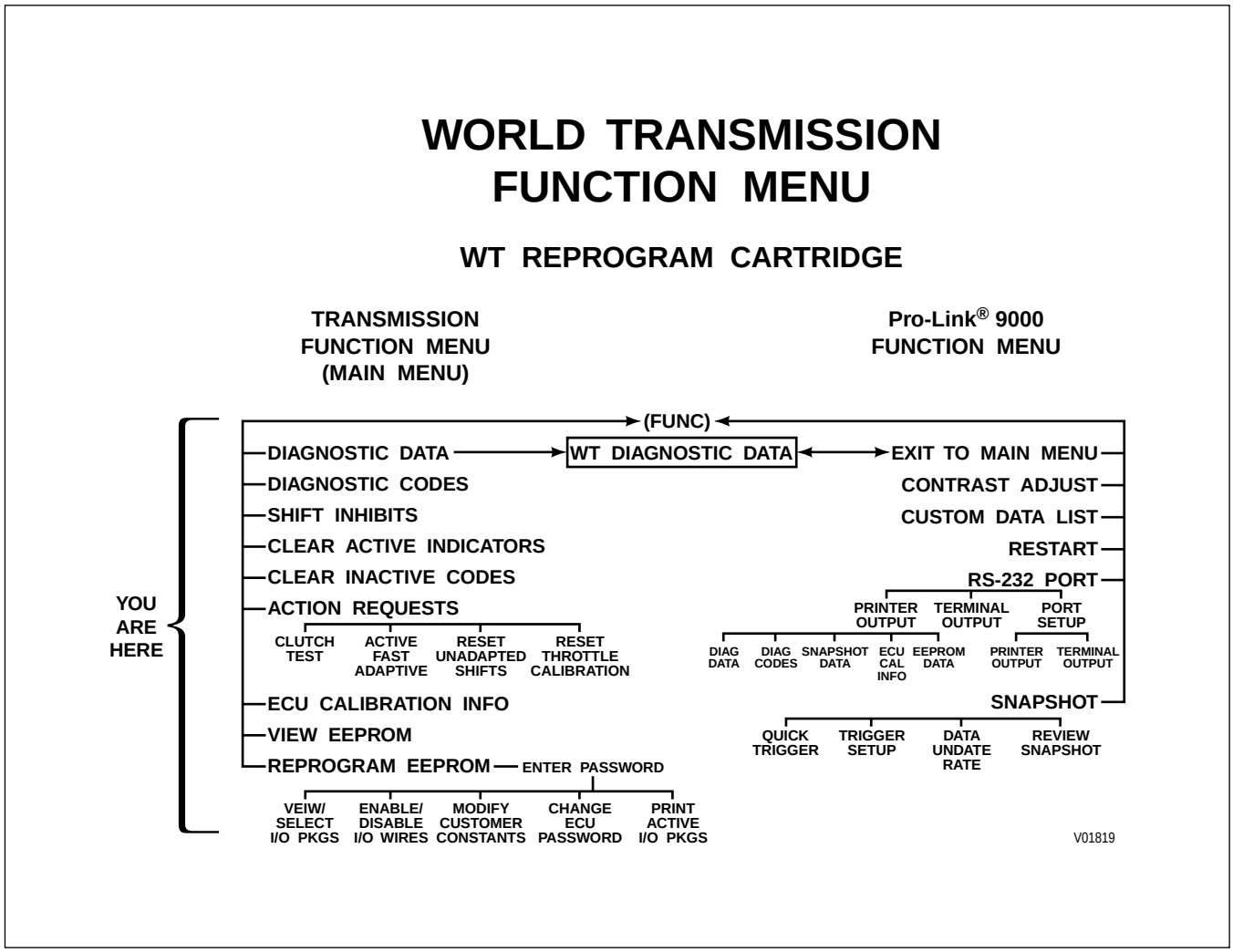


Figure N–1. Pro-Link® 9000 Menu Selections

B. Checking Transmission Fluid Level (covered in Section 5–2 of this Manual)

1. Press the **FUNC** (function) key until the screen display shows **WORLD TRANSMISSION FUNCTION MENU.**

2. Use the **UP** and **DOWN** arrow keys as needed until **DIAGNOSTIC DATA** appears in the display screen under **WORLD TRANSMISSION FUNCTION MENU**.

3. Press **ENTER**. This selects the **DIAGNOSTIC DATA LIST**. Scroll through the list using the **UP** and **DOWN** arrow keys until **OIL LVL** is reached. Fluid level will be displayed as + or - liters or quarts as long as preset conditions for the check have been met. When test conditions have not been met, a code is displayed on the DDR screen explaining why the fluid level is not being displayed.

4. The fluid level is correct when a 0 (zero) appears in front of **QT** (quarts) or **LT** (liters). Press the **FUNC**tion key to return to the menu of choice.

APPENDIX N — PRO-LINK® 9000 DIAGNOSTIC DATA READER INFORMATION

C. Checking for Diagnostic Codes (use of the Pro-Link® 9000 mentioned, but not explained in Section 6)

1. Press the **FUNC** (function) key until the screen display shows **WORLD TRANSMISSION FUNCTION MENU.**

2. Use the **UP** and **DOWN** arrow keys as needed until **DIAGNOSTIC CODES** appears in the display screen under **WORLD TRANSMISSION FUNCTION MENU**.

3. Press **ENTER**. This asks the ECU to display any diagnostic codes. If no codes are present, the display screen shows this message: **NO DIAGNOSTIC CODES [FUNC**] TO EXIT.

4. If diagnostic codes are present, they are displayed on the screen in line two under the headings: **CODE**, **d1**, **ACTV**, **CTR**, and **IGN** (line one of the screen display). Under the **CODE** heading, the main code and sub code will appear (such as 24 12, where 24 is the main code and 12 is the sub code). Under **d1**, nothing appears; this means that this is the first code to be displayed (the second code is **d2**, up to the final code which can be displayed, d5). Under **ACTV**, the display will show **YES** if the code is active, or **NO** if the code is inactive. Under **CTR**, a number appears which shows how many times this code has occurred. Under **IGN**, a number appears which shows how many times the ignition switch was cycled since this code was detected.

5. On the third and fourth lines of the screen display, an English explanation of the code is displayed (for example, code 24 12's message would read **OIL TEMPERATURE COLD**). If there are arrows at the side of line four of the display, this means that there are more codes to be displayed. Use the **UP** and **DOWN** arrow keys to display the other codes. If no arrows are present on line four of the display, there are no other codes to be displayed.

6. Press the **FUNC**tion key to return to the menu of choice.

D. Clearing Diagnostic Codes (covered in Section 6 of this Manual)

1. Clear either active codes (indicators) or inactive codes as follows:

2. Press the **FUNC** (function) key until the screen display shows **WORLD TRANSMISSION FUNCTION MENU.**

3. Use the **UP** and **DOWN** arrow keys as needed until either **CLEAR ACTIVE INDICATORS** or **CLEAR INACTIVE CODES** appears in the display screen under **WORLD TRANSMISSION FUNCTION MENU.**

4. Press **ENTER**. A screen display gives one of the following messages: **CLEAR ACTIVE INDICATORS ARE YOU SURE? [YES] NO**; or, **CLEAR INACTIVE CODES ARE YOU SURE? [YES] NO**. Use the left arrow key to answer yes and the right arrow key to answer no. No is the abort selection and returns to the **WORLD TRANSMISSION FUNCTION MENU** screen.

5. When [**YES**] is selected, the display screen shows one of the following messages: **CLEARING ACTIVE INDICATORS PLEASE WAIT** or **CLEARING INACTIVE CODES PLEASE WAIT.** When the clearing is completed, one of these messages appears: **ACTIVE INDICATORS HAVE BEEN CLEARED [ENTER]** to continue or **INACTIVE CODES HAVE BEEN CLEARED [ENTER**] to continue.

6. Pressing **ENTER** returns the display screen to the **WORLD TRANSMISSION FUNCTION MENU.**

APPENDIX N — PRO-LINK® 9000 DIAGNOSTIC DATA READER INFORMATION

E. Checking Other Troubleshooting Parameters

1. Press the **FUNC** (function) key until the screen display shows **WORLD TRANSMISSION FUNCTION MENU.**

2. Use the **UP** and **DOWN** arrow keys as needed until **DIAGNOSTIC DATA** appears in the display screen under **WORLD TRANSMISSION FUNCTION MENU**.

3. Press **ENTER**. This selects the **DIAGNOSTIC DATA LIST.** Scroll through the list using the **UP** and **DOWN** arrow keys until one of the following selections is reached. Press enter to access the data desired:

IGN VOLTS	Displays battery voltage and indicates whether ignition is turned on
BATTERY VOLTS	Displays voltage inside the ECU; used frequently in diagnostic code checking
TPS CNTS	Displays throttle position as counts; used to check throttle position sensor
INPUT SPD RPM	Displays engine speed; used during various functional checks
TURBIN SPD RPM	Displays transmission turbine speed; used during various functional checks
OUTPUT SPD RPM	Displays transmission output speed; used during various functional checks
C3 PRESSURE SW	Indicates when C3 clutch is applied
DO NOT SHIFT	Indicates status of the DO NOT SHIFT output from the ECU
RTDR REQ CNTS	Displays counts form a retarder modulation device; used to check retarder devices
RTDR	Displays temperature of fluid in the retarder cavity, not in the sump
WIRE XXX IN # OFF	Indicates what INPUT FUNCTION wire is being used, what the input function number is, if the input function is used (ON or OFF), and a second line gives an English description of the input function if it is used
WIRE XXX OUT # OFF	Same as above, only for OUTPUT FUNCTION
CLTCH TST ENABL	Shows state, either ON or OFF; must be on to conduct clutch test

F. Performing a Clutch Test (covered in Appendix B)

1. Press the **FUNC** (function) key until the screen display shows **WORLD TRANSMISSION FUNCTION MENU.**

2. Use the **UP** and **DOWN** arrow keys as needed until **ACTION REQUESTS** appears in the display screen under **WORLD TRANSMISSION FUNCTION MENU**. Use the **UP** and **DOWN** arrow keys to scroll through the selections until **CLUTCH TEST** is shown on the display screen.

3. Press **ENTER**. The display screen shows: **CLUTCH TEST [ENABLE] DISABLE [ENTER]** to continue Use the right arrow key to select **DISABLE**; this is the abort selection or the choice to make after the test is complete.

4. Press **ENTER** to select **ENABLE**. The display will show: **ENABLING CLUTCH TEST PLEASE WAIT**. Once the test is enabled, the following display screen appears: **CLUTCH TEST ENABLED TEST MAY DISABLE AUTOMATICALLY [ENTER**] to continue.

APPENDIX N — PRO-LINK® 9000 DIAGNOSTIC DATA READER INFORMATION

F. Performing a Clutch Test (covered in Appendix B) *(cont'd)*

5. Press **ENTER**. Move the shift selector from **N** (Neutral) to **D** (Drive). The transmission starts out in the highest range attainable (sixth for a six-speed). Lower ranges are selected individually by moving the lever selector or by using the **DOWN** arrow on a pushbutton selector. The display screen shows various data parameters for the transmission range selected.

NOTE: CLUTCH TEST is also useful for selecting higher ranges to conduct a torque converter stall test. Using a higher range reduces torque loads on internal transmission components.

6. During clutch testing, it is possible to continuously monitor clutch test enable by using the following procedure:

   - Note that four lines of data parameters are shown on the display screen
   - The **UP** arrow key is used to change the data parameters that appear on the display
   - Use the **UP** arrow key until **CLTCH TST ENABL** is on the fourth line of the display screen
   - Press the numeric key 4 — **CLTCH TST ENABL** will be displayed continuously, followed by **YES** as long as it is enabled

7. Press the **FUNC**tion key to return to the **CLUTCH TEST [ENABLE] DISABLE** screen and use the **RIGHT** arrow key to select **DISABLE**.

APPENDIX N — PRO-LINK® 9000 DIAGNOSTIC DATA READER INFORMATION

NOTES

APPENDIX P — INPUT/OUTPUT FUNCTIONS

The schematics which follow were taken from the Sales Tech Data Book entitled "WTEC III Controls." These schematics provide detail information needed to correctly perform input and output function connections. For an overview of Input/Output Functions, refer to Section 7 of this Manual.

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

SECONDARY SHIFT SCHEDULE

USES: Provides operator selection of dual shift schedules. Can be used for performance/economy, loaded/empty, or other shift schedule combinations.

VARIABLES TO SPECIFY: None

VOCATIONS: Various

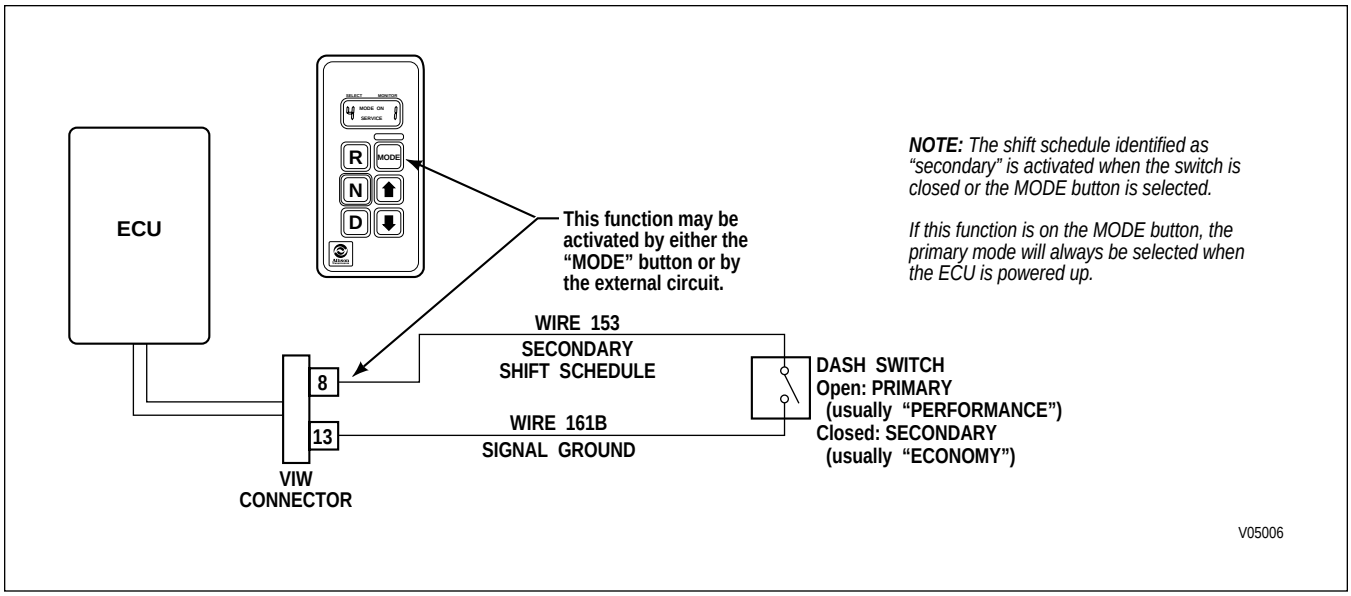


Figure P–1. Secondary Shift Schedule

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

D1 SELECTION

USES: Provides a convenient means of attaining 1st range hold for pushbutton shift selectors. Range to select is programmable for Primary and Secondary modes.

VARIABLES TO SPECIFY: Primary Mode selected range, Secondary Mode selected range (usually 1st range). Can be used only on the MODE button.

VOCATIONS: Various

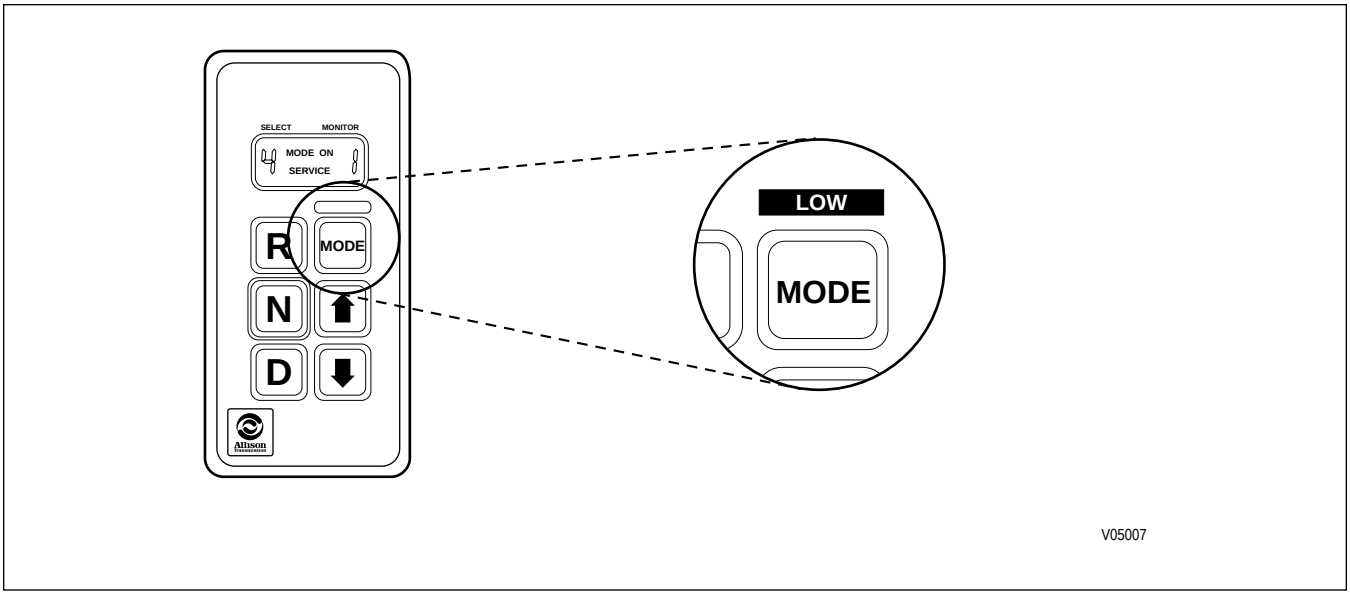


Figure P–2. D1 Selection

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could cause unscheduled operation of the PTO or other unpredictable operation resulting in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

PTO ENABLE (USING "PTO" SWITCH)

USES: Permits PTO to be engaged only when engine speed and output speed are in allowable range and throttle is low. Also disengages PTO if speeds are exceeded.

VARIABLES TO SPECIFY: Minimum and maximum engine speed for engagement, maximum engine speed for allowable operation, minimum and maximum output speed for engagement, maximum output speed for allowable operation.

VOCATIONS: Various (with usage of PTO)

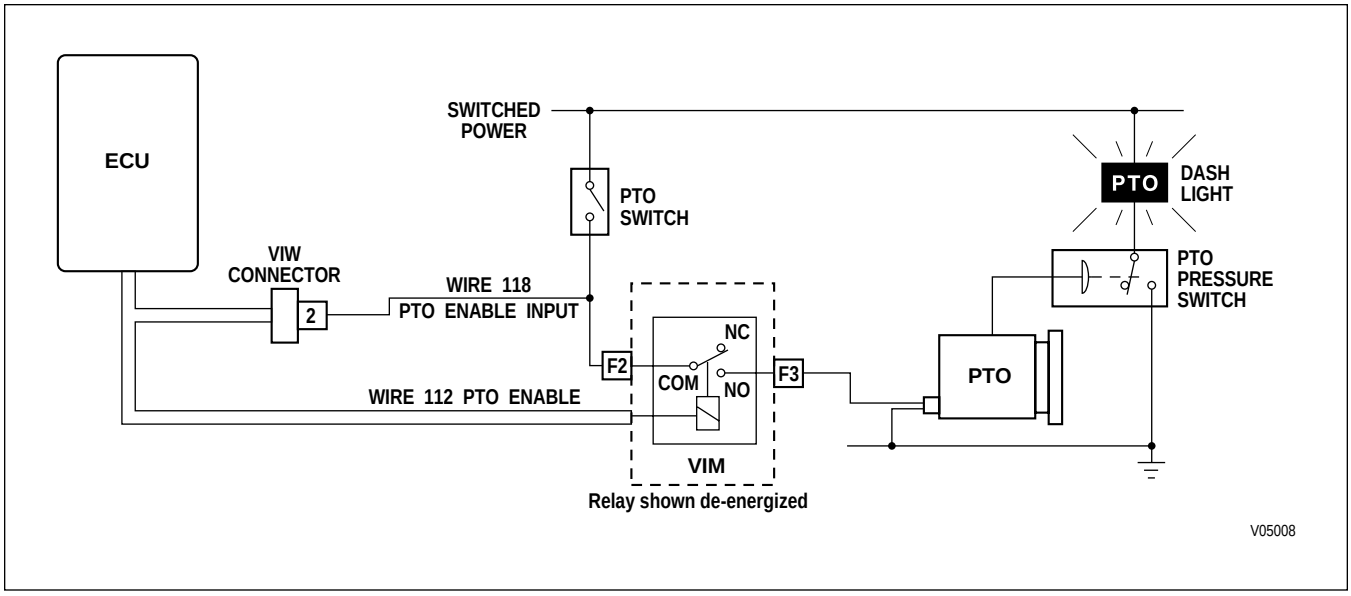


Figure P–3. PTO Enable (Using "PTO" Switch)

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!	**These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could cause unscheduled operation of the PTO or other unpredictable operation resulting in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.**

PTO ENABLE (USING "MODE" BUTTON)

USES: Permits PTO to be engaged only when engine speed and output speed are in allowable range and throttle is low. Also disengages PTO if speeds are exceeded.

VARIABLES TO SPECIFY: Minimum and maximum engine speed for engagement, maximum engine speed for allowable operation, minimum and maximum output speed for engagement, maximum output speed for allowable operation.

VOCATIONS: Various (with usage of PTO)

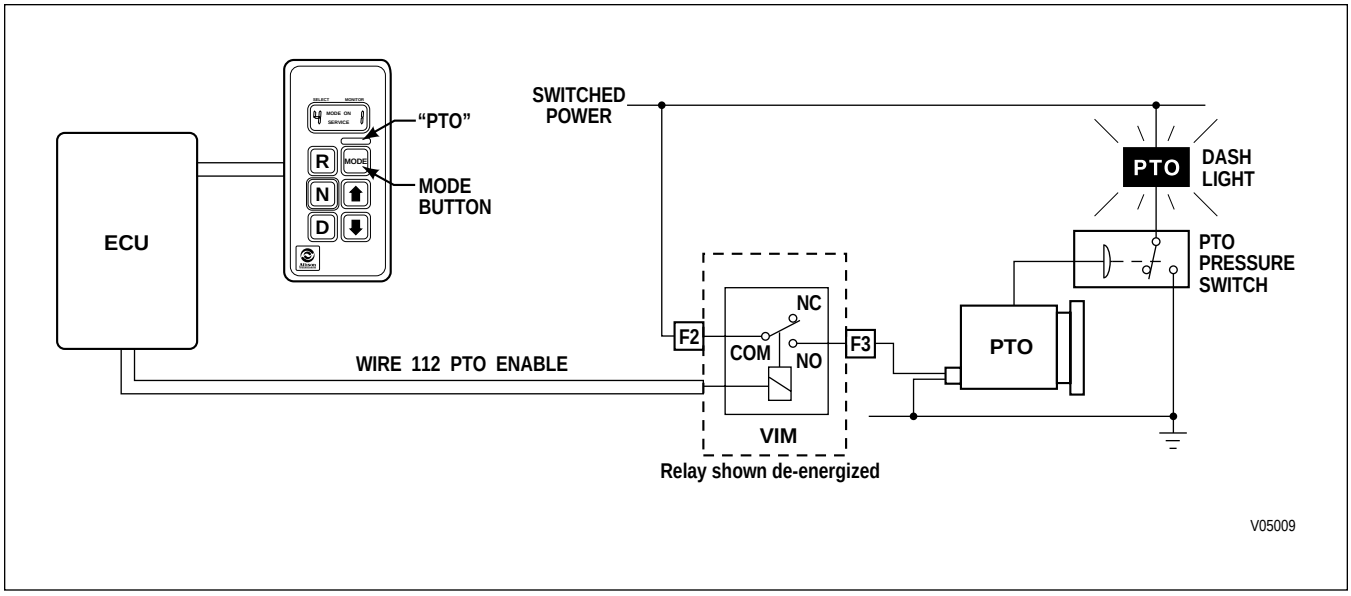


Figure P–4. PTO Enable (Using "MODE" Button)

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

SHIFT SELECTOR TRANSITION

USES: When two shift selectors are used, to select which one is active.

VARIABLES TO SPECIFY: None

VOCATIONS: Various

WARNING!

If this function is enabled in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be disabled in the calibration.

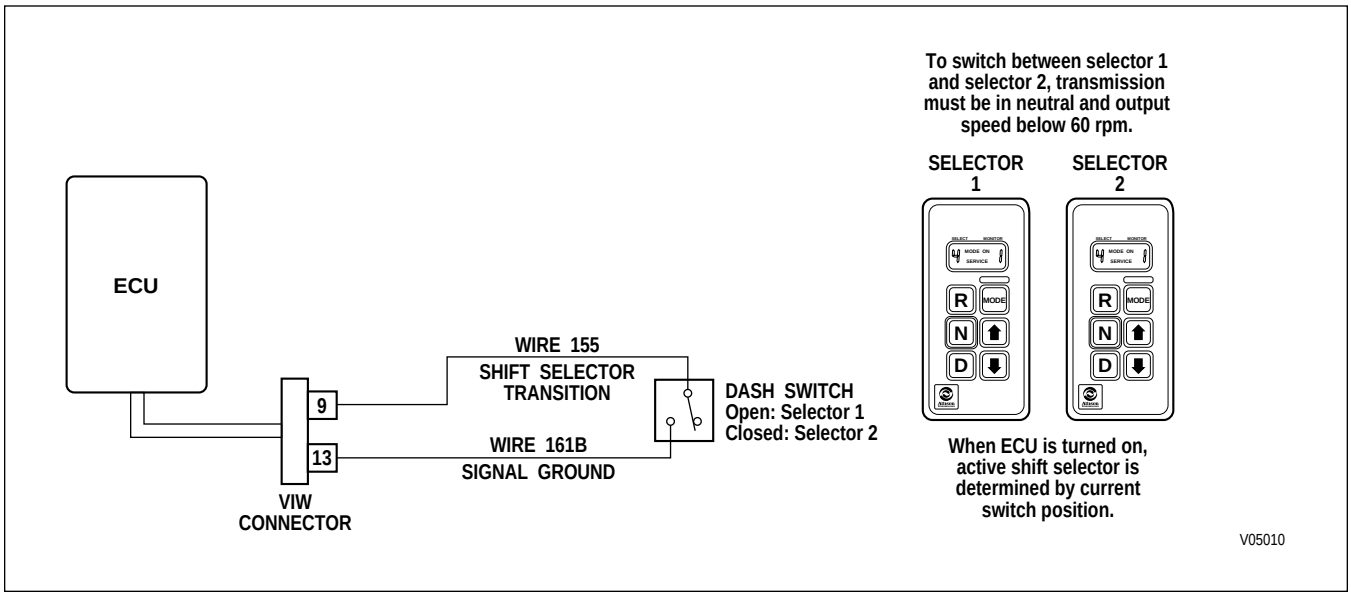


Figure P–5. Shift Selector Transition

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could cause unintended selection of range or other unpredictable operation resulting in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

AUXILIARY FUNCTION RANGE INHIBIT (STANDARD)

USES: Prevents inadvertent range selection when auxiliary equipment is operating or prevents engagement of the transmission unless brake pedal is depressed.

VARIABLES TO SPECIFY: None

VOCATIONS: Transit bus, school bus — auxiliary equipment input; various (brake pedal input)

WARNING!

If this function is enabled in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be disabled in the calibration.

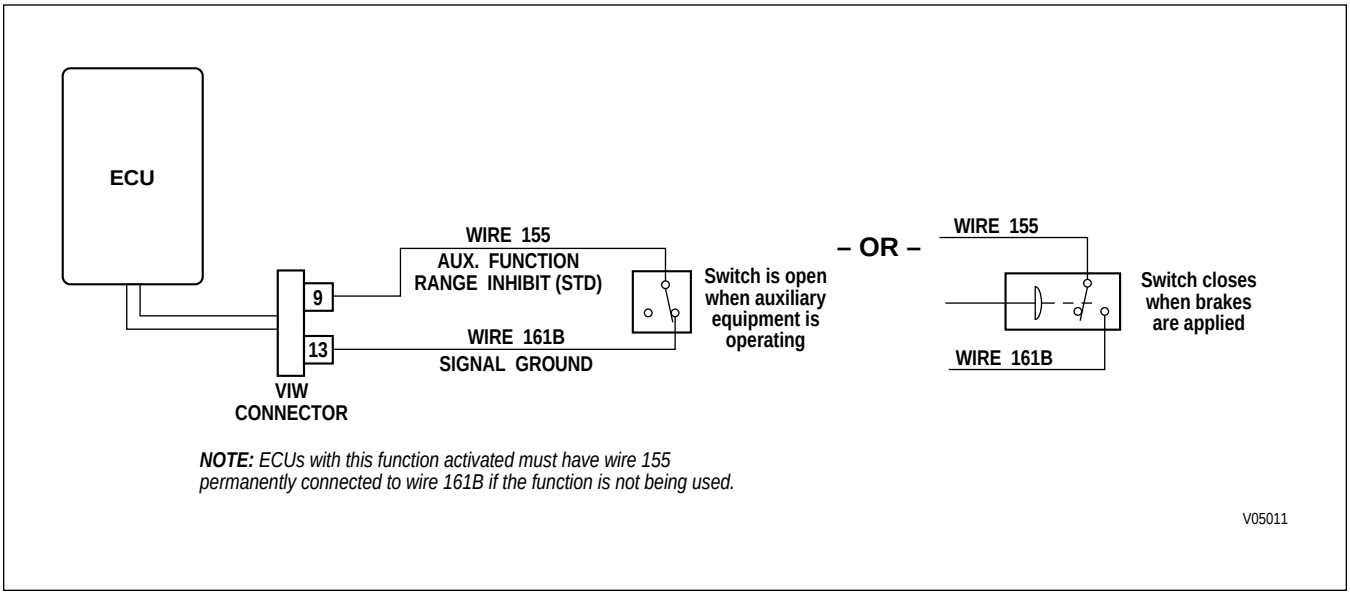


Figure P–6. Auxiliary Function Range Inhibit (Standard)

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could cause unintended selection of range or other unpredictable operation resulting in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

AUXILIARY FUNCTION RANGE INHIBIT (SPECIAL)

USES: Prevents inadvertent range selection when auxiliary equipment is operating. Used in emergency equipment to prevent inadvertent range selection from NEUTRAL.

VARIABLES TO SPECIFY: None

VOCATIONS: Fire trucks, crash trucks

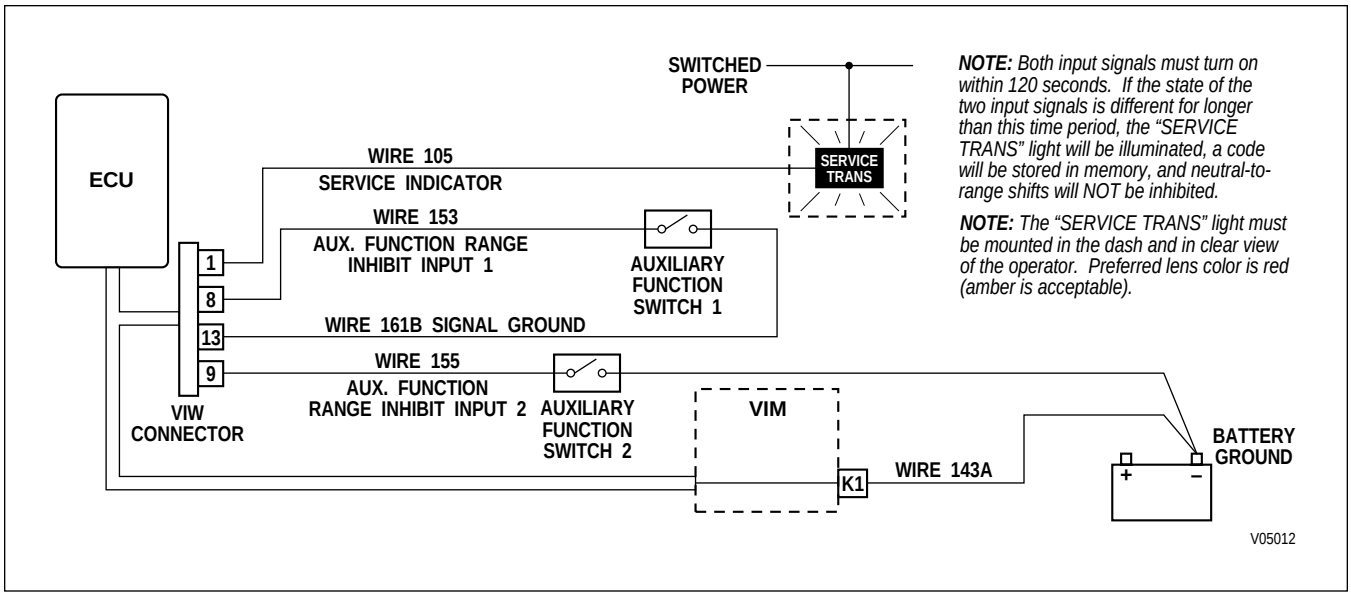


Figure P–7. Auxiliary Function Range Inhibit (Special)

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

AUXILIARY HOLD

USES: Provide a discrete input to hold the transmission in present range.

VARIABLES TO SPECIFY: None

VOCATIONS: Various

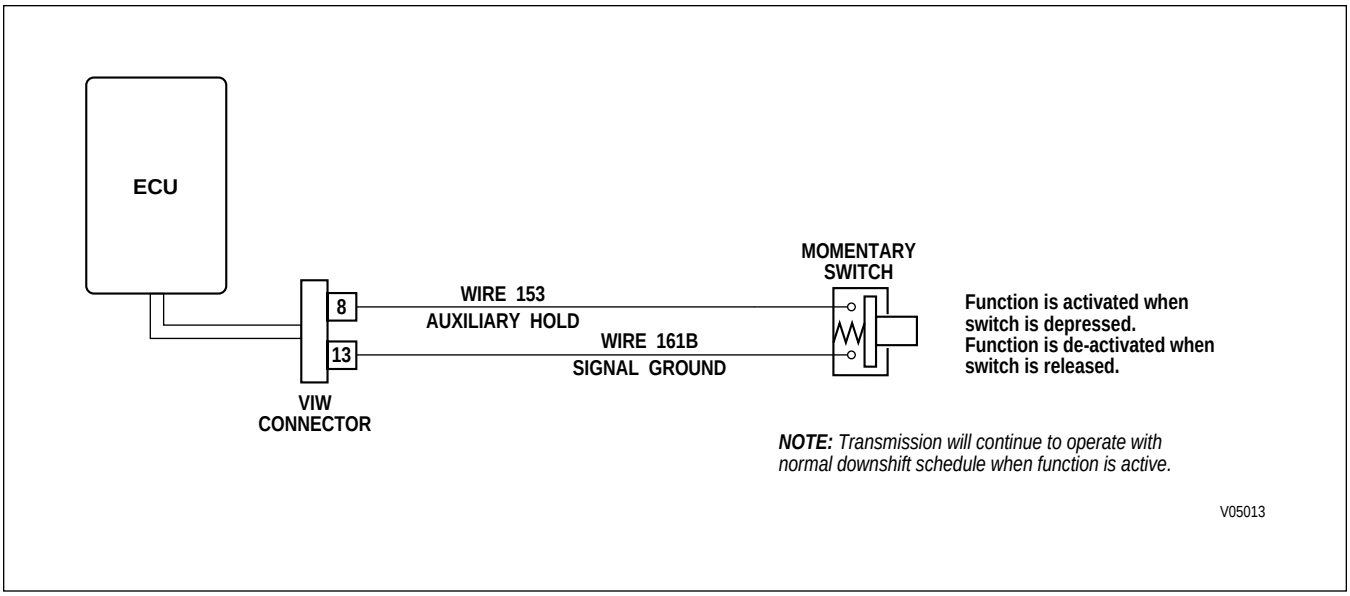


Figure P–8. Auxiliary Hold

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

ENGINE BRAKE/PRESELECT REQUEST AND ENGINE BRAKE ENABLE (STANDARD)

USES: Used with engine compression brakes to signal the ECU that the brake is active and to provide increased braking by preselecting a lower range. Also prevents engagement of engine brake with throttle > 0 or lockup OFF.

VARIABLES TO SPECIFY: Preselect range. Standard value is second range for exhaust style brakes and fourth range for compression style brakes.

VOCATIONS: Various

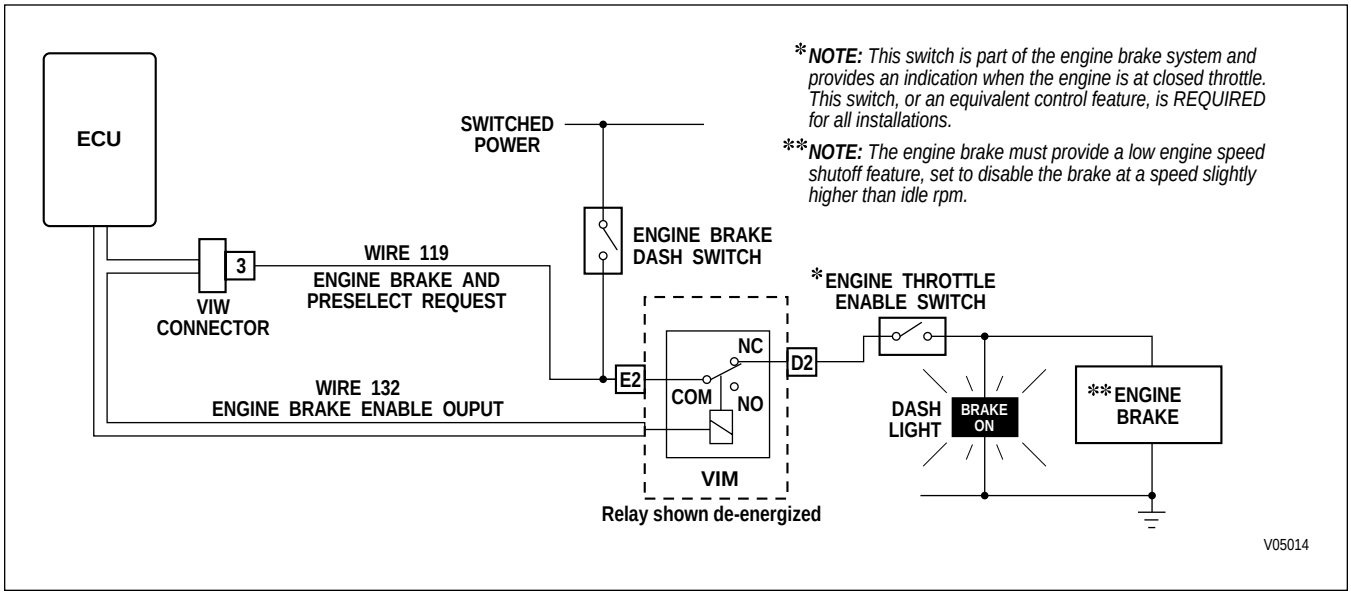


Figure P–9. Engine Brake/Preselect Request and Engine Brake Enable (Standard)

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

ENGINE BRAKE/PRESELECT REQUEST AND ENGINE BRAKE ENABLE (EUROPEAN)

USES: Used with engine exhaust brakes to provide a signal to the ECU that the brake is active and to provide increased braking by preselecting a lower range. Also prevents engagement of engine brake with throttle > 0 or lockup OFF.

VARIABLES TO SPECIFY: Preselect range. Standard value is second range for exhaust style brake and fourth for compression style brake.

VOCATIONS: Various

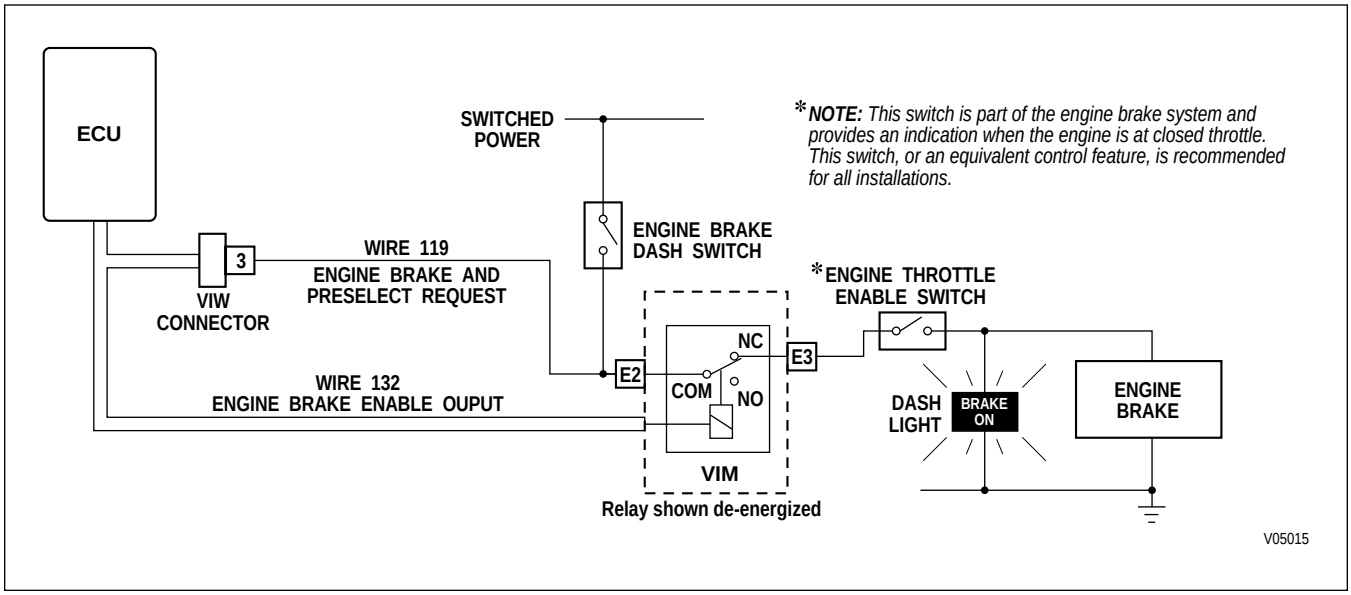


Figure P–10. Engine Brake/Preselect Request and Engine Brake Enable (European)

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

FIRE TRUCK PUMP MODE

USES: Facilitates engagement of split shaft PTO and shifts transmission to fourth range lockup.

VARIABLES TO SPECIFY: None

VOCATIONS: Fire Truck Pumpers

WARNING!

If this function is enabled in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be disabled in the calibration.

SYSTEM OPERATION

OPERATOR ACTION — System Response

TO ENGAGE:

1. *SELECT NEUTRAL* — Transmission shifts to Neutral.
2. *APPLY PARKING BRAKE* — None
3. *SELECT PUMP* — Turns on "Pump Mode Requested" light. Stops output shaft rotation. When split-shaft engages, PPE signal and "Pump Engaged" light are turned on. Transmission output unlocks.
4. *SELECT DRIVE* — Transmission shifts to fourth lockup. "OK To Pump" light is turned on.

TO DISENGAGE:

1. *SELECT NEUTRAL* — Transmission shifts to Neutral if output rpm < 1000.
2. *SELECT ROAD MODE* — Stops output shaft rotation. PTO disengages. Transmission shifts back to Neutral.

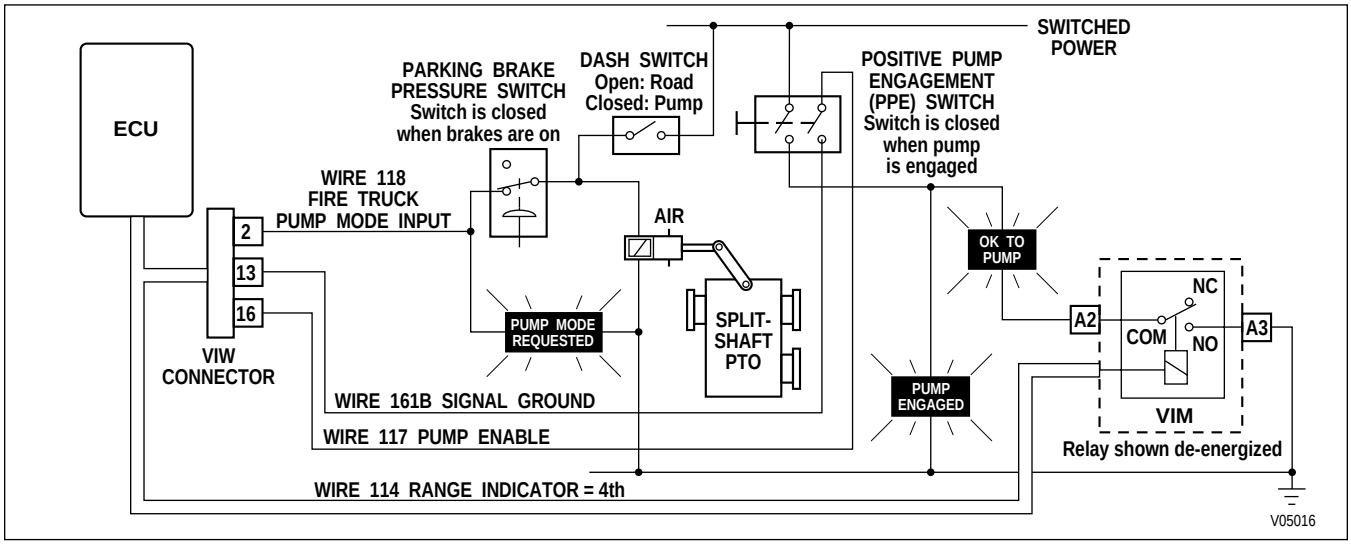


Figure P–11. Fire Truck Pump Mode

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

FIRE TRUCK PUMP MODE (OPTIONAL)

USES: Facilitates engagement of split shaft PTO and shifts transmission to fourth range lockup.

VARIABLES TO SPECIFY: None

VOCATIONS: Fire Truck Pumpers

WARNING!

If this function is enabled in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be disabled in the calibration.

SYSTEM OPERATION

OPERATOR ACTION — System Response

TO ENGAGE:

1. SELECT NEUTRAL — Transmission shifts to Neutral.
2. APPLY PARKING BRAKE — None
3. SELECT PUMP — Turns on "Pump Mode Requested" light. Turns on both input signals to ECU (wires 117 and 118) which activates "fire truck" mode. When split-shaft shifts, "Pump Engaged" light is turned on.
4. SELECT DRIVE — Transmission shifts to fourth lockup. "OK To Pump" light is turned on.

TO DISENGAGE:

1. SELECT NEUTRAL — Transmission shifts to Neutral if output rpm < 1000.
2. SELECT ROAD MODE — PTO disengages.

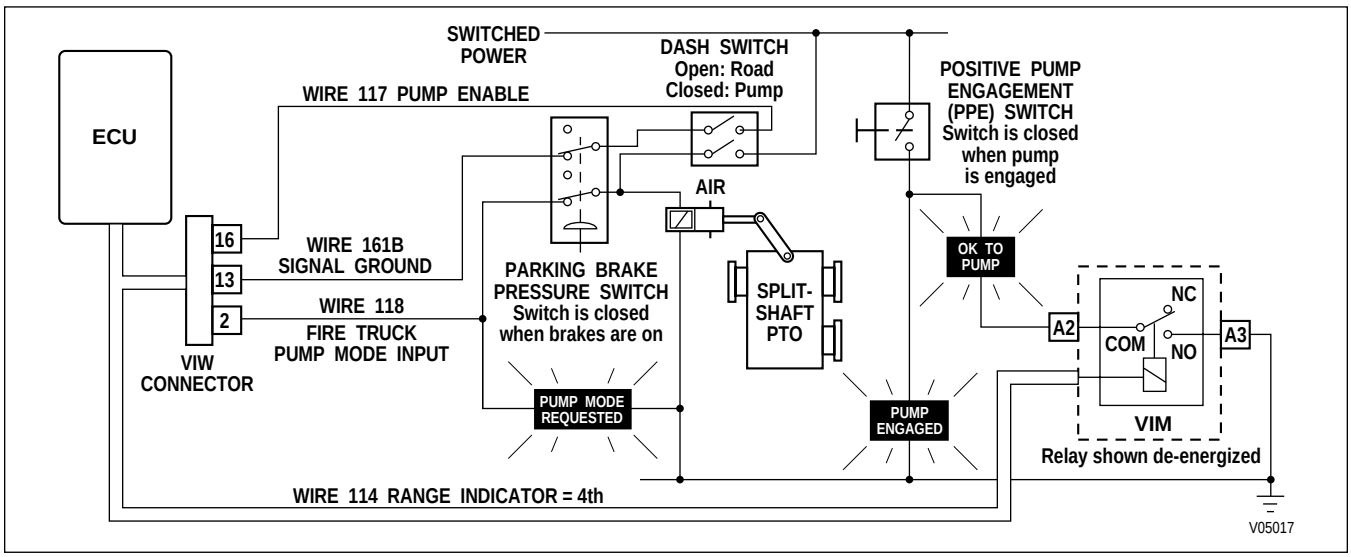


Figure P–12. Fire Truck Pump Mode (Optional)

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could cause unintended selection of range or other unpredictable operation resulting in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

QUICK-TO-NEUTRAL PUMP

USES: Automatically shifts transmission to NEUTRAL when pumped medium approaches excessive pressure levels.

VARIABLES TO SPECIFY: None

VOCATIONS: Oil field pumping

WARNING!

If this function is enabled in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be disabled in the calibration.

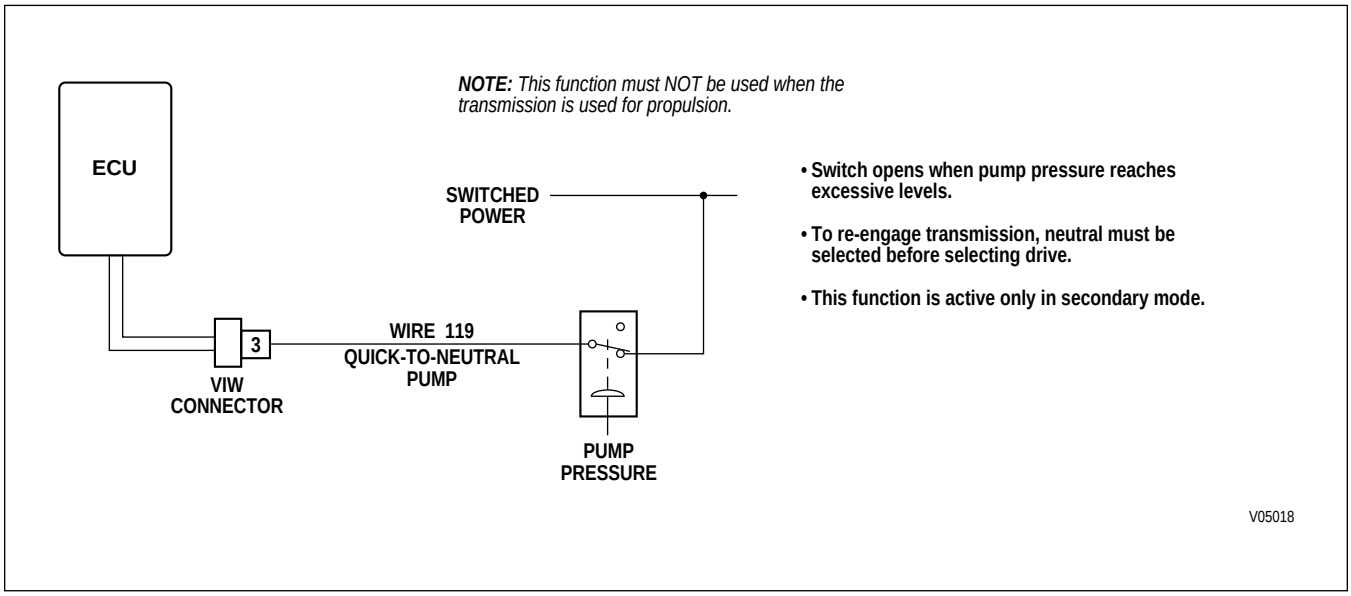


Figure P–13. Quick-To-Neutral Pump

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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AUTOMATIC NEUTRAL FOR PTO (STANDARD)

USES: Provides for automatic selection of NEUTRAL when PTO is operated regardless of range selected. Requires re-selecting range to shift out of NEUTRAL

VARIABLES TO SPECIFY: Maximum output speed for activating this function.

VOCATIONS: Various (with usage of PTO)

WARNING!

If this function is enabled in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be disabled in the calibration.

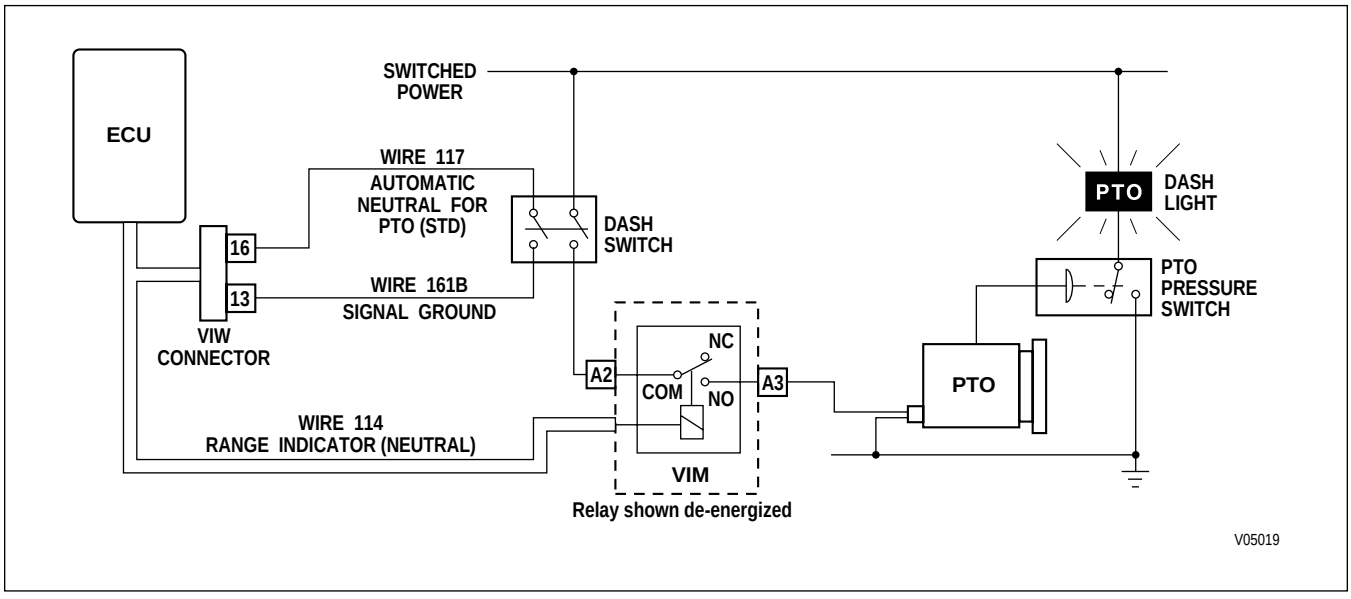


Figure P–14. Automatic Neutral for PTO (Standard)

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could cause unintended selection of range or other unpredictable operation resulting in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

AUTOMATIC NEUTRAL FOR PTO (SPECIAL)

USES: Provides for automatic selection of NEUTRAL and enables fast idle when work brake is applied. Automatic re-engagement of forward ranges occurs when packing is completed and work brake is released.

VARIABLES TO SPECIFY: Maximum output speed to activate this function.

VOCATIONS: Refuse packer

WARNING!

If this function is enabled in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be disabled in the calibration.

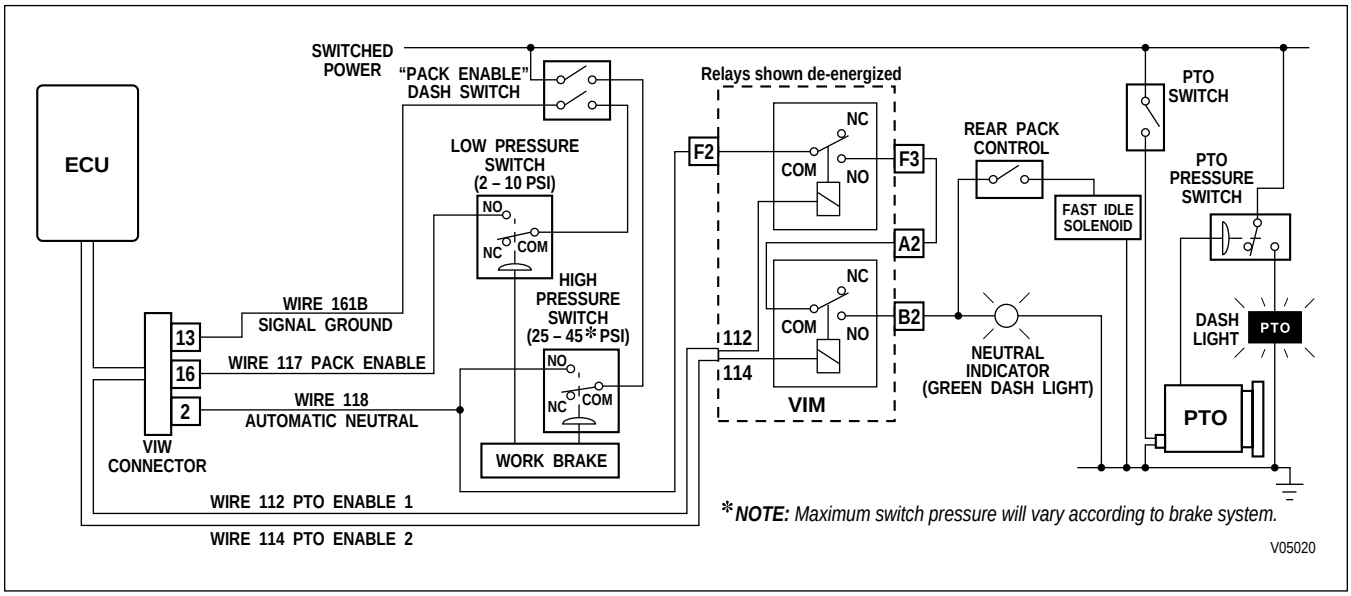


Figure P–15. Automatic Neutral for PTO (Special)

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could cause unintended selection of range or other unpredictable operation resulting in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

AUTOMATIC NEUTRAL

USES: Automatically shifts transmission to NEUTRAL when vehicle doors are opened. Re-engages transmission in DRIVE when doors are closed.

VARIABLES TO SPECIFY: None

VOCATIONS: Transit bus

WARNING!

If this function is enabled in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be disabled in the calibration.

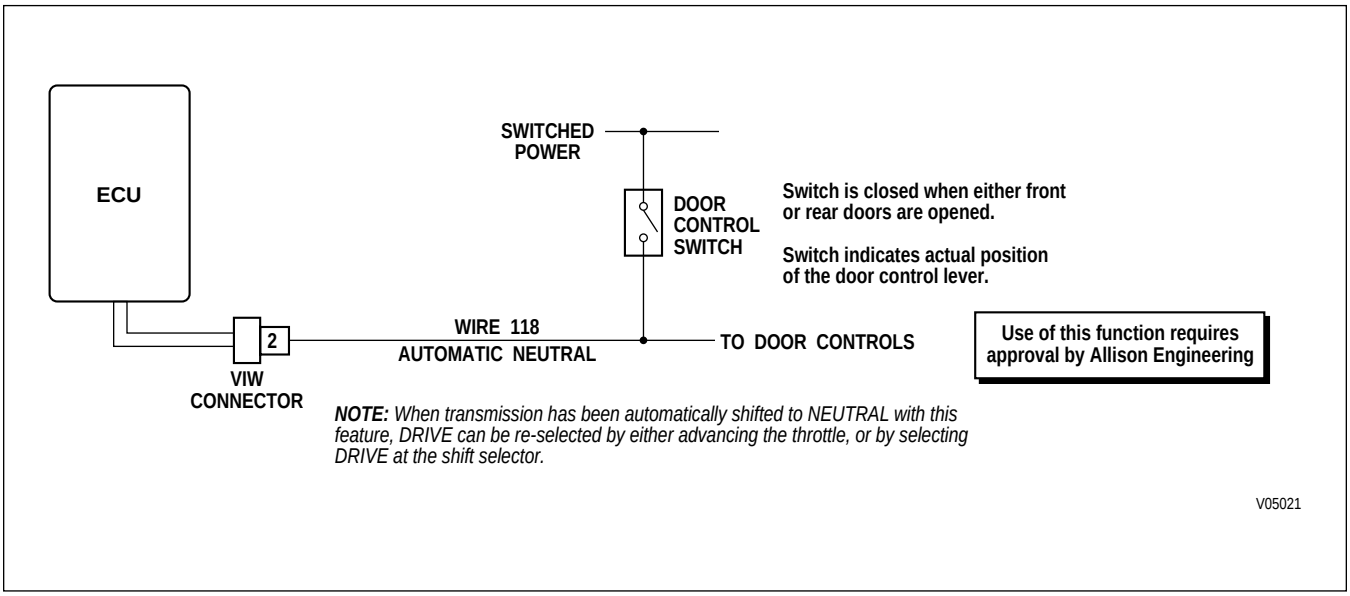


Figure P–16. Automatic Neutral

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

TWO SPEED AXLE INPUT AND OUTPUT

USES: Provides output speed interlock for axle engagement, input to ECU, and input to speedometer to adjust for axle ratio change.

VARIABLES TO SPECIFY: Output speed to activate, output speed to deactivate

VOCATIONS: Dump truck, refuse packer, cement mixer, two-speed axle equipped vehicles

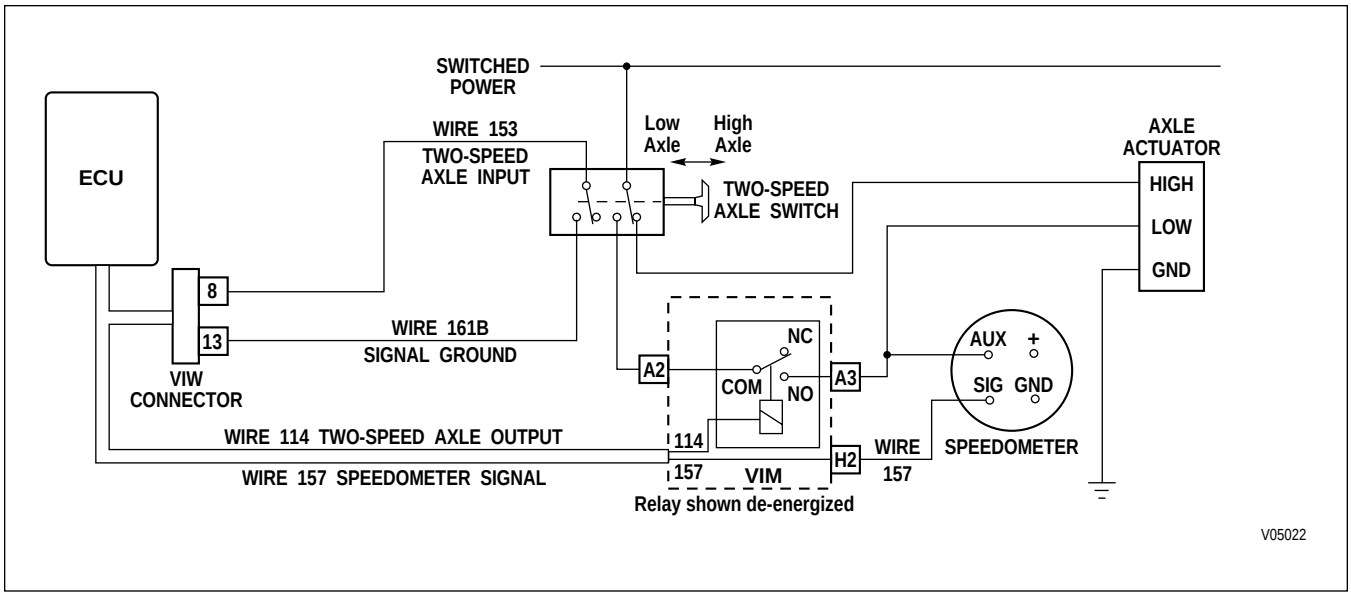


Figure P–17. Two Speed Axle Input and Output

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

MANUAL LOCKUP

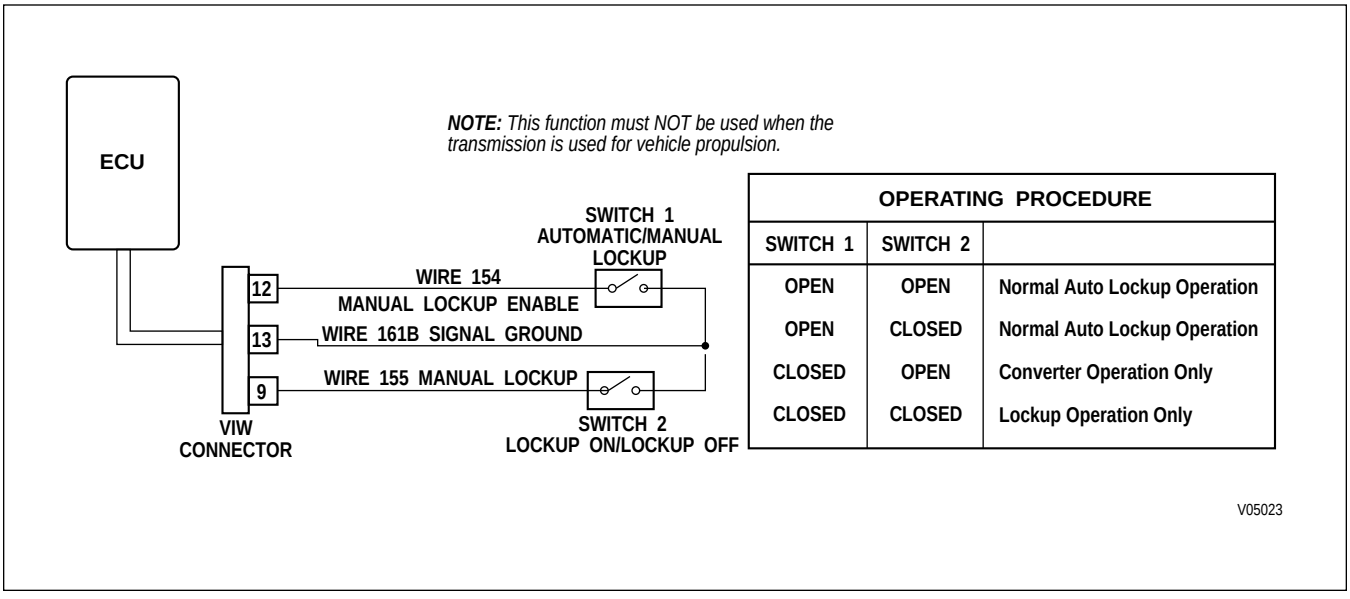
USES: Provides for the manual application of the lockup clutch for non-roading applications. Uses two inputs: one to select manual versus automatic lockup shift mode, and the second as the switching mechanism to command the lockup clutch on and off.

VARIABLES TO SPECIFY: None

VOCATIONS: Oil field pumping, mud pumps, hoists, drilling

WARNING!

If this function is enabled in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be disabled in the calibration.



OPERATING PROCEDURE		
SWITCH 1	SWITCH 2	
OPEN	OPEN	Normal Auto Lockup Operation
OPEN	CLOSED	Normal Auto Lockup Operation
CLOSED	OPEN	Converter Operation Only
CLOSED	CLOSED	Lockup Operation Only

Figure P–18. Manual Lockup

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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REVERSE ENABLE

USES: Provides for a separate instrument panel-mounted switch which must be pressed simultaneously with the REVERSE button to achieve Reverse. MODE button may also be used.

VARIABLES TO SPECIFY: None

VOCATIONS: European transit buses and tour buses

WARNING!

If this function is enabled in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be disabled in the calibration.

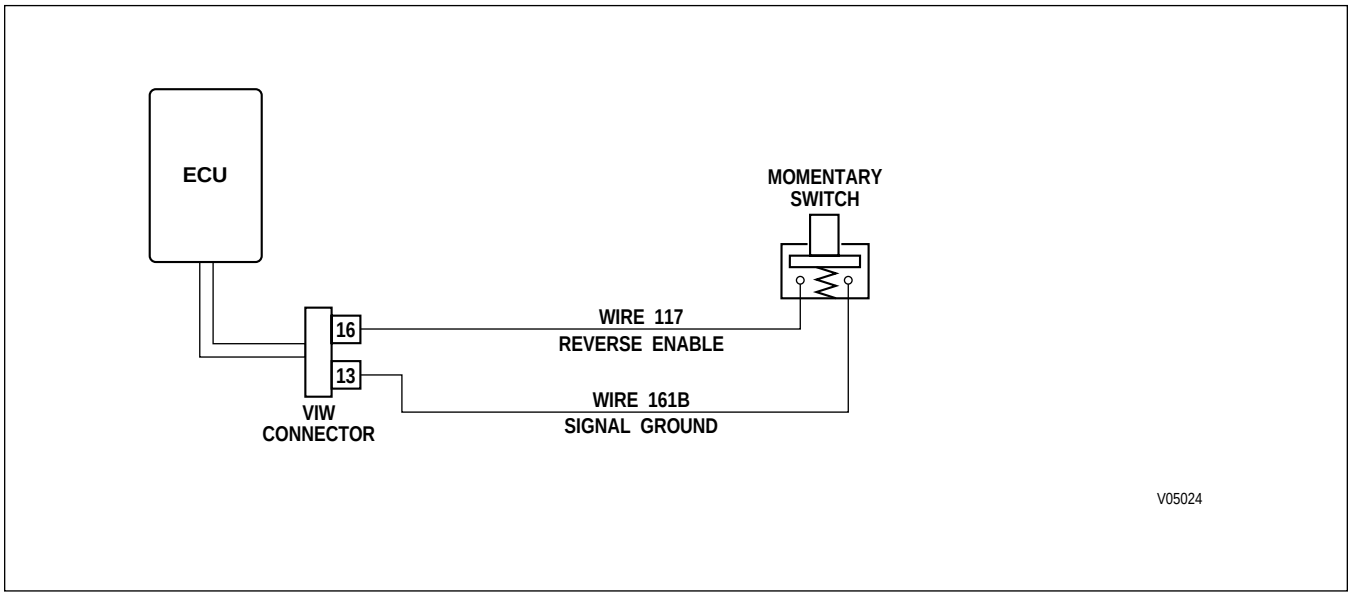

Figure P–19. Reverse Enable

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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SHIFT IN PROCESS/SHIFT ENABLE

USES: Used to reduce engine power during a shift for high horsepower applications.

VARIABLES TO SPECIFY: None

VOCATIONS: Oil field pumping

WARNING!

If this function is enabled in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be disabled in the calibration.

OPERATING PROCEDURE

1. ECU sends signal (“Shift in Process”) to powertrain module that a shift is being requested.
2. Powertrain module reduces engine power and sends a signal to ECU (“Shift Enable”) indicating that it is OK to shift.
3. ECU commands shift. When shift is completed, “Shift in Process” output turns off.
4. Powertrain module turns off the Shift Enable signal.

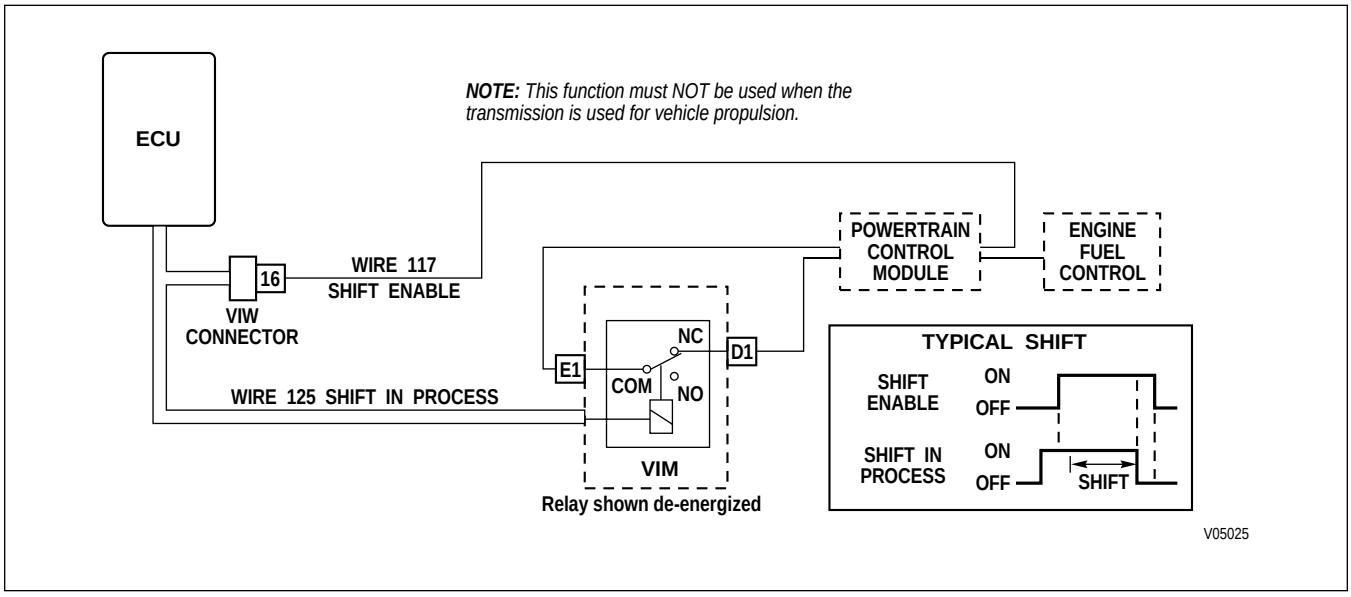

Figure P–20. Shift in Process/Shift Enable

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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ANTI-LOCK BRAKE RESPONSE

USES: Signals the ECU when ABS function is active, so that lockup clutch and retarder will be disabled.

VARIABLES TO SPECIFY: None

VOCATIONS: Various

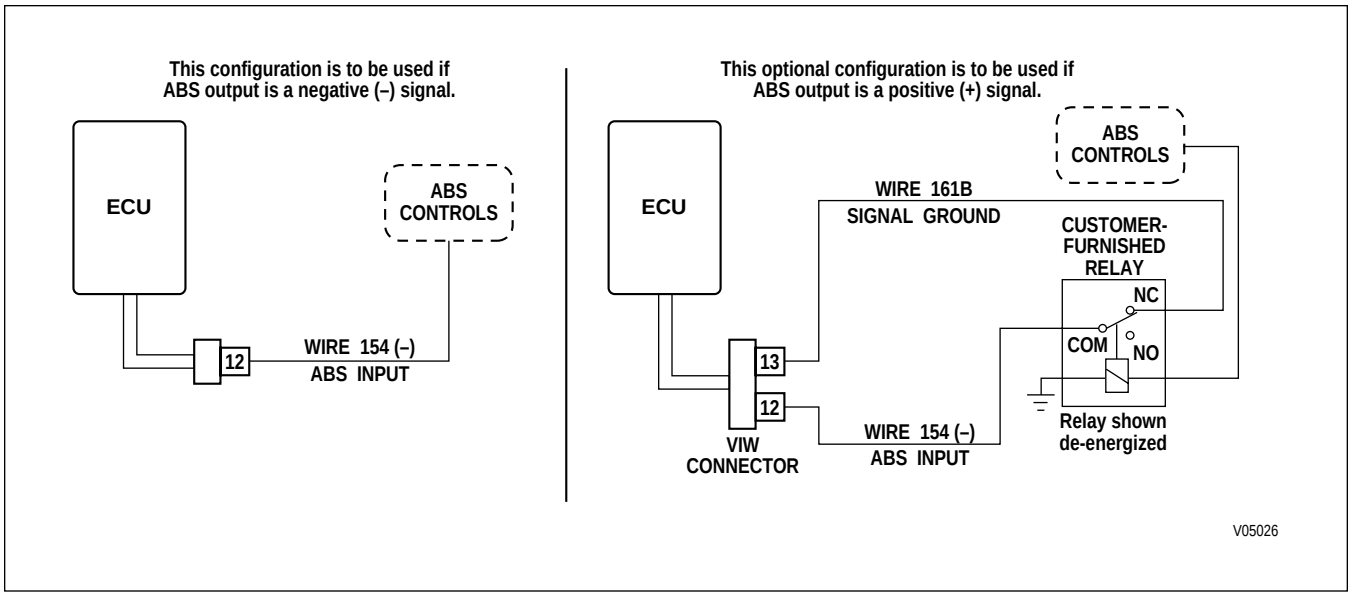

Figure P–21. Anti-Lock Brake Response

NOTE: ***This signal must stay constantly low during the duration of the ABS-active period. When ABS switches off, the transmission lockup clutch is re-applied, and retarder or engine-brake operation is resumed.***

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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RETARDER ENABLE

USES: Provides for operator ON/OFF control of the retarder, transmission temperature indication, and brake lights during retarder operation.

USES: None

VOCATIONS: Various. This function is **required** for retarder-equipped transmissions.

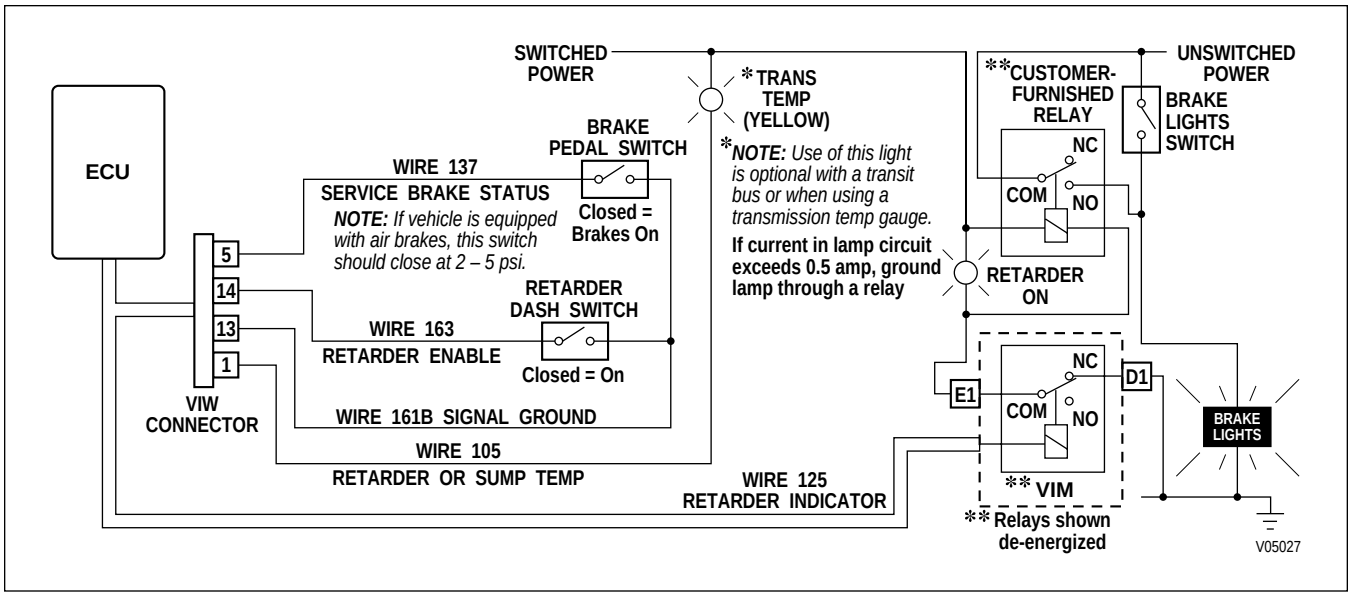

Figure P–22. Retarder Enable

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

SERVICE BRAKE STATUS

USES: Indicates to the ECU whether vehicle braking is being provided by the retarder or vehicle brakes, so that the transmission controls can be adapted accordingly.

VARIABLES TO SPECIFY: None

VOCATIONS: Various. This function is **required** for retarder-equipped transmissions.

This function is used in conjunction with Retarder Enable Input Function. Refer to schematic for Input Function, noting the use of wire 137.

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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DIFFERENTIAL CLUTCH REQUEST

USES: Provides for operator ON/OFF control of the differential locking clutch in the MD 3070PT transmission transfer case.

VARIABLES TO SPECIFY: None

VOCATIONS: Various. This function is **required** for all MD 3070PT transmissions and used only with that model.

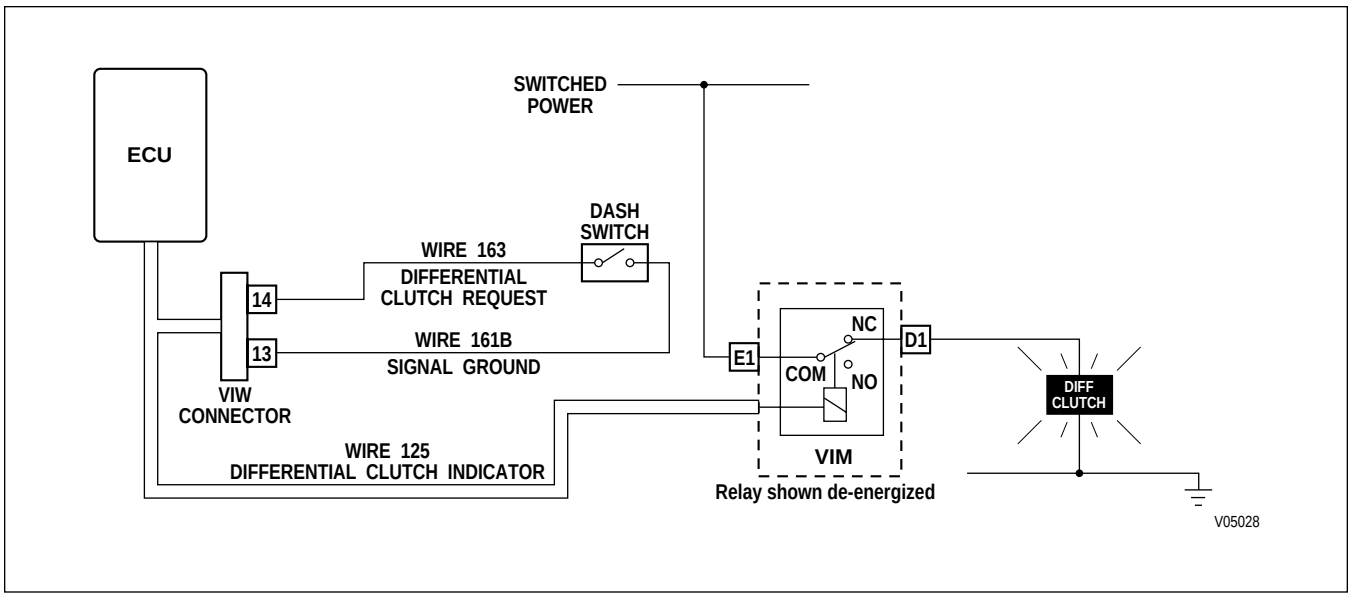

Figure P–23. Differential Clutch Request

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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AUTOMATIC NEUTRAL FOR REFUSE PACKER AND PTO ENABLE

USES: Provides for automatic selection of NEUTRAL and activation of PTO when park brake is applied. Automatically re-engages transmission when park brake is released.

VARIABLES TO SPECIFY: Max output rpm to enable Neutral, max engine rpm for PTO engagement, max engine rpm for PTO operation, max output rpm for PTO engagement, max output rpm for PTO operation.

VOCATIONS: Refuse packer, recycling truck

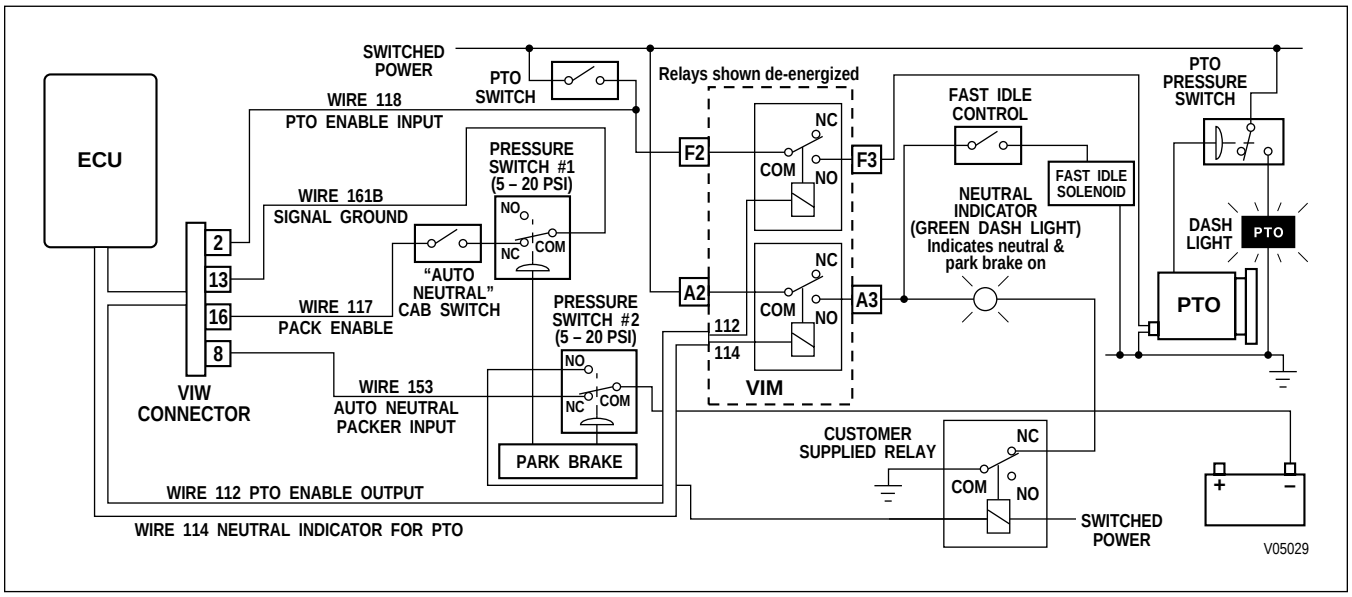

Figure P–24. Automatic Neutral for Refuse Packer and PTO Enable

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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AUTOMATIC NEUTRAL FOR REFUSE PACKER AND PTO ENABLE (OPTIONAL)

USES: Provides for automatic selection of NEUTRAL and activation of fast idle when work brake is applied. Automatically re-engages transmission when park brake is released.

VARIABLES TO SPECIFY: Max output rpm to enable Neutral, max engine rpm for PTO engagement, max engine rpm for PTO operation, max output rpm for PTO engagement, max output rpm for PTO operation.

VOCATIONS: Refuse packer, recycling truck

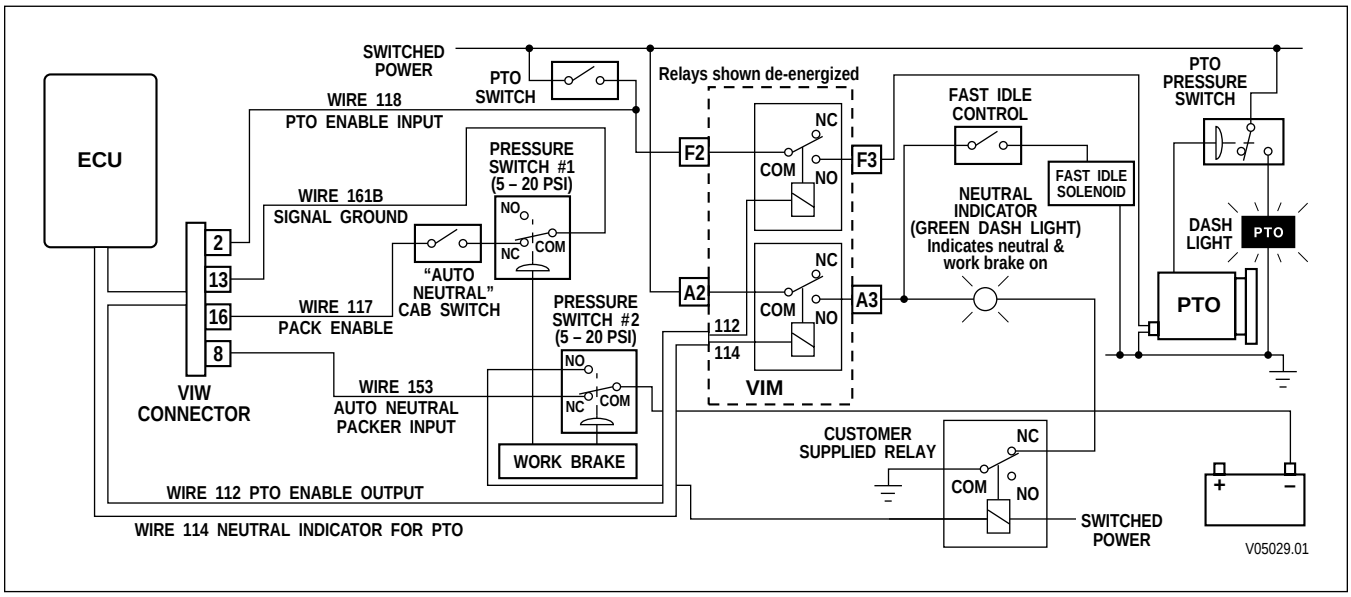

Figure P–25. Automatic Neutral for Refuse Packer and PTO Enable (Optional)

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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KICKDOWN

USES: Provides both economy and performance shift points at full throttle. Operator changes from economy to performance by stepping through a detent at the throttle pedal.

VARIABLES TO SPECIFY: None

VOCATIONS: Various

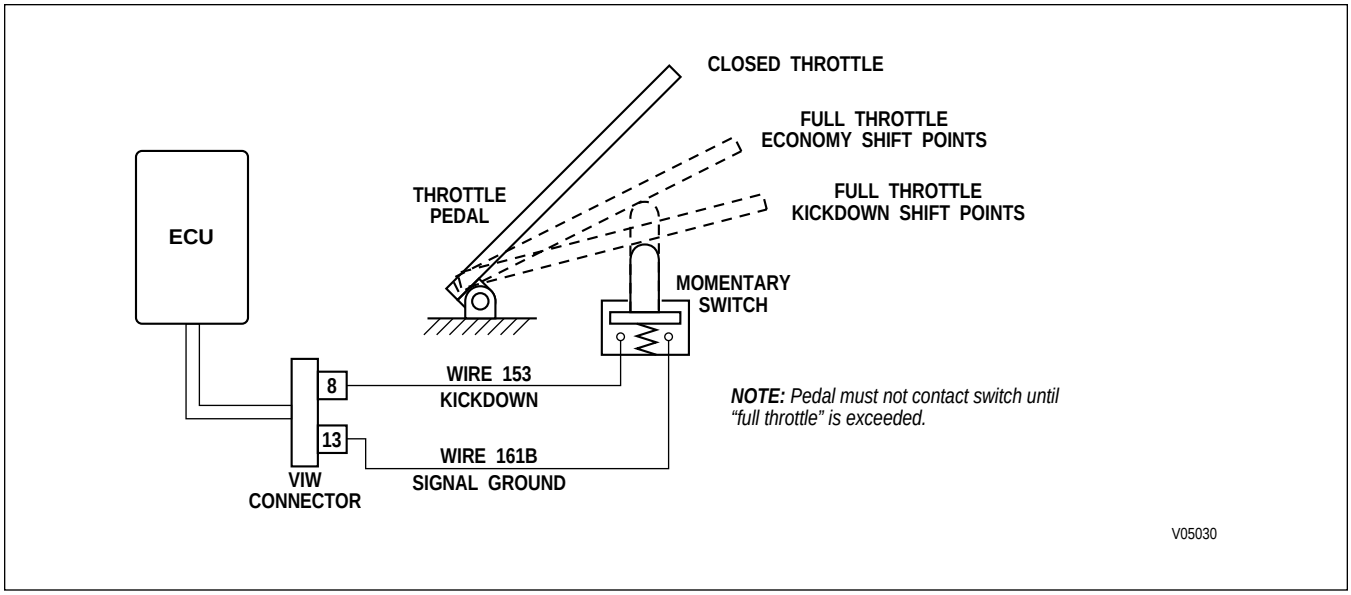

Figure P–26. Kickdown

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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FOURTH LOCKUP PUMP MODE

USES: Facilitates engagement of split shaft PTO and shifts transmission to fourth range lockup for driving a vehicle-mounted pump.

VARIABLES TO SPECIFY: None

VOCATIONS: Street cleaners, sewer cleaners

WARNING!

If this function is turned "ON" in the shift calibration, the function MUST be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it MUST be turned "OFF" in the calibration.

SYSTEM OPERATION

OPERATOR ACTION — System Response

TO ENGAGE:

1. *SELECT NEUTRAL* — Transmission shifts to Neutral.
2. *APPLY PARKING BRAKE* — None
3. *SELECT PUMP* — Turns on "Pump Mode Requested" light. Turns on both input signals to ECU (wires 117 and 118) which activates "pump" mode. When split-shaft shifts, "Pump Engaged" light is turned on.
4. *SELECT DRIVE* — Transmission shifts to fourth lockup. "OK To Pump" light is turned on.

TO DISENGAGE:

1. *SELECT NEUTRAL* — Transmission shifts to Neutral if output rpm < 1000.
2. *SELECT ROAD MODE* — PTO disengages.

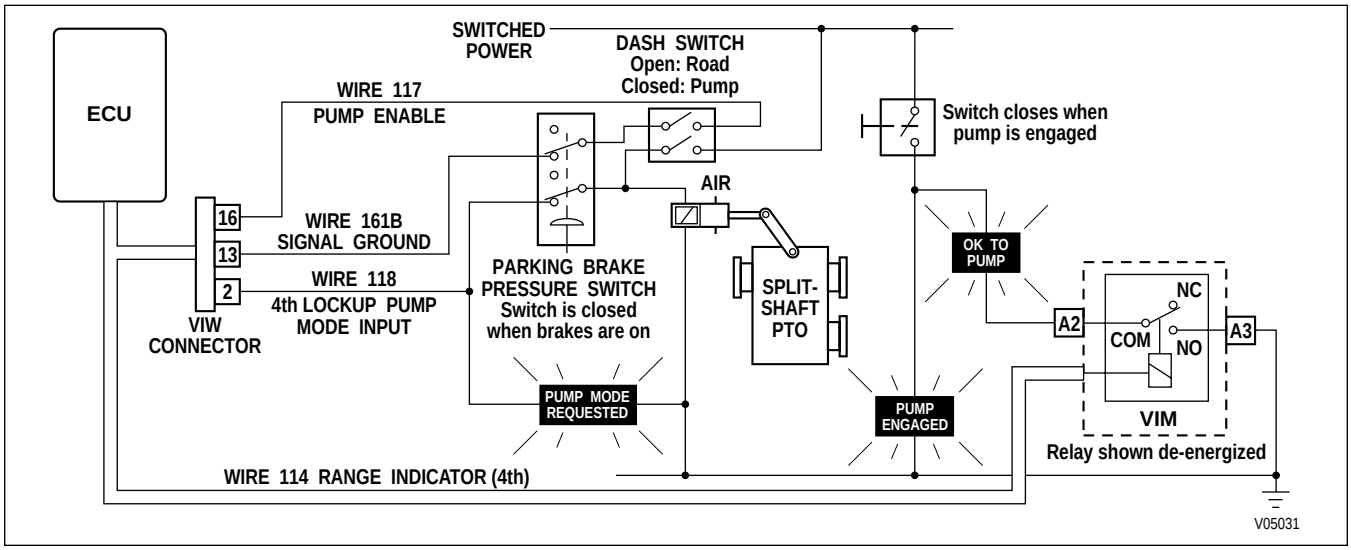

Figure P–27. Fourth Lockup Pump Mode

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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AUTOMATIC NEUTRAL FOR REFUSE PACKER AND PTO ENABLE WITH SERVICE BRAKE STATUS

USES: Provides for automatic selection of NEUTRAL and activation of fast idle when loading arm is activated. Automatically re-engages transmission when loading arm is retracted if service brake is depressed.

VARIABLES TO SPECIFY: Max output rpm to enable Neutral, max engine rpm for PTO engagement, max engine rpm for PTO operation, max output rpm for PTO engagement, max output rpm for PTO operation.

VOCATIONS: Refuse packer, recycling truck

WARNING!

This feature is meant to be used in applications where the vehicle operator remains in the cab. If the operator leaves the vehicle, the park brake must be engaged and Neutral must be selected prior to the operator exiting the cab. In addition, vehicles using this feature must have the following Warning sticker visible in the vehicle cab: "WARNING: Set Park Brake and select Neutral before exiting cab!"

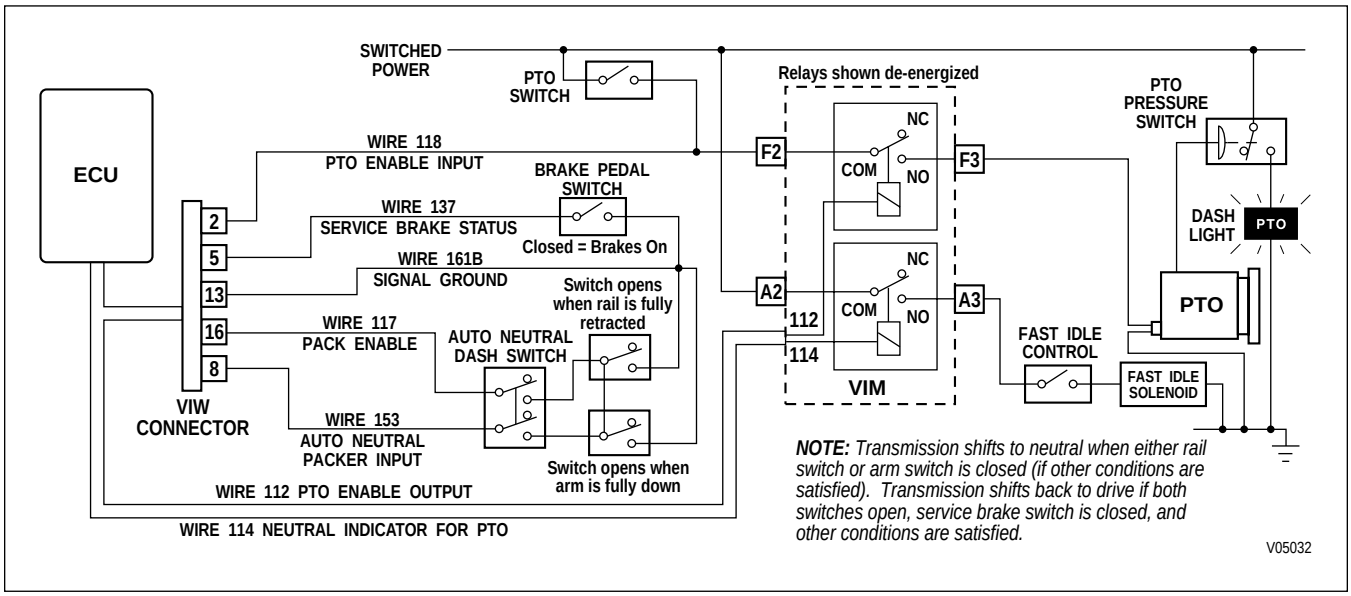

Figure P–28. Automatic Neutral for Refuse Packer and PTO Enable With Service Brake Status

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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AUTOMATIC NEUTRAL FOR REFUSE PACKER AND PTO ENABLE WITH SERVICE BRAKE STATUS (OPTION 1)

USES: Provides for selection of NEUTRAL and enabling fast idle through activation of a dash mounted switch. Automatically re-engages transmission when switch is opened if service brake is depressed.

VARIABLES TO SPECIFY: Max output rpm to enable Neutral, max engine rpm for PTO engagement, max engine rpm for PTO operation, max output rpm for PTO engagement, max output rpm for PTO operation.

VOCATIONS: Refuse packer, recycling truck

WARNING!

This feature is meant to be used in applications where the vehicle operator remains in the cab. If the operator leaves the vehicle, the park brake must be engaged and Neutral must be selected prior to the operator exiting the cab. In addition, vehicles using this feature must have the following Warning sticker visible in the vehicle cab: "WARNING: Set Park Brake and select Neutral before exiting cab!"

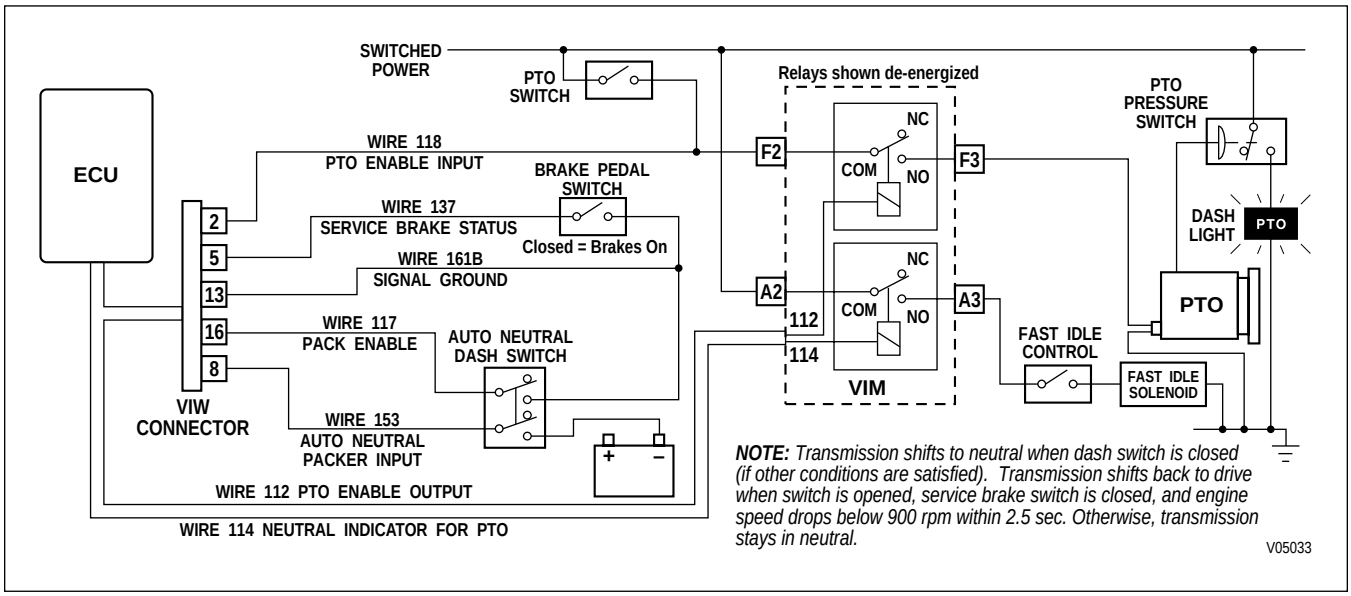

Figure P–29. Automatic Neutral for Refuse Packer and PTO Enable With Service Brake Status (Option 1)

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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SUMP/RETARDER TEMPERATURE INDICATOR

USES: Turn on dash indicator when transmission sump or retarder-out temperature has exceeded specified limits.

VARIABLES TO SPECIFY: Sump temperature to turn ON, sump temperature to turn OFF.

VOCATIONS: Various

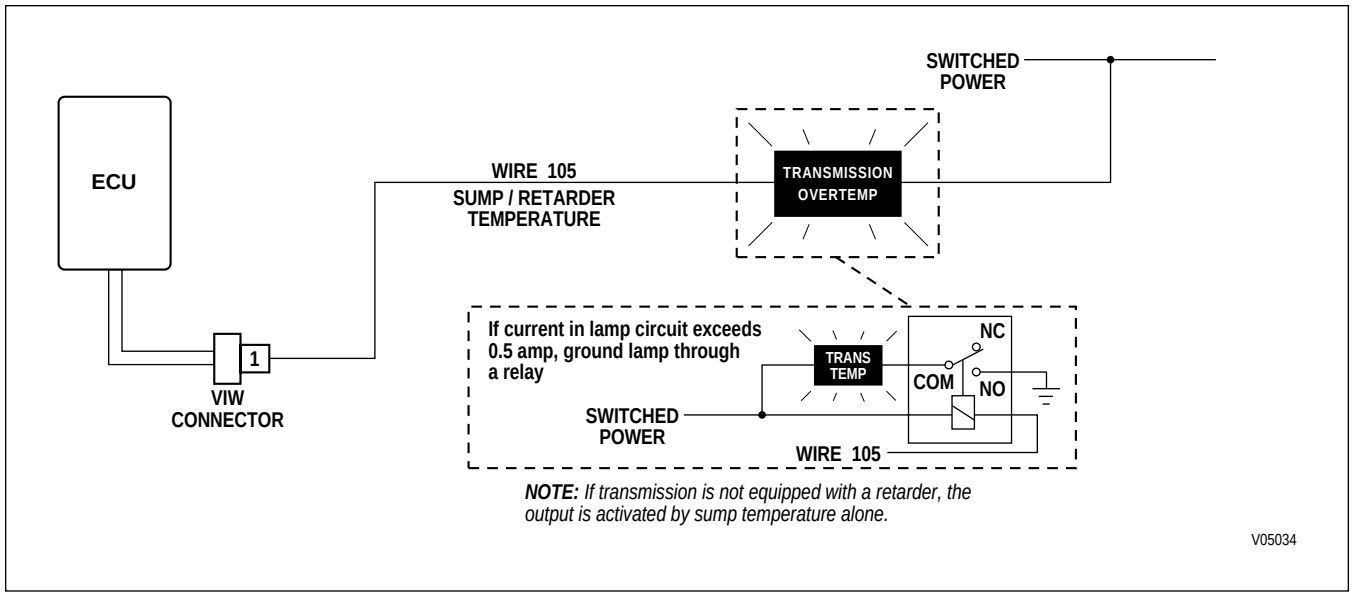

Figure P–30. Sump/Retarder Temperature Indicator

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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RANGE INDICATOR

USES: Used with auxiliary vehicle systems to permit operation only in specified transmission range(s).

VARIABLES TO SPECIFY: Range or ranges to be indicated

VOCATIONS: Various

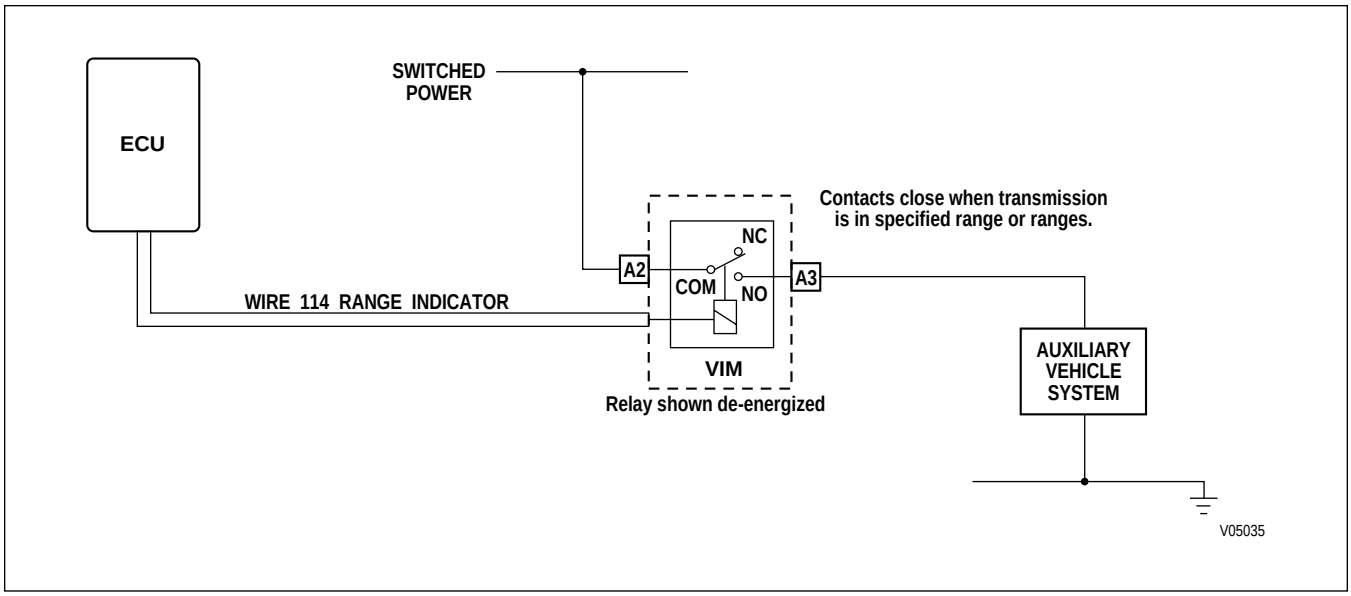

Figure P–31. Range Indicator

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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OUTPUT SPEED INDICATOR — A

USES: To signal that the transmission output shaft has exceeded a specified value.

VARIABLES TO SPECIFY: Rpm to turn output ON and to turn output OFF. The ON value must be higher than the OFF value.

VOCATIONS: Various

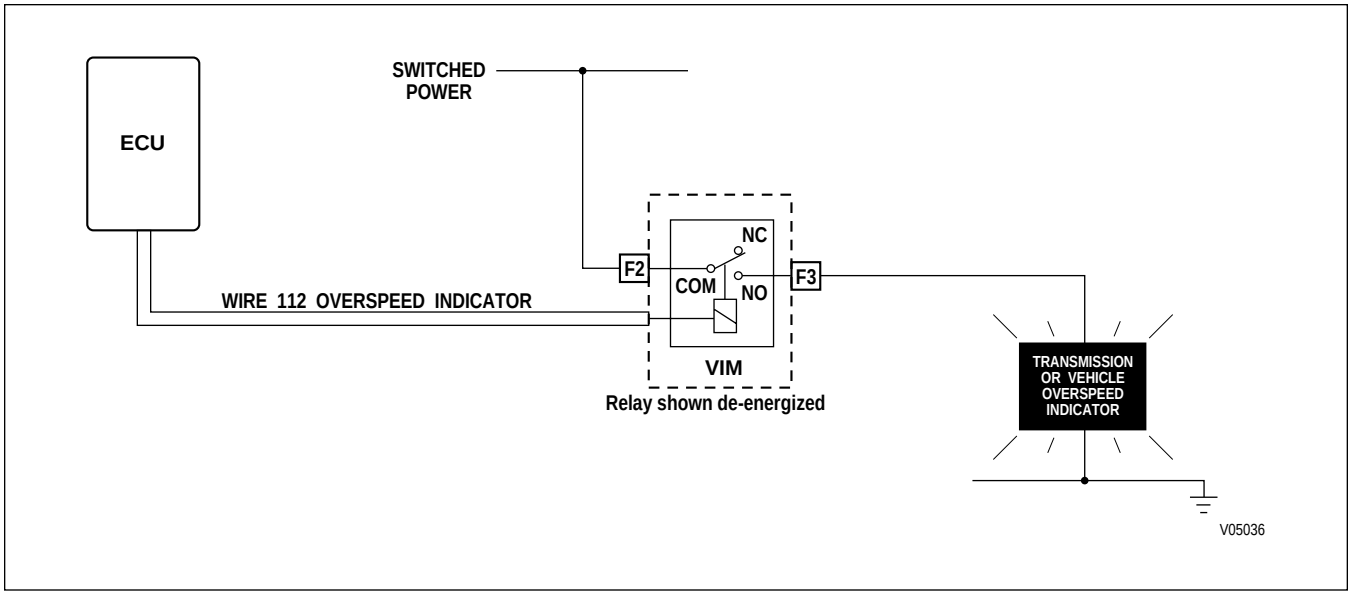

Figure P–32. Output Speed Indicator — A

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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OUTPUT SPEED INDICATOR — B

USES: To signal that the transmission output shaft has exceeded a specified value.

VARIABLES TO SPECIFY: Rpm to turn output ON and to turn output OFF. The ON value must be higher than the OFF value.

VOCATIONS: Various

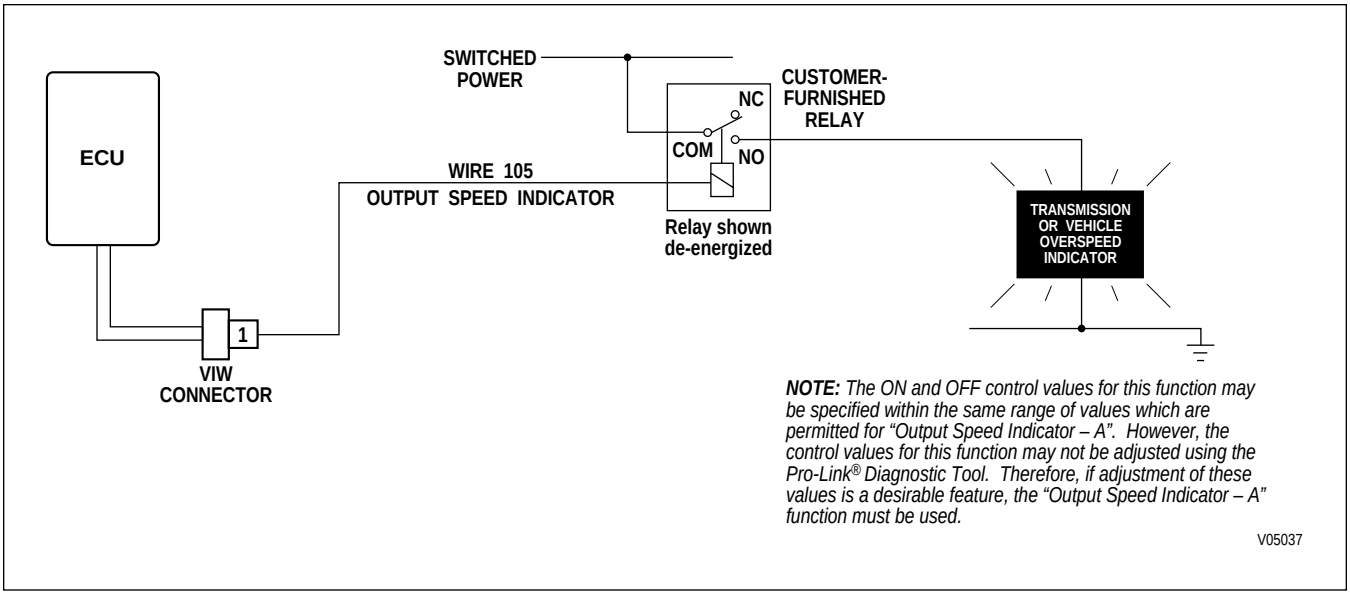

Figure P–33. Output Speed Indicator — B

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

PTO OVERSPEED INDICATOR

USES: Turn on dash light when PTO reaches an overspeed condition.

VARIABLES TO SPECIFY: Rpm to turn ON; rpm to turn OFF.

VOCATIONS: Various

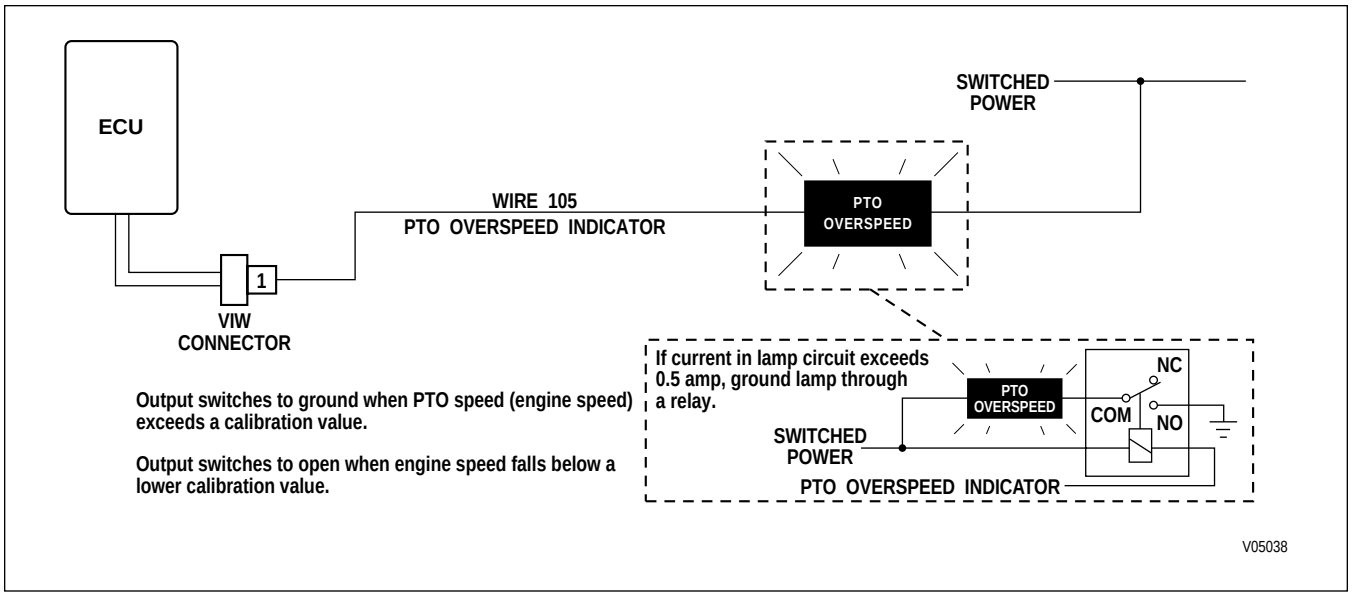

Figure P–34. PTO Overspeed Indicator

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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ENGINE OVERSPEED INDICATOR

USES: To turn on dash light when engine reaches an overspeed condition.

VARIABLES TO SPECIFY: Rpm to turn ON; rpm to turn OFF.

VOCATIONS: Various

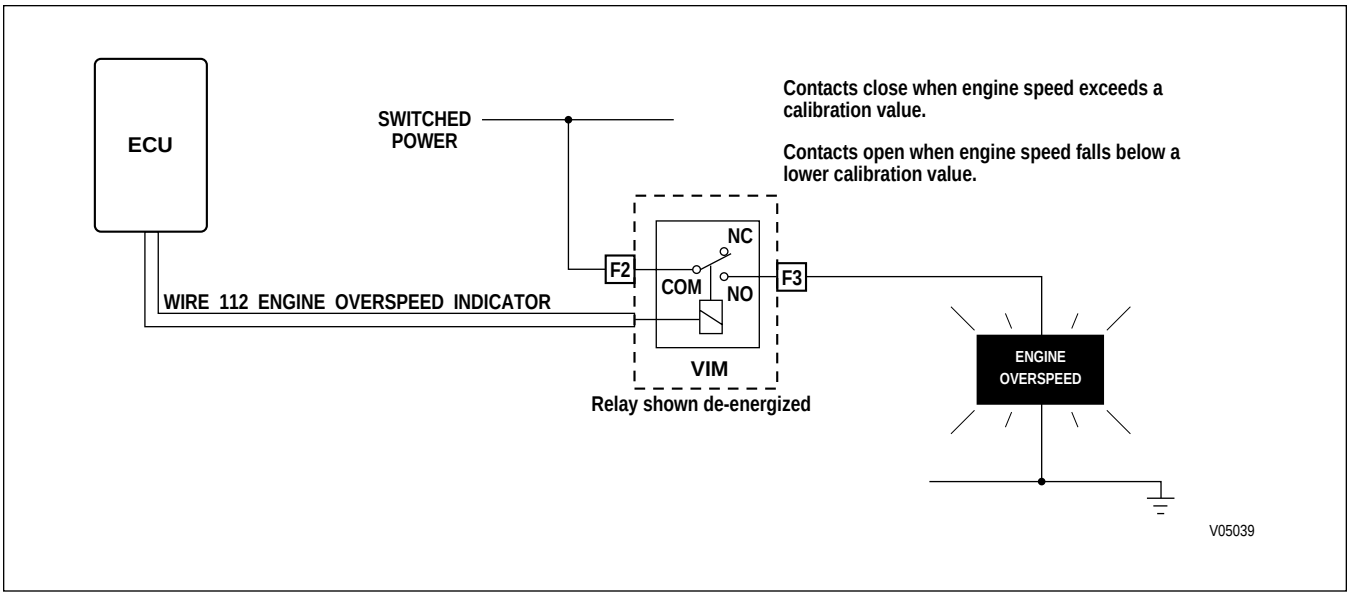

Figure P–35. Engine Overspeed Indicator

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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LOCKUP INDICATOR

USES: Turn on dash indicator when transmission lockup clutch is engaged. Used to indicate when maximum engine braking is available.

VARIABLES TO SPECIFY: None

VOCATIONS: Various

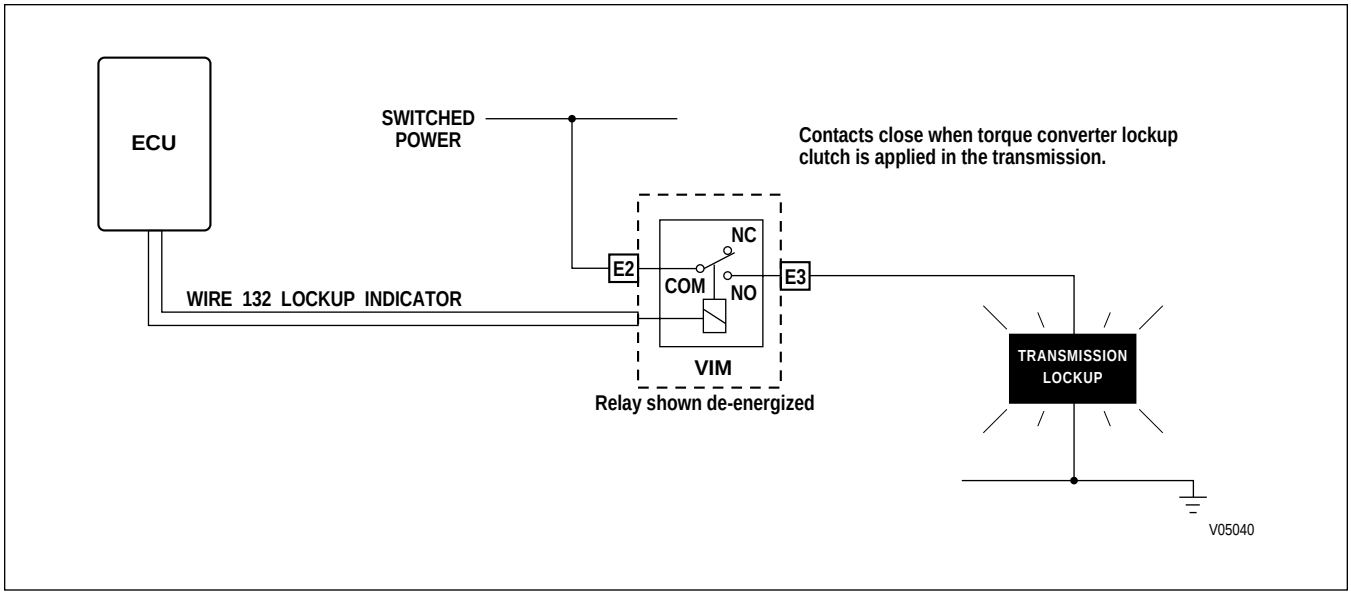

Figure P–36. Lockup Indicator

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

These schematics show the intended use of the specified controls features which have been validated in the configuration shown. Any miswiring or use of these features which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

SECONDARY MODE INDICATOR

USES: To indicate that Secondary Mode is active.

VARIABLES TO SPECIFY: None

VOCATIONS: Various

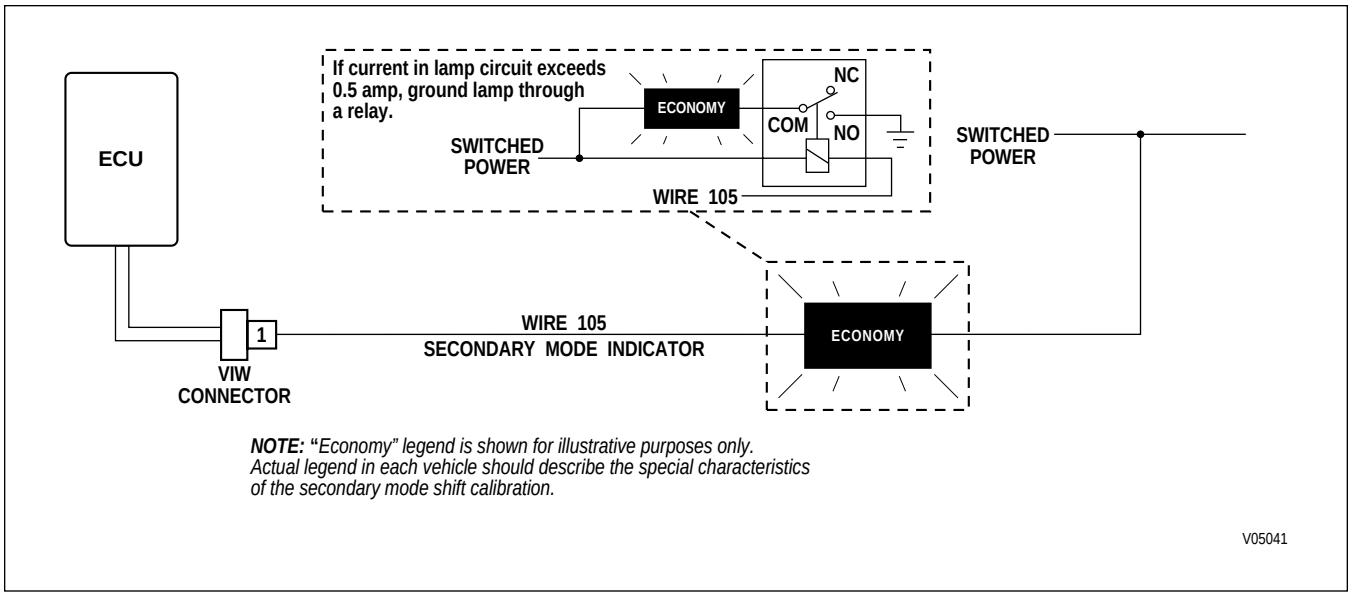

Figure P–37. Secondary Mode Indicator

APPENDIX P — INPUT/OUTPUT FUNCTIONS

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RETARDER INDICATOR

USES: Signals that the retarder is active. Typically used to turn on the vehicle brake lights when the retarder is in use.

VARIABLES TO SPECIFY: None

VOCATIONS: Various

This function is used in conjunction with Retarder Enable Input Function. Refer to schematic for Retarder Enable Input Function, noting the use of wire 125.

APPENDIX P — INPUT/OUTPUT FUNCTIONS

WARNING!

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NEUTRAL INDICATOR FOR PTO AND PTO ENABLE

USES: Provides for fast idle operation in neutral, “pack-on-the-fly”, and PTO engagement with overspeed protection.

VARIABLES TO SPECIFY: Max engine rpm for PTO engagement, max engine rpm for PTO operation, max output rpm for PTO engagement, max output rpm for PTO operation.

VOCATIONS: Refuse packer, recycling truck.

SYSTEM OPERATION:

Operator selects NEUTRAL to enable fast idle.

Transmission shifts to neutral if throttle and output speed are low.

When DRIVE is re-selected, fast idle is interrupted and transmission shifts to drive if engine speed drops below 900 rpm within approximately two seconds.

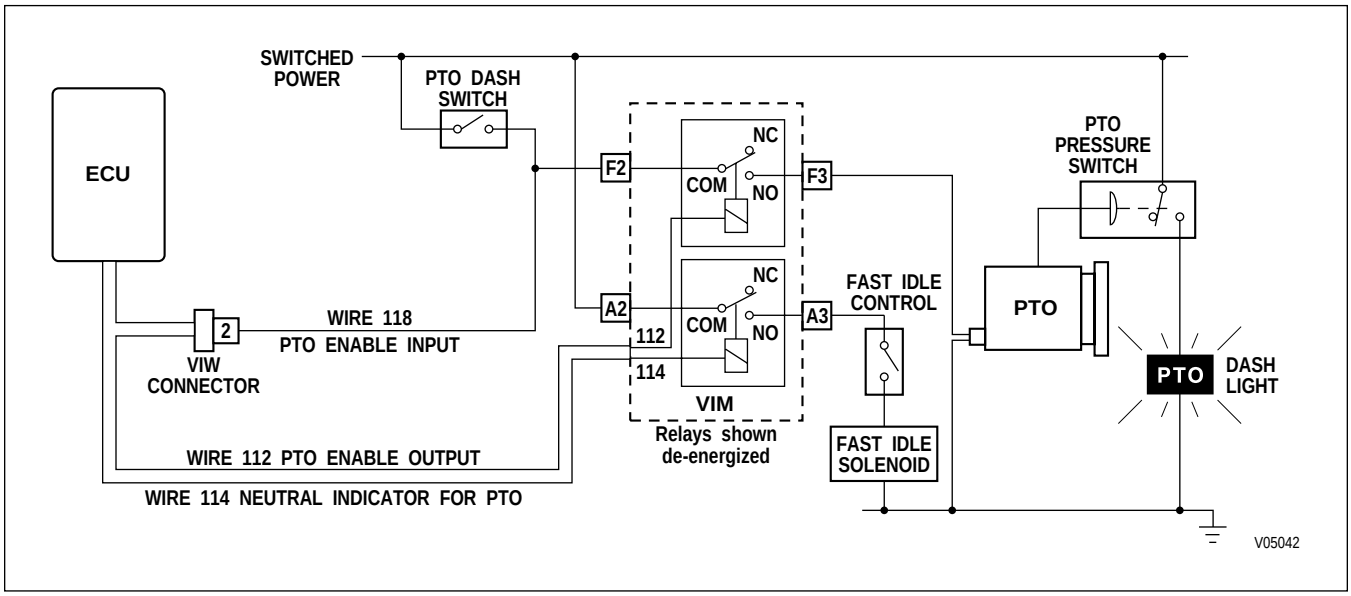

Figure P–38. Neutral Indicator for PTO and PTO Enable