Volume

1

BEEL INDUSTRIAL CONTROLS LTD.

Drives and Controls for Industry

SMC SERIES MANUAL

BEEL INDUSTRIAL CONTROLS LTD.

SMC SERIES MANUAL

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Chapter

1

General Information

Multiple Motor Applications

The SMC-00 can be used to drive more than one motor providing the total load (current) does not exceed the maximum current rating of the controller. The IR Comp. (regulation) and the current limit would respond only to total current and would not react to the characteristics of the individual motors. Furthermore, each motor should be protected with an overload relay.

S M C - 0 0

- Can start and stop without the need for interrupting the AC lines. Just connect a switch in the inhibit circuit. (See 4.5)
- Can be operated in the voltage follower mode providing the speed reference signal is isolated and limited to volts. For a non-isolated signal, select model SMC-OP which includes a signal isolator module.
- Can be operated in the current follower mode, when upgraded to the model SMC-OP.
- Can be selected for applications requiring improved speed regulation. Model SMC-TF includes a module to accept an analog signal from a DC tachogenerator. (See 27-215, page 6)
- Can be used for reversing applications. A three position manually operated reversing switch can be furnished either as a loose item or installed on the front cover of an enclosed model (SMC-412R).
- The SMC-TP is used for applications for drives which are required to follow a process signal 4-20mA or 0-10V, and provide improved speed regulation by using a feedback signal from motor driven tachogenerator.
  Refer to diagram BC1377K (page).

Chapter 2

Specifications

The SMC-00 is capable of controlling the speed of both PM (permanent magnet) and Shunt Wound DC motors up to 1 HP at 115 VAC and up to 2HP at 230VAC.

Line Power 1 Phase, 50/60 Hz
1HP: 115 VAC 15 Amps
2HP: 230 VAC 15 Amps

Motor Armature
0-90VDC (for 115VAC)
0-180VDC(for 230VAC)

Operating Temperature
0 to 45° C (32 to 113°F)

Storage Temperature
0 to + 60°C 32 to 140°F

Motor Field
100VDC (for 230VAC)
200VDC (for 230VAC)

Input Voltage
115VAC ± 10% 40 to 70Hz
230VAC ± 10% 40 to 70 Hz

Speed Control Potentiometer
Potentiometer value: 5k ohm
Terminal "P": +10VDC max
Terminal "O": 0 to + 10VDC
Terminal "T": 0VDC min.

Current Limit (Torque)
Adjustable: 0 to 150%
Factory Preset to 125% of controller rating

Controller Adjustments
Min. Speed: 0 to 80% of rated speed
Max. Speed: 33 to 120% of rated speed.
IR Compensation: 0 to approximately 10% voltage at rated load
Torque Limit: 10% to 150% controller rating
Accel / Decel Time: 0.5 to 20 Seconds

Start / Stop Switch
Dry contact

Chapter

3

Installation

For long life and trouble free operation, the controller should be operated in a clean, dry environment where the ambient temperature will not exceed 45°C. Mount the controller flat on a metal chassis or surface to ensure adequate cooling at its maximum current rating. Allow adequate clearance around the controller for air circulation.
When this controller is shipped it is set for use on 230VAC.
For 115VAC operation, move jumpers (J1 & J2) to the '90' setting.

Power Line

Connected to terminals **L1** and **L2**, 115VAC or 230 VAC, 50 or 60 Hz.
For 230VAC operation jumpers (J1 & J2) are set to 180.
For 115VAC operation jumpers (J1 & J2) are set to 90.

Armature

Connected to terminals **A1 (+)** and **A2.**

Field

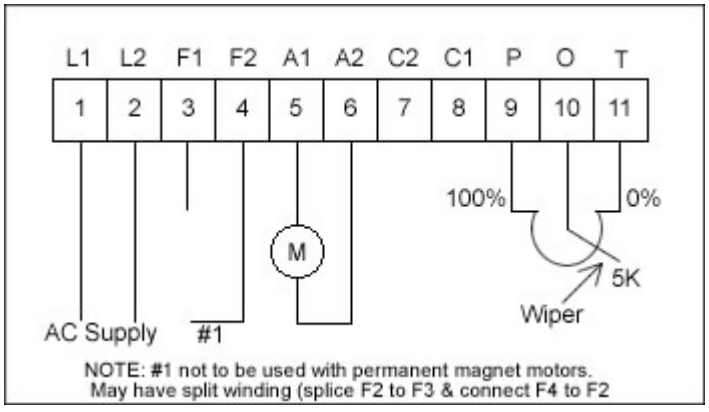
Connected to terminals **F1** and **F2 (+)** (for shunt wound motors)

Start / Stop Switch

If required, can be connected to terminals C1 and C2. (See Section 3.5)

Speed Control Potentiometer

Connected to terminals "P", "O", "T".



CAUTION:

DO NOT GROUND ANY LIVE PARTS OF THE CONTROLLER. SERIOUS DAMAGE AND/OR INJURY WILL OCCUR.

CAUTION:

THE CONTROLLER SHOULD BE INSTALLED IN AN ENVIRONMENT FREE OF EXCESSIVE MECHANICAL VIBRATIONS, MOISTURE AND CORROSIVE VAPOURS.

THE AMBIENT TEMPERATURE SHOULD NOT BE HIGHER THAN +45°C (+113°F), OR LOWER THAN 0°C (32°F).

Line and Motor Currents

The table below gives the approximate line and motor currents. The user must supply branch circuit protection required to meet applicable electrical codes. Use the line current when you select the wire sizes for the AC supply and motor armature leads.

LINE			ARMATURE		FIELD	
LOAD HP	VOLTS AC	AMPS AC	VOLTS DC	AMPS DC	VOLTS DC	AMPS DC
¼	115	5.5	90	3.1	100	0.7
⅓	115	6.0	90	4.1	100	0.7
½	115	9.0	90	6.0	100	0.6
¾	115	11.4	90	7.5	100	0.6
¾	230	5.4	180	3.7	200	0.2
1	115	16.5	90	11.0	100	0.5
1	230	8.3	180	5.5	200	0.3
1½	230	12.0	180	8.0	200	0.4
2	230	15.0	180	11.0	200	0.3

WARNING

THERE ARE DANGEROUS VOLTAGES ON PARTS OF THE EQUIPMENT. BE VERY CAREFUL WHEN WORKING WITH LIVE EQUIPMENT.

DO NOT WORK ON LIVE EQUIPMENT UNLESS IT IS ABSOLUTELY NECESSARY AND YOU ARE QUALIFIED TO DO SO.

Chapter 4

Adjustments

Minimum and Maximum Speed Potentiometers

The controller has separate potentiometers to set the minimum **(Min)** and the maximum **(Max)** speed. Altering one of these controls will affect the setting of the other.

I.R. Compensation Potentiometers

The potentiometer marked **IR Comp** adjusts the motor voltage boost to maintain approximately constant speed with changes in motor load. The potentiometer is set for zero boost at the factory (fully counter clockwise.)

To compensate for drop in speed with load, turn the IR potentiometer clockwise for best performance.

NOTE: Too much compensation may lead to unstable motor operation.

Torque (Current Limit) Potentiometer

The potentiometer designated “Torque” sets the limits for maximum motor current in order to protect the controller and the motor against excessive currents. The limit is factory preset to 125% of the maximum rated output of the unit.

Accel / Decel Potentiometer

The **Acc/Dec** potentiometer sets the acceleration and deceleration times. Turning the potentiometer clockwise will increase the times.

Start/Stop Switch

The motor **On/Off** operation may be controlled by an external **Run/Stop Switch.** The **Run/Stop Switch** may be configured in two ways:

Configuration 1:

Switch between C1 and C2. The switch must be open to run the motor. When it closes, the controller output immediately goes to zero and the deceleration setting is ignored. When the switch is re-opened, the motor will ramp up to the level set by the **Speed Control Potentiometer** and the **Min and Max** potentiometers at the rate set by the **Acc/Dec** control.

Configuration 2:

Switch in series with speed set lead going to “P” (terminal 9) or “O” (terminal 10.) The switch must be closed to run the motor. When the switch is opened, the motor will go to zero speed at the rate set by the Acc/Dec control. When the switch is closed, the motor will start and will ramp up to the level set by the Speed Control Potentiometer and Min and Max potentiometers. Both the Start and Stop speeds will ramp at the rate set by the Acc/Dec potentiometer. The Run/Stop switch current is less then 50 mA.

27-215

For drives with tachogenerator feedback refer to BC1420K p.10

Description:

The 27-215 Kit allows the conversion of Series, SMC DC drives armature feeback controllers to tachogenerator speed regulation. The Kit consists of a small printed circuit card (part# 27-215) and a 2.2 mfd 250 VDC capacitor with spade lug terminals, ready for installation. A tachogenerator must be installed and driven by the DC motor. The Kit is intended to be used with the Model 27-206 tachogenerator which has a 15VDC per 1000 RPM output, however, any DC Tacho giving an output of 20 to 80VDC at rated motor speed can be used.

CAUTION:
DISCONNECT THE AC SUPPLY BEFORE WORKING IN THE CONTROLLER ENCLOSURE.

NOTE:
THIS SECTION ASSUMES THAT THE CONTROLLER HAS BEEN OPERATING PROPERLY ON ARMATURE FEEDBACK.

1. Uncouple the motor from its load and turn it by hand in its normal direction. Check the tachogenerator for output and polarity. Connect tachogenerator to G1 and G2 on the main terminal block.
   (G1 should be positive)

2. Turn the maximum speed control (P1) on the 27-215 fully to the left (C.C.W.) The max. speed pot (P4) on the control amplifier 27-822 is no longer in circuit.

Chapter 5

Troubleshooting & Maintenance

Motor Does Not Run:

POSSIBLE CAUSE	SOLUTION
Blown fuse	Replace Fuse
Incorrect or no power source	Install correct voltage
Speed pot set to zero	Turn pot cw

Motor Stalls or Runs Very Slowly with Control Fully CW

POSSIBLE CAUSE	SOLUTION
Low voltage	Should be above 100V or 200V
Overload condition	Reduce load
Worn motor brushes	Replace brushes
Max speed set incorrectly	See Adjustment Procedure

Motor Hunts

POSSIBLE CAUSE	SOLUTION
Too much IR Comp	See adjustment procedure
Motor is in current limit	See adjustment procedure
Motor speed is above rated speed	Reduce speed
Low voltage	Should be above 100V or 200V
Overload condition	Reduce load
Worn motor brushes	Replace brushes
Defective motor bearing	Replace bearing
Defective electrical components	Call Beel Industrial Controls Ltd.

Maintenance

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 the disconnect position and tag to prevent unexpected application of power.

ONLY A QUALIFIED ELECTRICIAN OR SERVICE PERSON SHOULD PERFORM ANY ELECTRICAL TROUBLESHOOTING OR MAINTENANCE.

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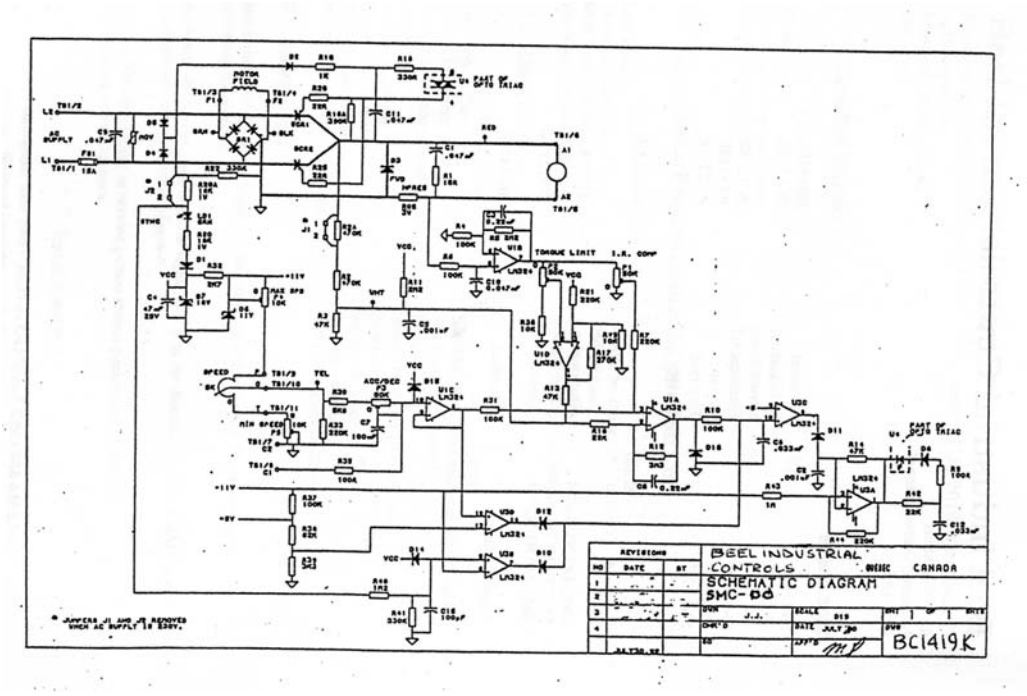
Chapter

6

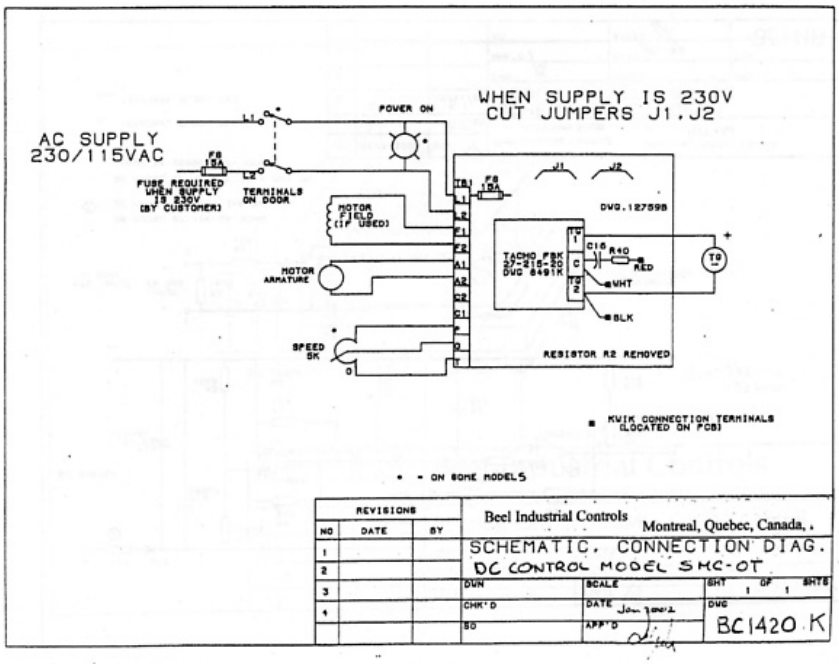
Schematics & Connection Diagrams

Open Chassis Models

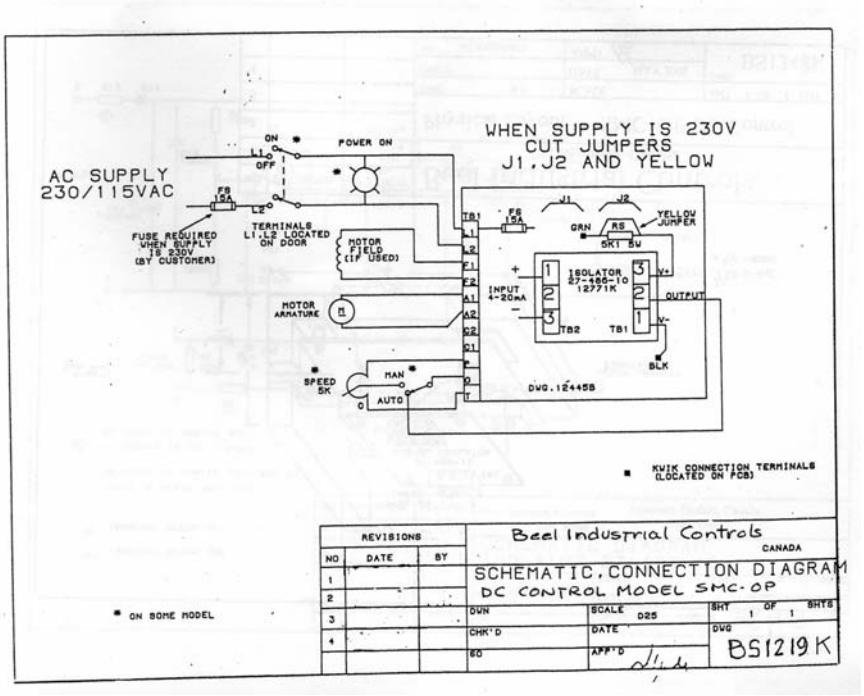
SMC-00 SCHEMATIC DIAGRAM



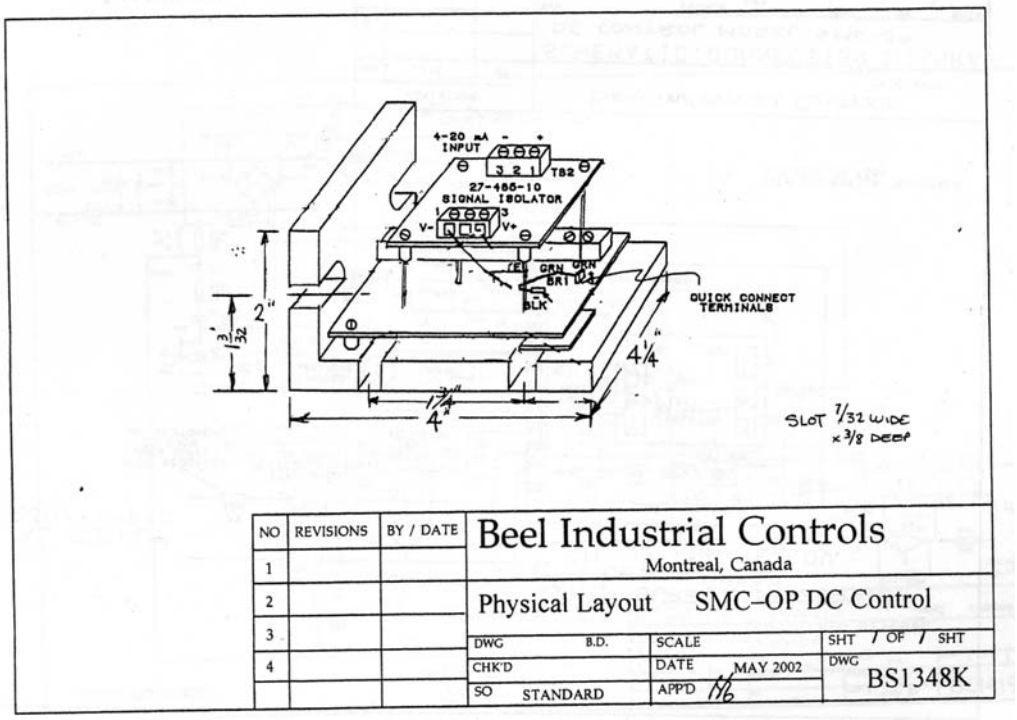
SMC-OT SCHEMATIC, CONNECTION DIAGRAM



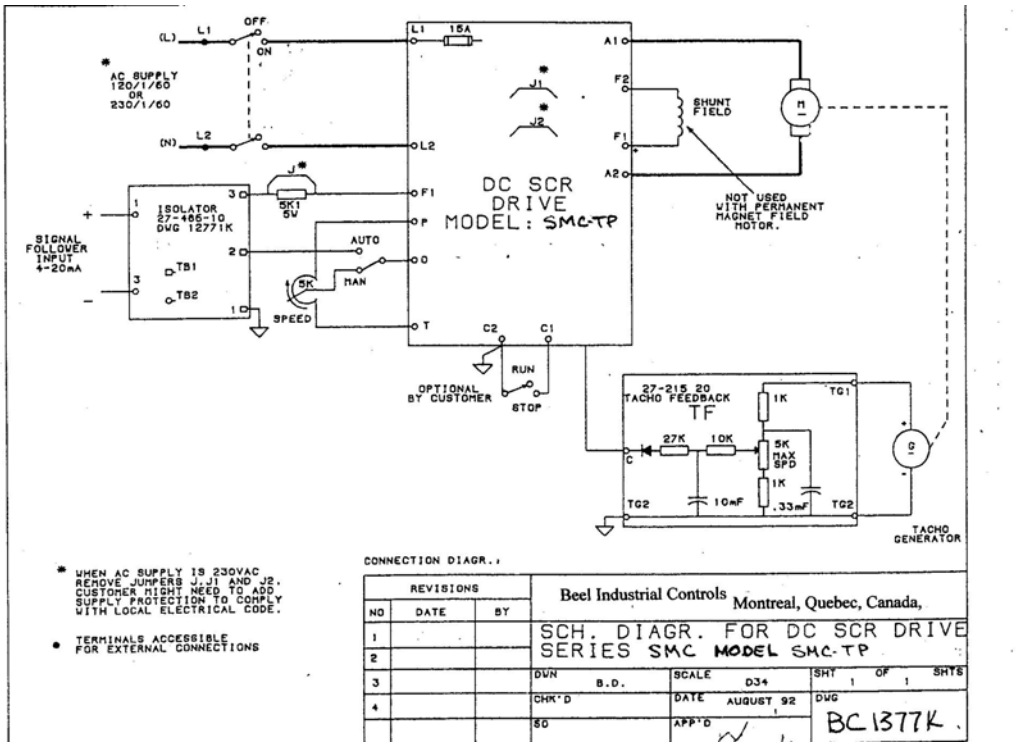
SMC-OP SCHEMATIC, CONNECTION DIAGRAM



SMC-OP PHYSICAL LAYOUT DIAGRAM

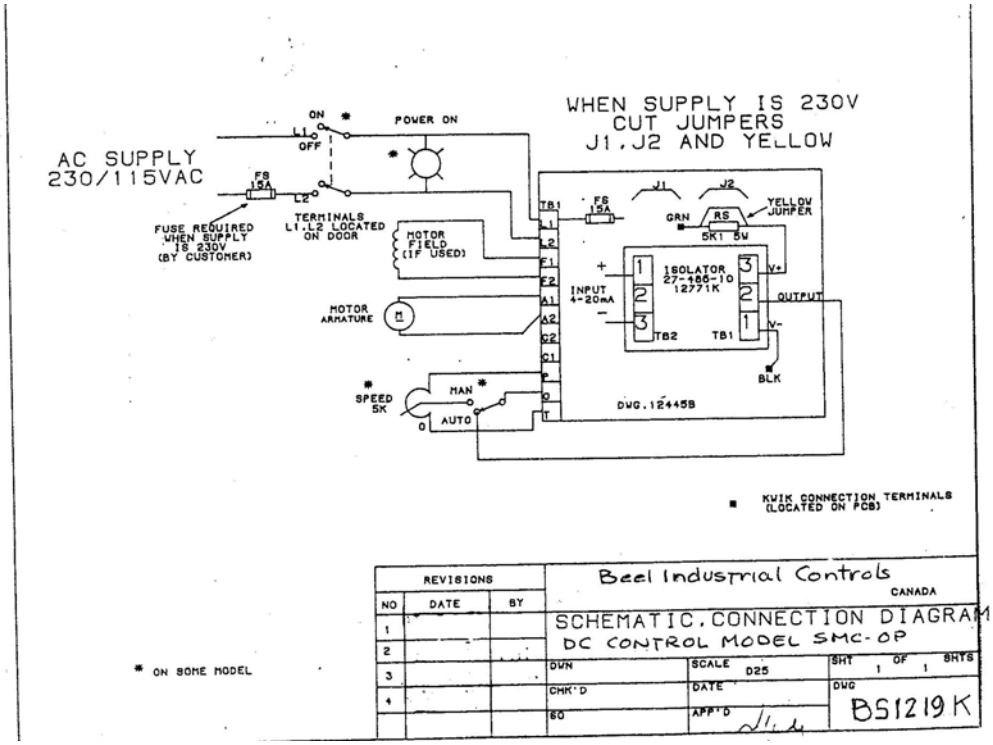


SMC-TP SCHEMATIC DIAGRAM

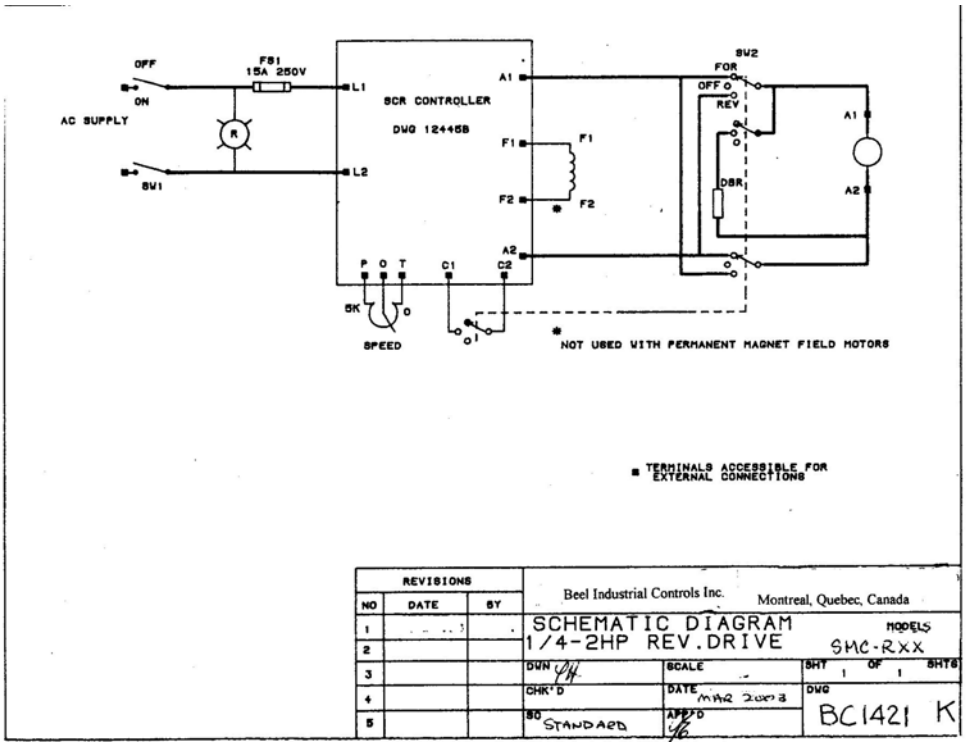


Enclosed Units

SMC-00 R
N1/N2/N4
SCHEMATIC
DIAGRAM



SMC-OP
N1/N2/N4
SCHEMATIC
DIAGRAM



SIGNAL ISOLATOR