

SMOKEYS**CLN NGV Tech****3526 NE 109th Ave****Portland, OR 97220****Price list, CNG (compressed natural gas) equipment****FUELMAKER, vehicle refueling appliances**

Part Number	Description	Quantity	M/SLP Price	M/SLP Total
FMQ-2	Vehicle Refueling Appliance 3000psi	1	\$8,169	\$8,169
50.108	Single Breakaway Outlet Assembly	1	\$360	\$360
50.118	Lock Assembly	1	\$65	\$65
H4.5F	Fill Hose 15' (Dual hose breakaway requires 2 hoses & 2 Nozzles)	1	\$220	\$220
P30	Fill Nozzle (Dual hose breakaway requires 2 hoses & 2 Nozzles)	1	\$251	\$251
	Total			\$9,065
FMQ-2	Vehicle Refueling Appliance 3000psi	1	\$8,169	\$8,169
50.11	Dual Breakaway Outlet Assembly	1	\$555	\$555
50.118	Lock Assembly	1	\$65	\$65
H4.5F	Fill Hose 15' (Dual hose breakaway requires 2 hoses & 2 Nozzles)	2	\$220	\$440
P30	Fill Nozzle (Dual hose breakaway requires 2 hoses & 2 Nozzles)	2	\$251	\$502
	Total			\$9,731
FMQ-2-36	Vehicle Refueling Appliance 3600psi	1	\$8,778	\$8,778
50.114	Single Breakaway Outlet Assembly	1	\$415	\$415
50.118	Lock Assembly	1	\$65	\$65
H4.5F-36	Fill Hose 15' (Dual hose breakaway requires 2 hoses & 2 Nozzles)	1	\$230	\$230
P36	Fill Nozzle (Dual hose breakaway requires 2 hoses & 2 Nozzles)	1	\$393	\$393
	Total			\$9,881
FMQ-2-36	Vehicle Refueling Appliance 3600psi	1	\$8,778	\$8,778
50.116	Dual Breakaway Outlet Assembly	1	\$653	\$653
50.118	Lock Assembly	1	\$65	\$65
H3F-36	Fill Hose 10' (Dual hose breakaway requires 2 hoses & 2 Nozzles)	2	\$200	\$400
P36	Fill Nozzle (Dual hose breakaway requires 2 hoses & 2 Nozzles)	2	\$393	\$786
	Total			\$10,682

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VEHICLE REFUELING APPLIANCE

MODEL FMQ-2/FMQ-2.5/FMQ-2-36

3 INSTALLATION INSTRUCTIONS

3.1 GENERAL

Inspect the unit for shipping damage; report any to your distributor immediately. Please do not return product to the manufacturer without prior authorization.

Verify that the nameplate ratings of the FuelMaker are compatible with the electrical and gas supplies available. In Canada, the FuelMaker must be installed in accordance with CAN/CGA-B149.1 Natural Gas Installation Code, CSA-B108 Natural Gas Fuelling Stations Installation Code, CSA-C22.1 Canadian Electrical Code-Part 1 and with the requirements of the authorities having jurisdiction. In the United States, the FuelMaker shall be installed in accordance with NFPA 52 CNG Vehicular Fuel Systems, NFPA 54 National Fuel Gas Code, NFPA 70 National Electrical Code and the requirements of the authorities having jurisdiction.

Do not install the FuelMaker under or near a window or directly under potential gas accumulating overhangs. Local codes and regulations take precedence over any recommendations contained in these instructions.

Particular attention should be paid to codes dealing with fuel storage, vehicle refueling, and permissible sound levels

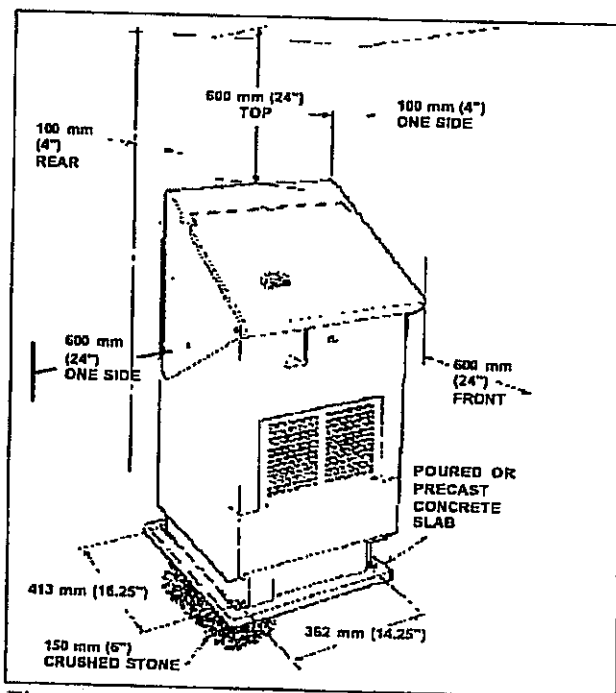


Figure 1 Service Clearances and Mounting Dimensions

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at the property line.

The Installer shall instruct the User in the proper operation of the FuelMaker and any approved ancillary devices. Before leaving the site, the Installer shall complete Table 7 on Page 13 in the Owner Instructions manual and shall leave the Owner Instructions manual, and any ancillary device manuals, with the User.

3.2 LOCATION OF THE FUELMAKER

Positioning of Base

- ① The FuelMaker must be installed outdoors only in accordance with the requirements of the authorities having jurisdiction.

- ② The FuelMaker must be mounted on a firm, level, non-combustible base. Where ground is not level a poured or precast concrete slab placed on a suitably prepared base (e.g. crushed stone, 150 mm (6") deep) is acceptable. Ensure that the servicing clearances stated on the nameplate are maintained, (See Figure 1). Avoid areas where damage from excessive ice build-up may occur such as building overhangs or where vegetation, snow or debris may clog the cooling air inlet/outlet.

Vehicle Refueling Point

The VRA is supplied with a coiled high pressure hose to deliver fuel to the vehicle. Single hose lengths from 2 m (7 ft.) to 7.5 m (25 ft.) are available. Dual hoses are restricted to a combined length of 9 m (30 ft) for FMQ-2/FMQ-2.5 VRAs and 6 m (20 ft) for FMQ-2-36 VRAs. The VRA contains a temperature sensor to determine the allowable fill pressure for any ambient temperature. The VRA must be installed in the vicinity of the cylinders to be refueled. The VRA should not be situated where the vehicle fill hose or outlet tubing must cross a walkway or access route.

- ③ Electrical and Gas Supply

FuelMaker FMQ-2, FMQ-2.5 and FMQ-2-36 VRAs require a dedicated 240 Volt, 15Amp, Single Phase, 60 Hertz electrical supply.

Lower input voltage to the FuelMaker can cause the unit to overheat and shut off during warm weather - see *Field Wiring* section in this manual.



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The VRA should only be installed in distribution areas of relatively dry gas, typically not more than 110 mg/m³ (7 lbs per million cubic feet) of water vapour. The pressure supplied to the VRA must not exceed the rated supply pressure. Higher pressure will cause damage to the VRA.

Pressure Start System (Optional)

All VRAs equipped with the Pressure Start option will automatically restart and fill the storage or manifold line. All VRAs are equipped with automatic temperature compensation and will shut down at a maximum pressure determined by the ambient temperature sensed at the VRA (see Table 3). When connected to a storage system or manifold line the Pressure Start System continuously monitors the line pressure and turns the VRAs on when the line pressure drops below a pre-determined level. The *Electronics Module* must have software version 64Q22B.

Sound Levels

The VRA is designed to ensure a sound pressure level of less than 49 dBA (hemispherical field) at a distance of 5 m (16.5 ft). Some local codes restrict the sound level at a property line. Units should not be located where direct or reflected noise is aimed at neighbouring windows or other building opening. Avoid locating the unit near a sound reflecting surface or between buildings which are close together.

A noise reduction package is available (model FMQ-2 only) as a factory option which ensures a sound pressure level of less than 45 dBA hemispherical field. Contact FuelMaker for details.

④ Protection from Vehicle Impact

Position the VRA in a location where it will not become damaged from possible vehicle impact. If the FuelMaker must be located close to a driveway, provision must be made to protect the unit from damage.

Typically, 4" diameter steel posts embedded at least 1 m (3 ft.) in the ground, with at least 1 m (3 ft.) extending above-ground, and filled with concrete are suitable. Heavy squared timbers or wheel stops may also be used. In any case, the local gas distribution utility should be consulted to determine what practice is locally accepted by the authority having jurisdiction.

3.3 INSTALLATION OF THE FUELMAKER

Mounting to Base

- ⑤ Prepare the base as explained in Section 3.2. Lag Bolts (3/8 inch) and anchors must be used to secure the FuelMaker feet to the base; the locations of the mounting bolt holes in the FuelMaker base are indicated in Figure 1.

It is very important to bolt the FuelMaker to the base as the FuelMaker must resist the force applied to it in the event of a break-away (e.g. vehicle driven away with the fill hose still attached).

Gas Piping - Inlet side

- ⑥ The gas supply is connected to the FuelMaker via a 1/2" NPT nipple provided (See Figure 2). A coupling and transition fittings need to be field-supplied in order to adapt to the supply piping system. Where the supply piping is fixed to a wall, a flex connector may be required to prevent noise transmission into the building.

It is important to clean any contaminants such as cutting oil, rust, and metal shavings out of the interior of the gas inlet piping. Pipe dope and other sealing compounds must not enter the piping.

- ⑦ On low-pressure gas systems in the range of 1.7 kPa (7" w.c.), the VRA must be connected using 1" (minimum) pipe unless the pipe run is less than 3 m (10 ft.); in that case, 3/4" piping can be used. In order to prevent operation with excessively low pressures at the gas inlet to the FuelMaker (e.g. as a result of a partially closed shut-off valve), the FuelMaker has been equipped with a low-pressure switch factory-set to 1.3 kPa (5.2" w.c.).

The FuelMaker may shut down due to low inlet pressure when other gas loads (e.g. furnace, water heater, etc.) draw from the gas supply system. The utility regulator set provided by the local gas utility must have an orifice/spring/setting appropriate for the maximum gas load that the system will experience. In Canada, the installer shall ensure that the compressor and integral low-pressure cut-off switch operates so as to prevent a piping system pressure loss in excess of that specified in CAN/CGA-B149.1 Natural Gas Installation Code.



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MODEL FMQ-2/FMQ-2.5/FMQ-2-36

It is strongly recommended that the VRA be started while simultaneously operating all major gas appliances on the User's system in order to verify the regulator setting. If the FuelMaker shuts down from low inlet pressure, the gas regulator should be reset or resized.

Gas Piping - Outlet

The VRA is available with one or two fibre-reinforced high pressure fill hose. The fill hose is connected to the VRA via a break-away fitting which allows the hose to be pulled free from the VRA without damage should the user drive the vehicle away without disconnecting. The break-away force is approximately 150 N (34 lbs.) and is independent of the pressure contained in the fill hose.

The VRA can be connected to a Remote Fueling Panel, Auxillary Fueling Panel or Fast Fill Storage System. The VRA can also be manifolded to other VRAs via manifold adaptor assemblies and tubing. For slow fill applications the FuelMaker must be used with

a refueling nozzle that is AGA/CGA NGV1 Type 3 approved. The nozzle must seal reliably throughout the temperature range and conditions anticipated for the location. An integral normally-closed poppet valve in the nozzle is absolutely essential as it must maintain a positive pressure in the FuelMaker's Blow-down System at all times; air must not migrate up the fill hose and into the *Blow-Down Vessel* during standby.

The use of the Canadian Gas Association (CGA) Certification Seal is contingent upon the use of a refueling nozzle that is CGA NGV1 Type 3 approved for use with a Vehicle Refueling Appliance. Therefore, installations requiring the CGA certification to be in force must be equipped with a CGA NGV1 Type 3 approved nozzle.

FuelMaker Corporation has done, and continues to perform, extensive testing on fueling nozzles. Please contact FuelMaker for recommendations.

The fill hose incorporates a fitting and a seal to connect the refueling nozzle. Various adapters are available from FuelMaker Corporation to facilitate the attachment of vari-

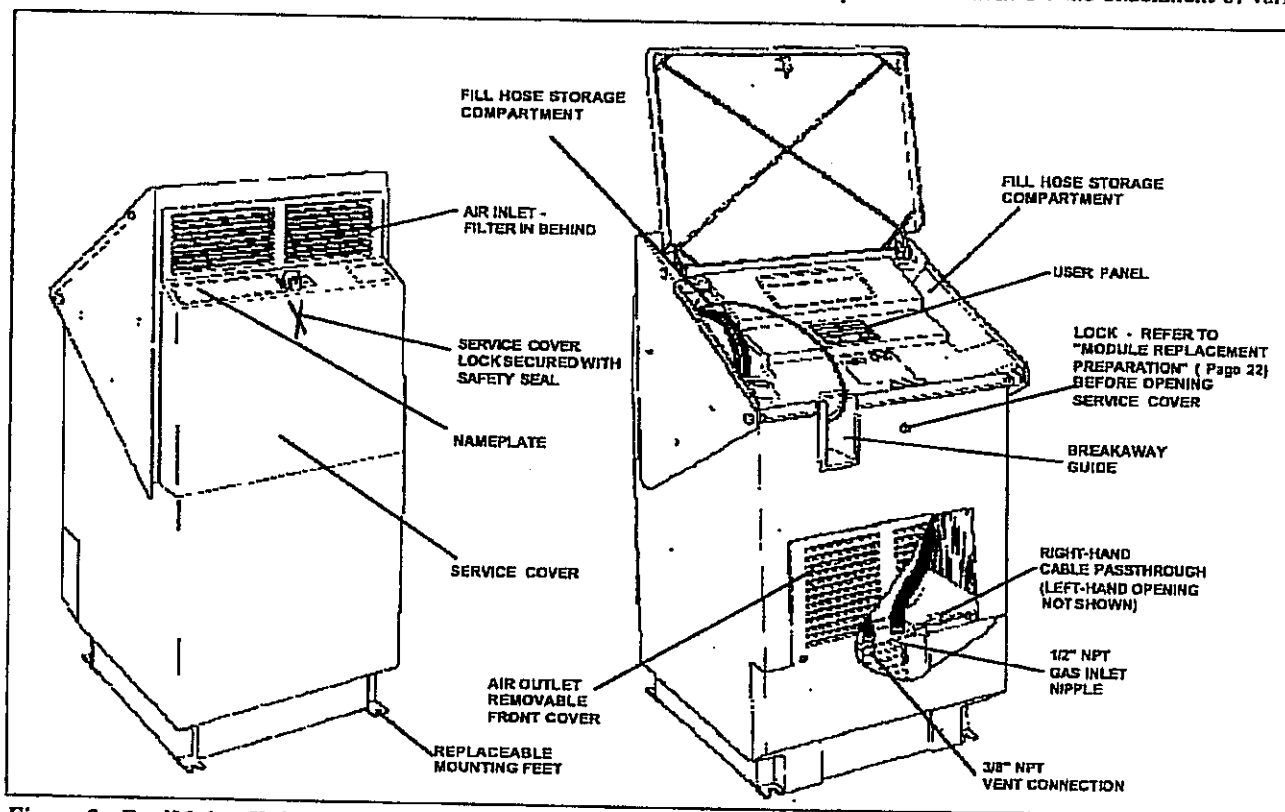


Figure 2 FuelMaker Unit



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MODEL FMQ-2/FMQ-2.5/FMQ-2-36

Gas Piping - Outlet (cont'd)

ous nozzles, including angular or straight take-offs. The fill hose is coiled to allow storage within one of the side pockets of the VRA.

IMPORTANT

The break-away in the FMQ-2-36 will not engage the hose designed for the FMQ-2/ FMQ-2.5 or vice versa. Please ensure proper hose is used on the VRA. Attempt to use an incorrect hose on the VRA may result in serious injury.

At the completion of each refueling cycle the high pressure gas contained downstream of the compressor is returned to a *Blow-Down Vessel* (See Figure 4) thus reducing the pressure in the fill hose to approximately 2 bar g (29 psig). "Blow-down" allows the nozzle to be disconnected from the vehicle.

The FuelMaker Blow-down System has been designed to accommodate the volume of gas contained by the fill hose, refueling nozzle, and the space between the vehicle receptacle and check valve only. Therefore, the allowable maximum length of fill hose has been limited to a combined

length of 6 m (20 ft.) for FMQ-2-36 and 9 m (30 ft) for FMQ-2 and FMQ-2.5. Refueling nozzles used with the VRA shall not have an internal volume exceeding 5 cc (0.3 in³) per nozzle. When connecting a VRA to a Remote Panel or Auxiliary Fueling Panel, refer to the Installation and Operating instructions for that product regarding maximum allowable tubing and hose lengths. When connecting the VRA to a Fast Fill Storage System, a check valve must be installed between the VRA and the Fast Fill Storage System. When using 1/8" tubing, the check valve must be no more than 27m (85 ft.) from the VRA. When using 1/4" tubing, the check valve must be no more than 6m (20 ft.) from VRA. When manifolding VRAs, a check valve must be installed in the branch line to each VRA. Contact FuelMaker for information regarding accessories available to connect VRAs to the above noted products.

Do not connect additional devices or hose lengths to the delivery side of the VRA. To do so will over-pressurize the Blow-down System and cause the pressure relief valve to open, venting Natural Gas to the atmosphere. Contact the local authority having jurisdiction for requirements pertaining to manifolding VRAs or connecting VRAs to ground Storage.

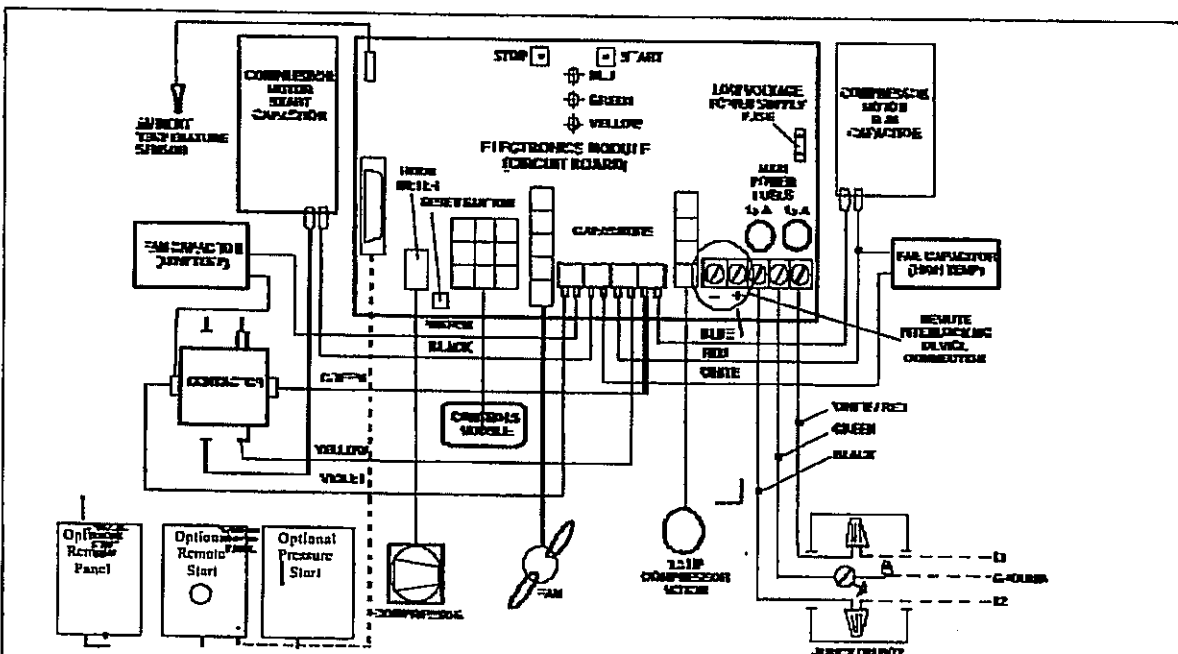


Figure 3 Schematic Diagram of Electronics Module



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Vent Connection

The 3/8" NPT vent connection (See Figure 2) is protected from blockage by ice or insects by the supplied screen fitting. The Vent discharges any gas released by the pressure relief valve in order to protect the Blow-down System from over-pressurization. If the VRA must be installed near building openings, a 10 mm (3/8") minimum inside diameter steel vent line should be connected to the 3/8" NPT Vent Connection and routed to a safe place of discharge as required by the local codes. The maximum allowable vent line length is limited to 5 m (17 ft.) when using 3/8" vent to protect the low pressure switch from over-pressurization. Refer to the applicable gas code for appropriate pipe size if vent line must extend beyond 5m (17 ft.). Be sure to transfer the screen fitting to the end of the remote vent line (if applicable) to protect it from blockage.

It is extremely important to terminate the remote vent line in such a way that water cannot enter the vent line and freeze. Do not allow ice to build up at the open vent connection or the remote vent line termination. The vent line must remain clear if it is to be able to vent gas and protect the Blow-down System from over-pressurization.

Field Wiring

The VRA has been wired at the factory and is ready for connection to the electrical service. The junction box can be accessed by opening the *service cover* of the VRA (See Figure 4). Three No. 16 gauge wires have been provided; Line 1, Line 2, and a grounding conductor. The connections can be made with any approved wire splicing devices such as wire nuts. The junction box incorporates 7/8" knock-outs to accept various wiring methods (e.g. armoured liquid-flex, BX, portable cable with strain relief, etc.). The cable/conduit is passed through one of the two cable passthrough openings located on either side of the piping bulkhead (the left-hand passthrough opening is most convenient) and then routed up to the junction box.

The electrical wiring must comply with the latest revision of the Canadian Electrical Code Part I in Canada, or the National Electrical Code NEC in the United States and the requirements of the authority having jurisdiction. Each branch circuit feeding the VRA should be protected from overcurrent by a separate 2-pole circuit breaker, or time delay fuse disconnect. In addition to the overcurrent protection device, an emergency disconnect should be located within sight and within 30 feet of the VRA. If allowed by

local codes, a manually operated general purpose AC switch rated at 15A 240 VAC housed in a suitable enclosure, may be used as the emergency disconnect.

Low-voltage wiring is required when connecting an interlocking (remote shutdown) device such as a *natural gas detector*. The low-voltage wiring can be routed into the VRAR adjacent to electrical supply cable or conduit, and connected to the terminal strip on the electronics board as shown in Figure 3 (do not run low-voltage wiring and electrical supply wiring within the same conduit). The interlocking device should be selected to provide a 12 VDC Normally-On signal. Once the interlocking device has been installed, the VRA, must be programmed to acknowledge the presence of the device.

Field Programming

A programming device is available from FuelMaker Corporation to allow the installer or service personnel to change the following parameters in the field:

- recognition of remote panel connected
- maximum tank volume, 140 or 280 litres (37 or 74 US gal.)
- recognition of remote shutdown device (eg. Natural Gas Detector) connected
- pressure rise monitoring ON/OFF

Upon receipt of a new VRA, the parameters have been factory-set to: *Remote Panel* not connected (OFF), 280 litres, and pressure rise monitoring ON. The programming device is connected to the *Electronics Module* via the programming device connection located underneath the *Electronics Module* (See Figure 4). Follow the instructions included with the programming device.

IMPORTANT

After the changing of any of the settings, the unit must be powered down at the main electrical switch (NOT the STOP button only) for 1 minute and turned on again. If this procedure is not followed, the settings may not change.

The VRA monitors the pressure rise at the fill hose during refueling in order to check for possible leaks. A leak is presumed if the pressure does not rise at a sufficient rate. Since the rate of pressure rise depends on the volume of the vehicle cylinder(s), some adjustment must be made to ac-