INSTRUCTION TO SERVICE

ITS-61254	1/28/2025
SECTION:	246 – Air, Brake & Leveling System
SUBJECT:	VMAC Air Compressor GEN 1.1 Field Retrofit
ISSUE:	Supplier retrofit to incorporate recommended design updates to improve both the function and reliability of the air compressor.
SUMMARY:	VMAC field instructions to upgrade compressors with GEN 1.1 retrofit kit.

ITS-61254

Ref. NHTSA Recall No.	Ref. Transport Canada Recall No.
Not Applicable	Not Applicable

THIS ITS DOCUMENT SHOULD BE RETAINED AND REFERRED TO FOR FUTURE MAINTENANCE UNTIL THE NEW FLYER PARTS AND/OR SERVICE MANUAL IS UPDATED TO REFLECT WORK DONE AS A RESULT OF THIS DOCUMENT. ENSURE THAT THIS DOCUMENT IS AVAILABLE FOR PARTS AND MAINTENANCE STAFF GOING FORWARD.

E100108-B & E100110-A Retrofit Installation Instructions

For HV20 units on North America City Busses

WeBuildReliability.com

1.0 Table of Contents

Document Revision History VMAC 1901247					
Rev	**Date**	**By**	**Eng**	**Eng**	**Notes / Summary of Changes**
A	10DEC2024	MRR	RRP	NDB	Initial release for retrofit service instructions

☞ **NOTE: The instructions contained in this ITS document were created by VMAC. This field retrofit is ONLY to be completed by VMAC personnel or properly trained field staff.**

2. IMPORTANT

The designer, manufacturer, and seller of the bus's (BUS OEM) service and maintenance instructions take priority and supersede VMAC's Global Technology Inc's (VMAC) service instructions as long as the minimum service intervals in this manual are performed by trained and authorized personnel. BUS OEM's lockout procedures, removal/installation, and maintenance instructions must be performed before any service on VMAC's compressor. Removal of any compressor access panels or of the unit itself must be performed by qualified personnel as determined by the BUS OEM and the end user. Service of the VMAC compressor may require following the BUS OEM's instructions for the removal of BUS panels or structural elements as defined by the BUS OEM and dependent on the level of repair or maintenance. VMAC makes no service or warranty support for these bus parts beyond the control of our design of the delivered compressor to the BUS OEM for factory installation.

The BUS OEM's instructions for bus shutdown and lock out must be followed before servicing the compressor. All service must be completed and the VMAC compressor restored to its operation ready condition before proceeding with the bus's startup procedure. VMAC's compressor is application approved in the BUS OEM factory configuration only. If the installation configuration is altered from its factory configuration in anyway without VMAC and the BUS OEM's written permission and acceptance, then the bus should not be operated, and the BUS OEM service contacted directly.

Please contact VMAC in case of discrepancies or questions regarding the service of the compressor.

The information contained in this manual is based on sound engineering principles, research, extensive field experience and technical information. Information is constantly changing with the addition of new models, assemblies, service techniques and running OEM changes. If a discrepancy is found in this manual, contact VMAC prior to initiating or proceeding with installation, service, or repair. Current information may clarify the issue. Anyone with knowledge of such discrepancies, who proceeds to perform service and repair, assumes all risks.

Only proven service procedures are recommended. Anyone who departs from the specific instructions provided in this manual must first ensure that their safety and that of others is not being compromised, and that there will be no adverse effects on the operational safety or performance of the equipment. VMAC shall not be held responsible for any liability, consequential damages, injuries, loss, or damage to individuals or to equipment caused by the failure of anyone to properly adhere to the procedures set out in this manual, or standard safety practices. Safety must be the first consideration when performing any service operations.

3. Safety Messages

This manual contains various warnings, cautions, and notices that must be observed to reduce the risk of personal injury during installation, service or repair and the possibility that improper installation, service, or repair may damage the equipment or render it unsafe.

	This symbol is used to call attention to instructions concerning personal safety. Watch for this symbol; it points out important safety precautions, it means, “Attention, become alert! Your personal safety is involved”. Read the message that follows and be aware of the possibility of personal injury or death. As it is impossible to warn of every conceivable hazard, common sense and industry standard safety practices must be observed.

	This symbol is used to call attention to instructions on a specific procedure that if not followed may damage or reduce the useful life of the compressor or other equipment.

	This symbol is used to call attention to additional instructions or special emphasis on a specific procedure.

4. Safety Precautions

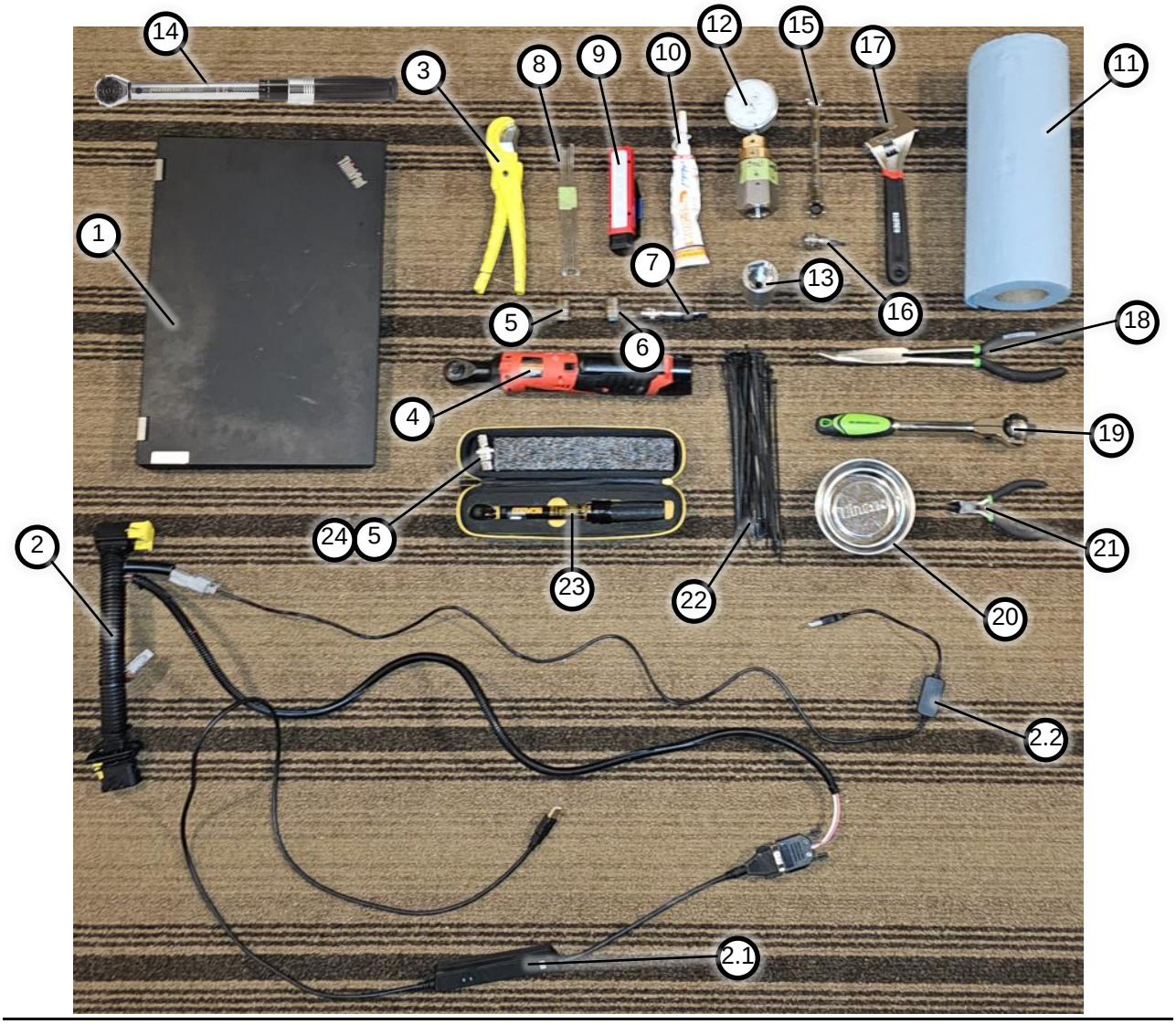
	**Burn Hazard** **• The compressor system gets very hot during operation, contact with the components or the oil can cause serious injury. Allow sufficient time for the system to cool prior to performing service.** **• Avoid contact with the engine or compressor components until the system has cooled sufficiently.**
 	**Personal Safety** **• Do not breathe the compressor air as vaporized oil is a respiratory hazard.** **• Always use the appropriate personal protective equipment when servicing the compressor.**
 	**Fire and Explosion Hazard** **• Vaporized oil propelled by high pressure air is an explosive mixture.** **• Fire in the compressor can cause an explosion and flame projection. Should this occur, there is potential for serious injury or death.** **• Ensure the compressor air intake is located in a well-ventilated area that is free of flammable vapors, dust, or other combustible materials** **• Never place objects against or on top of the compressor.** **• Never expose the system to extreme heat.**
	**Skin Contact Hazard** **• Wear nitrile gloves or similar protective equipment when servicing the compressor to protect against grease, compressor oil, and coolant.**
	**Compressor Air and Oil Hazard** **• The compressor system is under sufficient pressure that a leak could force the air/oil mixture through the skin directly into your bloodstream. This could cause serious injury or death.** **• Ensure the system is completely depressurized before attempting maintenance or repair.** **• Do not use compressed air to clean off clothing or skin, compressed air and/or entrained particles can penetrate the skin causing serious injury or death.** **• Do not service the system while it is pressurized or operating.** **• Components and hoses under pressure could separate suddenly and cause serious injury or death. The air supply system and piping must be drained prior to servicing the system.** **• Never adjust or attempt to make any repairs to the system while the compressor is running. Components and hoses under pressure could fail and cause serious injury or death.**

	**Electrical Shock/High Voltage Hazard** **The voltage supplying the compressor is potentially deadly! Any time the compressor is operating, the compressor is drawing nominal 600 Vdc. Prior to disconnecting the compressor, ensure the motor is de-energized and appropriate lockout procedures are utilized.**
	**Burst Hazard** **This system is designed to generate air pressure up to the Original Equipment Manufacturers (OEM) specification during normal operation.** **• Serious injury or death may result from an air tank explosion.** **• Never exceed manufacturer's maximum air pressure rating.** **• Do not repair components, only replace with approved parts.** **• Do not tamper with or disable factory safety equipment.**
	**Moving Parts Hazard** **• Prior to performing service, ensure the motor is de-energized and appropriate lockout procedures are utilized.**
	**General Warnings** **• Prior to attempting any repair or service, ensure the compressor and compressor motor are de-energized and appropriate lockout procedures are utilized.** **• Be attentive for unexplained changes in operation parameters and record any changes.** **• Ensure scheduled service intervals are adhered to.** **• Use only approved oils, hoses, and replacement parts.** **• Keep hoses and wiring away from hot, sharp, or moving components.** **• Do not modify the equipment.** **• Do not operate this system unless this manual has been read in its entirety.** **• Do not operate this system when fatigued or under the influence of alcohol or drugs.** **• Never bypass or disable any of the safety equipment.** **• Never adjust, or attempt to make any repairs to this system while the compressor system under pressure or energized.** **• Components and hoses that are under pressure could fail and cause serious injury or death, take precautions!**

5. Gen 1.1 Retrofit (Kit# A710084)

5.1 Tools Required

5.1.1 Under bus tool kit



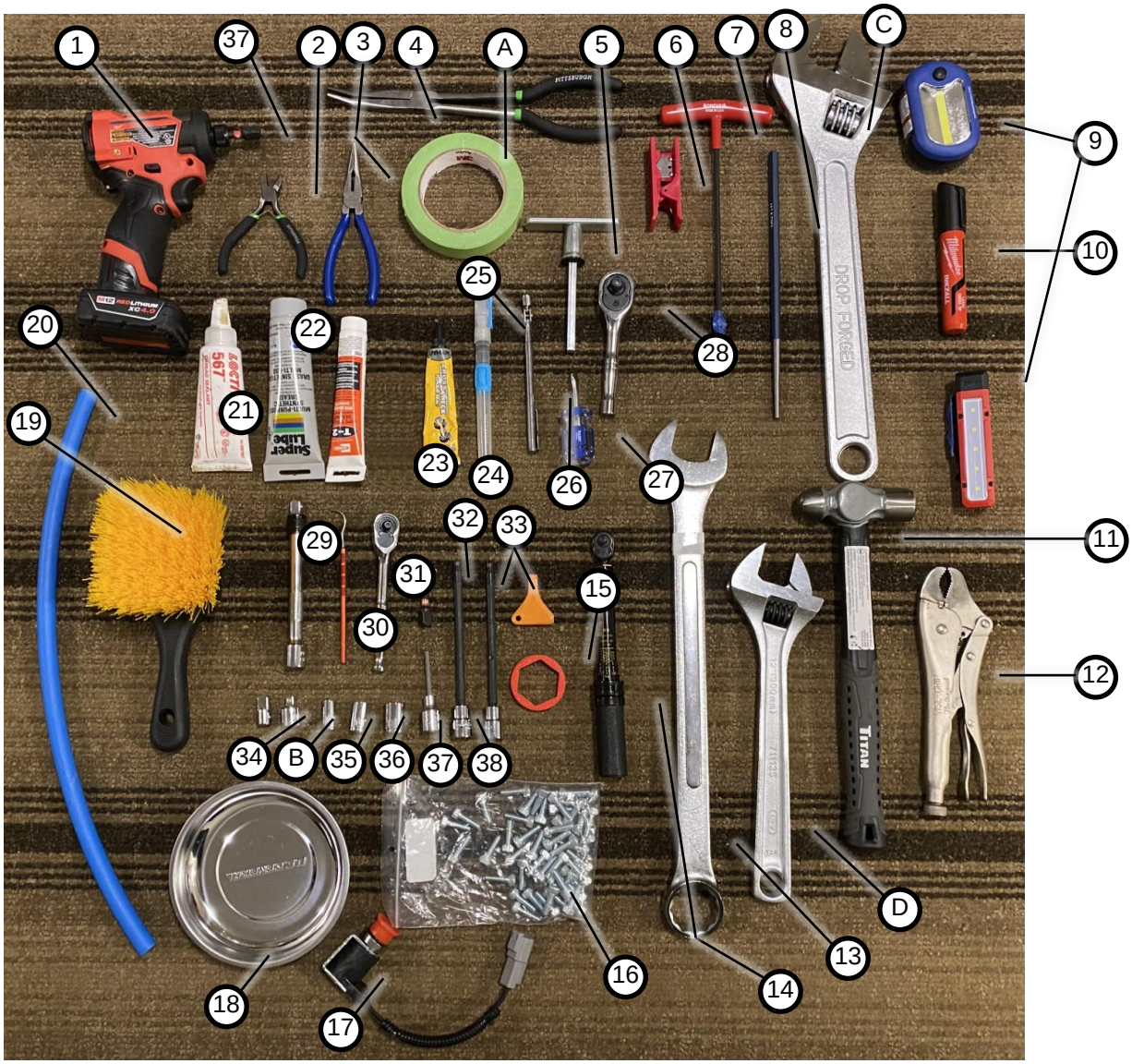
1. Laptop with pre-loaded software installation zip-file and 2 available USB-A ports. Operating system must be either Windows or Linux, Apple Mac is incompatible with Kvaser drivers.
2. VMAC low voltage bypass harness with attached:
   2.1. Kvaser leaf CAN interface device
   2.2. USB 12V Power booster for updating the software on the motor
3. Hose/tube cutter for cutting the blowdown tube
4. 3/8” drive Battery powered ratchet tool for removing panels (low clearance)
5. M10 socket (3/8” drive) for removing panels
6. M13 socket (3/8” drive) for removing bolt on bottom plate
7. 2” long 3/8” socket extension
8. Washer installation tool for holding star washers

9. Small magnetic battery powered flood light
10. Torque paint (Markal security check paint marker Red, or similar) for marking motor bolt and MPCV bolt
11. Shop towel for cleaning torque paint
12. VMAC MPCV calibration tool for calibrating MPCV
13. VMAC MPCV socket tool for removing and installing MPCV
14. 3/8” drive torque wrench
15. 10mm open box end wrench for calibrating MPCV
16. 3mm hex bit socket (3/8” drive) for calibrating MPCV
17. 1” Adjustable wrench for calibrating MPCV
18. Long needle nose pliers with 45° angle tips for removing MPCV piston
19. 3/8” socket wrench with omni-directional head for installing and removing MPCV
20. 4” diam magnetic tray for holding fasteners and bits
21. Snipping tool for snipping zip ties
22. Zip ties for replacing cut zip ties
23. VMAC calibrated ¼” drive torque wrench for installing panels
24. 1/4" female to 3/8” male socket drive adaptor for installing panels

5.1.2 Optional under bus accessories:

A. Magnetic retrieval tool
B. Spare oil pen
C. XL sharpie for marking boxes
D. Spare needle nose pliers
E. Spare magnetic light source
F. Spare tube cutter

5.1.3 Inside the bus tool kit:



1. Impact driver for removing bolts
2. Wire cutters for cutting for removing zip ties
3. Needle nose pliers for setting inlet adaptor bolts in place
4. Long needle nose pliers with 45° angle tips for setting inlet adaptor bolts in place
5. T-handle 8mm square drive for operating hatch latches and service panel latches (E100110A)
6. Hose/tube cutter for adjusting Teflon blowdown tube
7. 5mm ball end hex, 9” long T-handle
8. 3/16” pin punch, 10” long, for installing seal plug
9. Small magnetic battery powered flood lights
10. Black XL sharpie for marking intake hose fitting clocking angle
11. Hammer for installing seal plug
12. Vise grips for holding solenoid
13. 1-3/8” crescent wrench for adjusting the air filter housing cap
14. VMAC calibrated ¼” drive torque wrench for torquing fasteners, solenoid coil, and hose clamp

15. Air filter decal alignment tool for centering the decal
16. Spare bolts
17. Spare solenoid
18. 4” diam magnetic tray for holding fasteners and bits
19. Nylon hair brush for cleaning debris off of hatch and service panel
20. Plastic pipe for guiding Teflon blowdown tube
21. Loctite 567 or similar pipe thread sealant for sealing NPT fittings
22. Dielectric grease for greasing electrical connection (if replacing solenoid coil is required)
23. Blue Loctite for thread locking fasteners
24. Crosscheck torque seal (yellow) for applying tamper-proof indicators
25. Oil pen; water color brush pen filled with VMAC compressor oil for lubricating O-rings
26. Magnetic retrieval tool for retrieving fallen fasteners
27. Stubby flathead screwdriver for operating service panel latches (E100108)
28. Stubby 3/8” ratchet for removing solenoid bolt
29. 6” extension for 3/8” drive for removing solenoid bolt
30. Fine hooked pick for retrieving O-rings and pulling down on motor connector yellow latch
31. 1/4” drive ratchet for loosening intake hose clamp
32. Hex impact drive to 3/8” socket drive adaptor
33. 5mm hex bit with 5” long 3/8” socket drive for inlet adaptor fasteners
34. 1/4" socket to 3/8” drive adaptor for attaching 3/8” sockets to the torque wrench (Item 17)
35. 5/16” socket for loosening and tightening intake hose clamp
36. 8mm socket for adjusting hose clamp
37. 13mm socket for removing M8x16mm bolt on bottom of enclosure
38. 4mm hex bit with 2” long 3/8” drive for removing and installing solenoid
39. Vice (not shown)

5.1.4 Optional accessories for inside the bus:

A. Painters tape
B. 3/8” socket to 1/4" drive adaptor
C. 2” adjustable wrench
D. 1.5” adjustable wrench

5.2 Items for Rework and Disposal

5.2.1 Items for Rework

Depending on the situation the service technician encounters, the following components may be packaged and sent to VMAC for rework and/or re-use in future systems (in order of priority):

- Unused retrofit kits
- Air filter housing bottoms
- Unused air filter caps that have an orange torque mark
- Unused poppets (if new poppet is already installed)
- Replaced poppets (non-channeled poppets)
- Solenoid stems that have been removed from a damaged coil removal.
- Unused air filter decals
- Unused cut Teflon poly tube*

***At discretion of technician, low-cost part, can dispose instead**

5.2.2 Items for Disposal

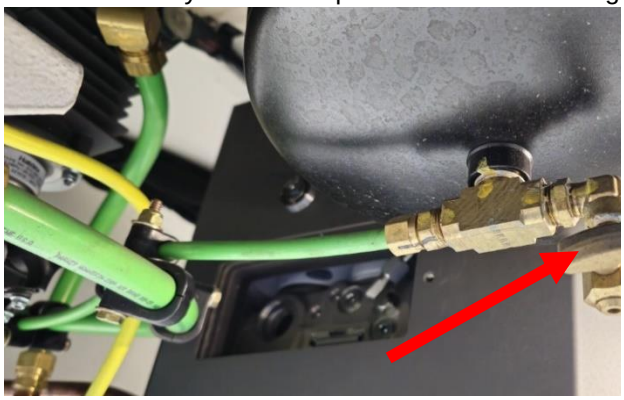
The following components may be disposed of in the appropriate manner as made available by the facility where the retrofit is being performed:

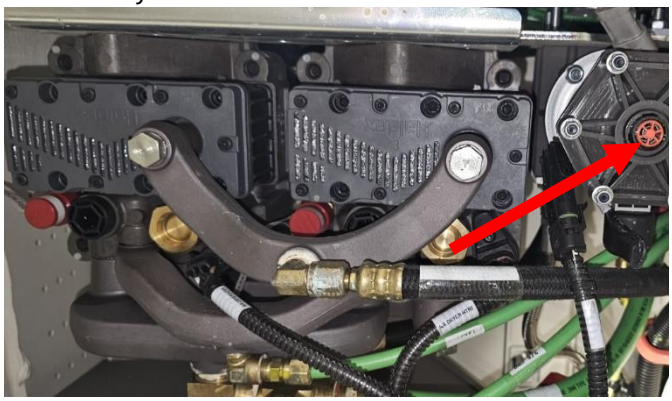
- Replaced inlet assemblies (inlets without casting for blowdown coalescer)
- M8x16mm bolt removed from bottom plate
- Used O-rings

5.3 Retrofit Procedure – Under the Bus

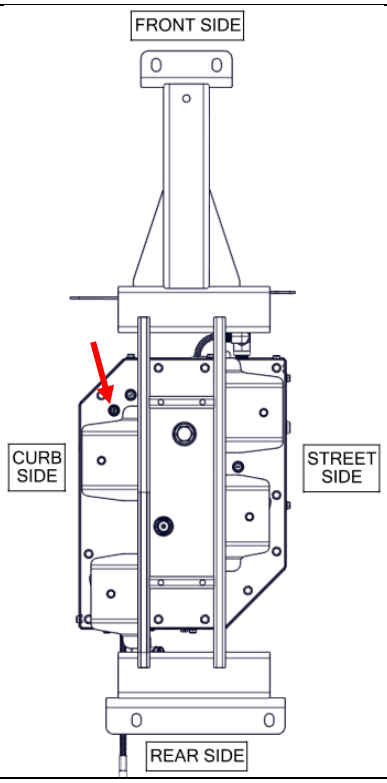
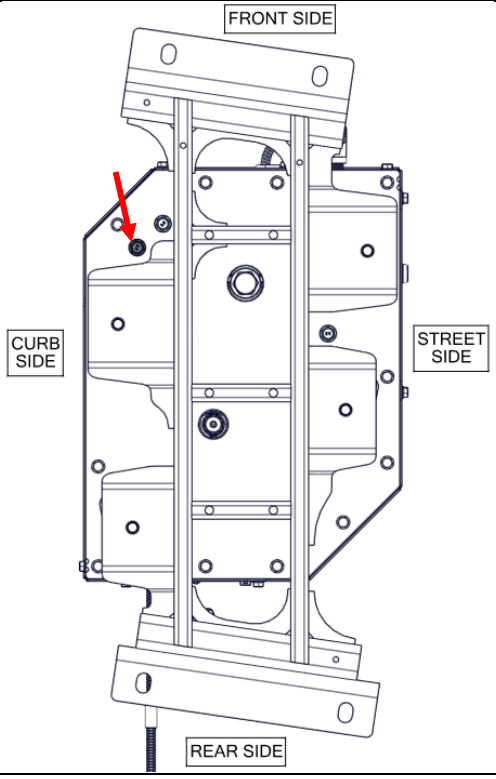
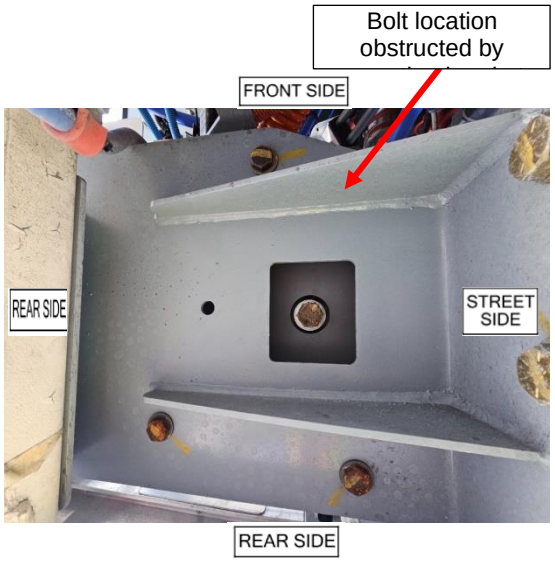
	Bump caps are the minimum requirement for head protection when working underneath the bus.
	Reaching underneath the bus while it is not on jacks is prohibited. There is serious risk of severe injury as the air suspension could loose pressure and lower the bus to within an inch of the ground. When reaching underneath the bus, a 7-ton (or greater) jack is to be used and be secured against the bus frame for the duration of the activity. 
	Ensure the environment you are working in has sufficient lighting. Use magnetic mounted lights where visibility is poor.

1. Ensure the system is de-energized before commencing work.
   1.1. Ensure that the low voltage knife switch is off and locked out.
   1.2. Ensure the air compressor is depressurized by pulling on the pressure relief valve or by cracking open the dipstick to relieve internal pressure
   1.3. Ensure the dryer line is depressurized.
      a. On dryer systems with purge tanks, turn the quarter turn valve on the purge tank 90 degrees to open and relief the pressure in the dyer line and compressor discharge line. Close the quarter turn vale on the purge tank by -90° after depressurization has finished
      b. On dryer systems with concept oil separators, use a tool to press and hold down the purge on the separators to relieve the pressure in the compressor discharge line.
      c. If encountering a vehicle with neither of these systems, consult New Flyer service personnel on how to safely relieve the pressure in the discharge line and dryers.


Dryer system with purge tank


Dryer system with oil separator

2. Use the 13mm socket attached to the electric ratchet via the 2” extension to remove the outer M8x16mm bolt.

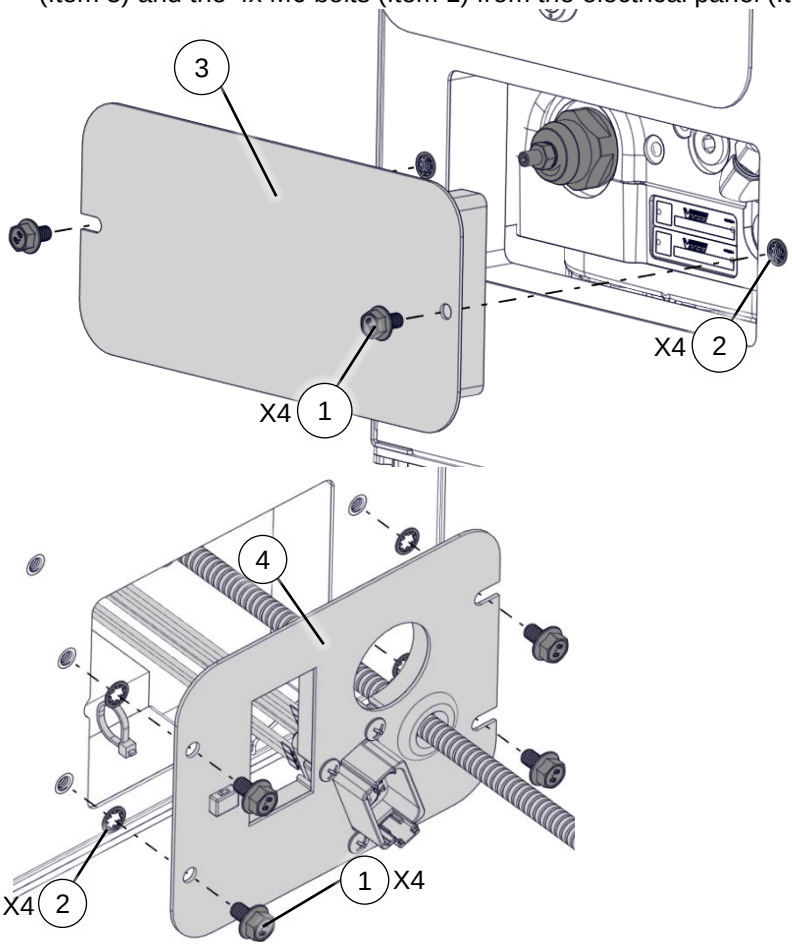
Standard XE/XHE busses	5-door XE/XHE busses	XDE busses
		

3. Insert the rubber grommet into the hole that the M8 bolt was in.

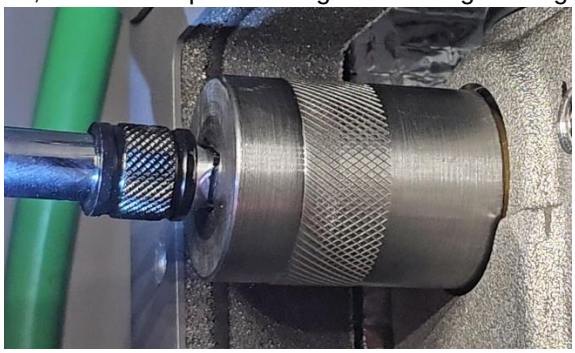
4. Feed most of the 1/4" Polytube through the grommet into the compressor enclosure until there is about 6-8 inches left sticking out of the bottom. If there is resistance, back up the tube a bit and rotate it about its axis.

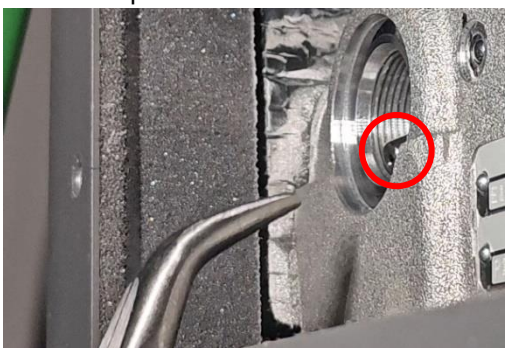
	The provided blue plastic pipe may be used from inside the bus to help guide the tube around wires and foam by placing the blue pipe onto the hole from above while feeding the tube through as part of step 4 of the under the bus instructions.

5. Using the 3/8” drive ratchet and the 10mm socket, remove the 2x M6 hex bolts (Item 1) from the MPCV panel (Item 3) and the 4x M6 bolts (Item 1) from the electrical panel (Item 4).

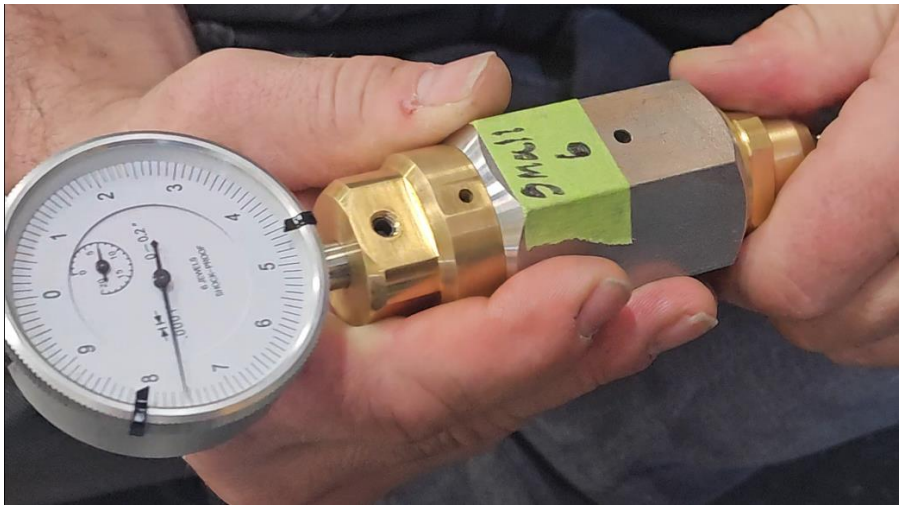


6. Remove the MPCV panel and set aside. Some serrated washers may release from the panel, remove and discard the used washers.
7. Attach the MPCV socket tool to the 3/8” omni-directional socket wrench and remove the MPCV from the compressor. The MPCV piston will usually remain inside the compressor when the body of the MPCV is removed, retrieve the piston using the 45° angled long needle nose pliers.





8. Place the MPCV components (Main body, spring, and piston) into the MPCV calibration tool and tighten using the 1” adjustable wrench.

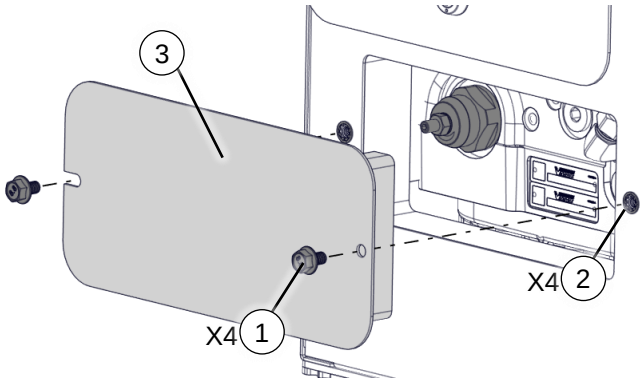


9. With the wrench on the MPCV, unfasten the locking nut on the MPCV set screw using the 10mm open box wrench.

10. Use the 3mm hex bit on the set screw and calibrate the MPCV:
    10.1. Refer to the range provided on the sticker on the hex of the gauge tool, a minimum and maximum range of the calibrated tool are printed (We'll use 65-68 as an example). The gauge measures in 1/10ths of a thousandth of an inch (thou). 1/10ths of a thou are indicated by the large dial (red arrow), whereas thou are measured by the smaller dial (green arrow).

    10.2. Turn the set screw CCW to back off the spring force such that the small dial is 1 thou below the minimum (Ex: 5).
    10.3. Turn the set screw CW slowly until the minimum value of the indicated range is met (Ex: 65, the small dial (green arrow) should read '6' and the large dial (red arrow) should read '5').
    10.4. Remove the 3mm hex bit from the set screw and use it to tap on the body of the calibration tool to help settle the spring force. The large dial should settle between the minimum and maximum values (Ex: 65-68). If over the maximum value (Ex: 70), repeat steps 10.2 and 10.3.
    10.5. Use the 10mm open box wrench to re-engage the locking nut on the set screw.
    10.6. Remove the MPCV from the calibration tool using the 1" adjustable wrench.
11. Place the piston into the MPCV compressing the spring, and re-install into the air compressor. Tighten hand tight.
12. Attach the MPCV socket tool to the 3/8" drive torque wrench and tighten to 25 N-m (19 ft-lbs).
13. Apply torque paint to the set screw and body of the MPCV. Do not cover the hex socket of the set screw with torque paint.

14. Take the MPCV panel (Item 3) and place the 2x M6 bolts (Item 1) through their holes. Apply the 2x M6 serrated washers (Item 2) onto the bolts on the opposite side of the panel and install hand-tight onto the compressor enclosure. Torque both M6 bolts to 10 N-m (90 in-lbs) on the MPCV panel.



15. Back off the electrical panel from the enclosure. Some serrated washers may release from the panel, remove and discard the used washers.
16. Pull down on the yellow latch to release the motor low voltage connector. Remove the connector and set aside.

In some cases, there have been reports of the yellow latch missing or removed on the vehicle harness allowing for the plug to easily slide out of the receptacle on the motor. In such a case, continue with the retrofit and notify new flyer personnel of the missing latch on the connector which can lead to connection and communication issues with the compressor.

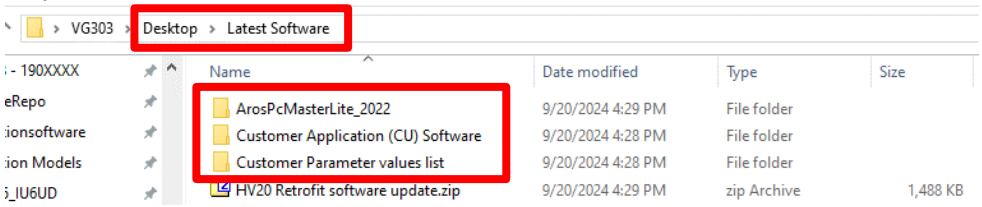
Incorrect	Correct
	

17. Plug in the bypass harness via the same connector and engage the yellow latch. Ensure that the Kvaser leaf CAN interface device is connected to the bypass harness and plug it into an available USB port on the laptop.
18. Determine and connect the power source you wish to use:
    a) Laptop USB (recommended): Connect the 12V USB power booster to the bypass harness via the 2 pin Deutsch connector on the harness and plug the USB into the laptop.

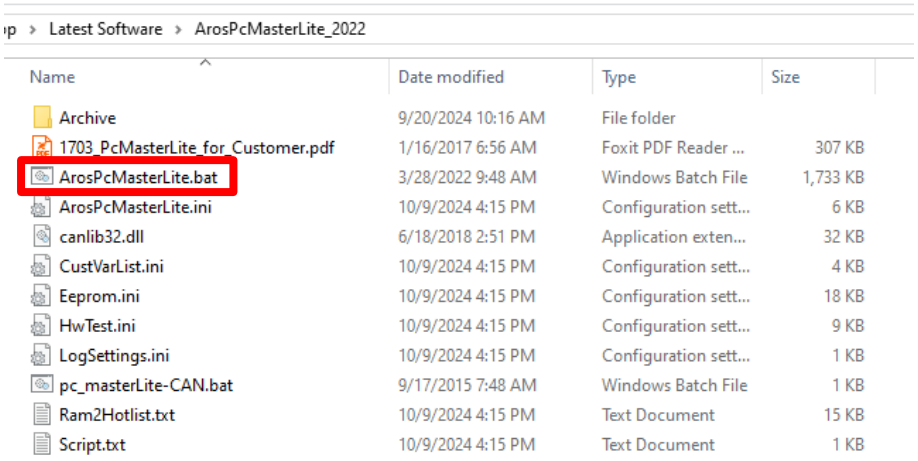
To avoid power issues, ensure that the 12V USB power booster is plugged directly into a USB port on the laptop, do not use a USB hub.

    b) Wall power: Connect the wall power adaptor to the bypass harness via the 2 pin Deutsch connector on the harness and plug the power adaptor into a suitable 120V wall receptacle.

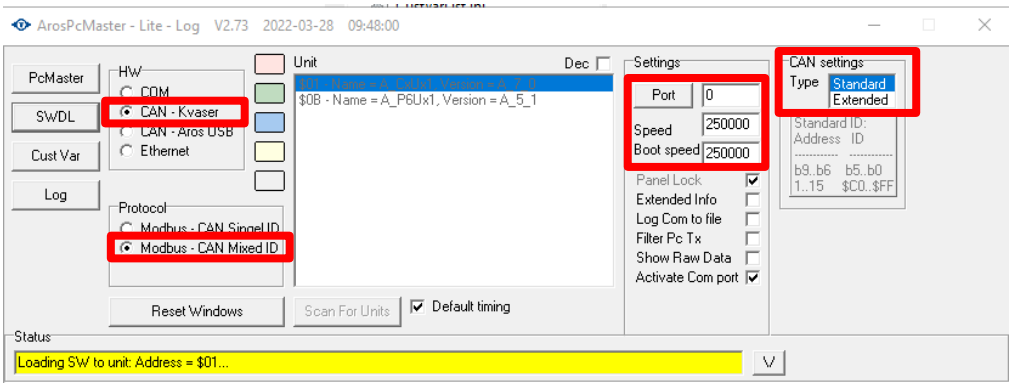
19. To download and setup the program, follow instructions a) to e) below. If the software package is already installed, proceed to step 20.
    a) Download and install the Kvaser drivers. Apple Mac is incompatible with Kvaser.
        a. For windows users, use this link: https://kvaser.com/single-download/?download_id=47105
        b. For Linux users, use this link: https://kvaser.com/single-download/?download_id=47147
    b) Download the HV20 retrofit update package located in the following link and password: Software update package.zip (Password: VMAC_Retrofit)
    c) Go to the downloads folder and extract the retrofit zip file “HV20 Retrofit software update.zip” to your desktop.



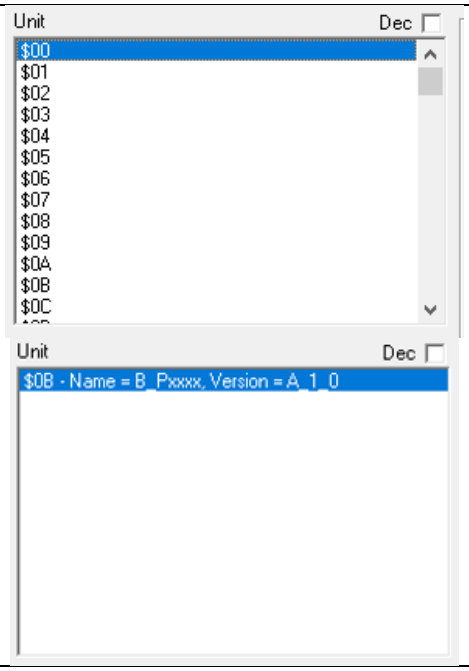
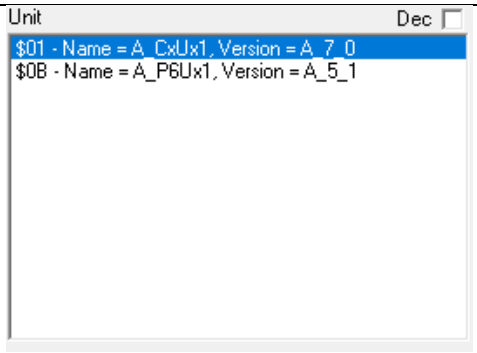
    d) The software is ready to run (no install required) by double clicking “ArosPcMasterLite.bat” under the ArosPcMasterLite_2022 folder.

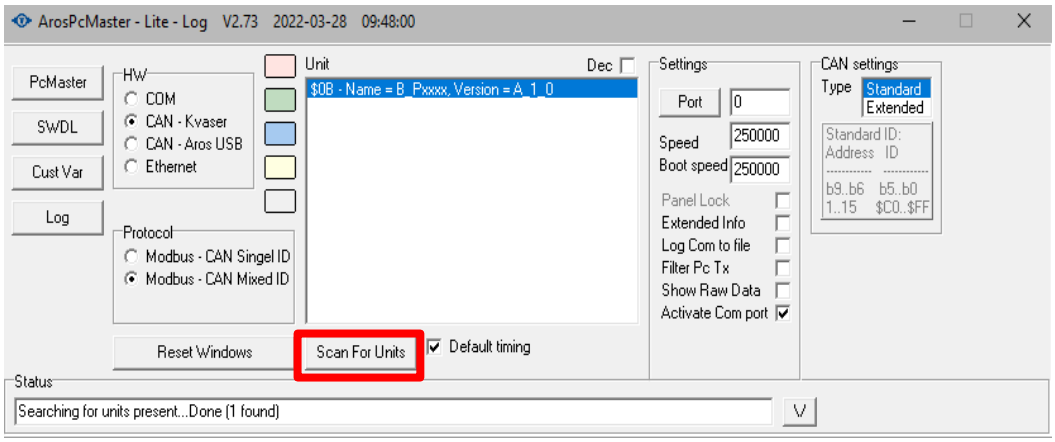


    e) Ensure the settings are set in ArosPcMaster-Lite:
        a. HW: CAN – Kvaser
        b. Protocol: Modbus – CAN Mixed ID
        c. Settings:
            i. Port: 0
            ii. Speed: 250000
            iii. Boot speed: 250000
        d. CAN settings type: Standard

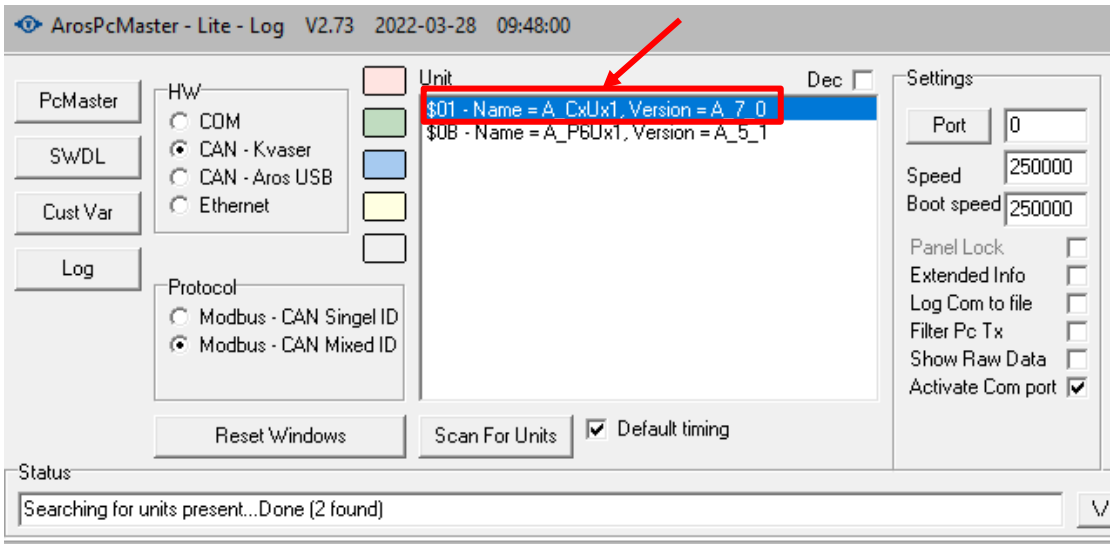


20. Hit “Scan For Units”. Two microcontroller units should pop up. If a long list, empty table, or only 1 module is shown, click “Scan For Units” a couple more times until both microcontrollers show up. If none show up, close and restart the ArosPcMaster lite software.

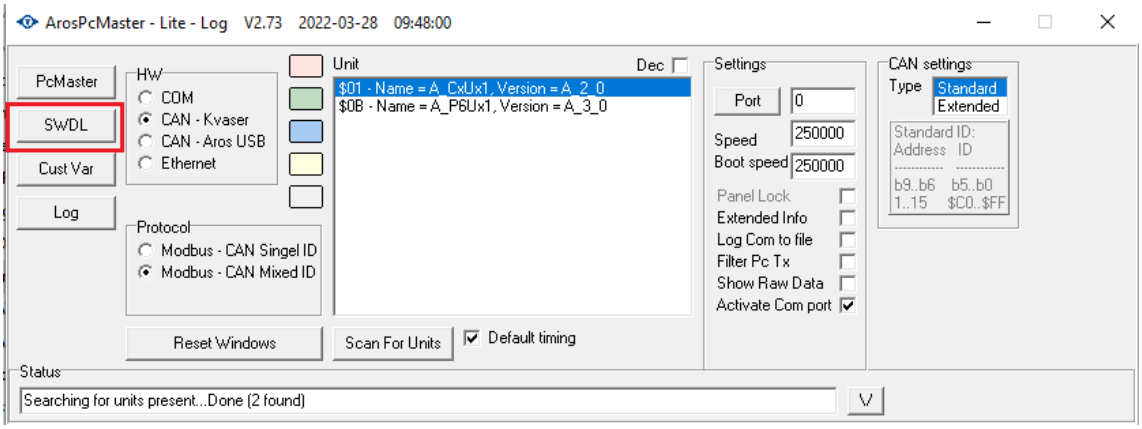
INCORRECT	CORRECT
	



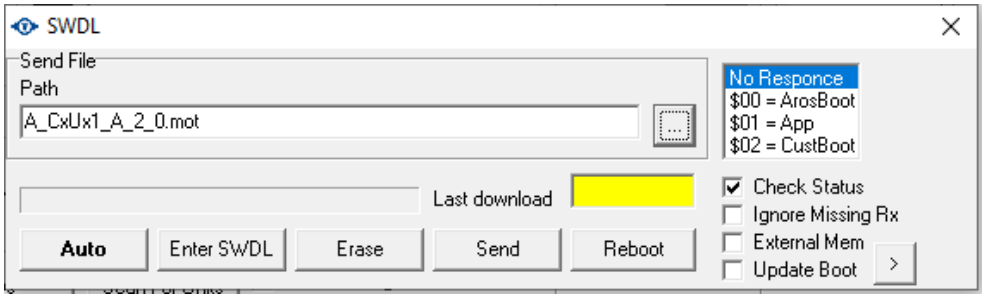
21. Select the “$01 – Name = A_CxUx1” Controller Unit (CU) microcontroller under the “Unit” Table.



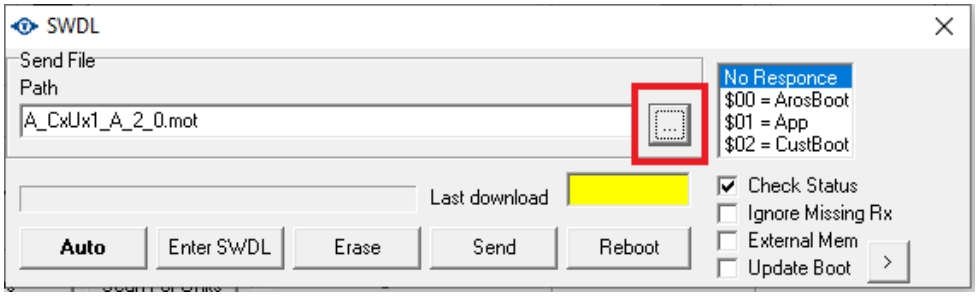
22. Click the button on the left labelled “SWDL” with the CU microcontroller selected.



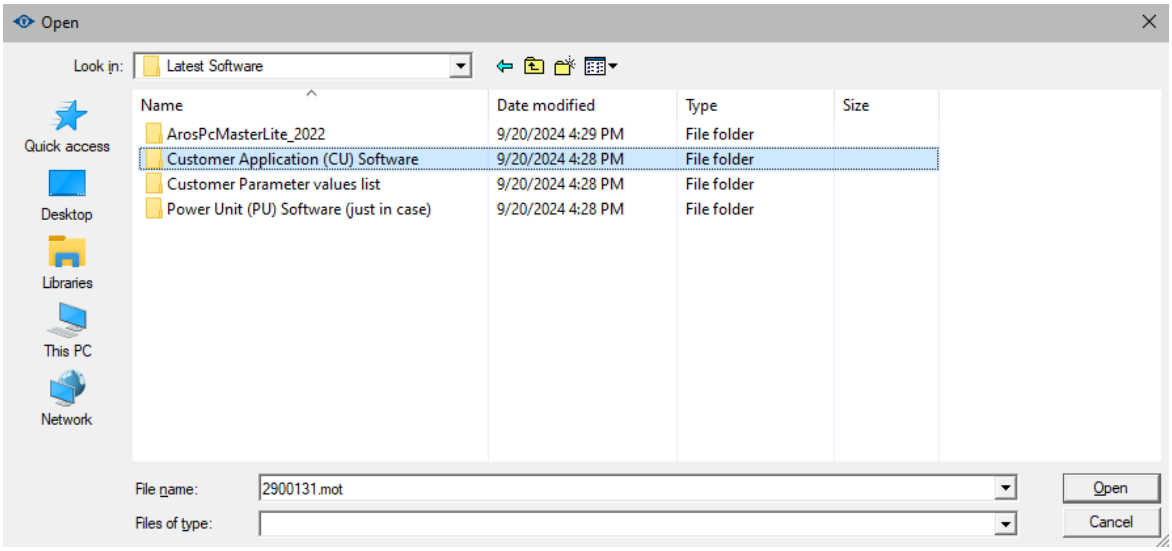
23. A new dialogue box named “SWDL” opens up.



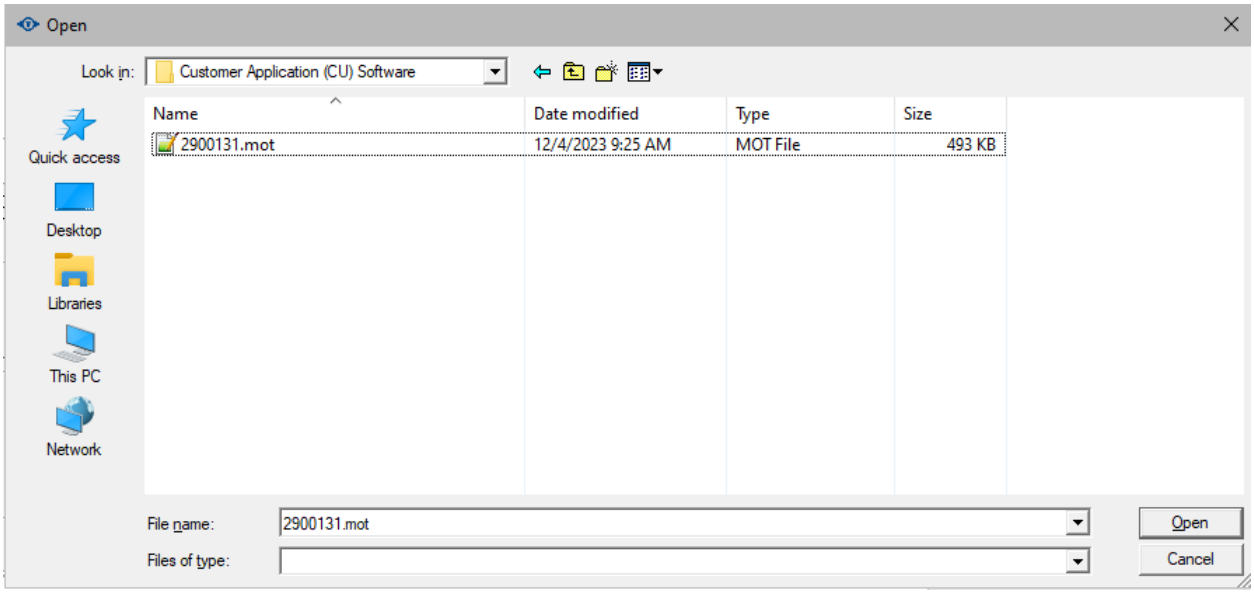
24. Double click the box with “…”.



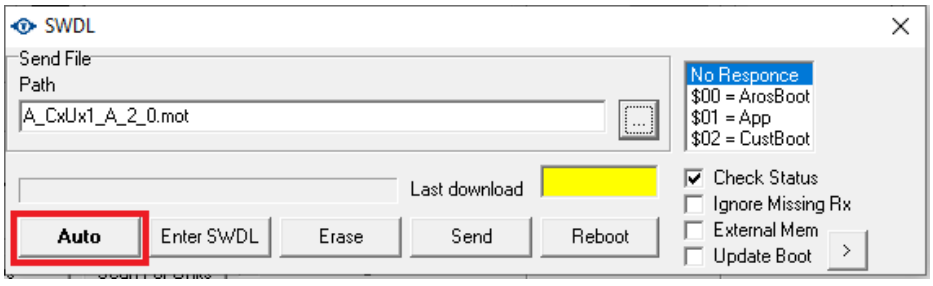
25. A windows open dialogue box will pop up. Navigate to your desktop and the “Latest Software” folder. Open the “Customer Application (CU) Software” folder.



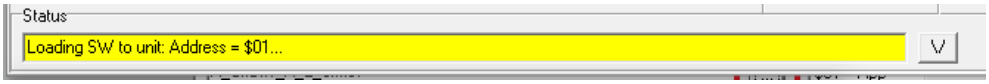
26. In this folder, select “2900131.mot” and double click to open.



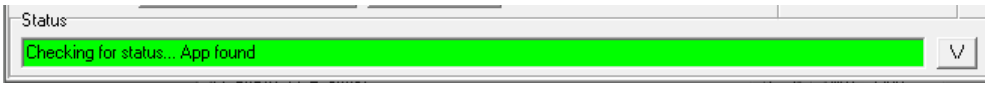
27. Press the “Auto” Button to commence the software erase and flashing of the new software.



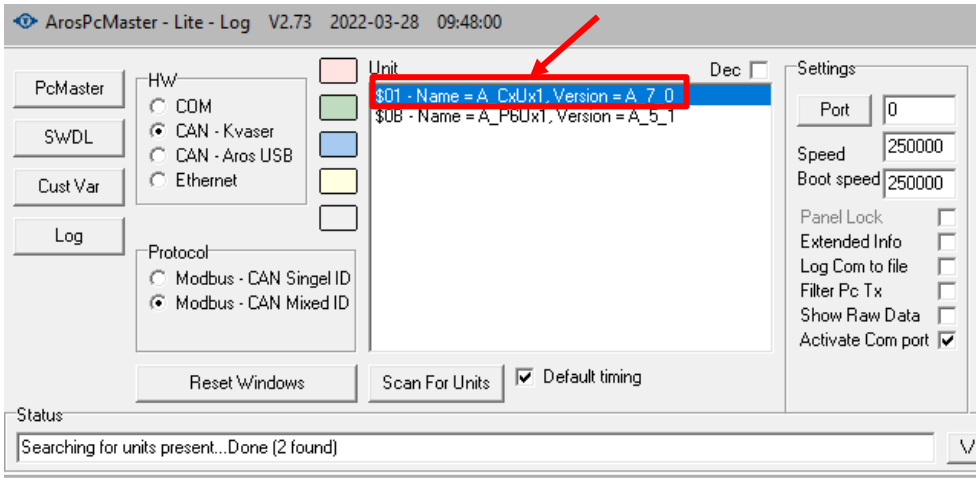
a. The Status bar on the ArosPcMaster – Lite – Log dialogue box will show the progress. Should the status bar turn red, review the error and attempt option 2 which follows the manual method.



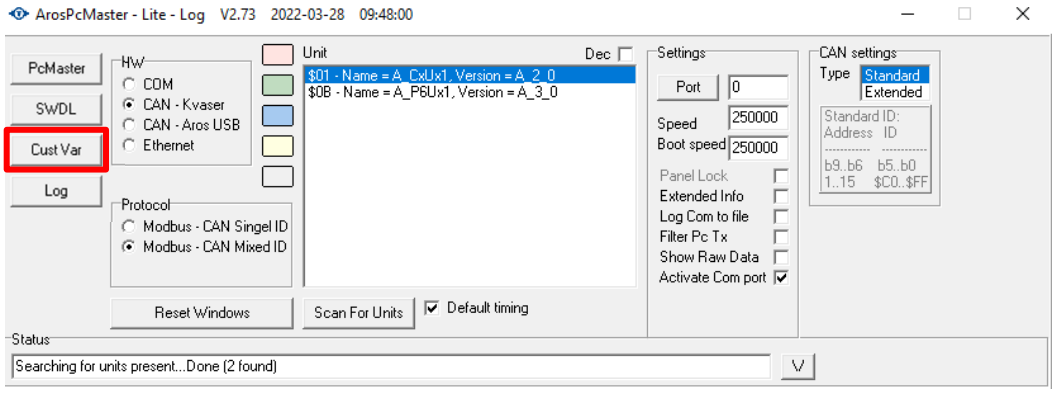
b. If the status bar turns green, the software has been successfully flashed. If the status bar is red, the software has failed and steps 24 through 27 should be repeated. If this process still fails, reach out to VMAC HV20 support at support@vmacev.com



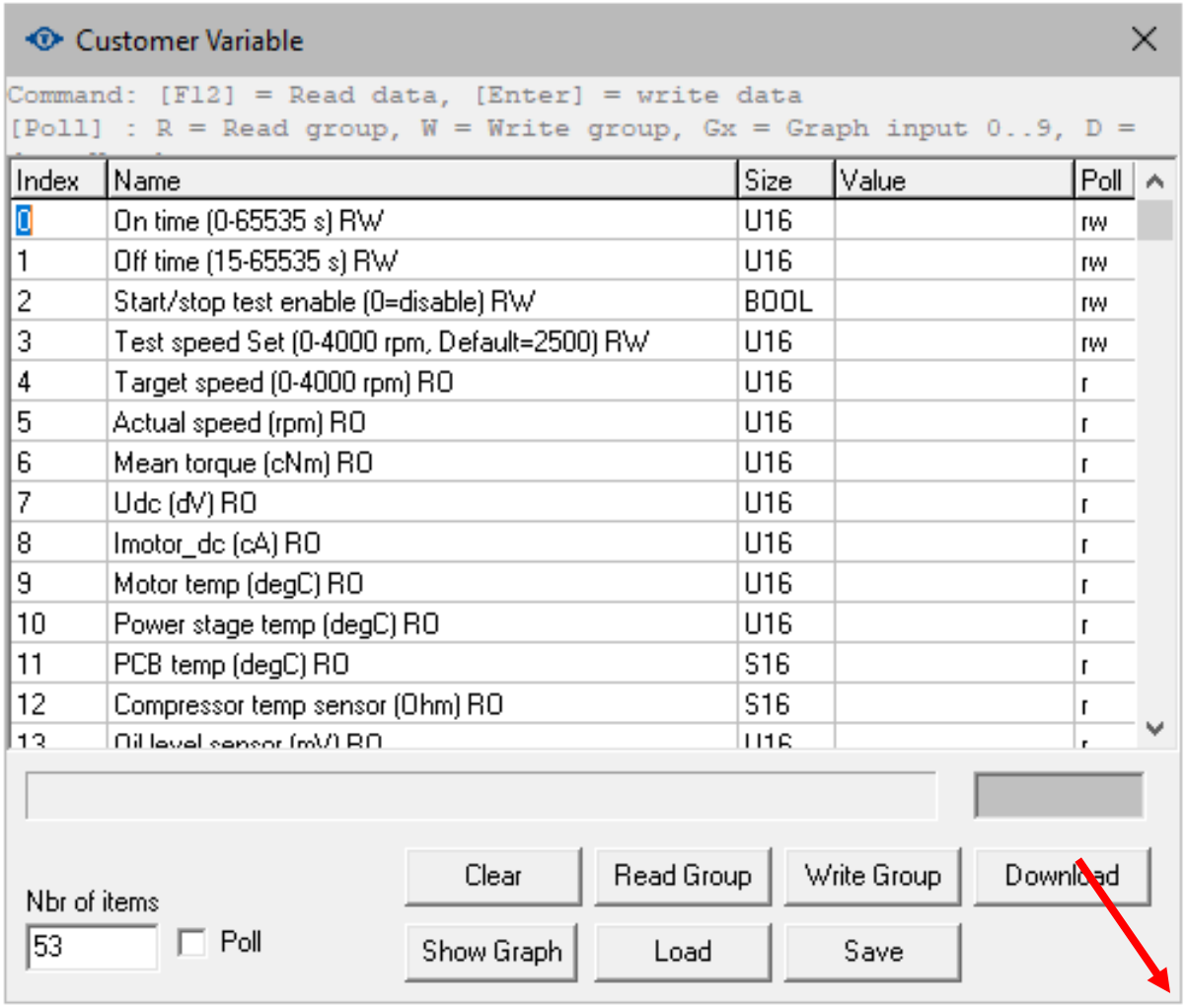
28. Flashing is complete. Ensure that the software version for A_CxUx1 is 'Version = A_7_0'.



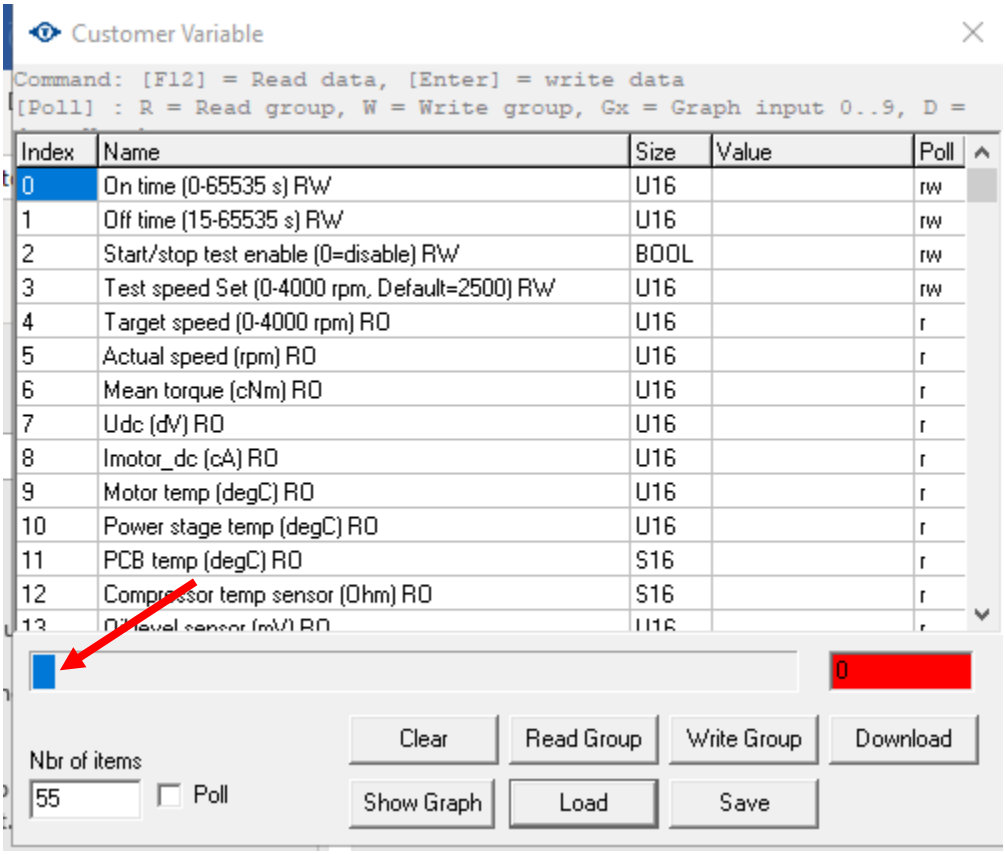
29. Click on the 'Cust Var' button on the left.



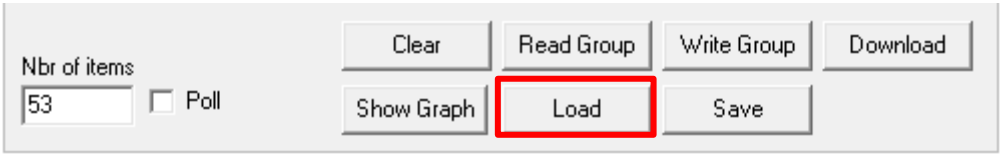
30. The Customer Variable window will pop up. The lower right corner of the window can be dragged to increase the size for a better view.

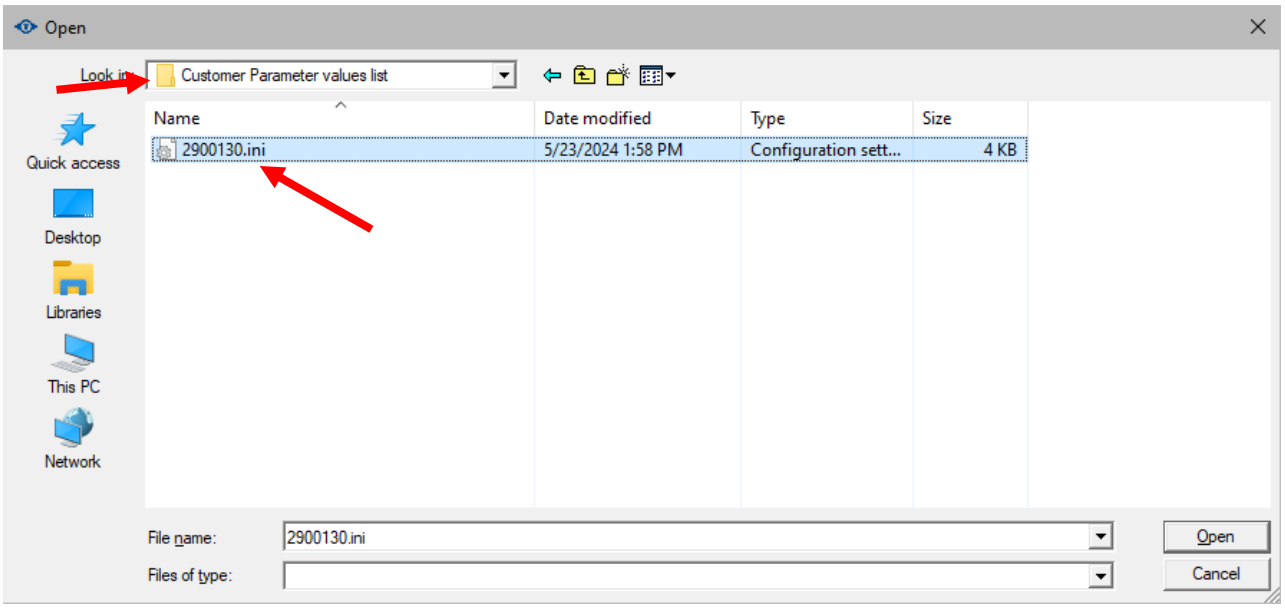

Customer Variable
Command: [F12] = Read data, [Enter] = write data
[Poll] : R = Read group, W = Write group, Gx = Graph input 0..9, D =
Index
Name
Size
Value
Poll
0 On time (0-65535 s) RW U16 rw
1 Off time (15-65535 s) RW U16 rw
2 Start/stop test enable (0=disable) RW BOOL rw
3 Test speed Set (0-4000 rpm, Default=2500) RW U16 rw
4 Target speed (0-4000 rpm) RO U16 r
5 Actual speed (rpm) RO U16 r
6 Mean torque (cNm) RO U16 r
7 Udc (dV) RO U16 r
8 Imotor_dc (cA) RO U16 r
9 Motor temp (degC) RO U16 r
10 Power stage temp (degC) RO U16 r
11 PCB temp (degC) RO S16 r
12 Compressor temp sensor (Ohm) RO S16 r
Nbr of items
53
Poll
Clear
Read Group
Write Group
Download
Show Graph
Load
Save

31. In the following steps, it is common for the loading bar to reach 1 bar and fail to perform the action. If this happens, simply click the button a few times until the loading bar fills and the action is completed.

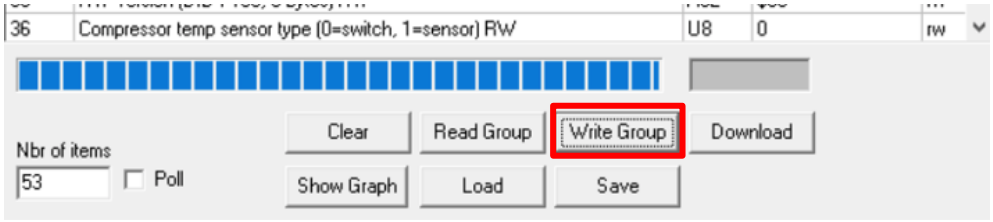


32. Click “Load” and navigate to the “Latest Software” folder on your desktop. Open the “Customer Parameter Values List” folder and select the **2900130.ini** file.

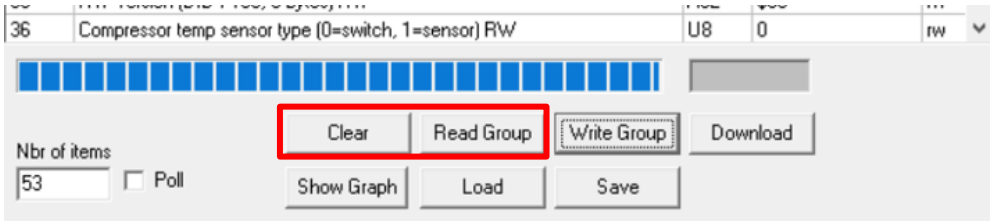



Open
Look in:
Customer Parameter values list
Quick access
Desktop
Libraries
This PC
Network
Name
Date modified
Type
Size
2900130.ini
5/23/2024 1:58 PM
Configuration sett...
4 KB
File name:
2900130.ini
Files of type:
Open
Cancel

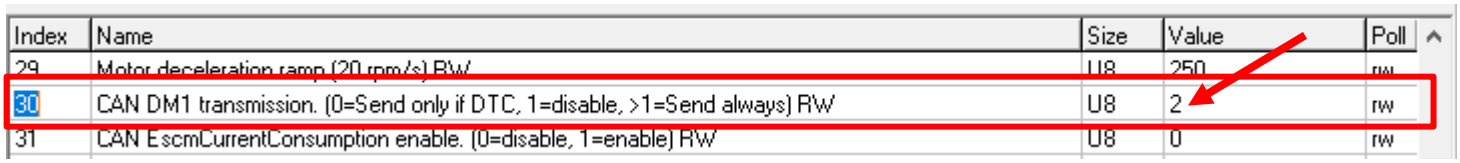
33. Press “Write Group” to save the values to the motor. The loading bar will fill when completed. There may be instances where “Write group” may have to be pressed several times prior to successful completion.



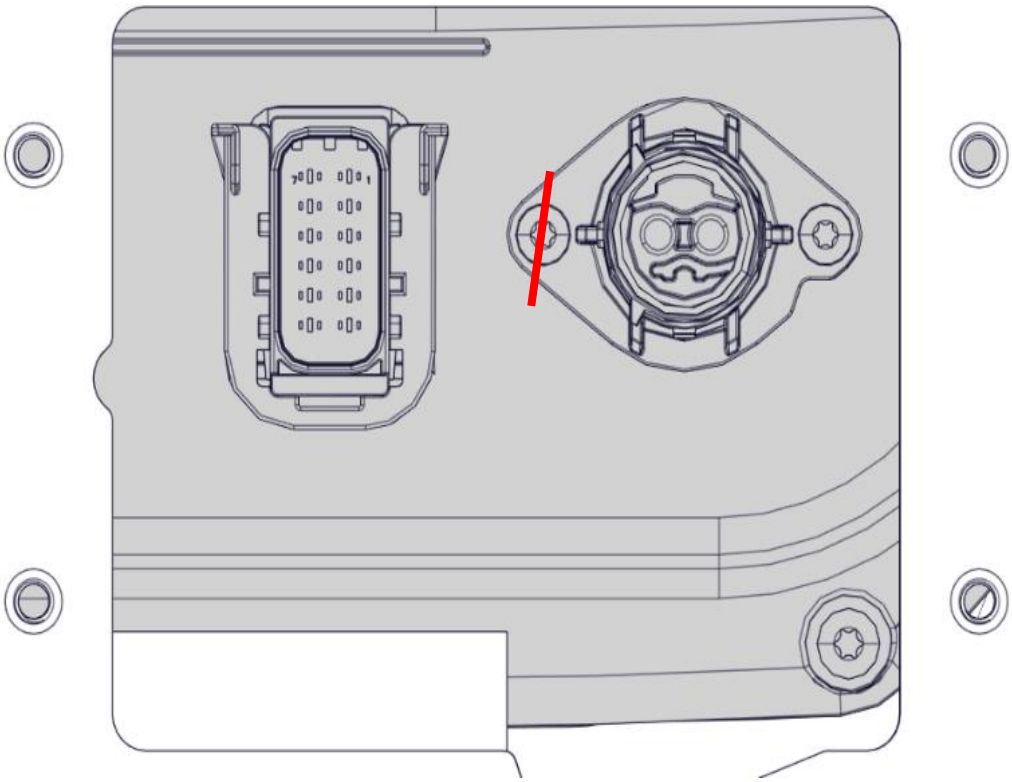
34. Press “Clear” to clear the values as shown on the screen. Then click “Read Group” to show the values output by the motor. There may be instances where “Read group” may have to be pressed several times prior to successful completion.



35. Confirm that the parameter for index #30 ‘CAN DM1 transmission.’ is set to a value of “2”. This confirms that the latest parameter list has been successfully uploaded. If this value is a ‘0’, the upload has failed and restart from step 29.



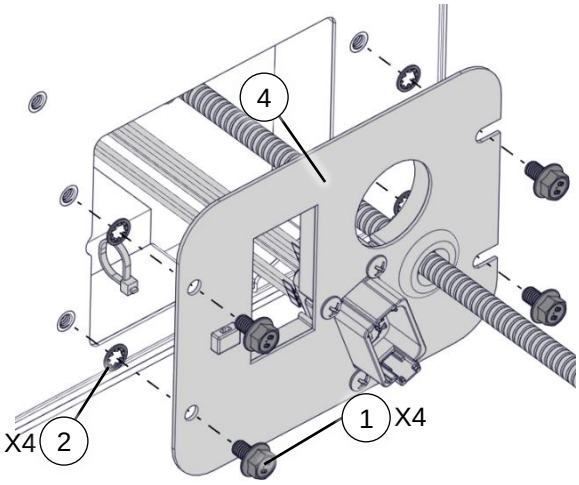
36. Close PcMaster-Lite and disconnect the harness connections from the laptop.
37. Remove the bypass harness from the compressor by pulling down on the yellow latch and removing the connector from the receptacle.
38. Identify the left black bolt of the high voltage receptacle on the motor and apply torque paint across the bolt ensuring that the torque paint covers the drive head preventing tool insertion.



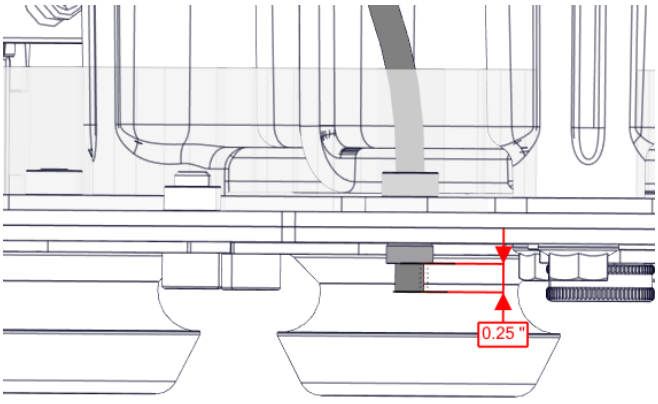
39. Re-install the vehicle's low voltage harness for the compressor motor. Ensure the yellow latch is pushed up and fully engaged.

⚠	In the event that the plug is missing it's yellow latch, ensure that the plug is fully seated inside the receptacle and that the harness is providing enough force to keep the plug pushed into the receptacle. Notify new flyer personnel of the missing latch on the connector as this can lead to connection and communication issues with the compressor.

40. Install the 4x M6 bolts (Item 1) into the electrical panel and apply the 4x M6 serrated washers (item 2) onto the bolts on the opposite side of the panel (item 4) and install the panel with bolts hand-tight onto the compressor enclosure.



41. Using the 10mm socket on the electric ratchet, thread the 6x M6 bolts on the MPCV panel (2x) and the electrical panel (4x) until they bottom out.
42. Using the 10mm socket with the 3/8" to 1/4" drive adaptor attached to the small torque wrench, torque all 4x M6 bolts to 10 N-m (90 in-lbs) on the electrical panel.
43. Skip steps 44 through 46 for now and return once step 37 of the inside the bus instructions has been reached with the polytube installed into the new inlet adaptor.
44. Once the new inlet has been installed, pull on the Polytube until it is taught. Cut off any excess tube (roughly 15") so that there is 1/4"-1/2" poking out of the rubber grommet.



45. Apply the ‘Gen 1.1’ decal to the bottom side of the unit under the serial number as shown in the picture below. The surface may need to be cleaned first for proper adhesion.

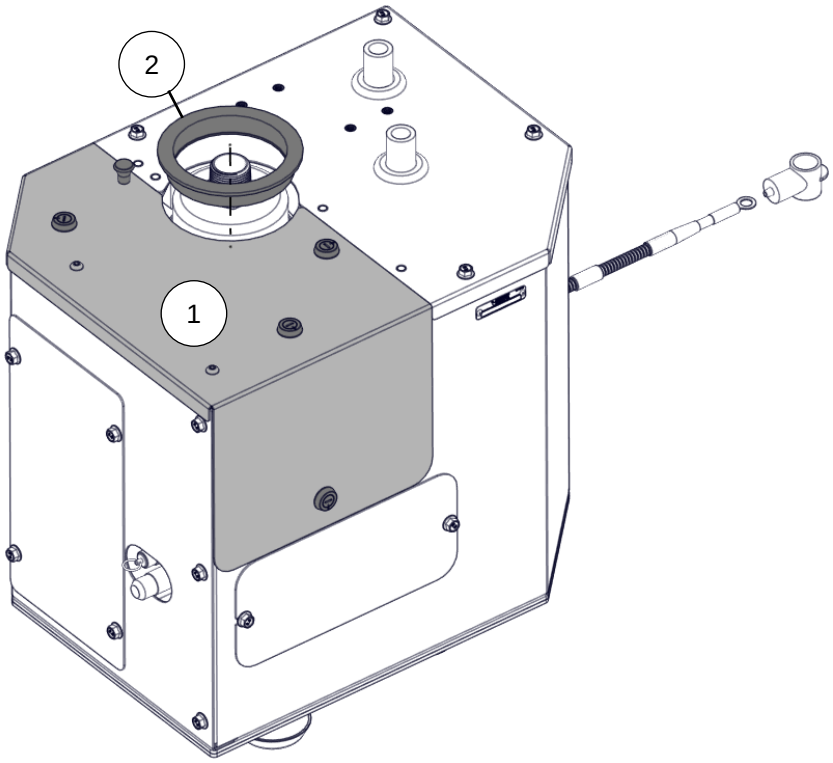
46. Return the step 38 of the inside the bus instructions.

5.4 Retrofit Procedure – Inside the Bus

	• Allow the oil to cool sufficiently to allow handling of parts safely, avoiding injury. • Follow the Bus OEM's instructions to ensure the compressor will not turn on during service and interlocks are in place to assure this is the case. • Depressurize the system per the Bus OEM's instructions. Checking that the system is depressurized can be performed by activating the pressure relief valve. This should only be performed after shutdown, de-energizing, and safety lockout procedures are performed. DO NOT SERVICE THE COMPRESSOR IF THERE IS A RISK THAT IT COULD BE ENERGIZED.

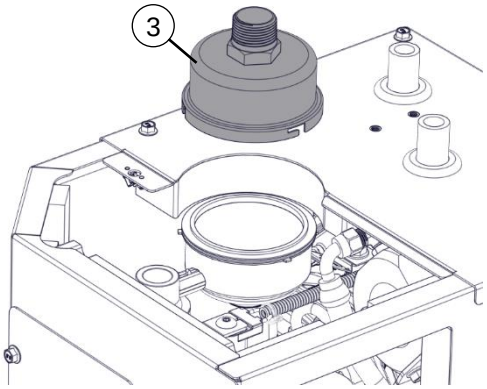
5.4.1 Air Inlet Retrofit

1. Ensure the unit is shut off and de-energized for 5 mins before proceeding, follow the vehicle manufacturer's instructions for shut off and de-energizing the system.
2. Use the 8mm square key to undo the bus floor latch and move it out of the way.
3. Thoroughly clean the top of the enclosure and any surrounding areas including the floor latch flange that could contaminate the compressor internals during servicing due to dislodging dirt or debris while working on the compressor.
4. Move the rubber boot (2) covering the air filter out of the way.
5. Disengage the slotted latches and remove the service panel (1) using a flat head screwdriver or the square key, place safely aside.



6. Use the ¼" ratchet with the 8mm socket to loosen the intake hose clamp, move the clamp back.

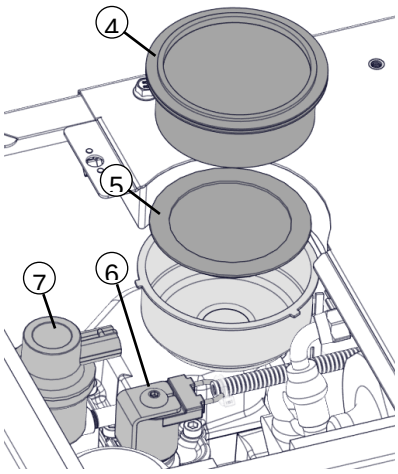
7. Unlock and pull up the filter top (3), disconnect it from the intake hose and set aside.



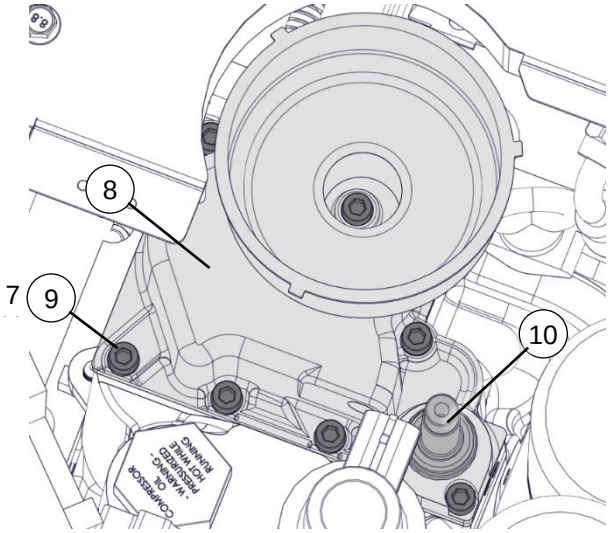
8. Remove the filter element (4) from the air filter housing. Disconnect the filter minder (7) and set the harnesses aside, twist the filter minder ¼ turn counterclockwise to move the connector receptacle out of the way.

	If the old top half of the intake filter has the orange mark on the fitting as shown, this top half should be returned to VMAC. If the old top half is missing this mark or is damaged, the old top half should be disposed of.	
	The solenoid coil bolt on top of the solenoid may be tight against stem and the entire solenoid assembly may turn causing wire crimping. If the wire is bent too much, the coil must be replaced. Use caution when removing the top bolt.	

9. Clamp down the Vice-Grip onto the solenoid metal bracket and unbolt the solenoid retaining screw using the 4mm hex bit while holding onto the Vice-Grip to prevent the solenoid from twisting. **IMPORTANT:** There is a chance that the solenoid stem will unscrew from the inlet adaptor instead of the retaining screw separating from the stem. If this occurs, remove the entire solenoid from the inlet adaptor, carefully reinstall the Vice Grip around the base of the solenoid stem, use the ratchet and 4mm hex bit to separate the retaining screw from the stem. Once the retaining screw is separated from the stem, place them both in the metal bracket into the magnetic bowl. Move the coil (6) of the blowdown solenoid aside.



10. Remove the safety filter (4) from the air filter housing. Unfasten the inlet adaptor (8) by unbolting the first six easily accessible M6 bolts (9) using a long 5mm hex Tee or impact driver fitted with the 5” long 5mm hex bit. Use the 9” Long 5mm ball end hex T-Handle to unfasten the last remaining screw while lifting the inlet adaptor assembly out of the compressor. Place all 7 bolts into the magnetic bowl. Wipe down the oil from the sealing surface and throw away any O-Rings that may have stuck to the inlet adaptor.

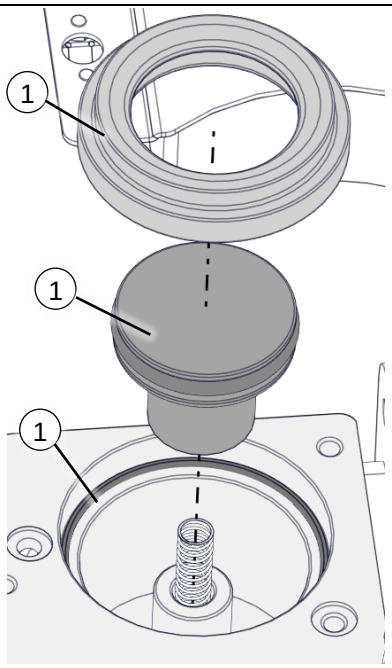


11. Use a ratchet and the 4mm hex bit to remove the solenoid stem (10) from the inlet adaptor and place it in the magnetic bowl.
12. Remove the filter minder (7) and place it in the magnetic bowl. Set the old inlet adaptor assembly aside.

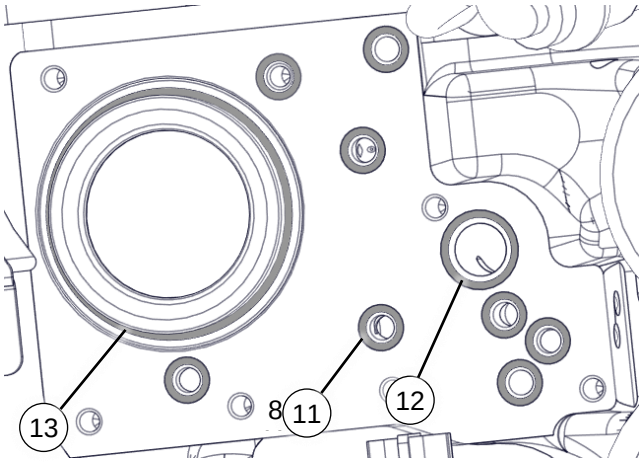
⚠	When removing the poppet the rotor cavity is exposed, take great care in ensuring no debris or parts fall into the cavity. Having debris inside the rotor cavity may damage the compressor rotors

13. Remove the poppet retainer (17) and place aside. Remove the old poppet (18) and put aside. Discard the old poppet seat O-ring (19). Use the oil pen to lubricate the O-Ring surface in the poppet retainer bore, place the new O-Ring (19) and lubricate the O-Ring surface. Use the oil pen to lubricate the new poppet (18) O-Ring, make sure the existing spring is still in place, and slide the poppet on its stem. Place the poppet retainer (17) back into position. Test the new poppet (18) by pressing it down and letting it spring back up, there should be smooth operation.

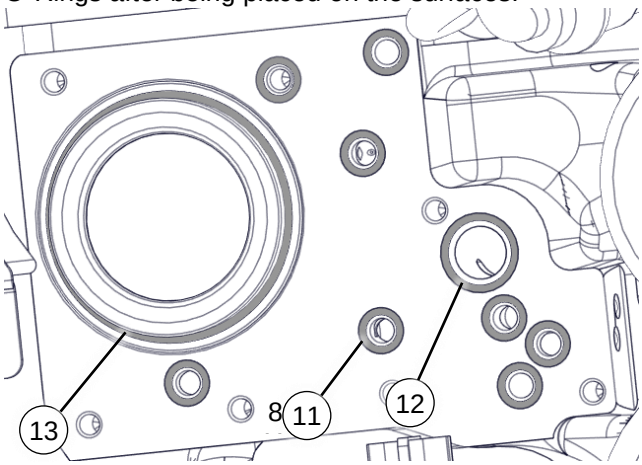
ℹ	The old poppet (18) will be packed up and shipped back to VMAC for remanufacturing.
ℹ	O-rings 13 and 19 are of similar shape and may be difficult to tell apart. The thicker one goes under the retainer (17), and the thinner one goes on top of the retainer.



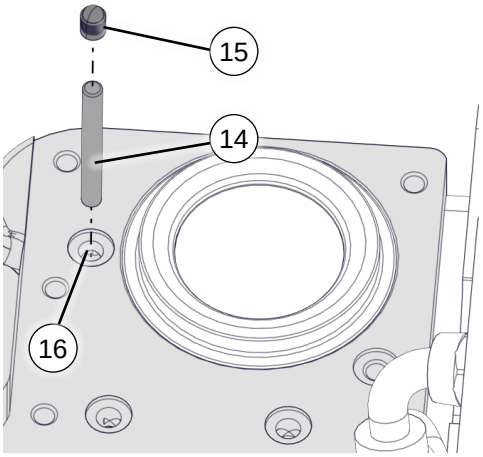
14. Remove and discard all O-rings (11, 12, & 13), a fine pick may be used to help with the removal, being careful not to scratch any sealing surfaces.



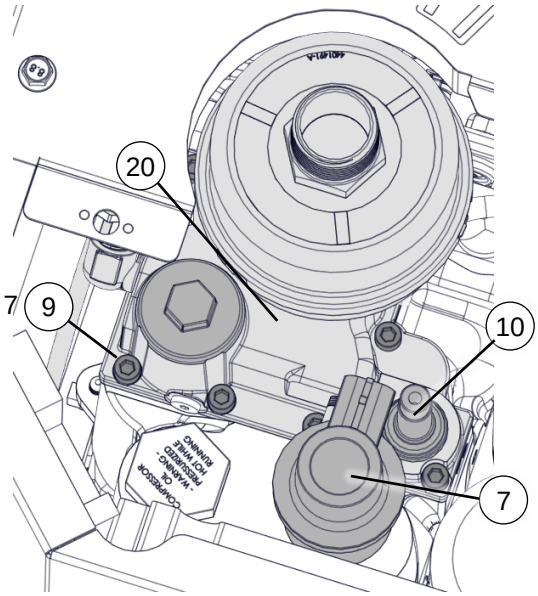
15. Ensure the sealing surfaces are clean and use the oil pen to lubricate all surfaces where the new O-Rings will be placed. Place all the new O-rings (11, 12, & 13) in all of the locations on the face as shown. Use the oil pen again to lubricate the O-Rings after being placed on the surfaces.



16. Check the cross-drill hole depth in hole (16). If the hole is observed to be several inches deep, proceed to the next step. If the hole is shallow and observed to be about a half inch deep, skip to step 17.
17. Drop the steel dowel (14) into the cross drill specified (16). Drop the seal plug (15) with the ball side up into the cross drill (16) and ensure it is seated, use the 10” long 3/16” punch to tap the plug into position. Give the seal plug ball a three to five whacks with a hammer and punch tool such that the top of the ball is flush with the side edge of the plug jacket.

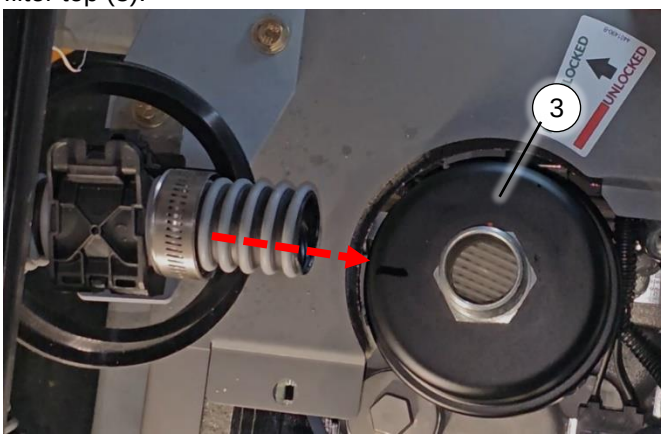


18. Remove the air filter top (3) and air filter element (4) from the new inlet cover assembly.
19. Use the small torque wrench with the 4mm hex bit and the ¼” drive to 3/8” drive adaptor to torque the solenoid stem (10) to 10 N-m (90 in-lbs) into the new inlet adapter.
20. Install the filter minder (7) onto the brass fitting hand tight with the connector housing oriented the same way as step 8.
21. Ensure that the polytube from step 4 of under the bus instructions has been fed through and is now accessible from the top of the compressor. Take the polytube and connect it to the new inlet using the push to connect fitting.
22. Apply fresh blue Loctite to the one difficult to access M6 bolt and insert it into the corresponding hole on the inlet cover.
23. Push the polytube into the push to connect fitting, ensure the tube bottoms out into the fitting.
24. Carefully lower the whole inlet assembly (20) onto position, making sure that the polytube is nicely routed for retraction and not kinked.
25. Use the long T-Handle 5mm hex driver and fasten the hard to access bolt until it seats, then apply Loctite to a second M6 bolt and fasten into the hole next to the solenoid stem. Fasten both fasteners (9) so the inlet adaptor is fully seated.
26. Apply Loctite to the remaining fasteners (9) and use the 45-degree long needle nose pliers to deposit each bolt into their respective holes. Use the torque wrench, the 5” long 5mm hex bit, and the ¼” drive to 3/8” drive adaptor and torque all seven bolts to 10 N-m (90 in-lbs) and repeat a second time on the first two bolts of the pattern.
27. Reinstall the safety filter (5) in the bottom of the air filter housing.
28. Reinstall solenoid coil (6), metal bracket, and retaining bolt onto solenoid stem (10). Use the small torque wrench with the 4mm hex bit and the ¼” drive to 3/8” drive adaptor to torque the solenoid retaining bolt to 5.6 N-m (50 in-lbs).
29. Twist the filter minder (7) to line up the connector housing with the solenoid (6) and reconnect it to the harness.

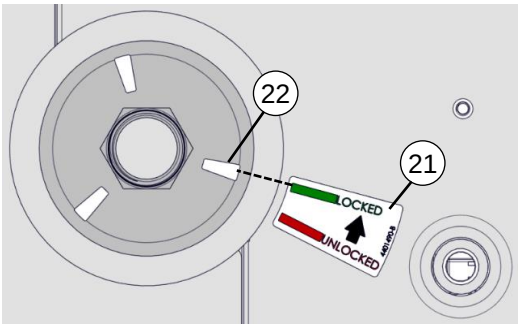


30. Install the new air filter element (4) and filter housing top (3) and ensure it is in the locked position, if the air filter housing top got oily or dirty, properly clean before moving to the next step. Ensure the housing top has the orange torque paint mark on the fitting as shown in the image below.

31. With a marker pen, mark the filter housing top in line where the hose fitting should be clocked, it is important that this be done in a way that will not let the filter want to naturally twist towards the “unlocked” position due to the hose curvature. It is recommended to slightly overclock the fitting a few extra degrees clockwise, this way the hose will want to naturally pull the air filter top in the “locked” position. Keep this in mind when placing the clocking mark on the filter top (3).

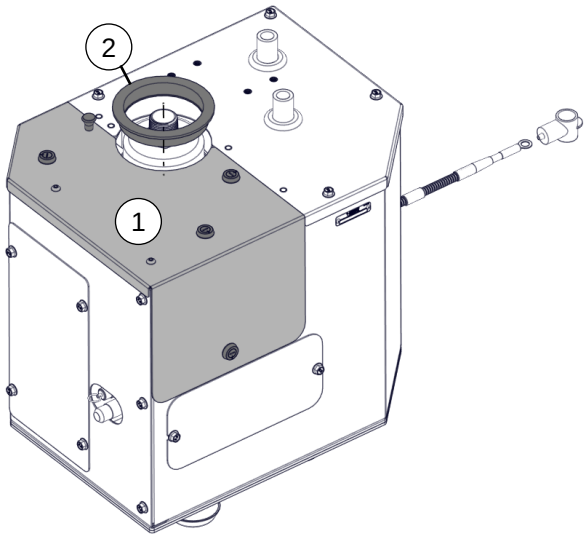


32. Install the decal alignment tool onto the air filter housing top fitting, peel off the decal (22) backing, align one of the 3 marks with the green “locked” position (21) and apply the decal. Rub each mark to ensure they stick properly before removing the decal front paper.



33. Unlock the new air filter housing top (3). Grab the new filter housing top and the old filter housing top with fittings, the 1-3/8” wrench, Loctite 567, and head over to a vice.
34. Using the vice, clamp down on the 90-degree fitting in a way that the hose barb fitting is pointing upwards. Make sure there is enough clearance between the vice jaws and the air filter top fitting to fit the 1-3/8” wrench. Using the wrench, undo the old filter top from the fitting.
35. Apply a bead of Loctite 567 on the new filter top NPT fitting and fasten it to the fitting still in the vice by hand as much as possible, then use the wrench to torque it down and clock your mark from step 33 with the hose barb fitting.
36. Head back under the compressor and complete steps 44 and 45 in under the bus instructions for finishing off the polytube and sticker installation.
37. Head back over to the compressor inside the bus, make sure the silicon flange (2) is still hanging on the hose or place it on the hose, and insert the hose barb fitting into the air intake hose, make sure that the hose butts up against the fitting flange.
38. With the safety filter (5) and air filter element (4) in place in the air filter bottom housing, place the housing top and twist it in the “locked” position.
39. Using the torque wrench and the 8mm socket, tighten the air intake hose clamp onto the hose and fitting to 9 N-m (80 in-lbs). Put a bead of yellow tamper-proof indicator paste across the hose clamp body and tightening screw.

40. Reinstall the service panel (1), lock all 4 latches, place the silicon flange (2) back around the air filter housing top (3).



41. Take a picture of the compressor serial number tag, this can also be done from underneath the bus, place the floor latch back into position and lock all 4 laches with the square key.

42. Fill in the required information on the retrofit registration form.

43. To wrap up the job, take the old inlet cover to the vice, remove the air filter housing bottom, assemble the old filter housing with the old air filter element and place in the kit bag with all the other leftover parts to be returned to VMAC.

44. Remove all tools and debris from work area to return bus to service condition.

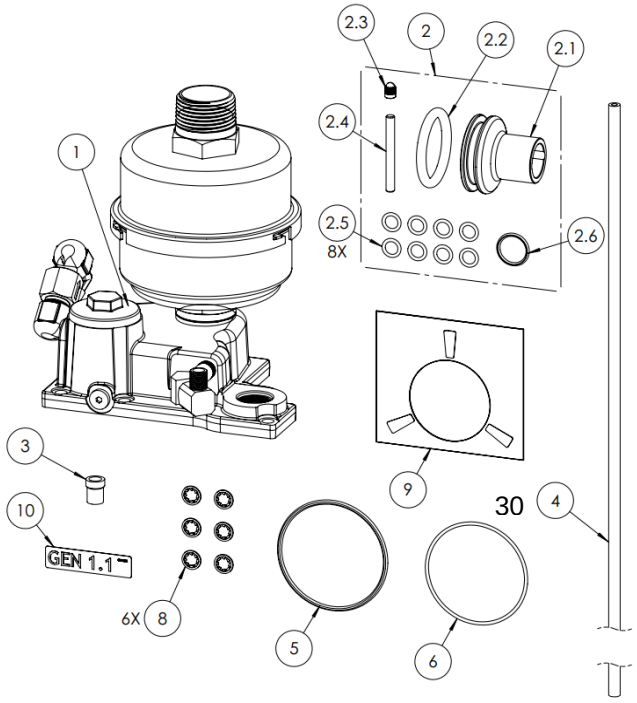
45. Remove the lock out tag and turn the Hight Voltage Interlock Switch to the “ON” position.

46. Turn the main battery disconnect switch to the “ON” position. Start the bus and allow the air system to pressurize while looking for and listening for air leaks. Repair leaks as necessary.

47. Obtain applicable PLC program update from RPSM and load on bus.

6. IPL - Gen 1.1 Retrofit Pkg | A710084

Item #	Part #	Qty	Description
1	A710085	1	PKG, RETROFIT, INLET ADAPTOR, HVEV
2	A710082	1	PKG, RETROFIT, INLET VALVE, HVEV
2.1	9100272	1	POPPET, INLET VALVE, HVEV, RFIT MOD
2.2	5830130	1	O-RING, VITON, 1 5/16 ID X 3/16
2.3	3600239	1	PLUG, SEALING, EXPANDER, 6MM, PL
2.4	1500785	1	DOWEL, PIN, 3/16 X 1-3/4, SS
2.5	5830040	8	O-RING, VITON, 5/16 ID X 1/16
2.6	5830072	1	O-RING, VITON, 5/8 ID X 1/16
3	5800211	1	GROMMET, ONE-WAY, FLEX PVC, .28ID
4	1700570	30 IN	TUBE, TEFLON, PTFE,1/4"OD
5	5830002	1	O-RING, VITON, 2 3/8 ID X 3/32
6	5830189	1	O-RING, VITON, 2 1/4 ID X 1/16
7	2900130	1	PARAMETERS, ICPU MOTOR, EC20, BUS
8	1570532	6	WASHER, INT SERR LOCK, M6, SS
9	4401491	1	DECAL, EC20, AIR FILTER CAP
10	4401509	1	LABEL, RETROFIT TAG, HV20, 1.1



LABOUR ESTIMATE				
	Operation	Number of Technician(s)	Hours	Labor Time T X HR
1	Perform VMAC Air Compressor GEN 1.1 Field Retrofit	2	1.5	3.0

PARTS REQUIRED					
Item	Part Number	Description	Qty. per Coach	Units	Notes
1	N/A	See Section 6 - IPL – VMAC Gen 1.1 Retrofit Pkg A710084	1	EA	