NU·WAY

Handbook

automatic dual fuel burners

MODEL
CD5
CD6
CD7
CD8

SECTION 1

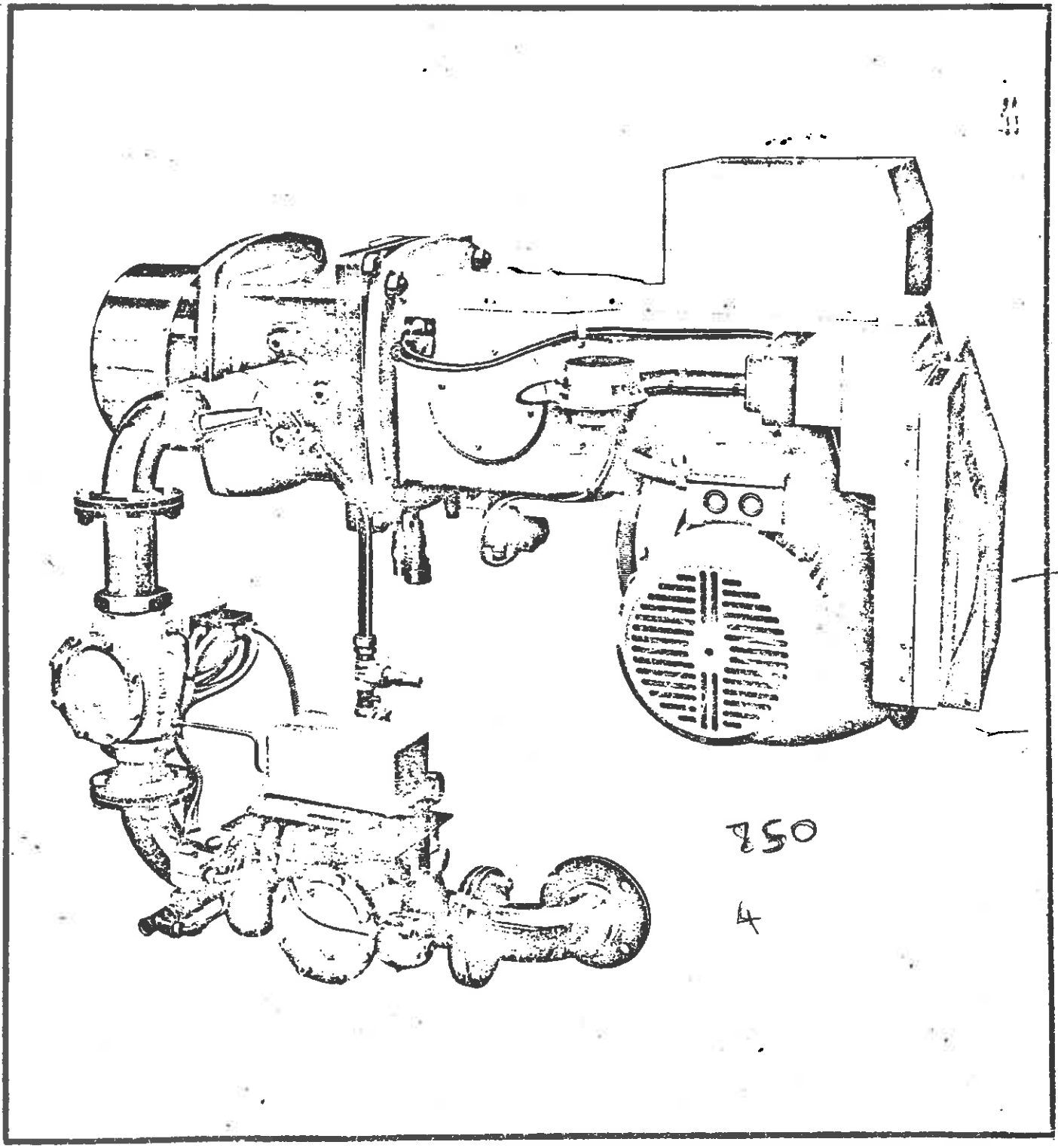
INTRODUCTION

NU·WAY

Technical data

automatic dual fuel burners

MODEL
CD5
CD6
CD7
CD8



ELECTRICAL DATA – MODULATING NAT GAS/DISTILLATE OIL UNITS ONLY

Burner Model	Motors Fan kW	Fan hp	Pump kW	Pump hp	Burner Start A/ph	Burner run A/ph	Cable size mm²	HRC Fuse A
CD5–25B	1·1	1·5	0·375	0·5	15	2·5	1·0	10
CD6–28B	2·2	3·0	0·375	0·5	32	5·8	2·5	25
CD6–28C	2·2	3·0	0·75	1·0	32	5·8	2·5	25
CD6–28D	3·0	4·0	0·75	1·0	36	6·7	2·5	30
CD6–34A	2·2	3·0	0·375	0·5	32	5·8	2·5	25
CD6–34B	2·2	3·0	0·375	0·5	32	5·8	2·5	25
CD6–34C	3·0	4·0	0·75	1·0	42	7·3	2·5	25
CD6–34D	4·0	5·5	0·75	1·0	56	10·1	4	30
CD7–38A	3·0	4·0	0·375	0·5	42	7·3	2·5	25
CD7–38B	3·0	4·0	0·375	0·5	42	7·3	2·5	25
CD7–38C	4·0	5·5	0·75	1·0	50	10·5	2·5	40
CD7–38D	4·0	5·5	0·75	1·0	50	10·5	2·5	40
CD7–38E	5·5	7·5	1·5	2·0	58	15·0	4·0	40
CD8–36B	7·5	10·0	1·5	2·0	78	17·8	6·0	50
CD8–36C	11·0	15·0	1·5	2·0	83	25·0	6·0	40
CD8–41A	11·0	15·0	1·5*	2·0*	83	25·0	6·0	40
CD8–41B	11·0	15·0	1·5	2·0	83	25·0	6·0	40
CD8–41C	11·0	15·0	1·5	2·0	83	25·0	6·0	40
CD8–44A	11·0	15·0	1·5*	2·0*	83	25·0	6·0	40
CD8–44B	11·0	15·0	1·5	2·0	83	25·0	6·0	40
CD8–44C	15·0	20·0	1·5	2·0	103	30·4	6·0	40

*Below 2345 kW (2,000 000 kcal/h 8,000 000 Btu h) the pump motor rating is 0·75 kW (1·0 hp).

All data calculated at 415V 50 Hz. All motors are two pole machines running at 2840 rev/min.
Starting is Star/Delta above 4·0 kW.

TITLE:
ELECTRICAL DETAILS FOR C.D.H. & X.
MODULATING DUAL FUEL BURNERS.

BURNER.	FAN MOTOR. H.P.	K.W.	RUN.	START.	OVERLOAD	FUSE.	OIL PUMP MOTOR. H.P.	K.W.	RUN.	START.	OVERLOAD	FUSE.	HEATER K.W.	FUS
CD7–38D.	7·5	5·5	11·5A	40A	10·4–16A	20A	1	0·75	2·1A	11A	1·8–2·8A	10A	7·5	15A
CD7–38E.	10	7·5	14·4A	50A	10·4–16A	25A	1	0·75	2·1A	11A	1·8–2·8A	10A	7·5	15A
CD8–36A.	10	7·5	14·4A	50A	10·4–16A	25A	1	0·75	2·1A	11A	1·8–2·8A	10A	7·5	15A
CD8–36B.	10	7·5	14·4A	50A	10·4–16A	25A	2	1·5	3·4A	18A	2·7–4·2A	15A	9	15A
CD8–36C.	15	11	21·6A	65A	19–27A	40A	2	1·5	3·4A	18A	2·7–4·2A	15A	12	20
CD8–41A.	15	11	21·6A	65A	19–27A	40A	1	0·75	2·1A	11A	1·8–2·8A	10A	7·5	15A
CD8–41B.	15	11	21·6A	65A	19–27A	40A	2	1·5	3·4A	18A	2·7–4·2A	15A	9	15A
CD8–41C.	15	11	21·6A	65A	19–27A	40A	2	1·5	3·4A	18A	2·7–4·2A	15A	12	20
CD8–44A.	15	11	21·6A	65A	19–27A	40A	1	0·75	2·1A	11A	1·8–2·8A	10A	7·5	15A
CD8–44B.	15	11	21·6A	65A	19–27A	40A	2	1·5	3·4A	18A	2·7–4·2A	15A	9	15A
CD8–44C.	20	15	27·0A	85A	26·5–45A	40A	2	1·5	3·4A	18A	2·7–4·2A	15A	12	20

ALL CURRENT RATINGS RELATE TO 415V SUPPLY.

ALL MAIN FUSES MUST COMPLY TO B.S.88

ALL MOTORS STAR-DELTA ABOVE 5·5 H.P.

SECTION 1 - INTRODUCTION

1. The CD range of fully automatic dual fuel burners, is available for modulating and high/low methods of operation.

The modulating series covers outputs of 1831 to 4400 kW (6,250,000 - 15,000,000 Btu/h), with high/low from 586 to 1831 kW (2.0 Mill - 6.25 Btu/h), available for operation on natural gas and oil having viscosities of 35 seconds H/L and 35 - 3500 seconds Redwood No 1 modulating, (refer to Table I paragraph 3.6 for burner operation and fuels offered.

On all dual fuel burners the construction and sequence of function of both oil and gas systems, comply with relevant standards and international requirements.

2. Modulating Range of Burners

The burners are offered in a monobloc form and the extent of supply to fire any appliance is as follows :

2.1 Main Burner Body: Consisting of burner casing, motor, impeller, air pressure switch, oil and gas separate inner assembly (oil fitted, gas supplied loose), ignition transformer, gasket, connection terminal panel, and gas train.

2.2 Pumping / Heating Unit: Supplied separate for floor mounting, consisting of fuel pump, heater tank (when required), motor, base plate, air bottle and filter. The unit must be installed in the immediate vicinity of the burner.

2.3 Control Panel (Hot Water): Supplied separate for wall or floor mounting, containing all the necessary control equipment for the operation of the burner and boiler. Separate sequence control boxes are fitted for oil and gas, to give the required sequence of operation for each fuel.

2.4 Control Panel (Steam): Would be included in hot water panel as or when required.

2.5 Flexible Oil Connecting Pipes: Two sets of oil pipes are supplied, one set for inlet to the pumping unit, and a set to cater for hinged door applications between pumping unit and burner.

2.6 Gas Interlock Valve and Main Governor: Supplied loose, for installation in supply gas pipework by the installer.

2.7 Boiler Sensing Probe: Supplied loose to suit either Hot Water or Steam appliance, and to be fitted by the boiler maker or installer.

2.8 Gas Booster: Supplied as or when required.

3. HIGH/LOW RANGE OF BURNERS

The burners are offered in a monobloc form and the extent of supply to fire any appliance is as follows :

3.1 Main Burner Body: Consisting of burner casing, motor impeller, air pressure switch, oil and gas separate inner assembly.(oil fitted, gas supplied loose), ignition transformer, gasket, connection terminal panel and gas train.

3.2 Pumping Unit: Supplied separate for floor mounting, consisting of fuel pump, motor, base plate, air bottle and filter. The unit must be installed in the immediate vicinity of the burner.

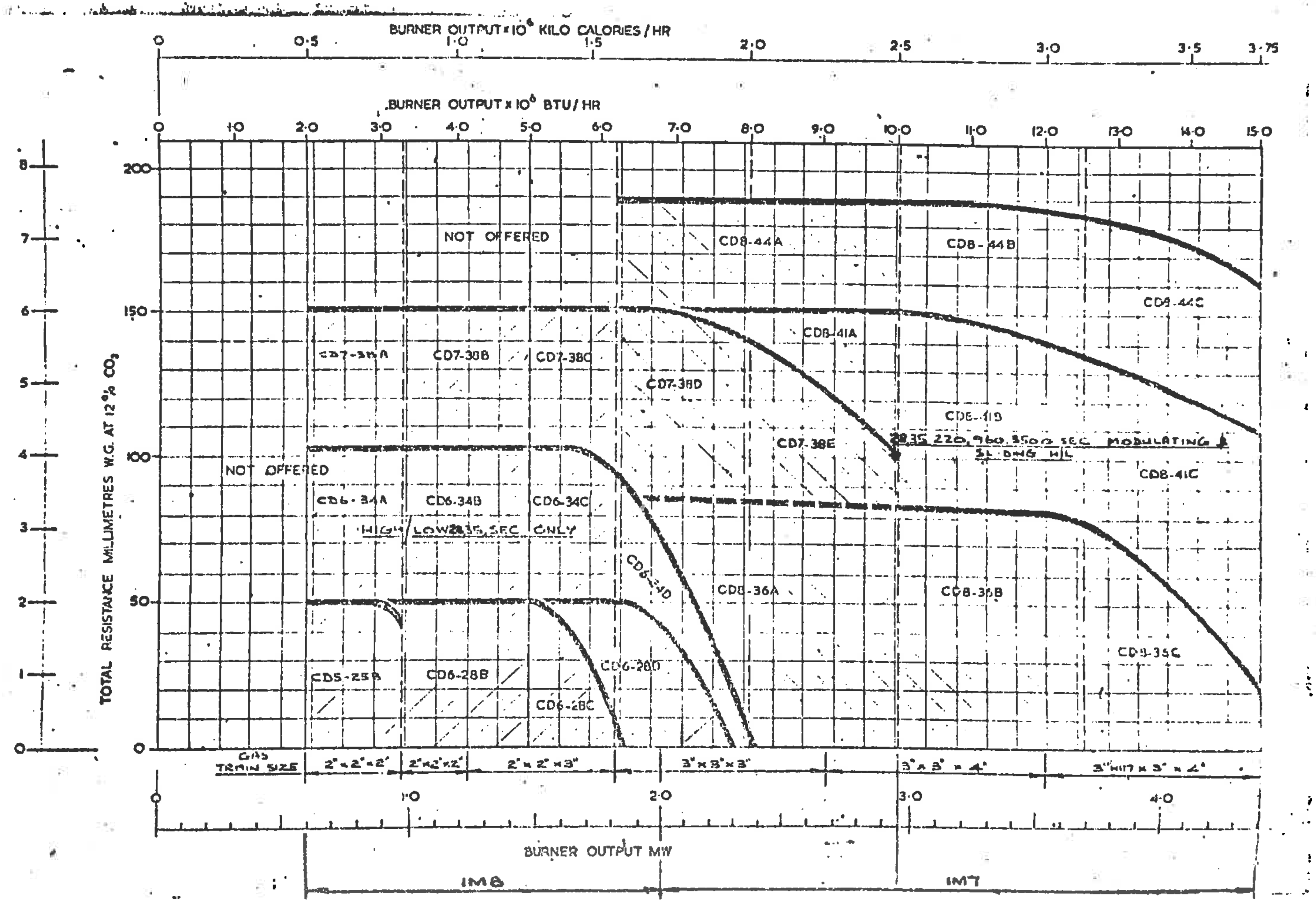
3.3 Control Panel (Hot Water): Supplied separate for wall or floor mounting, containing all the necessary control equipment for the operation of the boiler and burner. Separate sequence control boxes are fitted for oil and gas to give the required sequence of operation for each fuel.

3.4 Control Panel (Steam): Would be included in hot water panel as or when required.

3.5 Gas Interlock Valve and Main Governor: Supplied loose for installation in gas supply pipework by the installer.

SECTION 2

PRE-INSTALLATION PROCEDURE



BURNER OUTPUT x 10^6 KILO CALORIES / HR
BURNER OUTPUT x 10^6 BTU / HR
TOTAL RESISTANCE MILLIMETRES W.G. AT 12% CO2
NOT OFFERED
CD8-44A
CD8-44B
CD8-44C
CD7-38A
CD7-38B
CD7-38C
CD7-38D
CD8-41A
CD8-41B
CD7-38E
2835 220, 960, 3500 SEC MODULATING & SL DNG H/L
CD8-41C
NOT OFFERED
CD6-34A
CD6-34B
CD6-34C
HIGH/LOW 2835 SEC ONLY
CD6-34D
CD8-36A
CD8-36B
CD8-36C
CD5-25B
CD6-28B
CD6-28C
CD6-28D
GAS TRAIN SIZE
2" x 2" x 2"
2" x 2" x 2"
2" x 2" x 3"
3" x 3" x 3"
3" x 3" x 4"
3" H17 x 3" x 4"
BURNER OUTPUT MW
IMB
IMT

3.6 Gas Booster: Supplied as or when required.

3.7. Table I

BURNER	OPERATION			FUEL		
	High/Low	Modulating	Sliding High/Low	Light 'D'	Heavy 'E' & 'F'	Extra Heavy 'G'
CD5	✓	-	-	✓	-	-
CD6-28 & 34	✓	-	-	✓	-	-
CD7-38A, B & C	✓	-	-	✓	-	-
CD7-38D & E	-	✓	✓	✓	✓	✓
CD8	-	✓	✓	✓	✓	✓

SECTION 2 - PRE-INSTALLATION PROCEDURE

2.1 Site Survey:

When the burner is not part of a packaged boiler or air heater it is most important to carry out a site survey before a burner is ordered, in order to check that the boiler or air heater etc. (hereinafter called the "appliance") is suitable for firing with this burner, that it is in good condition, and that the site conditions are satisfactory.

If the appliance is not new, its current condition is very important. It must be sound in construction, clean and well sealed against the ingress of air. "Ingress air" is excess air which may never take part in the combustion process and merely carries away heat up the chimney.

The change in the method of firing will impose different stress patterns in the appliance structure, and these may show up unsuspected weaknesses. When converting an existing appliance to dual fuel firing, the boiler manufacturers should be consulted as to the suitability of the appliance.

2.2 Stack System:

If the appliance is not sealed, and is to be operated under natural draught, the calculations for a suitable stack system, should be obtained from a qualified combustion engineer. The maximum pressure in the appliance combustion chamber should be within the range 0.05 - 0.12 mbar (0.5 - 1.27 mm w.g : 0.02 - 0.05 in w.g.) negative pressure. The above figures should be measured at M.C.R. (Maximum Continuous Rating).

It must be stressed that the calculations obtained are valid only if the flue and chimney are unrestricted and free from leaks. Air ingress through the clean-out and inspection openings, through poor joints between flue pipe sections, where the flue pipe enters the stack, and through the brickwork joints themselves, will reduce the

draught available at the appliance. The effect is two-fold. A reduction of gas temperature hence of gas buoyancy, and an increase in gas volume, hence velocity and resistance.

When two brick flues run together with a brick mid-feather separating them, leakage is extremely difficult to avoid since the joints cannot be re-pointed. Therefore this method of construction is not recommended. Leakage will not occur when both flues are working, but when one is idle, cold air will be drawn down from the top of the idle flue through the leakage points.

When using residual fuel gas, the gas exit temperature from the stack should not fall below "dew point" plus an acceptable tolerance, otherwise smutting can occur. Solid fuel burning appliances must not use the same flue or stack as an oil/gas fired appliance.

2.3 Boilerhouse Ventilation:

The permanent ventilation of the boilerhouse (not including doors and windows which may be closed) is essential.

Boilerhouse ventilation serves two essential purposes. One is to admit combustion air to flow freely to the burner or burners from outside the building. The second is to maintain a clean atmosphere within the boilerhouse at a reasonable temperature level.

The minimum area of entry into the boilerhouse required for combustion air purposes only is proportional to the rating(s) of the appliance(s) within.

The minimum area provided should be $4,21 \times 10^{-3} m^2/kg/h$ ($0.2\ ft^2$/Imp gal/hr) based on the maximum rated oil consumption of the appliance(s). To maintain a satisfactory atmosphere in the boilerhouse, this area must be substantially increased. The extra area must be disposed in two parts, one at a low and the other at a high level so that natural convection will create the necessary air changes.

The frequency of air changes needed will depend to a large extent upon the effectiveness of the appliance lagging and the amount of exposed metal flue pipe within the boilerhouse. Although automatic oil burners and their associated controls will operate at temperatures up to 43°C, their ultimate reliability will be impaired by such temperatures and it is strongly recommended that the temperature should be held below 27°C, whenever possible, by effective lagging of both appliances and flue and by good boilerhouse ventilation.

It is suggested that for the ground level and higher situated boilerhouse the area for ventilation should be based on 12,6 x 10^{-3} m^2/kg/h (0.6 ft^2/Imp gal/h) based on maximum rated oil consumption of the appliance(s). The stated ventilation figures would also be suitable for the burner when firing on natural gas.

When the boilerhouse is situated below ground level, arrangements should be made to induce fresh air if necessary; that is, if the air access to the boilerhouse is restricted and of a type which forms a 'chimney' from the boilerhouse windows to ground level.

2.4 Appliance Preparation:

Generally this is a matter for consultation with the appliance manufacturer, and the following principles should be followed depending on their relevance to the particular application. All uncooled surfaces inside the appliance should be covered with refractory and insulating brickwork. A minimum of 75mm refractory and 150mm insulating brickwork should be applied to the floor of the combustion chamber if it is uncooled. If this floor is 'tanked' the insulation thickness must be increased or provision made for ventilating this base.

A back (or target) wall is not essential to ensure flame stability, and may need fitting only if the appliance manufacturer anticipates local overheating due to flame impingement.

Twin flue boilers must have a dividing wall in the rear chamber.

The frontplate should be prepared as shown on the dimensional drawing which is included in the relevant data sheet.

In order to reach the combustion chamber a 8 mm Ø hole should be drilled through the frontplate in a position where it will not be covered by the internal brickwork. During commissioning, a probe will be inserted through this hole in order to measure the draught existing within the combustion chamber. The hole may be plugged at the completion of the commissioning procedure.

Alternatively, the hole may be used for the connection of an air pressure switch if the appliance is working under negative pressure.

A further 8 mm Ø hole should be drilled in the appliance flue gas outlet before any damper or draught stabiliser.

This hole should be arranged so that a sampling tube can be inserted into the centre of the flue gas passage so that flue gas analysis can be made. The sampling process through the open end of this tube must not be affected by air ingress at either the damper spindle or the draught stabiliser.

NOTE: The above facility may already be available. The burner may now be mounted on the appliance. The front-plate drilling details are shown at the front of this manual and on the burner data sheet.

I M P O R T A N T

The wiring from the modulating control thermostat (or pressure switch) to the control panel, must be wired in screened cable suitably earthed.

The wiring between the feedback potentiometer of the modulating motor and the control panel, must also be screened cable suitably earthed. This cable should be

SECTION 3

GAS SUPPLY SYSTEM

burner in order to guarantee the requirements of the booster and/or burner.

3.5 It may be necessary to fit a gas filter in the supply line to the burner, to avoid any ingress of dirt into the governors and gas valves.

3.6 Gas Booster: When a gas booster is required (insufficient mains pressure) it will be supplied in a packaged form. It will consist of inlet and outlet gas pressure switches, motor starter, overload and control panel, all to suit a single booster/burner operation. Alternative variations of booster systems can be supplied, where one booster will serve up to a maximum of three burners or alternatively a booster standby system. Information on these systems can be obtained from the section of gas boosters at the rear of this manual.

3.7 Pipework: The supply pipework should be fully supported throughput its length to the burner, thus avoiding any strain being transmitted from the pipework to either the burner or booster. A gas cock and navy union or flange should be incorporated in the supply pipe, adjacent to the burner, to permit removal of burner for maintenance.

3.8 Gas Systems

3.8.1 Drawing A2-762 Scheme 7/8 indicates the gas train arrangements for burners CD5, 6 & 7. As indicated previously, the main governor and manual valve interlock is supplied loose, for fitting into supply pipework by the contractor. The manual valve interlock has to be connected into the main control panel to give the necessary electrical interlock.

3.8.2 Drawing A2-762 Scheme 9 indicated the gas train arrangement for burners CD8. A supply shut-off valve proving system is fitted to this system, including low and high gas pressure switches to comply with the required standards. The governor and manual valve interlock is supplied loose, as described in 3.8.1.

SECTION 3 - GAS SUPPLY SYSTEM

3.1 Natural Gas Supply System:

The gas mains and meter must be checked by the local gas authority to ensure that both are capable of handling the gas required by the burner and any other existing load. The gas train on the CD range has been designed and sized using Natural gas with a CV 1035 BTU/cu.ft and SG 0.56. To calculate the cu.ft/hour requirement for any given model, use the following equation.

N.B. The below listed figures are applicable in the UK and may vary in other countries.

3.2 1 Therm/hour = 100,000 BTU/hr.
Calorific value of Natural gas 1035 Btu/cu.ft (approx) 0.56 SG.

$$\frac{\text{Appliance Output BTU/HR} \times 100}{\text{Appliance efficiency \%} \times 100{,}000} = \text{Thermal input required.}$$

3.3 Example: Appliance rating 5,000,000 BTU/HR Efficiency 80%.

$$\frac{5{,}000{,}000 \times 100}{80 \times 100{,}000} = \frac{500}{8} = 62.5 \text{ Therms/Hour}$$

To convert this the cu.ft/hr multiply x 96.5 as cu.ft/therm is obtained from formula

$$\frac{\text{Therm}}{\text{CV}} = \frac{100{,}000}{1035} = 96.5$$

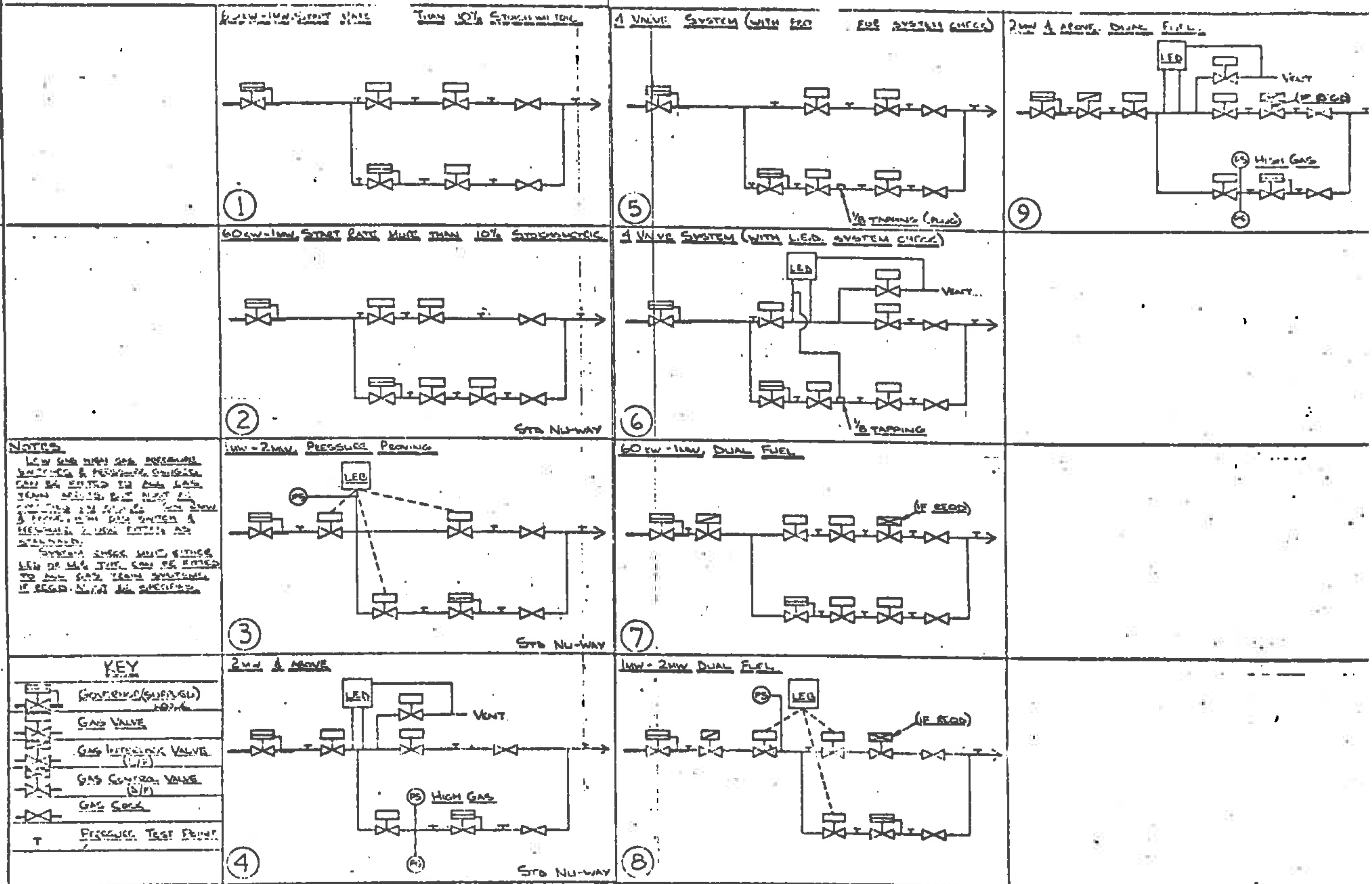
3.4 Unless the supply pressure is already adequate for the burner model (refer to general selection chart as guide) a gas booster unit will be required. In this case a minimum supply pressure of 100 mm wg (4 in wg). Will be required at the inlet to the booster in order to obtain satisfactory operation of the burner. In the event of the pressure falling below this set figure, the burner will shut down to a safe condition (due to insufficient supply pressure). The supply authorities should be consulted on the size of pipework between the meter

DRG No. A2-762

ISSUE					
0	1	2	3	4	5
6	7	8	9	10	11

MODS.

THIRD ANGLE PROJECTION



DRAWN	KJH	PROTECTIVE FINISH		
DATE	27.6.78	MACHINE FINISH	ROUGH / FINISHED	FINE FINISHED
SCALE	—	DIMENSION TOLERANCE	0-150mm ± 0.5mm	150mm & OVER ± 1.0mm

NU-WAY HEATING PLANTS LTD.
DROITWICH · WORC'S

TITLE: GAS TRAIN SCHEMES.

FIN. CODE —
MATL. CODE —
DRG. No. A2-76

SECTION 4

OIL FUEL SUPPLY SYSTEM

SECTION 4 - OIL FUEL SUPPLY SYSTEM

4.1 Oil Tank:

The tank should be placed in the open air, but should not be on a roof or in any other elevated position. If the tank must be installed indoors check all relevant fire regulations.

If the tank must be installed indoors in a position where it is not possible to construct a completely separate fire resisting tank chamber, a catchpit should be provided, its capacity being at least 10% greater than that of the tank itself. The interior of the tank should be left unpainted. The outside should be protected by a suitable anti-corrosion paint.

A galvanised or open tank must never be used:

A dipstick or other form of contents gauge should be fitted, but a gauge glass is not permissible.

A sludge drain valve and plug must be fitted at the lowest point of the tank, and preferably at the opposite end from the draw off outlet. The tank should be installed so that there is a fall of 42 mm/m($\frac{1}{2}$ in/ft) away from the outlet and towards the sludge drain cock.

Ensure that the filling pipe enters the tank at the opposite end to the outlet and that it extends to a point which is readily accessible to the oil supplier's tanker. Obtain the oil supplier's recommendations regarding the size of fill pipe and type of end fitting needed to match his supply hose. If the filling point is below the top of the tank, a stop valve, and dust-cap and cap-retaining chair should be fitted at the end of the fill pipe.

A vent pipe must be fitted. It should be of the same size as that of the fill pipe and its vertical height should be strictly limited to prevent excessive bursting stresses being imposed on the tank in the event of over-filling.

If the oil tank is installed indoors the vent should be led outside the building and in any case should not terminate near a window.

A return bend and a coarse wire cage should be fitted to open end of the vent pipe to prevent the ingress of rain, birds etc.

When the cage is located outdoors in an exposed situation the entire contents of the tank should be maintained at a temperature not lower than that recommended by the fuel supplier.

If the appliance is to be fired by medium, heavy or extra heavy oil the tank must be equipped with means for raising the contents to the handling temperature recommended by the fuel supplier.

Nominal fuel viscosity		Minimum Storage Temperature	Temperature required at burner unit inlet	Atomising Oil Temperature
Seconds Redwood No 1 at 38°C	cSt at 82.2°C	°C	°C	°C
220	12.5	10	16	82
960	30	25	43	104
3500	70	35	77	127

In the case of a system to use medium, heavy or extra heavy oil a thermostatically controlled immersion type outflow heater (preferably vented to tank) should be fitted at the draw off outlet. Also, a limit thermostat should be sufficient to ensure proper control of the heating medium when no fuel is being drawn off.

4.2 Oil Supply Pipework:

Pipes and fitting should be inspected and hammered before installation to ensure that they are free of loose scale.

Galvanised fittings must NOT be used:

Wherever possible, bends should be fitted rather than elbows.

All joints in the pipework must be absolutely oil-tight.

Do not use any jointing materials which harden (eg shellac or litharge). Use a good proprietary, oil-proof jointing compound which will remain permanently in a semi-plastic condition.

Keep the oil supply pipe out of the way, for protection from mechanical damage, but make its route as direct as possible.

Take care not to provide an air trap in the line. The line should always be inclined slightly. It is advisable to provide a tee-plug at any point in the line where air is likely to accumulate, i.e. at the highest point in any run.

A fire-valve should be fitted, under cover, but as close to the tank as possible. This valve is arranged to close automatically when a fusible link mounted above the burner reaches a temperature of 60°C. Additional fuse links should be fitted near the tank (if inside the building), and in any closed passage-ways through which the oil pipe passes.

If the fuel burned by the appliance is medium, heavy or extra heavy oil, the supply pipe must be maintained at the minimum oil handling temperature between the oil storage tank and burner (see table). It is therefore, strongly recommended that the oil supply pipe be traced with thermostatically controlled pipe heating cable and lagged to maintain the contents at a satisfactory temperature. This precaution will ensure an ample supply of oil to the burner at all times, particularly after weekend and holiday shut-down periods during cold weather.

4.3 Oil Supply to Burner:

Residual oil must be available at the burner pump (under all circumstances) at a positive pressure of between 0.35 - 0.7 bars (5 - 10 p.s.i) and at temperatures specified in table (Section 4.1). The ring main pump and supply pipework must be sized to cater for the total swept volume of the burner pump/s x 1.25.

4.3.1 **Oil Supply To Burner - Modulating & Sliding High/Low**

Distillate and residual oil must be available to the burner pump under all circumstances at a positive pressure of .35 - 0.7 bars (5.0 - 10 lb/in^2), and at a temperature as shown in table below. The ring main supply pipework must be sized to cater for the swept volume of the pump (on residual oil this should be at least 1¼ BSP) and not the throughput of the burner nozzle. The following table indicates the pump type and swept volumes.

Note:

The ring main pump must be sized 1.25 x swept total volume of all burner pumps on system.

Burner Size	Pump	35 Sec Fuel Swept Volume	Burner Output Maximum	220, 960 & 3500 Sec Fuel Pump Type	Swept Volume
CD7-D	Fuelmaster H7	136 GPH	6.0 mill	Fuelmaster H6	97 GPH
CD7-E	Fuelmaster H7	136 GPH	8.0 mill	Fuelmaster H7	136 GPH
CD7-F	Sundstrand T3	142 GPH	10.0 mill	Fuelmaster H7	136 GPH
CD8-A	Fuelmaster H7	136 GPH	7.0 mill	Fuelmaster H7	136 GPH
CD8-A	Sundstrand T3	142 GPH	10.0 mill	Fuelmaster H7	136 GPH
CD8-B	Sundstrand T4	197 GPH	12.0 mill	Sundstrand T3	142 GPH
				*Fuelmaster H7	240 GPH (Alt.)
CD8-C	*Sundstrand T2	264 GPH	15.0 mill	Sundstrand T3	142 GPH

* 2850 RPM

Fuel Class BS 2869 1970	Nominal Viscosity Seconds Redwood No 1 @ 100°F (38°C)	cSt @ 82.2°C	Minimum Storage & Handling Temperature °F	°C	Temperature required at burner unit inlet °F	°C	Atomising Oil Temperature °F	°C
E	220	12.5	50	10	60	16	180	82
F	960	30	77	25	110	43	220	104
G	3500	70	95	35	170	77	250	127

4.4 Oil System - distillate oils (35 secs Redwood No 1) - Modulating operation:

Drawing A4-1171 shows the hydraulic circuit for the burner. It is recommended that a two pipe system be installed to suit this equipment, with a return, via an air bottle to the ring main/tank. The air bottle must be vented, as required, when running on oil.

4.5 Oil Systems - residual oils (220-3500 secs Redwood No 1) - Modulating operation / sliding High/Low:

Drawing A4-1101/1 shows the hydraulic circuit for the burner. It is recommended that the system is a ring main, which ensures oil circulates through the pre-heater, solenoid valves, inner assembly, etc., without spillage into the ring main, when the burner is in a shut-down condition. The air bottle must be vented as required. When a stop valve is installed, a pressure relief valve must be fitted by the installer, set of 0.7 kg/cm^2 (10 p.s.i) above operating pressure of ring main (see drawing).

4.6 Oil System - distillate oils (35 secs Redwood No 1) - High/Low operation:

Drawing A4-985/2 shows the hydraulic circuit for high/low burners. It is usual for this burner to work on single pipe gravity feed systems. However, in the event of a suction lift two pipe system being required, an internal by-pass plug should be fitted in pump and the return line from the pump to tank should be as shown on the drawing.

4.7 Oil System - distillate oil (35 secs Redwood No 1) and residual oil (300-3500 secs Redwood No 1):

Drawing A4-933 shows the hydraulic circuit for the burner, with a return to ring main on 35 seconds oil and single pipe feed only on 3500 seconds ie no return. Air bottle to be vented as required.

DRG. NO.
A4-1171

MODS.

THIRD ANGLE PROJECTION

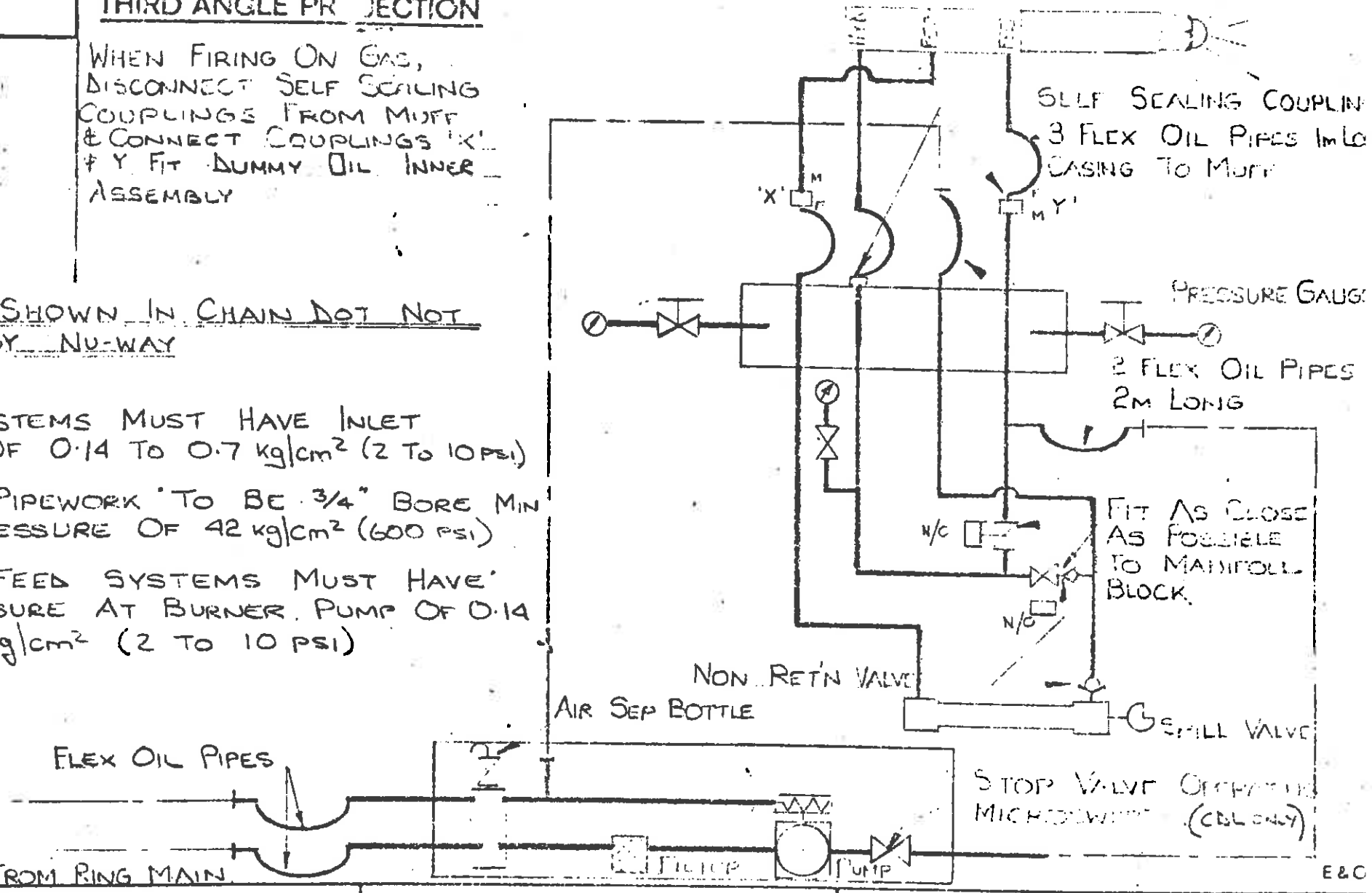
WHEN FIRING ON GAS, DISCONNECT SELF SEALING COUPLINGS FROM MUFF & CONNECT COUPLINGS 'X' & 'Y' FIT DUMMY OIL INNER ASSEMBLY

PIPEWORK SHOWN IN CHAIN DOT NOT SUPPLIED BY NU-WAY

PUMPED SYSTEMS MUST HAVE INLET PRESSURE OF 0·14 TO 0·7 kg/cm² (2 TO 10 PSI)

PRESSURE PIPEWORK TO BE 3/4" BORE MIN TO SUIT PRESSURE OF 42 kg/cm² (600 PSI)

GRAVITY FEED SYSTEMS MUST HAVE INLET PRESSURE AT BURNER PUMP OF 0·14 TO 0·7 kg/cm² (2 TO 10 PSI)



E&C

DRAWN A.P.H.	PROTECTIVE FINISH			
DATE 16-7-79	MACHINE FINISH	ROUGH ✓	FINISHED 32	FINE FINISHED 08
SCALE —	DIMENSION TOLERANCE	0-150mm ±0·5mm	150mm & OVER ±1·0mm	

NU-WAY HEATING PLANTS LTD
DROITWICH ENGLAND

TITLE OIL SYSTEM FOR CDL & CL. MOD. BURNERS

MATL CODE

FIN. CODE

DRG. NO. A4 985/2

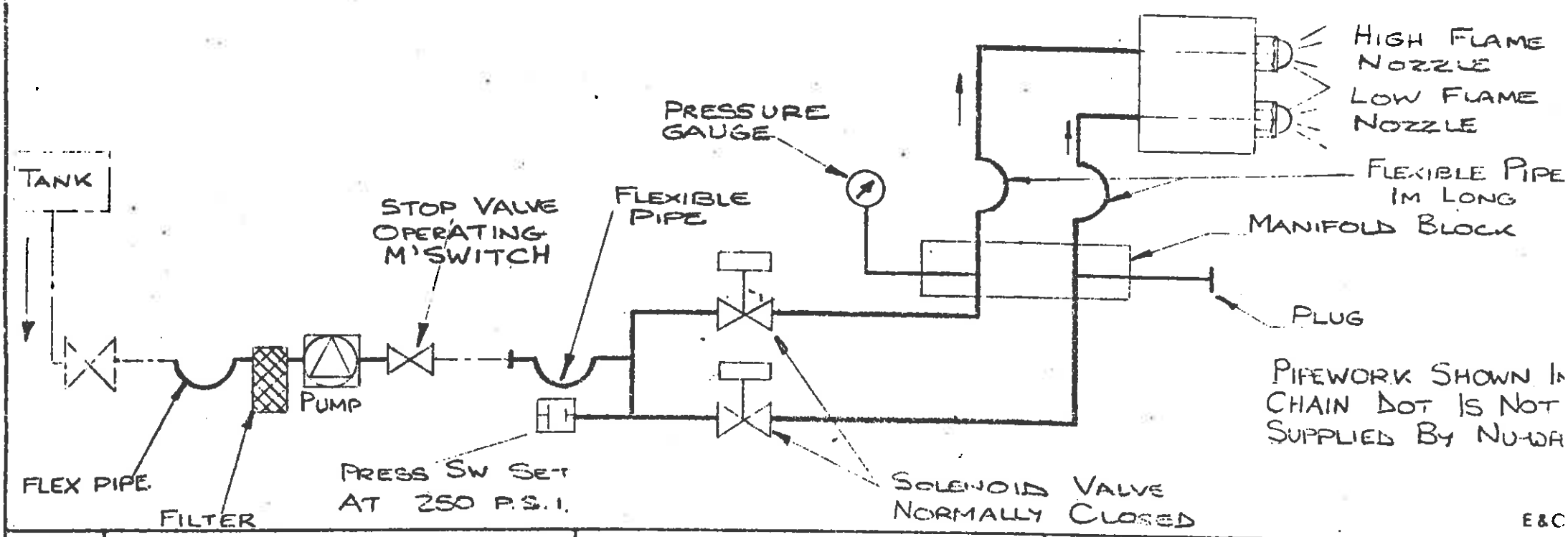
THIRD ANGLE PROJECTION

MODS.

/2. REDRAWN A.R.H. 5-7-79

GRAVITY FEED SYSTEMS MUST HAVE INLET PRESSURE AT BURNER PUMP OF 0.14 TO 0.7 Kg/Cm² (2 TO 10 PSI)

PUMPED SYSTEMS MUST HAVE INLET PRESSURE OF 0.14 TO 0.7 Kg/Cm² (2 TO 10 PSI)



E&C

DRAWN ARP	PROTECTIVE FINISH			
DATE 6.7.79	MACHINE FINISH	ROUGH ✓	FINISHED 3.2 ✓	FINE FINISHED 0.8 ✓
SCALE ———	DIMENSION TOLERANCE	0–150mm ± 0.5mm	150mm & OVER ± 1.0mm	

NU-WAY HEATING PLANTS LTD
DROITWICH ENGLAND

TITLE OIL SYSTEM FOR 35 SEC OIL HIGH/LOW DUAL FUEL BURNER

MATL. COD

FIN. CODE

DRG NO.
A4-1101/1

MODS.
1. REDRAWN 9/1/79 ARW

THIRD ANGLE PROJECTION

WHEN FIRING ON GAS, DISCONNECT SELF SEALING COUPLINGS FROM MUFF & CONNECT COUPLINGS 'X' & 'Y' TO ALLOW OIL TO CIRCULATE. FIT DUMMY OIL INNER ASSY.

WHEN FIRING ON OIL FIT OTHER HALF OF S.S CPLG TO 'Y' (PLUGGED)

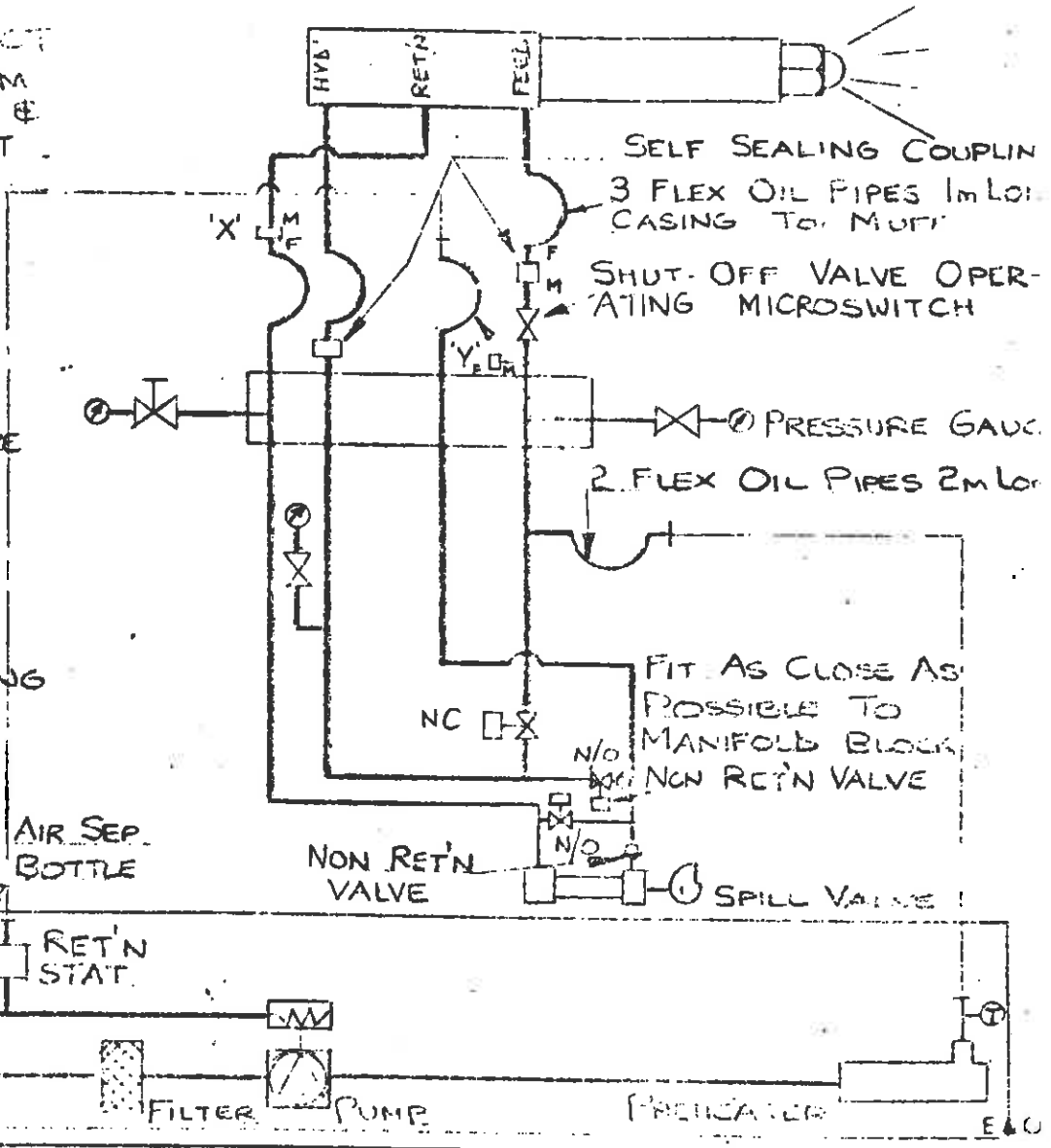
PIPEWORK SHOWN IN CHAIN DOT NOT SUPPLIED BY NU-WAY

PUMPED SYSTEMS MUST HAVE INLET PRESSURE OF 0.35 TO 0.7 kg/cm² (5 TO 10 P.S.I.)

ALL PIPEWORK MUST BE TRACED

FOR 960 & 3500 SEC OIL

PRESSURE PIPEWORK TO BE 3/4" BORE MIN TO SUIT PRESSURE OF 42 kg/cm² (600 PSI) AND MAINTAINED AT BURNER ATOMISING TEMP. SYSTEMS MUST HAVE OIL INLET TEMP MAINTAINED AS RECOMMENDED IN BURNER INSTRUCTION MANUAL. IF A SHUT-OFF VALVE IS FITTED ON INLET LINE A PRESS-RELIEF VALVE SET AT 0.7 kg/cm² (10 PSI) ABOVE SUPPLY PRESSURE MUST BE FITTED TO PREVENT DAMAGE IF VALVE IS LEFT SHUT ON BURNER/HEATER START UP



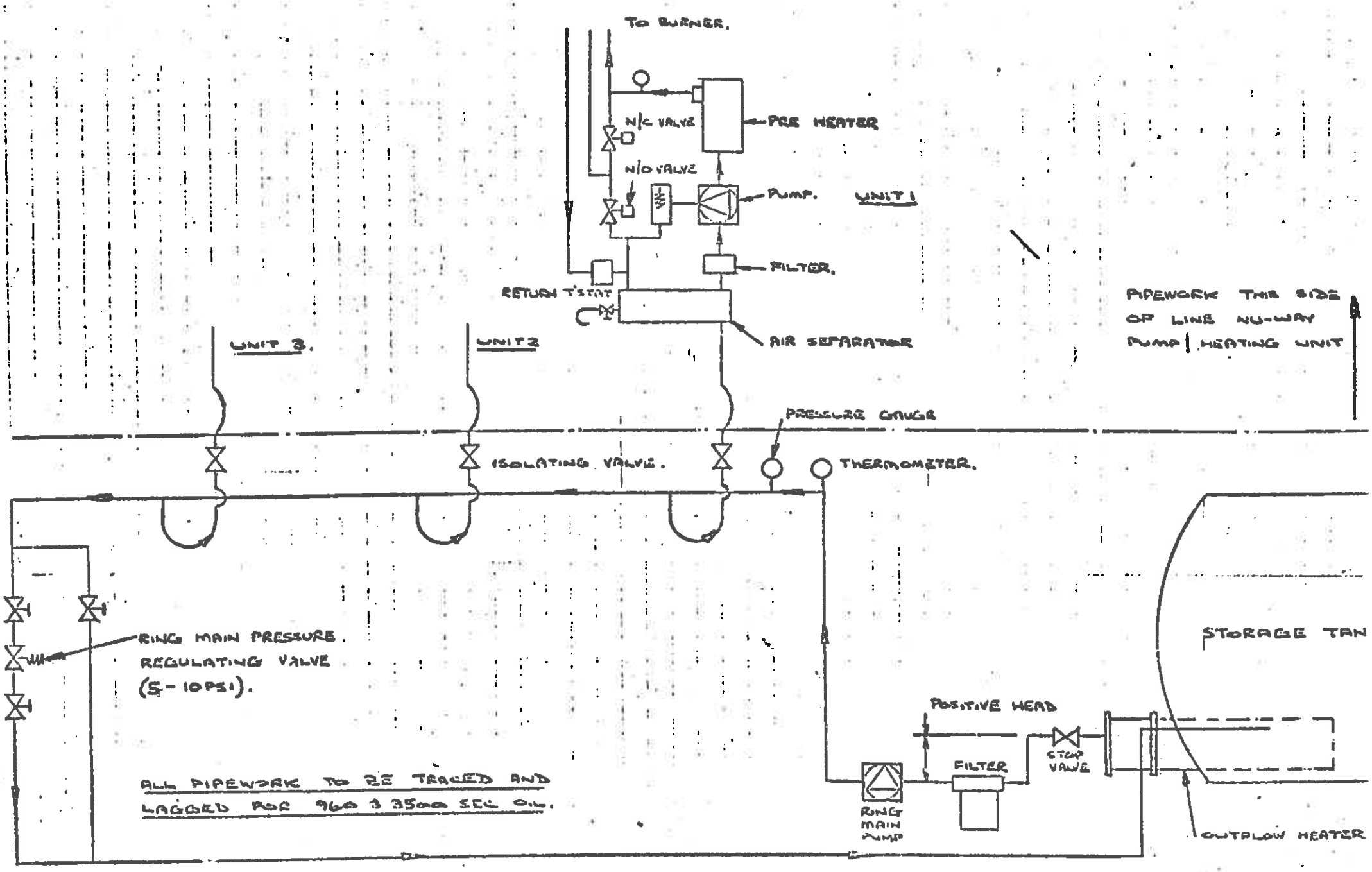
DRAWN AJ	PROTECTIVE FINISH				
DATE 9-7-79	MACHINE FINISH	ROUGH ✓	FINISHED 32	FINE FINISHED 63	
SCALE —	DIMENSION TOLERANCE	0-150mm ± 0.5mm	150mm & OVER ± 1.0mm		

NU-WAY HEATING PLANTS LTD
DROITWICH ENGLAND

TITLE OIL SYSTEM FOR CDX MODU BURNERS

MATL COL

FIN. CODE



SUGGESTED RING MAIN SYSTEM FOR FUEL OIL (2nd 960 & 35sec SEC).

SECTION 5

MODULATING CONTROL SYSTEM

SECTION 5 - MODULATING CONTROL SYSTEM

Modulating Dual Fuel Control System

5.1 General Description: The Nu-Way modulating dual fuel control system (Fig 1) is designed to respond to an error signal between a set value of boiler temperature or pressure and an actual value measured at the boiler. The signal is produced by a Satchwell climatronic CZS modulating controller and used to drive a servo motor which in turn drives a cam-shaft through a timing belt. Three adjustable cams (see Fig 1) are mounted on the cam shaft, one of which is connected to a flexible cable operating the burner air inlet control damper, one to a cable operating the gas control butterfly valve, and the third directly operates the hydraulic spill valve.

A further small fixed cam is mounted on the end of the cam shaft, operating limit switches which safeguard the servo motor and indicates an intermediate position for purging and lighting up (see Fig. 3).

Sequence control and flame sensing functions are performed by oil and gas control boxes mounted in the main control panel which are automatically selected as the burner is switched from one fuel to the other. The modulating controller is also housed in the main control panel.

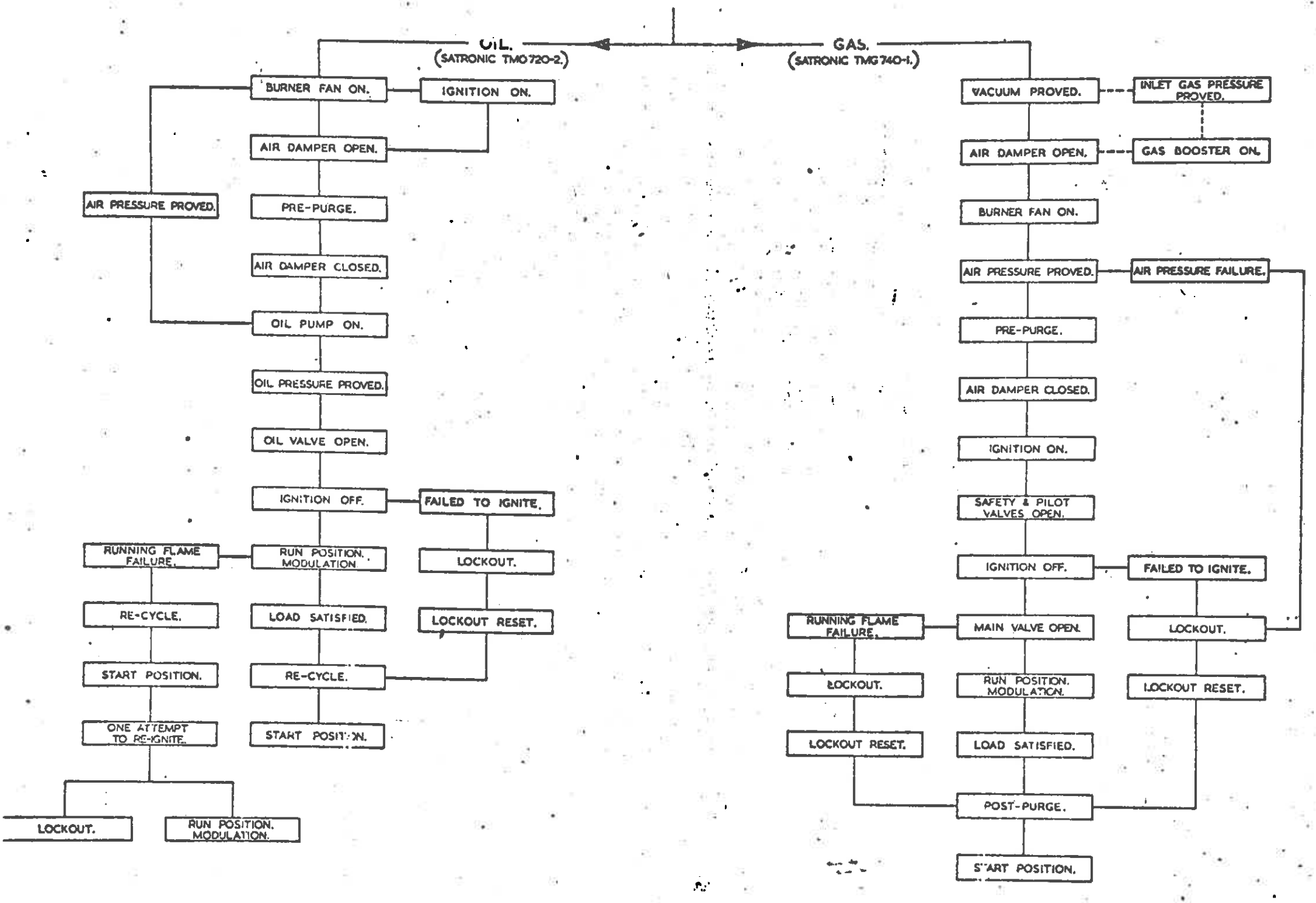
5.2 Sequence of Operation: When the boiler control calls for heat, the modulating unit will travel to the final "high" position (if not already there) and interlock the control circuit. Purging will take place at this rate (30 seconds on oil). At the end of the purge, the control box will stop, but remain energised. The modulating unit will travel to the final "low" position and interlock the control circuit again. The control box then recommences it's operational cycle and the burner will light at this rate and remain there until the high flame release signal is given by the control box. The unit will then modulate between the two limit switches, at a position dependent on the mean boiler load.

There is a well-defined relationship between the delivery of oil through the nozzle and the pressure behind the nozzle, therefore movement of the cam 'modulates' the nozzle output and hence the output of the burner.

5.5.2 It follows from 5.5.1 above that the volume of air required for combustion must be varied as the nozzle output is varied, and this is done by the air control damper, which is operated by a flexible ('Bowden') cable from a simple lever bearing on the air inlet control cam (see Fig. 2A). Once the oil cam has been adjusted as described below under commissioning procedure, the profile of the air cam is adjusted to give the desired combustion conditions by screwing the thumbscrews under the cam strip in or out as the burner is 'inched' up through its firing range.

The air control damper is spring-loaded to open fo safety in the unlikely event of cable failure.

5.5.3 Having profiled the air cam to suit the oil throughput as defined by tne oil cam, the gas cam (Fig. 2A), which is identical to tne air cam is then profiled to suit the air cam. This is done by inching the burner through its firing range on gas, and adjusting the gas cam to give the desired flue gas analysis at each stage.



SEQUENCE OF OPERATIONS FOR MODULATING DUAL FUEL BURNER

5.3 Factory Adjustment

Before leaving the works the modulating unit is set up as follows:

5.3.1 The unmounted modulating motor is connected to a mains supply, neutral to 1, live to A or B. A resistance meter is connected to terminals 4 and 5.

If the resistance between 4 and 5 is approximately 60 ohms, the meter is then connected between 5 and 6. If both readings are equal, the motor is correctly set. If not, the mains supply is switched on and the motor rotated until they are equal. It will then be found that the flats on the motor shaft are horizontal and vertical. The bush is then fitted to the motor shaft and tightened up, and the face of the bush is marked to indicate 'top'.

5.3.2 The motor is mounted on the cam box, the pulley grub screw removed and set on one side.

5.3.3 The camshaft is rotated manually to the mid travel position. Note that the oil cam fixing bolts are in line with the spill regulating valve in this position. The motor and cam unit are now synchronised.

5.3.4 The motor shaft bush is now 'dimpled' through the grub screw hole in the pulley, and the grub screw fitted.

5.4 Procedure to replace a Modulating Motor

5.4.1 Set the motor to central position (see 5.3.1). Fit existing bush with index mark at 'top'. Fit the pulley and tighten the grub screw on the original dimple.

5.4.2 Fit the motor to the cam box assembly, place the shaft in the midway position and fit the belt, ensuring that the camshaft and motor are still centrally located. Tighten motor mounting screws.

5.5 Mechanical and Hydraulic Functions

5.5.1 Drawings in sections 4.4 - 4.7 shows the hydrauli circuits for the burner. Oil for combustion is drawn from the supply through a fixed displacemen pump, and supplied direct to the burner nozzle. a return line from the back of the nozzle is connected to a 'spill regulating valve' which simply regulates the pressure at the nozzle according to the position of an internal piston, which in turn is moved by the oil cam in the cam

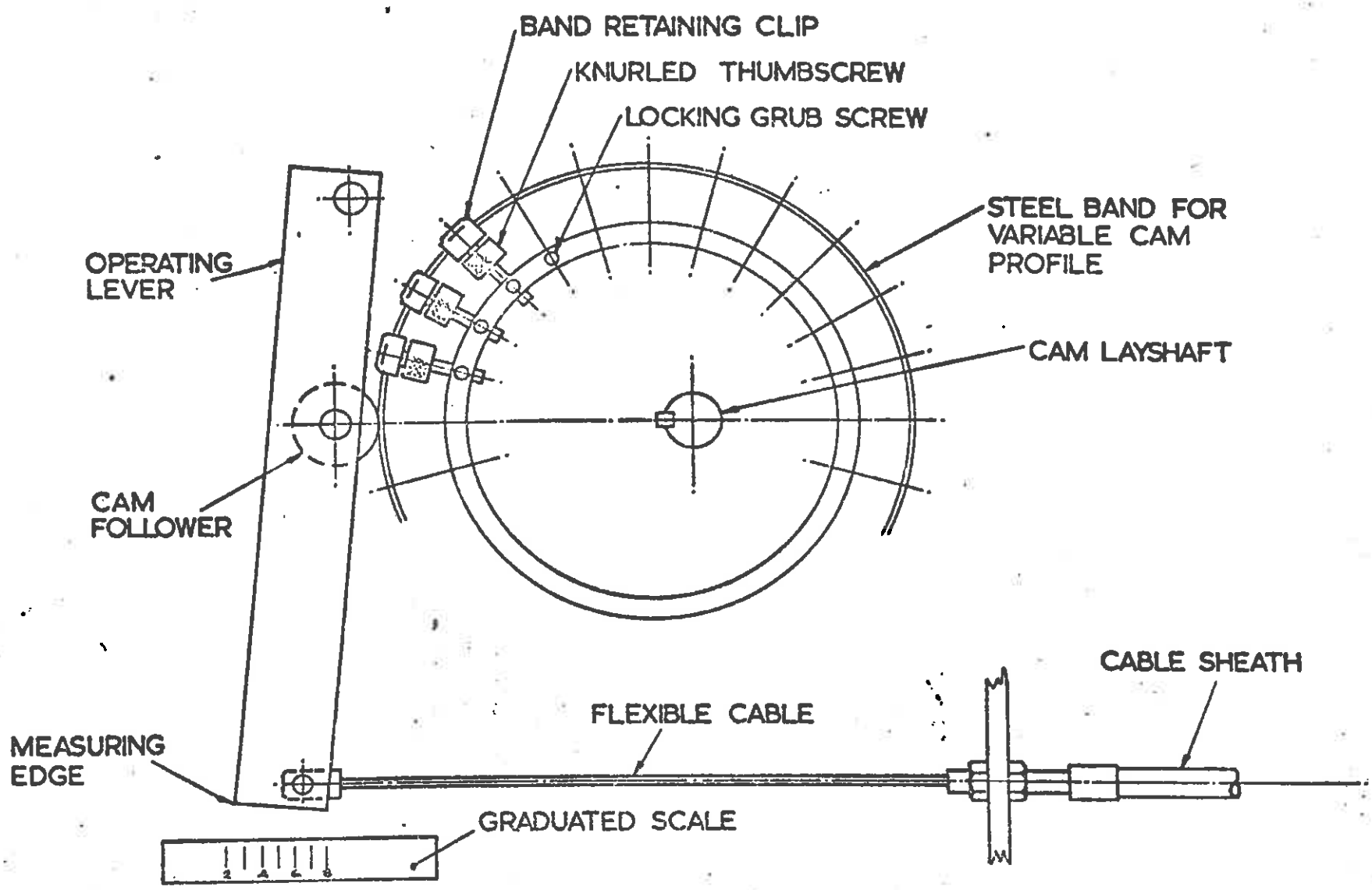


FIG. 2A DETAIL OF MODULATING AIR OR GAS CAM MECHANISM

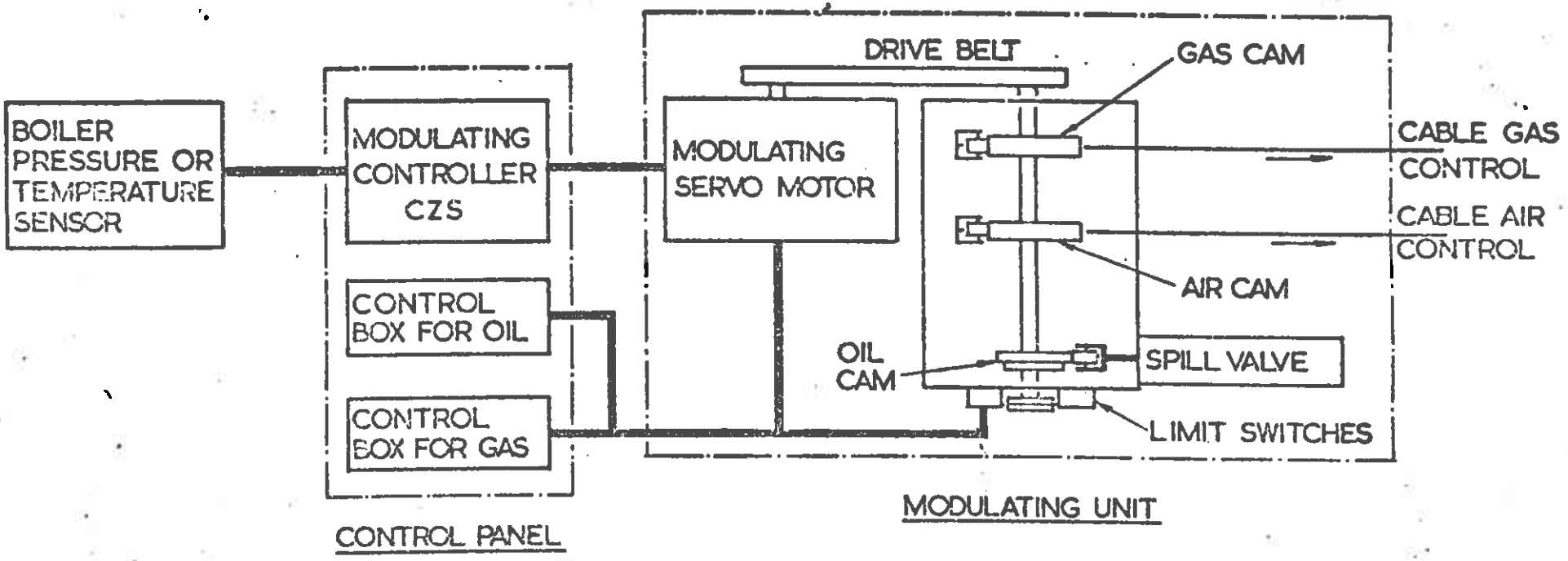


FIG. 1 BLOCK DIAGRAM OF MODULATING CONTROL SYSTEM

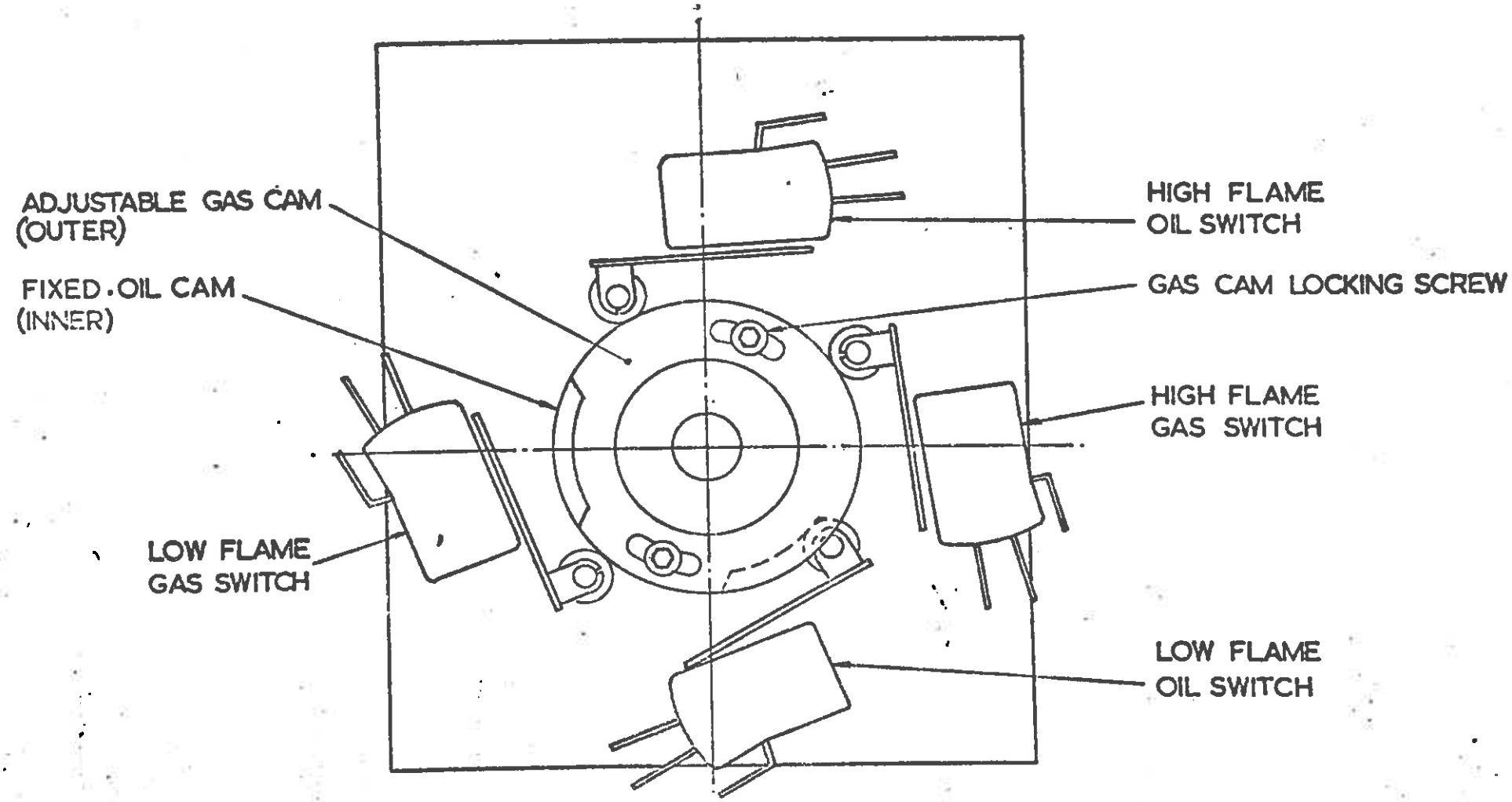


FIG. 3 DETAIL OF LIMIT SWITCHES ON MODULATING UNIT

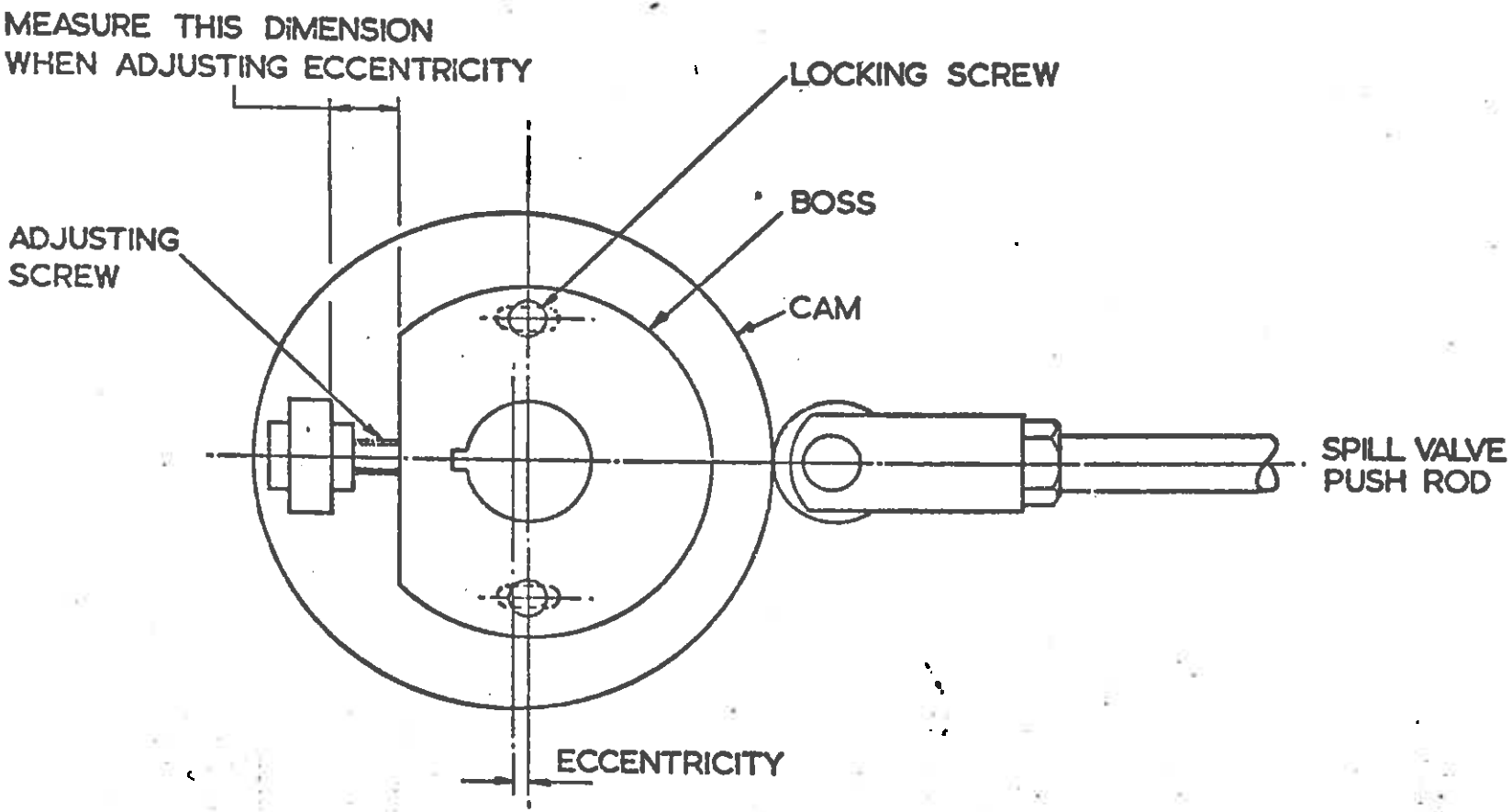


FIG. 2B. DETAIL OF MODULATING OIL CAM IN LOW FLAME POSITION

OPTIONAL EXTRAS

Air inlet silencers (standard on CD8).

High and Low gas pressure switches.

Vacuum or pressure proving system where not already fitted.

GENERAL DESCRIPTION

The Nu-Way CD5, CD6, CD7 and CD8 interchangeable head Dual Fuel Burners are designed for automatic operation with burner outputs in the range 586 - 4400 kw (504,000 - 3,789,000 kcal/h 2,000,000 - 15,000,000 Btu/h). Burners are available for High/Low, Modulation or Sliding High/Low operation (refer to Table 1 for burner operation availability), and will fire appliances having resistances as listed under the burner selection graph. The burner is designed and marketed to meet the requirements of international markets.

FUEL

Suitable for operation on Towns, Natural and LPG gases and distillate or residual fuel oils. (As specified below):

Distillate	-	**Class D** (35 seconds Redwood No 1).
Residual	-	**Class E & F** (220 seconds and 1,000 seconds Redwood No 1).
Residual	-	**Class G** (3500 seconds Redwood No 1).

British Standard BS2869-1970.

Refer to Table 1 for burner fuel availability.

NOTE:

The fuels must be stated when ordering the burner.

FUEL SYSTEMS

GAS: The burner is supplied complete with gas train - consisting of main and pilot governors, control valves, pilot gas valves and manual head valves (the main governor is supplied loose). Electrical connections are supplied with plugs and sockets on gas train and burner body for easy installation and service. Burners with ratings from 930 kw - 2930 kw (3,200,000 - 10,000,000 Btu/h) will be fitted with pressure proving system. Apart from CD8 burners all these will be fitted with vacuum proving system.

All burners require a gas pressure in excess of 178 mm (7" wg) therefore gas boosters necessary if required pressure not available.

OIL: A separate free standing pump unit feeds oil to the burner head at a constant pressure and temperature as required for atomisation; and is complete with filter.

OIL SYSTEM

HIGH/LOW For distillate Class D fuel a single pipe gravity (providing stipulated pressure available) or two pipe suction lift system should be used.

1. Gravity feed system (single pipe) inlet pressure at burner pump 0.17 bars to 0.5 bars (2.5 to 7.0 lb/in^2).

2. Suction lift system two pipe pump system must be used to pump manufacturers recommendations.

3. Ring main system with inlet pressure at burner pump of 0.35 bars to 0.7 bars (5 to 10 lb/in^2).

MODULATING & SLIDING H/L: For distillate and residual (Class D, E & F) fuels a pumped ring main must be used of at least 1¼" BSP with inlet pressure to the burner pump of 0.35 bars to 0.7 bars (5 to 10 lb/in^2).

Minimum oil temperature required at inlet to burner pump.

16°C for Class E
43°C for Class F
77°C for Class G

The ring main pump must be sized at 1.25 x swept total volume of all burner pumps on system. All pipework must be traced and lagged for Class E, F and G fuels, and appropriate temperature maintained.

The ring main system pipework must be carefully sized to suit the requirements of the application.

Fuel connections to the burner ½" to ¾" BSP depending on burner size.

BURNER SELECTION

Maximum turndown ratio 2:1 High/Low and 2.5:1 modulating and sliding High/Low. (This is dependent on appliance and installation requirements). Refer to burner selection graph for size and rating of burner required.

CONSTRUCTION / DESCRIPTION

A modular metric design using fastenings to ISO standards suitable for flange mounting. Burners are supplied with separate free standing control panel and separate pump unit.

The interchangeable head burner is supplied with separate oil and gas inner assemblies to give optimum combustion efficiency on both fuels and can be changed from one fuel to the other within approximately 20 minutes. Both fuels are safety inter-locked to give complete safety of operation.

AIR REGULATION

Combustion air is controlled by a motorised butterfly type damper on the CD5, CD6 and CD7, and a motorised rotary damper on the CD8. Air inlet silencer is fitted as standard on CD8 only.

CONTROLS

Flame supervision is by ultra violet (UV)cell for gas and photo electric (PE) cell for oil, and separate oil and gas sequence control boxes.

These burners may be controlled by suitable thermostats, pressure controller time switches, frost-stats etc.

The burner is supplied with a free standing pre-wired control panel, containing al necessary controllers and hour run meters, one off each for gas and oil. The pane also includes DOL star delta starting and AOTC steam boiler requirements when applicable.

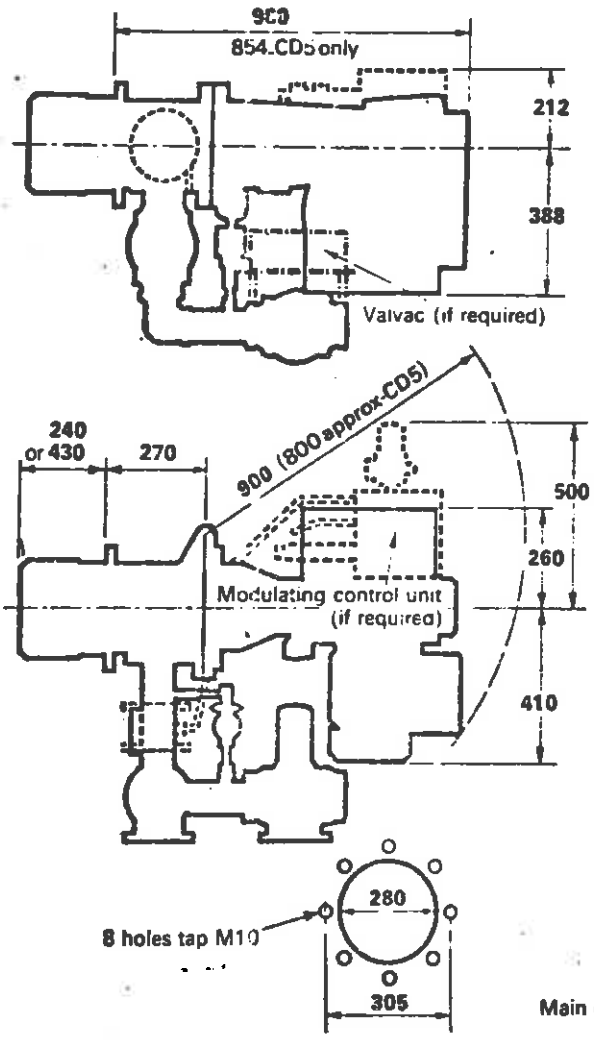
Modulating burners are supplied with a suitable modulating thermostat or pressure switch.

An air pressure switch gives protection if combustion air fan fails.

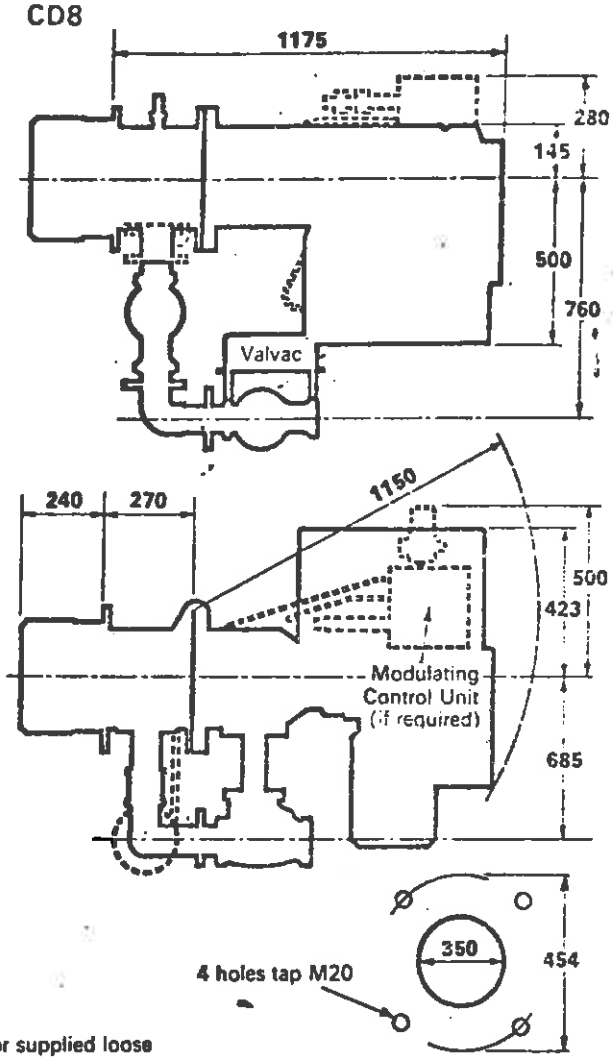
A micro switch is fitted to the muff to ensure that the control circuit is off whe

DIMENSIONS

CD5,6&7



CD8



Main governor supplied loose

Burner Fixing Details (Blown-Up Draught Tube)

Burner	Rating	Boiler Apperture	Fixing Studs
CD5		280 mm	8 x M10 off CRS on 305 PCD
CD6 & 7 up to	1831 kw (6.25 mill)	280 mm	8 x M10 off CRS on 305 PCD
CD6 & 7 over	1831 kw (6.26 mill)	330 mm	4 x M20 off CRS on 454 PCD
CD8	(All Rates)	330 mm	4 x M20 off CRS on 454 PCD

Note: 280 mm apperture small muff
330 mm CG8 size muff throughout.

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May 1980