Precision Circuits Inc

Power Control System 50A

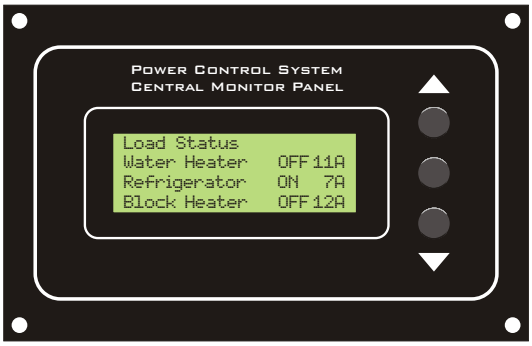
System:

The Power Control System (PCS) consists of two major components:

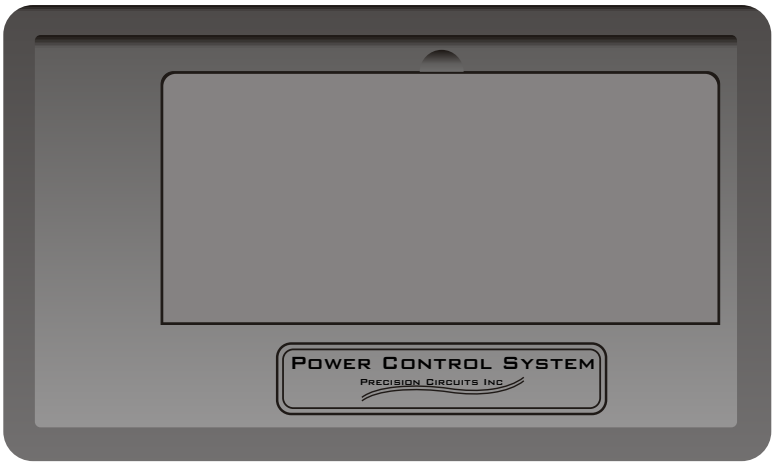
1. PCS Central Monitor Panel &
2. PCS Panelboard for 50amp service.

The Panelboard may optionally have a subpanel built in.

a. The Panelboard also houses the PCS Control Module, and has two current sensors



Central Monitor Panel



Panelboard (Optional Subpanel)

Overview:

The Power Control System (PCS) Panelboard distributes all the 120VAC power throughout the RV, whether it comes from Shore Power, Generator, or the Inverter. The PCS Control monitors the incoming power, and manages the power to reduce Circuit Breaker tripping. It does this by momentarily shedding power to the loads under its control when the owner turns on other more critical appliances in the RV. PCS restores power when the owner controlled appliance is turned off. The PCS Central Monitor Panel displays the status of Incoming Power, and the Controlled Loads.

When coupled with a Magnum Inverter, PCS reduces Battery Charge Rate prior to shedding any loads. Working together, an Inverter Assist feature is available. Normally the Inverter is at rest when Shore Power is available. PCS utilizes the Inverter and the Coach Battery Bank to smooth out Peak Load Demands. In other words the Inverter will temporarily provide power to some of the appliances, prior to shedding any loads.

Features:

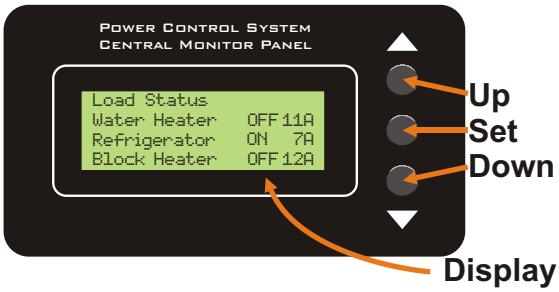
- Monitor and Manage total RV current to avoid nuisance circuit breaker tripping.
- Manage power no matter what the source:
  50-amp Service, Generator, 30-amp Service, 20-amp Service.
- Manage battery charging during high peak demands.
- Provide Inverter-Assit, additional power from battery bank to smooth high peak demands.
- Shed non-critical loads during high peak loads.
- Remote Panel displays Service Type, Load Status, and RV Current & Voltage.
- Generator Soft Start

DANGER:
HAZARD OF ELECTRICAL SHOCK OR BURN. TURN OFF POWER SUPPLY BEFORE WORKING INSIDE.

120/240VAC present inside Panelboard posing potential lethal electrical shock. This equipment should only be serviced by a qualified Service Technician.

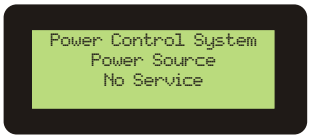
c UL us 36V9 LISTED

Central Monitor Panel:

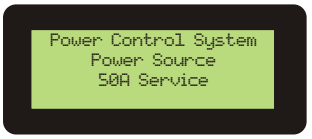


The PCS Monitor displays pertinent Power Control System status information. The UP and DOWN buttons are used to step through each individual Screen of information. Pressing & releasing either the UP or Down button will step to either the Previous or Next Display Screen. Once all the Screens have been 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, to Select between 30A Service and 20A Service. (Note: 50A Service or Generator Service overrides the SET Button.) If there have not been any key presses for awhile, the PCS Monitor turns off the backlighting to save on power. The first press of any key will only turn on the back lighting.

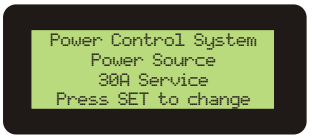
Service Type:



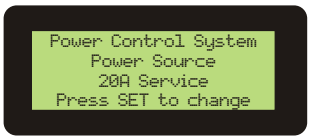
No Service - PCS has 12V Battery power to run the electronics, however, it does not sense any 120/240VAC Power.



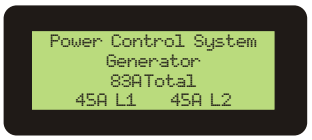
50-amp Service - PCS senses 240/208VAC between L1 and L2 to determine this mode of operation. PCS controls the loads so that the current does not exceed L1 limit of 50amps, L2 limit of 50amps, and a combined limit of 100 amps.



30-amp Service - PCS senses 0VAC 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.



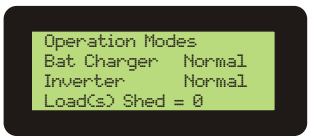
20-amp Service - PCS senses 0VAC between L1 and L2, and the owner selects 20A on the Central Monitor Panel. PCS adds the current of the two sensors and controls the loads so that the current does not exceed 20 amps.



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 ratings of the installed Generator, for example L1 limit of 35amps, L2 limit of 35amps, and a combined Limit of 63 amps.

Operation Mode:

This Screen gives the general information about Load Status.



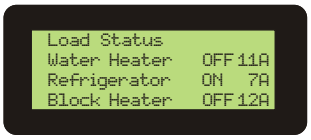
The First Line shows the Status of the Magnum Battery Charger. It will either be: BatChargeNormal, under complete Magnum Control, or BatChargeReduced, which means an Owner activated appliance would have caused a circuit breaker to trip but instead the BatCharger Rate has been reduced. Reducing the Battery will be the 1st thing that PCS will attempt in order to reduce overall RV Power. Battery Charge may not be reduced if the Battery is Low, or the Magnum Inverter is on Line 1 Circuit Breaker and the Overload is on Line 2 only.

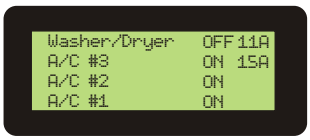
The Second Line show the Status of the Magnum Inverter. It will either show InverterNormal, under complete Magnum Control.
InverterAssist, PCS is requesting that the Magnum Inverter assist by temporarily generating 120VAC power from the batteries.
InverterAssist 12A, the end of this line shows the amount of 120VAC current that the Inverter is supplying.
InverterAssistDeny, means the Magnum Inverter can not Assist at this time, for one of many Magnum Inverter reasons, i.e. Battery Low, Over-current, etc. (See Magnum Owner's Manual).

The Last Line shows if any Loads have been Shed to prevent circuit breaker tripping.
Load(s)Shed=7, depending on the model RV, there can be up to 7 Loads that PCS can control.

Load Status:

Where the last Screen gave general information about all the controlled Loads, these next two screens gives detailed information about the status of each Load under PCS control





WaterHeater OFF 11A, indicates that the Water Heater power has been temporarily turned OFF, and the current at the instant the Water Heater was turned off last was 11amps.

Refrigerator ON 7A, indicates that the Refrigerator has power. Again the 7amps of current is NOT the present current draw, but rather the current at the instant the Refrigerator was turned off last.
A/C#2 ON, indicates that the A/C #2 has power. Since there is no current displayed, that only indicates that this load has not been turned OFF even once since the Battery has been reconnected and 12V power applied to PCS. PCS has never had a chance to "Learn" the current. The Current Displayed, is re-learned each and every time that the Load is turned OFF.

Looking at the list, it appears that PCS does not turn off Loads in Order Preference. PCS will always start shedding loads from the top of the list when PCS in 30A or 20A Service. However, in 50A Service, or running on the Generator there are two Main Breaker, Line 1 & Line 2. PCS will only shed loads if there is an overload detected on its associated Line. In other words, if shedding the Load will not help, skip it and move on. If then sometime in the future an overload is detected on the other Line, PCS will start at the top of the list again. The same is true with Magnum Battery Charge Reduction and Inverter Assist. Magnum can only help on the Line it is wired to, so if it will not help to Assist, don't bother.

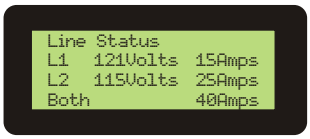
Power Management:

When the current exceeds the limit, because possibly the owner has turned on the Microwave, the PCS will independently limit the current on each line by performing the following in order: Reduce Magnum Battery Charge Rate, Inverter Assist, Load Shed. (If the Magnum Inverter is wired to the opposite leg, only Load Shedding will occur.
As each appliance is shed, PCS learns the current for that specific appliance, to ensure that there will be sufficient headroom to turn the appliance back on and be under the current limit. To ensure that Air Conditioner compressor pressure is bled, and to reduce quick cycling, there is a 2 minute delay from the time a Load has been shed, to the time power is restored.

Once the total RV current has dropped, for example because an owner operated appliance has been turned off, the PCS will reverse the above procedure, returning power to appliances whose operation was not immediately critical.

Line Status:

PCS not only monitors total RV current but also has two built in Volt Meters, and monitors the voltage on each of the Lines.

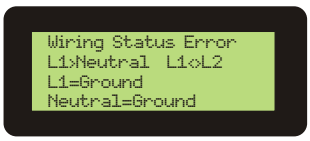


L1 121Volts 15Amps, indicates that Line 1 has 121Voltsrms and is presently drawing 15 amps.

!BrownOut!, if the display indicates Brown Out, the Display will hold the lowest captured voltage that may have occurred while the RV owner is away. Pressing any switch clears the display, and resumes displaying the present readings.

Wiring Status:

Similar to an Outlet Tester that is plugged into outlets in your home to test for proper wiring, PCS monitors the wiring status of the Camp Ground Outlets you may plug into.



WARNING, IF THE DISPLAY EVER INDICATES
WiringStatusError
IMMEDIATELY, unplug the RV from the outlet, and have the outlet inspected by a qualified technician.

The other lines on the Display to the right indicate proper wiring for 50A Service. For 30A Service L1=L2.

Inverter Assist Feature:

PCS works with the MAGNUM Energy Inverter/Charger to bring the RV industry a revolutionary new concept. In the past, energy management systems operated when 120VAC was available and inverters operated when 120VAC was not available from either shore power or generator.
The POWER CONTROL SYSTEM brings these two worlds together.
First PCS will communicate with the Magnum Inverter/Charger and reduce Battery Charge Rate during periods of RV high current demands.
While plugged into shore power, or when the generator is running, the PCS will allow the RV to have more power than available on the shore power or generator, for short periods of time. When the PCS senses that 120VAC power has reached its maximum current, the PCS communicates to the MAGNUM inverter requesting additional power be generated from the battery. If more demands are put on the RV with additional appliances, or with the RV batteries are low, the PCS will shed non-critical loads and avoid nuisance tripping of circuit breakers.

Generator Soft Start:

When the Generator is first turned on, PCS will shed all the controlled loads. The loads are sequenced back on. This is done to allow the generator to come up with minimum load, and to reduce the current the Transfer Switch must handle. Note: PCS applies the same 2 minute delay to turning loads on is when Power Management Load Shedding occurs.

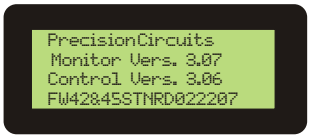
RV Data Parameters:

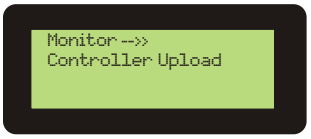
The RV manufacturer has full flexibility to set up the RV Data Parameters through a Windows Program and Program Dongle. The following parameters are downloaded into each PCS system.
Load Names, Load Shed Order, Load-Relay Association, Generator Size, Inverter Information.
These parameters can not be set or changed by the dealer or owner. Each RV Data Set has a unique 18-character Reference ID, where the first digits are the manufacturer's code, the last digits are the revision date, and the remaining middle characters have some model designation.

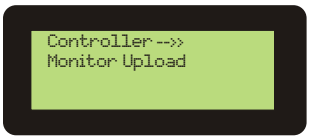
RV Data Synchronization:

The RV Data Parameters are stored in both the PCS CENTRAL MONITOR PANEL and the PCS CONTROL. Should dealer or field replacement of either unit become necessary, a blank unit can be installed and the RV Data will be synchronized or transferred from remaining Unit. During Power-Up the Monitor and Controller check their RV Data and one of four screens can appear.
1. Everything is Synchronized and the Monitor Version, Controller Version, and Ref ID are displayed.
2. RV Data is transferred from Controller to Monitor
3. RV Data is being transferred from Monitor to Controller
4. RV DATA in Monitor and Controller is different and the PCS System can not continue. This can happen for example if a Monitor from one RV is installed in a different model RV.

If for any reason the Controller stops to function, no problem with the Limp Home Feature, all Controlled Loads will continue to operate. Care will have to be used not to turn on too many appliances, overload the system, and trip breakers.

1


2


3


4