

# 600U Ultra Flame Rod Signal Processor

## USER MANUAL



## APPLICATION

The Honeywell 600U Ultra flame rod signal processor is a reliable flame monitoring system based on the proven principle of measuring rectified current flow through a flame rod when a flame touches it. An AC voltage of 175 VAC is applied to the flame rod; when a flame touches the rod, a rectified current flows from the rod through the flame to the ground of the burner. The 600U controller measures the rectified current and energizes the flame relay if the current exceeds the value for the flame-on setpoint. If the current flow drops below the value for the flame-off setpoint, the flame relay de-energizes. A visual display indicates whether or not the flame relay is on and the relative signal strength, i.e., the DC current flow through the flame.

The 600U is also capable of driving either (a) an ignition coil or (b) an ignition transformer. (a) The ignition coil would be part of an ignitor assembly; when using the ignition coil, the flame rod which is used for sensing flame serves also as an ignition rod. (b) AC power to an external ignition transformer is switched on by a power relay in the 600U controller when an ignition signal is applied. In this case, the high voltage from the ignition transformer cannot be applied to the flame rod; a separate ignition rod is required.

An AC or DC signal is applied to the 600U controller to turn on the ignition coil and the ignition transformer. When the signal is applied, the 600U controller pulses the ignition coil at 50 or 60 times per second, depending on the line frequency. The

ignition signal also causes a power relay in the controller to close, connecting the controller's AC input voltage (after fuses) to an external ignition transformer if one is hooked up. While the ignition signal is applied, the flame relay is de-energized.

By means of a jumper the sensitivity of the 600U to flame can be changed. Four sensitivity levels are provided. The sensitivity of the display and the values of the flame-on and flame-off setpoints are all changed together by the jumper.

Various protection features are provided. The flame rod itself can be shorted to ground indefinitely without harm to the unit. If the flame rod becomes fouled so that an unreasonably large amount of AC current flows from the flame to ground, first a yellow "ROD FOULED" LED is turned on. If the AC current increases further a "ROD FAULT" LED is turned on and the flame relay is de-energized. Note that the 600U controller distinguishes between AC current flow due to fouling and DC current flow caused by the presence of a flame.

If a grounded person touches the flame rod, he will receive a perceptible shock, but he will not be hurt because less than .5 mA of AC current will flow. If the flame rod is also being used as an ignition rod and the rod is pulsed by an ignition coil, the shock will be strong but it should not be dangerous because of the short duration of the pulses.

## SPECIFICATIONS

### ELECTRICAL

**Primary Input Power:** 85 to 132 VAC, or 170 to 264 VAC; 50/60 Hz.

**Input Current (monitoring only):** 0.07 A at 115 VAC, 0.035 A at 230 VAC.

**Input Current (ignition on):** 0.3 A at 115 VAC, 0.15 A at 230 VAC; plus current to ignition transformer (5 Amps maximum.)

**Ignition Command Input:** 12 to 50 VDC or 85 to 264 VAC, 50/60 Hz.; (using labeled DC and AC inputs).

**Command Current:** 0.02 A DC at 50 VDC, 0.015 A RMS at 230 VAC.

**Maximum Capacitance Load:** 1.0 nF, flame rod drive to ground (through wire insulation).



## OUTPUTS

**Flame Relay:** DPDT contacts, rated 5 A at 125 VAC, 277 VAC, and 30 VDC.

**Ignition Transformer Relay:** DPST contacts, rated 5 A at 125 VAC and 250 VAC.

**Ignition Coil Drive:** A capacitance of 4.4  $\mu$ F is discharged from 230 VDC through the ignition coil tap at the AC line rate by a 4 A, 400 V SCR.

## ENVIRONMENTAL

**Ambient Temperature:** Controller 0 to 60 °C (32 to 140 °F).

## SAFETY

**Flame rod voltage:** 175 VAC at 115/230 VAC input.

**Flame rod current (not firing):**  
Maximum current to ground <0.5 ma.

## INSTALLATION

The 600U mounts on a 35 mm DIN rail. See Figure 1. The DIN rail release is at the top of the unit.

See Figure 2. Five Phoenix plugs are provided with the controller, P1 through P5. AC power is connected to pins AC L1 and AC L2 of P5. Set P4 for 115 VAC or 230 VAC depending on the line voltage. The voltage does not have to be extremely close to 115 VAC or 230 VAC; the controller is quite tolerant accepting 85 VAC to 132 VAC or 170 VAC to 264 VAC. However, the flame signal strength will be affected somewhat with AC voltage changes. This should not be a problem because flame rods have excellent discrimination between flame on and flame off.

The controller will operate equally well on 50 Hz or 60 Hz power.

It is very important to connect the GND input on the controller to the ground of the burner. It is assumed that the third wire AC ground is at roughly the same potential as the burner ground, so connection of GND to the AC line ground should be satisfactory. If the GND input is left open, flame will not be detected.

The ignition command is applied at pins IGN AC, IGN COM, and IGN DC. A DC ignition command from 12 VDC to 50 VDC is applied between IGN DC and IGN COM; it can be either positive or negative in polarity. An AC ignition command from 85 VAC to 264 VAC (50 or 60 Hz) is applied between pins IGN AC and IGN COM.

The 600U will operate equally well in several configurations: flame rod only, flame rod with ignition coil, and flame rod with ignition transformer. (It will also operate with both an ignition coil and an ignition transformer.)

The connection for the flame rod only is shown in Figure 2; it connects to the ROD/COIL pin on the controller. If the ignition command is applied without the ignition coil present, the voltage to the flame rod is not affected. The pulsing of the ignition coil is done from the COIL TAP pin of the controller.

The connection of the ignition coil is shown in Figure 2. Pin C for the coil is usually connected to ground in the ignitor assembly; this ground connection is not necessary for coil operation. The flame rod operates through the ignition coil when the ignition coil is not being pulsed. When an ignition command is present, with every pulse to the coil a strong spark is emitted from the coil tip through the flame rod to ground. The pulse rate will be the same as the line frequency, 50 or 60 pulses per second. The air gap between the flame rod and ground should be 2 to 3 mm. The nominal arc voltage is 7,000V. If the gap is very large, there will be no arc when the coil is pulsed. Such pulsing will not be damaging to the coil. The peak voltage at the coil tip when no arc results will not exceed 11,000V.

When the ignition command is applied the AC power to an ignition transformer is turned on by a DPST relay. See Figure 2. The controller is shipped with two 5 A fuses installed.

## Front Panel Functions and Setup

Six numeric LED digits arranged vertically provide a graphic visual display of the flame signal. If the Flame Rod is connected and the AC power is on (green POWER LED will be on) and there is no flame signal, none of the numeric digits will be on. With a weak flame signal, either the "1" or "2" digits will be on but the Flame Relay will be off. A stronger signal will be indicated by "3" or a higher digit turning on; with this stronger signal the Flame Relay will be turned on.

In normal operation when the flame is present the "5" or "6" digits should be on with, perhaps, digit "4" turning on occasionally. If the "3" or "4" digits are on most of the time, the gain should be increased by moving P2 to a higher gain position.

If the "6" digit is on steadily, the gain is probably set too high; move the P2 plug to a lower gain position. If the LED for ROD FOULED is on, the 600U controller will continue to operate, but this is a warning that a small amount of AC current is flowing from the flame rod to ground. This means that the flame rod or its mount probably needs cleaning.

If the fouling gets to be significant, approaching the point where the flame signal could be affected, the LED for ROD FAULT will turn on, causing the flame relay to open. This fault condition will be removed as soon as the fouling is sufficiently reduced.

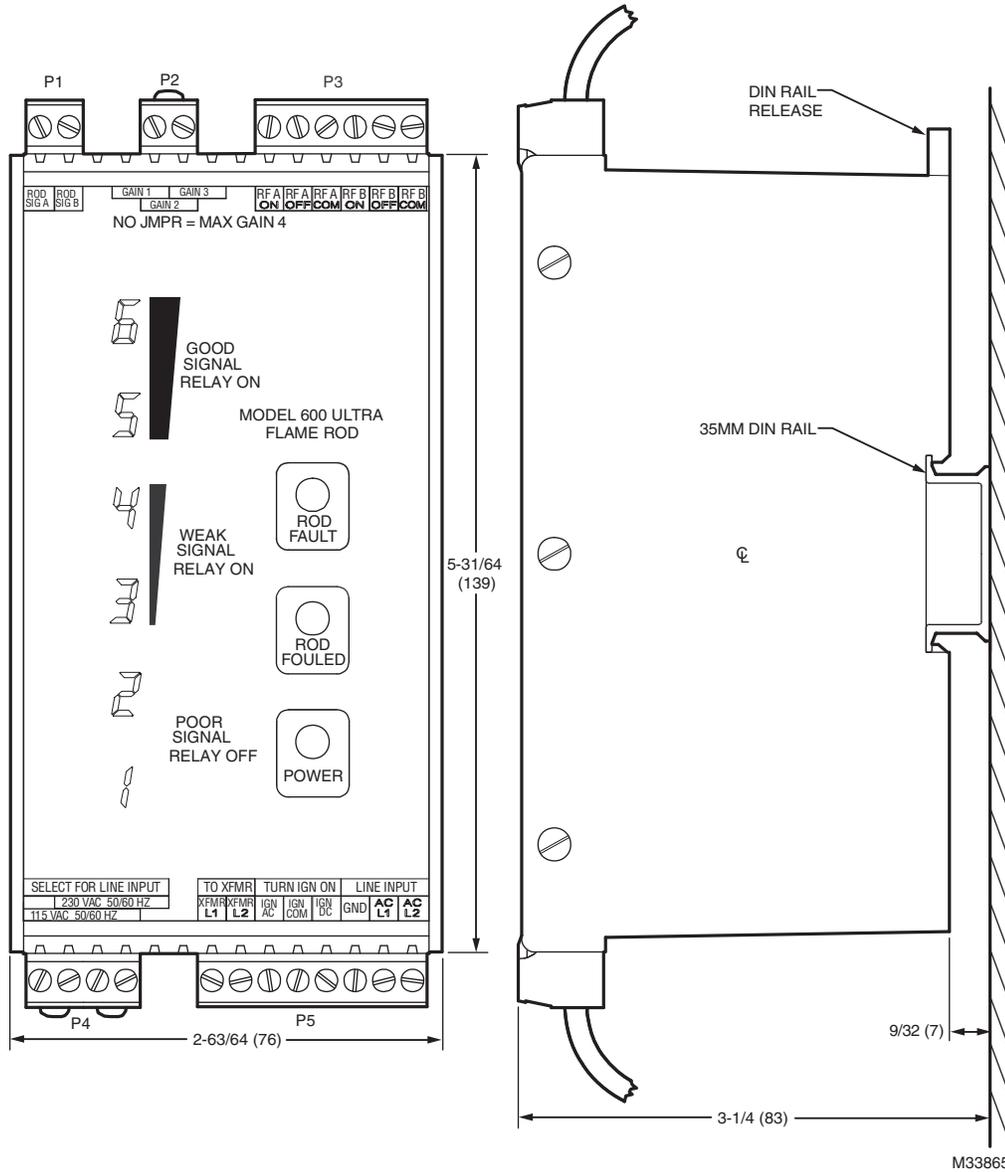


Fig. 1. 600U Ultra flame rod controller.

600U ULTRA FLAME ROD SIGNAL PROCESSOR

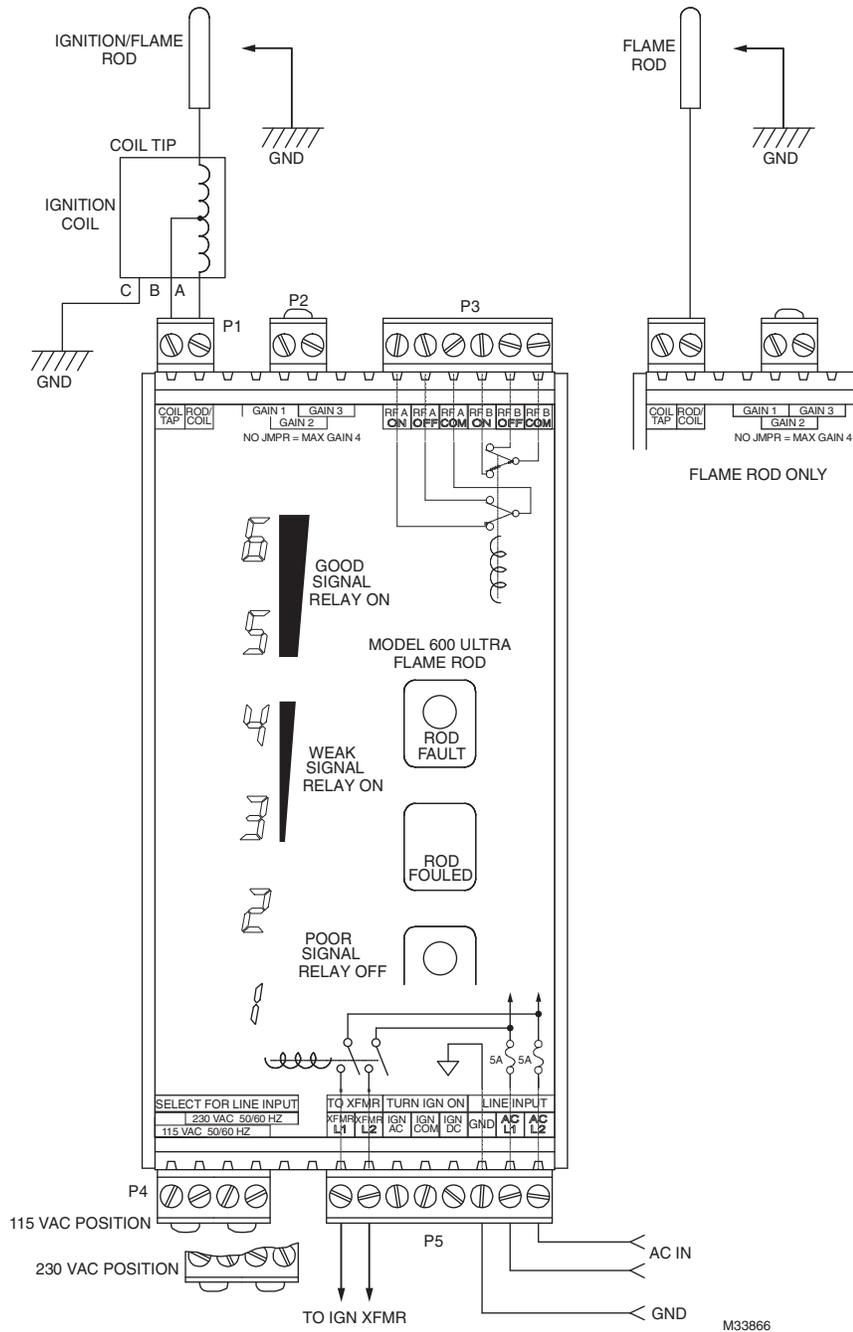


Fig. 2. Wiring the 600U.

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