

# SERIES 35-80

## 24 VAC Direct Spark Ignition Control with Integrated Furnace Blower Control



35.80.01

### FEATURES

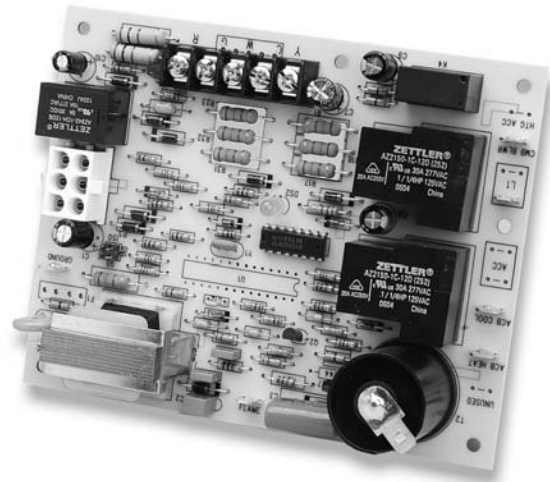
- Combustion blower control
- Indoor air fan control with Heat/Cool Speeds
- Adjustable fan-off delay - 90, 120, 150, 180 seconds
- Thermostat interface
- Pressure switch monitoring
- Rollout and limit switch monitoring
- Diagnostic LED
- Safe start
- Remote or local flame sensing

### APPLICATIONS

- Rooftop HVAC units
- Residential gas furnaces
- Unit heaters

### ADVANTAGES

- Functional integration lowers cost
- OEM custom designs



### DESCRIPTION

The 35-80 is a 24 VAC direct spark ignition control with integrated furnace blower control features. In addition to controlling the gas valve, the 35-80 controls combustion and indoor blower motors, monitors the thermal limit, flame rollout and combustion air flow switches and provides service diagnostics. The control is not sensitive to line voltage or polarity since it internally generates its high voltage for flame sense and spark.

The microprocessor circuit design provides precise, repeatable timing and operating sequences. Four field selectable blower delays allow the furnace cool down time to be properly matched for every application. The on-board diagnostics with LED output provide assistance with troubleshooting and ensure safe and efficient furnace operation.

### APPROVALS



Design certified by CSA International to CAN C22.2 #199-M89 and ANSI Z21.20 for Automatic Ignition Systems, including UL1998 software review.



Australian Gas Association Approved

### SPECIFICATIONS

<b>Input Power</b>	
<b>Control Voltage</b>	18 to 30 VAC 50/60 Hz(Class 2 Transformer)
<b>Current</b>	400 mA max @ 24 VAC at 25C with blower and gas valve relays energized (Control only)
<b>Output (Contact Ratings)</b>	
Gas Valve	1.5A @ 24 VAC (Inrush 3.0A maximum)
Combustion Blower	1/8 hp @ 120/240 VAC, 3A
Indoor Blower	½ hp @ 120 VAC, 11A 1 hp @ 240 VAC
<b>Operating Temperature</b>	-40°F to +175°F (-40°C to +80°C)
<b>Storage Temperature</b>	-40°F to +185°F (-40°C to +85°C)
<b>Flame Sensitivity</b>	< 0.5uA minimum
<b>Types of Gas</b>	Natural, LP, or manufactured
<b>Moisture Resistance</b>	Conformal coated to operate non-condensing to 95% R.H. Care must be taken to protect module from direct exposure to water
<b>Dimensions</b>	5.75" x 4.50" x 1.80"
<b>Weight</b>	11 oz including options

# SEQUENCE OF OPERATION / FLAME RECOVERY/ SAFETY LOCKOUT

## Power-UP

Upon applying power (24 volts) to the 24VAC HOT terminal, the control will reset, perform a self-check routine, flash the diagnostic LED and enter the thermostat scan state.

## Call for Heat

When a call for heat is received from the thermostat supplying 24 volts to the W terminal, the control will flash the diagnostic LED at a fast rate and begin the safety timing sequence. The control will verify the pressure switch for normally open contacts.

The combustion blower is then energized and, once the pressure switch contacts close, an optional "pre-purge" period begins. After pre-purge, the control energizes the gas valve relay and enables the HV spark output for the "trial for ignition" (TFI) period.

## Ignition

When a valid flame is detected during the trial-for-ignition period, sparking is terminated and the gas valve and blower outputs remain energized. The control shall continuously monitor the flame sense, safety switches, and thermostat inputs during the heating period. The indoor fan relay (heat speed) will be energized after the specified delay.

When the heating cycle is finished, the thermostat input becomes inactive and the control immediately disables the gas valve relay. The combustion air blower output is then disabled after the selected postpurge delay. The indoor fan is disabled after the selected fan off delay.

## Failure to Light - Lockout

### SINGLE TRIAL MODEL

Should the main burner fail to light or the flame is not detected during the TFI, the control will lockout. The gas valve will be turned off immediately. The combustion blower will be turned off following an optional "post-purge" period. The LED will indicate the code for ignition lockout.

### MULTI TRIAL MODEL

Should the main burner fail to light or the flame is not detected during the first TFI, the gas valve is de-energized and the control performs an optional "inter-purge" delay before attempting another TFI. The control will attempt 2 additional TFI's before locking out. In lockout, the gas valve will be turned off immediately. The combustion blower will be turned off following an optional "post-purge" period. The LED will indicate the code for ignition lockout.



**WARNING:** Operation outside specifications could result in failure of the Fenwal product and other equipment with injury or death to people and damage to property. Service to this product should only be performed by a qualified technician.

## Lockout Recovery

With the 1 hour reset option, if the thermostat is still calling for heat, the control will automatically reset and attempt a new TFI after one hour. Otherwise, recovery from lockout requires a manual reset by either resetting the thermostat or by removing the 24 volts for a period of 5 seconds.

## Flame Failure of Established Flame

### RE-IGNITION MODE

If the established flame signal is lost while the burner is operating, the control will respond within 1 second by energizing the HV spark in attempt to relight the burner. If the burner does not light within the TFI period, the gas valve is immediately de-energized and a new TFI sequence begins. Multi-try models will make 2 more attempts to light the burner. If flame is re-established, normal operation resumes. If the burner does not relight, the control will lockout as previously described in the "Failure to Light - Lockout" section.

### RECYCLE MODE

If the established flame signal is lost while the burner is operating, the control will de-energize the gas valve within 1 second. The control will then begin a new ignition sequence starting with the prepurge period. As with the original call for heat, the control will make up to three retrial attempts (on multi-try models) to relight the burner. If the burner does not relight, the control will go into lockout as noted in the "Failure to light" paragraph. If flame is re-established normal operation resumes.

## DIAGNOSTIC FAULT CODES

Table 1

LED INDICATION	FAULT MODE
Slow Flash	Normal Operation - No Call for Heat
Fast Flash	Normal Operation - Call for Heat
2 Flashes	Ignition Lockout - No Flame Detected
3 Flashes	Airflow Fault - Pressure Switch Open or Closed
4 Flashes	High Limit or Rollout Switch Open
5 Flashes	Flame Sense Error - Gas Valve Not Energized
Steady On	Internal Control Failure

## Airflow Fault:

If the pressure switch remains closed for more than 30 seconds after the call for heat is initiated and without a request for combustion air blower from the control, an airflow fault displays and the control remains in this mode with the combustion air blower off. If the pressure switch remains open for more than 30 seconds after the combustion air blower output has been energized, an airflow fault displays and the control remains in this mode with the combustion air blower on.

If ignition has occurred and the pressure switch indicates the combustion air blower has stopped, the gas valve is immediately de-energized. The combustion air blower remains on for the postpurge period while monitoring the pressure switch. If the pressure switch again indicates rotation within this period, a recycle starting with the prepurge period is attempted. If not, the control will enter lockout with the combustion air blower off.

The LED displays a fault code of three flashes when an airflow fault has occurred. This fault is reset and the error code cleared after the call for heat goes away, and the pressure switch will be tested again on the next call for heat.

## Limit Switch Open:

Anytime the Limit Switch is open, the gas valve is immediately de-energized and both the combustion blower and indoor blower are enabled. The LED displays a fault code of four flashes when a limit fault has occurred. This fault shall be reset and the error code cleared if the limit switch closes. The combustion and indoor air blowers are shut off after their selected delay times and normal operation resumes.

## Flame Sense Error:

If a flame is sensed during the prepurge or interpurge periods without the control enabling the gas valve, the combustion air blower and indoor air blower (heat speed) outputs shall be energized. An error code of five flashes is displayed and the control remains in this state as long as the flame is sensed. Should the flame signal later disappear, the combustion and indoor air blowers will be shut off after their selected delay times and normal operation shall resume.

## Internal Control Failure:

If the control detects an error in its software, all outputs are turned off and the LED displays a steady ON condition.

## TROUBLE SHOOTING GUIDE

Table 2:

SYMPTOM	RECOMMENDED ACTIONS
1. Control does not start	A. Miswired B. 24 VAC Transformer bad C. Fuse/Circuit breaker bad D. Bad control, check LED for steady on or flashing codes
2. Thermostat on - no spark	A. Miswired B. Bad thermostat, no voltage at thermostat terminal W C. Bad control, check LED for steady on or flashing codes
3. Valve on - no spark during TFI	A. Shorted electrode - establish 1/8th inch gap B. Check high voltage cable C. Miswired
4. Spark on - valve off	A. Valve coil open B. Valve wire disconnected C. Bad control, check voltage at gas valve terminal
5. Flame okay during TFI - no flame sense after TFI	A. Check electrode position B. Check high voltage wire C. Poor ground at burner D. Poor flame, check flame current

## Indoor Fan Off Delay:

The heating fan off delay is field-selectable using the 4-position jumper to optimize the control for any application. Standard timings of 90, 120, 150 and 180 seconds are provided.

## Continuous Fan:

If the G signal from the thermostat is present, the control will immediately energize the ACB COOL and ACC outputs to run the indoor fan at cooling speed. If the G signal is removed, the control will immediately disable the ACB COOL and ACC outputs.

## Cooling Mode:

If the Y signal from the thermostat is present, the control will enter cooling mode. The ACB COOL output will be energized after the specified cooling fan on delay. When the Y signal is terminated, the ACB COOL output will be disabled after the specified cooling fan off delay. The W input shall be ignored whenever there is a call for cooling. If the control is in the heating mode when the Y signal is activated, the control shall disable the gas valve, terminate the heating cycle, and enter the cooling mode.

## MOUNTING AND WIRING

The 35-80 models are not position sensitive and can be mounted vertically or horizontally. The control may be mounted on any surface and fastened with #6 sheet metal screws. Secure the control in an area that will experience a minimum of vibration and remain below the maximum ambient temperature of 80°C (176°F). All connections should be made with UL approved, 105°C (221°F) rated 18 gauge, stranded, wire with .054" min insulation. Refer to Fig. 1 wiring diagram when connecting the control to other components in the system.



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

### Quick Connect Terminal Designations

Table 3:

	TERMINAL	DESCRIPTION	TERMINATION
1	24 VAC HOT	24 VAC supply to processor	¼ inch male terminal
2	Ground	Ground	¼ inch male terminal
3	HTG ACC	Heating Accessory	¼ inch male terminal
4	CMB BLWR	Combustion Blower	¼ inch male terminal
5	L1	Line Voltage	¼ inch male terminal
6	L1	Line Voltage	¼ inch male terminal
7	ACC	Accessory	¼ inch male terminal
8	ACC	Accessory	¼ inch male terminal
9	ACB COOL	Indoor Blower Cool	¼ inch male terminal
10	ACB HEAT	Indoor Blower Heat	¼ inch male terminal
11	UNUSED	Unused (isolated)	¼ inch male terminal
12	FLAME	Flame Sensor	3/16 inch male terminal

## Thermostat Connection Designations

Table 4:

TERMINAL	DESCRIPTION	TERMINATIONS AVAILABLE
Y	Call for Cool*	Terminal Strip, Mate-n-Loc, .156 Header
C	Common	Terminal Strip, Mate-n-Loc, .156 Header
W	Call for Heat	Terminal Strip, Mate-n-Loc, .156 Header
G	Continuous Fan	Terminal Strip, Mate-n-Loc, .156 Header
R	24 VAC Power	Terminal Strip, Mate-n-Loc, .156 Header

\* Heat only models do not have Y terminal

### Low Voltage Control Wiring Designations

Table 5:

PIN	DESCRIPTION	TERMINATIONS AVAILABLE
1	Rollout/Limit Switch Return	AMP 6 Position, Mate-n-Loc Socket
2	Pressure Switch Out	AMP 6 Position, Mate-n-Loc Socket
3	Gas Valve Common	AMP 6 Position, Mate-n-Loc Socket
4	Gas Valve Output	AMP 6 Position, Mate-n-Loc Socket
5	Pressure Switch Return	AMP 6 Position, Mate-n-Loc Socket
6	Rollout/Limit Switch Out	AMP 6 Position, Mate-n-Loc Socket



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

# WIRING DIAGRAMS

Figure 1a: Remote Sense

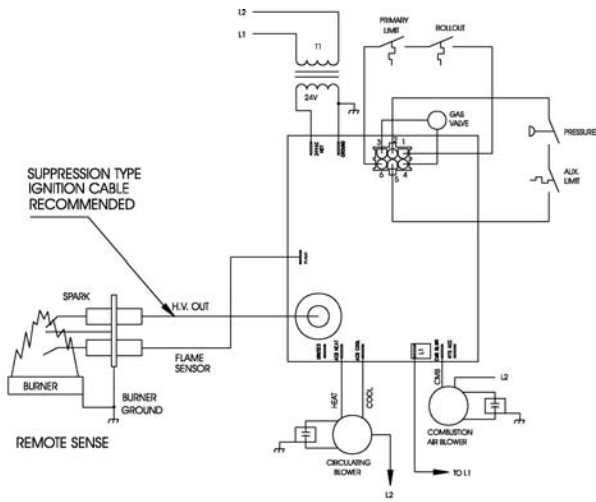
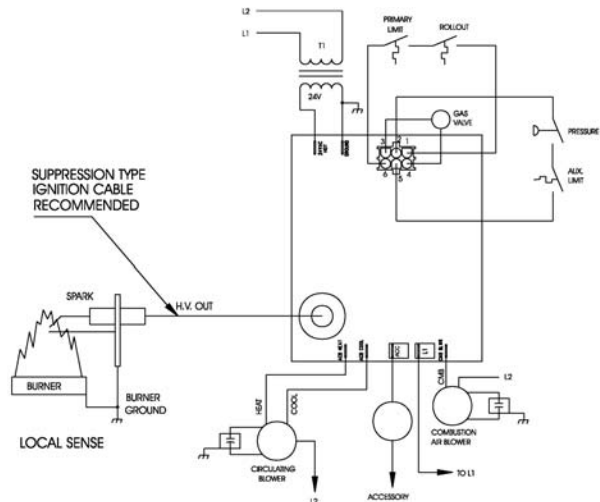
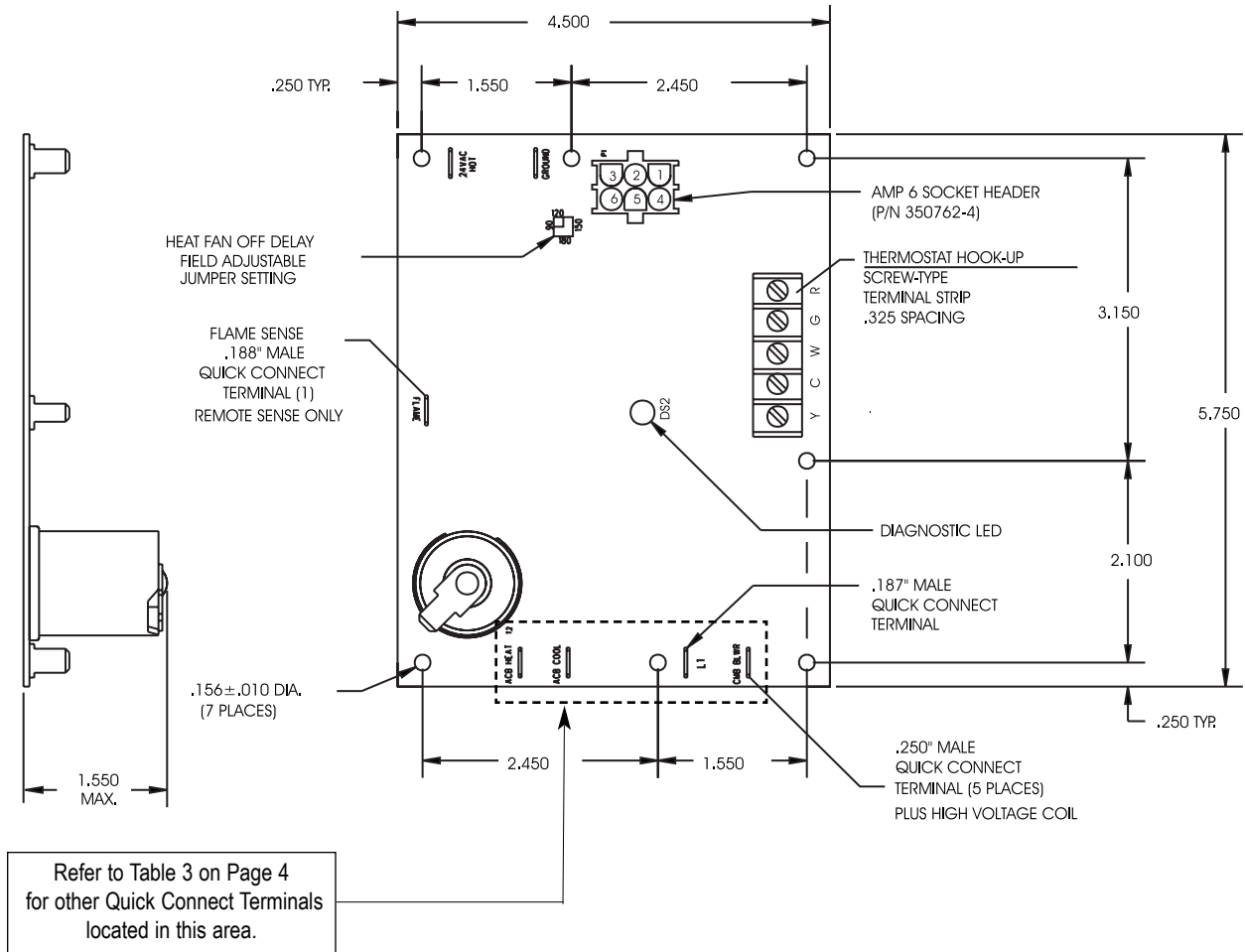


Figure 1b: Local Sense



# DIMENSIONS

Figure 2: Open Board with Standoffs



**MOUNTING NOTE:** Nylon PCB supports are available from Richco Plastics (LCBS-4 Series) of Keystone Electronics.

# CONTROL CONFIGURATION

**35 - 80**

**X X X X - X X X**

## DESCRIPTION

### TRIAL FOR IGNITION

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

### INTER-PURGE

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

### PRE-PURGE

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

### TRIES FOR IGNITION

- 0 = Single Try - Local Sense
- 1 = Single Try - Remote Sense
- 2 = Single Try - Local Sense With 1 Hour Automatic Reset
- 3 = Single Try - Remote Sense With 1 Hour Automatic Reset
- 5 = Three Tries - Local Sense
- 6 = Three Tries - Remote Sense
- 7 = Three Tries - Local Sense With 1 Hour Automatic Reset
- 8 = Three Tries - Remote Sense With 1 Hour Automatic Reset

### INDUCER CONTROL

- 1 = No Post Purge
- 2 = 30 Second Post Purge
- 3 = 60 Second Post Purge

### OTHER FEATURES

- 2 = Board Only - No Stand-Offs
- 9 = Special OEM Configuration

### THERMOSTAT CONNECTION

- 1 = Mate-N-Lock Connector
- 2 = Screw Terminal Block
- 3 = 5 PIN MTA-156 Connector



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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.



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