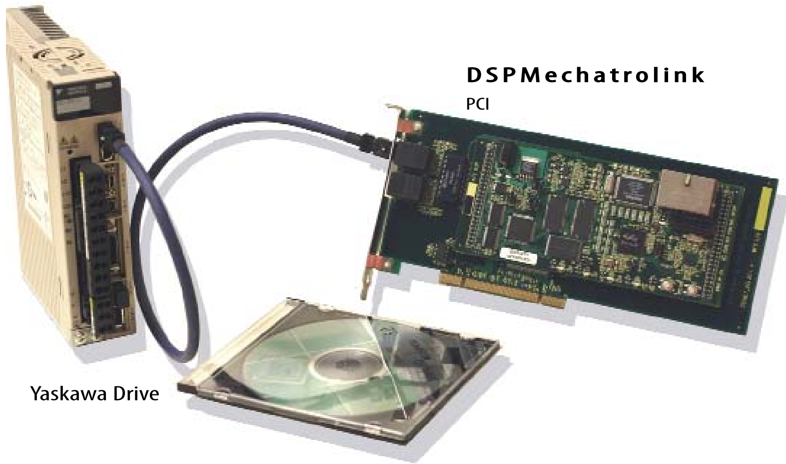
DSPMechatrolink

Mechatrolink III Master Motion Controller and Network Manager



Features

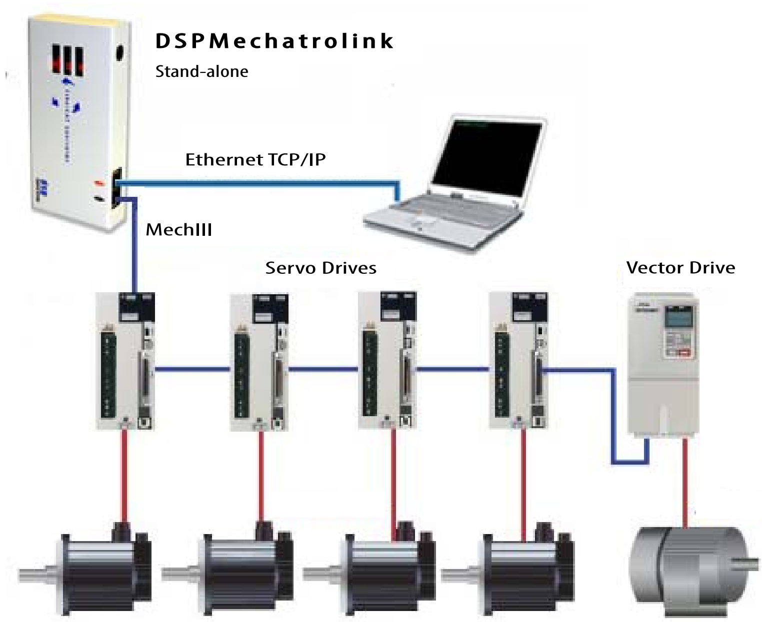
- Fully compliant with MIII standard
- Fully compliant with IEEE 802.3 standard
- Simultanous use of MIII and TCP/IP
- Maps Mechatrolink III I/O onto DPRAM
- 100 Mbps of Isochronous speed
- Maps automation commands onto network
- Includes Ethernet Gateway
- Offered in PCI and Stand-alone forms
- Offered with a DSP Motion Control Based HW or Soft Motion (where PC generates motion commands.)

Industrial ethernet for automation of Motion, PLC and other MIII Network Nodes

DSPMechatroLink offers a simple, low-cost digital alternative to a cumbersom noise prone analog system. By combining the power of Ethernet with Yaskawa's MIII protocol that is both simple and reliable, a complete network solution has been created. Of all the digital networking standards that have been created over the years, one of the oldest, most flexible, and most reliable is Industrial Ethernet. This product is avaliable on PCI and stand-alone forms and is accompanied by an application software that runs on Windows 7. The robustness of MIII Ethernet is attested to by the fact that it continues to be adapted to new applications, and is constantly being upgraded to provide new capabilities. **DSPMechatrolink** is offerered in three platforms of

1) PCI-based DSP motion controller
2) Stand-alone DSP motion controller
3) Soft motion controller (meaning, motion commands are generated inside a PC by the user program.)

Transmission Cycle (ms)	Maximum Nodes
0.25	8
0.5	14
1	20
2	32



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Any interface between a high-speed motion controller and its motor drives must meet two basic criteria. It must be fast, and it must be reliable. Conceptually, a serial digital interface would seem to be a natural fit for this application, but technology has been slow to catch up with the particular requirements of the motion control industry. Most motor drives still operate with an analog voltage command input and parallel encoder feedback. While it is hard to imagine a faster interface over copper, data corruption and cable complexity are ubiquitous problems.

Real-time Industrial Ethernet

The Mechatrolink III protocol, developed by Yaskawa, is a real-time industrial Ethernet protocol. Most people are now familiar with the term "Ethernet". This technology is very prevalent in home and office networks as the mechanism for PCs to be a part of a network, which usually involves access to the Internet and internal networked servers. However, because this technology has been so developed and tested, it now presents itself as a solution for industrial networking as well. The components, such as Ethernet cabling and PHY interfaces, are well-tested and widely available.

No concrete definition for "Real-time" among vendors

While there is no concrete definition across the industry for "Real-time", the concept is universally known. What is desired is for communication to happen "when scheduled". The controller in your industrial network will be what schedules the communication. Since the communication occurs over and over, repeatedly, this is termed a "cycle". A typical cycle might be 1 millisecond. Communication from a controller to a slave(s) will start at the beginning of a cycle, and then the controller will wait until the next cycle to begin the next round of communication.

Jitter can be thought of as the difference between when an event (such as updating of data) occurred and when the event should have occurred.

The Mechatrolink III protocol can be operated in either synchronous (real-time) or asynchronous mode. With synchronous mode, data is sent from the master to the slave(s) every cycle with very low jitter. At the same time, data is being sent from the slave(s) to the master (again, with very low jitter). Certainly, if you have an application which requires adherence to strict timing requirements, synchronous mode is the way to go.

Mechatrolink III offers a range of servo commands that Mechatrolink III devices must support. These allow for Torque Control, Speed Control, and Position Control. The commands are 32 bytes in length. An additional 16 bytes can be used for sending a subcommand. Similarly, the response from the slave can be either 32 or 48 bytes in length. With a 32 byte response, three 4-byte monitoring fields can be given to the master. With the addition of a subcommand, an additional three fields of 4 bytes each can be returned from the slave.

Mechatrolink III also has the following properties:

- One controller can be responsible for up to 62 slaves.
- Cycle times as low as 31.25 microseconds, or as high as 64 milliseconds can be achieved. (However, note that not all slaves are guaranteed to support these times.)
- Slaves can be configured in a line or star topology.
- Since it is Ethernet-based, the transmission rate is 100 Mbps.

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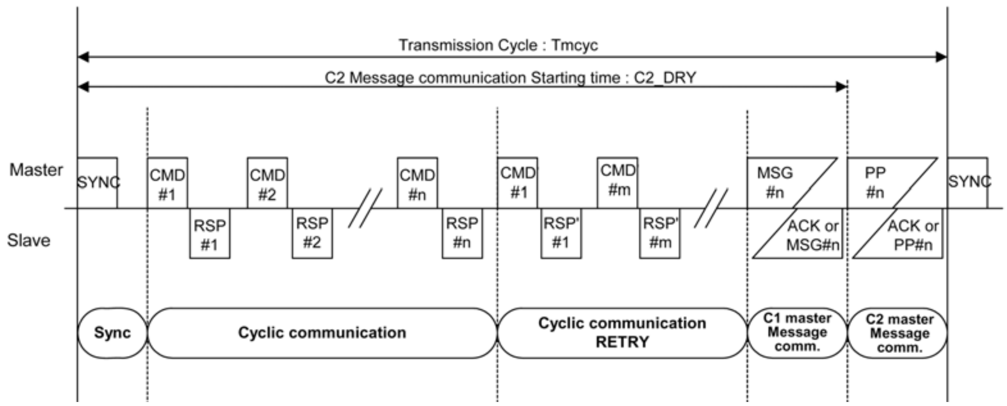
Mechatrolink III Master Motion Controller Transmission Cycle

Here is how the transmission cycle works. After broad casting the synchronous frame at the start of the transmission cycle, the C1 master **DSPMechatroLink**, monitors the response from the slaves and determines the slaves to be retry targets. Slaves from which data reception was abnormal or slaves from which the response data was not received within the response monitoring time are taken as retry targets.

Cyclic communication



After finishing the exchange of command data and response data for all slaves, the C1 master re-sends the command data to the retry target slaves to receive the response data. After finishing the retry, the C1 master performs C1 message communication if sufficient time is available before the scheduled start of C2 (e.g., monitoring laptop computer) message communications.

If the C1 master completes cyclic communication and C1 message communication before the time to start sending C2 message, it sends a message token to the C2 master to prompt C2 message communication.

The C2 master performs C2 message communication at the C2 message communication start time or when it receives the message token from the C1 master. C2 message communication continues until the end of the transmission cycle.

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