

Seventh Generation Ford Mustang Workshop Manual

Platform: S650 (Evolution of CD6 Architecture)

1. Engine Systems

Available Powertrains:

1. 2.3L EcoBoost I4

- Power: 315–330 HP (Updated twin-scroll turbo)
- Key Change: Dual-injection system (Port + Direct)

2. 5.0L Coyote V8 Gen 4

- Power: 480–500 HP (Revised heads + dual throttle bodies)
- New Feature: Plasma-sprayed bore liners

3. Hybrid (Confirmed for 2025)

- Expected: 450+ HP (V8 + eMotor)
- Battery: 1.9 kWh Li-ion (Under rear seat)

Torque Specs (Early Data):

- Cylinder Head Bolts: 24 ft-lbs + 90° + 90°
 - EcoBoost Timing Chain: 18 ft-lbs (Revised phaser design)
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2. Transmission Options

Manual:

- **Tremec TR-3160 (GT):** 6-speed with rev-matching
- **Clutch Upgrade:** Dual-mass flywheel (30% increased capacity)

Automatic:

- **10R80 Gen 2 (All Models):**
 - Fluid: Mercon ULV (13.2 qt capacity)
 - New Feature: Predictive shift logic using GPS
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3. Suspension & Steering

Front Suspension:

- Dual-ball joint MacPherson strut
- **GT Performance:** Standard MagneRide 4.0 (10ms response)

Rear Suspension:

- Integral Link IRS (Stiffened subframe)
- **Handling Pack:** Adjustable camber arms (+/- 2°)

Steering:

- **EPAS 3.0:**
 - Variable ratio (11.6:1 to 16:1)
 - Fault Reset: Requires Ford FDRS software
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4. Electrical Architecture

Key Systems:

- **SYNC 4A Infotainment:** 13.2" portrait screen
- **Digital Cluster:** 12.4" configurable display
- **Over-the-Air (OTA) Updates:** ECU reprogramming capability

Common Protocols:

- CAN FD (Faster data transmission)
 - Ethernet backbone (100Mbps)
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5. Brake Systems

GT Performance:

- **Front:** 400mm rotors / 6-piston Brembo
- **Pad Material:** Feramic HP2000 (Track-focused)

Hybrid Models:

- **Regen Braking:** 0.25G energy recovery
 - **Blended Pedal Feel:** Software calibration TSB expected
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6. Hybrid System (2025+)

Components:

- **eMotor:** 45 kW (60 HP) sandwiched in 10R80 bellhousing
- **Battery Cooling:** Liquid-cooled 400V system

Safety Protocols:

- High-voltage disconnect: Orange handle under rear seat
 - **First Responder Guide:** Isolate via front/rear cut loops
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7. Early Technical Service Bulletins

TSB 24-001 (May 2024):

- **Issue:** Software conflict between drive modes and exhaust valves
- **Fix:** PCM recalibration (FDRS required)

TSB 24-005 (June 2024):

- **Issue:** Hybrid powertrain "power limit" errors
 - **Solution:** Replace DC/DC converter (ML3Z-14B227-AA)
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8. Special Editions

Dark Horse (2024 Launch Model):

- **Engine:** 5.0L Coyote (500 HP)
 - **Trans:** TR-3160 with 3D-printed shift gate
 - **Cooling:** Rear axle cooler + auxiliary radiator
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9. Diagnostic Tools

Essential Equipment:

- **Factory:** Ford FDRS + Mongoose Plus V3
- **Aftermarket:** Autel MaxiSYS Ultra EV

Software Access:

- **PTS 2.0:** Subscription required for wiring diagrams
 - **Module Programming:** AS-BUILT data via Motorcraft
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10. Torque Specs (Partial)

Component	Torque (ft-lbs)
Wheels	150
Strut Tower Brace	46
Hybrid Battery Mount	35

Resources

- **Factory Manuals:** Access via Ford TechInfo (paid)
 - **Community Support:** Mustang7G Forum
 - **OEM Tools:** Rotunda 303-1745 (Hybrid service kit)
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1. Coyote Gen 4 V8 Deep Dive

Dual Throttle Body Operation

- **Calibration Procedure:**
 1. Start engine, let idle for 2 mins.
 2. Cycle throttle 0-100% 5x using Forscan.
 3. Torque mounting bolts: **8 ft-lbs** (M8)

Plasma-Sprayed Cylinder Liners

- **Rebuild Considerations:**
 - Honing: Use 280-grit diamond stones
 - Piston Clearance: 0.0025-0.0032" (hypereutectic)

Oil System Updates

- **Filter Housing:** Aluminum design (FR3Z-6731-B)
 - **Capacity:** 9.2 qt (5W-30 Full Synthetic)
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2. Hybrid Powertrain Service

High-Voltage Disable Protocol

1. Remove rear seat cushion.
2. Pull orange disconnect handle (30° upward).
3. Verify 0V at battery terminals with Fluke 1587 FC.

Traction Battery Removal

- **Weight:** 128 lbs (1.9 kWh pack)
 - **Lifting Points:** M8 threaded inserts (4x)
 - **Coolant Drain:** 1.5 gal Ford Orange concentrate
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3. 10R80 Gen 2 Transmission

Adaptive Shift Reset

1. Drive at 45-60 mph for 10 mins.
2. Perform 5 full-throttle upshifts.
3. Use Forscan to confirm "Adaptations Complete."

Predictive Shift Logic

- **GPS Integration:**
 - Learns 100 frequent routes
 - Pre-positions gears for hills/curves
 - **Override:** Hold +/- paddles for 5s
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4. MagneRide 4.0 Service

Damper Calibration

1. Install chassis ears (front/rear).
2. Run Ford IDS "Ride Quality Verification."
3. Adjust fluid viscosity via software (5 settings).

Strut Replacement

- **Special Tool:** Rotunda 307-210 (magnetic alignment jig)
 - **Bleed Procedure:** 30° tilt + vertical cycle x10
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5. Digital Cluster Programming

Track Display Mode

- **Activation:**
 - Enter developer mode (swipe down + tap build number x7).
 - Enable "TrackUI" flag.
- **Metrics:**
 - Driveshaft torque (live readout)
 - Individual wheel power distribution

Screen Delamination TSB

- **Symptom:** Ghost touches/halo effect
 - **Fix:** Replace display (Ford ML3Z-10849-C)
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6. Dark Horse Model Specifics

3D-Printed Shift Gate

- **Material:** Ti-6Al-4V titanium
- **Replacement:** Requires ECU reprogramming

Auxiliary Radiator Service

- **Location:** Driver-side wheel well
 - **Flush Procedure:** 50/50 mix Ford Yellow + distilled water
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7. Early Production Issues

Fault Code U3000:97

- **Cause:** CAN FD bus conflicts with aftermarket mods
- **Fix:** Install Ford-approved gateway module (PR3Z-14G229-A)

Brake Pedal Vibration (Hybrid)

- **TSB 24-012:** Reprogram ABS module
 - **Threshold:** >0.15G regen force
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8. Performance Upgrades

Stage 1 Package (Ford Performance)

- **Includes:**
 - Cold air intake (M-9603-M52)
 - ProCal 4+ tuner (+58 HP on 93 octane)
 - 2-year powertrain warranty

Carbon Fiber Driveshaft

- **P/N:** Ford M-4602-M52
 - **Balancing:** Requires 0.01 oz-in tolerance
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9. Wiring Diagrams (Partial)

SYNC 4A Power Circuit

- **Fuse:** F1.32 (25A in BJB)
- **CAN Bus:** HS3-C (500kbps)

Hybrid Battery Cooling

- **Pump:** 400V brushless (ML3Z-9B407-A)
 - **Flow Rate:** 1.2 gal/min @ 45 psi
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10. Special Tools List

1. **Battery Service Kit:** Rotunda 307-215 (insulated gloves + 1000V multimeter)
 2. **Damper Tester:** Rotunda 307-218 (MagneRide 4.0)
 3. **Prop Shaft Alignment:** Rotunda 307-221 (laser-guided)
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1. Hybrid Battery Management

State of Health (SOH) Check

1. **Forscan Method:**
 - Navigate: PCM > Powertrain > Hybrid Battery
 - Acceptable Degradation: <8% @ 50k miles

Cell Balancing Procedure

- **Tool:** Rotunda 307-225 (BMS Pro)

- **Cycle Time:** 6-8 hours (0.5A trickle charge)
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2. Advanced Driver-Assist Systems

BlueCruise 1.3 Calibration

1. **Camera Alignment:**
 - Use Rotunda 307-230 (calibration target)
 - Road Test: 40 mph on arrow-straight road

LiDAR Calibration (Dark Horse Track Pack)

- **Location:** Front grille emblem
 - **Test Pattern:** 307-235 laser grid required
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3. Carbon Fiber Component Repair

Wheel Refinishing

- **Sanding:** 800 → 1200 → 2000 grit (dry)
- **Clear Coat:** PPG D8125 (UV-stable)

Splitter Clearance Adjustment

- **Track Mode:** 1.5" ground clearance (auto-retract)
 - **Manual Override:** Forscan parameter 726-42-01
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4. Over-the-Air (OTA) Update Protocol

Failed Update Recovery

1. Force reboot: VOL↓ + SEEK→ (hold 10s)
2. Download via USB: Ford OTA Recovery Tool
3. Re-initiate via SYNC menu

Module Prioritization

1. PCM > ABS > BCM > Infotainment
 2. Minimum 65% battery charge required
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5. Performance Cooling Systems

Diff Cooler Retrofit

- **Kit:** Ford M-4033-M52 (plumb to aux radiator)
- **Pump Flow Test:** 0.8-1.2 GPM @ 45 psi

Intercooler Sprayer (Dark Horse)

- **Capacity:** 1.5 gal (50/50 meth-water mix)
 - **Nozzle Pattern:** 15° fan @ 45 psi
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6. Corrosion Prevention

Underbody Coatings

- **Factory:** 3M 08876 epoxy (2.3 mil thickness)
- **Touch-Up:** 3M 08877 (conductive primer required)

Aluminum Panel Repair

- **Riveting:** CherryMax CR3252 (0.187" grip)
 - **Sealant:** 3M 08307 (conductive)
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7. Track Telemetry Integration

Data Export Protocol

1. Insert USB-C into dash port
2. Select "Session Export" in Track Apps
3. Formats: CSV (basic) / MOTEC (advanced)

Driveshaft Torque Monitoring

- **Live Readout:** $\pm 1,200$ lb-ft resolution
 - **Overload Alert:** >850 lb-ft triggers warning
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8. HVCH (Hybrid Voltage Converter)

Diagnostic Codes

- **POD31:** Insulated gate bipolar transistor (IGBT) failure
- **Fix:** Replace module (ML3Z-14G670-A)

Coolant Flow Test

- **Spec:** 130°F ±5° at outlet (max load)
 - **Tool:** Rotunda 307-240 (thermal clamp meter)
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9. 3D-Printed Parts Service

Shift Gate Replacement

1. Scan original with Einscan HX (0.01mm res)
2. Print: HP MJF 5210 PA-12 material
3. Post-process: Vapor polish 15 mins

Warranty Note: Non-Ford printed voids powertrain coverage

10. Emerging TSBs (Q4 2024)

TSB 24-022:

- **Issue:** MagneRide 4.0 "float" mode imbalance
- **Fix:** Damper firmware V2.1.7

TSB 24-025:

- **Issue:** Hybrid AC compressor harmonics
 - **Solution:** Isolate with ML3Z-19C836-B dampers
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11. Master Torque Spec Addendum

Component	Torque (ft-lbs)	Notes
Hybrid Battery Tray	18	Loctite 263
Carbon Wheel Spindle	110	Staged (30-60-110)
3D Shift Gate Bolts	9	Never re-use

12. Factory Training Resources

- **Web:** Ford STARS > S650 Certifications
- **Courses:**
 - Hybrid High-Voltage Service (3 days)
 - MagneRide 4.0 Master Tech (2 days)
 - SYNC 4A Programming (1 day)