

IDP100 SERIES

MOTOR CONTROL

Instruction Manual

Models

IDP102-000

IDP102-BC1

IDP102-BC2

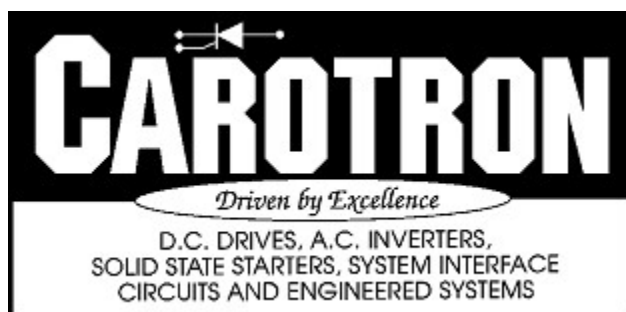
IDP102-RC1

IDP102-RC2

IDP105-000

IDP105-BC2

IDP105-RC2



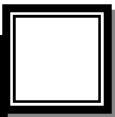


TABLE OF CONTENTS

1. General Description.....	3
2. Specifications.....	3
2.1 Electrical.....	3
2.2 Physical.....	4
3. Installation.....	4
3.1 Circuit Protection.....	4
3.2 Connection Information.....	4
4. Programming & Adjustments.....	6
4.1 Programming Jumpers.....	6
4.2 Potentiometers.....	6
4.3 Adjustment Presets.....	7
4.4 Adjustment Procedure - Speed Regulator.....	7
4.5 Adjustment Procedure - Torque Regulator.....	8
4.6 Adjustment Procedure - Torque/Taper Option.....	9
5. Run-Brake Models.....	10
6. Contactor Reversing Models.....	11
7. Spare Parts.....	12
8. Prints.....	13
D13996 Power/Control Board Schematic.....	13
C13995 Power/Control Board Assembly.....	14
C11657 Reversing Logic Board Schematic & Assembly.....	15
C11658 Torque/Taper Board Schematic & Assembly.....	16
D14212 IDP102-000, -BC1, -BC2 Wiring & Connections.....	17
D14213 IDP102-RC1, -RC2 Wiring & Connections.....	18
D14214 IDP105-000, -BC2, -RC2 Wiring & Connections.....	19
D14215 Dimension Drawings.....	20

1

GENERAL DESCRIPTION

The Carotron IDP100 Series Isolated Drive Package provides full range speed or torque control of shunt wound or permanent magnet D.C. motors. IDP102 models operate motors between ¼ and 2 horsepower, and IDP105 models operate motors between 3 and 5 horsepower.

Features

- IDP102 Series operates at 115 or 230 VAC input for 90 or 180 VDC motor armatures.
- IDP105 Series operates at 230 VAC input for 180 VDC motor armatures.
- Selectable armature voltage or tachometer feedback.
- Independently adjustable linear Acceleration and Deceleration, two ranges selectable by programming jumper.
- Isolated Control Circuitry.
- A single "Enable" input for starting and stopping of basic models.
- A hard firing, high frequency multi-pulse gating circuit.
- Inner current loop for fast stable response under varying load conditions.
- I.C. regulated power supplies, metal film resistors and cermet potentiometers for stable operation with fluctuations in temperature and line voltage.
- 110 quick connect type terminals for test points and optional circuit access.
- A low profile chassis provides custom design flexibility for O.E.M. applications.

2

SPECIFICATIONS

2.1 Electrical

A.C. INPUT

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

Suitable for use on a circuit capable of delivering not more than 5000 RMS symmetrical amps, 253 VAC maximum.

ARMATURE OUTPUT

- 0 - 90 VDC for 115 VAC input
- 0 - 180 VDC for 230 VAC input

FIELD OUTPUT

- 100 VDC @ 1 Amp for 115 VAC input
- 200 VDC @ 1 Amp for 230 VAC input

HORSEPOWER RANGE: IDP102 Series

- ¼ - 1 HP @ 90 VDC
- ½ - 2 HP @ 180 VDC

HORSEPOWER RANGE: IDP105 Series

- 3 - 5 HP @ 180 VDC

ADJUSTMENTS

- Minimum
 - Speed Mode: 0 to 25% of full speed
 - Torque Mode: 0 to 10% of rated torque

• Maximum

- Speed Mode: -20 to +10% of full speed
- Torque Mode: -20 to +10% of rated torque

• Current Limit

- 0 to 150% of full load current (Refer to Table 2)

• IR Compensation

- Range set by HP range

• Acceleration and Deceleration, Linear Independently adjustable with two ranges, 1 - 5 seconds or 4 - 40 seconds.

SPEED RANGE

- 20:1 Typical determined by motor specification

SPEED REGULATION

- Armature Feedback: \pm 2% of base speed
 - Tachometer Feedback: \pm 0.5% of base speed
- Note: Designed for 7 VDC or 50 VDC/1000 RPM tachometer

TORQUE REGULATION

- \pm 2% of current range selected

TEMPERATURE RANGE

- 0 - 55° C for chassis units
- 0 - 40° C for enclosed units

2.2 Physical

Refer to print D14215 in Section 8 for complete mounting dimension information on all models and options.

3

INSTALLATION

3.1 Circuit Protection

The IDP100 Series of drives 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.

Customer wiring terminals TB1, TB2, TB5, TB6, & TB10 should be torqued to 12 in.-lbs.

Customer wiring terminals TB3 & TB4-GND,L1,L2,A1,A2 should be torqued to 14in.-lbs.

Customer wiring terminals TB3 & TB4-F1,F2 should be torqued to 7in.-lbs.

A 20 amp maximum Circuit Breaker should be used for branch circuit protection on IDP102 models, and a 40 amp maximum should be used on IDP105 models.

Models supplied from the factory with line fuses (F1 & F2) are sized to allow maximum horsepower rating. Use the following table to determine fuse size if maximum horsepower is not required.

Table 1: Fuse Sizing

MODEL	HP	INPUT VOLTAGE	INPUT A.C. CURRENT @ F.L.	RECOMMENDED FUSE
IDP102	¼	115 VAC	4.3 Amps	5 Amp, FLM
IDP102	½	115 VAC	7.9 Amps	8 Amp, FLM
IDP102	¾	115 VAC	11.7 Amps	15 Amp, FLM
IDP102	1	115 VAC	15.0 Amps	20 Amp, FLM
IDP102	½	230 VAC	4.3 Amps	5 Amp, FLM
IDP102	1	230 VAC	7.9 Amps	8 Amp, FLM
IDP102	1 ½	230 VAC	12.2 Amps	15 Amp, FLM
IDP102	2	230 VAC	15.0 Amps	20 Amp, FLM
IDP105	3	230 VAC	22.0 Amps	30 Amp, SLC
IDP105	5	230 VAC	34.0 Amps	40 Amp, SLC

NOTE: Fuses shown are manufactured by Littelfuse. Gould type TRM and Bussmann type FNM may be substituted for type FLM. Bussmann type SC may be substituted for type SLC. Refer to Section 7.

3.2 Connection Information

Refer to wiring and connection diagrams D14212 and D14213 for model IDP102 and D14214 for model IDP105. Also refer to Section 3.1 to insure proper installation.

WIRING PRECAUTIONS

Ground the control only at designated ground terminals such as TB1-1 on the IDP102 and TB3-GND on the IDP105.

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

Any relays, contactors, motor starters, solenoids, etc. located in close proximity to or on the same A.C. line as the IDP100 control should have a transient suppression device in parallel with the coil to minimize interference with the control.

IDP102 POWER TERMINAL CONNECTIONS

TB1-1 (GND): ONLY this terminal should be connected to ground.

TB1-2,3,4 & 5 (A.C. Input): These terminals are used for the A.C. line input. Either 115 VAC or 230 VAC input can be connected to terminals 2 and 5. If 115 VAC input is used, jumper terminals 2 to 3 and 4 to 5. If 230 VAC input is used, jumper terminal 3 to 4.

NOTE: Jumper J1 must also be selected for proper operation.

TB1-6 & 7 (Armature): Motor lead A1 connects to terminal 6 and motor lead A2 connects to terminal 7. These connections will produce CCW motor rotation when viewed from the commutator end, and with the field connected as shown on the connection diagram. The armature leads should be switched if reverse rotation is desired.

NOTE: When operating in tachometer feedback, the tachometer leads must also be reversed when motor rotation is reversed.

TB1 - 8 & 9 (Field): Motor field lead F2 connects to terminal 8 and motor field lead F1 connects to terminal 9. There is no connection required for these terminals when a permanent magnet type motor is used.

IDP105 POWER TERMINAL CONNECTIONS

TB3-GND: ONLY this terminal should be connected to earth ground.

TB3-L1 & -L2 (A.C. Input): These terminals are used for the 230V A.C. line input.

TB3-A1: Motor lead A1 connects to A1 and A2 connects to A2 on TB3 to produce CCW motor rotation when viewed from the commutator end and with the field connected as shown on the connection diagram. The armature leads may be switched to produce reverse rotation.

TB3 - F1 (Field): Motor field lead F1 connects to TB3 - F1 Terminal.

TB3 - F2 (Field): Motor field lead F2 connects to TB3 - F2 Terminal.

NOTE: When operating in tachometer feedback, the tachometer leads must also be reversed when motor rotation is reversed.

NOTE: The current limit range is selected by Jumper J2. E.g. 5HP motor would be J2 in 25 AMP range.

IDP102 / IDP105 CONTROL TERMINAL CONNECTIONS

TB2 - 1, 2, & 3 (Speed pot): A potentiometer with a resistance value between 2,000 OHMS and 10,000 OHMS connects to these terminals. The CCW lead and shield connect to terminal 1. The wiper connects to terminal 2 and the CW lead connects to terminal 3.

TB2 - 4 & 5 (Enable): A normally open contact connects to these terminals to start and stop the basic model drives. Closing the contact allows the output to accelerate to a level set by the speed pot. Opening the contact immediately resets the drive output.

TB2 - 6 & 7 (Tachometer): An optional motor mounted 7 or 50 VDC/1000 RPM tachometer may be connected to these terminals for speed feedback with 1750 RPM base speed motors. Connect the negative lead and shield to terminal 6 and the positive lead to terminal 7.

4

PROGRAMMING & ADJUSTMENTS

4.1 Programming Jumpers

J1 (Input Voltage)

J1 selects the armature feedback voltage level according to the A.C. line voltage input. On IDP102 models, connect to 115 for 115 VAC input and 90 VDC motors or 230 for 230 VAC input and 180 VDC motors.

J2 (Armature Current /Torque Range)

On IDP102 models, four full load current ranges are selectable to match different motors. On IDP105 models, six full load current ranges are selectable to match different motors. The current limit pot has a range equal to 150% of the value selected. Refer to the following table to select proper location based on motor horsepower and input voltage.

Table 2: IDP102 & IDP105 Armature I						
Input Voltage	J2 Jumper Position					
	3 Amp	6 Amp	8 Amp	11 Amp	15 Amp	25 Amp
115 VAC	¼ HP	½ HP	¾ HP	1 HP	-	-
230 VAC	½ HP	1 HP	1 ½ HP	2 HP	3 HP	5 HP

J3 (Accel/Decel Range)

Select either a 1-5 second or 4-40 second range for the Acceleration and Deceleration pots.

J4 (Tachometer Voltage Rating)

7 or 50 VDC per thousand RPM tachometers can be selected.

S1

Selects operating mode of control; either VELOCITY or TORQUE.

S2 (Feedback Mode)

Either armature or tachometer feedback is selected by S2.

4.2 Potentiometers

MIN (Minimum) P1

MIN sets the minimum motor speed when the speed pot is set to zero. Clockwise rotation increases the output speed. In the torque regulator mode, this pot sets the minimum torque level.

MAX (Maximum) P2

MAX sets the maximum motor speed when the speed pot is set for 100%. Clockwise rotation increases speed. When the control is used as a torque regulator, the MAX pot sets the maximum torque level.

IR (IR Compensation) P3

IR 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.

C. LIMIT (Current Limit) P4

C. LIMIT sets the maximum armature current level. On IDP102 & IDP105 models, its range is 0 to 150% of the current value selected by jumper J2 (Refer to Table 2). Clockwise rotation increases the current limit setting. When the control is operated as a torque regulator, the C. LIMIT pot should be turned full CW since the range of current is set by other adjustments.

ACCEL (Acceleration Time) P5

Jumper J3 on the Control Board sets the range of the ACCEL pot to 1-5 seconds or 4-40 seconds. Clockwise rotation increases the time taken to accelerate the motor linearly to full speed. To accelerate to speeds less than full speed will take less time. To accelerate to 50% speed would take 50% of the ACCEL time.

DECEL (Deceleration Time) P6

Jumper J3 on the Control Board sets the range of the DECEL pot to 1-5 seconds or 4-40 seconds. Clockwise rotation increases the time taken to decelerate the motor linearly to the new speed setting. The deceleration time is limited to times in excess of the normal coast down time of the equipment since the drive cannot produce braking torque.

NOTE: The DECEL pot does not control stopping time when the Enable contact is opened.

4.3 Adjustment Presets

Carotron IDP100 Series drives are all functionally tested and calibrated with motor loads and should require further calibration only to tailor operation for a specific application. The adjustment presets are listed in the event that the condition of the control and its adjustments are unknown or in doubt.

MIN	Full CCW
MAX	Mid-Range
IR	Full CCW
C.LIMIT	Full CW
ACCEL	Mid-Range
DECEL	Mid-Range

4.4 Adjustment Procedure: Speed Regulator

Step 1

- Visually inspect all connections to check for tightness, proper insulation, and agreement with the connection diagram. ONLY TB1-1 on IDP102 models and TB3-GND on IDP105 models should be connected to ground.
- On IDP102 models, verify the line voltage level and the jumper positions at TB1-2,3,4, & 5. Also select the proper voltage level for jumper J1. For IDP105 models, verify the 230 VAC line voltage level.
- Note the motor name plate full load current and horsepower. On IDP102 and IDP105 models, select the proper current range at J2.
- Place S2 in the ARM position even if tachometer feedback is to be used. Select the desired ACCEL/DECEL range with jumper J3.

Step 2

- With no load on the motor or machine and with the speed pot at zero, apply power to the control. Close the ENABLE contact or START command to start the drive.
- Increase the MIN pot CW until the motor just begins to creep and then CCW until the motor just stops.

Step 3

- Rotate the speed pot to maximum. Measure the motor speed or armature voltage. Adjust the MAX pot for base speed or full rated armature voltage.

Step 4

(Armature feedback only - Omit this step if tachometer feedback is used.)

- Adjust the speed pot 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 machine load to the motor. The speed will usually drop off a small percentage.
- Increase the IR pot clockwise until the loaded speed matches the unloaded speed. Recheck the unloaded speed level and repeat this step until there is no difference in speed from no load to full load.

NOTE: The signal from the IR pot may affect the MIN and MAX pot settings. Recheck Min and Max speed after adjusting the IR pot 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 in the FORWARD direction if applicable and measure the tachometer voltage at the TB2-6 and 7. Verify that Terminal 7 is positive with the respect to Terminal 6. Reverse the connections if necessary to correct the polarity.
- Remove power from the control. Move S2 from the ARM position to the TACH position.

NOTE: The settings of the MIN and MAX pot may change due to variations in the tachometer voltage. Repeat Steps 2 and 3.

Step 6

- The C. LIMIT pot is factory adjusted for 150% of rated current when the motor is stalled.
- NOTE: The motor armature should never be energized at stall for more than a few seconds to prevent the chance of overheating the windings and degrading the insulation.
- Should it become necessary to readjust the C. LIMIT pot, use the following procedure:
 - Insert a D.C. ammeter in series with the motor armature. Any clamp-on ammeter should be a True RMS reading type.
 - Mechanically lock the motor shaft to prevent it from turning.
 - Set the C. LIMIT pot to 25% CW.
 - Set the Speed pot to 50% CW.
 - Select the proper HP range.
 - Apply power to the control and close the ENABLE contact. Increase the C. LIMIT pot to allow 150% of motor nameplate full load current.
 - Remove the power and the mechanical lock on the motor shaft.

Step 7

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

4.5 Adjustment Procedure: Torque Regulator

Step 1

- Visually inspect all connections to check for tightness, proper insulation, and agreement with the connection diagram. ONLY TB1-1 on IDP102 models and TB3-GND on IDP105 models should be connected to earth ground.
- On IDP102 models, verify the line voltage level and the jumper positions at TB1-2,3,4, & 5. Also select the proper voltage level for jumper J1. For IDP105 models, verify the 230 VAC line voltage level.

- Note the motor name plate full load current and horse power. On IDP102 & IDP105 models, select the proper current range at J2.
- Place S1 in the TORQ position.
- Select the desired ACCEL/DECEL range with jumper J3.
- NOTE: In the following steps, motor torque should be monitored directly by the use of a D.C. ammeter in series with armature. Full rated torque is produced at full rated current. The motor shaft must be mechanically locked to prevent rotation.

Step 2

- In the torque regulator mode, the external pot connected to TB2-1, TB2-2, and TB2-3 becomes the torque reference pot. Turn this pot full CCW. Apply power to the control and close the ENABLE contact or START command.

Step 3

- Adjust the MIN pot clockwise to set the minimum current level with the torque reference pot at zero.

Step 4

- Turn the torque reference pot to 100%. Adjust the MAX pot clockwise to set the current for 100% of rated motor current.
NOTE: DO NOT operate the motor for more than several seconds at full load while stalled to prevent overheating.

Step 5

- Adjust the ACCEL and DECEL pots to control the desired rate of change in current in response to a change in the torque reference pot. When the ENABLE contact is opened, the current will be turned off instantly. Closing the ENABLE contact allows the current to ramp to a level set by the torque reference pot at a rate set by the ACCEL pot. Clockwise adjustment of the ACCEL and DECEL pots increases time.

Step 6

- Turn off the power and remove the mechanical lock from the motor shaft. The torque regulator is now ready for use. Use caution in operating the motor at slow speeds near rated torque to prevent overheating. Check the full torque speed range of the motor to determine the lowest operating speed at full torque.

4.6 Adjustment Procedure: Torque/Taper Option

Step 1

- Visually inspect all connections to check for tightness, proper insulation, and agreement with the connection diagram. ONLY TB1-1 on IDP102 models and TB3-GND on IDP105 models should be connected to earth ground.
- On IDP102 models verify the line voltage level and the jumper positions at TB1-2,3,4, & 5. Also select the proper voltage level for jumper J1. For IDP105 models, verify the 230 VAC line voltage level.
- Note the motor name plate full load current and horsepower. On IDP102 and IDP105 models, select the proper current range at J2.

Step 2

- If not already done, mount the Torque/Taper Option. This is done by removing the two center nuts and washers holding down the control board and installing the two upper 1" standoffs supplied with the Torque/Taper Option. Mount the option board on the standoffs and mount the P.C. board in place. (Two lower mounting holes not fastened to board.) Reference diagram C11658 and connect the appropriate wires to the test points TP1, TP2, TP3, TP10 and TP12 on the Control Board.

Step 3

- Add a jumper between TB2-2 and TB2-3 to supply +10 VDC to the speed reference input. Place S2 in the ARM position, and select the ACCEL/DECEL range using Jumper J3.
NOTE: S1 will remain in the VEL position.

Step 4

- An external torque pot (2 to 10k Ohms) can be connected to TB10 on the Torque/Taper Option. If an external Torque pot is used, turn the P.C. mounted Torque pot fully counter clockwise. If the internal Torque pot is used, no connections are required on TB10.

Step 5

- Turn the Torque pot fully clockwise and the Taper pot fully counter clockwise. Turn the IR Comp pot fully counter clockwise, and leave the CL (Current Limit) pot as set by the factory at 150% of current range selected.

Step 6

- With no load on the motor, apply power to the drive. Close the enable contact between TB2-4 & TB2-5 to start the drive. Adjust the no load speed (core speed) using the Max pot on the Control Board. The no load speed should be slightly higher than line speed in order to produce tension when a load is applied. Use the Accel pot to adjust the acceleration time on start-up.

Step 7

- Load material and start the drive. Adjust the Torque pot counter clockwise to set the tension at core (counter clockwise decreases tension). The Torque Limit LED turns on when the drive begins to limit the output current. Adjust the Taper pot clockwise to set the tension when at full roll diameter (clockwise increases torque as speed decreases).

5

RUN BRAKE MODELS

MODEL IDP102-BC1 accepts 115 VAC input and is designed for use with ¼ to 1 HP, 90 VDC armature motors. Refer to wiring and connection diagram D14212 in Section 8 for connections of this model.

MODEL IDP102-BC2 accepts 230 VAC input and is designed for use with ½ to 2 HP, 180 VDC armature motors. Refer to wiring and connection diagram D14212 in Section 8 for connections of this model.

MODEL IDP105-BC2 accepts 230 VAC input and is designed for use with 3 to 5 HP, 180 VDC armature motors. Refer to wiring and connection diagram D14214 in Section 8 for connections of this model.

FEATURES:

- Input A.C. line fuses and 115 VAC control fuse.
- Armature contactor with 115 VAC coil:
IDP102: 25 amp
IDP105: 40 amp
- Dynamic brake resistor(s).
- 230 VAC form C contact for customer use:
IDP102: 10 amp
IDP105: 25 amp
- Contact to interface enable circuit and latching contact for momentary start/stop push button interface.
- 230/115 VAC step down transformer (-BC2 models only).

6

CONTACTOR REVERSING MODELS

MODEL IDP102-RC1 accepts 115 VAC input and is designed for use with ¼ to 1 HP, 90 VDC armature motors. Refer to wiring and connection diagram D14213 in Section 8 for connections of this model.

MODEL IDP102-RC2 accepts 230 VAC input and is designed for use with ½ to 2 HP, 180 VDC armature motors. Refer to wiring and connection diagram D14213 in Section 8 for connections of this model.

MODEL IDP105-RC2 accepts 230 VAC input and is designed for use with 3 to 5 HP, 180 VDC armature motors. Refer to wiring and connection diagram D14214 in Section 8 for connections of this model.

FEATURES:

- Input A.C. line fuses and 115 VAC control fuse.
- Armature contactor with 115 VAC coil:
IDP102: 25 amp
IDP105: 40 amp
- Dynamic brake resistor(s).
- Reversing logic assembly with anti-plugging logic and 115 VDC pilot relays to interface with the armature contactors, enable circuit, tach feedback, and pushbuttons for Forward, Stop, and Reverse.
- 230/115 VAC step down transformer (-RC2 models only).

REVERSING MODELS:

Reversing Logic Board AssyC10093-000

RUN/BRAKE & REVERSING:

Brake resistor(s), 4 Ω , 1000WRES62-0004

1 ea. on 115 VAC models; 2 ea. on 230 VAC models

F3: 1 amp, 250 VAC

CarotronFUS1000-00

BussmannAGC-1

Littelfuse312002

IDP102 SERIES

Power/Control Board AssyC13995-000

F1 & F2: 20 amp, 250 VAC

CarotronFUS1001-03

BussmannFNM-20

LittelfuseFLM-20

GouldTRM-20

Power Module, 25 amp, 600 V

CarotronPMD1001-00

IRP102W

CrydomM252512F

Armature contactor, 20 amp, 4 pole

CarotronREL2002-00

Potter BrumfieldPM17AY-120

OPTION:

Torque/Taper Board AssyB10112-000

IDP105 SERIES

Power/Control Board AssyC13995-001

F1 & F2: 40 amp, 300 VAC

CarotronFUS1002-01

BussmannSC-40

LittelfuseSLC-40

Power Module, 80 amp, 600 V

CarotronPMD1002-00

CrydomM508012F

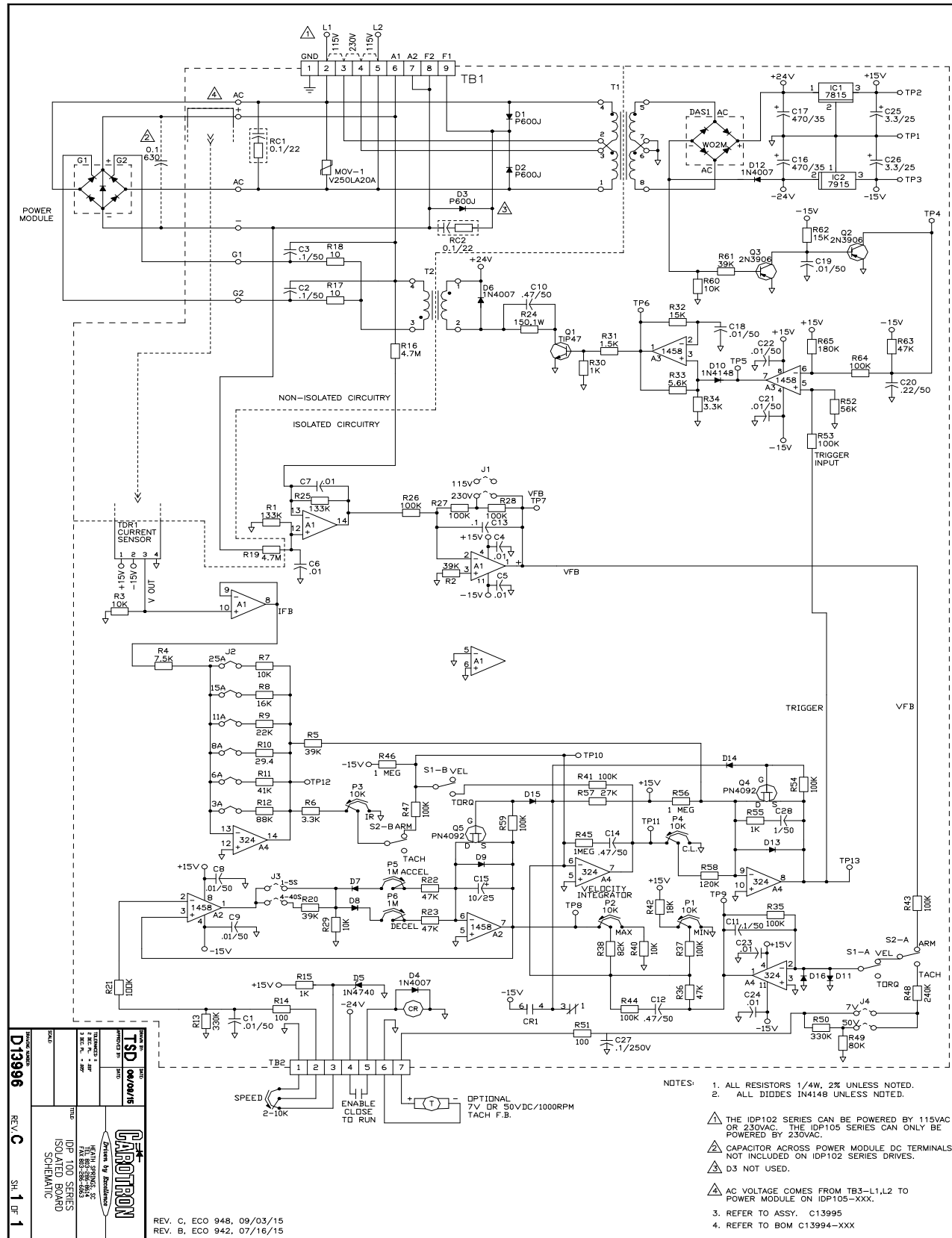
Armature contactor, 40 amp, 3 pole

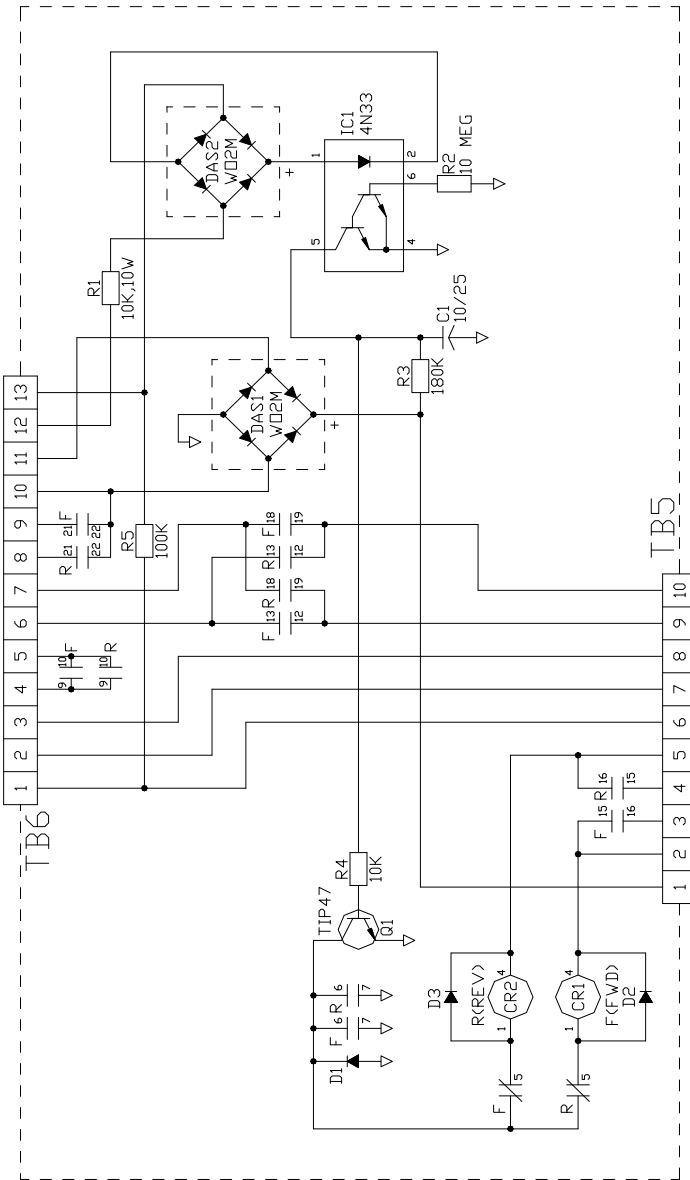
CarotronREL2000-00

Furnas42BE65AF

OPTION:

Torque/Taper Board AssyB10112-000





SCHEMATIC B10094

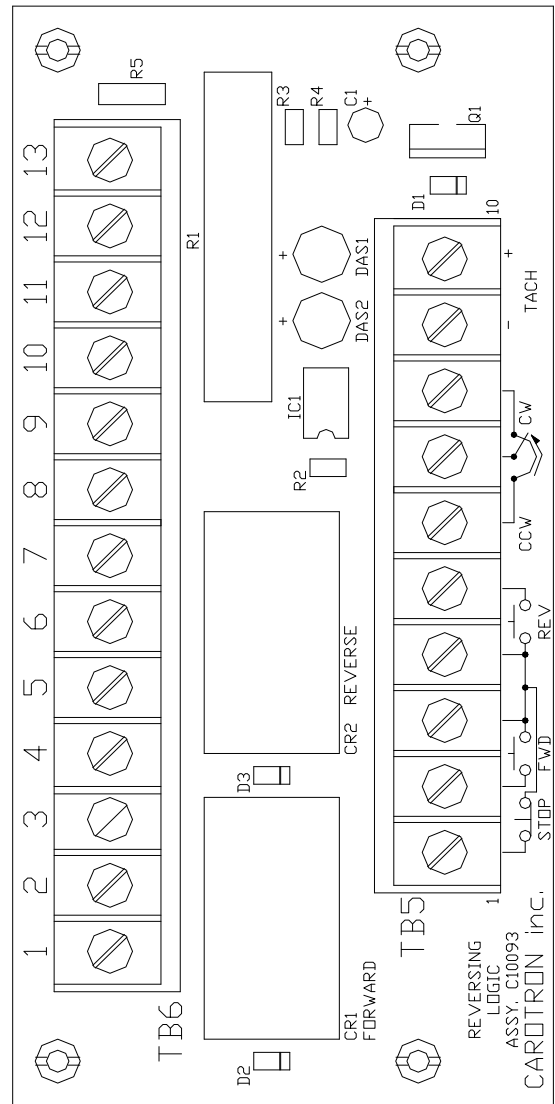
NOTES:

1. ALL RESISTORS ARE 1/4 WATT, 2% UNLESS OTHERWISE NOTED. ALL DIODES ARE 1N4004.

ASSEMBLY C10093

NOTES:

1. REF. B.D.M. A10093.



REV. 9-8-98, REV. RELAY LABEL TO TB5-10

DRAWN BY: **BKP** 5-5-95
DATE: 5-5-95

APPROVED BY: DATE:

TOLERANCES:
2 DEC. PL. = .001
3 DEC. PL. = .005

SCALE:

TITLE:

SCHEMATIC & ASSEMBLY,
ADP/IDP100 SERIES
REVERSING LOGIC BD.

DRAWING NUMBER

C11657

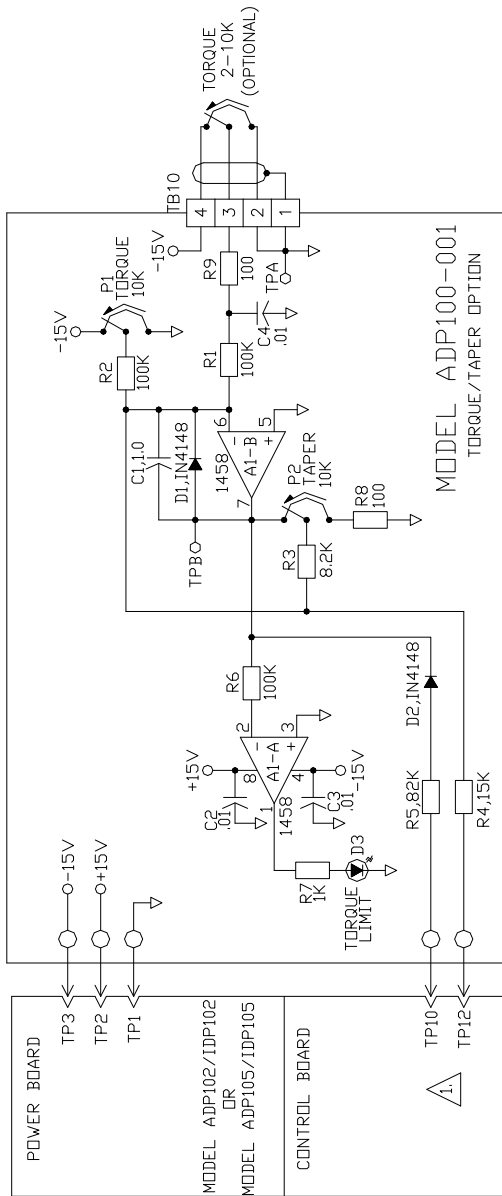
REV.

SH. **1** OF **1**

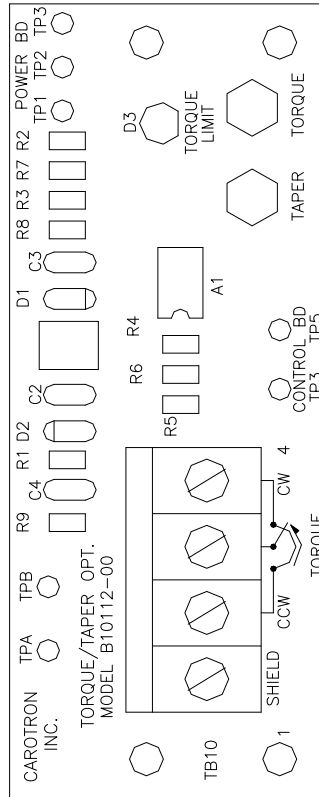
CAROTRON
Driven by Excellence

HEATH SPRINGS, SC
P.O. BOX 586
FAX 803-586-6063

IDP102/IDP105 IS ONLY A ONE BOARD CONTROL.



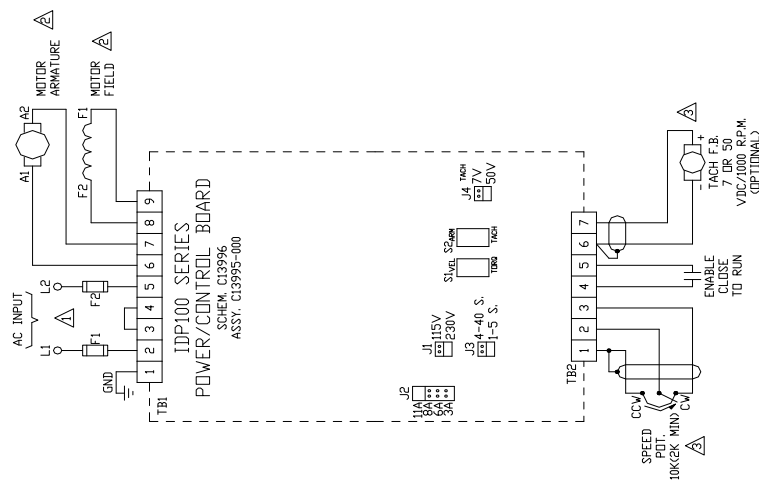
SCHEMATIC B10111



ASSEMBLY B10112-000

NOTES:
1. TP10 AND TP12 WERE LABELED TP3 AND TP5 ON REV. A BOARDS ONLY.

DRAWN BY BKP	DATE 6-2-95	CAROTRON <i>Driven by Excellence</i>	
APPROVED BY	DATE	HEATH SPRINGS, SC 2 REC. PL. = .010" 3 REC. PL. = .005" FAX 803-586-6063	
TOLERANCES ±		TITLE SCHEMATIC & ASSEMBLY, ADP/IDP100 SERIES TORQUE TAPER OPTION	
SCALE		DRAWING NUMBER C11658	
REV. A		SH. 1 OF 1	



CONNECTION DIAGRAM
MODEL
IDP102-000

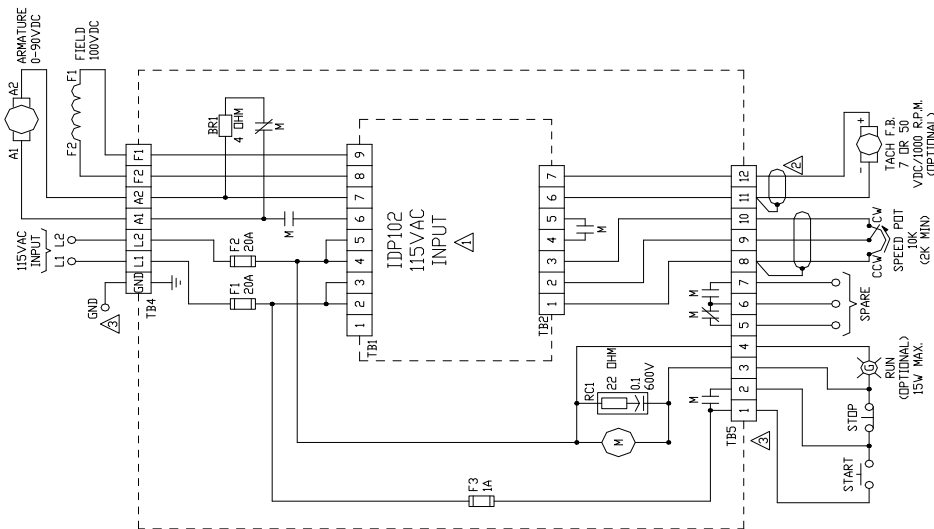
NOTES:

- △ CONNECTIONS SHOWN FOR 230VAC. FOR 115VAC, REMOVE JUMPER 3 TO 4 & JUMPER 3 TO 2 & 4 TO 5. ALSO MOVE J2 FROM 230 TO 115. FUSE PER MANUAL.
- △ USE PROPER MOTOR RATING PER CHART:

INPUT	RANGE	ARMATURE	FIELD
115VAC	1/4-1 HP	0-90VDC	100VDC
230VAC	1/2-2 HP	0-180VDC	200VDC

ROUTE CONTROL WIRES AWAY FROM POWER. USE SHIELDED CABLE FOR POT. & TACH. TIE SHIELD AT CONTROL END ONLY. INSULATE OTHER END.

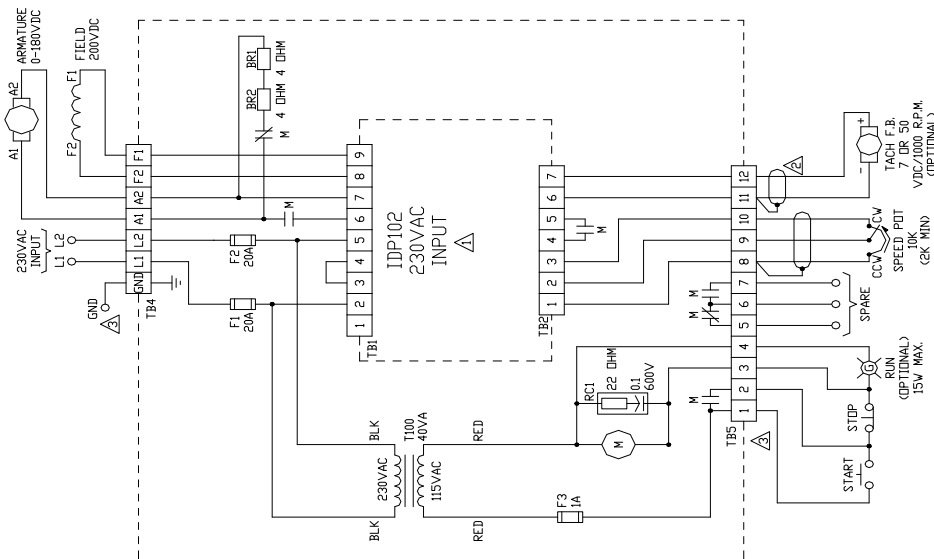
- △ CONTROL BOARD JUMPERS:
J1-SELECTS FULL LOAD ARM. CURRENT RANGE.
J2-SELECTS VELOCITY FEEDBACK VOLTAGE
J3-SELECTS ACCEL/DECEL TIMES
J4-SELECTS TACH INPUT VOLTAGE



WIRING AND CONNECTION
DIAGRAM MODEL
IDP102-BC1

NOTES:

- △ REF. MANUAL FOR JUMPER CONNECTIONS.
- △ USE SHIELDED CABLE. TIE SHIELD AT CONTROL ONLY AND INSULATE OTHER END.
- △ CONNECTIONS TO TB4 AND TB5 SUPPLIED BY CUSTOMER.

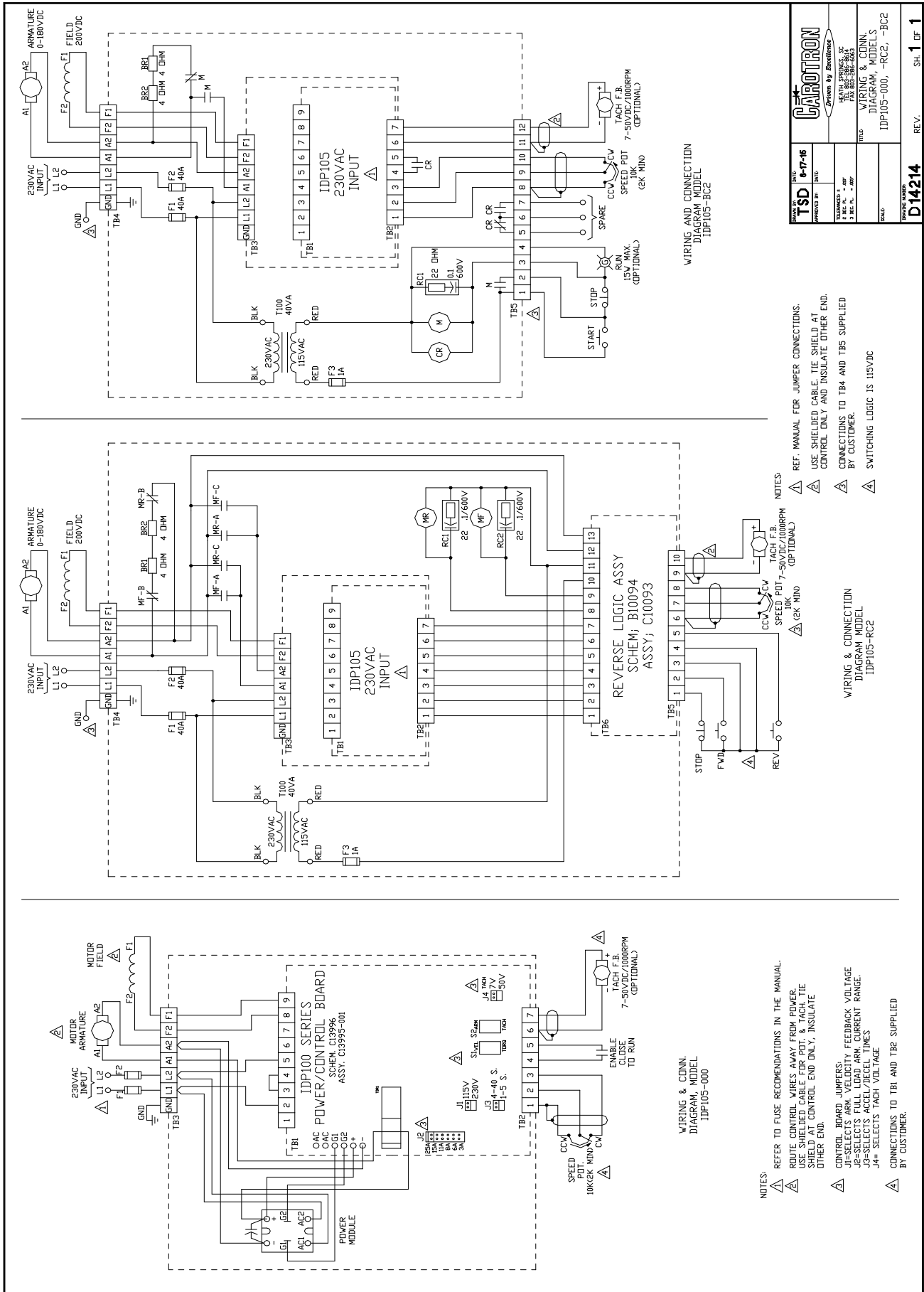


WIRING AND CONNECTION
DIAGRAM MODEL
IDP102-BC2

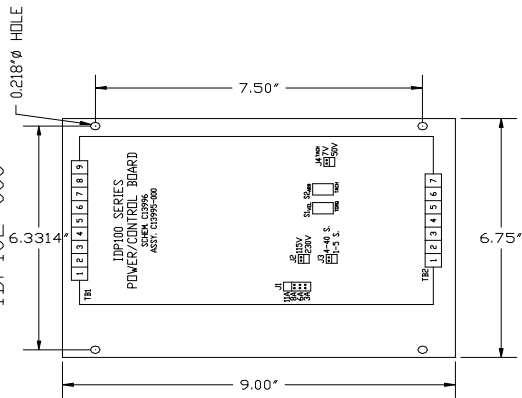
NOTES:

- △ REF. MANUAL FOR JUMPER CONNECTIONS.
- △ USE SHIELDED CABLE. TIE SHIELD AT CONTROL ONLY AND INSULATE OTHER END.
- △ CONNECTIONS TO TB4 AND TB5 SUPPLIED BY CUSTOMER.

TSD 6-17-16 APPROVED BY:	DATE:
DRAWN BY:	CHECKED BY:
SCALE:	TITLE:
WIRING & CONNECTION DIAGRAMS, MODEL S IDP102-000, -BC1, -BC2	
DRAWING NUMBER: D14212 REV. 1 OF 1	

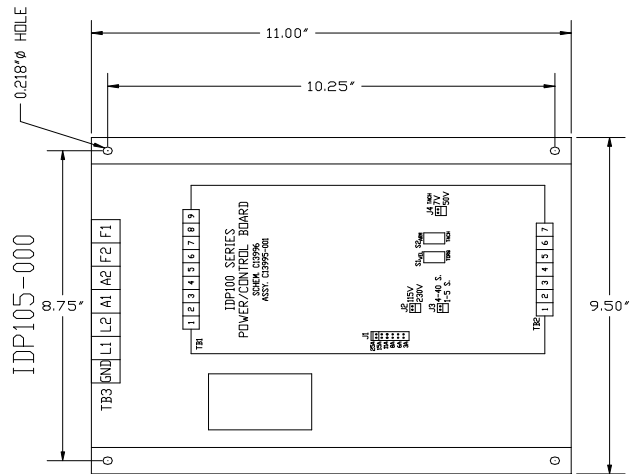


IDP102-000



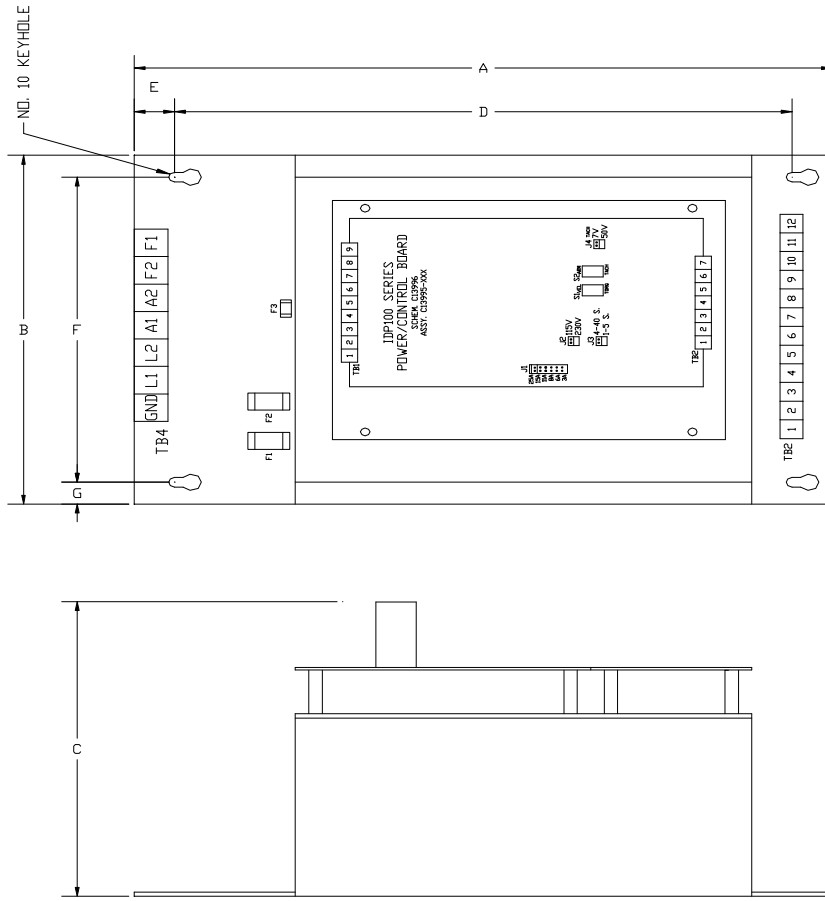
1. DIMENSIONS IN INCHES
2. MAX. DEPTH OF BASIC MODEL IS 2.75". MAX. DEPTH WITH ADP100-001 TORQUE/TAPER OPTION IS 3.00".

IDP105-000



1. DIMENSIONS IN INCHES
2. MAX. DEPTH OF BASIC MODEL IS 3.25". MAX. DEPTH WITH ADP100-001 TORQUE/TAPER OPTION IS 3.50".

IDP100 OPTIONS



DIMENSIONS						
MODEL NO.	A	B	C	D	E	F
IDP102-BC1	13	8	6.75	11.5	0.75	7
IDP102-BC2	13	8	6.75	11.5	0.75	7
IDP102-RC1	13	8	6.75	11.5	0.75	7
IDP102-RC2	13	8	6.75	11.5	0.75	7
IDP105-BC2	16	10	7.25	14.5	0.75	9
IDP105-RC2	16	10	7.25	14.5	0.75	9

1. DIMENSIONS IN INCHES
2. ADDITION OF ADP100-001 TORQUE/TAPER OPTION WILL ADD 0.25" TO DEPTH (C DIMENSION).

TSD 6-17-16 PREPARED BY: [Signature] DATE: [Date]		CAROTRON Drives by Excellence 16211 SPRINGS, SC TEL: 803-396-2600 FAX: 803-396-2603
TITLE: IDP100 SERIES DIMENSIONS Dwg. No.: D14215 REV. 1 OF 1		

STANDARDS 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.

5. 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

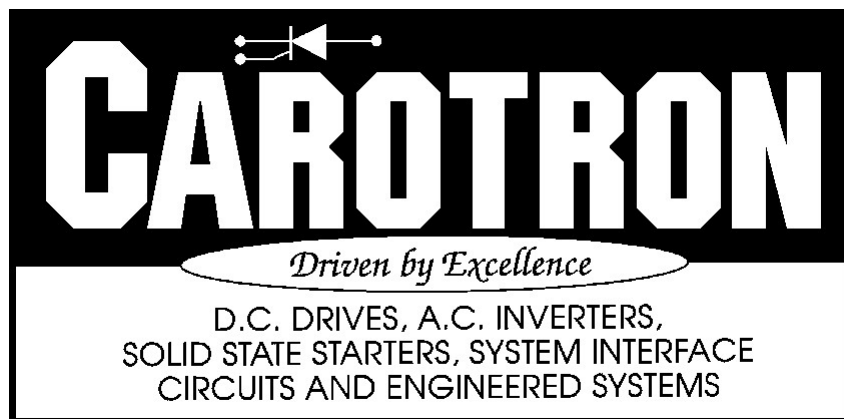
If the Purchaser desires to return any product or part, written authorization thereof must first be obtained from the Company which will advise the Purchaser of the credit to be allowed and restocking charges to be paid in regard to such return. No product or part shall be returned to the Company without 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.



3204 Rocky River Road
Heath Springs, SC 29058
Phone: 803.286.8614
Fax: 803.286.6063
Email: saleserv@carotron.com
Web: www.carotron.com
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