

# SERVICE AND APPLICATION NOTES

February 15, 2013  
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## Enphase M215 Single- or Three-Phase Microinverter

### Residential Application — M215 Single-Phase Inverter

New for 2013, the SunSource® Home Energy System has been upgraded from the Enphase M190 to the M215 microinverter. This document summarizes some of the key features and differences.

#### AFFECTED MODELS

Lennox revised the nameplate information on the Dave Lennox *Signature*® Collection (DLSC) outdoor units to show the higher amperage. This change was implemented to the following models:

Model Numbers
XC17-XX-230-08 and later (ALL SIZES)
XP17-XX-230-08 and later (ALL SIZES)
XP17N-XX-230-02 and later (ALL SIZES)
XC21-24-230-09 and later
XC21-36-230-09 and later
XC21-48-230-09 and later
XC21-60-230-10 and later
XP21-24-230-06 and later
XP21-36-230-05 and later
XP21-48-230-05 and later
XP21-60-230-05 and later
XP21N-XX-230-02 and later (ALL SIZES)

The above model nameplates now show 15A as the maximum allowable solar source circuit whereas it used to be 12A.

The wiring system is new and now includes Engage trunk cable (see figure 1 on page 2). The new Enphase M215 microinverter has a single AC cable with plug to attach to receptacles on the Engage cable. The new string limit is 17 solar modules with microinverters as compared to the M190 which was limited to fifteen. The output amperage rating is also slightly higher. The rating was increased on the new solar sub-panel (part number 605324-02 / catalog number 62E02) from 12A up to 15A. The sub-panel now utilizes a 20A circuit breaker to protect the solar source conductors.

The previous version solar sub-panel and DLSC outdoor units (earlier dash numbers) can be used with the new M215 system (see table 2 on page 2). Be careful to stay within the previous 12A solar source circuit limit. This means limiting the number of solar modules/microinverters, as indicated in table 2.

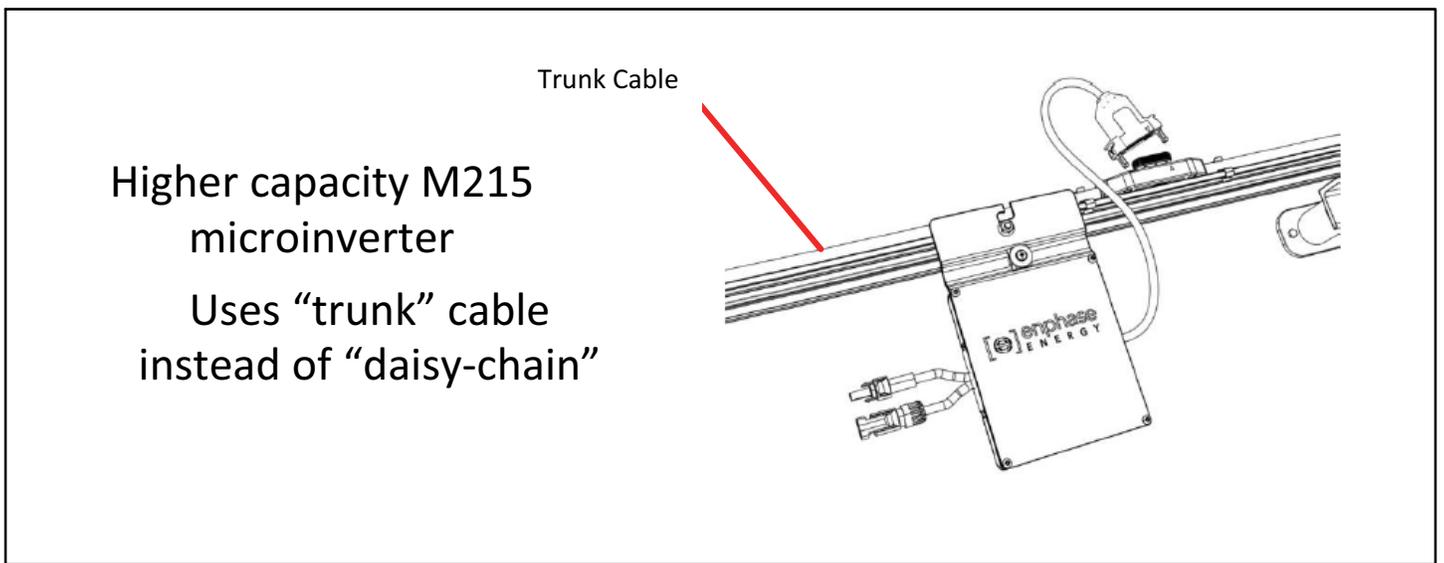
TABLE 1

OUTPUT DATA (AC)	@240VAC
Maximum Output Power	215W
Nominal Output Power	0.9A (arms at nominal duration)
Nominal Voltage / Range	240V/211-264V
Nominal Frequency / Range	60.0/59.3-60.5 Hz
Extended Frequency Range	60.0/59.2-60.6 Hz
Power Factor	>0.95
Maximum Units per 20 amp Branch Circuit	17 (single-phase)



**TABLE 2**

Outdoor Units	Microinverter	Maximum Number of 190W Modules	Microinverter	Maximum Number of 260W Modules
<b>2012 and Older Models</b>				
XC17-XX-230-01 through -07 (ALL SIZES)	M190	15	M215	13
XP17-XX-230-01 through -07 (ALL SIZES)				
XP17N-XX-230-01 (ALL SIZES)				
XC21-24-230-01 through -08	M190	15	M215	13
XC21-36-230-01 through -08				
XC21-48-230-01 through -08				
XC21-60-230-01 through -09	M190	15	M215	13
XP21-24-230-01 through -05				
XP21-36-230-01 through -04				
XP21-48-230-01 through -04				
XP21-60-230-01 through -04				
XP21N-XX-230-01 and later (ALL SIZES)			M215	17
<b>2013 Models</b>				
XC17-XX-230-08 and later (ALL SIZES)			M215	17
XP17-XX-230-08 and later (ALL SIZES)				
XP17N-XX-230-02 and later (ALL SIZES)				
XC21-24-230-09 and later			M215	17
XC21-36-230-09 and later				
XC21-48-230-09 and later				
XC21-60-230-10 and later			M215	17
XP21-24-230-06 and later				
XP21-36-230-05 and later				
XP21-48-230-05 and later			M215	17
XP21-60-230-05 and later			M215	17
XP21N-XX-230-02 and later (ALL SIZES)			M215	17



**FIGURE 1**

## Commercial Application — M215 Single- or Three-Phase Inverter

Also new for 2013, the SunSource® Commercial Energy System has been upgraded from the Enphase M190 to the M215 microinverter. This document summarizes some of the key features and differences. The previous M190 microinverter came in single- and three-phase versions. The new M215 microinverter will work with single or three phase, however the Engage trunk cable must be properly selected for either single-phase or three-phase application. The Engage trunk cable also comes with two different receptacle spacings; one for landscape solar module orientation and the other for portrait orientation.

Since most commercial applications will be for flat-roof installation and three-phase wiring, the most common Engage cable in commercial applications will be the three-phase version with the connectors spaced for landscape solar module orientation. (The UniRac RapidRac G10 flat roof ballasted mounting system has the solar modules mounted in landscape orientation.)

For three-phase operation, the M215 can operate with up to 25 solar modules in a string whereas the three-phase M190 was limited to 21. The output amperage rating of the M215 microinverter is also slightly higher than the M190. Lennox increased the rating on the Emergence Solar Disconnect option for 208 volt units from 12A up to 15A. (On 460 volt units the current rating was increased from 6A to 8A. 460 volt systems must use a transformer to interface the solar power system which only operates as a 208V WYE system\*. Lennox also updated the nameplate information and the F54 fuse sizes on Emergence units with the solar disconnect option. 208V units now use 20 A and 460V use 10A F54 fuses. These changes were implemented as of March 8<sup>th</sup> 2013 production.

**TABLE 3**

<b>OUTPUT DATA (AC)</b>	<b>@208VAC</b>
Maximum Output Power	215W
Nominal Output Power	1.0A (arms at nominal duration)
Nominal Voltage / Range	208V/183-229V
Nominal Frequency / Range	60.0/59.3-60.5 Hz
Extended Frequency Range	60.0/59.2-60.6 Hz
Power Factor	>0.95
Maximum Units per 20 amp Branch Circuit	25 (three-phase)

It is acceptable to use the new M215 system with older Emergence units equipped with the solar disconnect option. The important limitation is to reduce the maximum number of solar modules/microinverters in the string to 20. This will keep the solar source circuit at 12A or less. (This is determined as:  $12A/15A * 25$  inverters = 20 inverters.)

Lennox had 4 kVA transformers set up for the M190 system. New 5 kVA transformers were set up for the new, higher power M215 system. See the SunSource® Commercial Energy System Product Specifications for the new transformer catalog numbers.

*\*Additional note about transformers: Remember that the solar source circuit is 208V WYE only. If connecting to a 240V Delta system, there is a transformer for that situation as well.*

## Technical Brief: Wiring Solar World modules to Andalay Modules

In case a customer chooses to add more solar panels to their existing array, a few special considerations and limiting factors need to be taken into account. The original Andalay system uses Enphase M190 microinverters operating at a peak .8A each. Its AC cabling system uses 14 AWG wire, limiting its max current to 12A after de-rate factors are considered. The new M215 microinverters, operating at a peak .9A, use a larger 12 AWG wire limiting its max current to about 15A. If the customer wants to splice in new panels, they will need to limit the max current to the lower ampacity 12A.

Using the following equation, a contractor can calculate the maximum number of inverters that can be added to a string. **x** represents M190s and “**y**” represents M215 inverters

$$.8x + .9y = 12$$

Solving for “y,” the number of M215s

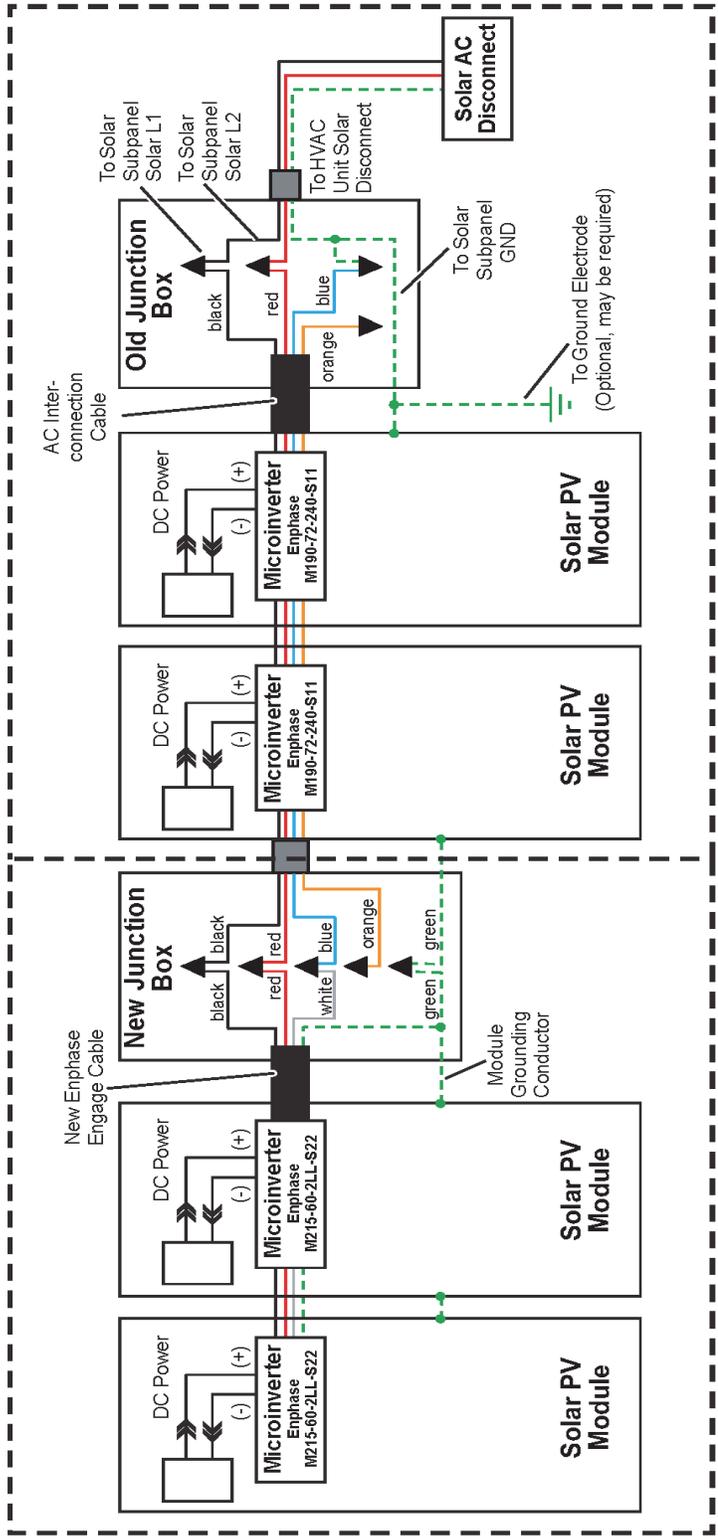
$$\frac{12 - .8x}{.9} = y$$

Or use table 4 to look up the maximum number of M215 inverters that may be added.

**TABLE 4**

Inverter Pairs			
Number of M190s	Number of M215's	Total Number of Inverters	Total Max Amps Output
1	12	13	11.6
2	11	13	11.5
3	10	13	11.4
4	9	13	11.3
5	8	13	11.2
6	8	14	12.0
7	7	14	11.9
8	6	14	11.8
9	5	14	11.7
10	4	14	11.6
11	3	14	11.5
12	2	14	11.4
13	1	14	11.3
14	0	14	11.2
15	0	15	12.0

# System Schematic (Showing M190 Microinverter System with Addition of Modules using M215 Microinverter) Retrofit - Wiring



Existing

New Addition

Inverter Wire Colors		
M190 Wire Color	M215 Wire Color	Function
Black	Black	L1
Red	Red	L2
Orange	-	Unused
Blue	White	Neutral
-	Green	Ground

FIGURE 2