

CrossFire GX1

CANopen Slave Developers Guide



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Revision history

Rev	Date	Author	Comments
1.0	2009-01-29		
1.1	2009-11-11		
1.1	2011-04-26		CC Systems to CrossControl changes Clarification on digital outputs and PWM combinations

1. Introduction

1.1. Background

CrossFire GX1 is a CiA DS 401 I/O (Input/Output) CANopen module. It can set up to automatically send and receive I/O to and from the CAN bus network.

This document describes the usage of CrossFire GX1 CANopen node. The reader should be familiar with the CANopen standard in order to fully understand the manual.

1.2. References

CAN in Automation - CANopen standard: <http://www.can-cia.org>

CrossFire GX1 -

2. CANopen Slave Development

2.1. CANopen Related Technical Data

CAN Interface	ISO 11898-2 (High Speed CAN)
No. of CAN	1 interface with CANin and CANout connectors.
Communication Profile	CANopen
Device Profile	I/O module to CiA DS401
Driver	NXP TJA1050T
Baud Rate	10, 20, 50, 100, 125, 250 kbit/s
Node ID	1 to 16 hardware set

- Storage for up to 10 Error codes
- Reset function restores settings back to their factory default values
- CANopen Node ID is hardware-configurable by means of a dongle

2.2. Port Overview

CrossFire GX1 is highly configurable. The configuration can be changed by writing to the object dictionary in the Manufacturer-Specific Profile Area (0x2000 to 0x5FFF).

2.2.1. ID Interface

The node id is configurable via the ID connector unless the ports are configured as analog or digital inputs.

2.2.2. ID Interface Lookup Table

CANopen Node ID	ID3	ID2	ID1	ID0
1	0	0	0	0
2	0	0	0	1
3	0	0	1	0
4	0	0	1	1
....				
16	1	1	1	1

- State 0 is reached by wiring corresponding ID pin to pin 3 (GND)
- State 1 is reached by leaving corresponding ID pin disconnected

2.3. LED indicators

Status Indicator

LED Description	Blink Pattern	Meaning
RED (CAN Status)	Off	Communication OK
	Single Flash	CAN error state
	Double Flash	Guarding failed
	On	Bus Off
GREEN (CANopen)	Slow Blinking	Initialization
	Blinking	Preoperational
	On	Operational
RED & GREEN	Single Flash	Stopped (Prepared)
RED & GREEN	Off	No power to CrossFire GX1

+5 V Power Indicators 1 & 2

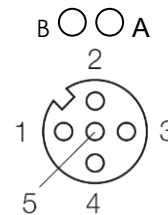
+5	Meaning
GREEN	+5 V Supply Power ON
RED	+5 V Supply Shorted to GND
OFF	+5 V Supply Failure

+24 V Power Indicators 1 & 2

+24	Meaning
GREEN	+24 V Supply Power ON
RED	+24 V Supply Shorted to GND
OFF	+24 V Supply Failure

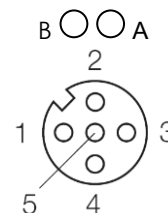
DIO and, DIOP Built-In Test Indicators, for Channels B and A respectively

LED Colour	Meaning
YELLOW	Normal Function: Output active and operating
GREEN	24 V at Input/Output
RED	Output active from MCU
OFF	Output in OFF state



EDIO Built-In Test Indicators, for Channels B and A respectively

LED Colour	Meaning
YELLOW	Normal Function: Output active and operating
GREEN	0 V at Input/Output
RED	Output active from MCU
OFF	Output in OFF state



2.4. CANopen Interface

Overview:

- CrossFire GX1 supports the CANopen protocol.
- The default CANopen Node ID is 1.
- However, during the preoperational stage, the Node ID pins will be read.
- If no pins have been tied to GND then the Node ID will be set to 16.
- The default baudrate is 125 kbits/s
- CrossFire GX1 supports both heartbeat and node guarding.
- CrossFire GX1 is an NMT slave device. It is a heartbeat producer.
- CrossFire GX1 is a SYNCH message consumer.

2.4.1. EMCY object overview

The following error codes are supported according to DS-401 and DS-301. Up to 127 errors codes are stored at index 0x1003 of the object dictionary.

EMCY Object

Error code	Error register	Manufacturer-Specific Error Field	Meaning
0x8110	0x1	Not used	Buffer overrun. A CAN buffer overrun has occurred in CrossFire GX1. Index 0x1029 specifies the action to take when this error occurs.
0x6100	0x1	SW error code	An internal software error has occurred. This error can be a result of a bug in the software. Please note the manufacturer specific error field of the message, and report the error to CrossControl. Index 0x1029 specifies the action to take when this error occurs
0x8130	0x1	Not used	Guarding of node failed. This will occur if CrossFire GX1 is guarded with Node Guarding and the master has failed to send a guarding remote frame within the time specified in object 0x100C. Error will also occur if CrossFire GX1 is configured as a heartbeat consumer with object 0x1016 and another node has failed to send its heartbeat message. Index 0x1029 specifies the action to take when this error occurs.
0x8210	0x11	Not used	PDO not processed because of length error. A PDO with the wrong length has been received and thereby ignored. Index 0x1029 specifies the action to take when this error occurs.
0x8140	0x1	Not used	CrossFire GX1 has recovered from Bus off.
0x8120	0x1	Not used	CrossFire GX1 has recovered from CAN error state.
0x1000	0x1	0x1	CrossFire GX1 runs in EEPROM Error mode. This means that the EEPROM has malfunctioned. CrossFire GX1 reverts to the default values for EEPROM, instead of the real values in EEPROM. CrossFire GX1 can still work as desired if all the desired settings are sent by SDO's at startup.

2.4.2. Receive PDO's (Digital Outputs, PWM Outputs)

This section describes the Receive PDO information to CrossFire GX1. The information received on these PDO's will directly affect the CrossFire GX1 outputs.

Ports 7 – 22, 27 – 36 and 43 – 46 may be configurable as inputs or outputs. If configured as outputs (and therefore relevant to the Receive PDOs), they can either be configured as Digital Outputs, received on RPDO1, or PWM (Analog) Outputs which use RPDOs 2 through 5.

It is although not possible to combine a Digital Output with a PWM in the same connector. If any of the ports in a connector is configured as digital out, the other one will also work as digital out even if it is configured as PWM.

By default, Ports 7, 8, 43 & 44 are configured as Encoder Inputs, Ports 9, 10, 19 – 22 & 33 – 36 are Digital Outputs and Ports 11 – 18, 27 – 32, 45 & 46 are configured as PWM Outputs. To reconfigure the ports, index 0x2000 is used. For more information, see description of Object Dictionary.

By default, the PDO's of the node are mapped to the I/O following the mapping described in DS401.

Receive PDO 1: (COB ID: 200h + Node ID)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0..7	0..7	0..7	0..5	0..7	0..7	0..7	0..7
Digital ON/OFF Output Ports 7 to 14*	Digital ON/OFF Output Ports 15 to 22*	Digital ON/OFF Output Ports 27 to 34*	Digital ON/OFF Output Ports 35, 36, 43-46 *	Unused	Unused	Unused	Unused
			6..7 Unused				

* Only bits that corresponds to port configured as Digital Output will be used

There are 2 bytes for each PWM Output, however valid values range from 0 to 1023.

Receive PDO 2: (COB ID: 300h + Node ID)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
PWM Output Port 11 *	PWM Output Port 12 *	PWM Output Port 13 *	PWM Output Port 14 *				

Receive PDO 3: (COB ID: 400h + Node ID)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
PWM Output Port 15 *	PWM Output Port 16 *	PWM Output Port 17*	PWM Output Port 18 *				

Receive PDO 4: (COB ID: 500h + Node ID)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
PWM Output Port 27 *	PWM Port Output 28 *	PWM Output Port 29 *	PWM Output Port 30 *				

* Value will only be used if port is configured as Analog Output.

Note: ports 13 to 16 are non-regulated.

CrossFire GX1 has more outputs available than those shown in Receive PDO 1, 2, 3 and 4. However, since the 401 standard allows for a total of only 4 RPDOs by default, the remaining outputs will not be received unless the user explicitly requests them during the pre-operational stage by sending the appropriate SDOs to configure CrossFire GX1 to receive the additional information.

The following additional PDO is already mapped but need to be enabled in order to be received. One unused CANopen Node ID must be set aside in order to enable the additional PDO listed below. See description of the Object Dictionary for further details.

Receive PDO 5:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
PWM Output Port 31 *	PWM Port Output 32 *			PWM Output Port 45 *		PWM Output Port 46 *	

* Value will only be used if port is configured as Analog Output.

2.4.3. Transmit PDO's (Digital Inputs, Analog Inputs & Status Bits)

This section describes the Transmit PDO information from CrossFire GX1. The information transmitted on these Transmit PDOs directly reflects the status of the CrossFire GX1 inputs.

Every port on CrossFire GX1 from 1 to 46, even those listed in the Receive PDO section above, has the capability of being configured as an Input of some kind. For the purposes of the Transmit PDO discussion these inputs are considered to be either Digital or Analog Inputs.

All of the ports with Analog Input capabilities (1 – 6 and 37 – 42) are configured as such by default. Ports 9 to 16 are configured by default as Digital Inputs. Additional ports (every remaining port on CrossFire GX1 – with the exception of even-numbered analog ports, namely Ports 2, 4, 6, 38, 40, & 42) can be reconfigured to act as a Digital Input as well. To reconfigure the ports, the index 0x2000 is used. For further information, see description of the Object Dictionary.

Note that if Ports 7, 8, 10, 43 and 44 are configured as Encoder or Pulse Counter inputs, although digital by nature, then these should use Transmit PDO 2 or higher as their values are stored as 16-bit values.

The default transmission type for the Transmit PDOs is 255 (Event Triggered). This means that the Transmit PDOs will be sent only when a change occurs. By default, the PDOs of the node are mapped to the I/O following the mapping described in DS401:

Transmit PDO 1: (COB ID: 180h + Node ID)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0..7	0..7	0..7	0..7	0..7	0..7	0..7	0..7
Digital Input Ports 1, 3, 5, 7 – 11*	Digital Input Ports 12 – 19*	Digital Input Ports 20– 22* Port 27 – 31*	Digital Input Ports 32 – 37* Ports 39, 41*	Digital Input Ports 43 – 46* Ports 52 – 55*	Unused	Unused	Unused

* Only bits that correspond to ports configured as Digital Inputs will be used.

Note: by default, the transmission of PDO 1 will only be triggered if change in status occurs.

Transmit PDO 2: (COB ID: 280h + Node ID)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Analog Input Port 1 *		Analog Input Port 2 *		Analog Input Port 3 *		Analog Input Port 4 *	

* Value will only be valid if port is configured as an Analog Input.

Transmit PDO 3: (COB ID: 380h + Node ID)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Analog Input Port 5 *		Analog Input Port 6 *		Analog Input Port 37 *		Analog Input Port 38 *	

* Value will only be valid if port is configured as an Analog Input.

Transmit PDO 4: (COB ID: 480h + Node ID)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Analog Input Port 39 *		Analog Input Port 40 *		Analog Input Port 41 *		Analog Input Port 42 *	

* Value will only be valid if port is configured as an Analog Input.

2.4.4. Additional Transmit PDO 5 - Shaft Encoder / Pulse Counter Input

CrossFire GX1 has more inputs available than those shown in Transmit PDO 1, 2, 3 and 4. However, since the 401 standard allows for a total of only 4 TPDOs by default, the remaining inputs will not be transmitted unless the user explicitly requests them during the pre-operational stage by sending the appropriate SDOs to configure CrossFire GX1 to send the additional information.

The following additional PDO is already mapped but needs to be enabled in order to be transmitted. One unused CANopen Node ID must be set aside in order to enable all of the Additional PDOs listed below. See description of the Object Dictionary for further details.

CrossFire GX1 can process input from a shaft encoder, or count pulses in a pulse train.

Transmit PDO 5:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Encoder Position Ports 7 and 8*		Encoder Position Ports 43 and 44*		Pulse Counter Port 8**		Pulse Counter Port 10**	

* Value will only be valid if port is configured as an Encoder Input

** Value will only be valid if port is configured as a Pulse Counter Input

2.4.5. Additional Transmit PDO 6 - Status Information

CrossFire GX1 has more inputs available than those shown in Transmit PDO 1, 2, 3 and 4. However, since the 401 standard allows for a total of only 4 TPDOs by default, the status information will not be transmitted unless the user explicitly requests them during the pre-operational stage by sending the appropriate SDOs to configure CrossFire GX1 to send the additional information.

The following additional PDO is already mapped but needs to be enabled in order to be transmitted. One unused CANopen Node ID must be set aside in order to enable all of the Additional PDOs listed below. See description of the Object Dictionary for further details.

Transmit PDO 6:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0..7	0..7	0..7	0..7	0..7	0..7	0..7	0..7
Short Circuit Status Ports 7 - 14*	Short Circuit Status Ports 15 - 22*	Short Circuit Status Ports 27 - 34*	Short Circuit Status Ports 35, 36, 43 - 46*	Open Load Status Ports 7 - 14*	Open Load Status Ports 15 - 22*	Open Load Status Ports 27 - 34*	Open Load Status Ports 35, 36, 43 - 46*

* Value will only be valid if port is configured as an Output

2.4.6. Object Dictionary

Communication Profile Area; Index 0x1000 to 0x1FFF

Index	S-Idx	Type, Access	Default (possible)	Saved	Description
0x1800	0	u8 ro	5	-	Transmit PDO 1: Number of entries
	1	u32 rw	0x180 + Node ID	No	COB ID for Transmit PDO 1
	2	u8 rw	255	No	Transmission type for Transmit PDO 1
	3	u16 rw	500	No	Inhibit time for Transmit PDO 1
	4	-	-	-	Not used
	5	u16 rw	0	No	Event timer for Transmit PDO 2
0x1801	0	u8 ro	5	-	Transmit PDO 2: Number of entries
	1	u32 rw	0x280 + Node ID	No	COB ID for Transmit PDO 2
	2	u8 rw	255	No	Transmission type for Transmit PDO 2
	3	u16 rw	500	No	Inhibit time for Transmit PDO 2
	4	-	-	-	Not used
	5	u16 rw	0	No	Event timer for Transmit PDO 2
0x1802	0	u8 ro	5	-	Transmit PDO 3: Number of entries
	1	u32 rw	0x380 + Node ID	No	COB ID for Transmit PDO 3
	2	u8 rw	255	No	Transmission type for Transmit PDO 3
	3	u16 rw	500	No	Inhibit time for Transmit PDO 3
	4	-	-	-	Not used
	5	u16 rw	0	No	Event timer for Transmit PDO 3
0x1803	0	u8 ro	5	-	Transmit PDO 4: Number of entries
	1	u32 rw	0x480 + Node ID	No	COB ID for Transmit PDO 4
	2	u8 rw	255	No	Transmission type for Transmit PDO 4
	3	u16 rw	500	No	Inhibit time for Transmit PDO 4
	4	-	-	-	Not used
	5	u16 rw	0	No	Event timer for Transmit PDO 4
0x1804	0	u8 ro	5	-	Transmit PDO 5: Number of entries
	1	u32 rw	0x4CC	No	COB ID for Transmit PDO 5
	2	u8 rw	255	No	Transmission type for Transmit PDO 5
	3	u16 rw	500	No	Inhibit time for Transmit PDO 5
	4	-	-	-	Not used
	5	u16 rw	0	No	Event timer for Transmit PDO 5
0x1805	0	u8 ro	5	-	Transmit PDO 6: Number of entries
	1	u32 rw	0x4CD	No	COB ID for Transmit PDO 6
	2	u8 rw	255	No	Transmission type for Transmit PDO 6
	3	u16 rw	500	No	Inhibit time for Transmit PDO 6
	4	-	-	-	Not used
	5	u16 rw	0	No	Event timer for Transmit PDO 6

Mapping Parameters for Transmit PDOs

Index	S-Idx	Type, Access	Default (possible)	Saved	Description
0x1A00	0	u8 rw	5	No	Transmit PDO 1, number of entries
	1	u32 rw	0x60000108	No	1 st mapped object for Transmit PDO 1 Digital Input Ports 1, 3, 5, 7-11
	2	u32 rw	0x60000208	No	2 nd mapped object for Transmit PDO 1 Digital Input Ports 12 – 19
	3	u32 rw	0x60000308	No	3 rd mapped object for Transmit PDO 1 Digital Input Ports 20 - 22, 27 – 31
	4	u32 rw	0x60000408	No	4 th mapped object for Transmit PDO 1 Digital Input Ports 32 – 37, 39, 41
	5	u32 rw	0x60000508	No	5 th mapped object for Transmit PDO 1 Digital Input Ports 43 – 46, 52 – 55
0x1A01	0	u8 rw	4	No	Transmit PDO 2, number of entries
	1	u32 rw	0x64010110	No	1 st mapped object for Transmit PDO 2 Analog Input Port 1
	2	u32 rw	0x64010210	No	2 nd mapped object for Transmit PDO 2 Analog Input Port 2
	3	u32 rw	0x64010310	No	3 rd mapped object for Transmit PDO 2 Analog Input Port 3
	4	u32 rw	0x64010410	No	4 th mapped object for Transmit PDO 2 Analog Input Port 4
0x1A02	0	u8 rw	4	No	Transmit PDO 3, number of entries
	1	u16 rw	0x64010510	No	1 st mapped object for Transmit PDO 3 Analog Input Port 5
	2	u16 rw	0x64010610	No	2 nd mapped object for Transmit PDO 3 Analog Input Port 6
	3	u16 rw	0x64010710	No	3 rd mapped object for Transmit PDO 3 Analog Input Port 37.
	4	u16 rw	0x64010810	No	4 th mapped object for Transmit PDO 3 Analog Input Port 38
0x1A03	0	u8 rw	4	No	Transmit PDO 4, number of entries
	1	u16 rw	0x64010910	No	1 st mapped object for Transmit PDO 4 Analog Input Port 39
	2	u16 rw	0x64011010	No	2 nd mapped object for Transmit PDO 4 Analog Input Port 40
	3	u16 rw	0x64011110	No	3 rd mapped object for Transmit PDO 4 Analog Input Port 41
	4	u16 rw	0x64011210	No	4 th mapped object for Transmit PDO 4 Analog Input Port 42
0x1A04	0	u8 rw	4	No	Transmit PDO 5, number of entries
	1	u16 rw	0x64020110	No	1 st mapped object for Transmit PDO 5 Pulse Counter Input Port 8
	2	u16 rw	0x64020210	No	2 nd mapped object for Transmit PDO 5 Pulse Counter Input Port 10
	3	u16 rw	0x64020310	No	3 rd mapped object for Transmit PDO 5 Encoder Position Input Ports 7 & 8
	4	u16 rw	0x64020410	No	4 th mapped object for Transmit PDO 5 Encoder Position Input Ports 43 & 44
0x1A05	0	u8 rw	8	No	Transmit PDO 6, number of entries
	1	u8 rw	0x20150108	No	1 st mapped object for Transmit PDO 6 Short Circuit Status Bits Ports 7-14
	2	u8 rw	0x20150208	No	2 nd mapped object for Transmit PDO 6 Short Circuit Status Bits Ports 15-22

3	u8	rw	0x20150308	No	3 rd mapped object for Transmit PDO 6 Short Circuit Status Bits Ports 27-34
4	u8	rw	0x20150408	No	4 th mapped object for Transmit PDO 6 Short Circuit Status Bits Ports 35, 36, 43-46
5	u8	rw	0x20160108	No	5 th mapped object for Transmit PDO 6 Open Load Status Bits Ports 7-14
6	u8	rw	0x20160208	No	6 th mapped object for Transmit PDO 6 Open Load Status Bits Ports 15-22
7	u8	rw	0x20160308	No	7 th mapped object for Transmit PDO 6 Open Load Status Bits Ports 27-34
8	u8	rw	0x20160408	No	8 th mapped object for Transmit PDO 6 Open Load Status Bits Ports 35, 36, 43-46

Note on Mapping Addresses

The mapping area controls where the received data in the Receive PDOs will be stored. If these values are not changed then the default values will be used. The values can be read as follows:

Eg: **0x62000108**: 6200 = address in manufacturer specific area of Object Dictionary.
 01 = sub index 1
 08 = 1 byte (10 = 2 bytes, 20 = 4 bytes, etc.)

2.4.7. Manufacturer Specific Profile Area

Index	S-Idx	Type, Access	Default (possible)	Saved	Description
Port Configuration					
Number of entries.					
0 = Analog Input					
1 = Analog Output (and PWM Output)					
2 = Digital Input					
3 = Digital Output					
4 = Pulse Counter Input					
5 = Shaft Encoder Input					
9 = not applicable					
0x2000	0	u8 ro	63	-	
	1	u8 rw	0 (2)	Yes	Port configuration for Port 1
	2	u8 ro	0	Yes	Port configuration for Port 2
	3	u8 rw	0 (2)	Yes	Port configuration for Port 3
	4	u8 ro	0	Yes	Port configuration for Port 4
	5	u8 rw	0 (2)	Yes	Port configuration for Port 5
	6	u8 ro	0	Yes	Port configuration for Port 6
	7	u8 rw	3 (2,5)	Yes	Port configuration for Port 7 if configured as Encoder In (= 5), also Port 8 must be configured as Encoder In (= 5)
	8	u8 rw	3 (2,4,5)	Yes	Port configuration for Port 8 if configured as Encoder In (= 5), also Port 7 must be configured as Encoder In (= 5)
	9	u8 rw	2 (3)	Yes	Port configuration for Port 9
	10	u8 rw	2 (3,4)	Yes	Port configuration for Port 10
	11	u8 rw	2 (1,3)	Yes	Port configuration for Port 11
	12	u8 rw	2 (1,3)	Yes	Port configuration for Port 12
	13	u8 rw	2 (1,3)	Yes	Port configuration for Port 13
	14	u8 rw	2 (1,3)	Yes	Port configuration for Port 14
	15	u8 rw	2 (1,3)	Yes	Port configuration for Port 15
	16	u8 rw	2 (1,3)	Yes	Port configuration for Port 16
	17	u8 rw	3 (1,2)	Yes	Port configuration for Port 17
	18	u8 rw	3 (1,2)	Yes	Port configuration for Port 18
	19	u8 rw	3 (2)	Yes	Port configuration for Port 19
	20	u8 rw	3 (2)	Yes	Port configuration for Port 20
	21	u8 rw	3 (2)	Yes	Port configuration for Port 21
	22	u8 rw	3 (2)	Yes	Port configuration for Port 22
	23-26	u8 ro	9	-	Unused
	27	u8 rw	3 (1,2)	Yes	Port configuration for Port 27
	28	u8 rw	3 (1,2)	Yes	Port configuration for Port 28
	29	u8 rw	3 (1,2)	Yes	Port configuration for Port 29
	30	u8 rw	3 (1,2)	Yes	Port configuration for Port 30
	31	u8 rw	3 (1,2)	Yes	Port configuration for Port 31
	32	u8 rw	3 (1,2)	Yes	Port configuration for Port 32
	33	u8 rw	3 (2)	Yes	Port configuration for Port 33
	34	u8 rw	3 (2)	Yes	Port configuration for Port 34
	35	u8 rw	3 (2)	Yes	Port configuration for Port 35
	36	u8 rw	3 (2)	Yes	Port configuration for Port 36
	37	u8 rw	0 (2)	Yes	Port configuration for Port 37

	38	u8	ro	0	Yes	Port configuration for Port 38
	39	u8	rw	0 (2)	Yes	Port configuration for Port 39
	40	u8	ro	0	Yes	Port configuration for Port 40
	41	u8	rw	0 (2)	Yes	Port configuration for Port 41
	42	u8	ro	0	Yes	Port configuration for Port 42
	43	u8	rw	3 (2,5)	Yes	Port configuration for Port 43 if configured as Encoder In (= 5), also Port 44 must be configured as Encoder In (= 5)
	44	u8	rw	3 (2,5)	Yes	Port configuration for Port 44 if configured as Encoder In (= 5), also Port 43 must be configured as Encoder In (= 5)
	45	u8	rw	3 (1,2)	Yes	Port configuration for Port 45
	46	u8	rw	3 (1,2)	Yes	Port configuration for Port 46
	47-51	u8	ro	9	-	Unused
	52	u8	rw	2	Yes	Port configuration for Port 52 If Node ID = 0, this Port is used as ID input
	53	u8	rw	2	Yes	Port configuration for Port 53 If Node ID = 0, this Port is used as ID input
	54	u8	rw	2	Yes	Port configuration for Port 54 If Node ID = 0, this Port is used as ID input
	55	u8	rw	2	Yes	Port configuration for Port 55 If Node ID = 0, this Port is used as ID input
	56-57	u8	ro	9	-	Unused
	58	u8	ro	0	Yes	Port configuration for Port 58
	59	u8	ro	0	Yes	Port configuration for Port 59
	60	u8	ro	0	Yes	Port configuration for Port 60
	61	u8	ro	0	Yes	Port configuration for Port 61
	62	u8	ro	0	Yes	Port configuration for Port 62
	63	u8	ro	0	Yes	Port configuration for Port 63
						Port Bias Number of Entries
	0	u8	ro	63		When changing the port bias, the bias of the port on the same plug will also be changed to this value. This index specifies the bias of the port. 0 = pull down 1 = pull up
0x2003	1-8	u8	ro	0	-	Unused
	9	u8	rw	0 (1)	Yes	Port Bias for Port 9
	10	u8	rw	0 (1)	Yes	Port Bias for Port 10
	11-18	u8	ro	0	-	Unused
	19	u8	rw	0 (1)	Yes	Port Bias for Port 19
	20	u8	rw	0 (1)	Yes	Port Bias for Port 20
	21	u8	rw	0 (1)	Yes	Port Bias for Port 21
	22	u8	rw	0 (1)	Yes	Port Bias for Port 22
	23-32	u8	ro	0	-	Unused
	33	u8	rw	0 (1)	Yes	Port Bias for Port 33
	34	u8	rw	0 (1)	Yes	Port Bias for Port 34
	35	u8	rw	0 (1)	Yes	Port Bias for Port 35
	36	u8	rw	0 (1)	Yes	Port Bias for Port 36
	37-63	u8	ro	0	-	Unused

	0	u8	ro	2	-	<p>PWM Ripple Frequency Number of entries</p> <p>The PWM Ripple Frequency is used for superimposing a ripple to the PWM Outputs. By incorporating this ripple, the coil is always in motion thus breaking the static friction and eliminating the start energy that is otherwise needed when changing the value of a PWM. This makes control of the coil more linear</p>
0x2004	1	u16	rw	100 (0–1000)	Yes	<p>Left Side PWM Ripple Frequency: Specify the ripple frequency in Hz. Valid values are from 0 to 1000 Hz. Valid for all connectors on the left side of the unit (X4, X8, X12, and X16).</p>
	2	u16	rw	100 (0–1000)	Yes	<p>Right Side PWM Ripple Frequency: Specify the ripple frequency in Hz. Valid values are from 0 to 1000 Hz. Valid for all connectors on the right side of the unit (X9, X13, X17 and X21).</p>
0x2007	0	u8	ro	2	-	<p>PWM Mode Number of entries</p> <p>0 = True PWM 1 = Current</p>
	1	u8	rw	0 (1)	Yes	Left Side PWM Mode
	2	u8	rw	0 (1)	Yes	Right Side PWM Mode
0x2008	0	u8	ro	6	-	<p>Internal Measurements Number of Entries</p>
	1	u16	ro	--	No	5V Reference Supply Measurement
	2	u16	ro	--	No	5V Reference Supply Measurement
	3	u16	ro	--	No	24V Sensor Supply Measurement
	4	u16	ro	--	No	24V Sensor Supply Measurement
	5	u16	ro	--	No	Case Temperature Measurement
0x200A	0	u8	ro	43	-	<p>Shaft Encoder Reset Number of Entries</p> <p>to set an encoder to 0, overwrite with nonzero value.</p>
	1...6	u8	rw	0	No	Not used
	7	u8	rw	0	No	Shaft Encoder on Ports 7 & 8
	8...42	u8	rw	0	No	Not used
	43	u8	rw	0	No	Shaft Encoder on Ports 43 & 44
0x200B	0	u8	ro	43	-	<p>Shaft Encoder Overrun Number of Entries</p> <p>This entry contains the maximum value the encoder value runs to before starting from zero again</p>
	1...6	u16	rw	0	No	Not used
	7	u16	rw	0	Yes	Overrun Value for Shaft Encoder on Ports 7 & 8
	8...42	u16	rw	0	No	Not used
	43	u16	rw	0	Yes	Overrun Value for Shaft Encoder on Port 43 & 44

0x2010	0	u8	rw	0 (0 – 127)	Yes	<p>CANopen Node ID The default node ID is 0. Valid values are 0 – 127.</p> <p>In the preoperational stage, if the node ID is 0, then the ID pins will be read to set the new node ID.</p> <p>If the node ID is changed with an SDO, then the new Node ID will be activated when the node is restarted or reset.</p>
0x2011	0	u8	rw	4 (0 – 8)	Yes	<p>CAN baud rate index The new baud rate is activated when the node is restarted or reset. Possible values are: 0 = 1000 kbit/s – not available 1 = 800 kbit/s – not available 2 = 500 kbit/s – not available 3 = 250 kbit/s 4 = 125 kbit/s 5 = 100 kbit/s 6 = 50 kbit/s 7 = 20 kbit/s 8 = 10 kbit/s</p>
0x2012	0	u8	rw	0	No	<p>Reset EEPROM function By writing a nonzero value to this index, the EPROM will reset to its default values the next time the node is restarted or reset.</p>
0x2014	0	u8	rw	0	Yes	<p>Mode selection for checking the status bits: 0 = manual 1 = periodically</p> <p>Periodical checking of the port status can lead to the sending of the status bit PDO</p>
0x2015	0	u8	ro	4	-	<p>Output short circuit status Number of Entries</p> <p>this entry contains the bitwise status of the given ports. 0 = no error 1 = short circuit detected</p>
	1	u8	ro	0	No	Ports 7 - 14
	2	u8	ro	0	No	Ports 15 - 22
	3	u8	ro	0	No	Ports 27 - 34
	4	u8	ro	0	No	Ports 35, 36, 43 - 46
0x2016	0	u8	ro	4	-	<p>Output open load status Number of Entries</p> <p>this entry contains the bitwise status of the given ports. 0 = no error 1 = open load detected</p>
	1	u8	ro	0	No	Ports 7 - 14
	2	u8	ro	0	No	Ports 15 - 22
	3	u8	ro	0	No	Ports 27 - 34
	4	u8	ro	0	No	Ports 35, 36, 43 - 46
0x2020	0	u32	ro	0	No	Minimum program cycle time in ms
0x2021	0	u32	ro	0	No	Maximum program cycle time in ms
0x2022	0	u32	ro	0	No	Average program cycle time in ms

0x2040	0x2023	0	u8	rw	0	No	Resets the program cycle timers when written. (all values)
		0	u8	rw	0	Yes	If heartbeat failure occurs and 0x1029 is set to 1 (No state change) 1 = shall reset, 0 = do nothing Subindex 0 determines if this feature shall be used. 1 = true, 0 = false
		1	u8	rw	0	Yes	Port 1
		2	u8	rw	0	Yes	Port 2
		4	u8	rw	0	Yes	Port 4
		5	u8	rw	0	Yes	Port 5
		6	u8	rw	0	Yes	Port 6
		7	u8	rw	0	Yes	Port 7
		8	u8	rw	0	Yes	Port 8
		9	u8	rw	0	Yes	Port 9
		10	u8	rw	0	Yes	Port 10
		11	u8	rw	0	Yes	Port 11
		12	u8	rw	0	Yes	Port 12
		13	u8	rw	0	Yes	Port 13
		14	u8	rw	0	Yes	Port 14
		15	u8	rw	0	Yes	Port 15
		16	u8	rw	0	Yes	Port 16
		17	u8	rw	0	Yes	Port 17
		18	u8	rw	0	Yes	Port 18
		19	u8	rw	0	Yes	Port 19
		20	u8	rw	0	Yes	Port 20
		21	u8	rw	0	Yes	Port 21
		22	u8	rw	0	Yes	Port 22
		23	u8	rw	0	Yes	Port 23
		24	u8	rw	0	Yes	Port 24
		25	u8	rw	0	Yes	Port 25
		26	u8	rw	0	Yes	Port 26
		27	u8	rw	0	Yes	Port 27
		28	u8	rw	0	Yes	Port 28
		29	u8	rw	0	Yes	Port 29
		30	u8	rw	0	Yes	Port 30
		31	u8	rw	0	Yes	Port 31
		32	u8	rw	0	Yes	Port 32
		33	u8	rw	0	Yes	Port 33
		34	u8	rw	0	Yes	Port 34
		35	u8	rw	0	Yes	Port 35
		36	u8	rw	0	Yes	Port 36
		37	u8	rw	0	Yes	Port 37
		38	u8	rw	0	Yes	Port 38
		39	u8	rw	0	Yes	Port 39
		40	u8	rw	0	Yes	Port 40
		41	u8	rw	0	Yes	Port 41
		42	u8	rw	0	Yes	Port 42
		43	u8	rw	0	Yes	Port 43
		44	u8	rw	0	Yes	Port 44
		45	u8	rw	0	Yes	Port 45
		46	u8	rw	0	Yes	Port 46

	47	u8	rw	0	Yes	Port 47
	48	u8	rw	0	Yes	Port 48
	49	u8	rw	0	Yes	Port 49
	50	u8	rw	0	Yes	Port 50
	51	u8	rw	0	Yes	Port 51
	52	u8	rw	0	Yes	Port 52
	53	u8	rw	0	Yes	Port 53
	54	u8	rw	0	Yes	Port 54
	55	u8	rw	0	Yes	Port 55
	56	u8	rw	0	Yes	Port 56
	57	u8	rw	0	Yes	Port 57
	58	u8	rw	0	Yes	Port 58
	59	u8	rw	0	Yes	Port 59
	60	u8	rw	0	Yes	Port 60
	61	u8	rw	0	Yes	Port 61
	62	u8	rw	0	Yes	Port 62
	63	u8	rw	0	Yes	Port 63
	0	u8	rw	0	Yes	Defines for each port if it is possible to set the port in a protected state. When a port is in protected state it is not possible to set outputs.
0x2050	1	u8	rw	0	Yes	Port 1
	2	u8	rw	0	Yes	Port 2
	4	u8	rw	0	Yes	Port 4
	5	u8	rw	0	Yes	Port 5
	6	u8	rw	0	Yes	Port 6
	7	u8	rw	0	Yes	Port 7
	8	u8	rw	0	Yes	Port 8
	9	u8	rw	0	Yes	Port 9
	10	u8	rw	0	Yes	Port 10
	11	u8	rw	0	Yes	Port 11
	12	u8	rw	0	Yes	Port 12
	13	u8	rw	0	Yes	Port 13
	14	u8	rw	0	Yes	Port 14
	15	u8	rw	0	Yes	Port 15
	16	u8	rw	0	Yes	Port 16
	17	u8	rw	0	Yes	Port 17
	18	u8	rw	0	Yes	Port 18
	19	u8	rw	0	Yes	Port 19
	20	u8	rw	0	Yes	Port 20
	21	u8	rw	0	Yes	Port 21
	22	u8	rw	0	Yes	Port 22
	23	u8	rw	0	Yes	Port 23
	24	u8	rw	0	Yes	Port 24
	25	u8	rw	0	Yes	Port 25
	26	u8	rw	0	Yes	Port 26
	27	u8	rw	0	Yes	Port 27
	28	u8	rw	0	Yes	Port 28
	29	u8	rw	0	Yes	Port 29
	30	u8	rw	0	Yes	Port 30
	31	u8	rw	0	Yes	Port 31
	32	u8	rw	0	Yes	Port 32

	33	u8	rw	0	Yes	Port 33
	34	u8	rw	0	Yes	Port 34
	35	u8	rw	0	Yes	Port 35
	36	u8	rw	0	Yes	Port 36
	37	u8	rw	0	Yes	Port 37
	38	u8	rw	0	Yes	Port 38
	39	u8	rw	0	Yes	Port 39
	40	u8	rw	0	Yes	Port 40
	41	u8	rw	0	Yes	Port 41
	42	u8	rw	0	Yes	Port 42
	43	u8	rw	0	Yes	Port 43
	44	u8	rw	0	Yes	Port 44
	45	u8	rw	0	Yes	Port 45
	46	u8	rw	0	Yes	Port 46
	47	u8	rw	0	Yes	Port 47
	48	u8	rw	0	Yes	Port 48
	49	u8	rw	0	Yes	Port 49
	50	u8	rw	0	Yes	Port 50
	51	u8	rw	0	Yes	Port 51
	52	u8	rw	0	Yes	Port 52
	53	u8	rw	0	Yes	Port 53
	54	u8	rw	0	Yes	Port 54
	55	u8	rw	0	Yes	Port 55
	56	u8	rw	0	Yes	Port 56
	57	u8	rw	0	Yes	Port 57
	58	u8	rw	0	Yes	Port 58
	59	u8	rw	0	Yes	Port 59
	60	u8	rw	0	Yes	Port 60
	61	u8	rw	0	Yes	Port 61
	62	u8	rw	0	Yes	Port 62
	63	u8	rw	0	Yes	Port 63
	0	u8	rw	0	No	Defines for each port if it is in a protected state. In order to reset the state write zero to the subindex corresponding to the port number.
0x2051	1	u8	rw	0	No	Port 1
	2	u8	rw	0	No	Port 2
	4	u8	rw	0	No	Port 4
	5	u8	rw	0	No	Port 5
	6	u8	rw	0	No	Port 6
	7	u8	rw	0	No	Port 7
	8	u8	rw	0	No	Port 8
	9	u8	rw	0	No	Port 9
	10	u8	rw	0	No	Port 10
	11	u8	rw	0	No	Port 11
	12	u8	rw	0	No	Port 12
	13	u8	rw	0	No	Port 13
	14	u8	rw	0	No	Port 14
	15	u8	rw	0	No	Port 15
	16	u8	rw	0	No	Port 16
	17	u8	rw	0	No	Port 17
	18	u8	rw	0	No	Port 18

19	u8	rw	0	No	Port 19
20	u8	rw	0	No	Port 20
21	u8	rw	0	No	Port 21
22	u8	rw	0	No	Port 22
23	u8	rw	0	No	Port 23
24	u8	rw	0	No	Port 24
25	u8	rw	0	No	Port 25
26	u8	rw	0	No	Port 26
27	u8	rw	0	No	Port 27
28	u8	rw	0	No	Port 28
29	u8	rw	0	No	Port 29
30	u8	rw	0	No	Port 30
31	u8	rw	0	No	Port 31
32	u8	rw	0	No	Port 32
33	u8	rw	0	No	Port 33
34	u8	rw	0	No	Port 34
35	u8	rw	0	No	Port 35
36	u8	rw	0	No	Port 36
37	u8	rw	0	No	Port 37
38	u8	rw	0	No	Port 38
39	u8	rw	0	No	Port 39
40	u8	rw	0	No	Port 40
41	u8	rw	0	No	Port 41
42	u8	rw	0	No	Port 42
43	u8	rw	0	No	Port 43
44	u8	rw	0	No	Port 44
45	u8	rw	0	No	Port 45
46	u8	rw	0	No	Port 46
47	u8	rw	0	No	Port 47
48	u8	rw	0	No	Port 48
49	u8	rw	0	No	Port 49
50	u8	rw	0	No	Port 50
51	u8	rw	0	No	Port 51
52	u8	rw	0	No	Port 52
53	u8	rw	0	No	Port 53
54	u8	rw	0	No	Port 54
55	u8	rw	0	No	Port 55
56	u8	rw	0	No	Port 56
57	u8	rw	0	No	Port 57
58	u8	rw	0	No	Port 58
59	u8	rw	0	No	Port 59
60	u8	rw	0	No	Port 60
61	u8	rw	0	No	Port 61
62	u8	rw	0	No	Port 62
63	u8	rw	0	No	Port 63

2.4.8. Device Specific Profile Area (DS401)

Index	S-Idx	Type, Access	Default (possible)	Saved	Description
0x6000	0	u8 ro	5	-	Digital Inputs Number of entries
	1	u8 ro	0	-	Digital Input Ports 1, 3, 5, 7-11 Bit 0 - Port 1 Bit 1 - Port 3 Bit 2 - Port 5 Bit 3 - Port 7 Bit 4 - Port 8 Bit 5 - Port 9 Bit 6 - Port 10 Bit 7 - Port 11 Each bit is only used when the corresponding port is configured as Digital Input.
	2	u8 ro	0	-	Digital Input Ports 12-19 Bit 0 - Port 12 Bit 1 - Port 13 Bit 2 - Port 14 Bit 3 - Port 15 Bit 4 - Port 16 Bit 5 - Port 17 Bit 6 - Port 18 Bit 7 - Port 19 Each bit is only used when the corresponding port is configured as Digital Input.
	3	u8 ro	0	-	Digital Input Ports 20 – 22, 27 – 31 Bit 0 - Port 20 Bit 1 - Port 21 Bit 2 - Port 22 Bit 3 - Port 27 Bit 4 - Port 28 Bit 5 - Port 29 Bit 6 - Port 30 Bit 7 - Port 31 Each bit is only used when the corresponding port is configured as Digital Input.
	4	u8 ro	0	-	Digital Input Ports 32 – 37, 39, 41 Bit 0 - Port 32 Bit 1 - Port 33 Bit 2 - Port 34 Bit 3 - Port 35 Bit 4 - Port 36 Bit 5 - Port 37 Bit 6 - Port 39 Bit 7 - Port 41 Each bit is only used when the corresponding port is configured as Digital Input.
	5	u8 ro	0	-	Digital Input Ports 43 – 46, 52 – 55 Bit 0 - Port 43 Bit 1 - Port 44 Bit 2 - Port 45

						<p>Bit 3 - Port 46 Bit 4 - Port 52 Bit 5 - Port 53 Bit 6 - Port 54 Bit 7 - Port 55</p> <p>Each bit is only used when the corresponding port is configured as Digital Input.</p>
0x6200	0	u8	ro	4	-	<p>Digital Outputs Number of entries</p>
	1	u8	rw	0	No	<p>Digital Output Ports 7-14 Bit 0 - Port 7 Bit 1 - Port 8 Bit 2 - Port 9 Bit 3 - Port 10 Bit 4 - Port 11 Bit 5 - Port 12 Bit 6 - Port 13 Bit 7 - Port 14</p> <p>Each bit is only used when the corresponding port is configured as Digital Output.</p>
	2	u8	rw	0	No	<p>Digital Output Ports 15-22 Bit 0 - Port 15 Bit 1 - Port 16 Bit 2 - Port 17 Bit 3 - Port 18 Bit 4 - Port 19 Bit 5 - Port 20 Bit 6 - Port 21 Bit 7 - Port 22</p> <p>Each bit is only used when the corresponding port is configured as Digital Output.</p>
	3	u8	rw	0	No	<p>Digital Output Ports 27-34 Bit 0 - Port 27 Bit 1 - Port 28 Bit 2 - Port 29 Bit 3 - Port 30 Bit 4 - Port 31 Bit 5 - Port 32 Bit 6 - Port 33 Bit 7 - Port 34</p> <p>Each bit is only used when the corresponding port is configured as Digital Output.</p>
	4	u8	rw	0	No	<p>Digital Output Ports 35, 36, 43-46 Bit 0 - Port 35 Bit 1 - Port 36 Bit 2 - Port 43 Bit 3 - Port 44 Bit 4 - Port 45 Bit 5 - Port 46 Bit 6 - Unused Bit 7 - Unused</p> <p>Each bit is only used when the corresponding port is configured as Digital Output.</p>
0x6401	0	u8	ro	12	-	<p>Analog Inputs Number of entries</p>

Each sub-index is only valid when the corresponding port is configured as an Analog Input						
	1	u16	ro	0	-	Analog Input Port 1
	2	u16	ro	0	-	Analog Input Port 2
	3	u16	ro	0	-	Analog Input Port 3
	4	u16	ro	0	-	Analog Input Port 4
	5	u16	ro	0	-	Analog Input Port 5
	6	u16	ro	0	-	Analog Input Port 6
	7	u16	ro	0	-	Analog Input Port 37
	8	u16	ro	0	-	Analog Input Port 38
	9	u16	ro	0	-	Analog Input Port 39
	10	u16	ro	0	-	Analog Input Port 40
	11	u16	ro	0	-	Analog Input Port 41
	12	u16	ro	0	-	Analog Input Port 42
	13-57	u16	ro	0	-	unused
	58	u16	ro	0	-	Internal Analog Input Port 58
	59	u16	ro	0	-	Internal Analog Input Port 59
	60	u16	ro	0	-	Internal Analog Input Port 60
	61	u16	ro	0	-	Internal Analog Input Port 61
	62	u16	ro	0	-	Internal Analog Input Port 62
	63	u16	ro	0	-	Internal Analog Input Port 63
0x6402	Analog Inputs (Pulse Counters)					
	0	u8	ro	5	-	Number of Entries Each sub-index is only valid when the corresponding port is configured as pulse counter / encoder input
	1	u16	ro	0	-	Pulse Counter Input Port 8
	2	u16	ro	0	-	Pulse Counter Input Port 10
	3	u16	ro	0	-	Shaft Encoder Ports 7 & 8
4	u16	ro	0	-	Shaft Encoder Ports 43 & 44	
0x6411	Analog Outputs					
	0	u8	ro	16	-	Number of entries Each sub-index is only valid when the corresponding port is configured as an Analog Output Valid values range from 0 to 1023
	1	u16	rw	0	No	Analog Output Port 11
	2	u16	rw	0	No	Analog Output Port 12
	3	u16	rw	0	No	Analog Output Port 13
	4	u16	rw	0	No	Analog Output Port 14
	5	u16	rw	0	No	Analog Output Port 15
	6	u16	rw	0	No	Analog Output Port 16
	7	u16	rw	0	No	Analog Output Port 17
	8	u16	rw	0	No	Analog Output Port 18
	9	u16	rw	0	No	Analog Output Port 27
	10	u16	rw	0	No	Analog Output Port 28
	11	u16	rw	0	No	Analog Output Port 29
	12	u16	rw	0	No	Analog Output Port 30
	13	u16	rw	0	No	Analog Output Port 31
	14	u16	rw	0	No	Analog Output Port 32
	15	u16	rw	0	No	Analog Output Port 45
16	u16	rw	0	No	Analog Output Port 46	

3. Technical Support

Contact your reseller or supplier for help with possible problems with your CrossFire GX1. In order to get the best help, you should have access to your CrossFire GX1 and be prepared with the following information before you contact support.

- Part number and serial number of the unit, which you find on the brand label
- Date of purchase, which is found on the invoice
- The conditions and circumstances under which the problem arises
- LED indicator colours and blink patterns.
- EMCY object error codes (if possible)
- Description of external equipment which is connected to CrossFire GX1

4. Trademark, etc

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