DIGITAL MOTOR CONTROL DATA SHEET

Description:

The Digital Motor Control utilizes a custom ASIC control chip that can be programmed to operate the motor in a variety of closed loop and open loop control modes. The digital control offers fault output signals and optional encoder feedback signals. Several levels of encoder resolution are available depending on the option selected at time of order. The NT Dynamo with Digital Motor Control comes preprogrammed for analog control interface and closed loop speed control mode (using hall signal or encoder depending upon the option selected at time of order).

By using the optional RS232 interface kit (Hurst part number 120034) and a computer running Windows® 95 or greater, the Digital Motor Control can be reprogrammed for other control methods and operating modes. Once the control configuration has been changed and saved to the ASIC, the motor can be operated in the selected control mode. If desired, motors can be preconfigured at our factory per your specifications. Contact Hurst Manufacturing for additional programming information.

Environment:

The NT Dynamo uses a TENV (totally enclosed non-ventilated) non-gasket construction. Installation and operating conditions should not exceed the recommended values for humidity and temperature. Contact the Hurst engineering department regarding any special installation issues you may have regarding vapors, oils or dust.

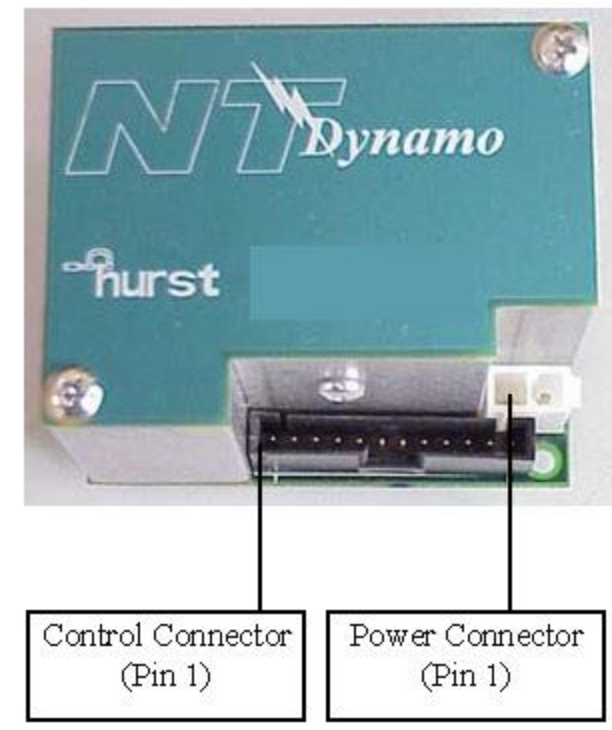
Storage Temp.: 32-158°F (0-70°C) Humidity: 90% Max. Non-condensing Operating Temp.: 32-104°F (0-40°C)

Power:

DC power must be connected to the 2-pin connector on the drive printed circuit board. Observe the correct polarity when making this connection. Filter capacitors are supplied internal to the NT Dynamo for increased reliability under typical power conditions. Excessive amounts of voltage ripple can cause shortened product life.

Minimum DC Voltage: 10Vdc Maximum DC Voltage: 48Vdc

Connector	Pin #	Function	Mating Connector	Mating Terminal	Recommended Wire Size	Cable Length
Power	1	V_s	Molex 39-01-2020	Molex 39-00-0039	18 AWG	30 ft. Max[1]
	2	$V_{s(RTN)}$				
Control	1	+5V Output[2]	Molex 50-57-9412	Molex 16-02-0103	22 AWG	30 ft. Max[1]
	2	0-5V Input				
	3	0-10V Input				
	4	$V_{(RTN)}$				
	5	Encoder B				
	6	Encoder A				
	7	Transmit Data Out				
	8	Receive Data In				
	9	Run/Stop				
	10	Fwd/Rev				
	11	PWM Input				
	12	Fault Output				



Notes

1) Longer cable runs may require a larger wire size to maintain the correct input voltage level and a signal amplifier / conditioner to avoid erroneous signal values. For cable runs longer than 3 ft, shielded wire is recommended.
2) This output is not to be used for powering other circuitry. It is intended for use with a potentiometer (1kΩ minimum, 10kΩ recommended) for speed input and control switches only (See figure 1).

Control Methods:

Analog

The user interface includes two analog inputs, 0-5V and a 0-10V input. The 0-5V and 0-10V inputs share common circuitry and therefore cannot be used at the same time. The unused input should be left open. The impedance of the 0-5V input is 20KΩ. The impedance of the 0-10 volt input is 40KΩ. When analog control is selected, the 0-5V or 0-10V input will provide the magnitude of the command input. A 0 volt input will be interpreted as zero command. A 5 or 10 volt (depending on which input command pin is used) input will be interpreted as maximum command.

The Run/Stop pin is used to enable the drive. A high level signal on the Run/Stop pin causes the drive to start. A low level signal on the Run/Stop pin causes the drive to stop controlling the motor, thus allowing the motor to coast. This line has an internal 4.7KΩ pull down. The minimum high level signal is +3.5Vdc. The maximum low level is +1.0Vdc. The 4.7KΩ pull down requires the pin to be driven by a circuit capable of sourcing at least 1mA.

The Fwd/Rev input is used in conjunction with the analog input to determine the direction in which the command input should be applied (Fwd meaning clockwise motor shaft rotation when viewing the motor from the lead end). A high level signal commands the forward direction. This line has an internal 4.7KΩ pull down. The minimum high level is +3.5Vdc. The maximum low level is +1.0Vdc. The 4.7KΩ pull down requires the pin to be driven by a circuit capable of sourcing at least 1mA.

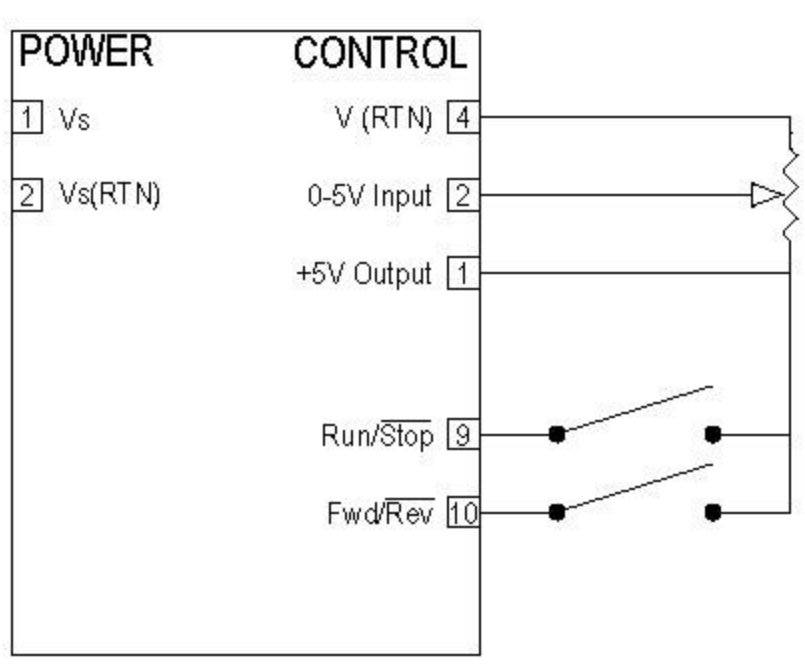


Figure 1
0-5V Input (Typical Connections)

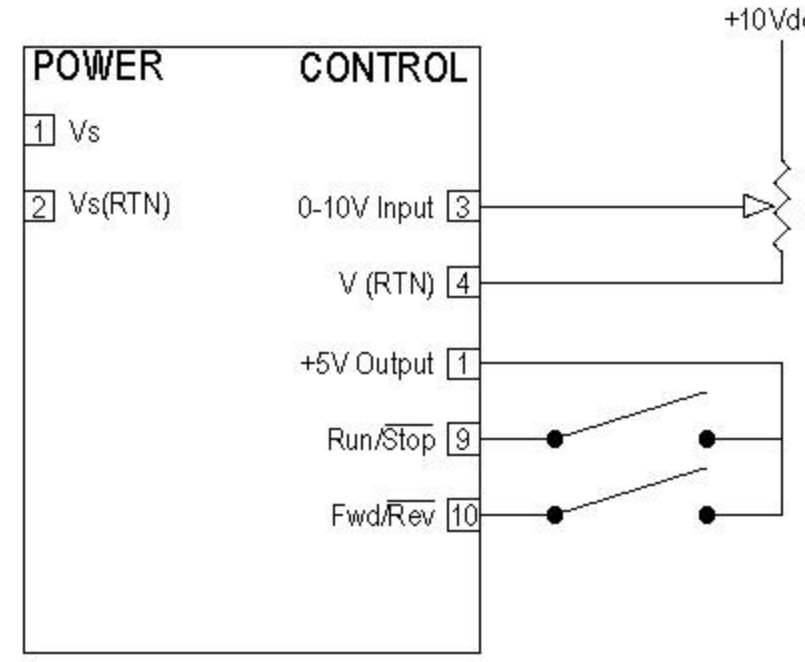


Figure 2
0-10V Input (Typical Connections)

PWM

The PWM input is able to function as a command input in all three operating modes as determined by the programming setup. For user input apply an active high PWM signal at 105 Hz to 4 kHz to the PWM input pin. (105 Hz gives maximum command resolution). A 0% duty cycle input indicates maximum command in the counterclockwise direction when viewing the motor from the lead end. A 50% duty cycle input indicates minimum command. A 100% duty cycle input indicates maximum command in the clockwise direction when viewing the motor from the lead end.

A high level on the Run/Stop enables the drive (See 'Analog' section above for details). When the PWM Input is used as the command input the Fwd/Rev input is redundant and will be ignored.

Serial Port

NT Dynamo motors utilizing the Digital Control can be controlled via the Hurst RS232 interface kit (Hurst Part Number 120034) with the Windows® based program for easy user interface. The signals at the control connector are at 5V levels and are NOT compatible with RS-232 signals. Connecting RS-232 signals to these lines may damage the motor control and/or other device. OEMs desiring to use this interface with custom hardware/software should contact Hurst Manufacturing.

Preset Constant

Using the Windows® based program the drive can be programmed to a predetermined command level and direction when the control is powered.

Pass Through

PWM pass through accepts a user supplied PWM signal on the PWM input pin of the user interface. The PWM signal is directly passed to the inverter via the commutation logic of the Digital Motor Control. This control method is a form of voltage control, which in combination with the quadrature encoder outputs allows the user to close a speed loop with maximum bandwidth. A 50% duty cycle on the PWM Input pin applies zero volts to the motor. A 100% duty cycle applies full voltage in the clockwise direction when viewing the motor from the lead end. A 0% duty cycle applies full voltage in the counterclockwise direction when viewing the motor from the lead end. The PWM frequency for this mode should be 15 – 25 kHz.

Operating Modes:

All modes are capable of 4 quadrant operation.

Speed

The digital control can implement closed loop speed control using the hall or encoder signals. Steady state speed is maintained within ± 3% from 1% to 100% of rated torque.

Torque

Closed loop torque control will be implemented using a combination of bus current feedback and feed forward motor torque profiles stored within the digital control.

Voltage

Open loop voltage control varies the percentage of the bus voltage applied to the motor depending on the user input.

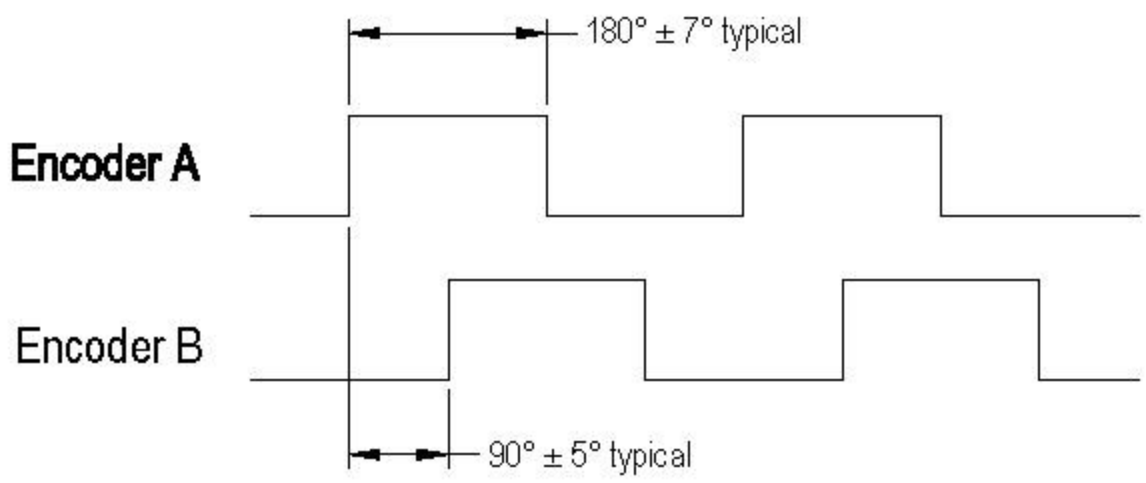
Outputs:

Encoder Output

The drive may contain a optional shaft mounted optical encoder. The encoder outputs two channel quadrature signals from which direction and speed can be determined. These outputs can be used by the motor control to close the speed loop. The signals are also available to the user to close a speed loop external to the Digital Motor Control.

Encoder Type	Incremental	
Output Format	Two Channel Quadrature	
Output Type	Square Wave	
Frequency Response	20 kHz	(Velocity (rpm) X N)/60 N= Number of Counts per Revolution

CCW Direction viewed from Lead End
Figure 2



Fault Output

The Fault output of the user interface shall transmit PWM signals indicating fault states of the drive. All PWM levels defined for the Fault output are active low at the Fault output pin of the user interface. A 0% PWM level (constant 5Vdc signal) indicates no faults. The fault output is an open collector output which needs to be pulled up to a positive power supply in the users equipment which is referenced to the common of the motor control (i.e. no isolation is involved). The value of the resistor used depends on the voltage the pull up is connected to. The current should be limited to 1mA. The maximum voltage is 40Vdc.

No faults

The Fault output pin shall output a 0% duty cycle

Drive not enabled

The Fault output pin shall output a 50% duty cycle

Motor stalled

The Fault output pin shall output a 70% duty cycle

For More Information Visit The Website at www.hurst-motors.com or Contact Hurst Engineering at 812-385-2564