

CAN

HLP Comparison



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**Comparison between
CANopen, DeviceNet,
Can Kingdom
Higher Layer Protocols**



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Bit Rates

	CANopen	DeviceNet/PDMS	CAN Kingdom
Possible bit rates	1M, 800k, 500k, 250k, 125k, 50k, 20k, 10k	125k, 250k, 500k	Any bit rate, Service at 125k
Protection against modules with incorrect bit rate.	No	No	Yes
Autobaud	No	Possible, but not specified.	Possible, but not specified.
Changeable by the HLP	No, possible by SDO	Yes No if set by switches.	Yes.



Node Numbers

	CANopen	DeviceNet/PDMS	CAN Kingdom
Possible node numbers.	(0) 1-127	0-63	(0) 1-255
Default node number.	None.	63	None Set in service mode or read from connector.
Protection against duplicate numbers.	No/Yes can be done by the NMT master.	Yes Duplicate MAC ID Check.	No/Yes HLP supports checking by the King.
Changeable by the HLP	Yes, in a configuration mode if supported.	Yes No if set by switches.	Yes.



Fundamentals about Priorities

	CANopen	DeviceNet/PDMS	CAN Kingdom
Priorities owned by a module at power on.	8 + (1-9)	31 + (63)	0/1 + (2)
Priorities open for general use.	6 (4 PDO and 2 SDO)	26 at each module.	Any not already used.
CAN Remote Transmit Request	No	No	Yes
Extended CAN	No	No	Yes
System control of priorities.	No/Yes, If supported by module through SDO peer to peer channel.	3 groups containing 16, 5 and 5 given priorities from which to select.	Yes, controlled by system designer.
Free priorities.	None	None	All



System Start-up

	CANopen	DeviceNet/PDMS	CAN Kingdom
Start with predefined settings	Yes.	No support by the HLP. Any module is free to do what it wants with the 27 priorities/IDs owned by the module.	The King can command the modules to start with settings from nonvolatile storage.
Automatic start at power on.	Yes, but it is possible to wait for the NMT to check the system before start.	PDMS module will always wait for the master.	Yes, if allowed previously by the King. This is a degenerated Kingdom.
Predefined Priority/IDs at the start and reserved for the module.	8 priorities from the list below: [1, 3, 4, 5, 6, 11, 12, 14] *127 + NodeNr.	At the start: 2 Tx, 3 Rx Grp1: $N+M*64$ $M=0-15$ Grp2: $N*8+1024+M$ $M=0-7$ Grp3: $N+1536+M*64$ $M=0-6$	At the start: During the first 200 ms: 0 Tx, 2Rx0 and 2031. Then any number as previously set by the King.



System Controls

	CANopen	DeviceNet/PDMS	CAN Kingdom
Reset of a module.	Yes	Yes, from an established connection.	Yes
Assigning a module to a group.	No	No	Yes, 255 minus the number of modules in the system
Setting of CAN reception masks	No	No	Yes.



Assignment of Priorities

	CANopen	DeviceNet/PDMS	CAN Kingdom
Assignment of priority to new connection	Yes/No: 2 levels for SDO 4 levels for PDO	Yes, by connection objects, max 26 producer objects.	Yes. Only limited by the number of free priorities and module memory.

Real-Time Support

	CANopen	DeviceNet/PDMS	CAN Kingdom
Real Time Clock(RTC).	Yes.	No.	Yes.
RTC Resolution	1 us.		1 ns .. 1h
RTC deviation between modules	1-30us.		Within 1 bit length.
Restricted repetition rates of priority/IDs	Yes	No	Yes
Timed HLP production	Yes, by one specific sync-message.	Yes, 1 ms resolution.	Yes, at RTC resolution, for any CAN message.
Production within a time window.	Yes, in a window after one specific sync-message.	No	Yes, at RTC resolution, for any CAN message.
HLP production at consumption events	Yes, after one specific sync-message.	Yes always in the master-slave connection.	Yes, at HLP level, for any CAN message.



Application Support

	CANopen	DeviceNet/PDMS	CAN Kingdom
Functions and data structures (Profiles) in HLP.	SIGs have made a number of profiles e.g. encoder, motor controller.	Yes, by ODVA defined devices.	No specification, but there are a number of specifications like CDA-101 from US-Navy.
Possibility to build new data structures from application layer primitives.	No.	Yes, it is possible to have an assembly object	Yes, HLP includes tools to make new data structures by linking primitives to generic objects.
Possibility to have data in the priority bits.	No	No	Yes, any bit sequence can be linked to an internal data structure
HLP support for Appl. data structures larger than 8 byte	No.	Yes, unlimited length. 7 or 6 bytes in each transfer	No HLP support.
Block transfer	Yes if the module have CAL support.	No	Yes, unlimited length. Six bytes in each transfer.



Module Identity Registration

	CANopen	DeviceNet/PDMS	CAN Kingdom
Administrator.	SIGs in CiA	ODVA	EAN International, UCC
Vendor Id number	7 char ASCII	16 bits, 0..65535	Incl. in product code.
Device type	7 char ASCII	16 bits, 0..65535	Incl. in product code.
Product code	7 char ASCII	16 bits, 0..65535	40 bits EAN-13 code.
Serial number	None	32 bit	40 bit
Software version	7 char ASCII	16 bit Major 16 bit Minor	Incl. in or an additional EAN-13 code.
ASCII information	See above	Product name 0 to 255 bytes	Not specified



Summary DeviceNet

- ! Open system; each module is a local master.
 - ! A system designer can not always get control of the modules (the local master).
 - ! Supports the production/consumption model for module to module transfer.
 - ! Limited number (27) of freely usable priorities in one module.
 - ! A small kernel only in Predefined Master/Slave Connection Set.
 - ! Supports only Std. CAN.
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Summary CAN Kingdom

- ! The system designer has always 100% control of all modules by "The King".
 - ! Supports the production/consumption model for module to modules transfers.
 - ! Possibilities to control the real time behavior on the CAN-bus.
 - ! Full utilization of the priority function in the CAN protocol.
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Summary CAN Kingdom (cont.)

- ! Any number of priorities can be assigned to a module.
 - ! Support for making data structure conversion in the HLP.
 - ! Small kernel, typically 500-1500 byte code and 24-48 byte RAM.
 - ! Supports Std. and Ext. CAN.
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CANopen

- ! Is based on CAN, but the priorities are reduced and fixed to the NodeNr.
 - ! Has support for realtime performance by a specific sync. protocol.
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