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.

**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

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.
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)

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.
**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.

**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 at 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 less than 60°F (16°C) or greater than 85°F (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.

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 across terminals 10 and 11 should be zero ohms.

**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. Reconnect the wires to terminals 10 and 11.

Reconnect wires to terminals 10 and 11. Amplifier is not faulty if the above conditions are met.
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>FIELD TEST</th>
</tr>
</thead>
</table>
| **A** | Automatic control valve will not close despite full range of modulating voltage at terminals 1 and 2. | 1. Faulty automatic control valve.  
2. Installation wiring error.  
3. Amplifier is faulty. | 1. Remove wire from valve, if valve doesn’t close - 24V AC is not applied.  
2. Remove wire from amplifier terminal 10 or 11.  
3. If AC voltage is above 20 V DC - amplifier is faulty.  
If space temperature is greater than 85 F (<16 or >29 C), see Preliminary Circuit Analysis. |
| **B** | Automatic control valve won’t open despite full range of modulating voltage at terminals 1 and 2. | 4. Faulty automatic control valve.  
5. Open wire to automatic valve.  
6. Amplifier is faulty. | 4. Read voltage across valve terminals. If 24V AC is not applied, see Preliminary Circuit Analysis, page 2.  
5. Read voltage across terminals 8 and 11 on automatic valve. If space temperature is less than 75 F (<29 C), see Preliminary Circuit Analysis, page 3.  
6. If AC voltage reading remains zero - when DC voltage is zero, amplifier is faulty. If space temperature is greater than 85 F (<16 or >29 C), see Preliminary Circuit Analysis, page 5. |
| **C** | No gas flow. | 7. Faulty power supply.  
8. MR valve installed backwards. | 7. Read voltage at amplifier terminals 8 and 9 (24V AC).  
8. Arrow on MR valve should point in direction of gas flow. |
| **D** | Continuous high fire. | 9. Open circuit in sensing and setting circuit. | 9. Disconnect and measure across wires connected to gas valve. Read between 8,000 and 12,000 ohms. |
| **E** | Continuous high fire but automatic valve cycles. | 1- 3. Open circuit in wiring to MR valve.  
0. Plunger jammed or installed upside down.  
1- 1. Faulty MR valve.  
1- 2. | 1- Check wiring for defects.  
0. Plunger should be smooth and clean and operate freely.  
1- 1. Measure voltage across MR valve.  
1- 2. |
| **F** | Furnace won’t activate due to constant high modulating voltage (above 17V DC). | 1- 3. Short circuit in sensing and setting circuit. | 1- Disconnect and measure across wires connected to gas valve. Read between 8,000 and 12,000 ohms. |
| **G** | Continuous low or medium fire, but automatic valve cycles correctly. | 1- 3. Heat load requires low fire only.  
4. Plunger and/or maximum spring missing.  
1- 1. Jammed plunger.  
1- 5. Other valve faults.  
1- 6. Inadequate supply pressure.  
1- 7.  
1- 8. | 1- Increase temperature setting 10 degrees.  
4. Check for parts. (See ‘Valve Adjustments’ figure 1. page 2.)  
1- 1. Examine. Plunger should be clean, smooth, and operate freely.  
1- 5. Remove wire from MR valve.  
1- 6. Remove Spring 5 from MR valve (Figure 1. page 3.)  
1- 7. Inspect manifold pressure with furnace operating.  
1- 8. |
| **H** | Incorrect space temperature. | 1- 9. Calibration. | 1- Check seal on calibration potentiometer. |
| **I** | Erratic or severely pulsating flame. | 2- 0. Dirty or sticking plunger.  
2- 1. Intermittent shorting in wiring.  
2- 2. Faulty amplifier. | 2- Examine. Plunger should be clean, smooth, and operate freely.  
0. Inspect wiring.  
2- 1. Observe DC voltage across amplifier terminals.  
2- 2. |

* Control circuits external to the Series 20 and 30 can cause burner malfunction. Always check for defective parts.*
<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas valve is faulty. If valve remains open, check for</td>
<td>1. Replace automatic control valve.</td>
</tr>
<tr>
<td>items 9 and 11 - when DC voltage at terminals 1 and 2 is less than 60</td>
<td>2. Correct wiring.</td>
</tr>
<tr>
<td>or greater than 85 F (&lt;16 or 93 F).</td>
<td>3. Replace amplifier.</td>
</tr>
<tr>
<td>Voltage at terminals 1 and 2 is below 14 V</td>
<td>4. Replace automatic control valve.</td>
</tr>
<tr>
<td>or greater than 85 F (&lt;16 or 93 F).</td>
<td>5. Correct wiring.</td>
</tr>
<tr>
<td>Voltage at terminals 3 and 4 is less than 12,000 ohms</td>
<td>6. Replace amplifier.</td>
</tr>
<tr>
<td>Gas flow.</td>
<td>7. Power supply must be 24 V AC.</td>
</tr>
<tr>
<td>Should be checked to amplifier terminals 3 and 4.</td>
<td>8. Install properly.</td>
</tr>
<tr>
<td>Solenoid valve must operate freely in solenoid sleeve. Must be</td>
<td>9. If above 12,000 ohms check circuit for open or loose wires.</td>
</tr>
<tr>
<td>checked for open or leak, page 8.</td>
<td></td>
</tr>
<tr>
<td>Should be checked to amplifier terminals 3 and 4.</td>
<td>1-</td>
</tr>
<tr>
<td>Gas valve should operate freely in solenoid sleeve. (Check item 8)</td>
<td>0. Replace wiring if necessary.</td>
</tr>
<tr>
<td>Push down on plunger. Insufficient supply is then too low.</td>
<td>1-</td>
</tr>
<tr>
<td>If heater goes to high fire, system is working correctly.</td>
<td>1. Clean or replace plunger.</td>
</tr>
<tr>
<td>Install correct parts.</td>
<td>2. If MR valve remains on low fire, valve may be faulty. Check item 18</td>
</tr>
<tr>
<td>Clean or replace plunger if necessary.</td>
<td>4. If heater goes to high fire, system is working correctly.</td>
</tr>
<tr>
<td>If MR valve remains on low fire, valve may be faulty. Check item 18</td>
<td>5. If MR valve remains on low fire, valve may be faulty. Check item 18</td>
</tr>
<tr>
<td>Check for obstruction in gas pipe ahead of controls. Increase</td>
<td></td>
</tr>
<tr>
<td>gas pressure if possible.</td>
<td>6. Check for obstruction in gas pipe ahead of controls. Increase</td>
</tr>
<tr>
<td>Clean or replace plunger if necessary.</td>
<td>gas pressure if possible.</td>
</tr>
<tr>
<td>Clean or replace plunger if necessary.</td>
<td></td>
</tr>
<tr>
<td>Correct wiring.</td>
<td>7. Clean or replace plunger if necessary.</td>
</tr>
<tr>
<td>If erratic or pulsating DC voltage is observed and wiring shows no</td>
<td>8. Correct wiring.</td>
</tr>
<tr>
<td>defects, replace amplifier. If erratic or pulsating voltage</td>
<td>9. Increase gas pressure if possible.</td>
</tr>
<tr>
<td>continues, contact Maxitrol.</td>
<td></td>
</tr>
</tbody>
</table>

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 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.

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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.

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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.