# VoltMaster® 24V

**Product order codes**

For DSI or DALI digital versions, add suffix /DSI or /DALI eg VMD400/24/SO/DSI

| Single outlet | Multi outlet |
|---|---|
| **VMD400/24/SO** | **VMD400/24/MO** |

**The VoltMaster® Intelligent Transformer is designed to greatly increase the design options for low voltage lighting installations by allowing the transformer to be placed at great distance from the lamps whilst maintaining the optimum 23.6V RMS at the lamps. Transformers can be positioned conveniently to allow easy access and to avoid problems with acoustic noise and EMC. Substantial installation cost savings can be made by careful selection of cable diameters.**

**This Data Sheet is designed to enable the specifier to produce a wiring plan with optimum transformer positioning, cable runs and diameters. The wiring plan should include Voltage Sensing Points. NB. All cable volt drops and cable lengths are for the combination feed and return cable, ie. cable length is the single distance along the cable to the lamps.**

## Sensor Wire and Voltage Sensing Point

VoltMaster advantages are made possible by its unique **sensor wire** which runs alongside the low voltage supply cable to the lamps. The point where the end of this cable is attached is known as the **voltage sensing point** and at this point the voltage is maintained at 23.6V RMS.

## Cable Size and Volt Drop

The high current required by low voltage lamps causes significant volt drop down the low voltage supply cable. In systems other than VoltMaster, large cable must be used to keep this volt drop low since it reduces as lamps blow, thereby overvolting the remaining lamps and causing **cascade failure**. With VoltMaster more cost effective cable sizing is possible since the volt drop may be substantially increased owing to VoltMaster automatically compensating for it whatever the number of lamps operating.

## Maximum and Tolerance Volt Drop

VoltMaster caters for a **maximum volt drop** of 6V between VoltMaster and the **voltage sensing point** (usually at the nearest lamp or at the supply terminals of Track, High-Wire or Distribution Box).

In practice it has been found that, for ease of installation and without affecting visual quality, the stabilised voltage on the farther lamps may be allowed to deviate slightly from the 23.6V set at the **voltage sensing point.** The maximum deviation permitted **(tolerance volt drop)** is 0.8V. All lamps will then receive between 22.8V and 23.6V.

## Maximum Cable Length and Tolerance Length

Tables 1 and 2 are for the two basic Wiring Configurations (see 4a & 4b overleaf) showing: the maximum overall cable length to track (corresponding to 6V volt drop); the maximum individual cable length to the nearest single lamp holder with the additional Tolerance Length to the other holders (corresponding to the 0.8V tolerance drop). For other configurations, including mixed cabling, the General Formula (opposite) should be used as explained in the text.

## Cabling Options

Conventional equipment allows only two methods of supplying low voltage lamps:

i **Track, high-wire or distribution box systems** with a single overall cable to their supply terminals (see 4a overleaf);
ii **separate lamp holders** with individual cables from the transformer (see 4b and 4c overleaf).

**In addition** to these two options, to reduce installation costs, VoltMaster allows **mixed cabling**; ie. single overall cable to distribution box together with individual cables from the box to the lamps (see 4d and 4e overleaf).

To cater for **multi-outlet installations** (individual wiring to each lamp) where distances are much greater than tolerance distances shown in Table 2, it may be necessary to snag cables or to use different size cables (see 4e overleaf). Contact Multiload for free design assistance.

**Table 1 - Single Overall Outlet**
Maximum Overall Cable Length to track or high wire

| Cable Size mm² | Maximum Length metres 300W load | 400W load |
|---|---|---|
| 4.0 | 40.0 | 30.0 |
| 6.0 | 64.0 | 48.0 |
| 10.0 | 112.0 | 84.0 |

**Table 2 - Multi-Outlet to Individual Lamp Holders**
Maximum Length and Tolerance Length to lamps (metres)

| Cable Size mm² | 50W max. length | 50W tol. length | 100W max. length | 100W tol. length | 150W max. length | 150W tol. length |
|---|---|---|---|---|---|---|
| 1.0 | 54.0 | 9.0 | 27.0 | 4.5 | 18.0 | 3.0 |
| 1.5 | 82.0 | 14.0 | 41.0 | 7.0 | 27.0 | 4.5 |
| 2.5 | 138.0 | 22.0 | 69.0 | 11.0 | 46.0 | 7.0 |
| 4.0 | 210.0 | 34.0 | 105.0 | 17.05 | 70.0 | 11.0 |

## General Formula

**volt drop** = **length** x **current** x **unit drop**

where:
**length**: is single distance along cable in metres

**current**: total current in cable found by summing the individual lamp currents **(Table 3a)** for all lamps supplied by that cable

**unit drop**: volt drop per amp per metre for that cable **(Table 3b)**

**Table 3a**

| Lamp Wattage | Lamp Current |
|---|---|
| 50W | 2.08A |
| 100W | 4.16A |
| 150W | 6.24A |

**Table 3b**

| Cable Size mm² | Unit Drop V/A/M |
|---|---|
| 1.0 | 0.042 |
| 1.5 | 0.028 |
| 2.5 | 0.017 |
| 4.0 | 0.011 |
| 6.0 | 0.0071 |
| 10.0 | 0.0042 |

Safety factor: margin to allow for lamp current tolerance, variations of wire resistance with temperature etc. We suggest using a factor of 1.15.

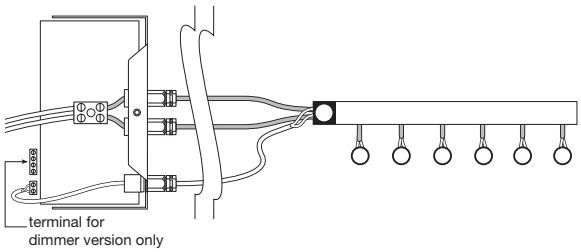
## Special Installations

For wiring arrangements other than those specified on this sheet please check with manufacturer to ensure acceptable voltage to lamps under all conditions.

## Wiring Configurations

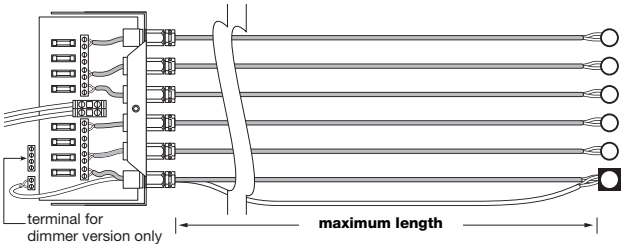
**NB. All wiring configurations shown with 6 lamp only**

**4a Single Overall Cable to Track or High-Wire system**
Voltage Sensing Point ✯ at supply terminals of Track etc

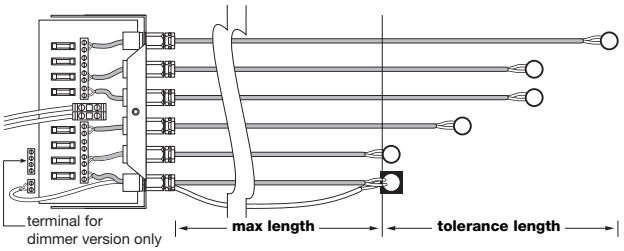



**4b Multi-Outlet Installation using Individual Cables of equal diameter to lamps of equal wattage**

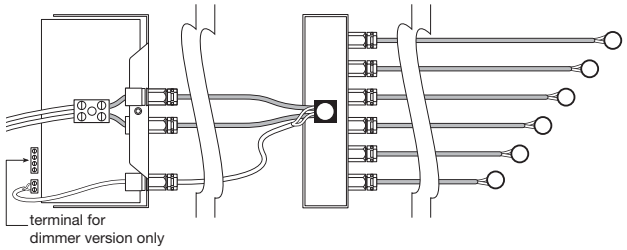
**i Cables of same length**
Voltage Sensing Point ✯ at any lamp




**ii Cables of different lengths**
Voltage Sensing Point ✯ at nearest lamp




**4c Overall Outlet to Distribution Box with lamps close by**
Voltage Sensing Point ✯ at Distribution Box

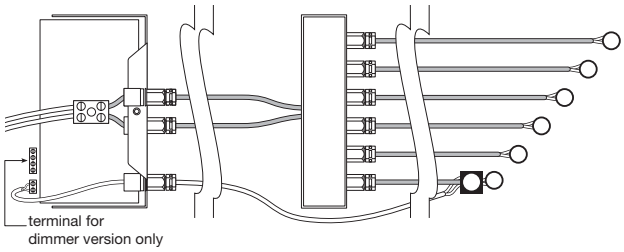



Overall Cable Length from VoltMaster to Distribution Box: up to Maximum Overall Cable Length (see **Table 1** over).

Individual Cable Lengths from Distribution Box to lamps: up to Tolerance Length for relevant lamp wattage and cable size (**Table 2**).

**NB.** For larger distances thicker cable may be used as necessary.

**4d Overall Outlet to Distribution Box with distant lamps**
Voltage Sensing Point ✯ at nearest lamp



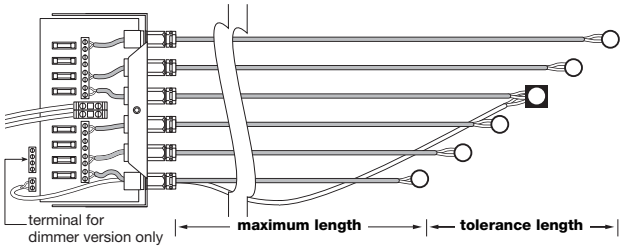

In many installations the full benefits of increased lamp distance and separation are achieved by use of longer individual cables from the Distribution Box to the lamps.

In this case the volt drop to the lamps is split between the single overall cable to the Distribution Box and the individual cables to the lamps. The **total** volt drop to each lamp is Overall Cable Volt Drop + Individual Cable Volt Drop. These are calculated separately by General Formula using the current carried by the particular cable. (cf 4c).

**i Individual cables with equal diameter and lamp wattage:** voltage sensing point at nearest lamp (**total** volt drop <7V), permitted extra length to other lamps within tolerance length;

**ii Individual cables with different diameters** to cope with very different distances (or wattages). The voltage sensing point is at lamp with lowest **total volt drop** (<7V) and all other volt drops must be no more than 0.4V greater. See 4E below for a similar situation where the wiring is directly from the VoltMaster without a Junction Box.

**4e Multi-Outlet Installation using Individual Cables of different diameters to lamps of different wattage**




When lamp distances or wattages are substantially unequal, cables of different diameter may be used:

i For each lamp measure the **cable length** required and using Table 3a read off lamp **current** for the particular wattage;

ii Using these values, and the **unit drops** from Table 3b for each cable size available, calculate the **volt drop** using General Formula (see also example opposite);

iii Choose a cable size for each lamp such that all the resulting volt drops are within 0.4V of each other, with the largest drop less than 7.4V;

iv Designate the Voltage Sensing Point at the lamp with the lowest drop irrespective of distance or wattage.