2.4.1 DC Wire Sizing

It is important to use the correct sized DC wire to achieve maximum efficiency from the system and to reduce fire hazards associated with overheating. Always keep your wire runs as short as practical to prevent low voltage shutdowns and to keep the DC breaker from nuisance tripping (or open fuses) because of increased current draw. See Table 2-1 to select the minimum DC wire size (and corresponding overcurrent device) required based on your inverter model. The cable sizes listed in Table 2-1 are required in order to reduce stress on the inverter, minimize voltage drops, increase system efficiency, and ensure the inverter's ability to surge heavy loads.

If the distance from the inverter to the battery bank is >5 feet (1.5 cm), the DC wire needs to be increased. Longer distances cause an increase in resistance, which affects the performance of the inverter. Use the overcurrent device previously determined from Table 2-1 and then refer to Table 2-2 to determine the minimum DC wire size needed for various distances.

Table 2-1, Recommended DC Wire/Overcurrent Device for Rated Use

Inverter Model	Maximum Continuous Current[1]	Using Conduit		In Free Air		DC Grounding Electrode Wire Size[4]
		Minimum DC Wire Size [rating][2]	Recommended DC Breaker Size	Minimum DC Wire Size [rating][2]	Maximum DC Fuse Size[3]	
MS2000/ MS2012	267 amps	#4/0 AWG (107.2 mm²) [260 amps]	250 amps[5]	#2/0 AWG (67.4 mm²) [300 amps]	300 amps with time delay	#6 AWG (13.3 mm²)
MS2812	373 amps	#4/0 AWG (107.2 mm²) [260 amps]	250 amps[5]	#4/0 AWG (107.2 mm²) [405 amps]	400 amps with time delay	#6 AWG (13.3 mm²)
MS2024	133 amps	#1 AWG (42.4 mm²) [150 amps]	150 amps	#4 AWG (107.2 mm²) [140 amps]	150 amps[3] with time delay	#6 AWG (13.3 mm²)
MS4024	267 amps	#4/0 AWG (107.2 mm²) [260 amps]	250 amps[5]	#2/0 AWG (67.4 mm²) [300 amps]	300 amps with time delay	#6 AWG (13.3 mm²)
MS4048	133 amps	#1 AWG (42.4 mm²) [150 amps]	150 amps	#4 AWG (107.2 mm²) [140 amps]	150 amps[3] with time delay	#6 AWG (13.3 mm²)

Note[1] *– Maximum continuous current is based on the inverter's continuous power rating at the lowest input voltage with an inverter inefficiency factored in.*
Note[2] *– Copper wire rated with 90°C (194°F) insulation at an ambient temperature of 30°C (86°F), with a multiple cable fill factor (0.8) de-rating (if needed).*
Note[3] *– The next larger standard size overcurrent device may be used if the derated cable ampacity falls between the standard overcurrent devices found in the NEC.*
Note[4] *– Per NEC, the DC grounding electrode conductor can be a #6 AWG conductor if that is the only connection to the grounding electrode and that grounding electrode is a rod, pipe, or plate electrode.*
Note[5] *– May not allow continuous operation at full rated power as defined by the NEC.*

2.4.2 DC Overcurrent Protection

DC overcurrent protection is not included in the inverter—for safety reasons and to comply with electrical code regulations—it must be provided as part of the installation. The DC overcurrent protection device must be installed in the positive DC cable line, it can be a fuse or a circuit breaker and must be DC rated. It must be correctly sized according to the size of DC cables being used, which means it is required to open before the cable reaches its maximum current carrying capability, thereby preventing a fire. In a residential or commercial electrical installation, the NEC requires both overcurrent protection and a disconnect switch. If a circuit breaker is used as the overcurrent protection device, it can also be used as the required DC disconnect.

If a fuse is used as an overcurrent device, a Class-T type or equivalent is recommended. This fuse type is rated for DC operation, can handle high short-circuit currents, and has a time delay that allows for momentary current surges from the inverter without opening the fuse. However, because the fuse can be energized from both directions, the NEC requires that it be installed in a manner that the power must be disconnected on both ends of the fuse before servicing.

Use Table 2-1 to select the DC overcurrent device needed based on the recommended minimum wire size for your particular inverter model (may not meet all local code or NEC requirements).

Table 2-2, DC Wire Size For Increased Distance

Inverter Model	Minimum Recommended DC Wire Size (one way)*					
	5 feet or less (1.5 m or less)		5 to 10 feet (1.5 m to 3.0 m)		10 to 15 feet (3.0 m to 4.6 m)	
	In Conduit	In Free Air	In Conduit	In Free Air	In Conduit	In Free Air
MS2000	#4/0 AWG (107.2 mm²)	#2/0 AWG (67.4 mm²)	#4/0 AWG x2 (107.2 mm²)	#4/0 AWG (107.2 mm²)	not recommended	#4/0 AWG x2 (107.2 mm²)
MS2012	#4/0 AWG (107.2 mm²)	#2/0 AWG (67.4 mm²)	#4/0 AWG x2 (107.2 mm²)	#4/0 AWG (107.2 mm²)	not recommended	#4/0 AWG x2 (107.2 mm²)
MS2812	#4/0 AWG (107.2 mm²)	#4/0 AWG (107.2 mm²)	#4/0 AWG x2 (107.2 mm²)	#4/0 AWG x2 (107.2 mm²)	not recommended	not recommended
MS2024	#1 AWG (42.4 mm²)	#4 AWG (21.1 mm²)	#1/0 AWG (53.5 mm²)	#2 AWG (33.6 mm²)	#2/0 AWG (67.4 mm²)	#1/0 AWG (53.5 mm²)
MS4024	#4/0 AWG (107.2 mm²)	#2/0 AWG (67.4 mm²)	#4/0 AWG x2 (107.2 mm²)	#4/0 AWG (107.2 mm²)	not recommended	#4/0 AWG x2 (107.2 mm²)
MS4048	#1 AWG (42.4 mm²)	#4 AWG (21.1 mm²)	#1/0 AWG (53.5 mm²)	#2 AWG (33.6 mm²)	#2/0 AWG (67.4 mm²)	#1/0 AWG (53.5 mm²)

** Copper wire rated with 90°C (194°F) insulation at an ambient temperature of 30°C (86°F).*

2.4.3 DC Cable Connections

Do not put anything between the battery cable ring lug and the battery post or the flat metal part of the inverter's DC terminal. When connecting the battery cable to the battery post or inverter DC terminal, the cable should be placed directly against the inverter terminal or battery post. Incorrectly installed hardware causes a high resistance connection which could lead to poor inverter/charger performance, and may melt the cable and terminal connections.

CAUTION: The DC terminal and Flange/Kep nuts are made of stainless steel which have a high likelihood of seizure. To help prevent the bolt and nut from seizing—causing the bolts to strip or snap/break-off—the use of anti-seize lubricant is highly recommended.

Info: If antioxidant grease or spray is used, apply it after all the connections have been made and are properly tightened. A 1/2-inch wrench or socket is used to tighten the 5/16 SAE Flange/Kep nuts.

Refer to Figures 2-7 and 2-8 on the next page to connect the DC cables and to stack the hardware correctly. Tighten the terminal connections from 10 to 12 ft lbf (13.6 to 16.3 N-m).