Linear Systems **Ph/Fax: +91 22 2557 6002**

GAS BURNER SEQUENCE CONTROLLER

(MODEL 207-FR-S)

GENERAL

This Controller is designed for automatic start up of Gas Burner with Pilot Flame proven start up sequence. It has built in Flame Rod Amplifier, hence there is no need for a separate Flame Rod Amplifier. This model also has interlock for proven air pressure. The Controller has the feature of False Flame Signal check at the beginning of the sequence. The details of the sequence are as given below.

The Controller uses microprocessor-based design and is housed in a ABS plastic enclosure with overall size of 150(L) x 70(B) x 110(H) mm. The mounting is by means of 35 mm DIN rail or on back panel with two screws.

The outputs are in the form of potential free relay contacts rated at 3 A resistive @ 230V AC. However, the total output current of the Controller should not exceed 3 A. The input contacts must be potential free

SEQUENCE SPECIFICATIONS:

The power supply (230V AC, 50 Hz) is connected to the Sequence Controller across terminals 1 & 2. The sequence starts when the Safety Loop (Terminals 6 & 7) is closed and the Start Push Button (Terminals 4 & 5) is momentarily depressed.

Step No.	Time in Seconds	Operation	Symbol Ref	Terminal Ref
1	T1 = 0	Blower ON	B	9
		Run Indicator ON	R	3
2	T2 = T1 + 60	Pilot Valve ON (Open)	P	11
		Ignition ON	I	10
If Flame is present				
3A	T3 = T2 + 5	Ignition OFF (Go to Step 4)	I	10
If Flame is not present				
3B	T3 = T2 + 5	All Outputs OFF		
		LOCK OUT ON	L	14
4	T4 = T3 + 10	Main Solenoid ON (open)	V	12

5	T5 = T4 + 5	Pilot Valve OFF (Closed)	P	11
		High Flame Terminal ON	H	13

The **LOCKOUT** sequence is initiated in the case of LOW Air Pressure, Flame Failure, False Flame and Low Gas Pressure conditions.

1. If the Air Pressure Switch (connected across Terminals 7 & 8) is not closed with in **5 seconds** of starting of the Blower or at any instant there after, the Controller goes to Lockout.
2. If the flame is not present at the end of Step 3 or if there is no flame during normal operation, then all devices are turned OFF and Lockout terminal is energized.
3. If Flame is sensed before the opening of Pilot Valve and Ignition, the Controller goes to Lock Out.

When the Controller is under Lock Out condition, the sequence can be restarted ONLY by depressing the Start Push Button. The sequence then restarts from the beginning.

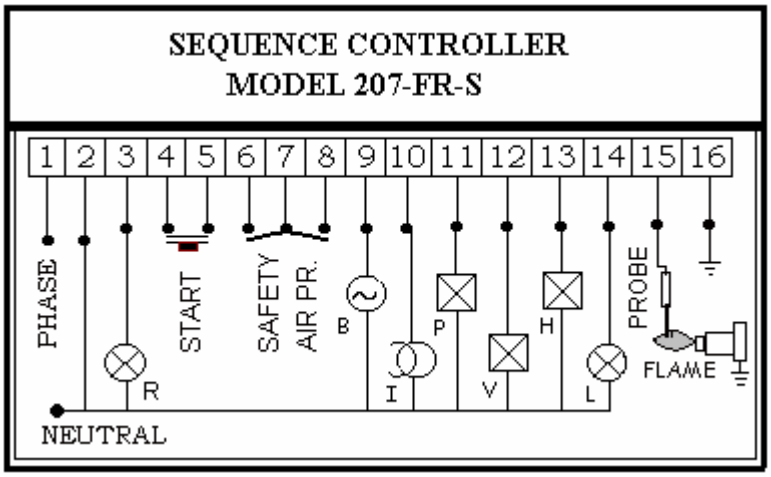
SAFETY LOOP / POST PURGE SEQUENCE

The Safety circuit is typically formed by connecting Steam Pressure Switch and , Temperature controller Switch in series, across terminals 6 & 7. The switches must be potential free. The line voltage is supplied from inside the Controller.

When Safety loop is OPEN, all circuits are switched OFF, except for the Blower and Run Indicator. The Blower runs for **10 seconds** before it stops.

The Controller now waits for Safety Loop to close again. This condition is indicated by RUN Indicator ON and all other Indicators OFF. Upon closure of Safety Loop, the Controller restarts **Step 1**.

WIRING DIAGRAM



Note: It is important to connect Burner body to the Controller Ground at Terminal 16.

IMPORTANT INSTRUCTIONS FOR FLAME ROD INSTALLATIONS

The Burner Controller senses the flame by means of a metal rod (called the Flame Rod or Flame Electrode) immersed in the flame. The Controller provides the supply voltage (230V AC) to the flame rod. When the flame is present, there is a small electron flow into the flame rod. In other words, the flame essentially acts a rectifier with the Flame Rod as anode. The Controller is designed to measure the effective DC current flowing from flame rod to the ground.

In a typical burner installation, there is always a small AC leakage current, mainly due to the insulation leakage. The Controller is designed to be immune to such small leakage currents. However, substantially large AC leakage currents (due insulation degradation or insulation failure) will result in the flame not being sensed, since it will reduce the effective DC current value. The Controller will initiate a LOCKOUT under such conditions, even if the flame is present. Hence, the Controller will also go to LOCKOUT, if the Flame Rod touches the Burner metal surface or Ground.

Hence, it is important that the Flame Rod is properly insulated while mounting. A HV cable with good insulation must be used for connecting Flame Rod to the Controller. Also, an insulated wire from the Burner surface must be connected directly to the Ground Terminal at the Controller. The cable insulation must be adequately rated for the ambient temperature present at the installation, and must have very low leakage.

It has been observed that that the magnitude of effective DC current flow (also, called Ionisation Current) is affected by the following factors.

1. The Flame rod must be immersed in the blue outer core of the gas flame.
2. The Burner Surface Area touching the flame must be sufficiently large. In practice it must be at least 4 to 5 times the surface area of the flame rod touching the flame. If the Burner Surface Area touching the flame is insufficient, then additional plates can be welded to burner metal frame to increase the area.
3. The flame rod and the burner surface must always be in contact with the flame. This is an important issue when the flame has a tendency to move around. In such cases, flame rod mounting will play a crucial role for obtaining reliable flame signal.
4. Lack of sufficient air for proper combustion will result in low values of ionistaion current. It is essential to maintain good Air-Fuel Ratio for proper sensing of flame.
5. The Flame Rod must be clean and free of carbon deposits. Hence, it is important to clean the Flame Rod at regular intervals.

It is possible to measure the effective DC current, by connecting a DC micro-ammeter between the Flame Rod Output Terminal on the Controller and the Flame Rod. In a typical installation, one can expect DC currents in excess of 15 to 20 micro-amps. For reliable flame sensing, the DC current flow must be at least 4 to 5 micro-amps.