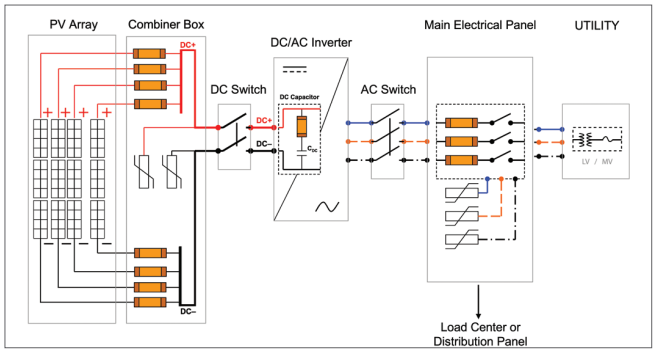
PIQ Quiz Notes

Photovoltaic Systems

How much light can you shed on the subject?
There are several locations within a photovoltaic system where circuit protection is essential, from switches and batteries right through to the AC power distribution network.

Question 1 Introduction
The image shown is a top-level schematic of a typical photovoltaic system, including the PV array, combiner box, and inverter. Notice that each PV string is protected by a fuse.



Question 1:
Which of the following characteristics is not a primary concern when selecting an appropriate fuse for overcurrent protection of a PV or solar cell array?
A. DC voltage rating
B. Losses
C. Interrupt rating
D. Minimum Breaking Capacity (MBC)

Explanation of Question 1
A PV array is different from standard electrical applications in that it can only produce a short circuit current of approximately 2 to 3 times its rated current. Therefore, a high interrupting rating is unnecessary and may even come at the expense of watt losses, which can decrease system efficiency.

Rather, what's needed is a fuse with the current Minimum Breaking Capacity, or MBC for short, which is the amount of current that the fuse will safely interrupt. Because PV systems have such a very low fault current, a properly selected fuse must have a low enough MBC to safely open this low fault current.

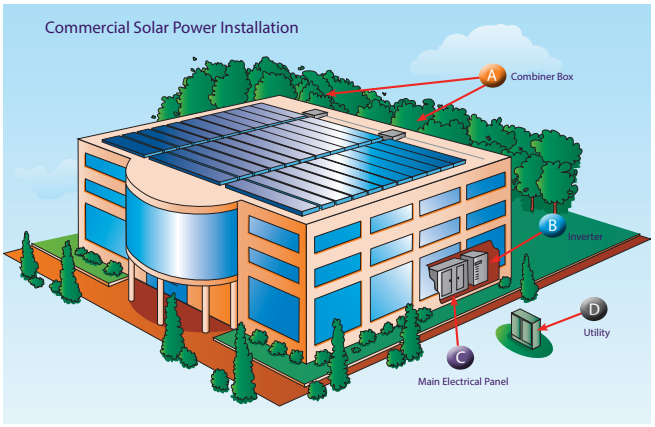
Additional Resources
- Mersen Solar Energy Markets and Applications Page
- Mersen Wind Energy Markets and Applications Page
- Mersen Electrical Energy Storage Markets and Applications Page

Question 2 Introduction
A PV system must be protected from a potential back-feed from parallel connected power conditioning or storage devices. A common storage device used within PV systems is the inverter's DC capacitor.

Question 2:
What characteristics are important when selecting an appropriate overcurrent protection device from the DC capacitor?
A. DC voltage rating
B. Interrupt Rating
C. Opening Time
D. All of the Above

Explanation of Question 2
Under a short circuit, the DC capacitors can produce a high discharge current, requiring an overcurrent protection device that opens quickly to limit the energy the capacitors feed into the array. The recommended overcurrent device for this is a high speed semiconductor protection fuse, installed in series with the DC Capacitor and in parallel with the PV array, which will provide protection without adding to the system losses.

Summary of a Commercial Solar Power Installation



Circuit Protection Components for Solar Power

A Combiner Box
ATM 600VDC midget fuses
DCT 1000VDC midget fuses
A6D-R 600VDC/AC Class RK1 Fuses
ATMR 600VDC/AC Class CC Fuses
UltraSafe™ Class CC & midget fuse holders
Finger-Safe Power Distribution Blocks
Surge-Trap® Surge Protective Devices

B Inverter
A70QS 700VDC High Speed Fuses
A150X 1000VDC High Speed Fuses
PSC High Speed Square Body Fuses
Surge-Trap® Surge Protective Devices
Modular fuse holders

C Main Electrical Panel
AJT 600VAC Class J Fuses
A6D-R 600VDC/AC Class RK1 Fuses
UltraSafe™ Class J Fuse Holders
Surge-Trap® Surge Protective Devices

D Utility
Medium Voltage E-Rated Fuses
Cable Limiters

Mersen
Expertise, our source of energy