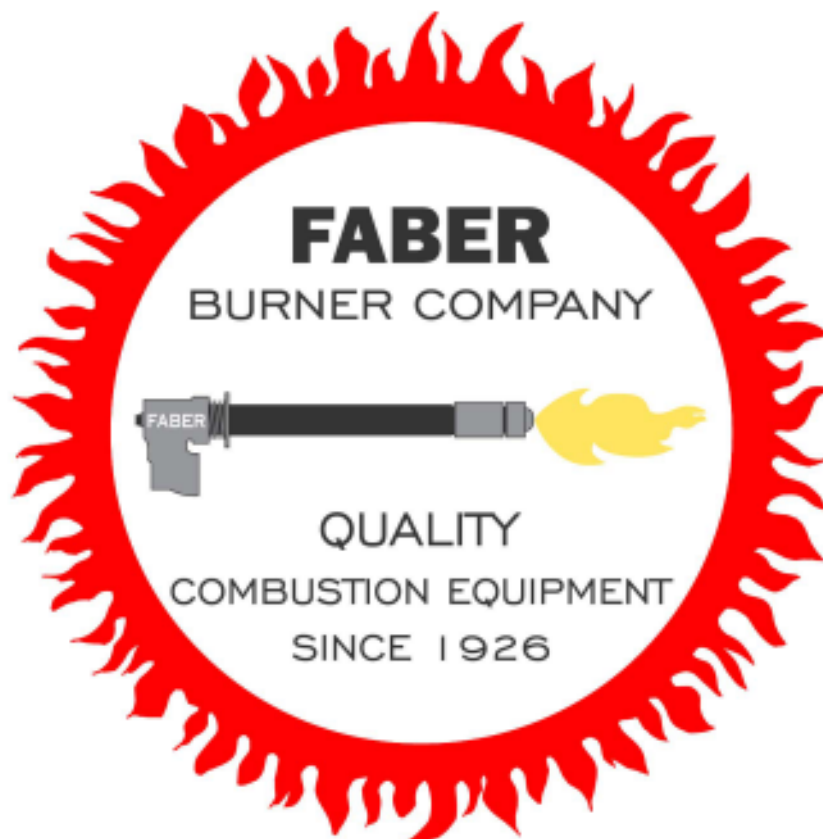


FABER *Burner Company*

WB Burner Packages



Bulletin WB-1

FABER Burner Company

Package Burner Specification

Customer: _____ Contact: _____

Location: _____ Phone/Fax: _____

Boiler Manufacturer & Type: _____

Boiler Capacity (lb/hr): _____ Operating Pressure (psig): _____

Flue Gas Temperature °F: _____

Furnace Dimensions (HxWxL): _____ FBC use only

Burner

WB- - - - - - - - - - - - - -

Combustion air temperature (f): _____ Unit Handing RH LH

Paint Color: _____ (if a paint color has not been specified, Faber Black will be used.)

Notes

Flame Safeguard

FSG - - - - - -

Notes

Combustion Control

CC - - - - - - -

Notes

Options

- | Main Gas | Oil Train | Atomizing Train | Forced Draft | Miscellaneous |
|------------------------------|-----------------------------|-----------------------------|------------------------------|---------------------------------|
| <input type="checkbox"/> MG1 | <input type="checkbox"/> O1 | <input type="checkbox"/> A1 | <input type="checkbox"/> FD1 | <input type="checkbox"/> NEMA 4 |
| <input type="checkbox"/> MG2 | <input type="checkbox"/> O2 | <input type="checkbox"/> A2 | <input type="checkbox"/> FD2 | <input type="checkbox"/> M1 |
| <input type="checkbox"/> MG3 | <input type="checkbox"/> O3 | <input type="checkbox"/> A3 | <input type="checkbox"/> FD3 | |

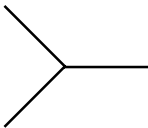
Package Burner

Burner Model Identification:(Example of a Typical Specification)

WB - 1 - VPSSS - 22 - 53 - 52 - NG - 2 - 30P - 80P - 200P - NG - 3.46 -

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13)

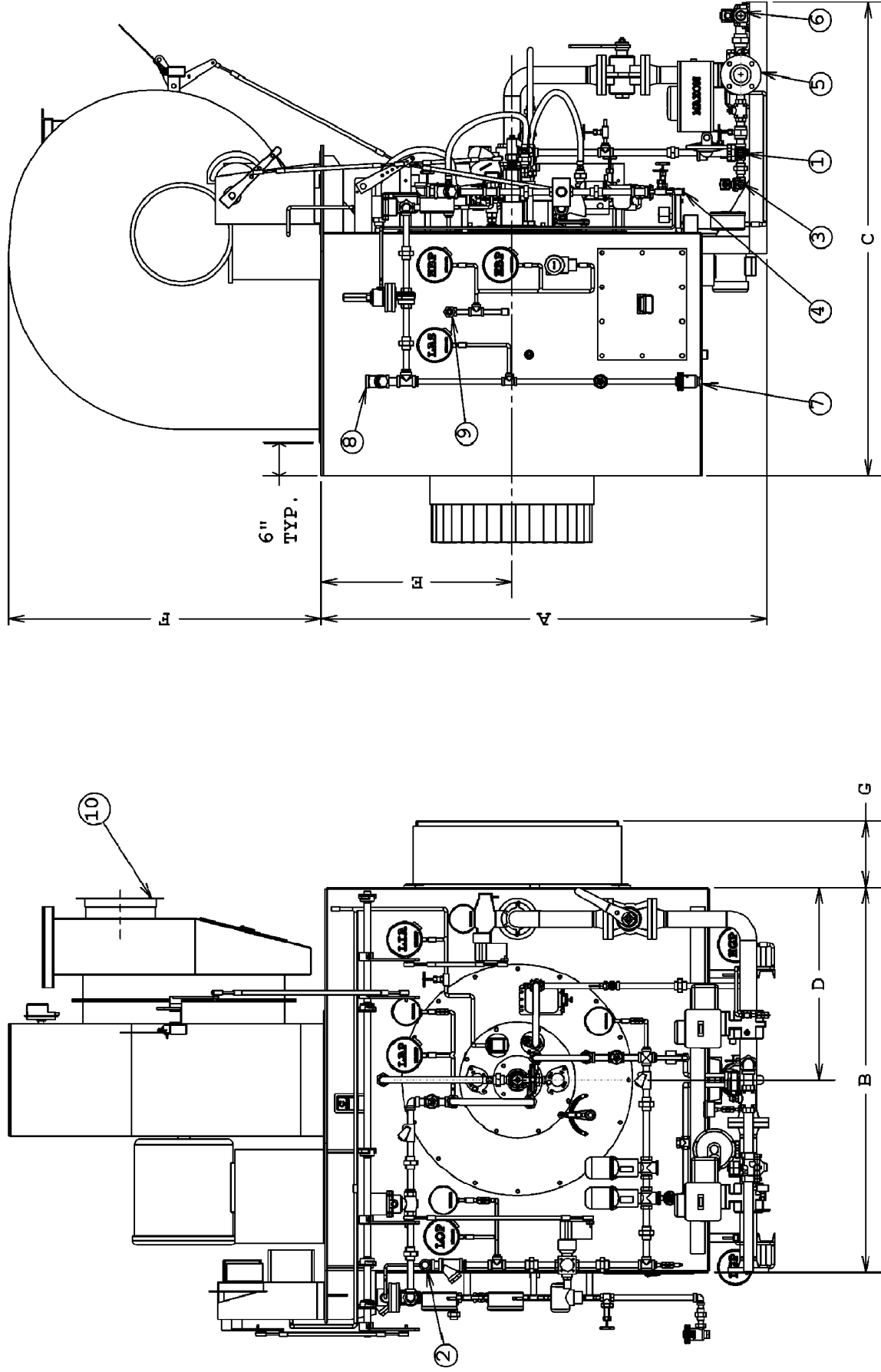
- (1) Number of registers per windbox.
- (2) Register type: (DJ), (GVD), (VP), (VPSSS), (ULN)
- (3) Register size
- (4) Heat input first fuel: In million btu per hour (MM BTU/HR)
- (5) Heat input second fuel: In million btu per hour (MM BTU/HR)
- (6) First fuel type: (NG)=natural gas, (2)=#2 oil, (4)=#4 oil
- (7) Second fuel type: (6)=#6 oil, ** (LG)=Landfill gas, ** (X)=Other, (00)=None
- (8) First fuel NO_x emissions requirement or (n\a) if none required. (such as [30p] for 30ppm corrected to 3% O₂ dry basis or [.036l] for .036 lb mmbtu)
- (9) Second fuel NO_x emissions requirement or (n\a) if none required. (such as [80p] for 80ppm corrected to 3% O₂ dry basis or [0.1l] for 0.1 lb/mmbtu)
- (10) Carbon Monoxide (co) emission requirements, or enter 400p if none required. (such as [200p] for 200ppm corrected to 3% O₂ dry basis or (.15l) for .15 lb/mmbtu)
- (11) Ignitor fuel type: (NG)=natural gas (2m)=#2 oil mechanical atomized (P)=Propane (2a)=#2 oil low pressure air atomized
- (12) Total Furnace pressure at rated capacity in inches water column (inwc) with no flue gas recirculation. (Include economizer, ducts, and any other losses.)
- (13) Enter (S) if any special requirements and note requirements. **Examples below:**
 - Design system to engineers specification #837201
 - Space limitations: burner must fit in area shown on attached sheet.
 - Modular design: burner must be of modular design so it can be disassembled to gain access to the boiler room.



Our technical sales staff will complete this information for you.

** A fuel analysis (ultimate analysis and higher heating value for liquid fuels, or percent volume analysis and higher heating value for gaseous fuels) is necessary to quote or design a package burner.

FABER WB Package Burner



Right Hand (RH) unit shown, Left Hand (LH) unit is a mirror image of RH unit.

Typical Dimensions in Inches

REGISTER SIZE	HEAT INPUT (MMBTU/HR)	A	B	C	D	E	F	G
13	20	85	54 ¹ / ₂	72	27 ¹ / ₄	33	46	16
14 ¹ / ₂	27	85	56 ¹ / ₂	72	28 ¹ / ₄	33	46	16
16	32	85	59 ¹ / ₂	72	29 ³ / ₄	33	46	16
18	40	78	66 ¹ / ₂	83	33 ¹ / ₄	33	54	16
20	51	79	66 ¹ / ₂	87	33 ¹ / ₄	33	58	16
22	61	79 ¹ / ₂	66 ¹ / ₂	97 ¹ / ₄	33 ¹ / ₄	33	58	16
23 ¹ / ₂	70	84 ³ / ₄	66 ¹ / ₂	97 ¹ / ₄	33 ¹ / ₄	33	58	16
25	80	98	72 ¹ / ₂	97 ¹ / ₄	36 ¹ / ₄	33	63	16
26 ¹ / ₂	86	101	72 ¹ / ₂	97 ¹ / ₄	36 ¹ / ₄	33	63	16
28	100	101	72 ¹ / ₂	97 ¹ / ₄	36 ¹ / ₄	33	70	16
31	129	101	72 ¹ / ₂	97 ¹ / ₄	36 ¹ / ₄	34 ¹ / ₄	70	16
34	155	101	78 ¹ / ₂	97 ³ / ₈	39 ¹ / ₄	34 ¹ / ₄	**	16
36	175	84 ¹ / ₂	84 ¹ / ₂	*	42 ¹ / ₄	42 ¹ / ₄	**	16
38	195	88 ¹ / ₂	88 ¹ / ₂	*	44 ¹ / ₄	44 ¹ / ₄	**	16
40	229	88 ¹ / ₂	88 ¹ / ₂	*	44 ¹ / ₄	44 ¹ / ₄	**	16
42	252	90 ¹ / ₂	90 ¹ / ₂	*	45 ¹ / ₄	45 ¹ / ₄	**	16
43	265	92 ¹ / ₂	92 ¹ / ₂	*	46 ¹ / ₄	46 ¹ / ₄	**	16
44	277	92 ¹ / ₂	92 ¹ / ₂	*	46 ¹ / ₄	46 ¹ / ₄	**	16
45	300	94 ¹ / ₂	94 ¹ / ₂	*	47 ¹ / ₄	47 ¹ / ₄	**	16

* Indicates that piping is commonly mounted on a freestanding pipe rack.

** Indicates that a top mounted fan is not used.

Burner Connection Key:

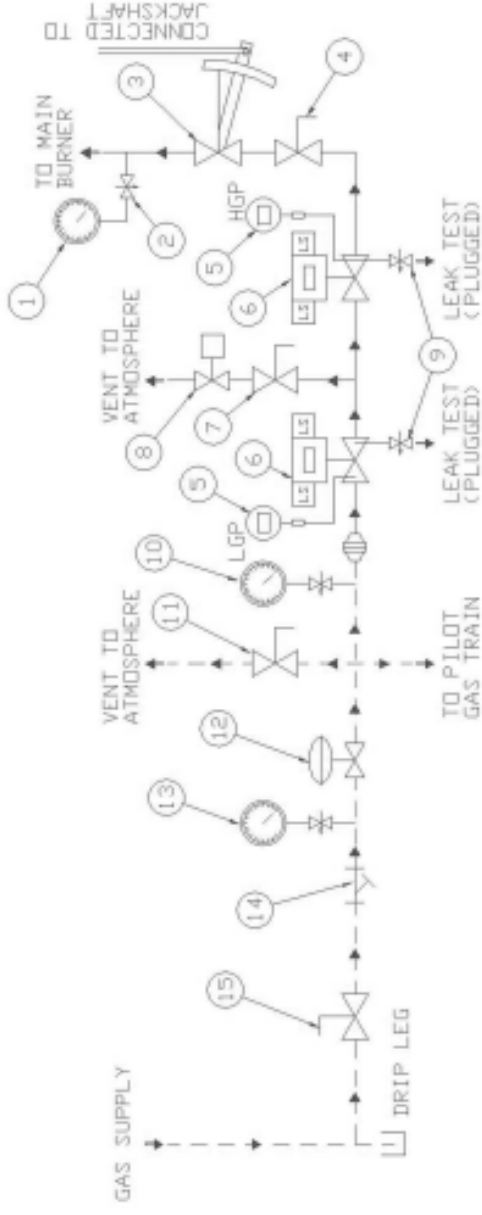
- 1 Pilot Gas Supply
- 2 Oil Supply
- 3 Pilot Vent
- 4 Oil Return
- 5 Main Gas Supply
- 6 Main Gas Vent
- 7 Condensate
- 8 Atomizing Supply
- 9 Steam Impulse Line
- 10 Flue Gas

Note: Our combustion equipment is engineered for optimal performance and specifically designed for the unique conditions of the application. Furthermore, our company practices a policy of continuous improvement. For these reasons, specifications are subject to change without prior notice.

FABER Main Gas Train

Per NFPA, IRI & FM Standards

- Dashed lines indicate field installed piping and equipment
- Solid lines indicate factory installed piping and equipment



- 1 Gas Burner Pressure Gauge – Wika 4" dial, stainless steel case
- 2 Gauge Shutoff Valve – ¼" N.P.T. needle valve
- 3 Gas Flow Control Valve – Maxon, characterizable (12 points)
- 4 Plug Valve with Wrench – Homestead
- 5 High & Low Gas Pressure Switches – Ashcroft, with visible set point indication
- 6 Gas Safety Shutoff Valves – Maxon, normally closed, with proof of closure switches
- 7 3 Piece Full Port Ball Valve, lockable in the open position – Apollo
- 8 Vent Valve – ASCO, normally open, full port
- 9 Leak Test Valves – ¼" N.P.T. needle valves, plugged with ¼" pipe plug

- 10 Pressure Gauge with Shutoff Valve – 4" dial, stainless steel case with ¼" N.P.T. needle valve
- 11 Gas Train Supply Manual Vent Valve – Apollo full port with lockable handle
- 12 Main Gas Pressure Regulating Valve – Fisher
- 13 Pressure Gauge with Shutoff Valve – 4" dial, stainless steel case with ¼" N.P.T. needle valve
- 14 Gas Strainer
- 15 Plug Valve with Wrench – Homestead

Optional
Equipment

Options:

- MG1 = Main Gas Pressure Regulating Valve and Accessories – Includes items 10, 11, 12,13 (shipped loose for field installation) and installation drawings and manuals. If option MG1 is selected, note the gas supply pressure on the burner package specification sheet.
- MG2 = Gas Strainer, Item 14, shipped loose for field installation
- MG3 = Gas Plug Valve with wrench, Item 15, shipped loose for field installation
- NEMA 4- Changes item 8 to weatherproof (NEMA 4)

Specifications for Main Gas Train Piping & Fittings:

- 3" Pipe and smaller sizes = Schedule 40 pipe with 150# malleable iron threaded fittings
 Pipe larger than 3"= Schedule 40 pipe with standard weight butt weld fittings

Gas Supply Pressure:

To inlet of main gas train: 10 psig regulated, for units with heat inputs less than 120 mmBtu/hr
 15 psig regulated, for units with heat inputs greater than 120 mmBtu/hr

Low Pressure Units:

If the regulated gas supply pressure is lower than that listed above, enter (S) in position 13 of the burner model number and specification sheet. Note the available gas pressure on the burner package.

Notes:

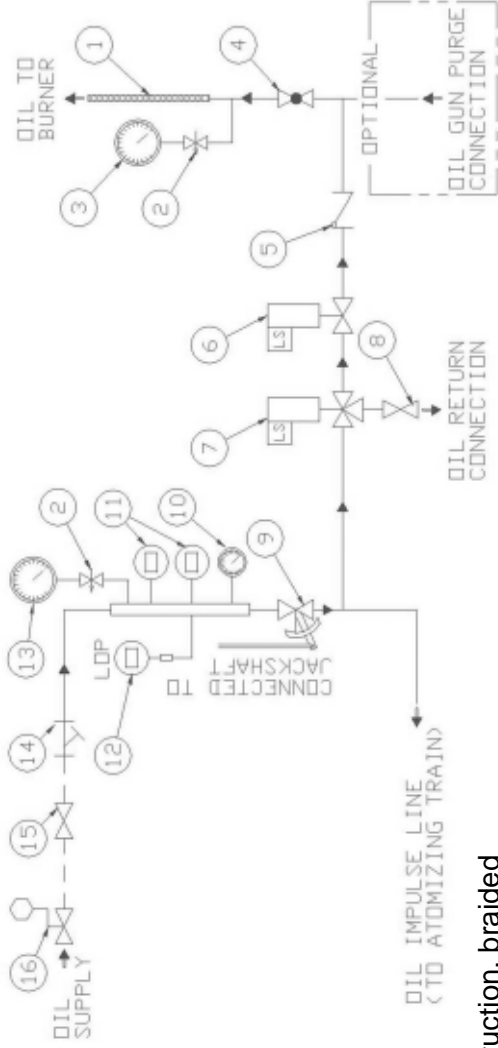
The gas flow control valve, Item 3, will be an electric or pneumatic positioning type if the combustion control selected is one of the following:

- NON Standard Parallel Positioning System
- Full Metering System

FABER Oil Train

Per NFPA, IRI & FM* Standards

- Dashed lines indicate field installed piping and equipment
- Solid lines indicate factory installed piping and equipment



- | | | |
|----|--|----------------------------|
| 1 | Oil Burner Flex Hose – 321 stainless steel construction, braided | |
| 2 | Gauge Shutoff Valves – 1/4" N.P.T. needle valve | |
| 3 | Pressure Gauge – Wika, 4" dial, stainless steel case | |
| 4 | Globe Valve – Milwaukee, 300#, with replaceable seat and disc | |
| 5 | Check Valve – Milwaukee 300# | |
| 6 | Oil Safety Shutoff Valve, 2 way – ASCO General Controls, normally closed, with proof of closure switch | |
| 7 | Oil Safety Shutoff Valve, 3 way – ASCO General Controls, normally closed, with proof of closure switch | |
| 8 | Gate Valve – Milwaukee, 300#, with replaceable gate | |
| 9 | Oil Flow Control Valve – Maxon, characterizable (12 points) | |
| 10 | Thermometer – Weksler, 3" dial, all stainless steel construction | Required for preheated oil |
| 11 | High & Low Oil Temperature Switches – Burling, with visible set point indication | |
| 12 | Low Oil Pressure Switch – Ashcroft, with visible set point indication | |
| 13 | Pressure Gauge – Wika, 4" dial, stainless steel case | |
| 14 | Strainer – Mueller, with 30 mesh screen | |
| 15 | Gate Valve | Optional Equipment |
| 16 | Fusible link | |

OPTIONS:

- O1 = Fusible Link and Gate Valve, Items 14 and 15, shipped loose for field installation.
* (The fusible link is an FM requirement. It is not required by NFPA 8501 or IRI.)
- O2 = Replace items 6 & 7 with two Maxon safety shutoff valves and an ASCO oil return line shutoff valve.
- O3 = Oil Gun Scavenger Pump for light oil. After a burner shut down, the scavenger pump evacuates the oil from the oil gun and pumps it into the oil return line.
- NEMA 4- Changes items 6, 7 to weatherproof (NEMA 4).

Specifications for Oil Train Piping & Fittings: Schedule 80 pipe with 300# malleable iron threaded fittings

Oil Supply Pressure:

To inlet of oil train: 150 psig, for units up to 120mm Btu/hr heat input.
200 psig, for units with heat inputs greater than 120 mm Btu/Hr.

Low Pressure Units: If the available oil pressure is lower than listed above, enter (S) in position 13 of the burner model number and note the oil pressure on the burner package specification sheet.

NOTES:

The oil flow control valve, Item 9, will be an electric or pneumatic positioning type if the combustion control selected is one of the following:

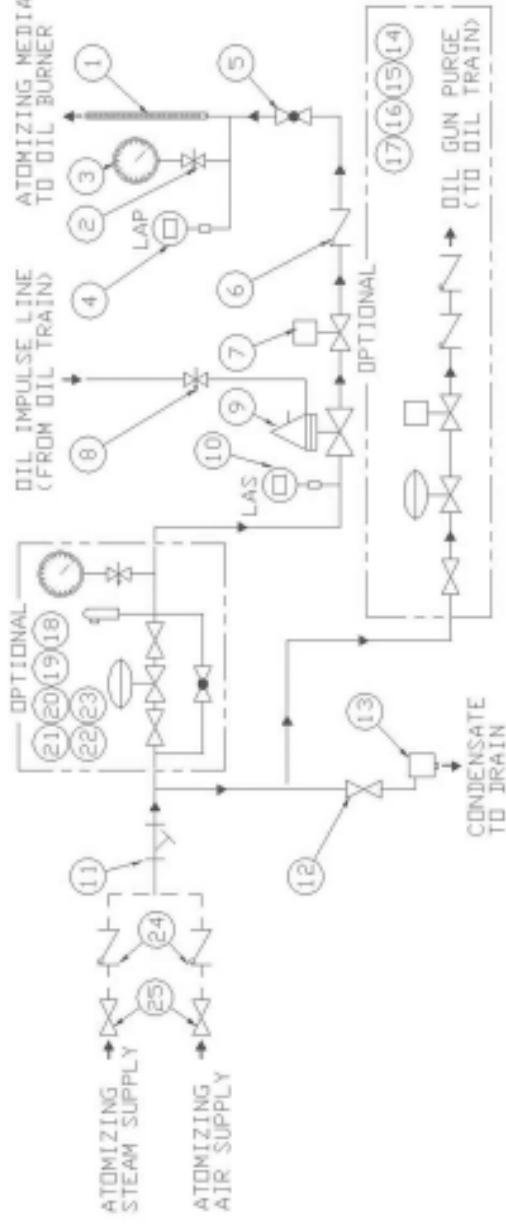
- NON Standard Parallel Positioning System
- Full Metering System

FABER Atomizing Train

Per NFPA, IRI & FM Standards

--- Dashed lines indicate field installed piping and equipment

— Solid lines indicate factory installed piping and equipment



- 1 Atomizing Media Flex Hose – 321 stainless steel construction, braided
- 2 Gauge Shutoff Valves – ¼" N.P.T. needle valve
- 3 Pressure Gauge – Wika, 4" dial, stainless steel case
- 4 Low Atomizing Pressure Switch – Ashcroft, with visible set point indication
- 5 Gate Valve – Milwaukee, 300#, with replaceable gate
- 6 Check Valve – Milwaukee 300#
- 7 Atomizing Media Shutoff Valve - Magnatrol, normally closed
- 8 Oil Impulse Line Shutoff Valve – ¼" N.P.T. needle valve
- 9 Atomizing Media Differential Pressure Regulator
- 10 Low Atomizing Supply Pressure Switch – Ashcroft, with visible set point indication
- 11 Strainer – Mueller, with 30 mesh screen
- 12 Steam Trap Shutoff Valve, – Milwaukee 300# gate valve, with replaceable gate
- 13 Steam Trap – Sarco, balanced pressure thermostatic steam trap

14	Check Valves – United, spring loaded	Optional Equipment
15	Oil Gun Purge Solenoid Valve – Gould, normally closed	
16	Oil Gun Purge Pressure Regulator – Fisher	
17	Oil Gun Purge Isolation Valve – Milwaukee, 300# gate valve, with replaceable gate	
18	Pressure Relief Valve – Kunkle	
19	Pressure Gauge – Wika, 4" dial, stainless steel case	
20	Gauge Shutoff Valve – ¼" N.P.T. needle valve	
21	Pressure Regulator Isolation Valves – Milwaukee 300# gate valve, with replaceable gate	
22	Pressure Regulator – Fisher	
23	Pressure Regulator Bypass Valve – Milwaukee 300# globe valve, with replaceable seat and disc	
24	Check Valves – Milwaukee 300#	
25	Gate Valves – Milwaukee 300#, with replaceable gate	

OPTIONS:

- A1 - Oil Gun Purge System, Items 14, 15, 16, and 17, factory installed. This system automatically cleans out the oil gun upon a "planned" oil burner shut down. When the burner control is turned off while firing oil, the unit is sent to low fire. The pilot is energized, the oil safety shutoff valves close, and the oil gun is cleaned out with atomizing media. The burner shuts down at the completion of this sequence. All the safety limits are monitored during this sequence. If a limit should fail, the sequence is stopped immediately, and all the fuel valves will close.
- A2 - Atomizing Steam Pressure Reducing Station – If the atomizing steam supply pressure is over 200 PSIG, a pressure reducing station will be required. This option includes items 18, 19, 20, 21, 22, and 23, factory installed on the burner.
- A3 - Atomizing Media Change Over Equipment – This includes items 24, and 25 shipped loose for field installation.
- NEMA 4 - No Changes

Specifications for Atomizing Media Train Piping & Fittings: Schedule 80 pipe with 300# malleable iron threaded fittings. Supply Pressure:

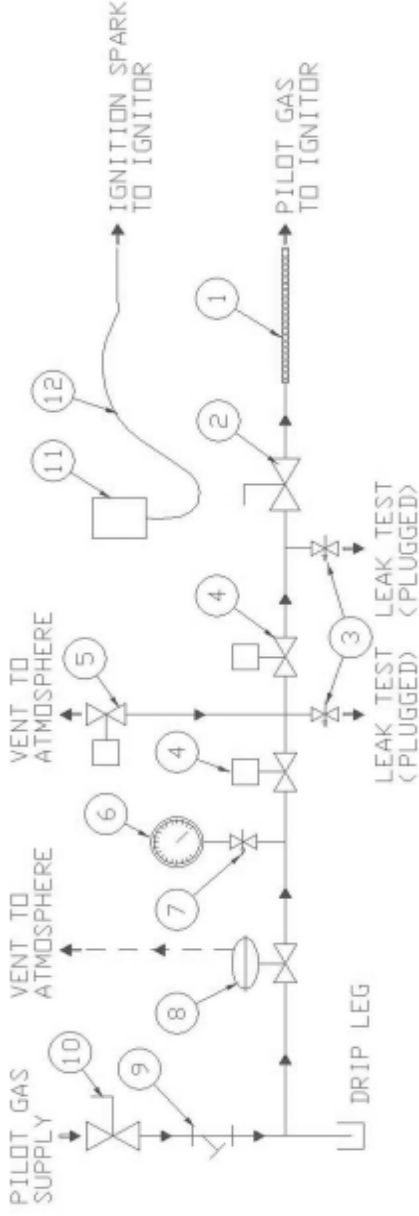
To inlet of atomizing train: 100 - 200 psig steam at 400 f or less

100 - 200 psig compressed air if the available atomizing media supply pressure is greater than 200 psig option A2 will be required.

FABER Gas Pilot Train

Per NFPA, IRI & FM Standards

- Dashed lines indicate field installed piping and equipment
- Solid lines indicate factory installed piping and equipment



- 1 Pilot Gas Flex Hose – 321 stainless steel construction, braided
- 2 Pilot Gas Shutoff Valve – Apollo, 3 piece, full port, ball valve
- 3 Leak Test Valves – ¼" N.P.T. needle valves, plugged with ¼" pipe plug
- 4 Pilot Gas Shutoff Valves – Asco, normally closed
- 5 Pilot Gas Vent Valve – Asco, normally open
- 6 Pressure Gauge – Weksler, 2 ½" dial
- 7 Gauge Shutoff Valve – ¼" N.P.T. needle valve
- 8 Pilot Gas Pressure Regulator – American Meter
- 9 Strainer – Mueller, with 30 mesh screen
- 10 Pilot Gas Train Shutoff Valve – Apollo, 3 piece, full port, ball valve
- 11 Ignition Transformer – 10,000 VAC output.
- 12 High Temperature Ignition Cable Assembly

OPTIONS:

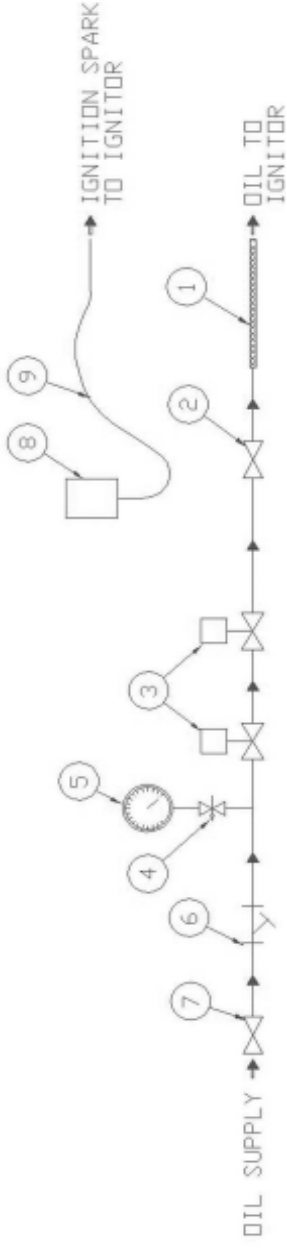
NEMA 4 - Changes items 11 & 12 to weatherproof (NEMA 4).

Specifications for Gas Pilot Train Piping & Fittings: Schedule 80 pipe with 150# malleable iron threaded fittings.

FABER

Oil Pilot Train

Per NFPA, IRI & FM Standards



- ① Oil Pilot Flex Hose – 321 stainless steel construction, braided
- ② Oil Pilot Shutoff Valve – Milwaukee, 300# gate valve, with replaceable gate
- ③ Oil Pilot Shutoff Valves – Asco, normally closed
- ④ Gauge Shutoff Valve – ¼" N.P.T. needle valve
- ⑤ Pressure Gauge – Wika, 4" dial, stainless steel case
- ⑥ Strainer – Mueller, with 30 mesh screen
- ⑦ Oil Pilot Train Shutoff Valve - Milwaukee, 300# gate valve, with replaceable gate
- ⑧ Ignition Transformer – 10,000 VAC output.
- ⑨ High Temperature Ignition Cable Assembly

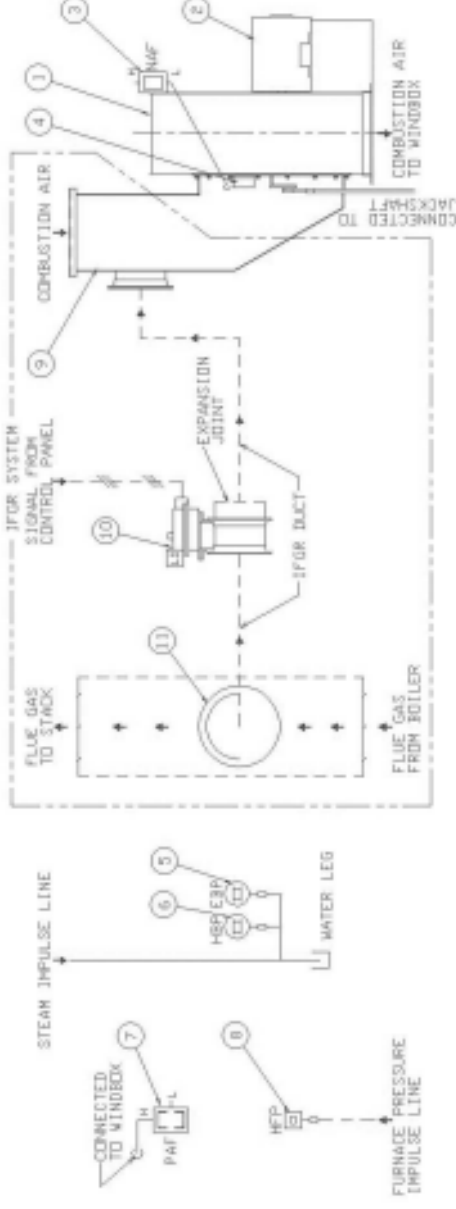
OPTIONS:

NEMA 4 - Changes items 8 & 9 to weatherproof (NEMA 4).

Specifications for Oil Pilot Train Piping & Fittings: Schedule 80 pipe with 300# malleable iron threaded fittings.

FABER Forced Draft Fan, IFGR System, and Miscellaneous Limits

Per NFPA, IRI & FM Standards



--- Dashed lines indicate field installed piping and equipment

— Solid lines indicate factory installed piping and equipment

1	Forced Draft Fan – Chicago Blower, arrangement 4, airfoil centrifugal type fan with inlet vortex control damper (Shipped loose for field mounting on the windbox or remote mounted, depending on burner size)	<p>Forced Draft Fan Assembly</p> <p><i>Miscellaneous Limits</i></p>
2	Fan Motor – 1800 RPM, ODP type, 460 VAC / 3 phase / 60 hertz (Part of fan assembly)	
3	Normal Air Flow Switch – (Part of fan assembly)	
4	Forced Draft Damper Open Switch – (Part of fan assembly)	
5	Excess Boiler Pressure Switch – Ashcroft, with visible set point indication (Factory mounted on the windbox)	
6	High Boiler Pressure Switch - Ashcroft, with visible set point indication and adjustable deadband (Factory mounted on the windbox)	
7	Purge Air Flow Switch – (Factory mounted on the windbox)	
8	High Furnace Pressure Switch – (Shipped loose for field installation)	
9	IFGR Inlet Box – (Shipped loose for field installation)	
10	IFGR Flow Control Damper – Flow control damper with modulating electric actuator (Shipped loose for field installation)	
11	IFGR Stack Scoop – (Shipped loose for field installation)	
12	High Temperature IFGR Duct Gaskets (4) – Not shown in the schematic above, (Shipped loose for field installation)	
13	High Temperature IFGR Mixing Box Gasket (1) – Not shown in the schematic above, (Shipped loose for field installation)	

OPTIONS:

- FD1= Forced Draft Fan Silencer (Only applies to fans with a noise level of 85 dBA or greater)– Silencer Field mounted on the forced draft fan inlet to reduce the noise level emanating from the fan inlet to 85 dBA at 5 feet.
- FD2= Forced Draft Fan Motor Starter – Includes a combination motor starter with overloads and a fusible disconnect in a NEMA 12 enclosure. (shipped loose for field installation)
- FD3= TEFC Type Forced Draft Fan Motor – A TEFC type motor will be supplied in lieu of the standard ODP Type motor.
- M1 = FABER Low Draft Cutout -- Necessary on installations where the furnace operates under a negative pressure. This system consists of a draft sensing element, an auxiliary relay, a time delay relay, a terminal strip, and an indicator light, packaged in a NEMA 12 enclosure. The indicating light is energized when a low draft condition exists in the furnace. The low draft cutout contact is wired directly into the burner safety limits circuit. This contact opens after a low draft condition has existed for the adjustable time delay period, which shuts down the burner on a safety limits failure. The time delay is set during commissioning, usually 4 to 8 seconds, and the setting is protected with a tamper proof cover.

NEMA 4 – Changes items 3, 7, & 8 to weatherproof (NEMA 4). Option FD3 must also be selected for NEMA 4. If option FD2 has been purchased, the FD fan motor starter will be supplied in a NEMA 4 enclosure.

Notes:

If the available fd fan power supply is other than 460 vac/3 phase/60 hertz, enter (s) in the position 13 on the burner model number and note the available fd fan power supply on the burner package specification sheet.

IFGR system, items 9, 10, 11, 12, & 13, supplied when necessary to meet project emission requirements.

Flame Safeguard Systems

Flame Safeguard Model Identification (Example of a typical spec):

FSG - **E110/E300** - **UV** - **NFPA/IRI/FM** - **W3** - **FC** - **S**

(1) (2) (3) (4) (5) (6)

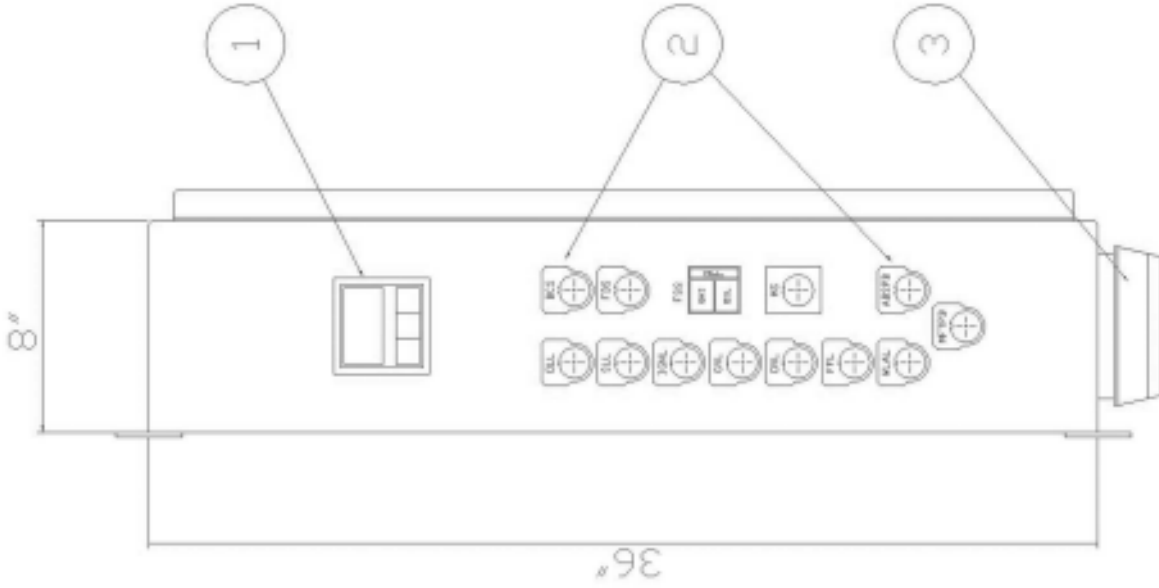
- 1 Sequencer type– Enter one of the following:
E110 = Fireeye E110 Flame Monitor
E110 / E300 = Fireeye E110 Flame Monitor with Fireeye E300 Expansion Module
SLC1= Allen-Bradley SLC500/01 programmable controller &14 point annunciator
SLC4 = Allen-Bradley SLC500/04 programmable controller & 14 point annunciator
SLC5 = Allen-Bradley SLC500/05 programmable controller & 14 point annunciator
- 2 Flame Scanner Type– Enter one of the following:
UV = Self checking ultraviolet (uv) scanner & UV Flame Amplifier
IR = Infrared (ir) Scanner & IR Flame Amplifier
- 3 Insurance Requirements– Enter one of the following:
NFPA/IRI = National Fire Protection Association and Industrial Risk Insurers
NFPA/IRI/FM = National Fire Protection Association, Industrial Risk Insurers, and Factory Mutual
- 4 Water Level Relays– Enter one of the following:
W0 = None
W1= Low Water Cutout Relay
W2 = W1 plus, Low Water Level Alarm, High Water Level Alarm, and Alarm Bell (Alarm bell rings until the water level is restored to the proper level.)
W3 = W2 plus, Water Level Alarm Bell Silence Push Button, and Water Level Abnormal Light (The push button silences the alarm bell, the light remains on until the water level is restored to the proper level.)
- 5 Options– Enter as many as required, separate entries by back slashes:
FC = Fuel change at low fire without shutting the unit down
N4 = NEMA 4 enclosure in lieu of the standard NEMA 12 enclosure
RP = Free standing remote panel in lieu of the standard burner mounted panel
SF = Simultaneous firing of two fuels, an Allen-Bradley SLC 500 series processor is required for this option.
- 6 Enter (S) if any special requirements and note requirement
For example: Customer requires the following dry contacts for remote annunciation, Burner On, Burner Flame Failure, High Water Level Alarm, and Low Water Level Alarm.

Notes:

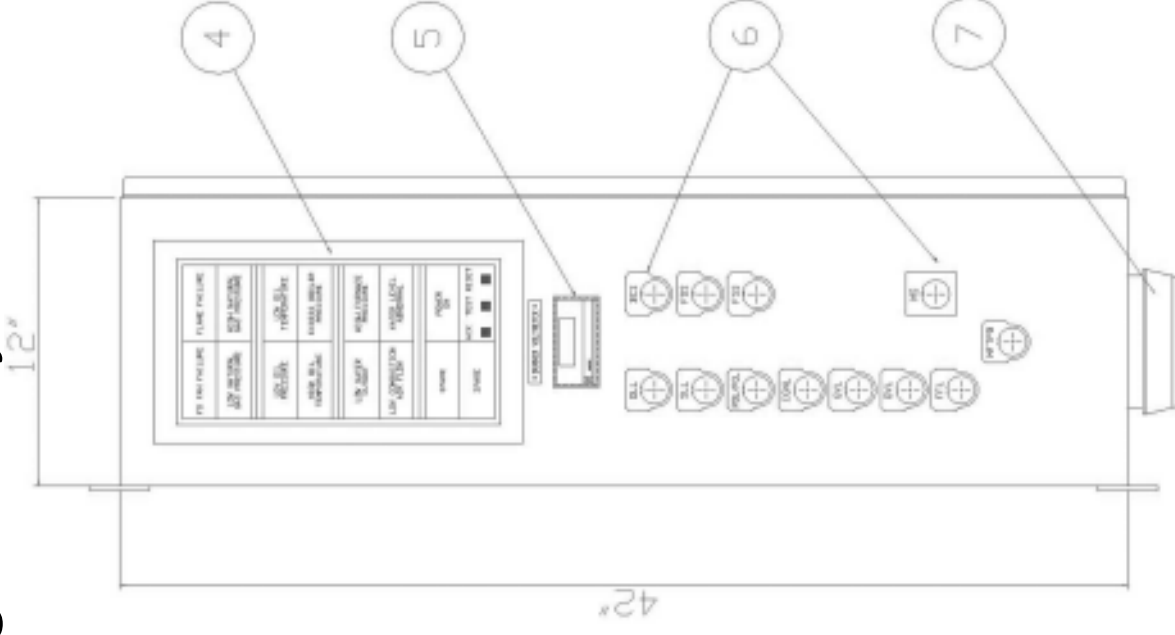
If the available flame safeguard power supply is other than 120 vac/3 phase/60 hertz, enter (s) in the position 6 on the flame safeguard model number, and note the available flame safeguard power supply on the burner specification sheet.

*Allen-Bradley processors are a product of Rockwell Automation Inc.

FABER Flame Safeguard Systems



Model: FSG-E110/E300-UV-NFPA/IRI-W3



Model: FSG-SLC4-UV-NFPA/IRI-W3

Right Hand (RH) unit shown. Left Hand (LH) unit is a mirror image of RH unit.

Model: FSG-E110/E300-UV-NFPA/IRI-W3
Flame Safeguard

- ① Fireye ED 510 Display module
- ② Push buttons, lights & switches
- ③ Alarm horn & Bell

Model: FSG-SLC4-UV-NFPA/IRI-W3
Flame Safeguard

- ④ 14 point "First Out" Annunciator
- ⑤ Burner voltmeter
- ⑥ Push buttons, lights & switches
- ⑦ Alarm horn & Bell

SEQUENCER TYPES

E110 - The Fireye E110 Flame Monitor is a microprocessor based burner management control system with self-diagnostics and non-volatile memory. The Flame Monitor provides the proper burner sequencing and displays the burner status on the ED510 display mounted on the flame safeguard panel enclosure. The Flame Monitor has a fixed or "burnt in" memory and cannot be field adjusted or customized. Customization requires the addition of external timers and relays.

E110/E300 - Adding a Fireye E300 Expansion Module to the Fireye E110 Flame Monitor up-grades the display module to a "first out" annunciator. Lockout alarm messages are displayed on the ED510 display mounted on the flame safeguard panel enclosure. This feature is very helpful when trouble shooting the system. For instance, if the burner "trips" due to low gas pressure, the message "3 – P Low Gas Pressure" will scroll across the display module. Without the E300 expansion module, any trip due to a safety limits failure is displayed as "3 – P INTLK OPEN."

SLC1, SLC4, and SLC5 Summary – The Allen-Bradley SLC 500 series processors are rugged and dependable programmable controllers, designed to withstand harsh industrial environments. Because these processors are both modular in design and have several communication options available, they can be easily factory configured to meet specific project requirements. Each unit is factory programmed and tested. The program is backed up on an EEPROM or Flash Memory module located on the processor. A 14 point "first out" annunciator is a standard offering with all Allen-Bradley SLC 500 series processors. The annunciator has integral "Test," "Acknowledge," and "Reset" push buttons. All the burner safety limits are annunciated by 1 7/16" h x 3 5/16" w lighted windows.

SLC1 = Allen-Bradley SLC 5/01 processor, with EEPROM memory module, all the necessary digital input and output cards, and a DH-485 communication port.

SLC4 = Allen-Bradley SLC 5/04 processor, with Flash Memory module, all the necessary digital input and output cards, a DH+ communication port, and an RS-232 port which can be configured to communicate with a DH-485 network.

SLC5 = Allen-Bradley SLC 5/05 processor, with Flash Memory module, all the necessary digital input and output cards, an Ethernet communication port, and an RS-232 port which can be configured to communicate with a DH-485 network.

FLAME SCANNER TYPES

UV, IR Summary – All flames emit electromagnetic waves: ultraviolet (UV) radiation, visible radiation, and infrared (IR) radiation. Typically, the flame spectrum generated by an oil or gas flame is approximately 1% UV radiation, 10% visible radiation, and 89% IR radiation. UV radiation usually originates from the first third of the flame, or the flame base. IR radiation originates largely from the last two thirds of the flame. IR radiation is also emitted from surfaces with a temperature greater than 1000°F, such as hot refractory. Either type of flame scanner, UV or IR, can detect the presence or absence of an oil or gas flame. However, IR type flame scanners should never be used in an application where the scanner can “see” hot refractory in a furnace.

UV – Fireye self-checking UV flame scanner and UV flame amplifier.

IR – Fireye IR flame scanner and IR flame amplifier.

INSURANCE REQUIREMENTS

NFPA/IRI – The system will be designed per the National Fire Protection Association Standard for Single Burner Boiler Operation (NFPA 8501), and Industrial Risk Insurers standard for Single Burner Boiler-Furnaces (IRInformation section IM.4.1.1).

NFPA/IRI/FM – The system will be designed per the National Fire Protection Association Standard for Single Burner Boiler Operation (NFPA 8501), Industrial Risk Insurers standard for Single Burner Boiler-Furnaces (IRInformation section IM.4.1.1), and Factory Mutual Engineering Corporation standard for Oil and Gas Fired Single Burner Boilers Property Loss Prevention Data Sheet (Factory Mutual 6-4 12-69).

WATER LEVEL RELAYS

WO = None

W1 = One Warrick electromechanical low water cutout relay, wired into the safety limit circuit.

W2 = W1 plus, Low Water Level Alarm, High Water Level Alarm, and Alarm Bell (Alarm bell rings until the water level is restored to the proper level).

W3 = W2 plus, Water Level Alarm Bell Silence Push Button, and Water Level Abnormal Light (The push button silences the alarm bell, the light remains on until the water level is restored to the proper level).

OPTIONS

FC = Fuel change at low fire without shutting the unit down. With this equipment, a fuel change is performed as follows: The fuel change switch is turned to the on position. The unit moves to the low fire position. At low fire, the ignitor is energized. The fuel selector switch is turned from the “current” fuel, to the “other” fuel. The fuel change switch is turned off.

N4 = NEMA 4 flame safeguard panel enclosure in lieu of the standard NEMA 12 enclosure.

RP = Free Standing panel in lieu of the standard burner mounted panel.

SF = Simultaneous firing of two fuels, an Allen-Bradley SLC 500 series processor is required for this option.

Combustion Control Systems

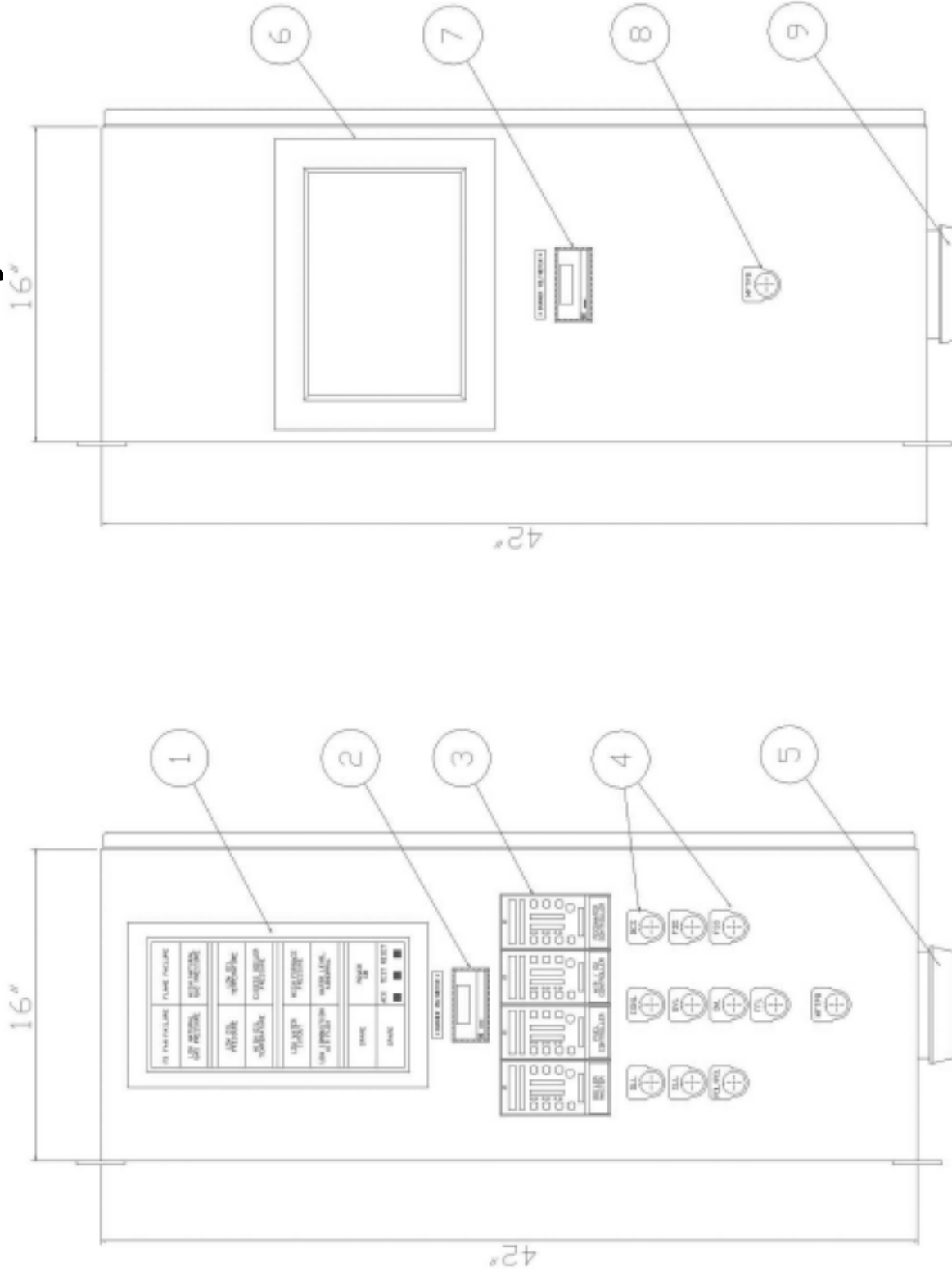
Combustion Control Model Identification (Example of a typical spec):

CC - SPP - MR - OO - FO - DO - OO - S

1 2 3 4 5 6 7

-
- 1 **Combustion Control Type**— Enter one of the following:
- Single Point Positioning*
SPP-MR = Jackshaft with Master Regulator (Enter this in positions 1 & 2)
SPP = Jackshaft with Actuator, firing rate controller, and steam pressure transmitter
- Single Point Positioning + Plus*
SPP+P-MR = SPP-MR plus, Waste stream flow element and flow transmitter, air flow element and flow transmitter, trim actuator, Oxygen analyzer, and Air / Fuel ratio controller (Enter this in positions 1 & 2)
SPP+P = SPP-MR plus, Waste stream flow element & flow transmitter, Air flow element, flow transmitter, trim actuator, Oxygen analyzer, and Air / Fuel ratio controller
- Parallel Positioning (with Actuator Position Feedback)*
PP = Fuel Valve jackshaft, fuel valve actuator, air flow actuator, Firing rate controller, and steam pressure transmitter
- Full Metering*
FM= Fuel and air flow elements and transmitters, flow control valves and air flow control actuator, fuel, air, and steam pressure controllers, and steam pressure transmitter
- 2 **Type of Actuators**— Enter one of the following: This position will have MR if master regulator required
PN= Pneumatic actuators with 4-20ma input EC= Electric actuators with 4-20ma input
- 3 **Oxygen Trim**— Enter one of the following: 00 = None 01= Oxygen Trim System
- 4 **Feedwater Control**— Enter one of the following:
F0 = None
F1 = Single element feedwater control, includes feedwater controller and drum level transmitter
F2 = F1 plus, steam flow element and steam flow transmitter
F3 = F2 plus, feedwater flow element and feedwater flow transmitter
- 5 **Draft Control**— Enter one of the following:
D0 = None D1= Draft control, includes draft transmitter and draft controller
- 6 **Faber View Touch Screen Operator Interface**— Enter one of the following:
00=None FV=Faber View Touch Screen Operator Interface (Not available with SPP-MR type combustion control option)
- 7 **Enter (S) if any special requirements and note requirement:**
For example: Use the 4-20ma signal from the existing Oxygen analyzer in the oxygen trim system, or use the 4-20ma signal from the existing Steam pressure transmitter. OR No Steam pressure transmitter required; 4-20ma demand signal will be from the existing plant master.

FABER Combustion Control Systems



Model: CC-FM-02-F3-D0-00

Model: CC-FM-02-F3-D0-FV

Right Hand (RH) unit shown. Left Hand (LH) unit is a mirror image of RH unit.

Model: CC-FM-02-F3-D0-00

Combustion Control System

With: FSG-SLC4-UV-NFPA/IRI-W3 Flame Safeguard

- ① 14 point "First Out" Annunciator
- ② Burner voltmeter
- ③ Combustion Controllers
- ④ Push buttons, lights & switches
- ⑤ Alarm horn & Bell

Model: CC-FM-02-F3-D0-FV

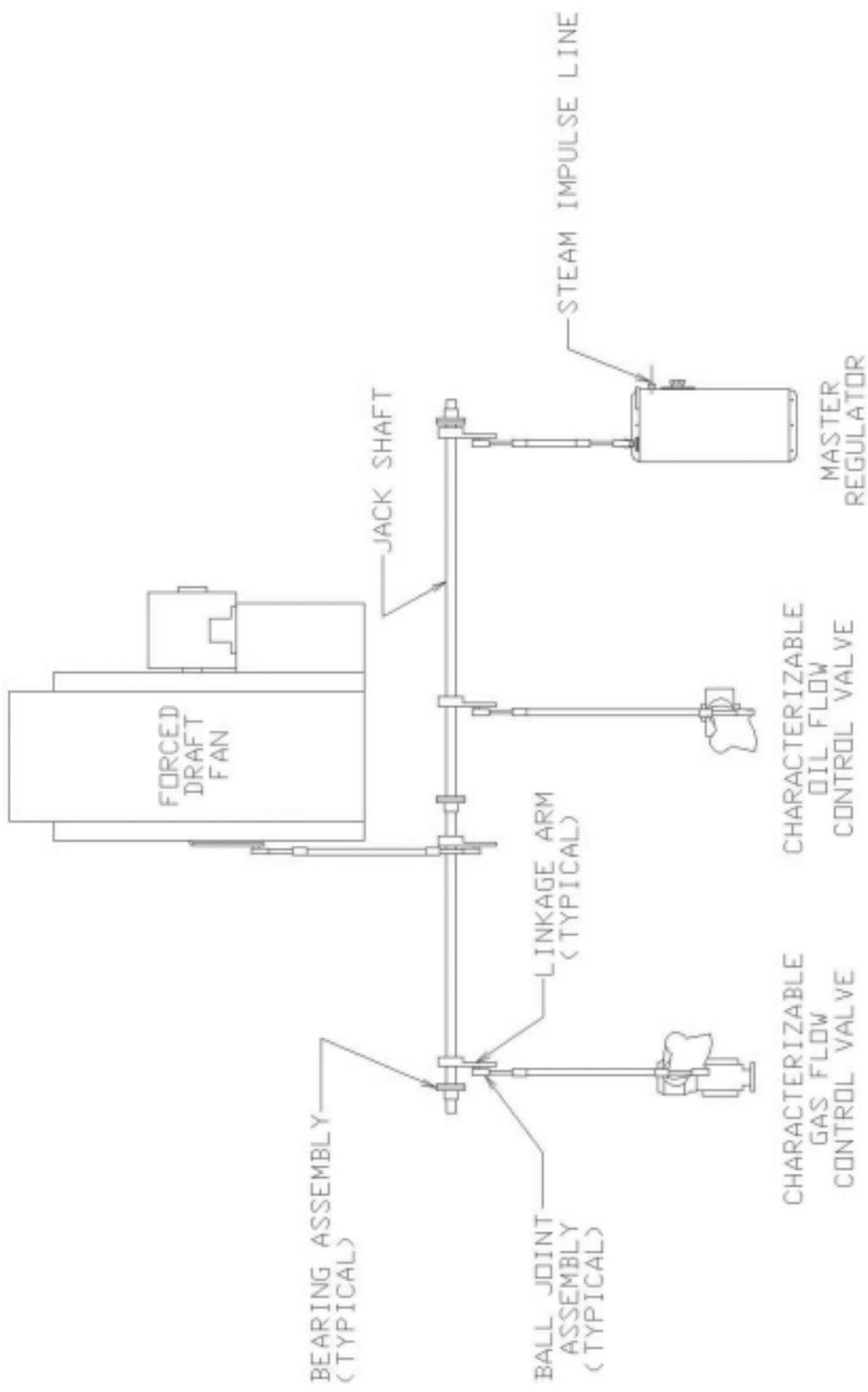
Combustion Control System

With: FSG-SLC4-UV-NFPA/IRI-W3 Flame Safeguard

- ⑥ Faber view touch screen operator nterface
- ⑦ Burner voltmeter
- ⑧ Main fuel trip button (emergency stop)
- ⑨ Alarm horn & Bell

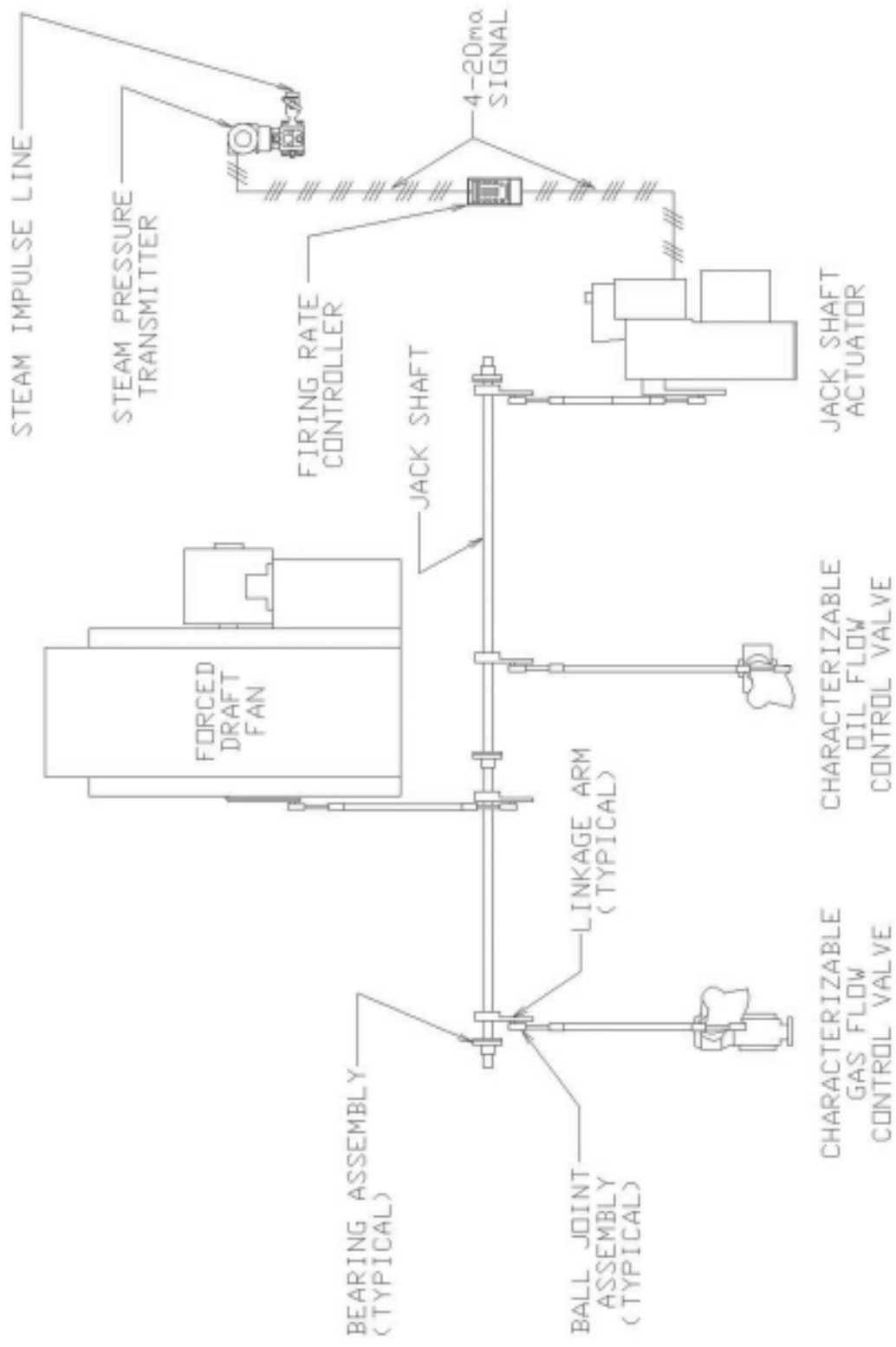
FABER Type "SPP-MR" Single Point Positioning Combustion Control

(Typical Arrangement)



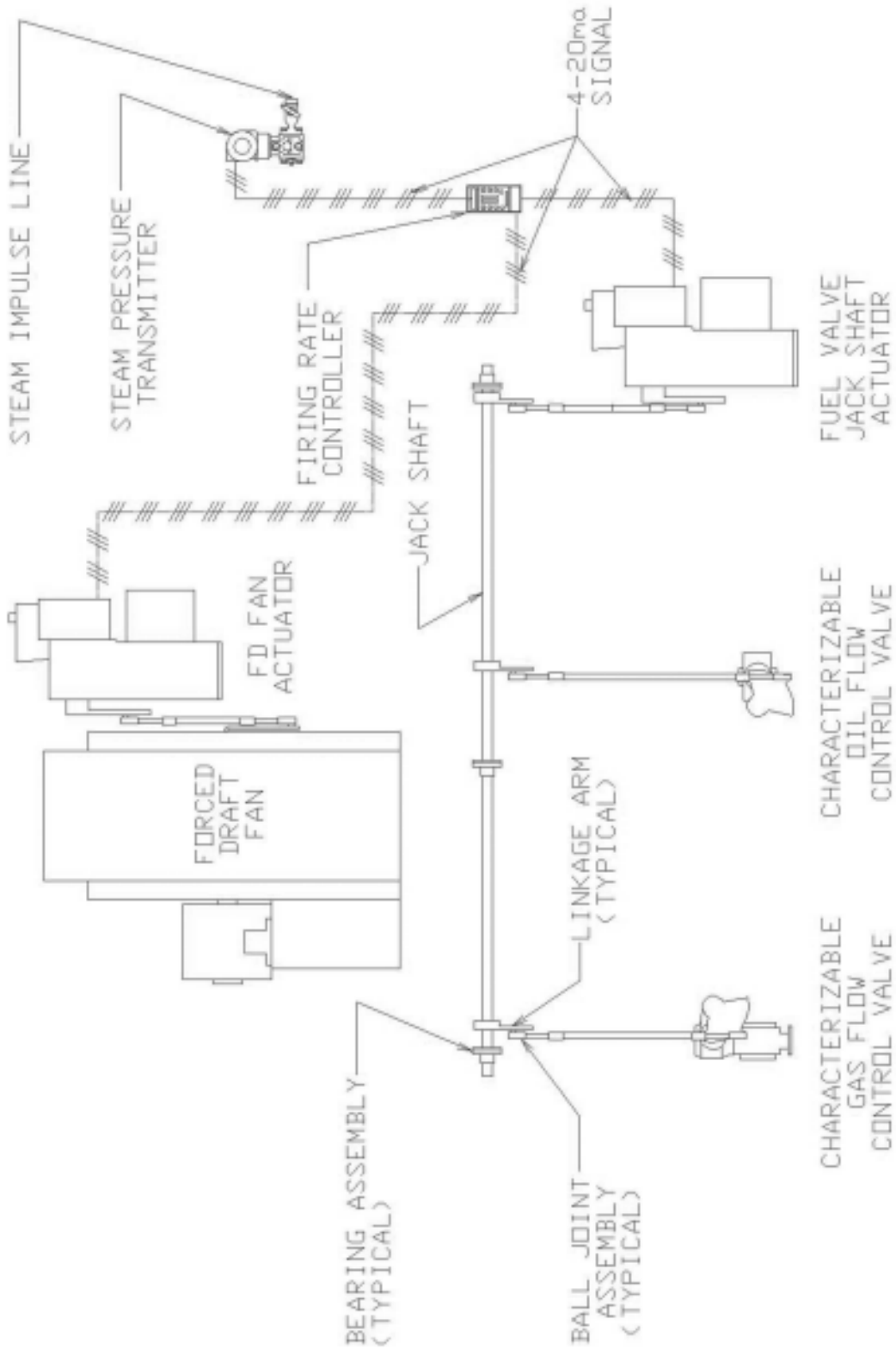
FABER Type "SPP-PN" or "SPP-EC" Single Point Positioning Combustion Control

(Typical Arrangement)



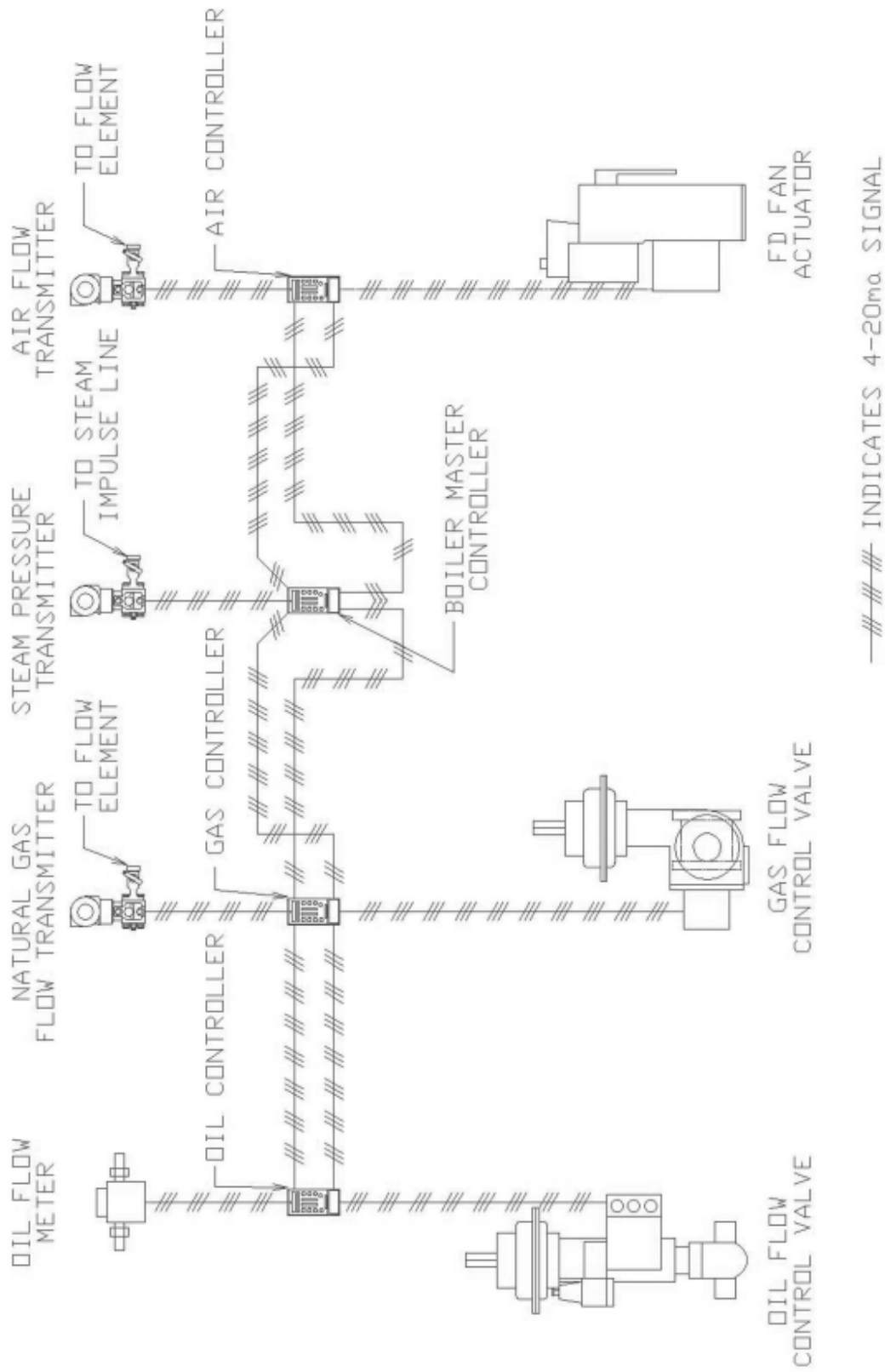
FABER Type "PP-PN" or "PP-EC" Parallel Positioning Combustion Control

(Typical Arrangement)



FABER Type "FM-PN" or "FM-EC" Full Metering Combustion Control

(Typical Arrangement)



COMBUSTION CONTROL TYPE

SINGLE POINT POSITIONING:

Single point positioning systems are simple, highly reliable, and cost effective. A jack shaft is rotated by an actuator. The forced draft fan flow control damper and the fuel valves are mechanically linked to the jack shaft. The fuel valves are characterized, over the burner firing range, to achieve the proper fuel to air ratio. This system is ideal for burners with top-mounted forced draft fans that fire fuels with a relatively constant heating value. This system cannot be used on burners that fire two or more fuels simultaneously, or have a remote-mounted forced draft fan.

SPP-MR = The jack shaft actuator in this single point positioning system is a Hays Cleveland master regulator. The master regulator is a self-contained, fully automatic firing rate controller, combining the sensing element, response mechanism, and power actuator in one unit. A MANUAL-AUTO selector on the burner control panel allows switching from manual to automatic mode. In automatic mode, the jack shaft is regulated in direct proportion to the steam pressure demand signal.

SPP-PN or SPP-EC = The jack shaft actuator in this single point positioning system is a pneumatically or electrically powered actuator. A pressure transmitter measures the steam pressure. The firing rate controller receives the signal from the pressure transmitter. A MANUAL-AUTO button on the firing rate controller faceplate allows switching from manual to automatic mode. In automatic mode, the firing rate controller sends a signal to the jack shaft actuator to maintain the desired steam pressure set point.

SINGLE POINT POSITIONING + PLUS:

The single point positioning + plus system is a jack shaft system, plus a waste fuel metering system with oxygen trim. This system is designed to burn a main fuel simultaneously with small quantities, up to 20% of the total burner heat input, of a waste fuel stream with a varying flow rate and supply pressure. A jack shaft controls the fuel to air ratio of the main fuel. The waste fuel stream and total air flow are measured by flow transmitters. The jack shaft position is measured by a position transmitter. This information is sent to a Moore Products* 353 controller. The controller processes this information and sends a signal to the air trim actuator. The air trim actuator changes the length of the linkage connecting the FD fan damper to the jack shaft. By changing the length of this link, the desired fuel to air ratio is maintained at any waste flue flow rate. An additional loop in the controller is used for oxygen trim. The oxygen trim system compensates for variations in the waste gas content and ambient air temperature, maximizing boiler efficiency.

SPP+P-MR = FABER type "SPP-MR" system described above, plus a waste stream flow element and flow transmitter, an air flow element and flow transmitter, an air trim actuator, oxygen analyzer, and air to fuel ratio controller.

SPP+P = FABER type "SPP-PN or SPP-EC" system described above, plus a waste stream flow element and flow transmitter, an air flow element and flow transmitter, an air trim actuator, oxygen analyzer, and air to fuel ratio controller.

*Moore products controllers are a product of Siemens Moore Process Automation Inc.

PARALLEL POSITIONING (with Actuator Position Feedback):

Parallel positioning systems use two actuators, one to position the fuel valve jack shaft, and one to position the FD fan damper. A pressure transmitter measures the steam pressure. The firing rate controller receives the signal from the steam pressure transmitter. The firing rate controller sends a signal to both the fuel valve jack shaft actuator and the forced draft fan damper to maintain the desired steam pressure set point. The characteristics of a parallel positioning system are essentially the same as the characteristics of a single point positioning system. Both systems rely on the position of the fuel and air flow devices to maintain proper fuel to air ratios. The fuel and air flow control devices in a parallel positioning system are linked “electronically,” as opposed to the mechanical linkage used in a single point positioning system. For this reason, fuel and air actuator feedback signals are used to ensure that the actuators “position” properly. The system automatically shuts down if the position error between the fuel and air actuators is too large. Parallel positioning systems cannot be used on burners that fire two or more fuels simultaneously.

PP = The Faber parallel positioning system consists of a fuel valve jack shaft, a fuel valve actuator, an air flow actuator, a firing rate controller, and a steam pressure transmitter.

FULL METERING:

Full metering systems continuously measure the fuel and air streams, adjusting the fuel and air control devices to maintain the desired fuel to air ratio. “Cross limiting” the fuel and air flow rates ensures that the air leads the fuel on load increases, and that the fuel leads the air on load decreases. This system will automatically shut down if the fuel-to-air ratio error becomes too large. Full metering systems can be used to fire two or more fuels simultaneously.

FM = The FABER full metering system consists of fuel and air flow elements and transmitters, fuel flow control valves, an air flow control actuator, fuel and air flow controllers, a steam pressure controller, and a steam pressure transmitter.

OXYGEN TRIM:

An oxygen trim system increases the performance of any type of combustion control system by allowing more precise control of the fuel to air ratio. This results in increased boiler efficiency and lower operating costs. The oxygen trim system corrects for hysteresis in linkage type systems, slight changes in fuel heating value, and variations in the combustion air temperature. This system measures the excess oxygen in the flue gas and corrects the combustion air flow rate to maintain the proper excess air level.

O1= If FABER type “SPP” combustion controls are selected, the following equipment will be supplied: Oxygen analyzer with display and probe assembly (shipped loose for field mounting and installation), oxygen trim linear actuator, and an oxygen trim controller.

(Oxygen trim continued on next page)

O1 = If FABER type "PP" combustion controls are selected, the following equipment will be supplied: Oxygen analyzer with display and probe assembly (shipped loose for field mounting and installation), and an oxygen trim controller.

O1 = If FABER type "FM" combustion controls are selected, the following equipment will be supplied: Oxygen analyzer with display and probe assembly and a second loop will be added to the air controller for oxygen trim control.

FEEDWATER CONTROL:

F1 = Single element feedwater control, includes a feedwater controller, and a drum level transmitter (shipped loose for field installation).

F2 = Two element feedwater control, includes a feedwater controller and the following items will be shipped loose for field installation: a drum level transmitter, a steam flow transmitter, and a steam flow orifice.

F3 = Three element feedwater control, includes a feedwater controller. The following items will be shipped loose for field installation: a drum level transmitter, a feedwater flow transmitter, a feedwater flow orifice, a steam flow transmitter, and a steam flow orifice.

FABER VIEW TOUCH SCREEN OPERATOR INTERFACE:

TV = FABER view touch screen operator interface. All the indicating lights, switches, push buttons, annunciator points (if an Allen-Bradley* SLC 500 series processor is selected), and controller face plates on the flame safeguard / combustion control panel are replaced with a 12" color touch screen display. The touch screen interface will be configured with a minimum of 4 graphics displays.

STANDARD EQUIPMENT USED IN COMBUSTION CONTROL SYSTEMS:

Process Controllers: SIEMENS Moore 353 Process Automation Controllers

Pressure Transmitters: SIEMENS SITRANS, DSIII Series pressure transmitters with HART communication Protocol, LCD indicator and push buttons for configuration and calibration.

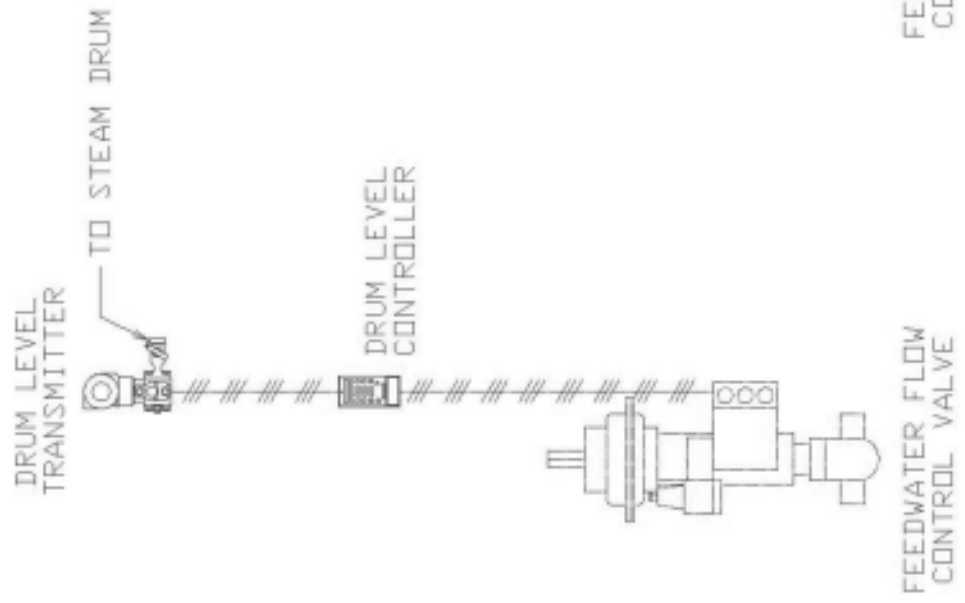
Differential Pressure Transmitters: SIEMENS SITRANS, DSIII Series differential pressure transmitters with HART communication Protocol, LCD indicator and push buttons for configuration and calibration.

*Allen-Bradley processors are a product of Rockwell Automation Inc.

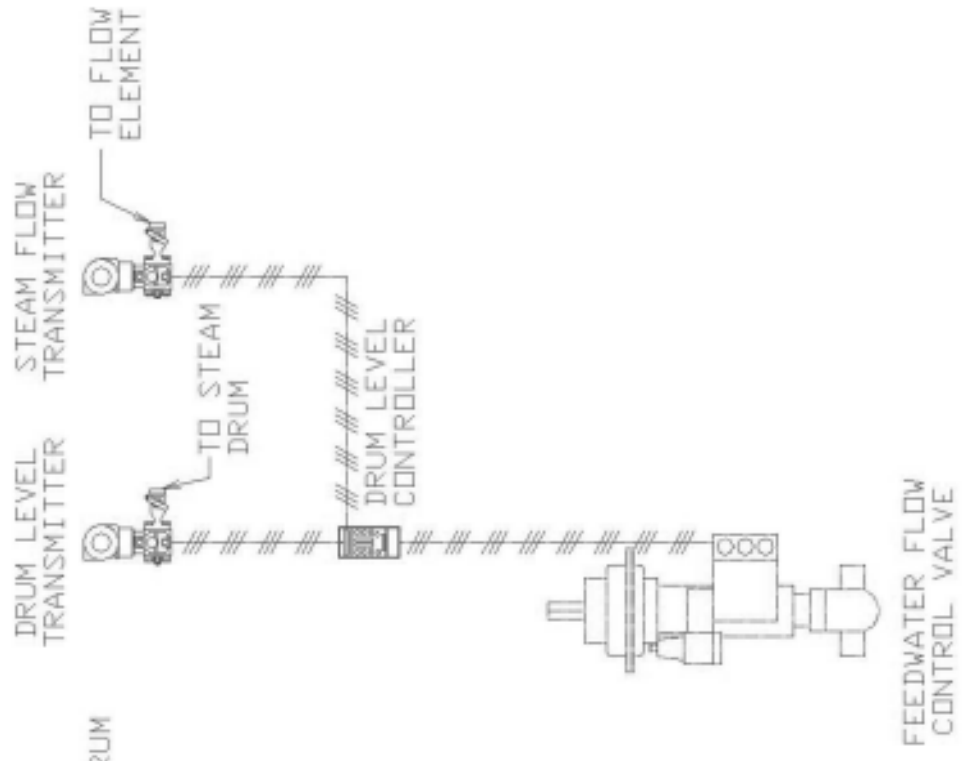
**Moore products controllers are a product of Siemens Moore Process Automation Inc.

FABER Type "F1" and "F2" Feedwater Control (Typical Arrangement)

Type "F1" - Single Element

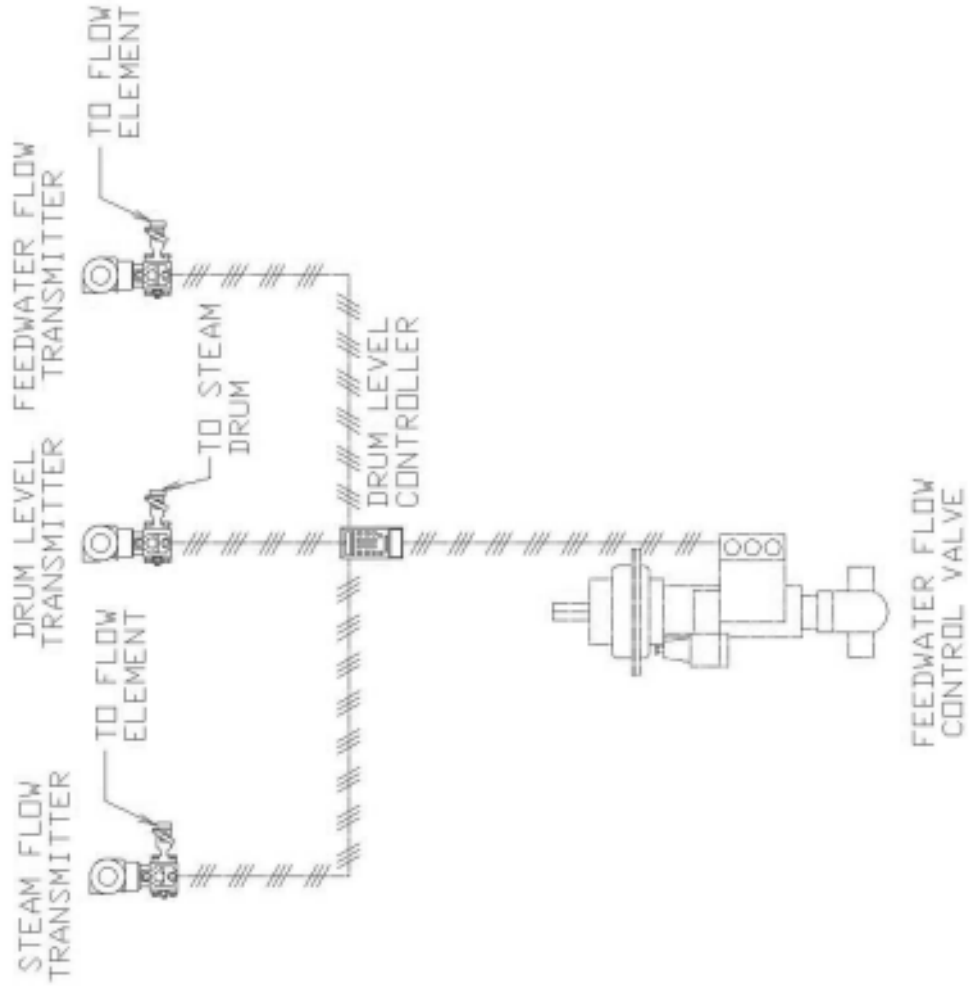


Type "F2" - Two Element



--- INDICATES 4-20ma SIGNAL

FABER Type "F3" Three Element Feedwater Control (Typical Arrangement)



--- INDICATES 4-20ma SIGNAL

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