



# FuelMaker Model C3

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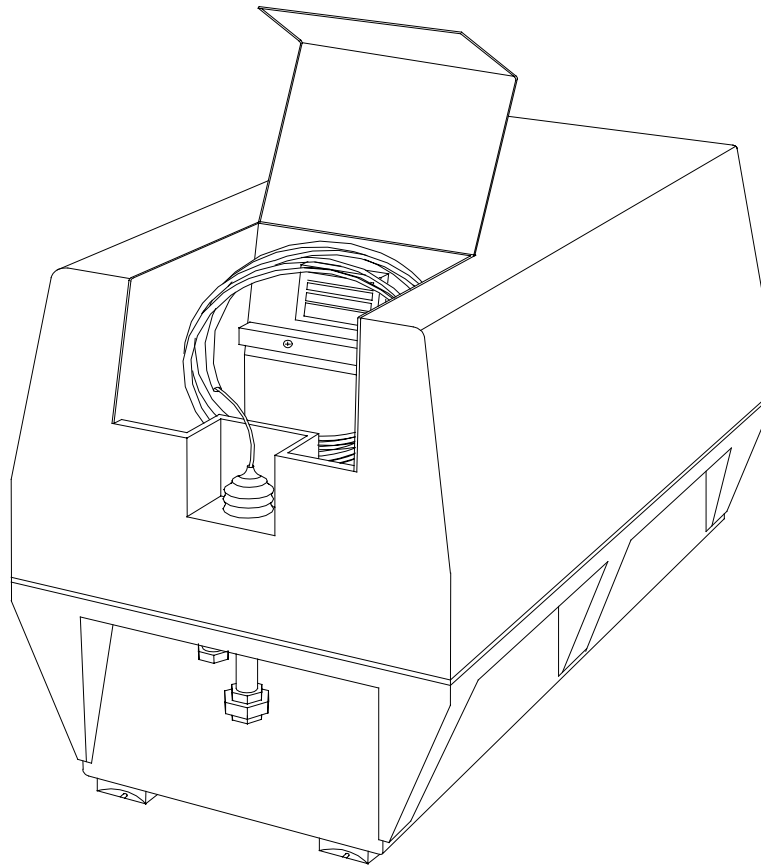
## Vehicle Refueling Appliance

April 2000

Model C3

## SERVICE INSTRUCTIONS

### READ PRIOR TO SERVICING THE FUELMAKER



**FOR USE BY TRAINED  
SERVICE PERSONNEL ONLY**

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## SAFETY INSTRUCTIONS

### PLEASE READ CAREFULLY PRIOR TO INSTALLATION

#### 1. NO FIELD SERVICEABLE COMPONENTS

The FuelMaker Modules (Compression Module, Control Module, and Electronic Module) can only be serviced by FuelMaker personnel or those specifically trained by FuelMaker. **Do not attempt to dismantle these Modules. To do so will void all warranties and may result in serious injury.**

#### 2. READ INSTRUCTIONS CAREFULLY

Please read and review the Operating Instructions enclosed with the FuelMaker and these Service Instructions carefully before servicing the FuelMaker. If you are unsure about any features or are experiencing

any difficulty, please contact FuelMaker Corporation.

#### 3. REFUELING WITH NATURAL GAS

The FuelMaker is for use with natural gas only and should not be used for any purpose other than the refueling of cylinders certified for gas storage at 3000 psig. **Attempts to use the FuelMaker for any other purpose could result in serious injury or death. Do not run the vehicle's engine while refueling. Do not smoke or bring an open flame within 3 m (10 feet) of the vehicle while it is being refueled. Ensure that the vehicle is parked outdoors unless a FuelMaker Remote User Panel has been installed.**

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## TECHNICAL SPECIFICATIONS

Gas:		Electrical:	
Minimum Inlet Pressure	1.7 kPa (7 in water)	Voltage	230/208 Volt, single phase, 60 Hz
Maximum Inlet Pressure	14 kPa (2.0 psi)	Motor	1.5 Hp, TEFC
Discharge Pressure	20 MPa (2900 psig) at 20°C (68°F)	Power Consumption	1.8 kW (complete unit)
Minimum Flow Rate	2.7 Nm <sup>3</sup> /hr @ 20°C and 1.7 kPa inlet pressure	<b>Mechanical:</b>	
Maximum Flow Rate	4.5 Nm <sup>3</sup> /hr @ -40°C and 14 kPa inlet pressure	Dimensions (LxWxH)	700x473x720mm (28"x19"x28")
Nominal Flow Rate	3.0 Nm <sup>3</sup> /hr (1.8 SCFM)	Weight	66 kg (145 lbs)
		Noise	45 dbA at 5m (open field)
		Ambient Temperature	-40°C to +40°C (-40°F to +104°F)

## GENERAL:

### Introduction:

The FuelMaker is a self-contained, air-cooled, oil-free outdoor appliance delivering natural gas for vehicle refueling. It will fill a 100-litre (26 US gal) gas cylinder to a pressure of 20 MPa (2900 psi) at 20°C (68°C) within 8 hours. Depending on the energy content of the natural gas, this is roughly equivalent to about 3.5 litres (.9 US gal) of gasoline per hour.

The appliance is air cooled, air being drawn from one set of vents in the front portion of the housing and exhausted through the vents at the rear of the housing. For this reason it is important that the base of the FuelMaker be kept clear of snow, dead leaves, newspapers, or other debris that might clog the air inlets.

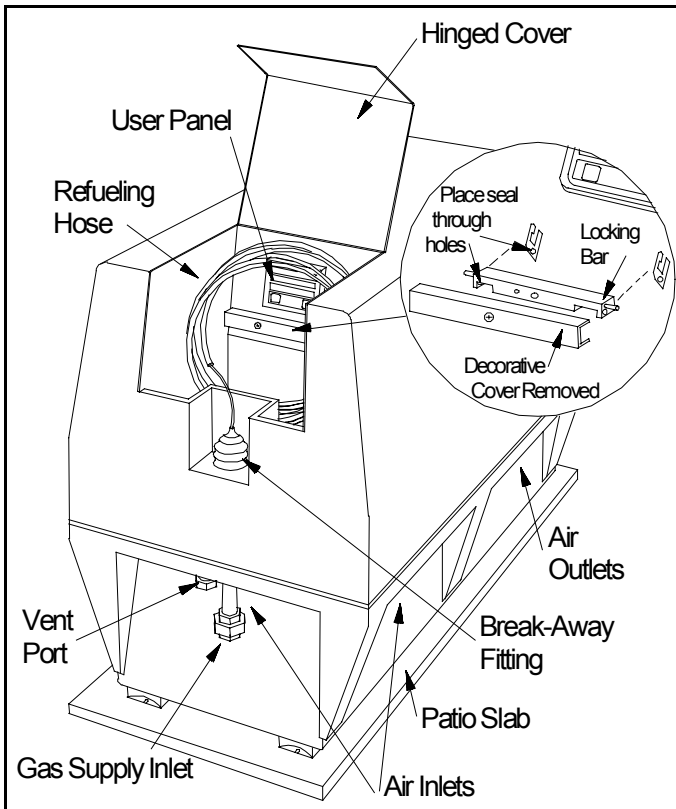


Figure 1 - The FuelMaker, Model C3

Safety precautions require that the FuelMaker's internals be inaccessible to the user and other unauthorized persons, and accordingly the top housing is sealed by Gas Utility service personnel. Only authorized service representatives may service the FuelMaker at the users' premises. When carrying out a service call on a FuelMaker the service representative should:

1. Check the FAULT DIAGNOSIS system as described in the section on page 5.
2. Correct the faults indicated.
3. Follow the reset procedure (see ELECTRONIC MODULE SETTINGS on page 12).

Any detailed service not described in this document may only be carried out by FuelMaker Corporation service staff, in FuelMaker Corporation's service facilities. **Any service undertaken by unauthorized persons may cause the FuelMaker to operate incorrectly and may result in damage or serious injury.**

The Compression Module must be serviced after every 2000 hours running time. The red light on the user panel will illuminate indicating when only 100 hours of operating time remain. If service is not performed during that remaining 100 hours the FuelMaker will shut down until service is performed. Other service checks are required as described below.

FuelMaker Corporation maintains service facilities where the FuelMaker's modules are reconditioned as follows:

- Compression Module (after every 2000 hours of operation or if a fault is indicated).
- Control Module whenever a fault is indicated.
- Electronic Module whenever a fault is indicated
- Motor, fan or drive coupling (if fault indicated, noisy or vibrating excessively).

All normal safety precautions must be observed when undertaking on-site service and replacing FuelMaker modules.

When removing and replacing modules, it is essential to prevent dirt or debris from entering the gas passages. All gas inlets and outlets must be plugged or covered before transport back to the FuelMaker Corporation service centre, e.g., by applying tape over the openings.

### REGULAR SERVICE CHECKS:

A service call must be made every 2000 hours of operating time in order to verify the FuelMaker's shut-down pressure. The other checks described below should be carried out at the same time or whenever other service work is performed.

### Shut-Down Pressure:

The FuelMaker will shut down at a pressure determined by the temperature at the user panel. This feature prevents the risk of tank over-pressurisation which could occur as the ambient temperature rises during the day (gas pressure rises with temperature). Shut-down pressures and their corresponding temperatures are shown in Table 1 below. At temperatures below -45°C the FuelMaker will shut down as "Incorrect" - see the section on FAULT DIAGNOSIS.

Following completion of service, the FuelMaker should be vented (purged) for about 15 seconds while running on natural gas and then connected to a high pressure test kit with a volume of 2 litres. These test kits are available from FuelMaker Corporation and come complete with the same refueling receptacle as used on NGV vehicles, a hand operated vent valve, and a pressure gauge. Ensure that the pressure gauge has been properly calibrated.

The FuelMaker should fill the test cylinder in six to thirteen minutes, depending on ambient temperature and the condition of the Compression Module, and then shut down, indicating VEHICLE CYLINDER(S) FULL (steady yellow LED) at the User Panel.

Temperature	Pressure
20°C \ 68°F or over	20 MPa \ 2900 psi
10°C \ 50°F	18.5 MPa \ 2680 psi
0°C \ 32°F	17 MPa \ 2470 psi
-10°C \ 14°F	15.5 MPa \ 2250 psi
-20°C \ -4°F	14 MPa \ 2030 psi
-30°C \ -22°F	12.5 MPa \ 1810 psi
-40°C \ -40°F	11 MPa \ 1600 psi

**Table 1 - Shut-Down Pressure vs. Temperature**

The FuelMaker's shut-down pressure should match that shown in Table 1 for the corresponding ambient temperature i.e. the temperature at the user panel. If the shut-down pressure differs by more than 1.2 MPa (175 psi) then either the Electronic or Control Module requires replacement. Replace first the Electronic Module and if the deviation is not eliminated then replace the Control Module reinstalling the original Electronic Module. The deviation must be reported to FuelMaker Corporation when the Module is returned for service.

### Fittings:

Connections should be leak tested using a suitable liquid e.g. Snoop. The high pressure connections can be checked while the appliance is fueling a vehicle or a test cylinder. As a minimum, the following points should be checked during operation - check high pressure fittings with delivery pressure between 19 and 20 MPa (2800 to 2900 psi):

- all connections at the manifold block
- the two connections at the Compression Module
- all inlet piping connections
- the high pressure hose/tube joint (see Figure 3) between the Compression Module and the manifold block
- all high pressure piping connections including the connection between the hose and the refueling probe
- the screen fitting at end of the vent line (small leaks from the blow-down vessel's pressure relief valve may not be detected by the Fault Diagnosis system). Ensure that the solution does not freeze and block the vent line screen fitting.

### High Pressure Fueling Hose:

The FuelMaker is supplied with a fibre reinforced high pressure fueling hose connected to the appliance through a break-away fitting. The hose should be carefully inspected for any evidence of abrasion, kinks, or cuts and replaced if such are found. A foam insulation covers the fueling hose. It maintains the gas temperature and helps to prevent any "freeze-up" of the gas within the hose.

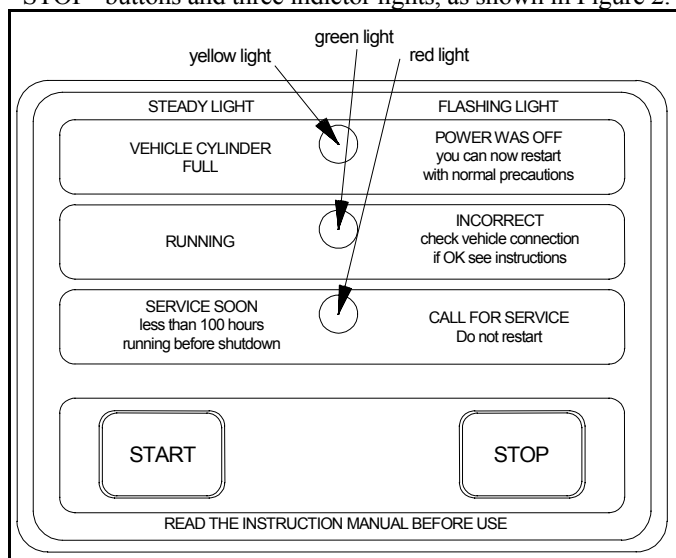
The break-away fitting allows the high pressure hose to be pulled free from the FuelMaker without damage should the user drive away without disconnecting. The break-away force is approximately 150 N (35 lb). Following service of the FuelMaker the high pressure hose should be pulled clear of the

break-away fitting to check the break-away force. If it exceeds 190 N (44 lb) the hose nipple and break-away fitting should be inspected for wear or damage and replaced.

**Safety precautions require that the FuelMaker's internals be inaccessible to the user and other unauthorized persons, and accordingly service personnel must ensure that the FuelMaker is sealed prior to leaving the site. This is done by placing a seal through the holes in the locking bar and tabs immediately below the User Panel - see Figure 1.**

### USER PANEL OPERATION:

Starting, stopping and monitoring of the FuelMaker takes place at the User Panel. The user panel has separate "START" and "STOP" buttons and three indicator lights, as shown in Figure 2.



**Figure 2 - User Panel**

After shut-down, the pressure in the refueling hose will be automatically reduced to about .26 MPa (38 psi) making it easy to disconnect the refueling nozzle from the vehicle.

### User Panel Indications:

The lights on the user panel indicate the following conditions:

**No Light Illuminated: READY** to start, or fuses require replacement, or electrical power is disconnected. Note: If a power failure lasts less than one minute, the FuelMaker will start automatically 15 seconds after the return of power (provided it was in operation before the power failure).

**Yellow Light Steady: VEHICLE CYLINDER(S) FULL** The vehicle is full or the maximum pressure has been reached in a disconnected filling hose. The FuelMaker can be restarted by pressing the START button.

**Green Light Steady: RUNNING** The FuelMaker is running.

**Red Light Steady: SERVICE SOON** The FuelMaker will run for another 100 hours after which it will shut down if not serviced. During these remaining 100 hours the Red and the Green LED's will both be illuminated whenever the FuelMaker is in operation.

### Abnormal User Panel Indications (flashing lights):

**Yellow Light Flashing: POWER WAS OFF** for more than one minute. Press START to operate the FuelMaker. Note: If the power failure lasts less than one minute, the FuelMaker will start automatically 15 seconds after the return of power (provided it was in operation before the power failure).

**Green Light Flashing: INCORRECT** The FuelMaker is shut down in an INCORRECT state but may be restarted by the user if the fault is corrected. The most common causes of an “INCORRECT” indication will be:

- Incorrect or damaged connection to the vehicle
- Gas supply shut-off valve closed
- Blockage of FuelMaker air vents
- Faulty filling hose e.g.leak
- Excessive filling time (25 hours continuous running)

Details on the above faults are given in “FAULT DIAGNOSIS” below. When the above have been checked and any obvious faults corrected, then the unit may be restarted after first pressing the “STOP” button.

Vehicles with total tank capacities in excess of 140 litres (37 US gal) may take longer than 25 hours to fill from empty under certain conditions (e.g., large tank, high ambient temperature, Compression Module approaching service interval, etc.). In this case, a thorough check for gas leakage shall be conducted. The FuelMaker may be simply restarted after a positive check that there is no other cause of the “INCORRECT” indication. If the user is routinely filling vehicles with a cylinder capacity greater than 140 litres, the DIP switches on the Electronic Module can be reset - see section titled ELECTRONIC MODULE SETTINGS.

**Red Light Flashing: CALL FOR SERVICE** The FuelMaker is shut down and a CALL FOR SERVICE is necessary. The automatic safety system will prevent a restart unless the fault is corrected by authorised personnel.

### Indicator Lights Check:

To check that the indicator lights are working correctly, press and hold the STOP button. All three indicator lights should light briefly, for about one second, and then go out. If none light, there is probably no power to the Electronics Module or the fuses require replacement. If one or more fail to light there is probably an error in the user panel.

### Service Hours:

Table 3 below displays the operating hours until the FuelMaker requires service (or hours since service up to 50 hours). To obtain the indications, the following button(s) have to be pressed:

When the FuelMaker is “RUNNING”:

Press and hold the “START” button.

When the FuelMaker is not running:

First press and hold the “STOP” button, then press the “START” button. After the code is displayed, release the “START” button first, followed by the “STOP” button.

At first, all lights are illuminated briefly as a light check. The light check is followed by the operating hours check.

(1 = steady light; 0 = off)								
Yellow	0	0	0	0	1	1	1	1
Green	0	0	1	1	0	0	1	1
Red	0	1	0	1	0	1	0	1
<-- Hours Since Service -->				<----- Hours Remaining ----->				
Hours	fault or no power	0-49	50 or more	350-649	250-349	150-249	50-149	0-49

**Table 3 – Hours Remaining Before Service**

### FAULT DIAGNOSIS:

The FuelMaker has diagnostic capabilities both in the “INCORRECT” (green light flashing) and the “CALL FOR SERVICE” (red light flashing) mode. To display the cause of an “INCORRECT” or a “CALL FOR SERVICE” mode, press and hold the “STOP” button. Tables 4 and 5 show the fault diagnosis and corrective actions. The digits 0, 1, and 2 in Tables 4 and 5 correspond to the following light status:

0 = light off	Top = Yellow Light
1 = steady light	Centre = Green Light
2 = light flashing	Bottom = Red Light

### Diagnostics When In “INCORRECT” Mode:

Pressing and holding the “STOP” button first acts as a light check by illuminating all 3 lights briefly. After this brief delay, error codes are displayed.

Error Code	Corrective Action
0	Check power and lights by pressing
0	and holding "START" button.
0	All lights should light up.
Error in display or user panel or control unit or in connecting cables.	<u>If OK</u> , try normal filling procedure.  <u>If fault persists</u> , check fuses. <u>If OK</u> , Test FuelMaker and reseal
0	Check cooling air path is
0	clear. <u>If OK</u> , check connection
1	to motor; correct if necessary.
Excessive motor Temperature	<u>If OK</u> , remove Compression Module; if drive shaft stiff or seized, fit new Compression Module. If motor shaft stiff, seized, or showing signs of overheating, or temperature protection circuit open, fit new motor. Test and purge FuelMaker, reseal.
<u>Note:</u> Over-heating may occur if inlet pressure is above 14 kPa (2 psi), with supply voltage below 208 V, when ambient temperature is near 40°C (104°F).	
0	Check that refueling nozzle is
1	properly connected to
0	vehicle.
Insufficient rise of filling pressure at beginning of fill cycle	<u>If OK</u> , check that total vehicle cylinder volume does not exceed the maximum allowable volume of 140 l (may be reset to 280 l - refer to section titled ELECTRONIC MODULE SETTINGS). <u>If OK</u> , check high pressure system for leaks.  <u>If OK</u> , turn off gas supply and restart FuelMaker. FuelMaker should shut down within 1 minute indicating "INCORRECT" and light display 101. If FuelMaker does not shut down within 1 minute, fit new Control Module. <u>If shutdown OK</u> restore gas supply and connect empty test kit. Check cylinder filling time. <u>If</u> <u>cylinder filling time excessive</u> , fit new Compression Module. <u>If fault</u> <u>persists</u> , fit new Electronic Module. <u>If OK with new Electronic Module</u> , refit original Compression Module.  Test and purge FuelMaker, reseal.

Table 4 - Diagnostics for "INCORRECT" Mode

Error Code	Corrective Action
0	Check high pressure system
1	for leaks.
1	
Sudden pressure drop in high pressure system (during first 3 minutes after start-up)	<u>If OK</u> , start FuelMaker with fill hose disconnected from vehicle Allow FuelMaker to run until FULL is indicated while checking vent line for escaping gas.  <u>If gas flows through vent line</u> , fit new Control Module.  Test and purge FuelMaker, reseal.
<u>Note:</u> This indication can also result from simultaneously filling two or more vehicles if either of the vehicle check valves sticks, or if a second vehicle is connected while the FuelMaker is running. Always start filling procedure of vehicle by first connecting refueling nozzle, opening shut- off valve if provided, and subsequently starting the FuelMaker.	
1	Verify that maximum vehicle
2	cylinder volume to be filled does
2	not exceed the maximum allowed
Maximum running time exceeded (more than 25 hrs.)	volume of 140 l (may be reset to 280 l - see section titled ELECTRONIC MODULE SETT- INGS). Check for leaks. <u>If OK</u> check flow rate of Compression Module by filling empty test kit. <u>If filling time is</u> <u>excessive</u> , fit new Compression Module. <u>If fault persists</u> , fit new Electronic Module.  Test and purge FuelMaker, reseal.
1	Check that the main natural gas
0	supply valve is open and that
1	adequate pressure is present at the
Insufficient inlet Pressure	inlet to the FuelMaker (7" wc - 1.4 kPa) <u>If OK</u> , start FuelMaker with fill hose disconnected from vehicle. Allow FuelMaker to run until "FULL" is indicated (should take less than 1 minute). <u>If fault persists</u> , fit new Control Module. <u>If fault persists</u> fit new Electronic Module and refit original control unit.  Test and purge FuelMaker, reseal.

Table 4 - Diagnostics for "INCORRECT" mode, cont'd

Error Code	Corrective Action
1	Check cooling air path is clear.
0	
2	<u>If OK</u> , check connection to
Electronic	
Excessive cooling	Module, correct if necessary. <u>If OK</u> ,
air temperature or	visually inspect cooling fan
failure of temp-	for proper condition and position. <u>If</u>
erature sensor	<u>OK</u> , fit new Compression Module
while FuelMaker	and check for easy turning running
	fan.
	<u>If fault persists</u> , refit original Com-
	pression Module and fit new Electro-
	nic Module.
	Test and purge FuelMaker, reseal.
1	Press power OFF then ON to
1	start unit.
1	
Electronics error	<u>If fault persists</u> , replace Electronic
	Module.
	Test and purge FuelMaker, reseal.
2	Restart the unit.
0	
0	
Power was off	
0	Check condition which caused
2	interlock (if an external
1	interlock has been installed).
External interlock	e.g. external timer activated.
(remote shutdown)	Restart the unit.
1	Restart unit if cause was
0	temperature below -45°C.
0	<u>Otherwise</u> , fit new Electronic
Temperature too	Module or remote user panel if
low <u>or</u> failure of	appropriate.
temperature sensor	Test FuelMaker, reseal.

Table 4 - Diagnostics for “INCORRECT” mode, cont’d

Error Code	Corrective Action
2	<u>If refueling nozzle is difficult</u>
0	<u>to disconnect</u> , reduce pressure
1	in hose by closing valve on
Failure of	vehicle tank and starting
blowdown	engine.
system	Fit new Control Module.
	Test and purge FuelMaker, reseal
2	<u>If fault persists</u> , fit new
0	Control Module.
2	
Failure of low	Test and purge FuelMaker, reseal.
pressure switch	
1	Restart the unit.
1	
2	
No storage of operating	
hours during last power	
failure	
1	Restart the unit.
2	<u>If fault persists</u> , replace
0	Electronic Module.
Motor drive failure	Test FuelMaker, reseal.
2	Check electrical connection to
2	hour meter. <u>If OK</u> , replace
0	Compression Module.
Faulty hour meter	<u>If indication persists</u> , fit new Electronic
	Module and refit original Compression
	Module.
	Test and purge FuelMaker, reseal.

Table 4 - Diagnostics for “INCORRECT” mode, cont’d

## Diagnostics When In

### “CALL FOR SERVICE” Mode:

Pressing and holding the “STOP” button first acts as a light check by illuminating all three lights briefly. After this brief delay, the error codes described in Table 5 are displayed by pressing and holding the “STOP” button. Up to five error conditions are stored and retrieved by repetitively pressing the “START” button (while the “STOP” button remains pressed continuously) until the 222 indication (end of stored messages) is given. After the appropriate corrective action is taken, as indicated in Table 5, the reset button (shown in Figure 6) should be pushed to clear the error.

Error Code	Corrective Action
0	Check high pressure system for
2	leaks. <u>If OK</u> , start FuelMaker with
fill	
2	hose disconnected from vehicle.
Sudden pressure	Allow FuelMaker to run until
drop in high	“FULL” is indicated while checking
pressure system	vent line for escaping gas. <u>If gas</u>
(beyond 3 min.	<u>flows through vent line</u> fit new
after start up)	Control Module.
	Test and purge FuelMaker, reseal.
<u>Note:</u> This indication can also result from filling two or more vehicles simultaneously if either of the vehicle check valves sticks, or if a second vehicle is connected while the FuelMaker is running.	
2	Fit new Control Module.
1	Test and purge FuelMaker, reseal.
1	
Burst disc	
failure	
2	Check electrical connection to hour
2	meter. <u>If OK</u> , replace Compression
0	Module. <u>If indication persists</u> ,
Faulty hour	fit new Electronic Module and refit
meter	original Compression Module.
	Test and purge FuelMaker, reseal.
2	
2	
2	
End of stored error	
messages	
1	Restart FuelMaker.
2	<u>If fault persists</u> , replace
0	Electronic Module.
Failure of motor	Test FuelMaker, reseal.
Drive	

**Table 5 - Diagnostics for “CALL FOR SERVICE” Mode**

Error Code	Corrective Action
0	Check that filling hose is in
1	accordance with installation
2	instructions (hose and nozzle
Excessive blow down	volume).
pressure or vehicle	<u>If OK</u> , start FuelMaker with
check valve stuck	fill hose disconnected from vehicle.
	Allow unit to run until “FULL” is
	indicated and blowdown is normal. <u>If</u>
	<u>blowdown is OK</u> , problem may be
	either excessive total volume
	between FuelMaker and vehicle
	check valve or faulty vehicle check
	valve. <u>If fault persists</u> , fit new
	Electronic Module. <u>If fault persists</u> ,
	fit new Control Module, replace
	original Electronics Module.
	Test and purge FuelMaker, reseal.
0	Replace Compression Module.
0	Test and purge FuelMaker,
2	reseal.
Service overdue	
0	Fit new Control Module.
2	<u>If fault persists</u> , fit new
0	Electronic Module. <u>If OK</u> ,
Failure of high	refit original Control Module.
pressure transducer	
	Test and purge FuelMaker, reseal.
2	Check high pressure system
1	for leaks. <u>If OK</u> , turn off gas
0	supply and restart the
Insufficient pressure	FuelMaker. It should shut down
rise (with tank	within 1 minute indicating
pressure exceeding	“INCORRECT”. <u>If FuelMaker</u>
2 MPa) or beyond 6	<u>does not shutdown within 1</u>
minutes after start	<u>minute</u> fit new Control Module.
up	
	<u>If shutdown OK</u> , restore gas supply
	and connect empty test kit. Check
	filling time.
	<u>If filling time excessive</u> fit new
	Compression Module. <u>If fault</u>
	<u>persists</u> , fit new Control Module. <u>If</u>
	<u>OK with new Control Module</u> , refit
	original Compression Module.
	Test and purge FuelMaker, reseal.
<u>Note:</u> This shutdown function is not operative if DIP switch #3 is in the on position.	

**Table 5 - Diagnostics for “CALL FOR SERVICE” mode, cont’d**



## REPLACEMENT OF FUELMAKER COMPONENTS:

Under most circumstances, the FuelMaker can be repaired in the field. When it is necessary to remove the entire unit please refer to the section entitled "REMOVING THE FUELMAKER".

### Preparation For Replacement of Any Module:

**Shut off all electrical power to the FuelMaker.** Unlock and open the hinged cover. Pull the fill hose clear of the break-away fitting. The gas utility seal should then be broken and the top cover removed.

### Compression Module Removal (see Figure 3):

#### -turn off gas supply.

-remove the acoustic shroud. Early models may have a 2 piece acoustic shroud.

-release the internal residual pressure by loosening the fitting at the end of the large low pressure hose (7/8" (22 mm) or 15/16" (24 mm) wrench) attached to the Compression Module; undo the fitting.

-disconnect the high pressure tube at the Swagelok coupling (covered by a rubber sleeve). Ensure that the body of the coupling remains with the long section of the tube. **Note: The short curved piece of the tube must be returned with the Compression Module.**

-tilt the Electronic Module forward by depressing the release tabs and disconnect the hour meter/temperature sensor - do not remove the sensor from the Compression Module.

-remove the two long Compression Module mounting screws, locking washers, and levelling bar which attach the Compression Module to the motor mounting bracket. **Note:** the four screws on top of the Compression Module; these must be left untouched.

-the Compression Module can now be lifted from the FuelMaker.

-the plastic bushings in the compressor/motor coupling normally remain in the motor half of the coupling; if they stick to the pins of the compressor half of the coupling they must be removed before returning the compressor for service; one or two flat screwdrivers can be used to pry the bushings off the pins.

**Note: DO NOT SET THE COMPRESSION MODULE DOWN ON THE COUPLING PINS AS THE SHAFT WILL BE DISPLACED.**

### Compression Module Replacement:

-carefully lower the replacement Compression Module into position, taking care to align and engage the three compressor coupling pins into the motor coupling (make sure that the plastic bushings are in the motor coupling holes), and orient the gas connections to enable the low and high-pressure lines to be connected.

-replace the two Compression Module mounting screws, locking washers, and levelling bar. **Note:** The levelling bar should be level with the two screws fingertight. Then tighten each screw  $\frac{3}{4}$  of a turn. Ensure that the levelling bar is level i.e. keep the same gap between the Compression Module and the bar at each end. If a gap cannot be maintained at each end then the screws are too tight (back them off a  $\frac{1}{2}$  turn) or the bar is bent (replace it). Then apply an additional  $\frac{1}{8}$  turn. **Note:** If either screw is over-tightened the Compression Module coupling will not align properly and noise and damage may result.

-remove transportation seals from the new Compression Module gas connections and fit these to the Compression Module which is being replaced.

-reattach the low and high pressure gas connections.

-reconnect the hour meter/temperature sensor to the Electronic Module.

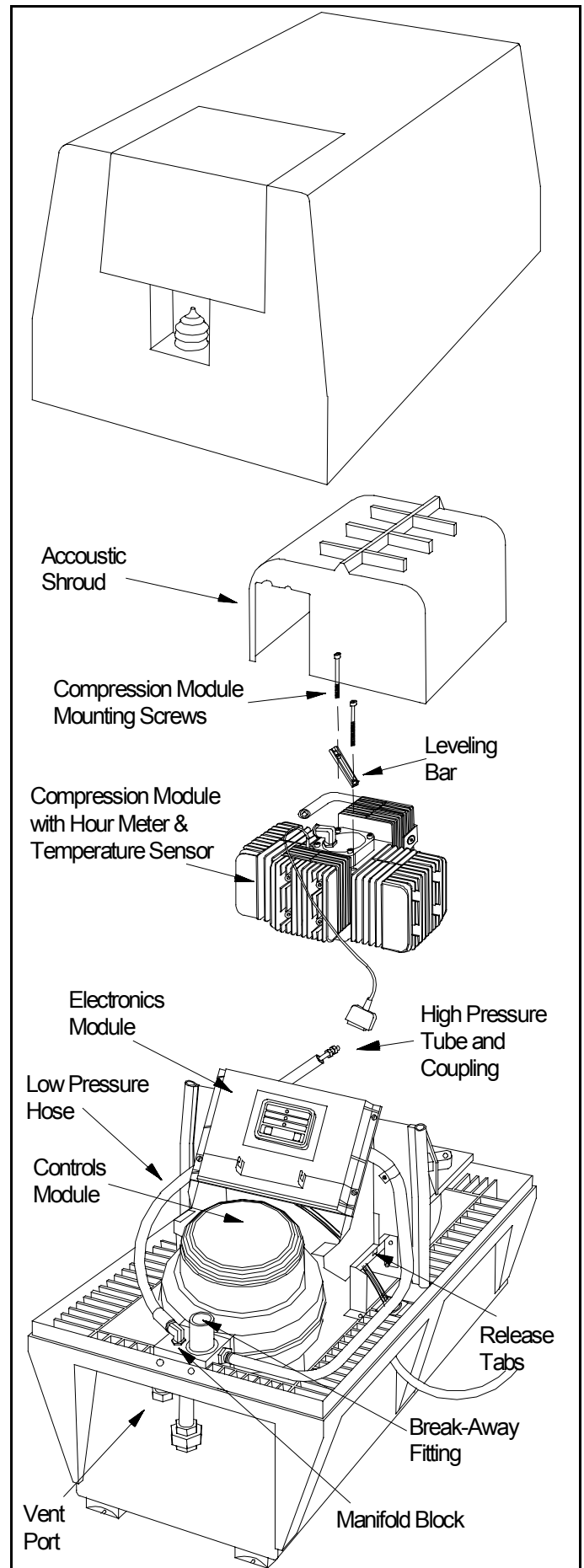


Figure 3 - FuelMaker With Compression Module Removed

- reconnect the electrical power.
- turn on gas supply.
- purge and test the FuelMaker checking the gas connections to and from the Compression Module for leaks.
- replace the acoustic shroud(s).
- replace and reseal the top cover of the FuelMaker.

### Motor Removal:

- see Figure 4
- if the motor is defective or if the coupling is noisy the motor can be replaced with its coupling.
- ensure that the power and gas supply are off.**
- remove the Compression Module as outlined above.
- tilt the Electronic Module forward to remove the motor wires.
- loosen but do not remove the four bolts holding the motor to the motor mounting bracket.
- loosen but do not remove the four screws which secure the tops of the four air guide vanes to the motor mounting bracket.
- loosen and remove the four nuts holding the motor mounting bracket to the rubber mounts - note position of motor in the housing.
- lift bracket/motor assembly straight up and turn the motor upside down i.e. fan on top.
- remove and set aside the four air guide vanes.
- insert a 3/8 hex bolt into the brass bushing in the centre of the fan and tighten until the fan is driven off the motor shaft; do not attempt to pry off the fan with screw drivers! Note the position of the motor mounting bracket on the motor.
- lay the motor on its side and remove the four hex bolts and bracket from the motor.

**Please Note:** the compressor coupling is matched to the motor shaft by FuelMaker and can only be replaced in a properly equipped workshop following an approved procedure. Accordingly, FuelMaker Corp. will supply spare motors with the coupling already mounted. Do not change couplings from one motor to another in the field.

### Motor Replacement:

- attach the motor mounting bracket to the new motor (in the same position as the motor which was removed) and turn fan end up.
- replace the used tolerance ring in the brass bushing with a new one (replacement fans and motors will be supplied with a new tolerance ring).
- push the fan onto the shaft end until it stops; then using a drift with a diameter of no more than 19mm (3/4") and a hammer, drive the fan all the way onto the shaft end (it will stop against a shoulder on the shaft).
- spin the fan to ensure wobble free operation.
- position the lower ends of the four air guide vanes under the motor protection strap and the upper ends under the screws in the motor mounting bracket.
- lower the motor/bracket/fan assembly into the FuelMaker housing locating the motor mounting bracket on the rubber mounts; replace the four nuts and lock washers which secure the bracket to the mounts.

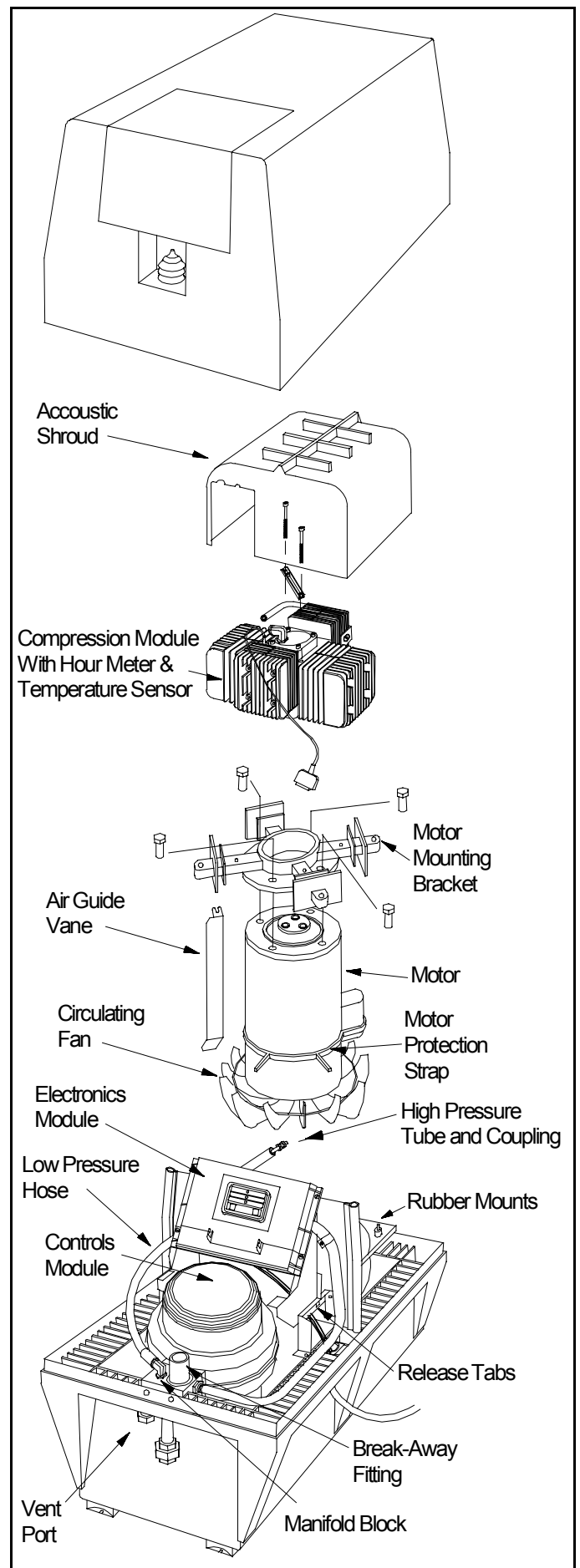


Figure 4 - Removal of Motor, and Fan

- tighten the screws which secure the tops of the four air guide vanes to the motor mounting bracket.
- reconnect the motor wires to the terminals on the Electronic Module.
- replace the Compression Module as outlined above.
- purge, test and reseal the FuelMaker.

### Fan Removal and Replacement:

- if noisy or damaged the fan can be replaced (see Figure 4).
- follow the above steps for motor removal and replacement, leaving the motor and air guide vanes attached to the motor mounting bracket.

### Control Module Removal:

- see Figure 5.
- ensure that power and gas supply to the FuelMaker are turned off.**
- loosen and back off the two manifold block mounting screws two or three turns to release the residual pressure from the Control Module; remove the mounting screws.
- unplug the cable from the Control Module flange.
- tilt the Electronic Module forward by depressing the release tabs (see Figure 5).
- temporarily remove the hour meter cable from the Electronic Module.
- remove the Control Module from the FuelMaker.
- ensure that the manifold sealing plate remains with the Control Module.
- seal the Control Module gas passages e.g. with tape.

### Control Module Replacement:

- position the manifold mounting screws in the manifold block.
- inspect the sealing plate for any damage to the rubber surfaces.
- lower new Control Module into position.
- tighten the manifold mounting screws.
- reconnect electrical cable.
- return the Electronic Module to its normal position.
- switch on electrical supply to the FuelMaker.
- turn on gas supply.
- test the gas connections at the manifold block for leaks.
- replace and secure cover.
- purge, test and reseal the FuelMaker.

### Electronic Module Removal:

- see Figure 5.
- ensure that the electrical supply to the FuelMaker is turned off.**
- tilt the Electronic Module forward after depressing the release tabs.
- disconnect the motor wires (see Figure 6), electrical supply, external interlocks (if connected), Control Module plug, and the hour meter/temperature sensor.
- remove the Electronic Module's mounting screws.
- remove the rubber gasket from the front of the Electronic Module.

### Electronic Module Replacement:

- place the Electronic Module in position and fix screws.
- replace the rubber gasket on the front of the Electronic Module.
- reconnect the cables removed as above.
- test the FuelMaker and reseal.

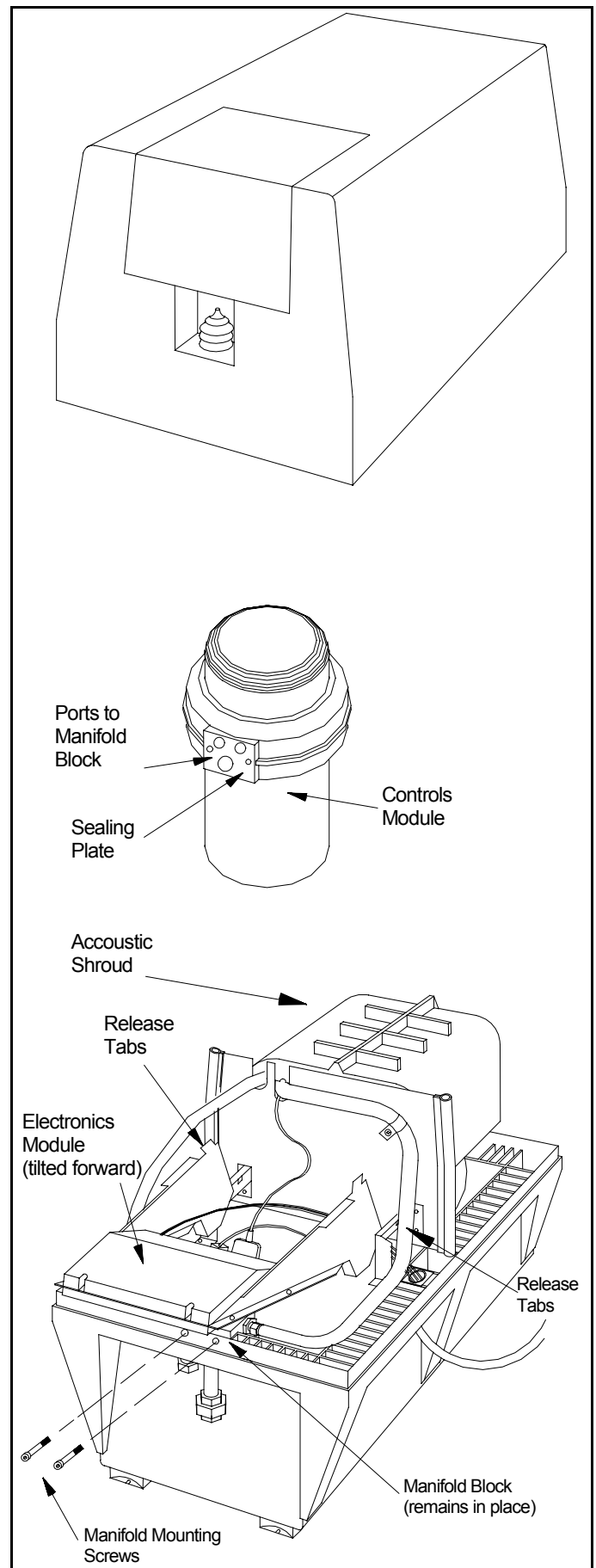


Figure 5 - Control Module Removal

## Removing the FuelMaker:

If for any reason the whole FuelMaker needs to be removed, **first disconnect the Fuelmaker from the electrical supply, turn off the gas supply** and release the residual pressure by loosening one of the fittings on the large low pressure hose.

All normal safety precautions must be observed when disconnecting the FuelMaker. Before transport, the gas inlet connection and the vent should be covered or plugged. The filling hose should either be neatly stowed (e.g., in the FuelMaker) or removed. If the hose is removed, the high pressure outlet on the FuelMaker must be covered or plugged.

## ELECTRONIC MODULE SETTINGS:

The Electronic Module is illustrated in Figure 6. **Ensure that the power is turned off.** Easy access to the terminals, reset button, and connectors is gained by depressing the release tabs on the Electronic Module mounting bracket and tilting the module forward.

The DIP switches are set as follows:

Switch #1 -Place in ON position to allow 280 l (74 U.S. gal) tank volume instead of the standard 140 l (37 U.S. gal)

Switch #2 -Place in ON position to enable remote interlock

Switch #3 -Place in ON position to defeat pressure rise monitoring (This should only be done when the installation is for the fueling of vehicles with tankage well in excess of 280 l (74 U.S. gal) )

Switch #4 -Not Used

Switch #5 -Leave in OFF position

Note - The FuelMaker monitors the pressure rise at the fueling hose in order to check for possible leaks (if pressure does not rise sufficiently, a leak is presumed). Of course, the pressure rise is dependant on the volume of the vehicle's tanks. Switch #1 permits the slower pressure rise expected with a tank volume of 280 l (74 U.S. gal). Switch #3 permits zero pressure rise in the rare situation where the vehicle's tanks are well in excess of 280 l (74 U.S. gal) - it should not be used unless absolutely necessary and after the user is made aware that leakage at the hose will **not be monitored**.

The reset button is also shown in Figure 6 - following correction of any of the "CALL FOR SERVICE" faults it should be pressed to clear the fault. Two power fuses (15 A. 230 Volt) are also located near the terminal strips on the back of the Electronic Module.

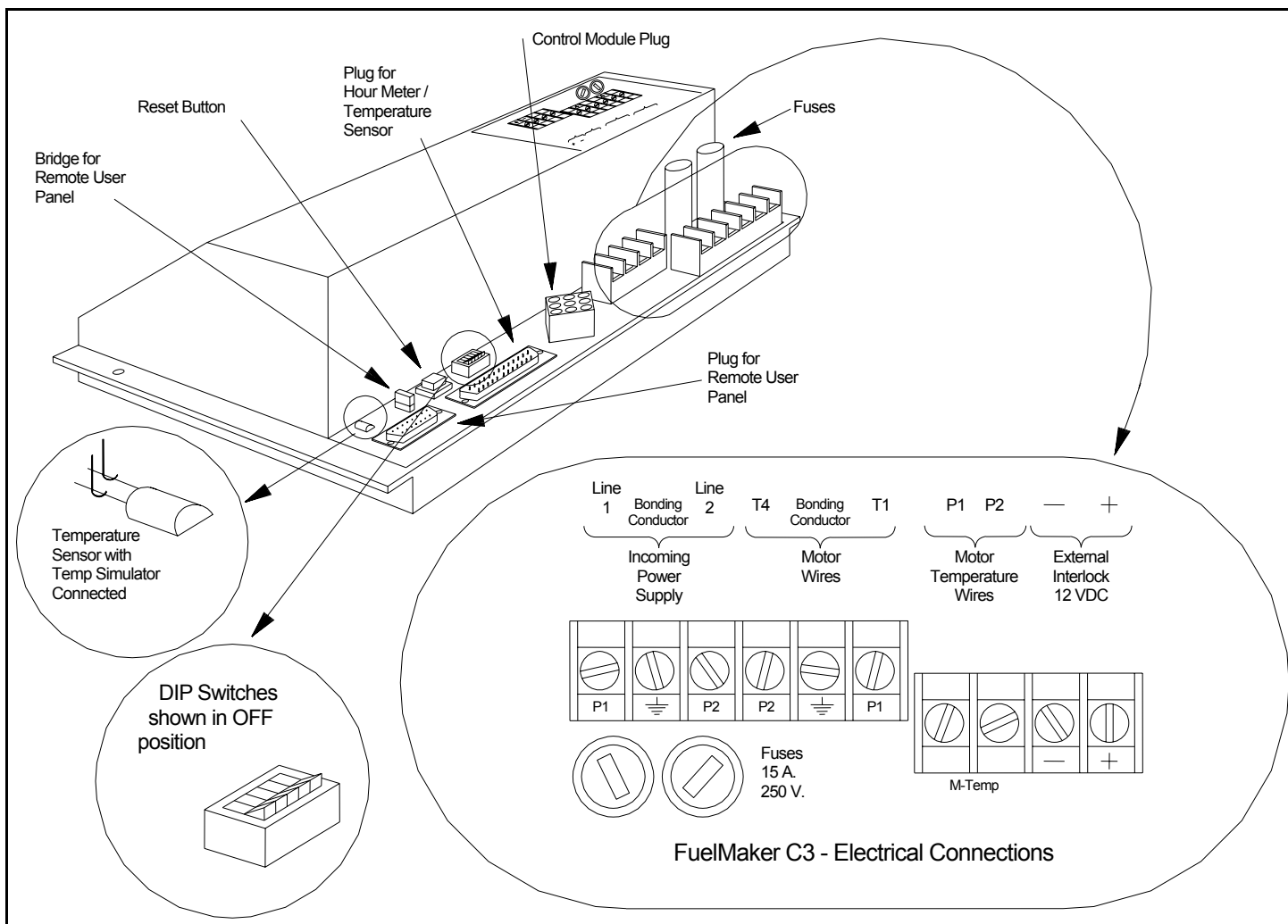


Figure 6 - Connections to Electronic Module