

**WASHINGTON METROPOLITAN AREA TRANSIT
AUTHORITY**

ANDREWS FEDERAL HOMT REHABILITATION GUIDE

NEW FLYER 2015-2016

XCELSIOR DIESEL-ELECTRIC 40 FT. TRANSIT BUS

Models: SR1946

Fleets: 56

Bus Numbers: 7300-7355

Bus Number: _____

BUS FLEET ENGINEERING

BUS FLEET MAINTENANCE



Bus No. _____
Work Order No. _____

SAFETY PROVISIONS

ALL WORK MUST BE CONDUCTED IN A SAFE MANNER AND IN ACCORDANCE WITH ALL BMNT SAFETY RULES AND STANDARD OPERATING PROCEDURES.

ALL WORK SHALL BE PERFORMED IN SUCH A WAY AS TO PRECLUDE ANY DANGER TO PERSONNEL, OR DAMAGE TO WMATA PROPERTY.

 **WARNING** Refer to "High Voltage Safety" safety requirements before performing any maintenance or repair on the Allison H40EP Systems™ Service Manual

Minimum safety requirements for these procedures should include the following personal protection equipment (PPE):

- Hearing Protection
- Fall Protection
- Proper Footwear
- Eye Protection
- 1000 VDC, Class 0 Isolation Gloves with Leather Outer Gloves
- Bump Cap

Note: Many items may need only to be repaired, and not replaced with a new or remanufactured part. It is the Supervisor's decision and responsibility to ensure that all mechanics are aware of what is to be repaired, and what is to be replaced. Supervisors are to inspect the bus prior to assigning work to a mechanic.

Refer to the OEM Service manual for safety precautions, replacement procedures, torque specifications, and lubrication application and lubricating specifications.

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 **WARNING**

The following are basic guidelines that apply to all shop practices and procedures.

- To prevent eye injury, always wear eye protection - safety glasses or face shields when performing vehicle maintenance, service or body repair.
- Always wear a face shield with appropriate light filters when welding. Prolonged unprotected exposure to the intense light generated by arc welding can cause severe and permanent retinal damage. Welding area should be sectioned off with filtered panels to prevent inadvertent damage.
- Always wear a face shield when grinding or performing work beneath the vehicle.
- Always wear appropriate ear protection; plugs or headgear.
- Always secure or remove jewelry, watches, loose clothing and/or hair when operating power tools or repairing components with moving parts.
- Always wear an appropriate respirator, cartridge mask or HEPA type filter mask when sanding by hand or with power tools.
- Avoid ingesting the dust spray or fumes of cured/uncured substances.
- Always wear a 100 % air mask hood positive-pressure supplied respirator (NIOSH/MSHA TC-19C), eye protection, gloves and protective clothing when mixing chemicals during application of paint and topcoats, and until all vapor and mist are exhausted.
- Never attempt to operate a piece of equipment or power tool if you are unsure how to use it safely. Consult your supervisor.
- Wear protective clothing.
- Always refer to the Safety Data Sheets and/or product documentation provided with the products for safety information. Always be aware of the potential hazards when working with any chemical substances. Improper handling of some products can cause severe illness and personal injury and/or death.
- Always ensure that a portable fire extinguisher is within reach, in the event of an emergency and ensure that is in operating condition.

Dispose of hazard waste in proper containers in compliance with standards, through the services of a

Bus Engineering/Bus Maintenance

New Flyer Rehabilitation Guide

Chassis Line (CL) - Station 1



If working near high voltage cabling or components, use 1,000 VDC electrical gloves, rubber-soled shoes, and make sure you and the environment are perfectly dry.



Refer to "High Voltage Safety" in this section and familiarize yourself with the safety requirements before performing any maintenance or repair on the Allison EP 40/50 System™. Refer to Allison EP 40/50 Systems™ Service Manual.

CL-1) HIGH VOLTAGE DISCONNECT VERIFICATION / 2 HOURS

(See Attached Allison Electric Drive Electrical Disconnect Verification Procedure)

[New Flyer Manual High Voltage Disconnect Section 5](#)

- Follow procedures outlined in *SOPs 5.4 Bus Lift Operation, 2.25 Fall Protection, 2.35 Lockout Tagout*
- Check DVOM (Digital Volt-Ohmmeter) function with a known good voltage source.
- Set Master Run switch to the STOP ENGINE position.
- If the vehicle is so equipped, place the switch for the +24V/+12V battery disconnect in the OFF position. Use a lockout device to prevent unauthorized access to the +24V/+12V battery switch.
- Remove connector PI120 (low voltage 24-pin connector) from the Dual Power Inverter Module (DPIM).
- Remove connector PB140 (low voltage 31-pin connector) from the Energy Storage System (ESS).
- Remove DPIM DC bus access cover.
- Use J-46708 Fluke 87 High Impedance DVOM and proper personal protective equipment (J-50090 Class 0 isolation gloves with leather outer gloves), to measure the following voltages:
 - Measure the DC voltage between DC+ and DC-.
 - Measure DC+ to DPIM chassis.
 - Measure DC- to DPIM chassis.

All voltage measurements must read less than 3 VDC before proceeding to next step. If measurements are not less than 3 VDC, replace the access cover and allow the DPIM to dissipate residual energy.

- Remove both HVIL covers on the ESS.
- Using proper personal protective equipment (J-50090 Class 0 isolation gloves with leather outer gloves), remove the (+) and (-) connectors from the ESS. Use a lockout device to prevent unauthorized reinstallation.
- Remove A/C lug access covers on the DPIM. Use J-46708 Fluke 87 High Impedance DVOM and proper personal protective equipment (J-50090 Class 0 isolation gloves with leather outer gloves), to measure the following voltages in each lug box:
 - A/C Phase to Phase; A-B, A-C, C-B.
 - Each A/C Phase to chassis ground.

All voltage measurements must read less than 3 VDC before proceeding to the next step. If measurements are not less than 3 VDC, replace the access cover and allow the DPIM to dissipate residual energy.

- Re-check DVOM function with a known good voltage source.
- Work can now be performed on the high voltage Circuit and EP 40/50 System components.

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Supervisor/Designee Signature _____ **Employee ID #** _____

CL-2) ENGINE/DRIVE UNIT ASSEMBLY REMOVAL & INSTALLATION / 90 HOURS

Engine & Drive Unit Assembly & Aftertreatment Component REMOVAL/ 40 Hours

Engine Compartment Area

- Disconnect the fire suppression system.
- Remove license plates and turn them in to the lead-man.
- Remove batteries. (Small Units)
- Drain all air tanks.
- Drain coolant.
- Drain engine oil.
- Drain the drive unit fluid.
- Drain differential fluid.
- Disconnect all electrical wiring harnesses.
- Disconnect DPIM oil and cooler lines.
- Disconnect all electrical connectors from drive unit including main harness A and B motor speed sensors, output sensor, and HVIL switches.
- Remove high voltage covers and disconnect lugs retaining HV wiring.
- Remove driveshaft and torsional damper, ***Note: Mark torsion damper location on flat side of driveshaft to be used on installation instructions.***
- Drain hydraulic tank and disconnect lines.
- Disconnect exhaust piping, air filter housing piping, coolant lines, air lines, and ground strap.
- Remove belt guard.
- Remove AC belt, water pump belt, and alternator belt.
- Support rear bumper, remove 4 retaining bolts, and remove bumper.
- Recover refrigerant from AC system. (HVAC)
- Remove Proheat Unit. (HVAC)
- Remove charge air piping.
- Remove radiator/charge air cooler/heat exchanger assembly.
- Remove trans cooler tube/ bracket.
- Remove engine and drive unit assembly.
- Deliver engine and drive unit assembly to steam room to be pressure-washed.
- Prepare and secure engine and drive unit assembly for delivery to CTF.
- Remove wiring harnesses.
- Remove coolant pipes, lines, fittings, and brackets.
- Remove air filter housing and piping.
- Remove surge tank assembly.
- Remove coolant recovery tank.
- Remove boost pump.
- Remove Spinner Oil Filter assembly.
- Diesel Exhaust Fluid (DEF) Tank & Cap.** Clean Diesel Exhaust Fluid (DEF) tank and cap; remove all crystallized DEF fluid, dirt, etc.; inspect tank for damage, wear, and fluid leaks; tank to be replaced as needed.

! WARNING

Drain air system. Follow all system draining precautions. Failure to do so may result in injury or death.

Aftertreatment Compartment/ Area – *Needs Further Discussion within Management

- *Selective Catalytic Reduction (SCR) Assembly.** Remove SCR Assembly. ***Note: To be replaced as an assembly when parts are available.; currently, the Diesel Oxidation Catalyst (DOC) Assembly components are available for replacement.***
- *Diesel Particulate Filter (DPF) Assembly.** Remove DPF Assembly (WMATA P/N 842720221). ***Note: To be replaced as an assembly when parts are available; currently, the Soot Filter part is available for replacement.***

Roof – *Needs Further Discussion within Management

- *DPIM.** Determine change of DPIM; remove DPIM if 2.5 years or older. **Note:** To be replaced with rebuilt DPIM when parts are available.
- High Voltage Cables.** Disconnect and remove high voltage cables (2) from drive unit to DPIM and from DPIM to ESS (1); test high voltage cables with the digital Megohmmeter – Insulation Resistance Tester; cables to be replaced as needed.
- Low Voltage Connectors.** Inspect low voltage harnesses between the DPIM, ESS, and drive unit for damage and mounting; test with break-out box; harnesses to be replaced as needed.
- Energy Storage System.** Remove ESS cover and inspect fuses and contactors for damage; replace as needed.

Cleaning & Preparation

- Move bus to steam room and pressure wash bulkhead.
- Place bus back on lift.

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Supervisor/Designee Signature _____ **Employee ID #** _____



WARNING

To avoid personal injury, do not wear rings, wrist watches, or loose-fitting clothing. Any of these items could catch on moving parts and cause serious injury

Engine & Drive Unit Assembly & Aftertreatment Component INSTALLATION / 50 Hours

Note: Inspect all lines on bulkhead to ensure they have been repaired or replaced.

- Install rebuilt engine with drive unit assembly.
- Front engine mounts torque the four 1/2" bolts with lock nuts to 70 ft-lb.
- Front engine mounts torque the two 5/8"x 4 9/16" bolts with lock nuts 160 ft-lb.
- Engine side mounts torque the two 3/4" x 5 1/2" with lock nut to 250 ft-lb.
- Install torsional damper on the flat side of driveshaft using alignment mark.**
- Install drive shaft to axle using eight bolts and lock nuts, torque to 75-77 ft-lb.
- Align the cross-tooth flange on the drive shaft with the drive axle flange ensure they are properly seated and install new four M12 cap-screws torque bolts alternately torque to **63 to 75 ft-lb.** Apply torque witness marks.
- Install wiring harness.
- Install dipstick tube.
- Install new primary fuel filter.
- Install new secondary fuel filter.
- Connect all electrical connectors to drive unit including main harness, (A) and (B) motor speed sensors, output speed sensors, and HVIL switches.
- Connect lugs that retain high voltage wiring to drive unit. Install high voltage covers with new Electromagnetic Interference (EMI) gasket and torque cover bolts to 21 ft-lb.
- Connect the DPIM oil lines and oil cooler line to drive unit.
- Install rebuilt surge tank assembly.

- Install OEM approved coolant hoses, lines, fittings, and brackets. *See SB # 22-PT-27-00 Surge Tank Cooling Hoses Supersession – HOMT Rehab.*
- Install radiator / charge air cooler assembly.
- Install new trans cooler and bracket assembly.
- Install air intake piping.
- Install new air filter, air filter housing, and piping.
- Install charge air piping.
- Install new/rebuilt spinner oil filter assembly.
- Install coolant hoses with constant tension clamps. *See SB # 22-PT-24-00 Hose Clamp Torque Specifications.*
- Install rebuilt Proheat unit. (HVAC)
- Connect hydraulic lines. *See SB # 22-PT-20-00 Hydraulic O-Ring Boss Fitting Installation*
- Connect fuel lines.
- Install exhaust piping. *See SB # 22-PT-26-00 Correct Application for Exhaust V-Band Clamps & SB # 18-P-001*
- Install new boost pump.
- Install new AC belt, water pump belt, and alternator belt.
- Install belt guard.
- Ensure that tank is clean and free of dirt and crystallized DEF.

Aftertreatment Compartment/ Area– *Needs Further Discussion within Management

- ***Selective Catalytic Reduction (SCR) Assembly.** *Install new SCR Assembly. Note: To be replaced as an assembly when all parts are available.; currently, the Decomposition Reactor Assembly components are available for replacement.*
- ***Diesel Particulate Filter (DPF) Assembly.** *Install new DPF Assembly (WMATA P/N 842720221). Note: To be replaced as an assembly when parts are available; currently, the Soot Filter part is available for replacement.*

Roof – *Needs Further Discussion within Management

- ***DPIM.** *Install rebuilt DPIM & program (as needed). Note: To be replaced with rebuilt DPIM when parts are available.*

Continued Installation Procedures & Inspection

- Add all respective fluids to engine, drive unit, power steering system, coolant system, DEF tank per manufacturer's specifications.
- Pressure-test the engine cooling system and check for leaks; perform repairs as needed.
- Ensure that AC system has been charged with refrigerant per manufacturer's specifications. (HVAC)
- Reconnect/energize high voltage system.
- Start engine. Check for the following:
 - Belts and tensioner for proper operation.
 - Air and fluid leaks (engine oil, drive unit fluid, hydraulic fluid, coolant, DEF, fuel, etc.); make repairs as needed to eliminate leaks.

Roof (After System is Re-energized)

- Energy Storage System (ESS).**
 - **Enerdel Filters.** Change out the ESS filters. *See SB # BUSV-BMNT-SB-24-PM-03-00 EnerDel ESS Inspection & Service.*
 - Use the EnerDel software to perform the ESS Fan Test Procedure; remove and replace all defective fans. *See SB# BUSV-BMNT-SB-24-PM-01-00 EnerDel ESS Fan Test Procedure for reference.*

Continued Preparation

- Reinstall the license plates.
- Move bus to designated inspection lift.

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CL-3) FRONT AXLE REMOVAL & INSTALLATION/ 40 HOURS

Refer to NF 7300-7355 service manual and SOP 5.04 Bus/ Non-Revenue Lift Operation for complete axle support/ removal procedures.

Front Axle REMOVAL/ 16 Hours

DO NOT TORCH, CUT OR GRIND TO REMOVE AXLES

- Inspect the power steering gear box and miter box. Remove and replace as needed.
- Remove upper (vertical) and lower (horizontal) steering shafts.
- Exhaust air from air supply.
- Disconnect drag link from steering arm.
- Disconnect upper radius rods save all alignment shims and spacers.
- Disconnect lower radius rods save all alignment shims and spacers.
- Disconnect shock absorbers.
- Remove steering damper.
- Inspect steering damper mounting brackets. Remove and replace as needed.
- Disconnect air spring assemblies.
- Disconnect the leveling valve control rod from bracket.
- Disconnect ABS sensors.
- Disconnect E-Stroke cables from brake chambers.
- Disconnect air hoses from brake chambers.
- Remove front axle from vehicle.
- Remove front wheels.
- Secure front axle assembly for delivery to CTF.



WARNING

From this point on, make sure the axle is securely restrained to the lift cradles to prevent rolling or rotating when freed from the frame mounting point.



WARNING

Use the appropriate equipment to transport the axle. Failure to do so can cause serious injury.

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Front Axle INSTALLATION / 24 Hours

Torque all front axle components to OEM Specification pg. xx

- Install new splash guards (mudflaps).
- Install power steering gear box and miter box (if applicable).
- Lubricate miter box.
- Tighten bolt connecting steering miter box to frame to 25-30 ft-lb, Loctite-272.
- Tighten power steering gear mounting plate to frame to 157-173 ft-lb, Never-Seez.
- Tighten power steering gear to mounting plate bolt t..... 350 ft-lb, Never-Seez.
- Install new (upper) vertical steering shaft and torque clamp bolts to 50 ft-lb.
- Install new (lower) horizontal steering shaft and torque clamp bolts to 50 ft-lb.
- Install front axle per service manual.
- Connect the brake hoses to air supply.
- Connect the new ABS sensors.
- Connect the new E-stroke sensor cables.
- Mount the **new** leveling valve control rod to mounting bracket.
- Mount the new air spring assemblies to the air spring plates. **Note: *Use Contitech Continental Air Springs P/N 955-72-0042 when parts become available.**

- Tighten bolts connecting lower air springs to plate **25-35 ft-lb, Never-Seez.**
 - Tighten bolts connecting upper air springs to frame (3/4" UNF) to **45 ft-lb, Never-Seez.**
 - Tighten bolts connecting upper air spring to frame (1/2" UNC – Lock) to..... **20 ft-lb, Never-Seez.**
- Connect the airlines to air spring fittings.
- Install new shock absorbers with bushings, torque upper and lower mount lock nuts to...**56 ft-lb, Never-Seez.**
- Connect upper shock mounting plates to frame and torque to **35 ft-lb, Never-Seez.**
- See SB # 22-CC-03-00 ***Radius Rod Hardware.***
- Install & connect **new upper radius** rods to frame, tightening bolts to..... **105 ft-lb, Never-Seez.**
- Install & connect **new lower radius** rods to frame, tightening bolts to **230 ft-lb, Never-Seez.**
- Install & connect **new** drag link to the upper steering arm and torque new nut to...**95-115 ft-lb, Never-Seez.** Install cotter pins.
- Tighten drag link tie rod end clamp bolt to **59-70 ft-lb, Never-Seez.**
- If steering damper mounting brackets were removed, reinstall as follows:
 - Reinstall the bracket to the vehicle frame and torque fasteners to **35 ft-lb, Never-Seez.**
 - Reinstall the bracket to the axle and torque fasteners to **260 ft-lb, Loctite.**
- Install steering damper, torque castle nut to **55 ft-lb**, and install cotter pin.
- Adjust front brakes. *See SB-22-CC-12-00 for Meritor Calipers Install – Overhaul/Rehabilitation.*
- Set ride height – by the front axle measuring from top of axle beam to low chassis beam to **4"**.
- Lubricate (upper) vertical and (lower) horizontal steering shafts (4) U-joints.
- Install new ground strap.
- Install the front wheels per ***SOP 1.14 Wheel and Tire Maintenance Program; EMI-B55L12 Zafety Lug Lock Installation.***

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CL-4) REAR AXLE REMOVAL & INSTALLATION/ 40 HOURS

DO NOT TORCH, CUT OR GRIND TO REMOVE AXLES

Refer to service manual and *SOP 5.04 Bus/ Non-Revenue Lift Operation* for complete rear axle support/ removal procedures.

Rear Axle REMOVAL/ 16 Hours

- Drain the differential oil.
- Remove membrane breather from the vehicle structure mounting bracket.
- Disconnect the leveling valve control rods from the brackets.
- Disconnect the shock absorbers from the rear shock mount brackets.
- Disconnect the air spring assemblies from the rear axle beam assembly.
- Disconnect the ABS sensors cables.
- Disconnect and label the E-stroke cables L/S and R/S to avoid confusion during installation of the new brake chambers.
- Disconnect the air hoses from the brake chambers.
- Disconnect the **upper radius rods** from the vehicle frame and save all alignment shims and spacers.
- Disconnect the **lower radius rods** from the vehicle frame and save all alignment shims and spacers.
- Remove the old U-bolts from the rear axle beam.
- Remove the axle from the rear axle beam assembly.
- Remove rear wheels.
- Secure the rear axle for delivery to CTF.

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WARNING

From this point on, make sure the axle is securely restrained to the lift cradles to prevent rolling or rotating when free from the frame mounting point.

Rear Axle INSTALLATION/ 24 Hours

- Install new splash guards (mudflaps)
- Install new membrane breather.
- Install new axle on to rear axle beam assembly and align axle with suspension beam pads.
- Insert new U-bolts per side; hand tighten and tighten to initial torque of 100 ft-lb. Work in a circular pattern from outer to inner U-bolts on each side of the axle, torque in increments of 100 ft-lb final torque to 380 ft-lb.
- Install new upper and lower radius rods from axle to frame torque to 300 ft-lb.
- Install new lower radius rods to axle housing torque to 230 ft-lb.
- Install suspension beam to the vehicle frame and install shock absorbers with bushings, spacers, and nuts onto suspension beam.
- Torque shock absorber locking nuts to 56 ft-lb.

- Install new air springs to suspension beam with bolt and washer torque to**20 ft-lb.**
Note: *Use Contitech Continental Air Springs P/N 955-72-0042 when parts become available.
- Connect new brake hoses.
- Connect ABS cable sensors.
- Connect E-stroke cables.
- Install drive shaft and torsional damper with flange on to the drive unit, torque the eight bolts with locknuts to **75 ft-lbs**. Apply torque witness marks.
- Connect leveling valve rods to suspension beam.
- Connect shop air check components for leaks, brake hoses, leveling valves, and air springs.
- Add differential fluid.
- Set ride height – by the rear axle measuring from top of axle beam to low chassis beam to **3 7/8"**
- Adjust brakes *See SB # 22-CC-12-00 for Meritor Calipers Install – Overhaul/Rehabilitation.*
- Install new ground strap.
- Install rear wheels per ***SOP 1.14 Wheel and Tire Maintenance Program; EMI-B55L12 Zafety Lug Lock Installation***

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Bus Engineering/Bus Maintenance

New Flyer Rehabilitation Guide

Pneumatics (P) Station 1, Small Units

P-1) PNEUMATICS/ 32 HOURS

Perform the following:

- Inspect Wet/ Rear Brakes Tank Assembly for damage, air leaks, etc.; replace as needed.
 - Check operation of internal single check valve; if it fails, replace tank assembly.
- Inspect Accessory/ Kneeling Tank Assembly for damage, air leaks, etc.; replace as needed.
 - Check operation of internal single check valve; if it fails, replace tank assembly.
- Inspect Front Brakes / Emergency Tank Assembly for damage, air leaks, etc.; replace as needed.

Inspect the following components for damage/ leakage; replace the parts and their respective hardware and tubing as needed:

- Air Governor (1). *See SB # 19-AS-001 Xcelsoir High Temperature Air Governor.*
- Muffler Tank (1) & Drain Valve (1)
- Muffler Tank Safety Valve (200 psi) (1)
- Retrofit Graham White Air Dryer to Haldex Air Dryer Assembly. *See EMI-00-AS-00-00 Haldex Air Dryer Retrofit.*
- Wet Tank Safety Valve (150 psi) (1)
- Wet Tank Drain Valve (1)
- Rear Brakes Tank Pressure Sending Unit **70 psi** (1)
- Rear Brake Tank Drain Valve (1)
- Front Brakes Tank Pressure Sending Unit **70 psi** (1)
- Front Brakes Tank Drain Valve (1)
- Pressure Protection Valve (PR-2) (1)
- Brake Pedal Assembly (1)
- Accelerator Pedal Assembly (1)
- E-6 Brake Application Valve (1) & Brake Valve Actuator (BVA-85) (1)
- Brake Valve Actuator Solenoid, 12V (Interlock) (1)
- Pressure Switch Interlock Warning **4 psi (PS8)**
- Pressure Reducing Valve (RV-3) **75 psi** (Interlock) (1)
- Pressure Test Valve (Outlet of RV-3) (1)
- Parking Brake Control Valve (PP-1) **40 psi** (1); *See EMI-50L23 – Bendix PP-1 Valve Button Inspection & Replacement.*
- Emergency Brake Release Valve (RD-3) (1)
- Pressure Switch Stop Light Emergency/Parking **60 psi. (PS4)**
- Pressure Transducer – E-stroke (1)
- Pressure Transducer Switch **250 psi (PT15)** (1)
- Brake Application Pressure Transducer – Stop Light/ Retarder Brake Warning **(PT3)** (1)
- Pressure Switch Stop Light **4 psi. (PS5)** (1)
- QR-1 Valve (1)
- R14 Relay Valve (Crack Pressure: **5.5 psi**) (1)
- SR-7 Valve (1)
- ATC Valve (1)
- ABS Valves, 24V Front (2) & Rear (2)
- Single Check Valves
 - Single Check Valve at Inlet to Front Brakes Tank (1)
 - Single Check Valve at Inlet to Emergency Release Tank (1)
 - Single Check Valve at Front Charge Line (1)
 - Single Check Valve at Rear Charge Line (1)

WARNING

Flying debris can cause serious eye injury. Wear safety glasses during vehicle maintenance to avoid personal injury.

- Single Check Valve at Inlet to Kneeling Block Assembly (1)
- Single Check Valve at Inlet to Front Leveling Valve (1)
- Single Check Valve at Outlet to Rear Junction Block (1)
- Single Check Valve at Supply Port of SR-7 (1)
- Double Check Valve (1)
- Leveling Valves Front (1) and Rear (2)
- Kneeling Block (1)
- Junction Block (Rear) (1)
- Rotary Dump Valve (Driver's Console) (1)
- Strainer (1)

Perform the following:

- Check operation of Supply Air, Front Service Brake, Rear Service Brakes, Interlock, and Parking/Emergency Brake Air Circuits.
- Check kneeling operation.
- Check entire Air System for air leaks and make repairs as needed.

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Bus Engineering/Bus Maintenance

New Flyer Rehabilitation Guide

Electrical I Station 1, Small Units

E-1) BULKHEAD ELECTRICAL / 40 HOURS

- Inspect all wiring; repair as needed.
- Connect all Electrical Components.
- Install new engine compartment lamps.
- Inspect and repair all wiring in apparatus compartment.
- Replace all bad connectors.
- Install main engine harness.
- Install EMP cables.
- Rebuild rear run switch box.

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Battery Safety Precautions

- Always wear proper eye, face and hand protection
- Keep all sparks, flames and cigarettes away from batteries
- Never try to open a battery with non-removable vents
- Make sure work area is well ventilated
- NEVER lean over battery while boosting, testing or charging
- Exercise caution when working with metallic tools or conductors to prevent short circuits and sparks.

E-2) BATTERY COMPARTMENT / 16 HOURS

See SOP 1.21-04 (04/11/2022) Bus Battery Maintenance Program.

- Remove batteries.
- Replace battery switch.
- Remove and inspect battery tray (repair/replace bushing as needed).
- Inspect battery tray roller bearings and replace as needed, grease bearing.
- Install new batteries.
- Install new battery cables as needed.
- Check battery tray lock in, repair or replace if needed.

Employee Signature _____ **Employee ID #** _____

Employee Signature _____ **Employee ID #** _____

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Supervisor/Designee Signature _____ **Employee ID #** _____

E-3) EXTERIOR LIGHTING ELECTRICAL REPAIR / 16 HOURS

- Markers
- Stop
- Back-up
- License
- Aux.
- Turn signals
- Engine compartment

Employee Signature _____ Employee ID # _____

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E-4) INTERIOR ELECTRICAL / 36 HOURS

Inspect, repair, or replace components as needed.

- E-Stroke panel
- Replace horn assembly (use kit); check horn operation high / low pitch.
- Headlights dash indicator, low beam and high beam lights
- Low indicator light/ buzzer warning at 70 psi.
- Brake & Accelerator interlock holds in all door position.
- Exterior and Interior lighting
- Dash lights, gauges, Dimmer switch
- Doors Emergency override switch
- Defroster/heater operation
- Back-up alarm
- Turn signal switches.
- Driver's booster blower switch
- ABS Diagnostic switch
- Passenger chime switch
- Check fire suppression button.
- Silent alarm Indicator light
- Silent alarm button
- Hazard light
- LED warning lights / indicator panel. *See EMI-21-ENG-00-02 Operator Instrumentation Update: Removal of Low Coolant Indicators/ Alarms.*
- Front step well heater switch
- Replace rear door sensitive edge switches.
- Check Class door sensors and replace as needed.
- Check Clever Device system.
- Check PA system microphone and speaker volume.
- Entrance and exit door motors.
- Door control valve

 **WARNING**

Flying debris can cause serious eye injury. Wear safety glasses during vehicle maintenance to avoid personal injury.

- Speedometer
- Clever Device panel
- Engine Diagnostic switch
- Climate Control blower switch
- Interior light switch
- Driver's Overhead Light switch
- Drive Unit Selector
- Master Run Switch. *See SB # 15-E-003 Low Voltage Disconnect.*
- Engine emergency override switch
- Hazard light switch
- Engine start switch
- Wiper control switch
- Instrument Cluster with harness. *See SB # 17-E-001 Xcelior Instrument Cluster Replacement.*
- Kneel system switch.
- Wheelchair ramp switch and ramp alarm operation
- Front S/C Air pressure switches
- LED Dome lights
- Replace S/C panel decal.
- Windshield wiper motors
- Front door dump valve (rotary)
- Note: Destination sign inspection/ repairs will be performed by contractor.**

 **WARNING**
 To avoid personal injury, do not wear rings, wrist watches, or loose-fitting clothing. Any of these items could catch on moving parts and cause serious injury

Employee Signature _____ **Employee ID #** _____

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Bus Engineering/Bus Maintenance

New Flyer Rehabilitation Guide

HVAC System (AC)

AC-1) HVAC SYSTEM / 40 HOURS

Refer to Thermo King Manual RLF2-M7 for HVAC procedures and specifications (BMNT website).

Refer to Robinair Recovery/ Recycling/ Recharging Unit Manual.

Follow procedures outlined in BUSV-BMNT-SOP-2.25-05 Fall Protection Program for roof work.

Engine Compartment Inspection & Procedures

- Remove AC belt (Station 1)
- Inspect AC compressor's overall condition for damage and wear; replace as needed.
- Inspect AC compressor switches, wiring, and connectors for damage and wear; replace as needed.
- Recover refrigerant from system.
- Check for signs of refrigerant leaks (i.e. oil build-up) at AC compressor; discharge and suction service valves and lines; other refrigerant tubing; perform repairs/ replacements as needed.
- Drain old compressor oil/ add fresh oil.
- Remove and replace AC compressor clutch assembly (kit).
- Align compressor to crankshaft, torque the 3/8" mounting bolts to 35 ft-lbs.
- Inspect AC compressor platform; replace turn buckles and hardware.
- Remove and replace bottom pulley (snubber).
- Remove and replace evaporator drain tubing and kazoos.
- Remove and replace solenoid valve assemblies (2) (Station 1).
- Install new AC belt and align AC compressor using gauge (after powerplant has been installed)
- Remove and replace booster pump.
- Auxiliary Coolant Heater: Proheat M80 Unit Procedures:**
 - Remove and disassemble unit.
 - Clean inside of heat exchanger.
 - Clean inside of the combustion tube.
 - Replace Proheat Control Module (PCM)/burner head assembly.
 - Replace temperature sensor.
 - Reassemble unit and install.
 - Install new exhaust blanket.
 - Install new 90° elbow inlet and outlet hoses.

HVAC (Bus Interior Ceiling) Compartment Inspection & Procedures

- Inspect the following components for damage and wear; replace as needed:
 - Control Panel
 - Compartment wiring
 - Evaporator/Heater blower motors
 - Return air sensor
- Remove and replace return air (evaporator) filter.
- Wash louver access cover.

Overhead Crowns

- Ensure that curtains behind paneling are closed after all inspections and replacements/ repairs have been performed (Station 5)

HVAC (Roof) Compartment Inspection & Procedures

- Remove and replace filter drier.
- Inspect the following refrigerant components for damage, wear, and signs of leakage (i.e. oil build-up) and replace as needed:
 - Refrigerant tubing and lines
 - Service valves. **Note: Also check functionality during filter drier replacement.**
 - Receiver tank/ sight glass
 - Liquid line sight glass.
 - High pressure relief valve
 - Thermostatic Expansion Valve (TXV). **Note: Ensure that sensing bulb is insulated.**
 - Evaporator Pressure Regulator (EPR).
- Inspect condenser coils for damage, wear, debris, and signs of refrigerant leakage (i.e. oil build-up); replace as needed; if no replacement is required, clean and straighten fins as needed.
- Inspect evaporator coil for damage, wear, debris, and signs of refrigerant leakage (i.e. oil build-up); replace as needed; if not replacement is required, clean coils and straighten fins as needed.
- Inspect heater coil for damage, wear, debris, and coolant leaks; replace as needed; if no replacement is required, clean coil and straighten fins as needed.
- Inspect motorized water valve for damage and coolant leaks; replace as needed.
- Inspect condenser fan/motor condition for damaged structure and wiring, wear, etc.; replace as needed.

HVAC Bus Interior (Floor) Inspection and Procedures

- Check operation of floor heaters, repair/replace as necessary; this is to include replacement/ repair of rusted floor blower housings.
- Replace floor heater filters.

HVAC SDS Compartment Inspection and Procedures

- Replace coolant hoses and clamps in the SDS Enclosure. *See BUSV-BMNT-SB-24-HV-01-00 SDS Enclosure Coolant Hoses Inspection & Replacement.*

Defroster Compartment

- Inspect defroster blower motor condition; replace as needed.
- Replace Defrost/Floor (Heater) Actuator.
- Replace defroster water control valve.
- Replace defroster filter.
- Inspect driver's booster fan assembly for damage and wear; replace as needed.

Driver's Compartment

- Check defroster control dash knobs/cables, replace as needed.
- Check all dash vents for presence, damage, and wear; replace as needed.

Refrigeration System

- After completing replacements/ repairs of refrigeration system components and tubing, evacuate the system; if the system does not hold a vacuum, recheck the system for leaks and perform repairs as needed. Once repairs have been completed, leak-test the system. Evacuate the system again. Once it has been confirmed that all leaks have been addressed and system can hold a vacuum, the system can be recharged.
- Charge the refrigeration system with R-407c refrigerant.

HVAC Operations Inspections & Procedures

- Use Intelliaire III software/ Control Panel to check the following:
 - Heating & Cooling Modes.
 - Set Points: 72° for heat; 72° for cool.
 - Condenser fans & evaporator fans (blowers)
 - Suction & Discharge Pressures
 - Temperature sensors/ pressure transducers
- Check operation of Auxiliary Coolant Heater (Proheat)
 - Check for fuel and coolant leaks; replace/ repair as needed.
 - Check for fumes; perform repairs as needed to eliminate fumes.
- Check operation of the following:
 - Driver's Floor Heat Control
 - Defroster Fan Control
 - Defroster Air Recirculation Control
 - Defroster Temperature Control
 - Blend Air Door Actuator; replace as needed **[Note: Controlled by fresh air knob]**
- Recheck refrigerant oil level when system has been running for 30 minutes; sight glass should show 1/4 to 1/2 full; top off oil level as needed.
- If there are fault codes, troubleshoot and perform repairs as needed.

Employee Signature _____ **Employee ID #** _____

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Bus Engineering/Bus Maintenance

New Flyer Rehabilitation Guide

Farebox Shop (FB)

FB-1) FAREBOX PROCEDURES/ 8 HOURS

Note: The Fast Fare farebox systems have been installed on all buses and will not require an overhaul during this specific rehab program. However, certain inspection and preparation procedures will be performed, and they are outlined in this section.

Note: Prior to the bus coming to be rehabbed, the farebox should already have been probed, and the cash box vaulted.

Pre-Inspection (Station 1)

Inspect the following components for damage/ wear, looseness, and overall structural integrity and note all defects for repair:

Main Farebox Unit (Includes the following components)

- Farebox Lid & Lid Lock
- Passenger Display & Buttons
- Coin Insertion Cup
- Bill Insertion Slot
- Coin Return Cup
- Shroud (Cover)
- Cashbox Door
- Infrared Data Port
- Passenger Information Speaker
- Coin Bypass Lever
- Pedestal
- Decals
- Braille Placard

Driver Control Console (DCC) (Includes the following components)

- Screen
- Havis Mount & Adjuster Mechanisms
- Cables/ Wiring
- Tether

Front (Entrance Door) and Rear (Exit Door) Validator (Includes the following component)

- Screens

Farebox Component Preparation & Removal/ XX Hours (Station 1)

NOTE: Farebox Personnel (Electronic Equipment Repairers) will perform these procedures BEFORE the Station 2 Procedures of removing the driver's area/ farebox yellow stanchion.

Front Validator

- Disconnect the cables (Cat RJ45 and Microfit Junior) to the front validator; carefully slide out the cabling from the yellow stanchion that houses it.
- Remove front validator; label it with the bus number and note as "Front" position.

Main Farebox Unit & Driver Control Console (DCC)

- Place the designated protective cover over the main farebox unit and DCC; the protective cover will remain until Station 4 procedures have been completed.

Note: Removal of DCC to be determined; if removal is needed, label it with the bus number, and transfer to the Farebox Shop for storage.

Rear Validator

- Disconnect the cables (Cat 64J45 and Microfit Junior) to rear validator.
- Remove the rear validator and label it with the bus number and note as "Rear" position.

Note: Both front and rear validators will be transferred to the Farebox Shop at CTF and placed on the "hot rack".

Farebox Validator Preparation (Farebox Shop – CTF)

Front & Rear Validators

- **Cleaning Procedures (To remove all grease, grime, dirt, etc.)**
 - Clean exterior using soft cloth and mild detergent.
 - Clean front glass using dampened microfiber cloth and glass cleaner.
- Check Coin Cell Battery Voltage using DVOM.
- Connect validators to the test simulator to perform software updates. *Note. This will be performed just prior to returning validators to Andrew's Federal Center HOMT.*

Farebox Component Installation and Preparation (After Station 4 and Before Station 5)

Main Farebox Unit & Driver's Control Console (DCC)

• **Main Farebox Unit.**

- Remove protective cover.
- Perform repairs/ replacements to components as needed.
- Remove damaged or outdated decals and braille placard as needed; new decals and placard to be applied/ installed after cleaning of the unit.
- **Cleaning Procedures (To remove all grease, grime, dirt, etc.)**
 - **Farebox Lid & Other Plastic Surfaces.** Clean with soft cloth and mild detergent.
 - **Farebox Stainless Steel Surfaces.** Clean using soft cloth mild detergent and water to remove dirt, grease, and markings; for stubborn dirt which may require the use of an abrasive cleaner, make sure to rub in the direction of the brush lines to preserve the finish.
 - **Passenger Display Screen & Buttons.** Clean with damp, microfiber cloths.
 - **Coin Insertion Cup.** Clean and remove lint and debris; use sponge and isopropyl alcohol.
 - **Coin Return Cup.** Clean and remove lint and debris; use all-purpose cleaner or mild detergent and water.
 - **Data Port.** Clean using soft damp cloth and glass cleaner.

• **Driver's Control Console (DCC)**

- Install DCC (if removal was needed).
- Check the Havis mount for looseness, and secure and adjust as needed; also ensure that tether is present and secured.
- Check that cables are connected.
- **Cleaning Procedures (To remove all grease, grime, dirt, etc.)**
 - **Exterior.** Clean using soft cloth and mild detergent and water solution.
 - **Screen.** Clean using microfiber cloth and glass cleaner (if needed).

• **Operation**

- Use burn-in jumper to navigate DCC screen display to Maintenance Mode.
- Perform cycle test to perform the following farebox system/ component tests:
 - Bill Motor Test
 - Bill Valid Test
 - Audio Test
 - Patron Display Test
- Return DDC display back to Regular Operator Mode.

Front & Rear Validators

- **Front Validator.** Install front validator onto validator mount farebox yellow stanchion extension; insert cabling through the stanchion and reconnect.

- **Rear Validator.** Install rear validator onto validator mount and reconnect cables.

- **Operation**

- Ensure that both front and rear validators connect, and that proper screen display appears.
- Use employee ID to log into validators; check for beeping sound, which will confirm that the transaction was logged.

Farebox Probing & Vaulting (Station 5)

- When the bus goes through the service lane, probe the farebox and vault the cash box to ensure proper operation.

Employee Signature _____ **Employee ID #** _____

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Bus Engineering/Bus Maintenance

New Flyer Rehabilitation Guide

Wheelchair Lift Shop (WC)

WC-1) WHEELCHAIR RAMP SERVICE/ 16 HOURS

Refer to SR1946 New Flyer Service Manual, Section 20 for full replacement procedures, adjustments, and specifications.

Disassembly (Station 1)

- Remove the two wheelchair ramp chain covers. *Note: If covers are damaged or worn, replace in Station 5)*
- Elevate the bus.
- Remove the seven screws and closeout plate that attach the rubber cover to the bottom of the ramp box.
Note: Upon removal of the screws that secure the close-out plate, some of the inserts ("Rivnuts") may get stuck or damaged; new screws and inserts can be obtained from the Fastenal Cabinet and installed when bus is in Station 5.
- Lower the bus.
- Manually deploy the ramp plate.
- Remove the eleven screws that attach the cover to the ramp box. *Note: New screws will be installed in Station 5.*
- Carefully support and remove the ramp plate.
- Remove the cover assembly to the ramp enclosure; inspect the components within the enclosure for damage, wear, corrosion, and hydraulic fluid leaks prior to pressure washing and note all defects.
- Disconnect the two hydraulic hoses and drain hydraulic fluid from reservoir.
- In the steam bay, pressure wash the ramp enclosure to remove dirt, debris, grease, etc.
- Note: Install old cover assembly while bus goes through the various Stations.*

Rebuild (Station 1)

- Apply new reflective strips onto sides of ramp plate and install new ramp pull-out strap.
- Remove and replace the following components:
 - Ramp pump assembly. *Note: Transfer fittings from old assembly to new; use new O-rings from Fastenal.*
 - Hydraulic cylinder assembly *Note: Transfer fittings from old assembly to new; use new O-rings from Fastenal.*
 - Hydraulic lines
 - Bearing sleeves
 - Ramp pivot arms
 - Proximity switch
 - Closeout plate *Note: Installed in Station 5*
 - Dash stow/deploy switch *Note: Installed in Station 5*
- Inspect the following components for damage, wear, and corrosion; remove and replace as needed:
 - Ramp Mechanism Assembly
 - Single Strand Roller Chains
 - Sprockets
- Inspect and adjust chain tension as required.
- Lubricate the chains, Teflon bearings, bronze bushings, and all sliding surfaces with white lithium grease.
- Add hydraulic fluid to reservoir.

Rebuild Cont'd/ Check Operation (Station 5)

- Remove old cover assembly.
- Install new ramp plate/ hinge.
- Check the kneeling, deployment, and stowing operations; ensure that the ramp operates with the entrance door in the open position, that the interlock engages, and that the interlock, door, and ramp lights illuminate on the instrument panel, and the ramp alarm sounds; if the kneeling, deploy/stow, interlock, etc. does not function properly, repair as needed and recheck operation.

- **Note:** Ensure stowed proximity switch is functioning and is positioned to activate at 15° from the STOWED position.
- During ramp operations, inspect ramp mechanism, chains, etc.; ensure that all components are securely fastened, and perform adjustments as needed.
- After ramp has been cycled, check for hydraulic fluid leaks; repair as needed. Also recheck reservoir fluid level and top off as needed.
- Reinstall ramp chain covers.
- Install new cover assembly **Note:** Transfer the spacer from the old cover assembly to the new one.
- Elevate bus.
- Install new closeout plate **Install new screws/ inserts as needed from Fastenal.**
- Clean and inspect the wheelchair ramp harness connector for damage and corrosion; replace as needed. **Note: The close-out plate does not need to be removed to view the connector.**
- Lower bus.

Employee Signature _____ Employee ID # _____

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Safety Tip

When disconnecting hydraulic hoses during maintenance procedures, always cap or plug open lines during maintenance procedures and clearly identify their original location and connection point. This will also prevent air from displacing hydraulic fluid. If pressurizing capped or plugged hoses, always restrain your hoses prior to re-starting machinery to prevent whipping. Removing the hose completely will also prevent whipping.

Bus Engineering/Bus Maintenance

New Flyer Rehabilitation Guide

Body Shop (BS), Station 2

⚠️WARNING

The following are basic guidelines that apply to all shop practices and procedures, and specific requirements required to perform body work, "prep" and painting procedures Safely.

- To prevent eye injury, always wear eye protection - safety glasses or face shields when performing vehicle maintenance, service or body repair.
- Always wear a face shield with appropriate light filters when welding. Prolonged unprotected exposure to the intense light generated by arc welding can cause severe and permanent retinal damage. Welding area should be sectioned off with filtered panels to prevent inadvertent damage.
- Always wear a face shield when grinding or performing work beneath the vehicle.
- Always wear appropriate ear protection; plugs or headgear.
- Always secure or remove jewelry, watches, loose clothing and/or hair when operating power tools or repairing components with moving parts.
- Always wear an appropriate respirator, cartridge mask or HEPA type filter mask when sanding by hand or with power tools.
- Avoid ingesting the dust spray or fumes of cured/uncured substances.
- Always wear a 100 % air mask positive-pressure supplied respirator (NIOSH/MSHA TC-19C), eye protection, gloves and protective clothing when mixing chemicals during application of paint and top coats, and until all vapor and mist are exhausted.
- Never attempt to operate a piece of equipment or power tool if you are unsure how to use it safely. Consult your supervisor.
- Wear protective clothing.
- Always refer to the Safety Data Sheets and/or product documentation provided with the products for safety information. Always be aware of the potential hazards when working with any chemical substances. Improper handling of some products can cause severe illness personal injury and/or death.
- Always ensure that a portable fire extinguisher is within reach, in the event of an emergency and ensure that it is in operating condition.
- Dispose of resins and containers in compliance with standards, through the services of a qualified waste treatment company.

Bus Engineering/Bus Maintenance

New Flyer Rehabilitation Guide

Body Shop (BS), Station 2

BS-1) BUS INTERIOR/ EXTERIOR REPAIRS/ 120 HOURS

BUS INTERIOR Repairs/ 4 Hours

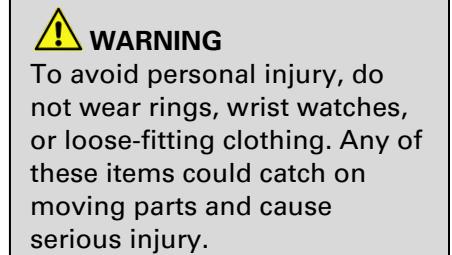
Note: All items removed will be properly labeled with bus number and installation location. All defective repairable items removed will be repaired at designated work areas and stored in pre-arranged locations for reinstallation at Station 4. All other reusable items will be cleaned and stored in the above-mentioned location.

Passenger Seats (*Note: This process can also be performed in Station 1 while Powerplant is being removed*)

- **Seat Pans**
 - Remove seat pans and hardware.
 - Prepare seat pans to be sent to vendor (Needle's Eye) for re-upholstering.
- **Passenger Seat Assemblies.** Inspect passenger seat assemblies and hardware; check for damage, wear, and secureness; replace/repair as needed.

Driver/ Front Destination Sign Compartment Area (Underneath)

- **Bike Rack Mirror.** Remove bike rack mirror (*Note: New one to be installed in Station 4*)
- **Driver/ Farebox Area**
 - **Farebox Stanchion.**
NOTE: Farebox Personnel (Electronic Equipment Repairers) will remove the Front Validator BEFORE the Station 2 Procedures of removing the driver's area/ farebox yellow stanchion.
 - Remove yellow stanchion.
 - Prepare stanchion to be sent to Station 3 (Paint Shop).



Wheelchair Area

- **Passenger Fold-Up Seats.** Inspect the fold-up seats for damage, wear, and functionality; ensure that seats fold and lock into place; replace/ repair as needed.
- **Wheelchair Restraint Barriers.** Inspect for damage, wear, and mounting; if found to be loose, need to remove and inspect internal metal frame for damage; replace/ repair and secure as needed.
- **Wheelchair Restraints.** Inspect wheelchair restraints/ buckles for damage, wear, and functionality; replace as needed; otherwise, clean restraints/ buckles and reinstall.
- **Decals.** Remove old decals.

Entrance Door/ Entrance Door Area

- Remove door entrance yellow passenger handles; prepare handles to be sent to Station 3 (Paint Shop).
- Remove driver's mirror (*Note: This is the mirror that is attached to the access door for the entrance door's door motor assembly; new one to be installed in Station 4*).
- Using 0.180 grit sand paper, sand off all corrosion found on the **EXTERIOR** lower portion of the entrance door panels ("Door #1" and "Door # 2").

Front Curbside Wheel Well Area

- Remove yellow stanchion; prepare stanchion to be sent to Station 3 Paint Shop.
 - Remove lid of Emergency Equipment Box; prepare lid to be sent to Station 3 (Paint Shop).
- Exit Door/ Exit Door Area**
- Remove exit door brackets, bushings ("bearings"), and rods ("pins").
 - Using 0.180 grit sand paper, sand off all corrosion found on the **EXTERIOR** lower portion of the exit door panels ("Door #3 and Door #4").
 - Remove exit door yellow nosing (the exit doorstep tread); inspect plywood for damage, wear, or other defects; repair as needed.
 - Install new exit door bushings, rods, and brackets.
 - Remove exit door yellow passenger handles; prepare handles to be sent to Station 3 (Paint Shop).
Note: Any plywood replacement will be use ¾" thick seven-ply fir AC grad pressure treated plywood and will be undercoated and sealed.
 - Note: The new yellow nosing will be installed in Station 4*
- Clean Bus Interior**
- Perform inspection prior to vehicle going into Station 3; perform all repairs/ replacements and corrections as needed.**

**WARNING**

Always wear adequate foot protection - safety shoes or work boots when performing vehicle maintenance, service or body repair

Employee Signature _____ **Employee ID #** _____

Supervisor/Designee Signature _____ **Employee ID #** _____

BUS EXTERIOR Repairs/ 116 Hours

Pre-Audit Inspection.

- Perform a pre-audit inspection of the bus and make necessary corrections.

Note: All exterior metal and fiberglass paneling, including the roof, shall be inspected; areas in need of repair or replacement shall be identified and repaired or replaced accordingly. All other repair information will be noted on tags or tape and attached to the area in need of repair.

Front Exterior

- **Bike Rack & Bike Rack Pivot.**

- Remove bike rack.
- Inspect bike rack pivot for damage, wear, and functionality; replace as needed (***Note: Replacement to be performed in Station 4.***)

- **Front Bumper.** Inspect bumper for damage; replace/repair as needed.

- **Windshields & Front Destination Sign**

- **Harness.** Inspect harness for presence and for damage/wear; remove/replace as needed.
- **Front Mask.** Reseal front cap/ roof seam.
- **Glass.** Inspect for damage (i.e. chips, cracks, holes, starbursts, etc.); replace as needed; for certain repairs, vendor will be contacted to address the defects.

- **Curbside & Streetside Driver Mirrors.** Loosen mirrors.

- **Access Doors.** Inspect the following panels for damage, wear, and secureness; replace/repair as needed and perform alignment.

- **Defroster Access Panel**
- **Front Curbside Lower Corner**
- **Front Roadside Lower Corner**

Rear Exterior

- **Rear Panel Assembly.** Inspect and replace/repair and perform alignment as needed.

- **Rear Bumper.** Install rear bumper using new mounting kit and perform alignment; torque the $\frac{3}{4}$ " retaining bolts to ***250 ft-lb.***

- **Taillights.** Remove taillights (***Note: New ones to be installed by Small Units.***)

- **Access Doors.** Inspect the following access doors for damage, wear, and secureness; replace/repair as needed and perform alignment:

- **Engine Access Door.** Inspect area below access door latch for stress cracks; repair as needed.
- **Curbside Upper Corner Pillar**
- **Streetside Upper Corner Pillar**
- **SCR Access Panel.** Repair/replace and align as needed.

Curbside Exterior

- **Curbside Roof & Side Panels.** Inspect and replace/repair and perform alignment as needed.

- **Access Doors.** Inspect the following access doors for damage, wear, and secureness; replace/repair as needed and perform alignment:

- **Fuel Filler Access Door.** ***Note: Install rivets into door.***
- **Battery Access Door.** ***Note: Install rivets into door.***
- **Side Engine Compartment/ Fuse Box Access Door**
 - **Battery Cutoff Switch Access Door.** ***Note: Install rivets into door.***
 - **DEF Manual Fill Access Door.** ***Note: Install rivets into door.***

- **Turn Signal Lights (Above front and rear wheel fenders)**

- Remove turn signal lights (***Note: New ones to be installed by Small Units.***)
- Inspect inserts ("Riv nuts"); replace as needed.

Streetside Exterior

- **Streetside Roof & Side Panels.** Inspect and replace/repair and perform alignment as needed.

- **Access Doors.** Inspect the following panels for damage, wear, and secureness; replace/repair as needed and perform alignment:
 - **Side Console Door**
 - **Radiator Access Door**
 - **Surge Tank Door**
- **Turn Signal Lights**
 - Remove turn signal lights above the front and rear wheel fenders (*Note: New ones to be installed by Small Units*).
- **Roof.** Reseal seam at the following locations:
 - **Front Roof Hatch**
 - **Rear Roof Hatch**
 - **Antenna**
- **Marker Lights.** Remove all marker lights.
- **Perform inspection prior to vehicle going into Station 3; perform all repairs/ replacements and corrections as needed.**

Employee Signature _____ **Employee ID #** _____

Supervisor/Designee Signature _____ **Employee ID #** _____

Bus Engineering/Bus Maintenance

New Flyer Rehabilitation Guide

Paint Shop (PS), Station 3 & Body Shop (BS), Station 4

PS- 1) EXTERIOR/ INTERIOR PREPARATIONS & REFINISHING/ 100 HOURS

Exterior Preparations

Do Not Paint over Stainless Steel or Aluminum. Clean Only

- Perform inspection prior to performing Station 3 procedures; perform all repairs/ replacements and corrections as needed.**
- Remove all exterior decals and adhesive.
- Sand exterior painted areas with 0.320 sand paper.
- Drive bus through wash rack to remove grease, road dirt, decal adhesive, etc.
- Inspect bus exterior and perform final cleaning with the approved cleaner to ensure all contaminants are removed.
- Mask all unpainted areas; ensure that mudflaps are masked.
- Perform an inspection prior to painting and ensure that all corrections and cleaning is performed.

WARNING

Always select the proper treatment or cleaning solvent that is approved for the given material. Consult your supervisor if you are unsure.

Exterior Refinishing

- Prime coat entire exterior of bus with approved epoxy primer/sealer.
- Apply all striping decals over prime coats and squeegee.
- Apply black low VOC paint to the areas between the side windows, the exterior mirror brackets, and the front and rear bumpers. Then mask all black surfaces, prepare for color.
- Apply low VOC paints Red / Silver/ as designed to the exterior.
- Remove all masking tape and paper.
- Remove 'over spray' with polishing compound as needed.
- Perform a pre-audit inspection of the bus and make necessary corrections.**

Interior Preparations & Refinishing (Select Components)

- Paint the entrance and exit door passenger handles gloss yellow.
- Paint the driver's area/ farebox stanchion gloss yellow.
- Paint the front curbside wheel well stanchion gloss yellow.
- Paint the Emergency Equipment Box lid semi-gloss black.
- After paint jobs are complete for the handles, stanchions, and lid, prepare the items to be sent to Station 4 (Body Shop) for installation.

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BS-2) INTERIOR/ EXTERIOR INSTALLATIONS & DOORS OPERATIONS/ 160 HOURS

Note: Any problems not repaired or corrected at Station 2 will be taken care of before calling for the Station 4 internal audit.

Interior Installations

- **Driver's Platform & Farebox Area**
 - **Driver's Seat Assembly.** Remove and replace the driver's seat assembly. *See BUSV-BMNT-24-BB-02-00 New Flyer Xcelsior RECARO Seat Belt Buckle Retrofit.*
 - **Steering Wheel Area**
 - **Steering Wheel.** Inspect for damage, and wear. Check telescoping and tilt functions; replace as needed. *Note: Alignment to be inspected/ adjusted in Station 5.*
 - **Steering Column Covers.** Inspect for presence, damage, wear; replace/ repair as needed.
 - **Farebox Stanchion.** Install and secure the re-painted gloss yellow farebox stanchion.
 - **Driver's Barrier**
 - Inspect for damage, wear, functionality; replace/repair as needed. *See SB #16-B-002 Xcelsior Driver's Barrier Lower Hinge Joint & SB #15-B-001 Bus Operator Safety Shields* for reference.
 - Inspect glass and sliding glass for damage; replace as needed.
 - Replace latch to Farebox stanchion and stops as needed; adjust latches and stop to ensure secure closure.
 - **Trash Bag.** Install new trash bag.
- **Driver's Front Console & Overall Front Dash Area**
 - **Panels.** Inspect driver's front console/ dash area panels for damage and wear; replace/repair as needed.
 - **Panel Vents.** Check for presence and condition of all vents (i.e. defroster, fresh air, etc.); replace damaged/ missing vents as needed.
- **Front Destination Sign Compartment & Area**
 - **Front Destination Sign Access Door**
 - Inspect panel and hinge for damage & wear; replace/ repair as needed.
 - Remove and replace shocks.
 - Remove and replace latches.
 - Inspect switch access door/knob; replace/ repair as needed.
 - **Front Driver Visor.** Remove and replace visor.
 - **Rearview Mirror.** Inspect mirror assembly for damage and secureness; replace/ repair and secure as needed.
 - **Bike Rack Mirror.** Install and secure new bike rack mirror.
- **Driver's Overhead Area**
 - **Driver's Pull-Down Visor.** Check for damage, secureness, and functionality; replace/repair as needed.
 - **Driver's Window Assembly.** Inspect glass, frame, seals, stops for damage; replace/repair as needed.
 - **Driver's Overhead Bin (Locker) & Access Door.** Inspect locker and door latch for damage, wear and secureness; replace/repair as needed.
 - **Registration Storage Panel & Latch.** Inspect panel and latch for damage, wear, secureness, and functionality; replace/ repair as needed.
- **Driver's Side Console**
 - **Console Paneling.** Check for damage and secureness; replace/repair as needed.
 - **Electrical Access Door & Handle.** Inspect for damage, secureness, and functionality; replace/ repair as needed.
- **Front Curbside Wheel Well Area**
 - **Wheel Well Stanchion.** Install the re-painted gloss yellow stanchion.
 - **Emergency Equipment Box**
 - **Emergency Equipment Box Lid.** Install the repainted semi-gloss black lid.

- **Emergency Equipment Box Condition/ Mounting.** Inspect box for damage, wear, and mounting; replace/ repair and secure as needed.
 - **Fire Extinguisher.**
 - Inspect fire extinguisher cylinder, hose, and nozzle for damage; replace as needed.
 - Ensure that fire extinguisher is securely mounted in its proper location; inspect brackets for presence, damage, and functionality; replace/ repair as needed.
 - Check that safety pin lock is installed.
 - Confirm that cylinder pressure indicated on gauge is within green operating range.
 - **Wheel Chocks (2).** Check for presence, damage, wear, and for secure mounting; replace as needed.
 - **Emergency Triangles.** Check for presence, damage, wear, and for secure mounting; replace as needed.
- **Passenger Seats**
- **Seat Pans.** Install refurbished seat pans and new hardware/ fasteners (tabs/ studs).
 - **Rearmost Passenger Seats & Engine Compartment (Drive Unit) Access Door.**
 - **Seat Assembly & Hinge.**
 - Inspect seat assembly & hinge for damage, wear, and functionality; replace/repair as needed.
 - **Underneath Seat Assembly**
 - ❖ **Gas Shock.** Replace.
 - ❖ **Locking Gas Shock.** Inspect for damage and function; replace as needed.
 - ❖ **Prop for Seat Assembly.** Clean area around prop; inspect prop, bracket, and safety lock pin for presence, damage, and wear; replace/ repair as needed.
 - **Engine Compartment (Drive Unit) Access Door**
 - Clean and access door area; check for damage, wear, and functionality of panel locks and catches; replace as needed; also ensure that the access door seals, to prevent emergence of fumes.
- **Wheelchair Area**
- Reinspect the following components to ensure proper operation and that all repairs/ replacements have been performed:
 - **Passenger Fold-Up Seats**
 - **Wheelchair Restraint Barriers.**
 - **Wheelchair Restraints**
 - **Decals.** Remove old decals and apply new ones.
- **SDS Enclosure & Front Roadside Wheel Well Area.**
- **SDS Enclosure**
 - **Access Panel.** Inspect for damage, tether, and alignment; replace as needed; inspect latches for damage and function; replace as needed.
 - **Enclosure (Compartment):** Inspect condition and function of rolling trays/tracks and locking mechanisms; replace as needed.
 - **Window.** Inspect for damage and functionality (opening and closing/ securing); replace as needed; lubricate mechanism with WD-40.
- **Windows**
- **Glass.** Vendor replaces plastic windowpanes with glass (CTF).
 - **Frames**
 - Inspect for damage; replace/repair as needed.
 - Clean frames.

- **Emergency Windows & Window Latch/ Mechanism**
 - Inspect latch and mechanism for damage and check operation; replace as needed and lubricate.
 - Remove old decals and apply new ones.
- **Passenger Chime Cords.** Replace all cords.
- **Stanchions**
 - Inspect stanchions for damage and secureness; replace and secure as needed.
 - **Yellow Stanchion Passenger Straps.** Remove and replace all straps.
- **Ceiling/Overhead Crowns**
 - Inspect ceiling/ crown access panel rubber strips for presence and damage/ wear; replace as needed.
 - **Evaporator (Return Air) Filter Access Panel.** Inspect for damage and wear, including the tether; replace as needed.
 - **Roof Hatches (Front and Rear)**
 - Inspect for damage, wear, and operation; ensure that roof hatch can open and close properly; replace/ repair as needed.
 - Remove old decals and apply new ones.
- **Floor**
 - Inspect all areas of floor for damage, corrosion, wear, fatigue, and other defects; replace defective floor area/ carpet as needed.

Note: Any plywood replacement will be use ¾" thick seven-ply fir AC grad pressure treated plywood and will be undercoated and sealed after install.

 - **Driveshaft Access Panel**
 - Inspect for damage, weak spots (i.e. buckling, dipping, etc.); replace as needed.
 - **Latches.** Inspect latches for presence, damage, and functionality; replace as needed; clean and lubricate with WD-40.

Employee Signature _____ **Employee ID #** _____

Supervisor/Designee Signature _____ **Employee ID #** _____

Door Operations [Installations & Adjustments]

- **Entrance Door/ Entrance Door Area**
 - **Entrance Door.** Remove and replace entrance door brackets, bushings ("bearings"), and rods ("pins").
 - **Entrance Door, Fore Panel (Door #1), Lower Pivot Assembly.**
 - Inspect Hyme joint plastic sleeve and pin for damage and wear; replace as needed.
 - **Entrance Door Panel Glass.** Inspect for damage and wear; replace as needed.
 - **Entrance Door Rollers (2):** Remove and replace rollers.
 - **Entrance Door Rubber Edges.** Inspect for damage/ wear; replace as needed.
 - **Entrance Door Upper Brush.** Remove and replace.
 - **Entrance Door Lower Brushes (2).** Remove and replace brushes and perform adjustment.
 - **Entrance Door Overhead Access Panel**
 - **Shock.** Remove and replace shock.
 - **Latches.** Remove and replace latches.
 - **Emergency Door Exit (Front).**
 - Remove and replace glass for rotary valve.
 - Check for presence and damage of emergency door hammer; replace as needed.
 - Remove old decal and apply new one.
 - **Driver Mirror.** Install and secure new driver mirror.
- **Exit Door/ Exit Door Area**
 - **Yellow Nosing.** Install new yellow nosing (exit doorstep tread).
 - **Exit Door Panel Glass.** Remove and replace door panel glass.
 - **Exit Door Rubber Edges.** Inspect for damage/ wear; replace as needed.
 - **Exit Door Lower Brushes (2).** Remove and replace brushes and perform adjustment.
 - **Exit Door Upper and Lower Bushings (Grease Fittings Quantity = 4).** Lubricate with EP-2 Grease.
 - **Emergency Door Exit (Rear)**
 - Remove and replace access compartment glass for Emergency Pull-Down Handle.
 - Check for presence and damage of emergency exit door hammer; replace as needed.
 - Remove old decal and apply new one.
 - **Exit Door Convex Mirror Assembly.** Inspect mirror for damage and secureness; replace as needed and secure.
 - **Exit Door Modesty Panels.** Remove and replace modesty panels.
 - **Decals.** Remove all old exit door area decals and apply new ones.
- **Entrance & Exit Door Adjustments**
 - Ensure that front and rear door mounting bolts are fully tightened. ***Note: Apply torque putty to all jam nuts on rear door hardware.***
 - With front doors fully closed check that the top brush forms a tight seal with the top of the door.
 - Manually push the rear doors to their fully open position. Verify that the doors open to 90° angle.
 - Manually open and close the front and rear doors. Verify that the leading panel overlaps the trailing panel during closing.
 - Perform the pre-load adjustment.
 - Exhaust air to the front and rear door motor. With the front and rear doors in the close position, verify that the leading door edge metal-to-metal distance is **4.00' to 4.25** across the leading edges of the entire door length.

- Gap between door panel trailing edge and trim for both fore and aft panels should be approximately 3/4."

Employee Signature _____ **Employee ID #** _____

Employee Signature _____ **Employee ID #** _____

Employee Signature _____ **Employee ID #** _____

Supervisor/Designee Signature _____ **Employee ID #** _____

Exterior Installations

- Front Exterior**
 - **Bike Rack & Bike Rack Pivot**
 - Bike Rack Pivot. If found to be damaged or does not function properly, remove and replace pivot; lubricate.
 - Install new bike rack.
 - **Defroster Access Door.** Replace access door shocks.
 - **Wiper Arm Assemblies.** Remove and replace wiper arm assemblies.
 - **Driver's Mirrors.** Adjust and secure both curbside and roadside mirrors.
- Rear Exterior**
 - **Engine Access Door**
 - Remove and replace shocks.
 - Inspect latch for damage, wear, and functionality; replace as needed.
- Curbside Exterior**
 - **Access Doors.** Remove and replace shocks, latches (other securing mechanisms), and lubricate; also ensure that latches secure the access doors on the following access doors:
 - **Fuel Filler Access Door**
 - **Battery Access Door**
 - **Side Engine Compartment/ Fuse Box Access Door**
 - **Battery Cutoff Switch Access Door**
 - **DEF Manual Fill Access Door**
- Streetside Exterior**
 - **Access Doors.** Remove and replace shocks, latches (other securing mechanisms), and lubricate; also ensure that latches secure the access doors on the following access doors:
 - **Side Console Door**
 - **Radiator Access Door**
 - **Surge Tank Access Door.** Replace door.
- Decals.** Apply all new exterior decals and re-squeegee to ensure good adhesion.

Employee Signature _____ **Employee ID #** _____

Supervisor/Designee Signature _____ **Employee ID #** _____

Bus Engineering/Bus Maintenance
New Flyer Rehabilitation Guide
Final Inspection – Chassis Line (CL), Station 5

Final Inspection Check-off Sheet
Bus Reliability

Bus # _____ Rehab # _____ Work Order # _____ Miles _____

Inspected By _____ Employee ID # _____

CL-5) FINAL INSPECTION & ROAD TEST PRE-CHECK/ CLEAN & RELEASE BUS/ 40 HOURS

Note: All inspection checks are to be found fully operational according to manufacturer's specifications and engineering modifications (form, fit, function) while paying full attention to safety and cleanliness.

Interior

- Chime cords, chime strips, and jump seat buttons.
- Emergency equipment, fire extinguisher, three (3) safety triangles, fire suppression system (Kidde), and wheel chocks. **Note:** Fire suppression system is inspected/ re-connected by Fireline contractor.
- Interior lighting, steps, domes, fare box, dash, dash signs, and drivers panel lamps.
- Emergency hatches, seals, springs, and decals.
- Driver's seat, passenger seats, wheelchairs jump seats, wheelchair restraints, and seat belts.
- Driver's shield, upper and lower doors, latches, and mounting hardware.
- Stanchion poles and grab rails.
- Floorings and moldings.
- Ceiling and sidewall panels.
- Modesty panels and glass.
- Mirrors and mounting brackets.
- Windows, latches, slides, and emergency egress.
- Decals.
- Access compartment doors, hinges, props, and compartment lights.
- Engine access panel (under rear seat cushion); should be sealed not to allow engine noise and exhaust.
- Destination and dash signs.
- Steering wheel alignment, horn operation, telescopic and tilt functions. *See SB # 18-E-004 Steering Wheel Retaining Nut Torque. [Note: Performed after front end alignment]*
- Trash bags.
- Registration and operators defect card holders.
- Phone mounting.
- PA system.
- Driver side control panel (test all switches and knobs).

Wheelchair compartment

- Check hydraulic fluid reservoir; top off as needed.
- Ramp pull-up strap.
- Inspect hydraulic hoses.
- Inspect condition of drive chain.

- Check pump.
- Wiring harnesses.
- Cleanliness.
- Free of debris.
- Check dump valve modification.

Exterior

- License tags.
- DC Inspection sticker.
- Windshield wipers and washer.
- Decals and paint.
- Drip moldings: check that they are sealed.
- Bike rack.
- Head lamps, (High/low) turn signal lights, marker lamps, stop lamps, flashers, exit door lamps, wheelchair.
lamps and reflectors; check that they are sealed.
- Document mileage on inspection sheet.
- Access doors, hinges, seals, props, locks, and catches.

Roadside and Curbside Compartments

Fuel Tank Access

- Door
- Filler Neck
- Inspect fuel tank.

Engine Access Compartment

- Routing and clamping of hoses and harnesses.
- Check radiator fan operation.

Surge Tank Compartment

- Surge tank fill.
- Pressure test valve.
- Pressure relief valve.

Ensure terminals are protected and lubricated with protective coating dielectric compound.

Electrical Compartment

- Compartment lamp
- Loose wiring
- Loose connectors and contacts
- Sealing of compartment

Rear Engine Compartment

- Compartment lamps and emergency flashers.
- NOCO Niehoff alternator connections.
- Check the alternator connections conform to OEM.
- Check routing of electrical harnesses and chaffing.
- Check installation of hoses, clamps, and chaffing.
- Check mounting of drive unit breather.
- Check engine belt guard.

- Check oil and drive unit fluids.
- Pressure-test surge tank and check system for leaks.
- Check fire suppression nozzles for obstruction and proper position.

Start engine and while running, check the following:

Note: During, look and listen for any telltale signs of engine compartment problems

- Check rear emergency engine shut-off/start control switch.
- Check idle speed.
- Check EMP fans.
- Check charging system.
- Check oil pressure (Diagnostic cart).
- Check for any visual signs of fluid leakage on all engine components.
- Shut engine off, raise bus and proceed with undercarriage inspection.

Undercarriage Inspection

- Skid plates.
- Front axle
- Mounting saddles
- Radius and lateral rods
- Shocks
- Bellows
- Drag link ends.
- Tie rod and rod ends.
- Steering box
- Steering U-joints
- Column and prop shaft
- Leveling valves
- Check all air valves and air line connections for leaks
- Open air tank valves to assure all are void of moisture
- Check undercarriage structure for any signs of fatigue, cracks, etc.
- Inspect fuel tank for any signs of leakage.
- Inspect underside of all compartments
- Engine mounts
- Check for leaks, wire harnesses or hose lines chaffing, and all clamps are secure.
- Brakes front and rear: brake chambers and air lines air leaks while brakes are being applied.
- Rear axle: shocks, air bags, drive shaft and safety bracket, and mounting flange bolts and nuts are marked with torque putty.
- Check splash guards (mudflaps)

Inspections/ Updates (Internal and Vendor)

- Fireline
- Clever Device
- Reliability
- Repairs/ replacements as needed.

Road Test Pre-Check

- DC Inspection if needed
- Wheel torque (Wheel & Tire SOP – Zafety Lock)
- Adjust all mirrors.
- Parking brake/brakes
- Interlocks

- Drive unit engagement, forward and reverse.
- Back-up alarm
- Operate entrance and exit doors.
- Operate kneeling and wheelchair ramp.
- Ensure that bus is fueled.

Road Test

- Burnish brakes.
- Record brake rotor temperatures.
- Turning radius (Right- and Left-Hand U-turns)
- Operate heat and A/C
- Operate windshield defroster.
- Operate driver's heater.

Take bus up to highway speed and monitor:

- Steering play/vibration
- Drive unit shifting/vibration.
- Dog-Tracking
- Differential noise
- Check Regenerative Braking

Clean And Release Bus / 8 Hours

- Check for proper front and rear tags.
- Final Inspection
- Check for exhaust leaks with the Bosch HPT 500 High -Pressure Leak Detector. See Operating manual; record results on Fumes Checklist.
- Check the following exhaust components for leaks and repair:
 - V-Clamps
 - Seal Clamps
 - Spherical Clamps
 - Particulate Filter Clamps
- Inspect and re-torque all wheels after road test. SOP 1.14/0 (02/16/2021) Wheel & Tire Maintenance Program
- Clean the interior and windows of the bus.
- Check Fire Extinguisher ensure PM Inspection tag is attached.
- Release the bus to division.
- Notify garage to satisfy / adjust PM requirements in Maximo and Bus Reliability.

Employee Signature _____ **Employee ID #** _____

Supervisor/Designee Signature _____ **Employee ID #** _____

Index

CL Chassis Line

P Pneumatics

E Electrical

AC HVAC System

WC Wheelchair Lift

BS Body Shop

PS Paint Shop

FB Fare Box Shop

ENGINEERING MODIFICATION INSTRUCTION - BUS

**BENDIX PP-1 VALVE BUTTON INSPECTION
AND REPLACEMENT**

**BENG ENGINEERING - BUS
WMATA EMI NO. 50L23
Sheet 1 of 4**

BENDIX

PP-1 VALVE BUTTON

INSPECTION &

REPLACEMENT ,

ALL BUS FLEETS

Checked By	Rev		Rev		Rev		Rev
Date Checked							
RCES Approved							
Date Approved							
Concurrence	Date						

ENGINEERING MODIFICATION INSTRUCTION - BUS

BENDIX PP-1 VALVE BUTTON INSPECTION
AND REPLACEMENT

BENG ENGINEERING - BUS
WMATA EMI NO. 50L23
Sheet 2 of 4

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10.0	FIGURE #2	N/A

ENGINEERING MODIFICATION INSTRUCTION - BUS

**BENDIX PP-1 VALVE BUTTON INSPECTION
AND REPLACEMENT**

**BENG ENGINEERING - BUS
WMATA EMI NO. 50L23
Sheet 3 of 4**

1.0 PURPOSE

This procedure will document the inspection and replacement of the yellow Bendix PP-1 Valve Button on all WMATA bus fleets.

2.0 BACKGROUND

This EMI is being released to document the replacement of all of the existing plastic PP-1 Valve Buttons on the WMATA bus fleet as listed below.

3.0 APPLICABLE BUSES

Orion-V, VI, VII, Ikarus, Neoplan, and New Flyer buses.

4.0 APPLICABLE MAXIMO DATA

Asset List: 3390; CrewCode = BMNTGM.

5.0 MATERIAL REQUIRED

(See Maximo Work Order, Job Plan #3499)

6.0 TOOLS REQUIRED Standard hand tools

ENGINEERING MODIFICATION INSTRUCTION - BUS

BENDIX PP-1 VALVE BUTTON INSPECTION
AND REPLACEMENT

BENG ENGINEERING - BUS
WMATA EMI NO. 50L23
Sheet 4 of 4

7.0 PROCEDURE

7.1 **Evaluate Existing PP-1 Valve Button**

7.1.1 Visually inspect the PP-1 Valve Button. The plastic button is bright yellow with black lettering. The desired aluminum PP-1 Valve Button is anodized aluminum and has a yellow/olive color with a matte finish.

(There will be a number of buses which have had the new aluminum valve installed, as all old plastic stock has been replaced with the new aluminum buttons. Any replaced buttons prior to this EMI have not been accounted for.)

7.2 **Install Aluminum PP-1 Valve Button**

7.2.1 If the yellow plastic button is installed onto the PP-1 Valve, change the quantity of the two items listed on the Plans Tab on the Work Order in Maximo from zero to one each. Verify and correct the Storeroom to reflect your Division as required. After receiving the new parts, remove the existing roll pin and remove and replace the button with the desired aluminum button. Install a new roll pin and verify proper operation of the PP-1 Valve. Discard the old PP-1 button.

8.0 MAINTENANCE

N/A

9.0 ATTACHMENTS

N/A

ENGINEERING MODIFICATION INSTRUCTION - BUS

**ZAFETY LUG LOCK INSTALLATION,
ALL BUS FLEETS**

**BENG ENGINEERING - BUS
WMATA EMI NO. B55L12
Sheet 1 of 6**

Zafety Lug Lock Installation, All Bus Fleets

Checked By	Rev		Rev		Rev		Rev
Date Checked							
RCES Approved							
Date Approved							
Concurrence			Date				

ENGINEERING MODIFICATION INSTRUCTION - BUS

ZAFETY LUG LOCK INSTALLATION,
ALL BUS FLEETS

BENG ENGINEERING - BUS
WMATA EMI NO. B55L12
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9.0	ATTACHMENTS	N/A

ENGINEERING MODIFICATION INSTRUCTION - BUS

ZAFETY LUG LOCK INSTALLATION,
ALL BUS FLEETS

BENG ENGINEERING - BUS
WMATA EMI NO. B55L12
Sheet 3 of 6

1.0 PURPOSE

This EMI Procedure will document the installation of the Zafety Lug Lock on all of WMATA's Bus Fleets. These devices will replace the use of the Orange Torque Putty from this point forward.

2.0 BACKGROUND

BMNT was asked to evaluate a replacement device/system to the existing Orange Torque Putty. Unlike the existing Torque Putty and other lug nut monitoring type systems/devices, the Zafety Lug Lock is designed to prevent a lug nut from backing off and potentially allowing a wheel to come off the bus. It is also easier for a Bus Driver or Mechanic to visually check the lug nuts on the bus. If the Zafety Lug Lock device is installed onto the lug nuts, the bus would be considered safe and ready for Revenue Service.

3.0 APPLICABLE BUSES

All WMATA Bus Fleets.

4.0 APPLICABLE MAXIMO DATA

Job Plan #5590, Asset List #4007	(Hi Floor Buses)
Job Plan #5591, Asset List #4008	(Hi Floor Articulated Buses)
Job Plan #5592, Asset List #4009	(Low Floor Buses)
Job Plan #5593, Asset List #4010	(TAGs Buses)
Job Plan #5594, Asset List #4011	(Low Floor Articulated Buses)

5.0 MATERIAL REQUIRED

See Material listing included herein and on Work Order (Job Plan).

6.0 TOOLS REQUIRED

Scraper or other similar hand tool to remove existing torque putty, Zafety Lug Lock Installation Tool #Z0001. (Tooling

ENGINEERING MODIFICATION INSTRUCTION - BUS

ZAFETY LUG LOCK INSTALLATION,
ALL BUS FLEETS

BENG ENGINEERING - BUS
WMATA EMI NO. B55L12
Sheet 4 of 6

distributed to Divisions, only applicable for 33mm size Lug Locks.
See Note at end of installation procedure.)

5.0 MATERIAL

<u>DESCRIPTION</u> (Vendor/Mfr)	<u>PART NUMBER</u>	<u>QTY. Per Bus</u>
o Zafety Lug Lock for 38MM (1-1/2" Hex) lug nuts	943-55-0010	20 (Std Bus)
o Zafety Lug Lock for 38MM (1-1/2" Hex) lug nuts	943-55-0010	30 (Artic Bus)
o Zafety Lug Lock for 33MM (1-5/16" Hex) lug nuts	943-55-0011	20 (Std Bus)
o Zafety Lug Lock for 33MM (1-5/16" Hex) lug nuts	943-55-0011	30 (Artic Bus)
o Zafety Lug Lock for 21MM (13/16" Hex) lug nuts	943-55-0012	20 (TAGs Bus)

7.0 PROCEDURE

7.1 Remove existing Torque Putty

7.1.1 CAREFULLY remove the existing Orange Torque Putty from the wheel surfaces and lug nuts using a (dull) metal scraper, plastic scraper or a piece of wood. (Take care not to damage the aluminum wheel.) There is no need to remove the lug nuts from the vehicle.

ENGINEERING MODIFICATION INSTRUCTION - BUS

ZAFETY LUG LOCK INSTALLATION,
ALL BUS FLEETS

BENG ENGINEERING - BUS
WMATA EMI NO. B55L12
Sheet 5 of 6

7.2 Install Zafety Lug Locks

7.2.1 Look at the Zafety Lug Lock device. Orient the device with the words "Patent Pending", "Zafety Lug Lock" and the "Canadian leaf" logo facing you. Install one side of the Zafety Lug Lock device onto one lug nut while orienting the uninstalled part of the device closest to the center the adjacent lug nut. (You may need to remove and reinstall the first lug nut position in order to find the "best fit" position to line up the other half of the device.) Push the device onto the outer edge of the hex. Do not fully engage the lug nut until both lug nuts have the device on them. Install the other half of the device on the adjacent lug nut. The device may "twist" slightly if the hexes are not oriented exactly the same. (This is normal and acceptable. Sometime the device will be installed with the accordion portion straight, sometime the accordion portion will be slightly twisted. Do NOT loosen up or tighten the lug nut to get the hexes to "line up".) After the device has been installed onto both lug nuts, push them fully onto the lug nuts. Repeat for all lug nuts on each wheel and all wheels on bus.

See Figure #1 on page #6.

Note: For 33mm lug nuts, the Zafety Lug Lock Tool #Z0001 may be helpful in installing the devices on low floor buses, but will not fit the 38mm (1-1/2") and may be too big for the 21mm (13/16") lug nuts. A deep socket on a short extension may be helpful for other buses. All Divisions were provided with a limited number of the tools, but more may be purchased if deemed appropriate. (Contact Bus Engineering) A Stock Number may be set up in the future if justified for the T0001 tool.

8.0 MAINTENANCE

N/A

9.0 ATTACHMENTS

N/A

ENGINEERING MODIFICATION INSTRUCTION - BUS

ZAFETY LUG LOCK INSTALLATION,
ALL BUS FLEETS

BENG ENGINEERING - BUS
WMATA EMI NO. B55L12
Sheet 6 of 6

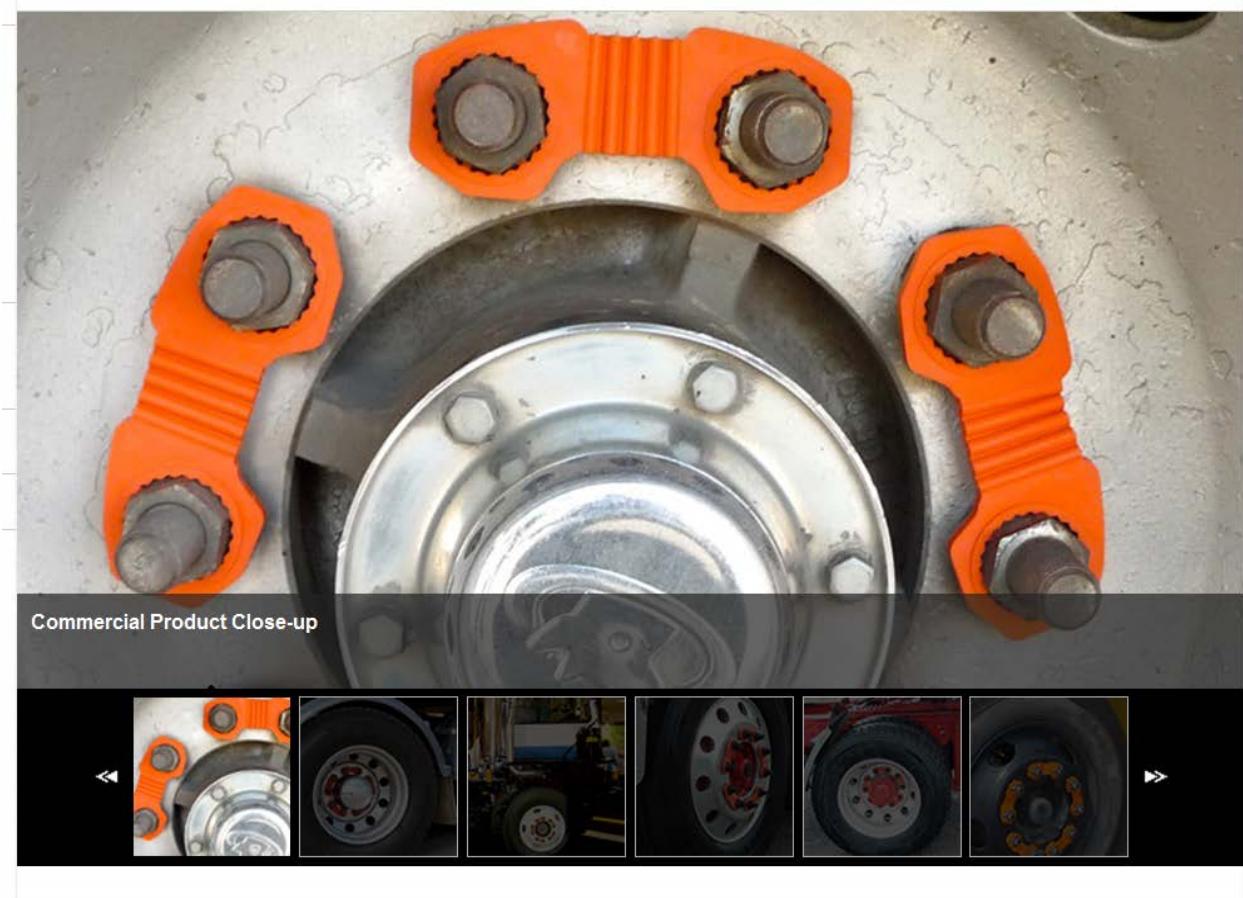


Figure #1, Close Up Installation View

Each Zafety Lug Lock device may install with the "accordion" section straight or uniform across the device, or the accordion section may be bent or distorted as shown on the right.

(Bending or bowing is normal and acceptable.)

ENGINEERING MODIFICATION INSTRUCTION - BUS

Fozmula Coolant Sensor Upgrade

BENG [ENGINEERING-BUS]
WMATA EMI NO. B00L34
Sheet 1 of 10

FOZMULA COOLANT SENSOR UPGRADE

EMI # B00L34

Checked By	Rev	Rev	Rev	Rev	Rev	Rev
Date Checked						
BENG Approved						
Date Approved						
Concurrence	Date					

ENGINEERING MODIFICATION INSTRUCTION - BUS

Fozmula Coolant Sensor Upgrade

BENG [ENGINEERING-BUS]
WMATA EMI NO. B00L34
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ENGINEERING MODIFICATION INSTRUCTION - BUS

Fozmula Coolant Sensor Upgrade

BENG [ENGINEERING-BUS]
WMATA EMI NO. B00L34
Sheet 3 of 10

1.0 PURPOSE

Replace Engine Protection low coolant sensor with more robust unit.

2.0 BACKGROUND

The OEM-equipment low coolant sensors installed in the Engine Protection position of the coolant surge tank have experienced higher than expected failure rates. The typical failure mode of the OEM sensors is a false engine shutdown. To correct this condition, the OEM equipment sensors manufactured by Stoneridge will be replaced with qualified sensors manufactured by Fuzmula Corp.

3.0 APPLICABLE BUSES

This modification applies to Fleets 54, 56, and 57; buses bearing fleet numbers:

**5460-5480 (54)
7300-7355 (56)
7356-7409 (57)**

Maximo Information:

**Job Plan: 8260
Asset List: 5826**

4.0 MATERIAL REQUIRED

<u>DESCRIPTION</u>	<u>WMATA CLASS NUMBER</u>	<u>QTY. Per Bus*</u>
➤ Fozmula Coolant Sensor	824-70-0031	1
➤ Harness, Wiring	Shop Mfg.	1
➤ Splice, Sealing	861-55-0001	1

5.0 TOOLS REQUIRED

- General Mechanics Toolbox.

ENGINEERING MODIFICATION INSTRUCTION - BUS

Fozmula Coolant Sensor Upgrade

BENG [ENGINEERING-BUS]
WMATA EMI NO. B00L34
Sheet 4 of 10

6.0 SAFETY PROCEDURES

6.1 GENERAL SAFETY STATEMENT

ALL WORK MUST BE CONDUCTED IN A SAFE MANNER AND IN ACCORDANCE WITH ALL BMNT SAFETY RULES AND PROCEDURES.

6.2 GENERAL SAFETY REQUIREMENTS

- 6.2.1 When working with wiring and electrical equipment, always assume that the circuit is energized, and exercise caution accordingly.
- 6.2.2 Follow proper lock-out tag-out procedures before working on any electrical wiring or equipment on the bus. Consult Lock-out Tag-out Standard Operating Procedures for additional information on this topic.

6.3 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

- 6.3.1 Approved Eye Protection.
 - 6.3.1.1 Safety Glasses
 - 6.3.1.2 Goggles
 - 6.3.1.3 Face Shield
- 6.3.2 Hand Protection
 - 6.3.2.1 Rubber Gloves
 - 6.3.2.2 Protective Work Gloves

Note: Gloves should be chosen with regard to both protection and dexterity requirements for these procedures.

- 6.3.3 Technician should be completely familiar with the procedures listing in this modification before starting. Incorrect methods or procedures may result in injury or damage to equipment.

CAUTION: THIS PROCEDURE REQUIRES THAT THE BATTERIES AND ANY EXTERNAL POWER SOURCES BE LOCKED OUT OR REMOVED AND REMAIN LOCKED OUT FOR THE DURATION OF THESE PROCEDURES.

ENGINEERING MODIFICATION INSTRUCTION - BUS

Fozmula Coolant Sensor Upgrade

BENG [ENGINEERING-BUS]
WMATA EMI NO. B00L34
Sheet 5 of 10

7.0 PROCEDURE

7.1 Secure the vehicle.

- 7.1.1 Ensure bus is in a safe work area with clearance to open engine door.
- 7.1.2 Ensure that the parking brake is set and that wheel chocks, or equivalent, are used to prevent movement of the vehicle.

7.2 Locate Battery Master disconnect, rotate to the OFF position and install safety lockout device.

7.3 Verify cooling system is close to ambient temperature and that pressure has been released.

- 7.3.1 Open cooling system fill door and activate pressure release valve. If significant pressure release occurs, recheck engine temperature for safety.

WARNING – DO NOT PROCEED IF COOLANT IS HOT – SEVERE BURNS MAY RESULT

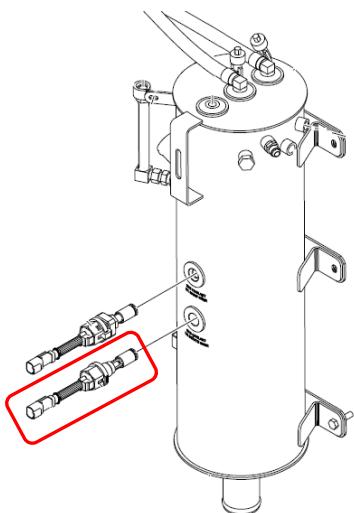
7.4 Open engine door and locate the engine coolant surge tank on the roadside of the engine.

7.5 Locate the Engine Protection Low Coolant Sensor. This is the lower of the two sensors on the Engine surge tank. See figure below for location detail.

ENGINEERING MODIFICATION INSTRUCTION - BUS

Fozmula Coolant Sensor Upgrade

BENG [ENGINEERING-BUS]
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Engine Coolant Surge Tank

- 7.6 Disconnect the wiring harness from the Engine Protection Coolant Sensor and remove the sensor from the surge tank.
- 7.7 Install the replacement sensor in the same location. Tighten to 15 Ft.-Lbs. (20 Nm).
- 7.8 Locate the coolant sensor upgrade wiring harness.
- 7.9 Connect the existing coolant sensor connector to the mating two-way socket on the new wiring harness. This is the connector to the old coolant sensor.
- 7.10 Connect the four-way plug to the new coolant sensor in the surge tank.
- 7.11 Route the long leg of the wiring harness up, together with the existing harnessing for the coolant sensors and route to the area of the Engine Switch Box, following the path below.

ENGINEERING MODIFICATION INSTRUCTION - BUS

Fozmula Coolant Sensor Upgrade

BENG [ENGINEERING-BUS]
WMATA EMI NO. B00L34
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Coolant Sensor Harness Routing

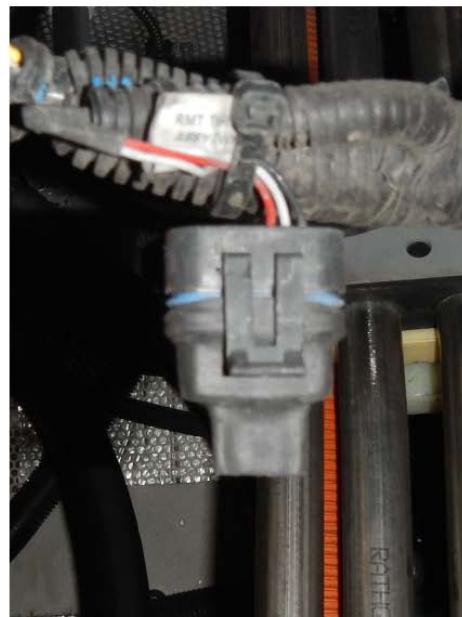
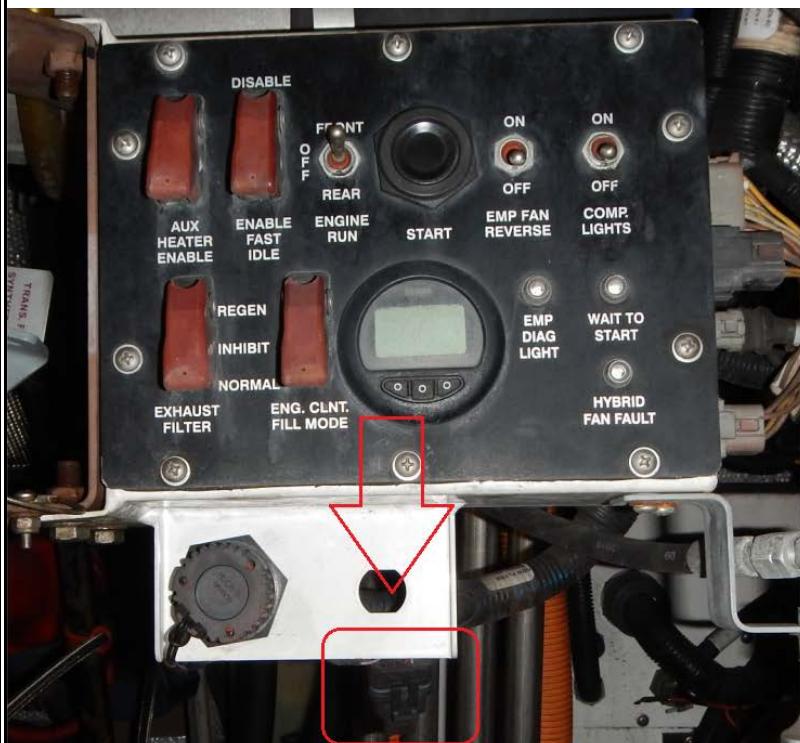
ENGINEERING MODIFICATION INSTRUCTION - BUS

Fozmula Coolant Sensor Upgrade

BENG [ENGINEERING-BUS]
WMATA EMI NO. B00L34
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7.12 Secure coolant sensor harness to existing harnessing. Verify fire suppression components are unobstructed by new harness.

7.13 Working in the area of the Engine Switch box, locate the unused remote throttle connector. See detail below:



Remote Throttle Harness Connector Location

7.14 Cut tie(s) securing remote throttle connector to harnessing and extend the connector away to access the three wires on the reverse side.

ENGINEERING MODIFICATION INSTRUCTION - BUS

Fozmula Coolant Sensor Upgrade

BENG [ENGINEERING-BUS]
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- 7.15 Cut the **RED** wire at the connector shown above. Cut as close to the connector as possible. Cut the **RED** wire only; leave the remaining White and Black wires intact in the connector.
- 7.16 Using a sealing splice, connect the **RED** wire to the new low coolant sensor harness wire. Heat the splice and verify the sealant flows.
- 7.17 Verify the new low coolant sensor wiring harness is secure and clear of all hot engine components.
- 7.18 Perform final testing in section 8. Following successful testing, verify coolant level in surge tank – adjusting as needed.

ENGINEERING MODIFICATION INSTRUCTION - BUS

Fozmula Coolant Sensor Upgrade

BENG [ENGINEERING-BUS]
WMATA EMI NO. B00L34
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8.0 TEST PROCEDURE

- 8.1 Verify Engine Run Switch is in the Front Run position and the Master Run Switch is OFF.
- 8.2 Remove Battery Master Switch lock and rotate the switch to ON.
- 8.3 Start engine and observe the instrument panel for Check Engine and Stop Engine indicators.
Verify both extinguish following engine start.

**IF ANY OF THESE TESTS DID NOT PRODUCE THE INDICATED RESULT,
REVIEW YOUR WORK, REFERRING TO THE REVISED SCHEMATIC(s) AS
NEEDED.**

9.0 PERIODIC INSPECTION AND MAINTENANCE

“The components installed and/or modified under this EMI shall be inspected and maintained as part of the regularly scheduled Maintenance Inspection process, following established guidelines applicable to the system(s) installed or modified.”



WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
OFFICE OF BUS MAINTENANCE
ENGINEERING MODIFICATION INSTRUCTIONS - BUS



Title:
2015/16 New Flyer Reliability Programming

WMATA BUS ENGINEERING (BENG)
EMI No.: B55L28
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2015/16 New Flyer Reliability Programming

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WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
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Title:
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LIST OF FIGURES

FIGURE NO.

1	XXX	3
2 ...	YYY	3

LIST OF ATTACHMENTS

ATTACHMENT NO.

1	AAA	3
2 ...	BBB	3



WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
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Title:
2015/16 New Flyer Reliability Programming

WMATA BUS ENGINEERING (BENG)
EMI No.: B55L28

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1.0 PURPOSE

Increase reliability of 2015-2016 New Flyer Fleets through updated multiplex programming.

2.0 BACKGROUND

The 2015 / 2016 New Flyer deliveries have been the subject of many reported 'Cut Off' incidents. While no documented pattern has been established to these incidents, we believe some of these occurrences can be attributed to the idle restrictions automatically imposed on these vehicles which will shut down the engine after 15 minutes of idling a secured bus (transmission in neutral, parking brake applied). Unsuspecting operators may misinterpret this shut down as a malfunction. BENG intends to remove this automation from 164 of these buses (2830-2993) as a controlled evaluation against the remaining 131 hybrid buses.

These coaches are also equipped with a battery management system designed to maintain battery reserve of a parked bus by automatically disconnecting the batteries. BENG believes the system may activate during a layover or other short breaks and potentially create operator confusion. We intend to enhance this system to increase the time to disconnect by 30 minutes.

3.0 APPLICABLE BUSES

WMATA Fleets 54, 55, 56, and 57.

Bus Assets bearing fleet numbers 5460-5480, 7300-7409, and 2830-2993, inclusive.

3.0 APPLICABLE HARDWARE ID

Job Plan: **7517**

Asset List: **5204**

5.0 MATERIAL REQUIRED

No material required for these procedures.

6.0 TOOLS REQUIRED

1. Laptop computer with Vansco VMM program installed.
2. Interface adapter.

CAUTION: ALL WORK MUST BE CONDUCTED IN A SAFE MANNER AND IN ACCORDANCE WITH THE METROBUS



WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
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**SAFETY RULES AND PROCEDURES. ALL WORK SHOULD BE PERFORMED IN SUCH A WAY THAT IT
WOULD NOT INVOLVE ANY DANGER TO PERSONNEL OR DAMAGE TO PROPERTY.**

7.0 INSTALLATION PROCEDURE

- 7.1 Connect the interface adapter to the bus and to the laptop computer.
- 7.2 Using the Vansco VMM program, upload the current firmware.
 - 7.2.1 Follow the manufacturer's current published documentation, located in the help file of the software program for specific instructions on this activity.
 - 7.2.2 The current firmware will be made available by BENG.

8.0 TEST PROCEDURES

- 8.1 With laptop computer and interface adapter still connected to the bus, perform the following sequence of actions:
 - 8.1.1 Query the system.
 - 8.1.2 Verify the Logic Version listed matches the updated firmware revision.
 - 8.1.3 If firmware version does not match expected version, verify correct file was loaded.

9.0 PERIODIC INSPECTION AND MAINTENANCE

All PM schedules remain the same.

ENGINEERING MODIFICATION INSTRUCTION - BUS

**BATTERY DISCONNECT ACCESS DOOR LOCK
2015 New Flyer Fleets**

**WMATA BUS ENGINEERING
(BENG) - EMI # B00L04
Sheet 1 of 6**

BATTERY DISCONNECT SWITCH ACCESS DOOR LOCK

**2015 NEW FLYER FLEETS:
(B2830-2994, B5460-5481, and B7300-7355)**

Checked By	Rev		Rev		Rev		Rev
Date Checked							
RCES Approved							
Date Approved							
Concurrence	Date						

ENGINEERING MODIFICATION INSTRUCTION - BUS

**BATTERY DISCONNECT ACCESS DOOR LOCK
2015 New Flyer Fleets**

**WMATA BUS ENGINEERING
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ENGINEERING MODIFICATION INSTRUCTION - BUS

**BATTERY DISCONNECT ACCESS DOOR LOCK
2015 New Flyer Fleets**

**WMATA BUS ENGINEERING
(BENG) - EMI # B00L04
Sheet 3 of 6**

1.0 PURPOSE

This Engineering Modification Instruction describes the scope of work required in order to install a lock on the Battery Disconnect Switch Access Door Panel on 2015 New Flyer bus series – B2830-2994, B5460-5481, and B7300-7355. The goal of this modification is to prevent un-authorized access to the battery switch and provide safe and reliable buses to the customers.

2.0 BACKGROUND

Un-authorized access to the battery switch, may cause equipment failures/damage, service disruptions, and customer inconvenience; it can also jeopardize the safety of equipment, personnel, and passengers. The locks will prevent unauthorized access to the Battery Disconnect Switches; and will enhance equipment safety, and safety of personnel and customers.

3.0 APPLICABLE BUSES

2015 – 2016 New Flyer fleets 42-45: B2830-2872, B5460-5481, and B7300-7328.

4.0 MATERIAL REQUIRED

DESCRIPTION	PART #	WMATA # S/N	QTY / Bus
Latch, Quarter Turn	280736 (NF)	972-55-0271	1
Aluminum Plate 1/4X3/4X3"	Shop fabricated (CTF)	N/A	1
Rivets	0126203 (Fastenal)	N/A	2
Double Sided Tape 3M OR Sikaflex Adhesive		R59700148 067-00-0811	A/R

5.0 TOOLS REQUIRED

STD Mechanic Tools
Rivet Gun (Optional)

ENGINEERING MODIFICATION INSTRUCTION - BUS

BATTERY DISCONNECT ACCESS DOOR LOCK
2015 New Flyer Fleets

WMATA BUS ENGINEERING
(BENG) - EMI # B00L04
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6.0 PROCEDURE



CAUTION: ALL WORK MUST BE CONDUCTED IN A SAFE MANNER AND IN ACCORDANCE WITH THE METROBUS SAFETY RULES AND PROCEDURES. ALL WORK SHOULD BE PERFORMED IN SUCH A WAY THAT IT WOULD NOT INVOLVE ANY DANGER TO PERSONNEL OR DAMAGE TO PROPERTY.

6.1 CTF Body Shop.

Remove battery switch access door and send to Machine Shop.



6.2 CTF Machine Shop.

Punch out door panel with 3/4" square punch. Cut 3" long piece from 1/4" Aluminum sheet. Drill 2 13/64" holes on Aluminum plate.



ENGINEERING MODIFICATION INSTRUCTION - BUS

**BATTERY DISCONNECT ACCESS DOOR LOCK
2015 New Flyer Fleets**

**WMATA BUS ENGINEERING
(BENG) - EMI # B00L04
Sheet 5 of 6**

6.3 CTF Body Shop.

Install O-Ring on latch. Install latch on modified door.



6.4 Install door and lift up panel. Apply 3M double sided adhesive tape or Sikaflex Adhesive on one side of Aluminum plate.



6.5 Stick Aluminum plate on panel. Drill 13/64" holes.



ENGINEERING MODIFICATION INSTRUCTION - BUS

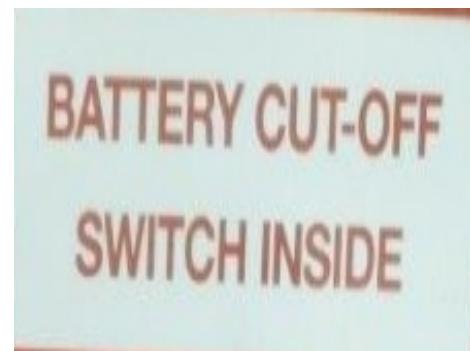
**BATTERY DISCONNECT ACCESS DOOR LOCK
2015 New Flyer Fleets**

**WMATA BUS ENGINEERING
(BENG) - EMI # B00L04
Sheet 6 of 6**

6.6 Install rivets. Use of pneumatic rivet gun is optional.



6.7 Check decals on both sides of door. Replace decals, if damaged or missing.



6.8 Lower down panel. Lock panel and battery disconnect switch access door.





WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
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LOW COOLANT INDICATORS

WMATA BUS ENGINEERING (BENG)
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OPERATOR INSTRUMENTATION UPDATE:

REMOVAL OF LOW COOLANT INDICATORS / ALARMS

Print Name & Initial	Date	Rev. 0	Rev. 1	Rev. 2	Rev. 3
Checked By					
Approved By					



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LOW COOLANT INDICATORS

WMATA BUS ENGINEERING (BENG)
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LOW COOLANT INDICATORS

WMATA BUS ENGINEERING (BENG)
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1.0 PURPOSE

Remove indications of Low Coolant from operator instrumentation.

2.0 BACKGROUND

Portions of the WMATA bus fleet are equipped with instrument panel indications of low coolant level in one or more onboard systems. These indications vary by bus sub-fleet and installed equipment, generally having one or more amber dashboard indicators identifying low coolant level conditions in the respective systems – Engine or isolated cabin heating and are presented with accompanying audible alarms to the bus operator on several of these fleet groups.

Bus Maintenance and Engineering (BENG) has determined that these visual and audible indicators are redundant to other maintenance monitoring systems and activities and may potentially lead to unnecessary service interruptions. This instructional will modify the affected fleets to standardize indications by removing the activation of audible and visual indications of low coolant level from the operator instrument panel area.

3.0 APPLICABLE BUSES

This modification will be completed on the following WMATA bus fleets:

Fleet	Fleet Numbers	Manufacturer	Model	Number in Service
37	6101-6217	New Flyer	D40LFR	82
43	6301-6461	New Flyer	DE40LFA	160
45	6462-6609	New Flyer	DE40LFA	146
46	7001-7263	New Flyer	XDE40	209
47	7101-7152	New Flyer	XDE40	52
48	3036-3062	Orion	07.503	27
49	3063-3087	Orion	07.503	25
50	7264-7272	New Flyer	XDE40	9
52	8001-8095	NABI	BRT40	93
53	8096-8105	NABI	BRT40	10
54	5460-5480	New Flyer	XDE60	21
55	2830-2993	New Flyer	XN40	164
56	7300-7355	New Flyer	XDE40	56
57	7356-7409	New Flyer	XDE40	54
59	3100-3199	New Flyer	XN40	100
60	5481-5492	New Flyer	XDE60	12
61	3200-3274	New Flyer	XN40	75
Total Number of Applicable Buses:				1295



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ENGINEERING MODIFICATION INSTRUCTIONS - BUS**



LOW COOLANT INDICATORS

**WMATA BUS ENGINEERING (BENG)
EMI Number: EMI-21-ENG-00-2
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4.0 MAXIMO INFORMATION

Job Plan: 8581 Asset List: 6068

5.0 MATERIAL REQUIRED

BENG-provided flash media containing PLC and instrument panel update files. One device per technician.

6.0 TOOLS REQUIRED

1. WMATA issued Laptop with licensed VANSCO VMM Software version 7.3.8.7159 installed
2. RP1210A Compliant data interface module with SAE J-1939 Type 2 connection.

CAUTION: ALL WORK MUST BE CONDUCTED IN A SAFE MANNER AND IN ACCORDANCE WITH ALL METROBUS SAFETY RULES AND PROCEDURES. ALL WORK SHOULD BE PERFORMED IN SUCH A WAY THAT IT WOULD NOT INVOLVE ANY DANGER TO PERSONNEL OR DAMAGE TO PROPERTY.

7.0 INSTALLATION PROCEDURE

Please refer to the table below for fleet-specific procedures:

- | | |
|---------------------------------|-------------|
| Fleets 48, 49, 52, and 53 | Section 7.1 |
| All other Fleets | Section 7.2 |



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LOW COOLANT INDICATORS

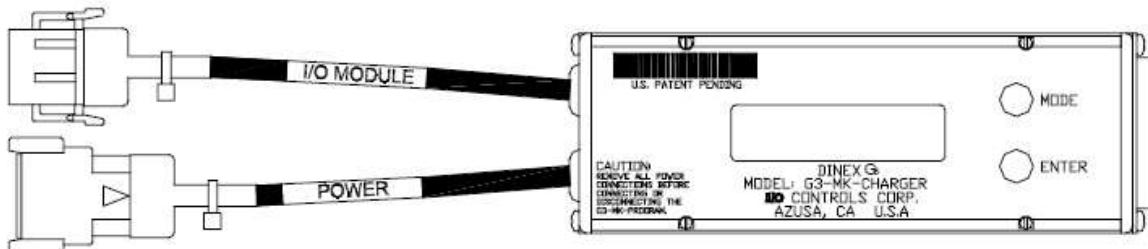
WMATA BUS ENGINEERING (BENG)
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7.1 Buses with IOControls Multiplexing.

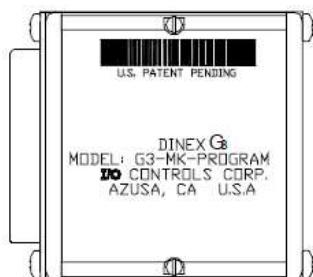
- 7.1.1 Secure the vehicle. Ensure that the parking brake is set and that wheel chocks, or equivalent, are used to prevent movement of the vehicle.
- 7.1.2 Set the following conditions:
 - 7.1.2.1 Bus batteries fully charged, and master disconnect ‘ON’.
 - 7.1.2.2 If battery power unavailable, tool power adapter may be used.
 - 7.1.2.3 Bus master run switch ‘OFF’.
 - 7.1.2.4 Bus ‘Awake’. Set MBC SLEEP switch to “OFF” See section 7.1.6 for location illustration of this control.

Download Multiplex Program

- 7.1.3 Locate the DINEX T2-MK-CHARGER programming tool and power adapter.



- 7.1.4 Locate applicable Program Cube for the fleet number, consult BENG file list.



- 7.1.5 Connect the Program Cube to the Charger.
- 7.1.6 Locate the MBC module in the inside main electrical panel.

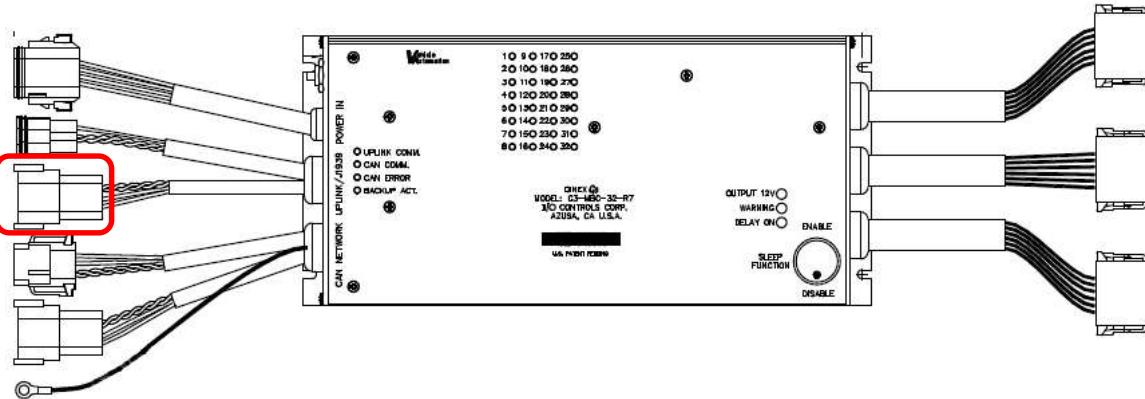


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LOW COOLANT INDICATORS

WMATA BUS ENGINEERING (BENG)
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- 7.1.6.1 Connect the Charger cable labeled 'I/O Module' to the mating MBC connector labeled 'UPLINK'. See figure above for identification.
- 7.1.6.2 If necessary, connect the power adapter to the Charger cable labeled 'Power' and plug the power adapter into an AC power source.
- 7.1.6.3 Verify the Charger display is lit. If not, check power to the adapter.
- 7.1.6.4 Press the MODE button once. The Charger should read:
"DOWNLOAD (REV#_) ENTER TO SELECT".
- 7.1.6.5 Press the Enter button once. The Charger should read:
"ID=77 PROGRAM OK CKSUM=__ REV#__"
- 7.1.6.6 Press the Enter button once more. The Charger should read:
"DOWNLOADING...__% COMPLETED"
- 7.1.6.7 After the previous display counts from 0% up to 100%, the Charger display should read **"DOWNLOAD OK! CKSUM=__ REV#__"**.
- 7.1.6.8 If the Charger displays **"MODULE TIMEOUT! RETRY PLEASE!"** the loading process was not successful. Repeat the process.
- 7.1.6.9 Unplug the Charger from the MBC.



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ENGINEERING MODIFICATION INSTRUCTIONS - BUS**



LOW COOLANT INDICATORS

**WMATA BUS ENGINEERING (BENG)
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7.2 Buses with Vansco Multiplexing

- 7.2.1 Secure the vehicle. Ensure that the parking brake is set and that wheel chocks, or equivalent, are used to prevent movement of the vehicle.

- 7.2.2 Set the following conditions:

- 7.2.2.1 Bus batteries fully charged, and master disconnect 'ON'.
- 7.2.2.2 Bus master run switch 'OFF'.
- 7.2.2.3 Bus 'Awake'. Set operator Hazard switch to ON to wake bus.

Download Multiplex Program:

- 7.2.3 Locate the 9-pin diagnostic connector. This connector will be located either on the wall behind the operator seat or on the lower portion of the front aisle light panel on the right (curb) side of the bus. Use the 'Front' diagnostic connector, as the multiplex wiring is not populated in the engine compartment connector.
- 7.2.4 Connect the mating 9-pin connector from the diagnostic interface to this bus connector. Ensure the interface unit is also connected to a USB port on the laptop.
- 7.2.5 Launch the Vansco VMM software. The following message will be displayed:



- 7.2.6 Select the ACCEPT button.
7.2.7 From the main program ribbon, select the QUERY button:





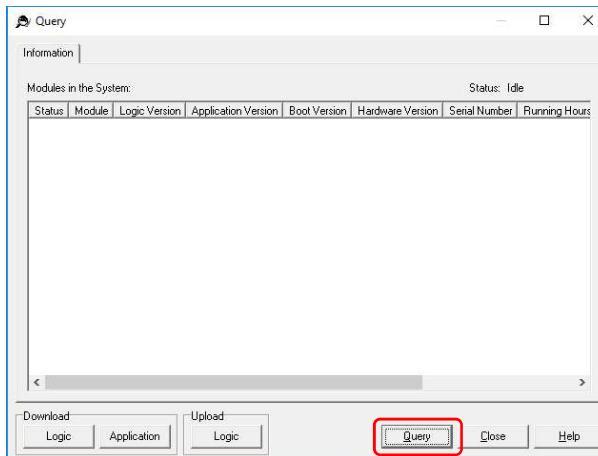
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ENGINEERING MODIFICATION INSTRUCTIONS - BUS**



LOW COOLANT INDICATORS

**WMATA BUS ENGINEERING (BENG)
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7.2.8 Upon selecting the Query function, a System Information dialog will appear:



7.2.9 Select the QUERY button.

7.2.10 The Query System Information Window will populate with the current System Information values.

Status	Module	Logic Version	Application Version	Boot Version	Hardware Version
VMM1615 D2V4051DA	V2	V483919.5	V3.0 Build 73	V1.3	V7.5.3
VMM1615 D2V4051DA	V9	V483919.5	V3.0 Build 73	V1.3	V7.5.3
VMM1615 D2V4051DA	V11	V483919.5	V3.0 Build 73	V1.3	V7.5.3
VMM1615 D2V4051DA	V13	V483919.5	V3.0 Build 73	V1.3	V7.5.3
VMM1615 D2V4051DA - Output Fault Present	V14	V483919.5	V3.0 Build 73	V1.3	V7.5.3
VMM1615 D2V4051DA	V15	V483919.5	V3.0 Build 73	V1.3	V7.5.3
VMM1615 D2V4051DA	V22	V483919.5	V3.0 Build 73	V1.3	V7.5.3

7.2.11 From the Query results screen, select the Download Logic button.



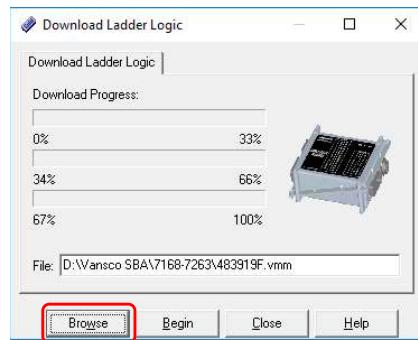
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LOW COOLANT INDICATORS

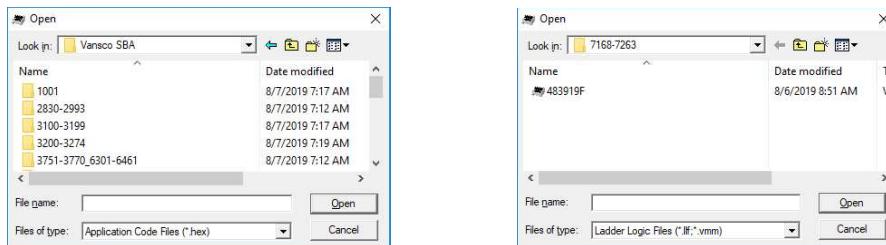
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7.2.12 The Download Ladder Logic screen will appear:



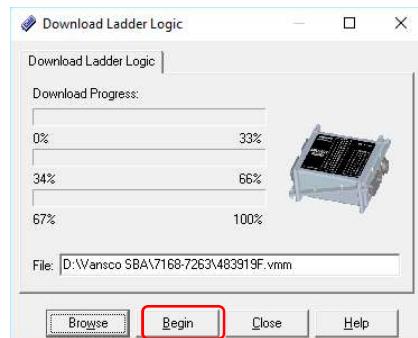
7.2.13 Select the Browse button from the Ladder Logic Download screen.

7.2.14 The File Open window will appear:



7.2.15 From the folder structure presented, select the CORRECT file for the bus you are modifying.

7.2.16 Once the file has been selected, select Begin from the Download Ladder Logic screen:





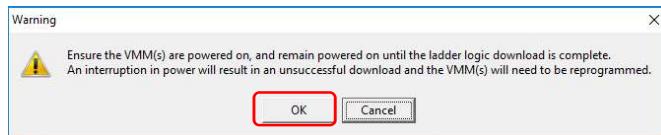
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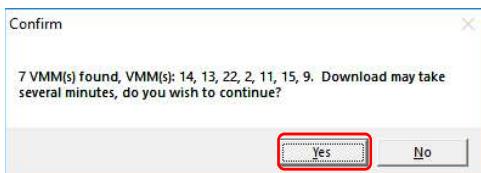
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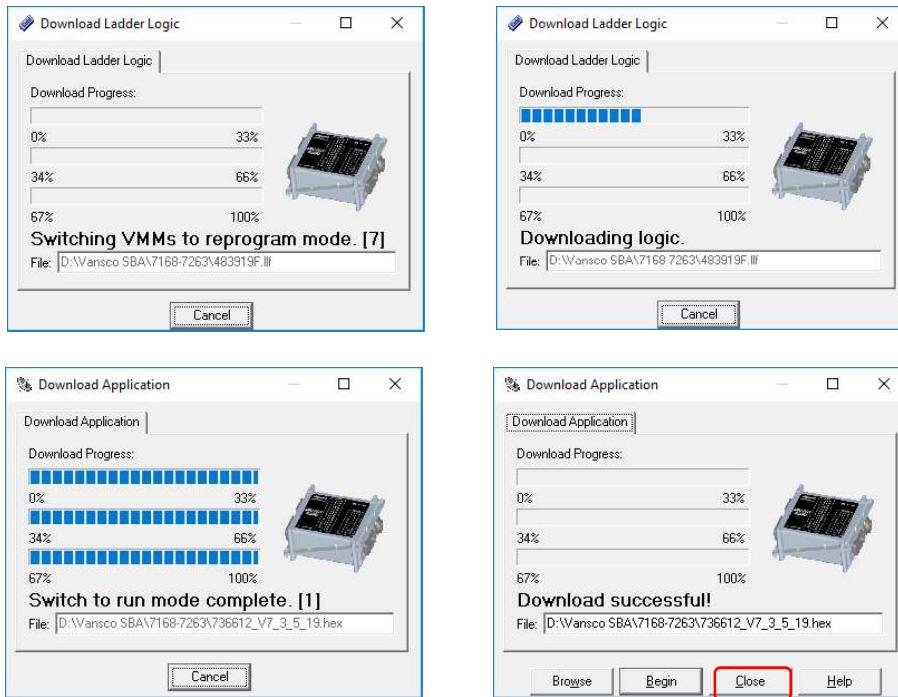
7.2.17 The warning screen will appear. Read carefully and select OK.



7.2.18 The Confirmation screen will appear. Read and select Yes.



7.2.19 The reprogramming process will begin.



7.2.20 Once all operations have completed, 'Download Successful!' will be displayed. Do not proceed until this indication is presented. Select Close to proceed.



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- 7.2.21 Once the Logic Download has completed successfully, the Query window will automatically be displayed with updated values.

Status	Module	Logic Version	Application Version	Boot Version	Hardware Version	Serial Number
VMM1615 D2V40S1DA	V2	V483919.6	V3.5 Build 103	V1.3	V7.5.3	8672
VMM1615 D2V40S1DA	V9	V483919.6	V3.5 Build 103	V1.3	V7.5.3	8856
VMM1615 D2V40S1DA	V11	V483919.6	V3.5 Build 103	V1.3	V7.5.3	8420
VMM1615 D2V40S1DA	V13	V483919.6	V3.5 Build 103	V1.3	V7.5.3	7650
VMM1615 D2V40S1DA	V14	V483919.6	V3.5 Build 103	V1.3	V7.5.3	8433
VMM1615 D2V40S1DA	V15	V483919.6	V3.5 Build 103	V1.3	V7.5.3	7854
VMM1615 D2V40S1DA	V22	V483919.6	V3.5 Build 103	V1.3	V7.5.3	7886

- 7.2.22 Verify the updated Logic Version number matches the correct file name from the flash media folder for the bus number being updated.
7.2.23 Turn the Hazard Flasher switch to the OFF position.
7.2.24 Disconnect interface from bus diagnostic connector.

7.3 Update the Instrument Panel (Fleets 54 thru 60 only)

- 7.3.1 Turn the Master Run Switch to the Day Run position to wake the system.
7.3.2 Insert the Flash Media provided by BENG into the instrument panel communications port on the lower left underside of the operators dash panel.



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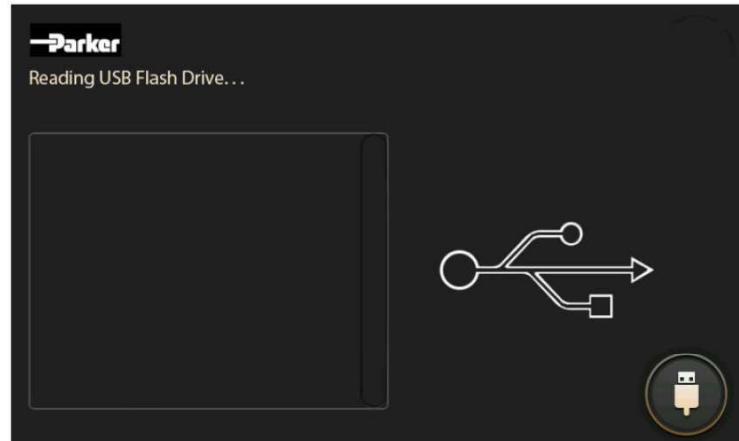
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7.3.3 From the instrument panel Service Mode menu, select the UPDATE APPLICATION button:



7.3.4 The system will read the Flash media:





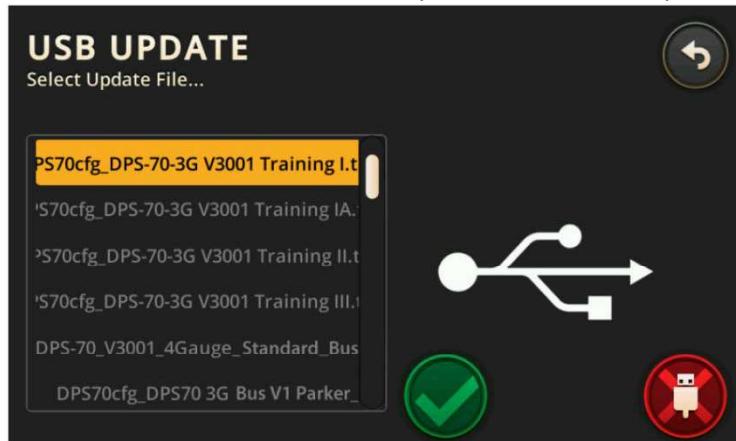
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- 7.3.5 Once the media has been read, an update file list will be presented:



- 7.3.6 Referring to the application matrix document provided by BENG, select the correct update file from the list.

IMPORTANT!
It is important to verify the correct update file to the bus being updated.
Loading an incorrect file will result in an inoperative bus and may require replacement of the instrument panel for factory reset.

- 7.3.7 Once the correct update has been selected, the Warning screen will be displayed:



- 7.3.8 Select the green checkmark to proceed.



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- 7.3.9 The update file will be loaded, and the technician will be instructed to remove the Flash Media:



- 7.3.10 The instrument panel will reboot several times during the updating process. Once the update has completed, the panel will return to the operation view of instrumentation.

8.0 TEST PROCEDURES

- 8.1 Disconnect all updating equipment from the bus: laptops, interfaces, and Flash Media.
- 8.2 Turn the battery master disconnect off.
- 8.3 Wait 10 seconds
- 8.4 Turn the battery master disconnect on.
- 8.5 Rotate Master Run Switch to Day Run and start the bus.
- 8.6 Verify bus starts and instrument panel displays are functional – not blank or off.
- 8.7 If bus does not start or instrumentation is incorrect, review your work:
 - 8.7.1 Verify Ladder Logic update for correct application.
 - 8.7.2 Verify Instrument Panel update (if performed) for correct application.
 - 8.7.3 Contact Bus Engineering for additional instructions if needed.

9.0 PERIODIC INSPECTION AND MAINTENANCE

All applicable PM schedules remain unchanged.



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BUS ROUTER REPLACEMENT

MULTIPLE FLEETS

Revision History				
Revision No.	Revision Date	Reviser / Author	Document Section No. (if applicable) or	Description of Changes
00	10/13/22	Don Rich	N/A	Initial Release

SOP 3.8 Revision 9 – Bus Change Control Board (BCCB)



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1.0 PURPOSE

Install Sierra Wireless Gateway / Router.

2.0 BACKGROUND

Buses equipped with older gateways cannot communicate on current cellular networks used by WMATA and need to be replaced with hardware that supports current protocols. This procedure will guide the installation of this new hardware.

3.0 APPLICABLE BUSES

OEM Order #	Bus Numbers	WMATA Fleet #
SR2243	5481 – 5492	60
SR2107	3100 – 3199	59
SR2020	1001	58
SR1976	7356 – 7409	57
SR1947	2830 – 2993	55
SR1946	7300 – 7355	56
SR1913	5460 – 5480	54
SR1751	7264 – 7272	50
SR1680	7168 – 7263	46
SR1634	7153 – 7167	46
SR1585	7091 – 7100	46
SR1554	7101 – 7152	47
SR1514	7053 - 7090	46
SR1513	7001 – 7052	46
SR1472	6600 – 6609	45
SR1413	6462 – 6599	45
SR1264	3751 – 3770	42
SR1263	6301 – 6461	43
SR1086	6101 – 6205	37
1385A	3036 – 3062	48
1385B	3063 – 3087	49
325000	8001 – 8095	52
325500	8096 – 8105	53

4.0 Job Plan: 9156 Asset List: _____



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5.0 MATERIAL REQUIRED

Qty	Description	WMATA #	Manufacturer #
1	MG90 Gateway Router	883-55-0042	1103982
1	MG90 Mounting Bracket		6001138
1	6-in-1 Antenna		6001121
1	2-in-1 Antenna		6001123
1	Cellular SIM Card	> NPN <	> NPN <
1	Router Installation Plate (certain buses only)	HOMT Manufactured	N/A
1	Antenna Installation Plate (certain buses only)	HOMT Manufactured	N/A

Additional bench stock/shop supplies: 2" masking tape, White Sikaflex, assorted screws, nuts, washers, zip ties.

6.0 TOOLS REQUIRED

- Antenna Drill Template
- General mechanics' toolbox
- Fall Protection Harness
- Oscillating Cutting tool with blade attachment
- $\frac{3}{4}$ " holesaw with arbor
- $\frac{3}{4}$ " Drill bit
- Hand drill
- Utility Knife or similar cutting tool
- Fish tape for pulling cables
- Wire cutters and strippers
- Wiring connector crimpers
- Measuring tape
- Sharpie or marking pencil
- Laptop



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CAUTION: ALL WORK MUST BE CONDUCTED IN A SAFE MANNER AND IN ACCORDANCE WITH METROBUS SAFETY RULES AND PROCEDURES. ALL WORK SHOULD BE PERFORMED IN A MANNER TO PREVENT DANGER TO PERSONNEL OR DAMAGE TO PROPERTY.

Relevant Standard Operating Procedures for this EMI:

2.25 - FALL PROTECTION PROGRAM

2.26 - PROPER USE OF PPE

2.35 – Lockout/Tagout Program

7.0 WORK INSTRUCTIONS

7.1 Prepare Bus

- 7.1.1 Ensure bus is parked under fall protection rail.
- 7.1.2 Ensure parking brake is set.
- 7.1.3 Set the following conditions:
 - 7.1.3.1 Master Run Switch OFF.
 - 7.1.3.2 Battery Switch OFF.
 - 7.1.3.3 Equipment closet Unlocked and Open.

7.1.4 Select Installation Procedure

- 7.1.5 Identify the bus in the following table for correct procedure to be used:

Bus Number	Document Section	Document Page
7001 – 7272	7.2	6
2830 – 2993, 3100 – 3199	7.3	18
7300 – 7409, 5460 - 5480 1001	7.4	31
8001 – 8105	7.5	44
5481 – 5492	7.6	54
3036 – 3087	7.7	68
6301 – 6609	7.8	78
6101 – 6217	7.9	87



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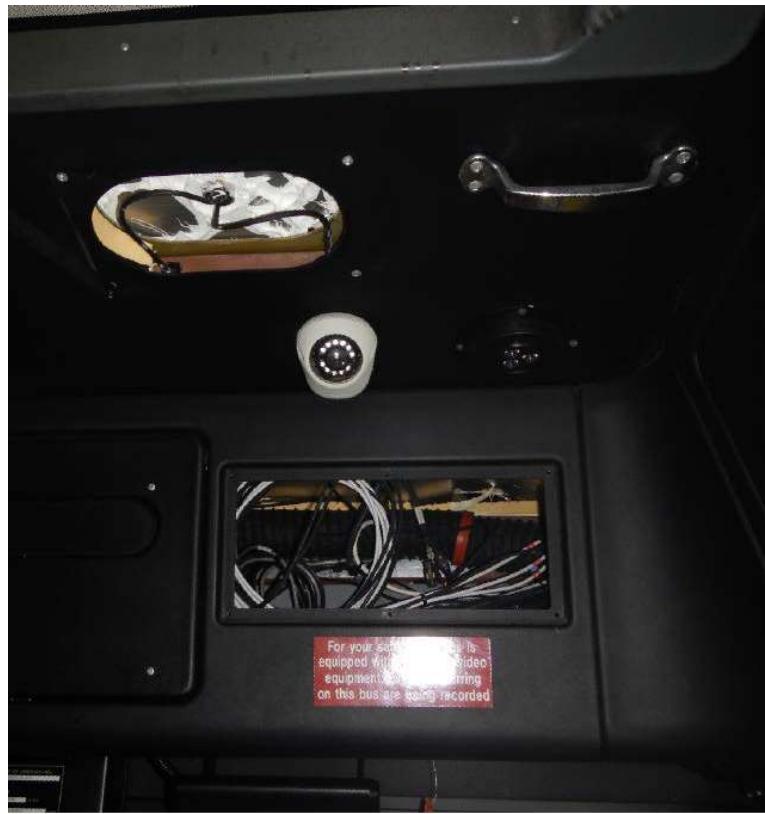
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7.4 Procedure for buses 7300 – 7409, 5460 – 5480, 1001

7.4.1 Install Antennas

7.4.1.1 Working inside the bus, remove the cover plate from the ceiling directly above the operator's seat.

7.4.1.2 Remove the overhead trim panel above the operator side window.



Remove Antenna Access Plate and Sidewall cover

7.4.1.3 Locate the existing antenna cables in the ceiling cover area. Disconnect all cables.

7.4.1.4 Following **SOP 2.25 – Fall Protection System**, access the roof in the area above the operator seat.

7.4.1.5 Locate the existing Streetside antenna plate:



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Streetside Antenna Plate – Antennas to be Removed

- 7.4.1.6 Locate the two smaller antennas that are positioned side-by-side.
- 7.4.1.7 Inside the bus, disconnect the cables and remove the nuts from the antennas to be removed.
- 7.4.1.8 Remove the two antennas shown. Use a scraper to remove the old sealer.
- 7.4.1.9 Remove the two rear screws securing the antenna plate to the roof and use these to align the drill template.



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Drill Template



1 Drill Template Installed

7.4.1.10 Drill a $\frac{1}{4}$ " hole in the antenna plate using the template as a guide.



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2Drilling Pilot Hole Using Template

- 7.4.1.11 Remove the drill template and reinstall the screws securing the antenna plate.
- 7.4.1.12 Use a drill to enlarge the $\frac{1}{4}$ " hole to $\frac{3}{4}$ ".
- 7.4.1.13 Clear the plate of debris.
- 7.4.1.14 Locate the **2-in-1** antenna from the parts kit. Remove the nut and washer from the antenna, peel the backing paper from the gasket and install the antenna into the plate with the raised portion aligned with the long edge of the plate.
- 7.4.1.15 Apply a bead of Sikaflex to the circumference of the new antenna and to the screw heads securing the plate.

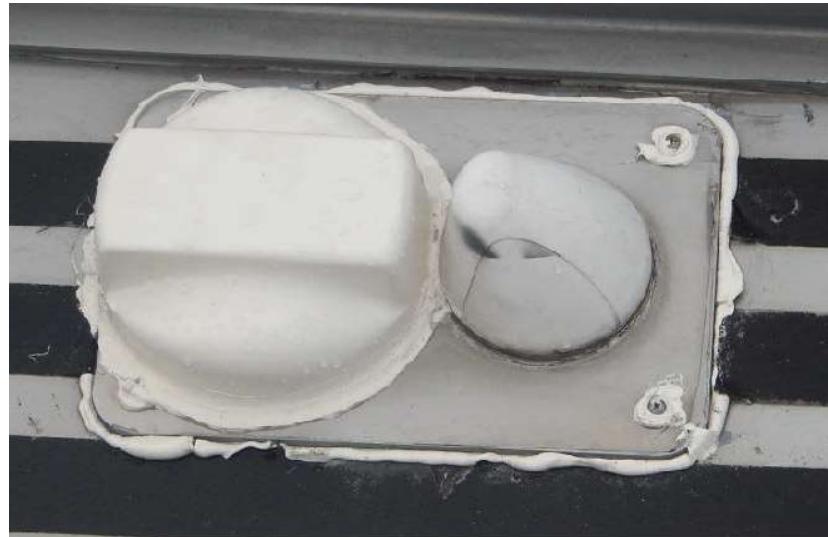


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2-in-1 Antenna Installed

- 7.4.1.16 Working on the streetside front roof area, locate the area for the second antenna mount using the measurements below:

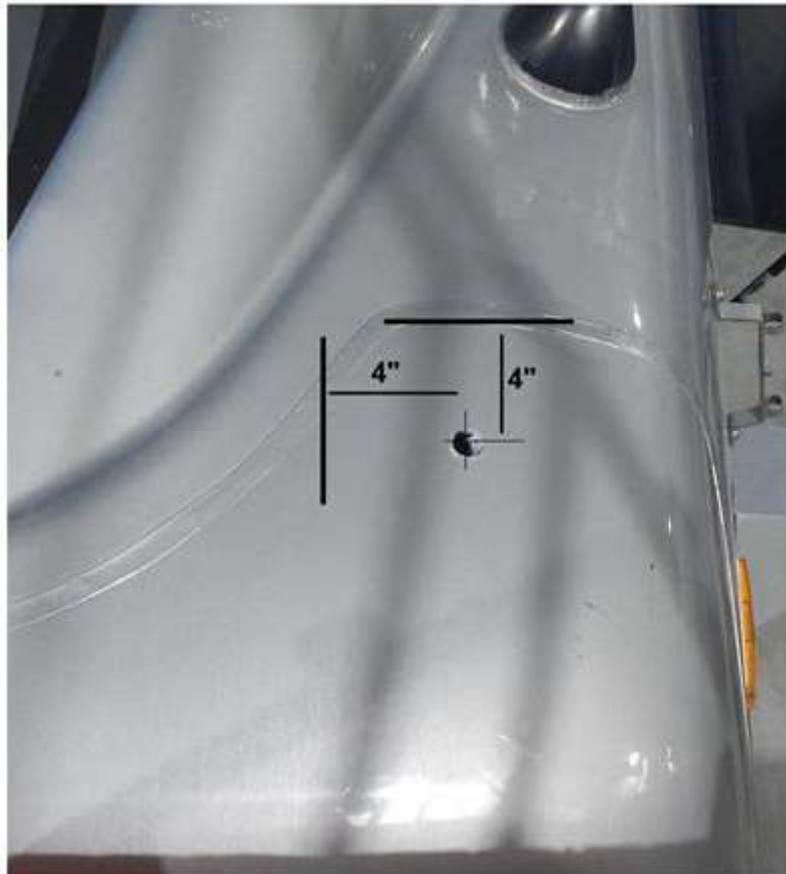


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Locating Antenna

- 7.4.1.17 Using a holesaw, cut a $\frac{3}{4}$ " hole at the intersection of the marks made above.
- 7.4.1.18 Locate the **6-in-1** antenna.
- 7.4.1.19 Remove the nut and washer from the mounting stems.
- 7.4.1.20 Install the **6-in-1** antenna into the hole
- 7.4.1.21 Remove the adhesive backing paper from the antenna and insert into the hole drilled, orienting the antenna as shown.
- 7.4.1.22 With the assistance of a helper, install the washers and nuts on the antenna from inside the bus and tighten with a crow's-foot wrench or similar tool. DO NOT OVERTIGHTEN.
- 7.4.1.23 Apply a continuous bead of Sikaflex around the base of the antenna at the roof



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6-in-1 Antenna Installed

7.4.2

7.4.3 Remove Existing Router

7.4.3.1 Working inside the bus, extend the bottom shelf of the equipment closet and locate the existing router mounted to the *underside* of the bottom shelf.



Existing Router Location

7.4.3.2 Remove all cables from the existing router

7.4.3.2.1 Ethernet



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7.4.3.2.2 Antenna

7.4.3.2.3 Power

7.4.3.3 Secure the antenna cables permanently out of the way – these will not be reused.

7.4.3.4 Route the Ethernet and power cables up to the top of the closet and allow to sit for the moment.

7.4.3.5 Remove the four screws securing the router and remove the router from the tray.

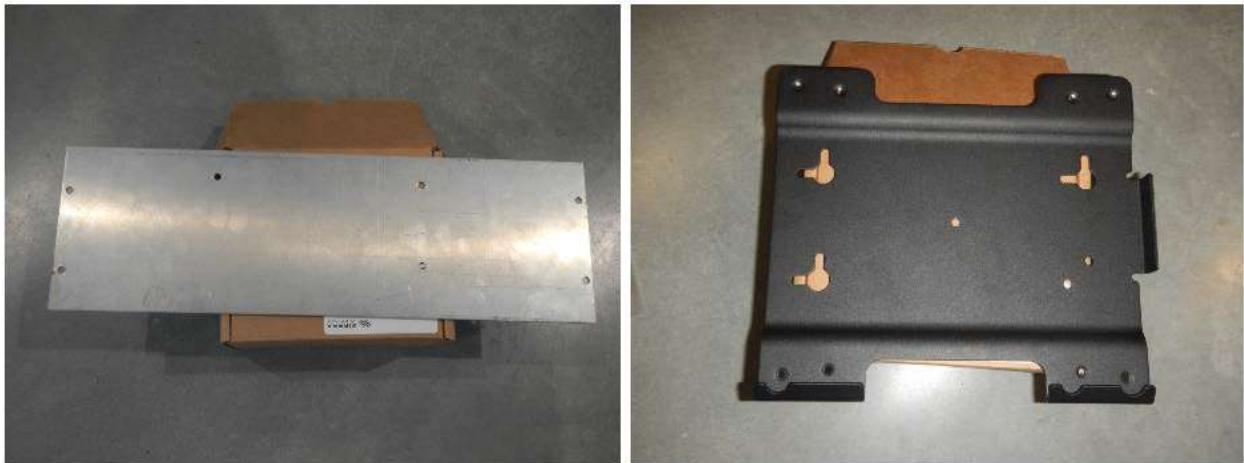
7.4.3.6 Set old router aside, it will be needed to update the progress spreadsheet.

7.4.3.7 Slide in the shelf until it latches.

7.4.4 Install New Router Mounting Plate

7.4.4.1 Locate the router mounting plate from the installation materials.

7.4.4.2 Locate the router bracket from the installation materials.



Router Mounting Plate and Bracket

7.4.4.3 Using bench stock hardware, mount the Router bracket to the router mounting plate. – Do not lose the pack of screws from the Router bracket – they are necessary to mount the router to the bracket.

7.4.4.4 Working from the open streetside window, install the assembled plate onto the rear of the closet frame as shown using $\frac{1}{4}$ " screws, flat washers and locking nuts.

>>> NOTE: <<<

Make sure the 'CLAWS' of the bracket are on the bottom.



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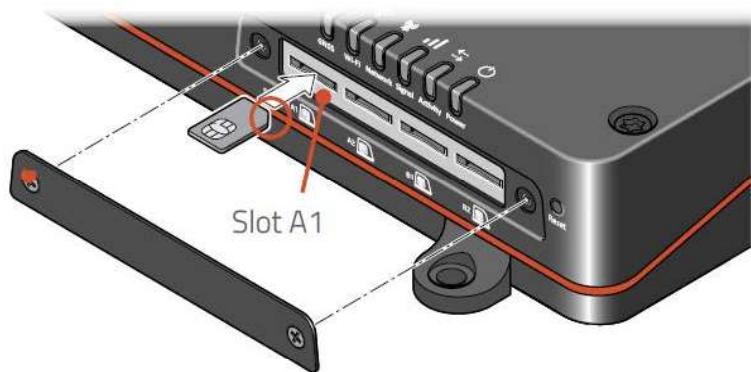
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7.4.5 Prepare the Router

7.4.5.1 Locate the new router from the installation materials and remove from packaging.

7.4.5.2 Locate a White FirstNet® SIM card for the bus being installed.

7.4.5.3 As shown in figure below, remove the SIM card cover form the router, carefully break the SIM card from the carrier and insert into Slot A1 – make sure it clicks.



Installing SIM Card

7.4.5.4 Reinstall the SIM card cover.

7.4.6 Install New Router

7.4.6.1 Place the router on the bracket with the antenna connections up (SIM card cover facing down) and secure with screws from the bracket package.



Router Mounted to Bracket

7.4.6.2 Locate the cables removed from the old device:



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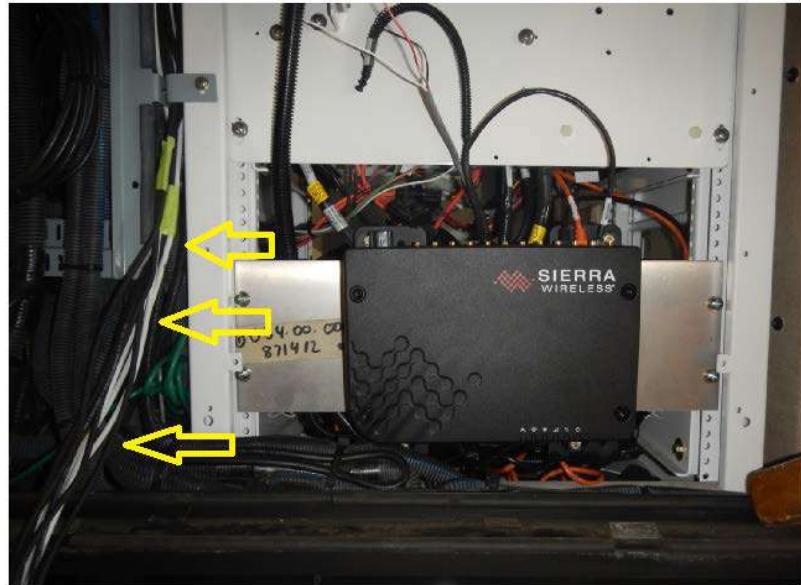
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7.4.6.2.1 **Antenna Coax Cables:** coil these up and zip tie out of the way of the shelves – these will not be reused.

7.4.6.2.2 **Power cable and Ethernet cables:** Route these to the area on top of the new device. It may be necessary to remove cable ties to permit free movement of these cables. Make sure the route chosen does not interfere with movement of the shelves once installation is completed.

7.4.6.3 Locate the new antenna cables – there should be eight (8) of them. Route these cables between the closet frame and the forward closet panel to the area of the new router as shown:



Routing New Antenna Cables

7.4.7 **Power Cable Modification**

7.4.7.1 Locate the Power Cable from the new router package, remove ties and cut to a length of 12" from the connector end.

7.4.7.2 Remove the cable jacket 4" from the wire end and fan out the conductors as shown:



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Prepare Power Cable

7.4.7.3 Cut the **GREEN** conductor short – it will not be used.

7.4.7.4 Locate the power cable that went to the old router.

>>> Make Sure the Batteries are OFF Before Proceeding <<<

7.4.7.5 Cut the connector off of the old power cable and remove 4" of the cable jacket.

7.4.7.6 Connect the wires of the new power connector to the old power cable matching the wire colors Red to Red, White to White and Black to Black using crimp connectors. Retape the harness when complete.

7.4.7.7 Locate the antenna cables and route them under and behind the new router as shown:



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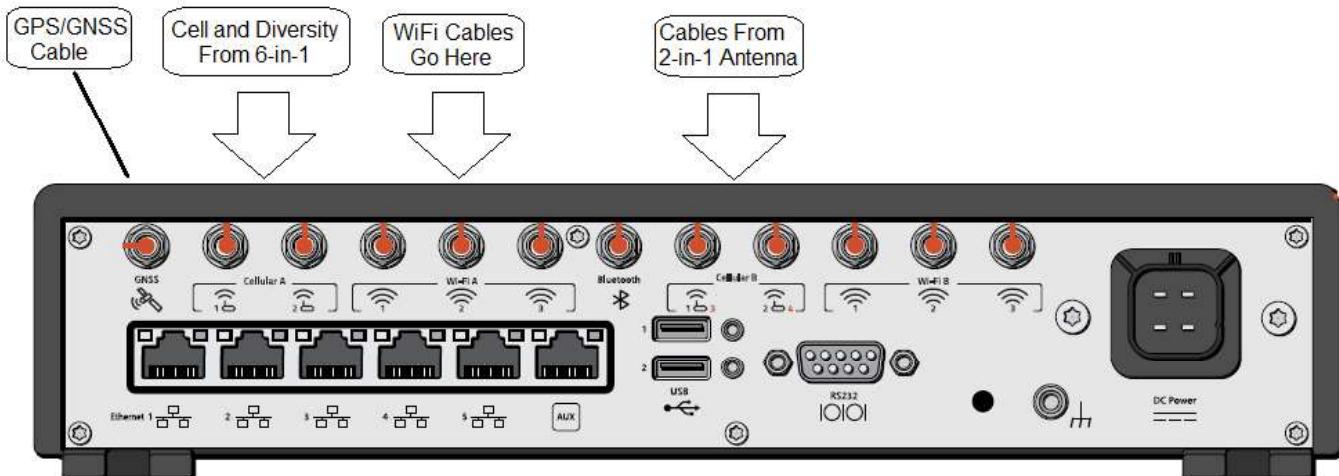
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Routing Antenna Cables

7.4.7.8 Connect the Antenna cables to the router as shown. Use the tool from the router package to secure all antenna connections with proper torque.



Antenna Cable Connections

7.4.7.9 Connect the Ethernet cables to network positions 1-4 Do Not Connect any Ethernet cables to the AUX position.



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7.4.7.10 Connect the Power Cable to the connector.

7.4.7.11 Secure cables as shown:



7.4.8 Go To Section 8.0 – COMMISSIONING PROCESS



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New Flyer Xcelsior RECARO Seat Belt Buckle Retrofit

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NEW FLYER XCELSIOR RECARO SEAT BELT BUCKLE RETROFIT

Bus No.	Fleet No.	Build No.
5460-5480	54	SR1913
2830-2993	55	SR1947
7300-7355	56	SR1946
7356-7409	57	SR1976
3100-3199	59	SR2107
5481-5492	60	SR2243
3200-3274	61	SR2307
4450-4474	62	SR2308
4475-4499	63	SR2405
3275-3349	64	SR2406
5500-5509	65	SR2407
5510-5541	66	SR2472
4500-4598	67	SR2471
4600-4700	68	SR2574

Revision History				
Revision No.	Revision Date	Reviser / Author	Document Section No. (if applicable) or N/A	Description of Changes
00	05/17/2024	Marlon Speed	N/A	Initial Release



**WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
OFFICE OF BUS MAINTENANCE
ENGINEERING MODIFICATION INSTRUCTIONS - BUS**



New Flyer Xcelsior RECARO Seat Belt Buckle Retrofit

**WMATA BUS ENGINEERING (BENG)
EMI No.: BUSV-BMNT-EMI-24-BB-02-00
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1.0 PURPOSE

This EMI is designed to reduce service interruptions/ incidents caused by the operator's seat belt warning/alarm system being triggered by a problematic seat belt buckle assembly.

2.0 BACKGROUND

WMATA's New Flyer Xcelsior fleet was manufactured with seat belt buckles that were prone to failure. Bus Engineering investigated these failures and found that the belt buckle's wiring harness became fatigued from normal operator usage, which would trigger both the "SEAT BELT" warning light on the instrument panel and the audible alarm.

RECARO, the original equipment manufacturer (OEM), has developed an improved seat belt buckle to address this design flaw (P/N 7226505E-01). The new seat belt buckle features an internally rerouted and insulated wiring harness. The newly designed buckle was tested and evaluated on ten WMATA buses under **BUSV-BMNT-TCN-22-BB-05-00 RECARO Seat Belt Buckle Evaluation** with no failures recorded during the 6-month test. During this period, RECARO discontinued manufacturing the original seat belt buckle and now exclusively sells the improved version.

3.0 APPLICABLE BUSES

Bus No.	Fleet No.	Build No.
5460-5480	54	SR1913
2830-2993	55	SR1947
7300-7355	56	SR1946
7356-7409	57	SR1976
3100-3199	59	SR2107
5481-5492	60	SR2243
3200-3274	61	SR2307
4450-4474	62	SR2308
4475-4499	63	SR2405
3275-3349	64	SR2406
5500-5509	65	SR2407
5510-5541	66	SR2472
4500-4598	67	SR2471
4600-4700	68	SR2574

Note: Bus fleets 46 (7001-7100;7168-7263), 47 (7101-7152), and 50 (7264-7272) and buses newer than fleet 68 are excluded.

4.0 Job Plan: 9704 Asset List: 6564 Campaign: 18615864

SOP 3.8 Revision 11 – Bus Change Control Board (BCCB)



**WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY
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5.0 MATERIAL REQUIRED

1. RECARO seat belt 7226505E-01
2. Cable Ties

6.0 TOOLS REQUIRED

1. #2 Phillips screwdriver
2. 3/8 drive ratchet
3. 5/8 6-point socket
4. Trim panel removal tool (or similar prying tool)
5. Torque wrench

CAUTION: ALL WORK MUST BE CONDUCTED IN A SAFE MANNER AND IN ACCORDANCE WITH THE METROBUS SAFETY RULES AND PROCEDURES. ALL WORK SHOULD BE PERFORMED IN SUCH A WAY THAT IT WOULD NOT INVOLVE ANY DANGER TO PERSONNEL OR DAMAGE TO PROPERTY.

7.0 INSTALLATION PROCEDURE

7.1 Removal

7.1.1 Ensure that the parking is applied, secure the bus with wheel chocks, and turn off the main battery disconnect switch.

7.1.2 Remove the hand wheel from the recliner shaft by gently prying with a trim panel removal tool (or similar prying tool). See Figure 1a and 1b.

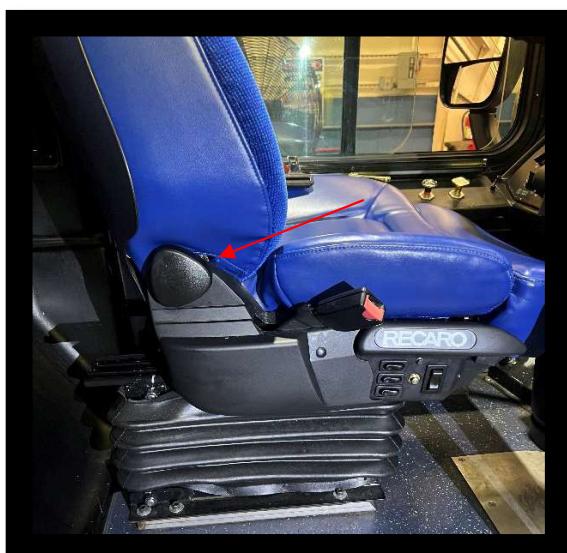


Figure 1a: Operator's Seat Knob Removal

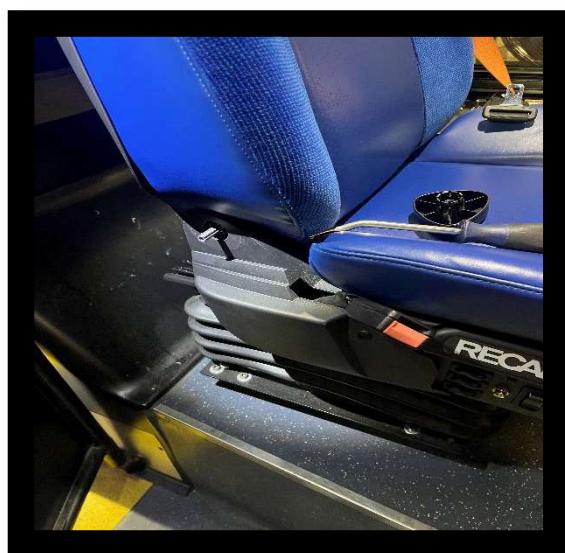


Figure 1b: Operator's Seat Knob Removal



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7.1.3 Remove the three screws from the rear lower trim panel using a #2 Phillips. Set aside the screws and panel for re-use (Figure 2).



Figure 2: Rear Lower Trim Panel With Screw Locations



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7.1.4 Remove the screw securing the side trim panel using a #2 Phillips screwdriver and move the trim panel aside to gain access to the seat belt buckle bolt (Figure 3).

7.1.5 Using a 5/8" socket, remove the seat belt buckle bolt and washer from the J-bracket. Set aside for re-use (Figure 4).

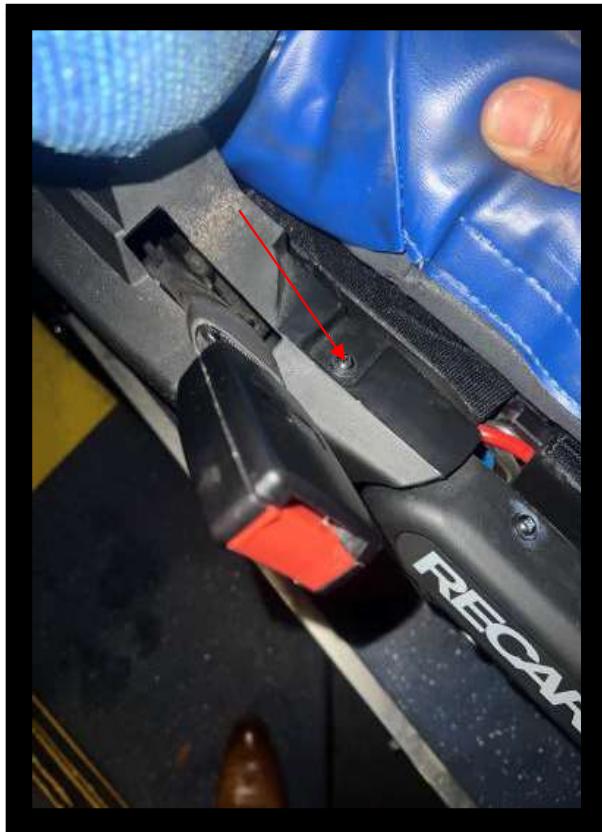


Figure 3: Side Trim Panel Screw Location

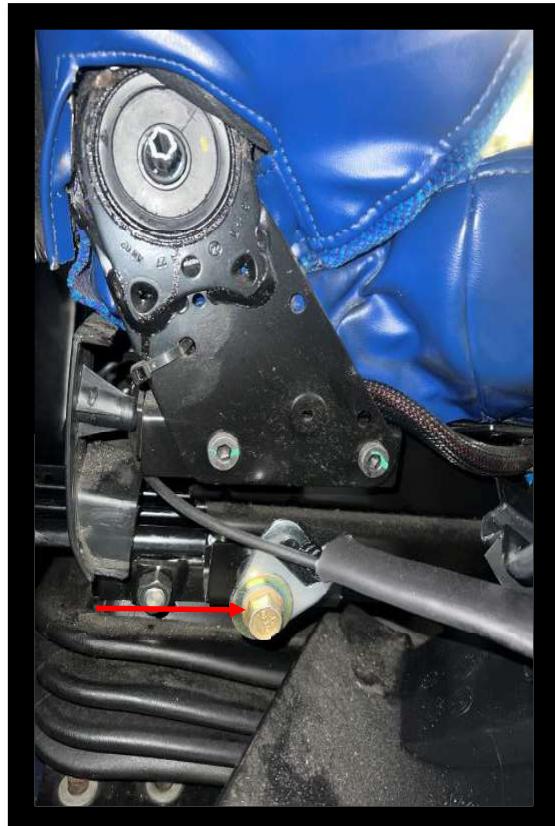


Figure 4: Seat Belt Mounting Bolt Location



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7.1.6 Cut any cable ties securing the seat belt buckle wiring harness to the seat frame and disconnect the connector from the body harness. Take note of the harness routing for future reference. Remove the buckle assembly from the seat.



Figure: 5 Wiring Harness Routing



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7.2 Installation

- 7.2.1 Obtain a new buckle (P/N 7226505E-01) and route the bottom of the buckle through the opening in the side trim panel.
- 7.2.2 Place the buckle on the J-bracket and secure it with the bolt and washer previously removed.
Ensure the washer does not pinch the wire harness. Torque to 37 ft-lbs.
- 7.2.3 Connect the seat belt buckle wiring harness to the body harness and secure the harness to the seat frame using a zip tie. Ensure the wiring harness is routed the same as previously. (See Figure 5)
- 7.2.4 Reinstall the side trim panel and secure the Phillips head screw to the cushion frame.
- 7.2.5 Reinstall the rear lower trim panel and secure with the 3 Phillips head screws.
- 7.2.6 Reinstall the recliner knob on the recliner shaft, ensuring it is fully seated.
- 7.2.7 Turn the main battery disconnect switch to the “ON” position.

8.0

TEST PROCEDURES

Sit in the operator's seat (do not fasten the seat belt). Start the bus and release the parking brake while firmly depressing the service brake pedal to apply the service brakes. Ensure that the “SEAT BELT” warning light is illuminated on the instrument panel and that the audible alarm activates. Then fasten the seat belt and ensure that the “SEAT BELT” warning light and the audible alarm deactivate. Pull on the seat belt, ensuring that it remains fastened to the buckle.

9.0

PERIODIC INSPECTION AND MAINTENANCE

All PM schedules remain the same.



DRIVING TRANSMISSION TECHNOLOGY®



MECHANIC'S TIPS

EP 40/50 SYSTEM™

ALLISON ELECTRIC DRIVES™

MT5811EN

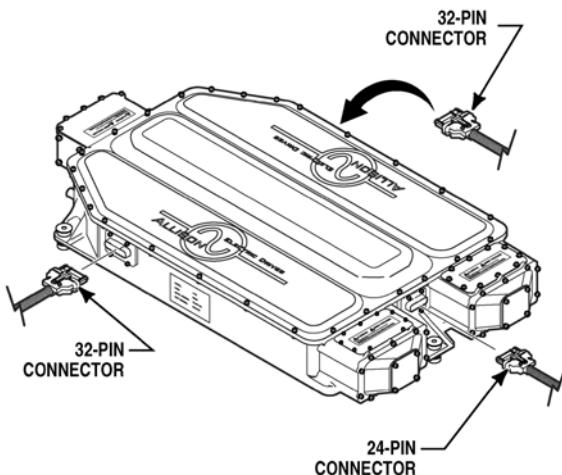
TECHNICAL PUB



2.1.4 Electrical Disconnect Verification Procedure.

Before beginning any repair on the E^V Drive™, DPIM, or ESS you must perform the following Electrical Disconnect Verification Procedure:

1. Check DVOM function with a known good voltage source.
2. Vehicle ignition must be turned **OFF**.
3. If the vehicle is so equipped, place the switch for the +24V/+12V battery disconnect in the **OFF** position. Use a lockout device to prevent unauthorized access to the +24V/+12V battery switch.
4. Remove the low voltage 24-pin connector from the DPIM (Ref. PI120 on the wiring schematics in the appendix of the E^P 40/50 Troubleshooting Manual). Refer to [Figure 2–5](#).



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Figure 2–5. DPIM Low Voltage Disconnect Points

5. Remove the main ESS connector (31-pin Deutsch) from the ESS.
6. Remove the DPIM DC bus access cover.
7. Use J–46708 Fluke 87 High Impedance Digital Multimeter and proper personal protective equipment (J–50090 Class 0 isolation gloves with leather outer gloves), to measure the following voltages:
 - Measure the DC voltage between DC(+) and DC(–) (refer to [Figure 2–6](#))
 - Measure DC(+) to DPIM chassis (refer to [Figure 2–7](#))
 - Measure DC(–) to DPIM chassis

All voltage measurements must read less than 3 VDC before proceeding to the next step. If measurements are not less than 3 VDC, replace the access cover and allow the DPIM to dissipate residual energy.

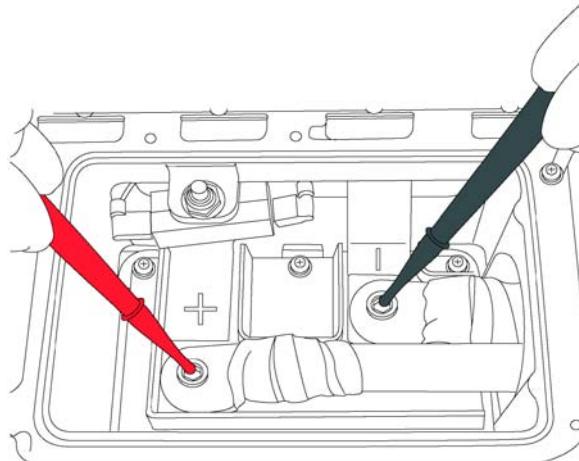


Figure 2–6. Measure Voltage Between DPIM DC Terminals

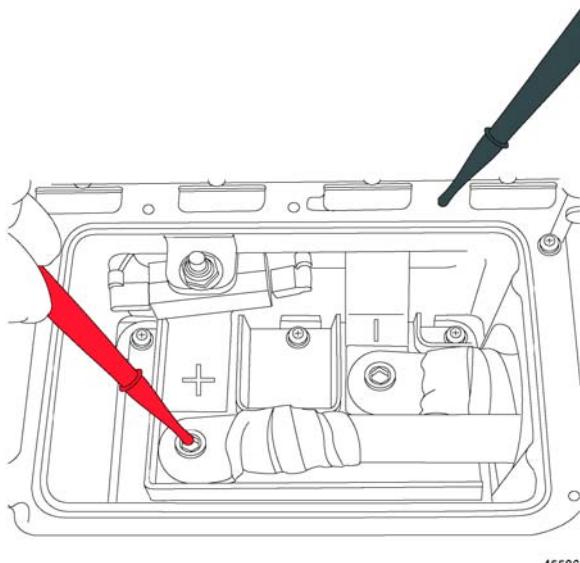


Figure 2–7. Measure Voltage Between Each DPIM DC HV Terminal and Ground

8. Remove both HVIL covers on the ESS ([Figure 2–8](#)).
9. Using proper personal protective equipment (J–50090 Class 0 isolation gloves with leather outer gloves), remove the positive (+) and negative (–) connectors from the ESS ([Figure 2–9](#)). Use a lockout device to prevent unauthorized reinstallation ([Figure 2–11](#)).

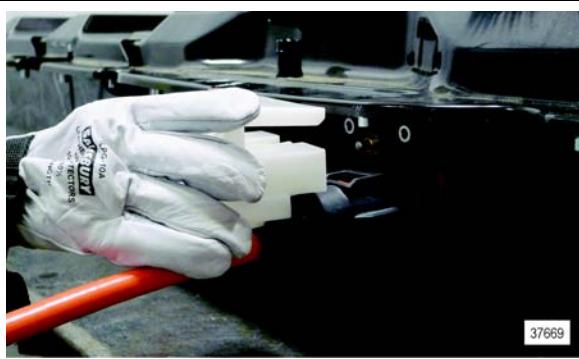


Figure 2–8. ESS HVIL Cover Removal



Figure 2–9. Disconnect Electrical Connector

10. Remove AC lug access covers on the DPIM. Use J-46708 Fluke 87 High Impedance Digital Multimeter and proper personal protective equipment (J-50090 Class 0 isolation gloves with leather outer gloves), to measure the following voltages in each lug box:
 - AC Phase to Phase; A-B, A-C, C-B
 - Each AC Phase to Chassis ground ([Figure 2–10](#)).
11. Re-check DVOM function with a known good voltage source.
12. Before proceeding to the next step, all measurements must be less than 3 VDC. If measurements are not less than 3 VDC, replace access lid cover and allow DPIM to dissipate residual energy.

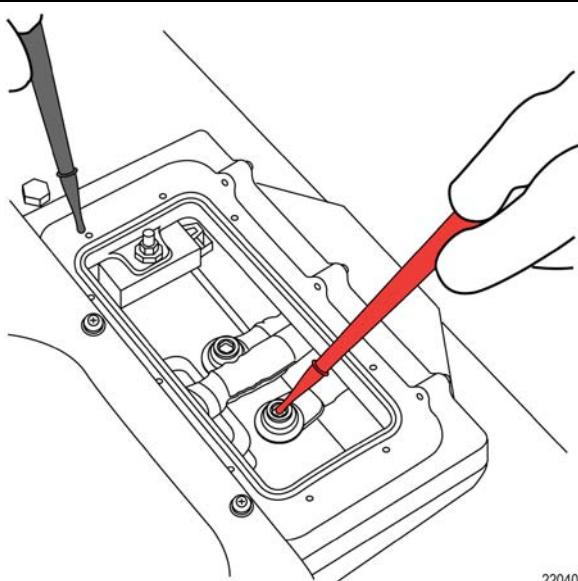


Figure 2–10. Measure Voltage Between Each DPIM AC Phase and Ground

13. Work can now be performed on the high voltage circuit and EP System™ components.

2.1.5 Energy Storage Lockout.

To prevent installation of the ESS DC connectors during service, use lockout devices commercially available from electrical safety suppliers ([Figure 2–11](#)).



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Figure 2–11. Lockout Devices

2.1.6 Electrical Safe Work Practices.

More information for establishing safe electrical work practices can be found at the following sources:

- www.OSHA.gov, 29CFR 1910 Subpart S
- www.NFPA.org, NFPA 70E-2004



Washington Metropolitan Area Transit Authority

PROCEDURE

Procedure Number: BUSV-BMNT-SOP-1.14-09

Wheel and Tire Maintenance Program

February 16, 2021

Revision History

Revision No.	Revision Date	Reviser/Author	Document Section No. (if applicable) or N/A	Description of Changes
00-01	N/A	BMNT	N/A	Software no longer supported
02	06/30/09	BMNT	All	Biennial Review
03	01/15/10	BMNT	All	Biennial Review
04	03/28/11	BMNT	All	Biennial Review
05	01/03/12	BMNT	All	Biennial Review
06	05/21/13	BMNT	All	Biennial Review
07	02/27/15	BMNT	All	Biennial Review
08	11/05/18	R. French	All	Biennial Review
09	02/16/21	R. French	7.2, 8.1.10, 8.1.15	7.2 Replacing tires on the front axle in pairs and replacing the rear tires in wheel end pairs. 8.1.10 The tire contractor is responsible for correcting any tire inflation deficiencies. 8.1.15 Removed the use of the Blue Torque gun.

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1 Scope

- 1.1 This Standard Operating Procedure is applicable to all operating divisions, shops, and support activities within the Office of Bus Maintenance (BMNT).
- 1.2 This document has been created in compliance with the Quality Management System Plan (QMSP), Policy Instructions 1.1 (Document Governance and Hierarchy) and 6.1 (Records Management), and the Records Retention Manual.

2 Purpose

- 2.1 This procedure establishes the standard practices/processes employed within BMNT for the scheduling, performance, and recording of all Wheel and Tire Maintenance on all Washington Metropolitan Area Transit Authority (WMATA) revenue vehicles.

3 Definitions

- 3.1 **Controlled Document** – A document that is reviewed and approved prior to use; it is version-controlled, has a life cycle, and has been uploaded to BMNT's electronic document repository. Examples include, but are not limited to SOPs, bulletins, work instructions, and forms. Any controlled document printed from its electronic repository is considered uncontrolled.
- 3.2 **BMNT DQMS Manager/Coordinator** – Person(s) designated by BMNT Vice President to actively monitor compliance with this procedure.
- 3.3 **Document Quality Management System (DQMS)** – This is the electronic repository for all controlled Quality-related documents throughout WMATA. It houses controlled copies of ALL documents at each level, allows read-only access for select users (e.g., Authority-wide for documentation applicable to all of WMATA), and allows write access for specific users (e.g., the DQMS Managers/Coordinators of their respective departments).

4 Acronyms

- 4.1 **BMNT** – Office of Bus Maintenance
- 4.2 **BUSV** – Department of Bus Services
- 4.3 **PM** – Preventive Maintenance
- 4.4 **PPE** – Personal Protective Equipment
- 4.5 **SAFE** - Department of Safety and Environmental Management
- 4.6 **SDS** – Safety Data Sheet
- 4.7 **SOP** – Standard Operating Procedure
- 4.8 **WMATA** – Washington Metropolitan Area Transit Authority (also referred to as WMATA or the “Authority”)

5 Responsibilities

- 5.1 The Vice President of Bus Maintenance (BMNT) has overall responsibility for the administration of this Standard Operating Procedure.
- 5.2 Directors, superintendents, managers, bus maintenance supervisors and lead persons (or designees) are responsible for dissemination and review of this SOP with all appropriate employees. Each is further responsible for appropriate oversight and quality control necessary to ensure full adherence to this SOP at all operating and support locations.

6 Safety Management

- 6.1 It is the responsibility of each supervisor and employee to ensure that all safety guidelines are followed when performing maintenance, or any activity, on Authority equipment or while on Authority property. This includes the use of Lockout /Tagout procedures and safety equipment such as but not limited to, safety vests, gloves, goggles, proper footwear, and bump caps. Employees shall also follow the Safety Data Sheet (SDS) guidelines when using products containing chemicals and adhere to the requirements of the Authority Electronic Device Policy.
- 6.2 This document has been created in compliance with WMATA's safety plan and safety policy. Any hazards and risks associated with the processes within this document have been evaluated for safety and have appropriate mitigation strategies established as part of WMATA's overall risk assessment management, where applicable and/or relevant. This document is also subject to monitoring for safety risk mitigation adherence and safety performance, and has effective communication practices in place, including adequate safety training to ensure competencies, and to solicit feedback from the affected employees, where applicable and/or relevant. For further guidance on WMATA's safety plan, visit the Department of Safety and Environmental Management's (SAFE) intranet homepage.

7 Policy

- 7.1 All buses within the WMATA fleet are equipped with hub-piloted wheels and appropriate hardware to ensure standardized practices and procedures are utilized. All wheels and tires will be maintained in strict adherence to this SOP.
- 7.2 When replacing tires on the front axle, both front tires **must** be changed at the same time. When replacing tires on the rear axle, both the inner and outer tire on that side I.E. curbside or street side **must** be replaced.

8 Wheel Maintenance Procedures

8.1 Wheel Installation Procedure

NOTE: When practical, the entire wheel installation process should be completed by the same mechanic to reduce the chance of a step being omitted.

- 8.1.1 The drum mounting face must be cleaned and surface kept flat. Clean the drum surface and pilots with a wire brush if rust or debris is present.
- 8.1.2 Using a wire brush clean the base of each stud as well as the threads to remove any rust or foreign material which could cause interference with the wheel nuts.

- 8.1.3 Check for damaged studs and/or stripped stud threads. If a stud is broken, damaged or stripped, replace that stud and both studs on either side of it, and check the mating surfaces for flatness.
- 8.1.4 Clean the exposed wheel surfaces, as needed, using a multipurpose cleaner (067-00-0780) and water with a brush or rag. Use WD40 or similar product to remove road tar and debris that was not removed by the cleaning solution.
- 8.1.5 Remove dirt and oxidation by hand cleaning only using a multipurpose cleaner (067-00-0780). If necessary clean the flange/mating surface with steel wool scouring pad impregnated with soap; such as S.O.S, Brillo or equivalent.

NOTE: Using Scotch Brite abrasive pads will damage the Dura-Brite finish on the Alco wheels. A list of all authorized wheel cleaning materials can be found on the BMNT home page under Maintenance information_Parts Application Chart_WMATA Wheel Hardware Application Chart.

- 8.1.6 Make sure the center hole of the wheel is clean so it will fit easily on the hub pilots.
- 8.1.7 Lightly lubricate the pilot lugs on the hub using dielectric grease (061-00-2415) to ease wheel installation and removal as shown in (Attachment A).

CAUTION: Do not place grease on the mounting face of the drum or wheel.

- 8.1.8 Prepare wheel nuts as follows (see Attachment B):
 - Apply two drops oil to each wheel nut between the nut and flange. Do not place oil on the stud threads.
 - For the Alcoa sleeved cap nuts used on aluminum wheels, apply a coating of dielectric grease (061-00-2415) on the outside diameter of the lug nut sleeve. Note: The grease will act as an insulator between the dissimilar metals (steel and aluminum) and prevent corrosion.
 - 8.1.9 Check to ensure that the multi-piece flange nuts turn smoothly on their flanges and have no thread damage. Replace all defective wheel nuts.
- CAUTION:** Always use correct wheel nuts. Hub piloted wheels use flange nuts for both single and dual wheel applications. Other style wheel nuts should never be used on hub piloted systems.
- 8.1.10 Before installing the wheels, check the tires for the correct air pressure using a tire pressure gauge (066-00-0002). The correct tire pressure can be found on the side of the bus at the wheel well.
- Note:** If the tire pressure is incorrect, notify the tire contractor on site of the need to have them adjusted.
- 8.1.11 Rotate the hub so that one of the pilot lugs is at the 12 o'clock position and place the wheel on the wheel pilot. Make sure the wheel is fully seated against the rotor or drum.
 - 8.1.12 For dual wheels, place the outer wheel onto the hub making sure the hand holes are lined up for easy access to the valve stems. The valve stem on each wheel should be positioned approximately 180 degrees apart from each other.

NOTE: To help with the installation of the rear dual wheels, the use of alignment dowels (942-55-0003) is recommended.

- 8.1.13 Make sure the outer wheel is pushed up fully against the inner wheel. Install the nuts finger-tight at the 12 o'clock and 6 o'clock positions. Install the remaining nuts finger-tight.
- 8.1.14 Snug the nuts to 100–200 ft-lbs. using a $\frac{1}{2}$ " (maximum) air impact gun following the sequence shown in Figure 1. Do not exceed 200 ft-lbs.
- 8.1.15 A standard calibrated torque wrench must be used to achieve a final torque of 450 ft lbs. Using Figure 1 as a reference for the proper wheel nut tightening sequence.

NOTE: When using a 1" drive torque wrench with a 1" drive extension (re: at rear wheels), the extension does not affect the torque output of the torque wrench to the wheel nut.

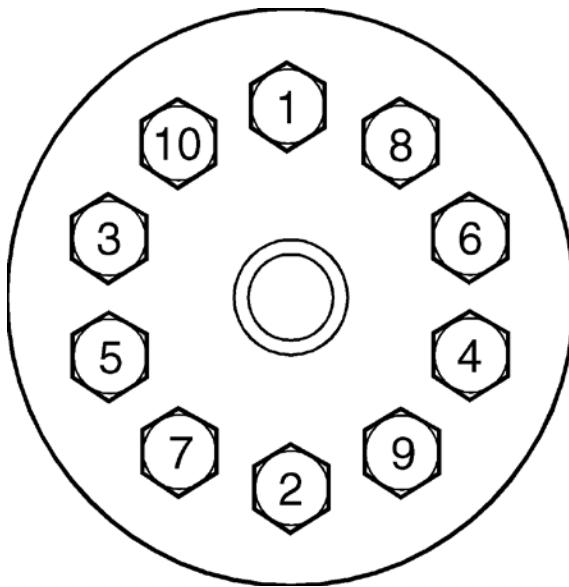


FIGURE 1 - WHEEL NUT TIGHTENING SEQUENCE

- 8.1.16 After the wheels are installed, visually check to see that both wheels are properly seated on the pilots and flat against the rotor or drum.
- 8.1.17 With wheel properly cleaned and mounted, all old torque seal must be removed.
- 8.1.18 Install the proper size Zafety Lug Locks in accordance with manufacturer's installation instructions (see attachment E).
- 8.1.19 All buses having wheels installed must be scheduled to have the Zafety lug locks inspected after 50 to 100 miles of operation since the installation.

NOTE: A Work Order must be created in Maximo for each bus needing to have the Zafety lug locks inspected. Job Plan 8580 has been created in Maximo for this purpose. The Work Order will remain open until the inspection has been performed. In addition, the bus number shall be placed on the Division Turn-over sheet as a reminder that the Zafety Lug Locks must be checked.

NOTE: When buses are returned from HOMT, after having had work performed that required the removal of wheels, the home Division will be notified that the Zafety lug lock inspection must be completed by the home Division. The home Division shall create a Work Order in Maximo and perform the inspection.

- 8.1.20 During the Zafety lug lock inspection, a visual inspection of the Zafety lug locks must be completed looking for any missing or damaged lug locks which would indicate the possibility of a loose lug nut condition. If a Zafety lug lock is missing or damaged all lug nuts on that wheel must be retorqued to 450 ft lbs.
- 8.1.21 If any wheel nut is found to be loose during the Zafety lug lock inspection, a new Work Order must be created to have the Zafety lug locks inspected after another 50 to 100 miles of operation. The bus number shall remain on the Division Turn-over sheet until the recheck has been completed.

8.2 Wheel and Tire Service

- 8.2.1 At every PM-A the following tasks shall be conducted:

- 8.2.1.1 Visually inspect all wheel nuts to ensure that the Zafety Lug Locks are in place and indicating that there has been no movement of the nuts.

NOTE: Wheel nuts should not be re-torqued unless the Zafety Lug Lock is found broken or missing. If retorquing is required, the wheel nuts must be checked for movement after 50 to 100 miles of operation following the procedure in paragraphs 8.1.20 – 8.1.21.

- 8.2.1.2 Inspect all visible wheel and tire surfaces. Check for the following:

- Excessive rust or corrosion build-up
 - Cracks in metal
 - Bent flanges, resulting from road obstructions
 - Loose, missing, or damaged stud nuts
 - Bent or stripped studs
 - Damage to the tire or unusual tread wear

- 8.2.1.3 Inspect aluminum wheels for signs of excessive heat exposure. Observe the one-inch round heat indicator or logo decal for signs of blistering, charring, blackened or cracked appearance. Also, discoloration of the polished surface is an indication that the wheel has experienced excessive heating. Any wheel showing signs of excessive heat is subject to sudden failure and must be removed from service immediately. See Attachment C (Aluminum Wheel Inspection for Heat Damage).

- 8.2.1.4 If any wheel has one or more broken or missing wheel studs, the bus must be placed out-of-service until the studs have been replaced and the mating surfaces checked for flatness.

- 8.2.1.5 Exposed wheel surfaces must be cleaned at each PM-A-Service or more frequently, if needed.

8.2.2 WMATA personnel are responsible for the following activities during each PM-A Service:

- 8.2.2.1 Gauge check tire inflation. Refer to the tire pressure label located on the wheel well of the bus for proper inflation pressures. Notify the tire contractor if found to be low.
- 8.2.2.2 Check for valve core leaks, loose valve stems, and valve caps.
- 8.2.2.3 Inspect tires for evidence of irregular wear that may occur as a result of mechanical adversities. Check the vehicle for mechanical defects and report to Division Lead person/Supervision. Refer to Attachment D for examples of common abnormal wear patterns and their causes.
- 8.2.2.4 Perform tire checks for minimum tread depth (4/32" front - 2/32" rear). Replace all worn tires.

8.2.3 Tire Maintenance Procedures

- 8.2.3.1 Currently, WMATA leases its bus tires under a tire servicing contract. The following outlines contractual responsibilities:
 - 8.2.3.2 Provide monthly reports on tires to include:
 - Bus tire mileage for each bus
 - Beginning and ending balance of tire quantities on-hand
 - Rolling tires on equipment including spares
 - Tires removed from service
 - Provide tire mileage for each type of tire in the fleet
 - Monthly report on refurbished wheels
 - Monthly report on all tire misalignments and air pressure checks/adjustments.
 - 8.2.3.3 Furnish all labor, equipment, and materials to mount tires on wheels, balance tires and wheels, remove tires from wheels, and make necessary repairs to tires covered by this contract.
 - 8.2.3.4 Supply all labor and equipment necessary to load, unload and transport tires.
 - 8.2.3.5 Contractor personnel are required to follow all WMATA safe work practices and personal protective equipment (PPE) requirements while working on WMATA properties.
 - 8.2.3.6 All Tire Service Contractor personnel are required to attend Vendor Safety Training and obtain and display WMATA issued contractor passes while present on WMATA properties.
 - 8.2.3.7 Inspect all tires when mounted on bus including tread depth and bumping of inner duals within a maximum of fourteen (14) calendar day intervals.
 - 8.2.3.8 The contractor will supply new tires only. No retreads or blemished tires will be accepted as part of this contract.

- 8.2.3.9 Furnish a minimum of fourteen (14) full-time people working a normal forty (40) hour week to service the tires on WMATA property, exclusively. This staff shall consist of a minimum of thirteen (13) tire service mechanics and one (1) supervisor. The number of tire service personnel may be increased or decreased by agreement between the Authority and the Contractor.
- 8.2.3.10 The vendor shall be responsible for disposal of vendor's and WMATA's scrap tires through the run-out period specified.
- 8.2.3.11 Each month perform an inventory of tires at each location. This inventory count is to be verified by the appropriate division superintendent or designee.
- 8.2.3.12 Supply sufficient tire service to meet revenue operations.
- 8.2.3.13 Provide recommended air pressure for each type of tire application. The Contractor shall provide portable air compressors to adjust/inflate tires to proper pressures as needed. Tire pressure checks will be performed on a minimum of ten (10) buses per day (50 per week) at each garage.

Compliance with this SOP will enable BUSV to help meet our goal of providing safe, reliable transportation to the riding public.

9 References

- 9.1 Authority Electronic Device Policy P/I 10.XX*
- 9.2 Policy Instruction (P/I) 1.1 Document Governance and Hierarchy
- 9.3 Policy Instruction (P/I) 6.1 Records Management
- 9.4 Quality Management System Plan (QMSP)
- 9.5 Records Retention Manual

10 Records

- 10.1 N/A

11 Appendices, Attachments and/or Exhibits

- 11.1 Attachment A - Wheel Pilot Lubrication Points
- 11.2 Attachment B - Wheel Nut Lubrication
- 11.3 Attachment C – Aluminum Wheel Inspection for Heat Damage
- 11.4 Attachment D - Common Tire Wear Patterns
- 11.5 Attachment E - Safety Lug Lock Application Chart

*Denotes the latest version

Attachment A

Wheel Pilot Lubrication Points

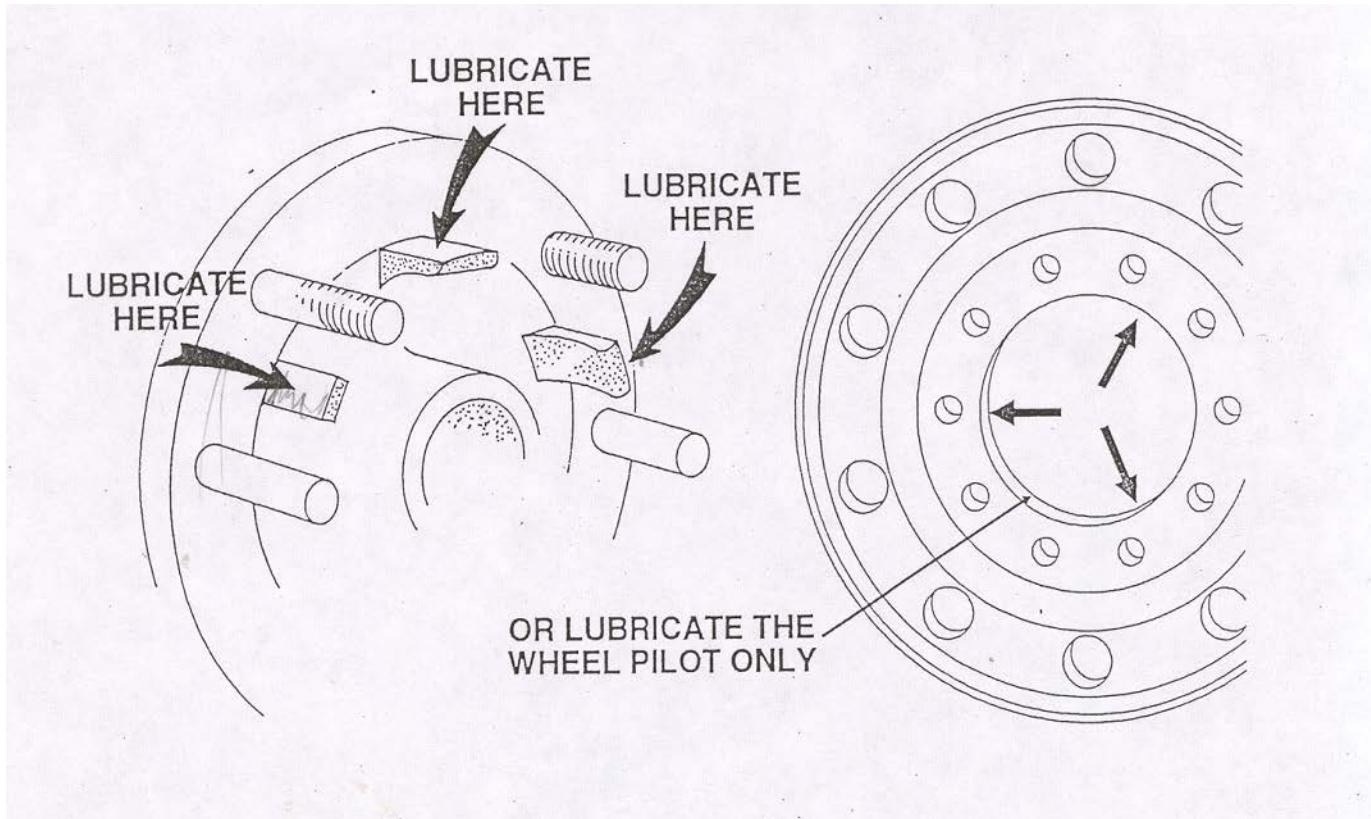


FIGURE 1 - WHEEL PILOT LUBRICATION POINTS

Attachment B

Wheel Nut Lubrication

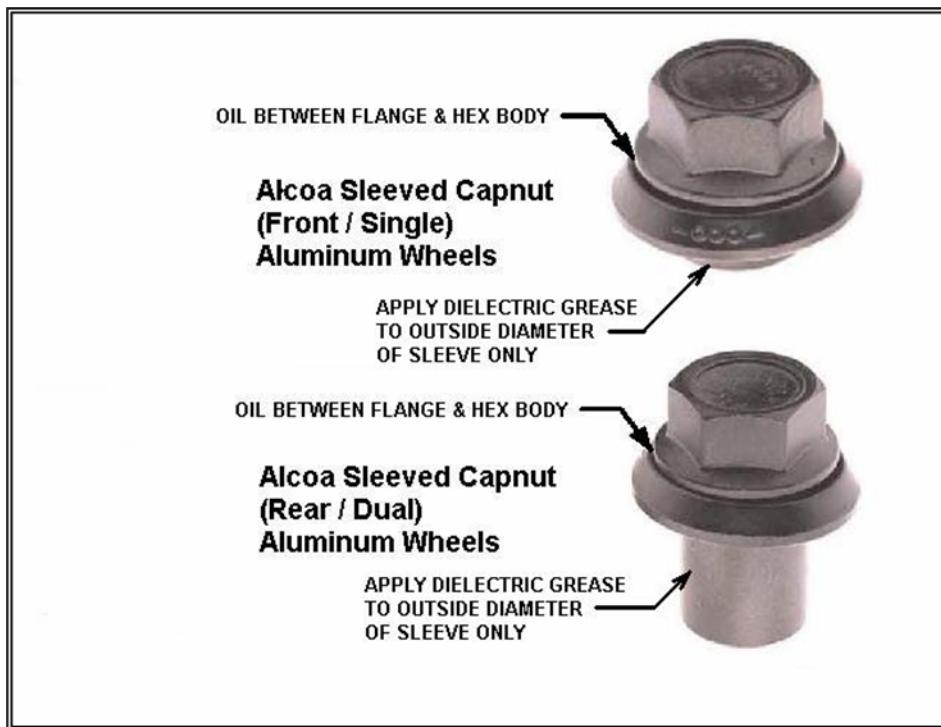


FIGURE 1 - SLEEVED FLANGE NUTS FOR ALUMINUM WHEEL USAGE

Attachment C

Aluminum Wheel Inspection for Heat Damage



WARNING: Excessive heat from fire, brake malfunction, wheel bearing failure, tire failure or other sources may weaken the metal and cause the wheel/tire assembly to separate explosively. Exploding wheel/tire assembly can cause serious injury or death. Immediately and permanently remove from service any wheel that has been exposed to excessive heat.

Inspect for exposure to excessive heat. A wheel that has been subjected to excessive heat may appear charred or burned. A wheel that has been exposed to excessive heat may appear to be in good condition if it has been cleaned. Do not use any wheel that has been overheated regardless of appearance. Even if a wheel does not appear to be obviously burned, inspect the labels, tire bead, brake drum and high temperature nylon spacer for evidence of charring, melting, blistering, or burning.

A wheel may discolor from excessive heat. It can appear a dull grayish color and will not polish to a bright finish as a typical wheel would.

Any wheel run with a flat tire longer than the time necessary to immediately pull off the road should be checked for excessive heat damage.

Note: After January 2009, the new Alcoa Logo may not show heat damage.

A blistered, charred, blackened or cracked-looking logo decal on an Alcoa wheel may indicate that the wheel has been exposed to excessive heat as shown in Figure 1, or discoloration as shown in Figure 2.

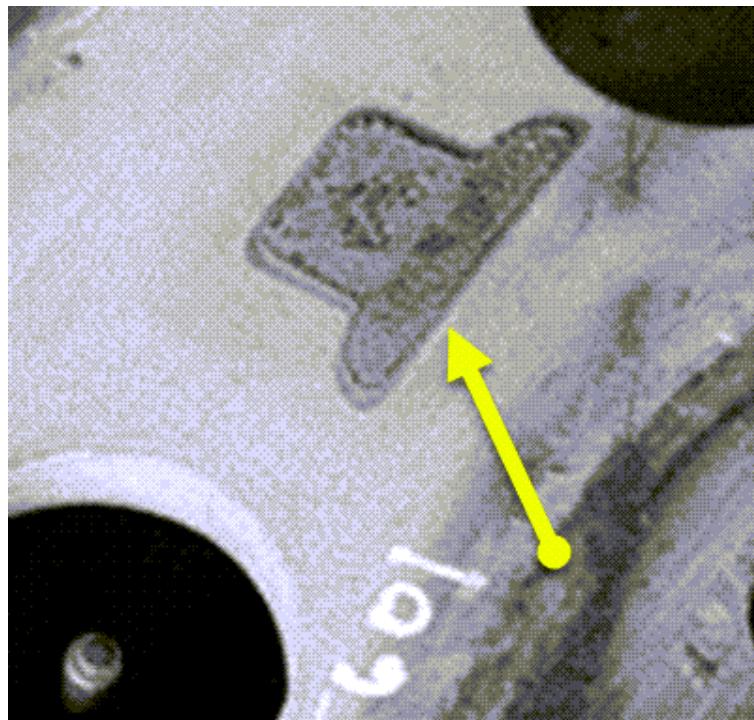


FIGURE 1 - CHARRED STICKER (PRIOR TO 2009)

Attachment C

Aluminum Wheel Inspection for Heat Damage

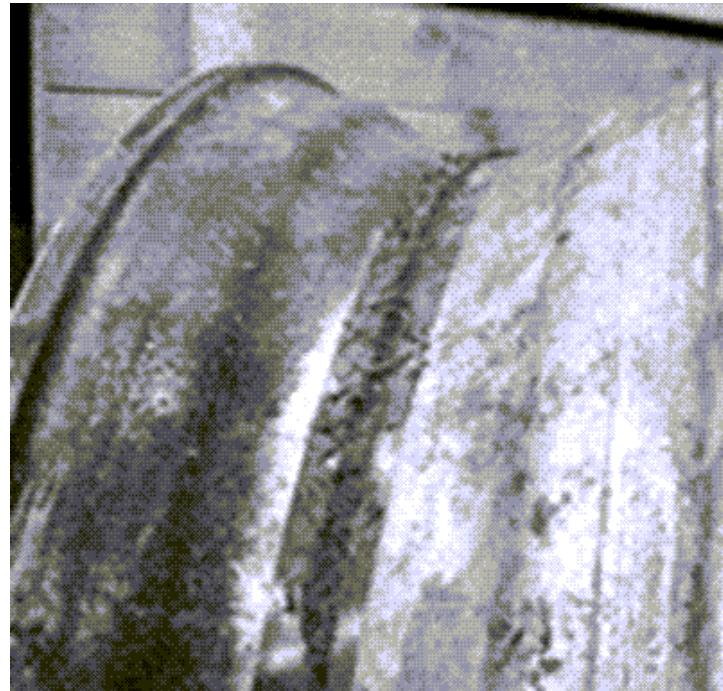


FIGURE 2 - DISCOLORATION OF WHEEL

Inspect all axle end components for signs of exposure to excessive heat. Pay particular attention to brake drums (or discs), high temperature nylon spacer wheel liners (Figure 3) and tire beads. If these components show signs of overheating, the entire assembly, including the wheel, should be replaced.

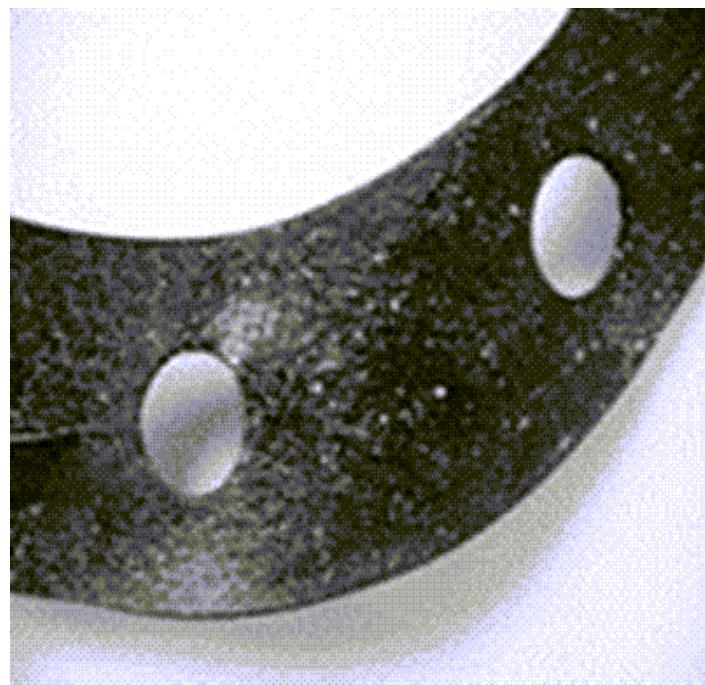


FIGURE 3 - CHARRED HIGH TEMPERATURE NYLON SPACER

Attachment C

Aluminum Wheel Inspection for Heat Damage

Wheels manufactured starting in January 2009 will have a 1-inch clear round heat indicator located next to the roll stamp on the inside as shown in Figure 4, along with the same 1-inch clear round heat indicator located on the tire side drop well as shown in Figure 5.

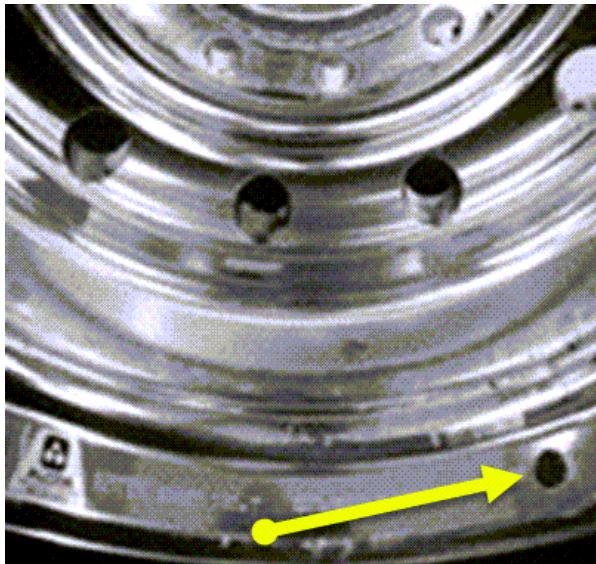


FIGURE 4 - CHARRED HEAT INDICATOR (2009 AND AFTER)

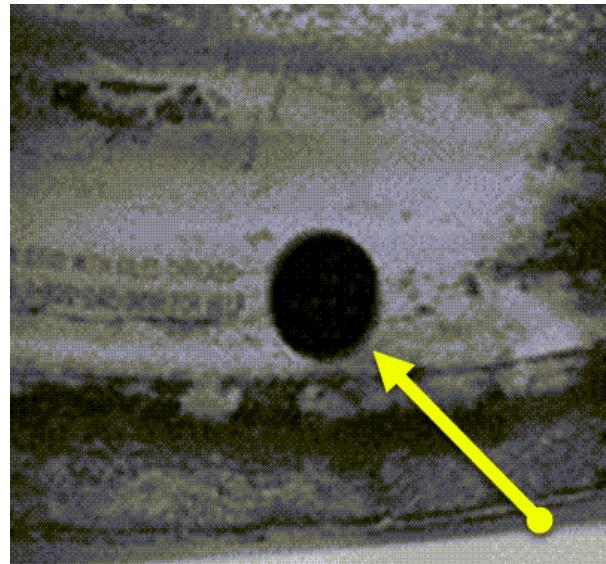


FIGURE 5 – CHARRED HEAT INDICATOR (2009 AND AFTER)

If either of these round labels show signs of blistering, or have a charred, blackened, or cracked look, this may indicate that wheel has been exposed to excessive heat.

IF ANY OF THE ABOVE CONDITIONS ARE SEEN, REMOVE THE WHEEL FROM SERVICE IMMEDIATELY. THIS INCLUDES ANY HEAT DAMAGE TO THE TIRE, DISCOLORATION TO THE WHEEL, AND OR BRAKE DRUM, AND ANY BURNT OR CHARRED LABELS.

Attachment D

Common Tire Wear Patterns

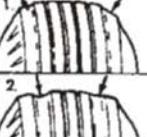
	RAPID WEAR AT SHOULDERS	RAPID WEAR AT CENTER	CRACKED TREADS	WEAR ON ONE SIDE	FEATHERED EDGE	BALD SPOTS	SCALLOPED WEAR
CONDITON							
CAUSE	UNDER INFLATION OR LACK OF ROTATION	OVER INFLATION OR LACK OF ROTATION	UNDER INFLATION OR EXCESSIVE SPEED	EXCESSIVE CANTER	INCORRECT TOE	UNBALANCED WHEEL	LACK OF ROTATION OF TIRES OR WORN OR OUT-OF-ALIGNMENT SUSPENSION
CORRECTION	ADJUST PRESSURE TO SPECIFICATIONS WHEN TIRES ARE COOL ROTATE TIRES		ADJUST CANTER TO SPECIFICATIONS	ADJUST TOE-IN TO SPECIFICATIONS	DYNAMIC OR STATIC BALANCE WHEELS	ROTATE TIRES AND INSPECT SUSPENSION	

FIGURE 1 - COMMON TIRE WEAR PATTERNS

Attachment E

Zafety Lug Lock Application Chart

Stock #	Description	Fleets
943-55-0010	Zafety Lug Lock - 38mm	2101-2231 4200-4412
943-55-0011	Zafety Lug Lock - 33mm	All Low Floor Buses

Zafety Lug Lock Installation Instructions

Orient the device with the words "Patent Pending", "Zafety Lug Lock" and the "Canadian leaf" logo facing you. Install one side of the Zafety Lug Lock device onto one lug nut while orienting the uninstalled part of the device closest to the center the adjacent lug nut. (You may need to remove and reinstall the first lug nut position in order to find the "best fit" position to line up the other half of the device.) Push the device onto the outer edge of the hex. Do not fully engage the lug nut until both lug nuts have the device on them. Install the other half of the device on the adjacent lug nut. The device may "twist" slightly if the hexes are not oriented exactly the same. (This is normal and acceptable. Sometimes the device will be installed with the accordion portion straight. At times the accordion portion will be slightly twisted. Do NOT loosen up or tighten the lug nut to get the hexes to "line up".) After the device has been installed onto both lug nuts, push them fully onto the lug nuts. Repeat for all lug nuts on each wheel and all wheels on bus.

Note: For 33mm lug nuts, the Zafety Lug Lock Tool #Z0001 may be helpful in installing the devices on low floor buses but will not fit the 38mm (1-1/2") and may be too big for the 21mm (13/16") lug nuts. A deep socket on a short extension may be helpful for these applications.



FIGURE 1 - PROPERLY INSTALLED LUG LOCKS

12 Approvals

Controlled Quality Document

I hereby state that I have found no errors of this controlled quality document, and thus the document is authorized for release.

DQMS Manager

BMNT Safety Coordinator

Efficiency Engineer – BMNT

Chief Engineer - BENG

Vice President - BMNT

Senior Vice President - BUSV



Washington Metropolitan Area Transit Authority

PROCEDURE

Procedure Number: BUSV-BMNT-SOP-1.21-05

Battery Maintenance Program

7/25/2024

Revision History

Revision No.	Revision Date	Reviser/Author	Document Section No. (if applicable) or N/A	Description of Changes
01	11/17/2010	BMNT		Initial release
02	07/11/2016	BMNT		Biennial review
03	11/14/2019	BMNT		Biennial review and conversion to new template
04	04/11/22	BMNT	6.5, 6.6	Biennial review, updates to load test and battery charging procedures
05	7/25/2024	Alex Shereika	Throughout, 6.2.2, 6.3.2, 6.4.2.1, 6.5.4, 6.7.6	Updated to reflect reorg, added guidance on battery rotation, added Midtronics tester, corrected polarity sequence, added matching of battery age

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1 Scope

- 1.1 This Standard Operating Procedure (SOP) is applicable to all operating divisions, shops, and support activities within Bus Fleet.
- 1.2 This document has been created in compliance with the Quality Management System Plan (QMSP), Policy Instructions 1.1 (Document Governance and Hierarchy) and 6.1 (Records Management), and the Records Retention Manual.

2 Purpose

- 2.1 This SOP establishes the process for the effective management of the bus battery program and maintenance of batteries used in the WMATA bus fleet. Careful management of the bus battery maintenance program via compliance with this SOP will result in reduced costs to WMATA and ensure a reliable supply of batteries for the bus fleet.

3 Definitions

- 3.1 **Absorbed Glass Mat (AGM) Battery** – A sealed spill-proof lead acid dry cell battery comprised of a fiberglass-like mat soaked in an electrolyte solution.
- 3.2 **Controlled Document** – A document that is reviewed and approved prior to use; it is version-controlled, has a life cycle, and has been uploaded to Bus Fleet's electronic document repository. Examples include, but are not limited to SOPs, bulletins, work instructions, and forms. Any controlled document printed from its electronic repository is considered uncontrolled.
- 3.3 **Document Control** – Those methods established to control the receipt, review, approval, transmittal, dissemination, storage, and archiving of controlled documents such as specifications, work instructions, procedures, and drawings; this includes changes or revisions, which describe and/or document activities affecting quality.
- 3.4 **Lockout/Tagout** - A procedure to ensure the machine or equipment is stopped, isolated for all potential hazardous or energy sources before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury or damage to personnel or the equipment.
- 3.5 **Safety Data Sheet (SDS)** - A document that contains information on the potential health effects of exposure to chemicals, or other potentially dangerous substances, and on safe working procedures when handling chemical products.
- 3.6 **Scrap Battery** – A battery, which is either greater than 4 years old, will not hold a satisfactory charge or has visible damage.
- 3.7 **Warranty Battery** - A battery with defects due to product material, workmanship or not holding a satisfactory charge during the applicable warranty period.

4 Acronyms

- 4.1 **AGM** – Absorbed Gas Mat
- 4.2 **CTF** - Carmen Turner Facility
- 4.3 **PPE** – Personal Protective Equipment
- 4.4 **SDS** - Safety Data Sheet
- 4.5 **SOC** - State of Charge
- 4.6 **SOP** – Standard Operating Procedure
- 4.7 **WMATA** – Washington Metropolitan Area Transit Authority

5 Responsibilities

- 5.1 The Assistant Chief Fleet Officer, Bus has overall responsibility for the administration of this Standard Operating Procedure.
- 5.2 Directors, superintendents, managers, bus maintenance supervisors and lead persons (or designees) are responsible for dissemination and review of this SOP with all appropriate employees. Each is further responsible for appropriate oversight and quality control necessary to ensure full adherence to this SOP at all operating and support locations.
- 5.3 Supervisors must ensure that battery room eyewash stations, fire extinguishers, and personal protective equipment (PPE), are available, appropriate, and in good working order.
- 5.4 Each division and shop are responsible for evaluating and maintaining an adequate supply of batteries within the division or shop.
- 5.5 Bus Fleet Engineering is responsible for the contents of this SOP.

6 Process Steps

6.1 Training

- 6.1.1 All training will be through Technical Training & Development.
- 6.1.2 Any employee performing battery maintenance or diagnostic work must be fully trained. Refresher training is required anytime new equipment or process changes are implemented.
- 6.1.3 Every effort must be made to ensure that there is at least one properly trained employee assigned to overlook the battery room operation per shift. The shift supervisor is responsible for ensuring a backup replacement is fully trained and available during the assigned employee's absence.

6.2 Battery Room

- 6.2.1 Each division or shop must have a designated battery room or area with three distinct sections labeled "Recharged Batteries", "Warranty Batteries", and "Scrap Batteries".
- 6.2.2 Batteries shall be charged and utilized in the order they were removed from service.
- 6.2.3 Battery racks shall be made of materials nonconductive to spark generation or be coated to achieve this objective.
- 6.2.4 Battery load tester instruction posters and battery charger instruction posters shall be displayed in an area where they can be easily referenced in the battery charging/evaluation area.
- 6.2.5 Batteries must be stored on a spill pallet in the battery room area.
- 6.2.6 The battery room door must remain closed at all times to regulate the temperature in the battery room.

6.3 Inventory

- 6.3.1 All new batteries are kept in a secure area such as the storeroom and must be on a spill pallet. Absorbed Glass Mat (AGM) batteries can be stored for up to two years at 77F (25C). Ideal storage temperature is 68F (20C) for even longer storage time.
 - 6.3.2 Batteries shall be charged and utilized in the order they were removed from service.
- NOTE:** Do not store batteries outdoors or in areas where the temperature is not regulated.
- 6.3.3 Any new batteries taken out of the storeroom are to be charged out as a part through a workorder in Maximo. This will establish a proper count usage for cost analysis and enable better inventory management.

6.4 Maintenance Program

6.4.1 Preparation for Testing and Charging

NOTE: Safety goggles and rubber gloves must be worn at all times.

- 6.4.1.1 Visual Inspection – Visually inspect batteries for damage, including cracks, leaks, bulging, and bent, melted or missing terminals. Batteries with any of those conditions shall be removed from service, designated as scrap, and returned to the warranty office for proper disposal.
- 6.4.1.2 Batteries removed from a bus for charging must be charged in a timely manner as to not negatively affect the battery's performance.
- 6.4.1.3 When cleaning batteries, the following instructions shall be followed:
 - No cleaning detergents shall be used on the batteries as this voids the warranty.
 - Batteries shall be washed only by hand or with low pressure water.
 - A small wire brush can be used to remove excess dirt around the terminals.
 - No other tools shall be used to clean batteries.

6.4.2 Approved Equipment

- 6.4.2.1 Only the approved equipment listed below shall be used for battery load testing and charging.

Approved Equipment List			
Equipment Description	Manufacturer	Part Number	Equipment Visual
Terminal Lug Adapter Kit	Enersys	WMATA Stock No: 999550130 Enersys Part No: 3217-0049	
Analog Battery Load Tester	Autometer	WMATA Stock No: N/A Autometer Model No: SB-5/2	

Digital Battery Load Tester	Autometer	WMATA Stock No: N/A Autometer Model No: BVA-34	
6366 Battery Charger	Associated	WMATA Stock No: 999550130 Associated Model No: 6366	
EXP-1000 Meter	Midtronics	WMATA Stock No: N/A Midtronics Model No: EXP-1000	

6.4.3 Contact List

6.4.3.1 The following is a list of contacts associated with the Bus Battery Maintenance Program.

	Northeast Battery	
Odyssey Contractor	Ryan Malloy Warehouse Manager rmalloy@northeastbattery.com 3920 Vero Rd Halethorpe, MD 21227 800-441-8824	Johnny Khem Customer Service Manager jkhem@northeastbattery.com 489 Washington Street, Suite 102 Auburn, MA 01501 800-441-8824 x 104
Associated Charger	Customer Service 800-949-1472	
Autometer Equipment	Customer Service 866-883-8378	
WMATA Warranty Dept.	301-955-7051	

6.5 Battery Testing

NOTE: Accurate testing depends on the temperature of the battery. Before testing a battery, ensure that the battery temperature is at least 50°F. For instance, do not test a battery that was recently removed from a bus that sat outside in cold weather just prior to testing.

- 6.5.1 Brass terminal lug adapters, WMATA stock number 999-55-0130, shall be used at all times when testing.

NOTE: The double striped adapter is for the positive terminal and the single striped adapter is for the negative terminal.

- 6.5.2 Terminal lug adapters shall be hand tightened only. Verify proper contact between the lug adapters and the base of the terminal.

- 6.5.3 Ensure that the tester's load is off.

- 6.5.4 Connect load tester leads to the battery under test to measure the initial state of charge (voltage). To avoid sparks, connect positive lead first.

- 6.5.5 Check the voltage reading.

NOTE: When using the BVA-34 load tester, ensure the Internal/External volts switch is set to "Internal".

- 6.5.5.1 If the battery voltage reading is equal to or greater than 12.4 volts, continue with the load test.

- 6.5.5.2 If the voltage is less than 12.4 volts, discontinue the load test. The battery must be fully charged prior to conducting a load test.

6.5.6 Load Test

- 6.5.6.1 The load to be set for the test is $\frac{1}{2}$ the cold cranking amp rating of the battery under test. For AGM batteries, the load to be set is 575 amps ($\frac{1}{2}$ of 1150 amps).

- 6.5.6.2 Apply the load by turning the load control knob clockwise until the amps display reads 575.

Note: The tester has an auto unload feature, requiring the user to hold the knob in the loaded position. If let go, the knob will spin back and cancel the applied load.

- 6.5.6.3 Once the load is set, immediately press the timer button on the tester.

- 6.5.6.4 During the 15 second test period, the amps reading will slowly drop in value as the voltage of the battery drops. Carefully turn the load control knob clockwise to maintain the load at 575 amps for the duration of the test.

NOTE: Failure to maintain a 575 amp load for the duration of the test will result in an invalid test that could result in a bad battery being declared as having passed the test.

- 6.5.6.5 Once the timer light on the tester turns off, immediately observe the voltage reading and write this value down.

- 6.5.6.6 Immediately turn the load control knob fully counterclockwise to remove the load on the battery.
- 6.5.6.7 Refer to the table below to determine pass/fail criteria.

TABLE 1 - BATTERY LOAD TEST PASS/FAIL CRITERIA

Battery Temperature	Minimum Voltage Required
70°F or Above	9.6
60°F	9.5
50°F	9.4

- 6.5.6.8 If the battery voltage reading is less than the required value in the above table, perform a full charge of the battery and then perform a new load test. If the second load test fails, the battery is bad and **shall be prepared for warranty claim**.
- 6.5.6.9 After ensuring the load is off, disconnect the tester, negative lead first.

Caution: The SB-5/2 load tester has a fan override switch that when put into the override position will keep the fan running any time the tester is connected to a battery. If multiple batteries are being tested in rapid succession with the same tester, place the switch in the override position to help prevent the carbon pile within the tester from overheating.

When using the BVA-34 tester, allow the tester to rest for a minimum of one minute between load tests to avoid excess loading of the carbon pile that could result in damage to the tester.

6.6 Battery Charging

- 6.6.1 Brass terminal lug adapters, WMATA stock number 999-55-0130, shall be used at all times when testing.

NOTE: The double striped adapter is for the positive terminal and the single striped adapter is for the negative terminal.

- 6.6.2 Terminal lug adapters shall be hand tightened only. Verify proper contact between the lug adapters and the base of the terminal.

6.6.3 Charger Status Lights

- 6.6.3.1 The battery charger has three status lights for each of the four charger channels. The following describes their function and what each indicates:

Light Condition	Status Indication
Continuous Red Light	AC power is on
Slow Blinking Red Light	Weak Battery
Fast Blinking Red Light	Battery connection is incorrect (reversed polarity), check connection

Continuous Green Light	Battery connection is correct
Continuous Yellow Light	Charging in progress
Blinking Yellow Light	Battery charging is nearly complete, and charger is in the finish charging mode.
Blinking Green Light	Charging is complete and charger is in float mode
Flashing Green and Yellow Lights	Charger is in the first stage of deep discharge recovery mode.

6.6.4 Charger Operation

- 6.6.4.1 Turn the charger power switch to “ON” (Red indicator light should come on).
- 6.6.4.2 Position the battery type selector switch to the appropriate setting for the battery to be charged (Typically, AGM).
- 6.6.4.3 Connect the positive (Red) clamp to the positive (+) battery terminal.
- 6.6.4.4 Connect the negative (Black) clamp to the negative (-) battery terminal

Note: The green light should come on for five seconds. The yellow light will come on when the green light goes off and charging will begin.
- 6.6.4.5 If the green light does not come on there may be a bad connection, or the battery voltage may be too low (less than three volts). Ensure proper electrical connections by rocking the clamps back and forth on the terminal lug adapters.
- 6.6.4.6 If the green light still does not come on, check the battery voltage, if voltage reading is less than 3 volts, perform the following “Dead Battery Override” steps.
 - 6.6.4.6.1 Connect the dead battery to the charger’s channel 2, placing the battery as far away from the charger as the cables will allow.
 - 6.6.4.6.2 Press and hold the charger’s override switch.
CAUTION: Never press the override switch without a battery connected.
 - 6.6.4.6.3 After ten seconds, release the override switch. If the battery accepts a charge, the charger will indicate charging by continuously illuminating the yellow light.
 - 6.6.4.6.4 If the battery does not accept a charge after three attempts, the battery is bad and shall be prepared for warranty claim.
- 6.6.4.7 Once the green light is flashing, charging is complete.
- 6.6.4.8 Turn off power to the charger.
- 6.6.4.9 Disconnect the battery from the charger.

6.7 Battery Installation

- 6.7.1 Batteries are installed in accordance with the established maintenance procedures following the utilization of all safety requirements.
- 6.7.2 The supply of recharged batteries is to be depleted prior to the use of new batteries.
- 6.7.3 Prior to installation, the State of Charge (SOC) must be verified with the Autometer battery load tester, the battery must be at least 12.4 volts or above.
- 6.7.4 Any time there is a battery charged out to a bus, the correct battery part number and component code shall be used on each work order.

Component Code: 000-200-110-0001 Odyssey Battery Part No. 876-72-0041

NOTE: Do not use any type of anti-corrosion protectant directly to the battery terminal (i.e., Noco corrosion preventive compound metro part number R61-60-0083).

NOTE: Only use hand tools to loosen and tighten battery terminal hardware.

- 6.7.5 On each new battery, the Bus Fleet employee punches out the appropriate month/year disks on the date sticker showing the initial installation date.
- 6.7.6 When possible, Bus Fleet employees should group batteries with similar installation (in-service) dates when performing a battery replacement.

6.8 Warranty

- 6.8.1 All AGM batteries have a warranty period of four years. During this time, there shall be a full replacement at no charge to WMATA.
- 6.8.2 All batteries are to be returned to the warranty department at the Carmen Turner Facility (CTF). Battery returns are only accepted on Tuesdays between the hours of 6-11 AM. Before any division or shop returns any batteries, they must first contact the warranty department to determine if there is sufficient space. Personnel delivering batteries must check in at the warranty department so the pallet can be inspected.
- 6.8.3 Warranty batteries being delivered to the warranty department shall be:
 - Cleaned
 - Placed on pallets
 - Stacked no more than two batteries high with cardboard honeycomb between the layers
 - Secured with shrink wrap
 - Accompanied by a Battery Warranty Worksheet

Note: The pallet will be rejected if the above conditions are not met.

Note: Non-bus batteries will not be accepted.

6.8.4 The warranty department will work with the battery manufacturers/suppliers to resolve any warranty disputes. Batteries confirmed to be under warranty will be replaced at no cost to the Authority and will be placed back in inventory.

6.8.5 The battery is void of warranty when the batteries are outside the warranty period, there is any damage or abuse, and if the voltage is below 10 volts.

6.9 Scrap Batteries

6.9.1 Each division and shop will return all batteries designated as scrap to the warranty department. The batteries will be on a separate pallet stacked no more than two batteries high with cardboard honeycomb between the layers, secured with shrink wrap, labeled as "scrap" with masking tape. Do not write on the batteries.

6.9.2 The warranty department will validate 10% of the batteries from each Battery Warranty Worksheet to determine that the battery has reached its useful life or has been damaged.

6.9.3 Batteries that have been confirmed as "scrap" will either be turned over to surplus property for auction or turned over to the battery vendor for core value credit.

6.9.4 Once sufficient core value is accumulated, they are exchanged for new batteries which are returned to inventory.

6.10 Compliance with this SOP and careful management of the Bus Battery Maintenance Program will result in reduced cost to the Authority, ensure a reliable supply of batteries and help achieve our goal of providing safe reliable transportation to the riding public.

7 Safety Management

- 7.1 This document has been created in compliance with WMATA's safety plan and safety policy. Any hazards and risks associated with the processes within this document have been evaluated for safety and have appropriate mitigation strategies established as part of WMATA's overall risk assessment management, where applicable and/or relevant. This document is also subject to monitoring for safety risk mitigation adherence and safety performance, and has effective communication practices in place, including adequate safety training to ensure competencies, and to solicit feedback from the affected employees, where applicable and/or relevant. For further guidance on WMATA's safety plan, visit the Department of Safety and Readiness intranet homepage.
- 7.2 It is the responsibility of each supervisor and employee to ensure that all applicable Safety guidelines are followed when performing maintenance, or any activity, on Authority equipment or while on Authority property. This includes the adherence to any Lockout/Tagout procedures, and safety equipment such as but not limited to, safety vest, gloves, goggles, and proper footwear. Employees shall also follow Safety Data Sheet (SDS) guidelines when using products containing chemicals and adhere to the requirements of the Authority Electronic Device Policy.

8 References

- 8.1 Authority Electronic Device Policy
- 8.2 Policy Instruction (P/I) 1.1 Document Governance and Hierarchy
- 8.3 Policy Instruction (P/I) 6.1 Records Management
- 8.4 Quality Management System Plan (QMSP)
- 8.5 Records Retention Manual

Note: Always check to ensure use of most recent revision of the above referenced documents

9 Records

- 9.1 Battery Warranty Worksheet

10 Appendices, Attachments and/or Exhibits

N/A

11 Approvals

Controlled Quality Document

I hereby state that I have found no errors of this controlled quality document, and thus the document is authorized for release.

Director, Bus Fleet Garage Operations

Signature: Joseph A Haberkorn
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BOSCH

HPT 500

High Pressure Leak Tester

P/N 1699500000



OPERATION MANUAL FOR HD / MEDIUM DUTY APPLICATIONS

Pair With HD / Medium Duty Accessory Kit BOSCH P/N 1699500001

OPERATION MANUAL FOR AUTOMOTIVE / LIGHT TRUCK APPLICATIONS

Pair With Automotive / Light Truck Accessory Kit BOSCH P/N 1699500002





IMPORTANT NOTE:

The HPT 500 High Pressure Leak Tester is intended to be paired with a specially engineered Bosch Accessory Kit, available from any authorized Bosch dealer

HPT 500 HD / Medium Duty Accessory Kit (optional) P/N 1699500001

For use on Heavy and Medium Duty Trucks and Equipment

Use with the HPT 500 High Pressure Leak Tester to block off, pressurize, and test the intake and exhaust system of heavy duty and medium duty trucks, pinpointing faults within minutes. Also included are the accessories to test for cooling system leaks as well as exhaust leaks in the cab, water intrusion, and wind/water leaks.

HPT 500 Automotive / Light Truck Accessory Kit (optional) P/N 1699500002

For use on Turbo, Diesel, and Boosted Vehicles

When paired with the HPT 500 High Pressure Leak Tester, special adapters allow technicians to test the intake and exhaust systems of turbo / diesel / boosted automobiles and light duty trucks, pinpointing leaks in minutes.





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Product Support / Warranty

Telephone: 1-855-BoschTech (1-855-267-2483)
Fax: 1-800-955-8329
E-mail: techsupport.diagnostics@us.bosch.com



SPECIFICATIONS

Dimensions	10 in x 11 in x 14 1/2 in (25 cm x 28 cm x 37 cm)
Weight - HPT 500	19 lbs. (8.5 kg)
Shipping - Weight	23 lbs. (10.5 kg)
Shipping - Dimensions	12.5 in x 15.5 in. x 18.25 in. (32 cm x 39 cm x 46 cm)
Electrical Power Supply	110-240V AC or 11.5-12.5V DC
Compressed Air (Clean, Dry)	20 to 110 PSI (1.38 to 8.25 bar)
Output Pressure	2 to 20 PSI (0.14 to 1.4 BAR)
Operating Temperature	0°F to 140°F (-17°C to 60°C)
Operating Humidity	10 to 90% RH Non-Condensing
Operating Altitude	6562 ft. (2000m)
Vapor Output Hose	15 ft. (5 m)
AC Power Cable	6 ft. (2 m)
Operating Modes	Vapor Cycle / Air Only Cycle
Enclosure Material	Sheet Steel, Powder Coated
Vapor Chamber Materials	Billet Aluminum & Steel
Vapor Chamber Assembly	Bolted
Vapor Chamber Warranty	Lifetime
HPT 500 Warranty	1 Year

REFERENCE GUIDE

1. Flow Control Valve (Variable)

Releases vapor / pressure into the system
Close flow control valve to lock out system for pressure decay testing

2. Power Indicator

Green light indicates proper connection to electrical power

3. Vapor Test Switch

Begins 15-minute vapor cycle. Red light indicates vapor cycle. Push again to stop testing

4. Air Only Test

Begins 15-minute air only cycle. Blue light indicates air only cycle. Push again to stop testing

5. Reset Switch

Clears stored logic

6. System Pressure Gauge

Displays the back pressure of system under test

7. Flow Meter

Measures flow rate into system under test

8. Adjustable Pressure Regulator

Adjust test pressure from 2 to 20 PSI (0.14 to 1.4 BAR)

9. Test Pressure Gauge

Indicates test pressure set by regulator

10. Vapor Output Hose

11. Power Supply Selector Switch

AC-OFF-DC

12. Compressed Air Inlet

Replace coupler fitting if necessary.
Female 1/4 in. NPT fitting

13. International AC Power Inlet (110-240V)

14. 12V DC Power Inlet

15. 12 Amp Circuit Breaker

16. Fluid Fill Port

Remove fluid fill plug to fill machine with OEM- Approved Vapor Producing Fluid

FRONT VIEW



BACK VIEW



ACCESSORIES INCLUDED

1. Vapor Producing Fluid [580904] 8 fl. oz. (237 ml)

Vapor Producing Fluid will perform over 500+ typical tests per bottle

Important: Contains NO Dye / Contaminants

1



2. Ball-End Hex Point L Key 1/8 in x 6 in (0.3 cm x 15 cm) [580903]

To remove / replace fluid fill plug

2



3. AC Power Cable [580902]

Use with AC Power. Cable must be rated to match input voltage and plug configuration

3



4. Wand / Tip Adaptor [580901]

Install into SmokeMeister™ wand for pinpoint vapor stream

4



5. Spare Fuse [580900]

Spare fuse included in AC fuse storage receptacle

5



6. Remote Control Key Fob [580899]

Use for remote control operation

6





1. FILL / ADD VAPOR PRODUCING FLUID

- Remove fluid fill plug with hex key.
- Pour OEM-Approved Vapor Producing Fluid into fluid fill port.
- Fill fluid fill port until fluid level is near top of port.
- Replace fluid fill plug.

⚠ 2 fl. oz. (60 ml) maximum to refill when empty

2. CONNECT TO POWER

- Use the power selector switch on rear of machine to select input power, AC or DC.
- If 12 Volt DC is preferred, connect the detachable battery cable to a fully charged 12 Volt battery. RED to positive, BLACK to chassis ground.
- If AC power is preferred, connect a properly rated power cord into the AC Power Port.
- Green Power Indicator lamp illuminates with proper connection and power source selected.

⚠ Never connect HPT 500 to a battery charger or jumper box.

⚠ Never connect HPT 500 to vehicle with engine running.

3. CONNECT TO AIR SUPPLY

- Connect compressed air supply to Air Inlet.
- *Replace quick coupler fitting if necessary. 1/4 in. NPT male.

4. Adjust HPT 500 for testing

- Turn Flow Control Valve off.
- Set desired Test Pressure. (**PULL** to unlock, **TURN** to adjust pressure, **PUSH** to lock)
- Attach Vapor Hose to installed adapter of system being tested.
- Depress the Vapor start switch to begin 15-minute vapor cycle.
- Turn Flow Control Valve to release pressure / vapor.
- Use halogen inspection light provided to inspect for leaks.



SAFETY

HPT 500 is designed only to be used in conjunction with BOSCH accessory kits (P/N 1699500001, 1699500002) Power INTAKE™ Adapters, threaded sensor port adapters or cooling system adapters to test the intake, exhaust, and cooling systems of boosted engines.

DO NOT USE IN EVAP SYSTEM

HPT 500 utilizes higher test pressure that may damage components in evaporative emission systems.

SAFETY TIPS

- All diagnostic work should be performed with the engine off
- For use only by professional technicians
- Ensure that the vehicle is secure and stable
- Exercise caution when connecting and disconnecting compressed shop air supply
- Do not leave a vehicle unattended while equipment is operating
- Always wear proper safety protection
- This safety guide is not intended to take the place of common sense and good judgment

Power INTAKE™ Adapter Safety Warnings:

- The maximum test pressure a Power INTAKE™ Adapter may restrain can only be estimated.
- Slippage of a Power INTAKE™ Adapter is influenced by many factors including debris / residue in the Intake / Exhaust system, coefficient of friction, internal pressure of the Power INTAKE™ Adapter, and the accuracy of inflation instruments.
- Generally, a Power INTAKE™ Adapter properly inserted into an Intake / Exhaust system may begin slipping when test pressure exceeds 50% of the internal inflation pressure. Inflation pressure and back pressure limitations are subject to temperature / humidity change.
- Power INTAKE™ Adapter should NEVER be inflated over 1.6 times its outside diameter.
- Debris, protrusions and residue in the Intake / Exhaust system could weaken and / or rupture the bladder of the Power INTAKE™ Adapter. Bladder failures due to misuse or abuse are not covered by warranty. Bosch USA shall not be responsible for any incidental or consequential damages.
- Power INTAKE™ Adapter must be mechanically anchored with the provided chain / cable to a secure anchor before use.
- Power INTAKE™ Adapter slippage under test pressures may cause property damage or injury.
- NEVER use inflation pressure with Power INTAKE™ Adapter or a test pressure that is greater than the capacity of the weakest component in the system under test.
- NEVER use Power INTAKE™ Adapter when its failure could cause injury or catastrophic damage.
- Before use: Refer to Power INTAKE™ Adapter Installation and Inflation procedures, back pressure limitations and tether restraint installation instructions.



POWER INTAKE™ ADAPTER INSTALLATION

Installing Power INTAKE™ Adapter:

1. Install Power INTAKE™ Adapter fully into intake system ductwork or exhaust tubing. Make sure there are no obstructions or sharp edges that might puncture bladder when inflated. Power INTAKE™ Adapter must insert completely inside ducting / tubing.
2. Install safety chain / cable to a secure location.
3. Inflate Power INTAKE™ Adapter to 30 PSI (2 BAR) maximum. If over inflated, pop off safety valve may release. If release occurs, reinflate to 30 PSI (2 BAR).
4. Firmly tug on safety chain to insure Power INTAKE™ Adapter is firmly installed and properly secure.
5. Attach vapor hose for testing.



Proper Installation



Improper Installation

Removal of Power INTAKE™ Adapter:

1. Remove vapor hose (or block off adapter) at quick coupler to deflate tested system
2. ONLY AFTER system under test is fully depressurized, release internal pressure of Power INTAKE™ slowly by depressing Schrader valve
3. Detach safety chain / cable
4. Remove Power INTAKE™ Adapter from ductwork, making sure not to rub across sharp edge

Power INTAKE™ Adapters are available in optional accessory kits (P/N 1699500001, 1699500002) or individual purchase



TESTING FOR LEAKS

Intake System Leak Testing

This test will find any leaks in ducting, charged air cooler, turbocharger, intake manifold, throttle body, seals, gaskets, hoses, etc.

Seal off intake system by installing Power Intake™ Adapter (see instructions) into intake ducting after air cleaner box. Begin a 15-minute vapor cycle and pressurize entire system with vapor at 5 PSI (0.35 BAR) while inspecting for leaks using provided halogen inspection light. If no leaks are present, increase pressure to 10 PSI (0.7 BAR) to observe leaks. Retest after repairs are performed to confirm proper repair and seal.

Exhaust System Leak Testing

This test will find any leaks in exhaust tubing, clamps, flex pipe, muffler, diesel particulate filter, turbocharger, exhaust manifold, etc.

Seal off exhaust system by installing Power Intake™ Adapter (see instructions) into exhaust pipe. If using inside exhaust stack use the exhaust retention hoop to keep Power Intake™ Adapter from falling inside exhaust stack. Exhaust Particulate Filter or Catalytic Convertor may not allow visible vapor to pass through because the particulates get trapped. In that case you may use block off coupler to convert Power Intake™ Adapter into a block off adapter while injecting smoke into the system using the Temperature Sensor Port Adapter, Pressure Sensor Port Adapter or Oxygen Sensor Port Adapter. These adapters give you a great amount of flexibility in testing all areas of the exhaust system. Retest after repairs are performed to confirm proper repair and seal.

Combination Intake / Exhaust Testing

Some vehicles allow for a single procedure to test the entire intake and exhaust system at one time.

Many engine systems can be tested from the air box to the tip of the exhaust completely in a single test. To do so, install Power Intake™ Adapter (see instructions) into intake ducting after air cleaner box AND install Power Intake™ Adapter (see instructions) into exhaust pipe. Convert Power Intake™ Adapter in exhaust system into a block off by installing block off coupler. Inject vapor into the intake system through the Power Intake™ Adapter. Pressurize entire system inspecting for leaks. Note: Complete system testing can occur when valve overlap is present or EGR valve is in open position. In cases where valve overlap cannot occur or EGR may not be opened either manually or computer controlled, separate system testing must be performed. Retest after repairs are performed to confirm proper repair and seal.

Cab Leak Testing

Test for driver cabin exhaust / carbon monoxide infiltration, wind and water leaks.

Key on / Engine off, turn circulation fan to its highest speed making sure that the fresh air option is used (NOT recirculate). If vehicle has dual air option, also initiate fan, selecting highest fan speed setting. The circulation fan produces a positive cabin pressure. Make sure all windows and doors are completely closed. Install SmokeMeister™ Wand to end of Vapor hose. Set test pressure to 3 PSI (0.2 BAR). Make sure test is performed in a "still air" environment such as in a closed building. Using SmokeMeister™ Wand proceed around vehicle cabin laying down fluffy vapor on all seams, seals and joints looking for vapor deflection from escaping air (leaks). Where vapor is deflected is a visual confirmation of a leak. Seal leak and retest entire cabin for further leaks. To check for doghouse engine cover leaks, turn off fans, install wand tip adapter into wand, and inject vapor underside of doghouse while someone inside cabin looks for leaks. Retest after repairs are performed to confirm proper repair and seal.



TESTING FOR LEAKS

Coolant System Leak Testing

Cooling system leak testing can be performed two ways

Use Bosch HPT 500 to quickly and easily find cooling system leaks either with decay testing or using visible vapor. First, attach provided cooling system adapter to pressurized coolant bottle or radiator at cap. For decay testing, simply pressurize coolant system with air-only to manufacturers recommended test pressure, typically 15 PSI (1 BAR). Turn off flow control valve to lock out system and watch for decay. Inspect visually for leaking fluid. Alternatively, to perform leak test using vapor, first drain the cooling system of all fluid. Introduce pressurized vapor in to cooling system at no more than the manufacturers recommended test pressure and use inspection light to find leaks. Retest after repairs are performed to confirm proper repair and seal.



IMPORTANT NOTE

Many leaks in heavy duty systems are considered "normal" or "within tolerance." For example, a weep hole in a muffler is acceptable. DO NOT assume every wisp of vapor represents a failing component. Check with vehicle manufacturer before replacing suspected failed part.

OPTIONAL HD / MEDIUM DUTY TRUCK ACCESSORY KIT (P/N 1699500001)

1. Accessory Storage Case [580915]

2. Power INTAKE™ Adapter 3.9 in. (10 cm) Diameter [580914]

Inflatable block off bladder with a pressurized vapor pass-through.
Kit includes 2 adapters

3. Exhaust Stack Retention Hoop [580913]

Prevents adapter from falling down exhaust stack

4. SmokeMeister™ Wands [580912]

Delivers vapor to difficult to reach areas to pinpoint water intrusion,
carbon monoxide cab leaks, all wind and water leaks (set of 3)

5. Halogen Inspection Light [580911]

12V DC with 20 ft. (6.1 m) cable. Always use to pinpoint leaks

6. Vapor Producing Fluid 8 fl. oz. (237 ml) [580904]

Vapor Producing Fluid will perform over 500+ typical tests per bottle
Important: Contains NO Dye / Contaminants. Kit includes 2 bottles

7. Ball-End Hex Point L Key 1/8 in x 6 in (0.3 cm x 15 cm) [580903]

To remove / replace fluid fill plug

8. Cooling System Adapter [580910]

To test cooling system or coolant reservoir. Attach to radiator

9. Oxygen Sensor Port Adapter [580909]

Use to access exhaust system through oxygen sensor port

10. Temperature Sensor Port Adapter [580908]

Use to access intake or exhaust system through temp sensor port

11. Pressure Sensor Port Adapter [580907]

Use to access intake or exhaust system through pressure sensor port

12. Block Off Coupler [580906]

Used to block smoke hose to convert Power INTAKE™ Adapter into
a block off bladder

13. Detachable 12V DC Power Cable [580905]

Detachable 12V DC power cable if preferred over AC. 15 ft (5 m)





OPTIONAL AUTOMOTIVE / LIGHT TRUCK ACCESSORY KIT (P/N 1699500002)

1. Accessory Storage Case [580915]

2. Power INTAKE™ Adapter 1.9 in. (5 cm) Diameter [95-0086]

Inflatable block off bladder with a pressurized vapor pass-through

3. Power INTAKE™ Adapter 2.9 in. (7 cm) Diameter [95-0081]

Inflatable block off bladder with a pressurized vapor pass-through

4. Halogen Inspection Light [580911]

12V DC with 20 ft. (6.1 m) cable. Always use to pinpoint leaks

5. Vapor Producing Fluid 8 fl. oz. (237 ml) [580904]

Vapor Producing Fluid will perform over 500+ typical tests per bottle

Important: Contains NO Dye / Contaminants

6. Ball-End Hex Point L Key 1/8 in x 6 in (0.3 cm x 15 cm) [580903]

To remove / replace fluid fill plug

7. Oxygen Sensor Port Adapter [580909]

Use to access exhaust system through oxygen sensor port

8. Temperature Sensor Port Adapter [580908]

Use to access intake or exhaust system through temp sensor port

9. Pressure Sensor Port Adapter [580907]

Use to access intake or exhaust system through pressure sensor port

10. Block Off Coupler [580906]

Used to block smoke hose to convert PowerSmoke™ Adapter into a block off bladder

11. Detachable 12V DC Power Cable [580905]

Detachable 12V DC power cable if preferred over AC. 15 ft (5 m)



OPTIONAL / REPLACEMENT ACCESSORIES

1. Replacement Bulb [580920]

MR-16 bulb, replacement for Inspection Light



2. Power INTAKE™ Adapter 1.5 in (4 cm) [580919]

Inflatable block off bladder with a pressurized vapor pass-through



3. Power INTAKE™ Adapter 1.9 in (5 cm) [580918]

Inflatable block off bladder with a pressurized vapor pass-through



4. Power INTAKE™ Adapter 2.9 in (7 cm) [580917]

Inflatable block off bladder with a pressurized vapor pass-through



5. Power INTAKE™ Adapter 3.9 in (10 cm) [580914]

Inflatable block off bladder with a pressurized vapor pass-through



6. Power INTAKE™ Adapter 5.9 in (15 cm) [580916]

Inflatable block off bladder with a pressurized vapor pass-through



7. Vapor Producing Fluid [580904] 8 fl. oz. (237 ml)

Vapor Producing Fluid will perform over 500+ typical tests per bottle

Important: Contains NO Dye / Contaminants



8. Fuse [580900]

Spare fuse included in AC fuse storage receptacle





TROUBLE SHOOTING / WARRANTY

PROBLEM	SOLUTION
No Green Light	<ul style="list-style-type: none">• Check for proper battery voltage• Align power supply switch with input (AC or DC)• Check polarity if 12V DC is selected• Check fuse if AC Power is selected
Red Light Flashing	<ul style="list-style-type: none">• Open circuit / internal component• Contact: 1-855-BoschTech (1-855-267-2483)Fax: 1-800-955-8329Email: techsupport.diagnostics@us.bosch.com
No Air Flow	<ul style="list-style-type: none">• Check connection to compressed air• Open the flow control valve• Check hoses are not kinked or pushed into machine
Poor Vapor Density or Volume	<ul style="list-style-type: none">• Insufficient Vapor Producing Fluid: Refill• Flow Control Valve is partially closed• Vapor Output Hose is kinked
High Test Pressure Reading	<ul style="list-style-type: none">• Vapor Output Hose is kinked

WARRANTY

Bosch USA ("Bosch") warrants this product to be free from defects in workmanship and material under normal use and service for a period of one-year from the date of purchase. Bosch USA's liability under this warranty is limited to: (1) repair or replacement of any parts or product which are determined to be defective; or at Bosch USA's sole option (2) refund of the purchase price. In either event, product to be returned shipping prepaid within the one year warranty period. Additionally, the vapor chamber in any Bosch USA product has a lifetime warranty as to its structural integrity: Any Bosch USA vapor chamber that leaks, cracks, or separates in any way shall be repaired or replaced by Bosch USA at no charge. Products are only to be used by persons having skill and knowledge in the motor vehicle repair field, and improper use or maintenance may cause serious injury. In no event shall Bosch USA be liable beyond replacement of product or refund of the purchase price. This warranty shall void if a product is improperly maintained, altered, abused or otherwise misused in any way.

THE AFORESAID WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, AND THERE ARE NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER MADE BY BOSCH USA, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR APPLICATION.

THE PURCHASER'S SOLE REMEDY FOR ANY DEFECTIVE PRODUCT SHALL BE REPAIR, REPLACEMENT OR REFUND AS STATED ABOVE AND BOSCH USA SHALL NOT BE LIABLE TO ANYONE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, INDIRECT OR PUNITIVE DAMAGES ON ACCOUNT OF DEFECTIVE PRODUCTS, HOWEVER CAUSED, UNDER ANY THEORY OF LIABILITY.



BOSCH

Product Support / Warranty

Telephone: 1-855-BoschTech (1-855-267-2483)
Fax: 1-800-955-8329
E-mail: techsupport.diagnostics@us.bosch.com

MADE IN

CALIFORNIA
USA

Bosch USA

US & INT'L PATENTS PENDING

HPT 500 OPM 031302017

P/N 01-0120/A

FUMES COMPLAINT CHECKLIST

Bus #:	Division:
Work Order #:	Date:

1. Check Maximo History

Fumes related repairs Yes No

Work Order #: _____ Date: _____

Exhaust /Engine repairs Yes No

Work Order #: _____ Date: _____

2. Check Engine Light Yes No Codes: _____

3. Cummins Insite Aftertreatment Data

How often is Regen occurring? _____ What is the Soot load? _____

4. Pressure Test Cooling System

Split Loop Yes No

Coolant Leaks (Engine Loop) Yes No

Coolant Leaks (Heater Loop) Yes No

(NOTE: Both loops must be tested on Split Systems)

5. Defroster/Heater Compartment Inspection

Coolant Leaks Yes No

Defects: _____

6. Other Fluid Leaks

Engine Oil Yes No

Transmission Yes No

Hydraulic Yes No

7. Inspect Interior Engine Compartment Access Door

Worn or damaged bulb seal Yes No

FUMES COMPLAINT CHECKLIST

8. Inspect Exhaust/Aftertreatment System

Leaking Gaskets	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Evidence of Soot	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Loose or Damaged Clamps	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Exhaust Blankets Damaged	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Damaged Piping/Component	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Contact with Other Components	<input type="checkbox"/> Yes	<input type="checkbox"/> No

9. Use Bosch HPT 500 Leak / Smoke Machine (Reference Operator Manual)

Leaks Yes No

10. Auxiliary Heater Functional Yes No

Defect: _____

11. Road Test

Perform Road Test Yes No
Drivability Issues Yes No

12. Stationary Regeneration

Perform Stationary Regeneration Yes No
Evidence of Engine Blowby Yes No
Smoke Coming from Tailpipe Yes No

13. Observations:

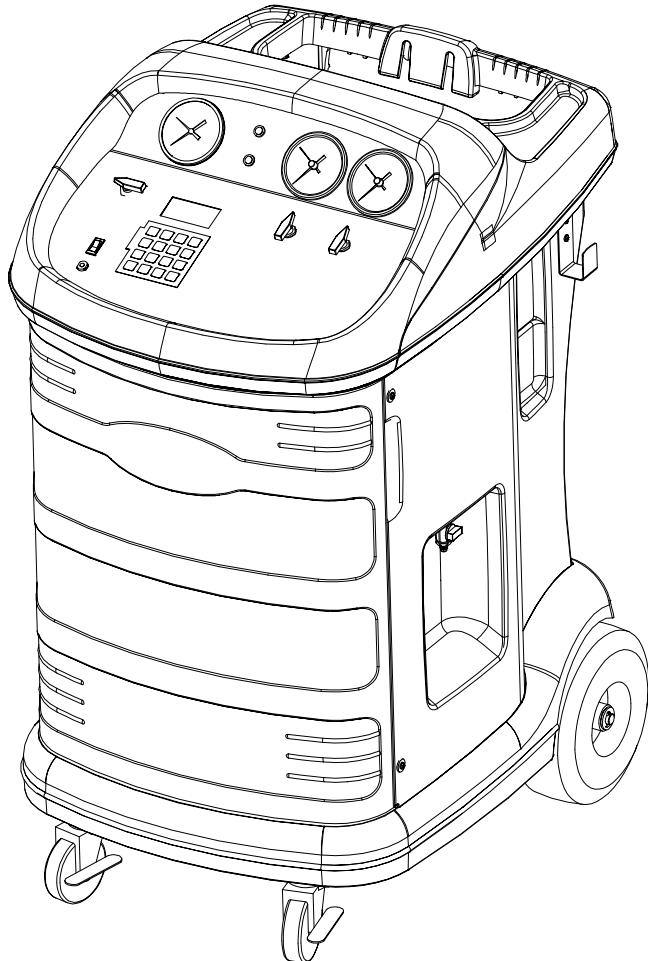
Employee Name	(Print)	ID Number
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Supervisor Name	(Print)	ID Number
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Distribution:
Master Bus File
Electronic Copy Bus Reliability

ROBINAIR

Operating Manual



Model 17800B/17801B
Recovery/Recycling/Recharging Unit
For Multiple Refrigerants

ROBINAIR

Refrigerant Recovery,
Recycling, and Recharging
Station

Design Certified by

Underwriters

Laboratories Inc.,®
to meet SAE-J-1770
for recycling R-134a
and R-12 using
common refrigeration
circuits.



LISTED



80S2

Model: 17800B

Volts: 115V 60 Hz

Amps: 12.0

Refrigerants: R-12, R-134a,
ARI 98 Class III, and ARI 98 Class IV

Design Pressure: High 382 psig
Low 171 psig

Serial No.:

Date Code:



WARNING



PRESSURIZED TANK CONTAINS LIQUID REFRIGERANT. OVERFILLING OF THE TANK MAY CAUSE VIOLENT EXPLOSION AND POSSIBLE INJURY OR DEATH. Safety devices require the use of only authorized refillable refrigerant tanks. This includes Robinair Part Numbers 17506 and 34750 (50lb.) tank. Do not recover refrigerants into a non-refillable storage container! Federal regulations require refrigerant to be transported only in containers meeting DOT spec. 4BW or DOT spec. 4BA.

ALL HOSES MAY CONTAIN LIQUID REFRIGERANT UNDER PRESSURE. Contact with refrigerant may cause injury. Wear proper protective equipment, including safety goggles. Disconnect hoses with extreme caution.

HIGH VOLTAGE ELECTRICITY INSIDE PANELS. RISK OF ELECTRICAL SHOCK. Disconnect power before servicing unit. Refer to the operating manual.

TO REDUCE THE RISK OF FIRE, avoid the use of an extension cord because the extension cord may overheat. However, if you must use an extension cord, the cord shall be No. 14 AWG minimum and keep the cord as short as possible. Do not use this equipment in the vicinity of spilled or open containers of gasoline or other flammable substances.

Use this equipment in locations with mechanical ventilation that provides at least four air changes per hour or locate the equipment at least 18 inches off the floor.

Make certain that all safety devices are functioning properly before operating the unit. Before operating, read and follow the instructions and warnings in the operating manual.

CAUTION: RISK OF INJURY. THIS EQUIPMENT SHOULD ONLY BE OPERATED BY CERTIFIED PERSONNEL. Operator must be familiar with A/C systems, refrigerants and the dangers of pressurized components.

Use this unit only with R-12, R-134a, and ARI 98 Refrigerant Classes III and IV systems only. This unit is not designed for any other purpose than recovering or recycling refrigerants! Do not mix refrigerant types!

Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

ATTENTION!

Ce réservoir sous pression contient du frigorigène liquide. S'il est surchargé, ce réservoir peut exploser et causer des blessures ou la mort.

ATTENTION. Débrancher avant la maintenance.

ATTENTION. Pour réduire les risques d'incendie, ne pas utiliser de cordon prolongateur de section inférieure à 14 AWG de façon à éviter la surchauffe du cordon.

ATTENTION. Utiliser seulement du frigorigène R-12 and R-134a.

OPERATING NOTES

Drain the System Oil Separator at the end of each recovery. The display will indicate when a filter-drier and vacuum pump oil change are required except if you are recovering from a burnout system. Then the filter-drier should be changed at the completion of that job. When switching refrigerant types, the unit must always be self-cleaned.

Non-condensables can be purged from the refillable tank during the recycling procedure. Get the temperature of the refrigerant you are recycling from the air purge gauge. Look at the pressure-temperature chart to find what the pressure should be at that temperature and compare it to what the air purge gauge pressure is. If the pressure on the air purge gauge exceeds the desired pressure by more than 10 psi, open the gauge for 30 seconds, then close it and re-check the pressure. Continue as needed during the recycling procedure.

This equipment is protected by one or more of the following U.S. and foreign patents: US 4,523,897; 4,688,388; RE:33,212; 4,768,347; 4,805,416; 4,878,356; 4,938,031; 5,005,369; 5,005,375; 5,038,578; 5,042,271; 5,063,749; 5,095,713; 5,181,391; 5,203,177; 5,231,842; 5,248,125; 5,493,869; 5,603,223; AUS 609,240; AUS 613,058; AUS 622,833; BRAP1 8803612; CAN 1,311,621; CAN 1,311,622; CAN 1,331,922; CAN 2,012,620; CAN 2,026,348; EUR 0315 296 B1; EUR 0329 321 B1; EUR 0437 021 B1; MEX 16028; SAF 88/4981. Other U.S. and Foreign Patents Pending.

Manufactured by Robinair, SPX Corporation, Montpelier, OH 43543-1952

Printed in U.S.A.

This manual contains important safety procedures concerning the operation, use and maintenance of this product. Failure to follow the instructions contained in this manual may result in serious injury. If you are unable to understand any of the contents of this manual, please bring it to the attention of your supervisor. Do not operate this equipment unless you have read and understood the contents of this manual.

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See the Index on page 49 for a listing of all procedures and diagrams.

Introduction

The 17800B is a complete A/C-R service center. It recovers, recycles and recharges a wide range of refrigerants—from existing refrigerants to new substitutes and blends. With its multi-refrigerant capabilities, it is ideal for trucks, buses and refrigerated trailers, as well as in-plant maintenance and other accessible installations.

The built-in manifold means the entire service procedure can be done with just one hook-up. A microprocessor controls the unit's functions; evacuation time and the amount of refrigerant to be recharged can be programmed at the beginning of the job. Prompts lead you through programming and alert you when the filter and vacuum pump oil need to be changed.

This unit is UL-listed and meets the SAE specifications for recycled refrigerant. It is also designed to be compatible with existing service equipment and standard service procedures.

This unit is simple to operate and has many user-friendly features:

- a built-in 6 cfm vacuum pump for quick, yet thorough evacuation,
- a plastic enclosure for safe and easy maneuvering around vehicles without the worry of scratches,
- an electronic scale that weighs recovered refrigerant and recharges by weight for greatest accuracy,
- a pressure/temperature chart mounted directly above the gauges—with just a quick glance you can tell the temperatures in the system,
- large diameter wheels that make it easy to move the unit,

IMPORTANT! To validate your warranty, complete the warranty card attached to your unit and return it within ten days from date of purchase.

GLOSSARY OF TERMS

A/C-R	Air conditioning or refrigeration
A/C-R System	The air conditioning or refrigeration system serviced
Unit	The refrigerant recovery, recycling, recharging unit
Tank	The refillable refrigerant tank

GENERAL OPERATING GUIDELINES

- The voltage at the unit must be $\pm 10\%$ of the unit's rated voltage. Extension cords must be a minimum of 14 AWG and kept as short as possible.
- To interrupt any procedure (other than clearing), press **HOLD/CONT**. Press **HOLD/CONT** again to resume operation.
- The system oil should be drained at the end of every recovery or recycling procedure, during the clearing process, or whenever oil is visible in the sight glass.
- The indicator light will tell you the state of the refrigerant coming into the unit during recovery. **ON** is liquid, **OFF** is vapor. The light is not used for recycling since the refrigerant coming from the tank will always be a liquid.
- Some tanks have slightly different valve configurations. Be sure to connect the red hose to the GAS (vapor) valve and connect the blue hose to the LIQUID valve.
- To insure that the scale readings are as accurate as possible, be sure the tank is not touching the sides of the cart before each procedure.
- To minimize mixing of refrigerants, follow the steps in *Changing Refrigerant Types* when switching between refrigerant types.
- When the unit is first turned on, the display shows either:
 "134a"—indicates R-134a automotive refrigerant using $\frac{1}{2}$ " Acme fittings,
 "R12" — indicates all other refrigerant types using $\frac{1}{4}$ " flare fittings, or
 "door" — indicates the unit has been cleared; select R-12 or R-134a.
 Be sure you have selected the correct refrigerant type.
- Be sure to use the correct hose set for the refrigerant type selected:

Hose Set	Tank Hoses (3)	System Hoses (2)
R-134a automotive	36", $\frac{1}{2}$ " Acme with double Quick Seal	96", one Quick Seal with one quick coupler
R-12 automotive	36", $\frac{1}{4}$ " flare with double Quick Seal	96", $\frac{1}{4}$ " flare with double Quick Seal
All other refrigerant types	36", $\frac{1}{4}$ " flare with single Quick Seal	96", $\frac{1}{4}$ " flare with ball valve

Set Up Instructions

Before you begin any procedure, familiarize yourself with the components of your unit.

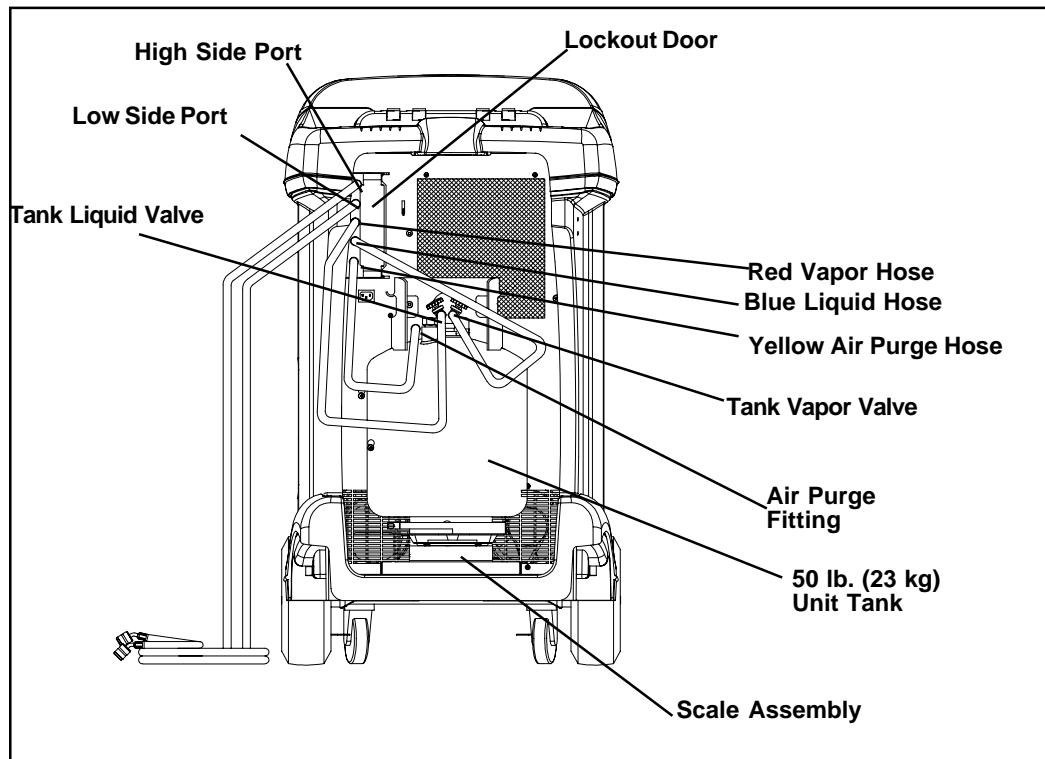


Diagram of Unit's Components — External View

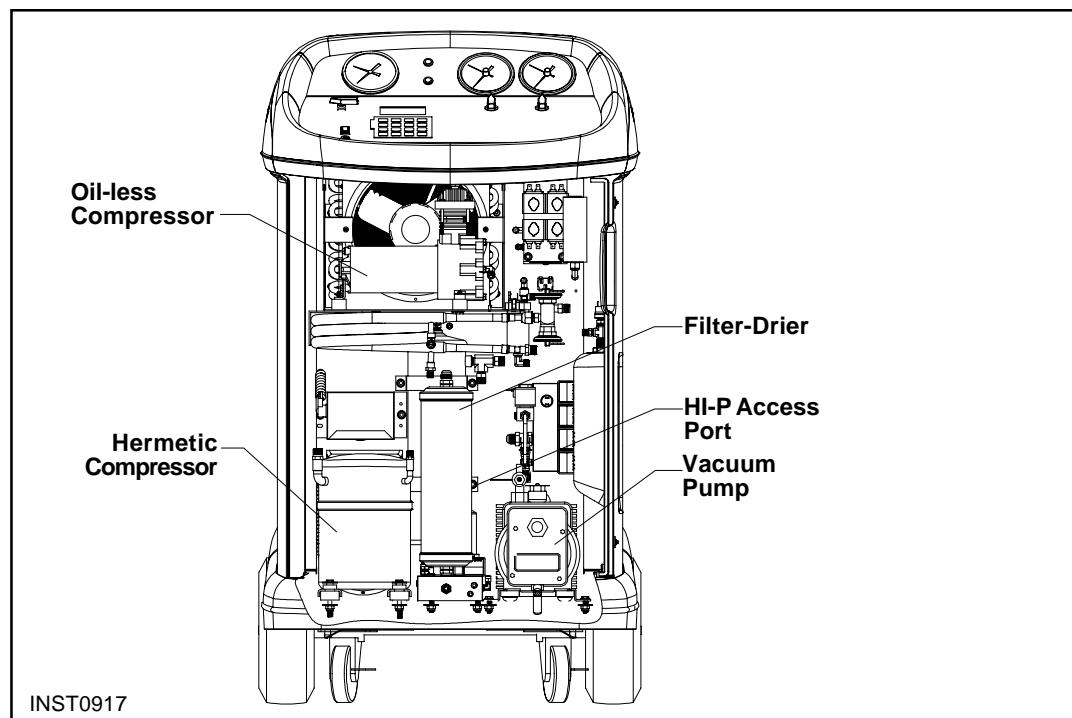


Diagram of Unit's Components — Internal View

Set Up Instructions

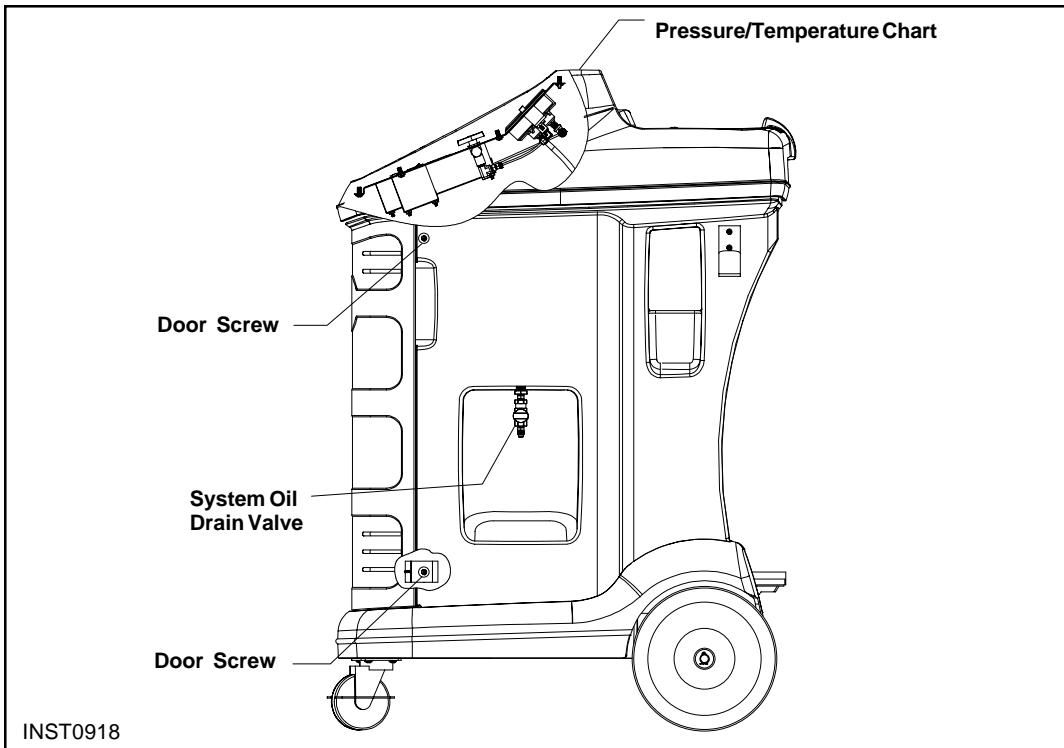


Diagram of Unit's Components — Side Views

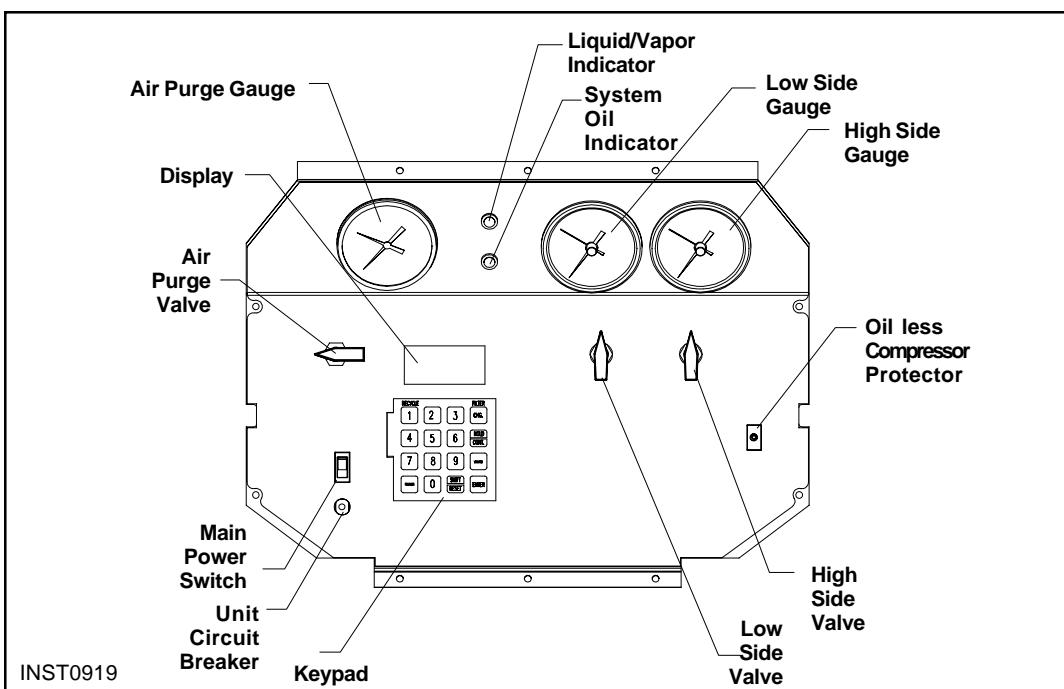


Diagram of Control Panel and Keypad

Set Up Instructions

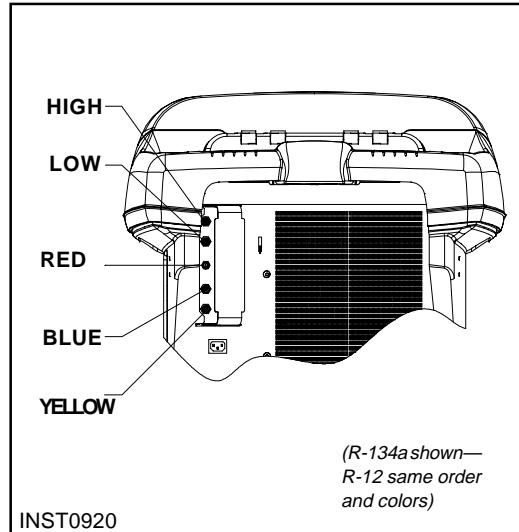
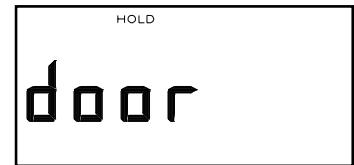
Before starting the set up procedures, open the system oil drain valve and allow the unit to depressurize.

1. Plug the unit into a proper voltage outlet.

CAUTION! Avoid the use of an extension cord because the extension cord may overheat. However, if you must use an extension cord, use a No. 14 AWG minimum and keep the cord length to 25 feet (7.6 meters) or less.

2. Be sure the oil drain valve on the side of the unit is in the **CLOSED** position.
3. Turn on the unit. The display flashes “door.” Slide the lockout door (in the upper left corner of the back of the unit) to expose the $\frac{1}{4}$ ” flare fittings for R-12, or the $\frac{1}{2}$ ” Acme fittings for R-134a then press **SHIFT/RESET** to continue.
4. Connect either of the automotive hose sets as follows:

- Connect the 36” red hose to the **RED** fitting on the back of the unit
- Connect the 36” blue hose to the **BLUE** fitting on the back of the unit
- Connect the 36” yellow hose to the **YELLOW** fitting on the back of the unit

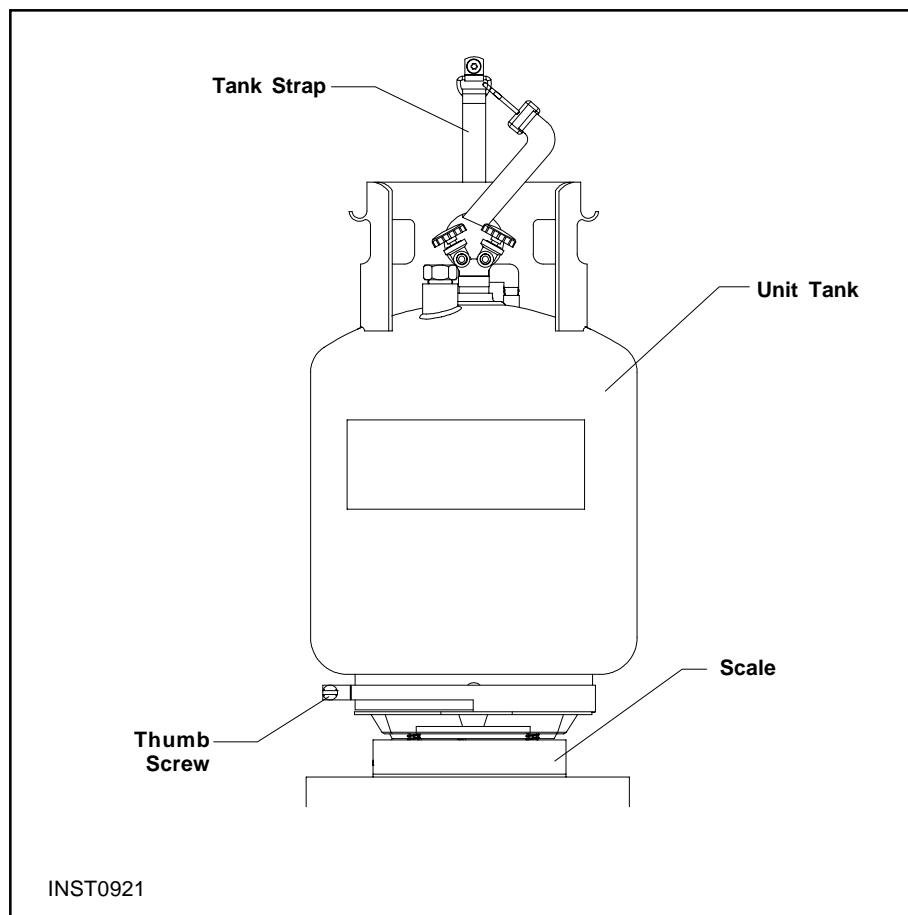


*Diagram of Hose Connections □
Lockout Box*

CAUTION! R-134a automotive systems have $\frac{1}{2}$ ” Acme fittings (per SAE specifications) to avoid cross-contamination with systems using $\frac{1}{4}$ ” flare fittings. Do not attempt to adapt your unit for the other refrigerant — system failure will result!

Set Up Instructions

5. A new tank comes with a dry nitrogen charge of 5 to 10 psi to keep it clean and dry during shipment. Purge the nitrogen charge on the R-12 (gray and yellow) tank by opening the **GAS** (vapor) valve on the tank. Vent the pressure to the atmosphere, then close the valve.
6. Place the unit tank inside the ring on the scale platform on the back of the unit. Loop the tank strap through the tank collar and secure the latch end of the strap to the metal loop at the other end of the strap. Use the thumb screw on the scale ring to tighten the tank to the scale platform.
7. Connect the 36" red hose to the red valve on the tank and open the valve. Connect the 36" blue hose to the blue valve on the tank and open the valve. Connect the 36" yellow hose to the air purge fitting on the tank.
8. Open both the low and high side valves on the control panel.



Placing the Tank on the Scale

Set Up Instructions

The VacuMaster® vacuum pump is shipped without oil in the reservoir. Before starting the unit, you must fill the pump with oil. Two 16-ounce (472 milliliters) bottles of oil are included with your unit.

I m p o r t a n t !
Be sure the pump
is running when
adding oil. Do not
overfill the pump.
The approximate
oil charge is 13
oz. (384 millili-
ters).

9. Remove the door access screws from the right side of the unit. Open the door.
10. Remove the black plastic plug from the pump's oil fill port. Attach the flexible spout and cap to the bottle of oil included with your unit. This makes it easier to fill the pump.
11. Add one-half of a bottle of vacuum pump oil to the vacuum pump.
12. Press **SHIFT/RESET** and **ENTER** at the same time, then press "1." The vacuum pump will start and run continuously. While the pump is running, pour oil into the pump's oil fill port until the level of oil is even with the line of the pump reservoir sight glass. Replace the black plug on the oil fill port.
13. Let the pump run for about five (5) minutes to remove any air from the unit.
14. To turn off the pump, press **HOLD/CONT**. Then press **SHIFT/RESET** to exit the diagnostics mode.
15. Connect the blue 96" Hose to the low side port, and the red 96" hose to the high side port on the back of the unit.

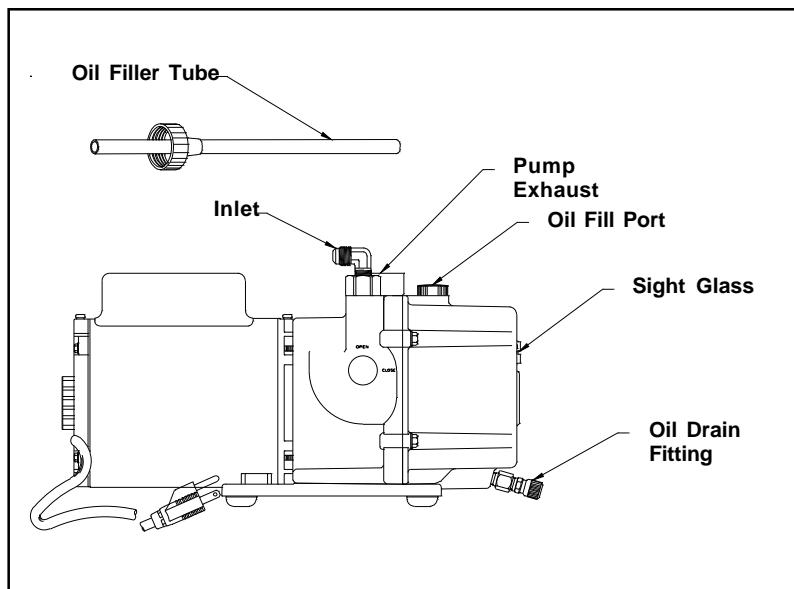


Diagram of Vacuum Pump Components

Set Up Instructions

Before using a new tank, you must purge its nitrogen charge and pull it into a vacuum.

The 50 lb (23kg) unit tank must be filled with refrigerant before the unit is ready for use.

Tank Fill

17. Connect the 96" Blue low side hose to the fitting on the source tank. If using R-134a you may need the 1/2" acme to low side adapter included in the accessory kit.
18. Press **SHIFT/RESET** and **ENTER** at the same time, then press 2. The unit will begin transferring refrigerant from the source tank to the unit tank.
19. The unit will fill the recovery tank up to 30 lbs of refrigerant and automatically stop. The display will flash "CPL" when the process is complete.
20. To discontinue tank fill at any time press **HOLD/CONT**.

WARNING!

Always wear safety goggles when working with refrigerant. Use only authorized refillable refrigerant tanks. Disconnect hoses with extreme caution!

All hoses may contain refrigerant under pressure. Read and follow all warnings at the beginning of this manual before operating the unit.

Operating Instructions

RECOVERY PROCEDURES

WARNING!

Always wear safety goggles when working with refrigerant. Use only authorized refillable refrigerant tanks. Disconnect hoses with extreme caution!

All hoses may contain refrigerant under pressure. Read and follow all warnings at the beginning of this manual before operating the unit.

Before beginning recovery, be sure your unit is set up as described in the *Set Up Instructions*. Also be sure there is vacuum pump oil in the vacuum pump.

1. Connect the high and low side hoses to the A/C-R system, as you would normally connect your manifold gauge set.
2. Be sure both the high and low side valves on the control panel are open. Also be sure both valves on the tank are open.
3. Plug the unit into the proper voltage outlet, and turn on the **MAIN POWER** switch. The display shows either "134a" (which indicates R-134a automotive refrigerant that uses $\frac{1}{2}$ " Acme fittings) or "R12" (which indicates all other refrigerant types that use $\frac{1}{4}$ " flare fittings.). The display may flash "door", which indicates the unit is cleared and can be set up for any refrigerant type.
4. Press **RECOVER**.

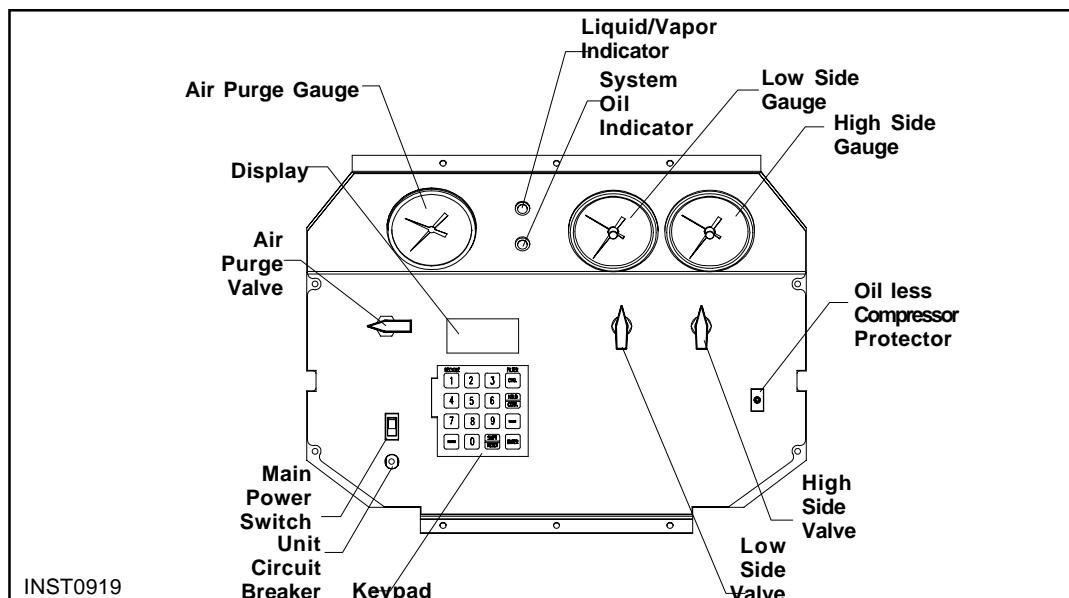
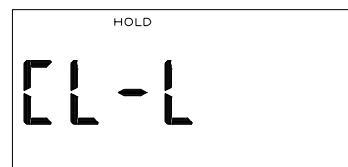


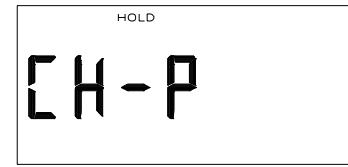
Diagram of Control Panel

Operating Instructions

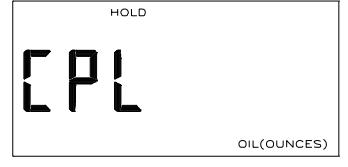
The “CL-L” message shows on the display if there is pressure in the unit, and a self-clearing process of the components begins. You can press **HOLD/CONT** to bypass clearing if an accurate recovery amount is not required. Otherwise, the compressor will start and the “CL-L” message remains on the display. This process takes from 20 seconds to four minutes to complete. Once the clearing is complete, the unit automatically begins to recover refrigerant from the system. If there is no internal pressure in the unit, refrigerant recovery begins immediately.



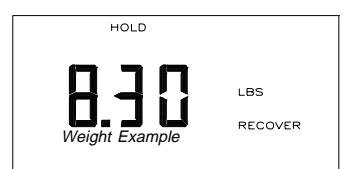
CAUTION! If the A/C system pressure is 25 psi or less, the message “CH-P” appears on the display to alert you not to attempt recovery from an empty system. Do not press HOLD/CONT to continue the recovery process unless you know the A/C system contains refrigerant.



The display shows that the unit is in the RECOVER mode and the AUTOMATIC cycle. You can monitor the amount of refrigerant removed from the system by watching the display. The compressor shuts off automatically when recovery is complete (at approximately 13 inches of vacuum). The display shows the “CPL” message and then alternately flashes the weight of refrigerant recovered.



5. To assure complete recovery of refrigerant, wait for five (5) minutes and watch the manifold gauges for a rise in pressure above “0.” If a rise occurs, press **HOLD/CONT**. Repeat as needed until the system pressure holds for two (2) minutes.



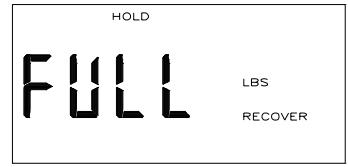
CAUTION! Drain the oil from the separator only after each recovery. Do not completely depressurize the oil separator; immediately close the valve when oil is completely drained in the next step. The lower right corner of the display will indicate “OIL (OUNCES)” as a reminder.



6. Be sure the oil catch bottle is empty, then *slowly* open the oil drain valve, and drain the oil into the oil catch bottle. This oil was removed from the A/C system during recovery. It must be replaced with new oil. When all the recovered oil has completely drained, immediately close the valve and record the amount of oil in the bottle. Dispose of waste oil in an appropriate manner.

If the recovery tank fills completely:

- The compressor shuts off; the digital display shows the message “FULL.”
- Change the tank.



The A/C system is now empty. Make any repairs at this time.

Operating Instructions

**First!
Perform
"RECOVERY
PROCES-
DURES"
before starting
"CHANGING
REFRIGER-
ANT TYPES".**

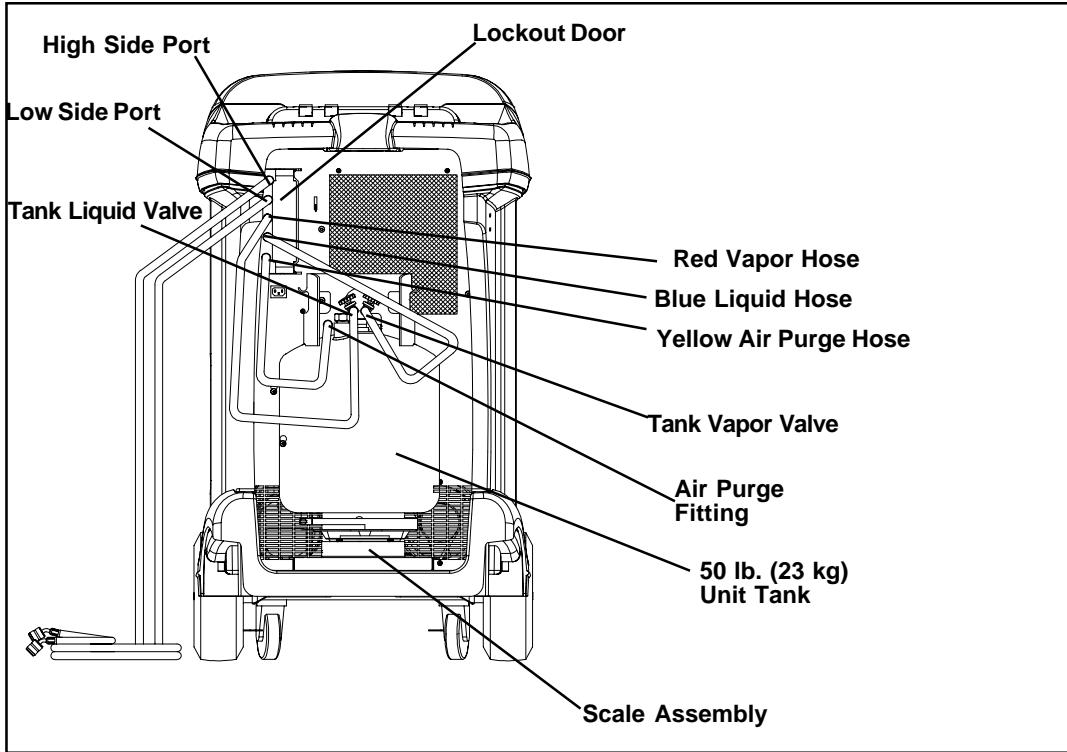
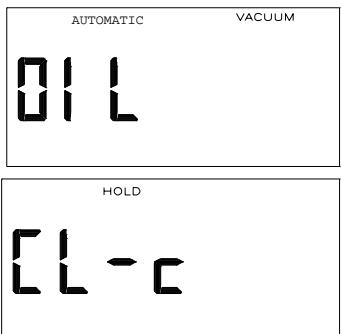


Diagram of Unit's Components — External View

**I m p o r t a n t !
Before changing
refrigerant types,
be sure the red
high side and blue
low side hoses are
disconnected from
the A/C system.**

CHANGING REFRIGERANT TYPES

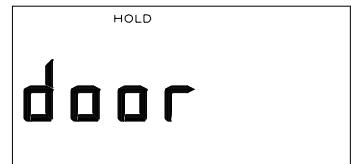
1. Be sure the red high side and blue low side hoses are disconnected from the A/C system, then open the manifold and tank valves.
2. Press and release SHIFT/RESET until the "Clr" message appears.
3. Press HOLD/CONT to start the system oil separator clearing process.



During the system oil separator clearing process, the compressor is activated and the "OIL" message displays. The compressor will stop while the unit equalizes pressure and the "OIL" message will continue to display. When the unit reaches the correct pressure, the display alternately flashes the messages "OIL" and "drn." Open the system oil drain valve to drain the oil. After all oil has drained, close the oil drain valve. The message changes to "Cont." Press any key to complete the oil separator clearing process. When compressor stops again, the message changes to "CL-c."

Operating Instructions

4. If you need to change hoses for the next refrigerant type, go to Step 5. If you do not need to change hoses, press **SHIFT/RESET** and go to Step 6.
5. To start the self-clearing process, press **VACUUM** while the “CL-c” message is displayed. The “Clr” message then displays and the vacuum pump runs for 5 minutes before shutting off automatically. The “door” message will then display.
6. Close the tank valves and disconnect the red, blue and yellow hoses from the tank. Then remove the tank from the unit.
7. If you are using the same hoses for the next refrigerant type, go to Step 11. If you need to change the hoses, go to Step 8.
8. Disconnect all five (5) hoses from the lockout box fittings. If you need to change the door position on the lockout box, go to Step 9.
If you do not need to change the door position, go to Step 10.
9. Slide the door on the lockout box to expose the fittings needed for the next refrigerant type.
10. Connect the correct hoses for the next refrigerant to the fittings in the lockout box.



Be sure to use the correct hose set for the refrigerant type selected:

Hose Set	Tank Hoses (3)	System Hoses (2)
R-134a automotive	36", 1/2" Acme with double Quick Seal	96", one Quick Seal with one quick coupler
R-12 automotive	36", 1/4" flare with double Quick Seal	96", 1/4" flare with double Quick Seal
All other refrigerant types	36", 1/4" flare with single Quick Seal	96", 1/4" flare with ball valve

11. Place a tank (already set up for the next refrigerant) on the unit. Connect the red, blue and yellow hoses to the appropriate tank fittings.

The unit is now ready to process the next refrigerant type.

Operating Instructions

A/C-R SYSTEM EVACUATION

WARNING!

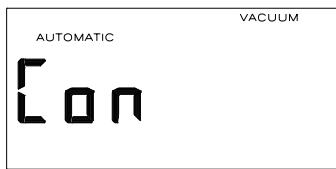
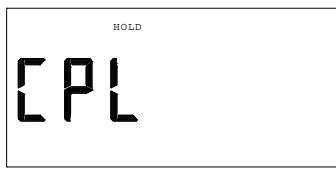
Always wear safety goggles when working with refrigerant. Use only authorized refillable refrigerant tanks. Disconnect hoses with extreme caution!

All hoses may contain refrigerant under pressure. Read and follow all warnings at the beginning of this manual before operating the unit.

1. Be sure the high and low side hoses are connected to the A/C-R system and that the high and low side valves are open.
2. Press **SHIFT/RESET** to toggle the display to show “PROGRAM VACUUM MINUTES 15.00.” Fifteen minutes is the default time for evacuation. To change the time, press the appropriate keys to display the desired time. Then press **ENTER**.



- The longest time that can be programmed is 98.99 (98 minutes and 99 seconds).*
3. Press **VACUUM** to start evacuation. The display counts down the time remaining. If the message “U-HI” appears, you have 25 psi or greater of pressure at the inlet. You must recover that pressure to continue. If necessary, press **RECOVER**.
 4. When the programmed time has expired, the vacuum pump will automatically shut off and the display will show “CPL.” Press any key to exit vacuum mode.



To run the vacuum pump continuously, program the time to “99.00,” press **ENTER**, then press **VACUUM**. The pump will start and the display will show “CON AUTOMATIC VACUUM.” To turn the vacuum pump off, press **HOLD/CONT**.

Operating Instructions

RECYCLING PROCEDURES

WARNING!

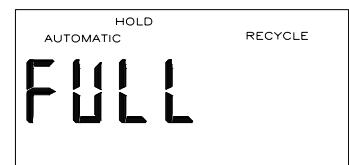
Always wear safety goggles when working with refrigerant. Use only authorized refillable refrigerant tanks. Disconnect hoses with extreme caution!

All hoses may contain refrigerant under pressure. Read and follow all warnings at the beginning of this manual before operating the unit.

1. Be sure both valves on the tank are open.

2. Press and hold **SHIFT/RESET** and then press “1” to start the recycling process.

If the recovery tank is full, the display will show the message “FULL.” Press **HOLD/CONT** to resume operation.



3. After about five (5) minutes of recycling, the tank temperature should equalize. You can then purge non-condensables.

4. To purge non-condensables, check the air purge gauge to find the temperature of the refrigerant. Use that temperature to find the correct pressure for that refrigerant on the pressure/temperature chart on the top of the unit. Compare the pressure from the chart to the pressure shown on the gauge. If the gauge pressure exceeds the target pressure by more than 10 psi, open the air purge valve on the control panel for about 30 seconds to release non-condensables from the tank. Then close the air purge valve and allow the tank to stabilize for about 30 seconds. Check the air purge gauge again. Repeat this step as necessary during the recycling procedure.

5. To stop recycling, close the tank’s LIQUID valve. The unit will pull into a vacuum and shut off automatically. Press any key to exit recycle mode.

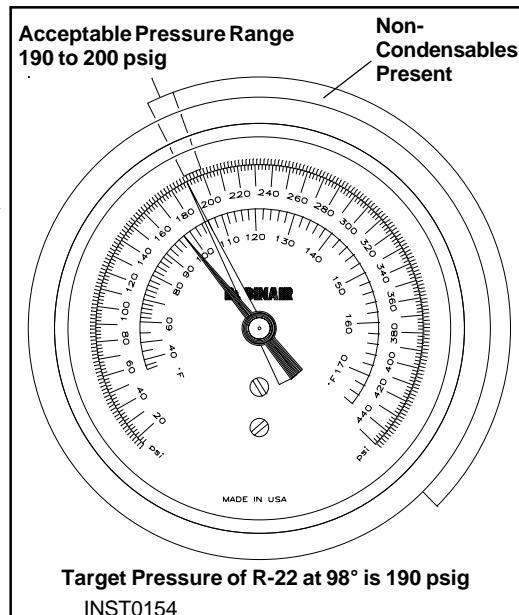


Diagram of Air Purge Gauge

I m p o r t a n t !
You can stop recycling instantly by pressing HOLD/CONT then SHIFT/RESET, but this can leave liquid refrigerant in the low side of the unit. Closing the tank’s LIQUID valve is the recommended method.

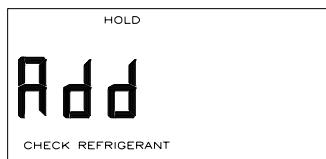
Operating Instructions

CHARGING PROCEDURES

WARNING!

Always wear safety goggles when working with refrigerant. Use only authorized refillable refrigerant tanks. Disconnect hoses with extreme caution!

All hoses may contain refrigerant under pressure. Read and follow all warnings at the beginning of this manual before operating the unit.



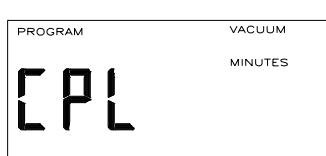
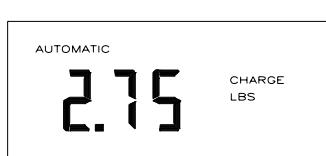
The unit will display the message "CHECK REFRIGERANT" if there is less than six (6) pounds of refrigerant in the tank. The charging system will not function if this message is displayed. If you try to charge in this situation, the display will also show "Add HOLD" to let you know that refrigerant needs to be added to the tank.

You should add more refrigerant to the tank than what is needed for charging (see *Adding Refrigerant to the Tank*). To check the weight of refrigerant in the tank, press and hold **SHIFT/RESET** then press **ENTER** to access the diagnostic mode. Press "7" to display the weight of refrigerant in the tank. Press **SHIFT/RESET** again to exit the diagnostic mode.

Follow the A/C-R system manufacturer's instructions regarding specific recharging specifications. You must replace any oil lost from the A/C-R system during recovery with new oil. Dispose of waste oil in an appropriate manner.

1. Open the high side valve and, if allowable, the low side valve on the unit's control panel.
2. Press **SHIFT/RESET** until the message "CHG" appears on the display.
3. Press **CHG** and enter the weight of the refrigerant to be charged.
4. Press **ENTER**. The display will flash to indicate that the charge amount has been recorded in the unit's memory.
5. Press **CHG** again to begin the charging process.
6. The display will show the message "AUTOMATIC" and the amount programmed for recharging. The display counts down to zero as charging proceeds.
7. When charging is complete, the display shows the message "CPL."

If the unit beeps continuously, the transfer of refrigerant has stopped before the charging procedure was completed (see *Correcting An Incomplete Transfer*).



*Enter the correct weight for your application.

Operating Instructions

8. Close the high and low side valves on the control panel and start the A/C-R system.
Compare the gauge readings to the manufacturer's specifications.
9. Turn off the A/C-R system and disconnect the high side hose from it.
10. Start the A/C-R system and open both the high and low side valves. This will pull the portion of the programmed charge that is trapped in the hoses into the low side of the A/C-R system.
11. At the lowest recommended operating pressure, close the low side valve and turn off the A/C-R system. Disconnect the low side hose from the system.
12. Close the high side valve and turn off the **MAIN POWER** switch.

CORRECTING AN INCOMPLETE TRANSFER

If the scale value does not change for 30 seconds, the unit beeps continuously to indicate that the transfer of refrigerant was not completed. There are two reasons for an incomplete transfer of refrigerant:

- The pressure in the A/C-R system is equal to the pressure in the tank. The unit produces an audible signal and shows the weight remaining to complete the transfer.
1. Close the high side valve on the control panel.
 2. Disconnect the high side hose from the A/C-R system.
 3. Continue with Step 9 in *Charging Procedures*.
- The display shows the message "CHECK REFRIGERANT" because there is not enough refrigerant in the tank.
1. Press **HOLD/CONT** to interrupt the transfer.
 2. Be sure both valves on the tank are closed, then disconnect and remove the tank from the unit. Replace it with a tank containing additional refrigerant.
 3. Press **HOLD/CONT** again to resume the transfer.

ADDING REFRIGERANT TO THE TANK

CAUTION! R-134a systems have special fittings (per SAE specifications) to avoid cross-contamination with other refrigerant systems. Read and follow all warnings given at the beginning of this manual.

**IMPORTANT!
When setting up
for new types of
refrigerant, a
clearing process
will have to be
performed.**

NOTE: Purchase only tanks of R-134a refrigerant that have 1/2 inch (1.2cm) Acme threads. This is necessary to match the hose adapter.

1. Connect the 96-inch (244 cm) blue low side hose to the unit's low-side port.

NOTE: Disposable tanks have only one valve and most must be turned upside down to transfer liquid. If you are using a disposable tank, follow the instructions on the side of the tank to obtain a liquid supply.

2. When using R-12 connect the 6-inch (15.2-cm) yellow adapter to the source tank liquid valve *first*. Then connect the 96-inch (244-cm) blue low-side hose to the adapter.

When using R-134a, connect the low-side connector port adapter to the source tank liquid valve *first*. Then connect the blue 96-inch (244-cm) low-side hose directly to the adapter.

3. Open the LIQUID valve on the source tank (there is only one valve on a non-refillable tank.)
4. Close the high-side manifold valve and open the low-side manifold valve on the front panel of the unit. Open both valves on the unit tank.
5. Press **SHIFT/RESET** and **ENTER** at the same time to access the diagnostic mode. The display shows the message "FUNC."
6. Press **2** to begin transferring refrigerant. The display shows the "Add" message for about two seconds, then shows the amount of refrigerant transferred.
7. Transfer stops automatically and the display shows the "CPL" message when the source tank is empty and has been pulled to a partial vacuum **or** the weight of refrigerant in the unit tank reaches 37 pounds. The display toggles between "CPL" and the weight in the tank

Operating Instructions

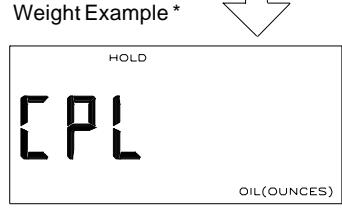
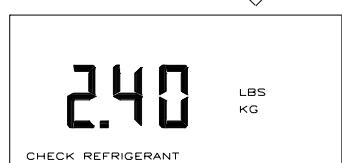
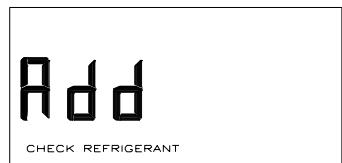
(Adding Refrigerant to the Tank continued)

This process takes about 45 minutes. You can interrupt it at any time by pressing HOLD/CONT once. Press HOLD/CONT again to resume operation, or press SHIFT/RESET to end the process. The transfer of new refrigerant is limited by weight to leave space (about 6 pounds of refrigerant) in the unit tank for recovery purposes.

8. When using R-12, close the supply valve on the source tank (when using a disposable tank, turn it right side up first). Carefully disconnect the 96 inch (244-cm) blue low-side hose from the 6-inch (15.2-cm) yellow adapter, and then remove the yellow adapter from the source tank.

When using R-134a, close the supply valve on the source tank, (when using a disposable tank, turn it right side up first). Carefully disconnect the 96 inch (244-cm) blue low-side hose from the low-side connector port adapter and then remove the adapter from the source tank.

9. Press RECOVER. The hose will be pulled into a partial vacuum and the unit will turn off automatically. If the hose is partially clear, the unit will display "CH-P". Press HOLD/CONT to finish clearing the hose. Close the low-side manifold valve.
10. Connect the 96-inch (244-cm) red high-side hose to the unit's high-side port. You can also attach an oil injector to the unit's low-side port. Oil injectors will not connect to the wrong ports. The R-12 oil injector has a $\frac{1}{4}$ inch flare connector; the R-134a oil injector has a $\frac{1}{2}$ Acme connector.



* The display shows the weight of refrigerant added to the tank.

Any non-condensable gases in the tank can be removed during the recycling sequence. Your unit is now ready for use.

IMPORTANT!
Be sure to close both tank valves when the unit is not in use. Inspect the unit periodically for leaks. The manufacturer of the recovery/recycling unit does not reimburse for lost refrigerant.

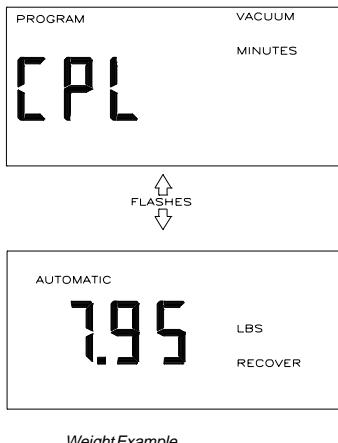
Operating Overview

This overview is designed as a quick reference when using your unit. Read and follow all warnings in the operating manual.

RECOVERY OVERVIEW

1. Connect the high and low side hoses to the A/C-R system.
2. Check the manifold gauges. There must be pressure to recover refrigerant.
3. Be sure both the high and low side valves on the control panel are open. Also be sure both valves on the tank are open.
4. Plug the unit into the proper voltage outlet, then turn on the **MAIN POWER** switch.
5. Press **RECOVER**:
 - If there is pressure in the unit, the self-clearing process starts.
 - If there is no internal pressure, refrigerant recovery begins.
 - The unit then shows “RECOVER AUTOMATIC” and the weight of refrigerant being recovered into the tank.
6. Once the recovery and/or self-clearing procedure is complete, the compressor will shut off automatically. The display will flash “CPL” and the weight of refrigerant recovered.
7. If the A/C-R system pressure rises above zero, you can press **HOLD/CONT** to recover the remaining refrigerant.
8. The display also shows “OIL (OUNCES).” This is a reminder to drain the system oil separator into a suitable container by opening the ball valve on the side of the unit.

You must replace any oil lost from the A/C-R system during recovery with new oil. Dispose of waste oil in an appropriate manner.

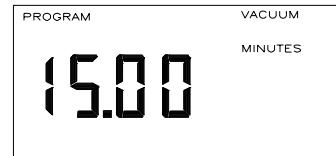


EVACUATION OVERVIEW

1. Be sure the high and low side hoses are connected to the A/C-R system and that the high and low side valves are open.
2. Press **SHIFT/RESET** to toggle the display to show “PROGRAM VACUUM MINUTES 15.00.” Fifteen minutes is the default time for evacuation. To change the time, press the appropriate keys to display the desired time. Then press **ENTER**.

The longest time that can be programmed is 98.99 (98 minutes and 99 seconds).

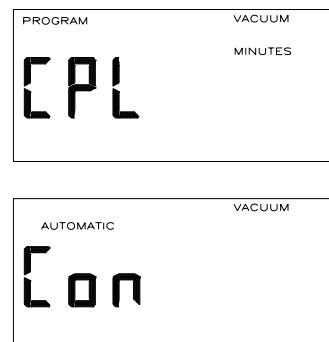
3. Press **VACUUM** to start evacuation. The display counts down the time remaining. If the message “U-HI” appears, you have 25 psi or greater of pressure at the inlet. You must recover that pressure to continue. If necessary, press **RECOVER**.
4. When the programmed time has expired the vacuum pump will automatically shut off and the display will show “CPL.”



To run the vacuum pump continuously, program the time to “99.00,” press **ENTER**, then press **VACUUM**. The pump will start and the display will show “CON AUTOMATIC VACUUM.” To turn the vacuum pump off, press **HOLD/CONT**.

RECYCLING OVERVIEW

1. Be sure both valves on the tank are open. Press and hold **SHIFT/RESET** and then press “1” to start the recycling process.
2. When the tank temperature equalizes (after about five minutes of recycling time), purge non-condensables from the tank. To purge, use the air purge gauge to determine the temperature of the refrigerant. Then use the pressure/temperature chart on the top of the unit to determine the correct pressure for that refrigerant. If the gauge pressure exceeds the target pressure by more than 10 psi, open the air purge valve for about 30 seconds and release non-condensables from the tank.
3. Close the air purge valve and let the tank stabilize (about 30 seconds). Check the air purge gauge again. Repeat Steps 2 and 3 as necessary during the recycling process.
4. Close the tank's **LIQUID** valve to stop the recycling process. The unit will pull into a vacuum and shut off automatically.



CHARGING OVERVIEW

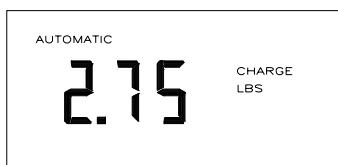
Follow the manufacturer's recommendation for charging. You must replace any oil lost from the A/C-R system during recovery with new oil. Dispose of waste oil in an appropriate manner.

1. Open the high side valve and, if allowable, the low side valve.
2. Press **CHG** and enter the weight of the refrigerant to be charged.
3. Press **ENTER**, then press **CHG** again. The display counts down to zero, then shows the “CPL” message when complete.

I m p o r t a n t !
You can stop recycling instantly by pressing **HOLD/CONT** then **SHIFT/RESET**, but this can leave liquid refrigerant in the low side of the unit. Closing the tank's **LIQUID** valve is the recommended method.

Operating Overview

4. Close the high and low side valves and start the A/C-R system.
Compare the gauge readings to the manufacturer's specifications.
5. Turn off the A/C-R system and disconnect the high side hose from it.
6. Start the A/C-R system and open both manifold valves to pull refrigerant from the hoses.
7. At the lowest recommended operating pressure, close the low side valve and turn off the A/C-R system. Disconnect the low side hose.
8. Close both manifold valves and turn off the **MAIN POWER** switch.



**Enter the correct weight for your application.*

CHANGING THE VACUUM PUMP OIL

When the vacuum pump has run for a total of 10 hours, the “OIL” message will flash on the display to signal that an oil change is needed. To change the vacuum pump oil, follow these steps:

1. Turn on the **MAIN POWER** switch. The display shows the selected refrigerant type.
2. Press **SHIFT/RESET** and the messages “PROGRAM VACUUM MINUTES 15:00” display.
3. Press **VACUUM**. The display shows the “OIL” message.
4. Remove the door access screws from the right side of the unit. Open the door.
5. Remove the black plastic plug on the oil fill port.
6. Remove the oil drain cap from the vacuum pump, then drain the contaminated oil into a suitable container (be sure to dispose of it properly). Replace the oil drain cap.
7. Attach the flexible spout and cap to the oil bottle and pour approximately six (6) ounces of vacuum pump oil into the oil fill port.
8. Be sure the manifold valves are closed, then press **SHIFT/RESET** and **ENTER** at the same time to reset the ten-hour timer.
9. Press **VACUUM**. While the pump is running, *slowly* add new vacuum pump oil until the oil level is even with the line on the reservoir’s sight glass.
10. Replace the black plastic plug on the oil fill port.

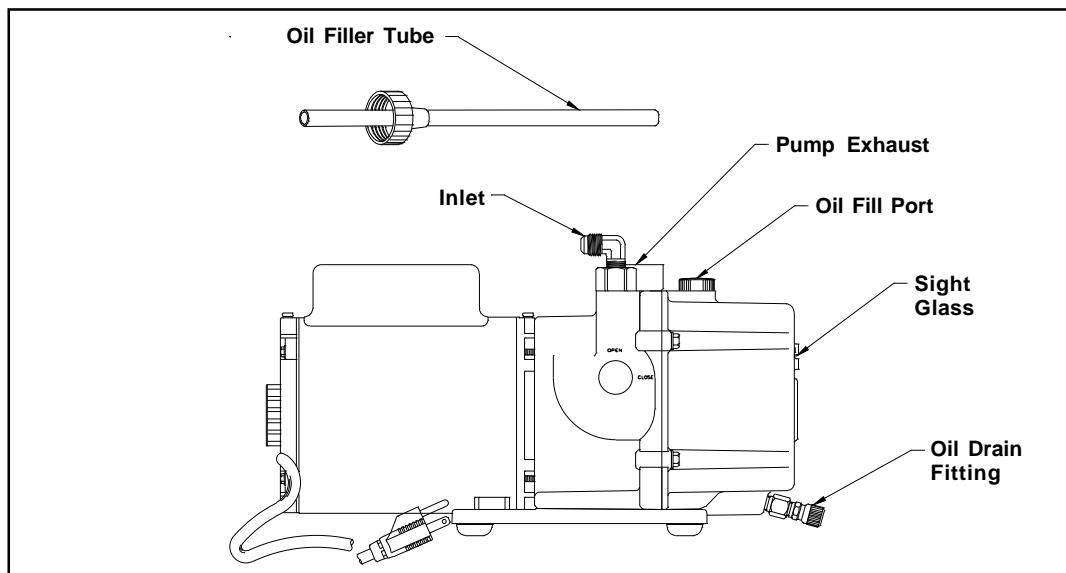
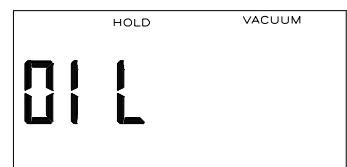
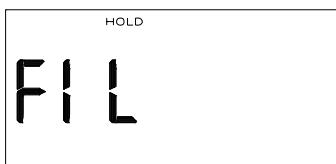
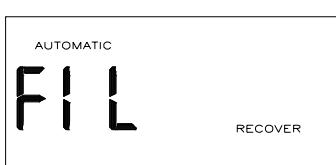
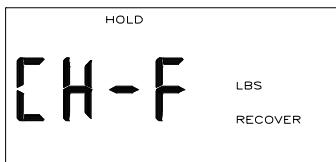


Diagram of Vacuum Pump Components
Model 17800B Recovery/Recycling/Recharging Unit

Maintenance Procedures

CHANGING THE FILTER-

You should change the filter-drier whenever refrigerant has been recovered from a burn-out system or when the display shows the "CH-F" message (which means that the unit has recovered 200 pounds of refrigerant since the last change). To change the filter/drier follow these steps:



1. Press and hold **SHIFT/RESET** and then press **FILTER**.
The compressor will start and the display will show the messages "FIL" and "AUTOMATIC."
2. The compressor will shut off when the vacuum switch trips, and the display will show the messages "FIL" and "HOLD."
3. Turn off the **MAIN POWER** switch and unplug the unit.
4. Remove the door access screws from the right side of the unit. Open the door.
5. Disconnect the hose from the top of the filter-drier and unscrew the filter-drier by rotating it counter clockwise. (you may need a 5/8" wrench to break it loose.)
6. Open the new filter-drier and generously lubricate the O-ring with vacuum pump grease. Also lubricate the gasket in the end of the hose which connects to the top of the filter-drier.
7. Replace the greased o-ring into the groove in the manifold. Screw the new filter-drier into place. Reattach the hose with the greased gasket to the top of the filter-drier.
8. Once the new filter-drier is correctly installed. Close the cabinet door, and replace the door access screws.
9. Turn on the **MAIN POWER** switch.
10. Press **HOLD/CONT**. The vacuum pump will start, the display will show the messages "FIL AUTOMATIC", the pump will run for about 2 minutes, and shut off. The display will show the message "CPL".

This procedure automatically resets the filter-drier change counter for another 200 pounds of refrigerant.

I m p o r t a n t :
**Do not remove
the filter-drier
from its sealed
bag until you are
ready to use it.**

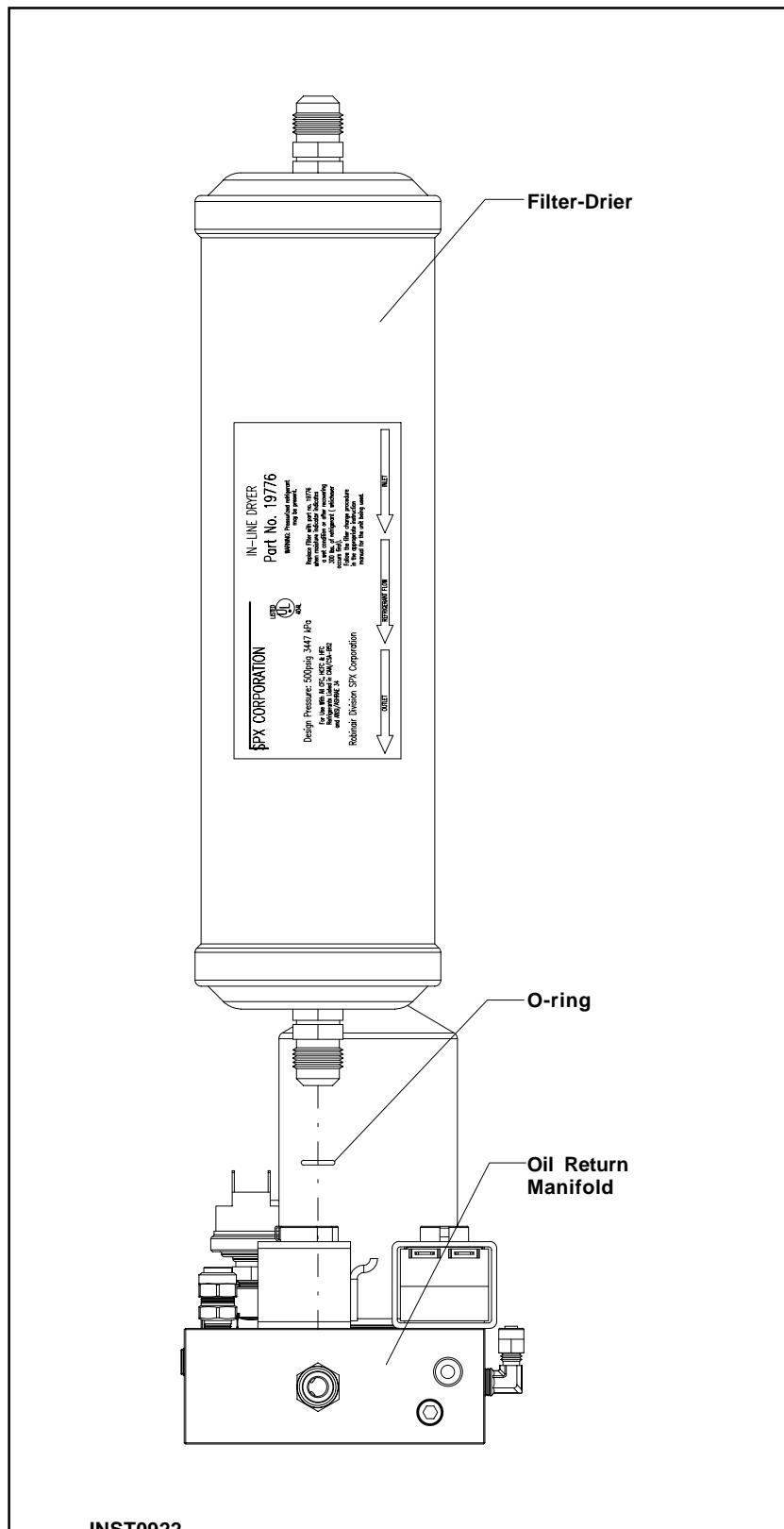


Diagram of Filter-Drier

CONFIRMING THE SCALE CHECKLIST

Important:
Check the scale accuracy every three months.

Blank Display or No Warnings.

Check wire connections from scale assembly to the circuit board for configuration and continuity.

Verify that the circuit board is receiving proper voltage (refer to the decal on the back of the unit) and the two amp or 1/2 amp fuse is not blown. Use properly grounded active electrical outlets only. Replace the circuit board or fuses as needed.

Total Amounts Not Accurate

Verify that nothing is touching, blocking, or interfering in any way with the scale assembly, tank, or hoses. Confirm that the total weight on the scale assembly is not exceeding 80 lb/37 kg. If it is, reduce the amount of refrigerant in the tank.

Full (Full Tank Setting)

The compressor will shut off at the weight previously set. To check the weight of the tank, scale, and refrigerant being recovered, follow the appropriate sections found under USING THE DIAGNOSTIC MODE.

CORRECT WEIGHT VERIFICATION

1. Turn on the **MAIN POWER** switch.
2. Press **SHIFT/RESET** until "PROGRAM" displays.

Func

NOTE: If the unit is just being turned on, the screen will default to display the selected refrigerant type. Press **SHIFT/RESET** until "PROGRAM" displays.

3. When "PROGRAM" message displays, press and hold **SHIFT/RESET**, then press **ENTER**. The "FUNC" message will display when the manual diagnostic mode has been accessed properly.
4. Remove all weight from the scale platform.
5. Press **6** to turn the scale into a direct-reading weight scale.

NOTE: Any weight on the scale when **6** is pressed will not be shown on the display. The unit automatically zeros the weight on the scale when **6** is pressed. If you remove the weight, the display will show the change in total weight but will not show a negative sign.

6. Place a known weight of between 30-60 lbs./13-28 kg. on the scale. The display will show the known weight " $\pm .04\text{lb}./.02\text{kg.}$ "
7. If the scale does not read the weight accurately, recalibrate the scale and UL circuit using the following instructions.

If the scale does not respond to testing, verify that the scale cable is plugged into the main circuit board.

8. Press **SHIFT/RESET** to exit this mode

CALIBRATING THE SCALE

NOTE: The scale assembly and UL circuit MUST be calibrated when installing a replacement scale assembly or circuit board. To ensure continued charging accuracy, periodically confirm the checklist below.

Important:
You must have a known weight of 75 lb. ± .01 / 34.02 kg. ± 005).

1. Remove all weight from the scale platform.
2. Turn on the **MAINPOWER** switch.

NOTE: If the unit is just being turned on, the screen will default to display the selected refrigerant type.

3. Press **SHIFT/RESET** and **ENTER** until "PROGRAM" displays.
4. When the "PROGRAM" message displays, press **SHIFT/RESET** at the same time. The "FUNC" message displays.
5. Press **9**. The display is blank.
6. Press **RECOVER** and **ENTER** at the same time.
7. The DATE message flashes, then "0.00" displays. Enter the current month and year. For example, if the unit is being calibrated on November 8th, 1998, enter **1,1,9,8** and then press **ENTER**.
8. The "CAL" message will flash, then the "ZERO" message displays.
9. Be sure nothing is on or touching the scale platform, then press **ENTER**.
10. The "CAL" message will flash, then the "A1" message displays.
11. Place a certified weight (between 20 and 70 lbs.) in the center of the scale platform. Enter the weight from the display. For example, to record 20 lbs. on the scale, press "**2,0,0,0**" on the keypad, then press **ENTER**. The display returns to the vacuum mode.
12. To check scale accuracy, follow the **CORRECT WEIGHT VERIFICATION** procedure.



WARNING



Unplug the unit before beginning any service work.

Improper use or connections can cause electrical shock. Only qualified personnel should perform service work.

If scale assembly and UL circuit are not calibrated, scale can overfill the tank, causing possible explosion and/or vehicle overcharge.

UL CIRCUIT CALIBRATION

NOTE: Always calibrate the scale first. Then remove the (4) screws that hold down the keypad on the control panel before attempting to calibrate the UL circuit.

1. Remove all weight from the scale platform.

2. Turn on the **MAIN POWER**.

NOTE: If the unit is just being turned on, the screen will default to display the selected refrigerant type.

3. Press **SHIFT/RESET** until "PROGRAM" displays.

4. When the "PROGRAM" message displays, press **SHIFT/RESET** and **ENTER** at the same time. The "FUNC" message displays.

5. Press **6**.

NOTE: Any weight on the scale when **6** is pressed will not be shown on the display.

The unit automatically zeros the weight on the scale when **6** is pressed. If you remove the weight, the display will show the change in total weight but will not show a negative sign.

6. Place a known weight of EXACTLY 75 lbs. on the scale platform. The display will show "75 lb. ± .04 lbs/.02kg."

7. Adjust the potentiometer (P1 POT) set screw* just until the "HOLD" message displays.

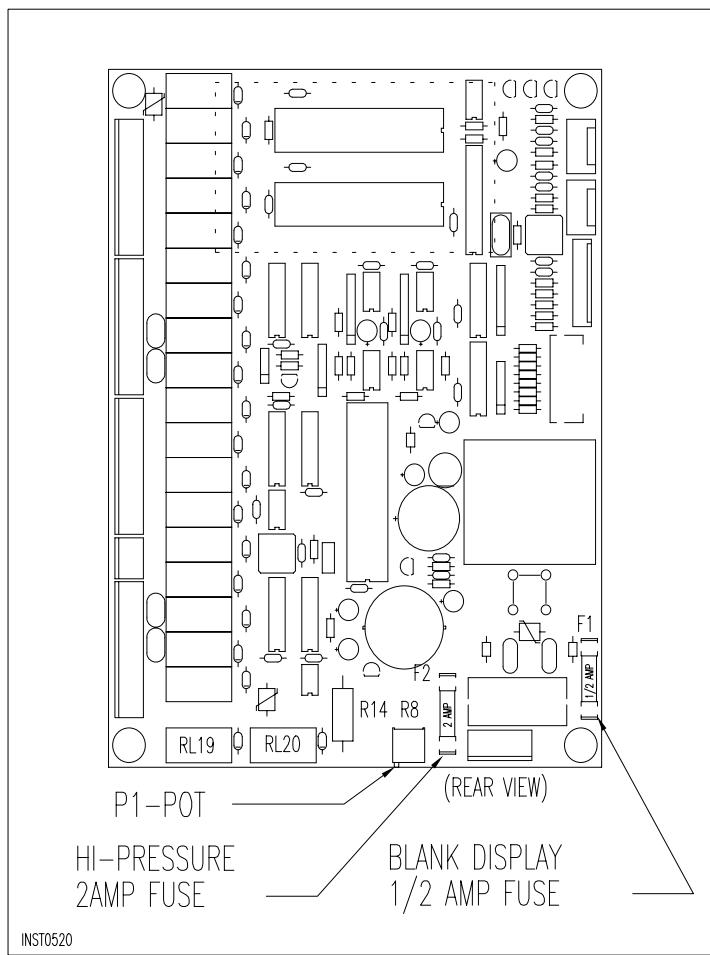
NOTE: Turning the P1 POT *clockwise increases* the weight capacity of the scale. Turning the P1-POT *counterclockwise decreases* the weight capacity of the scale

8. Lift the weight from the scale and "HOLD" should appear.

NOTE: The display should read "HOLD" for 75 lbs. ONLY, not for anything more or less.

9. If the UL circuit will not calibrate, replace the main circuit board

*The potentiometer adjusting screw is located on the circuit board



Maintenance Procedures

CHECKING FOR LEAKS

Important:
Inspect
the unit
periodi-
cally for
leaks. The
manufac-
turer
does not
reimburse
for lost
refriger-
ant!

Every three months, or as specified by local or state laws, you should check your unit for leaks. As with any mechanical equipment, general use, moving the unit and vibration can cause fittings to loosen.

1. Turn off the **MAINPOWER** switch, and disconnect the power cord from the outlet.
2. Remove the door access screws from the right side of the unit. Open the door.
3. Use a leak detector to probe all fitting connections for refrigerant leaks. Tighten fittings if a leak is indicated.
4. Close the door and replace the door access screws.

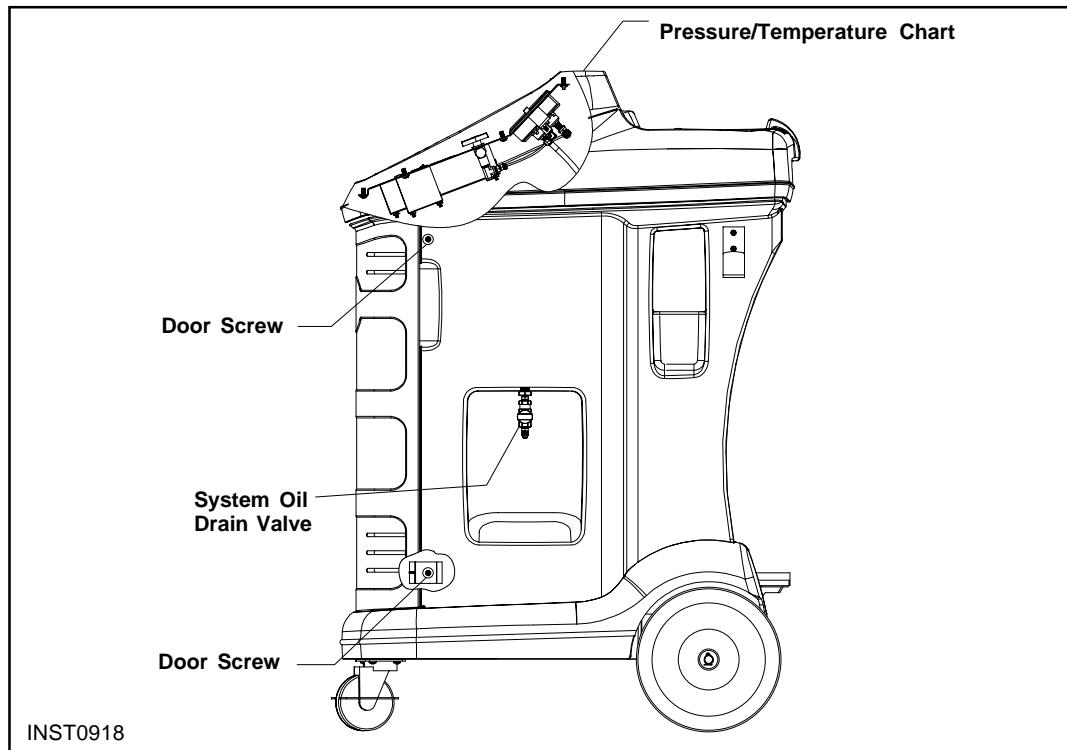


Diagram of Unit's Components — Side Views

USING THE CONTROL PANEL

MAIN POWER Switch—Supplies electrical power to the control panel.

Digital Display—Shows the time programmed for vacuum and the weight of refrigerant programmed for recharging. Detailed instructions for programming the digital display follow this section.

Air Purge Indicator—Shows when non-condensables need to be purged from the tank.

LIQUID/VAPOR Indicator—Shows if liquid or vapor refrigerant is being recovered.

System Oil Indicator—Shows when the system oil separator is full and an oil drain needs to be performed.

LOW Side Manifold Gauge—Connects to an A/C-R system and shows the system's low side pressure.

HIGH Side Manifold Gauge—Connects to an A/C-R system and shows the system's high side pressure.

HIGH Side Valve—Controls the high side flow from the A/C-R system through the unit.

LOW Side Valve—Controls the low side flow from the A/C-R system through the unit.

Air Purge Valve—Controls the release of non-condensables from the tank.

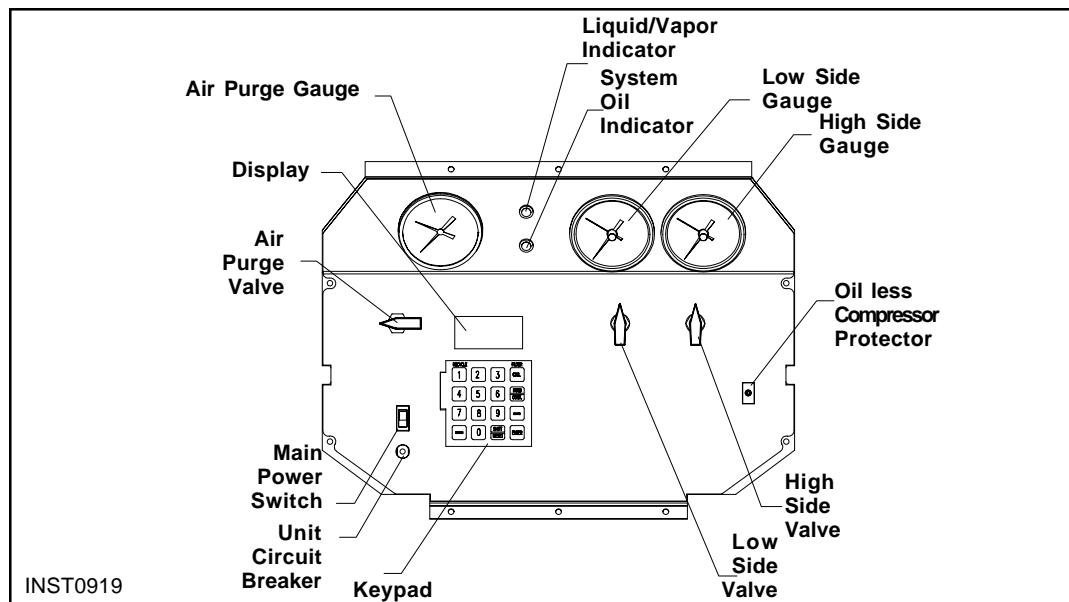


Diagram of Control Panel

Operating Guidelines

KEYPAD FUNCTIONS

In addition to the number keys, the keypad contains special keys that accomplish specific operating functions.

- **RECYCLE**—Activates the recycling sequence when pressed at the same time as the **SHIFT/RESET** key.
- **RECOVER**—Activates the recovery sequence.
- **SHIFT/RESET**—Accesses the “PROGRAM” mode and moves from one program function to the next.
- **FILTER**—When pressed at the same time as the **SHIFT/RESET** key, automatically recovers and evacuates to 13 inches of vacuum from the filter and low side of the unit so you can change the filter.
- **CHG**—Automatically charges the A/C-R system with the programmed amount of refrigerant.
- **HOLD/CONT**—Interrupts the “AUTOMATIC” cycle (**HOLD**), and then resumes functions (**CONT**). Press once for **HOLD**, and again for **CONT** (continue).
- **VACUUM**—Activates the vacuum process.
- **ENTER**—Enters programmed data into the unit’s memory.

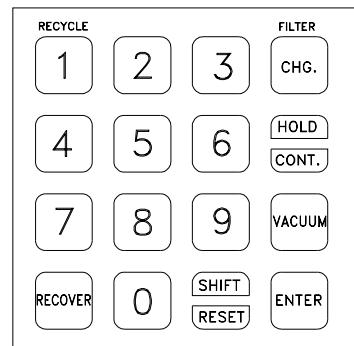


Diagram of
Keypad

USING THE DIGITAL DISPLAY

This section explains the messages shown on the digital display, which is illustrated here for your convenience.

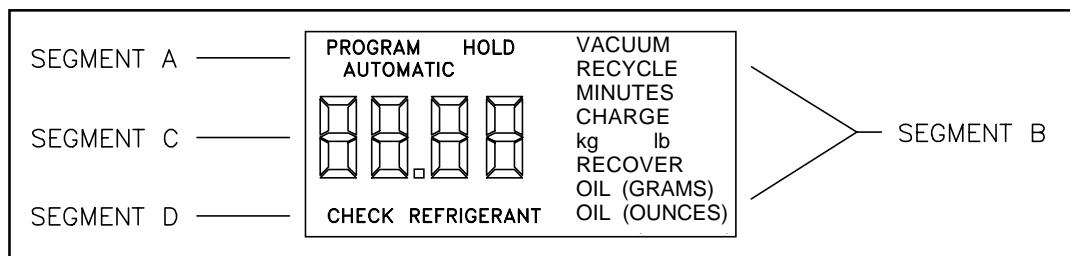


Diagram of Digital Display

Segment A—Indicates in which mode the unit is operating:

PROGRAM—The unit is in the programming mode, which allows you to program vacuum time and refrigerant weight **or** to review the existing program.

HOLD—This mode is used to change a refrigerant tank or to interrupt the vacuum/charging/recovery cycles.

AUTOMATIC—Indicates that the unit is running in a given cycle and will automatically stop when the cycle is complete. One exception: the recycling process must be stopped by pressing **HOLD/CONT**.

Segment B—Indicates that the unit is either evacuating the A/C-R system **or** recovering, recycling, or recharging refrigerant **or** that the unit is ready to be programmed for one of the following functions.

(Use the chart on the next page as a quick reference for interpreting Segment B messages.)

VACUUM

- With PROGRAM, indicates that the unit is ready to be programmed for vacuum.
- With AUTOMATIC, indicates that the vacuum pump is running; the number displayed counts down in minutes and seconds, showing the amount of time remaining.
- With HOLD, indicates that **HOLD/CONT** was pressed to interrupt the vacuum cycle.

RECYCLE

- With AUTOMATIC, indicates the unit is recycling refrigerant from the tank.

CHARGE

- With PROGRAM, indicates that the unit is ready to be programmed for the amount of refrigerant to be charged into the A/C-R system; on the keypad enter the charge in pounds and hundredths of a pound or kilograms, depending on the measurement mode selected.
- With AUTOMATIC, indicates the unit is charging refrigerant into the A/C-R system; the number shown on the digital display counts down, showing the remaining amount of refrigerant to be dispensed.
- With HOLD, indicates that **HOLD/CONT** was pressed to interrupt the charging cycle; the number shown on the digital display is the amount of refrigerant remaining

to be charged into the A/C-R system; to continue charging, press **HOLD/CONT** again.

RECOVER

- With AUTOMATIC, indicates the unit is recovering refrigerant from the A/C-R system and shows the amount of refrigerant recovered in pounds or kilograms, depending on the measurement mode selected.

OIL(OUNCES) or OIL(GRAMS)

- Lights up as a reminder to drain the oil separator after each job.

Segment C — Shows a number or a coded error message on the digital display that indicates the unit's operating status or any specific problems. See *Troubleshooting* for a list of error codes and messages.

Segment D — Indicates that refrigerant is low — approximately six pounds (or 2.7 kilograms) of refrigerant is left in the tank. Either replace the tank or add refrigerant to the tank.

VACUUM	+	PROGRAM	=	Program unit for vacuum
VACUUM	+	AUTOMATIC	=	Vacuum pump is running
VACUUM	+	HOLD	=	Interrupted vacuum cycle
RECYCLE	+	AUTOMATIC	=	Unit is recycling refrigerant
CHARGE	+	PROGRAM	=	Program unit for charge
CHARGE	+	AUTOMATIC	=	Unit is charging A/C-R system
CHARGE	+	HOLD	=	Interrupted charging cycle
RECOVER	+	AUTOMATIC	=	Unit is recovering refrigerant

Quick Reference Chart for Segment B

USING THE DIAGNOSTIC MODE

The diagnostic mode allows you to run individual components or retrieve stored information. To access the diagnostic mode, you must press and hold **SHIFT/RESET** and then press **ENTER**. The display will show the message “FUNC.” To exit the diagnostic mode, press **SHIFT/RESET** again.



Some diagnostic functions exit the diagnostic mode when completed so to continue with more diagnostic functions you must re-enter the diagnostic mode.

Once in the diagnostic mode you can do the following:

Initial Vacuum Mode:

1. Press **1** to enter initial vacuum mode. The display will show the message “VACUUM.” The proper use of this mode is described in the intial set up instructions which begin on page 6.
2. Press **HOLD/CONT** to stop the pump.

I m p o r t a n t :
To access the diagnostic mode, you must press and hold SHIFT/RESET and press ENTER. The display will show the message **FUNC.** To exit the diagnostic mode, press SHIFT/RESET again.

Set display for pounds or kilograms:

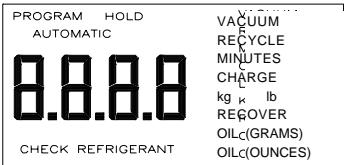
1. Press “0” to display the unit of measure currently set (the unit assumes you want to change the setting).
2. Press **ENTER** to toggle between "lb" and "kg".
3. When the desired setting displays, press **SHIFT/RESET** to save the selection.

Display total weight of recovered refrigerant:

1. Press “3” to display the total amount of refrigerant recovered by unit since the last filter-drier change.
2. This counter resets with every filter-drier change.

To Test Full Display:

Operating Guidelines



Example of Full Display Test

1. Press “5” to see the complete LCD display, which only displays momentarily before returning to the Program mode.

2. Press any key to exit.

To Access Scale Function:

1. Press “6” to “zero out” the display (regardless of what is on the scale platform).
The weight of anything you add to the scale platform will now display.
2. Press **SHIFT/RESET** to exit.

To Display Weight of Refrigerant in Tank:

1. Press “7” to display the weight of refrigerant in the tank.
2. Press any key to exit.

USING DISPLAY CODES

134A	R-134a; indicates R-134a automotive refrigerant requiring 1/2" Acme fittings.
Add	Add refrigerant to the tank before starting charging procedures.
CAL	The scale is out of calibration; see <i>Calibrating the Scale</i> .
Check Refrigerant	Tank has six (6) pounds or less of refrigerant; charging will not activate.
CH-F	Change compressor oil and filter/drier; 200 pounds of refrigerant has been recovered since the last change.
CH-P	A/C-R system pressure is low; prevents pulling air into the unit from a leaky system.
CL-c	Clearing complete; indicates that the first stage of the clearing process is complete.
CL-L	The low side clearing routine is in progress; this occurs when you press RECOVER and can last up to four minutes.
Clr	Self-clearing; if this message is displayed, the unit is in the self-clearing process.
CON	The vacuum pump will run continuously; press SHIFT/RESET to stop.
CPL	Complete; the current procedure is finished.
door	(Flashes) The unit has been cleared and you can now select a door

Operating Guidelines

position. Slide the refrigerant lockout panel (located on the back of the unit, top left corner) to expose the fittings for the selected refrigerant type.

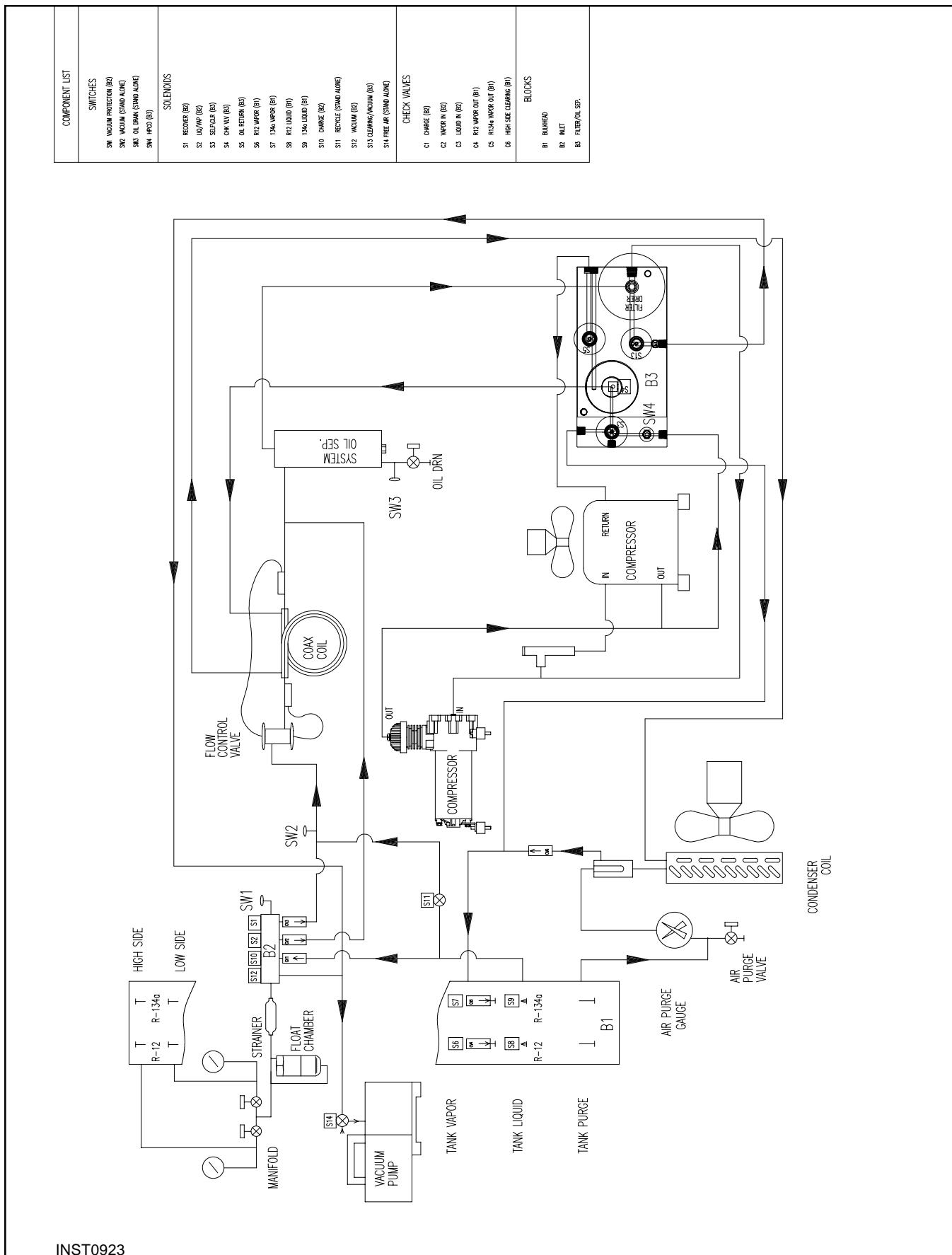
OIL/drn	(Flashes alternately) Drain; open the oil drain valve to relieve the pressure in the unit.
FIL	Compressor oil and filter/drier change procedures are being performed.
FULL	The tank is full; recovery stops automatically.
HI-P	High pressure; the unit pressure is greater than 435 psi.
OIL	Change vacuum pump oil; it has been 10 hours since the last oil change.
R12	R-12; indicates R-12 or other refrigerant type requiring $\frac{1}{4}$ " flare fittings.
SCAL	Scale problem; the scale is broken or disconnected, or the tank has exceeded 75 pounds gross weight.
U-HI	High pressure to vacuum pump; prevents blowing refrigerant through the vacuum pump. To relieve pressure, perform a recovery process (see the <i>Operating Instructions</i>).

Replacement Parts

Following is a list of replacement parts and accessories you may need to service or maintain your unit. Tanks, filter-drier and vacuum pump oil should be purchased through your regular Robinair distributor.

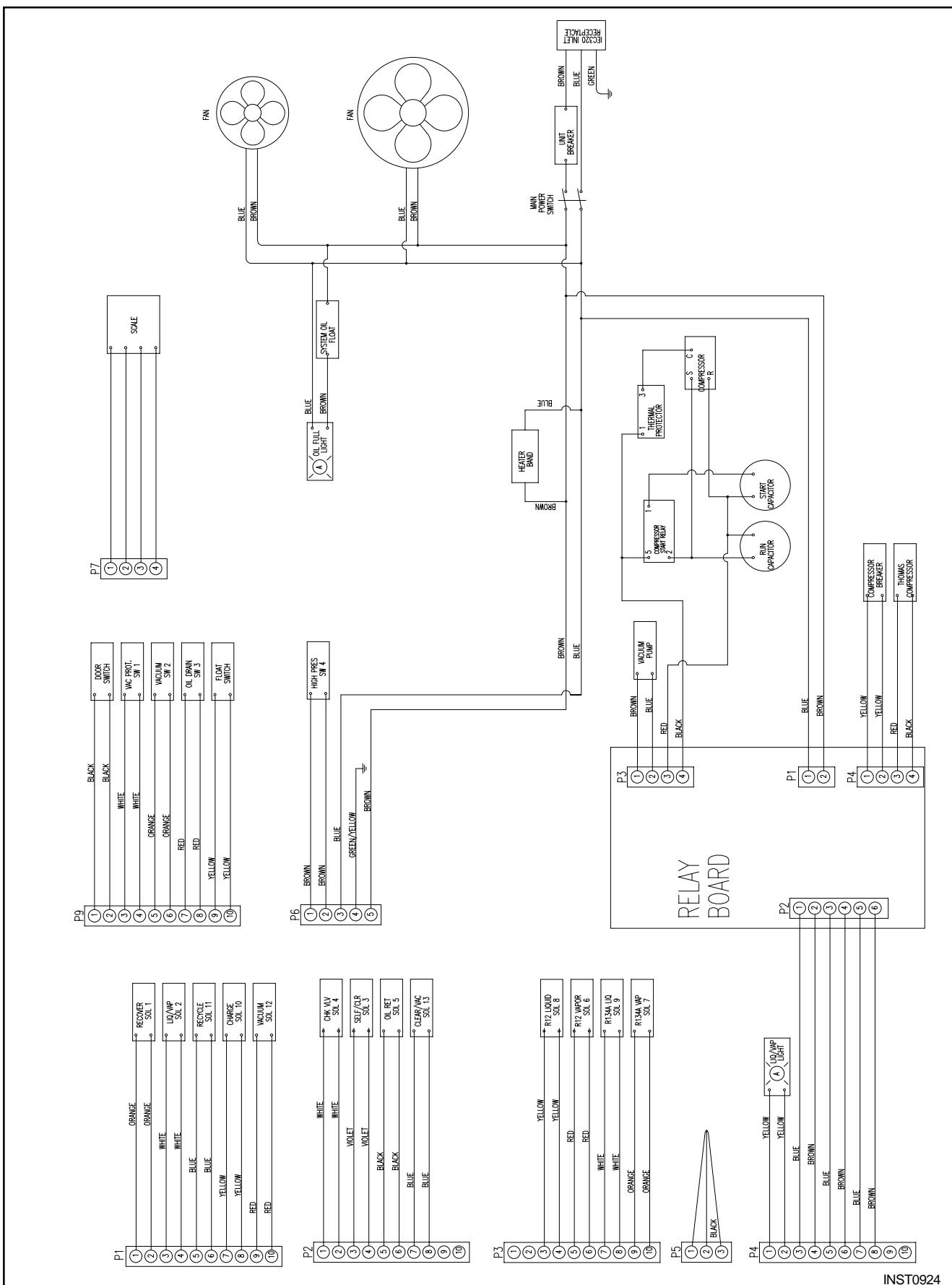
Description	115-Volt	230-Volt
50 lb. (23 kg) tank, $\frac{1}{4}$ " flare fittings -----	17506	17506
50 lb. (23 kg) tank, $\frac{1}{2}$ " Acme fittings -----	34750	34750
36" Yellow Hose, Single Quick Seal -----	19293	19293
36" Red Hose, Single Quick Seal -----	68336A	68336A
36" Blue Hose, Single Quick Seal w/valve core depressor -----	19339	19339
36" Red Hose, Auto Shut Off -----	19312	19312
36" Blue Hose, Auto Shut Off -----	19311	19311
36" Yellow Hose, Auto Shut Off -----	19310	19310
36" Blue Acme Hose -----	19306	19306
36" Red Acme Hose -----	19307	19307
36" Yellow Acme Hose -----	19313	19313
96" Red Hose, With Ball Valve -----	19296	19296
96" Blue Hose, With Ball Valve -----	19298	19298
96" Red Hose, Auto Shut Off -----	19308	19308
96" Blue Hose, Auto Shut Off -----	19309	19309
96" Red Acme Quick Seal Hose -----	19328	19328
96" Blue Acme Quick Seal Hose -----	19329	19329
Coupler ($\frac{1}{2}$ Acme x Service Coupler) -----	16301	16301
Copeland Compressor -----	RA19775	RA19785
Thomas Oil-Less Compressor -----	RA19782	RA19783
Quick Change Filter -----	19776	19776
Gauge, Air Purge -----	RA19281	RA19285
Gauge, High Side -----	RA19787	RA19787
Gauge, Low Side -----	RA19786	RA19786
Indicator Light (Amber) -----	RA17107	RA19351
Keypad -----	RA19065	RA19065
Main Circuit Board -----	RA19774	RA19774
Relay Board -----	RA19778	RA19784
R-134a Low Side Coupler -----	18190A	18190A
R-134a High Side Coupler -----	18191A	18191A
Scale -----	RA19773	RA19773
Vacuum Pump Oil (1 case of quart bottles) -----	13203	13203

Flow Diagram



INST0923

Wiring Diagram



INST0924

Troubleshooting

RECOVERY OPERATION

Compressor does not start

Problem: Main power switch is off

Solution: Turn on switch

Problem: Power cord is not plugged in or there is no power at plug

Solution: Check circuit for power

Problem: "FULL" message shows on digital display

Solution: Change tanks (see *Installing a Tank and Pulling A Vacuum*)

Problem: "HI-P" message shows on digital display

Solution: Be sure tanks valves are open and hoses are properly connected to the tank, **or**

Check for air in the tank (recycle tank to purge any air), **or**

Check the scale calibration (see *Checking the Scale Accuracy*)

Note: If "HI-P" message does not disappear in 20 minutes the pressure will have to be released manually. Recover the pressure from the HI-P Access Port shown on page 4 in the Diagram of Units Components - Internal View.

Problem: "CH-F" message on digital display

Solution: Remove and replace the filter-drier (see *Replacing the Filter-Drier*), and be sure to pull a vacuum before continuing

Runs for a short time but does not complete recovery

Problem: Tank valves are closed

Solution: Open both valves and be sure hoses are properly connected to the tank

Problem: Manifold valves are closed

Solution: Open both valves

Runs but will not shut off

Problem: Oil drain valve is open

Solution: Close the oil drain valve

Problem: There is a leak in the A/C-R system

Solution: Locate and repair all system leaks

Problem: Hoses are not properly connected to the vehicle

Solution: Check hose connections

Problem: Oil return solenoid is open

Solution: Replace the oil return solenoid

RECYCLING OPERATION

Compressor does not start or stops prematurely

Problem: Power cord is not plugged in or there is no power at plug

Solution: Check circuit for power

Problem: Tank valves are closed

Solution: Open both valves and be sure hoses are properly connected to the tank

Problem: “CH-F” message on digital display

Solution: Remove and replace the filter-drier (see *Replacing the Filter-Drier*), and be sure to pull a vacuum before continuing

Refrigerant does not flow

Problem: Refrigerant supply empty or low

Solution: Add refrigerant to the tank

Problem: Tank valves are closed

Solution: Open both valves and be sure hoses are properly connected to the tank and the unit

RECHARGING OPERATION

No power when MAIN POWER switch is on — no display showing

Problem: Power cord is not plugged in or there is no power at plug
Solution: Check circuit for power

Problem: The “CHECK REFRIGERANT” message is displayed
Solution: There is less than 6 pounds of refrigerant in the tank; add refrigerant to the tank

Audible tone sounds during refrigerant transfer

Problem: Transfer stopped or too slow
Solution: Close the high side valve, then start the A/C-R system and pull the remaining refrigerant into the system

Problem: Refrigerant supply is low or empty
Solution: Add refrigerant to the tank or change tanks

Problem: Tank valves are closed
Solution: Open both valves and be sure hoses are properly connected to the tank and the unit

EVACUATION OPERATION

Vacuum pump will not start

Problem: Power cord is not plugged in or there is no power at plug

Solution: Check circuit for power

Problem: The pressure in the A/C-R system is too high

Solution: Recover the remaining A/C-R system charge

Problem: “U-HI” message on digital display

Solution: Recover all refrigerant before pulling a vacuum

Problem: Vacuum time not entered

Solution: Program the required time for vacuum

Vacuum pump runs but low side gauge does not register an appropriate vacuum

Problem: Low side valve is closed

Solution: Open the low side valve

Problem: Pump oil is contaminated

Solution: Flush and change the vacuum pump oil

Problem: Hose connection is loose or manifold is leaking

Solution: Check connections

CLEARING OPERATION

“CLR” displays on screen

Problem: Pressing **HOLD/CONT** does not clear the display

Solution: Slide the lockout panel on the back of the unit to expose the fittings for the correct refrigerant type, connect the appropriate hoses and perform a clearing procedure (see Step 12 in *Set Up Instructions*)

Limited Warranty

This product is warranted to be free from defects in workmanship, materials, and components for a period of one year from date of purchase. All parts and labor required to repair defective products covered under the warranty will be at no charge. The following restrictions apply:

1. The limited warranty applies to the original purchaser only.
2. The warranty applies to the product in normal usage situations only, as described in the Operating Manual. The product must also be serviced and maintained as specified.
3. If the product fails, it will be repaired or replaced at the option of the manufacturer.
4. Transportation charges for warranty service will be reimbursed by the factory upon verification of the warranty claim and submission of a freight bill for normal ground service. Approval from the manufacturer must be obtained prior to shipping to an authorized service center.
5. Warranty service claims are subject to authorized inspection for product defect(s).
6. The manufacturer shall not be responsible for any additional costs associated with a product failure including, but not limited to, loss of work time, loss of refrigerant, cross-contamination of refrigerant, and unauthorized shipping and/or labor charges.
7. All warranty service claims must be made within the specified warranty period. Proof-of-purchase date must be supplied to the manufacturer.
8. Use of this recovery/recycling equipment with unauthorized refrigerants will void the warranty. Authorized refrigerants are listed on the equipment or are available through the Technical Service Department.

I m p o r t a n t !
Please have
model number,
serial number,
date code and
proof of purchase
(invoice) ready
when you call for
authorization.

This Limited Warranty does not apply if:

- The product, or product part, is broken by accident.
- The product is misused, tampered with, or modified.
- The product is used for recovering or recycling any substance other than the specified refrigerant type.

Note: Refillable refrigerant tanks are reusable.

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Changing the Vacuum Pump Oil	23	 <i>This equipment is protected by one or more of the following U.S. and foreign patents.</i>	
Checking for Leaks	30	<i>U.S. Patents: 4,523,897; 4,688,388 Re 33,212; 4,768,347; 4,805,416; 4,878,356; 4,938,031; 5,005,369; 5,005,375; 5,038,578; 5,042,271; 5,063,749; 5,095,713; 5,181,391; 5,203,177; 5,231,842; 5,248,125.</i>	
Operating Guidelines	31	<i>Foreign Patents:</i>	
Keypad Functions	32	<i>AUS 609,240; 613,058; 622,833; 633,766. BRAZ PI 8803612.</i>	
Using the Control Panel	31	<i>CAN 616,474; 1,311,621; 1,311,622; 2,012,620; 2,026,348.</i>	
Using the Diagnostic Mode	35	<i>EUR 0 315 296; 0 329 321 BI; 0 437 021 BI.</i>	
Using the Digital Display	32	<i>MEX 16208. SAF 88/4981.</i>	
Using Display Codes	37	<i>Other U.S. and Foreign Patents Pending.</i>	
		<i>Manufactured by Robinair, SPX Corporation, Montpelier, OH 43543. PRINTED IN USA.</i>	

CONVERSION TABLE

OZ.	LBS.
0.5	0.03
1.0	0.06
1.5	0.09
2.0	0.13
2.5	0.16
3.0	0.19
3.5	0.22
4.0	0.25
4.5	0.28
5.0	0.31
5.5	0.34
6.0	0.38
6.5	0.41
7.0	0.44
7.5	0.47
8.0	0.50
8.5	0.53
9.0	0.56
9.5	0.59
10.0	0.63
10.5	0.66
11.0	0.69
11.5	0.72
12.0	0.75
12.5	0.78
13.0	0.81
13.5	0.84
14.0	0.88
14.5	0.91
15.0	0.94
15.5	0.97
16.0	1 lb.

Call toll-free



Technical Support Line

800-822-5561

in the continental U.S. or Canada.

In all other locations, contact your local distributor. To help us serve you better, please be prepared to provide the model number, serial number, and date of purchase.

To validate your warranty, you must complete the warranty card attached to your unit and return it within ten days from date of purchase.

• NATIONWIDE NETWORK OF AUTHORIZED SERVICE CENTERS

If your unit needs repairs or replacement parts, you should contact the service center in your area. For help in locating a service center, call the toll free technical support line.

This equipment is designed to meet all applicable agency certifications including Underwriter's Laboratories, Inc., SAE Standards and CUL. Proper maintenance of this equipment will provide accurate A/C service for many years.

Certain state and local jurisdictions dictate that using this equipment to sell refrigerant by weight may not be permitted. We recommend charging for any A/C service by the job performed.

This weight scale provides a means of metering the amount of refrigerant needed for optimum A/C system performance as recommended by OEM manufacturers.



Due to ongoing product improvements,
we reserve the right to change design,
specifications and materials without notice.

PM-A FLUIDS / LUBRICATION CHART (For Contract CQ19195, 12/3/2019.)

(Use "BMNT (SVMT) Various Lubricants Contract Internal Order Form" on BMNT website to order items.)

Component	Fluid Type	Applicable Buses	Brand Name
Engine (Diesel)	15W-40, CK-4/SN Engine Oil	3036-3087, 3751-3770, 4450-4598, 5460-5480, 5481-5492, 5500-5541, 6101-6217, 6301-6609, 7001-7272, 7300-7355, 7356-7409, 8001-8105	Mileguard HD Syn Blend 15W-40 Was: Warren Coastal Lubriguard Fleet 15W-40 Was: Chevron Ursa (Use Warren Coastal, Chevron Ursa or Mobil Fleet till depleted.)
Engine (CNG)	Low Ash 15W-40 Engine Oil	2801-2825, 2830-2993, 3001-3035, 3100-3199, 3200-3349	Warren GEO Low Ash 15W-40
Transmission / Hybrid Drive Units	Full Synthetic ATF	All Bus Fleets	Mobil Delvac 1 Synthetic ATF Was: Castrol TranSynd (Use Castrol till depleted.)
Steering and Hydraulic System	Full Synthetic ATF	All Bus Fleets	Mobil Delvac 1 Synthetic ATF Was: Castrol TranSynd (Use Castrol till depleted.)
Differential and Planetary Hubs	Mineral Base Gear Lube	2801-2825, 3751-3770, 6101-6217, 6301-6609	Mobilube HD Plus 80w90 Was: Petro Canada TRAXON 80W-90 Gear Oil (Use Petro till depleted.)
Differential	Full Synthetic Gear Lube	2830-2993, 3001-3035, 3036-3087, 3100-3199, 3200-3349, 4450-4598, 5460-5480, 5481-5492, 5500-5541, 7001-7272, 7300-7355, 7356-7409, 8001-8105	Mobil Delvac 75W-90 (Synthetic Gear Lube)
Wheel Chair Ramp	Full Synthetic ATF	2801-2825, 2830-2993, 3001-3035, 3100-3199, 3751-3770, 5460-5480, 5481-5492, 6101-6217, 6301-6609, 7001-7272, 7300-7355, 7356-7409	Mobil Delvac 1 Synthetic ATF Was: Castrol TranSynd (Use Castrol till depleted)
Articulated Joint Hydraulic Fluid	Hydraulic Fluid	5460-5480, 5481-5492, 5500-5541	Shell Tellus 15 (5 Gallon Pails Only)
Wheel Bearings	Grease, EP-2	All	Mobilux EP-2 Grease
Chassis	Grease, EP-2	All	Mobilux EP-2 Grease
King Pin Bushings	Grease, EP-2	All Meritor Front Axle Buses* (2801-2825, 3036-3087, 6101-6217 & 8001-8105) (Stock No. 932-55-0012, 35# Pail)	ECL #TEK-678 (Red Disp.) *Plus any 2005 Orion-VII CNG Buses still in Revenue Service.
King Pin Bushings	Grease, EP-2	All MAN Front Axle Buses (2830-2993, 3100-3199, 3200-3349, 3751-3770, 4450-4598, 5460-5480, 5481-5492, 6301-6609, 7001-7272, 7300-7409)	ECL #TEK-678 (Red Disp.)
Steering/Gear Box	Grease, EP-1	All (Stock No. 061-00-0505)	Castrol Pyroplex Red #1
Miter/Transfer Box	Grease, EP-2	All	Mobilux EP-2 Grease

Effective date: 2/2/2021/ epmBENG

Component	Fluid Type	Applicable Buses	Brand Name
Slack Adjusters	Grease, EP-1	All (Stock No. 061-00-0505)	Castrol Pyroplex Red #1
Battery Terminals, Electrical Connectors	Battery Corrosion Inhibitor, Mineral Oil, 32 oz. Can w/Brush	Group 31 Lead Acid Battery Buses Only & A/R (Stock No. R61-60-0083)	NOCO, NCP-2 Compound, CB304
Window, Hinges & Latches	Spray Lubricant, Water Displacing w/PTFE (Teflon)	All (Fastenal Dispenser)	WD-40 Specialist, Dirt & Dust Resistant Dry Lube PTFE Spray
Door Sliders	Synthetic Spray Lubricant w/PTFE (Teflon)	All (Stock No. R91-50-0078)	Loctite 20029 Super Lube / Teflube
Coolant (Separate Cummins Contract)	Long Life Coolant, 50/50 Pre-Mixed	All (All buses use 50/50 pre-mixed.)	Fleetguard EA Compleat OAT EG Premix 50/50 Coolant
Dual Brake Valve, E-6, E-10 & E-10P; Graham White Dryer O-Rings	Lubricant, Silicone, NLGI #1, 5.3oz Tube	All (WMATA Stock No. 061-00-2419)	Dow Corning 7 Release Compound (Replaces Bendix BW-204-M Barium Grease, Bendix #246671)
HVAC Compressor Oil (R22/R134A Freon)	Mineral Base Compressor Oil	2100-2231, 2501-2685, 2701-2730, 2801-2825, 3001-3035, 3751-3770, 4200-4412, 5401-5422, 5431-5452, 6001-6050, 6101-6217*, 6301-6461 (WMATA Stock No. 061-00-0303)	Suniso (or) Parker, Type 3GS
HVAC Compressor Oil (R407C Freon, Reciprocating Type Compressor)	Polyol Ester Base Compressor Oil, (Thermo King Solest 35)	2830-2993, 5460-5480, 6462-6599, 7001-7272, 7300-7355, 7356-7409, 8001-8105, 6101-6217** (WMATA Stock No. 061-00-2413)	Thermo King Solest 35, Thermo King #203-0513
HVAC Compressor Oil (R407C Freon, Screw Type Compressor)	Polyol Ester Base Compressor Oil, (Thermo King Solest 120)	3036-3087, 3100-3199, 3200-3274, 4450-4598, 5481-5492, 5500-5541, 6600-6609 (WMATA Stock No. 061-00-2416)	Thermo King Solest 120, Thermo King #203-0515
WeatherPack/Other Elec Connectors	Aerosol Spray Lacquer Sealer	All (Stock No. 999-65-1713)	Sprayon EL2000
ATG Artic Joint Sys Spray Lubricant	Aerosol Spray, White Lithium Grease	New Flyer 5431-5452 & A/R (Stock No. 061-00-2412)	Lubriplate Spray Lube A
Electrical Connections	Dielectric Grease, Inorganic Mineral Oil, 2 oz. Tube	All (Stock No. 061-00-0510)	Niagra Lubricant #NYK-77
CNG Spark Plugs	Dielectric Silicone w/PTFE Grease, 1.5cc Packets (Single use)	All CNG Engines (Stock No. 061-00-0513)	Fuchs Chemplex 839 #1
Galvanic Corrosion Prevention	Dielectric Grease, Silicone, NLGI #2, Broad Temp Range, 8 oz. Tube	All (Aluminum Wheel to Steel Interfaces) (Stock No. 061-00-2415)	Fuchs Chemplex #825
Assembly Lubricant (Anti Friction Lube)	Graphite Paste, 1 lb. Can	New Flyer Xcelsiors w/MAN axles, 2830-3199, 7001-7409, 5460-5480 (Stock No. 061-00-2414)	Dow Corning Molykote-D

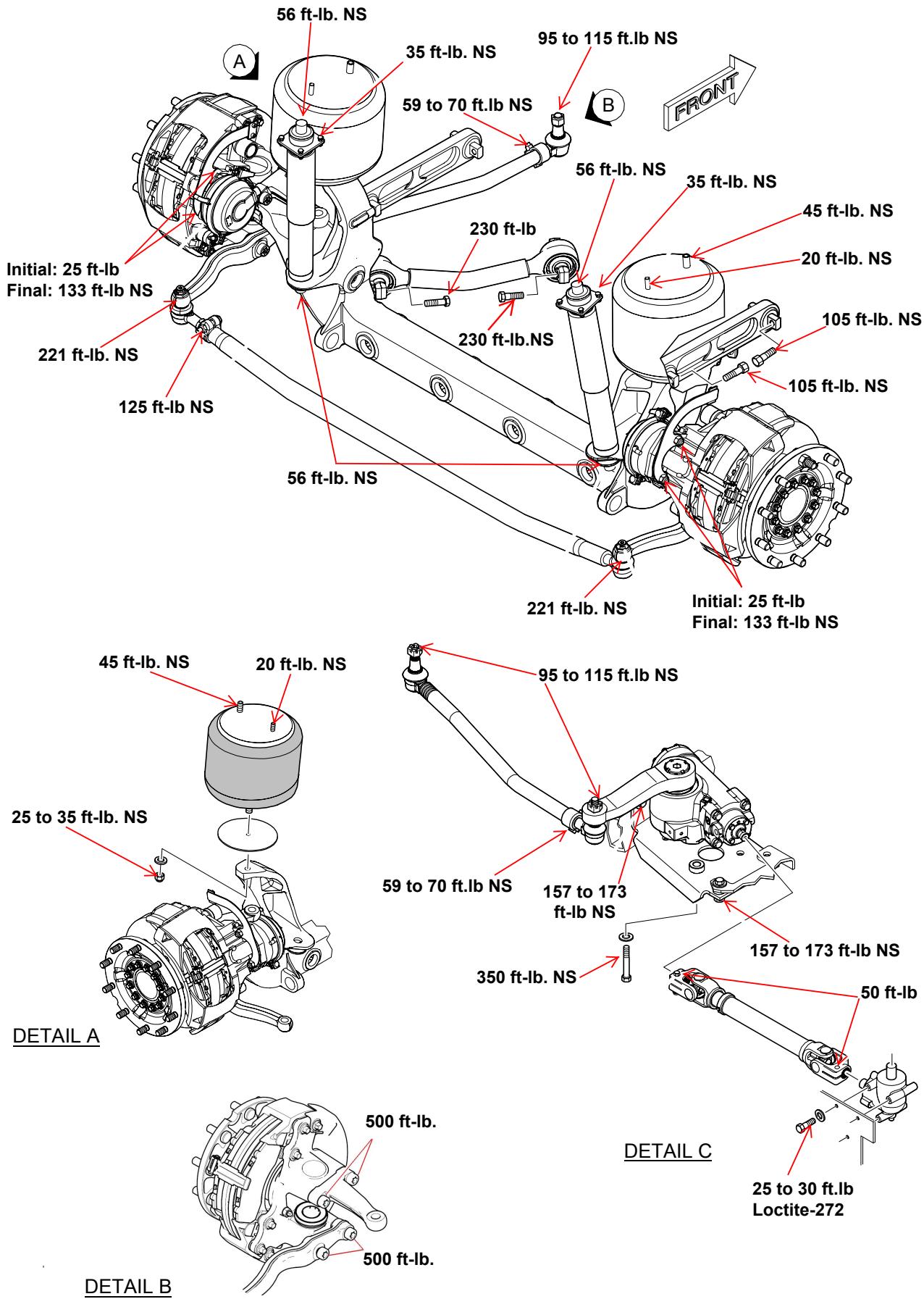
Effective date: 2/2/2021/ epmBENG

Component	Fluid Type	Applicable Buses	Brand Name
Brake Pad Lube (Use on Abutment Surfaces Only)	75ml Tube (Fastenal #12351-02162)	All New Flyer (MAN Axle) Disc Brakes (as required per NF SMB-152) Stock No. TBD, Fastenal Vending Mach, WMATA SDS #14554	Textar Cera Tec, Anti-Squeal Lubricant, Textar OEM #81000400

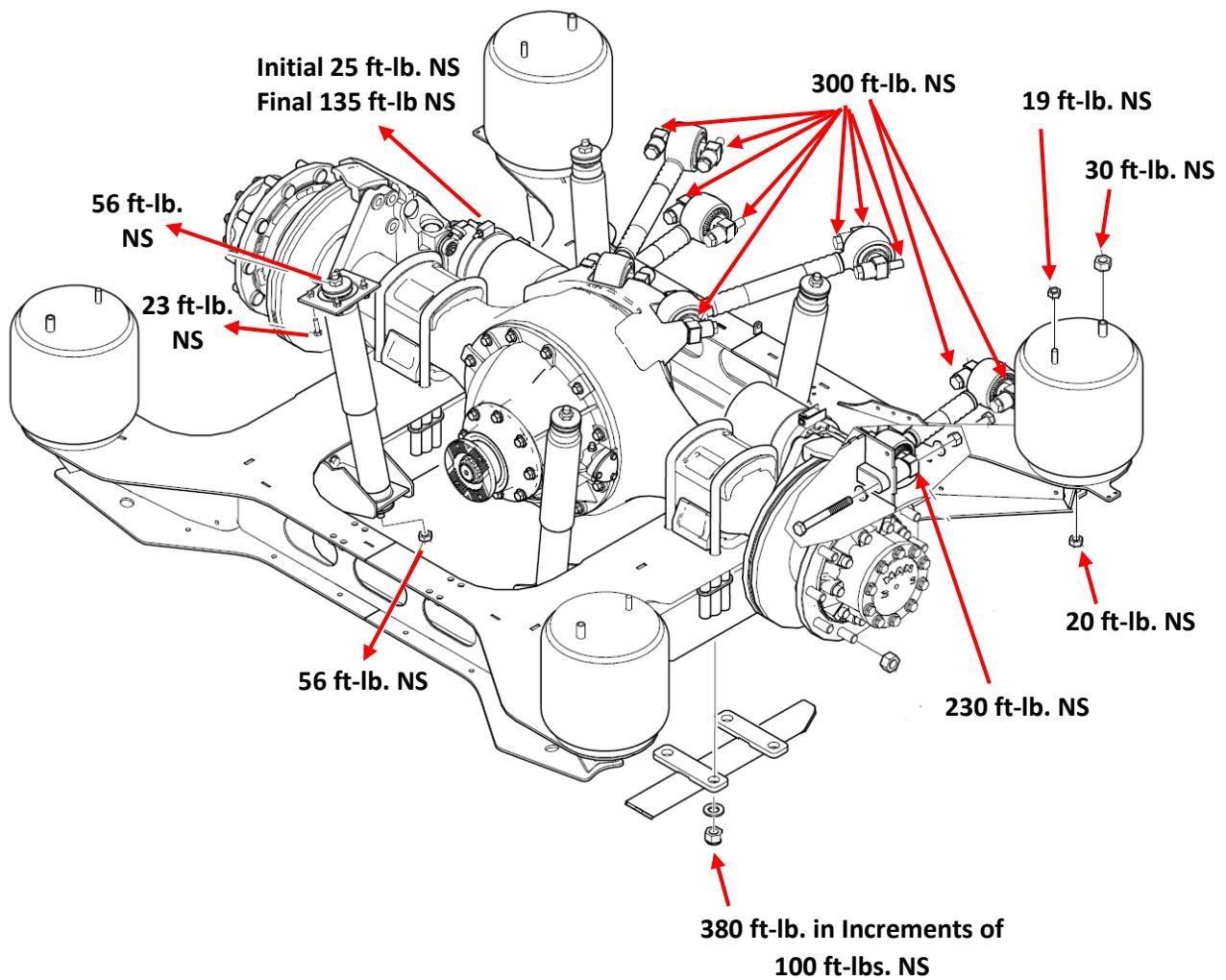
HVAC Compressor Oil: *(6101-6217 current (before) Mid Life Overhaul); **(6101-6217 after Mid Life Overhaul)

Ed Murawski / BENG / 2/26/2015; 5/27/2016; 6/10/2016; 10/7/2016; 3/2/2017; 3/10/2017; 3/29/18; 3/4/2019; 6/3/2019; 6/4/2019; 2/2/2021;

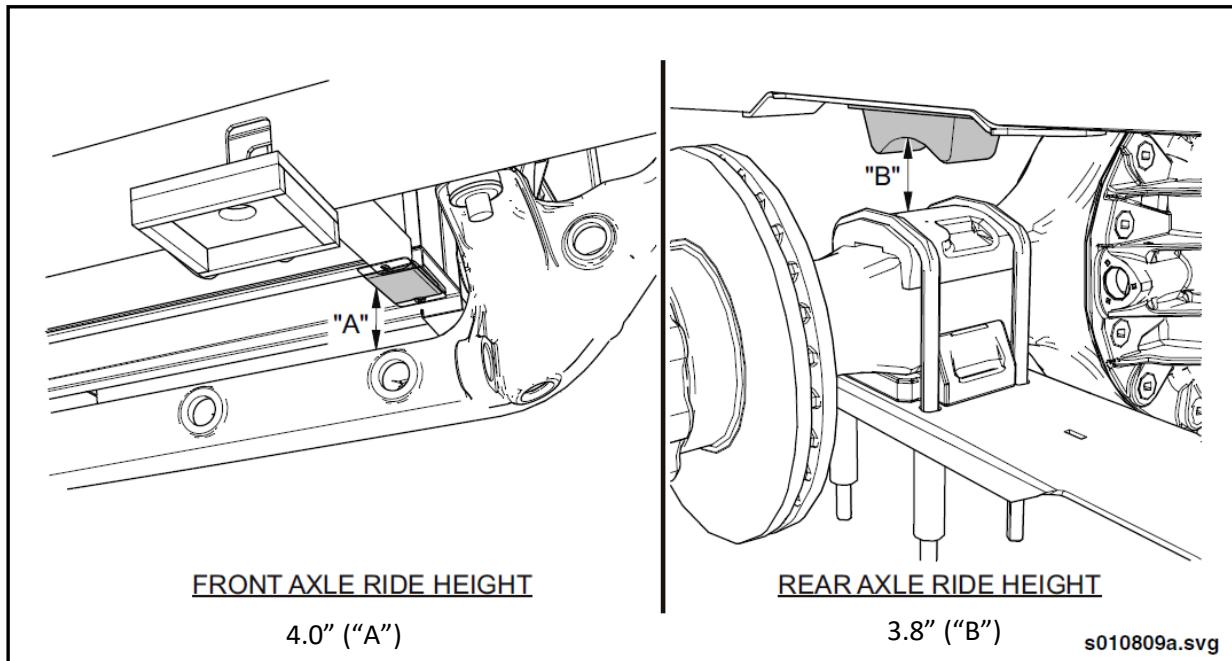
7300-7355,
7356-7409
Never-Seez = NS



7300-7409
Never-Seez = NS



7300-7409 Ride Height Specifications



7300-7409 Engine Mount Torque

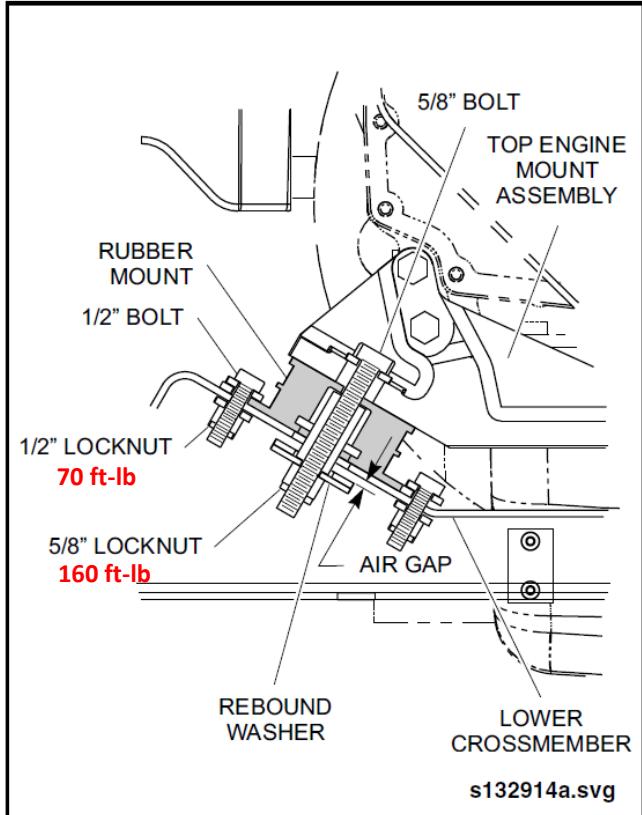


Fig. 4-9: Front Engine Mount Cross-Section

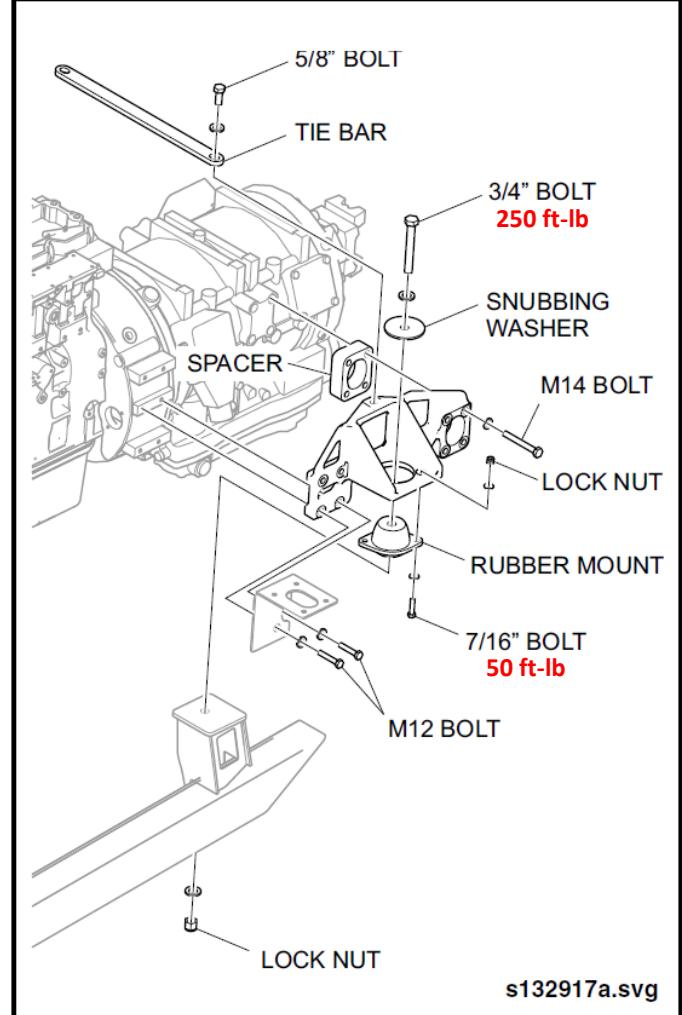


Fig. 4-10: Rear Engine Mount



M E M O R A N D U M



SUBJECT: **Low Voltage Disconnect**

DATE: November 16, 2015

FROM: BMNT – Barry Goldman
THRU: Phillip C. Wallace (*original signed*)

TO: Distribution

This Service Bulletin applies to New Flyer Buses 5460-5480, 7300-7409 and 2830-2993

In an effort to extend battery life and reduce instances of deeply discharged batteries, all model year 2015 and 2016 New Flyer Xcelsior buses are being delivered equipped with a battery rundown protection feature called **Low Voltage Disconnect**. With this feature, the battery state of charge is monitored when the master run switch is OFF. If the state of charge falls below 50% capacity the multiplex system will disconnect all 12 and 24 volt loads from the batteries - with the exception of fire suppression and CNG leak detection.

With the addition of this new technology, there is a new process to be used in starting these buses:

1. Rotate the Master Run Switch to DAY RUN.
2. If the bus 'wakes up' normally (dash lights, buzzer come on) then start the bus as normal, pressing the START button after 'Wait to Start' indications have extinguished.
3. If the bus does not 'wake up', leave the Master Run Switch in Day Run and press the Start button for three seconds and release. This will override the Low Voltage Disconnect and restore battery power.
4. Once the bus 'wakes up', start as normal.
5. If pressing the start button does not wake the bus, use published diagnostic repair procedures to determine the root cause and correct the problem These can be found on the BMNT website:

BMNT Website > Main Menu > Maintenance Information > Bus Manufacturers Manuals > New Flyer > New Flyer Transit Information Viewer

**Washington
Metropolitan Area
Transit Authority**

DISTRIBUTION

BUS:	Potts
BMNT:	Wallace
	Golden
	Silvani
	Skelton
	Directors
	Superintendents
	Bus Maintenance Supervisors
BQAL:	Briscoe
SAFE:	Gilbert

**BMNT SERVICE BULLETIN 15-E-003
POST ON ALL BMNT BULLETIN BOARDS**



M E M O R A N D U M



SUBJECT: **Xcelsior Drivers Barrier Lower Hinge Bolt**

DATE:: December 21, 2016

FROM: BMNT – Barry Goldman
THRU: Phillip C. Wallace (original signed)

TO: Distribution

This Bulletin Applies to all 2015 /2016 New Flyer Xcelsior Buses (5460-5480 / 7300-7409 / 2830-2993)

New Flyer has identified some instances of the driver's barrier door pivot hardware coming loose. Over time the lower hinge may loosen, eventually allowing the barrier door to drop. In order to prevent the lower barrier hinge bolt from coming loose the bolt must be removed and installed with Loctite 243 or approved equivalent Vibra –Tite 121 Medium Strength Removable Thread locker, available in the Fastenal vending machines



Figure 1 Hinge Bolt Location

**Washington
Metropolitan Area
Transit Authority**

During the next PMA Service perform the steps detailed in the attached New Flyer Technical Service Information Bulletin (TSIB 16-03 rev. A) This will ensure the hinge bolt is installed properly and will remain secured.

The hinge bolt should be checked periodically during PM level inspections to ensure it has not loosened.

New Flyer Service Technical Bulletin 16-03 rev. A as well as other TSIB's can be found on the BMNT Website > Main Menu > Maintenance Information > Bus Manufacturer Manuals > New Flyer > Technical Service Bulletins

DISTRIBUTION

BUS: Potts
BMNT: Wallace
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Singh
Directors
Superintendents
Bus Maintenance Supervisors
SAFE: Gilbert

**BMNT SERVICE BULLETIN 16-B-002
POST ON ALL BMNT BULLETIN BOARDS**



M E M O R A N D U M



SUBJECT: **Xcelsior Instrument Cluster Replacement Process**

DATE: May 19, 2017

FROM: BMNT – Barry Goldman
THRU: David B. Michels (Original signed)

This Service Bulletin applies to all Xcelsior Fleets (7001-7272 / 5460-5480 / 7300-7409 / 2830-2993)

Due to the power management system on some of these buses, it is imperative that programming and configurations of replacement instrument clusters be done in a bench environment.

If programming is attempted on the bus and the battery management system were to activate and cut power, the new replacement cluster would be damaged beyond repair.

Therefore, effective immediately prior to installing a replacement instrument cluster contact BENG-Don Rich to have it bench programmed and configured.

Part Name	Part Number	Application
Instrument Cluster	385755	SR1513 (7001-7052) SR1514 (7053-7090) SR1554 (7101-7152) SR1585 (7091-7100) SR1684 (7153-7167) SR1680 (7168-7263)
Instrument Cluster	507992	SR1751(7264-7272)
Instrument Cluster	517431	SR1913 (5460-5480) SR1946 (7300-7355) SR1947 (2830-2993) SR1976 (7356-7409)

**Washington
Metropolitan Area
Transit Authority**

BMNT SERVICE BULLETIN 17-E-001 POST ON ALL BMNT BULLETIN BOARDS

DISTRIBUTION

BUS: Potts
BMNT: Michels
Golden
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Bus Maintenance Supervisors
SAFE: Gilbert



M E M O R A N D U M



SUBJECT: **Vibrant Power Inc. V-Band Exhaust Clamp**

DATE: January 4, 2018

FROM: BMNT – Steve West
THRU: David B. Michels

TO: Distribution

This Bulletin Applies to all New Flyer Fleets

Bus Maintenance continues to experience a high number of reported service interruptions for fumes in the bus. The top cause of these service interruptions has been exhaust leaks, particularly on the New Flyer LFAs and Xcelior fleets. These buses use several sizes of V-band exhaust clamps manufactured by Vibrant Power Inc. (see figure 1). When servicing systems with these types of clamps it is imperative to note the following:

1. **Used clamps should never be reinstalled.** These clamps are single use only and should be discarded after removal and replaced with a new clamp.
2. **The lock nut should be torqued to 75 in-lbs.** Under or over torqueing can lead to a poor seal and allow exhaust fumes to escape.



Figure 1 Vibrant Power Inc. V-Band Exhaust Clamp

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**BMNT SERVICE BULLETIN 18-P-001
POST ON ALL BMNT BULLETIN BOARDS**



Service Bulletin

SUBJECT: LED Headlight Assembly Replacement Date: 02/05/2020

FROM: BMNT – Frederick L. Miller Jr.
THRU - David B. Michels (Original signed)

TO: Distribution

This Bulletin Applies to the New Flyer Xcelsior Fleets (Bus# 7001-7272; 7300-7409; 5460-5480; 2830-2993; 1001)

Note: This is to be performed when a failure of the headlight assembly (ONLY) occurs. If the headlight module is the only failure, replace using Metro #882700076.

The headlight assemblies (#881550380 and #881550381) on these buses are controlled by a separate remotely mounted headlight module (see Figure 1 and 2).

The new headlight assembly is fully LED and incorporates the headlight module providing the same form, fit and function as the previous assembly (see Figure 3).

When installing the new headlight assembly connect the OEM wire harness connector directly into the new headlight assembly wire harness connector (see Figure 4). The high beam connector for the original assembly is unused, insulate open connection with electrical tape and secure with other harnesses. Mount headlight assembly per the service manual procedure and secure the excess wiring harness.



Figure 1 (Original Curbside Headlight Assembly and Module)



Figure 2 (Original Roadside Headlight Assembly and Module)



Figure 3 (New LED Headlight Assemblies)



Figure 4 (Harness Connection)

DISTRIBUTION

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BMNT: Michels
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BMNT SERVICE BULLETIN 20-E-002
POST ON ALL BMNT BULLETIN BOARDS



Washington Metropolitan Area Transit Authority

BMNT SERVICE BULLETIN



Subject: Xcelsior High Temperature Air Governor O-Ring Upgrade **Date:** 5/24/2022
SB #: 22-AS-01-00

FROM: BMNT – Frances Jallu | Jerry Guaracino

THRU: BMNT – Raphael Alfred Raphael W Alfred
Raphael W Alfred (Jun 10, 2022 08:54 EDT)

TO: Distribution

APPLIES TO:

Bus No.	Fleet No.	Build No.	Bus No.	Fleet No.	Build No.
2830-2993	55	SR1947	5460-5492	54/60	SR1913/2243
3100-3349	59/61/64	SR2107/2307/2406	5500-5541	65/66	SR2407/2472
4450-4598	62/63/67	SR2308/2405/2471	7300-7409	56/57	SR1946/1976

This Service Bulletin Supersedes Service Bulletin # 19-A-001

In 2015, New Flyer began using a narrow band air governor, 842-55-0041(New Flyer PN 399079), on their buses to help the air system keep up with additional air pressure demands. The new governor has a higher cut in point than previous versions (117psi vs 105-110psi). The narrow band air governor came equipped with standard temperature O-rings which led to high rates of failures.

To improve reliability, the Main shop is modifying this part by replacing standard O-rings with high temperature O-rings and relabeling with the appropriate WMATA part number. Please note that Part No. 842-55-0041 is for Main Shop use only and is not to be used on WMATA assets. After this modification is complete, the updated air governor will be stocked at the Divisions as part number X842-55-0041.

Initially, the modified Air Governor part was being stocked under Part No. 842-70-0041 which has been obsoleted and replaced by the new part no. X842-55-0041.

842-55-0041	842-70-0041	X842-55-0041
Air Governor w/ Std O-Ring	Old Modified Part No.	Air Governor w/ High Temp O-Ring
MAIN SHOP USE ONLY	OBSOLETED	DIVISION USE



Washington Metropolitan Area Transit Authority

BMNT SERVICE BULLETIN

**Subject:** Radius Rod Hardware Installation**Date:** 10/21/2024**SB #:** BUSV-BMNT-SB-22-CC-03-01**FROM:** Abiodun Animashawun | Jerry Guaracino**THRU:** Raphael Alfred Raphael W AlfredRaphael W Alfred (Oct 21, 2024 13:16 EDT)**TO:** Distribution**Applies To:** All Fleets**This Service Bulletin Supersedes Service Bulletin # 22-CC-03-00**

Proper installation of radius rod hardware is essential to avoid safety hazards and damaged components resulting from broken hardware and damage threads. New installations of radius rods will now require new radius rod bolts. Old mounting hardware is not to be reused.

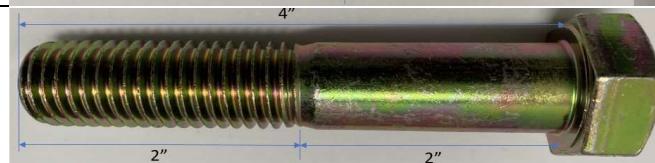
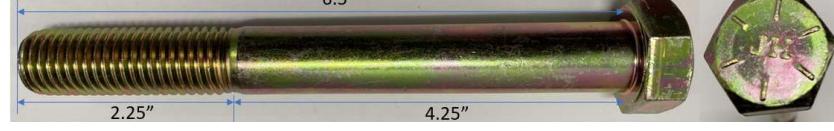
Each fleet has unique radius rod hardware and mounting configurations, including SAE bolts, metric bolts, machined spacers, and washers. Mounting hardware may seem similar but it comes in different thicknesses, lengths, thread pitch, and grades. Improper installation or orientation will result in equipment damage.

The hardened washers located between the radius rod cross-pin and the axle or vehicle structure serve as shims for alignment purposes. ALWAYS replace washers at each location with the same quantity as originally removed.

The OEM Service Manual should be followed to verify:

- Proper hardware configuration (location and orientation)
- Proper installation procedures
- Proper torque specifications

Please refer to the Table below, for hardware configurations for NF Xcelior fleets.

WMATA Item Number/Vendor Part Number	Description	Number of Items per Bus	Location	Picture with Dimensions
999720121/356808	BOLT, HEX: GRADE: 10.9, LENGTH: 100 MM, SIZE: M18, THREAD PITCH: 1.5	4 (4-Rear)	Rear Upper Axle Side	 
999720122/240061	BOLT, HEX: GRADE: 10.9, LENGTH: 115 MM, SIZE: M18, THREAD PITCH: 2	8 (8-Front)	Front Lower Frame Side Front Lower Axle Side	 
999720123/240064	BOLT, HEX: GRADE: 10.9, LENGTH: 65 MM, SIZE: M14, THREAD PITCH: 1.5	8 (8-Front)	Front Upper Frame Side Front Upper Axle Side	 
954720041/10B12064	BOLT, HEX: LENGTH: 4", SIZE: 3/4"-10	8 (8-Rear)	Rear Upper Frame Side Rear Lower Frame Side	 
999720462/10B12104	SCREW, CAP: COARSE THREAD UNC: 10, DIAMETER: .375, HEAD: HEX SOCKET, LENGTH: 6.5 INCH	4 (4-Rear)	Rear Lower Axle Side	 
999720461/130733	NUT, LOCK: DIAMETER: 3/4 IN	4 (4-Rear)	Rear Lower Axle Side	



Washington Metropolitan Area Transit Authority

BMNT SERVICE BULLETIN



Subject: Meritor Calipers Install - Overhaul/ Rehabilitation **Date:** 12/31/2022
SB #: 22-CC-12-00

FROM: Abiodun Animashawun | Jerry Guaracino

THRU: Raphael Alfred *Raphael W Alfred*
Raphael W Alfred (Feb 28, 2023 09:38 EST)

TO: Distribution

Applies To: New Flyer Xcelsior Bus Fleets 56 and Newer

The New Flyer Xcelsior bus fleets come equipped with Knorr-Bremse calipers. However, starting with **Fleets 56 (7300-7355) and 57 (7356-7409)**, the Knorr-Bremse calipers will be replaced with **Meritor EX225 calipers** on all axles during the buses' midlife overhaul/ rehabilitation.

These Meritor calipers are a direct replacement for the Knorr-Bremse calipers. They have been adapted to fit onto the wheel ends of the MAN VOK-07-F steer axle and the MAN HY-1350-F rear axle. **Note: They are not interchangeable with the Meritor calipers used on the Orion or NABI fleets.**

The Meritor caliper kits for overhaul/ rehabilitation consist of the following:

WMATA P/N	MERITOR CALIPER KIT COMPONENTS	AXLES
921720288	CALIPERS (2), BRAKE PAD KITS (1), HARDWARE	FRONT
921720289	CALIPERS (2), BRAKE PAD KIT (1), HARDWARE	REAR

Note the following specifications and procedures for caliper installation and inspection:

- **Caliper (or Carrier) Mounting Bolts Torque Value:**
 - Front & Rear Axle Caliper Bolts: **288 ft-lb (same as Knorr-Bremse)**
- **Manual Adjustment Procedure.** After brake pad installation, use a 10 mm box-end wrench or socket to tighten the adjusting nut (clockwise) until the pads contact the rotor. Then back off the nut (counterclockwise) **1/2 turn**. **Caution: Do not exceed 30 ft-lb when turning the adjusting nut in either direction.** Apply the brakes multiple times before measuring the running clearance.
 - **Note:** There is no “clicking” when backing off the adjusting nut on this caliper, but there should be resistance.
- **Brake Temperature Chart.** When measuring brake temperatures, use the MAN-ZF Axle Bus Fleets (Estimated) Rotor Temperatures Chart (See link).

For further information on the Meritor EX225 caliper, refer to Meritor Maintenance Manual MM-0467 EX+™ Air Disc Brake L and H Models (See link).

The PM line cards and brake relining job plans of the respective fleets will be updated to reflect the caliper replacement upon completion of the overhaul/ rehabilitation.

Links:

[MAN-ZF Axle Bus Fleets \(Estimated\) Rotor Temperatures](#)

[Meritor MM-0467 EX+™ Air Disc Brake L and H Models](#)



Washington Metropolitan Area Transit Authority

BMNT SERVICE BULLETIN

**Subject:** Xcelsior Front Engine Mount Part Update**Date:** 10/31/2022**SB #:** 22-PT-19-00**FROM:** Jerry Guaracino**THRU:** Raphael Alfred *Raphael W Alfred*Raphael W Alfred [Dec 19, 2022 08:37 EST]**TO:** Distribution**Applies To:** All New Flyer Xcelsior Fleets

Bus No.	Fleet No.	Build No.	Bus No.	Fleet No.	Build No.
2830-2993	55	SR1947	5500-5541	65/66	SR2407/SR2472
3100-3349	59/61/64	SR2107/SR2307/SR2406	7001-7100	46	SR1513/SR1514/SR1585
4450-4598	62/63/67	SR2308/SR2405/SR2471	7101-7263	47/46	SR1554/SR1634/SR1680
4600-4700	68	SR2574	7264-7272	50	SR1751
5460-5492	54/60	SR1913/SR2243	7300-7409	56/57	SR1946/SR1976

This Service Bulletin Supersedes Service Bulletin #20-P-001

The New Flyer Xcelsior fleets feature two different front engine mounts. Although they are the same dimensionally, they have different temperature ratings. In 2013, New Flyer started supplying the high-temperature engine mounts exclusively on all newer fleets.

WMATA will use the high-temperature mounts on all fleets to combat high-trending engine mount failures and remove the low temperature engine mounts from inventory as shown in the table below.

WMATA P/N	New Flyer P/N	Description	Action
811-70-0002	499546	High Temperature Engine Mount	Active Part
802-60-0003	109982	Low Temperature Engine Mount	Obsolete



Washington Metropolitan Area Transit Authority

BMNT SERVICE BULLETIN

**Subject:** Hydraulic O-Ring Boss Fitting Installation**Date:** 7/19/2022**SB #:** 22-PT-20-00**FROM:** Frances Jallu | Jerry Guaracino**THRU:** Raphael Alfred Raphael W Alfred
Raphael W Alfred (Aug 12, 2022 13:33 EDT)**TO:** Distribution**Applies To:** All Fleets**This Service Bulletin Supersedes Service Bulletins #09-P-001**

The hydraulic systems in transit buses have O-Ring Boss (ORB) fittings on components such as power steering pumps and boxes, transmissions, trans coolers, drive units, etc. It is critical to follow proper procedures when installing these types of fittings. Loose or overtightened fittings can result in hydraulic fluid leaks. Hydraulic fluid leaks that spill onto certain engine compartment components may lead to thermal events.

Following the repair of hydraulic system leaks, all hydraulic oil spillage on components must be pressure washed in accordance with SOP 1.4 Bus Pressure Washing Program.

Note: Use Mobil Delvac 1 Synthetic ATF to lubricate O-rings.



Tompkins® fittings have two methods of installing ORB fittings properly, and the videos for these procedures are on the BMNT website.

Link: [ORB Hydraulic fitting installation procedure](#)



Washington Metropolitan Area Transit Authority

BMNT SERVICE BULLETIN

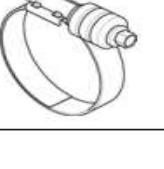
**Subject:** Hose Clamp Torque Specifications**Date:** 9/27/2022**SB #:** 22-PT-24-00**FROM:** Jerry Guaracino**THRU:** Raphael Alfred *Raphael W Alfred*
Raphael W Alfred (Oct 20, 2022 21:19 EDT)**TO:** Distribution**APPLIES TO:**

Bus No.	Fleet No.	Build No.	Bus No.	Fleet No.	Build No.	Bus No.	Fleet No.	Build No.
2830-2993	55	SR1947	4600-4700	68	SR2574	7153-7263	46	SR1613/1680
3100-3199	59	SR2107	5460-5480	54	SR1913	7264-7272	50	SR1751
3200-3274	61	SR2307	5481-5492	60	SR2243	7300-7355	56	SR1946
3275-3349	64	SR2406	5500-5541	65/66	SR2407/2472	7356-7409	57	SR1976
4450-4499	62/63	SR2308/2405	7001-7100	46	SR1513/1514/1585			
4500-4598	67	SR2471	7100-7152	47	SR1554			

This Service Bulletin Supersedes SB #16-P-003

New Flyer released Service Manual Bulletin SMB-158 that provides a listing of the various types of hose clamps used in the cooling system and the applicable torque for the specific clamp.

IDEAL - TRIDON HOSE CLAMP TORQUE SPECIFICATIONS

Item	Clamp	Description	Width	Torque (in-lb.)
1	 <small>SPRING LINER PROFILE</small>	Ideal Smartseal Stainless Steel Clamp	0.625	125 in-lb.
2	 <small>SPRING LINER PROFILE</small>	Ideal Wavesseal Stainless Steel Clamp	0.562	80 in-lb.
3	 <small>SPRING LINER PROFILE</small>	Ideal Flexgear Stainless Steel Clamp	0.562	50 in-lb.

Notes:

1. Do not exceed 75 RPM when tightening Smartseal and Waveseal clamps
2. Do not exceed 250 RPM when tightening Flexgear Clamps
3. Retorque all hose clamps after 30 minutes of use.
4. Do not overtighten the hose clamps. This can cause the clamp to break and damage the hose.

SMB-158 Hose Clamp Torque Specifications



Washington Metropolitan Area Transit Authority

BMNT SERVICE BULLETIN

**Subject:** Correct Application for Exhaust V-Band Clamps**Date:** 10/31/2022**SB #:** 22-PT-26-00**FROM:** Jerry Guaracino**THRU:** Raphael Alfred *Raphael W Alfred*Raphael W Alfred (Dec 19, 2022 08:36 EST)**TO:** Distribution**APPLIES TO:** LFAs and Xcelsior Bus Fleets

Bus No.	Fleet No.	Build No.	Bus No.	Fleet No.	Build No.	Bus No.	Fleet No.	Build No.
3751-3770	42	SR1264	5481-5492	60	SR2243	7153-7263	46	SR1634,1680
4450-4474	62	SR2308	5500-5509	65	SR2407	7264-7272	50	SR1751
4475-4499	63	SR2405	5510-5541	66	SR2472	7300-7355	56	SR1946
4500-4598	67	SR2471	6301-6609	43/45	SR1263/1355,1413,1472	7356-7409	57	SR1976
4600-4700	68	SR2574	7001-7100	46	SR1513,1514/1585			
5460-5480	54	SR1913	7101-7152	47	SR1554			

This Service Bulletin Supersedes SB #18-P-002

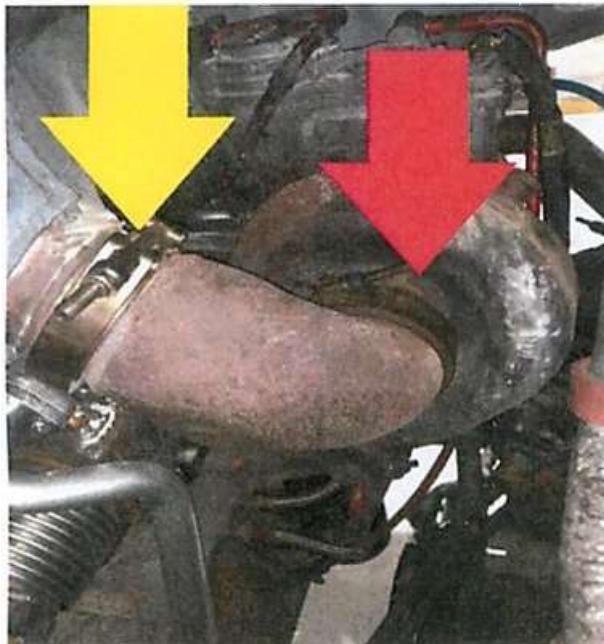
On these affected bus fleets, the incorrect application of exhaust V-Band clamps can result in exhaust leaks. This can then cause exhaust fumes to enter the passenger compartment.

One of the most common errors involves installing the incorrect V-Bands in the turbo area. The clamp that secures the exhaust horn to the turbo is supplied by Cummins and is stocked under **WMATA P/N 836-55-0023 (Figure 1, red arrow)**, whereas the clamp that holds the exhaust pipe to the turbo horn is supplied by New Flyer and is stocked under **WMATA P/N 842-72-0074 (Figure 1, yellow arrow)**.

Although the clamps are similar in size, they are **NOT** interchangeable and can easily be differentiated by the following items:

- Check the differences between the profiles of the V-Band groove on the clamp (**Figure 2**).
- Check the markings on the clamps:
 - The New Flyer clamp will be marked with the New Flyer P/N 331992.
 - The Cummins clamp will be marked with the Cummins P/N 102408.

NEW FLYER



CUMMINS

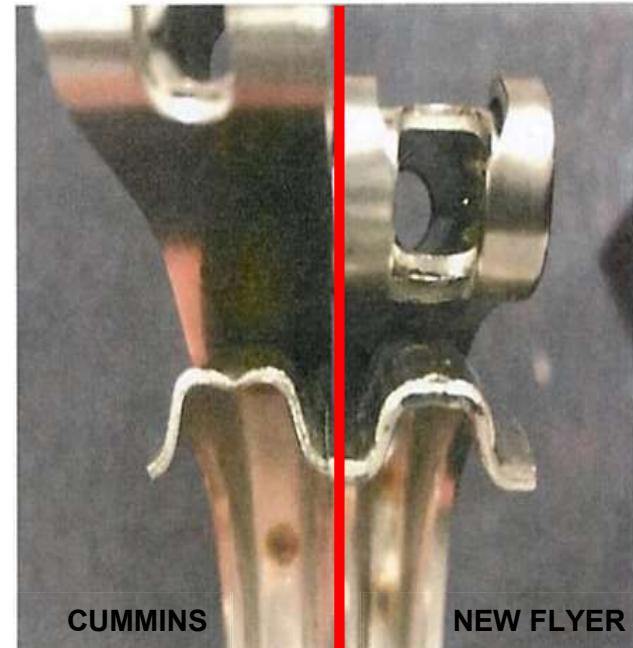


Figure 1

Figure 2



Washington Metropolitan Area Transit Authority

BMNT SERVICE BULLETIN



Subject: Surge Tank Cooling Hoses Supersession -
HOMT Rehab Reference Guide

Date: 10/31/2022**SB #:** 22-PT-27-00**FROM:** Jerry Guaracino**THRU:** Raphael Alfred *Raphael W Alfred*Raphael W Alfred (Dec 19, 2022 08:36 EST)**TO:** Distribution**APPLIES TO:**

Bus No.	Fleet No.	Build No.	Bus No.	Fleet No.	Build No.
2830-2993	55	SR1947	5460-5480	54	SR1913
3100-3199	59	SR2107	5481-5492	60	SR2243
3200-3274	61	SR2307	7300-7355	56	SR1946
4450-4474	62	SR2308	7356-7409	57	SR1976

Due to the high failure rate of the rubber Manuli surge tank coolant hoses, they will be superseded by the Eaton Aeroquip Stainless Steel hoses by New Flyer.

BMNT has stocked Eaton Aeroquip stainless steel hoses to cover a replacement campaign starting with Fleet 55 (See SB #22-PT-02-00). Campaign work will be completed during the overhaul program.

Remaining stock of Manuli hoses will be obsoleted once all replacement campaigns have been completed.

The following chart provides the old Manuli part numbers (both New Flyer P/Ns and WMATA P/Ns) and the new corresponding Eaton Aeroquip part numbers.

Note: This chart will serve as a reference guide for the HOMT Rehabilitation Program for future campaigns of the referenced Xcelsior Bus Fleets.

SURGE TANK COOLING HOSES SUPERSESSION REHAB REFERENCE GUIDE

BUS NOs.	HOSE DESCRIPTION	MANULI RUBBER HOSES		EATON AEROQUIP STAINLESS STEEL HOSES	
		NEW FLYER PART NO.	WMATA PART NO.	SUPERSEDED NEW FLYER PART NO.	NEW WMATA PART NO.
2830-2993	ASSY-HOSE 2807-4 FL 44.5 (<i>Transmission Cooler to Surge Tank Hose Manifold</i>)	602164	824700101	6488446	824720842
	ASSY-HOSE 2807-4 FL 33.0 (<i>Radiator to Surge Tank Manifold</i>)	454111	824700102	54061	824720846
	ASSY-HOSE 2807-4 FL 29.0 (<i>Heat Exchanger to Surge Tank Manifold</i>)	421360	824700103	6488447	824720847
	ASSY-HOSE 2807-6 FL 31.0 (<i>Surge Tank to Surge Tank Manifold</i>)	521567	824700142	638705	824700142
	ASSY-HOSE 2807-6 FL 25.5 (<i>Surge Tank to Surge Tank Manifold</i>)	601784	824700144	6488448	824720848
	ASSY-HOSE 2807-4 FL 15.0 (<i>Heat Exchanger to Surge Tank Manifold</i>)	427187	824700145	6474961	824720849
	ASSY-HOSE 2807-4 FL 23.5 (<i>Radiator to Surge Tank Manifold</i>)	602178	824700146	6488449	824720850
	ASSY-HOSE 2807-4 FL 91.0 (<i>Transmission to Probalizer</i>)	511519	906700141	6489327	906550784
5460-5480 7300-7355	ASSY - HOSE 2807-4 FL 33.0 (<i>Surge tank Manifold to Radiator</i>)	454111	824700102	54061	824720846
	ASSY - HOSE 2807-4 FL 28.0 (<i>Surge Tank Manifold to Heat Exchanger</i>)	488558	824550502	6460106	824550889
	ASSY - HOSE 2807-4 FL 24.0 (<i>Surge Tank Manifold to Radiator</i>)	601757	999550384	6490310	824550890
	ASSY - HOSE 2807-4 FL 15.0 (<i>Surge Tank Manifold to Heat Exchanger</i>)	427187	824700145	6474961	824720849
	ASSY - HOSE 2807- 6 FL 31.0 (<i>Surge Tank to Surge Tank Manifold</i>)	521567	824700142	638705	824700142
	ASSY - HOSE 2807- 6 FL 25.5 (<i>Surge Tank to Surge Tank Manifold</i>)	601784	824700144	6488448	824720848
	ASSY - HOSE FC355-4 FL 72.0 (<i>Drive Unit to Probalizer</i>)	446241	906720301	295275	906550785
7356-7409	ASSY-HOSE 2807-4 FL 15.5 (<i>Cabin Surge Tank to Overflow Tank</i>)	608027	N/A	6490311	824550888
	ASSY-HOSE 2807-4 FL 29.0 (<i>Surge Tank to Surge Tank Tee Fitting</i>)	615124	824700328	247842	824720855
	ASSY-HOSE 2807-4 FL 25 (<i>Surge Tank Tee Fitting to Radiator</i>)	488399	N/A	6474958	824550891
	ASSY-HOSE 2807-06 FL 33.0 (<i>Surge Tank to Radiator</i>)	580971	N/A	652784	824550892
	ASSY-HOSE FC355-4 FL 80 (<i>Drive Unit to Probalizer</i>)	415137	N/A	365495	906550786

3100-3274	ASSY-HOSE 2807-4 FL 26.0 (Radiator to Surge Tank Manifold)	509257	824700321	6366935	824720851
	ASSY-HOSE 2807-4 FL 51.0 (Transcooler to Surge Tank Manifold)	608025	824700322	6336302	824720853
	ASSY-HOSE 2807-4 FL 16.5 (Radiator to Surge Tank Manifold)	608026	824700323	6482867	824720854
	ASSY-HOSE 2807-6 FL 19.5 (Surge Tank to Surge Tank Manifold)	608031	824700326	6482868	824720852
	ASSY-HOSE 2807-4 FL 29.0 (Surge Tank to Surge Tank Manifold)	615124	824700328	247842	824720855
	ASSY-HOSE FC355-04 FL 32.0 (Engine to Probabilizer Manifold)	411267	N/A	413149	853550265
	ASSY-HOSE FC355-04 FL 87 (Transmission to Probabilizer Manifold)	448896	853700362	6482865	853550266
5481-5492	ASSY-HOSE 2807-4 FL 26.0 (Surge Tank Tee Fitting to Radiator)	509257	824700321	6366935	824720851
	ASSY-HOSE 2807-06 FL 33.0 (Surge Tank to Radiator)	580971	N/A	652784	824550892
	ASSY-HOSE 2807-4 FL 29.0 (Surge Tank to Surge Tank Tee Fitting)	615124	824700328	247842	824720855
	ASSY-HOSE FC355-04 FL 38 (Engine Oil Cooler to Probabilizer)	441433	N/A	307103	824550893
	ASSY-HOSE FC355-04 FL 87 (Drive Unit to Probabilizer)	448896	853700362	6482865	853550266
4450-4474	ASSY-HOSE 2807-6 FL 19.5 (Surge Tank to Surge Tank Manifold)	608031	824700326	6482868	824550894
	ASSY-HOSE 2807-4 FL 26.0 (Surge Tank Manifold to Radiator)	509257	824700321	6366935	824720851
	ASSY-HOSE 2807-4 FL 33.5 PHASE (Surge Tank Manifold to Radiator)	739615	N/A	6490313	824550896
	ASSY-HOSE FC355-04 FL 42.0 (Engine Oil Cooler to Probabilizer)	505241	N/A	351730	853550267
	ASSY-HOSE FC355-4 FL 99 (Transmission to Probabilizer)	762760	N/A	6490312	906550787



Washington Metropolitan Area Transit Authority

BMNT SERVICE BULLETIN



Subject: SDS Enclosure Coolant Hoses Inspection & **Date:** 1/31/2024
Replacement

SB #: BUSV-BMNT-SB-24-HV-01-00

FROM: Abiodun Animashawun | Jerry Guaracino

THRU: Raphael Alfred Raphael W Alfred
Raphael W Alfred (Feb 29, 2024 10:00 EST)

TO: Distribution

Applies To:

Campaign No.	Job Plan No.	Asset List
14550023	7823	5503/ 5615

Bus No.	Fleet No.	Build No.	Bus No.	Fleet No.	Build No.	Bus No.	Fleet No.	Build No.
5460-5480	54	SR1913	7101-7152	47	SR1554	7264-7272	50	SR1751
7001-7052	46	SR1513	7153-7167	46	SR1634	7300-7355	56	SR1946
7053-7100	46	SR1514/ 1585	7168-7263	46	SR1680	7356-7409	57	SR1976

This Service Bulletin Supersedes SB #18-H-001.

This service bulletin serves as a **reference** for a past campaign that consisted of the inspection/replacement of the two HVAC coolant hoses in the Secure Diagnostic Station (SDS) enclosure (See Figure 1) on the referenced bus fleets. **This campaign has since been completed.**

There were a large number of these coolant hose failures (i.e. seeping, splitting, bulging, especially around the crimped connectors). See Figure 2. These hoses are located above the radio equipment in the SDS enclosure. One of these failures resulted in a thermal event in which coolant leaked on to electrical components and created a short circuit.



FIGURE 1: HOSE LOCATION IN SDS
ENCLOSURE



FIGURE 2: FAILED HOSE

New Flyer updated the original coolant hose, changing out the material. New Flyer issued a new part number for the updated hose, which supersedes the old part number.

The table below lists the SDS coolant hose description, the WMATA part number, the old part number, and the updated part number.

NOTE: The NF part number was updated and the WMATA part number remained the same.

PART DESCRIPTION	WMATA P/N	OLD P/N	NEW P/N
ASSEMBLY, HOSE: LENGTH: 19.0 IN, TYPE: FC355-16	971720964	425963	665009

New Flyer also issued instructions for the coolant hoses' replacement in **ITS-6505 "Remove and replace the flexible coolant lines located above the SDS box"**. See link below.

Link:

[**New Flyer ITS-6505 "Remove and replace the flexible coolant lines located above the SDS box"**](#)



Washington Metropolitan Area Transit Authority

BMNT SERVICE BULLETIN



Subject: EnerDel ESS Fan Test Procedure
SB #: BUSV-BMNT-SB-24-PM-01-00

Date: 3/29/2024**FROM:** Abiodun Animashawun | Jerry Guaracino**THRU:** Raphael Alfred Raphael W Alfred
Raphael W Alfred (May 13, 2024 12:16 EDT)**TO:** Distribution**Applies To:** All Allison Hybrid Fleets **EXCEPT** Buses 8001-8105 and 5481-5492

Bus No.	Fleet No.	Build No.	Bus No.	Fleet No.	Build No.
3751-3770	42	SR1264	7053-7100	46	SR1514/1585
5432-5433	44	SR1265	7153-7167	46	SR1634
5460-5480	54	SR1913	7168-7263	46	SR1680
6313-6461	43	SR1263	7264-7272	50	SR1751
6462-6609	45	SR1413	7300-7355	56	SR1946
7001-7052	46	SR1513	7356-7409	57	SR1976

Background

The Allison Hybrid's Energy Storage System (ESS) uses fans to cool down the battery packs.

Note: The original Panasonic battery packs have since been retrofitted with EnerDel battery packs on the specified fleets.

As a proactive measure, the inspection of the ESS fans operation will be incorporated into the job plan(s) for replacing the ESS filters.

There is currently no written procedure for checking the ESS fans operation within the EnerDel manufacturer service manuals. However, there is an Override function within the EnerDel software to Disable/Enable the fan operation.

The instructions for checking the fans operation using the software are outlined below.

Instructions

1. Turn the master switch to the "ON" position with the engine off.
2. Connect the diagnostic laptop equipped with the EnerDel program using a PCAN connector to the J1939 port.
3. Select the EnerDel application icon from the desktop menu.
4. After the program opens, select the "Connect" icon in the upper left-hand corner of the screen. The connection icon will change from "Connect" to "Disconnect" when connected. **See Figure 1, green arrow.**
5. Select the Overrides tab.
6. Under the Overrides tab, select "Enable" in the Fan section.

7. After enabling the fans, select “On.”
8. If the fans have activated, a whirring sound should be detected while standing outside of the bus. If no sound is detected, record the defect in Maximo and notify the Leadman/Supervisor. Perform repairs as directed.
9. To complete the test, select “Off” and “Disable” in the Fan section.
10. Select the “Disconnect” icon to disconnect the EnerDel software. **See Figure 1, red arrow.**

Refer to **EnerDel Diagnostic Tool Installation and User Manual** for further instruction on connecting/disconnecting the software. See link below.

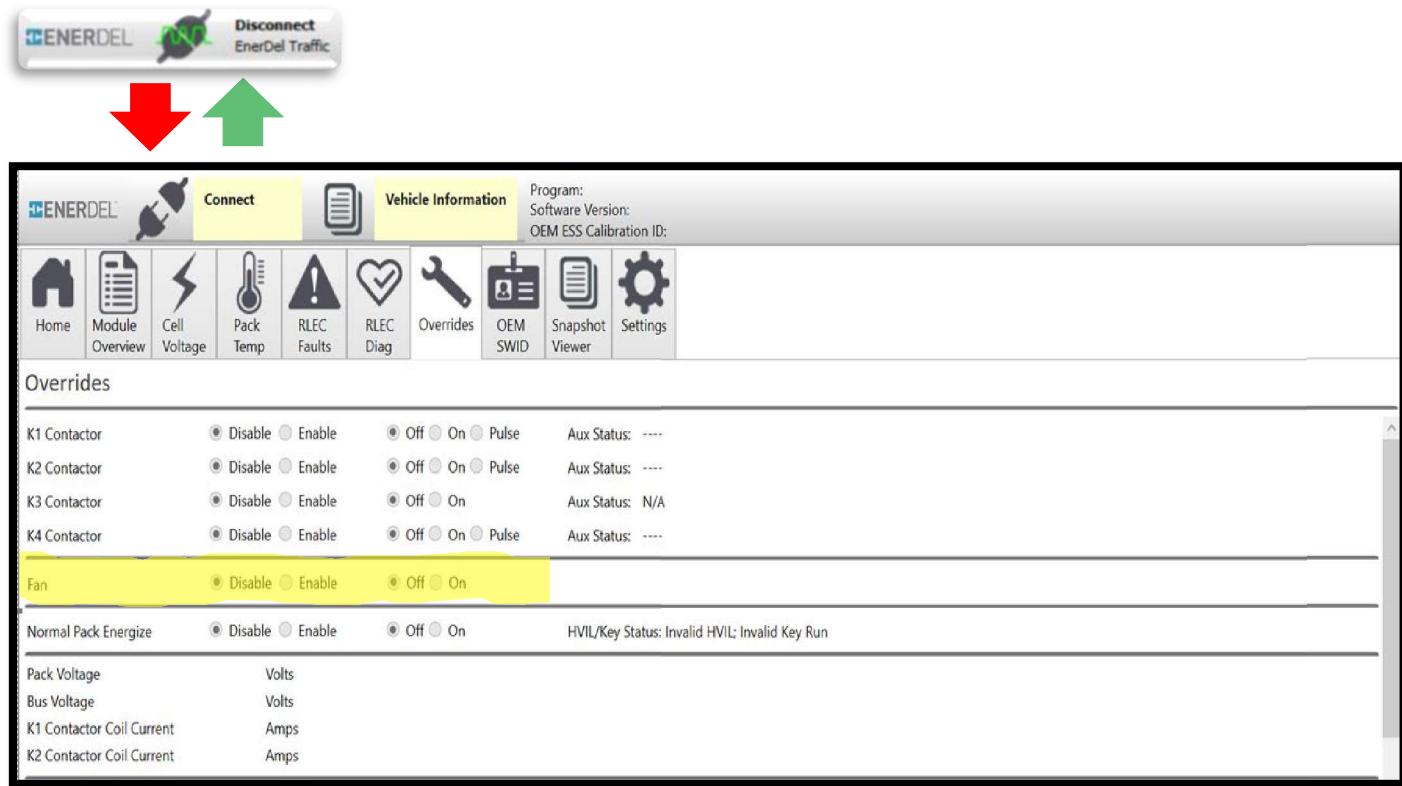


FIGURE 1 – SCREENSHOT OF ENERDEL SOFTWARE FAN DISABLE/ ENABLE FUNCTION

For further assistance, contact the Bus Diagnostics Group (BDAS):

- Phone: (301) 955-2790
- Email: BMNT_BusDiagnostics_Service@wmata.com

Link: [EnerDel Diagnostic Tool Installation and User Manual](#)



Washington Metropolitan Area Transit Authority

BMNT SERVICE BULLETIN



Subject: EnerDel ESS Inspection & Service
SB #: BUSV-BMNT-SB-24-PM-03-00

Date: 6/10/2024**FROM:** Abiodun Animashawun | Jerry Guaracino**THRU:** Raphael Alfred Raphael W Alfred
Raphael W Alfred (Jun 14, 2024 08:41 EDT)**TO:** Distribution**Applies To:** All Allison Hybrid Fleets with the EnerDel ESS Installed

Bus No.	Fleet No.	Build No.	Bus No.	Fleet No.	Build No.
3751-3770	42	SR1264	7053-7100	46	SR1514/1585
5432-5433	44	SR1265	7153-7167	46	SR1634
5460-5480	54	SR1913	7168-7263	46	SR1680
6313-6461	43	SR1263	7264-7272	50	SR1751
6462-6609	45	SR1413	7300-7355	56	SR1946
7001-7052	46	SR1513	7356-7409	57	SR1976

The PM-A Service 18K and 36K Mileage Intervals for the specified Allison Hybrid bus fleets will be updated to include servicing/ inspecting certain components of the EnerDel Energy Storage System (ESS).

Note: The original Panasonic battery packs have since been retrofitted with EnerDel battery packs on the specified fleets.

The updates to the PM-A Service will include the following procedures:

- **18K Mileage Interval Service Procedure**
 - Replace the intake and exhaust filter (**WMATA KIT P/N 825-70-0004**).
 - Inspect chassis ground.
- **36K Mileage Interval Service Procedure**
 - Replace the intake and exhaust filter (**WMATA KIT P/N 825-70-0004**).
 - Inspect chassis ground.
 - Check the ESS fans operation.

See the EnerDel **Filter Maintenance Manual** for the filter replacement and chassis ground inspection procedures and see service bulletin **BUSV-BMNT-SB-24-PM-01-00 EnerDel ESS Fan Test Procedures** for instructions on checking the ESS fans operation.

The links for the EnerDel **Filter Maintenance Manual** and the service bulletin are below:

- [Filter Maintenance Manual](#)
- [EnerDel ESS Fan Test Procedure](#)