System Overview
Quick-Start Guide
Mini-Hybrid® Cooling System for Refuse Applications

Prepared for __________________
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Product Overview

The EMP Mini-Hybrid® Cooling System is a revolutionary advanced thermal product designed for heavy duty vehicles. The Mini-Hybrid® is ideal for retrofitting/refurbishing existing fleets. Benefits include better fuel economy and lower maintenance costs. EMP’s Mini-Hybrid® uses proprietary precision cooling algorithms to manage cooling needs of engines and AC systems. The strategy employed maintains temperatures within an ideal range for operation.

Each Mini-Hybrid® Fan Array contains variable-speed electric fans and an EMP TMC™ system controller. The assembly replaces the OEM mechanical fan and shroud and is designed to fit on the OEM radiator. There is no need to replace the radiator or charge air cooler. The system is available in configurations for each truck model.
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INTRODUCTION

Purpose
The purpose of the Quick Start Manual is to present basic information and procedures required to properly service and maintain your Mini-Hybrid® cooling system. Complete documentation is available in Service Manuals, Service Drawings and Troubleshooting documents located on the EMP Website at www.emp-corp.com.

Service Technician Responsibilities
Ensure that all safety messages and information messages are read and understood before installation, maintenance, or any repairs are performed. The person who services the Mini-Hybrid® may be unfamiliar with many of the components on the product. It is important to use caution when service work is performed. Knowledge of the Mini-Hybrid® system and operation are important before the removal or disassembly of any component.

Liability Disclaimer
EMP cannot anticipate every possible circumstance that might involve a potential hazard. The safety messages in this document, in related manuals, and on the product are therefore not all inclusive. If a tool, procedure, work method, or operating technique that is not specifically recommended by EMP is used, you must satisfy yourself that it is safe for you and for others. You should ensure that the product will not be damaged or be made unsafe by the operation, maintenance, or repair procedures that you choose.

Definition of Terms
LH = Left Hand
RH = Right Hand
CAC = Charge Air Cooler
JW = Jacket Water
LED = Light Emitting Diode
EMP-Link™ = EMP LIN Based Propriety Serial Data Bus
TMC™ = Thermal Management Controller
FiL-11™ = 11” Fan with Integral Controller and EMP-Link Communications
FiL-15™ = 15” Fan with Integral Controller and EMP-Link Communications
SAFETY

Warnings, Cautions & Notes

Three types of headings are used in this manual to stress your safety and safe operation of the system. They appear in the text as follows:

⚠️ WARNING: This symbol is used to make you aware of an unsafe condition, hazard, or practice that can result in personal injury or death.

⚠️ CAUTION: This symbol is used to alert you to a condition or practice that can cause damage to the system or the vehicle, or both.

NOTE: Is used to provide additional information that requires special attention by the technician.

Product Safety Warnings

⚠️ WARNING: EMP cannot anticipate every possible circumstance that might involve a potential hazard. The safety messages in this document, in related manuals, and on the product are therefore not all inclusive. If a tool, procedure, work method, or operating technique that is not specifically recommended by EMP is used, you must satisfy yourself that it is safe for you and for others. You should ensure that the product will not be damaged or be made unsafe by the operation, maintenance, or repair procedures that you choose.

⚠️ WARNING: Ensure that all safety messages and information messages are read and understood before installation, maintenance, or any repairs are performed. The person servicing may be unfamiliar with many of the systems on the vehicle. It is important to use caution when service work is performed. Knowledge of the vehicle system and operation are important before the removal or disassembly of any component.

⚠️ WARNING: Make sure the vehicle is in neutral, the parking brake is set, and the wheels are blocked before doing any work or diagnostic procedures on the Mini-Hybrid® or vehicle.

⚠️ WARNING: Disconnect the main negative battery cable and/or switch off the battery disconnect switch before installation or servicing.

⚠️ WARNING: Use extreme caution when working on systems under pressure (i.e. coolant, hydraulic fluids, air, fire suppression, etc...)

⚠️ WARNING: Make sure the work area is ventilated and well lit.

⚠️ WARNING: Make sure charged fire extinguishers are in the work area.

⚠️ WARNING: Reinstall all safety guards, shields, and covers after servicing the vehicle.

⚠️ WARNING: Make sure all tools, parts, and service equipment are removed from the engine compartment and vehicle after all work is done.

⚠️ WARNING: Ensure that all system power and ground connection points are torqued to EMP specifications to prevent system damage. Failure to follow specified torque requirements at any point of the vehicle system power and ground can result in loose connections which can damage electronic components on the Mini-Hybrid® and will void EMP warranty.
EXPLANATION OF FUNCTION

The Mini-Hybrid® Fan Array consists of variable-speed electric fans and an EMP TMC™ system controller. The Mini-Hybrid® system replaces the OEM mechanical fan and shroud, while mounting directly to the OEM radiator with no need to replace the radiator or charge air cooler.

The Mini-Hybrid® fan array configuration varies by vehicle make, model, and year.

Each FiL-15™ fan can draw up to 70 Amps
Each FiL-11™ fan can draw up to 30 Amps

For the Mini-Hybrid® system pictured to the right:
- 3 FiL-15™ (12V) @ 70 Amps each
- 2 FiL-11™ (12V) @ 30 Amps each
- Maximum total draw = 270 Amps
- Based on field test data, Mini-Hybrid® systems consume less than 40% of max current for 90% of operation time.
  - The OEM alternator must be replaced with a high-output alternator. EMP will provide recommendations.

Fan speeds are controlled via the EMP TMC™ system controller using three automatic fan control inputs:

**Engine coolant temperature**
- Controls fan speeds based on engine coolant temperature reported by the ECU

**Intake manifold temperature**
- Controls fan speeds based on intake manifold temperature reported by the ECU

**Air conditioning/windshield defrost**
- Controls fan speeds based on AC compressor duty cycle

Figure 1 - Mini-Hybrid® System for 2013 Peterbilt 320
**CAN/J1939 Communications**

Engine coolant and intake manifold temperature inputs from the ECU are acquired by installing a Y-adapter harness in the existing vehicle CAN wiring. The CAN communication protocol is SAE J1939 Protocol. The EMP CAN adapter harness is located under the dash panels on most trucks. See Figure 2.

**AC Control**

Air conditioning input is obtained by installing a Y-adapter harness in the existing AC compressor power circuit. The EMP AC adapter harness is located near the AC compressor on most trucks. See Figure 3.

![Figure 2](image1.png)

![Figure 3](image2.png)
**Explanation of Function**

**Ignition Source**

Mini-Hybrid® systems require a key on/off-based ignition source.

The system can obtain ignition from a variety of locations depending on the vehicle. Usual locations include fuse panels, auxiliary equipment control units, and dash instrument clusters. See Figure 4 and Figure 5.

![Figure 4](image1.png)

**Push Button Reverse**

The Fan Reverse/Diagnostic LED Panel is located in the cab. See Figure 6. Press the fan reverse button and immediately release to activate a fan reverse cycle. This function helps to clean debris from the radiator.

The vehicle must be stationary (vehicle speed = 0).

The diagnostic light will illuminate to indicate that the reverse cycle has been activated and after a short delay, the fans will run at max speed in reverse for 20 seconds. Pressing the button a second time at any point after reverse cycle initiation will cancel the reverse cycle.

![Figure 6](image2.png)
Explanation of Function

On-Board Diagnostic LED
The Fan Reverse/Diagnostic LED Panel is located in the cab. In the event that the Mini-Hybrid® system experiences a fault, the diagnostic light will flash a code.
Read active fault codes from the blinking cooling system diagnostic LED.

The format of the fault code is:

XX-YY, where
XX is the first number of the fault code
YY is the second number of the fault code

The fault code is communicated by the LED as follows:

1. On for 4 seconds to indicate the start of the fault code list.
2. Off for 2.5 seconds to indicate the start of a single code.
3. A sequence of 0.5 second blinks. The number of these blinks indicates the first number (XX) of the fault code.
4. Off for 1.25 seconds to indicate the start of the second digit of the fault code.
5. A sequence of 0.5 second blinks. The number of these blinks indicates the second number (YY) of the fault code.
6. If multiple fault codes are active, the next active fault code will be communicated beginning with step 2. When all fault codes have been communicated, the fault code list will be repeated beginning with the long on time of step 1. As an example, Figure 7 illustrates code 03-02, a fan 2 communications fault.

![Figure 7](image1.jpg)

If an active fault exists, the Mini-Hybrid® system will continue to operate, but perhaps not normally depending on fault severity

The engine will only derate or disable if necessary based on ECU measurements of excessive temperature(s).

Fault codes are listed in the troubleshooting manual for the system and are available in the Service Suite™ software package available at [www.emp-corp.com](http://www.emp-corp.com).
EMP Service Suite™

When you install Service Suite on your shop computer, several programs and utilities will load and be saved in a program folder “EMP Tools.” An icon will be placed on your desktop for EMPower Connect™, EMP’s diagnostics and control service tool.

Troubleshooting manuals and fault code definitions are available under the Trouble Shooting menu.

The best way to learn about the EMP Service Suite™ is to browse the tutorial located in the Help menu of EMPower Connect™. See Figure 8.

![Figure 8](image-url)
EMPower Connect™ provides interactive Mini-Hybrid® cooling system troubleshooting and diagnostics. When first connected to the system, the program will display the Diagnostics page which lists out active, inactive and pending codes as well as providing links directly to the troubleshooting manual from displayed codes. See Figure 9.

Figure 9

EMPower Connect™ also has a virtual dashboard (F3 – Dash) which allows system monitoring and manual controls. See Figure 10.

Figure 10
TECHNICAL HELP
Contact EMP Customer Service for technical help at +1 (906) 789-7497 or service@emp-corp.com. Additional information about this product is located under the support tab of the EMP official website: www.emp-corp.com

FINAL AUDIT/WARRANTY
Mail, Fax, or Email the completed final audit/warranty registration form located at the end of this document to:

EMP Advanced Development, LLC
2701 North 30th Street
Escanaba, MI, USA 49829
FAX# +1 (906) 789-7825
warranty@emp-corp.com