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PROJECT TITLE :

MODEL RAILWAY SPEED CONTROLLER

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TABLE OF CONTENTS	PAGE
Acknowledgement	
Preface	
Synopsis	
Table Of Contents	
CHAPTER 1: INTRODUCTION	
1.1 Motor Basics	1
1.2 Objectives	4
1.3 The Characteristic Of Speed Controller	5
CHAPTER 2: GENERAL PRINCIPLE	
2.1 Block Diagram	6
2.2 Back EMF Sampling	9
CHAPTER 3: OPERATION	
3.1 Voltage Control	11
3.2 Back EMF Sampling	11
3.3 Speed Control	12
3.4 Speed Setpoint	13
3.5 Motor Direction	14
3.6 Overload Protection	15
3.7 Power Supply	16
CHAPTER 4: CONSTRUCTION	
4.1 Part List	17

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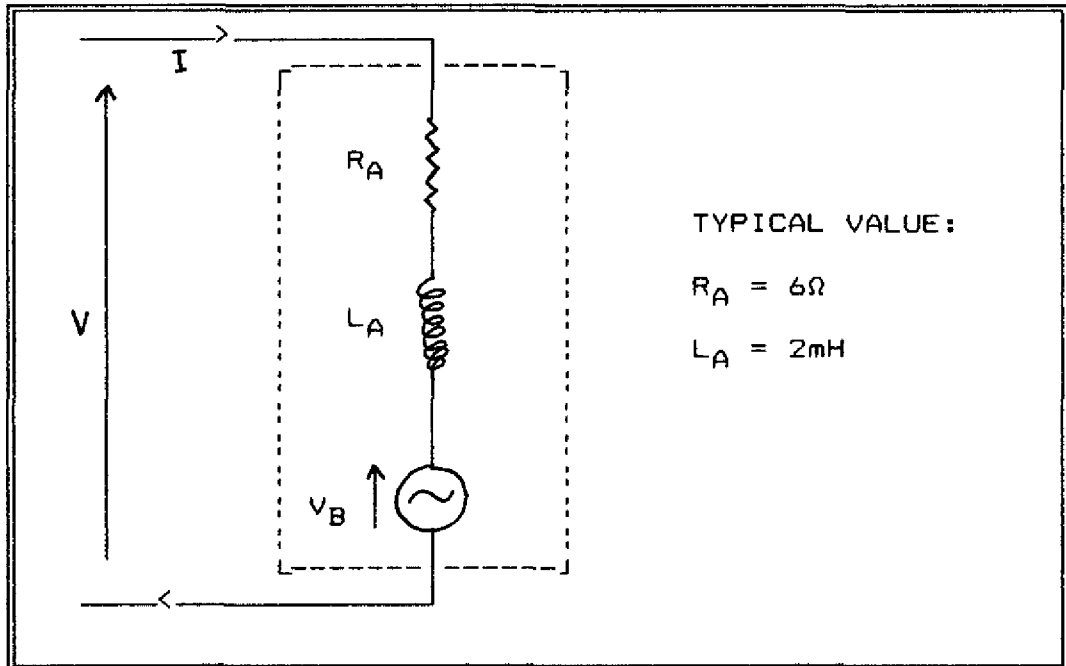
SYNOPSIS

The motor speed controller circuit to be described was developed for use with 00 gauge model railway engines. However it can be easily modified to control any other small 12V DC motor such as in a *minidrill*. The circuit achieves "*closed loop*" control of motor speed by measuring the *back-EMF* of the motor.

This gives excellent speed regulation at all speeds and reduce "*stiction*" when starting. A single *potentiometer* controls both speed and direction. Alternatively a speed control and separate reversing switch can be incorporated. The controller has latching over-load protection.

1.0 INTRODUCTION

1.1 Motor Basics



Equivalent Circuit of DC Motor

Figure 1

The electrical characteristics of a simple permanent magnet motor can be modelled fairly accurately by the equivalent circuit shown in figure 1 is the armature current R_A and L_A the resistance and inductance of the armature respectively and V_B the back-EMF is proportional to the current, whilst the back-EMF is proportional to the speed. If the motor is running at a constant speed with an applied voltage V then we can say that electrically:

$$V = V_B + IR_A \text{ ----- (1)}$$