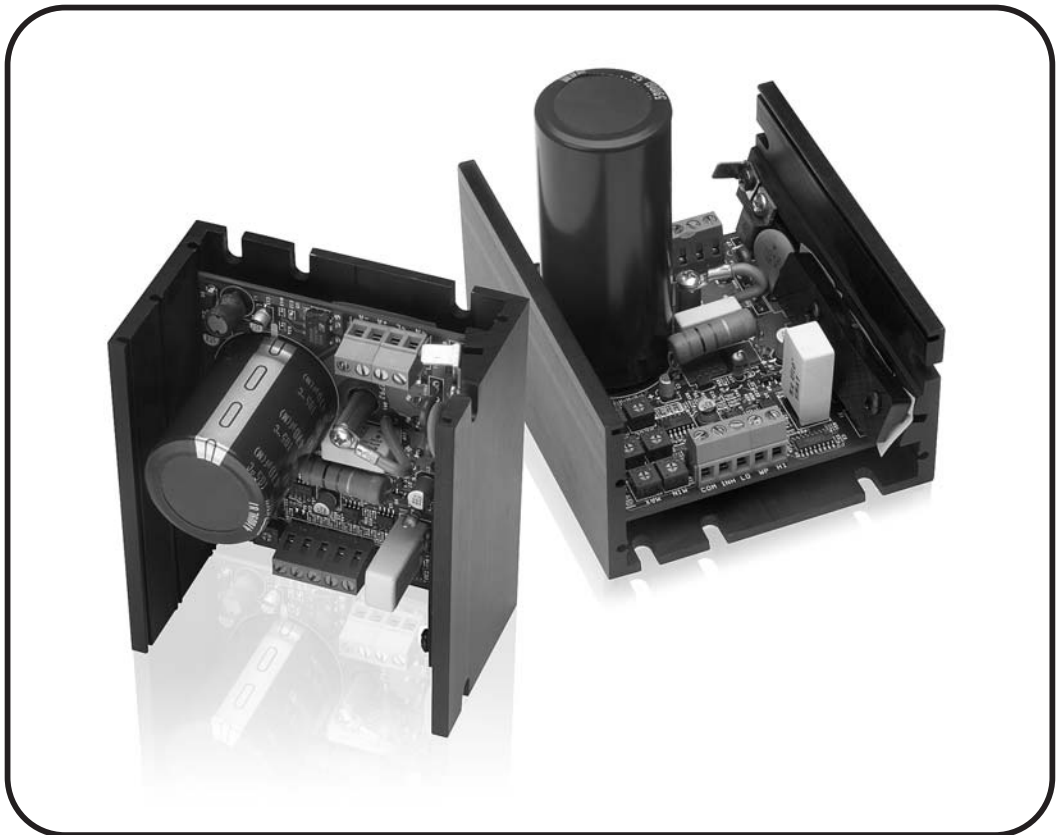


DPW CONTROL SERIES

DART

CONTROLS

Instruction Manual



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QUICK JUMP

What models and options are available?

See page 4.

Looking for detailed specifications?

See page 12.

Want to get started fast?

See basic electrical hook-up details on page 5, 6 & 7.

See mechanical installation details on page 3 & 4.

Need Help?

See troubleshooting on page 11.

WARRANTY

Dart Controls, Inc. (DCI) warrants its products to be free from defects in material and workmanship. The exclusive remedy for this warranty is DCI factory replacement of any part or parts of such product which shall within 12 months after delivery to the purchaser be returned to DCI factory with all transportation charges prepaid and which DCI determines to its satisfaction to be defective. This warranty shall not extend to defects in assembly by other than DCI or to any article which has been repaired or altered by other than DCI or to any article which DCI determines has been subjected to improper use. DCI assumes no responsibility for the design characteristics of any unit or its operation in any circuit or assembly. This warranty is in lieu of all other warranties, express or implied; all other liabilities or obligations on the part of DCI, including consequential damages, are hereby expressly excluded.

NOTE: Carefully check the control for shipping damage. Report any damage to the carrier immediately. Do not attempt to operate the drive if visible damage is evident to either the circuit or to the electronic components.

All information contained in this manual is intended to be correct, however information and data in this manual are subject to change without notice. DCI makes no warranty of any kind with regard to this information or data. Further, DCI is not responsible for any omissions or errors or consequential damage caused by the user of the product. DCI reserves the right to make manufacturing changes which may not be included in this manual.

WARNING

Improper installation or operation of this control may cause injury to personnel or control failure. The control must be installed in accordance with local, state, and national safety codes. Make certain that the power supply is disconnected and the power ON indicator is off before attempting to service or remove any components!!! If the power disconnect point is out of sight, lock it in disconnected position and tag to prevent unexpected application of power. Only a qualified electrician or service personnel should perform any electrical troubleshooting or maintenance. At no time should circuit continuity be checked by shorting terminals with a screwdriver or other metal device.

INTRODUCTION

The DPW Series controls are PWM DC controls that are designed to meet and exceed the industry standards of reliability and performance that you expect.

- The compact, surface mount design comes in an industry standard footprint.
- Dart's unique Power Supply Regulator Circuit keeps the power supply charged when voltage drops suddenly to provide a smooth ramp-down and avoid sudden speed "bumps"
- The "Pre-Charge" circuit allows a power-up without tripping breakers due to high inrush current
- The Cycle to Cycle Current Limit circuit enables the DPW controls to be less susceptible to short circuit damage

CONTROL FEATURES

MINIMUM SPEED - Allows adjustment of the motor speed up to 30% of max set point when the speedpot is set at minimum (CCW). This also permits the user to eliminate "Deadband" on the main speedpot, permitting zero calibration. Clockwise rotation of "MIN" trimpot increases speed.

MAX SPEED (Maximum Speed) - Allows adjustment of the motor speed maximum set point when the speedpot is set at maximum (CW) rotation. The maximum set point can be adjusted from 45% to 110% of rated output. Rotation of the "MAX" trimpot in the clockwise direction increases the maximum motor speed.

I.R. COMP (Speed Regulation) - This allows for adjustment of the circuitry that controls the speed regulation of the motor. The circuitry controls armature speed by changing the armature voltage to compensate for increased or decreased motor loading. Clockwise rotation of the "IR COMP" trimpot will increase compensation.

CUR. LIM. (Current Limit) - Provides protection from excessive armature current by limiting the maximum armature current the control can provide. Current Limit is preset at 125% of rated output current. Clockwise rotation of the "CUR. LIM." trimpot increases the torque (current) the control will provide.

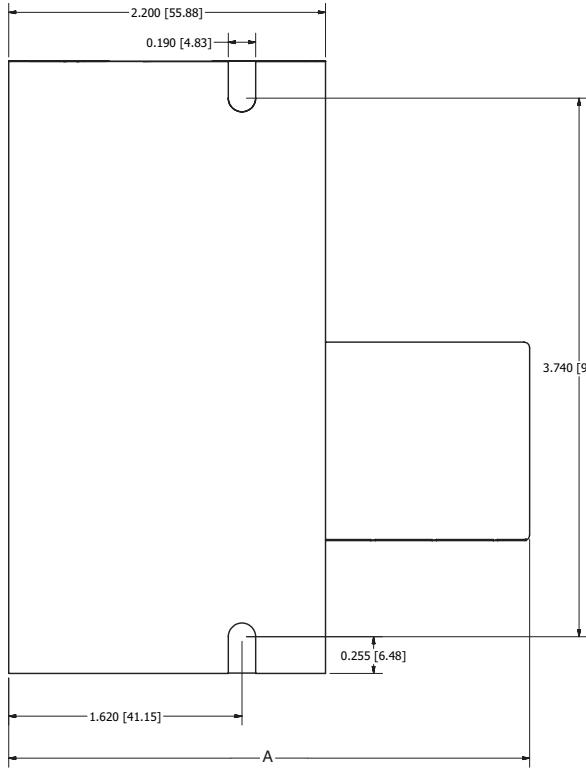
ACCEL (Acceleration) - Allows adjustment of the motor acceleration from a minimum of 0.5 seconds to a maximum of 8 seconds.

DECEL (Deceleration) - Allows adjustment of the motor deceleration from a minimum of 0.5 seconds to a maximum of 8 seconds.

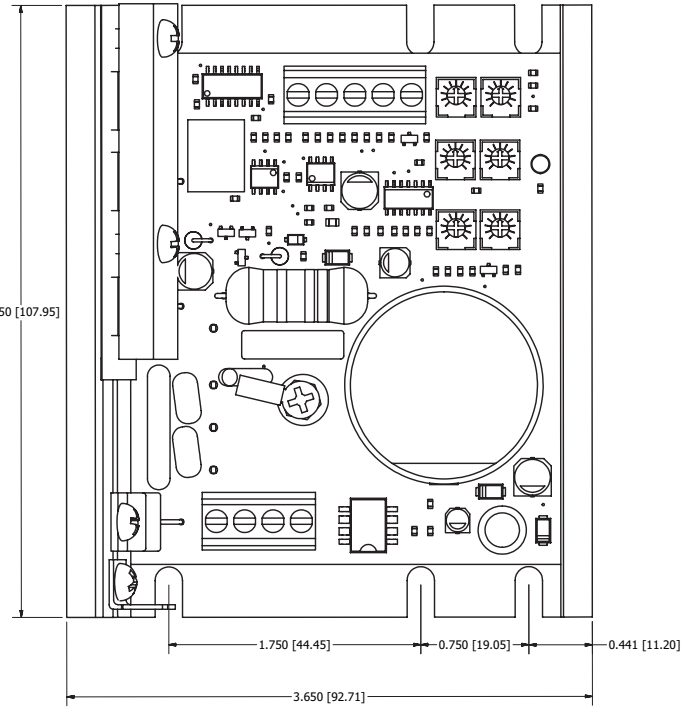
INHIBIT TERMINAL PIN (Active Low) - Allows the user a choice of stopping and starting hard (fast) without breaking the AC lines.

DPW SERIES HEATSINK DIMENSIONS

MODEL NUMBER	HEIGHT (A)	
DPW02DVC	2.200 in	55.87mm
DPW05DVC	2.270 in	57.65mm
DPW10DVC	3.617 in	91.87mm

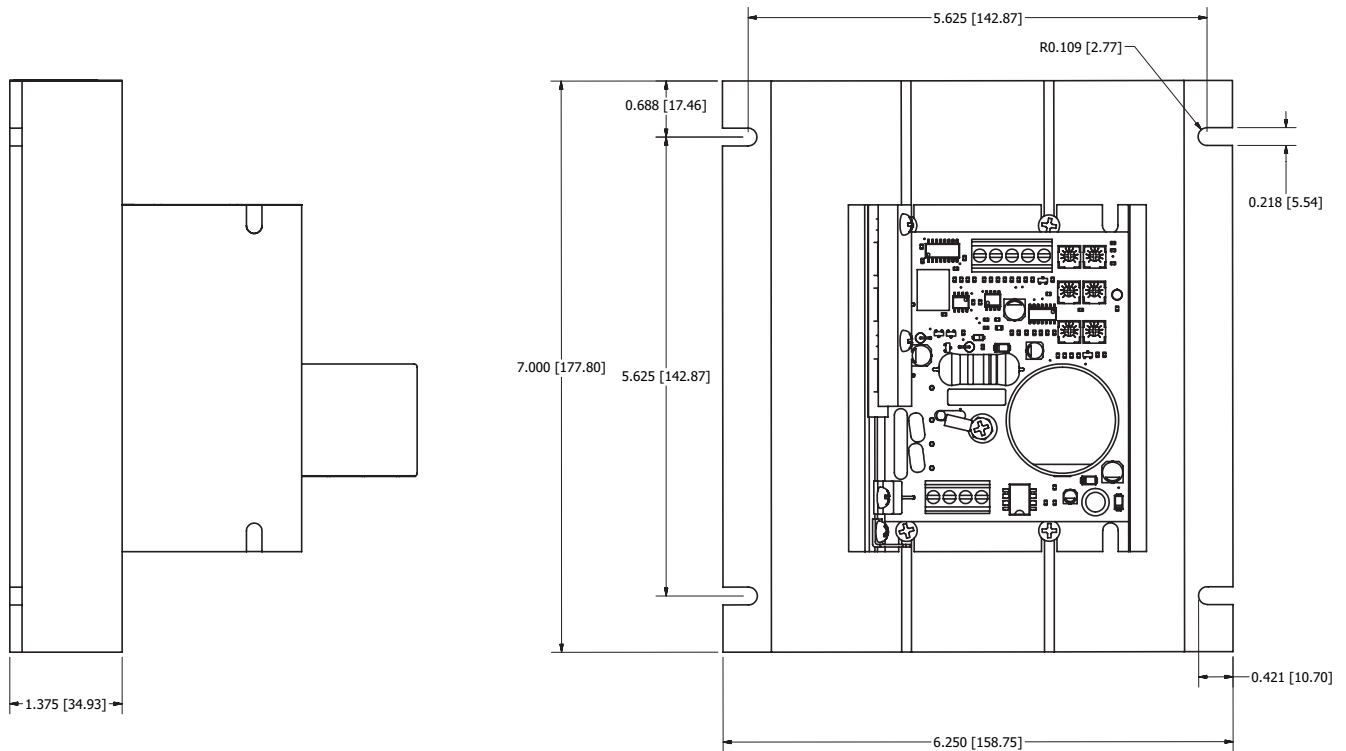


SIDE VIEW



TOP VIEW

-HS OPTION DIMENSIONS



MOUNTING PROCEDURE

1. Six 3/16" wide slots are provided for control mounting.
2. Control chassis can be used as a template.
3. Use #8 screws to mount.

CAUTION:

DO NOT MOUNT WHERE AMBIENT TEMPERATURE IS OUTSIDE THE RANGE OF -10° C (15° F) TO 45° C (115° F)

MODEL SELECTION

MODEL NUMBER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT DC AMPS	HORSEPOWER
DPW02DVC	85VAC thru 265VAC	90VDC thru 230VDC	2A	100mA thru 2A
DPW05DVC	85VAC thru 265VAC	90VDC thru 230VDC	5A	1A thru 5A
DPW10DVC*	85VAC thru 265VAC	90VDC thru 230VDC	10A	3A thru 10A

NOTE: * With -HS(125D) or suitable external heat sink (where DPW extrusion temperature does not exceed 80° C.), the Output Amps can be increased to 10 Amps D.C.

WIRING PROCEDURE & FUSING

1. Size all wires which carry armature or line currents AS SPECIFIED BY NATIONAL, STATE, AND/OR LOCAL CODES. All other wires may be # 18 AWG or smaller as permitted by local code.
2. Separate the control wires from the armature and AC lines when routed in conduit or in wire trays.
3. Fusing:
 FOR 120 VAC INPUT - fuse protection should be added by the customer in the "hot" AC Line only (see following chart)

 FOR 240 VAC INPUT - fuse protection should be added by the customer in AC Line 1 and Line 2 (see following chart)

FUSING ADDED BY CUSTOMER (Bussman ABC or Little Fuse 314 Series ceramic fuses)

TERMINAL STRIP WIRING INSTRUCTIONS

HORSEPOWER	120VAC INPUT	240VAC INPUT
1/50	2 AMP	-----
1/20	2 AMP	1 AMP
1/8	3 AMP	2 AMP
1/4	4 AMP	3 AMP
1/3	6 AMP	3 AMP
1/2	8 AMP	4 AMP
3/4	12 AMP	6 AMP
1	15 AMP	8 AMP
1.5	-----	12 AMP
2	-----	15 AMP

- P1-3, 4 (AC or L) 120 VAC - Connect incoming hot AC or L (black wire) to P1-3 and neutral AC or N (white wire) to P1-4. Connect ground (green wire) to CHASSIS of control.
 240 VAC - Connect one side of AC input to P1-3 and the other side to P1-4. Connect ground (green wire) wire to CHASSIS of control.
- P1-2 (+Arm) Connect to PLUS (+) Armature wire on motor. 0-90/130 VDC for 120 VAC input or 0-180/230 VDC for 240 VAC input. See "SPECIFICATIONS" for output rating.
- P1-1 (-Arm) Connect to MINUS (-) Armature wire on motor. 0-90/130 VDC for 120 VAC input or 0-180/230 VDC for 240 VAC input. See "SPECIFICATIONS" for output rating.
- P2-5 (Speedpot Hi) Connects to high side (white wire) of Speedpot (CW end). This is internal +12 volts. For soft start stop applications, the connection between this terminal and Speedpot HI can be opened and closed by a SPST switch. INPUT MUST NOT BE GROUNDED!
- P2-4 (Speedpot Wiper) Connects to wiper (red wire) of Speedpot (center lead). For Voltage Follower applications, this INPUT MUST NOT BE GREATER THAN +12V MAXIMUM AND MUST NOT BE GROUNDED!

P2-3 (Speedpot Lo) Connects to Low side (orange wire) of 5K Speedpot (CCW end). This input is raised and lowered by the MIN. trimpot (5K). Electronic speed input (voltage follower) may be referenced to Speedpot LO if the MIN trimpot adjustments are to be active. Otherwise, inputs may be referenced to -ARM, which will bypass the MIN trimpot. INPUT MUST NOT BE GROUNDED!

P2-2 (Inhibit) Connects to P2-1 (COM) though a switch or relay so you can stop or start the motor remotely. Connecting P2-2 to P2-1 together will cause the motor to stop. By opening that connection the motor will start.

P2-1 (COM) Connects to P2-2 (INH) though a switch or relay so you can stop or start the motor remotely. Connecting P2-1 to P2-2 together will cause the motor to stop. By opening that connection the motor will start.

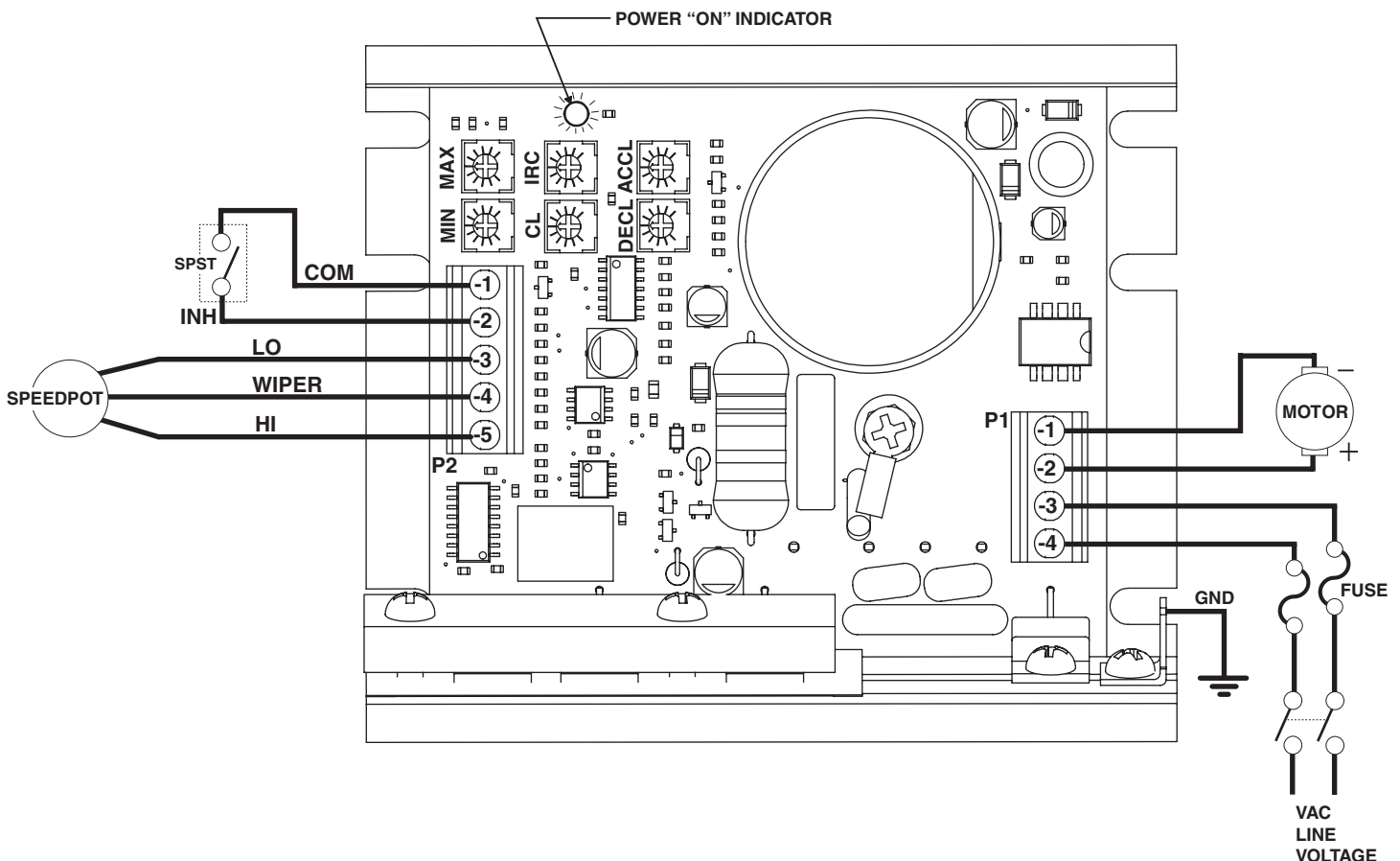
Warning:

1. Be sure the control housing is properly grounded.
2. Armature connections must not be switched or broken while the control is on. Serious control damage may result.
3. For non-speedpot applications, the input connection to the LO, WIPER, and HI terminals must not be grounded! Serious control damage may result from a grounded input.

DPW HOOK-UP DIAGRAM

Warning:

Do not attempt to perform Hi-pot test across AC lines with control in circuit.
This will result in immediate or long term damage to the control.



CONTROL START-UP

WARNING: ALL POWER MUST BE TURNED OFF BEFORE PROCEEDING!

1. Recheck all wiring. Accidental grounds, loose or pinched wires on armature or speedpot wires may damage the control when power is applied.
2. Check to see that incoming service is of correct voltage.
3. Turn speedpot to zero (fully CCW).
4. Turn power on, and advance speedpot while observing motor. Power must be off before step 5 can be accomplished!
5. If motor rotation is incorrect, turn power off at external disconnect and wait for the Power On indicator to turn completely off. Then reverse the +ARM and –ARM connections.
6. Check for satisfactory operation throughout the speed range.
7. If operation is satisfactory, no readjustments are needed.
8. If instability or surging is observed, or if maximum speed is higher than desired, see “TRIMPOT ADJUSTMENT PROCEDURE”.
9. For other problems, consult the “TROUBLESHOOTING” Section.

WARNING SHOCK HAZARD

All wiring connections or wiring changes must be done with AC power turned off to the control and the power “on” indicator on the control completely off. Note: It may take up to 60 seconds after disconnecting the AC power for all high voltage on the control to dissipate and the power “on” indicator to turn off.

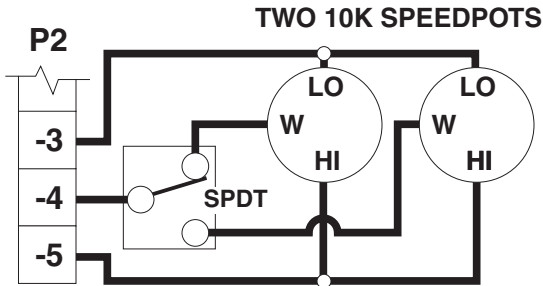
TRIMPOT ADJUSTMENT PROCEDURE

TRIMPOT	FUNCTION	ADJUSTMENT
MIN.	Sets minimum motor speed when speedpot is set at zero. CW rotation will increase minimum motor speed.	<ol style="list-style-type: none"> 1. Set Speedpot to zero (fully CCW). 2. Rotate MIN trimpot CW until motor starts to rotate. 3. Slowly rotate MIN trimpot CCW until motor stops. <p>NOTE: If motor rotation is desired, rotate MIN trimpot CW until desired MIN speed is reached.</p>
IR COMP	Provides a means of improving motor speed regulation in the armature feedback mode. If a slowdown due to load change is of no concern, rotate this trimpot fully CCW.	<ol style="list-style-type: none"> 1. Set Speedpot at 50%. 2. Observe motor speed at no load condition. 3. Apply full load to motor. 4. Turn IR COMP trimpot CW to obtain the same motor speed as with no load.
MAX.	Sets maximum motor speed when speedpot is set at maximum (fully CW rotation). CW rotation of MAX trimpot increases maximum motor speed.	<ol style="list-style-type: none"> 1. TURN DRIVE POWER OFF!! 2. Connect a DC Voltmeter: + to +ARM, - to -ARM. <p>NOTE: Meter must not be grounded!!</p> <ol style="list-style-type: none"> 3. Set meter voltage range if applicable for meter being used. 4. Turn power on. Set Speedpot at 100%. 5. Adjust MAX trimpot to rated motor armature voltage as shown on meter. <p>NOTE: A motor or equivalent load must be applied to + and - Arm output to achieve proper setup</p>
CUR.LIM.	Limits DC motor armature current (torque) to prevent damage to the motor or control. The current limit is set for the rated motor current. CW rotation of this trimpot increases the armature current (or torque produced).	<ol style="list-style-type: none"> 1. TURN DRIVE POWER OFF! 2. Connect a DC Ammeter between A1 on motor and +ARM on control. This is in series with the motor. 3. Turn power on. 4. Set Speedpot at the 50% position. 5. Apply full load to motor shaft and turn Current Limit pot counterclockwise until motor stalls. 6. With motor stalled, set current at 125% of rated motor armature current by adjusting CUR. LIM. trimpot.
ACCEL	Allows adjustment of acceleration by user.	<ol style="list-style-type: none"> 1) Clockwise trimpot rotation increases length of acceleration time needed for the control to reach full speed.
DECEL	Allows adjustment of deceleration by user.	<ol style="list-style-type: none"> 1) Clockwise trimpot rotation increases length of deceleration time needed for the control to reach zero speed.

CONTROL MODIFICATIONS

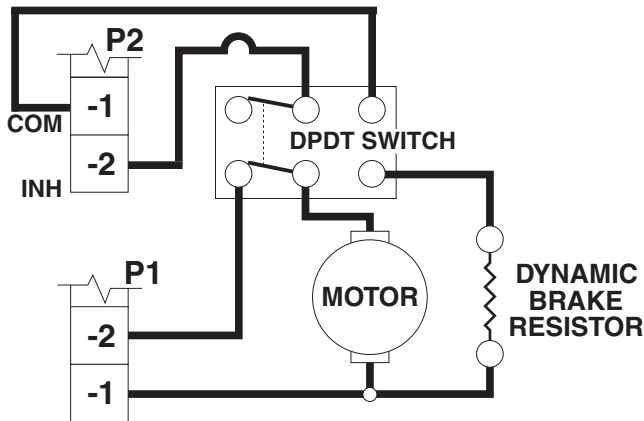
TWO SPEED OPERATION

Two pot operation is done using two 10K ohm speed potentiometers in parallel (both HI's to P2-5, both LO's to P2-3). The WIPER is switched using a SPDT switch.



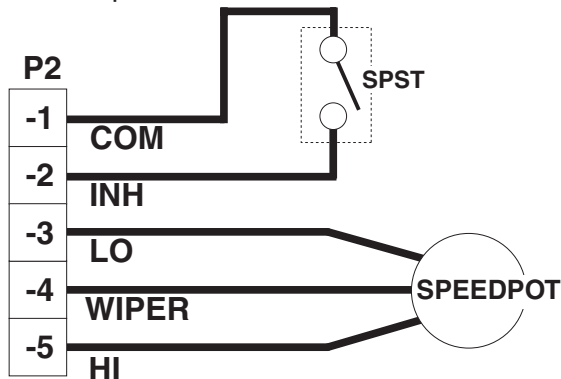
DYNAMIC BRAKING

A DPDT switch or relay is used to inhibit the control and to connect the DBR. Note that motor horsepower, inertia, and cycle time effect sizing of the DBR and the switch or relay being used.



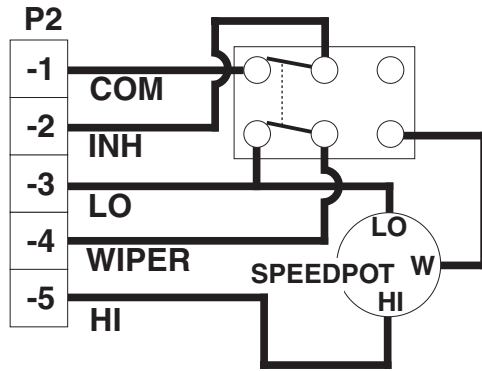
INHIBIT USED INDEPENDENTLY (Hard stop and start)

The customer supplied SPST switch is connected in series between the com (P2-1) and the Inhibit (P2-2). To inhibit (stop motor), Com is closed to the Inhibit pin. To restart, the switch is returned to open. NOTE: The control will stop and start fast and will bypass the accel and decel ramps.



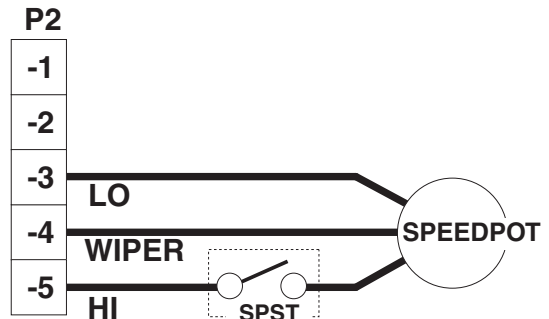
INHIBIT USED WITH SPEEDPOT (Hard stop and soft start)

A DPDT switch or relay is used to connect com (P2-1) to inhibit (P2-2) and at the same time to open the connection from the speedpot Hi to the Hi (P2-5) of the control. NOTE: The control will stop fast and soft start through the accel pot setting.



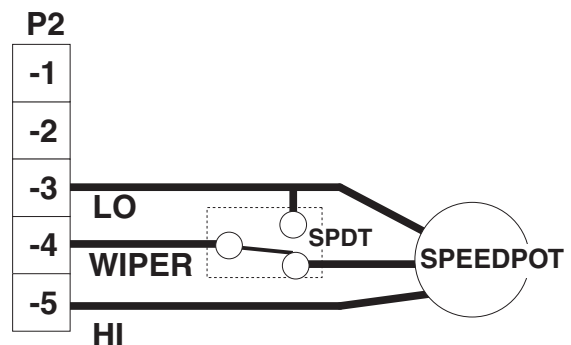
INHIBIT VIA THE SPEEDPOT (Soft stop and start)

A SPST switch or relay is connected between Hi of the control and the speedpot Hi. Breaking the connection causes the motor ramp to a stop though the decel pot setting. Making the connection causes the motor to ramp up to speed though the accel pot setting.

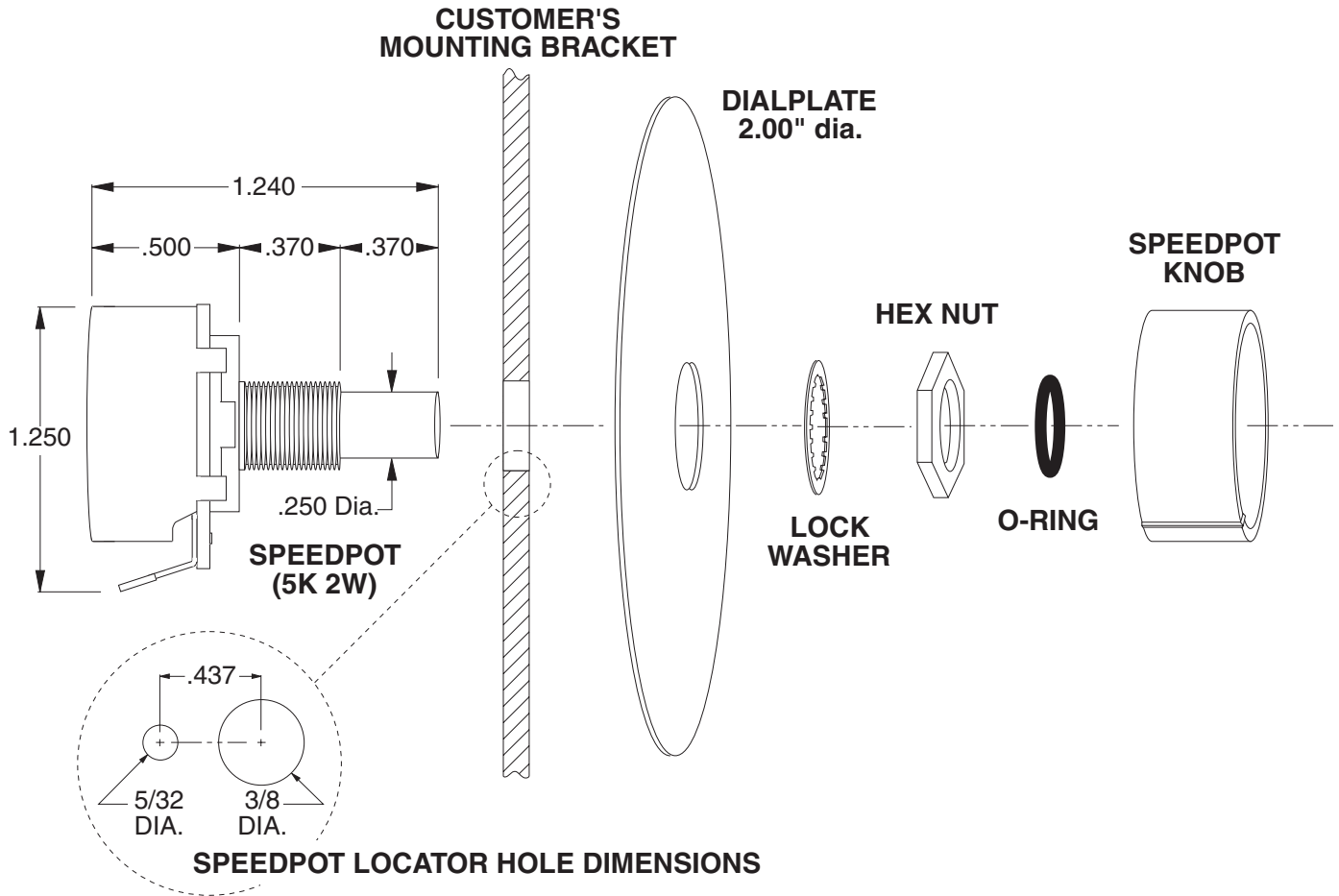


INHIBIT VIA THE SPEEDPOT WITH MIN OR DEADBAND SETTING (Soft stop and start)

A SPDT switch or relay is used to connect the control wiper input to the speedpot wiper, or the speedpot LO. When connected to the pot Wiper, the control will accel to set point. When connected to pot LO, the control will decel to min speed setting or deadband.



SPEEDPOT KIT ASSEMBLY



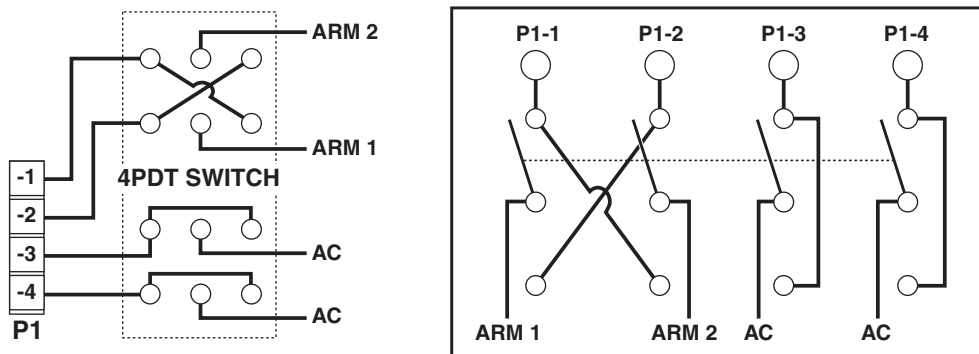
OPTION DESCRIPTIONS

-29B option

Manual Forward-Off-Reverse Switch (Field Installed Only)

Permits reversing of motor. This is accomplished using a 4PDT blocked center switch. When switched between the forward/reverse positions, a delay is encountered due to the blocked center position, which protects the control from any voltage that may be at the ARM terminals. The center position is OFF/NEUTRAL.

THE MOTOR MUST COME TO A COMPLETE STOP BEFORE CHANGING DIRECTIONS. IF THE MOTOR DOES NOT COME TO A COMPLETE STOP, SERIOUS DAMAGE TO THE CONTROL AND MOTOR MAY RESULT.



TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION(S)
Motor doesn't operate	Blown Fuse Incorrect or no power source Speedpot set at Zero Worn motor brushes	Replace Fuse Install proper service Adjust Speedpot CW to start Replace brushes
Armature output voltage cannot be adjusted; output is a constant DC level.	No motor or load connected Speedpot low connection open Low Voltage	Check that motor or load is connected to armature terminals Check that speedpot low wire is connected Check-should be above 100V or 208 V
Motor stalls, or runs very slowly with speed control turned fully CW	Overload Condition Worn motor brushes MAX SPEED set incorrectly	Reduce load or reset C.L. pot Replace brushes See ADJUSTMENT PROCEDURE
Motor hunts	Too much IR COMP Motor is in current limit Motor speed is above rated speed Max set too high	See ADJUSTMENT PROCEDURE See ADJUSTMENT PROCEDURE Reduce Speed See ADJUSTMENT PROCEDURE
Repeated fuse blowing	Low input VAC Voltage Overload Condition Worn motor brushes Defective motor Defective electrical components	Check-should be above 100V or 208V Reduce load Replace Have motor checked for defective bearings or shorted armature Call Dart Distributor or Representative

If control still will not operate, consult your Dart Distributor or Representative.

SPECIFICATIONS

AC input voltage 85-265 VAC of rated line voltage
 Amps - DC output 100 mA to 10 ADC*

MODEL	HORSEPOWER
DPW02DVC	100mA thru 2A
DPW05DVC	2A thru 5A
DPW10DVC*	5A thru 10A

Controller overload capacity 150% for one minute

Current limit trimpot range

Acceleration 0.5 to 8 seconds

Deceleration 0.5 to 8 seconds

Dimensions and weights:

MODEL NUMBER	WIDTH		LENGTH		HEIGHT		WEIGHT	
DPW02DVC	3.65 IN	92.7mm	4.25 IN	107.95mm	2.2 IN	55.87mm	0.9lbs	408.24g
DPW05DVC	3.65 IN	92.7mm	4.25 IN	107.95mm	2.27 IN	57.65mm	0.9lbs	408.24g
DPW10DVC	3.65 IN	92.7mm	4.25 IN	107.95mm	3.617 IN	91.87mm	1lbs	453.60g

Drive service factor 1.0

Form Factor 1.05

Input frequency 50 or 60 Hertz

Max. trimpot speed range 45% to 110% of base speed

Min. trimpot speed range 0% to 30% of maximum speed

Speed control via 5Kohms potentiometer or 0-10VDC isolated signal

Speed range 50:1

Speed regulation ±1% of base speed

Temperature range -10° to 45° C. ambient (15° to 115° F.)

Transient protection G-Mov

* With -HS(125D) or suitable external heat sink (where DPW extrusion temperature does not exceed 80° C.), maximum U.L. rating for output amps can be increased to 10 amps D.C.

REPAIR PROCEDURE

In the event that a Product manufactured by Dart Controls Incorporated (DCI) is in need of repair service, it should be shipped, freight paid, to: Dart Controls, Inc., 5000 W. 106th Street, Zionsville, IN. 46077, ATTN: Repair Department.

Those orders received from anyone without an existing account with DCI will need to specify if they will be paying COD or Credit Card (Master Card or Visa). This information is required before work can begin. If you have an account with Dart your order will be processed according to the terms listed on your account.

Completed repairs are returned with a Repair Report that states the problem with the control and the possible cause. Repair orders are returned via UPS Ground unless other arrangements are made. If you have further questions regarding repair procedures, contact your Dart Controls, Inc. at 317-733-2133 Ext.460.

YOUR MOTION SYSTEMS SOLUTION PROVIDER



125D SERIES
AC INPUT - VARIABLE DC OUTPUT
1/50 HP through 1.0 HP



250G SERIES
AC INPUT - VARIABLE DC OUTPUT
1/50 HP through 2.0 HP



65 SERIES
DC INPUT - VARIABLE DC OUTPUT
CURRENT RATINGS OF 20, 40, AND
60 AMPS



700/COMMUTROL SERIES
DC BRUSHLESS
5 & 20 Amp for
12,24,& 36VDC Inputs



MDP SERIES
PROGRAMMABLE
CLOSED LOOP DC
SPEED CONTROL



DM SERIES
FIELD PROGRAMMABLE
DIGITAL TACHOMETER

Dart Controls, Inc. is a designer, manufacturer, and marketer of analog and digital electronic variable speed drives, controls, and accessories for AC, DC, and DC brushless motor applications.

Shown above is just a sampling of the expanded line of Dart controls that feature the latest in electronic technology and engineering. Products are manufactured in the U.S.A. at our Zionsville (Indianapolis,

Indiana) production and headquarters facility - with over 2,000,000 variable speed units in the field.

In addition to the standard off-the-shelf products, you can select from a wide variety of options to customize controls for your specific application. For further information and application assistance, contact your local Dart sales representative, stocking distributor, or Dart Controls, Inc.

Dart Controls, Inc.

Manufacturer of high quality DC and AC motor speed controls and accessories since 1963.

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