ProcessPowerä Points of Differentiation

When we compare SCI's ProcessPower™ UPS design verses a UPS system designed by commercial grade manufactures such as Liebert, Powerware, MGE or Mitsubishi it is apparent that ProcessPower™ UPS design has many important advantages. It is also clear that all of the manufactures have designed UPS systems around the requirements of their intended markets. SCI's ProcessPower™ UPS system has been designed with features that insure continuous power to the load. SCI's markets equipment to industrial clients that can not afford their loads to be dropped either from a financial or safety standpoint. Manufactures such as Liebert, Powerware, MGE and Mitsubishi design UPS systems that are intended to provide protection to less critical loads, such as business computer systems. The failure of these systems is more of an inconvenience, than a financial or safety concern. These systems are not designed for power conditions or environmental conditions encountered in industrial applications. System first cost is more important to these manufactures than designing failsafe UPS systems. In short we don't share similar design priorities or philosophies.

The following is a brief overview of areas of major differentiation between SCI's ProcessPower™ UPS system and the UPS systems manufactured by UPS manufactures such as Liebert, Powerware, MGE and Mitsubishi.

Input Surge Suppression – SCI's ProcessPower™ charger control boards are equipped with circuits designed to suppress input surges. Off-the-shelve commercial grade systems have no such built-in protection, rather they rely on customer supplied surge suppression networks to protect their equipment. Commercial manufactures can add this protection, but it will increase their system cost and the UPS dimension.

Input & Output Isolation Transformer – Isolates the UPS's critical controls and your loads from noise introduced by the input power supply. Off-the-shelve commercial grade systems are not supplied with input & output isolation transformers. They rely on customer supplied isolation to protect their equipment from the introduction of noise. Commercial manufactures can add this protection, but it increases system cost and the UPS dimensions.

DC Bus Configuration – SCI's ProcessPower™ UPS systems are manufactured using 120VDC and 240VDC bus configurations. Commercial manufacture's standard DC bus voltages are in the 360-450VDC range. These high bus voltages are utilized because they offer Commercial grade UPS manufacture the most efficient designs, i.e. they allow the manufactures to optimize their UPS electrical designs to the maximum extent. While this is beneficial to the manufacture it is not necessarily beneficial to the end user. The following are the main problems associated with using this bus voltage level. (1.) A higher DC bus voltage means there are going to be more cells required to make up the battery system (Example – 360VDC bus has 180 cells while a 120VDC bus has only 60 cells). More cells equal more potential points of failure. (2.) More cells in the battery system also means increased maintenance cost for the end-user. (3.) The more battery cells utilized the larger the battery footprint becomes. (4.) DC distribution is based upon 120VDC and 240VDC bus voltage levels. SCI's ProcessPower™ UPS systems utilize smaller numbers of cells in their battery systems which reduces battery maintenance, footprint and increases overall system reliability.

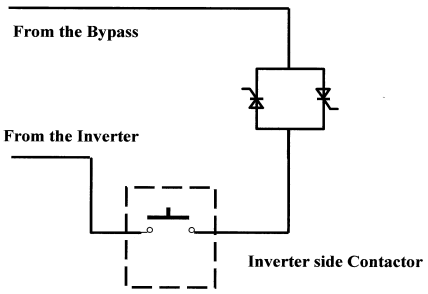
Type of Battery Systems Supplied – SCI's ProcessPower™ UPS systems can be provided with all types of battery designs and styles. Typical battery types supplied with ProcessPower™ UPS systems are 10 Year Sealed, 20 Year Sealed, 20 Year Lead Calcium (Wet) Stationary, 20 Year Antimony (Wet) Stationary, Nickel Cadmium, Tubular Designs and Lead Selenium Designs. SCI gives the end users a wide range of battery choices. Commercial grade systems use 5 and 10 Year sealed designs almost exclusively. From an economic standpoint commercial grade UPS manufactures are really limited to these choices. Yes, they can supply other battery types with their equipment. However, the battery will never be economical for the end-user. Why? The reason is simple. Their DC bus voltage (360-450VDC) window is optimized for 5 and 10 year sealed type batteries. For any other battery design their system cost will be much higher than systems which use 120 or 240VDC bus configurations. Add in the short life of five (5) and ten (10) year sealed batteries, typically eighteen to twenty-four months for five (5) year designs and three to five years for ten (10) year designs and you can see that these manufactures are limiting your choices and reliability.

Level of Discharge – SCI's ProcessPower™ UPS system is designed to discharge its battery system to a 1.75 End VPC level. Typically commercial grade systems discharge their battery systems (5 or 10 year VRLA type) to a 1.65 End VPC level. What difference does this make? A lot! Discharging a battery to 1.65 End VPC level takes much more energy out of the battery system compared to a 1.75 End VPC level. The result favors the UPS manufacture much more than it favors the end-user. Discharging the battery to a lower level allows the UPS manufacture to supply a smaller battery which lowers the initial cost of the UPS system. That is good for the customer to a point, however discharging a battery to a lower End VPC level also reduces the battery life which is bad especially when the UPS is supplying your critical loads. Remember that commercial grade systems are using five (5) and ten (10) year battery designs that already have a reduced battery life. Deeply discharging these batteries only hastens their early failure.

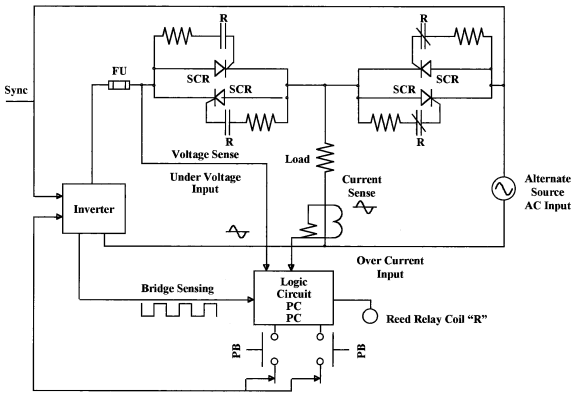
Static Switch Design – This is the most critical difference between SCI's ProcessPower™ UPS design and that of the commercial manufactures. Static switch designs used by commercial manufactures use inverse-parallel SCR (Silicon Controlled Rectifier) pair for electronic power switching on the bypass source. The Inverter side of the static switch uses a power relay (contactor) with normally open contacts to disconnect the inverter from the bypass during the normal static switch critical load transfer operation. Contactors are not as reliable as SCR devices, especially if the Inverter is exposed to repeated load faults. High fault current levels can weld the contactor's electrical contacts closed. If the contactor contacts fail to open, the UPS output will be connected continuously to the bypass source. PWM Inverters, are not designed to have their AC outputs back-fed from the bypass. This would result in damage to the inverter and loss of the load. As a result commercial manufactures design their static switches to have break transfers of ¼ cycle under all transfers conditions and to inhibit transfers under certain conditions. The result is that end user gets a switch designed to protect the UPS system from damage not the connected load.

SCI's ProcessPower™ UPS use SCR devices on both the Inverter and bypass poles. The ProcessPower™ UPS designs do not use an inverter side contactor, but instead use an additional inverse-parallel SCR pair. This modification to the commercial static switch design is, of course, a more expensive design feature, but the elimination of the contactor increases the static switch reliability. The addition of second pair of inverse-parallel SCR's does not in itself make the static switch design failsafe for industrial applications. One additional ingredient is necessary to make a failsafe static switch. That ingredient is a reed relay placed in the SCR gating logic. This relay is placed in the static switch circuitry such that a failure of inverter or static switch control will result in the bypass sources SCR's being gated "on". This would result in the bypass source assuming the client's critical load. This is an automatic event that is outside of any other static switch logic. What it insures is that your critical load is going to be supplied no mater what happens to the UPS. This is very different from what happens in commercial static switch designs.

Commercial Static Switch Design



Industrial Static Switch Design



Evaluation Factors	Typical Commercial UPS Static Switch Reaction	SCI ProcessPower UPS Static Switch Reaction
Inverter Fails - Bypass Source is Available	***S.S. Transfers to Bypass – ¼ Cycle Break***	***S.S. Transfer to Bypass – Zero Break***
Output Fault (Overload) Occurs – Bypass Source is Available	**S.S. Transfer to Bypass**. However under sustained faults the static switch may be damaged as SCR ratings are generally smaller than full continuous duty requirements. As a result many manufactures shutdown the UPS under sustained fault conditions. ***Load is Dropped.***	**S.S. Transfers to Bypass** ***Load is Maintained***
Output Fault or Inverter Fails – Bypass Source Voltage is Outside +/-10%.	**UPS Resets**. ***Load is /Dropped***	**S.S. Transfers to Bypass** ***Load is Maintained***
Static Switch Control or Component Fails – Bypass Source is Available	**S.S. Inhibits Transfer –** ***Load is Dropped***	**S.S. Fails to Bypass Source** ***Load is Maintained***
UPS is Out-of-Sync and Inverter Fails	**S.S. Inhibits Transfer –** ***Load is Dropped***	**S.S. Fails to Bypass Source** ***Load is Maintained***