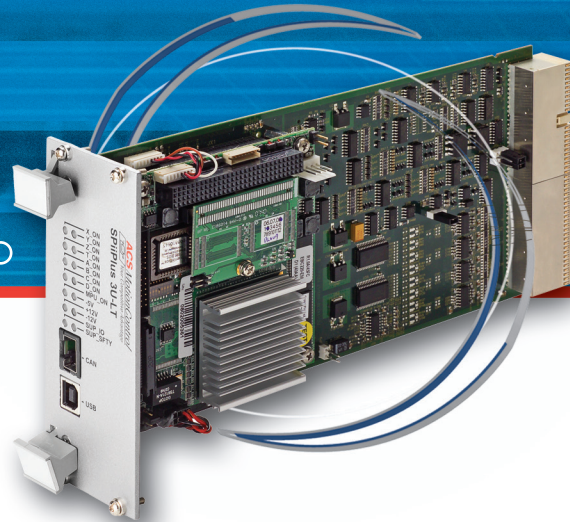


MC4U

EtherCAT Master and Drive Controllers

SPiiPlusNT - EtherCAT Master Controller
SPiiPlusDC - EtherCAT Drive Controller



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-32 - High Performance EtherCAT master for applications with up to 32 axes
2. SPiiPlusDC-HP - High Performance EtherCAT slave Drive Controllers, 4 and 8 axis versions
3. SPiiPlusNT-LT-32 - Economical EtherCAT master controller for applications with up to 32 axes
4. SPiiPlusDC-LT - Economical EtherCAT slave Drive Controllers, 4 and 8 axis versions

CE

Profile Generation

Motion Profile generation rate: 1kHz

Control

Position (P) loop + velocity loop (PI, 2nd order low-pass and Notch filters), BiQuad filters, Disturbance Rejection Algorithm, Gantry Control Algorithm.

Sampling Rate: 20 kHz.

Dual Loop Support.

Note: each dual loop consumes an additional axis feedback connector, unless an HSSI-ED2 is used for interfacing with one of the feedbacks.

Feedback

Feedback types: incremental digital encoders, Sin-Cos 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:

Multiplication factor: $x4 - x65,536$.

Rate: 250×10^3 or 2.5×10^6 sine periods/sec

Sin-Cos offset compensation: programmable, $\pm 500\text{mV}$.

Maximum acceleration with Sin-Cos encoder: 10^8 sine periods/second².

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/second².

Hall inputs:

Quantity: A set of three per axis. Single-ended, 5V, source, opto-isolated

Input circuit current: $<7\text{mA}$.

Drive Interface

Analog commands: two (commutation commands) per axis.

SPiiPlusNT/DC-HP:

Type: $\pm 10\text{V}$, differential, 16 bit resolution.

Offset compensation: programmable, 0.3mV resolution.

SPiiPlusNT/DC-LT: N/A

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 IO. 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: $<15\text{mA}$.

Digital Inputs:

General purpose inputs:

Quantity: eight. Type: single-ended, 5V or 24V, sink (default) or source, opto-isolated. Input current: $<15\text{mA}$.

Mark (position capture) inputs:

Quantity: Up to four. Refer to SPiiPlusNT user manual for detailed information. Type: RS-422. Propagation delay: $<0.1 \mu\text{sec}$.

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, opto-isolated, 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:

Quantity: Up to six. Refer to SPiiPlusNT user manual for detailed information.

Type: RS-422. Propagation delay: $<0.1 \mu\text{sec}$.

PEG pulse width: 25nsec to 1.7msec.

PEG position accuracy: ± 1 count at speeds up to 18,000,000 counts/sec.

PEG states outputs: Quantity: Up to six. Refer to SPiiPlusNT user manual for detailed information.

Type: RS-422. Propagation delay: $<0.1 \mu\text{sec}$.

HSSI Expansion Channels: Up to three. Each channel provides 64 input bits and 64 output bits per channel, sampled and updated every 50 μS . 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 $>72\text{db}$

SPiiPlusNT/DC-LT: 12 bit, SNR $>52\text{db}$

General purpose $\pm 10\text{V}$ 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: $\pm 10\text{V}$, 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: $\pm 10\text{V}$, differential. Resolution: 12 bits.

General purpose $\pm 10\text{V}$ analog outputs:

SPiiPlusNT/DC-HP:

Quantity: up to four. Type: $\pm 10\text{V}$, differential, 16 bit resolution.

SPiiPlusNT/DC-LT: N/A

Communication Channels

Serial: two RS-232. Up to 115,200bps.

Ethernet: one, TCP/IP, 10/100 Mb/s/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: 25sec.

Power Supplies

Power Supply Voltage/Current: +5Vdc ($\pm 10\%$)/2.7A, -5Vdc ($\pm 10\%$)/0.1A, $\pm 12\text{Vdc}$ ($\pm 5\%$)/0.6A. Supplied internally from the power supply module enclosed in the MC4U configuration

I/O Supply Voltage/Current:

+5Vdc ($\pm 10\%$)/1A, or 24Vdc ($\pm 10\%$)/1A.

Safety Supply Voltage/Current:

+5Vdc ($\pm 10\%$)/1A, or 24Vdc ($\pm 10\%$)/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) certified and RoHS compliant.