

Selectra® SERIES 20/30 INSTALLATION INSTRUCTIONS and field service check list



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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.

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

Specifications and Dimensions

Power Requirements:

Single Furnace.....24V AC, 40VA capacity
 Multiple Furnace.....24V AC, 100VA capacity

Temperature Control Range: 60° to 85°F

Ambient Limits: -30° to 125°F / -34° to 52°C

Gases: All fuel gases.

Pressure Limits:

Inlet (maximum) MR410 / 510 / 610.....1 psi / 69 mbar

Outlet (maximum fire)

standard spring*.....3.0" to 5.0" w.c. / 7 to 12 mbar

H - models.....7.5" to 12" w.c. / 19 to 30 mbar

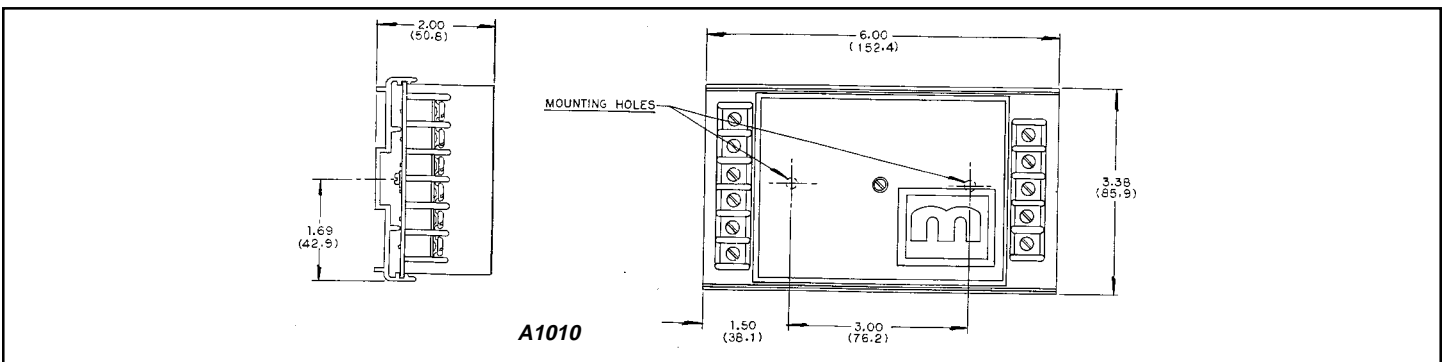
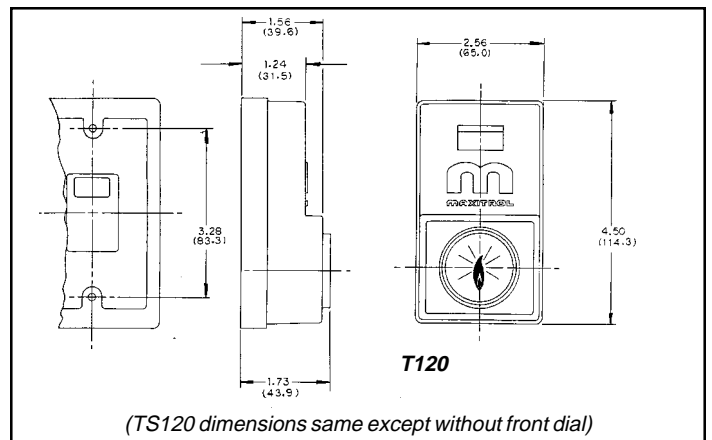
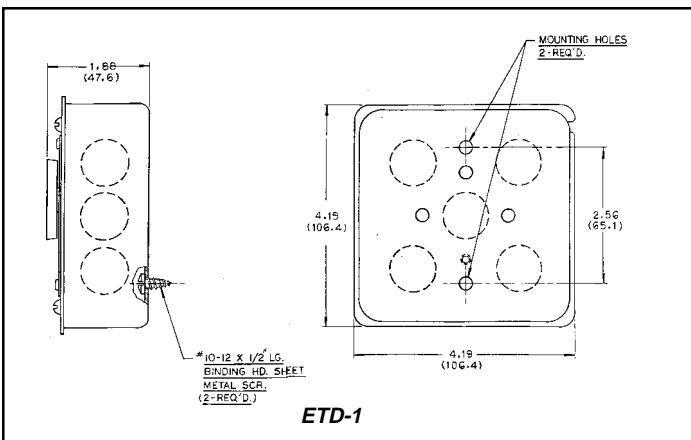
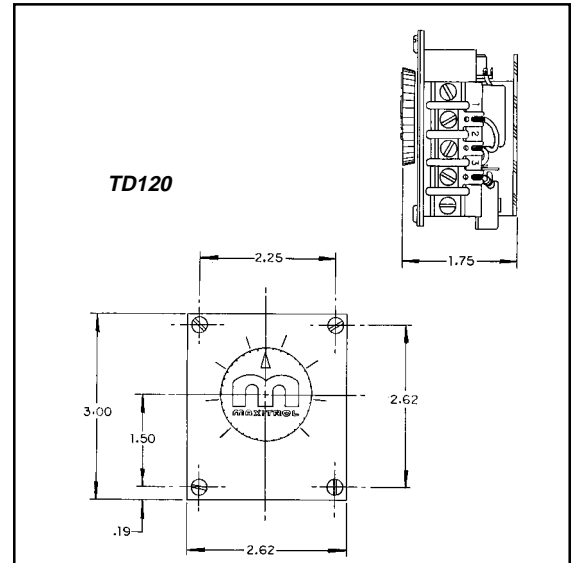
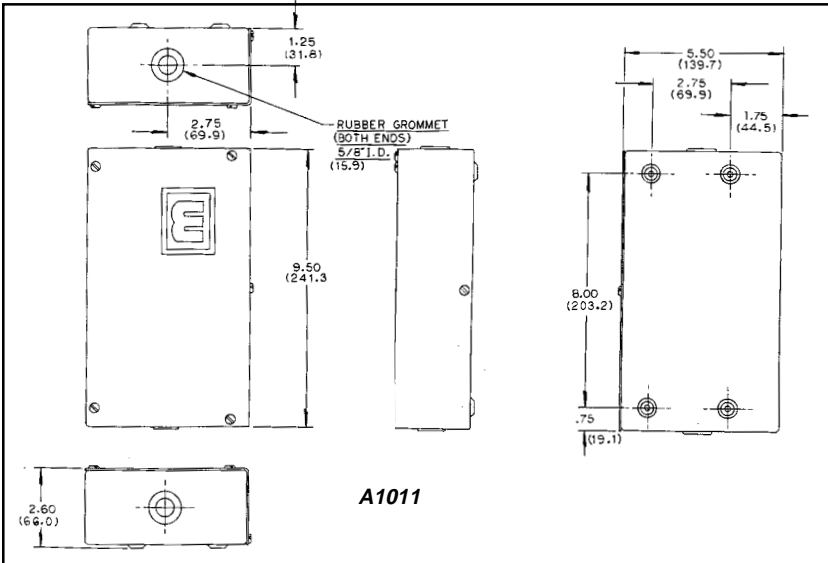
(Max. set point not to exceed 10" w.c. above min. set point)

Outlet (minimum fire)

standard spring*.....0.2" to 1.2" w.c. / .5 to 3 mbar

(-1) spring*.....1" to 2.8" w.c. / 2.5 to 7 mbar

(* other spring ranges available - consult factory)



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.

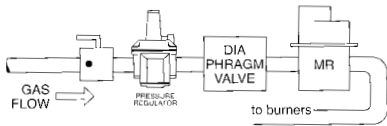
Space Temperature Sensor: Remove cover and install in area where representative space temperature is to be sensed. Wire as shown in diagram, page 7 - reassemble.

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

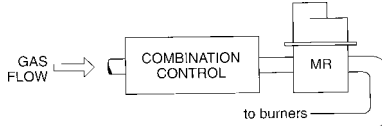
Note: For systems using up to four automatic gas valves with 0.8 amp maximum current each, a 100VA transformer will be adequate.

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.

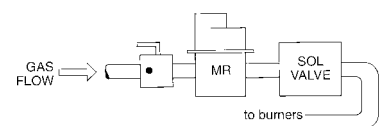
Valve: The MR valve must be in upright position, in a horizontal run of pipe only, with pilot gas supply upstream.



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

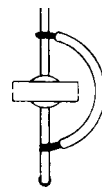
In order to diagnose the cause of problems in this system it is necessary to determine certain values. It is helpful to have an AC and DC voltmeter and an ohmmeter capable of reading 0 to 15,000 ohms.

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.

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.

SYMPTOM	POSSIBLE CAUSE	FIELD TESTS
A- Automatic control valve will not close despite full range of modulating voltage at terminals 1 and 2.	<ol style="list-style-type: none"> 1. Faulty automatic control valve. 2. Installation wiring error. 3. Amplifier is faulty. 	<ol style="list-style-type: none"> 1. Remove wire from valve, if valve doesn't close - 2. Remove wire from amplifier terminal 10 or 11. If miswiring. 3. If AC voltage will not drop to zero at terminals 8 and 2 is above 20 V DC - amplifier is faulty. If space temperature is greater than 85 F (<16 or >29 C), see Preliminary
B- Automatic control valve won't open despite full range of modulating voltage at terminals 1 and 2.	<ol style="list-style-type: none"> 4. Faulty automatic control valve. 5. Open wire to automatic valve. 6. Amplifier is faulty. 	<ol style="list-style-type: none"> 4. Read voltage across valve terminals. If 24V AC 5. Read voltage across terminals 8 and 11 on amplifier automatic valve. If space temperature is less than >29 C), see Preliminary Circuit Analysis, page 6. If AC voltage reading remains zero - when DC voltage is DC - amplifier is faulty. If space temperature is or >29 C), see Preliminary Circuit Analysis, page
C- No gas flow.	<ol style="list-style-type: none"> 7. Faulty power supply. 8. MR valve installed backwards. 	<ol style="list-style-type: none"> 7. Read voltage at amplifier terminals 8 and 9 (24V) 8. Arrow on MR valve should point in direction of flow
D- Continuous high fire.	<ol style="list-style-type: none"> 9. Open circuit in sensing and setting circuit. 	<ol style="list-style-type: none"> 9. Disconnect and measure across wires connected to read between 8,000 and 12,000 ohms.
E- Continuous high fire but automatic valve cycles.	<ol style="list-style-type: none"> 1- Open circuit in wiring to MR valve. 0. Plunger jammed or installed upside down. 1- Faulty MR valve. 1- Faulty MR valve. 1- Faulty MR valve. 2. 	<ol style="list-style-type: none"> 1- Check wiring for defects. 0. Plunger should be smooth and clean and operate installed as shown in 'Valve Adjustments' figure 1- Measure voltage across MR valve. 1- Measure voltage across MR valve. 1- Measure voltage across MR valve. 2.
F- Furnace won't activate due to constant high modulating voltage (above 17V DC).	<ol style="list-style-type: none"> 1- Short circuit in sensing and setting circuit. 3. 	<ol style="list-style-type: none"> 1- Disconnect and measure across wires connected to read between 8,000 and 12,000 ohms. 3.
G- Continuous low or medium fire, but automatic valve cycles correctly.	<ol style="list-style-type: none"> 1- Heat load requires low fire only. 4. Plunger and/or maximum spring missing. 1- Jammed plunger. 5. Other valve faults. 1- Other valve faults. 6. Inadequate supply pressure. 1- Inadequate supply pressure. 7. 1- Inadequate supply pressure. 8. 	<ol style="list-style-type: none"> 1- Increase temperature setting 10 degrees. 4. Check for parts. (See 'Valve Adjustments' figure) 1- Examine. Plunger should be clean, smooth, and 5. Remove wire from MR valve. 1- Remove wire from MR valve. 6. Remove Spring 5 from MR valve (Figure 1, page) 1- manifold pressure with furnace operating indicator 7. 1- manifold pressure with furnace operating indicator 8.
H- Incorrect space temperature.	<ol style="list-style-type: none"> 1- Calibration. 9. 	<ol style="list-style-type: none"> 1- Check seal on calibration potentiometer. 9.
I- Erratic or severely pulsating flame.	<ol style="list-style-type: none"> 2- Dirty or sticking plunger. 0. Intermittent shorting in wiring. 2- Faulty amplifier. 1. Dirty or sticking plunger. 2- Dirty or sticking plunger. 2. 	<ol style="list-style-type: none"> 2- Examine. Plunger should be clean, smooth, and 0. Inspect wiring. 2- Observe DC voltage across amplifier terminals 1. Observe DC voltage across amplifier terminals 2- Observe DC voltage across amplifier terminals 2.

** Control circuits external to the Series 20 and 30 can cause burner malfunction. Always*

Checklist

T	REMEDY
<p>valve is faulty. If valve remains open, check for</p> <p>and 11 - when DC voltage at terminals 1 space temperature is less than 60 or ary Circuit Analysis, page 3.</p>	<ol style="list-style-type: none"> 1. Replace automatic control valve. 2. Correct wiring. 3. Replace amplifier.
<p>, valve is faulty. olifier. If 24V AC, check for open circuit to an 60 or greater than 85 F (<16 or 3.</p> <p>voltage at terminals 1 and 2 is below 14V less than 60 or greater than 85 F (<16 ge 3.</p>	<ol style="list-style-type: none"> 4. Replace automatic control valve. 5. Correct wiring. 6. Replace amplifier.
<p>V AC). gas flow.</p>	<ol style="list-style-type: none"> 7. Power supply must be 24V AC. 8. Install properly.
<p>ed to amplifier terminals 3 and 4. Should</p>	<ol style="list-style-type: none"> 9. If above 12,000 ohms check circuit for open or loose wires.
<p>ate freely in solenoid sleeve. Must be , page 8.</p>	<ol style="list-style-type: none"> 1- Replace wiring if necessary. 0. Clean or replace plunger. 1- 1. If modulating voltages are obtained, but no gas modulation, MR valve is faulty. Replace if necessary. 1- 2.
<p>ed to amplifier terminals 3 and 4. Should</p>	<ol style="list-style-type: none"> 1- 3. If below 8,000 ohms check circuit for shorts or miswiring..
<p>e, page 8) d operate freely in solenoid sleeve.</p> <p>e 8), push down on plunger. Insufficient tes supply is too low.</p>	<ol style="list-style-type: none"> 1- If heater goes to high fire, system is working correctly. 4. Install correct parts. 1- Clean, or replace plunger if necessary. 5. If MR valve remains on low fire, valve may be faulty. Check item 18 below, then replace valve if necessary. 1- 6. Check for obstruction in gas pipe ahead of controls. Increase gas pressure if possible. 1- 7. 1- 8.
	<ol style="list-style-type: none"> 1- Recalibrate per 'Temperature Calibration' procedure. 9.
<p>d operate freely in solenoid sleeve.</p> <p>1 and 2.</p>	<ol style="list-style-type: none"> 2- Clean, or replace plunger if necessary. 0. Correct wiring. 2- If erratic or pulsating DC voltage is observed and wiring shows no defects, replace amplifier. If erratic or pulsating voltage continues, contact Maxitrol. 1- 2- 2.
<p>check manual valve to be certain gas is on, and check limit controls for normal operation.</p>	

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 Selectrastat / 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:

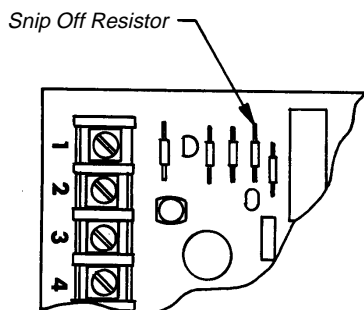
For space heating, first calculate heat loss. If reduction of furnace input is indicated, consult furnace manufacturer about changing to smaller orifices. *Do not try to reduce by pressure adjustment or throttling the gas supply.*

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

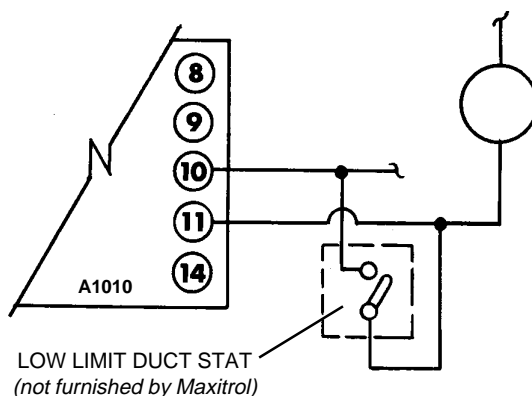
On A1010B and A1011B amplifiers, the high fire start duration is approximately five seconds. To extend it from 5 seconds to approximately 25 seconds, remove 100K (brown-black-yellow-gold) resistor from board as shown.

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



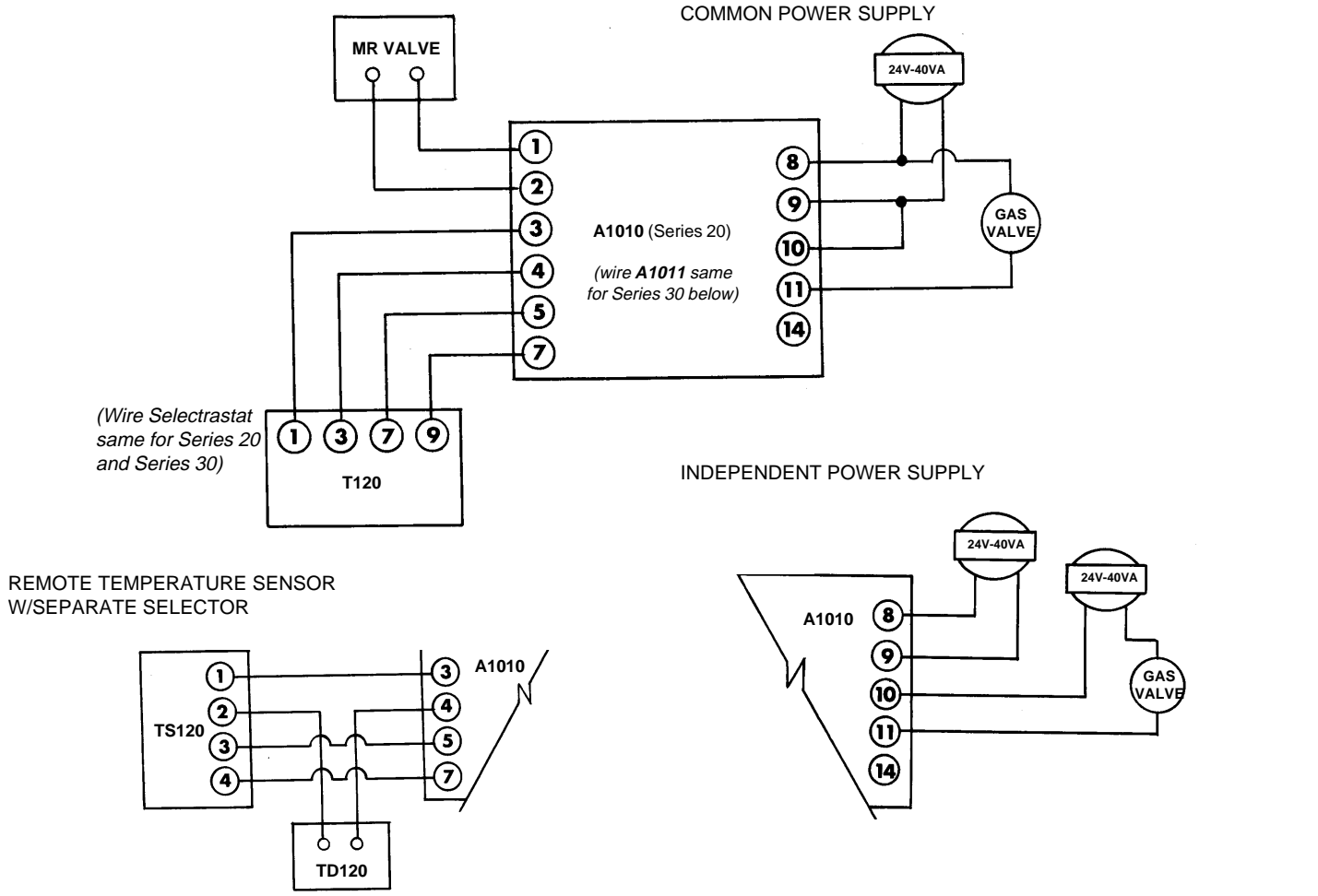
Low Limit Stat

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.

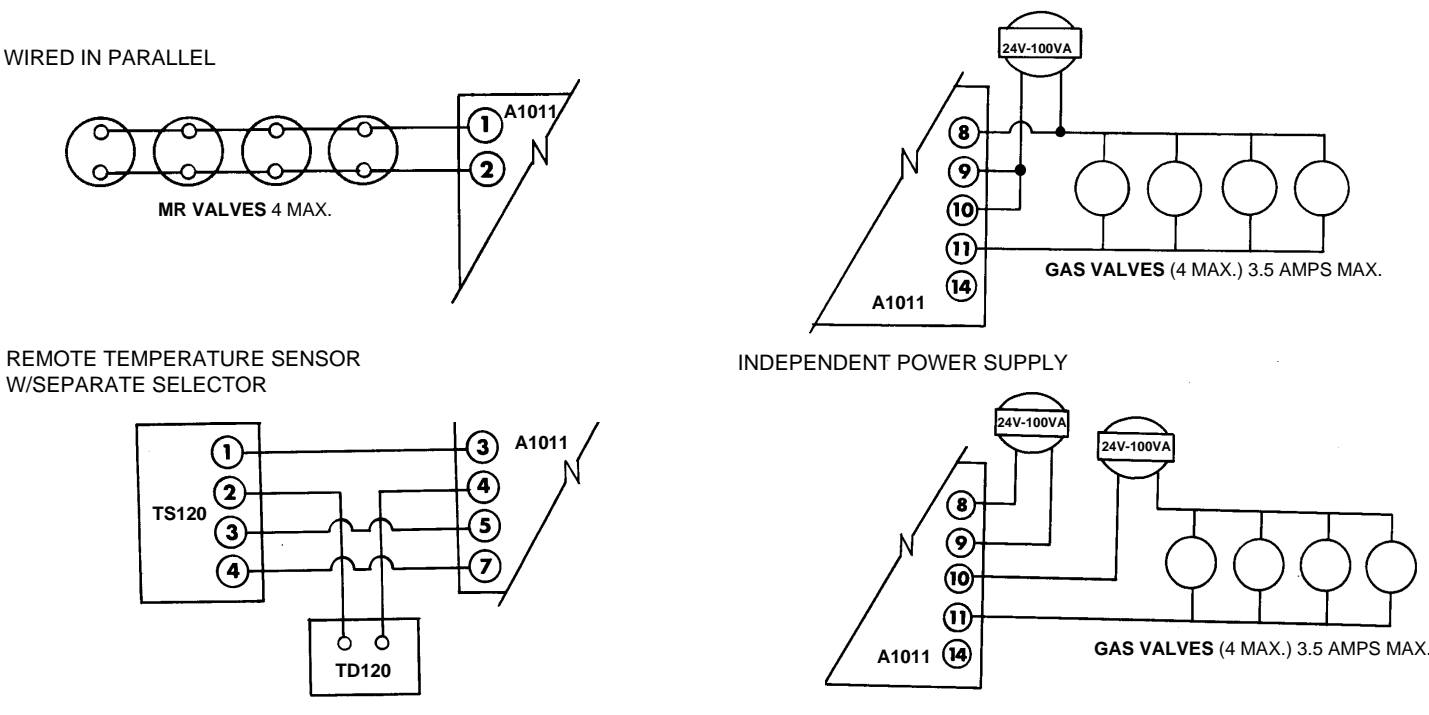


Wiring Diagrams

Single Furnace Operation - Series 20



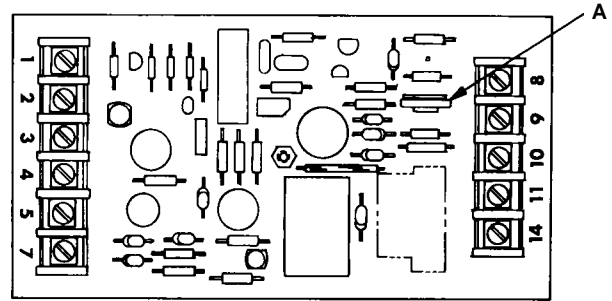
Multiple Furnace Operation - Series 30



Temperature Calibration

If needed - amplifier potentiometer adjustment - for space heat sensing with either Selectrastat (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.

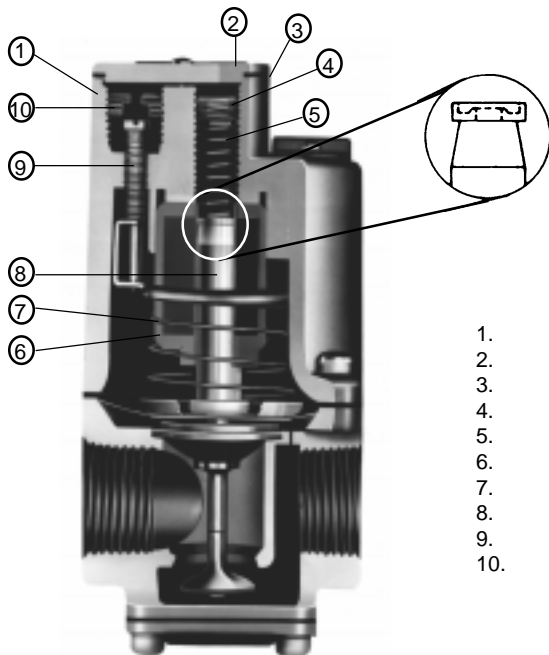
Disconnect wire from amplifier terminal 3, remove cover plate (2).

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

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