

# Power Flame Incorporated



## **TYPE SL, LL, AND ML BASIC RELAY AND SWITCH LEAD-LAG SYSTEMS MANUAL**

***THE POWER TO MANAGE ENERGY***  
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## TYPICAL MODEL NUMBER EXPLANATION

SL - 3 R C - F

- SL = On-Off or Low-High-Off Mode
- LL = Low-High-Low Mode
- ML = Modulating Mode

Quantity of Boilers system is to control

- R = Remote Panel Mounting
- I = Integral Panel Mounting in new burner cabinet

System Description:

\_\_(Blank) = The Basic Lead-Lag System

- A = Alternating Lead-Lag System
- B = Alternating System with Lag Boiler(s) Time Delay Feature
- C = Basic Lead-Lag system with Load Isolation Relays
- D = Basic Lead-Lag System with Load Isolation Relays & Lag Boiler(s) Time Delay Feature
- F = Failure Transfer System. Call for heat by Lead Operating Control must be followed within five minutes by the energizing of the fuel valve circuit of the lead burner. If the fuel valve circuit is not energized, lag boiler assumes lead boiler role, alarm light is energized, failed boiler is locked out, manual reset is required.

FUNCTION	SYSTEM MODEL	QTY. ON-OFF CONTROLS	QTY. MOD CONTROLS	SEQUENCE PAGE #	PANEL BOX SIZE	WIRING DIAG. NO.	INTEGRAL STD. BILL NO.	REMOTE STD. BILL NO.
2 BOILER LEAD- LAG FOR ON-OFF OR LHO BURNERS	SL-2I or SL-2R SL-2IA or SL-2RA SL-2IB or SL-2RB SL-2IC or SL-2RC SL-2ID or SL-2RD SL-2IA-F or SL-2RA-F SL-2IB-F or SL-2RB-F SL-2IC-F or SL-2RC-F SL-2ID-F or SL-2RD-F	2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3	15.5 x 10 15.5 x 17 15.5 x 10 15.5 x 10 15.5 x 10 15.5 x 24 15.5 x 24 15.5 x 10 15.5 x 10	WE-104 WE-351M WE-82M WE-160M WE-83 WE-371M WE-371M WE-224M WE-224M	94210 94212 94216 94220 94224 94214 94218 94222 94226	94228 94230 94234 94238 94242 94232 94236 94240 94244
2 BOILER LEAD- LAG FOR LHL BURNERS	LL-2I or LL-2R LL-2IA or LL-2RA LL-2IB or LL-2RB LL-2IC or LL-2RC LL-2ID or LL-2RD LL-2IA-F or LL-2RA-F LL-2IB-F or LL-2RB-F LL-2IC-F or LL-2RC-F LL-2ID-F or LL-2RD-F	4 4 4 4 4 4 4 4 4	0 0 0 0 0 0 0 0 0	4 4 4 4 4 4 4 4 4	15.5 x 10 15.5 x 10 15.5 x 10 15.5 x 17 15.5 x 17 15.5 x 34 15.5 x 34 15.5 x 17 15.5 x 17	WE-382M WE-117L WE-117L WE-98 WE-98 WE-504M WE-504M WE-174M WE-174M	94004 94006 94010 94014 94018 94008 94012 94016 94020	94022 94024 94028 94032 94036 94026 94030 94034 94038
2 BOILER LEAD- LAG FOR FULL MOD BURNERS	ML-2I or ML-2R ML-2IA or ML-2RA ML-2IB or ML-2RB ML-2IC or ML-2RC ML-2ID or ML-2RD ML-2IA-F or ML-2RA-F ML-2IB-F or ML-2RB-F ML-2IC-F or ML-2RC-F ML-2ID-F or ML-2RD-F	2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2	5 5 5 5 5 5 5 5 5	15.5 x 10 15.5 x 24 15.5 x 24 15.5 x 17 15.5 x 17 15.5 x 34 15.5 x 34 15.5 x 24 15.5 x 24	WE-305M WE-105M WE-105M WE-107M WE-106M WE-292M WE-292M WE-421M WE-421M	94114 94116 94120 94124 94128 94118 94122 94126 94130	94132 94134 94138 94142 94146 94136 94140 94144 94148
3 BOILER LEAD- LAG FOR ON-OFF BURNERS	SL-3I or SL-3R SL-3IA or SL-3RA SL-3IB or SL-3RB SL-3IC or SL-3RC SL-3ID or SL-3RD SL-3IC-F or SL-3RC-F SL-3ID-F or SL-3RD-F	3 3 3 3 3 3 3	0 0 0 0 0 0 0	6 6 6 6 6 6 6	15.5 x 10 15.5 x 10 15.5 x 10 15.5 x 10 15.5 x 10 15.5 x 17 15.5 x 17	WE-138 SEE PFI SEE PFI WE-481 WE-222 SEE PFI SEE PFI	94246 94248 94250 94252 94260 94256 94264	94266 94268 94270 94272 94280 94276 94284
3 BOILER LEAD- LAG FOR LHL BURNERS	LL-3I or LL-3R LL-3IA or LL-3RA LL-3IB or LL-3RB LL-3IC or LL-3RC LL-3ID or LL-3RD LL-3IC-F or LL-3RC-F LL-3ID-F or LL-3RD-F	6 6 6 6 6 6 6	0 0 0 0 0 0 0	7 7 7 7 7 7 7	15.5 x 17 15.5 x 17 15.5 x 17 15.5 x 17 15.5 x 17 15.5 x 17 15.5 x 17	WE-128M WE-212L SEE PFI SEE PFI SEE PFI WE-909L WE-909L	94040 94042 94044 94046 94054 94048 94056	94058 94060 94062 94064 94068 94066 94074
3 BOILER LEAD- LAG FOR FULL MOD BURNERS	ML-3I or ML-3R ML-3IA or ML-3RA ML-3IB or ML-3RB ML-3IC or ML-3RC ML-3ID or ML-3RD ML-3IC-F or ML-3RC-F ML-3ID-F or ML-3RD-F	3 3 3 3 3 3 3	3 3 3 3 3 3 3	8 8 8 8 8 8 8	15.5 x 17 15.5 x 42 15.5 x 42 15.5 x 34 15.5 x 34 15.5 x 42 15.5 x 42	WE-111L WE-387L WE-133L WE-488L WE-1114L SEE PFI WE-108L	94150 94152 94154 94156 94164 94162 94166	94168 94170 94172 94174 94180 94178 94182
4 BOILER LEAD- LAG ON-OFF	SL-4I or SL-4R SL-4IC or SL-4RC SL-4ID or WL-4RD	4 4 4	0 0 0	9 9 9	15.5 x 10 15.5 x 17 15.5 x 17	WE-93M WE-715 WE-715	94286 94288 94290	94292 94296 94298
4 BOILER LEAD- LAG LHL	LL-4I or LL-4R LL-4IC or LL-4RC LL-4ID or LL-4RD	8 8 8	0 0 0	10 10 10	15.5 x 34 15.5 x 34 15.5 x 34	WE-147L WE-147L WE-93L	94078 94084 94086	94096 94102 94104
4 BOILER LEAD- LAG MOD	ML-4I or ML-4R ML-4IC or ML-4RC ML-4ID or ML-4RD	4 4 4	4 4 4	11 11 11	15.5 x 34 15.5 x 42 15.5 x 42	WE-364L WE-934L WE-328L	94184 94186 94190	94194 94198 94202

## **LEAD-LAG SYSTEM PURPOSE**

A multiple boiler system often requires multiple setpoints for the operating controls to start and stop the boilers, thus during mild conditions, the minimum number of boilers can be operated for a given load condition, preserving boiler and burner equipment life. Different setpoints for the start and stop controls in a multiple burner system can be accomplished by merely setting the temperature or pressure controls to the desired setpoint.

A multiple boiler lead-lag system will allow all the above, with the added benefit of being able to switch the operating controls from boiler to boiler. Thus the number of hours of operation on an individual boiler can be controlled, this action will allow for equal wear and tear on all the boilers in the multiple boiler system.

All lead-lag systems have one common feature: the controls that start and stop the burner are mounted in common header piping as opposed to mounting the controls on the individual boilers. No control tied into the lead-lag system should be mounted in a location that only senses the steam pressure (or water temperature) condition in an individual boiler. If this condition existed a boiler could possibly be responding to the conditions sensed by a control element mounted in another boiler.

Also, if a multiple boiler arrangement is composed of burners that operate in a low-high-low sequence of operation, or full modulation, the control elements that allow these burners to operate at high fire, or modulate according to load demand, should also be mounted in the same common header piping location.

It is also good practice to mount an on-off control element on the individual boiler. A lead-lag control mounted in header piping can actually call for more heat than the boiler should provide. A control element on the boiler will prevent the lead-lag controls from causing a boiler to shutdown due to the operating of the high temperature or pressure limit.

**TWO BOILER LEAD-LAG FOR ON-OFF OR LOW-HIGH-OFF BURNERS**

<u>System Model</u>	<u>Features</u>	<u>System Model</u>	<u>Features</u>
SL-21	1-2-4	SL-2R	1-3-4
SL-21A	1-2-4-6	SL-2RA	1-3-4-6
SL-21B	1-2-4-5-6	SL-2RB	1-3-4-5-6
SL-21C	1-2-4	SL-2RC	1-3-4
SL-21D	1-2-4-5	SL-2RD	1-3-4-5
SL-21A-F	1-2-4-6-7	SL-2RA-F	1-3-4-6-7
SL-21B-F	1-2-4-5-6-7	SL-2RB-F	1-3-4-5-6-7
SL-21C-F	1-2-4-7	SL-2RC-F	1-3-4-7
SL-21D-F	1-2-4-5-7	SL-2RD-F	1-3-4-5-7

Features

1. The \_\_\_\_\_ system is designed to control the on-off setpoint of two Power Flame on-off or low-high-off type burners. The system requires two s.p.s.t. on-off operating devices, both mounted on the common boiler header.
2. The \_\_\_\_\_ system is designed for incorporation within one of the panel boxes of two new Power Flame burners as the burners are being manufactured.
3. The \_\_\_\_\_ system is assembled in a Power Flame panel box equipped with brackets for wall mounting.
4. The setpoints of the two on-off type controls are to be adjusted so that as steam pressure (or water temperature) drops, first one burner/boiler unit will be called to fire, then as pressure (or temperature) drops further, the second burner will be called to fire. The lead boiler selector switch allows the selection of either burner one or two as lead burner.
5. When the lag burner is called to fire, a 300 second (or adjustable) delay on make timer is energized. After the delay period, the boiler will be allowed to operate. This delay is designed to prevent short cycling of the lag boiler.
6. The lead boiler selector switch also allows the operator to select an “alternating” mode of operation. While the system is in this mode, each time the lead operating control closes, the boilers will reverse the lead and lag roles.
7. If the lead burner fails to start (the fuel valve circuit is not energized after 5 minutes have elapsed since the lead burner was called for heat) the lag burner is transferred to the lead burner role, the failed burner is disabled, and an alarm light is energized.

**TWO BOILER LEAD-LAG FOR LOW-HIGH-LOW BURNERS**

<u>System Model</u>	<u>Features</u>	<u>System Model</u>	<u>Features</u>
LL-21	1-2-4	LL-2R	1-3-4
LL-21A	1-2-4-6	LL-2RA	1-3-4-6
LL-21B	1-2-4-5-6	LL-2RB	1-3-4-5-6
LL-21C	1-2-4	LL-2RC	1-3-4
LL-21D	1-2-4-5	LL-2RD	1-3-4-5
LL-21A-F	1-2-4-6-7	LL-2RA-F	1-3-4-6-7
LL-21B-F	1-2-4-5-6-7	LL-2RB-F	1-3-4-5-6-7
LL-21C-F	1-2-4-7	LL-2RC-F	1-3-4-7
LL-21D-F	1-2-4-5-7	LL-2RD-F	1-3-4-5-7

Features

1. The \_\_\_\_\_ system is designed to control the on-off setpoint and the high fire setpoint of two Power Flame low-high-low type burners. The system requires four s.p.s.t. on-off operating devices, all to be mounted on the common boiler exhaust header.
2. The \_\_\_\_\_ system is designed for incorporation within one of the panel boxes of two new Power Flame burners as the burners are being manufactured.
3. The \_\_\_\_\_ system is assembled in a Power Flame panel box equipped with brackets for wall mounting.
4. The setpoints of the four on-off type controls are to be adjusted so that as steam pressure (or water temperature) drops, first one burner/boiler unit will be called to low fire, then as pressure (or temperature) drops further, the first burner will be called to fire. Further decreases in pressure (or temperature) and the second burner will be called to low fire, and if needed, to high fire. The lead boiler selector switch allows the selection of either burner one or two as lead burner.
5. When the lag burner is called to fire, a 300 second (or adjustable) delay on make timer is energized. After the delay period, the boiler will be allowed to operate. This delay is designed to prevent short cycling of the lag boiler.
6. The lead boiler selector switch also allows the operator to select an “alternating” mode of operation. While the system is in this mode, each time the lead operating control closes, the boilers will reverse the lead and lag roles.
7. If the lead burner fails to start (the fuel valve circuit is not energized after 5 minutes have elapsed since the lead burner was called for heat) the lag burner is transferred to the lead burner role, the failed burner is disabled, and an alarm light is energized.

## TWO BOILER LEAD-LAG FOR FULL MODULATION BURNERS

<u>System Model</u>	<u>Features</u>	<u>System Model</u>	<u>Features</u>
ML-21	1-2-4	ML-2R	1-3-4
ML-21A	1-2-4-6	ML-2RA	1-3-4-6
ML-21B	1-2-4-5-6	ML-2RB	1-3-4-5-6
ML-21C	1-2-4	ML-2RC	1-3-4
ML-21D	1-2-4-5	ML-2RD	1-3-4-5
ML-21A-F	1-2-4-6-7	ML-2RA-F	1-3-4-6-7
ML-21B-F	1-2-4-5-6-7	ML-2RB-F	1-3-4-5-6-7
ML-21C-F	1-2-4-7	ML-2RC-F	1-3-4-7
ML-21D-F	1-2-4-5-7	ML-2RD-F	1-3-4-5-7

### Features

1. The \_\_\_\_\_ system is designed to control the on-off setpoint and the modulation band of two Power Flame full modulation type burners. The system requires two s.p.s.t. on-off operating devices, and two modulating operating devices, all to be mounted on the common boiler exhaust header.
2. The \_\_\_\_\_ system is designed for incorporation within one of the panel boxes of two new Power Flame burners as the burners are being manufactured.
3. The \_\_\_\_\_ system is assembled is a Power Flame panel box equipped with brackets for wall mounting.
4. The setpoints of the two on-off type controls are to be adjusted so that as steam pressure (or water temperature) drops, first one burner/boiler unit will be called to fire, then as pressure (or temperature) drops further, the second burner will be called to fire. The bandwidth of the two modulating type controls are set so that the lead boiler will modulate to high fire (or close to high fire) before the lag boiler is called to fire, and the lag burner will modulate when the lag burner is called to fire. The lead boiler selector switch allows the selection of either burner one or two as lead burner.
5. When the lag burner is called to fire, a 300 second (or adjustable) delay on make timer is energized. After the delay period, the boiler will be allowed to operate. This delay is designed to prevent short cycling of the lag boiler.
6. The lead boiler selector switch also allows the operator to select an “alternating” mode of operation. While the system is in this mode, each time the lead operating control closes, the boilers will reverse the lead and lag roles.
7. If the lead burner fails to start (the fuel valve circuit is not energized after 5 minutes have elapsed since the lead burner was called for heat) the lag burner is transferred to the lead burner role, the failed burner is disabled, and an alarm light is energized.

**THREE BOILER LEAD-LAG FOR ON-OFF OR LOW-HIGH-OFF BURNERS**

<u>System Model</u>	<u>Features</u>	<u>System Model</u>	<u>Features</u>
SL-31	1-2-4	SL-3R	1-3-4
SL-31A	1-2-4-6	SL-3RA	1-3-4-6
SL-31B	1-2-4-5-6	SL-3RB	1-3-4-5-6
SL-31C	1-2-4	SL-3RC	1-3-4
SL-31D	1-2-4-5	SL-3RD	1-3-4-5
SL-31A-F	1-2-4-6-7	SL-3RA-F	1-3-4-6-7
SL-31B-F	1-2-4-5-6-7	SL-3RB-F	1-3-4-5-6-7
SL-31C-F	1-2-4-7	SL-3RC-F	1-3-4-7
SL-31D-F	1-2-4-5-7	SL-3RD-F	1-3-4-5-7

Features

1. The \_\_\_\_\_ system is designed to control the on-off setpoint of three Power Flame on-off or low-high-off type burners. The system requires three s.p.s.t. on-off operating devices, all to be mounted on the common boiler header.
2. The \_\_\_\_\_ system is designed for incorporation within one of the panel boxes of three new Power Flame burners as the burners are being manufactured.
3. The \_\_\_\_\_ system is assembled in a Power Flame panel box equipped with brackets for wall mounting.
4. The setpoints of the three on-off type controls are to be adjusted so that as steam pressure (or water temperature) drops, first one burner/boiler unit will be called to fire, then as pressure (or temperature) drops further, the second burner will be called to fire. Further decrease in pressure will call the third boiler to fire. The lead boiler selector switch allows the selection of any burner as lead burner.
5. When the first lag burner is called to fire, a 300 second (or adjustable) delay on make timer is energized. After the delay period, the boiler will be allowed to operate. This delay is designed to prevent short cycling of the lag boilers. The second lag circuit is also equipped with a similar time delay.
6. The system includes a second mode selector switch for the operator to select an “alternating” or “sequence” mode of operation. While the system is in “sequence” mode, the boilers operate in a normal lead-lag sequence. When in the “alternating” mode, each time the lead operating control closes the lag boilers will reverse the first lag and second lag roles.
7. If the lead burner fails to start (the fuel valve circuit is not energized after 5 minutes have elapsed since the lead burner was called for heat) the first lag burner is transferred to the lead burner role, the second lag burner is transferred to the first lag role, the failed burner is disabled, and an alarm light is energized.



## THREE BOILER LEAD-LAG FOR LOW-HIGH-LOW BURNERS

<u>System Model</u>	<u>Features</u>	<u>System Model</u>	<u>Features</u>
LL-31	1-2-4	LL-3R	1-3-4
LL-31A	1-2-4-6	LL-3RA	1-3-4-6
LL-31B	1-2-4-5-6	LL-3RB	1-3-4-5-6
LL-31C	1-2-4	LL-3RC	1-3-4
LL-31D	1-2-4-5	LL-3RD	1-3-4-5
LL-31A-F	1-2-4-6-7	LL-3RA-F	1-3-4-6-7
LL-31B-F	1-2-4-5-6-7	LL-3RB-F	1-3-4-5-6-7
LL-31C-F	1-2-4-7	LL-3RC-F	1-3-4-7
LL-31D-F	1-2-4-5-7	LL-3RD-F	1-3-4-5-7

### Features

1. The \_\_\_\_\_ system is designed to control the on-off setpoint and the high fire setpoint of three Power Flame low-high-low type burners. The system requires six s.p.s.t. on-off operating devices, all to be mounted on the common boiler exhaust header.
2. The \_\_\_\_\_ system is designed for incorporation within one of the panel boxes of three new Power Flame burners as the burners are being manufactured.
3. The \_\_\_\_\_ system is assembled in a Power Flame panel box equipped with brackets for wall mounting.
4. The setpoints of the six on-off type controls are to be adjusted so that as steam pressure (or water temperature) drops, first one burner/boiler unit will be called to low fire, then as pressure (or temperature) drops further, the first burner will be called to high fire. Further decreases in pressure (or temperature) and the second burner will be called to low fire, and if needed, to high fire. If needed, the third burner will also be called to fire in a similar manner. The lead boiler selector switch allows the selection of any burner as lead burner.
5. When the first lag burner is called to fire, a 300 second (or adjustable) delay on make timer is energized. After the delay period, the boiler will be allowed to operate. This delay is designed to prevent short cycling of the lag boilers. The second lag circuit is also equipped with a similar time delay.
6. The system includes a second mode selector switch for the operator to select an “alternating” or “sequence” mode of operation. While the system is in “sequence” mode, the boilers operate in a normal lead-lag sequence. When in the “alternating” mode, each time the lead operating control closes the lag boilers will reverse the first lag and second lag roles.
7. If the lead burner fails to start (the fuel valve circuit is not energized after 5 minutes have elapsed since the lead burner was called for heat) the first lag burner is transferred to the lead burner role, the second lag burner is transferred to the lead burner role, the second lag burner is transferred to the first lag role, the failed burner is disabled, and an alarm light is energized.

**THREE BOILER LEAD-LAG FOR FULL MODULATION BURNERS**

<u>System Model</u>	<u>Features</u>	<u>System Model</u>	<u>Features</u>
ML-31	1-2-4	ML-3R	1-3-4
ML-31A	1-2-4-6	ML-3RA	1-3-4-6
ML-31B	1-2-4-5-6	ML-3RB	1-3-4-5-6
ML-31C	1-2-4	ML-3RC	1-3-4
ML-31D	1-2-4-5	ML-3RD	1-3-4-5
ML-31A-F	1-2-4-6-7	ML-3RA-F	1-3-4-6-7
ML-31B-F	1-2-4-5-6-7	ML-3RB-F	1-3-4-5-6-7
ML-31C-F	1-2-4-7	ML-3RC-F	1-3-4-7
ML-31D-F	1-2-4-5-7	ML-3RD-F	1-3-4-5-7

Features

1. The \_\_\_\_\_ system is designed to control the on-off setpoint and the modulation band of three Power Flame full modulation type burners. The system requires three s.p.s.t. on-off operating devices, and three modulating operating devices, all to be mounted on the common boiler exhaust header.
2. The \_\_\_\_\_ system is designed for incorporation within one of the panel boxes of three new Power Flame burners as the burners are being manufactured.
3. The \_\_\_\_\_ system is assembled in a Power Flame panel box equipped with brackets for wall mounting.
4. The setpoints of the three on-off type controls are to be adjusted so that as steam pressure (or water temperature) drops, first one burner/boiler unit will be called to fire, then as pressure (or temperature) drops further, the second burner will be called to fire, and if needed, the third burner will be called to fire. The bandwidth of the three modulating type controls are set to that the lead boiler will modulate to high fire (or close to high fire) before the first lag boiler is called to fire, and the first lag burner will modulate when the lag burner is called to fire. The second lag burner will be called to fire when the first lag burner is at or near high fire. The lead boiler selector switch allows the selection of any burner as lead burner.
5. When the first or second lag burner are called to fire, a 300 second (or adjustable) delay on make timer is energized. After the delay period, the boiler will be allowed to operate. This delay is designed to prevent short cycling of the lag boilers.
6. The system includes a second mode selector switch for the operator to select an “alternating” or “sequence” mode of operation. While the system is in “sequence” mode, the boilers operate in a normal lead-lag sequence. When in the “alternating” mode, each time the lead operating control closed the lag boilers will reverse the first lag and second lag roles.
7. If the lead burner fails to start (the fuel valve circuit is not energized after 5 minutes have elapsed since the lead burner was called for heat) the first lag burner is transferred to the lead burner role, the second lag burner is transferred to the first lag role, the failed burner is disabled, and an alarm light is energized.

**FOUR BOILER LEAD-LAG FOR ON-OFF OR LOW-HIGH-OFF BURNERS**

<u>System Model</u>	<u>Features</u>	<u>System Model</u>	<u>Features</u>
SL-41	1-2-4	SL-4R	1-3-4
SL-41C	1-2-4	SL-4RC	1-3-4
SL-41D	1-2-4-5	SL-4RD	1-3-4-5

Features

1. The \_\_\_\_\_ system is designed to control the on-off setpoint of four Power Flame on-off or low-high-off burners. The system requires four s.p.s.t. on-off operating devices, all to be mounted on the common boiler header.
2. The \_\_\_\_\_ system is designed for incorporation within one of the panel boxes of four new Power Flame burners as the burners are being manufactured.
3. The \_\_\_\_\_ system is assembled in a Power Flame panel box equipped with brackets for wall mounting.
4. The setpoints of the four on-off type controls are to be adjusted so that as steam pressure (or water temperature) drops, first one burner/boiler unit will be called to fire, then as pressure (or temperature) drops further, the second burner will be called to fire. Further decreases in pressure will call the third boiler to fire and if needed, the fourth boiler will be called to fire. The lead boiler selector switch allows the selection of any burner as lead burner.
5. When the first, second or third lag burners are called to fire, a 300 second (or adjustable) delay on make timer is energized. After the delay period, the boiler will be allowed to operate. This delay is designed to prevent short cycling of the lag boiler.

**FOUR BOILER LEAD-LAG FOR LOW-HIGH-LOW BURNERS**

<u>System Model</u>	<u>Features</u>	<u>System Model</u>	<u>Features</u>
LL-41	1-2-4	LL-4R	1-3-4
LL-41C	1-2-4	LL-4RC	1-3-4
LL-41D	1-2-4-5	LL-4RD	1-3-4-5

Features

1. The \_\_\_\_\_ system is designed to control the on-off setpoint and the high fire setpoint of four Power Flame low-high-low type burners. The system requires eight s.p.s.t. on-off operating devices, all to be mounted on the common boiler exhaust header.
2. The \_\_\_\_\_ system is designed for incorporation within one of the panel boxes of four new Power Flame burners as the burners are being manufactured.
3. The \_\_\_\_\_ system is assembled in a Power Flame panel box equipped with brackets for wall mounting.
4. The setpoints of the eight on-off type controls are to be adjusted so that as steam pressure (or water temperature) drops, first one burner/boiler unit will be called to low fire, than as pressure (or temperature) drops further, the first burner will be called to high fire. Further decreases in pressure (or temperature) and the second burner will be called to low fire, and if needed, to high fire. If needed, the third burner will also be called to fire in a similar manner, and as needed, the fourth burner will be called to fire. The lead boiler selector switch allows the selection of any burner as lead burner.
5. When the first, second or third lag burners are called to fire, a 300 second (or adjustable) delay on make timer is energized. After the delay period, the boiler will be allowed to operate. This delay is designed to prevent short cycling of the lag boilers.

**FOUR BOILER LEAD-LAG FOR FULL MODULATION BURNERS**

<u>System Model</u>	<u>Features</u>	<u>System Model</u>	<u>Features</u>
ML-41	1-2-4	ML-4R	1-3-4
ML-41C	1-2-4	ML-4RC	1-3-4
ML-41D	1-2-4-5	ML-4RD	1-3-4-5

Features

1. The \_\_\_\_\_ system is designed to control the on-off setpoint and the modulation band of four Power Flame full modulation type burners. The system requires four on-off operating devices, and four modulating operating devices, all to be mounted on the common boiler exhaust header.
2. The \_\_\_\_\_ system is designed for incorporation within one of the panel boxes of four new Power Flame burners as the burners are being manufactured.
3. The \_\_\_\_\_ system is assembled in a Power Flame panel box equipped with brackets for wall mounting.
4. The setpoints of the four on-off type controls are to be adjusted so that as steam pressure (or water temperature) drops, first one burner/boiler unit will be called to fire, then as pressure (or temperature) drops further, the second burner will be called to fire, and if needed, the third burner will be call to fire, and if needed, the fourth burner. The bandwidth of the four modulating type controls are set so that the lead boiler will modulate to high fire (or close to high fire) before the first lag boiler is called to fire, and the first lag burner will modulate when the lag burner is called to fire. The second lag burner will be called to fire when the first lag burner is as or near high fire. The third lag burner will be called to fire when the second lag burner is at or near high fire. The lead boiler selector switch allows the selection of any burner as lead burner.
5. When the first, second or third lag burners are called to fire, a 300 second (or adjustable) delay on make timer is energized. After the delay period, the boiler will be allowed to operate. This delay is designed to prevent short cycling of the lag boilers.

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## NOTES

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