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October 1972

**INSTALLATION AND
MAINTENANCE INSTRUCTIONS**

AVON

**GAS-FIRED BOILERS
WITH
LANDON KINGSWAY BURNERS**

Potterton

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WITH LONDON KINGSWAY BURNERS
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CONTENTS

	Page No.
SECTION 1. BOILER INSTALLATION	1-3
SECTION 2. BURNER INSTALLATION	3-6
SECTION 3. MAINTENANCE	6-7
SECTION 4. FAULT FINDING	8
TABLE 1. APPROXIMATE WEIGHTS	9
TABLE 2. FRESH AIR REQUIREMENTS	9
TABLE 3. BURNER DATA	10

DIAGRAMS

See Appendix

Figure 1.	Dimensions
" 2.	Assembly of Sections
" 3.	Waterways & Platework Assembly
" 4.	Assembly of Front & Rear Walls
" 5.	Fluehood Assembly
" 6.	Casing Assembly
" 7.	Burner Assembly, Landon Kingsway 85TG/NG
" 8.	Gas Control Assembly, Landon Kingsway 85TG/NG

WIRING DIAGRAMS

See Appendix

WDC 7154	Installers Wiring
WDC 7155	Schematic Wiring
WDC 7152	Boiler Wiring

INTRODUCTION

Avon boilers are delivered to site cartoned and crated with the exception of the waterway sections which are supplied loose. All small parts such as bolts, nuts, etc., are contained in polythene packs. These are contained in two cardboard boxes and are each identified by a letter for easy reference.

SECTION 1. BOILER INSTALLATION

SITE REQUIREMENTS

Access There must be adequate access to the boiler site for boiler sections each measuring approximately 50 in. x 24 in. x 5 in. (1270 mm x 610 mm x 127 mm) and weighing approximately 3–1/2 cwt. (178 kg).

Clearances Minimum clearances required for erection and maintenance are 18 in. (457 mm) at the rear of the boiler (measured from the rear boiler plate), full waterway length in front of the boiler and at least 18 in. (457 mm) on either side. Allow an extra 12 in. (305 mm) on the gas supply side.

Boiler Base A smooth level floor is necessary, capable of bearing the weight of the boiler being installed (see Table 1). The base of the boiler is water-cooled and no special insulation is needed other than that specified by Building Regulations 1965 or local authorities.

Flue and Air Supply Proper evacuation of flue products is essential. British Standards Code of Practice CP.342 should be consulted and the flue designed to give a draught of 0.02 in.w.g. (0.05 mbar) in excess of boiler requirements.

The stabiliser fitted is capable of dealing with excess draught of up to 0.2 in. w.g. (0.5 mbar) where the flue is equivalent in size to that of the boiler flue outlet.

Both fluepipe and chimney stack should be insulated where exposed, especially where this is likely to result in excessive condensation.

There must be an air supply to the boiler house for combustion and ventilation at all times. There should be 50 sq. in. (322 cm²) per 100,000 Btu/h (29 kW) free air inlet to the boiler room for combustion and low level ventilation. On boiler houses with forced ventilation, the amount of air required is 75 cfm @ stp (0.03 m³/s) per 100,000 Btu/h (29 kW). See Table 2. for minimum fresh air requirements.

ERECTION

Before erecting the boiler check that all the parts shown on the packing sheets are available on site.

Identification of Sections


The front waterway section has the water flow flange on top and the burner aperture at the front. The rear section has the two water return flanges facing rearwards. The lower half of the rear section forms the water-cooled back of the

combustion chamber. The remaining sections are all intermediate.

The cast arrows on each side of these sections (next to the second and third cross tubes from the bottom) indicate the flat sides of the cross tubes and also assist in the correct assembly of the sections (see Figure 2—Assembly of Sections).

Erecting the Waterway Sections (see Figures 2 and 3)

1. Lay the two boiler length foundation strips (Pack B) on the concrete base at 21–1/2 in. (546 mm) centres to form a level track for the waterway sections.
2. Remove the protective covering from the water ports on the rear section and clean the machined faces with abrasive paper.
3. Stand the rear section upright in its working position on the track and prop it up with a plank. The two return flanges should be facing rearwards. Metal shims may be used for final levelling.
4. Apply 2 or 3 dabs of adhesive (Pack C) to each water port face and place a joint ring (Pack C) in position on each, a 4 in. (102 mm) ring at the top and two 3 in. (76 mm) rings at the bottom. It is important that no adhesive is allowed to get on to the exposed faces of the joint rings.
5. Clean the first intermediate section and stick the joint rings on the side facing the front of the boiler—the cast arrow next to the third cross tube from the bottom should point to the rear and mate with the arrow on the rear section pointing towards the front (see Figure 2—Assembly of Sections). Prop the section in position and secure it to the rear section by passing a 3/8 in. Bsw x 7–3/8 in. (187 mm) long assembly rod (Pack D) through the lower hole in each of the double-drilled lugs at the corners of the sections. Use 3/8 in. Bsw nuts and washers (Pack D) but only hand tighten at this stage.
6. Check that both sections are vertical and that the water ports are lined up correctly. Use shims under the section feet if necessary.
7. Fully tighten the nuts on the assembly rods.
8. Prepare and assemble the second intermediate section with the cast arrow on the side mating up with the arrow on the first intermediate section. With these three sections assembled the boiler becomes free-standing and the props may be removed.
9. Seal the gaps in the combustion chamber wall between the sections up to immediately below the level of the lower cross tube, with the white boiler cement supplied. Force the cement well in between the sections.
10. The target wall consists of two halves, upper and lower with an additional rear insert (all packed in the crate). Fit the lower half up against the back of the combustion chamber (the lower half of the rear waterway section) and place the rear insert on the ledge directly below the lower cross tube. Place the upper half of the



target wall up against the rear insert with the chamfered edge uppermost and facing forwards. See Figure 4—Assembly of Front and Rear Walls.

11. Fill in the gaps between the target wall and the sides of the combustion chamber with white boiler cement, pressing it well home.
12. Prepare and assemble the remaining intermediate sections and the front waterway section making sure that the cast arrows on the sides mate correctly.
13. Take the six 5/8 in. Bsw tie rods (Pack B) and screw 5/8 in. Bsw nuts and washers (Pack E) to four of them. To the remaining two rods screw 5/8 in. Bsw special long nuts and washers (Pack E).
14. Pass the tie rods with the long nuts through the large lugs under the front waterway sections (these are approximately 6 in. (150 mm) from each boiler foot). The nuts should be at the front of the boiler.
15. Similarly, pass two of the remaining tie rods through the large lugs approximately 8 in. (200 mm) up from the floor on each side of the boiler and the final two through the lugs on each side of the boiler next to the flow ports at the top.
16. Place 5/8 in. Bsw nuts and washers (Pack E) on the rear ends of the six tie rods and tighten progressively diagonally, using a torque spanner. Starting at 50–60 lb./ft. (67–81 N/m) tighten in 20 lb./ft. (27N/m) stages to a final torque of 90–100 lb./ft (121–135 N/m) on each tie rod.
17. Fit the combined flow outlet (packed in crate) to the front waterway section. Screw four 5/8 in. Bsw (64 mm) long studs (Pack F) in the flanged water port on top of the front waterway section and place a 3 in. counterflange gasket (Pack F) over the hole. Place the combined flow outlet over the studs and secure with 5/8 in. Bsw nuts and washers (Pack F). 3 in. Bsp counterflanges (packed in crate) are supplied for connecting to the water system and should be fitted together with gaskets (Pack F) to the entries on the top and rear of the combined flow outlet. Use 5/8 in. Bsw studs, nuts and washers to make the connections.
18. Similarly screw four 5/8 in. Bsw studs into each of the flanged water ports in the rear waterway section and connect to the system using the counterflanges, gaskets, studs, nuts and washers supplied in Pack F.
19. Fit the 1 in. Bsp drain cock (packed in crate) to seal off the unused tapping.
20. Fit the thermostat pocket (contained in burner carton) into the 1/2 in. Bsp tapping on the front of the combined flow outlet.
21. The boiler is now ready for testing for leaks and the method adopted should be the one most convenient to the situation. If the water system is ready, connect up to the flow and return outlets and fill the boiler by the main stop valves. Connect a pressure pump on the boiler side of the valves. An alternative method is to

fit a blanking flange to the rear flow port on the combined flow outlet and two blanking flanges to the return ports. Fit a flange tapped 1 in. Bsp and valve for venting on the top flow port on the combined flow outlet and plug any remaining tappings. Fill the boiler through the drain cock. The applied test pressure for the assembled boiler should be one and half times the working head of the installation plus 20 lb./sq.in. (1380 mbar) if the working pressure is above 40 lb./sq.in. (2760 mbar), or twice the working pressure if this is below 40 lb./sq.in. (2760 mbar) see British Standard Code of Practice CP.341.300. The normal working head of the installation should not exceed 140 ft.w.g. (4180 mbar).

22. Test the boiler for leaks.
23. Seal between the waterway sections externally down each side from the top waterway port to the bottom using buff boiler cement.

Fitting the Flue Adaptor and Draught Stabiliser (see Figure 5)

1. Take the five 3/8 in. Bsw 1–1/2 in. (38 mm) long studs and the two 3/8 in. Bsw x 1–3/4 in. (45 mm) long studs and screw them into the rear waterway sections around the flue offtake flange. The two longer studs are the end ones and are used to secure the boiler casing. Place the flue adaptor (packed in crate) over the seven studs and check that it lines up correctly. Secure with 3/8 in. Bsw nuts and washers, which together with the studs are contained in Pack G.
Seal around the gap with asbestos string and buff boiler cement.
2. Screw four 1/4 in. Bsw x 1 in. (25 mm) long studs into the bottom of the flue adaptor and place the stabiliser (packed in crate) over them with the opening towards the boiler. Secure with 1/4 in. Bsw nuts and washers. Fit the gate assembly into the V-shaped lugs at each side of the stabiliser assembly. Studs, nuts and washers are contained in Pack G.

Fitting the Front and Rear Boiler Plates (see Figure 3)

1. Screw three 3/8 in. Bsw x 1–1/2 in. (38 mm) long studs (Pack H) into the rear waterway section immediately below the flueway aperture and fit the support plate (packed in crate) over them. Secure with 3/8 in. Bsw nuts and washers (Pack H) but only hand tighten at this stage.
2. Screw three 3/8 in. Bsw x 1–1/2 in. (38 mm) long studs (Pack H) into the rear waterway section down each side of the flueway aperture. Rest the rear upper boiler plate (packed in crate) on the support plate and hold it in position by placing a clamping strip (packed in crate) over the three studs on each side. Secure these with 3/8 in. Bsw wing nuts and washers (Pack H) but only hand tighten at this stage.
3. Lift the support plate and boiler plate so that the upper edge touches the flue adaptor and tighten all the nuts securely.

4. Screw two 3/8 in. Bsw x 1 in. (25 mm) long studs (Pack H) into the front waterway section immediately under the flueway aperture and fit the angled shelf (packed in crate) in position over them. Secure with 3/8 in. Bsw nuts and washers (Pack H) but only hand tighten.
5. Screw three 3/8 in. Bsw x 1-1/2 in. (38 mm) long studs (Pack N) into the front waterway section down each side of the flueway aperture. Rest the front upper boiler plate (packed in crate) on the angled shelf and hold it in position by placing a clamping strip (packed in crate) over the three studs on each side. Secure these with 3/8 in. Bsw wing nuts and washers (Pack H) but only hand tighten at this stage.
6. Raise or lower the boiler plate and shelf until the flueway aperture is completely covered and tighten all the nuts securely.
7. Run a fillet of buff boiler cement into the recess around the outside of the combustion chamber aperture. Take the pre-formed front wall (packed in crate) and position it in the aperture with the five cut-outs around its inner edge fitting over the corresponding lugs on the front waterway section. See Figure 4—Assembly of Front and Rear Walls.
8. Screw six 3/8 in. Bsw x 1-1/2 in. (38 mm) long studs (Pack J) into the tappings around the combustion chamber aperture and fit the lower front boiler plate (packed in crate) over them. Secure with 3/8 in. Bsw nuts and washers (Pack J) and smooth off any surplus boiler cement around the plate.

Fitting the Boiler Thermostat (see Figure 3)

Fit the boiler thermostat (packed in crate) into its pocket in the combined flow outlet. The mineral insulated cable attached to the thermostat should be run down the right-hand side of the boiler. The junction box connected to the other end of the cable is left hanging free until the casing has been erected.

Fitting the Boiler Code Badge

Fit the boiler code badge (Pack L) to the outlet flange at the top of the front waterway section using the two No. 4 type "U" hammer screws x 3/16 in. (5 mm) long (Pack L).

Erecting the Casing (see Figure 6)

The boiler casing with all its screws, nuts, washers etc., is packed in a carton together with the apron and cleaning tools. The method of assembly is as follows:—

1. Fit two adjustable feet with covers to each of the side panel sub-assemblies and rest these against the sides of the boiler in their correct positions.
2. Take the top panel sub-assembly and place it in position with the slot around the combined flow outlet and the edges resting on the side of the two side panels.
3. Secure the top panel to the side panels with 1/4 in. Bsw hex head screws x 1/2 in. (13 mm) long and fit the strengthening angle piece on the front of the top panel using No. 10A self tapping pan head screws x 3/8 in. (10 mm) long. At the top front corners fit gussets using No. 10Z self tapping pan head screws x 1/2 in. (13 mm) long.
4. Fit the rear panel to the side panels with No. 10Z self tapping pan head screws x 1/2 in. (13 mm) long, and above this, secure the side panel to the flue offtake flange by means of the two fixing brackets. These are secured to the side panels with 1/4 in. Bsw round head screws x 3/8 in. (10 mm) long and 1/4 in. Bsw square nuts, and to the outer studs on the flue offtake flange with 3/8 in. Bsw nuts.
5. Remove the cross rail from the lower front panel sub-assembly and secure it to the bottom front corners of the two side panels with 1/4 in. Bsw round head screws x 5/8 in. (16 mm) long.
6. Fit the lower front panel assembly to the cross rail and also to the side panels using 1/4 in. Bsw round head screws x 5/8 in. (16 mm) long. At this stage, fit the boiler junction box which is hanging on the mineral insulated cable. Secure it to the lower front panel behind the square hole on the right-hand side. Fit the cover on the outside and pass the fixing screws through the front panel into the junction box itself.
7. Fit the upper front panel sub-assembly by locating the two pegs in the holes in the lower panel and securing at the top corners with 1/4 in. Bsw chromium plated mushroom head screws x 1-1/4 in. (32 mm) long washers.

SECTION 2. BURNER INSTALLATION

Landon Kingsway 85 TG/NG burners supplied with Avon boilers are packed in a wooden crate which also contains the gas manifold. This is made up from the various gas controls and can be supplied for either left or right-hand assembly. Burners are pre-wired, fully assembled and fitted with the Landis and Gyr LFA.1.335 control box.

The Gas Controls

The gas controls fitted in the manifold are

Town Gas burners

- | | |
|--------------------------|--|
| 1. Pilot governor | 1/4 in. Bsp Jeavons J.10SG, spring loaded. |
| 2. Pilot solenoid valve | 1/4 in. Bsp Black 5712. |
| 3. Main governor | 1-1/2 in. Bsp Jeavons J47, spring loaded (Avon 400).
2 in. Bsp Jeavons J47, spring loaded (Avon 500 and 600). |
| 4. Safety shut-off valve | 1-1/2 in. Bsp ITT General Controls Hydramotor (Avon 400).
2 in. Bsp ITT General Controls Hydramotor (Avon 500 and 600). |
| 5. Main gas cock | 1-1/2 in. Bsp loose key type (Avon 400).
2 in. Bsp loose key type (Avon 500 and 600). |

Natural Gas burners

1. Pilot governor 1/4 in. Bsp Jeavons J10SG, spring loaded.
2. Pilot solenoid valve 1/4 in. Bsp Black 5712.
3. Main governor 1 in. Bsp Jeavons J.47SP, spring loaded.
4. Safety shut-off valve 1 in. Bsp ITT General Controls Hydramotor.
5. Main gas cock 1 in. Bsp loose key cock.

Before installing the burner, check that the correct size choke ring has been fitted on the draught tube and that the firing head is correctly positioned. The foremost edge of the air swirler should be 5/8 in. from the front face of the choke ring.

Fitting the burner

1. Screw the four 3/8 in. Bsw x 2 in. (51 mm) long studs (Pack K) into the lower front boiler plate. Check that the draught tube is flush with the front edge of the quarl so that it does not protrude into the combustion chamber. Fit the burner flange and gasket over the studs and secure with 3/8 in. Bsw nuts and washers (Pack K).
2. Fit the upper and lower halves of the apron with the screws provided (all packed in the carton with the boiler casing). Fit the gas manifold to the burner but on natural gas burners insert an orifice plate (12 mm for Avon 400 and 500, 14 mm for Avon 600), provided with the burner, between the two halves of the union before tightening. Support the manifold with the pipe stand assembly (packed in crate).
3. Connect the pilot gas manifold on the burner to the main gas supply at a point upstream of the main gas cock using the length of 1/4 in. (6 mm) copper tube provided. This will permit either left or right-hand assembly and the tube should be run neatly around the outside of the burner. Connect the main gas supply to the manifold and test all connections for leaks.

Electrical Supply

Check that the main supply is switched off before making any connections.

The electrical supply required for Avon 400–600 boilers is 220/240 volts a.c. 50 Hz single phase, connected via a double-pole isolator and suitable HRC fuses (these items to be supplied by the installer) to the terminal box on the burner. Remove the terminal box cover and connect as follows:—

Line to terminal L Neutral to terminal N
Earth to terminal E

The final 24–30 inches (610–762 mm) of the cable should be encased in flexible conduit for easy movement during maintenance.

On-Site Wiring

The following connections must be made on site:—

- (a) From the safety shut-off valve to the terminal box on

the burner.

Green/Yellow lead to terminal 19

Black lead to terminal 18

Red lead to terminal 17

All three leads are encased in a single flexible conduit.

- (b) Connect the three leads from the pilot solenoid valve as follows:—

Green/Yellow lead to earth terminal on safety shut-off valve.

Yellow lead to neutral terminal on safety shut-off valve.

The above leads are encased in a single flexible conduit.

2nd yellow lead to terminal 5 in LFA control box (this should run through the flexible conduit carrying the leads from the safety shut-off valve to the terminal box).

- (c) From the junction box (on the front casing panel) to the burner terminal box.

Red lead from limit thermostat terminal 3 to burner terminal 23.

Blue lead from limit thermostat terminal 1 to burner terminal 22.

Yellow lead from control thermostat terminal 3 to burner terminal 20.

White lead from control thermostat terminal 1 to burner terminal 21.

Green/Yellow lead to terminal E.

All five leads are encased in a single flexible conduit.

All the above-mentioned connections are shown in the Installers Wiring Diagram WDC.7154.

Optional Controls

Where applicable, the following installation instructions should be carried out:—

- (a) **Clock Control**

If an independent time switch is required it should be wired in series with the boiler control thermostat, see Installation Wiring Diagram WDC.7154. Disconnect the existing wire from terminal 21 and connect the time switch contact.

Time Switch Warning Label

WARNING

If a time switch control is used in the way described in this manual the attached label should be affixed to it.

Replacement time switches must have the switch isolated from the time switch motor power supply.

- (b) **Other Controls**

Any other remote device which gives control of the boiler e.g. compensator, should have a single pole contact which can be wired in series with the boiler control thermostat.

- (c) **Circulating Pump**

No provision is made in the control box for controlling the water circulating pump. Where there is no gravity circulation, the pump must be kept running for a

time after the boiler has shut down to dissipate any residual heat in the boiler fabric. This will prevent an excessive local temperature rise and possible cutting out of the limit thermostat. A method of making sure that the pump continues to run after the boiler has shut down is to wire in parallel with the time switch contact controlling the pump, a thermostat whose contact breaks circuit on a fall in temperature. This thermostat can be either the clamp-on or immersion type and should be fitted in the system flow header as close to the boiler as possible. Control details are shown in Wiring Diagram WDC.7155.

(d) Low Limit Protection

These controls should be wired in parallel with the clock control, see Wiring Diagram WDC.7154 and 7155. When the clock is off it will be overridden by the low limit controls and temperature control will be on the boiler thermostat. A method of low limit control is to have an outdoor thermostat set at approximately 35°F (2°C) wired in parallel with the clock contact in the pump starter circuit. When the outdoor temperature falls, the pump will start running. An immersion type thermostat sensing the water temperature in the return main, set at approximately 40°F (4°C) is wired in parallel with the clock contact. When the temperature falls, the burner will fire and both pump and burner will be operating.

(e) Remote Indication

If desired, a remote lockout light can be connected by the installer and provision for such a connection is made within the boiler control box, terminals 12 and neutral. The loading on this connection should not exceed 15 watts at 240 volts. Similarly, a remote indication of a high limit condition can also be connected by the installer to terminal 2 on the limit thermostat. The current rating for this connection is 1 amp at 240 volts.

Procedure for setting up the burner

1. On towns gas burners connect a water gauge to the test point on the main gas supply line where it enters the burner casing. On natural gas burners, connect the gauge between the safety shut-off valve and the main gas governor.
2. Connect a water gauge to the test point on the pilot gas manifold.
3. Remove the screw cap from the main gas governor to adjust the governor if necessary.
4. Set the air inlet control approximately half open by equally adjusting each of the three shutters around the air regulating ring.
5. Before firing the burner it is important to check the seating of the safety shut-off valve. This is done by trapping gas in the manifold between the valve and the main gas cock. Proceed as follows:—
 - (a) Close the main gas cock and fit a water gauge between it and the safety shut-off valve.

- (b) Open the cock, allow the level on the gauge to steady then note the reading and wait for five minutes. If no significant change is detected after this time then all the joints and the valve seating can be considered sound.
- (c) If, however, the level has dropped, check all the joints and the main gas governor for leaks (soap and water test). If there are no leaks, check the valve seating as follows:—

Remove the baseplate from the valve by undoing two of the diagonally placed bolts and gradually slackening the remaining two (smaller valves have a single plug with a hexagonal head). The return spring holding the valve closed exerts a pressure on the baseplate which is eased when the plate is freed.

Remove the spring and seating and inspect and clean if necessary. Replace the seating by mounting it on the spring and re-positioning it in the valve. Refit the baseplate, tighten the bolts and check for leaks.

Note:— a piece of wood or brick wedged under the baseplate will be useful when re-locating the securing bolts.

An alternative method of testing the safety shut-off valve is to insert a metal blanking disc (provided with the burner) in the union between the safety shut-off valve and the burner. A water gauge connected to the test point between the valve and the union will indicate any gas leakage.

Firing the burner

At this stage it is necessary to maintain a constant pilot to set the pilot gas pressure. A micro-ammeter should be connected in series with the probe lead, the positive terminal to the burner control box and the negative terminal to the probe. This is to indicate flame rectification. A convenient test point is located within the terminal box adjacent to the commissioning switch. Remove the link from the test point before connecting the leads to the micro-ammeter.

Starting procedure

1. Make sure that all air has been purged from the main gas supply line.
2. Open the pilot gas cock. Close the main gas cock.
3. Remove the cover from the terminal box.
4. Move the commissioning switch to the PILOT ONLY position.
5. Switch on the electricity supply. The fan will start running, followed by the ignition spark and the pilot flame will light and become established.
6. During the fan purge (before the spark commences), adjust the air shutter to give the back pressure recommended in Table 3. This is measured on the water gauge connected to the main gas supply line

(see "Procedure for setting up the burner").

7. With the pilot flame established, set the pilot gas pressure to the recommended figure in Table 3 by adjusting the pilot governor. The reading on the micro-ammeter should be at least 7 and preferably over 10 micro-amps.
8. Move the commissioning switch to the NORMAL OPERATION position. The safety shut-off valve will open and close and, as the main gas cock is closed, the burner will run to the lockout condition.
9. Replace the terminal box cover after removing the micro-ammeter connections and replacing the link in the test point.
10. Now that the safety shut-off valve has opened and closed it will be necessary to again check that the valve seats correctly. Switch off the electricity supply and proceed as detailed in para.5 of the previous section.
11. After checking that the valve is leak-proof, switch on the electricity supply, open the main gas cock and press the lockout reset button on the control box.
12. The pilot will ignite and when the flame is established, the safety shut-off valve will open and the burner will fire on main flame. After 9 seconds the pilot will go out leaving the main flame established.
13. Set the burner pressure to the recommended figure in Table 3 by adjusting the main gas governor. Finally, check the gas rate on the site meter and adjust if necessary (again by the main gas governor).
14. The control box timing sequence is as follows:—
 - (a) Pre-purge (fan only) 36 seconds
 - (b) Pre-ignition (spark on) 3 seconds
 - (c) Ignition and pilot gas 3 seconds
 - (d) Pilot gas only 6 seconds
 - (e) Pilot and main gas 4.5 seconds
(both burners alight)
 - (f) Main gas only (pilot out)
Complete starting time 79.5 seconds.
When thermostat is satisfied, there is a post-purge period lasting 10.5 seconds.

The complete time cycle for the control box is 90 seconds.

Flue draught

Adjust the weight on the stabiliser until a flue draught of 0.03 to 0.05 in. w.g. (0.07 to 0.12 mbar) is obtained. Use the test hole on the left hand side of the flue offtake to measure this. Move the stabiliser flap by hand to the fully open position and release it when it should return to the controlling position.

Oxygen concentration

Insert a gas sampling probe horizontally for about 4 in. (100 mm) in the test hole on the left-hand side of the flue offtake. Allow the boiler to run for 30 minutes and measure the oxygen concentration. Adjust the air shutter until the

oxygen concentration is 5 to 6% by volume for towns gas and 6 to 7% for natural gas. Check the gas rate on the site meter and make sure that no other gas appliances are functioning on the same meter. If the gas rate is incorrect, adjust the main gas governor and reset the air shutter to give the correct O₂ setting. Re-check the gas rate and repeat the procedure until it is correct. If there is a large differential between the gas rate pressures, check that the burner head and controls are the correct type as the gas pressures given are an indication of the gas consumption.

Optimum operating conditions

The recommended figures for optimum operating conditions are as follows:—

Flue temperature	550°F (288°C)
O ₂	5–6% (towns gas), 6–7% (natural gas)
CO not more than	.005%
Fluehood draught	.03 in.w.g. (0.07 mbar)

Final Check

With the burner firing normally on main flame, close the main gas cock. The flame will go out and the burner will go to a lockout condition. Open the main gas cock, press the reset button and the burner will fire again. Should the mains electricity supply be interrupted (through failure of a control instrument or the power supply), the programme switch will stop its cycle, and when the supply is restored, run through the remaining parts of the cycle, including post purge to the starting position.

A new start with pre-purge will then follow. This is the normal pattern of events whether the failure occurs during the normal running period or during a starting period.

Setting the pressure switch

With the burner firing normally on main flame, set the air pressure switch as follows:—

85 TG/NG burners

Remove the domed cap from the Black 8039 pressure switch and turn the setting screw clockwise until the burner switches off. Turn the screw anti-clockwise (about seven turns) until the burner fires and refit the domed cap.

SECTION 3. MAINTENANCE

The operating efficiency of the boiler is dependent on satisfactory chimney conditions, adequate air supply and correct burner adjustment. If the burner has been initially commissioned as described in Section 2, service visits should not be necessary more than twice a year.

If the boiler has been running satisfactorily, it is unlikely that the flueways will need cleaning. Remove the upper front casing panel and front boiler plate and inspect the flueways. If they need cleaning, it will be necessary to remove the burner.

Proceed as follows:—

1. Isolate the electricity supply at the main switch and the main gas supply upstream of the main gas cock.

2. Remove the burner apron to gain access to the burner mounting flange.
3. Undo the pilot and main gas unions underneath the burner.
4. Remove the nuts securing the burner to the boiler and lift the burner clear.
5. Remove the asbestos gasket.

Cleaning the boiler

An industrial vacuum cleaner will be needed together with the tools supplied with the boiler. Cover the burner with a cloth to protect it from the dirt. Brush and rake all deposits in the flueways into the combustion chamber and remove them through the burner aperture with the vacuum cleaner.

While the burner is removed from the boiler, examine the target wall at the rear of the combustion chamber with the aid of a torch. If any repairs are necessary, remove the lower front plate and the pre-cast insulating wall to gain access to the combustion chamber. Fill any cracks with boiler cement (white) and replace the wall and plate. Run a fillet of boiler cement (buff) round the edge of the front plate before securing it.

Remove the boiler casing side panels and examine the joints between the waterway sections. Scrape out any cracked or loose cement and force fresh boiler cement in its place. Refit the panels.

Checking the burner

It is equally possible to service the burner whether it is fitted to the boiler or removed for flueway cleaning. The same procedure applies in each case.

85 TG/NG burner

1. Undo the four screws at the back of the burner and remove the draught tube inspection panel.
2. With a 1/4 in. Bsw spanner, slacken the two nuts securing the burner head clamping plate beneath the burner.
3. Partially withdraw the burner head until the ignition and flame probe leads are accessible.
4. Disconnect the leads and remove the burner head from the burner.
5. Clean the ignition and flame detection probes with emery cloth and wipe off any soot and dirt on the firing head. Check that the ignition probe is parallel with the side of the pilot housing and not in danger of short-circuiting. Check that the flame detection probe is central in the ceramic insulation bush and that the ceramic is not cracked.
6. Refit the burner in the draught tube and re-connect the ignition and detection leads. Position the burner head so that the front edge of the air swirler is 5/8 in. from the front face of the choke ring and secure the two nuts under the burner.
7. Refit the draught tube inspection panel.
8. Fit a new asbestos gasket if necessary on the burner mounting flange and fit the burner to the boiler.

With the burner checked and cleaned, refit the apron, front boiler plate and upper front casing panel. Run the burner with the gas supply turned off and commission the boiler as described in Section 2.

SECTION 4. FAULT FINDING

CONDITION	POSSIBLE CAUSE	REMEDY
Burner fails to light.	(a) Interrupted electrical supply (b) Controls incorrectly set. (c) Faulty connections.	(a) Check main switch, time switch and fuse. Check that supply is available to control box. (b) Check that control and limit thermostat are set correctly and that lockout button is depressed. (c) Check connections to control box from motor and motor relay where fitted.
Burner motor starts, and control box re-cycles with continuous purge.	Pressure switch setting incorrect or switch faulty.	Check air back pressure and pressure switch setting. Check connection to pressure switch.
Burner starts but runs to lockout.	(a) Gas turned off. (b) No ignition spark. (c) Air in gas line. (d) Probe incorrectly positioned. (e) Faulty pilot solenoid. (f) Incorrect pilot pressure setting. (g) Pilot orifice blocked.	(a) Check and rectify. (b) Check electrode setting and HT connections. Check that supply is available to transformer. (c) Check that all air is purged from gas line. (d) Check that the probe current is a least 7 micro-amps (e) Check and fit new solenoid if necessary. (f) Check and rectify. (g) Check and clear obstruction.
Pilot establishes but main flame will not light and burner runs to lockout.	(a) No mains gas supply. (b) Incorrect probe setting. (c) Safety shut-off valve does not open.	(a) Turn on main gas cock. (b) Check probe position in relation to to main flame. (c) Check connection from control box to safety shut-off valve.
Noisy burner	Incorrect gas rate or air setting.	Check and rectify.

NOTE:— if the control box is faulty, then this would normally be apparent. If no fault is visible, the box should only be changed after a close examination for other possible faults. The most common fault is when the pilot ignites but does not become established and the control box locks out.

If this occurs, the probe should be thoroughly checked for position and possible short circuiting. Check also flame rectification on a micro-ammeter.

TABLE 1. APPROXIMATE WEIGHTS

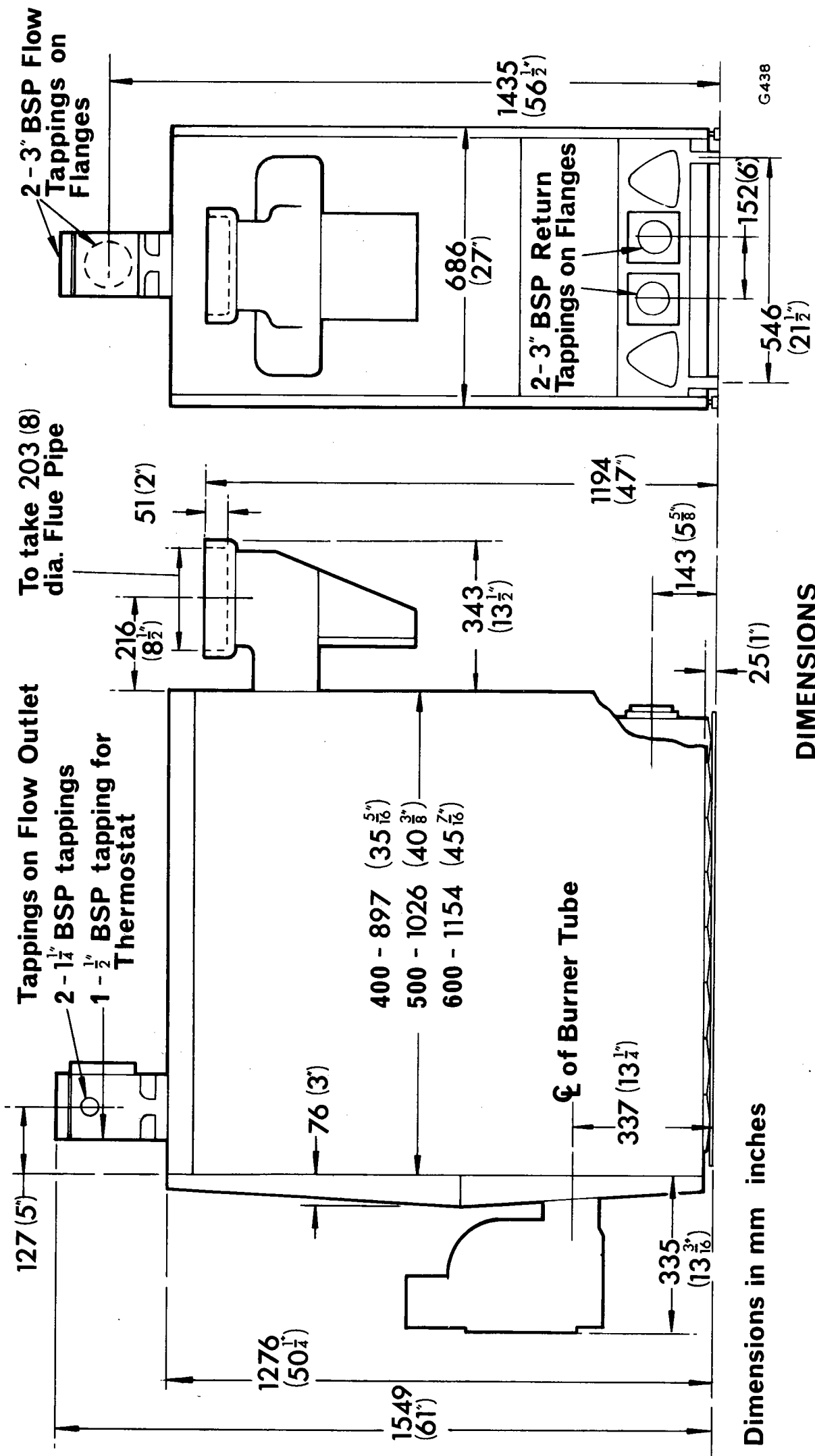
AVON	NUMBER OF SECTIONS	BOILER AND BURNER		WATER		TOTAL	
		lb	kg	lb	kg	lb	kg
400	6	2080	943	336	152	2416	1095
500	7	2360	1070	392	177	2752	1247
600	8	2640	1197	448	203	3088	1400

TABLE 2. FRESH AIR REQUIREMENTS

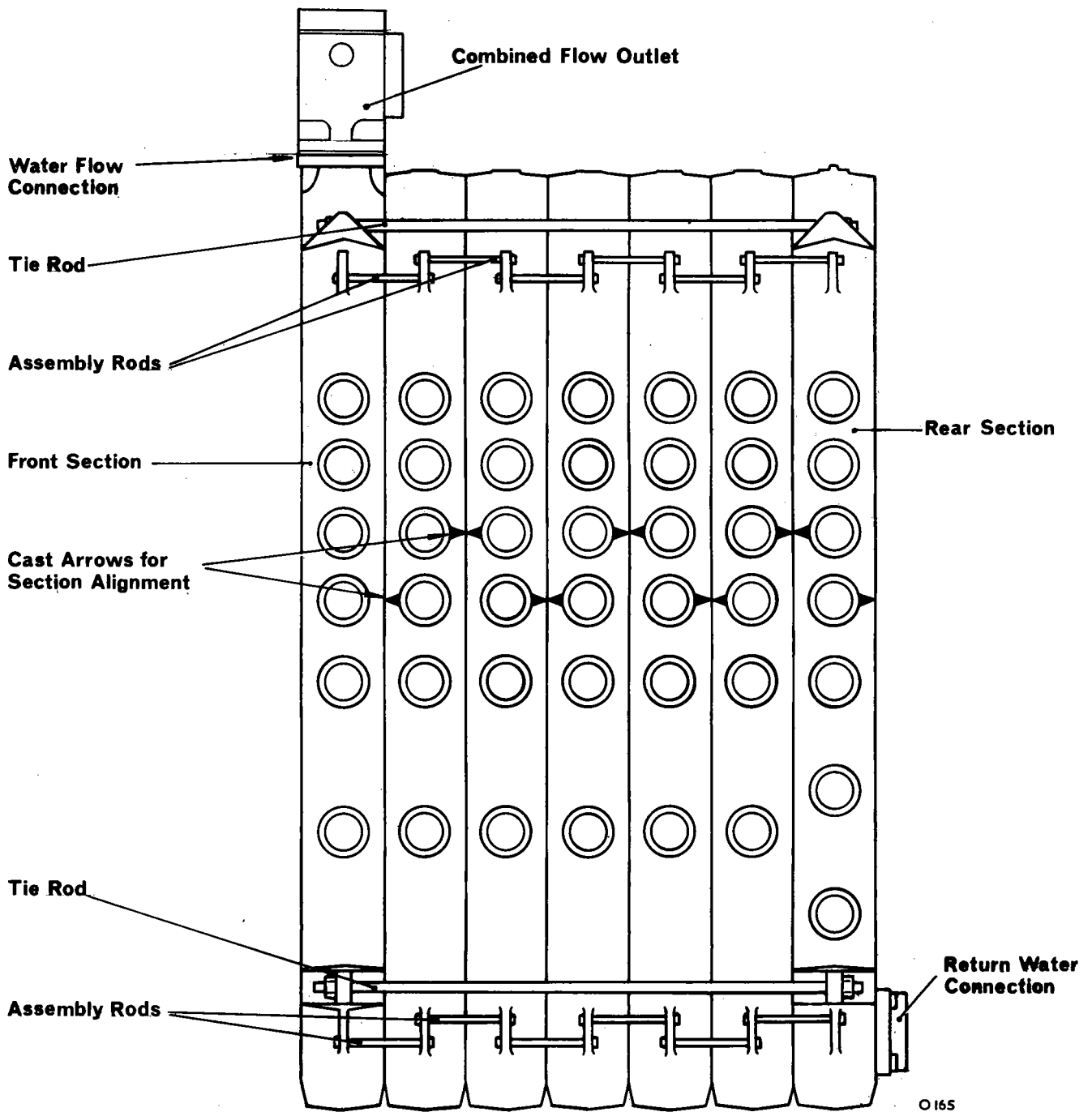
AVON		400	500	600
Minimum fresh air requirements	cfm @ stp	377	395	450
	m ³ /s @ stp	.18	.19	.21
	sq. in.	240	287	321
	sq. cm.	1548	1852	2071

TABLE 3. BURNER DATA

AVON			400	500	600	
OUTPUT	TOWNS AND NATURAL GAS		Btu/h kW	400,000 117	500,000 146	600,000 176
	INPUT	TOWNS GAS	Btu/h kW	532,500 156	647,500 190	780,000 228
NATURAL GAS		Btu/h kW	534,000 157	666,000 195	800,000 234	
GAS RATE	TOWNS GAS		cu. ft/h m ³ /h	1,065 30	1,295 37	1,560 44
	NATURAL GAS		cu. ft/h m ³ /h	534 15	666 19	800 22.5
MAIN BURNER PRESSURE	TOWNS GAS	G.3	in. w.g. mbar	0.9 2.25	0.6 1.5	1.0 2.5
		G.4	in. w.g. mbar	1.0 2.5	0.7 1.75	1.1 2.75
		G.5	in. w.g. mbar	1.1 2.75	0.8 2.0	1.2 3.0
	NATURAL GAS		in. w.g. mbar	4.6 11.5	6.0 15.0	5.5 13.75
PILOT PRESSURE	TOWNS GAS	G.3	in. w.g. mbar	2.0 5.0	1.5 3.75	1.6 4.0
		G.4	in. w.g. mbar	2.2 5.5	1.7 4.25	1.9 4.75
		G.5	in. w.g. mbar	2.5 6.25	2.0 5.0	2.2 5.5
	NATURAL GAS		in. w.g. mbar	2.2 5.5	2.2 5.5	2.2 5.5
MINIMUM APPLIANCE INLET GAS PRESSURE	TOWNS GAS	G.3	in. w.g. mbar	2.7 6.75	2.7 6.75	2.7 6.75
		G.4	in. w.g. mbar	3.0 7.5	3.0 7.5	3.0 7.5
		G.5	in. w.g. mbar	3.3 8.25	3.3 8.25	3.3 8.25
	NATURAL GAS		in. w.g. mbar	7.0 17.5	8.0 20.0	8.0 20.0
AIR BACK PRESSURE	TOWNS GAS		in. w.g. mbar	.7 1.75	.2 .5	.3 .75
	NATURAL GAS		in. w.g. mbar	.6 1.5	.4 1.0	.5 1.25
QUANTITY OF COMBUSTION PRODUCTS	TOWNS GAS		lb/h kg/h	502 228	610 277	735 332
	NATURAL GAS		lb/h kg/h	570 259	716 325	860 389
CHOKE RING DIAMETER	TOWNS GAS		in. mm.	4-7/32 107	4-11/16 119	4-11/16 119
	NATURAL GAS		in. mm.	4-9/16 116	4-11/16 119	4-11/16 119

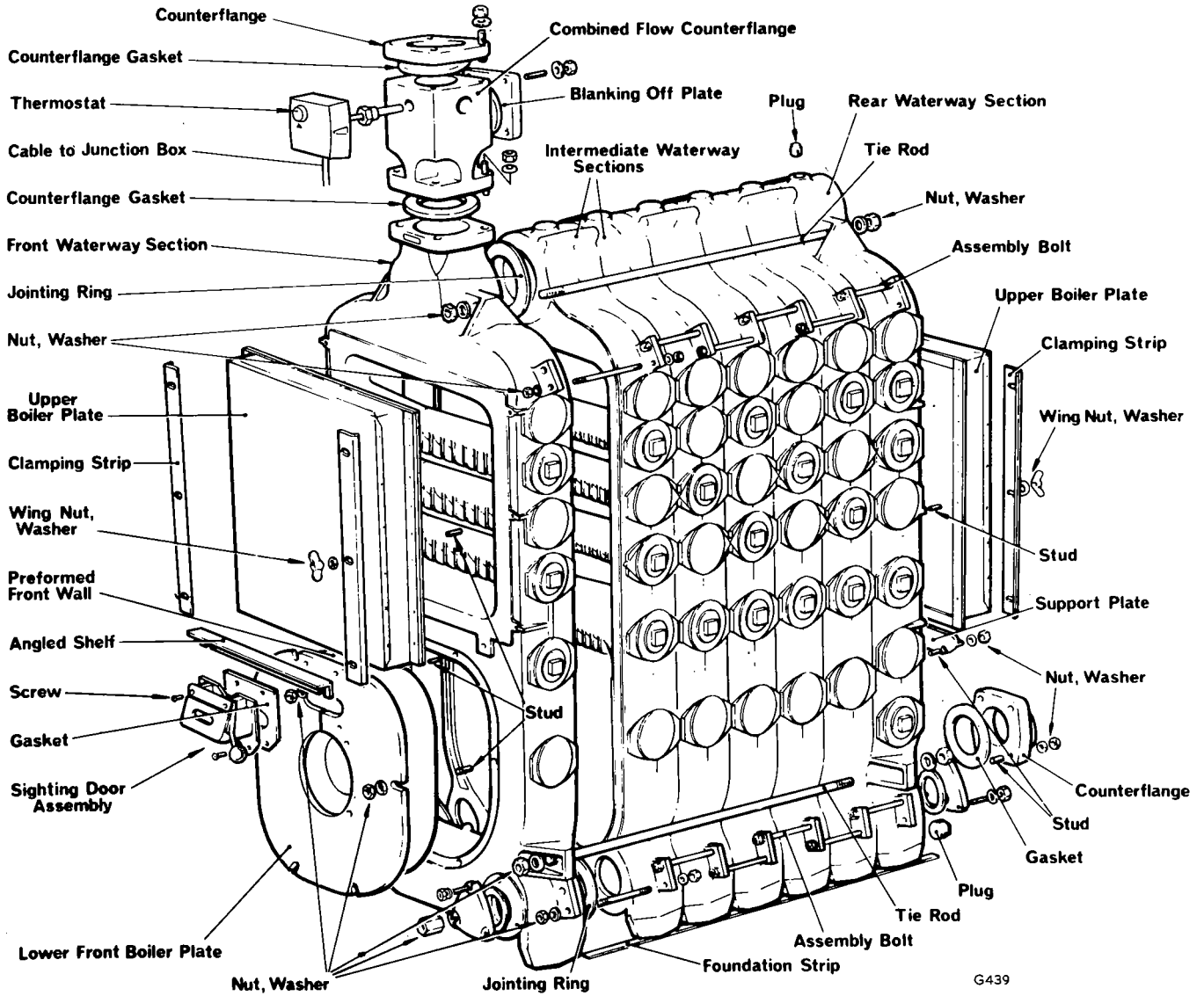


DIMENSIONS
Figure 1



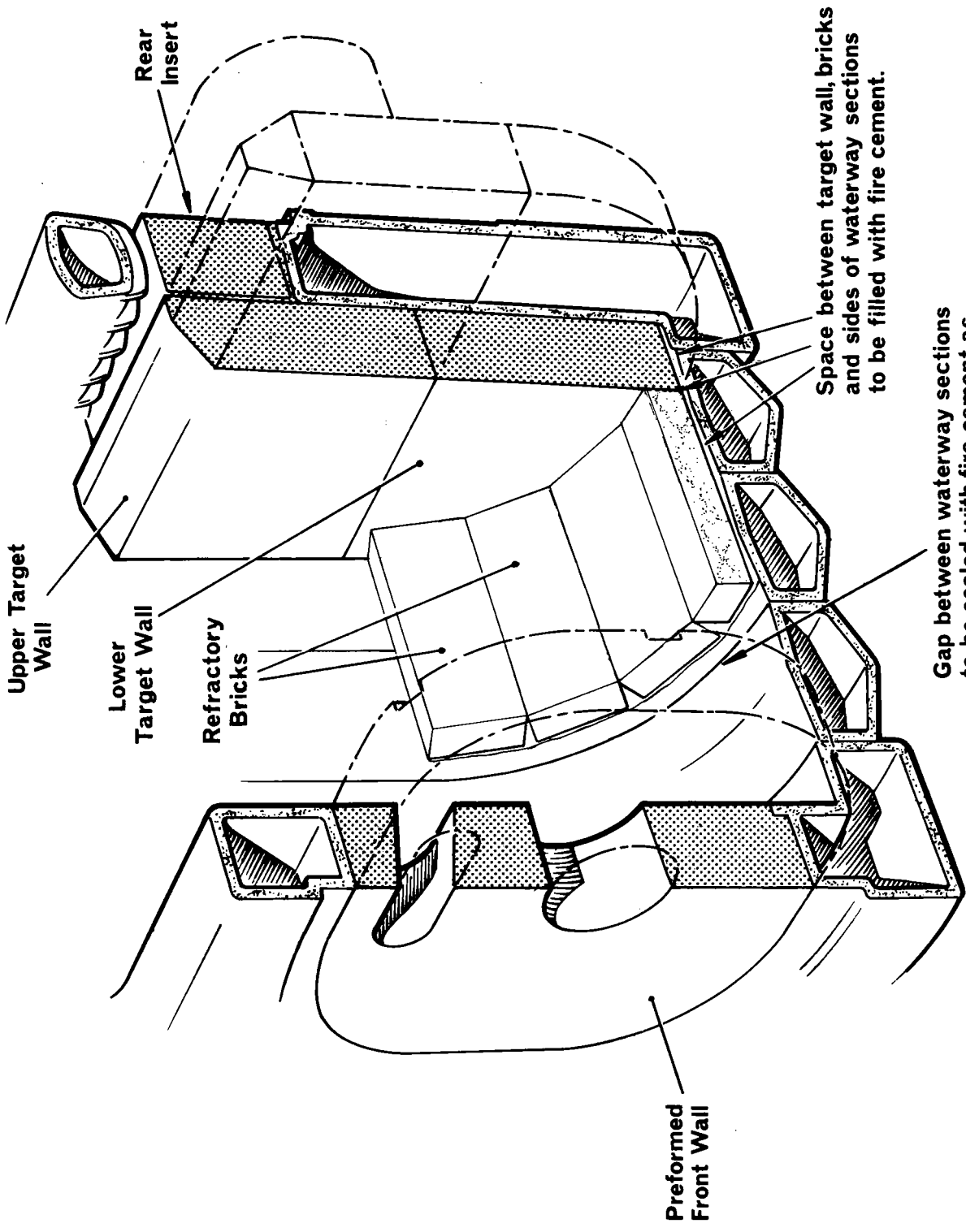
ASSEMBLY OF SECTIONS
Figure 2

O 165



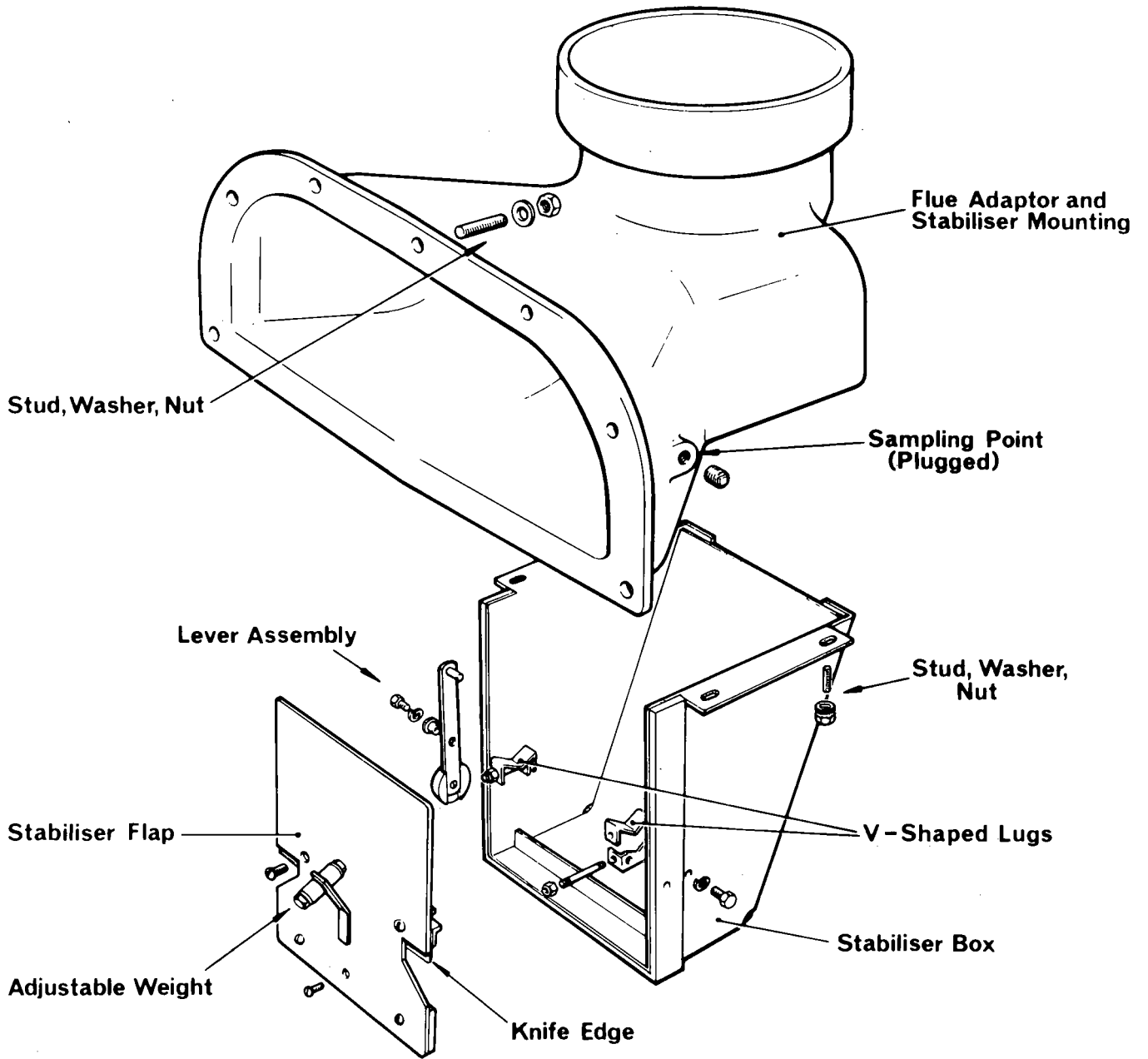
G439

WATERWAYS AND PLATEWORK ASSEMBLY
Figure 3



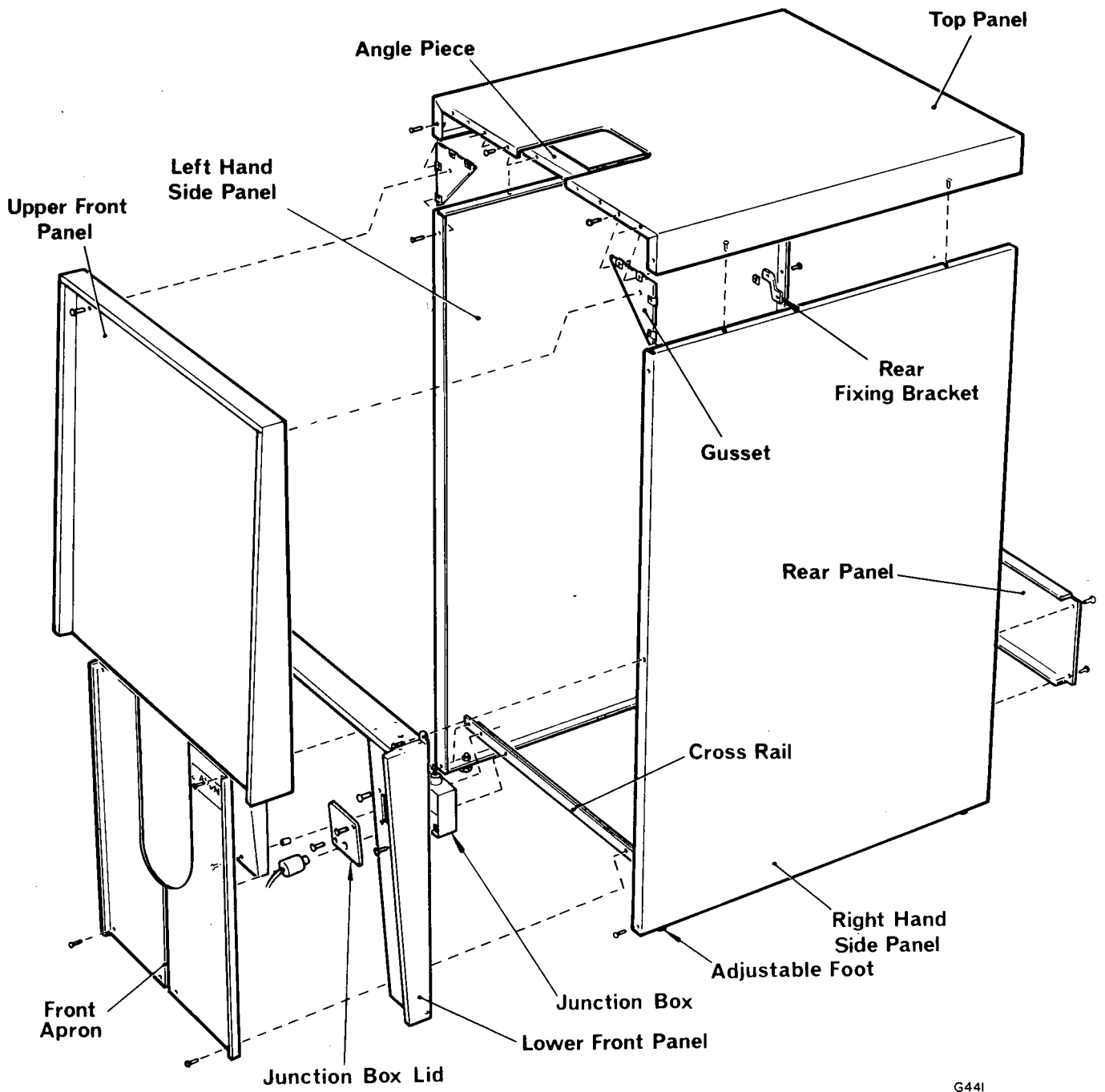
O33A

ASSEMBLY OF FRONT AND REAR WALLS
Figure 4



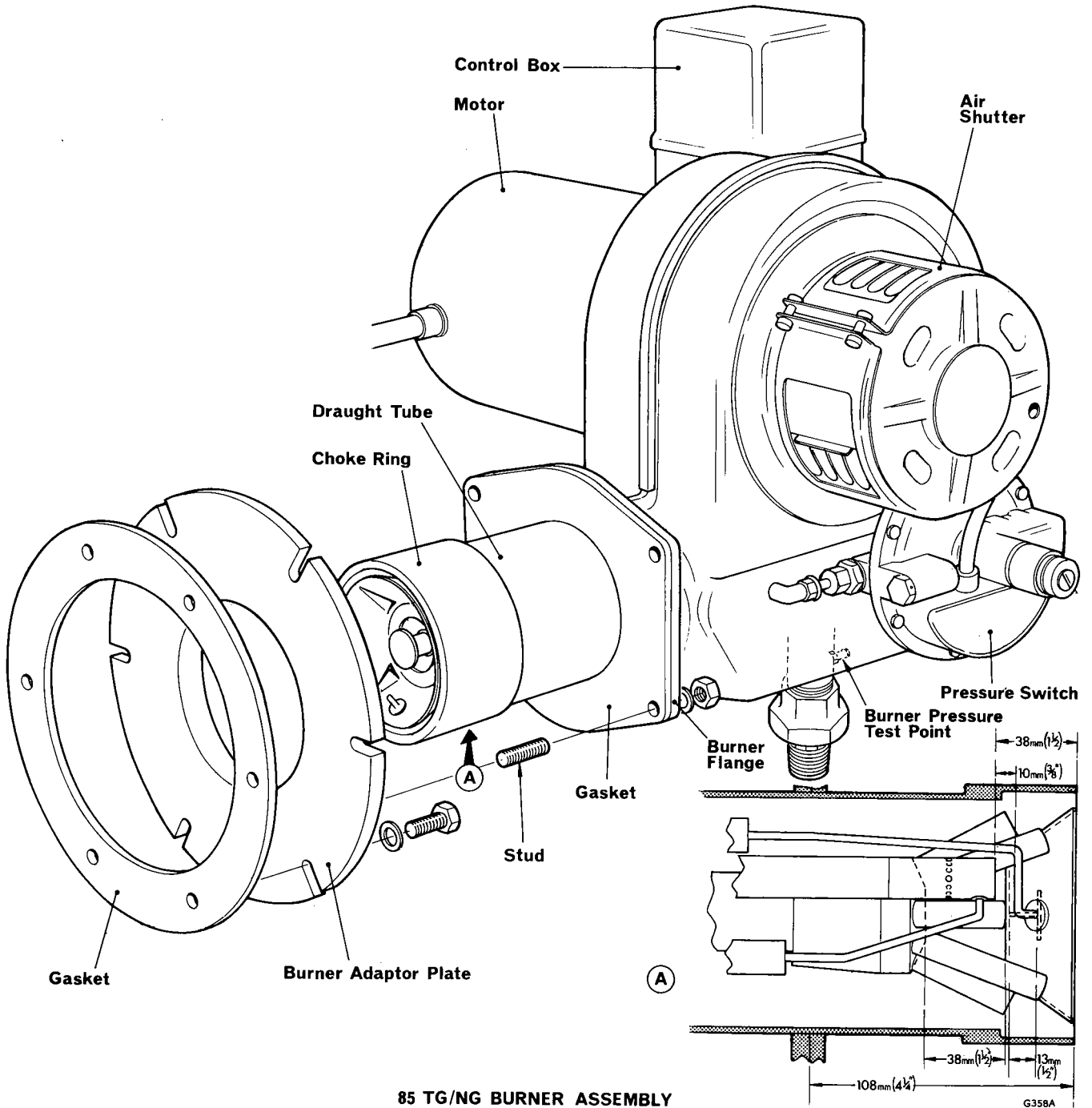
FLUEHOOD ASSEMBLY
 Figure 5

G440.

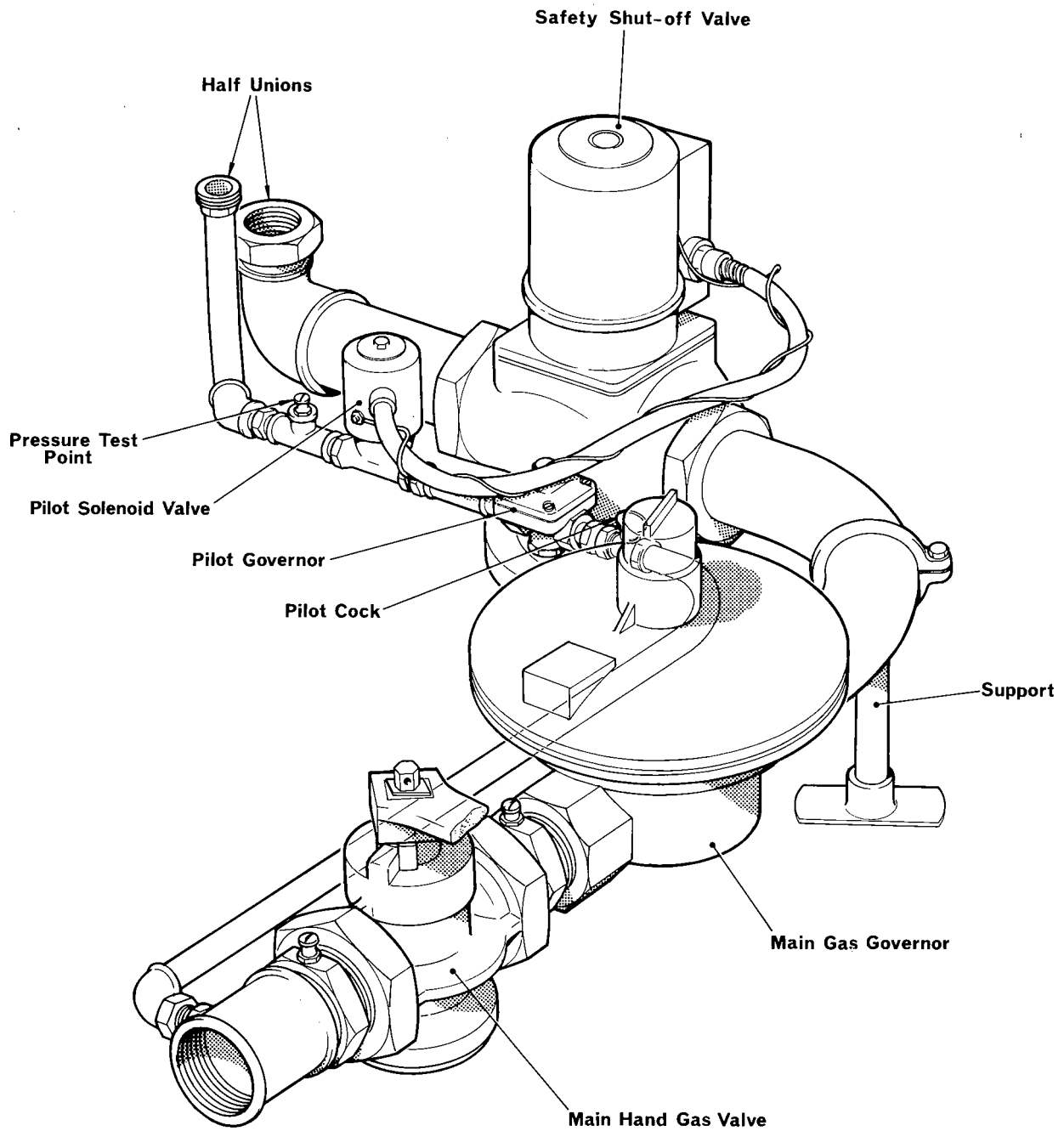


CASING ASSEMBLY
 Figure 6

G441

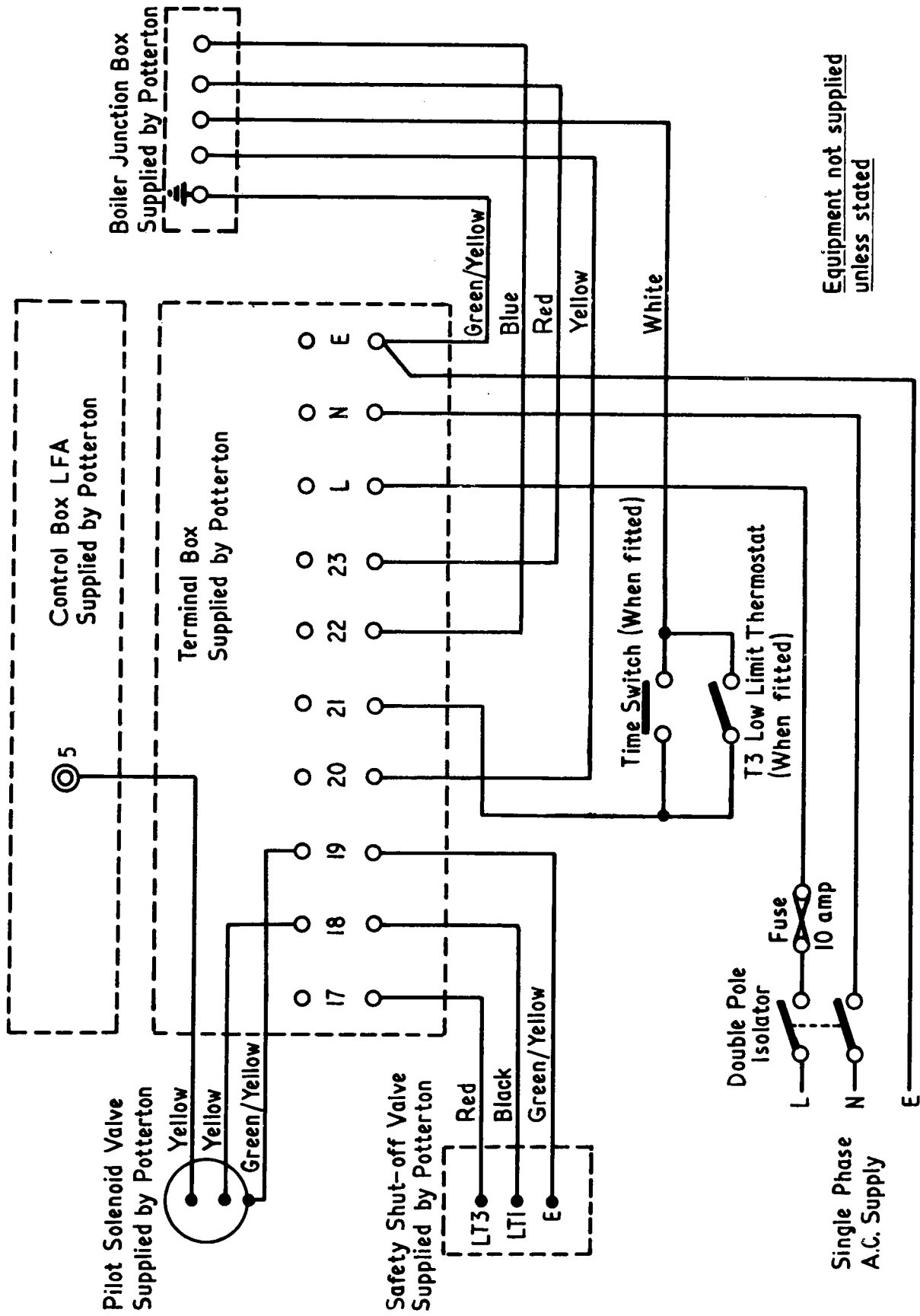


85 TG/NG BURNER ASSEMBLY
Figure 7

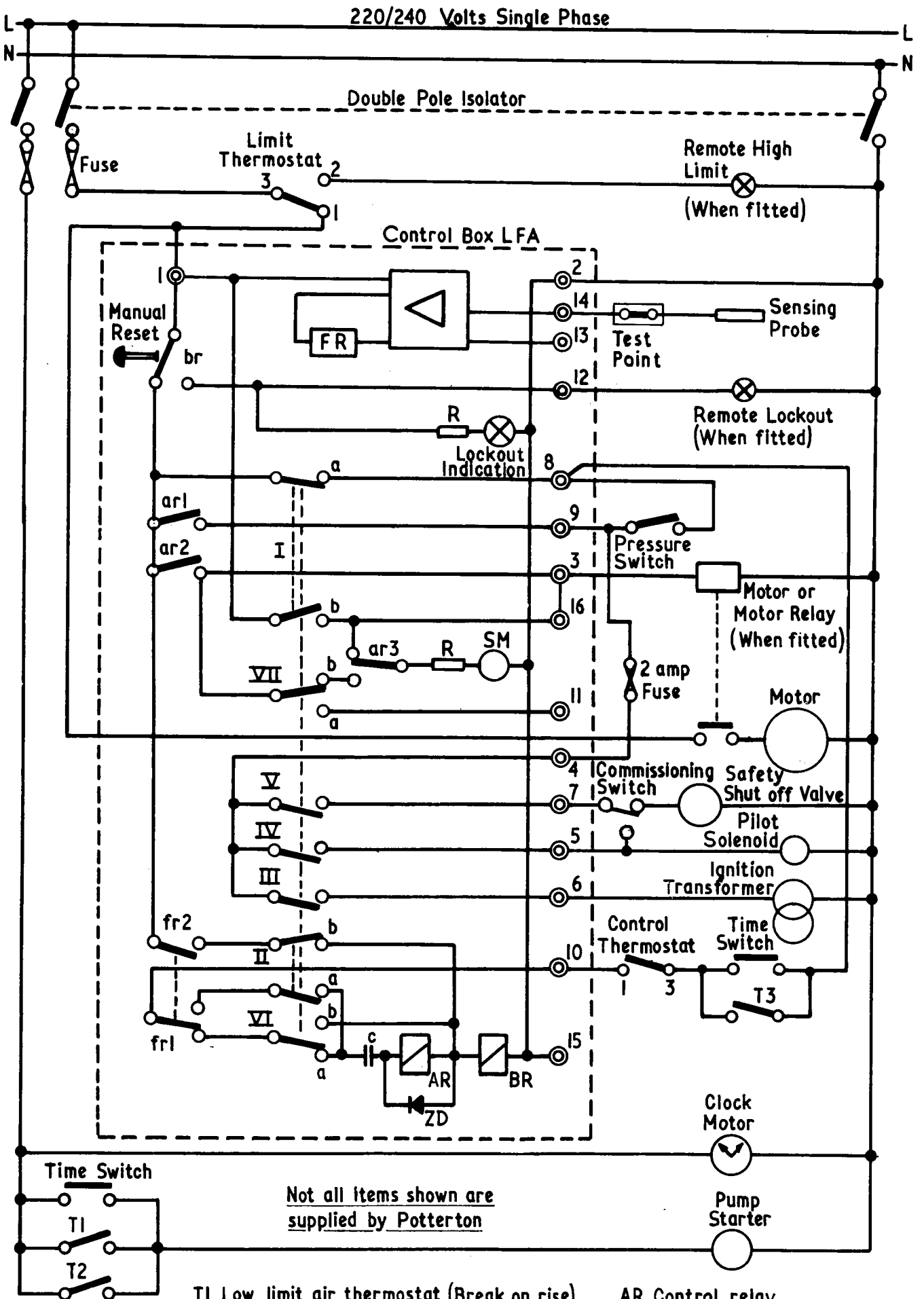


85 TG/NG BURNER, GAS CONTROLS
 Figure 8

G359A

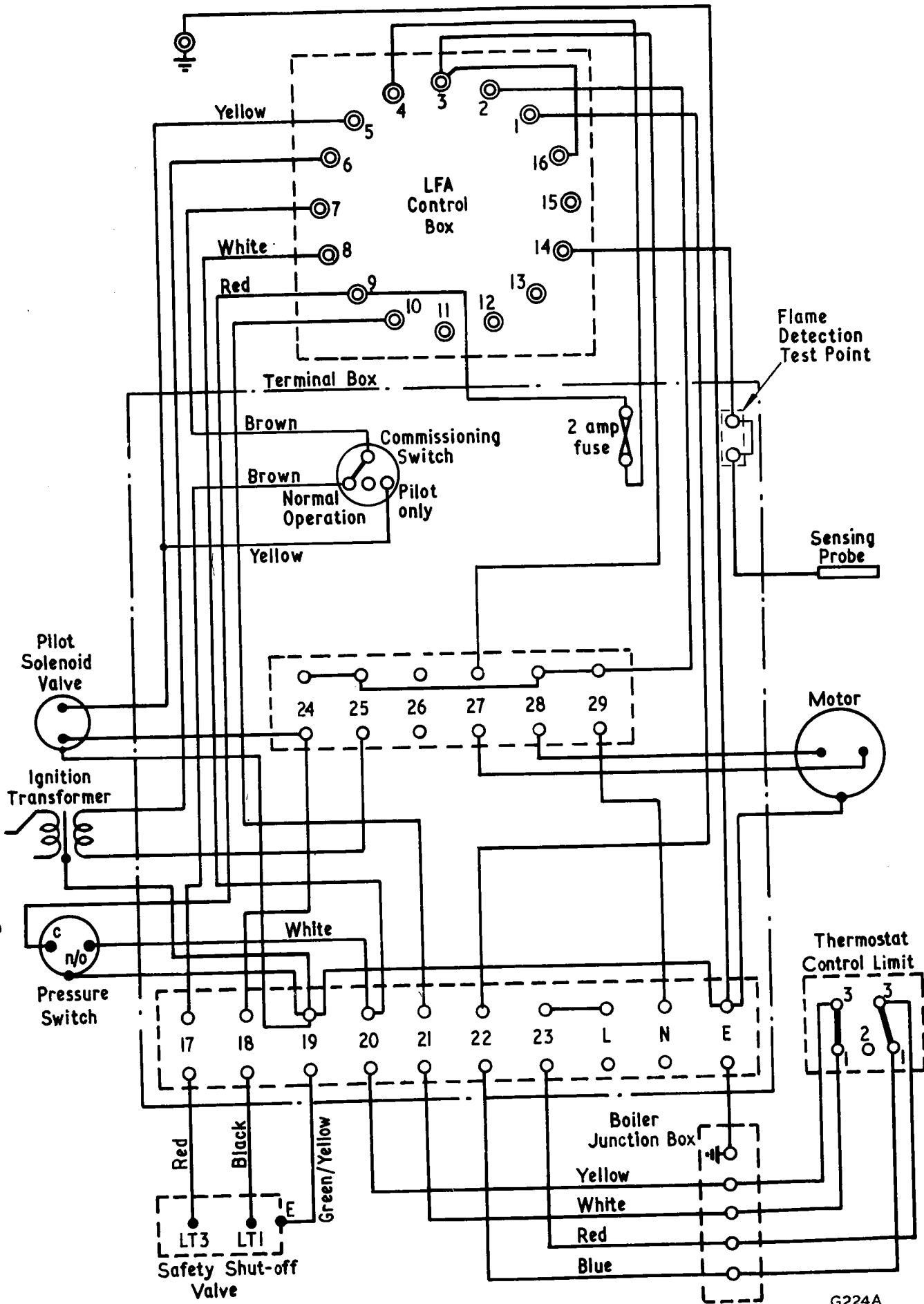


Equipment not supplied unless stated



- | | |
|---|------------------------------------|
| T1 Low limit air thermostat (Break on rise) | AR Control relay |
| T2 Pump delay thermostat (Break on fall) | BR Lockout relay |
| T3 Low limit immersion thermostat (Break on fall) | SM Synchronous Timer |
| FR Flame relay | I-VII Switching mechanism contacts |

TYPICAL SCHEMATIC DIAGRAM, WDC7155 G436
 LANDON KINGSWAY GAS FIRED 85 TG/NG BURNER SINGLE PHASE



INSTALLERS WIRING, WDC7152
 LANDON KINGSWAY GAS FIRED 85 TG/NG BURNER SINGLE PHASE

G224A