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Parker Hannifin in no way is responsible for compliance of emission laws applicable to a CNG vehicle in the country of operation. It is the responsibility of the OEM or the vehicle upfit/modifying party to ensure proper compliance to the regulations.

Disclaimer

Parker Hannifin, Veriflo Division is the supplier for the FM80 product. Due to the wide variety of operating conditions and applications for CNG products, Parker and its distributors do not represent or warrant that any particular Veriflo product is suitable for any specific end use system using CNG. This guide does not analyze all technical parameters that must be considered in selecting a CNG regulation product but provides a comprehensive set of instructions for installation and operation of the FM80.

User Responsibility

The customer and/or user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the appropriate version of this product.
- Assuring that all user’s performance, endurance, maintenance, safety, and warning requirements are met and that the any health or safety risks presented by the application are controlled appropriately.
- Complying with all existing warning labels and/or providing all appropriate health and safety warnings on the equipment on which the Veriflo products are used.
- Assuring compliance with all applicable government and industry standards.
1. Definitions

1.1 Signal Words

Definition of signal words used in this guide:

<table>
<thead>
<tr>
<th>Signal Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANGER</td>
<td><strong>DANGER</strong> indicates a hazardous situation which, if not avoided, will result in death or serious injury.</td>
</tr>
<tr>
<td>WARNING</td>
<td><strong>WARNING</strong> indicates a hazardous situation which, if not avoided, could result in death or serious injury.</td>
</tr>
<tr>
<td>CAUTION</td>
<td><strong>CAUTION</strong> used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</td>
</tr>
<tr>
<td>NOTICE</td>
<td><strong>NOTICE</strong> addresses practices not related to personal injury.</td>
</tr>
</tbody>
</table>

1.2 Abbreviations and Acronyms

Table 1 is a list of abbreviations and acronyms used in this manual.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>CDA</td>
<td>Controllable Drive Actuator</td>
<td>NFPA</td>
<td>National Fire Protection Association</td>
</tr>
<tr>
<td>CNG</td>
<td>Compressed Natural Gas</td>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
</tr>
<tr>
<td>DOT</td>
<td>Department of Transportation</td>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
</tr>
<tr>
<td>ECE</td>
<td>Economic Commission of Europe</td>
<td>PPE</td>
<td>Personal Protection Equipment</td>
</tr>
<tr>
<td>FM80</td>
<td>Fuel Regulation Module</td>
<td>PRV</td>
<td>Pressure Relief Valve</td>
</tr>
<tr>
<td>POS</td>
<td>Point of Sale</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Abbreviations and Acronyms
2. Safety Information

2.1. General Safety Information

- Inspect the product for any signs of damage before installation. DO NOT use any product that displays any signs of visible damage.
- Read all sections of this document before installing the Fuel Regulation Module (FM80).
- Only competent personnel who are trained and qualified may install, maintain, and repair the FM80.
- The FM80 has been tested and certified for safe and reliable service in natural gas vehicles. There are significant potential hazards associated with compressed natural gas (CNG) which the user and/or installer must be aware of when using this product.
- Install the FM80 in accordance with National Fire Protection Association (NFPA) 52, CAN/CGA-B149.4, and other codes and standards applicable to installation and service.
- CNG can cause damage and/or injury due to high pressure, flammability, and extreme cold during expansion. Employ suitable safeguards during installation, commissioning, and service to prevent harm to personnel and property.
- If a CNG-fueled vehicle is involved in an accident, a certified CNG fuel system inspector must inspect all components of the CNG system before operating the vehicle.
- Installation, operation, removal, and servicing of these products must be performed by knowledgeable personnel who are trained on CNG fuel systems and natural gas vehicles and are trained to handle, use and service the CNG systems equipped natural gas vehicles.

2.2. Maintenance Safety Precautions

Observe the following safety requirements during install, maintenance, and repair of the Fuel Regulator Module:

- Do not allow any open flames or equipment that may cause a spark or open flame into the installation area when CNG may be present.
- Provide an open space for the natural gas to disperse in the installation area.
- Wear personal protection equipment (PPE) appropriate for the task and environment.
- Locate a fire extinguisher appropriate for CNG so that it is accessible by installation personnel.
2.3. Important Installation and Operating Safety Considerations

- A CNG vehicle fuel system must be designed as per the prevailing laws of the country of use – for example for USA please follow NFPA 52, ASI/NGV3.1. For Europe, please consult International Organization of Standardization (ISO) 15500 and United Nations Economic Commission for Europe (UNECE) R110.
- The installer must identify the product inlet and outlet ports by the markings on the product and corresponding documentation to ensure a proper connection to the system. Do not use any product with unclear or missing inlet high pressure and outlet low pressure port markings.
- Do not use a product or operate a system if there is evidence of contamination at the ports (e.g. debris, particles, oils, lubricants, grease).
- Do not interchange products, components, and accessories with those that were used in other types of gas service. This may affect the performance of the FM80.
- Do not operate the FM80 without a proper inlet filter either incorporated as a part of the FM80 or installed upstream. Poor gas quality or debris in the gas may affect FM80 performance and operating life.
- Before installation, service, or repair, follow Lockout/Tagout procedures for the system and equipment. Follow all government, state and local safety and servicing practices.
- Mount the Fuel Regulation Module as described in this guide.

⚠️ WARNING ⚠️

- Fire or explosion causing injury or death may occur if fuel vapors are present when working with electricity.
- Make sure that no vapors are present before proceeding with electrical work. Follow Lockout/Tagout procedure - Occupational Safety and Health Administration (OSHA) Standard for Control of Hazardous Energy - Lockout/Tagout or equivalent local procedure.

These instructions are available by calling 1-800-CPARKER, or at www.parker.com
2.4. Local, State, and Federal Code and Regulation Information

Understand and follow the codes, standards, and regulations of the NFPA, National Electrical Code or Canadian Electrical Code, Department of Transportation (DOT) or equivalent agencies or authorities.

All elements of the Parker FM80 must be installed in accordance with these instructions and in compliance with local and regional automotive codes pertaining to alternative fuels and CNG vehicles.

These requirements might include references to the codes, standards and regulations in Table 2.

<table>
<thead>
<tr>
<th>Document</th>
<th>Applicability</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFPA 52 - Compressed Natural Gas Vehicular Fuel System Code - 2013</td>
<td>CNG vehicles (including marine) and fueling facilities</td>
<td>Widely recognized source of guidance for CNG vehicles and fueling facilities in the United States</td>
</tr>
<tr>
<td>SAE J1616 - Recommended Practice for Compressed Natural Gas Vehicle Fuel - 1994</td>
<td>CNG vehicles (including marine) and fueling facilities</td>
<td>Recommendations on vehicular fuel composition</td>
</tr>
<tr>
<td>SAE J2406 - Recommended Practices for CNG Powered Medium and Heavy Duty Trucks - 2002</td>
<td>CNG medium and heavy duty trucks</td>
<td>Primarily medium and heavy duty trucks recommendations but some maintenance facility equipment and procedures</td>
</tr>
<tr>
<td>Design Guidelines for Bus Transit Systems Using Compressed Natural Gas as an Alternative Fuel (6/96)</td>
<td>Transit Facilities but useful reference for other fleets</td>
<td>Federal Transit Administration Report - Not only references required codes (e.g., NFPA) but also suggests additional precautions and provides general information</td>
</tr>
<tr>
<td>Uniform Fire Code - 2015</td>
<td>The most widely adopted model building code in the United States</td>
<td>May be the fire code used in your area. Check with local fire marshal</td>
</tr>
<tr>
<td>International Fire Code - 2015</td>
<td>Fire code</td>
<td>Check with local fire marshal on applicability</td>
</tr>
<tr>
<td>ANSI NGV3.1 – 2014 - Fuel System Components for Natural Gas Powered Vehicles</td>
<td>Fuel system components for NGVs (excludes liquid natural gas components upstream of vaporizer)</td>
<td>Primarily for converted vehicles</td>
</tr>
<tr>
<td>49 CFR 571.303, FMVSS 303 - Fuel System Integrity of Compressed Natural Gas Vehicles</td>
<td>CNG vehicles ≤ 10,000 lbs. gross vehicle weight rating and school buses</td>
<td>DOT Federal Motor Vehicle Safety Standard for crash test of light duty vehicle and school bus CNG fuel systems</td>
</tr>
<tr>
<td>49 CFR 393.65, FMCSR - All Fuel Systems</td>
<td>Commercial vehicles in interstate commerce</td>
<td>DOT Federal Motor Carrier Safety Regulations</td>
</tr>
<tr>
<td>Electrical Code</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 2: Standard, Codes, and Regulations
Where local requirements do not include CNG considerations, Parker recommends using the codes listed in Table 2 for guidance. These codes are comprehensive, detailed, and often require interpretation to cover unusual situations. Consult the associated handbooks when applicable. Handbooks are available from the agency responsible for the code.

The FM80 can be installed at different locations in a vehicle. Codes, standards, and regulations directly applicable to the Fuel Regulation Module may be considered during installation of the FM80.

Parker strongly recommends engaging a qualified engineer or contractor familiar with local regulations and practices before starting installation.

Information and codes are available from the following sources:

**Association for Composite Tanks**
108 North State Street
Suite 720
Chicago, IL 60602
(301) 355-1307 (for information requests)

**American Petroleum Institute**
1220 L Street, N.W.
Washington, DC 20005
(202) 682-8000

**Canadian Standards Association (CSA)**
178 Rexdale Blvd.
Toronto, ON
Canada M9W 1R3
Tel: 416 747 4000
Toll-Free: (800) 463 6727

**Canadian Standards Association - Ohio**
8501 East Pleasant Valley Road
Independence, OH 44133-5516
Tel: 216 524 4990
Toll-Free: (877) 235 9791

**Fiberglass Tank and Pipe Institute**
14323 Heatherfield
Houston, TX 77079-7407
info@fiberglasstankandpipe.com

**National Association of Corrosion Engineers**
15835 Park Ten Place
Houston, TX 77084
(281) 228-6200

**National Fire Protection Association**
One Batterymarch Park
Quincy, MA 02269-9101
(617) 770-3000

**National Leak Prevention Association**
685 Fields Ertel Road
Cincinnati, OH 45241
(815) 301-2785

**US Department of Energy**
Alternative Fuels Data Center
1-800-254-6735.
technicalresponse@afci.com

**Petroleum Equipment Institute Box 2380**
Tulsa, OK 74101
(918) 494-9696

**Steel Tank Institute**
944 Donata Ct.
Lake Zurich, IL 60047
(847) 438-8265

**Underwriters Laboratories Inc.**
333 Pfingsten Road
Northbrook, IL 60062
(847) 272-8800
2.5. Fuel System Design Responsibility

The original equipment manufacturer (OEM) or vehicle integrator that fits the system with the CNG system is ultimately responsible for ensuring that the FM80 is properly installed and functioning before the end user receives the vehicle. The OEM, integrator, or selling dealer is ultimately responsible for educating the end user and helping them understand and develop a maintenance program to ensure safe proper functioning through the life of the product.

It is recommended to design the overall system fail safe. This product can and does fail without warning for many reasons. Design all systems and equipment in a fail safe mode so that failure of Parker FM80 will not endanger persons or property.

The user, through analysis and testing, is solely responsible for:

- Making the final selection of the appropriate version of this product.
- Assuring that all user’s performance, endurance, maintenance, safety, and warning requirements are met and that the application presents no health or safety hazards.
- Complying with all existing warning labels and/or providing all appropriate health and safety warnings on the equipment on which the Veriflo products are used.
- Assuring compliance with all applicable government and industry standards.

2.6. Distribution

Provide a copy of this document to each person that is responsible for selection, installation, or use of this product. Do not select or use this product without thoroughly reading and understanding this document as well as other FM80 publications such as Technical Bulletins, Drawings, and Product Specification catalogs.
2.7. Safety Devices

The FM80 has an integrated, factory installed pressure relief valve (PRV) included in every unit. The integrated PRV is designed to relieve excess pressure from the regulator should a minor leak occur in order to enable regulator operation and provide regulator protection. While the PRV does limit the maximum pressure downstream, it is not a high-flow device and may not protect your downstream fuel system components. Parker recommends the use of a high flow PRV device to protect the system downstream fuel system components.

2.8. User Warning Labels

As part of the fuel system and vehicle protection plan, consider using of a system of warning labels that clearly advises maintenance technicians of precautions. As a customer for the FM80 and the responsible party for the fuel system selection and design, the customer is responsible for ensuring the system has labels and instruction for the users and maintenance technicians.
Examples are:

- DO NOT DISABLE any automatic upstream isolation valves.
- CLOSE upstream isolation valves and bleed system pressure prior to servicing.
- BLEED system pressure prior to removal and servicing of this FM80.
3. Product Overview

This section is intended for people responsible for the design of the natural gas system which will include the FM80 fuel regulation module.

3.1. Application

The FM80 is a self-contained, pressure-reducing fuel regulation module designed and qualified for 3600 psig (250 barg) (P36) and 3000 psig (200 barg) CNG vehicle fuel systems. The function of the FM80 is to regulate natural gas from storage pressure to a lower outlet pressure for use in combustion reciprocating and turbine engines. It is optimized for use in medium to heavy-duty applications (5L to 12L engines) with a rated maximum flow rate of 176 lb/hr (80 kg/hr).

The FM80 is factory calibrated and is not field adjustable. It has a built in heat exchanger using the vehicle’s existing engine cooling system fluid to maintain a safe operating temperature of the FM80.

The FM80 is available with the following options:

- A high-pressure coalescing filter
- A high-pressure solenoid valve
- High/low pressure sensor(s)
- A selection of inlet and outlet fittings

3.2. FM80 Specifications and Construction Materials

Table 3 contains a list of the FM80 Specifications. Table 4 contains a list of Construction Materials.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Pressure</td>
<td>3600 psig (250 bar) or 3000 psig (200 bar)</td>
</tr>
</tbody>
</table>
| Outlet Pressure               | Factory Preset: 25-140 psig (1.72-9.65 bar)  
Device is factory preset at 250 psig (17.24 bar) inlet pressure and 2.2 lb/hr (1 kg/hr) methane.  |
| Working Pressure              | 150 psig (10.3 bar)  
Under normal operating conditions |
| Inlet Pressure                | 4250 psig maximum                                                           |
| Outlet Pressure Variation in Service | -20 psi to + 0 psi (-1.38 bar to +0 bar) from labeled setting throughout the range of operating inlet pressure, temperature, and gas flow. Refer to flow curves in the FM80 Technical Bulletin (Document Number 25000314) or contact factory for unit specific flow curves. |
| Boost Pressure Assist         | 1:1 Clean Dry Air to Compressed Natural Gas Ratio                           |
### Table 3: FM80 Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
</table>
| Engine Coolant        | Anti-Freeze Protection ≤ -40°F (-40°C)  
Coolant Temperature ≤ 248°F (120°C), no boiling  
Coolant shall be compatible with anodized aluminum |
| Temperature Range     | -40°F to 248°F (-40 °C to 120 °C)                                           |
| Solenoid              | • Normally closed, two stage  
• 12 or 24 VDC systems, 1.5 Amp max draw  
• 5A line fuse recommended Amp Superseal 1.5 |
| Connection Torques    | • Inlet (SAE-6): 30 ft-lb (40.7 Nm)  
• Outlet (SAE-8): 50 ft-lb (67.8 Nm)  
• Mounting Bolts: 15 ft-lb (20.3 Nm) |
| Flow Capacity         | Up to 176 lb/hr (80 kg/hr) of CNG (Flow varies by application – consult the factory for data) |
| PRV Opening           | 250 +/- 50 psig 17.2 (+/- 3.4 bar) (Standard, unless otherwise specified)       |
| PRV Type              | Reseetable                                                                    |
| Pressure Sensor (optional) | See Pressure Sensor Specification, Varies by Manufacturer                      |
| Certifications and Approvals | ANSI/NGV 3.1- Certified  
UNECE R110 - Approvals in Progress  
ISO 15500 - Approvals in Progress |

### Table 4: Construction Materials

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>6061-T6 Aluminum, Anodized</td>
</tr>
<tr>
<td>Bonnet</td>
<td>6061-T6 Aluminum, Anodized</td>
</tr>
<tr>
<td>Seals</td>
<td>Low Temp Parker FKM Compound (VG 109-90)</td>
</tr>
<tr>
<td>Valve Trim</td>
<td>Stainless Steel/PEEK™/VG109-90</td>
</tr>
<tr>
<td>Inlet and Outlet Gas Fittings</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Heat Exchanger Barb Fittings</td>
<td>Brass</td>
</tr>
<tr>
<td>Poppet</td>
<td>Stainless Steel</td>
</tr>
</tbody>
</table>

*Table 3: FM80 Specifications*

*Table 4: Construction Materials*
3.3. FM80 Flow Curves

Please refer to the FM80 Technical Bulletin (Veriflo Document Number 25000314) for flow curves. For flow curves specific to the unit purchased, please contact the factory.

3.4. FM80 Configurations

Figure 1, Figure 2, and Figure 3 show the FM80 without a coalescing filter and with a standard and large filter.

Figure 1: FM80 without Filter

Figure 2: FM80 with Standard Size 0.5 oz Filter Sump
3.4.1. FM80 Numbering and Options Key

The Parker FM80 part number includes information about the options ordered for each unit. The keys below describe those options.

The format of the part number is: `FM80-AAAA-BCCC-DEFG-HIJJ-KK` where:
FM80 indicates the Parker On-Board Fuel Regulation Module.

The **AAAA** block indicates:

<table>
<thead>
<tr>
<th>Place</th>
<th>Description</th>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAAA</td>
<td>Outlet Pressure</td>
<td>120P</td>
<td>120 PSIG outlet pressure set point</td>
</tr>
<tr>
<td></td>
<td></td>
<td>083B</td>
<td>8.3 BAR outlet pressure set point</td>
</tr>
<tr>
<td></td>
<td></td>
<td>###P</td>
<td>Customizable outlet pressure set point</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min: 25 PSIG (ex. 025P)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max: 140 PSIG (ex. 140P)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>###B</td>
<td>Customizable outlet pressure set point</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min: 1.7 BAR (ex. 017B)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max: 9.6 BAR (ex. 096B)</td>
</tr>
</tbody>
</table>

Note: Outlet pressures are set at 250 psi (17 bar) inlet pressure and 2.2 lb/hr (1 kg/hr) flow.
### The **BCCC** block indicates:

<table>
<thead>
<tr>
<th>Place</th>
<th>Description</th>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Pressure Relief Valve</td>
<td>A</td>
<td>272 PSIG ± 50 PSI (17.2 bar ± 3.4 bar), #4 SAE Female Outlet Connection</td>
</tr>
</tbody>
</table>

Note: If a Pressure Relief Valve is not desired, consult factory.

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>No Filter</td>
</tr>
<tr>
<td>A06</td>
<td>5 oz (150 mL) Sump Capacity, Filter Grade 06</td>
</tr>
<tr>
<td>A10</td>
<td>5 oz (150 mL) Sump Capacity, Filter Grade 10</td>
</tr>
<tr>
<td>B06</td>
<td>0.5 oz (15 mL) Sump Capacity, Filter Grade 06</td>
</tr>
<tr>
<td>B10</td>
<td>0.5 oz (15 mL) Sump Capacity, Filter Grade 10</td>
</tr>
<tr>
<td>C06</td>
<td>3 oz (89 mL) Sump Capacity, Filter Grade 06</td>
</tr>
<tr>
<td>C10</td>
<td>3 oz (89 mL) Sump Capacity, Filter Grade 10</td>
</tr>
</tbody>
</table>

### The **DEFG** block indicates:

<table>
<thead>
<tr>
<th>Place</th>
<th>Description</th>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Solenoid Valve</td>
<td>0</td>
<td>None, Plugged Port</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>12 V Solenoid with Deutsch DT04-2P Connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>24 V Solenoid with Deutsch DT04-2P Connector</td>
</tr>
<tr>
<td>E</td>
<td>Boost Pressure</td>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Dome Load (1/8&quot; Hose Barb Connection)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Dome Load (3 mm Hose Barb Connection)</td>
</tr>
<tr>
<td>F</td>
<td>High Pressure Sensor</td>
<td>0</td>
<td>None, Plugged Port</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>0.50 – 4.5 V with Deutsch DTM04-3P Connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>4 – 20 mA with Deutsch DTM04-3P Connector</td>
</tr>
<tr>
<td>G</td>
<td>Low Pressure Sensor</td>
<td>0</td>
<td>None, Plugged Port</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>0.50 – 4.5 V with Deutsch DTM04-3P Connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>4 – 20 mA with Deutsch DTM04-3P Connector</td>
</tr>
</tbody>
</table>
The **HIJJ** block indicates:

<table>
<thead>
<tr>
<th>Place</th>
<th>Description</th>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Inlet Connection</td>
<td>O</td>
<td>None (SAE #6 Female)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>3/8&quot; Seal Lok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>3/8&quot; A-Lok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>8 mm Seal Lok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>8 mm A-Lok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E</td>
<td>1/2&quot; Seal Lok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>1/2&quot; A-Lok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>G</td>
<td>12 mm Seal Lok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H</td>
<td>12 mm A-Lok</td>
</tr>
<tr>
<td>I</td>
<td>Outlet Connection</td>
<td>O</td>
<td>SAE #8 Female</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>1/2&quot; Seal Lok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P</td>
<td>1/2&quot; A-Lok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R</td>
<td>12 mm Seal Lok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S</td>
<td>12 mm A-Lok</td>
</tr>
<tr>
<td>JJ</td>
<td>Heat Exchanger Connection</td>
<td>HO</td>
<td>None (3/8&quot; NPT Female)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HA</td>
<td>1/4&quot; Hose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HB</td>
<td>1/4&quot; Hose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HC</td>
<td>12 mm Hose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HD</td>
<td>6 mm Hose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HE</td>
<td>3/8&quot; Hose</td>
</tr>
</tbody>
</table>
The **KK** block indicates:

<table>
<thead>
<tr>
<th>Place</th>
<th>Description</th>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL</td>
<td>Class</td>
<td>CD</td>
<td>No Engine, Bench Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CL</td>
<td>Light Duty (Class 1 to Class 3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CM</td>
<td>Medium Duty (Class 4 to Class 6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CH</td>
<td>Heavy Duty (Class 7 to Class 8)</td>
</tr>
</tbody>
</table>

Please consult the Parker factory for special requests such as fittings and sensor connections.

### 3.4.2. FM80 Options Schematic

![Figure 4: FM80 Dimensions with Filter](image-url)
3.5. FM80 Dimensions and Clearance Considerations

3.5.1. FM80 - Configurations with Solenoid and No Filter

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FUEL REGULATION MODULE BODY</td>
<td>7</td>
<td>LOW-PRESSURE SENSOR (OPTIONAL)</td>
</tr>
<tr>
<td>2</td>
<td>HEAT EXCHANGER HOSE CONNECTION</td>
<td>8</td>
<td>HIGH-PRESSURE SENSOR (OPTIONAL)</td>
</tr>
<tr>
<td>3</td>
<td>INLET CONNECTION (HIGH-PRESSURE)</td>
<td>9*</td>
<td>FILTER ELEMENT (OPTIONAL)</td>
</tr>
<tr>
<td>4</td>
<td>OUTLET CONNECTION (LOW-PRESSURE)</td>
<td>10*</td>
<td>FILTER HOUSING (OPTIONAL)</td>
</tr>
<tr>
<td>5</td>
<td>PRESSURE RELIEF VALVE</td>
<td>11*</td>
<td>FILTER DRAIN PLUG (OPTIONAL)</td>
</tr>
<tr>
<td>6</td>
<td>SOLENOID VALVE (OPTIONAL)</td>
<td>*</td>
<td>Items 9, 10 and 11 will always accompany one another</td>
</tr>
</tbody>
</table>

Table 5: FM80 Connections

Figure 5: FM80 Configurations with Solenoid and No Filter
3.5.2. FM80 - Configurations with 0.5 oz Filter

* Solenoid & Filter replacement clearances.

Figure 6: FM80 - Configurations with 0.5 oz Filter
3.5.3. FM80 - Configurations with 3 oz or 5 oz Filter

* Solenoid & Filter replacement clearances.

Figure 7: FM80 - Configurations with 3 oz or 5 oz Filter
4. System Requirements

Table 6 lists components required for the proper operation of the FM80.

<table>
<thead>
<tr>
<th>Component</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream Filter</td>
<td>If not included in the system options, provide a high-pressure CNG filter (10 micron rating) to keep particulates in the gas stream from damaging the Fuel Regulation Module and downstream components. Locate this filter upstream of the FM80. Please consult factory on the risks of failure if you are not using a filter.</td>
</tr>
</tbody>
</table>
| Inlet Port             | • SAE J1926 O-ring boss connection  
• 3/8" (8mm) size tubing (minimum)  
• 9/16-18 thread                                                                                                                                 |
| Outlet Port            | • SAE J1926 O-ring boss connection  
• 1/2" (12mm) size tubing or hose  
• 3/4-16 thread                                                                                                                                 |
| Downstream Relief Valve| Install a high flow relief valve or other protective strategy between the FM80 and the remainder of the fuel system.                                                                                       |

Use clean, burr free fittings and lines to prevent particulate damage to the FM80.

Table 6: System Components Requirements

**NOTICE**

Upstream equipment, including tubing and hose sizes, can affect system performance and should be selected as to impose minimal pressure drops. Do not operate a flow regulator without a proper filter.

The Fuel Regulation Module PRV is provided for optimal performance of the system under normal operating conditions. It is not a high flow device and may not protect the equipment downstream of the fuel regulation device in case of sudden failure. In case of sudden failure downstream equipment may see increased pressures leading to potential gas leak path. Natural gas present in the engine compartment or the surroundings may lead to a potential fire risk.
5. Design Specifications and Considerations

This section provides guidelines for fuel system design engineers and system integrators on various operating specifications, capability and environmental compatibility for the FM80.

5.1. Operating Pressure

Assure that the pressures applied to the product never exceed the maximum operating pressure of the product, the maximum operating pressure of any options and accessories connected to the product, or the maximum operating pressure of any other system component. Consult product labeling and Veriflo Division catalogs for maximum operating pressures and additional operating pressure considerations.

This FM80 is recommended for use at a maximum service pressure of 3600 psig (250 bar) gas per NGV prevailing laws.

- Fuel regulators have an outlet operating pressure range that is less than the maximum operating inlet pressure. Never exceed the maximum operating outlet pressure.
- Never exceed the maximum operating inlet pressure.
- Pressure gauges may be selected such that the pressure measured is no more than 75% of the full scale range of the gauge. For additional information, refer to ASME standard B40.1, Pressure Gauges and Gauge Attachments. Refer to www.asme.org for ordering information. Any accessory used must comply with all applicable laws that govern NGVs in the country of production/modification and use.
- Products may be fitted with special connections and adaptors to connect the product to a pressure cylinder (CNG fuel tank). The maximum operating pressure of the product, its options, and accessories must equal or exceed the maximum pressure of the cylinder. Please check local applicable laws for natural gas vehicles such as NPFA 52, UNECE R110, ISO 15500, ANSI/NGV 3.1 or visit the CGA web page at www.cganet.com.

5.2. Temperature Rating

Never operate the FM80 outside of the specified temperature ratings. Excessive heat or cold outside the operating specifications of the product can shorten the life expectancy of a product, cause improper function, and product failure. Consult the Veriflo Division product catalogs for maximum and minimum temperature ratings.

5.3. Leakage

Most products experience small amounts of leakage. Product leakage must be suitable for the application, environment, and the process fluid. Good system design and product selection require consideration of both internal and external leakage. Leakage can create hazardous situations due to exposure to natural gas, unintended chemical reactions, loss of system pressure, or unexpected transfer of fluids and pressures within the system. Consult the Veriflo Division product catalogs for product leakage rates.
5.3.1. Severe Leakage

The system designer must address in the system design and product selection any hazards that may result from severe leakage due to product or system failure. A good system design requires consideration of the possibility of severe internal and external leakage and may require safety pressure relief devices and safe removal of natural gas to the atmosphere above and away from the vehicle/fueling equipment. Severe leakage can create hazardous situations due to exposure to natural gas, unintended chemical reactions, loss of system pressure, unexpected transfer of fluids and pressures within the system, rapid combustion of natural gas and an explosion.

5.4. Flow Rate

The flow rate requirements of a system are an important consideration when selecting a product. Products need to be able to provide adequate flow and pressure for the desired application. Upstream equipment, including tubing and hose sizes, can effect system performance and should be selected as to impose minimal pressure drops.

5.5. Environment

Many environmental conditions can affect the integrity and suitability of a product for a given application. The FM80 is designed for use in NGV applications. If this product is used in circumstances outside of the specifications, useful life can be shortened and lead to premature failure of a product.

5.6. Fluid Capability and Conditioning

Veriflo products are constructed from a variety of materials. The FM80 is made for use with natural gas as a vehicular fuel as described in the SAE J1616 standard. The vehicle OEM, integrator, or user should contact their gas supplier to ensure the gas meets the standard of quality for natural gas as a vehicular fuel.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Do not use the FM80 if there is evidence of contamination (e.g. debris, particles, oils, lubricants, grease, etc.)</td>
</tr>
<tr>
<td>• Do not operate FM80 without a proper filter</td>
</tr>
<tr>
<td>• Always apply pressure to the regulator slowly to avoid heating from adiabatic compression</td>
</tr>
<tr>
<td>• Do not use fast opening valves. A manual isolation valve after the storage cylinders and upstream of the FM80 is recommended.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not interchange products, components, or accessories with those that have been used in other types of gas service. This may cause contamination of the system leading to gas leak or performance degradation.</td>
</tr>
</tbody>
</table>
6. Product Inspection and Installation

Before assembly or installation, perform a careful examination of the product (Figure 8). Check all products for the correct style, size, and model number.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Do not install if items are damaged or missing. Installing damaged items may result in injury or death to the installer or the operators of the vehicle.</td>
</tr>
<tr>
<td>• Inspect the product for any signs of damage before installation. DO NOT use any product that displays any signs of nonconformance</td>
</tr>
</tbody>
</table>

![Figure 8: FM80 Fuel Regulation Module](image)

On receiving and unpacking, first identify the unit and complete part number to ascertain the options and settings. Refer to section 3.4.

Record the serial number and vehicle VIN number in the user’s database that is accessible at all times through the life of vehicle. Please ensure the serial number is not removed from this unit.
Plan the installation for the best combination of accessibility, protection from engine exhaust heat, mechanical vibration or impact, and suitable mounting orientation by observing these guidelines:

- The FM80 may be mounted on the vehicle engine bay or chassis.
- Mount the FM80 that includes a filter with the filter below the fuel module body so that it may be drained with gravity. Models with no built-in filter may be mounted in any orientation. Mounting in alignment with vertical plane is recommended for optimal performance of the product.
- Do not run the outlet line upward from the FM80 outlet port as this could cause excessive oil and condensate collection. Use level or downward run.
- Avoid placing the fuel module in areas with potentially high temperatures such as near the exhaust system. If this is unavoidable, use a heat shield to protect the fuel module from temperatures over 248°F (120°C).
- If using the FM80 in a vehicle that normally crosses flooded roads, choose a mounting location that is high on the vehicle to avoid water ingress into the FM80.
- Parker recommends that installers provide protection from excessive exposure to corrosive fluids such as gasoline fuel and diesel fuel.
- Except for those installations requiring boost pressure assist from the inlet manifold, the fuel module uses an atmospheric reference hole in the bonnet to sense ambient pressure. This atmospheric reference hole is protected by a porous filter. This plug may not prevent water intrusion if the fuel module becomes submerged in water or is exposed to a high-pressure source.
- When installing fittings for the coolant circuit, use thread sealant tape rated for engine coolant pressures and temperatures.
- The inlet and outlet fittings on the FM80 for natural gas circuit normally do not require thread sealant or lubrication. The inlet and outlet fittings on the FM80 shall not be modified if pre-installed at the manufacturer. Parker recommends that all fittings be installed at the manufacturer prior to shipment.

**WARNING**

- Do not reset the FM80 pressure setting. The FM80 is preset and tested to customer requirements and tampering with the bonnet nut will cause change in the regulator performance.
- The FM80 Fuel Regulation Module is factory preset. Changing the pressure setting can cause unexpected and/or potentially hazardous operation. This can result in increase of downstream pressure or loss of ability to regulate gas pressure to required downstream pressure.
- Read all sections of this document before installing the FM80.
- Only competent personnel who are trained and qualified may install the FM80.
- Damaged units may be potential sources of leakage or may not perform the intended function.

### 6.1. Planning the Installation

Plan the installation for the best combination of accessibility, protection from engine exhaust heat, mechanical vibration or impact, and suitable mounting orientation by observing these guidelines:

- The FM80 may be mounted on the vehicle engine bay or chassis.
- Mount the FM80 that includes a filter with the filter below the fuel module body so that it may be drained with gravity. Models with no built-in filter may be mounted in any orientation. Mounting in alignment with vertical plane is recommended for optimal performance of the product.
- Do not run the outlet line upward from the FM80 outlet port as this could cause excessive oil and condensate collection. Use level or downward run.
- Avoid placing the fuel module in areas with potentially high temperatures such as near the exhaust system. If this is unavoidable, use a heat shield to protect the fuel module from temperatures over 248°F (120°C).
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- Parker recommends that installers provide protection from excessive exposure to corrosive fluids such as gasoline fuel and diesel fuel.
- Except for those installations requiring boost pressure assist from the inlet manifold, the fuel module uses an atmospheric reference hole in the bonnet to sense ambient pressure. This atmospheric reference hole is protected by a porous filter. This plug may not prevent water intrusion if the fuel module becomes submerged in water or is exposed to a high-pressure source.
- When installing fittings for the coolant circuit, use thread sealant tape rated for engine coolant pressures and temperatures.
- The inlet and outlet fittings on the FM80 for natural gas circuit normally do not require thread sealant or lubrication. The inlet and outlet fittings on the FM80 shall not be modified if pre-installed at the manufacturer. Parker recommends that all fittings be installed at the manufacturer prior to shipment.
NOTICE

- Do not use silicon grease – silicon may damage the oxygen sensor in some vehicles.
- All provided o-rings are factory lubricated to specification. Lubrication in-field is not recommended unless otherwise stated.
- Sealant use in these connections will void the factory warranty.

6.2. Installation

These instructions apply only to the FM80 installation. Other components such as valves, hoses, and additional filters are not addressed in this section.

**WARNING**

Use correct tools and exercise caution when installing or connecting fittings to prevent injury.

1) Attach the FM80 securely to the engine bay or vehicle body, using two M8 x 1.25 mounting bolts (not included).

**WARNING**

Do not mount the FM80 by gas or coolant connections only. This may lead to damage of the high pressure tubing or the connections on the FM80 due to excessive vibration resulting in a natural gas leak from the system.

2) Connect the inlet, outlet, and heat exchanger (coolant) connections.

**WARNING**

Inadequate torque could allow the fitting to loosen in service and leak. Excessive torque could weaken or shear the threads in the inlet and/or outlet port of the Fuel Regulation Module.

- The correct assembly torque for the inlet [SAE-6] fitting is 30 ±5 ft-lb (40 ±6.7 Nm).
- The correct assembly torque for the outlet [SAE-8] fitting is 50 ±10 ft-lb (67.8 ±13.5 Nm).
- The correct assembly torque for the pressure sensors [SAE-4] fitting is 205 ±20 in-lb.

Use CNG rated Parker O-rings provided with the fittings and the assembly. These are especially designed for this application. WARNING! Using non-CNG rated O-rings can cause leakage of flammable vapors.
3) Use a calibrated torque wrench with the appropriate attachment to connect the heat exchanger connection to the radiator fluid lines of the vehicle using hoses that fit the appropriate size. Refer to the order code in Figure 6 for correct size.

4) Purge the system with nitrogen or natural gas to ensure there is no debris present. Some applications may also require elimination of air in the fuel lines.

5) If applicable, connect the vent piping to the PRV and the wiring harness to sensor, and solenoid.

Proceed to the next steps after the CNG system is fully installed.

6) Pressurize the system by moving the high-pressure CNG valve to the ON position.

7) Perform a leak test of gas connections with liquid leak detection solution. This can be done by observing for bubbles at potential leak points such as connections. A gas sniffer probe or other leak test devices may be used.

8) Energize the solenoid circuit to admit gas through the FM80 and verify the outlet gas connection is leak tight.

9) After installation and servicing, the product must be tested for proper function and leakage.
7. Operating Precautions

This section provides guidelines for vehicle operators, maintenance technicians and fuel system test engineers.

Observe these precautions to maintain the warranty, prevent FM80 failure, and extend the life of the device.

### 7.1. Engine Coolant

If the coolant freezes in the fuel module, for any reason, the performance of the system FM80 may be compromised.

The expansion of high-pressure gas to low pressure creates a significant temperature drop. To prevent moisture from freezing inside the fuel module and creating a blockage, heated engine coolant must be circulated within the fuel module. The fuel module is equipped with an integral heat exchanger for this purpose.

Antifreeze must be used to prevent freezing below -35°F (-37°C). Follow the vehicle OEM manual for additional information for operation in severe cold weather. Refer to Table: 7 for the antifreeze ratios.

### WARNING

Always apply pressure to the regulator slowly to avoid heating from adiabatic compression. Fast opening valves should not be used. A manual isolation valve after the storage cylinders and up stream of the FM80 is recommended to reduce rapid pressurization and energizing of the fuel system.

### NOTICE

The higher antifreeze mixture percentage also retards the radiator's ability to get rid of the coolant heat.

<table>
<thead>
<tr>
<th>Antifreeze % In Water By Volume</th>
<th>Freezing Protection Down To</th>
<th>Delta Increase In Boiling Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>-51°C</td>
<td>+15°C</td>
</tr>
<tr>
<td>50%</td>
<td>-37°C</td>
<td>+8°C</td>
</tr>
<tr>
<td>40%</td>
<td>-24°C</td>
<td>+5°C</td>
</tr>
<tr>
<td>30%</td>
<td>-20°C</td>
<td>+4°C</td>
</tr>
</tbody>
</table>

*Table 7: Antifreeze Ratio to Water by Volume*
To compute the boiling point, check system pressure and corresponding boiling point and add as per % mix in Table 7. For example a 15 psig [1 barg] system water boils at 257°F [125°C] therefore 50% antifreeze mix boils at 265°F [129.4°C].

Consult the OEM or authorized dealer for the best possible mix for your operating conditions as the higher the antifreeze mixture percentage its ability to adsorb heat from the engine goes down.

7.2. Operating Temperature

Temperatures greater than 248°F [120°C] and less than -40°F [-40°C] can cause permanent damage to internal seals and reduce the useful life of the pressure fuel module by degradation of the seals and o-rings.

7.3. Chemicals in Fuels

Any cleaners or abnormal additives, drying agents, etc. in the fuel could cause damage to the fuel module’s internal seals. The fuel module is tolerant to substances that occur in compressed natural gas, including most compressor oils, present in trace amounts, under normal operating conditions.

Contact Parker Hannifin regarding other materials.
8. Maintenance and Service

This section is appropriate for the people performing maintenance and service on the FM80 product.

8.1. Inspection

Any of the conditions listed in Table 8 require an immediate system shut down and replacement of worn or damaged components or the complete FM80 unit.

Never approach a product or system exhibiting these or other abnormal conditions until the system has been shut down and depressurized.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Cause</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escaping (natural gas) fluid and abnormal</td>
<td>Escaping fluid and abnormal pressure readings may indicate severe leakage,</td>
<td>Replace or repair the FM80.</td>
</tr>
<tr>
<td>pressure readings</td>
<td>product or system failure.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Damaged or degraded components</td>
<td>Visible signs of wear or component degradation</td>
<td>Replace or repair the FM80.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crushed or damaged hoses and plumbing</td>
<td>Kinked plumbing can result in restricted fluid flow and lead to unpredictable</td>
<td>Replace or repair the damaged plumbing.</td>
</tr>
<tr>
<td></td>
<td>system behavior</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kinked, crushed, or damaged electrical cables</td>
<td>Kinked cables can result in electrical short circuit or inconsistent voltage</td>
<td>Replace or repair the damaged electrical cables.</td>
</tr>
<tr>
<td></td>
<td>and lead to unpredictable system behavior</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any observed improper system or component function – either in operation or by use of diagnostic methods prevalent in the automotive industry such as On-Board Diagnostic System or OBDS</td>
<td>Immediately shut down the system and check the FM80 and its components for malfunction. The filter and electric solenoid coils are field replacement parts; however, the internals of the regulation system are not. Replace the FM80 at any sign of regulation malfunction or call 1-800-CParker.</td>
<td></td>
</tr>
<tr>
<td>Excessive dirt build-up</td>
<td>Dirt and debris can mask potentially hazardous situations</td>
<td>Clean using a damp cloth</td>
</tr>
</tbody>
</table>

Table 8: Inspection and Troubleshooting
8.2. Maintenance Schedule

Even with proper selection and installation, product service life may be significantly reduced without a continuing maintenance program. A maintenance program must be established and followed by the user.

Maintain this Fuel Regulation Module according to the schedule in Table 9.

<table>
<thead>
<tr>
<th>Item</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leak test (bubble test or methane detector)</td>
<td>Every month</td>
</tr>
<tr>
<td>Inspect components for wear or damage</td>
<td>Every month</td>
</tr>
<tr>
<td>Inspect vent lines</td>
<td>Every month</td>
</tr>
<tr>
<td>Drain the standard sized high-pressure filter</td>
<td>Every 2,000 miles (3,000km) or as necessary*</td>
</tr>
<tr>
<td>Drain the large sized high-pressure filter</td>
<td>Every 4,000 miles (3,000km) or as necessary*</td>
</tr>
<tr>
<td>Replace the standard sized high-pressure filter</td>
<td>Every 6,000 miles (10,000km) or at any oil change intervals*</td>
</tr>
<tr>
<td>Replace the large sized high-pressure filter</td>
<td>Every 12,000 miles (10,000km) or at any oil change intervals*</td>
</tr>
</tbody>
</table>

*Filter element maintenance intervals are dependent upon gas quality.

Table 9: Maintenance Schedule

Under certain conditions of heavy use and/or heavy carryover of oil from the compressor, the filter may need to be drained and replaced more frequently.

Establish a schedule that best suits your usage patterns for optimal performance of your FM80 and your natural gas vehicle.

Parker has designed kits shown in the table below for use when maintaining the FM80. Please order these kits in preparation for maintenance.

<table>
<thead>
<tr>
<th>Kit Category</th>
<th>Kit Name</th>
<th>Kit Description</th>
<th>Suitable For Configurations Containing</th>
</tr>
</thead>
</table>
| Filter       | AFM80-ST06 | Standard Filter Grade 6 Element | FM80-****-AB06-****-****-**  
|              |            |                         | FM80-****-AC06-****-****-**                                  |
| Filter       | AFM80-ST10 | Standard Filter Grade 10 Element | FM80-****-AB10-****-****-**  
|              |            |                         | FM80-****-AC10-****-****-**                                  |
| Filter       | AFM80-LG06 | Large Filter Grade 6 Element | FM80-****-AA06-****-****-**                                  |
| Filter       | AFM80-LG10 | Large Filter Grade 10 Element | FM80-****-AA10-****-****-**                                  |
| Solenoid Valve | AFM80-SV12 | Solenoid Valve Coil, 12V | FM80-****-A***-A***-****-**                                  |
| Solenoid Valve | AFM80-SV24 | Solenoid Valve Coil, 24V | FM80-****-A***-B***-****-**                                  |

Table 10: Maintenance Kits
8.3. Maintenance Safety

Observe these safety requirements when working with CNG:

- Do not allow any open flames or equipment that may cause a spark or open flame into the installation area when CNG may be present. Verify that no vapors are present before proceeding with electrical work. Follow Lockout/Tagout procedure - OSHA standard for Control of Hazardous Energy-Lockout/Tagout or equivalent local procedure. Fire or explosion causing injury or death will occur if fuel vapors are present when working with electricity.
- Provide adequate ventilation in the work area due to possibility of gas build up.
- Wear PPE appropriate for the task such as safety glasses, and steel toe boots.
- Locate a fire extinguisher appropriate for CNG so that it is accessible by maintenance personnel.
- Using non-Parker replacement or spare parts may result in damage and/or injury, and voids the warranty.
- Do not rapidly or frequently decompress CNG systems. Doing so will cause high pressure gas absorbed in non-metallic materials to rapidly escape those materials, decreasing the useful life of the product.
- Depressurize the FM80 prior to attempting any maintenance activity. Please follow all facility lock-out/ tag-out (LOTO) procedures as well as appropriate system defueling/ depressurization refueling/ repressurization procedures prior to and following any and all maintenance activities. Users should follow procedures as outlined and provided by the CNG fuel system manufacturer and/or CNG vehicle manufacturer to ensure that the system is safe for servicing.
8.4. Service

8.4.1. Draining the High-Pressure Filter

This procedure is a guideline and may vary by vehicle and configuration.

Required tools:

- ¼” Allen wrench
- Eye protection
- A bucket or suitable container to catch liquid from the filter
- Towels and clean-up supplies
- 1-3/8” bottom flats/wrench attachment
- Torque wrenches
- Lockout tags
- Fire extinguisher

1) Depressurize the CNG system. Refer to Section 8.3.
2) Position a bucket or other suitable container under the filter to capture liquid from filter.
3) Carefully remove the filter drain plug with a ¼” Allen wrench. Be aware that there may be residual pressure in the system. Refer to Figure 4 item 11 for the location of the drain plug.
4) Wait for the liquid in the filter to stop draining.
5) Replace the drain plug and torque to 240 ± 20 in lbs [27.1 ± 2.3 Nm]. Use specified torque to ensure that it is leak tight.
6) Re-pressurize the CNG system.
7) Perform a leak test on the system.
8) Dispose of waste liquid according to local regulations.

![WARNING]
Removing the filter drain plug while the system is under pressure can cause injury from exposure to high pressure gas

8.4.2. Replacing the High-Pressure Filter

This procedure is a guideline and may vary by vehicle and configuration.

Required tools:

- 1-3/8” bottom flats/wrench attachment
- Torque wrenches
- Lockout tags
- Eye protection
- Towels and clean-up supplies
- Fire extinguisher
- Parker filter replacement kit (contains a filter element and two O-rings)

1) Depressurize the CNG System. Refer to Section 8.3.
2) Position a bucket or other suitable container under the filter to capture liquid from filter.
3) Carefully remove the filter drain plug with a ¼” Allen wrench. Be aware that there may be residual pressure in the system. Refer to Figure 4 item 11 for the location of the drain plug.
4) Wait for the liquid in the filter to stop draining.
5) Open the filter bowl using bottom flats
6) Remove the filter
7) Place new O-rings and a new filter
8) Torque to 45 ± 5 ft-lbs [61 ± 6.8 Nm]. Replace drain plug when completed. Torque to 240 ± 20 in lbs [27.1 ± 2.3 Nm].
9) Re-pressurize the CNG system. Refer to Section 8.3.
10) Test for leaks, with system pressurized, by using leak detection fluid.
11) Dispose of the filter according to local regulations.

**WARNING**
Removing the filter drain plug while the system is under pressure can cause injury from exposure to high pressure gas

8.4.3. Replacing the Solenoid Valve Coil

**Required tools:**
- 9/16” open-end wrench or socket wrench

1) Follow Lockout/Tagout procedures. Disconnect the electrical connections and follow control of hazardous energy procedure (lockout/tagout) for your workplace.
2) Remove the 9/16” hex nut and washer.
3) Remove coil and replace coil.
   - Coils are available for both 12 and 24V operation.
   - The coil operating voltage can be found on the coil label.
4) Install the washer and the hex nut.
5) Torque the hex nut to 120 +/- 10 in-lbs

**WARNING**
Follow Lockout/Tagout procedure - OSHA standard for Control of Hazardous Energy-Lockout/Tagout or equivalent local procedure.

**WARNING**
If appropriate control of hazardous energy procedures are not followed, the coil may become energized during this procedure, resulting in electric shock.
8.4.4. Replacing the Solenoid Valve

Required tools:

- Customer spanner wrench
  Parker Hannifin | Veriflo Division part number 15001010

1) Follow Lockout/Tagout procedures. Disconnect the electrical connections and follow control of hazardous energy procedure (lockout/tagout) for your workplace.
2) Remove the solenoid coil as described above.
3) Use the spanner wrench to remove the sleeve assembly.
4) Inspect the solenoid valve cavity to insure that it is free of debris.
5) Replace components.
6) Torque the sleeve assembly to 360 ± 30 in lbs.
7) Install the coil as shown in the previous section.

<table>
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<th>WARNING</th>
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<td>If appropriate control of hazardous energy procedures are not followed, the coil may become energized during this procedure, resulting in electric shock.</td>
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Natural Gas media specification are referenced from Natural Gas as a fuel specification from SAE J1616.

Call the appropriate Parker technical service department if you have any questions or require any additional information.

See the Parker publication for the product being considered or used, or call 1-800-CPARKER, or go to www.parker.com, for telephone numbers of the appropriate technical service department and FM80 catalogs and publications.
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