DeviceNet™ - ODVA Conformance Test Results

Test Information	
Scheduled Test Date	**July 9, 2012**
Composite Test Revision	**23**
ODVA File Number	**10105.06**
Test Type	**Single Product**

Vendor Information	
Vendor Name	**Bronkhorst High-Tech B.V.**

Device Information

Device Information from Identity Object Instance* 1

For multiple identity object instances, additional Device Information tables are inserted into the report.

Identity Object	Attribute	Value			
Attribute 1	Vendor ID (decimal)	**706**			
Attribute 2	Device Type (hex)	**0x1A**			
Not an Attribute	Device Profile Name	**Mass Flow Controller**			
Attribute 4	Product Revision (decimal)	Major Rev	**1**	Minor rev	**003**
Identity Object	**Attribute**	**Value for Device 1**		**Value for Device 2**	
Attribute 3	Product Code (decimal)	**7**		**N/A**	
Attribute 7	Product Name	**Bronkhorst meter/controller**		**N/A**	

*For multiple instances, additional Device Information tables should be inserted into the report.

TSP Information	
TSP Location	ODVA TSP - Ann Arbor
Engineer Initials or Name	wbh
Completion Date	7/11/2012, Revised 7/12/2012 to correct revision to 1.003
Test Result	**PASS**
All advisories, warnings, and failures are summarized and described in Table 1 below.	

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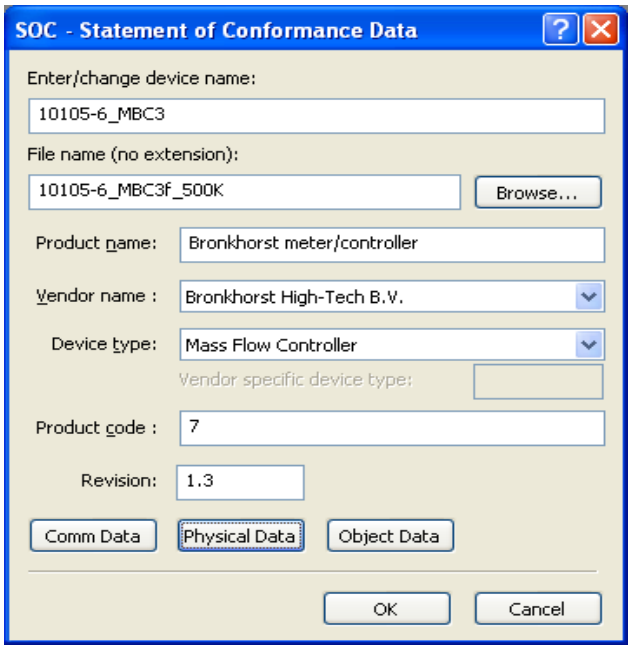
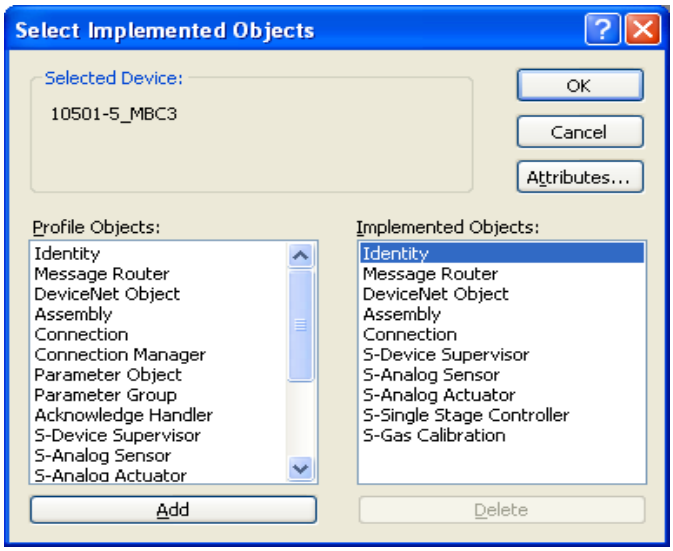
Table 1 Conformance Failures and Advisories

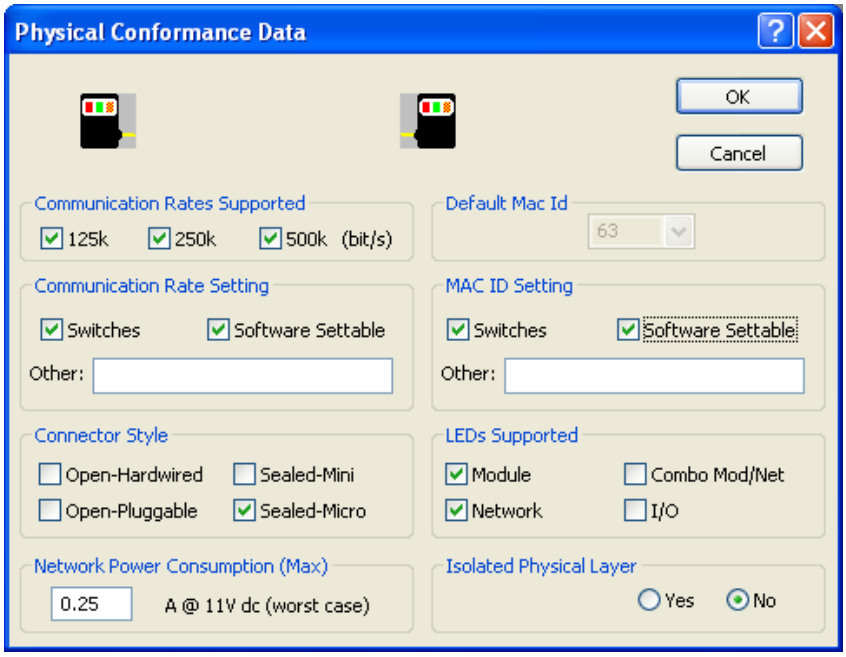
NOTE: **Advisories** indicate recommendations, W**arnings** indicate behavior that must be changed before subsequent tests, and F**ailures** must be resolved to pass

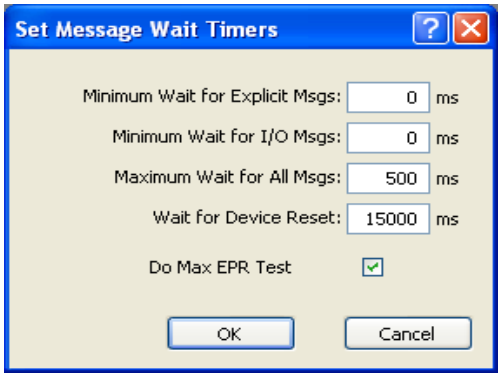
Index	Test Item	Advisories and Failures: Observed DUT Behavior	Required Behavior & Specification Reference
1	**Protocol Test**	**Advisory:** S-Analog Sensor Alarm Settling Time (attribute 20) seems to have a resolution of 1 second (1000 ms) instead of the expected 1 ms.	Vol 1 5-36.2
2			
3			
4			
5			

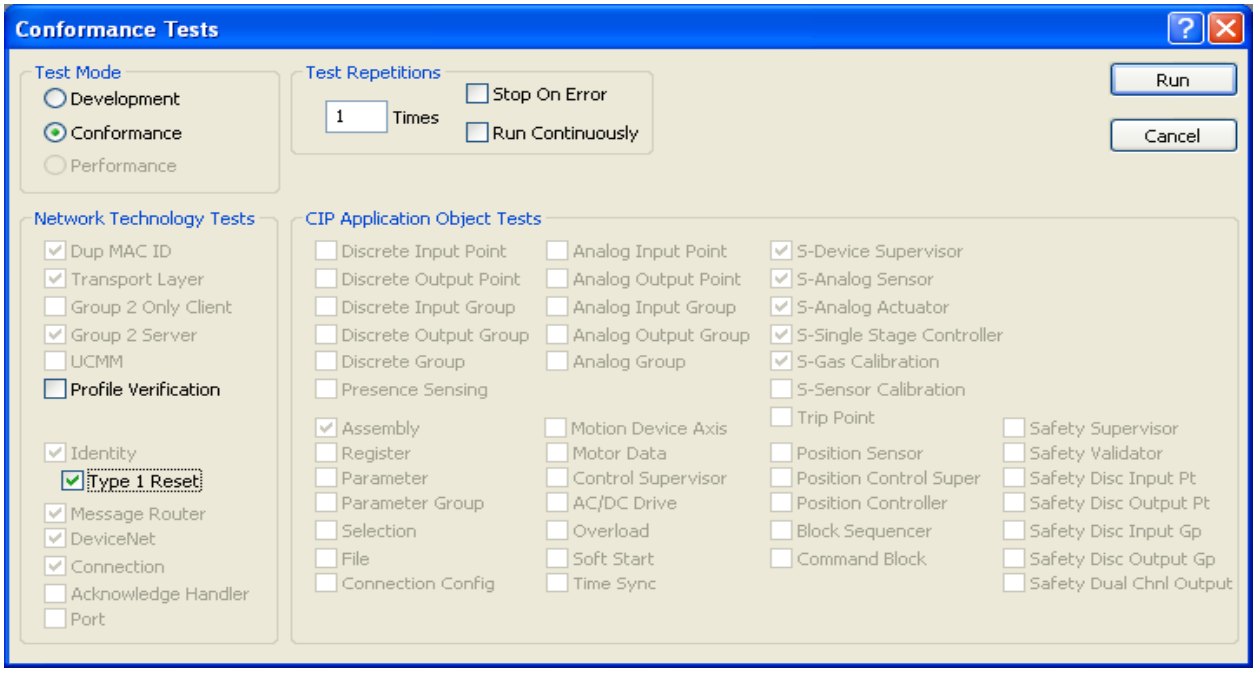
DeviceNet™ Device Under Test








Set Message Wait Timers
Minimum Wait for Explicit Msgs: 0 ms
Minimum Wait for I/O Msgs: 0 ms
Maximum Wait for All Msgs: 500 ms
Wait for Device Reset: 15000 ms
Do Max EPR Test
OK
Cancel


Conformance Tests
Test Mode
Development
Conformance
Performance
Test Repetitions
1 Times
Stop On Error
Run Continuously
Run
Cancel
Network Technology Tests
Dup MAC ID
Transport Layer
Group 2 Only Client
Group 2 Server
UCMM
Profile Verification
Identity
Type 1 Reset
Message Router
DeviceNet
Connection
Acknowledge Handler
Port
CIP Application Object Tests
Discrete Input Point
Discrete Output Point
Discrete Input Group
Discrete Output Group
Discrete Group
Presence Sensing
Analog Input Point
Analog Output Point
Analog Input Group
Analog Output Group
Analog Group
S-Device Supervisor
S-Analog Sensor
S-Analog Actuator
S-Single Stage Controller
S-Gas Calibration
S-Sensor Calibration
Trip Point
Assembly
Register
Parameter
Parameter Group
Selection
File
Connection Config
Motion Device Axis
Motor Data
Control Supervisor
AC/DC Drive
Overload
Soft Start
Time Sync
Position Sensor
Position Control Super
Position Controller
Block Sequencer
Command Block
Safety Supervisor
Safety Validator
Safety Disc Input Pt
Safety Disc Output Pt
Safety Disc Input Gp
Safety Disc Output Gp
Safety Dual Chnl Output

DeviceNet™ Conformance Composite Test Results - CT23

Protocol Test Results Table

Baud Rate	SOC File (*.stc)	Log File (*.log)	Wait for Explicit (*) ms	Wait for all, ms	Result
250K	10105-6_MBC3.stc	10105-6_MBC3f_250K_PA_PB_DeviceNetObj	0	500	Pass
250K		10105-6_MBC3f_250K_PA_PB_Identity_Type1	0	500	Pass
125K		10501-5_MBC3_FA_FB_125K.log	0	500	Pass
250K		10105-6_MBC3f_250K_PA_PB.log	0	500	Pass
500K		10105-6_MBC3f_500K_FA_FB.log	0	500	Pass

(*) Wait for Explicit cannot exceed 10 ms for a passing result

Physical Layer Test – Revision B6

B6-5.1 DeviceNet Connector

B6-5.1.3 Connector Presence and Type

DeviceNet Connector Criteria	Result
Connector matches SOC and Connector Profile from 8-3.12	Pass
Connector type is male	Pass
Connector pins are gold colored	Pass

B6-5.2 Indicators

Indicator	Specified in SOC	Present in DUT	Result
Module Status LED	Yes	Yes	Pass
Network Status LED	Yes	Yes	Pass
Mod/Net LED	No	No	Pass

B6-5.2.3 Module Status LED operation

Test #	Required indicator behavior	Result
5.2.3	The product contains a red/green indicator for the device status	Pass
5.2.3	The indicator is labeled “Module Status” or “MS”	Pass
5.2.3.1	The indicator flashes green for 0.25 sec. then red for 0.25 sec during power-up self test.	Pass
5.2.3.1	The indicator is flashing green or solid green after completion of power-up self test.	Pass
5.2.3.2	If the DUT supports Node Address switches and the switches can be set to a different value than the DUT is currently on line at, the Module Status LED flashes Red when the Node Address switch setting is valid (0 – 63) and does not match the on-line address.	Pass
5.2.3.3	If the DUT supports Data Rate switches and the switches can be set to a different value than the DUT is currently on line at, the Module Status LED flashes Red when the Data Rate switch setting is valid (0 – 2) and does not match the on-line data rate.	Pass
5.2.3.4	The only indicator states observed during test sequence 5.2.3 are off, flashing green, green, flashing red, red.	Pass

B6-5.2.4 Network Status and Module / Network Status LED operation or Device operation (NO LED Case)

Test #	Required indicator behavior	Result
5.2.4	The product contains a red/green indicator for the network communication status	Pass
5.2.4	The Network Status indicator is labeled “Network Status” or “NS” The Module/Network Status indicator is labeled “Module/Network Status”, “Mod/Net Status” or “MNS”.	Pass
5.2.4	MNS LED Only: If the DUT supports Node Address switches and the switches can be set to a different value than the DUT is currently on line at, the Module Status LED flashes Red when the Node Address switch setting is valid (0 – 63) and does not match the on-line address.	N/A
5.2.4		N/A
5.2.4.1	The indicator flashes green for 0.25 sec. then red for 0.25 sec during power-up self test.	Pass
5.2.4.1	The indicator is off after completion of power-up self test.	Pass
5.2.4.2	The indicator flashes green after self test when DUT is a node on an occupied network and DUT MAC ID is unique.	Pass
5.2.4.3	The indicator becomes solid red after a CAN_H to CAN_L short - Stops Sending DUP MAC	Pass
5.2.4.3	The DUT CAN transceiver remains recessive until DUT is manually reset when BOI = 0	Pass
5.2.4.3	Network FSM resets after a network power cycle.	Pass
5.2.4.4	The NS LED becomes solid red after (CAN_H, CAN_L) to (+5V, 0) - Stops Sending DUP MAC	Pass
5.2.4.3	The DUT CAN transceiver remains recessive until DUT is manually reset when BOI = 0	Pass
5.2.4.4	Network FSM resets after a network power cycle.	Pass
5.2.4.5	The indicator becomes solid red when DUT is connected to a network where device with DUT Mac Id exists and is on-line - or device does not go on line (No LED case)	Pass
5.2.4.6	The indicator becomes solid red after a DUT reset and the DUT does not go on-line when the DUT supports node address switches, does not support software set of the node address, and the switches are set to values > 63.	N/A
5.2.4.7	The indicator becomes solid red after a DUT reset and the DUT does not go on-line when the DUT supports data rate switches, does not support software set of the data rate, and the switches are set to values > 2.	N/A
(5.2.4.8)	The only indicator states observed during test sequence 5.2.4 are off, flashing green, green, flashing red, red.	Pass

B6-5.3 Switches

B6-5.3.3 Node Address Switch - NV check if no switch or SW set supported

Test #	Required Node Address switch characteristics and behavior				Result
5.3.3	Node Address switches present on DUT match SOC				Pass
5.3.3	Node Address switches are labeled “Node Address” or “NA”				Pass
5.3.3.1	Most significant digit switch is set to the left or top of the product and determined by the orientation of the switch label.				Pass
5.3.3.1	If the Node Address switch is rotary, thumb-wheel, or push-wheel, switch must be labeled in decimal format.				Pass
5.3.3.2	Node Address Set by DIP Switch	Node Address Set by Rotary Switch	Node Address switch value in 3-1-8	MAC ID on Network	Pass
	0	0	0	0	
	0x15 (21)	21	0x15 (21)	21	
	0x3F (63)	63	0x3F (63)	63	
	0x2A (42)	42	0x2A (42)	42	
	0x4F (79)*	99*	0x4F (79)*	42	
5.3.3.3	If the DUT supports software set of the node address, the node address is saved to NV ram on power-up.				Pass
	Node address set via SW	Node Address Set by Switch(es)	Applied by device immediately	Node Address detected after Network Power cycle	
	21	99	Yes	21	

B6-5.3.4 Data Rate Switch - NV check if no switch or SW set supported

Test #	Required Data Rate switch characteristics and behavior				Result
5.3.4	Data Rate switches present on DUT match SOC				Pass
5.3.4	Data Rate switches are labeled “Data Rate” or “DR”				Pass
5.3.4.1	Most significant digit switch is set to the left or top of the product and determined by the orientation of the switch label.				Pass
5.3.4.1	Data Rate Set by DIP Switch	Data Rate Set by Rotary Switch	Data Rate switch value in 3-1-9	Data Rate on Network	Pass
	0	0	0	125	
	2	2	2	500	
	1	1	1	250	
	3	9	9	250	
5.3.4.2	If the DUT supports software set of the data rate, the data rate is saved to NV ram on power-up.				Pass
	Data rate Set via SW	Data Rate Set by Switch(es)	Applied by device immediately	Data Rate detected after Network Power cycle	
	2	9	No	500	

B6-5.4 Isolation

B6-5.4.1 Isolation

Results test or of Vendor Supplied HIPOT Data	Maximum Current @ +500 VDC, ma	Maximum Current @ -500 VDC, ma	Result
DUT has metallic chassis not isolated from earth gnd	<1ma	<1ma	Pass
DUT has field wiring			N/A

B6-5.5 Impedance

B6-5.5.3 Resistance and Capacitance: CAN_H to CAN_L

Parameter	Limit	Measured (kΩ & pF)	Result
CAN_H to CAN_L Resistance	20K ohm, minimum	38	Pass
CAN_H to CAN_L Capacitance (Unpowered OR Faulted and Powered - per DeviceNet circuitry implementation)	24 pf, maximum	6	Pass

B6-5.6 Power

B6-5.6.3.1 Physical Layer Power Sequence Verification

Auxiliary Powered DUT only	Result
Device communicates when network power is reapplied	Pass

B6-5.6.3.2 Minimum Operating Voltage

Minimum Operating Voltage	Result
Device starts and operates for 1 minute at a network voltage of 11 VDC	Pass

B6-5.6.3.3 Network Current Consumption: Advisory only – perform at vendor request

V+ Device Voltage, V	DUT Network Current, A	DUT Connector Current Rating, A	Power Supply Type	Advisory Result
11.0	**0.21**	**3**	Switching	Pass
17.0	**0.16**			
25.0	**0.13**			

B4-5.6.3.4 Inrush Current: Advisory only – perform at vendor request

Network Voltage, V	Inrush Current max, Amp	Inrush Current Duration, ms	Advisory Result
25	**2.5**		Pass

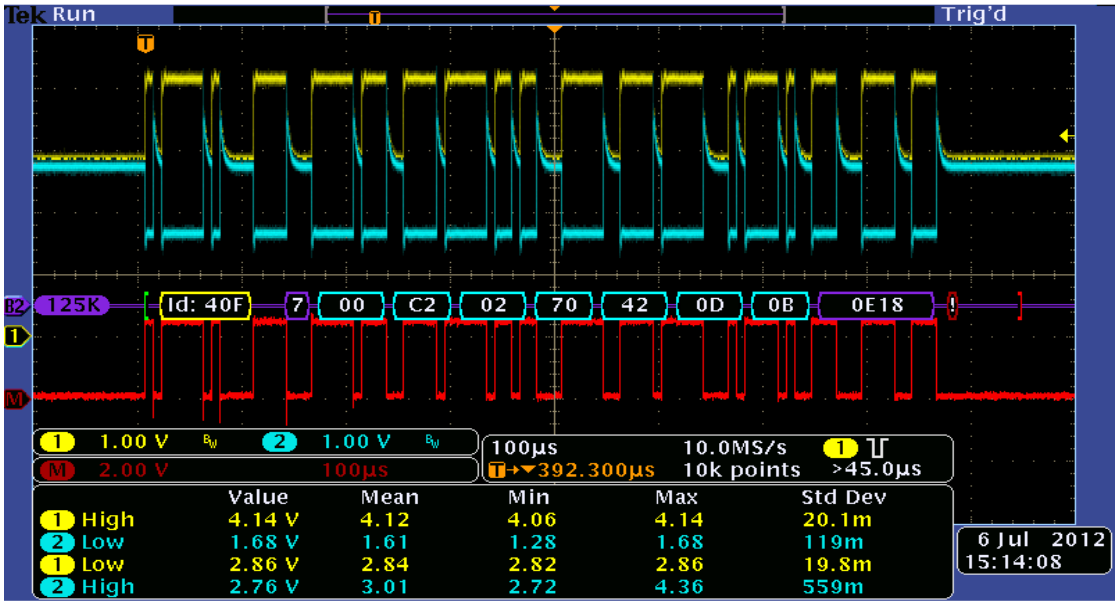
B6-5.6.3.6 Power-up / Power-down CAN Dominant

DUT Power Event	Delay to CAN Dominant ms	CAN Dominant Duration, ms, Pass if Duration < 1ms	Result
Network Power-up		0.015	Pass
Network Power-down		none observed	Pass
Aux Power-up			N/A
Aux Power-down			N/A

B6-5.7 CAN Voltage Levels

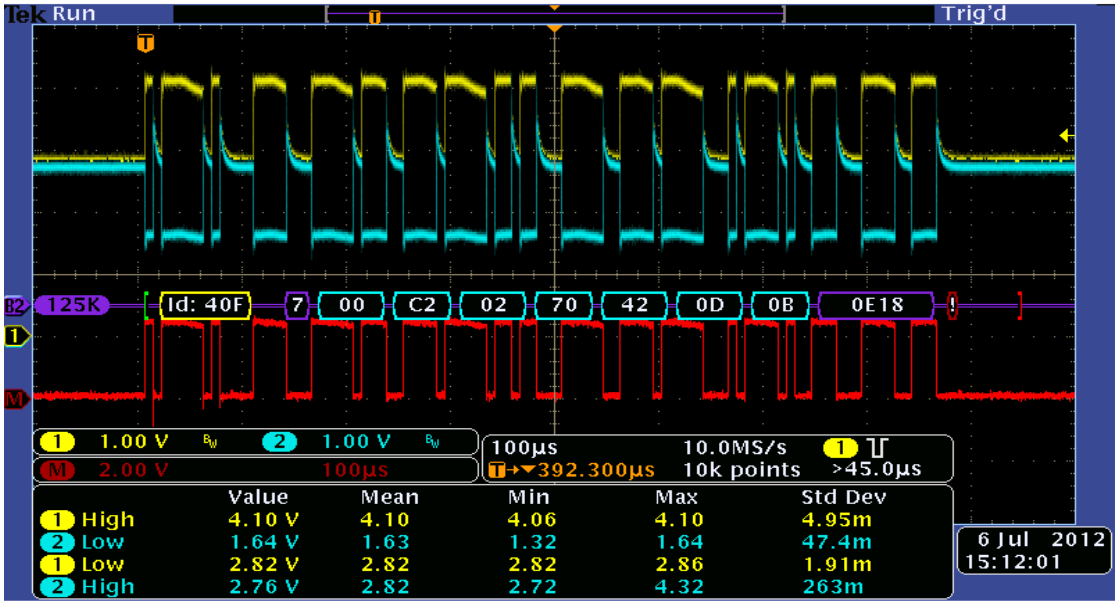
B6-5.7.3.1 Can-H and CAN-L Recessive Voltage Levels: Measure CAN-H, CAN-L with respect to V- with DVM at DUT with DUT in Communication Fault state

Measured value, volts				Pass / Fail Criteria	Result
Tests		@25V	@11V		
Recessive level on CAN_H	V	2.79	2.78	2.25V<Pass<3.6V	Pass
				2.25V<Warning<2.7V	
				3.1V<Warning<3.6V	
Recessive level on CAN_L	V	2.79	2.78	2.25V<Pass<3.6V	Pass
				2.25V<Warning<2.7V	
				3.1V<Warning<3.6V	
Recessive level Differential (CAN_H – CAN_L)	mV	0.00	0.00	-500mV<Pass<+50mV	Pass



DupMac @ 125K, 25VDC

Color Key: Yellow = CAN_H; Blue = CAN_L; Red = CAN_H – CAN_L



DupMac @ 125K, 11VDC

Color Key: Yellow = CAN_H; Blue = CAN_L; Red = CAN_H – CAN_L

B6-5.7.3.2 Can-H and CAN-L Dominant Voltage Levels

Measured value, volts				Pass / Fail Criteria	Result
Tests		@25V	@11V		
Dominant level on CAN_H	V	4.14	4.10	3.0V<Pass<5.1V	Pass
				3.0V<Warning<3.5V	
				4.5V<Warning<5.1V	
Dominant level on CAN_L	V	1.68	1.64	0.75V<Pass<2.85V	Pass
				0.75V<Warning<1.25V	
				2.25V<Warning<2.85V	

B6-5.7.3.3 Can-H and CAN-L Differential Voltage Level

Measured value, volts				Pass / Fail	Result
Tests		@25V	@11V		
Dominant level Differential (CAN_H – CAN_L)	V	2.46	2.46	1.5V<Pass<3.0V	Pass

B6-5.8 CAN Timing

B6-5.8.2.1 Bit Time

Baud Rate (Kbps)	Bit Time, us			Result
	Minimum	Maximum	Measured	
125	7.992	8.008	8.000	Pass
250	3.996	4.004	4.000	Pass
500	1.998	2.002	2.000	Pass

B6-5.8.2.2 Dominant - Recessive Bit Asymmetry

Baud Rate (Kbps)	Dominant minus Recessive Bit Width, ns			Result
	Minimum	Maximum	Measured	
500	-100	100	30	Pass

B6-5.8.2.3 SOF Domiant Edge to Next Recessive to Dominant Edge Jitter

Baud Rate (Kbps)	Jitter between Dominant Edges, ns p-p			Result
	Minimum	Maximum	Measured	
500	0	4	1.3	Pass

B6-5.8.3.1 Bit Sample Point

Baud Rate (Kbps)	Bit Sample Point, % Bit time		Result
	Minimum	Measured	
125	80%	81%	Pass
250	80%	81%	Pass
500	80%	83%	Pass

B6-5.8.3.2 Phy Propagation Delay

Baud Rate (Kbps)	Bit Time, ns			Result
	Minimum	Maximum	Measured	
500	None specified	312.5	150	Pass

B6-5.9 Device Mis-wiring

B6-5.9.3 Device Mis-wiring

Step #	Verify that mis-wiring does not damage the DUT	Result
1	No obvious damage during or after mis-wiring	Pass
2	CAN_L to CAN_H input resistance is >= 20K ohms	Pass
3	Device powers up and communicates on network	Pass

EDS File Syntax Check

EDS File Syntax Utility: EZ-EDS 3.9		Result
EDS file name	bht_dmfc.eds	Pass
EDS file revision	1.3	

Interoperability Conformance Test Revision C6

Master devices used for the interoperability test

Interoperability Master Device; P=Primary Master, A=Alternate Master	
Allen-Bradley 1756-DNB/A (F/W Revision 3.10)	P
Allen-Bradley 1747-SDN (F/W Revision 4.026)	A
Omron CJ1W-DRM21 (Revision 1.01)	A

Manager tools used for the interoperability test

Interoperability Manager Tool; P=Primary Tool, A=Alternate Tool	
RSNetWorx for DeviceNet (Revision 6.00-Alpha)	P
CH_Studio (Revision 2.0)	A
Omron DeviceNet Configurator (Revision 2.21)	A

C6-7.1 EDS File Test

No.	Test: Using Primary Manager Tool				Result
1	Install the EDS file into the Manager				
2	Use a configuration tool to configure the DUT to use the I/O Assembly with the largest produced/consumed connection sizes referenced in the EDS file.				Pass
	Producing Assy	Size	Consuming Assy	Size	
	0x12	14	0x14	5	
3	Configure the Primary Master scan list for the selected I/O configuration:				Pass
	Poll (Prd/Cnsm)	BS (Prd/Cnsm)	COS (Prd/Cnsm)	Cyclic (Prd/Cnsm)	
	14/5	na	na	na	

C6-7.2 Power Cycle Test

Verify that after turning on all power supplies in each test, all of the connections are established within one minute and the network returns to the "Operational" state.

C6-7.2.1 Power Supply Sequence – Slave DUT

For a DUT with an Auxiliary Power Input

Test #	Power Supply Turn ON Sequence – Primary Master – performed twice				Result
	1	2	3	4	
1	Network	Master	DUT	Aux Pwd Dev	N/A
2	Network	DUT	Aux Pwd Dev	Master	N/A
1	Network	DUT	Master	Aux Pwd Dev	N/A
2	Network	Aux Pwd Dev	DUT	Master	N/A
3	DUT	Master	Network	Aux Pwd Dev	N/A
4	DUT	Aux Pwd Dev	Network	Master	N/A
7	DUT	Master	Aux Pwd Dev	Network	N/A

For a Network Powered DUT

Test #	Power Supply Turn ON Sequence – Primary Master – performed twice				Result
	1	2	3	4	
1	Network	Master	Aux Pwd Dev	N/A	Pass
2	Network	Aux Pwd Dev	Master	N/A	Pass
3	Master	Network	Aux Pwd Dev	N/A	Pass
4	Aux Pwd Dev	Network	Master	N/A	Pass
7	Master	Aux Pwd Dev	Network	N/A	Pass

C6-7.2.3 Power On/Off

Test #	Performed 5 times	Result
1	Master Power On/Off (5 times)	Pass
2	Network Power On/Off (5 times)	Pass
3	DUT Aux Power On/Off (5 times)	N/A

C6-7.3 Device Disconnect-Reconnect Test

Test #	Performed 5 times	Result
7.3.1	Master Disconnect-Reconnect with time out	Pass
7.3.2	Master Disconnect-Reconnect without time out	Pass
7.3.3	DUT Disconnect-Reconnect (5 times)	Pass

C6-7.4 Network Aerobic Test

C6-7.4.1 Master Idle/Active Test

Step #	Primary Master – performed twice	Result
1	Two successful network WHO in 5 minutes	Pass
2	Upload DUT parameters twice between WHO	Pass
3	Modify DUT parameters twice between WHO	Pass
4a	Master Idle upload DUT parameters between WHO	Pass
4b	Master Idle modify DUT parameters between WHO	Pass
5	Verify network remains in "Operational State"	Pass

C6-7.4.2 Master Active Test

Step #	Primary Master – Run time >= 1.5 hours	Result
1	With Master in the Run state, network remains in the "Operational State" for 1.5 hours	Pass