

# MIDYEAR CORVETTE ASSEMBLY PROCESS

## 2011 NCRS National Convention Technical Seminar

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### Body Shop:

**Birdcage** assigned job number per run sheet and assembled in several subassembly fixtures and complex main steel welding fixture (including N14 sill notching and rocker molding bracket delete), spray washed and rinsed, zinc chromate-primed, job number applied, joints sealed, bonding strip holes drilled and strips attached with over 100 pop-rivets for roof, cowl, and front surround.

**Underbody** job number assigned from run sheet and applied, bracket/reinforcement riveting for seat mounts, luggage stop panel, seat belt reinforcements, shifter hole reinforcement, console brackets, power window cup brackets, body mount bolt reinforcements, parking brake lever brackets, jack retainers, shoulder belt reinforcements, N03

brackets/holes/side filler panels/inner wheelhouse patch panels/jack brackets/rear bulkhead rework, convertible rear bulkhead rework and top frame brackets, quarter trim panel brackets, deck lid latch strikers, console screw brackets, tunnel heat insulator retainers, splash pan brackets, etc. Nearly 200 parts and rivets required.

Underbody panel sent up to main floor level and loaded/bolted to pedestals on steel body build truck.

**Subassemblies** were built-up in off-line bonding fixtures, each assembly identified with its Job Number from the run sheet:

**Cowl & Dash** assembly, including A/C holes rework & #1 body mount brackets, wiper and pedal support reinforcements, wire harness clips, power brake anchor plate, hood catches and cross-cable.

**Front Clip**, including radiator support and headlight buckets,

Grille brackets, wiring clips, A/C horn bracket, F.I. air cleaner mounting plate, washer bottle or bag bracket, rubber splash seals, expansion tank bracket, header bar reinforcement, cut opening for A/C battery access panel in LH inner fender, etc.

**Rear Clip**, including roof and rear window reinforcement on coupe, convertible deck lid hinges/springs/towers, deck lid striker plates, quarter panels, front and rear wheelhouse filler panels, and taillamp panel with valance panel anchor plates.

**Doors**, including latches and power window rework, outside mirror anchor plate, hinge and latch reinforcements and anchor plates, coupe upper glass run channels, anchor plates for inside release, inside lock remote, and window regulators.

**Convertible Deck Lid**, including soft and/or hardtop receiver holes, release handle, cables, and latches.

All surfaces of panel bonding fixtures and clamps that touched the parts adjacent to joint areas were made of Teflon™, so bonding material wouldn't stick to the fixture, especially along panel bond seam gaps on exterior surfaces; this helped maintain dimensional accuracy, eliminated panel surface damage from the fixture, and simplified fixture cleaning and maintenance.

Polyester resin and hardener were mixed in air-operated pedestal-mounted dispensing units which blended the two materials at the dispensing nozzle; operators rolled waxed paper into a cone, stepped on a foot pedal, and the machine dispensed ready-to-use bond into the cone. The small end of the cone was snipped off with scissors, and the other end was twisted closed; as the cone was twisted further, the bond was squeezed out of the small end and applied as a thick bead to the panel to be bonded, much like decorating a cake.

The bond material "went off" (cured completely) in 7-8 minutes, giving off considerable heat during the curing process; this determined the cycle time in the Body Shop, thus the seven per hour line rate.

After the birdcage was completed downstairs, it was sent up to the main floor in the Body Shop and was loaded/bonded/riveted into the underbody, forming the foundation for the rest of the body build.

Cowl & Dash subassembly (including the female hood latches and cross-cable), also built up downstairs, was loaded and fixture-located to the underbody and build truck and bonded in place.

Door sill panels loaded/bonded/riveted, with carpet support retainers

Hinge pillar covers loaded/bonded/riveted (including power window rework)

Lock pillar panels loaded/bonded

Rear Clip loaded and bonded/riveted

Convertible deck lid installed/fitted

Front Clip loaded and bonded

Front fender rear side panels bonded

Hood installed and fitted

Door opening front edge fixture-routed, doors installed/fitted, strikers installed on the lock pillars.

Filler material skived into all exterior body panel seams

N14 sidepipe cuts made at front fender lower and rear quarter and lock pillar filler panel at front of rear wheelhouse.

Rear valance panel temporarily attached with one screw per side

Grind Booth – all bond seams ground and 280-grit paper finished

### **Paint Shop:**

Body truck was moved manually with steel poles through steel floor-plated transfer areas between holding/prep areas and booths and ovens; only spray booth and oven interiors had floor chain conveyors.

All paint materials (primer, sealer, topcoat, thinners and blackout) were supplied by DuPont; they were the single largest GM stockholder at the time.

The fiberglass shell for the optional midyear hardtop on St. Louis bodies was processed through the Paint Shop on a windshield frame-mounted rack with the body and was subassembled and installed later in the Trim Shop (A.O. Smith bodies arrived with the hardtop already painted, trimmed and installed).

Dry-sand entire body and quick-dry pit-fill as required, blowoff and tack-rag to remove sanding dust

Sprayers blow body off again and tack-rag entire body surface

Headlight bezels and cowl vent grilles laid on body floor area

Body transferred into 3-job long downdraft spray booth

Spray quick-flash lacquer-based red oxide primer coat, flash for one job length, spray lacquer-based gray primer coat (including parts on body floor); two sprayers – one on each side, mirroring each other's spray action.

Body moved across transfer area by sprayers to one of four floor conveyors into prime bake oven.

Gas-fired primer bake oven – 60 minutes at 280°F

Body moved across transfer area to Wet-Sand conveyor

Wet-sand entire body with 360-grit paper to smooth finish. Parts on body floor not wet-sanded.

After wet-sand, body was moved through transfer area and run through Primer Oven again to dry water.

Body moved through transfer area onto #1 Color Topcoat spray booth conveyor; booth was three job lengths long, floor chain conveyor.

Job Number checked against run sheet to determine color; sprayers apply lacquer-based quick-flash sealer coat to entire body and parts on floor; sealer (called “adhesive” by sprayers) helped topcoat adhere to primer coat. After one-job flash, sprayed three coats of topcoat color lacquer, wet-on-wet, including parts on floor. Flash time between sealer and each color coat was 1-2 minutes.

Sprayers moved body through transfer area to one of the two Topcoat Color Bake Oven conveyors; flash time between spray booth and oven was 5-6 minutes. Body was then baked in a gas-fired oven at 160°F for 20 minutes to set up paint for subsequent repair sanding and handling without causing surface imperfections.

After first color bake, body was moved into transfer/prep area where minor surface imperfections were hand-sanded and tacked off prior to re-coat; 427 hood stingers, lock pillars, and areas requiring contrasting interior color painting were masked in this area.

Body was moved from the transfer/prep area to the Repair Spray Booth, where areas to be repaired were topcoated and thinner-blended, 427 hood stingers were sprayed the specified color, and interior trim color painting was done. After flash time and masking material removal, the body was moved through the transfer area to the Final Bake Oven conveyor.

Final color bake was a gas-fired oven, 45 minutes at 250°F (not hot enough for lacquer reflow, so polishing was required later).

After final bake, body was moved through a transfer area to the Black-Out Spray Booth, where the engine compartment, hood underside, cowl plenum cavities, and wheel wells were sprayed with a 10°-gloss black quick-flash air-dry Duco lacquer; a large cardboard spray mask was used for the hood underside application, but no masking was used along the front edge of the hood inner panel.

Since the Corvette fiberglass body couldn't withstand the required lacquer reflow temperature (35 minutes at 325°F) used on steel-bodied cars, final polishing was necessary to create the same exterior gloss level. Polishing compound was brush-applied and buffed with wool pads, only above the body side feature line, in the open area between the end of the Paint Shop and the beginning of the Hard Trim Line.

Wheel well air-dry sound deadener/undercoat material was applied after the final bake oven and the black-out booth, with airless spray guns fed from 55-gallon drums; no masking or shielding was used, and care was taken to keep the material off exterior surfaces and away from the #3 body mount access hole.

Interior color small parts (including coupe garnish moldings, steering column upper covers and steering wheel hub, speaker grille/defroster outlet panel, radio console side panels and kickpad retainer strips) were painted separately in an off-line dry spray booth in the Trim Shop, baked for ten minutes at 180°F in an infra-red oven, and delivered to the line stations where they were subassembled and installed.

Wheels, radiator supports, and the hundreds of smaller steel and iron parts (brackets, reinforcements and engine dress components) were processed in the main passenger/truck plant and delivered from there to the Corvette plant in various sizes of racks and containers for use on the line. There was no raw-metal prime or paint facility in the Corvette plant other than the small crude zinc chromate primer system in the basement used for the birdcage.

Wheels and most metal parts were received raw and oiled from their suppliers, and were processed through a 6-stage hot degreasing/wash/rinse system, followed by iron phosphating and a chromate rinse. Then they went through a flow-coat booth where they were deluged with a semi-gloss black primer from many nozzles like showerheads on all sides; excess primer dripped off the parts through floor grates into a sump tank and was recirculated again, and the parts were baked for 45 minutes at 325°F.

Wheels were then placed on special racks with rotating hubs, five wheels to a rack, on an overhead conveyor, and only the outer face was topcoated with 83°-gloss wheel enamel (through '66) and argent silver wheel enamel from '67-up. Wheels were baked again for 30 minutes at 275°F, racked, and delivered.

Final Paint Repair, after the car was driven off the Final Line, will be covered later, in the "Final Paint Repair" section.

**Note:** Special thanks are due to fellow Michigan Chapter member Harry Jones for much of the process detail for the Paint Shop operations; Harry "was there" at St. Louis during the midyear era when he was with the Chevrolet Central Office Paint Standards Department, and his extensive process notes and recollections of the St. Louis Paint Shop operations and facilities made much of this section possible.

### **Hard Trim Line:**

VIN plate and trim tag created and affixed (only VIN plate on A.O. Smith bodies). Car data sent electronically to teletype printers throughout the plant, creating the Broadcast Copy the car was built from.

Hood support

Rear compartment ventilation blower, drain hose and cable ('64-'65 only)

Windshield and back window reveal molding clips

Hood release cable and rear male hood pins

Convertible door and deck lid wedges

Apply GM "Mark of Excellence" stickers to door jamb ('67 only)

Convertible deck lid soft top latches and hardtop receivers

Convertible deck lid front trim strip

Upper dash insulation

Dash mat and rubber retainer pins

Wiper motor and linkage/transmissions & plenum seal

U-nuts for cowl vent grille screws

W/Washer bottle, hoses, grommets, nozzles, and painted cowl vent grilles

Cowl side kickpad air vent grilles/valves and cables

A/C adapter assembly in RH side cowl plenum

Inner and outer heater or A/C assemblies and control cables

Subassemble pedal support assembly for manual or Powerglide and manual or power brake configuration and install, with clutch pushrod & boot

Accelerator rod, pivot, and lever assembly

Dimmer switch

Forward lamp harness, headlight motors, horn relay, voltage regulator, headlight capsules and bulbs (painted bezels installed later in Final Process after headlight aim operation).

Ignition ballast resistor or T.I. harness and amplifier

Door outside handles and lock cylinders

Door inside remote release rods and handle, remote lock rods

Power window wiring harness, door conduits and switch shield

Jack, lug wrench, spring retainer, N89 screwdriver, P48 hammer

Headlamp and power window circuit breakers, power window relay

Parking brake lever/handle assembly and front cable

Windshield installed with rubber channel, sealers and outer reveal moldings applied.

Wiper arms and blades

Back window(s) installed with rubber channels ('63) or with dam and Thiokol adhesive ('64-'67), sealers and outer reveal moldings applied; apply "Air Conditioned" decal to inside of glass on A/C-equipped '64-'66 coupe units.

Vent window assemblies, glass run channels, and outer wipe seals

Door glass (apply "Air Conditioned" decal on '64-'66 convertibles with A/C).

Main dash-to-rear body wiring harness, grommet, and antenna cable

Carpet support panels on floor

Side courtesy light brackets

Coupe rear upper vinyl trim piece ('63-'66)

Coupe dome lamp and convertible rear courtesy lamp

Door, deck lid, and hood rear weatherstrips

Header, hood, fender and rear deck emblems and fuel filler door

Speedo and tach cables, oil pressure line

Power brake booster

A/C condenser & dehydrator bottle

A/C Battery compartment access panel

A/C seals to top, bottom, and sides of radiator support

Powerglide transmission fluid cooler

Powerglide shift lever/neutral safety switch assembly ('65-'67)

N03 Fuel tank assembly, straps and filler neck/vent pipe assembly

Main dash panel installation (off-line subassembly includes main dash panel, speaker & grille, defroster outlet, eyebrow pads, radio bezel, clock bracket, RH radio bracket, and A/C center outlet). Drive screws across top front edge of panel to lower windshield frame, bond bottom edge to "bump" and bracket on floor pan, set five pop-rivets on each side.

Install radio, clock and heater or A/C cables/knobs to main dash panel

Convertible windshield header upper moldings and receptacles, side and lower inner garnish moldings, inside mirror, and sun visors.

Coupe headliner, halo panel, windshield upper, side, and lower garnish moldings, inside mirror, and sun visors.

Instrument cluster (off-line subassembly includes the cluster, all switches, radio capacitors, and the complete instrument panel wiring harness, including the fuse panel and wiper/ignition extensions); connect speedo and tach cables and oil pressure line, secure cluster to dash panel, attach fuse panel to firewall, route and connect courtesy light and Powerglide neutral safety switch wires, radio power connection, and glove box light wire, secure main ground connection to lower dash brace, route wiper/ignition extensions through firewall hole into engine compartment.

Glove box assembly complete (box, frame, hinge, striker and door), connect and install light.

RH side A/C lower air duct and outlet

Install ignition and glove box cylinders

Steering column, loose-install (subassembly includes column, cancelling cam, upper hub covers, steering wheel, horn contact and horn button); also loose-install seal and bracket on firewall side.

Install radiator, expansion tank, balance and heater hoses.

Hardtops were subassembled off-line starting with the painted bare shell that traveled with the body through the paint shop, installed on the body, and side glass was adjusted to fit the hardtop weatherstrips. Hardtops were removed after Body Drop (except on A.O. Smith bodies) to permit Final Line installation of the soft top, then re-installed for shipment.

**NOTE:** A.O. Smith bodies (starting in mid-January, 1964) were received with the following parts already installed:

Windshield and back glass including outer reveal and rear inner garnish moldings, side glass with outer seals and all inner and outer door hardware, door and deck lid weatherstrips, trim tag, power window harness and door conduits, main body harness and antenna cable, accelerator pivot and lever, and coupe upper body trim (headliner, halo panel, vinyl rear trim, and dome light). Convertibles included the soft top (and/or hardtop if ordered), and the front/rear latching hardware. The rear valance panel was also installed; it was removed at the end of the Trim Line before Body Drop, as it was on St. Louis bodies.

Remove rear valance panel, assemble tailpipe bezels, and place in body.

Final Hard Trim Inspection and transfer to overhead conveyor carrier to Body Drop. Parking, tail, backup, and license lamp and bezel, antenna body, N03 underbody plumbing, N14 side exhaust cover U-nuts and the underbody tunnel insulator were installed after the body was elevated in the body drop carrier and before the carrier was transferred over the Chassis Line for body drop.

## **Frame Upside-Down Line:**

Schedule frame from stack and place upside-down on first station measuring and alignment fixture (the “frame buck”); mark “pull date” on frame (except '67).

Cycle clamps, observe plunger readings and mark shim count on frame side rail, rivet upper and lower ball joints to front control arms, subassemble jounce bumpers to lower control arms, assemble rebound bumpers and press upper control arm shaft splined bolts to frame, install upper and lower control arms to frame, leaving upper control arm shaft attachment loose.

Install rear suspension module (subassembly from basement included the suspension crossmember and cushions, differential and nose bracket, half-shafts, trailing arm assemblies, strut bracket and rods, and rear spring with the ends free). Bolt crossmember and differential nose bracket to frame, install rear jounce bumpers and big-block rear stabilizer bar.

Apply rear hub locating/sensing fixtures (which set rear suspension at normal ride height), adjust cam bolts on strut rods to obtain green camber lights and torque cam bolts. Note trailing arm toe-in shim pack required for green lights, install shim packs and install and torque pivot bolts.

Install rear shocks, apply compression fixture to spring, install spring-to-trailing arm link bolts, cushions, washers and nuts, and release compression fixture.

Install front hub/caliper/knuckle assembly to upper ball joint, torque and insert cotter pin. Position front spring to frame pocket and lower control arm pocket, apply compression fixture to set suspension at normal ride height, and attach bottom of knuckle to lower ball joint, torque, and insert cotter pin. Mash upper and lower cotter pins down over nuts for fixture clearance.

Apply front hub caster/camber fixtures to upper and lower ball stud extensions, cycle tool to green lights, stuff-shim resulting gaps at

upper control arm shaft-to-frame studs, and final-torque upper control arm shaft attaching nuts and lower control arm shaft end retainer bolts.

Install front stabilizer bar and end link bolts, release compression fixture.

Install front shocks

Install steering gear/rag joint assembly to frame

Install manual steering linkage; assemble pitman arm to steering gear, steering idler arm to frame, tie rod ends to outer holes in steering arms, and steering damper to relay rod and frame bracket.

With power steering, subassemble steering linkage off-line with control valve and pitman arm, power cylinder and hoses, bench-bleed, and install to steering gear, frame and frame bracket; install tie rod ends to inner holes in steering arms, and peen aluminum plugs in outer steering arm holes.

Install fuel tank support and spare tire tub and tray

Frame turnover device transfers assembled frame to Chassis Line chain-on-edge conveyor in right-side-up position.

### **Engine Dress Line:**

Schedule correct engine out of shipping rack and hang on engine dress line conveyor, tape broadcast copy to front of engine hook.

Lube and install throwout bearing, install manual transmission to bellhousing. For Powerglide, remove converter shipping strap, install transmission case to block, apply air-powered dummy starter tool to rotate flexplate and drive converter bolts, and install inspection cover. Match gang-stamp holder dies to VIN on broadcast and stamp engine and transmission VIN derivatives.

Install correct speedo gear and adapter sleeve, attach transmission rear mount and side engine mounts (including ground strap on LH mount).

Fill manual transmission lube, on Powerglides install fill tube and fill with ATF, install dipstick (Powerglide final top-off after car-start on the Final Line when the converter has filled).

Install Powerglide kickdown linkage, adjust after carburetor installation.

Install manual shifter and linkage and adjust (mid-'66-'67's were installed and adjusted on the Chassis Line due to crossmember-mounted shifter).

Install Powerglide shifter and linkage and adjust ('63-'64).

Install oil filter bypass valve, filter element and canister, intake manifold oil fill tube, fill engine oil and install filler cap.

Install fuel pump pushrod, mounting plate, and fuel pump

Install carburetor, pump-to-carb fuel line, fuel filter, and choke hot air tube or remote thermostat and choke rod.

Install rear crankcase vent tube, adjust Powerglide kickdown linkage

Install heater hose fittings and intake manifold vacuum fitting

Install rear upper spark plug wire supports and coil

Install spark plug wires, lower V-shields, and spark plug heat shields

Install A/C compressor and brackets (loose)

Install A.I.R. pump and brackets (loose)

Install power steering pump and brackets (loose)

Install crank pulley(s) and balancer bolt

Install water pump pulley, fan, and clutch

Install clutch cross shaft pivot stud to block

Install and tension drive belts, secure all brackets and braces (except alternator, installed on the Final Line after body drop)

Install starter, positive and negative battery cables, and heater/wiper motor ground pigtail.

Install engine wiring harness to starter, coil and temp sender

Install forward starter brace and heat shield

Install horizontal, side vertical, and upper ignition shielding and bend french-locks closed on exhaust manifold bolts.

Install heat riser valve (or F.I. spacer) and gasket and secure with rubber band around manifold studs.

### **Chassis Line:**

Apply locating fixture and arc-weld #2 body mount brackets to frame on convertibles, and weld required shim pack on front frame horns at the radiator support mount locations.

Install front crossover brake pipe, blocks, and brake hoses to calipers

Install rear crossover brake pipe, blocks, rear brake hoses, and pipes to calipers

Install front and rear main brake pipes

Install main fuel line (short one for N03)

Install fuel tank (except N03), insulator pads and straps (off-line subassembly operation has installed the sending unit and filler neck and water-tank leak-tested the tank, and installed the boot, nipple,

drain hose, spring, and cap), connect hose to main fuel line and install hose clip to rear crossmember.

Install rear parking brake cable

Install front and rear standard exhaust pipes, heat shields and mufflers, leaving pipe joints loose at the transmission crossmember.

Transfer dressed engine/transmission assembly from delivery conveyor and assemble to frame; install side mount bolts and transmission mount bolts, secure exhaust pipe ends to exhaust manifolds with donuts, install U-bolts and ground straps to pipe joints at transmission mount hanger bracket, secure ground straps to crossmember, connect rubber hose from main line to fuel pump inlet.

With N14 side exhaust, install sidepipes to exhaust manifolds and to carriage bolt at rear of frame side rail.

Attach free end of LH engine mount ground strap to frame bracket

Install front hub static collectors

Route, clip, and connect power steering pressure and return hoses to pump, and fill pump reservoir.

Install clutch cross-shaft assembly (Z-bar) to engine stud and frame bracket, install lower fork pushrod and springs to cross-shaft lower arm and to clutch fork.

Install shifter mount bracket, shifter and linkage, and adjust (mid-'66-up).

Install driveshaft front yoke to transmission output shaft, attach rear U-joint to differential pinion yoke, aligning paint marks.

Install Powerglide trans cooler lines, secure to front crossmember.

Fill differential with regular hypoid or Positraction gear lube.

Install master cylinder and distribution block subassembly to front and rear brake pipes (using support tool to steering gear), remove cap and prepare for brake system evacuate-and-fill.

Clamp overhead-suspended fill head adapter to master cylinder with probes in compensating ports, and push button to begin machine cycle. Machine draws brake system down to high vacuum, pauses to hold while monitoring for decay that would indicate a gross leak, then injects conditioned/degassed brake fluid at 80 psi into the system. Unclamp adapter, install cap, and prepare for brake pressure test.

Apply overhead-suspended pressure-test fixture to rear of master cylinder casting and clamp in place, push button to start machine cycle. Fixture applies pressure directly to rear piston and brings the brake system to 2,000 psi, holds for ten seconds while monitoring for decay that would indicate a leak, then releases pressure and automatically unclamps from the master cylinder at end of machine cycle.

Push master cylinder forward and inboard for body drop clearance, remove support tool.

Install battery tray, battery, and hold-down hardware

Install #1-2-3-4 body mount spacers/cushions with shims per frame markings and tape to frame brackets.

Spray chassis blackout paint on the outboard side of both mufflers.

### **Body Drop:**

Apply compression fixture to both tailpipes and throw over-center lever to pull mufflers together so they clear quarter panels, place shift lever in neutral.

Drop body on frame using alignment pins at radiator support mount and at #4 body mount; drive all body mount bolts and remove tailpipe compression fixture. Vehicle remains elevated on Chassis conveyor.

## **Final Line:**

Connect pink, tan, and ground wires to fuel tank sending unit, attach antenna ground strap to frame.

Install off-line bench fixture-subassembled grille and front bumpers as a unit, using header-located fixture for fit/parallel; install outer braces last.

Install rear bumpers, route/strap fuel drain hose to RH support rod.

Install covers on #3 body mount access holes.

Install rear valance panel to body rear and quarter panels, install bright tailpipe extensions and clamps.

Install P48 knock-off wheel hub adapters to front and rear hubs with special lug nuts.

Install wheels & tires, install spare tire in tub and secure tray at rear.

Vehicle transfers from Chassis conveyor to flat-top conveyor, on its tires.

Connect front parking brake cable to rear cable with equalizer and adjust tension.

Staple seals to outer splash shields (except N14 side exhaust cars) and install inner and outer front splash shields.

Install rocker molding retainer strips

On standard under-car exhaust units, install rocker moldings

On N14 side exhaust units, install side covers and narrow rocker moldings

On N03 units, connect tank outlet hose on underbody to main fuel line at the #3 crossmember.

Connect Powerglide trans cooler line hoses to fluid cooler.

Secure seat belt restraining cables to frame and reinforcements.

Connect heater and radiator hoses to engine.

Connect tachometer cable to distributor drive fitting.

Connect speedo cable to transmission speedo gear adapter housing.

Assemble oil pressure line to fitting adjacent to distributor.

Install alternator, adjust and tension drive belt.

Install A/C compressor drive belt, adjust and tension.

Connect A/C refrigerant hoses at evaporator & condenser.

Assemble steering shaft to rag joint, secure column to pedal support, lower cluster, and bracket/clamp on engine side of firewall.

Install LH side A/C lower air duct and outlet

Position master cylinder to firewall or booster studs and secure with nuts.

Connect clutch pedal pushrod to cross-shaft with swivel and nuts and adjust for free pedal travel.

Connect and adjust throttle linkage rod to carburetor.

Route, clip and connect backup light pigtail from switch to body harness on firewall.

Connect and adjust Powerglide floor shift linkage to transmission lever ('65-'67).

Tuck inner fender rubber splash shields into upper control arms.

Evacuate-and-fill cooling system through expansion tank or radiator.

Evacuate-and-fill A/C refrigerant system through service fittings and check for leaks.

Install manual transmission shift lever rubber boot and retainer.

Remove hardtop (St. Louis 2-top bodies only) and place on aisle rack; re-install later for water test.

Install convertible top (St. Louis bodies only).

Install outside mirror base and mirror.

Add three gallons of gasoline to fuel tank.

Assemble engine and forward lamp harness multiple connectors to engine compartment side of fuse block.

Connect positive and negative cables to battery terminals.

Install temporary driver's seat

Prime carburetor with gasoline through bowl vent tube.

Start engine (check neutral safety switch function on Powerglides), check for good oil pressure, fluid leaks or unusual noises, adjust idle if required.

Install air cleaner.

Create Protect-O-Plate on Addressograph machine from inspector's notations on Chassis Broadcast Copy ('65-'67), affix to Owner Protection Plan pamphlet, and place in glove compartment.

Rubber-stamp last six digits of VIN on computer pre-printed price sticker, apply water-based mucilage adhesive, and affix to side glass.

Type engine, transmission, axle, key, VIN, and production date numbers on computer pre-printed copy #7 of Corvette Order and place in glove compartment with Car Shipper copy.

Place Owner's Manual, plastic envelope, spare key, lighter, license plate attachment packet, trim ring instruction card, hardtop wrench and sealing washers and cloth bag in glove compartment.

Place wheel covers or caps and trim rings, license plate frames, and '63-'64 and '67 radio antenna mast in rear storage area.

Final Line Inspection – all assembly operations performed on the Final Line are inspected and adjustments are made as required.

Verify correct A/C system operation and outlet air temperatures.

Check Powerglide ATF level and power steering fluid and top off as required.

Check brakes for good pedal, parking brake adjustment, and clutch adjustment for pedal free travel.

Drive car off the line to Roll Test.

### **Roll Test & Toe-In:**

Driver locates car in the roll-test machine and pushes button on pedestal to start machine cycle; front and rear car-width rollers rise up so all four wheels are on the rollers, and driver accelerates. Rear wheels drive the rear roller, which in turn drives the front roller so all four wheels turn at the same speed. The left side of the rollers are smooth, and the right sides have raised sections to simulate a bumpy road.

Driver accelerates through the gears to 60 mph, listening for any unusual noises, and compares speedo reading to the machine's overhead speedo dial to ensure correct speedo gear is installed. Driver slows to 30 mph and exercises lights, wipers and washers,

radio, turn signals, horn, hazards, and moves over to the “rough road” side of the rollers to check for vibration, squeaks and rattles.

Driver moves back to the smooth-road side of the rollers, accelerates to 60 mph, and applies parking brake several times to “burnish” the shoes prior to final cable adjustment. Driver then slows to a stop on the rollers and pushes the button on the pedestal; the rollers retract and the driver proceeds into the toe-in machine.

Car is driven into the Toe-In machine and driver attaches steering wheel lock/level tool to wheel and top of door. Pit operator cycles machine, which moves locating rollers on floating heads against inside and outside of tires and machine spins the front wheels.

Watching dials on his control panels, pit operator turns tie rod adjusting sleeves until dials indicate that toe-in is within specifications while steering wheel is held level and straight-ahead; he then positions tie rod clamps correctly and tightens clamp bolts with an air tool and a wrench. Driver removes steering wheel tool, hangs it on pedestal, and proceeds into Final Process Repair for any needed adjustments.

### **Water Test:**

When repairs are complete, St. Louis-bodied cars are driven into the Water Test booth, where they’re subjected to spray from 30 nozzles above, beside, and below the body for four minutes. Inspectors check for any leaks, trace the source, and correct them.

St. Louis-bodied 2-top cars then have the soft top stowed, their hardtop (removed earlier on the Final Line) is installed, and they go back through the Water Test booth again to check the hardtop seals. A.O. Smith-bodied cars have already been water-tested at their Ionia, Michigan plant prior to rail shipment to St. Louis.

The lack of any interior soft trim below the belt line simplifies leak detection and repair, and prevents water damage to soft-trimmed

interior components. From here, the car moves on to Final Paint Repair.

### **Final Paint Repair:**

All units proceed to Final Paint Repair on a dual-strand flat-top conveyor similar to the one on the Final Line; any imperfections from the assembly process are repaired by 400-grit dry or wet machine and hand sanding and tack-off, followed by masking, re-coat and thinner-blending in a side-draft spray booth, followed by a 20-minute bake at 180°F as they pass through an infra-red oven, and final polishing for correct luster and gloss uniformity.

The riveted end tabs on the instrument panel in the door openings were also painted here; in 1963-64, all units had the ends of the eyebrow pads masked off and the “tabs” were painted exterior color. From 1965-1967, the end “tabs” were only painted exterior color when the interior and exterior were different colors.

After polishing, the flat-top conveyor continued and took each unit into the Final Trim Line, where the interior was installed.

### **Final Trim Line:**

Install back window inner garnish moldings

Install rear area and luggage stop panel carpet, quarter trim/top linkage cover panels, and carpeted jack stowage area cover board (with correct stickers for jack instructions and Positraction).

Install door trim panels, door pull handles, window cranks, inside release and lock knobs.

Install kickpads and interior-color retainer strips

Cut seat track clearance slots and install front carpets, accelerator pedal support filler plate, accelerator pedal, and sill plates.

Install inner and outer seat belts (and '66-'67 optional shoulder belts and buckle storage pocket).

Assemble power window switch (if specified) and install correct color/configuration chrome shifter console and ashtray; with Powerglide, install shifter knob.

Install center console radio side panels.

Install seat belt buckle retainer to rear of console plate ('65-'66)

Install parking brake console and seat belt buckle retainer ('67)

Install seats.

**Headlight Aim** – the unit is driven off the line, parked on level pads, and overhead-suspended Hopkins aimers are applied to the aiming pads on the headlight lenses; horizontal and vertical adjustments are made to bring headlight aim into specifications, and the painted headlight bezels are installed.

**Final Inspection** – all assembly operations performed on the Final Trim Line are checked, adjustments are made as required, all internal plant paperwork, inspection tickets, labels and Broadcast Copies are removed, paint gets a final polish, and the unit is released to the truck or rail carrier for shipment to the dealer (or parked outside awaiting customer delivery at the plant).

The MSO (Manufacturer's Statement of Origin), the Dealer Wholesale Invoice, and the dealer's copy of the Car Shipper are created and mailed to the dealer, and the unit is reported to the dealer and to Chevrolet-Central Office as "produced".

## **A.O. SMITH – THE "OTHER" CORVETTE BODY BUILDER**

A.O. Smith (the Dow-Smith division of the A.O. Smith corporation) built 50% of the Corvette bodies from January, 1964 through the end of the 1967 model year at their plant in Ionia, Michigan. They used a

duplicate set of major body assembly tooling supplied by Chevrolet, and designed and built many of the smaller fixtures and hand tools themselves from Chevrolet drawings. They also produced an extremely detailed 500-page package of assembly process sheets to document every step, part, and tool required to build, paint, and partially trim the Corvette body, to support their contractual billings to Chevrolet for each body produced.

A.O. Smith built the Corvette body in essentially the same manner as the St. Louis body, with a few exceptions as noted below.

### **Body Shop:**

The front fender rear side panel was bonded in place in the off-line front clip bonding fixture instead of bonding it on the main line after installing the front clip as St. Louis did.

In the door subassembly process, A.O. Smith used two conventional aluminum body rivets to attach the top of the door hinge pillar reinforcement to the front upper corner of the door inner panel; St. Louis used large pop-rivets.

The radiator support, front header reinforcement bar, and all of the various riveted-on body brackets, reinforcements and anchor plates installed in the underbody subassembly operation were spray-primed with green zinc chromate vs. the St. Louis black flow-coat primer process. A.O. Smith didn't have a black prime flow-coat system, so they used the same zinc chromate process they used for the birdcage. This required extra operations in their body blackout booth to fully cover both sides of the radiator support so the green primer didn't show against the black background in the engine compartment.

A.O. Smith installed the cowl-mounted female hood latches and the cross-cable AFTER the Paint Shop, so those items didn't show any engine compartment blackout overspray like they usually did on St. Louis bodies.

The birdcage tooling furnished to A.O. Smith didn't include the air-over-hydraulic piercing tool and dies to create the clearance notches in the steel birdcage sill panels for the N14 sidepipe option, so no

orders for units specifying sidepipes were ever allocated to A.O. Smith; bodies for those units were all built at St. Louis.

### **Paint Shop:**

Green zinc chromate primer used instead of black flow-coat as noted above.

The A.O. Smith Paint Shop physical layout wasn't conducive to the time-consuming and labor-intensive masking required to paint the contrasting colors on the '67 big-block "stinger" hood and header panel, and their personnel were never able to master the masking process successfully. As a result, it's generally accepted that only a few very early '67 big-block bodies (or none at all) were built at A.O. Smith.

### **Trim Shop:**

A.O. Smith produced their own trim tags, which were quite different from those created at St. Louis; the A.O. Smith tags had an "A" prefix on the body number, the plant-applied characters were double-spaced and differently aligned vertically, and the trim number didn't include the complete trim ECL code suffix.

A.O. Smith installed the door lock cylinders so the body could be locked for rail shipment; since all of the lock cylinders for the car (ignition, doors, glove box and spare tire lock) along with the keys came in a single "lock unit" pack, they placed the ignition, glove box, and tire lock cylinders and the extra key in a plastic bag and taped it to the lower instrument panel brace for later use at St. Louis.

A.O. Smith used the same steel body carrying truck that St. Louis used to carry the body through their Ionia Body, Paint, and Trim Shop operations; the body truck carried the bodies by rail to St. Louis, and the rail cars came back to Ionia full of empty body trucks that had been accumulated for return at St. Louis.

### **Summary:**

The rivalry that developed between St. Louis and A.O. Smith and their regular joint quality audits fostered a continuing competition between the two for continuous body and paint quality improvement which ultimately was of benefit to the customer.

The huge A.O. Smith fiberglass panel molding plant in Ionia continued to supply many Corvette body panels and assemblies to St. Louis after 1967, all the way through the C3 era. In 1971, the Ionia plant was sold to General Tire and Rubber and became part of GTR's "GenCorp" plastics division.

**Note:** This file is available for download in .pdf format from the Michigan NCRS website at [www.michiganncrs.org](http://www.michiganncrs.org).

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