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Campbell Scientific Australia

DNP3 DEVICE PROFILE

Real-time monitoring and Control Systems

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Device Profile Document

Vendor name: Campbell Scientific, Inc.

Device Name: CR800, CR850, CR1000, CR3000, CR6

Highest DNP Level Supported:

For Requests: 2

For Responses: 2

Device Function

Master Slave

Notable objects, functions, and or qualifiers supported in addition to the highest DNP levels supported (the complete list is described in the attached table):

Function code 20 (Enable Unsolicited Messages) for class 1, 2, 3 objects only

Function code 21 (Disable Unsolicited Messages) for class 1, 2, 3 objects only

Object 10, variation 1 (Binary Output – packed format)

Object 30, variation 5 (Analog Input – single precision floating point with flag)

Object 32, variation 7 (Analog Input Event - single precision floating point with time)

Object 40, variation 3 (Analog Output Status - single precision floating point with flag)

Object 41, variation 1 (32-bit analog output block)

Object 41, variation 3 (32-bit analog output block - single precision floating point)

Maximum Data Link Frame Size (octets):

Transmitted: 292

Received: 292 (must be 292)

Maximum Application Fragment Size (octets):

Transmitted: 1992

Received: 1992

Maximum Data Link Re-tries:

None

Fixed at 2

Configurable, range 0 to 255

Maximum Application Layer Re-tries:

None

Configurable, range 0 -255

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Requires Data Link Layer Confirmation:

- Never
- Always
- Sometimes
- Configurable for Always or Never

Requires Application Layer Confirmation:

- Never
- Always (not recommended)
- When reporting Event Data (Slave devices only)
- When sending multi-fragment responses (Slave devices only)

Timeouts while waiting for:

- | | | | | |
|-------------------------|-------------------------------|---|-----------------------------------|--|
| Data Link Confirm | <input type="checkbox"/> None | <input type="checkbox"/> Fixed at _____ | <input type="checkbox"/> Variable | <input checked="" type="checkbox"/> Configurable |
| Complete Appl. Fragment | <input type="checkbox"/> None | <input type="checkbox"/> Fixed at _____ | <input type="checkbox"/> Variable | <input checked="" type="checkbox"/> Configurable |
| Application Confirm | <input type="checkbox"/> None | <input type="checkbox"/> Fixed at _____ | <input type="checkbox"/> Variable | <input checked="" type="checkbox"/> Configurable |
| Complete Appl. Response | <input type="checkbox"/> None | <input type="checkbox"/> Fixed at _____ | <input type="checkbox"/> Variable | <input checked="" type="checkbox"/> Configurable |

Sends/Executes Control Operations:

- | | | | | |
|-------------------------|---|---------------------------------------|------------------------------------|--|
| WRITE Binary | <input type="checkbox"/> Never | <input type="checkbox"/> Always _____ | <input type="checkbox"/> Sometimes | <input checked="" type="checkbox"/> Configurable |
| SELECT/OPERATE | <input type="checkbox"/> Never | <input type="checkbox"/> Always _____ | <input type="checkbox"/> Sometimes | <input checked="" type="checkbox"/> Configurable |
| DIRECT OPERATE | <input type="checkbox"/> Never | <input type="checkbox"/> Always _____ | <input type="checkbox"/> Sometimes | <input checked="" type="checkbox"/> Configurable |
| DIRECT OPERATE – NO ACK | <input type="checkbox"/> Never | <input type="checkbox"/> Always _____ | <input type="checkbox"/> Sometimes | <input checked="" type="checkbox"/> Configurable |
| Count > 1 | <input type="checkbox"/> Never | <input type="checkbox"/> Always _____ | <input type="checkbox"/> Sometimes | <input checked="" type="checkbox"/> Configurable |
| Pulse On | <input type="checkbox"/> Never | <input type="checkbox"/> Always _____ | <input type="checkbox"/> Sometimes | <input checked="" type="checkbox"/> Configurable |
| Pulse Off | <input type="checkbox"/> Never | <input type="checkbox"/> Always _____ | <input type="checkbox"/> Sometimes | <input checked="" type="checkbox"/> Configurable |
| Latch On | <input type="checkbox"/> Never | <input type="checkbox"/> Always _____ | <input type="checkbox"/> Sometimes | <input checked="" type="checkbox"/> Configurable |
| Latch Off | <input type="checkbox"/> Never | <input type="checkbox"/> Always _____ | <input type="checkbox"/> Sometimes | <input checked="" type="checkbox"/> Configurable |
| Queue | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always _____ | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Clear Queue | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always _____ | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |

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FILL OUT THE FOLLOWING ITEM FOR MASTER DEVICES ONLY:

Expects Binary Input Change Events:

- Either time-tagged or non-time tagged for a single event
- Both time-tagged and non-time-tagged for a single event
- Configurable (attach explanation)

FILL OUT THE FOLLOWING ITEMS FOR SLAVE DEVICES ONLY:

Reports Binary Input Change Events when no specific variation requested:

- Never
- Only time-tagged
- Only non-time-tagged
- Configurable to send both, one or the other (CRBasic program)

Reports time-tagged Binary Input Change Events when no specific variation requested:

- Never
- Binary Input Change with Time
- Binary Input Change with Relative Time
- Configurable (CRBasic program)

Sends Unsolicited Responses:

- Never
- Configurable by class
- Only certain objects
- Sometimes (attach explanation)
- ENABLE/DISABLE UNSOLICITED

Sends Static Data in Unsolicited Responses:

- Never
 - When device restarts
 - When Status Flags Change
- No other options are permitted.

Default Counter Object/Variation:

- No counters reported
- Configurable (CRBasic program)
- Default Object 20
- Point-by-point list attached

Counters Roll Over at:

- No counters reported
- Configurable (attach explanation)
- 16 Bits
- 32 Bits
- Never
- 16 Bits for 16-bit counters
32 Bits for 32-bit counters
- Point-by-point list attached

Sends Multi-Fragment Responses: Yes No

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IMPLEMENTATION OBJECT

This table describes the objects, function codes and qualifiers used in the device:

Object			REQUEST (slave must parse)		RESPONSE (master must parse)	
Obj	Var	Description	Func Codes (dec)	Qual Codes (hex)	Func Codes (dec)	Qual Codes (hex)
0	240	Device Attribute – max transmit fragment size	1 (read)	00 (start-stop)	129 (response)	00 (start-stop), 17 (index)
0	241	Device Attribute – max receive fragment size	1 (read)	00 (start-stop)	129 (response)	00 (start-stop), 17 (index)
0	242	Device Attribute – OS version	1 (read)	00 (start-stop)	129 (response)	00 (start-stop), 17 (index)
0	243	Device Attribute – rev board-ti chip	1 (read)	00 (start-stop)	129 (response)	00 (start-stop), 17 (index)
0	247	Device Attribute – station name	1 (read)	00 (start-stop)	129 (response)	00 (start-stop), 17 (index)
0	248	Device Attribute – serial number	1 (read)	00 (start-stop)	129 (response)	00 (start-stop), 17 (index)
0	250	Device Attribute – product name and model	1 (read)	00 (start-stop)	129 (response)	00 (start-stop), 17 (index)
0	252	Device Attribute – name of device manufacturer	1 (read)	00 (start-stop)	129 (response)	00 (start-stop), 17 (index)

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0	254	Device Attribute – return all device attributes in a single response	1 (read)	00 (start-stop), 06 (no range, or all)		
0	255	Device Attribute – retrieve all of the device attribute variation numbers supported	1 (read)	00 (start-stop), 06 (no range, or all)	129 (response)	00 (start-stop), 17 (index)
1	0	Binary Input - any variation	1 (read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 28 (index)		
1	1	Binary Input - Single-bit packed	1 (read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 28 (index)	129 (response)	00, 01 (start-stop), 17, 28 (index)
1	2	Binary Input - Single-bit with flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 28 (index)	129 (response)	00, 01 (start-stop), 17, 28 (index)
2	0	Binary Input Change Event - any variation	1 (read)	06 (no range, or all), 07, 08 (limited qty)		
2	1	Binary Input Change Event - without time	1 (read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)

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2	2	Binary Input Change Event - with absolute time	1(read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)
2	3	Binary Input Change Event - with relative time	1(read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)
10	0	Binary Output - any variation	1(read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 28 (index)		
10	1	Binary Output - packed format	2(write)	00, 01 (start-stop)		
10	1	Binary Output - packed format	1(read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 28 (index)	129 (response)	00, 01 (start-stop), 17, 28 (index)
10	2	Continuous Control - output status with flags	1(read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 28 (index)		
12	1	Binary Output Command (CROB) - control relay output block	3(select), 4(operate) 5(direct op.),	00, 01, (start-stop), 17, 27 28 (index)	129 (response)	echo of request
12	1	Binary Output Command (CROB) - control relay output block	6(direct op, no ack)	00, 01, (start-stop), 17, 27 28 (index)		

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20	0	Counter Static Objects	1 (read), 7 (freeze), 8 (freeze noack), 9 (freeze clear), 10 (frz. cl. noack)	00, 01 (start-stop), 06 (no range, or all), 17, 28 (index)		
20	1	Counter- 32-bit with flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 17, 28 (index)	129 (response)	00, 01, 17, 28 (index)
20	2	Counter- 16-bit with flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 17, 28 (index)	129 (response)	00, 01, 17, 28 (index)
20	5	Counter- 32-bit without flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 17, 28 (index)	129 (response)	00, 01, 17, 28 (index)
20	6	Counter- 16-bit without flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 17, 28 (index)	129 (response)	00, 01, 17, 28 (index)
21	1	Frozen Counter- 32-bit with flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 17, 28 (index)	129 (response)	00, 01, 17, 28 (index)
21	2	Frozen Counter- 16-bit with flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 17, 28 (index)	129 (response)	00, 01, 17, 28 (index)

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21	5	Frozen Counter- 32-bit with flag and time	1 (read)	00, 01 (start-stop), 06 (no range, or all), 17, 28 (index)	129 (response)	00, 01, 17, 28 (index)
21	6	Frozen Counter- 16-bit with flag and time	1 (read)	00, 01 (start-stop), 06 (no range, or all), 17, 28 (index)	129 (response)	00, 01, 17, 28 (index)
21	9	Frozen Counter- 32-bit without flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 17, 28 (index)	129 (response)	00, 01, 17, 28 (index)
21	10	Frozen Counter- 16-bit without flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 17, 28 (index)	129 (response)	00, 01, 17, 28 (index)
22	0	Counter Event Objects	1 (read)	06 (no range, or all), 07, 08 (limited qty)		
22	1	Counter Event- 32-bit with flag	1 (read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)
22	2	Counter Event- 16-bit with flag	1 (read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)
22	5	Counter Event- 32-bit with flag and time	1 (read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)

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22	6	Counter Event- 16-bit with flag and time	1 (read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)
30	0	Analog Input - any variation	1 (read)	00, 01 (start-stop), 06 (no range, or all)		
30	1	Analog Input - 32-bit with flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 27, 28 (index)	129 (response)	00, 01 (start-stop), 17, 28 (index)
30	2	Analog Input - 16-bit with flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 27, 28 (index)	129 (response)	00, 01 (start-stop), 17, 28 (index)
30	3	Analog Input - 32-bit without flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 27, 28 (index)	129 (response)	00, 01 (start-stop), 17, 28 (index)
30	4	Analog Input - 16-bit without flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 27, 28 (index)	129 (response)	00, 01 (start-stop), 17, 28 (index)

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30	5	Analog Input - single precision floating point with flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 27, 28 (index)	129 (response)	00, 01 (start-stop), 17, 28 (index)
32	0	Analog Input Change Event - any variation	1 (read)	06 (no range, or all), 07, 08 (limited qty)		
32	1	Analog Input Change Event - 32-bit without time	1 (read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)
32	2	Analog Input Change Event - 16-bit without time	1 (read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)
32	3	Analog Input Change Event - 32-bit with time	1 (Read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)
32	4	Analog Input Change Event - 16-bit with time	1 (read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)
32	5	Analog Input Event - single precision floating point without time	1 (read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)
32	7	Analog Input Event - single precision floating point with time	1 (read)	06 (no range, or all), 07, 08 (limited qty)	129 (response), 139 (unsol. response)	17, 28 (index)

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40	0	Analog Output Status - any variation	1 (read)	00, 01 (start-stop), 06 (no range, or all),		
40	1	Analog Output Status - 32-bit with flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 27, 28 (index)	129 (response)	00, 01 (start-stop), 17, 28 (index)
40	2	Analog Output – single precision floating point	1 (read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 27, 28 (index)	129 (response)	00, 01 (start-stop), 17, 28 (index)
40	3	Analog Output Status - 16-bit with flag	1 (read)	00, 01 (start-stop), 06 (no range, or all), 07, 08 (limited qty), 17, 27, 28 (index)	129 (response)	00, 01 (start-stop), 17, 28 (index)
41	1	Analog Output Block - 32-bit	3(select), 4(operate), 5(direct op.), 6(direct op, no ack)	17, 27, 28 (index)	129 (response)	echo of request
41	2	Analog Output Block - 16-bit	3(select), 4(operate), 5(direct op.), 6(direct op, no ack)	17, 27, 28 (index)	129 (response)	echo of request
50	1	Time and Date - absolute time	1(read), 23 (delay measurement), 24(record current time)	07 (limited qty = 1)	129 (response)	07 (limited qty = 1)

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50	1	Time and Date - absolute time	2(write),	07 (limited qty = 1)		
50	3	Time and Date - absolute time at last recorded time	2(write)	07 (limited qty = 1)		
60	1	Class Objects - class 0 data	1(read)	06 (no range, or all)		
60	2	Class Objects - class 1 data	1(read)	06 (no range, or all), 07, 08 (limited qty)		
60	3	Class Objects - class 2 data	1(read)	06 (no range, or all), 07, 08 (limited qty)		
60	4	Class Objects - class 3 data	1(read)	06 (no range, or all), 07, 08 (limited qty)		
80	1	Internal Indications - packed format	1(read)	00, 01 (start-stop)	129 (response)	00, 01 (start-stop)
80	1	Internal Indications - packed format	2(write)	00 (start-stop)		
110	Variation is used to declare max length of string	Octet String	2(write)	00 (start-stop)		

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TIME SYNCHRONIZATION PARAMETERS	
PARAMETER	VALUE
Maximum Time Base Drift (milliseconds per minute)	<input type="checkbox"/> Fixed at 0 ms <input type="checkbox"/> Range to ms <input type="checkbox"/> Selectable from ms <input checked="" type="checkbox"/> Other, describe (REAL-TIME CLOCK ACCURACY: ± 3 min per year over a -25°C to $+50^{\circ}\text{C}$ non-condensing environment. Correction via GPS optional)
Maximum Internal Time Reference Error when set via DNP (ms):	<input type="checkbox"/> Fixed at 0 ms <input type="checkbox"/> Range to ms <input type="checkbox"/> Selectable from ms <input checked="" type="checkbox"/> Other, describe (REAL-TIME CLOCK RESOLUTION: 10 ms)
Maximum Delay Measurement Error	<input type="checkbox"/> Fixed at 0 ms <input type="checkbox"/> Range to ms <input type="checkbox"/> Selectable from ms <input checked="" type="checkbox"/> Other, describe (REAL-TIME CLOCK RESOLUTION: 10 ms)
Maximum Response Time	<input type="checkbox"/> Fixed at 0 ms <input type="checkbox"/> Range to ms <input type="checkbox"/> Selectable from ms <input checked="" type="checkbox"/> Other, describe (REAL-TIME CLOCK RESOLUTION: 10 ms)

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Revision history

Modifications to the last Revision are indicated with a vertical line (|) in the left margin.

<i>Revision</i>		<i>Short description of the modifications</i>	<i>prepared</i>	<i>checked</i>	<i>approved</i>
<i>No</i>	<i>Datum</i>				
1	25-07-2014	First external document release.	S.UTLEY	D.ROEBUCK	R.KURZ