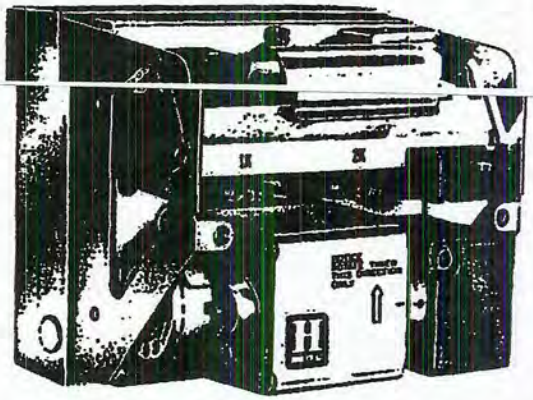
INSTRUCTIONS

R4150G FLAME SAFEGUARD CONTROL



APPLICATION

The R4150G Flame Safeguard Control provides automatic sequencing control of fan (burner motor), damper motor, pilot valve, ignition, and main fuel valve on gas, oil, or gas/oil burners. The R4150G is available in either open damper or lo-hi-lo prepurge models.

The open damper model powers a spring return motor to hold the damper open throughout the prepurge cycle. The damper returns to the low fire position at the end of the prepurge and remains there until the end of the trial for main flame. The lo-hi-lo model (with low fire interlock circuit) provides lo-hi-lo prepurge and modulation of the firing rate during the main flame run cycle.

These controls can be mounted directly on the burner or in an enclosure of six inches minimum depth. A motor driven sequencing timer provides sequencing control; either interrupted or intermittent pilot may be used. The control is cycled by a line voltage controller and a combustion air interlock circuit is provided.

A selection of plug in amplifiers allows the R4150C to be used with rectifying, lead sulfide, or ultraviolet type flame detectors.

FEATURES

GENERAL

PLUG-IN SEQUENCING CHASSIS: Mounts on subbase or panel equipped with quick-connect contacts.

PLUG-IN AMPLIFIERS: Potted, solid-state, color coded:
- Rectification Amplifier (green) R7257A
- Infrared Amplifier (red) R7258A
- Ultraviolet Amplifier (violet) R7259A

ALARM TERMINAL: Powered to operate an external line-voltage alarm on safety-switch lockout.

FLAME-CURRENT JACK: Located on amplifier, provides convenient means of plugging in a microammeter to measure flame signal.

INTERLOCK TERMINALS: Provide for connecting separate safe start and running interlocks.

FLAME SAFEGUARD

FLAME SUPERVISION: Pilot and main flame.

SAFE START: If, after the first 10 seconds of prepurge, the flame relay should pull in for any reason the ignition cycle cannot be started. Instead, the timer will complete its revolution and lock up at start position. A burner start cannot be made if the flame relay holds in for any reason.

CUTOFF OF FUEL AND IGNITION: On loss of flame after trial for pilot ignition period.

SAFETY-SWITCH LOCKOUT: On failure to ignite, or loss of flame; manual reset.

RAPID FLAME RESPONSE: On loss of flame, de-energizes fuel valve in 3 seconds (nominal).

SPECIFICATIONS

MODEL: R4150G1012 Open Damper Purge
R4150G1004 Lo-Hi-Lo Purge

VOLTAGE: 120 volts 60 Hz. 60 Hz. model may be used on 50 Hz. if timing values multiplied by 1.2.

MAXIMUM LOAD RATINGS:

Ignition	540 va
Pilot valve	50 va (pilot duty)
Main valve	250 va pilot duty rating
	2500 va pilot duty inrush rating
	400 va motorized valve rating
	1000 va motorized valve inrush rating
Alarm	75 va pilot duty
Burner motor	9.8 amps (full load at 120v).
	58.8 amps (locked rotor at 120v).

TOTAL CONNECTED LOAD: 2000 va.

POWER CONSUMPTION: 11 watts (max.) at 120v/60 Hz.

PLUG-IN AMPLIFIERS:

R7257A1002 Plug-In Amplifier. Rectification-type (green), 2 to 4 sec. flame response. For use with C7004B, C7005A and B, C7008A, or Q179A rectifying flame-rod devices (for gas), C7003A, C7010A, C7013A or C7014A photocell (for oil), or C7012A, C ultraviolet flame detectors (gas or oil).

R7258A1001 Plug-In Amplifier. Lead sulfide-type (red), 2 to 4 sec. flame response. For use with C7015A lead-sulfide photocell (for gas or oil).

R7259A1000 Plug-In Amplifier. Ultraviolet-type (violet), 2 to 4 sec. flame response. For use with C7027A or C7035A Ultraviolet Flame Detectors (for gas or oil).

Rev. 8-69
J. S.

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Form Number 95-6895-2
Residential Div.

PREPURGE

Lo-Hi-Lo Model — 50 seconds
Open Damper Model — 50 seconds

POSTPURGE

Lo-Hi-Lo Model — 8 seconds
Open Damper Model — 12 seconds

SAFETY SWITCH TIMING: 30 seconds

FLAME RESPONSE TIME: 3 seconds (nominal)

PERMISSIBLE AMBIENT TEMPERATURES:
Minus 20 F to 125 F

ACCESSORIES: 123514A Flame Simulator, for use with R7257A Amplifier only. 123514B Flame Simulator, for use with R7259A Amplifier only.

MOUNTING:
Q520A1030 Panel Style Wiring Base (open bottom).
Q520A1055 Enclosed Wiring Base.
Order base separately. Open damper model is provided without cover; lo-hi-lo model is provided with cover.

MOUNTING DIMENSIONS:
Subbase may be mounted on a standard four by four junction box. Overall depth of the relay and subbase is 6 inches; refer to figure 1 for mounting dimensions.

ORDERING INFORMATION:
Specify—

1. Model number of control.
2. Open damper or Lo-Hi-Lo purge.
3. Type of flame detector to be used.
4. Number and quantity of amplifier.
5. Q520A1030 Base or Q520A1055 Base.
6. Accessories, if required.

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)

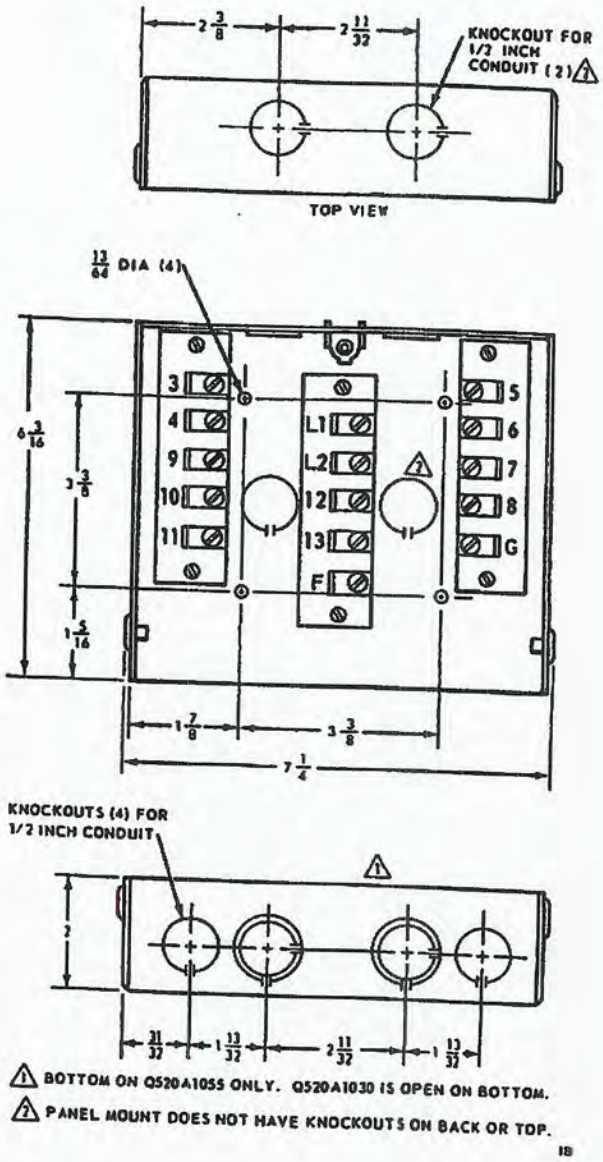

Fig. 1—Installation dimensions of the Q520A wiring base.

INSTALLATION

Use applicable installation instructions provided by the burner manufacturer in addition to the corresponding instruction given here. Before putting the system into service, check out the installation using the procedures on pages 4 and 5 of this sheet, and any others stipulated by the manufacturer.

MOUNTING THE Q520 BASE

See Fig. 1 for installation dimensions.

1. Locate the base where the surrounding temperatures will remain within -20 to 125 F.

2. The base or panel can be mounted in any position, however, the standard vertical position is recommended. The Q520 may be mounted on a standard vertical 4 x 4 junction box.

3. Be sure to allow clearances for servicing and for removal of the chassis.

WIRING TO BASE OR PANEL MOUNT

1. All wiring must comply with applicable electrical codes, including use of NEC Class 1 wiring.

2. Refer to Fig. 2 or 3 for typical wiring connections; follow the burner manufacturer's wiring diagrams if provided.

3. Add required disconnecting means and overload protection to power supply circuit.

4. Check wiring circuits before installing the R4150 chassis.

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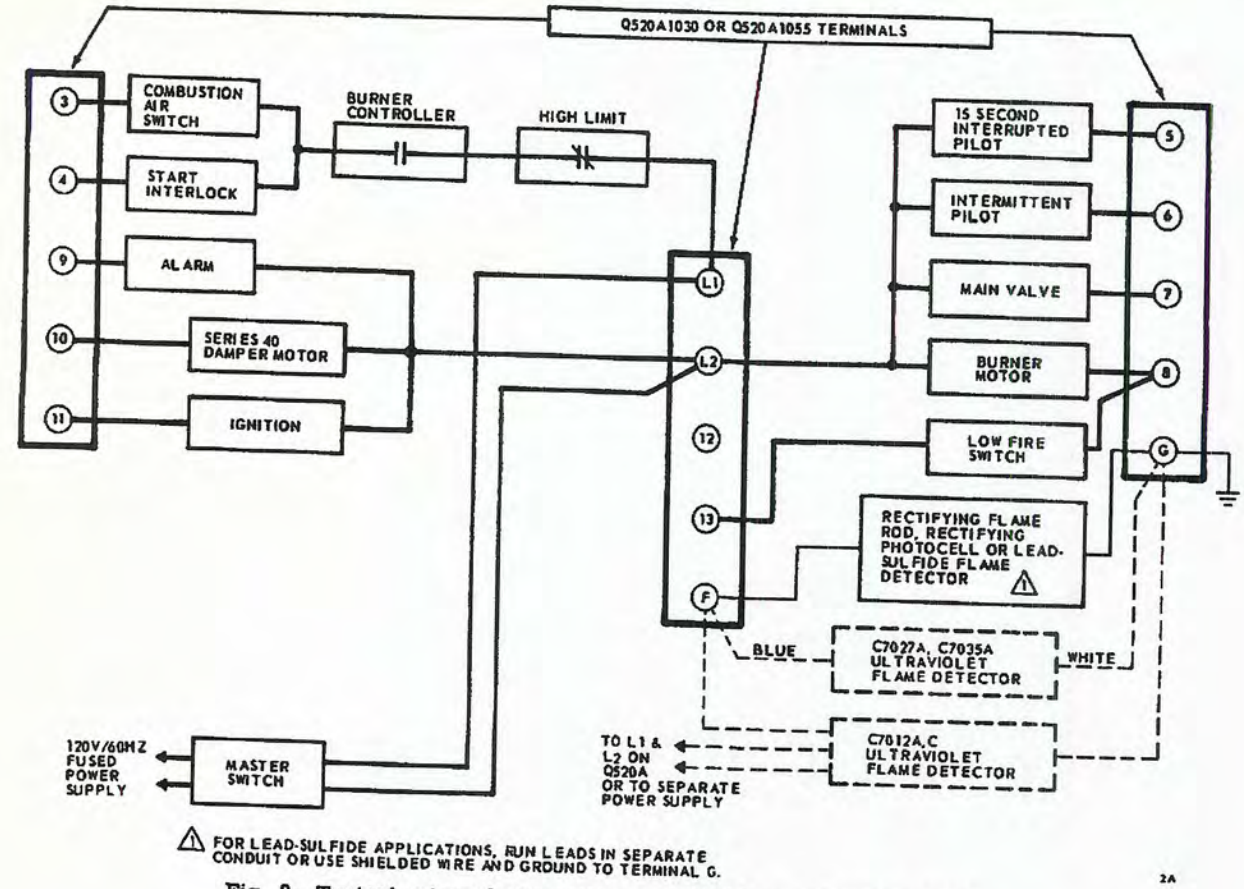

Fig. 2—Typical external connections — R4150G open damper model.

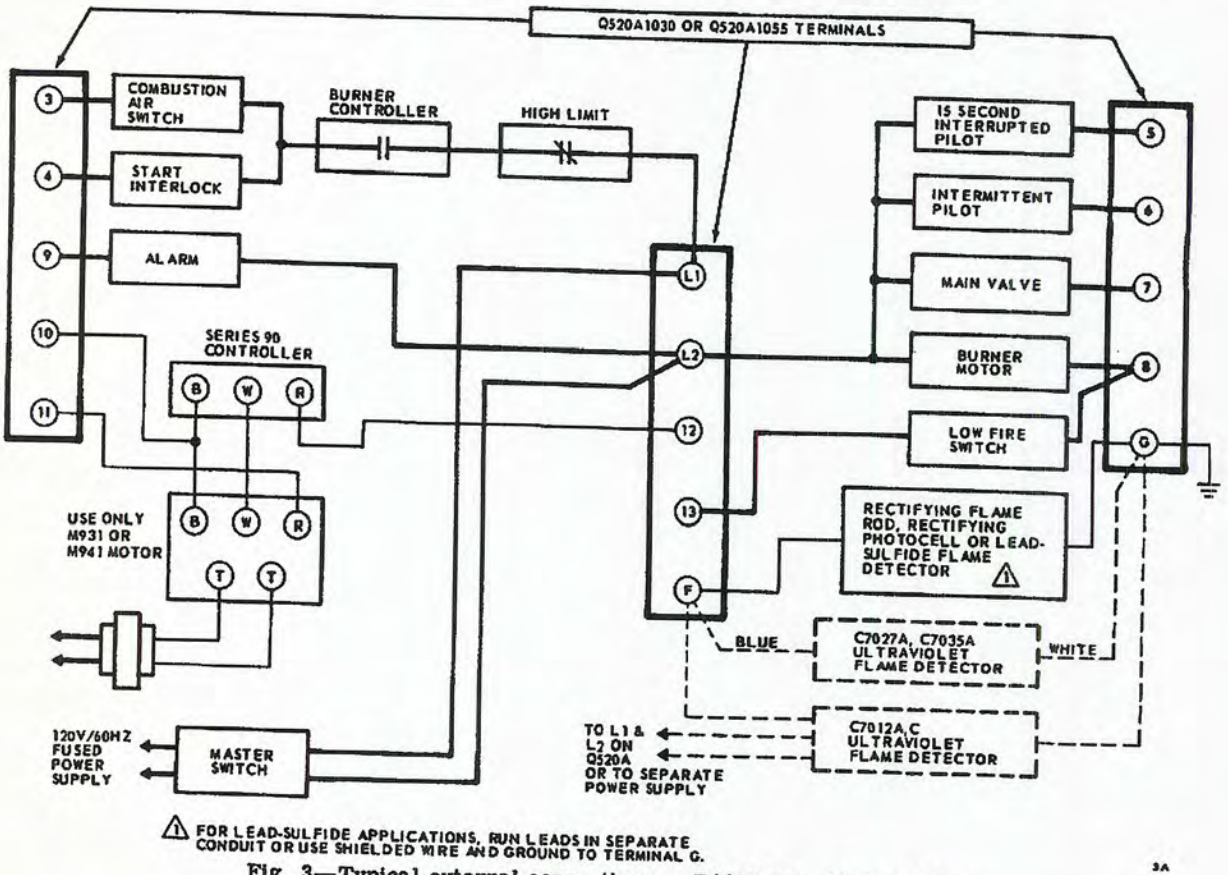

Fig. 3—Typical external connections — R4150G Lo-Hi-Lo model.

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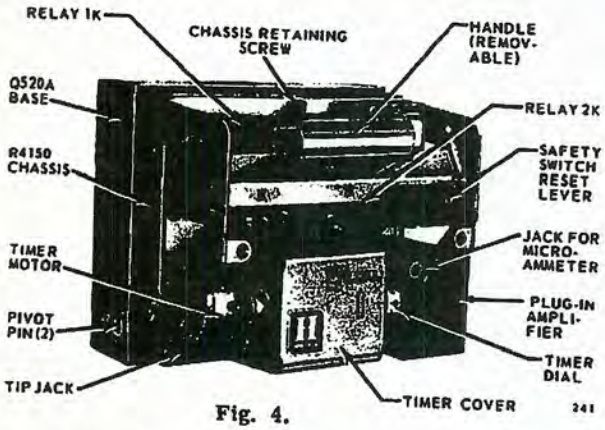

Fig. 4.

INSTALLING THE CHASSIS

1. Open the line switch.

2. Grasp the handle of the R4150 chassis, Fig. 4, and engage the two pivot pins on the base with the chassis hinge brackets.

3. Swing the chassis inward until the spring connectors engage the knife-blade contacts. Push in until the contacts are fully engaged.

4. Tighten the chassis retaining screw.

FLAME-DETECTOR

Proper flame detector installation is the basis of a good flame-safeguard installation. Refer to the instructions packed with the flame detector and to the burner manufacturer's instructions. Follow instructions carefully to make the best possible application of the flame detector.

CHECKOUT

PRELIMINARY INSPECTION

Make certain that:

1. Wiring connections are correct and all terminal screws are tight.

2. Flame detector installation is completed.

3. Correct combination of amplifier and flame detector is used. Refer to Plug-In Amplifiers under Specifications.

4. Burner is completely installed and ready to fire; fuel lines are purged of air.

5. Combustion chamber and flues are clear of fuel.

6. Power is on at system disconnect switch.

FLAME-DETECTOR CHECKOUT

The checkout procedure depends on the type of flame detector, but all types require measuring the flame signal. This should be done with a Honeywell W136A Microammeter, or equivalent, which has a plug for inserting into the meter jack on the plug-in amplifier. (A 117053 Meter Connecting Plug Assembly may be ordered separately if needed for an older W136A.)

Flame-detector performance is affected by:

1. Position, size and burning characteristics of the flame.

2. Hot refractory (except flame rod and ultraviolet flame detectors where refractory temperatures are 2500 F or less).

3. Ambient temperature at detector (except flame rod). See detector instruction sheet.

Flame Detector	FLAME SIGNAL	
	Recommended condition	If less than minimum or unsteady[b], check for:
Rectifying Flame Rod	2 microamperes minimum[a]	Sufficient grounding area. Good ground connections. Proper positioning of flame rod in flame.
Rectifying Photocell[c]	2 microamperes minimum[a]	Proper sighting. Clean lens and/or filter.
C7012A, C Ultraviolet (rectifying) C7027, C7035 Ultraviolet	Must be steady. Will be approx. 4 microamperes Must be steady.	Proper sighting. Clean lens and/or filter.
Lead Sulfide[d]	Must be steady. Will be approx. 4 microamperes	An unsteady signal indicates the detector is viewing an unstable part of flame.

[a] This minimum or stronger signal should be easily obtained if detector is correctly installed and positioned to sense flame properly. This condition must be improved before completing checkout.

[b] Indicates a marginal installation, a defect in the circuit, or a defective component.

[c] Avoid a signal current greater than 5 microamperes as it will shorten photocell life.

[d] The lead-sulfide cells are available in three ranges of flame-sensing sensitivity: 104662A (red), lowest; 104662B (yellow), middle; and 104662C (green), highest sensitivity. But production of a flame signal depends not only on cell sensitivity but also on the resistance of the cell when not exposed to light, and this resistance of different cells in the same sensitivity range may vary considerably. If a sufficiently strong signal cannot otherwise be obtained, try a different cell of the same or a different sensitivity range.

PILOT TURNDOWN TEST

If the R4150 is used to prove a pilot flame, perform the following turndown test to insure that the main burner can be lighted by the smallest pilot flame that will hold in the 2K relay. Proceed as follows:

1. Close the Manual Main Burner Shutoff Cock.

2. Turn the line power off and remove the chassis from the base.

3. Connect a long jumper (about 12 inches) between terminals 6 and 7. When power is restored this will hold open the main automatic gas valve whenever the pilot valve is energized.

NOTE: A long jumper is recommended to insure that the jumper will not be forgotten. The jumper must be removed upon completion of the test.

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4. Reinstall the chassis on the subbase, bringing the jumper out along the side of the base so that it is plainly visible. Be careful not to pinch the wire between the chassis and the base.

5. Prevent motor advancement of the timer as follows:

a. Check that power is off.

b. Remove the timer cover.

c. Insert a clean strip of paper between the M8 contacts (See page 12).

Warning

Most timer contacts are line voltage

6. Close the line power switch.

7. Check that the Manual Main Burner Shutoff Cock is closed, and that the other manual gas valves are open.

8. Start the system on a call for heat (or by closing the controller switch manually.) Relay 1K will pull in but the timer motor will not start.

9. Slowly advance the timer manually, stopping when the pilot is lit and relay 2K pulls in.

10. Turn the pilot down very slowly, STOPPING INSTANTLY when relay 2K drops out. The pilot is at the turndown condition.

11. Open the Manual Main Burner Shutoff Cock. If the main burner does not light within 1 second close the main burner shutoff cock.

12. Wait about 3 minutes and try the light off in step 11 once more. This is done because it may take one attempt to purge the lines and bring sufficient gas to the burner.

13. If the second attempt is unsucessful, make the necessary change in flame detector so that a larger pilot is required to hold in relay 2K. This usually requires resighting the flame detector, or relocating the flame rod farther out on the axis of the pilot flame.

14. Repeat the pilot turndown test (Steps 1-12).

15. If the largest pilot flame that will permit relay 2K to drop out still will not positively light the main burner, repeat this program of adjustment, checkout test, and turndown test until it has been determined that the main burner positively will be lighted with the pilot flame too small to hold in relay 2K. Repeat the lighting several times with the pilot flame at this turndown point to make sure.

16. When the system passes the pilot turndown test:

a. Turn the pilot up to normal.

b. Shut down the system and shut off the power.

c. REMOVE THE JUMPER FROM TERMINALS 6 AND 7.

d. Remove the paper strip from the M8 contacts and replace the timer motor cover.

17. Restore the power and cycle the system for normal operation.

HOT-REFRACTORY HOLD-IN
(photocells only)

Test to make certain that hot refractory will not cause relay 2K to remain in after the end of the normal run; this would indicate inability to detect flame failure, and also prevent a system restart as long as relay 2K remains in.

Operate the burner until the refractory reaches its maximum temperature, then stop the burner by means of the controller. Relay 2K should drop out within 4 seconds; if this does not occur, the photocell is affected by the hot refractory. The condition must be corrected. Try sighting the photocell at a cooler and/or more distant refractory background. If that does not eliminate the trouble, try adding an orifice or filter to the detector. Continue to adjust and test until hot-refractory hold-in is eliminated.

NOTE: Repeat ALL flame-detector and pilot tests after all adjustments have been completed. ALL tests must be satisfied at the FINAL flame-detector position.

SAFETY LOCKOUT

Safety lockout should occur upon failure to ignite the pilot, upon failure to light the main flame, and upon loss of flame. Check each of these conditions as follows to make sure that safety lockout will occur.

A. Failure to Ignite Pilot:

1. Shut off the fuel supply to both pilot and main burner manually.
2. Turn on the power.
3. Reset the safety switch if tripped.
4. Start the system.
5. Pilot will not light. Control should lock out.

B. Failure to light Main Flame:

1. Turn on the fuel supply to the pilot burner only; leave main-burner fuel valve shut off.
2. Reset the safety switch.
3. Start the system.
4. Pilot should light but main burner will not light.

Relay 2K should drop out within 4 seconds after main-burner ends; the safety switch should trip and lock out about 30 seconds after end of the ignition trial.

C. Loss of Flame:

1. Turn on the fuel supply to the main burner; pilot gas supply also must be on.
2. Reset the safety switch.
3. Start the system. Start-up should be normal and the main burner should light normally.
4. After timer stops in normal running position, shut off the main-burner fuel supply to extinguish the main flame.
5. Relay 2K should drop out within 4 seconds.
6. The safety switch should trip and lock out about 30 seconds later.

NOTE: If the safety switch fails to trip and shut down the system on any of these three tests, replace the R4150 with a new one; then rerun all CHECKOUT tests from the beginning.

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OPERATION-OPEN DAMPER MODEL

The wiring schematic below shows all contacts in the standby position (zero seconds). The opening and closing times of each timer contact are shown adjacent to the respective contacts. Refer to the facing page for step by step operation.

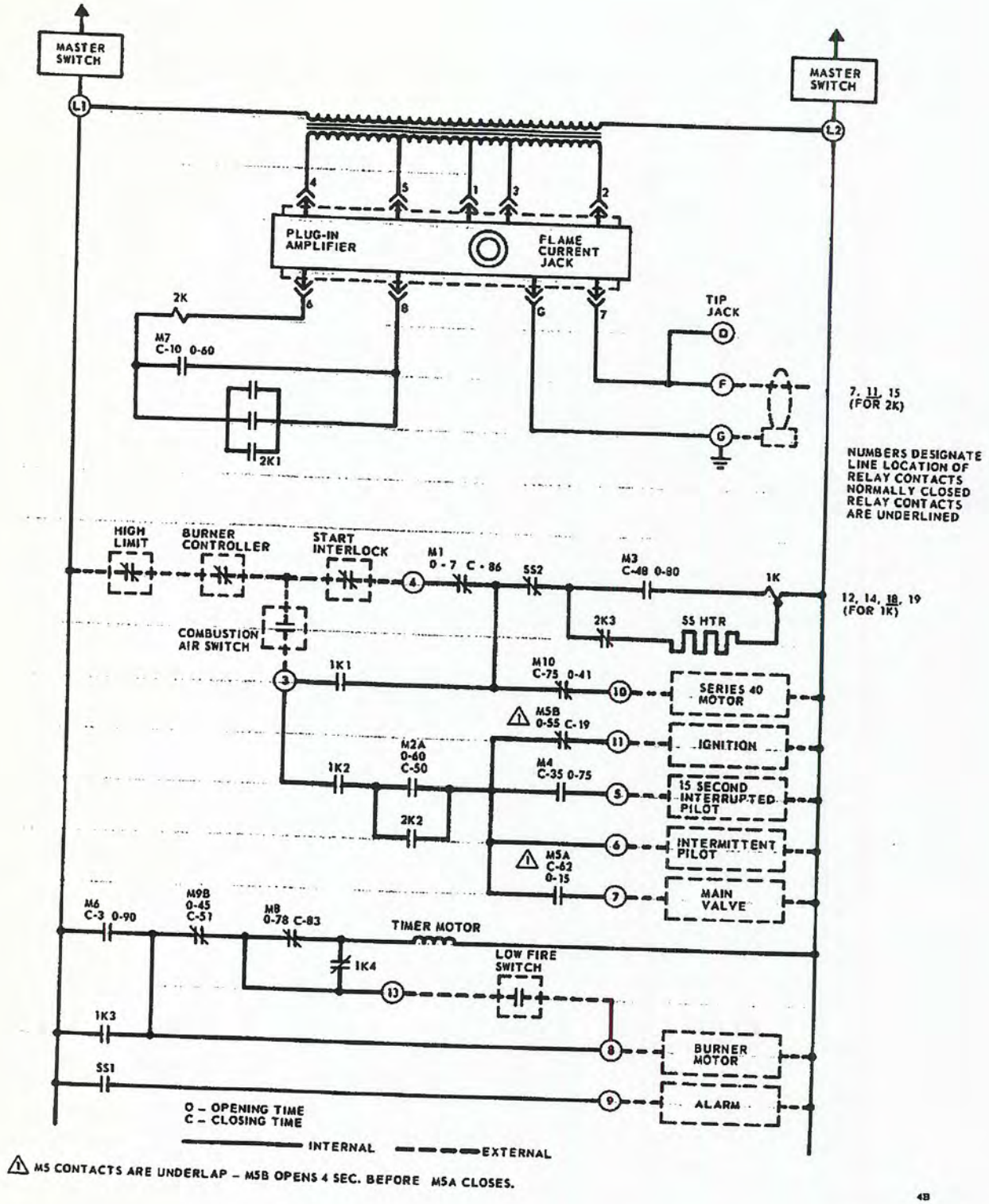

Fig. 5—Schematic diagram of the R4150G open damper model.

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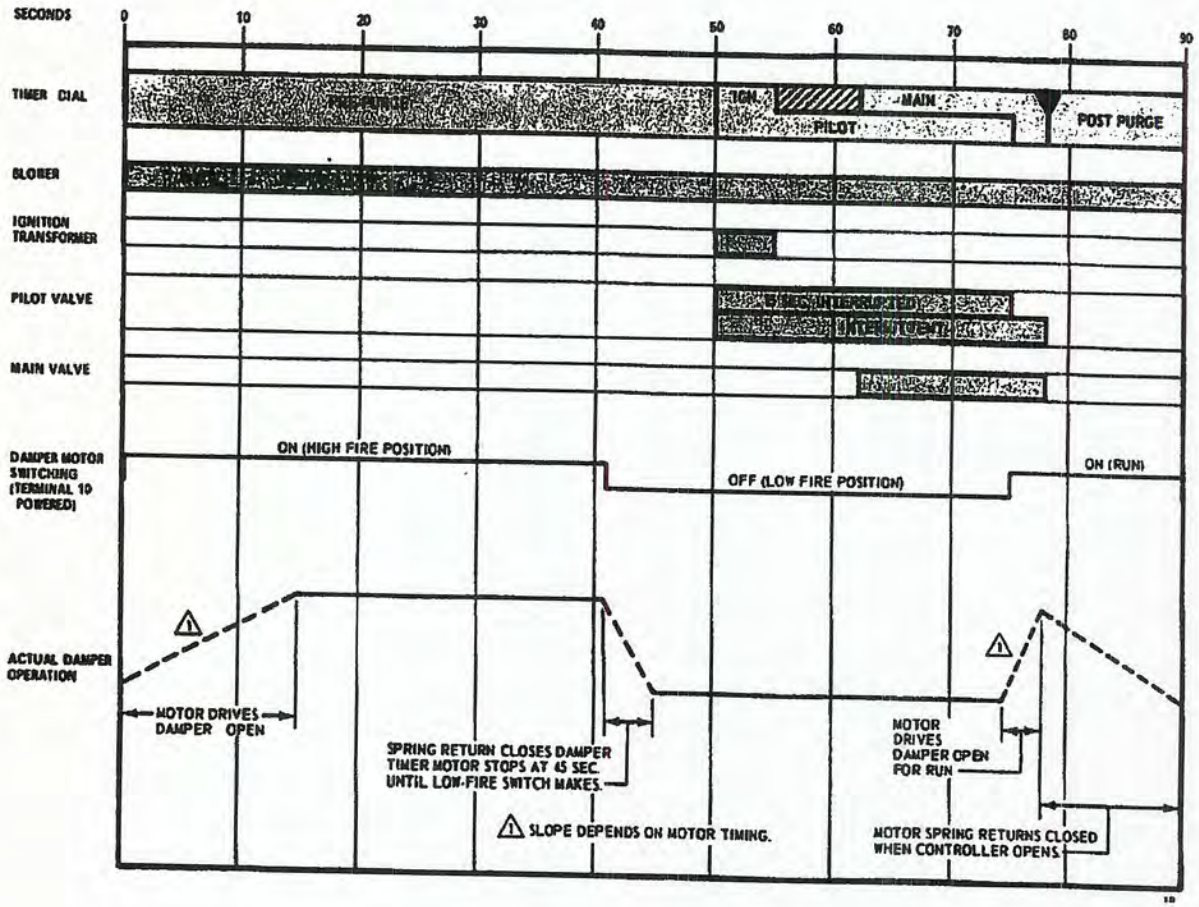
TIMER SEQUENCE - OPEN DAMPER MODEL



STEP BY STEP OPERATION

START

1. 0 seconds; controller closes; if limits and start ing interlocks are closed, relay 1K pulls in. The fan (burner motor) is energized (terminal 8), timer starts, spring return damper motor is powered (terminal 10) and starts driving the damper to the open position.

2. At 7 seconds, M1 opens; combustion air switch must be made (airflow proven) or 1K will drop out.

3. With the damper open, purge continues until 41 seconds when M10 opens; terminal 10 is de-energized to allow the spring return motor to drive the damper closed (low fire position).

4. At 45 seconds, M9B opens to stop the timer motor. The timer cannot start until the low fire switch makes.

5. At 48 seconds, M3 closes to start heating safety switch heater.

6. At 50 seconds, M2A closes to energize pilot and ignition (terminals 5, 6, and 11).

7. At 55 seconds, M5B opens to cut off ignition (terminal 11).

8. M5A closes at 62 seconds to power the main fuel valve (terminal 7). At 60 seconds, M7 and M2A open. If flame is not proven (relay 2K in), ignition and fuel are cut off.

9. At 75 seconds, M4 opens to cut off the pilot if connected to terminal 5 (15 second interrupted pilot). M 10 closes and the damper motor drives open.

10. At 78 seconds, M8 opens to stop the timer and the system is in the run position.

STOP

11. Controller opens, 1K drops out, all valves close, 2K drops out, timer starts, postpurge begins. Motor Spring returns closed.

12. At 90 seconds the firing cycle is complete; M6 opens to cut off the timer and the fan.

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OPERATION-LO-HI-LO MODEL

The wiring schematic below shows all contacts in the standby position (zero seconds). The opening and closing times of each timer contact are shown adjacent to the respective contacts. Refer to the facing page for step by step operation.

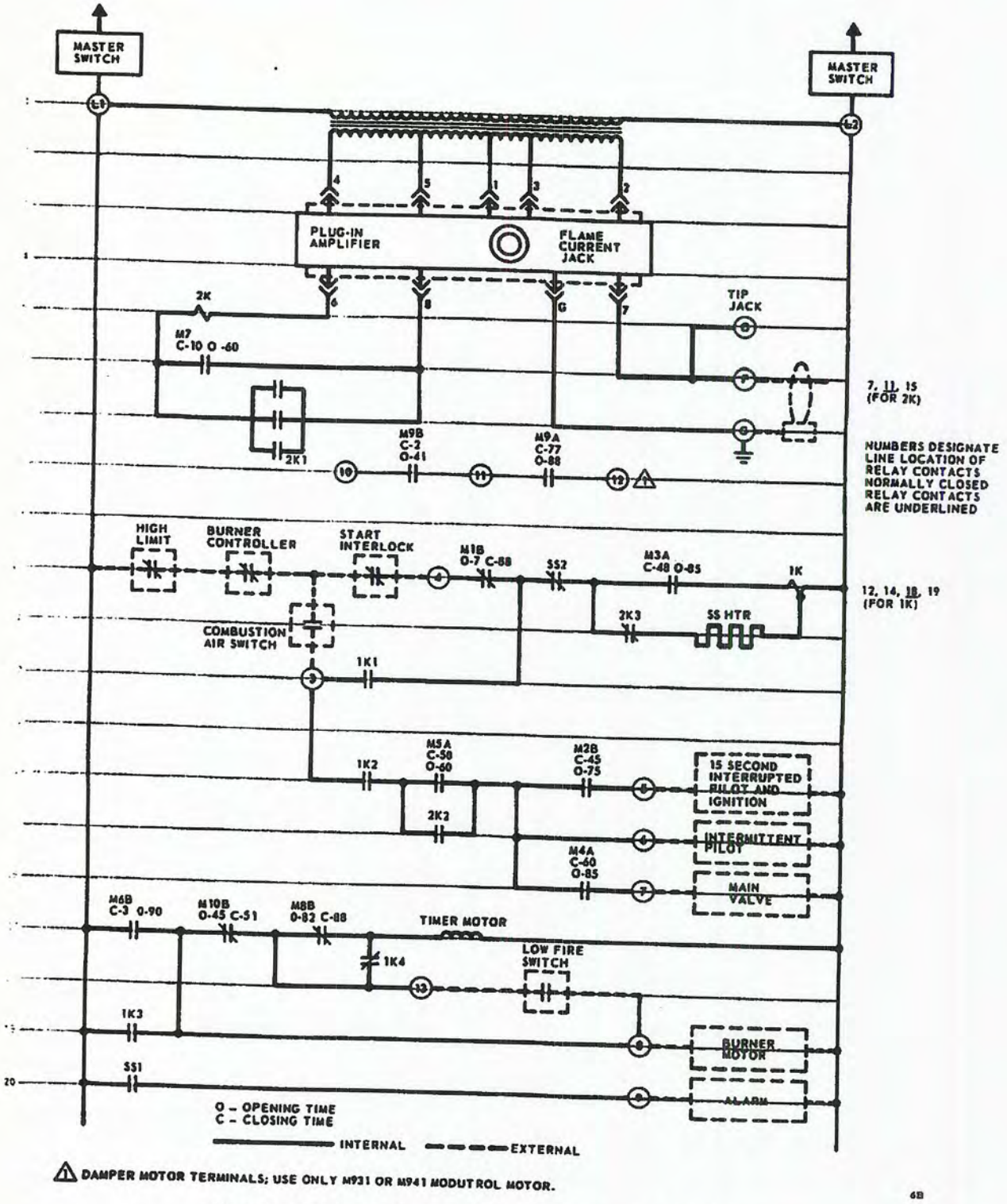

Fig. 6—Schematic diagram of the R4150G Lo-Hi-Lo Model.

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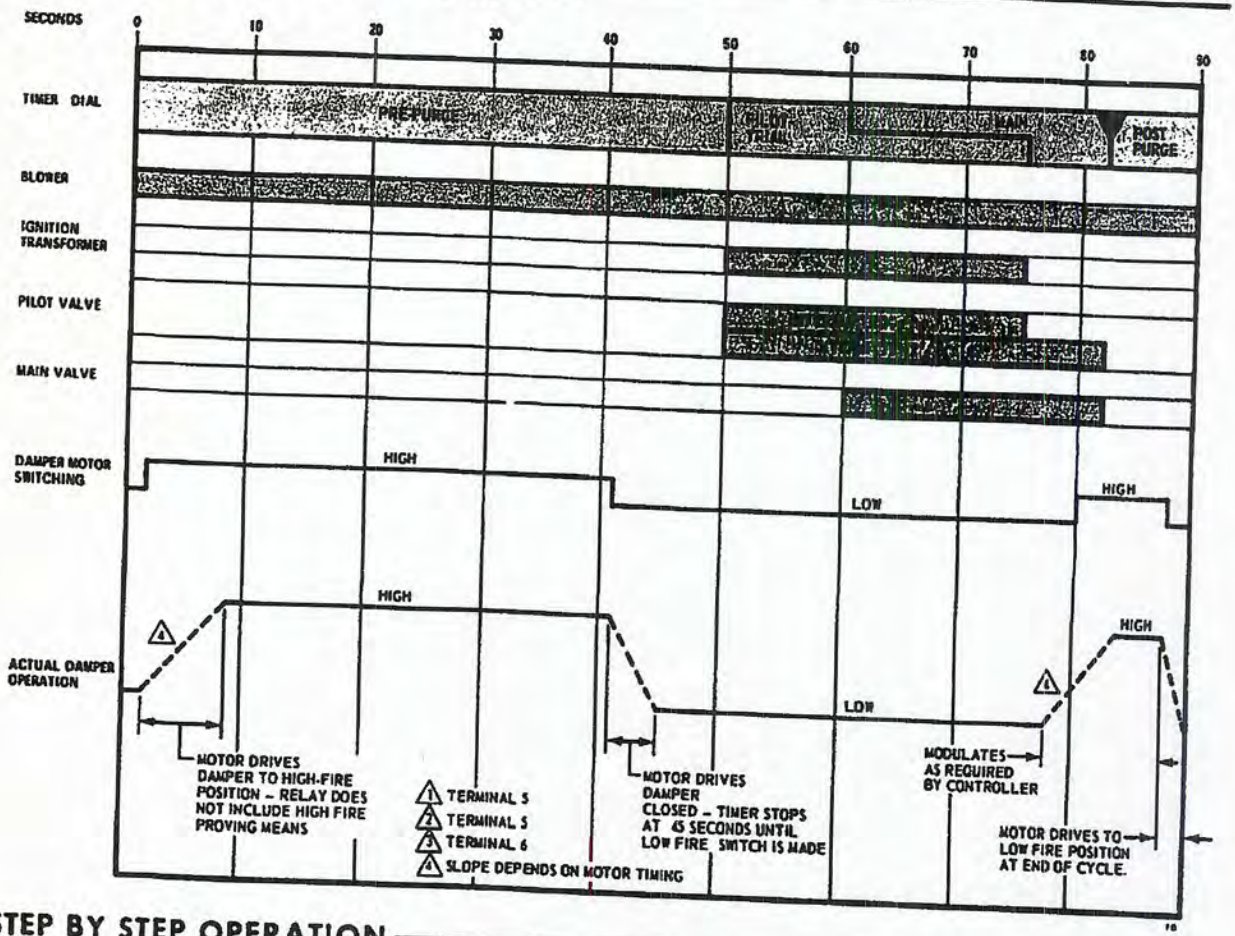
TIMER SEQUENCE - LO-HI-LO MODEL



STEP BY STEP OPERATION

START

1. 0 seconds; controller closes; if limits and starting interlocks are closed, relay 1K pulls in; the fan (burner motor) is energized (terminal 8); timer starts.

2. At 2 seconds, M9B closes to power series 90 motor (terminal 10); motor drives to the high fire position.

3. At 7 seconds, M1 opens; the combustion air switch must be made (air flow proven) or 1K will drop out.

4. With the damper in the high fire position, purge continues until 41 seconds when M9B opens; terminal 10 is de-energized, and the modulating motor drives to the low fire position (due to the spring loaded balancing relay in the series 90 motor).

5. At 45 seconds, M10B opens to stop the timer motor. The timer cannot start until the low fire switch makes.

6. At 50 seconds, M5A closes to energize the pilot and ignition (terminals 5 and 6). M3A closes at 48 seconds to begin heating the safety switch heater.

7. At 59 seconds M5A opens and at 60 seconds M7 opens. If the flame has not been proven (relay 2K in), the ignition and pilot will be cut off.

8. At 61 seconds, M4A closes to power the main fuel-valve (terminal 7).

9. At 75 seconds, M2B opens to cut off power to terminal 5 (ignition and 15 second interrupted pilot if used).

10. At 77 seconds, M9A closes to allow the series 90 controller to operate the firing rate motor.

11. At 82 seconds, M8B opens. The timer stops and the system is in the run position.

STOP

12. Controller opens, 1K, drops out, terminal 7 is de-energized, main fuel valve cut off, relay 2K drops out, postpurge begins.

13. At 88 seconds, M9A opens and the motor drives back to the low fire position.

14. At 90 seconds the firing cycle is complete; M6 opens to cut off the timer and the fan.

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TROUBLE SHOOTING

The first step in troubleshooting the R4150 is to determine the location of the trouble in the system. To do this, refer to the normal operation summary on page 7 or page 9 depending on the model; locate the point where the operation of the control deviates from normal; refer to the applicable procedure (see trouble list below).

NOTE: At the completion of any troubleshooting procedure be sure to perform the CHECKOUT on pages 4 and 5.

PRELIMINARY CHECK

Eliminate the possiblity of trouble being caused by poor contacts of the quick connectors on the R4150 by seeing that they are properly aligned.

a. Turn off the power.
b. Loosen the chassis holddown screw behind the handle.
c. By pulling lightly on the handle the R4150 can be tilted out and removed from the subbase.
d. If a dime slips between the spring connectors, the contacts should be pressed together so that it is necessary to force a dime through.

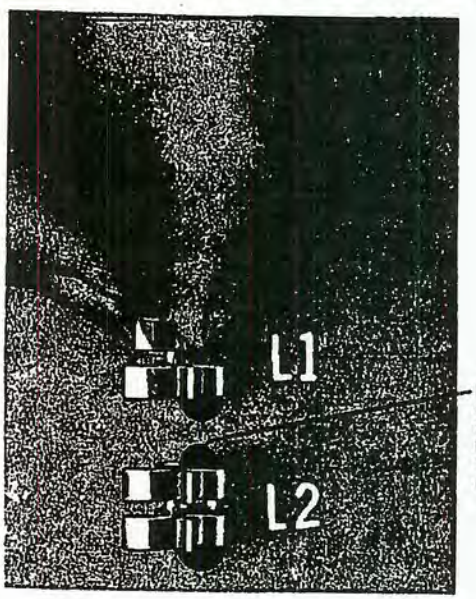


Fig. 7—Adjusting the spring connectors.

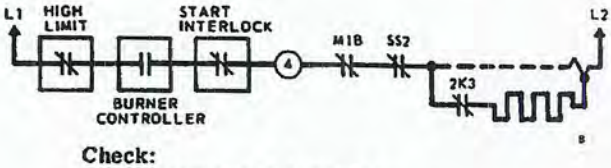
CHECKOUT PROCEDURE

Locate the point on the trouble list that follows where the operation of the control deviates from the normal operation sequence; then proceed to the applicable troubleshooting instructions.

A. On a call for heat, relay 1K does not pull in.
B. Timer motor does not start from normal shutdown position.
C. Relay 1K pulls in but burner motor does not start.
D. Relay 1K drops out in approximately seven seconds, followed by recycling at 90 second intervals.
E. Pilot does not light.
F. Pilot lights but relay 2K does not pull in.
G. Pilot lights, relay 2K pulls in, but main burner does not light.
H. Relay 2K remains in after flame is out.

A. ON CALL FOF HEAT, RELAY 1K DOES NOT PULL IN.

1. Check start circuit. Remove the relay from the subbase.



Check:
a. for power to L1 and L2.
b. that high limit switch is closed.
c. that burner controller is closed or turned up enough to call for heat.
d. that the start interlock is operating properly
e. that timer contacts M1 are clean.
f. that the safety switch (contact SS2) is not tripped.
g. that relay contact 2K3 is clean. (NOTE: relay 2K cannot pull in to open 2K3 until contacts M7 close at 10 seconds.)

2. Remount the R4150 by lifting it back into position and tightening the holddown screw. With power at terminal four, relay 1K will pull in whenever the controller calls for heat if the relay is in the starting position. Reset the safety switch and again check the operation. If relay 1K still does not pull in, replace the R4150.

B. TIMER MOTOR DOES NOT START FROM NORMAL SHUT DOWN POSITION

(when large dot on dial, between POSTPURGE and PREPURGE, is at index position).

NOTE: 1K must be pulled in.

1. Check timer motor circuit:

Check:
a. for power to L1 and L2
b. that contacts 1K3 are closed (relay 1K must have pulled in on the call for heat), and that they are clean.
c. that contacts M8 and M10 are clean.

2. If M8 and M10 contacts are conducting and the relay is operating but the timer still does not run, the timer is defective and the entire R4150 must be replaced (excluding amplifier).

C. IF RELAY 1K PULLS IN BUT BURNER MOTOR DOES NOT START

1. Check burner circuit:

Check:
a. power at terminal 8. If no power at terminal 8, check 1K3. If power cannot be placed on terminal 8, replace R4150 (except amplifier).

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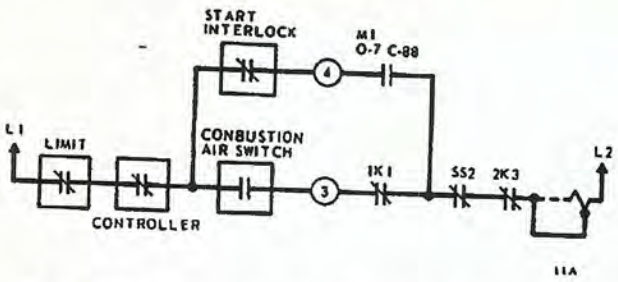
b. Manual switch of burner motor or fan to see that it is closed.
c. motor power supply, motor overload protection, and motor starter.
d. burner motor or draft-fan circuit.
e. burner motor or draft fan according to manufacturer's instructions.

D. IF RELAY 1K DROPS OUT IN APPROXIMATELY 7 SECONDS, FOLLOWED BY RECYCLING AT 90 SECOND INTERVALS

1. Check the combustion-air circuit:



If the relay drops out at 7 seconds, the combustion air switch is not closing the parallel circuit that holds in relay 1K. Check the combustion-air switch and its external circuit, draft fan operation and contacts 1K1.

E. IF PILOT DOES NOT LIGHT

1. Stop timer in the trial-for-pilot position, using the method described under PILOT TURNDOWN TEST to manually control timer motor rotation.
NOTE: During trial-for-pilot the safety switch is heating and will trip out in approximately 30 seconds.

2. Make certain that pilot manual gas cock is open.

3. See whether terminals 5 and 6 are powered. (and terminal 11 on open damper model).
   a. If terminals 5 and 6 are powered but pilot valve does not open, trouble is outside the R4150. Check pilot valve circuit and pilot valve.
   b. If pilot valve opens but pilot does not light, check ignition transformer, ignition circuit, and ignition electrodes.
   c. If terminals 5 and 6 are not powered,
      (1) Open the master switch.
      (2) Clean relay contacts 1K2 and timer contacts M2 and M5 as instructed under CLEANING CONTACTS, page 12.
      (3) Recycle the timer, then stop rotation at the trial-for-pilot position.
      (4) If terminals 5 and 6 still are not powered, replace the R4150, then reinstall amplifier.

F. IF THE PILOT LIGHTS BUT RELAY 2K DOES NOT PULL IN

The pilot will be extinguished within about 10 seconds; the safety switch will trip about 30 seconds later.

1. Allow the timer to complete its revolution, then open the master switch.
   a. Clean timer contacts M7 as instructed under CLEANING CONTACTS, page 12.
   b. Close the master switch, reset the safety switch, and cycle the system.
2. If the trouble still exists, again allow the timer to complete its revolution. The flame sensor, plug in amplifier, and the flame relay (2K) form a series circuit which can be broken by failure of any of the components.
   a. Plug a W136A Microammeter into the jack on the plug-in amplifier.
   b. Reset the safety switch and cycle the timer motor. When the timer reaches the PILOT TRIAL position and the PILOT IS LIGHTED, stop the timer using the method outlined on page 5, under pilot turndown test.
   c. Note the microammeter reading. If at least 2 microamperes and steady for a flame rod or rectifying photocell flame detector, or steady for an ultraviolet or lead-sulfide flame detector, a fault in the plug-in amplifier is preventing relay 2K from pulling in. Replace the amplifier with a new one of the same number. But, if the meter reading is less than 2 microamperes or unsteady, proceed to step 3.
3. The procedure in this step depends on the type of flame detector used.
   a. If a flame-rod, rectifying photocell, or C7012A flame detector, open the master switch, disengage the chassis from the base and remove the lead from the F terminal. Replace the chassis, then close the master switch. Repeat 2 above. Plug the probe end of a Honeywell No. 123514A Flame Simulator into the tip jack on the R4150 chassis, then touch the lead of the Simulator against the chassis. Relay 2K should pull in. If it does not, install a new R4150 chassis.

> NOTE: If a C7027A or C7035A flame detector with R7259A amplifier, use a No. 123514B Flame Simulator.

   b. If the flame detector is a lead-sulfide cell, open the master switch, disengage the chassis from the base, and remove the lead from the F terminal. Replace the chassis and close the master switch. Repeat 2b above. Remove 3/4 inch of insulation from each end of a 10 inch length of insulated wire; plug one end of this wire into the tip jack, then tap the free end of the wire against the chassis frame at a rapid frequency to simulate flame. Relay 2K should pull in. If it does, proceed to step 4. If it does not, install a new R4150 Chassis.
4. The pulling in of relay 2K in the previous step shows that the trouble is in the flame detector or the flame detector circuit outside the R4150. Clean any detector lens and filter, and check the detector circuit for open- and/or short-circuit. If necessary, resight or reposition the detector. Replace the detector if trouble persists. (Open the master switch before reconnecting the flame detector; then close the switch.)

> IMPORTANT:
> If any change other than cleaning the lens and filter and correcting opens and grounds in the circuit are made in the flame-detector system, a complete checkout of the flame detector will be required.

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G. IF THE PILOT LIGHTS AND RELAY 2K PULLS IN, BUT MAIN BURNER DOES NOT LIGHT

Check voltage between terminals L2 and 7 when the timer reaches main burner.

1. If the voltmeter indicates normal line voltage, the trouble is outside the R4150.
   a. Check the main-fuel hand cock, the main-fuel valve, and the main-fuel valve circuit including any interlocks.
   b. Check the pilot flame; make a pilot-turn-down test if needed.

2. If the voltmeter indicates no voltage, open the line switch.
   a. Clean relay contacts 2K2 and timer contacts M5 as instructed under CLEANING CONTACTS, page 12. Then close the line switch.
   b. Repeat the voltage test. If test still shows no voltage, replace the R4150 with a new one, then reinstall the plug-in amplifier.

H. IF RELAY 2K REMAINS IN AFTER FLAME IS EXTINGUISHED

1. If the flame detector is a rectifying flame-rod or ultraviolet flame detector, install a new plug-in amplifier.

2. If the flame detector is a rectifying phototube or lead-sulfide cell plug the jack end of the 123514A or B Flame Simulator into the jack of the plug-in amplifier to disconnect the flame circuit.
   a. If that does not cause relay 2K to drop out, install a new plug-in amplifier.
   b. If plugging into the meter jack or shorting the tip jack to ground causes relay 2K to drop out, the trouble is caused by hot-refractory hold-in, detector failure, or other flame simulating condition.
      (1) Resight the flame detector at a cooler or more remote area of the refractory.
      (2) Recheck the flame-detector current for the condition recommended in the CHECK-OUT section. Replace the detector if necessary.
      (3) Remove any flame-simulating condition such as false light, etc.
      (4) Any change made in the detector or its sighting will require a pilot-turndown test.

3. If the trouble persists, replace the R4150 with a new one, then reinstall the plug-in amplifier.

SERVICE INFORMATION

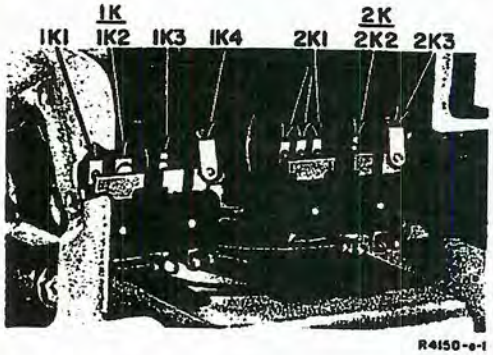
SCHEDULED INSPECTION AND MAINTENANCE

A schedule should be set up, and followed, for periodic inspection and maintenance, including burner and all other controls as well as the R4150. Include the following in that schedule.

1. Keep burner (s) and fuel mixture always adjusted according to the burner manufacturer's recommendations.

2. Clean the flame-detector lens and sight tube, and check the detector output. See subject FLAME DETECTOR CHECKOUT, page 4.

3. If a flame-rod detector is used check the flame rod and its output.

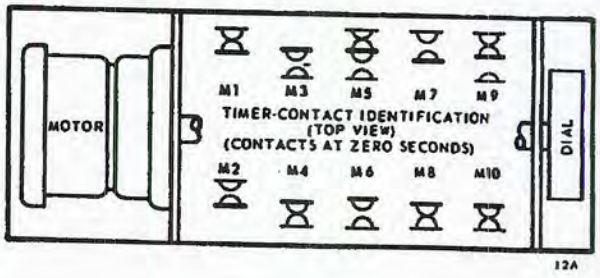


CONTACT CLEANING

Contacts should be cleaned only when a careful check made as described under TROUBLESHOOTING indicates the possibility of dirty contacts.

Contacts should be cleaned only with Honeywell Contact Cleaner, part no. 132569. Directions for using the cleaner are printed on the can. Do not use abrasive materials or any other liquid contact cleaner. Do not push in the control relays.

The location of the various relay and timer contacts are shown in the two figures below.



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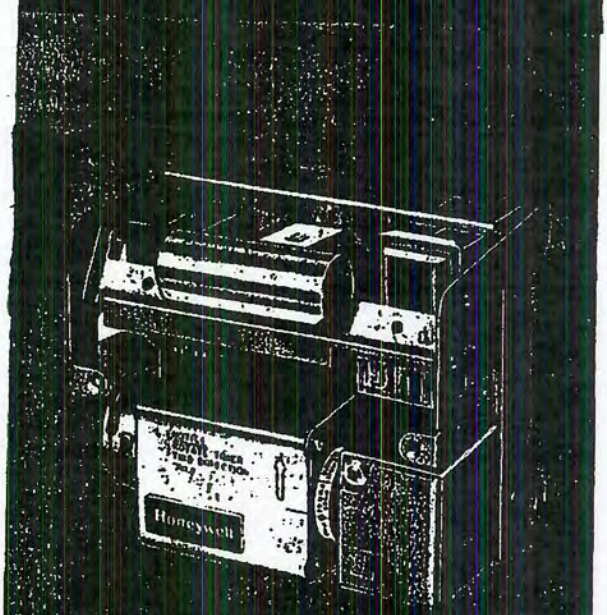
Honeywell

FLAME SAFEGUARD PROGRAMMING CONTROL



R4150H

THE R4150H FLAME SAFEGUARD PROGRAMMING CONTROL IS A PROGRAMMER WHICH PROVIDES FLAMEOUT PROTECTION PLUS AUTOMATIC SEQUENCING OF BURNER MOTOR, FIRING RATE MOTOR, PILOT VALVE, IGNITION, AND MAIN FUEL VALVE ON GAS, OIL, OR COMBINATION GAS-OIL BURNERS.

- ☐ Motor driven timer controls the operating sequence.
- ☐ Programmer provides 15 or 60 second (field selectable) interrupted pilot.
- ☐ Firing rate sequence includes low fire start, low fire prepurge, and modulation of the firing rate during the "run" period.
- ☐ Safe start check prevents burner start if a flame simulating component failure, or actual flame, is present at start.
- ☐ Safety switch lockout will occur on failure to ignite pilot or main flame, or on loss of flame while burner is running.
- ☐ Safety switch lockout shuts down the system; timer will complete its revolution and lock up at the start position; safety switch must be manually reset to restart the system.
- ☐ On loss of flame, fuel valve is de-energized in 3 seconds (nominal).
- ☐ If combustion air switch opens after 12 seconds, system will be shut down and programmer will recycle.
- ☐ Firing rate motor switching is incorporated for either a 2-position or a modulating motor.
- ☐ Plug-in sequencing chassis mounts on subbase equipped with quick-connect contacts.
- ☐ Selection of potted, solid state, color-coded, interchangeable plug-in amplifiers allow same programmer to use rectification, infrared, or ultraviolet flame detectors.
- ☐ Flame current jack, located on amplifier, provides means of plugging in microammeter to measure flame signal with system in operation.
- ☐ Alarm terminal is available to operate an external line volage alarm on safety switch lockout.

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MODELS:

R4150H Flame Safeguard Programming Control—flame safeguard protection and sequencing control for use on gas, oil, or combination gas-oil burners.

VOLTAGE: 120, 208, 240 volts, 60 Hz. 60 Hz model may be used on 50 Hz if timing values are multiplied by 1.2.

MAXIMUM LOAD RATINGS:

Ignition:	540 va.
Pilot valve:	50 va (pilot duty).
Main valve:	250 va pilot duty rating.
	2500 va pilot duty inrush rating.
	400 va motorized valve rating.
	1000 va motorized valve inrush rating.
Alarm:	75 va pilot duty.
Burner motor:	9.8 amps (full load at 120v).
	58.8 amps (locked rotor at 120v).

TOTAL CONNECTED LOAD: 2000 va.

POWER CONSUMPTION: 14 watts (max.) at rated voltage.

PLUG-IN AMPLIFIERS (Must be ordered separately):

R7257A Plug-In Amplifier. Rectification-type (green), 2 to 4 sec. flame response. For use with C7004B, C7005A and B, C7008A, or Q179A Rectifying Flame Rods (for gas); C7003A, C7010A, C7013A, or C7014A Photocell (for oil); or C7012A, C Ultraviolet Flame Detectors (gas or oil).

R7258A Plug-In Amplifier. Infrared type (red), 2 to 4 sec. flame response. For use with C7015A or 104662 Lead Sulfide Photocells (for gas or oil).

R7259A Plug-In Amplifier. Ultraviolet type (violet), 2 to 4 sec. flame response. For use with C7027A or C7035A Ultraviolet Flame Detectors (for gas or oil).

PREPURGE: 30 seconds.

TRIAL FOR PILOT: 10 seconds.

TRIAL FOR MAIN FLAME: 15 or 60 sec. (field selectable).

POSTPURGE: 15 seconds.

SAFETY SWITCH TIMING: 30 seconds

FLAME RESPONSE TIME: 3 seconds (nominal).

AMBIENT TEMPERATURE RATING: -20 to 125 F (0 to 125 when used with R7258A).

MOUNTING: 3-sided Q520A1089 Wiring Subbase, or 4-sided Q520A1121 Wiring Subbase; both have 20 knife-blade contacts (order subbase separately).

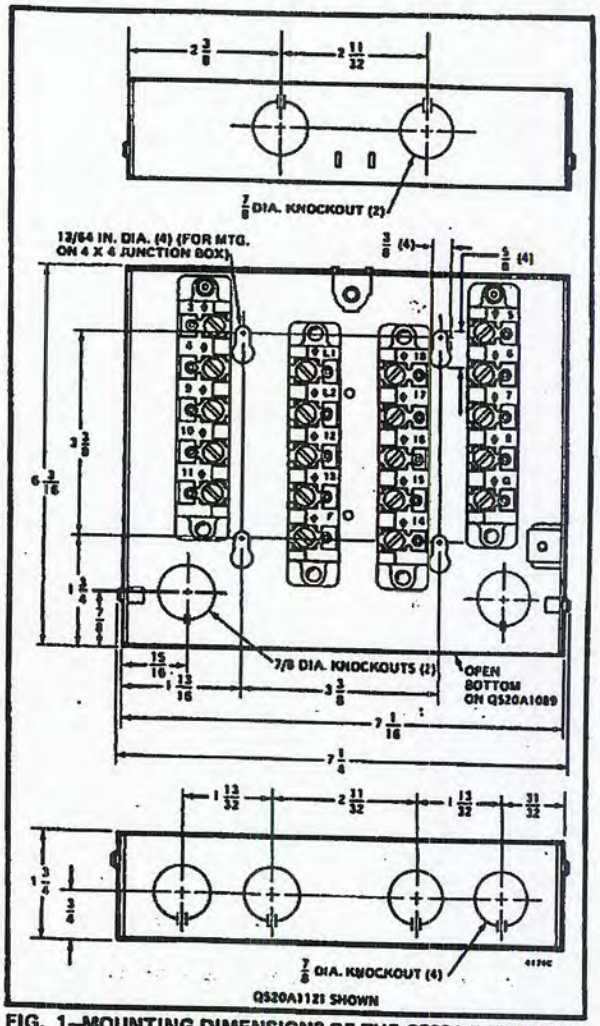

FIG. 1—MOUNTING DIMENSIONS OF THE Q520A WIRING SUBBASE (IN INCHES).

(continued on page 3)

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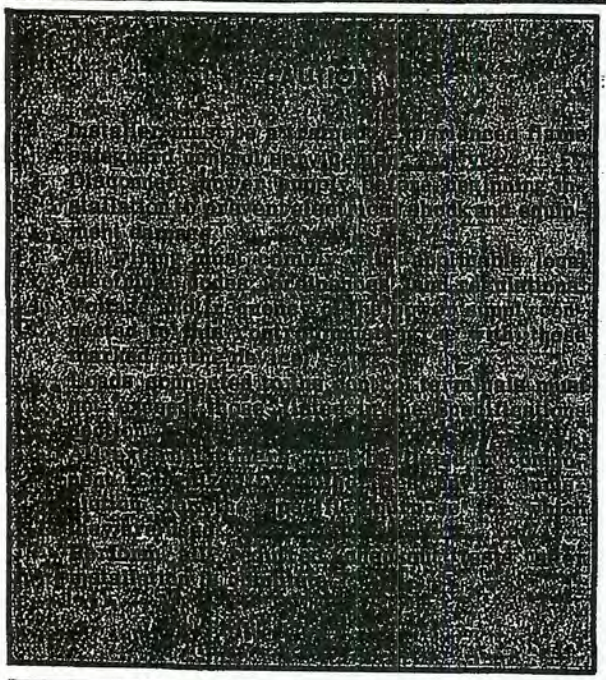
ACCESSORIES:

1. Cover assemblies (required if replacing a device without a cabinet): 132546A—with reset button on front, or 124872A—without reset button.
2. 123514A Flame Simulator, for use with R7257A Amplifier.
3. 123514B Flame Simulator, for use with R7259A Amplifier.
4. W136A Microammeter, includes 117053 Meter Connector Plug.



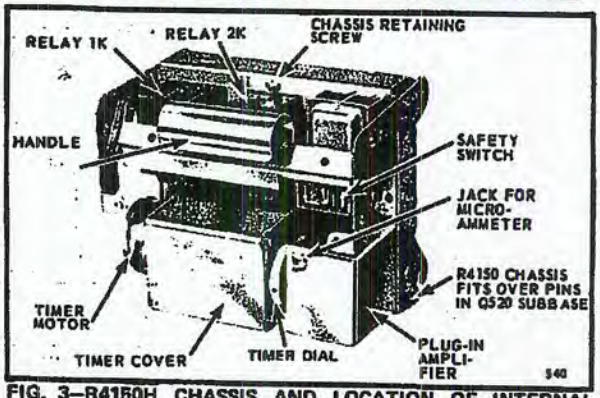
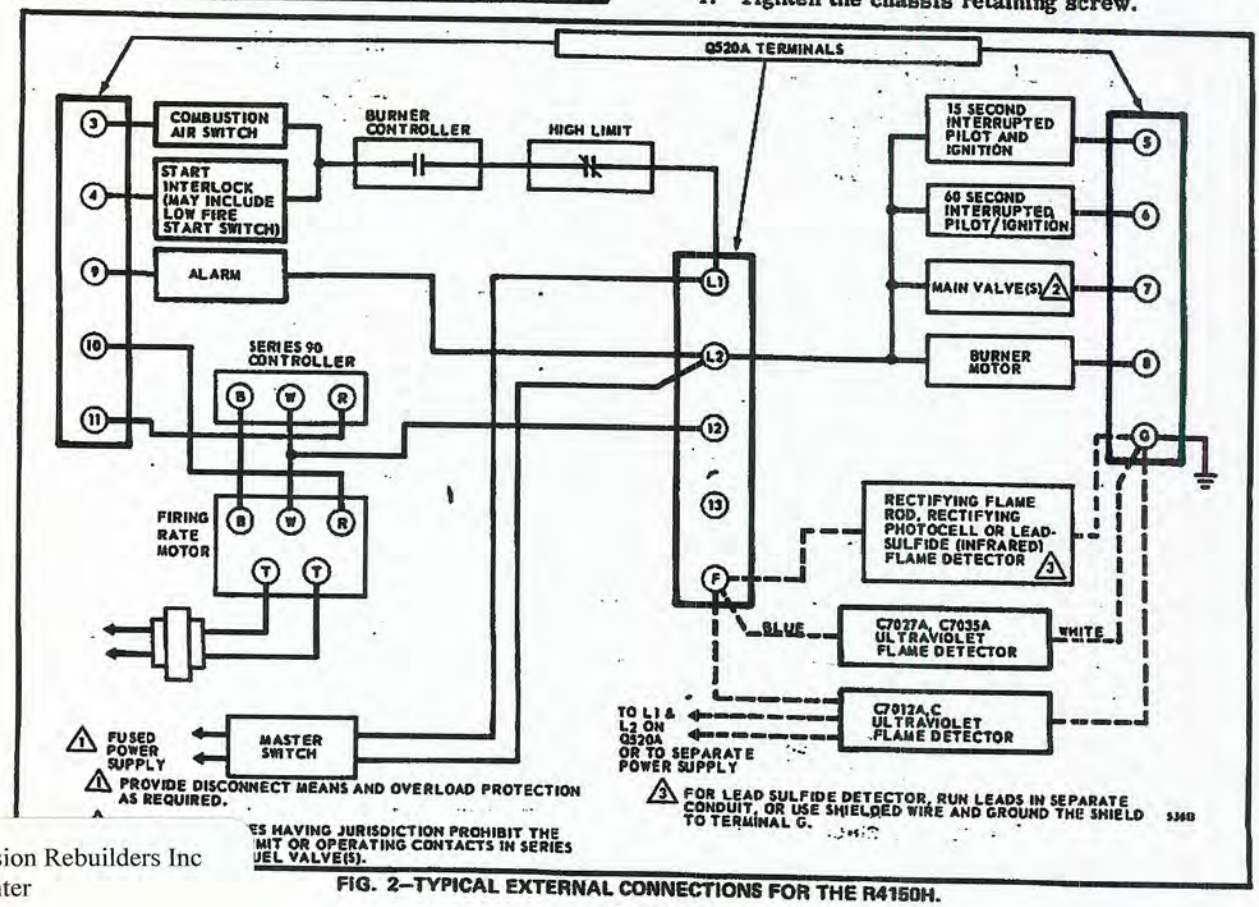


FIG. 3—R4150H CHASSIS AND LOCATION OF INTERNAL PARTS.

INSTALLING THE CHASSIS

1. Check that the line switch is open.
2. Grasp the handle of the R4150 chassis, Fig. 3, and engage the two pivot pins on the base with the chassis hinge brackets.
3. Swing the chassis inward until the spring connectors engage the knife-blade contacts. Push in until the contacts are fully engaged.
4. Tighten the chassis retaining screw.



ES HAVING JURISDICTION PROHIBIT THE MIT OR OPERATING CONTACTS IN SERIES UEL VALVE(S).

FIG. 2—TYPICAL EXTERNAL CONNECTIONS FOR THE R4150H.

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The wiring schematic below shows all contacts in the standby position (zero seconds). The opening and closing times of each timer contact are shown adjacent to the respective contacts. Refer to the facing page for step by step operation.

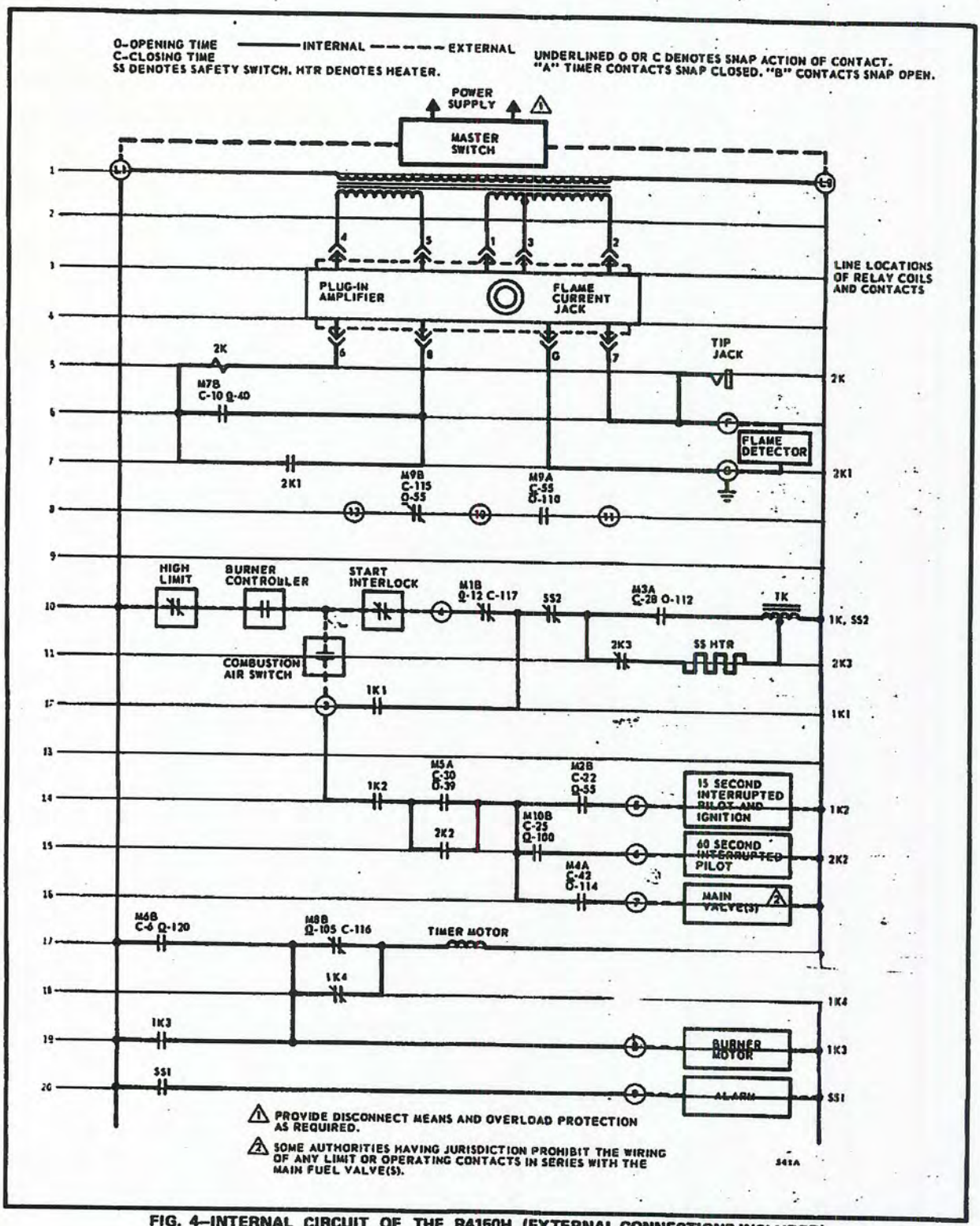

FIG. 4–INTERNAL CIRCUIT OF THE R4150H (EXTERNAL CONNECTIONS INCLUDED).

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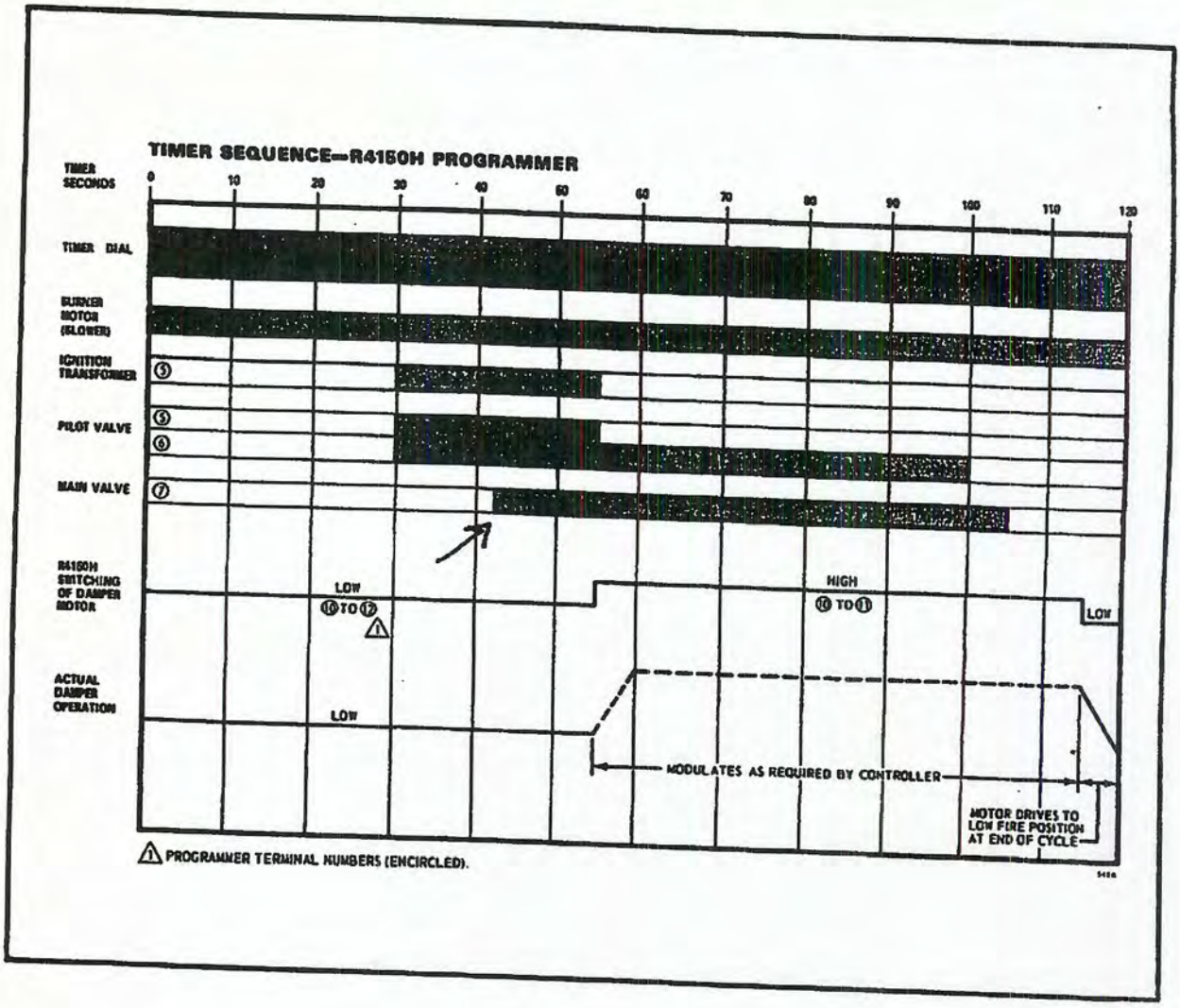

STEP-BY-STEP OPERATION

START

1. At 0 seconds, controller closes; if limits and starting interlocks are closed, relay 1K pulls in, the fan (burner motor) is energized and the timer starts.

2. At 12 seconds, M1 opens; the combustion air switch must be made (air flow proven) or the 1K relay will drop out.

3. At 30 seconds, M5A closes to energize the pilot and ignition (terminals 5 and 6). M3A closes at 28 seconds to begin heating the safety switch heater.

4. At 39 seconds, M5A opens and at 40 seconds M7B opens. If the flame has not been proven (relay 2K pulled in), the ignition and pilot will be cut off.

5. At 42 seconds, M4A closes to power the main fuel valve (terminal 7).

6. At 55 seconds, M2B opens to cut off power to terminal 5 (ignition and 15 second trial for main flame if used).

7. M9B opens, M9A closes to allow the Series 90 controller to modulate the firing rate motor.

8. At 100 seconds, M10B opens to cut off power to terminal 6 and end the 60 second trial for main flame ignition, if used.

9. At 105 seconds, M8B opens and the timer stops. The system is in the run position.

STOP

10. Controller opens, 1K drops out, terminal 7 is de-energized to cut off the main fuel valve, relay 2K drops out, postpurge begins.

11. At 115 seconds, M9B closes and the firing rate motor drives back to the low fire position.

12. At 120 seconds, the firing cycle is complete; M6 opens to cut off the timer and the fan.

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PRELIMINARY INSPECTION

Make certain that:

1. Wiring connections are correct and all terminal screws are tight.

2. Flame detector installation is completed.

3. Correct combination of amplifier and flame detector is used. Refer to Plug-In Amplifiers under Specifications.

4. Burner is completely installed and ready to fire; fuel lines are purged of air.

5. Combustion chamber and flues are clear of fuel.

6. Power is on at system disconnect switch.

FLAME DETECTOR CHECKOUT

The checkout procedure depends on the type of flame detector, but all types require measuring the flame signal. This should be done with a Honeywell W136A Microammeter, or equivalent, which has a plug for inserting into the meter jack on the plug-in amplifier. (A 117053 Meter Connector Plug Assembly may be ordered separately if needed for an older W136A.)

Flame detector performance is affected by:

1. Position, size, and burning characteristics of the flame.

2. Hot refractory (except flame rod and ultraviolet flame detectors where refractory temperatures are 2500 F or less).

3. Ambient temperature at detector (except flame rod). See detector instruction sheet.

Flame Detector	FLAME SIGNAL	
	Recommended condition	If less than minimum or unsteady[b], check for:
Rectifying Flame Rod	2 microamperes minimum[a]	Sufficient grounding area. Good ground connections. Proper positioning of flame rod in flame.
Rectifying Photocell[c]	2 microamperes minimum[a]	Proper sighting. Clean lens and/or filter.
C7012A, C Ultraviolet (rectifying) C7027, C7035 Ultraviolet	Must be steady. Will be approx. 6 microamperes. Must be steady.	Proper sighting. Clean lens and/or filter.
Lead Sulfide	Must be steady. Will be approx. 4 microamperes.	An unsteady signal indicates the detector is viewing an unstable part of flame.

[a]This minimum or stronger signal should be easily obtained if detector is correctly installed and positioned to sense flame properly. This condition must be improved before completing checkout.
[b]Indicates a marginal installation, a defect in the circuit, or a defective component.
[c]Avoid a signal current greater than 5 microamperes as it will shorten photocell life.

PILOT TURNDOWN TEST

If the R4150 is used to prove a pilot flame, perform the following turndown test to insure that the main burner can be lighted by the smallest pilot flame that will hold in the 2K relay. Proceed as follows:

1. Close the manual main burner shutoff cock.

2. Turn the line power off and remove the chassis from the base.

3. Connect a long jumper (about 12 inches) between terminals 6 and 7. When power is restored this will hold open the main automatic gas valve whenever the pilot valve is energized.

NOTE: A long jumper is recommended to insure that the jumper will not be forgotten. The jumper must be removed upon completion of the test.

4. Reinstall the chassis on the subbase, bringing the jumper out along the side of the base so that it is plainly visible. Be careful not to pinch the wire between the chassis and the base.

5. Prevent motor advancement of the timer as follows:

   a. Check that power is off.

   b. Remove the timer cover.

   c. Insert a clean strip of paper between the M8B contacts (see page 10).

6. Close the line power switch.

7. Check that the manual main burner shutoff cock is closed and that the other manual gas valves are open.

8. Start the system on a call for heat (or by closing the controller switch manually). Relay 1K will pull in but the timer motor will not start.

9. Slowly advance the timer manually, stopping when the pilot is lit and relay 2K pulls in.

10. Turn the pilot down very slowly, STOPPING INSTANTLY when relay 2K drops out. The pilot is at the turndown condition.

11. Open the manual main burner shutoff cock. If the main burner does not light within 1 second, close the main burner shutoff cock.

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12. If the light-off attempt is unsuccessful, make the necessary flame detector change so that a larger pilot is required to hold in relay 2K. This usually requires resighting the flame detector or relocating the flame rod farther out on the axis of the pilot flame.

13. Repeat the pilot turndown test (Steps 1-11).

14. If the largest pilot flame that will permit relay 2K to drop out still will not positively light the main burner, repeat this program of adjustment, checkout test, and turndown test until it had been determined that the main burner positively will be lighted with the pilot flame too small to hold in relay 2K. Repeat the lighting several times with the pilot flame at this turndown point to verify smooth lightoff.

15. When the system passes the pilot turndown test:

a. Turn the pilot up to normal.

b. Shut down the system and shut off the power.

c. REMOVE THE JUMPER FROM TERMINALS 6 AND 7.

d. Remove the paper strip from the M8 contacts and replace the timer motor cover.

16. Restore the power and cycle the system for normal operation.

HOT REFRACTORY HOLD-IN

(Photocells only)

Test to make certain that hot refractory will not cause relay 2K to remain in after the end of the normal run; this would indicate inability to detect flame failure and also prevent a system restart as long as relay 2K remains in.

Operate the burner until the refractory reaches its maximum temperature, then stop the burner by means of the controller. Relay 2K should drop out within 4 seconds; if this does not occur, the photocell is affected by the hot refractory. The condition must be corrected. Try sighting the photocell at a cooler and/or more distant refractory background. If that does not eliminate the trouble, try adding an orifice or filter to the detector. Continue to adjust and test until hot refractory hold-in is eliminated.

IGNITION SPARK RESPONSE TEST (UV DETECTORS)

The flame relay should not respond (pull in) to ignition spark. To determine flame detector sensitivity to ignition spark, perform the following test.

1. Shut the manual pilot and main fuel cocks.

2. Start the system by raising the controller set point or pressing the start button. After prepurge the ignition will come on but the pilot will not light.

3. Check the flame relay 2K. The relay should not pull in.

4. If the relay pulls in, relocate the flame detector or electrode.

NOTE: Repeat ALL flame detector and pilot tests after all adjustments have been completed. ALL tests must be satisfied at the FINAL flame detector position.

SAFETY LOCKOUT

Safety lockout should occur upon failure to ignite the pilot, upon failure to light the main flame, and loss of flame. Check each of these conditions as follows to make sure that safety lockout will occur.

A. Failure to ignite pilot:

1. Shut off the fuel supply to both pilot and main burner manually.

2. Turn on the power.

3. Reset the safety switch if tripped.

4. Start the system.

5. Pilot will not light. Control should lock out.

B. Failure to light main flame:

1. Turn on the fuel supply to the pilot burner only; leave main burner fuel valve shut off.

2. Reset the safety switch.

3. Start the system.

4. Pilot should light but main burner will not light. Relay 2K should drop out within 4 seconds after main burner ignition trial ends; the safety switch should trip and lock out about 30 seconds later.

C. Loss of flame:

1. Turn on the fuel supply to the main burner; pilot gas supply also must be on.

2. Reset the safety switch.

3. Start the system. Start-up should be normal and the main burner should light normally.

4. After timer stops in normal running position, shut off the main burner fuel supply to extinguish the main flame.

5. Relay 2K should drop out within 4 seconds.

6. The safety switch should trip and lock out about 30 seconds later.

NOTE: If the safety switch fails to trip and shut down the system on any of these three tests, replace the R4150; then rerun all CHECKOUT tests from the beginning.

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The first step in troubleshooting the R4150 is to determine the location of the trouble in the system. To do this, refer to the normal operation summary on page 5; locate the point where the operation of the control deviates from normal and refer to the applicable procedure (see trouble list below).

NOTE: At the completion of any troubleshooting procedure, perform the CHECKOUT on page 6.

PRELIMINARY CHECK

Eliminate the possibility of poor contacts at the quick-connects on the back of the R4150 or at the quick-connects to the old terminal strip. Check the terminal strip connections for tightness. Then insure that the spring connectors on the back of the R4150 are properly tensioned; they should be tight enough so that it is necessary to force a dime between the contacts. If a dime slips through, press the connector together gently with your finger tips - do not use pliers.

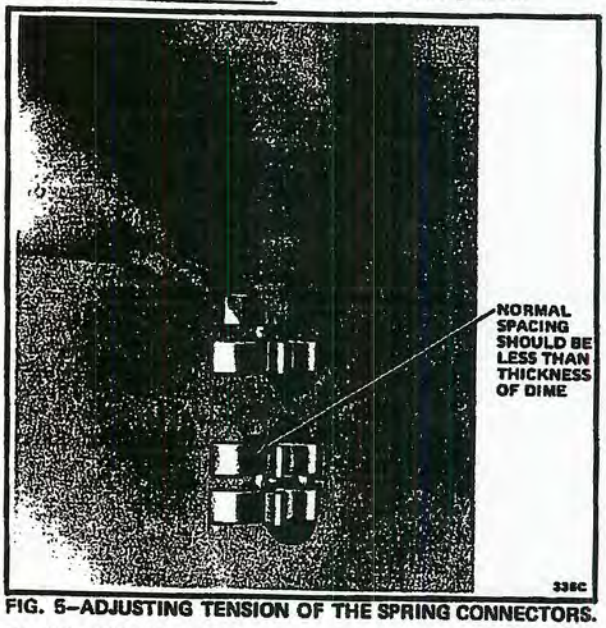


FIG. 5–ADJUSTING TENSION OF THE SPRING CONNECTORS.

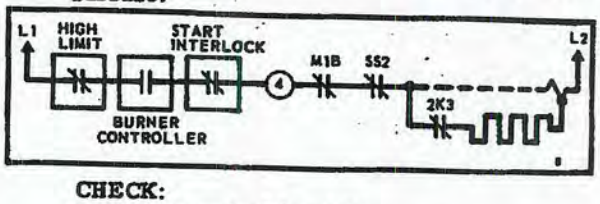
CHECKOUT PROCEDURE

Locate the point on the following list where the operation of the control deviates from the normal operation sequence; then proceed to the applicable troubleshooting instructions.

A. On a call for heat, relay 1K does not pull in.
B. Timer motor does not start from normal shutdown position.
C. Relay 1K pulls in but burner motor does not start.
D. Relay 1K drops out in approximately twelve seconds, followed by recycling at 120 second intervals.
E. Pilot does not light.
F. Pilot lights but relay 2K does not pull in.
G. Pilot lights, relay 2K pulls in, but main burner does not light.
H. Relay 2K remains in after flame is out.
I. Firing rate motor does not modulate during run cycle.

A. ON CALL FOR HEAT, RELAY 1K DOES NOT PULL IN

1. Check start circuit. Remove the R4150 from subbase.



CHECK:
a. for power to L1 and L2.
b. that high limit switch is closed.
c. that burner controller is closed or turned up enough to call for heat.
d. that the start interlock is operating properly.
e. that timer contacts M1 are clean.
f. that the safety switch (contact SS2) is not tripped.
g. that relay contact 2K3 is clean. (NOTE: Relay 2K cannot pull in to open 2K3 until contacts M7 close at 10 seconds.)

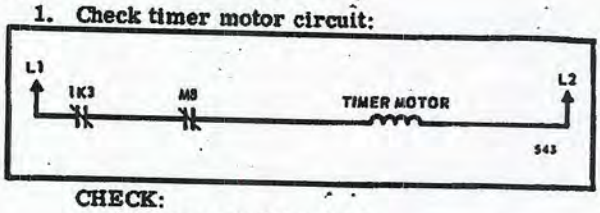
2. Remount the R4150 by lifting it back into position and tightening the holddown screw. With power at terminal 4, relay 1K will pull in whenever the controller calls for heat if the relay is in the starting position. Reset the safety switch and again check the operation. If relay 1K still does not pull in, replace the R4150.

B. TIMER MOTOR DOES NOT START FROM NORMAL SHUT DOWN POSITION

(when large dot on dial, between POSTPURGE and PREPURGE, is at index position)

NOTE: 1K must be pulled in.

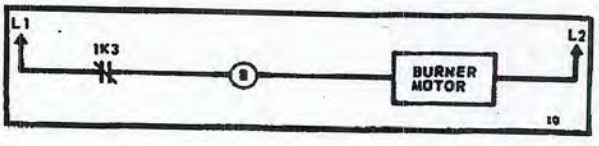
1. Check timer motor circuit:



CHECK:
a. for power to L1 and L2.
b. that contacts 1K3 are closed (relay 1K must have pulled in on the call for heat), and that they are clean.
c. that contacts M8 are clean.

2. If M8 contacts are conducting and the relay is operating but the timer still does not run, the timer is defective and the entire R4150 must be replaced (excluding amplifier).

C. IF RELAY 1K PULLS IN BUT BURNER MOTOR DOES NOT START



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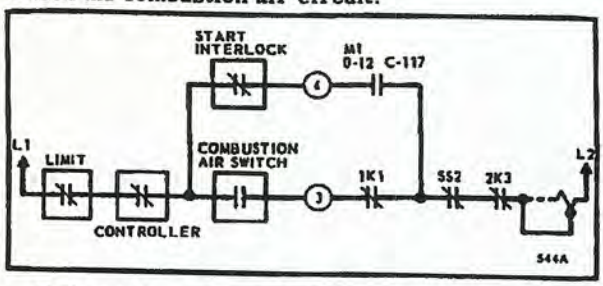
CHECK:

a. power at terminal 8. If no power at terminal 8, check 1K3. If power cannot be placed on terminal 8, replace R4150 (except amplifier).
b. manual switch of burner motor or fan to see that it is closed.
c. motor power supply, motor overload protection, and motor starter.
d. burner motor or draft fan circuit.
e. burner motor or draft fan according to manufacturer's instructions.

D. IF RELAY 1K DROPS OUT IN APPROXIMATELY 12 SECONDS, FOLLOWED BY RECYCLING AT 120 SECOND INTERVALS

Check the combustion air circuit:



If the relay drops out at 12 seconds, the combustion air switch is not closing the parallel circuit that holds in relay 1K. Check the combustion air switch and its external circuit, draft fan operation, and contacts 1K1.

E. IF PILOT DOES NOT LIGHT

1. Stop timer in the trial-for-pilot position, using the method described under PILOT TURNDOWN TEST to manually control timer motor rotation.

NOTE: During trial-for-pilot the safety switch is heating and will trip out in approximately 30 seconds.

2. Make certain that pilot manual gas cock is open.
3. See whether terminals 5 and 6 are powered.
   a. If terminals 5 and 6 are powered but pilot valve does not open, trouble is outside the R4150H.
   b. If pilot valve opens but pilot does not light, check ignition transformer, ignition circuit, and ignition electrodes.
   c. If terminals 5 and 6 are not powered,
      (1) Open the master switch.
      (2) Clean relay contacts, timer contacts, and M10 as instructed under CONTACT CLEANING, page 10.
      (3) Recycle the timer, then stop rotation at the trial-for-pilot position.
      (4) If terminals 5 and 6 still are not powered, replace the R4150, then reinstall amplifier.

F. IF THE PILOT LIGHTS BUT RELAY 2K DOES NOT PULL IN

The pilot will be extinguished within about 10 seconds; the safety switch will trip about 30 seconds later.

1. Allow the timer to complete its revolution, then open the master switch.
   a. Clean timer contacts M7 as instructed under CONTACT CLEANING, page 10.
   b. Close the master switch, reset the safety switch, and cycle the system.
2. If the trouble still exists, again allow the timer to complete its revolution. The flame sensor, plug-in amplifier, and the flame relay (2K) form a series circuit which can be broken by failure of any of the components.
   a. Plug a W136A Microammeter into the jack on the plug-in amplifier.
   b. Reset the safety switch and cycle the timer motor. When the timer reaches the PILOT TRIAL position and the PILOT IS LIGHTED, stop the timer using the method outlined under PILOT TURNDOWN TEST.
   c. Note the microammeter reading. If at least 2 microamperes and steady for a flame rod or rectifying photocell flame detector, or steady for an ultraviolet or lead sulfide flame detector, a fault in the plug-in amplifier is preventing relay 2K from pulling in. Replace the amplifier with a new one of the same number. However, if the meter reading is less than 2 microamperes or unsteady, proceed to step 3.
3. The procedure in this step depends on the type of flame detector used.
   a. If a flame rod, rectifying photocell, or C7012A Flame Detector, open the master switch, disengage the chassis from the base, and remove the lead from the F terminal. Replace the chassis, then close the master switch. Repeat step 2 above. Plug the probe end of a Honeywell No. 123514A Flame Simulator into the tip jack on the R4150 chassis, then touch the lead of the simulator against the chassis. Relay 2K should pull in. If it does not, install a new R4150 chassis.

NOTE: If the application uses a C7027A or C7035A Flame Detector with R7259A Amplifier, use a No. 123514B Flame Simulator.

   b. If the flame detector is a lead sulfide cell, open the master switch, disengage the chassis from the base, and remove the lead from the F terminal. Replace the chassis and close the master switch. Repeat step 2b above. Remove 3/4 inch of insulation from each end of a 10 inch length of insulated wire; plug one end of this wire into the tip jack, then tap the free end of the wire against the chassis frame at a rapid frequency to simulate flame. Relay 2K should pull in. If it does, proceed to step 4. If it does not, install a new R4150 chassis.
4. The pulling in of relay 2K in the previous step shows that the trouble is in the flame detector or the flame detector circuit outside the R4150. Clean any detector lens and filter, and check the detector circuit for open and/or short circuit. If necessary, resight or reposition the detector. Replace the detector if trouble persists. (Open the master switch before reconnecting the flame detector; then close the switch.)

IMPORTANT

If any change other than cleaning the lens and filter and correcting opens and grounds in the circuit are made in the flame detector system, a complete checkout of the flame detector will be required.

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G. IF THE PILOT LIGHTS AND RELAY 2K PULLS IN, BUT MAIN BURNER DOES NOT LIGHT

Check voltage between terminals L2 and 7 when the timer reaches main burner.

1. If the voltmeter indicates normal line voltage, the trouble is outside the R4150.
   a. Check the main fuel hand cock, the main fuel valve, and the main fuel valve circuit, including any interlocks.
   b. Check the pilot flame; make a pilot turndown test if needed.
2. If the voltmeter indicates no voltage, open the line switch.
   a. Clean relay contacts and timer contacts M4 as instructed under CONTACT CLEANING, then close the line switch.
   b. Repeat the voltage test. If test still shows no voltage, replace the R4150, then reinstall the plug-in amplifier.

H. IF RELAY 2K REMAINS IN AFTER FLAME IS EXTINGUISHED

1. If the flame detector is a rectifying flame rod install a new plug-in amplifier.
2. If the flame detector is a rectifying phototube, lead sulfide cell, or ultraviolet flame detector, plug the jack end of the 123514A or B Flame Simulator or 117053 meter lead into the jack of the plug-in amplifier to disconnect the flame circuit.
   a. If that does not cause relay 2K to drop out, install a new plug-in amplifier.
   b. If plugging into the meter jack or shorting the tip jack to ground causes relay 2K to drop out, the trouble is caused by hot refractory hold-in, detector failure, or other flame simulating condition.
      (1) Resight the flame detector at a cooler or more remote area of the refractory.
      (2) Recheck the flame detector current for the condition recommended in the CHECKOUT section. Replace the detector if necessary.
      (3) Remove any flame simulating condition such as false light or stray signal (lead sulfide).
      (4) Any change made in the detector or its sighting will require a pilot turndown test.
3. If the trouble persists, replace the R4150.

I. FIRING RATE MOTOR DOES NOT MODULATE DURING RUN CYCLE.

1. Insure that the controller is turned up high enough so that it is calling for modulation.
2. If the R4150H is installed in a Fireye cabinet, jumper terminals 10-11 at the cabinet terminal strip. This closes the R leg of the motor controller circuit.
   a. If the motor still does not modulate, check the motor itself according to the instructions with it.
   b. If the motor modulates when the terminals are jumpered, shut down the system. Remove the timer cover and clean both M9 contacts as instructed below. Power to the control must be disconnected.
3. If the motor still does not modulate after cleaning the timer contacts, replace the R4150 (except amplifier).

SCHEDULED INSPECTION AND MAINTENANCE

A schedule should be set up, and followed, for periodic inspection and maintenance, including burner and all other controls as well as the R4150. Include the following:

1. Always keep burner(s) and fuel mixture adjusted according to the burner manufacturer's recommendations.
2. Clean the flame detector lens and sight tube, and check the detector output. See FLAME DETECTOR CHECKOUT.
3. If a flame rod detector is used, check the flame rod and its output.

CONTACT CLEANING

Contacts should be cleaned only when a careful check made as described under TROUBLESHOOTING indicates the possibility of dirty contacts.

Contacts should be cleaned only with Honeywell Contact Cleaner, part no. 132569. Directions for using the cleaner are printed on the can. Do not use abrasive materials or any other liquid contact cleaner. Do not push in the control relays.

The location of the various relay and timer contacts are shown in Figs. 6 and 7.

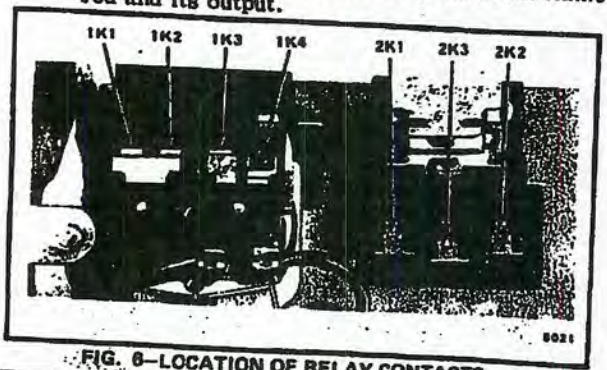

FIG. 6—LOCATION OF RELAY CONTACTS.

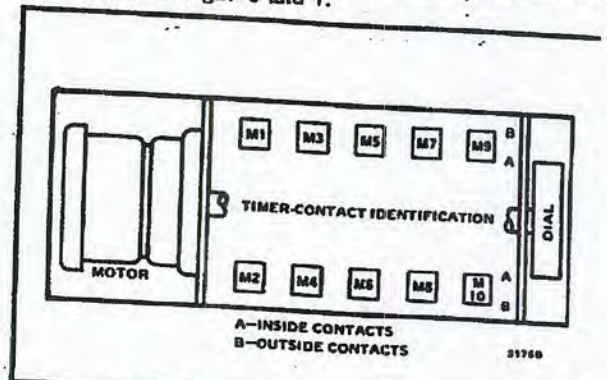

FIG. 7—LOCATION OF TIMER CONTACTS.

WARRANTY "Unless otherwise specified, the Company warrants all Residential Division equipment manufactured by it and bearing its nameplate to be free from defects in workmanship and materials under normal use and service as follows:
1. Equipment which is received transportation prepaid at the factory originating shipment (1) within twelve months after date of manufacture, or (2) with a certification by the installer to be within twelve months after date of installation, and found by the Company's inspection to be defective in workmanship or materials within the guarantee, will be repaired or replaced at the Company's option, free of charge and returned lowest cost transportation prepaid. Premium transportation will be used at customer's request and expense;
2. If inspection by the Company does not disclose any defect covered by the guarantee, equipment will be repaired or replaced and the Company's regular service charge will apply;
3. WITH EXCEPTION OF THE FOREGOING AND UNLESS SPECIFICALLY EXPRESSED IN WRITING, THE COMPANY MAKES NO EXPRESS WARRANTIES, NO WARRANTIES OF MERCHANTABILITY AND NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF."

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