

Jeep XJ 4.0L — RENIX Wiring Diagnostic Quick Reference

1987–1990 Renault-Bendix MPI • Pre-OBD, no stored codes, no check-engine light • All diagnosis is DMM voltage / resistance / continuity. Document 1 of 3 (companions: 1991–1995 OBD-I and 1996–2001 OBD-II references).

1. System Overview

Item	Detail
Controller	Renix (Renault-Bendix) ECU, under dash, right of steering column
Connector	Single 52-pin: rows A(12), B(12), C(16), D(12)
Diagnostics	Pre-OBD. No DTCs, no MIL. Real-time data only via DRB-II / MT2500 / M.S.1700. DMM sufficient for nearly everything.
Ignition	Distributor with separate ignition control module (ICM)
Idle control	Idle Speed Actuator (ISA) — stepper that moves the throttle stop
Fuel pump	ECU grounds pump relay; ballast resistor drops to ~6V during run (full 12V during crank via starter relay bypass)
Main power relay	B+ Latch relay — holds ECU power 3–5s after key-off so the ISA can reposition for next start
CPS	2-wire magnetic pickup on bellhousing (generates AC voltage)
Sync sensor	In distributor — cylinder identification
Charging	External voltage regulator on fenderwell
Known weakness	Under-engineered grounding, especially the multi-wire ground at the dipstick tube stud

Year variations within Renix: 1987–1988 use a **C101 firewall connector** (above the brake booster) that is eliminated on 1989–1990. Sensor-ground splice is **3 wires** → **1** on 1987–1988 and **4 wires** → **1** on 1989–1990. Wire colors / circuits below reflect the 1990 harness; confirm against the FSM 8W diagrams for your exact year.

Golden rule: always start with grounds and power supply. ~80% of Renix driveability problems trace back to poor grounds or corroded connections. Use an analog (needle) voltmeter for O2 swing and a vacuum gauge for MAP / mechanical tests.

2. Sensor Specs & Expected Readings

Crankshaft Position (CPS) — 2-wire magnetic

Type	Variable reluctance (AC)
ECU pins	C1 signal (F52 VT), D1 return (F53 WT)
Resistance	125–275 Ω
AC volts cranking	≥0.5 VAC (≤0.35V = intermittent)
Location	Bellhousing, rear of engine
Common fail	Low AC output despite OK resistance; some aftermarket units read 0.2V — use NAPA/dealer

Sync Sensor (distributor)

Type	Hall-effect
ECU pins	C5 signal (F65 GY), C16 7.1V supply (F66 BL)
Note	Both CPS + sync required to fire injectors

Coolant (ECT) & Intake Air (IAT) — NTC thermistor (same curve)

Temp	-40°F	32°F	70°F	100°F	160°F	200°F	212°F
Resistance	~100kΩ	~7,500Ω	~3,400Ω	~1,600Ω	~450Ω	~250Ω	~185Ω
Approx volts	~4.9V	~3.5V	~2.8V	~2.0V	~1.0V	~0.6V	~0.5V

ECT = ECU pin C10 (F24 TN) • IAT = ECU pin C8 (F7 TN). **Open** → reads -40°F, max enrichment, runs rich/black smoke. **Short** → reads max hot, lean, hard cold start. The temperature gauge sender is a separate sensor.

TPS — 3-wire potentiometer

Pins	C15 5V (F77 GY), C7 sig (F50 YL/GN), D3 gnd (F15 BR)
5V ref	5.0V ± 0.5V
Closed throttle	0.5–0.95V (adjust to 0.8V at A–B)
WOT	~4.5V (smooth, no dead spots)

MAP

Pins	C14 5V (F2 RD), C6 sig (F14 VT), D3 gnd
Terminals	A=gnd, B=signal, C=5V
KOEO (atmos)	4.0–5.0V
Hot idle 17-20"	1.1–2.1V
Decel (hi vac)	<1.0V

Oxygen Sensor (single upstream, heated)

Signal pin	D9 (F6 GY)
Heater resist.	5–7 Ω (infinite = replace)
Rich	>0.6V (up to ~0.9V)
Lean	<0.3V (down to ~0.1V)
Switching	Toggles ~every 2s at hot idle
Tool	Analog needle meter to see swing

Injector test: unplug, measure resistance across terminals — all 6 within ~1 Ω ; OL/0 Ω = replace. Confirm 12V on feed wire (from O2 heat relay) key-ON.

Injectors & Ignition Coil

Inj. type	High-Z saturated; ~12–16 Ω era-typical
Inj. feed	12V from O2 heat relay (F22 OR)
Inj. ground	ECU switches ground to fire each
Inj. ECU pins	A1 cyl3, A2 cyl4, A3 cyl5, A4 cyl6, B1 cyl1, B2 cyl2
Coil primary	1.13–1.23 Ω @75°F (~1.5 Ω @200°F)
Coil secondary	7,700–9,300 Ω (~12k @200°F)

3. ECU Pinout Reference (37 active of 52)

Pin	Ckt	Wire	Function
A1	F73	18TN	Injector 3 (Cyl 3)
A2	F76	18BR	Injector 6 (Cyl 4)
A3	F72	18LG	Injector 2 (Cyl 5)
A4	F74	18YL	Injector 4 (Cyl 6)
A5	F17	16OR*	Fuel Pump Relay gnd ctrl
A7	F86	GY/YL	O2 Heat Relay gnd ctrl
A9	F20	16BK*	B+ Latch Relay gnd ctrl
A10	F19	16GN	EGR Solenoid ctrl
B1	F71	18LB	Injector 1 (Cyl 1)
B2	F75	18WT	Injector 5 (Cyl 2)
B3	F68	RD/YL	AIS Motor Coil A
B4	F67	BK/YL	AIS Motor Coil D
B5	F70	GN/BK	AIS Motor Coil C
B6	F69	PK/BK	AIS Motor Coil B
B7	10	16RD	Battery (+) constant
B8	11	14YL	Ignition run (+) sense
B10	F21	16PK	B+ Latch Relay coil (+)
B11	99	18BK	Power Ground #1
B12	99	18BK	Power Ground #2

Pin	Ckt	Wire	Function
C1	F52	18VT	CPS signal (crank)
C3	88	16GN	Start signal (+)
C4	34	20BK	Start signal (-)
C5	F65	18GY	Sync signal (distrib.)
C6	F14	18VT	MAP signal
C7	F50	YL/GN	TPS signal
C8	F7	18TN*	IAT signal
C10	F24	18TN	ECT signal
C11	F22	16OR	Injector feed sense #1
C14	F2	18RD*	MAP 5V reference
C15	F77	20GY	TPS 5V reference
C16	F66	18BL	Sync 7.1V supply
D1	F53	18WT	CPS return
D3	F15	18BR	Sensor Ground bus
D8	F54	18VT*	Knock sensor ground
D9	F6	18GY	O2 sensor signal
D10	F22	16OR	Injector feed sense #2
D13	F27	16OR	Timing ref to ign module
D16	F55	18YL*	Knock sensor signal

Build notes: Sensor ground (D3) MUST stay separate from power grounds (B11/B12). F22 OR feeds both C11 and D10. B11+B12 = same circuit 99 (dual pins for current). EGR (A10) and O2 heat relay (A7) optional on delete / cold-start-only builds.

ECU Pin Voltages — Key-On Engine-Off (KOEO)

Pin	Function	KOEO V
B7	Battery (+) constant	12.4–12.8V
B8	Ignition run sense	Battery V
C14	MAP 5V ref	5.0 ±0.5V
C15	TPS 5V ref	5.0 ±0.5V
C16	Sync 7.1V supply	~7.1V
C6	MAP signal	4.0–5.0V

Pin	Function	KOEO V
C7	TPS signal	~0.8V
C8	IAT signal	~2.0–3.0V @70°F
C10	ECT signal	varies w/ temp
D9	O2 signal	~0.45V (inactive)
D3	Sensor ground	0V
B11/12	Power ground	0V

KOER (running): MAP 1.1–2.1V @idle • TPS 0.5–0.95V @idle • O2 0.1–0.9V oscillating (warm) • CPS/Sync = AC pulse (not meaningful on DC).

4. Relays

Relay	Pin 30	Pin 85	Pin 86	Pin 87 out
Fuel Pump	Constant via fusible link	Pwr from ign switch	Gnd via ECU A5 (F17)	Pump via ballast resistor
B+ Latch	—	Gnd via ECU A9 (F20)	Coil(+) from ECU B10 (F21)	Holds ECU 3-5s post key-off (ISA reset)
O2 Heater	Gnd ctrl from ECU A7 (F86 GY/YL)		Also provides injector feed (F22 OR)	

Bench test: coil 85–86 = 50–120Ω (OL=open, 0=short). 30–87 open de-energized; apply 12V to 85/86 → click → 30–87 ~0Ω. **In-circuit:** key ON, relay out — power on exactly 2 of 4 pins (30 always hot, 85 switched).

5. The Renix Ground Problem (do this first)

Critical ground points

- **Engine dipstick tube stud** — multiple grounds terminate here; corrosion cascades.
- **C101 firewall connector** (1987–1988 only) — high-resistance, above brake booster.
- **Sensor ground bus** (F15 BR → ECU D3) — shared by TPS, MAP, ECT, IAT, diag connector.
- **Power grounds** (circuit 99, B11/B12) — separate from sensor ground.

Ground test & upgrade

Test: DMM ohms, key OFF. Red to TPS terminal B (ground), black to battery neg — should be ~0Ω. Wiggle harness along valve cover / firewall (and C101 on 87-88); any fluctuation = bad connection.

Upgrade (Cruiser54 #6): sensor grounds splice 3-to-1 (87-88) or 4-to-1 (89-90) at the dipstick area; factory crimps develop resistance. Cut out the crimps, solder all sensor grounds together, heat-shrink.

Common Renix failure modes

CPS (#1 no-start; test AC volts cranking, not just resistance) • sensor ground degradation (affects all sensors at once) • C101 corrosion (87-88) • TPS ground failure (surge, tip-in hesitation) • cold-start flooding (open ECT reads -40°F) • injector leaks (external = fire hazard) • B+ latch relay (ISA no reset) • ballast resistor (pump 12V always or 0V after start).

6. Troubleshooting Decision Trees

Crank—No-Start

ENGINE CRANKS BUT WON'T START (Renix 1987-1990)

└ Check ALL grounds first: dipstick stud, C101 (87-88), sensor ground bus

└ Fuel pump prime (2-3s buzz at key-ON)?

└ YES → CPS: AC volts while cranking ≥ 0.5V?

└ YES → check sync sensor, spark, injector pulse

└ NO → replace CPS (NAPA/dealer), check gap adjustment

└ NO → test fuel pump relay (pin 85 ground from ECU A5?)

└ Relay clicks → check fuel pressure, ballast resistor, pump

└ No click → check ECU power (B7, B8), grounds (B11, B12)

└ Also: B+ latch relay click at key RUN? (sustains ECU power)

Rough Idle

ENGINE IDLES ROUGH

└ Vacuum leak (spray test)?

└ Found → repair hose / intake / TB gasket

└ None found

└ Clean / check ISA stepper

└ TPS volts at idle

└ Out of spec → adjust to 0.8V

└ In spec → continue

└ MAP at idle (1.1-2.1V)

└ Fouled injector (resistance compare)

└ ECT reading (wrong temp = wrong mix)

└ O2 activity (stuck rich / lean?)

└ Check ALL grounds (sensor bus)

Charging / Sensor Circuit

CHARGING (Renix)

└ Running V at battery = 13.8-14.4V?

└ Low → check EXTERNAL voltage

└ regulator, field connections, belt

SENSOR READING SUSPICIOUS

└ 5V/7.1V ref at connector (key ON)?

└ 0V → open wire / ECU fault

└ OK → continue

└ Sensor ground <0.5Ω to batt neg?

└ No → repair ground

└ Signal: stuck 5V=open, 0V=short, erratic=intermittent (wiggle test)

7. Procedures & Wire Color Codes

Key DMM procedures

- **Voltage:** DC 20V; black to good ground, red to pin; backprobe live circuits.
- **Resistance:** power OFF, disconnected. OL=open, 0Ω=short.
- **Continuity:** good wire beeps, ≤0.3Ω.
- **Voltage drop (ground):** red to ground point, black to batt neg, load the circuit. <0.1V good; >0.2V = repair.
- **Backprobe** from wire side only; never probe connector front.

Wire color codes

Code	Color	Code	Color
BK	Black	OR	Orange
BL	Blue	PK	Pink
BR	Brown	RD	Red
GN	Green	TN	Tan
GY	Gray	VT	Violet
LB	Lt Blue	WT	White
LG	Lt Green	YL	Yellow

BK/RD = base/striped • * = tracer stripe • harness wires 18 AWG unless noted.

Renix (1987–1990) quick reference, Document 1 of 3. Colors/circuits reflect the 1990 XJ harness — verify against the FSM 8W diagrams for 1987–1989. Sources: Chrysler/Jeep FSM, Cruiser54, LungHD, Boxy Jeep, NAXJA. For diagnostic guidance only.