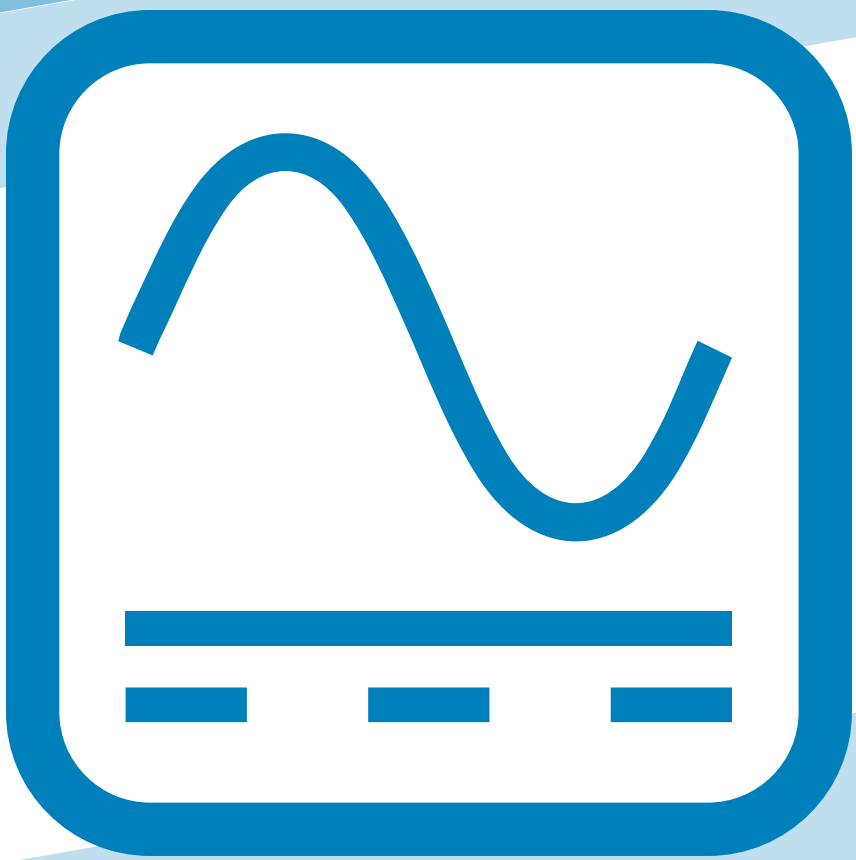
Electrical System Guide



Class A and C Motorhomes

thormotorcoach.com

THOR MOTOR COACH

About This Guide

Thank you for choosing Thor Motor Coach (TMC). This Electrical System Guide is intended to help you understand and operate the electrical devices and systems of your new motorhome. It includes information provided by your selling dealer during your new motorhome pre-delivery inspection (PDI), and much more.

THOR MOTOR COACH

Made to fit.

This guide is not intended for use as a service manual, nor is it model specific. Although some information is specific to certain brands and models, it is of a general nature. Some features may not be installed or available on your motorhome's model or floor plan. Illustrations and descriptions provided may differ from the components installed in your motorhome.

Thor Motor Coach's Continuing Commitment

Thor Motor Coach's continuing commitment is to provide quality and value for our motorhome customers. Features, options, and components will constantly change as new and improved devices become available and designed into TMC's line-up, with the goal of always providing recreational vehicles that meet and exceed expectations.

Contact Us

You are extremely important to us, and you can be assured Thor Motor Coach and your selling dealer will always strive to do everything possible to earn your trust and goodwill. Your selling dealer should be your first source for information regarding any questions or concerns you may have about your motorhome.

You can also contact TMC Customer Care anytime you have a question about your motorhome or the operation of any factory-installed appliance, equipment, or component.

By telephone, TMC Customer Care representatives are available Monday through Friday, 8:00 am to 5:00 pm EST. If you call off-hours, leave a detailed message and a representative will contact you ASAP.

Contact to a TMC Customer Care representative is also available via direct email or email through the Thor Motor Coach website. You can also send or fax written requests to the address and number listed below:

Thor Motor Coach
Attn: Customer Care
PO Box 1486
Elkhart IN 46515-1486

Phone: 877-855-2867 (24/7 assistance)
Fax: 574-294-3618
Email: wsupport@tmcrv.com
Website: www.thormotorcoach.com

TMC Part Number 0428787 Rev 09/15/2022

Electrical Component Suppliers:

Automatic Transfer Switch:	Progressive Dynamics: **www.progressivedyn.com**
Battery Isolation Manager:	Precision Circuits: **www.precisioncircuitsinc.com**
Converter:	Arterra: **www.wfcoelectronics.com** Magnum Energy: **www.magnum-dimensions.com**
Power Control System: (Energy Management Sys.)	Precision Circuits: **www.precisioncircuitsinc.com**
Generator:	Onan: **http://www.power.cummins.com/rv**
Generator, AGS System:	Magnum Energy: **www.magnum-dimensions.com**
House Battery(ies):	Interstate Batteries: **www.interstatebatteries.com**
Inverter:	Magnum Energy: **www.magnum-dimensions.com** Xantrex: **www.xantrex.com** Cooper Bussmann: **www.cooperbussmann.com**
Load Center (30A, 50A):	Progressive Dynamics: **www.progressivedyn.com**
Monitor Panel:	KIB: **www.kib.us**
Power Cord Reel:	Glendinning Marine Products Inc: **www.glendinningprods.com**
Shore line Power Cord 30A: 50A:	Wesco: **www.buy.wesco.com** Furrion: **www.furrion.com**
Solar - Charging Controller and Panel:	Dehco / Tri-Star Distributing: **www.tristardistributing.com**

Other Resources:

Thor Motor Coach Customer Care: **877-855-2867**

Thor Motor Coach Customer Resources Web Site:
https://thormotorcoach.com/motorhome-owners-resources/

Thor Motor Coach YouTube Site: **https://www.youtube.com/user/ThorMotorCoach**

Table of Contents

CLICK ON PAGE NUMBER

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Safety

Safety Labels, Alerts, and Symbols

Safety labels and decals are placed throughout the motorhome in locations where the potential for a hazardous condition is present. Make sure that you and your traveling companions understand and follow all safety instructions. Never remove safety labels and decals. If a safety label should become damaged, illegible, or removed, it should be replaced as soon as possible. Contact Thor Motor Coach Customer Care for a replacement.

Thor Motor Coach uses the following signal words to warn you of possible safety concerns and to provide information to help prevent personal injury and/or damage to the motorhome:

NOTE: Provides helpful information on the topic being covered in the section.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death. This symbol may be used in conjunction with the following signal words and with a color that corresponds with the associated safety label.

⚠ DANGER

Danger indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This alert information is limited to the most extreme situations.

⚠ WARNING

Warning indicates a potentially hazardous situation that, if not avoided, may result in death or serious injury.

⚠ CAUTION

Caution indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTICE

A Notice indicates a potential situation that, if not avoided, may result in property damage or damage to your motorhome.

Fire Safety

⚠ DANGER

NO SMOKING

Before dispensing fuel, turn OFF all engines, fuel-burning appliances, and their igniters (see operating instructions).

Do not dispense fuel within 20ft (6.1m) of an ignition source.

Can cause ignition of flammable vapors, which can lead to a fire or explosion and result in death or serious injury.

⚠ DANGER

Vehicles and equipment powered by internal combustion engines and placed in recreation vehicles may cause carbon monoxide poisoning or asphyxiation, which could result in death or serious injury.

The flammable liquids used to power these items can cause a fire or explosion, which can result in death or SERIOUS INJURY.

TO REDUCE RISK:

1. **Do not ride in the vehicle storage area when vehicles are present.**
2. **Close doors and windows in walls of separation (if installed) when any vehicle is present.**
3. **Run fuel out of engines or stored vehicles after shutting off fuel at the tank.**
4. **Do not store, transport, or dispense fuel inside this vehicle.**
5. **Open the windows, openings, or air ventilation systems provided for venting the transportation area when vehicles are present.**
6. **Do not operate propane appliances, pilot lights, or electrical equipment when motorized vehicles are present.**

⚠ CAUTION

Always replace the fire extinguisher with a similar Class B-C type.

- **Fire extinguishers must be replaced after any use, even if used briefly.**
- **Fire extinguishers have an effective service life. Replace expired fire extinguishers.**

⚠ CAUTION

Ensure the smoke detector and alarm is always kept in good working order. Test this device regularly and immediately replace if it is not functioning properly.

The smoke detector operates on an internal battery. Immediately replace battery when needed and/or on an annual schedule.

For the safety of you and your traveling companions, make sure that everyone traveling in the motorhome is familiar with the location of exits and operation of emergency exits, including emergency exit egress windows. The risk of fire can be reduced by following a few basic fire prevention rules:

Typical Class B-C fire extinguisher

- Know the location of your fire extinguisher(s) and keep them in a state of readiness
- Never store flammable liquids inside the motorhome
- Keep cooking surfaces clean and free of obstructions
- Never use a flammable liquid or material as a cleaning agent
- Never leave operational cooking appliances unattended
- Never smoke in bed, around propane appliances and devices, and during fueling of the motorhome and/or propane system
- Never allow children to play with propane gas or electrical equipment
- Never use an open flame as an illumination device
- Immediately repair or discard faulty or damaged wiring and electrical components
- Never overload electrical circuits
- Locate and repair propane gas leaks immediately
- Don't allow rubbish to accumulate inside storage compartments, near or around appliances, propane, and electrical devices or equipment
- Apply flame retardant treatments to interior fabrics; renew treatment at manufacturers recommendations
- Test and inspect circuit breakers and fuses on a regular basis
- Maintain fresh batteries in the smoke alarm and perform regular tests to ensure proper operational condition

NOTE: Know the location of the fire extinguisher installed in your motorhome, become familiar with its use, and keep it in good operating condition. Fire extinguishers have an effective service time-period; always replace expired fire extinguishers.

If a fire does start or smoke is detected, follow these basic rules of safety:

1. Immediately evacuate everyone (including pets) from the motorhome!
2. After everyone is accounted for, clear and at a safe distance from the motorhome, call emergency responders.
3. Check the fire or source of smoke to determine if you can attempt to put it out.
4. If it is too large for the fire extinguishing tools you have, or the fire is fuel fed, stay clear of the motorhome and have the fire department and/or emergency responders manage the emergency.
5. Only if you have safe access to the shore power stand, turn OFF the main 120 VAC circuit breaker at the shore power source and disconnect the shore power cord from this source.
6. Only if you have safe access to the Main Battery Switch, turn it OFF.
7. ONLY if you have safe access to the main propane valve located on the propane tank, turn OFF the main propane valve.
8. ONLY if you have safe access to the battery compartment(s), disconnect the negative battery cable(s) at the house battery and chassis battery
9. Do not attempt to use water to put out an electrical or grease fire. Water can spread many types of flammable materials, and electrocution is possible when the fire has an electrical source.

NOTE: Please strictly follow the instructions and heed the warnings of all safety labels affixed to your motorhome.

Electrical Safety

⚠ DANGER

The potential of electrical shock and fatal electrocution is an ever-present danger when working with electricity and electrical components.

⚠ WARNING

Use extreme caution when using metal tools near electrical system terminals, connections, and components. Short circuits can occur when metal tools bridge between electrical terminals of opposite polarity, causing sparks, possible equipment damage, potential of fire, explosion, bodily injury and/or electrocution.

⚠ WARNING

Whenever electrical system maintenance is required and before working on the electrical system of the motorhome:

- **Turn off the main battery switch**
- **Disconnect the shore line power cord**
- **Turn OFF the generator**
- **Disable the automatic generator start functionality**
- **Disconnect the negative 12 VDC auxiliary (house) battery terminal(s)**
- **Attach an electrical lockout device to the electrical service panel**

Before disconnecting your house and/or chassis batteries, always make sure the main battery switch is turned off, and the inverter/charger (if so equipped) is turned off.

⚠ CAUTION

Safety precautions must always be observed when using any electrical device or working with electrical wires and connections. Careless handling of electrical components can be fatal. Never touch or use electrical components or appliances while feet are bare, while hands are wet, or while standing in water or on wet ground. Always remove jewelry and wear protective clothing and eye covering. Avoid creating sparks, which could ignite nearby flammable materials.

All installations of the electrical system and components of your motorhome have been made in compliance with industry standards applicable on the date of manufacture. The electrical equipment and associated circuitry are designed and engineered into a dedicated system specific to your motorhome. Do not modify or make changes to the electrical system of your motorhome that are unauthorized by TMC Customer Care. Changes or modifications made after delivery may result in hazardous conditions, cause damage to factory-installed equipment, and may void TMC and equipment manufacturers warranties.

NOTE: Your motorhome's electrical system is engineered and tested for safety. Circuit breakers and fuses protect the electrical circuits from overloading.

If you plan to make modifications or additions to the electrical system, TMC strongly recommends consulting a qualified electrician for assistance to ensure continued integrity and safety of the electrical systems.

Please note that any modifications may void the TMC Limited Warranty or appliance and component manufacturers warranties.

Electrical System Maintenance and Repairs

Always use extreme caution when performing maintenance or repairs on the electrical system, electrical components, and electrical devices of your motorhome. Service, maintenance, and/or modification of the electrical system should only be performed by qualified electrical technicians using approved materials, components, and installation methods that meet current safety and code requirements. Please consult your dealer's service department or TMC Customer Care for assistance.

Welding and Chassis Repairs

⚠ CAUTION

BEFORE performing welding repairs on the motorhome chassis, disconnect battery ground cables (negative) and ground lugs from all factory-installed wiring harnesses.

If your motorhome's chassis should ever require welding repairs, it is imperative to disconnect the negative cables from the house and chassis batteries and ground lugs from all TMC-installed wiring harnesses BEFORE welding. Disconnecting these ground terminals from the chassis will help prevent damage to sensitive electrical circuits and devices due to arc-welding.

After the welding repairs are completed, ensure all wiring harness ground lugs are properly re-installed BEFORE re-attaching the battery cables.

Diagrams indicating the location of wiring harness ground lugs for the chassis of your motorhome model can be obtained from a TMC Customer Service representative.

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Electrical System Introduction

⚠ WARNING

Whether a device or appliance operates on 120 volts AC or 12 volts DC, great care must be observed while using any electrical device and working with electrical wires and connections. Although all electrical circuits of your motorhome are protected by either fuses or circuit breakers, either system has the potential of delivering dangerous electrical shock or the possibility of fatal electrocution. All maintenance and repairs to the wiring, devices, or components of the electrical system should be performed by a qualified electrical technician.

Your motorhome is designed to provide you and your traveling companions with many modern living conveniences, while also providing the enjoyment and freedom of traveling the highways and byways of your choosing. Your motorhome's electrical system is designed to provide safe, reliable energy to power the mobile features that enhance the RV'ing experience.

The electrical system is a blend of two distinct electrical platforms, consisting of an 120 volt alternating current (VAC) system, and a 12 volt direct current (VDC) system. The 12 volt DC system is further segregated into the coach, or house system and the vehicle, or chassis system. Both the AC and DC power systems are required in order for your motorhome to function as intended. For terminology purposes, this guide will reference the living space of the motorhome as the HOUSE, while the vehicle portion will be referred to as the CHASSIS.

NOTE: Throughout this guide, the term 'house' or 'RV' is used to describe the recreational vehicle (RV) living quarters, components, systems and features of your motorhome, while the term 'chassis' refers to the chassis manufacturer's components, systems, and features.

Most of the electrical components of your motorhome are designed to operate on 12 volts DC. This includes: lights, furnace control, water heater control, water pump, powered ventilation fans, awnings, slideout rooms, and some appliances. While other features, like the kitchen appliances, air conditioner, TV's, DVD players, and some awnings operate on 120 volts AC. Provided with your motorhome are power outlets for both 120 volts AC and 12 volts DC; so that you can conveniently power portable appliances you bring along while traveling.

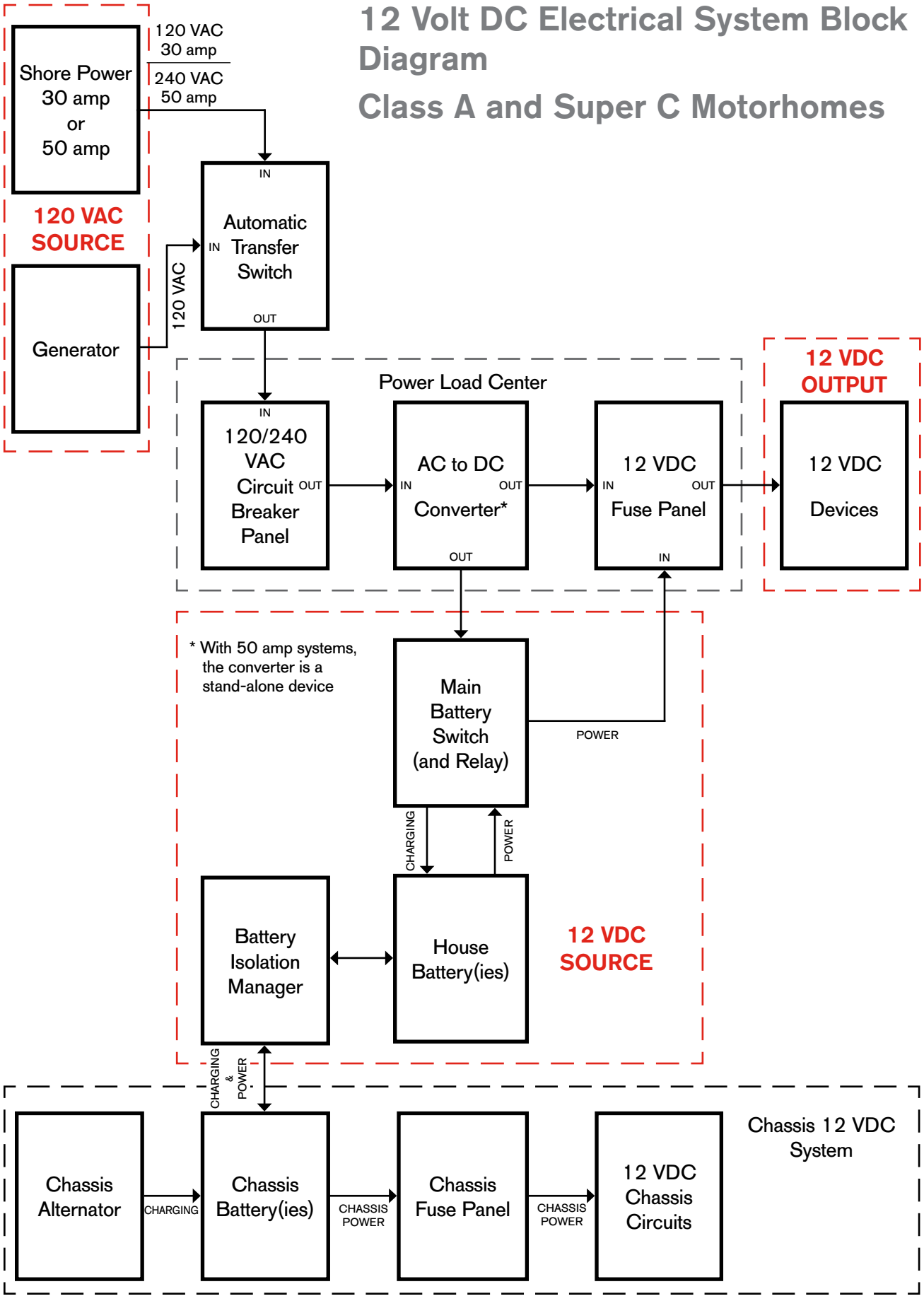
The Electrical System Block Diagrams, contained in the following pages, illustrate the main components of the electrical systems for both Class A and Class C motorhomes. These diagrams illustrate the major components of the electrical system and how these components interact to supply reliable 120 volts AC and 12 volts DC power to the motorhome.

Following the electrical system diagrams are brief explanations of each system component, along with important operational and maintenance information.

NOTE: Due to the many model variations, options, and continuous production changes offered by TMC, wiring diagrams are not included in this guide. Any specific questions you may have regarding the electrical system of your motorhome should be directed to your TMC Motorhome Dealer or to a TMC Customer Service representative, which can be reached via telephone (toll free): 877-855-2867.

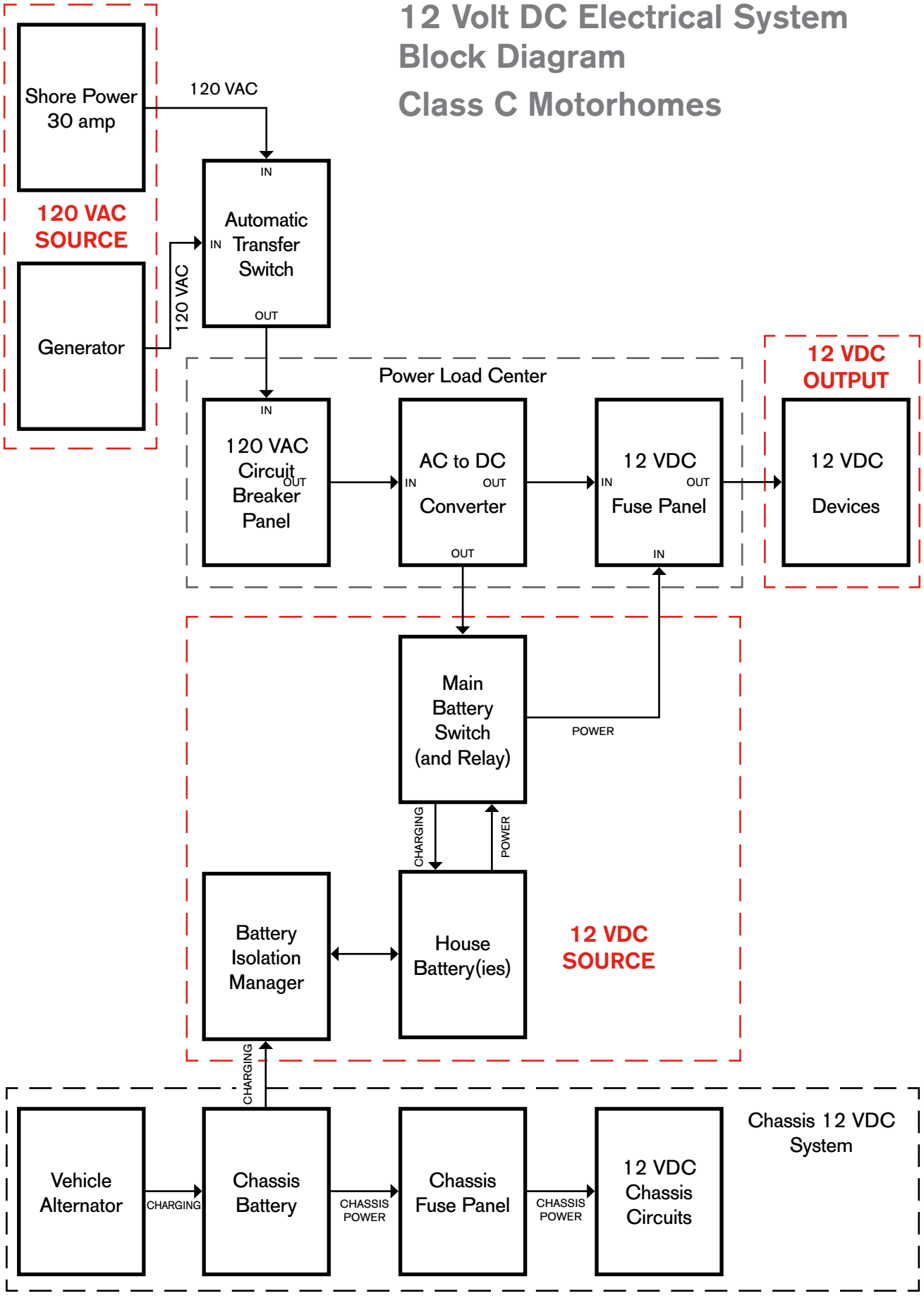
12 Volt DC Electrical System Block Diagram

Class A and Super C Motorhomes

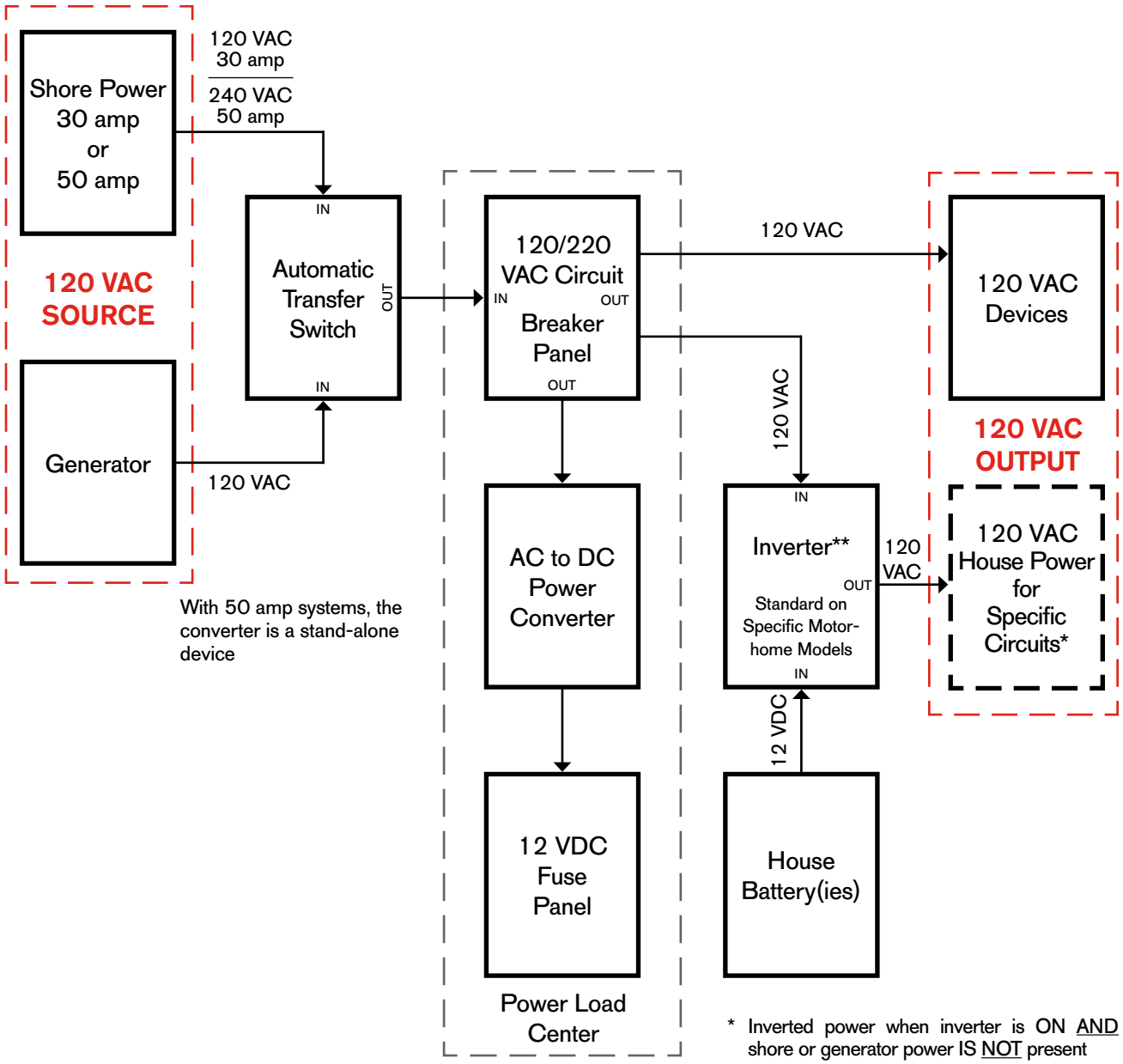


12 Volt DC Electrical System Block Diagram

Class C Motorhomes



120 Volt AC Electrical System Block Diagram
Class A and Super C Motorhomes



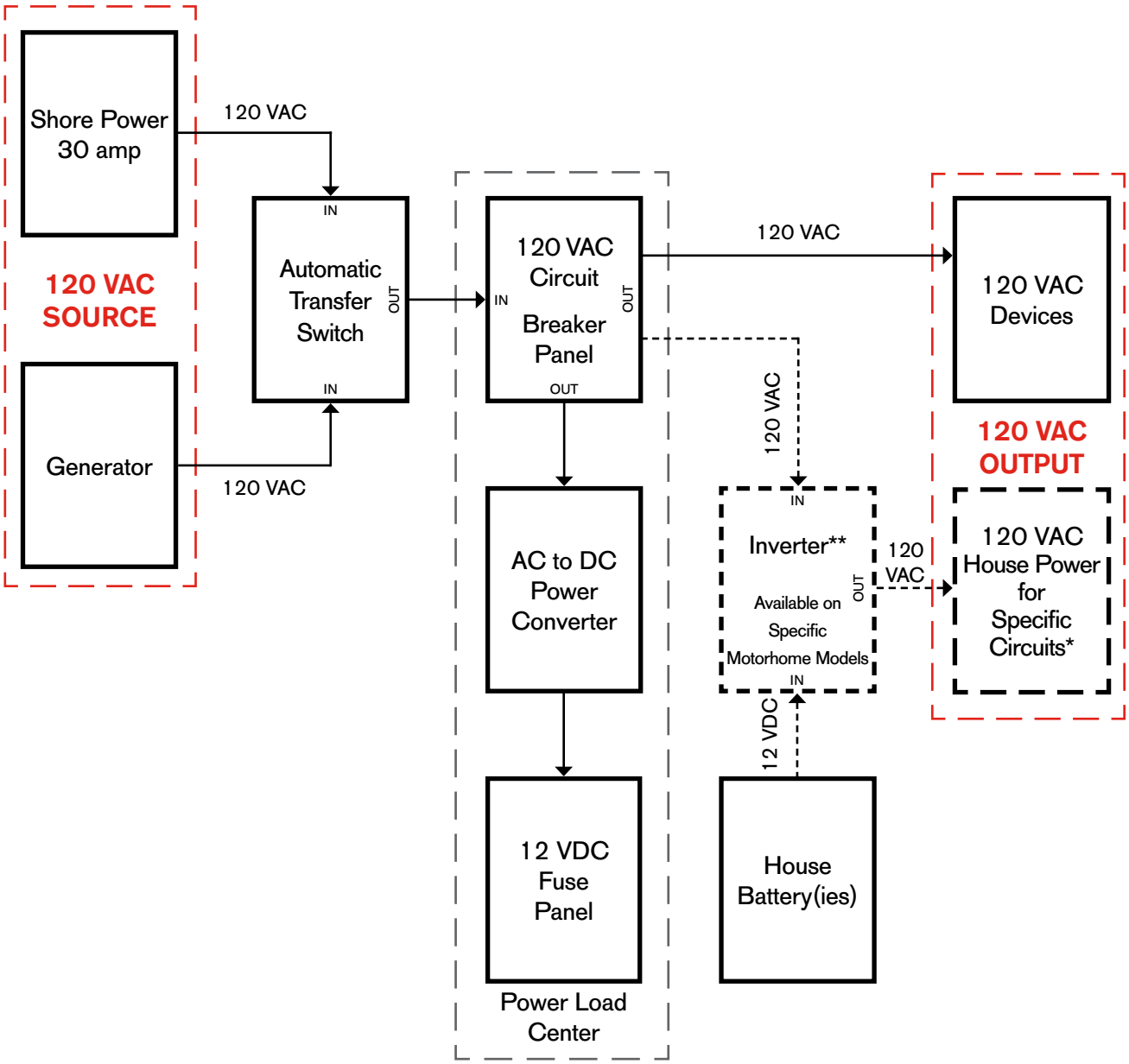
* Inverted power when inverter is ON AND shore or generator power IS NOT present

Non-inverted power when inverter is OFF AND shore or generator power IS present

** Some inverter models have an internal transfer switch that automatically switches the input source, depending upon the presence of 120 VAC from shore or generator power

Typical AC electrical system block diagram. Note the input of the inverter (DC) is from the auxiliary battery(ies) and the output (AC) goes to specific circuits and devices. The AC input to the inverter is a control circuit, turning the inverter ON when there is no shore or generator power, and turning the inverter OFF when shore or generator power is available.

120 Volt AC Electrical System Block Diagram
Class C Motorhomes



* Inverted power when inverter is ON AND shore or generator power IS NOT present.

Non-inverted power when inverter is OFF AND shore or generator power IS present

** Some inverter models have an internal transfer switch that automatically switches the input source, depending upon the presence of 120 VAC from shore or generator power

Self-Contained Power Sources

One of the most convenient features of your motorhome is its ability to provide reliable, self-contained power for appliances and other useful electrical devices. Self-contained power is delivered by the 12 VDC battery system, the 120 VAC generator, or a combination of both. Following is an explanation of how power is supplied to the electrical devices of you motorhome while operating from self-contained power sources.

12 Volt DC via the House Battery(ies)

Referring to the 12 volt DC System Diagrams on pages 6 and 7; when the generator is NOT operating, power for the 12 volt DC circuits is delivered by the house battery(ies), through the 12 volt Fuse Panel (part of the Power Load Center). From the 12 volt Fuse Panel, power is supplied to devices such as interior lights, water pump, appliance controls, and 12 volt outlets.

The Main Battery Switch, located near the main entrance of the motorhome, must be turned ON in order to power 12 volt house circuits and devices. When the motorhome's engine is running and the house main battery switch is ON, the chassis electrical charging system is supplying charging energy to the house battery(ies).

NOTES:

- When operating 12 volt devices from the battery, minimize use to conserve battery power. Gradual dimming of lights, and slowing of motors are indicators of low battery power.
- The dash radio and back-up camera systems (if equipped) are powered by the house battery, not the chassis electrical system. When traveling, the main battery switch must be turned ON to operate the dash radio and backup camera.

12 Volt DC Power via the Converter

When the generator is operating, 12 volt DC power for the motorhome is supplied by the combined functions of the generator and converter. With the generator producing 120 volts AC, power is connected to the converter via the automatic transfer switch. The converter transforms 120 volts AC into 12 volts DC and then feeds power to the 12 volt DC Fuse Panel, and in-turn, to the 12 volt circuits and devices of the motorhome. The converter also supplies charging voltage to the house battery(ies).

When the generator is turned off, the converter is bypassed by the automatic transfer switch and 12 volt power is again supplied by the house battery(ies).

Also, when the motorhome is connected to shore power, the converter supplies 12 volts DC for lights, control circuits and other 12 volt devices. Again, the automatic transfer switch senses when 120 volts AC is present, either by the generator or shore power and automatically connects incoming power sources to the Power Load Center.

120 Volt AC via the Inverter

Select Class A and Class C models are factory-equipped with an inverter. The inverter transforms battery-supplied 12 volts DC to 120 volts AC. It is mainly used to power specific 120 volt AC appliances and entertainment devices when operating the motorhome strictly on 12 volt DC battery power. In Class A diesel motorhomes, the inverter is the source for house battery charging and also operates as a converter. It may also contain the automatic transfer switch function.

Your motorhome dealer and a TMC Customer Care representative can provide information regarding which 120 volt AC appliances and circuits are powered by the motorhome's inverter (see Inverter Section).

NOTE: Extensive use of appliances powered by the inverter may rapidly deplete the house batteries.

120 Volt AC via the Generator

Whether the motorhome is stationary or in-motion, self-contained 120 volt AC power can be supplied by the on-board generator. Power from the generator is fed to the automatic transfer switch, which is a device that automatically switches AC power between the generator or shore power source. In most systems, the generator takes priority over shore power (see Generator Section).

From the transfer switch, AC voltage is fed to the 120 volt AC Circuit Breaker Panel, considered part of the Power Load Center, then onto to the AC circuits and devices of the motorhome's living quarters.

The generator equipped with your motorhome was selected to have an output power rating that will adequately power the factory-installed appliances and electrical devices. However, generator overloading can happen if the electrical demand is higher than the generator's output rating. In some circumstances, you may need to turn OFF some non-essential electrical devices in order to operate the generator under its maximum power rating.

12 Volt Power System

Power for your motorhome's 12 volt system is supplied by either:

- On-board auxiliary battery(ies), or;
- By the converter, which is a 12 volt power supply operating on 120 volts AC from either the on-board generator or external shore power.

Your motorhome's auxiliary battery(ies) are lead-acid, deep-cycle type, similar to the batteries found in recreational boats and golf carts. Deep cycle batteries are designed to be less susceptible to internal damage when operated in cycles of near depletion (discharge) and full recharge.

For Class C Motorhomes, the house battery is generally located in a compartment underneath the entry steps. Class A motorhomes usually have a battery compartment, accessed by a panel located along the lower portion of the exterior. Some models are provided with a slide-out battery tray, making battery access more convenient. Class A diesel motorhomes may have multiple 6 volt batteries, but are wired to deliver 12 volts DC to the house. This battery configuration is designed to provide increased battery amperage capacity.

Controlling Battery Power

⚠ WARNING

Do not store items in the battery compartment or near the battery(ies) that might come in contact with the battery terminals. This could cause an electrical short circuit, drain the battery, cause a spark, or ignite combustible materials.

There are several devices installed within the electrical system that are designed to control power to and from the motorhome's house and chassis batteries. Battery power management is important in order to:

- Turn the house battery(ies) power on and off
- Charge the house and chassis batteries
- Manage battery power output
- Monitor battery charge condition

Following, is a brief description of the electrical devices used to control the battery power of your motorhome.

Master Battery Disconnect Switch

⚠ WARNING

When refueling the vehicle or refilling the propane tank, turn OFF the master battery disconnect switch, along with the generator if it is running. This will ensure all electronic ignitors are OFF for safe fueling.

NOTICE

When traveling, the master battery disconnect switch must be turned ON to operate the dash radio and backup camera system (if equipped).

The master battery disconnect switch is located just inside the motorhome's main entrance, usually near the entry steps. It is used to connect power from the auxiliary (house) battery(ies) to the motorhome's 12 volt DC electrical system, hereby providing power to the motorhome's interior lighting and other 12 volt DC devices. Although the style of this switch may vary, from a rocker-type to a rotary switch, the function remains the same.

- When the switch is in the ON position, the auxiliary (house) batteries are connected to the 12 volt electrical system.
- When the switch is in the OFF position, the auxiliary (house) batteries are disconnected from the 12 volt electrical system.

Typical master battery disconnect switches; rotary and rocker-type. Rocker-type switches control a relay, which in-turn, turns on and off power from the auxiliary battery(ies).

In most installations, the master battery disconnect switch does not directly connect and disconnect 12 volt power. Direct power connection is accomplished through the battery relay, which is controlled by the master battery disconnect switch. The battery relay is located in the battery compartment and can be identified by the direct connection of the positive battery cables to it.

When connected to 120 volt shore power or the on-board generator is being used, the 12 volt system is powered through the converter, therefore, the master battery switch is not controlling 12 volt system power. However, when connected to shore power or operating the on-board generator, charging voltage is provided to the auxiliary battery(ies) whenever the master battery disconnect switch is ON. Similarly, the master battery disconnect switch must be ON in order for charging voltage from the solar charging system to connect to the auxiliary battery(ies).

USING THE MASTER BATTERY DISCONNECT SWITCH

It is good practice to turn the master battery disconnect switch ON when first entering the motorhome and leave the switch ON whenever the motorhome is occupied, whether parked or traveling.

- This will energize the 12 volt electrical system, so that interior lights, appliance control circuits, and other 12 volt devices can be used.
- This provides charging voltage to the auxiliary battery(ies) via the vehicle's alternator.
- This will provide power to the dash radio, which is powered by the auxiliary battery(ies). Therefore, keeping the master battery disconnect switch ON while the motorhome is in motion, will allow the use of the dash radio and driving cameras, which in most installations, use the dash radio display for rear view and side view camera monitoring.
- When leaving the motorhome unattended for a few hours or more, turn the master battery disconnect switch OFF to conserve battery power.

12 Volt Power Outlets

Your motorhome is well equipped with standard 12 volt DC automotive-type power outlets, which are conveniently located throughout the cabin. These outlets are useful for powering laptop computers, video games, phone chargers, and other portable devices. Some ports offer a USB-type power connection.

The master battery switch must be ON in order to operate devices from these 12 volt outlets.

Interior Lighting

The interior lighting installed in your Thor Motor Coach motorhome provides safe and convenient illumination for the living space of your RV. All interior lighting fixtures, which include ceiling, reading, accent, and safety illumination operate on 12 volts DC. In later model motorhomes, interior lighting comprises of energy-efficient and long-lasting LEDs.

As in your home, most control switches for interior lights are located on an interior or exterior wall, with some switches for accent lighting located underneath wall cabinets. Some accent lighting fixtures have a built-in push-on, push-off switch located in the center of the fixture cover.

Provides safe and convenient illumination in all areas of the motorhome

Powering the Lighting System

Since all interior lighting fixtures operate on 12 volt DC power, the motorhome's 12 volt DC power system must be activated.

TO OPERATE LIGHTING FIXTURES BY THE ON-BOARD12 VOLT AUXILIARY BATTERY(IES):

1. Turn ON the main battery disconnect switch, located near the main entrance door of the motorhome.
2. Operate interior lights as needed.

TO OPERATE LIGHTING FIXTURES BY SHORE POWER:

1. Connect the shore power cord to an external power source.
2. Operate interior lights as needed. Power for the lights (and other 12 volt devices) is sourced through the on-board converter (located within the power load center), which transforms incoming 120 volts AC to 12 volts DC.

TO OPERATE LIGHTING FIXTURES BY THE ON-BOARD GENERATOR:

1. Turn the main battery disconnect switch ON (must be ON in order to start and operate the generator.
2. Operate interior light as needed. Power for the lights and other 12 volt devices is sourced through the on-board converter (located within the power load center), which transforms incoming 120 volts AC to 12 volts DC.

NOTE: Motorhomes equipped with a multiplex control system have the interior lighting controls integrated into the main control panel, with additional remote lighting panels located throughout the motorhome. Individual lighting icons that display and arrow are dimmable. Press and hold the light icon until the light fixture dims to the desired illumination level.

TROUBLESHOOTING INTERIOR LIGHTING PROBLEMS

If the interior lights flicker or are dim:

- Possible low auxiliary battery. Check battery condition and recharge if necessary. For non-maintenance-free batteries, verify there is sufficient water level in the individual cell compartments.
- Possible low battery. Run the generator or plug into 120 volt AC shore power if available.
- Converter may be overloaded. Open the cover to cool down and reduce the electrical load by turning off some 12 volt devices.
- Possible converter malfunction. Have converter checked by an authorized service center.
- Loose or defective bulb(s). Tighten or replace as needed.

NOTE: When leaving the motorhome for longer than a few hours and not connected to shore power, it is good practice to turn off interior lighting and turn OFF the main battery disconnect switch. Doing so will prevent the auxiliary (house) battery from unnecessary discharging.

Battery Isolation Relay

⚠ CAUTION

Unless you intend to run the vehicle engine, keep the ignition switch in the OFF position. Doing so will:

- **Reduce the risk of unnecessary chassis battery drain.**
- **Allows the battery isolation relay to connect the auxiliary battery to the house charging system.**

Typical battery isolation manager. This device is usually located in the battery compartment or the engine bay of the motorhome.

NOTE: The chassis battery will also be charged when 120 VAC is present, via the Battery Isolation Manager.

When the motorhome's engine is not running, the chassis and auxiliary battery(ies) are electrically isolated by the use of a battery isolation relay. This device prevents house power consumption from discharging the chassis battery while the motorhome is parked.

ADDITIONAL CHARACTERISTICS OF THE BATTERY ISOLATION RELAY:

1. The battery isolation relay electrically delays connecting the auxiliary batteries to the vehicle charging system for approximately 15 seconds; this allows the alternator time to reach full charging ability.
2. After this initial time delay, the battery isolation relay senses the voltage of the vehicle charging system. The isolator connects the auxiliary battery to the vehicle's charging system only when the chassis charging system reaches the correct voltage.
3. If the vehicle's charging voltage drops below 13.2 volts for a period of 4 seconds, due to low idle speed and/or excessive load, the battery isolation relay will disconnect the auxiliary batteries from the vehicle's charging system until the vehicle's charging voltage returns to a level of 13.2 volts or above. For this feature, there is a built-in delay period of approximately 10 seconds.
4. The battery isolation relay allows vehicle starting from the auxiliary battery(ies) via the Emergency (Auxiliary) Start Switch.

Emergency (Auxiliary) Start Switch (Not available with M-B Sprinter-based motorhomes)

NOTICE

It is strongly advised to turn off all 12 volt DC devices before using the emergency start feature. This will help ensure that all available energy stored in the auxiliary battery(ies) can be used for vehicle starting.

Typical emergency start switch

Your motorhome may be equipped with an Emergency (auxiliary or AUX) Start Switch. Located in the vehicle's cockpit, near the drivers seating area, this switch connects the auxiliary battery(ies) to the vehicle's starting circuit. This feature is used for situations when the chassis battery is too depleted to start the vehicle on its own. Connecting the auxiliary battery(ies) to the engine starting circuit may provide the needed energy to start the motorhome's engine. When the Emergency Start Switch is released, the auxiliary battery(ies) are removed from the engine starting circuit.

TO OPERATE:

1. Ensure the main battery switch is ON
2. Depress the 'EMER START' switch, located on the front driver's dash and HOLD.
3. Use the ignition switch (key or start button) to start chassis engine.
4. Release the 'EMER START' switch after the engine has started.

NOTES:

- When using the Emergency Start feature, do not hold the ignition key in the start position for more than 30 seconds.
- If starting cannot be accomplished, operating the generator for a few minutes may give the batteries the charge needed to start the vehicle.
- Determine and correct the cause of the chassis battery failure. Troubleshooting suggestions: Were vehicle lights left on? Are the battery terminals corroded? Are the battery cables tightly connected to the battery terminals? Is the chassis charging system working correctly?

EMERGENCY GENERATOR STARTING:

The Emergency Start switch can also be used to deliver extra starting power to the generator. This is accomplished by tying the chassis battery to the house battery via the battery isolation relay. This feature is useful in circumstances when the house battery is too depleted to start the generator.

1. Ensure the main battery switch is ON
2. Press and hold the Emergency Start Switch
3. While holding the Emergency Start Switch ON, DEPRESS the generator start switch. Since these two switches are not physically near each other, you might need to enlist the assistance of another person to operate one of the switches
4. When you detect the generator has started, RELEASE the generator start switch and the Emergency Start switch
5. Keep the main battery switch ON while the generator is operating. This will allow power from the generator to charge the house and chassis batteries (via the converter or inverter).

Monitor Panel and Battery Condition Indicator

The charge condition of the batteries can be checked with the Battery Condition Monitor, located on the monitor panel. To check, press and hold Battery Test Switch while reading the charge level on the battery gauge LED. The indicator is divided into sections from weak through fully charged.

Press the BATT switch. An LED will illuminate; indicating the charge condition of the battery

LED Condition Indicators

Battery Condition LED's:

L = Low F = Fair G = Good C = Full Charge

NOTES:

- Use the monitor panel to check both house battery and chassis battery voltage. A fully charged lead-acid battery will read 12.7 volts DC and 1.265 specific gravity at 80°F (32°C). A lead-acid battery is considered discharged at 11.8 volts DC by electronic standards.
- When voltage drops below these levels, permanent damage may occur. Due to their large energy storage capacity and depending on the rate of depletion, it may take up to 24 hours for a lead-acid battery to fully recharge.
- When connected to a 120 VAC power source, the converter (or the inverter) will trickle charge the house, and in some installations, the chassis battery.

Typical Monitor Panel

Typical multiplex main control panel. Electrical system monitoring is usually located on the main menu (House) screen.

NOTE: Monitor panel design, features, and functions vary depending on model year, make, and model of the motorhome.

Battery Charging

It is important to keep the auxiliary battery(ies) in a condition of full or near-full charge. Doing so will ensure you will have enough stored 12 volt DC energy when needed. Battery charging is accomplished by:

- Automatic charging through the converter or inverter (shore power or generator);
- With the vehicle engine running, auxiliary battery(ies) are charged via the chassis alternator (when Master Battery Disconnect Switch is ON);
- Auxiliary battery charging via solar charging system (equipped as standard, optional, or customer installed).

Take time to turn off all lights or other 12 volt accessories when not in use. Connect the motorhome to a 120 volt AC external source or run the generator whenever possible. Doing so will keep the auxiliary battery charged.

The auxiliary batteries are a deep-cycle type and are capable of being deeply discharged and rebound to full capacity when recharged. Due to their large energy storage capacity, the auxiliary battery(ies) may take up to 24 hours to completely recharge.

If for any reason, you recharge a auxiliary battery with a charger or power source other than what was supplied as part of the motorhome's original electrical system, make sure to follow all battery maintenance and safety instructions from the battery and battery charger manufacturers.

NOTE: The Master Battery Disconnect Switch must be ON in order to charge the battery(ies) by any onboard method described in the following sections.

Charging by the Vehicle's Alternator

The motorhome's electrical system is wired so that when the vehicle's engine is running, and the chassis alternator is properly operating, charging voltage is supplied to both the chassis and house battery(ies). The master battery disconnect switch must be ON in order for the house battery to be charged by the chassis alternator (see Chassis Alternator and Battery Isolation Relay Sections).

Charging by the Converter

The Converter is a 12 volt power supply, which operates on 120 volts AC (see Converter section) and is designed to power the 12 volt system when the motorhome is connected to shore power or when the generator is running. The Converter also provides charging energy for the auxiliary (house) battery(ies).

If the battery condition is below its full charge, the charger will begin recharging the auxiliary battery at a rate that reflects the level of discharge. When the battery is fully charged, the charger drops its charging level back to a maintenance or trickle level to keep the battery fully charged.

Solar Battery Charging

Your Thor Motor Coach motorhome may be factory-equipped with a solar charge controller. Along with a roof-mounted solar panel (except for most Class B motorhomes, not typically factory-supplied), this system is designed to provide an alternate battery charging method for your auxiliary (house) battery(ies).

The solar charging system seamlessly integrates with your motorhomes 12 volt DC power system. The auxiliary batteries are automatically charged when the solar charge controller is ON, along with the master batter disconnect switch. The solar charge controller provides monitoring of battery condition, monitoring of the charge energy being supplied by the solar panel(s), and regulation of the charging energy.

When the controller senses that the auxiliary battery(ies) require a rapid-charge, the controller allows the full energy from the solar panel to charge the battery. When the battery(ies) reach 100% state of charge, the controller reduces charge energy to a trickle charge level, thus protecting the battery(ies) from damage caused by overcharging.

Depending on the model, the maximum input current rating of the solar controller is 10 or 30 amps (energy supplied by the solar panel(s). The typical factory-installed solar panel is rated for 100 watts (peak), with some solar panels having a rating of 190 watts (peak power). The output charge voltage is up to 14 volts DC. Solar panel(s) installed on your motorhome may vary from these specifications; refer to your Owner's Packet for details.

NOTES:

- Peak solar panel power is obtained with full and direct exposure of sunlight. Atmospheric conditions determine the available power from the solar panel(s).
- The solar charge controller and associated solar panel is not designed to directly power the appliances and/or electric components installed in your motorhome.
- All 12 volt systems and components are either powered directly from the auxiliary batteries or through the converter, which receives input power from either the on-board generator or external shore power service.

Typical 10 Amp Solar Charge Controller

Maintenance and operational instructions from the manufacturer are included with your owner's packet and also available on-line, through the TMC Owners Resource document service.

Solar Prep

⚠ WARNING

If not installed properly, a solar charging system can present electrical and fire hazards. Always ensure installations strictly follow all manufacture's safety and installation guidelines.

Never install solar panels that have a higher current rating than the maximum input capacity of the solar controller installed in your motorhome.

Most TMC motorhomes are factory-equipped with either a solar charging system (10 or 30 amp) or solar prep. All factory-installed solar preps include 10 gauge wire to the roof area, where a solar panel can be installed, along with 10 gauge wiring from the solar controller installation area to the battery compartment.

Along with 10 gauge wiring, many solar prep installations also include a 10 amp controller. With this configuration, it is simply up to the user to add solar panels to the roof area and connect the panels to the controller and the controller to the house battery. One MUST ALWAYS be aware of the maximum current capacity of the solar controller and never install solar panels of a higher current capacity than the rated input of the solar controller.

Follow all solar panel and solar controller manufacturer's safety and installation guidelines when installing a solar charging system to your motorhome.

NOTES: Consult with your dealer or TMC Customer Care when installing a solar panel with your factory-installed solar controller.

10 Gauge stranded wire is rated for up to 300 watts of electrical energy. Where:

- Wattage = Voltage x Current,
- 300 w = 12 volts x 25 amps
- Do not exceed the capacity of the solar charging wiring.

A 10 amp solar controller has the maximum input current capacity from the solar panels of 100 -120 watts:

- 120 w = 12 volts x 10 amps
- Do not exceed the input current capacity of the solar controller.
- Ensure all installations are properly fuse protected.

A 30 amp controller has the maximum input capacity from the solar panel array of:

- 360 w = 12 volts x 30 amps
- The system is wired with 10 gauge wire.
- Do not exceed the input current capacity of the solar controller or the system wiring.

Solar Panels

Many TMC motorhome models are pre-wired from the factory for a dealer or owner installed solar panel. On select models, a 100 watt solar panel is a standard factory-installed feature. When installed, a solar panel and associated power controller becomes part of the auxiliary (house) battery charging system. A properly installed solar panel charging system offers many advantages:

- **Clean, quiet, and easy to use**
  - ▹ Solar panels consume no fuel and give off no waste.
  - ▹ There are no moving parts, which means no mechanical noise.
  - ▹ Simply place the solar panel in the sun and you generate electricity!
- **Low maintenance**
  - ▹ Since solar panels consume no fuel and have no moving parts to wear out, there are no air, oil, or fuel filters to change. Simply keep the surface of the panels clean.
- **Safe and reliable**
  - ▹ Due to its relatively low power output and if the system is installed using proper wire sizes and fuses, it is inherently safe.

Typical 100 Watt Solar Panel

The wattage rating of your solar panel was derived by a standard test method that all solar panel manufacturers use. This rating represents the solar panel's peak output under ideal conditions of sunlight intensity, direction, cleanliness of the surface and temperature of the panel. There are many atmospheric factors and physical conditions that will affect the output of your solar panel. On average, however, you should expect the output of your solar panel to be approximately 75-80 percent of its peak rating.

Solar Charge Controller

Featured from Model Year 2019, all TMC motorhomes are factory-equipped with a solar charge controller as part of the solar prep. A 10 amp solar charge controller is typically installed in TMC motorhomes, however, some of the larger diesel motorhomes are supplied with a 30 amp solar charge controller.

For details regarding your solar panel and solar charge controller, refer to the manufacturers owner's manuals included with TMC Owner's Packet.

Solar Charging, 10 amp Controller

When installed, a 10 amp solar charging system includes 1 - 10 amp solar controller and 1 - 100 watt solar panel. This factory-installation is wired with 10 gauge wire from the solar panel to the solar controller and to the house battery. Due to controller capacity, it is not recommended to add additional solar panels to this system.

Solar Charging, 30 amp Controller

Select TMC motorhomes are equipped with a 30 amp solar charging controller and system. These installations include 1 - 30 amp solar controller and 2 - 100 watt solar panels, wired in parallel (200 watts). Some TMC models are equipped with a 30 amp solar charging controller and one 190 watt solar panel.

⚠ CAUTION

Battery type selection on the controller determines charging parameters that best suit the battery type. Incorrect battery type selection settings may damage the battery.

1. Turn ON the solar charge controller. Check the battery manufacturer's specification to select correct battery type. The controller provides 4 battery types for selection: Gel, AGM, WET (conventional lead acid), and Calcium. Check the label on the battery to determine the type.

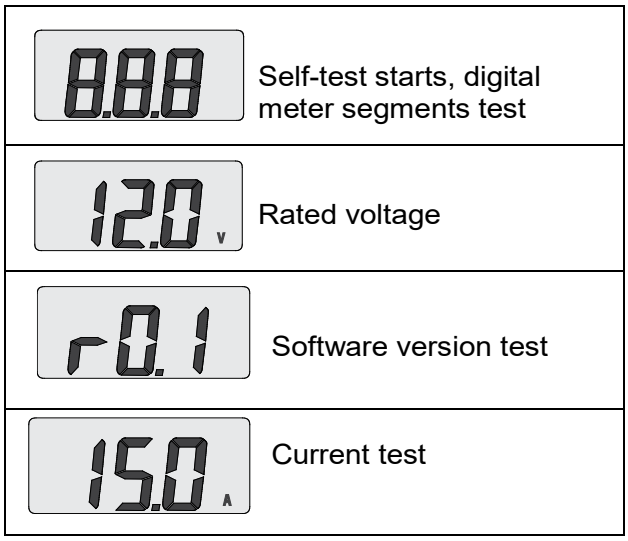
2. Press **BATTERY TYPE** button and hold for 3 seconds to enter the battery type selection mode. The battery type selected will display on the LCD panel. This setting is placed in the controller's memory.

Controller's LCD Display

3. With the battery type selected, the solar charger is ready to use. The LCD displays the charging states as below. Pressing the **AMP/VOLT** button sequences through these displays:
   - Battery Voltage;
   - Charging Current;
   - Charged capacity (amp-hour); and,
   - Battery Temperature (if an external temperature sensor is connected).

4. Turn ON the master battery disconnect switch to connect the solar charger to the auxiliary battery(ies).

Once the battery type is entered into the controller's memory, it does not need re-setting, unless the auxiliary battery(ies) are replaced with a different type.

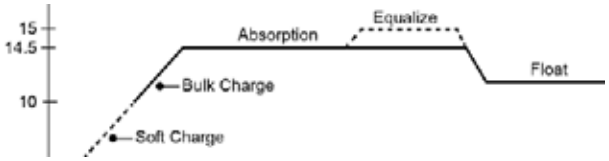


Examples of LCD panel display information

Wet Cell Battery Charging Algorithm

The following information describes the automatic charging methods the controller is programmed to perform.

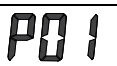
- **Auto Equalize**: The GP-PWM 10-SQ and 30-SQ have an automatic equalize feature that will charge and recondition your batteries once a month at a higher voltage to ensure that any excess sulfation is removed. This feature is recommended for Flooded batteries only. Check with the battery manufacturer if you are unsure of the battery type.
- **Soft Charge**: When batteries suffer an over-discharge, the controller will softly ramp the battery voltage up to 10 volts.
- **Bulk Charge**: Maximum current charging until batteries rise to Absorption level.
- **Absorption Charge**: Constant voltage charging and battery is over 85%
- **Equalization Charge** (only for WET battery, Flooded lead acid or Calcium battery type): When the battery is deeply drained below 10 volts, it will automatically run this stage to bring the internal cells as equal states and fully complement the loss of capacity. (Gel and AGM battery do not run Equalization charge.
- **Float Charge**: Battery is fully charged and maintained at a safe level. A fully charged battery has a voltage of more than 16.6 volts.

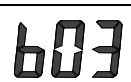


Battery Charge Profile Chart

Refer to the charts below to determine the status of the solar charging system.

The 6 LED's indicate the charging status and the battery condition						
	RED	BLUE	GREEN	GREEN	YELLOW	RED
Solar Power Present- No battery connected	ON	OFF	OFF	OFF	OFF	Flash
Soft charging	ON	Flash	OFF	OFF	OFF	ON
Bulk charging	ON	ON	OFF	Subject to battery voltage		
Absorption charging	ON	ON	OFF	ON	OFF	OFF
Equalization charging	ON	ON	OFF	ON	OFF	OFF
Float charging	ON	OFF	ON	OFF	OFF	OFF
Solar panel weak	Flash	OFF	OFF	Subject to battery voltage		
At night no charge	OFF	OFF	OFF	Subject to battery voltage		
Battery Voltage below 11.5V (+/- 0.2V)	ON	ON	OFF	OFF	OFF	ON
Battery Voltage between 11.5V - 12.5V(+/-0.2V)	ON	ON	OFF	OFF	ON	OFF
Battery Voltage above 12.5V (+/- 0.2V)	ON	ON	OFF	ON	OFF	OFF

Solar Panel Abnormal Mode	**LCD display**	**LED indication**	**LCD backlight**
Solar panel weak		 Flash	ON
Solar panel reverse connection		Flash	Flash
Solar panel over voltage (> 26.5V)		Flash	Flash

Battery Abnormal Mode	**LCD display**	**LED indication**	**LCD backlight**
Battery disconnected or less than 3.0V		 Flash  Flash  Flash	Flash
Battery reverse connection		 Flash	Flash
Battery over voltage than > 17.5V		 Flash	Flash
Battery temperature over 65C		 Flash  Flash  Flash	Flash

Solar Controller Abnormal Mode	**LCD Display**	**LED indication**	**LCD backlight**
The controller over temp. protection			Flash

10 amp Solar Controller Specifications

Description	Value
Nominal System Voltage	12V
Max. Solar Array Current	10 amps
Battery Voltage Range	6V – 15.5V
Max. Solar Voltage	25V
Bulk / Charge Voltage	10 – 14 V
Absorption Charge (Gel/AGM/WET)	(14.1 / 14.4 / 14.7) (25 °C / 77 °F), 1 - 2h / day
Float Voltage	13.6 (25 °C / 77 °F)
Equalization Voltage	15.5V (25 °C / 77 °F), 2h / 28 day or V < 12.1
Temperature Compensation	- 24mV / cell*K
Operating / Display Operating Temp.	- 20 to 50 °C / - 13 to 122 °F
Storage Operating Temp.	- 40 to 85 °C / - 40 to 185 °F
Humidity	100% N.C.
Protection	Battery reverse polarity, solar array reverse polarity, over temp., PV short circuit, over current

Dimensions (H x W x D):
102 x 130 x 27 mm
4.02 x 5.12 x 1.06 in
Weight: 151 grams / 5.34 oz
Maximum Wire Gauge: #6 AWG
Warranty: 1 year

- PWM charging
- 4 Battery charging profiles
- 4 Stage charging
- Monthly equalize option
- Displays charging current, Battery voltage and battery state of charge
- Reverse polarity protected
- Temperature compensated
- RoHS compliant
- Accepts up to 10 Amps DC Input Current

The total rated Maximum Power Current (Imp) of the PV input should not exceed 10 Amps

30 amp Solar Controller Specifications

Description	Value
Nominal System Voltage	12V
Max. Solar Array Current	30 amps
Battery Voltage Range	6V – 15.5V
Max. Solar Voltage	25V
Bulk / Charge Voltage	10 – 14 V
Absorption Charge (Gel/AGM/WET)	(14.1 / 14.4 / 14.7) (25 °C / 77 °F), 1 - 2h / day
Float Voltage	13.6 (25 °C / 77 °F)
Equalization Voltage	15.5V (25 °C / 77 °F), 2h / 28 day or V < 12.1
Temperature Compensation	- 24mV / cell*K
Operating / Display Operating Temp.	- 20 to 50 °C / - 13 to 122 °F
Storage Operating Temp.	- 40 to 85 °C / - 40 to 185 °F
Humidity	100% N.C.
Protection	Battery reverse polarity, solar array reverse polarity, over temp., PV short circuit, over current

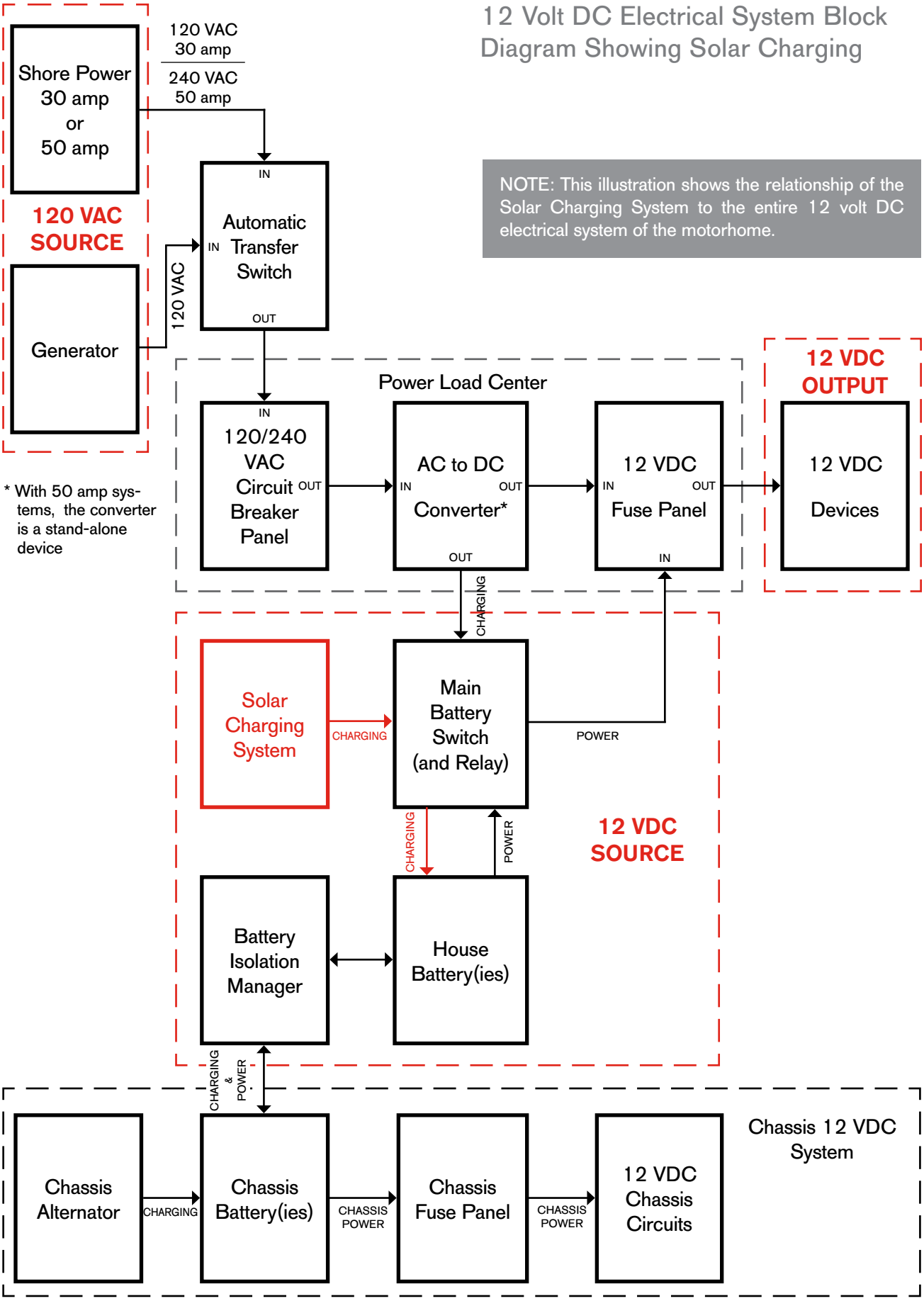
Dimensions (H x W x D):
156 x 122x 38 mm
6.14 x 4.80 x 1.50 in
Weight: 151 grams / 5.34 oz
Maximum Wire Gauge: #6 AWG
Warranty: 1 year

- PWM charging
- 4 Battery charging profiles
- 4 Stage charging
- Monthly equalize option
- Displays charging current, Battery voltage and battery state of charge
- Reverse polarity protected
- Temperature compensated
- RoHS compliant
- Accepts up to 30 Amps DC Input Current

The total rated Maximum Power Current (Imp) of the PV input should not exceed 30 Amps

12 Volt DC Electrical System Block Diagram Showing Solar Charging

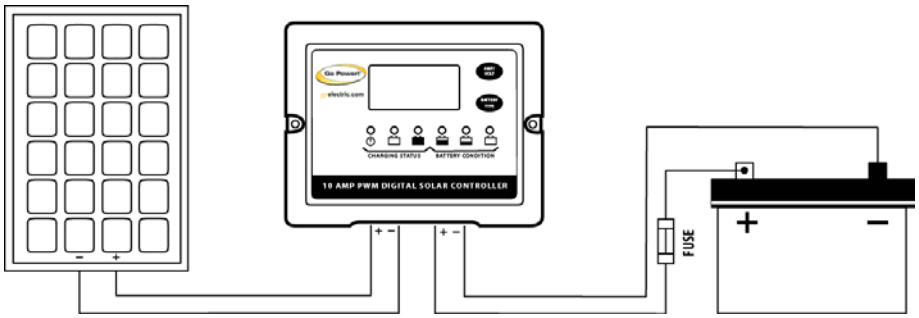
NOTE: This illustration shows the relationship of the Solar Charging System to the entire 12 volt DC electrical system of the motorhome.



10 amp Solar Charging Wiring Diagram

The GP-PMW-10 SQ is based on a 10 amp maximum input from the solar panels. Use the wiring diagram to connect your battery to the battery terminals on the solar controller First connect the battery to the controller and then connect the solar panel to the controller.

NOTE: The controller will not work unless there is a battery connected to the battery terminals



Solar Panel +

Solar Panel –

Battery +

Battery -

Note: Use a 10 amp fuse or breaker.

30 amp Solar Charging Wiring Diagram

To protect the battery and the solar panel, it is recommended that an in-line fuse is placed on the positive wire of both the solar and battery circuits. Use a 30 amp fuse for the GP-PWM-30-SQ, placed as close to the battery as possible.

The solar controller has 4 terminals which are clearly marked 'solar' and 'battery'. There is a 12 volt and ground terminal for each circuit. Refer to the wiring diagram below.

Solar Panel +

Solar Panel –

Battery +

Battery -

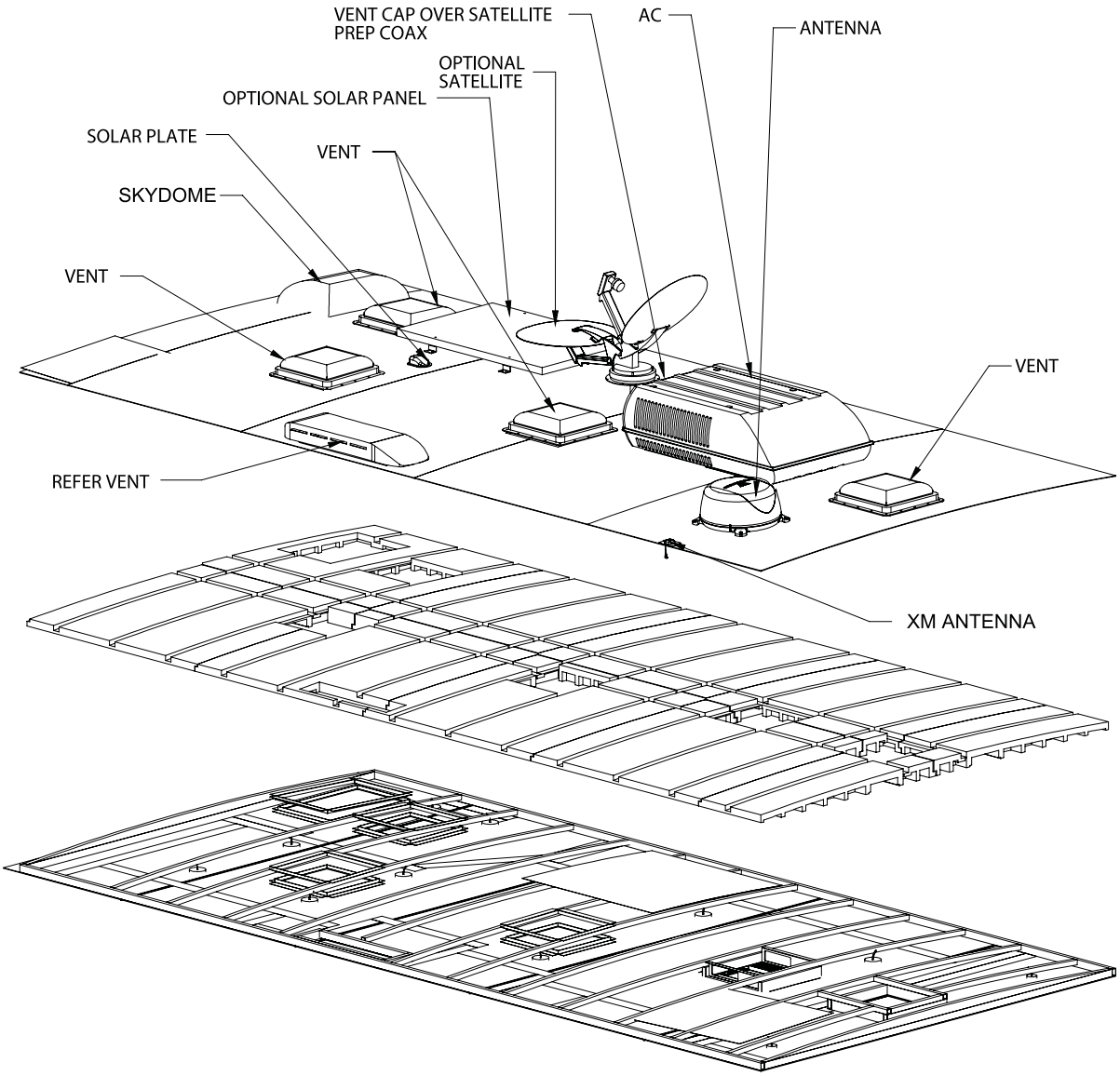
Note: The fuse or breaker used should be no larger than 40 amps

NOTICE

When installing a roof-mounted solar panel(s), ensure they are securely attached to mounting brackets and to structural components of the motorhome's roof. All mounting points and wiring ports need to be well sealed from moisture intrusion.

Owners who want to install a solar panel on the roof of their motorhomes need to know where the factory recommends solar panel placement.

The illustration below shows items that are typically installed on a roof, along with insulation and aluminum framing of the roof structure.



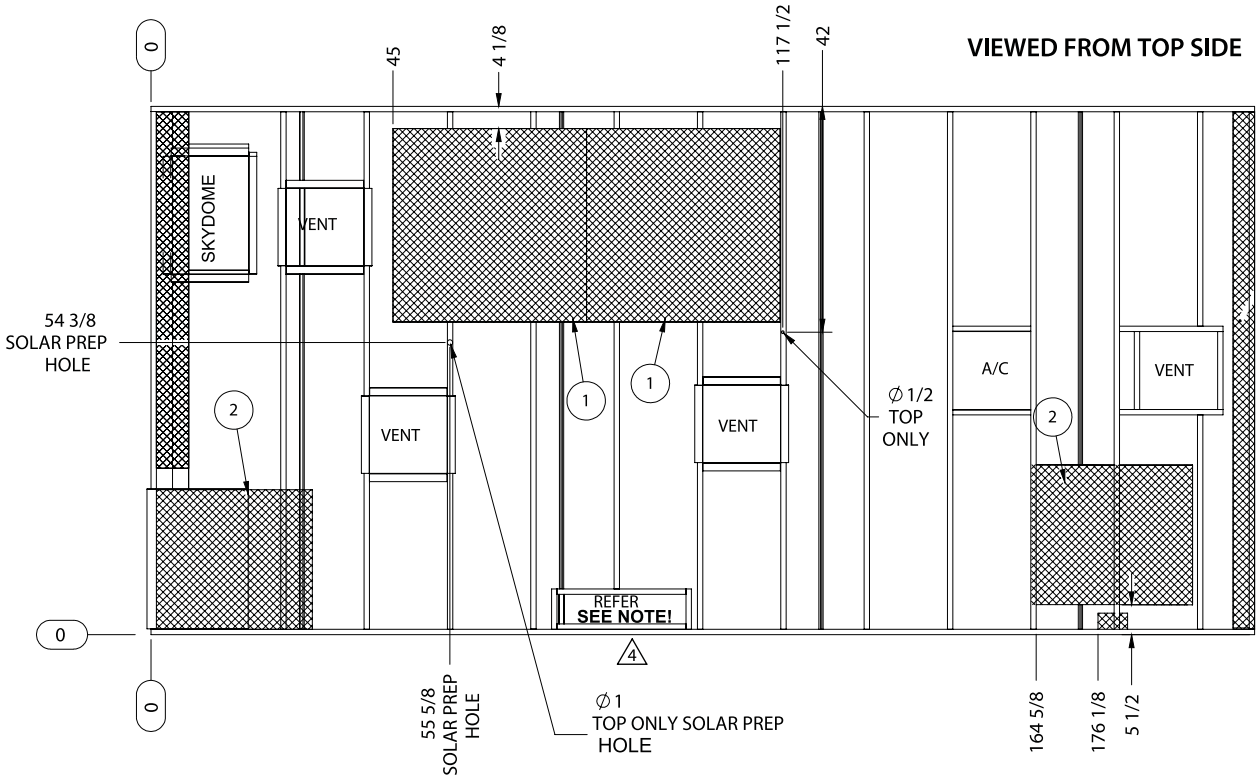
NOTE: FOR ILLUSTRATION PURPOSES ONLY. THE PLACEMENT OF ROOF ITEMS AND ROOF STRUCTURE COMPONENTS VARY BY CLASS AND FLOOR PLAN.

Roof Reinforcement

The shaded areas of this illustration shows reinforcing panels that are installed in the roof structure at time of roof fabrication. Reinforcement panels are fabricated from 28 gauge electro-galvanized steel (EGS). These areas are designed for secure accessory attachment.

Solar panel brackets must be fastened to either the roof aluminum structure or to the roof reinforcement sections. Recommended installation method is to secure solar panel mounting brackets to these reinforced sections using self-tapping screws that are generously sealed. Do not over-tighten screws; too much torque will strip-through the sheet steel.

Contact TMC Customer Care for specific installation instructions.



NOTE: FOR ILLUSTRATION PURPOSES ONLY. THE PLACEMENT OF ROOF ITEMS AND ROOF STRUCTURE COMPONENTS VARY BY CLASS AND FLOOR PLAN.

Battery Maintenance

⚠ WARNING

- **Keep sparks, cigarettes and flames away from the batteries as the hydrogen gas they create may explode.**
- **Do not connect a booster battery or other power source that outputs more than 14.2-volts DC to the motorhome batteries.**
- **Use adequate ventilation when charging or using batteries in an enclosed space.**
- **Remove metal jewelry and always wear eye protection when working around batteries.**
- **Do not allow battery electrolyte (acid) to come into contact with skin, eyes, fabric or painted surfaces. Electrolyte is a sulfuric acid solution that could cause serious personal injury or property damage.**
- **If your hands, eyes, clothes or the painted surface of your motorhome are exposed to electrolyte, flush the exposed area thoroughly with water.**
- **If electrolyte gets in your eyes, immediately flush them thoroughly with water and get prompt medical attention.**

⚠ WARNING

- **DO NOT SHORT ACROSS THE BATTERY TERMINALS. The spark could ignite the gases. Do not wear metal jewelry, such as rings, watches, or metal wrist bands when working on a battery.**
- **Before doing ANY work on electrical system, disconnect battery cable and the 120 volt power cord. Do not reconnect the cables until all work has been completed. This will avoid the possibility of shorting or causing damage to electrical components or shock to the servicing person.**
- **Battery electrolyte is a corrosive, poisonous, sulfuric acid. Avoid contact with skin, eyes, clothing, or any painted surface.**
- **ALWAYS WEAR SPLASH PROOF SAFETY GLASSES OR FACE SHIELD AND USE ACID-PROOF RUBBER GLOVES WHEN HANDLING AND WORKING WITH LEAD-ACID BATTERIES.**

Proper battery maintenance is important in order to ensure the battery retains its power delivery capacity while prolonging its useful life. Listed here are a few instructions for maintaining and servicing batteries. Some instructions apply only to batteries which are NOT maintenance-free, or sealed batteries.

The house batteries and chassis battery supplied with your motorhome may be maintenance-free, sealed type battery. Do not open or break seals on maintenance-free batteries.

1. Keep the battery mounted securely. Routinely check the battery terminals for loose battery clamps. Tighten when necessary.
2. Keep battery hold downs and trays clean and free of debris and corrosion.
3. Check the electrolyte level of the house batteries at regular intervals. Keep each cell filled to just above the plates with DISTILLED water only. Once the plates have dried out, they cannot be reactivated, and the capacity of the battery is reduced in direct proportion to the area of plate surface that has become dry. This kind of damage can occur quickly. If the fluid level is low, simply add distilled water.
4. Be cautious when removing battery fill caps. Pry off caps carefully. Forcing caps off can cause the electrolyte solution to splash. Electrolyte solution can burn, and even small amounts can damage eyes and skin. Always use proper personal protective equipment when working with batteries.
5. Keep the battery terminals clean. Corroded terminals make poor electrical contact and will prevent normal operation of the 12 volt system. Battery terminal corrosion occurs when the battery has been standing in a discharged condition over a long period of time, or when the battery has been operated continually in a state of partial discharge. Use a baking soda solution to neutralize the corrosion on the battery terminals and cable clamps. Do not allow the soda solution to enter the battery. Make sure the vent caps are secure. Flush with water. Thoroughly dry all cables clamps and terminals, reinstall, and use a battery terminal protecting spray or compound, available at automotive parts or auto service centers.
6. Check the outside condition of the battery. Look for cracks in the case or vent plugs. If the case is cracked, the battery must be replaced. If the vent plugs are cracked, they must be replaced.
7. Keep the battery in a full-charged condition. This will help prolong its useful life and help maintain its charge-holding capacity.
8. Watch for overcharging. Three indications of overcharging are:
   a. Active material on the vent cap (heavy deposit of black lead-like material on the underside of the vent cap);
   b. Excessive use of water or water escaping at vent caps;
   c. Abnormal voltage regulator output.
9. When removing a battery, disconnect the ground battery clamp first. When installing a battery, always connect the grounded battery clamp last.

10. When replacing batteries, make sure the new battery is the same type and rating of the battery that was originally equipped with your motorhome. If in doubt, consult your RV dealer for advice on battery replacement.

NOTES:

- Only use distilled water when filling battery cavities. Be careful not to overfill battery cavities and never move or travel with a battery that is uncapped.
- Use a battery terminal conditioning spray (available at auto parts stores) to prevent battery terminal corrosion.

Storage

To prevent house battery discharge when the motorhome is not connected to power through the shore line power cord, turn OFF the main battery switch and disconnect the negative battery cable at the terminal.

If the motorhome is connected to power through the shore line power cord, it is recommended the main battery switch be left ON (do not disconnect the battery(ies). This will allow the converter, inverter (if designed to do so), or solar panel (if so equipped) to trickle charge the house battery(ies).

Replacement

⚠ WARNING

TO PREVENT HAZARDS FROM DANGEROUS BATTERY GASES;

If replacing or adding additional batteries to the 12 volt electrical system, ensure batteries are always located in a well-ventilated area and separated from the living space of the motorhome.

When replacing batteries, make sure the new battery is the same type and rating of the battery that was originally equipped with your motorhome. If in doubt, consult your selling dealer or a qualified RV technician for assistance. Always re-connect the battery cables in the original factory-installed positions.

- Do not replace a deep cycle battery with a starting battery. Only use deep cycle batteries for your motorhome's house application.
- Do not replace your chassis, or starting battery with a deep cycle battery. A starting battery is designed to deliver higher instant amperage, needed to start the vehicle's engine.
- Check to be sure the replacement battery will fit the battery tray of your motorhome. Group 24 batteries are physically smaller than Group 27 batteries.

NOTES:

- For long-term storage, remove the battery(ies) from the motorhome and connect to a properly-sized trickle-charger. Consult with your motorhome dealer for further long-term storage recommendations.
- Always dispose of used batteries properly. It is best to take used batteries to a recycling center or ask your battery supplier to recycle the battery for you.

⚠ WARNING

Extinguish all pilot lights and igniters anytime the motorhome is in motion or refueling. This is accomplished by turning OFF the water heater, all propane appliances, and the propane gas supply (at the propane tank valve).

Conveniently located just inside the main entry of the motorhome, the monitor panel contains several useful features and system controls. Although monitor panels may vary by motorhome model and available features, in their basic form, the monitor panel provides these functions:

- Generator START (ON)/STOP (OFF) switch and hour meter
- Slideout EXTEND and RETRACT switch
- House (auxiliary) battery condition
- Fluid level Monitoring of the holding tanks (full to empty)
- Propane level within the LP tank
- Water heater ON/OFF switch
- Water pump ON/OFF switch
- Holding tank heaters ON/OFF switch (optional on some models)

To monitor the fluid level within the holding tanks, propane level within the LP tank, or monitor the energy level of the auxiliary batteries:

1. Press and hold the Selection Buttons that corresponds to the tank (holding or LP) or battery
2. One of the 4 LED indicator lights will illuminate, indicating an approximate level of a tank or an approximate charge condition of the auxiliary battery

LED Condition or Level Indicators

Selection Buttons

Battery Condition

L = Low F = Fair G = Good C = Full Charge

Typical Monitor Panel

Multiplex Control Systems

Select TMC motorhomes are equipped with multiplex wiring systems. A multiplex system uses low-voltage, digital signals to control the electrical and electro-mechanical devices within your motorhome via an intuitive, user-friendly touchpad. Control functions vary from motorhome to motorhome, depending upon the standard and optional equipment available. However, in its typical configuration, a multiplex system will allow the user to monitor and operate these features:

- Lighting and fan controls
- Climate (HVAC) control
- Holding Tank Level Monitoring
- Water heater ON/OFF
- Water Pump ON/OFF
- Electrical system monitoring; both AC and DC
- Battery monitoring and charging; both house and chassis batteries
- Inverter settings and controls
- Generator ON/OFF
- AGS (Automatic Generator Start) settings and controls
- PCS (Power Control System) settings and controls
- Slideout control
- Awning control
- Drop-down bunk controls
- Shore Power Fault Indicator

Depending on the model and floorplan of your motorhome, it may be supplied with a multiplex control system from a variety of manufacturers. However, every multiplex system is designed to be intuitive to operate. Basic operation involves these steps:

1. Ensure power is ON, either from 12 volts DC or 120 volts AC (shore power). With a power source ON, locate the main system panel. Some system panels will automatically 'turn on' when power is present, while other panels will require the user to press a button on the panel, or touch the display.

2. Select the feature you want to control. Some panels will have feature icons along one edge of the panel, while other systems will have feature icons displayed on the panel screen.

3. With the feature selected, operate the control. For example, turn on or off the lights, raise or lower the temperature, turn on or turn off the generator, operate slideouts, or operate awnings.

4. Return to the main menu by either pressing the 'Home' icon along the bottom edge of the panel, or on some system panels, press a return arrow on the display panel.

Some multiplex systems include individual switch panels for room control of lights, fans, etc.

Multiplex systems details are described in the manufacturers owner's manuals available on-line through your TMC Owners Resource account. Multiplex system how-to videos are also available on TMC's YouTube site:

https://www.youtube.com/user/ThorMotorCoach

Also refer to the TMC Multiplex Systems Guides available through your on-line TMC Owners Resource account.

Typical Multiplex Main Control Panels. Features vary depending upon model and floorplan

Multiplex Switch Panels

All Firefly multiplex systems installed on TMC motorhomes use SSP17 series wireless switch panels. Wireless switch panels are conveniently located throughout the motorhome to remotely control many of the functions found on the main touch-screen panel. Control functions vary from switch panel to switch panel. Some may control room lights and fans, while others may control awnings, water heaters, generators, bed lifts, or bed slides.

On the face of each switch panel are control icons that represent the function of the switch. Each control icon has a LED backlight to indicate whether the function is on or off. Depending on the control function, the switches may be momentary (press once for ON, press again for OFF), while other functions may require the user to press-and-hold for the function to operate correctly. Lights that are dimmable will have Up/Down arrows next to the icon. Press and hold these buttons to ramp the brightness up and down. Each time a button is pressed, the green operational LED will illuminate to indicate that the command has been sent to the system's controller.

The switch panels are easily removed from their mounting cradle, and because they are wireless, they can function as a remote control for the features indicated on the panel front plate. The panels are powered by a single watch-type battery (#2032), which will power the switch for years. If, when pressing a switch panel button, the green LED does not illuminate, the battery will need to be replaced (see note).

You can check battery status for all wireless switch panels by clicking on the settings button on the multiplex main touch-screen panel, then navigating to the Wireless Switches screen.

NOTE: Pry the switch from the wall mounting cradle to expose the battery compartment on the rear of the switch and replace the #2032 coin cell battery.

Typical multiplex wireless switch panel. Battery compartment access (below).

Multiplex System 12 Volt Circuit Breaker Panel

Instead of a fuse panel, select diesel pusher motorhomes with 50 amp electrical service and using a Firefly multiplex system, may have a 12 volt circuit breaker panel, similar to the illustrations shown on this page. Panels like this are typically located in a rearward closet or service bay.

These panels will contain a list of 12 volt circuits and devices printed on the face and include a corresponding row of LEDs that indicate whether or not the circuit or device is in-service. Along the bottom or side-edge of the panel will be a row of push-button circuit breakers with the prefix label of 'B'. The face label indicates the circuit that is controlled by each corresponding circuit breaker.

If a device LED is not illuminated, press the corresponding circuit breaker button to reset. If resetting the circuit breaker does not restore power to the device, there is either a problem with the device or circuit. If the circuit breaker refuses to re-set, this indicates there is something wrong with that circuit. **DO NOT ATTEMPT TO FORCE IT TO THE ON POSITION**:

- The circuit may be overloaded with too many devices;
- The device may draw more current that what the circuit is designed to supply;
- The device may have developed an internal short circuit;
- The circuit wiring or outlet (receptacle) may be damaged;
- The circuit breaker may be faulty and requires replacement.

DO NOT attempt to use that circuit or device until the problem is diagnosed and repaired by a qualified electrician. Contact your dealer or TMC Customer Care for electrical system advice.

Typical 12 volt circuit breaker panel for Firefly multiplex system

On select diesel motorhomes, the master battery disconnect switch, along with 12 volt circuit breakers, is located on a panel installed in a service bay of the motorhome.

Shore Line Power

⚠ DANGER

CONNECTING THE SHORE CORD TO A NON-GROUNDED OR IMPROPERLY GROUNDED POWER SOURCE CAN RESULT IN DANGEROUS AND POSSIBLY FATAL ELECTRIC SHOCK.

Due to the potential danger in failing to heed this warning, the motorhome manufacturer cannot be responsible should damage, injury, or death result from failure to connect the power cord to a properly grounded power source.

⚠ WARNING

The campsite power receptacle(s) should always be tested for proper functionality prior to connecting your motorhome's shore line power cord to it. Do not hook up the shore line power cord to any receptacle until you have verified proper voltage, polarity, and grounding.

DO NOT plug the shore line power cord into a campsite receptacle:

- **Improper voltage**
- **That has reverse polarity**
- **With non-functioning ground circuits**
- **That shows outward signs of heat or other damage**

Doing so may result in property damage or serious injury. Damage or injury resulting from a connection to a malfunctioning or improperly wired power source is not covered by warranty.

It is the responsibility of the owner of the electrical service to ensure that the receptacle is properly wired and grounded. Reverse polarity and/or improper grounding can cause personal injury or death.

⚠ WARNING

- **Do not use a cheater plug, adapter, or extension cord to reconfigure incoming alternating current (AC) power or break the continuity of the circuit connected to the grounding pin.**
- **Do not connect the shore line power cord into an outlet that is not grounded, or adapt the power cord plug to connect it to a receptacle for which it is not designed.**
- **Do not remove the grounding pin to connect to a non-grounded receptacle. Removal of the ground pin disables an important safety feature designed to prevent shock and electrocution hazards.**
- **Do not connect the shore line power cord to an extension cord. Use of an improper extension cord may cause overheating of the cord, power reduction, as well as potentially causing failure of electrical-powered equipment.**

⚠ WARNING

Make sure the circuit breakers at the electrical power source are in the OFF position before connecting and disconnecting the shore line power cord to the shore power source.

⚠ WARNING

The shore line power cord must be fully extended when in use, and not left coiled in the electrical compartment or on the ground. Doing so helps dissipate heat generated by electricity flowing through the conductors (wires) in the power cord.

⚠ CAUTION

It is strongly advisable to test the wiring of any external power source BEFORE connecting your motorhome. Along with a proper ground, the 120/220 volt AC source must have properly wired neutral and hot terminals.

Testing for correct power source wiring can be easily accomplished with a portable polarity tester, obtained from a RV parts supplier or dealer. Follow the instructions provided by the manufacturer when operating the tester.

If a problem with the external power source is found, CONTACT THE CAMPSITE MANAGER for repairs. Do not attempt repairs to the site power source and do not connect your motorhome to the site power source until it is determined safe to do so.

Typical shore line power port. Some power ports include a LED indicator that illuminates when power is ON to the motorhome.

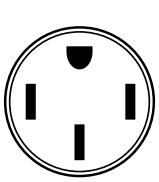
Depending on the electrical service wiring of your motorhome, a 30 amp or 50 amp shore line power cord is provided to connect the motorhome to a grounded AC external power source. The shore line power cord will either be permanently affixed to the motorhome's exterior compartment or detachable. Power cords rated for 30 amps are identified by 3-prongs, while 50 amp shore cords have 4-prong connectors.

Select motorhomes are equipped with a shore power cord attached to an electrically-powered reel, which makes handling and storing the rather heavy 50 amp cord more convenient.

Most campgrounds and RV parks provide external 30 and 50 amp AC power for your use. In addition, the park's electrical service usually includes a 15-20 amp, 110-120 volt AC outlet. Do not attempt to power your motorhome with this outlet; it is not designed to supply the amount of electrical energy your motorhome requires for normal operation.

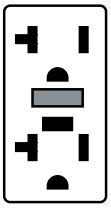
However, if the park only provides lesser-amperage service than what is required by your motorhome, shore power cord adapters are available that allow connecting your motorhome to the available power source. Whenever connecting to a power source that does not match your motorhome's power system, be mindful that your motorhome's full power requirements may not be met. You must limit power consumption (avoid using some powered devices).

NOTE: The three shore power source outlets illustrated are most commonly used throughout the United States and Canada.



220 volt AC
50 Amp

120 volt AC
30 Amp



120 volt AC
15-20 Amp

15-20 Amp, 120 Volt Power

⚠ WARNING

DO NOT USE A STANDARD HOUSEHOLD EXTENSION CORD TO CONNECT YOUR MOTORHOME TO ELECTRICAL SERVICE. IF SHORE POWER SERVICE IS LIMITED TO 15 OR 20 AMPS, USE OF LIGHT DUTY EXTENSION CORDS AND ELECTRICAL ADAPTERS WILL CREATE A VOLTAGE LOSS THROUGH THE CORD AND AT EACH ELECTRICAL CONNECTION.

Line voltage loss and the resistance at each electrical connection can be a hazardous combination. Damage to sensitive electronic equipment may result.

The 15-20 amp park service should only be used to power an external appliance, such as a portable compressor, electric power tools, electric leaf blower, or electric power washer. Only use a 3-pronged GROUNDED extension cord when connected to this power source. Use a power cord that has at the minimum, 14 gauge wire and suitable for outdoor use (not included with your motorhome). If the outlet is a GFCI type, test the outlet before using. Also test for proper outlet wiring with a portable polarity tester, available from most RV dealers.

Be sure to regularly inspect your extension cords and shore line power cords for cracks in the insulation, loose or missing prongs (pins), and other damage. Do not use if the ground prong is missing.

With care, a 120 volt AC, 15-20 amp electrical source can be used to power a few internal lights and an appliance, such as the refrigerator. A 15-20 amp source can also be used to trickle-charge the auxiliary battery(ies), especially when the motorhome is in storage.

Typical Campground electrical service stand. This illustration shows 50 amp, 30 amp, and 15-20 amp outlets, along with corresponding circuit breakers.

30 Amp, 120 Volt Shore Line Power

⚠ WARNING

MOTORHOMES THAT ARE FACTORY-EQUIPPED WITH A 30 AMP ELECTRICAL SERVICE SHOULD NEVER BE CONNECTED TO A POWER SOURCE THAT WILL PROVIDE MORE THAN 120 VOLTS AC.

Although 30 amp RV connectors look similar to 240 volt AC connectors found in residential homes (electrical dryers, stoves, etc.), the 30 amp RV power service is 120 volt AC.

Failure to follow this power requirement will result in serious damage to appliances and electrical devices.

If your motorhome is designed for 30 amp electrical service, a 30 amp shore line power cord is provided to attach the motorhome to a grounded 110-125 volt AC, 30 amp external power source. Always turn OFF the main power switch or circuit breaker of the shore power electrical outlet before connecting or disconnecting the shore line power cord. This will eliminate arcing of electrical contacts and reduce the potential of electrical shock. Please strictly follow all electrical-related safety labels affixed to your motorhome.

NOTE: The motorhome end of shore line power cords may be affixed to the to the motorhome, while other shore line power cords may have connectors on both ends. Connect the pronged (or male) end to the shore power cord to the external electrical service, and the socket (or female) end to the motorhome's electrical connection port.

⚠ WARNING

THIS CONNECTION IS FOR 110-125-VOLT AC, 60 HZ, 30 AMPERE SUPPLY.
DO NOT EXCEED CIRCUIT RATING.
EXCEEDING THE CIRCUIT RATING MAY CAUSE A FIRE AND RESULT IN DEATH OR SERIOUS INJURY.

A Warning Label, similar to the one shown here, is affixed on your motorhome, near the 30 amp shore line cord inlet.

4-prong, 50 amp shore power cord (left) and 3-prong, 30 amp shore power cord (right)

50 Amp, 240 Volt Shore Line Power

⚠ WARNING

MOTORHOMES THAT ARE FACTORY-EQUIPPED WITH A 50 AMP ELECTRICAL SERVICE ARE DESIGNED TO BE CONNECTED TO A 50 AMP EXTERNAL POWER SOURCE, WHICH PROVIDES A COMBINED TOTAL OF 240 VOLTS AC.

The 240 Volts comes from two 120 Volt power legs (measured to neutral or ground and 180 degrees out of phase). This power service provides 100 amps total to the motorhome. The motorhome should never be connected to a power source that supplies voltages that are more than 120 Volts on either incoming power leg.

Failure to follow this power requirement will result in serious damage to appliances and electrical devices.

NOTICE

50 amp shore power must be capable of supplying 220-240 volts AC, measured across both legs of the service, and supply 50 amps on each leg of the service (100 amps total).

Depending on the model, your motorhome may be supplied with a 50 amp electrical service and have a 50 amp shore line power cord, which is used to attach the motorhome to a grounded 50 amp external power source. Similar to the incoming power service to your house, the incoming voltage of a 50 amp service is 240 volts AC, consisting of two 120 volts AC power legs. At the circuit breaker panel of the Power Load Center, the 2 power legs are split, each feeding 120 volts AC power to separate sections of the fuse panel.

Always turn OFF the main power switch or circuit breaker of the external power source when connecting or disconnecting the shore line power cord. This will eliminate arcing of electrical contacts and reduce the potential of electrical shock.

NOTE: A 50 amp shore power source supplies 240 VAC incoming power; 120 VAC on each of the two power legs. The Power Load Center is wired to split the incoming 240 VAC into two 120 VAC branches for the motorhome's electrical circuits.

A Warning Label, similar to the one shown here, is affixed on your motorhome, near the 50 amp shore line power cord inlet.

⚠ WARNING

THIS CONNECTION IS FOR 208Y/120-VOLT or 120/240-VOLT AC, 3-POLE, 4-WIRE, 60 HZ, 50 AMPERE SUPPLY.
DO NOT EXCEED CIRCUIT RATING.
EXCEEDING THE CIRCUIT RATING MAY CAUSE A FIRE AND RESULT IN DEATH OR SERIOUS INJURY.

Powered Shore Line Cord Reel

Select TMC motorhomes are equipped with a powered shore line cord reel. 50 amp shore power cords have large diameter wires and, due to their size and weight, can be difficult to handle. A powered cord reel facilitates retracting the shore line cord when not in use.

The motor of the powered cord reel operates on 12 volts DC from the auxiliary (house) batteries. Therefore, the master battery disconnect switch must be ON in order to operate the powered cord reel.

50 amp shore power cord attached to an electrical-powered reel.

Connecting to an External Power Source

Inquire with the campsite owner or manager if they provide the electrical service your motorhome requires. Ensure the external electrical source is properly wired and grounded before connecting your motorhome. If the external electrical source is confirmed to be appropriate for your motorhome's electrical system, follow this electrical hook-up procedure:

1. Locate the Power Load Center inside your motorhome and turn OFF the MAIN circuit breaker.
2. Carefully extend the entire length of the shore line power cord (approximately 35 feet) from the motorhome to the external power source.
3. Ensure the circuit breaker(s) at the external power source are OFF.
4. Connect the shore power cord to the receptacle on the motorhome. If the connector has a locking ring, carefully engage the threads until snug. Some connector designs may require a slight twist after insertion, while some power cords are wired directly to the motorhome, making this step unnecessary.
5. Plug the shore line power cord into either the 30 amp or 50 amp external power receptacle, matching the power requirements and power cord connector of your motorhome. Be sure all the connector prongs are properly and completely inserted into the power source receptacle.
6. Turn ON the circuit breaker at the external power source.
7. Turn ON the MAIN circuit breaker at the motorhome's Power Load Center.

Attach the shore power cord to the motorhome by slipping the connector over the pins of the connection port. Give the connector a slight twist to the right, then spin-on the locking ring to secure the power cord.

Turn OFF shore power service circuit breakers before connecting shore power cords. Also, turn OFF circuit breakers before disconnecting shore power cords.

The shore power cord is usually stored in an external storage bay. Some shore power cords are wired directly to the motorhome, while other styles require connection to both the motorhome and the external power source.

When you are ready to leave the campsite, reverse the shore line power cord connection process. Use care to prevent damaging the electrical connection pins when connecting or disconnecting the shore line power cord. Grasp the plug to remove the shore line power cord from the outlet; do not unplug it by pulling on the cord.

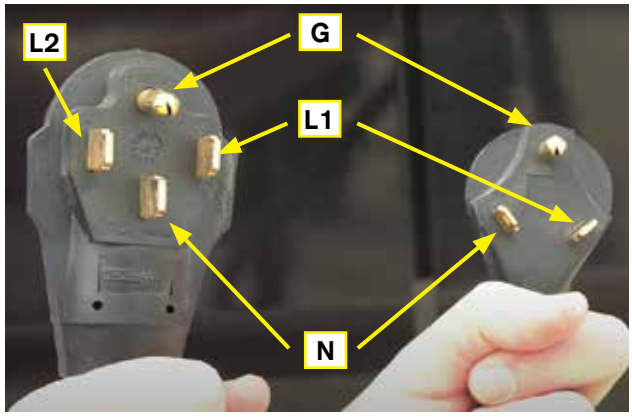
NOTE: The shore line power cord should be unplugged when the motorhome is left unattended for long periods of time.

If a fault should occur with the shore power system, your motorhome will be isolated from the power source, therefore preventing potential damage to your motorhome's electrical system.

Shore Power Wiring Configuration

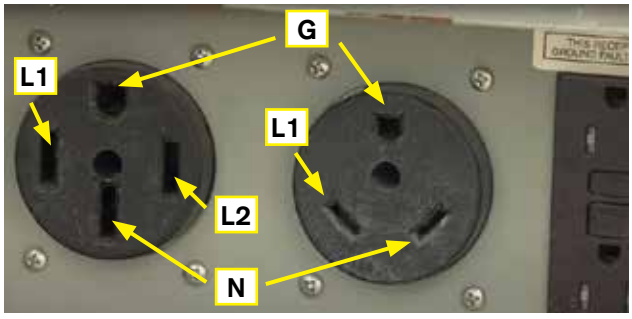
For safe electrical power for your motorhome's electrical system, it is important that the external power source is correctly wired. If the shore power source is incorrectly wired, it is possible that the chassis frame and metal objects could become energized. It is also extremely important that the shore power source is properly grounded, thus protecting from the physical hazards of electrical shock.

Below are illustrations of the proper wiring for the 50 amp and 30 amp shore power cords and their corresponding power receptacles. Please talk to the campground's maintenance personnel if you have any questions or concerns regarding the wiring of the campground's electrical hook-ups.



G = Ground L1 = Leg 1 (120 VAC measured to neutral or ground)

N = Neutral L2 = Leg 2 (120 VAC measured to neutral or ground. L1 and L2 are 180 degrees out of phase)



INCOMING POWER PROTECTION

Beginning with model year 2022, all TMC motorhomes will be equipped with transfer switches that provide reverse polarity and open ground protection. If there is a fault with the shore power source, a fault warning message will be displayed either on the multiplex main panel screen or an indicator on the monitor panel and power will not be passed through the transfer switch to the motorhome.

Shore Line Cord Plug Adapters

⚠ WARNING

USE EXTREME CAUTION WHENEVER ADAPTING SHORE POWER CORDS TO A UN-MATCHED ELECTRICAL SERVICE.

- **50 AMP SHORE POWER CORD TO A 30 AMP SERVICE**
- **50 OR 30 AMP SHORE POWER CORD TO A 15-20 AMP SERVICE**

THE SIGNIFICANTLY REDUCED AMOUNT OF AVAILABLE INCOMING POWER COULD DAMAGE ELECTRICAL MOTORS, COMPRESSORS, AND OTHER DEVICES.

⚠ WARNING

NEVER ADAPT A 30 AMP SHORE POWER CORD TO A 50 AMP EXTERNAL POWER SERVICE.

SEVERE ELECTRICAL OVERLOAD TO THE SHORE POWER CORD AND/OR THE MOTORHOME'S ELECTRICAL SYSTEM COMPONENTS COULD CAUSE ELECTRICAL FIRES OR OTHER DAMAGE.

⚠ CAUTION

REDUCE POWER LOADS WHENEVER ADAPTING A LARGER AMPERAGE SHORE POWER CORD TO A SMALLER SHORE POWER SOURCE.

DO NOT USE POWER-CONSUMING ITEMS, SUCH AS AIR CONDITIONERS, MICROWAVE OVENS, ETC.

Plug adapters are available to allow connecting your 4-prong, 50 amp shore line power cord to a 3-prong, 30 amp shore power service, and a 3-prong, 30 amp shore power cord to a standard, 3-prong household electrical plug.

WARNING, if you are adapting from a 50 amp electrical system to a 30 amp power source, your motorhome will NOT be supplied with the total electrical power required

Power cord adapters are available in several styles and configurations. Only use adapters when absolutely necessary and on a temporary basis. Always be aware that the use of adapters usually restricts the available power to the motorhome.

NOTE: In limited shore power situations such as described here, when possible, it is a better solution to use the motorhome's generator to supply electrical power.

to operate all on-board devices simultaneously. A 30 amp, 120 volt service can only supply up to 3,600 watts of power (watts = amps x volts), where a 50 amp, 240 volt service can supply up to 12,000 watts of power, or 3 times the power compared to a 30 amp service.

Only do so as a **TEMPORARY** means of supplying limited electrical power to your motorhome. Use high-demand electrical devices, such as air conditioners and kitchen appliances judiciously. Electrical overloads can easily happen and could cause damage to the electrical devices of your motorhome.

USING A 120 VOLT, 15-20 AMP POWER ADAPTER

Use 120 volt, 15-10 amp adapters only for extremely limited use, such as powering a few internal lights, powering a refrigerator, or providing charging energy for your auxiliary batteries when the motorhome is in storage.

Trickle Charging Batteries During Storage

The shore power cord and the motorhome's converter can be used to keep the auxiliary batteries charged during storage.

1. Use a plug adapter to convert the shore power plug to a standard, 3-prong household outlet.
2. At the motorhome's circuit breaker panel, turn ON the Main Circuit breaker(s) and the Converter circuit breaker. Turn OFF all other circuit breakers.
3. Plug in the shore power cord to the household outlet.
4. Turn ON the master battery disconnect switch.
5. Ensure all interior lights and 12 volt devices are OFF or disconnected from the power source.

NOTE: Batteries in Class A Diesel Pushers with inverter/chargers can be charged without the master battery disconnect switch ON.

Shore Power Cord Maintenance

Inspect the shoreline power cord for damaged or missing contact pins, cuts, cracks, and worn insulation. Damaged shore power cords are an electrical shock hazard. For your own safety and to maintain the integrity of the electrical system, replace damaged shore power cords immediately.

NOTE: Travel with a circuit tester or a digital multimeter in your tool bag. This will allow testing shore power service and help diagnose power-related issues.

Power and Electrical Accessories

Your dealer is the best source for advice and recommendations for shore power accessories, such as power plug adapters, extensions, circuit testers, surge protectors and other useful devices pertaining to shore power and the electrical system of your motorhome.

NOTE: Always respect electrical energy and never use an electrical device that is faulty or damaged. Only use an electrical device or accessory for its designed purpose.

Tips and Troubleshooting

NO POWER TO THE MOTORHOME:

- Make sure the motorhome's shore power cord is plugged in correctly and completely.
- Check campground's shore power service for a tripped circuit breaker. Turn the circuit breaker OFF, then back ON. **NEVER** force a circuit breaker to stay ON if it does not latch in the ON position.
- Check Main circuit breaker(s) located in the motorhome's Power Load Center (circuit breaker panel). Turn the circuit breaker OFF, then back ON. **NEVER** force a circuit breaker to stay ON if it does not latch in the ON position.
- Check the circuit breaker(s) on the generator's control panel (located on the generator. Turn the circuit breaker OFF, then back ON. **NEVER** force a circuit breaker to stay ON if it does not latch in the ON position.
- If using a surge protector, try bypassing the surge protector to determine if power can be restored.

NO ELECTRICITY IN COACH:

- Make sure the master battery disconnect switch is ON.
- Check the circuit breaker for the converter (located in the Power Load Center (circuit breaker panel). Turn the circuit breaker OFF, then back ON. **NEVER** force a circuit breaker to stay ON if it does not latch in the ON position.
- A power source fault may have been detected by the transfer switch. Verify by viewing the fault indicator located on the monitor panel or multiplex control panel.
- Try operating the generator to determine if power can be supplied by the generator.
  - ▹ If the motorhome can be powered by the generator, but not shore power, then something is likely wrong with the shore power service.
  - ▹ If the motorhome cannot be powered by either shore power service or the generator, then something may be wrong with the transfer switch or electrical supply wiring.

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120 Volt Power System

Generator

⚠ DANGER

OPERATING THE GENERATOR CREATES EXHAUST GASES THAT CONTAIN CARBON MONOXIDE. CARBON MONOXIDE IS POISONOUS AND CAN CAUSE UNCONSCIOUSNESS AND DEATH.

- **THE GENERATOR PRODUCES DANGEROUS FUMES WHEN IT IS RUNNING. SEVERE PERSONAL INJURY, DEATH, AND EQUIPMENT DAMAGE CAN RESULT FROM OPERATING THE GENERATOR IN A GARAGE, BUILDING, OR A CONFINED SPACE. WHENEVER THE MOTORHOME IS PARKED OR STORED IN A GARAGE OR CONFINED SPACE, DISABLE THE AGS SYSTEM TO PREVENT THE GENERATOR FROM AUTOMATICALLY OPERATING.**
- **TO AVOID EXHAUST GAS ENTRY INTO THE MOTORHOME, KEEP WINDOWS CLOSED WHEN THE CHASSIS OR GENERATOR ENGINES ARE RUNNING.**
- **Test the CO/LP detector installed in your motorhome frequently to ensure protection from carbon monoxide and/or LP gas leaks. If an alarm sounds, immediately shut off the generator and all gas and electric appliances and evacuate the motorhome. Turn off the main battery disconnect switch and main gas valve at the LP tank. Seek medical assistance if necessary. Have all necessary repairs to equipment made by a qualified technician before continuing use.**
- **Disable the AGS system when sleeping in the motorhome. The potential of carbon monoxide poisoning is present when the generator is operating and the alarm may not awake you to the hazard.**
- **When parked, be sure that the generator's exhaust is clear of any obstructions, such as underbrush, rocks, and snow. Follow all generator safety guidelines provided by TMC in your owner's manual and the instruction manual provided by the generator's manufacturer.**

⚠ CAUTION

Read and understand the generator owner's manual before operating the generator. Observe all operating instructions and warnings, as well as all recommended maintenance schedules and procedures.

The on-board generator provides 120 volts AC energy when shore power is unavailable. Most generators are designed to operate whether the motorhome is stationary or in-motion, therefore, it is a convenient source of 120 volts AC power. As when connected to shore power, the generator also works in unison with the converter (See Converter Section) to also supply 12 volts DC to the motorhome, thus conserving house battery usage.

Typical Cummins-Onan RV Generator

Always be mindful that exhaust gas produced by the generator contains deadly carbon monoxide gas! **NEVER sleep in the motorhome with the generator running.** Before you start and use the generator, inspect the exhaust system. Do not use the generator if the exhaust system is damaged. Test the carbon monoxide detector every time you use the motorhome. Know the symptoms of carbon monoxide poisoning:

If you or any of your traveling companions experiences these physical symptoms, move the person to fresh air immediately. If the physical symptoms persist, seek medical attention! Shut the generator down and do not operate it until it has been inspected and repaired by a qualified technician.

- Dizziness
- Vomiting
- Nausea
- Muscular twitching
- Intense headache
- Throbbing in the temples
- Weakness and sleepiness
- Inability to think coherently

Generator Safety Guidelines

Always follow these generator safety guidelines:

- NEVER store anything in the generator compartment. Always keep the compartment clean and dry.
- DO NOT operate the generator in an enclosed building or in a partly enclosed area such as a garage.

- READ and be familiar with all safety precautions for fuel and exhaust fumes found in your owner's manual.
- READ and be familiar with the instructions, cautions and warnings associated with the generator that are provided in the manufacturer's owner's guide.
- DO NOT operate the generator when the motorhome is parked in high grass or brush. Heat from the exhaust could cause a fire in dry conditions.
- NEVER operate the chassis or generator engine, or the engine of any vehicle, longer than necessary when the vehicle is parked.
- DO NOT simultaneously operate generator and a ventilator which could result in the entry of exhaust gas.
- When parked, position the motorhome so that the wind will carry the exhaust away from the motorhome. DO NOT open nearby windows, ventilators, or doors into the passenger compartment, particularly those which can be 'down wind,' even part of the time.
- DO NOT operate the generator when parked in close proximity to vegetation, snow, buildings, vehicles, or any other object which could deflect the exhaust under or into the motorhome.
- DO NOT touch the generator when running, or immediately after shutting OFF. Heat from the generator can cause burns. Allow the generator to cool before attempting maintenance or service.
- Before using the generator, inspect the exhaust system. Do not use it if the exhaust system is damaged. Test the carbon monoxide alarm every time you use the motorhome. If the CO alarm sounds, immediately move everyone to fresh air and ventilate the motorhome. Shut the generator OFF, and do not operate it until it has been inspected and repaired by a qualified technician.

Generator Power Rating

Every generator has a power capacity rating, stated in watts or kilowatts:

1,000 watts = 1 kW

Most Class C gasoline motorhomes are equipped with generators ranging from 3.2 kW to 4.0 kW. Some Class C diesel models have 6.0 kW generators. Class A motorhomes are supplied with generators ranging from 4.0 kW to 6.0 kw and up to 10.0 kW for the larger diesel models.

Often, this power rating is referred to as the generator's 'size,' which does not refer to the generator's physical dimensions, but its power-generating capacity The 'size' of the generator supplied with your motorhome was determined by the supply amperage of the motorhome, 30 amps or 50 amps, and the number of electrical circuits and features of the motorhome. Larger motorhomes typically require more power than smaller models, due to additional electrical features. It is important to know the generating capacity of your motorhome's generator and have a good knowledge of the power demands of the devices contained within the motorhome, both built-in features and the extra electrical devices you bring along with your travels. Typically, devices that use a significant amount of electrical energy are those that contain motors, compressors and electrical heating elements.

The generator has built-in overload protection, which will turn off electrical power if the demand exceeds what the generator can safely supply. This overload protection device, similar to a circuit breaker, is located on the generator's control panel. Typically, this is not a remotely mounted device. It is important not to exceed the power-generating capacity of the generator by attempting to operate too many appliances at the same time.

Starting and Stopping Procedures

Your generator can be started and stopped from the integral control panel on the generator, or from the optional remote control panels or switches located inside the motorhome. Outlined here are the simple steps for starting and stopping the generator:

- Before starting the generator, turn OFF air conditioners and large electrical loads.
- Before starting in cold weather, turn OFF all appliances for best long-term performance.

TO START:

1. Locate the Generator ON/OFF switch, on the Monitor Panel or integrated into the Multiplex Control Panel.
2. Prime the engine by holding the OFF position of the start/stop switch for a few seconds. The LED on the switch will turn on.
3. After priming, press and hold the ON position until you hear the generator start. The LED will flash during starting, then remain on when the generator is running.
   a. The engine will turn over and should start within a few seconds.
   b. If the engine fails to start within a few seconds, do not over-crank.
4. Before turning ON appliances, let the generator warm up for a few minutes. Generally, a beep from an appliance indicates that the generator is supplying electricity.

Under normal operating conditions, you may detect the engine of the generator increase and decrease in RPM (run faster and slower). This is normal, due to changes in electrical power demand.

TO STOP:

1. Turn off air conditioners and large electrical loads and allow the generator to run for 3-5 minutes before stopping, to allow the generator to cool down.

2. Press and hold the OFF switch position until the generator stops. The indicator LED on the switch will turn off.

NOTES:

- To prevent generator overload due to initial start-up current demand, turn ON air conditioners and appliances in a sequential order and ONLY AFTER THE GENERATOR IS STARTED AND RUNS FOR A FEW MINUTES.
- If you lose power to the motorhome while operating the generator, check the overload circuit breaker on the generator; it may have tripped due to too much power demand. Turn off some appliances or electrical devices in order to reduce the total power demand.
- Control switches for operating the generator are located on the monitor panel or, if equipped, on the multiplex touch-screen panel.
- Your motorhome's generator may be equipped with features that prevent operation if certain maintenance parameters are not met, i.e., low engine oil level, clogged air and fuel filters, etc.
- If your generator fails to start or remain running, and there is an adequate fuel supply and 12 volts DC present, it may need maintenance attention. Refer to the manufacturer's owner's manual for troubleshooting and maintenance procedures.
- The generator will continue to run after a circuit breaker trips. Turn OFF all appliances before resetting the breaker. If the breaker trips again with all electrical loads off, turn OFF the generator and contact a qualified technician for repairs.
- If your motorhome is supplied with an AGS system, refer to your motorhome's Owner's Packet for details regarding its features, set-up programming, and operation.
- If your motorhome has a multiplex wiring system, settings for the automatic generator start system are incorporated in the Settings Menu of the multiplex system.
- For complete generator instructions, refer to the manufacturer's guidelines included in your Owner's Packet, or available through your TMC Owners Resource account, or available from the manufacturer's website.

Generator Fuel

Depending on the motorhome model, generators may be fueled by either gasoline, diesel, or propane (LP). If the generator is fueled by either gasoline or diesel, fuel for the generator is drawn from the vehicle's fuel tank. There is provision built into the fuel delivery system that prevents the generator from depleting the entire fuel supply, which could potentially leave the vehicle stranded. Fuel to the generator will be cut-off when the level in the vehicle's fuel tank reaches 1/4 full.

Select motorhome models are equipped with a LP-fueled generator. LP is drawn from the motorhome's propane tank to fuel the generator's engine. There is no fuel cut-off provision with the LP system, so it is possible for the generator to deplete the fuel in the LP tank, leaving little-to-no LP for other gas appliances.

NOTES:

- Diesel and gasoline-fueled generators require 12 volt DC power to start. Operating fuel is drawn from the motorhome's fuel tank. If the fuel level of the motorhome's fuel tank drops to or below ¼ full, the generator will automatically shut OFF and cannot be restarted until the motorhome's fuel tank is filled to above ¼ full.
- Propane-fueled generators also require 12 volt DC power to start, but draw operating fuel from the LP tank. There is no fuel-limiting provision, therefore, monitor LP usage to ensure an adequate supply of LP remains available for other LP appliances (furnace, refrigerator, stove, water heater).
- The use of fuel stabilization treatments may be helpful in order to avoid moisture build-up in the fuel-delivery components of your generator. Consult with the manufacturer of your generator for fuel-treatment recommendations.

Refer to your generator's owner's guide for complete break-in, operating, and maintenance information.

Managing Electrical Loads

If you try to operate too many electrical devices at the same time, you will likely 'overload' the generator. In overload conditions, your ceiling lights may flicker or dim, or the circuit breakers on the generator or the main electrical panel may trip open, disrupting the flow of electrical power. Listed below are a few electrical devices that, because of their significant power demand, have the potential of overloading your generator:

- During start-up, air conditioners need reserve power and can draw 3-4 times the typical 1400-2400 watts needed to run. Low, or insufficient electrical power can prevent air conditioners from starting.
- Battery chargers (built into the converter) are activated automatically and can draw a large load (up to 3000 watts). Manage your electrical loads by adjusting battery charge rates to best suit your needs. Consult your inverter/charger manual or manufacturer's web site.
- If you have an automatic generator start/stop system (AGS), consult the inverter/charger owner's manual for adjustment procedures. Adjust automatic generator control parameters to best suit your total electrical needs.

POWER DEMAND CAN BE DETERMINED BY A COUPLE OF WAYS:

1. Simply note the amperage rating of the circuit breaker (120 volts AC) or fuse (12 volts DC) within the Power Load Center that is powering the device. Then, using the power formula:

   Power (Watts) = Voltage x Current (amperage),

   you can determine the power consumption of that particular circuit.

   For example, perhaps your air conditioner is connected to a 20 amp circuit; the maximum power requirements of that circuit would be 20 amps x 120 volts, which equals 2,400 watts. Because electrical circuit loads are designed not run at maximum capacity, the actual current requirement of the air conditioner is likely less than 20 amps.

   If you total all the power ratings of the circuits you are using, then you will have a good idea of the power-generating demand that will be required from your generator.

   Again, this method calculates the circuit capacity, not the device power consumption of the device, yet, it can be a quick and useful method of determining power consumption.

2. The second, and more accurate way of determining the power demand of your devices is to add all the wattage requirements of every electrical device being operated at a given time. This will give you the total power demand of your electrical devices. Although this is a more accurate method of determining total power demand, it requires that you know, or are able to obtain, the power consumption rating of each electrical device in use (see Calculating Electrical Loads section).

Motors, and compressors require higher energy at initial start-up than at operating conditions. Therefore, to ensure the generator can supply this extra power demand, it is best to turn ON devices such as air conditioners, furnace blowers, refrigerators and other motorized appliances in a sequential order.

Power Surging

NOTICE

When operating sensitive electronic appliances or devices, such as computers, it is highly recommended to use surge protectors to prevent power surges from damaging your electronic devices.

The electrical supply (voltage and frequency) for any appliance must remain within very close limits for it to operate properly. Changes in the electrical supply, called surging, can damage the appliances in your motorhome. Proper care of your generator will enable it to supply stable power and prevent surging.

Effects of High Altitude and Extreme Temperatures

When you travel at high altitudes or in extreme temperatures, you may find that the generator is not capable of supplying the same level of energy as it would at lower altitudes or moderate temperatures. During these conditions, it may be necessary to limit the use of some electrical appliances and devices.

Power decreases 3.5% for each 1,000 feet above an altitude of 500 feet. For example, to operate at 4,500 feet altitude, multiply 3.5% (.035) x 4 (4,000 ft) = 14% power loss. Then multiply 14% (0.14) x your generator's power rating. This will give you the generator's altitude-adjusted power rating.

NOTE: The carburetor on a non-EFI gasoline generator may require adjustment at high altitudes. Refer to the generator's operating manual or contact an authorized RV generator service center.

Generator Break-in and Maintenance

NOTICE

It is very important to monitor your generator's fuel, oil and other maintenance items on a regular schedule.

The generator may be equipped with a safety feature that prevents its engine from operating if the oil level is low. Check oil level frequently. Top off and change at the manufacturer's recommended intervals.

Your generator is a rather complex piece of equipment, and as such, does require a proper break-in period and routine maintenance in order to remain in prime operating condition. It is also recommended that the generator be 'exercised' or used for at least 60 to 120 minutes every month. This brings in fresh fuel into the carburetor and helps expel excess moisture that can cause corrosion in the internal components.

NOTE: Refer to your generator's owner's guide for complete break-in, operating, and maintenance information.

Automatic Generator Start (AGS)

⚠ DANGER

- **SEVERE PERSONAL INJURY, DEATH, AND EQUIPMENT DAMAGE CAN RESULT FROM OPERATING THE GENERATOR IN A GARAGE, BUILDING, OR A CONFINED SPACE. THE GENERATOR PRODUCES DANGEROUS FUMES WHEN IT IS RUNNING. IF A GENERATOR IS INSTALLED IN AN RV, DISABLE THE AGS SYSTEM TO PREVENT THE GENERATOR FROM STARTING WHEN THE RV IS IN A CONFINED SPACE.**
- **Test the CO/LP detector installed in your motorhome frequently to ensure protection from carbon monoxide and/or LP gas leaks. If an alarm sounds, immediately shut off the generator and all gas and electric appliances and evacuate the motorhome. Turn off the main battery disconnect switch and main gas valve at the LP tank. Seek medical assistance if necessary. Have all necessary repairs to equipment made by a qualified technician before continuing use.**
- **Disable the AGS system when sleeping in the motorhome. The potential of carbon monoxide poisoning is present when the generator is operating and the alarm may not awake you to the hazard.**
- **When parked, be sure that the generator's exhaust is clear of any obstructions, such as underbrush, rocks, and snow. Follow all generator safety guidelines provided by TMC in your owner's manual and the instruction manual provided by the generator's manufacturer.**

Motorhomes equipped with the 12 volt DC refrigerator (compressor-type) or other 12 volt DC or 120 volt AC appliances (such as a roof-top air conditioner) may have an automatic generator start (AGS) system installed. When enabled, this device will automatically turn ON the on-board generator when the voltage of the 12 volt system drops to a programmed setting. Some AGS systems turn on at a pre-programmed temperature setting. The generator will remain ON for either a timed duration or until the auxiliary battery(ies) are re-charged to a programmed setting.

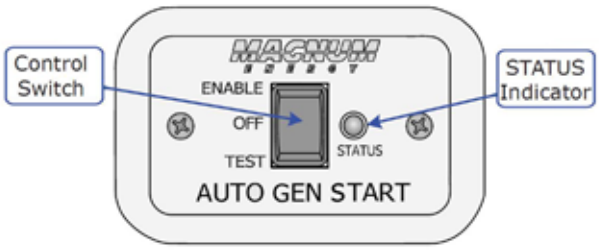
NOTE: Motorhomes equipped with a Multiplex Wiring System will have built-in AGS controls. Use the multiplex main panel to control, monitor, and adjust AGS parameters.

AGS SYSTEM OPERATION

When the AGS is enabled and has determined that a low battery and/or a high temperature condition exists, it attempts an automatic generator start. This is done by closing its internal relays (based on the GEN TYPE selection) to control the starter much like a person does when manually starting the generator. The starter is turned on for short periods of time and then turned off. If the AGS determines that the engine has started while cranking (indicated by a solid green STATUS indicator), the starter is turned off after a short delay. If the engine does not start, another attempt to turn on the starter is made after a long delay period. This is repeated until either the generator starts or the maximum number of start attempts is reached, which causes the AGS to go into a fault condition (indicated by a solid red STATUS indicator).

REMOTE PANEL OPERATION

The AGS remote panel provides information and enables you to operate the AGS system. The remote panel receives its power from the controller through the communications cable, and comes on automatically when power is applied to the AGS controller. The remote switch provides an ENABLE position to activate the AGS system, an OFF position to turn the AGS system off, and a momentary TEST position that allows the AGS system to be tested remotely. A STATUS indicator is also included to remotely view system status.



Auto Gen Start (AGS) remote panel

Switch Positions

- **OFF** – When the AGS switch is placed in the OFF position, the STATUS indicator will be off and all AGS generator start functions are disabled.
- **ENABLE (normal operating position)** – When the AGS switch is placed in the ENABLE position, the AGS system is activated/enabled and monitors battery voltage and/or temperature to determine when to automatically start the generator.
- **TEST** – When the AGS switch is pushed to the momentary TEST position, the AGS initiates an automatic generator start/stop sequence. This test attempts to turn on the generator and allow it to run for at least 30 seconds before turning the generator off. This start/stop test is used to confirm that all wiring from the generator to the AGS is correct and that the AGS is correctly configured for your generator type.

NOTE: Pushing and releasing the momentary TEST position enables the same test as pressing and releasing the red TEST pushbutton switch on the AGS controller.

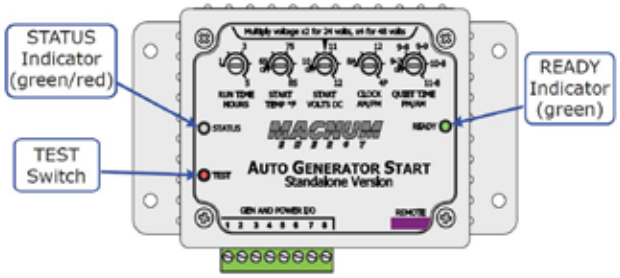
STATUS LED Indicator

- **Flashing Green** – Indicates that the AGS system is initiating a generator start sequence. This can happen based on two conditions, either: 1) The TEST switch (on the controller or remote switch) has been pressed and released; or, 2) The remote switch has been set to the ENABLE position and the START TEMP °F setting and/or the START VOLTS DC setting has been reached.
- **Solid Green** – Indicates the generator has started successfully and is providing the required run sense voltage to Terminals 2 (+) and 4 (–) of the AGS.
- **Solid Red** – This is a fault condition to indicate that the generator has not provided a correct run sense voltage to Terminals 2 (+) and 4 (–) of the AGS controller after four start attempts.

AGS CONTROLLER

The AGS controller provides a pushbutton to test system operation, and two LED indicators for viewing system operation.

NOTE: For ease-of-access, the AGS Controller is usually located in a storage bay near the generator.



Auto Gen Start (AGS) Controller

TEST Switch

When pressed and released, the TEST switch attempts to turn on the connected generator and allows it to run for at least 30 seconds before turning it off. This start/stop test is used to confirm that all wiring from the generator to the AGS is correct and that the GEN TYPE setting is correctly configured for your generator type.

NOTE: Pushing and releasing the AGS red TEST pushbutton switch enables the same test as pressing and releasing the momentary TEST position on the AGS remote switch.

STATUS LED Indicator

- **Flashing Green** – Indicates that the AGS system is initiating a generator start sequence. This can happen based on two conditions, either: a) The TEST switch (on the controller or remote switch) has been pressed and released; or, b) The remote switch has been set to the ENABLE position and the START TEMP °F setting and/or the START VOLTS DC setting has been reached.
- **Solid Green** – Indicates the generator successfully started and is providing the run sense voltage to Terminals 2 (+) and 4 (–) of the AGS controller.
- **Solid Red** – This is a fault condition to indicate that the generator has not provided a correct run sense voltage to Terminals 2 (+) and 4 (–) of the AGS controller after four start attempts.

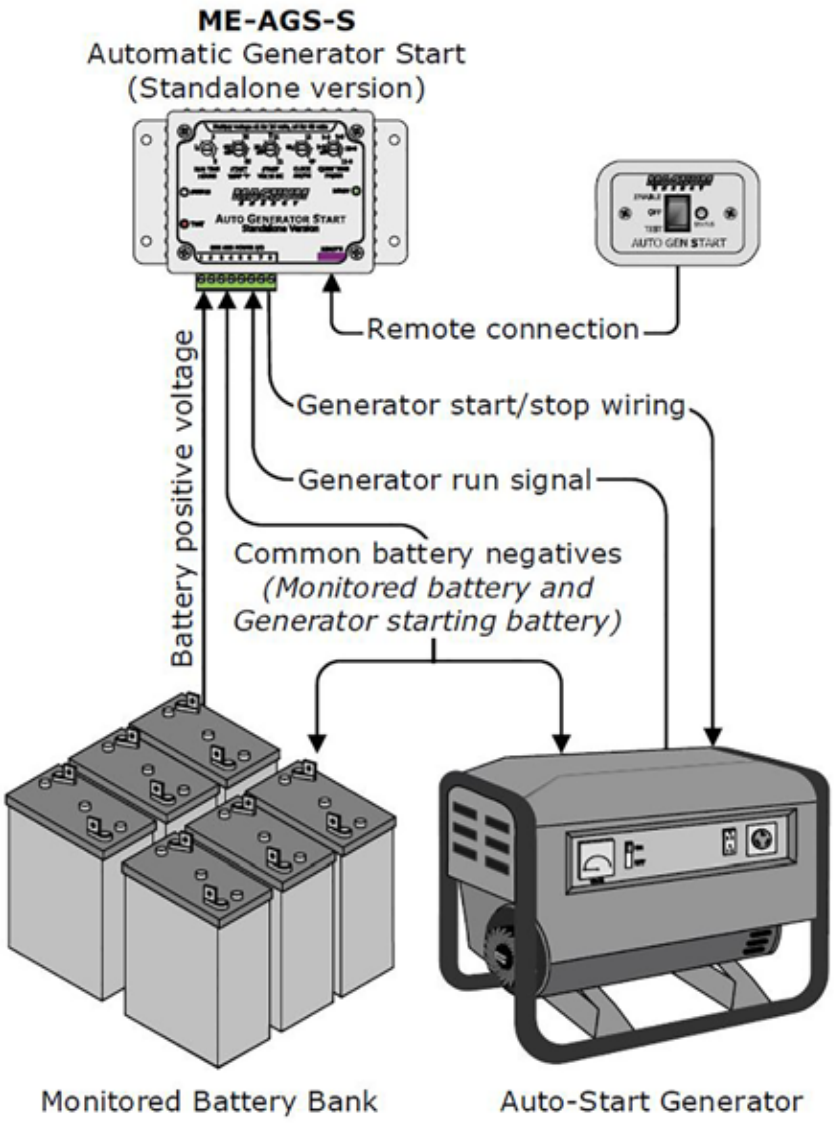
READY LED Indicator

- **Solid Green (normal AGS system indication)** – Indicates the AGS controller has power and the remote switch is plugged in correctly.
- **Flashing Green** – Indicates that the AGS controller has power, but the remote switch is not sensed. This means the remote switch is either not connected, incorrectly connected, is defective, or has an incorrect or defective cable.

AGS OPERATIONAL NOTES

- The main battery disconnect switch must be ON in order to operate any and all 12 volt devices and systems, including the AGS and control circuits for the generator.
- The AGS control switch must be manually set to ENABLE to use the AGS system.
- The AGS system has a 5-amp in-line fuse located near the auxiliary battery(ies). Check this fuse if the AGS system is not working. If necessary, only replace with a fuse of the same type and rating.
- To manually stop the generator during the run time cycle, simply press the control switch to the OFF position.
- If a fault condition occurs, press the AGS control switch to OFF and then back to the ENABLE or TEST position. If the problem persists, refer to the Troubleshooting section in the manufacturer's instruction manual.
- When the AGS control switch is placed in the OFF position, all AGS generator start functions are disabled. The STATUS indicator is also off when the switch is in this position.

  HOWEVER, the generator can always be manually operated by using the generator control switch located on the Monitor Panel or Multiplex Panel (if equipped).
- Once the generator has completed the RUN TIME HOURS, the AGS immediately begins to monitor the START TEMP °F and START VOLTS DC settings for the next autostart cycle.



Typical AGS System Diagram

- It is recommended that the AGS control switch be set to the OFF position if the connected generator is placed into storage or left unattended for extended lengths of time.
- If using the temperature start feature in an RV coach, set the air conditioner thermostat to match the START TEMP °F setting. If using two air conditioners, it is suggested that the second air conditioner thermostat be set 2°-5° higher than the first air conditioner. This staggered setting allows the first air conditioner to start and run in an effort to keep the coach cool. If the temperature continues to rise inside the coach, the second air conditioner turns on to further cool the coach.
- When the generator starts successfully, the STATUS indicator turns solid green. The generator runs until the RUN TIME HOURS setting is reached, at which time a stop signal is sent to the generator.
- If the generator is running when either switch is placed in the TEST position, the generator stops and then starts again. The generator then runs for approximately 30 seconds before shutting off.

- There is a two minute delay before the AGS attempts to start the generator if the voltage to the AGS controller falls to the START VOLTS DC setting. There is no delay if the AGS attempts to start the generator when the temperature around the remote switch rises to the START TEMP °F setting.

NOTES:

- The AGS is factory-set to keep the auxiliary battery(ies) in the proper voltage range for the 12 volt refrigerator and other 12 volt devices. If you change the low-voltage turn-on setting, ensure it is kept within the proper operating range for the refrigerator, or compressor damage could occur.
- There may be other programmable parameters available with your AGS system, such as generator run-time, temperature-controlled start (for automatic A/C operation), quiet-time settings, etc. Consult the manufacturer's instruction manual for complete AGS system operations.

AGS Troubleshooting Guide

LED Indication	Symptom	Solution
STATUS is ON: Red = Gen Fault	1) Gen won't start; or, 2) Gen won't run. Starts, but is stopped by AGS (B+ or run sense voltage not sensed to Terminal #2)	Check gen to AGS start wiring; or check B+ wiring from gen to AGS. Measure DC voltage from Terminal 2 (+) to Terminal 4 (-), ensure DC voltage is 10-40 volts only when the generator is running. Switch OFF, then ENABLE to reset.
STATUS flashing Green = gen start initiated	Gen start initiated	No problem - normal operation.
STATUS is ON (solid) Green = Gen Run	Gen started OK	No problem - normal operation
READY is OFF = no power to AGS	DC voltage to Terminals 3 (+) and 4 (-) incorrect	1) Check battery voltage. 2) Check fuse. 3) Check DC wiring.
READY is flashing = remote switch is not connected	Remote control switch not sensed or plugged into the REMOTE port	1) Check communications cable connection to remote and controller, or 2) Try a different 6-conductor telephone cable. Switch OFF, then ENABLE to reset.
READY is ON (solid) = remote switch is not connected	Remote switch connected to REMOTE port	No problem - normal operation.

Automatic Transfer Switch

⚠ WARNING

Beginning with model year 2022, the transfer switch provides protection from reverse polarity and ground faults due to faulty shore power source and generator wiring. DO NOT DEFEAT THESE PROTECTIVE FEATURES. SEVERE DAMAGE TO THE ELECTRICAL SYSTEM, INCLUDING ELECTRICAL SHOCK COULD OCCUR.

The Automatic Transfer Switch is an electronically controlled relay that senses the presence of 120 volts AC incoming power; either from shore power or from the on-board generator. It automatically switches between these two incoming power sources, connecting the active incoming power source to the Power Load Center, thereby powering the motorhome's electrical system.

When 120 volts AC is not present, the Automatic Transfer Switch connects the auxiliary battery to the house 12 volt system. If an inverter is installed, limited 120 volts AC is available for a restricted number of circuits and appliances.

THE AUTOMATIC TRANSFER SWITCH OPERATES UNDER THESE CONDITIONS:

- When shore power is sensed, it connects the external AC power source to the Power Load Center.
- If there is a shore power outage and the generator is started, either manually or by the Automatic Generator Start System (see Section 10, AGS), incoming power is switched from the shore power source to the generator after a 20-45 second delay.
- If shore power returns while the generator power is present, the system remains on generated power until the generator is turned off. With the generator off, electrical power for the motorhome is switched to the shore power source.
- The generator overrides shore power.
- If 120 volts AC is not present, check the circuit breakers at the shore power source and/or the output of the generator.

INCOMING POWER PROTECTION

Beginning with model year 2022, TMC motorhomes are equipped with transfer switches that provide reverse polarity and open ground protection. If there is a fault with the shore power source or generator power, a fault warning message will be displayed either on the multiplex main panel screen or an indicator on the monitor panel and power will not be passed through the transfer switch to the motorhome.

IF A FAULT MESSAGE IS DISPLAYED:

1. Contact the park maintenance personnel to check the wiring of the shore power source. **DO NOT ATTEMPT TO REPAIR A FAULTY SHORE POWER SOURCE. LEAVE IT TO A PROFESSIONAL ELECTRICIAN.**
2. If 120 volts AC is NOT present while attempting to power your motorhome with the on-board generator, check the circuit breakers on the generator.
   - Turn OFF air conditioner and other electrical appliances.
   - Reset circuit breakers if needed.
   - Re-start the generator and after 30 seconds, turn ON electrical appliances. If power is not restored, have a qualified service technician look into possible problems with the generator or transfer switch.

NOTE: The transfer switch supplied with your motorhome is rated for either 30 amp or 50 amp service, depending on the electrical system configuration of your motorhome.

Power Load Center, 30 Amp

Power Load Center of your motorhome provides electrical control for both 120 volt AC and 12 volt DC circuits. This unit consists of three main components:

- **120 volt AC Circuit Breaker Panel**
- **12 volt DC Fuse Panel**
- **Converter**

The Power Load Center is usually located in the rear bed pedestal or a rear closet, but may be located elsewhere within the motorhome. Each circuit of the main power panel is labeled according to the device(s) connected to it.

Typical 30 Amp Power Load Center with integrated converter

Typical 30 Amp circuit breaker and fuse panel. Note circuit and device labels.

120 Volt Circuit Breaker Panel

⚠ DANGER

- **Do not force a tripped circuit breaker into resetting. A tripped circuit breaker indicates a problem with the circuit that must be corrected.**
- **Do not replace circuit breakers with one of a higher current rating.**
- **Do not replace blown fuses with a fuse of a higher current rating.**
- **Circuit damage could result, creating the potential of electrical shock, electrocution, and fire.**

⚠ WARNING

- **Any needed repairs to the electrical system of your motorhome should be performed by a qualified RV electrician. If misused, electrical energy is dangerous and can cause fires, electrical shock, or electrocution.**
- **Replacement circuit breakers must be of the same voltage, amperage rating, and type. Never use a higher rated replacement circuit breaker than what was originally installed with your motorhome. Doing so may cause a fire by overheating the motorhome's wiring.**

The 120 volt AC section of the Power Load Center contains toggle-type circuit breakers. Circuit breakers protect the 120 volt wiring and components in your motorhome from circuit overloads and shorted circuits. Should a circuit overload or short circuit occur, the circuit breaker protecting the affected circuit will 'trip,' preventing the flow of electricity through that circuit.

A circuit breaker identification label is permanently attached to the inside surface of the 120 volt AC Load Center. The circuit breakers will not offer complete protection of the motorhome electrical system in the event of a power surge or spike.

If a circuit breaker trips, turn OFF and unplug the electrical appliance(s) or devices on that circuit and allow the circuit breaker to cool down. After the cool down period, reset the circuit breaker by moving the switch to the OFF position and then back to the ON position, then plug-in the electrical devices and try operating them. If the circuit breaker re-trips or frequently trips, unplug the appliances(s) on the circuit and contact your selling dealer's service department to have the electrical problem diagnosed and repaired. It is possible that the appliance is faulty, not the circuit.

If the circuit breaker refuses to re-set, this indicates there is something wrong with that circuit. DO NOT ATTEMPT TO FORCE IT TO THE ON POSITION:

- The circuit may be overloaded with too many devices
- The device may draw more current that what the circuit is designed to supply
- The device may have developed an internal short circuit
- The circuit wiring or outlet (receptacle) may be damaged

Do Not attempt to use that circuit or device until the problem is determined and repaired by a qualified electrician.

NOTES:

- Circuit breakers and fuses are vital in keeping the electrical system of your motorhome in a safe operational condition. Never bypass or defeat circuit breakers or circuit fuses.
- Some electrical appliances may have their own circuit breakers. If there is an interruption in electrical service of an appliance, consult the manual for that appliance to determine the recommended action to take.
- For motorhomes equipped with a multiplex wiring system, the power load center and associated circuit breaker/fuse panels is quite different than the power load center described in this section.

  For information regarding multiplex wiring systems, please contact your selling dealer or a TMC Customer Care representative.

Maintenance

Before using your motorhome, inspect the circuit breakers and replace them as needed. Test each circuit breaker by moving the individual switches to the OFF position, and then back to the ON position. Circuit breakers may degrade over time and, as part of your motorhome's maintenance, must be replaced as needed.

12 Volt Fuse Panel

⚠ WARNING

Replacement fuses must be of the same voltage, amperage rating, and type. Never use a higher rated replacement fuse as it may cause a fire by overheating your motorhome's wiring.

The circuits that receive power from the 12 volt DC section of the Power Load Center are protected by automotive blade-type (ATC) fuses. The 12 volts DC fuse panel label indicates fuse sizes, positions, and the electrical components powered through the 12 volt circuits. To determine if a fuse has BLOWN (unable to pass electricity), it must be pulled from its socket and visually inspected. A blown fuse will have a distinct, open gap in the wire or conductor between the fuse blades.

Only replace blown fuses with fuses of the same size and current rating of the fuse that was originally supplied in the fuse socket. Each socket will be labeled with the correct current rating. Replacing any fuse with a higher current rated fuse will create an unsafe condition, possibly causing circuit damage and a fire.

ATC Blade-Style Fuse

A blown fuse indicates a problem with the circuit that is associated with the fuse. You must determine the cause and take corrective actions whenever a fuse is blown. Possible causes of blown fuses are:

- Too many devices attached to the circuit, causing circuit overload
- The circuit may be overloaded by a device that demands more energy than what the circuit is designed to deliver
- A short-circuited or defective device attached to the circuit
- A short-circuited wire or outlet associated with the circuit

Automotive-type 12 volt fuses

Before replacing a fuse always shut OFF the engine, generator, and all motorhome electrical systems completely, including making sure the electrical components listed on the fuse label are in the OFF position:

1. Shut OFF the chassis engine.
2. Disconnect the shore line power cord.
3. Shut the generator OFF (if equipped).
4. Turn the inverter OFF (if equipped).
5. Turn OFF the Master Battery Disconnect Switch and disconnect the auxiliary battery main negative battery cable.
6. Remove the fuse panel cover.
7. Make sure the electrical component located on the fuse label is turned OFF.
8. Pull the fuse straight out of the fuse block. If inspection of the fuse confirms that it is not blown, some other electrical problem may exist.
9. Insert a new fuse of the same specified voltage, amperage rating, and type in the original location. Never use a higher rated replacement fuse.

The fuse panel label should be kept permanently affixed to your motorhome. The fuses will not offer complete protection of the motorhome electrical system in the event of a power surge or spike. Fuses are maintenance components and must be replaced as needed. Please contact your selling dealer's Service Department for further repair assistance.

Take corrective action to repair any defective electrical circuit or device. If help is needed, seek assistance or repairs from a qualified RV electrician or technician.

NOTE: Blade-type fuses come in several sizes; mini, standard and large. The fuse sockets of the Power Load Center only accept standard ATC-size blade type fuses.

Keep a supply of properly rated blade-type fuses on hand in case a fuse needs to be replaced. Replacement fuses can be obtained at auto parts stores or auto repair facilities.

Converter

When 120 volts AC is present, either by an external power source (shore power) or the generator, 12 volts DC power requirements for the motorhome are provided by the converter. The converter is a switching power supply, effectively transforming 120 volts AC to 12 volts DC; providing power for lights, slideouts, awnings, battery charging, and other 12 volt DC-powered items. The output of the converter is connected to the 12 volt fuse panel, which in turn, provides electrical power to each 12 volt circuit. Whether your motorhome has a 30 amp or 50 amp electrical service, and if the converter is part of the Power Load center or a stand-alone unit, the converter is designed to integrate with the Power Load Center, becoming an integral part of the power distribution system of your motorhome.

Typical converter: model, features, and installation location varies, depending on motorhome model and floorplan.

CONVERTER OPERATION MODES

Most converters are automatic three-stage switching power supplies. The converter senses which mode it needs to be in by sensing the demands of the motorhome's power distribution system.

The three modes/stages of operation include:

- **Absorption mode/Normal operation**

  The converter normally provides a constant target output voltage of 13.6 volts (nominal) to power all the branch circuits. However, it is current limited, and if the output (load) current reaches its maximum, the output voltage will drop as necessary to hold the converter's maximum output current level (the amperage rating) without exceeding it.

- **Bulk mode/Charge mode**

  If the output current reaches its maximum (normally caused by a discharged battery), this will cause the converter to go into Bulk Mode, which means the target output voltage will change to 14.4 volts and a timer will start. Although the converter is outputting 14.4 volts, the voltage increase will not be detectable on a voltmeter due to the voltage-current relationship.

The actual output voltage will not rise until the load is reduced, which happens naturally as the battery charges or if 12-volt appliances are turned off.

Bulk Mode will be maintained until the current draw drops to approximately 5 amps, or until the timer reaches four hours (whichever happens first). Then the target output voltage is changed back to 13.6 volts for Absorption Mode. Lights that are powered from the output may change brightness slightly at that time.

- **Float mode/Trickle charge**

  After the output has been maintained at 13.6 volts (Absorption Mode) for 44 hours, the converter will change to Float Mode with an output of 13.2 volts. This output may then reset to Absorption Mode (13.6 volts) if power is interrupted, or to Bulk Mode (14.4 volts) if the output current limit is reached.

NOTES:

- While in Float Mode, the converter will supply a trickle charge to the battery. If the motorhome is in storage for any length of time, check the battery(ies) and battery fluid levels every 3 weeks.
- In order for electrical charging energy from the converter to connect to the auxiliary battery(ies), the master battery disconnect switch must be ON.

If the transfer switch does not sense 120 volts AC at its input, it automatically switches the auxiliary (house) batteries to the 12 volt DC electrical system and the auxiliary batteries become the source of 12 volt power. When connected to a 120 volt AC power source, the transfer switch automatically disconnects the auxiliary batteries from the 12 volt electrical system and again, the converter becomes the source of 12 volts DC power.

NOTE: Converters installed in motorhomes with 50 amp electrical service are usually stand-alone units; physically separate from the Power Load Center.

USING THE CONVERTER

NOTICE

If the converter is not operating correctly, the reverse polarity protection fuse may be blown (located on the converter front panel). Check the connections on the house battery for proper polarity and correct if necessary. If a fuse requires replacement, only replace with one of the same type and rating.

Under normal operating conditions, the converter requires no user attention or maintenance. However, if the auxiliary batteries happen to become reverse connected, fuses that protect the converter from cross-polarization may blow. If your converter is not operating, check the polarity of the auxiliary battery connections and correct if necessary. If the fuses on the front panel of the converter have blown, replace with the same type and amperage rating. If the incoming AC voltages are normal, but the converter output is still **NOT** delivering 12 volts DC, the converter requires repair. Contact the manufacturer for service details.

The converter has several design features that protect it and the 12 volt electrical system of your motorhome.

- **Over-Temperature Protection**

  If the internal temperature of the converter exceeds a critical point, it will shut down. This protects the unit from excessive heat that may damage sensitive components. The unit will restart once the internal temperature of the converter has dropped to a safe level.

- **Electronic Current Limiting**

  In the event that the output current exceeds the maximum rating for the WF-9800 Series Converter/Charger, the output current will remain constant, but the output voltage will begin to drop. If this occurs, the unit will recover once loads are reduced.

- **Short-Circuit Protection**

  Should a short circuit occur in the motorhome's 12 volt system, the WF-9800 Series Converter/Charger will drop the voltage output to zero volts. If the short-circuit condition is removed and no other fault conditions are detected, the converter will resume normal operation. However, short-circuit conditions are dangerous, and the electrical system will require inspection by a qualified service technician.

Due to the high level of electrical energy it supplies, the converter may be warm to the touch when operational, and this is normal. It does, however, have built-in thermal protection; if it gets too hot, it will turn itself off. After it cools down, the converter will return to normal operation. In most cases, this thermal cycling is caused by some object being placed in too close of proximity to the converter, preventing it from receiving adequate ventilation.

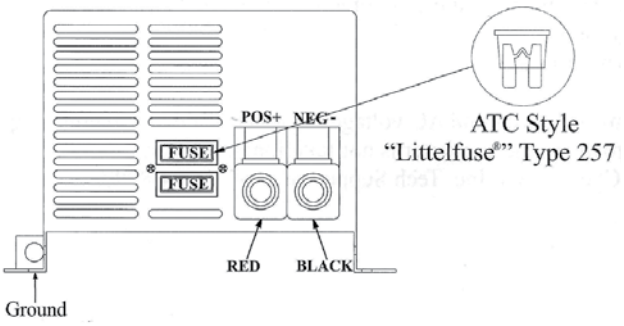
DO NOT OBSTRUCT VENTILATION OPENINGS. Make sure not to place anything near the converter that could obstruct ventilation.

INSPECTION AND MAINTENANCE

If the power converter is not working check the fuse(s) located on the outer case. There are no customer serviceable parts inside the converter case and the manufacturer's warranty will be voided if the case has been opened. If you have further concerns please contact your selling dealer.

CONVERTER FUSES

If the converter installed in your motorhome is a stand-alone type, it may have reverse polarity protection fuses. These fuses will 'blow' if the battery leads are swapped. If your converter is not working, check the fuses on the unit and insure the battery leads are connected to the correct terminals. See previous converter section for converter details.



Reverse polarity protection fuses

Converter Tips and Troubleshooting

If the converter is overheating or not working correctly:

- Make sure there is adequate power to the motorhome. Is the motorhome plugged in to shore power? Are the shore power circuit breakers ON (located on the campground's electrical service)? Are the converter circuit breakers ON (located on the inside electrical circuit breaker panel)?
- Check the 12 volt DC fuses (or circuit breakers) in the power load center to make sure they are not blown. Replace if necessary with a fuse of the same type and rating.
- Has the 100 amp inverter circuit breaker tripped (located in the battery compartment)? If so, reset it.
- Make sure that the battery connections are not reversed. This will cause a blown 12 volt DC fuse(s) on input of the converter. Always replace fuses with the same type and rating of the original fuse.
- Has the Electronic Current Limiting protection activated? The converter will automatically shut down power during overload or short-circuit conditions. It will automatically returns to normal operation after conditions are corrected.
- Excessive electrical loads can reduce operation efficiency. Reduce loads (turn OFF some 12 volt DC devices) if necessary.
- Bad battery cells can lead to low voltage output. Check your auxiliary battery(ies) with a hydrometer.

Power Load Center, 50 Amp

⚠ DANGER

- **Do not force a tripped circuit breaker into resetting. A tripped circuit breaker indicates a problem with the circuit that must be corrected.**
- **Do not replace circuit breakers with one of a higher current rating.**
- **Do not replace blown fuses with a fuse of a higher current rating.**
- **Circuit damage could result, creating the potential of electrical shock, electrocution, and fire.**

⚠ WARNING

- **Any needed repairs to the electrical system of your motorhome should be performed by a qualified RV electrician. If misused, electrical energy is dangerous and can cause fires, electrical shock, or electrocution.**
- **Replacement circuit breakers must be of the same voltage, amperage rating, and type. Never use a higher rated replacement circuit breaker than what was originally installed with your motorhome. Doing so may cause a fire by overheating the motorhome's wiring.**

Except for a few smaller models, almost all TMC Class A motorhomes are equipped with a 50 amp power service, which includes the following:

- **Power Load Center, including 120 volt AC circuit breaker panel and 12 volt DC fuse panel or 12 volt DC breaker panel**
- **Stand-alone Converter**

Typical 50 Amp Power Load Center

The Power Load Center is usually located in the rear of the motorhome; in a bed pedestal, closet, or wall panel. Although the location differs, all power load panels are readily accessible, regardless of slideout positions.

Each circuit of the power load center is labeled according to the device(s) connected to it.

120 Volt Circuit Breaker Panel

The Power Load Center contains toggle-type circuit breakers. Circuit breakers protect the 120 volt wiring and components in your motorhome from circuit overloads and shorted circuits. Should a circuit overload or short circuit occur, the circuit breaker protecting the affected circuit will 'trip,' preventing the flow of electricity to that circuit.

A circuit breaker identification label is permanently attached to the inside surface of the 120 volt circuit breaker panel. The circuit breakers will not offer complete protection of the motorhome's electrical system in the event of a power surge or power spike. Delicate electronic devices should be protected by separate surge protectors (customer supplied).

If a circuit breaker trips, turn OFF and unplug the electrical appliance(s) or devices on that circuit and allow the circuit breaker to cool down. After the cool down period, reset the circuit breaker by moving the lever to the OFF position and then back to the ON position, then plug-in the electrical devices and try operating them. If the circuit breaker re-trips or frequently trips, unplug the appliances(s) on the circuit and contact your selling dealer's service department to have the electrical problem diagnosed and repaired. It is possible that the appliance is faulty, not the circuit.

If the circuit breaker refuses to re-set, this indicates there is something wrong with that circuit. **DO NOT ATTEMPT TO FORCE IT TO THE ON POSITION:**

- The circuit may be overloaded with too many devices.
- The device may draw more current that what the circuit is designed to supply.
- The device may have developed an internal short circuit.
- The circuit wiring or outlet (receptacle) may be damaged.
- The circuit breaker may be faulty and requires replacement.

Do Not attempt to use that circuit or device until the problem is diagnosed and repaired by a qualified electrician.

NOTES:

- Circuit breakers and fuses are vital in keeping the electrical system of your motorhome in a safe operational condition. Never bypass or defeat circuit breakers or circuit fuses.
- Some electrical appliances may have their own circuit breakers. If there is an interruption in electrical service of an appliance, consult the manual for that appliance to determine the recommended action to take.
- For information regarding multiplex wiring systems and circuit control devices, please contact your selling dealer or a TMC Customer Care representative.

Maintenance

Before using your motorhome after a long storage period, inspect and test each circuit breaker by moving the individual switches to the OFF position, and then back to the ON position. Circuit breakers may degrade over time and as part of your motorhome's maintenance, must be replaced as needed.

12 Volt Fuse Panel

Except for select diesel pusher motorhomes, the 12 volt fuse panel section of the 50 amp Power Load Center is similar in operation to the 30 amp panel described earlier in this section.

Converter

See Converter Section

Inverter

⚠ WARNING

Review all manufacturer's information and observe all manufacturer's safety warnings and cautions before using the inverter installed in your motorhome.

The factory-installed inverter is not intended for use with medical device(s).

⚠ CAUTION

Some appliances and equipment may not operate correctly from the modified sine wave of an inverter, and other appliances may actually be damaged if operated on inverted power.

Check with the device manufacturer regarding the suitability of use with an inverter.

Typical inverter: model, features, and installation location varies, depending on motorhome model and floorplan. Most installations include a remote-control panel for the inverter.

Select TMC motorhomes are equipped with an inverter. An inverter takes 12 volts DC power from the auxiliary (house) battery(ies) and transforms it into 120 volts AC power. It is mainly used to power a few electrical circuits and devices when an external source of 120 volts AC power is not available, or when it is not appropriate to operate the on-board generator. Inverters are also installed in motorhomes that have a household-type refrigerator (compressor, instead of an evaporator type). These appliances usually require 120 volts AC in order to operate, therefore the inverter allows the refrigerator to be used whenever shore power or generator power is not available.

NOTE: TMC installs 12 volt DC, compressor-type refrigerators in some motorhomes. These refrigerators do not require the inverter to be ON in order to operate. Similarly, gas (LP) and gas/electric refrigerators do not use inverted power.

Some inverters include a built-in automatic transfer switch, which will connect the inverter to the electrical system when needed, and disconnect when either shore power or generated power is detected. In addition, some inverter models also perform the function of a converter (supplying 12 volt DC power from a 120 volt AC source). Inverter/Converter models are mainly installed on Class A diesel motorhomes. Although wiring varies from model to model, in general terms, the inverted-powered outlets are those that feed power to the main TV, household-type refrigerator (if installed), and a few essential AC power outlets.

All inverters have a wattage rating that will indicate the maximum load (or electrical power) the inverter can supply. For example, an 1,800 watt inverter will be able to provide approximately 15-20 amps of current (amperage). Sometimes, the wattage capacity is stated in kilowatts (kW). For example, 1,800 watts becomes 1.8 kW. Depending on the model and floor plan, TMC installs inverters with power ratings of 1,000 watts, 1,800 watts, or 2,000 watts.

Since the inverter is drawing power from the auxiliary battery(ies), the condition and storage capacity of the batteries determines how long the inverter can supply power to your 120 volt AC devices. Keep in mind that while traveling, a charging voltage to the batteries from the vehicle's alternator is available, as long as the master battery disconnect switch is ON. Maintaining a charging voltage to the auxiliary battery(ies) will prolong the energy available from the battery(ies) to the inverter.

Battery voltage is also important for proper inverter operation. Most inverters have an automatic shut-off feature that turns the inverter off in the event that the incoming voltage of the supply battery(ies) drops out of range; usually below 10 volts DC or above 16 volts DC.

For details regarding the inverter supplied to your motorhome, its features and functions, please refer to the manufacturer's operational guide included with your Thor Motor Coach Owner's Packet, available through the TMC Owners Resource service, or directly from the inverter manufacturer's website.

NOTES:

- The condition of the house battery should be monitored when using the inverter. During some load conditions, it is possible to completely deplete the stored energy of the battery(ies).
- Calculating the total power consumption (in watts) is very important for proper inverter use. DO NOT exceed the power output rating of your inverter. For example, if your inverter is rated for 1,800 watts, never attempt to power more than 1,800 watts of combined power consumption from your devices.

- Inverters will safely operate most AC loads within their power rating. However, some appliances and equipment may not operate correctly with the modified sine wave of inverted power and actually be damaged if operated by an inverter. It is especially important to check all medical devices to determine if they can operate safely with inverted power.
- Except for the TMC Class B motorhome outfitted with the Re(li)able battery power system, inverters do not power air conditioning units.

Circuits and devices powered by the inverter

- **1,000 watt inverters:** Powers TVs, outlets for A/V components, outside refrigerator if applicable, and possibly one or more general AC outlets.
- **1,800 watt inverters:** Powers TVs, outlets for A/V components, outside refrigerator if applicable, possibly one or more general AC outlets, and residential-type refrigerators.
- **2,000 watt inverters:** Powers TVs, outlets for A/V components, general outlets, residential refrigerator, microwave, and GFCI outlets.

Operating the Inverter

Inverter settings are entered on the front panel, remote inverter panel (typically located near the entrance door), or through the settings menu of the multiplex main control panel (if equipped). Some remote panels simply provide ON/OFF control, while others provide a variety of useful control and power monitoring settings. Refer to the manufacturer's instructions for information regarding the inverter's remote panel installed in your motorhome.

The master battery disconnect switch, located near the entrance of your motorhome, must be ON and remain on whenever the inverter is in use.

Since the inverter draws power from the auxiliary battery(ies), and also draws a small amount of energy when in stand-by mode, it should always be turned OFF when placing the motorhome in short or long-term storage.

Inverter remote panels vary in style and functionality. Refer to the manufacturer's owner's manual for features and operating instructions.

⚠ WARNING

Do not disassemble the inverter. It contains no user-serviceable parts. See manufacturer's warranty for instructions on obtaining service. Attempting to service the inverter yourself may result in a risk of electrical shock or fire. Internal capacitors remain charged after all power is disconnected.

To reduce the risk of electrical shock, disconnect both AC and DC power from the inverter before attempting any maintenance, cleaning, or working on any circuits connected to the inverter. Turning off controls at the remote panel will not reduce this risk.

⚠ CAUTION

Do not block the ventilation air-flow to the inverter. The inverter becomes warm to the touch when operating, Do not store items, especially flammable solids or liquids around the inverter.

With most inverter installations, a separate circuit breaker is mounted in the battery compartment, near the auxiliary battery(ies). This circuit breaker (usually rated at 100 amps) protects the inverter from DC over-current (shorted battery or battery terminals). If the inverter is not working, check to determine if this circuit breaker is 'tripped.' If so, re-set it and reduce power consumption through the inverter.

Also check the fuse located on the inverter. Inverters are typically installed behind a panel or bed pedestal near the Power Load Center (fuse and circuit breaker panel). There are no consumer serviceable parts inside the inverter case and the manufacturer's warranty will be void if the case has been opened. The inverter's cooling fins and the cooling fan should be kept clear of any obstructions. Routinely perform the maintenance steps listed below. If you have further concerns contact your dealer.

- Clean the exterior of the unit with a vacuum or damp cloth to prevent the accumulation of dust and dirt.
- Ensure that the DC cables are secure and fasteners are tight.
- Make sure the ventilation openings are not clogged.

Tips and Troubleshooting

Inverter is overheating or not working correctly:

- Make sure the master battery disconnect switch is ON.
- Make sure the power switch on the inverter's remote panel is ON.
- Make sure there is adequate power to the motorhome. Is the motorhome plugged in to Shore Power? Are the shore power circuit breakers ON?
- Check the Inverter circuit breaker located in the battery compartment. Re-set if it is tripped.
- Check the Main Power circuit breaker in the Power load center. If it is off, re-set it.
- Check the inverter fuse or circuit breaker located in the Power Load Center (fuse panel). Reset the breaker or replace the fuse if blown.
- If there is a fuse or circuit breaker on the inverter's case, check it and re-set the circuit breaker or, if the fuse is blown, replace with the same type and rating.

  NOTE: Some inverters may have an internal reverse-polarity protection fuse. This fuse is not user-serviceable.
- Excessive electrical loads can reduce operation efficiency. Turn off un-necessary appliances.
- Low battery voltage or bad battery cells can lead to low or no inverter output. Check the auxiliary battery(ies) with a voltmeter and hydrometer.

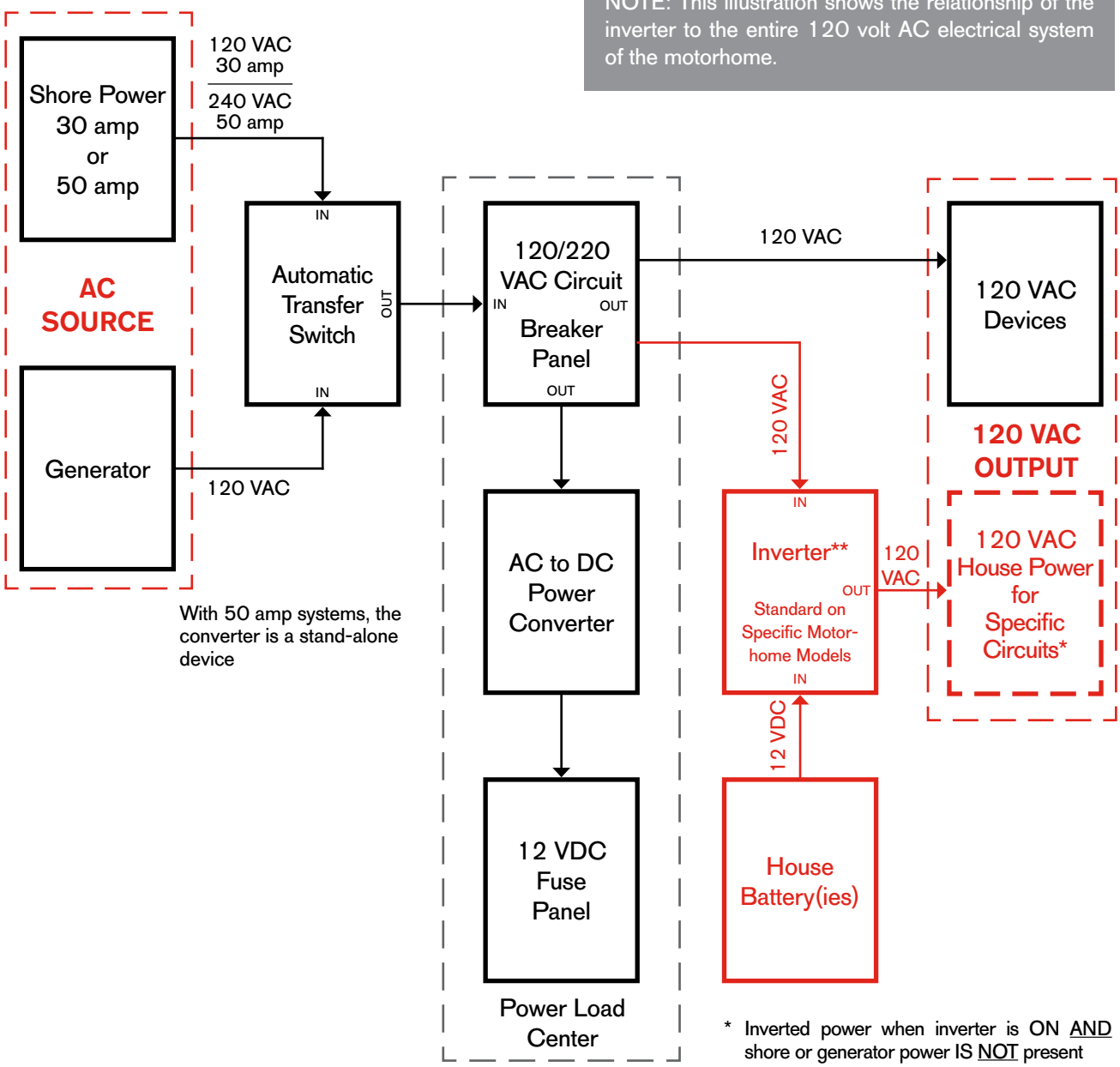
NOTE: A hydrometer reading of 1.265 indicates a fully charged battery. A 75% charge is 1.225. Approximately 1.190 is half-charged, 25% is 1.155 and 1.120 indicates complete discharge. Each cell of the battery should be checked.

- The inverter's built-in thermal protection may have been activated. Make sure inverter has adequate air flow to prevent overheating.
- Make sure that the GFCI that the appliance is plugged into has not been tripped.
- Some inverters have an adjustable AC voltage output setting. Ensure this setting is correct for your appliances (110 volts AC).

Typical Inverter Circuit Breaker

Electrical System Block Diagram Showing Inverter Details

NOTE: This illustration shows the relationship of the inverter to the entire 120 volt AC electrical system of the motorhome.



* Inverted power when inverter is ON AND shore or generator power IS NOT present

Non-inverted power when inverter is OFF AND shore or generator power IS present

Typical AC electrical system block diagram. Note the input of the inverter (DC) is from the auxiliary battery(ies) and the output (AC) goes to specific circuits and devices. The AC input to the inverter is a control circuit, turning the inverter ON when there is no shore or generator power, and turning the inverter OFF when shore or generator power is available.

** Some inverter models have an internal transfer switch that automatically switches the input source, depending upon the presence of 120 VAC from shore or generator power

Calculating Electrical Loads

Although the electrical system of your motorhome is designed to adequately power all factory-installed electrical devices, many RV owners choose to bring additional power-consuming devices as they travel. It is important to know the approximate power consumption of these devices, and to use them cautiously, so that electrical overloads can be avoided.

Always be mindful of the power output capacity of your generator, converter, and inverter. Never place a power-consumption load on these devices that exceed their power capacity (usually expressed in maximum wattage). When traveling in your motorhome, keep in mind that each appliance, when used in conjunction with each other, adds to the total load of the electrical system. You may periodically trip a circuit breakers, blow fuses, or experience generator, converter, or inverter shut-downs due to an electrical overload condition.

Also be aware that motorized appliances or electrical devices that contain motors usually require much higher energy at start-up than during normal operation. For example, you may experience a overload conditions when several kitchen appliances are in use and the compressor motor of the air conditioner starts (see Power Control System (PCS) section).

You can determine the amperage rating of an appliance by dividing its power consumption (in watts) by the amount of voltage at the power source.

For example: 1200 watts divided by 120 volts equals 10 amps.

You can also determine the total wattage load of your electrical devices by adding the wattage of each device.

For example:

Device 'A' draws 1000 watts

Device 'B' draws 500 watts

Device 'C' draws 100 watts

For a total of 1600 watts of load on the electrical system when these three devices are operated simultaneously.

NOTE: The electrical power formula is:

P = V x A, where

P represents power in watts

V represents voltage

A represents amperage or current

Listed here are examples of common electrical devices and their approximate electrical energy requirements:

Item	Wattage	Amperage
Air Conditioner	1200-2400	10-20
Battery Charger	Up to 3000	6-28
Blender	450-700	3.3-5.8
Broiler	1400-1700	11.6-14
Broom/Vacuum	1000-1440	8.3-12
CD/mp3 player & Speakers	85	0.7
Coffeepot	900-1200	7.5-10
Computer, Laptop	20-50	0.16-0.41
Cooktop	1500-2000	12.5-16.6
Crock Pot	250-500	2-4
Curling Iron	20-50	0.16-0.41
Dishwasher	1200-2400	10-20
Electric Drill	250-1000	2-8
Electric Blanket	60-100	0.5-0.8
Fan	10-175	0.08-1.45
Frying Pan/Wok	1000-1350	8-11.25
Game Console	19-200	0.16-1.6
Hair Dryer	1200-1875	10-15.6
Iron	1000-1800	8-15
Microwave/ Convection Oven	750-1100	6.25-9.2
Radio	50-200	0.4-1.6
Refrigerator	400-1000	3.3-8
Shaver	15-20	0.12-0.16
Space Heater	750-1500	6.25-12.5
Television	43-600	0.35-5
Toaster	800-1400	6.6-11.6
VCR/DVD/ Blu-ray player	6-30	0.05-0.25
Washer/Dryer	350-500/ 1800-5000	3-4/15-42
Water Pump	250-1100	2-9.16

⚠ WARNING

If the display of the EMS ever indicates 'Wiring Status Error,' IMMEDIATELY unplug the motorhome from the shore power source and have the source outlet inspected by a qualified electrical technician.

NOTICE

50 amp shore power must be capable of supplying 220-240 volts AC measured across both legs of the service, and supply 50 amps on each leg of the service.

General EMS Information

Specific TMC motorhome models (Class A diesel pushers and select Class C with dual air conditioners) are equipped with an Energy Management System (EMS), sometimes referred to as a Power Control System (PCS). When installed, an Energy Management System manages all the 120 volt AC power throughout the motorhome, whether the electrical energy comes from shore power, the generator, or the inverter/battery system. The EMS monitors power loads and manages the power to reduce circuit breaker tripping that may be caused by a momentary power overloads.

Momentary power overloads happen when the demand for power from electric appliances and devices exceeds the capacity of the power source. This does not indicate a problem with the motorhome's electrical system, but it indicates that shore power source is under capacity for the total peak electrical demands of your motorhome.

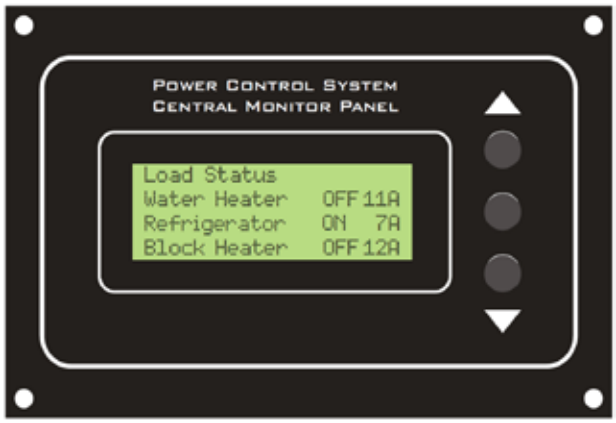
For example, when an appliance such as an air conditioner is first turned on, the momentary power demand of the compressor's motor may be several times that of its operating power consumption. If several high power-consuming appliances are in operation at the same time and a second air conditioner turns on, the momentary power demand may exceed the capacity of the power source, thus tripping the power source circuit breaker(s).

Depending on how the EMS is wired into the electrical system, it manages power loads by performing three basic functions in this order:

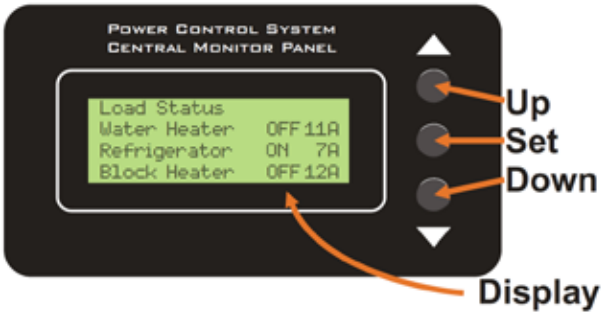
1. Since battery charging typically requires a high amount of electrical energy, the EMS will reduce charge current in an attempt to gain power for other appliances.

2. If more power is still needed, the EMS will attempt to make up the power deficit by turning on and controlling the inverter. This function is known as Inverter Assist. Normally the inverter is at rest when shore or generator power is available. EMS utilizes the inverter and the house battery system to smooth out peak load demands. An EMS-controlled inverter will temporarily provide power to some of the appliances, which in turn, augments power from the shore or generator power source. If, for some reason, the total power demand is still more than shore or generator power **and** Inverter Assist is capable of supplying (perhaps a low battery condition or some other issue), the EMS will;

3. Begin shedding loads to non-essential electrical devices that are pre-programmed into the system. Load shedding means that certain devices and appliances will be automatically turned off in a prescribed sequence until the power demand can be met by the incoming



PCS Control Panel



PCS Function Buttons

PCS Wiring Status Display

power source. As power to each appliance is shed, the EMS learns the power requirement for that specific appliance, to ensure that there will be sufficient reserve power to turn the appliance back on.

If power is shed to an air conditioner, there is at minimum a 2 minute delay from the time the load was shed to the time power is restored. This delay ensures that the compressor pressure is sufficiently bled and prevents short-cycling the air conditioner.

Power is then restored in reverse sequence to the appliances that were momentarily turned off, as long as the EMS senses there is adequate power capacity from the power source to operate the appliance(s).

MONITOR PANEL:

The EMS monitor displays pertinent information about the status of the energy management system. The Up and Down buttons (illustrated on the previous page) are used to step through each individual screen of information. Pressing & releasing either the Up or Down button will step to either the Previous or Next Display Screen. Once all the screens have been seen, the next press of the button will wrap back around through all the display screens once again.

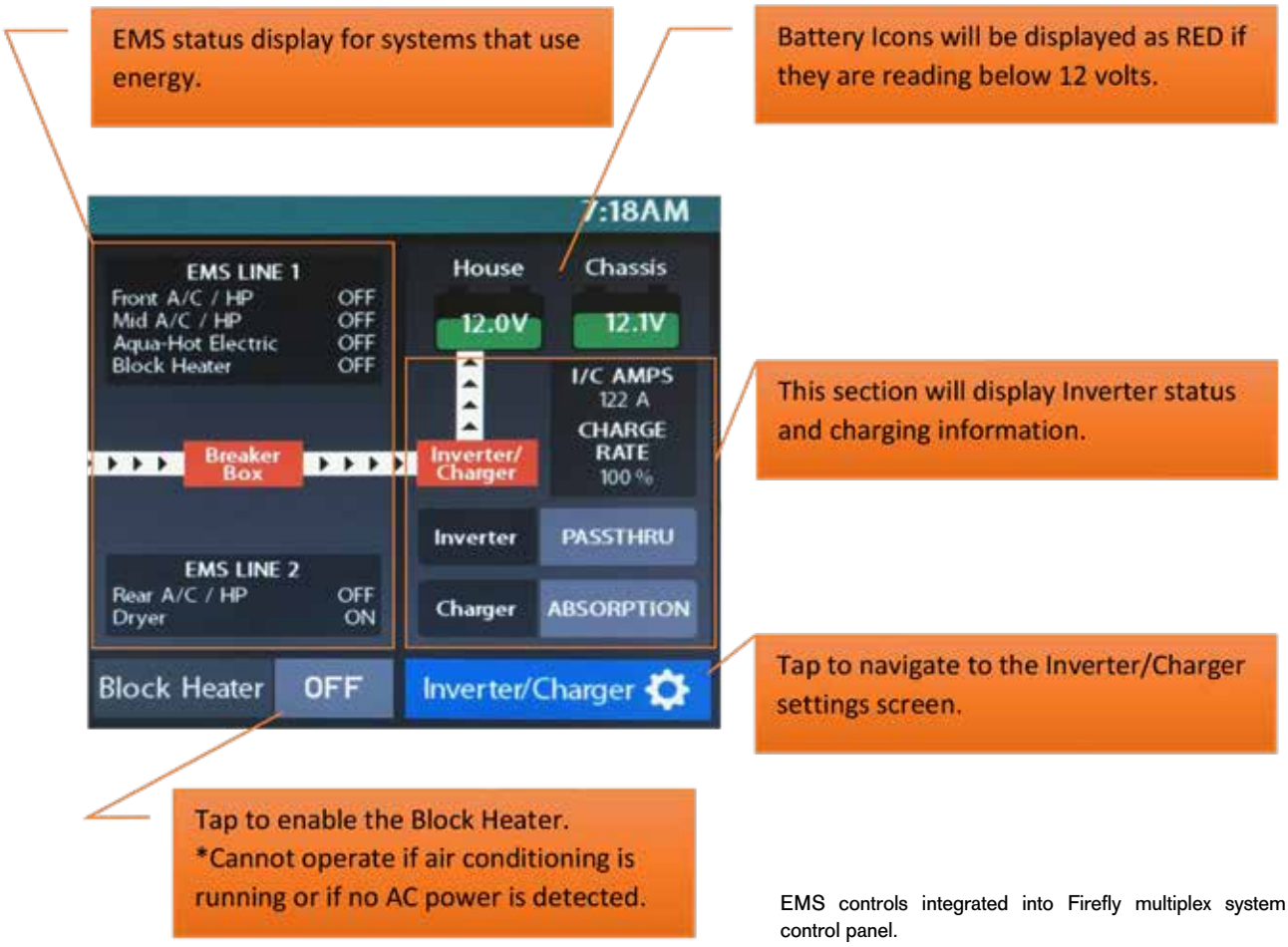
The Set Button only functions when the Service Type screen is displayed, allowing the user to select between 30A (amp) Service and 20A (amp) Service. If there have not been any key presses for a pre-determined time period, the EMS monitor turns off the back-lighting to save power. The first press of any key will only turn on the back-lighting.

EMS AND MULTIPLEX INTEGRATION:

The control features on some EMS systems are integrated into the multiplex touch-screen panel. Firefly, Version 10 for TMC Diesel Pusher motorhomes has EMS integration. (see illustration). When EMS multiplex integration is present, a PCS control panel is not installed. Whether the EMS system uses a control panel as illustrated on the previous page, or EMS is integrated into the multiplex control panel, basic system operations remain the same.

SHORE POWER STATUS:

One of the many functions of the EMS is its ability to display shore power wiring status. Functioning similar to an outlet power tester, the EMS monitors the wiring status of the campground or RV park's power source. It can show problems with improper grounds or improperly-wired power legs.



EMS controls integrated into Firefly multiplex system control panel.

LINE STATUS:

Some models of EMS include built-in volt meters, which are used to display the power condition (voltage and current) of each power leg (L1 and L2).

SERVICE TYPE DISPLAY SCREENS:

- **No Service** - PCS has 12 V battery power to run the electronics, however it does not sense the presence of 120/240VAC power.

- **50 Amp Service** - PCS senses 240/208 VAC between L1 and L2 to determine this mode of operation. PCS controls the loads so that the current does not exceed L1 limit of 50 amps, L2 limit of 50 amps, and a combined limit of 100 amps.

- **30 Amp Service** - PCS senses 0 VAC between L1 and L2. PCS adds the current of the two sensors and controls the loads so that the current does not exceed 30 amps.

- **20 Amp Service** - PCS senses 0 VAC between L1 and L2, and the owner selects 20A on the monitor panel. PCS adds the current of the two sensors and controls the loads so that the current does not exceed 20 amps.

- **Generator** - PCS senses power to the Gen Hour Meter to determine this mode of operation. PCS controls the loads so that the current does not exceed the output rating of the installed generator.

OPERATION MODE DISPLAY SCREENS:

When installed in conjunction with a compatible Magnum Inverter, the Operation Mode panel display indicates the status of the inverter as it relates to power management.

- **Bat Charger Normal** - indicates that the inverter is supplying normal power to the battery charging circuits.
- **Bat Charger Reduced** - indicates that power to the battery charging circuits has been reduced, which in-turn, makes this energy available to for other AC appliances.
- **Inverter Normal** - indicates that the Magnum inverter is operating in a non-modified mode.
- **Inverter Assist XXA** - indicates that additional power from the house batteries, supplied by the inverter, is supplementing energy to the AC circuits. This line will also indicate the amount of additional current being supplied by the house batteries, where XX indicates a value in amps.
- **Inverter Assist Deny** - indicates that for some reason, the inverter is unable to supply additional power to the AC electrical system. It does not necessarily indicate a fault with the inverter; but it could mean that the battery condition is low.
- **Load(s) Shed=X** - where X indicates the number of appliances that have been temporarily turned-off in order to make power available for other, higher-priority appliances. Depending on the model of EMS installed, 4, 5, or up to 7 appliances can be wired in a load-shedding priority sequence.

LOAD STATUS DISPLAY SCREENS:

The Load Status Screens indicate the condition and power shed from each load (appliance) on the load-shedding priority list. For example, if the Load Status displays:

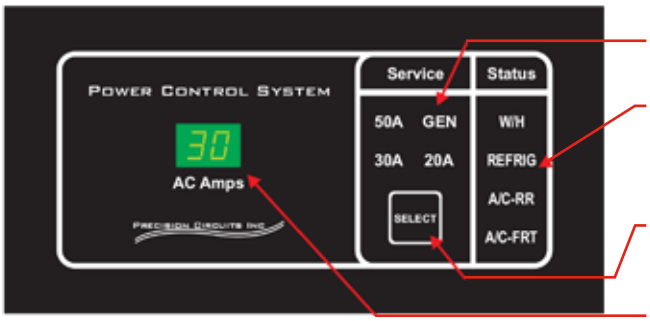
Water Heater OFF 11A - this indicates that power to the water heater is temporarily off and that the last measured current draw (the instant when the power was shed) from the water heater circuit was 11 amps. Power will be restored to the water heater as soon as the EMS system senses the AC electrical system can supply adequate operating power.

POWER MANAGEMENT:

When the current demand exceeds the limits of the available energy supply, the EMS will independently limit the current on each power leg (L1, L2) by performing the following in order:

- Reduce battery charge rate (when installed in conjunction with a compatible inverter/charger)
- Inverter Assist (when installed in conjunction with a compatible inverter)
- Load Shed

As each appliance circuit is shed (automatically turned off), the EMS records the amperage last used on that circuit for its corresponding appliance, then restores power to the circuits in reverse order of shedding and only when there is adequate power available to do so. When power is shed from air conditioner circuits, there is a 2 minute delay in the power restoration to ensure the air conditioner is not short-cycled (trying to turn on before latent pressure in the compressor has bled off).



PCS Mini Control Panel

1) **Service Window** displays the selected incoming power

2) **Status Window** illuminates when power is being supplied to the appliance. When the illumination is out, power is being shed to the appliance.

3) **Select** button between main service power (30 or 50 amps) and 20 amps.

4) **AC Amps** displays the total current being grawn by the RV. It will be blank when the RV is plugged into 50A service or when the generator is running.

GENERATOR SOFT START:

Some EMS models have a generator soft start feature, which sheds loads during generator start-up. When the generator is up to operating condition, the loads are sequenced back on. Again, for circuits that power air conditioners, there is a built-in 2 minute delay in order to avoid short cycling.

Generator soft start is also accomplished by some transfer switches, which have a built-in delay before connecting the generator output to the motorhome's electrical panel.

EMS Mini System

NOTICE

The EMS Mini System is typically installed in Larger Class C motorhomes with 30 Amp service and include a second roof-mounted air conditioning unit.

OVERVIEW:

The PCS Mini System is a fully automatic EMS system that requires little to no owner interface. It is typically installed on larger Class C motorhomes that have dual roof air conditioning units.

The Display is there to help the user understand Power Management and how Mini-PCS is helping manage power demand (see illustration above). The Mini-PCS monitors the total AC current of an RV and prevents circuit breaker tripping by momentarily shedding up to four loads. As the user turns on additional appliances, such as a microwave, coffee pot, or hair dryer, the Mini-PCS can shed the electrical loads that it controls; such as the water heater (electric heating elements) and air conditioners.

As owner selected appliances are turned OFF, the Mini-PCS will automatically turn power back ON to each of the shed loads (appliances under PCS control) in reverse sequence. The Mini-PCS will constantly monitor the available 120VAC source for the motorhome and shed and restore power to the four controlled loads, therefore, preventing temporary overloads that can trip circuit breakers.

The Display Panel has all the brains, and includes a Data Connector to the I/O Module, and also another connector to control the air conditioner units through low voltage control signals.

1) In the Service Type Window, Mini-PCS automatically detects and displays the type of Power the RV is connected to. When "30A" is illuminated, the owner can press the

2) The Status Window illuminates each of the appliances that it controls. If the indicator is out, that means Mini-PCS has temporarily removed power to prevent the circuit breaker from tripping. Power will be automatically restored and the indicator illuminated, once other appliances in the RV have been turned off, and 2 minutes has passed.

3) "Select" button and toggle between 30A and 20A service.

4) The AC Amps displays the total current being drawn by the RV. It will be blank when the RV is plugged into "50A" service or "GEN" the Generator is running.

The I/O Module is installed inside the circuit breaker panel. (5) The screw terminals are used to make the 120VAC connections. (6) It has a built in Current Sensor to Monitor Total RV Power. (7) Outside the circuit breaker panel a data cable is connected which goes to the Display Panel.

AUTOMATIC OPERATION:

30-amp Service -

PCS senses 0VAC between L1 and L2. The I/O Module has a current sensor, which monitors the current on the neutral wire. When the current exceeds the 30-amp limit, because possibly the owner has turned on the Microwave, the Mini-PCS will limit the current by shedding appliances. Once the total RV current has dropped, for example because an owner operated appliance has been turned off, the Mini-PCS will reverse the above procedure, returning power to appliances whose operation was not immediately critical. Appliance shed order is easily determined by the manufacturer by wiring the appliances to the appropriate number relay.

20-amp Service:

NOTICE

20 Amp electrical service should only be selected when 30 amp service is unavailable. Note, that with a lower amperage service, great car must be exercised, for not all appliances and electrical features installed in the motorhome can be used simotaneously.

Mini-PCS senses 0VAC between L1 and L2, and the owner selects 20A on the Remote Display. Mini-PCS performs the same functions as above except that it limits total current to 20amps.

50-amp Service:

⚠ CAUTION

It is not recommended to adapt a 30 Amp motorhome service to a 50 Amp Shore Power source. Severe damage to the motorhome's electrical system could occur because the source is capable of supplying far more power than the motorhome's electrical service is designed to handle.

Shore power cords, wiring, and component damage is possible. Refer to the Shore Power Section in this and your owner's manual for additional information.

Mini-PCS senses 240VAC between L1 and L2 to determine this mode of operation. In this mode, the Mini-PCS assumes enough power is available and goes to sleep. It displays the fact that 50-amp Service is available and that all Loads are powered.

For compete details on the features and functions of the Power Control System (if installed), please refer to the manufacturer's owner's guide included in your Thor Motor Coach Owner's Packet.

Electrical Load Shedding

NOTICE

During electrical load shedding cycles, certain electrical devices or appliances may not be operational, or tempoarily turned off due to pre-set electrical demand parameters, where some electrical devices will have power preference over other devices.

For example, a microwave oven may have power preference over an air conditioner whenever the motorhome's electrical energy is being supplied by a restricted power source.

NOTE: Although the load-shedding system described below performs some of the same function as the previously describe EMS systems, this system does not include a user-interface and is usually installed where the on-board generator's output rating is lower than the total 120 volt electrical load of the on-board electrical devices if operated simultaneously.

Your motorhome's electrical system may be equipped with an automatic load shedding circuit, which is designed to prevent circuit-breaker tripping when certain overload conditions exist; usually while operating on generator power. Load shedding parameters can operate quite differently, depending on the particular factory-installed equipment of the motorhome. Following, is a brief description of load shedding operation for certain TMC models:

CLASS A GAS MOTORHOMES WITHOUT MULTIPLEX

Electrical Load shedding is activated in this condition: when operating on generator power and the roof air conditioner(s) are ON; the rear air conditioner is disabled (load sheaded) while the microwave oven is operating. The air conditioner comes back ON after the microwave oven is turned off and after a two-minute period, which allows the air-conditioner to de-pressurize.

CLASS A GAS MOTORHOMES WITH MULTIPLEX

If your gas Class A motorhome is equipped with a multiplex system, load shedding is usually controlled by settings programmed into the multiplex system (integrated energy management). The system monitors the current being drawn through the main circuit breakers and sheads loads as needed, usually in a programmed sequential order. With multiplex systems, automatic load shedding can occur on generated power and shore power, which is very useful at times when your 50 amp electrical system is limited to a 30 amp shore power service. Some integrated energy management systems allow for the selection of 10 or 20 amp service as well; useful for times when plugging into a household circuit to maintain battery charging, or keeping a refrigerator or air conditioner operating during short-term storage.

Outside 120 Volt AC Power Receptacle

⚠ WARNING

NEVER USE AN APPLIANCE OR ELECTRICAL DEVICE THAT IS NOT PROPERLY GROUNDED OR HAS A MISSING OR DEFEATED GROUND PIN. INJURY OR DEATH DUE TO ELECTROCUTION IS POSSIBLE.

Your motorhome is equipped with a convenient outside 120 volt AC power receptacle that is useful for operating appliances and entertainment devices. For your safety, the outside receptacle is grounded and ground-fault protected (Ground Fault Circuit Interruption, or GFCI).

Powering the Outside Receptacle:

The outside 120 volt AC power receptacle is energized whenever the motorhome is connected to shore power or the on-board generator is running. In typical RV wiring fashion, this receptacle is wired to a circuit that is ground-fault protected and likely includes other receptacles; usually located in the bathroom and kitchen; areas where the likely-hood of water is present. Refer to your motorhome's 120 volt wiring diagram to locate other receptacles on the GFCI circuit.

Typical outside 120 volt AC receptacle

Tips and Troubleshooting

- Make sure RV's battery disconnect switch is activated in the ON position.
- Check circuit breakers at RV's power load center. The 120 volt AC circuit breaker may be off or tripped.
- Check the shore power electrical hook-up for a tripped circuit breaker.
- GFCI receptacle may be tripped and requires a reset.

  Contact your selling dealer's service department for repair assistance if the GFCI RESET button does not restore 120 volt power when it pops back out.

Ground Fault Circuit Interrupter (GFCI)

⚠ WARNING

- **If the GFCI fails EITHER the self-test or manual test, turn OFF power to the failed circuit at the ` Load Center. Do not restore power to the faulty circuit until proper repairs have been made.**
- **For the safety of you and your passengers, all ground faults must be repaired before using your motorhome.**
- **Even with GFCI protection, persons with severe heart or other health problems may still be seriously affected by an electrical shock. The GFCI outlet is not a substitute for good electrical safety. It DOES NOT protect against contact of the hot and neutral wire at the same time.**

Typical GFCI receptacle

Your motorhome is furnished with ground fault circuit interruption (GFCI) protection on specific 120 volt AC outlets (receptacles). GFCI circuit breakers are found in the bath, while outlets in the kitchen area and exterior may be electrically connected to this circuit; therefore, GFCI protected.

GFCI circuit breakers are designed to stop the flow of current to the protected outlet when an imbalance of current flow is detected between the supply-side (hot) and ground. This can happen if an unwanted electrical path to ground is available due to faulty wiring or compromised electrical insulation within an electrical appliance or device. If a user comes in contact with the device **and** at the same time a ground source, such as a water pipe, furnace duct, metal frame structure or earth ground, the user will become the electrical return path, creating a condition of electrical shock or electrocution. If an electrical imbalance is detected, the GFCI will trip and shut off power to the outlet.

The GFCI does not protect against short circuits or system overloads. Circuit breakers in the Power Load Center, which supply power to the circuit, will trip if these conditions exist.

GFCI outlets supplied in your motorhome are compliant to the self-test industry standards implemented in 2015. These new GFCI's automatically monitor the presence of ground, and if a ground fault is present, whether a load is plugged in or not, the GFCI shuts off power to the outlet. Although

the self-testing feature increases the safety of the outlet, it does not eliminate the need for occasional manual testing of the GFCI circuit breaker to ensure it is working properly. Manually test GFCI's at the beginning of the travel season and monthly thereafter.

To test the GFCI circuit breaker, use the following procedure:

1. Make sure power is switched ON to the circuit. Use a test meter, test probe or a low-wattage electrical device.
2. PUSH the test button. The reset button should pop out.
3. With the reset button out, all power should be interrupted (OFF) to the outlet being tested.
4. Verify there is no voltage to the outlet by using the test probe or low-wattage electrical device.
5. Push the RESET button in to restore power to the GFCI outlet.
6. Verify that voltage has been restored to the GFCI outlet.

If the reset button does not pop out after pushing the test button, or GFCI circuit breaker continues to trip, or if the power is not interrupted to the test light, immediately turn OFF power at the main circuit breaker panel and have a qualified electrician repair the circuit. Do not use that circuit until repairs are made.

Your motorhome may be wired in such a way that two or more standard outlets are on the same circuit as the GFCI circuit breaker. If it is detected that a non-GFCI outlet is 'dead', check the near-by GFCI circuit breaker; it may need to be reset. If so, unplug all electrical devices from the GFCI receptacle and all receptacles wired to this circuit, and reset it. Then, monitor it for proper circuit functionality.

If resetting the GFCI does not restore power to it and to the other GFCI-protected outlets **and** the corresponding circuit breaker in the Power Load Center is not tripped, then there is a problem with the electrical circuit or GFCI outlet. If needed, enlist the service of a qualified electrical technician to repair the GFCI receptacle or associated circuit.

NOTES:

- It is normal RV wiring practice to wire one or more electrical receptacles to the GFCI circuit. If another outlet in the motorhome is 'dead' check the GFCI in the bathroom; it may be tripped.
- Repair or disable and discard any electrical device that has a faulty ground or presents the potential of electrical shock to its user.
- The GFCI only protects against faulty ground connections in circuits that are directly and properly wired to it.
- GFCI outlets comply to the self-test standards adopted in 2015.
- Beginning in model year 2022, GFCI circuit wiring (Romex) may contain wire sheathing that is green in color, instead of the standard white. The purpose of this color change is simply to indicte GFCI circuit wiring and does not represent any other meaning or wiring modifications.

Chassis 12 Volt System

The chassis of your motorhome has a 12 volt DC electrical system that provides energy to power headlights, running lights, brake lights, turn signals, heating fans, vehicle air conditioning, and a number of other electrical components. Although separate from the house 12V system, both the chassis and house 12 volt electrical systems work in tandem to provide 12 volt power to the motorhome.

Chassis Battery

The location of the chassis battery varies, depending on the class and chassis configuration of the motorhome. Knowing where batteries are located allows for servicing and maintenance. If you need assistance locating the chassis battery, refer to the chassis owner's manual found within the TMC Owner's Packet. Your dealer or TMC Customer Care can also assist you with this and other questions you may have regarding the chassis and its components.

TYPICAL LOCATIONS OF THE CHASSIS BATTERY:

- Class C Gas - Within the engine compartment.
- Class C Transit - Under the driver's seat.
- Class C Sprinter - Under a driver's side floor board compartment.
- Class A Gas - Within the engine compartment (except Axis and Vegas, see below).
- Class A Diesel - Within or near the rear engine compartment.

Maintenance of the chassis battery should be performed just as you would with your automobile battery. Refer to the chassis owner's manual for specific battery and electrical-related information.

Accessing the Chassis Battery on the Axis and Vegas Motorhomes

With the Thor Motor Coach Axis and Vegas models, the chassis battery is accessed through a panel located on the passenger side (curb side) dash. To gain access to the chassis battery:

1. Remove the passenger-side work station.
2. Remove the seal and the access panel.
3. The battery will be below and forward of the opening.
4. Reinstall the wood access panel.
5. Reseal the panel. Failure to properly reseal the panel will allow air intrusion into the cab of the motorhome.
6. Reinstall the passenger-side work station.

Chassis Fuse Panel

Class C motorhomes are equipped with an automotive 12 volt fuse panel located below the dash, near the steering column and/or in the vehicle's engine compartment. Power to vehicle's headlights, running lights, turn signals, heater fans, windshield wipers, and other accessories is supplied by the vehicle's 12 volt electrical system and through the chassis fuse panel. Troubleshooting vehicle-related electrical issues must be traced through this fuse panel. Refer to the chassis owner's manual for details regarding the location and circuits associated with the chassis fuse panel.

Class A motorhomes also have a 12 volt fuse panel and electrical distribution panel, located on the fire wall in the engine compartment. These fuses protect the vehicle-related features which are installed by TMC. There is a diagram on the various fuses and circuits printed on the backside of this fuse panel cover.

Chassis Alternator

When the vehicle's engine is running, the chassis alternator supplies charging energy to the chassis battery, which in turn, powers the 12 volt systems of the vehicle. The motorhome's electrical system is wired so that when the vehicle's engine is running (allowing the alternator to function), charging voltage is also available to for the house battery. The house Main Battery Switch must be ON in order for the house battery to be charged by the chassis alternator.

The alternator normally compensates for electrical usage demand of the vehicle while in motion. While traveling, your motorhome's house and chassis 12 volt systems, working in tandem, is capable of supplying electrical power sufficient for the normal demand of lights, radios, and other low-power-consuming devices.

While traveling, if the alternator isn't keeping pace with the electrical demand of the 12 volt house devices, it means the 12 volt system is operating in a negative mode: more power is being used than the alternator is capable of replenishing. If you draw too much energy from the batteries, there may not be enough power left in the battery to start the motorhome or run appliances when you stop for a break or for the night.

The alternator will charge at a higher voltage rate right after the vehicle's been started, replacing the battery energy needed to start the vehicle, but the charge voltage should quickly drop back to a normal level and hold at that level, even when house lights or appliances are used.

Alternator voltage is displayed by a gauge on the vehicles dash panel. If the alternator shows a discharge while the engine is running, turn OFF appliances and house lights to see if the charge voltage returns to normal or indicates

'neutral.' The vehicle's air conditioning system also places a heavy electrical demand on the chassis 12 volt system. If a discharge persists, contact your dealer or automotive service center for an inspection and/or repairs of the chassis electrical system.

Under heavy usage and in particular, in warm weather conditions, batteries can loose fluid rapidly. Check the fluid level of both the house and chassis batteries often. Top up with distilled water when necessary. Low battery fluid level is very harmful to the battery's longevity.

NOTES:

- The chassis fuse panel also uses automotive blade-type fuses. For on-the-road repairs, always travel with a few extra fuses of the proper type and rating.
- Do not replace a blown chassis fuse with a fuse of a higher amperage rating.
- While traveling, pay attention to the vehicle dash gauges. They relay important information about the operating status of the engine and the chassis electrical system.
- Should you lose 12 volt power inside your Class A gas motorhome, there is a 50 amp reset button in the Battery Control Center, located under the hood. Remove cover from the black box to access.
- On a Class C gas motorhome there is a 50 amp reset button located behind or on the converter.

Please use this information as a guide. Check your motorhome for the label that provides exact instructions for battery access.

Electrical Connections to a Towed Vehicle

⚠ WARNING

DO NOT TOW LOADS THAT EXCEED THE GROSS COMBINED VEHICLE WEIGHT RATING OR OTHER TOW RATINGS OF THIS MOTORHOME.

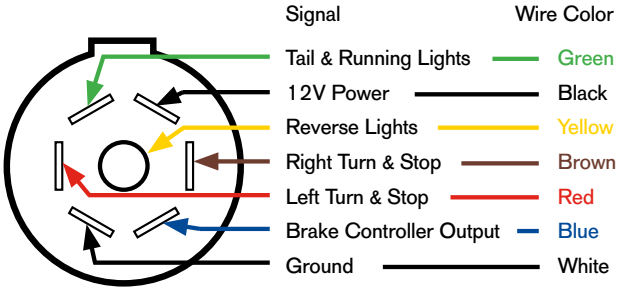
⚠ WARNING

THE DESIGNATED HITCH RATING MAY EXCEED THE GCWR OR OTHER TOWING CAPACITY LIMITS OF THE MOTORHOME. It is your responsibility to properly load the motorhome, while staying within the tow ratings, gross combined and gross vehicle weight ratings.

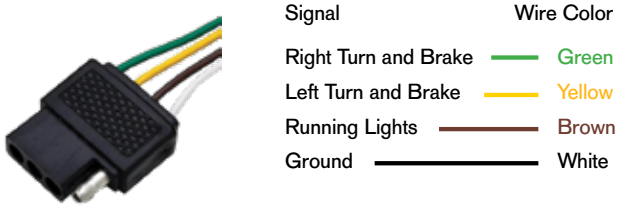
If you choose to tow a trailer or vehicle behind your motorhome, a chassis manufacturer-supplied 7-way trailer plug is pre-wired to the chassis electrical system. This plug provides electrical power for trailer running lights, turn signals, stop lights, and trailer brakes. Before connecting your motorhome to any towed vehicle, verify that the wiring of the towed vehicle matches the wiring of the 7-way connector on you motorhome.

Please refer to your vehicle's owner's manual for important information regarding safe vehicle towing.

7-WAY CONNECTOR WIRING



4-WAY CONNECTOR WIRING



Replacing Light Bulbs

Before replacing a light bulb, be sure the circuit to the light is OFF. Do not touch the glass part of the new bulb with your bare fingers. The skin oil left on the glass will evaporate when the bulb gets hot, the vapor will condense on the reflector and it will dim the surface.

Replace a bulb only with a new bulb of the same rating and type. If you contact your selling dealer parts or service representative to order or obtain replacement light bulbs, they will need the model number of the light fixture. This number is usually stamped on or molded into the light assembly housing.

Many interior ceiling and under-cabinet lights installed in your motorhome are LED type. These lamps will typically out-last conventional tungsten filament bulbs. However, if you experience a light fixture failure, please Contact TMC Customer Service for replacement instructions on how to obtain replacement fixtures.

NOTE: Most of the ceiling lights installed in your motorhome are the LED type. These bulbs have the advantage of longer life and lower power requirements as compared to standard tungsten bulbs.

Tools for Electrical Repairs

⚠ WARNING

Whenever electrical system maintenance is required and before working on the electrical system of the motorhome:

- **Turn off the main battery switch**
- **Disconnect the shore line power cord**
- **Turn OFF the generator**
- **Disable the automatic generator start functionality**
- **Disconnect the negative 12 VDC auxiliary (house) battery terminal(s)**
- **Attach an electrical lockout device to the electrical service panel**

Before disconnecting your house and/or chassis batteries, always make sure the main battery switch is turned off, and the inverter/charger (if so equipped) is turned off.

⚠ CAUTION

Safety precautions must always be observed when using any electrical device or working with electrical wires and connections. Careless handling of electrical components can be fatal. Never touch or use electrical components or appliances while feet are bare, while hands are wet, or while standing in water or on wet ground. Always remove jewelry and wear protective clothing and eye covering. Avoid creating sparks, which could ignite nearby flammable materials.

Listed here are a few electrical-related tools that are recommended to take with you when traveling in your motorhome. These items will help facilitate minor or emergency electrical repairs and maintenance. Always use extreme caution when performing maintenance or repairs on the electrical system, electrical components, and electrical devices of your motorhome. If you are unsure of any electrical device or repair method, seek the advice and assistance of a qualified electrician or technician.

- 25 - 50 foot, 3-pronged extension cord of at least 14 gauge wire and suitable for outdoor use
- Surge protector/line voltage conditioner for sensitive electronic devices
- Circuit Tester capable of detecting 120 volts AC power, neutral and ground
- Multi-meter capable of reading Volts AC, Volts DC, Current, Ohms
- Extra fuses (Automotive blade-type)
- A turkey baster (bulb-type) is useful to refill batteries with distilled water. (Keep separate from food preparation)
- A set of wrenches to tighten loose battery terminal connections
- Electrical tape for emergency electrical repairs
- Safety glasses and rubber gloves (used for battery maintenance)
- Zip ties for tying loose wires
- Roll of of 14 gauge and 16 gauge stranded wire
- Wire cutter and wire stripper
- Crimp connectors and crimp tool

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