

ENERGY MANAGEMENT SYSTEM CONNECTIVITY

INTRODUCTION

The cost of electricity can be anywhere from 10 to 30 percent of an industrial or commercial customer's total operating cost and energy prices are increasing annually. Due to these rising costs, energy users are being forced to identify and implement methods of energy conservation throughout their plants or commercial facilities.

Many facility managers have recognized the need for automated building management systems. These systems allow for monitoring and control of the facility lighting,

heating equipment, air conditioning equipment, and electrical loads. *Remember: if you cannot measure it, you cannot manage it.*

COMMUNICATION

A communication protocol is how data is electronically transmitted. Specifically, how is the data packaged. An open protocol is a communication code available to anyone. Conversely, a proprietary (or closed) protocol is a communication protocol developed by a company and is not available to programmers outside that company.

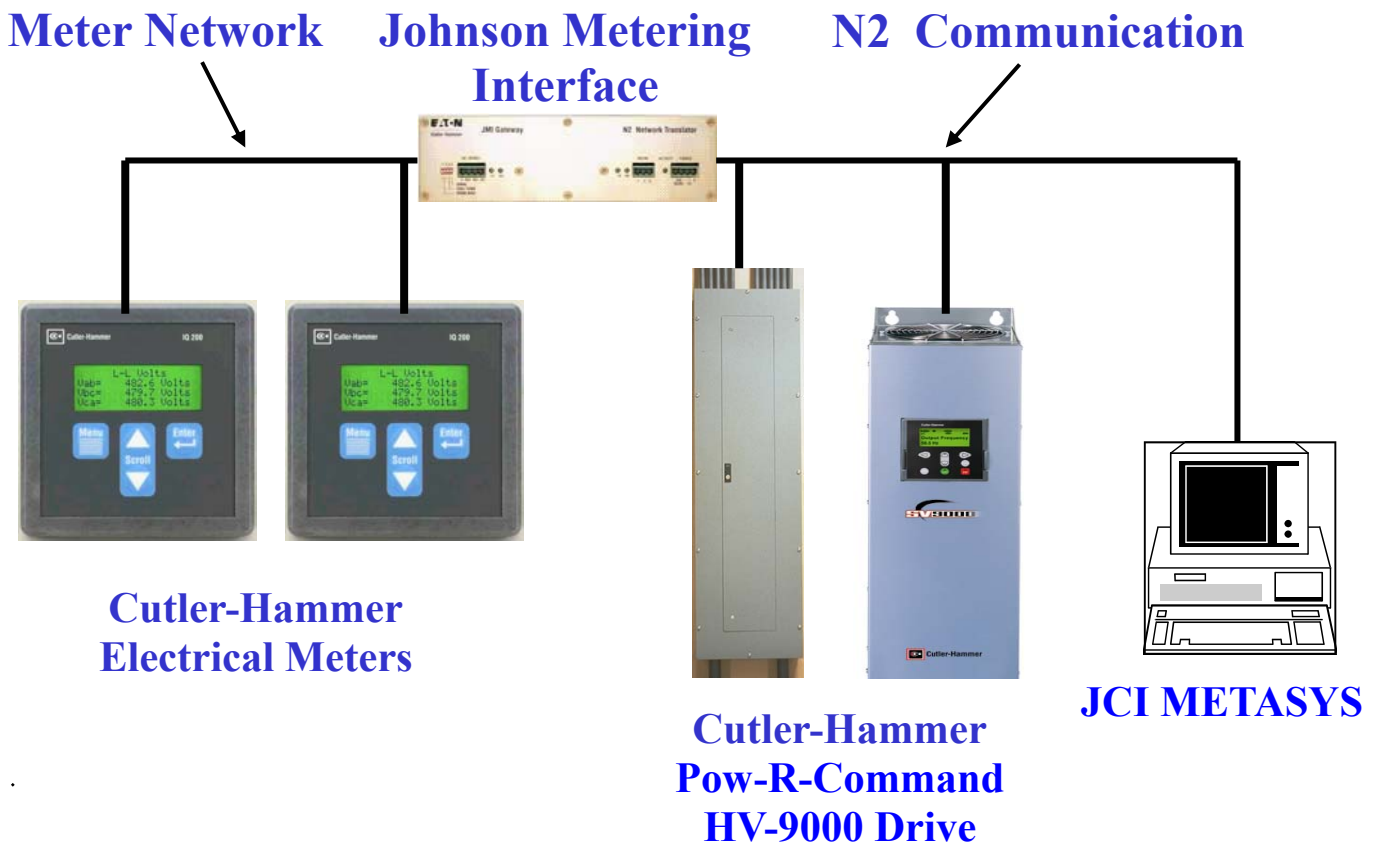


FIGURE 1 - Cutler-Hammer System Communicating on Johnson Controls Metasys Bus

Cutler-Hammer Offers Direct Communication Capability with Johnson Controls Metasys

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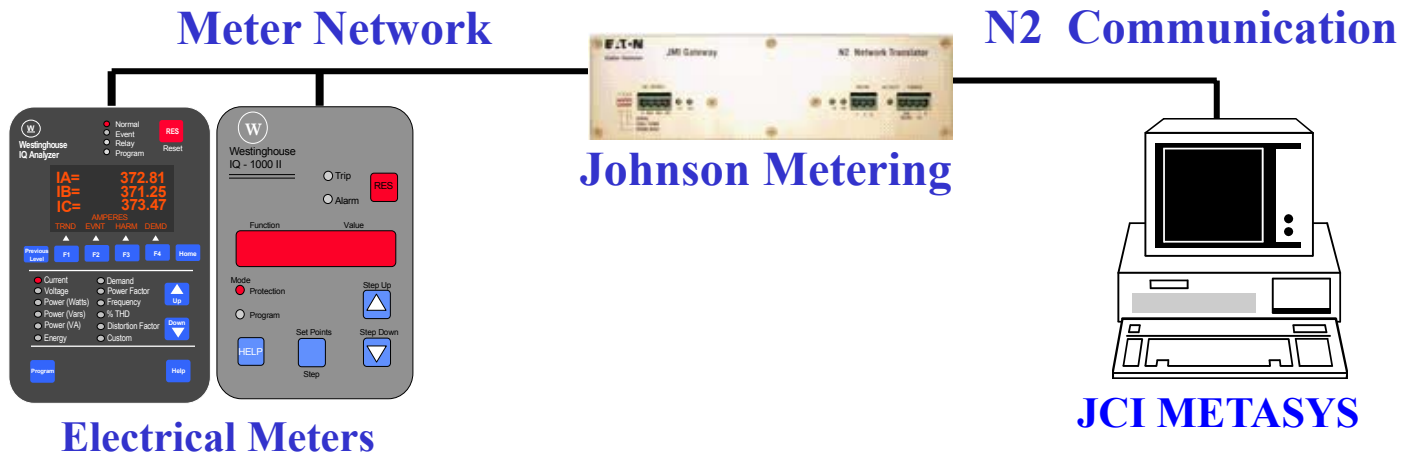


FIGURE 2 - Johnson Metering Interface

Several commonly used open protocol platforms are Ethernet TCP-IP, Devicenet, Modbus RS-232, and Modbus RS-485. These communication protocols are widely accepted throughout industry.

Cutler-Hammer offers several open communication gateways for integrating meters, lighting panels, variable frequency drives, and electronic breaker modules into a facility management system. The Cutler-Hammer devices are networked using a twisted pair of wires.

Traditionally, communication between Metasys and non-Johnson Controls devices (such as electrical meters, drives and lighting panels) requires two data conversions.

Specifically, a communication gateway is inserted into the network to convert the non-Johnson Controls device data into a more commonly used, open protocol such as Ethernet, Devicenet, Modbus RS-232, or Modbus RS-485. This data, now in an open protocol, must be converted to the Johnson Controls N2 communication protocol using a second gateway.

JOHNSON CONTROLS

Cutler-Hammer and Johnson Controls have developed a direct communication capability between the Johnson Controls Metasys system and Cutler-Hammer meters, lighting panels, and variable frequency drives. This capability seamlessly integrates electrical devices into the energy management system.

This includes all Cutler-Hammer's IQ devices (including transfer switches), HV-9000 drives, and lighting control

panels with solenoid operated breakers.

Therefore, all of your facility electrical monitoring and control can be performed through one central system.

JOHNSON METERING INTERFACE

Figure 1 shows several Cutler-Hammer devices communicating directly on the Johnson Control N2 communication bus. The N2 communication capability eliminates the need for gateways when connecting to a Metasys system. Each device is uniquely addressed and is recognized as a Metasys device.

Figure 2 shows a low voltage electrical distribution metering system communicating to a Metasys system using the **Johnson Metering Interface (JMI)**. The Cutler-Hammer electronic breaker trip units and IQ Analyzer units communicate using the Impacc communication protocol. Impacc communication has the advantage of highly reliable data transmission unsusceptible to electrical interference. Electrical interference is a major issue within electrical switchgear. Up to 64 Cutler-Hammer IQ devices can be connected through a single JMI.

The JMI allows for electrical meters to communicate with the Metasys using only one data conversion. This communication scheme provides a highly reliable system that is monitored and controlled from a single energy management system.

The JMI offers the advantage of the facility management personnel needing to learn and operate only one energy

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management system. This reduces training costs, system maintenance costs, and future system upgrade costs.

The JMI is an exclusive Cutler-Hammer Offering.

LIGHTING CONTROL

The Pow-R-Command Panelboard is offered from 100 through 400 Amps. Available voltages are 120/240, 208Y/120, and 480Y/277 single phase and three phase. The panel utilizes solenoid operated thermal magnetic breakers for control of lighting loads.

The Pow-R-Command panel, shown in **Figure 3**, houses up to 42 solenoid operated breakers and includes a 200% rated neutral. The installation uses the same branch wiring

Pow-R Command 75.

The **JCI15** is a basic lighting control panel with solenoid operated breakers and no "smarts" (meaning no scheduling or zone grouping capability). Rather, the scheduling, grouping of zones, and all on/off commands originate from the Metasys system.

The advantage of this lighting control panel is low cost. This panel is ideally applied where the speed of an on/off command is not critical. For example, corridor lighting that is commanded on once per day is a good application for the JCI15. Typically, this lighting is controlled from a morning purge cycle time schedule resident in the Metasys.

The **Pow-R-Command 75** controls the lighting using solenoid operated breakers similar to the JCI15 and communicated directly over the Metasys N2 bus. The difference is the Pow-R-Command 75 includes "smarts" giving the panel stand-alone scheduling and grouping capability.

The advantage of N2 communication is the Pow-R-Command 75 is programmed and monitored by the Metasys energy management system. Therefore, a separate lighting control system is not needed at the facility.

Because the commands originate within the panel, speed is not compromised. For example, lighting controlled by an ultra-sonic occupancy sensor will immediately energize the associated zone lights.

In contrast if a JCI15 panel is used in this application, the Metasys the occupancy sensor transmits a signal to the Metasys, the Metasys interprets the signal, and sends a command to the JCI15 panel to turn lights on. In larger systems, this volley of communications may take up to 1 second before the lights are turned on. Having the "smarts" resident within the panel eliminates this issue while still maintaining central control

U.L. listings include:

- UL 916 - Energy Management Equipment
- UL 67 - Panelboards
- UI 50 - Enclosures

The direct communication of lighting panels over the Metasys N2 bus is a Cutler-Hammer exclusive.

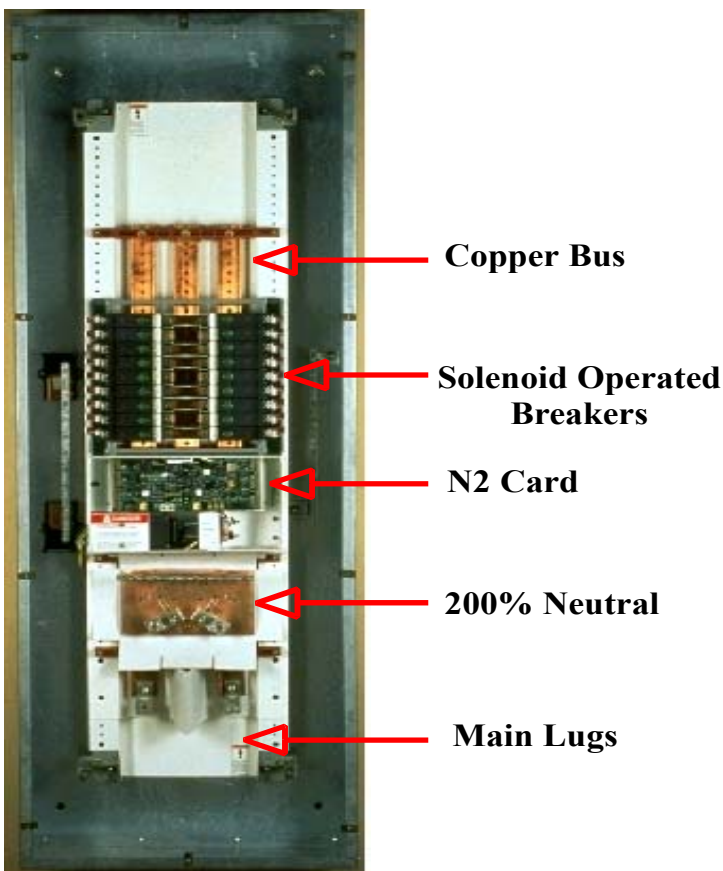


FIGURE 3 - Pow-R Command Lighting Panel

methods as traditional panelboards making field installation easier.

Two lighting control panels are available with Johnson Controls Metasys N2 communication: **JCI15** and the

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VARIABLE FREQUENCY DRIVES

Using direct N2 communication, the Cutler-Hammer HV-9000 is monitored, programmed, and can be remotely controlled from a Metasys system.

The HV-9000, as shown in **Figure 4**, is specifically engineered for HVAC, pump and fluid control applications. Specific applications include variable air volume fan systems, PI control, cooling towers, and primary/secondary loop pumping.

Protective features included with each HV-9000 are:

- Over Current Trip - 400% of rated current
- Overvoltage Trip
- Undervoltage Trip
- Ground Fault
- Input/Output Phase Rotation Protection
- Motor Overload, Stall, Underload
- Drive Over Temperature

Cutler-Hammer offers programming software for the drive at no additional cost. The software is downloadable from the Cutler-Hammer Website and provides Windows based configuration of the drive.

The following values are displayed on the control panel and are exchanged to the building management system.

- Motor Current
- Motor Torque
- Motor Voltage
- Output Speed
- Output Frequency
- Operating Hours (resettable)
- Megawatt Hours (resettable)
- Voltage Input
- Current Input

The local display is an easy to read graphic control panel.

All parameter can be locally set and displayed.

Cutler-Hammer has developed an integrated bypass for the HV-9000 known as the **Durapass**. This modular approach saves space, equipment costs, and installation costs.

Cutler-Hammer has several HV-9000 drives with direct Metasys N2 communication installed at Miller Park, home of the Milwaukee Brewers.

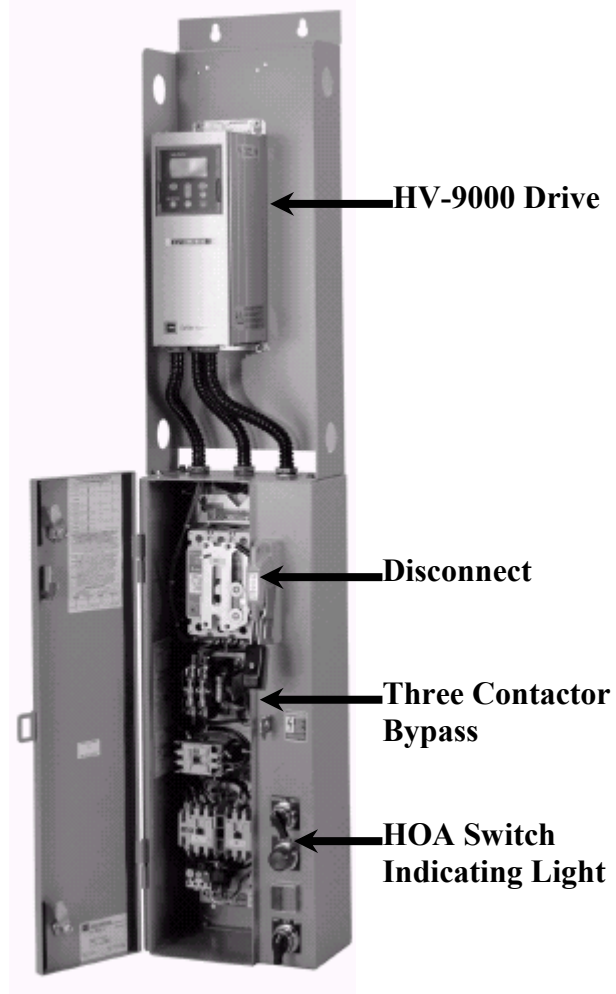


FIGURE 4 - HV-9000 with Durapass