

LMV51... / LMV52...

Parameters



Section 4 Parameters

Parameters Introduction 4-1

The Siemens LMV5 BMS has a number of parameters (settings) that can be adjusted to suit the wide variety of applications that exist in the burner / boiler and industrial heating market.

These parameters are broken up into three main groups by password access.

- User** Level access does not require a password, and encompasses all of the parameters that an end user might have to look at and / or adjust during the life of the burner / boiler.
- Service** Level access does require a password, and this level encompasses all of the user level, plus parameters that a service technician might need to access, to tune or maintain the burner / boiler.
- OEM** Level access requires a different password than the service level, and enables the OEM to access all parameters, including safety related parameters.

The parameters are accessed through the AZL5 in an outline-type structure that will be thoroughly illustrated on the following pages.

Typical Settings

Although the LMV5 has many parameters that can be adjusted, most burners / boilers only need a few parameters adjusted to operate properly.

If the burner / boiler has been shop tested, the number of parameters that must be adjusted is reduced even further.

The following table lists the parameters that must be set on an un-programmed LMV51 in order to operate most simple non-FGR burner / boiler safely.

Table 4-1.1 Necessary LMV51 Parameters

DUAL FUEL Example		
Common to Both Fuels	Gas Burner	Light Oil Burner
<i>Auto/Manual/Off</i>	<i>FuelTrainGas</i>	<i>FuelTrainOil</i>
<i>1 AirActuator (address)</i>	<i>2 GasActuator (address)</i>	<i>3 OilActuator (address)</i>
<i>2 AirActuator (rotation direction)</i>	<i>2 GasActuator (rotation direction)</i>	<i>3 Oil Actuator (rotation direction)</i>
<i>IgnitionPosAir</i>	<i>IgnitionPosGas</i>	<i>IgnitionPosOil</i>
<i>PrepurgePosAir</i>	<i>CurveParams Gas</i>	<i>CurveParams Oil</i>
<i>OperatRampMod</i>	<i>MinT_PrepurgeGas</i>	<i>MinT_PrepurgeOil</i>
<i>SetLoad</i>	<i>PrepurgeTmeGas</i>	<i>PrepurgeTmeOil</i>
<i>LC_OptgMode</i>	<i>SafteyTme1Gas</i>	<i>SafteyTme1Oil</i>
<i>StandardParam</i>	<i>SafteyTme2Gas</i>	<i>SafteyTme2Oil</i>
<i>SD_ModOn</i>	<i>PS-VP/ CPI</i>	<i>IgnOilPumpStart</i>
<i>SD_ModOff</i>		<i>OilPumpCoupling</i>
<i>TimeNoFlame</i>		<i>OilPressureMax</i>
<i>ForcedIntermit</i>		
<i>SensorSelect</i>		
<i>MRangePressSens</i>		
<i>MRangeTempSens</i>		
<i>MeasureRangePtNi</i>		
<i>Ext Inp X61 UII</i>		
<i>SetpointW1</i>		

Note: The index at the beginning of Section 4-2 shows the above parameters in bold type.

Parameter Worksheet Legend

The parameters listed in Figure 4-1.1 outline the basic parameters that are necessary for a LMV51 on a simple burner / boiler.

The LMV51 has many more capabilities than what is listed above, and the LMV52 has many more capabilities than the LMV51.

In order to make its many features user friendly, an LMV5 Parameter worksheet was created.

This worksheet is Section 4-2 and carries all pertinent information concerning the parameters of the LMV5. A sample of the worksheet is explained below:

Figure 4-1.2 LMV5 Parameter worksheet legend

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> BurnerControl> Times> TimesStartup2	SafteyTme1Gas or SafetyTme1Oil (TSA1)	O			When a fuel train is selected that has a pilot, this setting defines the overlap of the spark (OUTPUT X4-02.3) and the pilot valve (OUTPUT X9-01.02). After this.... States which phase the parameter effects.	40 - 42		
	Interval1Gas or Interval1Oil	S			When a fuel train is selected that has a pilot, this setting defines the pilot stabilization period. This time..... States if the paramter is available on a LMV51 or a LMV52. Shaded = Available, Not Shaded = Not Available	44		
	SafetyTme2Gas or SafetyTme2Oil (TSA2)	O			When GP2 gas train is selected, this setting defines..... States what password is necessary to access the parameter U = no password (User) S = Service, O = OEM	50		

The parameter worksheet should be used the first few times an engineer / technician sets up a LMV5 since it provides the necessary information for each parameter in a concise manner.

Note: Not all gas parameters are available to set when the currently selected fuel is oil, and not all oil parameters are available to set when the currently selected fuel is gas.

Downloading and Uploading Entire Parameter Sets

Entire parameter sets can be uploaded and downloaded into the LMV5. This is particularly useful and timesaving if identical (or similar) burners / boilers are being commissioned. This can be accomplished in two different ways, with an AZL5 or with a PC having the ACS450 software loaded. (Refer to section 9 for ACS450 instructions)

Note: Do not connect an AZL51 to an LMV52 since incompatible memory exists between these two. If attempted, memory can be permanently damaged. An AZL52 can be used on any LMV5, (LMV51, LMV52) with no problem.

When a parameter is changed (via AZL5 or ACS450) the actual change in memory (parameter set) occurs in the LMV5 and not the AZL5. The parameter set that the LMV5 uses for operation is stored in the LMV5 itself. The AZL5 stores a parameter set that may or may not be the same as the parameter set in the LMV5. If parameter back-up is made from the LMV5 to the AZL5, then the parameter set in the LMV5 and the AZL5 will be identical.

Procedure to use an AZL5 to transfer a parameter set from LMV5(Y) to LMV5(Z)

I. Match parameters on AZL5(Y) to LMV5(Y)

- 1) After setting the parameters (by using the AZL5 or ACS450), be sure that the parameter set stored in the AZL5(Y) completely matches the parameter set stored in the LMV5(Y). This can be accomplished in two different ways:
 - a. Whenever the ESC key is used to back out of the *Params & Display* menu, and there has been a change in a parameter, the AZL5 will prompt the user with "*Make Parameter Backup? ENTER: yes ESC: no*", pressing ENTER synchronizes the AZL5 and LMV5 parameter sets.
 - b. The parameter *LMV5x -> AZL5*, can also be done at anytime so that the parameter set in the LMV5 will be written to the AZL5. This can be found under *Updating> ParamBackup*.
- 2) When either of these methods is used to update the AZL5, the following text will be shown:

*"Parameters being updated Cancel with ESC"
"Backup is made"*

WAIT for the next line of text / step. It may take up to 5 minutes!

"Parameters have been stored Continue with ESC"

- 3) A current parameter set now exists on AZL5(Y).

II. Match *BurnerID*'s on LMV5(Y) and LMV5(Z)

- 1) On AZL5(Y) go to *Operation>* press Enter, scroll down to *BurnerID*, press Enter again, and record LMV5(Y)'s *BurnerID*. On AZL5(Z) go to *Operation>* press Enter, scroll down to *BurnerID*, press Enter again, and check LMV5(Z)'s *BurnerID*. If it's XXXX, LMV5(Z) is blank. If LMV5(Z) has a *BurnerID*, it must be changed to exactly match LMV5(Y). Go to *Updating>*, enter the Service or OEM level password, scroll down to *BurnerID*, press Enter and modify as needed.

III. Restore LMV5(Y) parameters to LMV5(Z)

- 1) Connect AZL5(Y) to the blank or *BurnerID* matched LMV5(Z).
Input the Service or OEM password.
Go to *Updating> Parambackup >*, select *AZL ->LMV5x*, and press Enter.
The parameter set will be transferred from AZL5(Y) to LMV5(Z).
The following text will be shown on the AZL5 during the transfer:

"Parameters being updated Cancel with ESC"
"Backup Restore is carried out"

WAIT for the next line of text / step. Do not interrupt! It may take up to 5 minutes!

"Backup Restore finished Parameter BC : Complete"
Or
"Backup Restore finished Parameter BC : Partial"

Either of the above lines indicates that the parameter set transfer from the AZL5(Y) to the LMV5(Z) was successful and that the process is complete.

Also, it is normal to get an alarm (!) during this process.

Note: It is VERY IMPORTANT that no interruptions occur when the parameters are transferred between the AZL5 and the LMV5. If an interruption occurs, a damaged parameter set will result. If this happens, backup the AZL5 to the LMV5 again.

IV. Return AZL5(Y) to LMV5(Y) and AZL(Z) to LMV5(Z)

- 1) After this is done, AZL5(Y) can be put back on LMV5(Y), the one it was originally connected to.
Connect the AZL5(Z) to LMV(Z).
Once again go to *Updating> Parambackup*, but this time select *LMV5x -> AZL*.
Press Enter, and the parameter set will be written from LMV5(Z) to AZL5(Z).

Note: The AZL5(Z) does not need to be blank. The *BurnerID* in the LMV5 will overwrite it.
An LMV5 will always overwrite the *BurnerID* in the AZL5.
An AZL5 will never overwrite a *BurnerID* in an LMV5 that has a different *BurnerID*.
An AZL5 will write a *BurnerID* to a LMV5 that does not have a *BurnerID*.

V. Modify LMV5(Z) *BurnerID*

- 1) Change the *BurnerID* of LMV5(Z) to something unique, different from LMV5(Y).
The *BurnerID* is typically set to the burner or boiler serial number.
The OEM password is needed to access this.

Note: The *BurnerID* is a safety feature that identifies and matches a parameter set to a burner. It functions as a parameter set's name. Whenever a Restore is attempted, the *BurnerID* is verified in a programmed LMV5. This verification does not happen if the LMV5 is blank.

Setting Fuel Trains

A number of different fuel train options exist for the LMV5. There are several trains for gas and several trains for oil. The following schematics describe the various options available for parameters (FuelTrainGas and FuelTrainOil).

For gas, Pilot GP2 is normally used. For Light Oil, LO w Gasp is normally used.

Diagrams are also provided that outline fuel valve sequence during light off and operation.

Gas Fuel Trains:

Figure 4-1.3 Direct spark Ignition

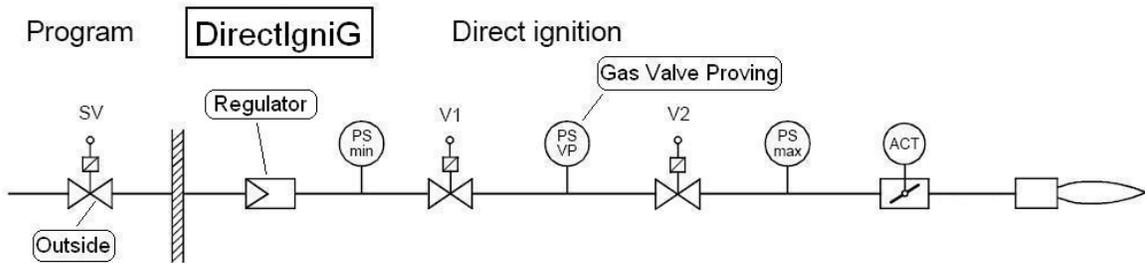


Figure 4-1.4 Pilot ignition (pilot from between main gas valves V1 and V2)

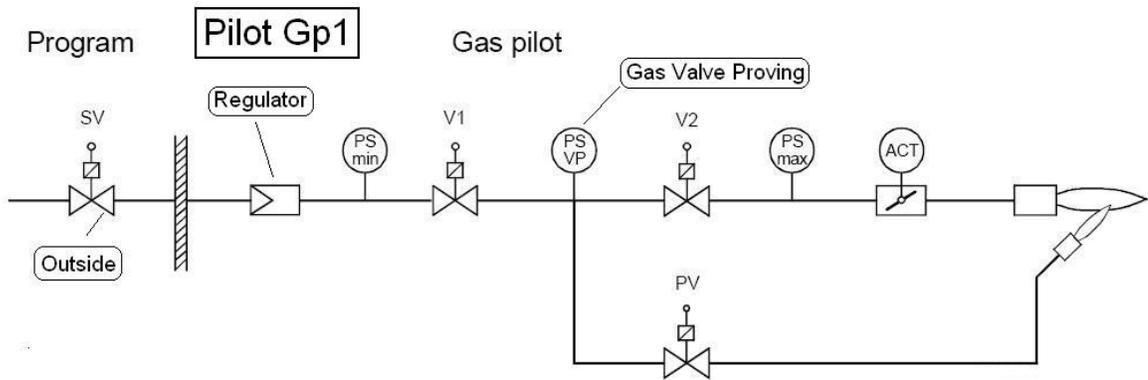
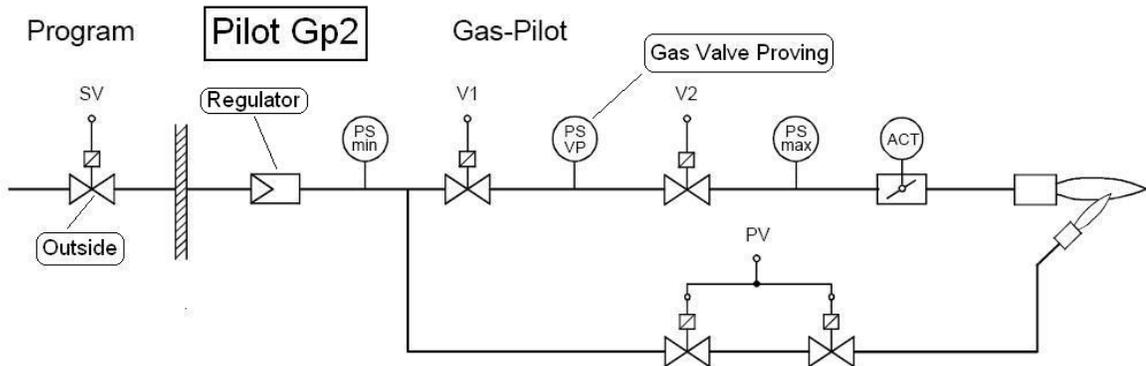


Figure 4-1.5 Pilot ignition (pilot before main gas valves V1 and V2)



Gas Fuel Train Nomenclature:

- ACT = Actuator
- V1 = Upstream gas valve (main)
- V2 = Downstream gas valve (main)
- PV = Pilot Valve
- SV = Shutoff (Safety) valve
- PS = Pressure switch
- VP = Valve Proving

Figure 4-1.6 : Gas train sequences (shaded indicates energized)

		Drive to Ignition Pos.	Preignition (SPARK) = ON	Pilot Valve = ON	IGN (SPARK)= OFF	Interval 1 (Pilot Stabilization)	Safety Time 2	Interval 2 (Main Stabilization)	Drive to Low Fire Pos.
		36	38	40	42	44	50	52	54
Terminal	Description	SAFETY TIME 1							
DirectIgniG	X4-02.3 Ignition								
	X9-01.4 Gas valve V1 (Main, up stream)								
	X9-01.3 Gas valve V2 (Main, dwn. stream)								
Pilot Gp1	X4-02.3 Ignition								
	X9-01.1 Gas valve SV (Usually Outdoor)								
	X9-01.2 Gas valve PV (Pilot Valve)								
	X9-01.4 Gas valve V1 (Main, up stream)								
	X9-01.3 Gas valve V2 (Main, dwn. stream)								
Pilot Gp2	X4-02.3 Ignition								
	X9-01.1 Gas valve SV (Usually Outdoor)								
	X9-01.2 Gas valve PV (Pilot Valve)								
	X9-01.4 Gas valve V1 (Main, up stream)								
	X9-01.3 Gas valve V2 (Main, dwn. stream)								

Oil Fuel Trains:

Figure 4-1.7: Direct spark ignition for light oil, single stage or multi-stage (other trains possible)

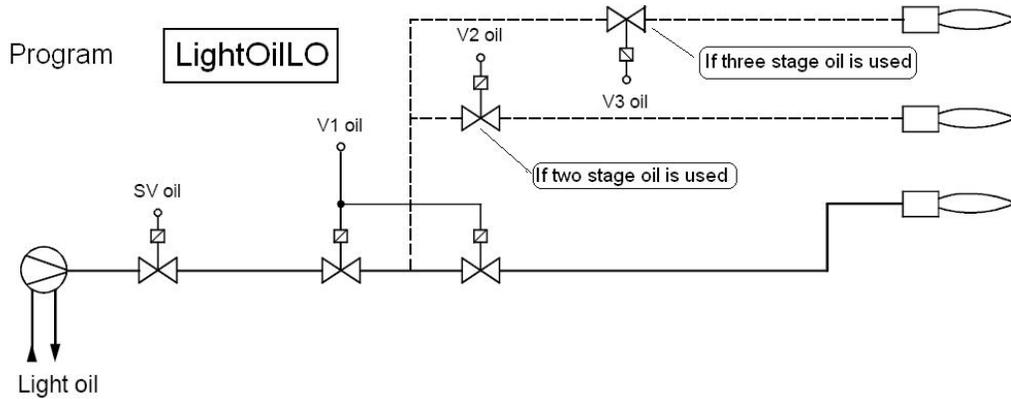


Figure 4-1.8 : Gas pilot ignition for light oil, staged or modulating (other trains possible)

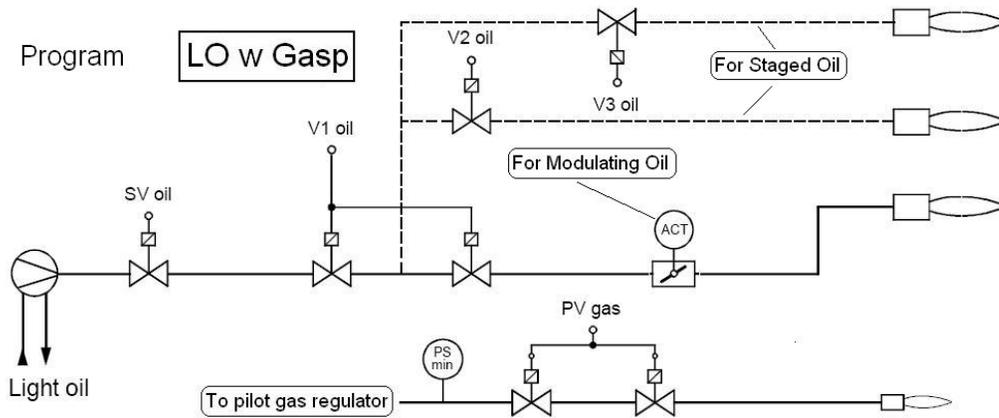
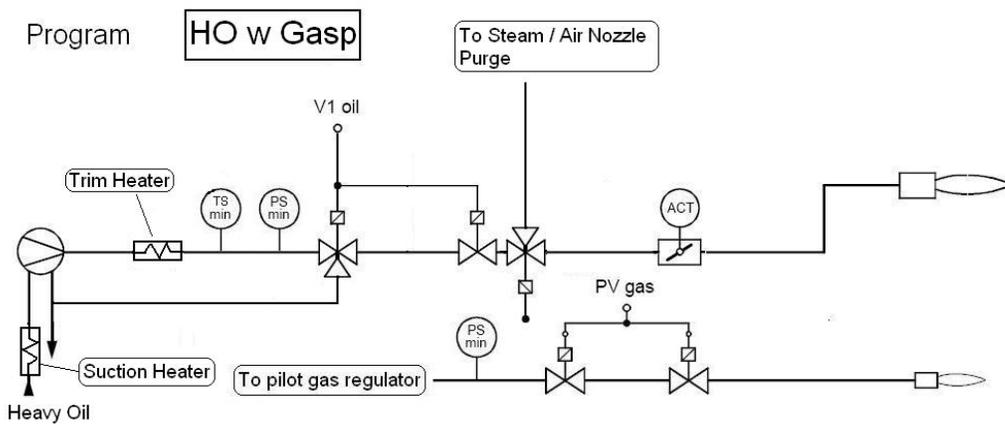


Figure 4-1.9 : Gas pilot ignition for Heavy oil, modulating (other trains possible)



Oil Fuel Train Nomenclature:

- ACT = Actuator
- V1 = Oil Valves (main)
- V2 = Stage 2 oil valve
- V3 = Stage 3 oil valve
- PV = Pilot Valve
- SV = Shutoff (Safety) valve
- PS = Pressure switch
- TS = Temperature switch

Figure 4-1.10 : Oil train sequences (shaded indicates energized)

			Drive to Ignition Pos.	Preignition (SPARK) = ON	Pilot Valve = ON	IGN (SPARK)= OFF	Interval 1	Safety Time 2	Interval 2 (Main Stabilization)	Drive to Low Fire Pos.
			36	38	40	42	44	50	52	54
			SAFETY TIME 1							
LightOilLO	Terminal	Description								
	X4-02.3	Ignition								
	X8-02.1	Oil valve V1 (Main)								
	X8-03.1	Oil valve V1 (Main)								
LO w Gasp	X4-02.3	Ignition								
	X9-01.1	Gas valve SV (Usually Outdoor)								
	X9-01.2	Gas valve PV (Pilot Valve)								
	X8-02.1	Oil valve V1 (Main)								
	X8-03.1	Oil valve V1 (Main)								
							Safety Time 2 HO ONLY			
HO w Gasp	X4-02.3	Ignition								
	X9-01.1	Gas valve SV (Usually Outdoor)								
	X9-01.2	Gas valve PV (Pilot Valve)								
	X8-02.1	Oil valve V1 (Main)								
	X8-03.1	Oil valve V1 (Main)								

Addressing SQM4 Actuators

Before actuators can be operated by the LMV5 they must be addressed and the direction or rotation must be set if it was not previously set.

Depending on direction of rotation and home position set in the LMV5, the actuator may rotate as soon as it is addressed. **For this reason it is highly recommended that the actuator shaft be uncoupled from the valve / damper when the actuator is addressed.**

Addressing is accomplished by going under *Parameters & Display > Actuators > Addressing* and selecting the actuator to be addressed.

The AZL5 will then prompt the technician to press the red address button on a specific actuator (air, gas, aux1, etc...). The red address button is located under the plastic cover on the back of the actuator. After the red address button is pressed on a specific actuator, the AZL5 should indicate that the address assignment is successful.

The actuator's green LED should also blink a certain number of times after the actuator has been addressed. One blink means air actuator, 2 = Gas or Gas/Oil, 3 = Oil, 4 = Aux1, and so on. This is also outlined in the parameter worksheet (Section 4-2). A solid (non-blinking) LED on the actuator means that the actuator has power, but is not addressed.

Note: Actuator positions are stated in degrees (0 to 90°), and the VSD is stated in percent (0 to 100%)

The addressing of any actuator can be erased (un-addressed) by holding down the red button on that actuator for approximately 8-10 seconds, until a solid, non-blinking green LED occurs. The actuator must be connected to power and CanBus to do this.

If an actuator is not addressed, and has power (12VAC1 and / or 12VAC2 connected) the green LED will remain solid (non-blinking). Only 12 VAC (one wire) is necessary to light the green LED, but 24 VAC is necessary (both wires) to have the actuator operate properly.

If an actuator has been addressed, and has correct power (12VAC1 and 12VAC2), but one of the CanBus wires is disconnected, the LED will not light. The LED may blink for a couple of seconds, but then will go blank if the CanBus wiring is not correct.



Checking Actuator Operation

After the actuators are addressed and the direction of rotation for each actuator is set, the actuator shaft can be coupled to the valve / damper that it will drive.

The direction or rotation for each actuator can be viewed / adjusted under *Parameters & Display > Actuators > DirectionRot*.

Standard rotation – Clockwise (CW) when the actuator shaft is pointed away from you or Counterclockwise (CCW) rotation when the shaft it pointed directly at you.

Reversed rotation – CCW when the when the actuator shaft is pointed away from you or CW rotation when the shaft is pointed directly at you.

IMPORTANT: Make absolutely certain that when the actuator is at 0 degrees the valve / damper that it is coupled to is in fact closed. The actuator position must be verified by reading the actuator position on the AZL5 display since this reading accounts for the programmed direction of rotation.

Actuator positions can be viewed under:

Params & Display > Ratio Control > Gas (Oil) Settings > CurveParams

Actuators should be coupled to valve / dampers with robust, near zero lash flexible couplings to avoid binding due to minor shaft misalignment but still retain highly accurate valve / damper positioning.

After the actuators are properly coupled to the valve / damper that they are driving, they should be stroked through their normal range of operation to check for smooth operation.

Actuators with the coupled valve / damper can be stroked through their range of operation under:

Params & Display > Ratio Control / > Gas (Oil) Settings > CurveParams

The actuators can be stroked with the burner off. This can be done by entering a point (typically point 1) and moving the actuators up and down individually. When finished verifying the stroke of the actuator, **do not** save the changes to the point.

Note: Check rotation of ALL actuators BEFORE commissioning combustion curves. This includes the oil actuator BEFORE commissioning the combustion curves on gas.

If the direction of rotation is changed for any actuator, ALL combustion curves (both fuels) MUST be deleted.

Setting Special Positions and Burner Light off

After actuators are addressed and coupled, the special positions can be set. These must be set before attempting to light the burner. The special positions are:

- 1) Home Position – sets the actuator positions when the LMV5 is in standby, Phase 12.
- 2) Prepurge Position – sets the actuator positions for prepurge, other than fuel actuators.
- 3) Ignition Position – sets the ignition position for actuators, can be different than low fire.
- 4) Postpurge Position – sets the postpurge position for all actuators, including fuel actuators.

Angular positions of all activated actuators and % for VSD are adjustable for each special position, except for the fuel actuator at the pre-purge position. The angular position of the fuel actuator remains unchanged from the home position during pre-purge. Please consult the parameter worksheet (section 4-2) for specific information about setting each one of these special positions. The service level password will be necessary to access these special positions.

After the special positions are set, the burner can be lit-off. Please see below for the recommended light off procedure.

The LMV5 can hold the burner in the pilot phase (Interval 1, phase 44) as well as a number of other phases with the “Program Stop” function. See parameter worksheet under *Params & Display > Ratio Control > ProgramStop*

IMPORTANT: Before lighting off a new burner for the first time it is recommended to shut the main gas (oil) manual shutoff valve. Next, set the program stop to Phase 44 so that the pilot can be adjusted and made to burn properly when the LMV5 stops its sequence in Phase 44. The air damper can also be adjusted when the LMV5 is stopped at ignition position in Phase 44.

After the pilot is tuned with the manual gas (oil) valve still shut, it is recommended to change the program stop to Phase 52. The LMV5 will open the automatic main gas (oil) valves and remove the pilot according to the start-up timings that were set. A flame failure should result. This procedure will verify that the main valves open when they should, and that the flame failure is recognized by the LMV5.

After the pilot is tuned and safety checks are done, the manual main gas (oil) valve can be opened and the program stop can be left at Phase 52. This program stop will hold the LMV5 at the ignition position and will enable the main fuel at the ignition position to be tuned the next time the LMV5 is started. Phase 52 program stop can also be used for boil-out if desired.

Note: Once the program stop is deactivated, the LMV5 is released to modulate if a Fuel-Air Ratio Curve is defined. Typically, a fuel air ratio curve is *not* defined by the burner / boiler OEM, and the LMV5 will sit at ignition position until the fuel air ratio curve is set up.

To remove the possibility that the LMV5 will modulate the burner on a fuel air ratio curve that was left in the LMV5, it is highly recommended that the LMV5 is put into manual load control. This is done by placing the LMV5 in “Burner ON” mode under: *Manual Operation > Auto / Manual / Off* and setting the load is set as low as possible under *Manual Operation > SetLoad*. This must be done before the program stop is deactivated in order to stop possible unwanted modulation.

Fuel-Air Ratio Curves (Combustion Curves)

On most new installations, the Fuel-Air ratio curves are not set by the burner OEM, and must be set at start-up. If this is the case, the LMV5 will automatically set Point 1 (low fire) to the ignition position that was previously set. Point 1 can be changed without changing the ignition position if a low fire different from ignition is desired.

The Fuel-Air ratio curves are programmed by defining points for each actuator / VSD across the firing range of the burner. These points (a maximum of 15 from low to high fire) are connected in a "connect the dots" fashion to construct the Fuel-Air ratio curves. The following paragraphs outline a method to define these points.

After selecting *curve params* on gas or *curve params > curve settings* on oil, select 'Point' by pressing Enter. The cursor will move below the word point. Select which point is to be adjusted by pressing the arrow keys. If no points exist, 'XXXX' will appear for the actuator positions.

Press Enter on the point to be adjusted. The AZL5 will prompt to change or delete the point. Press Enter to change the point. The AZL5 will then prompt for *followed* or *not-followed*. If *followed* is selected the actuators will move real-time when the point is adjusted so that the results of the adjustment can be seen on a combustion analyzer.

IMPORTANT: Using *not-followed* is possible but not recommended for most situations since the actuators are not moved in real time, so the results of changing the point cannot be seen real time on a combustion analyzer. When *followed* is selected, a carat ">" is shown when the actuator / VSD *is moving* to the displayed position. A colon ":" is shown when the indicated position is reached.

If the arrow key is pressed over to a point that is not defined yet (XXXX shown for the positions and load), pressing enter will put in values for the positions and load from the last point. The load / positions can then be adjusted for the new point by scrolling up or down with the arrows and pressing enter on the load / position to be adjusted. The cursor will move to the number, and the number can then be adjusted with the arrows, thus changing the position of an actuator / VSD.

Pressing Esc will bring the cursor back to the left, off of the numbers. Pressing escape again, while off the numbers, will bring up a prompt to ask if the point is to be stored (press enter) or the changes canceled (press escape). If store is selected, the LMV5 will take a few seconds to store the point. A bar will rotate on the left hand side of the AZL5 display while the point is being stored.

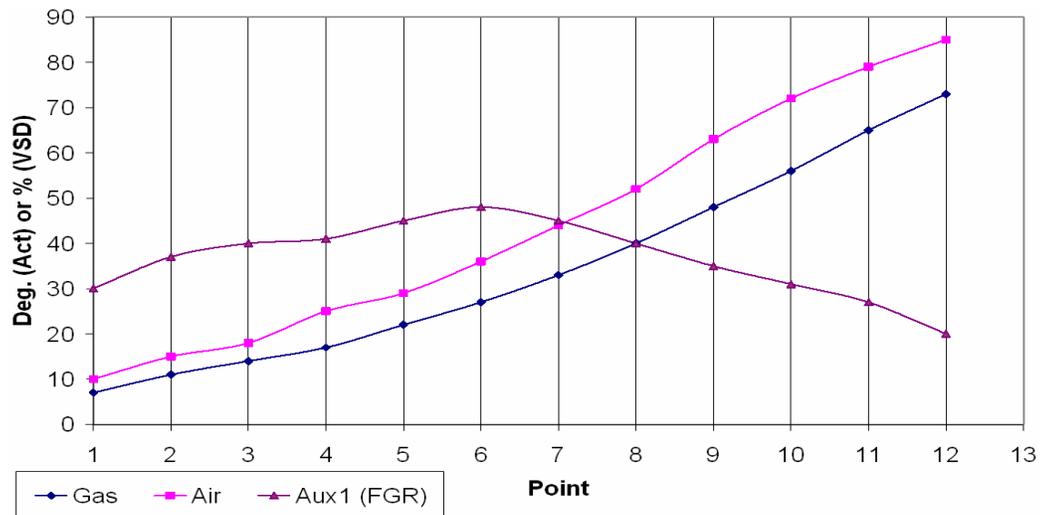
IMPORTANT: While the combustion curves are being set, the technician is solely responsible for maintaining safe combustion conditions for the burner since he / she is in direct control of the individual actuators. If an AZL5 arrow key is held down when adjusting an actuator position, the position will be changed at a progressively faster rate.

Fuel-Air Ratio Curves (Combustion Curves) continued..

The 'Load' is the label used to designate the fuel input (firing rate) of the burner at any point. The 'Load' number should be set based upon a fuel meter. If a fuel meter is unavailable, burner head pressures could be used to approximate fuel flow into the burner. A 10 to 1 turndown burner should have Point 1 set to 10% load, and Point (up to 15) set to 100% load. A spreadsheet is available to automatically calculate the numbers seen below for any given burner.

Figure 4-1.11 Example of Typical Combustion Curves

16 MM Btu/hr Gas Burner, 10 to 1 Turndown, FGR, Gas 1000 BTU /SCFH					
Point	Gas SCFH	Load %	Gas Deg	Air Deg	Aux 1 Deg
1	1600	10	7	10	30
2	2909	18	11	15	37
3	4218	26	14	18	40
4	5527	35	17	25	41
5	6836	43	22	29	45
6	8145	51	27	36	48
7	9455	59	33	44	45
8	10764	67	40	52	40
9	12073	75	48	63	35
10	13382	84	56	72	31
11	14691	92	65	79	27
12	16000	100	73	85	20



After a curve is set up, points can be added and subtracted to any location in the curve. The load that is selected for the additional point determines where it will be inserted. When the point is inserted, it will 'bump' the other point numbers over 1 number. For example if Point 5 is defined as 43% load, and Point 6 is defined as 51% load, and an additional point is added at 48% load, Point 5 will remain 43% load and Point 6 will now be 48% load. Point 7 will be 51 % load.

If points are deleted from an existing curve, the reverse of what was previously explained happens. Although not recommended, a curve could consist of two points. One point at low fire and one point at high fire. The LMV5 would simply draw a line between the two points and that would be the combustion 'curve'.

Typically at least 10 points are defined from low to high fire, and each point is set at optimum combustion. If O2 trim is being used, at least 10 points must be set for proper O2 trim functionality.

Load Controller

The LMV51.140 and LMV52 are equipped with an internal load controller. The load controller's primary purpose is to read a temperature or pressure sensor, compare the pressure or temperature value (known as the Process Variable PV) to the current setpoint, and control the burner load accordingly. Many different types and ranges of sensors can be wired (Section 3-3) and scaled (Section 4-2) to cover most temperature and pressure applications. The load controller also has a Cold Start function so that it can hold the burner at low fire, or slowly step the firing rate until a temperature or pressure is reached that completely releases the burner to modulate.

The load controller can be operated in six different modes, mode 1 having two different variations. Figure 4-1.12 details the different modes of the load controller, and what action is taken when a dry contact is closed between X62.1 and X62.2.

Note: If desired, Terminal X5-03.01 can be deactivated, in effect deactivating the local on/off switch on the burner. This can be done under parameter *InputController*. See Section 4-2.

Figure 4-1.12 Operating modes of the LMV51.140... and LMV52... Load controller.

Mode	Label	Description	Typical Usage	Setpoint	Upon X62.1 - X62.2 Closure
1A	ExtLC X5-03	External Load Control, Floating / Bumping	When using a RWF 40 as the external load controller, or "toggle switch" low fire hold.	N/A	Change to Mode 2, Setpoint W1
1B	ExtLC X5-03	External Load Control, Staged Oil	Externally controlled 2 or 3 stage oil.	N/A	Change to Mode 2, Setpoint W1
2*	IntLC	Internal Load Control, Temp. or Press, sensor connected to LMV5...	Internal Load control with a Local setpoint. (Set through AZL)	W1 / W2	Remains in Mode 2, Change to W2 setpoint.
3	Int LC bus	Internal Load Control, Temp. or Press, sensor connected to LMV5...	Internal Load control with a remote setpoint via ModBUS.	W3	Change to Mode 2, Setpoint W1
4	Int LC X62	Internal Load Control, Temp. or Press, sensor connected to LMV5...	Internal Load control with a remote setpoint via analog input X62	Remote Setpoint	
5*	ExtLC X62	External Load Control, analog signal connected to X62	Remote Modulation control via analog signal	N/A	
6	ExtLC Bus	External Load Control via ModBUS	Remote Modulation control via ModBUS	N/A	

* Bumpless transfer (LMV5 will not cycle off) is possible, from Mode 5 to Mode 2, or from Mode 2 to Mode 5.

Cold Start (Thermal Shock Protection)

All LMV5 which are equipped with a load controller have a built in cold start function. See parameter worksheet under *Params & Display > Load Controller > Cold Start* for specific details. The cold start feature requires that the temperature or pressure of the boiler is measured by a sensor connected to the LMV5, and that load control is being operated in Mode 2, 3 or 4.

For a hot water boiler (temperature based modulation) the same temperature sensor that is used for modulation must be used for the cold start feature. For a steam boiler (pressure based modulation) the pressure sensor used for modulation can also be used for cold start or an additional temperature sensor can be added. Temperature sensors are generally recommended since pressure does not always represent temperature in a steam boiler, especially when a steam boiler is warming up. The paragraphs below will only mention temperature based cold start, but the same ideas also apply to pressure based cold start.

The cold start feature can be set-up to warm the boiler in **4** different ways:

1. Low - fire hold

The LMV5 will be held at low fire until the threshold off temperature is reached, and then the LMV5 will be released to modulate. This “hold” will re-engage when the temperature falls below the threshold on value. *ThresholdOn* and *ThresholdOff* must be set to the desired temperatures. *StageLoad* must be set to 0.

2. Temperature based stepping start

The LMV5 will be held at low fire until a certain temperature change is detected, and then a step up in burner output (load) will be taken. This will repeat until the threshold off temperature is reached. *ThresholdOn* and *ThresholdOFF* must be set and *StageLoad* must be set to a value greater than 0, since the step-up in load is determined by this parameter. *StageSetp_Mod* must also be set to determine how much temperature change triggers a step-up in load. *MaxTmeMod* should be set to a high number (30 min) so that it has no effect.

3. Time based stepping start

The LMV5 will be held at low fire until a certain time elapses, and then a step-up in load will be taken. This continues until the *ThresholdOFF* value is reached. As the other two methods, *ThresholdON*, *ThresholdOFF*, and *StageLoad* must be set. However, now *StageSetp_Mod* is set to a high number (80%) so that it has no effect and, *MaxTmeMod* is set to determine how much time should elapse before the next load step is triggered.

4. Temperature / Time based stepping start

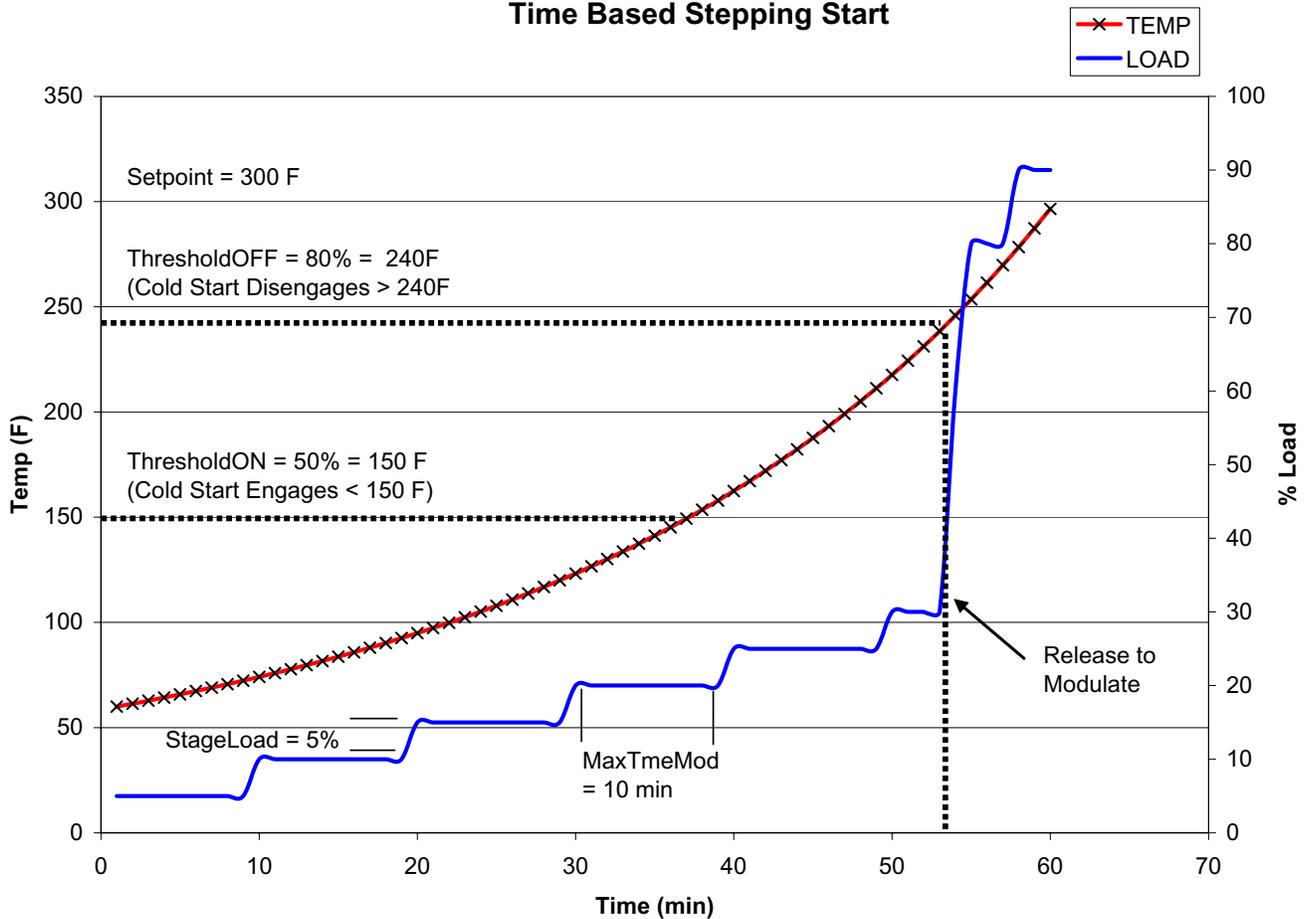
This is similar to method 2, however, now *MaxTmeMod* is set to have an effect (10 minutes for example). When this is done, the maximum time that a step-up in load will take is 10 minutes, regardless of the temperature change. If the temperature change defined by *StageSetp_Mod* happens before the 10 minutes elapses, then the temperature change will trigger the step-up in load.

When this mode is used, time usually triggers the load steps at the start of boiler warming and temperature change usually triggers the load steps closer to the *ThresholdOff* temperature. This is due to the more rapid rise in boiler temperature at higher firing rates.

Figure 4-1.13 Example of a Time Based Cold Start Set-up

Parameter	%	Value	Notes
<i>Boiler Setpoint</i> or <i>Setp Add Sensor</i>	n/a	300° F	Current setpoint
<i>ThresholdON</i> (% of current setpoint)	50	150° F	Measured temperature must go below <i>ThresholdON</i> to engage Cold Start.
<i>ThresholdOFF</i> (% of current setpoint)	80	240° F	Cold Start will not disengage until <i>ThesholdOFF</i> is met.
<i>StageSetp_Mod</i> (% of current setpoint)	10	20° F	Defines necessary temperature change required to trigger a load step. (not used in graph below)
<i>StageLoad</i>	5	n/a	Determines the size of the load step.
<i>MaxTmeMod</i>	n/a	10 min	Determines max time per load step.

Time Based Stepping Start



Special Features

In addition to the capabilities mentioned above, the LMV5 also has many special settings that are very useful in some situations. These special settings are detailed in the next section, section 4-2. This section details the special settings (parameters) that are used most frequently. These are:

<i>NumFuelActuators</i>	Permits the LMV5 to run dual fuel with a single actuator.
<i>MinTimeStartRel</i>	Permits the LMV5 to hold in phase 21 for a specified period of time. Since the blower is energized in phase 22. This can be used as a delay to let stack and/or fresh air dampers open.
<i>PressReacTime</i>	Allows the LMV5 to disregard the high and low gas / oil pressure switches for a settable time period after the main gas / oil valves open. This is used with automatic reset pressure switches so that pressure spikes due to the main valves opening will be ignored. This also allows for a reduced delta between switch setpoints and normal operating pressures. This time can also be reduced to 0.2 seconds, deactivating the feature.
<i>AfterburnTme</i>	Permits the LMV5 to ignore a flame signal for a settable period of time after the main fuel valves close. This setting is useful for oil nozzles that are purged with steam or air after the main fuel valves close.
<i>NormDirectStart</i>	Permits the LMV5 to go from post-purge directly into prepurge without turning the blower off. The blower air pressure switch is checked by using a 3-way solenoid valve.
<i>StartReleaseGas</i>	On a LMV52, configures terminal X7-03.02 as a start release for gas, CPI gas (closed position indication) CPI oil, or CPI gas + CPI oil.
<i>PS-VP/CPI</i>	On a LMV51/52, configures terminal X9-03.02. For a LMV51, options are PS-VP (Pressure Switch Valve Proving) or CPI gas. Options for a LMV52 are PS-VP, CPI gas, CPI oil, or CPI gas + CPI oil.
<i>ValveProvingType</i>	Enables gas valve proving on start-up or shutdown or both. This type of testing ensures that the gas valves are closed, and that the valve's seats are in good condition.
<i>ProgramStop</i>	Stops the LMV5 at a particular phase in the start-up or shutdown sequence. This is particularly useful when set to phase 44 for tuning the pilot.
<i>FGR-Mode</i>	On an LMV52, enables only the Aux 3 actuator to be held from modulating until a certain temperature or time after light off is met. This is usually used to delay the use of FGR until a time or until a stack temperature is met.

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Section 4-2

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Note: The Parameters shown in bold type must be set in an unprogrammed LMV51. See section 4-1, table 4-1.1.

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Operation> Hours Run	GasFiring				Hours run on gas. Reset / adjust: <i>Params & Display > HoursRun > GasFiring</i>			
	OilStage1/Mod				Hours run on OilStage1/Mod. Reset / adjust: <i>Params & Display > HoursRun > OilStage1/Mod</i>			
	OilStage2				Hours run on OilStage2. Reset / adjust at: <i>Params & Display > HoursRun > OilStage2</i>			
	OilStage3				Hours run on OilStage3. Reset / adjust at: <i>Params & Display > HoursRun > OilStage3</i>			
	TotalHoursReset				Hours run, all fuels. Reset / adjust: <i>Params&Display > HoursRun > Reset > Total Hours Reset</i>			
Operation> Start Counter	TotalHours				Displays the number of hours run on all fuels. Cannot be reset or adjusted.			
	SystemOnPower				Hours the system has been powered. Cannot be reset or adjusted.			
	GasStartCount				Number of startups on gas. Reset / adjust: <i>Params & Display > StartCounter > GasStartCount</i>			
	OilStartCount				Number of startups on oil. Reset / adjust: <i>Params & Display > StartCounter > OilStartCount</i>			
	TotalStartCountR				Displays the number of Startups on all fuels. Reset / adjust at: <i>Params & Display > StartCounter > TotalHourR</i>			
Operation> Fuel Meter	TotalStartCount				Displays the number of Startups on all fuels. Cannot be reset.			
	Curr Flow Rate				Displays the current flow rate of fuel, Gas or Oil.			
	Volume Gas				Displays the total Volume of Gas that has entered the burner as calculated by the VSD module. Reset / adjust: <i>Params & Display > StartCounter > Volume Gas</i>			
	Volume Oil				Total Volume of Oil that has entered the burner as calculated by the VSD module. Reset / adjust: <i>Params & Display > StartCounter > Volume Oil</i>	All		
	Volume Gas R Volume Oil R				Displays the Volume of Gas or Oil that has entered the burner since the last reset. Pressing ENTER will cause these values to be reset.			
Operation	Reset DateGas				Displays the Date when the Volume of Gas was last Reset. Cannot be changed.			
	Reset DateOil				Displays the Date when the Volume of Oil was last Reset. Cannot be changed.			
	LockoutCounter				Displays the total number of Lockouts that have occurred.			
	Current O2 Value				Current O2 Sensor Reading (Wet basis)			
	O2 Setpoint				O2 target value for the current load can be viewed here.			
Operation> O2 Module	SupplyAirTemp				Combustion air temperature if equipped with the proper sensors. PLL Module necessary.			
	FlueGasTemp				Flue gas temperature if equipped with the proper sensors. PLL Module necessary.			
	CombEfficiency				A calculated value of the Combustion Efficiency based on the wet O2 value. Supply air temperature a O2 sensor and a flue gas temperature sensor are required for this feature.			
Operation	BurnerID				Burner Identification. (Mandatory) Adjust at: <i>Updating > BurnerID</i> (requires OEM password)			
	InterfacePC				This places the AZL into the Interface mode making it able to communicate with a PC.			
Operation> OptgMode Select	GatewayBASon				This enables or disables Com 2, the RJ45 jack on the back of the AZL, for ModBus or eBUS communication.			
	GatewayBASoff				This port uses RS-232 communications.			
	Type of Gateway				This parameter configures the protocol of Com 2. Options are ModBus or eBUS			

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase
Operation	O2Ctrl activate	U		Activates the O2 Ctrl (Control). LMV52 & PLL52 (O2 trim module) required. If control automatically deactivates, reactivate here. Def = deactivated Typ = activated.	60-62
	SetLoad			During manual operation, firing rate can be set between the min and max allowed by: <i>Params & Display > RatioControl > Gas/Oil/Settings > LoadLimits > Min/MaxLoadGas/Oil</i>	
Manual Operation	Autom/Manual/Off			<p>1) Automatic - Enable the burner allowing it to respond to setpoints. 2) Burner off - Manually turn the burner off, setpoints are ignored. 3) Burner on - Manually turn the burner on all setpoints are ignored. For normal operation this should be placed in automatic. If terminal X5-03.01 is enabled (ON /OFF switch), this will override the (Burner on) setting. Version B and later.</p> <p>When the LMV gets a call for heat, (phase 12), this defines the minimum time the LMV will hold (in phase 21) Start releases could be made, but the LMV will still hold for this period of time. Typical start release devices: outside air damper, low gas press, stack damper limit switch, ect... Start releases with their associated line voltage INPUT terminals are:</p> <p>LMV5x terminal X6-01.1 can be used for start release oil (atomizing media press. switch) LMV52 terminal X7-03.2 can be used for start release gas as well as other functions. LMV51 terminal X7-03.2 has no function. LMV52 terminal X9-03.4 is used for the low gas pressure switch only. LMV51 terminal X9-03.4 can be used for the low gas pressure switch and also Start Release Gas - switches must be wired in series. Range = 0.2 - 63 sec, Def / Typ = 1 sec Also see: <i>Params & Display > Burner Control > Times > Times General MaxTmeStartRel</i></p>	21
Params & Display> BurnerControl> Times> Times Startup1	FanRunupTme	S		Time allowed to let the fan get up to speed before the actuators start driving to prepurge. Only used for <i>non-continuous</i> fan applications. Time depends on inertia of fan wheel. Range = 0.2 to 63 sec, Def /Typ = 2 sec. See <i>Params & Display > Burner Control > Times > Config Genera > Continuous Purge</i>	22
	PrepurgTmeGas or PrepurgTmeOil			Time begins when the air actuator has reached it's specified purge position. Setting cannot be set less than MinT_PrepurgeGas (Oil) below. Set for 5-10 air exchanges of combustion chamber volume. Range = longer than MinT_PrepurgeGas (Oil) to 63 min. Def = 20 sec Gas, 15 sec oil. Typ = 60 sec.	30
MinT_PrepurgeGas or MinT_PrepurgeOil			Sets a minimum allowable time for PrepurgTmeGas (Oil) above. This parameter should be set by the OEM for 5-10 air exchanges of combustion chamber volume. Range = 0.2 to 63min Def = 20 sec Typ = By OEM		
	PrepurgSafeGas or PrepurgSafeOil	O		After a safety related shutdown of the LMV, instead of the normal <i>PrepurgTmeGas (Oil)</i> , this prepurge time is used for the next LMV start-up. Range = longer than MinT_PrepurgeGas (Oil) to 63min Def = 20 sec Typ = By OEM	

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> BurnerControl> Times> Times Startup 1	PrepurgePt1Gas or PrepurgePt1Oil			If a Aux3 actuator is used, this defines the purge time that the air actuator or VSD is at purge position and the Aux3 actuator is at home (closed) position. If a Aux3 actuator is not used, this setting has no effect. Range = 0.2 to 630 sec Def = 0.2 sec Typ = 0.2 sec	30		
	PrepurgePt3Gas or PrepurgePt3Oil			If a Aux3 actuator is used, this defines the purge time that the air actuator or VSD is at purge position and the Aux3 actuator is at purge (open) position. If a Aux3 actuator is not used, this setting has no effect. Range = 0.2 to 630 sec Def / Typ = 0.2 sec	34		
	PreIgnitionTGas or PreIgnitionTOil	S		This defines the time the ignition transformer (OUTPUT X4-02.03) is energized before the pilot valve (OUTPUT X9-01.02) or main valves (for direct spark fuel trains) become energized. Range = 0.2 to 63sec Def / Typ = 2sec	38		
	MinOnTmeOilPump			When LO w Gasp (Light Oil with Gas pilot) is selected, this is the minimum time the oil pump can run (OUTPUT terminal X6-02.3) before the LMV attempts to light the pilot, (OUTPUT terminal X9-01.2). Time starts when air actuator reaches the pre-ignition position, phase 22, and will hold in phase 36 until this parameter times out (if the time setting is sufficiently long). Range = 0 to 63 sec Def / Typ = 1 sec	22 - 36		
	SafetyTme1Gas or SafetyTme1Oil (TSA1)	O		When a fuel train is selected that has a pilot, this setting defines the overlap of the spark (OUTPUT X4-02.3) and the pilot valve (OUTPUT X9-01.02). After this time expires, spark is de-energized but the PV remains open if a flame is present. If a flame is not sensed, a lockout occurs. Can be thought of as the first half of PTFI. (Pilot Trial For Ignition) Shorter times are more safe. Range = 0.2 to 10 sec, 15 sec for oil Def = 3 sec Typ = 5 sec	40 - 42		
Params & Display> BurnerControl> Times> TimesStartup2	Interval1Gas or Interval1Oil	S		When a fuel train is selected that has a pilot, this setting defines the pilot stabilization period. This time begins after SafetyTme1Gas (Oil) expires. During this period, only the pilot valve is open. The spark is de-energized. Can be thought of as the second half of PTFI. Range = 0.2 to 63 sec. Def = 2 sec. Typ = 5 sec.	44		
	SafetyTme2Gas or SafetyTme2Oil (TSA2)	O		When GP2 gas train is selected, this setting defines the overlap of the PV (pilot OUTPUT X9-01.02) and the main gas valves, V1 & V2, (OUTPUT X9.01.04 and X9.01.03 respectively) After this time expires the PV is de-energized, if continuous pilot is not selected. Can be thought of as the first half of MTFI. When LO w Gasp oil train is selected, this setting defines the overlap of the PV energized (pilot) and the main oil valves, V1 & V1, (OUTPUT terminals X8.02.01 and X8.03.01) After this time expires, the PV is de-energized, if continuous pilot is not selected. Most critical safety time other than prepurge. Shorter times are more safe. Range = 0.2 to 10 sec, 15 sec for oil Def = 3 sec Typ = 5 sec	50		

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> BurnerControl> Times> TimesStartup2	Interval2Gas or Interval2Oil	S			Defines the main flame stabilization period before modulation. This time begins after SafteyTme2Gas(Oil) expires. During this period, only the main fuel valves are open. The PV (Pilot valve) is de-energized, (unless continuous pilot is selected). Can be thought of as the second half of MTFI. (Main flame Trial For Ignition) Range = 0.2 to 630 sec. Def = 2 sec. Typ = 5 sec.	52		
	PressReacTme	O			Reflects the time that the LMV will "ignore" the high and low gas pressure switches after the main gas valves open. This is done so that normal pressure peaks and valleys caused by the valve opening do not cause erroneous alarms on a properly adjusted high or low gas pressure switches. Does not work with manual reset switches. (switch stays tripped) Range = 0.2 to 10 sec. Def / Typ = 2 sec	50		
	MaxTmeLowFire				Outlines the allowable time to let the LMV modulate to low fire when there is no longer a call for heat. This is done so that the main gas valves will not close at mid to high fire, and create pressure spikes upstream in the gas piping. Does not effect fuel valve closing in the event of a safety related shutdown. Usually set for full modulation time of burner, (parameter OperatrampMod) Note: A setting of 0.2 seconds deactivates the feature. Range = 0.2 to 630 sec. Def / Typ = 35 sec	62		
	AfterburnTme	S			Defines the permissible time for a flame to be detected after the main fuel valves are closed without causing a startblock or alarm. This is especially useful for air postpurged oil nozzles. Range = 0.2 to 63 sec Def / Typ = 8 sec	70		
Params & Display> BurnerControl> Times> Times Shutdown	PostpurgeT1Gas or PostpurgeT1Oil				Defines the mandatory postpurge period. Even if the direct start option is selected and a call for heat exists, the LMV will only go into prepurge after this period times out. Range = 0.2 to 63 min Def = 0.2 sec Typ = 15 sec	74		
	PostpurgeT3Gas or PostpurgeT3Oil				Defines an optional postpurge period. If the direct start option is selected and a call for heat exists, the LMV will go directly into prepurge after PostpurgeT1Gas (Oil). Range = 0.2 to 63 min. Def = 5 sec. Typ = 0.2 sec.	78		
	MinTmeHomeRun				Defines the minimum amount of time that the actuators must remain at rest, in their specified home positions. (Phase 10) Range = 0.2 to 63 sec Def / Typ = 1 sec.	10		
	DelayLackGas	O			If there is a lack of gas pressure (low gas pressure switch open) then the LMV will wait this period of time before attempting to relight, provided that the repetition Counter (RepetitCounter) for gas is set for more than one (not done in the US). This time period will double after the first relight attempt. This doubling would occur if the RepetitCounter were set to 3 or greater. Range = MinTmeHomeRun to 63sec Def / Typ = 10 sec	21		

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> BurnerControl> Times> TimesGeneral	AlarmDelay				If a condition exists that does not open the safety loop but does prevent the LMV from starting when there is a call for heat, this specifies the period of time that can elapse with this condition before the alarm is energized. If AlarmStartPrev (alarm in the case of start prevention) is disabled, setting this time has no effect. Range = 0.4 to 630 sec. Def / Typ = 1 sec.	12 -20		
	DelayStartPrev	S			Delay Start Prevention: Period of time before a start prevention is displayed on the AZL. When there is a call for heat, and a start prevention occurs that does not open the safety loop but does prevent the LMV from starting, this specifies the period of time that can elapse before the condition is displayed on the AZL. Range = 0.4 to 630 sec. Def = 35 sec. Typ = 1 sec.	12 -20		
	PostpurgeLockout	S			If a lockout condition occurs, and the combustion air fan was running (OUTPUT terminal X3-01.01) it will continue running in the lockout phase (Phase 00) for this period of time. This time replaces the postpurge time in the event of a lockout. If the combustion air fan was not running the fan will remain off for the rest of the lockout phase. Range = 0.2 to 63min Def / Typ = 2 min	00		
	MaxTmeStartRel	O			When the LMV gets a call for heat, this is the maximum time the LMV will hold (in phase 21) waiting for a start release to make. If this time expires and the start release is not made, the LMV will go into alarm. Range = 0.2 to 63 sec, Def = 120 sec, Typ = 30 sec. See: <i>Params & Display > Burner Control > Times > MinTimeStartRel</i>	21		
	AlarmStartPrev	S			Alarm Start Prevention - Determines if the alarm (Terminal X3-01.02) will be energized in the event of a start prevention. DelayStartPrev defines how long the LMV will wait before alarming. Def = deactivated, Typ = activated.	20-22		
	ShutdwnStbyOnErr	O			If this is set to activated, an alarm will occur if the safety loop is opened in Phase 12 (Standby) if deactivated, the safety loop can be open when the LMV is in Phase 12. Def / Typ = deactivated	12		
Params & Display> BurnerControl> Configuration> ConfigGeneral	NormDirectStart	S			Determines if the LMV can eliminate the optional postpurge (T3) time, and go directly into prepurge if there is a call for heat during postpurge. If set to DirectStart, a 3-way valve (on OUTPUT X4-03.03) must be used to check the fan air switch. Def / Typ = NormalStart	78		
	OilPumpCoupling	S			Combined with IgnOilPumpStart determines the behavior of the oil pump motor starter (OUTPUT X6-02.03) during oil firing. Magnetocoupl - the output will energize, in either phase 22 or 38, depending on the setting of IgnOilPumpStart. De-energizes as soon as V1 & V1 are closed (in a cycle off situation). Directcoupl - the output will energize at the same time as the fan, and de-energizes 15 seconds after the fan is deenergized. Def / Typ = Magnetocoupl	22-38, 62		
	IgnOilPumpStart	O			When Magnetocoupl is selected, this setting determines when terminal X6-02.03 is energized. Def = on in Ph22, Typ = on in Ph38, Note: If a direct spark oil train is selected, spark will occur during prepurge if set to Ph22.	22-38		

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> BurnerControl> Configuration> ConfigGeneral	ForcedIntermit	S			When activated, this setting forces the LMV to shut the burner down, every 23 Hours 50 minutes. The burner will automatically restart. The purpose of this is to check and cycle safety devices. Also, if a QRB flame scanner is used, this setting must be activated. Def = activated, Typ = deactivated	60-62		
	Skip Prepurge Gas				If activated, prepurge for gas will be skipped. Def / Typ = deactivated			
Params & Display> BurnerControl> Configuration> ConfigGeneral	Skip Prepurge Oil	O			If activated, prepurge for oil will be skipped. Def / Typ = deactivated	30		
	ContinuousPurge	S			When activated, purges continuously (runs the fan) in all phases. Typically used to prevent return heat from coming back into the burner, in multiple burner applications. A 3-way valve OUTPUT terminal X4-03.3 must be used to check the fan air switch function. Def / Typ = deactivated	00-21		
Params & Display> BurnerControl> Configuration> ConfigGeneral> FuelTrainReset	FuelTrainGas or FuelTrainOil				Selects the fuel train (s) Default is "invalid", which means not assigned or configured. For North America: Gas Trains are usually set to GP2, which is gas with gas pilot ignition. Oil Trains are usually set to LO w Gasp. (Light Oil with Gas pilot ignition). See Section 4-1 for schematics.	38-50		
	FuelTrainGas or FuelTrainOil				Resets the fuel train to a value of "invalid" (means not configured). This allows removal a fuel train previously configured, if it is not longer used, or to allow a different fuel train to be selected.	All		
Params & Display> BurnerControl> Configuration> ConfigGeneral	ContPilotGas or ContPilotOil	O			Activates or deactivates a continuous pilot. Each fuel can be configured separately. Def / Typ = deactivated	60-62		
	MainsFrequency				Set to the local power frequency. Def / Typ = 60 Hz (North America)	All		
Params & Display> BurnerControl> Configuration> ConfigIn/Output	StartReleaseGas				INPUT X7-03.02 has multiple functions, depending upon how this parameter is set. It could be used as a start release for gas that is expected to be made in Phase 21-62. This input can also be programmed as CPI (proof of closure) for gas, oil, gas plus oil, or the input can be deactivated. Usually configured for CPI (proof of closure) on oil valves. Def = StartRelGas, Typ = CPI Oil NOTE : This terminal has no function on a LMV51.	21-62		
	StartReleaseOil				When firing oil, this INPUT X6-01.01 is used to release the LMV5x to start. It is required to be energized in Phase 21, and if it de-energizes at any time after, it will cause a lockout. This is usually wired to a atomizing media pressure switch. A temperature switch may also be placed here for heavy oil. Can be deactivated. Def / Typ = Activated	20-21		

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> BurnerControl> Configuration> ConfigIn/Output	AirPressureTest				Enables or disables INPUT X3-02.01, the air pressure switch (fan air switch), during any phase that the fan is running. Enable for forced or induced draft burners. Def / Typ = Activated	22-78		
	PS-VP/CPI				INPUT X9-03.02 has multiple functions, depending upon how this parameter is set. An LMV51 options are CPI (proof of closure for gas), or PS-VP, (Pressure Switch for gas Valve Proving). Default : PS-VP Oil proof of closure switches are not intended to be wired to this terminal on a LMV51. An LMV52 options are PS-VP, CPI oil, CPI gas, or CPI gas and oil. Typically configured for CPI gas (proof of closure on gas valves). Def = PS-VP Set at: <i>Params & Display > BurnerControl > ValveProving > Config_PM-VPI CPI</i>	52-70 80-83		
	FGR-PS/FCC				Enables or disables INPUT X4-01.03, checking the status of fan motor starter, or a flue gas recirculation pressure switch. (checked on both gas and oil firing) Phase affected is any phase when the fan is running. Usually set to monitor auxiliary fan motor starter contacts (FCC) Def = FCC	22 - 24		
	InputController		O		This can be used with the internal load controller as a overall enable / disable, even if the internal load controller is calling for heat. In other words, the ON /OFF switch. Activated , the LMV requires power on INPUT terminal X5-03.01 to begin its operating sequence. A traditional "string" of switches, including the on /off switch could be wired in between line voltage to X5.03.01, and the LMV would begin when these switches are made. Activate if the burner has a hard wired on / off switch. Deactivated , the LMV does not need require power on INPUT terminal X5-03.01 to begin its sequence. This may be done if the burner is controlled via ModBus. Def / Typ = Activated	12 - 20		
	GasPressureMin				Determines the function of INPUT terminal X9-03.04. In Activated mode, a signal is expected on this terminal when firing gas, or when using any oil train that requires a pilot. Thus, when in Activated mode, with a piloted oil train, this terminal can be used for a general start release, like a fresh air damper. Deact x OGP mode, a signal is expected only when firing gas, so a start release specific to gas can be wired in series with the low gas pressure switch. Can also be deactivated. Def = Activated Deact x OGP is only offered on the LMV52.	12-20		
	GasPressureMax				Activates or deactivates (INPUT X9-03.03) for a high gas pressure switch. Most gas fired installations require high a gas pressure switch. Def = Activated			

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> BurnerControl> Configuration> ConfigIn/Output	OilPressureMin			Activates or deactivates (INPUT X5-01.02) for a low oil pressure switch. If this is set to (act from ts) the LMV will look for this switch to be made in phase 40. When set to (activated), the LMV will look for the switch to be made in phase 38. Def = Activated	38 - 62		
	OilPressureMax	O		Activates or deactivates INPUT X5-02.02 as an input for the high oil pressure switch. Def = Activated, Typ = Deactivated	22-62		
	HeavyOilDirStart			This activates or deactivates INPUT X6-01.03 for a Heavy Oil Stage release contact. If this terminal has power, it releases the LMV for stage 2 heavy oil. Not intended for running interlocks, such as oil temperature. Def = activated, however this setting has no effect unless HOGp (Heavy Oil with a gas pilot) fuel train is configured.	38		
Params & Display> BurnerControl> Configuration> Config FlameDet	Start/PS-Valve	S		Setting controls the behavior of OUTPUT terminal X4-03.03. StartSignal mode, this output energizes in phase 21 with the fan, as would be suited to open an outside air damper or stack damper. Note: If ContinuousPurge is activated, this terminal will be energized as long as the fan is running. PS Relief mode, this output energizes a 3-way valve, used to check the fan air press switch. The valve is energized (venting the air press switch to atmosphere) during Phase 79. PS Relief_inv mode, this output energizes a 3-way valve, used to check the fan air press switch. This is energized (exposing the air press switch to fan pressure) in every phase except Phase 79. The fan air switch is still vented to atmosphere in Phase 79. Def / Typ = StartSignal	22 - 30 or 30 - 78		
	ReacExtranLight			Setting determines what action the LMV should take in the event of an unexpected flame signal. The LMV does not expect to "see" a flame when the pilot valve, and the main fuel valves are closed. The LMV will also ignore a flame signal for the afterburn time. If a flame is seen other than at these times, provided that the extraneous light test is activated then either a startblock or a lockout will occur, depending upon this setting. Def / Typ= Startblock	70		
	ExtranLightTest	O		Activates or deactivates the extraneous light check during the start sequence and during standby. NOTE : This setting is intended to be used with applications such as waste incinerators. DO NOT deactivate for boiler burners. Def = Activated	All		

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> BurnerControl> Configuration> Config FlameDet> FlameSignal	Standardize			<p>Sets a datum for a "normal" flame, so that a "normal" flame can be displayed as 100% flame signal on the OperationalStat screen. If a 82.3% flame is present and the flame standardization is performed, what was displayed as 82.3% is now displayed as 100%</p> <p>It does not actually affect when, the LMV will lockout due to a poor flame signal.</p> <p>This re-datum operation should be performed when a stable, normal flame exists at the burner.</p> <p>40-70</p>			
	StandardFactor		O	<p>Normally this value does not need to be adjusted.</p> <p>Can be viewed to see what raw flame signal will result in 100% flame, being displayed on the 'OperationalStat' screen. If the flame signal is not standardized, XXXX % will be displayed indicating that the raw signal is the displayed signal.</p> <p>The LMV will lock out on low flame signal at about 16% raw flame signal. Standardization does not affect the lockout point.</p>			
	FlameSig QR_LB			<p>This can be viewed to see what raw flame signal (in %) is being sent to the LMV by the flame scanner. This parameter only exists on the LMV52.</p> <p>The LMV will alarm when this value is less than about 16%.</p> <p>This signal refers to INPUT terminals X10-01.01 or (X10-02.02)</p> <p>Not adjustable.</p>			
	FlameSigION		U	<p>This can be viewed to see what raw flame signal (in %) is being sent to the LMV by the ionization probe (flame rod) or UV sensor on terminal X10-03.01. This parameter only exists on the LMV52.</p> <p>The LMV will alarm when this value is less than about 16%.</p> <p>Not adjustable.</p>	All		

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> BurnerControl> Configuration> Config FlameDet	SensExtranlGas				<p>For the LMV52, this defines how the combustion chamber will be supervised during the period when the fuel valves are closed (gas firing). Def / Typ = 1 sensor.</p> <p>The choices for supervision during this phase are as follows:</p> <p>1) 1 sensor Either a flame rod (ION) or scanner can be connected and used. Both cannot be connected.</p> <p>2) QRI_B / ION Both sensors can be connected.</p> <p>3) QRI_B & / ION A flame signal on either will cause a signal to be registered. Both sensors can be connected. Flame must be detected by QRI_B and not ION.</p> <p>4) QRI_B Both sensors can be connected. Only QRI_B is used.</p> <p>5) ION &/ QRI_B Both sensors can be connected. Flame must be detected by ION and not QRI_B.</p> <p>6) ION Both sensors can be connected. Only ION is used.</p>	10-38, 72-83		
	SensPilotPhGas			O	For the LMV52, this defines how the pilot for gas firing is supervised. Options 1 thru 6 as described in parameter SensExtranlGas also apply to this parameter. Additionally, there is one additional option added for this parameter. This option is 7) QRI_B and ION Both sensors can be connected. Both sensors must detect a flame at the same time or a flame failure will occur. Def = 1 Sensor	40-44		
	SensOperPhGas				For the LMV52, this defines how the main flame for gas firing is supervised. Options 1 thru 7 as described in parameter SensExtranlGas and SensPilotPhGas also apply to this parameter. Def = 1 Sensor	60-62		
	SensExtranlOil				For the LMV52, this defines how the combustion chamber will be supervised during the period when the fuel valves are closed. (oil firing) Options 1 thru 6 as described in parameter SensExtranlGas apply to this parameter. Def = 1 Sensor	10-38, 72-79		
	SensPilotPhOil				For the LMV52, this defines how the pilot for oil firing is supervised. Options 1 thru 6 as described in parameter SensExtranlGas also apply to this parameter. Additionally, there is one additional option added for this parameter. This option is 7) QRI_B and ION Both sensors can be connected. Both sensors must detect a flame at the same time or a flame failure will occur. Def = 1 Sensor	40-44		
	SensOperPhOil				For the LMV52, this defines how the main flame for oil firing is supervised. Options 1 thru 7 as described in parameter SensExtranlGas and SensPilotPhGas also apply to this parameter. Def = 1 Sensor	60-62		

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	LMV51	LMV52	
Params & Display> BurnerControl>	LossOfFlame	O			Sets the number of recycles in the event of a flame failure. Range = 1 or 2. Def / Typ = 1	60-62			
	HeavyOil	S			Sets how many times the LMV will attempt to proceed past Phase 21 if a start release for heavy oil is not met. After this number if tries, a lockout will occur. Range = 1 to 16 Def / Typ = 1	< 21			
	StartRelease				Sets how many times the LMV will attempt to proceed past Phase 21 if a general start release is not met, such as a fresh air damper or low gas pressure on INPUT terminal X9-03.04. After this number if tries, a lockout will occur. Range = 1 to 16 Def / Typ = 1	< 21			
	SafetyLoop				This parameter should always be set to 1. Def = 1	All			
Params & Display> BurnerControl> ValveProving	ValveProvingType	O			This determines if gas valve proving (leak testing) will be performed. Gas valve proving can be performed on start-up, shutdown, or both. If "No VP" is selected, valve proving will not be performed. Range = VP shutdown, VP Startup, No VP, VP Stup/shd, Def / Typ = No VP	80-83, 10-52			
	Config_PM-VP/CPI				INPUT X9-03.02 has multiple functions, depending upon how this parameter is set. On a LMV51 it can be set for either CPI (proof of closure) for gas or PS-VP, which is a pressure switch for gas valve proving. Oil proof of closure switches are not intended to be wired to this terminal on a LMV51. On a LMV52, options are PS-VP, CPI oil, CPI gas, or CPI gas and oil. Usually configured for CPI (proof of closure) on gas valves. Access to this same parameter is also available under : <i>Params & Display> BurnerControl> Configuration> ConfigIn/Output> PS-VP/CPI.</i>				
	VP_EvacTme				If valve proving is activated, this specifies the time that the downstream valve (V2) is energized, OUTPUT X9 01.03. This will evacuate any gas that might exist between the gas valves. Note: If gas valve proving is used, opening times of the gas valves must be less than the maximum value for this parameter. Range = 0.2 to 10 sec Def / Typ = 3 sec		80		
	VP_TmeAtmPress				If valve proving is enabled, this is the time that both the upstream and downstream valves are closed. If the pressure rises between the valves during this period (enough to open the N.C. pressure switch), then the upstream valve is leaking and the LMV will lockout. A longer time period will produce a more sensitive test. Range = 10 to 63 sec, Def / Typ = 10 sec		81		
Params & Display> BurnerControl> ValveProving	VP_FillTme	O			If valve proving is activated, this specifies the time that the upstream valve (V1) is energized (OUTPUT X9.01.04). This will fill the volume between the main gas valves to line pressure. Note: If gas valve proving is to be used, opening times of the gas valves must be less than the maximum value for this parameter. Range = 0.2 to 10 sec, Def / Typ = 3 sec	82			
	VP_Tme_GasPress				If valve proving is enabled, this is the time that both the upstream and downstream valves are closed. If the pressure falls between the valves during this period (enough to close the N.C. pressure switch), then the downstream valve is leaking and the LMV will lockout. A longer time period will produce a more sensitive test. Range = 10 to 63 sec, Def / Typ = 10 sec	83			

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase
Params & Display> Burner Control> Product ID	ASN	U			Product version identification.	All
	ProductionDate				Date LVM unit was produced.	
	SerialNumber				Serial number of unit.	
	ParamSet Code				Parameter set code.	
	ParamSet_Vers				Version (revision) of the tagged parameter set.	
Params & Display> Burner Control	SW Version				LVM software version.	
Params & Display> RatioControl> Gas/Oil Settings> Special Positions> HomePos	HomePosGas or HomePosOil	S			Sets the home position of the fuel actuator(s). The fuel actuator(s) will also stay in this position during prepurge. Each fuel can have its own setting. Range = 0° - 90°, Def = 0°. Typ = 2° from valve / damper mechanical stop.	10-12
	HomePosAir				Sets the home position of the air actuator. Each fuel can have its own setting. Range = 0° - 90°, Def = 0° Typ = 2° from valve / damper mechanical stop.	
	HomePosAux1				Sets the home position of the aux1 actuator. Each fuel can have its own setting. Range = 0° - 90°, Def = 0° Typ = 2° from valve / damper mechanical stop.	
	HomePosAux2				Sets the home position of the aux2 actuator. Each fuel can have its own setting. Range = 0° - 90°, Def = 0° Typ = 2° from valve / damper mechanical stop.	
	HomePosAux3				Sets the home position of the aux3 actuator. Each fuel can have its own setting. Range = 0° - 90°, Def = 0° Typ = 2° from valve / damper mechanical stop.	
	HomePosVSD				Sets the home position of the VSD. Each fuel can have its own setting. Range = 0 to 100 %, Def = 0 Typ = 0	
	PrepurgPosAir				Sets the prepurge position of the air actuator. Range = 0° - 90° Def = 90° Typ = 60° to 85°.	
Params & Display> RatioControl> Gas/Oil Settings> Special Positions> PrepurgPos	PrepurgPosAux1	S			Sets the prepurge position of the aux1 actuator. Range = 0° - 90° Def = 90° Typ = at least 2° from valve / damper mechanical stops.	24
	PrepurgPosAux2				Sets the prepurge position of the aux2 actuator. Range = 0° - 90° Def = 90° Typ = at least 2° from valve / damper mechanical stops.	
	PrepurgPosAux3				Sets the prepurge position of the aux3 actuator. Range = 0° - 90° Def = 90° Typ = at least 2° from valve / damper mechanical stops.	
	PrepurgPosVSD				Sets the prepurge position of the VSD. Range = 10 to 100% Def = 100% Typ = At least 60%.	

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase
Params & Display> RatioControl> Gas/Oil Settings> Special Positions> IgnitionPos	IgnitionPosGas or IgnitionPosOil		Sets ignition position of the fuel actuator(s). If one fuel actuator is connected to both the gas and oil valve, it can still have independent ignition positions for gas and oil. Setting is independent low fire. Range = 0° - 90° Def = XXXX (not set) Typ = 3°.			
	IgnitionPosAir		Sets ignition position of the air actuator. Setting is independent of the low fire position. Range = 0° - 90° Def = XXXX (not set) Typ = 5°.			
	IgnitionPosAux1		Sets ignition position of the aux1 actuator. Setting is independent of the low fire position. Range = 0° - 90° Def = XXXX (not set) Typ = 5°.			
	IgnitionPosAux2		Sets ignition position of the aux2 actuator. Setting is independent of the low fire position. Range = 0° - 90° Def = XXXX (not set) Typ = 5°.			38
	IgnitionPosAux3		Sets ignition position of the aux3 actuator. Setting is independent of the low fire position. Range = 0° - 90° Def = XXXX (not set) Typ = 5°.			
	IgnitionPosVSD		Sets ignition position of the VSD. Setting is independent of the low fire position. Range = 0 to 100% Def = XXXX (not set) Typ = 50%			
	PostpurgePosGas or PostpurgePosOil		Sets the postpurge position of the fuel actuator(s). Range = 0° - 90° Def = 15 deg Typ = 5°.			
	PostpurgePosAir		Sets the postpurge position of the air actuator. Range = 0° - 90° Def = 15 deg Typ = 30°.			
	PostpurgePosAux1		Sets the postpurge position of the aux1 actuator. Range = 0° - 90° Def = 25 deg Typ = 25°.			74-78
	PostpurgePosAux2		Sets the postpurge position of the aux2 actuator. Range = 0° - 90° Def = 25 deg Typ = 25°.			
PostpurgePosAux3		Sets the postpurge position of the aux3 actuator. Range = 0° - 90° Def = 25 deg Typ = 25°.				
PostpurgePosVSD		Sets the postpurge position of the VSD. Range = 0 to 100% Def = 50% Typ = 50%				
Params & Display> RatioControl> Gas/Oil Settings> Special Positions	ProgramStop		For gas or oil firing, this parameter will stop the sequence in the selected phase. This is useful for service work, such as; adjusting pilots, measuring prepurge, etc. The LMV can be held (program stopped) in the following phases: 24 prepurge, 32 Prepurge FGR, 36 Ignition position, 44 Interval 1 (pilot stabilization), 52 Interval 2 (Main flame Stabilization), 72 Postpurge position, 76 Postpurge FGR Def = deactivated Typ = deactivated (for normal operation)			Varies

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase
Params & Display> Ratio Control> Gas/Oil Settings> ResetIgnitPos	IgnitionPosGas or IgnitionPosOil	S			Resets the ignition position of the actuator to an invalid value.	38
	IgnitionPosAir				Resets the ignition position of the air actuator to a invalid value.	
	IgnitionPosAux1				Resets the ignition position of the aux1 actuator to a invalid value.	
	IgnitionPosAux2				Resets the ignition position of the aux2 actuator to a invalid value.	
	IgnitionPosAux3				Resets the ignition position of the aux3 actuator to a invalid value.	
	IgnitionPosVSD				Resets the ignition position of the VSD to a invalid value.	
	CurveParams					
Params & Display> Ratio Control> <u>GasSettings></u> LoadLimits	MinLoad				Sets the low fire load. During normal operation the burner will not modulate below this point. Should be set to reflect low fire fuel input. On a 10:1 turndown burner, set at 10%. Range = 0 to 100% Def = 0% Typ = 10-40%	
	MaxLoad				Sets the high fire load. During normal operation the burner will not modulate above this point. Range = 0 to 100% Def = 0% Typ = 100%	

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> Ratio Control> <u>Oil Settings></u> Curve Params	CurveSettings	S		This is where actuator curves (fuel air ratio) are set from low to high fire. For an LMV52, five actuators and one VSD can be set at every point. Fifteen points can be set from low to high fire. Colons(:) indicate that the actuator is at the indicated position, and a (>) indicates the actuator is seeking a new position. If a O2 sensor is attached and activated, (LMV52) the O2 value will also be displayed on the screen. When a specific point is selected (Point 2 for example) the LMV5 will prompt if the point is to be changed or deleted. If change is selected, then the LMV5 will prompt the user to select followed or not followed. If followed is selected, the LMV5 will drive the actuators / VSD to the point, and then the point can be changed. If not followed is selected, the LMV5 will not drive to the point, but the point can still be changed. NOTE : When not followed is selected, the effect of actuator changes cannot be seen on a combustion analyzer. If not followed is selected, extreme caution must be used.	12, 60-62		
		Operation Mode	O	Mode for firing oil. Range = Two-stage, Three-stage, Modulating Def = Modulating			
Params & Display> Ratio Control> <u>Oil Settings></u> LoadLimits	MinLoad	S		Sets the low fire load. During normal operation the burner will not modulate below this point. Should be set to reflect low fire fuel input. On a 10:1 turndown burner, set at 10%. Range = 0 to 100% Def = 0% Typ = 10-40%	60-62		
	MaxLoad			Sets the high fire load. During normal operation the burner will not modulate above this point. Range = 0 to 100% Def = 100% Typ = 100%			
Params & Display> Ratio Control> Gas/Oil Settings> Load mask out	LoadMaskLowLimit			These settings allow a masking of a particular load range. This is useful for combustion resonances that occur at a particular load (firing rate). For example, if a resonance occurred at 37% load, the low load mask could be set to 32% and the high load mask could be set to 42%. The LMV5 will always modulate through this load range without stopping in the load range.	60-62		
	LoadMaskHighLimit						
Params & Display> Ratio Control> Gas/Oil Settings	Air Actuator	O		The first five parameters appear under each fuel, (gas and oil), and each fuel can have a different setting. The last two parameters depend on which fuel is currently selected.	All		
	AuxActuator 1			1. activated - This activates the specific actuator.			
	AuxActuator 2			2. deactivated - This de-activates the specific actuator.			
	AuxActuator 3			3. air influen(ced) - This means that the actuator (VSD) will respond to achieve an oxygen level in the stack. This setting is only for O2 sensor equipped LMV52. O2 control must also be activated. Fuel actuators cannot be set to air influenced.			
	VSD			Note : Any actuator (VSD) can be activated or deactivated on a LMV52. The only actuator that can be changed on LMV51 is the Aux Actuator.			
	GasActuator						
	Oil Actuator						

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> RatioControl	Autom/Manual/Off	U			<p>1) Automatic - Enable the burner allowing it to respond to setpoints. 2) Burner off - Manually turn the burner off setpoints are ignored. 3) Burner on - Manually turn the burner on setpoints are ignored. For normal operation this should be placed in automatic. Def = Automatic This parameter is also available under <i>Manual Operation</i>> <i>Autom/Manual/Off</i></p>			
	OperatRampMod				Controls the speed at which the Actuators / VSD will ramp during normal operation (fuel valves open). Do not set to less than the slowest actuator. Range = 30-120sec Def / Typ = 30s (SQM 45 - 10 sec, SQM 48.4 - 30 sec, SQM 48.6 -60 sec)	60-62		
Params & Display> Ratio Control> Times	OperatRampStage	S			Controls the speed at which the LMV will ramp in multistage operation. Range =10-60sec Def / Typ =10sec			
	TimeNoFlame				Controls the speed at which the actuators / VSD will ramp when the fuel valves are closed. Do not set less than the slowest actuator. Range = 30-120sec Def = 10 sec Typ = 30 sec	Not 60-62		
Params & Display> RatioControl	NumFuelActuators	O			It is possible, though not recommended, to configure the LMV for 1 fuel actuator, and link that single actuator to a gas valve AND an oil valve. Also useful if firing 2 gaseous fuels Range = 1, 2 Def/ Typ = 2	All		
	ShutdownBehav				Controls the position of the Actuators when a lockout occurs. Range = HomePos, PostpurgeP, Unchanged Def / Typ = HomePos	0		
Params & Display> RatioControl	ProgramStop	S			For gas or oil firing, this parameter will stop the sequence, in the selected phase. This is useful for service work, such as; adjusting pilots, measuring prepurge, etc. The LMV can be held (program stopped) in the following phases: 24 prepurge, 32 Prepurge FGR, 36 Ignition position, 44 Interval 1 (pilot stabilization), 52 Interval 2 (Main flame Stabilization), 72 Postpurge position, 76 Postpurge FGR Def = deactivated, Typ = deactivated (for normal operation)	Varies		

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase
	OptgMode			<p>4 choices for each fuel. The default is man deact.</p> <ol style="list-style-type: none"> man deact - O2 trim controller AND O2 monitor are de-activated. Burner runs on the Ratio Curve (fuel lean) O2 Limiter - (also called O2 Guard) Only the O2 monitor is activated. Any O2 fault , including low O2 levels in the stack will cause a burner shutdown.(O2 guard curve or "rich" curve must be input for this function.) O2 Control - O2 trim controller AND O2 monitor are activated. Any O2 fault will cause a burner shutdown.(O2 guard curve or "rich" curve, and O2 setpoint or curve must be input for this function.) conAutoDeact configured to Automatically Deactivate the O2 trim controller AND O2 monitor if any O2 fault occurs. Burner runs on the Ratio Curve (fuel lean) when O2 guard/control deactivates. This is the best choice to keep the burner on-line and avoid any shutdowns due to any O2 system fault, including O2 sensor not being up to temperature. Note: auto deact - This status will appear when the O2 control deactivates itself, due to an operating fault or component malfunction. <p>If the control goes into auto deact, it has to be reactivated under: <i>Operation > O2Ctrl active</i> .</p>	
Params & Display> O2ContrGuard> Gas/Oil Settings	O2 Control	S		<p>This is where the O2 setpoint curve or "trim" curve is input. NOTE : The ratio curve and O2 guard curve must be set before this curve is entered. The O2 setpoints are set at each point on the ratio curve that was set previously. It is highly recommended that at least 10 points be input on the ratio curve prior to setting the O2 setpoint curve. When O2 trim is used, the ratio curve should be set about 2% O2 leaner that it would be normally. The LMV52 will drive to the point on the ratio control curve when it is selected, and the technician will have to press enter when the O2 value stabilizes. This is done to measure the gas velocity from the burner to the sensor at that specific point. The technician will then have to back the air actuator down its curve (while the fuel actuator does not move) by increasing the StandVal number. When the technician achieves the desired O2 level, the point can be saved.</p> <p>This point must be 0.5% O2 above the O2 Monitor curve and 1.0% O2 below the O2 lean curve.</p>	60-62
	O2 Monitor			<p>This is where the O2 Monitor curve or "rich" curve is input. This can be thought of as a low O2 alarm point. NOTE : The ratio curve must be set before this curve is entered. The O2 Monitor points are set at each point on the ratio curve that was set previously. This is usually set as rich as the burner can safely operate. As a general guideline, the burner should not be smoking or having CO higher than 400ppm at any of the O2 Monitor points. The O2 Monitor points can be directly input as a %O2 (at O2-MinValue) or the burner can be "probed" by starting at a point on the ratio control curve and backing the air actuator down its curve while holding the fuel actuator constant. This is done by increasing P-air man.</p> <p>After a lower than normal but still safe O2 value is achieved, the point can be stored.</p>	

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase			
Params & Display> O2ContrGuard> Gas/Oil Settings> Control Param	P Low-Fire	S		These six O2 parameters make up the Low-Fire and the High-Fire PID control response parameters of the O2 trim (Tau is essentially D). These parameters are all automatically adjusted during the O2 setup procedure. While it is possible to manually adjust some of these parameters, it is not recommended to do so. P Low-Fire - Range = 3 to 500%, Def = invalid I Low-Fire - Range = 0 to 500 sec, Def = invalid Tau Low-Fire - Range = 1 to 27 sec, Def = invalid (must be set automatically) Tau Low-Fire OEM - Range = 1 to 27 sec, Def = invalid (can be set manually) P High-Fire - Range = 3 to 500%, Def = invalid I High-Fire - Range = 0 to 500 sec, Def = invalid Tau High-Fire - Range = 1 to 27 sec, Def = invalid (must be set automatically) Tau High-Fire OEM - Range = 1 to 27 sec, Def = invalid (can be set manually) This is the minimum load for O2 Control. If the load drops below this value, the O2 trim control de-activates. 5% above this load setting O2 control will reactivate. Typically set to the same load value as Point 2. Range = 0 to 100 %, Def = 0%, Typ = 20% Sets the point that Tau low fire is automatically measured. In effect, this sets the "autotune" point for low fire. The "autotune" point for high fire is done at the last point, typically point 10. Def / Typ = 2 This enables the user to pick what type of fuel will be burnt with the O2 Control / Guard. Options : user defined, naturalgasH(at or above 960 Btu/SCF), naturalgasL(below 960 Btu/SCF), propane, butane. These choices appear when gas is the current fuel selected. This enables the user to pick what type of fuel will be burnt with the O2 Control / Guard. Options : user defined, Oil EL, oil H. Default is Oil EL. Oil EL should be used for #2 fuel oil. These choices appear when oil is the current fuel selected. For user-defined fuels, this represents the amount of air needed for stoichiometric combustion of the fuel. For gas, this is cubic meters of air per cubic meter of gas, and for oil this is cubic meters of air per kg of oil. Range = 0 to 90 Def / Typ = 9.90 For user defined fuels, this represents the quantity of flue gas generated (wet basis) when either one cubic meter (for gases) or one kg (for oil) of fuel is combusted at stoichiometric conditions. Range = 0 to 40 Def / Typ = 10.93 For user defined fuels, this represents the quantity of flue gas generated (dry basis) when either one cubic meter (for gases) or one kg (for oil) of fuel is combusted at stoichiometric conditions. Range = 0 to 40 Def / Typ = 8.89 Adjustable constants for calculating the combustion efficiency when firing gas. A2 -- Range = 0.40 to 80 Def = 0.65 Typ = 0.65 B/1000 -- Range = 1 to 20 Def / Typ = 9				
	I Low-Fire							
	Tau Low-Fire OEM	O						
	Tau Low-Fire	U						
	P High-Fire	S						
	I High-Fire							
	Tau High-Fire OEM	O						
	Tau Low-Fire	U						
	O2 CtrlThreshold							
	LowfireAdaptPtNo							
Type of Fuel		S			60-62			
V_Lnmin								
V_afNmin								
V_atrNmin								
A2								
B / 1000								

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	
Params & Display> O2ContrGuard> Gas/Oil Settings	O2 Content Air	O			Defines the O2 content of the combustion air. The LMV52 must see this value during purge. This value can be adjusted if O2 enriched air is used. Range = 0 to 30%, Def = 20.9%.	60-62	
	Type of Air Change	S			When firing gas select like P air (change in airflow does affect gas flow) When firing oil select like theory (change in airflow does not affect oil flow) Def= like theory		
	O2 Offset Gas or O2 Offset Oil				During a load change, this offset temporarily increases the O2 setpoint. When the change in load is completed, the O2 setpoint will revert to the O2 control curve. Range = 0-5% Def / Typ = 0%. However, if the burner tends to go below the O2 Monitor curve during load changes, then this setting can be increased (0.5% or more) to eliminate O2 readings below the O2 Monitor curve.		
	Load Ctrl Suspend				During a load change, the O2 trim control will lock, meaning that it will "remember" where the air influenced actuators (usually just the air actuator) tracked the last time the burner went through a similar load change. When locked, the O2 trim will not be making real time adjustments. This locking during load changes is referred to as precontrol. This setting enables adjustment of what the LMV52 considers as a load change that will lock the O2 trim. Adjustment is generally not recommended, however reducing this setting can help deactivation in some circumstances. Range = 0-25% Default & Typ = 5%		
	Filter Time Load				After a load change that locks the O2 trim control, a time factor is applied that makes the LMV wait to unlock the trim control. This setting adjusts the unlocking time. Adjustment is generally not recommended, however increasing this setting can help deactivation in some circumstances. Range = 4-10 Def / Typ = 5		
	Comb Efficiency	U			Calculated Combustion Efficiency, based on wet O2 levels in the stack, combustion air temperature, and flue gas temperature.		
	ManVar O2 Ctrl				This value represents how much the O2 control is trimming from the base O2 Ratio control curve. When this value is decreasing it means that the LMV is closing the air influenced actuators to compensate for a higher than setpoint O2 value in the stack. When this value is increasing, the LMV is opening the air damper approaching the O2 ratio control curve. When the LMV has compensated as much as possible for a lean condition, value will be about 15%, and as much as possible for a rich condition, value will be about 52%.		

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase
Params & Display> Load Controller> Controller Param> ContrlParam List	StandardParam			<p>These are "canned" values for the PID loop in the internal load controller as well as and option to use values found during adaptation (autotune). Adaptation (autotune) is not performed with this parameter, but the PID results of an adaptation (autotune) can be used by selecting adaptation.</p> <p>Values are labeled: very slow, slow, normal, fast, and very fast. When any one is selected "canned" values will be assigned to P I and D that will determine how the load controller responds.</p> <p>Note that every time this parameter is viewed, current will be shown as "XXX" and new will show "very slow". This does not mean that the load controller is using very slow PID values. The "StandardParam" screen just shows "very slow" since it the first option in line.</p> <p>When very slow is selected, the P value is small (small proportional band), and values for I and D are longer (greater number of seconds), meaning there is less integral and derivative action. If very fast is selected, the P value is large and the I and D are short, meaning that the proportional band is large and there is a large amount of integral and derivative action.</p> <p>Recommendations: Normal will work well for most situations (P = 6.4%, I = 136 sec, D = 24)</p>	
	P-Part			<p>P part of the PID loop, is the proportional band around the setpoint, in % units. This % is based on the measured range or span of attached sensor. If normal response was selected above, then this will be 6.4%. If "canned" values are not used, 10% is usually a good starting point. Range = 2 to 500% Def = 15% Typ = 6.4%</p>	60-62
	I-Part		U	<p>I part of the PID loop, is the integral function that is applied to the behavior of the process variable (boiler temp. or press).</p> <p>Basically it counteracts fast decreases in the process variable by increasing boiler load even faster than the P alone. If normal response was selected above, this will be 136 seconds. This can also be deactivated by setting this to 0 sec.</p> <p>If "canned" values are not used, 80 seconds is usually a good starting point. Range = 0 to 2000sec Def = 320sec Typ = 136 sec</p>	
	D-Part			<p>D part of the PID loop. D is the derivative function that is applied to the behavior of the process variable (boiler temp. or press).</p> <p>Basically it counteracts fast increases in the process variable by decreasing boiler load even faster than the P alone.</p> <p>If normal response was selected above this will be 24 seconds.</p> <p>This setting must always be at least 1/5 of the setting for I or the PID loop may be unstable. Setting this to 0 sec is also possible, deactivating this part of the loop and leaving a PI loop.</p> <p>If "canned" values are not used 15 seconds is usually a good starting point.</p> <p>Range = 0 to 1000sec Def = 40sec Typ = 24sec</p>	

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase
Params & Display> LoadController> ControllerParam	SD_Stage1Off	U		Determines what Temp. / Press. a staged oil combustion burner, will disengage stage 1. Set at a positive % so that the burner will turn off stage 1 oil at a set % above the current setpoint. The % is based on the current setpoint. Range = 0 to +50%, Def / Typ = 10%	60-62
	SD_Stage2Off			Determines what Temp. / Press. a staged oil combustion burner, will disengage stage 2. Set at a positive % so that the boiler will turn off stage 2 oil at a set % above the current setpoint. The % is based on the current setpoint. Range = 0 to +50%. Def / Typ = 8%	
	SD_Stage3Off			Determines what Temp. / Press. a staged oil combustion burner, will disengage stage 3. Set at a positive % so that the boiler will turn off stage 3 oil at a set % above the current setpoint. The % is based from the current setpoint. Range = 0 to +50%. Def / Typ = 6%	
	ThreshStage2On			This value is the integral of a control deviation multiplied by time. This serves to not call on stage 2 unless the pressure / temperature deviates from the desired setpoint for a length of time and/or by a large margin. Range = 0 to 1000. Def / Typ = 300	
	ThreshStage3On			This value is the integral of a control deviation multiplied by time. This serves to not call on stage 3 unless the pressure / temperature deviates from the desired setpoint for a length of time and/or by a large margin. Range = 0 to 1000. Def / Typ = 600	
	TL_Thresh_Off			If a temperature sensor is used, (connected to input X60) this parameter controls when the burner shuts off and goes into alarm due to an over temperature situation. This is normally used to prevent hot water boilers from exceeding their design temperatures. Range = 0 to 2000° F. Def / Typ = 203° F.	
Params & Display> LoadController> TempLimiter	TL_SD_On	S		Creates a negative dead band for the temperature limiter function. If the temperature reaches the threshold off value (previous parameter), the burner will shut off with a alarm. This setting controls what temperature under the threshold off value the burner can be restarted. Range = -50 to 0%. Def / Typ = -5%	

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	LMV51	LMV52	
	LC_OptgMode	U			<p>Note - "Load Controller not active..." is displayed go to: <i>SystemConfig > LC_OptgMode</i></p> <ol style="list-style-type: none"> External load controller X5-03 - use with a floating bumping type of universal controller such as a RWF40. Internal load controller not required. Internal load controller- use with a directly connected pressure or temperature sensor. Setpoint W1 is normally used with this mode. Internal load controller BUS- same as 2 except setpoint W3 can be changed via BUS connection. Internal load controller X62 - same as 2 except setpoint can be changed by using an external analog signal on terminal X62. External load controller X62 - LMV can be modulated directly by an analog signal on terminal X62. External load controller BUS - LMV can be modulated directly via a BUS connection. Note: Modes 3 thru 6 can be switched back to mode 2 by closing a contact between X62.1 and X62.2. When in mode 2 this contact closure can be used to switch between setpoint W1 and W2. 	60-62			
Params & Display> Load Controller> Configuration	Sensor Select				<p>Defines the type of sensor that will be used for the internal load controller.</p> <ol style="list-style-type: none"> Pt100, Pt1000, Ni1000 - Temperature sensors (RTD) wired into terminals X60. The internal temperature limiter is active when any of these three are selected. TempSensor, PressureSensor - Temperature or Pressure sensor wired to terminals X61. Can be 0 to 10VDC or 4-20mA. Pt100Pt1000, Pt100Ni1000 - Redundant Temperature Sensors wired to terminals X60. Pt100 used for load controller and temperature limiter, redundant sensor also used for temperature limiter. No Sensor - Selected if LMV5x being remotely modulated, no sensor for the load controller or the temperature limiter. 	All			
	MeasureRangePtNi				Sets the end of measurement range for standard platinum or nickel temperature sensors connected to terminals X60. Range = 302 F, 752 F, 1562 F Def / Typ = 302 F				
	Var. RangePtNi				Sets the end of measurement range for non-standard platinum or nickel temperature sensors connected to terminals X60. Range = 0 to 1562 F Def / Typ = 1562 F				
	Ext Inp X61 U/I				Configuration of terminals X61. This input can be configured for 4 to 20mA, 2 to 10VDC, or 0 to 10VDC. Set to the type of signal expected on X61. NOTE : The limits on this terminal are 3mA to 21mA, 10.5 VDC. Signals not in this range will cause a alarm.				
	MRange TempSens				Sets the end of the scale for a temperature sensor connected to terminals X61. Also, this serves to scale input X62 if used for remote temperature setpoints. Range = 0 to 3632 F Def / Typ = range of X61 temp sensor	All			
	MRange PressSens				Sets the end of the scale for a pressure sensor connected to terminals X61. This value would correspond to the pressure sensor output (mA or V) at rated pressure. Also, this serves to scale input X62 if used for remote pressure setpoints. Range = 0 to 1449 psi Def = 29 psi, Typ = range of connected pressure sensor				

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase
Params & Display> Load Controller> Configuration	Ext Inp X62 U/I	S			Configuration of INPUT terminals X62. This input can be configured for 4 to 20mA, 0 to 20mA, 2 to 10VDC, or 0 to 10VDC. This terminal is usually used for remote setpoint or remote modulation. This input signal is scaled by parameter Mrange TempSense or Mrange PressSens. NOTE : The limits on this terminal are 3mA to 21mA, 10.5 VDC. Signals not in this range will cause a alarm.	All
	Ext MinSetpoint				Establishes the minimum external setpoint that can be input via terminals X62. Range = 0 to 100% Def = 0 Typ = 10	
	Ext MaxSetpoint				Establishes the maximum external setpoint that can be input via terminals X62. Range = 0 to 100% Def = 60 Typ = 100	60- 62
Params & Display> Load Controller> Configuration> AnalogOutput	OutValueSelection	S			This selects the process value associated with analog output X63. The selected process value will be transmitted from X63 with either a 0 to 20mA or a 4 to 20mA signal. The choices for this output are: 1) Load - The current load of the burner using 4-20mA. Parameters CurrMode 0/4mA ,Scale 20mA and Scale 0/4mA have no effect on this choice. 2) Load 0 - The current load of the burner using 4-20mA or 0-20mA. 3) O2 - The percent O2 currently read by the stack O2 sensor. 4) Pos Air - The current position of the air actuator in angular degrees. 5) Pos Fuel - The current position of the fuel actuator in angular degrees. 6) Pos Aux 1 - The current position of the Aux 1 actuator in angular degrees. 7) Pos Aux 2 - The current position of the Aux 2 actuator in angular degrees. 8) Pos Aux 3 - The current position of the Aux 3 actuator in angular degrees. 9) Speed VSD - The current speed of the VSD motor in percent. 10) Flame - The current raw flame signal 11) TempPT1000 - The temperature read by the PT1000 sensor on terminal X60. 12) TempNi1000 - The temperature read by the Ni1000 sensor on terminal X60. 13) TempPt100 - The temperature read by the PT100 sensor on terminal X60. 14) Temp X61 - The temperature read by the temperature transducer on terminal X61 15) Press X61 - The pressure read by the pressure transducer on terminal X61.	All
	CurrMode 0/4mA				Selects the output signal to be either a 0 to 20mA signal or a 4 to 20mA signal. Range = 0 to 20mA or 4 to 20mA Def = 0 to 20mA Typ = 4 to 20mA	

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase
Params & Display> Load Controller> Configuration> AnalogOutput	Scale20mA perc	S		Scales the analog output for the percent values (other than Load). Specifically, this parameter defines what percentage of Pos Air, Load 0, Speed VSD, Flame, etc.. will output 20mA. Range = 0 to 999%, Def / Typ = 100%	All
	Scale20mA temp			Scales the analog output for the temperature values. Specifically, this parameter defines what temperature (read by Temp Pt1000, Temp Ni1000, etc..) will output 20mA. Range = 0 to 3632 F, Def = 1562 F, Typ = 400 F	
	Scale20mA press			Scales the analog output for the pressure value. Specifically, this parameter defines what pressure (read by Press X61) will output 20mA. Range = 0 to 1449 psi, Def = 2 psi, Typ = 150 psi	
	Scale20mA angle			Scales the analog output for the actuators. Specifically, this parameter defines what angular degrees will output 20mA. Range = 0 to 90 deg, Def = 90, Typ = 90	
	Scale 0/4mA			Sets the start of the scale for every process value other than Load . (The start of the scale Load 0 can be set here, but if Load is selected above this parameter has not effect.) For example : If Parameter "OutValueSelection" is set to Pos Air, "CurrMode 0/4mA" is set to 4mA, "Scale 20mA angle" is set to 90°, and "Scale 0/4mA" is set to 0%, then 12 mA will be output when the air actuator is at 45 degrees, and 20mA will be output at 90 degrees. If all other values are unchanged and "Scale 0/4mA" is now set to 50%, then 4 mA will be output when the air actuator is 45 degrees, and 20mA will be output when the actuator is at 90 degrees. Range = 0 to 999% Def = 0 Typ = 0	
Params & Display> LoadController> Adaption	StartAdaption	U		This starts the Adaption process. During the Adaption process the LMV will determine the thermal response of the system (burner / boiler and attached thermal users). Values for PID will be calculated based on this information. The LMV does this by modulating to minimum load letting the system "settle" to a particular pressure or temperature. After this "settling" period the LMV will modulate up to the Adaption Load and see how long it takes for the system temperature / pressure to respond. Based off of this response the LMV will choose values for P I and D. These calculated values are implemented by choosing Adaption under <i>StandardParam</i> .	60-62
	AdaptionLoad			Note : Adaption has to be started when the burner is running and a representative load exists on the system. This load is used to determine the thermal response of the system during Adaption only. LMV will travel to this load during the heating phase of the Adaption. Range = 40 to 100% Def / Typ = 100	

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase
Params & Display> Load Controller	SW Version	U		Software version of the load controller	
	Params & Display> AZL> Times	PasswordTime	O		Sets the length of time for the password to time out. Range = 10 to 400 min. Def = 120 min.
Sum/WinterTime				Automatic: Daylight savings automatically, Manual: Disables daylight savings time feature.	
Time EU/US				Daylight savings time schedule. US setting START: 1st Sun in Apr END: last Sun in Oct.	
Params & Display> AZL	Language			Select the language you want the AZL to display. Default is English.	
	DateFormat			Date format has 2 Choices: MM-DD-YY (US) or DD.MM.YY (European) Default is US.	
Params & Display> AZL	PhysicalUnits			Either °C / bar or °F / psi can be chosen. Def = °F / psi.	
	Params & Display> AZL> Ebus	Address		Sets the LMV address for Ebus (job specific...) Range = 1 to 8 Def = 1	All
SendCycleBU				Sets the cycle time for the LMV to send data to the BAS (job specific...) Range = 10 to 60 sec Def = 30 sec	
Params & Display> AZL> ModBus	Address	U		Sets the LMV address for Modbus (job specific...) Range = 1 to 247 Def = 1	
	Baudrate			Sets the baud rate of the ModBus port, which is an RJ45 jack located on the underside of the AZL. NOTE: To use ModBus, it must be activated at: <i>Operation > Optmodeselect</i> . Def = 9600	
	Parity			This sets the parity of the ModBus port. Range = Parity , No Parity Def = no parity.	
	Timeout			If no communication occurs for this period, the AZL considers the ModBus to be unavailable. If the AZL considers the Modbus to be unavailable, then it will make setpoint W1 the current setpoint. Other ModBus values will remain what they were previous to the unavailability, and or be overwritten by input through the AZL. Range = 0 to 7200s Def / Typ = 30 s	
	Lokal / Remote			This enables or disables the use of a ModBus conveyed setpoint, setpoint W3. Lokal: (local) W3 will not be observed. Remote: there is no timeout condition and the remote operating mode is automatic then setpoint W3 will be observed.	
	Remote Mode			View the ModBus "Remote Mode" status: Automatic, On, Off	
	W3			W3 is the ModBus conveyed setpoint. Range = 0 to 3632 degrees F or 1500 PSIG	

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> AZL	Display Contrast	U		Change with < > keys store with Enter key, cancel with the Esc key.	All		
	ASN						
Params & Display> AZL> ProductID	ProductionDate	U		Information concerning the AZL.	All		
	SerialNumber						
	ParamSet Code						
	ParamSet Vers						
Params & Display> AZL	SW Version	U		Software Version on the AZL	All		
Params & Display> Actuators> Addressing	1 AirActuator	S		Enables addressing of the actuators. Select one of the actuators and press enter. The AZL will then serve as a guide through the rest of the procedure. This procedure involves pressing a red button (hold about 1 sec.) on the selected actuator. The actuators can be wired and addressed in any order. The green LED will be on when the actuator is powered and not addressed, and it will blink then pause after it has been addressed. 1 blink = Air, 2 blinks = gas or gas(oil), 3 blinks = oil, 4 blinks = aux1, 5 blinks = aux2, 6 blinks = aux3 Holding the red button on the actuator down for approx 10 seconds will clear the addressing on that actuator.	0		
	2 GasActuat(Oil)						
	3 OilActuator						
	4 AuxActuator1						
	5 AuxActuator2						
	6 AuxActuator3						
DeleteCurves		O		This deletes the ratio control (fuel / air) curves. Curves must be deleted if the direction of rotation on any actuator is changed.	12		
Params & Display> Actuators> DirectionRot	1 AirActuator	O		Sets the direction of rotation for each actuator, regardless of which fuel is selected. If you are looking at the actuator with the shaft pointed directly at you, Standard Rotation would be counterclockwise, Reversed Rotation would be clockwise. These descriptions are opposite if viewed from the cover end of the actuator. (shaft pointing away from you) Range = Standard, Reversed Def = Standard	All		
	2 GasActuat(Oil)						
	3 OilActuator						
	4 AuxActuator1						
	5 AuxActuator2						
	6 AuxActuator3						

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase
Params& Display> Actuators> ProductID> 1 Air Actuator	ASN	U			Information concerning the currently addressed air actuator.	
	ProductionDate					
	SerialNumber					
	ParamSet Code					
Params& Display> Actuators> ProductID> 2 Gas Actuator(Oil)	ParamSet Vers	U			Information concerning the currently addressed gas(oil) actuator.	
	ASN					
	ProductionDate					
	SerialNumber					
Params& Display> Actuators> ProductID> 3 Oil Actuator	ParamSet Code	U			Information concerning the currently addressed oil actuator.	
	ParamSet Vers					
	ASN					
	ProductionDate					
Params& Display> Actuators> ProductID> 4 Aux Actuators 1	SerialNumber	U			Information concerning the currently addressed aux1 actuator.	All
	ParamSet Code					
	ParamSet Vers					
	ASN					
Params& Display> Actuators> ProductID> 5 Aux Actuators 2	ProductionDate	U			Information concerning the currently addressed aux2 actuator.	
	SerialNumber					
	ParamSet Code					
	ParamSet Vers					
Params& Display> Actuators> ProductID> 6 Aux Actuator 3	ASN	U			Information concerning the currently addressed aux3 actuator.	
	ProductionDate					
	SerialNumber					
	ParamSet Code					
Params& Display> Actuator> SW Version	ParamSet Vers	U			Information concerning the software versions of the attached actuators.	
	1 Air Actuators					
	2 Gas Actuator(Oil)					
	3 Oil Actuators					
	4 Aux Actuators 1					
	5 Aux Actuators 2					
6 Aux Actuators 3						

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase
Params & Display> VSD Module > Configuration	ReleaseContactVSD	S			This sets the behavior of the run / stop dry contact (terminals X73.1 and X73.2). If set to closed, then this dry contact will stay closed from posture (phase 78) into phase 10 when the VSD is driving to home position, which is typically set at 0 % (0 RPM). If set to open, the blower will freewheel after phase 78. Typ = open	78-10
	ToQuickShutdown	O			This sets the percentage of speed deviation from the desired fan speed that will cause an immediate shut down the burner. Typically does not need to be adjusted. Range = 0 to 100% Def / Typ = 10%	
	Num Puls per R				This sets the expected number of pulses per motor revolution. This setting depends upon what type of speed wheel is used. Range = 3 or 6. Def = 3	
	Standardization	S			This starts the standardization process for the motor driven by the VSD. When activated, it will ramp the VSD up and then down with the air damper open. During this time, the LMV52 will correlate a milliamp signal to the peak motor RPM.	
	StandardizedSp				Shows the motor speed corresponding to 19.5 mA input to the VSD / motor combination. This is automatically set when the VSD / motor is standardized. It can be set manually, but this is not recommend in most circumstances.	22-78
Params & Display> VSD Module> Configuration> Speed	Absolute Speed	U			This displays the real time speed of the blower motor in RPM (tachometer).	
	Setpoint Output	S			This sets what the output signal will be to the VSD. It can be set to 4 to 20mA or 0 to 20mA. Typically this is set to 4-20mA. Def = 4-20mA.	
	Settling Time	O			This sets a filter time or a delay time between when a speed is read from the speed wheel to when the LMV52 attempts to correct the speed by varying the 4-20mA signal to the VSD. Adjust if VSD is oscillating or "hunting" Time is multiplied by 25 milliseconds, so a setting of 16 yields 400ms or 0.4 seconds. Range = 200 to 5000ms. Def =16, or 400ms	
	PulseValueGas	S			This sets the number of pulses per unit of gas flow (for use with gas meters having a pulsed output, such as a modern turbine gas meter) Can be set for cubic meters or cubic feet. Range = 0 to 999.99999 pulses / (cubic feet) Def / Typ = meter specific	60-62
	PulseValueOil				This sets the number of pulses per unit of oil flow (for use with oil meters having a pulsed output) Can be set for liters or gallons. Range = 0 to 999.99999 pulses / (gal) Def / Typ = meter specific	
Params & Display> VSD Module> Process Data	Max Stat Dev				Maximum motor speed deviation from setpoint during steady state operation (steady load) during a run period. Range = 0 to 100%	
	Max Dyn Dev	U			Maximum motor speed deviation from setpoint during an acceleration or deceleration of the motor(changing load) during a run period. Range = 0 to 100%	
	Num Dev >0.3%				The number of speed deviations exceeding 0.3% of the speed setpoint during a VSD run period.	22-78
	Num Dev >0.5%				The number of speed deviations exceeding 0.5% of the speed setpoint during a VSD run period.	
	Absolute Speed				This displays the real time speed of the blower motor in RPM (tachometer).	

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase
Params & Display> VSD Module> Product ID	ASN	U		Information concerning the VSD board (pieces internal to the LMV)	
	ProductionDate				
	SerialNumber				
	ParamSet Code				
	ParamSet Vers				
Params & Display> VSD Module	SW Version	S		Software version of the VSD.	All
	O2 Sensor			This defines what O2 sensor is used with the PLL52 module. QGO20 Max. flue gas temp 572 deg F Range = No sensor, QGO20, Def = No Sensor, Typ = QGO20	
Params & Display> O2 Module> Configuration	SupAirTempSens	S		This sensor connects to the PLL module and is necessary for the boiler efficiency calculation. Range = No sensor, Ni1000, Pt1000, Def / Typ = Ni1000	
	FlueGasTempSens			This sensor connects to the PLL module and is necessary for the boiler efficiency calculation. Range = No sensor, Ni1000, Pt1000, Def / Typ = Pt1000 NOTE : If configured for Pt1000, any 1000 ohm Platinum RTD having a temperature coefficient of 385 will be accurate. Resistance of the correct RTD is 1000 ohms @ 32F.	
	MaxTempFlGasGas or MaxTempFlGas/Oil			Maximum flue temperature setpoint for each fuel. A warning will appear if temperatures exceed this setting. PLL52 module must have a flue gas sensor wired in for this function. Range = 32 deg F to 752 deg F Def = 32 def F, Typ = boiler specific	
	Actual O2 Value			This displays the current wet O2 values in the flue.	
	O2 Setpoint			This displays the O2 setpoint at any operating point. This is the target for the O2 trim.	
	SupplyAirTemp			This displays the current ambient air temperature.	
	CombEfficiency			This displays the current combustion efficiency. If the O2 sensor is deactivated, this number will not be displayed. Also the flue and ambient temperatures are needed for this number to display.	
Params & Display> O2 Module> Displayed Values	FlueGasTemp	U		This displays the current flue gas temperature.	All
	QGO SensorTemp			This displays the current O2 Sensor temperature. Absolute minimum operating temperature = 1202 °F	
	QGO HeatingLoad			This displays the current heating load for the O2 Sensor. The PLL regulates the heating voltage to the QGO20 sensor. Maximum heating load is 60%.	
	QGO Resistance			This measures the resistance of the O2 sensor. As a sensor is used, the resistance increases. New sensors have a resistance of 0 ohms. When this value exceeds 100 ohms, sensor should be replaced the next time the burner is serviced. Absolute maximum is 150 ohms.	

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> O2 Module> ProductID	ASN	U		Information concerning the currently attached O2 sensor.	All		
	ProductionDate						
	SerialNumber						
	ParamSet Code						
	ParamSet Vers						
Params & Display> O2 Module	SW Version			Software version of the O2 module.			
	FGR-Mode	S		Sets the mode of the FGR hold for the Aux 3 actuator. This can be time or temperature based. The Aux 3 actuator can be made to release to its normal fuel-air ratio curve position after a certain length of time, or after a certain temperature (typically stack temperature) is reached. This serves to let the boiler to warm before admitting FGR to the burner. This will not stop the other actuators (fuel, air, aux 1, etc...) from driving to whatever load is defined by the load controller. Range = deactivated, time, temperature Def = deactivated	60-62		
Params & Display> Flue Gas Recirc	FGR-Sensor			Selection of the temperature sensor if the temperature based FGR hold is used. Options are a Pt1000 connected to the PLL module (O2 trim module) or a Pt1000, Ni 1000 connected directly to the load controller. Def = PLL_Pt1000			
	ActTmpFGR-sensor	U		The actual temperature read by the selected sensor can be viewed at this parameter.	All		
	ThresholdFGR Gas	S		For gas firing, this sets the temperature that must be achieved to release the Aux 3 actuator to modulate. Has no effect if parameter "FGR-Mode" is set to time. Range = 32 to 1562 F Def = 752F Typ = 320F	60-62		
	DelaytimeFGR Gas		For gas firing, this sets the time that must elapse before the Aux 3 actuator is released to modulate. Has no effect if parameter "FGR-Mode" is set to temperature. Range = 0 to 63 minutes. Def = 300 sec Typ = 30 min				
	ThresholdFGR Oil		For oil firing, this sets the temperature that must be achieved to release the Aux 3 actuator to modulate. Has no effect if parameter "FGR-Mode" is set to time. Range = 32 to 1562 F Def = 752 F Typ =320 F				
	DelaytimeFGR Oil		For oil firing, this sets the time that must elapse before the Aux 3 actuator is released to modulate. Has no effect if parameter "FGR-Mode" is set to temperature. Range = 0 to 63 minutes. Def = 300 seconds. Typ = 30 minutes				

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase	LMV51	LMV52
Params & Display> System Config	LC_OptgMode	U			(Note - if "Load Controller not active..." message was seen under: <i>Params & Display > Load Control > LC_OptgMode</i> , adjust this parameter to some internal mode before returning to the Load Controller menu.) Current operating mode of the LMV. Change at: <i>Params & Display > Loadcontroller > Configuration > LC_OptgMode</i> .	All		
	Ext Inp X62 U/I				See: <i>Params & Display > LoadController > Configuration > Ext Inp X62 U/I</i>			
Params & Display> System Config> Temp Limiter	TL_Thresh_Off				See: <i>Params & Display > LoadController > Controller Params > Temp Limiter > L_Thresh_Off</i>			
	TL_SD_On				See: <i>Params & Display > LoadController > Controller Params > Temp Limiter > TL_SD_On</i>			
	Sensor Select				See: <i>Params & Display > LoadController > Configuration > Sensor Select</i>	60-62		
	MeasureRangePtNi				See: <i>Params & Display > LoadController > Configuration > Inp1/2/4Sel</i>			
	O2Ctrl/LimitrGas or O2Ctrl/LimitrOil				See: <i>Params & Display > O2 Contrl/Guard > GasSettings > OptgMode</i>			
Params & Display> System Config	LC Analog Output				See: <i>Params & Display > LoadController > Configuration > Analog Output > OutValueSelection</i>			
	Allowed Pot. Diff				Sets the allowable difference between channels A and B of the Actuator's Potentiometer. Range = 10 to 15. Def / Typ = 15	All		

Menu Path	Parameter	Level	U = User S = Service	O = OEM	Descriptions / Notes	Phase
Params & Display> Hours Run>	GasFiring	U			These values can be adjusted at this point. Range = 0 to 999999 Reset at: <i>Params & Display > Hours Run > Reset</i> Also view at: <i>Params & Display > Hours Run, and at: Operation > Hours Run</i>	
	OilStage1/Mod					
	OilStage2					
	OilStage3					
	TotalHoursReset					
	TotalHours					
Params & Display> Hours Run> Reset	SystemOnPower	U			These values CANNOT be adjusted or reset. Read Only	
	GasFiring					
	OilStage1/Mod					
	OilStage2					
	OilStage3					
	TotalHoursReset					
Params & Display> System Config> Start counter	GasStartCount	U			These settings set and reset various hours run. See <i>Operation > Start Counter</i> .	
	OilStartCount					
	TotalStartCountR					
	TotalStartCount					
Params & Display> System Config> Start Counter> Reset	GasStartCount	U			These values CANNOT be adjusted or reset. Read Only	All
	OilStartCount					
	TotalStartCountR					
	TotalStartCount					
Params & Display> Fuel Meter	Curr Flow Rate	O			These settings set/ reset/ and record quantities of fuel used. See <i>Operation > Fuel Meter</i> .	
	Volume Gas					
	Volume Oil					
	Volume Gas R					
	Volume Oil R					
	Reset DateGas					
Updating> Passwords	Reset DateOil	O			This displays the DATE of the last RESET.	
	ServicePassword					
Updating	OEM Password	O			The service level password can be changed here. Range = 3 to 8 characters. Def = 9876 The OEM level password can be changed here. Range = 4 to 8 characters. Def = START Burner ID must be set here. The burner ID can only be changed if be changed with OEM Access. Generally, the burner / boiler serial number is used. Range = 4-15 char ,Def = Invalid	
	Burner ID					

Menu Path	Parameter	Level	U = User S = Service O = OEM	Descriptions / Notes	Phase
Updating> ParamsBackup> BackupInfo	Date	U		This displays the date of the last back-up.	All
	TimeOfDay			This displays the time of day of the last back-up.	
	BU included?			This states if the Basic Unit (LMV) was included in the last back up.	
	AZL included?			This states if the AZL was included in the last back up.	
	LC included?			This states if the LC (Load controller) was included in the last back up.	
	ACT1 included?			This states if the Act 1 (Actuators 1) was included in the last back up.	
	ACT2 included?			This states if the Act 2 (Actuators 2) was included in the last back up.	
	ACT3 included?			This states if the Act 3 (Actuators 3) was included in the last back up.	
	ACT4 included?			This states if the Act 4 (Actuators 4) was included in the last back up.	
	ACT5 included?			This states if the Act 5 (Actuators 5) was included in the last back up.	
	ACT6 included?			This states if the Act 6 (Actuators 6) was included in the last back up.	
	VSD included?			This states if the VSD (Variable Speed Drive) was included in the last back up.	
	O2 included?			This states if the O2 module was included in the last back up.	
	LMV5x -> AZL			Transfers a parameter set from the LMV5x to the AZL.	
Updating> Param Backup	AZL -> LMV5x	S		Transfers a parameter set from the AZL to the LMV. Useful for transferring parameter sets to identical burners. NOTE : Each burner must have a UNIQUE burner ID for safety purposes. NOTE : When transferring parameter sets from the AZL to the LMV5, do not stop the transfer until "Backup Restore Finished Parameter BC : complete or BC : partial" is shown on the AZL screen. This could take up to 5 minutes. "backup restore is carried out" means that the back-up restore is in progress. Do not disturb the LMV5 while the back-up restore is in progress.	
	Load_SW_from_PC			Enables software updates on the AZL5x with a PC tool	
PW Login	Access w-out PW	U		Access w-out PW (with-out PassWord). Also called User level .	
	Access Serv	S		Obtaining access rights requires the correct Service Level password	
	Access OEM	O		Obtaining access rights requires the correct OEM Level password	
PW Logout	PW Logout			Selection reduces access to Access w-out PW , also called User level .	
	LossFlameTest	S		Enables testing of the flame sensor input on the LMV by momentarily interrupting the flame signal.	
SafetyCheck Funct	SLT Test	U		This enables the testing of the safety limits. Range = activated, deactivated. activated - The internal load controller's setpoint AND switch-off threshold will be ignored, allowing a test of a separate high limit control or pressure relief valve. deactivated - normal operation.	60-62
	SLT-Testload Mod			Load for the SLT test in modulating operation. Range = 0 to 100% Def = 100% Typ = 50%	
	SLT-Testload Sig			This sets the load for the SLT test in staged operation. Range = S1, S2, S3 Def = S3, Typ = S2	

Notes	
Contrast Adjust	<p>In: <i>Operational Stat > Normal Operation</i> , the AZL display contrast can be adjusted.</p> <p>To do this, keep the Enter button depressed, and at the same time press either Select button, < or >.</p>
Shutdown function	<p>Manual Lockout - A lockout can be initiated by pressing Enter and Esc simultaneously.</p> <p>This functions as a built-in E-stop (emergency-stop). Lockout will be stored in the AZL .</p>
Quick Access to Normal Operation	<p>To go back out of the menu and check burner operation, press the 2 Select buttons, < and > simultaneously.</p> <p>This will take the cursor to Normal Operation, so the normal operation screen can be viewed by pressing Enter.</p> <p>This can be done anywhere in the menu, as long as a single parameter is not currently displayed on the screen.</p> <p>Pressing Esc after pressing the two select buttons will take the cursor back "in" to where it was.</p>
Actuator positions (Only on LMV52)	<p>When the: <i>Operational Stat > Normal Operation</i> screen is displayed, the Enter key can be pressed, one additional time, so that the actuator positions of all devices (O2 module VSD etc..) will be displayed.</p>

Sequence Diagrams 4-3

The Siemens LMV5 BMS can perform a number of different burner sequences based upon how certain parameters are set. Although there are a number of parameters that affect small aspects of the burner sequence, the main parameters that affect the sequence are parameters *FuelTrainGas* or *FuelTrainOil*.

These parameters set the framework of the sequence, and are based upon the fuel train diagrams in Section 4-1. The OEM has the option of selecting one of three different gas trains with their associated sequence diagrams, and one of three different oil trains with their associated sequence diagrams. The sequence diagrams and fuel train diagrams for Direct Spark ignition with Heavy oil have been omitted. The sequence diagrams in Section 4-3 illustrate when input and output terminals are expected to be energized or de-energized. A legend on the bottom of each page describes the various symbols used in the diagrams. The last diagram describes what positions the attached actuators are expected to achieve at the various phases. This diagram also outlines the method that is used to check the actuators position during each phase.

Notes:

- 1) Only one fuel select terminal can be energized. If both terminals are energized, the LMV5... will go into Lockout. If no terminals are energized, fuel selection is internal, though the AZL5 (*Fue/Select*) or through the ModBUS.
- 2) The burner on / off switch can be disabled with parameter *InputController*. If activated, this terminal needs to be energized to have the LMV5.. start its sequence.
- 3) If a LMV51 is used, the only options are CPI (Closed Position Indication) Gas and PS-VP. CPI oil is possible through the use of a time delay relay. (See Section 3-3) With an LMV52.., PS-VP, CPI gas, CPI oil, or CPI gas + CPI oil are possible.
- 4) The alarm can be silenced through the AZL. This alarm silence resets when the LMV5 is reset or restarted.
- 5) When using an LMV52..., continuous pilot is possible (*ContPilotGas/ContPilotOil*).
- 6) If parameter *GasPressureMin* is set to activated, the low gas pressure switch is expected to remain closed during phase 21-50 of LO w *GasP*, ensuring adequate gas pressure for the pilot. If *GasPressureMin* is set to *Deact x OGP* mode, the low gas pressure switch is expected to remain closed only when firing gas. The *Deact x OGP* feature is only offered on the LMV52.
- 7) If parameter *OilPumpCoupling* is set to *Magnetcoupl*, the output for the oil pump can be energized in Phase 22 or in Phase 38, depending upon how parameter *IgnOilPumpStart* is set. If parameter *OilPumpCoupling* is set to *DirectCoupl*, the output will energize with the blower and de-energize 15 seconds after the blower de-energizes.

- 8) If gas valve proving is performed on startup (immediately after phase 30) the actuators will be in prepurge position. If gas valve proving is performed on shutdown (immediately after phase 62), the actuators will be in the same position as they were in phase 62. The actuators will not move during valve proving.
- 9) Shortly after post purge is complete, the air pressure switch must open causing input (terminal X3-02.1) to de-energize. The LMV5 will wait about 30 seconds in phase 10 (driving to home position) for the switch to open before the LMV5 goes into alarm. This done to check for welded contacts in the air pressure switch. If air pressure switch alarms are encountered in phase 10, increasing the setpoint of the air pressure switch typically cures this problem.
- 10) The LMV5 can be configured for different reactions to extraneous light (a flame signal when there should not be one). Depending on how parameters *ReacExtranLight* and *ExtranLightTest* are configured, the LMV5 can lockout, block the start, or ignore extraneous light altogether.
- 11) If direct start is enabled and there is a call for heat after phase 62, the LMV5... will omit phase 78 and will go to phase 79. In Phase 79, the LMV5... will check the blower air pressure switch with the blower still running by using a three-way solenoid valve (APS checking). If the switch checks out the LMV5... will then proceed directly to Phase 24, driving to prepurge.
- 12) Safety Time 1 is defined as the overlap of the ignition spark and pilot valve. Safety Time 2 is defined as the overlap of the pilot valve and the main fuel valves. Interval 1 and Interval 2 are stabilization times for the pilot and main flames, respectively.
- 13) Continuous purge can be used for multiple burner applications where return heat may be a problem.
- 14) Actuator position is checked by using one of three methods. The method depends upon the phase of the sequence. Position Required to Proceed means that the actuators must achieve and hold a certain position for the sequence to proceed. Dynamic Position Checking means that the actuator is evaluated by a "time and distance from target" algorithm. The further the actuator is away from its target, the less time the actuator is permitted to be in that position. Run -Time Position Checking means that the actuator is expected to be at a certain point in a certain amount of time (based off of the run-time of the actuator).
- 15) For direct spark oil fuel trains, spark (ignition) can occur during prepurge if *IgnOilPumpStart* is set to Phase 22.

IMPORTANT: The Extraneous Light Test should ALWAYS be enabled for gas / oil fired boilers. The only time parameter *ExtranLightTest* should be set to deactivated are for applications such as waste incineration.

Oil Train : LightOilLO

Terminal	Description	Phase	00	01	10	12	20	21	22	24	30	32	34	36	38	40	42	44	50	52	54	60	62	70	72	74	76	78	79							
		Lockout Phase	Safety Phase	Home Run Pos.	Burner Standby	Safety Relay = ON	Release of startup, SV=ON	Comb. Fan = ON	Drive to Purge Pos.	Purge	Purge	Preignite (SPARK) = ON	Pilot Valve = ON	IGN (SPARK)= OFF	Interval 1 (Pilot Stabilization)	Safety Time 1																				
		START-UP	SHUTDOWN																																	
		OPERATION	SHUTDOWN																																	
X4-01.2	Fuel Select Oil	Note 1																																		
X3-04.1	Safety Loop (Limits)	Note 2																																		
X5-03.1	ON / OFF Switch	Note 10																																		
N/A	Flame Signal	Note 9																																		
X3-02.1	Blower Air SW (APS)																																			
X4-01.3	Blower Aux. Contact (FCC)																																			
X4-01.3	FGR Press. SW (instead of FCC)																																			
X9-03.2	POC SW Gas (CPI)	Note 3																																		
X9-03.2	POC SW Oil (CPI) LMV52																																			
X9-03.2	POC SW Gas +Oil (CPI) LMV52																																			
X7-03.2	POC SW Gas (CPI)																																			
X7-03.2	POC SW Oil (CPI)																																			
X7-03.2	POC SW Gas +Oil (CPI)																																			
X6-01.1	Start Rel. Oil (Atom. Media PS)																																			
X5-02.2	High Oil Press SW																																			
X5-01.2	Low Oil Press SW																																			
X3-01.1	Fan																																			
X4-02.3	Ignition																																			
X6-02.3	Oil Pump Motor Starter																																			
X6-02.3	Oil Pump Motor Starter																																			
X4-03.3	Start Signal																																			
X4-03.3	3 Way Valve (APS checking)																																			
X4-03.3	3 Way Valve (APS checking) INV.																																			
X3-01.2	Alarm	Note 4																																		
X6-03.3	Oil valve SV (or Atom. Media)																																			
X8-01.2	Main fuel indicator (Oil)																																			
X8-02.1	Oil valve V1 (Main)																																			
X8-03.1	Oil valve V1 (Main)																																			
X7-01.3	Oil valve V2 (Staged, load depen.)																																			
X7-02.3	Oil valve V3 (Staged, load depen.)																																			

Legend :
 Energized
 Energized or De-energized
 X De-energized
M Must be Energized by end of Phase
F Must be De-energized by end of Phase
See the first pages of Section 4-3 for notes.

**Oil Train :
LO w Gasp**

Terminal	Description	Phase	00	01	10	12	20	21	22	24	30	32	34	36	38	40	42	44	50	52	54	60	62	70	72	74	76	78	79	
		Lockout Phase	Safety Phase	Home Run Pos.	Burner Standby	Safety Relay = ON	Release of startup, SV=ON	Comb. Fan = ON	Drive to Purge Pos.	Purge	Purge	Preignite (SPARK) = ON	Pilot Valve = ON	IGN (SPARK)= OFF	Interval 1 (Pilot Stabilization)	Safety Time 1	Safety Time 2	Interval 2 (Main Stabilization)	Drive to Low Fire Pos.	Operation 1 (Norm. Operation)	Operation 2 (Driving to L. Fire)	Afterburn Time	Driving to Postpurge Pos.	Mandatory Postpurge 1	Optional Postpurge 3	Direct start				
START-UP												OPERATION												SHUTDOWN						
X4-01.2	Fuel Select Oil	Note 1																												
X3-04.1	Safety Loop (Limits)	Note 2																												
X5-03.1	ON / OFF Switch	Note 10																												
N/A	Flame Signal	Note 9																												
X3-02.1	Blower Air SW (APS)																													
X4-01.3	Blower Aux. Contact (FCC)																													
	FGR Press. SW (instead of FCC)																													
X9-03.2	POC SW Gas (CPI)	Note 3																												
X9-03.2	POC SW Oil (CPI) LMV52																													
X9-03.4	Low Gas Press SW	Note 6																												
X7-03.2	POC SW Gas (CPI)																													
LMV52	POC SW Oil (CPI)																													
X6-01.1	POC SW Gas +Oil (CPI)																													
X6-01.1	Start Rel. Oil (Atom. Media PS)																													
X5-02.2	High Oil Press SW																													
X5-01.2	Low Oil Press SW																													
X3-01.1	Fan																													
X4-02.3	Ignition																													
X6-02.3	Oil Pump Motor Starter																													
	Start Signal																													
X4-03.3	3 Way Valve (APS checking)																													
	3 Way Valve (APS checking) INV.																													
X3-01.2	Alarm	Note 4																												
X6-03.3	Oil valve SV (or Atom. Media)																													
X9-01.1	Gas valve SV (Usually Outdoor)																													
X9-01.2	Gas valve PV (Pilot Valve)	Note 5																												
X8-01.2	Main fuel indicator (Oil)																													
X8-02.1	Oil valve V1 (Main)																													
X8-03.1	Oil valve V1 (Main)																													
X7-01.3	Oil valve V2 (Staged, load depen.)																													
X7-02.3	Oil valve V3 (Staged, load depen.)																													

Legend : Energized Energized or De-energized De-energized

M Must be Energized by end of Phase F Must be De-energized by end of Phase

See the first pages of Section 4-3 for notes.

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