



# All Electric Idle Mitigation



# Talking Points



## Lower Operating Cost

**\$50,000 of operational savings over the expected life of the apparatus.**

## Fewer Regens

**Idling is the fastest way to clog a DPF. With Eco Idle-Tec your crew spends less time performing stationary regeneration, or driving in circles to burn out the soot.**

## Less Pollution

**Operators have less exhaust exposure, and the apparatus produces fewer greenhouse gas emissions.**

## Seamless Operation

**System works seamlessly without input from the operator.**

## Quiet

**No engine noise since the engine is not running.**

# Introduction

Shutting the main vehicle engine off rather than letting it idle is an ever more common method of “going green” in vehicle design. Newer light duty cars and pickups are often designed to shut the engine off when stopped for red lights as a means of saving fuel and reducing emissions.

REV Fire Group now offers ECO IDLE-TEC, an idle reduction system specifically designed for fire apparatus. The system shuts off the main engine at the emergency scene while seamlessly maintaining power to all the 12-volt functions.

The engine remains off for the duration of the emergency, or until the charge in the system drops to a point where the engine is needed to perform a recharge. Battery recharging begins the minute the engine is started for the return trip, and continues once the apparatus is plugged into shore power at the station.

ECO IDLE-TEC can be optioned for the local environment to maintain cab interior heating or cooling during engine shut-down.

## Table of Contents

<b>Talking Points</b>	<b>2</b>
<b>Introduction</b>	<b>3</b>
<b>Operational Benefits</b>	<b>4</b>
<b>Environmental Benefits</b>	<b>9</b>
<b>Seamless Operations</b>	<b>12</b>
<b>Features and Options</b>	<b>21</b>
<b>Packaging</b>	<b>41</b>



# Operational Benefits

## Fuel Savings

EPA studies have shown that a heavy diesel engine will burn between 0.39 and 1.65 gallons per hour of fuel while idling. The added parasitic and emergency scene loads on a fire apparatus mean the fuel burn rate is probably closer to the high range than the average. The FAMA study shows that a typical urban pumper will spend 747 hours per year at idle without pumping. At \$3 per gallon of diesel, an electric IRT system could save \$2241 per year.

Considering that the typical pumper spends 17 years in active service, extended idle reduction will have an average payback of nearly \$40,000 in fuel savings alone.

Table 7: High, Low, and Average Emissions and Fuel Consumption Rates for 2002 Test Data

	NOx (g/hr)	CO <sub>2</sub> (g/hr)	gal/hr
ARITHMETIC MEAN FOR ALL TESTS			
High Value	329	16,578	1.65
Low Value	55	3,915	0.39
Average Value	144	8,224	0.82
Standard Deviation	72	3571	0.40
Coefficient of Variation	0.5	0.43	0.43
Low RPM avg. (600 - 800 rpm)	114	5805	0.58
High RPM avg. (1000 - 1200 rpm)	190	11815	1.18
WEIGHTED AVERAGE VALUES (60% High RPM, 40% Low RPM):			
Weighted Average Value:	160	9411	0.94
WEIGHTED AVERAGE VALUES (70% High RPM, 30% Low RPM):			
Weighted Average Value:	167	10012	1.00

From EPA Study

**\$2241 x 17 =  
\$38,097 Fuel  
Savings**

### Urban Pumper Hours per Year

Acceleration	80
Deceleration	77
Steady Speed	151
Stopped with Engine Running (Pump Off)	747
Pumping	64
Total	1123

From FAMA TC001 Study

# Oil Change Interval

Oil change intervals are usually determined based on engine hours. A typical urban pumper using idle mitigation will cut engine hours by more than half. This can translate into fewer oil changes and less time out of service. Assuming the engine hours is cut in half, and the oil gets changed twice annually without IRT, the IRT truck could have one less oil change per year amounting to an annual saving of \$300 per year, or \$5100 over the active life of the apparatus.



**One less Oil Change per Year**  
**\$450 per Oil Change**



**\$450 x 17 = \$7,650 Oil Savings**

# Engine Repair Savings

Another benefit to extended idle reduction is the fact that you log fewer engine hours for the same emergency response. This means reduced wear and tear on the engine, extended maintenance intervals, and lower service costs. This also means that the apparatus spends more time in-service, performing the functions that it is intended to perform. Engine service is expensive, and typically not covered under warranty past 5 years.

This means engine repairs for the remaining 12 years of an apparatus active life must be accounted for. On an apparatus that is well maintained and regularly serviced, this may be minimal, but for this study let's assume that cutting our engine hours nearly in half will [4] save another \$1500 over the life of the apparatus.



**Fewer Engine Hours**

**Less Engine Wear**

**Fewer Repair Bills**

**More Time In-Service**

**\$1,500 Savings**

# DPF Maintenance Reduced

DPF regeneration is the next cost savings opportunity. Idling is the bane of the DPF because the low engine load keeps the in-cylinder temperatures low. This leads to more soot in the exhaust and less of this soot being burned off passively. Both these factors cause more stationary regeneration events, which in turn burns more fuel, and wastes the time of your operators. In fact, a stationary regen not only consumes the fuel used to run the engine at high idle, it also injects raw fuel into the exhaust through the doser. If we assume that we can save even one stationary regen event per month by minimizing idle time we can save another twelve hundred dollars in fuel over the life of the truck.



**DPF Ash Cleaning \$850**

**2 Cleanings Saved**

$$\text{\$900} \times 2 = \text{\$1,700}$$

# Operations Summary

Adding up all these savings from Fuel, Oil Engine Repair DPF Regeneration, and DPF Service - comes to a total of over \$50,000 across the active life of an average apparatus in front-line service. It does not account for the additional savings if the unit remains in reserve status for years afterward. These savings may be even higher for your situation, especially if you add the cost of department labor into the equation.

<b>Fuel</b>	<b>\$38,097</b>
<b>Oil</b>	<b>\$7,650</b>
<b>Engine Repair</b>	<b>\$1,500</b>
<b>DPF Regen</b>	<b>\$1,224</b>
<b>DPF Service</b>	<b>\$1,700</b>

## \$50,171 Total Savings



# Environmental Benefits

## Greenhouse Gas Reduction

Greenhouse gas reduction is another benefit. Less idle time means fewer gases being released into the environment. We can get a rough idea of the impact by using the U.S. EPA value of 5 grams of CO<sub>2</sub> saved per ton/mile from the Greenhouse Emissions Model for heavy trucks. The average pumper weighs 20 tons. Multiplying the average miles per year by 17 years yields 110 thousand miles per year. Completing the math we can recognize a total reduction of twelve tons of carbon dioxide over the active life of the apparatus.

**5 g CO<sub>2</sub>/ton-mile saved by IRT**

**Ave apparatus weight 20 tons**

**Urban pumper drives 6428 miles/year**

**Average miles driven in active service 110,126**

**24,091 lbs CO<sub>2</sub> Saved**



# Exhaust Exposure Reduced

Beyond the economic equation, there is the impact on firefighter health from exposure to engine exhaust. Both NFPA 1500 Standard on Fire Department Occupational Safety, Health, and Wellness Program, and NFPA 1901 Standard for Automotive Fire Apparatus recommend that exposure to exhaust should be minimized. The longer vehicle engines run at the scene, the greater the exposure will be. In IRT mode with the engine OFF, there is no exhaust. Exposure is not only minimized, it is eliminated.

## No Engine Emissions With Engine OFF



**10.1.5\*** The fire department shall prevent exposure to fire fighters and contamination of living and sleeping areas to exhaust emissions.



**12.2.6.2** Exhaust pipe discharge shall be directed away from any operator's position.

## Reduced Exposure for Firefighters and Public

# Public Relations Benefits

Public relations is one more reason to Go Green with ECO IDLE-TEC. Toronto Fire Services (shown here) has been reducing idle time using Smeal's SG09 technology for years. The goal of Toronto's Consolidated Green Fleet Plan is to choose vehicles, equipment, fuels and practices that consume less fuel, emit less pollution, and meet the City Fleet's operational requirements. Like SG09, ECO IDLE-TEC can contribute significantly to these goals by offering improvements to Sustainability and Air Quality, all while reducing operating costs. Put it all together and Idle Reduction demonstrates to the public a department that is providing safety services in a way that is responsible to both the taxpayer's wellbeing, and to their wallets.

## Go Green



## Sustainable

## Environmentally Friendly

## Economic Payback



## Positive

## Public

## Relations

# Seamless Operation

ECO IDLE-TEC works by keeping all the 12-volt functions on the apparatus operating with the engine OFF. It shuts the engine down automatically, and seamlessly.

- **Set the parking brake.**
- **Put the transmission in neutral.**
- **Forget about it.**

All the low voltage items continue to function such as: Headlights, Warning Lights, Scene Lights, Perimeter Lights, In-Cab Chargers, Communications Equipment, Compartment Lights, and so on.

For the next 30 minutes to 180 minutes your firefighters can work around the apparatus with **No Noise, and No Exhaust.**



## Engine OFF Operation Includes:

- Headlights
- Warning Lights
- Scene Lights
- Perimeter Lights
- In-Cab Chargers
- Communications Equipment
- Compartment Lights

## No Noise – No Exhaust

# System Interlocks

System Interlocks are provided to ensure proper and safer operation. These include:

- Parking brake must be set.
- Transmission must be placed in neutral.
- Cab must be lowered and latched in place.
- Battery switch and ignition must both be ON.
- Engine must be running.
- Neither the water pump, aerial master, or other PTO function can be engaged (this is to ensure that the operator does not intend to run the pump, aerial, or line voltage generator, all functions that will need the engine ON to operate).
- Shorepower plug cannot be connected.
- Engine must be idling (high idle or below) for 2 minutes steadily.

Once all these requirements are satisfied the engine will shut down, and extended idle mitigation will commence.

**Park brake is set**

**Transmission is in neutral**

**Cab is lowered & locked**

**Battery and Ignition ON**

**Engine Running**

**Pump OFF, PTO OFF**

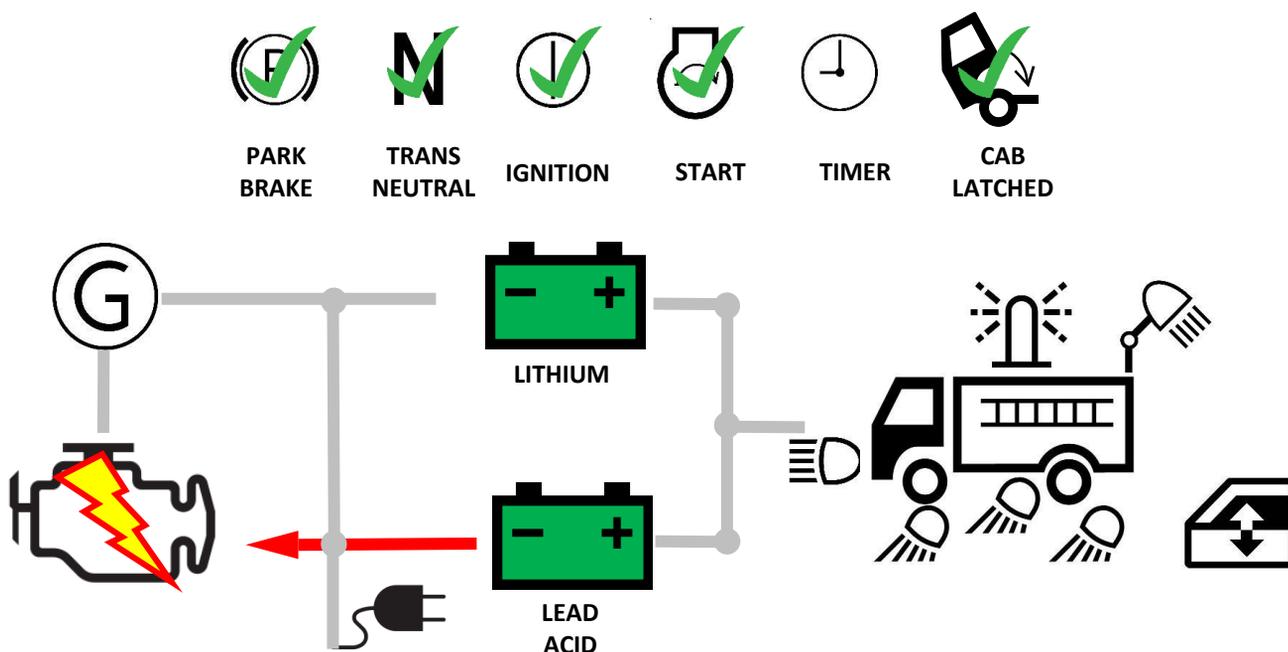
**Shorepower not plugged in**

**Engine idling for 2 minutes.**



# Starting the Engine

The driver enters the cab, turns the ignition ON and presses the starter button. There is a brief delay to make sure that the auto-eject has disconnected the charger, and that the system has switched from the Lithium Iron batteries to the starter batteries. After cranking, the starter batteries are left slightly depleted, but they begin to recharge immediately with power from the alternator. Once the lead acid batteries are full, then the Lithium batteries begin to charge.

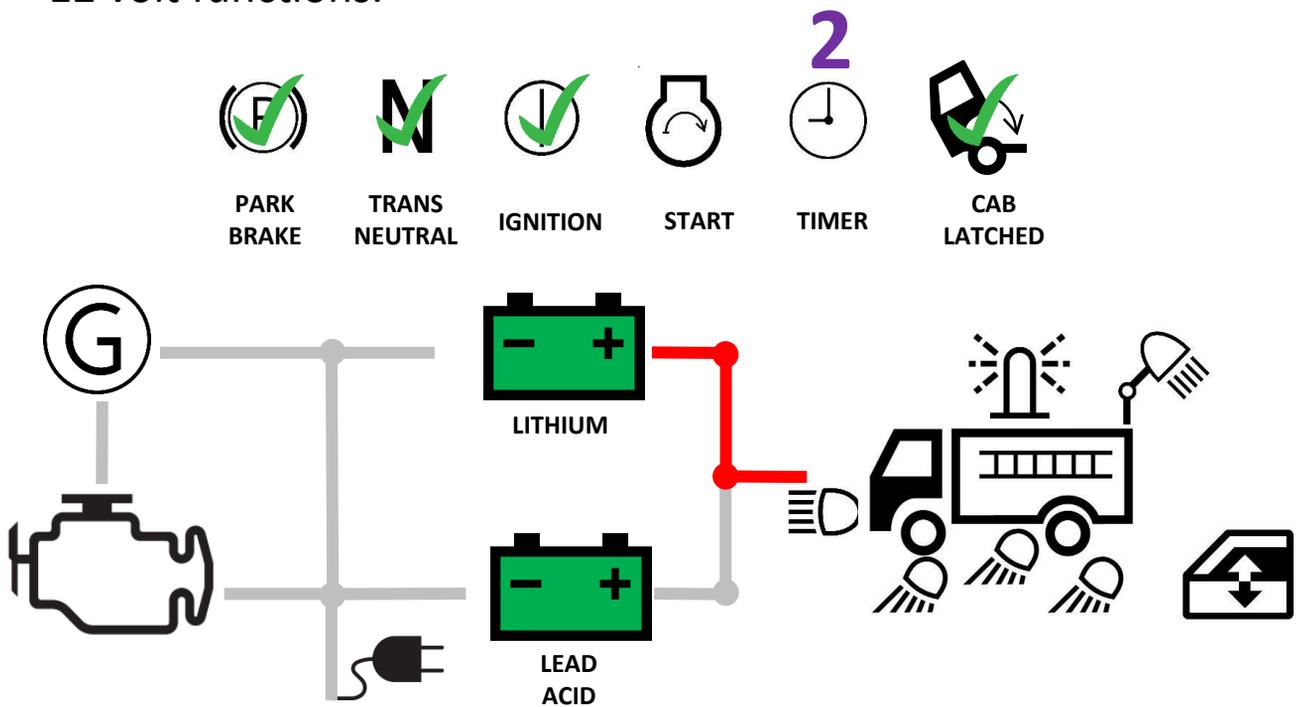


Note: If the apparatus is already in idle reduction mode, and the engine restarts, the apparatus electrical load is being supplied exclusively by the lithium batteries so that all the lead acid battery power can be devoted to starting.



# At the Scene

After arriving at the scene the driver positions the apparatus, sets the parking brake, and places the transmission in neutral. A timer now begins with a factory default of 2 minutes. If the operator places the pump in operation, or engages the aerial master, the engine will continue to run. If not, the timer counts and the engine shuts OFF. The Lithium bank seamlessly takes over providing power to the apparatus 12 volt functions.



## Engine-OFF Disabling

If the shut-down timer is counting down and the operator wishes to keep the engine ON, they can simply tap the brake pedal. This will keep the engine from shutting down until they tap the brake again, or the ignition is cycled OFF and ON.

## Automatic Engine Restart

The **engine will restart automatically** when the Lithium bank drops to a 20 percent state of charge. The alternator will take over providing power. Any excess power goes first to recharge the lead-acid starting batteries. After a few minutes the starter bank will be topped off, and the excess flow of current switches to the Lithium bank.

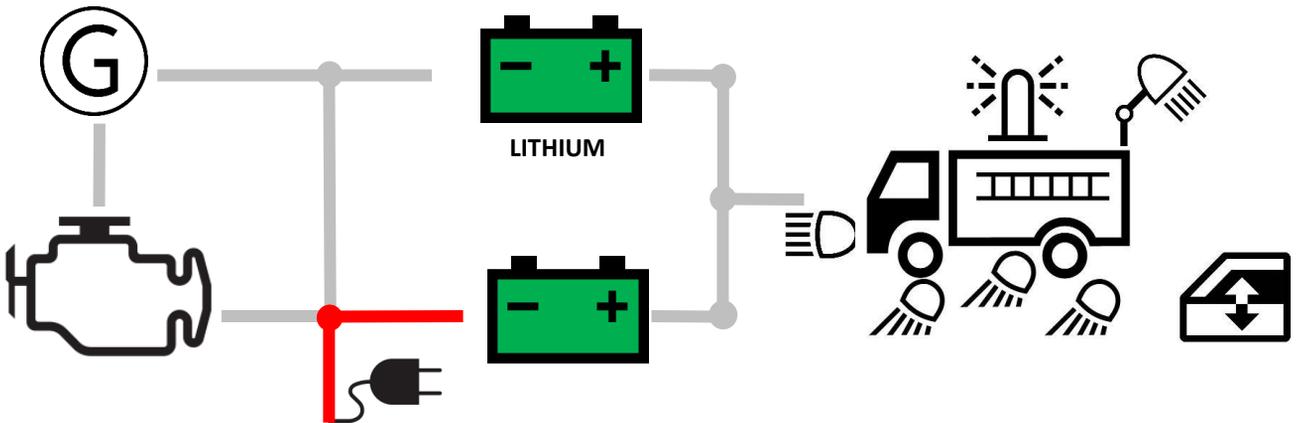
When the Lithium bank reaches a 40 percent state of charge the engine will automatically shut off and the apparatus will again be in IRT mode. This cycle will continue to repeat itself indefinitely, or until the engine is manually started by the operator for return to the station.

## Returning to the Station

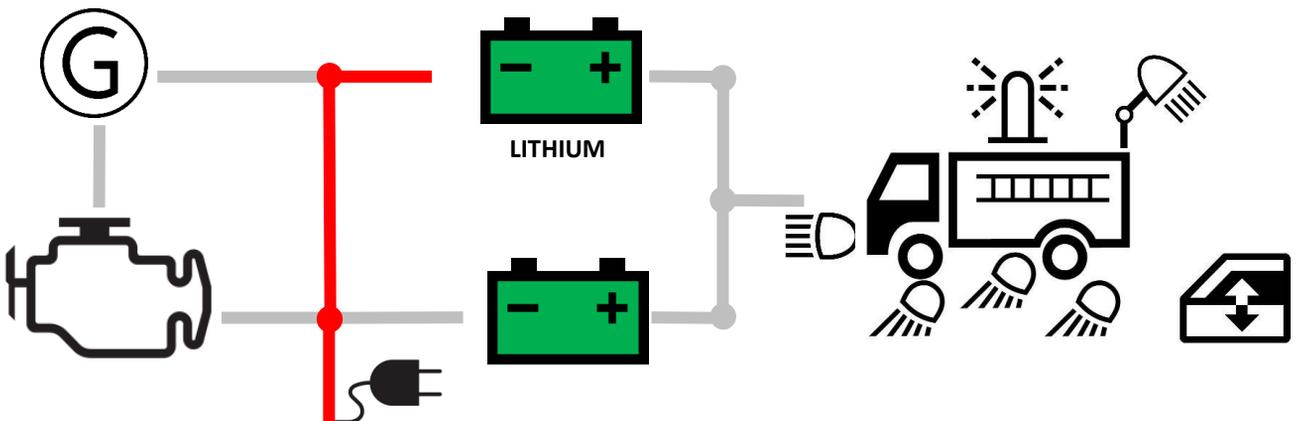
When ready to return to the station, or to the next call, the driver starts the engine and drives as they normally would. During the drive back to the station the lead-acid bank will be topped off first, and then the excess flow of current switches to the Lithium bank to begin replenishment. The amount that the batteries are replenished will depend on the duration of the return trip and the electrical load on the apparatus.

# Back at the Station

Back at the station the driver parks the apparatus, shuts OFF the engine, and turns OFF the ignition. Upon exiting the cab they plug in the shore-power connection. The Lead-Acid batteries are probably already topped off from the return trip to the station, but if not they get a charge.



Next the shore-power charger begins replenishing the Lithium bank. If the apparatus does not remain in the station long enough to top off the Lithium batteries, not to worry. The only consequence is that the engine-OFF time at the next call will be somewhat shorter.



# Features and Options

## Standard Range Package

At the heart of the ECO IDLE-TEC system is a Lithium Iron battery pack with 200 amp-hours of total capacity that yields 160 amp-hours of usable capacity. The battery pack includes an integrated control system that monitors the battery condition and manages engine start and stop. Battery charge state, trouble-shooting, and over-ride control is provided by an in-cab display.

The battery charge is replenished by the alternator any time the engine is running, or by a specialized battery charger when plugged in at the station. The system also includes integrated cellular telematics for remote monitoring of usage and fuel savings trends.

**Lithium Iron Batteries**

**200 Amp-Hour Total Capacity**

**160 Amp-Hour Usable Capacity**

**Integrated Controls**

**In-Cab Display**

**Dual-Voltage Charger**

**Cellular Telematics**



# Power Unit

The standard range Lithium-Iron battery pack and control system provides 2.0 KW-Hours of usable energy. While the batteries hold more power than this, only 80% of the storage capacity is usable because lithium batteries should not be discharged below a 20% state-of-charge. The pack can therefore provide 160 amps of 13.5 volt current for one hour.

Included with the master module is a control system that monitors the state of charge of the batteries, switches between the Lithium bank and the Lead-Acid bank, and runs other essential aspects of power management.

**2000 Watt-Hours Usable Energy**

**160 Amp-Hours Usable 13.5V**

**Current**

**Power Control System**



# Option Flexibility

Unlike the one-size fits all approach of the competition, ECO IDLE-TEC is offered in many configurations to suit the operational needs, climate, and budget of the fire department.

The following pages describe the many options available and the expected range from each.

Be sure to consider that the range is dependent on many factors. A thorough study of this document is necessary to understand the impact of option selections on range and utility. Keep in mind that increasing the range of the system also increases the recharge time. The right solution for the department should consider the following factors:

- Percent of calls without pumping or operating aerial.
- Length of typical run.
- Typical time at scenes without pumping or operating aerial.
- Typical time between runs back at the station.
- On-Scene electrical load.
- Alternator capacity.
- Climate.
- HVAC system use.

# ECO IDLE-TEC Option Matrix

	Warm Climate					Cold Climate				
	(normally above 32° F (0°C))					(frequently below 32° F (0°C))				
	Standard Range	Extended Range	Standard Range w/ Cab Cooling	Extended Range w/ Cab Cooling	Medium Range Extra Cab Cooling	Standard Range	Extended Range	Standard Range w/ Cab Cooling	Extended Range w/ Cab Cooling	Medium Range Extra Cab Cooling
EM-200 (2.0 kw-hr)	1	2	1	2	2	1	2	1	2	2
AC 40 (1.0 kw-hr)			1	1				1	1	
AC 40-24 (1.0 kw-hr)					1					1
Engine-Off Run time Expected - 200 amp draw* (min)	30-45	60-90	30-45	60-90	45-60	30-45	60-90	30-45	60-90	45-60
Engine-Off Run time Expected - 100 amp draw* (min)	60 - 90	120 - 180	60 - 90	120 - 180	90 - 120	60 - 90	120 - 180	60 - 90	120 - 180	90 - 120
Cool-Maintain Engine-Off Cab Air Conditioning (BTU)			11800		23600			11800		23600
Warm-Maintain Engine-Off Cab Heat (BTU)	Standard									
Extra Cab Heat Fuel-Fired 17,000 BTU Heater	Optional					Standard				
Lithium Iron Battery Heat	NA					Standard				
Low Ambient Temp. Override	Engine-Off down to 32°F (0°C)					Engine-Off down to -10°F (-23°C)				
Operator Override Feature	Standard									
Shore-Power Dual-Voltage Charger Circuit (Kusmaul)	Standard									
Cab-Tilt Interlock	Standard									
ECO IDLE-TEC Telematics	Standard									
Weight Estimate (lb)	165	275	315	395	425	235	345	385	465	495
Packaging Typical Installed Footprint (in)	20x20	20x32	20x44 or 28x28	32x32	32 x 36	20x20	20x32	20x44 or 28x28	32x32	32 x 36

\*Initial engine-OFF run time starting with fully charged system. Cycle time will vary depending on load.

PROPRIETARY AND CONFIDENTIAL | © 2020 REV Fire Group.



# Standard Range Option

The **Standard Range** option includes a single power unit, controller, display, and cab heat pump. While even the Standard Range offering has tremendous capacity, determining exact engine-off duration is very complex. It depends on the number of lights, radios, and other electrical devices that are operating on-scene. Assuming a higher-than-average loading, the standard range system should provide between 30 and 45 minutes of engine-off run-time when starting with a fully charged bank. Departments who run with lower electrical loads can extend that range to between 60 and 90 minutes. The effect of electrical device load can be seen from this chart. Dropping the load in half will yield twice the engine-OFF time.

Recommend this option for budget-conscious departments, or busy departments in cool climates.

	Standard Range	Extended Range	Standard Range w/ Cab Cooling	Extended Range w/ Cab Cooling	Medium Range Extra Cab Cooling
EM-200 (2.0 kw-hr)	1	2	1	2	2
AC 40 (1.0 kw-hr)			1	1	
AC 40-24 (1.0 kw-hr)					1
Engine-Off Run time Expected <b>200 amp</b> draw* (min)	30 - 45	60-90	30-45	60-90	45-60
Engine-Off Run time Expected <b>100 amp</b> draw* (min)	60 - 90	120 - 180	60 - 90	120 - 180	90 - 120



# Extended Range Option

The **Extended Range** option doubles the battery capacity and includes two power units. With a heavy load you should expect between 60 and 90 minutes of engine-off time , or twice that if the electric load is lower.

Recommend this configuration for departments in cool climates who spend more time at non-emergency scenes and will usually have 3 hours or more back at the station between calls.

	Standard Range	Extended Range	Standard Range w/ Cab Cooling	Extended Range w/ Cab Cooling	Medium Range Extra Cab Cooling
EM-200 (2.0 kw-hr)	1	2	1	2	2
AC 40 (1.0 kw-hr)			1	1	
AC 40-24 (1.0 kw-hr)					1
Engine-Off Run time Expected - 200 amp draw* (min)	30-45	60-90	30-45	60-90	45-60
Engine-Off Run time Expected - 100 amp draw* (min)	60 - 90	120 - 180	60 - 90	120 - 180	90 - 120



# Cab Cooling

ECO IDLE-TEC can be ordered with an electrically operated air conditioning compressor that will provide cool air to the cabin even with the engine off. The conditioned air blows through the regular cab HVAC system, utilizing the same blower motors, condenser fans, and outlet ducts.

The system capability is approximately 12000 BTUs of cooling with the engine off. This is perhaps half of the output you get with the engine ON and idling. Don't expect a meat-locker, but the system will perform nicely to maintain a cooler cab climate without the noise and expense of the engine running.

The AC module includes extra battery capacity that will make up for the draw of the compressor. When the engine restarts, the system reverts to the engine-driven compressor automatically.

- Electric Compressor**
- Blows through the Normal Vents**
- 12000 BTUs**
- Quiet Operation**



# Standard Range with Cab Cooling Option

The **Standard Range with Cab Cooling** option combines one power unit with one air conditioning unit. You get the same engine-off capability you would expect with the standard range system.

Recommend this option for busy departments in moderately warm climates.

	Standard Range	Extended Range	Standard Range w/ Cab Cooling	Extended Range w/ Cab Cooling	Medium Range Extra Cab Cooling
EM-200 (2.0 kw-hr)	1	2	1	2	2
AC 40 (1.0 kw-hr)			1	1	
AC 40-24 (1.0 kw-hr)					1
Engine-Off Run time Expected - 200 amp draw* (min)	30-45	60-90	30-45	60-90	45-60
Engine-Off Run time Expected - 100 amp draw* (min)	60 - 90	120 - 180	60 - 90	120 - 180	90 - 120



# Extended Range with Cab Cooling

**Extended Range with Cab Cooling** maximizes range on a fully charged Lithium-Iron bank. Two power units with one air conditioning unit provides maximum engine-off range and standard cab cooling.

Recommend this configuration for departments in moderately warm climates who spend more time at non-emergency scenes and will usually have 3 hours or more time between calls.

	Standard Range	Extended Range	Standard Range w/ Cab Cooling	Extended Range w/ Cab Cooling	Medium Range Extra Cab Cooling
EM-200 (2.0 kw-hr)	1	2	1	2	2
AC 40 (1.0 kw-hr)			1	1	
AC 40-24 (1.0 kw-hr)					1
Engine-Off Run time Expected - 200 amp draw* (min)	30-45	60-90	30-45	60-90	45-60
Engine-Off Run time Expected - 100 amp draw* (min)	60 - 90	120 - 180	60 - 90	120 - 180	90 - 120



# Medium Range with Extra Cab Cooling

**Medium Range with Extra Cab Cooling** is the option of choice for hot climates where engine-off comfort is really important. This option adds a second electric compressor that doubles the AC output from 12000 to 24000 BTUs. Engine-off capacity (with AC running) is somewhere mid-way between the standard and extended range options.

Recommend this option for departments in hot climates.

	Standard Range	Extended Range	Standard Range w/ Cab Cooling	Extended Range w/ Cab Cooling	Medium Range Extra Cab Cooling
EM-200 (2.0 kw-hr)	1	2	1	2	2
AC 40 (1.0 kw-hr)			1	1	
AC 40-24 (1.0 kw-hr)					1
Engine-Off Run time Expected - 200 amp draw* (min)	30-45	60-90	30-45	60-90	45-60
Engine-Off Run time Expected - 100 amp draw* (min)	60 - 90	120 - 180	60 - 90	120 - 180	90 - 120



# Engine-OFF Cab Heat

**Engine-OFF Cab Heat** is standard with every ECO IDLE-TEC configuration. A diesel engine is a massive hunk of iron that retains a large amount of heat after it is shut down.

Every ECO IDLE-TEC equipped apparatus comes with an electric pump that circulates coolant through the heater cores during engine-off operation. The normal cab heater blowers will operate as well, expelling warm air through the normal heating vents. This can keep the cab warm without any additional fuel burned until the latent heat is consumed.

Once the engine restarts, the engine block will heat up again, replenishing the heat sink for another round. This feature should be sufficient for warmer climates where the temperature seldom drops below freezing

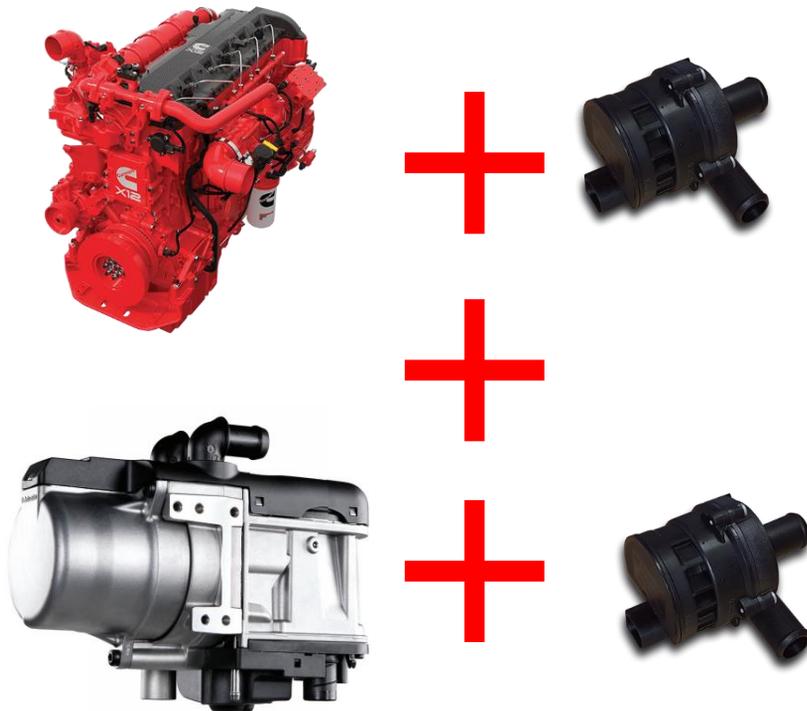
**Latent Engine Heat Captured**  
**Electric Pump Circulates Coolant**  
**Cab Heat Provided through Normal Ducts**



# Extra Cab Heat

For cold climates, ECO IDLE-TEC can be equipped with a fuel-fired heater option. The normal latent engine heat system is still active, but the fuel-fired heater will come on when needed to provide hot coolant for cab heating. Fuel-fired heaters use much less fuel than the vehicle's main engine because they supply heat directly by a small combustion flame to a heat exchanger. A fuel-fired heater typically consumes 1/16 of the amount of fuel it takes to idle the main engine.

**Fuel Fired Heater Added**  
**Latent Engine Heat Still Effective**  
**Uses 1/16th the Fuel**



# Engine-OFF Cab Heat Control

Engine-OFF cab heat is controlled through the normal cab HVAC controls. When the engine shuts down during idle reduction mode, the coolant pump quits spinning. The electric coolant pump then takes over to circulate warm coolant through the heater cores.

Cab heat can be turned off during idle reduction mode by simply by turning it off with the Cab HVAC controls as you normally would.

Engine-OFF cab heat can also be disabled using the settings in the Eco Idle-Tec display. This setting selection will keep the cab heat OFF during subsequent Engine-OFF events, but will reset to normal once the ignition switch is cycle OFF and ON.

Engine-OFF cab heat will also be disabled if the cab interior temperature rises above the maximum set-point of 100 degrees F.

When the engine coolant temperature reaches its predetermined factory default minimum of 104°F (40°C) the engine will restart even if the Eco Idle-Tec batteries still have adequate charge. The engine will remain ON until the coolant reaches the factory default of 150°F (75°C).



# Engine-OFF Air Conditioning Control

If the apparatus was specified with one of the Engine-OFF air conditioning options, then the air conditioning will be controlled through the normal cab HVAC controls. When the engine shuts down in idle reduction mode the engine driven compressor stops spinning and the Eco Idle-Tec compressor(s) take over.

Air conditioning can be turned OFF during idle reduction mode by simply by turning it off with the Cab HVAC controls as you normally would.

Engine-OFF air conditioning can also be disabled using the settings in the Eco Idle-Tec display. This setting selection will keep the air conditioning OFF during subsequent Engine-OFF events, but will reset to normal once the ignition switch is cycled OFF and ON.

Engine-OFF air conditioning will also be disabled if the cab interior temperature drops below the factory default minimum set-point of 60 degrees F.



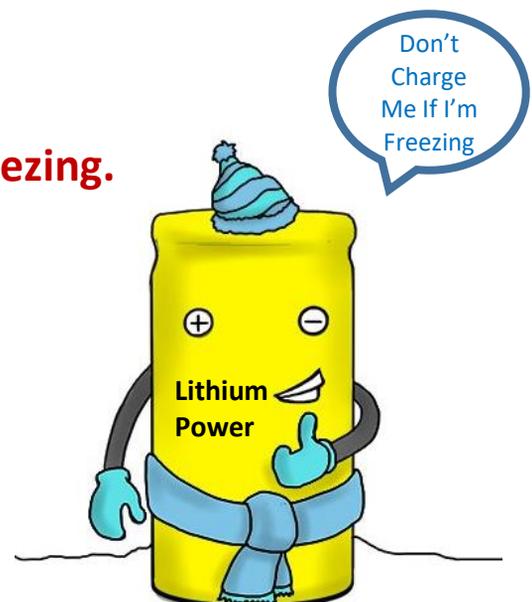
# Cold Climate Package – Battery Heat

Lithium Iron batteries can discharge (provide power) when they are below freezing, but they should not be charged when they are that cold. For this reason, apparatus operating in cold climates can be equipped with a battery warming system that uses engine heat to keep the battery pack above freezing.

The batteries themselves have a lot of mass and will retain the heat they will normally have if the apparatus is parked in a heated station. It takes some time for them to lose enough heat to drop below freezing, but when they do, the battery heater option will keep them warm enough to be charged.

If for any reason the Lithium Iron batteries do drop below freezing, the ECO IDLE-TEC controller will sense it and simply not allow them to be charged. The apparatus will operate as it normally would on the lead-acid battery capacity until the lithium batteries warm up.

**Lithium Batteries Don't Charge Below Freezing.  
Lithium-Iron Battery Pack Heater Option.  
Uses Engine Coolant as Heat Source.  
Circulates Only As-Needed.**



# Lithium Power and Load-Shedding

ECO IDLE-TEC Lithium batteries have significant advantages over standard Lead-Acid batteries.

Lead acid batteries drop in voltage as they are discharged, and should not be discharged lower than an 80% state of charge. As they are discharged to this level their voltage output drops. When the level drops to 11.8 volts the apparatus sounds an alarm and load shedding begins.

ECO IDLE-TEC does not have these drawbacks. Lithium Iron batteries can discharge to as low as 20 percent and still maintain very close to the fully charged voltage (around 13.5V volts).

Load shedding never occurs because the voltage stays high the entire time. This means that all the essential electrical loads will stay active while the engine is OFF and in IRT mode. When the batteries reach their discharge limit the engine is automatically started and the alternator can take over, providing as much current as it is sized for.

## Lead Acid Batteries

- Low-Limit of 80%
- Voltage Drops with Discharge
- “Load Shedding” Occurs



## Lithium Iron Batteries

- Low-Limit of 20%
- Voltage Steady near 13.5V
- No Load Shedding

# Shore-Power Charging

The ECO IDLE-TEC Shore-Power charger is specially designed to charge the lead acid batteries like normal but charge the lithium batteries at a higher voltage and charge profile. The current flowing into the lithium batteries is monitored to ensure that the cells are all balanced and that they reach their optimum state of charge. In addition, the system recognizes when the shore-power plug is connected and will not allow the engine to start. **NOTE: Auto-Eject shorepower is required for all ECO IDLE-TEC installations.**

**Charger Selects Voltage and Profile Appropriate to Battery Type**

**Engine Won't Start When Connected to Shorepower**



## Station Charging Power Source

The fire department will need to provide a dedicated 20 amp circuit to feed the shore power receptacle.

# Charging Time

The time it takes to recharge the ECO IDLE-TECH batteries depends on many factors such as:

Beginning state of charge (SOC)

Ambient temperature (hot chargers are less efficient)

System options (more batteries take longer to charge)

Parasitic load. (Leaving lights, radios, etc. ON while charging takes power away from the batteries)

As a rough guideline, the time to fully charge an apparatus with batteries fully depleted will take less than the following:

- Standard Range 2 Hrs
- Extended Range 4 Hrs
- Std Range with Cab Cooling 3 Hrs
- Extended Range with Cab Cooling 5 Hrs
- Medium Range –Extra Cab Cooling 5 Hrs



# Apparatus Options to Consider

Here are a few Apparatus Options that will improve the performance of your ECO IDLE-TEC system.

**Alternator:** The higher the alternator output is at idle, the faster the battery packs will be replenished and the sooner the re-started engine will shut down again. Select the largest alternator capacity allowed for the chassis model and engine. Alternator output regulator should be set at 14.5 Volts as the Lithium Iron batteries recharge faster at higher alternator settings..

**Cab Options:** Extra cab insulation should be specified to keep the cab cooler in the summer and warmer in the winter and stretch the capacity of the engine-off climate control. A white cab roof and tinted cab glass can also help reduce the solar load and is especially important in hot climates.

**High-Output Alternator**

**Cab Insulation**

**White Cab Roof**

**Tinted Cab Glass**



# Planning for Engine-Off Operation

The greater the electrical load during non-emergency scene idling, the shorter the engine-off time will be. Finding ways to reduce the load will increase engine-off time. Some things to consider if a department is interested in extending their engine-off time include:

## Warning Lights

- Specify a complete LED lighting package including compartment and perimeter lights.
- Do not use the following when stationary:
  - Roto ray
  - MARs lights
  - Motor powered rotators.

**Scene Lights** – Specify LED scene lights and be conscious of the load draw on the lights you do specify.

**Accessories** – Plan to keep non-essential electrical devices OFF during engine-off operation.



# Telematics

Every ECO IDLE-TEC system comes standard with a telematics feature with three years of paid-up cellular service. Fire Department staff can monitor the usage and fuel savings in real time on every equipped apparatus. The system also supports remote troubleshooting and software updates.

**Telematics on Every System**

**Paid Service for 3 Years**

**Monitor Fuel Savings Remotely**

**Remote Software Updates**

**GET  
RETURNS  
DAY 1**

**TRACK YOUR  
VEHICLES' SAVINGS  
WITH INTELLIMETRICS®**

# Batteries will NOT Cause Fires

Lithium batteries have been mentioned as a source of fire in some instances, but ECO IDLE-TEC batteries are safe and stable. Lithium has been used in watch batteries since the 1970s, but an elemental Lithium battery cannot be recharged. For this reason battery engineers began using Lithium Ion chemistry to obtain the high power density in a form that is stable enough for recharging.

Lithium Cobalt Oxide was the chemistry used in the computer APU battery that caught on fire on the Boeing Dreamliner in 2013. It provides the highest power density, but has the disadvantage of being less stable.

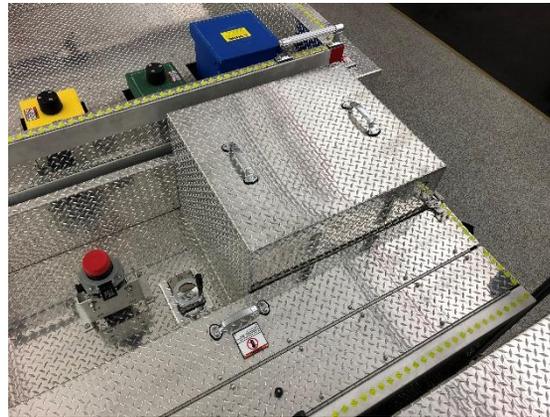
Lithium Iron Phosphate, the chemistry that ECO IDLE-TEC uses, is the most stable and safest form of rechargeable Lithium battery. It has a very good power density and high reliability.

**Lithium Cobalt Oxide Battery Unstable**  
**Lithium Iron Battery Very Stable**  
**Good Power Density and High Reliability**



# Packaging

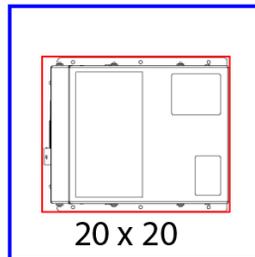
Each system will be protected from the environment inside a compartment or beneath an enclosure. Drain holes will be added when the system is mounted in a dunnage area.



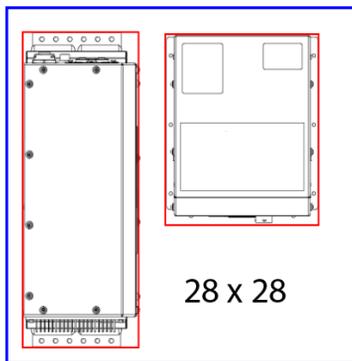
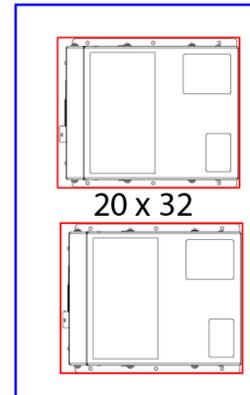
# Packaging (cont.)

The battery units can be oriented in various combinations, but accommodation for airflow and clearance must be made. Here are some of the orientations and rough packaging dimensions that are possible. The units require a cover to protect them from the elements.

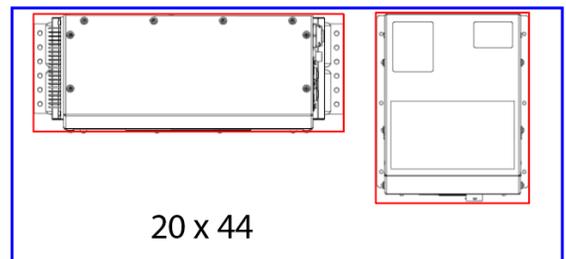
**Standard Range**



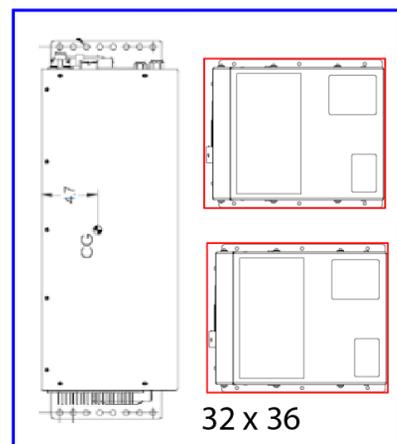
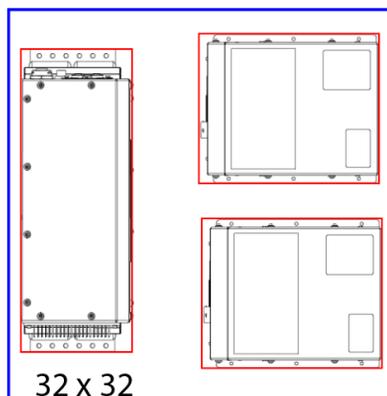
**Extended Range**



**Standard Range w/  
Cab Cooling**



**Extended Range w/  
Cab Cooling**



**Medium Range  
Extra Cab Cooling**

# Confidentiality of this Document

- This document is the property of REV for the use by REV employees, and Authorized REV sales representatives only.
- If you are a REV sales representative or dealer you may use this document for your own reference, and you may use this document during sales presentations to your customers as long as you do not leave it with them.
- You MAY NOT distribute this document in any form to customers, suppliers, competitors, or anyone that is not either employed by REV, or employed by a REV Authorized dealership.

## Disclaimer

- The information contained in this document is for the use of authorized REV Representatives only. Descriptions and photos are for illustrative purposes only and are subject to change. Nothing in this document should be construed to constitute part of any contract and is not a guarantee of product configuration, availability, or performance.

# SALES PRO

