

## Vehicle Refueling Appliance



## Operating Instructions

**This VRA Shall Only be Installed by Trained and Certified Personnel and Shall Only be Operated by a Trained Vehicle Owner or Operator**

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## **SAFETY GUIDELINES**

These instructions contain information that is very important to know and understand. This information is provided for **SAFETY** and to **PREVENT EQUIPMENT PROBLEMS**. To help recognize this information, observe the following symbols.

**! WARNING**

Indicates a hazardous situation that, if not avoided, MAY result in death or serious injury.

**! CAUTION**

Indicates a potentially hazardous situation that, if not avoided, MAY result in or moderate or minor injury.

**! NOTICE**

Indicates important information that, if not followed, MAY cause damage to the equipment.

**The information contained within this manual is subject to change without notice**



## SAFETY PRECAUTIONS

**Read and understand these instructions as well as the operating instructions before installing Phill.  
Failure to follow these instructions may result in serious injury, death or property damage.**

### 1. NO SERVICEABLE COMPONENTS

The internal components of *Phill* are not user serviceable. If *Phill* requires service, it shall only be carried out by FuelMaker authorized service personnel.

**! NOTICE** *Do not attempt to dismantle Phill or tamper with any components. To do so will void all warranties.*

### 2. PHILL INSTALLATION

**! NOTICE** *Installation of Phill shall be carried out by qualified persons only.*

In the interest of safety, *Phill* installation requirements are designed to take into account *Phill's* performance as well as that of the vehicle being fueled and therefore may differ from the requirements of local codes and regulations. The requirements of these instructions take precedence over local codes and regulations unless those codes or regulations are more stringent than the recommendations. Particular attention should be paid to Codes and Standards dealing with natural gas vehicle refueling.

If you experience any difficulties or are unsure about any feature of *Phill*, contact FuelMaker's Technical Support Group at :

**North America:** 1-866-MY-PHILL (1-866-697-4455)

**International:** +1-416-674-3034 (extension 290)

### 3. INTENDED FOR REFUELING NATURAL GAS VEHICLES ONLY

*Phill* is for use with Natural Gas only. *Phill* shall be used to fill cylinders with either a minimum working pressure of 20.7 MPa (3000 psig) for model HRA-P30, or a minimum working pressure of 24.8 MPa (3600 psig) for model HRA-P36.

**! WARNING** *Attempts to use Phill for any purpose other than its intended use may result in serious injury or death.*

### 4. INDOOR REFUELING

For refueling of vehicles indoors:

- 1) The natural gas fuel system in the vehicle shall be installed by the Original Equipment Manufacturer or by an OEM authorized company, AND;
- 2) The natural gas fuel system in the vehicle must have 2 check valves, or an equivalent degree of redundancy.

**After-market converted vehicles DO NOT meet this criteria and therefore shall only be refueled outdoors.**

### 5. LOCATION OF PHILL

*Phill* may be installed indoors in a unoccupied location (i.e. garage) or outdoors. It shall be installed in non-hazardous locations as defined by the NFPA 70 National Electrical Code (USA) and the C22.1 Canadian Electrical Code(Canada).

### 6. VENTILATION

When installed indoors, *Phill's* ventilation system exhausts approximately 140 cfm of air to the outdoors during operation. Ensure that the area in which *Phill* has been installed has adequate air infiltration to replace the exhausted air. A minimum vent opening of 5" (127 mm) in diameter or equivalent area of 20 square inches shall be provided.

### 7. REFUELING HOSE

The refueling hose assembly must be protected from physical damage, abrasion, and from being driven over. The nozzle shall be stored in its cradle when not in use.

Inspect the hose regularly. If signs of wear, deterioration, or other damage are apparent, it shall be replaced immediately.

### 8. P30 / P36 NOZZLE INCOMPATIBILITY

There are two types of nozzles used in natural gas refueling. The P30 nozzle is used for 20.7 MPa (3000 psig) systems and the P36 nozzle is used for 24.8 MPa (3600 psig) systems. In order to prevent over pressurization of the vehicle cylinder, a P36 nozzle cannot be connected to a P30 receptacle.

### 9. REFUELING PRECAUTIONS

The vehicle being filled and *Phill* shall be positioned such that they are both exposed to the same ambient temperature during refueling (i.e. both are indoors or both are outdoors).

**! WARNING** *Do not run the vehicle engine while refueling and ensure all ignition sources are OFF (including pilot lights in recreational vehicles). Do not smoke or bring an open flame within 1.5m (5') of the refueling point.*

### 10. IF YOU SMELL GAS

- Turn off *Phill's* inlet gas valve.
- Extinguish open flames and turn off all sources of ignition.
- If it is safe to do so, close the manually-operated tank valve of the vehicle being refueled.
- Ventilate the area.
- Contact your gas supplier or authorized service representative.
- DO NOT interrupt power to *Phill*.



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## 1 INTRODUCTION

FuelMaker model *HRA-P30* and *HRA-P36 Vehicle Refueling Appliances* are self-contained appliances designed to refuel natural gas vehicles. They operate on a 120 or 230 VAC electrical supply and a low pressure natural gas supply.

*Phill* is designed to fill 20.7 MPa (3000 psig) fuel systems at a nominal flow rate of 1.44 m<sup>3</sup>/hr (0.85 scfm) and 24.8 MPa (3600 psig) fuel systems at nominal flow rate of 1.37 m<sup>3</sup>/hr (0.8 scfm).

*Phill* contains ambient temperature sensors that allow it to determine the maximum pressure to be delivered to the vehicle tank in order to prevent over pressurization should the tank warm after being filled.

*Phill's* software monitors pressure rise in the vehicle tank during refueling as a function of the hose leak detection diagnostics. The total maximum tank capacity that can be monitored is 150 liters (approximately 40 US gallons) water capacity.

*Phill* incorporates a self-regenerating natural gas dryer to remove moisture that may be present in the gas supply.

During the fill cycle, the gas dryer will automatically purge the accumulated moisture.

*Phill* is equipped with an internal gas sensor. An external gas sensor can be connected to *Phill* where required by local Codes. When natural gas is detected at 20% of the Lower Explosive Limit an alarm will sound, the "Error" LED will illuminate, and *Phill's* compressor will shutdown while the ventilation fan continues to operate.

*Phill* is air-cooled and is rated for an operating ambient temperature range of -40°C to +46°C (-40°F to +115°F). Cooling air is drawn into *Phill* through a grill on the bottom of the housing and is vented outdoors through an opening on the top or rear of the *Phill* cabinet.

A User Panel, located on the front of the cabinet, incorporates the Start and Stop buttons, a *Phill Meter* and four status indicator LEDs.

*Phill* is designed to be maintenance free and requires no regular servicing. There are no user serviceable parts inside.

## 2 TECHNICAL SPECIFICATIONS

GAS		
Maximum Discharge Pressure:	Model: HRA-P30 Model: HRA-P36	20.7 MPa @ 21°C (3000 psig @ 70°F) 24.8 MPa @ 21°C (3600 psig @ 70°F)
Minimum Inlet Pressure:		1.7 kPa (7" water column) at rated flow
Maximum Inlet Pressure:		3.5 kPa (14" water column) at rated flow
Nominal Flow Rate (60 Hz)	Model: HRA-P30  Model: HRA-P36	1.44 m <sup>3</sup> /hr @ 21°C and 1.7 kPa inlet (0.85 scfm @ 70°F and 7" w.c. inlet)  1.37 m <sup>3</sup> /hr @ 21°C and 1.7 kPa inlet (0.80 scfm @ 70°F and 7" w.c. inlet)
ELECTRICAL		
Electrical Supply:		120 VAC 60Hz / 230 VAC 50 Hz, Single Phase
Circuit Ampacity:		15 Amps
Full Load Amperage:		10 / 4 Amps
Average Power Consumption:		800 Watts
MECHANICAL		
Dimensions (H x W x D):		762 mm x 356 mm x 330 mm (30" x 14" x 13" )
Unit Weight / Shipping Weight:		43.2 kg (95 lbs) / 50 kg (110 lbs)
Noise Level:		45 dBA @ 5 m (16.5 ft) open field (full sphere)
Ambient Temperature Rating:		-40°C to +46°C (-40°F to +115°F)

**Table 1 Technical Specifications**

## 3 OPERATION

### 3.1 GENERAL

Vehicle refueling is started by pressing the START button on the User Panel (Figure 1). *Phill* will stop automatically when the vehicle tank has filled to the maximum temperature compensated pressure or if an operational ERROR is detected.

*Phill*'s User Panel has 4 LEDs (Light Emitting Diodes) that display the operating status and a 5 LED *Phill Meter* indicating the rising fuel level in the vehicle tank.

Pressing the START button will cause all LEDs to flash momentarily. The cooling fan will start running, *Phill* will begin refueling the vehicle and the *Phill Meter* LEDs will indicate the fuel level in the vehicle tank. Upon completion of the refueling cycle the compression module will stop and the cooling fan will continue to run for a period of time. If the STOP button is pressed both the compression module and cooling fan will shutdown immediately.

After refueling has stopped the high pressure gas contained in the hose is discharged into *Phill*. This procedure reduces the pressure at the nozzle allowing it to be disconnected safely. During this blowdown process, which takes about 10 seconds, *Phill* cannot be restarted.

The refueling hose is pre-coiled to allow it to be neatly stored. It incorporates an in-line breakaway assembly that will separate if the vehicle is driven away while the nozzle is still attached to the vehicle. The refueling hose has an effective reach of 3.6 m (12'). Do not stretch the refueling hose beyond 3.6 m (12').

**! CAUTION** *DO NOT attempt to separate the refueling hose breakaway assembly while vehicle is refueling. To do so could result in serious injury.*

### 3.2 REFUELING PROCEDURE

**! CAUTION** *Ensure there is sufficient lighting in the refueling area to see the User Panel and refueling hose assembly.*

1. Connect *Phill*'s refueling nozzle to the vehicle by aligning with the vehicle receptacle. Push the nozzle until the sleeve moves forward to firmly lock it onto the vehicle receptacle.
2. Press the START button on the User Panel to begin the refueling operation.
3. When refueling has stopped automatically, or when the STOP button is pressed, wait 10 seconds. Push the nozzle assembly towards the vehicle receptacle while pulling back on the outer sleeve of the nozzle to disconnect it from the vehicle receptacle. Place nozzle into its cradle for storage.

*If all the LEDs are flashing and the unit beeps every 4 seconds and you cannot disconnect the nozzle from the vehicle, refer to section "4.2 ERROR CONDITIONS, Blowback" of these instructions for details.*

### 3.3 USER PANEL INDICATORS

#### Power

The POWER LED will illuminate as long as there is electrical power supplied to *Phill*. When initially plugged in the POWER LED will flash for a period of time before becoming steadily illuminated indicating *Phill* is ready to use.

#### Fueling

The FUELING LED will illuminate during the refueling operation. A hose leak detection diagnostics are performed periodically during refueling. This causes *Phill* to interrupt filling 25 seconds after the start of refueling, again every 2 hours and again when the vehicle tank is at 97% full. See Figure 2 for the refueling sequence.

The STOP button can be pressed at any time and *Phill* will shutdown immediately.

#### Drying (Natural Gas Dryer)

*Phill* incorporates a self-regenerating natural gas dryer to remove moisture from the gas. The natural gas dryer will periodically purge itself of accumulated water in order to function efficiently. During the gas dryer regeneration cycle the DRYING LED will illuminate, the refueling operation is suspended and the FUELING LED goes out.

Regeneration is initiated automatically every 8 hours of operation. Vehicle refueling will be interrupted for approximately 30 minutes while the natural gas dryer regenerates. If the STOP button is pressed during the regeneration cycle, the gas dryer regeneration operation will resume with the next refueling.

Refueling will resume automatically upon completion of the gas dryer regeneration cycle and the FUELING LED will illuminate. See Figure 2 for the refueling sequence.

*The DRYING operation can occur between refueling cycles causing the ventilation fan to run. Pushing STOP during the last 30 minutes of the regeneration cycle does not stop the ventilation fan. The fan will stop automatically at the completion of the regeneration cycle.*

#### Error

When *Phill* detects an operational fault, such as low voltage, insufficient inlet pressure or a gas leak, the ERROR LED will illuminate and *Phill*'s compressor will shutdown.

Refer to section 4.6 TROUBLESHOOTING and section 4.7 USER PANEL ERROR DISPLAY for further instructions.

*The ventilation fan will continue to run after an ERROR has occurred.*

### 3 OPERATION

#### Phill Meter

During refueling the *Phill Meter's* 5 LEDs will illuminate from bottom-to-top, indicating the fuel level in the vehicle tank.

Each *Phill Meter* LED will illuminate in sequence as the vehicle tank fills. When the vehicle tank is full, all 5 LEDs will remain lit and *Phill* will stop refueling. Pressing the STOP button will clear the *Phill Meter* after completion of the refueling cycle.

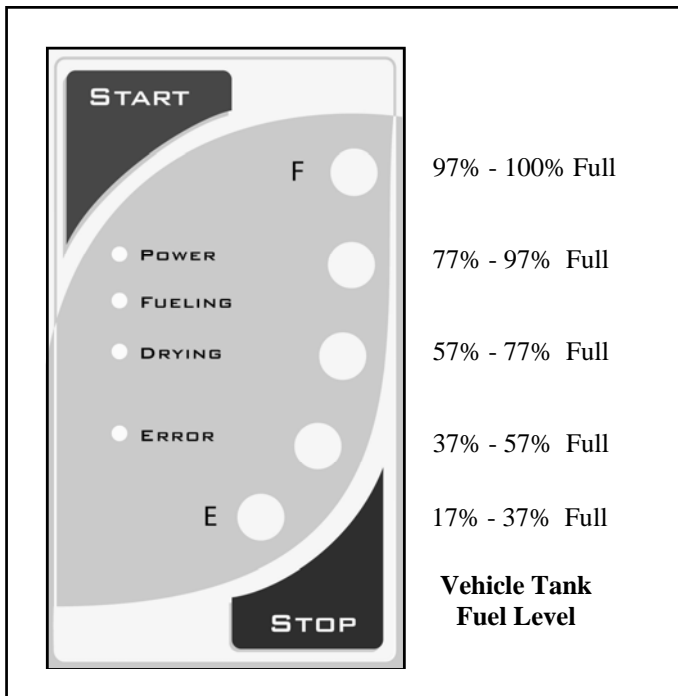


Figure 1 User Panel and Phill Meter

#### Refueling Sequence

During a refueling cycle, *Phill* goes through a series of functions including; periodic hose leak checks and dryer regeneration. The sequence of events is depicted in Figure 1.

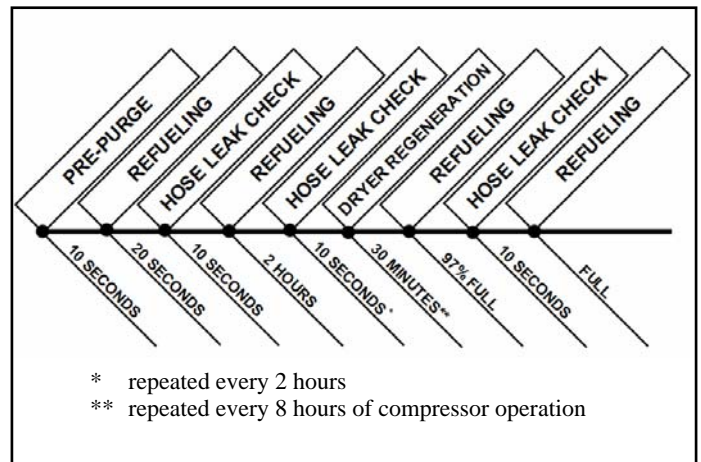


Figure 2 Refueling Sequence

HRA-P30	HRA-P36
20.5 - 20.7 MPa / 2969 - 3000 psig @ 21°C / 70°F and >	24.5 - 24.8 MPa / 3565 - 3600 psig @ 21°C / 70°F and >
19.0 MPa / 2760 psig* @ 10°C / 50°F	22.8 MPa / 3315* @ 10°C / 50°F
17.6 MPa / 2555 psig* @ 0°C / 32°F	21.1 MPa / 3065* @ 0°C / 32°F
16.2 MPa / 2345 psig* @ -10°C / 14°F	19.4 MPa / 2815* @ -10°C / 14°F
14.7 MPa / 2140 psig* @ -20°C / -4°F	17.7 MPa / 2570* @ -20°C / -4°F
13.3 MPa / 1930 psig* @ -30°C / -22°F	16.0 MPa / 2320* @ -30°C / -22°F
11.9 MPa / 1725 psig* @ -40°C / -40°F	14.3 MPa / 2075* @ -40°C / -40°F
*Note: Pressure readout may vary ± .20 MPa / 30 psig	*Note: Pressure readout may vary ± .25 MPa / 35 psig

Table 2 Vehicle Tank Pressure vs. Ambient Temperature

## 4 SERVICE

### 4.1 GENERAL

If *Phill* requires service, it shall only be carried out by a FuelMaker authorized service representative. Please contact an authorized service representative for service or removal of *Phill*.

**! WARNING** *Do not attempt to dismantle Phill or tamper with any components. To do so will void all warranties and could result in serious injury or death.*

### 4.2 ERROR CONDITIONS

If *Phill* detects a operational fault, it will stop refueling the vehicle and the ERROR LED will illuminate. In general, it is good practice to unplug *Phill* for 10 seconds, unless there is a gas leak, to reset all internal data before attempting to restart *Phill* during an ERROR condition. Call FuelMaker if the ERROR persists.

#### Blowback

If the ERROR LED is illuminated and all 5 *Phill* Meter LEDs are flashing and the unit beeps every four seconds a blowback condition has been detected. A blowback occurs when the check valve in the vehicle receptacle is unable to seal after *Phill* shuts down and natural gas from the vehicle flows back through the hose causing the pressure inside *Phill* to build up. *Phill*'s sensors and software will detect this condition and automatically seal off the blowback until the user can intervene. However, the resulting high pressure in the hose will prevent the nozzle from being removed from the vehicle receptacle.

**! CAUTION** *If the nozzle cannot be removed from the vehicle receptacle, DO NOT attempt to force the nozzle off or separate the refueling hose breakaway. Refer to the following instructions or contact an authorized service representative.*

If you experience a blowback condition, press the STOP button, wait ten seconds and disconnect the nozzle. Depending on the vehicle fuel system, you may need to repeat this procedure 2 or 3 times before the nozzle releases.

If you are still unable to disconnect the nozzle, the pressure in the vehicle fuel system must be reduced manually to facilitate removal of the nozzle. There are two types of vehicle fuel systems and it is important to follow the appropriate procedure.

**! CAUTION** *The following instructions for reducing the vehicle fuel system pressure manually must be clearly understood and carefully followed. If you are unsure or unable to carry out this procedure, contact an authorized service representative.*

#### Vehicles With Manually Operated Tank Valves

If the vehicle has a manually operated tank valve, close the valve and then press the STOP button on *Phill*. Wait ten seconds and disconnect the nozzle. Depending on the vehicle fuel system, you may need to repeat this procedure 2 or 3 times before the nozzle releases.

**ⓘ IMPORTANT NOTE:** *Many vehicles have a 1/4 turn shutoff valve in the fuel line between the cylinder and the engine. Do not mistake this valve for the manually operated tank valve mentioned above. A manually operated valve is located directly on the end of the cylinder.*

Once you have disconnected the *Phill* nozzle from the vehicle, do not attempt to use the vehicle or *Phill* until the cause of the blowback has been determined. Contact the vehicle manufacturer or their representative.

#### Vehicles Without Manually Operated Tank Valves

If the vehicle does not have a manually operated tank valve, the pressure in the vehicle cylinder must be released by allowing it to vent to atmosphere through *Phill*. Follow these steps:

1. Do Not unplug *Phill*.
2. Extinguish all open flames in the area.
3. Ensure that the vent line from *Phill* terminates outdoors and that the vented natural gas will not impinge on building openings (e.g. windows, doors, mechanical air intakes etc.) or potential gas-trapping pockets (e.g. overhangs etc.)
4. If the vehicle is parked indoors, open the garage door(s) and any windows in the garage.
5. Turn off the circuit breaker supplying power to *Phill*. Natural gas will begin to vent through *Phill*'s vent line.
6. Carefully monitor the venting of gas throughout the process to ensure it disperses safely. This may take up to 30 minutes depending on the capacity of the vehicle cylinder and how full it was when the condition occurred.

**ⓘ IMPORTANT NOTE:** *If you need to stop or interrupt the flow of gas at any time, turn on the circuit breaker supplying power to Phill. Phill will automatically seal off the flow of gas until the process can be resumed.*

7. Once the flow of vented gas has slowed and stopped, the vehicle cylinder is empty and the *Phill* nozzle can be disconnected.
8. Turn on the breaker supplying power to *Phill*.

Once you have disconnected the *Phill* nozzle from the vehicle, do not attempt to use the vehicle or *Phill* until the cause of the blowback has been determined. Contact the vehicle manufacturer or their representative.

## 4 SERVICE

### Gas Alarm

If gas is detected at 20% of the Lower Explosive Limit an alarm will sound, the ERROR LED will illuminate, *Phill* will stop the compressor refueling the vehicle and the exhaust fan will continue to operate.

The gas alarm will continue to sound and the exhaust fan will continue to ventilate the area until the gas/air mixture concentration has diminished to safe level. Observe the Safety Precautions found in section **4.5 TROUBLESHOOTING, YOU SMELL NATURAL GAS** until the alarm condition has reset. The compressor will restart and continue refueling the vehicle once the alarm has reset.

The gas alarm may be activated by chemicals spilled or stored in the garage. Do not use *Phill* until the source of the gas alarm has been determined.

The gas sensor will take 2 hours to stabilize after unit installation. Treat all gas alarm occurrences as if they were actual gas leaks and follow all precautions until cause of gas alarm is determined.

**! WARNING** *If a gas leak is detected turn off the gas supply to Phill and contact your authorized service representative. Do not use Phill until all leaks are repaired.*

### 4.3 BREAKAWAY ASSEMBLY

In the event that the vehicle is driven away with the *Phill* refueling hose still connected to the vehicle, the refueling hose will safely separate at the breakaway assembly located in the refueling hose and stop the flow of gas, .

If the vehicle is driven away while *Phill* is refueling and the refueling hose is still connected to the vehicle, the hose will safely separate at the breakaway and stop the flow of gas. The nozzle assembly will have to be de-pressurized (using a depressurizing tool available from FuelMaker) in order to remove it from the vehicle receptacle. Contact your installer or FuelMaker Corporation for further information on the depressurizing tool. To reconnect the breakaway assembly:

- Clean and inspect breakaway assembly. If it appears to be damaged, contact an authorized service representative.
- Push the male tubing of the breakaway assembly into the body of the breakaway fitting until it is securely attached.

Leak test the breakaway assembly after separation:

- With the refueling nozzle in the cradle, start *Phill*. With *Phill* running, perform a leak test by applying a soap water solution to the entire breakaway assembly. Look for bubbles indicating leaks.

### 4.3 BREAKAWAY ASSEMBLY continued

**! WARNING** *If leaks are detected, turn off the gas supply to Phill and contact your authorized service representative. Do not use Phill until leaks are repaired.*

### 4.4 PREVENTATIVE MAINTENANCE

To ensure many years of trouble free operation it is recommended that preventative maintenance be practiced. Ensure no items are placed against *Phill* and that the service clearances are maintained at all times.

#### Visual Inspection of Phill and Venting

Periodically inspect *Phill* for any damage and:

1. Check for obstructions or damage to the cooling air intake louver on the bottom of *Phill*.
2. Inspect the cooling exhaust ducting and PRV vent line for damage, obstructions or leaks.
3. Inspect the remote gas sensor for damage.
4. Inspect power cord for damage.
5. Inspect User Panel for cuts, punctures or lifting.

#### Refueling Hose

The refueling hose shall be inspected regularly, checking for kinks, cuts, holes or abrasions. A leak test can be performed using a non-corrosive leak detection fluid (soapy water) applied to the refueling hose and breakaway assembly while *Phill* is running. Look for bubbles indicating leaks. Replace the hose if it leaks or is damaged.

#### Refueling Nozzle

The nozzle must not be exposed to debris, dirt, water or chemicals. Contamination increases the potential for nozzle malfunction and decreases nozzle life. The nozzle shall be stored in its cradle when not in use.

The refueling nozzle should be cleaned and lubricated monthly to keep the assembly parts moving freely. Clean the inside of the nozzle with rubbing alcohol and a clean lint free cloth to remove debris from the assembly. Lubricate the nozzle by spraying a dry silicone lubricant, such as Dow Corning 557, into the nozzle opening.

**! NOTICE** *Do not use petroleum based lubricants (such as WD40) as these products leave a film that will attract dirt and other contaminants.*

#### Vehicle Refueling Receptacle

The vehicle refueling receptacle should be inspected whenever the vehicle is serviced. Refer to the vehicle owners manual for details. Always keep the vehicle receptacle covered when not in use.

## 4 SERVICE

### 4.5 SERVICE HOURS

The User Panel can display the accumulated operating hours of *Phill*. To obtain the information, first press “STOP” to clear the *Phill Meter*. Press and hold the “STOP” and “START” buttons simultaneously to display the service hour code. Refer to the table below to determine service hours based on the *Phill Meter* LEDs. (Black dot indicates illuminated LED)

Service Hours	Phill Meter Display	Service Hours	Phill Meter Display	Service Hours	Phill Meter Display
0 to 249	F ○ ○ ○ E ●	2,000 to 2,249	F ● ○ ○ E ●	4,000 to 4,249	F ● ○ ○ E ●
250 to 499	F ○ ○ ● E ○	2,250 to 2,499	F ○ ● ○ ● E ○	4,250 to 4,499	F ● ○ ○ ● E ○
500 to 749	F ○ ○ ○ ● E ●	2,500 to 2,749	F ○ ● ○ ● E ●	4,500 to 4,749	F ● ○ ○ ● E ●
750 to 999	F ○ ○ ● ○ E ○	2,750 to 2,999	F ○ ● ● ○ E ○	4,750 to 4,999	F ● ○ ● ○ E ○
1,000 to 1,249	F ○ ○ ● ○ E ●	3,000 to 3,249	F ○ ● ● ○ E ●	5,000 to 5,249	F ● ○ ● ○ E ●
1,250 to 1,499	F ○ ○ ● ● E ○	3,250 to 3,499	F ○ ● ● ● E ○	5,250 to 5,499	F ● ○ ● ● E ○
1,500 to 1,749	F ○ ○ ● ● E ●	3,500 to 3,749	F ○ ● ● ● E ●	5,500 to 5,749	F ● ○ ● ● E ●
1,750 to 1,999	F ○ ● ○ ○ E ○	3,750 to 3,999	F ● ○ ○ ○ E ○	5,750 to 5,999	F ● ● ○ ○ E ○

### 4.6 TROUBLESHOOTING

The “ERROR” LED will illuminate anytime an operational problem with *Phill* is detected. Refer to the troubleshooting steps below and those found in section 4.7 **USER PANEL ERROR DISPLAY** of these instructions for more detail and for corrective action.

#### USER PANEL DOES NOT RESPOND TO START OR STOP BUTTONS

- ✓ Unplug *Phill's* power cord, wait 10 seconds and plug in again.
- ✓ Check for power at the receptacle.
- ✓ Check the fuse or breaker at the electrical panel.

#### ERROR LED IS ILLUMINATED

- ✓ Ensure that *Phill's* inlet gas supply shutoff valve is open.
- ✓ Ensure that *Phill's* cooling air intake louvers, exhaust air ducting and the pressure relief valve outlet and piping are free of obstructions.
- ✓ Unplug *Phill's* power cord, wait 10 seconds and plug in again.

#### YOU CAN'T DISCONNECT PHILL NOZZLE FROM VEHICLE (refer to section 4.2 “Blowback” of this manual for more detail)

- ✓ Wait ten seconds after stopping *Phill* manually before attempting to remove the *Phill* nozzle from the vehicle.
- ✓ Push the nozzle assembly towards the vehicle receptacle while pulling back on the outer collar of the *Phill* nozzle.
- ✓ If the “ERROR” LED is illuminated, close the manually operated vehicle tank valve and push “STOP”. Wait 10 seconds and disconnect the *Phill* nozzle.

#### PHILL HOSE BREAKAWAY FITTING HAS SEPARATED

- ✓ Refer to section “4.3 Breakaway Assembly” of these *Operating Instructions*, for information on reconnecting the Breakaway Assembly.

#### YOU SMELL NATURAL GAS

- ✓ Turn off *Phill's* inlet gas valve.
- ✓ Extinguish open flames and turn off all sources of ignition.
- ✓ If possible, close the manually-operated tank valve of the vehicle being refueled.
- ✓ Ventilate the area.
- ✓ Contact your gas supplier or authorized service representative.
- ✓ DO NOT interrupt power to *Phill*.

## 4 SERVICE

### 4.7 USER PANEL ERROR DISPLAY

Phill has diagnostic capabilities that continuously monitor operation and display error conditions using the User Panel *Phill Meter*. If *Phill* detects an Error, the red Error LED will illuminate.

To display the error code, push and hold the “STOP” button. Refer to the table below for the type of error and corrective action. Do not attempt repairs to the unit. Contact a qualified FuelMaker service representative for assistance.

☀ = flashing LED

● = illuminated LED



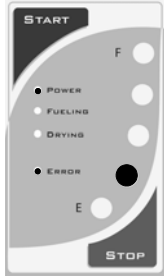
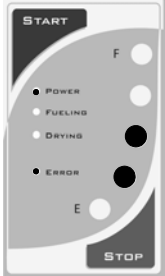
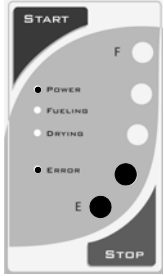
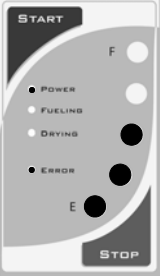
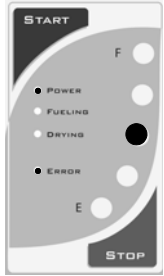
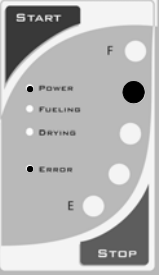
Error Display	Corrective Action	Error Display	Corrective Action
 <p><b>Low Inlet Pressure (00001)</b></p>	<ul style="list-style-type: none"> <li>✓ Confirm gas inlet pressure at <i>Phill</i> is within specification. Inlet pressure must be 1.7 – 3.5 kPa (0.25 – 0.50 psig).</li> <li>✓ Ensure that the 1/4 turn shut-off valve is fully open.</li> <li>✓ Check if gas pipe size is sufficient for pressure / flow.</li> <li>✓ Check if gas regulator is correct type and size for pressure / flow.</li> </ul>	 <p><b>Motor Over Current (00101)</b></p>	<ul style="list-style-type: none"> <li>✓ Confirm supply voltage to <i>Phill</i> is within specification.</li> <li>✓ 120 VAC supply voltage must be 108 - 126 VAC.</li> <li>✓ 240 VAC supply voltage must be 216 - 252 VAC.</li> <li>✓ Check voltage at receptacle.</li> <li>✓ Check voltage at service panel.</li> </ul>
 <p><b>Low Voltage (00010)</b></p>	<ul style="list-style-type: none"> <li>✓ Confirm supply voltage to <i>Phill</i> is within specification.</li> <li>✓ 120 VAC supply voltage must be 108 - 126 VAC.</li> <li>✓ 240 VAC supply voltage must be 216 - 252 VAC.</li> <li>✓ Check voltage at receptacle.</li> <li>✓ Check voltage at service panel.</li> </ul>	 <p><b>Internal Gas Alarm (00110)</b></p>	<ul style="list-style-type: none"> <li>✓ Check the following for the source of a gas leak: <ul style="list-style-type: none"> <li>- Nozzle</li> <li>- Breakaway assembly</li> <li>- Refueling hose</li> <li>- Inlet piping</li> <li>- Vehicle</li> <li>- Other combustibles stored in refueling area.</li> </ul> </li> <li>✓ Repair as required.</li> </ul>
 <p><b>Blowdown Failure (00011)</b></p>	<ul style="list-style-type: none"> <li>✓ Check breakaway assembly for obstructions.</li> <li>✓ Check nozzle for obstructions.</li> <li>✓ Check vehicle refueling receptacle for obstructions or binding.</li> <li>✓ Clean / replace vehicle receptacle as required.</li> </ul>	 <p><b>No Pressure Rise (00111)</b></p>	<ul style="list-style-type: none"> <li>✓ Check the following for the source of a gas leak: <ul style="list-style-type: none"> <li>- Nozzle</li> <li>- Breakaway assembly</li> <li>- Refueling hose</li> <li>- Vehicle</li> </ul> </li> <li>✓ Repair as required.</li> </ul> <p>This error may occur if the vehicle tank pressure is too low i.e. tank nearly empty. Use public refueling station.</p>
 <p><b>Motor Overheated (00100)</b></p>	<ul style="list-style-type: none"> <li>✓ Confirm supply voltage to <i>Phill</i> is within specification.</li> <li>✓ Check cooling exhaust vent for obstructions.</li> <li>✓ Check cooling air inlet louvers for obstructions.</li> <li>✓ Check exhaust duct size and length. <ul style="list-style-type: none"> <li>- Minimum 5" diameter ducting.</li> <li>- Maximum 45 feet run length and no more than 3 changes in direction.</li> </ul> </li> </ul>	 <p><b>Sudden Pressure Drop (01000)</b></p>	<ul style="list-style-type: none"> <li>✓ Check the following for the source of a gas leak: <ul style="list-style-type: none"> <li>- Nozzle</li> <li>- Breakaway assembly</li> <li>- Refueling hose</li> <li>- Vehicle fuel system</li> </ul> </li> <li>✓ Repair as required.</li> </ul>

Table 3 User Panel Error Display

## 4 SERVICE

### 4.7 USER PANEL ERROR DISPLAY continued



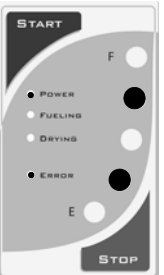
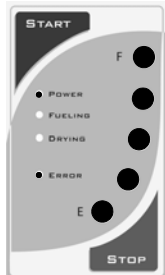
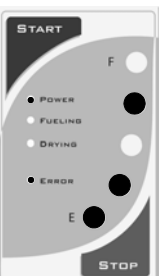
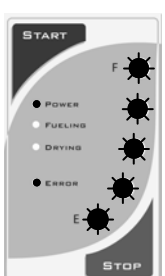
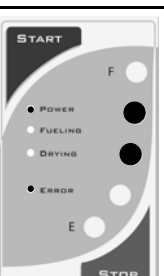
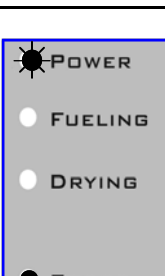
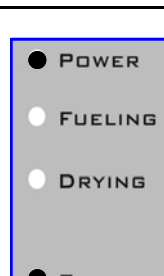
Error Display	Corrective Action	Error Display	Corrective Action
 <b>Low Cooling Air Flow (01001)</b>	<ul style="list-style-type: none"> <li>✓ Check cooling exhaust vent and ducting for obstructions.</li> <li>✓ Check cooling air inlet louver for obstructions.</li> <li>✓ Check exhaust duct size and length.                             <ul style="list-style-type: none"> <li>- Minimum 5" diameter ducting.</li> <li>- Maximum 45 feet run length and no more than 3 changes in direction.</li> </ul> </li> <li>✓ Ensure there is sufficient replacement air into the refueling area</li> </ul>	 <b>Remote Gas Alarm (01101)</b>	<ul style="list-style-type: none"> <li>✓ Check for the following for the source of a gas leak:                             <ul style="list-style-type: none"> <li>- Nozzle</li> <li>- Breakaway assembly</li> <li>- Refueling hose</li> <li>- Inlet piping</li> <li>- Vehicle</li> <li>- Other combustibles stored in refueling area.</li> </ul> </li> <li>✓ Repair as required.</li> </ul>
 <b>Maximum Run Time Exceeded (01010)</b>	<ul style="list-style-type: none"> <li>✓ Check the following for leaks.                             <ul style="list-style-type: none"> <li>- Nozzle</li> <li>- Breakaway</li> <li>- Refueling hose</li> <li>- Vehicle fuel system</li> </ul> </li> <li>✓ Restart <i>Phill</i>.</li> </ul>	 <b>Non Serviceable Error (11111)</b>	<ul style="list-style-type: none"> <li>✓ Unplug <i>Phill</i> for 1 minute and plug back in to reset.</li> </ul>
 <b>Excessive Inlet Pressure (01011)</b>	<ul style="list-style-type: none"> <li>✓ Confirm gas inlet pressure at <i>Phill</i> is within specification. Inlet pressure must be 1.7 – 3.5 kPa (0.25 – 0.50 psig).</li> <li>✓ Check gas regulator is correct type and size for pressure /flow.</li> </ul>	 <b>Blowback</b>	<p>Refer to section <b>4.2 ERROR CONDITIONS Blowback</b> of these instructions on how to correct this condition.</p> <ul style="list-style-type: none"> <li>✓ Inspect vehicle receptacle and repair as required.</li> </ul> <p><b>Do not use vehicle until cause of blowback has been determined.</b></p>
 <b>Hose Leak (01100)</b>	<ul style="list-style-type: none"> <li>✓ Check breakaway assembly for obstructions or damage.</li> <li>✓ Inspect hose assembly for damage or leaks.</li> <li>✓ Inspect nozzle assembly for damage or debris.</li> <li>✓ Inspect vehicle refueling receptacle for debris or damage.</li> <li>✓ Clean / replace as required.</li> </ul>	 <b>Calibration Error</b>	 <b>Software Error</b>

Table 3 User Panel Error Display

## 4 SERVICE

### 4.7 USER PANEL ERROR DISPLAY continued

☼ = flashing LED

● = illuminated LED


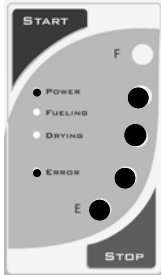



Error Display	Corrective Action	Error Display	Corrective Action
 <p><b>Start Button Failure (10001)</b></p>	<ul style="list-style-type: none"> <li>✓ Check the following by substitution:               <ul style="list-style-type: none"> <li>- User Panel</li> <li>- Header PCB</li> <li>- Ribbon cable</li> </ul> </li> <li>✓ Replace front housing if problem persists.</li> </ul>	 <p><b>Air Flow Switch (01111)</b></p>	<ul style="list-style-type: none"> <li>✓ Check the air flow switch for the following:               <ul style="list-style-type: none"> <li>- Obstructions or debris</li> <li>- Proper movement of air flow switch</li> </ul> </li> <li>✓ Confirm level installation of <i>Phill</i>.</li> <li>✓ Check air flow switch voltages.</li> </ul>
 <p><b>Stop Button Failure (10010)</b></p>	<ul style="list-style-type: none"> <li>✓ Check the following by substitution:               <ul style="list-style-type: none"> <li>- User Panel</li> <li>- Header PCB</li> <li>- Ribbon cable</li> </ul> </li> <li>✓ Replace front housing if problem persists.</li> </ul>		
 <p><b>Internal Gas Sensor Failure (10011)</b></p>	<ul style="list-style-type: none"> <li>✓ Check and clean gas sensor.</li> <li>✓ Check internal gas sensor voltages.</li> </ul>		
 <p><b>Gas Sensor Reference Voltage Failure (10100)</b></p>	<ul style="list-style-type: none"> <li>✓ Check internal gas sensor voltages.</li> </ul>		

Table 3 User Panel Error Display

## 5 DISPOSAL

### 5.1 DISPOSAL

At the end of *Phill's* life cycle, it is important to plan a careful disposal of the unit. *Phill* contains a drying desiccant that absorbs mercaptan from the natural gas during the refueling process which is considered as hazardous waste.

#### DO NOT DISPOSE OF PHILL WITH YOUR HOUSEHOLD WASTE.

*There is no danger of exposure to hazardous waste however, the disposal must be performed according to Federal and State environmental protection guidelines.*

In order to adhere to these guidelines, owners must call their local / county health or household hazardous waste management agencies to schedule a pick-up or drop-off.

These authorities have collection facilities available for the appropriate disposal of hazardous waste such as Mercaptan. These facilities usually have specific schedules for the collection of hazardous waste, so please contact them to find their applicable pick up schedule in your area.

The *Phill* unit to be disposed of must be carefully packed and labeled. In California, a special label has been designed to mark such as hazardous waste and is available at your local environmental protection/health agencies. Please find an example of such a label below.

#### Steps to be taken for the disposal of *Phill*:

1. Call your local hazardous waste management / environmental protection / health agency to inquire about specific procedures applicable to your area, including obtaining appropriate labeling for disposal.
2. Have a qualified installer remove *Phill* as per the *Installation Instructions* (see section 6.1).
3. Pack the product carefully.
4. Label the product according to the special labeling requirement.
5. Call your applicable authority to schedule a pick-up or to locate the hazardous waste collection facility for a drop-off.
6. Dispose of *Phill*.

For additional information on Household Hazardous Waste disposal agencies and contacts, you can also call FuelMaker at 416-674-3034.

HAZARDOUS WASTE	
STATE AND FEDERAL LAW PROHIBIT IMPROPER DISPOSAL. IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY AUTHORITY, THE U.S. ENVIRONMENTAL PROTECTION AGENCY OR THE CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL.	
GENERATOR INFORMATION:	
NAME <u>UNIVERSITY OF CALIFORNIA, BERKELEY</u>	
ADDRESS <u>UNIVERSITY HALL 3RD FLOOR</u> PHONE <u>510-642-3073</u>	
CITY <u>BERKELEY</u> STATE <u>CA</u> ZIP <u>94720-1150</u>	
EPA ID NO.	MANIFEST DOCUMENT NO.
EPA WASTE NO. <u>0008</u> CA WASTE NO. <u>181</u> ACCUMULATION START DATE	
CONTENTS, COMPOSITION: <u>LEAD BATTERY CHIPS</u>	
SPECIAL STRAT DATE: <u>11-01-01</u>	
PHYSICAL STATE: <input checked="" type="checkbox"/> SOLID <input type="checkbox"/> LIQUID	HAZARDOUS PROPERTIES: <input type="checkbox"/> FLAMMABLE <input checked="" type="checkbox"/> TOXIC
<input type="checkbox"/> CORROSIVE <input type="checkbox"/> REACTIVITY <input type="checkbox"/> OTHER	
D.O.T. PROPER SHIPPING NAME AND UN OR NA NO. WITH PREFIX	
<b>HANDLE WITH CARE!</b>	
STYLE CFWG48	

LABEL MASTER® (800) 621-0202 www.labelmaster.com



