SeaZone

Embedded Power
or
Erlang for Factories

Background

- SeaZone AB founded 2008

- Located outside Stockholm, Sweden

- Design hardware and software for power distribution system.

- Current products primary for the boat industry.

PRODUCTS

powerZone 860

8 output channels

32 input channels

12V/10A per channel

Max load 60A

Power to control panels

ioZone 24D / 24DA

24 Digital inputs
or
24 Analog inputs

More products

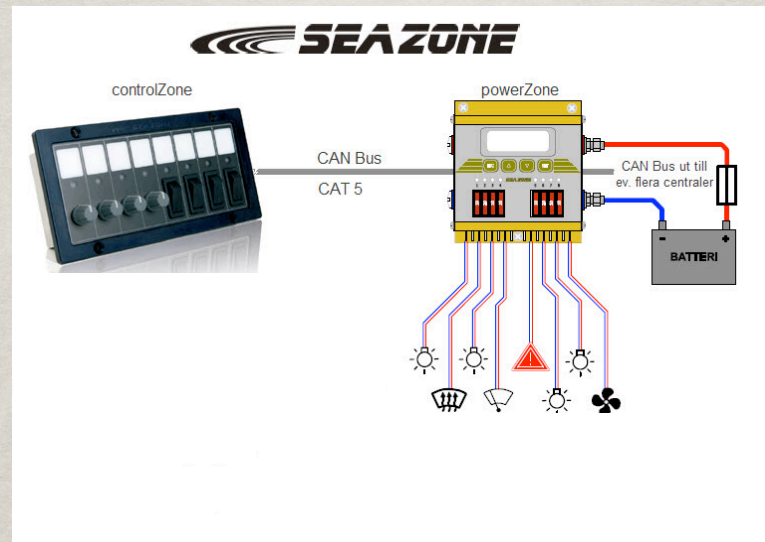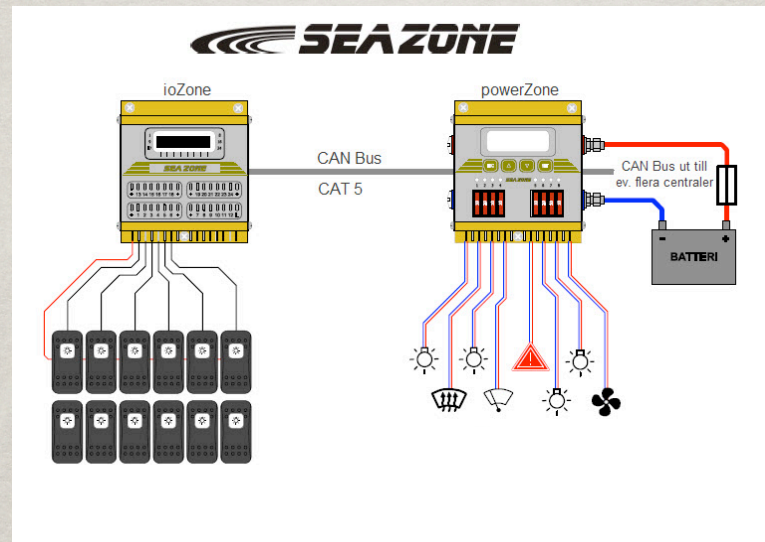controlZone 80

controlZone 80S

controlZone 44

controlZone 71

Control panels are powered by 12V, supplied by the signalling cable.

Red backlight is ideal when traveling in the night.
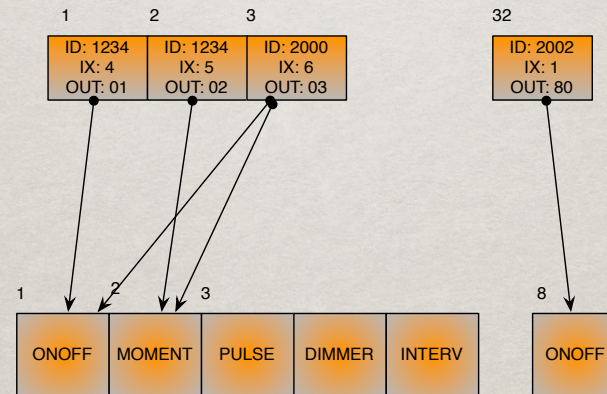
Example 1

Example 2

seaZone Features

☀ LPC 2129 @60MHz, 16KRam, 256K Flash, 32K EEPROM.

☀ Secondary CAN boot loader for easy firmware upgrade and production.

☀ CAN protocol
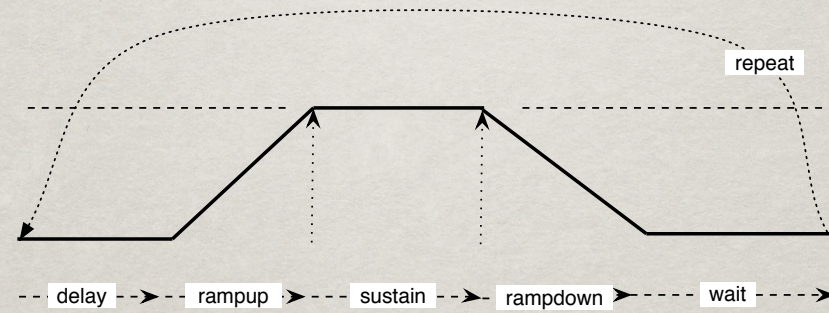
☀ Based on CANopen, not 100% compliant yet.

POWERZONE
OUTPUT FUNCTION

repeat

delay → rampup → sustain → rampdown → wait →

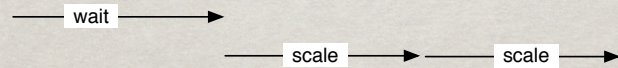Output function per output channel

POWERZONE
WAIT FUNCTION

wait →

← scale ← scale ← scale
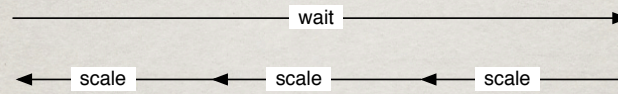
Wait function decreasing wait time
WAITMAX = 3
WAITSCALE = -1.0
WAIT = 3.0
w(i) = 3.0 + i*(-1.0)
w(0) = 3.0, w(1) = 2.0, w(2) = 1.0, w(3) = 0.0

wait →

scale → scale →

Wait function, increasing wait time
WAIT = 1.0
WAITMAX = 2
WAITSCALE = 1.0
w(i) = 1.0 + i*1.0
w(0) = 1.0, w(1) = 2.0, w(2) = 3.0

CAN
Controller Area Network

❋ Two wire, serial protocol. CAN_H and CAN_L.

❋ Transport up to 8 bytes per frame.

❋ Hardware implementation on bit level. Handle Arbitration, CRC and frame filtering.

❋ Frame format

SOF	ID	RTR	IDE	DCL	Data(0-8)	CRC	EOF

CAN

✳ Sending starts with an arbitration phase. The frame with the lowest numbered ID winds.

✳ CAN maximum transmission distances depend on bit rate.

CAN bus length

Bit-rate	Bus Length
1Mbit/s	25m
800Kbit/s	50m
500Kbit/s	100m
250Kbit/s	250m
125Kbit/s	500m
50Kbit/s	1000m
20Kbit/s	2500m
10Kbits/s	5000m

CANopen

* CAN based application layer protocol.

* Created around 1993, then called CAL, CAN application layer.

* Latest CANopen specifications from 2006.

* Kind of open. Members only.

* Dictionary based protocol.

* Used in cars, robots, boats and more.

CANopen components

- Object Dictionary

- SDO protocol

- PDO protocol

- SYNC protocol

- NMT protocol

Object Dictionary

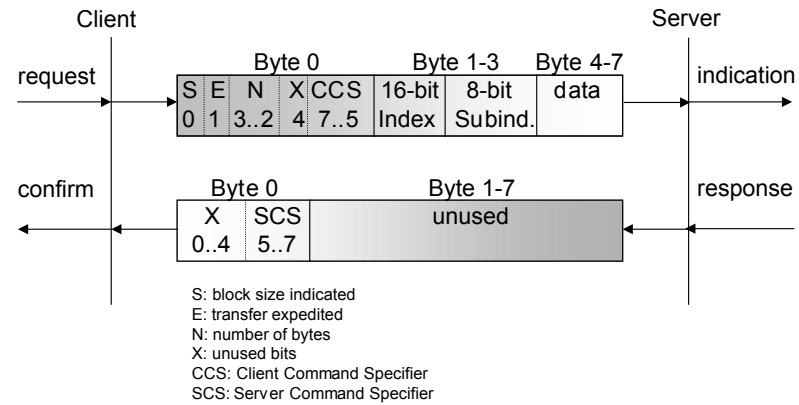| Index	Sub-Index	Name	Type
6000	0	A	unsigned8
6001	0	B	unsigned32
6002	0	C-len	unsigned8
	1		unsigned32
	2		unsigned32
	3		unsigned32

SDO PROTOCOL
Service Data Objects

- Configuration management.

- Segmented, Expedited and Block transfer.

- Firmware upgrade, OS prompt.

- Configure services.

- PDO connection management.

SDO PROTOCOL

Initiate SDO Download

Client   Server

request   indication

	Byte 0				Byte 1-3		Byte 4-7
S	E	N	X	CCS	16-bit	8-bit	data
0	1	3..2	4	7..5	Index	Subind.	

confirm   response

Byte 0	Byte 1-7
X	SCS	unused
0..4	5..7	

S: block size indicated
E: transfer expedited
N: number of bytes
X: unused bits
CCS: Client Command Specifier
SCS: Server Command Specifier

PDO
PROCESS DATA OBJECTS

* Message data is packed by TPDO and unpacked by RTDO.

* Synchronous processing, SYNC

* Asynchronous messages.

SYNC
Synchronisation Object

✳ Transmitted in fixed intervals.

✳ Synchronise PDO transmissions.

✳ PDO's are transmitted during the
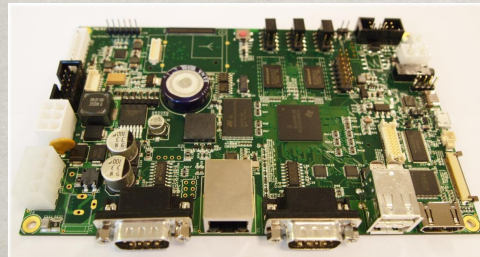Synchronous Window Length, if enabled.

NMT
NETWORK MANAGEMENT OBJECT

* Manage node states: start, stop, pre-operational, operational, reset.

* Node guarding (poll)

* Heart beat (push)

Embedded control

VIA AMOS-3001

VIA Eden 1GHz

MERISC-600

ARM Cortex-A8 500MHz

CAN controller

DEMO