

# EVOLUTION

IT WAS ONLY A MATTER OF TIME 

## Evolution by Mode Lighting (UK) Limited

### M-Bus Wiring

The M-Bus connects all Evolution devices, such as packs, plates and relay units together. It carries both power for the plates and other peripherals, and the proprietary data to tell all devices what to do. The M-Bus consists of four connections, marked A, B, C and D. Connect A, B, C and D on the first device, to the corresponding A, B, C and D terminals on the second device, and so on.

A daisy-chain method of wiring should be deployed, rather than wiring the devices in a star-topology. Most devices, including packs and plates, have two sets of A, B, C and D terminals. It does not matter which of the two A terminals is used as "in" and which is used as "out" when daisy-chaining as they are internally connected. The same is true for the B, C and D. Terminal A must never be connected to B, C or D etc.

The maximum bus length is 1000m (if you need to exceed this length, please contact Mode Lighting (UK) Limited for more information about bus extender units).

Whilst star-wiring is not permitted, you may connect a short spur of no more than 100m to the bus at any point. Up to three spurs are permitted on any one network. Spurs do not require termination, as long as they are shorter than the overall network.

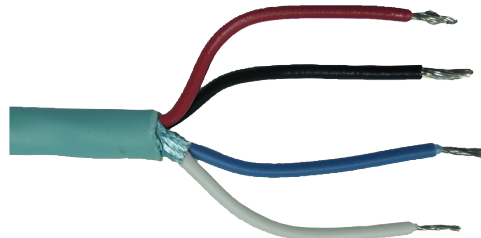
### M-Bus Termination

The bus must be terminated at both "open" ends. Termination is achieved using DIP-switch 9 on the packs, and DIP-switch 10 on the plates. No more than two devices on the network should be terminated. The termination switches place a 120Ω resistor across the C and D terminals of the M-Bus.

### M-Bus Cable Requirements

The M-Bus cable requires four conductors (two for power, and two for data). The "power" pair (A and B) should be no less than 0.5mm<sup>2</sup>. The data pair (C and D) should either be shielded or twisted.

*We recommend Belden 1502R cable*

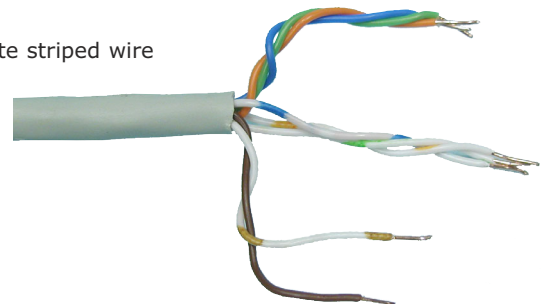


### Using Cat 5 Cable

The popular Cat 5 type of cable may be used. However, cat-5 cable has the disadvantage that the conductors are very small and therefore are not good at carrying the power from the packs to the bus devices. This is because cat-5 cable was originally designed for carrying data only on local computer data networks. On relatively small M-Bus networks, with just a handful of devices, this is not a problem, however to overcome this difficulty we recommend that the thin cat-5 conductors be bunched together. We recommend the following standardised wiring:

- A Group all three solid-colour cables together, except the brown wire
- B Group all three striped-colour cables together, except the brown/white striped wire
- C Brown/White Stripe
- D Solid Brown

If the cable runs are relatively short, and only a handful of devices are on the bus then you only need to use two conductors for each of A and B.



### Testing the M-Bus Wiring

With the power switched off, a basic test of the M-Bus wiring can be performed with an ohms-meter as follows:

With the bus terminated at just one end the measurement should be approx 120Ω.

With both bus terminations correctly switched on (one at each end of the bus) the measurement should be approx 60Ω.

Between A and C or A and D should be approx 4MΩ – 8MΩ. Likewise between B and C or B and D there should be approx 4MΩ – 8MΩ. If either of these measures a short-circuit you should contact Mode Lighting (UK) Limited for advice.

To test any one device on its own, remove it from the network and, with the bus termination switched off, measure between C and D. This should be approx 37kΩ.

## Verifying Correct Bus Operation At Power-Up

When the Evolution system is powered up wait for 10 seconds, until the green M-Bus power LED has illuminated (see section entitled "Diagnostics – Power Supply LEDs" for more details).

All plates on the system should perform the factory-default operations. However if the plates are flashing a sequence of Red-Green-Blue on all of the buttons then one of the following problems requires attention:

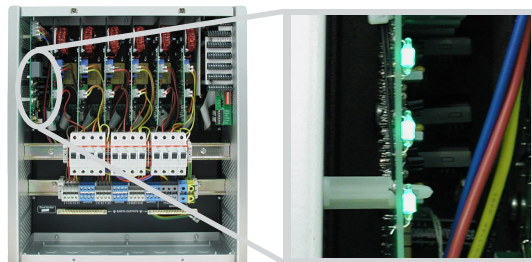
1. Bus Wiring Fault. Check that C and D are not shorted, swapped, or misconnected in any way.
2. Bus Termination Fault. Check that just two terminations, on the ends of the bus are in place using the DIP switches on the pack(s) and plate(s).
3. Pack DIP-switch fault. Check that all the packs have been set to the correct address, and that DIP switch 7 (firmware update mode switch) is off (i.e. set to the left).
4. Incorrect bus topology. Check that the total bus length is less than 1000m, that any spurs are less than 100m, and that the bus has been wired in a daisy-chain topology.

## Diagnostics – Power Supply LEDs

The Power Supply module is located on the left-hand side of the Evolution pack, and has three neon lights and two LEDs, one green and one amber.

### Neon Indicators - Mains

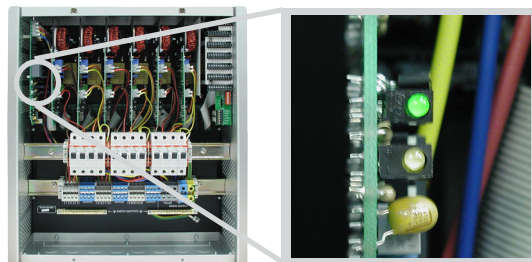
The three green neon lights indicate whether the fuses are intact, and that the three mains feeds are healthy.



### Green LED – M-Bus Power

The green LED indicates that the pack is supplying 24V to the M-Bus. After power is supplied to the pack there is a delay of approximately 10 seconds before the bus is powered, and during this time the LED will be off. If the LED remains off after 10 seconds then power-down the pack and check for a short-circuit across the A and B terminals of the bus.

If the green LED flashes it indicates that a heavy current is being drawn on the bus. This could be due to a short circuit at the end of a long length of bus cable, or it could indicate that you have too many plates or other bus devices connected.



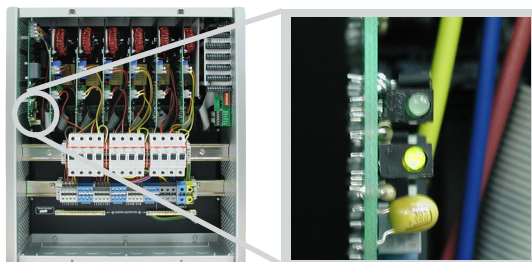
A combined maximum of 20 LCD plates or 100 Single-Gang Plates may be used per pack on the network.

### Amber LED - Mains

The amber LED is also an indication of the incoming mains supply. If all three phases are healthy then the amber LED will remain continuously lit. However if one or two phases fail then the LED will flash to indicate which phase is at fault.

One flash, followed by a pause, indicates that phase one is faulty. Two flashes, followed by a pause, indicates that phase two is faulty. Three flashes indicate that phase three is faulty. If two phases are faulty then there will be a number of flashes for the first faulty phase, then a pause, then a number of flashes for the third faulty phase. If all three phases are faulty then there will be no electricity with which to flash the LED, and so it will remain un-illuminated.

If any of the green neon indicators are illuminated but the amber LED is not illuminated then the PSU module has been damaged, and will require replacement. Please contact Mode Lighting (UK) Limited for advice and spares.

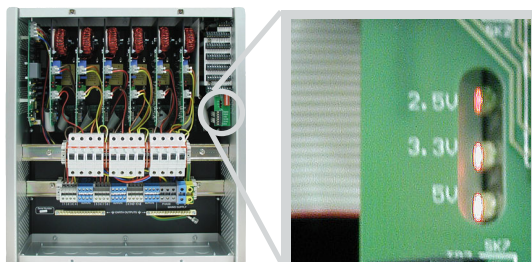


### Red LEDs On Digital Board – Low Voltage Power

There are three red LEDs, visible through a slot in the terminal board that show that the three low-voltage power supplies used by the processor are healthy. If any of the three LEDs is not illuminated then the unit will not function correctly.

### Amber LEDs On Digital Board

There are three amber LEDs, also visible through the slot in the terminal board. These indicate specific processor activity.



Mode Lighting (UK) Limited

The Maltings, 63 High Street, Ware, Hertfordshire, SG12 9AD, ENGLAND. Telephone:+44 (0)1920 462121 Facsimile:+44 (0)1920 466881  
e-mail:sales@modlighting.com website:www.evolutioncontrols.com