

ELECTRONIC CONTROL SYSTEM

DIAGNOSTIC FORM

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INTRODUCTION

GENERAL INSTRUCTIONS

This section contains the supporting information for the Electronic Control System Diagnostic form. It includes engine and vehicle recommended diagnostic procedures, a description of each control circuit's function and a detailed drawing with specifications for each circuit. The technician can be directed to the appropriate control circuit through the "Circuit Index" column on the **Electronic Control System Diagnostic form EGED-135-1**


Engine and Vehicle Electronic Diagnostics are indexed by circuit acronyms listed on the Electronic Control System Diagnostic form. The Section Index lists the acronyms with the corresponding page numbers to quickly locate the circuit (s) requiring diagnostics. The diagnostic information is structured as described below.

- The function page(s) for each circuit is intended to give a technician a brief description of what that circuit does and what faults the control system can detect.
- The diagnostic page(s) for each circuit is intended to give the technician information required to test that circuit and determine if it is functioning correctly.

ELECTRONIC CONTROL SYSTEM

DIAGNOSTIC FORM

ELECTRONIC CONTROL SYSTEM DIAGNOSTIC FORM EGED-135-1 (FRONT SIDE)

 INTERNATIONAL® T 444E DIESEL ELECTRONIC CONTROL SYSTEM DIAGNOSTICS	Technician _____	Date _____
	Customer Name _____	
	Dealer Name _____	
	Dealer Location _____	
	Unit# _____	

Flash Codes	Circuit Index	Condition Description	Comments	Probable Causes
111	ECM	No fault detected-Flash Code Only	No errors detected by the ECM or IDM	
112	ECM PWR	Elect.Sys. Voltage B+ Out of Range High	Battery voltage to ECM more than 16 volts	Charging System Fault
113	ECM PWR	Elect.Sys. Voltage B+ Out of Range Low	Battery voltage to ECM less than 8.5 volts	Low Battery or resistance in circuit
124	ECT	Engine coolant temp signal out of range low	Default 82°C-Glow plugs on 120 sec. No EBP operation	ECT signal circuit or sensor grounded
125	ECT	Eng. coolant temp signal out of range high	Default 82°C-Glow plugs on 120 sec. No EBP operation	ECT circuit or sensor open
126	MAP	MAP frequency out of range	Default Inferred MAP-Low power,slow acceleration	High frequency noise, defective sensor
127	MAP	MAP signal is inactive.	Default Inferred MAP-Low power,slow acceleration	Short high, low or open
128	MAP	MAP above spec. level at low idle	Default Inferred MAP-Low power,slow acceleration	hose to MAP sensor plugged
129	ICP	ICP signal out of range low	Default open loop control-Undermrun at idle	Circuit short low, open, defective sensor
130	ICP	ICP signal out of range high	Default open loop control-Undermrun at idle	Circuit short high, defective sensor
131	APS/IVS	Acceler. Position signal out of range low	APS voltage lower than .152 volts-Eng. idle only	Grounded, open circuit or defective sensor
132	APS/IVS	Acceler. Position signal out of range high	APS voltage higher than 4.55 volts-Eng. idle only	Short to Vref or 12 volt, defective sensor
133	APS/IVS	Acceler. Position signal in range fault	APS/IVS Conflict-Limited to 0% APS	Failed APS signal
134	APS/IVS	Acceler. Position & Idle Validation disagree	APS/IVS Conflict-Limited to 0% APS	Both APS & IVS signal failure
135	APS/IVS	Idle Validation Switch Circuit Fault	APS/IVS Conflict-Limited to 50% APS	Failed IVS signal
141	VSS	Vehicle Speed signal out of range low	VPM detects VSS out of range-Cruise/PTO disabled	VSS circuit open or shorted to ground
142	VSS	Vehicle Speed signal out of range high	VPM detects VSS out of range-Cruise/PTO disabled	VSS circuit shorted to Vref or 12 volts
143	CMP	Wrong # of CMP sig. transitions per cam rev.	CMP signal intermittent	Poor connection, defective sensor
144	CMP	CMP signal noise detected	ECM detects excessive outside inputs	Electrical noise
145	CMP	CMP signal inactive while ICP has increased	No CMP signal while ICP signal increased	Short high, low, open or defective sensor
151	BARO	Barometric Press. signal out of range high	BARO signal high	Short high or open circuit
152	BARO	Barometric Press. signal out of range low	BARO signal low	Short low
154	IAT	Intake air temp. signal out of range low	IAT signal low - EBP device disabled	IAT signal circuit or sensor grounded
155	IAT	Intake air temp. signal out of range high	IAT signal high - EBP device disabled	IAT circuit or sensor open
211	EOP	Engine Oil Press signal out of range low	EOP signal low	Short low
212	EOP	Engine Oil Press signal out of range high	EOP signal high	Short high or open
213	SCCS	Remote throttle signal out of range low	Remote APS signal lower than 152 mV	Open circuit
214	SCCS	Remote throttle signal out of range high	Remote APS signal higher than 4.55 volts	Shorted circuit
221	SCCS	SCCS switch or circuit fault	SCCS signal incorrect voltage	Short or resistance in SCCS circuit
222	BRAKE	Brake switch circuit fault	Term 23 (BNO) & 43 (BNC) disagree	Faulty switch or relay
223	DCL/ATA	VPM not communicating with ECM	Engine will operate on field defaults	DCL circuits open or shorted
224	KAM PWR	KAM corrupt	KAM memory supply voltage lost	No battery voltage to ECM terminal 1
231	DCL/ATA	ATA common fault	ATA link open or shorted	ATA device grounded or overloaded
232	DCL/ATA	Unable to forward ECM msg. to ATA DCL	Will not turn Warning Light ON	ATA data link circuits shorted high or low
233	TACH	Tachometer buffer is inactive	VPM not receiving Tach signal	Tach output open or shorted
234	DCL/ATA	Unable to forward ATA message to ECM	Will not turn Warning Light ON	EBT used with key OFF & VPM powered up
235	DCL/ATA	VPM/ECM DCL fault	No ECM diagnostic replies	DCL circuits open or shorted
241	IPR	Inj. Cntl. Pres Regulator OCC self test failed	IPR-Output Circuit Check-Engine Off Test	Shorted high or low or open
242	ECM/IDM	FDCS circuit to IDM OCC self test failed	FDCS Output Circuit Check-Engine Off Test	Shorted high or low or open
243	IDM PWR	IDM Power relay OCC self test failed	IDM relay-Output Circuit Check-Engine Off Test	IDM enable relay shorted high/low
244	EDL	EDL OCC fault	EDL relay-Output Circuit Check-Engine Off Test	EDL circuit open or shorted
245	EPR	Exhaust Press Reg. OCC self test failed	EPR-Output Circuit Check-Engine Off Test	Short high or low or open
251	GPC	Glow Plug Controller OCC self test failed	GP relay-Output Circuit Check-Engine Off Test	Short high or low or open
252	GPC	Glow Plug Lamp OCC self test failed	GP lamp-Output Circuit Check-Engine Off Test	Glow Plug Lamp circuit open/shorted
253	ECM/IDM	Fuel Inj. sync circuit OCC self test failed	Cyl. Identification-Output Ckt Check-Eng. Off Test	Open CI circuit - No IDM power
254	ECM	Output Circuit Check Out of Range High	-	High voltage during OCC test
255	ECM	Output Circuit Check Out of Range Low	-	Low voltage during OCC test
311	EOT	Engine Oil Temp. signal out of range low	EOT signal low	EOT signal circuit or sensor grounded
312	EOT	Engine Oil Temp. signal out of range high	EOT signal high	EOT sensor or circuit open
313	EOP**	Engine Oil Pressure Below Warning Level	ECM detects low oil pressure, Oil Light ON	No or low oil, defective oil pres. reg., pickup tube defective, worn bearings or oil pump
314	EOP**	Engine Oil Pressure Below Critical Level	ECM detects low oil pressure, Shutdown (if equipped)	
315	-	Engine Speed (Tach RPM) limit exceeded	ECM recorded excessive engine speed	Transmission improperly downshifted
316	ECT	Eng. coolant temp. unable to reach commanded set pt.	Enabled only when Cold Ambient Protection is enabled	Leaking thermostat, cooling system problems
321	ECT**	Engine Coolant Temp. above Warning level	Coolant Temperature Greater than 224.8°F (107°C)	Cooling system problem
322	ECT**	Engine Coolant Temp above Critical level	Coolant Temperature Greater than 233.6°F (112.5°C)	
323	ECL	Engine coolant level below Warning/Critical level	ECM detects low coolant level	Check coolant level, if low check for leaks

* Indicates Warning Lamp or Warning Fault Set

** Faults only available if Engine Protection is enabled

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ELECTRONIC CONTROL SYSTEM DIAGNOSTIC FORM EGED-135-1 (FRONT SIDE)

Chassis Model	Complaint
VIN Number	Active Codes
Engine Serial Number	Inactive Codes
VPM Serial Number	Standard Test Codes
ECM Serial Number	Event Log Codes

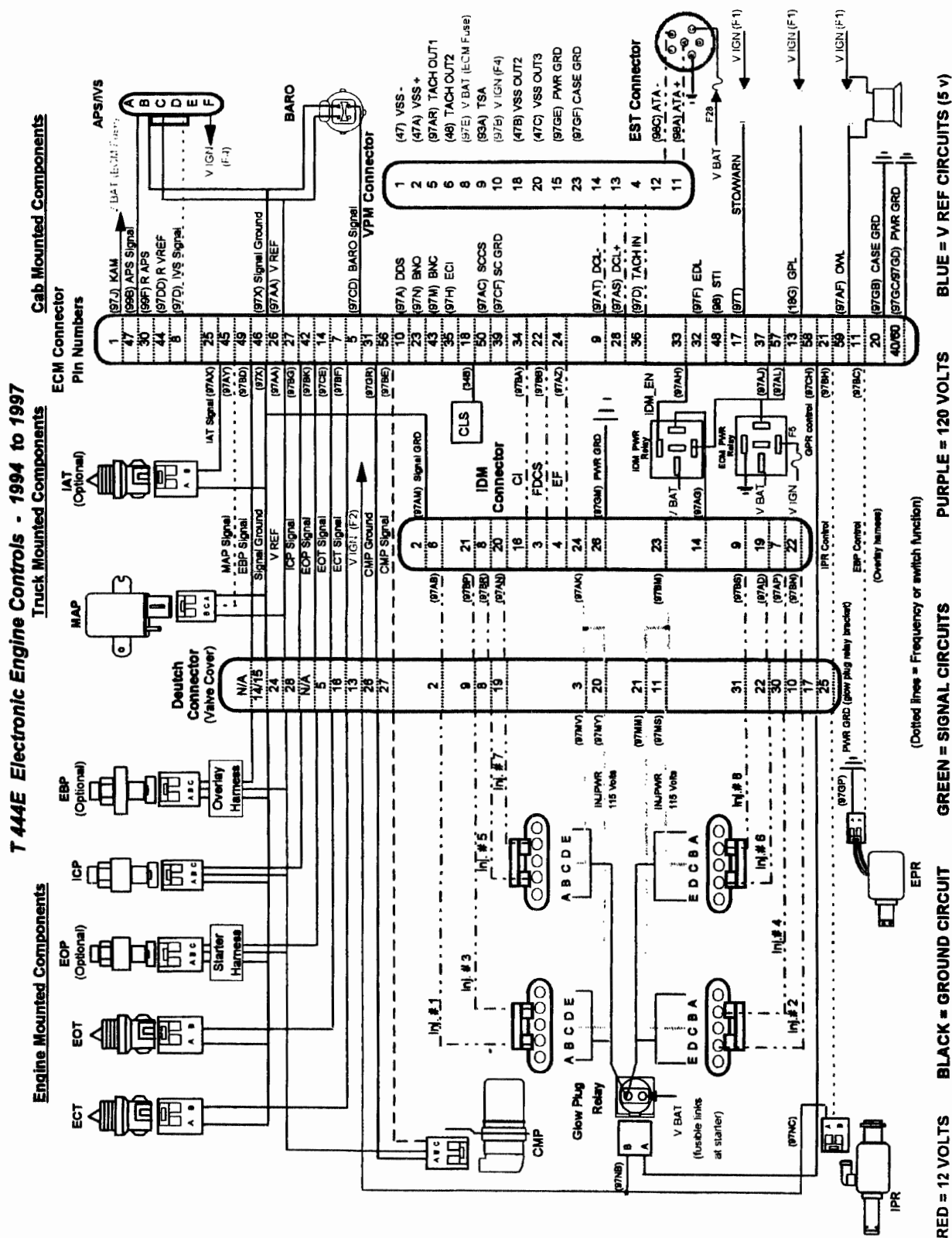
Flash Codes	Circuit Index	Condition Description	Comments	Probable Causes
324		Idle Shutdown Timer Enabled Engine shutdown.	Idle shutdown timer is on and idle time exceeded limit	Idle time exceeded limit
325	ECT	Pwr. reduced, matched to cooling sys performance	Engine power reduced due monitoring system	Low coolant level or coolant overtemp
331*	IPR	Inj. Cntrl. Press above system working range	ICP above 3875 psi (25 Mpa)	Grounded IPR circuit, stuck IPR valve
332*	ICP	Inj. Cntrl. Press above spec with engine off	ICP signal voltage higher than expected with Engine Off	Circuit shorted or defective sensor
333	IPR	Inj. Cntrl. Press above/below desired level	Desired pressure does not match output	Check for proper oil servicing, Test IPR
334*	IPR	ICP unable to achieve set point (poor performance)	ICP desired does not = ICP signal (short period of time)	Injector "O" rings, ICP sensor, High press. pump
335*	IPR	ICP unable to build pressure during cranking	Less than 725 psi ICP pressure after 10 sec. of cranking	Air in oil, injection press. problem (see manual)
341	EBP	Exhaust back pressure signal out of range low	EBP device disabled	Short low or open
342	EBP	Exhaust back pressure signal out of range high	EBP device disabled	Short high
343	EPR	Excessive exhaust back pressure	EBP above working range	Check EBP valve position, exhaust restriction
344	EBP	Exhaust back press above spec. w/Eng. off	EBP sig. volt. higher than expected w/Eng not running	Check for plugged EBP tube or biased sensor
351	EPR	EBP below expected level @ high Engine speed	EBP below expected @ 2300 RPM	EBP valve stuck, EPR stuck.
352	EPR	Exh. bk. press above or below desired level	Pressure does not match output in KOER test	EPR not responding, restricted exhaust
421-428	INJ	Low side to high side open (Cyl # indicated)	IDM detected an open injector circuit	Individual injector harness open.
431-438	INJ	Low side shorted to high side (Cyl # indicated)	IDM detected a shorted injector circuit	Injector or harness shorted low side to high side
441-448	INJ	Low side shorted to VBAT (Cyl # indicated)	IDM detected 12v @ injector drive low side	Inj. harness shorted on low (control) ckt to B+
451-458	INJ	Low side shorted to grd (Cyl # indicated)	IDM detected inj. low side shorted to grd -4 Cyl run	Inj. harness shorted on low (control) ckt to grd
461-468	Perf. Diag	Cyl. Contrib. test failed (Cyl # indicated)	ECM finds cylinder contribution insufficient	Refer to Performance Diagnostics
501*	INJ	Bank 1 has multiple faults	Right side has more than 1 high side fault	Right side short, open and ground
510*	INJ	Bank 2 has multiple faults	Left side has more than 1 high side fault	Left side short, open and ground
519*	INJ	High side to Bank 1 open	Right side high voltage supply open	Open ckt to right side injector feed
519*	INJ	High side to Bank 2 open	Left side high voltage supply open	Open ckt to left side injector feed
519*	INJ	Bank 1 high side short to ground or VBAT	Right side high voltage ckt shorted	Harness to right side of engine shorted
519*	INJ	Bank 2 high side short to ground or VBAT	Left side high voltage ckt shorted	Harness to left side of engine shorted
520*	IDM PWR	IDM Internal failure	Internal IDM fault	Defective IDM
523	IDM PWR	IDM power voltage is low	Voltage is low @ IDM	Ckt 97CP/97AG low volts, IDM relay def.
529*	INJ	Both high side switches shorted together	Short ckt between left and right banks	IDM harness shorted
531*	ECM/IDM	Cylinder Identification (CI) signal low	Detected low volt. @ CI signal-Eng. misfire/cutout	CI signal shorted low-intermittent
531*	ECM/IDM	Cylinder Identification (CI) signal high	Detected high volt. @ CI signal-Eng. misfire/cutout	CI sig. shorted high or open to ECM-intermittent
531*	ECM/IDM	IDM feedback toggle not detected by ECM	100 Hz signal sent from IDM w/key on Eng. off.	Ckt 97CP/97AG low volts, IDM relay def.
531*	ECM/IDM	IDM faults not received	Repair codes 242, 243 or 253 first if set	Ckt 97CP/97AG low volts, IDM relay def.
544	INJ	Injector fault in Bank 2	IDM detected more than 1 left side injector low volts	Injector harness shorted to ground
545	INJ	Injector fault in Bank 1	IDM detected more than 1 right side injector low volts	Injector harness shorted to ground
575*	CMP	Incorrect ECM installed for CMP timing wheel	Mismatch between ECM and CMP sensor	Incorrect ECM
579*	VPM	Installed ECM not compatible w/ VPM software	VPM/ECM are not compatible	Components changed in the field are not compatible
579*	VPM	Installed VPM not compatible w/ ECM software	VPM/ECM are not compatible	Components changed in the field are not compatible
585	ECM	Programmable parameter KAM corrupt fault	KAM memory defective	Interrupted KAM pwr supply or defective ECM
585*	VPM	Eng. using Mfg. default rating program engine	Engine operates @ 25 Hp. default	VPM not programmed, but installed on truck
585*	VPM	Engine using field default rating	Eng. limited to 180 Hp. Options not available	VPM not programming ECM, ck other codes
585*	VPM	Invalid Eng. rating code; ck VPM programming	Eng. family ratings not received from VPM	VPM not programmed properly
625	ECM	Module software background process was inactive	ECM software is faulty	Replace ECM
631	ECM	ROM (read only memory) self test fault	ECM failure	Replace ECM
632	ECM	RAM memory-CPU self test fault	ECM failure	Replace ECM
633	DCU/ATA	VPM is communicating incorrectly with ECM	ECM/VPM incorrect communications	Ckte 97AT/97AS as open/shorted
634	VPM	Internal fuelmeter memory location in error	VPM memory for fuelmeter cannot be read	Fuel totals may be incorrect; replace VPM
635	VPM	Internal hourmeter memory location in error	VPM memory for hourmeter cannot be read	Hour totals may be incorrect; replace VPM
641	VPM	Internal odometer memory location in error	VPM memory for odometer cannot be read	Mileage totals may be incorrect; replace VPM
642	VPM	Internal fuelmeter fault	EEPROM memory cannot write fuelmeter totals	Fuel totals are lost; Replace VPM to correct
643	VPM	Internal hourmeter fault	EEPROM memory cannot write hourmeter totals	Hour totals are lost; Replace VPM to correct
644	VPM	Internal odometer fault	EEPROM memory cannot write odometer totals	Mileage totals are lost; Replace VPM to correct
645	VPM	Internal EEPROM memory location error	EEPROM memory not read by VPM	Check for other codes set
651	VPM	Feature memory data content corrupted	VPM detects error in feature list	With VPM on, pull fuse F4 and reinstall
652	VPM	Eng.-fuel memory data content corrupted	VPM detects error in engine rating list	With VPM on, pull fuse F4 and reinstall
653	VPM	Engine/rating memory data content corrupted	Attempt to reprogram, replace VPM if reoccurs	-
654	VPM	Watchdog time-out fault	VPM software fault detected	VPM will reset

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ELECTRONIC CONTROL SYSTEM DIAGNOSTIC FORM EGED-135-1 (REAR SIDE)



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ELECTRONIC CONTROL SYSTEM DIAGNOSTIC FORM EGED-135-1 (REAR SIDE)

60 Pin Signal Values T 444-E											
Pin Number	Acronym	Circuit Name	Circuit Number	Key Off	Key On	Low Idle		High Idle		Operating Range	Comments
						Signal	Data List	Signal	Data List		
1	KAM PWR	Keep Alive Memory Power	97 J	V BAT	V BAT	V BAT	V BAT	V BAT	V BAT	V BAT	B+ for ECM KAM memory
5	BARO	Barometric Pressure Sensor	97 CD	0v	4.5 - 4.6 v	4.5 - 4.6 v	15-14 PSI	4.5 - 4.6 v	15-14 PSI	4.9 - 2.0 v	4.6v =Avg. BARO sea level
7	ECT	Engine Coolant Temperature	97 BF	0-25v			Temperature Dependent			.6v = 195°F	4.53 vs = 40°F / .358vs = 230°F
8	IVS	Idle Validation Switch	97 D	0v/0v	0v/12v	0v	-	12v	-	0/12v	APS Pedal Up/Down
9	DCL (-)	Data Communication Link	97 AT	0v	1 - 3 v	1 - 3 v	-	1 - 3 v	-	Variable Freq.	Digital data stream from VPM 1 - 3 v
10	DDS (clutch)	Driveline Disengagement Switch	97 A	0v/0v	12v/0v	12v/0v	Off/On	12v/0v	Off/On	12v/0v	Clutch Pedal Up/Down(Cruise/PTO)
11	EPR	Exhaust Back Pressure Regulator	97 BC	0v	1.5v	1.85v	-	1.91v	-	300/1195 Hz	Exhaust Back Pressure
13	GPI	Glow Plug Lamp	18 G	0v	0v/12v	12v	-	12v	-	0v/12v	0v=Light On 12v=Light Off
14	EOT	Engine Oil Temperature	97 CE	0v			Temperature Dependent			.6v = 195°F	4.53 vs = 40°F / .358vs = 230°F
17	STO/WARN	Self Test Output/Warn Lamp	97 T	0v	B +	B +	-	B +	-	12v	0v=Light On 12v=Light Off
18	CLS	Coolant Level Switch	34 B	0v	B +	B +	-	B +	-	12v	0v=Light On 12v=Light Off
20	CASE GRD	Case Ground	97 GB	0v	0v	0v	-	0v	-	0v	
21	IPR (reg)	Injection Pressure Regulator	97 BH	0v	10 - 13 v	10 - 13 v	-	10 - 13 v	-	10 - 13 v	Duty Cycle Current Controlled
22	FDCS	Fuel Delivery Command Signal	97 BB	0v	0v	1-2v/46.5 Hz	-	2-3v/200 Hz	-	49/200 Hz	700-3000 RPM
23	BNO	Brake Normally Open Switch	97 N	0v/12v	0v/12v	0v/12v	Off/On	0v/12v	Off/On	0v/12v	Brake Pedal Up/Down
24	EF	IDM Feedback (Electronic feedback)	97 AZ	0v	1 - 3 v	3-1 v	-	1.5 2.5 v	-	46.5/200 Hz	100 Hz with key on engine off
25	IAT	Intake Temperature Sensor	97 AX	0v			Temperature Dependent			3.07vs=68°F	4.53 vs = 40°F / .358vs = 230°F
26	V REF	Voltage Reference	97 AA	0v	5 ± .5v	5 ± .5v	-	5 ± .5v	-	5 ± .5v	
27	ICP - sensor	Injection Control Pressure Sensor	97 BG	0v	.2 - .3v	.88 - 1.0 v	540- 540 PSI	1.4 - 1.5 v	990 - 1050	9 - 3.25v	3.15 v = 2470 PSI (Full Load)
28	DCL (+)	Data Communication Link	97 AS	0v	1 - 3 v	1 - 3 v	-	1 - 3 v	-	Variable Freq.	Digital data stream from VPM 1 - 3 v
30	R APS	Remote Accelerator Pedal Sensor	99 F								
31	CMP GRD	CMP Sensor Ground	97 GR	0v	0v	0v	-	0v	-	0v	
32	EDL	Engine Data Line	97 F	0v	0v	0.1	-	B +	-	0/12	Auto Trans. only (WOT transition)
33	IDM - EN	IDM Enable Relay	97 AH	0v	12v-> 0v	0v	-	0v	-	12v/0v	12v=IDM Off 0v=IDM On
34	CI	Cylinder Identification	97 BA	0v	.5 v	6-7v / 5-7 Hz	-	7.2v/24.9 Hz	-	5 Hz-600 Hz	W/Fluke 88 in Tach mode reads RPM
35	ECI	Engine Crank Inhibit	97 H								
36	TACH (out)	Tachometer Output	97 D	0v	0v	6.5v/140Hz	700 RPM	6.5v/540 Hz	2700 RPM	140-600Hz	Varies with eng. RPM (RPM/5)
37	V PWR	Ignition Power	97 AJ	0v	V IGN	V IGN	V IGN	V IGN	V IGN	V IGN	Ignition source power
39	SC GRD	Speed Control Grd.	97 CF	0v	0v	0v	-	0v	-	0v	
40	PWR GRD	Power Ground	97 GC	0v	0v	0v	-	0v	-	0v	
42	EOP	Engine Oil Pressure Sensor	97 BK	0v	.7 - .1 v	2-4.7v	10-38 PSI	4.6-4.8 v	38 PSI	.7 - 4.8 v / 0-38 PSI	Sensor limited to 38 PSI Maximum
43	BNC	Brake Normally Closed	97 M	0v	12v/0v	12v/0v	Off/On	12v/0v	Off/On	12v/0v	Brake Pedal Up/Down (Cruise/PTO)
44	R VREF	Remote Voltage Reference	97 DD	0v	5 ± .5v	5 ± .5v	-	5 ± .5v	-	5 ± .5v	
45	MAP	Manifold Absolute Pressure Sensor	97 AY	0v	2.5v	2.5v	0 PSI	2.5v	.5 - 2.5 PSI	108-186 Hz	108/114Hz=Atmosp. Pres (sea level)
46	Sig. GRD	Signal Ground	97 X	0v	0v	0v	-	0v	-	0v	Ground for all sensor signals
47	APS	Accelerator Pedal Sensor	99B	0v	.25v - .5 v	.25v - .5 v	0%	3.5 - 4.0 v	100%	.25-4v / 0-100 %	
48	STI	Self Test Input	98	0v	5v	5v	-	5v	-	-	0v when grounded for engine off tests
49	EBP - Sensor	Exhaust Back Pressure Sensor	97 BD	0v	8-1 v	.8-1 v	-	1.5 - 1.7 v	-	.8 - 1.7	3.3v excessive pressure code set
50	SOCS	Cruise Control	97 AC	0v	6.58v	6.58v	-	6.58v	-	-	Varies with switch position
56	CMP	Camshaft Position Sensor	97 BE	0v	12 or 2.5 v	6 - 7v	-	6 - 7v	-	140-600 Hz	700-3000 RPM
57	V PWR	Ignition Power	97 AL	0v	V IGN	V IGN	V IGN	V IGN	V IGN	V IGN	Ignition source power
58	GPR	Glow Plug Relay	97 CH	0v	0v/12v	0v/12v	-	12v	-	0v	0v=GPR On 12v=GPR Off
59	OWL	Oil/Water Lamp	97 AF	0v	12v	12v	-	12v	-	0v	0v=OWL On 12v=OWL Off
60	PWR GRD	Power Ground	97 GD	0v	0v	0v	-	0v	-	0v	

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