



Typical Components For the Ontario Power Authority's 10kW microFIT Feed-in Tariff Program for Solar Photovoltaic Installation

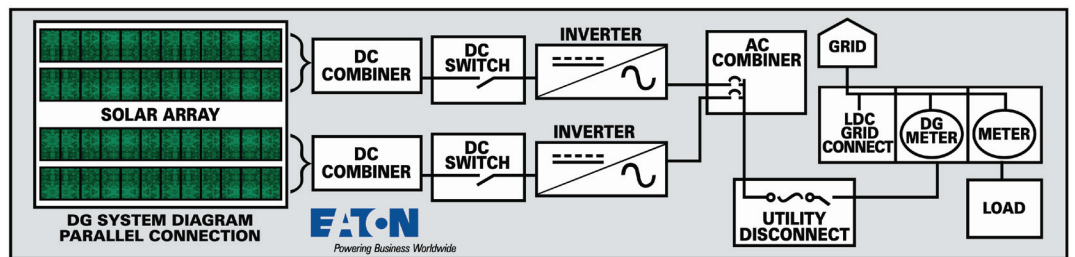
Eaton is a market leader in the manufacture of AC and DC electrical power distribution equipment and industrial control and automation products. Eaton has a large manufacturing presence in Ontario and

utilizes existing Ontario based facilities in Perth, Mississauga, Oshawa and Milton to assemble and supply Balance of System (BOS) electrical components and assemblies for solar PV installations from the smallest microFIT project through larger rooftop installations and multi-megawatt solar farms under the Ontario Power Authority's Feed-In Tariff (FIT) program.

As a home owner, farmer or small business owner in Ontario, you have the oppor-

tunity to develop a solar PV project of 10kW or less in size on your property. You will be paid a guaranteed rate for 20 years for all the electricity you produce through the microFIT program. Currently (2010) that rate is 80.2¢ / kWh for roof-top and 64.2¢ / kWh for ground-mounted. All installations are Grid Tied solar electric systems that are capable of feeding power to the grid (or utility company). This is in contrast to "off-grid" or "stand alone" systems that do not have this capability.

The diagram below represents a typical grid tied 10kW Solar PV system showing all of the components that are normally required.



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Solar Panels

A photovoltaic panel is a packaged interconnected assembly of photovoltaic cells, also known as solar cells. The photovoltaic module (solar panel) is then used as a component in a larger photovoltaic system to offer electricity for commercial and residential applications.

PV String: A set of 'Solar Panels' connected in series is known as a PV String.

PV Array: A PV Array is made up of a group of PV Strings. A single photovoltaic module can only produce a limited amount of power so many installations contain several strings of modules or panels and this is known as a photovoltaic array.

String Combiner

String Combiners, often referred to as source combiners, are located closest to the "strings" of solar panels. They are used in solar installations to combine the inputs from multiple strings of solar panels into one output circuit.

DC Disconnect Switch

A DC Disconnect Switch is required ahead of the inverter to isolate the load from the PV source. The DC switch is often shipped as part of the inverter but may also be sourced separately.

AC Panel(Loadcentre) When multiple inverters are used, there is a need to recombine the AC output into a single feed that can be connected to the utility meter through an AC Disconnect.

Utility Source Disconnect

The Electrical Safety Authority requires that a Service Entrance Disconnect be provided next to the utility meter.

Meter Socket

A utility grade meter socket is required for accurate measurement of the Solar PV power that is produced. Note: The type of socket required depends on the type of connection made with the utility. A parallel connection requires a dual meter socket. A direct connection requires a single socket for the PV Source. Refer to your local LDC for specific requirements.



OPA Recommended Connection Types for microFIT installations

There are three different connection configurations for microFIT Grid Tied installations; indirectly connected in series, indirectly connected in parallel and directly connected. On May 19th, 2010 the OPA issued a statement that a Series Connection is no longer allowed because Measurement Canada will not recognize or support the in-series metering configuration defined by Figure 2(b) of the microFIT Grid Connection Rules. This is primarily because there could be an unacceptable level of error that results when two meters are used to measure electricity consumed by a load customer.

Series Connection (Not Recommended)

The solar meter is connected into a load breaker in an existing panel. This method is also known as a "Behind the meter" connection since it is on the load side of the Utility Meter.

Parallel Connection

A Parallel connection is made in front of the utility meter. This type of connection utilizes a Dual Meter Socket that includes 2 sockets tied together on a common bus. The Incoming Utility Power is connected to the common line side bus from the 2 meter sockets. The Solar AC Disconnect Switch is

connected to the load side of the Solar Meter. The load side of the utility meter feeds into the home service.

Direct Connection A direct connection requires a single meter socket that is connected directly to the utility grid and does not interconnect with the existing building services. This

connection is normally made if the project is located at a significant distance from the existing load customer (e.g., the house) and is closer to the main distribution system.

Eaton offers all balance of system electrical products to meet your microFIT requirements.

Note: Some microFIT installations may only utilize a single inverter in which case, the AC Loadcentre may not be required. Also, the 2 circuit string combiner box referenced above may need to be expanded to accommodate 3 or 4 string inputs. Similarly, some applications may use 2 inverters in which case (2) string combiner boxes would be required or (1) dual output combiner.

Solar PV Balance of System Components -- Available from Eaton

String Combiners

SCC602NR	Compact 3R encl. 2 cct 30A max string fuse holders
SCC603NR	Compact 3R encl. 3 cct 30A max string fuse holders
SCC604NR	Compact 3R encl. 4 cct 30A max string fuse holders
SCCD604NR	Dual Output Combiner 3R encl. (2 x 2 circuit combiners in a single box.)

DC Disconnect Switches

DH161NRK	30A, 1pole 600VDC fusible, neutral, type 3R encl.
DH162NRK	60A, 1pole 600VDC fusible, neutral, type 3R encl.

AC Panel (Loadcentre)

RCCPL104	120/240VAC 1 phase, 3W panel, Type 3R – provision for 2 x 2 pole input breakers, outgoing terminals.
RCCPL108	120/240VAC 1 phase, 3W panel, Type 3R – provision for 8 poles of breakers, outgoing terminals
CCPL104	120/240VAC 1 phase, 3W panel, Type 1 - provision for (2) x 2 pole input breakers, outgoing terminals.
CCPL108	120/240VAC 1 phase, 3W panel, Type 1 indoor – provision for 8 poles of breakers, outgoing terminals
RCPM112	120/240VAC 1 phase, 3W panel, Type 3R – Main Breaker – prov'n for 12 poles of breakers

Utility Source Disconnect

CDG222NRB	60A, 2 pole 120/240VAC General Duty Safety Switch, Type 3R
12HD222NW	60A, 2 pole 120/240VAC Heavy Duty Safety Switch with Viewing Window, Type 3R

Meter Socket - Direct Connection

K1M-N	100A Single Socket for overhead OR Underground Services
LM2	200A Single Socket for overhead OR Underground Services, Mechanical Terminals
CLX	200A Single Socket for overhead OR Underground Services, Stud Type Connection

Dual Meter Socket - Parallel Connection

2KN1	Dual Socket - 200A main bus, 100A Sockets
2K2	Dual Socket - 200A main bus, 200A Sockets

microFIT Labels

LKMICRO	Kit - 5-DG SOURCE DISCONNECT,10-UTILITY INTERCONNECTED,5-DG SYSTEM DISCONNECT, 10-WARNING-TWO POWER SOURCES, 5-EA SINGLE LINES (incl. Direct/Parallel with1 or 2 inverters)
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Eaton’s microFIT Label Kit “LKMICRO” contains most of the labels required in a typical microFIT installation. The label requirements are shown in ESA bulletin ESA-SPEC-004 dated April 2010. Always contact ESA to ensure you are meeting the latest labeling requirements.

-DG Source Disconnect: Apply label to each DC Disconnect Device

-DG System Disconnect – Warning – Two Power Sources: Apply label to the Service Entrance rated Utility Disconnect.

-Single Line Diagram: Apply this label on or adjacent to the Utility Disconnect. Ensure that you apply the label that closely resembles all the related components of the interconnected system.

-Warning – Two Power Sources: Apply label on or adjacent to the electricity revenue meters.

-Utility Interconnected (not included): This label not supplied in the kit because it is required by code to already be factory installed on inverters (Grid-tied) that are approved as Utility Interconnected devices to CSA C22.2 No.107.

-System Rating (not included): A permanent label indicating the rated operating current and voltage; **rated open-circuit voltage; and rated short-circuit current** is also required but not provided in the label kit since it is not possible to predetermine this info on a pre-printed label.



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PowerChain Management solutions help enterprises achieve sustainable and competitive advantages through proactive management of the power system as a strategic, integrated asset throughout its life cycle. With Eaton's distribution, generation and power quality equipment; full-scale engineering services; and information management systems, the power system is positioned to deliver powerful results: greater reliability, operating cost efficiencies, effective use of capital, enhanced safety, and risk mitigation.

