

# CVR600



## Features:

Proven reliability and versatility

Isolated from dc bus

Suitable for battery chargers, magnet and electrochemical process power supply applications

Flexible packaging minimizes in-house assembly

## Applications:

Plating Rectifiers

Battery Chargers

Wind Turbine Controllers

DC Drives

Semiconverters

UPS Systems

Transformer Primary Controllers

## Firing / Regulator Board Package, Model CVR600 For Phase Controlled Converters and Controllers

Enerpro's SCR firing/regulator board package enables the Original Equipment Manufacturer or end user to fabricate current and voltage regulated phase controlled power supplies from widely available SCR's, heatsinks, fuses, control devices and enclosures. In-house assembly provides packaging flexibility and cost savings compared to the purchase of complete power supplies.

The three-phase CVR600 package is comprised of Enerpro's FCOG6100 firing board and ISOVLCL -3 regulator board. This board combination is suitable for battery chargers and electrochemical process power supplies. Gate drive levels are adequate for SCR wafers with diameters up to 50mm. This package is suitable for use in systems with input voltages up to 600 Vac.

System versatility is further enhanced by Enerpro designed and manufactured auxiliary firing boards. These auxiliary firing boards extend the range of application to include parallel/remote SCR systems and 4-quadrant converters. Please request product guide PD736 for a description of our auxiliary firing boards.

### FIRING/REGULATOR BOARD PACKAGE

#### BOARD COMPONENTS

##### FCOG6100 Firing Board

This is an industry standard design with over 100,000 in use in a wide variety of motor and generator controllers and large industrial power supplies. The firing circuit is based on a phase-locked-loop digital gate delay circuit that forms the required six equidistant 60° displaced SCR gate pulses. Major circuit elements are incorporated in an LSI device for reduced component count and improved reliability.



Key firing board parameters are:

- SCR gate drive: 1.8A short circuit current, 15V open circuit voltage.
- Phase balance: +/-1.0°
- Gate isolation: +3500 V- pk
- Phase loss inhibit
- High immunity to mains voltage distortion
- Phase sequence insensitive
- Fuse gate pulse modules
- Fused power transformer
- Enable status open collector output

The gate delay angle varies in negative proportion to the delay angle command voltage.

The firing circuit transfer function consists of a single order zero, a single order pole, and a complex 2nd order pole. The closed loop firing circuit frequency response is characterized by -45° phase shift at 384 rad/sec and -3 dB gain at 620 rad/sec. Gain and phase vs. frequency plots of the firing board transfer function are available. And extended bandwidth version of the firing board can be specified.

Standard firing board power is 120/240 Vac, 25VA, 50 or 60 Hz. Optional voltages of 24 Vac, 380 Vac, 480 Vac, or 30Vdc can be accommodated.

Additional detail on the firing circuit is provided in a conference paper and under PD720 Product Guide.

### ISOVLCL -3 REGULATOR BOARD

Our most popular regulator, the ISOVLCL -3 can be panel mounted or placed on standoffs above the FCOG6100 firing board. The ISOVLCL -3 regulator board provides the following functions:

- Isolation of the current and voltage feedback signals
- Load current limiting, or
- Load voltage limiting
- Automatic crossover between current and voltage limiting
- Over-current trip with automatic reset
- Soft-start and Soft-Stop
- Absolute value functions for the current and voltage feedback signals
- Load current readout signal
- Load voltage readout signal

Current and voltage feedback signals are obtained from a customer provided 0/ 50mVdc current shunt and a 0/4 Vdc resistor attenuator respectively. Other feedback levels can be accommodated. The current and voltage feedback signals are galvanically isolated from the regulator board circuitry by Analog Devices Model AD202KN Isolation Amplifiers. The rated isolation voltage of these devices is 2000 V- pk.

Current voltage feedback signals are processed by precision rectifier (absolute value) circuits to avoid positive feedback and to permit operation with polarity reversing loads.

Current and voltage command signals can be obtained from board-mounted potentiometers or external sources.

A board-mounted potentiometer sets the current trip level. The current trip resets the soft-start circuit and causes the commanded angle to be reduced. In most cases, the reduced firing angle causes the output current to decrease which results in the resetting of the current trip. Once the current trip clears, the soft-start circuit will ramp to the commanded angle in approximately 2.0 seconds. If the over-current condition persists, this cycle will continue.

### OPERATIONAL DETAILS:

Typical gain and filter break frequencies suitable for the battery charging application are:

- Current channel: 0.63 V/mV, 9.8 rad/sec
- Voltage channel: 5.5 V/V, 3.2 rad/sec

Actual regulator board gain and break frequencies are selected in conjunction with the dynamics of the converter load to give the required overall regulator stiffness and bandwidth.

The soft-start circuit ramps the gate delay command voltage input to the firing board up to the preset level in approximately 2.0 seconds. Other soft-start times can be specified.

A board-mounted potentiometer sets the current trip level. Trip response time to an over-current event is approximately 3msec. A current trip resets the soft-start circuit. The current trip cycles on and off if the over current condition persists.

### CONTROL INTERFACE

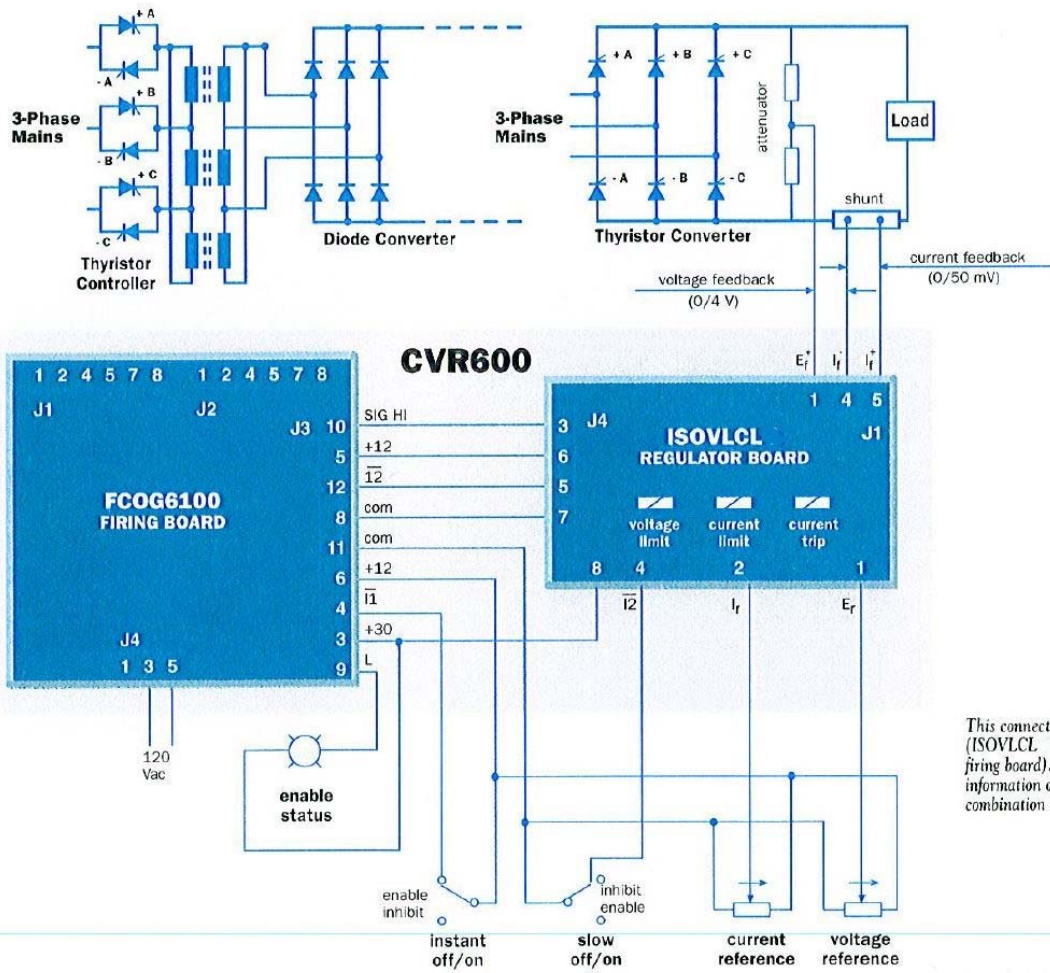
The connection diagram shows five customer provided control devices: instant off/on and slow off/on switches, current and voltage reference potentiometers, and a 24 Vdc enable status lamp. These devices may be wired directly to the firing board and regulator board connectors. Optionally, a control interface terminal block may be specified. This terminal block and the circuit boards are mounted on a 305 mm by 178 mm (12.0" by 7.0") aluminum panel.

### ADDITIONAL INFORMATION:

In addition to the CVR600 described, Enerpro offers single-phase (CVR200) and six-phase (CVR1200) versions of this product. For applications involving a variable frequency input, typically from an alternator, the ISOVLCL -3 can be coupled with our FCOVF6100 firing board.

We also offer model ISOVLCL -4, a modified version of the ISOVLCL -3 regulator board, which includes voltage/trip, trip latches, and remote status drivers in addition to all ISOVLCL -3 features.

For information on these or other products, please contact either Enerpro or one of our distributors.



This connection diagram shows the CVR600 (ISOVLCL regulator board and FCOG6100 firing board). Please contact Enerpro for information on CVR200, CVR1200, and other combination diagrams.

# CVR600



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<b>Firing Regulator Board Package Ordering Guide</b>		<b>C o d e</b>
<b>Parameter</b>	<b>Description</b>	
<i>Paralleled SCR</i>	<b>Code</b> 0 No 1 Yes ( <i>optional FCOAUX 60 board required</i> )	
<i>SCR Circuit</i>	<b>Code Converter</b> 0 1-Quadrant 3-pulse bridge 1 2-Quadrant 6-Pulse bridge 2 4-Quadrant 6-pulse bridge (FCOG61BP Firing Board is used) 5 Other <b>AC Controller</b> 6 6-SCR in-line 7 SCR inside-the-delta 8 Sequence Reversing (FCOG61BP Firing Board is used) 9 Other	
<i>Converter Load</i>	<b>Code</b> 0 Resistive 1 Magnet coil 2 LC filter 3 Motor 4 Battery or electrochemical cell 5 Other	
<i>Frequency</i>	<b>Code</b> 0 50/60 Hz 1 Other	
<i>Mains Voltage</i>	<b>Code</b> 0 240 1 380 3 480 4 Other	
<i>Transformer</i>	<b>Code</b> 0 Omit 3 120/240 Vac 4 240/480 Vac 5 380 Vac	
<i>Transformer Supply</i>	<b>Code</b> 0 External Source 1 From SCR cathodes	
<i>Snubber Circuit Included</i>	<b>Code</b> 0 No 1 Yes ( <i>added cost</i> )	
<i>Current Feedback</i>	<b>Code</b> 0 0/50 mVdc 1 Other	
<i>Voltage Feedback</i>	<b>Code</b> 0 0/4 Vdc 1 Other	
<i>Mounting Panel &amp; Terminal Block</i>	<b>Code</b> 0 No 1 Yes ( <i>added cost</i> )	