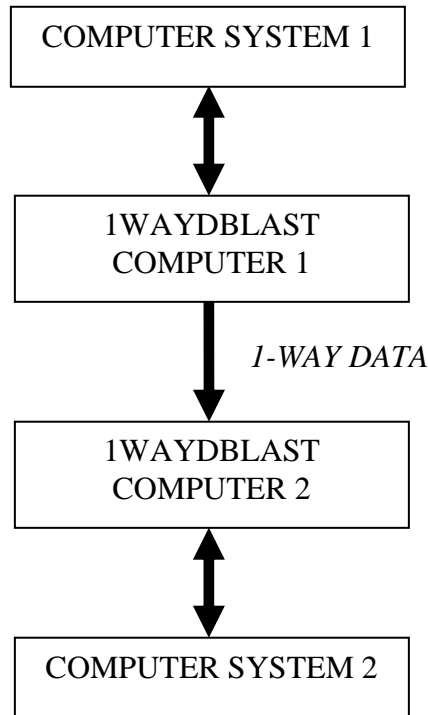


## 1WayDBlast™



## Product Description

This document provides a description of Engineered Solutions, Inc. 1WayDBlast™ product. The 1WayDBlast™ is placed between one computer system and another computer system to provide a true one-way communication interface. Data can flow in one direction only and therefore, 1WayDBlast™ performs a “data-diode” function.



The function of the device takes data that has been received on 1WayDBlast Computer 1 and sends it to 1WayDBlast Computer 2. 1WayDBlast Computer 2 becomes a Modbus server that can provide information to Computer System 2. The interface between 1WayDBlast Computer 1 and Computer System 1 is application specific. A Modbus client is standard on Computer 1; other protocols would require development of another module and are not included in this document.



The 1WayDBlast™ differs from other commercially available data-diodes as it is specifically designed for a control system to plant computer system interface in the nuclear power industry. The 1WayDBlast™ has been developed under Engineered Solutions 10 CFR 50 Appendix B QA program. Engineered Solutions QA program implements the requirements of ASME-NQA-1:1994, “Quality Assurance Requirements for Nuclear Facility Applications (QA)”, and ASME NQA-1a:1999, Subpart 2.7, “Quality Assurance Requirements for Computer Software for Nuclear Facility Applications” (Addenda to ASME NQA-1:1997). Reporting of Defects and Noncompliance is in accordance with 10 CFR Part 21.

## DEFINITIONS/ACRONYMS

- **Client** – A computer task used to receive information from another computer
- **CRC** – Cyclic Redundancy Check; a software method that calculates a short, fixed-length binary sequence for each block of data and sends or stores them both together. When a block is received the device repeats the calculation; if the new CRC does not match the one sent, then the block is considered to contain a data error; otherwise the data is assumed to be error free.
- **Datablaster** – Initial product development name for the 1WayDBlast™
- **External Computer System** – A computer system within a plant that receives data in a one-way fashion from the 1WayDBlast™.
- **Internal Computer System** – A computer or control system within a plant that provides data in a one-way fashion through the 1WayDBlast™.
- **PC1** – 1WayDBlast Computer 1
- **PC2** – 1WayDBlast Computer 2
- **Server** – A computer task used to transmit information to another computer
- **UDP/IP** – User Datagram Protocol/Internet Protocol, a network transport that uses a simple transmission model without implicit hand-shaking dialogues for guaranteeing reliability, ordering, or data integrity.
- **XML** – Extensible Markup Language; it is a set of rules for encoding documents electronically in a text-based format.

1WayDBlast™ is placed between two computer systems. PC1 performs poll-and-receive communications with Computer System 1. PC1 then sends this data via a one-way Ethernet interface to PC2. The transmit wiring from PC2 to PC1 is not connected – this provides a physical isolation of PC2 to PC1. Computer System 2 then performs poll-and-receive communications with PC2. Both PC1 and PC2 run the Windows 7 Operating System. Alternately, Windows XP may be used.

Modbus protocol is presently employed on both PC1 and PC2. PC1 performs Modbus client functions to receive information from an internal computer (e.g. control) system. Other interfaces could be written to bring in data to PC1 in other formats and are not within the scope of this document.

#### PC1 Functions:

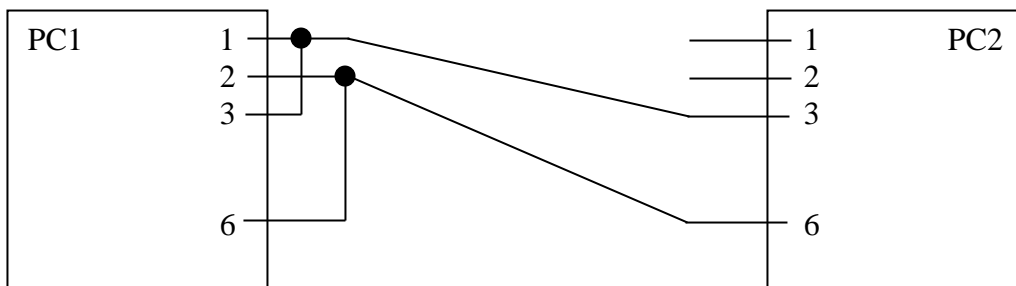
- Performs poll-and-receive communications with an internal computer via an Ethernet port.
- Packages data retrieved from the internal computer system.
- Sets flags if communications with the internal computer system fails or if the system reports bad data is being sent.
- Runs “Eventreporter” from Monitorware to track Windows events (i.e. intrusion detection), and sets a flag if an event is detected. Logs on PC1 can then be examined to determine the nature of the event. Performs a CRC on obtained data.
- Transmits data, CRC, and flags to PC2 via a different Ethernet network port.
- Disables USB storage capabilities by default and requires a special log to enable; a login would be a monitored event by Eventreporter and would therefore trigger an alert.

#### PC2 Functions:

- Receives and unpacks data, CRC, and messages from PC1.
- Performs a CRC calculation on the received data.
- Sets a flag if no information is received from PC1.
- Sets a flag if a different CRC from PC1 is calculated.
- Sets a flag if communications with the internal computer system fails.
- Runs “Eventreporter” from Monitorware to track Windows events (i.e. intrusion detection), and sets a flag if an event is detected. Logs on PC2 can then be examined to determine the nature of the event. Will also send a bit notification to the computer system if an event occurs on either PC1 or PC2.
- Becomes a Modbus server to allow an external computer system to perform poll-and-receive communications to obtain data from the protected computer system.

- Disables USB storage capabilities by default and requires a special log to enable; a login would be a monitored event by Eventreporter and would therefore trigger an alert.

True protection of the PC1 side of the 1WayDBlast™ is achieved by the connection method between PC1 and PC2. A standard RJ45 Ethernet jack is used. The standard pin-outs for this jack are: Pins 1 and 2 – Transmit; Pins 3 and 6 – Receive. The 1WayDBlast uses the following connection scheme:



A special adapter is installed in the 1WayDBlast™ to achieve this connection. By connecting the transmit pair of wires on PC1 to its receive pair, the Ethernet port hardware detects transmitted signals and thereby generates a link light regardless of computer setup. The same transmit pair of wires are connected to the receive pair on PC2. The transmit pair on PC2 is not connected. With this connection scheme, PC1 is capable of transmitting information to PC2 and PC2 CANNOT transmit information to PC1. Therefore, communications to any computer system to which PC1 is connected cannot be accomplished by any computer system connected to PC2.

Information is transmitted from PC1 to PC2 using the UDP/IP communication standard. This standard does not employ handshaking to ensure data is properly transmitted from one point to another. To provide an assurance of data integrity, both PC1 and PC2 perform a CRC calculation on the data.

## 1WayDBlast Features

- 1WayDBlast™ supports a customer's need to satisfy NEI 08-09 requirements for data diodes.
- 1WayDBlast™ uses commercially available, off-the-shelf components. There is no need for proprietary interfaces.
- An optional 1E isolator is available for electrical isolation from the control system if needed.
- Data from the 1WayDBlast™ is in Modbus-TCP format, an open interface. There is no need for proprietary software to communicate with the 1WayDBlast™ device.
- 1WayDBlast™ was developed under a 10CFR50 Appendix B, NQA-1 program.
- 1WayDBlast™ is qualified for Seismic II over I applications per the following standards:
  - IEEE Std 344-1987, Recommended Practices for Seismic Qualification of Class 1E Electric Equipment for Nuclear Power Generating Stations.
  - Regulatory Guide 1.100 Revision 2, Seismic Qualification for Electrical and Mechanical Equipment for Nuclear Power Plants, which endorses IEEE-344-1987.
- 1WayDBlast™ is qualified for electromagnetic compatibility per the following standards:
  - Electric Power Research Institute (EPRI) topical report TR-102323, "Guidelines for Electromagnetic Interference Testing in Nuclear Power Plants". The NRC staff accepted this report in a Safety Evaluation Report (SER) by letter dated April 17, 1996, as one method of addressing issues of Electromagnetic Compatibility (EMC) for safety-related digital I&C systems in nuclear power plants. Regulatory Guide 1.180 complements the position set forth in the SER. The guidance in these documents constitutes acceptable methods for addressing EMC considerations for qualifying safety-related I&C systems for the expected electromagnetic environment in nuclear power plants.
  - EPRI TR-102400 Handbook on Electromagnetic Compatibility of Digital Equipment in Power Plants.
- 1WayDBlast™ source code is available for purchase as an option. Coupled with the use of off-the-shelf components in 1WayDBlast™, the customer can be fully self-sufficient for future support needs by using 1WayDBlast™.

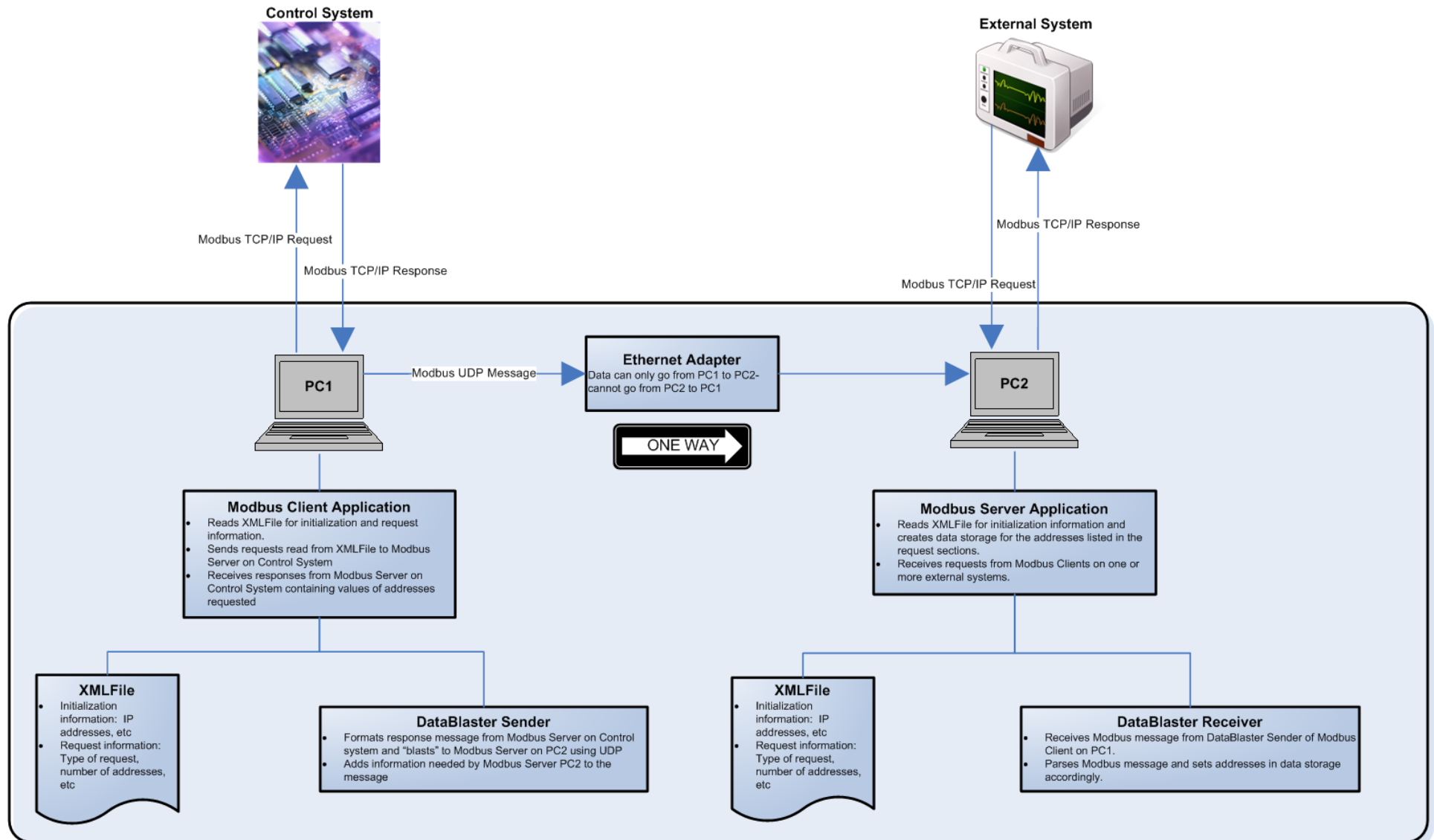
- 1WayDBlast™ software was developed in accordance with the following standards:
  - Regulatory Guide 1.152, "Criteria for Use of Computers in Safety Systems of Nuclear Power Plants," which endorses IEEE Std 7-4.3.2-2003, "IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations," with a few noted exceptions, and provides guidance for complying with requirements for safety systems that use digital computer systems. Additional guidance on the application of IEEE Std 7-4.3.2-2003 is provided in SRP Appendix 7.1-D.
  - Regulatory Guide 1.168, which endorses IEEE Std 1012-1998, "IEEE Standard for Software Verification and Validation," as providing methods acceptable to the NRC for meeting the regulatory requirements as they apply to verification and validation of safety system software, subject to the exceptions listed.
- 1WayDBlast™ testing information based on communications with a Programmable Logic Controller processing 100 analog points and 1000 digital points with a scan time of 13-15 milliseconds:
  - Data Latency was less than 100 milliseconds with Windows 7 and less than 200 milliseconds with Windows XP
  - Data Throughput was at least 30 samples per second.



## **1WayDBlast™**



# 1WayDBlast™ OVERVIEW



## 1WayDBlast™ DATA FLOW

