AKD®
SynqNet Communication

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KOLLMORGEN ®

Because Motion Matters™

Record of Document Revisions:

Revision	Remarks
A, 10/2011	Launch version
B, 03/2012	Added chapters on AKD SynqNet I/O Mapping and Enable Compare Output on RS485 I/O.
C, 08/2012	Added Important Things to Know chapter.
D, 09/2016	Updated SynqNet Supported Parameters (➜ p. 24).
E, 10/2017	Added information on Node I/O (➜ p. 19) mapping.
F, 10/2020	Added PMW, Brake Support for SynqNet, SynqNet Compare FB1.INITSIGNED and new SynqNet Supported Parameters.

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Technical changes which improve the performance of the device may be made without prior notice.

1 Table of Contents

2 General

2.1 About this Manual

This manual, *AKD SynqNet Communication*, describes the installation, setup, range of functions, and software protocol for the SynqNet AKD product series. All AKD SynqNet drives have built-in SynqNet functionality; therefore, an additional option card is not required.

A digital version of this manual (pdf format) is available on the disk included with your drive. Manual updates can be downloaded from the Kollmorgen website.

Related documents for the AKD series include:

- AKD Installation Manual This manual provides instructions for installation and drive setup.
- AKD WorkBench Online Help. This help system describes how to use your drive in common applications. It also provides tips for maximizing your system performance with the AKD. The Online Help includes the Parameter and Command Reference Guide which provides documentation for the parameters and commands used to program the AKD.
- Accessories Manual. This manual provides documentation for accessories like cables and regen resistors used with AKD. Regional versions of this manual exist.

2.2 Target Group

This manual addresses personnel with the following qualifications:

- Installation: only by electrically qualified personnel.
- Setup: only by qualified personnel with extensive knowledge of electrical engineering and drive technology
- Programming: software developers, project-planners

The qualified personnel must know and observe the following standards:

- ISO 12100, IEC 60364 and IEC 60664
- National accident prevention regulations

⚠ **WARNING**

During operation there are deadly hazards, with the possibility of death, severe injury or material damage. The operator must ensure that the safety instructions in this manual are followed. The operator must ensure that all personnel responsible for working with the servo drive have read and understand the manual.

2.3 Symbols Used

Symbol	Indication
⚠DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates situations which, if not avoided, could result in property damage.
NOTE	This symbol indicates important notes.
⚠	Warning of a danger (general). The type of danger is specified by the text next to the symbol.
⚡	Warning of danger from electricity and its effects.
⚠	Warning of danger from suspended loads.
⚠	Warning of danger from high temperature.
⚠	Warning of danger from automatic start.

3 Safety

3.1   Safety Instructions

⚠ **DANGER**

During operation there are deadly hazards, with the possibility of death, severe injury or material damage. Do not open or touch the equipment during operation. Keep all covers and cabinet doors closed during operation. Touching the equipment is allowed during installation and commissioning for properly qualified persons only.

- During operation, drives may have uncovered live components, depending on their level of enclosure protection.
- Control and power connections may be live, even though the motor is not rotating.
- Drives may have hot surfaces during operation. Heat sink can reach temperatures above 80°C.

⚠ **WARNING**

Electronic equipment can fail. The user is responsible for ensuring that in the event of a failure of the servo amplifier, the drive is set to a state that is safe for both machinery and personnel, for instance with the aid of a mechanical brake.

Drives with servo amplifiers and SynqNet are remote-controlled machines. They can start to move at any time without previous warning. Take appropriate measures to ensure that the operating and service personnel is aware of this danger.

Implement appropriate protective measures to ensure that any unintended start-up of the machines cannot result in dangerous situations for personnel or machinery. Software limit-switches are not a substitute for the hardware limit-switches in the machine.

NOTICE

Install the drive as described in the *Installation Manual*. Never break any of the electrical connections to the drive while it is live. This can result in destruction of the electronics.

NOTICE

Do not connect the Ethernet line for the PC with the set up software to the SynqNet interface X5/X6. The set up Ethernet cable must be connected to the service interface on X11.

3.2   Use as directed

Drives are components that are built into electrical plants or machines and can only be operated as integral components of these plants or machines. The manufacturer of the machine used with a drive must generate a risk assessment for the machine and take appropriate measures to ensure that unforeseen movements cannot cause personnel injury or property damage.

- Observe the chapters "Use as directed" and "Prohibited use" in the *AKD Installation Manual*.
- The SynqNet interface serves only for the connection of the *AKD* to a master with SynqNet connectivity.

3.3   Prohibited use

Use other than that described in chapter "Use as directed" is not intended and can lead to personnel injuries and equipment damage. The drive may not be used with a machine that does not comply with appropriate national directives or standards. The use of the drive in the following environments is also prohibited:

- potentially explosive areas
- environments with corrosive and/or electrically conductive acids, alkaline solutions, oils, vapors, dusts
- ships or offshore applications

The connectors X5 and X6 of the AKD SynqNet drive may not be used for any ethernet protocol except SynqNet.

4 Important Things to Know

This section addresses important things to know about AKD SynqNet.

4.1 Torque mode only

AKD SynqNet supports torque mode only. It does not support Velocity mode.

4.2 Wake-and-Shake support over SynqNet

Wake-and-shake is supported over SynqNet as of MPI 04.02.Beta04 and later. Wake-and-shake is triggered by the MPI "PhaseFind" function.

See the utility sqDrivePhaseFind.exe: http://support.motioneng.com/Utilities/phaseFind/default.htm

For the software API, see: http://support.motioneng.com/Software-MPI_04_00/Topics/mtr_phase_finding.htm

Before using PhaseFind, configure the wake-and-shake mode and parameters. These can be set using SynqNet parameters or through WorkBench. We recommend saving the parameters to NVM in the AKD SynqNet drive. The MPI PhaseFind function will then issue the final WS.ARM command and enable the drive, which triggers the actual wake-and-shake action. When the AKD drive reports PhaseFind is complete, the MPI clears the AmpEnable flag and return status (pass or fail).

> **NOTE**
>
> Before PhaseFind, clear any pending faults in the AKD SynqNet drive or on the controller (including position limit, HW Pos Limit, etc. associated with this motor).

The AKD offers 3 wake-and-shake modes, each with different parameters. The best results are with mode 1 (commutation). Mode 2 (auto) is least complex – no parameters required.

Over WorkBench, wake-and-shake is not affected by SynqNet unless SynqNet is cyclic, which blocks WorkBench from enabling the motor.

4.3 STO state ignored by "Not Ready for Remote Control" status bit

The cyclic status bit "Not Ready for Remote Control" should indicate when the motor is ready to be enabled. However, if the AKD is disabled by STO, the Not Ready for Remote Control is not cleared.

The STO input status is not directly visible over SynqNet (except by the parameter STO.STATE).

4.4 WorkBench must re-connect after SynqNet reset

Each SynqNet reset causes a full AKD reset, disconnecting any existing WorkBench session. You must re-connect from WorkBench after the reset.

SynqNet reset is triggered by the meiReset.exe utility, controller reset from MotionConsole, SynqNet initialization from MotionConsole, and similar events from any other utilities or customer applications.

4.5 WorkBench GUI requires Ethernet service port connection

WorkBench must be used over the Ethernet service port, X11. WorkBench is not supported through the SynqNet network.

4.6 Service motion disabled while SynqNet operational (cyclic)

After SynqNet discovers an AKD drive and enters cyclic operation, service motion is disabled from WorkBench. When SynqNet exits cyclic operation, the AKD drive remains disabled, causing service motion to remain disabled until the next drive reset.

4.7   Fieldbus fault cleared only by reset

When SynqNet reaches cyclic operation, and then exits cyclic operation, the AKD SynqNet will declare a fieldbus fault. This fault is cleared by the reset at the beginning of the next SynqNet discovery cycle. WorkBench cannot clear this fieldbus fault, so service motion is not possible until the drive is reset or power cycled.

5 Installation and Setup

5.1 Safety Instructions

⚠DANGER

Never disconnect any electrical connections to the drive while the drive is live. There is a danger of electrical arcing with damage to contacts and serious personal injury. Wait at least seven minutes after disconnecting the drive from the main supply power before touching potentially live sections of the equipment (e.g. contacts) or undoing any connections.

Capacitors can still have dangerous voltages present up to 7 minutes after switching off the supply power. To be sure, measure the voltage in the DC Bus link and wait until it has fallen below 60 V.

Control and power connections can still be live, even if the motor is not rotating.

⚠WARNING

Electronic equipment can fail. The user is responsible for ensuring that, in the event of a failure of the servo amplifier, the drive is set to a state that is safe for both machinery and personnel, for instance with the aid of a mechanical brake.

Drives with servo amplifiers and sercos® III are remote-controlled machines. They can start to move at any time without previous warning. Take appropriate measures to ensure that the operating and service personnel is aware of this danger.

Implement appropriate protective measures to ensure that any unintended start-up of the machines cannot result in dangerous situations for personnel or machinery. Software limit-switches are not a substitute for the hardware limit-switches in the machine.

NOTICE

Install the drive as described in the *Installation Manual*. The wiring for the analog setpoint input and the positioning interface, as shown in the wiring diagram in the *Installation Manual*, is not required. Never break any of the electrical connections to the drive while it is live. This action can result in destruction of the electronics.

NOTICE

The drive's status must be monitored by the PLC to acknowledge critical situations. Wire the FAULT contact in series into the emergency stop circuit of the installation. The emergency stop circuit must operate the supply contactor.

NOTE

Use WorkBench to alter drive settings. Any other alterations will invalidate the warranty.

NOTE

Because of the internal representation of the position-control parameters, the position controller can only be operated if the final limit speed of the drive does not exceed:

rotary
at sinusoidal² commutation: 7500 rpm
at trapezoidal commutation: 12000 rpm.
linear
at sinusoidal² commutation: 4 m/s
at trapezoidal commutation: 6.25 m/s

NOTE

All the data on resolution, step size, positioning accuracy etc. refer to calculatory values. Non-linearities in the mechanism (backlash, flexing, etc.) are not taken into account. If the final limit speed of the motor must be altered, then all the parameters that were previously entered for position control and motion blocks must be adapted.

5.2   SynqNet Onboard

Connection to the SynqNet Network can be made using the X5 (in port) and X6 (out port).
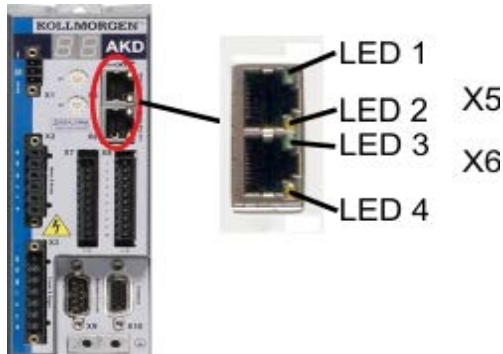
5.3   Synqnet Cables

You can connect to the SynqNet network using RJ-45 connectors.

5.3.1 Recommended SynqNet Cabling

The following is recommended for SynqNet Cabling:

- Use shielded category 5 cabling.
- The RF immunity of 100BT networks when using unshielded cable is moderate. Kollmorgen recommends that only shielded cabling is used.
- Braid + foil shielding is the most effective, but foil + drain wire shielding is acceptable.
- If unusually high levels of interference are generated by the machine or nearby equipment, consider using shielded cables with built-in ferrites.
- Ensure that each SynqNet node is effectively grounded, which implies connecting a short fat strap to the machine chassis or busbar.
- There is no minimum length requirement for 100BT cables. However, cables must not be longer than 100m. Longer links are possible over copper using repeaters or over fibre using media converters. Contact the cable factory for further information.
- The machine chassis must be effectively bonded together. This is particularly important when using SynqNet nodes that do not have independently shielded IN and OUT ports.
- Be sure to take the usual precautions to secure the cabling so as to avoid chafing and fatigue.
- High flexure cables are required for cable retractors. Only two signal pairs are needed.
- Do not use cable couplers. Commercially available units generally have poor shielding and are consequently an EMC hazard.
- SynqNet is not compatible with standard Ethernet hubs or repeaters.
- SynqNet does not support POE (Power-over-Ethernet).

5.3.2 Synqnet Cable Length

The SynqNet cable lengths are derived from the measured propagation delays during network initialization. This information is used to determine the spacing between packets for each node. SynqNet networks can have up to 32 nodes and cables can be up to 100 meters in length. By measuring the actual propagation delays and optimizing the packet spacing, the network performance and actual bandwidth is improved.

Typical CAT5 cable propagation delays are roughly 0.005 microsec per meter. Actual values are affected by cable construction and will vary, but the variation will be small for any reasonable cable. The propogation delay can be estimated by a cable propagation velocity of 70% the speed of light, using the formula:

delay = meters * (1,000,000 / (0.7 * 299,722,458))

Length (meters)	Time (microsec)
1	0.005
10	0.048
25	0.119
50	0.238
100	0.477

5.4 LED functions

The communication status is indicated by the built-in LEDs. SynqNet LEDs will BLINK to indicate a fault (or undiscovered network). A drive with no blinking LEDs is in normal cyclic operation (without faults). Each SynqNet port has two LEDs. And each LED has a particular function, which is described in further detail below.

Connector	LED	Port	Meaning	Function
X5	LED1	IN	Network activity	ON = running (cyclic phase) OFF = not running BLINK = discovery phase
	LED2	IN	Link activity	ON = link active OFF = link inactive
X6	LED3	OUT	Network activity	ON = running (cyclic phase) OFF = not running BLINK = discovery phase
	LED4	OUT	Link activity	ON = link active OFF = link inactive

5.5 SynqNet Interconnection

5.5.1 String Topology

The String Topology is the most basic network configuration. Packets are sent downstream from the controller to the nodes. Each node repeats the downstream data to the next node. Packets are also sent upstream from the nodes to the controller. Each node repeats the upstream data to the next node. If a cable breaks, the nodes downstream from the break will no longer be able to send/receive packets to/from the controller.

Due to the un-terminated nature of a String Topology, discovering a topology of this type requires a timeout period to detect the end of the string. Therefore, more time is needed to discover an un-terminated String Topology than other network types. To reduce the discovery time, add a Loop-back Connector to the end of the topology (String Topology with Termination).

A String Topology has nodes connected to the controller's OUT port or the controller's IN port, but not both. A Dual String Topology has nodes that are discovered on both the controller's OUT port and IN port.

> **NOTE**
> The String Topology does NOT support fault recovery.
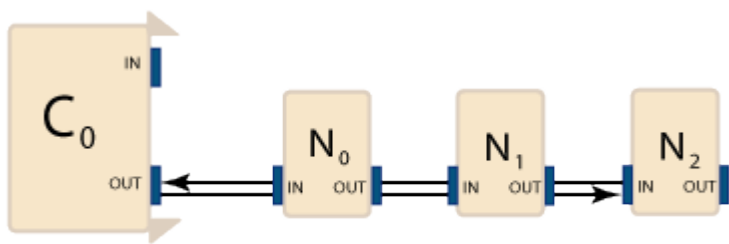
String Topology (OUT port)
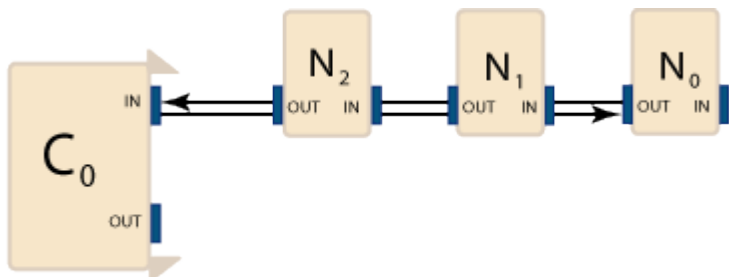
String Topology (IN port)

5.5.2 Dual String Topology

The Dual String Topology is a variation of the String network configuration. A Dual String network is a single SynqNet network with nodes connected to both the controller's OUT port and IN port. Packets are sent downstream from the controller to the nodes via the OUT port and IN port. Each node repeats the downstream data to the next node. Packets are also sent upstream from the nodes to the controller. Each node repeats the upstream data to the next node. If a cable breaks, the nodes downstream from the break will no longer be able to send/receive packets to/from the controller.

Due to the un-terminated nature of a Dual-String Topology, discovering a topology of this type requires a timeout period to detect the end of the string. Therefore, more time is needed to discover an un-terminated String Topology than other network types. To reduce the discovery time, add a Loop-back Connector to the end of the topology (Dual String Topology with Termination).

NOTE

The Dual String topology does NOT support fault recovery.
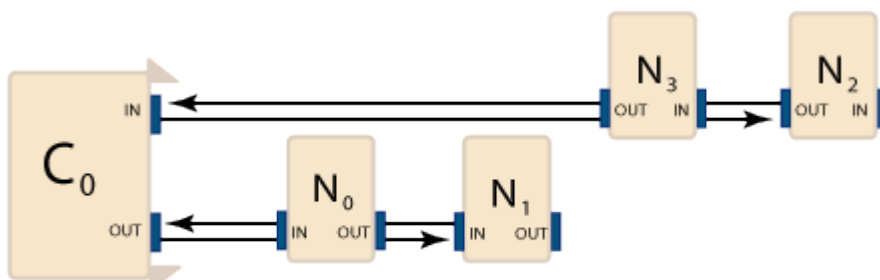
Dual String Topology

5.5.3 String and Dual String Topology with Termination

The String and Dual String Topologies support both termination and non-termination. A String or Dual String network with termination is the same as a String or Dual String topology, except a "loop-back" connector is added to the last node(s). The advantage of using a terminator on the last node is that the network initialization time is reduced, because the controller can deterministically find the last node on a network.

String Topology
(OUT port, terminated)

String Topology
(IN port, terminated)

Dual String Topology
(terminated)
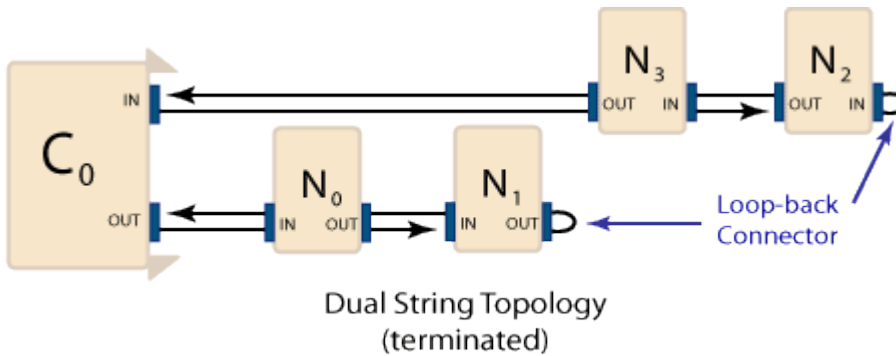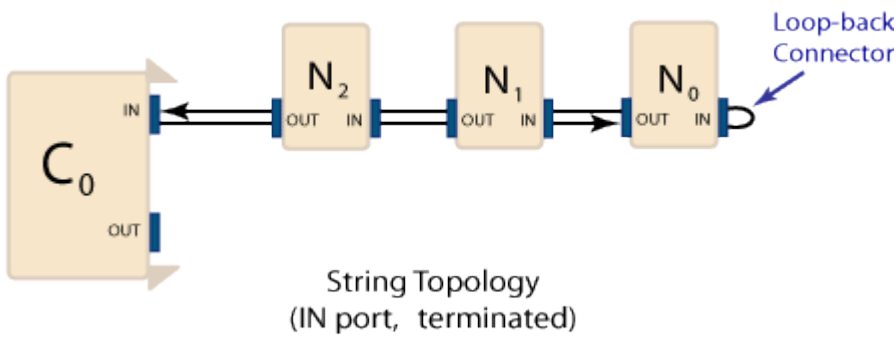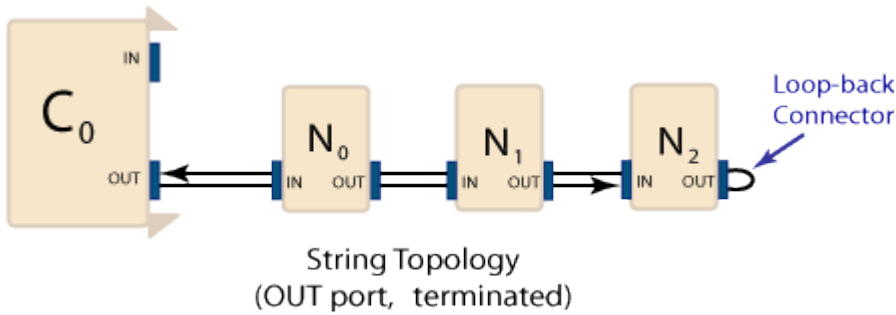
5.5.4 Ring topology

The ring is implemented with straight through cables. In SynqNet, the master node is referred to as the "Controller," and the slave nodes are referred to as "Nodes." Each link runs from an IN port to an OUT port. IN and OUT connector pin-outs are complementary (Receive+ on OUT pin 1 connects to IN pin 1 Transmit+ and so on). The IN and OUT port names are arbitrary conventions to assist in cabling systems properly since each link is bi-directional and there is no significant functional difference.
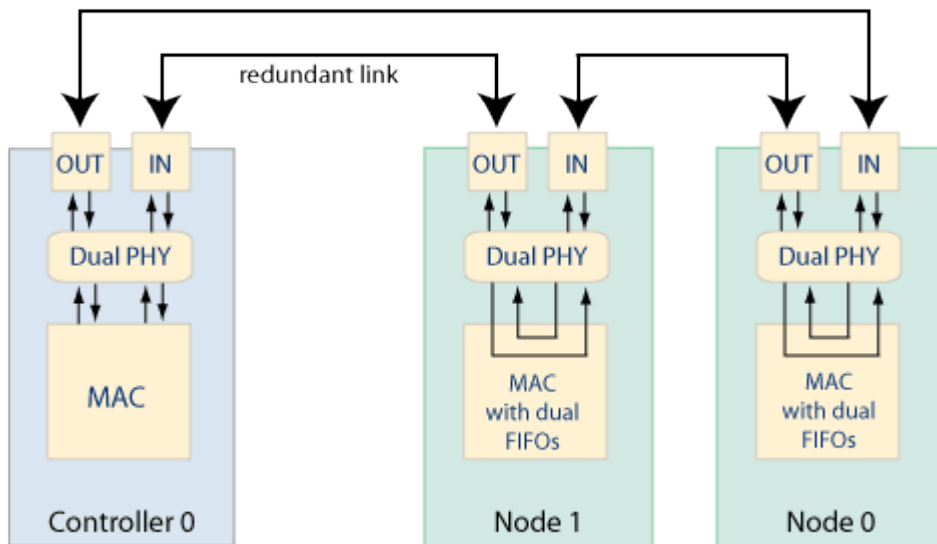
A SynqNet Ring with a controller and two nodes

The redundant link plays no part during normal operation of SynqNet. This link will become active if fault recovery is necessary. In this example, the redundant link is shown between Node 1 and the controller. Although it may be any link in the network.

The "farthest node" has the greatest number of downstream hops from the controller; in this case it is Node 1.

6   AKD SynqNet I/O Mapping

The following tables show the mapping from AKD physical pin names to SynqNet logical names.

These tables show mapping for FPGAs, version 0200_00_02 and later.

6.1   General Purpose I/O

AKD Firmware	AKD Connector	AKD Pin Name	SynqNet MPI Name	Notes
DIN1.STATE	X7-10	Digital Input 1	GPIO input "DIN 1 (HS)"	High speed opto input. Also maps to HOME.
DIN2.STATE	X7-9	Digital Input 2	GPIO input "DIN 2 (HS)"	High speed opto input.
DIN3.STATE	X7-4	Digital Input 3	GPIO input "DIN 3"	
DIN4.STATE	X7-3	Digital Input 4	GPIO input "DIN 4"	
DIN5.STATE	X8-6	Digital Input 5	GPIO input "DIN 5"	Also maps to "LIMIT_ HW_POS".
DIN6.STATE	X8-5	Digital Input 6	GPIO input "DIN 6"	Also maps to "LIMIT_ HW_NEG".
DIN7.STATE	X7-2	Digital Input 7	GPIO input "DIN 7"	
DIN9.STATE DIO9.STATE	X9-1/2	Emulated Encoder A	GPIO bidir "RS485 IO 1"	See note to enable output.
DIN10.STATE DIO10.STATE	X9-4/5	Emulated Encoder A	GPIO bidir "RS485 IO 2"	See note to enable output.
DIN11.STATE DIO11.STATE	X7-7/8	Emulated Encoder Zero	GPIO bidir "RS485 IO 3"	See note to enable output. Also maps to "INDEX_ SECONDARY."
DOUT1.STATE	X7-8/7	Digital Output 1	GPIO output "DOUT1"	
DOUT2.STATE	X7-6/5	Digital Output 2	GPIO output "DOUT1"	
NA	X10-6/7	Zero	GPIO input "Analog Z Pulse"	Also maps to "INDEX_ PRIMARY." Some encoder types do not use index pin.

Notes:

- The RS485 outputs must be enabled using AKD-SQ parameters.
- Set DRV.EMUMODE = 10 (fieldbus) for SynqNet gpio output mode.
- Set DIO9.DIR=1, DIO10.DIR=1, DIO11.DIR=1 to enable individual outputs.
- GPIO input "Analog Z Pulse" not supported on AKD Rev 7 control boards (AKD-SQ prototypes only).

6.2 Dedicated I/O

AKD Firmware	AKD Connector	AKD Pin Name	SynqNet MPI Name	Notes
DIN1.STATE	X7-10	Digital Input 1	Dedicated input "HOME"	High speed opto input. Also maps to DIN 1 (HS).
DIN5.STATE	X8-6	Digital Input 5	Dedicated input "LIMIT_HW_POS"	Also maps to "DIN 5."
DIN6.STATE	X8-5	Digital Input 6	Dedicated input "LIMIT_HW_NEG"	Also maps to "DIN 6."
DIN11.STATE	X9-7/8	Emulated Encoder Zero	Dedicated input "INDEX_ SECONDARY"	Also maps to "RS485 IO 3."
NA	X10-6/7	Zero	Dedicated input "INDEX_ PRIMARY"	Also maps to "Analog Z Pulse." Some encoder types do not use index pin.
NA	X8-1/2	Fault Relay Output	Dedicated input "AMP_FAULT"	Logical OR of AKD and SynqNet faults
FB1.HALLSTATEU	X10-1	Hall U	Dedicated input "Hall A"	See note on bit order
FB1.HALLSTATEV	X10-2	Hall V	Dedicated input "Hall B"	See note on bit order
FB1.HALLSTATEW	X10-3	Hall W	Dedicated input "Hall C"	See note on bit order
MOTOR.BRAKESTATE			Dedicated output "BRAKE_ RELEASE" Dedicated input "BRAKE_ APPLIED"	Brake release is command from SynqNet Brake applied is status from AKD drive (logical OR)

Notes:

- Hall input bit order is swapped in beta release FPGAs. Planned (corrected) order shown above.
- For AKD FPGA versions 0200 and prior, AKD U/V/W maps to Hall C/B/A.
- For AKD FPGA versions TBD and later, AKD U/V/W maps to Hall A/B/C.
- GPIO input "Analog Z Pulse" not supported on AKD Rev 7 control boards (AKD-SQ prototypes only).

6.3 Node I/O

AKD Firmware	AKD Connector	AKD Pin Name	SynqNet MPI Name
AOUT.VALUE	X8-7/8	Analog Output	Nodelo AnalogOut[0] output
AIN.VALUE	X8-10/9	Analog Input	Nodelo AnalogIn[0] input

6.3.1 Analog Output

When the AKD SynqNet drive enters normal cyclic operation, AOUT.MODE is automatically set to 12 (Syn-qNet AnalogOut), and the SynqNet controller sends the Nodelo AnalogOut value directly to the AKD's Analog Output pins. AOUT.MODE does not allow other values, and the filter and scaling is bypassed. AOUT.VALUE does not read back the AnalogOutput value. AOUT.VALUEU is ignored.

AOUT.MODE = 12:
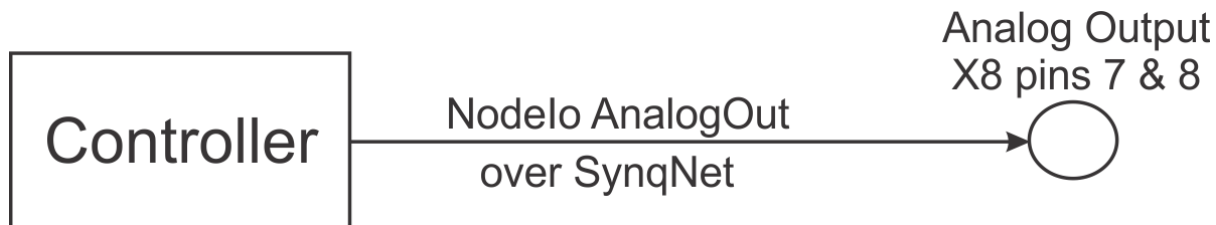
6.3.2 Analog Input

When the AKD SynqNet drive enters normal cyclic operation, AIN.MODE is automatically set to 0 (Monitor), and the drive sends the raw AnalogInput value to the SynqNet controller as Nodelo AnalogIn. The offset and scale are bypassed.
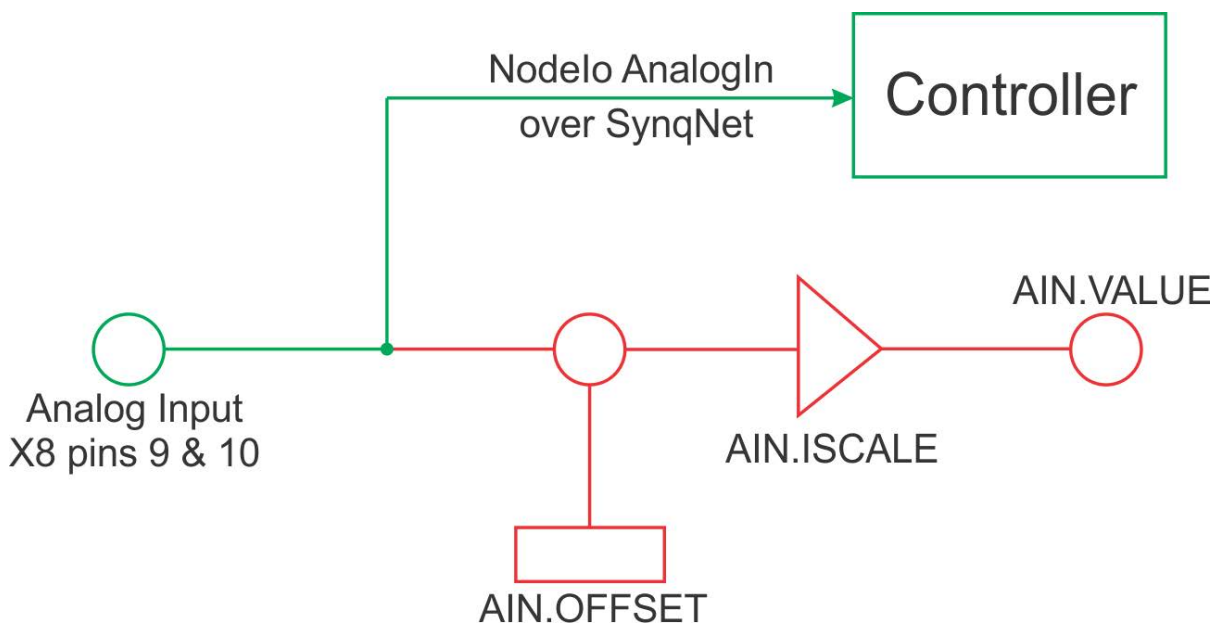
7 Enable PWM Output on RS485 I/O

These steps use both WorkBench and MotionConsole.

Enable the Pulse Width Modulation (PWM) output on an RS-485 I/O using the following steps:

NOTE
The PWM output is not available on the opto-isolated DOUT1 and DOUT2 because these outputs are too slow to be useful.

1. Set DRV.EMUEMODE parameter in WorkBench to 10 - General Purpose I/Os.

2. Set DOUT9.DIR in WorkBench to 1-Output.

NOTE
For SynqNet:
DOUT9.INV forced to 0 (SynqNet controls output polarity)
DOUT9.MODE forced to 0 (SynqNet controls output source)

3. Open MotionConsole.

4. Set Motor I/O Type to Source 5 (PWM0) in MotionConsole.
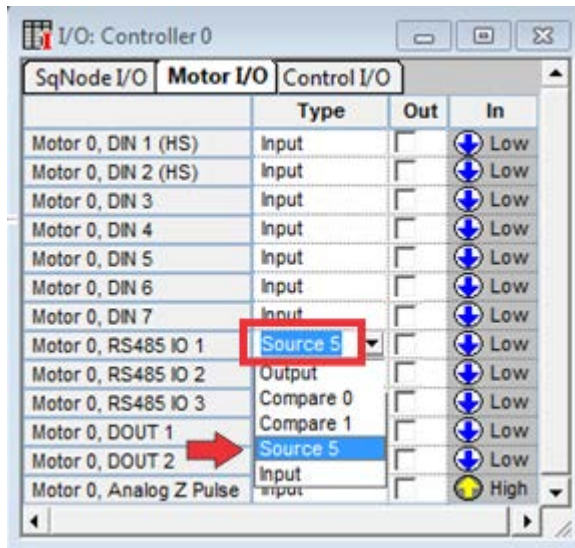
7.1 PWM Parameter Scaling

When using the SynqNet Drive Parameter methods, the scaling is:

```
DUTYCYCLE: (32-bit unsigned integer) Percent * 1000   //min 0 max 100000
```

Example: 12500 represents 12.5% duty cycle

```
PERIOD: (32-bit unsigned integer) uSec * 1000   //min 1000 max 500000
```

Example: 40000 represents a 40 uSec period.

```
MODE: (32-bit unsigned integer) 0 = parameter; 1 = fieldbus (aka cyclic)
```

When using the SynqNet Cyclic control method, the scaling is:

```
sqNodeIoAnalogOut[1] = DUTYCYCLE  = (16-bit unsigned integer) (DUTYCYCLE_
PERCENT / 100) * 0x8000   //min 0 max 0x8000
```

Example: 0x1000 represents 12.5% duty cycle

Since the hardware multiply truncates without roundoff, adding 1 count may be helpful.

```
sqNodeIoAnalogOut[2] = PERIOD = (16-bit unsigned integer) PERIOD_USEC *
25   //min 25 max 12500
```

Example: 1000 represents a 40 uSec period.

7.2 Brake Support for AKD SynqNet

AKD-SynqNet supports all MPI/SynqNet brake features. Brake delay (configured via MPI) is supported.

AKD-SynqNet does NOT support all AKD drive brake features (controlled stop is not available since AKD-SQ velocity control is always from SynqNet).

There are three parameters critical for AKD-SynqNet brake operation. All AKD-SQ brake users should be set to the following:

MOTOR.TBRAKETO = 0 (AKD default = -1 = disabled)	AKD firmware will not delay brake
MOTOR.BRAKEIMM = 1 (AKD default = 0 = disabled)	AKD firmware will not delay brake
DRV.DISMODE = 0 (AKD default = 0)	

7.3 AKD-SynqNet Compare FB1.INITSIGNED

When using the AKD-SynqNet Compare feature, set FB1.INITSIGNED depending on the feedback type:

Feedback types: Incremental (A-Quad-B, Sin/Cos, Resolver)	FB1.INITSIGNED 1
Feedback types: Absolute feedback and serial feedbacks (SFD, EnDat 2.2, BiSS)	FB1.INITSIGNED 0

The AKD-SynqNet Compare feature uses an internal 64-bit FPGA position value.

Depending on the feedback type and initial position, the AKD firmware multi-turn count may differ from the internal FPGA value. This offset (if any) is determined only at SynqNet discovery and is always +/-1 multi-turn count (+/-1 rev = +/- 2^{32} counts). This issue does not affect any feature other than AKD-SQ Compare.

This offset can also be detected by comparing the SynqNet (MPI) ActualPosition the AKD FB1.P position. The check should run one time after each SynqNet initialization. Use the MPI objects to read the axis ActualPosition and axis Origin offset if any. If an offset exists, the difference between raw MPI position and FB1.P will be near 1 rev.

| (ActualPosition-Orign) - FB1.P | ~= 2^{32}

8   SynqNet Drive Parameters

The drive's functionality is designed to use various drive parameters and instructions, which are communicated over SynqNet. Some parameters have read-only access, whereas other parameters may have read/write access. The parameters can be stored in non-volatile memory on the drive and are used on each power-up cycle.

Examples of read-only drive parameters are:

DRV.TYPE
STO.STATE
MOTOR.TEMP

Examples of read/write drive parameters are:

DIN1.FILTER
DRV.EMUEMODE
MOTOR.AUTOSET

Drives are shipped with motor parameters set to zero and application parameters set to default values. Parameters may be modified using AKD WorkBench, or by SynqNet parameter methods.

SynqNet parameter methods include:

- MPI function calls from customer application code. For example, mpiSqDriveParamSet()
- sqDriveConfig.exe command line utility (gets/sets parameter sets based on a *.dm (drive map) file)
- sqDriveParam.exe command line utility (get/set individual parameter)

For more information on SynqNet parameter methods visit : http://support.motioneng.com/Technology/SynqNet/drive_parameters.htm

Some SynqNet functions sqDriveConfig reference a "dm" (drive map) file to define a set of parameters.

The dm file uses an ascii format and is often a helpful reference to the programmer. An ascii editor may be used to modify the dm file. The dm file may contain multiple parameters set specific to different firmware versions (the format also allows multiple versions to reference the same parameter sets).

Each MPI release will ship with the latest known Kollmorgen_AKD.dm file. However, each AKD firmware release will generate an updated Kollmorgen_AKD.dm file which may not be in your MPI release. Check the Kollmorgen web site, or contact Kollmorgen support if you need an updated Kollmorgen_AKD.dm file.

> **NOTE**
>
> Supported parameters for a drive may be different, depending on the version of firmware.

8.1   SynqNet Supported Parameters

Most AKD parameters can be modified over SynqNet. There are three reasons why parameters may not be supported over SynqNet:

1. The feature may not be supported by AKD SynqNet. For example, velocity mode.
2. The feature may have an alternate method without parameters. For example, analog inputs and outputs.
3. The feature may be disabled while SynqNet is in operational cyclic mode. For example, service motion.

AKD SynqNet supports all AKD parameters except the following

- BODE.xxxx (Bode Plot)
- CS.xxxx (Controlled Stop)
- GEAR.xxxx (Gearing)
- GUI.xxxx (GUI)

- HOME.xxxx (Homing)
- HWLS.xxxx (HWLS)
- IP.xxxx (IP Networking)
- LOAD.xxxx (Load)
- MODBUS.xxxx (Modbus)
- MT.xxxx (Motion Tasking)
- PL.xxxx (Position Loop)
- PLS.xxxx (Programmable Limit Switch)
- REC.xxxx (Recorder)
- SM.xxxx (Service Motion)
- UNIT.xxxx (User units)
- VL.xxxx (Velocity Loop)

The following tables list the AKD parameters available using SynqNet parameter methods. A number of parameters will still be accessible (their values can be changed), but they will have no effect on the system. These parameter types are listed as NA (Not Available). All other SynqNet parameters retain the same parameter type as when analog and are listed as RW (Read/Write), RO (Read-Only), or CMD (Command).

> **NOTE**
>
> For some MOTOR parameters, the type will change between RO and RW depending on the setting of MOTOR.AUTOSET. This is reflected in the Motor parameter tables below.

The SynqNet Range column indicates any special range limits specific to AKDSyqnNet. Most parameter ranges are identical to an AKD analog drive.

For a detailed description of all AKD parameters see the Parameter and Command Reference Guide on kdn.kollmorgen.com.

AIN Parameters	SynqNet Type	SynqNet Range
AIN.CUTOFF	RW	-
AIN.DEADBAND	NA	-
AIN.DEADBANDMODE	NA	-
AIN.ISCALE	NA	-
AIN.MODE	RW	0
AIN.OFFSET	NA	-
AIN.PSCALE	NA	-
AIN.VALUE	NA (see AKD SynqNet I/O Mapping (➜ p. 18))	-
AIN.VSCALE	NA	-
AIN.ZERO	NA	-

AOUT Parameters	SynqNet Type	SynqNet Range
AOUT.CUTOFF	NA	-
AOUT.DEBUGADDR	NA	-
AOUT.DUBUGDATATYPE	NA	-

AOUT Parameters	SynqNet Type	SynqNet Range
AOUT.DEBUGSCALE	NA	-
AOUT.ISCALE	NA	-
AOUT.MODE	RW	12
AOUT.OFFSET	NA	-
AOUT.PSCALE	NA	-
AOUT.VALUE	NA (see AKD SynqNet I/O Mapping (➜ p. 18))	-
AOUT.VALUEU	NA	-
AOUT.VSCALE	NA	-

CAP Parameters	SynqNet Type	SynqNet Range
CAPx.EDGE	NA	-
CAPx.EN	NA	-
CAPx.EVENT	NA	-
CAPx.FILTER	NA	-
CAPx.MODE	NA	-
CAPx.PLFB	RO	-
CAPx.PREEDGE	NA	-
CAPx.PREFILTER	NA	-
CAPx.PRESELECT	NA	-
CAPx.STATE	RO	-
CAPx.T	RO	-
CAPx.TRIGGER	NA	-

DIN Parameters	SynqNet Type	SynqNet Range
DIN.HCMDx	NA	-
DIN.LCMDx	NA	-
DIN.ROTARY	RO	-
DIN.STATES	RO	-
DINx.FILTER	RW	-
DINx.INV	NA	-
DINx.MODE	RW	0

DIN Parameters	SynqNet Type	SynqNet Range
DINx.PARAM	NA	-
DINx.STATE	RO	-

DIO Parameters	SynqNet Type	SynqNet Range
DIO9.DIR	RW	0 to 1
DIO10.DIR	RW	0 to 1
DIO11.DIR	RW	0 to 1

DOUT Parameters	SynqNet Type	SynqNet Range
DOUT.CTRL	RW	1
DOUT.RELAYMODE	RW	-
DOUT.STATES	RO	-
DOUTx.MODE	RW	-
DOUT1.PARAM	NA	-
DOUTx.STATE	RO	-
DOUT1.STATEU	NA	-

DRV Parameters	SynqNet Type	SynqNet Range
DRV.ACC	RW	-
DRV.ACTIVE	RO	-
DRV.BLINKDISPLAY	CMD	-
DRV.CLRCRASHDUMP	CMD	-
DRV.CLRFAULTHIST	CMD	-
DRV.CLRFAULTS	CMD	-
DRV.CMDDELAY	NA	-
DRV.CMDSOURCE	RW	0
DRV.CRASHDUMP	CMD	-
DRV.DBLIMIT	RW	-
DRV.DEC	RW	-
DRV.DIR	NA	-
DRV.DIS	CMD	-
DRV.DISMODE	RW	0-2
DRV.DISSOURCES	RO	-

DRV Parameters	SynqNet Type	SynqNet Range
DRV.DISTO	RW	-
DRV.EMUEDIR	RW	-
DRV.EMUEMODE	RW	-
DRV.EMUETURN	RW	-
DRV.EMUERES	RW	-
DRV.EMUEZOFFSET	RW	-
DRV.EN	CMD	-
DRV.ENDEFAULT	RW	-
DRV.FAULTHIST	RO	-
DRV.FAULTS	RO	-
DRV.FEATURES	INFO	-
DRV.HANDWHEEL	RO	-
DRV.HELP	RO	-
DRV.HELPALL	RO	-
DRV.HWENMODE	NA	-
DRV.ICONT	RO	-
DRV.INFO	RO	-
DRV.IPEAK	RO	-
DRV.IZERO	RW	-
DRV.LIST	RO	-
DRV.LOGICVOLTS	RO	-
DRV.MEMADDR	RW	-
DRV.MEMDATA	RW	-
DRV.MOTIONSTAT	NA	-
DRV.NAME	RW	-
DRV.NVCHECK	RO	-
DRV.NVLIST	RO	-
DRV.NVLOAD	CMD	-
DRV.NVSAVE	CMD	-
DRV.ONTIME	RO	-
DRV.OPMODE	RW	-
DRV.PWD	RO	0
DRV.READFORMAT	RW	-
DRV.RSTVAR	CMD	-

DRV Parameters	SynqNet Type	SynqNet Range
DRV.RUNTIME	RO	-
DRV.SETUPREQBITS	RO	-
DRV.SETUPREQLIST	RO	-
DRV.STOP	NA	-
DRV.TEMPERATURES	RO	-
DRV.TYPE	RO	-
DRV.VER	RO	-
DRV.VERIMAGE	RO	-
DRV.WARNINGS	RO	-
DRV.ZERO	RW	-

FBUS Parameters	SynqNet Type	SynqNet Range
FBUS.PARAMx	RW	-
FBUS.PLLSTATE	RO	-
FBUS.PLLTHRESH	RW	-
FBUS.SAMPLEPERIOD	RW	-
FBUS.SYNCACT	RO	-
FBUS.SYNCDIST	RW	-
FBUS.SYNCWND	RW	-
FBUS.TYPE	RO	-

FB1 Parameters	SynqNet Type	SynqNet Range
FB1.P	R	64-bit count

IL Parameters	SynqNet Type	SynqNet Range
IL.BUSFF	RO	-
IL.CMD	RO	-
IL.CMDU	NA	-
IL.DIFOLD	RO	-
IL.FB	RO	-
IL.FF	RO	-
IL.FOLDFTHRESH	RW	-
IL.FOLDFTHRESHU	RW	-

IL Parameters	SynqNet Type	SynqNet Range
IL.FOLDWTHRESH	RW	-
IL.FRICTION	RW	-
IL.IFOLD	RO	-
IL.IUFB	RO	-
IL.IVFB	RO	-
IL.KACCFF	RW	-
IL.KBUSFF	RW	-
IL.KP	RW	-
IL.KPDRATIO	RW	-
IL.KPLOOKUPINDEX	RW	-
IL.KPLOOKUPVALUE	RW	-
IL.KPLOOKUPVALUES	RW	-
IL.KVFF	RW	-
IL.LIMITN	NA	-
IL.LIMITP	NA	-
IL.MFOLDD	RO	-
IL.MFOLDR	RO	-
IL.MFOLDT	RO	-
IL.MI2T	RO	-
IL.MI2TWTHRESH	RW	-
IL.MIFOLD	RO	-
IL.MIMODE	RW	-
IL.OFFSET	NA	-
IL.VCMD	RO	-
IL.VUFB	RO	-
IL.VVFB	RO	-

NOTE

Some MOTOR parameters change type to RO when MOTOR.AUTOSET is set to 1.

MOTOR Parameters	SynqNet Type	MOTOR.AUTOSET = 1	SynqNet Range
MOTOR.AUTOSET	RW		-
MOTOR.BRAKE	RW		-
MOTOR.BRAKERLS	NA		-
MOTOR.BRAKESTATE	RO		-

MOTOR Parameters	SynqNet Type	MOTOR.AUTOSET = 1	SynqNet Range
MOTOR.BRAKEIMM	RW		0 to 1
MOTOR.CTF0	RW	RO	-
MOTOR.ICONT	RW	RO	-
MOTOR.IDDATAVALID	RO		-
MOTOR.INERTIA	RW	RO	-
MOTOR.IPEAK	RW	RO	-
MOTOR.KE	RW		-
MOTOR.KT	RW	RO	-
MOTOR.LQLL	RW	RO	-
MOTOR.NAME	RW		-
MOTOR.PHASE	RW		-
MOTOR.PITCH	RW		-
MOTOR.POLES	RW	RO	-
MOTOR.R	RW	RO	-
MOTOR.RTYPE	RW		-
MOTOR.TBRAKEAPP	NA		-
MOTOR.TBRAKERLS	NA		-
MOTOR.TBRAKETO	RW		-1 to 30000
MOTOR.TEMP	RO		-
MOTOR.TEMPFAULT	RW		-
MOTOR.TEMPWARN	RW		-
MOTOR.TYPE	RW		-
MOTOR.VMAX	RW	RO	-
MOTOR.VOLTMAX	RW	RO	-
MOTOR.VOLTMIN	RW		-
MOTOR.VOLTRATED	RW		-
MOTOR.VRATED	RW		-

PWM0 Parameters	SynqNet Type	SynqNet Range
PWM0.DUTYCYCLE	RW	0 to 100000
PWM0.MODE	RW	0 to 1
PWM0.PERIOD	RW	1000 to 500000

REGEN Parameters	SynqNet Type	SynqNet Range
REGEN.POWER	RO	-
REGEN.REXT	RW	-
REGEN.TEXT	RW	-
REGEN.TYPE	RW	-
REGEN.WATTEXT	RW	-

STO Parameters	SynqNet Type	SynqNet Range
STO.STATE	RO	-

SWLS Parameters	SynqNet Type	SynqNet Range
SWLS.EN	RW	-
SWLS.LIMIT0	RW	-
SWLS.LIMIT1	RW	-
SWLS.STATE	RO	-

USER Parameter	SynqNet Type	SynqNet Range
USER.INT	RW	-

VBUS Parameters	SynqNet Type	SynqNet Range
VBUS.HALFVOLT	RW	-
VBUS.OVFTHRESH	RO	-
VBUS.OVWTHRESH	RW	-
VBUS.RMSLIMIT	RO	-
VBUS.UVFTHRESH	RW	-
VBUS.UVMODE	RW	-
VBUS.UVWTHRESH	RW	-
VBUS.VALUE	RO	-

WS Parameters	SynqNet Type	SynqNet Range
WS.ARM	CMD	-
WS.DISARM	CMD	-
WS.DISTMAX	RW	-
WS.DISTMIN	RW	-

WS Parameters	SynqNet Type	SynqNet Range
WS.IMAX	RW	-
WS.MODE	RW	-
WS.NUMLOOPS	RW	-
WS.STATE	RO	-
WS.T	RW	-
WS.TDELAY1	RW	-
WS.TDELAY2	RW	-
WS.TDELAY3	RW	-
WS.VTHRESH	RW	-

About KOLLMORGEN

Kollmorgen is a leading provider of motion systems and components for machine builders. Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions that are unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

Join the Kollmorgen Developer Network for product support. Ask the community questions, search the knowledge base for answers, get downloads, and suggest improvements.

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