



# SERIES 20/30 INSTALLATION INSTRUCTIONS and field service check list



## Introduction

The Selectra SERIES 20/30 electronic gas flame modulation systems are designed primarily for commercial and light industrial space heating, as components of indirect fired units with atmospheric burners. All fuel gases are compatible.

The SERIES 20 is designed for single furnace operation, and the SERIES 30 is capable of handling up to four furnaces. They may be field installed on existing equipment or specified for new equipment installation.

The systems utilize Modulator-Regulator valves. Amplifiers are available with high-fire ignition. A wall mounted Selectrastat senses space temperature and has an integral selector with a 60° to 85° F range. Optionally, a remote Temperature Sensor paired with a separate Temperature Selector (60° to 85° F) can be substituted for the Selectrastat.

## Table of Contents

Page 2	Specifications and Dimensions
Page 3	Installation of Components Preliminary Circuit Analysis
Page 4 & 5	Field Service Checklist
Page 6	Performance Check Extended High-Fire Ignition Low Limit Stat
Page 7	Wiring Diagrams
Page 8	Temperature Calibration Valve Adjustments

## System Components

### SERIES 20 Amplifiers:

- A1010A - single furnace
- A1010B - w/ high fire ignition

### SERIES 30 Amplifiers:

- A1011A - multiple furnace
- A1011B - w/ high fire ignition

### Modulator-Regulator Valves:

- MR410 (3/8" and 1/2" pipe size)
- MR510 (1/2" and 3/4" pipe size)
- MR610 (3/4" and 1" pipe size)

**Selectrastat:** selector and integral sensing  
T120 - (60° to 85° F) - *supersedes T107A-1*

*or optional pair to replace Selectrastat...*

**Space Temperature Selector:** selection only  
TD120 - (60° to 85° F) - *supersedes TD107A*

*Optional: ETD-1 enclosure,  
EFP-1 cover plate only - no enclosure*

**Space Temperature Sensor:** remote sensing  
TS120 - *supersedes TS2003A*



A1010 Amplifier



A1011 Amplifier



Valve



Selectrastat



Temperature Selector



Temperature Sensor

CAUTION: Operation of combustion equipment can be hazardous resulting in bodily injury or equipment damage. Each burner should be supervised by a combustion safeguard and only qualified personnel should install, make system adjustments and perform any required service.



**ORDAN THERMAL PRODUCTS LTD**  
Combustion Equipment & Controls for Industry  
21 Amber St # 9, Markham Ontario Canada L3R 4Z3  
Tel: (905) 475-9292 Fax: (905) 475-3286  
[www.ordanthermal.com](http://www.ordanthermal.com)

NOTICE: Maxitrol practices a policy of continuous improvement in the design of its products. It reserves the right to change the specifications at any time without prior notice.



## Installation of Components

**Amplifier:** Slide or snap out circuit board from amplifier base. Mount base with two screws in chosen location protected from weather or contaminated atmosphere. Amplifier is ready for wiring when circuit board is replaced on base - protective cover need not be removed. Control wires connecting the Selectrastat or Space Temperature Sensor must not be run close to or inside conduit with power or ignition wires. Doing so may cause the unit to function erratically or may destroy the amplifier. If shielded wires are used, shield must be insulated and grounded at the amplifier location only.

**Selectrastat:** Pull dial and cover outward. Loosen screws in terminal strip, tilt out and lift up. Install in area where representative space temperature is to be sensed. Wire as shown in diagram, page 7 - reassemble.

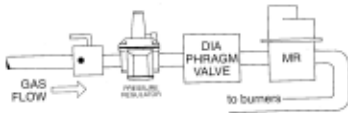
**Space Temperature Sensor:** Remove cover and install in area where representative space temperature is to be sensed. Wire as shown in diagram, page 7 - reassemble.

**Space Temperature Selector:** Install in control cabinet or other chosen location. Remove cover and wire as shown in diagram, page 7 - reassemble.

**Note:** For systems using up to four automatic gas valves with 0.8 amp maximum current each, a 100VA transformer will be adequate.

In the event that an automatic valve's current exceeds 0.8 amps, it would be advisable to wire according to the 'Independent Power Supply' diagram, page 7. The transformer for the modulating power - terminals 8 and 9 - should be 40VA, and the automatic valve transformer should be capable of handling required loads up to 3.5 amps maximum. If exceeding 3.5 amps, it will be necessary to operate an auxiliary relay with contact rating sufficient to handle the automatic valves.

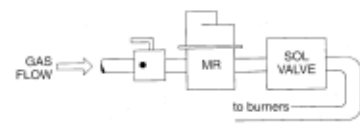
**Valve:** The MR valve must be in upright position, in a horizontal run of pipe only, with pilot gas supply upstream.



If diaphragm type automatic gas valve is used with separate regulator, install MR valve downstream from diaphragm gas valve. Retain regulator in manifold and adjust 2 or 3 turns to compensate for pressure drop of MR valve.



If full combination control is used, install MR valve downstream. Adjust regulator in combination control 2 or 3 turns to compensate for pressure drop at MR valve.



If solenoid type automatic gas valve is used with separate regulator, replace regulator with the MR valve.

## Preliminary Circuit Analysis

In order to diagnose the cause of problems in this system it is necessary to determine certain values. It is helpful to have an AC and DC voltmeter and an ohmmeter capable of reading 0 to 15,000 ohms.

**Modulating Function Test** - when temperature at Selectrastat or Sensor is 60° to 85°F (16° to 29°C): Connect a DC voltmeter to amplifier terminals 1 and 2. If more convenient, the meter may be attached to the MR valve terminals. Rotate temperature selection knob to maximum setting. The DC volts should read zero. The voltage should gradually increase to at least 20 volts when the temperature selector is slowly rotated to its minimum (generally over a 3° to 4° range).

**Automatic Valve Function** - when temperature at Selectrastat or Sensor is 60° to 80°F (16° to 29°C): Disconnect the wires at amplifier terminals 10 and 11, and connect an ohmmeter. Rotate temperature selector to maximum setting - ohmmeter should show continuity. Rotate temperature selector to minimum setting - ohmmeter should show open circuit. Reconnect the wires to terminals 10 and 11.

**CAUTION:** Operation of combustion equipment can be hazardous resulting in bodily injury or equipment damage. Each burner should be supervised by a combustion safeguard and only qualified personnel should install, make system adjustments and perform any required service.



**ORDAN THERMAL PRODUCTS LTD**  
**Combustion Equipment & Controls for Industry**  
 21 Amber St # 9, Markham Ontario Canada L3R 4Z3  
 Tel: (905) 475-9292 Fax: (905) 475-3286  
[www.ordanthermal.com](http://www.ordanthermal.com)

**NOTICE:** Maxitrol practices a policy of continuous improvement in the design of its products. It reserves the right to change the specifications at any time without prior notice.

**Automatic Valve Function** - when temperature at Selectrastat or Sensor is less than 60°F (16°C) or greater than 85°F (29°C): Disconnect the wires at amplifier terminals 10, 11 and 3. DC modulating voltage across terminals 1 and 2 should be zero. Ohm reading across terminals 10 and 11 should be zero ohms.



Reconnect wire to terminal 3 of amplifier. Carefully connect a piece of jumper wire across the thermistor as shown (make only temporary connection). Ohm reading at terminals 10 and 11 should be infinite (open circuit). Modulating voltage at terminals 1 and 2 should be greater than 17 volts.

Reconnect wires to terminals 10 and 11. Amplifier is not faulty if the above conditions are met.

# Field Service Checklist

SYMPTOM	POSSIBLE CAUSE	FIELD TEST	REMEDY
<p><b>A.</b> Automatic control valve will not close despite full range of modulating voltage at terminals 1 and 2.</p>	<p>1. Faulty automatic control valve. 2. Installation wiring error. 3. Amplifier is faulty.</p>	<p>1. Remove wire from valve, if valve does not close - valve is faulty. 2. Remove wire from amplifier terminal 10 or 11. If valve remains open, check for miswiring. 3. If AC voltage will not drop to zero at terminals 8 and 11 - when DC voltage at terminals 1 and 2 is above 20 VDC - amplifier is faulty. If space temperature is less than 60° or greater than 85° F (&lt;16° or &gt;29°C), see Preliminary Circuit Analysis, page 3. 4. Read voltage across valve terminals. If 24 V AC, valve is faulty. 5. Read voltage across terminals 8 and 11 on amplifier. If 24 V AC, check for open circuit to automatic valve. If space temperature is less than 60° or greater than 85° F (&lt;16° or &gt;29° C), see Preliminary Circuit Analysis, page 3. 6. If AC voltage reading remains zero - when DC voltage at terminals 1 and 2 is below 14 V DC - amplifier is faulty. If space temperature is less than 60° or greater than 85° F (&lt;16° &gt; 29°C), see Preliminary Circuit Analysis, page 3. 7. Read voltage at amplifier terminals 8 and 11 (24 V AC). 8. Arrow on MR valve should point in one direction of gas flow. 9. Disconnect and measure across wires connected to amplifier terminals 3 and 4 (A1010 models). Should read between 8,000 and 12,000 ohms. 10. Check wiring for defects. 11. Plunger should be smooth and clean and operate freely in solenoid sleeve. Must be installed as shown in "Valve Adjustments" figure, page 8. 12. Measure voltage across MR valve.</p>	<p>1. Replace automatic control valve. 2. Correct wiring. 3. Replace amplifier. 4. Replace automatic control valve. 5. Correct wiring. 6. Replace amplifier. 7. Power supply must be 24 V AC. 8. Install properly. 9. If above 12,000 ohms, check circuit for open or loose wires. 10. Replace wiring if necessary. 11. Clean or replace plunger. 12. If modulating voltages are obtained but no gas modulation, MR valve is faulty. Replace if necessary.</p>
<p><b>B.</b> Automatic control valve won't open despite full range of modulating voltage at terminals 1 and 2.</p>	<p>4. Faulty automatic control valve. 5. Open wire to automatic valve. 6. Amplifier is faulty.</p>	<p>13. Disconnect and measure across wires connected to amplifier terminals 3 and 4 (A1010 models). Should read between 8,000 and 12,000 ohms. 14. Increase temperature setting 10 degrees. 15. Check for parts ( see "Valve Adjustments" figure, page 8). 16. Examine. Plunger should be clean, smooth, and operate freely in solenoid sleeve. 17. Remove wire from MR valve. 18. Remove spring 5 from MR valve (see valve figure, page 8) push down on plunger. Insufficient manifold pressure with furnace operating indicates supply is too low. 19. Check seal on calibration potentiometer. 20. Examine. Plunger should be clean, smooth, and operate freely in solenoid sleeve. 21. Inspect wiring. 22. Observe DC voltage across amplifier terminals 1 and 2.</p>	<p>13. If below 8,000 ohms, check circuit for shorts or miswiring. 14. If heater goes to high fire, system is working correctly. 15. Install correct parts. 16. Clean, or replace plunger if necessary. 17. If MR valve remains on low fire, valve may be faulty. Check item 19 below, then replace valve if necessary. 18. Check for obstruction in gas pipe ahead of controls. Increase gas pressure if possible. 19. Recalibrate per "Temperature Calibration" procedure. 20. Clean, or replace plunger if necessary. 21. Correct wiring. 22. If erratic or pulsating DC voltage is observed and wiring shows no defects, replace amplifier. If erratic or pulsating voltage continues, contact Maxitrol.</p>
<p><b>C.</b> No gas flow</p>	<p>7. Faulty power supply. 8. MR valve installed backwards</p>	<p>19. Check seal on calibration potentiometer. 20. Examine. Plunger should be clean, smooth, and operate freely in solenoid sleeve. 21. Inspect wiring. 22. Observe DC voltage across amplifier terminals 1 and 2.</p>	<p>19. Recalibrate per "Temperature Calibration" procedure. 20. Clean, or replace plunger if necessary. 21. Correct wiring. 22. If erratic or pulsating DC voltage is observed and wiring shows no defects, replace amplifier. If erratic or pulsating voltage continues, contact Maxitrol.</p>
<p><b>D.</b> Continuous high fire.</p>	<p>9. Open circuit in sensing and setting circuit.</p>	<p>19. Check seal on calibration potentiometer. 20. Examine. Plunger should be clean, smooth, and operate freely in solenoid sleeve. 21. Inspect wiring. 22. Observe DC voltage across amplifier terminals 1 and 2.</p>	<p>19. Recalibrate per "Temperature Calibration" procedure. 20. Clean, or replace plunger if necessary. 21. Correct wiring. 22. If erratic or pulsating DC voltage is observed and wiring shows no defects, replace amplifier. If erratic or pulsating voltage continues, contact Maxitrol.</p>
<p><b>E.</b> Continuous high fire but automatic valve cycles.</p>	<p>10. Open circuit in wiring to MR valve. 11. Plunger jammed or installed upside down. 12. Faulty MR valve.</p>	<p>19. Check seal on calibration potentiometer. 20. Examine. Plunger should be clean, smooth, and operate freely in solenoid sleeve. 21. Inspect wiring. 22. Observe DC voltage across amplifier terminals 1 and 2.</p>	<p>19. Recalibrate per "Temperature Calibration" procedure. 20. Clean, or replace plunger if necessary. 21. Correct wiring. 22. If erratic or pulsating DC voltage is observed and wiring shows no defects, replace amplifier. If erratic or pulsating voltage continues, contact Maxitrol.</p>
<p><b>F.</b> Furnace won't activate due to constant high modulating voltage. (above 17 V DC)</p>	<p>13. Short circuit in sensing and setting circuit.</p>	<p>19. Check seal on calibration potentiometer. 20. Examine. Plunger should be clean, smooth, and operate freely in solenoid sleeve. 21. Inspect wiring. 22. Observe DC voltage across amplifier terminals 1 and 2.</p>	<p>19. Recalibrate per "Temperature Calibration" procedure. 20. Clean, or replace plunger if necessary. 21. Correct wiring. 22. If erratic or pulsating DC voltage is observed and wiring shows no defects, replace amplifier. If erratic or pulsating voltage continues, contact Maxitrol.</p>
<p><b>G.</b> Continuous low or medium fire, but automatic valve cycles correctly.</p>	<p>14. Heat load requires low fire only. 15. Plunger and/or maximum spring missing. 16. Jammed plunger. 17. Other valve faults. 18. Inadequate supply pressure.</p>	<p>19. Check seal on calibration potentiometer. 20. Examine. Plunger should be clean, smooth, and operate freely in solenoid sleeve. 21. Inspect wiring. 22. Observe DC voltage across amplifier terminals 1 and 2.</p>	<p>19. Recalibrate per "Temperature Calibration" procedure. 20. Clean, or replace plunger if necessary. 21. Correct wiring. 22. If erratic or pulsating DC voltage is observed and wiring shows no defects, replace amplifier. If erratic or pulsating voltage continues, contact Maxitrol.</p>
<p><b>H.</b> Incorrect discharge air temperature.</p>	<p>19. Calibration</p>	<p>19. Check seal on calibration potentiometer. 20. Examine. Plunger should be clean, smooth, and operate freely in solenoid sleeve. 21. Inspect wiring. 22. Observe DC voltage across amplifier terminals 1 and 2.</p>	<p>19. Recalibrate per "Temperature Calibration" procedure. 20. Clean, or replace plunger if necessary. 21. Correct wiring. 22. If erratic or pulsating DC voltage is observed and wiring shows no defects, replace amplifier. If erratic or pulsating voltage continues, contact Maxitrol.</p>
<p><b>I.</b> Erratic or severely pulsating flame.</p>	<p>20. Dirty or sticking plunger. 21. Intermittent shorting in wiring 22. Faulty amplifier.</p>	<p>19. Check seal on calibration potentiometer. 20. Examine. Plunger should be clean, smooth, and operate freely in solenoid sleeve. 21. Inspect wiring. 22. Observe DC voltage across amplifier terminals 1 and 2.</p>	<p>19. Recalibrate per "Temperature Calibration" procedure. 20. Clean, or replace plunger if necessary. 21. Correct wiring. 22. If erratic or pulsating DC voltage is observed and wiring shows no defects, replace amplifier. If erratic or pulsating voltage continues, contact Maxitrol.</p>

**\*Control circuits external to the Series 21 and 31 can cause burner malfunction. Always check manual valve to be certain gas is on, and check limit controls for normal operation.**

# Performance Check

With the modulator-regulator valve installed as instructed (voltages are approximate)...

**Minimum fire** is obtained above 14 volts DC.

Manifold pressure can be adjusted as follows: *Standard spring* 0.2" to 1.2" w.c. (.5 to 3 mbar), *MR\*10B10L-1 spring* 1" to 2.8" w.c. (2.5 to 7 mbar),

**Maximum fire** is obtained at zero volts DC.

Use manufacturer's pressure specifications when available. Maxitrol standard factory settings are 0.5" w.c. (1.25 mbar) minimum and 3.5" w.c. (8.75 mbar) maximum. H-1 models 1.75" w.c. (4.35 mbar) minimum and 11" w.c. (27 mbar) maximum.

## At Selectrstat / Temperature Selector:

1) Set below room temperature and slowly increase setting until furnace begins operating. Furnace should ignite and remain on low fire. If high fire ignition is being used - (A1010B or A1011B amplifiers) the furnace will ignite at high fire for a duration of either 5 or 25 seconds (see Extended High Fire Ignition below), then modulate to low fire. At low fire (manifold pressure about 0.5" w.c. [1.25 mbar]), a reading of approximately 14 or more volts DC should be obtained.

2) Rotate 3° higher.

3) Furnace should now be at high fire, manifold pressure about 3.5" w.c. (8.75 mbar). Less than 2 volts DC should read across Modulator-Regulator valve terminals. Rotate slowly to a lower setting. Furnace should modulate to low fire, with voltage at modulator approximately 15-17 volts, internal relay will trip and solenoid automatic control valve will close.

*If the preceding readings are obtained, proceed with Furnace Adjustments.*

*If the preceding readings are not obtained:*

4) Recheck wiring to ensure system is consistent with appropriate wiring diagram.

5) Check power source for 24 volts.

6) Some automatic control valves require as much as 20 seconds to open. In this case, check for 24VAC output at automatic valve terminals.

## Furnace Adjustments:

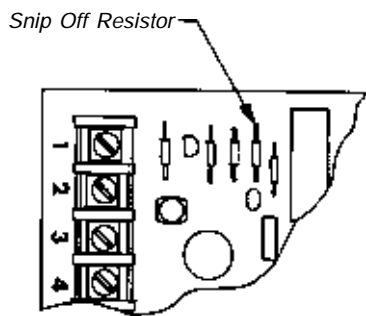
For space heating, first calculate heat loss. If reduction of furnace input is indicated, consult furnace manufacturer about changing to smaller orifices. *Do not try to reduce by pressure adjustment or throttling the gas supply.*

An oversized furnace input is easily identified, particularly during cold weather. If outdoor temperature is low and the system cycles on and off instead of maintaining a low input, the furnace is oversized. Consult furnace manufacturer.

## Extended High-Fire Ignition

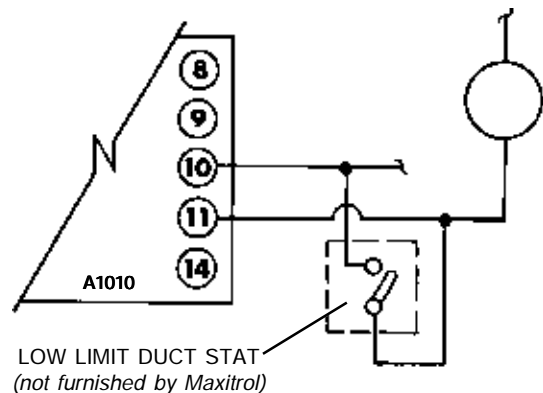
On A1010B and A1011B amplifiers, the high fire start duration is approximately five seconds. To extend it from 5 seconds to approximately 25 seconds, remove 100K (brown-black-yellow-gold) resistor from board as shown.

On furnaces equipped with slow opening automatic valves, it is recommended to make this modification.



## Low Limit Stat

When fresh outside air is introduced and the space being heated is up to temperature, the furnace will shut off. If the recirculated air should be too cool, temper it by wiring a duct-stat, as shown.



**CAUTION:** Operation of combustion equipment can be hazardous resulting in bodily injury or equipment damage. Each burner should be supervised by a combustion safeguard and only qualified personnel should install, make system adjustments and perform any required service.

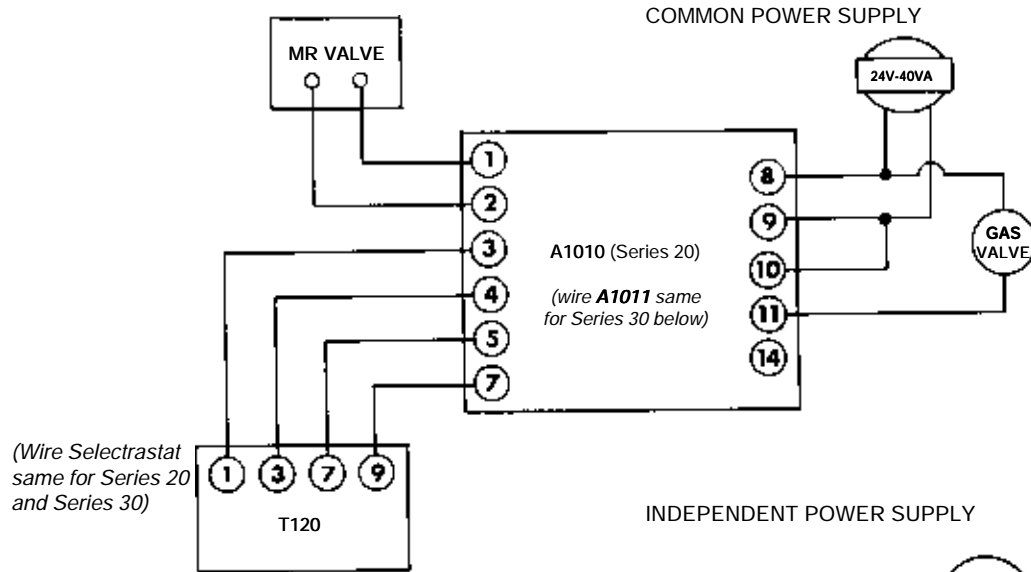


**ORDAN THERMAL PRODUCTS LTD**  
Combustion Equipment & Controls for Industry  
21 Amber St # 9, Markham Ontario Canada L3R 4Z3  
Tel: (905) 475-9292 Fax: (905) 475-3286  
[www.ordanthermal.com](http://www.ordanthermal.com)

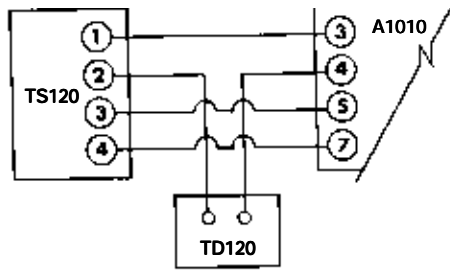
**NOTICE:** Maxitrol practices a policy of continuous improvement in the design of its products. It reserves the right to change the specifications at any time without prior notice.

# Wiring Diagrams

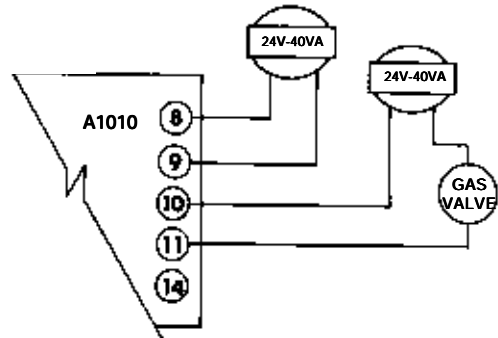
## Single Furnace Operation - Series 20



### REMOTE TEMPERATURE SENSOR W/SEPARATE SELECTOR

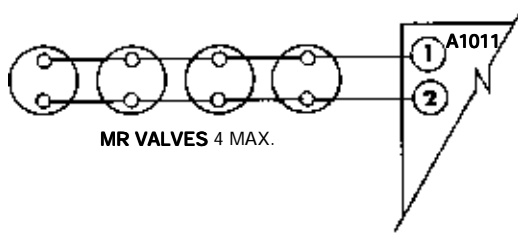


### INDEPENDENT POWER SUPPLY



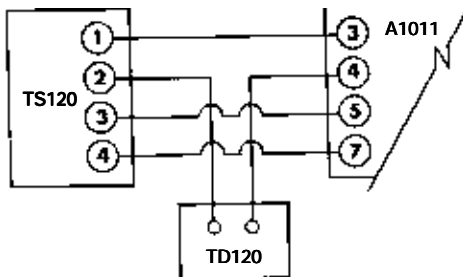
## Multiple Furnace Operation - Series 30

### WIRED IN PARALLEL

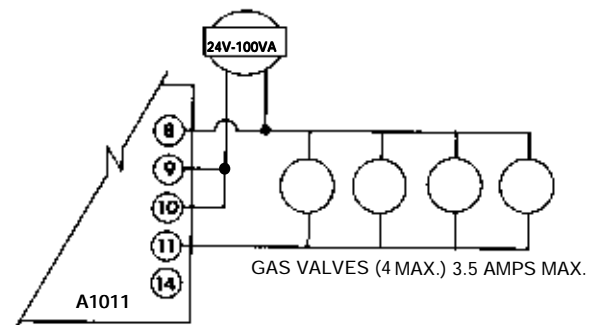


MR VALVES 4 MAX.

### REMOTE TEMPERATURE SENSOR W/SEPARATE SELECTOR

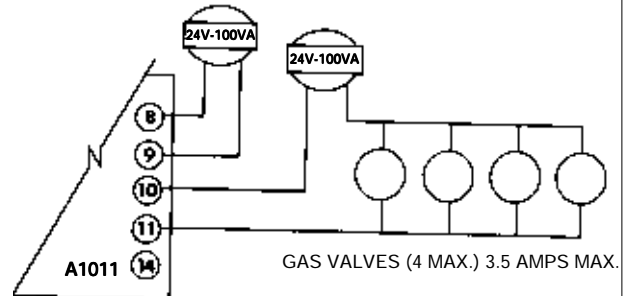


### COMMON POWER SUPPLY



GAS VALVES (4 MAX.) 3.5 AMPS MAX.

### INDEPENDENT POWER SUPPLY



GAS VALVES (4 MAX.) 3.5 AMPS MAX.

CAUTION: Operation of combustion equipment can be hazardous resulting in bodily injury or equipment damage. Each burner should be supervised by a combustion safeguard and only qualified personnel should install, make system adjustments and perform any required service.



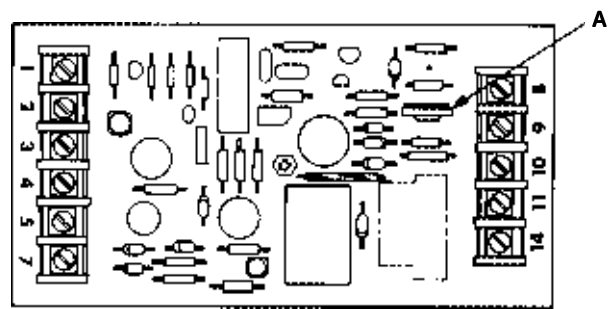
**ORDAN THERMAL PRODUCTS LTD**  
**Combustion Equipment & Controls for Industry**  
 21 Amber St # 9, Markham Ontario Canada L3R 4Z3  
 Tel: (905) 475-9292 Fax: (905) 475-3286  
[www.ordanthermal.com](http://www.ordanthermal.com)

NOTICE: Maxitrol practices a policy of continuous improvement in the design of its products. It reserves the right to change the specifications at any time without prior notice.

# Temperature Calibration

If needed - amplifier potentiometer adjustment - for space heat sensing with either Selectrstat (T120) or paired Selector (TD120) and Sensor (TS120):

Install a thermometer or other temperature measuring device at the room sensor. Set the temperature selector at this sensed temperature. Place DC voltmeter on MR valve or amplifier terminals 1 and 2. Adjust potentiometer (A) until a voltage of 14V DC is obtained.



## Valve Adjustments

(See bulletin MT2035 for additional M/MR valve information)

**Note:** High Fire Adjustment should be checked whenever Low Fire Adjustment is changed.

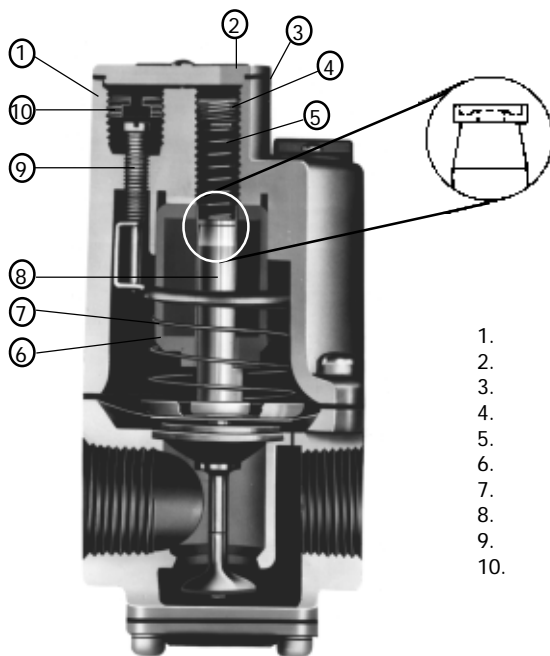
Disconnect wire from amplifier terminal 3, remove cover plate (2).

### High Fire Adjustments:

- A) Using maximum adjustment screw (4), set manifold pressure to furnace manufacturer's specifications.
- B) Replace cover plate (2) on Modulator-Regulator valve and reconnect wire to amplifier terminal 3.

### Low Fire Adjustments:

- A) Remove maximum adjusting screw (4), spring (5), and plunger (8). A small magnet is useful for this purpose. CAUTION - The plunger is a precision part. Handle carefully to avoid marring or picking up grease and dirt. Do not lubricate.
- B) Using minimum adjusting screw (9), set manifold pressure to furnace manufacturer's specifications.
- C) Replace plunger and spring retainer, spring, and maximum adjusting screw in proper order.



1. TOP HOUSING
2. COVER PLATE
3. SEAL GASKET
4. MAXIMUM ADJUSTMENT SCREW
5. MAXIMUM ADJUSTMENT SPRING
6. SOLENOID
7. MINIMUM ADJUSTMENT SPRING
8. PLUNGER
9. MINIMUM ADJUSTMENT SCREW
10. MINIMUM ADJUSTMENT SCREW STOP

CAUTION: Operation of combustion equipment can be hazardous resulting in bodily injury or equipment damage. Each burner should be supervised by a combustion safeguard and only qualified personnel should install, make system adjustments and perform any required service.



**ORDAN THERMAL PRODUCTS LTD**  
 Combustion Equipment & Controls for Industry  
 21 Amber St # 9, Markham Ontario Canada L3R 4Z3  
 Tel: (905) 475-9292 Fax: (905) 475-3286  
 www.ordanthermal.com



NOTICE: Maxitrol practices a policy of continuous improvement in the design of its products. It reserves the right to change the specifications at any time without prior notice.

**MAXITROL<sup>®</sup>**  **company**

**CAUTION:** Operation of combustion equipment can be hazardous resulting in bodily injury or equipment damage. Each burner should be supervised by a combustion safeguard and only qualified personnel should install, make system adjustments and perform any required service.



**ORDAN THERMAL PRODUCTS LTD**  
**Combustion Equipment & Controls for Industry**  
21 Amber St # 9, Markham Ontario Canada L3R 4Z3  
Tel: (905) 475-9292 Fax: (905) 475-3286  
[www.ordanthermal.com](http://www.ordanthermal.com)

NOTICE: Maxitrol practices a policy of continuous improvement in the design of its products. It reserves the right to change the specifications at any time without prior notice.