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Technical Bulletin #9

Virgo+™ LS1 Architectural Lighting Applications Installation Guide

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LOADING AND PHOTOMETRIC INFORMATION SUMMARY

Virgo+™ LS1 LED Modules System Loading

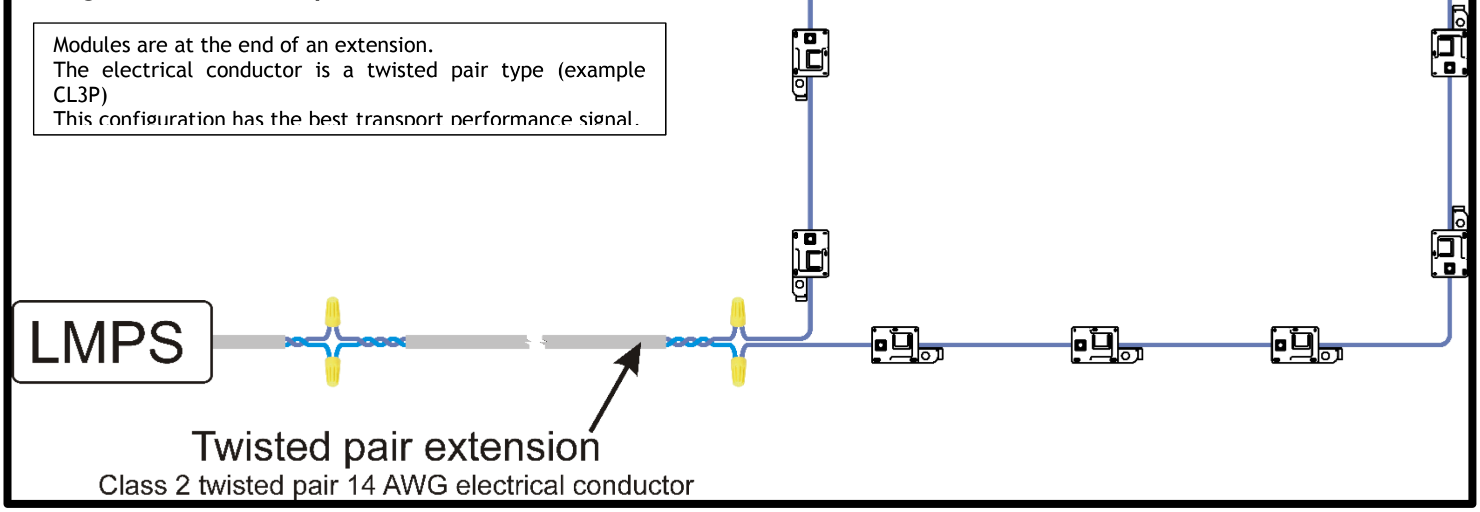
Model	Consumption						Maximum number of modules	
	Watts for 1 module	Watts for 1 foot					LMPS-350	LMPS-750
		2 modules per foot	3 modules per foot	7 modules per foot	9 modules per foot	13 modules per foot		
Virgo+™ LS1	0.48	0.96	1.44	3.36	4.32	6.24	72	156

Virgo+™ LS1 LED Modules Photometric Information

Virgo+™ LS1	Lumens per module	Lumens per foot					Lumens per watt	CRI
		Lumens for 2 modules per foot	Lumens for 3 modules per foot	Lumens for 7 modules per foot	Lumens for 9 modules per foot	Lumens for 13 modules per foot		
6500K	33	66	99	231	297	429	74	84

TWISTED PAIR EXTENSION

Figure 1 : Twisted pair extension



Calculating the wattage of the LEDs to be installed

The following method can also be used to calculate the load on only one power supply or individual sections of the architectural lighting project. Please note that the “watts per module" value must be taken from the specification sheet of the appropriate product.

wattage = number of modules X watts per module
total wattage = wattage of module type 1 + wattage of module type 2 + (…)

Applying the distance factor if applicable

If the power supply is installed away from the LEDs, use table 1 below to apply the appropriate distance factor to the wattage of the power supply.

Table 1: Distance Factor for Twisted Pair Extension

Configuration	Power supply	Feet							
		0	15	25	50	75	100	125	150
14 AWG Twisted pair extension (figure 1)	LMPS-350	1	1	1	0.95	0.91	0.66	0.41	N/A
	LMPS-750	1	0.85	0.81	0.77	0.73	0.69	0.57	0.50

The distance refers to the distance between the power supply and the first LED module.

Watts available for LEDs = wattage of the power supply X distance factor

The values given in table 1 are usually enough to do proper distance factor calculations. If the distance between the power supply and the first LED module falls between two columns in table 1, it is possible to calculate the distance factor using linear interpolation.

$$\textit{Target distance factor} = \frac{(\textit{target distance - length 1})(\textit{distance factor 2 - distance factor 1})}{(\textit{length 2 - length 1})} + \textit{distance factor 1}$$

Example (target distance of 88 feet with LMPS-750)

$$\text{Target Distance factor} = \frac{(88 - 75)(0.69 - 0.73)}{(100 - 75)} + 0.73 = 0.71$$

Calculating the number of power supplies your project requires

When using a distance factor use the "*watts available for the LEDs*" instead of the "*wattage of the power supply*". Round the result up to the next integer.

Number of power supplies = total wattage / wattage of the power supply

Please note that TFT Transfotec™'s LMPS-350 has a wattage of 35 watts and the LMPS-750 has a wattage of 75 watts.

Calculating the system wattage

Take the number of watts of LEDs at the output of each power supply and use the appropriate power curve on figures 8.1 and 8.2 (p.17-18) to determine each power supply's consumption. The average output power can also be used if the load is distributed evenly throughout the power supplies.

Calculating the total system power consumption

The total system power consumption equals the sum of the power consumption of each power supply.

Calculating the cost of electricity for a year for the complete architectural lighting system

$$\textit{Price of electricity per year} = \frac{\textit{Total system wattage X hours of usage per day X 365 days per year X price of electricity per kW/h}}{1000}$$

Please note that "Price of electricity per kW/h" is according to your local electricity rate.

Determining the system efficiency

Due to the high frequency nature of the output of the LMPS power supplies, the input power factor must be used to determine the system efficiency. Take the input watts of each power supply and use the appropriate power factor curve on figures 9.1 and 9.2 (p.19) to determine the system efficiency.

Additional Considerations

- Distribute the load equally between multiple power supplies. This ensures a uniform level of light across the power supplies.
- Contact TFT Transfotec™ for more details about power consumption calculations when using a distance factor.
- All calculations are theoretical. Measurements made on the real life installations can differ from the calculations.

EXAMPLE

Modules : 225 Virgo+ LS1 6500K	Power supply : LMPS-750 (75W)
Twisted pair extension : 50 ft	Distance factor at 50 ft: 0.77

Total wattage = 225 Virgo+ LS1 x 0.48 watts = 108 watts

Watts available for LEDs = 75 watts X 0.77 = 57.75 watts/power supply

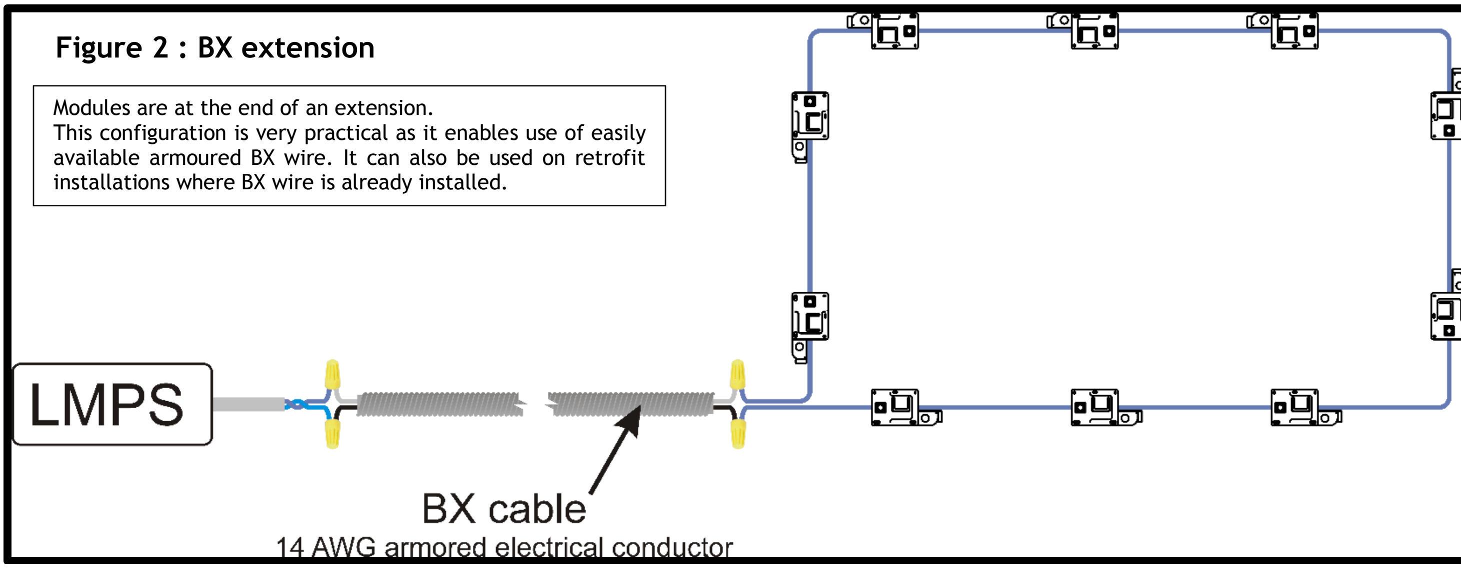
Number of power supplies required = 108 watts total/57.75 watts/power supply = 2 LMPS-750
Therefore, to distribute the load equally, install 112 modules on the first power supply and 113 modules on the second, for example, for the total 225 modules.

Total system power consumption = 66 watts + 67 watts = 133 watts

BX EXTENSION

Figure 2 : BX extension

Modules are at the end of an extension.
This configuration is very practical as it enables use of easily available armoured BX wire. It can also be used on retrofit installations where BX wire is already installed.



Calculating the wattage of the LEDs to be installed

The following method can also be used to calculate the load on only one power supply or individual sections of the architectural lighting project. Please note that the "watts per module" value must be taken from the specification sheet of the appropriate product.

wattage = number of modules X watts per module
total wattage = wattage of module type 1 + wattage of module type 2 + (…)

Applying the distance factor if applicable

If the power supply is installed away from the LEDs, use table 2 below to apply the appropriate distance factor to the wattage of the power supply.

Table 2: Distance Factor for BX Extension

Configuration	Power supply	Feet							
		0	**15**	**25**	**50**	**75**	**100**	**125**	**150**
14 AWG BX (figure 2)	LMPS-350	1	1	.95	.86	.62	.45	N/A	N/A
	LMPS-750	1	.84	.79	.73	.69	.63	.52	.36

The distance refers to the distance between the power supply and the first LED module.

Watts available for LEDs = wattage of the power supply X distance factor

The values given in table 2 are usually enough to do proper distance factor calculations. If the distance between the power supply and the first LED module falls between two columns in table 2, it is possible to calculate the distance factor using linear interpolation.

$$\textit{Target distance factor} = \frac{\textit{(target distance - length 1) (distance factor 2 - distance factor 1)}}{\textit{(length 2 - length 1)}} + \textit{distance factor 1}$$

Example (target distance of 88 feet with LMPS-750)

$$\text{Target Distance factor} = \frac{(88 - 75)\ (0.63 - 0.69)}{(100 - 75)} + 0.69 = 0.66$$

Calculating the number of power supplies your project requires

When using a distance factor use the "*watts available for the LEDs*" instead of the "*wattage of the power supply*". Round the result up to the next integer.

Number of power supplies = total wattage / wattage of the power supply

Please note that TFT Transfotec™'s LMPS-350 has a wattage of 35 watts and the LMPS-750 has a wattage of 75 watts.

Calculating the system wattage

Take the number of watts of LEDs at the output of each power supply and use the appropriate power curve on figures 8.1 and 8.2 (p.17-18) to determine each power supply's consumption. The average output power can also be used if the load is distributed evenly throughout the power supplies.

Calculating the total system power consumption

The total system power consumption equals the sum of the power consumption of each power supply.

Calculating the cost of electricity for a year for the complete architectural lighting project

$$\textit{Price of electricity per year} = \frac{\text{Total system wattage X hours of usage per day X 365 days per year X price of electricity per kW/h}}{1000}$$

Please note that "Price of electricity per kW/h" is according to your local electricity rate.

Determining the system efficiency

Due to the high frequency nature of the output of the LMPS power supplies, the input power factor must be used to determine the system efficiency. Take the input watts of each power supply and use the appropriate power factor curve on figures 9.1 and 9.2 (p.19) to determine the system efficiency.

Additional Considerations

- Distribute the load equally between multiple power supplies. This ensures a uniform level of light across the power supplies.
- Contact TFT Transfotec™ for more details about power consumption calculations when using a distance factor.
- All calculations are theoretical. Measurements made on the real life installations can differ from the calculations.

EXAMPLE

Modules : 225 Virgo+ LS1 6500K	Power supply : LMPS-750 (75W)
BX extension : 50 ft	Distance factor at 50 ft: 0.73

Total wattage = 225 Virgo+ LS1 x 0.48 watts = 108 watts

Watts available for LEDs = 75 watts X 0.73 = 54.75 watts/power supply

Number of power supplies required = 108 watts total/54.75 watts/power supply = 2 LMPS-750
Therefore, to distribute the load equally, install 112 modules on the first power supply and 113 modules on the second, for example, for the total 225 modules.

Total system power consumption = 66 watts + 67 watts = 133 watts

STRAIGHT PAIR EXTENSION

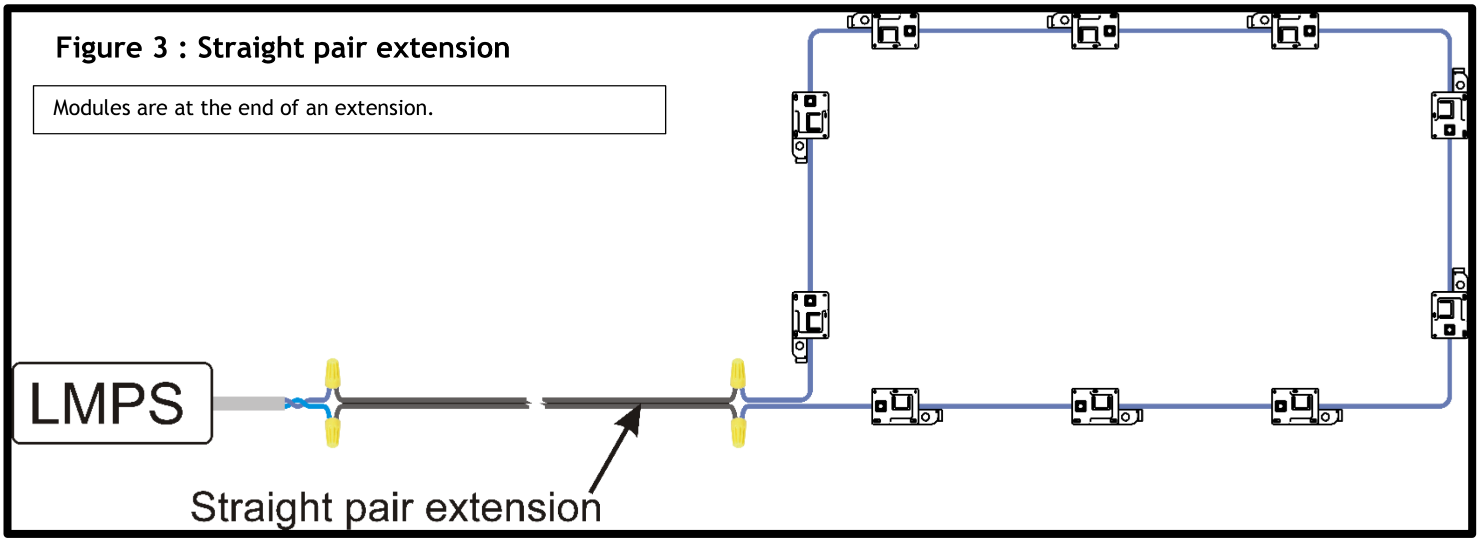


Figure 3 : Straight pair extension

Calculating the wattage of the LEDs to be installed

The following method can also be used to calculate the load on only one power supply or individual sections of the architectural lighting project. Please note that the "watts per module" value must be taken from the specification sheet of the appropriate product.

wattage = number of modules X watts per module
total wattage = wattage of module type 1 + wattage of module type 2 + (…)

Applying the distance factor if applicable

If the power supply is installed away from the LEDs, use table 3 below to apply the appropriate distance factor to the wattage of the power supply.

Table 3: Distance Factor for Straight Pair Extension

Configuration	Power supply	Feet							
		0	15	25	50	75	100	125	150
14 AWG straight pair extension (figure 3)	LMPS-350	1	1	1	.95	.74	.41	N/A	N/A
	LMPS-750	1	.77	.73	.69	.61	.54	.34	N/A
16 AWG & 18 AWG straight pair extension (figure 3)	LMPS-350	1	1	.95	.74	.41	.20	N/A	N/A
	LMPS-750	1	.73	.69	.61	.54	.42	.23	N/A

The distance refers to the distance between the power supply and the first LED module.

Watts available for LEDs = wattage of the power supply X distance factor

The values given in table 3 are usually enough to do proper distance factor calculations. If the distance between the power supply and the first LED module falls between two columns in table 3, it is possible to calculate the distance factor using linear interpolation.

$$\text{Target distance factor} = \frac{(\text{target distance} - \text{length 1})(\text{distance factor 2} - \text{distance factor 1})}{(\text{length 2} - \text{length 1})} + \text{distance factor 1}$$

Example (target distance of 88 feet with LMPS-750, 14 AWG)

$$\text{Target Distance factor} = \frac{(88 - 75)\ (0.54 - 0.61)}{(100 - 75)} + 0.69 = 0.65$$

Calculating the number of power supplies your project requires

When using a distance factor use the "*watts available for the LEDs*" instead of the "*wattage of the power supply*". Round the result up to the next integer.

Number of power supplies = total wattage / wattage of the power supply

Please note that TFT Transfotec™'s LMPS-350 has a wattage of 35 watts and the LMPS-750 has a wattage of 75 watts.

Calculating the system wattage

Take the number of watts of LEDs at the output of each power supply and use the appropriate power curve on figures 8.1 and 8.2 (p.17-18) to determine each power supply's consumption. The average output power can also be used if the load is distributed evenly throughout the power supplies.

Calculating the total system power consumption

The total system power consumption equals the sum of the power consumption of each power supply.

Calculating the cost of electricity for a year for the complete architectural lighting project

$$\textit{Price of electricity per year} = \frac{\textit{Total system wattage X hours of usage per day X 365 days per year X price of electricity per kW/h}}{1000}$$

Please note that "Price of electricity per kW/h" is according to your local electricity rate.

Determining the system efficiency

Due to the high frequency nature of the output of the LMPS power supplies, the input power factor must be used to determine the system efficiency. Take the input watts of each power supply and use the appropriate power factor curve on figures 9.1 and 9.2 (p.19) to determine the system efficiency.

Additional Considerations

- Distribute the load equally between multiple power supplies. This ensures a uniform level of light across the power supplies.
- Contact TFT Transfotec™ for more details about power consumption calculations when using a distance factor.
- All calculations are theoretical. Measurements made on the real life installations can differ from the calculations.

EXAMPLE

Modules : 200 Virgo+ LS1 6500K	Power supply : LMPS-750 (75W)
Straight pair extension : 50 ft	Distance factor at 50 ft: 0.69

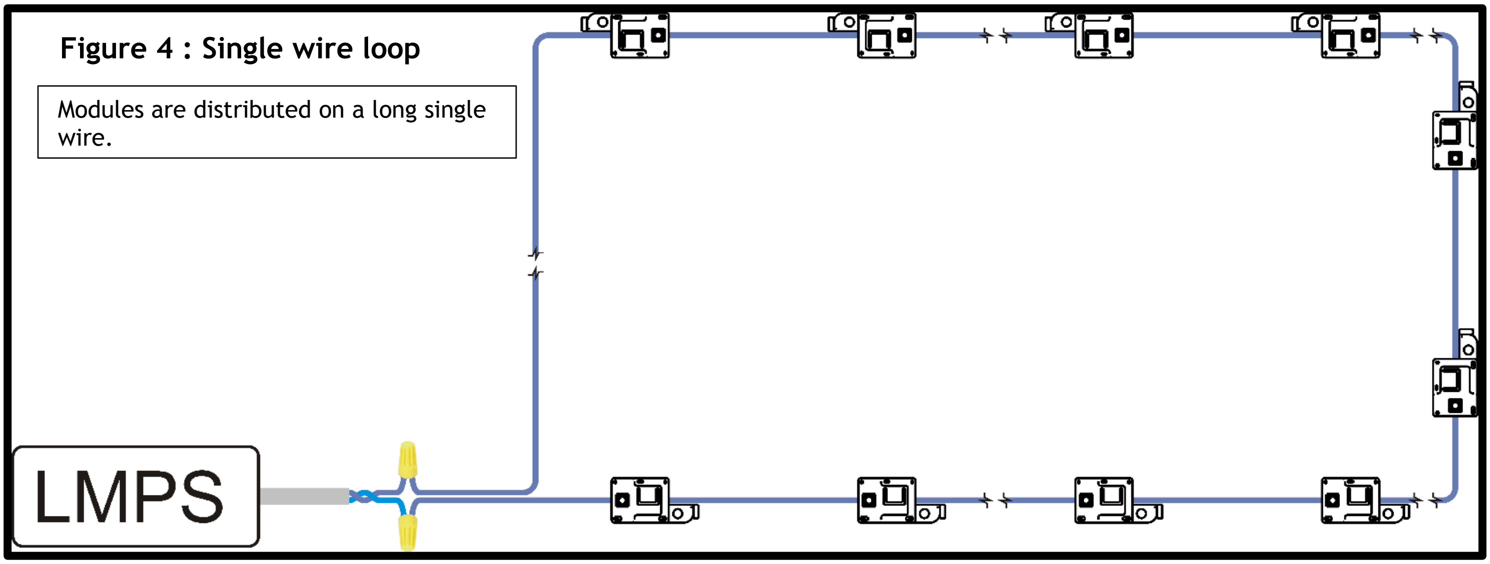
Total wattage = 200 Virgo+ LS1 x 0.48 watts = 96 watts

Watts available for LEDs = 75 watts X 0.69 = 51.75 watts/power supply

Number of power supplies required = 96 watts total/51.75 watts/power supply = 2 LMPS-750
Therefore, to distribute the load equally, install 100 modules on each power supply, for example, for the total 200 modules.

Total system power consumption = 61 watts + 61 watts = 122 watts

SINGLE WIRE LOOP



Calculating the wattage of the LEDs to be installed

The following method can also be used to calculate the load on only one power supply or individual sections of the architectural lighting project. Please note that the "watts per module" value must be taken from the specification sheet of the appropriate product.

wattage = number of modules X watts per module
total wattage = wattage of module type 1 + wattage of module type 2 + (...)

Applying the distance factor if applicable

If the power supply is installed away from the LEDs, use table 4 below to apply the appropriate distance factor to the wattage of the power supply.

Table 4: Distance Factor for Single Wire Loop

Configuration	Power supply	Feet							
		0	15	25	50	75	100	125	150
14 AWG single wire loop (figure 4)	LMPS-350	1	1	1	.87	.61	.34	N/A	N/A
	LMPS-750	1	1	1	1	.65	.32	.20	N/A
16 & 18 AWG single wire loop (figure 4)	LMPS-350	1	1	.95	.74	.24	N/A	N/A	N/A
	LMPS-750	1	.77	.73	.69	.54	.27	N/A	N/A

The distance refers to the distance between the power supply and the first LED module.

Watts available for LEDs = wattage of the power supply X distance factor

The values given in table 4 are usually enough to do proper distance factor calculations. If the distance between the power supply and the first LED module falls between two columns in table 4, it is possible to calculate the distance factor using linear interpolation.

$$\textit{Target distance factor} = \frac{\textit{(target distance - length 1) (distance factor 2 - distance factor 1)}}{\textit{(length 2 - length 1)}} + \textit{distance factor 1}$$

Example (target distance of 88 feet with LMPS-750, 14 AWG)

$$\text{Target distance factor} = \frac{(88 - 75)\ (0.32 - 0.65)}{(100 - 75)} + 0.65 = 0.48$$

Calculating the number of power supplies your project requires

When using a distance factor use the "*watts available for the LEDs*" instead of the "*wattage of the power supply*". Round the result up to the next integer.

Number of power supplies = total wattage / wattage of the power supply

Please note that TFT Transfotec™'s LMPS-350 has a wattage of 35 watts and the LMPS-750 has a wattage of 75 watts.

Calculating the system wattage

Take the number of watts of LEDs at the output of each power supply and use the appropriate power curve on figures 8.1 and 8.2 (p.17-18) to determine each power supply's consumption. The average output power can also be used if the load is distributed evenly throughout the power supplies.

Calculating the total system power consumption

The total system power consumption equals the sum of the power consumption of each power supply.

Calculating the cost of electricity for a year for the complete architectural lighting project

$$\textit{Price of electricity per year} = \frac{\textit{Total system wattage X hours of usage per day X 365 days per year X price of electricity per kW/h}}{1000}$$

Please note that "Price of electricity per kW/h" is according to your local electricity rate.

Determining the system efficiency

Due to the high frequency nature of the output of the LMPS power supplies, the input power factor must be used to determine the system efficiency. Take the input watts of each power supply and use the appropriate power factor curve on figures 9.1 and 9.2 (p.19) to determine the system efficiency.

Additional Considerations

- Distribute the load equally between multiple power supplies. This ensures a uniform level of light across the power supplies.
- Contact TFT Transfotec™ for more details about power consumption calculations when using a distance factor.
- All calculations are theoretical. Measurements made on the real life installation can differ from the calculations.

EXAMPLE

Modules : 275 Virgo+ LS1 6500K	Power supply : LMPS-750 (75W)
Twisted pair extension : 50 ft	Distance factor at 50 ft: 1

Total wattage = 275 Virgo+ LS1 x 0.48 watts = 132 watts

Watts available for LEDs = 75 watts X 1 = 75 watts/power supply

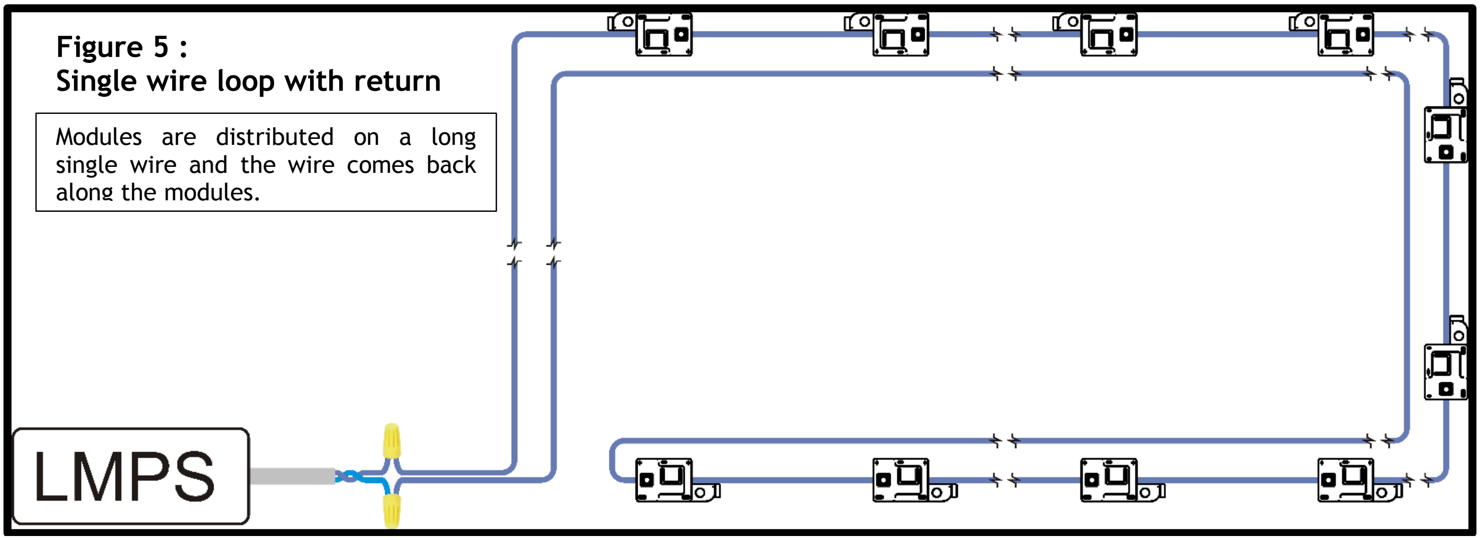
Number of power supplies required = 132 watts total/75 watts/power supply = 2 LMPS-750
Therefore, to distribute the load equally, install 137 modules on the first power supply and 138 modules on the second, for example, for the total 275 modules.

Total system power consumption = 74 watts + 75 watts = 149 watts

SINGLE WIRE LOOP WITH RETURN

Figure 5 :
Single wire loop with return

Modules are distributed on a long single wire and the wire comes back along the modules.



Calculating the wattage of the LEDs to be installed

The following method can also be used to calculate the load on only one power supply or individual sections of the architectural lighting project. Please note that the "watts per module" value must be taken from the specification sheet of the appropriate product.

wattage = number of modules X watts per module
total wattage = wattage of module type 1 + wattage of module type 2 + (…)

Applying the distance factor if applicable

If the power supply is installed away from the LEDs, use table 5 below to apply the appropriate distance factor to the wattage of the power supply.

Table 5: Distance Factor for Single Wire Loop With Return

Configuration	Power supply	Feet							
		0	15	25	50	75	100	125	150
14 AWG single wire loop with return (figure 5)	LMPS-350	1	1	1	1	1	.95	.95	.66
	LMPS-750	1	1	1	.77	.73	.65	.54	.34

The distance refers to the distance between the power supply and the first LED module.

Watts available for LEDs = wattage of the power supply X distance factor

The values given in table 5 are usually enough to do proper distance factor calculations. If the distance between the power supply and the first LED module falls between two columns in table 5, it is possible to calculate the distance factor using linear interpolation.

$$\textit{Target distance factor} = \frac{\textit{(target distance - length 1) (distance factor 2 - distance factor 1)}}{\textit{(length 2 - length 1)}} + \textit{distance factor 1}$$

Example (target distance = 88 feet)

$$\text{Target Distance factor} = \frac{(88 - 75)\ (0.65 - 0.73)}{(100 - 75)} + 0.73 = 0.69$$

Calculating the number of power supplies your project requires

When using a distance factor use the "*watts available for the LEDs*" instead of the "*wattage of the power supply*". Round the result up to the next integer.

Number of power supplies = total wattage / wattage of the power supply

Please note that TFT Transfotec™'s LMPS-350 has a wattage of 35 watts and the LMPS-750 has a wattage of 75 watts.

Calculating the system wattage

Take the number of watts of LEDs at the output of each power supply and use the appropriate power curve on figures 8.1 and 8.2 (p.17-18) to determine each power supply's consumption. The average output power can also be used if the load is distributed evenly throughout the power supplies.

Calculating the total system power consumption

The total system power consumption equals the sum of the power consumption of each power supply.

Calculating the cost of electricity for a year for the complete architectural lighting project

$$\textit{Price of electricity per year} = \frac{\textit{Total system wattage X hours of usage per day X 365 days per year X price of electricity per kW/h}}{1000}$$

Please note that "Price of electricity per kW/h" is according to your local electricity rate.

Determining the system efficiency

Due to the high frequency nature of the output of the LMPS power supplies, the input power factor must be used to determine the system efficiency. Take the input watts of each power supply and use the appropriate power factor curve on figures 9.1 and 9.2 (p.19) to determine the system efficiency.

Additional Considerations

- Distribute the load equally between multiple power supplies. This ensures a uniform level of light across the power supplies.
- Contact TFT Transfotec™ for more details about power consumption calculations when using a distance factor.
- All calculations are theoretical. Measurements made on the real life installations can differ from the calculations.

EXAMPLE

Modules : 225 Virgo+ LS1 6500K	Power supply : LMPS-750 (75W)
Single wire loop with return : 50 ft	Distance factor at 50 ft: 0.77

Total wattage = 225 Virgo+ LS1 x 0.48 watts = 108 watts

Watts available for LEDs = 75 watts X 0.77 = 57.75 watts/power supply

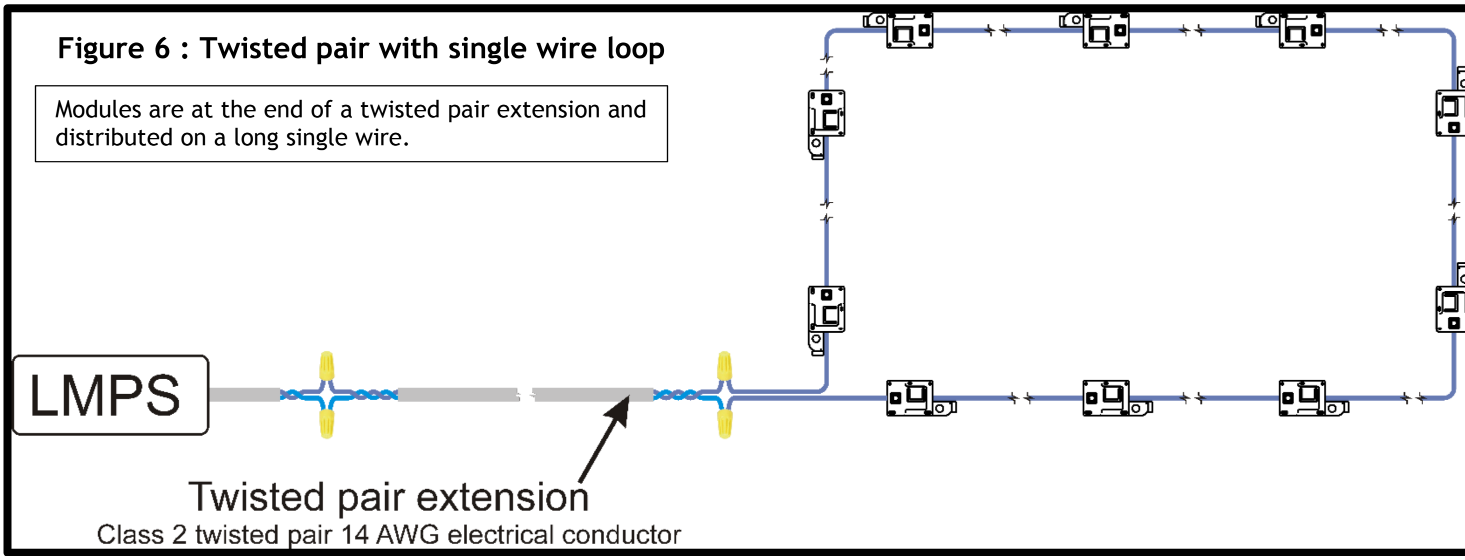
Number of power supplies required = 108 watts total/57.75 watts/power supply = 2 LMPS-750
Therefore, to distribute the load equally, install 112 modules on the first power supply and 113 modules on the second, for example, for the total 225 modules.

Total system power consumption = 65 watts + 66 watts = 131 watts

TWISTED PAIR WITH SINGLE WIRE LOOP

Figure 6 : Twisted pair with single wire loop

Modules are at the end of a twisted pair extension and distributed on a long single wire.



Calculating the wattage of the LEDs to be installed

The following method can also be used to calculate the load on only one power supply or individual sections of the architectural lighting project. Please note that the “watts per module" value must be taken from the specification sheet of the appropriate product.

wattage = number of modules X watts per module
total wattage = wattage of module type 1 + wattage of module type 2 + (…)

Applying the distance factor if applicable

If the power supply is installed away from the LEDs, use table 6 below to apply the appropriate distance factor to the wattage of the power supply.

Table 6: Distance Factor for Twisted Pair With Single Wire Loop

Power supply	Length of twisted pair extension	Feet of single wire loop			
		15	25	50	75
LMPS-350	15	0.95	0.95	0.49	N/A
	25	0.91	0.82	0.41	N/A
	50	0.66	.57	N/A	N/A
	75	0.41	0.33	N/A	N/A
LMPS-750	15	0.77	0.77	.65	.46
	25	0.73	0.73	.61	.34
	50	0.73	0.69	.50	N/A
	75	0.65	0.61	.34	N/A
	100	0.61	0.50	N/A	N/A
	125	0.46	0.34	N/A	N/A
	150	0.34	0.23	N/A	N/A

The distance refers to the distance between the power supply and the first LED module.

Watts available for LEDs = wattage of the power supply X distance factor

The values given in table 6 are usually enough to do proper distance factor calculations. If the distance between the power supply and the first LED module falls between two columns in table 6, it is possible to calculate the distance factor using linear interpolation.

$$\textit{Target distance factor} = \frac{\textit{(target distance - length 1) (distance factor 2 - distance factor 1)}}{\textit{(length 2 - length 1)}} + \textit{distance factor 1}$$

Example (target distance of 88 feet with LMPS-750)

$$\text{Target Distance factor} = \frac{(30 - 25)\ (0.50 - 0.69)}{(50 - 25)} + 0.69 = 0.65$$

Calculating the number of power supplies your project requires

When using a distance factor use the "*watts available for the LEDs*" instead of the "*wattage of the power supply*". Round the result up to the next integer.

Number of power supplies = total wattage / wattage of the power supply

Please note that TFT Transfotec™'s LMPS-350 has a wattage of 35 watts and the LMPS-750 has a wattage of 75 watts.

Calculating the system wattage

Take the number of watts of LEDs at the output of each power supply and use the appropriate power curve on figures 8.1 and 8.2 (p.17-18) to determine each power supply's consumption. The average output power can also be used if the load is distributed evenly throughout the power supplies.

Calculating the total system power consumption

The total system power consumption equals the sum of the power consumption of each power supply.

Calculating the cost of electricity for a year for the complete architectural lighting project

$$\textit{Price of electricity per year} = \frac{\textit{Total system wattage X hours of usage per day X 365 days per year X price of electricity per kW/h}}{1000}$$

Please note that "Price of electricity per kW/h" is according to your local electricity rate.

Determining the system efficiency

Due to the high frequency nature of the output of the LMPS power supplies, the input power factor must be used to determine the system efficiency. Take the input watts of each power supply and use the appropriate power factor curve on figures 9.1 and 9.2 (p.19) to determine the system efficiency.

Additional Considerations

- Distribute the load equally between multiple power supplies. This ensures a uniform level of light across the power supplies.
- Contact TFT Transfotec™ for more details about power consumption calculations when using a distance factor.
- All calculations are theoretical. Measurements made on the real life installations can differ from the calculations.

EXAMPLE	
Modules : 150 Virgo+ LS1 6500K	Power supply : LMPS-750 (75W)
Twisted pair with single wire loop : 50 ft	Distance factor : 0.50

Total wattage = 150 Virgo+ LS1 x 0.48 watts = 72 watts

Watts available for LEDs = 75 watts X 0.50 = 37.5 watts/power supply

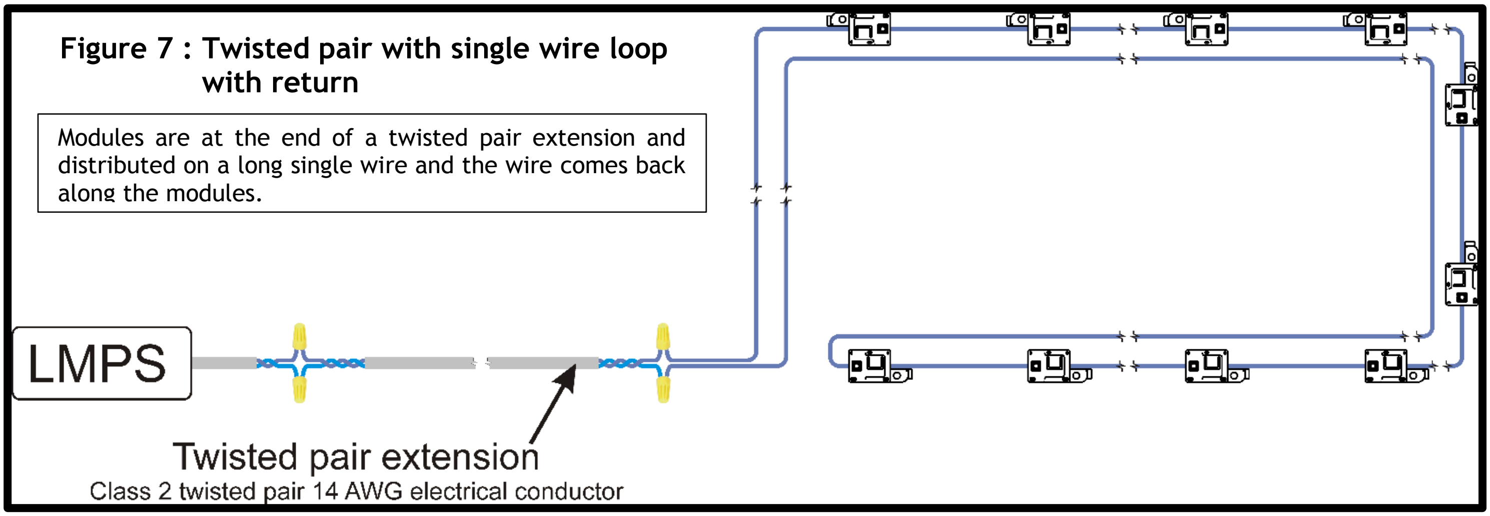
Number of power supplies required = 72 watts total/37.5 watts/power supply = 2 LMPS-750
Therefore, to distribute the load equally, install 36 modules on each power supply, for example, for the total 150 modules.

Total system power consumption = 25 watts + 25 watts = 50 watts

TWISTED PAIR WITH SINGLE WIRE LOOP WITH RETURN

Figure 7 : Twisted pair with single wire loop with return

Modules are at the end of a twisted pair extension and distributed on a long single wire and the wire comes back along the modules.



Calculating the wattage of the LEDs to be installed

The following method can also be used to calculate the load on only one power supply or individual sections of the architectural lighting project. Please note that the "watts per module" value must be taken from the specification sheet of the appropriate product.

wattage = number of modules X watts per module
total wattage = wattage of module type 1 + wattage of module type 2 + (…)

Applying the distance factor if applicable

If the power supply is installed away from the LEDs, use table 7 below to apply the appropriate distance factor to the wattage of the power supply.

Table 7: Distance Factor for Twisted Pair Extension

Power supply	Length of twisted pair extension	Feet of single wire loop with return					
		15	25	50	75	100	125
LMPS-350	15	.95	.95	.74	.49	N/A	N/A
	25	.95	.91	.66	.33	N/A	N/A
	50	.82	.66	.41	N/A	N/A	N/A
	75	.49	.41	N/A	N/A	N/A	N/A
LMPS-750	15	.77	.77	.69	.65	.61	.42
	25	.77	.73	.69	.65	.57	.38
	50	.69	.65	.65	.54	.42	N/A
	75	.65	.61	.50	.42	N/A	N/A
	100	.61	.57	.42	N/A	N/A	N/A
	125	.50	.42	N/A	N/A	N/A	N/A
	150	.38	.27	N/A	N/A	N/A	N/A

The distance refers to the distance between the power supply and the first module.

Watts available for LEDs = wattage of the power supply X distance factor

The values given in table 7 are usually enough to do proper distance factor calculations. If the distance between the power supply and the first LED module falls between two columns in table 7, it is possible to calculate the distance factor using linear interpolation.

$$\textit{Target distance factor} = \frac{(\textit{target distance - length 1})(\textit{distance factor 2 - distance factor 1})}{(\textit{length 2 - length 1})} + \textit{distance factor 1}$$

Example (target distance = 88 feet)

$$\text{Target Distance factor} = \frac{(88 - 75)(0.42 - 0.54)}{(100 - 75)} + 0.54 = 0.48$$

Calculating the number of power supplies your project requires

When using a distance factor use the "*watts available for the LEDs*" instead of the "*wattage of the power supply*". Round the result up to the next integer.

Number of power supplies = total wattage / wattage of the power supply

Please note that TFT Transfotec™'s LMPS-350 has a wattage of 35 watts and the LMPS-750 has a wattage of 75 watts.

Calculating the system wattage

Take the number of watts of LEDs at the output of each power supply and use the appropriate power curve on figures 8.1 and 8.2 (p.17-18) to determine each power supply's consumption. The average output power can also be used if the load is distributed evenly throughout the power supplies.

Calculating the total system power consumption

The total system power consumption equals the sum of the power consumption of each power supply.

Calculating the cost of electricity for a year for the complete architectural lighting project

$$\textit{Price of electricity per year} = \frac{\textit{Total system wattage X hours of usage per day X 365 days per year X price of electricity per kW/h}}{1000}$$

Please note that "Price of electricity per kW/h" is according to your local electricity rate.

Determining the system efficiency

Due to the high frequency nature of the output of the LMPS power supplies, the input power factor must be used to determine the system efficiency. Take the input watts of each power supply and use the appropriate power factor curve on figures 9.1 and 9.2 (p.19) to determine the system efficiency.

Additional Considerations

- Distribute the load equally between multiple power supplies. This ensures a uniform level of light across the power supplies.
- Contact TFT Transfotec™ for more details about power consumption calculations when using a distance factor.
- All calculations are theoretical. Measurements made on the real life installations can differ from the calculations.

EXAMPLE

Modules : 200 Virgo+ LS1 6500K	Power supply : LMPS-750 (75W)
Twisted pair with single wire loop with return : 50 ft	Distance factor at 50 ft: 0.65

Total wattage = 200 Virgo+ LS1 x 0.48 watts = 96 watts

Watts available for LEDs = 75 watts X 0.65 = 48.75 watts/power supply

Number of power supplies required = 96 watts total/48.75 watts/power supply = 2 LMPS-750
Therefore, to distribute the load equally, install 100 modules on each power supply, for example, for the total 200 modules.

Total system power consumption = 62 watts + 62 watts = 124 watts

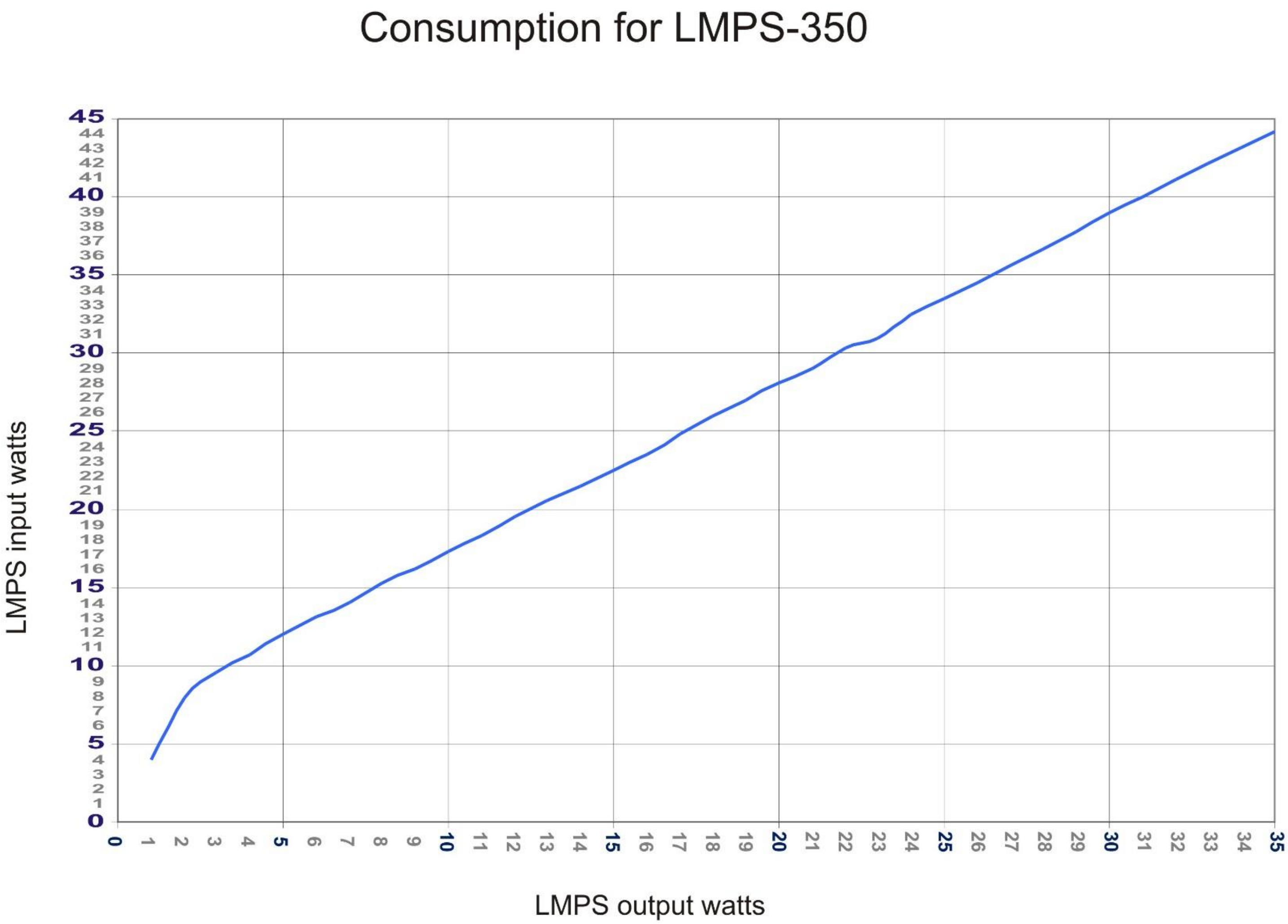


Figure 8.1: LMPS-350 system power consumption

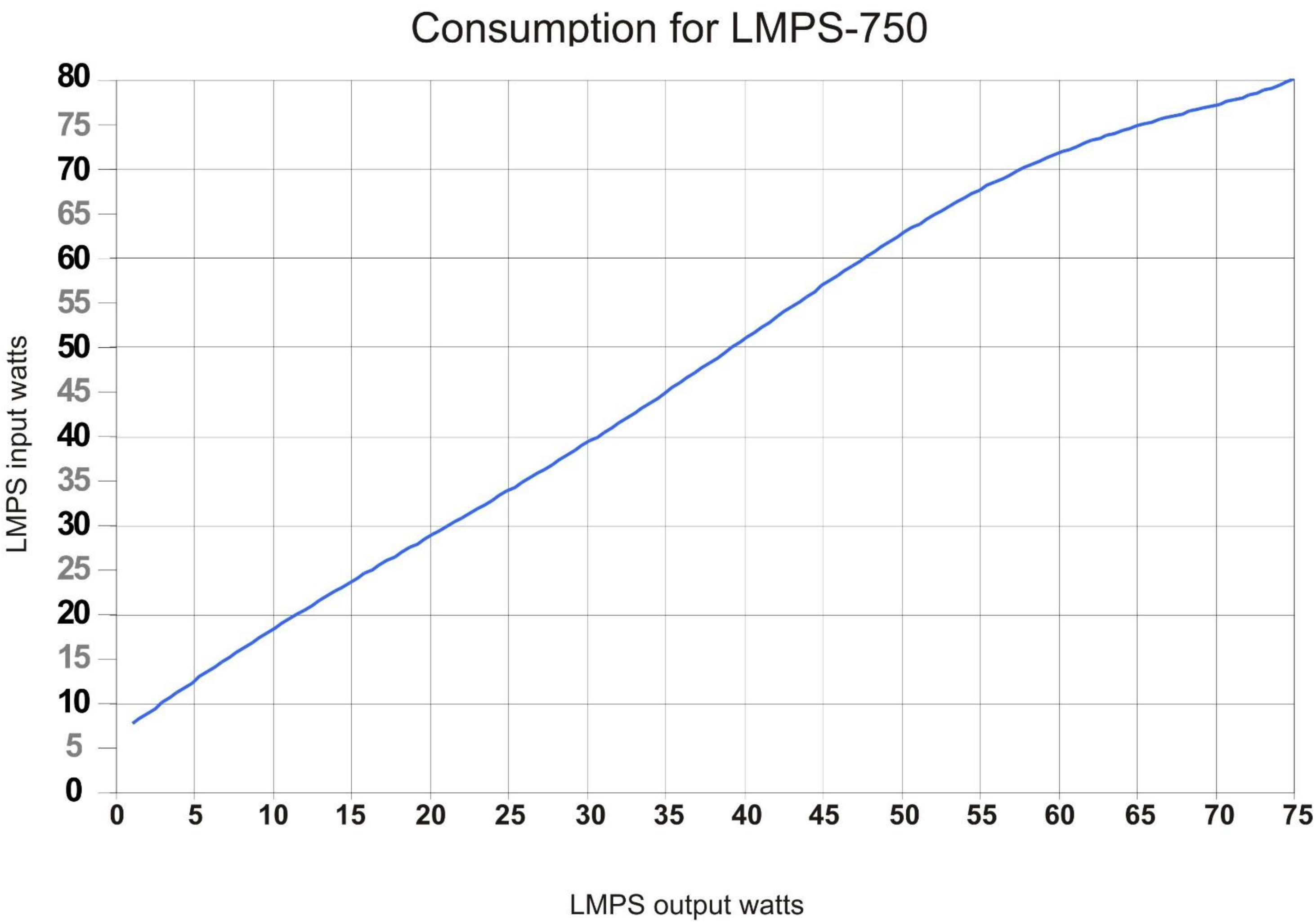


Figure 8.2: LMPS-750 system power consumption

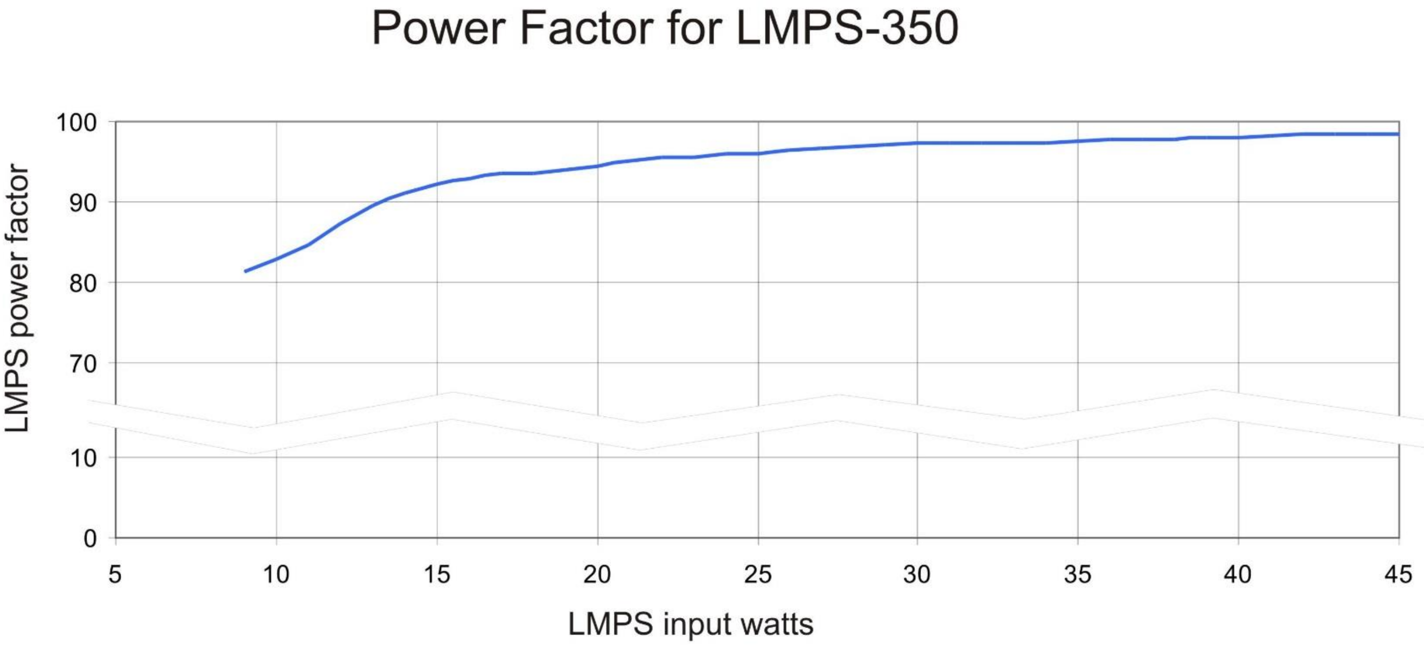


Figure 9.1: LMPS system efficiency

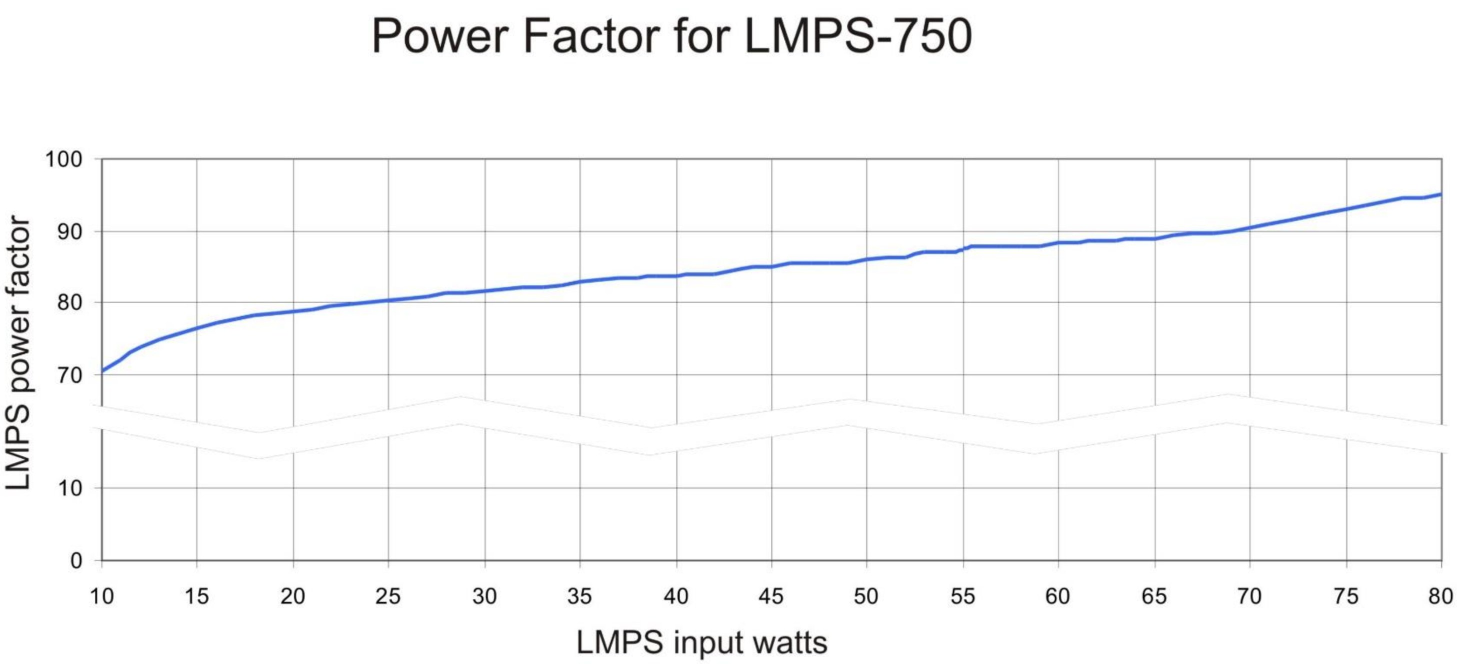


Figure 9.2: LMPS system efficiency

INSTALLATION INSTRUCTIONS

1. Installation shall be done in accordance with the national electrical code and any other electrical code applicable in your area. Also follow local electrical code ordinances when applicable.

2. Clean and remove all dust and debris from the area where the modules will be installed. Keep the area clean throughout the installation.

3. The modules installed in the same area should have the same bin letter.

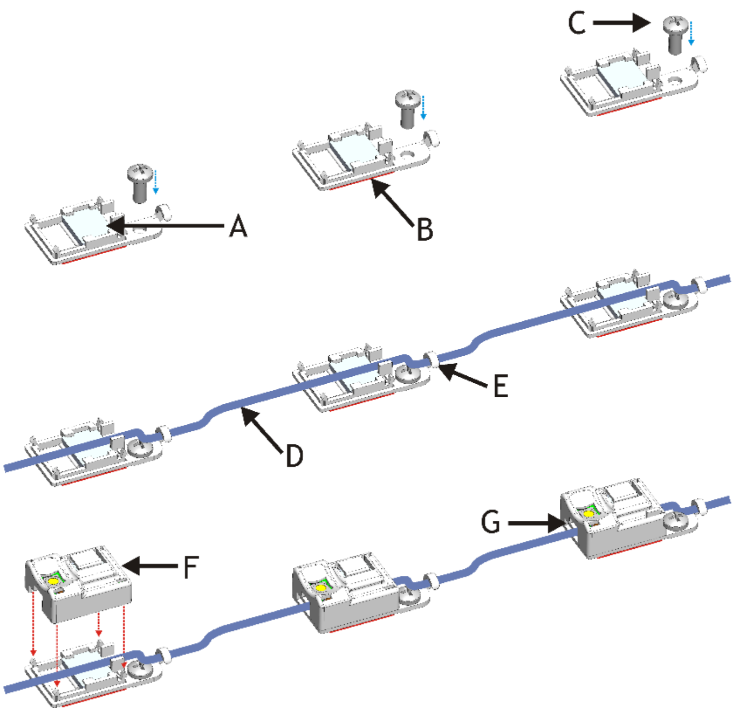
4. Lay the bases by either using the provided double-sided tape or by holding them in place using #8 fasteners where necessary.

5. Insert the 14 AWG electrical conductor (stranded wire) in the Virgo+™ LS1 bases and snap on the top portion of the Virgo+™ LS1. All modules are to be wired in series (figure 10).

6. If a dimmer is used refer to the installation requirements in technical bulletin #11 “LMPS-Dimmer Architectural Lighting Installation Guide”.

7. Due to maximum voltage limitations for Class 2 circuits in wet locations, only the LMPS-350 can be used if the modules are installed in a wet location.

8. TFT Transfotec™ Virgo+ LS1 cannot be installed in a manner that would not respect the limits of Ingress Protection IP66.



A. Virgo+™ LS1 base

B. High bond double sided tape

C. #8 fastener

D. 14 AWG electrical conductor (stranded wire)

E. Electrical conductor hook

F. Virgo+™ LS1 module

G. Tool slot (for decliping)

Figure 10: Installation of the Virgo+™ LS1 LED module

LOCATION DEFINITIONS

DRY LOCATION
"A location not normally subject to dampness, but may include a location subject to temporary dampness, as in the case of a building under construction, provided ventilation is adequate to prevent an accumulation of moisture." (UL Standard 1598, publication of 2008)

DAMP LOCATION
"An exterior or interior location that is normally or periodically subject to condensation of moisture in, on, or adjacent to, electrical equipment, and includes partially protected locations." (UL Standard 1598, publication of 2008)
It includes exterior locations such as under canopies, marquees, roofed open porches and similar locations. This also includes interior locations subject to moderate degrees of moisture, such as some basements, some barns and some cold-storage warehouses. Locations sheltered from the weather are considered damp locations.

WET LOCATION
"A location in which water or other liquid can drip, splash, or flow on or against electrical equipment." (UL Standard 1598, publication of 2008)
This also includes outdoor locations, which are any location exposed to the weather. Locations sheltered from the weather are not considered outdoor locations. Conductors exposed to direct sunlight shall bear the mark "SUN RESISTANT", "SR", or similar or be listed as being sun resistant if they don't bear such marking.

POWER SUPPLY ELECTRICAL CONNECTION IN DRY OR DAMP LOCATIONS

1. Installation shall be done in accordance with the national electrical code and any other electrical code applicable in your area. Also follow local electrical code ordinances when applicable.
2. A listed electrical enclosure approved for the purpose shall be used for the LMPS primary connection.
3. Power supplies and electrical boxes shall be adequately supported, plumb and true and firmly secured in place with appropriate fasteners.
4. Adequate spacing and airflow shall be provided in between transformers and surrounding materials.
5. Power supplies shall be oriented or protected in a way that will not let condensing water accumulate in the enclosure.
6. All wire and splice connectors shall be suitable for the temperature conditions and locations where installed. Splices shall be kept to a minimum.
7. The Class 2 circuit shall be physically separated from other circuit types.
8. Use #8 fasteners to secure the power supply and the electrical box in place.
9. If more than one (1) LMPS is used, keep a spacing of at least one (1) inch (25.4 mm) between each LMPS.
10. If the Class 2 feeder circuit needs to be extended between the LMPS and the LED arrays, use twisted pair cable type CL2 14 AWG or better, listed for the applicable environment (figure 11). Substitutions according to **NEC table 725.154(G)** and **CEC article 16.210, 16-222, table 19** are permitted (also refer to **CEC Appendix B**).
    Permitted substitutions for **CL2** wires are: **CMP, CL3P, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3**.
11. For more details refer to the LMPS-350 and LMPS-750 specification sheets (documents 11126.007.G1 and 11126.003.G2)

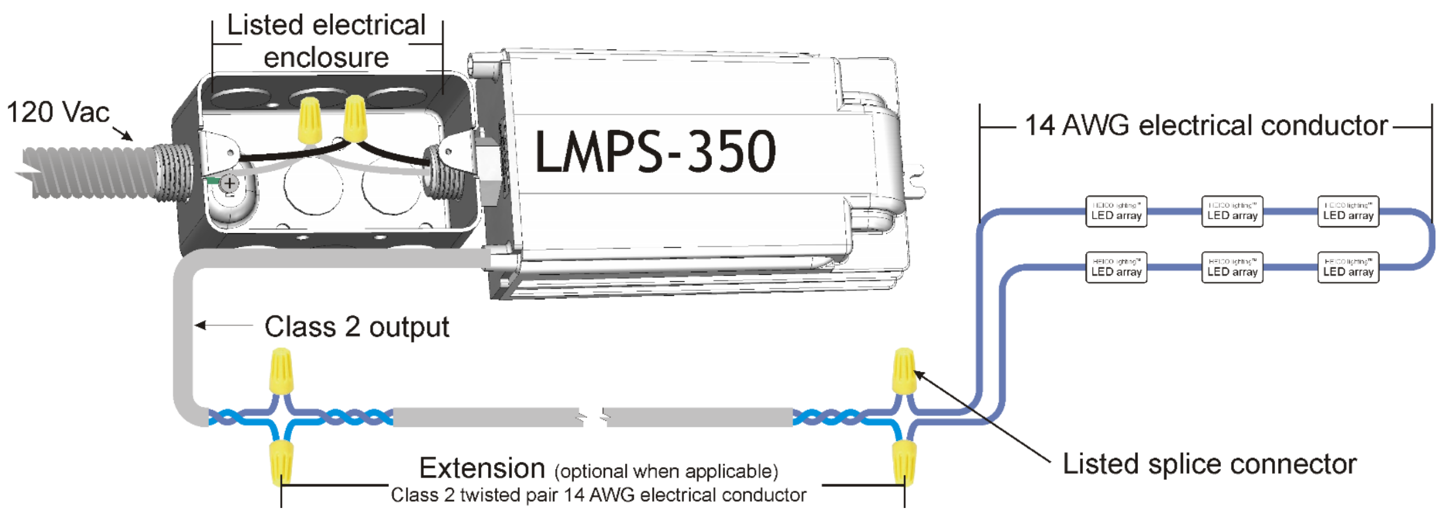


Figure 11: Electrical connections for installation in dry and damp locations (twisted pair extension and LMPS-350 shown, others are similar)

POWER SUPPLY ELECTRICAL CONNECTION IN WET LOCATIONS

1. Installation shall be done in accordance with the national electrical code and any other electrical code applicable in your area. Also follow local electrical code ordinances when applicable.
2. A listed electrical enclosure approved for the purpose shall be used for the LMPS primary connection.
3. Power supplies and electrical boxes shall be adequately supported, plumb and true and firmly secured in place with appropriate fasteners.
4. Adequate spacing and airflow shall be provided in between transformers and surrounding materials.
5. Power supplies shall be oriented or protected in a way that will not let condensing water accumulate in the enclosure.
6. All wire and splice connectors shall be suitable for the temperature conditions and locations where installed. Splices shall be kept to a minimum.
7. In wet locations the power supply shall be installed in an appropriate location and in a listed electrical enclosure approved for the purpose (examples: NEMA 3, 3R, 3S, 3X, 3RX, 3SX or 4).
8. The Class 2 circuit shall be physically separated from other circuit types.
9. Use #8 fasteners to secure the power supply and the electrical box in place.
10. If more than one (1) LMPS is used, keep a spacing of at least one (1) inch (25.4 mm) between each LMPS.
11. If the Class 2 feeder circuit needs to be extended between the LMPS and the LED arrays, use twisted pair cable type CL2 14 AWG or better, listed for the applicable environment (figure 12). Substitutions according to **NEC table 725.154(G)** and **CEC article 16.210, 16-222, table 19** are permitted (also refer to **CEC Appendix B**). Permitted substitutions for **CL2** wires are: **CMP, CL3P, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3**.
12. For more details refer to the LMPS-350 and LMPS-750 specification sheets (documents 11126.007.G1 and 11126.003.G2)

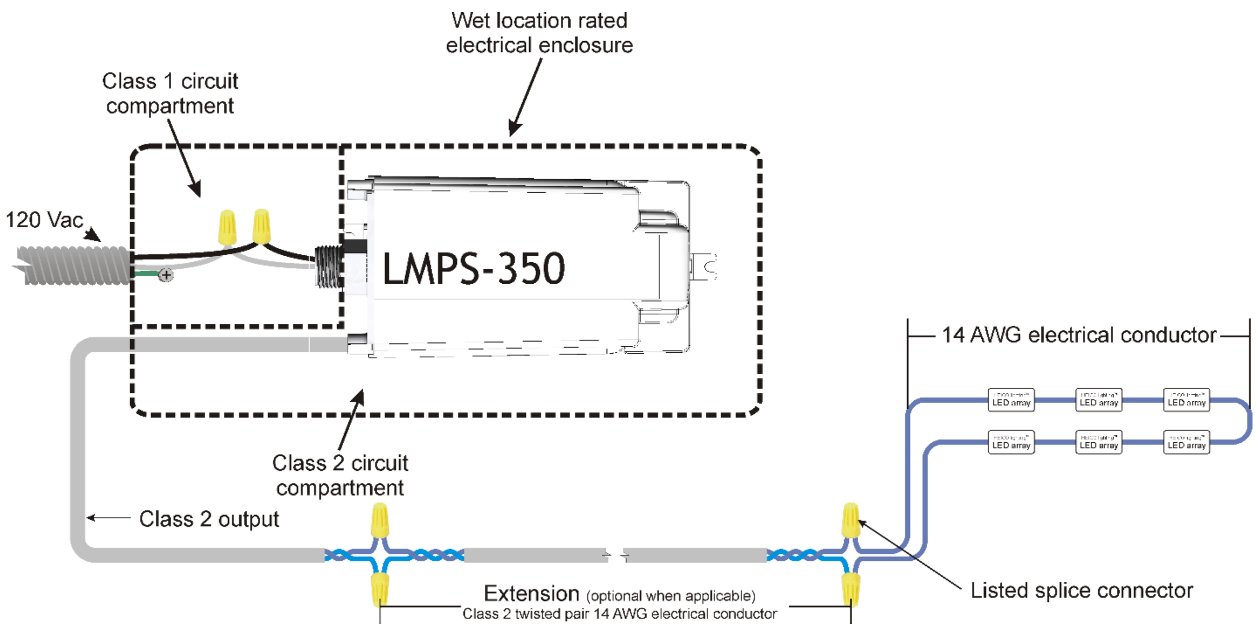


Figure 12: Electrical connections for installation in wet locations (twisted pair extension and LMPS-350 shown, others are similar)

ON-SITE INSTALLATION

1. Test the complete area either as a whole or in sections. Verify that illumination is uniform. If applicable, correct any seen problems.
2. Turn off power before installation, inspection, repair or removal.
3. Use the appropriate extension wire where applicable.
4. Connect the different areas to the power supplies according to the provided layout.
5. All sections on the same power supply shall be wired in series (figure 13).
6. Refer to technical bulletin #5 for troubleshooting details.

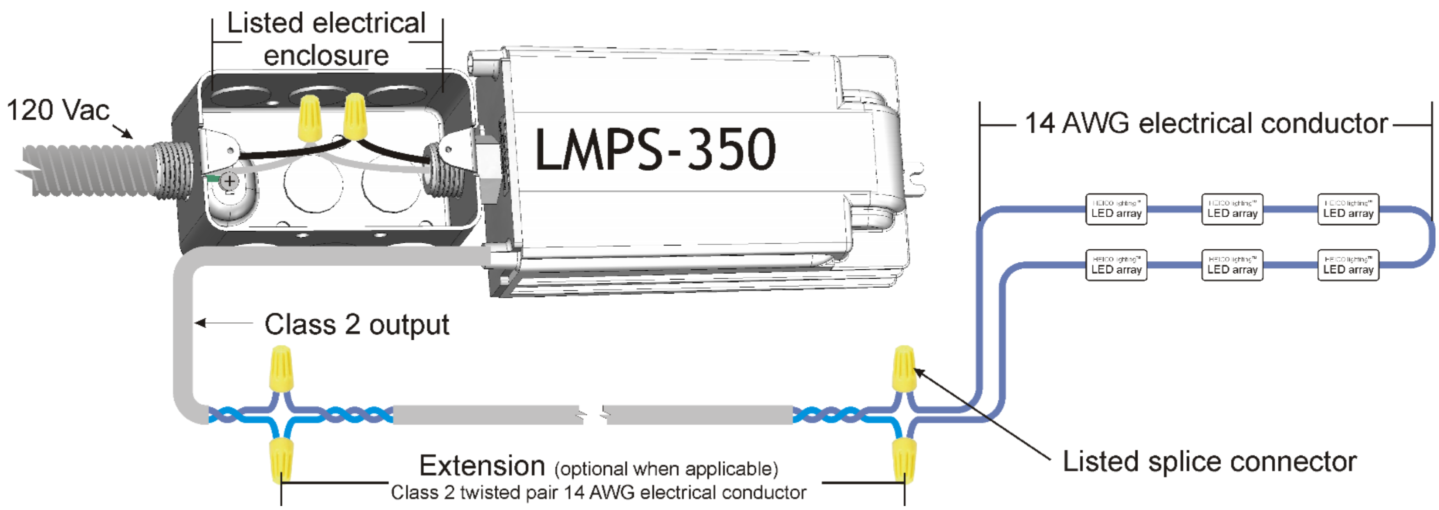
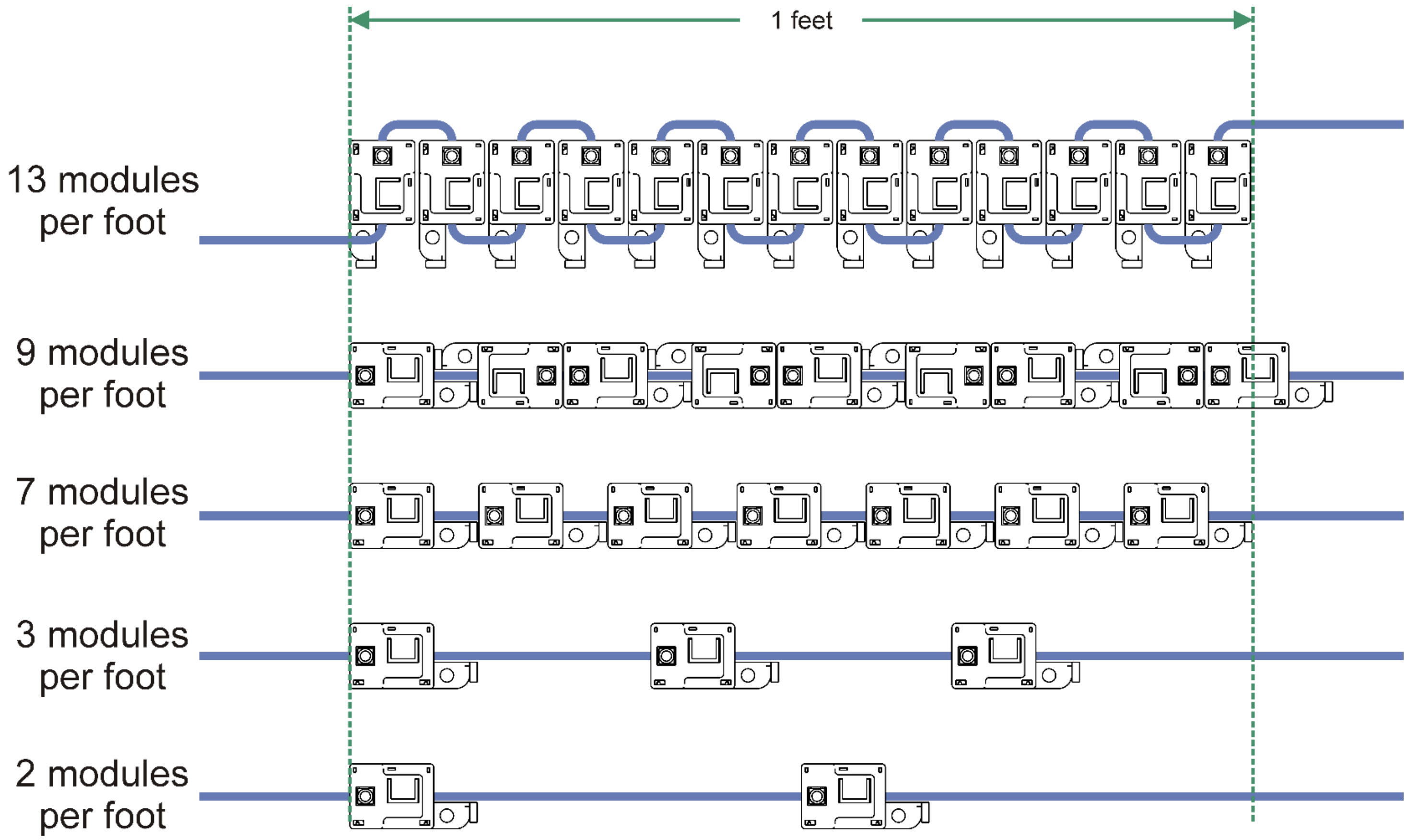


Figure 13: Typical installation

DENSITY CONFIGURATIONS

The Virgo+™ LS1 can be installed in many configurations to make for very high light density.



Modules per foot	Lumens per foot	Watts per foot
13	364	6.50
9	252	4.05
7	196	3.15
3	87	1.50
2	58	1

Figure 14: Density configurations

Loading Warnings

- Factors such as wire construction and the layout and length of the electrical circuit can affect the loading of the power supply. As those factors are beyond the control of TFT Transfotec™ it is the responsibility of the installer to ensure that maximum loading will not be exceeded.
- In wire loop with return configurations the return wire needs to be routed as close as possible from one another and they need to be tied together at least each foot.
- The user is responsible for proper selection of the electrical conductor type that will be used for the specific application; see the requirements in technical bulletin #27 "Wiring for architectural applications".
- Contact TFT Transfotec™ for other wire types and distances usage.

Installation Warnings

- **IMPORTANT: The user is responsible for the safe electrical and mechanical installation of the power supply and of the suitability of the wiring system, mounting surfaces and any mounting hardware used. Failure to do so can lead to electrical and mechanical failure of the system and serious personal injury.**
- All equipment shall be installed in a neat and workmanlike manner. See NECA 1-2010 standard "Good Workmanship in Electrical Construction".
- The user is responsible for proper selection of the electrical conductor type that will be used for the specific application; see the requirements in technical bulletin #27 "Wiring for architectural applications".
- The Class 2 circuit shall be physically separated from other circuit types.
- The user is responsible that the installation methods and materials used are appropriate for the location.
- It is possible to have the power supply and the LED arrays installed in different location types, the user is responsible that the installation methods and materials used are appropriate for each location.

General Warnings

- All technical data in this technical bulletin is based on test results and is believed to be correct. However since the end use of TFT Transfotec™ products, usage application and installation, is beyond our control, TFT Transfotec™ makes no warranty expressed or implied as to the fitness of use. Their use shall be solely by the judgment and at the risk of the user notwithstanding any statement in this technical bulletin.
- All equipment shall be installed in a neat and workmanlike manner. See NECA 1-2010 standard "Good Workmanship in Electrical Construction".
- The user is responsible for proper selection of the electrical conductor type that will be used for the specific application; see the requirements in technical bulletin #27 "Wiring for architectural applications".
- The modules installed in the same area should have the same bin letter.
- For other LED colors, configurations and general information about layouts please contact TFT Transfotec™
- Refer to the product sheet for more information about the LMPS-350 and LMPS-750 power supplies and the Virgolite™ modules.

CONTACT US!

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