C3 I20 T30 / T40 ArrayManager

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1 introduction

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1.2 Device assignment

1.2.1 This manual applies to the following devices:
- Compax3S025V2 + supplement
- Compax3S063V2 + supplement
- Compax3S100V2 + supplement
- Compax3S025V2 + supplement
- Compax3S063V2 + supplement
- Compax3S100V2 + supplement
- Compax3S150V2 + supplement
- Compax3S015V4 + supplement
- Compax3S038V4 + supplement
- Compax3S075V4 + supplement
- Compax3S150V4 + supplement
- Compax3S300V4 + supplement
- Compax3H050V4 + supplement
- Compax3H090V4 + supplement
- Compax3H125V4 + supplement
- Compax3H155V4 + supplement

1.2.2 With the supplement:
- F10 (Resolver)
- F11 (SinCos©)
- F12 (linear and rotary direct drives)
- I20
- T30
- T40
1.2.3 and the Master plc:
- SIMATIC S7-300 or
- SIMATIC S7-400
- with integrated PROFIBUS DP Master (e.g. CPU315-2DP)

2 purpose of the Block

2.1 overview

<table>
<thead>
<tr>
<th>Absolute</th>
<th>Symbol</th>
<th>Comment</th>
<th>Vers.</th>
<th>Datum</th>
<th>device</th>
<th>application</th>
</tr>
</thead>
<tbody>
<tr>
<td>FB40</td>
<td>C3ArrayManager</td>
<td>C3 I20 T30 / T40 Manager for reading and writing objects</td>
<td>V0.1</td>
<td>2004-04-29 07:44:14 PM</td>
<td>C3 I20 T30 / T40</td>
<td>Recipe - Array read / write</td>
</tr>
</tbody>
</table>

2.2 restrictions and application

The block is used to transfer tags, which are not very often changed. There’s a possibility to transfer in both directions. The more often changed tags should be transferred with cyclic channel (PZD).

Now you’ve the possibility to transfer lots of more tags with ArrayManager over the acyclic channel. The block is writing or reading any number of tags from 1 to 288. The actualisation time is increasing with the number of tags.

3 adjustment

3.1 Compax3 Configuration

With C3ServoManager few following adjustments:

At folder:
- \ communication \ PROFIBUS DP - node settings
  [PLC -> Compax3]
- The input parameters are up to the user.
  [Compax3 -> PLC]
- The output tags are up to the user.

Caution: don’t use the same tag in both ways in same direction, otherwise it could force the to be flashing with tow values.

[Operation Mode Settings]
- Acyclic process data channel / Parameter channel
  Select with "PKW"
  Error response on fieldbus failure is up to user.

At folder:
- \ communication \ scaling factors Y2/Y4
  The variables of the first two columns (col1, col2) are as C3 "REAL" -Variables declared. Via Fieldbus they are transferred throw "INT"-(col1) resp. "DINT"-(col2)
  Variables. The ArrayManager is transferring them into SIMATIC "real" variables.
  The adjustment of the decimal point is done with:
Y2 - Array_col2
Y4 - Array_col1

The adjustment of scaling factors is up to user according to the Application, for a meaningful adjustment you've the following array of values:

- For col2
  Values: -32768 ... 32767
  Default setting: "1 decimal place"
  Suggestion values: 0... 4 decimal places

- For col1
  Values: -2147483648 ... 2147483647
  Default setting: "3 Decimal places"
  Suggestion values: 0... 6 decimal places,

So, if you need a high amount of values use column 1. This two mentioned scaling factors are correlated the to first two columns (col1, col2). They're used in same way equal you transfer via PZD or PKW. The other settings are not used with ArrayManager.

### 3.2 Compax3 Hardware

DIP-Switch: Bus address
Bus plug: ``ON / OFF`` Bus- termination resistance

### 3.3 Compax3 configuration

![Image of Compax3 configuration](pic 1 communication - PROFIBUS DP node settings)
3.4 SIMATIC - HW Config

Correlated to PPO-Type (see pic 2 communication - PROFIBUS DP node settings - is shown in C3-Manager wizard) use the type at SIMATIC - HW Config.

![SIMATIC - HW Config](image)

Edit the Start address of PKW (here 256) in Instance Variable <nLaddr> (DB40.DBW12).

3.5 Application interface of “ArrayManager”

3.5.1 Schematic drawing for in- and output

DB40

| DBX0.0 | bExecute | bCommErr | DBX10.0 |
| DBX0.1 | bDirection | bTransErr | DBX10.1 |
| DBX0.2 | bRealAsDint | bRangeErr | DBX10.2 |
| DBW2 | iDBNum | bDone | DBX10.3 |
| DBW4 | iDBOff | bAborted | DBX10.4 |
| DBW6 | iNumberOfVars | bBusy | DBX10.5 |
| DBX8.0 | bExDataTransfer |  |  |
| DBW12 | nLaddr |  |  |
| DBX14.0 Word 4 | stC3PKWI nDint.nPKE | stC3PKWOutDint.nPKE | DBX22.0 Word 4 |

3.5.2 Declaration of In- and Output

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Declaration</th>
<th>Type</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klaus Zimmer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parker Hannifn GmbH &amp; Co KG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EME - Electromechanical Automation Europe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postfach 17 20 * 77607 Offenburg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robert-Bosch-Straße 22 * 77656 Offenburg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-Mail: <a href="mailto:klaus_zimmer@parker.com">klaus_zimmer@parker.com</a></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Parameter Declaration and Type Description

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Declaration</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bExecute</td>
<td>IN</td>
<td>BOOL</td>
<td>Start transfer with rising edge, that must be “high” during complete transfer (reset with bDone = 1)</td>
</tr>
<tr>
<td>bDirection</td>
<td>IN</td>
<td>BOOL</td>
<td>=0 Upload, =1 Download</td>
</tr>
<tr>
<td>bRealAsDint</td>
<td>IN</td>
<td>BOOL</td>
<td>=0 col. 1 and 2 are transferred to / from REAL at S7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>=1 col. 1 and 2 are transferred to / from DINT or INT (e.g. for special dates out of a HMI-device)</td>
</tr>
<tr>
<td>iDBNum</td>
<td>IN</td>
<td>INT</td>
<td>DB Number with Variables</td>
</tr>
<tr>
<td>iDBOff</td>
<td>IN</td>
<td>INT</td>
<td>Start address in iDBNum</td>
</tr>
<tr>
<td>iNumberOfVars</td>
<td>IN</td>
<td>INT</td>
<td>number of Variables for transfer</td>
</tr>
<tr>
<td>bExDataTransfer</td>
<td>IN</td>
<td>BOOL</td>
<td>=0 integrated DP interface (communication with SFC14 / SFC15)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>=1 external DP- interface (communication with FC1 / FC2)</td>
</tr>
<tr>
<td>bCommErr</td>
<td>OUT</td>
<td>BOOL</td>
<td>=1 communication failure (out of SFC14 / SFC15)</td>
</tr>
<tr>
<td>bTransErr</td>
<td>OUT</td>
<td>BOOL</td>
<td>=1 Format-, Commando failure with transfer to C3</td>
</tr>
<tr>
<td>bRangeErr</td>
<td>OUT</td>
<td>BOOL</td>
<td>=1 at</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- amount of Variables &lt; 1 or &gt; 288</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- number of rows &lt; 1 or &gt; 32</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- number of columns &lt; 1 or &gt; 9</td>
</tr>
<tr>
<td>bDone</td>
<td>OUT</td>
<td>BOOL</td>
<td>=1 if transfer finished and bExecute = 1</td>
</tr>
<tr>
<td>bAborted</td>
<td>OUT</td>
<td>BOOL</td>
<td>=1 if transfer not finished but bExecute = 0</td>
</tr>
<tr>
<td>bBusy</td>
<td>OUT</td>
<td>BOOL</td>
<td>=1 if transfer active</td>
</tr>
<tr>
<td>nLaddr</td>
<td>STATIC</td>
<td>WORD</td>
<td>Default = W#16#100, Start address C3-Slave at HW Config, necessary if bExDataTransfer = 0</td>
</tr>
<tr>
<td>StC3PKWInDint.nPKE</td>
<td>STATIC</td>
<td>Word 4</td>
<td>Local input area for external CP.</td>
</tr>
<tr>
<td>StC3PKWOOutDint.nPKE</td>
<td>STATIC</td>
<td>Word 4</td>
<td>Local output area for external CP.</td>
</tr>
</tbody>
</table>

### 3.5.3 sequence of process data

1. setting of inputs of the block
   - `<nLaddr>` (Parameter from HW Config)
   - `<bDirection>` (write o read)
   - `<iDBNum>` and `<iDBOff>` (pointer of Start address of Data block)
   - `<iNumberOfVars>` (number of variables for transferring)

2. settings of Parameters of the Data block
   - To transfer one variable a data set is needed. This data set contains three tags: two pointers (Row, Column) and the value. For Row / Column each on byte is needed for value 4 byte is reserved.
   - It is up to the user how much Variables (1 ... 288) and in which order they are transferred.
   - Each column of the C3 array is correlated one data type which is not possible to be changed.
     - 1. column REAL transferred as INT
     - 2. column REAL transferred as DINT
     - 3. - 5. column INT
     - 6. - 9. column DINT
     - that means: with the pointers is also the format fixed.
   - Each data set contains a value area with 4 bytes despite that is not used in any case (e.g. INT).
   - For engineering data blocks it is advisable to use the following data blocks
3. If transfer direction is from plc to C3 fill the data values in data block
4. Force the input
   - `<b_execute>`
   to "1": transfer is active!
5. If the output
   - `<b_done>`
   has reached the value "1" transfer is done. The input
   - `<b_execute>`
   should be reseted to "0".
6. If there are values transferred form c3 to plc: now it is possible to read them out of data block

### 3.6 setting for external Master

- the function block is only possible with S7 plc with integrated PROFINET DP master: Without the block is not suitable.
- If this interface is used for another purpose and the connection to c3 should be realised with an external communication processor (cp342-5) the function block is possible to be used with following settings:
  - For running the CP 342-5 there're to functions: FC1 / FC2 (DP_SEND / DP_RECV, out of SIMATIC Standard library).
  - Put at DP_SEND the global output area, and at DP_RECV the global input area.
  - attention! These global areas included the data's of all bus slaves.
  - The local field of c3 must be transferred to the field at DB40 (e.g. via SFC20 BLKMOV).
  - The local input and output field could be indentif ied with SIMATIC - HW Config.

### 4 Application example

#### 4.1 Overview of the connection:

Connection between one plc SIMATIC S7 300 as PROFIBUS DP Master and one drive C3 I20 T30 as PROFIBUS DP Slave.
4.2 cyclic channel (PZD)

The In- and output parameters are at the C3 CoDeSys Program available. They are transferred in the S7 to the in- and output data EB50... EB55 respectively AB50 ... AB55 with the functions FC51 / FC99.

<table>
<thead>
<tr>
<th>S7</th>
<th>= &gt;</th>
<th>C3</th>
<th>= &gt;</th>
<th>S7</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB50</td>
<td>0</td>
<td>Controlword_1</td>
<td>0</td>
<td>EB50</td>
</tr>
<tr>
<td>AB51</td>
<td>1</td>
<td>Statusword_1</td>
<td>1</td>
<td>EB51</td>
</tr>
<tr>
<td>AB52</td>
<td>2</td>
<td></td>
<td>2</td>
<td>EB52</td>
</tr>
<tr>
<td>AB53</td>
<td>3</td>
<td>Col01_Row01</td>
<td>3</td>
<td>EB53</td>
</tr>
<tr>
<td>AB54</td>
<td>4</td>
<td></td>
<td>4</td>
<td>EB54</td>
</tr>
<tr>
<td>AB55</td>
<td>5</td>
<td></td>
<td>5</td>
<td>EB55</td>
</tr>
</tbody>
</table>

4.3 Acyclic channel (PKW)

Via the 8 Byte PKW interface are 2 variables of the recipe array transferred to the C3. With an endless sequence is the transfer continuously repeated. This is done from the functions FC31, FC40, FB40, FC41, FC42, FC43, FC44.

<table>
<thead>
<tr>
<th>S7</th>
<th>Format</th>
<th>C3</th>
</tr>
</thead>
<tbody>
<tr>
<td>AW50</td>
<td>Word</td>
<td>C3Plus.DeviceControl_Controlword_1</td>
</tr>
<tr>
<td>EW50</td>
<td>Word</td>
<td>C3Plus.DeviceState_Statusword_1</td>
</tr>
<tr>
<td>ED52</td>
<td>DINT</td>
<td>C3Array.Col01_Row01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S7</th>
<th>Format</th>
<th>C3</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB104.DBD2</td>
<td>REAL</td>
<td>C3Array.Col01_Row01</td>
</tr>
<tr>
<td>DB104.DBD8</td>
<td>REAL</td>
<td>C3Array.Col01_Row02</td>
</tr>
</tbody>
</table>