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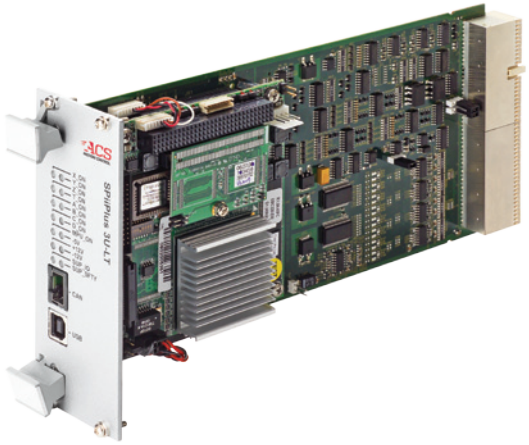
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MC4U

EtherCAT® Master and Drive Controllers



The SPiiPlusNT (NT - Network Controller) is designed for incorporation in the MC4U. Once plugged into an MC4U, the MC4U becomes also an EtherCAT master designated MC4Unt. It manages the EtherCAT network with up to 32 axes of motion and countless number of I/Os and sensor modules. The SPiiPlusNT also includes Servo Processors for controlling local drives that reside within the same MC4Unt enclosure.

Like all SPiiPlus products, the SPiiPlusNT uses the same ACSPL+ high level programming language and is supported by the same set of software tools such as the SPiiPlus MMI Application Studio and API for host application development.

The SPiiPlusDC (DC - Drive Controller) is also designed for incorporation in the MC4U. Once plugged into an MC4U, the MC4U becomes an EtherCAT slave designated MC4Udc. The MC4Udc is a drive module with up to 8 drives.

The SPiiPlusNT Master generates the motion trajectories for all the axes, transmitting the data over the EtherCAT network, and the SPiiPlusDC executes the real-time control of the drives and axes.

The following versions are available:

1. **SPiiPlusNT-HP** - High Performance EtherCAT master, with 4 or 8 built in drives for applications with up to 32 network axes
2. **SPiiPlusNT-LT** - Economical EtherCAT master controller, with 4 or 8 built in drives for applications with up to 32 network axes
3. **SPiiPlusNT-LD** - High Performance EtherCAT master Linear Drive controllers, with 4 or 8 built in drives for applications with up to 32 network axes
4. **SPiiPlusDC-HP** - High Performance EtherCAT slave Drive Controllers, 4 and 8 axis versions
5. **SPiiPlusDC-LT** - Economical EtherCAT slave Drive Controllers, 4 and 8 axis versions
6. **SPiiPlusDC-LD** - High Performance EtherCAT slave Linear Drive controllers, 4 and 8 axis versions

CE, UL

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ACS MOTION CONTROL

Profile Generation

Motion Profile generation rate: 1 or 2kHz (see HW guide for details)

Servo

A standard comprehensive set of powerful algorithms to enhance accuracy, move & settle time, smooth velocity, stability and robustness.

- Advanced PIV cascaded structure
- Loop shaping filters
- Gain Scheduling
- Gantry MIMO control
- Dual feedback / loop control
- Disturbance rejection control

Optional Servoboost™ algorithem that provides better, more consistent servo performance, insensitive to noise and large changes in the system.

Feedback

Feedback types: incremental digital encoders, Sin-Cos encoders (optional), Absolute encoders (optional) analog inputs and 3 hall inputs for initiating commutation.

Incremental Digital Encoder:
One per axis, A&B,I; UP/DN,I; CLK/DIR,I.
Type: RS-422.
Max. rate: 40 million encoder counts/sec.

Sin-Cos Encoder (optional)
SPiiPlusNT/DC-HP/LD:
Multiplication factor: From x4, to-DC-LT: -x4,096, DC-HP- x65,536
Rate: $250*10^3$ or (LD version) $4*10^6$ sine periods/sec
Sin-Cos offset compensation: programmable, ±500mV.
Maximum acceleration with Sin-Cos encoder: 10^8 sine periods/second^2

SPiiPlusNT/DC-LT:
Multiplication factor: x4 - x1,024
Sin-Cos offset compensation: N/A
Rate: $125*10^3$ sine periods/sec
Maximum acceleration with Sin-Cos encoder:10^8 sine periods/second^2

Hall inputs:
Quantity: A set of three per axis.
Single-ended, 5V, source, opto-isolated
Input circuit current: <7mA.

Absolute Encoder:
Absolute encoders (optional): EnDat 2.1(Digital)/2.2, Smart-ABS, Panasonic, Biss-C, Hiperface.

Drive Interface

Analog commands: Two per axis
For SPiiPlusNT-LD only:
Type: ±10V,differential, 16 bit resolution.
Offset compensation: programmable, 0.3mV resolution.

PWM Drive Commands: 3 per axis. PWM Switching Method, Advanced unipolar space vector modulation.
PWM Switching frequency: 40kHz on the motor. Current loop sampling rate: 20kHz
Control algorithm: Field Oriented control with PI filters
Current feedback resolution:
SPiiPlusNT/DC-HP: 16 bit
SPiiPlusNT/DC-LT: 12 bit

Digital I/O

Note: It is recommended to use a dedicated supply for digital I/O. See Power Supplies section.

Safety Inputs:
Emergency stop input:
Type: two-terminal, sink or source, opto-isolated.
Left and right limit inputs:
One pair per axis
Type: single-ended, sink (default) or source, configurable by jumper, opto-isolated.
Supply: 5V or 24V
Input current: <15mA

Digital Inputs:
General purpose inputs:
Quantity: eight. Type: single-ended, 5V or 24V, sink (default) or source, optoisolated.
Input current: <15mA
MARK (position capture) inputs:
Quantity: Up to four. Refer to SPiiPlusNT user manual for detailed information.
Type: RS-422
Propagation delay: <0.1 µsec
Note: additional four MARK inputs (MARK2), single-ended and opto-isolated, are available through general purpose digital inputs IN4, IN5, IN6 and IN7

Digital Outputs:
General purpose outputs:
Quantity: eight. Type: single-ended, 5V or 24V, sink (default) or source, optoisolated, 100mA per output
Mechanical Brake Outputs:
Quantity: one per axis. Type: single-ended, 5V, source only, opto-isolated, 7mA per output. By default, configured as dynamic brake.
Note: general purpose digital outputs can be configured as Mechanical Brake Outputs
PEG (Position Event Generator) pulse outputs:
For details, refer to "SPiiPlusNT PEG and MARK Operations" Application Note.
Quantity: Up to six. Refer to SPiiPlusNT user manual for detailed information.
Type: RS-422. Propagation delay: <0.1µsec.
PEG pulse width: 25nsec to 1.7msec.
PEG position accuracy: ±1 count at speeds up to 18,000,000 counts/sec.
PEG state outputs: Quantity: Up to six. Refer to SPiiPlusNT user manual for detailed information.
Type: RS-422. Propagation delay: <0.1µsec
HSSI Expansion Channels: Up to three. Each channel provides 64 input bits and 64 output bits per channel, sampled and updated every 50µS
Type: RS-422

Analog I/O

Analog Inputs:
Unused Sin-Cos encoder inputs can be used as general purpose analog inputs.
Quantity: up to 16
Type: 1Vptp, differential
Resolution and SNR:
SPiiPlusNT/DC-HP: 16 bit, SNR>72db
SPiiPlusNT/DC-LT: 12 bit, SNR>52db
General purpose ±10V analog inputs:
SPiiPlusNT/DC-HP:
Quantity: four and additional up to four when axes number 3 and/or 7 Sin-Cos encoders are not used. These inputs can be used as general purpose. Type: ±10V, differential
Resolution: 16 bits
SPiiPlusNT/DC-LT:
Quantity: up to four when axes number 3 and/ or 7 Sin-Cos encoders are not used. These inputs can be used for general purpose. Type: ±10V,differential.
Resolution: 12 bits

Analog Outputs:
General purpose Type: ±10V, PWM filtered
Quantity: 2, 4
Resolution: 10bit

Communication Channels

Serial: two RS-232. Up to 115,200bps
Ethernet: one, TCP/IP, 10/100 Mbits/sec
Simultaneous communication through all channels is fully supported. Modbus protocol as master or slave is supported via all channels
EtherCAT: One, 100 Mbit/sec, supporting CoE and FoE protocols

MPU

User Memory: RAM: 128Mb
Flash: 128Mb
Powerup Time: 25-100 sec. according to system and network configuration

Power Supplies

Power Supply Voltage/Current: +5Vdc (±10%)/2.7A, -5Vdc (±10%)/0.1A, ±12Vdc (±5%)/0.6A. Supplied internally from the power supply module enclosed in the MC4U
configuration I/O Supply Voltage/Current: +5Vdc (±10%)/1A, or 24Vdc (±10%)/1A
Safety Supply Voltage/Current: +5Vdc (±10%)/1A, or 24Vdc (±10%)/1A.
Six LEDs on the front panel indicate the status of all above power supplies.

Standards & Environment

Operating Temperature: 0°C to 55°C
Storage Temperature: - 40°C to 70°C
Humidity: 90%RH, non-condensing
The controllers are CE (EMC), UL certified and RoHS compliant

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