

# SERIES 35-61



## 24 VAC Microprocessor Based Direct Spark Ignition Control with Combustion Blower Relay

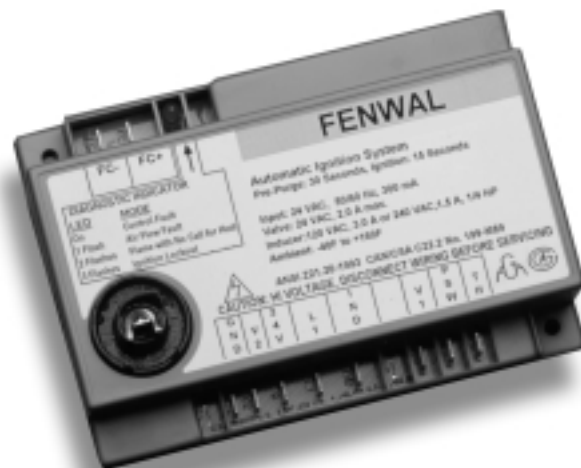
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### FEATURES

- 24 VAC Microprocessor Based DSI Control
- System Diagnostic LED
- Automatic reset 1 hour after lockout
- Custom prepurge and interpurge timings
- Flame sense test pins

### APPLICATIONS

- Gas Furnaces
- Boilers
- Water Heaters
- Other Similar Appliances



### DESCRIPTION

The Series 35-61 is a 24 VAC Microprocessor Based Direct Spark Ignition Control designed for use in all types of heating applications. The control utilizes a microprocessor to continually and safely monitor, analyze and control the proper operation of the gas burner. Value added features such as combustion blower control, LED diagnostics, automatic one hour reset, and flame current test pins highlight the controls benefits.

### Agency Certifications



Software conforms to UL 1998 requirements



Design certified to ANSI Z21.20, CAN/CSA C22.2 No. 199-M89

### SPECIFICATIONS

Input Power	Control: 18-30 VAC 50/60 Hz (Class 2 Transformer) Line: 120/240 VAC (L1, IND contacts only)
Input Current Drain	300 mA @ 24 VAC, combustion blower relay and gas valve relay energized (control only)
Gas Valve Rating	2.0A @ 24 VAC
Combustion Blower Rating	3.0 FLA @ 120 VAC (6.0 LRA) 1.5 FLA @ 240 VAC (3.0 LRA) 1/4 H.P. Motor
Operating Temperature	-40°F to +160°F -40°C to +71°C
Flame Sensitivity	.7µA minimum
Spark Rate	Line frequency (50/60 sparks/ sec.)
Enclosure	Gray (Noryl N-190) fire retardent plastic
Moisture Resistance	Conformal coated to operate to 95% R.H. Care must be taken to protect module from direct exposure to water
Tries for Ignition	One or three try versions available
Trial for Ignition Periods	4.0,7.0,10.0, or 15.0 seconds available
Prepurge & Interpurge	None, 15, or 30 seconds depending on model. Without prepurge there is a 3.5 second delay before the first try for ignition.

## SEQUENCE OF OPERATION / FLAME RECOVERY / SAFETY LOCKOUT

### Power Up / Stand By

Upon applying power (24 volts) to 24VAC/R, the control will reset, perform a self check routine, initiate full time flame sensing, flash the diagnostic LED for up to four seconds, and enter the thermostat scan state.

### Heat Mode

When a call for heat is received from the thermostat supplying 24 volts to TH/W, the control will check the pressure switch for normally open contacts. The combustion blower is then energized and once the pressure switch contacts close, a pre-purge delay begins. Following the pre-purge period the gas valve is energized and sparks commence for the trial for ignition period.

When flame is detected during the trial for ignition, sparks are shutoff immediately and the gas valve combustion blower remains energized. The thermostat, pressure switch, and main burner flame are constantly monitored to assure the system continues to operate properly. When the thermostat is satisfied and the demand for heat ends, the main valve is de-energized immediately, the control senses the loss of flame signal and initiates a post-purge period (optional) before de-energizing the combustion blower.

### Failure to Light - Lockout

#### SINGLE TRIAL MODEL

Should the main burner fail to light, or flame is not detected during the trial for ignition period, the control will go into lockout. The valve will be turned off immediately, and the combustion blower will be turned off following the optional post-purge period.

#### MULTI TRIAL MODEL

Multi-try Models will attempt two additional ignition trials before going into lockout. The valve relay will be de-energized immediately, and the combustion blower will be turned off following the optional post-purge period.

Recovery from lockout requires a manual reset by either resetting the thermostat or removing 24 volts for a period of 5 seconds.

If the thermostat is still calling for heat after one hour the control will automatically reset and attempt to ignite the burner again.

### Flame Failure - Re-Ignition

If the established flame signal is lost while the burner is operating, the control will respond within 0.8 seconds. The HV spark will be energized for a trial ignition period in an attempt to relight the burner. If the burner does not light the control will de-energize the gas valve. Multi-try models will make two more attempts to relight the burner. If the burner does not relight the control will go into lock out as noted above in "Failure to Light". If flame is re-established, normal operation resumes.

### Combustion Airflow Problems - Lockout

Combustion air flow is continually monitored during an ignition sequence by the air flow switch (PSW). If during the initial call for heat the pressure contacts are in the closed position for 30 seconds without an output to the Combustion Blower, an air flow fault will be declared and the control will remain in this mode with the combustion blower off.

If the air flow switch remains open for more than 30 seconds after the combustion blower output (L1 & IND) is energized, an air flow fault will be declared and the control will stay in this mode with the combustion blower on, waiting for the air flow switch to close.

When proper air flow is detected from the air flow switch input (PSW) the control begins the prepurge period with a normal ignition sequence following.

If the air flow signal is lost while the burner is firing, the control will immediately de-energize the gas valve and the combustion blower will remain on. If the call for heat remains, the control will wait for proper air flow to return. If proper air flow is not detected after 30 seconds an air flow fault signal will be declared. If proper air flow is detected at any time, a normal sequence will begin with the prepurge period.

### Flame Fault

If at any time the main valve fails to close completely and maintains a flame, the full time flame sense circuit will detect it and energize the combustion blower. Should the main valve later close completely removing the flame signal, the combustion blower will power off following the optional post-purge period.

### Fault Conditions

Error Mode	LED Indication
Internal Control Failure	Steady on
Air Flow Fault	1 flash
Flame with No Call for heat	2 flashes
Ignition Lockout	3 flashes

The LED will flash on for 1/4 second, then off for 1/4 second during a fault condition. The pause between fault codes is 3 seconds.

### MOUNTING AND WIRING

The Series 35-61 is not position sensitive and can be mounted vertically or horizontally. The case may be mounted on any surface with #6 sheet metal screws. All wiring must be done in accordance with both local and national electrical code.



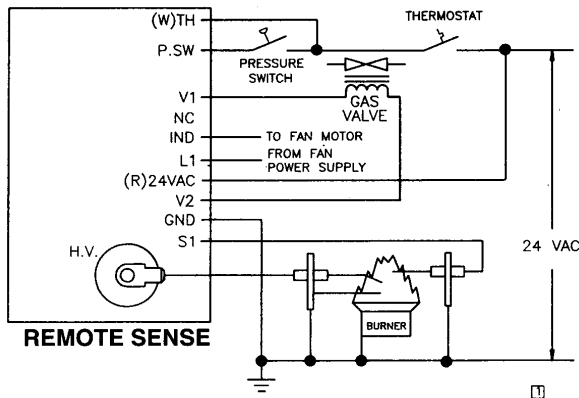
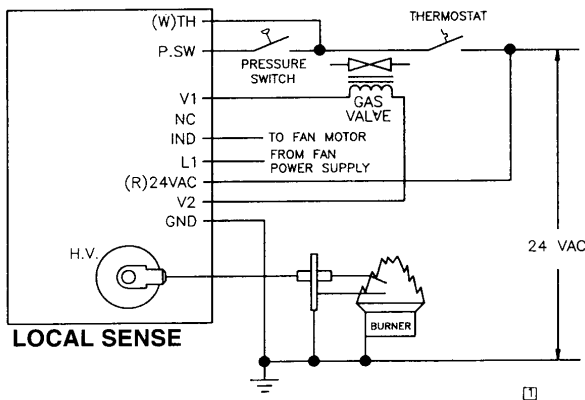
#### WARNING:

The Series 35-61 uses voltages of shock hazard potential. Wiring and initial operation must be done by a qualified service technician. The control must be secured in an area that will experience a minimum of vibration and remain below the operating temperature of 160°F. All connections should be made with UL approved 105°C rated 18 gauge, stranded, .054 thick insulated wire. Refer to wire diagram when connecting the Series 35-61 to other components in the system.

## TERMINAL DESIGNATIONS

24VAC/R	24 VAC Supply to Processor
TH/W	Thermostat Input
PS/W	Pressure Switch Input
GND	System Ground
V1	Valve Power
V2	Valve Ground
L1	120/240 VAC Input (Hot)
IND	Inducer Blower Output
NC	Alarm
S1	Remote Flame Sensor

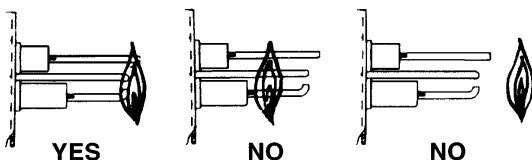
**CAUTION:**  
Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. A functional checkout of a replacement control is recommended.



## PROPER ELECTRODE LOCATION

Proper location of the electrode assembly is important for optimum system performance. It is recommended that electrode assembly be mounted temporarily using clamps or other suitable means so that the system can be checked before permanently mounting the assembly. The electrode assembly should be located so that the tips are inside the flame envelope and about 1/2 inch (1 cm) above the base of the flame. See Figure 3 below.

Figure 3



## CAUTIONS:

1. Ceramic insulators should not be in or close to the flame.
2. Electrode assemblies should not be adjusted or disassembled. Electrodes should have a gap spacing of  $0.125 \pm 0.031$  in ( $3.12 \pm 0.81$  mm). If this spacing is not correct, the assembly must be replaced. Electrodes are NOT field adjustable.
3. Exceeding the temperature limits can cause nuisance lockouts and premature electrode failure.



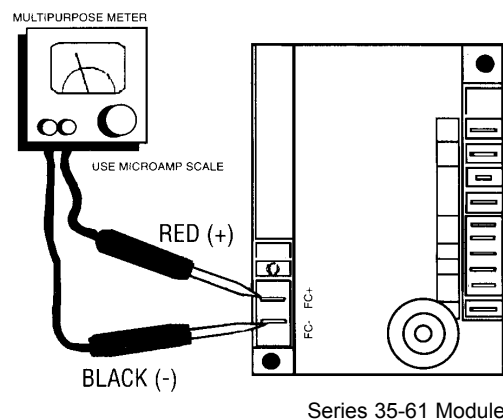
## WARNING:

Operation outside specifications could result in failure of the Fenwal product and other equipment with injury to people and property.

## TROUBLESHOOTING GUIDE

SYMPTOM	RECOMMENDED ACTIONS
1. Dead	A. Miswired B. Transformer bad C. Fuse/Circuit breaker bad D. Bad control (check LED for steady on)
2. Thermostat on - no blower output	A. Miswired B. Bad thermostat no voltage @ terminal W C. Bad control (check LED for steady on)
3. Pressure switch input okay but no Trial-for-Ignition after purge delay	A. Miswired (check psw terminal voltage) B. Flame sense problem (existing flame-check LED -2 flashes) C. Bad control (check voltage between L1 & IND)
4. Valve on, no spark	A. Shorted electrode B. Open HV cable C. Bad control
5. Spark on, no valve	A. Valve coil open B. Open valve wire C. Bad control (check voltage between V1 & V2)
6. Flame ok during TFI, no flame sense (after TFI)	A. Bad electrode B. Bad S1 or HV wire C. Poor ground at burner D. Poor flame (check flame current)

## FLAME SENSOR CURRENT CHECK



## SERVICE CHECKS

Flame current is the current which passes through the flame from the sensor to ground. The minimum flame current necessary to keep the system from lockout is .7 microamps. To measure flame current, connect an analog DC microammeter to the FC-FC+ terminals per figure. Meter should read .7 uA or higher. If the meter reads below "0" on scale, meter leads are reversed. Disconnect power and reconnect meter leads for proper polarity.

# CONTROL CONFIGURATION

## SERIES 35-61 X X X - X X X

### Description

#### Trial for Ignition Time (TFI)

- 1= 4 Seconds
- 3= 7 Seconds
- 5= 10 Seconds
- 7= 15 Seconds

#### Inter-Purge Time

- 0= NONE (SINGLE TRY MODELS ONLY)
- 1= 15 Seconds
- 2= 30 Seconds

#### Pre-Purge Time

- 0= NONE
- 1= 15 Seconds
- 2= 30 Seconds

#### Number of Ignition Tries and Methods of Flame Sensing

- 0= Single Try - Local Sense
- 1= Single Try - Remote Sense
- 5= Three Tries - Local Sense
- 6= Three Tries - Remote Sense

#### Inducer Control

- 0= No Post-Purge (w/input only)
- 1= No Post-Purge
- 2= 30 Second Post-Purge
- 3= 60 Second Post-Purge

#### Product Designation

- 5= Standard
- 8= Aftermarket Kit (may consist of control, high voltage ignition wire, electrode and harness)
- 9= \*Non-Standard Configuration

### Special Options

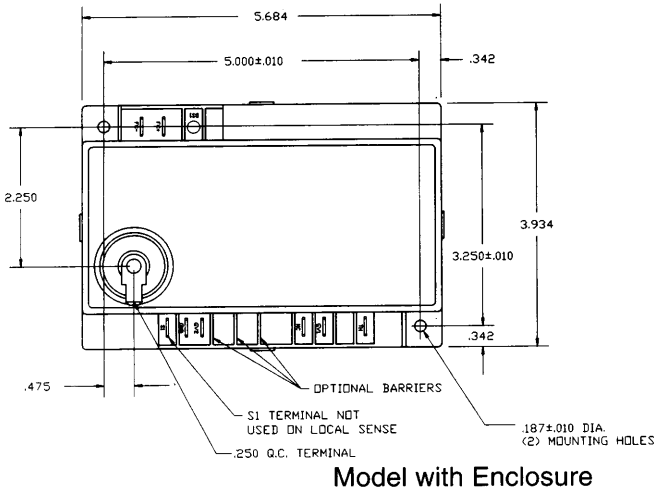
- No Cover
- No Diagnostics
- Recycle after Loss of Flame

### \*Non-Standard Configurations

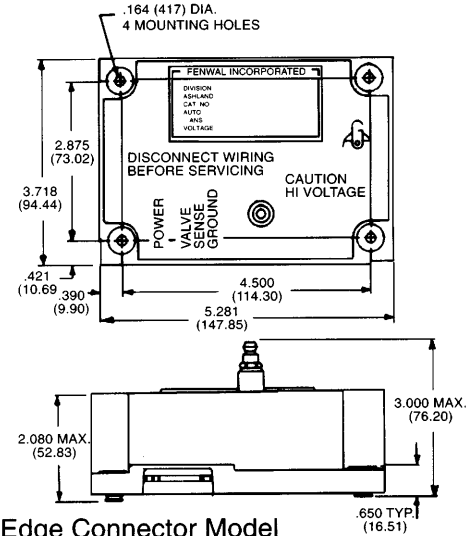
9 = Non Standard Configuration

A 9 in this location of the part number (i.e. 35-61 5 901 -113) identifies this configuration as a non-standard design. The part number does not follow the part numbering system. The 9XX is a sequential part number assigned by Fenwal. Consult factory for operating characteristics of this control.

## DIMENSIONS



Model with Enclosure



Edge Connector Model  
(NOT AVAILABLE ON EUROPEAN MODELS)



FENWAL  
400 MAIN STREET, ASHLAND, MA 01721  
TEL: (508) 881-2000 FAX: (508) 881-6729  
www.fenwalcontrols.com

These instructions do not purport to cover all the details or variations in the equipment described, nor do they provide for every possible contingency to be met in connection with installation, operation and maintenance. All specifications subject to change without notice. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to KIDDE-FENWAL, Inc., Ashland, Massachusetts.