PROCUREMENT SPECIFICATION

Ethernet Network System with OCX-ETF Communication Module

NOTICE: The specification guidelines in this document are intended to aid in the specification of products. Specific installations have precise requirements, and Phoenix Digital does not recommend or intend any specific application based solely upon the guidelines provided here. Because of the variety of uses for this information, the user of, and those responsible for applying this information, are responsible for ensuring the acceptability of each application and appropriate use of the guidelines. In no event will Phoenix Digital be liable for misuse, misapplication or reliance on these guidelines in connection with any specific application. Phoenix Digital also disclaims indirect or consequential damages resulting from the use or application of this information.

Note: To receive a copy (.doc file version) of this procurement specification, please contact Phoenix Digital. For contact information please use http://www.phoenixdigitalcorp.com/contact-us.html

SECTION XX XX XX

ETHERNET NETWORK SYSTEM WITH OCX-ETF Communication Module

GENERAL

1.01 SUMMARY

A. The Ethernet Network System shall include all equipment, interconnecting cables and accessories necessary for proper network operation and to meet the performance, protection, safety and certification criteria of this specification.

1.02 RELATED SECTIONS

A. Section 26 00 00 – Electrical – General Provisions
B. Section XX XX XX

1.03 REFERENCES

A. The Ethernet Network System shall meet applicable standards, including those in:

1. TIA/EIA-568-B/C (Series): Commercial Building Telecommunications Cabling Standards.
2. TIA/EIA-569 (Series): Commercial Building Standard for Telecommunications Pathways and Spaces.
3. TIA/EIA-526 (Series): Standard Test Procedures for Fiber Optic Systems.
4. TIA/EIA-604 (Series): Fiber Optic Connector Intermateability Standard (FOCIS).
5. IEC 11801 (Series): Cabling for customer premises.
6. IEC 24702: Information technology – Generic cabling – Industrial premises.
7. IEC 60068 (Series): Environmental testing.
8. IEC 60529: Degrees of protection provided by enclosures (IP Code).
9. IEC 60603-7: Connectors for electronic equipment – Detail specification for 8-way, unshielded, free and fixed connectors.
10. IEC 61000 (Series): Electromagnetic compatibility (EMC).
11. IEC 61076 (Series): Connectors for electronic equipment – Product requirements.
12. IEC 61131-2: Programmable controllers – Equipment requirements and tests.
13. IEC 61326 (Series): Electrical equipment for measurement, control and laboratory use – EMC requirements.
14. ANSI/ISA-99: Security for Industrial Automation and Control Systems.
15. IEEE 802 (Series): Standards for Local and Metropolitan Area Networks.
16. Internet Engineering Task Force (IETF) RFC documents (various).

1.04 SUBMITTALS

A. Submittals shall be made under provisions of Section 01 30 00.

B. The Ethernet Network System design submittal shall include:

1. Product data for all networking hardware, including —

a) Manufacturer's operation and installation instructions.
b) Data sheets, technical product brochures or bulletins.
c) Complete operation manuals.

2. A complete set of drawings.
3. Complete and detailed bills of materials for the cabling infrastructure and network infrastructure.
4. The consultant/designer shall provide a report on the projected bandwidth usage of the Ethernet network and each of the individual nodes on the network.

C. Test procedures shall be per the manufacturer's standards.

1.05 FUNCTIONAL REQUIREMENTS

A. Based on existing IEEE 802.3 Ethernet standards, the network system shall be compatible with commercial off-the-shelf Ethernet products and shall use unmodified TCP, UDP and IP protocols for Ethernet frame encapsulation and transport, as specified in the IETF RFC documents.
B. The network system shall utilize a common industrial application layer protocol.
C. The network system shall be designed to:

1. Meet real-time communication requirements of the industrial control equipment.
2. Support device capacity and traffic requirements and provide capacity for expansion.
3. Provide redundancy and high availability.
4. Comply with ANSI/ISA-99 standards for industrial automation and control system security.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Phoenix Digital Corporation – Ethernet Network System with OCX-ETF Communication Module (No substitution)

2.02 SYSTEM COMPONENTS

A. The network system shall consist of: [include applicable components]

1. Network Cabling
2. OCX-ETF Ethernet Communication Module(standalone)
3. OCX-ETF Ethernet Communication Module(in-chassis)
4. Fiber Optic Patch panel

B. The network components shall be interoperable with standard network equipment using IEEE 802.3 technology and there shall be no modifications of Ethernet protocol that create incompatibility.

2.03 NETWORK CABLING

A. CONSTRUCTION

1. The network system shall support the following Ethernet physical media standards:

   a) 100Base-TX copper
   b) 100Base fiber (multi-mode and single mode)

2. Consultant/Designer shall determine cabling components and forms of mitigation shall be selected based on an assessment of environmental factors of each area of the IACS network, using M.I.C.E. analysis as recommended by the ANSI/TIA/EIA-568-C.0 standard.

B. COMMERCIAL MEDIA

1. Copper media cables — 2-pair and 4-pair twisted pair cables (shielded or unshielded) shall meet the transmission performance requirements of ANSI/TIA/EIA-568-B standards.
2. RJ-45 connectors — Non-sealed RJ-45 connectors shall conform to ANSI/TIA/EIA-568-B.2 standards and meet the mechanical and electrical requirements of IEC 60603-7 series standards.
3. Fiber media cables — The following fiber optic cable shall be supported and meet the requirements of ANSI/TIA/EIA 568-C.3 standards:

   a) Multi-mode 50/125μm
   b) Multi-mode 62.5/125μm
   c) Single mode 9/125μm

4. Fiber connectors —

   a) Non-sealed fiber connectors shall be limited to the LC, SC, and ST variants. The LC connector variants shall be used for all new installations.
   b) Fiber connectors shall conform to ANSI/TIA/EIA-568-C.3 and TIA/EIA-604 FOCIS standards.
   c) LC transceivers shall have duplex jacks with center spacing compatible with the FOCIS standard.

C. INDUSTRIAL MEDIA

1. All industrial cabling components — Copper and fiber cabling components shall support the minimum environmental recommendations of IEC 60068-2 standards, and EMI requirements for IEC light industrial (IEC 61000-4, 61000-6, 61131-2, 61326-1).
2. Copper media cables — Industrial cabling components shall be designed to IEC 24702 standards, shall be suitable for high noise M3I3C3E3 (industrial) environments, and shall be available for installation in harsh environments:

   a) Cat5e unshielded twisted pair cable (UTP), four- and eight-conductor styles.

b) Shielded twisted pair cable (STP), four- and eight-conductor styles.
c) 600V STP cable, four- and eight-conductor styles, for use in a cable tray shared with high voltage power cables.

3. Copper connectors shall be Cat5e-tested and meet the following requirements:

a) Industrial non-sealed RJ-45 connectors —

i. Designed to withstand IP20 industrial applications.
ii. Suitable for M1I1C2E2 (light industrial) environments.
iii. Meet IEC 60603-7 specifications.

b) Industrial sealed RJ-45 connectors —

i. Designed to withstand IP67 industrial applications.
ii. Suitable for M3I3C3E3 (industrial) environments.
iii. Meet IEC 61076-3-106 specifications.

c) Industrial sealed M12 “D”-coded connectors —

i. Designed to withstand IP67 industrial applications.
ii. Suitable for M3I3C3E3 (industrial) environments.
iii. Meet IEC 61076-2-101 specifications.

4. Fiber media cables — Rugged IP-rated fiber cables shall be used for indoor and outdoor industrial applications.
5. Fiber connectors— Sealed industrial LC, ST and SC fiber connectors shall meet the requirements of the corresponding ANSI/TIA/EIA documents and be fully compatible with off-the-shelf fiber optic plugs and jacks.

D. NETWORK EQUIPMENT ENCLOSURES

1. Network equipment enclosures shall be used to house networking devices and patch panels in harsh environments, unless the network hardware is designed for mounting in such environment.
2. Network equipment enclosures shall provide a wire duct for communication cables and fiber optic cables between the communication devices in control panel and communication raceways.

E. PATCH PANELS

1. Cabling systems shall utilize patch panels, surface mount box or other enclosure, which allows the cable to be permanently terminated and tested. Direct cabling to switches shall be avoided.
2. Connections between switches and patch panels shall be made with patch cables not exceeding 3 meters in length and shall conform to ISO/IEC 11801 standards.

2.04 OCX-ETF SMART ETHERNET SWITCH

A. RATINGS

1. The smart Ethernet switch shall be rated for:

a) 0 to 60 °C (-32 to 140 °F) operating temperature.
b) 5 to 95% noncondensing ambient relative humidity.

c) Class A emissions compliance.

2. Certifications shall include:

a) UL Listed Industrial Control Equipment for Class I, Division 2 Group A, B, C, D Hazardous Locations, certified for US and Canada.
b) CE?

B. CONSTRUCTION

The communication module shall satisfy physical media standards:

For end device connectivity 100Base-TX copper with RJ-45 ports.
For connectivity to other industrial switches and distribution layer device:

- 100Base-TX copper with RJ-45 ports.
- 100Base multi-mode and single mode fiber.

1. The switch shall:

a) Have a spring-loaded latch on the rear panel for mounting on a DIN rail.
b) Be able to be powered by a single source or dual (redundant) sources, 24 VDC or 120/220 VAC.
c) Operate in a free airflow environment with no moving parts.
d) The switch shall have integrated diagnostic capability through provided software and/or minimum of 2 output relays.
e) Require no more than 2 minutes MTTR – Mean Time To Repair.
f) Provide a front panel push button activated maintenance routine to test the integrity of the Ethernet cables connected to all RJ45 ports validating connection to end device through use of LED feedback.

2. The switch shall have a copper port configuration of:

a) 4 ports, fixed configuration for in-chassis ControlLogix® PAC.
b) 6 ports, fixed configuration for stand alone.

3. The switch shall have 6 LED indicators displaying hardware and network link status.
4. The switch shall be configured by no more than single dip switch selection. Software configuration is not allowed.
5. The smart Ethernet switch shall provide a switching infrastructure for harsh environments (Class I, DIV II, All Groups), used for connection to network devices and Ethernet-enabled industrial communication devices.

C. FUNCTION

D. Operation

a) Switching hardware capabilities shall include:

i. Line rate/non-blocking ports.
ii. Wire-speed switching with 3.2 Gbps switching fabric.
iii. Broadcast rate limiting.
iv. Each port copper/fiber will have 100MBS through put.
v. Incoming unicast and multicast traffic filtering.

vi. Imbedded IMGP snooping.
vii. The switch shall have at least eight ingress and eight egress packet queues.
viii. The switch shall have integrated network traffic management.
ix. The switch shall provide networking functionality based on all Ethernet protocols including but not limited to EtherNet/IP, Modbus TCP/IP, PROFINET, and Standard IEEE 802 Ethernet protocol(s).
x. Intermediary IP addressing at the switch level is not acceptable.
xi. The network shall have the ability to add switches into an active running network without failure, disconnection, or data loss.
xii. The switch shall be able to be replaced and maintained without overall network loss of data.
xiii. The network shall support single mode and multi-mode cable.
xiv. The fiber optic network shall support distances up to 90km without repeaters.

2. Topology

a) Operate in a dual channel bus, star, or ring topology without programming configuration.
b) Ring operation shall be accomplished utilizing two (2) independent fiber optic channels offering synchronized communication simultaneously in opposing directions for true redundancy.
c) The Ring network shall have and perform with N+2 Resiliency – (Single fiber failure, single channel failure and single module failure).
d) The embedded switch device shall be capable of being configured for master module.
e) “REP” Resilient Ethernet Protocol networks are not allowed.

3. Fault Handling

a) Recovery from any single point of failure cable or device on the ring network shall be accomplished without the need to manage the redirection of the data flow.
b) The ring supervisor shall be capable of verification of the integrity of the ring and recover from a single fault without reconfiguration.
c) The switch shall have <1ms recovery time after a single fault on a network running 850nm fiber and 50 switch drops.
d) Upon reset or power up the network/device shall energize, pass data and establish full network operation in less than 5 seconds.

4. Alarming and Diagnostics

a) The switch shall be able to trigger alarms for faults, FCS bit error, loss of signal, port operation, channel loss) and make notifications via:

i. Backplane (ControlLogix In-Chassis) status.
ii. Relay output (Standalone).
iii. System message to a logging facility (syslog).
iv. Use of alarm relays or backplane data to trigger an external alarm device or monitoring software.
v. Annunciate in the provided diagnostic software.

b) The switch shall include PC based diagnostic software that provides 3 levels of detail on the individual modules - system level, module level and port level

i. The PC based software diagnostic tool will automatically provide a full graphical network representation of the existing system without user programming or configuration.
ii. Provides common language description of port level parameters

c) Provide a front panel push button activated maintenance routine to test the integrity of the Ethernet cables connected to all RJ45 ports validating connection to end device through use of LED feedback.

E. CONFIGURATION

1. The smart Ethernet switch shall have the following configuration options:

a) Plug-and-Play integration.
b) Port Priority.
c) DIP switch master selection.
d) No user accessible configuration software.

PART 3 EXECUTION

3.01 INSTALLATION AND CONFIGURATION

A. Installation shall be in compliance with all manufacturer requirements, instructions and drawings.
B. The integrator/contractor shall:

1. Properly label all cables, terminations, data ports and IP addresses.
2. Document the jack numbering scheme in a plan-view.
3. Provide a certification report showing compliance with ANSI/EIA/TIA specifications for data cable.

C. The integrator/contractor shall prepare a detailed network configuration report.

3.02 TESTING

A. All tests, verifications, checks and recommendations shall be in conformance with:

1. ANSI/TIA or ISO/IEC specifications.
2. Manufacturer’s additional electrical and mechanical parameters.

B. All test equipment shall bear current calibration certification from a certified laboratory.
C. Installed twisted-pair copper cabling links shall be tested to meet the requirements of ANSI/TIA/EIA 568-B standards to the maximum rating for its grade.
D. Installed fiber cabling links shall be tested to meet the requirements of ANSI/TIA/EIA 568-C and IEC 11801 standards.
E. The integrator/contractor shall perform a network walk-through to verify installation and environmental specifications are met and to visually inspect all cable terminations (copper and fiber).

3.03 TROUBLESHOOTING

A. The integrator/contractor shall be responsible for trouble-free and reliable network installation.
B. In the event that operational or reliability problems exist, the integrator/contractor shall:

1. Obtain any needed test equipment.
2. Utilize the services of a trained and certified network engineer.

END OF SECTION