

DNA Line Filter

Dissipative Noise Attenuation Line Filter

Model M20 Dual and M30 Dual

Installation Manual



1.0 Introduction

The DNA product line is designed to reduce the Dirty Electricity (DE) that is commonly found on AC power lines. This DE is sometimes referred-to by engineers as, "noise".

DE is energy (voltages and currents) flowing on the AC power lines that is of a higher frequency than the 50 or 60 Hz power frequency. DE is found, from, 100's of Hz to the MHz range.

These DE voltages and currents (flowing on the AC power lines) generate electric and magnetic fields that radiate into the spaces around the power wiring. It is these fields that people have reported sensitivity-to. Therefore by using our DNA technology, the voltages and currents of the DE, that are riding on the AC power lines, are reduced. This, then, brings about a reduction the the DE fields that the DE voltages and currents produce.

DE is caused by a wide variety of devices:

- Dirty electricity coming in from the power utility company connection. This dirty electricity can be from: 1] the non-linearities in the utility company's infrastructure, e.g. transformers. This type of dirty electricity is often referred-to as "harmonics", 2] broadband dirty electricity from insulator arcing, corona/multipaction in the utility company's infrastructure, 3] poor/corroded connections within the power utility company's infrastructure, 4] dirty electricity from neighboring residential, commercial and industrial properties.
- Dirty electricity from switch mode power supplies that power various electronics which are connected to the A.C. line, including computers, off-the-grid power inverters such as solar array inverters and wind mill inverters, office machines, uninterruptible power supplies (UPS), entertainment electronics, etc.
- Dirty electricity from switch mode power supplies that are a part of lighting such a LED

lights and especially compact fluorescent light.

- Harmonics from traditional power supplies (not switch mode supplies) that power various electronics, noted above.
- Dirty electricity and harmonics from motor speed controls, light dimmers and solid state switches. The latter includes SCR's and Triacs.
- Harmonics from electrical motors.
- Broadband Dirty electricity from electric arc welders. This is severe, intense dirty electricity.
- Dirty electricity from induction heaters. This is severe, intense dirty electricity.
- Dirty electricity from certain Radio Frequency (RF) transmitters.

2.0 DNA Products

Many of the DNA products are simple to install and use. They plug into a standard AC outlet. These are "parallel" devices that provide a path-of-least resistance to the DE. They capture the DE and turn it into a small amount of heat. These parallel devices work to reduce DE in the frequency range, from roughly 5 kHz to 500 kHz. In the lower end of this range (near 5 kHz) these parallel devices are not performing as well as they perform at higher frequencies – just by the nature of their design. Examples of these parallel products are: MxDNA, RxDNA-V2, PxDNA.

In addition, there are true "line filter" products that we offer that provide excellent reduction of DE at the frequencies of typical inverter switching regulators. Please continue to read for a discussion on these.

3.0 Alternative Power, A Source Of Dirty Electricity

3.1 Dirty Electricity Generation By Inverters

With the growing installation of alternative energy sources in recent years, there has been a significant increase in the DE in residential, commercial and industrial settings.

The most common alternative energy sources are photo-voltaic solar arrays and wind mills, aka wind turbines. These devices usually produce direct current (DC). Most, or all, of the appliances that the users have, will be alternating current (AC) appliances, at 50 or 60 Hz (cycles per second).

To accommodate this disparity between the DC available from the alternative source (solar and wind) and the AC required by the user's appliances, a device known as an Inverter is used. It is an electronic system that switches the DC on-and-off very quickly and thereby generates AC (for use by the appliances).

These Inverters are typically switch-mode-power-supplies and as a by-product they generate DE. These Inverters generate 60 Hz AC (in the US), but they do so by switching the DC on-and-off at a fundamental switch frequency, such as 16 KHz. As a result, the 60 Hz AC coming from this Inverter, will be "polluted" with the 16 KHz (in this example) switch frequency. In addition there will be numerous harmonics of the 16KHz present. For example:

$$2 \times 16 \text{ KHz} = 32 \text{ KHz}$$

$$3 \times 16 \text{ KHz} = 48 \text{ KHz}$$

$$4 \times 16 \text{ KHz} = 64 \text{ KHz}$$

etc.

These frequencies (16, 32, 48, 64 Khz), are not really intended to be a part of the 60 Hz (in this example) AC that is provided by the Inverter. They are a side effect. They represent DE.

3.2 Introduction To Reducing The Dirty Electricity From Inverters

The aforementioned parallel DNA products can be used to reduce the DE from alternative energy systems, specifically the Inverter(s) that are an integral part of the system. In this approach, laboratory test have typically shown a reduction of 10-to-1 of the DE.

In the case of alternative power, there can be Inverters that are supplying 1000's of watts of power from the solar or wind devices. The DE from an Inverter can be considerable, and the reduction of a parallel device (such as a MxDNA, RxDNA-V2, PxDNA) may not reduce the DE to a value that is acceptable to the User (in the residential, commercial or industrial setting).

The product that we offer to accomplish a large reduction of the DE from alternative energy systems is a "line filter" device, aka "inline filter". It is the DNA Line Filter.

While the aforementioned parallel products have the considerable convenience of the user simply "plugging them in", the DNA Line Filter requires a professional electrician to install them.

The DNA-Line Filter will be connected between the Inverter and the users power wiring. The DNA Line Filter will very effectively reduce the DE from the Inverter.

As a point of comparison, the parallel devices (**MxDNA, RxDNA-V2, PxDNA**) have been tested and typically reduce the DE, **10-to-1**.

DNA Line Filter testing shows typical reduction of **500-to-1** at 16 Khz and greater reductions at higher frequencies.

3.3 Detailed Description of Using DNA Line Filter to reduce Solar/Wind Inverter Dirty Electricity

Now, specifically referring to the application of the DNA Line Filters, many solar array / wind installations in the US are configured with the Inverter supplying 240 VAC with 2 Hot lines and 1 Neutral line. If a DNA Line Filter is being used to reduce DE from the Inverter Output, then 2 approaches can be used:

- Use 2 each of the single phase DNA Line Filter products
- Use 1 each of the dual phase DNA Line Filter products

Detailed connection diagram are included in the next major document section, 5.0

Not all solar/wind installations in the US are 2 phase (2 Leg). In some cases there is a single phase power circuit, usually 5 KW or less. In these cases, a single phase DNA Line Filter is used.

3.4 Using DNA Line Filter To Reduce Dirty Electricity From The Grid

The Bau Biologists of the world have become quite familiar with the phenomenon that significant DE can present on the incoming power utility lines. This DE can be due to one or more **residential neighbors** who are generating DE on their properties, **industrial neighbors** who are generating DE on their properties, or from the **utility company** itself.

When a residential or industrial neighbor share the same transformer, any DE generated within a property, will be present on the utility wiring for all the users of that transformer(s). In other words, one neighbor can pollute many other properties with DE.

In a **residential property**, obvious causes for the generation of DE, include, solar/wind inverters, HVAC (heating, ventilating, air conditioning) systems that have variable speed motors, pool pumps, portable electric heaters that use pulse width modulation for continuous adjustment of the amount of heat, lamp dimmers, compact fluorescent lamps, most LED lamps/lighting, electric stoves that use pulse width modulation for continuous heat adjustment, etc.

In an **industrial property**, the list of DE generating equipment includes most of the residential list plus dozens and dozens of additional sources – too many to list here.

An example of DE from the **utility company**, there are solar farms that are installed in some locations by the utility company. These farms can generate massive DE. Unfortunately, it is often at a significantly lower frequency than the typical residential Inverter. Because of this lower frequency, it becomes particularly problematic to mitigate.

3.5 Using DNA Line Filter To Reduce Dirty Electricity From Sources Within Your Property

There are a variety appliances/systems within a residence/commercial/industrial property that can generate a very significant amount of DE. Examples include, pool pumps and variable speed HVAC systems.

These appliances/systems will typically pollute the entire property and also, pollute the neighborhood. A DNA Line Filter can be used with a “reverse connection” to isolate the DE of said appliance/system and thereby save the property and the neighborhood from the DE.

This reverse connection can be accomplished with a “single” DNA Line Filter, or a “dual” DNA Line Filter.

4.0 DNA Line Filter Specifications

Model Numbers

DNA Line Filters are given model designations, beginning with M. The number that follows the M is the maximum AC current rating.

Examples:

M20 = maximum current 20 amperes 50/60 Hz

M30 = maximum current 30 amperes 50/60 Hz

M100 = maximum current 100 amperes 50/60 Hz

etc.

Model Letters

The model number may be followed by a letter if there is more than one model available for that specific configuration.

Example:

M100a

M100b

The difference between the above-cited models (version a and version b) is the amount of attenuation (the amount of DE reduction) that is available. In the above-cited example, the b model has 4 times as much attenuation as the a model.

Other Model Descriptors

There are various descriptors that may follow the model number.

Examples:

The descriptor **Dual** may be used for a model.

Examples:

- A model **M20** can accommodate a single AC line phase (aka single Leg), at either 120 VAC or 240/250 VAC.

- A model **M20 Dual** can accommodate two AC line phases (aka two Legs).

In the US in residential applications, a single phase is typically 120 VAC. Appliances that require high power (e.g. electric clothes dryers, electric stoves, etc.) will typically be connected with 2 phases (2 Legs), where there is 240 VAC 60 Hz across these 2 phases.

The descriptor **NEMA 3R** may be used for a model.

NEMA (National Electrical Manufacturers Association) designation is used with the DNA Line Filter products to indicate certain environmental capabilities. Specifically, NEMA 3R is a rain-proof, snow-proof, sleet-proof, drip-proof enclosure. Note that in all of these environmental conditions, the liquid is coming from above. NEMA 3R is not a “completely sealed” enclosure that will survive being hosed.

Specific Model Specifications Follow

M20 Dual

Maximum Line Voltage: 250 VAC, RMS, 50/60 Hz.

Maximum Current: 20 amperes AC, RMS, 50/60 Hz.

Wire gauge range on internal terminal strip: 18 AWG to 4 AWG

Weight: 38 lbs.

M30 Dual

Maximum Line Voltage: 250 VAC, RMS, 50/60 Hz.

Maximum Current: 30 amperes AC, RMS, 50/60 Hz.

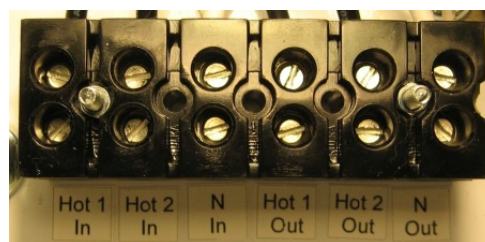
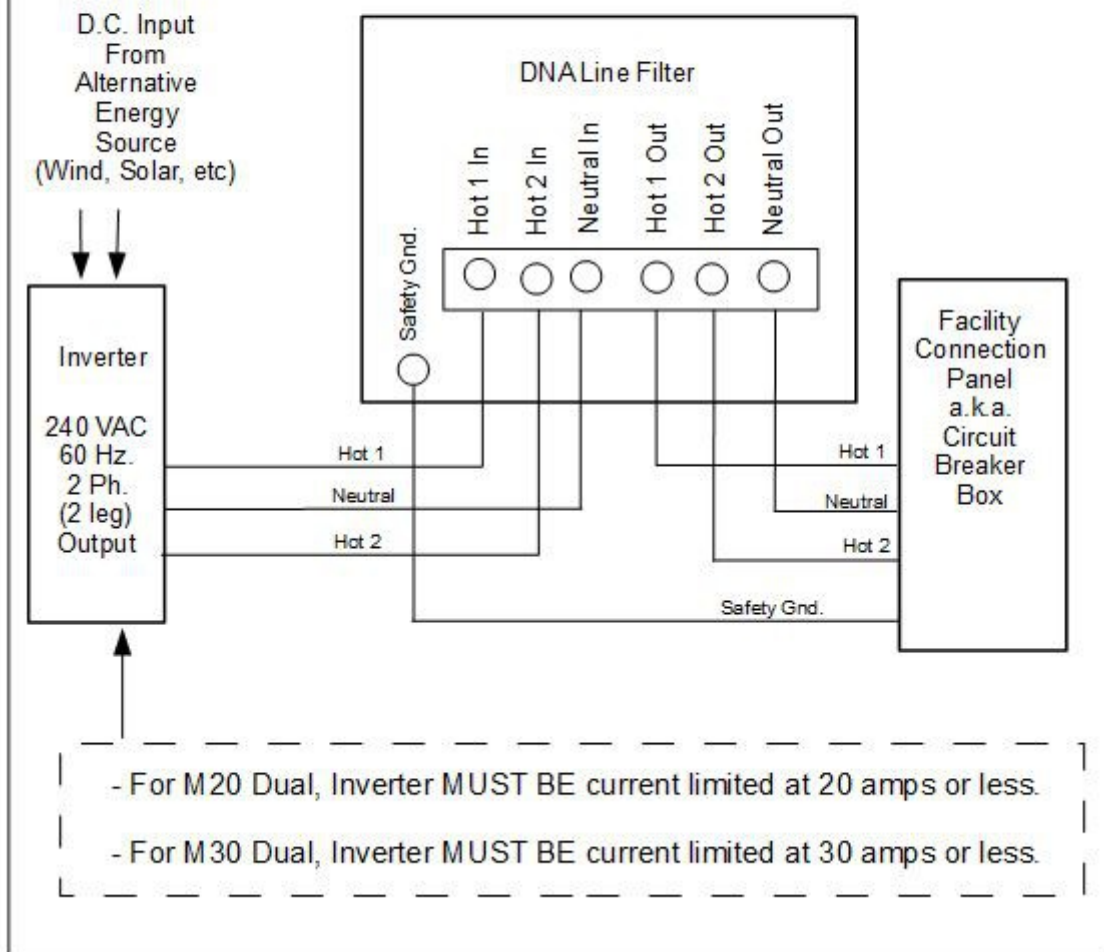
Wire gauge range on internal terminal strip: 18 AWG to 4 AWG

Weight: 50 lbs.

DNA Line Filter Installation Drawings and Images Follow

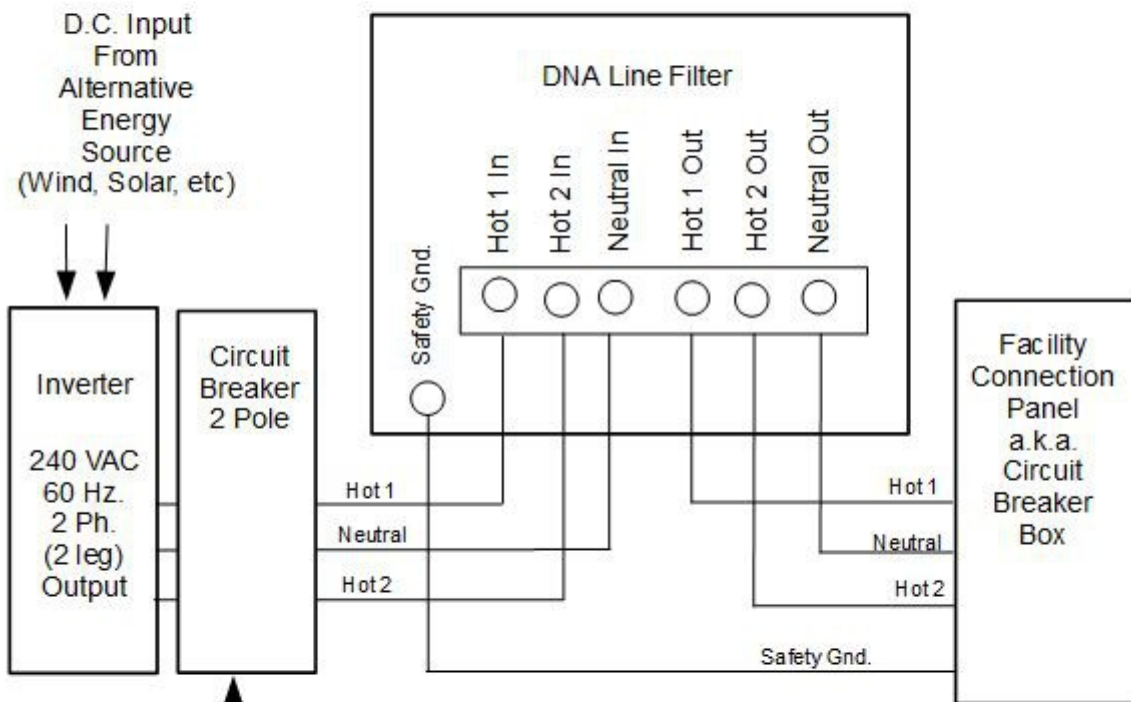
M20 Dual and M30 Dual Filtering Dirty Electricity From Inverter Inverter Has Required Current Limit Two Phase (Two Leg) Installation, U.S.

This Configuration **REQUIRES** That The Inverter Has Internal Current Limiting At or Below The Current Rating Of The DNA Line Filter.



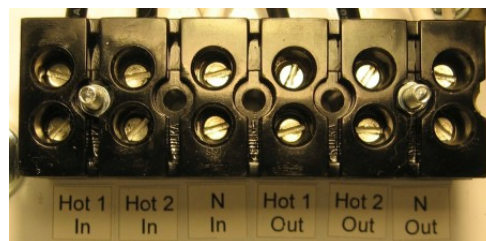
M20 Dual and M30 Dual Filtering Dirty Electricity From Inverter Inverter Does Not Have Required Current Limit Two Phase (Two Leg) Installation, U.S.

This Configuration **REQUIRES** That The Inverter
Circuits Be Fed Through A Circuit Breaker at or Below The
Current Rating Of The DNA Line Filter.

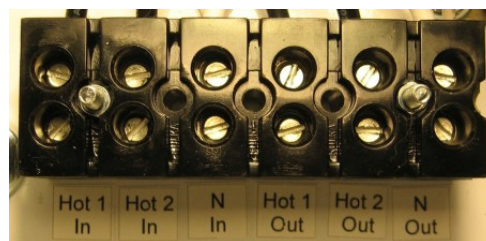
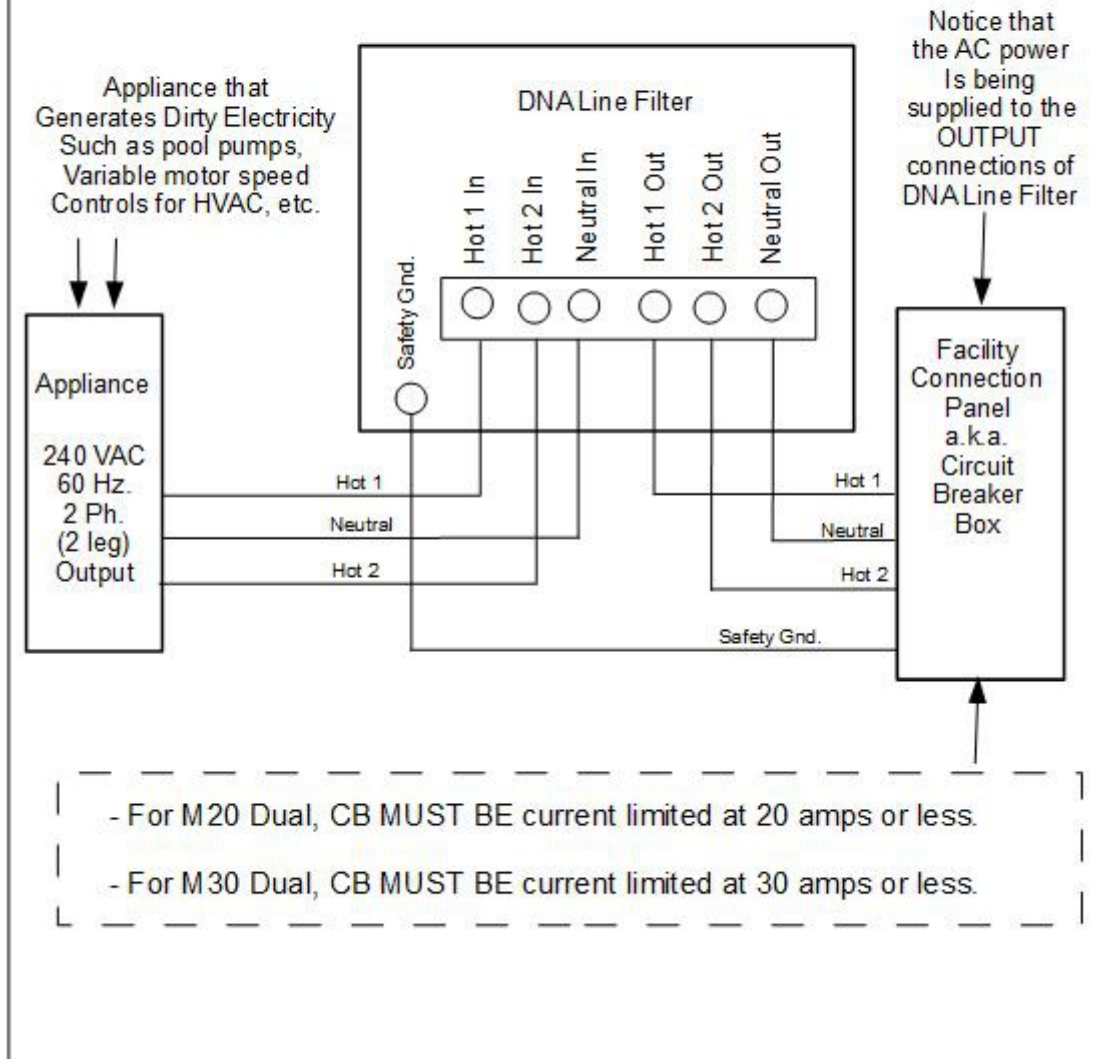


- For M20 Dual, CB MUST BE current limited at 20 amps or less.

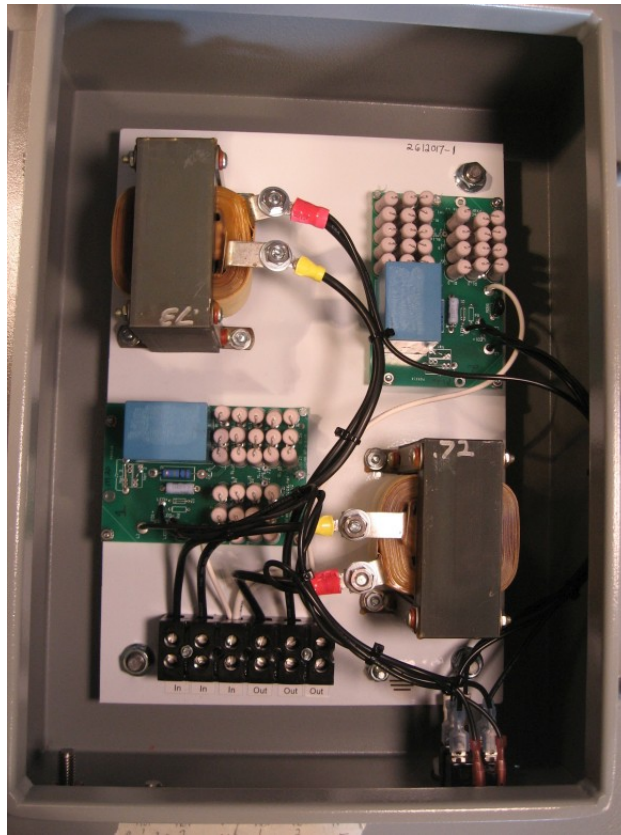
- For M30 Dual, CB MUST BE current limited at 30 amps or less.



M20 Dual and M30 Dual Filtering Dirty Electricity From Appliance Two Phase (Two Leg) Installation, U.S.



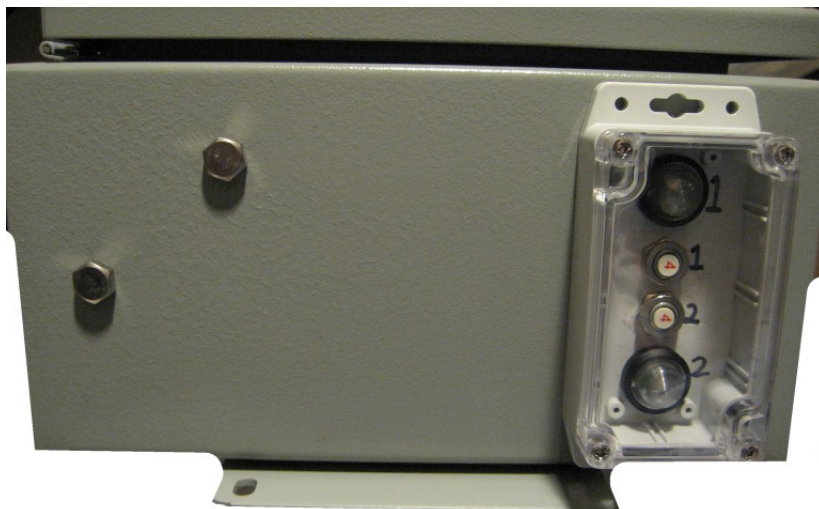
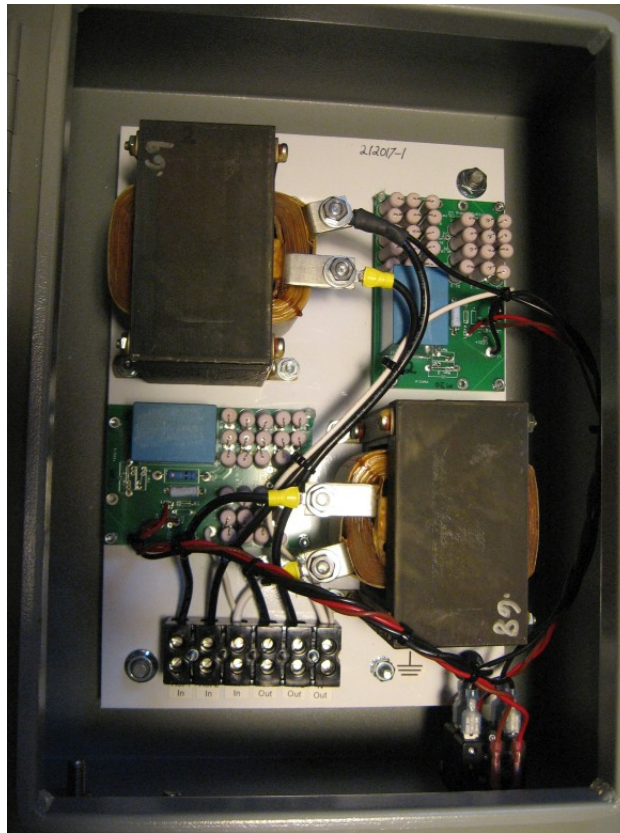
M20 Dual



M20 Dual



M30 Dual



M30 Dual



5.0 DNA Line Filter Installation

5.1 Internal Layout

Installation of the DNA Line Filter is by a professional electrician.

The DNA Line Filter is designed as a wall mount system. External, welded plates have mounting holes to fasten the unit to a wall.

Warning

O-ring sealed holes are provided as pilot holes for chassis punch to cut needed holes for conduit entry. Remove O-ring bolts, as required, to use these pilot holes.

It is Very Important to not cause there to be filings, shrapnel, chips, turnings, shavings, etc. in the chassis.

Do Not drill into the chassis.

Do Not use holesaw or sawzall to cut hole(s) in chassis.

6.0 DNA Line Filter Operation Notes

6.1 Overall Operation

The DNA Line Filter has a massive inductor at the core of its design. As with all inductors and transformers there is some humming and buzzing associated with this device.

Humming and buzzing from an inductor is caused by stray magnetic fields, emanating from the inductor, causing the enclosure and accessories to vibrate. In addition, Magnetostriction is a second source of vibration (and thereby humming and buzzing), where the iron core of the inductor changes shape minutely when exposed to magnetic fields.

The humming and buzzing will depend upon the load current placed on this device. If the humming/buzzing seems loud, then it is likely that there are loads, within the facility (residential, commercial, industrial) that are drawing current in a pulsed fashion.

An example is a portable electric heater that has a pulse-width-modulation controller to set the amount of heat being produced.

While most heaters have a simple on-off thermostat to regulate the heat, a few heaters have a pulse-width-modulation scheme and will be turning the power off-on-off-on at the power line frequency (50/60 Hz). These pulses of current will often be considerable (10 to 12 amperes) and this will result in loud humming/buzzing in the inductor.

While this humming/buzzing will not affect the filtering performance of the DNA Line Filter, the sound may be objectionable.

In the cases where humming or buzzing does occur, and if the user finds humming or buzzing objectionable, the DNA Line Filter can be mounted outdoors, in a weatherproof enclosure, on a pedestal, i.e. not mounted on the building that is occupied. The weatherproof enclosure and pedestal can be provided by the installing electrical contractor.

It is important to note that the idea of installing the DNA Line filter is to reduce DE in the facility. A heater that pulses on-off-on-off at the power line frequency, will be generating DE within the facility and it will be very powerful DE, that likely will extend up to the hundreds of kilohertz in range. Since this DE is down-stream of the DNA Line Filter, there will be no attenuation of this internally-generated DE, by the DNA Line Filter. Users who want low DE in their facility, would be well advised to not use such potent "DE generators" (the pulsed heater).

6.2 Internal Circuit Breaker and Panel Lamp

The DNA Line Filter has an internal circuit breaker that interrupts the current flow to the DNA dissipative electronics, if the Dirty Electricity current is too high, into those electronics. It is unlikely that this could ever happen because of the high impedance that the DNA Line filter inductor presents to the DE. Nevertheless it is a prudent part of a safe design.

The DNA Line Filter front panel lamp is connected on the load side of the aforementioned circuit breaker. If the circuit breaker is on, then the unit is functioning normally and the panel lamp will be on. If the circuit breaker has cycled off, then the panel lamp will be off.

In the case where the lamp is seen to be off, then reset the breaker and see if the panel lamp stays on. If for any reason the circuit breaker continues to cycle off, please contact the factory for troubleshooting information.

Visit us on the web: <http://mxdna.com>