MagneTek Drives & Systems

PID CONTROLLER

MODEL L771 OR MODEL L754

Before installing this module, a TECHNICALLY QUALIFIED INDIVIDUAL who is familiar with this type of equipment and the hazards involved, should READ this ENTIRE INSTRUCTION SHEET.

INTRODUCTION

The PID Controller module, Model L771 or Model L754, is designed for applications with simple process controls. Its main features, proportional gain, integral time and differential time, can be set at desired values within specified ranges.

Reference input signals and process feedback signals may be current signals (4-20mA) or voltage signals (1-5 VDC), as set by internal select connectors. Output is a voltage signal of 0-10 VDC, which can be directly supplied to other modules and GPD drives (inverters).

RECEIVING

All equipment is tested against defect at the factory. Report any damages or shortages evident when the equipment is received immediately to the commercial carrier who transported the equipment. Assistance, if required, is available from the nearest MagneTek Drives & Systems Office.

INSTALLATION

WARNING

HAZARDOUS VOLTAGE CAN CAUSE SEVERE INJURY OR DEATH.

LOCK ALL POWER SOURCES FEEDING DRIVE IN "OFF" POSITION.

1. Disconnect all electrical power to drive.
2. Remove drive front cover.
3. Verify that voltage has been disconnected by using a voltmeter to check for voltage at incoming power terminals.

Table 1. Specifications and Characteristics of PID Controller

AC Power Supply		220 VAC (180 to 242 VAC), 50/60HZ across terminals 2 and 4. 200 VAC (170 to 220 VAC), 50/60HZ across terminals 3 and 4.
AC Power Supply Capacity		Approx. 6VA
Input Signal Characteristics	Rated Reference Input Current	4 to 20mA across terminals 9 (+) and 10 (-), with S-1 short circuited.
	Rated Feedback Current	4 to 20mA across terminals 11 (+) and 12 (-), with S-2 short circuited.
	Current Signal Input Resistance	250 ohms (±1%)
	Rated Reference Input Voltage	1 to 5VDC across terminals 9 (+) and 10 (-), with S-1 open.
	Rated Feedback Voltage	1 to 5 VDC across terminals 11 (+) and 12 (-), with S-2 open.
	Differential Input Impedance	1 megohm or more at DC
	In-phase Input Impedance	1 megohm or more at DC
	In-phase Input Voltage Range	±10V
Output Characteristics	Rated Output Voltage	+10V at terminals 14 and 15
	Maximum Output Load Current	2.5mA at terminals 14 and 15 (common load)
	Minimum Rated Load Resistance	4K ohms at terminals 14 and 15 (common load)
	Zero Point Offset Voltage	±50mA or less
	Zero Point Temperature Drift	10mV/35°C or less
PID Operation Characteristics	Proportional Gain Setting Range	0.5 (200%) to 50 (2%)
	Integral Time Setting Range	1 to 10 sec, with S-5 shortcircuited; 10 to 100 sec, with S-5 open.
	Differential Time Setting Range	No differential function, with S-3 shortcircuited and S-4 open. 0.1 to 10 sec, with S-3 open and S-4 shortcircuited.
	Differential Gain	Approx. 10 times
	Differential Limit Range	30 to 100% (3 to 10V)
	Bias Voltage Setting Range	0 to 70% (0 to 7V)
Reset Input	Power Supply Voltage	24V ±30%, non-regulated (terminal 8)
	Input Current	10mA (terminal 7)
	Input Resistance	2.4K ohms
Operation Temperature		-10 to +55°C
Storage Temperature		-40 to +85°C

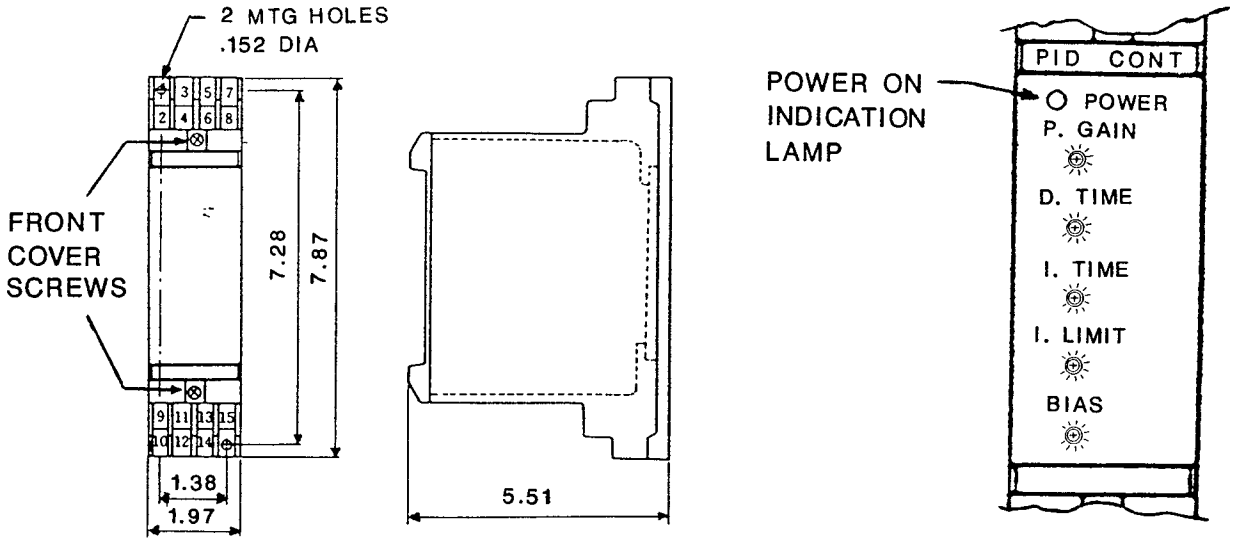

Figure 1. PID Controller Module

IMPORTANT

This instruction sheet describes direct interconnection with Lancer GPD drives. Other applications are possible; interconnection should be modified as necessary for the specific installation.

4. Mount the PID Controller module in the desired location (see dimensions in Figure 1). Then make connections according to the appropriate connection diagram, Figure 2 or 3.

5. Inverter Setup Requirements

A. GPD 502

If Direct Proportional control is required (Figure 5), system constant Sn-04 should be set to 0011.

If Inverse Proportional control is required (Figure 5), Sn-04 should be set to 0111.

Refer to the Technical Manual for the GPD 502 for constant setting instructions.

B. GPD 602

If Direct Proportional control is required, switch 3S on the Control PCB should be set to "0" with EPROM 503302 and above present, or to "F" with EPROM 500707 and above.

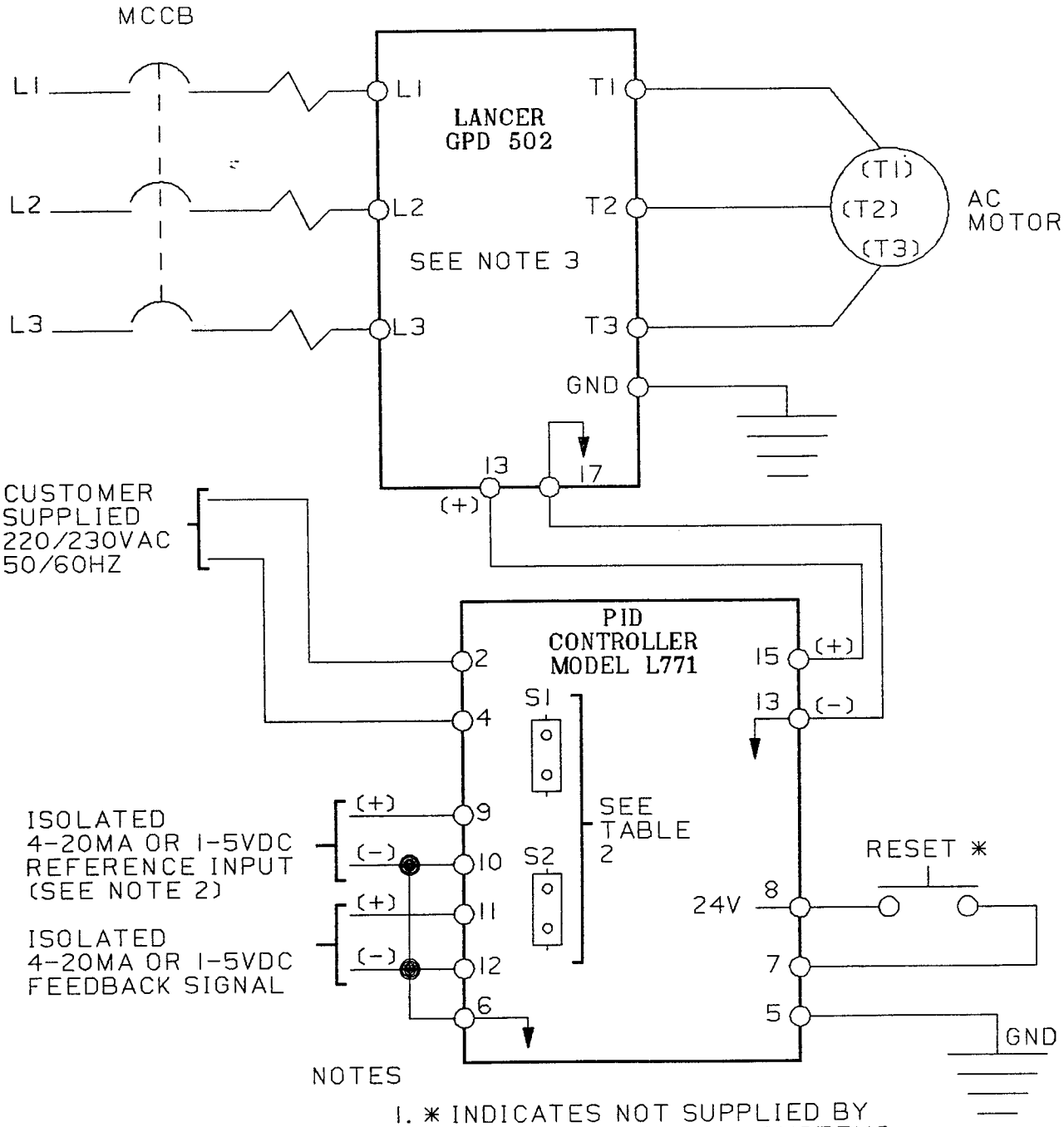

Figure 2. Connection of PID Controller With GPD 502

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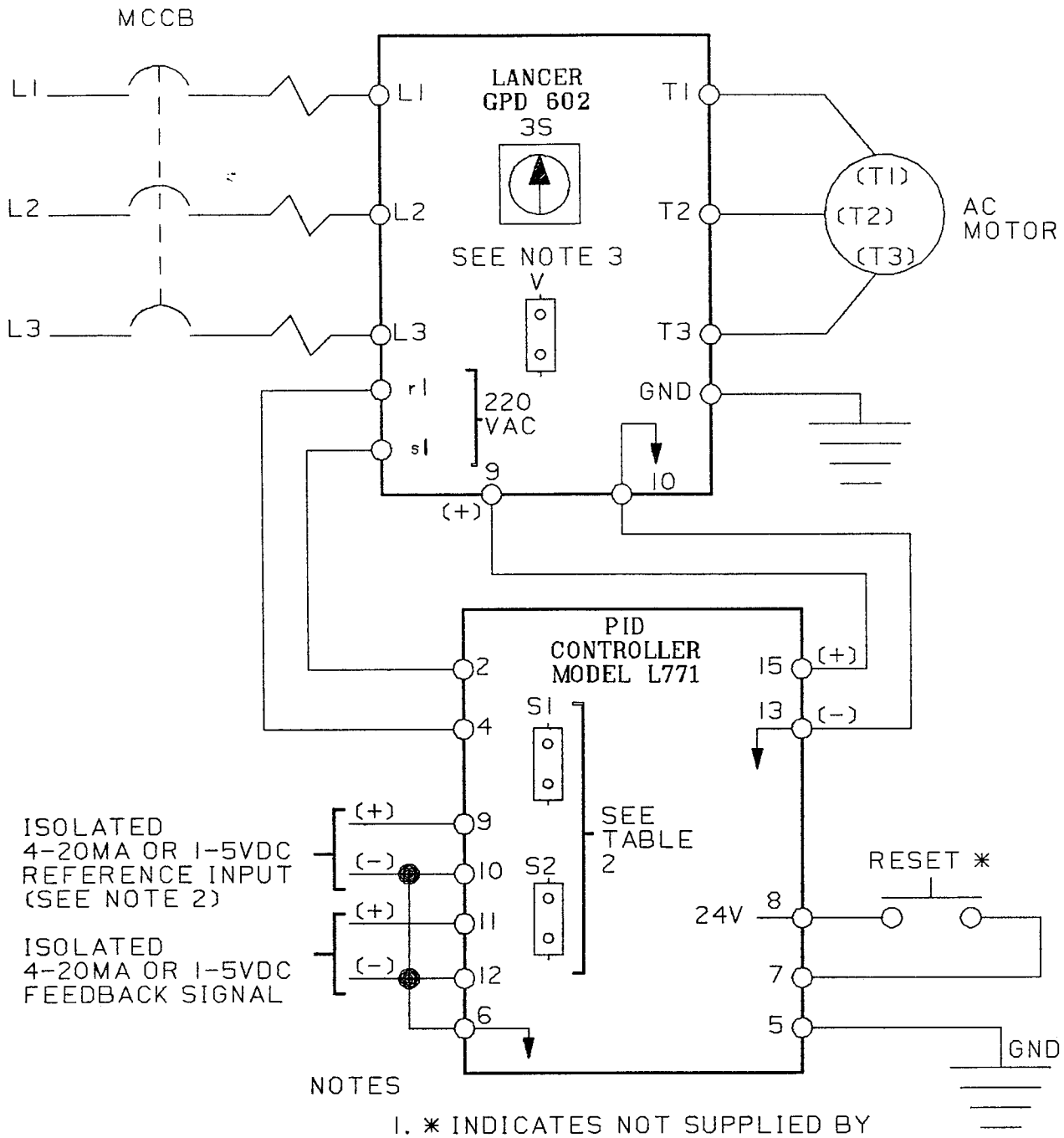

Figure 3. Connection of PID Controller With GPD 602

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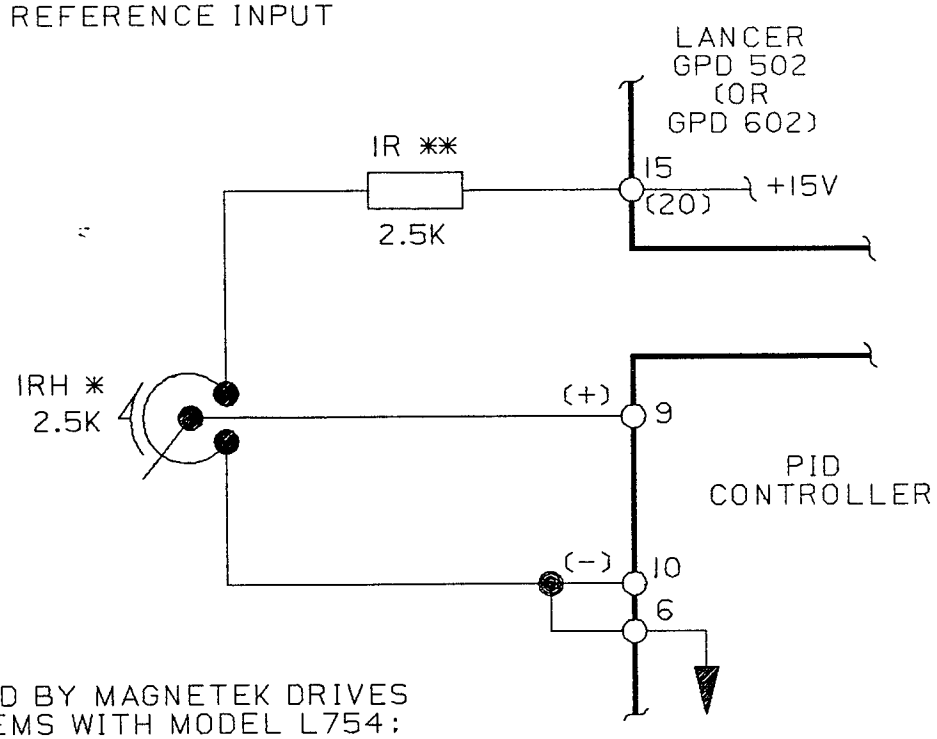
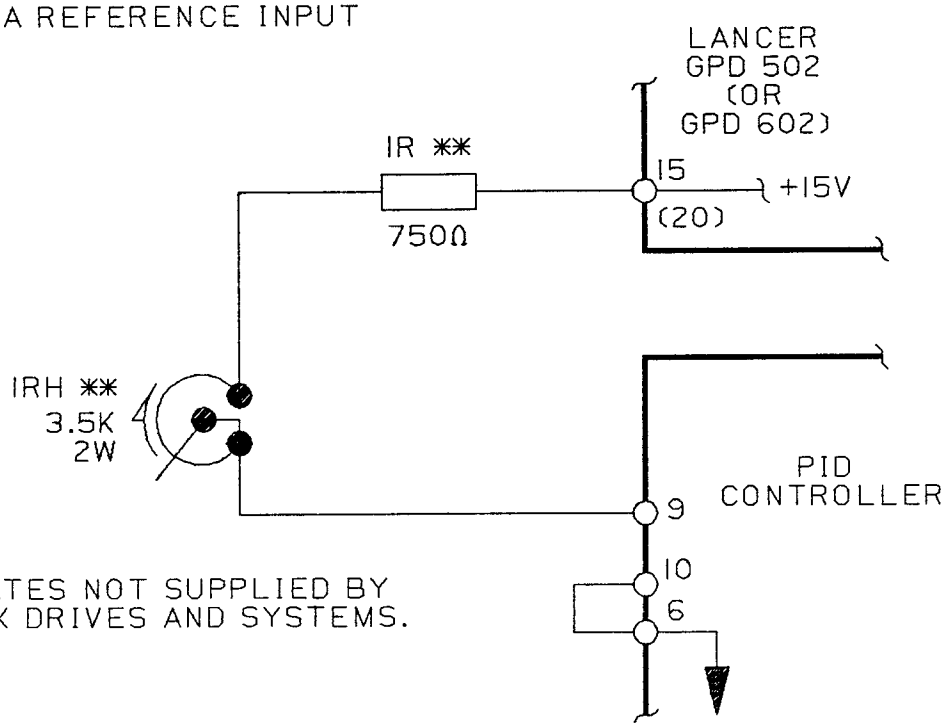
(A) 1-5VDC REFERENCE INPUT



* SUPPLIED BY MAGNETEK DRIVES AND SYSTEMS WITH MODEL L754; NOT SUPPLIED WITH MODEL L771.

(B) 4-20MA REFERENCE INPUT



** INDICATES NOT SUPPLIED BY MAGNETEK DRIVES AND SYSTEMS.

TD.I.2Y25.279,FIG4

Figure 4. Input Reference Circuits Using Voltage Supply From GPD

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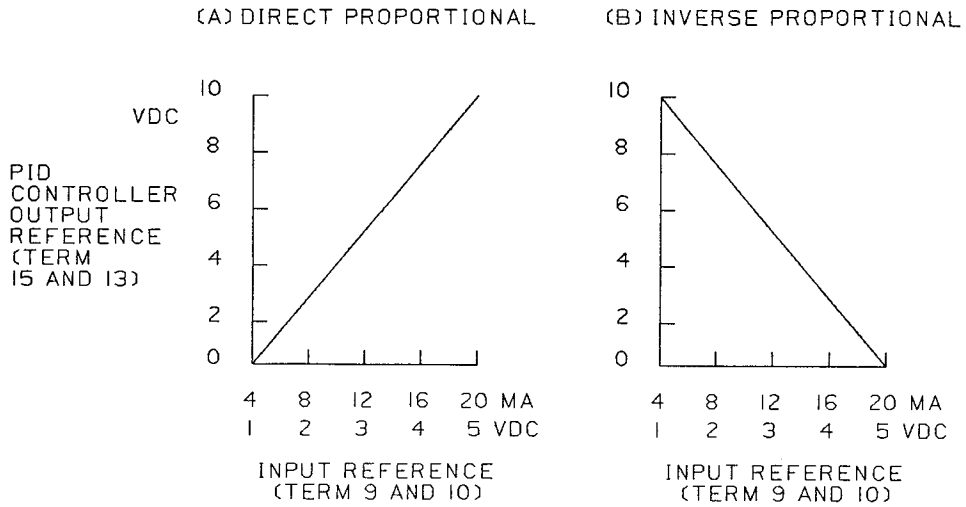
5. Inverter Setup Requirements (Continued)

B. GPD 602 (Continued)

If Inverse Proportional control is required, switch 3S should be set to "C" with EPROM 500707 and above. (Inverse Proportional control cannot be used with EPROM 503302 and above.)



TD.I 2Y25.279.FIG5

Figure 5. PID Controller Input/Output Relationship

6. PID Controller Setup Requirements

Loosen the PID Controller front cover screws, and pull the front cover/printed circuit board assembly out of the module casing. Refer to Figure 6 and Table 2 and set the select connectors on the printed circuit board to correspond to the requirements of your application (note that S1 and S2 settings are determined by the types of inputs that have been wired to PID Controller terminals 9-12). Then reinstall assembly and secure.

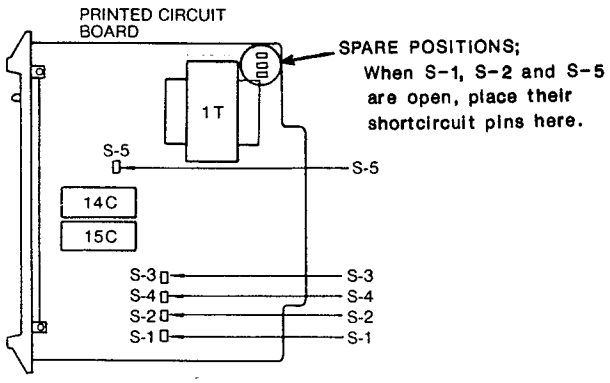


Figure 6. Layout of Internal Select Connectors

Table 2. Functions of Internal Select Connectors

Connector	Condition	Functions	Factory Setting
S-1	Shortcircuit	Reference input is current signal 4 to 20mA.	Shortcircuited
	Open	Reference input is voltage signal 1 to 5V.	
S-2	Shortcircuit	Feedback input is current signal 4-20mA.	Shortcircuited
	Open	Feedback input is voltage signal 1 to 5V.	
S-3 *	Shortcircuit	No differential function. (S-4 must be open)	Shortcircuited
	Open	Differential function. (S-4 must be shortcircuited)	
S-4 *	Shortcircuit	Differential function. (S-3 must be open)	Open
	Open	No differential function. (S-3 must be shortcircuited)	
S-5	Shortcircuit	Integral time: 1 to 10 seconds	Shortcircuited
	Open	Integral time: 10 to 100 seconds	

* Since S-3 and S-4 must be in "opposite" conditions, only one shortcircuit pin is provided for these two connectors.

ADJUSTMENTS

7. Description of PID Controller Operation (Ref. Figure 7)

The reference input signal is applied to terminals 9 (+) and 10 (-). Select connector S-1 must be shortcircuited if a 4-20mA current signal is used, or open if a 1-5 VDC voltage signal is used. The feedback signal is connected to terminals 11 (+) and 12 (-). S-2 serves the same purpose as S -1.

The differential function is performed only on the feedback signal. This provides smoothing in the event of an abrupt change of the input signal. The differential circuit is active when S-3 is open and S-4 is shortcircuited, and bypassed when S-3 is shortcircuited and S-4 is open. The differential time is adjustable in a range from 0.1 to 10 seconds by means of the "D TIME" potentiometer.

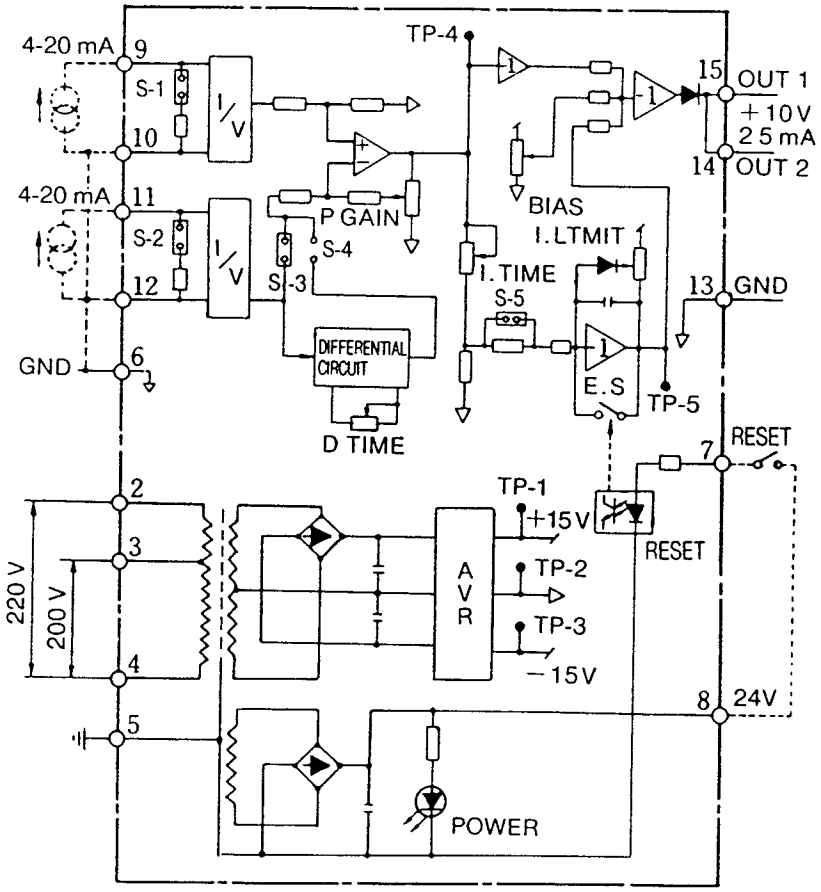


Figure 7. PID Controller Schematic

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The proportional gain can be adjusted in a range of 0.5 (200%) to 50 (2%) by the "P GAIN" potentiometer. The integral time is adjusted by the "I. TIME" potentiometer. The time can be set in a range of 1 to 10 seconds when S-5 is shortcircuit, or in a range of 10 seconds to 100 seconds when S-5 is open. To prevent overshoot caused by excessive integration output, the output voltage of the integrating circuit is limited (i.e. anti-reset windup function). The output voltage of the integrator can be set in a range of 10 to 30 seconds (3 to 10V) by adjusting the "I. LIMIT" potentiometer.

Bias voltage can be added to the PID Controller output, by means of the "BIAS" potentiometer, in the range of 0 to 70% (0 to 7V). The final output is obtained at terminals 14 and 15 as a voltage signal. The rated output voltage is +10V, and the maximum load current is 2.5mA.

A reset circuit is provided for the integrating circuit. When a 24V source (terminal 8 or external supply) is applied to terminal 7, electronic switch "E.S" operates and resets the integral output. The function of the reset circuit is to prevent the integrator drift from producing PID Controller output when the power is ON but the drive is not in operation. The reset signal is electrically insulated from the control signal, preventing noise in the reset circuit from affecting the output.

NOTE

PID Controller adjustment potentiometers are accessible through the front cover of the module (see Figure 1).

8. Setting PID Parameters.

The values of proportional gain, integral time and differential time, related to dial readings of the respective potentiometers, are shown in Figures 8, 9 and 10. The unit is shipped with the proportional gain set at 1, the integral time set at 10 seconds, and the differential time set at 0.1 seconds. The user can change these settings to suit the specific application.

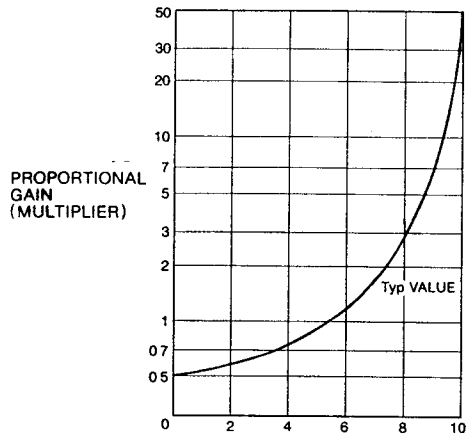

Figure 8. Proportional Gain Setting Characteristics

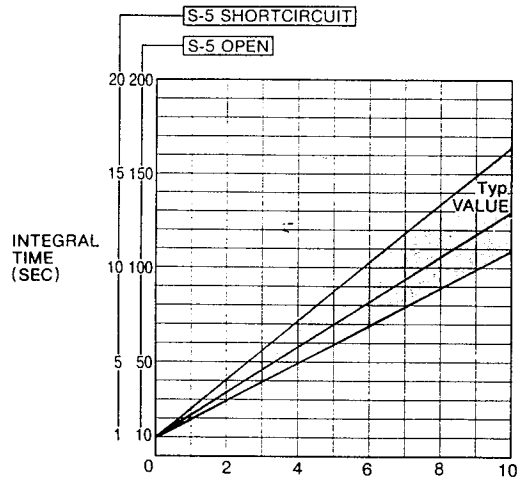

Figure 9. Integral Time Setting Characteristics

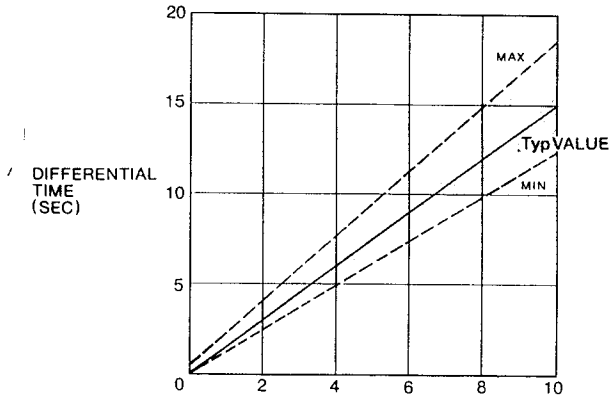

Figure 10. Differential Time Setting Characteristics

9. Setting I. Limit

The saturation voltage of the integrator is set by the "I. LIMIT" potentiometer. When turned fully CW, the limit voltage is approximately 10V; when turned fully CCW, the limit voltage is approximately 3V. This potentiometer is factory set fully CW.

10. Setting Bias

Setting the "BIAS" potentiometer applies a bias voltage to the PID Controller output. When turned fully CW, bias voltage is 70% (7V); when turned fully CCW, bias voltage is 0% (0V). This potentiometer is factory set fully CCW.

11. Reinstall and secure front cover on drive.

12. Place this instruction sheet with your drive Technical Manual.

This completes installation of this module.