LSSC-1h/f Signal Conditioner/Translator

1 Features

- No programming required
- Configured via simple jumper pin selections
- Selectable input:
  - 0-10Vdc Analog ***or***
  - 0-1V (low), 4-24V (high) PWM
- Selectable output
  - 0-10Vdc Analog **or**
  - 0 (low), 10V (high) PWM out
- Selectable response
  - Positive slope ***or***
  - Negative slope
- 24Vac powered
- Integral analog 60Hz noise filter
- Low quiescent current draw – 40mA typical

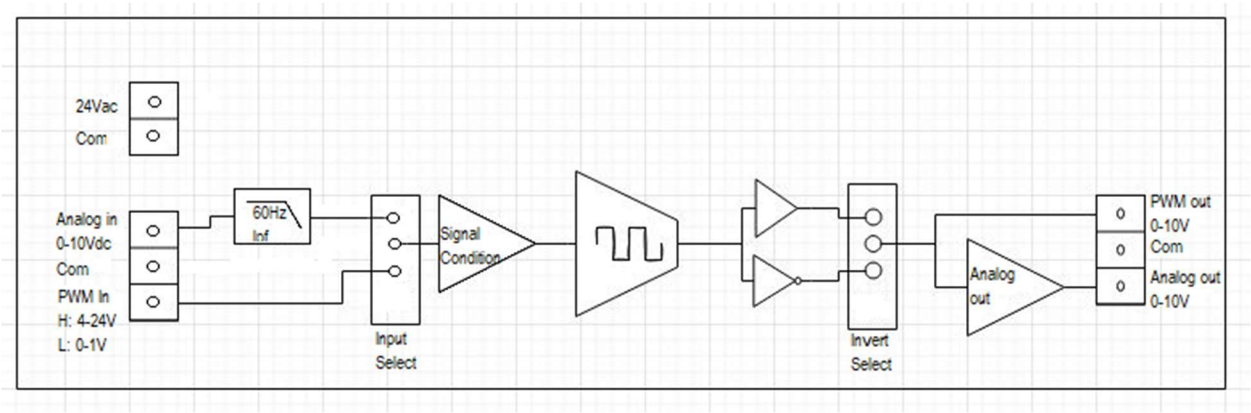
2 Applications

- Commercial and Residential equipment control
  - HVAC
  - Pumps & valves
  - Industrial controls

3 Description

The LSSC-1 is a low-voltage control signal conditioner that consolidates a broad range of control requirements in a single, easily configurable interface board. Independently user selectable input and output modes allow quick, no-programming configuration – each can be selected for either analog or PWM. System response can be selected for either positive or negative slope. The LSSC-1 reduces controller inventory needs by serving as a single universal translator between a wide variety of equipment control requirements.

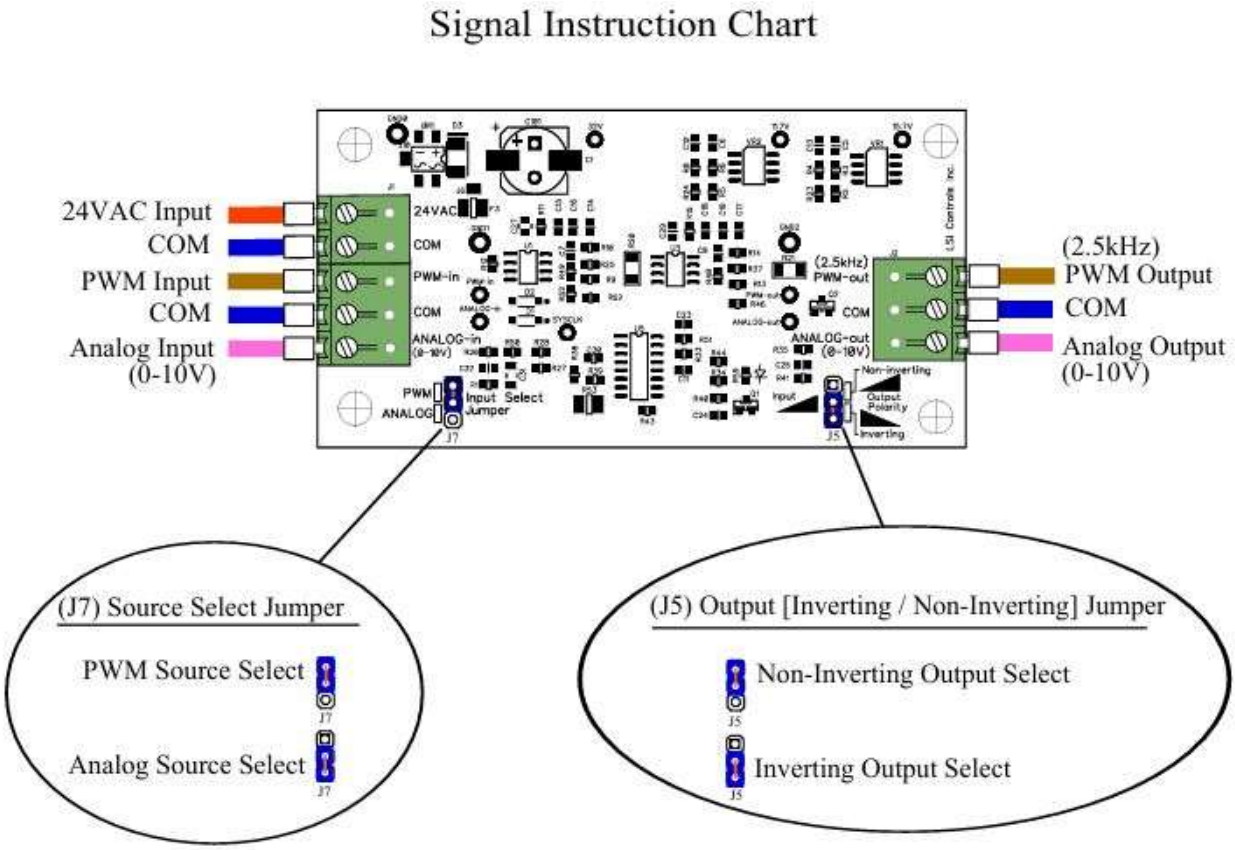
4 Simplified Schematic



5 Revision History

Description	Version	By	Date
Initial draft	V1.0 Rev A	RH	6/26/24
Rev B update	V1.0 Rev B	KC	7/10/24
Production update	V1.1 Rev B	RH	8/15/24

6 Connections and Functions



7 Specifications

7.1 Absolute Maximum Ratings

SYMBOL	Parameter	MIN	MAX	UNIT
Vcc	Supply Voltage		32	Vrms
Tamb	Operation Ambient environment temperature	0	70	°C

7.2 Storage / Handling Ratings

Parameter	Standard	MIN	MAX	UNIT
Storage Temperature		-65	150	°C
Electrostatic Discharge	JEDEC Human Body Model JEP-155	0	500	V

7.3 Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT
Vcc	AC Power supply input voltage	18	24	28	Vrms
Ioa	Output current – Analog w/ 1k output series Resistor		10		mA
Iop	Output current – PWM w/ 1k output lift Resistor		10		mA

7.4 Electrical Characteristics

PARAMETER	Test Conditions	MIN	TYP	MAX	UNIT
Power Supply					
Input supply voltage regulation	Vcc = 24Vac		0.6		mV
Supply current	Vcc = 24Vac	30	40	50	mA
Internal PWM Oscillator					
Oscillator frequency		2.48	2.5	2.55	KHz
Standard deviation of frequency			≤40		Hz
ΔFrequency with supply voltage			0.4		Hz
ΔFrequency with Tamb	ΔTamb = Min to Max		≤50		Hz
Analog input / output					
60Hz line filter		-10	-10.9	-11.7	dB
Input voltage range		0	10	11.5	V
Input threshold voltage	Zero duty cycle		200		mV
Input saturation voltage	Max duty cycle		10		V
Input impedance			20		KΩ
Output voltage		0	10	11.2	V
Output source current (short circuit)	1kΩ series resistor			200	mA
Output impedance	1kΩ series resistor		1		KΩ
PWM input / output					
Input level Low			0		V
Input level High		4.2	10	28	V
Input threshold duty cycle	Zero output duty cycle	0	1.3	2.5	%
Input saturation voltage	Max output duty cycle	97.5	98.7	100	%

Electrical Characteristics - continued

PARAMETER	Test Conditions	MIN	TYP	MAX	UNIT
PWM input / output					
Output level Low		0			V
Output level High		10	10.48	11.2	V
Output source current				10	mA
Output impedance			1		KΩ

8 Detailed Description

8.1 Overview

The LSI-SC1 addresses a broad range of control signal standards, both analog and PWM. This allows users to reduce inventory and consolidate HVAC or pump controller components into a single, easily configurable system. The SC1 allows a mix and match of analog or PWM inputs, analog or PWM outputs and positive or negative control slopes. Configuration is achieved through two jumper pin settings. No programming is required. One pin selects the input – analog in the range of 0-10V, or PWM, accepting a PWM high value between 4 and 24 volts.

Power is supplied via 24Vac input. Two options are available: SC-1h uses a half-wave rectified power supply input with common ground (supply and signal grounds are common). SC-1f offers full-wave rectification on input. Signal ground is separated.

8.2 Features

8.2.1 Power Supply

The SC-1 is available in two versions. SC-1h is powered by a half-wave rectifier for compatibility with older HVAC and pump management systems. 24Vac is supplied either from an upstream system or through a user supplied 115 Vac main to 24Vac step down transformer. The COM power supply input is referenced to ground. Both input and output signal COM grounds should be tied to this same ground point.

SC-1f employs a full-wave rectifier to conform to modern standards. The 24Vac and COM power supply inputs connect to each leg of the user supplied 24Vac transformer output. The full-wave rectifier provides an isolated DC signal GND for use in situations where neither side of the transformer output is utilized as a Common/GND leg.

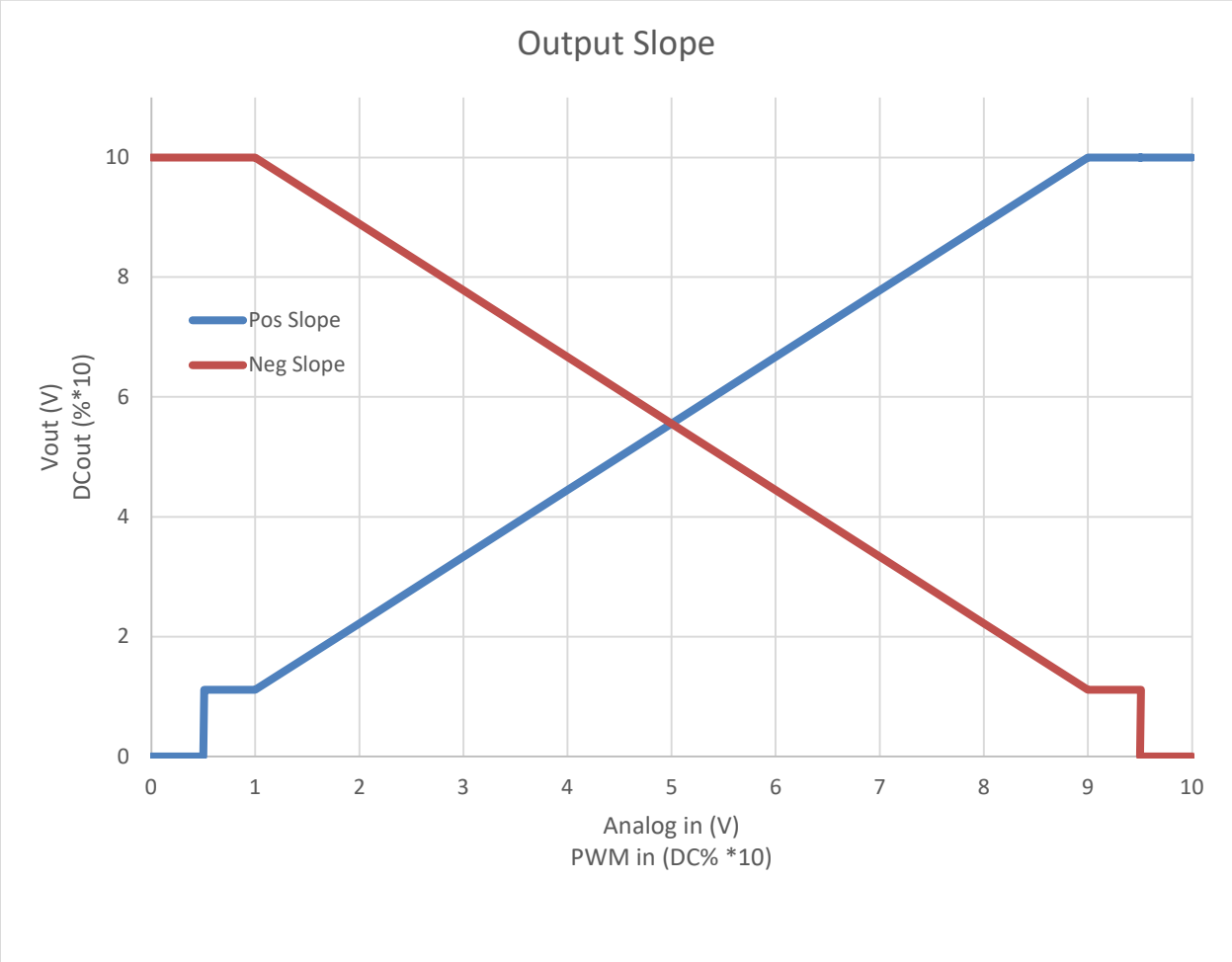
8.2.2 Configuration of Operation

The input signal is selected for Analog or PWM drive inputs via jumper pin J7. Acceptable analog input ranges from 0 to 10Vdc. Response is linear with positive slope – i.e. rising input voltage produces rising analog output voltage or an increasing PWM duty cycle, or negative slope – rising input voltage produces a decreasing analog output voltage or a decreasing PWM duty cycle. Selection of positive or negative slope is selected vie jumper pin J5. Selection of output – Analog or PWM is made by wiring the

output to the appropriate terminal block pin. Operating configurations are summarized in the below table. For output, V='Voltage' , DC = 'Duty Cycle'.

Input Select (J7)	ΔInput	Slope Select (J5)	Output Type	Output
Analog	V↑	Pos	Analog	V↑ (0-10V)
			PWM	DC↑ (0-Max%)
		Neg	Analog	V↓(10-0V)
			PWM	DC↓(Max-0%)
PWM	DC↑	Pos	Analog	V↑ (0-10V)
			PWM	DC↑ (0-Max%)
		Neg	Analog	V↓ (10-0V)
			PWM	DC↓ (Max-0%)

8.3 Application Curve



The SC-1 has built-in saturation and threshold zones in the output as shown in the application curve. This feature provides hysteresis as a protection to prevent unnecessary cycling (hunting) of the controlled equipment at both high and low input signal levels.

9 Mechanical

9.1 Footprint

- Footprint: 50.8mm X 97.8mm (2” X 3.85”)
- Height: 20mm (0.8”)

9.2 Wire Connections

Wire connections are made through 2 (qty 1) and 3 position (qty 2) Terminal Block Plugs. The terminal blocks accept 12-26 AWG gauge wire.

9.3 Mounting Options

- Mounting holes (0.128”) are provided on the four corners of the pcb suitable for #4-40 size standoffs.
- DIN rail mounting on the board edges.
- A DIN rail mountable enclosure version is also available.

10 Ordering Info

The LSSC-1h/f is available in single unit order quantities in both half-wave and full-wave power options as part of LSI Control’s *AcuWatt™* product line. Volume discounts are available. www.lsi-controls.com/shop/AcuWattShop.html

11 Contact Info

LSI Controls, Inc. (www.LSI-Controls.com) has provided comprehensive design and manufacturing services of high-density electronic systems and components for both OEM and aftermarket upgrade applications since 1979.

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