GN Electronics Inc.

Quanta-Flame Self-check Scanner System

Model 5002-01 Ultraviolet
Model 5001-11 Infra-Red

USER MANUAL

Patent Pending

Terracene International Ltd.
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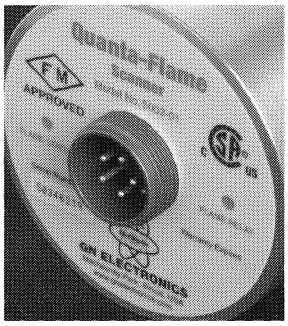
FEATURES



- **Internal Microcomputer** which controls internal functions as well as supervising the relay contacts to verify they are always operating correctly
- High quality fused silica quartz lens
- Machined alloy housing with seals NEMA 4
- Detectors and signal processor automatically checked every 10 seconds
- Replacement scanner can be replaced without disturbing wiring
- No scheduled replacement parts.
- Flame relay contacts and load circuit supervised
- Auto check circuit
    - New Optical interrupter technology with 100 million cycle life span (That's over 30years!)
- Status LEDs
    - Flame intensity
    - Output on indicator
    - Self-check indicator

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The Quanta-Flame Series 5002 is intended for monitoring all gas, oil and coal fired burners. The control is the basis for industrial or commercial burner management systems using PLC or relay logic.

Note: The Quanta-Flame 5002 is FM approved and CSA certified (US and Canada)

The 5002 Series combines many of the features of the 5501 control into the scanner housing itself. The internal microcomputer provides features, which are just not possible in scanners with no internal control capability. In other words the Quanta-Flame 5002 gives the customer the functions of a complete scanner control system all for about the same cost as a scanner alone.

All essential circuits are supervised.

It also has two indicator LEDs to show the self-checking action, the output status and the flame intensity (Variable LED).

It's designed to work with Burner Controls, Burner Management Systems and PLC as a control system to monitor burners and burner systems.

It is about the same size and cost as a standard UV Self-check Scanner and built into a NEMA 4 housing. A Class 1 Division 1 & 2 version is also available

Ultra-Violet Flame Scanner

The **5002-01** Flame Scanner uses a UV detector tube as a sensing element.
Incoming UV radiation from a flame is focused and thereby amplified optically. The radiation in turn energizes the detector tube, which works on the GEIGER-MUELLER principle. The pulsating anode voltage is used to trigger the pulse processor, which normalized the pulses as to length and amplitude.

The detector and pulse processor are continuously supervised by means of the unique optical interrupter mechanism that breaks the UV light path between lens and detector tube. The scanner's pulse processor is fail-safe by nature, since any failure mode results in a total loss of signal.

The internal microcomputer transforms the flame intensity into the selected output form, which is then transmitted to a PLC or other control via a military spec. 5 pin output connector.

Infra-Red Frequency Based Scanner

The **5002-11** Flame Scanner uses a silicon phototransistor as a sensing element. The presence of a flame is detected by sensing the variations of flame luminosity. This technique aids discrimination of flame radiated energy and background radiation from heated furnace parts. The internal microcomputer transforms the flame intensity into the selected output form, which is then transmitted to a PLC or other control via a military spec. 5 pin output connector.

SPECIFICATIONS-5002 Quanta-Flame

MECHANICAL:
Length Overall: 7" (177.8 mm)
Diameter: 3.25" (82.5 mm)
Housing: Machined 5052 Aluminum Alloy
Finish: Clear Anodized
Sight Tube Entrance: 1" Pipe Thread
Purge Air Entrance: 3/8" Pipe Thread

ELECTRICAL:
Supply Voltage: 120 V 50/60Hz, 24VDC, 230 V 50/60Hz (Depending on model)
Required power: 2VA
Output Contact Rating: 230VAC, 1 amp
Available Outputs (Depending on Model Ordered): Relay contact, 4 to 20ma, 0 to 10 volts, 1 to 5 volts, Frequency Modulation, RS232, RS485
Specifications for 4 to 20ma output (2 wire current loop)
Span error: 0.5%
Non-linearity: 0.03%
Supply required to the loop: 7.5 to 36 volts

ENVIRONMENTAL:
Class: NEMA type 4
Class 1 Div 1&2 available

Temperature: -20^{0}C to +60^{0}C (0^{0}F to 140^{0}F).

OPTICAL:
Lens: Fused Silica.

SPECTRAL SENSITIVITY:
Wavelength:
Ultra-violet: 180-230 nano-meters

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Flame Status LED

The Flame Status LED (FSL) is a dual color LED that acts as a multifunctional indicator.

When a flame is detected the FSL will illuminate with a **red color**. This light will vary in intensity proportional to the level of flame signal (flame strength) detected.

Every 10 seconds the Self-checking mechanism will interrupt the light coming from the flame. This is done in order to verify that the UV sensing element is still functioning properly. When this check is being performed the FSL will momentarily turn to a **yellow color (when flame present) or green color (when flame is not present)**.

Should the UV sensing element fail to function then the FSL the scanner will lockout all the outputs to indicate the failure and the FSL will remain **green** without blinking for one minute.

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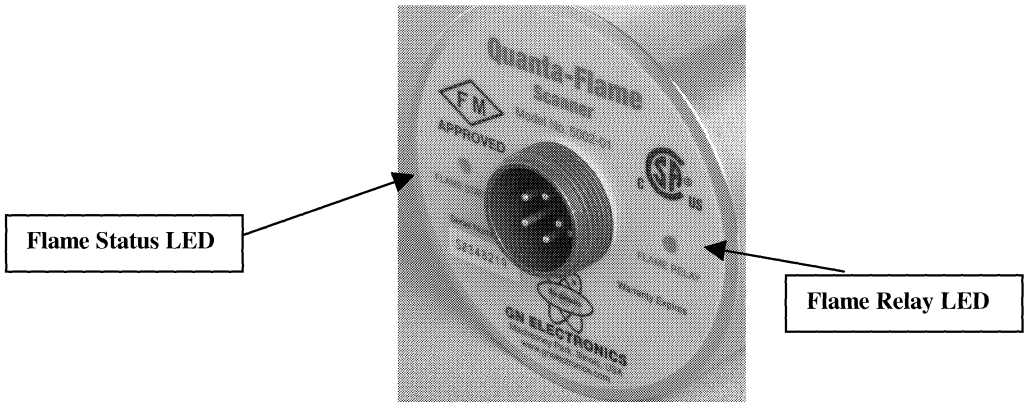
After one minute the control will automatically reset itself. The scanner's microcomputer will then continue to check the sensing element every ten seconds. Should the sensing tube be in a permanent "runaway " condition then the scanner will immediately lockout again for another period of one minute



Flame Relay LED

The Flame Relay LED (FRL) is a single color LED.

When a flame of sufficient intensity is detected the 5002 control will activate the output signal. This output may be any one of the possible output forms described above.
While the output is activated the FRL will illuminate. Should the flame signal fall below the minimum threshold or should on of the internal circuit or sensing elements tests fail the output will deactivate and the FRL will shut off.

Installation

Notes:

- All installation, wiring, or service activities must only be performed by knowledgeable and qualified technicians.

- All system wiring to and from the control and scanner should be run in accordance with the National Electrical Code and all local code requirements.

- Always remove all power to the system before wiring and never connect or disconnect scanner when power is present.

Choose a sighting location providing an unobstructed view of the flame under all firing conditions. UNDER NO CONDITIONS SHOULD THE SCANNER SEE IGNITOR SPARK.

A scanner monitoring a pilot flame should be positioned so that no flame will be detected if the pilot flame is too small to reliably and safely light the main flame.

In multiple burner furnaces, choose a sighting angle with the best possible view of the flame of interest and the poorest possible view of other flames in the furnace.

The sighting pipe should be inclined slightly downward toward the furnace floor so that unburned particles will not fall, or moisture will not drain, into the scanner cavities.

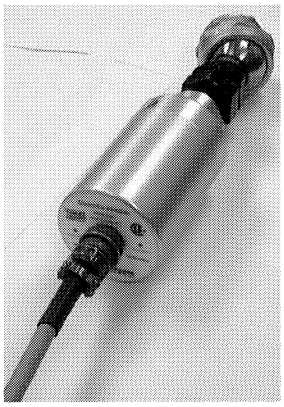
The actual attachment of the scanner to the burner can be varied to suit individual applications. The scanner when applied to multi burner applications should always be attached to a 5000-73/74 swivel mount to assist in burner discrimination. The swivel mount has a 2" NPT male connection and connects to a 2" NPT coupling welded to the burner front plate. The use of the swivel mount is recommended on single burner applications. A 1" NPT nipple connects the scanner to the swivel ball joint.

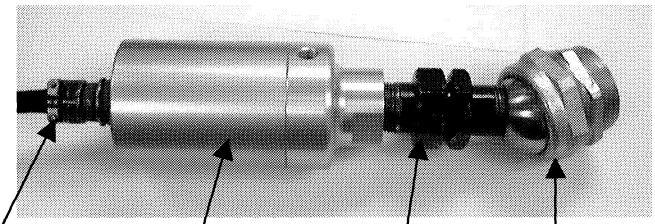
Note: Handle with Care- Internal Sensing element may be damaged if Scanner is dropped

- Neutral must be grounded

- This product is designed to work in a variety of applications and conditions, however some applications may not be applicable due to the presence of high electrical noise, lack of adequate ground connections, floating neutrals or other known or unknown conditions. It is therefore important to ensure proper system environment before installing these devices.

- Always Route Sensor signal wiring a sufficient distance away from any type of ignition or other wiring to avoid electrical noise interference. Each sensor wiring must be run separate from all other wires including other sensors. In some cases shielded cable or coax may be required for long distances or high electrical interference environments. Each pair of sensor leads should be in their own shielded or coaxial pair.





When mounting scanners the temperature ratings must not be exceeded. If temperatures are excessive, cooling air must be applied to the scanner by means of the 3/8" NPT air port or by injecting cooling air downstream of the scanner. Pressurizing the scanner site pipe also protects the lens from debris.
When the scanner has been installed on the burner the cable 5000-02 is attached to the 5-pin connector at the rear of the scanner.
Finger tight is sufficient.
Using excessive force may misalign the two indicator LEDs.

The bare ends of the cable are taken back to the control either directly to the control's sub-base or via a junction box.

Installation and operation notes:
With the contact output option the internal contact is supervised by the microcomputer. If the scanner detects an absence of flame and the contact fails to open, a second fault relay will open the circuit and the scanner will lockout all the outputs. The Flame Status LED will blink **(RED)** on for 3 seconds and off for 1 second. After one minute the scanner will reset itself and resume its normal functions. If the internal contact is permanently welded close the scanner will lockout again for one minute at the next flame off condition.

Caution:
Attempting to use a 5002 as a replacement for a 5000 series will result in damage to the scanners and controls.
The 5002 series scanner controls are **NOT** compatible with the 5000 series scanners and controls (ex. 5000-01, 5000-11, 5501-11).

WIRING and CONNECTIONS

Note: Scanner cable colors on charts and diagrams below. For the pin "D" connection to the scanner some of the 5000-02 scanner cables will have a blue colored conductor and some will have a brown colored conductor

5002-01 (120VAC/230VAC-contact version only)

Connector Pin	Function			5 Conductor Cable Color GNE# 5000-02/05 (5 feet)*
A	Neutral			Orange
B	120 VAC or 230VAC 50/60Hz (Depending on Model Number)			Yellow
C	Output (Output Contact Rating: 120VAC, 1 amp)	For Contact Output: Common side	For RS485 only: Negative (-)	Black
D	Output (Output Contact Rating: 120VAC, 1 amp)	For Contact Output: Normally open side	For Analog Outputs: Connection for the plus (+) side	Brown or Blue
E	Sensor Signal Output	(Flame Rod, Infrared & Ultraviolet type)		Red
Shield				Bare

***Longer lengths are also available- contact GN Electronics**

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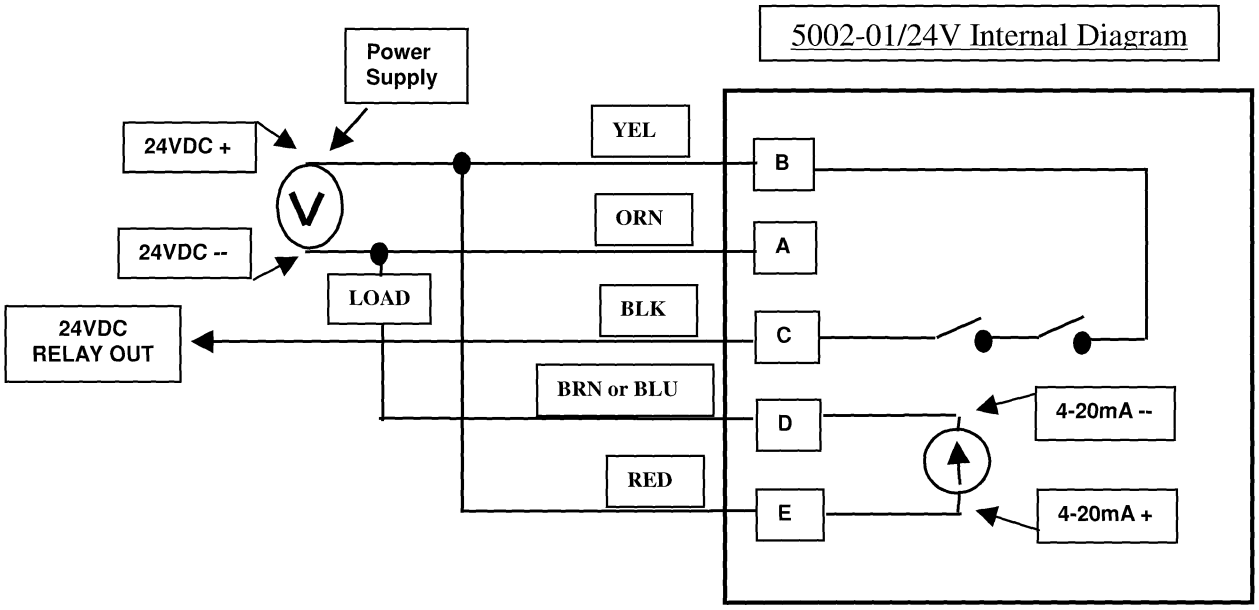
Model 5002-01/24V (24VDC with 4 to 20mA output only)

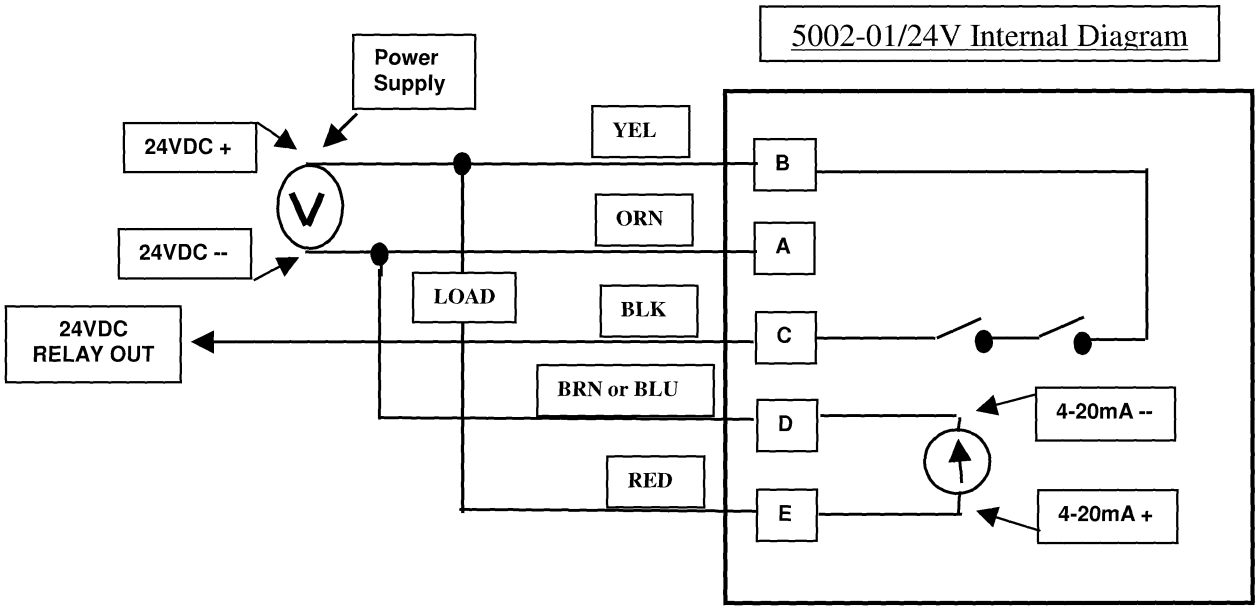
Connector Pin	Function	5 Conductor Cable Color GNE# 5000-02/05 (5 feet)*
A	24 VDC -	Orange
B	24 VDC +	Yellow
C	24VDC Relay Out	Black
D	4 to 20mA— (See wiring diagram on page 12 for proper load connection)	Brown or Blue
E	4 to 20mA+ (See wiring diagram on page 12 for proper load connection	Red
Shield		Bare

Wiring Diagrams

Model 5002-01/24V (24VDC with 4 to 20mA output-only)
Load on 4-20 negative side



Model 5002-01/24V (24VDC with 4 to 20mA output-only)
Load on 4-20 positive side



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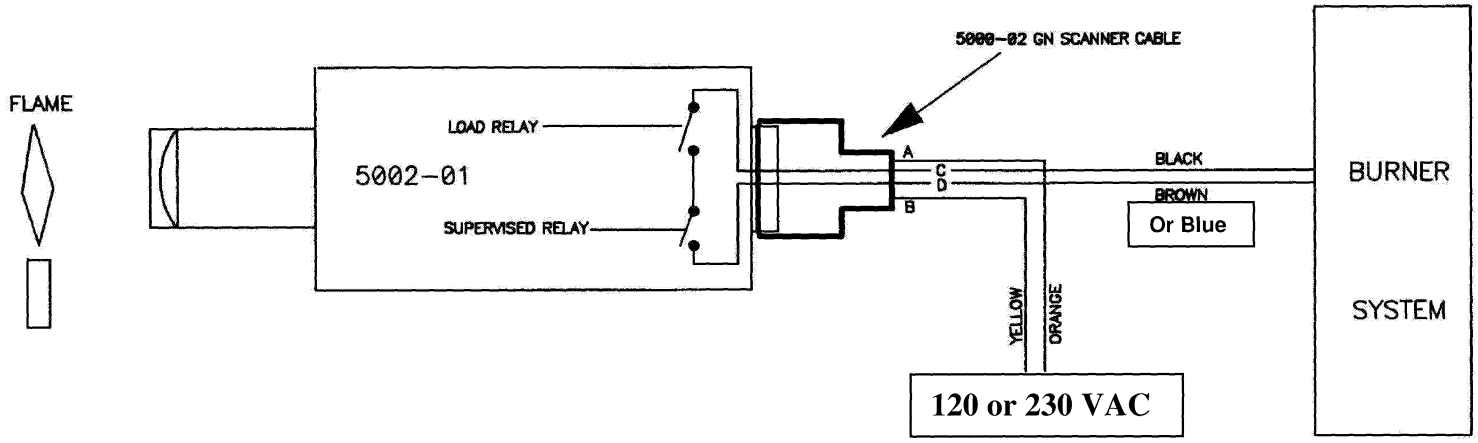
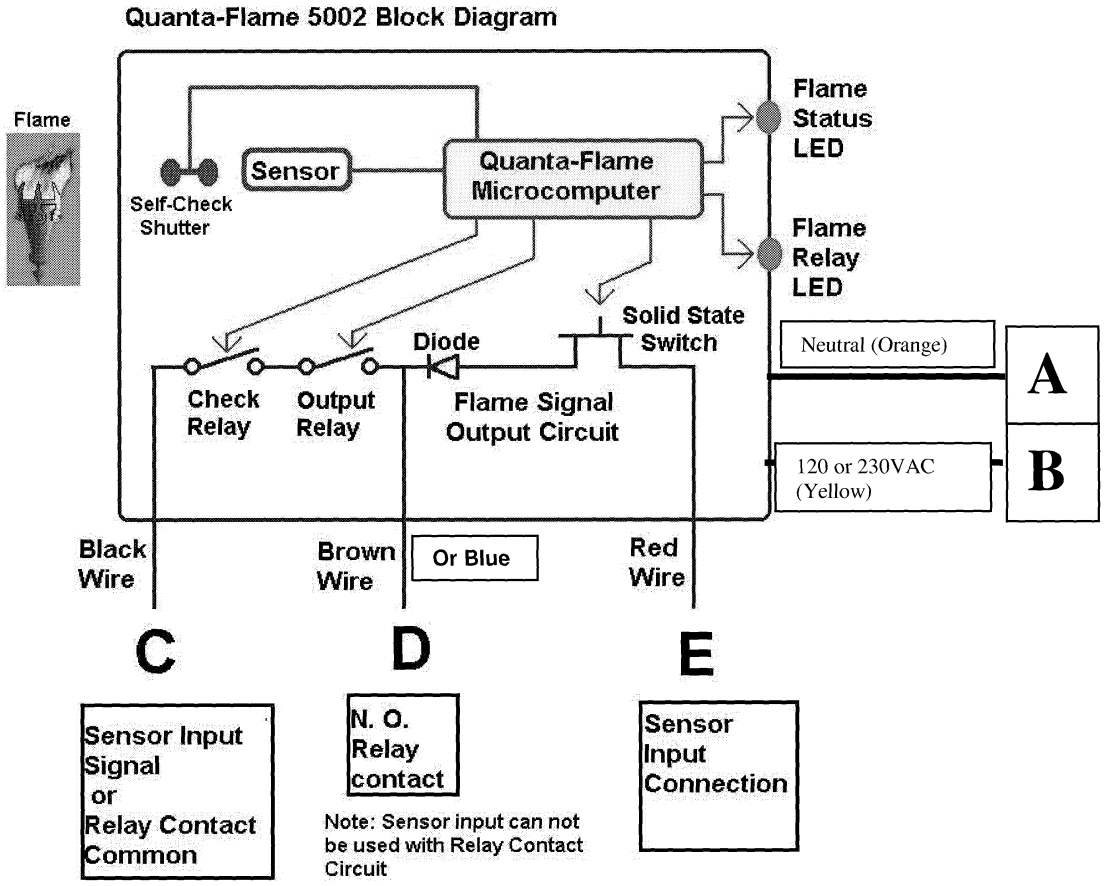
Wiring for Contact Output Model 5002-01 (120VAC or 230VAC)

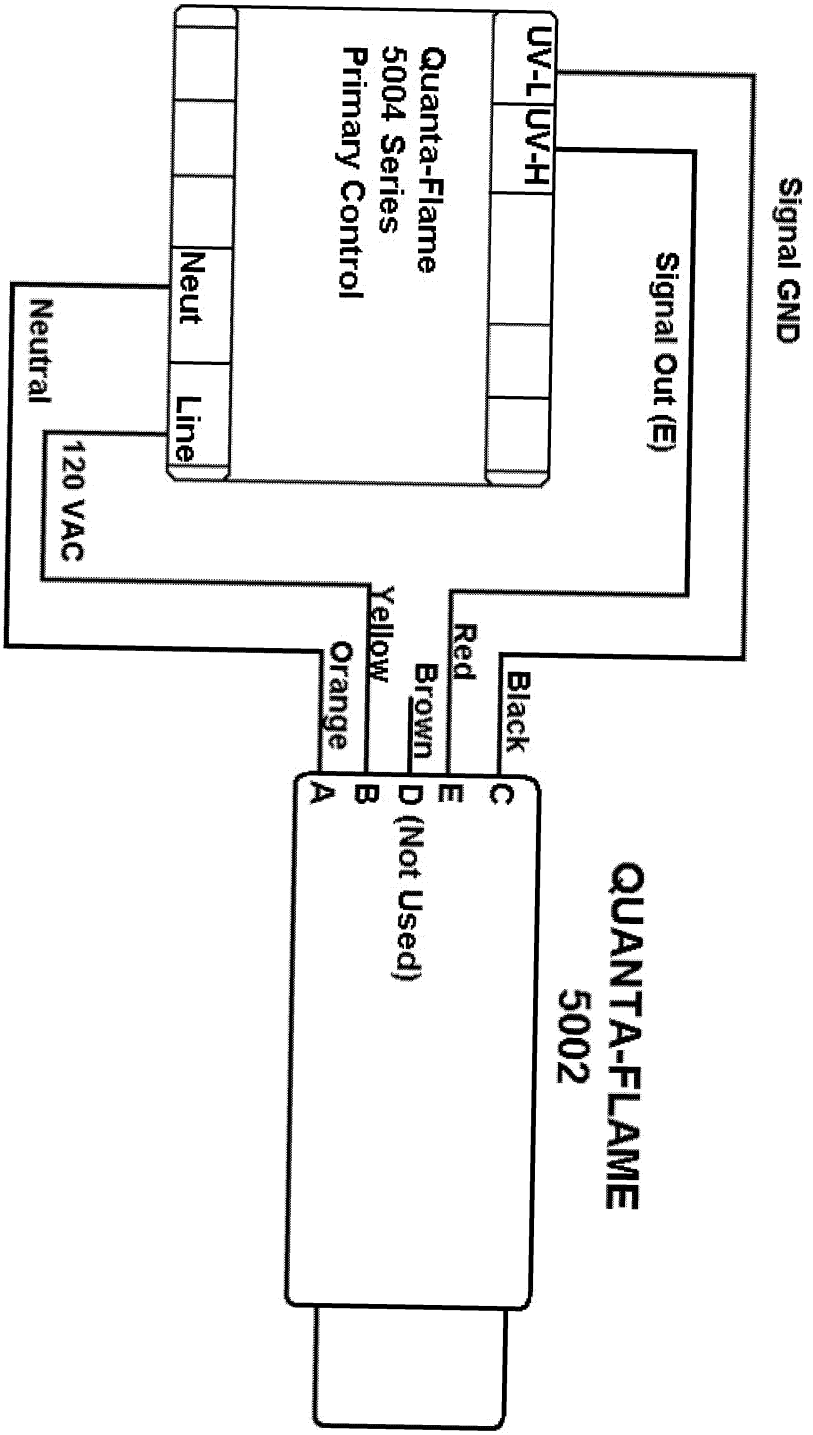


Wiring for contact or flame control Output

Note: **"E" is the flame control output for UV or FR controls: If E is used then "C" is the common for the sensor circuit and "D" must remain unconnected.**



Wiring Diagram for connection to a Quanta-Flame 5004 Series Control (5002-01 120VAC Contact Model)



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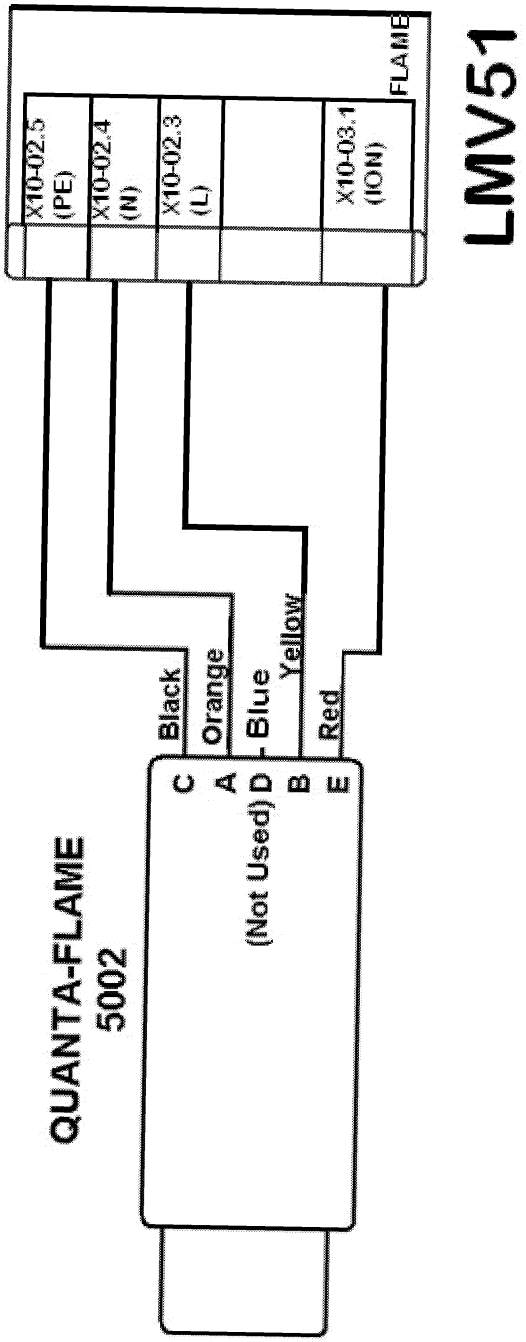
Wiring Diagram for connection to a Siemens Control (LMV) (5002-01 120VAC Contact Model)



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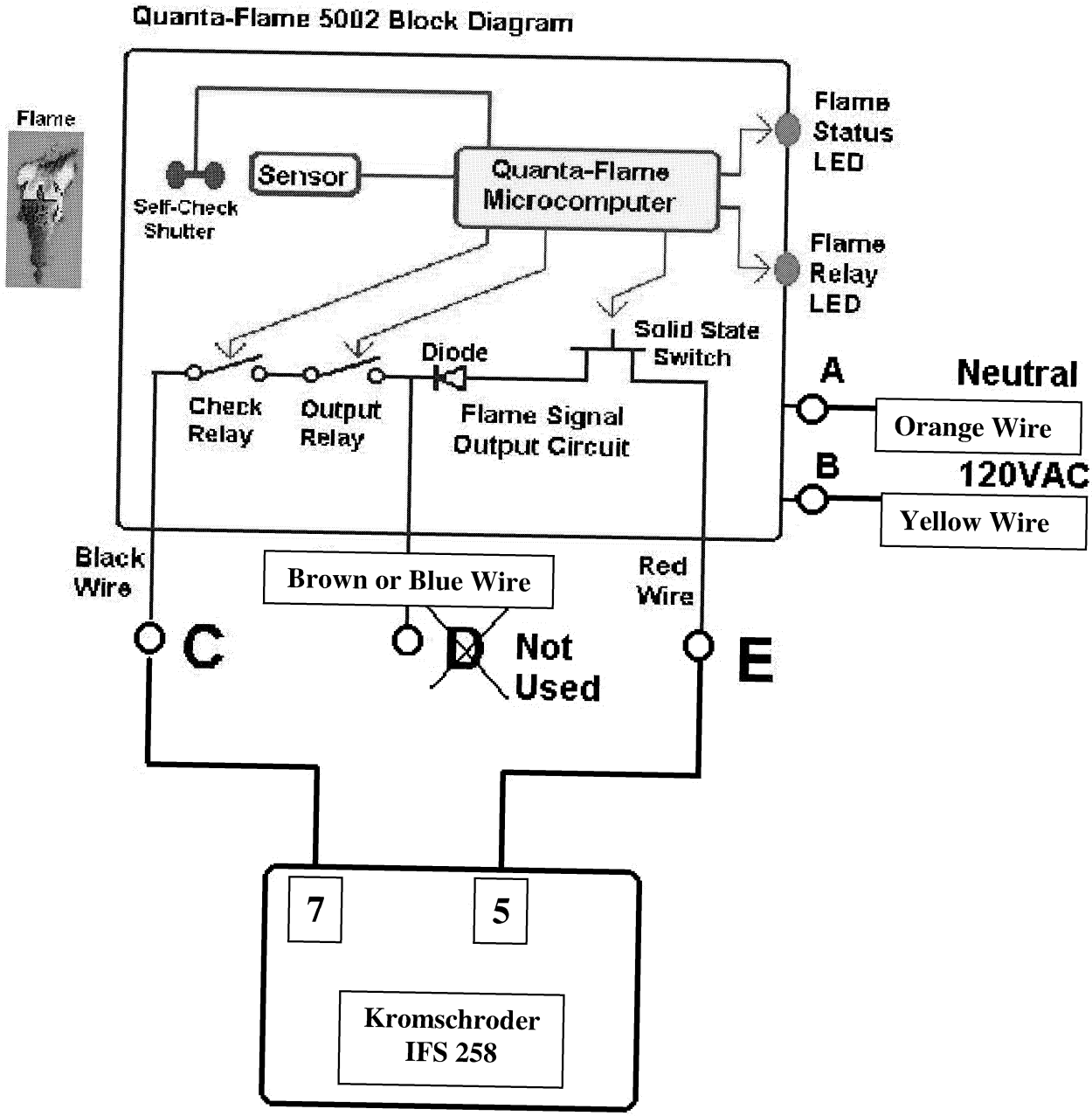
Wiring Diagram for connection to a Kromschroder Control (IFS 258) (5002-01 120VAC Contact Model)



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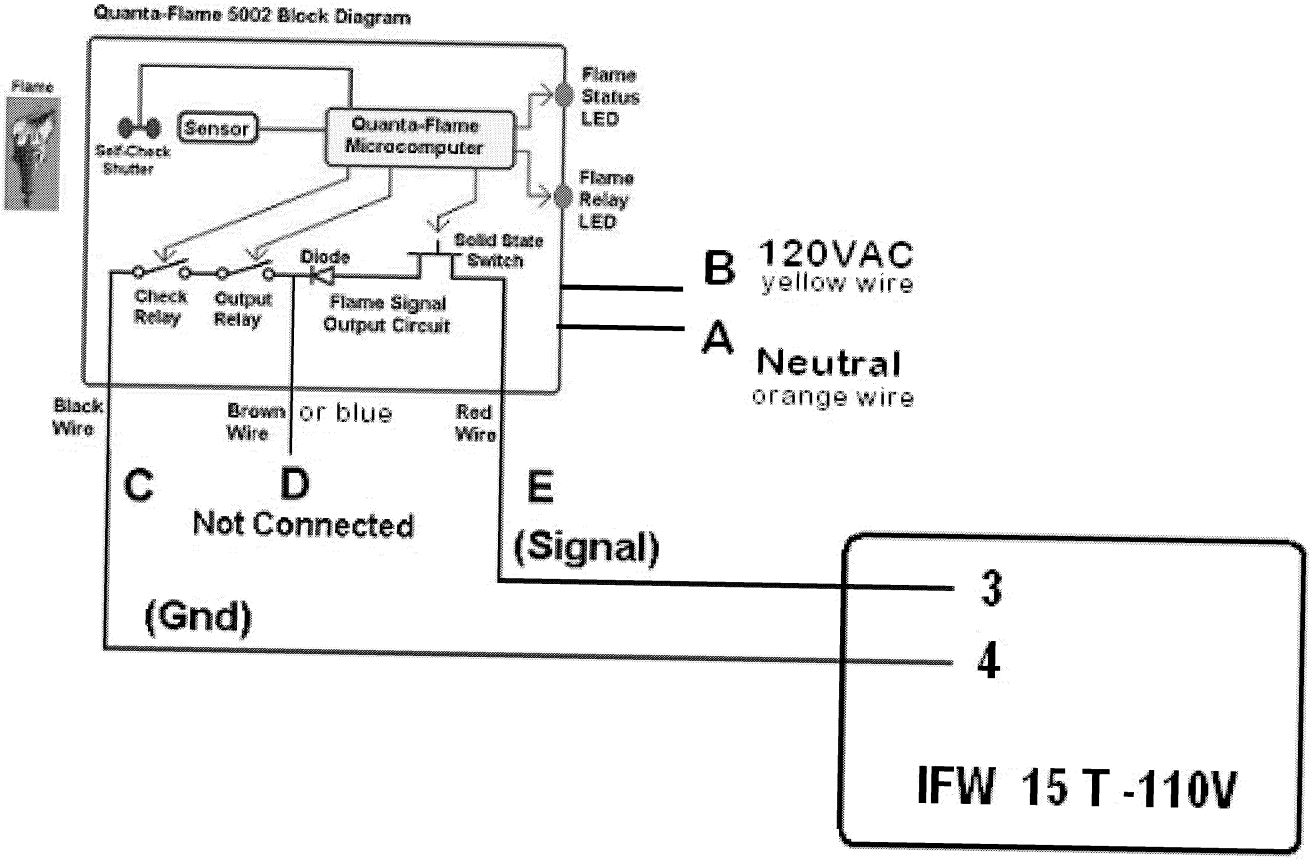
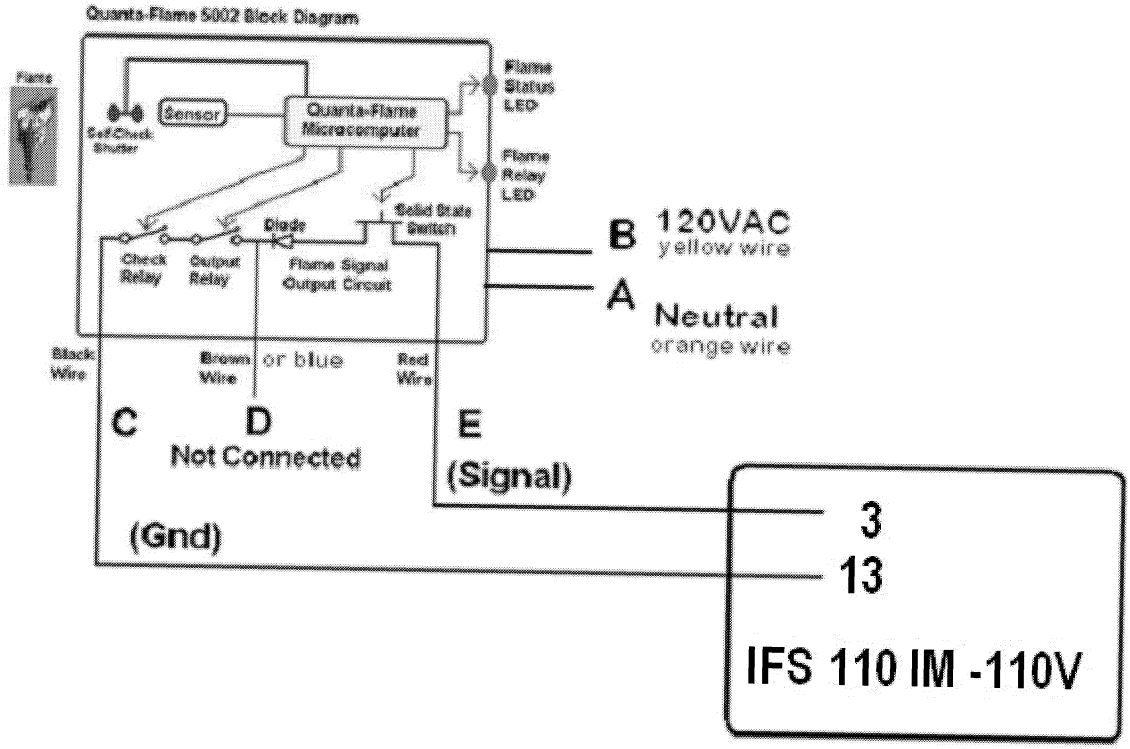
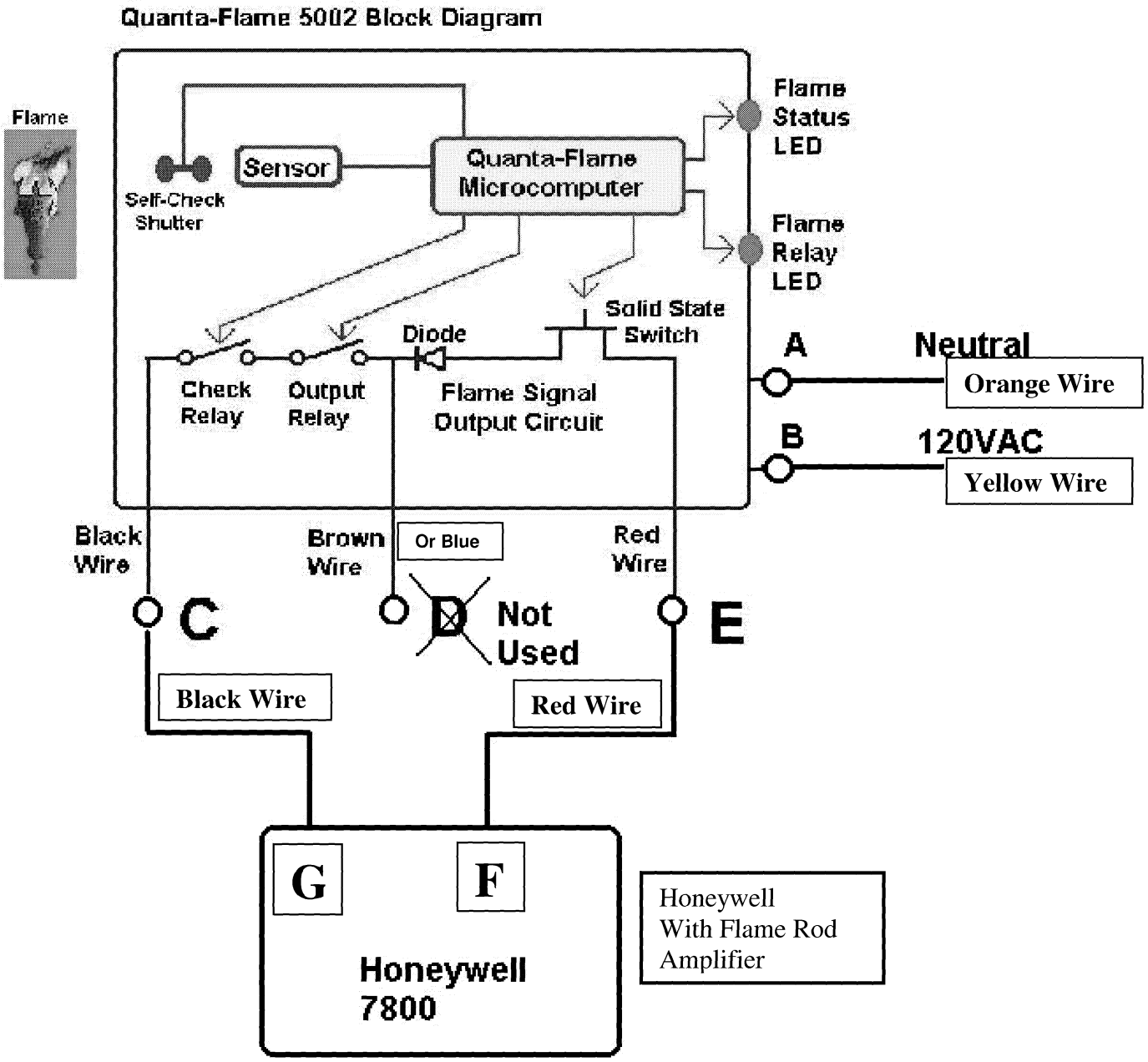
Wiring Diagram for connection to a Kromschroder Control (IFW 15T-110V) (5002-01 120VAC Contact Model)



Wiring Diagram for connection to a Kromschroder Control (IFS 110 IM-110V)
(5002-01 120VAC Contact Model)



Wiring Diagram for connection to a Honeywell 7800 series FR type Control (5002-01 120VAC Contact Model)



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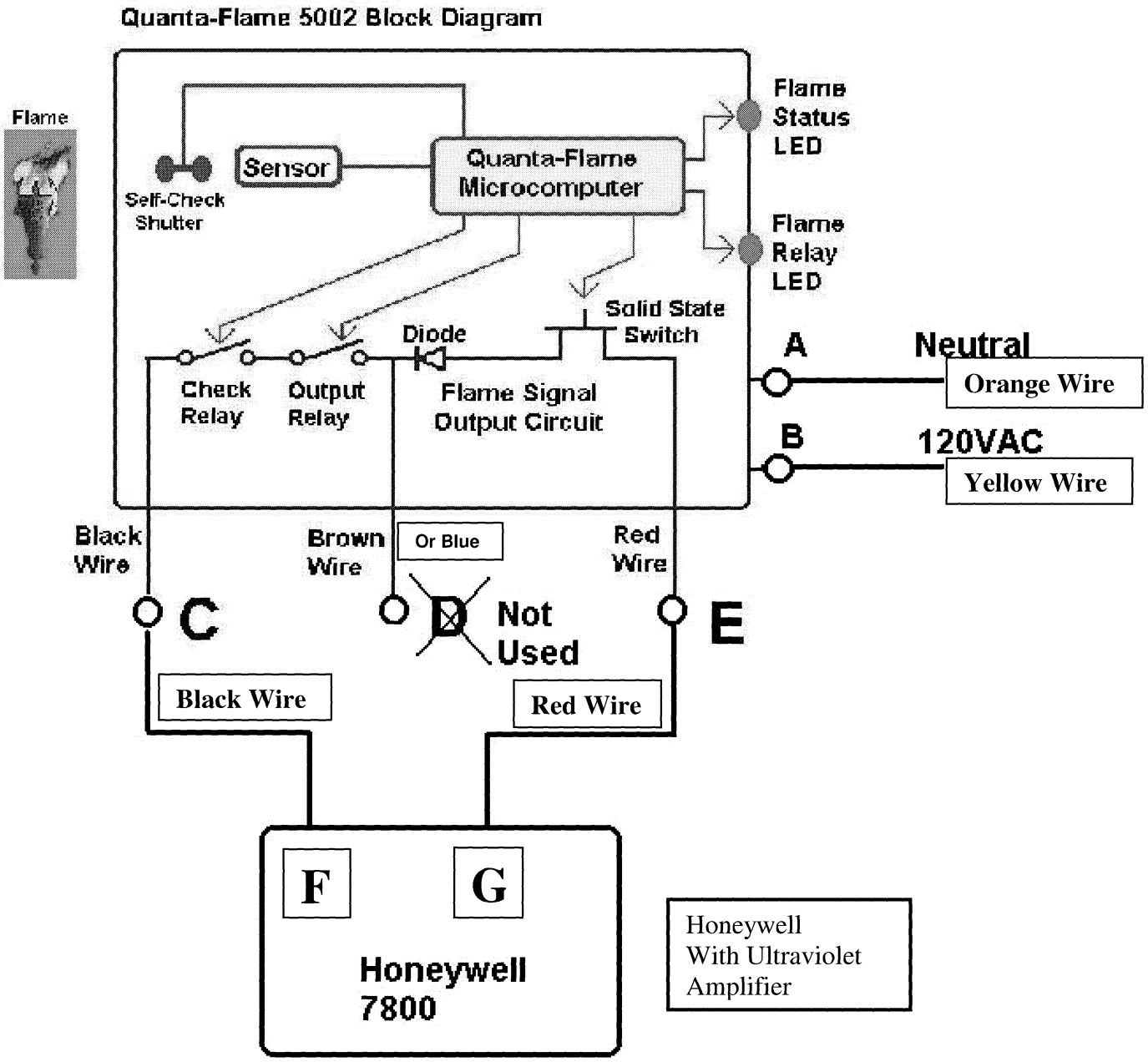
Wiring Diagram for connection to a Honeywell 7800 series UV type Control (5002-01 120VAC Contact Model)



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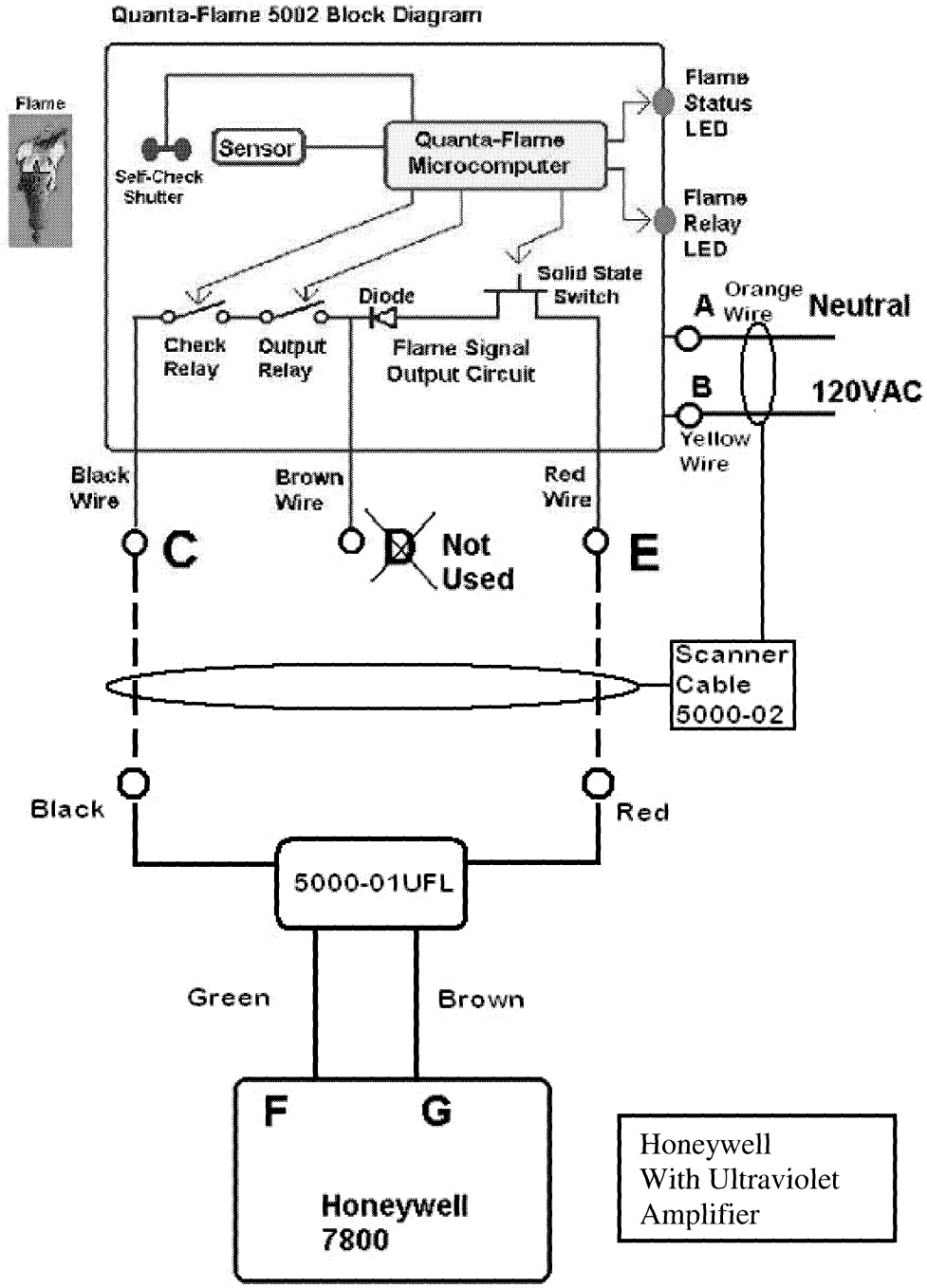
Installation of 5000-01UFL for scanner lead distances up to 1000 feet.



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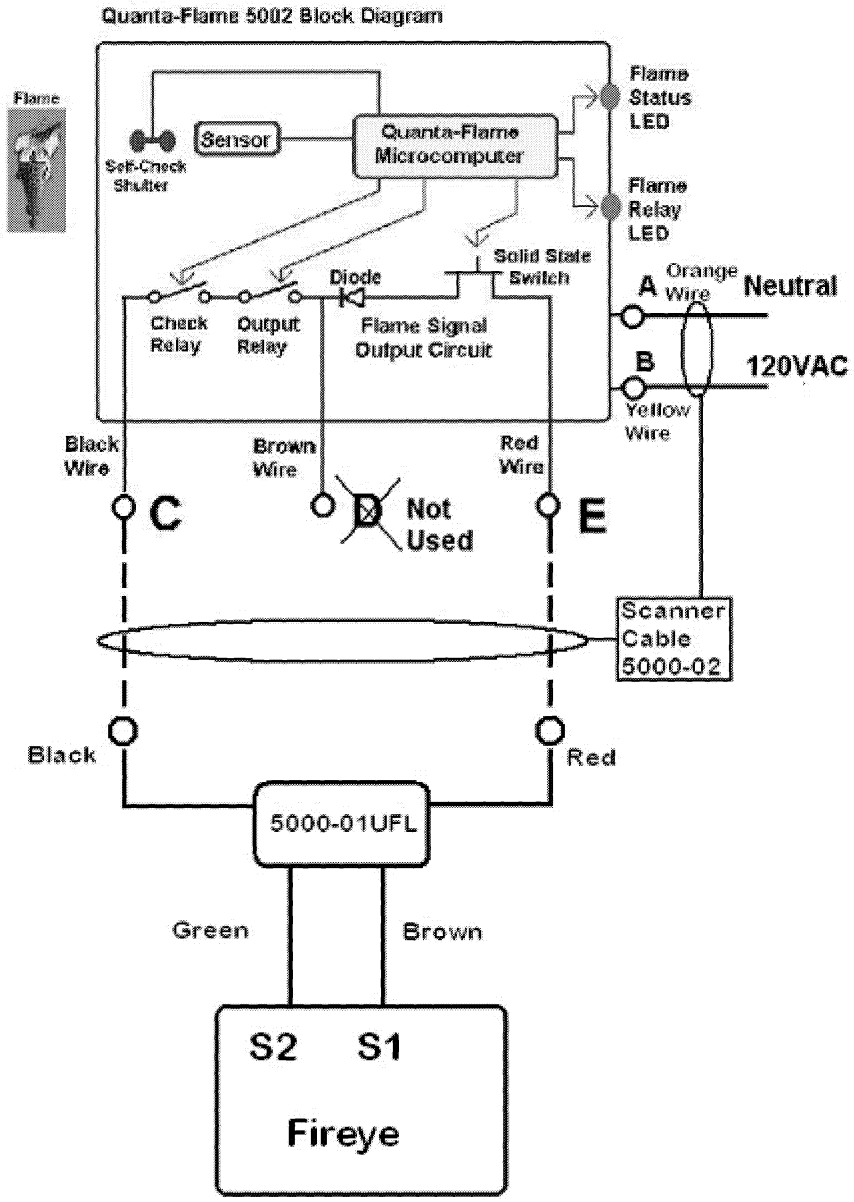
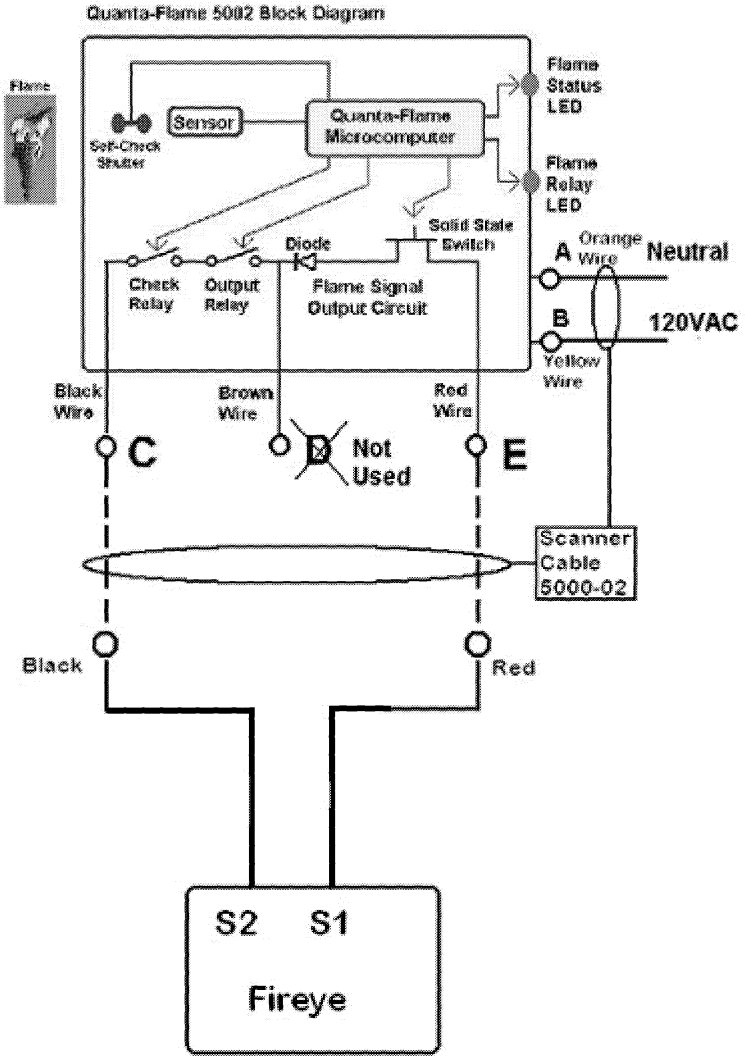
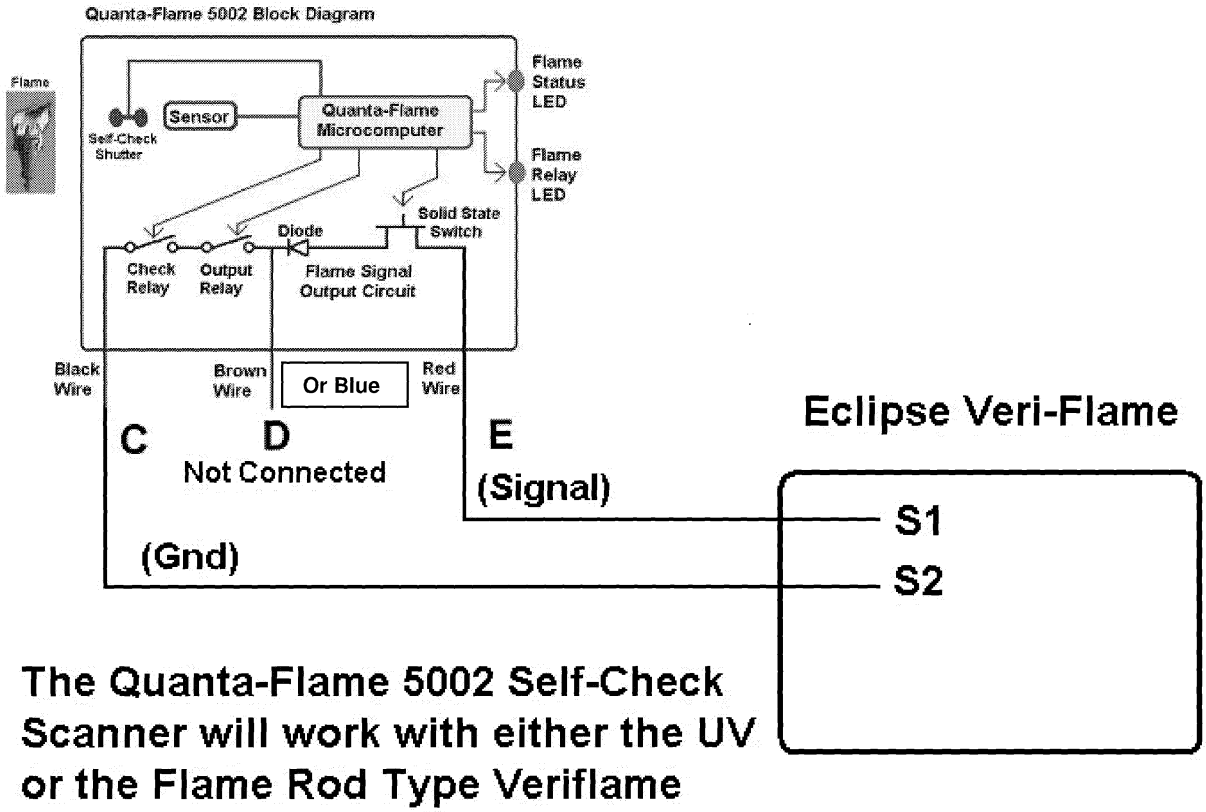
Wiring Diagram for connection to a Ultraviolet Type Fireye Control (Always use the 5000-01UFL) (5002-01 120VAC Contact Model)



Wiring Diagram for connection to a Flame Rod Model Fireye Control (5002-01 120VAC Contact Model)



Wiring Diagram for connection to an Eclipse Veri-Flame (5002-01 120VAC Contact Model)



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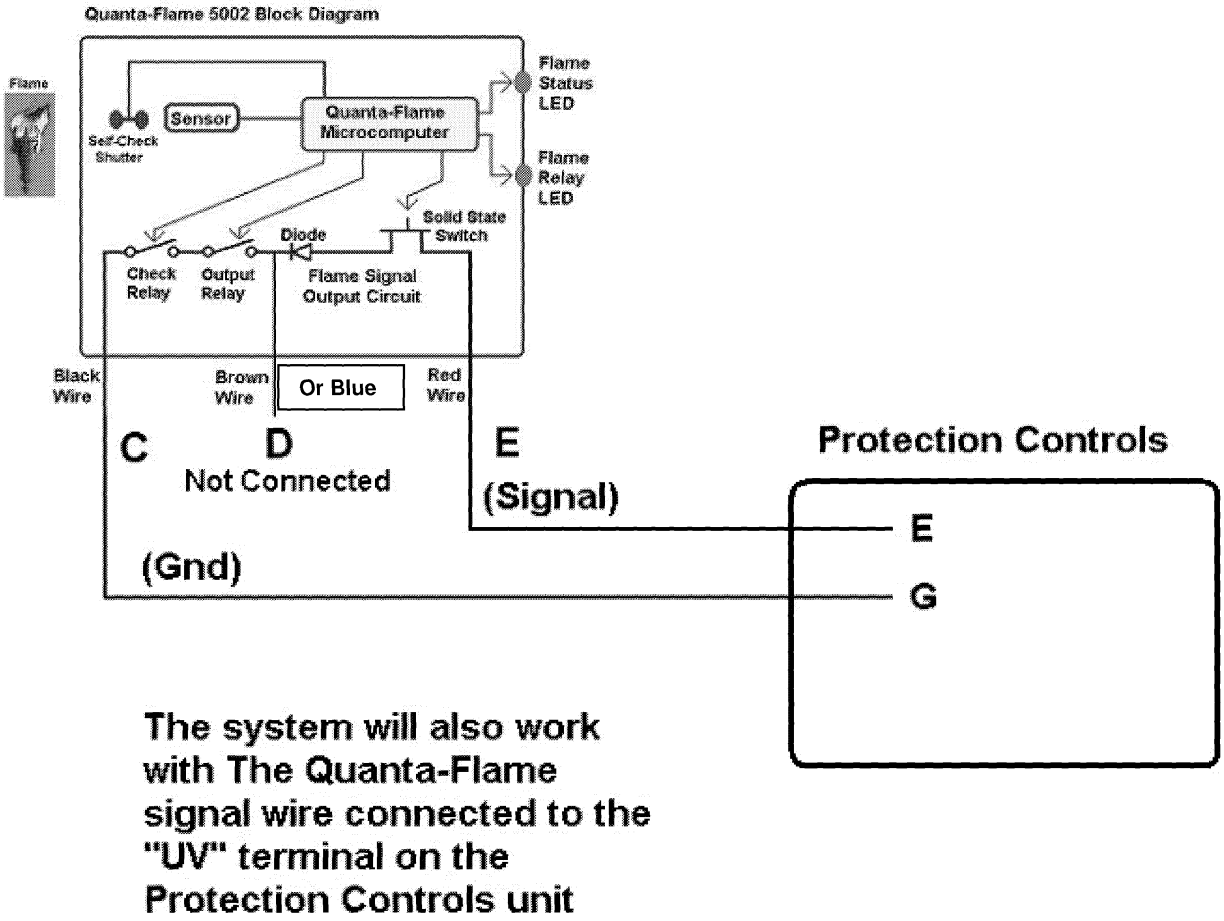
Wiring Diagram for connection to a PCI Control (5002-01 120VAC Contact Model)



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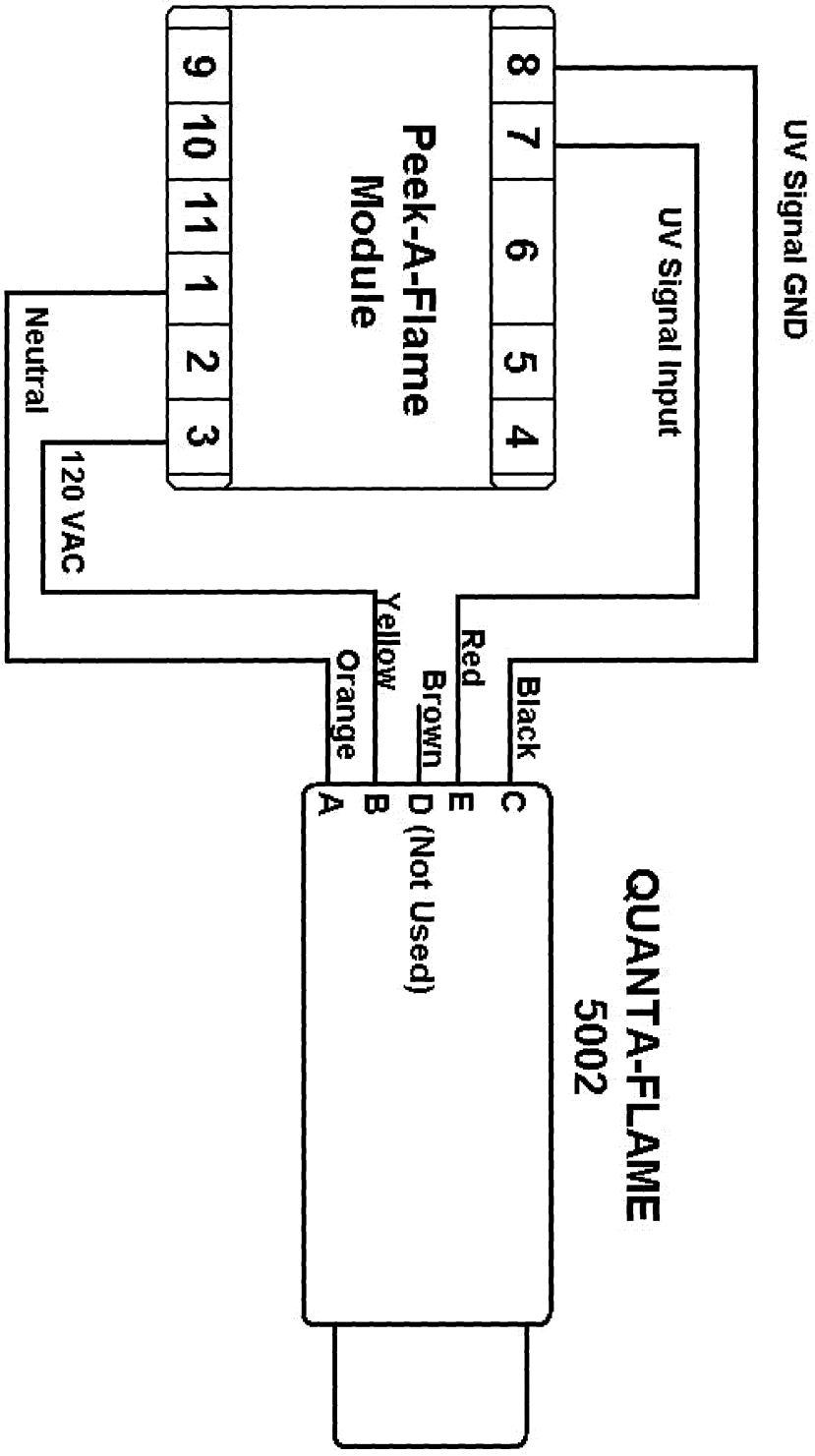
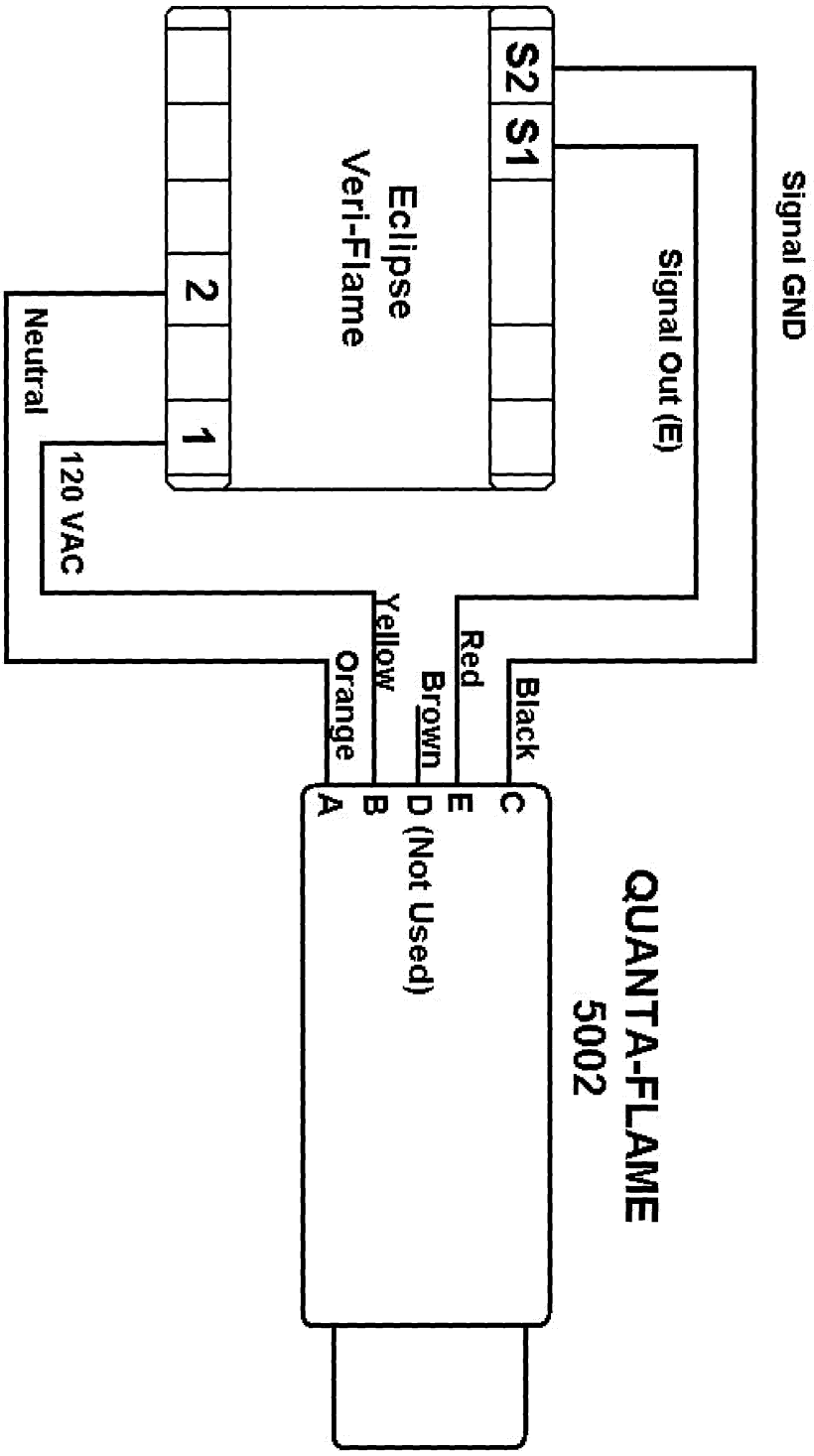
Wiring Diagram for connection to an Eclipse Peek-A-Flame Model 7000 (5002-01 120VAC Contact Model)

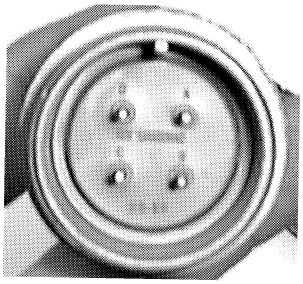


Wiring Diagram for connection to an Eclipse Veriflame (5002-01 120VAC Contact Model)



Adapter Cable (5002-02/91)

Adapts the 5602-91-7 cable (from a 5602-91 scanner) to the 5002-01scanner



4-Pin Eclipse End

A	Neutral	A
B	120 Volts	B
C	UV Signal –S1	E
D	UV GND –S2	C
		D

Note: Pin D is not used

5-Pin Quanta-Flame End

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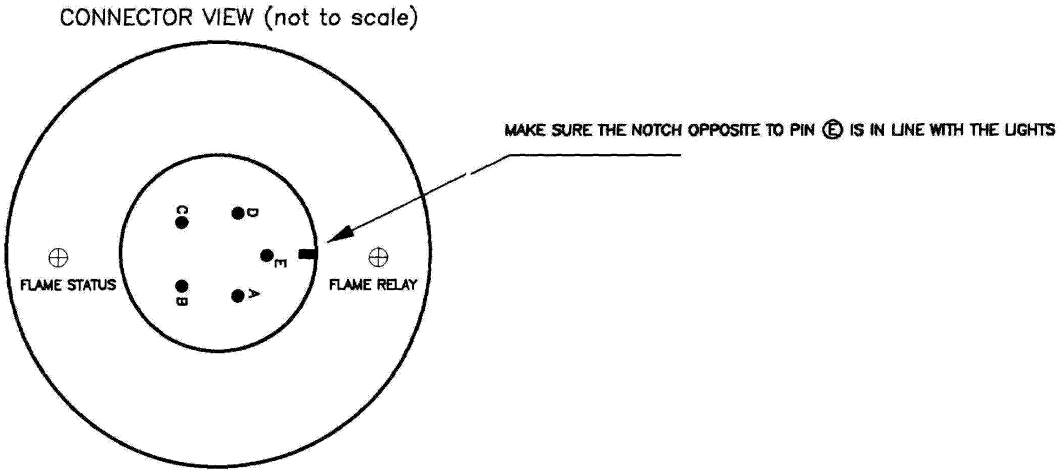
Wiring Considerations

Depending on the output option used the wiring requirements will vary somewhat.

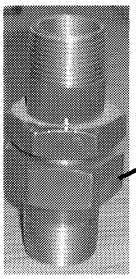
Output type	Suggested wire	Wiring run considerations
Contact	14 to 16 AWG	THHN or equivalent Nothing special- can be run with other wires in conduit
4 to 20 ma Flame Signal 1 to 5 volts 0 to 10 volts RS 232 RS 485	14 to 16 AWG	THHN if wire is run in separate conduit
		Shielded cable if multiple wires are in one conduit
		Coax cable if long distance runs are required or if high level of electrical noise is present

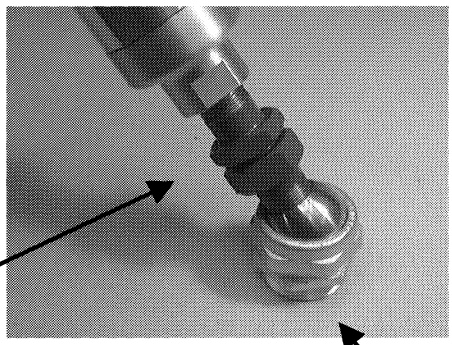
Note

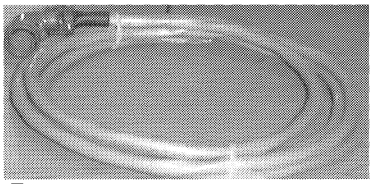
All wiring runs to the field on, or near, hot surfaces should be rated for 90°C (195°F) or at least 25°C (50°F) higher than the surface temperature.



Accessories

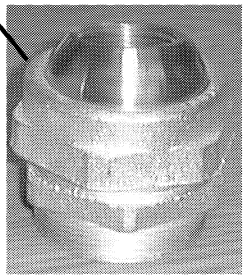






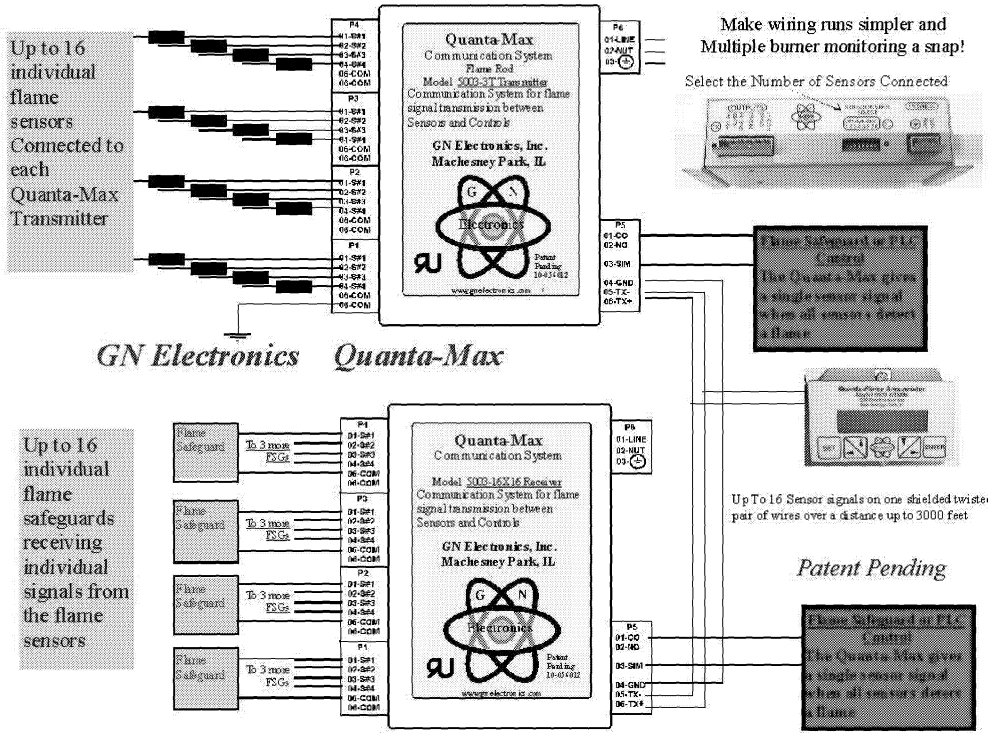
5000-02/05
5000-02/05-wt- Water Tight Scanner Cable (5 ft.)

5000-01-00
UV Mounting Nipple With Quartz Lens



5000-73/74
Swivel Mount

The 5002 Scanner can be used in a Quanta-Max Multiple Burner System



Maintenance

Lens Cleaning

This is the only routine maintenance required. It is suggested a good lens cleaning fluid and lint free tissue be used for this operation. Remove the scanner as follows:

1. Disengage the scanner cable from the scanner.

2. Turn off the purge air supply

3. Close any shut off valve in downstream of the scanner.

4. Keeping the scanner housing front solidly attached to the sight pipe, unscrew the cylinder rear portion of the scanner. The lens is now accessible for cleaning.

When the lens has been cleaned the scanner should be put back into service by reversing the above removal instructions.

Warranty of **Scanners**

This product (5002 Series) is warranted for one (1) year from the date of delivery against manufacturing defects only. GN Electronics standards terms and conditions apply.
GN Electronics' liability for its products, whether due to breach of warranty, negligence, strict liability, or otherwise, is limited to the furnishing of replacement parts and GN Electronics will not be liable for any other injury, loss, damage or expenses, whether direct or consequential, including but not limited to loss of use, income of, or damage to material arising in connection with the sale, installation, use of, inability to use or the repair or replacement of GN Electronics' products.

Units should be returned to G N Electronics. Controls should be well packed in a suitable container encased in appropriate stuffing.

All scanners should **be shipped prepaid to:**

G N Electronics Inc
9958 N. Alpine Rd Suite #104
Machesney Park, IL 61115

Tel: (815)637-8624
Fax: (815)637-8626

www. gnelectronics . com

Notes: