

Xcel Energy – Telemetry Requirements for Distributed Energy Resource Interconnections:

Revision 3.1

Version 3.1: September 22, 2017. Please note that this Revision 3.1 may be subject to subsequent revisions. Even if possible future changes might even be minor, they could have a material impact for an individual customer. Please check with Xcel Energy for the current status of this Revision 3.1 before proceeding with your project which may be relying on this Revision 3.1.

Communications Details:

Xcel Energy requires that the Customer run Ethernet from their site LAN to the communications enclosure for network connectivity from enclosure to every meter on site. Customer will provide all wiring, connectors, switches, panels and any other hardware to meet the requirement. Any failure of equipment downstream of the communications panel is the Customer's responsibility to fix within an expeditious time frame. Communications to all Xcel Energy meters on site is required.

NOTE: This network requirement is solely for the Local Area Network from Enclosure to Meter and has no requirement for an Internet connection from an Internet Service Provider. The customer has no obligation to provide internet service. All telemetry is run through Xcel Energy's enclosure.

Communications Enclosure Mounting Details:

- The Customer shall provide a location to mount the enclosure. The enclosure is approximately 20"x20"x12" with Unistrut mounts across the top and bottom. The enclosure weighs approximately 100 lbs.
- The enclosures are built to a NEMA 4 standard and work done on the enclosure during installation must adhere to NEMA 4 standards.
- The enclosure should be mounted such that the bottom of the cabinet is between 2'-4' off the ground.
- The install location is preferred to be on a stand-alone pedestal, but can be along the side of a building as long as it does not cause cellular interference. There must also be a location to install an AC disconnect near the enclosure mount location.

- The disconnect is a Square D Safety Switch, model H221NRB and must be mounted near the communications enclosure. Customer must provide a suitable place to mount within 6' of the enclosure location.
- This safety switch must be used as designed. It should be placed in series with the enclosure and fused.
- The safety switch must only supply power to the Xcel communication cabinet and cannot be tapped to supply power to Customer owned equipment.
- The enclosure and disconnect will be retrieved from the Xcel Energy Chestnut Service Center, located at 1617 Chestnut Ave N, Minneapolis 55403.
- It is the customer's responsibility to mount the enclosure and the disconnect switch as well as connect the AC power to the disconnect, run power from the disconnect to the enclosure following the guidelines in this document along with other materials provided from Xcel Energy.

Power Source Details:

120VAC, 15A circuit, #10 CU minimum, to be provided from Customer's panel

- To be connected to Xcel Energy provided fused-disconnect switch.
 - The disconnect will be provided along with the enclosure for customer installation at the site.
 - 20A fuses are required and must be provided by the Customer.
- The circuit must be run in conduit from the power source into the bottom of the fused-disconnect in its final mounting location and in conduit from the disconnect to the enclosure following applicable NEC standards.
- The conduit carrying the power cables must be connected at the bottom of the enclosure on the lower left side directly below the Panduit/AC breakers, labeled "120VAC INPUT".
 - The customer is required to drill a hole based on their conduit size to pass through the power cables and properly land and terminate the conduit with a weathertight seal meeting NEMA 4 Standards.
 - Holes must be drilled in the pre-defined location on the enclosure

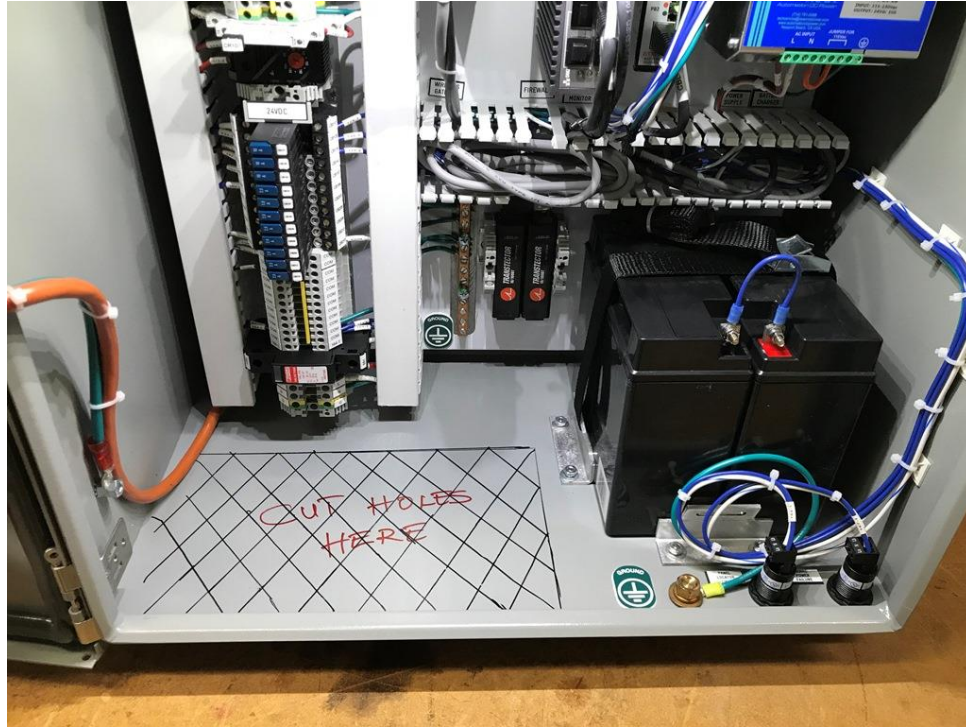


Image 1. The area on the inside of the cabinet where the Customer can drill holes to attach conduit terminations for power and communication.



Image 2. The area on the outside of the cabinet where the Customer can drill holes to attach conduit terminations for power and communication.

- Inside the cabinet are pre-labeled terminal blocks for Hot, Ground and Neutral. AC wiring must be connected to these terminals. Tampering with, cutting or removal of any equipment is prohibited and may result in the full replacement of the enclosure, at Customer's expense.

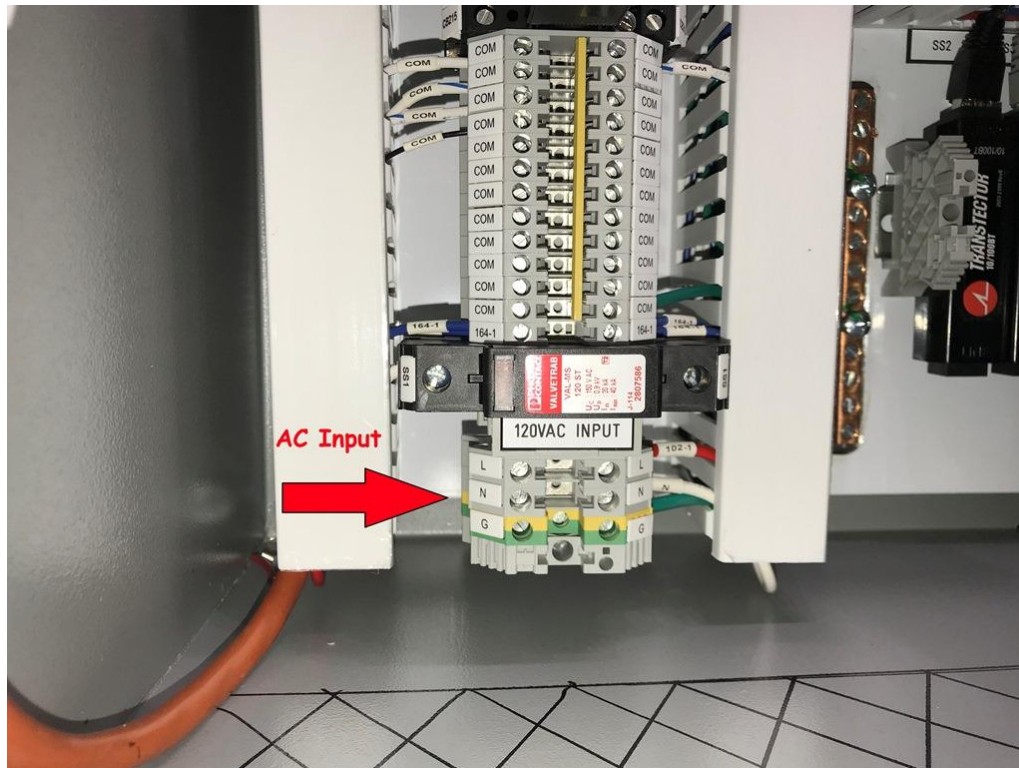


Image 3. The location to terminate the input power conductor by the Customer

Ethernet Requirements to Enclosure:

Requirements: - Industrial / Ruggedized Cable, RJ45, minimum of Cat5e, shielded, in conduit from meter location to communication enclosure

- One Ethernet cable per meter; to be connected between the meter and the Xcel Energy owned enclosure.
 - For single sites (two total meters), the Customer may run both cables individually to the enclosure, in conduit, secured to the bottom of the enclosure in conduit, adhering to NEMA 4 standards and connected to pre-labeled terminals.
 - For co-located sites with more than two meters, the Customer must use an Ethernet Switch to provide a single cable connection to the communications panel as the enclosure cannot accept more than two Ethernet cables.
 - Maximum recommended distance for Cat5e cable is 100 meters (328 feet.)

- For sites with distances greater than 100m between meter and communications panel, Fiber is recommended to connect all meters to a central location, where the Customer must convert to Ethernet for the run to Xcel Energy's telemetry enclosure.
- The customer must supply the Cat5e with an RJ45 female connector into each meter socket, with the other end connected to their LAN (eventually connecting to the communication cabinet). The connector must be tested and confirmed to be working prior to the witness test date.
- Ethernet connection is similar to the AC requirements. Customer must cut a hole in the bottom left of the enclosure and securely connect their conduit following NEMA 4 standards. The Ethernet cable must be landed on the pre-labeled terminal inside the enclosure. Any tampering with, cutting or removal of cables or equipment inside the enclosure may warrant full replacement at Customer's expense.

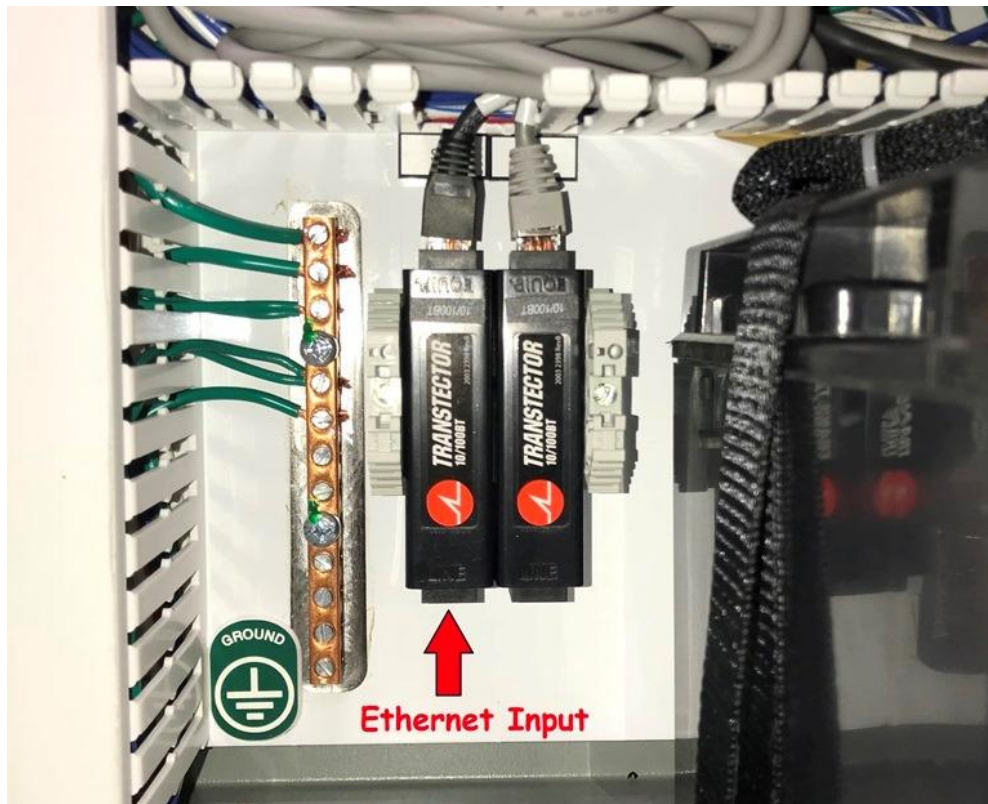



Image 4. The termination location for the Customer provided Cat5e connecting the meters from outside the cabinet to the communication equipment internal

Additional Details:

- The customer is also permitted to communicate with the site meters. This is available via Modbus with either RS-485 or RS-232 connectors. The cable for this connection will be provided by Xcel Energy with each Ion meter. For RS232, there is a standard 9-pin cable. For RS485, it is open wire, Data +, Data -, and shield wire, and must be wired by the customer. Communications settings for this connection can be specified by the customer. By default, the settings are: RS485, Com1, 9600, 8N1. Please work with Meter Engineering to change settings as needed. A table of the port listing and color coding can be seen below:

 COM breakout cable	Port connection	Wire or connector	Connect to
	COM1 (RS-232) ¹	DB9 connector (from breakout cable)	computer RS-232 serial port
	COM1 (RS-485) ²	White wire (from breakout cable)	RS-485 Data +
		Black wire (from breakout cable)	RS-485 Data -
	RS-485 common shield	Bare wire (from breakout cable)	RS-485 shield (COM1 and COM4)
	COM4 (RS-485)	Red wire (from breakout cable)	RS-485 Data +
		Black wire (from breakout cable)	RS-485 Data -