RCD 201 24V 5A MOTOR CONTROL PCB MODULE
USER INFORMATION SHEET

A. CONNECTION DETAILS

Connections are made using the 10 pin terminal block on the PCB. The pinout of terminals on the PCB is as follows (Refer to diagram for pin numbering) :

PIN 1 :	24V POWER INPUT (AC or DC)
PIN 2 :	24V POWER INPUT (AC or DC)
PIN 3 :	MOTOR -
PIN 4:	MOTOR +
PIN 5:	INHIBIT
PIN 6:	24V DC OUT
PIN 7:	GROUND
PIN 8:	POT HIGH SIDE (12V DC OUT)
PIN 9:	POT WIPER
PIN 10:	POT LOW SIDE

The speed pot is already wired to pins 8,9,10 on the PCB. If desired, the pot may be removed and mounted at any other convenient location. In such a case, keep the wire lengths to a minimum and avoid running the wires alongside any power cables. The use of a shielded cable is reccommended, especially in electrically noisy environments. Connect the cable shield to the system earth.

Pins 1 and 2 are used to connect the input power. Either 24V AC or DC supply may be used.

Pins 3 and 4 are used to connect the motor. Keep connecting wires as short as possible to minimise voltage drop on the conductors. Keep connecting wires away from any sensitive circuits, as they carry switching currents. Twisitng the wires together will minimise pickup problems. Connect an external slow blow fuse of 1.3 times the motor rating in series for protection of the motor.

A switch or relay contact may be connected between pins 5 (INHIBIT) and pin 8 (12V DC) to control the motor operation. The motor will run when the contact is open, and stop when the contact is closed. In case reverse polarity of contact operation is required, install the resistor R102 (1K ohms) shown as INHIBIT RESISTOR in the diagram. Now a switch or relay contact may be connected between pins 5 (INHIBIT) and pin 7 (GROUND) to control the motor operation. The motor will run when the contact is closed, and stop when the contact is open.

B. MAKING ADJUSTMENTS

Adjustments for optimum operation can be made by setting the four presets mounted on the PCB. Refer to the diagram for preset locations.

MIN : This is for setting the minimum speed. Set the speed control pot to minimum speed, and then adjust the MIN preset till the desired minimum speed is obtained. In case a minimum speed or zero is desired, adjust the preset till the motor just starts moving, and the reduce the setting till the motor just stops.

MAX : This is for setting the maximum speed. Set the speed control pot to maximum speed, and then adjust the MAX preset till the desired maximum speed is obtained.

CL : This is for setting the current limit. Connect an ammeter in series with the motor, and set the speed control pot midway. Apply friction braking till the motor stalls, and adjust the CL preset till the ammeter reads the motor's rated current.

IR COMP : Disconnect load from the motor and set the speed control midway. Measure the motor speed with a tacho. Now connect the load to the motor, and adjust the IR preset till the tacho indicates the original no-load speed. If the above cannot be carried out, then with the load connected increase IR COMP till the motor begins to hunt, and then back off until the hunting stops.

C. APPLICATION NOTES

VOLTAGE FOLLOWER / SPEED CONTROL THROUGH PLC : Disconnect the speed control pot from the PCB. The voltage to be tracked can be fed between GROUND (Pin 7 on the terminal block), and WIPER (Pin 9 on the terminal block). The voltage can be derived from a tacho, D/A converter, etc. and a level of 10V corresponds to full speed.

TACH FEEDBACK : Refer to the diagram and shift the jumper from IR COMP to TACH position. Connect the tach between pin 7 of the terminal block and the TACH lug on the PCB. The value of R103 may be changed, if required, to match the full speed requirements of the motor-tach combination.

BRAKING : Disconnect the motor positive lead from the drive. Connect an SPDT relay and brake resistor as follows . The relay must be a break-before-make type.
  POLE : To motor positive lead.
  NO : To drive MOTOR+ terminal.
  NC : To one end of brake resistor.
Connect the other end of the brake resistor to the MOTOR- terminal. The motor will run when the relay is energised. This configuration has the advantage that the motor will brake if power fails. If the relay has a 24V DC coil, power can be taken from the 24V DC and GROUND terminals on the PCB, provided the coil current does not exceed 150 mA.

REVERSING : Disconnect the motor from the drive. Connect a DPDT relay as follows :
  POLE1 and POLE2 : To motor wires.
  NO1 and NC2 : To drive MOTOR+ terminal.
  NO2 and NC1 : To drive MOTOR- terminal.

Ensure that the motor is fully stopped , by using INHIBIT signal, before the motor is reversed, or else damage to both drive and motor can result. If the relay has a 24V DC coil, power can be taken from the 24V DC and GROUND terminals on the PCB, provided the coil current does not exceed 150 mA.

D. IMPORTANT NOTE ON MOTOR SPEED REGULATION

The terminal voltage of a motor under load can be expressed as $Vt = Vnl + Im . Rm$, where
Vt = terminal voltage, Vnl = no-load voltage, Im = motor current, Rm = motor resistance.
Thus, the terminal voltage is seen to increase with load for a fixed rpm of the motor. The RCD 201 drive controls motor speed by increasing the terminal voltage in response to increasing loads. With a 24V AC supply, the drive can generate a maximum terminal voltage of 24V DC. In order to achieve proper regulation, the motor and running rpm must therefore be chosen so that the terminal voltage requirement **on load** does not exceed 24V DC.

Example 1 : Assume motor resistance = 1 ohm, motor current on load = 4 amps.
        IR drop = 1 x 4 = 4 volts.
        Max. no load voltage = 24 – 4 = 20 volts.
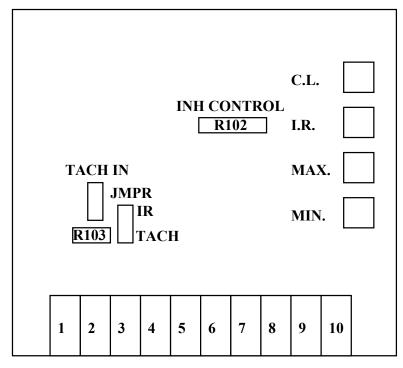
Example 2 : Assume motor resistance = 5 ohms, motor current on load = 2 amps.
        IR drop = 5 x 2 = 10 volts.
        Max. no load voltage = 24 – 10 = 14 volts.

Using no load voltages above these computed values can result in poor speed regulation. In general, higher load currents and motor resistance will result in lower no-load voltage limits.

Rm can be determined from the motor's data sheet, or by checking the terminal resistance of the motor with an ohm meter. The load current can be measured while running the motor under loaded conditions.

The IR compensation circuit on the drive is designed to cater to motor resistances upto 6 ohms. If motors of higher resistance are used, poor regulation will again result. For use with higher resistance motors, the setting can be changed to accommodate motors of upto 12 or upto 24 ohms. Contact factory for details.

DIAGRAM OF PCB MODULE

1	2	3	4	5	6	7	8	9	10

C.L.

INH CONTROL
R102   I.R.

TACH IN
JMPR
IR
R103   TACH

MAX.

MIN.

TERMINAL BLOCK

DIAGRAM OF PCB MODULE

PIN 1:	24V POWER INPUT	PIN 6:	24V DC OUT
PIN 2:	24V POWER INPUT	PIN 7:	GROUND
PIN 3:	MOTOR -	PIN 8:	POT HIGH / 12V
PIN 4:	MOTOR +	PIN 9:	POT WIPER
PIN 5:	INHIBIT	PIN 10:	POT LOW