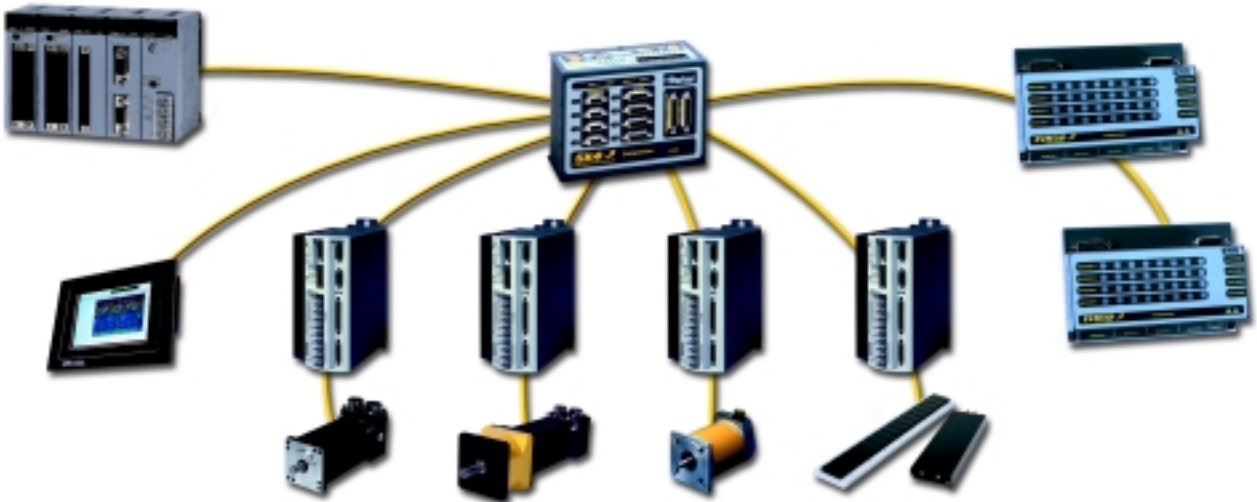


Four Machine Control Architecture Types

Machine control is the control of all elements of a machine or stand alone system. The elements can include motion control, control of the inputs and outputs, control of analog inputs and outputs from more advanced sensors, interface to the human machine interface (HMI), and communication with the enterprise level of the factory or other equipment.

As a motion control company, Compumotor engineers our products to tightly couple with machine control products. The following presentation over the next three pages highlight four common approaches for a machine control solution. Displayed with each machine control architecture is the 6K solution and the options for connection between the devices.

Motion Controller Based Machine Control



System Description

Many applications from low to moderate complexity can eliminate a separate machine control component and use the motion controller as the sole machine control. Motion controller capabilities have been expanding rapidly and are capable of controlling inputs and outputs as well as motion parameters. For many applications, this can provide the tightest coupling between a motion function and a machine control function.

For this type of control scheme the motion controller must be a stand-alone controller. A stand-alone controller has its own operating system and must be able to be installed as an individual component. In addition, the controller must be able to interface to human machine interface for data entry and be capable of efficiently controlling inputs and outputs.

This control scheme can also be used to break apart a complex machine into several simpler machine control components. In this case, communication between the sub-components must be fast and efficient.

Key Advantages with this Control Scheme:

- Best value for low to moderate complexity applications
- One programming platform for all machine control functions
- Tight coupling between motion control and machine control

Typical Applications:

- Less than 256 I/O points
- Tight coupling of machine control and motion control like electronic cam control

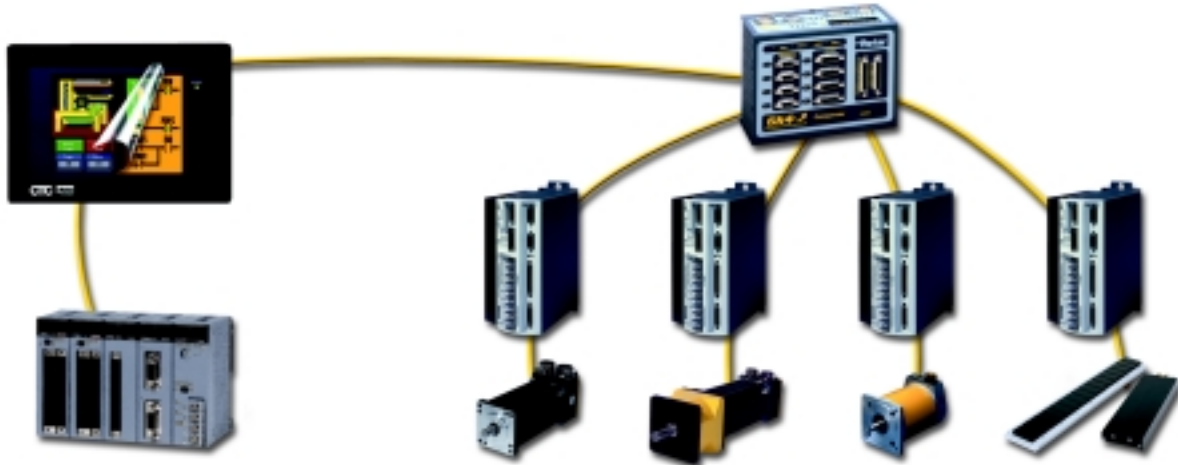
How the 6K Fits:

The 6K has several unique features to help integrate it easily as a machine control solution:

- PLC scan mode allows high scan rates on specified I/O points or registers
- Expandable I/O of the 6K with the EVM modules allows customization and expandability up to 256 I/O points
- Drivers to CTC's full family of human machine interfaces

Four Machine Control Architecture Types

PC-Logic Control (PCLC) Based Machine Control



System Description

Traditional industrial control methodologies meet with PC industry driven performance and price with the PCLC control type. By using a software-based PLC, or "soft control", cost effective PLC replacement is a reality.

MachineLogic™ is a DOS-based real time operating system control program that was developed by CTC, a division of Parker Hannifin. The program provides deterministic control that runs on any PC or any CTC PowerStation human-machine interface (HMI). As a real-time system, a hard disk is not required for operation removing a potential source of failure. Because soft control is provided with all the popular PLC programming languages, there is no need for incremental learning.

This solution provides the open environment inherent with PCs without having to reeducate the whole factory. This approach enhances supportability and minimizes the learning curve for programming and developmental tools.

This solution fully integrates HMI with the machine control in a tightly coupled and rugged package.

This machine control method is especially cost effective when used with a PowerStation HMI. For the same price of a HMI comes all the processing power of a machine controller.

Key Advantages With This Control Scheme:

- CTC PowerStation flash memory is more rugged than a PC hard disk
- Real time and deterministic behavior (Windows™ NT cannot guarantee this)
- Maintainable just like a PLC (programming language already known to maintenance and programmers)
- Reliable HW and SW integration when using PowerStation
- Standard network support for ease of information flow
- Common development environments save time and money
- New engineers are more familiar with PCs than PLCs
- System solution available through one vendor (motion, HMI, PLC), all fully integrated

Typical Applications

- Less than <500 I/O points
- Needed combination of HMI with the control engine or needed higher speed graphics

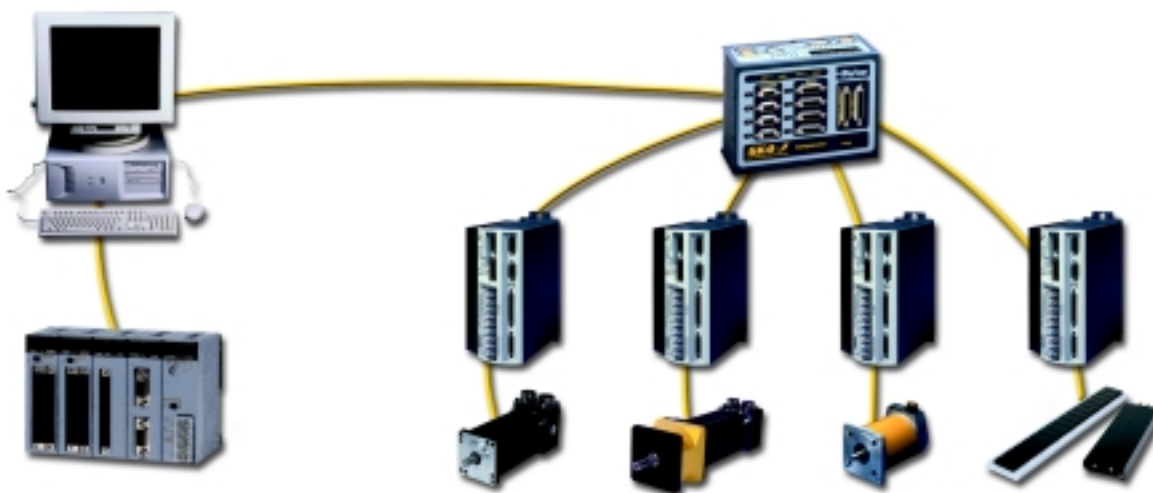
How the 6K Fits

- The 6K connects directly to the CTC PowerStation family with either an Ethernet or RS232/485 connection. Drivers are available with each PowerStation to make integration a snap.

Discover How The 6K Motion Controller Can Solve Your Next Application. Call 1-800-358-9070 Today.

Four Machine Control Architecture Types

PC-Based Machine Control



System Description

As a machine controller, no other device can compete with a common PC or Industrial PC in the areas of flexibility and the sheer versatility it can offer. Since the early 1980's, when the PC was first used to control industrial automation systems, industry has witnessed a technology explosion from extremely slow and limited memory machines into the very powerful and productive machines available today. A direct result of this increased power is that many industrial automation manufacturers have turned to the PC as a machine controller.

The PC is the natural choice for data intensive applications and also applications that benefit from front-end Windows-based software and operator interfaces. Many applications have specific data handling and visual display requirements that cannot be handled by other types of machine control.

Additionally, industrial automation users have found that there is a multitude of communication protocols for the PC providing several connectivity options. Bus-based cards, which fit into an empty computer expansion slot, RS-232, RS-485 serial communications, and most recently high-speed Ethernet communication are all used to communicate between the PC and control hardware.

Compumotor offers a line of motion control for any connectivity need. ISA based cards and RS-232/RS-485 controllers are available in multi-axis controllers. Ethernet is the latest protocol to be developed and offers a simple, inexpensive yet very high-speed connection to the PC and industrial networks.

Key Advantages With This Control Scheme

- Handles data intensive applications
- Variety of connectivity options
- Front end software can be customized
- New engineers are more familiar with PCs than PLCs

Typical Applications

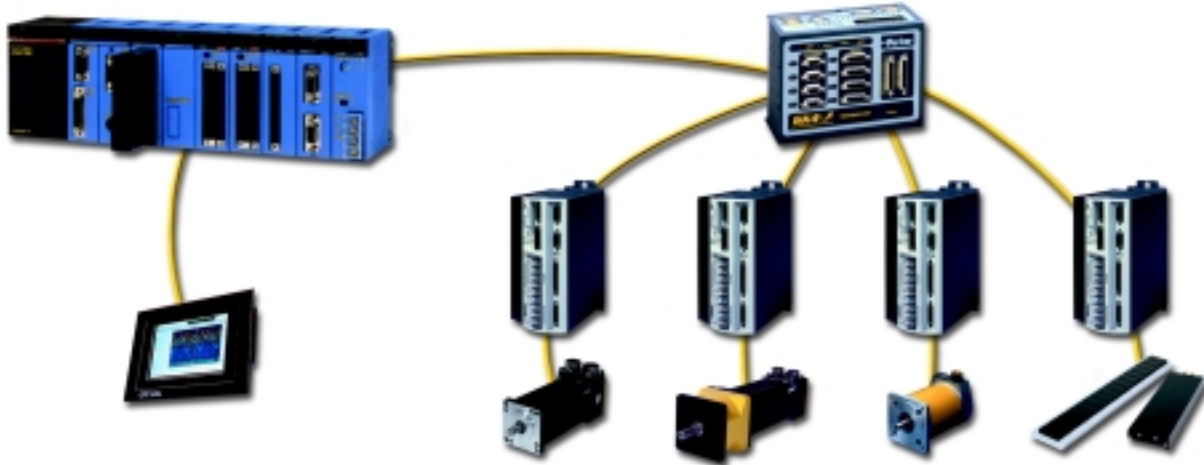
- Data acquisition/processing in addition to machine control—handling large amounts of data
- Networking of many machines or to other factory activities—connectivity to plant information technology system
- Need for central control of I/O devices distributed over a large area

How the 6K Fits

- The 6K communicates with any PC system via a 10Base-T Ethernet port making it a solution for bus-based machine control schemes. Connections are established by using the 6K Communications Server which is included on the Motion Planner™ CD ROM. The 6K Communications Server is a 32-bit OLE automation (COM) server which facilitates communications between 6K controllers and PC software applications. It is compatible with any 32-bit software application or programming environment which can utilize an OLE automation component, including Visual Basic, Visual C++, and Delphi. Individual commands or entire motion programs can be sent from the computer program to the 6K Controller. Likewise, alarm information and fast status updates are sent from the 6K back to the computer.

Four Machine Control Architecture Types

PLC-Based Machine Control



System Description

The programmable logic controller or PLC is the most common type of machine control and by far the most prevalent. PLCs were first developed in the late 1960s as an alternative to the relay cabinets that were the most common solution for machine control. Thirty years later, PLCs have had continual iterative developments and are now extremely reliable and flexible devices for machine control.

PLCs are perfect for applications requiring hundreds or thousands of I/O points and can control complex processes. Their weakness however has been in interfacing with complex equipment outside of the PLC rack such as vision systems and motion control equipment. Traditionally, the PLC used discrete outputs to communicate to the peripheral devices. This placed a great limitation on the type of communication that was possible and made the transmission of numerical values very inconvenient. Often an ASCII module was added to the PLC solely to communicate to the device.

The recent advent of the fieldbus promises to greatly increase the flexibility of communication by developing standards for communication that could bring many elements together.

Key Advantages with this Control Scheme:

- High reliability
- Proven technology
- On line editing

Typical Applications

- I/O centric applications (I/O control is the most critical criteria)
- Process control
- Greater than 500+ I/O points

How the 6K Fits

The 6K has several unique features to help integrate it easily with a PLC based system:

- Fieldbus interface cards for Profibus-DP and Interbus-S allow new levels of compatibility
- Functions controllable via discrete inputs and outputs

Discover How The 6K Motion Controller Can Solve Your Next Application. Call 1-800-358-9070 Today.