MASTERDRIVES MC
Function diagram "F01 technology option" (Positioning and synchronization)

Status: 01/2002 V.1.6

Notes: **- The F01 technology option must have been enabled:**

The F01 technology option can only be used with MASTERDRIVES units which are supplied ex-works with the enabled F01 option or for which this option has been enabled retrospectively by means of the PIN No.

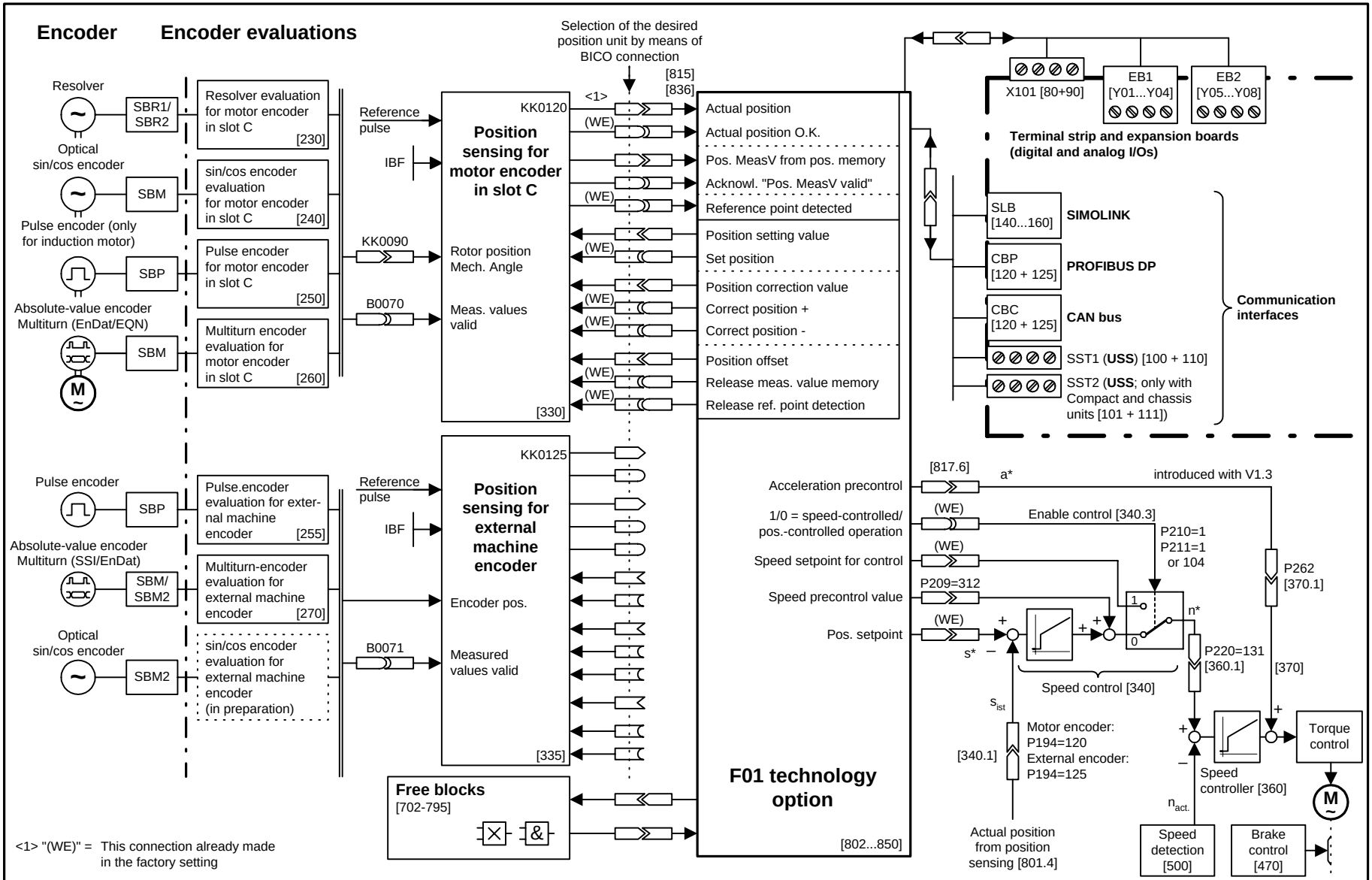
The display parameter n978 can be used to check if the F01 option is present:

n978 = 2 ==> F01 technology option has been enabled for 500 hours
n978 = 1 ==> F01 technology option has been enabled
n978 = 0 ==> F01 has been disabled

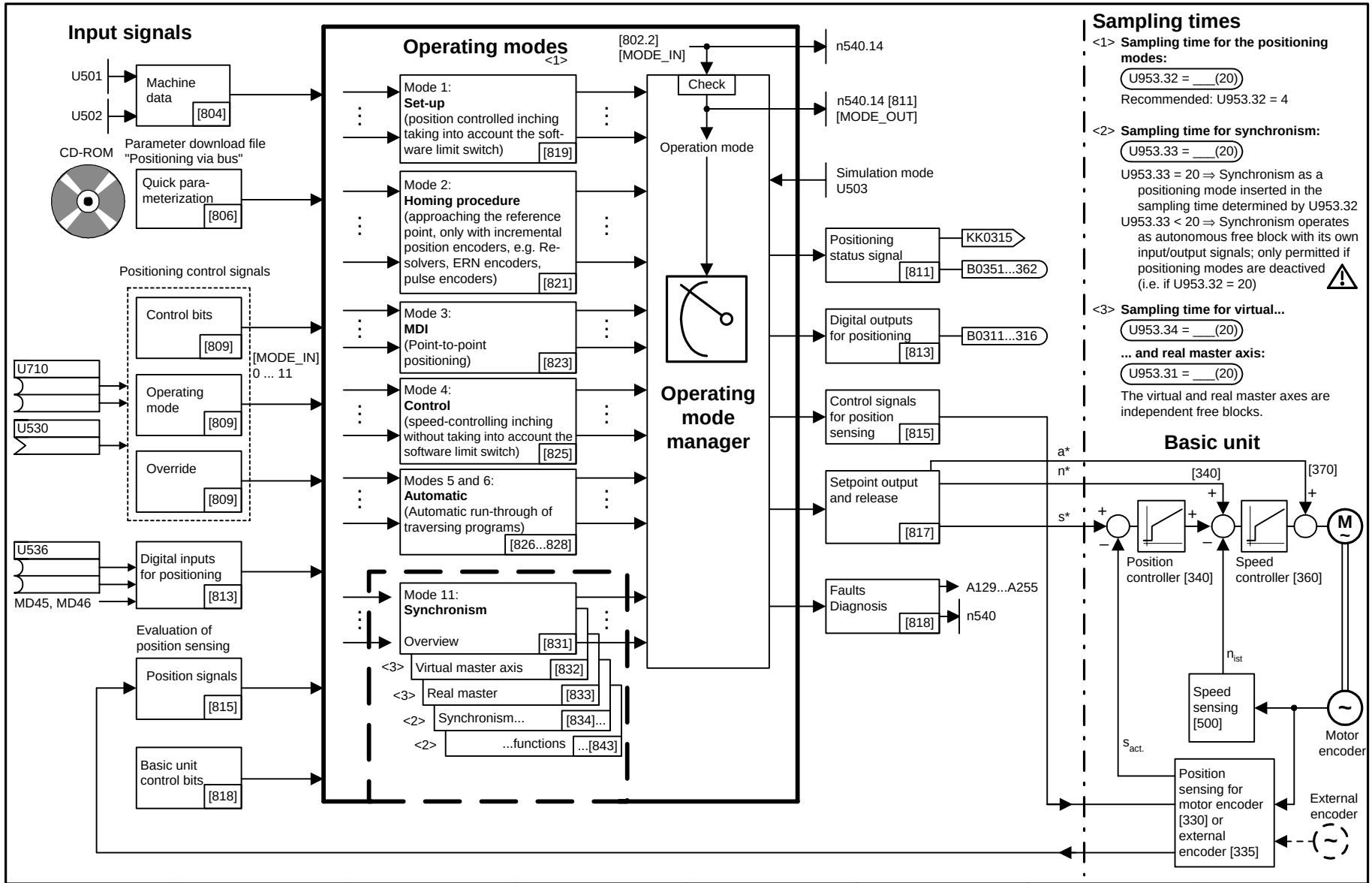
On sheet [850], you can find out how you can retrospectively enable the technology option on a permanent basis or for a 500-hours trial period.

- The technology functions are performed only if they are specifically nested in a sampling time by means of the assigned U95x parameter; see also sheets [702] and [802]! If the F01 technology option has not been enabled, when an attempt is made to nest a technology function in a sampling time, error message F063 appears.
- The technology functions synchronization (U953.33) and positioning (U953.32) must not be enabled at the same time.
- The following technology function can also be used without enabling of the technology option:
  - 833 - Real master with dead time compensation
- MD1 ... MD50 = Machine data for positioning (stored in parameters U501.01 ... U501.50); see [804]
- LU = **L**ength **U**nit = The unit of length defined by the position-feedback scaling factor (PSF). The PSF is specified by means of P169/P170 [330] if the motor encoder is used and by means of P155/P156 [335] if an external machine encoder is used.

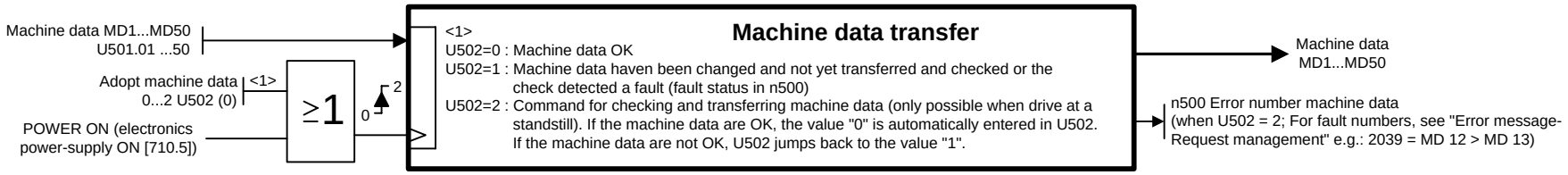
MASTERDRIVES MC function diagram - List of contents of the technology option



1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_801_e.vsd	Function diagram	- 801 -
Embedding the technology in the basic unit					08.01.02	MASTERDRIVES MC	



1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_802_e.vsd	Function diagram	- 802 -
Technology overview, operating mode manager					08.01.02	MASTERDRIVES MC	



I = Needed for incremental encoder (resolver, ERN encoder, pulse encoder...)
A = Needed for absolute-value encoder (EQN, SSI, ..)
W = Needed for roll feeding

MD No.	I A W <2>	Name (Factory setting) [Page in function diagram]	Range of values
MD1	I A W	Position-encoder type / axis type (1) Reset after an alteration of technology [RST] [809.4] or switch power on/off	0 = Axis does not exist 1 = Axis with incremental position encoder (resolver, ERN encoder, pulse encoder) 2 = Axis with absolute position encoder 3 = Roll feed
MD2	I A W	Axis assignment (1) Name give to the axis for automatic mode	1 = X axis 2 = Y axis 3 = Z axis 4 = A axis 5 = B axis 6 = C axis
MD3	I	Reference-point coordinate (0) [821.4]	-999 999 999... 999 999 999 LU
MD4	I	Reference-point offset (0) [821.5]	-999 999 999... 999 999 999 LU
MD5	I	Reference-point approach (1) [821.3]	1 = Reference point to right of proximity switch 2 = Reference point to left of proximity switch 3 = Set reference point
MD6	I	Reference-point reducing velocity (500) [821.3]	1... 19 999 999 *[x 1000 LU/min]*
MD7	I	Reference-point approach velocity (5000) [821.3]	1... 19 999 999 *[x 1000 LU/min]*
MD8		0 = Homing with bero and zero mark 1 = Homing with bero only 2 = Homing with zero mark only [822]	
MD10	A	Position-encoder alignment (0) [815.4] (offset for absolute-value encoder)	-999 999 999... 999 999 999 LU
MD11	I A W	Linear/rotary axis length (4096) [836.6] [837.3] [841.7]	0 = Linear axis >0 = Rotary axis 1... 999 999 999 LU = Length of rotary axis
MD12	I A	Software limit switches - negative, for linear axis (-999 999 999) [819.7] [823.7]	-999 999 999... 999 999 999 LU
MD13	I A	Software limit switches - positive, for linear axis (999 999 999) [819.7] [823.7]	-999 999 999... 999 999 999 LU
MD14	I A W	Following error monitoring - at standstill (100) [818.6]	1... 100 000 LU
MD15	I A W	Following error monitoring - in motion (20 000) [818.6]	1... 999 999 999 LU
MD16	I A W	In position - timer monitoring (500)	10... 99 999 ms [811.4]
MD17	I A W	In position erreicht - exact stop (100)	1... 99 999 LU [811.4]
MD18	I A W	Acceleration (1000) [819.5] [823.4]	1... 99 999 [x 1000 LU/s ^{2}]
MD19	I A W	Deceleration (1000) [819.5] [823.5]	1... 99 999 *[x 1000 LU/s^2]*
MD20	I A W	Deceleration for collision (1000) for autom. mode	0... 99 999 *[x 1000 LU/s^2]*
MD21	W	Jerk limiting - positive for roll feeding (0) [830]	1... 999 999 *[x 1000 LU/s^2]* 0 = inactive
MD23	I A W	Traversing velocity - maximum (12 288) must be = P205 [340.2] [817.5] [836.7]	0... 19 999 999 *[x 1000 LU/min]* [821.5] [825.5][837.2]
MD24	I A W	M functions - output type (1) for automatic mode	1 = During positioning, time-driven 2 = During positioning, acknowledge-driven 3 = Before positioning, time-driven 4 = Before positioning, acknowledge-driven 5 = After positioning, time-driven 6 = After positioning, acknowledge-driven
MD25	I A W	M functions output time (500) for automatic mode	4... 99 999 ms
MD26	I A W	Time override (1) for MDI and automatic mode	0 = Time override active 1 = Time override inactive

MD-No.	I A W <2>	Name (Factory setting) [Page in function diagram]	Range of values
MD29	W	Acceleration breakpoint - velocity for roll feeding (0) [830.2]	1... 1 500 000 [x 1000 LU/min] 0 = inactive
MD30	W	Deceleration breakpoint - velocity for roll feeding (0) [830]	1... 1 500 000 *[x 1000 LU/min]* 0 = inactive
MD31	W	Accelerating breakpoint - acceleration for roll feeding (0) [830]	1... 99 999 *[x 1000 LU/s^2]* 0 = inactive
MD32	W	Deceleration breakpoint - deceleration for roll feeding (0) [830]	1... 99 999 *[x 1000 LU/s^2]* 0 = inactive
MD33	W	Constant travel time for roll feeding (0) [830]	1.. 99 999 ms 0 = inactive
MD34	W	Pre-position reached - lead time for roll feeding (0) [830]	1... 99 999 ms 0 = inactive
MD35	W	Pre-position reached - output time for roll feeding (0) [830]	1... 99 999 ms 0 = inactive
MD36	W	Acceleration overshoot (0) [830]	0... 100% (for roll feeding)
MD37	W	Response after abort (0) [830] for roll feeding	0 = Standard response 1 = Approach last target position with no evaluation of direction of movement 2 = Approach last target position with evaluation of direction of movement
MD38	I A W	Backlash compensation (0)	0... 9 999 LU
MD39	A	Backlash compensation - preferred position (1) with absolute position encoder	1 = Preferred position positive (no backlash compensation calculated during first positive traversing movement) 2 = Preferred position negative (no backlash compensation calculated during first negative traversing movement)
MD40	I A W	Backlash compensation - velocity limitation (999)	1... 999 *[x 1000 LU/min]* 0 = inactive
MD41	I A W	Acceleration time, operating mode "reference-point approach/control" (1000) [821.4] [825.5]	1... 99 999 ms (from 0 to MD23 [340.2]) 0 = inactive
MD42	I A W	Deceleration time, operating mode "reference-point approach/control" (1000) [821.4] [825.5]	1... 99 999 ms (from MD23 to 0 [340.2]) 0 = inactive
MD43	I A W	Deceleration time during errors (1000) e.g. when following error > MD15 [818.7]	1... 99 999 ms (from MD23 to 0) 0 = inactive (jump function)
MD44	I A W	External block change - setting (0) for automatic mode	0 = Warning at end of NC block 1 = No warning at end of NC block
MD45	I A W	Digital inputs E1... E6 for positioning - function 1 (0) [813.3]	0... 9 (range of values per decade)
MD46	W	Digital inputs E1... E6 for positioning - function 2 (0) [813.5]	0... 4 (range of values per decade)
MD47	I A W	Digital outputs A1... A6 for positioning - funktion 1 (0) [813.3]	0... 6 (range of values per decade)
MD48	W	Digital outputs E1... E6 for positioning - function 2 (0) [813.5]	0... 5 (range of values per decade)
MD49	I A W	Precontrol - velocity Evaluation factor (0) [817.6]	0... 150 %
MD50	I A W	Precontrol - Acceleration Evaluation factor (0) [817.5]	1... 99 999 [x 1000 LU/s ^{2}] 0 = Acceleration precontrol switched off

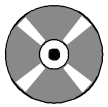
Parameter download file for controlling positioning / synchronization via the CBx field-bus interface (e.g. via PROFIBUS DP)

By means of this SIMOVIS / DriveMonitor download file, 10 process-data words are assigned to each field-bus telegram in the transmit and receive directions in accordance with Ch. 2, "Description of functions" (see manual "Motion Control for MASTERDRIVES MC and SIMATIC M7")

This download file is located on your SIMOVIS / DriveMonitor CD-ROM or floppy disk under the following name:

SIMOVIS for DOS:

- **POS_1_1.MCD+POS_1_1.M2D** for Compact PLUS units (Download both files)
- **POS_1_1.SCD+POS_1_1.S2D** for compact and chassis-type units with CUMC (Download both files)



SIMOVIS / DriveMonitor for WINDOWS 95 and higher:

- **POS_1_1.DNL** (Download this file. Is equally valid for Compact PLUS, Compact and chassis-type units)

Communication - General:

```
P53 = 7          ; Parameter access from CBx, PMU and USS
P722.1 = 500     ; Telegram OFF time 500 ms                    [120.1]
```

CBx receive word 1

Connect up basic unit control bits from CBx[120] ⇒ [180]:

```
P554.1 = 3100  ; [OFF1] from bit 0
P555.1 = 3101  ; [OFF2] from bit 1
P558.1 = 3102  ; [OFF3] from bit 2
P561.1 = 3103  ; [ENC] Inverter release from bit 3
P565.1 = 3107  ; [ACK_F] Fault acknowledgement from bit 7
```

CBx receive words 2 and 3

Connect up position control bit from CBx [120]⇒ [809]:

```
U530 = 3032    ; Receive words 2 and 3 (bytes 2-5) = Positioning control word
```

CBx receive word 4

Connect up synchronism control bits from CBx [120]⇒ [832...839]:

```
U619   = 3400  ; [SET_T] Set table                          [839.4] from bit  0
U612.2 = 3402  ; [SST] Eng./diseng. trigger signal          [834.2] from bit  2
U621   = 3403  ; [SYN_T] Synchronizing table                [839.4] from bit  3
U650   = 3404  ; [TABLE_NO] Selec. of current table         [839.7] from bit  4
U684.2 = 3407  ; [ST_VM] START virtual master               [832.2] from bit  7
U657.1 = 3408  ; [FUNCTION; Bit 0]                          [836.4] from bit  8
U657.2 = 3409  ; [FUNCTION; Bit 1]                          [836.4] from bit  9
U656.1 = 3410  ; [OPERATION; Bit 0]                         [834.5] from bit 10
U656.2 = 3411  ; [OPERATION; Bit 1]                         [834.5] from bit 11
U612.1 = 3412  ; [SSC] Eng./diseng. action permanent        [834.2] from bit 12
U684.3 = 3414  ; [S_VM] SET virtual master                  [832.2] from bit 14
U684.1 = 3415  ; [R_VM] RESET virtual master                [832.2] from bit 15
```

CBx transmit word 1

Connect up basic unit control bits [200] [210] to CBx word 1 [125] with the help of the binector / connector converter U076/K431 [720]

```
U076.1  = 100  ; Bit 0  from  K431 =  [RTS]    1 = Ready for switch-on
U076.2  = 102  ; Bit 1  from  K431 =  [RDY]    1 = Ready for operation
U076.3  = 104  ; Bit 2  from  K431 =  [IOP]    1 = Operation
U076.4  = 106  ; Bit 3  from  K431 =  [FAULT]  1 = Fault
U076.5  = 108  ; Bit 4  from  K431 =  [OFF2]   0 = OFF2
U076.6  = 110  ; Bit 5  from  K431 =  [OFF3]   0 = OFF3
U076.7  = 114  ; Bit 6  from  K431 =  [WARN]   1 = Alarm
U076.8  = 0    ; Bit 7  from  K431 = 0 (Reserve)
U076.9  = 136  ; Bit 8  from  K431 =  [SMAX]   0 = Overspeed [480]
U076.10 = 144  ; Bit 9  from  K431 =  [OLC]    1 = Alarm, converter overload
U076.11 = 148  ; Bit 10 from  K431 =  [OTC]    1 = Alarm, converter overtemp.
U076.12 = 150  ; Bit 11 from  K431 =  [OTM]    1 = Fault motor overtemp.
U076.13 = 0    ; Bit 12 from  K431 = 0 (Reserve)
U076.14 = 0    ; Bit 13 from  K431 = 0 (Reserve)
U076.15 = 0    ; Bit 14 from  K431 = 0 (Reserve)
U076.16 = 0    ; Bit 15 from  K431 = 0 (Reserve)
U952.89 = 4    ; Nest binector / connector converter in time slot T4
P734.1  = 431  ; Connect up its output K431 to CBx word 1
```

CBx transmit word 2

Connect up fault number and alarm number [510] to the CBx [125]:

```
P734.2 = 250
```

CBx transmit words 3 and 4

Connect up positioning status word [811] to the CBx [125]:

```
P734.3 = 315   ; Hi word to CBx transmit word 3
P734.4 = 315   ; Lo word to CBx transmit word 4
```

Nest technology in time slot

```
U953.32 = 4    ; Nest positioning technology in time slot T4
               ; (= 3.2 ms with 5 kHz clock frequency) [802.7]
U953.34 = 4    ; Nest virtual master in T4 [832]
```

Establishing connection between pos. controller and speed controller via ramp-function generator

```
P443.1 = 131   ; Pos. controller output [340.8] to ramp-function gen. [310.1]
P220.1 = 75    ; Connect up ramp-function generator output [320.8]
               ; to speed controller input [360.1]
P462.1 = 0     ; Acceleration time = 0 [320.3]
P464.1 = 0     ; Deceleration time = 0 [320.3]
```

Release for position controller [340.3] (see also [817])

```
P210.1 = 1     ; Release position controller 1 permanently to "1"
P211.1 = 104   ; Release position controller 2 from status word 1, bit 2 "Operation"
P213   = 305   ; Release controller
```

Connecting up speed precontrol from technology:

```
P209.1 = 312   ; Connect up speed precontrol value [817] to adding point
               ; behind speed controller [340.7]
```

Connecting up digital inputs / outputs for positioning

```
P647.1 = 3     ; Input E4 = Terminal X101.6 = Adoption of actual position
               ; into the measured-value memory with rising
               ; edge [90.5] [330.5]
P651.1 = 311   ; Outputs A1, A2, A3 from technology [813]
P652.1 = 312   ; ... ⇒ digital output terminals X101.3...5
P653.1 = 313   ; ... [90.5]
```

Connecting up technology ⇔ position sensing motor encoder slot C

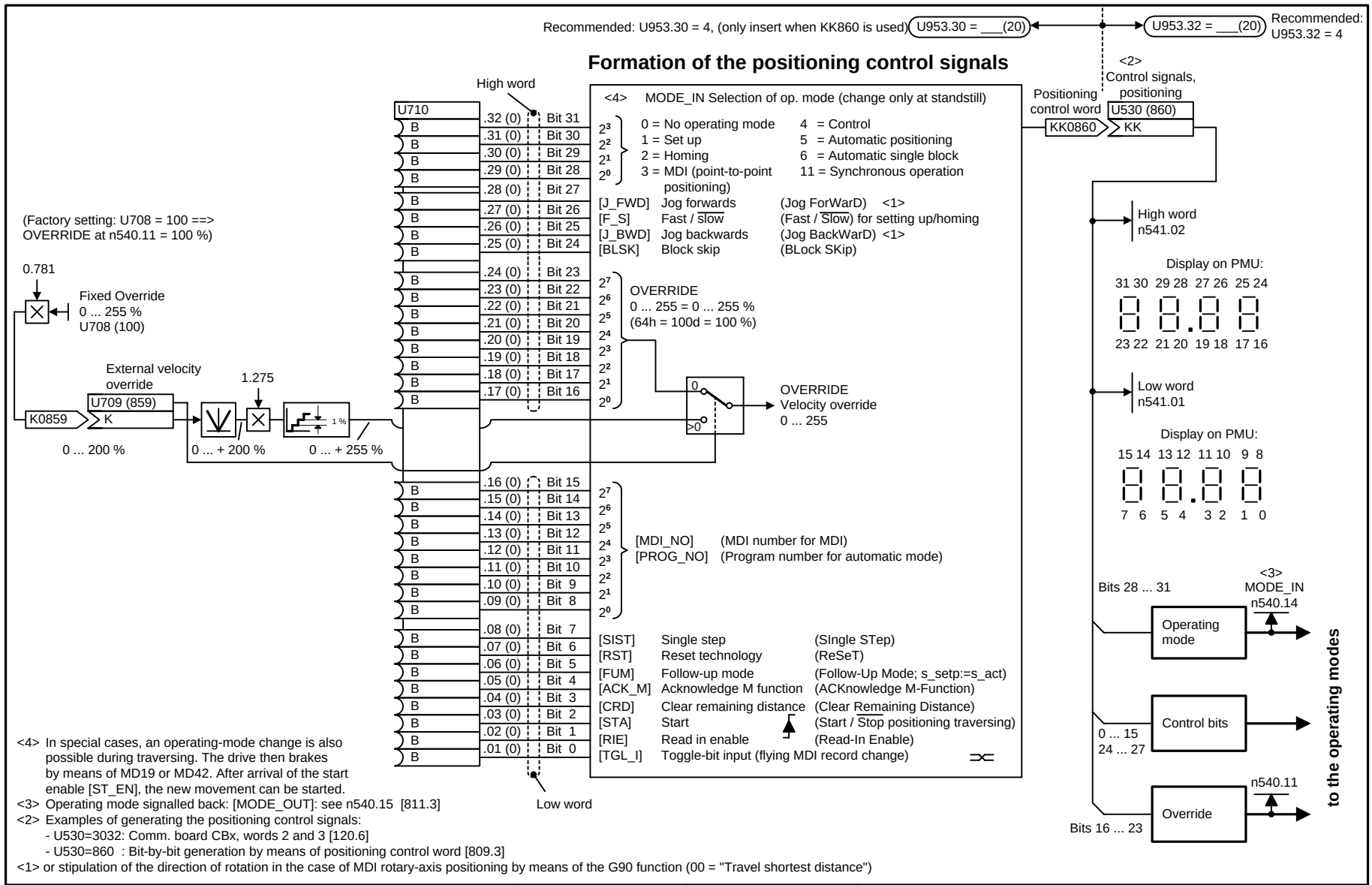
```
P178 = 20      ; Digital input DE6 terminal X101.8            [90.5] as rough-pulse
               ; proximity switch for position detection      [330.5]
P172 = 302     ; Position setting value                       [815.5] ⇒ [330.5]
P174 = 301     ; Position correction value                    [815.5] ⇒ [330.5]
P184 = 303     ; Position offset                              [815.5] ⇒ [330.7]
U535 = 120     ; Actual offset                                [330.8] ⇒ [815.3]
U539 = 122     ; Position measured value from position memory [330.7] ⇒ [815.3]
```

Connecting up synchronous-operation position correction [843] with position sensing slot C [330]:

```
U666 = 212     ; "Start position correction" by means of "Meas. val. valid" [330.7]
U665 = 122     ; "Pos. meas. value" to "Actual position for interrupt" [330.7]
```

Configuration of the virtual master axis

```
U683 = 1       ; Specification of the speed setpoint in
               ; [10 LU/min] [832.2]
```



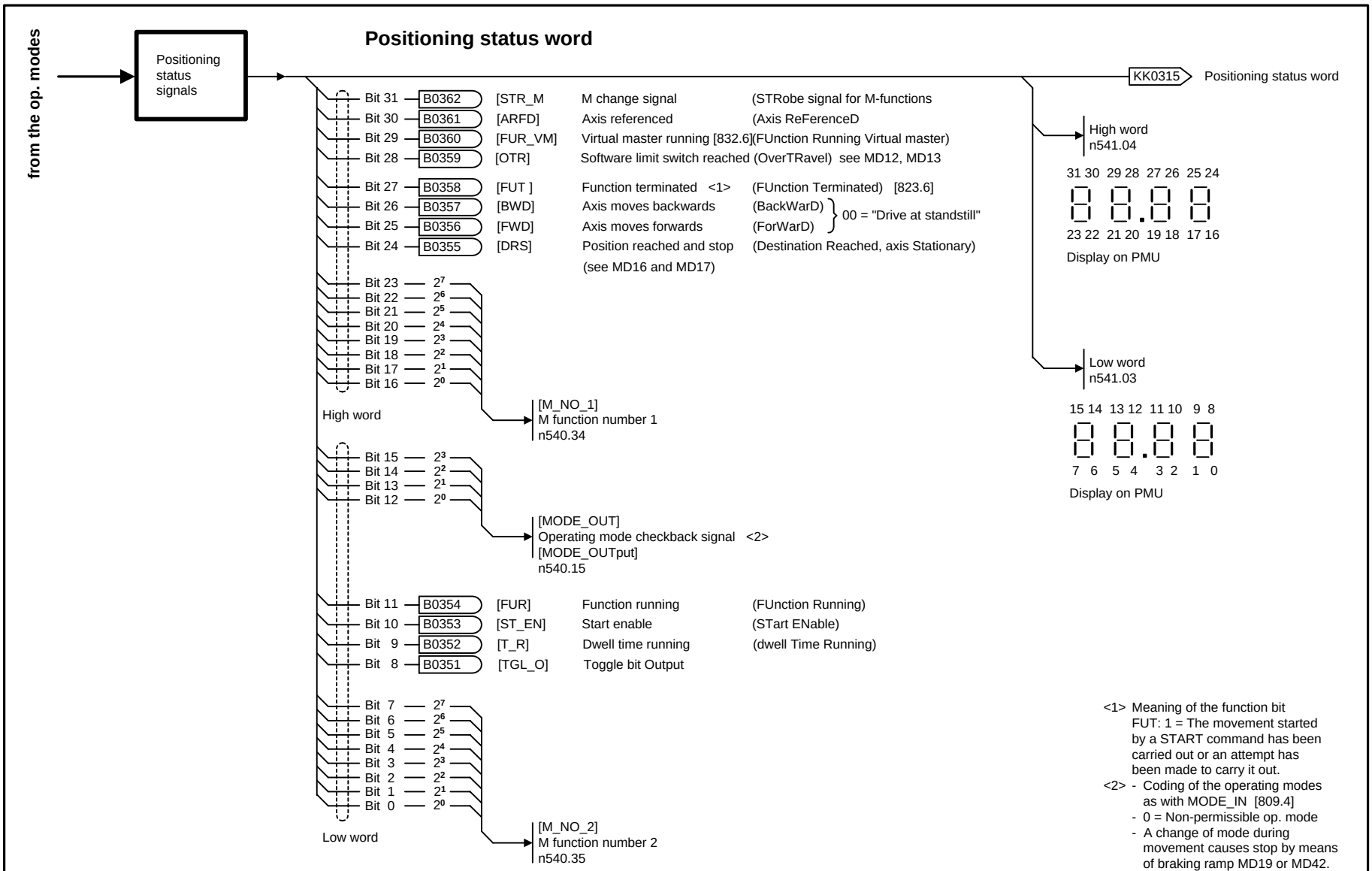
<4> In special cases, an operating-mode change is also possible during traversing. The drive then brakes by means of MD19 or MD42. After arrival of the start enable [ST_EN], the new movement can be started.

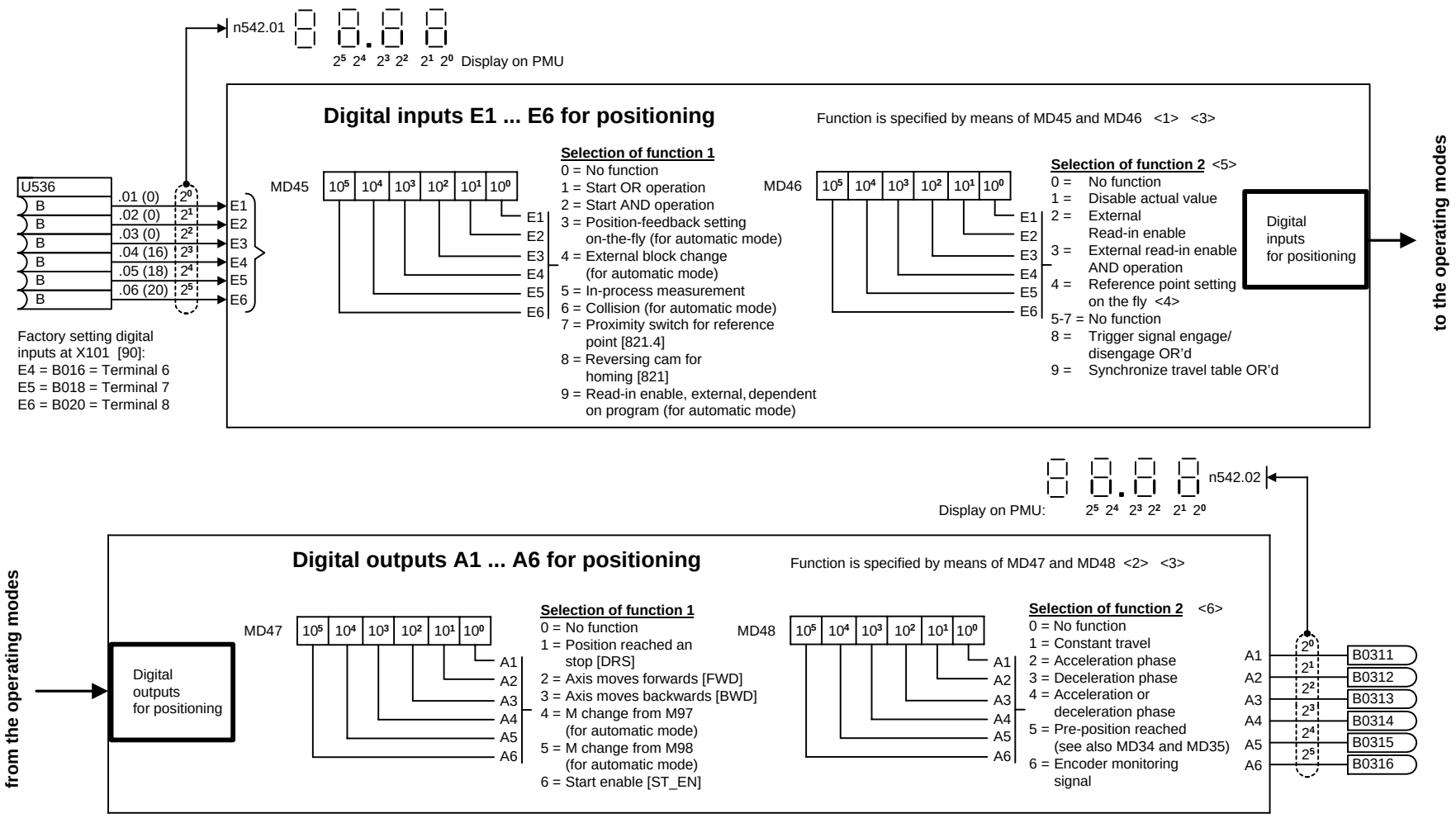
<3> Operating mode signalled back: [MODE_OUT]: see n540.15 [811.3]

<2> Examples of generating the positioning control signals:
- U530=3032: Comm. board CBx, words 2 and 3 [120.6]
- U530=860 : Bit-by-bit generation by means of positioning control word [809.3]

<1> or stipulation of the direction of rotation in the case of MDI rotary-axis positioning by means of the G90 function (00 = "Travel shortest distance")

1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_809_e.vsd	Function diagram	- 809 -
Positioning control signals					08.01.02	MASTERDRIVES MC	


from the op. modes
Positioning status signals
Positioning status word
KK0315
Positioning status word
Bit 31 B0362 [STR_M M change signal (STRobe signal for M-functions
Bit 30 B0361 [ARFD] Axis referenced (Axis ReFerenceD
Bit 29 B0360 [FUR_VM] Virtual master running [832.6] (FUnction Running Virtual master)
Bit 28 B0359 [OTR] Software limit switch reached (OverTRavel) see MD12, MD13
Bit 27 B0358 [FUT] Function terminated <1> (FUnction Terminated) [823.6]
Bit 26 B0357 [BWD] Axis moves backwards (BackWarD)
Bit 25 B0356 [FWD] Axis moves forwards (ForWarD)
00 = "Drive at standstill"
Bit 24 B0355 [DRS] Position reached and stop (Destination Reached, axis Stationary)
(see MD16 and MD17)
High word
n541.04
31 30 29 28 27 26 25 24
23 22 21 20 19 18 17 16
Display on PMU
Bit 23 2^7
Bit 22 2^6
Bit 21 2^5
Bit 20 2^4
Bit 19 2^3
Bit 18 2^2
Bit 17 2^1
Bit 16 2^0
High word
[M_NO_1]
M function number 1
n540.34
Low word
n541.03
15 14 13 12 11 10 9 8
7 6 5 4 3 2 1 0
Display on PMU
Bit 15 2^3
Bit 14 2^2
Bit 13 2^1
Bit 12 2^0
[MODE_OUT]
Operating mode checkback signal <2>
[MODE_OUTput]
n540.15
Bit 11 B0354 [FUR] Function running (FUnction Running)
Bit 10 B0353 [ST_EN] Start enable (STart ENable)
Bit 9 B0352 [T_R] Dwell time running (dwell Time Running)
Bit 8 B0351 [TGL_O] Toggle bit Output
Bit 7 2^7
Bit 6 2^6
Bit 5 2^5
Bit 4 2^4
Bit 3 2^3
Bit 2 2^2
Bit 1 2^1
Bit 0 2^0
Low word
[M_NO_2]
M function number 2
n540.35
<1> Meaning of the function bit
FUT: 1 = The movement started by a START command has been carried out or an attempt has been made to carry it out.
<2> - Coding of the operating modes as with MODE_IN [809.4]
- 0 = Non-permissible op. mode
- A change of mode during movement causes stop by means of braking ramp MD19 or MD42.



<1> Example of configuring the digital inputs for positioning:
MD45=7xxxxx) ==> Digital input, terminal X101.8 [90] =
Reference-point proximity switch U536.06 = 20)

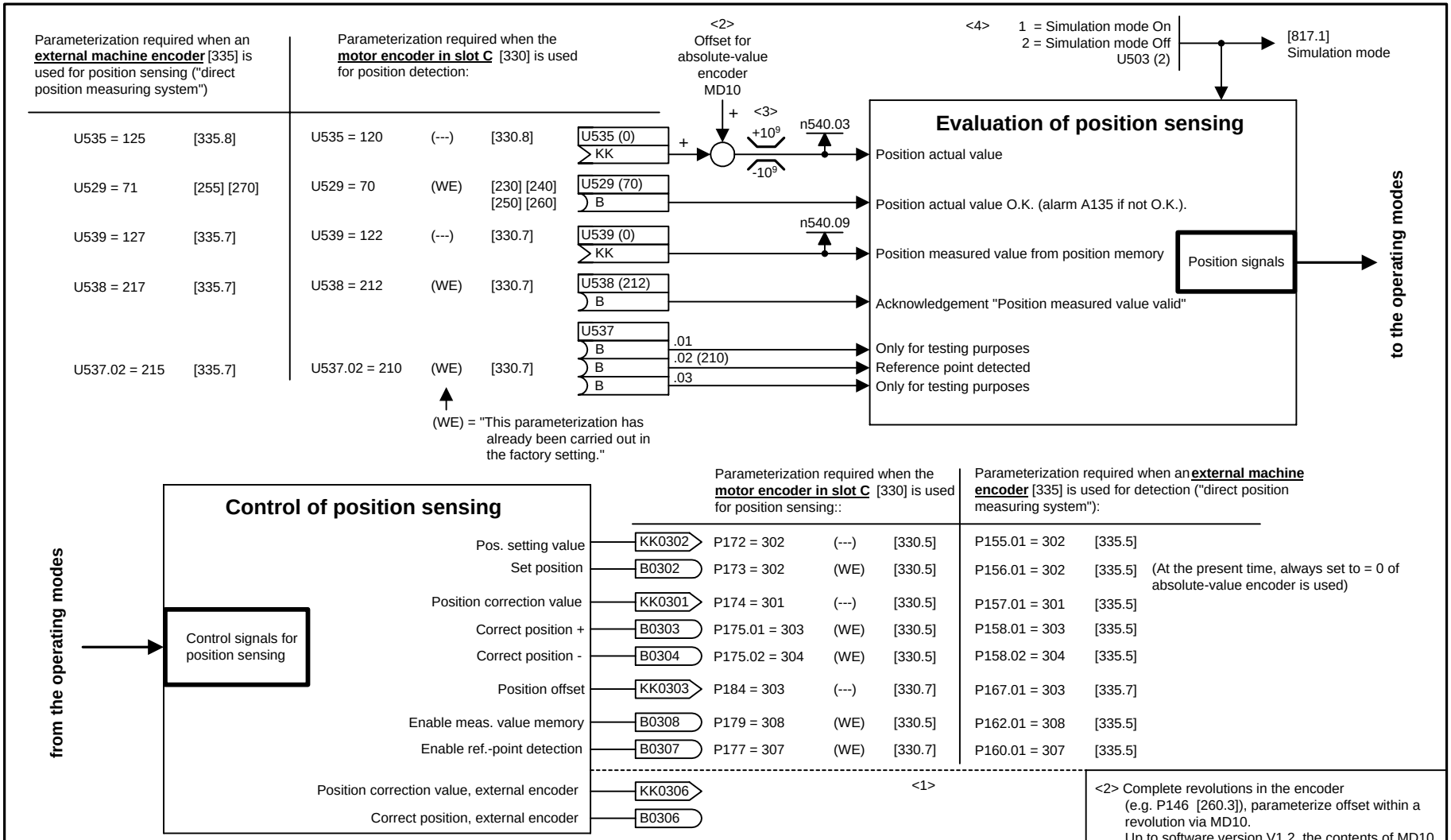
<2> Example of assigning the digital outputs for positioning:
MD47 = xxx4xx ==> Binector B313 = "M change from M97"

<3> Double assignment of an input or output with more than one function is not premitted.

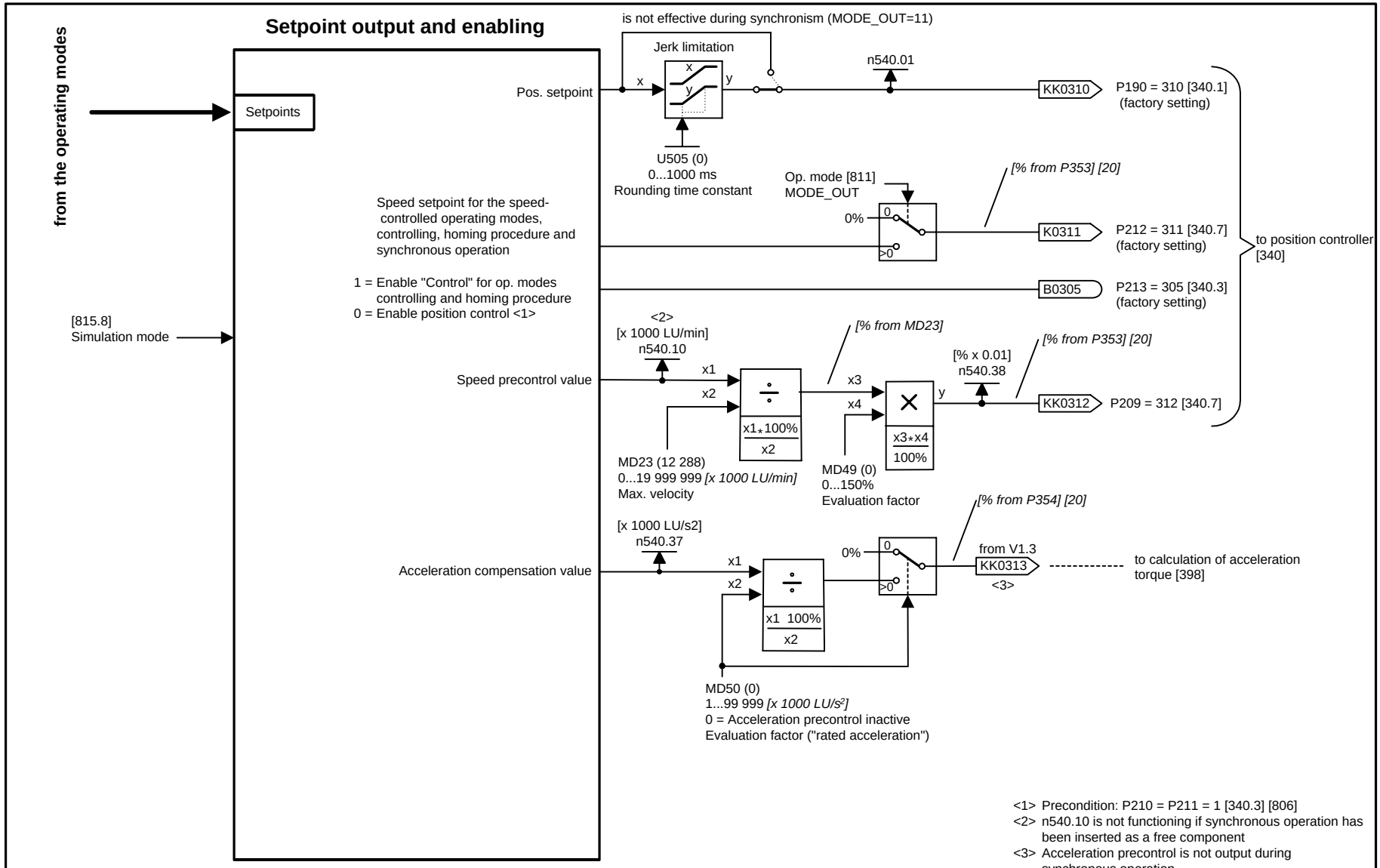
<4> The measured position value memory is used for this function, and one of the digital inputs, terminal 6 or 7, must be used [90.3].

<5> Function 1 - 3 for roller feed only

<6> For roller feed only



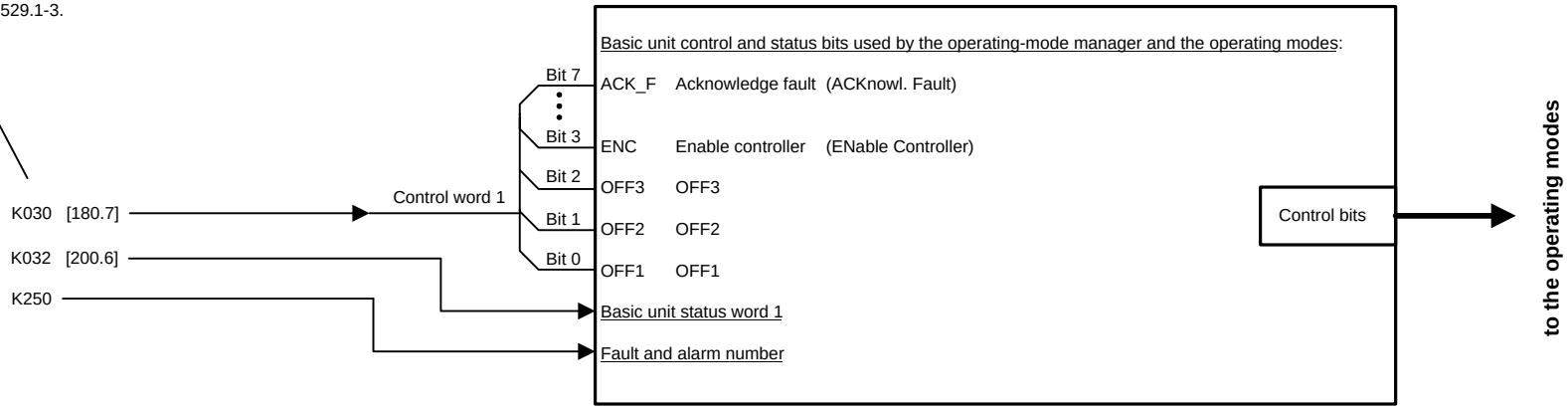
1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_815_e.vsd	Function diagram	- 815 -
Evaluation and control of position sensing					08.01.02	MASTERDRIVES MC	



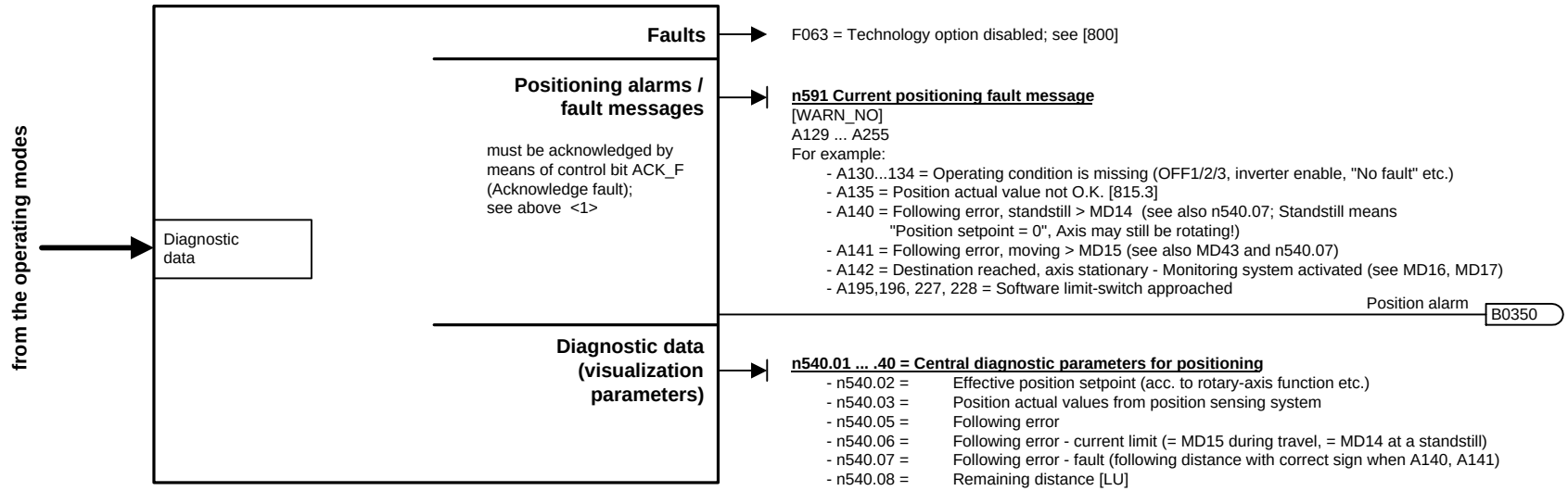
1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_817_e.vsd	Function diagram	- 817 -
Setpoint output and enabling					09.01.02	MASTERDRIVES MC	

Up to V1.0, these 3 signals from the basic unit were not permanently connected up but had to be connected up via U529.1-3.

Basic unit control bits



Faults, alarms, diagnosis



<1> Acknowledgement possible via PMU, binector and serial interface, not via OP1S

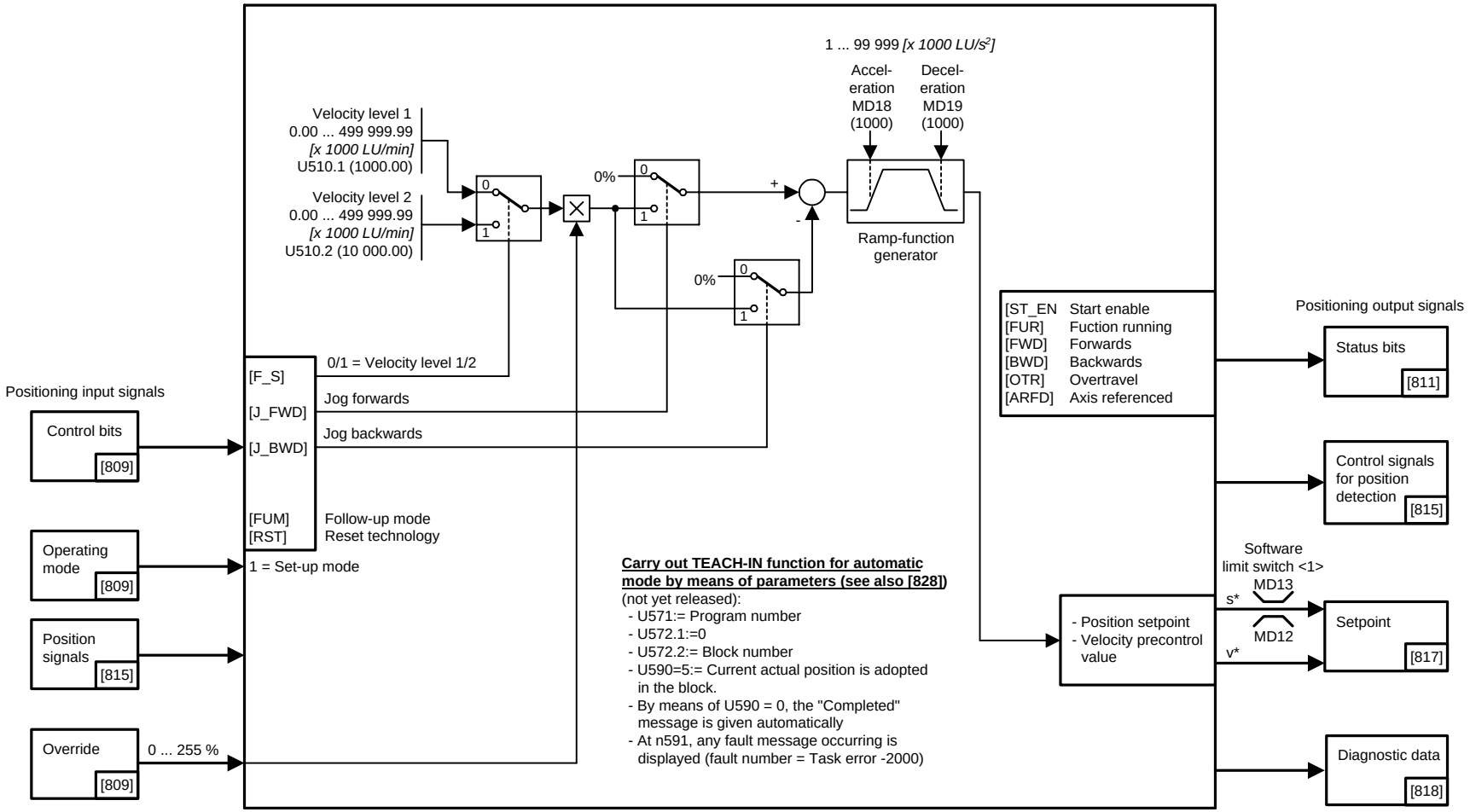
<1>

Set-up mode (position-controlled jogging with limit-switch evaluation)

Sampling time for positioning

U953.32 = ___(20)

Recommended: U953.32=4



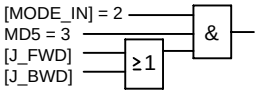
<1> The software limit switches are only evaluated on incremental position encoders if the axis is referenced (status bit [ARFD]=1)

<1>The homing position direction of approach in MD5 must correspond to the parameterization of position sensing (e.g.. P183 if the motor encoder is used in slot C [330.2]), i.e.:
MD5 = 1 ==> increasing positions from A to B ==> P183 = xx1x
MD5 = 2 ==> decreasing positions from A to B ==> P183 = xx2x

<2> If the technology option F01 in MASTERDRIVES MC is used, the "Homing position setting value" in position sensing (e.g. P176 [330]) is not required

<3> The BERO must be adjusted mechanically or via P188 [330.2] such that the falling edge of the BERO signal does not fall together with the encoder zero position (e.g. as can be observed at KK090 [550])

<4> **Special case MD5=3: Directly set homing position without approach:**



Set position setpoint and actual value to MD3 (Beforehand, traverse through any displacement path MD4 with speed MD6)

<5> Acceleration/deceleration times MD41/42 refer to a traversing action from 0 to MD23 or from MD23 to 0.

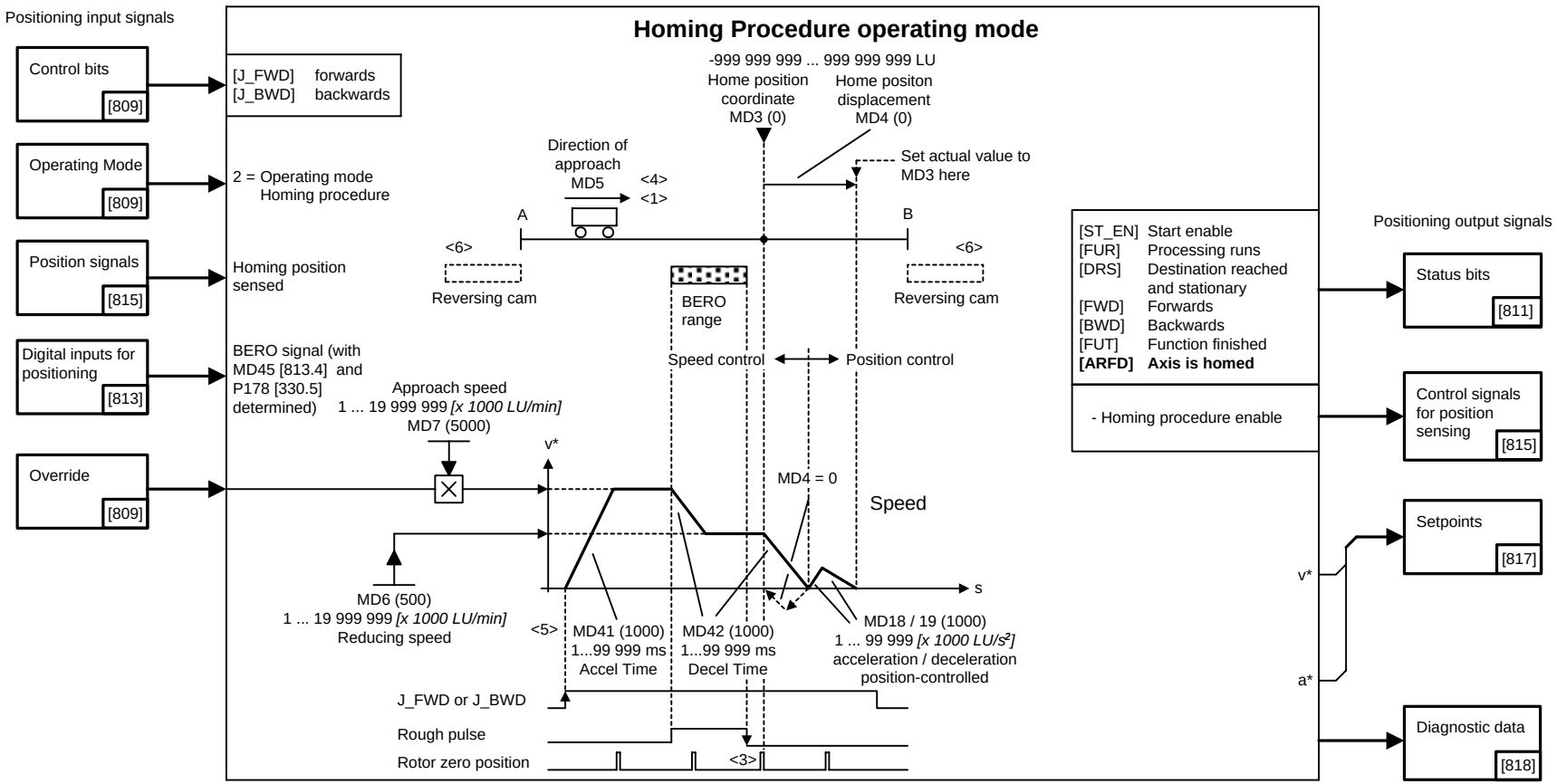
<6> Homing with automatic reversal at reversing cam right and/or left, see [813.4]

Sampling time for positioning

U953.32 = ___(20)

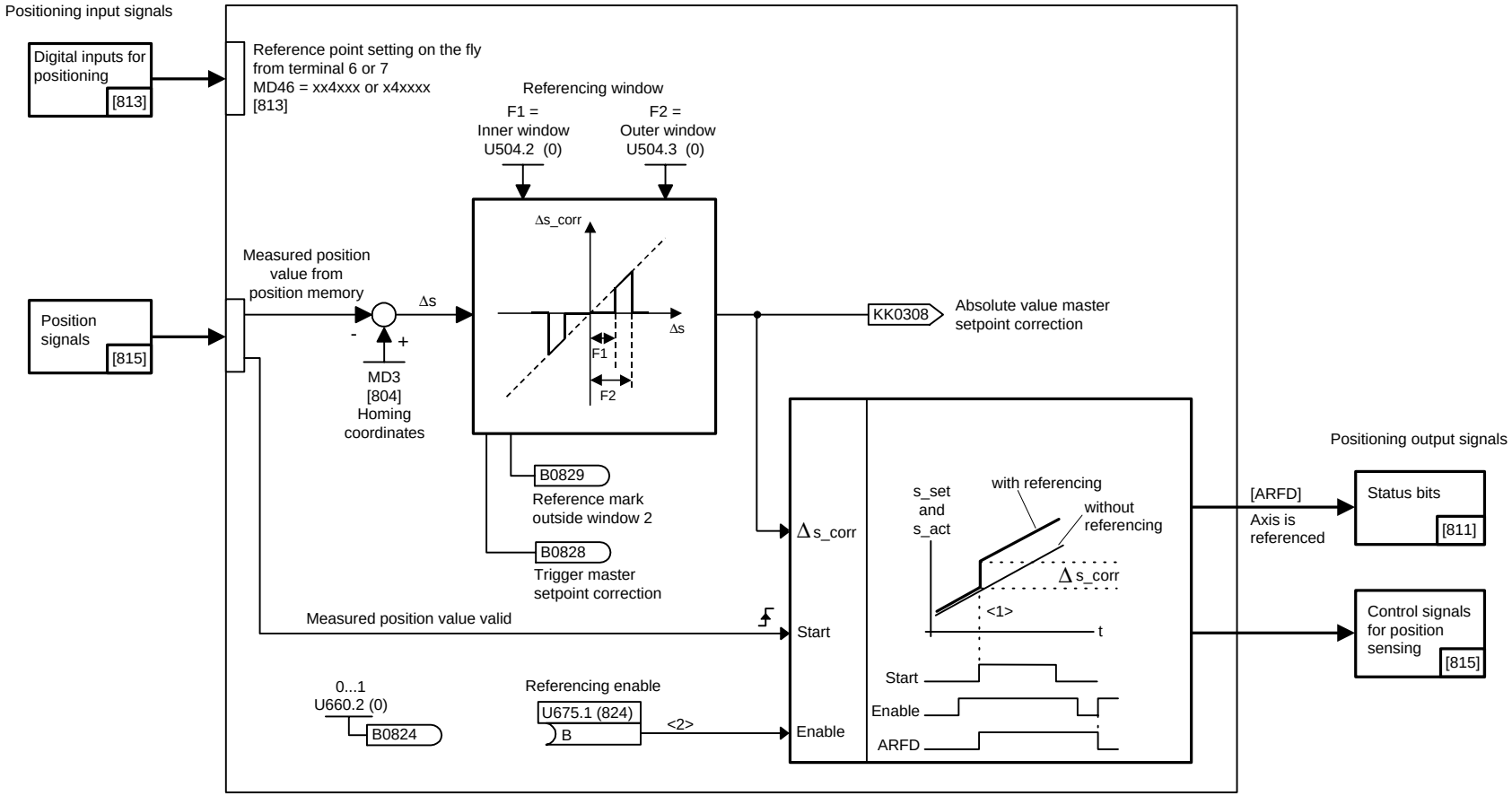
Recommended: U953.32 = 4

Special case: Bero and rotor zero position (as shown)
Special case: Homing with bero only: MD8 = 1
Special case: Homing with rotor zero position only or zero pulse only: MD8 = 2



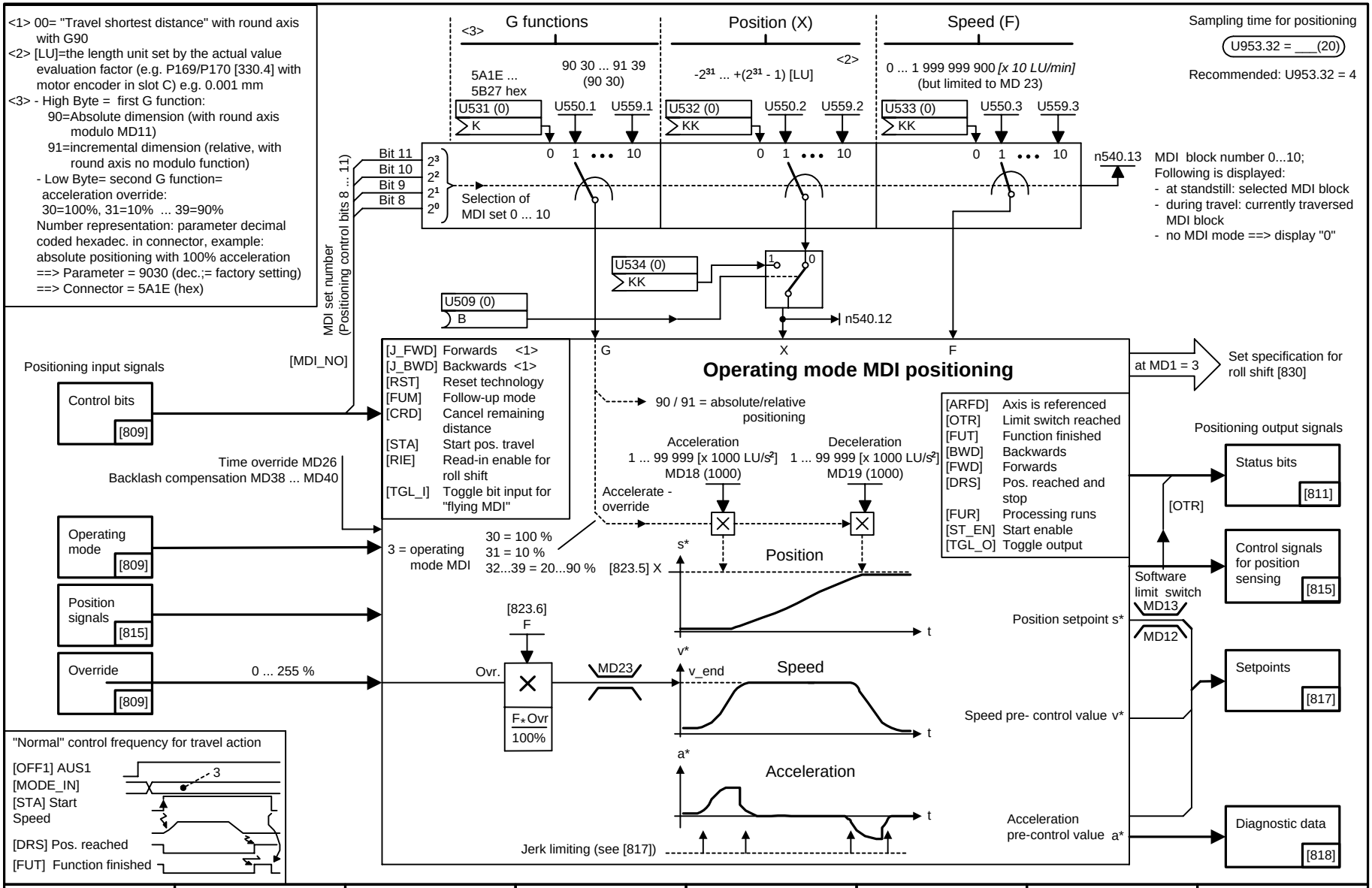
Reference point setting on the fly

(acts in control, setup, MDI and automatic)
For synchronism, see [843]



<1> During referencing, only the position setpoint and actual value are corrected by the same amount in each case. No compensation movement takes place.

<2> Referencing on the fly is enabled dynamically with "Enable referencing" (binector input U675.1).
The interrupt-generating digital inputs of terminal 6 or 7 are parameterized via MD46. Referencing is activated by the signal "Measured position value valid".



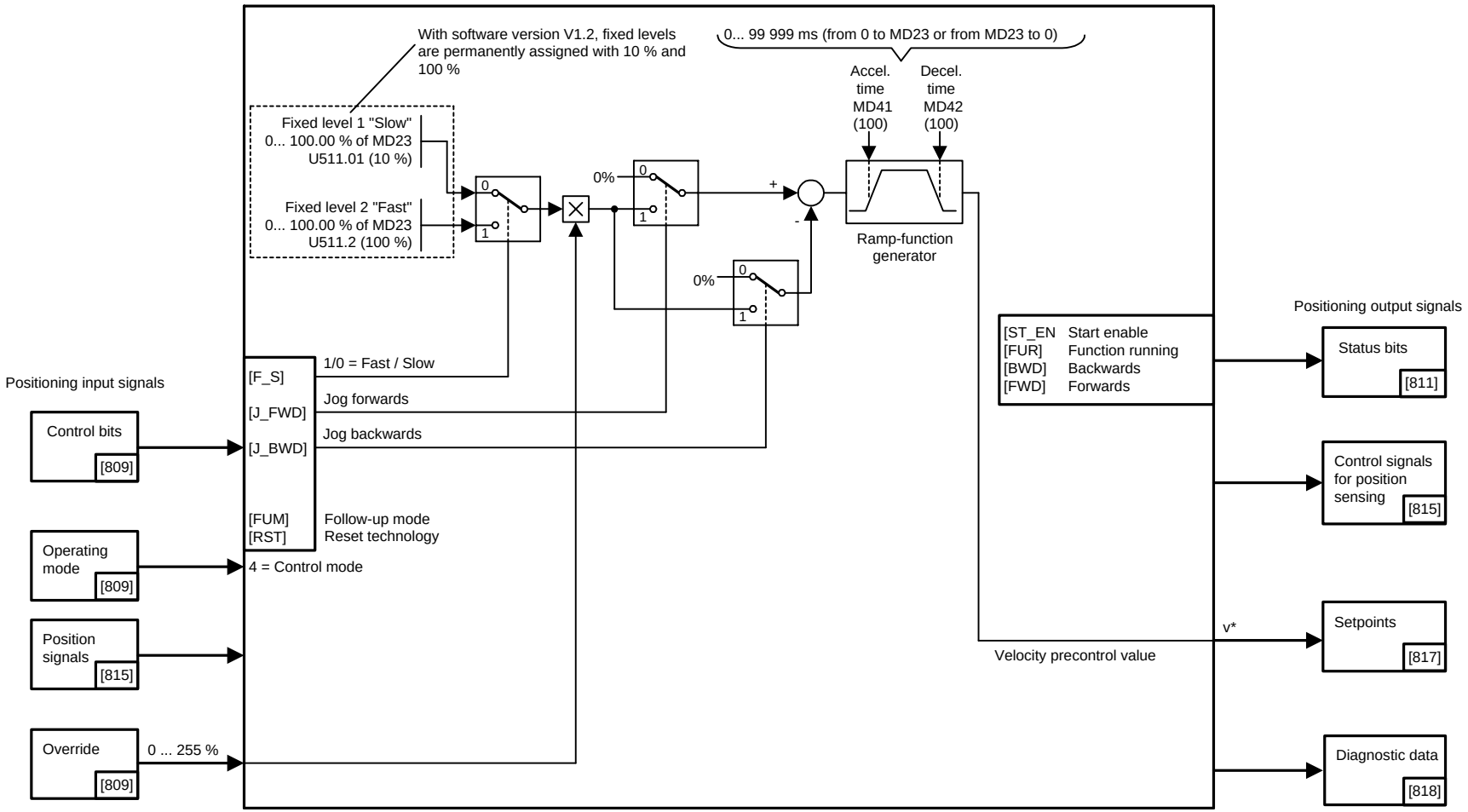
1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_823_e.vsd	Function diagram	- 823 -
Operating mode MDI (point-to-point positioning)					08.01.02	MASTERDRIVES MC	

Sampling time for positioning

U953.32 = ___(20)

Recommended: U953.32=4

Control mode (speed-controlled jogging without limit-switch evaluation)

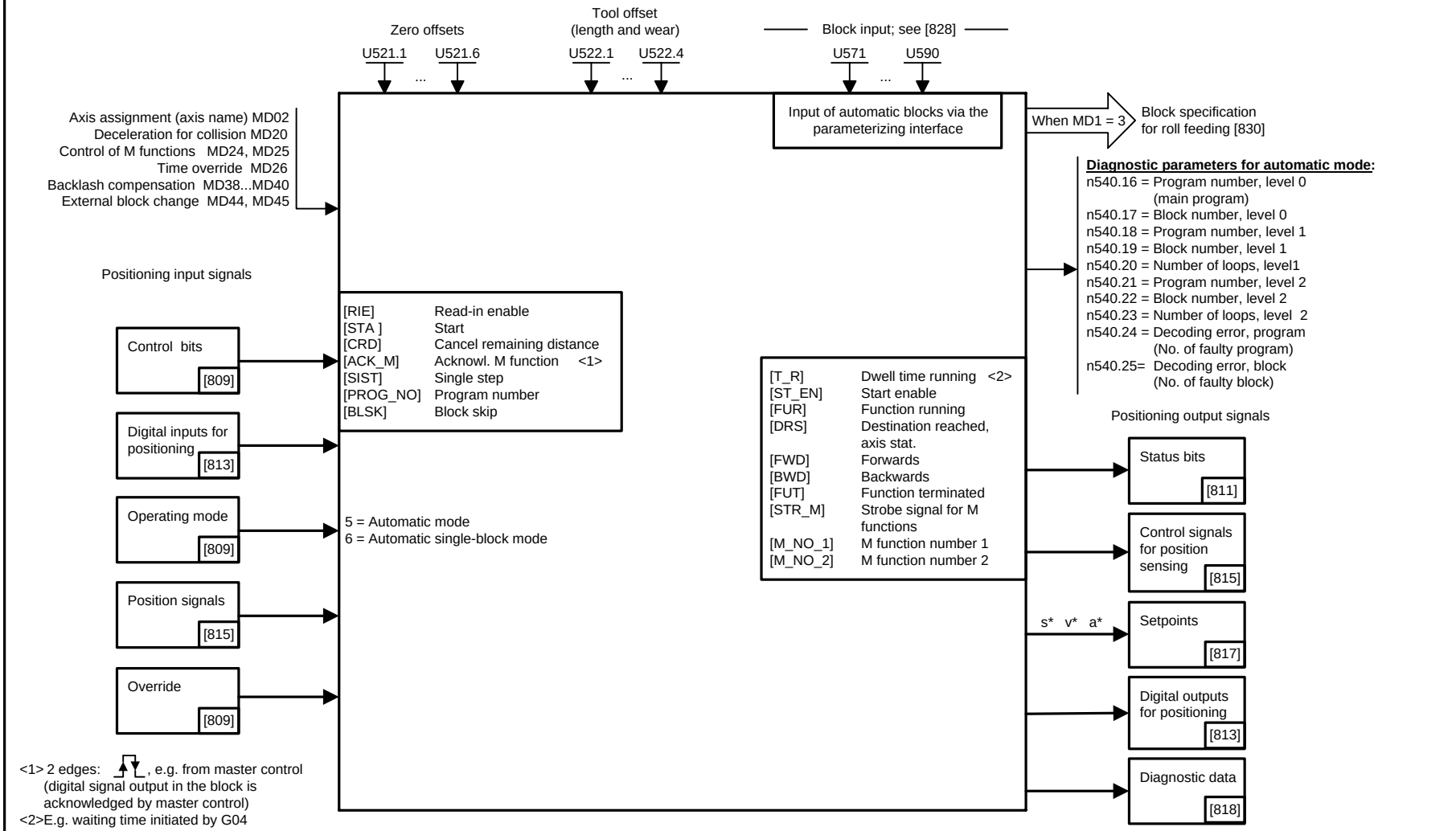


Automatic mode

Samping time for positioning

U953.32 = ___(20)

Recommended: U953.32=4



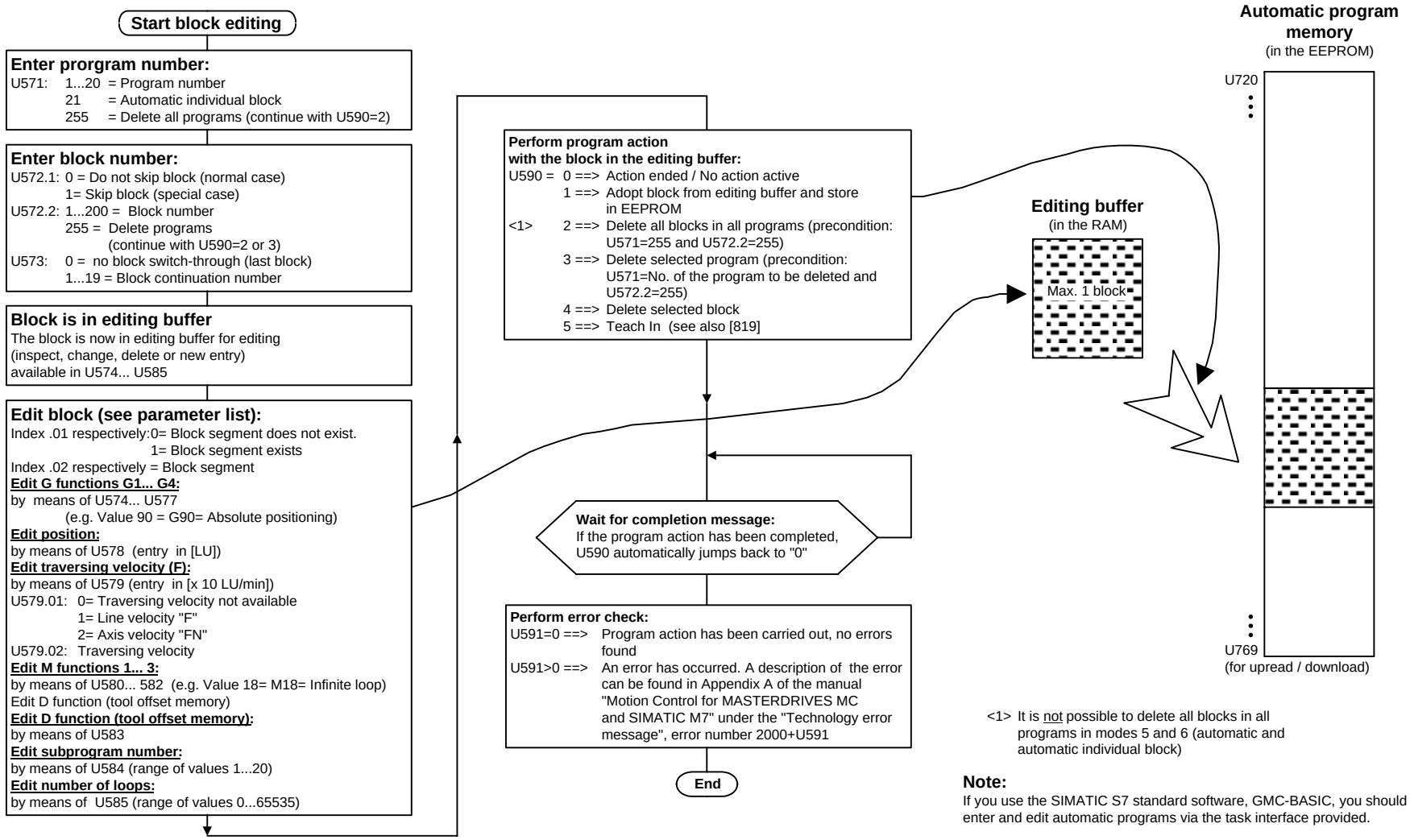
<1> 2 edges: , e.g. from master control (digital signal output in the block is acknowledged by master control)

<2>E.g. waiting time initiated by G04

1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_826_e.vsd	Function diagram	- 826 -
Automatic positioning mode					08.01.02	MASTERDRIVES MC	

Entering and editing automatic NC programs by means of parameters U571... U590

Proceed as follows in order to enter or edit a block (see also parameter list):

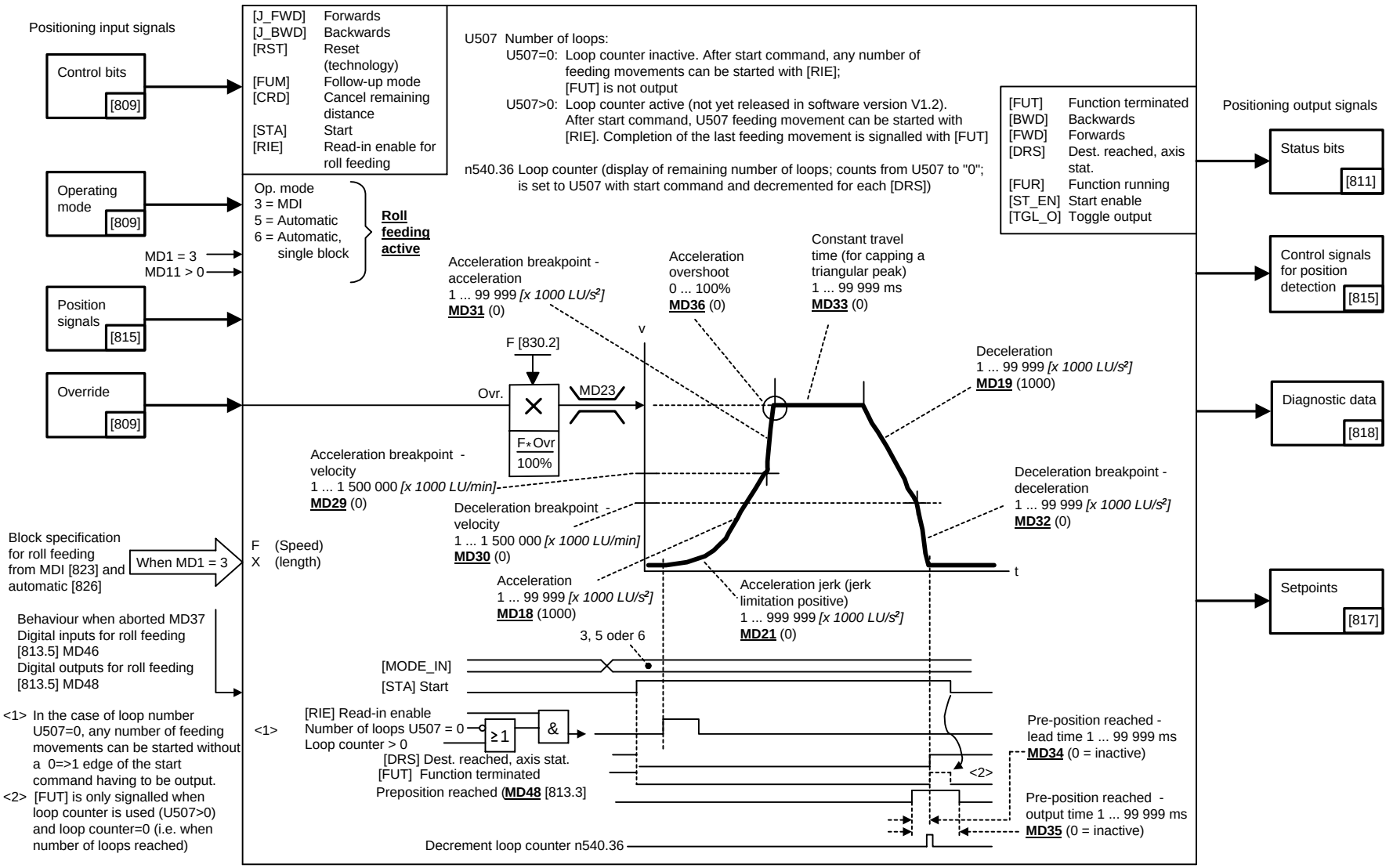


<1> It is not possible to delete all blocks in all programs in modes 5 and 6 (automatic and automatic individual block)

Note:
If you use the SIMATIC S7 standard software, GMC-BASIC, you should enter and edit automatic programs via the task interface provided.

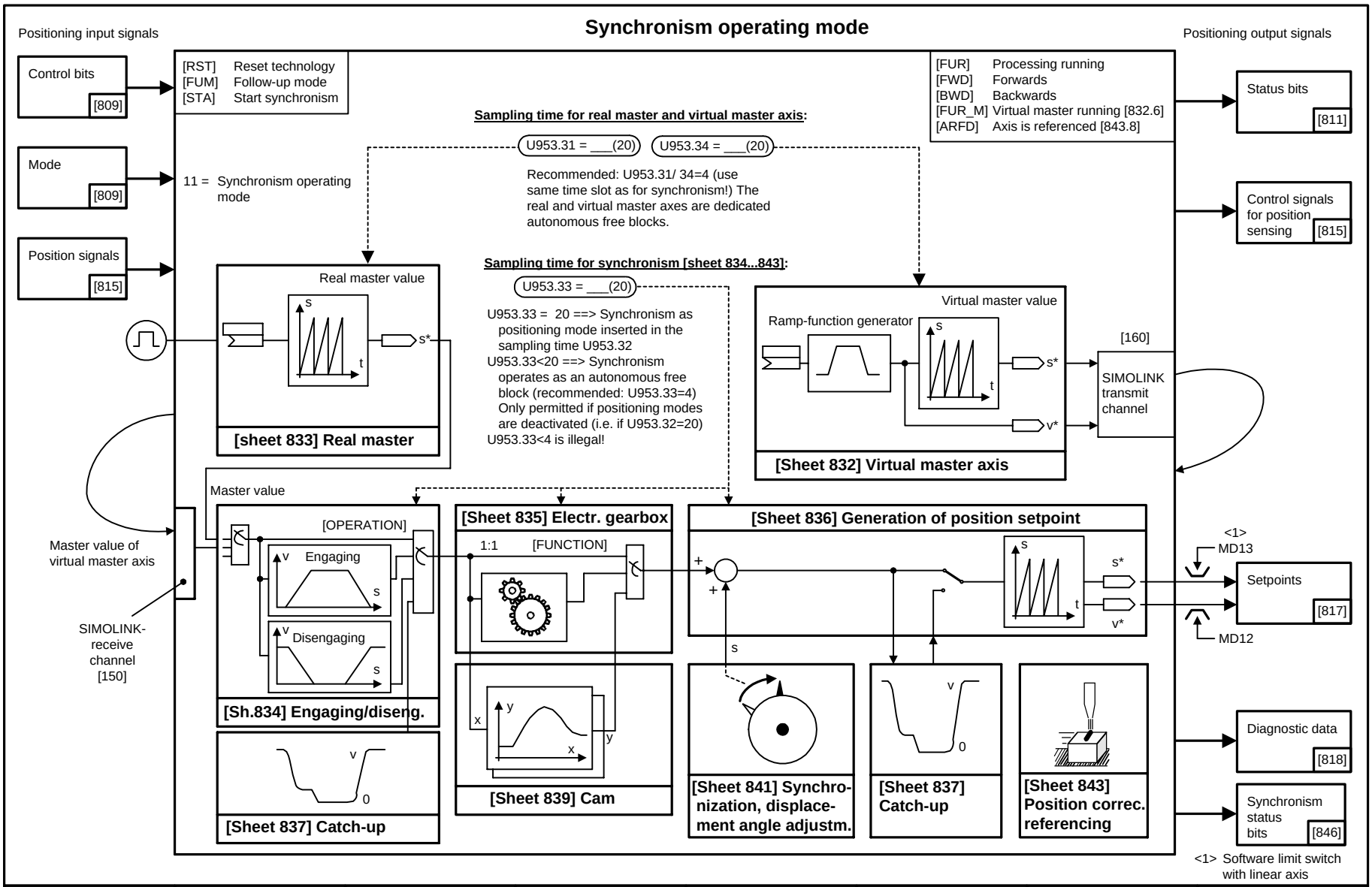
Roll feeding (possible in MDI and automatic modes)

See Function description, Ch. 5.2.2



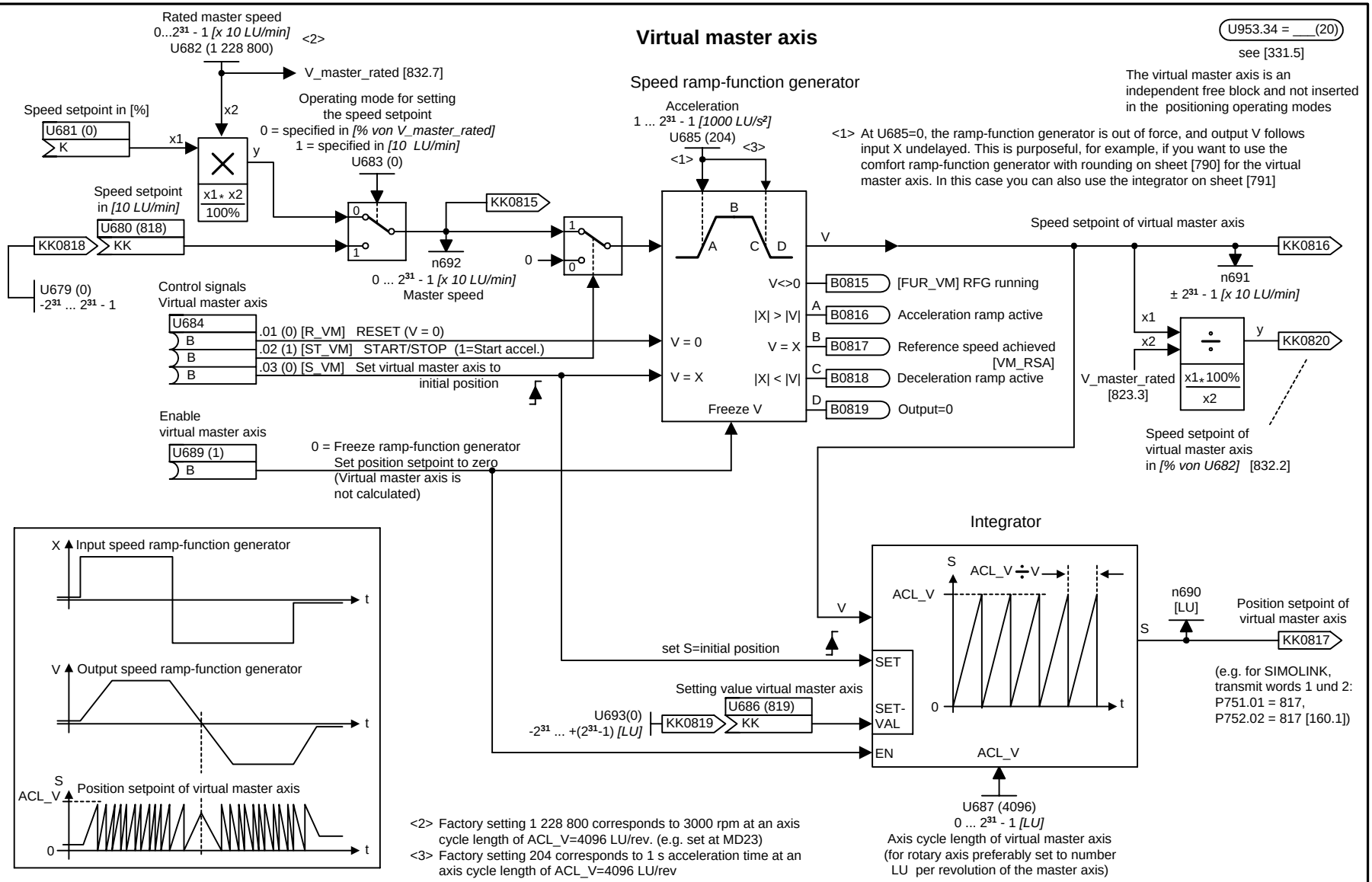
1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_830_e.vsd	Function diagram	- 830 -
Roll feeding					08.01.02	MASTERDRIVES MC	

Synchronism operating mode



1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_831_e.vsd	Function diagram	- 831 -
Synchronism operating mode (overview)					08.01.02	MASTERDRIVES MC	

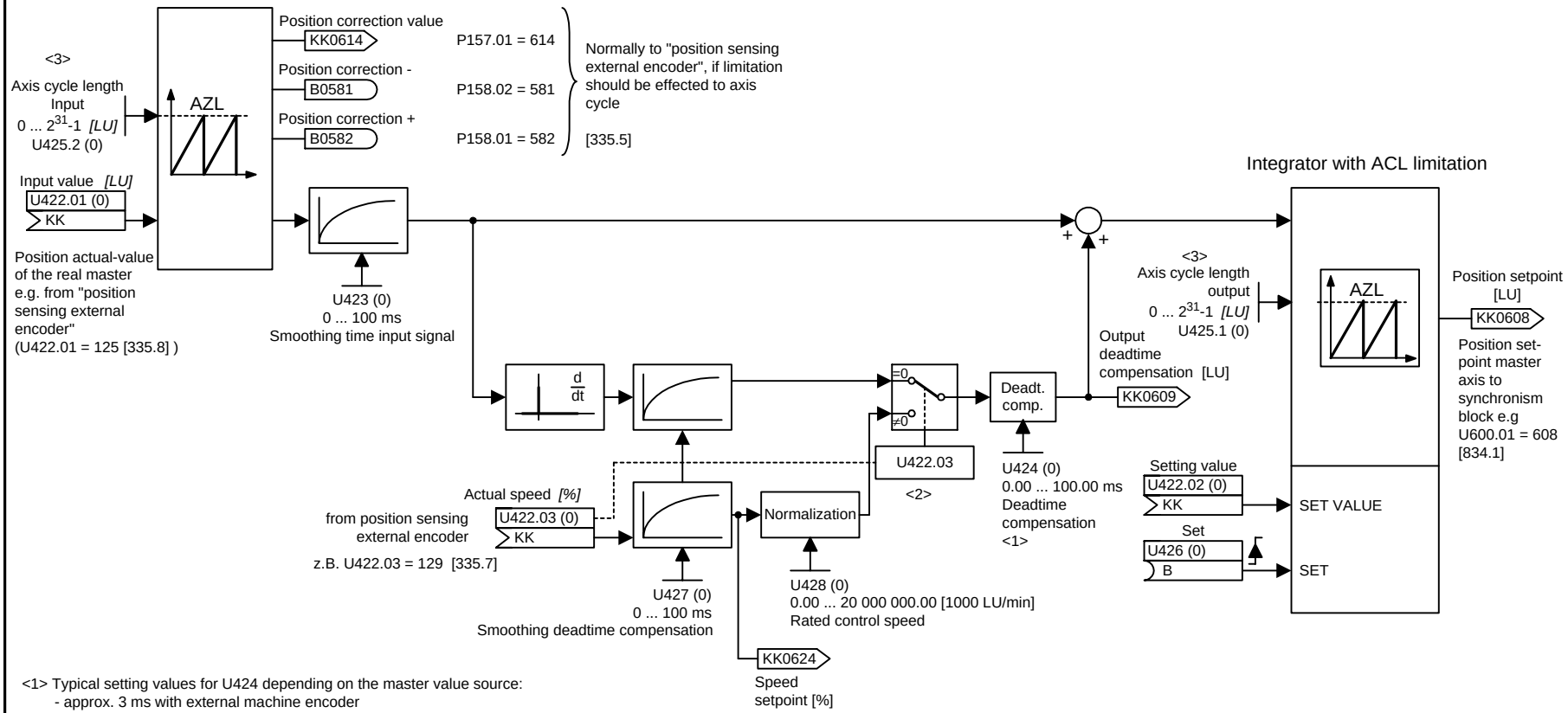
Virtual master axis



U953.31 = ___(20)

Should be calculated in the same time slot as the synchronization block.

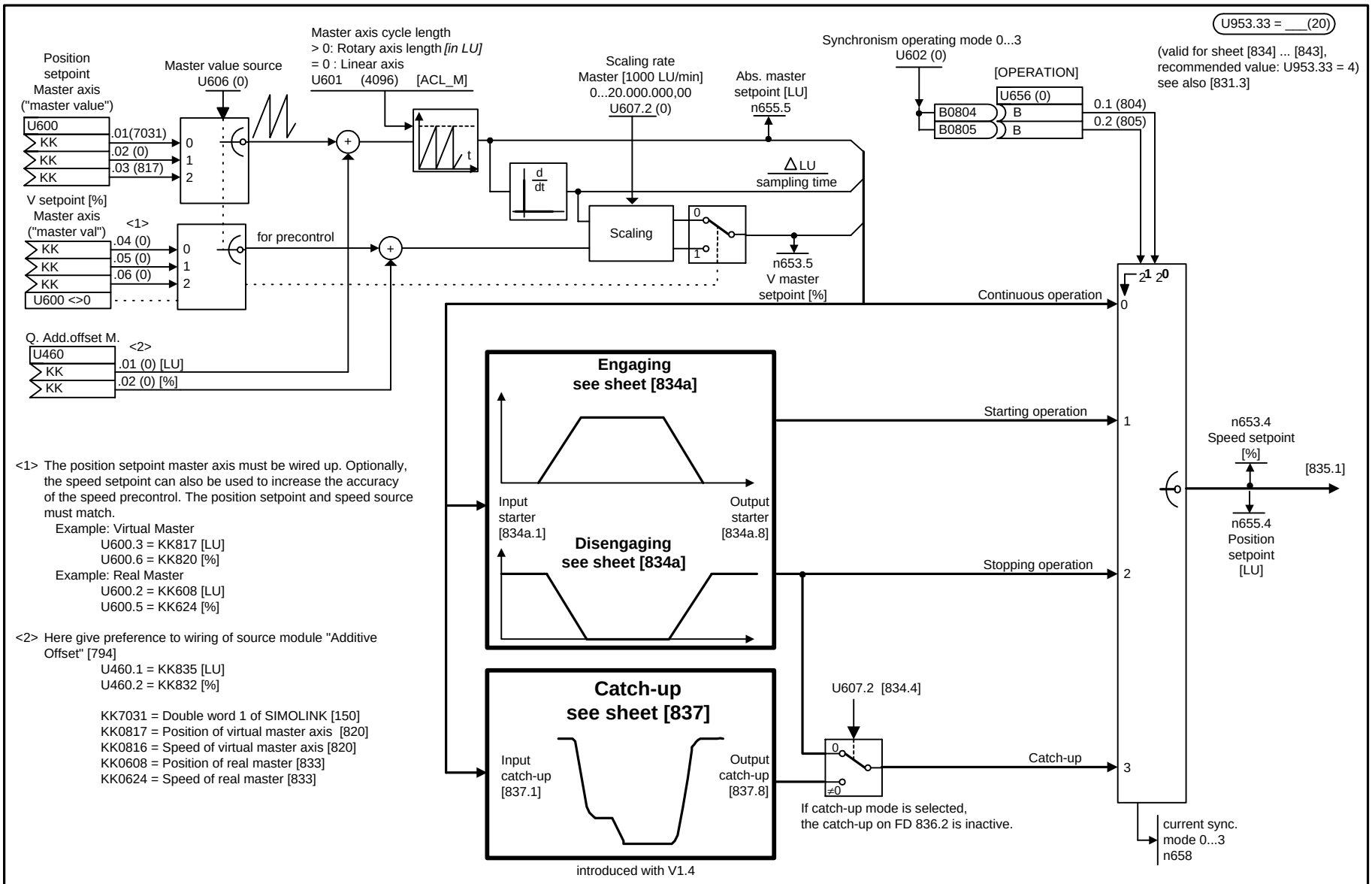
Real master with speed-dependent deadtime compensation (introduced with V1.3)



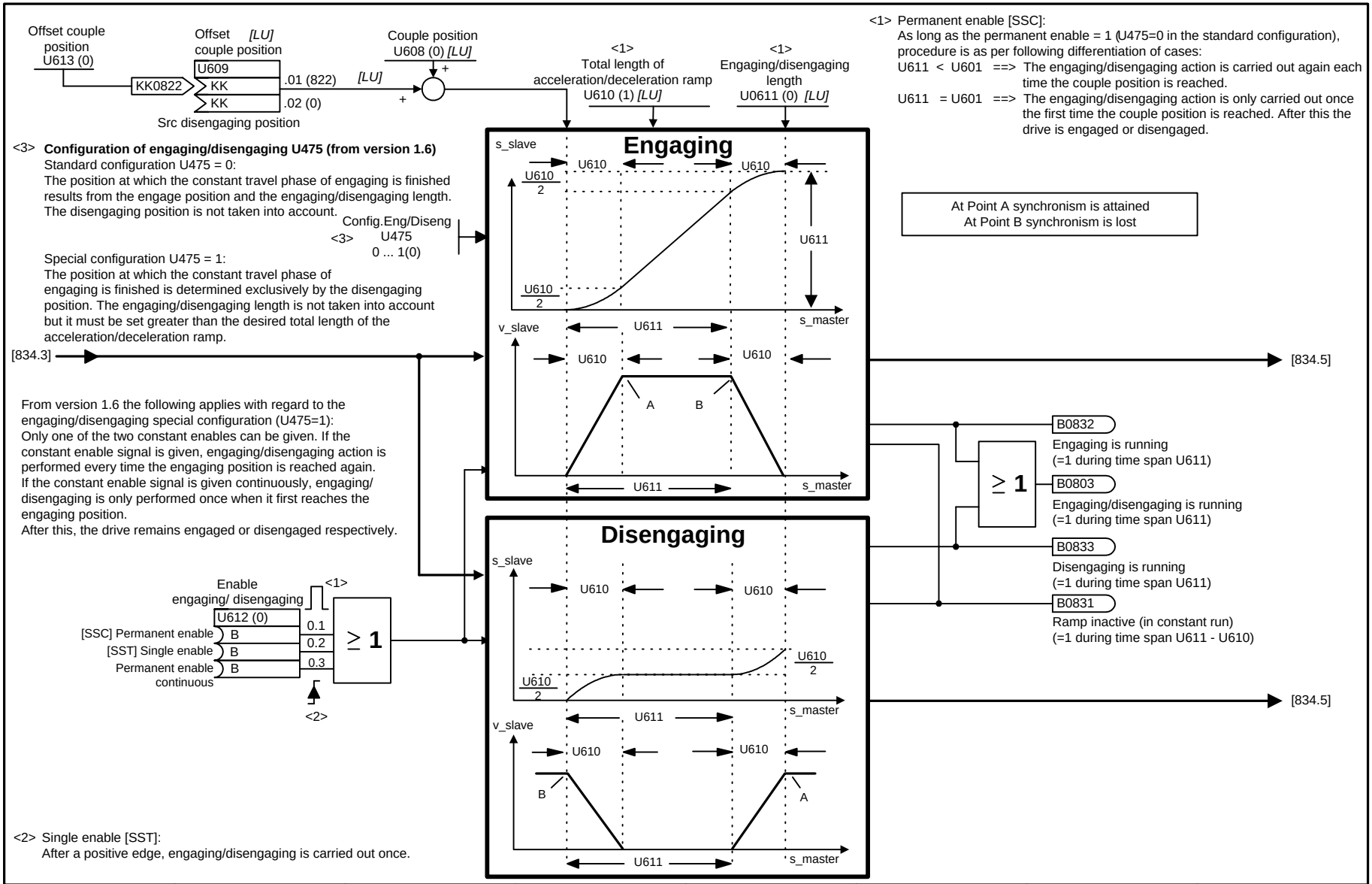
<1> Typical setting values for U424 depending on the master value source:
- approx. 3 ms with external machine encoder
- approx. 6 ms with motor encoder
- approx. 10 ms if input value is coming from SIMOLINK

<2> It is recommended to use the measured actual speed if possible (U422.03>0)

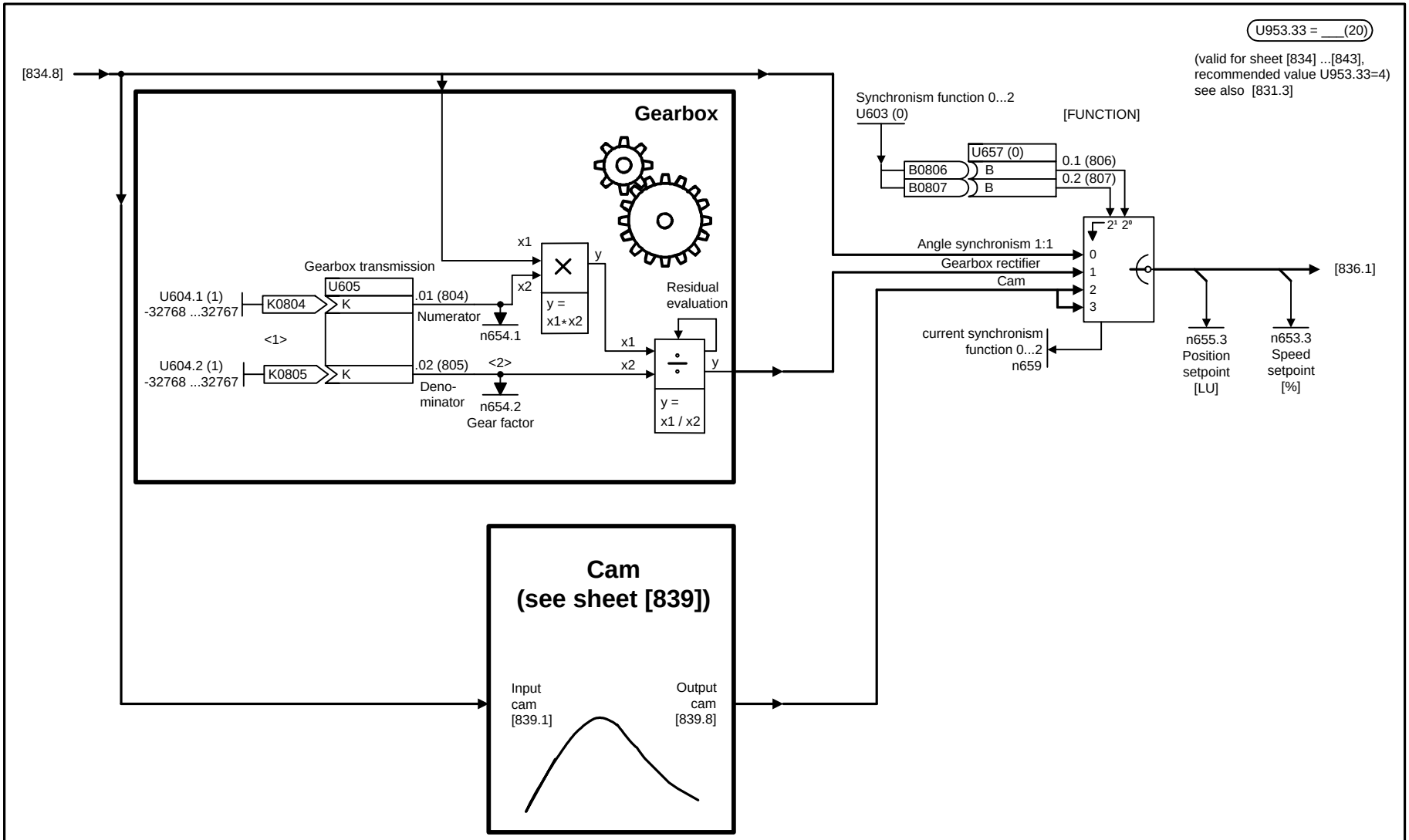
<3> You can normally set the axis cycle lengths U425.1 and U425.2 to the same value.

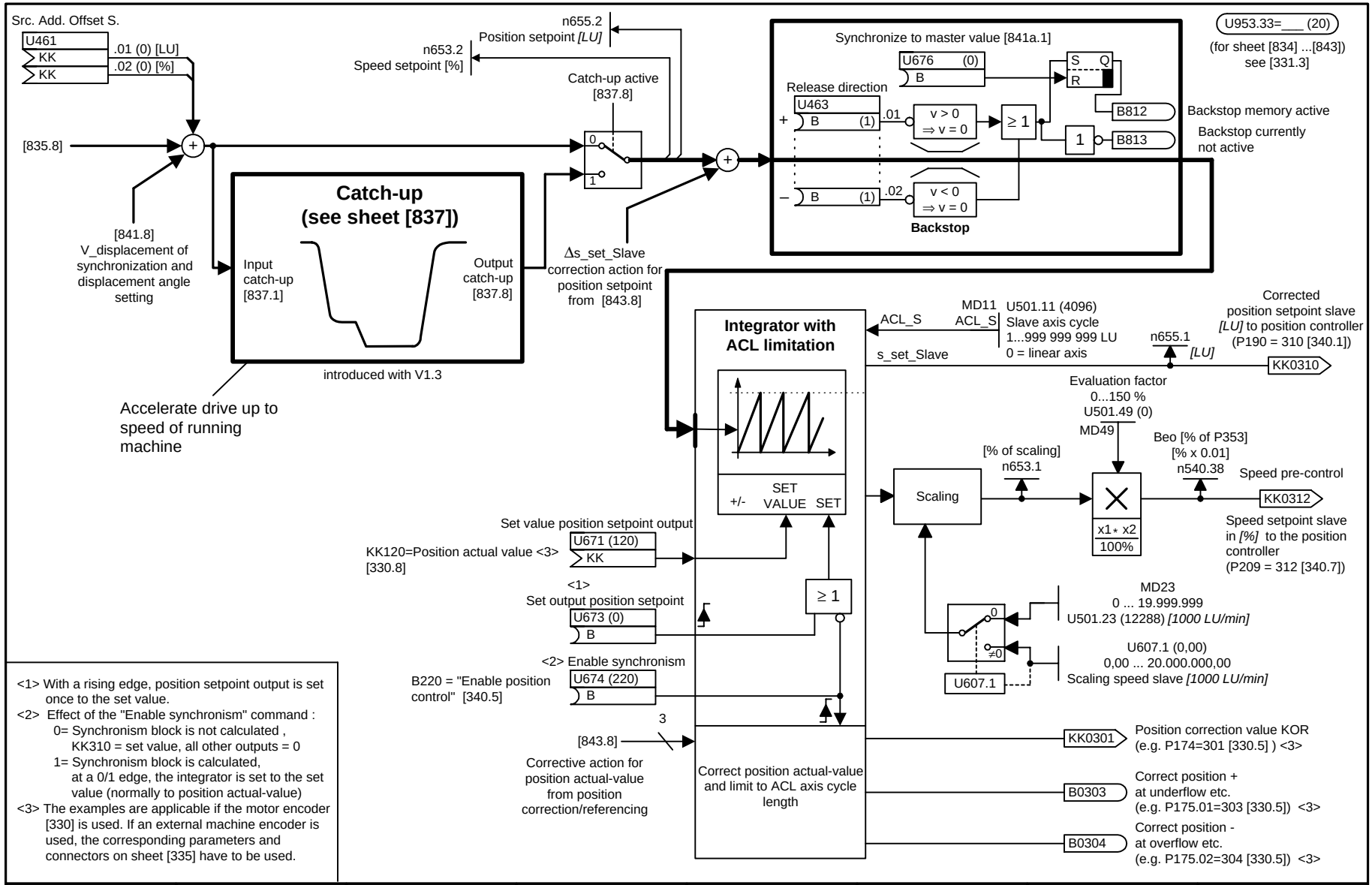


1	2	3	4	5	6	7	8
Technology Option				V1.6	fp_mc_834_e.vsd	Function diagram	- 834 -
Synchronism - engaging/disengaging actions catch-up					08.01.02	MASTERDRIVES MC	



1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_834a_e.vsd	Function diagram	- 834a -
Synchronism - engaging/disengaging actions catch-up					26.10.01	MASTERDRIVES MC	

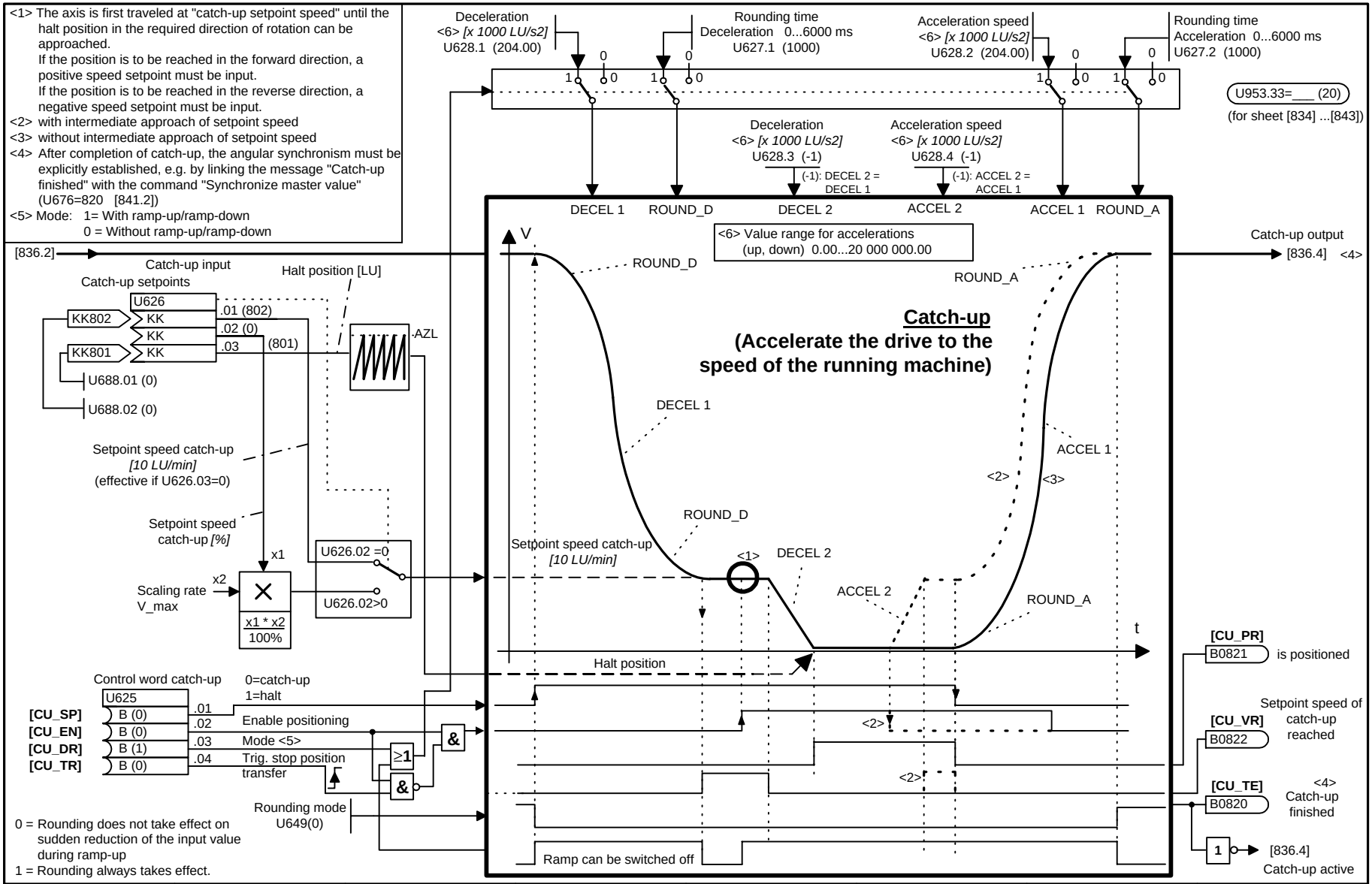

U953.33 = ___(20)
(valid for sheet [834] ...[843], recommended value U953.33=4)
see also [831.3]
[834.8]
Gearbox
Synchronism function 0...2
U603 (0)
[FUNCTION]
U657 (0)
B0806
B
B0807
B
0.1 (806)
0.2 (807)
Angle synchronism 1:1
Gearbox rectifier
Cam
current synchronism function 0...2
n659
[836.1]
n655.3
Position setpoint
[LU]
n653.3
Speed setpoint
[%]
Gearbox transmission
U605
K
U604.1 (1)
-32768 ...32767
K0804
U604.2 (1)
-32768 ...32767
K0805
.01 (804)
Numerator
n654.1
.02 (805)
Deno-minator
n654.2
Gear factor
<1>
<2>
x1
x2
y
y = x1∗x2
Residual evaluation
y = x1 / x2
Cam
(see sheet [839])
Input cam
[839.1]
Output cam
[839.8]
<1> Numerator/denominator < 1 => Slave travels slower than master
Numerator/denominator negative => Slave travels different sense of rotation to master
<2> Denominator = 0 => denominator = 1



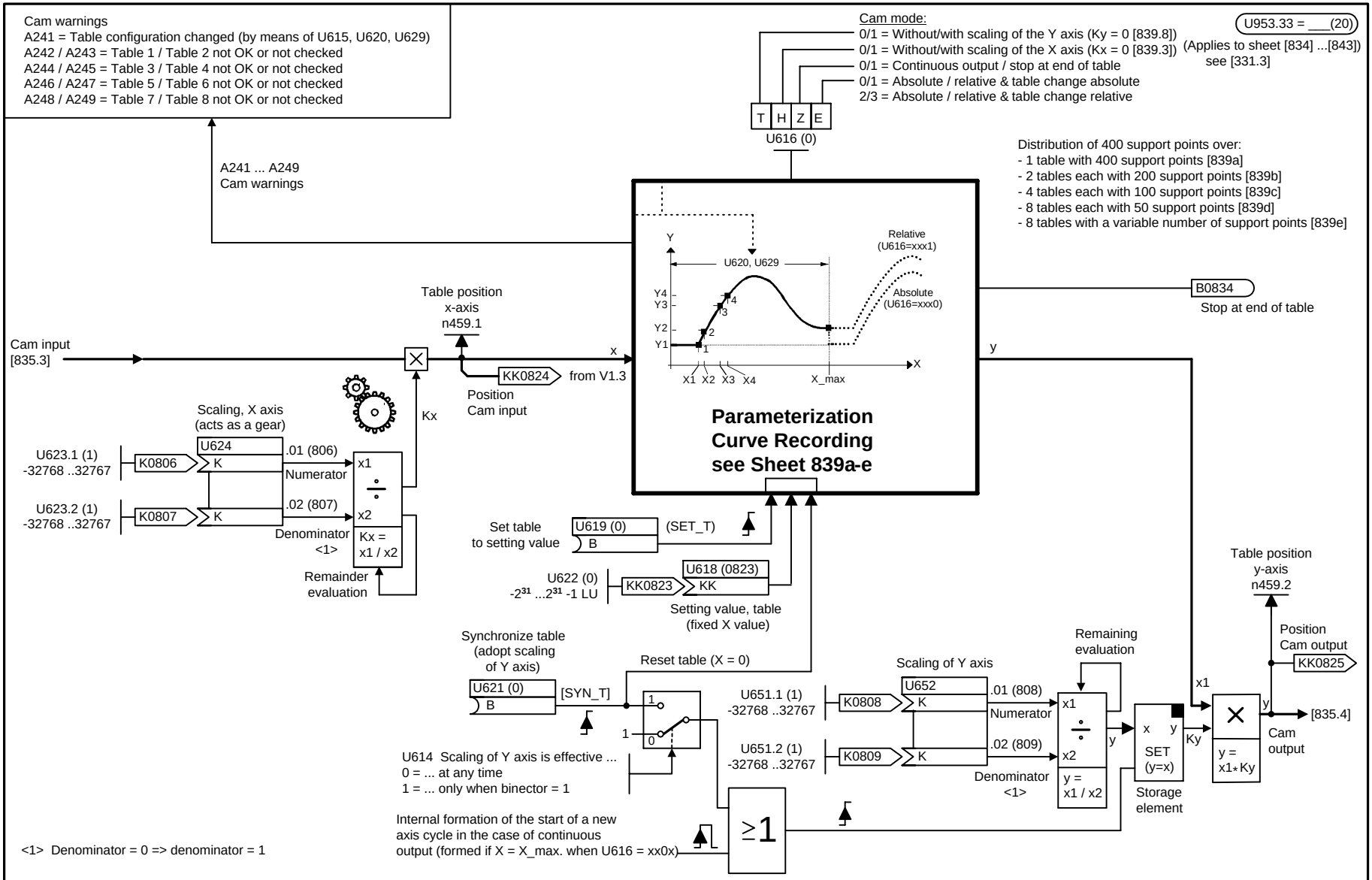
<1> With a rising edge, position setpoint output is set once to the set value.
<2> Effect of the "Enable synchronism" command :
0= Synchronism block is not calculated , KK310 = set value, all other outputs = 0
1= Synchronism block is calculated, at a 0/1 edge, the integrator is set to the set value (normally to position actual-value)
<3> The examples are applicable if the motor encoder [330] is used. If an external machine encoder is used, the corresponding parameters and connectors on sheet [335] have to be used.

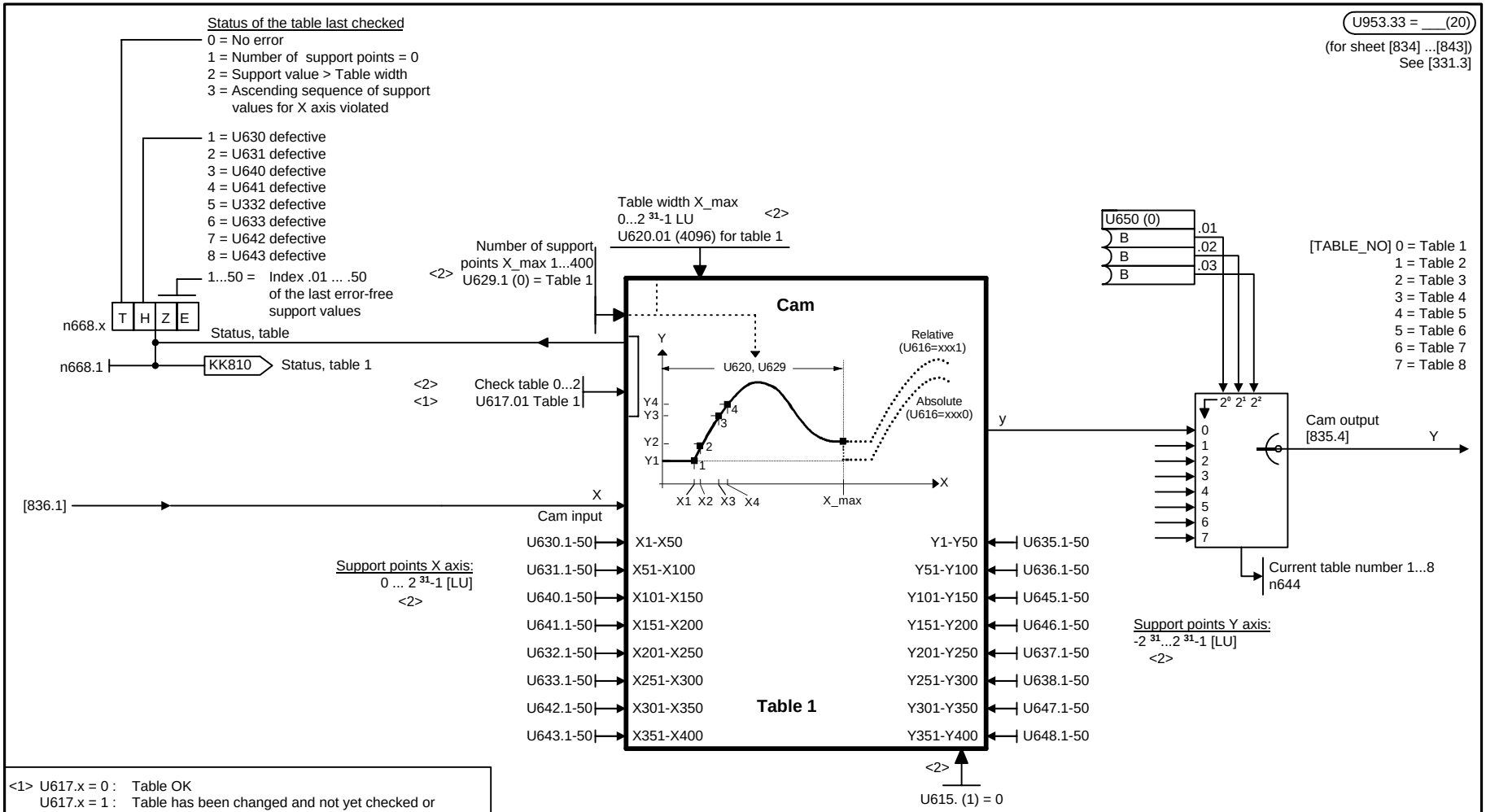
1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_836_e.vsd	Function diagram	- 836 -
Synchronism - generation of position setpoint					03.09.01	MASTERDRIVES MC	

<1> The axis is first traveled at "catch-up setpoint speed" until the halt position in the required direction of rotation can be approached.
If the position is to be reached in the forward direction, a positive speed setpoint must be input.
If the position is to be reached in the reverse direction, a negative speed setpoint must be input.
<2> with intermediate approach of setpoint speed
<3> without intermediate approach of setpoint speed
<4> After completion of catch-up, the angular synchronism must be explicitly established, e.g. by linking the message "Catch-up finished" with the command "Synchronize master value" (U676=820 [841.2])
<5> Mode: 1= With ramp-up/ramp-down
0 = Without ramp-up/ramp-down



1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_837_e.vsd	Function diagram	- 837 -
Synchronism - catch-up					08.01.02	MASTERDRIVES MC	

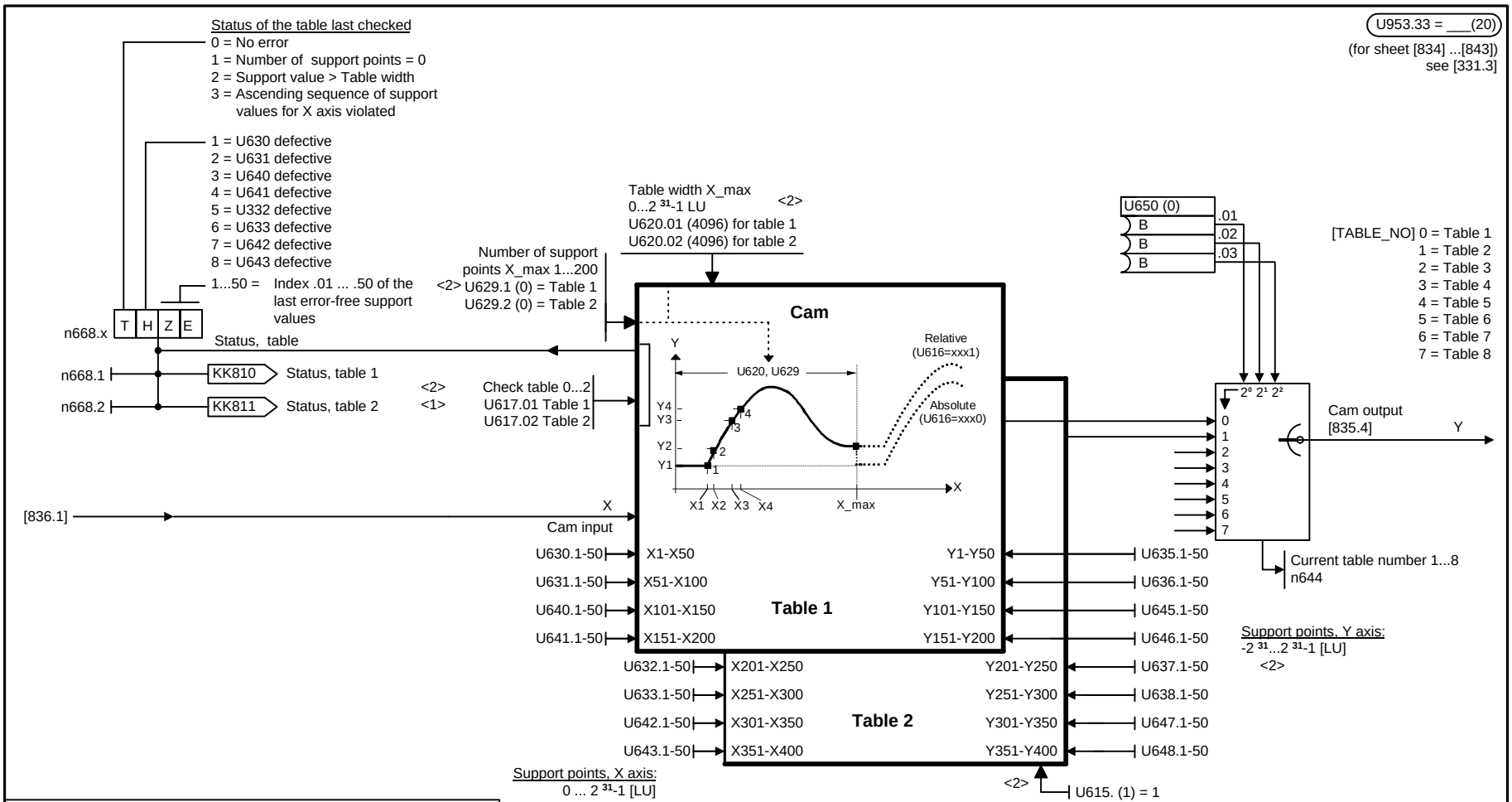

Cam warnings
A241 = Table configuration changed (by means of U615, U620, U629)
A242 / A243 = Table 1 / Table 2 not OK or not checked
A244 / A245 = Table 3 / Table 4 not OK or not checked
A246 / A247 = Table 5 / Table 6 not OK or not checked
A248 / A249 = Table 7 / Table 8 not OK or not checked
A241 ... A249
Cam warnings
Cam mode:
0/1 = Without/with scaling of the Y axis (Ky = 0 [839.8])
0/1 = Without/with scaling of the X axis (Kx = 0 [839.3])
0/1 = Continuous output / stop at end of table
0/1 = Absolute / relative & table change absolute
2/3 = Absolute / relative & table change relative
T H Z E
U616 (0)
U953.33 = ___(20)
(Applies to sheet [834] ...[843])
see [331.3]
Distribution of 400 support points over:
- 1 table with 400 support points [839a]
- 2 tables each with 200 support points [839b]
- 4 tables each with 100 support points [839c]
- 8 tables each with 50 support points [839d]
- 8 tables with a variable number of support points [839e]
Relative (U616=xxx1)
Absolute (U616=xxx0)
U620, U629
Y
X
Y1 Y2 Y3 Y4
X1 X2 X3 X4 X_max
B0834
Stop at end of table
Parameterization
Curve Recording
see Sheet 839a-e
Cam input
[835.3]
Table position
x-axis
n459.1
KK0824
from V1.3
Position
Cam input
x
y
Kx
Scaling, X axis
(acts as a gear)
U623.1 (1)
-32768 ..32767
K0806
U624
K
.01 (806)
Numerator
U623.2 (1)
-32768 ..32767
K0807
.02 (807)
Denominator
<1>
x1
x2
Kx =
x1 / x2
Remainder
evaluation
Set table
to setting value
U619 (0)
B
(SET_T)
U622 (0)
-2^31 ...2^31 -1 LU
KK0823
U618 (0823)
KK
Setting value, table
(fixed X value)
Synchronize table
(adopt scaling
of Y axis)
U621 (0)
B
[SYN_T]
Reset table (X = 0)
1
0
U614 Scaling of Y axis is effective ...
0 = ... at any time
1 = ... only when binector = 1
Internal formation of the start of a new
axis cycle in the case of continuous
output (formed if X = X_max. when U616 = xx0x)
≥1
Scaling of Y axis
U651.1 (1)
-32768 ..32767
K0808
U652
K
.01 (808)
Numerator
U651.2 (1)
-32768 ..32767
K0809
.02 (809)
Denominator
<1>
x1
x2
y =
x1 / x2
Remaining
evaluation
x y
SET
(y=x)
Storage
element
Ky
y =
x1 * Ky
Table position
y-axis
n459.2
Position
Cam output
KK0825
[835.4]
Cam
output
<1> Denominator = 0 => denominator = 1



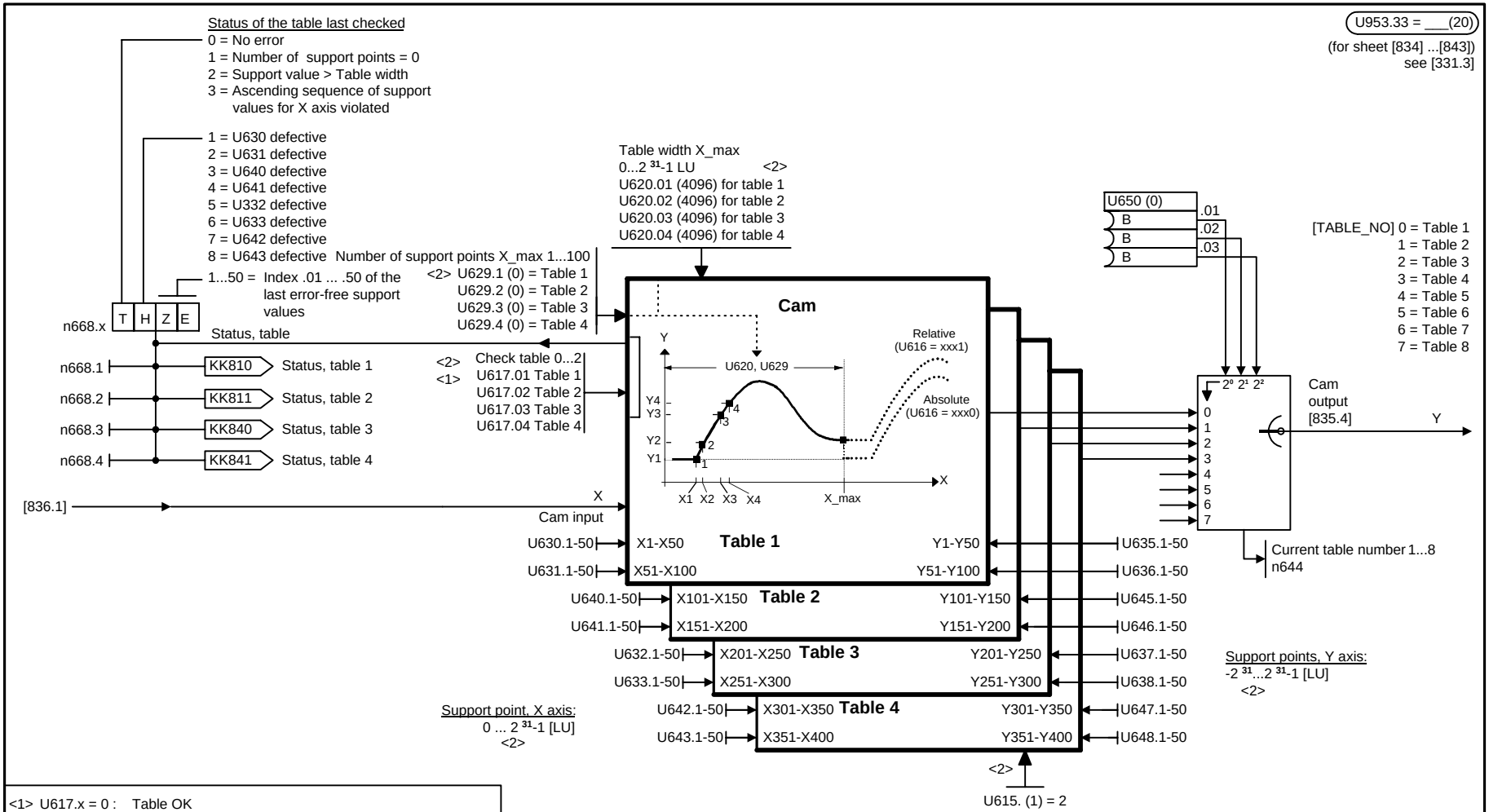
<1> U617.x = 0 : Table OK
U617.x = 1 : Table has been changed and not yet checked or the check found an error (error status in n668.x)
U617.x = 2 : Check command for table; if the table is OK, the value "0" is automatically entered in U617as an acknowledgement; if the table is not OK, U617 jumps back to the value "1"
U617.x =10: Table not present
<2> Can only be changed when curve cam is not selected

Table configuration
0 = One table with 400 points (Table 1 {X1-X400})
1 = Two tables with 200 points each (Tables 1 {X1-X200} and 2 {X201-X400})
2 = Four tables with 100 points each (Tables 1, 2, 3, and 4)
3 = Eight tables with 50 points each (Tables 1 ... 8)
4 = Variable with up to 8 tables with a total of 400 support values
(to V1.3: 1 = One table with 200 support values (Table 1 {X1-X200})

1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_839a_e.vsd	Function diagram	- 839a -
Mode of Operation Synchronism - Cam 1 table with 400 points					08.01.02	MASTERDRIVES MC	



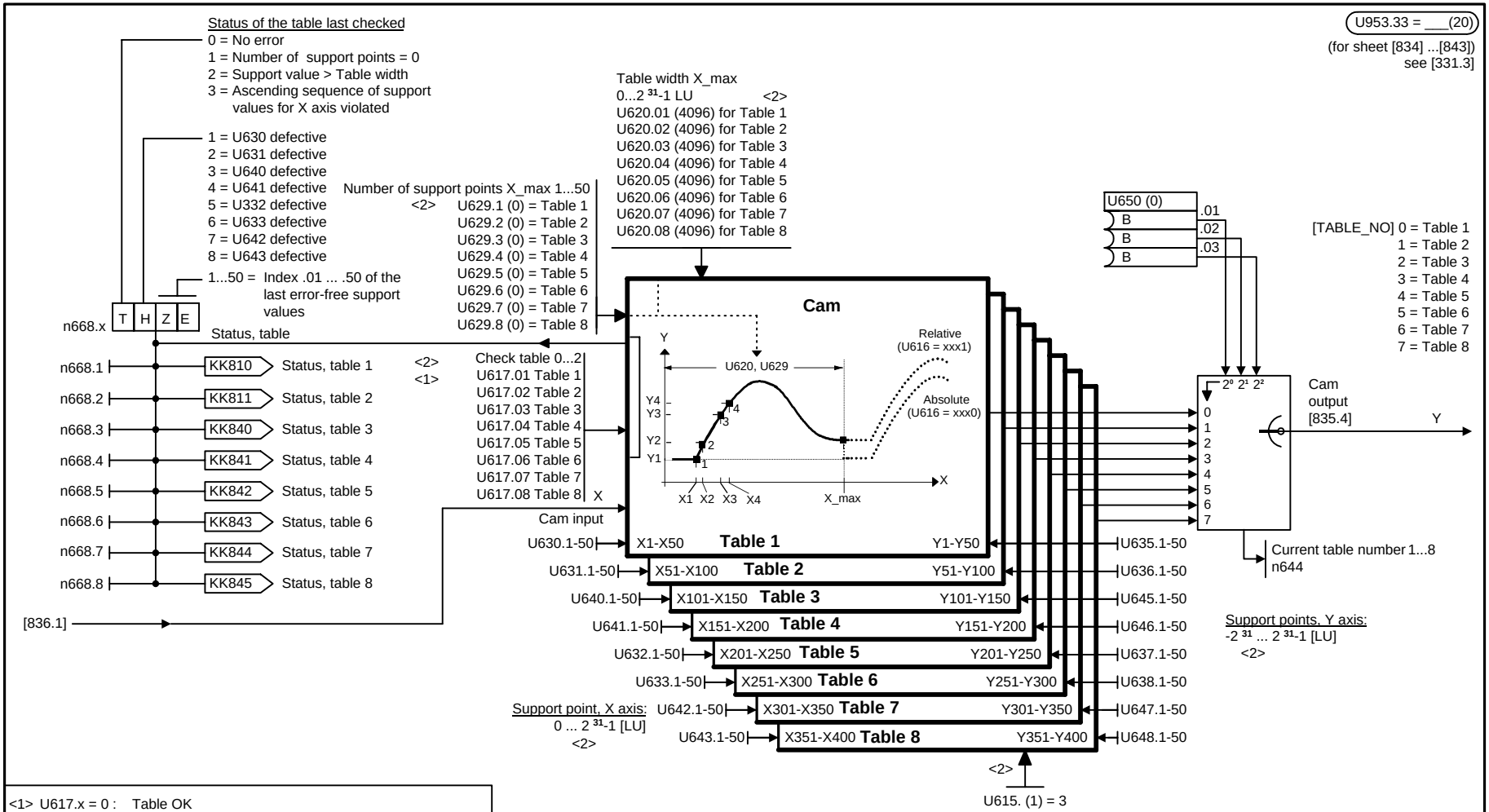
1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_839b_e.vsd	Function diagram	- 839b-
Mode of Operation Synchronism - Cam 2 tables with 200 points each					08.01.02	MASTERDRIVES MC	



<1> U617.x = 0 : Table OK
U617.x = 1 : Table has been changed and not yet checked or the check found an error (error status in n668.x)
U617.x = 2 : Check command for table; if the table is OK, the value "0" is automatically entered in U617 as an acknowledgement; if the table is not OK, U617 jumps back to the value "1"
U617.x =10: Table not present
<2> Can only be changed when curve cam is not selected

Table configuration
0 = One table with 400 points (Table 1 {X1-X400})
1 = Two tables with 200 points each (Tables 1 {X1-X200} and 2 {X201-X400})
2 = Four tables with 100 points each (Tables 1, 2, 3, and 4)
3 = Eight tables with 50 points each (Tables 1 ... 8)
4 = Variable with up to 8 tables with a total of 400 support points

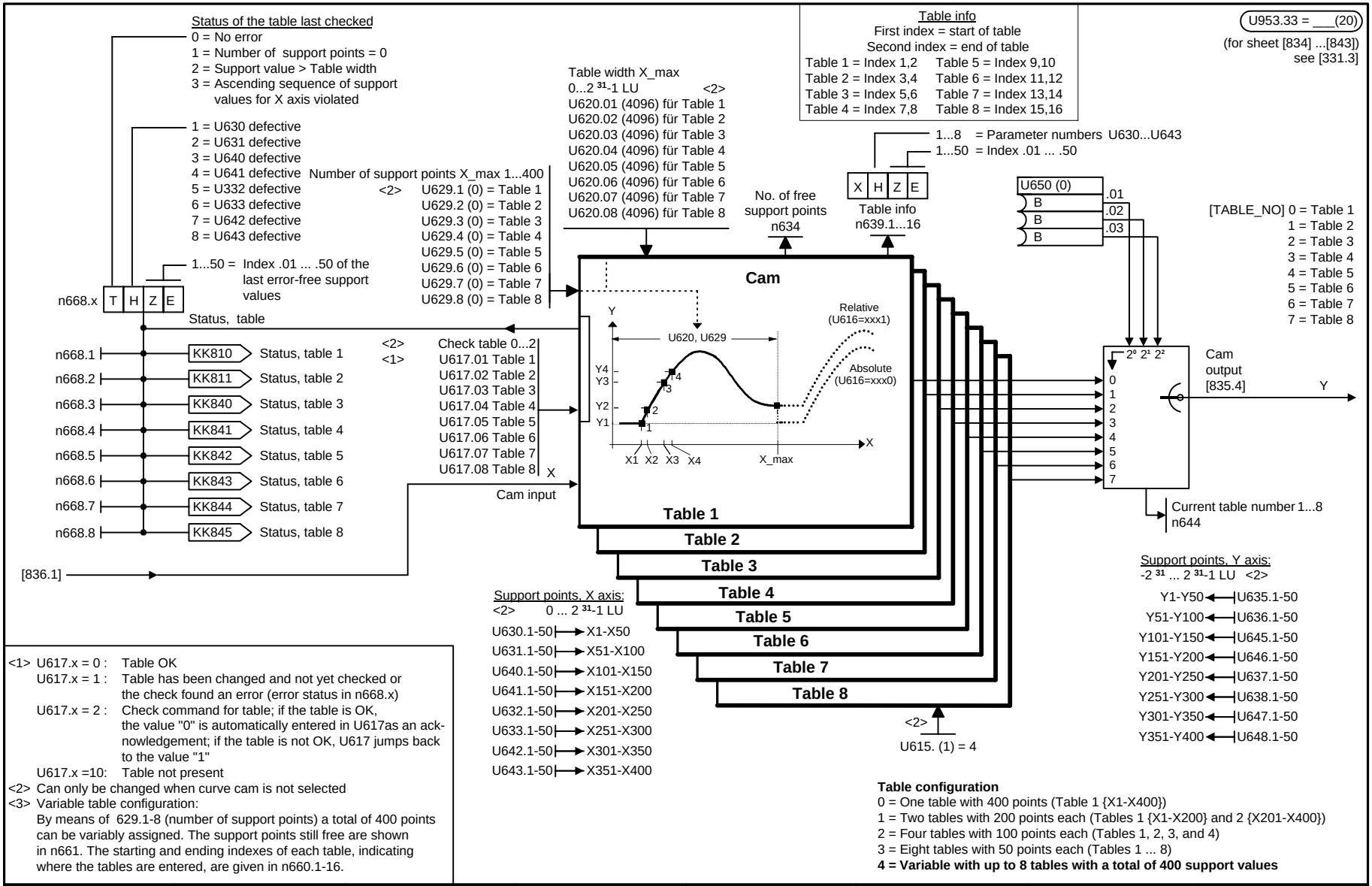
1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_839c_e.vsd	Function diagram	- 839c -
Mode of Operation Synchronism - Cam 4 tables with 100 points each					08.01.02	MASTERDRIVES MC	



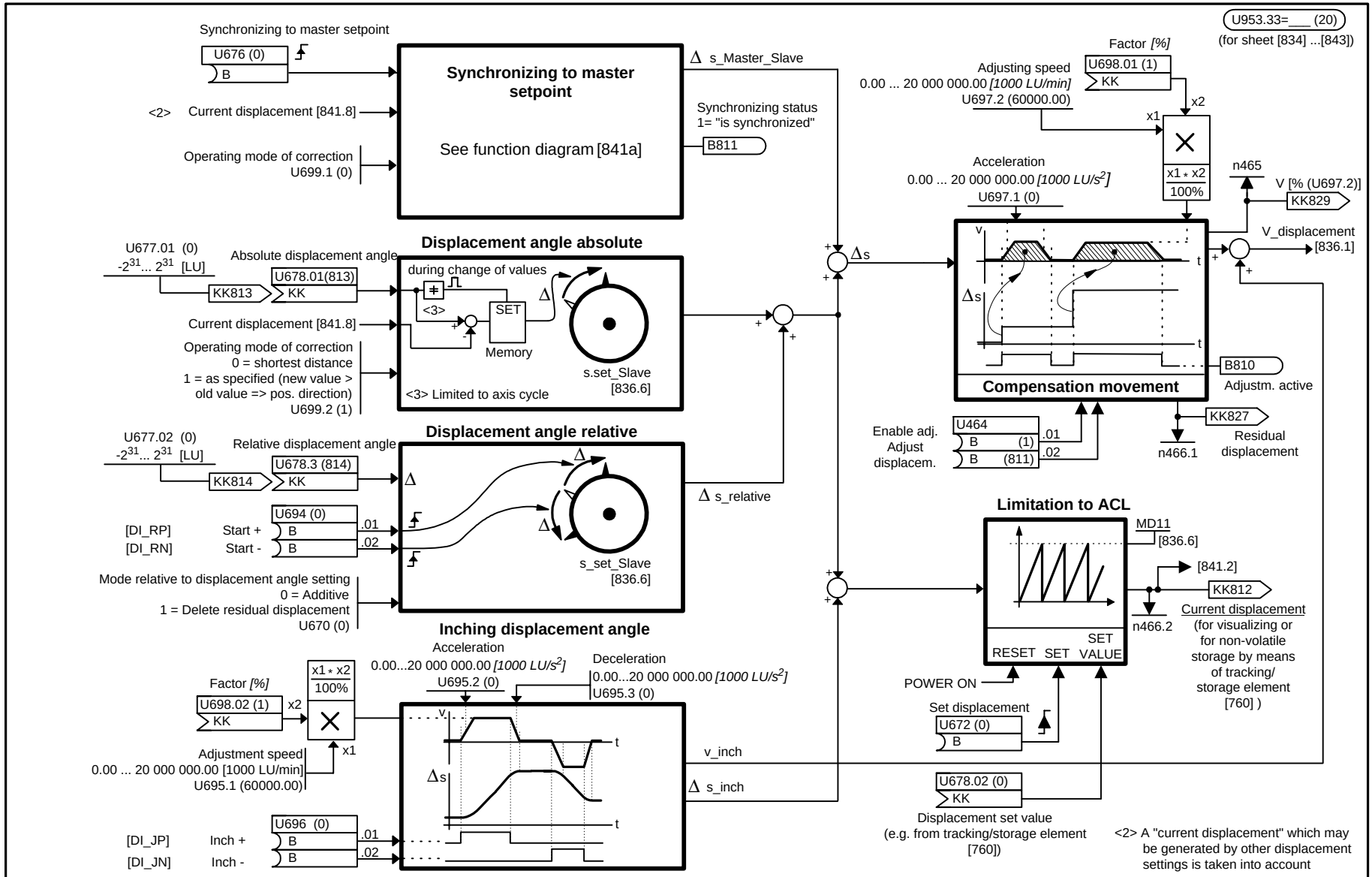
<1> U617.x = 0 : Table OK
U617.x = 1 : Table has been changed and not yet checked or the check found an error (error status in n668.x)
U617.x = 2 : Check command for table; if the table is OK, the value "0" is automatically entered in U617as an acknowledgement; if the table is not OK, U617 jumps back to the value "1"
U617.x =10: Table not present
<2> Can only be changed when curve cam is not selected

Table configuration
0 = One table with 400 points (Table 1 {X1-X400})
1 = Two tables with 200 points each (Tables 1 {X1-X200} and 2 {X201-X400})
2 = Four tables with 100 points each (Tables 1, 2, 3, and 4)
3 = Eight tables with 50 points each (Tables 1 ... 8)
4 = Variable with up to 8 tables with a total of 400 support values

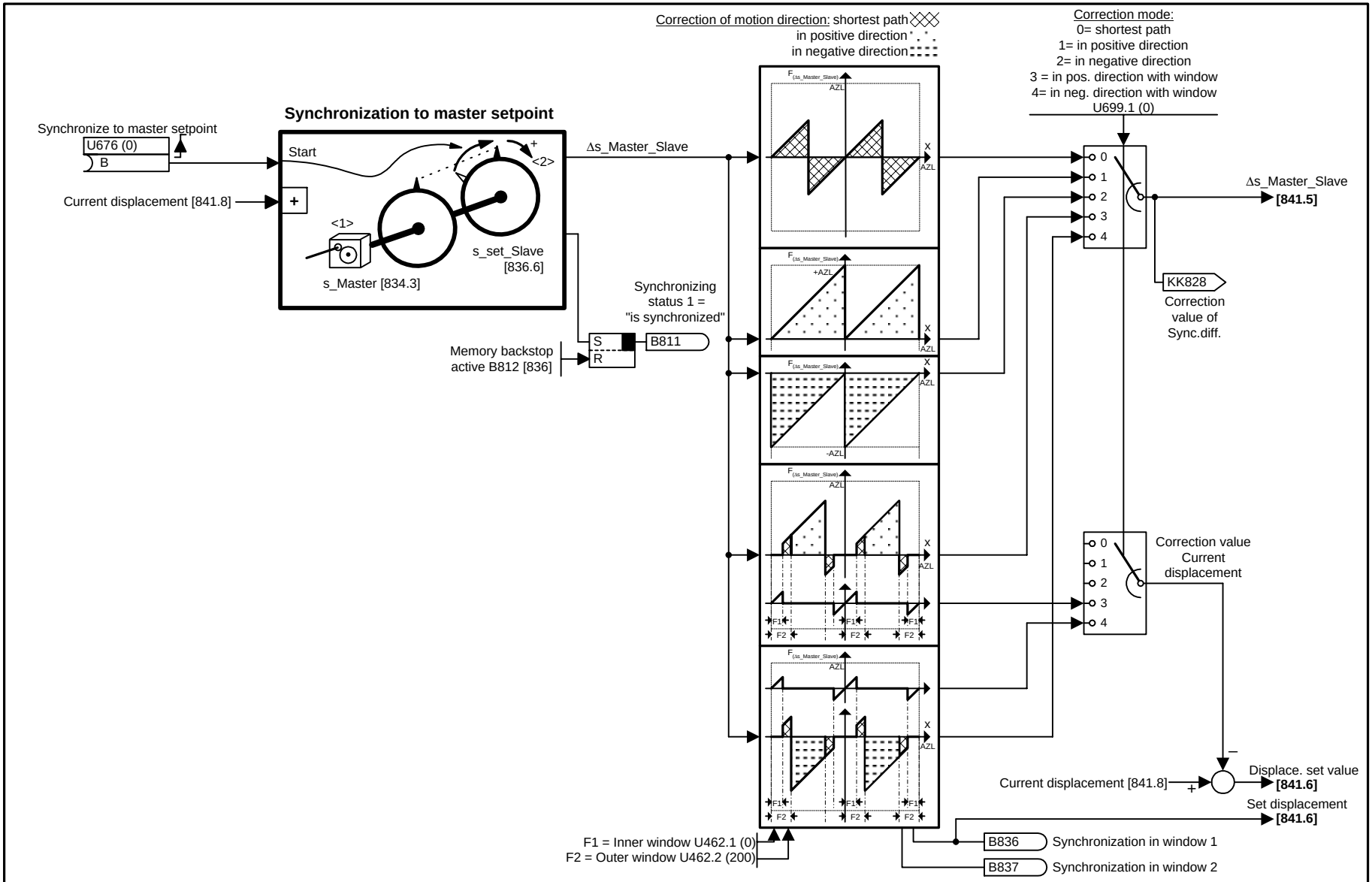
1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_839d_e.vsd	Function diagram	- 839d -
Mode of Operation Synchronism - Cam 8 tables with 50 points each					08.01.02	MASTERDRIVES MC	



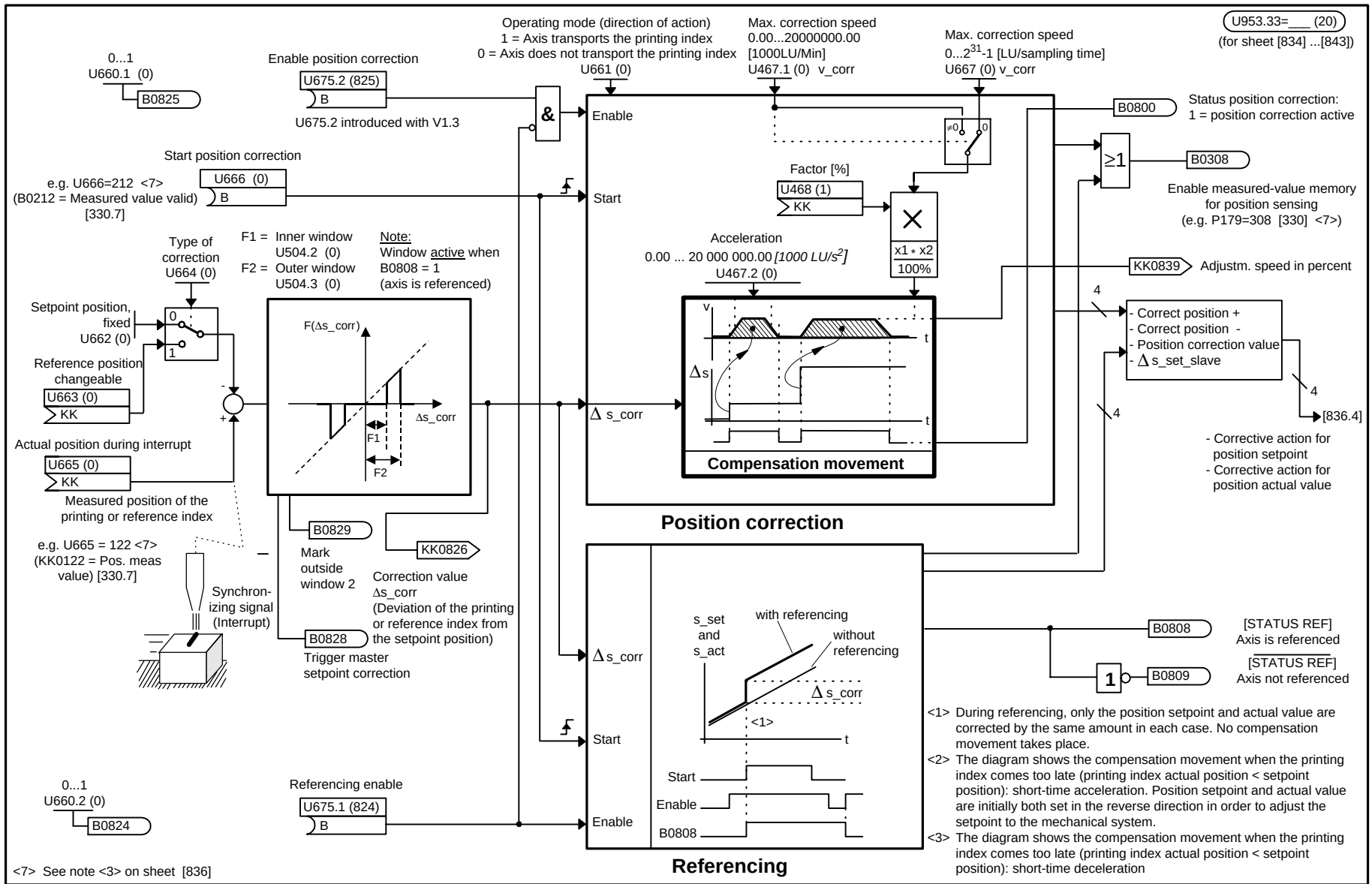
1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_839e_e.vsd	Function diagram	- 839e -
Mode of Operation Synchronism - Cam with max. 8 tables in variable configurations					08.01.02	MASTERDRIVES MC	



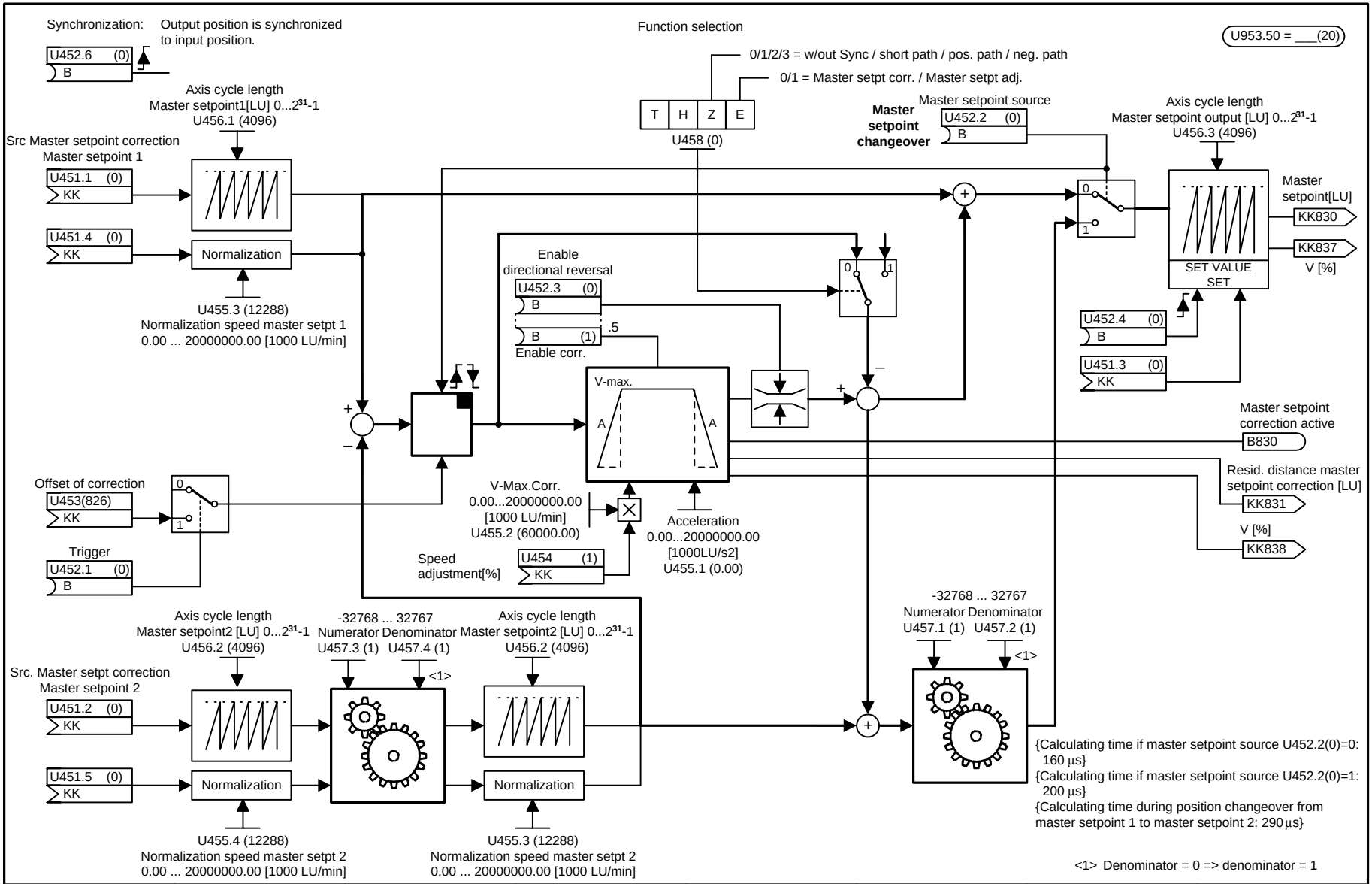
1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_841_e.vsd	Function diagram	- 841 -
Synchronism - Synchronization, displacement angle setting (introduced with V1.3)					08.01.02	MASTERDRIVES MC	



1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_841a_e.vsd	Function diagram	- 841a-
Synchronization with window / Synchronism - Synchronization					08.01.02	MASTERDRIVES MC	

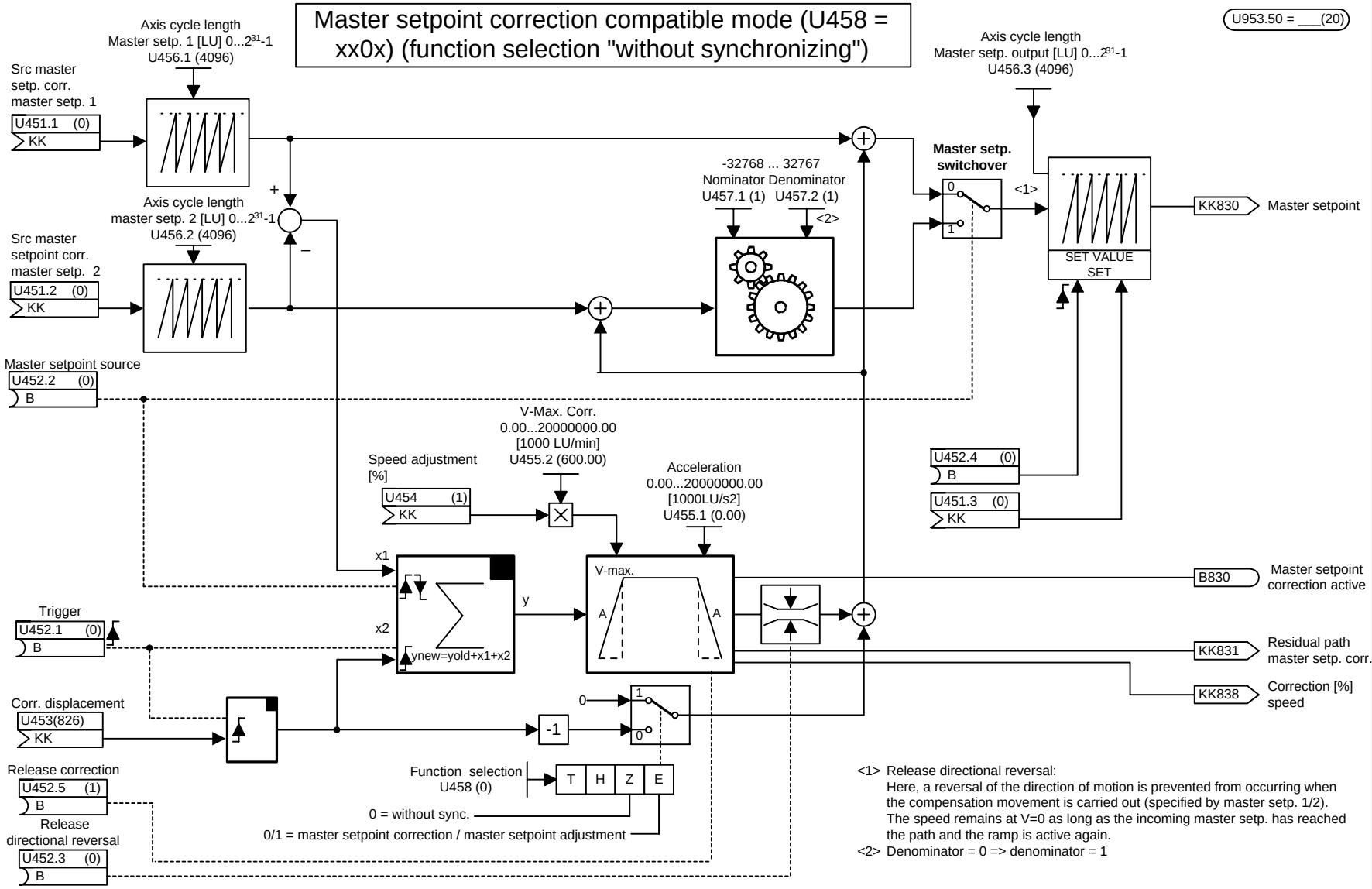


1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_843_e.vsd	Function diagram	- 843 -
Synchronism - position correction, referencing					09.01.02	MASTERDRIVES MC	



1	2	3	4	5	6	7	8
Technology Option				V1.6	fp_mc_845_e.vsd	Function diagram	- 845 -
Master setpoint correction					24.10.01	MASTERDRIVES MC	

Master setpoint correction compatible mode (U458 = xx0x) (function selection "without synchronizing")



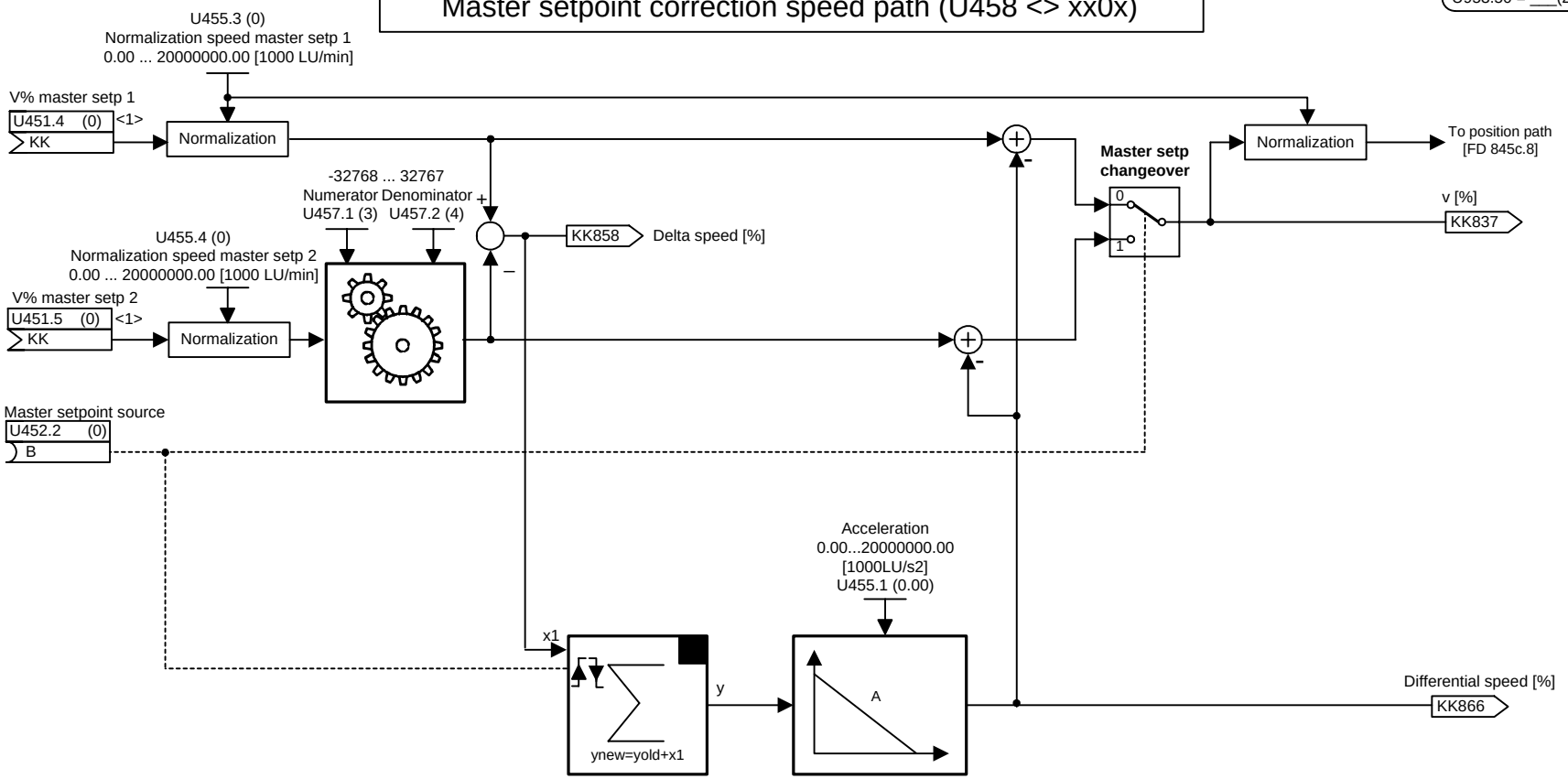
<1> Release directional reversal:
Here, a reversal of the direction of motion is prevented from occurring when the compensation movement is carried out (specified by master setp. 1/2). The speed remains at V=0 as long as the incoming master setp. has reached the path and the ramp is active again.

<2> Denominator = 0 => denominator = 1

1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_845a_e.vsd	Function diagram	- 845a -
Master setpoint correction compatible mode					03.09.01	MASTERDRIVES MC	

Master setpoint correction speed path (U458 <> xx0x)

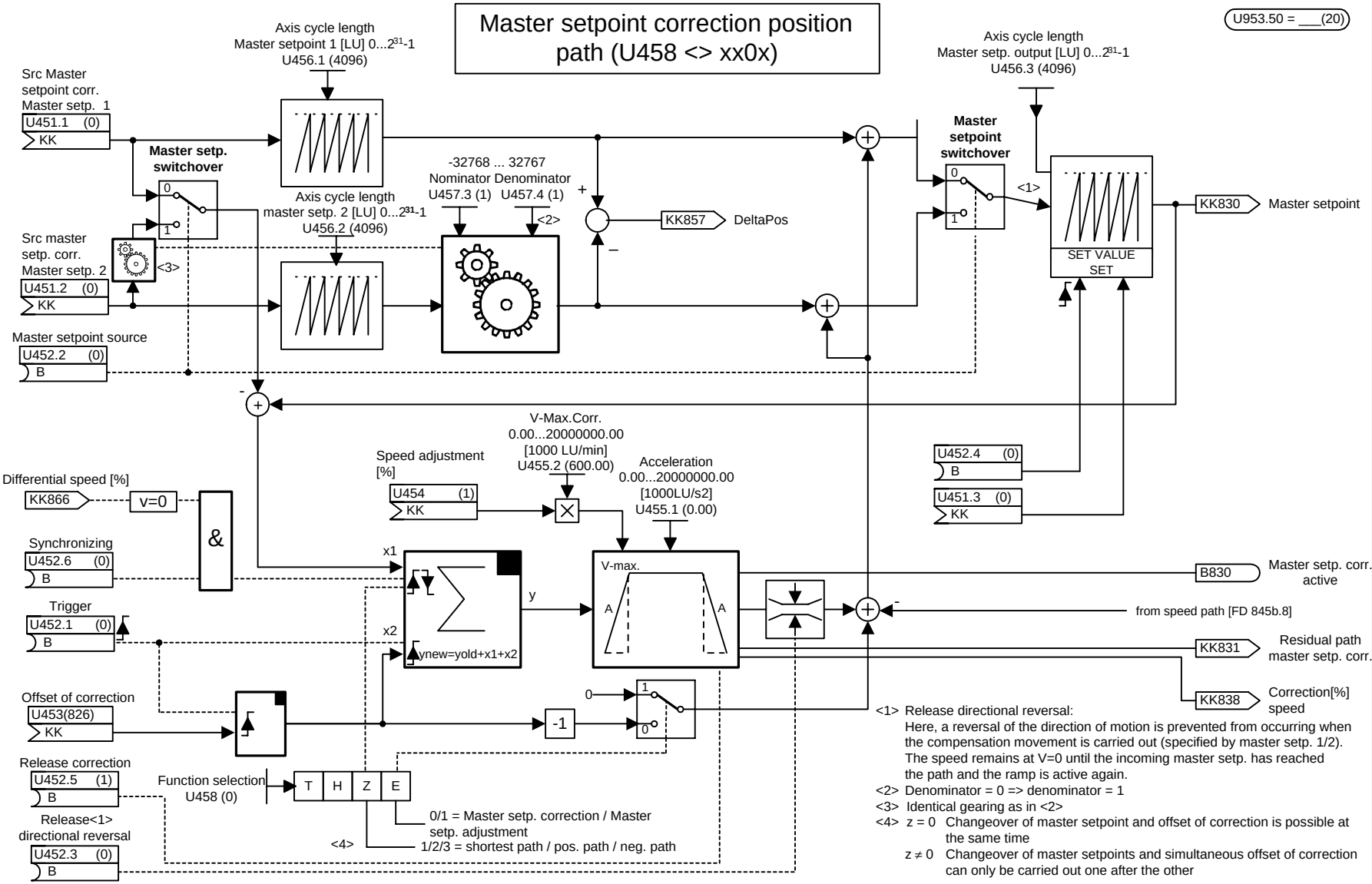
U953.50 = ___(20)



<1> If no percentage master setpoint is used in the speed path (U451.4 = 0, U451.5 = 0), the speed is derived from the position master setpoint 1 (U451.1) or the position master setpoint 2 (U451.2) by differentiation.

Master setpoint correction position path (U458 <> xx0x)

U953.50 = ___(20)



<1> Release directional reversal:
Here, a reversal of the direction of motion is prevented from occurring when the compensation movement is carried out (specified by master setp. 1/2). The speed remains at V=0 until the incoming master setp. has reached the path and the ramp is active again.

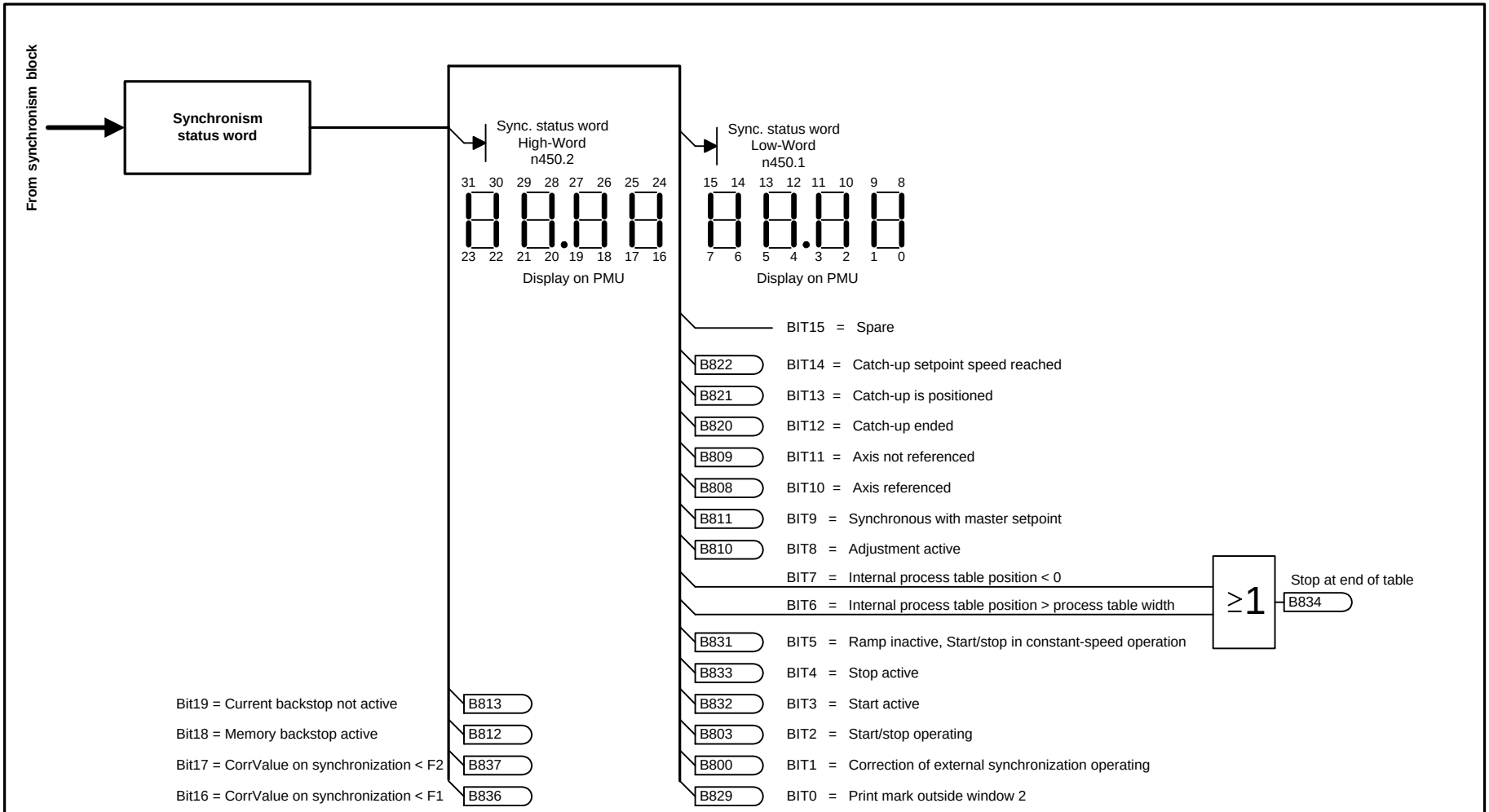
<2> Denominator = 0 => denominator = 1

<3> Identical gearing as in <2>

<4> z = 0 Changeover of master setpoint and offset of correction is possible at the same time

z ≠ 0 Changeover of master setpoints and simultaneous offset of correction can only be carried out one after the other

1	2	3	4	5	6	7	8
Technology option				V1.6	fp_mc_845c_e.vsd	Function diagram	- 845c-
Master setpoint position path					08.01.02	MASTERDRIVES MC	



1	2	3	4	5	6	7	8
Technology Option				V1.6	fp_mc_846_e.vsd	Function diagram	- 846 -
Synchronism status signals					03.09.01	MASTERDRIVES MC	

Enabling of the "F01 technology option" (positioning and synchronization)

It is necessary that the F01 technology option has been enabled:
The F01 technology option can only be used with MASTERDRIVES MC units which have been delivered ex-works with the enabled F01 option or for which this option has been enabled retrospectively by means of a PIN number. The display parameter n978 can be used to check if the F01 is present:

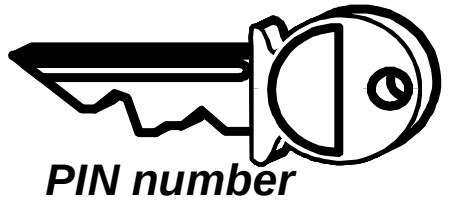
n978 = 2 ==> Technology option F01 is enabled for 500 h (from V1.31)
n978 = 1 ==> F01 technology option has been permanently enabled
n978 = 0 ==> F01 technology option has been disabled

The technology function remains enabled even after a software update and does not have to be entered again after new software has been loaded into the flash EPROM.
From version V1.31 onwards, temporary enabling is indicated by the value 2 in n978.

Retrospective enabling of the F01 technology function (involves extra costs):
Proceed as follows if you want to permanently enable the F01 technology option retrospectively

1) Determine the factory serial number of the MASTERDRIVES unit electronics. There are two ways of doing this:
   a) From parameters U976.01 and U976.02, you can read out the last 8 figures of the factory serial number which are necessary for determining the PIN number.
      (Example: U976.01 = 3032, U976.02 = 4198 ==> Factory serial number = ... 30324198)
   b) The serial number can also, if necessary, be obtained from a MASTERDRIVES unit without connecting it to the supply.
      - In the case of Compact PLUS units, it is on the sheet accompanying the delivery note or on the electronics PC board in the unit (remove side cover), e.g. "RFU80982510106"
      - In the case of Compact and chassis-type units, it is on the upper connector strip on the rear of the CUMC basic electronics board, e.g. "Q69707 30324198"
2) Contact your nearest Siemens branch in order to purchase the PIN number which matches your serial number. Quote the last eight figures of the serial number.
3) After you have obtained the PIN number, enter it in parameters U977.1 and U977.2.
4) Switch off the power supply to the electronics and then switch it on again.
5) The F01 technology option is now enabled. You can check this by referring to n978 (see above)

Caution: If the PIN-No. U977 is subsequently changed, enabling of the technology is reset (n978=0).



Temporary enabling of the F01 technology option (free of charge):
For all units and electronics boards, the F01 technology option can be enabled free of charge with a special PIN No.. This can be done **once** for a trial period of 500 hours. This time can be used for testing purposes or for using substitute units which have been ordered without the F01 option as long as the PIN number has not yet been received. The operating-hours counter (r825) determines when this time has expired. Only that time is counted during which the drive is on. After the 500 hours have expired and the voltage supply has been turned off, the F01 option is disabled again unless the 'normal' PIN has been entered in the meantime. The 500 hours can no longer be interrupted (e.g. by changing the PIN entries).
Input of the special PIN number can only be done via the PMU. The special PIN is the same for all units and is as follows

U977.1= 0727, U977.2 = 0101

Enabling for units with software version 1.1 (free of charge):
In the case of units which have been supplied with software version V1.1, an individual serial number has not been explicitly entered. In this case, permanent enabling of the F01 technology option when your equipment is upgraded with a new software version is always possible. If you have version V1.1, the following table shows the 4 possible serial numbers and the matching PIN numbers which can be read out in U976 in order to enable the function.

FID			PIN		FID			PIN	
U976.1	U976.2		U977.1	U977.2	U976.1	U976.2		U977.1	U977.2
0000	0000	==>	9970	5525	FFFF	FFFF	==>	9978	0025
0000	FFFF	==>	6682	5525	0000	2800	==>	1970	5543