



## GE Power Management Control System



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### Technical Note #10

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### Ethernet Offering -- Answers to Frequently Asked Questions

**Subject:** Questions and Answers on the Ethernet Offering

**Applies To:** PMCS Ethernet Offering

#### **Question :** When do I specify a Modbus System as opposed to the Ethernet System?

Answer : The choice is customer dependent.

Specify the PMCS Ethernet system if all the conditions below are met.

- Customer has a Local Area Network (LAN) running through their facility
- Customer is willing to use the LAN for the PMCS system
- Customer really does not want to pull RS485 cable to connect the PMCS system
- Customer has an active MIS organization administering the LAN system.
- Customer is willing to install and pay for additional LAN cable and components if needed

The key benefit of the PMCS Ethernet system is that the customer does not have to pull cable through out their facility. The existing LAN infrastructure connects the various PMCS substations together with the office areas. Ethernet cables have been shown to be less susceptible to electrical noise, EMI etc.

Offer the Modbus system if the Customer is willing to pull cable or is using the PMCS system in a very local area of operation.

#### **Question :** What exactly is the PMCS Ethernet System? How does it differ from the PMCS Modbus System?

Answer : The Modbus system permits the user to connect the server computer with all Native RS-485 devices and the Modbus Concentrator. The Modbus Concentrator connects all the Commnet devices together under certain configuration rules. From a hierarchy standpoint, the Modbus is a 2-tier network, with Modbus on top and comment at the bottom.

Ethernet is an additional tier on top on the Modbus system for the PMCS Ethernet system. All Native Modbus lines connect to a device called the Ethernet Gateway. Each Ethernet Gateway permits connection of four different Modbus lines. The Ethernet line is the only output from the Gateway. The PMCS 5.0 system allows a maximum of 8 gateways per system (32 different RS485 segments).

**Question : I do not know much about Ethernet. Do I need to learn a lot about Ethernet, LANs to sell a PMCS system ?**

Answer : No. GE-ED&Cs responsibility will end at the gateway. Customer's with Ethernet installations typically will have LAN administration personnel who are responsible for the LAN. The customer's LAN administration will also decide the appropriate connection means.

**Question : I am confused about Baud Rates and speeds of devices. Are there special Baud Rates necessary for Ethernet ? How do I know whether "our" Ethernet is compatible with what ever the customer has ?**

Answer : For each native Modbus devices, baud rates remain the same. For example a Modbus concentrator can communicate at 19200 Baud(19200 Bits/second) while a Multilin 269 would communicate at 2400 Baud. Each RS485 segment would need to communicate at the same baud rate. Each of the four RS-485 segments connected to the Gateway. This is a Gateway configuration item.

For Ethernet, the standard calls for 10 Mhz (10 Million Bits per second). There are several Ethernet media possible. The PMCS Ethernet Gateways support two of them.

- 10 Base T - Twisted Pair Ethernet for 10 MHz Ethernet
- 10 Base 2 - CoAx Ethernet for 10 MHz Ethernet (similar to cables for Cable TV)

There are several different Ethernet protocols available in the industry. The Ethernet Gateways support the TCP/IP protocol.

**Question : Can you walk me through a typical site installation with the PMCS Ethernet System ?**

Answer : We will describe the installation process for a typical site. In this factory, the customer had a fiber LAN Backbone running through out the facility. There were three substations scattered through out the facility. The substations were not connected together with any communication means prior to our visit.

For the PMCS Ethernet implementation, we mounted a Gateway and Concentrator at each substation. The customers' MIS people located the fiber-optic drop point nearest to each substation. At each drop of point, the customer's systems people mounted translator boxes called "routers". This allowed a 10 MHZ TCP/IP Ethernet connect to the Fiber Backbone. The customer then ran Ethernet 10 Base T cable between the Router and the Ethernet Gateway. This connected the substations to the Factory Backbone. We repeated the same process (hubs/routers) to connect the customer's computer to the fiber backbone. This computer had an Ethernet Card. The computer also got connected to the backbone through another "router".

The Customer's MIS people defined the specific IP, subnet, router and other addresses or configurations for the whole system to work. These were entered at each gateway and the PMCS computer for the system to operate correctly.

Notice that GE did not supply or install any of the LAN components. This was installed and paid for by the customer as part of the LAN upgrade. The following diagram shows the installation details.

**Question : You have mentioned several terms - Routers, Repeaters, Hubs in addition to the Gateways. Where are these mounted and does this have to be in the requisition**

Answer : This is again why the IM/Systems people from the customer need to be part of the selling process. ED&C's part of the sale should stop at the Ethernet Gateway. The systems people from the customer should purchase, install the other components. The Gateway is most likely to be mounted in a "Telco" closet as opposed to the Switchgear. The specifics of how a specific customer Ethernet system will be configured is managed and controlled by the customer's systems people.

**Question : The customer has a IM/Systems group, but, he still wants to install a separate PMCS Ethernet LAN system for the PMCS 5.0 system. Should I pursue this opportunity. The Customer is willing to let us include this in the price.**

Answer : Offer the Modbus system instead. If the Customer still wants the Ethernet system, bring in a systems integrator with total responsibility for the Ethernet part of the PMCS. Make sure that the customer understands GE is not responsible for the maintenance and upgrade of the PMCS Ethernet LAN.

**Question : How does the Ethernet system hold up when the facility is reconfigured ?**

Answer : This is a strong suite of the Ethernet system. By the very nature of connecting to a LAN, the Ethernet system is very reconfigurable. The server computer could be moved from one room in the building to another and connected to the LAN receptacle in that room and be operational in minutes. No rewiring is required as long as the entire facility is LAN compatible. Adding devices, new substations are similarly quite easy.

**Question : We have been told about the enhanced performance of PMCS. How does Modbus compare with Ethernet.**

Answer : Our lab tests indicates both systems are comparable. The Ethernet system, by virtue of 8 Gateways or 32 RS485 segments allows for greater flexibility in separating slower devices from faster devices.

**Caution** : Ethernet system performance is dependent on how busy the LAN infrastructure is. If the utilization of the network is very high (>50%), Ethernet system response will be poor. This can be easily determined by tools such as LAN Analyzer.

The Ethernet System allows for a maximum of 32 RS485 segments. By careful connection of the slower devices together and the faster devices together, one could maximize the throughput in a large system.

**Question : I understand IP in TCP/IP stands for the Internet protocol. Is there any concern that some hacker will be able to access the PMCS system through the Internet**

Answer : Most companies' systems group have "firewalls" to prevent this from

happening. GE will specify the specifics of our protocol to the Customer's Systems Group. The Systems people at the customer will insure appropriate firewall protection is maintained to prevent hackers from affecting the PMCS system. In addition, Communication between the PMCS 5.0 server and the Gateways follows a specific protocol (patent application pending). This is in addition will avoid illegal unauthorized access to the Gateway.

**Question : Are there any concerns to insure that some local programmer at the customer site can access PMCS data or affect the system operation some way.**

Answer : We recommend the PMCS Ethernet system sell be performed in conjunction with the customer's system group. Typically one can visualize a factory LAN like a multi-lane highway with separate entrance and exit ramps for each lane. Each lane is for a particular set of users only. By the LAN administrator segmentation, people can not cross lanes. Should the customer desire a completely secure system, the customer should install a private PMCS Ethernet LAN.

**Question : I have heard about 100 MHz Ethernet , does PMCS support that ?**

Answer : No. 100 MHz Ethernet has just emerged in the industry. It has some use for backbones today but has not reached the desktop as yet in large numbers. PMCS will definitely support 100 MHz Ethernet in the future when the cost per point reaches reasonable levels.

**Question : Some customers have a Token Ring LAN. Will PMCS support that as opposed to Ethernet LAN ?**

Answer : Yes. The customer will have to install a device called a router that translates between Token Ring and Ethernet LAN.

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