OPERATION AND MAINTENANCE MANUAL

MEGATRON

Ultra-high Powered Liquid Nitrogen Fog System (Cryogenic Cannon)

The Megatron cryogenic fog cannon is at the pinnacle of special fog effects utilising cutting-edge cryogenic technology to produce a unique and spectacular freezing-fog effect for nightclubs and theme parks alike.
The Megatron is fully self-contained and self-monitoring and really is a “plug and play” system designed for effective use in multiple environments.

The system comprises of five main components, these are:

- The liquid nitrogen storage and pressurisation vessel
- The system controller
- Oxygen depletion monitor
- Control valve and effects head/nozzle
- Vacuum jacketed supply hoses

In summary, these five major components work as follows:

The liquid nitrogen is stored in the storage vessel. The vessel has a vacuum jacket to self-insulate the nitrogen. The vessel also self-pressurises to the required operating pressure.

The high pressure liquid nitrogen is then transferred to the control valve and effects head via vacuum jacketed pipe work and hoses (to ensure the nitrogen remains a liquid).

The valve then opens sending the liquid nitrogen to the effects head where its surface area is increased to allow for rapid evaporation and subsequent condensation of airborne moisture creating the visual “fog” effect.

Releasing large volumes of nitrogen into an enclosed space can be dangerous as oxygen depletion can occur causing suffocation. This is avoided by the inclusion of the oxygen depletion monitor which will shut the system down if safe levels are exceeded.

A more detailed description of these five major components follows:

The system includes

A 500 litre, ultra-high pressure, liquid nitrogen storage vessel. The vessel has multiple, bespoke, modifications to facilitate integration with the controller unit and is fully certified, tested and CE marked. The vessel comes with both liquid and gas decant options, pressure regulators, gauges, electronic contents gauge and pressure monitoring transducers.

A fully integrated, electronic, logic controller (Megatron) built into a 4U 19inch rack mount enclosure. This purpose-built controller monitors and provides electronic readouts of; liquid remaining in the storage vessel, storage vessel pressure and oxygen levels with the club. The controller has a key switch isolator and simple “push button” to fire facility. The controller automatically builds the pressure in the tank, monitors all aspects of the system, tests all safety features and once “satisfied” it will give the green light to fire.

An oxygen depletion monitoring system is also included and integral to the controller. A remote sensor is mounted centrally in the club, this connects to the controller which then monitors the oxygen levels 24 hours a day and can not be switched off. Should oxygen levels drop to a level that could be deemed harmful then the controller will automatically shut down and lock-out. To re-enable the system a second key holder is required to reset the system.

An effects head which is mounted above the area to be “fogged”.

This unit encompasses the valve, pneumatics, safety spring actuated return mechanism, solenoid pilot and extended bonnet and connects the liquid nitrogen supply line to the actual nozzle by means of a short 1.3m hose.

A pair of stainless steel, braided, delivery hoses are included as is a total length of 9m of solid vacuum jacketed supply pipe. Both have a flexible stainless corrugated core with steel cover. A gaseous hose has a single skin and operates the effects head pneumatics – once connected to the gas decant of the storage vessel. The liquid hose/pipe transfers the liquid nitrogen at Minus -198°C from the storage vessel to the effects head. This hose has a double skin with a vacuum jacket around its exterior. The pipes O.D. are approx 110-125mm respectively.

Storage Vessel Specification

Technical Data	VHPV500
Capacity (Liquid)	400 Litres
Capacity (Gas)	100 Litres
Tank Diameter	1250mm
Tank Height	1470mm
Weight Empty	250kg
Weight Full	600kg
Static Evaporation rate	0.8% per day
Pressure Building Device	Manual & Automatic
Transport	4 high quality castors (2 with brakes)
Relief valves	2
Regulator	1
Electronic Contents Gauge	1

Installation, connection, testing and operating procedures are detailed in the following pages although these should be read in conjunction with the individual component manufacturers information – also enclosed.

Positioning the components

The key to the successful operation of the system is the positioning of each of the components. Careful consideration, in the initial stages of the installation, can greatly improve the performance of the system as a whole.

The Storage Tank

This can be installed inside or outside the building although, in either case, access will be required by the liquid nitrogen delivery vehicle to fill the tank. If outside, the delivery vehicle can simply drive up and fill the tank with little interference with the daily operation of the venue. If mounted inside, the tank will need to be disconnected from the pipe work and wheeled outside for filling and then wheeled back inside and reconnected – which can be difficult when full as the tank weighs in excess of 600kg. In addition to this a safety valve may need to be fitted and piped to the outside in case excess pressure builds up and venting is needed (this is only applicable to tanks that are situated inside a building).

Control Panel

This needs to be positioned with line-of-sight to the output nozzle so the operator can gauge if it is safe to fire the effect and can stop the effect should the need arise – usually the control panel is placed in the DJ or lighting control booth. The control panel will need to be connected to the storage tank and the oxygen depletion monitor and screened cables should be used for this – ideally armoured in the case of the storage tank.

Oxygen Depletion Monitor

This needs to be mounted in the centre of the effect blast. Once the output nozzle is angled in the correct direction the angle and therefore the centre of the blast can be determined. The monitor should then be mounted immediately above the centre of the blast and as near to it as possible. Ensure the monitor is not near any source of high temperatures such lamps as this can effect the sensors. A safe distance from lamps of 300mm minimum should be observed. The monitor will need to be connected to the control panel before the system will work so cabling should be allowed for and screened cable should be used at all times.

Effects head and Output Nozzle

These need to be mounted as high as possible and aimed down towards the area that is to receive the full effect of the blast – normally the centre of the dance floor. The effects head is connected to the pipe work and the nozzle is then connected via the flexible hose to allow it to be angled in any direction. The output nozzle must be a minimum of 4m above head height and should be in a position such that, should liquid nitrogen or condensation drip from the nozzle it does not fall onto people or delicate equipment/finishes.

Hoses and Pipe work

The large flexible hose (5m) will run from the storage tank, through the wall of the building, and connect to the solid pipe work. The solid pipe (2 x 4.5m) will then run into the club, at high level, and connect to the effects head (valve). The short flexible hose (1.3m) will then connect the effects head to the output nozzle. The smaller pneumatic hose will run from the regulator on the gas side of the storage tank, into the club following the main solid pipe line, to the gas input on the effect head (valve) – this will operate the pneumatic valve.