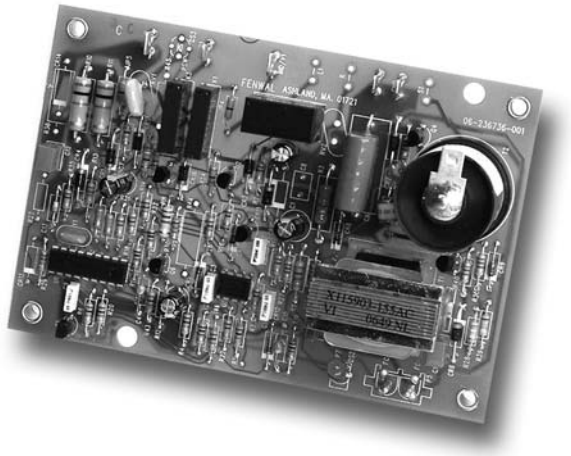
SERIES 35-60 & 35-61

24 VAC Microprocessor Based Direct Spark Ignition Control with or without Combustion Blower Relay

35-60,-61

FEATURES

- *24 VAC microprocessor based DSI control*
- *Pressure switch monitoring*
- *System diagnostic LED*
- *Alarm output (normally closed contact)*
- *Automatic reset 1 hour after lockout**
- *Custom prepurge and interpurge timings***
- *Multiple tries for ignition*
- *Remote or local flame sensing*
- *Flame sense test pins*



APPLICATIONS

- *Gas Furnaces*
- *Boilers*
- *Water Heaters*
- *Commercial Cooking*
- *Other Similar Appliances*

DESCRIPTION

The Series 35-60 and 35-61 are 24 VAC Microprocessor Based Direct Spark Ignition Controls 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

UL Component Recognized System.
Design certified to UL 372, file MH8817.
Software conforms to UL 1998 requirements.

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

CE Approved to EN 298:2003

Certified to Standards AG206 and AG210

*** Automatic reset after 1 hour is not allowed for CE approved models**

**** Prepurge time cannot exceed interpurge time on CE models**

SPECIFICATIONS

Input Power	
Voltage	Control: 18 to 30 VAC 50/60 Hz (Class 2 Transformer) Line: 120 or 240 VAC (L1 & IND contacts only)
Current	300 mA max @ 24 VAC with blower and gas valve relay energized (Control only)
Output (Contact Ratings)	
Gas Valve	2.0A max @ 24 VAC
Combustion Blower (Model 35-61 only)	3.0 FLA @ 120 VAC (6.0 LRA) 1.5 FLA @ 240 VAC (3.0 LRA) 1/4 H.P. Motor
Operating Temperature	-40ºF to +176ºF (-40ºC to +80ºC)
Flame Sensitivity	0.7µA minimum
Flame Failure Response Time	0.8 seconds maximum
Types of Gas	Natural, LP, or manufactured
Spark Rate	Line frequency (50/60 sparks/ sec.)
Size (LxWXH)	5.684" x 3.934" x 1.875" (with cover) 5.281" x 3.718" x 2.080" (edge connect)
Enclosure	Gray (Noryl N-190) fire retardant plastic
Moisture Resistance	Conformal coated to operate non-condensing to 95% R.H. Care must be taken to protect module from direct exposure to water
Weight	8 oz including cover
Tries for ignition	One or three try versions available
Trial for ignition Periods	4.0, 7.0, 10.0, or 15.0 seconds standard Contact factory for other settings
Prepurge & Interpurge	None, 15, or 30 seconds depending on model. Without prepurge there is a one second delay before the first try for ignition
Edge Connect Version	Optional Edge connect model for replacement product

Power Up / Stand By

35-61 Models only:
Upon applying power (24 volts) to 24VAC(R), the control will reset, perform a self check routine, flash the diagnostic LED, and enter the thermostat scan state.

Call for Heat

35-60 Models:
When a call for heat is received from the thermostat supplying 24 volts to TH/W, the control will reset, perform a self check routine, flash the diagnostic LED, and a pre-purge delay begins. Following the pre-purge period the gas valve is energized and sparks commence for the trial for ignition period.

35-61 Models:
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.

Ignition - 35-60:
When flame is detected during the trial for ignition, sparks are shutoff immediately and the gas valve remains energized. The thermostat 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.

Ignition - 35-61:
When flame is detected during the trial for ignition, sparks are shutoff immediately and the gas valve and combustion blower remain 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

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. For the 35-61 series, 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 for the 35-61 Series the combustion blower will be turned off following the optional post purge period.

Lockout and Reset

Recovery from lockout requires a manual reset by either resetting the thermostat or removing 24 volts from 24 VAC(R) 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 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. Recycle mode, which closes the valve and executes a pre-purge delay is available as an option.

Combustion Airflow Problems - Lockout

35-61 Models only:
Combustion air flow is continually monitored during an ignition sequence by the pressure switch (PSW). If during the initial call for heat the switch contacts are in the closed position for 30 seconds without the Combustion Blower being energized, an air flow fault will be declared and the control will remain in this mode with the combustion blower off.

If the pressure 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 pressure switch to close. When proper air flow is detected from the pressure 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 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 be turned off following the optional post purge period.

Fault Conditions

Error Mode	LED Indication
Internal Control Failure	Steady on
Air Flow Fault (35-61 Only)	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 35-60 and 35-61 controls are 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 35-60 and 35-61 use 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 minimum vibration and remain below the operating temperature of 160ºF. All connections should be made with UL approved 105ºC rated 18 gauge, stranded, .054 thick insulated wire. Refer to wiring diagram when connecting the control to other components in the system.

! 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.

TERMINAL DESIGNATIONS - QUICK CONNECT MODELS		
24VAC/R	24 VAC Supply to Processor	1/4" Quick Connect
TH/W	Thermostat Input	1/4" Quick Connect
PSW	Pressure Switch Input	1/4" Quick Connect
GND	System Ground	1/4" Quick Connect on 35-60 3/16" Quick Connect on 35-61
V1	Valve Power (output)	3/16" Quick Connect
V2	Valve Ground	3/16" Quick Connect
L1	120/240 VAC Input (hot)	1/4" Quick Connect
IND	Inducer Blower (output)	1/4" Quick Connect
NC	Alarm (normally closed contact)	1/4" Quick Connect
S1	Remote Flame Sensor	3/16" Quick Connect
FC+, FC-	Flame Current Test Pins	

CONNECTION LIST - 35-60 EDGE CONNECT MODELS		
PWR	24 VAC Power	PIN 1
NC	Alarm (normally closed contact)	PIN 3
VALVE	Valve Power (output)	PIN 4
SENSE	Remote Flame Sensor	PIN 5
GROUND	System Power	PIN 6

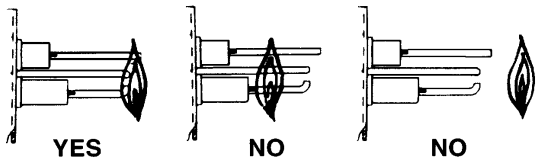
Edge connect harness is available from Fenwal:
Part Number: 05127324-0XX

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.

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± 0.031 in (3.12± 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.

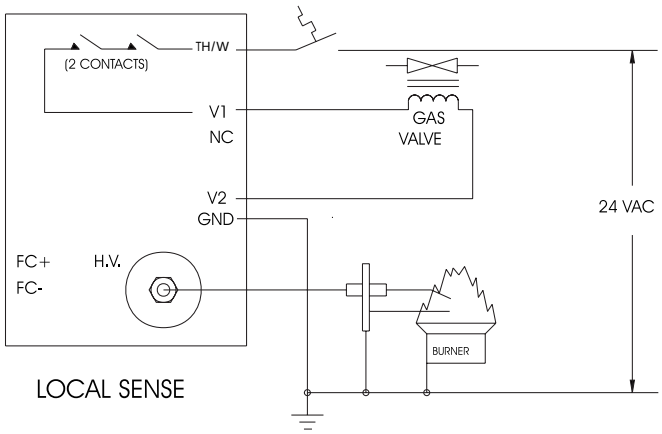
Figure 3



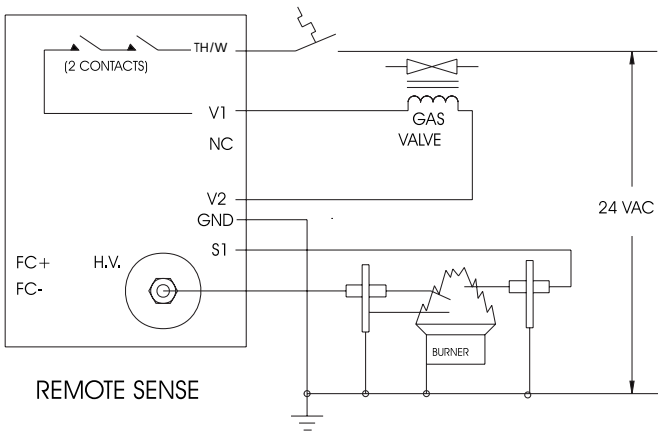
! CAUTIONS:
1. Ceramic insulators should not be in or close to the flame.
2. Electrode assemblies should not be adjusted or disassembled. Electrodes should have a gap spacing of 0.125± 0.031 in (3.12± 0.81 mm). If this spacing is not correct, the assembly must be replaced. Electrodes are NOT field adjustable.
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.

WIRING DIAGRAMS - 35-60

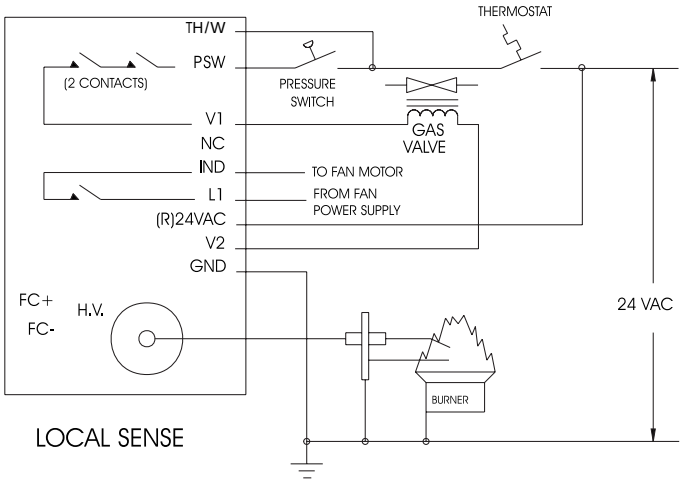


LOCAL SENSE

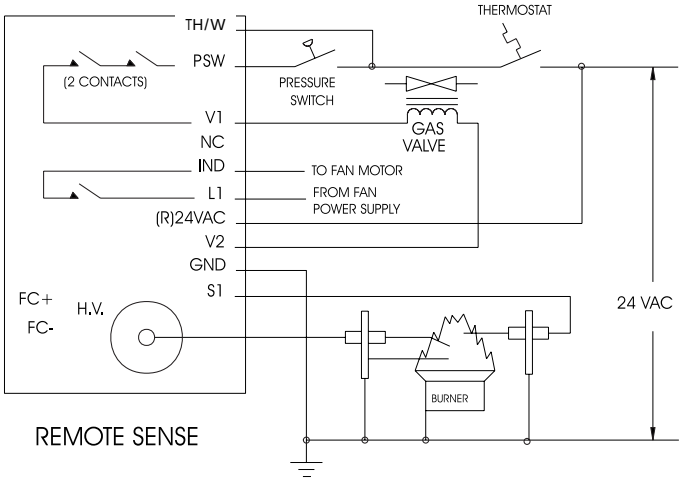


REMOTE SENSE

WIRING DIAGRAMS - 35-61



LOCAL SENSE

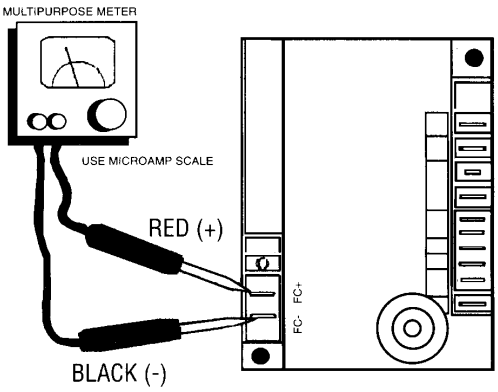


REMOTE SENSE

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 but no spark or blower output	A. Miswired B. Bad thermostat. C. No voltage @ terminal TH/W D. Bad control (check LED for steady on)
3. Blower on but no Trial-for-Ignition after purge delay	A. Miswired (check PSW terminal voltage) B. Flame sense problem (check LED-2 flashes) C. Pressure switch problem (check LED-1 flash) D. 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



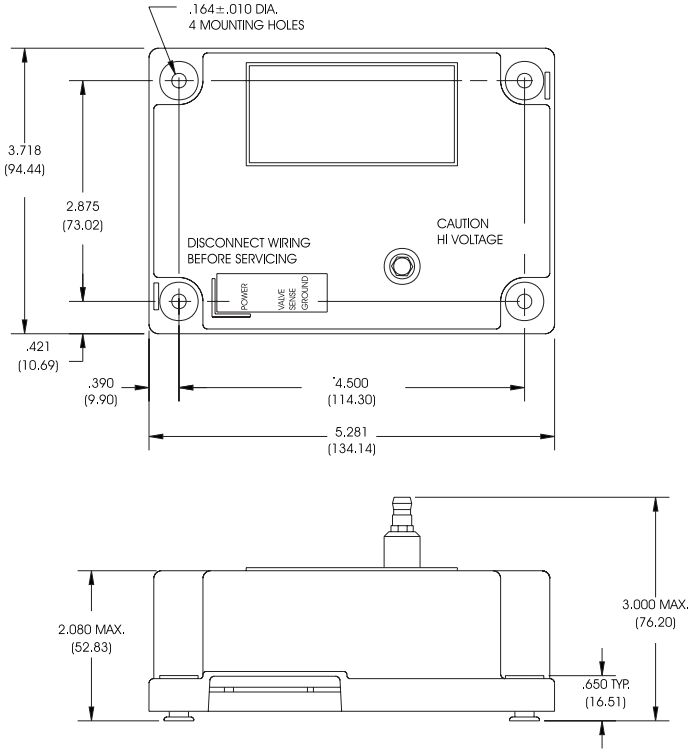
Series 35-60, 35-61 Modules

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 a 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.

NOTES

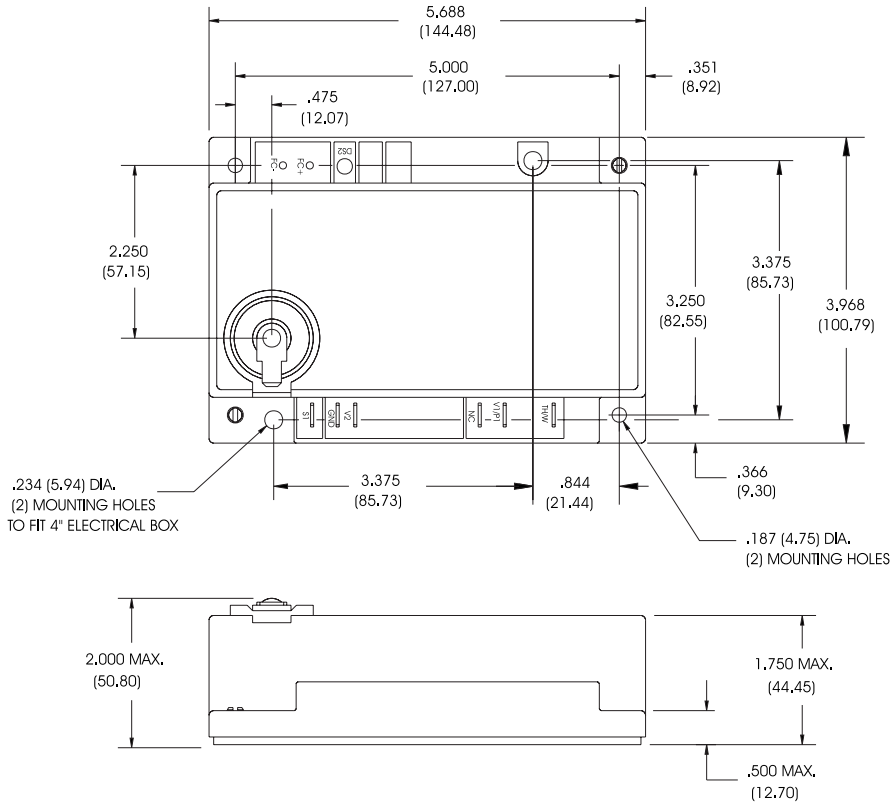
DIMENSIONS - EDGE CONNECT MODELS



Mating harness
available from Fenwal:

Part Number: 05127324-0XX

DIMENSIONS - QUICK CONNECT MODELS



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

35.60,61 7/13/07