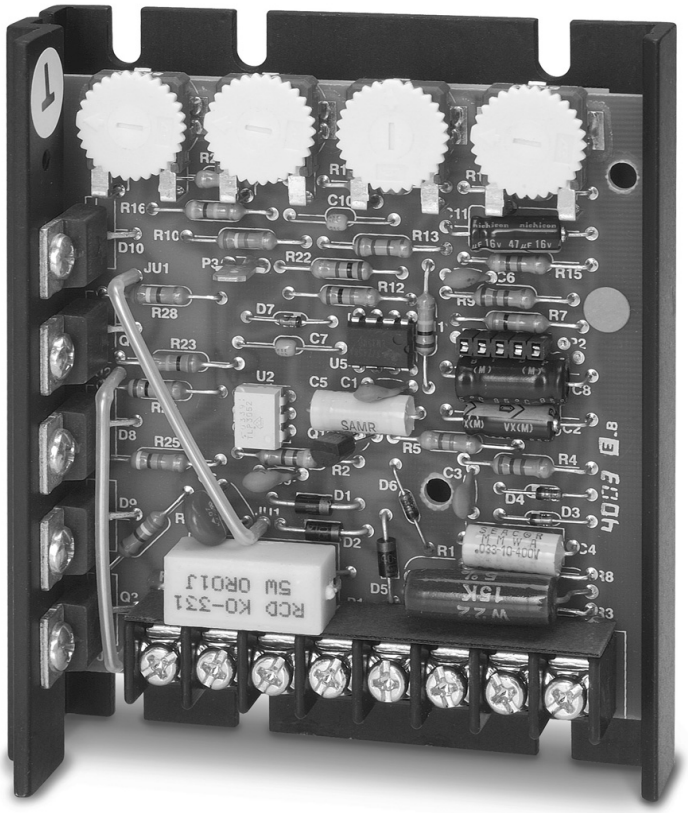
125D CONTROL SERIES

DART CONTROLS

Instruction Manual

Variable Speed Control



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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 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 123D variable speed control is available in a range of 150mA through 5.5 ADC (or up to 10 ADC if using a suitable external heatsink) at 24 through 36 VAC input.**
- **The 125D variable speed control is available in a range of 150mA through 1/4 H.P. at 120/240 VAC input.**
- **The 125DV variable speed control is available in a range of 1/8 through 1 H.P. at 120/240 VAC input. With -HS(125D) *or* suitable external heatsink (where 125D extrusion temperature does not exceed 70° C.), maximum U.L. rating can be increased to 2 H.P. and 10 Amps DC.**
- **The control is designed for DC Permanent Magnet, Shunt Wound, and some Universal (AC/DC) motors in the above horsepower ranges.**
- **Incoming AC voltage is converted to adjustable full wave rectified DC voltage to operate the DC motor. Also, a full wave field voltage is provided for shunt wound motors (see page 11 for voltages).**
- **The control incorporates transient voltage protection with adjustable current limit which fits into a compact package. It features adjustable minimum and maximum speeds along with adjustable IR compensation and an inhibit function.**
- **Options are available to change ACCEL/DECEL time (see page 8, -15 / -K options).**
- **cULus Recognized under, U.L. File # E78180.**

CONTROL FEATURES

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

MAX SPEED (Maximum Speed) - Allows adjustment of the motor speed when the speedpot is set at maximum (CW). This permits the user to eliminate the top end "Deadband", which will provide full speed at maximum rotation. 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.

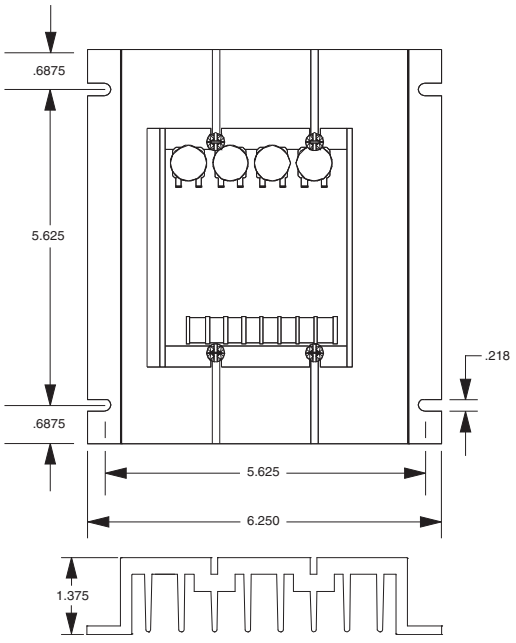
CUR. LIM. (Current Limit) - Provides protection from excessive armature current by limiting the maximum armature current the control can provide. This enables adjustment of the maximum torque the motor can deliver. Torque adjustment (Cur. Lim.) is preset at 125% of rated motor torque (current) based on horsepower. Clockwise rotation of the "CUR. LIM." trimpot increases the torque (current) the control will provide.

INHIBIT TERMINAL PIN - Allows the user a choice of stopping and starting hard (fast) or stopping hard with a soft start through an adjustable acceleration ramp, without breaking the AC lines (see page 6).

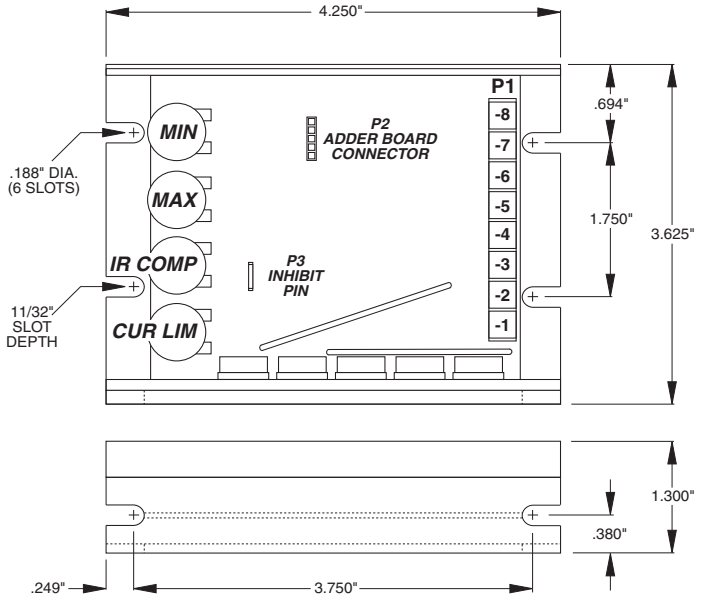
TERMINAL STRIP - Allows for connection of AC lines, motor leads, motor field (if needed), and speed potentiometer

125D SERIES HEATSINK DIMENSIONS

AUXILIARY HEATSINK -HS(125D)



STANDARD HEATSINK



MOUNTING PROCEDURE

1. Six 3/16" wide slots are provided for control mounting.
2. Control chassis can be used as a template.
3. Use standard hardware 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

HORSEPOWER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT* AMPS DC	MODEL NUMBER
150mA thru 5.5 A	24 to 36 VAC	0-20 / 0-30 VDC	5.5A	123D-C*
1/50 thru 1/8	120/240 VAC	0-90 / 0-180 VDC	1.2A	125D-12C
1/8 thru 1	120/240 VAC	0-90 / 0-180 VDC	5.5A	125DV-C*

NOTE: * With -HS(125D) *or* suitable external heatsink (where 125D extrusion temperature does not exceed 70° C.), maximum UL Rating for 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 control wires** from the armature and AC lines when routed in conduit or in wire trays.
3. **Fusing** - The motor and control are protected against overloads by the current limit circuit and a customer installed fuse in the AC line. **THIS PROTECTION ALREADY MAY BE PROVIDED BY THE CUSTOMER WITH CIRCUIT BREAKERS OR FUSES IN BOTH MAIN LINES. IF NOT:**

   FOR 120 VAC INPUT - fuse protection should be added by the customer in AC Line 1 (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)

HORSEPOWER	120 VAC INPUT	240 VAC 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
1.0	15 AMP	8 AMP
1.5	----------	12 AMP
2.0	----------	15 AMP

NOTE: To determine fusing for the 123D-C Series control (24 to 36 VAC input), use 200% of Full Load Current.

TERMINAL STRIP WIRING INSTRUCTIONS

The 125D Series uses an 8 position terminal strip for ease of connection.

P1-1,2 ***(AC or L)*** ***(AC or N)*** **120 VAC - Connect incoming hot AC or L (black wire) to P1-1 and neutral AC or N (white wire) to P1-2. Connect ground (green wire) to CHASSIS of control.**

240 VAC - Connect both hot sides (L & N), one to P1-1 and one to P1-2. Connect ground wire to CHASSIS of control.

P1-3 ***(+Arm)*** **Connect to PLUS (+) Armature wire on motor. 0-90 VDC for 120 VAC input or 0-180 VDC for 240 VAC input. See "SPECIFICATIONS" for output rating.**

P1-4 ***(-Arm/-Field)*** **Connects to MINUS (-) Armature wire on motor and, if necessary, connect MINUS (-) Field wire of SHUNT WOUND MOTOR.**

(continued of following page)

(continued)

P1-5 ***(+Field)*** **DO NOT use for Permanent Magnet Motor. This supplies +Field voltage for a SHUNT WOUND MOTOR (refer to field voltage table). For motors with dual voltage field (ie. 50/100V or 100/200V), make sure highest value is connected.**

FIELD VOLTAGE TABLE				
VAC INPUT	24	36	120	240
VDC FIELD	20	30	100	200

P1-6 ***(Speedpot Hi)*** **Connects to high side (white wire) of Speedpot (CW end). This is internal +12 volts. For 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!**

P1-7 ***(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!**

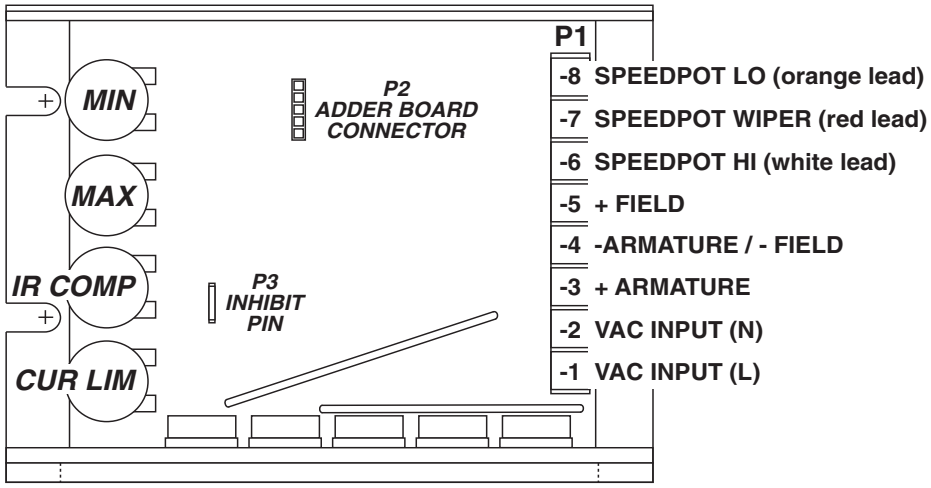
P1-8 ***(Speedpot Lo)*** **Connects to Low side (orange wire) of 5K Speedpot (CCW end). This input is raised and lowered by the MIN. trimpot (5K). Electronic speed input (voltage follower) may be referenced to Speedpot LO if the MIN trimpot adjustments are to be active. Otherwise, inputs may be referenced to -ARM, which will bypass the MIN trimpot. INPUT MUST NOT BE GROUNDED!**

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.**

123D/125D 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 reverse +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 CHART " on page 5.
9. For other problems, consult page 11, “IN CASE OF DIFFICULTY”.

TRIMPOT ADJUSTMENT CHART & PROCEDURE

Settings apply when using a 5K ohm master speedpot. This chart is used in conjunction with the adjustment procedure and is approximate.

	C.L.	I.R.	MAX	MIN	HP
125D-12C 120 VAC input; 0-90 VDC output					**1/50**
					**1/20**
					**1/8**
125DV-C 120 VAC input; 0-90 VDC output					**1/8**
					**1/4**
					**1/3**
					**1/2**
					**3/4***
					**1.0***

Operation of the control beyond ±10% of the normal line voltage could result in re-adjustment. These adjustments are permanent; periodic re-adjustment is normally not needed.

Settings apply when using a 5K ohm master speedpot. This chart is used in conjunction with the adjustment procedure and is approximate.

HP	C.L.	I.R.	MAX	MIN	
1/20					**125D-12C** 240 VAC input; 0-180 VDC output
1/8					
1/4					
1/4					**125DV-C** 240 VAC input; 0-180 VDC output
1/3					
1/2					
3/4*					
1.0*					
1.5*					
2.0*					

*** NOTE: ADDITIONAL CUSTOMER HEATSINK REQUIRED FOR 125DV-C (120 VAC INPUT - GREATER THAN 1/2 H.P. MOTORS) AND (240 VAC INPUT - GREATER THAN 1 H.P. MOTORS). 125 EXTRUSION TEMPERATURES SHOULD NOT EXCEED 70 DEGREES C.**

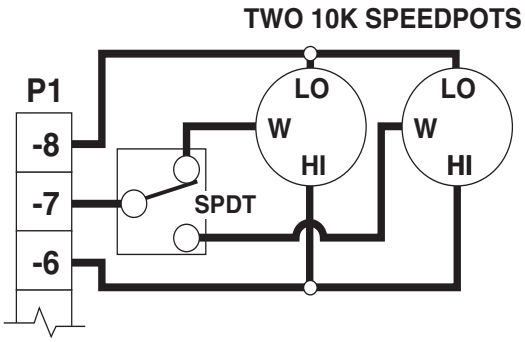
NOTE: FOR DETERMINING TRIMPOT SETTINGS FOR THE 123D-C SERIES, SEE TRIMPOT SETTINGS PROCEDURE BELOW.

TRIMPOT	FUNCTION	ADJUSTMENT
MIN.	Sets minimum motor speed when speedpot is set at zero. CW rotation will increase minimum motor speed.	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. NOTE: If motor rotation is desired, rotate MIN trimpot CW until desired MIN speed is reached.
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.	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.	1. TURN DRIVE POWER OFF!! 2. Connect a DC Voltmeter: + to +ARM, - to -ARM. **NOTE: Meter must not be grounded!!** 3. Set meter voltage range: (90 VDC for 120 VAC, 180 VDC for 240 VAC). 4. Turn power on. Set Speedpot at 100%. 5. Adjust MAX trimpot to rated motor armature voltage as shown on meter. NOTE: A tachometer or strobe may be used in lieu of a meter. Follow above steps, except adjust MAX trimpot to rated motor base speed indicated by tachometer or strobe.
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).	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 friction braking to motor shaft until motor stalls. 6. With motor stalled, set current at 125% of rated motor armature current by adjusting CUR. LIM . trimpot.

CONTROL MODIFICATIONS

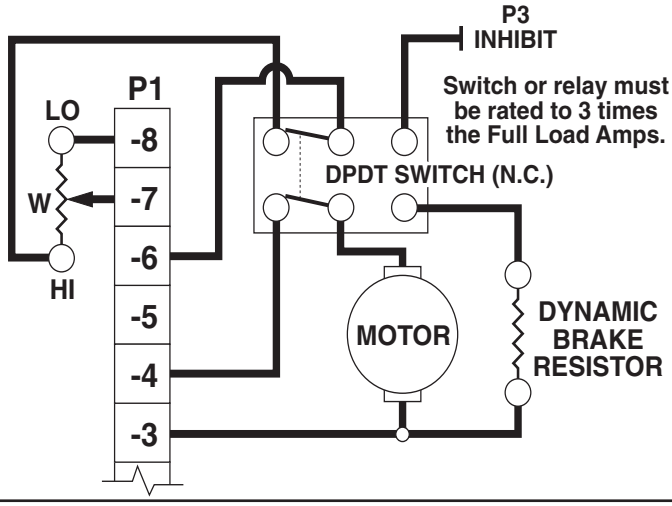
TWO SPEED OPERATION

Two pot operation is done using two 10K ohm speed potentiometers in parallel (both HI's to P1-6, both LO's to P1-8). The WIPER is switched using a SPDT switch.



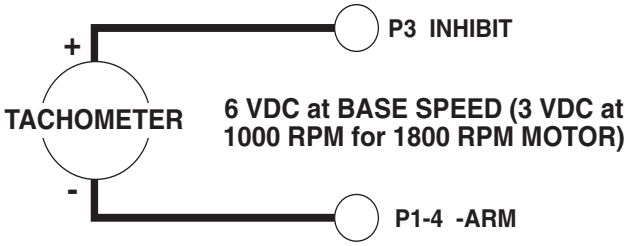
DYNAMIC BRAKING

A DPDT switch is used to inhibit the control and to connect the DBR. Typical values for the DBR (dynamic brake resistor) are 5 ohms for 120V, 10 ohms for 240V (both 35W to 50W). Note that motor horsepower, inertia, and cycle time effect sizing of the DBR. NOTE: This modification cannot be used with any of the -15 options.



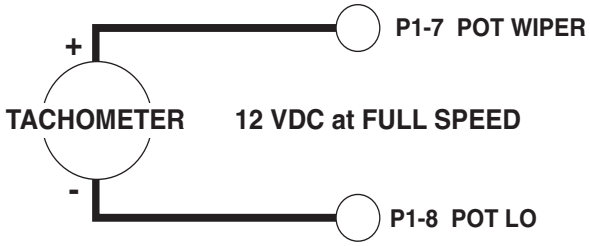
TACHOMETER FEEDBACK

Improves speed regulation to ±1/2% of base speed.



TACHOMETER FOLLOWER

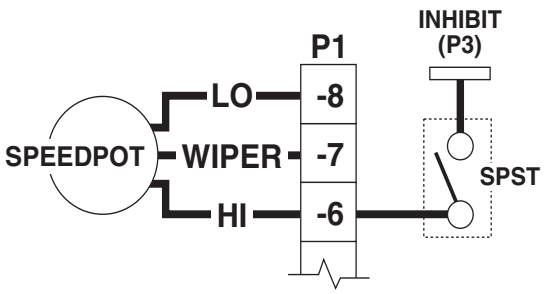
Allows control output to follow tachometer voltage.



NOTE: NEED 1% OR LESS - TACH OUTPUT RIPPLE

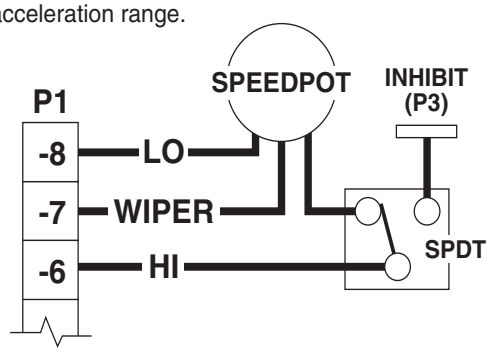
INHIBIT (USED INDEPENDENTLY)

The customer supplied SPST switch is connected in series between the speedpot HI (P1-6) and the Inhibit pin (P3). To inhibit (stop motor), speedpot HI is closed to the Inhibit pin. To restart, the switch is returned to open. NOTE: The control will stop and start fast.



INHIBIT (USED WITH SPEEDPOT)

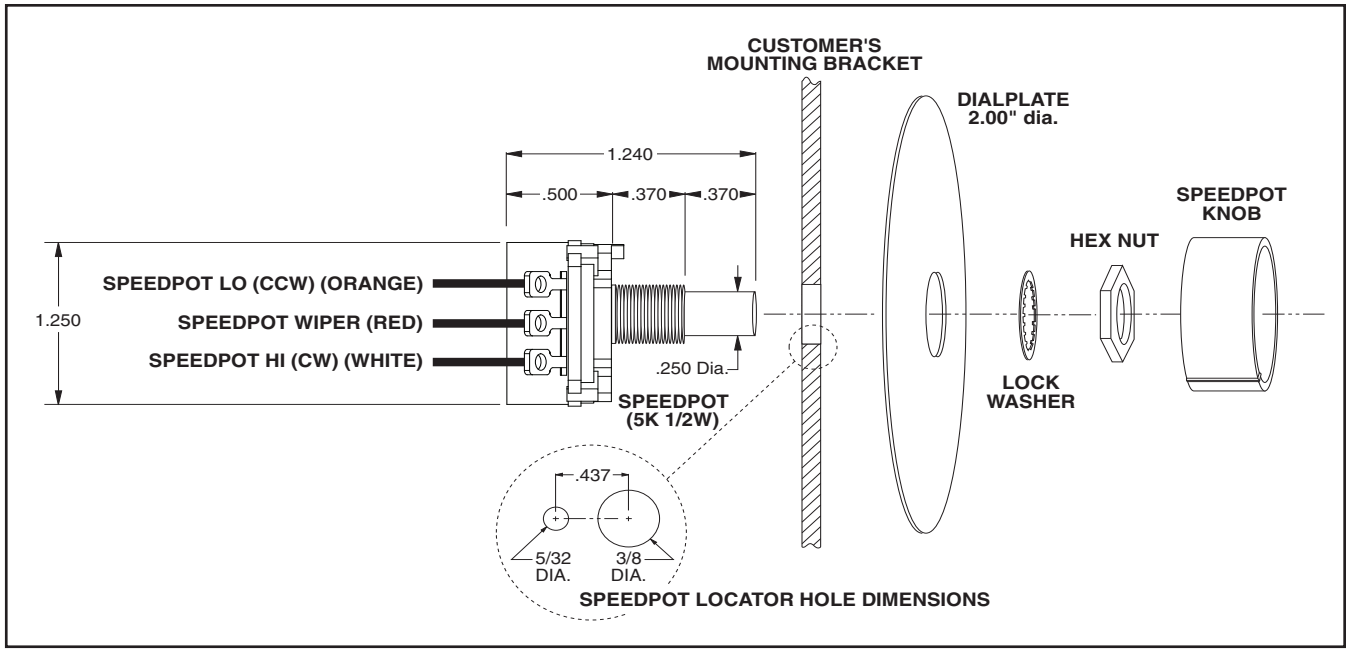
The Common of the SPDT switch is connected to control pot HI and is switched between Speedpot Hi and the Inhibit pin (P3). To inhibit (stop motor), speedpot HI is closed to the Inhibit pin. To restart, the switch is returned to Speedpot Hi. NOTE: The control will stop fast and soft start through a fixed acceleration range.



NOTE: Permits starting and stopping of motor without breaking AC lines. In the event of SCR failure or false triggering, the Inhibit circuit will not stop motor.

Always use a shielded wire when connecting to the inhibit terminal. The shield should be connected to -Armature or Common of the control.

SPEEDPOT KIT ASSEMBLY



OPTION DESCRIPTIONS

-1 option

Field or Factory Installed

Electronic Speedpot Interlock — **Available All Models**

The -1 adder board connects to the 125 series board through use of a female connector and plastic standoff support.

When incoming AC power to the control is applied, the Electronic Interlock will prevent the motor from starting until the speedpot is first rotated to the zero position and then rotated clockwise toward the set speed.

Also, should the incoming AC power be interrupted for any reason, then restored, the Electronic Interlock will prevent an automatic restart of the motor. To restart, the speedpot must first be rotated to the zero position and then rotated clockwise toward the set speed.

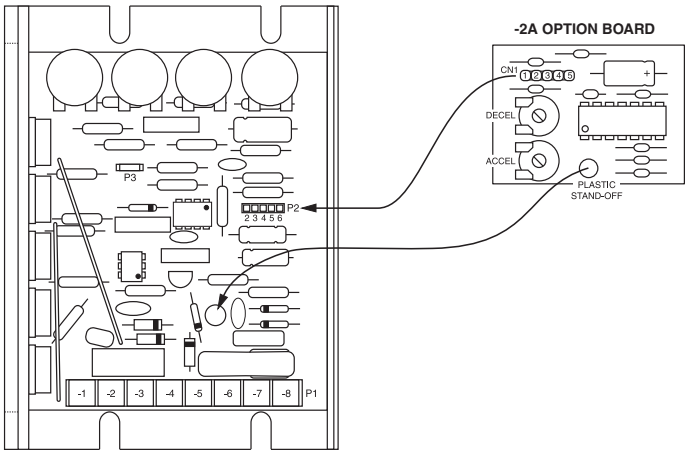
CAUTION: The Electronic Interlock becomes inoperative if SCR failure should occur.

-2A option

Field or Factory Installed

Individually Adjustable Linear Accel and Decel — **Available All Models**

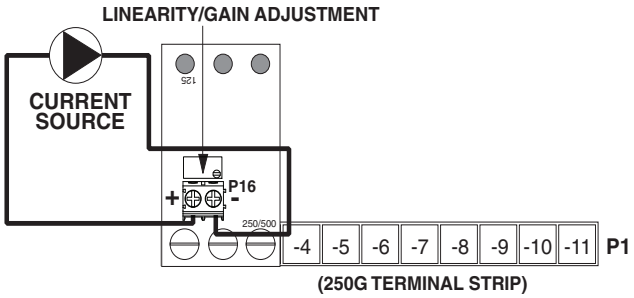
This option plugs into the five position expansion connector on the 125D main board. The -2A option overrides the fixed accel ramp built into the 125D control, providing independently adjustable linear accel and decel from 0.5 to 8.0 seconds. To install, flip over the -2A option board so the printed circuit lines are visible. Align the male connector CN1 (-2A option) with the female connector P2 (125D board) so terminal CN1-1 fits into P2-6, CN1-2 in P2-5, etc. Align the plastic stand-off on the -2A option board with the hole shown on the 125D main board. Once connectors and stand-off are aligned, snap into place. Adjustment of both trimpots is accomplished via the labeled access holes on the back side of the -2A option board. Full CCW rotation equals minimum accel or decel time and full CW rotation equals maximum accel or decel time. Note: Each trimpot operates independently of the other.



-5 option

Isolated 4-20 ma.Signal Follower

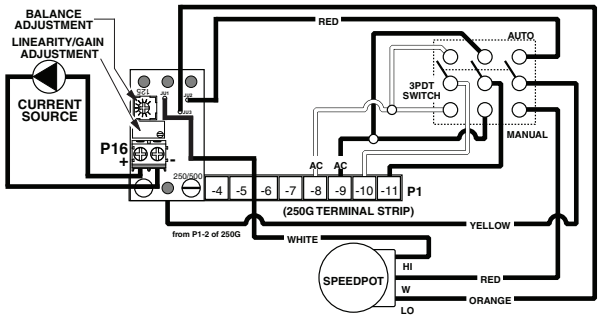
Field or Factory Installed
Available on Chassis Only*



-7 option

Isolated 4-20 ma. Signal Follower with Auto/Manual Switch

Enclosed - Factory Installed only
Chassis - Factory or Field Installed
Chassis - switch & wiring are customer provided



-5 and -7 option Hookup Procedure

DO NOT USE TRIMPOT CHART TO ADJUST MIN AND MAX TRIMPOTS ON MAIN BOARD. IF ADJUSTMENT IS NEEDED THEN REFER TO THE SETUP PROCEDURE BELOW.

The -5 option is a 4-20 mA isolated signal card that replaces the speedpot to control speed. The 4-20 mA signal input can be either grounded or ungrounded. The board sets on spacers screwed to the pot HI, Wiper, and LO terminals on the main board using long screws. The current source connects to the + and - two position terminal strip (P16-1 and -2) on the -5 option board.

The Linearity trimpot on the -5 option board is set at the factory for proper linearity, however this trimpot may need to be re-set after tuning the Max and Min trimpot settings on the control for your specific application. If needed then refer to the setup procedure below.

The -7 option is also a 4-20 mA isolated signal card but it allows the control to be run in either the Manual mode via a speed pot or the Auto mode via the 4-20 mA signal. This option also includes a Balance trimpot which is used to scale the maximum speed in the Manual mode. It is factory set so the maximum speed in Manual mode equals the maximum speed in Auto mode. The Linearity trimpot on the -7 option board is set at the factory for proper linearity, however this trimpot may need to be re-set after tuning the Max and Min trimpot settings on the control or if the Balance trimpot on the –7 must be reset for your specific application. If needed then refer to the setup procedure below.

The following is the recommended procedure to set up the -5/-7 option on the 125/250/500 Series:

1) With the 125/250/530 oriented so that trimpots are along the top, adjust Min trimpot to minimum (full CCW) and Max trimpot to 50%. The voltage is set below the typical motor voltage to make certain the drive is NOT in saturation before setting the -5/-7 board saturation point.

2) Set the Linearity/gain pot on the -5/-7 full CW. This is a 20 turn pot and you should hear a clicking with each turn when fully up or just count 20 turns.

3) Make certain your motor is connected to +/-ARM output of the drive, the AUTO / MAN switch is in AUTO mode for -7 options, and source power for the control is turned on. (Note: For proper tuning this setup is best done on an unloaded motor.)

4) With power applied and a voltmeter monitoring motor output Vdc, apply 4mA to -5/-7 board. Check voltmeter reading and adjust the Linearity/gain trimpot, R16, on the -5/-7 board CCW until motor output voltage is less than 0.1Vdc.

5) Now apply 20mA to the -5/-7 board and adjust the Max trimpot to a voltage that is 5 volts (15 volts for the 250G series controls) above the final desired max motor voltage output. Adjust the Linearity/gain trimpot on the -5/-7 board CCW until the motor output voltage decreases to the desired max voltage set point.

6) Now, apply 4mA to the -5/-7 board again and adjust the Min trimpot to deadband or the desired minimum motor voltage output. The deadband point is where you are at 0Vdc and any further increase of the Min trimpot would result in an output to the motor. Re-apply 20mA to the -5/-7 board and verify max output has not changed. A small adjustment may be needed to the Max trimpot to reset to desired max output.

7) Adjust 4-20 input to 12mA. If tuned properly the output voltage of an unloaded motor should be within a few volts of ½ output (based on max output setting above).

-7 option only: With 20mA applied to the -7 in Auto mode, move AUTO/MANUAL switch to MANUAL.

8) In manual mode turn the speedpot full CW, note motor voltage output reading on voltmeter. If not equal to output at 20mA in Auto Mode, adjust the Balance trimpot on the -7 board (CW or CCW) until the same reading is achieved. The motor output Vdc should not change more than 1 Vdc when flipping back and forth between AUTO and MANUAL position.

-11 option

10 Turn Master SpeedPot — **Field Installed** — **Available All Models**

Provides finer control of speed. Use standard Hook-up directions and Trimpot Chart (page 5).

-15B / -K options

Acceleration Time Ranges — **Factory Installed**

This option provides the Accel times shown below. The standard Accel time is 0.5 seconds.

	-15B OPTION	-K OPTION
ACCELERATION TIME	4 seconds	6 seconds

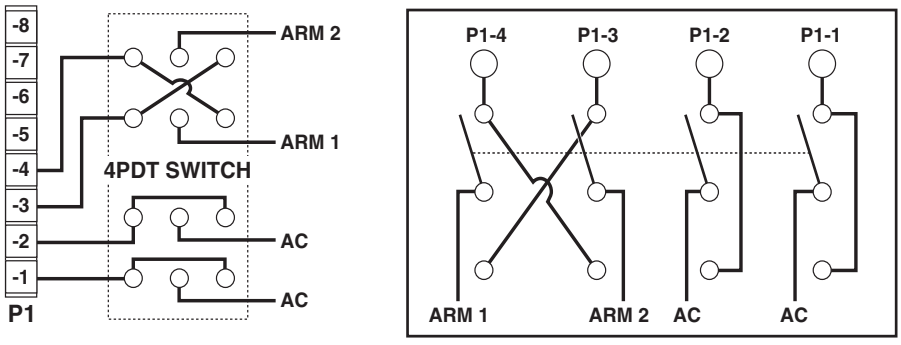
USE STANDARD HOOK-UP

-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 MAY RESULT. BYPASS OF THE SWITCH CENTER BLOCK MAY RESULT IN DAMAGE TO THE CONTROL.



-55H option

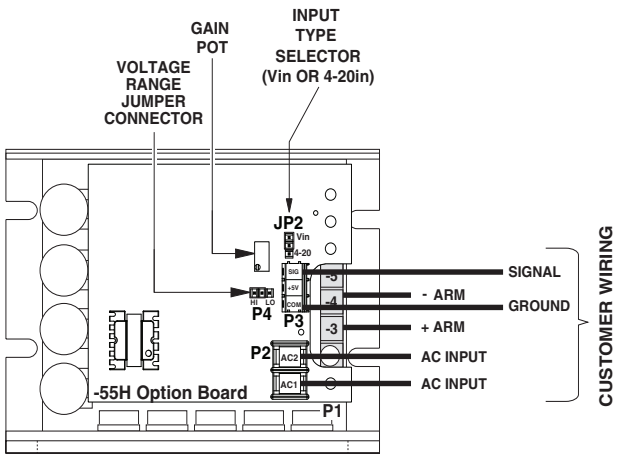
Isolated Signal Input — Factory or Field Installed

NOTE: This option cannot be used on the 123D-C series control.

This option card allows for the use of either a grounded or non-grounded remote DC signal such as 0 to 5 through 0 to 250Vdc, 4-20mA current, or a remote speed pot. The DC input signal type can be selected for voltage (Vin) or current (4-20mA) via the JP2 jumper clip. There is a Hi/Lo range jumper selection that should be set to the (Lo) setting when using a 4-20mA signal or voltage ranges of 0-5 through 0-25Vdc. When using voltage ranges of 0-25 through 0-250 this jumper must be set to (Hi). The GAIN trimpot is used to set full linear output in reference to the input signal range. The output of this remote signal isolation board is a linear signal that is proportional to the remote input signal being supplied.

(FOR SHUNT WOUND MOTOR, SEE PAGE 4 OF MANUAL FOR FIELD CONNECTIONS).

CAUTION: DO NOT use TRIMPOT ADJUSTMENT CHART. Set pots using directions in following SET-UP PROCEDURE.



SETUP PROCEDURE FOR -55H AND -56H OPTIONS

1. With NO power to control, connect a DC Voltmeter to control outputs as follows: Meter COMMON to the -ARM terminal, Meter POSITIVE to the +ARM terminal. Select correct meter range (0-90V or 0-180V).
2. Preset GAIN pot on the remote signal board fully CCW.
3. Place the JP2 jumper clip in the proper position based on the input signal being used.
4. Place the P4 jumper clip in the Lo position for 4-20mA signals or voltage signals less than 25Vdc. Place the P4 jumper clip in the Hi position for voltage signals greater than 25Vdc. (NOTE: Never exceed 250Vdc)
5. Make sure all connections are properly made per the hookup connection diagram and then apply AC power to the controller.
6. Set the remote input signal to its lowest setting. Adjust the MIN trimpot to deadband (the point just before an increase causes an output).
7. Apply the maximum remote input signal. Motor should start to run. Adjust the GAIN pot CW until no further increase in control output voltage occurs and then decrease the gain pot slowly until output voltage to the motor drops approximately 5Vdc.
8. Set the MAX trimpot on the control to the correct motor voltage.
9. Some interaction between trimpots may occur. Recheck the Min trimpot setting and repeat steps 6 through 8 as needed.

-56H option

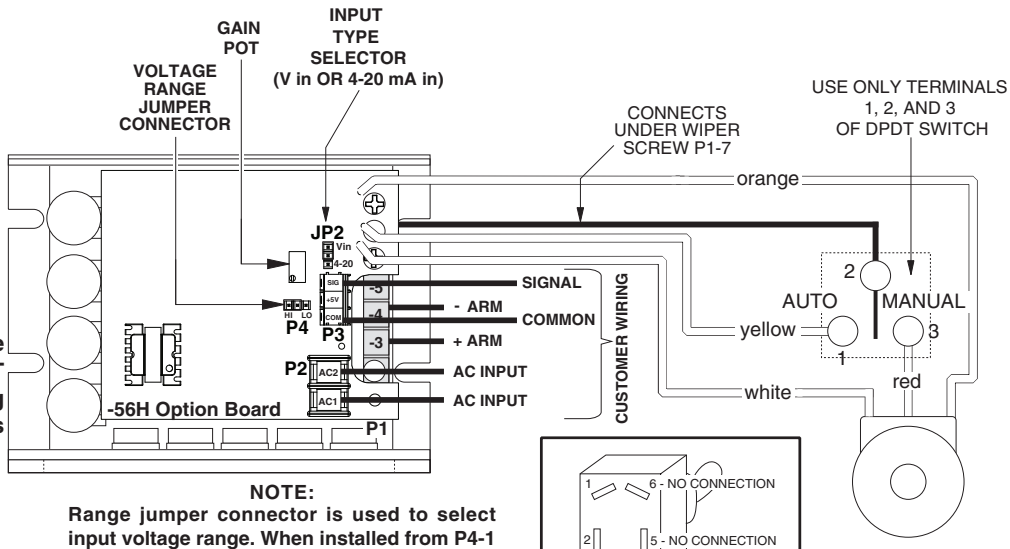
Isolated Signal Input with Auto / Manual Switch — Factory or Field Installed

NOTE: This option cannot be used on the 123D-C series control.

The -56H option is identical to the -55H option with the added ability to have remote Auto/Manual switching.
See -55H for more further detail.

(FOR SHUNT WOUND MOTOR, SEE PAGE 4 OF MANUAL FOR FIELD CONNECTIONS).

CAUTION: DO NOT use TRIMPOT ADJUSTMENT CHART. Set pots using directions in the previous SET-UP PROCEDURE.



NOTE:
Range jumper connector is used to select input voltage range. When installed from P4-1 to P4-2, the range is 0-25VDC through 0-250VDC; when installed from P4-2 to P4-3, range is 0-5VDC through 0-25VDC.

= CUSTOMER WIRING
= FACTORY WIRING

IN CASE OF DIFFICULTY

PROBLEM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION(S)
Motor doesn't operate	**- Blown Fuse or Breaker**	**Replace Fuse or reset breaker**
	- Incorrect or no power source	**Install proper service**
	- Speedpot set at zero	**Adjust Speedpot CW to start**
	- Worn motor brushes	**Replace brushes**
Armature output voltage cannot be adjusted, output is a constant DC level	**- No motor or load connected**	**Check that motor or load is connected to armature terminals**
	- Speedpot low connection open	**Check that speedpot low wire is connected**
Motor stalls, or runs very slowly with speed control turned fully CW	**- Low Voltage**	**Check that VAC is above 100VAC**
	- Overload Condition	**Reduce load or increase motor size and/or Cur. Lim. setting.**
	- Worn motor brushes	**Replace brushes**
	- MAX SPEED set incorrectly	**See ADJUSTMENT PROCEDURE**
Motor hunts	**- Motor current less than 150mA**	**Motor current must be greater than 150mA D.C.**
	- Too much IR COMP	**See ADJUSTMENT PROCEDURE**
	- Motor is in current limit	**See ADJUSTMENT PROCEDURE**
	- Motor speed is above rated speed	**Reduce Speed**
	- Max set too high	**See ADJUSTMENT PROCEDURE**
Repeated fuse blowing	**- Low Voltage**	**Check that VAC is above 100VAC**
	- Overload Condition	**Reduce load**
	- Worn motor brushes	**Replace**
	- Defective motor bearings	**Replace**
	- Defective electrical components	**Call Dart Distributor or Representative**

If control still will not operate, go to www.dartcontrols.com/support or call (317) 873-5211.

SPECIFICATIONS

AC input voltage ..... ±10% of rated line voltage
Acceleration ..... 0.5 seconds (standard 125D)
Amps - DC output ..... 150 mA to 5.5 ADC*
Controller overload capacity ..... 200% for one minute
Current limit trimpot range ..... 0.3 to 2.5 ADC (125D); 1 to 15 ADC (123D & 125DV)
Deceleration ..... 0.5 seconds (standard 125D)
Dimensions and weights:

	WIDTH	LENGTH	DEPTH	WEIGHT
ENGLISH	3.625"	4.250"	1.300"	8.00 oz.
METRIC	92mm	108mm	33mm	228 gms.

Drive service factor 1.0
Efficiency ..... 85% typical
Input frequency ..... 50 or 60 Hertz
Max. trimpot speed range ..... 60% to 110% of base speed
Min. trimpot speed range ..... 0% to 30% of maximum speed
Power devices ..... isolated case tab
Shunt field voltage ..... 20VDC for 24VAC input; 30VDC for 36VAC input; 100VDC for 120VAC input; 200VDC for 240VAC input; 1 amp maximum
Speed control ..... via 5kΩ 2W 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**
Trigger ..... opto-coupler
Type ramp of accel/decel ..... RC time constant

* With -HS(125D) *or* suitable external heatsink (where 125D extrusion temperature does not exceed 70° C.), maximum UL rating for output amps can be increased to 10 amps D.C.

** not used on the 123D-C series control

TYPICAL MOTOR CURRENTS

Horsepower	1/50	1/20	1/8	1/4	1/3	1/2	3/4	1.0	1.5	2.0
Typical AC Amps (120VAC)	0.50	1.00	2.00	3.50	4.40	6.50	9.30	13.20	-----	-----
Typical Arm Amps (120VAC)	0.42	0.81	1.60	2.70	3.40	5.00	8.20	10.90	-----	-----
Typical AC Amps (240VAC)	-----	0.80	1.20	1.80	2.20	3.30	4.80	6.50	9.70	12.90
Typical Arm Amps (240VAC)	-----	0.40	0.60	1.40	1.70	2.50	3.70	5.00	8.20	11.60

125D SERIES PARTS PLACEMENT & LIST

RESISTORS

R1	15K 6W
R2	470 Ω
R3	2.7K
R4	2.7K
R5	82K
R6	5K (MIN TRIM)
R7	300K
R8	180K
R9	1.2M
R10	39K
R11	100K
R12	10K
R13	2.2K
R14	820 Ω
R15	4.7K
R16	470K
R17	1K
R18	100 Ω (I.R. TRIM)
R19	5K (C.L. TRIM)
R20	300K
R21	10K (MAX TRIM)
R22	1K
R23	300K
R24	.01 Ω 5W
R25	91K
R26	1K
R27	390 Ω
R28	390 Ω
R29	5K SPEEDPOT *

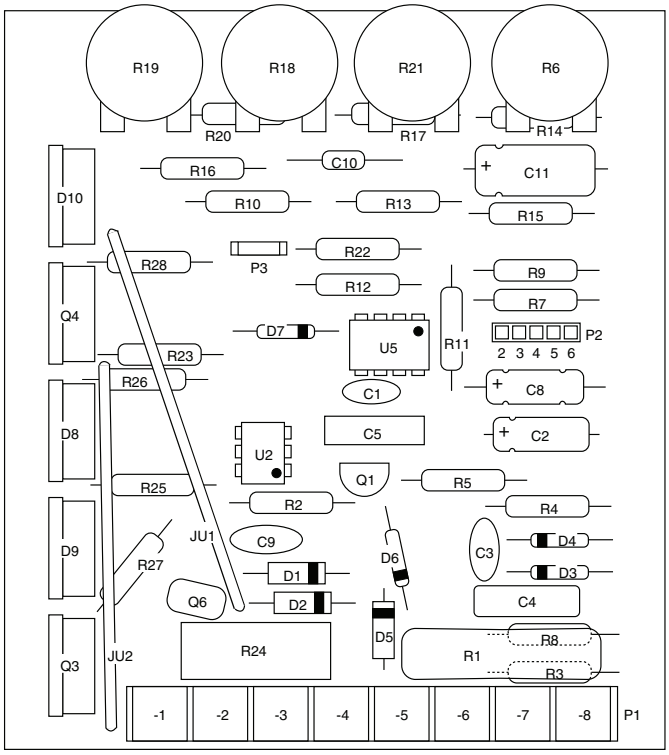
ACCEL CHANGES

Replace N.P. cap with polarized cap (see above)

-15A ... C8 ... 33uf 16V
-15B ... C8 ... 15uf 25V
-15C ... C8 ... 4.7uf 16V
- K ..... C8 ... 22uf 16V

125D-12C (1/50 thru 1/8 H.P.) CHANGES:

R24 ..... .062 Ω 5W



MISCELLANEOUS

JU1	18GA. SOLID INSULATED WIRE
JU2	18GA. SOLID INSULATED WIRE
PCB	A-4-2033F PRINTED CIRCUIT
P1 (-1 THRU -8)	8 POS. TERMINAL STRIP
P2 (-2 THRU -6)	5 POS. FEMALE CONNECTOR
P3	3/16" MALE SPADE PIN

ACTIVE DEVICES

Q1	2N6027
U2	3052 MOC
Q3	S4015L
Q4	S4015L
U5	LM358 IC
Q6	275V G-MOV

CAPACITORS

C1	.01µF 100V
C2	10µF 35V
C3	.01µF 100V
C4	.033µF 400V
C5	.22µF 1KV
C8	1µF 50V N.P.
C9	.0047µF 1KV
C10	.1µF 50V
C11	47µF 16V

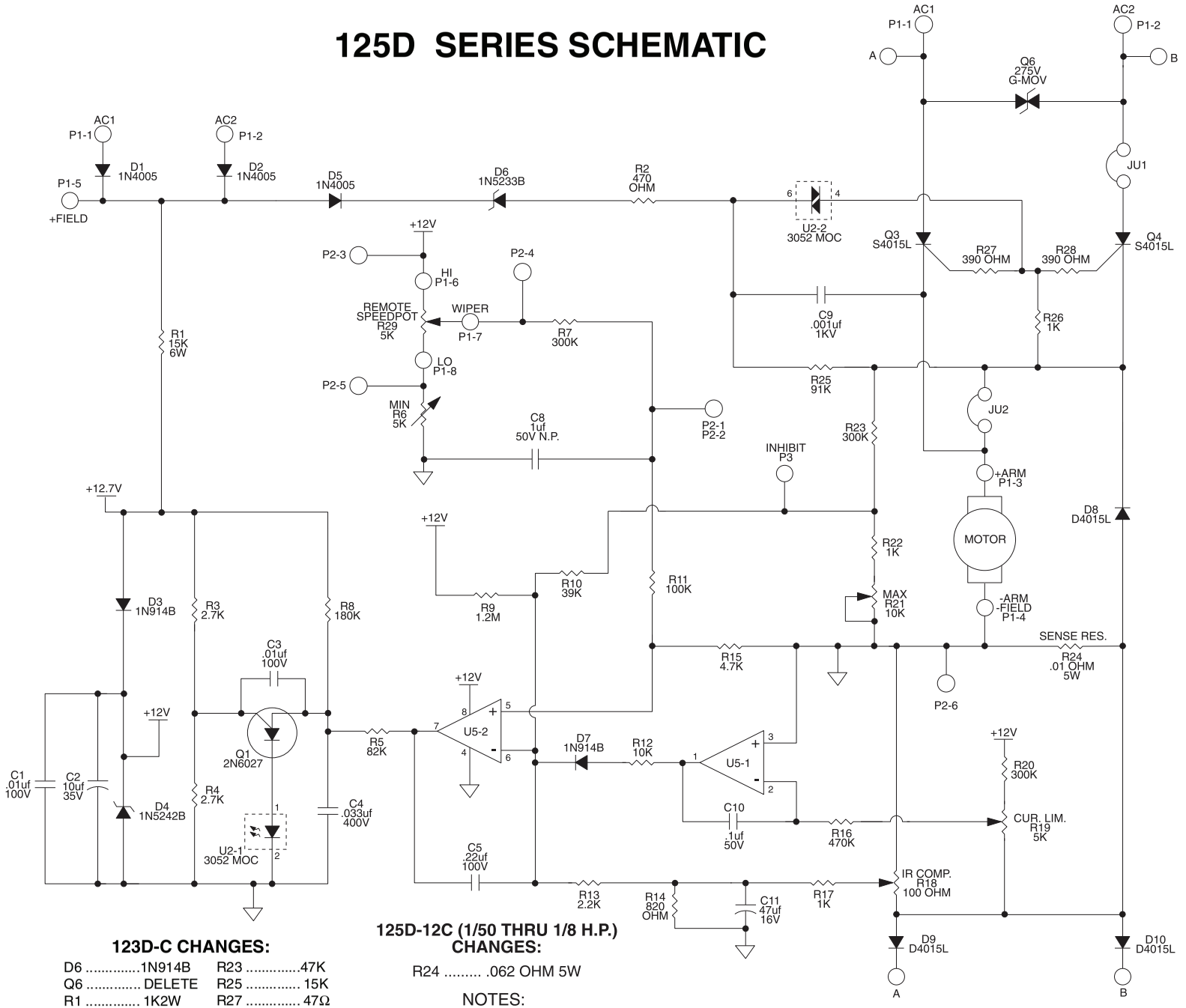
DIODES

D1	1N4005
D2	1N4005
D3	1N914B
D4	1N5242B
D5	1N4005
D6	1N5233B
D7	1N914B
D8	D4015L
D9	D4015L
D10	D4015L

123D-C CHANGES:

D6	1N914B (reverse direction)
Q6	DELETE
R1	1K 2W
R2	47Ω
R16	220K
R23	47K
R25	15K
R27	47Ω
R28	47Ω

125D SERIES SCHEMATIC



123D-C CHANGES:

D6 .....1N914B	R23 .....47K
Q6 ..... DELETE	R25 ..... 15K
R1 ..... 1K2W	R27 ..... 47Ω
R2 ..... 47Ω	R28 ..... 47Ω
R16 ..... 220K	

125D-12C (1/50 THRU 1/8 H.P.) CHANGES:

R24 ..... .062 OHM 5W

NOTES:

U5 ..... LM358 IC

NOTES:

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. Please include Name, Shipping Address (no P.O. Box), Phone Number and if possible, e-mail address.

Those orders received from anyone without an existing account with DCI must specify if they will be paying COD or Credit Card (Master Card/Visa/American Express). This information is required before work will begin. If you have an account with Dart your order will be processed according to the terms listed on your account. Products with Serial Number date codes over 5 years old will automatically be deemed Beyond Economical Repair (BER). A new, equivalent device will be offered at a substantial discount.

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 Dart Controls, Inc. at 317-873-5211.

YOUR MOTOR SPEED CONTROL SOLUTIONS 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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