

MDCM

MICRO-DRIVE™ DIGITAL VALVE CONTROLLER

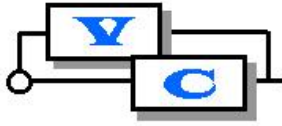


Advantages and Features

- Direct digital drive of hydraulic valves
- Precise, repeatable. digital valve control
- High resolution micro-step valve driver
- Programmable servo parameters
- Serial communication access to all control commands and parameters

User Benefits

- All functions integrated in one package
- Same source for valve and controller
- Reduced equipment maintenance
- Tighter control = shorter machine cycles
- No analog adjustments = drift free operation
- Easy, understandable interface



Victory Controls, LLC

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Overview

Victory Controls MICRO-DRIVE Digital Valve Controllers are microprocessor based controls used to operate MICRO-DRIVE™ Servo and Proportional Valves. Each controller may be configured with pre-engineered software modules to meet application requirements for open or closed loop control of velocity, position or force using hydraulic pumps, cylinders, motors and rotary actuators. Used as stand alone controls or direct interfaces to computers or programmable controllers these Digital Valve Controllers are new solutions to many of the difficult applications found in fluid power, automation applications.

Controller Operation

The Victory Controls MICRO-DRIVE Valve Controller line is comprised of three basic electronic hardware configurations and a continuously expanding library of software modules. The hardware is oriented around a specific type of feedback: 1) analog, 2) incremental optical encoder, or 3) linear sonic probes. Software modules provide a structured approach to implementing each system with regard to the type of control function required, i.e., open or closed loop, velocity, position or force.

The MICRO-DRIVE Controller operates Victory Controls' line of MICRO-DRIVE™ Digital Servo (DS) and Digital Proportional (DP) Valves. The controller was designed to allow flexibility in the choice of command and feedback signals. It can be used to implement open and closed loop systems for control of position, velocity and force. It can be used as a stand-alone controller or in conjunction with other control devices. Up to 30 controllers may be connected via daisy chained serial communications.

Each MICRO-DRIVE system consists of the main controller and one or two options in a modular control enclosure. The Analog/Encoder option reads in analog voltages and/or encoder signals. The analog and encoder sections may be used separately or together. The Analog/Encoder option may be used in conjunction with the Digital I/O Option. The Sonic Probe option reads in signals from sonic probe transducers, it also may be used in conjunction with the Digital I/O option.

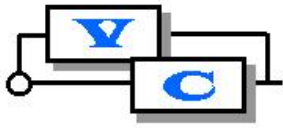
The Main Controller

The main controller provides the following functions: The microprocessor, Program memory (EPROM), Non-volatile parameter memory, an RS-232 serial port, An INHIBIT VALVE input, a FAULT output, and the microstepping valve driver.

The EPROM stores the software module or control function. Each software module is stored on a different EPROM. Simple exchange of the EPROMs will allow implementation of a different software control function. The user sets the parameters of the MICRO-DRIVE Controller over the RS-232 serial port. These parameters are then stored in the non-volatile RAM. The RAM is battery-backed and will retain the parameters even when power is turned off. The INHIBIT VALVE input and FAULT output are optically isolated emergency signals the user can use to control and monitor the MICRO-DRIVE Controller option.

A switch bank on the main controller allows the user to set operational parameters of the controller. Twelve switches select controller address (for multi-controller applications), valve type, digital I/O enable, baud rate, valve polarity, feedback polarity, and communications mode. These switches are only set during installation. The microstepping capability of the main board allows the controller to step the stepping motor on the valve in very small, repeat-able increments. The resulting placement of the valve spool allows for fine control of flow. This precise stable command of flow gives the DS and DP Valves unsurpassed performance.

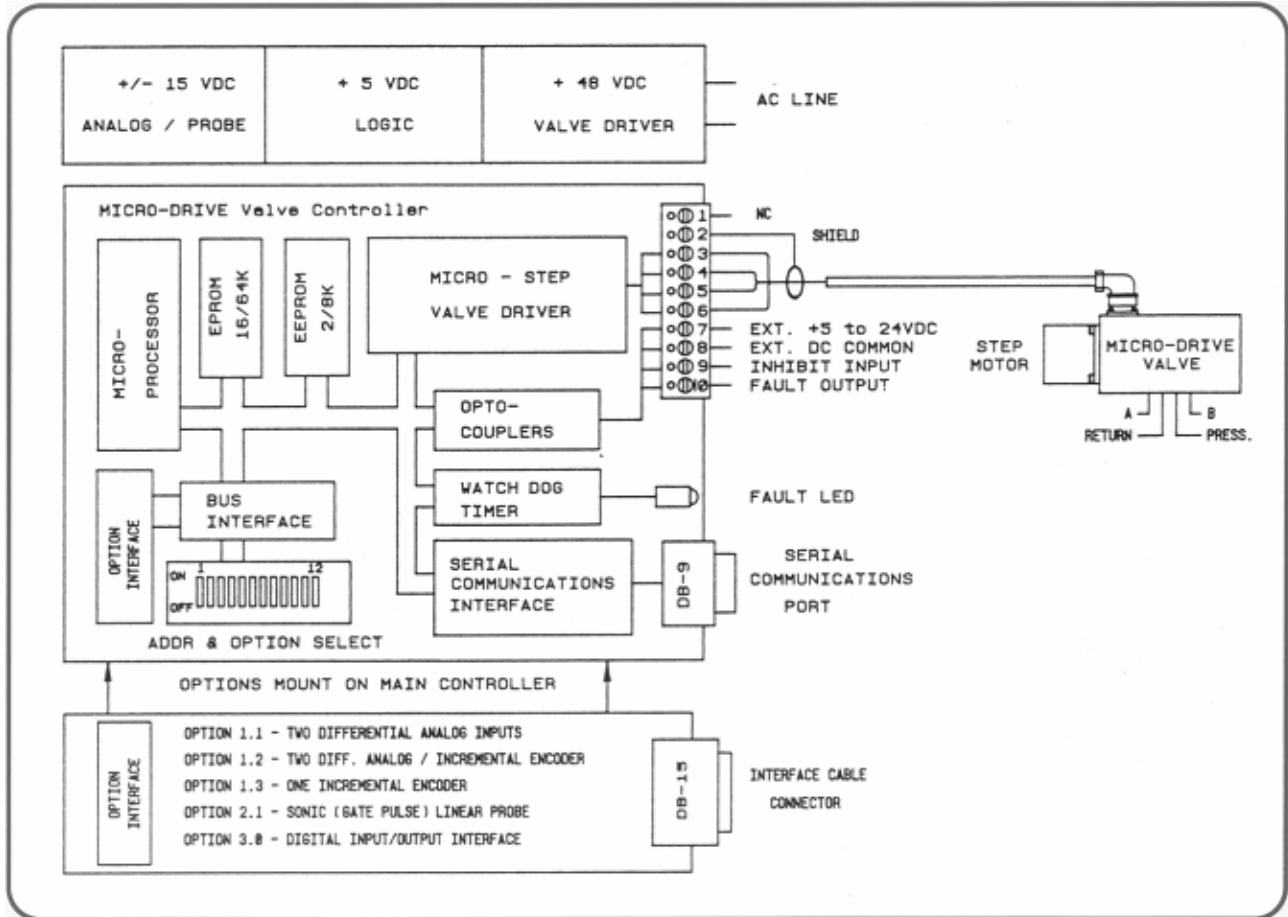
Digital Fluid Controls for Position, Velocity and Force



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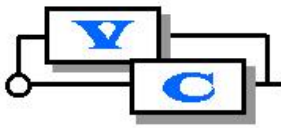
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Hardware Block Diagram with Options

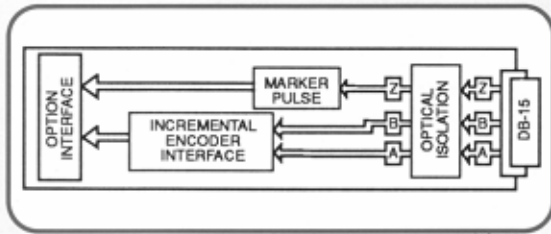


Feedback and IO Options

The options interface to the main controller and provide the necessary circuitry for reading feedback sensors or supplying extra digital inputs and outputs, as required for the command input and feedback. All power supplies required to operate the internal logic transducers and valve driver are an integral part of the MICRO-DRIVE Controller Module. The only external supply needed may be a 5 to 24 VDC supply if the INHIBIT VALVE input, FAULT output, or Digital I/O options are used. Available options are illustrated on the next page.

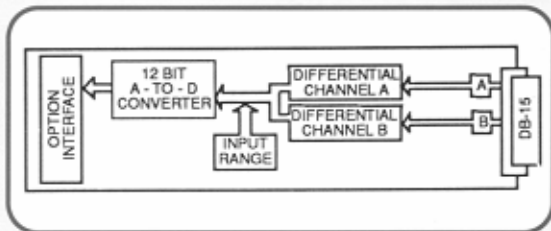


Encoder Option



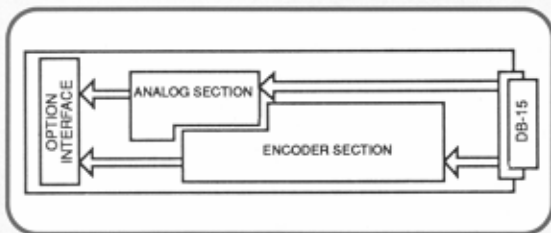
The Encoder Option reads in velocity and position information from rotary or linear feedback devices which have quadrature pulse output signals. The differential digital inputs provide a high degree of immunity in a noisy industrial environment. Final positioning accuracy is dependent upon the encoder resolution.

Analog Option



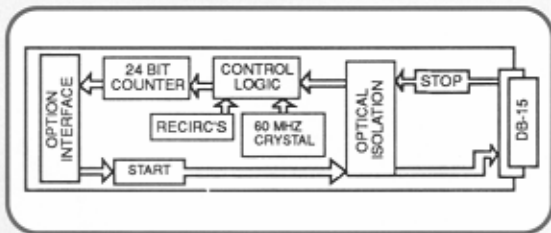
The Analog Option allows the controller to read in two analog signals. The analog input ranges are ± 10 VDC, ± 5 VDC, 0 to 10 VDC, or 4 to 20 mA. The analog signals may be command inputs or feedback signals depending upon the software module. Analog signals allow direct interface with tachometers, flow meters, linear potentiometers, pressure transducers, programmable logic controllers or computer-based systems with analog outputs.

Analog / Encoder Option



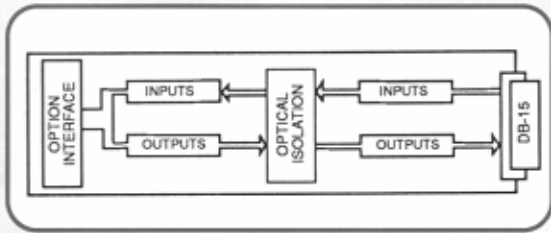
The Analog and Encoder Option sections may be used separately or together, depending on the software module.

Sonic Probe Option

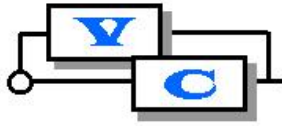


The Sonic Probe Option (digital gate pulse) provides a unique solution for applications that use hydraulic cylinders and require absolute position feedback. The Sonic Probe Transducer uses electrical and mechanical waves to measure the position of a magnet attached to the piston of the cylinder. This type of device may also be used in applications using hydraulic motors with lead-screws or reciprocating mechanical systems. Victory Controls guarantees compatibility with certain Temposonic® and Balluff® transducers.

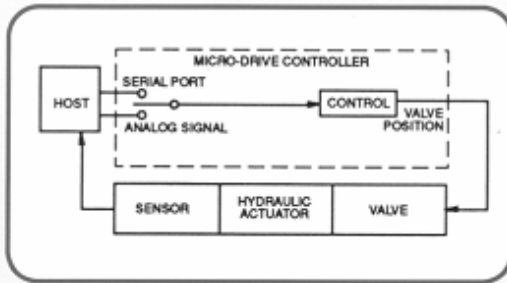
Digital I / O



The Digital I/O Option provides optically-coupled inputs and outputs that are used to improve the communication time of critical data and simplify the interface with Programmable Logic Controls. There are 16 discrete inputs, 8 discrete outputs, and 2 analog outputs. The discrete inputs may be used to initiate actions or send data. The discrete outputs signal system status and the analog outputs provide a continuous reading of two system parameters. The exact definitions of the I/O option are determined by the software module. External supplies are needed to supply the discrete inputs and outputs (5 to 24 VDC).

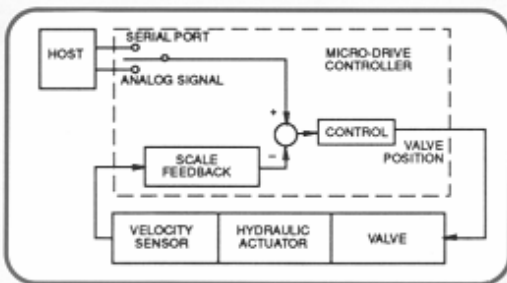


Open Loop Valve Positioning



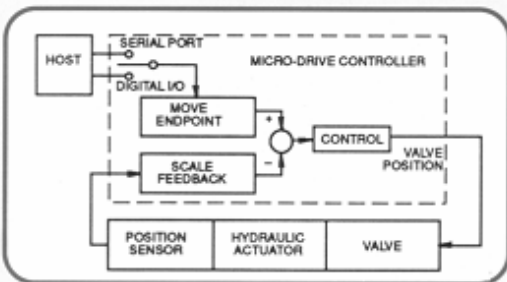
This software module is a simple open loop valve controller. The command input is an analog signal. The controller positions the valve according to the analog signal or a serial command. The valve may be operated in a four-way mode using ± 10 VDC or ± 5 VDC, or the valve may be operated in an offset mode using 0 to 10 VDC or 4 to 20 mA. Typical applications are systems with the loop closed outside the MICRO-DRIVE Controller. They may control flow, pressure, temperature or anything that can be regulated by a programmable controller, personal computer, or process controller.

Closed Loop Velocity



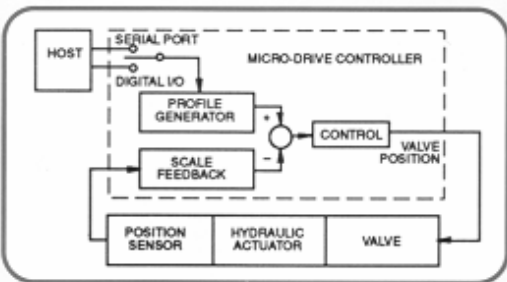
This software module closes the loop around system velocity. The input is either an analog signal or a serial command. The feedback signal is an incremental encoder or analog tachometer. The rate of change of the velocity and system overshoot are controlled by a command rate parameter and the control gains. A typical application for this software module would be a system where the velocity is controlled, but not the position. The system will only stop by requesting a zero velocity.

Closed Loop Position Indexing (point-to-point)



Move parameters are transmitted over the serial port. The feedback position is measured through either an incremental encoder or a sonic probe. A positioning move is implemented without velocity control. Acceleration and deceleration are functions of the valve rate limit and the control gains. The move is completed as fast as the system will permit. During long moves, the speed is limited only by the stroke limit on the valve. A typical application is a point-to-point positioning system where movement is done as fast as possible without velocity regulation.

Closed Loop Position Indexing (with profiling)



This software module has the added feature of defining the acceleration time, velocity, and deceleration time for a move. These parameters define a move profile. In addition to the positional control, velocity is also controlled during the move. Velocity may vary with each move. A typical application is a positioning system where varying speed and/or accelerations are needed. This software module gives the user the most control over system movements.

Custom Software for Positioning/Velocity/Force Control

Each custom software module draws upon a common set of pre-engineered routines which are stored in the controllers memory (EPROM). These routines are combined with the hardware options available through the controller to provide flexible solutions for many application. Sometimes an application occurs which is beyond the scope of the existing product line. In these cases, Victory Controls will quote price and delivery for a custom software module to fit the exact application.