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Smart Switch Behavior

Did you know that the 9060 series electronic switches provide many assurances to the user above that of a typical mechanical switch. Not only are they IP69K they are intelligent; akin to that of a precision instrument and they have visual indicators to alert the user that attention may be required. They incorporate back lighting, switch on-off indication along with providing **Over Current** and **In- Rush** fault protection with indication. Each switch has a preset internal amp rating from 0,3,5,7,10,15 or 20 Amps purposefully for the circuit it is controlling so there is no need for an inline circuit breaker, greatly reducing integration. The AMP setting determines the trip curve like in kind to a traditional circuit breaker but there is more.

As noted above and in understanding that the electronic switch is a precision instrument it is extremely important that wire sizing on the application is appropriate to handle the electrical load of the entire switch panel as "IF" a high voltage loss is present leading to the switch (s) @ PIN 3 is undersized the switches will indicate this to the user with an erratic flashing behavior. It is not uncommon to find this in an application. IF you have verified appropriate conductor sizing and this behavior occurs one would then need to verify that any daisy chained jumpers are adequately sized. We recommend no less than 12 AWG input wire to PIN 3 or jumpers be utilized If a 10 amp or higher circuit protection is chosen.

There is a simple method one can utilize to recognize this by simply adding up the circuit protection Amp rating you have chosen for all of the switches in the panel; then ensure that the AWG/.ga (Gauge) of the wire/cable based upon its length leading into the switch (s) has been appropriately chosen. Example if your application has 10 switches and the Amperage protection chosen of each switch is 10 amps; the sum of all of the switches would be 100 amps and one should ensure that the wire/cable (s) leading to the switch panel is capable (has the ampacity) to adequately carry 100 amps indefinitely. A useful guide for choosing the appropriate conductor size by the total sum of amperage and conductor lengths (one way) can be found at Tables (boathowto.com) in accordance to ABYC recommendations.

The Fault Indicators of the Electronic Switch

When exposed to ***Over Current*** the switch will display a **PURPLE** slow on-off blink. Indicating that it has been exposed to amperage load in excess of 120% of the amp setting of the switch or the output has a ground fault. Example: switch has 10 Amp setting. If more than 12 Amps is required by the load-device; the switch will recognize this and indicate the fault with a ***slow purple on-off blink*** and the load will be turned OFF.

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Simply press to RESET. Should this occur there is something that needs to be attended to between the switch and the load/device it is controlling (the amperage requirement is more than the Amp setting of the switch) If this occurs the device the switch is controlling could have a fault and should be attended to or could be grounded. If in doubt always measure the amperage consumption of the device while it is on and operating with a DC Clamp on ammeter or review the manufacturers product specifications to confirm normal amperage consumption should be. But be aware it could be a natural behavior of a device or pair of devices chosen and we will cover that a bit later in this document.

In-Rush protection: This has to do with instantaneous current being drawn by a load-device upon being switched on. Depending on the device and its environment the amperage requirement at turn on can be many times that of the continuous amperage requirement of the load/device in normal operation. This is natural of all devices but can be damaging to electronic components when it occurs over a short time span of milliseconds. The electronics within the switch recognize this and protect the switch and application from potential harm due to the magnitude of EFT (electrical fast transients) over a duration of time or a magnitude in excess of 120 Amps. When exposed to **In-Rush** exceeding this the switch will indicate the fault with a ***slow WHITE on-off blink***. simply press to reset.

If one sees this indication an underlying concern should be addressed as continued exposure could result in damage to other electronic components on the application or switch failure.

In understanding the above there are a few nuances or unique behaviors of electrical devices when being controlled by an electronic switch that could create one of the above faults. **In-Rush** indication can likely be present on multiple switches in a panel at one time and it is important to understand what device is attributing to the fault (typically at turn on). Knowing that quickly enables you resolve it. Should it occur once it will occur again. But no worries as it can be easily corrected.

Example A: **Wash down pump.** Most have a pressure switch internal to the pump. When pressure is relieved from the head of the pump a set of electrical contacts either open or close to activate the pump enabling it to run to maintain a certain flow and or achieve a certain pressure by design. In doing so high inductive switching occurs that produces a significant magnitude of noise and can result in an Overcurrent and or In-Rush fault. We recommend that an in-line choke part ID: **1400-000-001** be installed that will suppress the resulting noise. It is installed into wire in between the output of the switch and the load/device. Any pump and or electric motor that triggers an Over Current fault routinely can be resolved by installing this choke. See **Figure 1**

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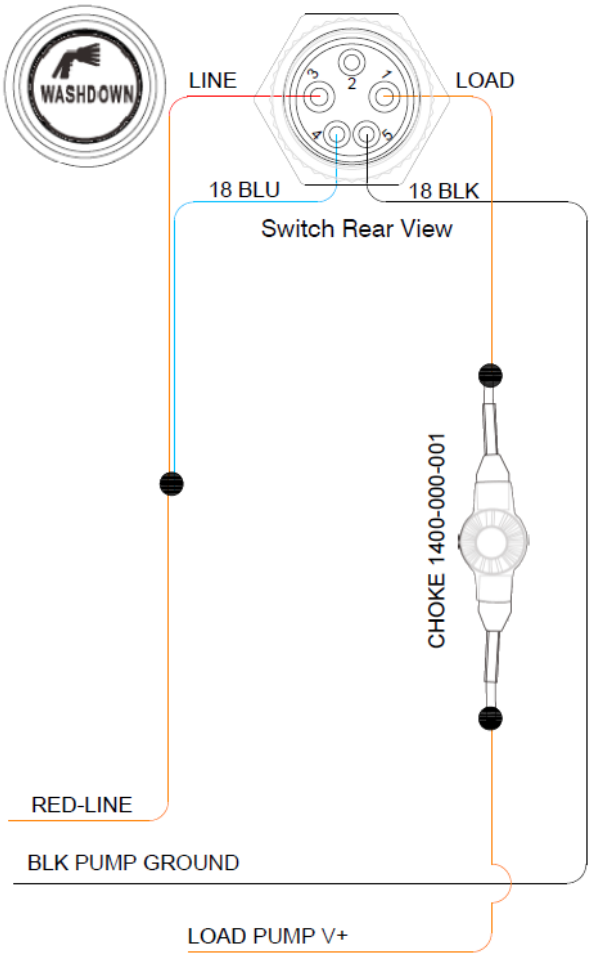
Figure 1



Example B: **Bilge Pump.** Most have a primary float switch that is wiried into 24 hour circuit which is direct to the battery. In some cases with water movement the float switch could turn on and off when the switch is ON. In such a scenereo “IF” the switch is being utilized for auto bilge indication… the 24 hour circuit will have a higher voltage than the switched circuit; this could cause an inrush or overcurrent fault. Due to this it is reccomended that a choke beinstalled as close to the pump as possible above the water line to supress noise that can be generated as a result. * IF one is utilizing an electronic ON/OFF switch to manually control the bilge a Diode equivilent to part ID: DST2045AX- DIODE SCHOTTKY 45V 20A P600 must be installed into conductor leading into PIN 3 input to the switch with the cathode facing the switch to prevent the 24 hour auto bilge from back feeding and powering other devices on the boat IF the battery switch is OFF. See **Figure 2**

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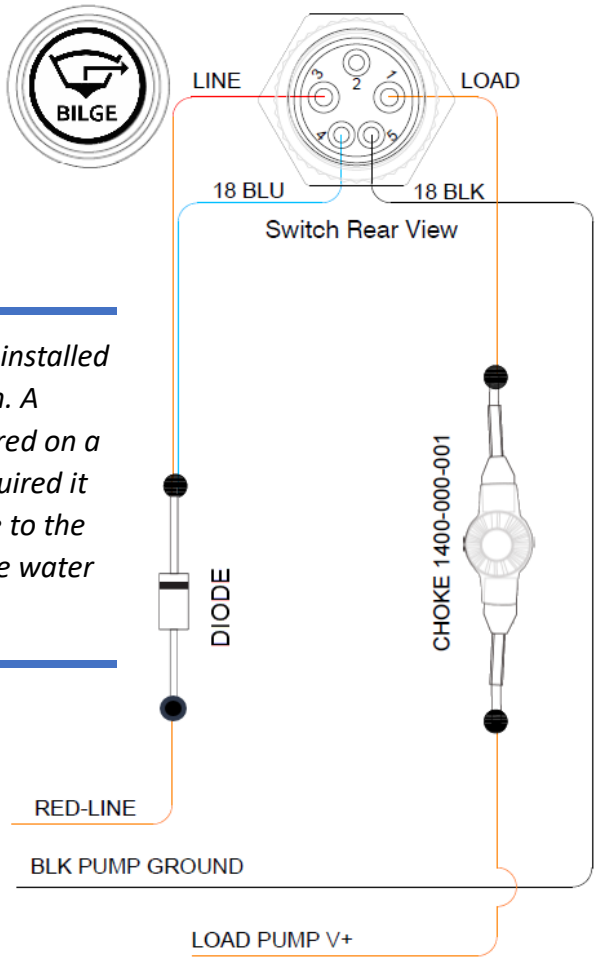
FIGURE 2



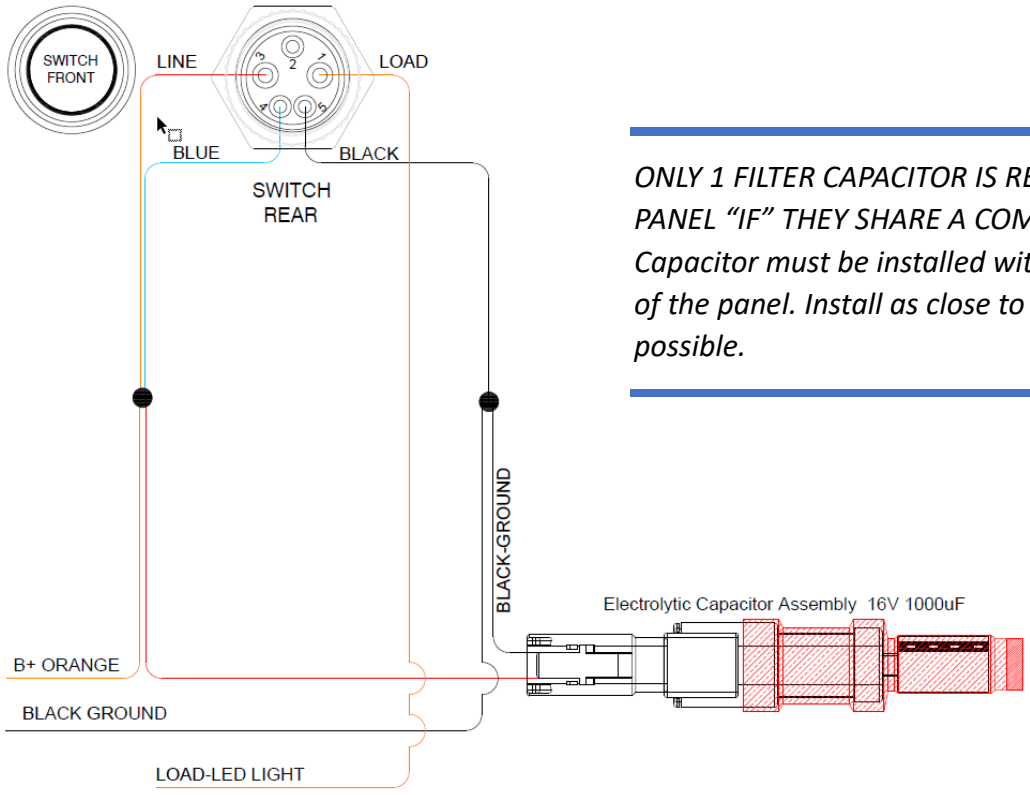
A diode is REQUIRED to be installed on every bilge pump switch. A choke is not typically required on a bilge pump however IF required it should be installed as close to the pump as possible above the water line.

Example C: **Relays and Bi-Stable relays** such as a Remote Battery Switch or Charge Control Relay exhibit similar behavior as above only have low amperage requirements in some cases less than 250 milliamps not even 1 Ampere required by the device. But the bounce or magnitude of the resulting EFT (electrical fast transient) when being switched can be excessively high.

Example D: **LED Lights** not all but some have internal power controllers. Others have basic switching drivers and have high noise or EFT (electrical fast transients) present while operating and when being switched on of a high magnitude and are expected; some are harsher than others. Could be very small LED's or large spreader LED lights; either could have similar negative electronic behavioral effects. Again, even ones that consume less than 1 amp could be a significant contributor to faults.

None of the above has to do with the quality of a particular manufacture it simply is an inherent characteristic of the referenced devices. However, there is a simple solution. Again, typically there is one switch or device when being turned on or operating that is attributing to the In-Rush fault indication and can be easily identified. Typically, when being turned on or off however in the LED light example it may not occur until after a long period of operation when voltage is depleted or temperature increases. In both examples C & D a 16V 1000uF electrolytic capacitor Part ID: **1406-000-001** can be installed across the Line V+ and Ground near the switch to correct the issue creating the fault. See **Figure 3** below.

Figure 3



ONLY 1 FILTER CAPACITOR IS REQUIRED PER PANEL "IF" THEY SHARE A COMMON B+ LINE. Capacitor must be installed within 36 inches of the panel. Install as close to the panel as possible.

Example E: Some devices could have high impedance such as an LED with an internal driver or could have residual magnetism such as engine bay evacuation **Blowers** could have a no turn on symptom. Meaning that when one presses the switch to turn the device ON the device will not turn ON however the switch will flash white or purple immediately upon pressing the switch. To resolve this one can simply install a diode between the output of the switch and the device with the cathode facing the device. A part equivalent to manufacture part ID: DST2045AX- DIODE SCHOTTKY 45V 20A P600 See **Figure 4**

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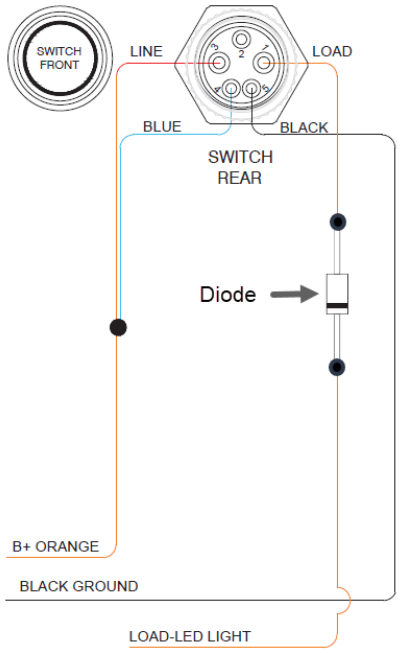
Figure 4



Momentary Electronic Switches: They to can experience all the above outlined discoveries however it is important to note that WE DO NOT RECOMMEND utilizing our electronic momentary switch for PUSH to START applications unless a smart controller is being utilized. This is due to the natural poling within the starting motor, its armature and or specific soft start mechanisms within the starter. The switch will recognize this intrinsic and an immediate fault will occur. Bluewater does offer a pleather of mechanical switches for this purpose that do have the external esthetics of the many electronic switches we offer for this application.

As today applications are vast and new discoveries are presented daily, we encourage you to utilize our engineering services for design review, technical assistance and our recommendations.

					
Blue indicates Back Lighting only if utilized	**Green Indicates ON with first Press relative to OFF-ON-ON variants**	**RED indicates ON with OFF-ON First press and ON with Second press in OFF-ON-ON varients**	**Yellow indicates Auto mode in timer and auto Nav/Anch variants**	**Purple indicates OVER CURRENT FAULT**	**White indicates IN-RUSH Fault**

*** If multiple switches are in one switch panel and they begin to randomly flash and or automatically change color... It typically indicates that low voltage is present. Check state of battery charge and or voltage loss in primary B+ supply circuit leading to switch panel**