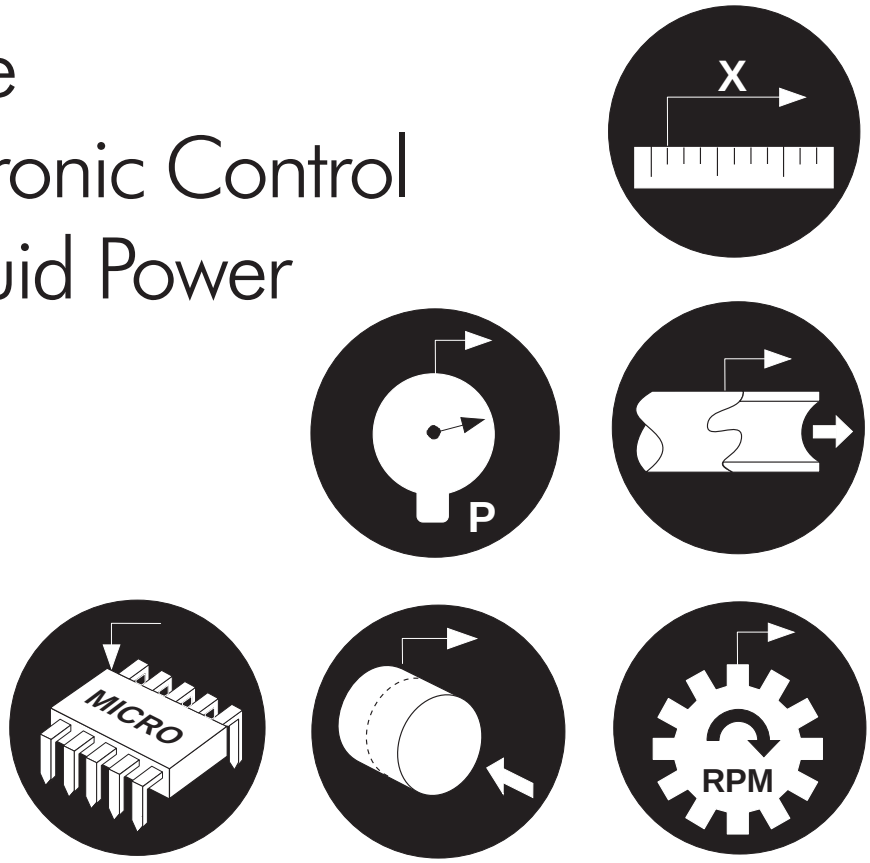
Your Guide to the Electronic Control of Fluid Power



The members of the National Fluid Power Association (NFPA) have prepared this application as an introduction to the electronic control of fluid power. The application and components described here are representative — electrohydraulics and electropneumatics can be effectively utilized in countless processes, and components are available in many different sizes and configurations.

NFPA's manufacturers invite you to contact them for additional information.

National FLUID POWER Association®

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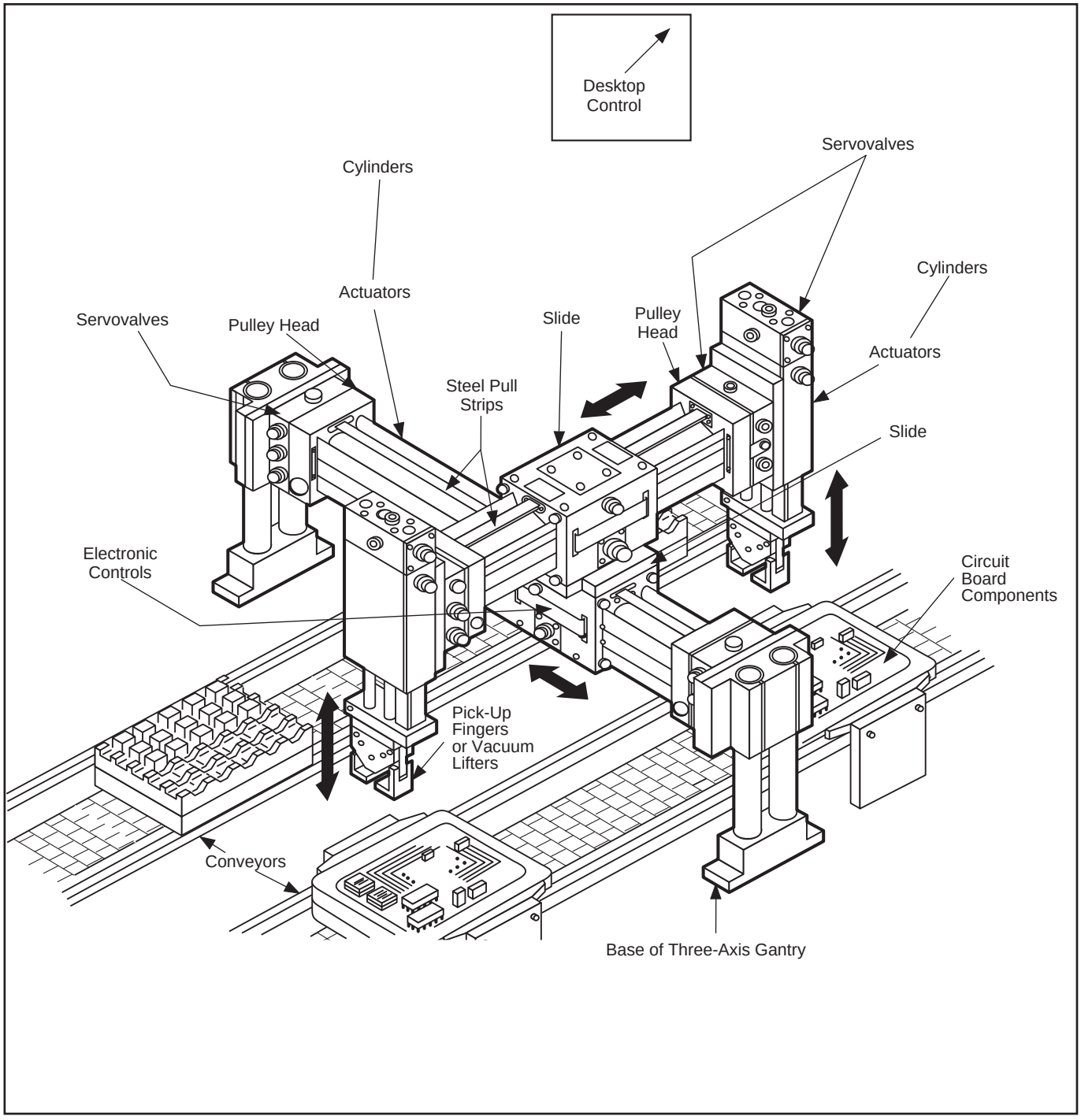
Electropneumatics at Work

Component Inserter



The Problem

Manufacturers of printed circuit boards use dedicated high speed insertion machinery for picking up and placing electronic components. Precision must be high because the pins of many components are placed into holes with spacings as close as 0.1 inch, and the locations can vary with each new board that is run.

Some of these components are large or odd-sized including relays, transformers and special connectors. In the recent past, hand-placement often was required.

Its Solution

Now there is an automated pick-and-place system that will do all these things and more. It is a component inserter (see the illustration) created by an electronics manufacturer who chose an unusual programmable electropneumatic three-axis gantry as the heart of the system.

Pneumatics easily fulfilled the speed requirements and was environmentally acceptable as well. One major challenge was to counteract the inherent compressibility of air, and to insure highly accurate, infinite multi-point stopping ability.

Electronic control solved all the problems, and achieved repeatable accuracy to as close as 0.0004 inches for velocities up to 11.5 feet/second and payloads up to 45 pounds. Even acceleration and deceleration can be controlled. All of the instructions are programmed externally through a personal computer.

Standard vacuum cups or mechanical fingers (end-effectors) lift the electronic components from trays on adjacent conveyors. The end-effectors are raised and lowered with two electropneumatic linear actuators, and the back-and-forth motions (X and Y) are made with electropneumatic rodless linear actuators. In concept, each of the two rodless actuators has a slide carriage, to which steel pull strips are attached. The hidden ends of the pull strips are attached to a piston within the long body of each actuator, and this piston creates motion when pressurized at one end or the other.

Electropneumatic servovalves and optical linear position sensors are integral with each actuator, and a microcontroller keeps them working together. By rapidly controlling air pressure on both ends of the piston, the final position is reached and held. In addition, there is an internal spring-operated braking system to lock the load in place.

It all works well and, with this combination of electronics and compressed air, average overall cycle time turns out to be about two seconds per placement.

Related Applications

Electropneumatic actuators that move fast and stop quickly at any position suggest innumerable new applications. Included are motion control systems for pick-and-place assemblers, multi-color multi-piston inkpad printers, and robots.

How Electronics Improved This Application

- Speed
- Accuracy
- Automation
- Adjustable sequence and timing
- Flexible placement of control
- Monitoring and diagnostics
- Standard components
- Upgradability

Components Used in Pneumatic Systems*

Actuators
After Coolers
Air Compressors
Air Dryers
Air Line Lubricators
Controls (electronic) and Software
Cylinders
Filters
Filter/Regulators
FRLs
Fittings
Gauges
Grippers
Hose
Manifolds
Motors
Mufflers
Regulators
Rotary Actuators
Seals
Shock Absorbers
Slides
Switches
Tubing
Vacuum Products
Valves

***Click here to access the NFPA Fluid Power Product Locator, which includes information about and links to NFPA member companies.**

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