Power Drive Controls
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Isolated Voltage and Current Regulation Board
Model VI-ISO (Rev. 3)

Description

The Isolated Voltage and Current Regulation Board designed to control three-phase or single-phase SCR firing board. The voltage and current feedback signals from the high-side output of the SCR can be then directly connected to the board and attenuated by the on-board resistors to signals of less than 250 mV.

The attenuated voltage and current signals are connected to the AMC1200 precision isolation amplifiers with an output separated from the input circuitry by a silicon dioxide (SiO2) barrier that is highly resistant to magnetic interference. This barrier has been certified to provide galvanic isolation of up to 4000 Vpeak.

The circuitry consists of 2 independent PID closed-loop circuits which can be configured for the following three working modes:

1. The current regulation and voltage limit control mode (commonly used).
2. The voltage regulation and current limit control mode.
3. The inner current loop and outer voltage loop control mode.

Circuitry Setup

1. **High Side Attenuation Resistors Selections**

   A). The rated voltage of the resistors R1 and R2 must be greater than the SCR output voltage.

   B). The voltage feedback signal divider resistors R1 and R3 are for the voltage attenuation. The current feedback signal divider resistors R2 and R4 are for current attenuation.
   Calculate resistors R1, R3, R2 and R4 resistances based on the maximum SCR output voltage and the current shunt voltage to get less than 250 mV at V1 and V2, refer to the schematics.
   For example: The SCR maximum DC voltage output is 120 VDC and the maximum current is 20 Amp. Use 75 mV/15 Amp current shunt.
   Select R1 = 200K (250V) and R3 = 10K, then the V1 voltage is approximate equal to 100 mV.
   20 Amp maximum current will generate 100 mV at V2 from the shunt of 75 mV/15 Amp.
   Select R2 = 0, R4 = Not install.

2. Isolation Amplifier and Buffer Gains

The isolation amplifiers U1 and U2 have fixed gain of 8.
The gain of buffer differential amplifiers U3A and U4A are determined by the ratios of resistor resistance.
The gain of voltage feedback signal is the ratio of R13/R9 (R13 = R15, R9 = R11).
The gain of current feedback signal is the ratio of R14/R10 (R14 = R16, R10 = R12)
The default ratios for both voltage and current signals are 2, with R9 = R11 = R10 = R12 = 10K and R13 = R15 = R14 = R16 = 20K.

3. Set Up Voltage and Current Commands

The voltage and current commands can be obtained from the on-board potentiometers POT1and POT2, or from the external input P3-1 and P3-2. See Table 1 for the settings.

Table 1

Use On-Board Voltage Command POT1	J5 Close			
Use On-Board Current Command POT2		J6 Close		
Use External Voltage Command P3-1	J5 Open			POT1 Set to Maximum
Use External Current Command P3-2		J6 Open	J8 Pins 1 and 2 Close	POT2 Set to Maximum

4. Working Modes Set Up (Assume use the on-board POT1 and POT2 as commands)

See Table 2

Table 2

1. Commonly Used	Current regulation and voltage limit	J7 Short Pins 1 & 2		Set POT1 to desired voltage limit	Adjust POT2 to control regulated current
2.	Voltage regulation and current limit	J7 Short Pins 1 & 2		Set POT2 to desired current limit	Adjust POT1 to control regulated voltage
3.	Inner current loop and outer voltage loop	J7 Short Pins 2 & 3	J8 Short Pins 2 & 3		

5. Voltage and Current PID Control Amplifiers

Amplifiers U3B and U4B are used for the PI close loop controls.
U3B, R19 and C7 configured for voltage control, and the resulting PI output can be measured at TP7.
U4B, R20 and C8 configured for Current control, and the resulting PI output can be measured at TP8.
Due to the nature of the PID closed loop, different types of system loads require the corresponding PID parameters, and the user may need to modify the values of resistors R19 and R20, capacitors C7 and C8 to meet the stability and response time requirements of the system.

6. Voltage or Current Regulation Selection

Diode D1 and D2 act as a switch to determine either voltage or current regulation.

7. Voltage and Current Inhibits

Use on-board potentiometers POT3 and POT4 to set up the voltage and current output inhibit levels.
Use External signal to inhibit the output by connecting P3-5 to GND.
The Inhibit pin output P3-4 should connect to pin 12 of FC6 board.

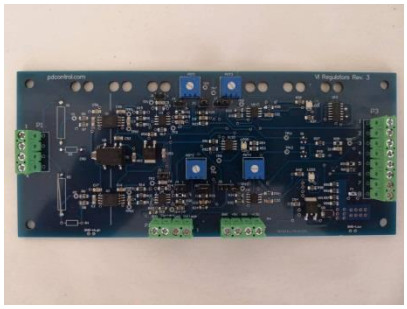
8. The Connector Pin Functions

The Connector pin descriptions shown in Table 3

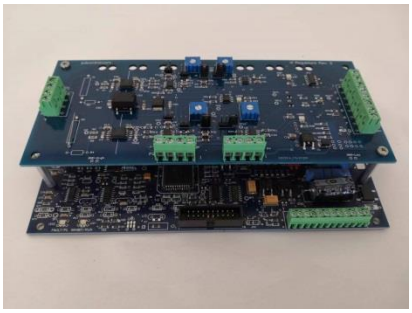
Table 3.

	Pin	Name	Descriptions	I/O
P1	1	V-FB	High side, SCR voltage feedback signal	I
	2			
	3	I-FB	High side, SCR current feedback signal	I
	4	GND	High side ground	
P2	1	P2-1	Low side, buffered voltage feedback signal	O
	2	GND	Low side ground	
	3	P2-3	Low side, buffered current feedback signal	O
	4	GND	Low side ground	
P3	1	E-L1	External voltage command input	I
	2	IL1	External current command input	I
	3	SIG	Control signal output	O
	4	Inhibit Out	Inhibit output	O
	5	Inhibit In	Connect to GND to disable output	I
	6	+12V	+12Vdc output	O
	7	GND	Low side ground	
	8	+30V	Power supply voltage from firing board	I
P4	1	+12Vdc	Low side, +12 Vdc output	O
	2	GND	Low side ground	
	3	+5Vdc	Low side, +5 Vdc output	O
	4	GND	Low side ground	

9. The Board Pictures



The Board Dimension: 190 mm x 80 mm



Build with FC6 Firing Board

10. Connection Diagram to FC6 Firing Board