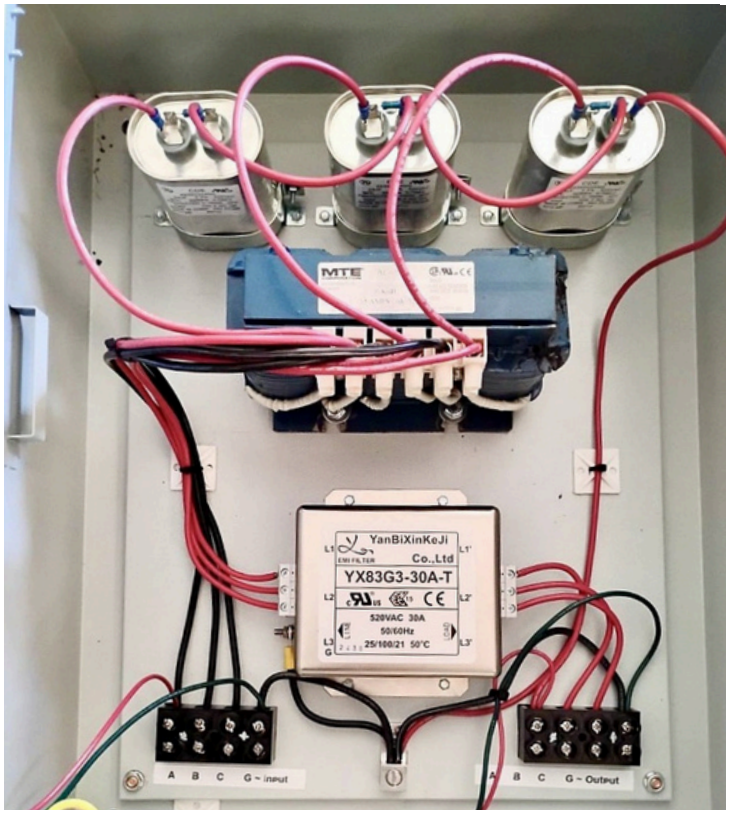
IPI SENTINEL™

The IPIU is a unit that has been designed to provide extremely fast transient suppression and noise reduction for power sources that are utilized to drive sensitive electronic and electrical loads. The sensitive loads may have a very low tolerance to voltage spikes or transients. Sensitive loads cannot survive a deluge of input power disturbances. The power disturbances may be caused by thunderstorms, Wind induced power line contact withtree limbs, arcing of neighboring loads on the power lines, and/or a series of reclosure operations from the power provider's electrical substations. In any event, the IPIU has been designed to isolate the sensitive load from the power line voltagetransients and voltage noise that could damage the sensitive equipment such as high voltage dc power supplies.

The IPIU has the following Frequency Response Characteristics to the input voltage waveforms and disturbances: The attenuation curve (Orange) illustrates that frequencies above 1,000 Hertz are attenuated or reduced by a factor of 4,000 to 1or more. A typical arcing or storm related 6,000 volt, 100 khz,ANSI C62.41 transient will be reduced to less than 3 volts on the 680 volt peak ac power voltage waveform – (in other words, it virtually disappears from the 60 Hertz Power Waveform).



Graph #1

Illustrates that voltage disturbance waveforms with frequencies at 3 kHz are reduced by 77%. At 6 kHz the reduction is 94% and at 9 kHz, the voltage disturbance waveform is reduced by 97%. The IPIU reduces the output of a 15kHz voltage waveform by 99%.
The IEC 61000 describes a typical voltage transient as a 6 KV peak voltage waveform with a 1.2 microsecond Rise Time and a 50 microsecond decay time with a follow on current resulting from the voltage waveform.

Graph #2

6 KV Peak voltage
The 1.2 microsecond rise time corresponds to approximately a 100 kHz voltage waveform and is very common in transient voltage generation in conventional 50/60 Hertz power generation and distribution systems. The IPIU reduces the peak voltage of the 100 kHz 1.2 us 6KV voltage waveform to less than 3 volts remaining on the 50/60 Hz voltage power sinewave. In other words, it is virtually eliminated.
This Unit is essential in power protection for sensitive electronic and electrical systems when standard solid state surge protectors are simply not fast enough to prevent the leading edges of the damaging transients from reaching and damaging the sensitive power supply providing power to the equipment requiring protection.
The IPIU is not a long term over voltage or under voltage protection system. Long term over voltage or under voltage conditions of 2.5 cycles (Approximately 40 milli seconds) and longer events cannot be regulated by the IPIU. There are other solutions available from U.S. Electric Technologies, LLC for addressing these and/or any other power disturbance issues or conditions.
The IPIU is very simple to install. It is simply installed between the fused disconnect or breaker panel and the sensitive load. It is in series with the sensitive load. It is installed with three phase wires and 1 grounding conductor for the input power block and three phase wires and 1 grounding conductor for the output power block that is wired to provide clean power to the protected and sensitive load.

Graph #3

Notice that for an 80 volt spike in input voltage, only a 0.7 voltvoltage bump gets through the IPIU to the sensitive load equipment.
The IPIU protects your equipment from:
• Interference caused by high frequency power line noise.• Damaging and rapidly rising transients on the Power Line• Arcing Neighborhood loads that flood the power lines with damaging transients.
The IPIU is a:
• Unique and Patented technological design• Transient Protection Unit.• Noise Voltage Interference Reduction Unit.

IPI Discussion of Operation

Discussion of the operation of the Instantaneous Power Isolator (IPI)

JDK

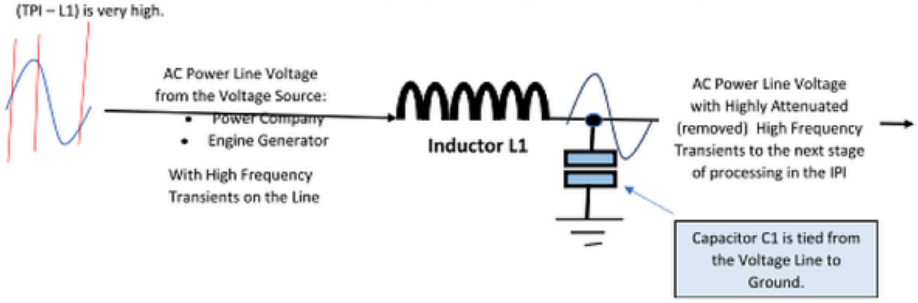
The Instantaneous Power Isolator (IPI) was designed to:

- Be electrically installed ahead of and in line with the Load that it is protecting
- provide a virtually instantaneous response
  - to Lightning
  - and Switching Voltage Transients

  that are coming into the unit from the power source.

1. The incoming power is first processed by the current passing in series through a three phase inductor (TPI - L1). The inductor provides a frequency sensitive impedance that increases directly with the increase in frequency of the power waveform transitions.

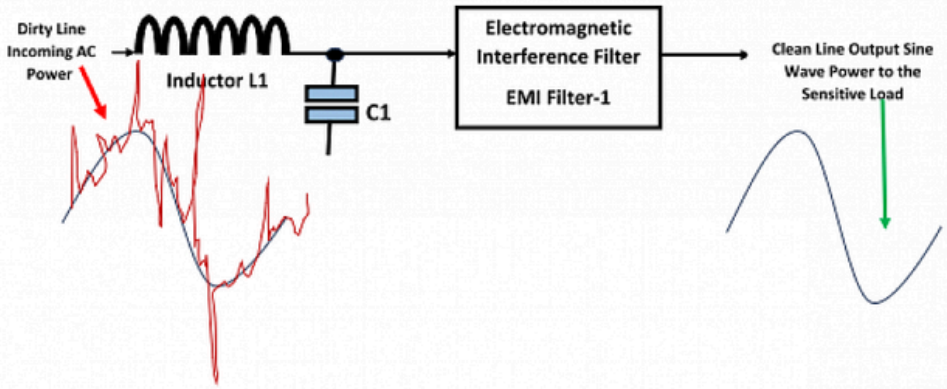
- At low frequencies where the normal power sine eave occurs @ 60 Hertz, the impedance of the Three Phase Inductor (TPI – L1) is very low.
- At high frequencies such as at 100,000 Hertz, where lightning and switching transients occur, the impedance of the Three Phase Inductor (TPI – L1) is very high.



2. A Capacitor is installed from the power line on the output side of L1 to ground to:
   - Provide a programmable Impedance to Ground
   - Provide a shunt path for transient Current in the Inductor L1

Discussion of the operation of the Instantaneous Power Isolator (IPI)

3. L1 and C1 are combined to form a low-pass filter that is designed to:
   - pass the low frequency 60 Hertz AC Power Wave
   - block the high frequency Voltage riding on the Low Frequency AC Power Wave



4. The EMI filter-1 is installed in series with the power line to the sensitive load to clean the sine wave of any Radio Frequency noise that is riding on the power sine wave that might cause interference with the operation of sensitive electronic circuits in the sensitive load.

5. The combination of L1, C1 and EMIF-1 provides a reduction or attenuation in Lightning and Switching Transient noise signal magnitudes greater than 1000 to 1. In other words, the noise coming in virtually disappears in the IPI and does not affect the operation or shorten the life of the sensitive load attached to and receiving it's AC Power from the IPI.

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