Jetter

Technical Information
Version Update

21 June 2001

D-CON/D-CON1/D-CON+ Modifications
from version 2.620 to version 2.800

The numbers in parentheses indicate the version numbers of interim versions.

1   Modifications / New Functions

1.1 D-CON1

- (2.800) The D-CON module has got an Intel 196NP processor; the D-CON+ module has got an Intel 296SA processor. Due to speed problems of the D-CON, more and more functions (virtual master, master in third submodule socket, etc.) have only been activated on the D-CON+. Therefore, the D-CON is replaced by the D-CON1. This module is also equipped with an Intel 296SA processor and has got all functions, which do not go beyond the individual module. This means that the D-CON+ is still used for follower control and interpolation via backplane bus.

1.2 General Axis Control

- (2.726) (D-CON1, D-CON+ only) An SSI absolute encoder in the third submodule socket is used to acquire the actual position. A D-SV1 module for this function will be needed. Single-turn or multi-turn encoders can be used. This actual position acquisition can also serve as master for the follower function.

  Exemplary program:
  SSI encoder with 15 bit resolution (0 ... 32767), non-controlled axis.
  Master-Slave ratio 8/5. The slave (DIMA3 axis) counts from 0 through 20479.

```
    ; Slot 1/2: D-DIMA3, slot 3: D-SV1
    REGISTER_LOAD [121098 with 3]          ;Complete position feedback control
    REGISTER_LOAD [123098 with 2]          ;Complete position feedback control
    REGISTER_LOAD [123064 with 15]         ;Length of data 15 bits
    REGISTER_LOAD [123066 with 15]         ;Resolution 15 bits
    REGISTER_LOAD [123001 with 92]         ;Axis 3 follower master
    REGISTER-LOAD [123001 with 90]         ;Axis 3 active
    REGISTER_LOAD [123017 with 8192]       ;32768/4 Number of lines of encoder
    REGISTER_LOAD [121056 with 10]         ;Transmission ratio 10/8
    REGISTER_LOAD [121057 with 8]
    REGISTER_LOAD [121058 with 32768]
    REG 121052                             ; Adaptation of
    =                                      ; different encoder-
    REG 121017                             ; resolutions
    /
    4
    /
    REG 123017
    *
    1000
    REGISTER_LOAD [121001 with 1]
    REGISTER_LOAD [121071 with R(123009)] ; Correct actual position
    REGISTER_LOAD [121001 with 44]         ; Follower ON
  WHEN
    FLAG 1
  THEN
    REGISTER_LOAD [121001 with 45]         ; Follower OFF
```

- (2.272) The axis mode (register 1xy098) can be defined separately for the 3 submodule sockets.
  A special procedure is necessary when switching on the controller to ensure downward compatibility with older versions:
  When writing a value into register 1x1098, this value will also be written into registers 1x2098 and 1x3098. Yet, this only applies as long as a value is written into registers 1x2098 and 1x3098 for the first time. Afterwards, only the respective register is modified.
  This function allows, for example, to operate the first axis with complete position control (SV4 mode) and the second axis without complete position control (SV3 mode). The cam group of the first two axes can now also be activated separately.
- (2.730) The status of the acceleration ramp can be read from the status register (1xy000) in bit 15. After having started positioning, at least 2 ms must have passed until the bit is evaluated. The acceleration ramp bit is only available in positioning mode (neither in interpolation nor in other special functions).
- (2.730) Actual position interpolation is carried out during DIMA axis control for accurate calculation of tracking errors if complete position control has been activated in the mode register. This ensures smooth tracking error behavior as well as smooth axis motion. This function is only available for D-CON+ cards with D-DIMA4 (2.692) and D-DIMA3 (2.751).
  Besides that, interpolation of the internal set position is performed if complete position control has been activated.
  This interpolation is available for all types of axes. For D-DIMA4, this function has been available from 2.691 onwards.
- (2.741) When no submodule has been detected, the value FFFFh will now be written into register 1xy199 (submodule identifier).
- (2.744) Optimum calculation of the deceleration ramp ensures smooth termination of the axis motion.
- (2.746) From this version onwards, the special function "original actual position" of registers 1xy156 / 1xy157 must be activated by command 146. Command 147 deactivates the function.
  In this function, the actual position of the incremental encoder is represented without internal offsets. This means that only a search for reference can change this position. "Set reference" by command 3 or "modify actual position" via register 1xy071 will not influence the indicated actual position.
  Register 1xy156 indicates the first 24 bits of the actual position, register 1xy157 indicates bits 25 – 32.
- (2.750) For the function "follower via variable transmission ratio (table mode)", the internal variable memory is used. This variable memory must always be queried first; if necessary, it can be released after completing the function. Yet, this might cause unreserved gaps in the internal memory. A requested memory is always reserved "as a whole", it can not be split. All axes on the controller card use and manage the variable memory together.
  A table in table mode requires for instance
  4 * registers 1xy055 + 1 byte.
  Command 145 can be used to find out how much continuous memory is available. The result can then be read in bytes in register 1xy239.

- (2.751) Now the statuses of limit and reference switches are indicated in the status registers and by the LEDs when the axes have been released the first time (command 1).
- (2.756 / 2.760 / 2.769) Linear interpolation with different encoder resolutions: Regarding linear interpolation, the speed of the path has always related to the encoder resolution of axis 1. In case of different encoder resolutions of the axes involved, a correction must be calculated in order to ensure correct speed of the path. The problem only appeared when axis 1 had to cover a short distance or no distance at all. The correction is activated by means of command 150. Command 151 will deactivate the function. The correction is limited to internal interpolation axes. This means that the correction cannot be used for interpolation with external slave axes. From version 2.770 onwards, this correction is activated when the controller card is started.
- (2.759) Endless mode can be quit by writing the set position (register 1xy002). The axis will continue at the speed written in register 1xy003. At the end of the positioning process, the axis will be stopped with a deceleration ramp.
- (2.760) The status "find reference" (command 4) can be reset by command 15.
- (2.768) Stopping with a deceleration ramp is also possible now for interpolation with external slaves (command 0).
- (2.771) New register (1xy245) for static limit switch and reference switch indication: Equal to bits 4 through 8 in the status register, the bits writtenin register 1xy245 are set as well. However, the individual bits will not be cleared by the operating system but have to be reset by the user program.
- (2.771) From this version onwards it is possible to quit the function "follower with variable transmission ratios (table mode)", when the set position (register 1xy002) has been written. The axis will continue at its present speed and will stop the positioning process with a deceleration rampat the set position. This behaviour now also applies to the function "follower with static transmission ratio (factor/divisor)".

1.3 D-DIMA3 / D-DIMA4

- (2.746) The actual position for axis 1 is read from the incremental encoder in the third submodule socket. The function is enabled by issuing command 59 and disabled by giving command 58. The following possibilities are available for these functions:
  - the direction of rotation of the incremental encoder can be reversed via bit 3 in register 1x3004.
  - the direction of rotation of the motor encoder combination can be reversed via bit 3 of register 1x1004.
  - the peak speed of the third submodule socket (register 1x3018) must be equal to the peak speed of the first submodule socket (register 1x1018).

  Exemplary program:

```
; Slot 1/2: D-DIMA3, slot 3: D-SV1
REGISTER_LOAD [121001 with 2]
REGISTER_LOAD [121098 with 3]
REGISTER_LOAD [121010 with 300]
REGISTER_LOAD [121024 with 10]
REGISTER_LOAD [121026 with 350]
;
REGISTER_LOAD [123098 with 3]           ; Complete position feedback control
BIT_SET [Reg=123004, Bit=3]             ; Reverse direction of rotation
REGISTER_LOAD [123017 with 500]         ; Number of encoder lines
REGISTER_LOAD [123018 with R(121018)]   ; Max. speed
;
REGISTER_LOAD [121001 with 59]          ; Actual position of encoder
NOP                                     ; in third socket
REGISTER_LOAD [121001 with 148]         ; Speed control on resolver
AXARR axis=21
REGISTER_LOAD [121001 with 1]
```

1.4 D-DIMA3

- (2.750) Regarding the special function, "0" will, for example, prevent the axis from moving backwards.

1.4.1   Interrupt Inputs

- (2.764) Interrupt inputs activated on D-CON1, D-CON+, D-CON2, D-CON3: This function allows the use of two interrupt inputs on the digital inputs 15 and 16 as a fast single-channel counter and as a tool for time measurement.
  Also see the description of interrupt inputs.

1.4.2   Cam Group

- (2.767) The cam group can now also be used for D-DIMA3, D-DIMA4 and D-DIMA4-3 (originally only D-SV).

2   Error Correction

2.1 Axis Control

- (2.720) Follower with variable transmission ratio (table mode):
  selecting the various tables did not work with the second axis.
- (2.726) Activating the follower function resulted in an incorrect calculation and
  therefore in a sudden jump to the next position.
- (2.726) For the special transition from endless mode to the follower function, giving
  command 30 (sending via bus) would be necessary for the master although there did
  not exist any external slaves .
- (2.740) The calculation of the acceleration ramp was incorrect for SV and DIMA
  control. The ramp was always calculated too large by factor 6/5.
- (2.741) Error correction since 2.727: Due to the separate mode registers, only
  constellations were possible where the first two axes were equipped.
  (2.746) Writing into register 1x3098 would not perform the separation of axis modes.
- (2.746) Since version 2.743, it has not been possible to release
  D-DIMA3 axes.
- (2.746) From this version onwards, an encoder on the third submodule socket is
  always processed with fourfold evaluation.
- (2.751) Since version 2.723, the slave axis has not been controlled correctly during
  interpolation with external slaves and arrived at the destination with delay. External
  slaves are slave axes that are not located on the same D-CON+ controller card as the
  data axis.
- (2.751) In endless mode, with large deceleration ramp and overflow position at 7.49
  million increments, a deceleration ramp was started erroneously and stopped abruptly
  when an overflow had occurred.
- (2.752) If there were two follower axes on an external controller card, only the busy bit
  of the first axis would be cleared after receiving the master data via backplane bus for
  the first time. The busy bit of the second axis remained active.
- Various error corrections for interpolation:
  - (2.753) Interpolation with external slaves.
  - (2.753) Interpolation with circular axes on different controller cards and additional
  external linear slaves.
  - (2.753) When the speed between linear and circular interpolation was to be changed,
  the new speed of the second axis would not be adopted.
  - (2.756) Continuous interpolation.
  - (2.760) If axes are not involved in interpolation, registers 1xy005, 1xy006 and 1xy007
  are not written into through the data axis any more.
  - (2.761) When circular interpolation is started, only the AXARR bits of the axes
  involved are cleared.
  - (2.761) Communication with external slaves.
  - (2.761) Interpolation with only one internal interpolation axis.
  - (2.763) Continuous interpolation for combined circular linear interpolation.
  - (2.765) External circular axis
  - (2.766) External circular axis with continuous interpolation
  - (2.768) In case of changed speed for several external slaves, it could sometimes

occur that the slave did not take over the speed.
- (2.768) In case of changed speed for external slaves, the deceleration ramp will now also be transferred.
- (2.768) The internal slave did not take over the changed speed correctly.
- (2.726) D-SV with absolute encoder in the third submodule socket. Position overflow did not function properly.
- (2.753) Command 71 (deactivate linear ramp) did not work.
- (2.757 / 2.758) In variable-frequency inverter mode (unipolar analogue output) and when positioning via outputs, the AXARR state would not be reached.
- (2.758 / 2.759) When giving command 42, internal flags were modified unintentionally. The error has occurred since version 2.750.
- (2.762) D-SV in the third submodule socket:
  Modifying the actual position via register 1x3071 did not work.
- (2.762) Virtual master:
  "Set reference" (command 3) did not work.
- (2.765) The mode register (register 1xy098) can be read back. If a DIMA is plugged in to be used as a submodule, bit 1 (digital speed controller) would generally be set in the mode register.
- (2.768) Actual position interpolation (from version 2.730 onwards) did not work properly for D-SV and D-SM when the axis had been stopped.

2.2 D-DIMA3

- (2.756) Command 149 (Speed control on incremental encoder) did not work.
- (2.770) The register for current limitation (1xy027) is initialized with 255.

2.3 D-DIMA4

- (2.690) As for the D-CON, the old speed controller had to be used again due to time problems.
- (2.744) Modification was necessary for speed acquisition over 3000 revolutions/min for encoders of the type SRS or SRM (32768 increments/revolutions). This modification requires version 1.16 on the submodule D-DIMA4.
  (2.745) It is not possible any more to control the D-DIMA4 axes on a D-CON.
- (2.744) The I-component of the speed controller has been limited to 327.
- (2.748) An internal check of the D-DIMA4 version for verson number 1.16 has failed.
- (2.744) It was not possible to position the axis correctly due to an incorrectly initialized internal variable.
- (2.754) Changing the encoder resolution via register 1xy017 did not work for the second axis.
- (2.755) It was possible to operate SRS or SRM encoders only up to a speed of 3750 revolutions/min.
  The internal check of the D-DIMA4 version did not work for axis 2.
  A discontinuity of speed occurred at the transition from 3700 to 3800 revolutions/min.

2.4 D-SM

- (2.740) The ramp was calculated incorrectly when the speed changed. Always the entire ramp duration would be covered.
- (2.760) When a new positioning was entered into an active acceleration ramp, an offset in speed would occur.
- (2.771) Since version 2.760, the error occurred that the stepper motor axis did not start positioning.

2.5 D-AD8

- (2.752) From this version onwards, the current range of 4 through 20 mA and the differential inputs for voltage and current will be read with correct channel-dependent adjustment. For the corrected processing of analog values, hardware revision "10" of the D-AD8 module is necessary ("2.10" or "4.10"). Older modules would basically function as well, but the adjusted values of the single-ended analog values are used in this case.
- (2.758) When configuring D-AD8 on the third submodule socket and circular interpolation, an internal variable was modified with the result that the axes were not controlled correctly.
- (2.763) Corrected modification of 2.758. It is now possible again to record the analog values with the Sympas Oszi mode (registers 1x3051 – 1x3058).