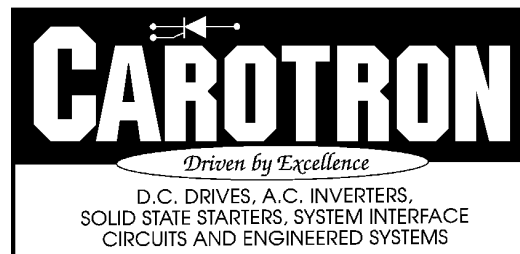


# D10425 Series Motor Controls

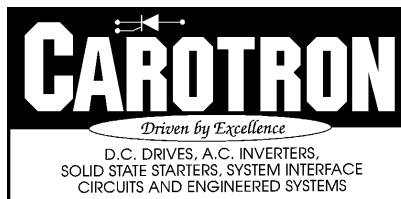
## Instruction Manuals

Models  
D10425-000  
D10425-200



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# 1

## General Description

The Carotron D10425 Series regenerative motor control provides full range – four quadrant – speed control or torque control of shunt wound or permanent magnet D.C. motors. Model D10425-000 operates motors between 1/8 to 1 horsepower. Model D10425-200 operates motors between 1/4 to 2 horsepower.

### **FEATURES**

- Operation from 115 or 230 VAC input for 90 or 180 VDC motor armatures.
- Switch selectable armature voltage or tachometer feedback.
- 7 or 50 VDC per thousand RPM feedback tachometer input.
- Independently adjustable Forward and Reverse Acceleration settings. Two time ranges are available for adjustment by programming jumper.
- A summing input connected directly to the input of the velocity loop that will accept an isolated input signal not to exceed  $\pm 10$  VDC.
- Single contact stopping by any of three methods:
  - Coast to stop
  - Controlled deceleration to stop
  - Rapid stop (in current limit)
- A hard firing, high frequency multipulse gating signal.
- I. C. regulated power supplies, metal film resistors, and cermet potentiometers for stable operation under varying conditions of temperature and line voltage.
- On board AC line fuses.
- Oversized power handling components.
- Line Transient suppression by MOV and RC snubber.
- Inner current loop type control circuit for fast and stable response under varying load conditions.
- Right angle type mounting to minimize required chassis area.

# 2

## Specifications

### **2.1 Electrical**

#### **A. C. Input**

115 VAC  $\pm 10\%$ , 50/60 Hz  $\pm 2\%$

230 VAC  $\pm 10\%$ , 50/60 Hz  $\pm 2\%$

Suitable for use on a circuit capable of delivering not more than 5000 RMS symmetrical amps, 240V maximum.

File E147521

#### **Armature Output**

0 – 90 VDC for 115 VAC input

0 – 180 VDC for 230 VAC input

#### **Field Output**

50 \* 100 VDC @ 1 Amp for 115 VAC input

100 \* 200 VDC @ 1 Amp for 230 VAC input

\* Alternate connection for 50% reduced voltage

#### **Horsepower Range: D10425-000**

1/8 – 1/2 HP @ 90 VDC

1/4 – 1/4 HP @ 180 VDC

#### **Horsepower Range: D10425-200**

1/4 – 1 HP @ 90 VDC

1/2 – 2 HP @ 180 VDC

## Adjustments

**NOTE:** The first three adjustments are duplicated for each direction, forward and reverse, and each only affects operation when running in that respective direction.

### MAX – FWD & REV

- (Speed mode) 45% to 110% of rated armature voltage
- (Torque mode) 50% to 120% of rated armature current

### C. L. (CURRENT LIMIT) – FWD & REV

- (Speed mode) 0 to 150% of current range selected
- (Torque mode) 0 to 120% of current range selected

### ACCEL – FWD & REV

- Independently adjustable over either of two selectable ranges, 1 – 4 seconds or 4 – 25 seconds

**NOTE:** Although the forward and reverse accel pots are independently adjustable, both will have the same time range as programmed by J2. FWD ACCEL control reverse DECEL time and REV ACCEL controls forward

DECEL time.

### DEADBAND

- Zero to 0.2 volts of Velocity Loop Integrator output

### IR COMP

- Range set by Arm I (amps) jumper, J1

### SPEED REGULATION

- Armature Feedback:  $\pm 1\%$  of base speed  
Tachometer Feedback:  $\pm 0.5\%$  of base speed

### TORQUE REGULATION

- $\pm 1\%$  of range selected

### SPEED RANGE

- 20 to 1 (motor dependent)

### TEMPERATURE RANGE

- Chassis: 0 - 55°C
- Enclosed: 0 - 40°C

**NOTE:** If enclosed, the D10425 Series should be mounted in an enclosure no less than 20" x 16" x 10" to meet U. L. listing requirements.

## 2.2 Physical

Refer to dimension drawing C10429 in Section 5 for complete dimension information.

# 3

## Installation

### 3.1 Circuit Protection

Model D10425-XXX should be installed in accordance with the National Electric Code and any applicable local or state codes.

All wiring should be rated at a minimum of 90°C.

Field wiring terminals at TB1 are for copper conductors only and should be torqued to 12 in. – lbs. The ground terminal should be torqued to 30 in. – lbs.

On D10425-000 models, a 10 amp maximum U. L. listed inverse – time circuit breaker should be used for branch circuit protection. On D10425-200 models, a 15 amp maximum U. L. listed inverse – time circuit breaker should be used for branch circuit protection.

The D10425 Series does not incorporate overload or over-speed protection. If desired, it must be added externally.

The drives are supplied from the factory with line fuses (FU1 & FU2) sized to allow maximum horsepower rating. Use the following table to determine fuse sizes if maximum horsepower is not required.

**Table 1: Fuse Sizing**

MODEL	HP	INPUT VOLTAGE	AC CURRENT @ F. L.	RECOMMEND FUSE
D10425-000	1/8	115VAC	2.4 Amps	3 Amp, MDA
	1/4	115VAC	4.5 Amps	5 Amp, MDA
	1/2	115VAC	8.7 Amps	10 Amp, MDA
	1/4	230VAC	2.4Amps	3 Amp, MDA
	1/2	230VAC	4.5 Amps	5 Amp, MDA
	1	230VAC	8.7 Amps	10 Amp, MDA
D10245-200	1/4	115VAC	4.5 Amps	5 Amp, MDA
	1/2	115VAC	8.7 Amps	10 Amp, MDA
	1	15VAC	14.8 Amps	15 Amp, MDA
	1/2	230VAC	4.5 Amps	5 Amp, MDA
	1	230VAC	8.7 Amps	10 Amp, MDA
	2	230VAC	14.8 Amps	15 Amp, MDA

**NOTE:** Fuses shown are manufactured by Bussmann. Littelfuse type 326 may be substituted.

### 3.2 Connection Information

Refer to connection drawing D10444 in Section 5.

#### Wiring Precautions

##### WARNING!

**CIRCUIT COMMON ON THE D10425 SERIES IS NOT EARTH OR CHASSIS GROUND. HIGH VOLTAGE POTENTIALS CAN BE PRESENT BETWEEN EARTH GROUND AND ANY POINT IN THE CIRCUIT. ALL TEST INSTRUMENTS SHOULD BE ISOLATED FROM EARTH GROUND TO PREVENT DAMAGE TO THE INSTRUMENT OR THE CONTROL. ANY INSTRUMENT CONNECTED TO THE CIRCUIT IS FLOATING AT POTENTIALS THAT APPROACH THE A. C. LINE VOLTAGE AND SHOULD**

#### BE HANDLED WITH CARE.

Ground the control only at the designated grounding stud on the mounting bracket marked by the symbol:



Use shielded cable for all speed pot, tachometer, summing input, reset, and enable circuit wiring. Connect the shield to circuit common at the control end only. These wires should be routed away from all A. C. power, armature, field and relay coil wiring.

##### WARNING!

**CONNECTION OF THE SHIELD TO CIRCUIT COMMON PLACES THE SHIELD AT LINE POTENTIAL WITH RESPECT TO EARTH GROUND AND REQUIRES THAT THE SHIELD BE INSULATED FROM GROUND AT BOTH ENDS. FAILURE TO INSULATE PROPERLY CAN CAUSE DAMAGE TO THE**

## CONTROL.

Any relays, contactors, motor starters, solenoids, etc. located in close proximity to or on the same A. C. line as the D10425 control should have a transient suppression device in parallel with the coil to minimize interference with the control.

## Terminal Connections

- **TB1-1 and 2 (L1 & L2-A.C. INPUT):** These terminals are used for the A. C. line input. Either 115 VAC or 230 VAC can be connected to these terminals. **NOTE:** Jumpers J3, J5, and J6 must be placed in the positions corresponding to the A. C. line voltage used.
- **TB1-3 and 4 (A1 & A2-Armature):** The motor armature leads, A1 and A2, connect to these terminals. These connections will produce CCW motor rotation as viewed from the commutator end with the field connected as shown on the connection diagram and with a positive polarity reference voltage. The armature leads should be switched if reverse rotation is desired. **NOTE:** When operating in tachometer feedback, the tachometer leads must be reversed when the armature leads are reversed.
- **TB1-5 and 6 (F1 & F2-Field):** The motor field leads, F1 and F2, connect to these terminals. No connection is required when a permanent magnet (P.M.) type motor is used. **NOTE:** To reduce field voltage by 50%, connect the F2 lead to TB1-1 or 2. This provides ½ wave rectification.
- **TB1-7 (COM):** This terminal is the common connecting point for

all reference input signals and reference wiring shields. Any reference input signals can be disabled by connecting them to this point.

- **TB1-8 (REF IN):** A signal applied here will have its rate of change controlled by the ACCEL pots. Forward direction acceleration is controlled by the P8 FWD ACCEL pot. Forward deceleration is controlled by the P7 REV ACCEL pot. Reverse direction acceleration is controlled by the P7 REV ACCEL pot. Reverse deceleration is controlled by P8 FWD ACCEL pot  $\pm 10$  VDC is the maximum voltage to be applied to this terminal. Shorting this terminal to COMMON, TB1-7, will cause the motor to decelerate to stop at a rate determined by the ACCEL pot for the opposite direction of rotation. These input signals are internally reset to zero instantly upon closure of a reference reset contact at TB1-12 and 13.
- **TB1-9 (FWD REF):** The +10 VDC reference supply here is current limited for protection during reference shorting operations. Normal load resistance should be 2K ohms or higher.
- **TB1-10 (REV REF):** This -10 VDC reference supply is also short protected and should normally be loaded by 2K ohms or higher.
- **TB1-11 (SUMMING INPUT):** This terminal connects directly to the Velocity Loop input. The input signal should not exceed  $\pm 10$  VDC and should be isolated. The input signal may be disabled by shorting Terminal 11 to COMMON or by operating the reference reset contact. This

signal is summed with the Terminal 8 Reference signal after its accel rate has been modified. The Summing Input has approximately the same scaling as the Reference signal. Like polarity signals at Terminals 8 and 11 will add together and opposite polarity signals will subtract or offset each other. Refer to the Summing Input connection drawing A10427 in Section 5.

- **TB1-12 and 13 (REF RESET):** Closing a contact across these terminals will instantly reset the ACCEL circuit output and the summing input to zero, and cause the motor to regeneratively brake to a stop at a rate determined by the C. L. (CURRENT LIMIT) pots. This stopping method, while normally faster than the quickest controlled deceleration to stop, may subject the motor and A. C. line supply to higher than normal peak currents. Also, the time to stop in "Current Limit" may not be consistent due to variables such as motor speed, load level, and load inertia.
- **TB1-14 and 15 (ENABLE):** Closing a contact across these terminals opens electronic clamps at five places in the control circuitry and "ENABLES" the drive to function normally. Opening this contact while running will shut off the control circuit and cause the motor to coast to stop.
- **TB1-16 (VELOCITY LOOP OUT):** This terminal connects directly to the output of the velocity loop integrator. If the drive is to be used as a Speed Regulator, jumper terminals 16 and 17. Refer to connection

drawing D10444 in Section 5.

- **TB1-17 (CURRENT LOOP IN):** This terminal connects directly to the input of the current integrator. If the drive is to be used as Speed Regulator, jumper terminals 16 and 17. If the drive is to be used as a Torque Regulator, jumper terminals 17 and 18. Refer to connection drawing D10444 in Section 5. An external Torque Reference Signal may also be applied to this terminal for special engineered applications. The signal applied must be isolated, and must not exceed  $\pm 10$  VDC. **NOTE:** Jumpers must be removed if an external signal is used.
- **TB1-18 (ACCEL/DECEL OUT):** This terminal provides a signal equal to but opposite in polarity to the output of the Forward and Reverse ACCEL circuit. If the drive is to be used as a Torque Regulator, jumper terminals 17 and 18. Refer to connection drawing D10444 in Section 5. This terminal may also be used as an inverted Reference Output signal for special engineered applications.
- **TB1-19 and 20 (+TACH & - TACH):** Operation of the control in tachometer feedback requires connection of 7 or 50 VDC per thousand RPM tachometer to these terminals. When motoring in the Forward direction, (positive reference voltage) the terminal 19 tachometer voltage should be positive with respect to terminal 20. The second tachometer lead and the shield should both tie to terminal 20.

### 4.1 Programming Jumpers

- **J1 (ARMATURE AMPS/TORQUE RANGE):** J1 is used to program the control according to the motor name plate full load armature current. The CURRENT LIMIT pots have a range up to 150% of the current level selected. Refer to the following tables to select the proper jumper location based on motor name plate and control voltage input.

Table 2: Model D10425-000

INPUT VOLTAGE	J1 Jumper Position		
	1.5 A	3 A	5 A
115 VAC	1/8 HP	1/4 HP	1/2 HP
230 VAC	1/4 HP	1/2 HP	1 HP

Table 3: Model D10425-200

INPUT VOLTAGE	J1 Jumper Position		
	3 A	6 A	10 A
115 VAC	1/4 HP	1/2 HP	1 HP
230 VAC	1/2 HP	1 HP	2 HP

- **J2 (ACCELERATION TIME – FWD & REV):** The range of time set by Forward and Reverse ACCEL pots can be 1- 4 or 4 – 25 seconds as determined by the J2 jumper position.

- **J3 (A.C. INPUT VOLTAGE):** J3 selects the armature feedback voltage level according to the A. C. line voltage used. Position at 115 VAC for 115 VAC input or 230 VAC for 230 VAC input.
- **J4 (TACHOMETER VOLTAGE):** When operating in tachometer feedback, use J4 to select 7 or 50 VDC per thousand RPM according to the rating of the tachometer used.
- **J5 AND J6 (A.C. INPUT VOLTAGE):** The J5 and J6 jumper wires program the power supply transformer according to the A. C. line voltage to be used. Position each at 115 VAC for 115 VAC input or 230 VAC for 230 VAC input.
- **SW1 (AFB/TFB):** Either Armature Feedback or Tachometer Feedback is selected by SW1. Selection of the TFB position disconnects the IR COMP pot from the circuit.

### 4.2 Potentiometers

- **MAX (MAXIMUM – P6 FWD & P5 REV):** MAX sets the maximum motor speed when the external Speed pot is set at 100%. Clockwise rotation increases speed. When the control is in the Torque mode, the MAX pot sets the maximum torque level.
- **C. L. (CURRENT LIMIT – P4 FWD & P3 REV):** C. L. sets the maximum armature current level. Its range is 0 to 150% of the current level selected by jumper J1. Clockwise rotation increases the Current Limit setting. When the control is operated as a torque



regulator, the C. L. pot should be turned fully clockwise since the range of current is determined by other adjustments.

- **ACCEL (ACCELERATION TIME – P8 FWD & P7 REV):** J2 sets the forward and reverse ACCEL pot range to 1 – 4 seconds or 4 – 25 seconds. Clockwise rotation of the ACCEL pots increases the time to accelerate the motor linearly to full speed. To accelerate to 50% speed would take 50% of the acceleration time.
- **IR COMP (IR COMPENSATION P2):** The IR COMP pot provides a signal proportional to armature current to compensate for motor losses as the motor load increases. This improves speed regulation in armature feedback. Clockwise rotation increases the compensation. When tachometer feedback is used, and when the control is used as a torque regulator, the IR COMP pot is not operational.
- **DEADBAND P1:** Deadband is an internal feedback loop adjustment used to minimize the effect of undesirable offset voltages. Clockwise rotation will increase the amount of deadband signal and can affect control response. Rather than increase the amount of input signal required to produce an output, it increases the time for the control to respond to very low input signals.

### **4.3 Adjustment Procedure:** **Speed Regulator**

#### **Step 1**

- Visually inspect all connections to check for tightness, proper insulation and agreement with the connection diagram. ONLY the

grounding stud on the mounting bracket should be connected to the chassis or earth ground.

- Verify the line voltage level and the positions of jumpers J3, J5, and J6.
- Place a jumper between terminals 16 and 17 at TB1. Refer to connection drawing D10444 in Section 5.
- Note the motor nameplate full load current and select the proper range at jumper J1. Place the AFB/TFB switch in the AFB position even if tachometer feedback is to be used. Select the desired ACCEL time ranges with jumper J2.
- Initially the potentiometers should be preset as follow:

DEADBAND.....	mid-range
IR COMP.....	fully CCW
FWD MAX.....	mid-range
REV MAX.....	mid-range
FWD C.L.....	fully CW
REV C.L.....	fully CW
FWD ACCEL.....	mid-range
REV ACCEL.....	mid-range

#### **Step 2**

- With no load on the motor or machine, apply line voltage and close the ENABLE contact to start the control. Apply maximum forward (positive) reference input.
- Measure the motor speed or armature voltage, and adjust the FWD MAX pot for base speed or rated armature voltage.

#### **Step 3**

- Repeat the Step 2 procedure for the reverse direction by applying maximum reverse (negative) reference and adjusting the REV MAX pot.

#### **Step 4 (Armature Feedback only – Omit this step if tachometer feedback is used.)**

- Adjust the speed (either direction) to mid – range, or if known the

speed at which the motor will be run most often. Closely note the motor or line speed. Apply rated or normal load to the motor. The speed will usually drop a small percentage. Increase the IR COMP pot rotation clockwise until the loaded speed level matches the unloaded speed. Recheck the unloaded speed level and repeat this step until there is no difference from no load to full load speed.

**NOTE:** The IR COMP signal may affect the maximum speed settings. After setting the IR COMP, recheck the MAX level for each direction and readjust if necessary.

**Step 5 (Tachometer Feedback Only – Omit this step if armature feedback is used.)**

- With the control in Armature feedback, run the motor forward (positive reference) and measure the tachometer voltage at terminals 19 and 20. Verify that terminal 19 is positive with respect to terminal 20. Reverse the leads to correct if necessary.
- Remove power from the control and switch from the AFB position to the TFB position.

**NOTE:** The maximum speed settings may change slightly due to variations in the tachometer voltage. Recheck and readjust the MAX pots if necessary.

**Step 6**

- The C. L. (CURRENT LIMIT) pots are normally adjusted to full clockwise to allow 150% of the current range selected by J1. The D10245 motor controls can safely handle this current level on an intermittent basis, i.e. during rapid accelerations and decelerations or upon application of a cyclic or

stepped load. If desired, the maximum current levels can be limited to a lower level by rotating the C.L. pots counter clockwise. **NOTE:** Precise setting of the Current Limit setpoint requires the insertion of a D. C. ammeter in series with the motor armature.

**Step 7**

- Adjust the ACCEL pots as required to achieve the desired rate of speed change. Clockwise rotation increases time.

**4.4 Adjustment Procedure: Torque Regulator**

**Step 1**

- Visually inspect all connections to check for tightness, proper insulation and agreement with the connection diagram. **ONLY** the grounding stud on the mounting bracket should be connected to the chassis or earth ground.
- Verify the line voltage level and the positions of jumpers J3, J5, and J6.
- Remove the jumper between terminals 16 and 17 at TB1 and reconnect between terminals 17 and 18. Refer to connection drawing D10444 in Section 5.
- Note the motor nameplate full load current and select the proper range at jumper J1. Select the desired ACCEL time range with jumper J2.
- Initially the potentiometers should be preset as follows:

DEADBAND.....	not applicable
IR COMP.....	not applicable
FWD MAX.....	mid-range
REV MAX.....	mid-range
FWD C. L.....	fully CW
REV C. L.....	fully CW
FWD ACCEL.....	mid-range
REV ACCEL.....	mid-range

**NOTE:** Motor full rated torque is produced at full rated armature current. In the following steps, motor torque should be monitored directly by use of a D. C. ammeter connected in series with the motor armature. The motor shaft must be mechanically locked to prevent rotation.

- **DO NOT** operate the motor stalled at full load for more than several seconds to prevent overheating.

### **Step 2**

- In the Torque Regulator mode, the reference signal applied to TB1-8 becomes the torque reference. Apply A. C. power, zero volts reference, and close the ENABLE contact. Gradually increase the reference (FWD or REV) to maximum, and adjust the corresponding MAX pot to set the

armature current to 100% of rated motor current.

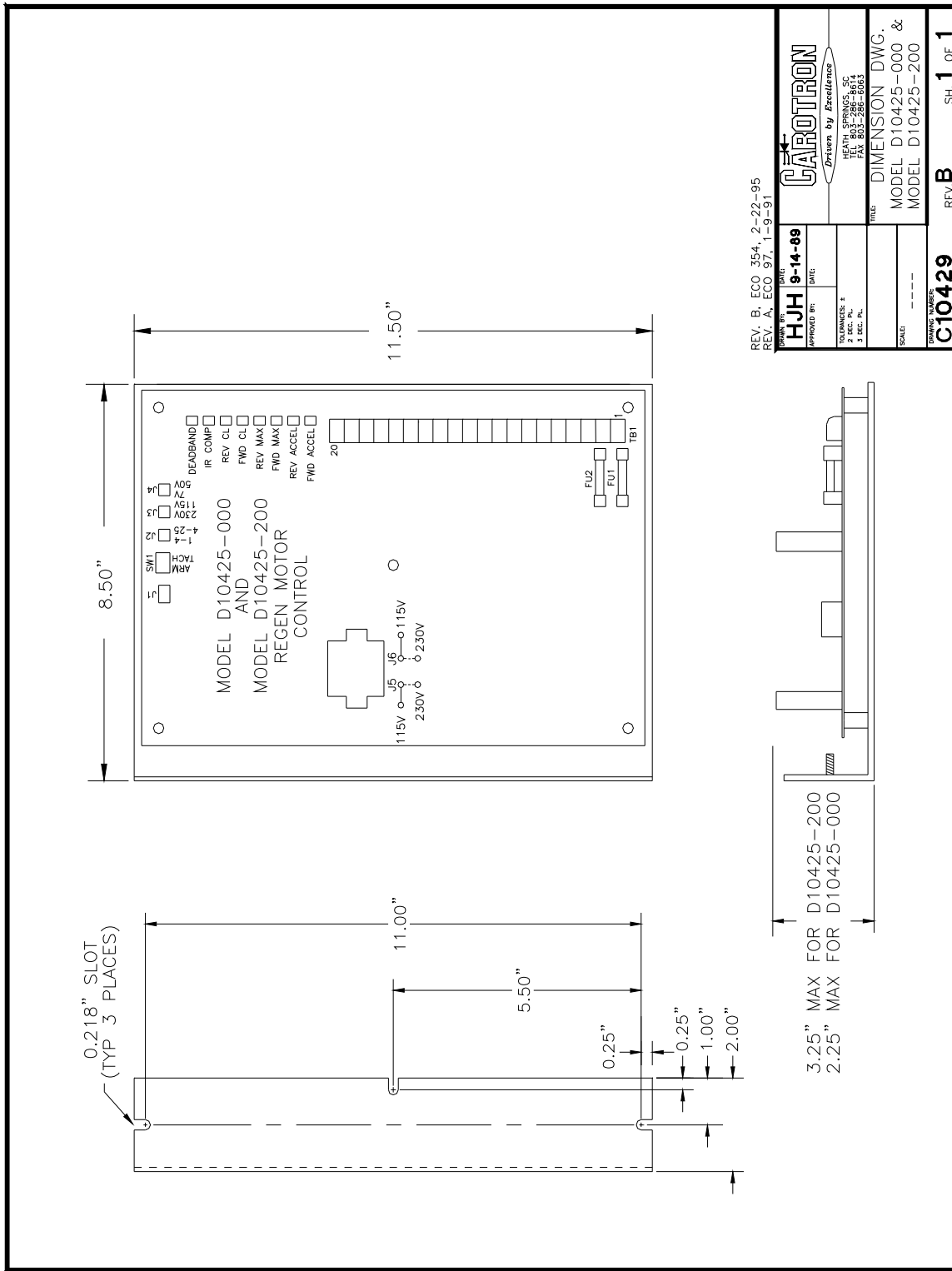
### **Step 3**

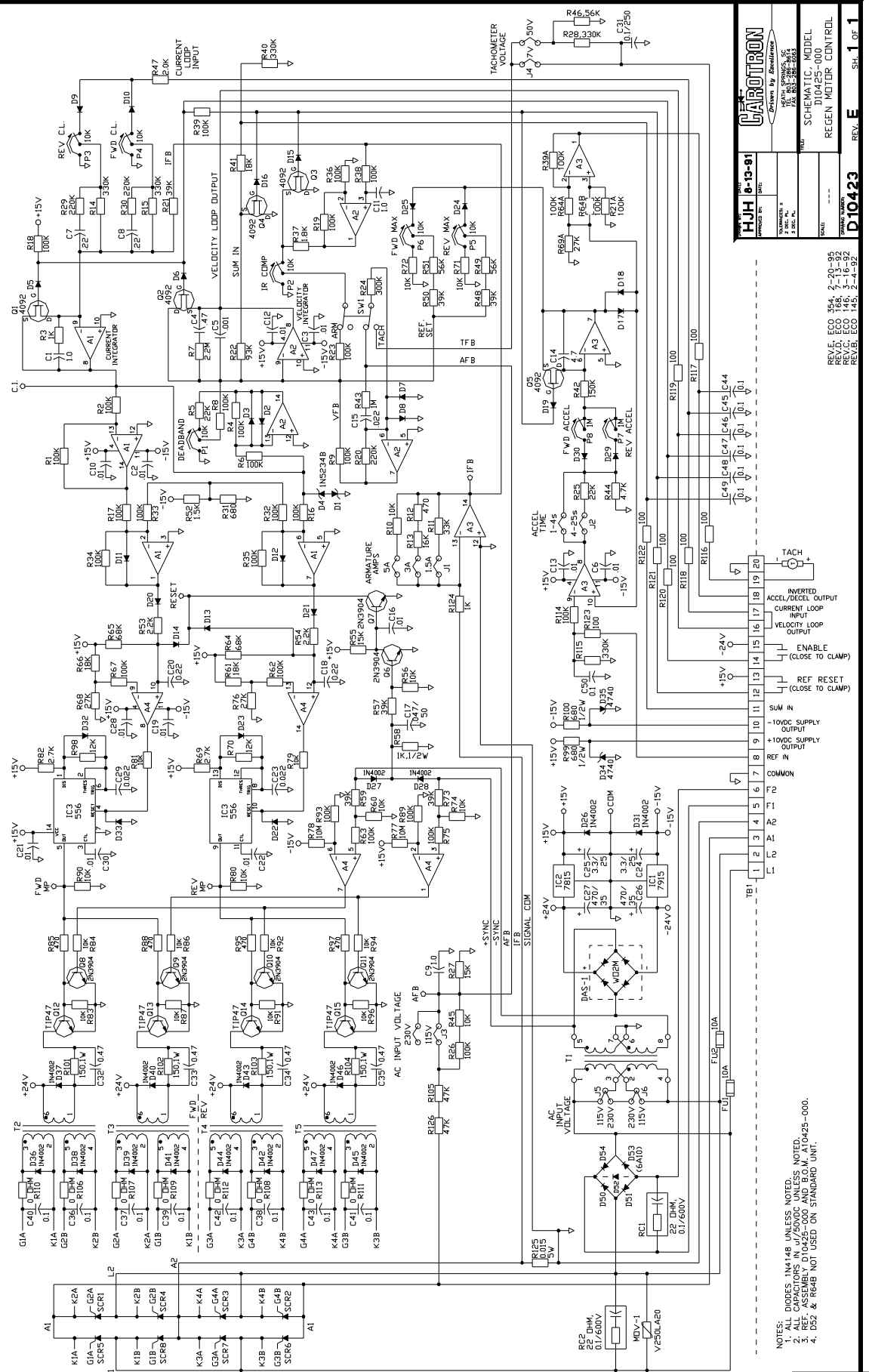
- Adjust the ACCEL pots for the desired rate of change in torque due to a reference change. Opening the ENABLE contact will turn off the current instantly.

### **Step 4**

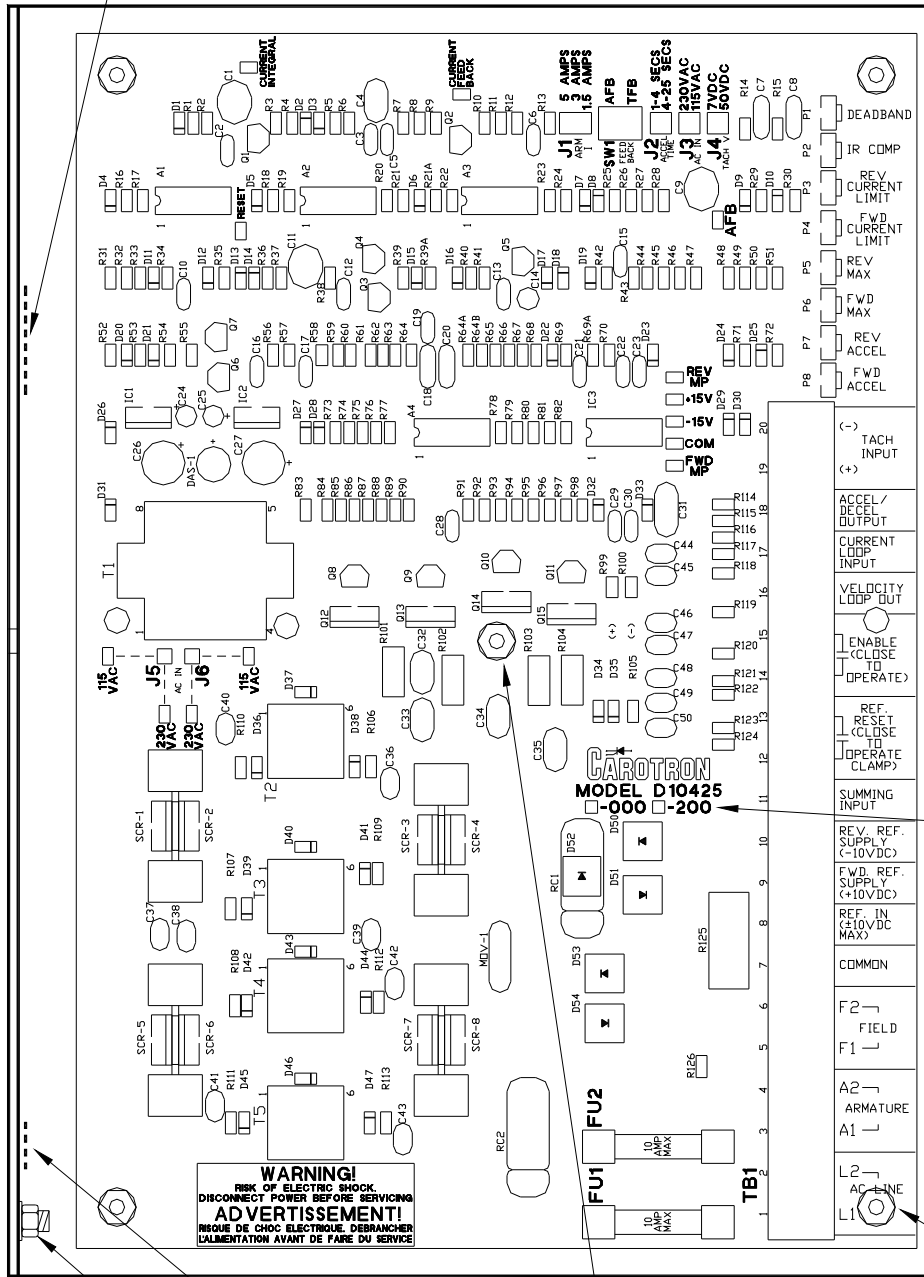
- Turn off the power and remove the mechanical lock from the motor shaft. The Torque Regulator is now ready for use. Check the torque/speed range of the motor to determine the lowest allowable operating speed at full torque without overheating.

**NOTE:** When used as a torque regulator, the D10425 motor controls will not provide four quadrant operation as in the speed regulator mode.





- NOTES:  
 1. ALL DIODES 1N4148 UNLESS NOTED.  
 2. REF. CASE NUMBERS D10A27, D10A28, D10A29, D10A30, D10A31, D10A32, D10A33, D10A34, D10A35, D10A36, D10A37, D10A38, D10A39, D10A40, D10A41, D10A42, D10A43, D10A44, D10A45, D10A46, D10A47, D10A48, D10A49, D10A50, D10A51, D10A52, D10A53, D10A54, D10A55, D10A56, D10A57, D10A58, D10A59, D10A60, D10A61, D10A62, D10A63, D10A64, D10A65, D10A66, D10A67, D10A68, D10A69, D10A70, D10A71, D10A72, D10A73, D10A74, D10A75, D10A76, D10A77, D10A78, D10A79, D10A80, D10A81, D10A82, D10A83, D10A84, D10A85, D10A86, D10A87, D10A88, D10A89, D10A90, D10A91, D10A92, D10A93, D10A94, D10A95, D10A96, D10A97, D10A98, D10A99, D10A100.  
 3. REF. CASE NUMBERS D10A27, D10A28, D10A29, D10A30, D10A31, D10A32, D10A33, D10A34, D10A35, D10A36, D10A37, D10A38, D10A39, D10A40, D10A41, D10A42, D10A43, D10A44, D10A45, D10A46, D10A47, D10A48, D10A49, D10A50, D10A51, D10A52, D10A53, D10A54, D10A55, D10A56, D10A57, D10A58, D10A59, D10A60, D10A61, D10A62, D10A63, D10A64, D10A65, D10A66, D10A67, D10A68, D10A69, D10A70, D10A71, D10A72, D10A73, D10A74, D10A75, D10A76, D10A77, D10A78, D10A79, D10A80, D10A81, D10A82, D10A83, D10A84, D10A85, D10A86, D10A87, D10A88, D10A89, D10A90, D10A91, D10A92, D10A93, D10A94, D10A95, D10A96, D10A97, D10A98, D10A99, D10A100.  
 4. D52 & R64B NOT USED ON STANDARD UNIT.



**WARNING!**  
RISK OF ELECTRIC SHOCK.  
DISCONNECT POWER BEFORE SERVICING!  
**ADVERTISSEMENT!**  
RISQUE DE CHOC ELECTRIQUE. DEBRANCHER  
L'ALIMENTATION AVANT DE FAIRE DU SERVICE

REV. D. ECO. 154. 7-21-95  
REV. C. ECO. 166. 7-1-92  
REV. B. ECO. 145. 6-1-92

**HJH 6-1-92**

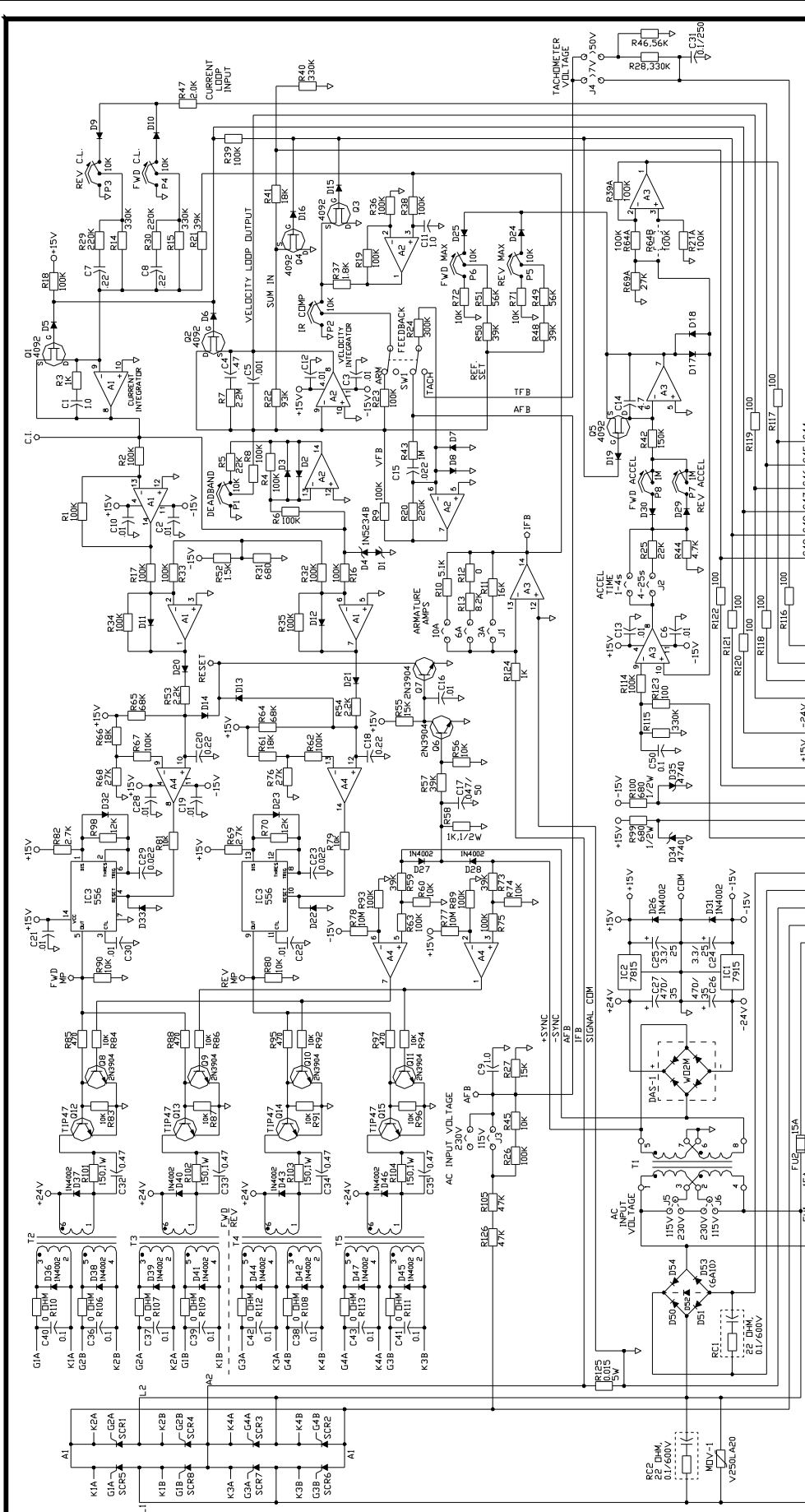
DESIGNED BY: [signature]  
DRAWN BY: [signature]  
PART NUMBER: [signature]  
REV: 2-1

D10425-000 REV. D SH. 1 OF 1

CHECK -000 ASSEMBLY BLOCK!

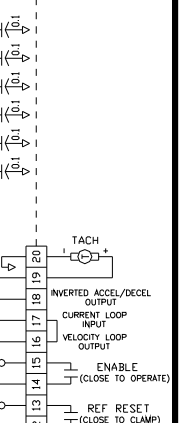
- NOTES:  
1. REF. B.O.M. A10425-000.  
2. D52 & R64B NOT USED ON STANDARD UNIT.

**CAROTRON**  
*Driven by Assistance*  
MOTOR CONTROL  
ASSEMBLY MODEL  
D10425-000 REGEN  
MOTOR CONTROL

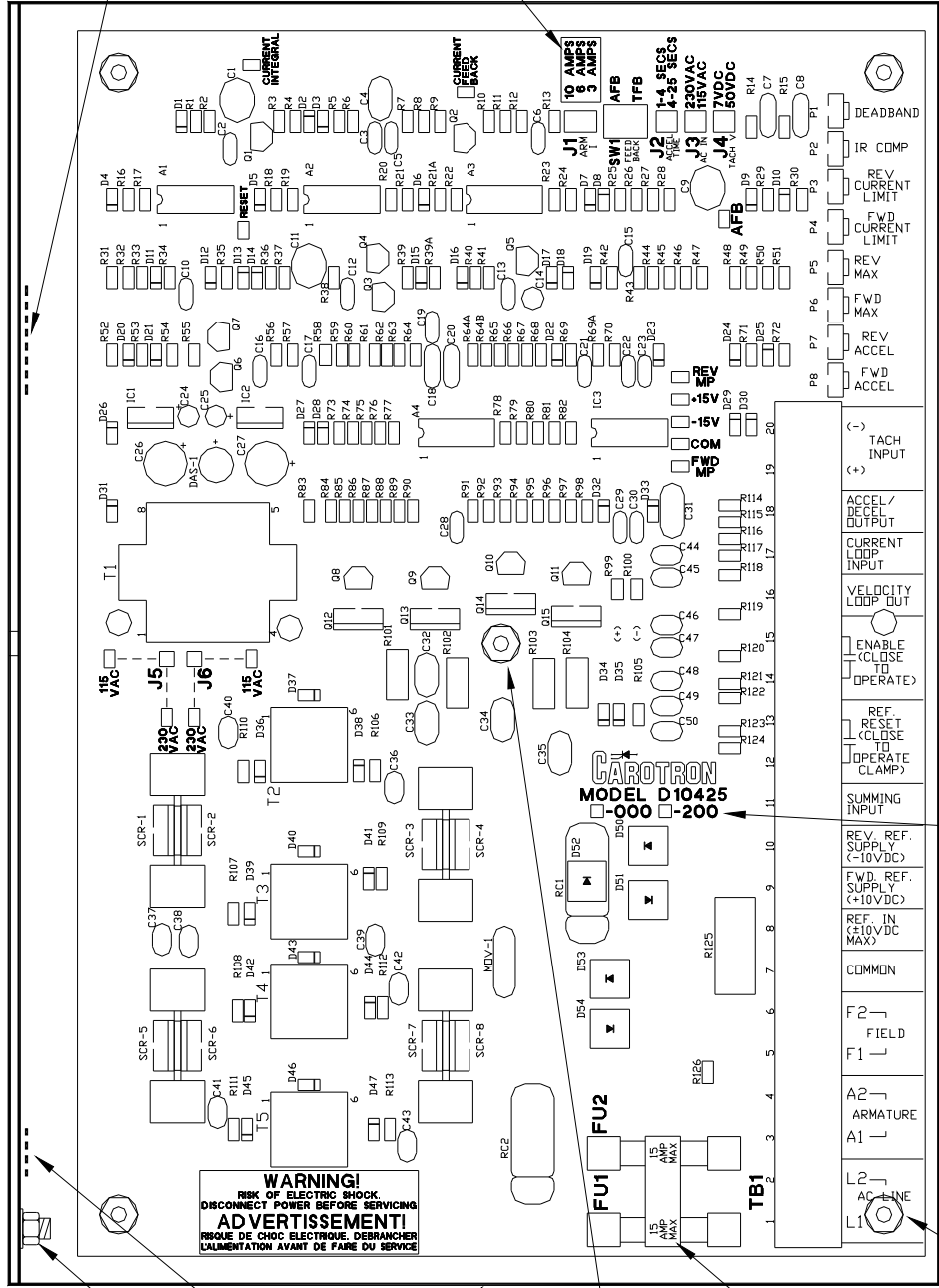


**HJH 6-19-81**  
 DATE: \_\_\_\_\_  
 DRAWN BY: \_\_\_\_\_  
 CHECKED BY: \_\_\_\_\_  
 APPROVED BY: \_\_\_\_\_  
 PARTS LIST: \_\_\_\_\_  
 REVISIONS: \_\_\_\_\_  
 SHEET NO. \_\_\_\_\_  
 TOTAL SHEETS: \_\_\_\_\_  
**PARATRON**  
 Drives by Anemotronics  
 10000 W. 10th St.  
 Torrance, CA 90503-2883  
 TEL: (310) 552-2883  
 FAX: (310) 552-2883

REV. ECO 145, 2-70-95  
 REV. ECO 146, 3-16-92  
 REV. ECO 148, 3-16-92  
 REV. ECO 149, 2-1-92  
**DJ0623**  
 REV. E SH. 1 OF 1



- NOTES:  
 1. ALL DIODES 1N4148 UNLESS NOTED.  
 2. ALL CAPACITORS IN  $\mu$ F/50VDC UNLESS NOTED.  
 3. RESISTOR VALUES IN OHMS UNLESS NOTED.  
 4. D54 & R68 NOT USED ON STANDARD UNIT.



REV. D. ECO 755, 2-21-95  
 REV. C. ECO 746, 6-1-92  
 REV. B. ECO 746, 6-1-92  
 REV. A. ECO 746, 6-1-92

**HJH 6-1-92**

DESIGNED BY: [ ]  
 DRAWN BY: [ ]  
 CHECKED BY: [ ]  
 APPROVED BY: [ ]

ASSEMBLY MODEL  
 D10425-200 REGEN  
 MOTOR CONTROL

SCALE: 2=1

**D10425-200 REV. D** SH. 1 OF 1

NOTES:  
 1. REF. B.O.M. A10425-200.  
 2. D52 & R64B NOT USED ON STANDARD UNIT.

CHECK -200 ASSEMBLY BLOCK!

(-)	TACH INPUT
(+)	ACCEL / DECEL OUTPUT
	CURRENT LOOP INPUT
	VELOCITY LOOP OUT
	ENABLE (CLOSE TO OPERATE)
	REF. RESET (CLOSE TO OPERATE CLAMP)
	SUMMING INPUT
	REV. REF. SUPPLY (-10VDC)
	FWD. REF. SUPPLY (+10VDC)
	REF. IN (10VDC MAX)
	COMMON
F2	FIELD
F1	ARMATURE
A2	AC LINE
A1	
L2	
L1	

LAB2

LAB4

HWA2 HWA4

LAB1

BKT1

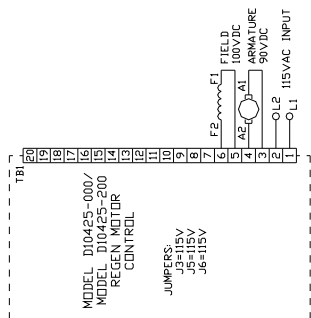
HWA1 HWA3

HWA5

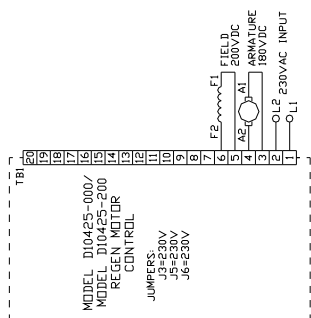
LAB3

HWA1 HWA3

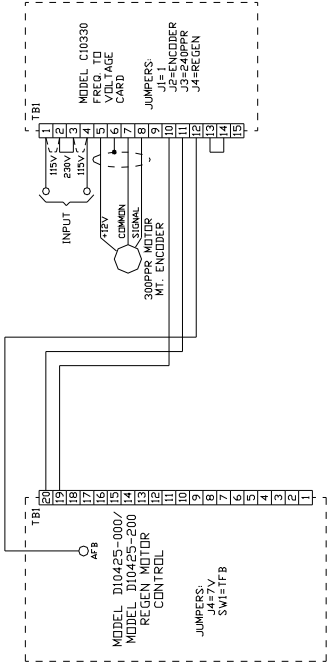




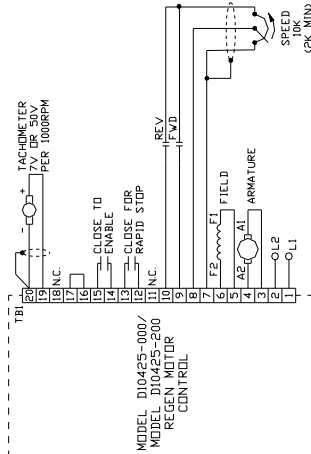
115VAC OPERATION



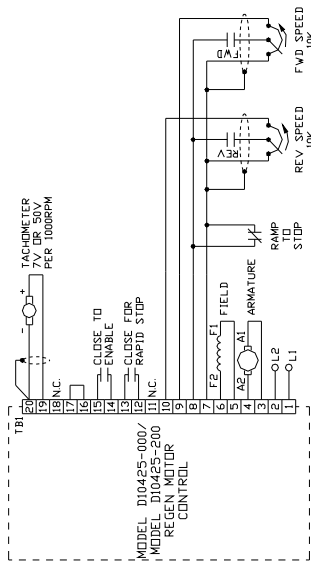
230VAC OPERATION



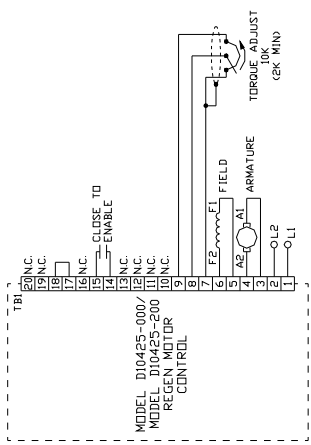
CONNECTIONS TO USE F TO V CARD AND ENCODER FOR SPEED MODE FEEDBACK



CONNECTIONS FOR SPEED REGULATOR MODE



CONNECTIONS FOR SPEED REGULATOR MODE



CONNECTIONS FOR TORQUE REGULATOR MODE

REV. A, ECD, 97, 1-9-91

**HJH 9-7-89**

Drives by **BRIDGES**

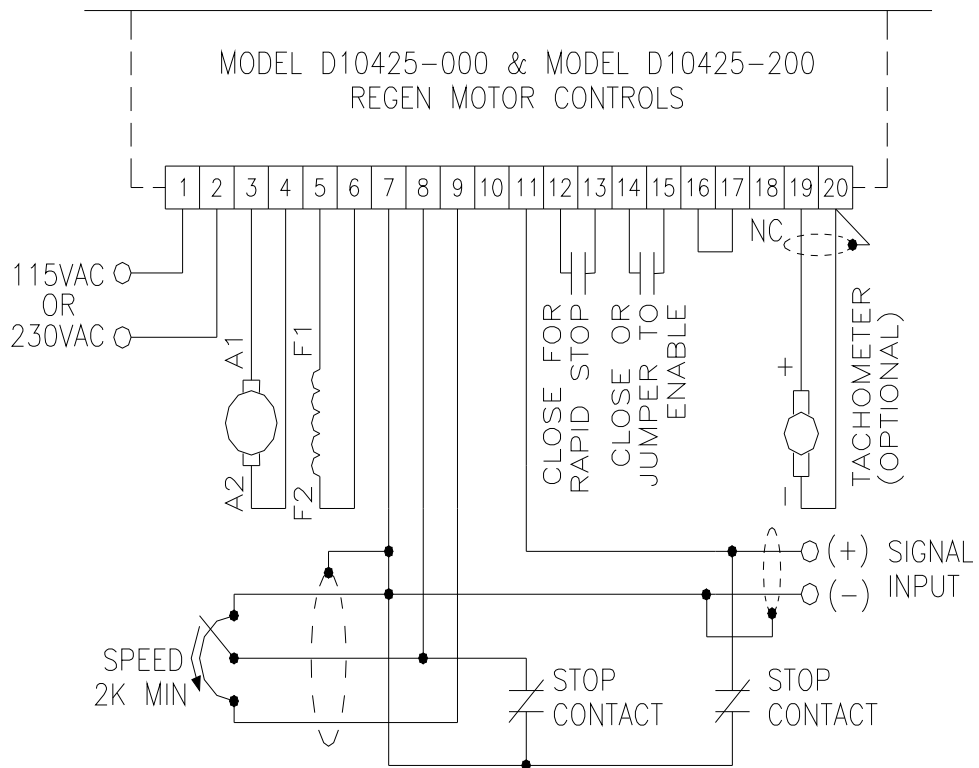
**CAROTRON**

7575 S. GARDEN ST. #55  
DALLAS, TEXAS 75249-2585

MODEL D10425-000/ REGEN MOTOR & CONTROL  
MODEL D10425-200 REGEN CONTROL

DATE: --- -- --

REV. A **D10444** SH. 1 OF 1



**NOTE:**

THE SUMMING INPUT SIGNAL MUST BE ISOLATED AND SHOULD NOT EXCEED  $\pm 10$  VDC. THIS INPUT SIGNAL SUMS WITH THE REF IN SIGNAL CONNECTED TO TB1-8. BOTH INPUT SIGNALS ARE REFERENCED TO CIRCUIT COMMON AT TB1-7. LIKE POLARITY SIGNALS WILL ADD TOGETHER AND UNLIKE POLARITY SIGNALS WILL SUBTRACT OR OFFSET EACH OTHER.

EXAMPLE: +5VDC AT TB1-8 AND +5VDC AT TB1-11 WOULD CAUSE APPROXIMATELY THE SAME OUTPUT AS +10VDC AT EITHER SINGLE INPUT. +10VDC AT TB1-8 AND -5VDC AT TB1-11 WOULD CAUSE APPROXIMATELY THE SAME OUTPUT AS +5VDC AT EITHER SINGLE INPUT.

REV.A, ECO 97, 1-9-91



TITLE: SUMMING INPUT MODEL D10425-000 & D10425-200 REGEN MOTOR CONTROLS

DWG. NO.

**A10427**

DRAWN BY: BKP

APPROVED BY:

DATE: 5-30-95

SCALE: -

REV. A

SHEET 1 OF 1

# Standard Terms & Conditions of Sale

## 1. General

The Standard Terms and Conditions of Sale of Carotron, Inc. (hereinafter called "Company") are set forth as follows in order to give the Company and the Purchaser a clear understanding thereof. No additional or different terms and conditions of sale by the Company shall be binding upon the Company unless they are expressly consented to by the Company in writing. The acceptance by the Company of any order of the Purchaser is expressly conditioned upon the Purchaser's agreement to said Standard Terms and Conditions. The acceptance or acknowledgement, written, oral, by conduct or otherwise, by the Company of the Purchaser's order shall not constitute written consent by the Company to addition to or change in said Standard Terms and Conditions.

## 2. Prices

Prices, discounts, allowances, services and commissions are subject to change without notice. Prices shown on any Company published price list and other published literature issued by the Company are not offers to sell and are subject to express confirmation by written quotation and acknowledgement. All orders of the Purchaser are subject to acceptance, which shall not be effective unless made in writing by an authorized Company representative at its office in Heath Springs, S.C. The Company may refuse to accept any order for any reason whatsoever without incurring any liability to the Purchaser. The Company reserves the right to correct clerical and stenographic errors at any time.

## 3. Shipping dates

Quotation of a shipping date by the Company is based on conditions at the date upon which the quotation is made. Any such shipping date is subject to change occasioned by agreements entered into previous to the Company's acceptance of the Purchaser's order, governmental priorities, strikes, riots, fires, the elements, explosion, war, embargoes, epidemics, quarantines, acts of God, labor troubles, delays of vendors or of transportation, inability to obtain raw materials, containers or transportation or manufacturing facilities or any other cause beyond the reasonable control of the Company. In no event shall the Company be liable for consequential damages for failure to meet any shipping date resulting from any of the above causes or any other cause.

In the event of any delay in the Purchaser's accepting shipment of products or parts in accordance with scheduled shipping dates, which delay has been requested by the Purchaser, or any such delay which has been caused by lack of shipping instructions, the Company shall store all products and parts involved at the Purchaser's risk and expense and shall invoice the Purchaser for the full contract price of such products and parts on the date scheduled for shipment or on the date on which the same is ready for delivery, whichever occurs later.

## 4. Warranty

The Company warrants to the Purchaser that products manufactured or parts repaired by the Company, will be free, under normal use and maintenance, from defects in material and workmanship for a period of one (1) year after the shipment date from the Company's factory to the Purchaser. The Company makes no warranty concerning products manufactured by other parties.

As the Purchaser's sole and exclusive remedy under said warranty in regard to such products and parts, including but not limited to remedy for consequential damages, the Company will at its option, repair or replace without charge any product manufactured or part repaired by it, which is found to the Company's satisfaction to be so defective; provided, however, that (a) the product or part involved is returned to the Company at the location designated by the Company, transportation charges prepaid by the Purchaser; or (b) at the Company's option the product or part will be repaired or replaced in the Purchaser's plant; and also provided that (c) the Company is notified of the defect within one (1) year after the shipment date from the Company's factory of the product or part so involved.

The Company warrants to the Purchaser that any system engineered by it and started up under the supervision of an authorized Company representative will, if properly installed, operated and maintained, perform in compliance with such system's written specifications for a period of one (1) year from the date of shipment of such system.

As the Purchaser's sole and exclusive remedy under said warrant in regard to such systems, including but not limited to remedy for consequential damages, the Company will, at its option, cause, without charges any such system to so perform, which system is found to the Company's satisfaction to have failed to so perform, or refund to the Purchaser the purchase price paid by the Purchaser to the Company in regard thereto; provided, however, that (a) Company and its representatives are permitted to inspect and work upon the system involved during reasonable

hours, and (b) the Company is notified of the failure within one (1) year after date of shipment of the system so involved.

The warranties hereunder of the Company specifically exclude and do not apply to the following:

a. Products and parts damaged or abused in shipment without fault of the Company.

b. Defects and failures due to operation, either intentional or otherwise, (1) above or beyond rated capacities, (2) in connection with equipment not recommended by the Company, or (3) in an otherwise improper manner.

c. Defects and failures due to misapplication, abuse, improper installation or abnormal conditions of temperature, humidity, abrasives, dirt or corrosive matter.

d. Products, parts and systems which have been in any way tampered with or altered by any party other than an authorized Company representative.

e. Products, parts and systems designed by the Purchaser.

f. Any party other than the Purchaser.

The Company makes no other warranties or representation, expressed or implied, of merchantability and of fitness for a particular purpose, in regard to products manufactured, parts repaired and systems engineered by it.

## 3. Terms of payment

Standard terms of payment are net thirty (30) days from date of the Company invoice. For invoice purposed, delivery shall be deemed to be complete at the time the products, parts and systems are shipped from the Company and shall not be conditioned upon the start up thereof. Amounts past due are subject to a service charge of 1.5% per month or fraction thereof.

## 6. Order cancellation

Any cancellation by the Purchaser of any order or contract between the Company and the Purchaser must be made in writing and receive written approval of an authorized Company representative at its office in Heath Springs, S.C. In the event of any cancellation of an order by either party, the Purchaser shall pay to the Company the reasonable costs, expenses, damages and loss of profit of the Company incurred there by, including but not limited to engineering expenses and expenses caused by commitments to the suppliers of the Company's subcontractors, as determined by the Company.

## 7. Changes

The Purchaser may, from time to time, but only with the written consent of an authorized Company representative, make a change in specifications to products, parts or systems covered by a purchase order accepted by the company. In the event of any such changes, the Company shall be entitled to revise its price and delivery schedule under such order.

## 8. Returned material

If the Purchaser desires to return any product or part, written authorization thereof must first be obtained from the Company which will advise the Purchaser of the credit to be allowed and restocking charges to be paid in regard to such return. No product or part shall be returned to the Company without a "RETURN TAG" attached thereon which has been issued by the Company.

## 9. Packing

Published prices and quotations include the Company's standard packing for domestic shipment. Additional expenses for special packing or overseas shipments shall be paid by the Purchaser. If the Purchaser does not specify packing or accepts parts unpacked, no allowance will be made to the Purchaser in lieu of packing.

## 10. Standard transportation policy

Unless expressly provided in writing to the contrary, products, parts and systems are sold f.o.b. first point of shipment. Partial shipments shall be permitted, and the Company may invoice each shipment separately. Claims for non-delivery of products, parts and systems, and for damages thereto must be filed with the carrier by the Purchaser. The Company's responsibility therefor shall cease when the carrier signs for and accepts the shipment.



**CAROTRON**

*Driven by Excellence*

D.C. DRIVES, A.C. INVERTERS,  
SOLID STATE STARTERS, SYSTEM INTERFACE  
CIRCUITS AND ENGINEERED SYSTEMS

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MAN1003-00 Rev. D

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