

Bulletin 64-1-1
Connection of utility-interactive inverters on the load side of service disconnecting means
Rules 64-060, 64-102 and 64-112

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Scope

- (1) Introduction
- (2) Point of connection
- (3) Existing ground fault protection on the main service
- (4) Disconnecting means and overcurrent protection for multiple inverters operating in parallel

(1) Introduction

Rule 64-112(3) permits the output circuit of a utility interactive inverter to be connected on the load side of the service disconnecting means of other source(s) at any distribution equipment, with some conditions.

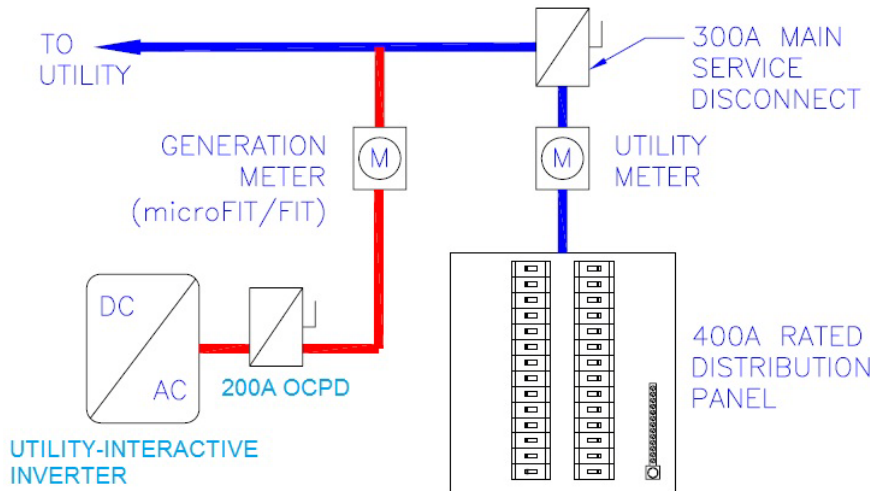
Where the distribution equipment such as a switchboard, panel board, or splitter is fed simultaneously from the utility (primary power supply) and one or more utility-interactive inverters, all the conditions outlined in Rule 64-112 need to be satisfied in order to have the output circuit of those inverters connected on the load side of the service box, otherwise the connection must be made on the supply side of the disconnecting means

(2) Point of connection

Rules 64-112(4)(c) & (d) permit that the sum of the ampere ratings of the overcurrent devices of source circuits feeding distribution equipment to exceed the busbar or conductor rating by a maximum of 125% in dwelling units and 120% in buildings other than dwelling units.

- Where the utility interactive inverter(s) output circuit **exceeds limits permitted in Rule 64-112(4)(c) & (d)**, it shall be connected on the supply side, as shown in Diagram B1.

Diagram B1 – Example of Connection of utility-interactive inverter output circuit on the supply side of main service disconnecting means, when inverter output overcurrent protection device (OCPD) rating exceeds limits permitted in Rule 64-112(4)

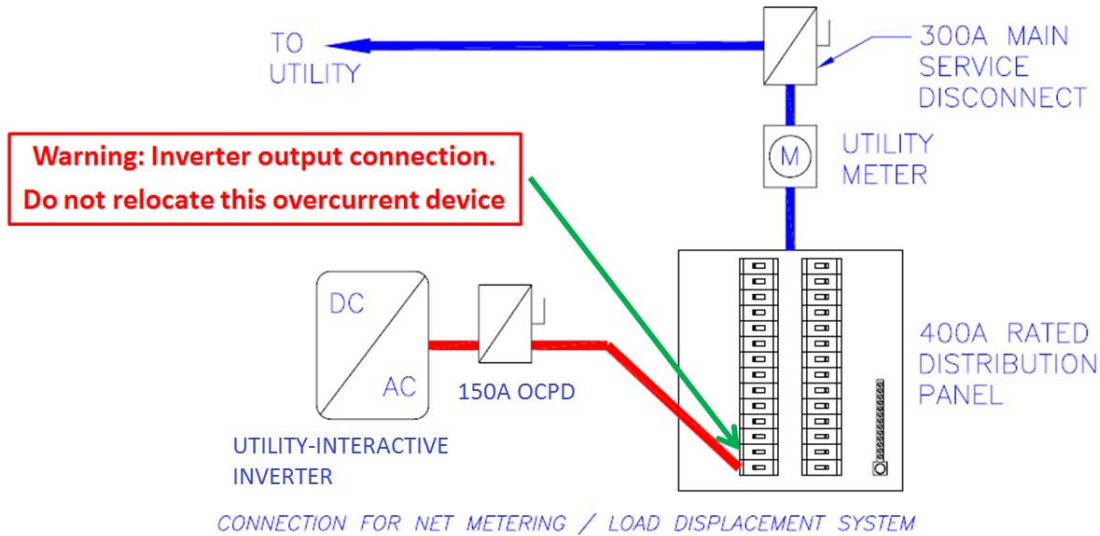


- Where the distribution equipment busbar is rated less than the sum of the ampere ratings of all OCPD supplying it, Rule 64-112(4)(b) requires the point of utility interactive inverter(s) output circuit to be at the opposite end from the main input feeder connection to the distribution equipment bus, as shown in the example illustrated by Diagram B2.

Note:

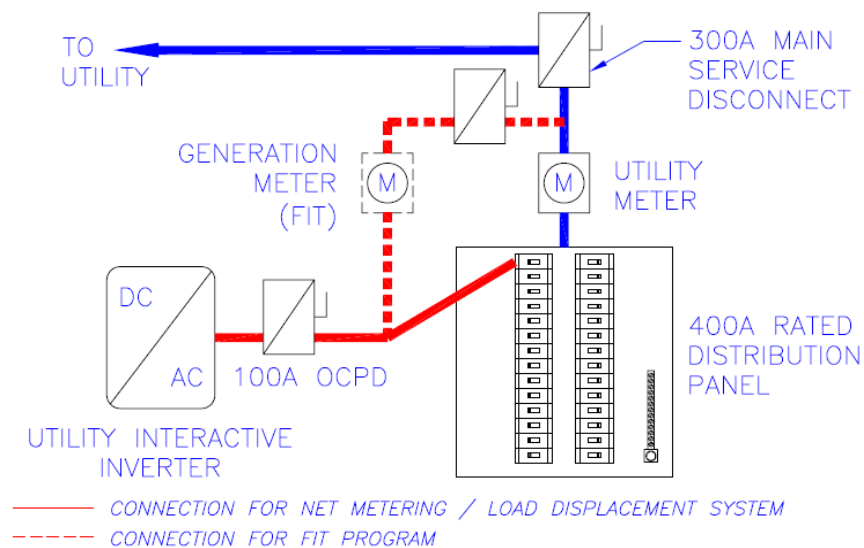
A warning shall be posted beside the OCPD to prevent relocating it on the bus, as shown on diagram B2 below.

Diagram B2 – Example of Connection of utility-interactive inverter output circuit on the load side of main service disconnecting means, when the sum of the OCPD supplying the bus is greater than the bus rating and within the limits permitted by Rules 64-112(4)(c) & (d)



- Where the sum of the ampere ratings of all OCPD supplying the bus is equal to or less than the bus rating, the connection can be made either on the supply side or load side of the service (with no restrictions on the location of inverter OCPD on the panelboard bus), as shown in Diagram B3

Diagram B3 – Example of Connection of utility-interactive inverter output circuit on the load side of main service disconnecting means, when the sum of the OCPD supplying the bus is equal to or less than the bus rating



(3) Existing ground fault protection on the main service

As per Rule 64-112(5), the point of connection on the load side of the main service shall be made on the line side of all ground fault protection devices unless:

- (a) There is ground fault protection for equipment from all ground fault current sources; and
- (b) Ground fault protection devices used with sources connected to the load side are identified and approved as suitable for back-feeding.

Note:

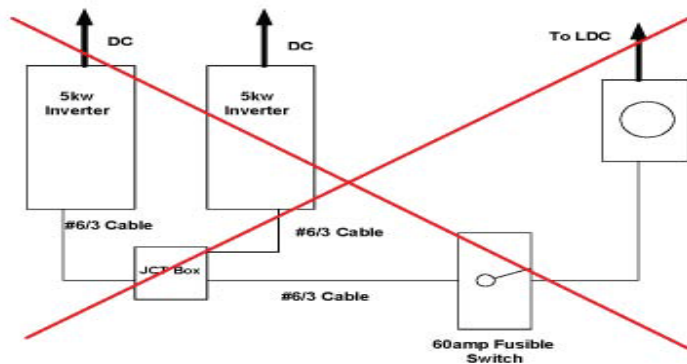
A circuit breaker with ground fault protection that is **not** suitable for back-feeding will have terminals **clearly marked “line” and “load”**.

(4) Disconnecting means and overcurrent protection for multiple inverters operating in parallel

Question 1

For an installation that incorporates two inverters tied to a common ac feeder, does a single disconnecting means on the ac common output satisfy Rules 64-060 and 84-020? (See Diagram B4)

Diagram B4 – Single disconnecting means for multiple inverters, unacceptable design



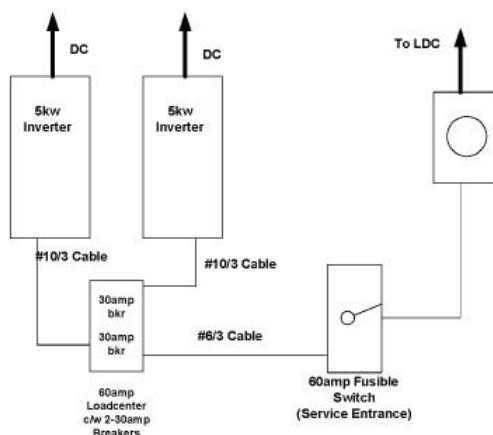
Answer 1

No

Rationale 1

The single disconnecting means satisfies Rule 84-022 for the supply authority disconnecting means; however Rules 84-020 and 64-060 require separate disconnecting means for each power production source (inverter). The separate disconnecting means are also required for compliance with Rule 14-414. Diagram B5 shows an example of a code compliant installation.

Diagram B5 – Separate disconnecting means for each inverter



Question 2

For an installation that incorporates two inverters tied to a common ac feeder, does each inverter output require a separate individual overcurrent device to be installed at the tap point, if the output conductors to each inverter are rated for the common feeder overcurrent rating (i.e. 60 A as per Diagram B4).

Answer 2

Yes

Rationale 2

Rules 64-102(b)(ii) and 64-112 require individual overcurrent protection to be provided for each inverter output as per Section 14 Rules. In addition, Rule 84-010 requires equipment and conductors that are energized from both directions to be provided with overcurrent protection from each source of supply. Although the larger tap conductors do not require overcurrent protection, the connected equipment (the inverter) does, in order to comply with the rule. The inverter manufacturer’s installation instructions shall also be followed and overcurrent protection shall also meet their requirements (Rule 2-034). Diagram B5 shows an example of a code compliant installation.

If the inverters have integral overcurrent protective / disconnecting devices, then external devices, referenced by Questions 1 and 2 are not required to be installed; however, the length of the conductors from the inverter to the point of common connection must then comply with Rule 14-100.

AC modules and micro-inverters that operate in a multiple ac module or micro-inverter system configuration are considered as one generation source. The requirement for a separate disconnecting means and overcurrent protection for each inverter, referenced by Questions 1 and 2, is not applicable. For the maximum number of ac modules or micro-inverters that are permitted to be connected to one branch circuit, manufacturer’s installation instructions shall be followed.