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1981 Yamaha XS650 Buyer's Guide

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The 1981 Yamaha XS650H / XS650SH

Factory-Correct Restoration Guide — IronHead

KEY FACTS AT A GLANCE

- **Model year covered:** 1981 only — both US variants: XS650H Special II (code 4N9) and XS650SH Special (code 4M4). TCI ignition and BS34 carbs continue; this guide does not cover other years except where differences are explicitly noted.
- **Engine (both):** 654 cc air-cooled SOHC 360° parallel twin; 75.0 mm × 74.0 mm bore × stroke; 8.4:1 compression; ~53 bhp.
- **Fuel system (both):** Two Mikuni BS34 constant-velocity carburetors.
- **Ignition (both):** Transistorized TCI electronic ignition (no points, no mechanical advance).
- **Starting (both):** Electric starter + kick starter.
- **Transmission (both):** 5-speed constant-mesh manual, chain final drive, wet multi-plate clutch.
- **XS650H Special II:** Indigo Blue or New Ruby Red; wire-spoked wheels; rear drum brake; reduced chrome; serials from 4N9-000101.
- **XS650SH Special:** New Yamaha Black or Frost Silver; cast/alloy wheels; 267 mm rear disc; full chrome trim; serials from 4M4-000101.
- **Key 1981-only features:** new colorways; Specials only; the last year before the Heritage Special era.

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The Yamaha story

Yamaha's history is summarized in full in the IronHead Yamaha manufacturer guide; the key points relevant to this restoration:

- Yamaha Motor Co., Ltd. was founded in 1955, spinning out of Nippon Gakki (the musical-instrument maker) under president Genichi Kawakami.
- Yamaha's first motorcycle was the 1955 YA-1 "Red Dragonfly," a 125 cc two-stroke whose success established the tuning-fork brand in motorcycling.
- Through the 1960s Yamaha built its reputation on two-strokes — the YDS series twins and the TD/TR production racers that dominated small-displacement road racing.
- The XS-1 of 1970 was Yamaha's deliberate four-stroke answer to the Triumph Bonneville and Harley-Davidson Sportster: a 654 cc overhead-cam parallel twin aimed squarely at the American big-bike market.
- By the mid-1970s the XS650 was established as the Japanese alternative to the British twin — and it outlasted them all, running in production from 1970 through 1983.

The XS650 story

The model-line history is summarized here; the sections below cover what makes the 1981 XS650H / XS650SH specifically correct.

- The XS-1 (1970) launched the line: 654 cc SOHC twin, kick-start only, drum brakes front and rear, built to take on Triumph and Harley-Davidson on their home ground.
- The XS-1B (1971) refined the formula in Candy Orange, retaining the front drum brake.
- The XS-2 (1972) added the electric starter and a 298 mm front disc — the first major mechanical revision.
- The TX650 (1973) brought the larger 14 L tank and a front end provisioned for a second disc.
- The TX650A (1974) was the Percy Tait chassis revolution: longer swingarm, repositioned engine, dual 267 mm front discs, and a stronger starter with the compression release deleted.
- The XS650B (1975) restored the XS name; the XS650C (1976) moved the front calipers behind the fork legs.
- The XS650D (1977) is the best-documented Standard — Yamaha's supplementary service manual was written for it.
- 1978 split the line: the XS650E Standard (the last roadster) and the XS650SE Special (the first factory custom), both on 35 mm forks with floating calipers.
- 1979 ran three variants — F Standard, SF Special (with rear disc), and the 2F Special II — the last year of points ignition and BS38 carburetors.
- 1980 brought transistorized TCI electronic ignition and Mikuni BS34 carburetors; the lineup became Specials only.
- 1981 (H/SH) carried the formula with new colors; 1982–83 closed the line as the Heritage Special (SJ/SK).
- Total XS650 production exceeded 500,000 units across the fourteen model years.

What makes the 1981 unique

1981 is a carryover year done right: the TCI/BS34 Special formula from 1980 continues with fresh colorways and the two-tier Special lineup intact. The H is the plainer wire-wheeled Special II; the SH is the full-dress Special. For the restorer, 1981 is about trim correctness — the mechanical package is the known 1980-on specification.

1981-only details:

- **XS650H Special II (4N9, from 4N9-000101)** — Indigo Blue or New Ruby Red,

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wire-spoked wheels, rear drum brake, restrained chrome with chrome-look plastic side covers.

- **XS650SH Special (4M4, from 4M4-000101)** — New Yamaha Black or Frost

Silver, cast/alloy wheels, 267 mm rear disc, full bright trim.

- **New colorways** are the year's headline change; mechanically the bike is

the 1980 specification (TCI, BS34, 35 mm forks, floating calipers).

- **Seventeen-digit VINs.** US-market 1981 motorcycles carry the federally

mandated 17-digit VIN format; the model-code serials in the ID table are the series portion. Verify the VIN plate against the frame stamping.

What carried over: engine, TCI ignition, BS34 carbs, 5-speed gearbox, dual 267 mm front discs, 11.5 L teardrop tanks, pullback bars — the full 1980-on Special package.

1981 buyer cautions:

- **H vs. SH trim.** As in 1980, wheels, rear brake, and brightwork differ

between the II and the full Special. The model code (4N9 vs 4M4) is the authority.

- **TCI-era electrics.** Same standing checks as 1980: igniter-box health,

pickup resistance, alternator rotor and brushes, and the full connector clean-and-dielectric-grease treatment — 45-year-old bullet connectors are a leading cause of "mystery" electrical faults.

- **BS34 pilot circuits.** The forums' standing finding holds: most BS34

running faults trace to incompletely cleaned pilot passages (the three tiny transfer holes in the carb throat must flow cleaner), not to jetting choices.

Serial numbers and model codes

Model year: 1981 · Designation: XS650H / XS650SH · Model code: 4N9 / 4M4. Frame and engine serials: H Special II: 4N9-000101 onward; SH Special: 4M4-000101 onward. The frame number is stamped on the steering head; the engine number is stamped on the crankcase. On a factory-correct bike the two numbers are in the same series and allocation — a mismatch means a replacement frame or engine, which must be disclosed on any judged restoration. Decode carefully: the serial prefix (e.g. S650-, 447-, 2F0-, 5V4-) identifies the model series, and the number that follows places the bike within the year's allocation. The XS650H / XS650SH's prefix is 4N9 / 4M4-series as listed above; any other prefix on the frame or engine means the component is not original to this model year.

Engine and internals

654 cc (1982–83 Specials: 653 cc) air-cooled SOHC 360° parallel twin. Bore × stroke 75.0 mm × 74.0 mm; compression ratio 8.4:1 (per the factory figures for this year); output ~53 bhp. The 360-degree crank gives the classic British-twin firing interval and the line's characteristic vibration. The bottom end is shared across the entire 1970–83 run — crankcases, crankshaft, and gearbox internals interchange far more widely than bodywork does — which is why the parts fiche for the engine looks so stable year to year while the trim fiche changes constantly. Factory valve clearances (XS650D supplementary service manual): intake 0.10 mm (0.004 in), exhaust 0.15 mm (0.006 in), checked cold. Cam timing, valve seats, and guides follow the factory manual's procedures; the D supplement's torque tables are the authority for fastener values (see Section 10).

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Fuel system

Carburetors: 2 × Mikuni BS34 constant-velocity. Points-era bikes (1970–79) run Mikuni BS38s; TCI-era bikes (1980–83) run BS34s. The two families share nothing in rebuild parts — jets, needles, diaphragms, and float specs are family-specific. Identify the carbs by the body stamping before ordering anything. Factory jetting for the XS650D (supplementary service manual): main jet #122.5, with market variants #117.5 and #112.5 — the manual explicitly documents all three. Set float height, synchronize the pair on vacuum gauges, and set the idle mixture by the book before chasing any jetting change; the marque forums' standing finding is that most "carb problems" are incompletely cleaned pilot circuits and intake leaks, not jetting. The fuel tap (petcock) is vacuum-operated on later bikes and gravity on early ones; either way, rebuild it — a weeping tap hydrolocks engines and washes bores.

Electrical system

Ignition: Transistorized TCI electronic ignition (no points, no mechanical advance). Starting: Electric starter + kick starter. TCI maintenance is connector-first: clean and treat every bullet connector with dielectric grease, verify pickup resistance against the manual's figures, check the alternator rotor resistance and brush length, and test the igniter box with a known-good unit before condemning anything else. The advance rod was deleted with the points — aftermarket ignition kits for TCI bikes must supply one. Battery, harness, switches, and grounds: replace the battery on any unknown-history bike, unwrap and inspect the harness for chafing at the steering head and under the seat, and verify every ground — 45+ year-old grounds are the leading cause of "mystery" electrical faults.

Transmission and driveline

5-speed constant-mesh manual gearbox. Primary reduction 72/27 (2.667). Factory gear ratios (D supplement): 1st 2.462, 2nd 1.588, 3rd 1.300, 4th and 5th per the manual's table; final drive by roller chain. Clutch: wet multi-plate. Measure the friction-plate stack against the manual's service limit, check the clutch basket fingers for notching (file smooth or replace — notched baskets cause drag and false neutrals), and replace the springs as a set on any unknown-history bike. Chain and sprockets: replace as a set. Check countershaft sprocket splines for wear — neglected chains fret the splines, and a worn countershaft is an engine-out repair.

Brakes

Dual 267 mm front discs (floating single-piston calipers); rear: drum (H) / 267 mm disc (SH). Rebuild every hydraulic component on an unknown-history bike: master cylinder, calipers (new seals, pistons inspected for pitting — pitted pistons are replaced, not reused), stainless or new rubber hoses (original rubber hoses are all time-expired), and fresh DOT fluid. 1978-on floating calipers need their slide pins cleaned and greased; opposed-piston pre-1978 calipers need all four seals per caliper. Discs: measure thickness and runout against the manual's limits. Note the 1978-on disc offset change — pre-1977 and 1978-on front discs do not interchange.

Wheels, forks, and suspension

Wheels: Wire-spoked (H Special II); cast/alloy (SH Special). Spoked wheels: check every spoke for correct tension and the rims for true before any cosmetic work — a freshly painted rim that is bent is wasted money. Takasago alloy rims polish well but pit deeply; decide early whether the rims are candidates for restoration or replacement. Cast wheels: inspect for cracks at the spokes, especially around the disc mounts. Forks: full rebuild — new seals, fresh oil at the manual's level, stanchions inspected for pitting (pitted stanchions eat new seals; re-chrome or replace). Rear shocks: the originals are all worn out; period-correct replacements are available, but verify eye-to-eye length and spring rate against the manual.

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Paint, trim, and finishes

1977-and-later factory colors for this year are listed in the Key facts section above. Paint codes and stripe layouts are year-specific — verify against the parts fiche for the XS650H / XS650SH, not against a generic XS650 reference. Tank and side-cover paint: base/clear two-stage in the original color, with the correct stripe width and placement. Badges are year-specific — the 1981 badges differ from neighboring years in script, color, or mounting. Chrome and brightwork: original chrome was thin; re-chrome to show standard where the bike warrants it. Special II models' chrome-look plastic trim is unique and fragile — handle with care and verify reproduction availability before stripping originals.

Torque specifications

All torque figures below are from the Yamaha XS650D factory supplementary service manual — the genuine article, applicable to the shared fasteners across the line. Always use the manual's figure for the specific fastener; the values here are the commonly referenced ones.

Fastener	Torque
Cylinder head nuts (M10)	36 Nm (26 ft-lb) — in sequence, in stages
Camshaft cap bolts (M6)	10 Nm (7.2 ft-lb)
Cam sprocket bolt	40 Nm (29 ft-lb)
Crankcase bolts (M6)	10 Nm (7.2 ft-lb)
Crankcase bolts (M8)	20 Nm (14.5 ft-lb)
Oil drain plug	43 Nm (31 ft-lb)
Front axle nut	105 Nm (77 ft-lb)
Rear axle nut	120 Nm (87 ft-lb)
Front fork pinch bolts	20 Nm (14.5 ft-lb)
Handlebar clamp bolts	23 Nm (17 ft-lb)
Brake caliper mounting bolts	40 Nm (29 ft-lb)
Rear brake torque arm nut	25 Nm (18 ft-lb)
Sprocket nuts	60 Nm (43 ft-lb)
Spark plugs	20 Nm (14.5 ft-lb)

Torque in stages, in the manual's sequence, with threads clean and lightly oiled unless the manual specifies dry. Cylinder-head and cam-cover fasteners are the critical ones — uneven torque warps covers and weeps oil permanently.

Service schedule and wear items

Factory service intervals (D supplement): engine oil every 1,500 miles / 6 months; oil filter every 3,000 miles; valve clearances, points (where fitted), and carburetor synchronization every 3,000 miles; brake fluid every year; fork oil every 12,000 miles; steering-head and swingarm bearings inspected every 6,000 miles.

Item	Spec / interval
Engine oil (with filter change)	2.5 L — SAE 20W-40/20W-50, every 1,500 miles

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Item	Spec / interval
Final drive chain	Clean, lube, and adjust every 300 miles
Valve clearances	IN 0.10 mm / EX 0.15 mm, check every 3,000 miles
Breaker points (pre-1980)	Gap and timing every 3,000 miles
Carburetor synchronization	Every 3,000 miles
Brake fluid	Replace annually (DOT 3/4)
Fork oil	Replace every 12,000 miles
Tires (factory spec)	3.50H-19 front, 4.00H-18 rear (D supplement)

Consumables to replace on any unknown-history bike regardless of appearance: tires (age, not tread — anything over six years old is suspect), brake hoses, battery, fuel lines, petcock seals, fork seals, wheel bearings, steering-head bearings, swingarm bushings, chain and sprockets, points and condensers (pre-1980), and all rubber intake manifolds.

Rust-prone areas and inspection points

Check in this order: (1) fuel tank interior — liner or replace; (2) exhaust system — originals rot from the inside at the collector and muffler seams; (3) frame at the steering head and swingarm pivot; (4) rear fender and chain-guard mounting points; (5) fork lower legs at the seals; (6) brake caliper pistons and master-cylinder bores; (7) electrical connectors and grounds; (8) the advance unit (pre-1980) for frozen weights. Frame inspection: with the bike stripped, dye-penetrant or careful visual inspection of the steering-head welds and swingarm pivot area. Any crack is a stop-work item — the frame is repaired by a qualified welder or replaced, never ridden cracked.

Restoration sequence

Step 1: Document and photograph everything before disassembly — cable routing, fastener positions, wiring runs. Bag and tag every fastener by assembly. **Step 2:** Assess the frame and running gear first: check the frame for cracks and straightness, then rebuild the rolling chassis (bearings, brakes, forks, wheels) before the cosmetics. **Step 3:** Engine: full strip, measure everything against the factory manual's service limits. The bottom end is robust; budget for valve seats, guides, and a rebore only if measurements demand it. **Step 4:** Carburetors: ultrasonic clean, all new soft parts, set to factory jetting and float height before any tuning. Do not re-jet to fix what is actually an intake leak or weak spark. **Step 5:** Electrical: rebuild the harness or replace it — 45+ year-old wiring is not trustworthy. Points-era bikes get new points, condensers, and advance-unit service; TCI-era bikes get connector hygiene and igniter/pickup testing. **Step 6:** Paint and plating: bodywork painted in the correct year color with correct stripes and badges; chrome re-plated to show standard; fasteners correctly finished (zinc, black, or plain as original). **Step 7:** Reassembly in the factory sequence, torqued to the manual's figures, with all fluids fresh and every adjustment set to spec. **Step 8:** Shakedown: 500 careful miles with frequent checks, then re-torque the head, re-check valve clearances, re-synchronize the carbs, and change the oil. The bike is finished when it starts, idles, and stops like Yamaha intended.

Sources and further reading

- Yamaha XS650D supplementary service manual (factory) — torque tables, BS38 jetting, gear ratios, valve clearances, tires, service chart, brake data.
- Yamaha XS650 shop manual (factory mirror) — general service procedures and specifications.
- Yamaha XS650 owner's manuals (factory) — operation, maintenance schedule, capacities.
- Yamaha parts fiches/catalogs by model code (S650-, 447-, 2F0-, 2M0-, 3N0-, 3G0-, 4N9-, 4M4-, 5V4-) — serial allocations, paint/trim, part interchange.

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