GREASE-AI — What to Log: PID Reference Guide

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Why This Guide Exists

A great analysis starts with a great log. GREASE-AI can only work with what's in the file — if a critical channel is missing, the AI will say so and tell you to re-log. This guide tells you exactly which PIDs to capture for each diagnostic scenario, organized by scanner type and goal.

Universal Required PIDs (Every Log)

These channels must be present in every log regardless of scanner type or vehicle.

PID	Description	Why It Matters
RPM	Engine speed (rev/min)	Baseline for all analysis — every other value is interpreted relative to RPM
TPS / APP	Throttle position / Accelerator pedal position (%)	Determines driver demand; separates idle from load events
MAP or MAF	Manifold absolute pressure (kPa) or Mass airflow (g/s)	Primary load signal; fuel trim root cause
IAT	Intake air temperature (°C or °F)	Affects fuel trim calculations and knock threshold
ECT	Engine coolant temperature (°C or °F)	Cold start vs warm idle vs operating temp behavior
STFT B1, B2	Short-term fuel trim, Bank 1 and Bank 2 (%)	Real-time O2 correction; identifies lean/rich conditions
LTFT B1, B2	Long-term fuel trim, Bank 1 and Bank 2 (%)	Learned correction; reveals persistent fuel delivery issues
O2 B1S1, B2S1	Upstream O2 sensor voltage (V) or lambda	Fuel control loop status; sensor health
O2 B1S2, B2S2	Downstream O2 sensor voltage (V)	Catalyst efficiency; exhaust leaks
Knock Retard / KR	Ignition timing retard from knock (°)	Detonation events; fuel quality and tune issues
Spark Advance	Total ignition timing (° BTDC)	Timing at load; compares to commanded vs actual
Injector PW	Injector pulse width (ms)	Fuel delivery; injector duty cycle
Vehicle Speed	VSS (mph or km/h)	Shift point analysis; TCC engagement detection
Gear (if available)	Current transmission gear	Shift quality analysis

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Recommended Additional PIDs (Adds Diagnostic Depth)

PID	Description	Use Case
Commanded AFR / Lambda	Target air-fuel ratio	Compares commanded vs actual fueling
Wideband O2 (if equipped)	Actual AFR from wideband sensor	Most accurate fueling data available
Boost Pressure	Turbo/supercharger boost (PSI or kPa)	Forced induction health; boost leaks
Fuel Pressure	Rail or return-line fuel pressure (PSI)	Pump health; pressure drop under load
Battery Voltage	System voltage (V)	Charging system; sensor reference voltage
Catalyst Temp	Exhaust/catalyst temperature (°C)	Overheating; rich condition damage
EGR Position	EGR valve position (%)	Emissions system; rough idle diagnosis
EVAP Purge	EVAP purge valve duty cycle (%)	Fuel trim contamination from EVAP
Cam Retard / Advance	VVT cam position (°)	Variable valve timing health
Trans Fluid Temp	ATF temperature (°C or °F)	Transmission thermal management
TCC Slip	Torque converter clutch slip (RPM)	TCC health; shudder diagnosis
Line Pressure	Transmission line pressure (PSI)	Shift quality; solenoid health
Throttle Actuator	TAC/ETC position (%)	Drive-by-wire system; throttle body carbon

GM-Specific PIDs (LS/LT/EcoTec3 Engines)

PID	Description	Notes
AFM Cylinder Status	Active Fuel Management state	Which cylinders are deactivated; AFM lifter health
Virtual Octane	Octane rating learned by ECM	Knock adaptation; fuel quality tracking
Desired Idle RPM	ECM target idle speed	Idle control system; IAC/ETC diagnosis
Commanded Fuel Mode	Open loop / closed loop status	Warm-up cycle; O2 sensor readiness
ETC Throttle Angle	Electronic throttle control angle	TAC system health; throttle body deposits
Cam Retard B1/B2	VVT cam retard angle (°)	Gen IV/V cam phaser health
Oil Life Remaining	Oil life monitor (%)	Maintenance tracking
Transmission Gear Ratio	Actual gear ratio	Slip detection; clutch pack health
Torque Management	Torque reduction active (%)	Transmission protection events
Torque Reduction Source	What triggered torque management	Shift quality; TCC events

Ford-Specific PIDs (Coyote / EcoBoost / Power Stroke)

PID	Description	Notes
DPFE Voltage	Differential pressure feedback EGR	EGR system diagnosis (older Fords)
IMRC Position	Intake manifold runner control	Modular V8 runner control health
Boost Pressure Desired	Commanded boost (PSI)	EcoBoost target vs actual boost
Wastegate Duty Cycle	Wastegate solenoid duty (%)	EcoBoost boost control
Charge Air Cooler Temp	Intercooler outlet temp (°C)	EcoBoost heat soak
Fuel Rail Pressure	High-pressure DI rail (PSI)	EcoBoost/Coyote GDI health
Port Injection Status	PFI active/inactive	Gen 3 Coyote dual injection
Transmission Slip	Torque converter slip (RPM)	10R80 / 6R80 health
FICM Voltage	Fuel injector control module voltage	6.0/6.4 Power Stroke injector health
ICP Pressure	Injector control pressure (PSI)	$7.^{3}/_{6}$.0 Power Stroke HEUI system

Dodge/RAM-Specific PIDs (HEMI / Cummins)

PID	Description	Notes
MDS Cylinder Status	Multi-Displacement System state	HEMI cylinder deactivation
VVT Cam Position	Variable valve timing (°)	5.7/6.4 HEMI cam phaser
Fuel Rail Pressure	Rail pressure (PSI)	Cummins common rail health
Boost Pressure	Turbo boost (PSI)	Cummins VGT health
EGR Flow Rate	EGR mass flow (g/s)	Cummins EGR system
DPF Differential Pressure	DPF restriction (kPa)	Cummins DPF regen health
Regen Status	DPF regeneration active/passive	Cummins DPF cycle tracking
Injection Timing	Fuel injection timing (° BTDC)	Cummins timing diagnosis

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Logging Conditions — What to Capture

Getting the right data means driving the right way. Here's what each condition reveals:

Condition	How to Log It	What It Reveals
Cold Start	Start engine from fully cold (overnight), log for 5–10 min at idle	Cold start enrichment, warm-up fuel trims, O2 sensor light-off time
Warm Idle	Engine at full operating temp, sitting still for 3–5 min	Idle fuel trims, IAC/ETC control, vacuum leaks
Light Cruise	35–55 mph, light throttle, steady speed for 2–3 min	Cruise fuel trims, TCC engagement, O2 switching
Highway Cruise	65–75 mph, steady throttle for 3–5 min	Long-term fuel trims at cruise load, TCC lockup
WOT Pull	Full throttle acceleration from 30–70 mph (safe location only)	Knock events, fuel delivery under load, timing pull, boost
Decel / Overrun	Release throttle from 50+ mph, coast down	Decel fuel cut, O2 behavior, vacuum leaks show up
Shift Events	Normal driving with multiple gear changes	Shift quality, TCC slip, torque management events

Minimum recommended log length: 10–15 minutes covering at least idle, cruise, and one WOT pull.

FORScan Setup (Ford / Lincoln / Mercury)

1. Connect OBDLink MX+ or compatible ELM327 adapter
2. Open FORScan → **PIDs** tab
3. Select all PIDs from the Universal Required list above
4. Add Ford-specific PIDs relevant to your diagnostic goal
5. Set sample rate: **10 Hz** (10 samples/second) — do not use “as fast as possible” for long logs
6. Start logging: **Log → Start Recording**
7. Drive the required conditions (see table above)
8. Stop recording: **Log → Stop Recording**

9. Export: **File → Export → CSV**
10. Upload the CSV to GREASE-AI

File naming tip: Name your file `YEAR-MAKE-MODEL-SYMPTOM.csv` (e.g., `2018-F150-5.0-rough-idle.csv`) — GREASE-AI uses the filename as context.

HP Tuners VCM Scanner Setup (GM / Ford / Dodge)

1. Connect HP Tuners MPVI2/3 interface
2. Open VCM Scanner
3. **Channels** tab → right-click → **Add Channels**
4. Search and add all PIDs from the Universal Required list
5. Add GM-specific or Ford-specific PIDs as needed
6. Set scan rate: **25 Hz** recommended for most channels; knock and fuel trim can go higher
7. **File → New Log** to start recording
8. Drive the required conditions
9. **File → Save Log** — saves as `.hpl` format
10. Export to CSV: **File → Export → CSV**
11. Upload the CSV to GREASE-AI

HP Tuners tip: Log in "all channels" mode for the first diagnostic run, then narrow down once you know what you're looking for.

EFI Live FlashScan / AutoCal Setup (GM)

1. Connect FlashScan V2 or AutoCal adapter
2. Open EFI Live Scan & Tune
3. **Logging** tab → **Configure Channels**
4. Add all Universal Required PIDs plus GM-specific channels

5. Set log rate: **20 Hz** minimum
6. **Logging → Start Logging**
7. Drive conditions
8. **Logging → Stop Logging**
9. Export: **File → Export → CSV**
10. Upload to GREASE-AI

Generic OBD2 Scanner Setup (ELM327 / Torque Pro / OBD Auto Doctor)

Generic OBD2 mode is the lowest common denominator — it works on any 1996+ vehicle but only exposes Mode 01 PIDs. You'll miss manufacturer-specific channels like per-cylinder knock, AFM status, and VVT position. Use this as a last resort or for quick checks only.

1. Connect any ELM327-compatible adapter (Bluetooth or USB)
2. Open your scan app (Torque Pro, OBD Auto Doctor, Car Scanner, etc.)
3. **Add these Mode 01 PIDs** — all are available on any OBD2 vehicle:
    - Engine RPM (PID 0x0C)
    - Vehicle Speed (PID 0x0D)
    - Engine Coolant Temp (PID 0x05)
    - Intake Air Temp (PID 0x0F)
    - MAF Air Flow Rate (PID 0x10) — if MAF-equipped
    - Throttle Position (PID 0x11)
    - Short-Term Fuel Trim B1 (PID 0x06)
    - Long-Term Fuel Trim B1 (PID 0x07)
    - Short-Term Fuel Trim B2 (PID 0x16) — V6/V8 only
    - Long-Term Fuel Trim B2 (PID 0x17) — V6/V8 only
    - O2 Sensor B1S1 (PID 0x14)
    - O2 Sensor B1S2 (PID 0x15)

    - Timing Advance (PID 0x0E)
    - Absolute Load Value (PID 0x43)
    - Commanded Throttle Actuator (PID 0x4C)
4. Set sample rate: **1 Hz is the OBD2 mode maximum** — this is why generic OBD2 misses fast events
5. Log and export as CSV
6. Upload to GREASE-AI

OBD2 mode limitations to know:

- No knock retard channel — you cannot diagnose detonation with generic OBD2
- No per-cylinder data — misfire counts are aggregate only
- No transmission-specific PIDs — shift quality analysis is limited
- 1 Hz max sample rate — fast transients are invisible
- **Upgrade recommendation:** For any serious diagnosis, use FORScan (Ford), HP Tuners (GM/Ford/Dodge), or EFI Live (GM) to get full manufacturer access.

AEM / Standalone ECU Setup

1. Open AEM Infinity Tuner or equivalent
2. **Data Logging → Configure Channels**
3. Add all Universal Required PIDs — most are available as internal ECU channels
4. Set log rate: **50 Hz** for performance tuning; **20 Hz** for street diagnosis
5. Start/stop log via software or dedicated log button
6. Export as CSV from the logging module
7. Upload to GREASE-AI

Common Mistakes That Kill Diagnostic Quality

Mistake	Why It's a Problem	Fix
Log is too short (under 5 min)	AI can't see warm-up behavior or cruise fuel trims	Log at least 10–15 minutes
No WOT data for knock complaint	Knock only shows at load — idle data is useless	Do a safe WOT pull and include it
Missing LTFT channels	Can't distinguish fuel delivery from sensor issues	Always log STFT AND LTFT for both banks
Sample rate too low (1 Hz)	Misses fast events like knock spikes and shift events	Use 10 Hz minimum; 25 Hz for performance
Log taken cold only	Fuel trims are meaningless until engine is at temp	Include warm operating temp data
Wrong file format	GREASE-AI expects CSV — binary log files won't parse	Export to CSV before uploading
Missing downstream O2	Can't assess catalyst efficiency or exhaust leaks	Log B1S2 and B2S2 whenever possible
No vehicle info entered	AI uses generic thresholds instead of platform-specific	Always enter year/make/model/engine

Quick Reference — Minimum Channel List by Goal

Diagnostic Goal	Minimum Required Channels
Rough idle / stall	RPM, TPS, MAP/MAF, IAT, ECT, STFT B1/B2, LTFT B1/B2, O2 B1S1/B2S1
Lean/rich condition	All fuel trim channels + O2 upstream/downstream + fuel pressure if available
Knock / detonation	RPM, TPS, MAP/MAF, Knock Retard, Spark Advance, IAT, ECT
Transmission shudder	RPM, VSS, TCC Slip, Gear, Trans Fluid Temp, Torque Management
Shift quality	RPM, VSS, Gear, TCC Slip, Line Pressure, Torque Reduction
Boost / turbo	RPM, TPS, MAP, Boost Pressure, Wastegate DC, IAT, Knock Retard
Fuel system (DI)	RPM, TPS, Fuel Rail Pressure, Injector PW, STFT/LTFT
Cold start issues	ECT, IAT, STFT B1/B2, Commanded Fuel Mode, O2 B1S1 (light-off time)
O2 / catalyst	O2 B1S1, B1S2, B2S1, B2S2, STFT/LTFT, Catalyst Temp

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This guide is provided for diagnostic reference. Always verify findings with physical inspection.