




























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## ICU CANOPEN IMPLEMENTATION

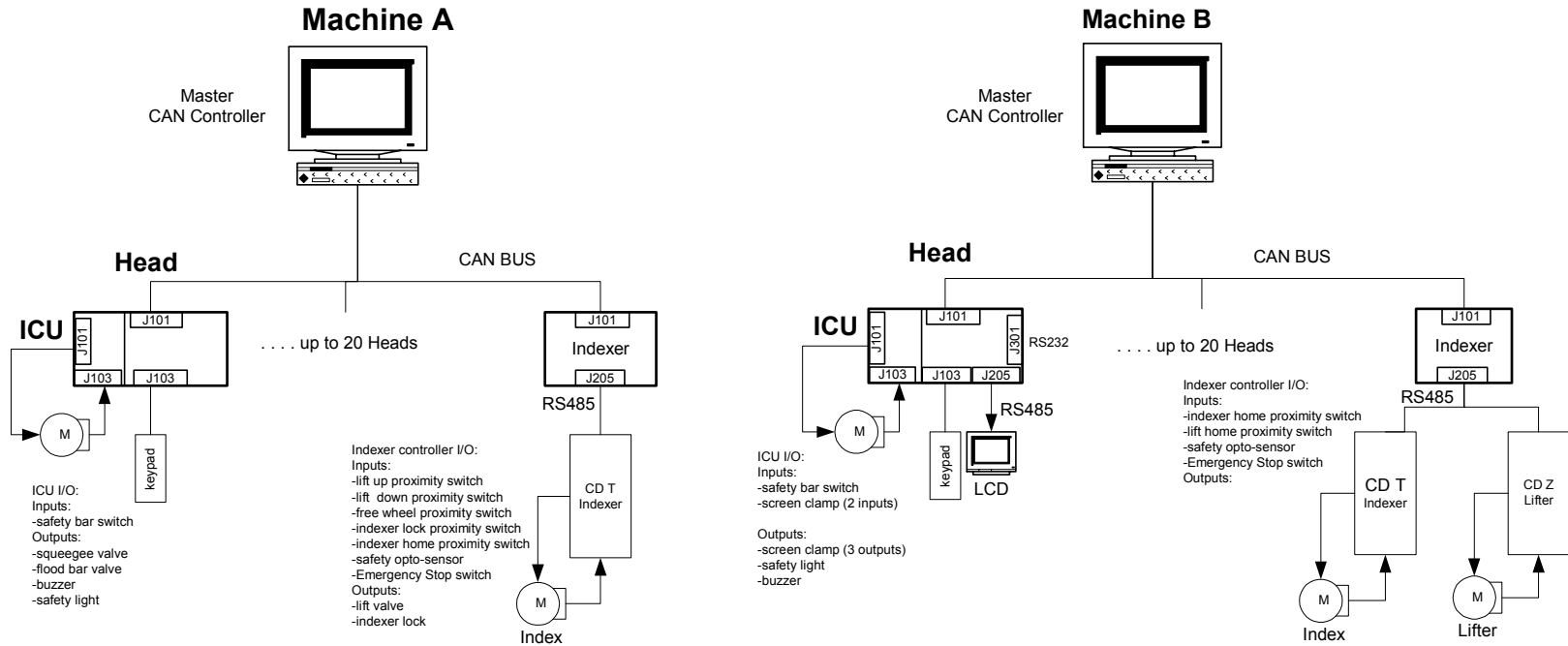
 CAN	 CANopen	 Standards
<ul style="list-style-type: none"><li>● general introduction</li><li>● technical introduction</li><li>● applications</li><li>● specification</li><li>● conformance test</li><li>● FAQ</li></ul> <p>The group is founded in March 1992 to provide technical, product and marketing information with the aim of fostering CAN's image and providing a path for future developments of the CAN protocol. The non-profit trade association with a persistently increasing number of members develops and supports various CAN-based higher layer protocols: CAN Application Layer (CAL), CAN Kingdom, CANopen, DeviceNet.</p>	<ul style="list-style-type: none"><li>● general introduction</li><li>● technical introduction</li><li>● applications</li><li>● specification</li><li>● conformance test</li><li>● FAQ</li></ul>	<ul style="list-style-type: none"><li>● DS 102 V2.0 </li><li>● DS 150 V1.1 </li><li>● DS 201 V1.1 </li><li>● DS 202-1 V1.1 </li><li>● DS 202-2 V1.1 </li><li>● DS 202-3 V1.1 </li><li>● DS 203-1 V1.1 </li><li>● DS 203-2 V1.1 </li><li>● DS 204-1 V1.1 </li><li>● DS 204-2 V1.1 </li><li>● DS 205-1 V1.1 </li><li>● DS 205-2 V1.1 </li><li>● DS 206 V1.1 </li><li>● DS 207 V1.1 </li><li>● DS 301 V4.02 </li><li>● DSP 302 V3.1.1 </li><li>● DR 303-1 V1.1.1 </li><li>● DR 303-2 V1.1 </li><li>● DR 303-3 V1.0 </li><li>● DSP 304 V1.0 </li><li>● DSP 305 V1.1 </li><li>● DSP 306 V1.1 </li><li>● DS 401 V2.1 </li><li>● DSP 402 V2.0 </li></ul>

**ICU drive** will work according to Standard DS102 to DSP402 ,DSP402 Version V2.0, We will implement only the following variable and command . Note:DSP 402 is standard for Drives and Motion control where you can find description of any function that is implemented

**Indexer** will only transfer String of KOLLMORGEN SERVOSTAR Variables and commands + address this string will be transfer as is to the addressed CD Drive. For KOLLMORGEN SERVOSTAR Variables and commands please refer to "VarCom Reference Guide" manual

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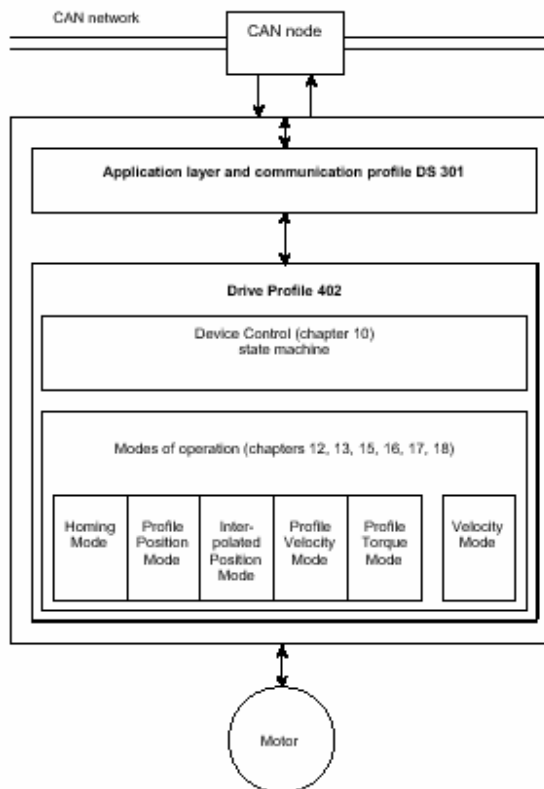
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System Diagram

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System diagram for Communication architecture

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## 1. Required Functionality

The following table contains a list of all the functions required or there link for the ICU and for the Indexer:

For Reference document see file **\_00x.html** This file is up dated and send together w/ the release ICU F/W.

The Variable/Command in ( ) are the equivalent Variable/Command of the SERVOSTAR.

Function	Direction	Description	Object Dictionary / Message	Implemented
<b>Motion Messages</b>				
Home	To ICU	Homes head servo motor hard stop homing	607C home_offset (HOME OFST) 6099 homing_speeds (HOMESPD) 2004 homing Torque limit (HOMEILIM)	Yes Yes Yes
	To Indexer	Homes indexer servo motor or lift servo motor positive proximity switch homing	MH [in pos ack] HOMETYPE 0 to 5 HOMESPD -VMAX to VMAX HOMESTATE 0-11	Yes
Velocity loop Jog	To ICU	servo motor jog	6042 VI Target velocity (J) 606C Velocity actual value (V)	Yes Yes
	To Indexer		J [speed] {time} V -15000 to 15000	Yes
Position loop Move Absolute (PTP)	To ICU	moves head servo motor from point to point	607A Target position (MA MI defined by control word) 6064 Position actual value (PFB) 60F4 Following error actual value (PE)	Yes Yes Yes

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	To Indxer	moves indexer servo motor or lift servo motor from point to point	MA <position> <velocity> [in pos ack] MI <pos> <vel> [in pos ack] PFB +/- 2,147,483,647 PE +/- 2,147,483,647	Yes
Stop	To ICU	Stop motion immediately, using fast deceleration	<b>605D</b> Halt option code	No
	To Indxer	stops indexer motion immediately, using fast deceleration	STOP	Yes
Disable	To ICU		<b>605C</b> Disable operation option code	No
	To Indxer		K	Yes
<b>Drive Configuration</b>				
Torque control parameter	To ICU		<b>60F6h</b> RECORD Torque control parameters ( manufacturer specific)	No
	To Indxer		See VarCom	Yes

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Velocity control parameter	To ICU		<b>60F9</b> Velocity control parameter set ENTRY DESCRIPTION (Sub 3 to Sub- Index 254 manufacturer specific) Sub- Index 0 number of entries x Sub- Index 1 Gain (KV) Sub- Index 2 $\tau_i$ – integration time constant (KVI) Sub- Index 3 Feed Forward (KVFR) Sub- Index 4 VF filter B0 Sub- Index 5 VF filter B1 Sub- Index 6 VF filter B2 Sub- Index 7 VF filter Bshift Sub- Index 8 VF filter A1 Sub- Index 9 VF filter A2 Sub- Index 10 VF filter Ashift Sub- Index 11 VD filter D1 Sub- Index 12 VD filter D2 Sub- Index 13 VD filter Dshift	Partial
	To Indxer		See VarCom	Yes
Position control parameter	To ICU		<b>60FB</b> Position control parameter set ( manufacturer specific) ENTRY DESCRIPTION (Sub 1 toSub- Index 254 manufacturer specific) Sub- Index 0 number of entries 4 Sub- Index 1 Position loop proportional (GP) Sub- Index 2 Position loop integral gain (GPI) Sub- Index 3 Position loop integrator input saturation (GPSTAIN) Sub- Index 4 Position loop loop integrator input saturation (GPSATOUT)	No
	To Indxer		See VarCom	Yes
TBD	To ICU			
	To Indxer			

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Keypad scan																																																																																																																
Read key press	From ICU	When ever a key is pressed/Released the first PDO message is sent to the CAN Master.	<p><b>2001</b> Key pad Digital inputs LSB 32 bits (KEYPADIN) The switch have to be " active high"</p> <table border="1"> <thead> <tr> <th></th> <th>C0</th> <th>C1</th> <th>C2</th> <th>C3</th> <th>C4</th> </tr> </thead> <tbody> <tr><td>R0</td><td>0</td><td>8</td><td>16</td><td>24</td><td></td></tr> <tr><td>R1</td><td>1</td><td>9</td><td>17</td><td>25</td><td></td></tr> <tr><td>R2</td><td>2</td><td>10</td><td>48</td><td>26</td><td></td></tr> <tr><td>R3</td><td>3</td><td>11</td><td>19</td><td>27</td><td></td></tr> <tr><td>R4</td><td>4</td><td>12</td><td>20</td><td>28</td><td></td></tr> <tr><td>R5</td><td>5</td><td>13</td><td>21</td><td>29</td><td></td></tr> <tr><td>R6</td><td>6</td><td>14</td><td>22</td><td>30</td><td></td></tr> <tr><td>R7</td><td>7</td><td>15</td><td>23</td><td>31</td><td></td></tr> </tbody> </table> <p><b>2002</b> Key pad Digital inputs MSB 8 bits</p> <table border="1"> <thead> <tr> <th></th> <th>C0</th> <th>C1</th> <th>C2</th> <th>C3</th> <th>C4</th> </tr> </thead> <tbody> <tr><td>R0</td><td></td><td></td><td></td><td></td><td>0</td></tr> <tr><td>R1</td><td></td><td></td><td></td><td></td><td>1</td></tr> <tr><td>R2</td><td></td><td></td><td></td><td></td><td>2</td></tr> <tr><td>R3</td><td></td><td></td><td></td><td></td><td>3</td></tr> <tr><td>R4</td><td></td><td></td><td></td><td></td><td>4</td></tr> <tr><td>R5</td><td></td><td></td><td></td><td></td><td>5</td></tr> <tr><td>R6</td><td></td><td></td><td></td><td></td><td>6</td></tr> <tr><td>R7</td><td></td><td></td><td></td><td></td><td>7</td></tr> </tbody> </table>		C0	C1	C2	C3	C4	R0	0	8	16	24		R1	1	9	17	25		R2	2	10	48	26		R3	3	11	19	27		R4	4	12	20	28		R5	5	13	21	29		R6	6	14	22	30		R7	7	15	23	31			C0	C1	C2	C3	C4	R0					0	R1					1	R2					2	R3					3	R4					4	R5					5	R6					6	R7					7	Yes
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R6					6																																																																																																											
R7					7																																																																																																											
Write LED state	To ICU	The Master tells the ICU what keypad LEDs need to be lit	<b>2003</b> Key pad Digital outputs (GROUPLD1 GROUPLD2)	Yes																																																																																																												
I/O Scan																																																																																																																
Digital Inputs	From ICU	When ever an input is detected by the ICU a first PDO message is sent to the CAN Master	<b>60FD</b> 6 x Digital inputs	Yes																																																																																																												

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	From Indexer		IN 000 - 111 (0=off, 1=on)	Yes
Analog input	From ICU	Temperature sensor Read only variable 0 to 65536	2000 Temperature actual value (ANSENS)	Yes
Digital Outputs	To ICU	The Master writes the state of the outputs	60FE Digital outputs (MACHOUT)	Yes
	To Indexer		O1 0 or 1 RELAY 0 = relay open 1 = relay closed	Yes
<b>RS 485 to LCD Display and to CD's</b>				
Write to ICU/Indexer RS485 port	To ICU or Indexer	The Master sends a string message to the ICU/Indexer.	2006 send RS485 string (RS485XMT)	Yes
Read from ICU/Indexer RS485 port	From ICU or Indexer	ICU/Indexer hold a buffer of 80 characters, the status word show if new string arr in the buffer	2005 recive RS485 string (RS485RD)	Yes
<b>RS 232</b>				
Write to ICU/Indexer RS232 port	To ICU or Indexer	The Master sends a string message to the ICU/Indexer.	2008 send RS232 string	From F/W 0.0.6
Read from ICU/Indexer RS232 port	From ICU or Indexer	ICU/Indexer hold a buffer of 80 characters, the status word show if new string arr in the buffer	2007 receive RS232 string	From F/W 0.0.6
<b>Control Status and Diagnostics</b>				
Control	ICU		6040 Controlword For full description please refer to CANOpen CiA DSP 402 for the mechanism and to _00x.html for the implementation.	Partial



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	Indexer		See VarCom	Yes
Status	From ICU		<b>6041</b> Statusword For full description please refer to CANOpen CiA DSP 402 for the mechanism and to _00x.html for the implementation.	Partial
	From Indexer		See VarCon	Yes
Read fault	From ICU		<b>2009</b> Drive fault	From F/W 0.0.7
	From Indexer		See VarCom	Yes
Error fault	To ICU		<b>1001</b> Error Registry	No
	To indexer		See VarCom	Yes
Pre-Defined Error	ICU		<b>1003</b> Pre-defined error	No
Change opmode	To ICU		<b>6060</b> Modes of operation (OPMODE n) Note: the numbering of CAN and SERVOSTAR for operation mode is different.	Yes
	To indexer		OPMODE n	Yes
Read Opmode	From ICU		<b>6061</b> Modes of operation display	Yes
	From Indexer		OPMODE	Yes
Read version	From ICU		<b>100A</b> manufacturer software version	Yes
	From Indexer		VER	Yes

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## 2. Address

Dip switch 1 to 6 Set the ICU CAN MAC address (0 to 63 CAN nodes).

## 3. Baud rate

Dip switch 7 and 8 Set the ICU CAN baud rate		
SW7	SW8	Baud Rate
1 (On)	0 (Off)	125 kbps
0 (Off)	1 (On)	250 kbps
1 (On)	1 (On)	500 kbps (Default)

## 4. PDO –Process Data Object (Send)

ICU/Indexer uses the first PDO message for Drive Keypad and Input Status.

## 5. SDO- Service Data Object (Send + Acknowledge)

All objects are transfer in this format.

## 6. Profiles

Not in use

## 7. Protocol

### 7.1 SYNC Object

Not in use

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## **7.2 Time Stamp Object**

Not in use

## **7.3 Emergency Object**

Not in use

## **7.4 Heart Beat Object**

Not in use

## **8. Messages timing**

If baud rate 500kpbs

SDO

Master to ICU/Indexer App 83 bit.

ICU/Indexer acknowledge to Master App 19 bit

One SDO App 120 bit

$500/120 = 4.166 \text{ KMessages/Sec}$  gives 0.24 mSec for SDO

ICU/Indexer process time 0.5 mSec

$0.24 + 0.5 = 0.74 \text{ mSec}$  for SDO message from Master to ICU/Indexer include the acknowledge.