

## SC40 Series Signal Conditioners

### ⚠ WARNING

Read these instructions carefully and completely before installing or operating. Failure to follow them could result in a fire or explosion causing property damage, personal injury, or loss of life. The product must be installed and operated according to all local regulations.

Service and installation must be performed by a trained/experienced service technician.

### DESCRIPTION

The SC40 Series Signal Conditioner, used with the E42H, E52H, and E62H Series modulating gas valves, is designed to modulate atmospheric indirect fired heaters with a 2-speed inducer. Most applications are able to achieve approximately a 5:1 turndown.

The system is easily integrated into existing heater designs. The system's reliability and simplicity greatly reduces the engineering time required to bring a high turndown modulating heater to market.

### SYSTEM FEATURES

#### SC40 Series Signal Conditioner

##### Controlled Start-Up

- Fixes the modulation output voltage and inducer state for a predetermined time after receiving EST input.

##### Inducer State

- Energizes/de-energizes on board SPDT relay setting inducer to low/high speed position.

##### Operating Stage

- Modulates E Valve based on TC control signal input.

##### Air Flow Switch (AFS)

- *A model only:* Limits maximum modulation VDC if 24 VDC AFS input is not present for a time greater than 3 seconds.

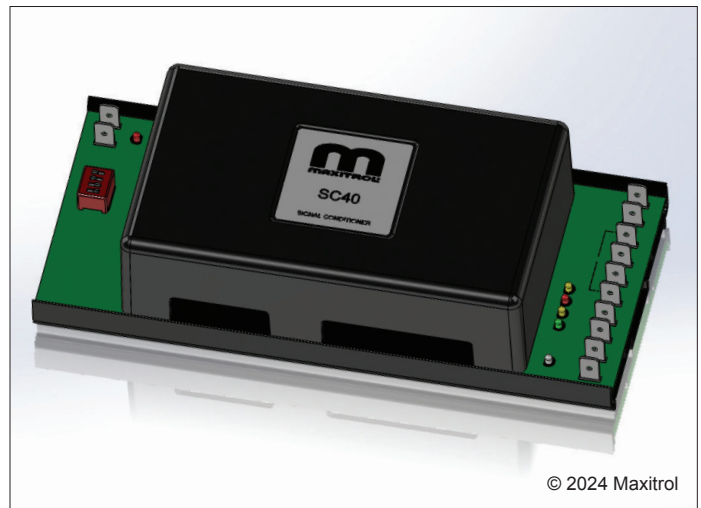


Figure 1: SC40 Signal Conditioner

### SYSTEM COMPONENTS

SC40 Series, SC40-A Series Signal Conditioners  
E42H, E52H, E62H Series modulating gas valves

#### Acronyms

E	EXA Series Modulating Valve
EST	Electronic Start Trigger
NC	Normally Closed
NO	Normally Open
SPDT	Single Pole Double Throw

## SPECIFICATIONS

### Dimensions:

Signal Conditioner: 7.5" L x 3.25" W x 2" H

### Ambient Temperature Limits

Operating: -40° F to 150° F (-40° C to 66° C)

Non-operating: -50° F to 185° F (-46° C to 85° C)

RH: 95% non-condensing

### Mounting

Snap Track, multipoise

### Power Supply

24 VAC +10-15% (50/60 Hz), Class II Transformer

20 VA - Rating for Maxitrol electronics and modulating gas valve only

Half-Wave Rectified

**NOTE:** Polarity is specified - Transformer can be externally grounded

### External Wiring

Gauge: 18-22 AWG, copper only

Connection: 1/4" male spade .032 thk

### Relay 1 - Single Pole Double Throw (SPDT)

Rated load: 2 A Max. @ 24 VAC (Resistive Load)

Max switching capacity: 50 VA (Resistive Load)

### Temperature Controller (TC) Signal

0 - 10 VDC, 2 - 10 VDC

Impedance 100k ohms (nominal)

0 - 20 mA, 4 - 20 mA

Impedance 500 ohms (nominal)

### Performance

See Figure 2, page 3 for locations of the following:

### Relay - Trigger Adjustment (TC Signal)

20 - 60% nominal

### Relay - Trigger Span Adjustment (TC Signal)

1 - 4% total centered around Trigger

### EST Input

24 VAC continuous source (must share common with 24 VAC power.)

**NOTE:** Commonly tied to MV gas valve 24 VAC input

### Start Timer

5 - 55 seconds

### Start Modulating Valve Voltage

1 - 10 VDC

### Air Flow Switch (AFS) Fault - Maximum Voltage (SC40-A)

2 - 7 VDC

### Reliability/Durability

100% Duty Cycle

## SHUNT JUMPER AND DIP SWITCH SETTINGS

TC INPUT	DIP Switch (SW1) Settings			
	1	2	3	4
0 - 10 VDC	OFF	ON	OFF	Set to ON to <i>disable</i> AFS Function (SC40-A only)
2 - 10 VDC	OFF	OFF	ON	
0 - 20 mA	ON	ON	OFF	
4 - 20 mA	ON	OFF	ON	

Table 1: DIP Switch Settings

# SC40 Series Signal Conditioners

J1	Connects T2 to T7	J1	Dry contact - no shunt 24 VAC - shunt installed
J3	Sets relay trigger input	NAT/LP	Trigger #1 - no shunt Trigger #2 - shunt installed

Table 2: Jumper Settings

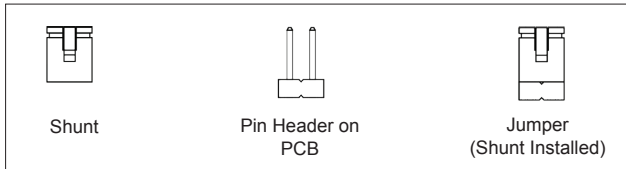


Figure 3: Shunt Jumper

## ADJUSTMENTS (If equipped)

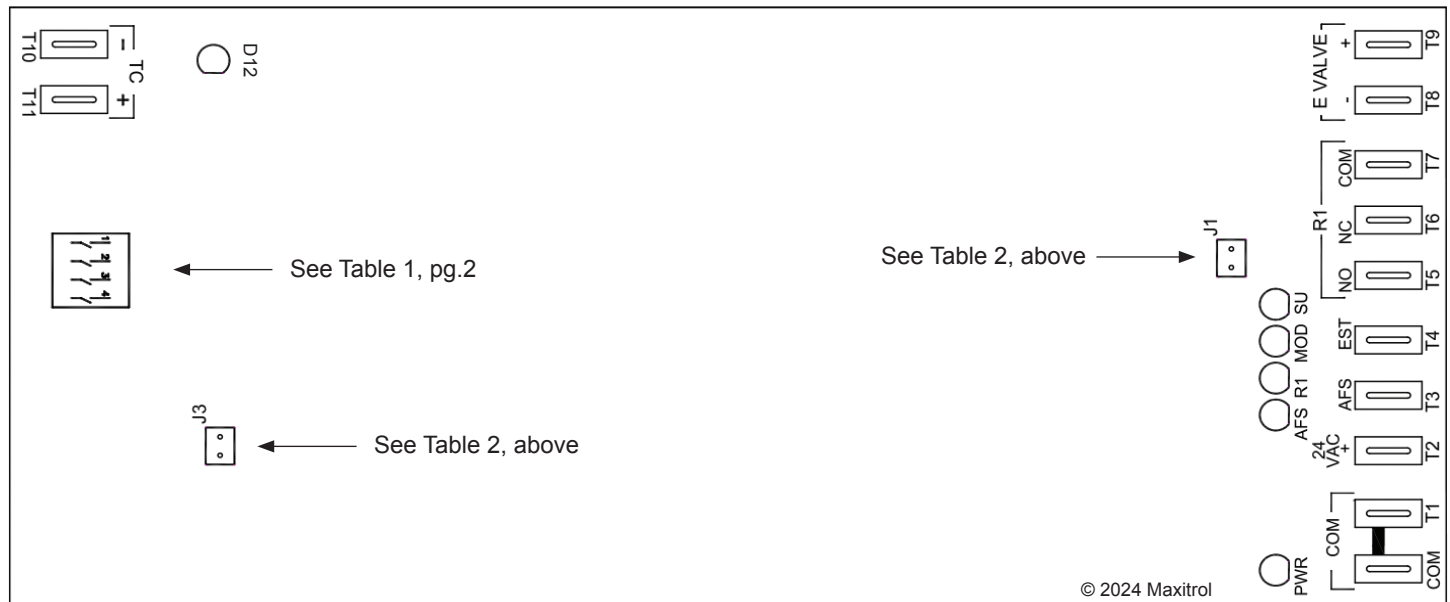


Figure 2: SC40 Trimpot, LED, Dip Switch and Jumper Locations

Customer Supplied Settings	
1	Start Time
2	Relay 1 Trigger #1 and Relay 1 Trigger #2
3	Relay 1 Deadband
4	Start Voltage
5	AFS Limit (SC40-A)

Table 3: Supplied Settings

WIRING DIAGRAM

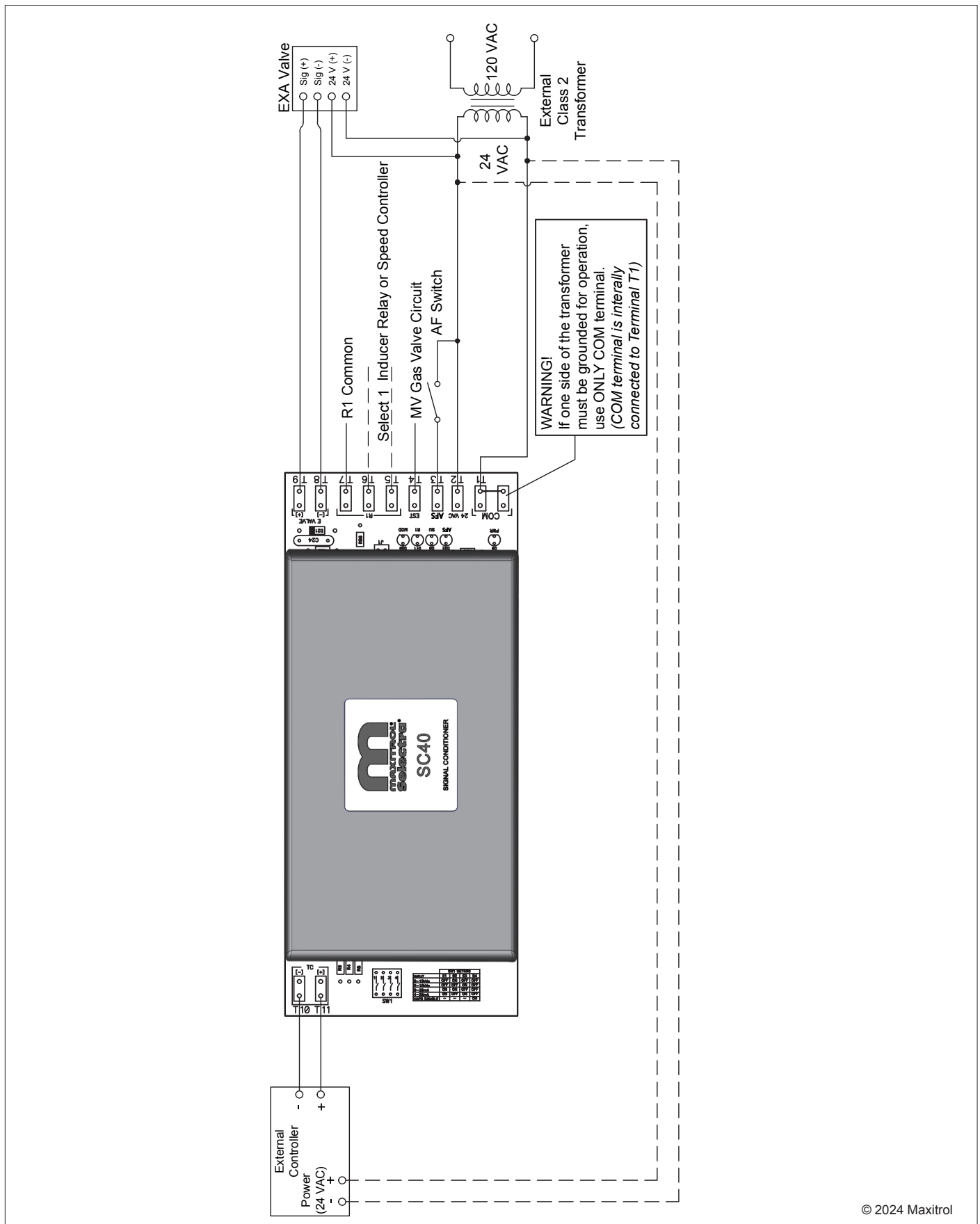


Figure 4: SC40 Wiring Diagram

## PCB CONNECTIONS

No	PCB Label		Description	Notes	
COM	COM		Power Common	Internally connected to T1	
T1	COM		Power Common	E valve T4	Polarity sensitive
T2	24 VAC	+	Power	E valve T3	
T3	AFS		Air Flow Switch	AFS Circuit, 24 VAC Input (SC40-A only)	
T4	EST		Electronic Start Trigger	MV Circuit, 24 VAC Input	
T5	R1	NO	Normally Open Contact	Inducer Speed Stage	
T6		NC	Normally Closed Contact		
T7		COM	Relay 1 Common	24 VAC - internally (J1)	
T8	EXA	-	0 - 10 VDC	E Valve T2	Polarity sensitive
T9		+		E Valve T1	
T10	TC	-	Temperature Controller Input	Control signal, polarity sensitive	
T11		+			

## LED STATUS INDICATORS

Status	PCB Label	Color
Main Power	PWR	Blue
Start Up	SU	Yellow
Relay 1 energized	R1	Red
AFS	AFS	Green
Modulation	MOD	Green
TC Polarity	D12	Red

## OPERATION

### CALL FOR HEAT MODE

- Thermostat relay is energized (completes W input).
- SC40 is powered with 24 VAC
- E valve is powered with 24 VAC
- Inducer Relay 1 (R1) is de-energized, inducer operates in high speed

LEDs: PWR, AFS (A model only)

### BURNER START UP MODE

- EST receives 24 VAC input from the ignition control gas valve (MV) circuit
- Timer starts and modulation voltage is fixed
- Inducer Relay 1 (R1) remains de-energized, inducer operates in high-speed stage

**Note:** The system remains in this mode throughout start up timer duration regardless of the TC input.

LEDs: PWR, SU, AFS (A model only)

### OPERATIONAL MODE

- Start up timer expires
- TC control signal now determines the mode
  - See "TC polarity LED" if TCP LED is lit

LEDs: PWR, MOD, AFS (A model only)

R1 - Lit when Relay 1 is energized

**OPERATION:** (see Table 3)

### Stage I - Minimum to 60% of total rating.\*\*

- TC Input: 0% - (25 - 50%) (nominal)
- Modulation Voltage 0 - (2 - 5) VDC
- Inducer operates in low speed mode

LEDs: PWR, MOD, R1

### Stage II - 60% to 100% of total rating\*\*

- TC Input: (25 - 50%) - 100% (nominal)
- Modulation Voltage (2 - 5) - 10 VDC
- TC Input voltage is above trigger setting and Relay 1 is de-energized
- Inducer operates in high-speed mode

LEDs: PWR, MOD, AFS (A model only)

### AFS (A Suffix Only) Models

- Operating Condition #1  
Relay 1 is energized and 24 VAC AFS input is present or not present  
Result: Normal operation of Stage I
- Operating Condition #2  
Relay 1 is de-energized and 24 VAC AFS input is present  
Result: Normal operation of Stage II
- Operating Condition #3  
Relay 1 is de-energized and 24 VAC AFS input is not present for duration greater than 3 seconds  
Result:
  - AFS Fault
  - VDC output to valve is fixed to user-selected voltage.
  - VDC output remains fixed, even if the 24 VAC AFS signal is re-established, until reset.
- Resetting AFS Fault  
Perform one of the following:
  - Cycle main power
  - Cycle EST input
  - Energize Relay 1 with TC input

### AFS Fault Override

Set SW1-4 to "ON"

### AFS LED

- Lit when 24 VAC input to AFS Terminal is present or SW1-4 is "ON"

### TC Polarity (TCP) LED

- Lit LED indicates TC input polarity is reversed

**NOTE:** LED will **NOT** be lit when TC polarity is correct or the TC input voltage, regardless of polarity, is less than 1 VDC

Table 3: Temperature Controller Input to SC40

TC Input Signal	Mode		Approx % of total**
	Modulated	Inducer	
0% - (25 - 50%)*	Low - Mid	Low	20 - 60%
(25 - 50%)* - 100%	Mid - High	High	60 - 100%

\* Adjustable R1 trigger VDC setting

\*\* Percentages are approximations of what one would expect to achieve.



