

CANOpen Communication Profile for AX-V drivers

Specifica tecnica n° SP02001

Versione	Autore	Data	File	Note

1 ABOUT THIS MANUAL

This manual describes the basic services and Communication Objects of CANopen communication profile DS 301 (www.can-cia.de) which are used in the AX-V drives.

It is assumed that the basic operating functions of communication profile are known, and available as reference documentation.

2 CANOpen COMMUNICATION PROTOCOL

Communication Objects supported by AX-V drives are:

- 2 transmission PDO
- 2 receive PDO
- SDO Protocol (Normal, Expedited, Segmented)
- 1 Emergency object
- 1 Synchronous object
- Node Guarding
- NMT Protocol
- Synchronous and asynchronous protocol
- PDO Mapping

For more details about communication objects refer to CiA Draft Standard 301 documentation (ver. 4.01 date 1/6/2000).

2.1 SERVICE DATA OBJECT: SDO

Six confirm services (SDO Download, SDO Upload, Initiate SDO Upload, Initiate SDO Download, SDO Segment, and Upload SDO Segment) and one unconfirmed service (Abort SDO Transfer) are defined for Service Data Objects doing the standard segmented/expedited transfer. Refer CiA Draft Standard 301 documentation to SDO Protocol.

AX-V drive supports normal and expedited transmission.

When a Master requires a read/write object, AX-V (Slave) carries out the request and it replies with a notice message. If any problem is encountered, Slave sends with Abort SDO Transfer Protocol.

The following table lists abort coder in AX-V drives.

Mnemonic	Code	Description
OBJ_NO_PAR	06020000h	Object does not exist in the object dictionary
OBJ_NO_SUB_I	06090011h	Sub index does not exist
OBJ_READONLY	06010002h	Attempt to write a read only object
OBJ_NOTWRITENOW	08000022h	Data cannot be transferred or stored to the application because of the present device state
OBJ_MINVAL	06090032h	Value of parameter written too low

OBJ_MAXVAL	06090031h	Value of parameter written too high
OBJ_CONSTANTLIMITS	08000021h	Data cannot be transferred or stored to the application because of local control
OBJ_VAL_EXCEEDED	06090030h	Value range of parameter exceeded (only for write access)
OBJ_ACCESS	06010000h	Unsupported access to an object
OBJ_GENERAL	08000000h	General error
OBJ_SAVE	06060000h	Access failed due to a hardware error
OBJ_SIGNATURE	08000020h	Data cannot be transferred or stored to the application
OBJ_TOGGLE	05030000h	Toggle bit error
OBJ_CSCOMM	05040001h	Client/Server command specifier not valid or unknown
OBJ_LEN	06070010h	Data type does not match, length of service parameter does not match
OBJ_LENHIGH	06070012h	Data type does not match, length of service parameter too high
OBJ_LENLOW	06070013h	Data type does not match, length of service parameter too low
OBJ_PDOMAPPED	06040041h	Object cannot be mapped into PDO
OBJ_PDOLLEN	060400042	The number and length of the object to be mapped would exceed PDO length

2.2 EMERGENCY OBJECT

Emergency object is triggered by the occurrence of a device internal error situation and it is transmitted from an emergency producer on the device.

By mean Emergency Protocol AX-V drive notifies to user and to Master its alarm state: the following table lists error code and their explanation.

Mnemonic	Code	Description
DRIVE_OK	0x0000	No error occurs
DRV_E_NODE	0x0001	Node number not allowed
DRV_E_SDO_LEN	0x0002	Data type does not match, length of service object does not match
DRV_E_NMT_LEN	0x0004	Data type does not match, length of NMT object does not match
DRV_E_NMT_INV	0x0008	Data type does not match, format of NMT object does not match

DRV_E_BUS_LOSS	0x0010	Node Guarding timeout error
DRV_E_BUS_OFF	0x0020	Hardware error occurred on Can Net
DRV_E_NO_OP	0x0040	Drive has been enabled in pre-operational state
DRV_E_PDO1_R_LEN	0x0100	Data type does not match, length of received PDO1 exceeds allowed length
DRV_E_PDO2_R_LEN	0x0200	Data type does not match, length of received PDO2 exceeds allowed length
DRV_E_SYNC_KO	0x0400	Synchronisation to sync master message failed
DRV_E_PDO_MAP	0x0800	PDO mapping failed
DRV_E_PDO1_T_LEN	0x1000	Data type does not match, length of transmitted PDO1 exceeds allowed length
DRV_E_PDO2_T_LEN	0x2000	Data type does not match, length of transmitted PDO2 exceeds allowed length
DRV_E_TX_BUSY	0x4000	Transmission timeout
DRV_E_OVR	0x8000	SDO received overrun

2.3 SYNCHRONIZATION OBJECT: SYNC

AX-V drive supports a broadcast synchronization object (1006h) for synchronous transmission of messages.

In case Node Guarding protocol is not in use, that is to say Guard time (100Ch) null, AX-V drive is able to control the presence of Client by means of sync message if Life time factor (100Dh) is set.

2.4 NODE GUARDING PROTOCOL

This protocol is used to detect remote errors in the network.

In case Node Guarding protocol is not in use, that is to say Guard time (100Ch) null, AX-V drive is able to control the presence of Client by mean sync message if Life time factor (100Dh) is set.

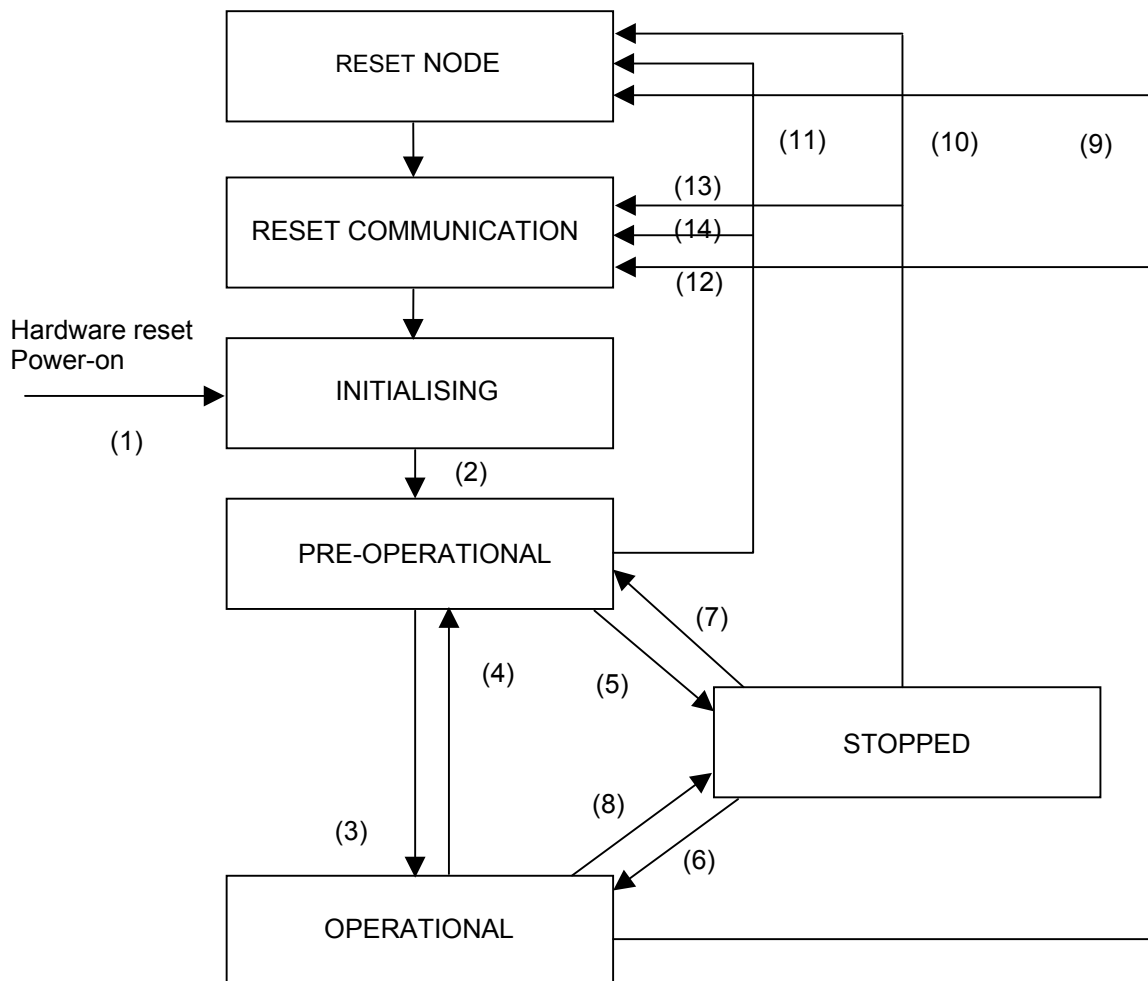
2.5 NMT PROTOCOL

Module Control Protocols supported by AX-V drive are:

- Start Remote Node Protocol
- Stop Remote Node Protocol
- Enter Pre-Operational Protocol
- Reset Node Protocol
- Reset Communication Protocol

For more details about NMT Protocol refer to CiA Draft Standard 301 documentation (ver. 4.01 date 1/6/2000).

The state and transitions diagram are shown below related to NMT protocol.



Transition	NMT Protocol
(1)	At Power on the initialisation state is entered autonomously
(2)	Enter in Pre-Operational automatically
(3),(6)	Start Remote Node indication
(4),(7)	Pre-Operational State indication
(5),(8)	Stop Remote Node indication
(9),(10),(11)	Reset Node indication
(12),(13),(14)	Reset Communication indication

The table below shows the relation between communication state and communication objects. Services on the listed communication object may only be executed if the devices involved in the communication are in the appropriate communication states.

Communication Object	INITIALISING	PRE-OPERATIONAL	OPERATIONAL	STOPPED
PDO			enabled	
SDO		enabled	enabled	

SYNC		enabled	enabled	
Emergency		enabled	enabled	
NMT		enabled	enabled	enabled

2.6 PROCESS DATA OBJECT: PDO

The real time data transfer is performed by means of "Process Data Objects (PDO)". The transfer of PDOs is performed with no protocol overhead.

AX-V supports 2 Transmit-PDOs and 2 Receive-PDOs in synchronous and asynchronous transmission.

For each PDO, it is possible to set: type, inhibit time (only Transmit-PDOs), object mapping according to CANopen communication profile DS 301.

Without any setting Transmit-PDOs are asynchronous and they are transmitted only when mapped data are changed (event-driven form).

The table below shows the Transmit-PDOs types supported.

Type	Transmit-PDO					Description
	Cic	Acic	Sinc	Asinc	RTR	
1	X		X			Data are transmitted when a sync message is received
253				X	X	Data are updated and transmitted automatically after each RTR request
254				X		Data are transmitted in event driven modality

3 OBJECT DICTIONARY

This section details the Object Dictionary structure and entries which are supported by AX-V drive. Object dictionary consists of two different areas:

- Communication-specific profile (index 1000h – 1FFFh): this section lists configuration parameters of basic protocol according to CANopen communication profile DS 301 (refer to CiA Draft Standard 301 documentation - ver. 4.01 - date 1/6/2000);
- Manufacturer-specific profile (index 2000h – 5FFFh): this section lists manufacturer parameters for drive configuration;

3.1 SUPPORTED OBJECT

	Index	Object	Descrizione
Communication area	1000h	Device type	Device type
	1001h	Err. register	Alarm presence register
	1002h	Status reg.	Device error status
	1006h	Cycle period	Sincronization period
	100Ch	Guard time	Guard time
	100Dh	Life time factor	Multiply factor for guard time
	1018h	Identity	Device identification
	1400-1h	Receive PDO	Receive-PDO configuration

	1600-1h	Rx PDO Mapping	Receive-PDO mapping
	1800-1h	Transmit PDO	Transmit-PDO configuration
	1A00-1h	Tx PDO Mapping	Transmit -PDO mapping
Manufacturer area	2000-5FFFh	AxV System variables	

3.1.1 COMMUNICATION-SPECIFIC PROFILE (INDEX 1000h – 1FFFh)

For a detail description of communication-specific objects refer to to CiA Draft Standard 301 documentation - ver. 4.01 - date 1/6/2000).

Following, we present a brief description of supported objects.

3.1.1.1 Device type (1000H)

Index	Sub index	Type	Attr.	Default	Unit	Description
1000h	0	UINT32	Ro	AAAA0001h		Device Type

3.1.1.2 Alarm presence register (1001h)

Index	Sub index	Type	Attr.	Default	Unit	Description
1001h	0	BYTE	Ro			If no alarm is present, the register is NULL, otherwise 1.

3.1.1.3 Device error status (1002h)

Index	Sub index	Type	Attr.	Default	Unit	Description
1002h	0	UINT32	Ro			It represents the actual alarm mask of the drive.

3.1.1.4 Synchronous period (1006h)

This object defines the communication cycle period in μ s. This period defines the SYNC interval. It is 0 if not used.

In case Node Guarding protocol is not in use, that is to say Guard time (100Ch) null, AX-V drive is able to control the presence of Client by means of sync message if Life time factor (100Dh) is set. Minimum value for SYNC period is 1000 (1ms).

Index	Sub index	Type	Attr.	Default	Unit	Description
1006h	0	UINT32	rw	0	uS	Synchronous period

3.1.1.5 Guard time period (100Ch)

The object at index 100Ch and 100Dh include the guard time in milliseconds and the life time factor. The life time factor multiplied with the guard time gives the life time for Node Guarding protocol. Minimum value is 10ms.

Index	Sub index	Type	Attr.	Default	Unit	Description
100Ch	0	UINT16	rw	0	ms	Node guarding period

3.1.1.6 Multiplicative Guard time factor (100Dh)

Index	Sub index	Type	Attr.	Default	Unit	Description
100Dh	0	BYTE	rw	0		Life time factor

3.1.1.7 Device identifier (1018h)

Index	Sub index	Type	Attr.	Default	Unit	Description
1018h	0	BYTE	ro			Parameter number of Device identifier object
	1	UINT32	ro	AAAAAAAAh		ID vendor
	2	UINT32	ro	BBBBBBBBh		Product code
	3	UINT32	ro	00010001h		Module revision
	4	UINT32	ro	12345678h		Serial number

3.1.1.8 RxPDO Configuration (1400-1h)

Index	Sub index	Type	Attr.	Default	Unit	Description
1400-1h	2	BYTE	rw	254		Type of transmission of receive-PDOx

The setting gets active when the drive enters in OPERATIONAL MODE.

3.1.1.9 RxPDO Mapping (1600-1h)

Contains the mapping for the PDOs the device is able to receive.

Index	Sub index	Type	Attr.	Default	Unit	Description
1600-1h	0	BYTE	rw			Enable mapping receive PDOx
	1	UINT32	rw			Map first receive-PDOx object
	2	UINT32	rw			Map second receive-PDOx object
	3	UINT32	rw			Map third receive-PDOx object
	4	UINT32	rw			Map fourth receive-PDOx object

The correct sequence to map receive-PDO is:

Send SDO with 160x, 00, 00, 00, 00, 00 to enable mapping procedure.

Send SDO with 160x, 01, length, sub-index, index to map the first receive-PDOx object.

Send SDO with 160x, 02, length, sub-index, index to map the second receive PDOx object.

Send SDO with 160x, 03, length, sub-index, index to map the third receive PDOx object.

Send SDO with 160x, 04, length, sub-index, index to map the fourth receive PDOx object.

It is necessary to map in sequence receive-PDO1 object.

The mapping gets active when the drive enters in OPERATIONAL MODE.

If the change of the PDO mapping cannot be execute, the device responds with an Abort SDO Transfer Service.

3.1.1.10 TxPDO Configuration (1800h)

Index	Sub index	Type	Attr.	Default	Unit	Description
1800h	2	BYTE	rw	254		Type of transmission of transmit-PDOx

The setting gets active when the drive enters in OPERATIONAL MODE.

3.1.1.11 TxPDO Mapping (1A00-1h)

Contains the mapping for the PDOs the device is able to receive.

Index	Sub index	Type	Attr.	Default	Unit	Description
1A00-1h	0	BYTE	rw			Enable mapping transmit-PDOx
	1	UINT32	rw			Map first transmit -PDOx object
	2	UINT32	rw			Map second transmit -PDOx object
	3	UINT32	rw			Map third transmit -PDOx object
	4	UINT32	rw			Map fourth transmit -PDOx object

The correct sequence to map transmit -PDO is:

Send SDO with 1A0x, 00, 00, 00, 00, 00 to enable mapping procedure.

Send SDO with 1A0x, 01, length, sub-index, index to map the first transmit -PDOx object.

Send SDO with 1A0x, 02, length, sub-index, index to map the second transmit PDOx object.

Send SDO with 1A0x, 03, length, sub-index, index to map the third transmit PDOx object.

Send SDO with 1A0x, 04, length, sub-index, index to map the fourth transmit PDOx object.

It is necessary to map in sequence transmit-PDO1 object.

The mapping gets active when the drive enters in OPERATIONAL MODE.

If the change of the PDO mapping cannot be execute, the device responds with an Abort SDO Transfer Service.

3.1.2 USER-SPECIFIC PROFILE (INDEX 2000h – 5FFFh)

Index (dec)	Index (hex)	Sub	Type	Mnemonic	Num
8200	2008h	0	16 bit int	Application 16 bit read only parametrs	640
9000	2328h	0	32 bit int	Application 32 bit read only parametrs	640
10000	2710h	0	32 bit real	Application floating point read only parametrs	128
11000	2AF8h	0	16 bit bool	Application boolean read only parametrs	128
12000	2EE0h	0	32 bit real	AML quotes	50
12100	2F44h	0	32 bit real	AML timers	50
12200	2FA8h	0	32 bit int	AML general purpose parameters	50
12300	300Ch	0	16 bit bool	AML flags	64
13000	32C8h	0	16 bit int	Application 16 bit parametrs	1000
14000	36B0h	0	32 bit int	Application 32 bit parametrs	528
15000	3A98h	0	32 bit real	Application floating point parametrs	500
16000	3E80h	0	16 bit bool	Application boolean parametrs	128
18000	4650h	0	16 bit int	System bits word	1
				0 – Software Reset	
				1 – Save parameters command	
				2 – Clear system errors command	
				3 – Simulated Input	
				4 – Simulated Output	
				5 – Fast Link Rx Packet Ready	
				6 – Lock drive	
				7 – Drive Ready	
				12 – Can Error	
18001	4651h	0	16 bit int	Digital inputs word	1
18002	4652h	0	16 bit int	Digital outputs word	1
18003	4653h	0	16 bit int	ADC value 0	1
18004	4654h	0	16 bit int	ADC value 1	1
18005	4655h	0	16 bit int	ADC value 2	1
18006	4656h	0	16 bit int	DAC value 0	1

18007	4657h	0	16 bit int		DAC value 1	1
18008	4658h	0	16 bit int		DAC value 2	1
18009	4659h	0	16 bit int		DAC value 3	1
18010	465Ah	0	16 bit bool		Software reset command	1
18011	465Bh	0	16 bit bool		Save parameters command	1
18012	465Ch	0	16 bit bool		Alarm reset command	1
18014	465Eh	0	16 bit bool		Simulated input command	1
18015	465Fh	0	16 bit bool		Simulated output command	1
18021	4665h	0	16 bit int		Expansion board digital inputs word	1
18022	4666h	0	16 bit int		Expansion board digital outputs word	1
18030	466Eh	0	32 bit word		System Error Bits	1
18031	466Fh	0	16 bit word		Drive RS485 address	1
18034	4672h	0	32 bit word		Total power-on time	1
18040	4678h	0	16 bit word		Drive model	1
18100	46B4h	0	16 bit int	SYS_IC_P_FAK	Proportional current loop gain	1
18101	46B5h	0	16 bit int	SYS_IC_I_FAK	Integral current loop gain	1
18102	46B6h	0	16 bit int	SYS_IC_D_FAK	Derivative current loop gain	1
18103	46B7h	0	16 bit int	SYS_OV_CLM_LIM	Clamp intervention threshold	1
18107	46BBh	0	16 bit int	SYS_P_BRAKE_MAX	Rated power of braking resistance	1
18108	46BCh	0	32 bit int	SYS_POS_ERR_MAX	Max. position error	1
18109	46BDh	0	16 bit word	SYS_R_BRAKE	Braking resistance value	1
18110	46BEh	0	16 bit word	SYS_FASTLINKADDR	IntraDrive Mode	1
18111	46BFh	0	16 bit word	SYS_DI_ENC_MODE	DI encoder mode	1
18112	46C0h	0	16 bit word	SYS_DI_ENC_FILT	DI filter time constant	1
18113	46C1h	0	16 bit word	SYS_AD_ENC_FILT	AD filter time constant	1
18115	46C3h	0	16 bit word	SYS_SPL_FILT	Speed loop output LP filter time constant	1
18116	46C4h	0	16 bit word	SYS_AN_FILT	AN filter time constant	1
18117	46C5h	0	16 bit word	SYS_UV_P_FAK	Undervoltage proportional factor	1
18118	46C6h	0	16 bit word	SYS_UV_V_MIN	Undervoltage intervention threshold	1
18119	46C7h	0	16 bit word	SYS_ENCAD_RIPPLE	AD encoder max. ripple	1
18120	46C8h	0	16 bit word	SYS_ENCAN_RIPPLE	AN encoder max. ripple	1
18121	46C9h	0	16 bit word	SYS_ENCABS_TOL		1
18122	46CAh	0	16 bit word	SYS_INDAD_TOL	AD index position tolerance in encoder counts	1
18123	46CBh	0	16 bit word	SYS_INDDI_TOL	DI index position tolerance in encoder counts	1
18124	46CCh	0	16 bit word	SYS_SPL_ZERO	Speed Loop output Zero position	1
18125	46CDh	0	16 bit word	SYS_IC_FFW_FAK	Current loop feed-forward factor	1
18126	46CEh	0	16 bit word	SYS_AD_GAIN1	Absolute Encoder A/D converter gain	1
18127	46CFh	0	16 bit word	SYS_AD_GAIN2	Incremental Encoder A/D converter gain	1
18128	46D0h	0	16 bit word	SYS_DACOFFSET[0]	Analog Output 0 Offset	1
18129	46D1h	0	16 bit word	SYS_DACOFFSET[1]	Analog Output 1 Offset	1
18130	46D2h	0	16 bit word	SYS_DACOFFSET[2]	Analog Output 2 Offset	1
18131	46D3h	0	16 bit word	SYS_DACOFFSET[3]	Analog Output 3 Offset	1
18132	46D4h	0	16 bit word	SYS_FASTLINKELEMENTS	Number of axis on IntraDrive Bus	1
18134	46D6h	0	32 bit word	SYS_AML_KEY		1
18135	46D7h	0	16 bit word	SYS_BAUD_RATE	Baud Rate serial link RS485	1
18136	46D8h	0	16 bit word	SYS_MOTOR_TC	Motor Thermal Time Constant	1
18137	46D9h	0	16 bit word	SYS_DELTIM	Delay time for TX and RX of R and W parameters	1
18138	46DAh	0	16 bit word	SYS_SPL_INT_WIN	Positioning Tolerance	1
18139	46DBh	0	16 bit word	SYS_DTRES	Resolver sampling instant	1
18150	46E6h	0	16 bit bool	SYS_BITSA		15
18201	4719h	0	32 bit word	fwSysName		1
18202	471Ah	0	16 bit int	fwSysVer1		1
18203	471Bh	0	16 bit int	fwSysVer2		1
18204	471Ch	0	32 bit word	FwName		1
18205	471Dh	0	16 bit int	fwVer1		1

18206	471Eh	0	16 bit int	fwVer2		1
18207	471Fh	0	32 bit word	AppName		1
18208	4720h	0	16 bit int	appVer1		1
18209	4721h	0	16 bit int	appVer2		1
18300	477Ch	0	16 bit word	FastLinkMaster.data	Intra drive master data words	16
18400	47E0h	0	16 bit word	sysCurr.wIUaverage		1
18401	47E1h	0	16 bit word	sysCurr.wIVaverage		1
18402	47E2h	0	16 bit word	sysCurr.wIWaverage		1
18404	47E4h	0	16 bit word	sysCurr.wVDCaverage		1
18405	47E5h	0	16 bit word	sysBrk.wDCBRAKEaverage		1
18406	47E6h	0	16 bit word	bitSystem8msTask		1
18407	47E7h	0	16 bit int	sysTemp.wTjU		1
18408	47E8h	0	16 bit int	sysTemp.wTjV		1
18409	47E9h	0	16 bit int	sysTemp.wTjW		1
18410	47EAh	0	16 bit int	sysTemp.wTjMax		1
18411	47EBh	0	16 bit int	sysBrk.wPBrake		1
18412	47ECh	0	16 bit int	sysBrk.wRBrake		1
18413	47EDh	0	16 bit int	sysUsr16.wlmax		1
18414	47EEh	0	16 bit int	sysCurr.wSyslmax		1
18415	47EFh	0	16 bit int	sysBrk.wPBrakeMax		1
18416	47F0h	0	16 bit int	sysTemp.wHeatSinkTemp		1
18417	47F1h	0	32 bit int	sysEnc.dwSiStep		1
18418	47F2h	0	32 bit int	sysEnc.dwSiFirstIndex		1
18419	47F3h	0	16 bit int	sysTemp.wPTCTemp		1
18420	47F4h	0	16 bit word	sysRamp.wCcwAcc		1
18421	47F5h	0	16 bit word	sysRamp.wCcwDec		1
18422	47F6h	0	16 bit word	sysRamp.wCwAcc		1
18423	47F7h	0	16 bit word	sysRamp.wCwDec		1
18430	47FEh	0	16 bit word	SYS_ENC_TYPE		1
18431	47FFh	0	16 bit word	SYS_ENC_SUP		1
18432	4800h	0	16 bit bool	SYS_ENC_PORT		1
18433	4801h	0	16 bit word	SYS_CY_REV		1
18434	4802h	0	16 bit word	SYS_IMAX		1
18435	4803h	0	16 bit word	SYS_I_NOM_MOT		1
18436	4804h	0	16 bit word	SYS_MOT_POLES		1
18437	4805h	0	16 bit word	SYS_SPL_I_FAK		1
18438	4806h	0	16 bit word	SYS_SPL_P_FAK		1
18439	4807h	0	16 bit word	SYS_SPL_S_FAK		1
18440	4808h	0	16 bit word	SYS_SPL_A_FAK		1
18441	4809h	0	16 bit word	SYS_CW_ACC		1
18442	480Ah	0	16 bit word	SYS_CCW_ACC		1
18443	480Bh	0	16 bit word	SYS_CW_DEC		1
18444	480Ch	0	16 bit word	SYS_CCW_DEC		1
18445	480Dh	0	32 bit word	SYS_POSSP_LIM		1
18446	480Eh	0	32 bit word	SYS_NEGSP_LIM		1
18500	4844h	0	32 bit word		Drive code	1
18501	4845h	0	32 bit word		Hardware release	1
18502	4846h	0	32 bit word		Hardware build ID	1
18503	4847h	0	32 bit word		Drive production date	1
18504	4848h	0	32 bit word		Drive serial number	1
19001	4A39h	0	16 bit int	AD_IN_PO		1
19002	4A3Ah	0	32 bit int	AD_VI_PO		1
19003	4A3Bh	0	32 bit int	AD_VI_TU		1
19004	4A3Ch	0	32 bit int	AD_VI_PU		1
19005	4A3Dh	0	16 bit int	AD_CO_OF		1

19006	4A3Eh	0	16 bit int	AD_SE_OF	1
19007	4A3Fh	0	32 bit int	AD_PE_SP	1
19010	4A42h	0	16 bit int	DI_IN_PO	1
19011	4A43h	0	32 bit int	DI_VI_PO	1
19012	4A44h	0	32 bit int	DI_VI_TU	1
19013	4A45h	0	32 bit int	DI_VI_PU	1
19014	4A46h	0	32 bit int	DI_PE_SP	1
19017	4A49h	0	16 bit int	AN_VI_PO	1
19018	4A4Ah	0	32 bit int	AN_VI_TU	1
19019	4A4Bh	0	16 bit int	AN_CO_OF	1
19020	4A4Ch	0	16 bit int	AN_SE_OF	1
19021	4A4Dh	0	32 bit int	AN_PE_SP	1
19022	4A4Eh	0	16 bit int	HA_VI_PO	1
19023	4A4Fh	0	16 bit int	HA_PE_SP	1
19026	4A52h	0	32 bit int	HA_VI_TU	1
19029	4A55h	0	32 bit int	SPL_ACC	1
19031	4A57h	0	16 bit int	PW_PH_U	1
19032	4A58h	0	16 bit int	PW_PH_V	1
19033	4A59h	0	16 bit int	CT_RHO_SEL	1
19034	4A5Ah	0	16 bit int	CT_RHO_FAK	1
19035	4A5Bh	0	16 bit int	CT_RHO	1
19036	4A5Ch	0	16 bit int	CT_SIN_RHO	1
19037	4A5Dh	0	16 bit int	CT_COS_RHO	1
19038	4A5Eh	0	16 bit int	CT_VSD	1
19039	4A5Fh	0	16 bit int	CT_VSQ	1
19040	4A60h	0	16 bit int	CT_VSU	1
19041	4A61h	0	16 bit int	CT_VSV	1
19042	4A62h	0	16 bit int	CT_PHASE	1
19043	4A63h	0	16 bit int	CT_ISD	1
19044	4A64h	0	16 bit int	CT_ISQ	1
19045	4A65h	0	16 bit int	CT_PHU_OF	1
19046	4A66h	0	16 bit int	CT_PHV_OF	1
19047	4A67h	0	16 bit int	CT_I_MAX	1
19048	4A68h	0	16 bit int	IC_ED_PREC	1
19049	4A69h	0	16 bit int	IC_EQ_PREC	1
19050	4A6Ah	0	16 bit int	IC_ISD_REF	1
19051	4A6Bh	0	32 bit int	IC_ISQ_REF	1
19052	4A6Ch	0	16 bit int	IC_VSD_REQ	1
19053	4A6Dh	0	16 bit int	IC_VSQ_REQ	1
19054	4A6Eh	0	16 bit int	IC_P_FAK	1
19055	4A6Fh	0	16 bit int	IC_I_FAK	1
19056	4A70h	0	16 bit int	IC_D_FAK	1
19057	4A71h	0	16 bit int	IC_VSD_LIM	1
19058	4A72h	0	16 bit int	IC_VSQ_LIM	1
19059	4A73h	0	16 bit int	IC_D_INT	1
19060	4A74h	0	16 bit int	IC_Q_INT	1
19061	4A75h	0	16 bit int	IC_IQ_MAX	1
19063	4A77h	0	16 bit int	OV_MAX_LIM	1
19064	4A78h	0	16 bit int	OV_CLM_LIM	1
19065	4A79h	0	16 bit int	AD_CO_GA	1
19066	4A7Ah	0	16 bit int	SPL_FBK_SEL	1
19067	4A7Bh	0	16 bit int	SPL_POS_FAK	1
19068	4A7Ch	0	16 bit int	SPL_VEL_FAK	1
19069	4A7Dh	0	16 bit int	SPL_ACCF_FAK	1
19070	4A7Eh	0	16 bit int	SPL_INT_FAK	1

19071	4A7Fh	0	16 bit int	SPL_OUT		1
19072	4A80h	0	32 bit int	SPL_POS_INT		1
19073	4A81h	0	32 bit int	SPL_POS_REF		1
19074	4A82h	0	32 bit int	SPL_TUR_REF		1
19075	4A83h	0	32 bit int	TUD_SOMMA		1
19076	4A84h	0	32 bit int	SPL_SP_PREC		1
19077	4A85h	0	32 bit int	SPL_PER_LIM		1
19078	4A86h	0	32 bit int	SPL_POS_COR		1
19079	4A87h	0	32 bit int	SPL_VI_PU		1
19080	4A88h	0	32 bit int	RG_SP_REF		1
19081	4A89h	0	32 bit int	RG_SP		1
19082	4A8Ah	0	32 bit int	RG_POSSP_LIM		1
19083	4A8Bh	0	32 bit int	RG_NEGSP_LIM		1
19084	4A8Ch	0	32 bit int	RG_LIN_OUT		1
19085	4A8Dh	0	32 bit int	RG_POS_STOP		1
19086	4A8Eh	0	32 bit int	RG_TUR_STOP		1
19087	4A8Fh	0	16 bit int	RG_EXP_RAMP		1
19088	4A90h	0	16 bit int	RG_CONT		1
19089	4A91h	0	16 bit int	RG_CW_ACC		1
19090	4A92h	0	16 bit int	RG_CCW_ACC		1
19091	4A93h	0	16 bit int	RG_CW_DEC		1
19092	4A94h	0	16 bit int	RG_CCW_DEC		1
19095	4A97h	0	32 bit int	IDI_VI_PO		1
19096	4A98h	0	32 bit int	IAD_VI_PO		1
19098	4A9Ah	0	16 bit int	CIC_ISQ_REF		1
19099	4A9Bh	0	16 bit int	SPL_FILT		1
19100	4A9Ch	0	32 bit int	SPL_VI_TU		1
19101	4A9Dh	0	32 bit int	SPL_VI_PO		1
19102	4A9Eh	0	32 bit int	SPL_PE_SP		1
19104	4AA0h	0	16 bit int	AN_FIL_TIME		1
19105	4AA1h	0	16 bit int	SE_FAK		1
19106	4AA2h	0	16 bit int	SE_DIV_FAK		1
19107	4AA3h	0	16 bit int	SE_MUL_FAK		1
19108	4AA4h	0	32 bit int	IAD_VI_TU		1
19109	4AA5h	0	32 bit int	CT_ISQ_MEAN		1
19110	4AA6h	0	16 bit int	CT_EL_SP		1
19111	4AA7h	0	16 bit int	IU_TEST		1
19112	4AA8h	0	16 bit int	IV_TEST		1
19113	4AA9h	0	32 bit int	SPL_POS_ERR		1
19114	4AAAh	0	32 bit int	SE_SP_MAX		1
19117	4AADh	0	16 bit int	AN_CO_GA		1
19120	4AB0h	0	16 bit word	BIT_DSP_INPUT	DSP input bits 0 - Encoder type selection 1 - Reserved 2 - Ramp disable 3 - Position control enable 4 - Current feed forward 5 - Speed loop enable 9 - Enable drive 12 - Encoder simulation enable 13 - High gains on 14 - Acceleration feed forward 15 - Direct position control	1
19121	4AB1h	0	16 bit word	BIT_DSP_INPUT_1	DSP input bits, 2 nd part 1- Reference mode selection	1
19122	4AB2h	0	16 bit word	BIT_DSP_OUTPUT	DSP output bits 0 - Over current 1 - Over voltage 2 - Braking on	1

				3 – Under voltage recover	
				4 – DC link failure	
				5 – Position loop saturation	
				6 – Simulated encoder alarm	
				12 – Ramp in execution	
				14 – Stop ramp in execution	
				15 – Position profile ended	
21301	5335h	0	16 bit word	AML Current execution line	1
21302	5336h	0	16 bit word	AML Execution state	1
21303	5337h	0	16 bit word	AML Error code	1
21310	533Eh	0	32 bit real	AML Nominal speed	1
21311	533Fh	0	32 bit real	AML Nominal acceleration	1
21312	5340h	0	32 bit real	AML Zero offset	1
21313	5341h	0	32 bit real	AML Encoder coupling	1
21314	5342h	0	32 bit real	AML Position window	1
21315	5343h	0	32 bit real	AML Maximum position error	1
21316	5344h	0	32 bit real	AML Negative software end-run	1
21317	5345h	0	32 bit real	AML Positive software end-run	1
21318	5346h	0	32 bit real	AML Jog speed	1
21319	5347h	0	32 bit real	AML Current position	1
21320	5348h	0	32 bit real	AML current error	1

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