Data Brochure

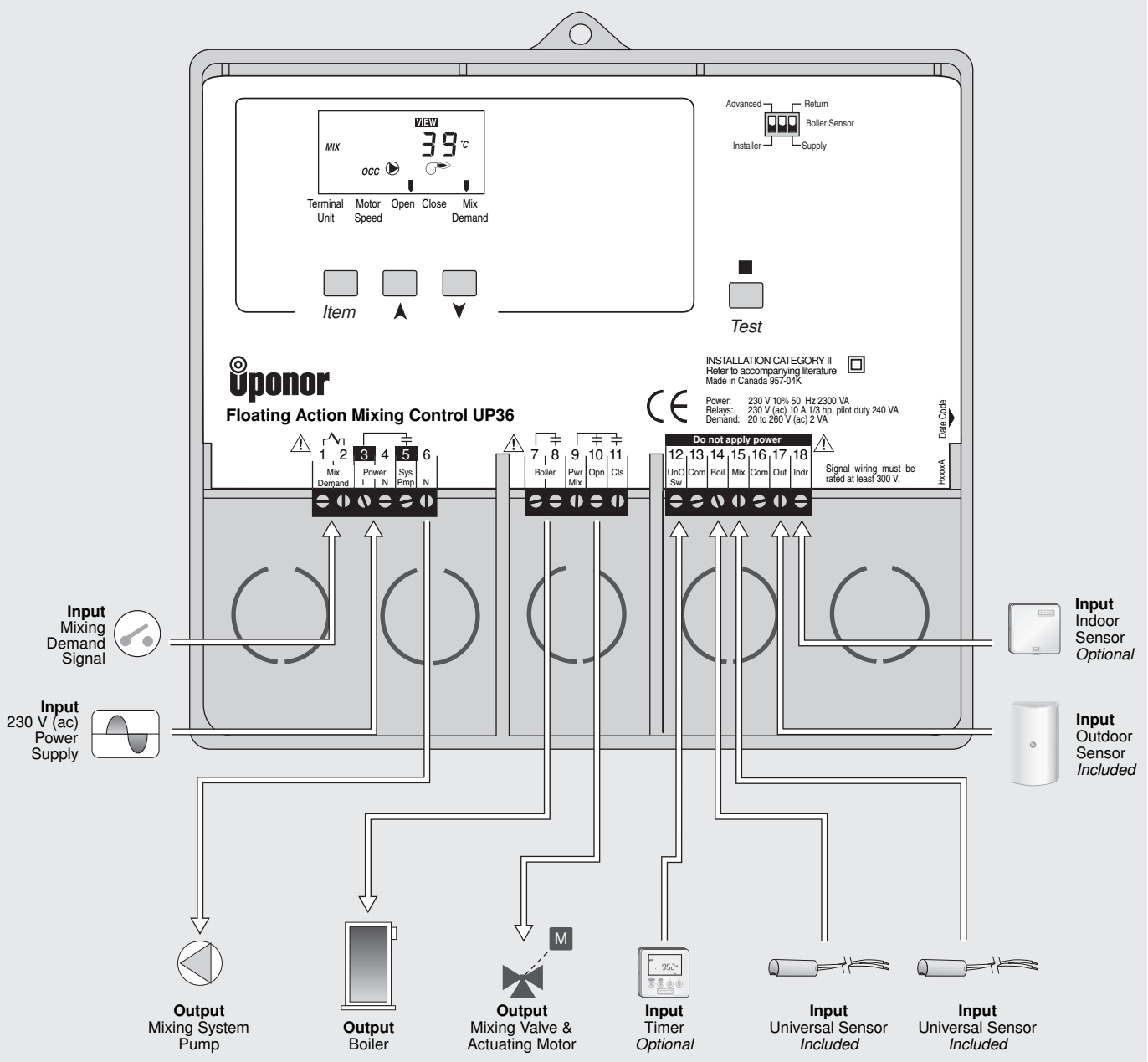
Floating Action Mixing Control UP36

D UP36
01/05

The Floating Action Mixing Control UP36 is designed to control the supply water temperature to a hydronic system in order to provide outdoor reset or setpoint operation. The control uses a floating action mixing valve to regulate the supply water temperature and can protect the boiler against flue gas condensation. The control has a Liquid Crystal Display (LCD) to view system status and operating information.

Additional functions include:

- User comfort adjustment to increase or decrease building space temperature
- Advanced settings to fine-tune building requirements
- Boiler Control for improved energy savings
- Powered mixing system pump output
- Optional indoor sensor for room air temperature control
- Test sequence to ensure proper component operation
- Setback input for energy savings
- 230 V (ac) power supply
- CE Approved



How To Use The Data Brochure

This brochure is organized into four main sections. They are: 1) *Sequence of Operation,* 2) *Installation,* 3) *Control Settings,* and 4) *Troubleshooting. The Sequence of Operation* section has three sub-sections. We recommend reading Section A: *General Operation of the Sequence of Operation*, as this contains important information on the overall operation of the control. Then read the sub-sections that apply to your installation. For quick installation and setup of the control, refer to the *Installation* section, *DIP Switch Settings* section, followed by the *Quick Setup* section.

The *Control Settings* section (starting at *DIP Switch Settings*) of this brochure describes the various items that are adjusted and displayed by the control. The control functions of each adjustable item are described in the *Sequence of Operation*.

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User Interface

The UP36 uses a Liquid Crystal Display (LCD) as the method of supplying information. You use the LCD in order to set up and monitor the operation of your system. The UP36 has three push buttons (***Item***, ▲, ▼) for selecting, viewing, and adjusting settings. As you program your control, record your settings in the ADJUST menu table which is found in the second half of this brochure.

Item

The abbreviated name of the selected item will be displayed in the item field of the display. To view the next available item, press and release the ***Item*** button. Once you have reached the last available item, pressing and releasing the ***Item*** button will return the display to the first item.

Adjust

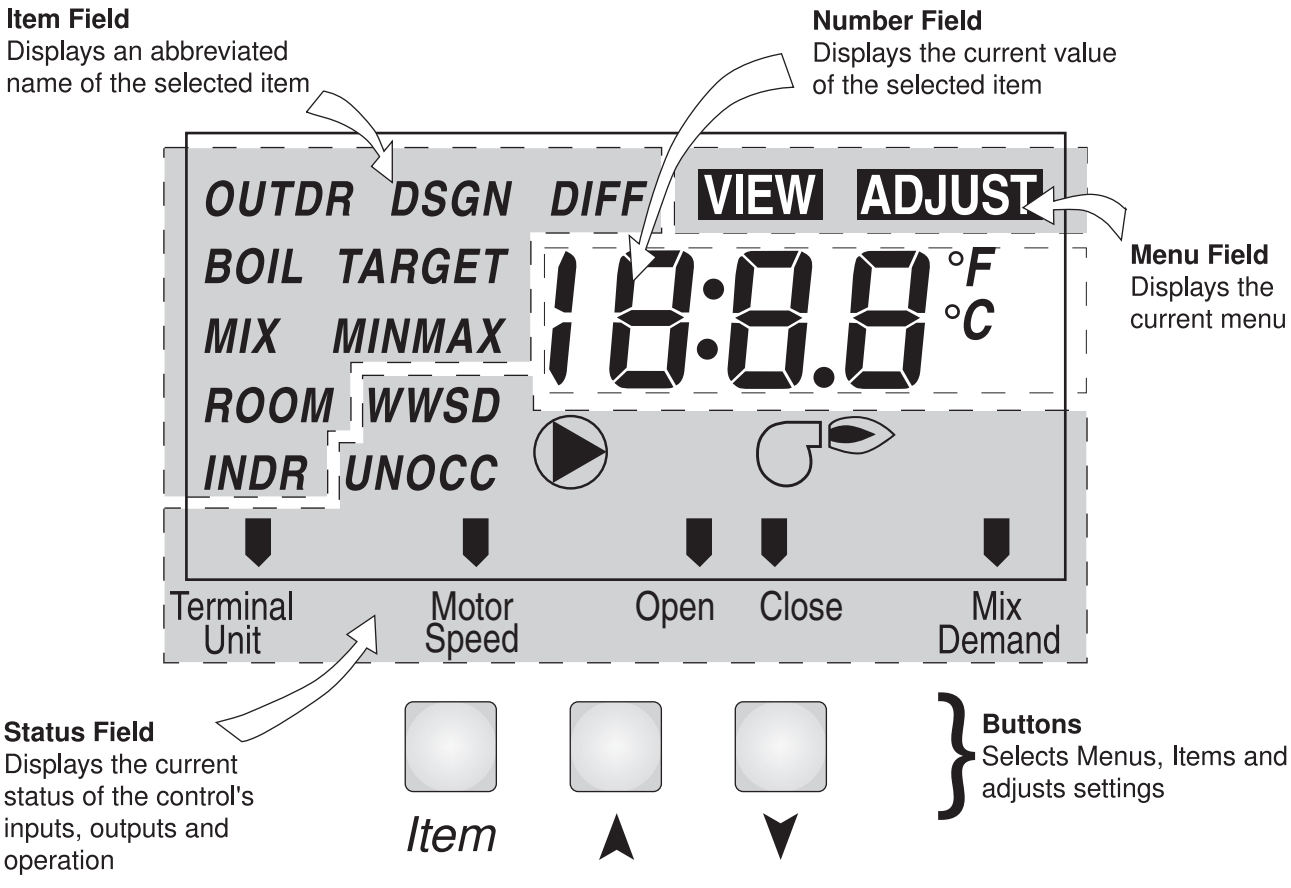
To make an adjustment to a setting in the control, press and hold simultaneously for 1 second the ***Item***, ▲ and ▼ buttons. The display will then show the word ADJUST in the top right corner. Then select the desired item using the ***Item*** button. Finally use the ▲ and/or ▼ button to make the adjustment.

To exit the ADJUST menu, either select the ESC item and press the ▲ or ▼ button, or leave the adjustment buttons alone for 20 seconds.

When the ***Item*** button is pressed and held in the VIEW menu, the display scrolls through all the adjust items in both access levels.

Additional information can be gained by observing the status field and pointers of the LCD. The status field will indicate which of the control's outputs are currently active. Most symbols in the status field are only visible when the VIEW menu is selected.

Display



Symbol Description

	**Pump** Displays when the mixing system pump is in operation.	UNOCC	**Unoccupied Schedule** Displays when the control is in unoccupied (Night) mode.
	**Burner** Displays when the boiler relay is turned on.	°C	**°C** Displays the unit of measure that all of the temperatures are to be displayed in the control.
OCC	**Occupied Schedule** Displays when the control is in occupied (Day) mode.		**Pointer** Displays the control operation as indicated by the text.

Definitions

The following defined terms and symbols are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

- Warning Symbol: Indicates presence of hazards which can cause severe personal injury, death or substantial property damage if ignored.

INSTALLATION CATEGORY II

- Double insulated
- Local level, appliances

Section A: General Operation

POWERING UP THE CONTROL

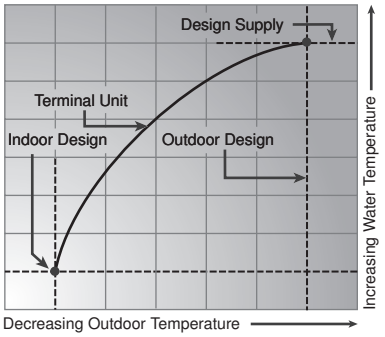
When the UP36 is powered up, the control displays all segments in the LCD for 2 seconds. Next, the software version is displayed for 2 seconds. Finally, the control enters into the normal operating mode.

OPERATION

The UP36 uses a floating action mixing valve to vary the supply water temperature to a hydronic system. The supply water temperature is based on either the current outdoor temperature, or a fixed setpoint.

Outdoor Reset

When the outdoor design (OUTDR DSGN) setting is not set to OFF, the UP36 calculates a mixing supply water temperature based on the outdoor air temperature. The UP36 uses a *Characterized Heating Curve* and optionally indoor temperature feedback from an indoor sensor in this calculation.



Setpoint Control

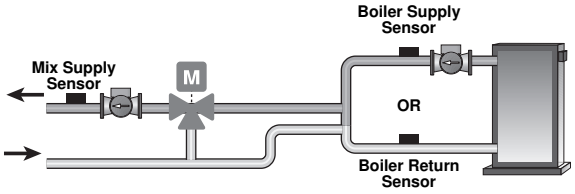
When the outdoor design (OUTDR DSGN) setting is set to OFF, the UP36 supplies a fixed mixing supply temperature equal to the MIX TARGET setting. An outdoor sensor is not required during this mode of operation. The indoor sensor option cannot be used with setpoint control.

FLOATING ACTION

A floating action actuator motor is connected to the UP36 on the *Pwr Mix*, *Opn*, and *Cls* terminals (9,10 and 11). The UP36 pulses the actuator motor open or close to maintain the correct mixed supply water temperature at the mix sensor when there is a mixing demand. The mixing valve that the actuator is connected to can be either a 2-way, 3-way, or 4-way valve. A visual indication as to whether the control is currently opening or closing the mixing valve is displayed in the LCD.

BOILER PROTECTION (BOIL MIN)

The UP36 is capable of providing boiler protection from cold mixing system return water temperatures. If the boiler sensor temperature is cooler than the BOIL MIN setting while the boiler is firing, the UP36 reduces the output to the mixing valve. This limits the amount of cool return water to the boiler and allows the boiler temperature to recover. This feature can only be used if a boiler sensor is installed.



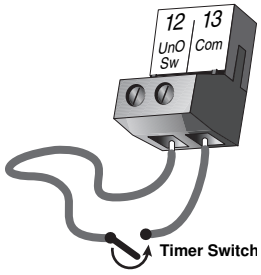
EXERCISING

The UP36 has a built-in exercising function. If the system pump or valve has not been operated at least once every three days, the control turns on the output for a minimum of 10 seconds. This minimizes the possibility of a pump or valve seizing during a long period of inactivity. The UP36 ensures that the mixing valve operates over its entire range at least once each exercising period. While the control is exercising the *Test* LED flashes.

Note: The exercising function does not work if power to the control, pump, or valve is disconnected.

SETBACK (UNOCCUPIED)

To provide greater energy savings, the UP36 has a setback capability. With setback, the supply water temperature in the system is reduced when the building is unoccupied. By reducing the supply water temperature, air temperature in the space may be reduced even when thermostat(s) are not turned down. Any time the *UnO Sw* (12) and the *Com* (13) terminals are shorted together, the control operates in the unoccupied (Night) mode. When in the unoccupied (Night) mode, the UNOCC segment is displayed in the LCD. The UP36 adjusts the supply water temperature based on the UNOCC settings made in the control.



FACTORY DEFAULTS

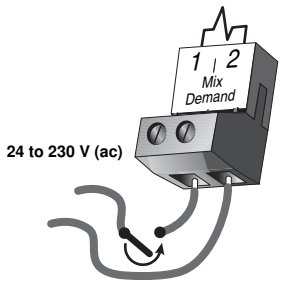
The control comes preset with several factory defaults. These defaults are based on the terminal unit selection (see section B). To fine-tune building requirements, these defaults may be changed. If a factory default value for a terminal unit is changed, the terminal unit number will flash when selected in the ADJUST menu.

To reload the factory defaults listed in section B, power down the control and wait for 10 seconds. Power up the control while simultaneously holding the ***Item*** and ▼ buttons. The terminal unit number should now be displayed constantly in the LCD rather than flashing.

Section B: Mixing

MIX DEMAND

A mix demand is required in order for the UP36 to provide heat. A mix demand is generated by applying a voltage between 24 and 230 V (ac) across the *Mix Demand* terminals (1 and 2). Once voltage is applied, the *Mix Demand* pointer is displayed in the LCD. If the UP36 is not in WWSD, the UP36 closes the *Sys Pmp* contact. The UP36 calculates a MIX TARGET supply temperature based on the outdoor air temperature and settings. If required, the UP36 operates the boiler in order to provide heat to the mixing valve.



SYSTEM PUMP OPERATION *(SYS PMP)*

The system pump contact (Sys Pmp, terminal 5) closes whenever there is a mixing demand and the UP36 is not in WWSD. The system pump segment is displayed in the LCD. After the mixing demand has been satisfied, the UP36 continues to operate the system pump for 20 seconds. This allows some residual heat to be purged out to the heating system. During WWSD, the system pump is operated based on the exercise function.

INDOOR SENSOR

An indoor sensor may be used in order to provide indoor temperature feedback. The indoor sensor is connected to the *Com* and *Indr* terminals (16 and 18). In addition, power must be applied to the *Mix Demand* terminals (1 and 2) as described in the MIX DEMAND section. With the indoor sensor connected, the UP36 is able to sense the actual room temperature. Indoor temperature feedback fine-tunes the supply water temperature in the mixing system to maintain room temperature. To adjust the room temperature, use the ROOM OCC or ROOM UNOCC setting in the ADJUST menu at the control.

If a multiple zone system is used with an indoor sensor, proper placement of the indoor sensor is essential. The indoor sensor should be located in an area which best represents the average air temperature of the zones.

The indoor sensor cannot be used with setpoint control.

CHARACTERIZED HEATING CURVE

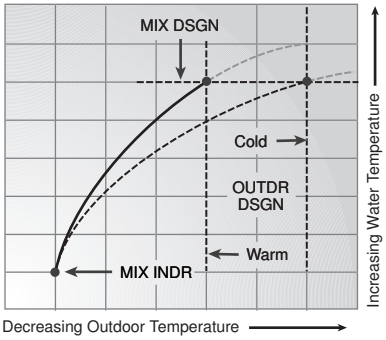
When used as a mixing reset control, the UP36 varies the supply water temperature based on the outdoor air temperature. The control takes into account the type of terminal unit that the system is using. Since different types of terminal units transfer heat to a space using different proportions of radiation, convection and conduction, the supply water temperature must be controlled differently. Once the control is told what type of terminal unit is used, the control varies the supply water temperature according to the type of terminal unit. This improves the control of the air temperature in the building.

MIXING TARGET TEMPERATURE (MIX TARGET)

When used as a mixing reset control, the MIX TARGET temperature is calculated from the *Characterized Heating Curve* settings, outdoor air temperature and optionally, indoor air temperature. When used as a setpoint control, the installer sets the MIX TARGET temperature. The control displays the temperature that it is currently trying to maintain as the mixing supply temperature. If the control does not have a mixing demand,"– – –" is displayed as the MIX TARGET.

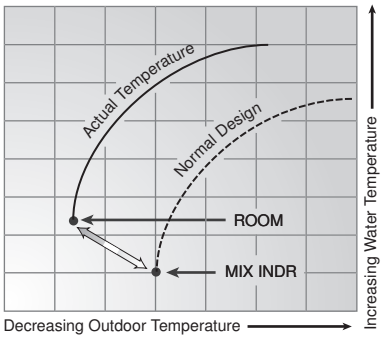
OUTDOOR DESIGN (OUTDR DSGN)

The OUTDR DSGN is the outdoor air temperature that is the typical coldest temperature of the year where the building is located. This temperature is used when doing the heat loss calculations for the building. If a cold outdoor design temperature is selected, the mixing supply temperature rises gradually as the outdoor temperature drops. If a warm outdoor design temperature is selected, the mixing supply temperature rises rapidly as the outdoor temperature drops.



SETPOINT OPERATION OCC & UNOCC (MIX TARGET)

For setpoint control, set the OUTDR DSGN to OFF. The MIX TARGET becomes the setpoint supply temperature that the control is to maintain. The MIX TARGET temperature is set by the installer in the ADJUST menu. A MIX TARGET setting is available for both the occupied (Day) and unoccupied (Night) modes. An outdoor sensor is not required during this mode of operation.



ROOM OCC & UNOCC (ROOM)

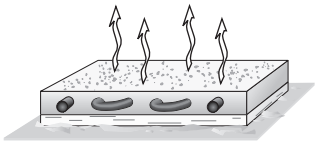
The ROOM is the desired room temperature for the mixing zones, and it provides a parallel shift of the *Characterized Heating Curve*. The room temperature desired by the occupants is often different from the design indoor temperature (MIX INDR). If the room temperature is not correct, adjusting the ROOM setting increases or decreases the amount of heat available to the building. A ROOM setting is available for both the occupied (Day) and unoccupied (Night) modes.

TERMINAL UNITS

When using a *Characterized Heating Curve*, the control requires the selection of a terminal unit. The terminal unit determines the shape of the *Characterized Heating Curve* according to how the terminal unit delivers heat into the building space. The UP36 provides for selection between six different terminal unit types: two types of radiant floor heat, fancoil, fin-tube convector, radiator, and baseboard. When a terminal unit is selected, the control automatically loads the design supply temperature (MIX DSGN), maximum supply temperature (MIX MAX) and minimum supply temperature (MIX MIN). The factory defaults are listed below.

TERMINAL UNIT	HIGH MASS RADIANT (1)	LOW MASS RADIANT (2)	FANCOIL (3)	FIN-TUBE CONVECTOR (4)	RADIATOR (5)	BASEBOARD (6)
MIX DSGN	45°C	55°C	85°C	80°C	75°C	65°C
MIX MAX	55°C	65°C	100°C	90°C	85°C	80°C
MIX MIN	OFF	OFF	40°C	OFF	OFF	OFF

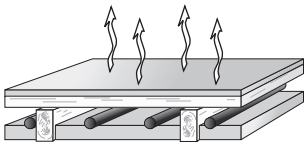
High Mass Radiant (1)



This type of a hydronic radiant floor is embedded in either concrete, sand / cement or pumped screed. This heating system has a large thermal mass and is slow acting.

Default values: MIX DSGN = 45°C, MIX MAX = 55°C, MIX MIN = OFF

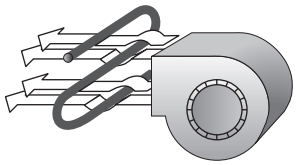
Low Mass Radiant (2)



This type of radiant heating system is either attached to the bottom of a wood sub-floor, suspended in the joist space, or sandwiched between the sub-floor and the surface. This type of radiant system has a relatively low thermal mass and responds faster than a high mass system.

Default values: MIX DSGN = 55°C, MIX MAX = 65°C, MIX MIN = OFF

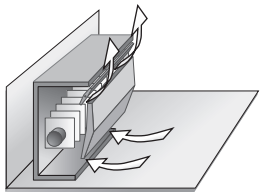
Fancoil (3)



A fancoil terminal unit or air handling unit (AHU) consists of a hydronic heating coil and either a fan or blower. Air is forced across the coil at a constant velocity by the fan or blower, and is then delivered into the building space.

Default values: MIX DSGN = 85°C, MIX MAX = 100°C, MIX MIN = 40°C

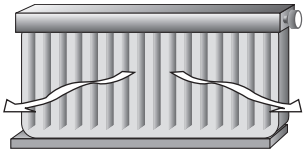
Fin-tube Convector (4)



A convector terminal unit is made up of a heating element with fins on it. This type of terminal unit relies on the natural convection of air across the heating element to deliver heated air into the space. The amount of natural convection to the space is dependant on the supply water temperature to the heating element and the room air temperature.

Default values: MIX DSGN = 80°C MIX MAX = 90°C, MIX MIN = OFF

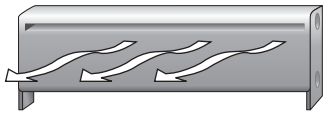
Radiator (5)



A radiator terminal unit has a large heated surface that is exposed to the room. A radiator provides heat to the room through radiant heat transfer and natural convection.

Default values: MIX DSGN = 75°C, MIX MAX = 85°C, MIX MIN = OFF

Baseboard (6)



A baseboard terminal unit is similar to a radiator, but has a low profile and is installed at the base of the wall. The proportion of heat transferred by radiation from a baseboard is greater than that from a fin-tube convector.

Default values: MIX DSGN = 65°C, MIX MAX = 80°C, MIX MIN = OFF

MIXING INDOOR (MIX INDR)

The MIX INDR is the room temperature used in the original heat loss calculations for the building. This setting establishes the beginning of the *Characterized Heating Curve* for the mixing zones.

MIXING DESIGN (MIX DSGN)

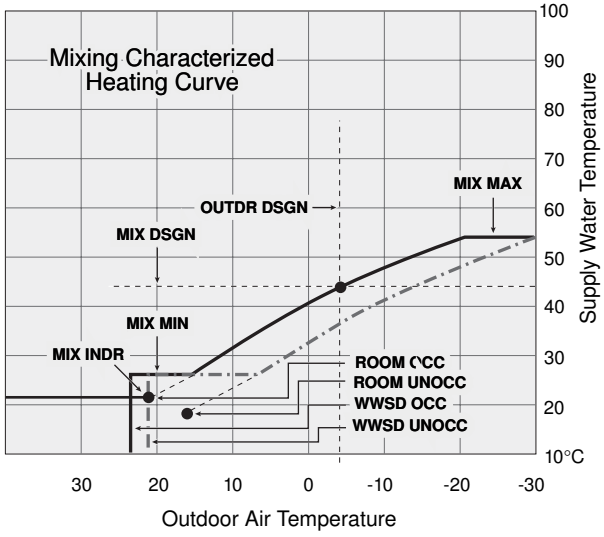
The MIX DSGN temperature is the supply water temperature required to heat the mixing zones when the outdoor air is as cold as the OUTDR DSGN temperature.

MIXING MAXIMUM (MIX MAX)

The MIX MAX sets the highest water temperature that the control is allowed to calculate as the MIX TARGET temperature. If the control does target the MIX MAX setting, and the MIX temperature is near the MIX MAX, the MAX segment will be displayed in the LCD while either the MIX TARGET temperature or the MIX temperature is being viewed.

MIXING MINIMUM (MIX MIN)

The MIX MIN is the lowest temperature that the control is allowed to use as a MIX TARGET temperature. During mild conditions, if the UP36 calculates a MIX TARGET temperature that is below the MIX MIN setting, the MIX TARGET temperature is adjusted to match the MIX MIN setting. During this condition, the MIN segment will be displayed in the LCD when either the MIX TARGET or MIX temperature is being viewed. If an indoor sensor is used, and the UP36 is operating at the MIX MIN temperature, the system pump is cycled using Pulse Width Modulation (PWM) with a 15 minute cycle length. By cycling the system pump and controlling the flow of supply water, the control provides an average supply water temperature to the system. This average temperature is equal to the original MIX TARGET. This minimizes overheating of the zone while the control is operating at the MIX MIN temperature.



WARM WEATHER SHUT DOWN (WWSD) OCC & UNOCC

When the outdoor air temperature rises above the WWSD setting, the UP36 turns on the WWSD segment in the display. When the control is in Warm Weather Shut Down, the *Mix Demand* pointer is displayed if there is a demand. However the control does not operate the heating system to satisfy this demand. If the control is in setpoint mode, the WWSD feature is not functional.

Section C: Boiler Operation

BOILER OPERATION

When the UP36 determines that boiler operation is required, the *Boiler* contact terminals (7 and 8) close. While the *Boiler* contact is closed, the burner segment in the LCD is displayed.

BOILER MINIMUM (BOIL MIN)

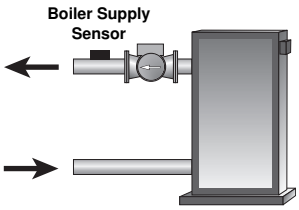
Some boilers, especially oil-fired boilers require a minimum water temperature in order to prevent flue gas condensation. The BOIL MIN adjustment is set to the boiler manufacturer's minimum recommended operating temperature. Only when the boiler temperature is measured by a boiler sensor can the UP36 provide boiler protection. In this case when the boiler is firing and the boiler temperature is below the BOIL MIN Setting the UP36 turns on the MIN segment and reduces the heating load on the boiler by limiting the output of the mixing valve. If the installed boiler is designed for low temperature operation, set the BOIL MIN adjustment to OFF.

BOILER PROTECTION

Refer to section A for a description of boiler protection.

BOILER SENSOR ON THE SUPPLY *(Boiler Sensor DIP switch = Supply)*

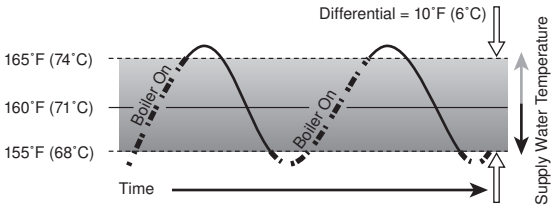
The boiler sensor can be located on the boiler supply if the UP36 is the only control that is operating the boiler. When in the supply mode, the UP36 determines the required operating temperature of the boiler using *Boiler Load Reset*. With *Boiler Load Reset*, the UP36 operates the boiler at the lowest possible supply temperature that is sufficient to satisfy the requirements of the mixing valve. If this mode of operation is selected, the boiler pump should either operate continuously, or be operated in parallel with the system pump contact (*Sys Pmp*).



Note: The boiler pump should not be operated by the boiler's aquastat, as this may lead to improper cycling of the boiler because of inconsistent flow past the boiler supply sensor.

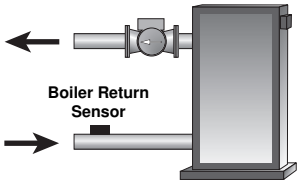
Boiler Differential (BOIL DIFF)

An on / off heat source such as a boiler must be operated with a differential in order to prevent short cycling. When the boiler supply temperature drops below the bottom rail of the differential, the UP36 closes the *Boiler* contact to fire the boiler. When the boiler supply temperature rises above the top rail of the differential, the UP36 opens the *Boiler* contact to turn off the boiler. With the UP36, either a fixed or automatic differential setting is selected. If automatic differential (**Ad**) is selected, the UP36 automatically adjusts the boiler differential under the current load conditions to avoid short cycling.



BOILER SENSOR ON THE RETURN (*Boiler Sensor* DIP switch = *Return*)

The boiler sensor should be located on the boiler return if the UP36 is one of many controls that can call for boiler operation. When in the return mode, the UP36 provides a boiler enable as described in the BOILER ENABLE section. The UP36 no longer tries to control the boiler supply water temperature directly but allows the boiler to operate at its operating aquastat setting when required. If this mode of operation is selected, the boiler pump should either operate continuously or be operated in parallel with the system pump contact (*Sys Pmp*).



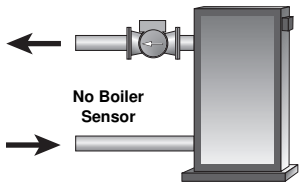
Note: The boiler pump should not be operated by the boiler's aquastat, as this may lead to improper cycling of the boiler because of inconsistent flow past the boiler return sensor.

NO BOILER SENSOR

The UP36 is capable of operating without a boiler sensor if desired. Without a boiler sensor, the UP36 provides a boiler enable as described in the BOILER ENABLE section, but is unable to provide boiler protection. This type of application is typical if the UP36 is drawing heat from a heat source that already incorporates some form of boiler protection.

BOILER ENABLE (*30% Enable* / *10% Enable*)

The UP36 has a DIP switch that allows for the selection between a 30% boiler enable and a 10% boiler enable. The Boiler Enable DIP switch is the middle switch of the three DIP switch package and is not labeled. This switch is only functional when the *Boiler Sensor* DIP switch is set to *Return*.



In the 30% position, DIP switch 'UP', the UP36 closes the *Boiler* contact when the position of the mixing valve exceeds 30%. The *Boiler* contact remains closed until the position of the mixing valve reduces below 15%. This setting would normally be chosen for low mass boilers (copper fin-tube, etc.) or systems with low thermal mass in the loop between the boiler and the mixing valve.

In the 10% position, DIP switch 'DOWN', the UP36 closes the *Boiler* contact when the position of the mixing valve exceeds 10%. The *Boiler* contact remains closed until the position of the mixing valve reduces below 5%. This setting is normally chosen for high mass boilers (cast iron, steel, fire-tube, etc.) or systems with large thermal mass in the loop between the boiler and the mixing valve.

In order to prevent short cycling, the *Boiler* contact has a minimum on time, and a minimum off time.

Installation

CAUTION

Improper installation and operation of this control could result in damage to the equipment and possibly even personal injury. It is your responsibility to ensure that this control is safely installed to all applicable codes and standards. This electronic control is not intended for use as a primary limit control. Other controls that are intended and certified as safety limits must be placed into the control circuit. Do not open the control. Refer to qualified personnel for servicing. Opening voids warranty and can result in damage to the equipment and possibly even personal injury.

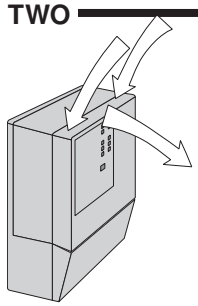
STEP ONE — GETTING READY

Check the contents of this package. If any of the contents listed are missing or damaged, please contact your system supplier for assistance.

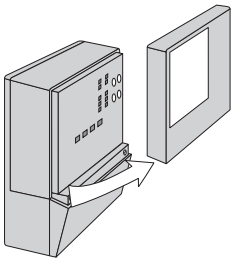
Type UP36 includes: One Floating Action Mixing Control UP36, One Outdoor Sensor 91624, Two Universal Sensors 91736, Data Brochure D UP36.

Note: Carefully read the details of the Sequence of Operation to ensure that you have chosen the proper control for your application.

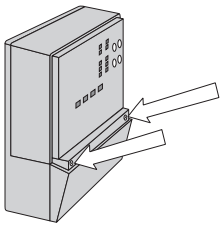
STEP TWO — MOUNTING THE BASE



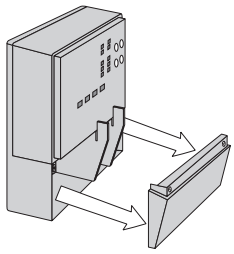
Press down at the fingertip grips on top of the front cover and pull out and down.



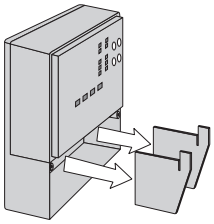
Lift the front cover up and away from the control.



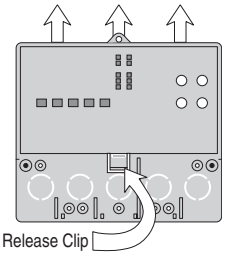
Loosen the screws at the front of the wiring cover.



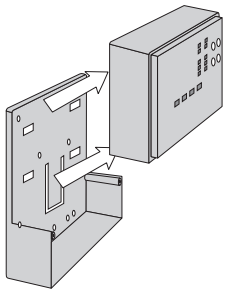
The wiring cover pulls straight out from the wiring chamber.



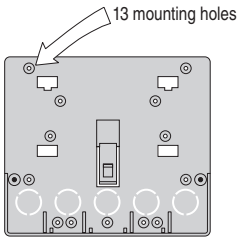
Remove the safety dividers from the wiring chamber by pulling them straight out of their grooves.



Press the control release clip on the base inside the wiring chamber and slide the control upwards.

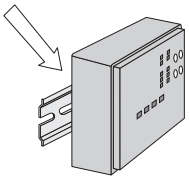


The control lifts up and away from the base.

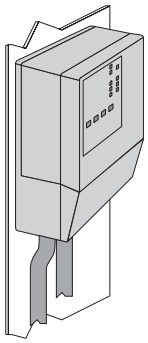


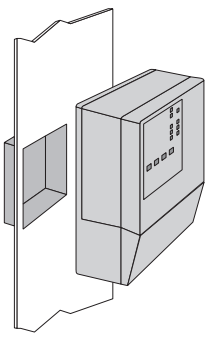
The base is ready for mounting. There are 10 conduit knock-outs at the back and bottom of the wiring chamber.

The control can be mounted on a standard DIN rail. This will be a popular option for those who prefer to mount the control inside a larger electrical panel.



The wiring can enter the bottom or the back of the enclosure. Knock-outs provided in the base allow the wiring to be run in conduit up to the enclosure. The base also has holes that line up with the mounting holes of most common electrical boxes.





STEP THREE — ROUGH-IN WIRING

All electrical wiring terminates in the control base wiring chamber. The base has standard 22 mm knockouts which accept common wiring hardware and conduit fittings. Before removing the knockouts, check the wiring diagram and select those sections of the chamber with common voltages. Do not allow the wiring to cross between sections, as the wires will interfere with safety dividers, which should be installed at a later time.

Power must not be applied to any of the wires during the rough-in wiring stage.

- All wires are to be stripped to a length of 9 mm to ensure proper connection to the control.
- Install the Outdoor Sensor 91624 according to the installation instructions in this brochure and run the wiring back to the control.
- Install the Mix Sensor 91736 according to the installation instructions in this brochure and run the wiring back to the control.
- If a Boiler Sensor 91736 is used, install the sensor according to the installation instructions in this brochure and run the wiring back to the control.
- If an Indoor Sensor is used, install the sensor according to the installation instructions provided with the sensor and run the wiring back to the control.
- Run wire from other system components (pumps, boilers, etc.) to the control.
- Run wires from the 230 V (ac) power to the control. Use a clean power source with a 15 A circuit to ensure proper operation. Multi-strand 16 AWG wire is recommended for all 230 V (ac) wiring due to its superior flexibility and ease of installation into the terminals.

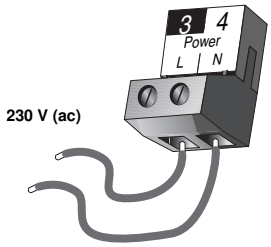
STEP FOUR — ELECTRICAL CONNECTIONS TO THE CONTROL

The installer should test to confirm that no voltage is present at any of the wires. Push the control into the base and slide it down until it snaps firmly into place.

⚠ *Powered Input Connections*

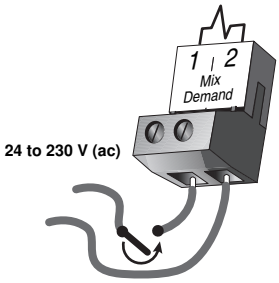
230 V (ac) Power

Connect the 230 V (ac) power supply to the *Power L* and *Power N* terminals (3 and 4). This connection provides power to the microprocessor and display of the control. As well, this connection provides power to the *Sys Pmp* terminal (5) from the *Power L* terminal (3).



Mix Demand

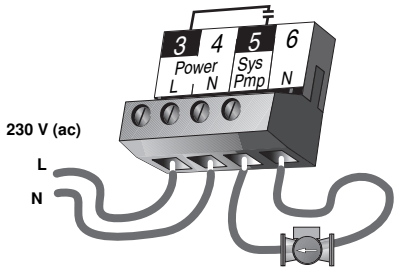
To generate a mix demand, a voltage between 24 V (ac) and 230 V (ac) must be applied across the *Mix Demand* terminals (1 and 2).



⚠ *Output Connections*

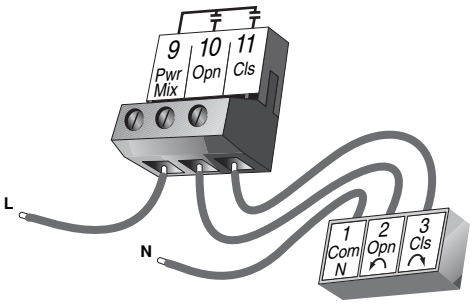
System Pump Contact (*Sys Pmp*)

The *Sys Pmp* output terminal (5) on the UP36 is a powered output. When the relay in the UP36 closes, 230 V (ac) is provided to the *Sys Pmp* terminal (5) from the *Power L* terminal (3). To operate the system pump, connect one side of the system pump circuit to terminal (5), and the second side of the pump circuit to the neutral (*N*) terminal 6.



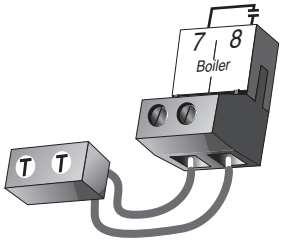
Mixing Valve Actuator

Terminals 9, 10 and 11 are volt-free relay contacts from the control. Connect one side of the actuator power to the Pwr Mix terminal (9) on the control. The output relay Opn (10) is then connected to the open terminal of the actuator and the output relay Cls (11) is connected to the close terminal of the actuator. Connect the second side of the actuator power to the common terminal of the actuator.



Boiler Contact

The *Boiler* terminals (7 and 8) provide a volt-free relay contact in the UP36. There is no power available on these terminals from the control. These terminals are to be used as a switch to either make or break the boiler circuit. When the UP36 requires the boiler to fire, it closes the contact between terminals 7 and 8.

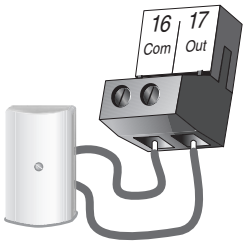


⚠ *Sensor and Unpowered Input Connections*

Do not apply power to these terminals as this will damage the control.

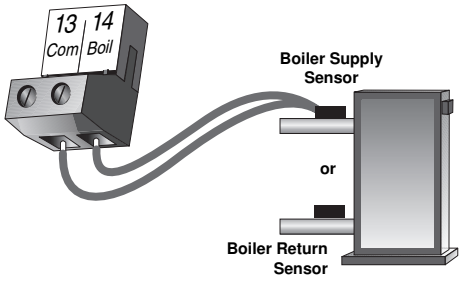
Outdoor Sensor

Connect the two wires from the Outdoor Sensor 91624 to the *Com* and *Out* terminals (16 and 17). The outdoor sensor is used by the UP36 to measure the outdoor air temperature



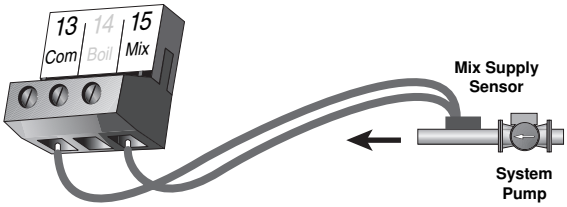
Boiler Sensor

Connect the two wires from the Boiler Sensor 91736 to the *Com* and *Boil* terminals (13 and 14). The boiler sensor is used by the UP36 to measure boiler temperature.



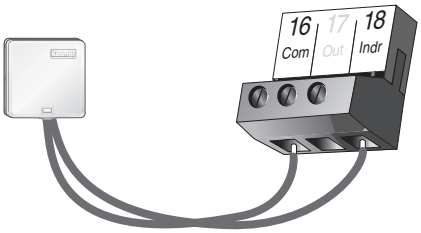
Mix Sensor

Connect the two wires from the Mix Sensor 91736 to the *Com* and *Mix* terminals (13 and 15). The mixing sensor is used by the UP36 to measure the supply water temperature after the mixing valve. Normally the sensor is attached to the pipe downstream of the system pump.



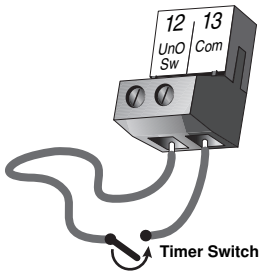
Indoor Sensor

If an indoor sensor is used, connect the two wires from the sensor to the *Com* and *Indr* terminals (16 and 18). The indoor sensor is used by the UP36 to measure the room air temperature.



Unoccupied Switch

If an external timer or switch is used, connect the two wires from the external switch to the *UnO Sw* and *Com* terminals (12 and 13). When these two terminals are shorted together, the control registers an unoccupied signal.



STEP FIVE — TESTING THE WIRING

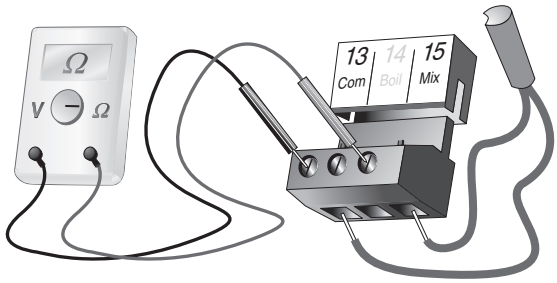
Each terminal block ***must be unplugged*** from its header on the control before power is applied for testing. To remove a terminal block, pull it straight down from the control.

The following tests are to be performed using standard testing practices and procedures, and should only be carried out by properly trained and experienced persons.

A good quality electrical test meter, capable of reading from at least 0-300 V (ac) and at least 0-2,000,000 Ω, is essential to properly test the wiring and sensors.

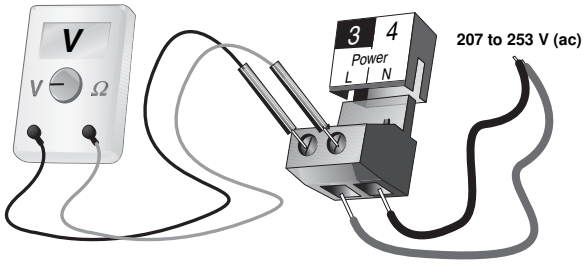
⚠ *Test The Sensors*

In order to test the sensors, the actual temperature at each sensor location must be measured. A good quality digital thermometer with a surface temperature probe is recommended for ease of use and accuracy. Where a digital thermometer is not available, a spare sensor can be strapped alongside the one to be tested, and the readings compared. Test the sensors according to the instructions in this brochure.



⚠ *Test The Power Supply*

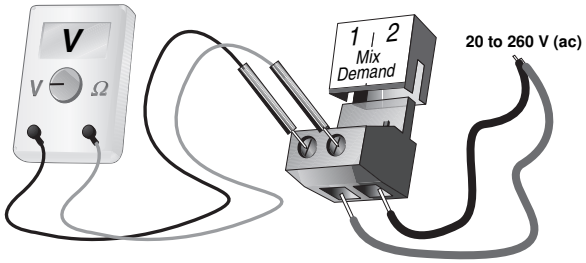
Make sure exposed wires and bare terminals are not in contact with other wires or grounded surfaces. Turn on the power and measure the voltage between the *Power L* and *Power N* terminals (3 and 4) using an AC voltmeter. The reading should be between 207 and 253 V (ac).



⚠ *Test The Powered Inputs*

Mix Demand

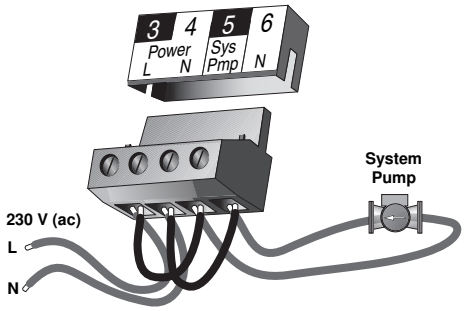
Measure the voltage between the *Mix Demand* terminals (1 and 2). When the mixing demand device calls for heat, you should measure between 20 and 260 V (ac) at the terminals. When the mix demand device is off, you should measure less than 5 V (ac).



⚠ *Test The Outputs*

System Pump (Sys Pmp)

If a system pump is connected to the *Sys Pmp* terminal (5) and N terminal (6), make sure that power to the terminal block is off, and install a link between the *Power L* and the *Sys Pmp* terminals (3 and 5). Install a second link between the *Power N* and *N* terminals (4 and 6). When power is applied to the *Power L* and *Power N* terminals (3 and 4), the system pump should start. If the pump does not turn on, check the wiring between the terminal block and pump, and refer to any installation or troubleshooting information supplied with the pump. If the pump operates properly, disconnect the power and remove the links.



Boiler

If the boiler circuit is connected to the *Boiler* terminals (7 and 8), make sure power to the boiler circuit is off, and install a link between the terminals. When the boiler circuit is powered up, the boiler should fire. If the boiler does not turn on, refer to any installation or troubleshooting information supplied with the boiler (The boiler may have a flow switch that prevents firing until the boiler loop pump is running). If the boiler operates properly, disconnect the power and remove the link.

Mixing Valve Actuator

Make sure power to the actuator circuit is off and install a link between the Pwr Mix (9) and the Opn (10) terminals. When the circuit is powered up, the actuator should move in the open direction. If it does not, check the wiring between the terminals and the actuator. Refer to any installation or troubleshooting information supplied with the actuator. If the motor closes instead of opening, the wiring of the actuator must be reversed. If the valve opens correctly, turn off the power to the circuit and remove the link. Install a link between the Pwr Mix (9) and the Cls (11) terminals. When the circuit is powered up, the valve should move in the closing direction. If it does not, check the wiring between the terminals and the actuator. Refer to any installation or troubleshooting information supplied with the motor. If the motor closes correctly, turn off the power to the circuit and remove the link.

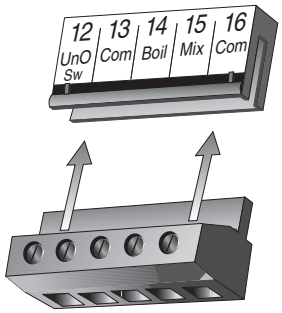
⚠ *Connecting The Control*

Make sure all power to the devices and terminal blocks is off, and remove any remaining links from the terminals.

Reconnect the terminal blocks to the control by carefully aligning them with their respective headers on the control, and then pushing the terminal blocks into the headers. The terminal blocks should snap firmly into place.

Install the supplied safety dividers between the unpowered sensor inputs and the powered 230 V (ac) or 24 V (ac) wiring chambers.

Apply power to the control. The operation of the control on power up is described in the Sequence of Operation section of this brochure.

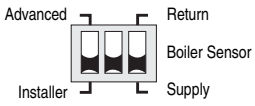


Cleaning

The control's exterior can be cleaned using a damp cloth. Moisten cloth with water and wring out prior to wiping control. Do not use solvents or cleaning solutions.

DIP Switch Settings

The DIP switch settings on the control are very important and should be set to the appropriate settings prior to making any adjustments to the control through the user interface. The DIP switch settings change the items that are available to be viewed and / or adjusted in the user interface.



ADVANCED / INSTALLER

The *Advanced* / *Installer* DIP switch is used to select which items are available to be viewed and / or adjusted in the user interface.

BOILER ENABLE (30% Enable = DIP switch 'UP' / 10% Enable = DIP switch 'DOWN')

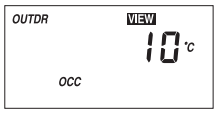
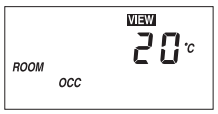
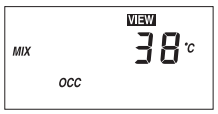
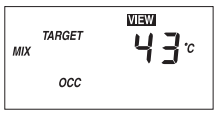
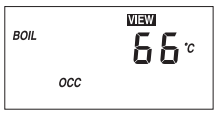
The Boiler Enable DIP switch is the middle DIP switch and is not labeled. The position of the *Boiler Enable* DIP switch determines at which valve position the control will close the Boiler contact under normal conditions. This switch is only operational if the *Boiler Sensor* DIP switch is set to *Return*. Refer to section C.

BOILER SENSOR (RETURN / SUPPLY)

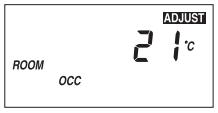
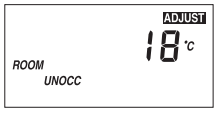
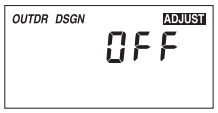
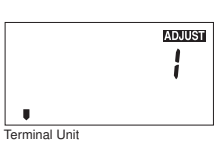
The Boiler Sensor DIP switch selects the installation location for the boiler sensor. When the boiler sensor is installed on the supply side of the boiler loop, the DIP switch must be set to *Supply*. The boiler aquastat should be set at least 11°C higher than the required design boiler water temperature. The boiler is controlled as described in section C.

For systems where the UP36 provides a heat demand to an external boiler control, the boiler sensor should be installed on the return side of the boiler loop. When the boiler sensor is installed on the return side of the boiler loop, the DIP switch must be set to Return. The UP36 enables the boiler when the position of the mixing valve exceeds the boiler enable DIP switch setting. The Boiler contact is controlled as described in section C. The boiler's operating temperature is controlled by its aquastat, or an external boiler reset control.

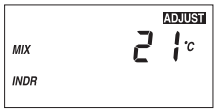
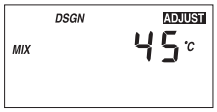
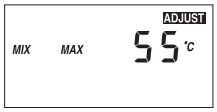
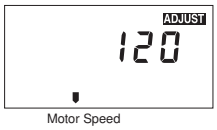
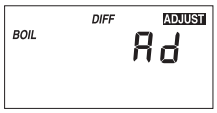
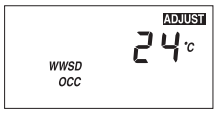
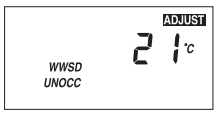
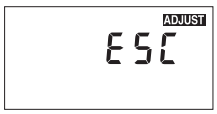
View Menu (1 of 1)

Display	Installer	Advanced	Description	Range
	●	●	Current outdoor air temperature as measured by the outdoor sensor. This is also the default display for the control. (OUTDR DSGN ≠ OFF OR Outdoor Sensor present)	-55 to 65 °C
	●	●	Current room air temperature as measured by the indoor sensor. (OUTDR DSGN ≠ OFF AND Indoor Sensor is present)	-5 to 45 °C
	●	●	Current mixed supply water temperature as measured by the mixing sensor	-10 to 130 °C
		●	Target mixed supply is the temperature the control is currently trying to maintain at the mixing sensor.	– – –, -10 to 130 °C
	●	●	Current boiler temperature as measured by the boiler sensor. (Boiler sensor is present OR BOIL MIN ≠ OFF)	-10 to 130 °C

Adjust Menu (1 of 2) - Installer Settings

Display	Installer	Advanced	Description	Range
	●	●	The desired room air temperature during the occupied (Day) period. (OUTDR DSGN ≠ OFF)	2 to 38 °C
	●	●	The desired room air temperature during an unoccupied (Night) period. (OUTDR DSGN ≠ OFF)	2 to 38 °C
	●	●	Mixing setpoint temperature during the occupied (Day) period. (OUTDR DSGN = OFF)	16 to 93 °C
	●	●	Mixing setpoint temperature during unoccupied (Night) period. (OUTDR DSGN = OFF)	16 to 93 °C
	●	●	The design outdoor air temperature used in the heat loss calculation for the heating system. For setpoint operation, set the OUTDR DSGN to OFF	-51 to 0 °C, OFF
 Terminal Unit	●	●	The type of terminal units that are being used in the heating system. (OUTDR DSGN ≠ OFF)	1 (High Mass Radiant) 2 (Low Mass Radiant) 3 (Fancoil) 4 (Fin-tube Convector) 5 (Radiator) 6 (Baseboard)

Adjust Menu (2 of 2) - Advanced Settings

Display	Installer	Advanced	Description	Range
		●	The design indoor air temperature used in the heat loss calculation for the heating system. (OUTDR DSGN ≠ OFF)	2 to 38°C
		●	The design supply water temperature used in the heat loss calculation for the heating system. (OUTDR DSGN ≠ OFF)	21 to 104°C
		●	The maximum supply water temperature for the mixing system (OUTDR DSGN ≠ OFF)	26 to 100°C
		●	The time that the actuating motor requires to operate from fully closed to fully open.	30 to 230 seconds (1 sec. increments)
		●	The minimum supply temperature for the mixing system. (OUTDR DSGN ≠ OFF)	OFF, 2 to 65°C
		●	The minimum temperature allowed for the boiler target temperature.	OFF, 27 to 82°C
		●	The differential that the control is to use when it is operating the boiler. (Boiler Sensor DIP switch = Supply AND Boiler Sensor present)	Ad, 1 to 23°C
		●	The system's warm weather shut down during the occupied (Day) period. (OUTDR DSGN ≠ OFF)	2 to 38°C, OFF
		●	The system's warm weather shut down during the unoccupied (Night) period. (OUTDR DSGN ≠ OFF)	2 to 38°C, OFF
		●	This item exits the ADJUST menu by pressing either the ▲ or ▼ button.	

Testing the Control

The Mixing Control UP36 has a built-in test routine which is used to test the main control functions. The UP36 continually monitors the sensors, and displays an error message whenever a fault is found. See the following pages for a list of the UP36's error messages and possible causes. When the ***Test*** button is pressed, the test light is turned on. The individual outputs and relays are tested in the following test sequence.

Test

off not testing
red testing
red testing paused

TEST SEQUENCE

Each step in the test sequence lasts 10 seconds.

During the test routine, the test sequence may be paused by pressing the ***Test*** button. Only if there is a mixing demand can the control be paused in a step. If the ***Test*** button is not pressed again for 5 minutes while the test sequence is paused, the control exits the entire test routine. If the test sequence is paused, the ***Test*** button can be pressed again to advance to the next step. This can also be used to rapidly advance through the test sequence. To reach the desired step, repeatedly press and release the ***Test*** button until the appropriate device and segment in the display turn on.

Step 1 - The mixing valve is run fully open.

Step 2 - The mixing valve is run fully closed, and then the system pump (*Sys Pmp*) is turned on.

Step 3 - The *Boiler* contact is turned on for 10 seconds. After 10 seconds, the *Boiler* and *Sys Pmp* contacts are shut off.

Step 4 - After the test sequence is completed, the control resumes its normal operation.

Troubleshooting

When troubleshooting any heating system, it is always a good idea to establish a set routine to follow. By following a consistent routine, many hours of potential headaches can be avoided. Below is an example of a sequence that can be used when diagnosing or troubleshooting problems in a hydronic heating system.

Establish the Problem

Establish the problem. Get as much information from the customer as possible about the problem. Is there too much heat, not enough heat, or no heat? Is the problem only in one particular zone or area of the building, or does the problem affect the entire system? Is this a consistent problem or only intermittent? How long has the problem existed for? This information is critical in correctly diagnosing the problem.

Understanding the Sequence of Operation

Understand the sequence of operation of the system. If a particular zone is not receiving enough heat, which pumps or valves in the system must operate in order to deliver heat to the affected zone? If the zone is receiving too much heat, which pumps, valves, or check valves must operate in order to stop the delivery of heat?

Use the Test Routine

Press the ***Test*** button on the control and follow the control through the test sequence as described in the Testing section. Pause the control as necessary to ensure that the correct device is operating as it should.

Sketch the Piping in the System

Sketch the piping of the system. This is a relatively simple step that tends to be overlooked, however, it can often save hours of time in troubleshooting a system. Note flow directions in the system paying close attention to the location of pumps, check valves, pressure bypass valves, and mixing valves. Ensure correct flow direction on all pumps. This is also a very useful step if additional assistance is required.

Document the Control

Document the control for future reference. Before making any adjustments to the control, note down all of the items that the control is currently displaying. This includes items such as error messages, current temperatures and settings, and which devices should be operating as indicated by the LCD. This information is an essential step if additional assistance is required to diagnose the problem.

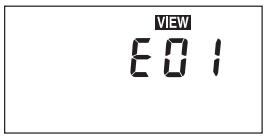
Isolate the Problem

Isolate the problem between the control and the system. Now that the sequence of operation is known and the system is sketched, is the control operating the proper pumps and valves at the correct times? Is the control receiving the correct signals from the system as to when it should be operating? Are the proper items selected in the menus of the control for the device that is to be operated?

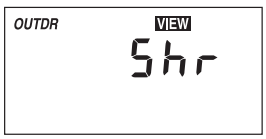
Test the Contacts, Voltages and Sensors

Test the contacts, voltages and sensors. Using a multimeter, ensure that the control is receiving adequate voltage to the power terminals and the demand terminals as noted in the technical data. Use the multimeter to determine if the internal contacts on the control are opening and closing correctly. Follow the instructions in the Testing the Wiring section to simulate closed contacts on the terminal blocks as required. Test the sensors and their wiring as described in the sensor Data Brochures.

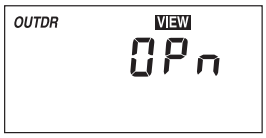
Error Messages



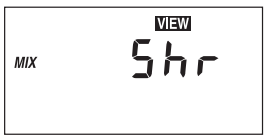
The control was unable to read a piece of information from its EEPROM. This error can be caused by a noisy power source. The control will load the factory defaults and stop operation until all the settings are verified.



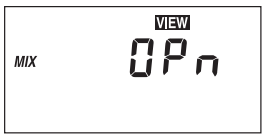
The control is no longer able to read the outdoor sensor due to a short circuit. In this case the control assumes an outdoor temperature of 0°C and continues operation. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



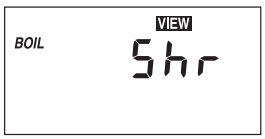
The control is no longer able to read the outdoor sensor due to an open circuit. In this case the control assumes an outdoor temperature of 0°C and continues operation. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



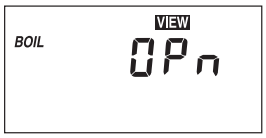
The control is no longer able to read the mixing supply sensor due to a short circuit. In this case the control will operate the mixing valve at a fixed output as long as there is a mixing demand. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



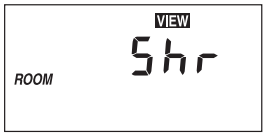
The control is no longer able to read the mixing supply sensor due to an open circuit. In this case the control will operate the mixing valve at a fixed output as long as there is a mixing demand. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



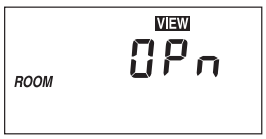
The control is no longer able to read the boiler sensor due to a short circuit. If the BOIL MIN adjustment is higher than 38°C, the control closes the Boiler contact when the mixing valve starts to operate. The boiler temperature is then limited by the operating aquastat. If the BOIL MIN adjustment is lower than 38°C, the control does not operate the Boiler contact. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



The control is no longer able to read the boiler sensor due to an open circuit. If the BOIL MIN adjustment is higher than 38°C, the control closes the Boiler contact when the mixing valve starts to operate. The boiler temperature is then limited by the operating aquastat. If the BOIL MIN adjustment is lower than 38°C, the control does not operate the Boiler contact. If the boiler sensor is deliberately removed, the control must be powered down, and then powered back up. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



The control is no longer able to read the indoor sensor due to a short circuit. The control will continue to operate as if there was nothing connected to the indoor sensor input. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



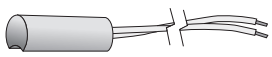
The control is no longer able to read the indoor sensor due to an open circuit. The control will continue to operate as if there was nothing connected to the indoor sensor input. If the indoor sensor is deliberately removed, the control must be powered down, and then powered back up. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.

10 K Sensors

OUTDOOR SENSOR 91624

The outdoor sensor includes a 10kΩ thermistor which provides an accurate measurement of the outdoor temperature. The sensor is protected by a white U.V. resistant PVC plastic enclosure.

UNIVERSAL SENSOR 91736



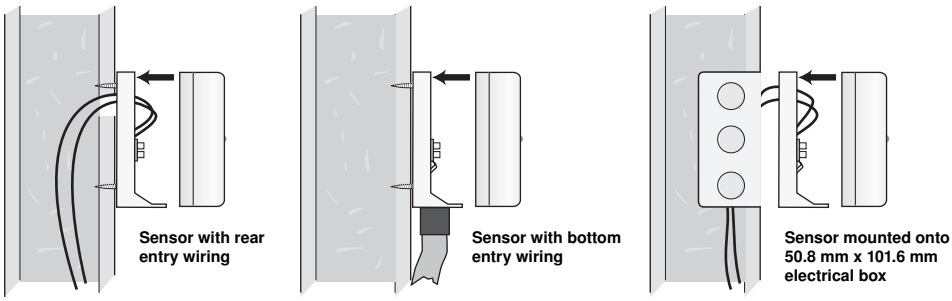
The universal sensor has a zinc sleeve for fast response and a wide operating range. The sensor is supplied with 300 mm of two conductor wire.

Installation - Outdoor Sensor 91624

STEP ONE — MOUNTING THE SENSOR

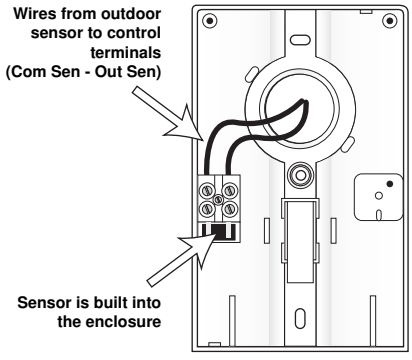
Note: The temperature sensor (thermistor) is built into the sensor enclosure.

- Remove the screw and pull the front cover off the sensor enclosure.
- The sensor can either be mounted directly onto a wall or a 50 x 100 mm electrical box. When the sensor is wall mounted, the wiring should enter through the back or bottom of the enclosure. Do not mount the sensor with the conduit knockout facing upwards as rain could enter the enclosure and damage the sensor.
- In order to prevent heat transmitted through the wall from affecting the sensor reading, it may be necessary to install an insulating barrier behind the enclosure.
- The sensor should be mounted on a wall which best represents the heat load on the building (a northern wall for most buildings and a southern facing wall for buildings with large south facing glass areas). The sensor should not be exposed to heat sources such as ventilation or window openings.
- The sensor should be installed at an elevation above the ground that will prevent accidental damage or tampering.



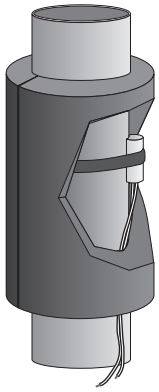
⚠ STEP TWO — WIRING AND TESTING THE SENSOR

- Connect 18 AWG or similar wire to the two terminals provided in the enclosure and run the wires from the sensor to the control. Ensure that all wires are stripped to 9 mm. Do not run the wires parallel to telephone or power cables. If the sensor wires are located in an area with strong sources of electromagnetic interference (EMI), shielded cable or twisted pair should be used or the wires can be run in a grounded metal conduit. If using shielded cable, the shield wire should be connected to the Com terminal on the control and not to earth ground.
- Follow the sensor testing instruction in this brochure and connect the wires to the control.
- Replace the front cover of the sensor enclosure.

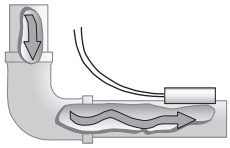


STEP ONE — MOUNTING THE SENSOR

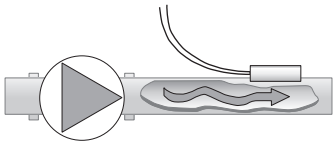
Note: This sensor is designed to mount on a pipe or in a temperature immersion well.



The Universal Sensor can be strapped directly to the pipe using the cable tie provided. Insulation should be placed around the sensor to reduce the effects of air currents on the sensor measurement.



The Universal Sensor should be placed downstream of a pump or after an elbow or similar fitting. This is especially important if large diameter pipes are used as the thermal stratification within the pipe can result in erroneous sensor readings. Proper sensor location requires that the fluid is thoroughly mixed within the pipe before it reaches the sensor.



⚠ STEP TWO — WIRING AND TESTING THE SENSOR

Caution Do not run the wires parallel to telephone or power lines. If the sensor wires are located in an area with strong sources of electromagnetic noise, shielded cable or twisted pair should be used or the wires can be run in a grounded metal conduit. If using shielded cable, one end of the shield should be connected to the *Com* terminal on the control and the other end should remain free. The shield must not be connected to earth ground.

- It will be necessary to connect 18 AWG wire to the two sensor wires. Ensure that all wires are stripped to 9 mm. Wire nuts can be used to hold the wires together.
- Follow the sensor testing instructions of this brochure and connect the wires to the control.

Sensor Testing Instructions

⚠ A good quality test meter capable of measuring up to 5,000 kΩ (1 kΩ =1000 Ω) is required to measure the sensor resistance. In addition to this, the actual temperature must be measured with either a good quality digital thermometer, or if a thermometer is not available, a second sensor can be placed alongside the one to be tested and the readings compared.

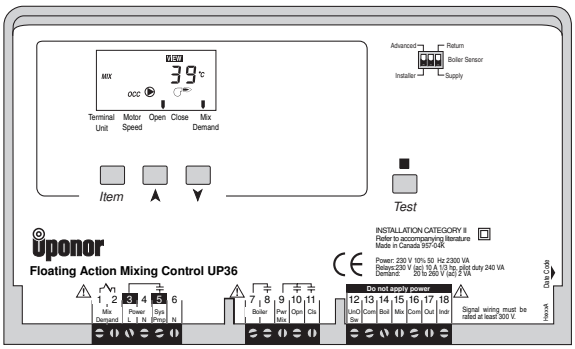
First measure the temperature using the thermometer and then measure the resistance of the sensor at the control. The wires from the sensor must not be connected to the control while the test is performed. Using the chart below, estimate the temperature measured by the sensor. The sensor and thermometer readings should be close. If the test meter reads a very high resistance, there may be a broken wire, a poor wiring connection or a defective sensor. If the resistance is very low, the wiring may be shorted, there may be moisture in the sensor or the sensor may be defective. To test for a defective sensor, measure the resistance directly at the sensor location.

Do not apply voltage to a sensor at any time as damage to the sensor may result.

Temperature	Resistance	Temperature	Resistance	Temperature	Resistance	Temperature	Resistance
°C	Ω	°C	Ω	°C	Ω	°C	Ω
-46	490,813	-7	46,218	32	7,334	71	1,689
-43	405,710	-4	39,913	35	6,532	74	1,538
-40	336,606	-1	34,558	38	5,828	77	1,403
-37	280,279	2	29,996	41	5,210	79	1,281
-34	234,196	4	26,099	43	4,665	82	1,172
-32	196,358	7	22,763	46	4,184	85	1,073
-29	165,180	10	19,900	49	3,760	88	983
-26	139,402	13	17,436	52	3,383	91	903
-23	118,018	16	15,311	54	3,050	93	829
-21	100,221	18	13,474	57	2,754	96	763
-18	85,362	21	11,883	60	2,490	99	703
-15	72,918	24	10,501	63	2,255	102	648
-12	62,465	27	9,299	66	2,045	104	598
-9	53,658	29	8,250	68	1,857	107	553

Notes

Floating Action Mixing Control UP36



Literature	— D UP36.
Control	— Microprocessor PID control; This is **not a safety (limit) control.**
Packaged weight	— 1250 g, white PVC plastic
Dimensions	— 170 x 193 x 72 mm
Approvals	— CE approved, meets ICES & FCC regulations for EMI/RFI.
Ambient conditions	— Indoor use only, 0 to 39°C, < 90% RH non-condensing. Altitude <2000 m, Installation Category II, Pollution Category II.
Power Supply	— 230 V ±10% 50 Hz 2300 VA
System Pump Relay	— 230 V (ac) 10 A 1/3 hp, pilot duty 240 VA
Boiler Relay	— 230 V (ac) 10 A 1/3 hp, pilot duty 240 VA
Open Relay	— 230 V (ac) 10 A 1/3 hp, pilot duty 240 VA
Close Relay	— 230 V (ac) 10 A 1/3 hp, pilot duty 240 VA
Mix Demand	— 20 to 260 V (ac) 2 VA
Sensors included	— NTC thermistor, 10 kΩ @ 25°C ±0.2°C ß =3892, Outdoor Sensor 91624 and 2 of Universal Sensor 91736.
Optional devices	— Timer, Indoor Sensor.

Caution: The non-metallic enclosure does not provide grounding between conduit connections. Use grounding type bushings and jumper wires.

Outdoor Sensor 91624

Enclosure	— white PVC plastic
Dimensions	— 114 x 73 x 38 mm
Approvals	— CSA C US, CE approved
Operating range	— -50 to 60°C
Sensor	— NTC thermistor, 10 kΩ @ 25°C ±0.2°C, ß=3892

Universal Sensor 91736

Enclosure, wire	— zinc sleeve, 250 mm, 20 AWG XPE wire
Dimensions	— 9.5 OD x 19 mm
Approvals	— CSA C US, CE approved
Operating range	— -50 to 125°C
Sensor	— NTC thermistor, 10 kΩ @ 25°C ±0.2°C, ß=3892

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