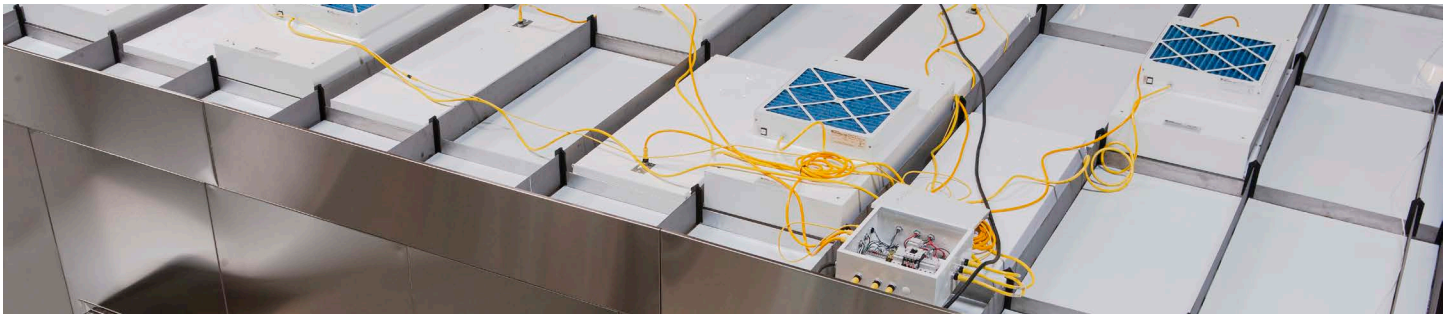
UL-Listed Cleanroom Control System

TERRA UNIVERSAL

Product Data Sheet



- UL-listed, scalable, plug-and-play cleanroom control system
- Powers complete network of HEPA-filtered fan units and lights
- Significant cost savings compared to standard, hard-wired systems
- Streamlines room permitting, compliance and certification
- Optimizes cleanroom relocation, FFU change-out and filter replacement
- Supports rapid cleanroom installation for time-sensitive projects
- UL-listed individual components: FFUs, lights, controllers and outlets
- Thousands of systems currently operating in cleanrooms around the world

SUMMARY

The cleanroom ceiling grid, shown above, is completely filled with HEPA-filtered fan units, lights and ceiling tiles. A construction team installing or retrofitting this room – whether the room is stick-built or modular – will face major challenges. Each FFU and light must be individually hard-wired for operation; since the ceiling isn't walkable, this task is costly, labor-intensive, and inefficient. A cleanroom maintenance crew will face similar obstacles in the event of room reconfiguration or relocation, FFU change-out or filter replacement. Terra's state-of-the-art, scalable, cost-effective, UL-listed cleanroom control system provides solutions that are unattainable within a completely hard-wired network. No matter the size of a Terra cleanroom, all of the FFUs and lights allow quick fit connections to the power distribution modules (PDMs). Hardwiring is only required to connect the Primary, Secondary, Booster, and Duplex PDM modules. Because no additional hard wiring is required to connect and disconnect power to additional lights and fan filters, contractors save time, money, and resources during cleanroom installation, expansion, or modification. Described in further detail below, Terra's UL-listed components are ready-to-ship and available for immediate delivery.

ROOM PERMITTING AND CERTIFICATION

Once installation is complete, the cleanroom must be permitted and certified before it is operational. Customized cleanroom assemblies without UL-listed components face major hurdles from building inspectors and certification agencies, causing the local permitting and compliance process to be lengthy, cumbersome and expensive. Terra's cleanroom control system, as a complete assembly, and each individual component (FFUs, lights, controllers, PDMs) is UL-listed, streamlining the permitting and certification process and supporting construction teams facing tight project timelines.

POWER DISTRIBUTION MODULE

Terra's **Power Distribution Modules** (PDMs) use 3-pin or 4-pin quick connect fittings to power all FFUs and lights, no matter the cleanroom size. The expertise of a licensed electrician is only needed to connect the main voltage to the Primary, Secondary, Booster, and Duplex PDM modules; lights and fan filters install via quick connect fittings without requiring hard wiring. The PDM modules must be wired to a dedicated 35A fused 120V circuit or a 30A fused 240V circuit to allow quick fit connection up to 5 light and 5 FFU connections.

NEXT-GENERATION PCB DESIGN

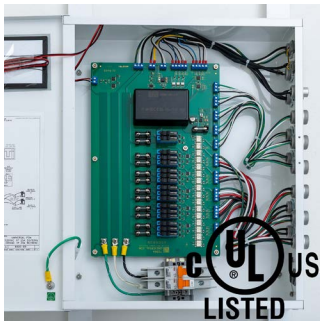
Advanced printed circuit board (PCB) technology replaces complex manual wiring, reducing potential manufacturing errors, improving reliability, and dramatically simplifying troubleshooting.

MASTER PDM

Serves as a main panel board for up to ten PDMs. This pre-engineered UL listed panel board saves precious time and money from custom work performed by licensed electricians. Dramatically simplifies electrical connections by allowing a single point of hard wiring to power all PDMs that support ceiling-mount FFUs and lights. Industrial twist-lock plugs and receptacles allow for speedy installation, and prevent accidental disconnects. Includes main breaker, plus relays and circuit breakers for overload protection of all connected devices. Systems with more than ten PDMs will require additional Master PDMs.



Includes quick connect fittings for outlets, overload protection for relays, breakers and other devices



High-voltage power distribution system is UL-listed for the highest safety and quality.



Master PDM supplies power to up to 10 PDMs

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Tier 2 and Tier 3 kits allow an existing structure to monitor the pressure levels in up to three cleanrooms



Cleanroom control panel with built-in Tier 4 touchscreen console; data logging (pressure/temp/RH) and FFU control for up to 16 rooms, 200 FFUs



PDM modules include quick-connect fittings for lighting and fan filter power. No hardwiring required.

CLEANROOM CONTROL PANELS

A control panel assembly includes power controls for the **Fan/Filter Units** and lights. Optional integrations include temperature, humidity, particle counts, differential pressure, and air velocity sensors. Only one cleanroom control panel is required for each cleanroom suite, however, additional units may be specified for multiple entrances.

STANDARD CLEANROOM CONTROL PANELS

A **standard cleanroom control panel**, typically mounted at the main entrance of a cleanroom, provides centralized control and monitoring of cleanroom functions. The control panel includes a gauge for monitoring differential pressure, and separate power switches for lights and blowers.

A **Fan Filter Replacement Alarm** provides a reliable, quantitative method for determining when a f an filter requires replacement. Automatic replacement alerts avoid costly and unexpected operational interruptions, while also maximizing the working life of the fan filters.

A **Night Service Switch** initiates a separate operation circuit that drops all Fan/Filter Units (FFUs) into low-energy operation mode. Ideal for nights and weekends, the lower power mode shaves 25% of energy costs off your power bill while maintaining uninterrupted cleanroom performance at your specified cleanliness level.

SMART CLEANROOM CONTROL PANELS

An upgraded **Smart Control System** allows additional environmental sensors and FFU control to meet critical performance/monitoring requirements. Configuration options include Tier 1, Tier 2, Tier 3, and Tier 4 systems. Tier 4 offers the most robust and advanced control for up to 200 fan filter units and 16 independently controlled rooms. Smart Control Panels allow programmable fan speed adjustment for energy savings or performance enhancement, remote shutdown, and are configurable for display of humidity, differential pressure, and temperature sensors.

SMART FAN FILTER UNITS AND SMART CONTROL FEATURES

Smart Control Panels allow remote management of FFU performance, fan speed control, and data logging. Once you select the FFU zone on the console, you can adjust the fan speed up or down to “dial-in” the proper air velocity, internal pressure, and air change rate. Because these zones generally correspond to separate rooms or processing areas, this variable control lets you balance FFU performance from one cleanliness zone to another, ensuring that you maintain the pressure gradients and air change rates for non-homogenous classifications.

QUICK CONNECT FITTINGS

Terra fan filter units provide a simple, quick connect system when fan filter units require replacement, servicing, troubleshooting, or installation. All electrical lines terminate in quick-connect fittings for easy installation. A status indicator light glows continuously to show FFUs are turned on and flash to indicate that FFUs are turned off.

LED LIGHTS

UL listed electrical components undergo safety and integrity inspection by a third party. The PDM system allows easy integration of **additional lights** in either standard LED or UV-C disinfection configuration. LED lighting produces about 15% of the heat that fluorescent does. Optional LED flat panel configurations include dimming and 5 selectable hues for perfect color balance.

UV LIGHTS

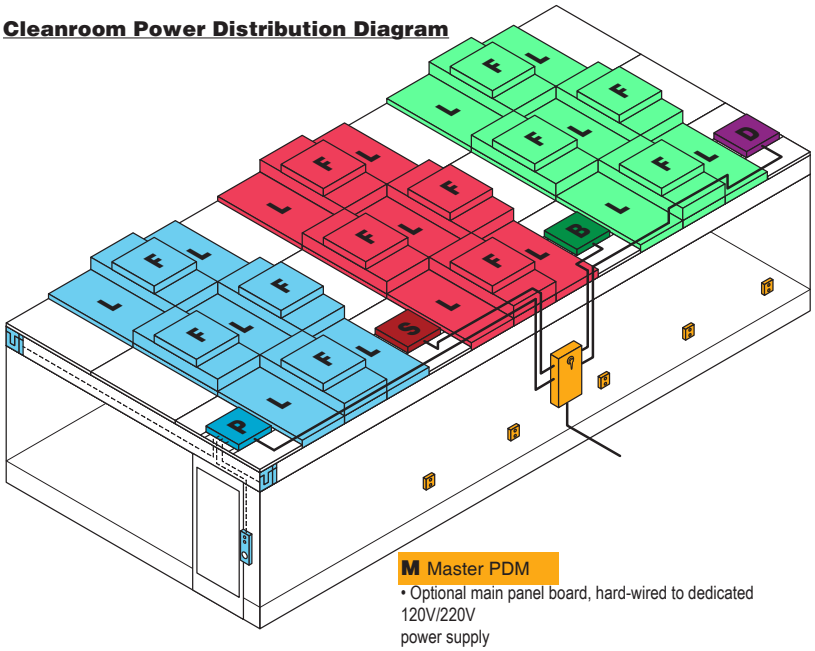
Although **UV-C lamps** may not produce an entirely sterile surface, they can maintain consistently low microbial loads throughout a wide range of operations and eliminate bioburden spikes that could necessitate extensive testing and decontamination measures. I

EMERGENCY LIGHTS

Emergency lighting allows for temporary backup lighting during a power outage. When receiving power, the light both operates normally and charges the emergency battery. A UL recognized emergency driver allows the LED fixture to be used for normal and emergency operation.

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Cleanroom Power Distribution Diagram



- Power Distribution Module
- Fan Filter Unit
- Light Panel
- Ceiling Panel
- Control Panel
- Status Indicator LED
- Duplex Outlet
- High Voltage Cable
- Low Voltage Cable

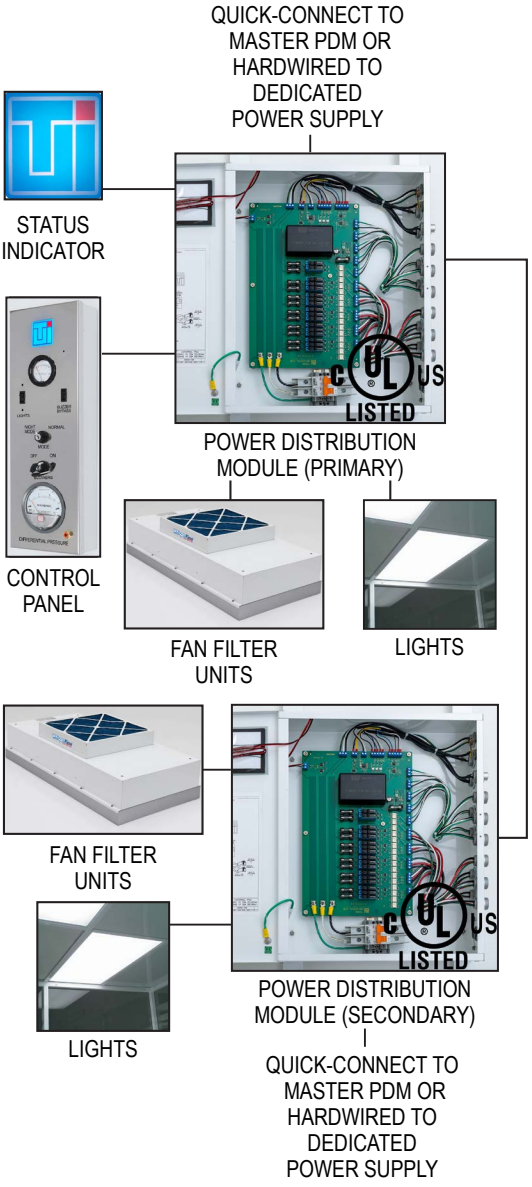
M Master PDM
- Optional main panel board, hard-wired to dedicated 120V/220V power supply
- Supports up to 10 PDMs
- Quick-connect cables supply power to primary/secondary/booster/duplex PDMS

P Primary PDM
- Quick-connect cable supplies power from Master PDM
- Supports first 5 FFUs and first 5 Light panels
- Supplies low voltage power to control panel and status indicator LEDs

S Secondary PDM
- Quick-connect cable supplies power from Master PDM
- Added after Primary PDM to support an additional 5 FFUs and 5 Light Panels

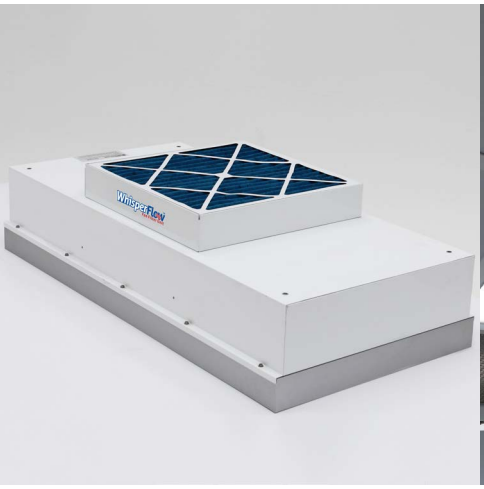
B Booster PDM
- Quick-connect cable supplies power from Master PDM
- Added after Secondary PDM to support an additional 5 FFUs and 5 Light Panels
- Additional Secondary and Booster PDMs alternate as needed for more FFUs/Lights

D Duplex PDM
- Quick-connect cable supplies power from Master PDM
- Distributes power supply to up to 5 Duplex outlets
- Outlets requiring dedicated power supply should be wired separately from Duplex PDM





Master PDM quick connect cables supply power for up to 10 PDMs



Smart® WhisperFlow® Fan Filter Units feature electronically commutated motors for improved energy efficiency, low noise, and remote speed control



Cleanroom LED lights are energy efficient, produce low heat, carry long life spans and are compatible with ISO class 3 spaces