BASIC OPERATION GUIDE

This guide provides basic operational instructions pertaining to the components, devices, or equipment that may be installed on your motorhome. Please refer to the component manufacturer owner's manual for safety, troubleshooting, maintenance, and more detailed operating information.

THOR MOTOR COACH

Made to fit.

Energy Management Systems (EMS)

THOR PART NUMBERS:
0183225, 0425736, 0426889, 0426890, 0427630
For 50 Amp and 30 Amp Systems

BASIC OPERATION

⚠ 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

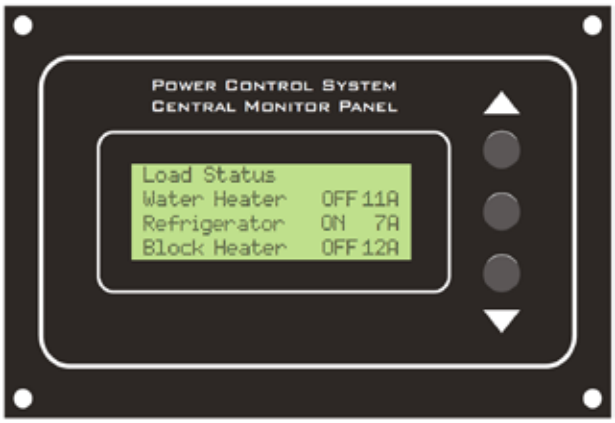
50 amp shore power must be capable of supplying 220-240 volts AC measured across both legs of the service, and supply 50 amps on each leg of the service.

General EMS Information

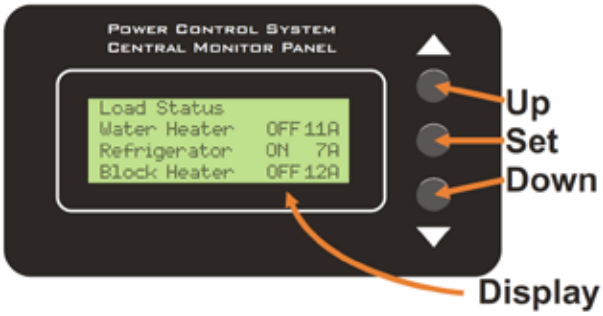
Specific TMC motorhome models (Class A diesel pushers and select Class C with dual air conditioners) are equipped with an Energy Management System (EMS), sometimes referred to as a Power Control System (PCS). When installed, an Energy Management System manages all the 120 volt AC power throughout the 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.

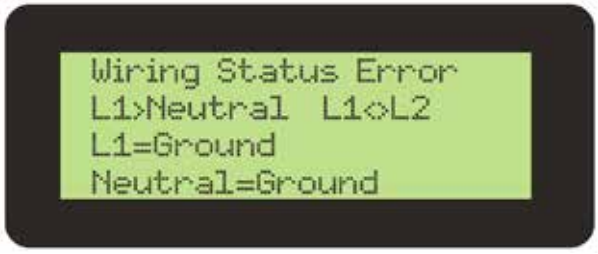
For example, when an appliance such as an air conditioner is first turned on, the momentary power demand of the compressor's motor may be several times that of its operating power consumption. If several high power-consuming appliances are in operation at the same time and a second air conditioner turns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



PCS Control Panel



PCS Function Buttons



PCS Wiring Status Display

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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:

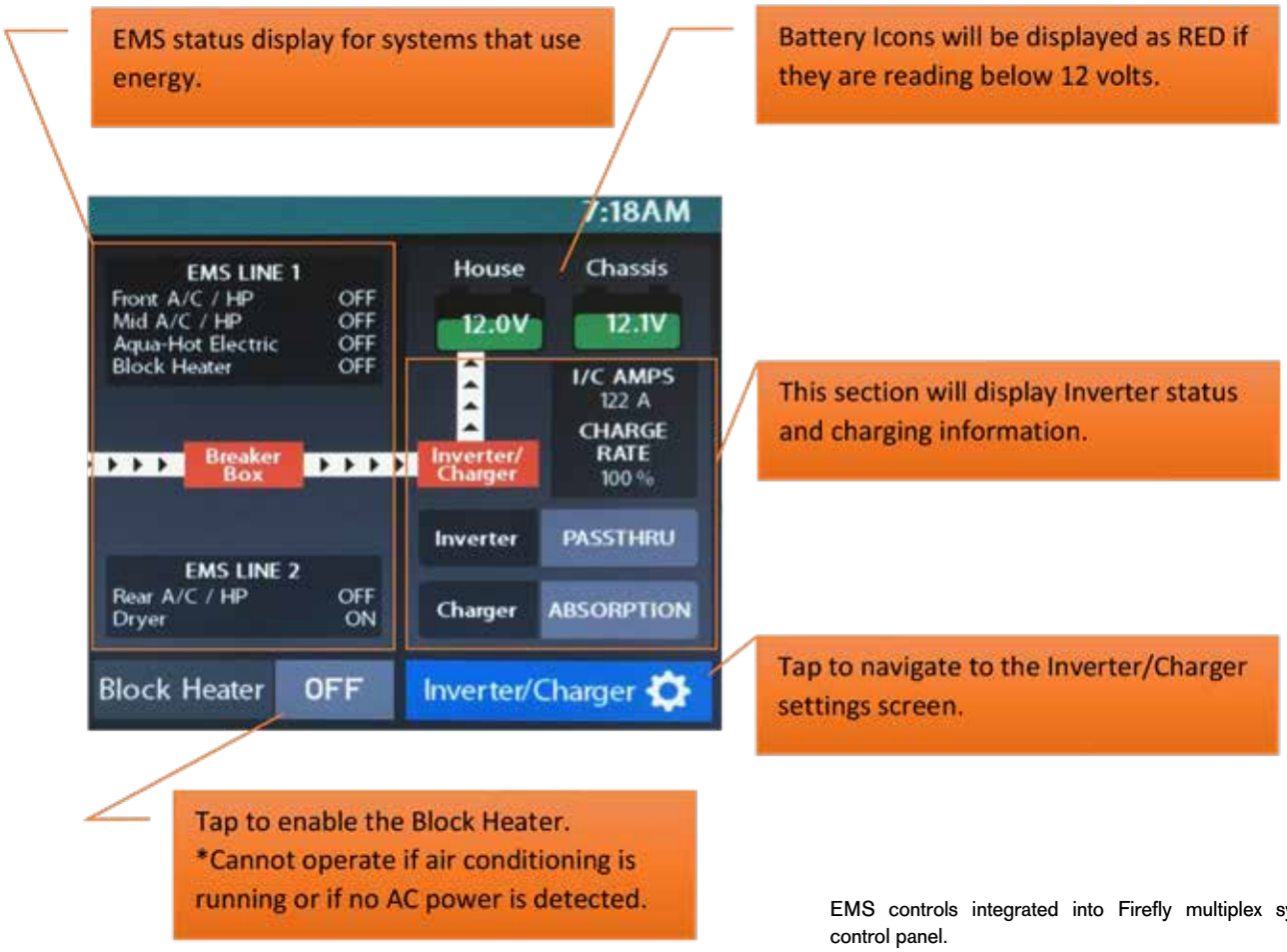
1. Since battery charging typically requires a high amount of electrical energy, the EMS will reduce charge current in an attempt to gain power for other appliances.

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 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).



EMS controls integrated into Firefly multiplex system control panel.

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.

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).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.

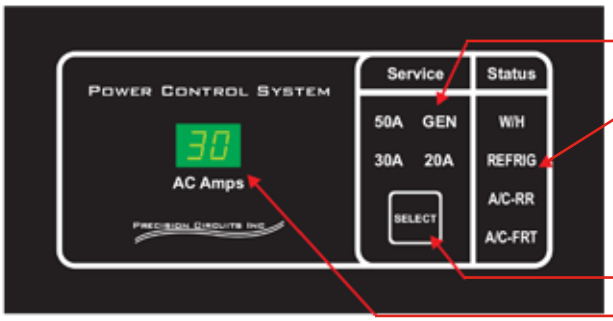
OVERVIEW:

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



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.

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.