INSTRUCTIONS

R485B PROTECTORELAY PRIMARY CONTROL

APPLICATION

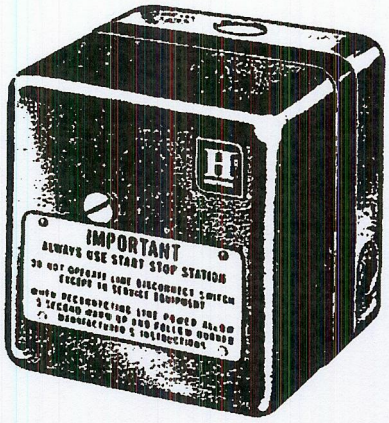
The R485B is a manual start flame safeguard control with solid state flame detector circuitry. It can be used with rectifying photocells, flame rods, or C7012A Ultraviolet Flame Detectors as applicable on oil, gas, or dual-fuel burners.

The R485B is adaptable to continuous firing, high-low, or modulating firing rates. The unit will operate with any of the following types of ignition:

1. Torch-ignited main burner using the S445A Start-Stop Station, or any conventional knee or foot operated start-stop station.

2. Torch-ignited pilot using the S445A Start-Stop Station, or any conventional knee or foot operated start-stop station.

3. Direct-ignition oil burner or electrically ignited pilot, using the S445A Start-Stop Station, which maintains electric ignition as long as the start button is depressed.



FEATURES

- Safe start check—burner cannot start if a flame simulating failure occurs on the off cycle.
- Solid state electronic network—no tube to replace.
- Control mounts compactly on the wiring subbase with ten captive mounting screws which also complete electrical connections.
- Test jack in the flame detector circuit permits direct reading of the flame current.
- Built-in protection against ignition crossover damaging the electronic network where a flame rod is used to detect a spark ignited pilot.
- Lexan thermoplastic base is nearly unbreakable.

SPECIFICATIONS

MODEL: R485B Protectorelay Control.

VOLTAGE AND FREQUENCY: 100, 120, 208, 220, and 240v, 50/60 Hz.

MOUNTING: Q270A Universal Mounting Base. Order separately.

TERMINAL RATINGS: Terminals 3 (alarm), 4 (pilot), and 7 (main valve), 125 va; alternate rating for terminal 7, 25 va pilot duty plus 1 or more motorized valves with total rating 400 va opening, 200 va holding. Terminal 8 (ignition), 345 va. Use starter or switching relay to carry any power-burner load.

FLAME RESPONSE: 3 seconds, nominal. 0.8 seconds available.

AMBIENT TEMPERATURE RATING: -20 to 125 F.

FLAME DETECTORS: For use with rectification type flame detectors.

—C7012A Ultraviolet Flame Detector for gas or oil flame.

—C7003A or C7010A Photocell Flame Detector for oil flame.

— Flame rod detector and a suitable holder for gas flame.

— Any combination of the above detectors.

DIMENSIONS (inches): Approximately 5 x 5 x 4-3/4 (including subbase).

ORDERING INFORMATION:

Specify—

1. Model number.
2. Voltage and frequency.
3. Flame response time.
4. Q270A Universal Mounting Base.

Order from—

1. Your usual source, or
2. Honeywell
   1885 Douglas Drive, North
   Minneapolis, Minnesota 55422
   (In Canada—Honeywell Controls Limited
   740 Ellesmere Road
   Scarborough, Ontario)

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J. C.

Form Number 95-6597—1
Residential Div.

INSTALLATION

Follow the burner manufacturers' instructions if provided: otherwise, proceed as follows.

MOUNT SUBBASE

Select a location for the subbase where the ambient temperatures remain between -20 and 125 F.

Mount the subbase using the screws provided. The top and bottom of the case should be horizontal and the back vertical. The control may lean backward as much as 45 degrees if necessary.

MOUNT FLAME DETECTOR

Mount the flame detector according to the instructions packed with it.

WIRE SUBBASE

CAUTION
Disconnect power supply before making wiring connections to prevent electrical shock or equipment damage.

NOTE: All wiring must agree with applicable electrical codes and ordinances.

All wiring to the control terminals must be NEC Class 1. No. 14 TW moisture resistant wire is recommended. For any leads that may be exposed to high temperatures (over 125 F) the following wire is recommended:

Part No. R1298020 wire rated at 400 F (continuous duty).

Part No. R1061012 ignition wire rated at 350 F (continuous duty).

The flame lead should be either No. 14 TW for normal installation or Spec. 1298 for high temperature installations.

Refer to Figs. 1 through 5 for typical wiring hookups and for system schematics.

Fig. 1 illustrates a typical wiring hookup using an ignition transformer. Also shown is an optional motor starter for power-type burners. The circuit is shown in normal standby stage, ready for pushbutton start, with continuous power supplied to terminals 1 and 2. Note that the alarm and electronic network are both energized.

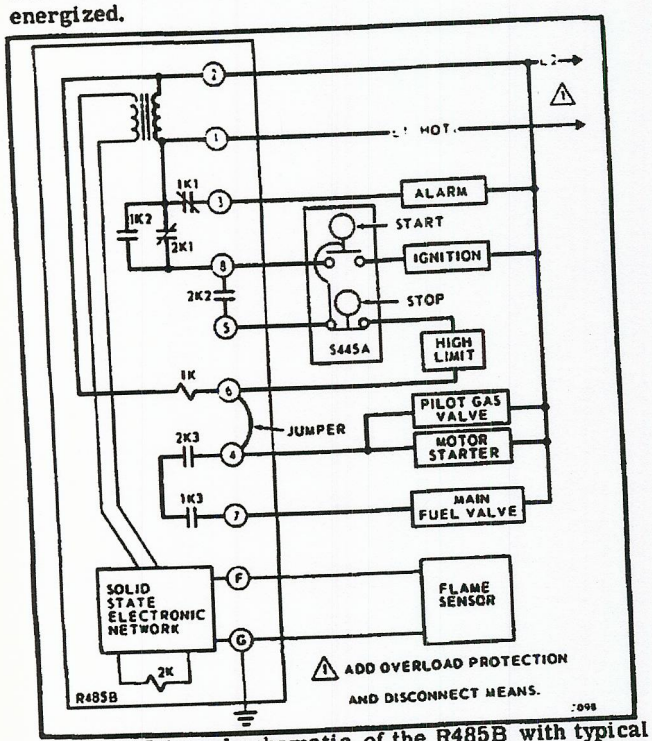

Fig. 1—Internal schematic of the R485B with typical external connections.

Fig. 2 illustrates external connections to the R485B and S445A. If torch ignition is desired, a standard pushbutton, or a foot- or knee-operated switch, may be used in place of the S445A. Fig. 2 also illustrates one method of silencing the alarm during startup. With this arrangement the burner cannot operate with the alarm disconnected, but the annoyance caused by the alarm during startup can be eliminated.

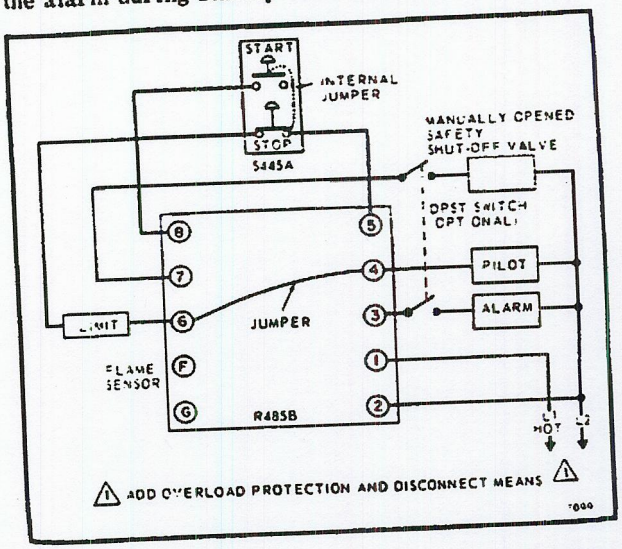

Fig. 2—Torch-ignited pilot, showing optional alarm silencing circuit using a dpst switch (see text).

Fig. 3 shows the use of a Hi-Lo or modulating motor with the Protectorelay control. Note that the starting circuit cannot be energized until the end switch on the Hi-Lo or modulating motor is in the low fire position. In addition, to prevent the Hi-Lo or modulating motor from running to the high fire position before the manually opened safety-shutoff valve is opened, a fuel pressure switch (connected downstream from the shut-off valve) is connected in series with the R482B Relay. This assures that the burner will light off in the low fire position before the controller can take command of the burner. This system may also be used with the alarm silencing switch illustrated in Fig. 2.

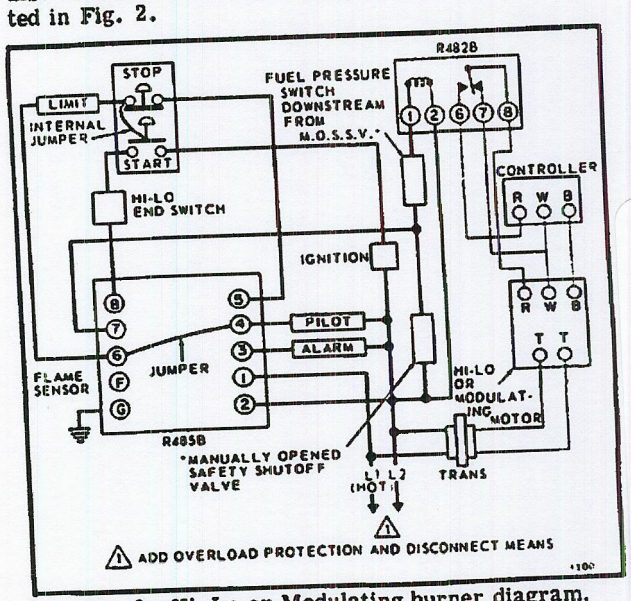

Fig. 3—Hi-Lo or Modulating burner diagram.

Fig. 4 shows a recommended circuit for cascading two or more burners. Each pilot is ignited and supervised by its respective controller, ignition transformer, flame rod, limit control, and Protectorelay control. The main gas valve, however, is not energized until all pilots have been ignited and proved, and their respective Protectorelay flame relays have pulled in. Failure of any of the pilots to ignite will prevent the main gas valve from being energized.

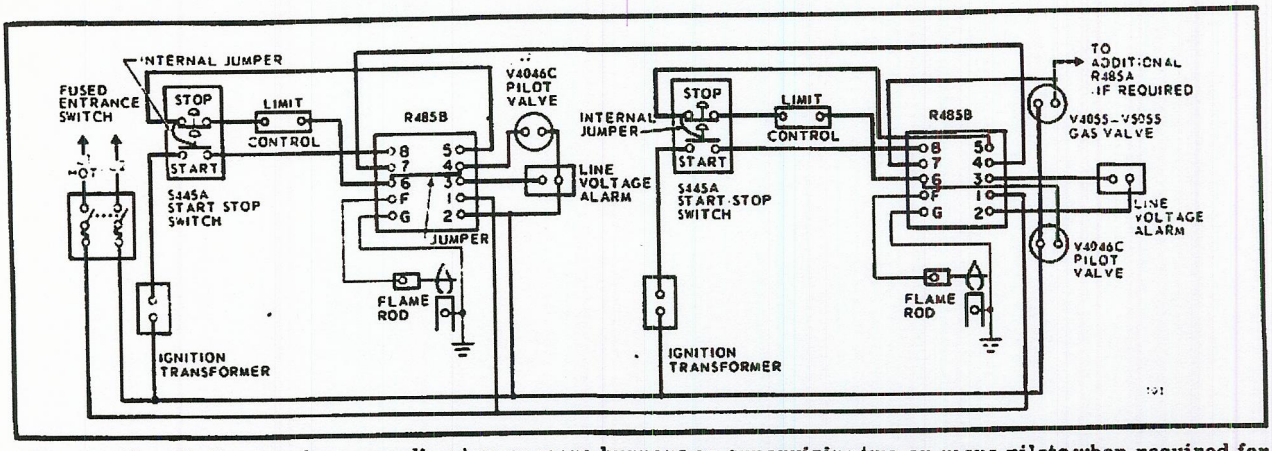

Fig. 4—Circuit diagram for cascading two or more burners or supervising two or more pilots when required for safe ignition of one burner.

Fig. 5 shows typical connections for a combination gas-oil application using Hi-Lo or modulating valves on both fuel systems, and pilot ignition on both cycles. With the motor end-switches and the R482B Relays connected as shown, a guaranteed low fire start is assured on either cycle. Note that transfer of flame-supervision from flame rod to photocell on the oil cycle is accomplished by interrupting the gas pilot when the start button is released. Note that the fuel switchover control switch is ganged.

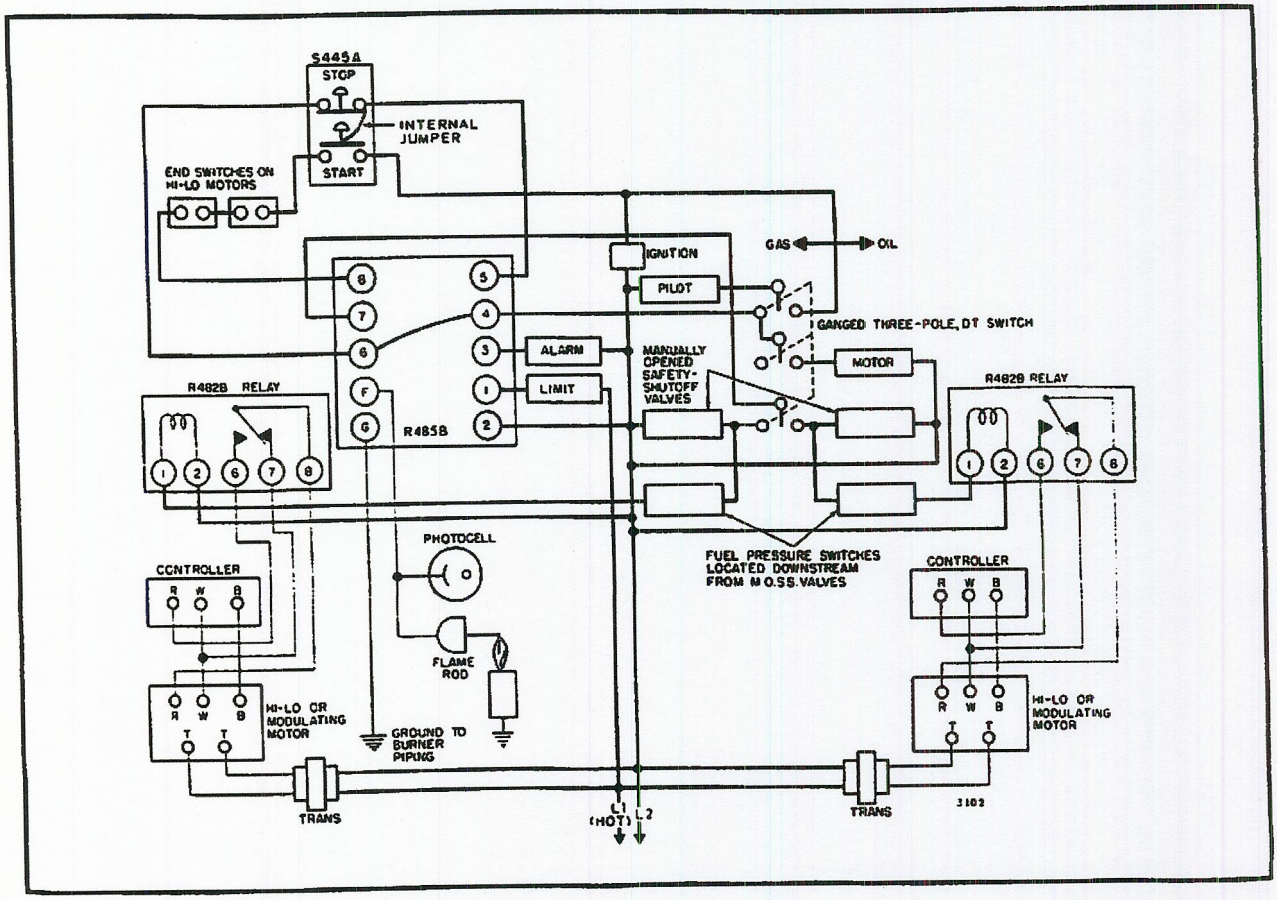

Fig. 5—Circuit diagram for Dual-Fuel burner using Hi-Lo or Modulating burners on both cycles.

CHECKOUT

PRELIMINARY CHECKS:

Make sure that—

1. The wiring connections are correct and tight.

2. The flame electrode is properly positioned for stable gas flame contact under all firing conditions.

3. The burner has been properly adjusted.

4. The fuel line is purged of air, and the combusion chamber and flues are clear of unburned gases or fuel.

5. The ignition electrode is properly positioned, (Arc should light flame, but not jump to sensor electrode).

NORMAL OPERATION CHECK

1. Close the line switch. Do not press the start button. Alarm should ring, and the relays should not pull in.

2. Wait approximately five seconds for the safe start check, then press the start button. The alarm should stop, the left hand relay (load relay) should pull in, and the pilot gas valve should open. The motor starter, if used, closes. If the system has electric ignition, the pilot should light. If the system is designed for torch ignition of the pilot, the start button (may be hand or foot operated) must be held in while the torch is applied to the pilot.

3. Pilot is lit. The flame sensor should immediately sense the presence of the flame and pull in the right hand (flame) relay. Release the start button electric ignition goes off. The main valve circuit is now energized and the free handle safety shutoff valve may be opened to light the main burner. If an alarm silencing switch is used as in Fig. 2, it must be closed.

NOTE: Holding in the start button will keep the electric ignition on, but the button may be released as soon as the right hand (flame) relay pulls in without cutting off the pilot gas supply.

4. After the burner has been in operation and the fire box is hot, check response to flame failure by shutting off all the fuel to the burner. In 2 to 4 seconds after disappearance of the flame, both relays should drop out, and the main shut-off valve as well as the pilot gas valve should close simultaneously. The alarm should come on.

FLAME CURRENT CHECK

The size and stability of the flame detector signal should be checked at installation and periodically afterwards.

To measure the flame detector signal, connect the leads from a 117053 meter connector plug to the leads of a W136A Microammeter. The leads are color-coded for proper connection. Insert the plug into the test jack shown in Fig. 6. The flame signal must be steady and it must be above 2 microamperes in magnitude for normal operation. If the current is too low or unsteady, adjust the detector. If a flame rod detector is used, insure that there is sufficient ground area.

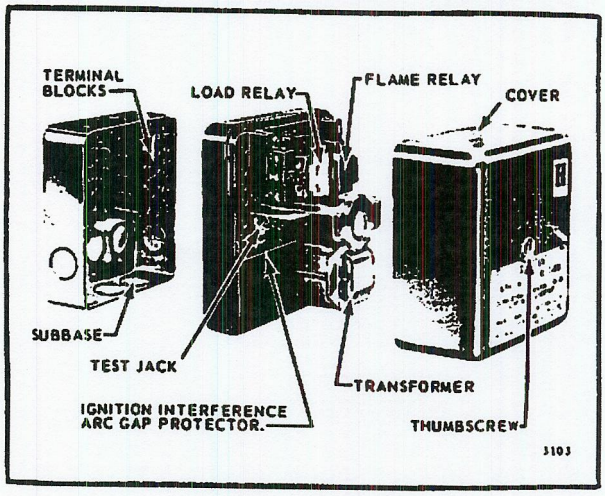

Fig. 6.

SERVICE

GENERAL

1. Only a qualified serviceman should attempt to service heating equipment or controls.
2. Do not adjust relay contacts or switches.
3. Refer to checkout procedure (above) or to burner manufacturer's instructions whenever relighting or replacing Protectorelay, or restoring power for any reason.
4. Before assuming that the Protectorelay or some other control device is defective, make sure that the wiring is correct, the burner properly adjusted, and so forth.
5. Never use oil on the Protectorelay.
6. On any service call, make sure that the relay contacts are clean, and mounting screws are tight.
7. Always pull the disconnect switch before loosening or tightening mounting screws.

NOTE: To take full advantage of the component check feature, the pushbutton station should always be used for startup or shutdown.

8. When cleaning the burner, clean the flame electrode assembly and insulator as well.
9. Replace cover on Protectorelay before leaving job.

There are few moving parts in the Protectorelay subject to wear. Therefore, simple preventative maintenance, such as periodic inspection of the flame electrode, scheduled replacement of the photocell, check of burner adjustment and flame characteristics, may forestall unnecessary shutdowns.

CONTROL SHUTS DOWN SYSTEM

If the system cannot be restarted:

1. Check power at terminals 1 and 2.

2. Check continuity of the start-stop station.

3. If relay 1K will not pull in with power on the control, replace the R485B.

4. If relay 1K pulls in but the fuel valve is not energized, clean the relay contacts. If this does not correct the problem, replace the R485B.

If the system starts but the flame relay will not pull in when flame is established.

1. Check the flame current. If the current is low but steady, try reading the current at the detector (in series with the detector in the F lead). If the current is higher at the detector, look for high resistance leakage to ground. Clean the detector and mount. Replace the wiring if necessary.

2. Make sure flame is not floating away from the detector (or ground area).

3. If the trouble continues, replace the R485B.

NOTE: A flame simulator, part No. 121708, with lead and plug, simplifies check the R485B. See instruction sheet packed with 121708 flame simulator.

RELAY CHATTER

Load relay chatter may result from extreme low-voltage (notify power company) or from a loose connection (tighten).

Flame relay chatter may result from improper combustion (adjust burner) or soot or carbon on flame detector (clean, and correct cause).

To clean relay contacts, push a piece of hard-surface paper (not newspaper) between the closed contacts.

HOW TO DETECT AND ELIMINATE IGN INTERFERENCE (FLAME ROD INSTALLAT WITH ELECTRIC IGNITION)

What It Is. Ignition interference is a false signa a spark ignition source, superimposed upon the l flame signal. It is normally associated with a m ginal flame reading, usually caused by a margi flame ground.

Interference can be either additive or subtractive to the main flame signal, depending on the hookup of the primary leads to the ignition transformer. Subtractive interference can cause a nuisance shutdown; positive interference may not even be noticed.

How detected. The arc gap circuit protects the R485B from ignition interference. However, it also prevents operation when ignition interference is present above the arcing level of the device. If a shutdown is caused by ignition interference, the arc gap protector (Fig. 6) will glow while the start button is held in.

Continuous interference below the arcing level can be detected by reading flame current with pilot and ignition on, then with pilot only. Any substantial difference indicates the presence of ignition interference.

Intermittent ignition interference may be due to very turbulent air in the ignition electrode area. For arc-over elsewhere, examine the electrodes for spacing, and for unusual dirt conditions or dust accumulations between the ignition leads and flame leads.

How Eliminated. Tabulated in order of importance.

1. Provide adequate flame grounding area.

2. Be sure the ignition electrode and the flame rod are on opposite sides of the grounding area.

3. Check for correct spacings on the ignition electrode. Spacing should be 1/16 inch to 3/32 inch for 6,000 volt systems, 1/8 inch to 3/16 inch for 10,000 volt systems.

4. Eliminate any marginal spacings at other areas along the lead routes. Replace any deteriorated leads.

5. A temporary solution for interference below the arcing level may be to reverse the ignition transformer primary leads, to make the ignition interference additive instead of subtractive.