



Sorensen
DCS Series M51
Isolated Analog Option
Programming Manual

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Important Safety Instructions

Before applying power to the system, verify that your product is configured properly for your particular application.

	Hazardous voltages may be present when covers are removed. Qualified personnel must use extreme caution when servicing this equipment. Circuit boards, test points, and output voltages also may be floating above (below) chassis ground.
	The equipment used contains ESD sensitive parts. When installing equipment, follow ESD Safety Procedures. Electrostatic discharges might cause damage to the equipment.

Only *qualified personnel* who deal with attendant hazards in power supplies, are allowed to perform installation and servicing.

Ensure that the AC power line ground is connected properly to the Power Rack input connector or chassis. Similarly, other power ground lines including those to application and maintenance equipment *must* be grounded properly for both personnel and equipment safety.

Always ensure that facility AC input power is de-energized prior to connecting or disconnecting any cable.

In normal operation, the operator does not have access to hazardous voltages within the chassis. However, depending on the user's application configuration, **HIGH VOLTAGES HAZARDOUS TO HUMAN SAFETY** may be normally generated on the output terminals. The customer/user must ensure that the output power lines are labeled properly as to the safety hazards and that any inadvertent contact with hazardous voltages is eliminated.

Guard against risks of electrical shock during open cover checks by not touching any portion of the electrical circuits. Even when power is off, capacitors may retain an electrical charge. Use safety glasses during open cover checks to avoid personal injury by any sudden component failure.

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SAFETY SYMBOLS



WARNING
Risk of Electrical Shock



CAUTION
Refer to Accompanying Documents



Off (Supply)



Direct Current (DC)



Standby (Supply)



Alternating Current (AC)



On (Supply)



Three-Phase Alternating Current



Protective Conductor Terminal



Earth (Ground) Terminal



Fuse



Chassis Ground

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SECTION 1 DESCRIPTION AND SPECIFICATIONS

1.1 Introduction

The M51 isolated interface allows complete remote programming control of either the power supply output voltage or current using analog program signals, that may be biased at any potential relative to the power supply return line (within the maximum voltage differential specification). The program mode is selected by setting 5 DIP switches located on the back panel, and the program input port is a standard 15 pin female D-SUB connector.

1.2 Specifications

Maximum Voltage Differential:

Between program input / power supply return	600VDC
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Remote Programming Control Coefficient: ($\pm 1\%$)

Output Voltage	(0-10V pgm, Switch Select)	1V/10% of V_o
	(0-5V pgm, Switch Select)	1V/20% of V_o
	(0-400mV pgm, Switch Select)	0.1V/25% of V_o
Output Current	(0-10V pgm, Switch Select)	1V/10% of I_o
	(0-5V pgm, Switch Select)	1V/20% of I_o
	(0-400mV pgm, Switch Select)	0.1V/25% of I_o

(Program scales can be adjusted within $\pm 5\%$ of the nominal value, if required, see Section 2.4 Calibration.)

Input Impedance: 20K

Program Connector:

15 pin D-sub female - mating part 15 pin D-sub male
(typical part AMP 747908)

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SECTION 2 INSTALLATION AND OPERATING INSTRUCTIONS

2.1 Programming Connection

Connect the remote program signal line to the input connector (J1) as shown below. Check that signal polarity is correct (+ to J1 pin 7, – to J1 pin 6). Wiring for the program line should be either a twisted pair, or a shielded pair, with the shield tied to the power supply chassis.

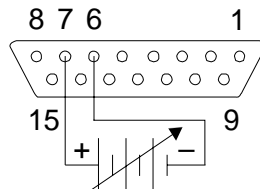


Figure 2-1 Connector J1

2.2 Programming Mode

The interface board may be set to remotely program either the output voltage or the output current of the power supply, or it may be set for standard local front panel control. The input can also be configured to accept either a 0-10V, 0-5V or 0-400mV control signal.

The operating mode of the interface is set with the 8-position DIP (SW1) located on the rear panel of the unit. The switch settings are as follows:

MODE	SW1-1	SW1-2	SW1-3	SW1-7	SW1-8
Local Control (no programming)	OFF	x	x	x	x
Output Current Pgm 0-400mV	ON	ON	OFF	OFF	OFF
0-5V	ON	ON	OFF	ON	OFF
0-10V	ON	ON	OFF	OFF	ON
Output Voltage Pgm 0-400mV	ON	OFF	ON	OFF	OFF
0-5V	ON	OFF	ON	ON	OFF
0-10V	ON	OFF	ON	OFF	ON

(x = don't care, SW1-4 to SW1-6 are always off)

Table 2-1 Mode Select Switch

2.3 Operation

After appropriate programming mode has been selected, and the external programming voltage source has been connected, the output of the power supply may be varied by adjusting the programming voltage.

**CAUTION!**

Never allow the power supply output voltage or current to exceed the rated maximum.

2.4 Calibration

If the program range or offset should require calibration, adjustments may be made via multi turn trimpots located on the M51 isolated interface control board. (Remove cover of power supply for access).

<u>Designation</u>	<u>Parameter Affected</u>
R11	Program Offset Adjust
R8	Program Range Adjust

SECTION 3

THEORY OF OPERATION

3.1 General

The M51 interface board consists of two functional blocks, the isolation amplifier with input buffer amplifier and associated switching circuitry, and the isolated power supply, which provides power to the input side of the isolation amplifier.

3.2 Isolation Amplifier

The isolation amplifier U1, has a capacitively isolated input stage, which prevents any D.C. currents from flowing between the programming source, and the power supply. It has a fixed overall unity gain, which allows for simple interfacing of the external program signal and the internal control points. U3 amplifies and buffers the input signal, with R8 and R11 providing range and offset adjustment points, while R7, R6 and R5 in conjunction with SW1-7 and 8 set the appropriate program scale.

Quad analog switch, U2, connects the output of the amplifier to either the voltage program line (J2-9) or the current program line (J2-8), depending on the setting of SW1-2 and SW1-3 (see Table 2-1 for settings). The control line that is not being programmed is connected to the R4, R3 voltage divider, which provides a fixed full scale (5V) program signal. SW1-1 sets the power supply in the remote control mode by pulling pin J2-4 low. In this way the single isolation amplifier can be used to program either the output voltage or current, while the other non-programmed line is held at the full scale level, independent of where the front panel control knobs are set.

3.3 Isolated Power Supply

The isolated power supply is required to provide +12V and -5V to the input side of the isolation amplifier, while maintaining electrical isolation between this section of the M51 board and the DCS unit output.

The power supply is a low power flyback type circuit, controlled by U5, a 100kHz current mode pulse width modulator (PWM). This PWM controls the on time of the switching transistor Q1, a N-channel MOSFET, which controls the power delivered to the secondary T1, the isolation transformer. The transformer winding voltage is sensed at the control circuit by rectifying and filtering the output of the control winding at T1 pin 9 and 2. This voltage is divided by R13 and

14 to approximately 2.5V, the same level as the internal reference in the PWM. The on time of Q1 is controlled to maintain this sensed voltage at 2.5V, which also keeps the main secondaries at pin 6, 7 and 8 regulated.

The main secondaries are rectified and filtered to provide approximately $\pm 15V$ to the post regulators U3 and U4. U3 provides a fixed 12V to the input stage of U1, while U4 provides a fixed -5V. The 14-20V input to the isolated supply is from the raw auxiliary supply on the main DCS unit, while the output stage of the isolation amplifier is driven by the +12V and -5V supply on the main DCS control board.