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Triangle MicroWorks, Inc.  
DNP3 Slave Conformance Test Module

What's New?

*a description of the changes included in all versions of the  
SDNP Conformance Test Module*

Version 3.13.00  
November 17, 2011

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This document describes features or corrections that have been added to the SCADA Data Gateway.

This section describes new features and/or bug fixes included with each new release of the SCADA Data Gateway. The symbols to the left of each revision are used to help define the following kinds of revisions:

**dnp3** Additional or enhanced DNP3 features.



Additional Conformance Test Module Features



Corrections to problems, with indications for when the problems were introduced.

### **Version 3.13 (November 17, 2011)**



Implemented v2.6Rev1 of DNP Conformance tests.



Improved CRC corruption algorithm in Test 6.6.3.4.



Updated Test .6.2 (and subtests) to conform with earlier changes to IED Conformance Test Procedure.

### **Version 3.12.00 (July 7, 2011)**



Group 0 Device Attribute tests are no longer mandatory. This change reflects a decision by the DNP Users Group that Group 0 Device Attributes are no longer mandatory



Modified in multifragment confirm test 8.9.2.2 Step 15 to allow a delay for an extra Application Confirm.



Improved error message when a variation beyond subset Level 2 is returned by the Outstation.



Modified Tests 8.13.2.3 and 8.16.1.2.3 to allow IIN2.1 (Object Unknown) to be set.



Removed limitation of 100 datapoints.



Allow multiple Object 2 Variation 3 groups after an Object 51 Variation 1 (CTO).



*Description:* If the DUT had a large number of points, some tests could fail incorrectly.

*Introduced:* v2.00.18 (initial release)

*Resolution:* Fixed in v3.09

### **Version 3.11.00 (October 1, 2010)**

No updates to DNP3 Conformance Test Module in this release.

## Version 3.10.00 (August 15, 2010)



Modified to allow IIN2.1 in Test 8.2.1.2.1 and related tests.



Modified test 8.11.2.5.8 to allow for a DUT restart.



*Description:* The Test Harness could send correct CRC bytes when testing for invalid CRC bytes.

*Introduced:* v2.00.18 (initial release)

*Resolution:* Fixed in v3.10



*Description:* Device Attributes tests in section 8.23 could use stale data from a previous test.

*Introduced:* v2.00.18 (initial release)

*Resolution:* Fixed in v3.10

## Version 3.09.00 (March 15, 2009)



Add ability to support ":" in file name for File Transfer Conformance Test Configuration.



Added configuration for directory separator in file transfer tests.



*Description:* Test 8.11.2.5.8 Step2 did not always see the response from the Outstation.

*Introduced:* v2.00.18 (initial release)

*Resolution:* Fixed in v3.09

## Version 3.08.00 (September 25, 2009)

**dnp3** Implemented 2009 Version of DNP IED Certification tests.

**dnp3** Added configuration to support connections via TCP/IP with broadcast over UDP.



Improved pop-up help for setting of Event Class for binary inputs, analog inputs, double bit inputs, and counters.



*Description:* Test 6.2.2.5 improperly failed when there was no response to the FC 15 (Disable Unsolicited Response) request.






*Introduced:* v2.00.18 (initial release)

*Resolution:* Fixed in v3.08

## Version 3.07.00 (July 17, 2009)

No updates to DNP3 Conformance Test Module in this release.


## Version 3.06.00 (April 14, 2009)

-  Modified input tests for objects that are not implemented to be tolerant of Unknown Object IIN bit being set.
-  Added configuration of Self-Address support to the configuration GUI.
-  *Description:* The test module could miss the Application Response in Test 6.4.1 Step 11.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.06
-  *Description:* Test 6.4.2 would incorrectly send a link status when testing retries.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.06
-  *Description:* Test 6.6.3.1 could fail if the Device Under Test (DUT) sent a large, slow response, resulting in a time out.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.06


## Version 3.05.00 (December 4, 2008)

No updates to DNP3 Conformance Test Module in this release.



## Version 3.04.02 (October 20, 2008)


-  *Description:* The "skip tests that require user intervention" feature did not always work properly with a user defined restart function. Test 6.6.3.4 might be skipped when it should be run, and tests 6.6.3.2 and 6.6.3.3 might be run when they should be skipped.  
*Introduced:* v3.04.01  
*Resolution:* Fixed in v3.04.02

## Version 3.04.01 (September 30, 2008)


-  *Description:* The test results would be shown as "PASS" instead of "Warning" if Tests 8.4.1.2.10 and 8.4.1.2.11 completed with warnings.  
*Introduced:* v2.00.19  
*Resolution:* Fixed in v3.04.01


## Version 3.04.00 (September 12, 2008)


-  Added call customer-defined function to restart DUT.
-  Added check for Master and Alternate Master address being the same; also improved prompts in tests that use these parameters.


 *Description:* Test 6.1.2 Step 17 did not wait for a new link confirm.  
*Introduced:* v3.00  
*Resolution:* Fixed in version 3.04.00

### **Version 3.03.00 (April 1, 2008)**


 *Description:* Test 8.7.2.2 did not work properly if local time was before Midnight but UTC time was after midnight.  
*Introduced:* v3.02  
*Resolution:* Fixed in version 3.03.00


 *Description:* Test 8.14.2.12 did not incorrectly reported a failure if the DUT did not support Object 2 Variation 3.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.03.


 *Description:* Test 8.11.2.5.8 did not generate events with OMICRON voltage generator.  
*Introduced:* v2.00.29  
*Resolution:* Fixed in v3.03.


 *Description:* Tests 8.14.2.12 and 8.14.2.15 did not compute relative times correctly.











### **Version 3.02.00 (January 11, 2008)**

 First Public Release of Test Harness v3. In addition to enhancements noted in Test Harness What's New document, this release includes additional bug fixes from Test Harness v2.

 *Description:* In tests 8.11.2.1 Steps 5 & 8, the Test Harness should close the socket  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00

 *Description:* Test 8.7.2.2 used Initial values instead of First values.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in version 3.00.00

 *Description:* In tests 8.11.2.1 Steps 5 & 8, the Test Harness did not properly close the socket.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00

-  *Description:* The Conformance Test Module attempts to send requests before the TCP connection reopens.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00
-  *Description:* The Conformance Test Module did not properly handle Common Time of Occurrence (CTO) objects between events.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00
-  *Description:* Some tests did not work properly if there were no Class 2 or Class 3 data points  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00
-  *Description:* Test 8.7.2.2 Step 4 always used milliseconds  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00
-  *Description:* The File Transfer Write command did not escape “\” characters in the file name  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00
-  *Description:* The Test Harness did not recognize that the DUT failed to send a link confirm at the beginning of Test 6.1.2  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00
-  *Description:* The Test Harness did not properly handle the case where only one control command was allowed in a request.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00
-  *Description:* The Test Harness used the wrong value (unsolicited retry period instead of application confirm timeout) in tests 8.11.2.5.4 and 8.11.2.5.5.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00
-  *Description:* The Conformance Test Module did not handle multifragment responses properly in test 6.1.2.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00
-  *Description:* The Conformance Test Module assumed extra points if extra class assignments, initial values, or first values were configured.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v3.02.00

## Version 3.01



Intermediate Beta Releases of Test Harness v3. All users of these versions should upgrade to v3.02.

## Version 3.00.00



Initial Beta Release of Test Harness v3. All users of these versions should upgrade to v3.02.

## Version 2.00.51 (February 28, 2007)



*Description:* The Conformance Test Module miscalculated the delay measurement.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.51



*Description:* In Test 8.11.2.5.8, the Test Harness would reconnect when the Outstation was configured to require more than 1 event if “Reconnect to DUT after configuration is modified” was checked.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.51



*Description:* The Conformance Test Module used the wrong timeout value in Test 8.2.11.2.5.7

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.51

## Version 2.00.50 (January 10, 2007)

No updates to DNP3 Conformance Test Module in this release.

## Version 2.00.49 (November 1, 2006)



Added the ability for the Conformance Tests to reconnect automatically after a step requiring modification of the configuration. This feature is controlled by a new configuration option.



Added the ability to use UDP in the Conformance Test Procedures.

## Version 2.00.47 (June 9, 2006)



*Description:* After loading a configuration file and running the conformance test, the Test Harness could issue a warning indicating that the test was run against a simulated slave even though it was not.

*Introduced:* v2.00.46

*Resolution:* Fixed in v2.00.47

## Version 2.00.46 (April 27, 2006)



Improved test result output to clearly indicate if the tests were completed using the Simulated Slave in loopback mode.



General performance improvements, including: better recovery from failed test (6.7.2); use of configured values for multi-object tests (8.4.4.2); improvements to event tests (8.5.2.2.2); improved handling of mixed sets of points that can be set automatically and points that require manual intervention; refreshing OMICRON screen; and reading events from slave before starting test 8.20.2 in order to make sure buffer overflow is not set.



*Description:* Test 8.9.2.2 Use of confirmation in fragmentation failed with short values of application layer timeouts.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.46

## Version 2.00.45 (March 17, 2006) ♣

No updates to DNP3 Conformance Test Module in this release.

## Version 2.00.44 (February 2, 2006)

No updates to DNP3 Conformance Test Module in this release.

## Version 2.00.43 (December 2, 2005)

**dnp3** Updated conformance tests per October release v2.5 of the Conformance Test Procedure (minor changes to Section 6.4.2 and 6.5.2.

## Version 2.00.42 (September 9, 2005)

No updates to DNP3 Conformance Test Module in this release.

## Version 2.00.41 (July 20, 2005)



Modified tests 8.11.2.5.5 and 8.11.2.5.6 to allow for +/- timing accuracy for Application Confirmation Timeout period.



Modified test 8.11.2.5.7 to allow for operator delays before pressing the "Proceed" version.



Modified test 8.11.2.5.9 to allow for varying unsolicited retry times.



*Description:* Test 6.4.2 Step 20 did not work properly if there were any additional responses.

*Introduced:* v2.00.18


*Resolution:* Fixed in v2.00.41



*Description:* Test 8.9.1.2 did not send an application confirm, even if requested to.


*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.41

 *Description:* Test 8.11.2.1 did not re-enable application confirms at the end of the test.

*Introduced:* v2.00.18


*Resolution:* Fixed in v2.00.41

 *Description:* Test 8.17.2.5 did not allow for data not being in the last object group of response.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.41

## **Version 2.00.40 (June 3, 2005)**

 *Description:* The Conformance Test Module did not apply the parity settings from the configuration menu.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.40

## **Version 2.00.39 (March 29, 2005)**

**dnp3** Added test 8.6.6.2.4 Buffer Overflow Double-bit



Added test to ensure Conformance Test Source Code version matches Test Harness version.



Improved test for determining if Conformance Test Script Source Code is present.



*Description:* The Conformance Test Module CTS assumed that application confirm timeout would always be larger than link confirm timeout (which it should be).

*Introduced:* v2.00.29

*Resolution:* Fixed in v2.00.39



*Description:* Tests in Section 8.11.5 could fail if preceding tests failed.

*Introduced:* v2.00.29

*Resolution:* Fixed in v2.00.39

## **Version 2.00.38 (January 18, 2005)**

**dnp3** Added support for new double bit and self address discovery mechanism.


**dnp3** Added support for double bit input object groups 3 and 4. Although not required for Level 2 compliance, certification tests for these object groups was added.









Added support for new double bit and self address tests.





Changed default value for event delay to be equal to event interval, and improved online help for these commands. These changes were made because the tests in Step 8.14 *appeared* to prompt for the wrong interval for generation of events.

-  *Description:* Test 8.10.2, Steps 7 and 8 would send to the wrong device (requests were sent to the “extra” device instead of the DUT).  
*Introduced:* v2.00.32  
*Resolution:* Fixed in v2.00.38


## **Version 2.00.37 (December 15, 2004)**

-  Relaxed constraints for Flags tests when appropriate. For example, it may be valid for the Slave to set the Restart flag after a device restart.
-  *Description:* Canceling a test (via the cancel button) caused an error.  
*Introduced:* v2.00.32  
*Resolution:* Fixed in v2.00.37
-  *Description:* The Conformance Test Module did not properly read all points if they were reported in different object headers.  
*Introduced:* v2.00.29  
*Resolution:* Fixed in v2.00.37
-  *Description:* The Conformance Test Module incorrectly issued a read between Operate commands, which would allow a Slave to return the correct status for the wrong reason in Tests 8.2.1.2.15 and 8.4.1.2.12.  
*Introduced:* v2.00.29  
*Resolution:* Fixed in v2.00.37
-  *Description:* The Conformance Test Module did not allow for a Status of 8 in step 13 of Test 8.2.4.2 if only one control point was supported in a single request.  
*Introduced:* v2.00.29  
*Resolution:* Fixed in v2.00.37
-  *Description:* Test 8.9 Step 3 did not allow for devices that cannot create multi-fragment messages.  
*Introduced:* v2.00.29  
*Resolution:* Fixed in v2.00.37






## **Version 2.00.36 (November 2, 2004)**

-  *Description:* Binary input tests read 2 events at a time instead of reading the required number and then reading all remaining events.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.36
-  *Description:* The Conformance Test Module log was misleading in 8.14.2.10. It did not accurately show all changes to set points.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.36





## Version 2.00.35 (September 23, 2004)











-  *Description:* Test 8.4.4.2 Analog Output Multiple Object Request did not correctly check the value of all points.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.35

## Version 2.00.34 (August 2, 2004)

-  Added ability to configure the firstCharWait parameter. This parameter can be used to force a minimum time delay between commands. (This parameter is not configured via the GUI. Save the configuration file and edit it. Search for firstCharWait and change the 0 to the number of milliseconds to delay.)
-  *Description:* The Conformance Test Module did not properly handle a restart over TCP/IP in Test 6.1.2  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.33
-  *Description:* The Conformance Test Module did not handle multifragment responses correctly in Tests 8.9.1.2 and 8.9.2.2.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.33
-  *Description:* In Tests 8.11.2.5.9, the Conformance Test Module could put the same point in the list twice.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.33
-  *Description:* The Conformance Test Module did not always wait for the feedback delay before issuing the feedback poll when testing Binary Output and Analog Output commands.  
*Introduced:* v2.00.32  
*Resolution:* Fixed in v2.00.33

## Version 2.00.32 (June 9, 2004)

-  Added a configurable delay between an output command and the feedback poll.
-  Added a delay between setting points in Test 8.6.6.2.1. Also improved help text describing event delay parameter.
-  The Test Module and the protocol analyzer window in the Test Harness now use the same timestamp.
-  Enhanced File Transfer functionality.

-  *Description:* Test 8.2.4.2 could use the wrong number of points. It now uses the maximum number of points, not the default configuration of points.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.32
-  *Description:* Test 8.3.2 incorrectly used Variation 1 instead of Variation 2.  
*Introduced:* v2.00.19  
*Resolution:* Fixed in v2.00.32
-  *Description:* Test 8.6.5.3 Step 1 always used Point 0, even if this point was not configured.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.32
-  *Description:* Test 8.6.6.2.1 did not allow multifragment responses.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.32
-  *Description:* Test 8.11.2.2 did not run properly if it was the first test run.  
*Introduced:* v2.00.19  
*Resolution:* Fixed in v2.00.32
-  *Description:* Test 8.11.2.5.9 could send a Clear the Restart IIN message before receiving the initial unsolicited response.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.32
-  *Description:* Test 8.14.2.5 did not properly check time order for all events and required events be generated 100 ms apart.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.32
-  *Description:* Test 8.20.1 (multiple analog objects) would fail if there were gaps in the point numbers.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.32
-  *Description:* Event processing delay for binary inputs and counters were incorrectly tied together.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.32
-  *Description:* The conformance Test Module incorrectly used the Application Confirm timeout when waiting for a NACK or no response.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.32



*Description:* When running over serial channels, the Conformance Test Script could incorrectly report tests as failing, due to timing problems.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.32

## Version 2.00.30 (April 13, 2004)



Added configuration to allow specification of a list of binary output and analog output points that permit the Online flag to be clear. This configuration is provided for convenience. Note that the conformance test (Section 8.1.2, Note 5) requires the Online flag to be set for all points.



Added File Transfer tests. These tests are Level 3+.



*Description:* The Conformance Test Module could appear to “freeze” waiting for responses that have already been sent.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.30

## Version 2.00.29 (March 31, 2004)

**dnp3** Modified Tests 8.2.1.2.13 and 8.2.1.2.14 to support retries of Select/Operate commands. This change was required due to a revision in the DNP3 Slave Conformance Test Procedure document to bring it in line with TB2000-002.



Added ability to specify an allowable range for Analog Output objects.



Added configuration parameter to indicate whether sfloat types are supported. This allows the Level 3+ tests to be run on devices that do not support sfloat.



Added ability to control OMICRON voltage generator for Binary Input and Analog Input tests.



*Description:* Test 6.1.2 did not allow for messages other than Reset Link.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.29



*Description:* Tests 8.1.2 and 8.3.2 failed when output data types were not supported.

*Introduced:* v2.00.27

*Resolution:* Fixed in v2.00.29



*Description:* Tests 8.2.1.2.10 and 8.4.1.2.7 did not allow for a Null Response.

*Introduced:* v2.00.18


*Resolution:* Fixed in v2.00.29




*Description:* When running in attended mode, Test 8.7.2.2 could fail with the following error: “can’t read “known time”: no such variable”


*Introduced:* v2.00.18


*Resolution:* Fixed in v2.00.29


 *Description:* The test Module did not allow for IIN 2.1 in Test 8.16.2.1  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.29


 *Description:* Binary Output and Analog Output tests did not properly parse response to feedback poll if the response consisted of multiple objects.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.29

## **Version 2.00.27 (February 3, 2004)**


 General enhancements, including: turn on physical layer trace in Tests 6.5.2, 6.6.3, and 7.2; verify that outstanding commands complete before starting the next test when a test fails; and add configuration parameter to indicate that the DUT will not create multiple events.


 *Description:* Trace information was shown in the wrong order in Test 6.1.2.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.27


 *Description:* Test 8.7.2.2 would sometimes display “can't read dnpdata(OBJ0,SECONDS0)” error.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.27

 *Description:* In Test 8.11.2.1, the Module could fail at step 20 if the DUT cleared the IIN1.7 bit but the test script did not see the change.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.27

## **Version 2.00.26 (January 15, 2004)**

 *Description:* The Conformance Tests did not wait a full 5000 ms on cold restart.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.26

 *Description:* Conformance Test Module could send Object 40 (Analog Output) requests even if the Analog Outputs box in the configuration screen was not checked.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.26

 *Description:* The Conformance Tests did not save all error messages to the log.  
*Introduced:* v2.00.18  
*Resolution:* Fixed in v2.00.26

## Version 2.00.25 (December 12, 2003)

*Description:* The Test Harness could crash when the log was cleared during execution of a Conformance Test step.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.25



*Description:* Class tests (e.g., 8.5.5.2.1) did not check the analog verification tolerance. As a result, if a parameter was sent with a value different than expected (but still within the verification tolerance), the test would fail.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.25

## Version 2.00.24 (November 10, 2003)



Automated 34 “manual verify” steps in multidrop, collision avoidance, unsolicited response, and link layer tests.

## Version 2.00.22 (October 8, 2003)



Conformance Test Module work in loopback mode. This mode allows automated testing of the Communication Protocol Test Harness. It is useful for generating a log showing successful tests.



Added step descriptions and ability to run tests on a remote device.



Added a Help Menu About box that displays the version information.



*Description:* In Class Assignment Verification Test (8.5.6.2), the Test Harness incorrectly issued a Class 123 Poll Request. It now polls the classes one at a time, as described in the procedure.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.22



*Description:* During some tests, the Conformance Test Module would write a “0” value to command points that were configured to have a non-zero value.

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.22



*Description:* The Conformance Test Module showed the incorrect description for step 8.4.1.2.5 Analog Output SBO, Execute value does not match select value..

*Introduced:* v2.00.18

*Resolution:* Fixed in v2.00.22

## Version 2.00.20 (September 2, 2003)



Added “fly over” help to Binary and Analog Output test configuration screens to provide a description of the data to be entered. Other data types already had “fly over” help.

**Version 2.00.19 (August 8, 2003)**

DNP3 Conformance Test Module updates in this release

**Version 2.00.18 (July 22, 2003)**

Initial Release.