IBC®

Installation & Operation Manual

SKY-35

Controller for Multiple Hydronic Heat Sources

C ETL LISTED US
Intertek

About this manual

Thank you for your purchase of IBC's Sky-35 controller for multiple hydronic heat sources. Please keep this manual on site for reference.

- Chapters four through seven document the four tabs of the controller screen:
  - 4 *Home*
  - 5 *Setup*
  - 6 *Status*
  - 7 ●●● *More*.
- Chapter 8 offers a survey of the best practices in hydronics.
- Chapter 9 provides concept drawings to aid in your application.

Caution: Handling the touchscreen

The touchscreen responds to a light finger touch on the screen. Use only a stylus or a clean finger to interact with the touchscreen. Using sharp or metallic objects will cause damage.

Caution: Controller's USB port

Be aware that the USB port is designed for software updates. It is not designed to power user devices that require and draw high amperage. Powering such devices via the USB port may result in a blank controller screen, and thus require a system reboot.

Accessories included

- Pump Relay Module
  - for on/off control of three pumps
  - with 24 Volt power source for Sky-35
- Supply temperature sensor
- Return temperature sensor
- Outdoor temperature sensor

Contents

1.0 Specifications

Sky-35 Controller Specifications	
Rated Voltage / Frequency / Phase	24V / 60Hz / 1Ph
Total Load (less pumps)	10VA / 0.42 A
Weight	3.2 lb / 1.45 kg
Max Fuse Size	2 A
Minimum Ambient Temperature	32°F / 0°C
Maximum Ambient Temperature	131°F / 55°C
Height	11.375" / 288.5 mm
Width	10.125" / 256.7 mm
Depth	1.75" / 43.7 mm
Rated Impulse Voltage	330 V
Action Type	1
Pollution Degree	2

Table 1 *Sky-35 controller Specifications*

Pump Relay Module Accessory Specifications	
Rated Voltage / Frequency / Phase	120V / 60Hz / 1Ph
3 x Relays 120VAC / 4.4 A max each	12.0 A Total
Total Load (less pumps)	0.1 A
Weight	2.4 lb / 1.09 kg
Max Fuse Size	15 A
Minimum Ambient Temperature	32°F / 0°C
Maximum Ambient Temperature	131°F / 55°C
Height	6.125" / 156 mm
Width	10.125" / 257 mm
Depth	2.125" / 49 mm
Rated Impulse Voltage	2500 V
Action Type	1
Pollution Degree	2

Table 2 *Pump Relay Module accessory Specifications*

1.1 Certifications / ETL Listings

The Sky-35 Controller conforms to UL STD 60730-1, and is certified to CSA STD E60730-1

FCC Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution

The Sky-35 is designed for indoor installation only.

1.2 Sky-35 dimensions

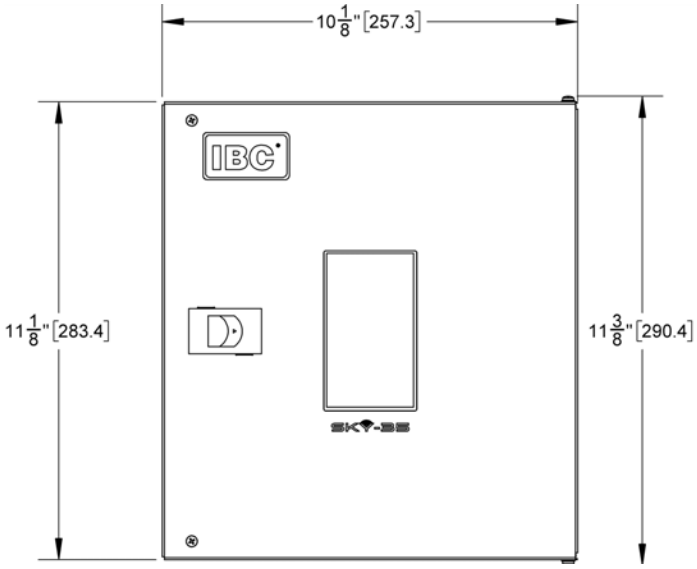

Figure 1 *Front view- Sky-35 Controller*

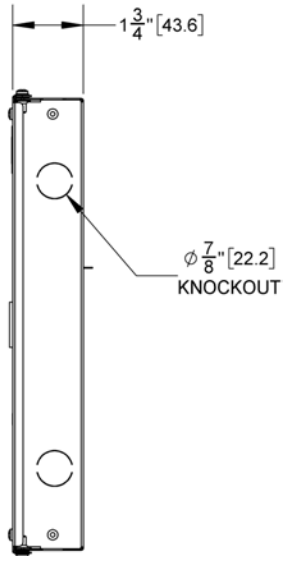

Figure 2 *Side view- Sky-35 Controller*

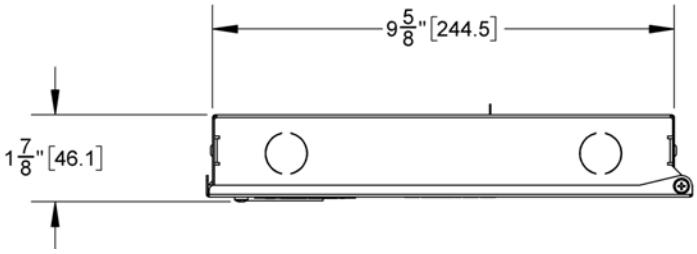

Figure 3 *Top view- Sky-35 Controller*

1.3 Relay Module dimensions

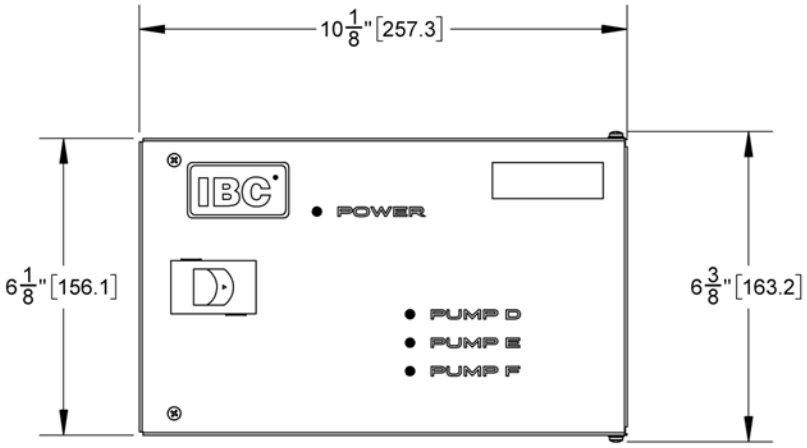

Figure 4 *Front view - Pump Relay Module*

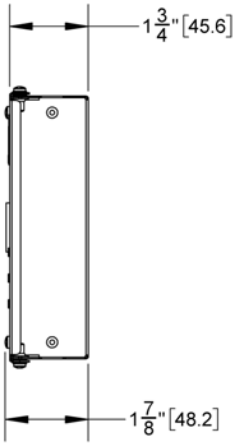

Figure 5 *Side view- Pump Relay Module*

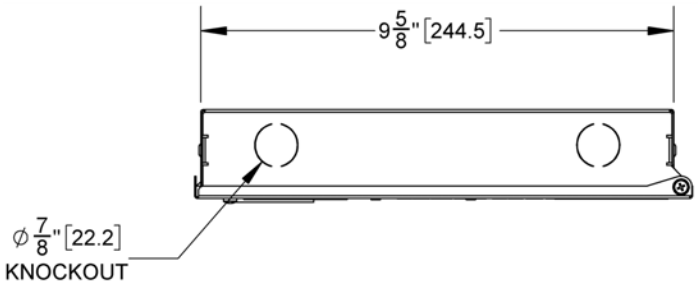

Figure 6 *Top view - Pump Relay Module*

1.4 Connection specifications

Sky-35 Connections	
Supply power wiring knock-out (1)	1/2"
Control wiring knock-outs (8)	1/2"
Ethernet port (1)	RJ45
USB port (1)	USB-A

Table 3 *Sky-35 Connections*

Clearances

When wall-mounting, leave adequate room for door swing, wiring connections and 6" (15cm) below for insertion of USB stick.

Pump Relay Module Connections	
Supply power wiring knock-out (1)	1/2"
Pump wiring knock-outs (7)	1/2"

Table 4 *Pump Relay Module Connections*

1.5 Warranty

IBC offers a 2-year warranty on all parts against defects in materials or workmanship. To view the warranty statement for the Sky-35 Controller, go to ibcboiler.com.

Figure 7 *IBC Warranties webpage*

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2.0 Sky-35 Controller Overview

The controller provides easy and versatile management of multiple hydronic heating and/or cooling sources. The Sky-35 allows you to set up primary and backup heat sources so that they work together in a priority sequence.

2.1 Features of the controller

- Control staging of up to six heat pumps, four electric boilers and a gas boiler network
- Main loop monitoring and control
- Buffer tank monitoring with Summer Shutdown
- Always-on status display
- Easy-to-set Outdoor Reset control option
- Two-way communication with IBC Heat Pumps, Electric Boilers and V10 boiler controllers
- Dry contacts for control of third-party heat sources
- Easy Heat Source setup
- Supply, Return and Outdoor temperature sensors included
- Control for up to six ECM pumps
- On/off control for three conventional pumps with included Pump Relay Module
- Heat Pump Over-temp Protection
- Heat Pump Freeze Protection
- Remote connectivity through IBC online Portal
- Flexible options for a wide spectrum of hydronic applications
- Easy expansion to six conventional pumps with purchase of additional Pump Relay Module

2.2 Controller's menu screens

The diagram below illustrates the controller's menu structure. Any of the four tabs can be selected at any time from the bottom of the touchscreen:

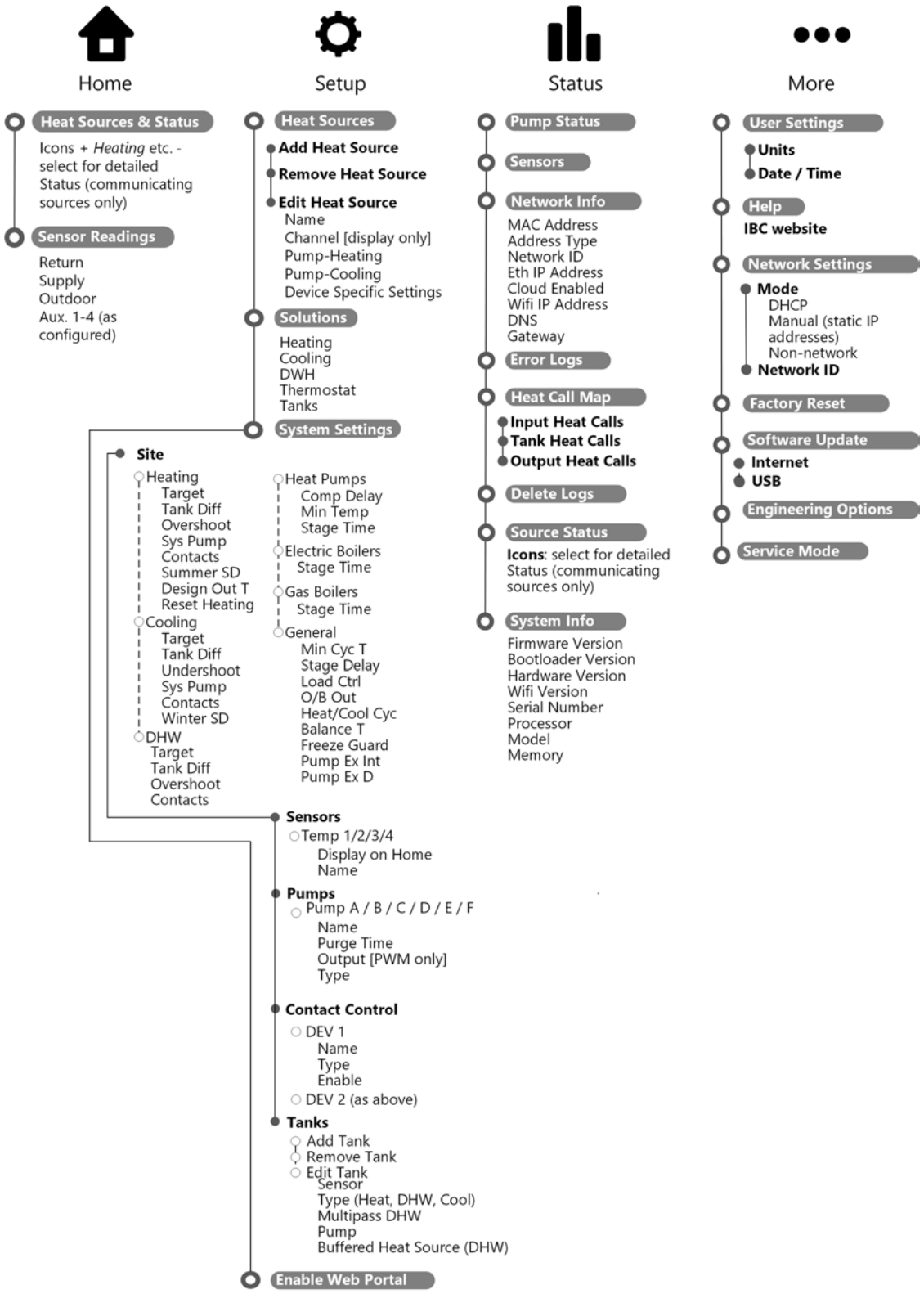

Figure 8 *Map of the controller*

2.3 Who is the manual for?

This manual is primarily written for heating professionals. Some of the content may be useful for building managers and homeowners.

2.4 Power-up sequence and operational states/cycles

When the Sky-35 is first energized, some settings will already be populated with default values: you will probably wish to change (and **Save**) certain settings. Generally, saved values take effect with the next heating (or cooling) call.

After a power interruption, the controller automatically resumes operation with all the previously stored values. During a power interruption a capacitor maintains the clock operation, but the capacitor charge is not required for retention of saved changes.

2.5 Getting to know the controller's interface

The controller's main screen displays four tabs: Home, Setup , Status, and ●●● More. These are covered in detail in the next four chapters.

At the bottom of all screens is a status bar; its colour has intuitive significance:

Status Bar Colour	Description
Green	Normal state - controller is operating within its limits.
Yellow	Warning error - When the controller detects an error.
Red	Alarm - Unresolved condition or error detected while a heat source is operating or preparing to operate.

Table 5 *Status bar background colours*

Errors are addressed in detail in the Status and Troubleshooting sections.

2.6 Multiple Heat Sources

For two or more heat sources a common control strategy is to designate one as primary and the other as a secondary heat source. The Sky-35 priority sequence (for the current software release) is:

1. Heat Pump (Heat Source 1)
2. Electric Boiler (Heat Source 2)
3. Gas Boiler (Heat Source 3)

The secondary heat source will turn on if

- the primary source run time reaches the *Staging Delay*. See *Setup* > *System Settings* > *Site* > *Heat Pump* > *Stage Time*.
- there is a W2 call from the thermostat
- the outdoor temperature is below the *Balance Point*

Heat sources of identical type are added and dropped in a first on / first off pattern. The "first on" role is rotated among units for balanced run-times.

Sequence of operation – heating a buffer tank with two heat pumps

- If the outdoor temperature is above the temperature set as *Summer Shutdown*, Sky-35 displays *Standby-Summer* and does not heat.
- If the outdoor temperature is below *Summer Shutdown*, the buffer tank setpoint activates. This will be either a setpoint determined by Outdoor Reset or a fixed Setpoint.
- The Sky-35 will begin running one heat pump. HPX heat output will be proportional to the degrees below target temperature. Heat pumps by other manufacturers may progress through a first and second level staging.
- If after the interval set as *Staging Delay* the tank temperature is below setpoint, the Sky-35 will bring on the second heat pump.
- As the buffer tank temperature approaches its target, the heat pump(s) will reduce output.
- When the buffer tank reaches its target plus half the *Differential*, the Sky-35 will shut off the heat pump(s). (Note for DHW heating stops exactly when the target is reached.)

Note

For a DHW tank the differential applies only below the target: heating stops when the target is reached, and begins again when the tank falls below target by the differential.

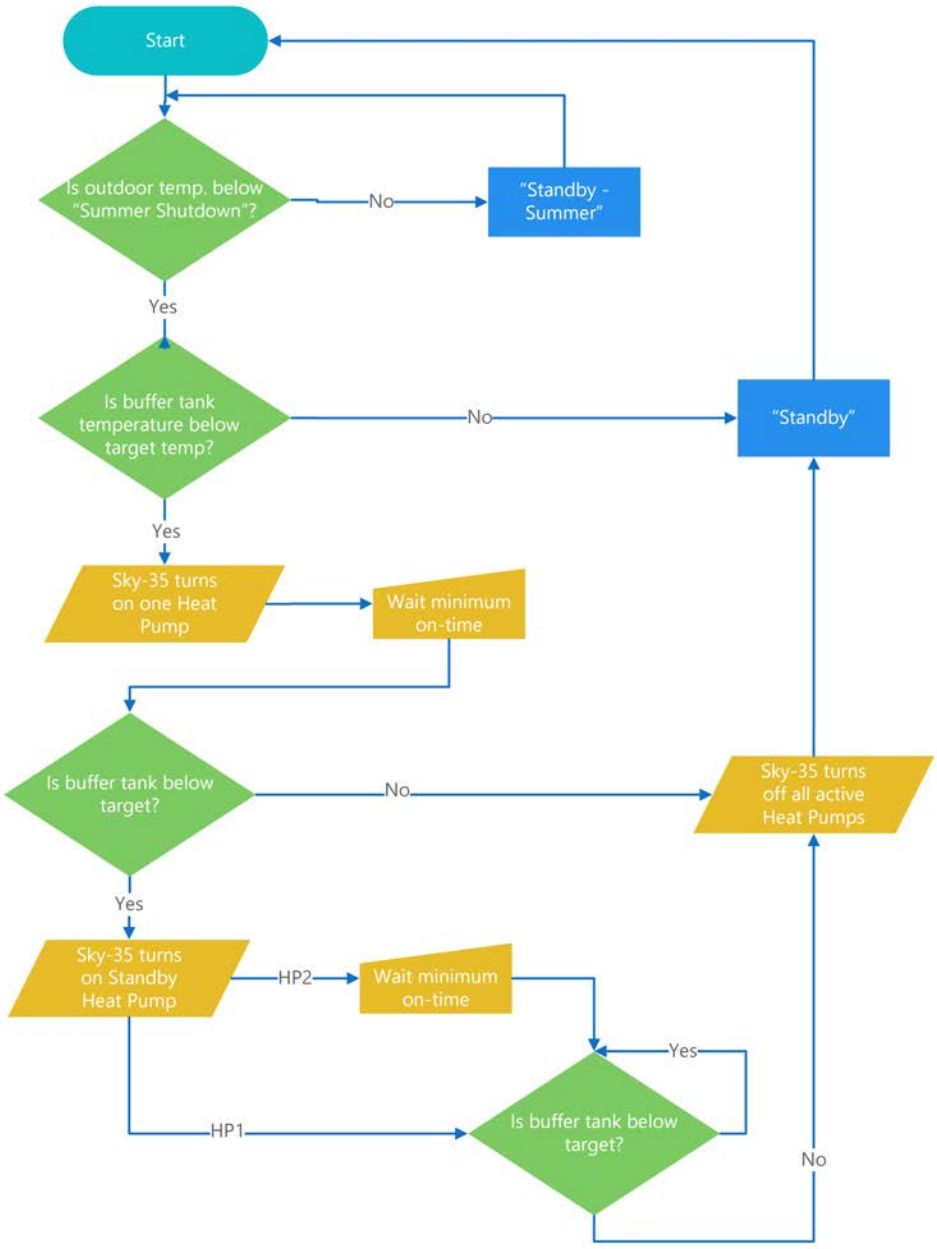

Figure 9 *Sequence of operation: heating with two heat pumps*

A similar sequence of operation can be seen in this example of a CX gas-fired boiler / water heater backup for space-heating:

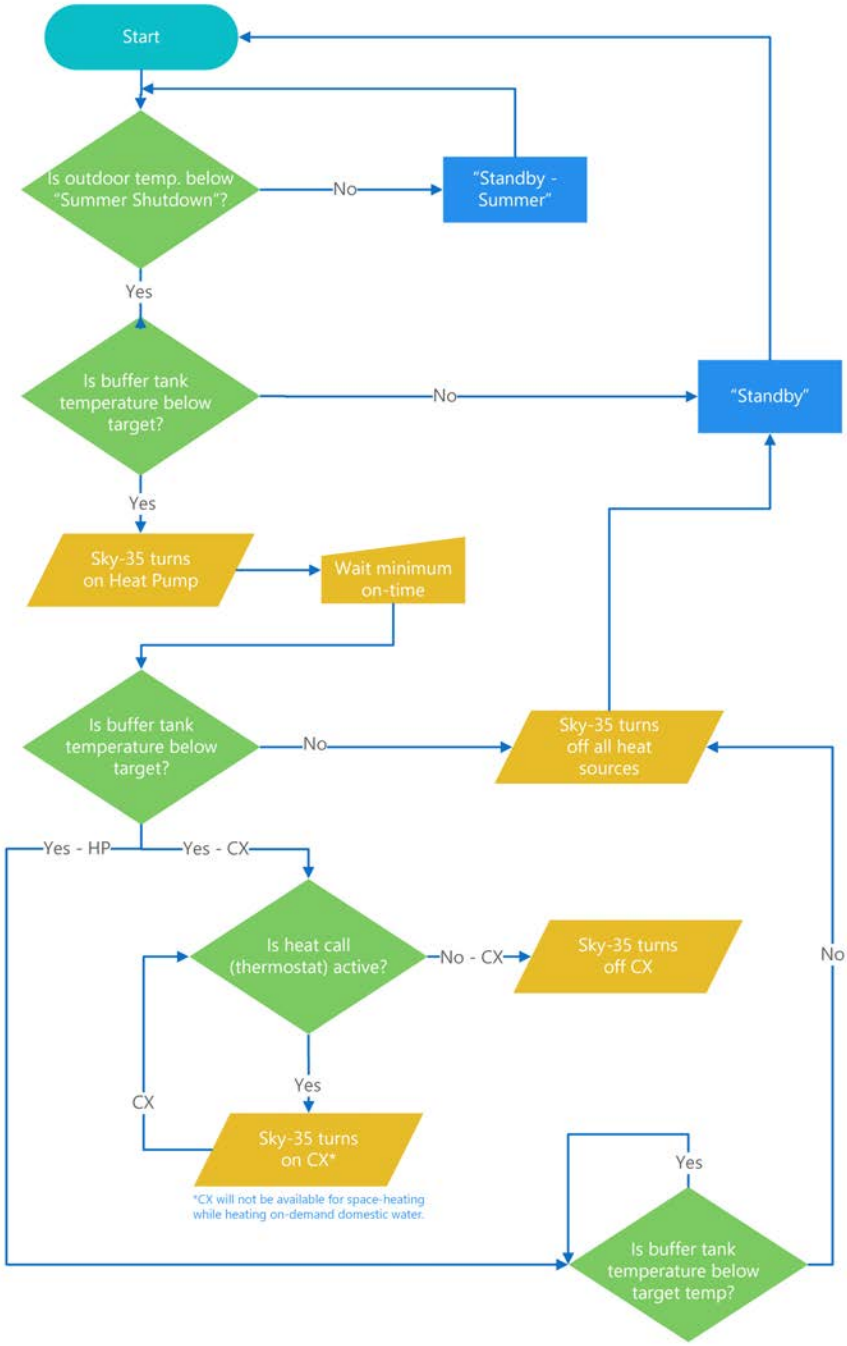

Figure 10 *Sequence of operation: heating with heat pump and combi boiler / water heater*

Sequence of operation – heating with heat pump with CX boiler backup

The heat pump acts as the primary heat source. Heating is active while the outdoor temperature stays below the value *Summer Shutdown*, which is typically set around 66°F (19°C).

While heating is active the Sky-35 directs a heat source or sources to maintain the buffer tank temperature. The reset heating range (or simple tank setpoint) and buffer tank differential values are entered directly into the *Setup* > *Site Settings* menu. The tank differential must not be so great that at the end of the off-cycle the water is too cool to provide space-heating, but it must not be so small that the system short-cycles. The optimum value will depend on the heat output and the buffer tank volume: see the section *Buffer Tank on page 53* below.

The heat sources themselves need to be set to operate just slightly hotter than the buffer tank target, so that the buffer tank load may be satisfied and the heat sources go into Standby during periods of low demand. Where it can dictate target temperatures, the Sky-35 applies this bias automatically. For those heat sources requiring your configuration, IBC suggests the heat sources be set 2°F to 6°F (1°C to 3.3°C) above the buffer tank and distribution system.

When the buffer tank reaches target temperature and the heat sources turn off, some of the heating zones may still be active. Heat is transferred from the buffer tank to the building and eventually the tank temperature drops below the differential, and the Sky-35 will turn on the heat pump once again.

Rotation

When multiple heat pumps or electric boilers are configured, a 'Rotation' routine is applied automatically. The lead unit is alternated with each cycle.

> **Note on Thermostats with Buffer Tank**
>
> In Buffer Tank mode the backup heat source joins heating the buffer tank after the staging delay, while there's an active call from the thermostat. If the thermostat isn't calling the primary heat source brings the tank up to temperature without the backup. If there is no thermostat connection to the Sky-35, the backup heat source will activate only if the outside temperature is below the setting *Balance Point*, or the primary heat source is in error.

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3.0 Installation and Wiring

3.1 Location

Situate the controller in the heating equipment room approximately 1.5 m (5ft) from the ground, or at a height offering easy access. Before mounting, consider accessibility to heat sources and pumps which are to be wired to the controller. Leave adequate room for door swing, wiring connections and 4" (10 cm) below for insertion of USB stick.

Warning

The supply voltage wiring must be permanent, fixed type.

Warning

Wiring and testing must be performed by experienced and trained professionals.

Warning

The units were tested and certified for wired connections no longer than 32.8 feet (10 m) maximum. This does not apply to the supply voltage wiring.

This section includes the following topics:

- Layout
- Terminal functions and Ratings
- Connections to Pump Relay Module
- RS-485 and Ethernet connections
- Thermostats and Sensors
- Load pumps or valves
- Sensors
- Wiring checklist

Note

Sensors connected to any sensor input contacts must be of the NTC Thermister type with a resistance of 10,000 ohms at 77°F (25°C) and β = 3892. We do not recommend using 3rd-party supplied sensors. Compatible water temperature sensors and outdoor sensors can be supplied by your IBC distributor.

3.2 Layout

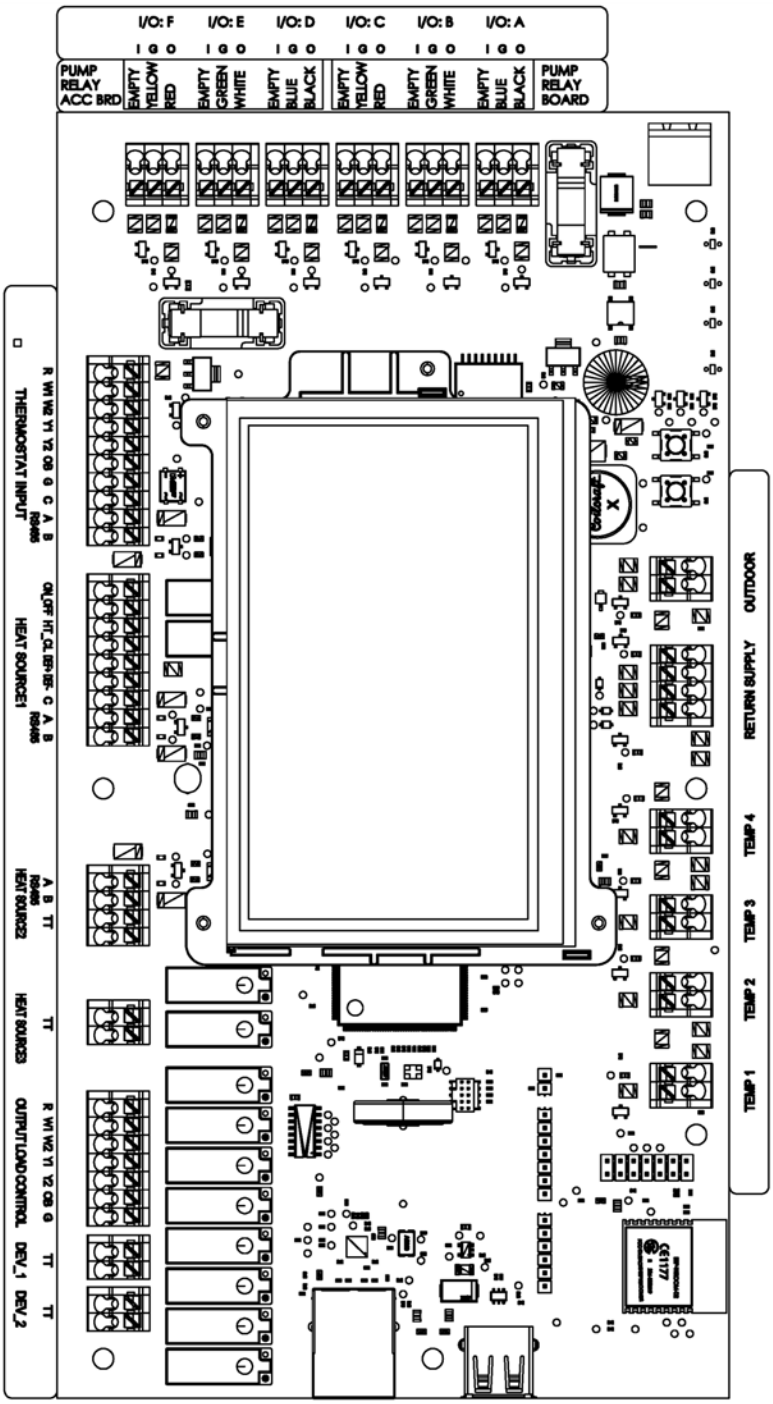


Figure 11 *Sky-35 controller layout*

3.3 Sky-35 Controller terminal functions and ratings

Block	Pin	Type	Description	Maximum Rating
AC IN		Input	24 VAC power to the Sky-35 controller from Pump Relay Module	24 VAC
I/O: PUMPS A-F	O	Output	EMC / PSC Circulator Control; 12V - PWM control signal relative to G terminal	150 mA; 400 mA total A-F
	I	Input	EMC / PSC Circulator Feedback; 5 to 24 V-PWM relative to G terminal	
	G	Output	With O terminal can connect to Pump Relay Module for standard PSC circulator control	
Thermostat Input Room thermostat connection	R	Output	24 VAC for wet contacts	24 VAC 100mA
	W1	Input	To trigger Heating	24 VAC
	W2	Input	To trigger Stage 2 Heating	24 VAC
	Y1	Input	To trigger Cooling	24 VAC
	Y2	Input	To trigger Stage 2 Cooling	24 VAC
	O/B	Input	To set mode as Heating or Cooling	24 VAC
	G	Input	To trigger fan operation	24 VAC
	C	Input	Common	
	A		RS485 comms interface for intelligent thermostats compatible with IBC	DO NOT APPLY POWER
	B			
Heat Source 1 (HP) Heat Pump demand terminal block	ON_OFF (2)	Dry contacts	To initiate a call for heat pump operation (like TT)	24 VAC/DC
	HT_CL (2)	Dry contacts	For heat pump to select heating or cooling mode (like TT)	24 VAC/DC
	DEF+ (2)	Input, isolated 24V	Defrost signal from heat pump	24 VAC/DC
	A		RS 485 comms interface for IBC heat pumps	DO NOT APPLY POWER
	B			
Heat 2 (EB) Electric boiler demand terminal block	A		RS 485 comms interface for IBC electric boilers	DO NOT APPLY POWER
	B			
	T (2)	Dry contacts	To initiate a call for electric boiler operation	24VAC/DC
Heat 3 (GB) Gas Boiler demand terminal block	T (2)	Dry contacts	To initiate a call for gas boiler operation	24VAC/DC

Block	Pin	Type	Description	Maximum Rating
Output Load Control Terminal block to control an air handler unit	R	Dry contacts	Common for other pins on terminal	24VAC/DC
	W1	Output	Stage 1 heating to Air Handler	*
	W2	Output	Stage 2 heating to Air Handler	*
	Y1	Output	Stage 1 cooling to Air Handler	*
	Y2	Output	Stage 2 cooling to Air Handler	*
	OB	Output	Reversing valve signal to Air Handler	*
	G	Output	Fan signal to Air Handler	*
DEV_1	T (2)	Dry contacts	Terminal block for auxiliary device 1 control [upcoming feature]	24VAC/DC
DEV_2	T (2)	Dry contacts	Terminal block for auxiliary device 2 control [upcoming feature]	24VAC/DC
TEMP_1	(2)	Input	Terminal block for auxiliary NTC 10KΩ thermistor as Temperature Sensor 1	DO NOT APPLY POWER
TEMP_2	(2)	Input	Terminal block for auxiliary NTC 10KΩ thermistor as Temperature Sensor 2	DO NOT APPLY POWER
TEMP_3	(2)	Input	Terminal block for auxiliary NTC 10KΩ thermistor as Temperature Sensor 3	DO NOT APPLY POWER
TEMP_4	(2)	Input	Terminal block for auxiliary NTC 10KΩ thermistor as Temperature Sensor 4	DO NOT APPLY POWER
RETURN	(2)	Input	Terminal block for supplied NTC 10KΩ thermistor as Return Temperature Sensor	DO NOT APPLY POWER
SUPPLY	(2)	Input	Terminal block for supplied NTC 10KΩ thermistor as Supply Temperature Sensor	DO NOT APPLY POWER
OUTDOOR	(2)	Input	Terminal block for supplied NTC 10KΩ thermistor as Outdoor Temperature Sensor	DO NOT APPLY POWER

*Output Load Control 24 VAC / VDC; 5.0 A; Resistive. 24 VAC @ 24 VA; 1.0 A; 3.6 A Inrush; Pilot

Table 6 *Sky-35 Controller terminals and ratings*

Warning

For all field wiring use copper conductors only.

3.4 Pump Relay Module terminal functions and ratings

Block	Pin	Type	Description	Maximum Rating
AC INPUT	L	Input	Line voltage supply to the Pump Relay Module	120 VAC; 60 Hz; 12.0 A
	N	Input	Neutral to the Pump Relay Module	
RELAY OUTPUTS	RL 1	Output	120 VAC for standard PSC I/O A control	1/6 HP @ 120 VAC*
	N1	Output	Neutral for standard PSC I/O A control	
	RL 2	Output	120 VAC for standard PSC I/O B control	1/6 HP @ 120 VAC*
	N2	Output	Neutral for standard PSC I/O B control	
	RL3	Output	120 VAC for standard PSC I/O C control	1/6 HP @ 120 VAC*
	N3	Output	Neutral for standard PSC I/O C control	
SKY-35 POWER	TOP	Output	24 VAC power supply for Sky-35 Controller	
	BOTTOM	Output		
RELAY CONTROL Pump control signal from Sky-35	PLUG (Blue)	Ground	GND to PWM signal from Sky-35 I/O A	
	PLUG (Black)	Input	12 VDC PWM signal from Sky-35 I/O A	
	PLUG (Green)	Ground	GND to PWM signal from Sky-35 I/O B	
	PLUG (White)	Input	12 VDC PWM signal from Sky-35 I/O B	
	PLUG (Yellow)	Ground	GND to PWM signal from Sky-35 I/O C	
	PLUG (Red)	Input	12 VDC PWM signal from Sky-35 I/O C	

* 4.4 A EACH; 12.0 A Total. Pilot duty 180 Va @ 120 VAC; 1.5 A. Min Pump conductor size 16 AWG

Table 7 *Pump Relay Module terminals and ratings*

3.5 Connections to Pump Relay Module

The Pump Relay Module supplies 24 V power for the Sky-35 through the cable provided (part #200-199), as shown. If used, the Module must be mounted within cable length, at most 11 inches (28 cm), from the controller.

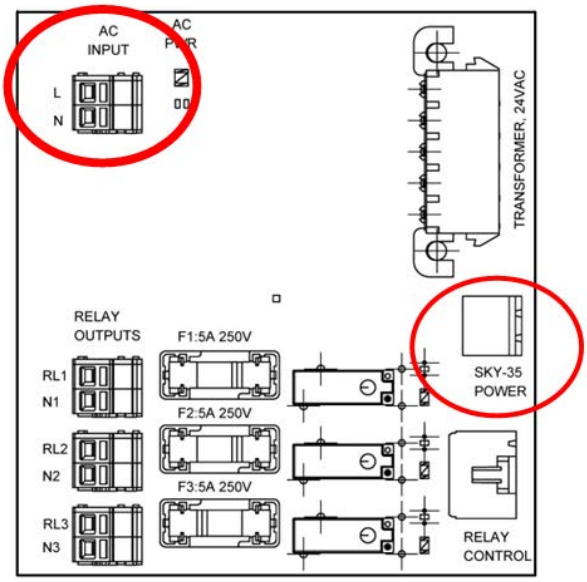


Figure 12 *Pump relay board: System AC input and 24V output to Sky-35 highlighted*

Your restrainer hardware may require you to remove the power cable terminal plug using a small slot screwdriver, then thread the wires through the restrainer and reconnect the wires. **Note wire polarity before removing the plug.**

Note the six Pump Relay wires for the terminals O (Red, White, Black) and G (Yellow, Green, Blue) for three pumps:

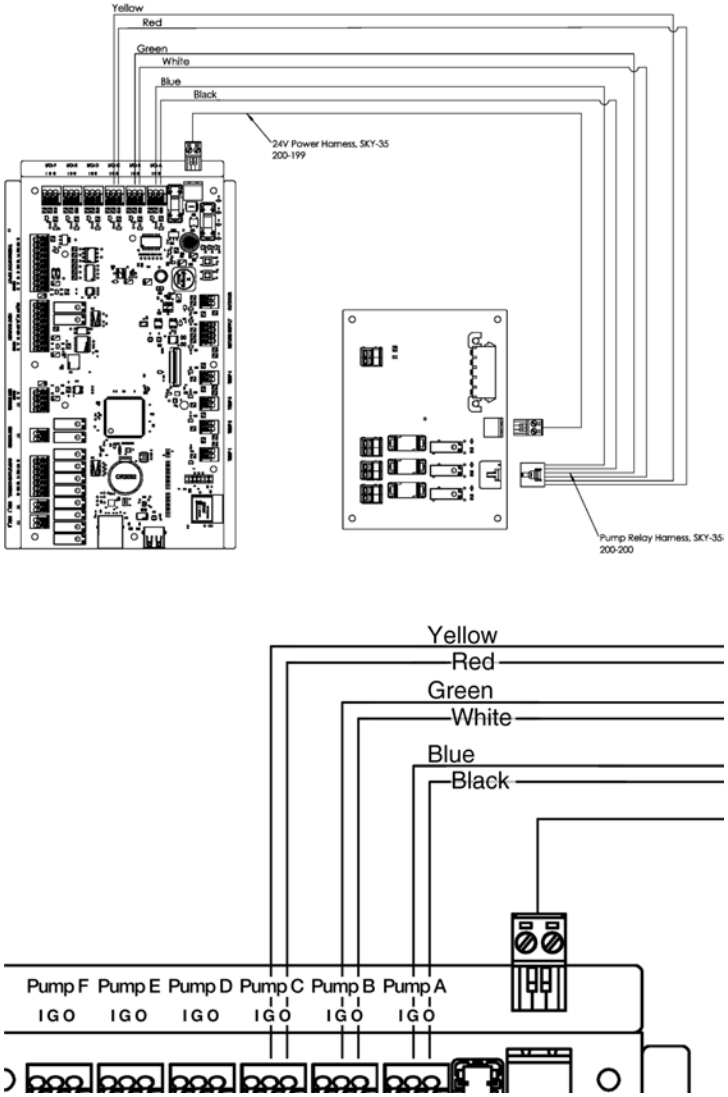


Figure 13 *Sky-35 controller connections to Pump Relay Module (with detail)*

3.6 RS-485 Connections

An IBC Heat Pump connects to the Sky-35 through the RS-485 A/B connections on the Heat 1 (HP) terminal block.

For multiple heat pumps the RS-485 A/B connections must be daisy chained, with every A together, and every B together.

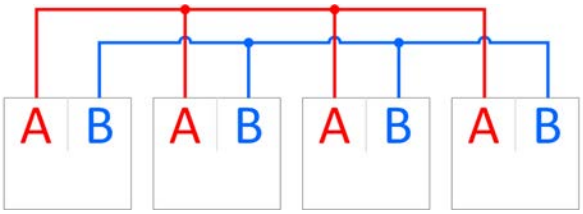


Figure 14 *Daisy chain wiring*

Note

To activate multiple RS-485 connections, power on only one HPX unit at a time and complete the ***Add Heat Source*** and ***Pump Setup*** routines before powering on the next HPX.

3.6.1 Wiring and networking multiple EBX electric boilers

An IBC EBX electric boiler connects to the Sky-35 through the RS-485 A/B connections on the Heat 2 (EB) terminal block.

To network multiple EBX boilers:

1. With the power off, daisy-chain wire the RS-485 connections (as shown in*Figure 14* above).
2. Assign an order to the EBX boilers; number them 1-4 if necessary.
3. On each boiler set the control board dipswitches as follows:
   a. EBX **1**: 32 (code ACE)
   b. EBX **2**: 33 (code ACF)
   c. EBX **3**: 34 (code CDE)
   d. EBX **4**: 35 (code ADF)
4. Power on the Sky-35 and navigate to ⚙ ***Setup > Add Heat Source.*** To ***Does your heat source support two-way communication with the Sky-35?*** answer ***Yes > EBX***.

5. Power on only EBX 1. The Sky-35 will confirm the DIP switch settings. If these are correct, you do not need to re-power the EBX and you can select ***Ready***.
6. Repeat the power-up and add process (step 5) for boiler(s) 2, 3 and 4 in sequence.

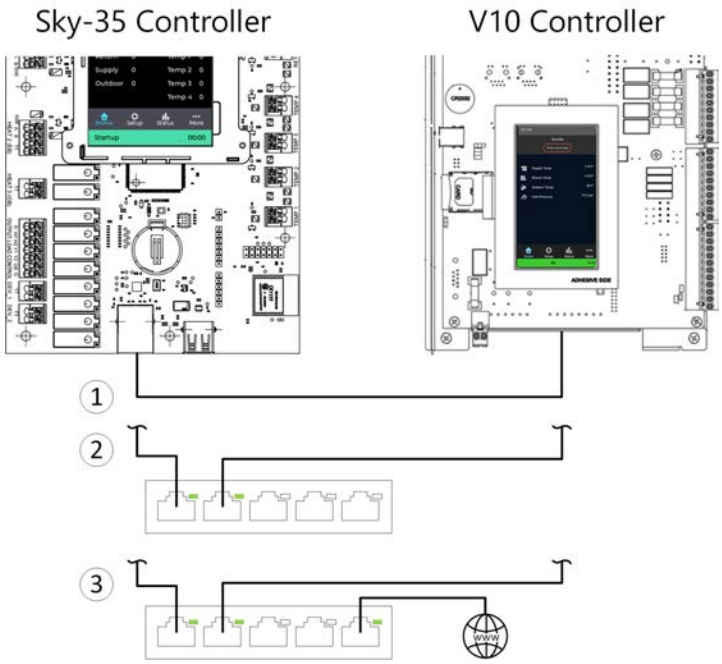
Leave the EBX electric boiler with its default settings (Setpoint mode): the setpoint temperatures will be supplied by the Sky-35 via the RS-485 connections.

3.7 Ethernet Connections

The Sky-35 controller can be connected through an ethernet cable to the Internet for remote monitoring, or to a IBC boiler's V10 Touchscreen controller. V10 controller must be running 2.01.6 or later. In V10 controller under *Network Settings* set "Sky-35 comm" to *Enabled*.

> **Note**
>
> When connecting a Sky-35 to a V10, change the *Network ID* on both devices to the same natural (**non-zero**) number.

When connecting to a V10 controller there are three options:



(1) Ethernet cable: this needn't be a crossover cable. Select the Non-network mode for static IP addresses in the menu ●●● **[More] > Network Settings > Mode > Non-Network** See *Network Settings on page 49*

2	Cables to an ethernet switch. Select the Non-network mode as above. Unmanaged switch recommended[1]
3	Cables to an ethernet switch connected to the internet; units are automatically assigned IP addresses when using the *Add IBC Heat Source* button in the Setup menu.

Figure 15 *Sky-35 controller connections to V10 controller*

Ethernet connections to IBC's AHU-series air handlers are not supported at the time of this printing.

3.8 Thermostats

The controller is compatible with most common thermostats including simple single contact types (for example, a mercury switch). The standard connection for common thermostats provides a simple contact closure .

» The **Thermostat Input R** terminal provides 24 volts AC to thermostat. This connects to the "R" terminal on the thermostat.

Note

Some thermostats, for example those with WiFi circuits, may require their own 24V power source.

Caution: power-stealing thermostats

The Sky-35 controller does not support power-stealing thermostats. Power stealing thermostats take their operating power from the thermostat line. If a t-stat has electronic display but does not use a C-wire or a battery, it is power-stealing.

[1] Alternatively, without a router you can allow a managed ethernet switch that includes a DHCP server to provide IP addresses to the controllers. **CAUTION FOR MANAGED SWITCHES:** if a router is to be introduced later, the DHCP server option on the switch must first be deactivated, because there can be only one DHCP server active on a network.

3.9 Sensors

The Sky-35 temperature sensor inputs are compatible with any 10K Ω NTC thermistor (also known as a 10K Type II NTC thermistor)with a beta value of 3895. Supply, Return and Outdoor temperature sensors are provided with the Sky-35. Kits for additional sensors such as the P-9073 temperature sensor are available from your IBC distributor.

The chart below gives the temperature/resistance relation:

Temp. °F/°C	Resist. Ω – Ohm	Temp. °F/°C	Resist. Ω – Ohm
0 / -18	85,362	100 / 38	5,828
5 / -15	72,918	105 / 41	5,210
10 / -12	62,465	110 / 43	4,665
15 / -9	53,658	115 / 46	4,184
20 / -7	42,218	120 / 49	3,760
25 / -4	39,913	125 / 52	3,383
30 / -1	34,558	130 / 54	3,050
35 / 2	29,996	135 / 57	2,754
40 / 4	26,099	140 / 60	2,490
45 / 7	22,763	145 / 63	2,255
50 / 10	19,900	150 / 66	2,045
55 / 13	17,436	155 / 68	1,857
60 / 16	15,311	160 / 71	1,689
65 / 18	13,474	165 / 74	1,538
70 / 21	11,883	170 / 77	1,403
75 / 24	10,501	175 / 79	1,281
80 / 27	9,299	180 / 82	1,172
85 / 29	8,250	185 / 85	1,073
90 / 32	7,334	190 / 88	983
95 / 35	6,532	195 / 91	903

Wire supplied thermisters (10K ohm type 2 sensor) to the following terminals:

- Supply
- Return
- Outdoor

Wire optional field-supplied thermister (10K ohm type 2 sensor) to TEMP 1/2/3/4 terminal:

- Buffer Tank Temperature
- DHW Temperature

> **Note**
> Always turn off electrical power to the Sky-35 before removing the circuit board cover.

3.10 Pumps

> **Note**
> Wiring for line terminals on the Relay Module should be Class 1, 12-14 AWG.

You can wire up to six variable speed pumps to the terminals "Output A/B/C/D/E/F." Variable speed pumps should be wired directly to the Sky-35 board (not to the accessory Relay Module). When a variable speed pump is wiring includes the "I" terminal, the Sky-35 displays an operating status on the *Status* screen.

Any pump being directly switched by an IBC control board must draw less than 4 amps.

3.11 DEV terminals

The terminals "DEV_1" or "DEV_2" are for a device control, for example to switch externally provided 24V to control a diverting valve. The terminals can be configured to activate during heating, cooling or DHW.

3.12 Wiring checklist

The following provides useful checks to confirm that wiring is successful.

Checklist for Wiring	Check
Ensure the appropriate loads are set to "Off" or to an appropriate load type.	☐
Ensure the pumps cycle on or off as expected.	☐
Check for poor connection or voltage problems from flickering screens or intermittent calls for heat.	☐
An Ethernet cable is installed if requiring Internet for connection to the IBC V10 portal.	☐

4.0 The *Home* screen

Figure 16 *Home icon*

4.1 Controller Status

The Home screen displays the current operating status in the bottom banner, e.g. *Standby, Heating, Cooling*, *Warning*, *Error*, *Service*, or (briefly) *Startup, Initialize*. The status *Standby-Summer* indicates that the Sky-35 will not respond to a call for heat because the current outdoor temperature is above the defined Summer Shutdown temperature. The bottom banner background colour indicates the system state (see *Status Bar Colour on page 15*).

The main panel reports the status of each heat source and the temperatures of the system sensors. (When you add an auxiliary temperature sensor you'll be asked whether you want it displayed on the Home screen.) You can see further data from any IBC Heat Source by touching its icon on the Home screen.

The top banner reads on the left *Sky-35* and, if the Web Portal has been enabled, on the right shows a cloud icon which by its colour indicates the Portal connectivity state.

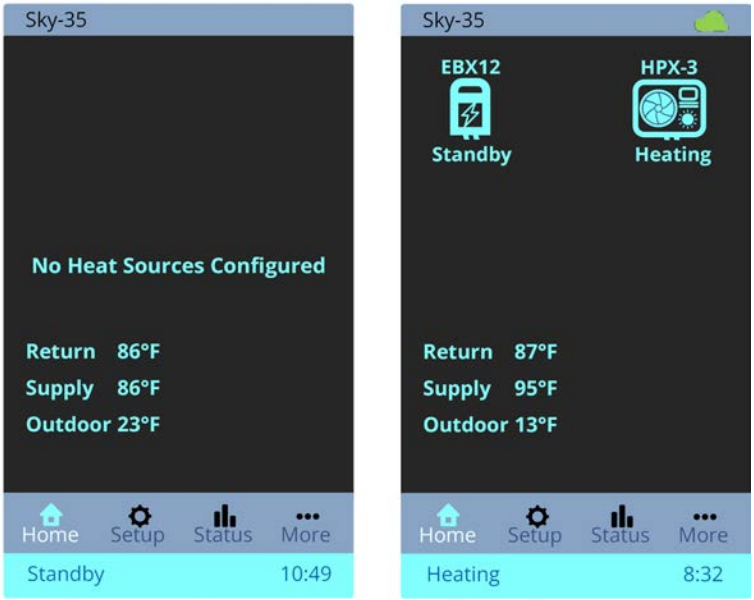


Figure 17 *Home screen on startup (L) and after configuration (R)*

Service status

Certain changes, such as adding or removing a heat source, or a software update, might produce erratic operation if performed in the midst of normal operation. To prevent this, the Sky-35 sometimes imposes a temporary pause to operation in order to apply changes safely. This is called *Service* mode, and it is announced as a yellow status along the bottom of the screen.

5.0 The *Setup* screen

Figure 18 *Setup icon*

The Setup tab is used for all of the basic setup of the controller. Changes to settings can be made at any time.

Figure 19 *Setup menu*

5.1 Heat Sources

Add Heat Source

While Adding or Removing heat sources the controller ignores calls for heat, and in the bottom banner displays *Service* mode.

Remove Heat Source

Remove existing heat sources here.

Edit Heat Source

Edit name and pump association for existing Heat Sources here. For heat pumps, separate pump assignments can be made for heating and cooling modes.

In this menu you will configure heat (and / or cooling) sources for your installation. In the menu ***Add Heat Source*** you will be asked **Does your heat source support two-way communication with Sky-35?** Answer **Yes** to establish communication to an IBC HPX Heat Pump, EBX Electric Boiler or V10 Touchscreen gas-fired boiler. Answer **No** to configure any heat sources wired to TT contacts on terminals Heat Source 1 (Heat Pump), 2 (Electric Boiler) or 3 (Gas Boiler). The screen will confirm wiring connections.

For multiple EBX electric boilers, see procedure *Wiring and networking multiple EBX electric boilers on page 28*

V10 setup

If connecting to a boiler with a V10 board, before using **Add Heat Source**, see *The More screen on page 47*. For any IBC heat source with two-way communication, such as the V10, there is no need for local programming; the Sky-35 will provide the target temperatures. The V10 will give priority to its own locally-programmed loads (if any). The Sky-35 presumes that the V10 will run its boiler pump during a call for heat; future software releases will introduce further pump control options.

5.2 Solutions

Setup begins with going to *Solutions* and selecting from the *Heating, Cooling, DHW, Thermostat* and *Tank* options. Activate modes for your system by toggling on any relevant slider buttons. If you can't find a heating, cooling or DHW menu, check here in *System Solutions* that the mode is selected.

Figure 20 *Solutions menu*

5.3 System Settings

Most of your setup decisions will be recorded in the System Settings menu.

5.3.1 Site Settings

The following Site Settings table is also reproduced in *Appendix C: Installer log for Site Settings on page 99*with an additional column for your notations.

Heating

Name	Options and Ranges (Defaults in bold)	Notes
Target	Min: 25°C (77°F) Max: 85°C (185°F) Default: **43°C (109°F)**	The target for supply water or for a buffer tank.
Tank Diff	Min: 2°C (4°F) Max: 12°C (22°F) Default: **10°C (18°F)**	Differential centered on Tank Target
Overshoot	Min: 1°C (2°F) Max: 8°C (14°F) Default: **5°C (9°F)**	For buffer tank applications, the heat source Target is the buffer tank Target plus this Overshoot.
Sys-Pump	**0 - Off** 1 - On	Associate one or more of six pumps with system (distribution) heating circulation.
Contacts	**0 - Off** 1 - On	Associates heating with DEV 1 and/or DEV 2 contact closure.
Reset Heating	**0 - Off** 1 - On	If On, *Heating Target* is reset using outdoor temperature sensor
Summer Shutdown T	Min: 10°C (50°F) Max: 45°C (113°F) Default: **45°C (113°F)**	Requires outdoor sensor. Default setting of 45°C effectively disables Summer Shutdown
Des Outdoor T	Min: -35°C (-31°F) Max: 15°C (59°F) Default: **-10°C (14°F)**	Expected winter cold, used for Reset Heating

Cooling

Name	Options and Ranges (Defaults in bold)	Notes
Target	Min: 7°C (45°F) Max: 25°C (77°F) Default: **13°C (55°F)**	
Tank Diff	Min: 2°C (4°F) Max: 4°C (7°F) Default: **2°C (4°F)**	Differential centered on Tank Target
Undershoot	Min: 1°C (2°F) Max: 8°C (14°F) Default: **5°C (9°F)**	For a cooling source, the differential below the buffer tank target temperature.
Sys-Pump	**0 - Off** 1 - On	Associate one or more of six pumps with system (distribution) heating circulation.
Contacts	**0 - Off** 1 - On	Associate cooling with DEV 1 and/or DEV 2 contact closure.
Winter Shutdown T	Min: -40°C (-40°F) Max: 30°C (86°F) Default: **10°C (50°F)**	Call for cooling is ignored below this temperature. Requires outdoor temperature sensor.

DHW

Name	Options and Ranges (Defaults in bold)	Notes
Target	Min: 49°C (120°F) Max: 63°C (145°F) Default: **49°C (120°F)**	DHW delivery target
Tank Diff	Min: 2°C (4°F) Max: 6°C (11°F) Default: **4°C (7°F)**	DHW call begins when tank falls below target by the differential amount
Overshoot	Min: 1°C (2°F) Max: 3°C (5°F) Default: **1°C (2°F)**	For the heat source, the boost above the DHW tank target temperature
Contacts	**0 - Off** 1 - On	Associate DEV 1 and/or DEV 2 contact closure with DHW.

Heat Pumps

Name	Options and Ranges (Defaults in bold)	Notes
Compressor Delay	Min: 0 Max: 10 Default: **0 minutes**	Most HP and A/C units have a built-in compressor delay
Heat Pump Min T	Min: -30°C (-22°F) Max: 0°C (32°F) Default: **-10°C (14°F)**	Must be lower than Balance Point
Stage Time	Min: 0 Max: 10 Default: **0 minutes**	Minimum interval between bringing on subsequent heat pumps

Electric Boilers

Name	Options and Ranges (Defaults in bold)	Notes
Stage Time	Min: 5 Max: 60 Default: **5 minutes**	Minimum interval between bringing on subsequent electric boilers

Gas Boilers

Name	Options and Ranges (Defaults in bold)	Notes
Stage Time	Min: 5 Max: 240 Default: **45 minutes**	Minimum interval between bringing on subsequent gas boilers

General

Name	Options and Ranges (Defaults in bold)	Notes
Minimum Cycle Time	Min: 0 Max: 60 Default: **0**	Minimum run time for a heating or cooling cycle
Stage Delay	Min: 0 Max: 10 Default: **0 minutes**	Minimum interval between thermostat Stage1/Stage2 heating
Load Control Outputs	**0 - Passthrough**1 - Controlled	Passthrough duplicates thermostat input
O/B Output	**0 - Passthrough**1 - Active Cooling 2 - Active Heating	Passthrough duplicates thermostat input
Heat / Cool Cycle	Min: 0 Max: 3000 Default: **10 minutes**	Minimum time for switching between heating and cooling cycles.
Balance T	Min: -30°C (-22°F) Max: 15°C (59°F) Default: **-4°C (25°F)**	Used in backup for Heat Pump source. Requires Outdoor sensor.
Freeze Guard	0 - Off **1 - On**	Calls for heat if the inlet water temperature drops below 41°F (5°C).
Pump Exercise Interval	Min: 0 Max: 96 Default: **48 hours**	
Pump Exercise Duration	Min: 1 Max: 10 Default: **1 minute**	

Table 8 Site Settings

Note on temperature units

The Sky-35 can be programmed in °F or °C. You can change the controller units in the menu ●●● **More** > **User Settings** > **Units**

Some notable settings, options and terms:

Heating Target: when the Buffer Tank mode is Enabled, this temperature will be the Buffer tank target temperature. The Sky-35 will apply a slight boost to the heat source target temperature so that the Buffer target may be satisfied.

Buffer Tank Differential: The Sky-35 manages the buffer tank temperature by activating a call for heat when the tank drops below the target temperature by half the *Differential*, and it ends the heating call when the tank exceeds target by half the *Differential*.

The tank differential must not be so great that at the end of the off-cycle the water is too cool to provide space-heating, but it must not be so small that the system short-cycles. The correct value will depend on the heat output and the buffer tank volume. The *Buffer Tank Differential* is critical to correct buffer tank sizing, and appears as the ΔT in the sizing calculation. See *Buffer tank sizing on page 53*

Load Control Outputs: The Passthrough / Controlled settting affects wiring (if any) only from the terminal marked "Output Load Control."

O/B Output: The O/B Output setting affects only wiring (if any) from the terminal marked "Output Load Control," connected to the heat pump's reversing valve.

- In *Passthrough*, the Sky-35 conveys the signal it receives from the thermostat.
- In *Active Cooling*, during a cooling call a 24V signal is sent from terminal *O/B* to the outdoor unit's reversing valve.
- In *Active Heating*, during a heating call a 24V signal is sent from terminal *O/B* to the outdoor unit's reversing valve.

Balance Point: is the Outdoor Temperature below which, if there is any call for heat including a Buffer Tank below target, the Sky-35 will always bring on both a primary and a supplementary heat source.

Freeze Guard routine

To protect the system water from freezing, Sky-35 runs a Freeze Protection routine if the inlet water temperature drops below 41°F.

• If the inlet temperature drops below 41°F (5°C), the system pump turns on.
• If after 5 minutes the temperature has not risen, the Sky-35 brings on a heat source with a supply target temperature of 77°F (25°C).
• The Freeze Guard parameters are not user-adjustable.

Warning

• Even during the Freeze Guard routine a very cold boiler room could freeze a condensate trap, halting condensing boiler operation.
• In the absence of a thermostat signal, Freeze Guard cannot prevent freezing in a secondary circuit. Do not leave thermostats set Off when weather may turn freezing.

5.3.2 Sensors

Here you can define temperature sensors you wish to add to the basic set of Supply, Return, Outdoor temperature sensors.

- The *Display on Home* slider selects the sensor for continuous display on the Home screen.
- The *Buffer Tank* slider selects the sensor to act as the Buffer Tank Sensor. (Only one sensor can be so selected.)
- *Name* may have up to five characters: numbers, dash, and / or letters (upper case).

5.3.3 Pumps

Here you can customize the name, purge time, output percentage, and type (conventional or PWM) of any pump connected to the Sky-35 controller.

- *Name* may have up to five characters (numbers, dash, and / or upper case letters).
- *Purge Time* is the number of seconds the pump should run after a call for heat has terminated.
- *Output* applies to PWM-controlled pumps only. The output field is a percentage.
  • NOTE While some PWM pumps vary signal in proportion to speed, others decrease speed with an increase in PWM signal. Therefore, it is possible that you will set the *Max Speed* to a lower percentage than the *Min Speed* (e.g. *Max Speed* "0", *Min Speed* "100").
- *Type* can be *Conventional* or *PWM*. Conventional pumps are controlled through the accessory Pump Relay Module. PWM pumps are wired to receive a signal directly from Sky-35 controller I/O terminals A-F.

Figure 21 *Pump naming keypad*

To associate a pump with a heat source, see the *Heat Source* menu.

5.3.4 Contact Controls

Enable, name and associate DEV 1 and/or DEV 2 contacts for a diverting valve.

5.3.5 Tanks

Installations using a Buffer Tank initiate a call from a drop in tank temperature, rather than initiating a call from a thermostat. This frees the heat production cycles to operate independently of thermostat cycles. In this case a Buffer Tank Sensor can replace thermostat connections to the Sky-35.

> **Note on Thermostats with Buffer Tank**
>
> In Buffer Tank mode the backup heat source(s) will join in heating the buffer tank (after the staging delay) as long as an active call for heating appears at the thermostat terminals. If the thermostat isn't calling, the primary heat source is left on its own to bring the tank up to temperature. If there is no thermostat connection to the Sky-35, the backup heat source will activate only if the outside temperature is below the setting *Balance Point* or the primary heat source is in error.

Before enabling Buffer Tank mode, you must assign an Aux Temperature Sensor as buffer tank sensor. The buffer tank sensor will be wired to one of the Sensor terminals, e.g. "TEMP 1." Define the buffer tank sensor by selecting "Buffer" for appropriate sensor terminal in the **Setup > System Settings > Sensor** menu.

Add Tank

Add Tank allows you to associate a sensor port with a tank, and define that tank as for *Heating, Cooling* or *DHW*.

Remove Tank

Edit Tank

- *Sensor Type* (Heat, DHW, Cool)
- *Multipass DHW* gives the Heat Pump a target of the DHW setpoint plus ½ of the Overshoot (instead of adding all Overshoot)
- *Buffered Heat Source (DHW)*. Select this when the DHW tank can draw from a buffer tank.
- *Isolated Pump* is selected when a pump is needed for the buffer tank to heat/cool without being tied to a particular heat/cool source. Select the terminal (A to F) from the drop-down menu.

5.4 Enable Web Portal

Here you can authorize communication with IBC's Web Portal. The Portal allows password-protected remote monitoring of the Sky-35.

6.0 The *Status* screen

Figure 22 *Status icon*

The Status menu displays the following options that enable you to survey the system and confirm proper operation or identify problems:

- Pump Status
- Sensors
- Network Information
- Error Logs
- Heat Call Map (incoming and outgoing calls)
- Clear Errors
- Source Status
- System Information

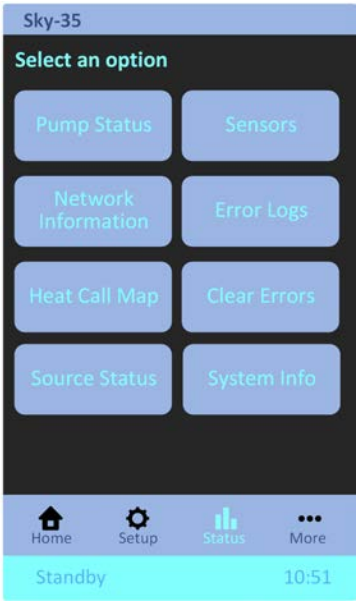


Figure 23 *Status menu*

6.1 Pump Status

A future feature for variable-output pumps.

6.2 Sensors

This screen displays readings from the Supply and Return temperature sensors, as well as Outdoor and Buffer Tank sensors if connected.

- To customize a sensor name, go to ⚙ **[Setup] > Aux. Temperature Sensors**
- If a temperature sensor is not connected to the controller, the text 'NC' is displayed.

6.3 Network Information

The Network Information screen displays the information:

- Cloud Enabled
- Network ID
- Eth[ernet] IP Address
- Wifi IP Address
- MAC Address
- Network ID
- DNS
- Gateway

6.4 Error logs

Errors are triggered when a sensor detects that the controller is operating outside its limits. On the Error Logs screen you can choose an error to see more details. The Error Log page shows two kinds of errors: those relayed from IBC Heat Sources, and those specific to the Sky-35.

An error relayed from a heat source is tagged by the model, e.g. *Error 2: EBX 32* (see the example to the right). A suffix number (if present) is only the MODbus address, which will be useful if there are multiple such models connected to the Sky-35. Heat source errors appear in the Sky-35 Error log but not in the bottom banner; while they're active they also appear as the heat source status.

The errors specific to the Sky-35, e.g. *Error 1: SKY-35*, would typically be triggered when the Sky-35 detects a temperature sensor, thermostat or

PWM pump fault. See *List of touchscreen controller error messages on page 91* for the full list of Sky-35 errors, and suggestions as to their possible causes.

The controller records all errors present at the time of an error event in a log. These logs date back to the original power-up, organized by date, time, classification, and type. For every error record, there is a "Details" button that provides the time of the error (displayed in Universal Time) and a plain language error message.

Status Bar Color	Description
Green	Normal state - system is operating within its limits.
Yellow	Warning error - When the controller detects an error.
Red	Alarm - Unresolved condition or error detected while the heat source is operating or preparing to operate.

Table 9 *Status bar background colors*

6.5 Heat Call Map

The Heat Call Map menu displays the current status of any calls:

- Incoming Heat Calls show with a check ✓ any energized terminals on the "Thermostat Input" (**W1 W2 Y1 Y2 G OB**)
- Tanks: a check ✓ indicates that a sensor-initiated call is active for a heating buffer, a cooling buffer, or a DHW tank.
- Output heat calls to the terminal strip "Output Load Control" are shown with a check ✓ (**W1 W2 Y1 Y2 G OB**). Typically this terminal would be wired to an air handler.

6.6 Clear Errors

Use this button to delete the error history. Deleted error logs cannot be retrieved.

6.7 Source Status

The status of any connected heat source is displayed under its icon: **Standby, Heating, Cooling, Circulating, Dev Error** (in the heat source), **Searching** (Sky-35 is looking for the device), **Init Error** (Sky-35 could not initially connect to the device), **Comm Warn**, and **Comm Error**.

Select the icon of an IBC heat source in this menu (or on the home screen) to read its status information on the Sky-35. If the first line *State* reads *Com Err* the status information is not currently available and default values may be displayed.

6.8 System Information

This menu displays:

- Firmware Version
- Hardware Version
- WiFi Version
- Serial Number
- Processor
- Model
- Memory Usage

7.0 The *More* screen

Figure 24 *More icon*

When you select the More menu, you will be provided with options that enable you to configure the Sky-35.

- User Settings
- Help
- Network Settings
- Software Update
- Factory Reset
- Restart
- Engineering Options
- Service Mode

Figure 25 *More screen*

7.1 User Settings

This screen enables the user (installer, homeowner, site manager) to set or adjust:

- Date and Time
- Units

Changing and updating date and time

Date and time in a Sky-35 connected to the Internet

If the Sky-35 is connected to the Internet or to a computer (e.g., a server set up on an internal network that acts as the NTP time source), it will automatically set its internal clock. This is called **SNTP** mode; in it you can activate Daylight Savings Time or manually set the Time Zone.

1. Go to ●●● > **User Settings** > **Date & Time**.
2. To manually set the time zone, select **Time Zone** and choose the time zone.
3. To manually activate or deactivate Daylight Savings Time, adjust the slider **Participate in DST**.
4. Tap **Save**.

Changing the date and time in a Sky-35 not connected to the Internet

If the Sky-35 is not connected to the internet, you may need to manually set a date and time.

To set the date and time manually:

1. Go to ●●● > **User Settings** > **Date & Time**.
2. The Sky-35 should display as being in **Offline Mode**. Set the Date and Time using the number pad:
   a. **Timezone**
   b. **Participate in DST** [On / Off]. Enter the current time. Daylight Savings hour will be automatically added in the spring and removed in the fall.
   c. **Day / Month / Year**
   d. **Hour / Min**
3. Tap **Save**.

Changing default units of measurement displayed on the controller's screens

You can set the controller to display imperial or metric units of measurement.

Go to ●●● > **User Settings** > **Units** > Tap the desired unit(s) > **Save**.

7.2 Help

This menu provides the web address for IBC's Technical Information pages. Here is a QR code for easy access:

Figure 26 *QR code for IBC Technical Information Homepage*

Alternatively, see the contact information for IBC Technical Support on the back cover.

7.3 Network Settings

Note

When connecting a Sky-35 to a V10, change the *Network ID* on both devices to the same natural (**non-zero**) number.

One purpose of the Network Settings page is to prepare a Sky-35 for connection to a V-10 boiler controller. In the menu *Mode*:

- *DHCP* The typical installation, where a Sky-35 connects to a V10 controller by using an active internet connection to assign IP addresses to the two devices.
- *Manual* Requires basic networking knowledge; used for situations where the network has been set up in a customized manner.
- *Non-network*: In the absence of an internet connection it is possible to connect a Sky-35 to a V10 controller (IBC boiler) using Non-network mode.
  - Select *Non-network*.
  - Then, on the V10 controller, go to ●●● **More > Network Settings > TCP/IP** and select *Non-network* mode.

» You may now proceed to **Setup > Add Heat Source > IBC? > Yes**, select the boiler series and enter a name.

» The Sky-35 will establish connection with the V10 controller using a special non-network routine. (This connection will be stable until it is replaced by DCHP addresses should internet access become available.)

7.4 Software Update

This section describes the ways in which you can perform an firmware update in a Sky-35. When you install firmware updates, the system checks if the Sky-35 has the latest firmware version. To view the firmware in a Sky-35, on the controller, go to **Status**> **System Info** and note the **Firmware Version**.

Tip

Consider updating a Sky-35 with the latest firmware only if the new features are beneficial to the operation of the Sky-35.

Software update by Internet

a. If the controller is not already in "Standby" activate ***Service Mode*** (in the ●●● ***More*** menu).

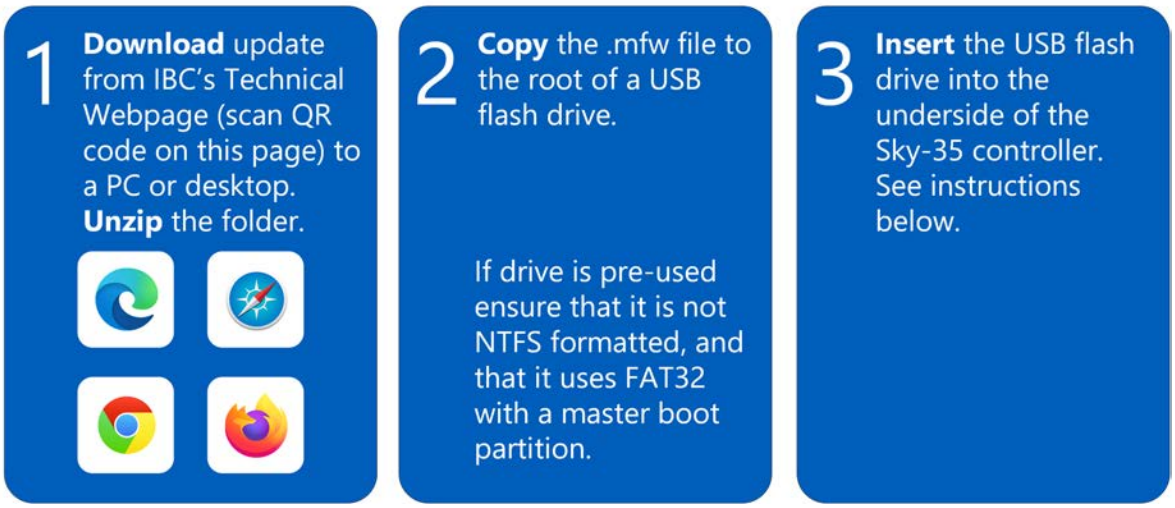
b. Select ●●● ***More > Software Update > Internet***

c. The Sky-35 will search for updates: if an internet connection is available within a few seconds the prompt appears ***Updates found: proceed?***Select ***Start***. When the download is complete select the button ***Begin***.

d. The controller will then shut down, stay dark for up to 15 minutes, and restart. It is then again fully operational.

Software update by USB

The Sky-35 software update by USB process is in three steps:



1. Download the software to your computer. Unzip the file.

a. Scan the QR code below, or go to IBC Technical Information pages and select the tab **Software Updates.** Scroll to **Sky-35 Controller** and select the tile **Download Sky-35 software update to a USB**. You will see a **Download** button that allows you to save a zipped folder to your computer.

b. Unzip the folder. You will use the .mfw inside (not the folder).

2. Copy the file to the USB stick.

a. Place a high-quality USB stick in your computer and note the drive letter (for example, **D:**). The device should be formatted in FAT 32. (It must *not* be NTFS enabled or formatted.)

b. Copy the .mfw file to the stick's root directory.

3. Take the USB to the Sky-35 site. The controller should be in "Standby ."

a. Insert the flash drive into the underside of the controller.

b. Select ●●● ***More > Software Update > USB***

c. You will see a message: **Sky35 will need to restart as part of the update process.** Press ***Start*** **The LCD will indicate *Preparing* for approximately one minute. It will then begin updating: do not power off or remove USB during this time.**

d. The controller will then shut down and stay dark for up to five minutes, and restart. It is then again fully operational. Remove the USB.

Figure 27 *QR code for IBC Software Update Homepage*

7.5 Factory Reset

This option restores all settings to the Factory Defaults. Note that this option will erase all field input including associations with heat sources.

7.6 Restart

Restarts the controller without altering any settings: this is recommended in troubleshooting connection issues.

7.7 Engineering Options

This menu is for IBC Engineering use only.

7.8 Service Mode

If you wish to pause system operation, for example to perform maintenance, settings adjustment or software update, toggle *Service Mode* to *On*.

8.0 Best practices

8.1 Temperature sensors

The supply and return temperature sensors furnished with your Sky-35 fit standard immersion wells with a 3/8" [9.5mm] internal diameter. For accuracy ensure that the well bottom is within flowing liquid.

> **Note**
>
> If surface-mounting the temperature sensors (on metallic piping only), insulate the sensor, e.g. with foam.

The outdoor sensor should be installed on the North face of the house (i.e. not exposed to winter sunlight), away from any other sources of heat such as openable windows or exhaust venting.

8.2 Buffer Tank

Many hydronic designs for multiple heat sources are centered around the use of a buffer tank. Buffer tanks provide the advantages of:

- Simplifying hydraulic separation between multiple heat sources and multiple heat loads.
- Simplifying control strategies by providing a common reference point for heat sources and heat loads.
- Providing additional thermal mass to prevent heat source short-cycling, in particular for heat pumps but also beneficial for the longevity of gas-fired equipment.
- Providing thermal storage, capturing heat when it is abundant such as during lowered rate periods for electric use, or during midday when using solar thermal collectors.

8.3 Buffer tank sizing

Because repeated heat pump short-cycling can lead to premature compressor failure and other component damage, when using a heat pump it is important at the planning stage to consider whether a buffer tank will be needed to prevent short-cycling by looking at the minimum output during warm-weather conditions.

Good practice is to design for a standard compressor cycle time of ten minutes or longer. To calculate the buffer tank size required:

$$V = \frac{t(Q_{heat\ source} - q_{load})}{500(\triangle T)}$$

where:

- V= minimum volume of buffer tank (US gallons)
- t = desired minimum cycle time; IBC recommends 8 (minutes) for a variable compressor
- Q = heat source output rate, i.e. minimum warm-weather output (Btu/h)
- q = minimum guaranteed rate of heat extraction from tank: may be zero (Btu/h)
- ΔT = tank differential; IBC recommends 10 and advises this should not exceed 20 (°F)

Quick calculation for buffer tank sizing

The buffer tank volume in gallons can be quickly calculated by taking the minimum output in MBtu/h *in mild summer conditions* and multiplying by two. (This presumes the tank temperature can vary by 10°F.)

$$V = Q_{heat\ source} \times 2$$

where:

- V= minimum volume of buffer tank (US gallons)
- Q = minimum heat source output rate (MBtu/h)

Example: if the Heat Pump's minimum output is 20MBH (read from the lowest water temperature at 77°F), 20 X 2 = 40; thus the buffer tank's minimum size is 40 gallons.

8.4 Using concrete slab as buffer

When an application is using a minimally-zoned concrete slab, that slab's thermal mass may be able to act as a thermal buffer. To determine whether the slab can protect your equipment from short-cycling, use this variation of the buffer tank formula:

$$A = \frac{t(Q_{heat\ source} - q_{load})}{147(\triangle T)d}$$

- A = minimum area of **smallest** concrete slab zone (ft^2)
- t = desired duration of heat source's on cycle; IBC recommends 8 (minutes)
- Q = heat source output rate, i.e. minimum output during warm weather (Btu/h)
- q = guaranteed rate of heat extraction from slab: may be zero (Btu/h)
- 147 = constant based on heat capacity of concrete and units used: (29.4 $Btu/ft^3/°F$) (60 min/hr) (0.0833 ft/in)
- ΔT = slab differential; IBC recommends 2 (°F)
- d = depth of slab (inches)

Example: if the heat pump's minimum output is 20MBH (e.g. for a modulating heat pump, read from the lowest modulation chart and at the lowest supply water temperature at an outdoor temperature of 77°F), given a minimum on-time of 10 minutes, a slab temperature differential of 2°F and a slab depth of 5" the **smallest** zone should have an area of at least:

$$A = \frac{10(20{,}000 - 0)}{147(2)5} = 136\ ft^2$$

Caution: potential equipment damage

A concrete slab can act as a buffer only if that slab's **smallest** zone can prevent short-cycling; the above formula gives the minimum area of this smallest zone, not the total area of a zoned slab.

Note on constant used above

Part of the constant 147 is the heat capacity of concrete 29.4 $Btu/ft^3/°F$, as derived from multiplying a concrete density of 140 lb/ft^3 by a concrete specific heat of 0.21 Btu/lb/°F. These are valid figures for typical concretes, but if uncertain of the mixture used on your site consult with an engineer about these properties and revise constant accordingly.

8.5 Domestic hot water (DHW)

With a single heat source, the system gives priority to servicing a call for DHW before switching to other loads to service calls for heat (see *Best practices on page 53*).

Default settings for the DHW load are suitable for residential applications. It may be necessary to change these settings to satisfy commercial requirements.

For information on wiring DHW, see *Sensors on page 31*.

DHW opt out

When set as a dedicated DHW load, an indirect storage water heater can call up a heat source to "opt out" to service DHW. When there are multiple heat sources, one or more dedicated DHW sources can be programmed to "opt out" of the heating load, enabling the remaining heat sources to continue heating uninterrupted. Multiple DHW opt-out heat sources can respond to a high demand in DHW in buildings with multiple bathrooms, for example. If opt-out heat sources are in the process of making DHW when the Sky-35 receives a setpoint or heating call, it will switch other heat sources to serve that load.

8.6 Reset heating

The heat lost by a building is proportional to the temperature difference between inside and outside. You can similarly scale the heat put into the building by using a Reset heating line. As the weather warms, reset heating preserves comfort by using cooler water, which is also particularly important for boosting heat pump efficiency.

The graphs below sample four *Outdoor Design Temperature*s to show how the target temperature tracks building heat loss over a heating season.

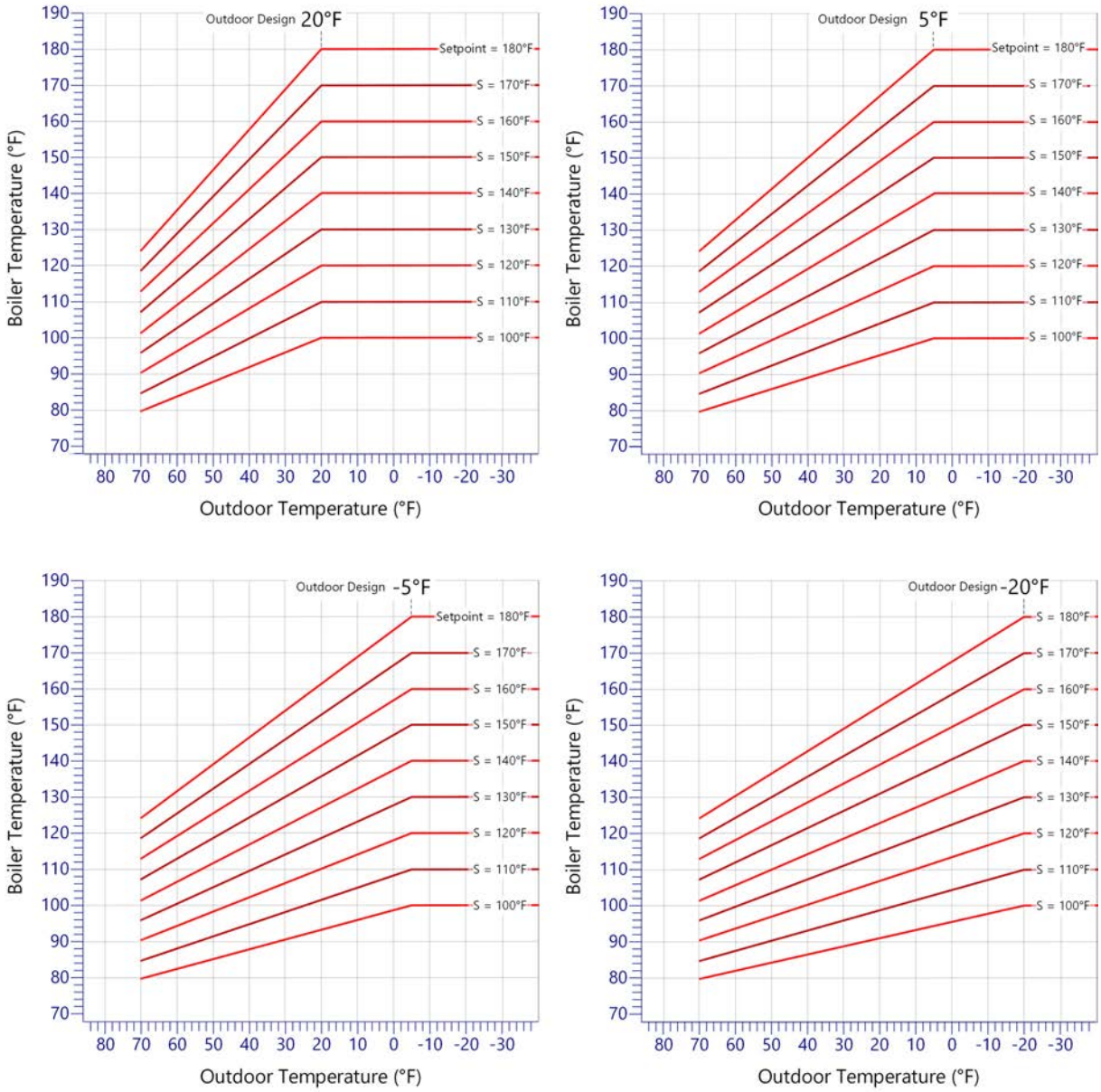


Figure 28 *Outdoor reset lines for sample Outdoor Design Temperatures and Setpoints in Imperial units 100°F-180°F*

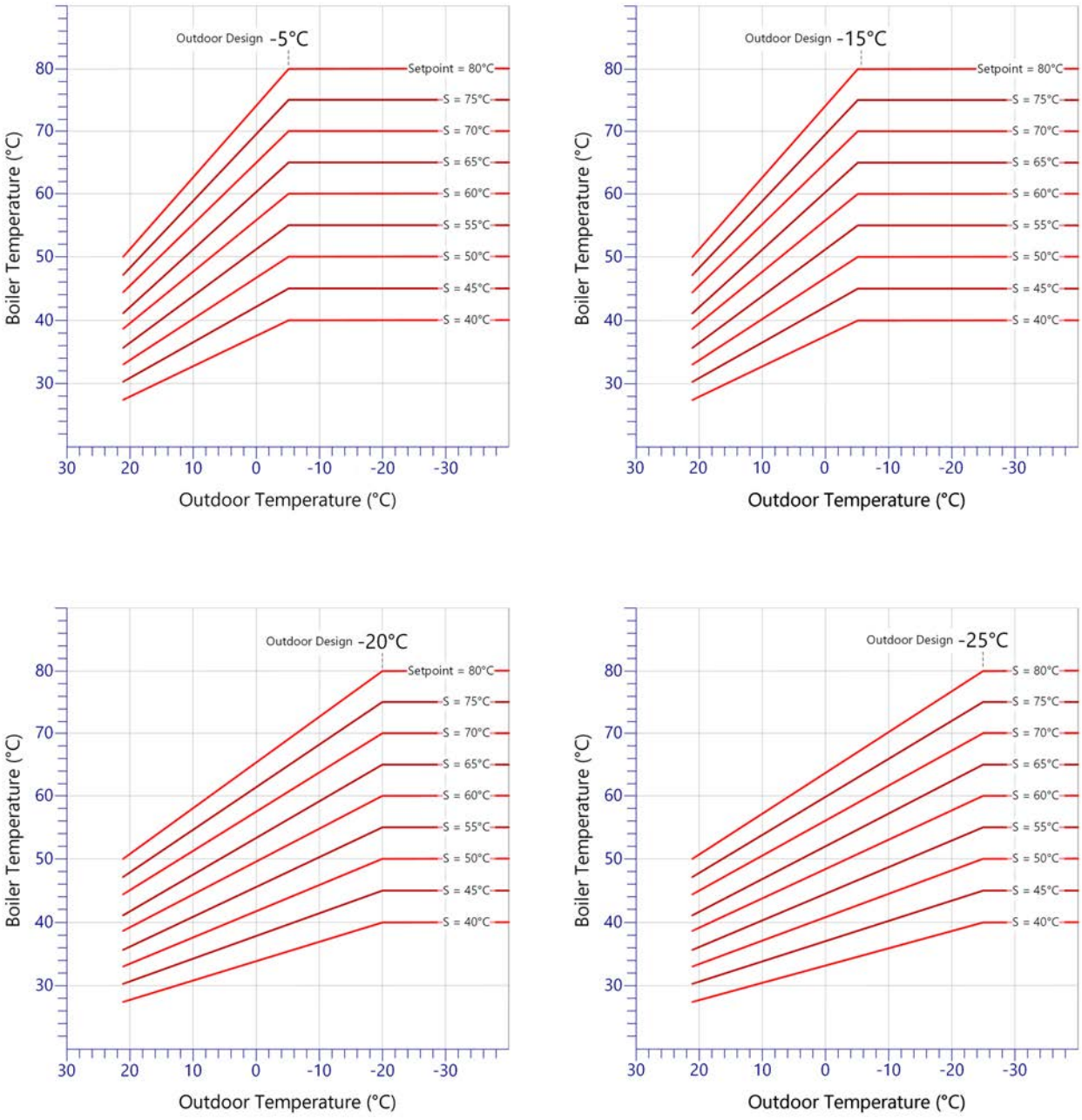


Figure 29 *Outdoor reset lines for sample Outdoor Design Temperatures and Setpoints in Metric units 40°C-80°C*

To set *Heat Type* to *Reset* you need just two variables: *Setpoint T* for the hottest water and *Outdoor Design T* for the local climate's winter temperature. Contact IBC Tech Support if you are uncertain of your local *Design Outdoor Temperature*.

Note

Reset Heating mode requires the installation of an outdoor temperature sensor (supplied with the Sky-35).

Ensure that the outdoor sensor is appropriately located, typically on the north face of the building away from any heat source. If there is no signal from the outdoor sensor, the controller assigns a default 32°F / 0°C value.

8.7 Set Point

To program the set point, set:

- Heating Target – desired or fixed supply/outlet water temperature.
- Cooling Target – desired or fixed supply/outlet water temperature.
- Summer shutdown° - The cut-off temperature level that prevents further heating. Sky-35 ignores a call for heat.

These targets might apply to a heat source or to a buffer tank. When for a buffer tank, the Sky-35 also applies a small boost to communicating IBC heat source targets.

8.8 Piping practices

Glycol fill tank and expansion tank connection (point of no pressure change); there should be minimal pressure drop to circulator inlet.

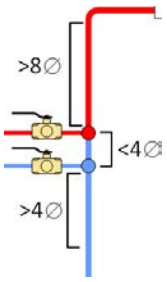
Intentionally left empty

9.0 System concept drawings

This section illustrates piping recommendations for space heating and domestic hot water (DHW) loads. Most of these illustrations adopt piping strategies that allow different loads to operate without interference with each other.

Note on closely-spaced tees

This symbol  refers to closely-spaced tees, which are used to prevent pumps inducing flow where not intended. Closely-spaced tees are a maximum of four pipe diameters apart (center-to-center), with a minimum of eight pipe diameters of straight tubing upstream of first tee, and four pipe diameters of straight tubing downstream of second tee.



Note on connections to Sky-35

These drawings show required connections such as Supply and Return temperature sensors, optional connections such as for Outdoor, Buffer Tank, and DHW sensors, and various circulators.

Setting a target temperature

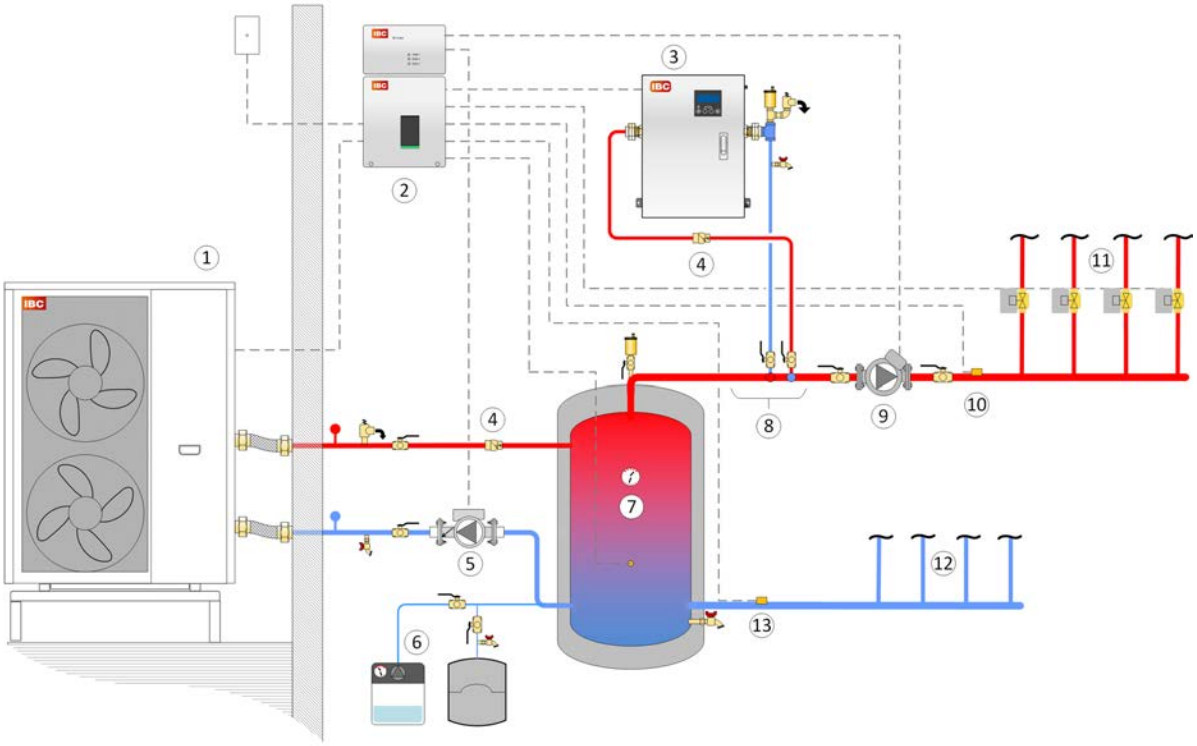
The following fields should be set for every heating application:

SOLUTIONS		**NOTES**
Heating / Cooling / DHW / Thermostat / Tanks		Activate modes as required
SYSTEM SETTINGS > SITE		
SYSTEM SETTINGS > SITE > HEATING		
Heating Target	E.g. **104°F (40°C)**	Supply or Buffer Tank target
Overshoot	E.g. **9°F (5°C)**	Boost to HP or gas boiler if buffer tank enabled
Reset Heating	**1 - On**	Requires Outdoor sensor; 0-Off if not used
Design Outdoor T	E.g. **-10°C (14°F)**	Local climate data
Summer Shutdown T	Example: **70°F (21°C)**	
SYSTEM SETTINGS > SITE > HEAT PUMPS (available after running *Add Heat Source*)		
Heat Pump Min T	**E.g. -22°F (-30°C)**	Must be lower than Balance Point

Applications with cooling need in addition:

SYSTEM SETTINGS > SITE > COOLING		
Cooling Target	E.g. **55.5°F (13°C)**	Default

9.1 HPX heat pump with backup EBX electric boiler

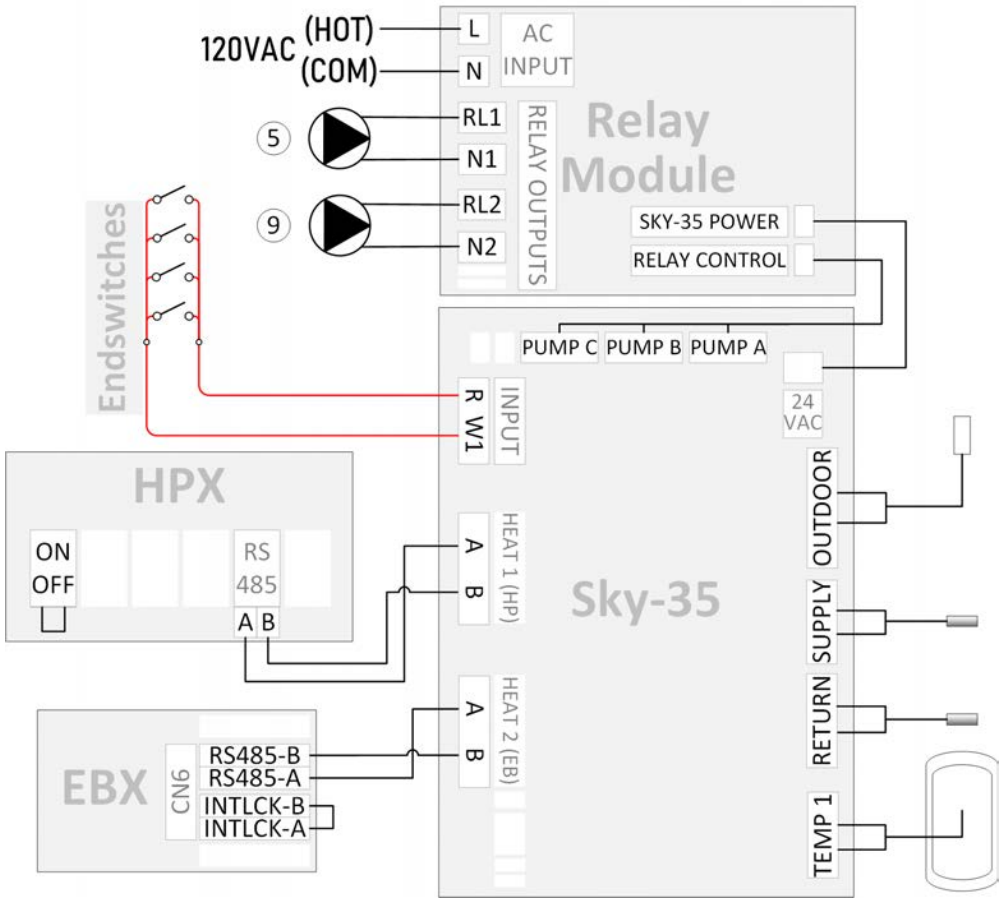


1	HPX-series heat pump (outdoors)	8	Closely-spaced tees (see *Note on closely-spaced tees on page 61*)
2	Sky-35 and Pump Relay Module	9	System (distribution) circulator
3	EBX-series electric boiler (pump built-in)	10	Supply sensor to Sky-35
4	Check valves (2)	11	To heating zones
5	Heat pump circulator	12	From heating zones
6	Glycol fill tank and expansion tank connection	13	Return sensor to Sky-35
7	Buffer tank		

Figure 30 *Concept drawing: heat pump with backup electric boiler*

Even if the Sky-35 does not control the system pump, the zone valve endswitches shown (or thermostat) facilitate backup heat logic because the backup heat source should run only during an active call for heat.

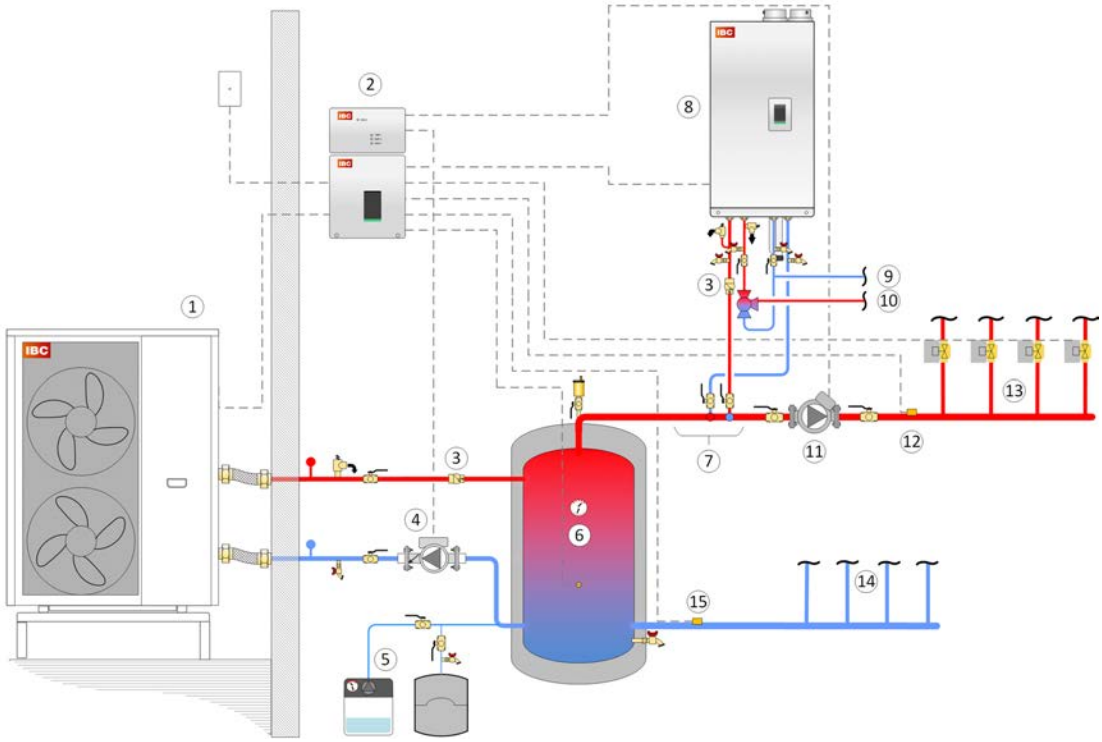
Wiring



Programming (see also *Setting a target temperature on page 61*)

HEAT SOURCES		**NOTES**
Add Heat Source	Follow prompts for IBC Heat Pump	
	Add pump **A**, rename e.g. *HPX-p*	Pump (5) in drawings
	Follow prompts for IBC Electric Boiler	
SYSTEM SETTINGS > SITE > HEAT PUMPS		
Minimum Cycle Time	E.g. **10** minutes	
Compressor Delay	E.g. **0** minutes	HPX has a built-in 4 min. delay
Sys-Pump H	Select ***B***; rename e.g. *Systm*	Pump (9) in drawings
SYSTEM SETTINGS > SENSORS		
Temp 1 or other	Rename, e.g. *buff*	
SYSTEM SETTINGS > TANKS > ADD TANKS		
Select named sensor	Define tank as *Heating*	

9.2 HPX heat pump with backup CX combi boiler / water heater

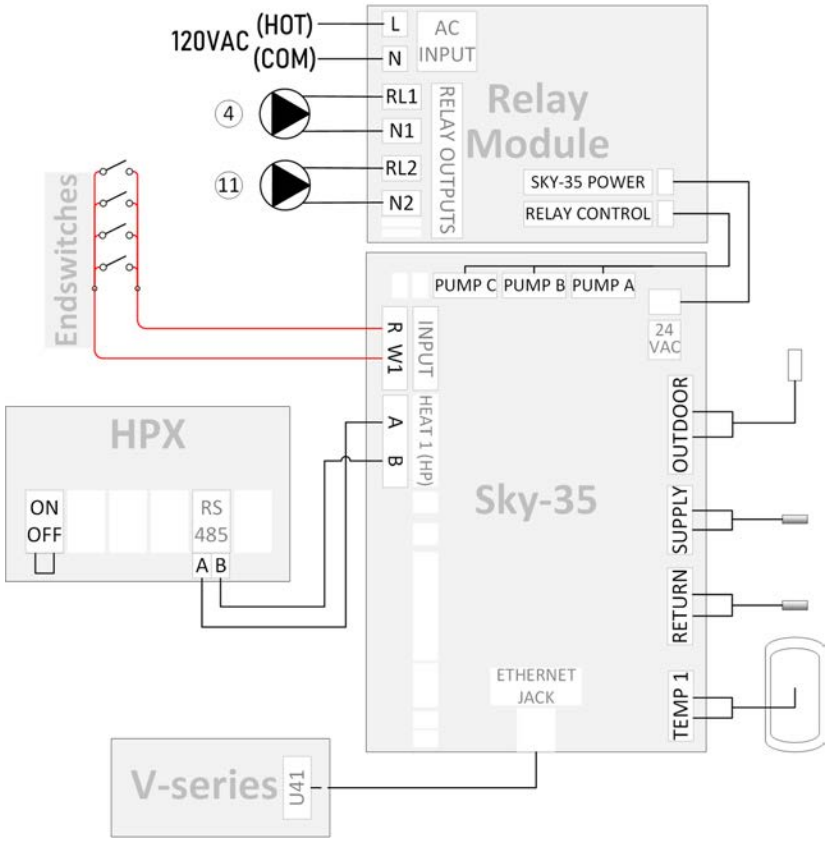


1	HPX Heat pump (outdoors)	9	Domestic cold water
2	Sky-35 and Pump Relay Module	10	Tempering valve and domestic hot water (DHW)
3	Check valves (2)	11	System (distribution) circulator
4	Heat pump circulator	12	Supply temp sensor to Sky-35
5	Glycol fill tank	13	To heating zones (zone valves)
6	Buffer tank	14	From heating zones
7	Closely-spaced tees	15	Return temp sensor to Sky-35
8	IBC CX gas combi boiler		

Figure 31 *Concept drawing: IBC HPX Heat pump with backup CX gas combi boiler / water heater*

Setup note: V10 controller must be running 2.01.6 or later. See *Ethernet Connections on page 29*.

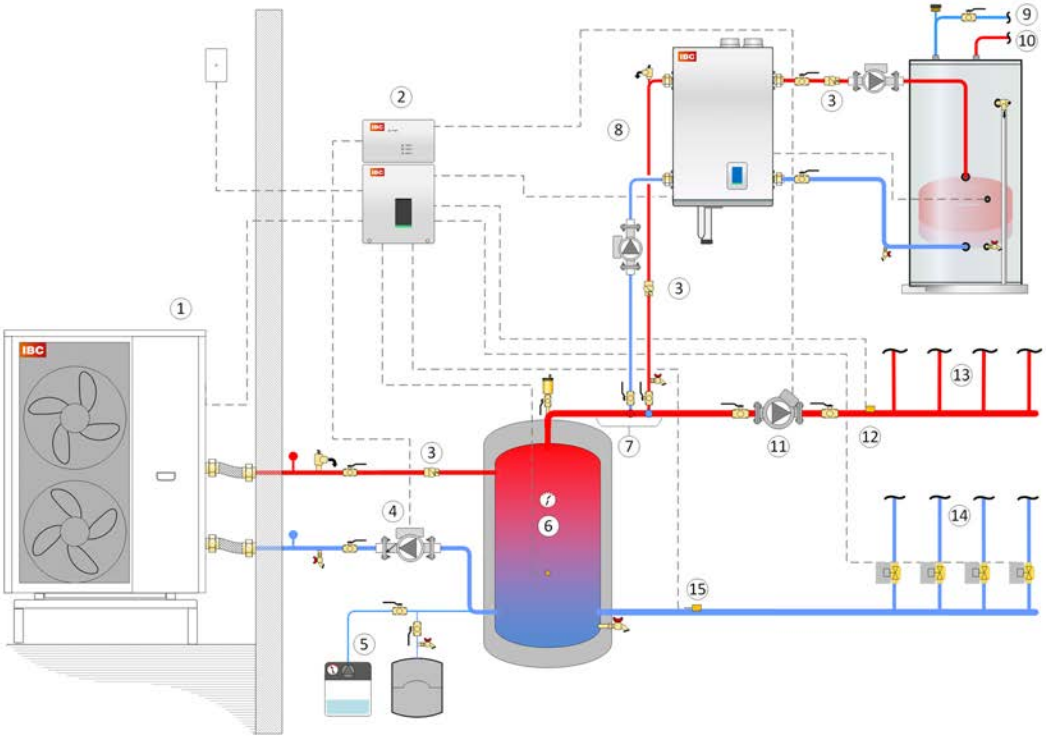
Wiring



Programming (see also *Setting a target temperature on page 61*)

HEAT SOURCES		NOTES
Add Heat Source	Follow prompts for IBC Heat Pump	
	Add pump ***A***, rename e.g. "Cndsr" or "HPX-p"	Pump (4) in drawings
	Follow prompts for IBC Gas Boiler	
SYSTEM SETTINGS > SITE > HEAT PUMPS		
Minimum Cycle Time	E.g. **10** minutes	
Compressor Delay	E.g. **0** minutes	HPX built-in delay = 4 min
Heat Pump Min T	E.g. **5°F (-15°C)**	Must be lower than Balance Point
Sys-Pump H	Select ***B***; rename e.g. *Systm*	Pump (11) in drawings
SYSTEM SETTINGS > SENSORS		
Temp 1 or other	Rename, e.g. *buff*	
SYSTEM SETTINGS > TANKS > ADD TANKS		
Select named sensor	Define tank as *Heating*	

9.3 HPX heat pump, SL boiler with indirect DHW

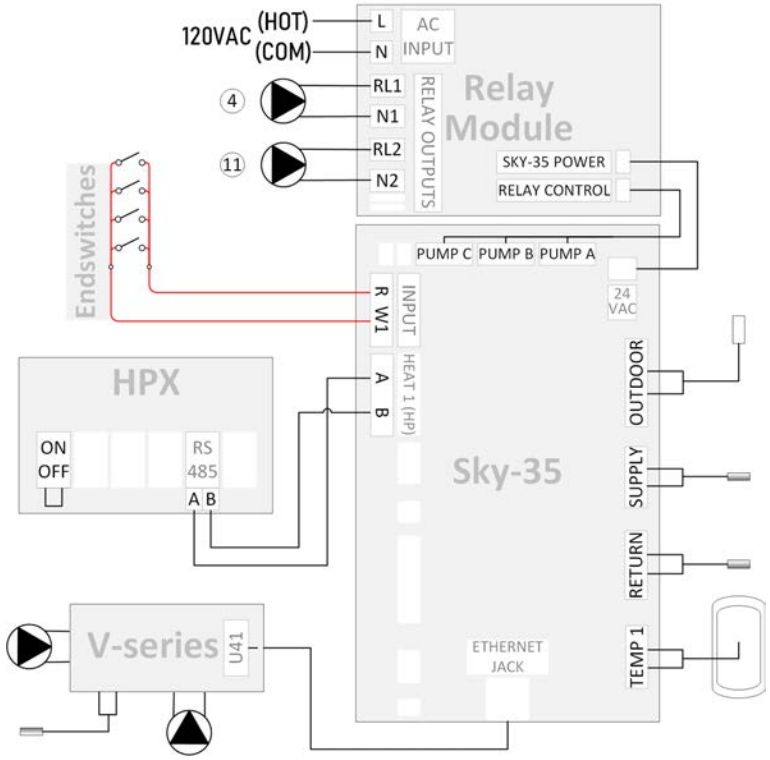


1	HPX-series heat pump (outdoors)	9	DCW to indirect tank
2	Sky-35 and Pump Relay Module	10	DHW from indirect tank
3	Check valves (3)	11	System circulator
4	Heat pump circulator	12	Supply sensor to Sky-35
5	Glycol fill tank and expansion tank connection	13	To heating zones
6	Buffer tank	14	From heating zones
7	Closely-spaced tees (see *Note on closely-spaced tees on page 61*)	15	Return sensor to Sky-35
8	IBC SL-series residential boiler		

Figure 32 *Concept drawing: HPX Heat pump, backup SL boiler with indirect DHW*

Setup note: V10 controller must be running 2.01.6 or later. Under *Network Settings* "Sky-35 comm" is *Enabled*. See *Ethernet Connections on page 29*.

Wiring



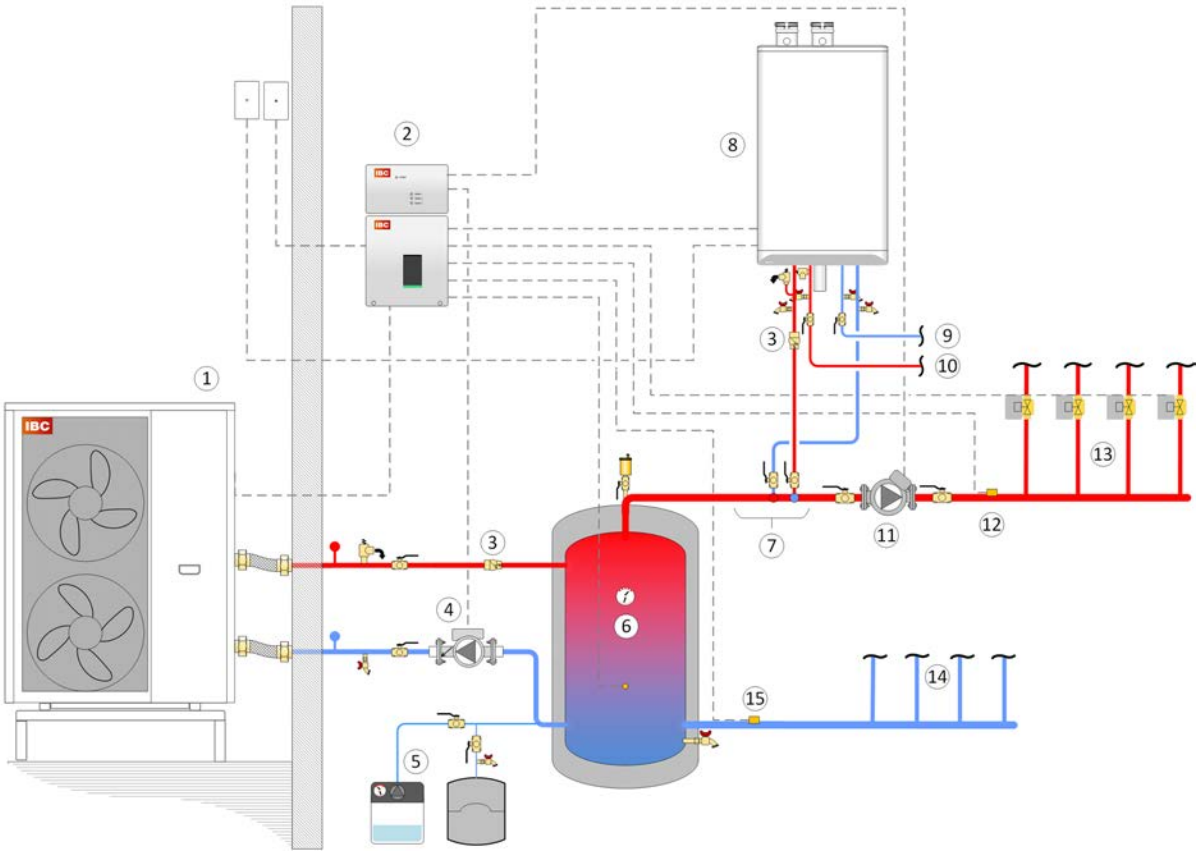
Programming (see also *Setting a target temperature on page 61*)

HEAT SOURCES		NOTES
Add Heat Source	Follow prompts for IBC Heat Pump	
	Add pump **A**, rename e.g. *HPX-p*	Pump (4) in drawings
	Follow prompts for IBC Gas Boiler	
SYSTEM SETTINGS > SITE > HEAT PUMPS		
Minimum Cycle Time	E.g. **10** minutes	
Compressor Delay	E.g. **0** minutes	HPX has a built-in 4 min. delay
Sys-Pump H	Select ***B***; rename e.g. *Systm*	Pump (11) in drawings
SYSTEM SETTINGS > SENSORS		
Temp 1 or other	Rename, e.g. *buff*	
SYSTEM SETTINGS > TANKS > ADD TANKS		
Select named sensor	Define tank as *Heating*	

Note

SL boiler is in charge of its pump, the DHW indirect pump, and the DWH temperature sensor. Indirect coil can operate at high temperature without affecting lower temperature space heating

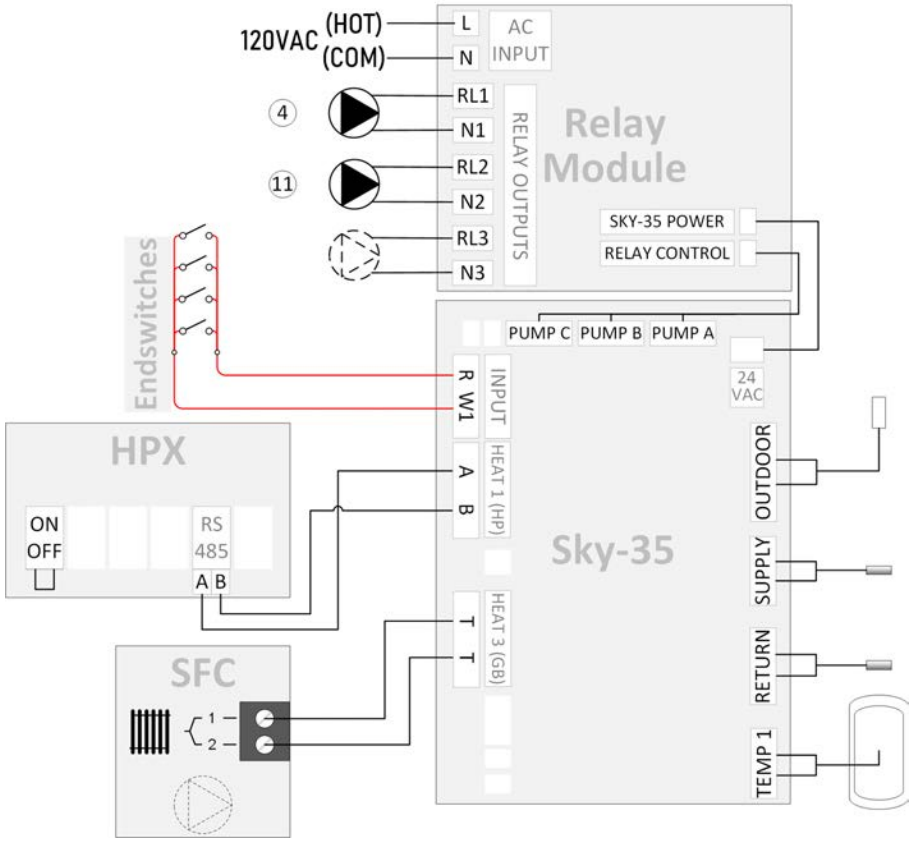
9.4 HPX heat pump with backup SFC (or generic) gas combi boiler / water heater



1	HPX Heat pump (outdoors)	9	Domestic cold water
2	Sky-35 and Pump Relay Module	10	Domestic hot water (DHW)
4	Check valves	11	System (distribution) circulator
4	Heat pump circulator	12	Supply temp sensor to Sky-35
5	Glycol fill tank	13	To heating zones (zone valves)
6	Buffer tank	14	From heating zones
7	Closely-spaced tees	15	Return temp sensor to Sky-35
8	IBC SF gas combi boiler		

Figure 33 *Concept drawing: Heat pump with backup gas combi boiler / water heater*

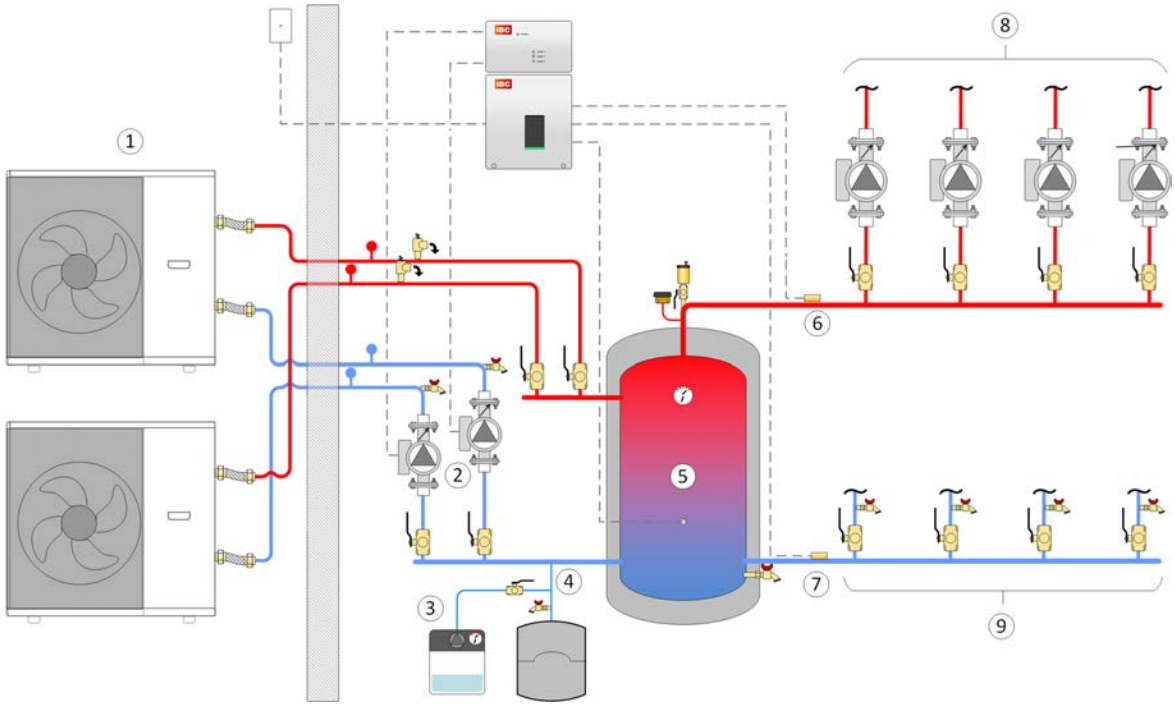
Wiring



Programming (see also *Setting a target temperature on page 61*)

HEAT SOURCES		**NOTES**
Add Heat Source	Follow prompts for IBC Heat Pump	
	Add pump **A**, rename e.g. *HPX-p*	Pump (4) in drawings
	Follow prompts for IBC SF series gas boiler	Set target temp approx. 5°F higher than buffer tank
SYSTEM SETTINGS > SITE > HEAT PUMPS		
Minimum Cycle Time	E.g. **10** minutes	
Compressor Delay	E.g. **0** minutes	HPX has a built-in 4 min. delay
Sys-Pump H	Select ***B***; rename e.g. *Systm*	Pump (11) in drawings
SYSTEM SETTINGS > SENSORS		
Temp 1 or other	Rename, e.g. *buff*	
SYSTEM SETTINGS > TANKS > ADD TANKS		
Select named sensor	Define tank as *Heating*	

9.5 Multiple HPX heat pumps with buffer tank

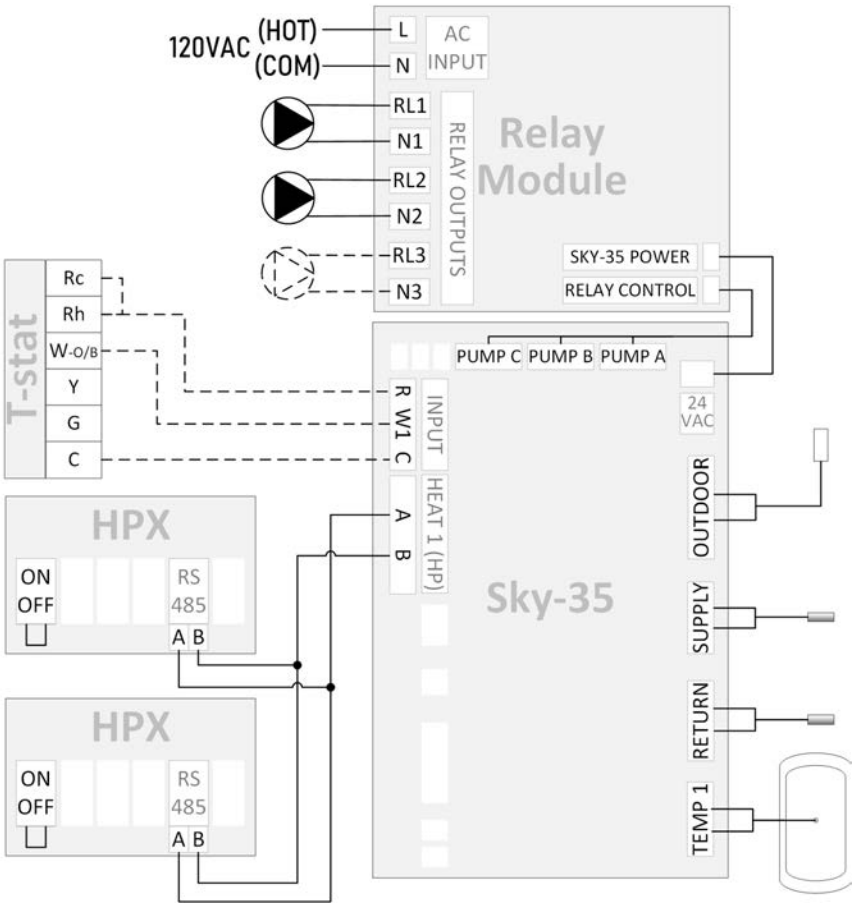


1	IBC Heat Pumps	6	Supply sensor to Sky-35
2	Heat pump circulators controlled by Sky-35 controller	7	Return sensor to Sky-35
3	Glycol fill tank (shown), or fill station with isolation closed	8	Supply piping to loads
4	Recommended expansion tank connection point	9	Returns from loads
5	Buffer tank (with sensor reporting to Sky-35); use short fat headers. Vacuum breaker needed for cooling mode.		

Figure 34 *Concept drawing: multiple IBC heat pumps*

Heat pumps alternate as lead with each cycle. Space-heating zone pump(s) can operate separately (as shown) controlled by zone / pump module, pressure-activated, or in constant circulation during heating season. Alternatively, a single load pump can be controlled by the Sky-35 if the thermostat is connected (see dotted "optional" lines in the wiring diagram).

Wiring



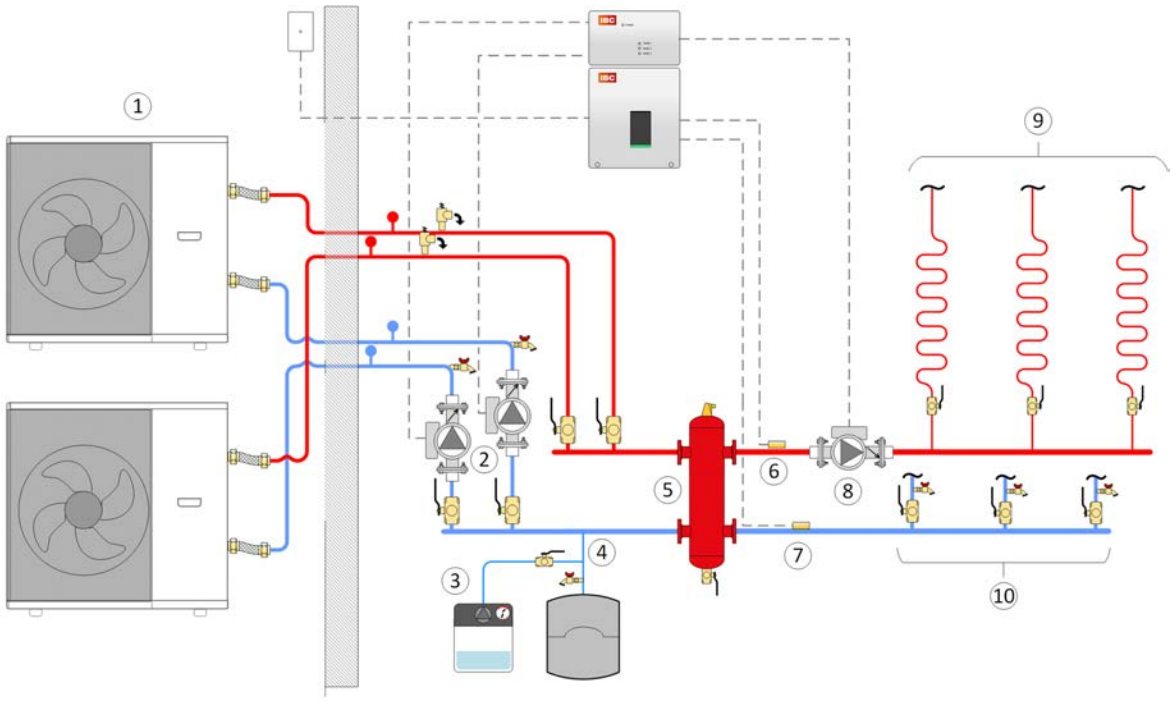
Programming (see also *Setting a target temperature on page 61*)

HEAT SOURCES		**NOTES**
Add Heat Source	Follow prompts for IBC Heat Pump	
	Add pump **A**, rename e.g. *HP1-p*	
	Add pump **B**, rename e.g. *HP2-p*	
SYSTEM SETTINGS > SITE > HEAT PUMPS		
Minimum Cycle Time	E.g. **10** minutes	
Compressor Delay	E.g. **0** minutes	HPX has a built-in 4 min. delay
Sys-Pump H	Select ***C*** [if used] Rename e.g. *Systm*	Singular pump not in drawings
SYSTEM SETTINGS > SENSORS		
Temp 1 or other	Rename, e.g. *buff*	
SYSTEM SETTINGS > TANKS > ADD TANKS		
Select named sensor	Define tank as *Heating*	

9.6 Multiple HPX heat pumps with concrete slab

Caution: potential equipment damage

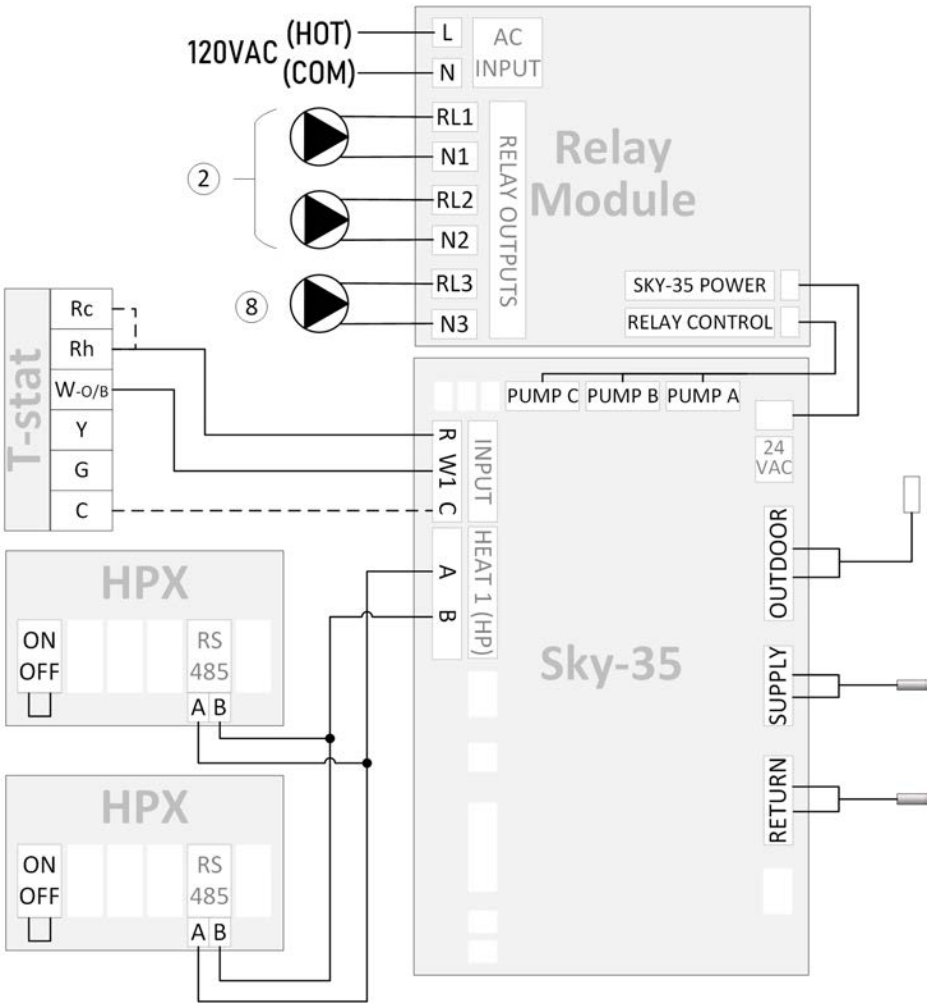
This application requires that the concrete slab's **smallest** zone has sufficient thermal mass to prevent short-cycling; see *Using concrete slab as buffer on page 54*.



1	IBC Heat Pumps	6	Supply sensor to Sky-35
2	Heat pump circulators controlled by Sky-35 controller	7	Return sensor to Sky-35
3	Glycol fill tank (shown)	8	System Pump
4	Recommended expansion tank connection point	9	Supply piping to loads
5	Hydraulic separator	10	Returns from loads

Figure 35 *Concept drawing: Multiple heat pumps with concrete*

Wiring



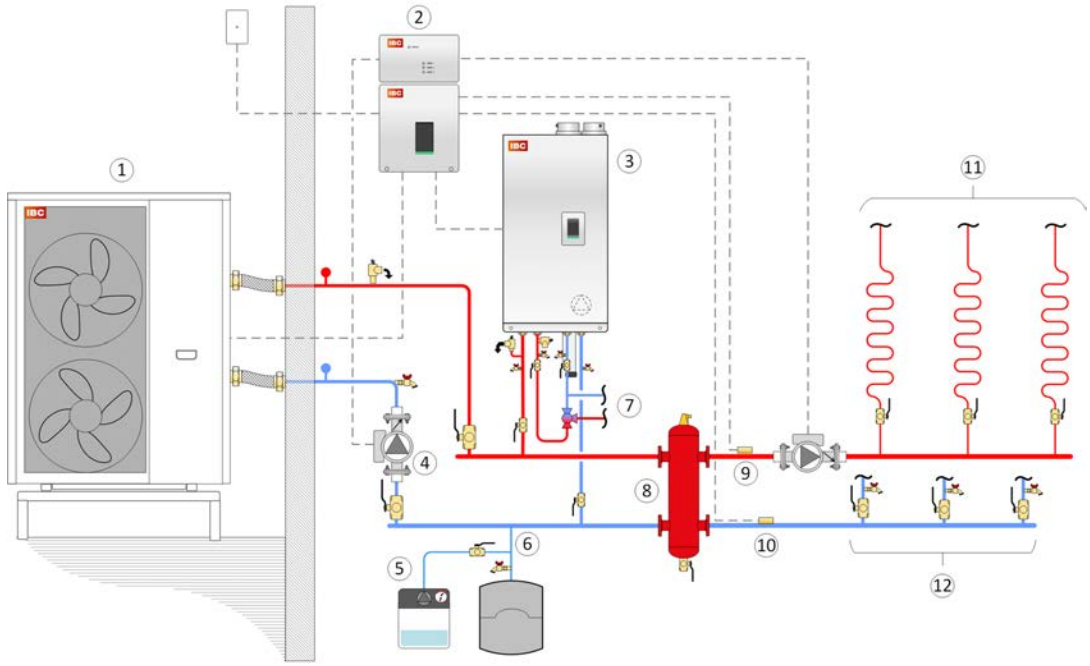
Programming (see also *Setting a target temperature on page 61*)

HEAT SOURCES		NOTES
Add Heat Source	Follow prompts for IBC Heat Pump	
	Add pump **A**, rename e.g. *HP1-p*	
Repeat Add for second HPX	Add pump **B**, rename e.g. *HP2-p*	
SYSTEM SETTINGS > SITE > HEAT PUMPS		
Sys-Pump H	Select **C**. Rename e.g. *Systm*	Pump (8) in drawings
Minimum Cycle Time	E.g. **10** minutes	
Compressor Delay	E.g. **0** minutes	HPX has a built-in 4 min. delay

9.7 HPX heat pump with backup gas CX combi boiler / water heater serving concrete slab

Caution: potential equipment damage

This application requires that the concrete slab's **smallest** zone has sufficient thermal mass to prevent short-cycling; see *Using concrete slab as buffer on page 54*.

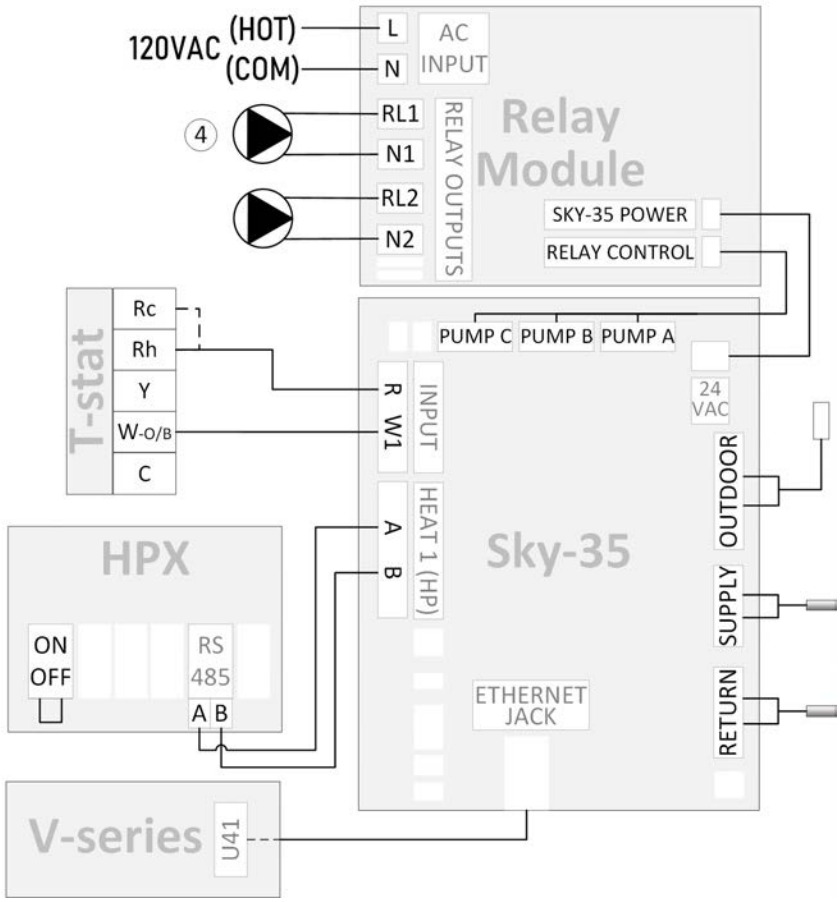


1	HPX Heat pump (outdoors)	7	Domestic cold and hot water connections
2	Pump Relay Module and Sky-35	8	Hydraulic separator
3	IBC CX gas combi boiler with V10 controller	9	Supply temp sensor to Sky-35
4	Heat pump circulator	10	Return temp sensor to Sky-35
5	Glycol fill tank	11	To heating (unzoned)
6	Expansion tank connection point	12	From heating zones

Figure 36 *Concept drawing: Heat pump with backup SFC or generic gas combi boiler / water heater*

Setup note: V10 controller must be running 2.01.6 or later. Under *Network Settings* "Sky-35 comm" is *Enabled*. See *Ethernet Connections on page 29*.

Wiring



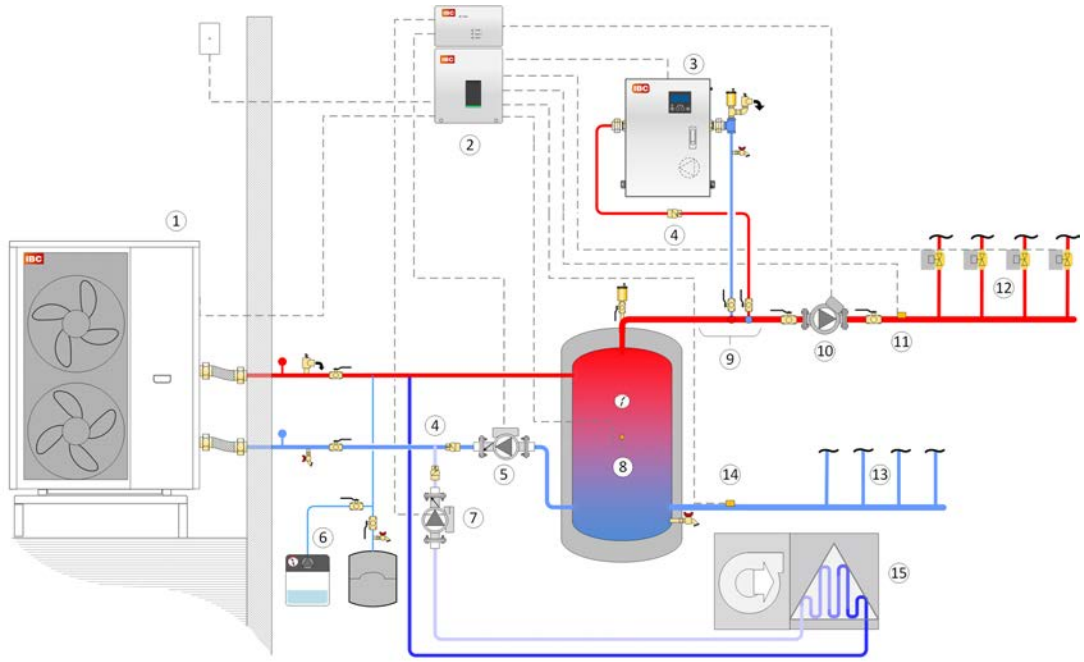
Programming (see also *Setting a target temperature on page 61*)

HEAT SOURCES		**NOTES**
Add Heat Source	Follow prompts for IBC Heat Pump	
	Add pump ***A***, rename e.g. "Cdnsr" or "HPX-p"	Pump (4) in drawings
	Follow prompts for IBC Gas Boiler	
SYSTEM SETTINGS > SITE > HEAT PUMPS		
Minimum Cycle Time	E.g. **10** minutes	
Compressor Delay	E.g. **0** minutes	HPX built-in delay = 4 min
Heat Pump Min T	E.g. **5°F (-15°C)**	
Sys-Pump H	Select ***B***; rename e.g. *Systm*	

9.8 HPX heat pump with cooling and backup EBX electric boiler

Caution: potential property damage

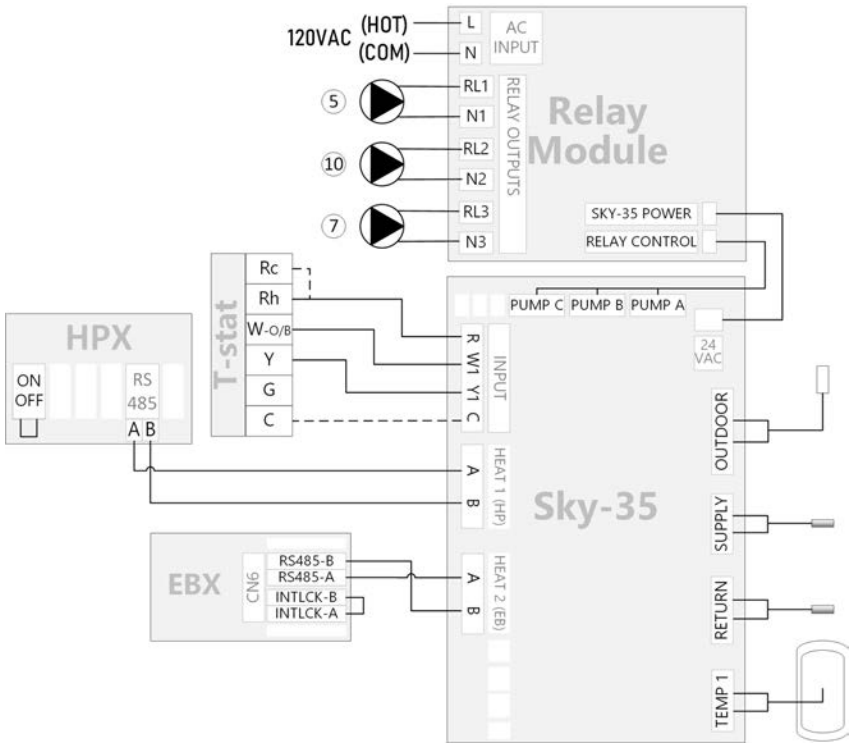
All cooling applications require thorough insulation of chilled water piping and fittings.



1	IBC HPX-series heat pump	9	Closely-spaced tees
2	Sky-35 and Pump Relay Module	10	System (distribution) circulator
3	EBX electric boiler with integral pump	11	Supply sensor to Sky-35
4	Check valves (3)	12	Supply piping to loads
5	Heat / tank circulator controlled by Sky-35	13	Returns from loads
6	Glycol fill tank	14	Return sensor to Sky-35
7	Cooling circulator controlled by Sky-35	15	Ducted air conditioning coil
8	Buffer tank		

Figure 37 *Concept drawing: heat pump with cooling, backup electric boiler and two circulators*

Wiring



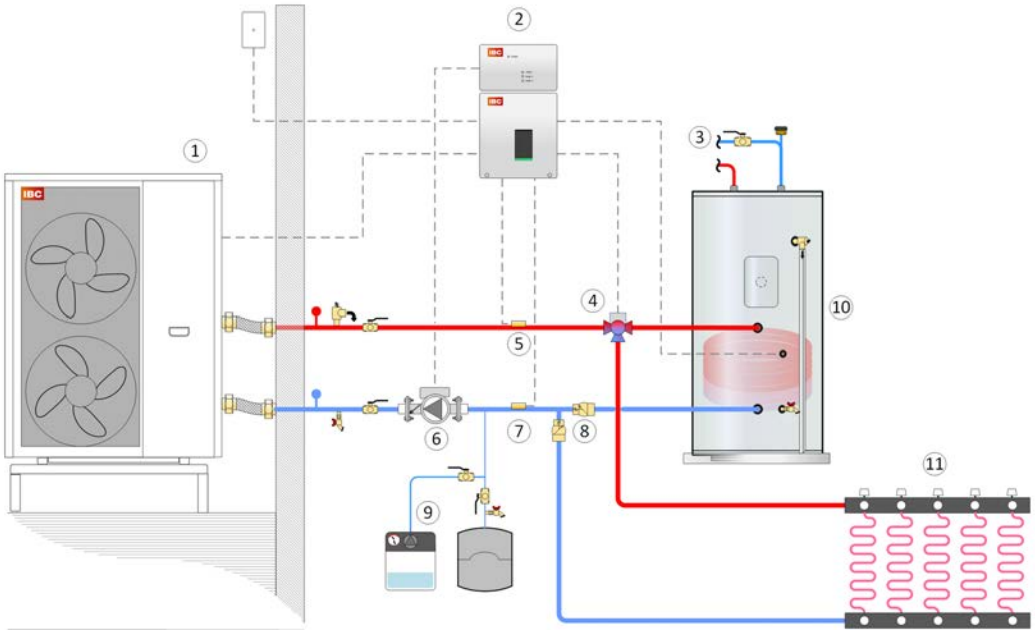
Programming (see also *Setting a target temperature on page 61*)

HEAT SOURCES		**NOTES**
Add Heat Source	Follow prompts for IBC Heat Pump	
	Add pump **A**, rename e.g. *Buffr*	Pump (5) in drawings
	Add pump **C**, rename e.g. *Cool*	Pump (7) in drawings
	Follow prompts for IBC Electric Boiler	
SYSTEM SETTINGS > SITE > HEAT PUMPS		
Minimum Cycle Time	E.g. **10** minutes	
Compressor Delay	E.g. **0** minutes	HPX has a built-in 4 min. delay
Sys-Pump H	Select ***B***; rename e.g. *Systm*	Pump (10) in drawings
SYSTEM SETTINGS > SENSORS		
Temp 1 or other	Rename, e.g. *buff*	
SYSTEM SETTINGS > TANKS > ADD TANKS		
Select named sensor	Define tank as *Heating*	

9.9 HPX heat pump with concrete slab and indirect DHW tank

Caution

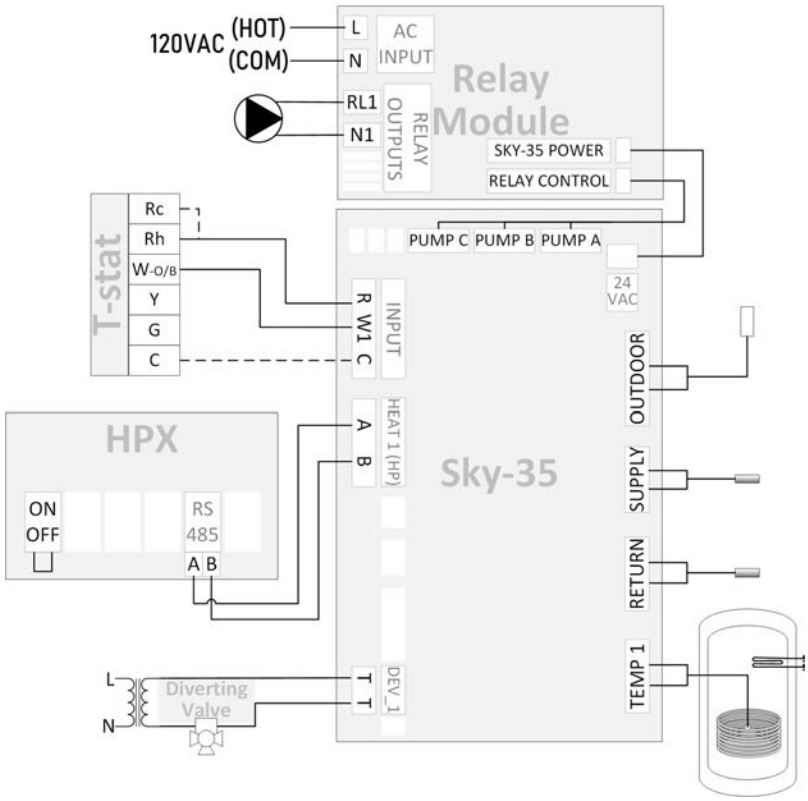
This application requires that the concrete slab's **smallest** zone has sufficient thermal mass to prevent short-cycling; see *Best practices on page 53*.



1	IBC Heat Pump	7	Return sensor
2	Pump Relay Module and Sky-35	8	Check valves (2)
3	Domestic cold and hot water connections	9	Glycol fill tank (shown), or fill station with isolation closed
4	Motorized diverter valve	10	Indirect tank with electric element
5	Supply sensor	11	Slab radiant heating (no small zones)
6	Heat pump circulator controlled by Sky-35 controller		

Figure 38 *Concept diagram: heat pump with concrete slab and indirect tank*

Wiring



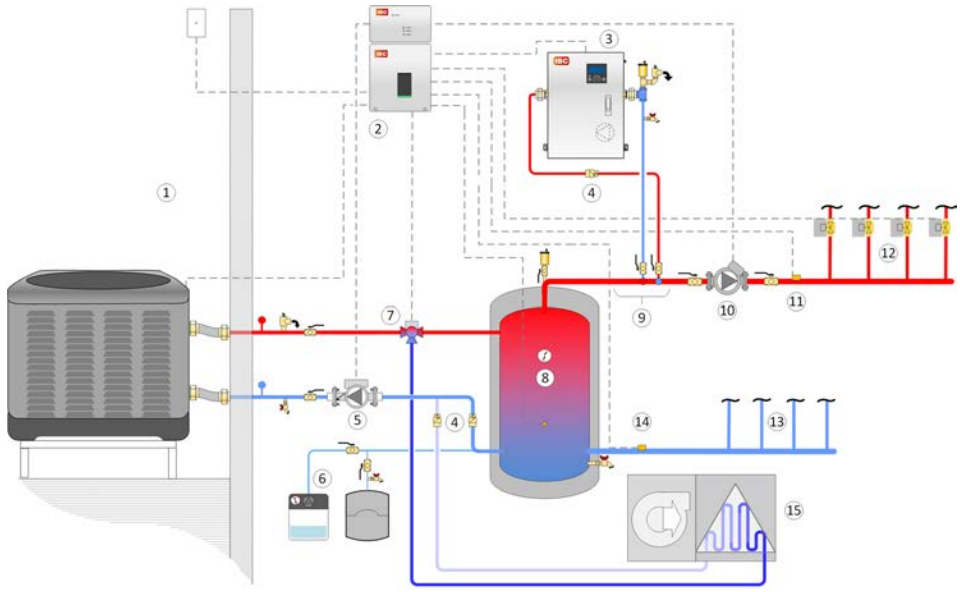
Programming (see also *Setting a target temperature on page 61*)

HEAT SOURCES		**NOTES**
Add Heat Source	Follow prompts for IBC Heat Pump	
	Add pump **A**, rename e.g. *HPX-p*	Pump (6) in drawings
	Follow prompts for IBC Electric Boiler	
SYSTEM SETTINGS > SITE > HEAT PUMPS		
Minimum Cycle Time	E.g. **10** minutes	
Compressor Delay	E.g. **0** minutes	HPX has a built-in 4 min. delay
SYSTEM SETTINGS > SENSORS		
Temp 1 or other	Rename, e.g. *DHW*	
SYSTEM SETTINGS > TANKS > ADD TANKS		
Select named sensor	Define as **DHW**	
SYSTEM SETTINGS > CONTACT CONTROL		
DEV_1	Select ***Heating***	Valve powers on for space-heating

9.10 Generic heat pump with buffer tank, cooling and backup EBX electric boiler

Caution: potential property damage

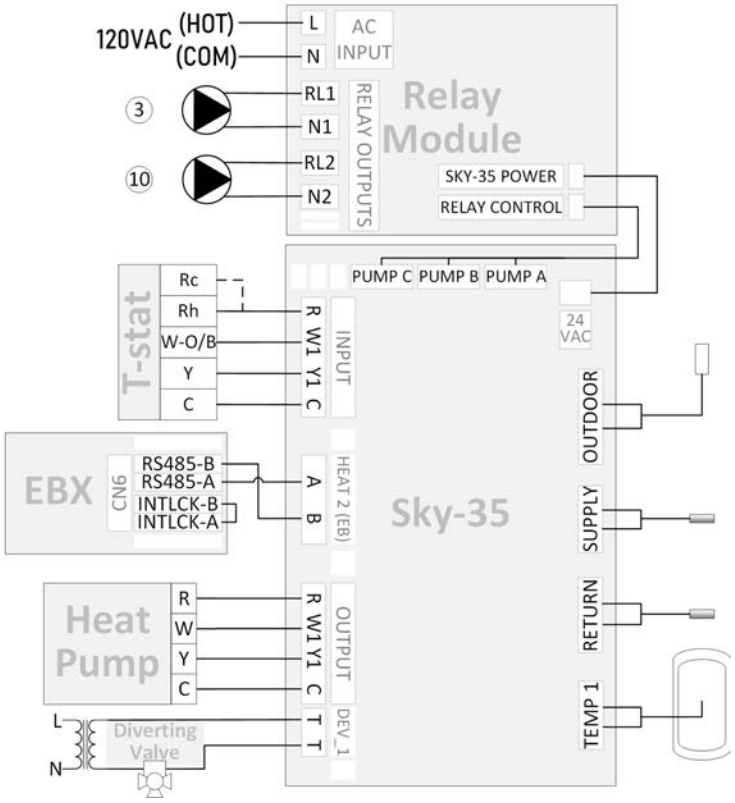
All cooling applications require thorough insulation of all chilled water piping and fittings.



1	Generic heat pump	9	Closely-spaced tees
2	Sky-35 and Pump Relay Module	10	System (distribution) circulator [relay 2]
3	IBC EBX-series electric boiler (with integral pump)	11	Supply sensor to Sky-35
4	Check valves (3)	12	Supply piping to loads
5	Heat pump circulator [relay 1]	13	Returns from loads
6	Glycol fill tank	14	Return sensor to Sky-35
7	Motorized diverting valve	15	Ducted air conditioning coil
8	Buffer tank		

Figure 39 *Concept drawing: generic heat pump with buffer tank, cooling and backup electric boiler*

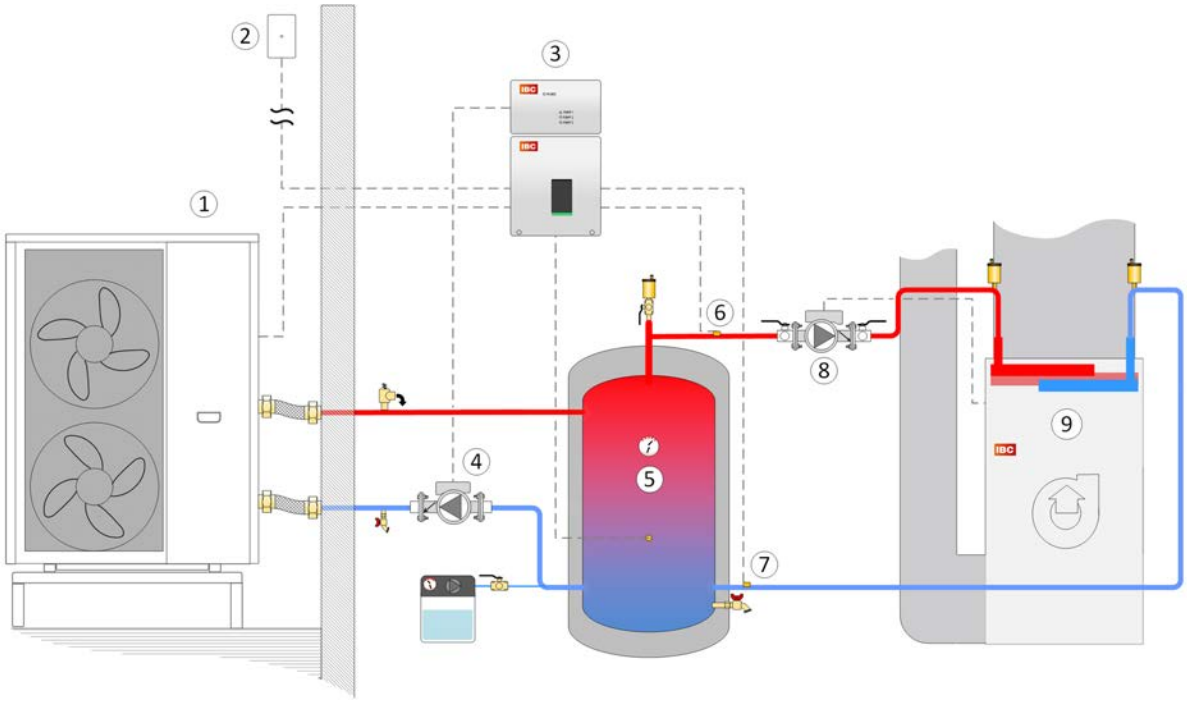
Wiring



Programming (see also *Setting a target temperature on page 61*)

HEAT SOURCES		**NOTES**
Add Heat Source	Follow prompts for Other / Heat Pump	
	Add pump **A**, rename e.g. *HPpmp*	Pump (3) in drawings
	Follow prompts for IBC Electric Boiler	
SYSTEM SETTINGS > SITE > HEAT PUMPS		
Minimum Cycle Time	E.g. **10** minutes	
Compressor Delay	E.g. **12** minutes	Check HP and A/C units for a built-in compressor delay
Sys-Pump H	Select ***B***; rename e.g. *Systm*	Pump (10) in drawings
SYSTEM SETTINGS > SENSORS		
Temp 1 or other	Rename, e.g. *buff*	
SYSTEM SETTINGS > TANKS > ADD TANKS		
Select named sensor	Define tank as *Heating*	
SYSTEM SETTINGS > CONTACT CONTROL	Select Dev_1 as ***Cooling***	Valve powers on for cooling

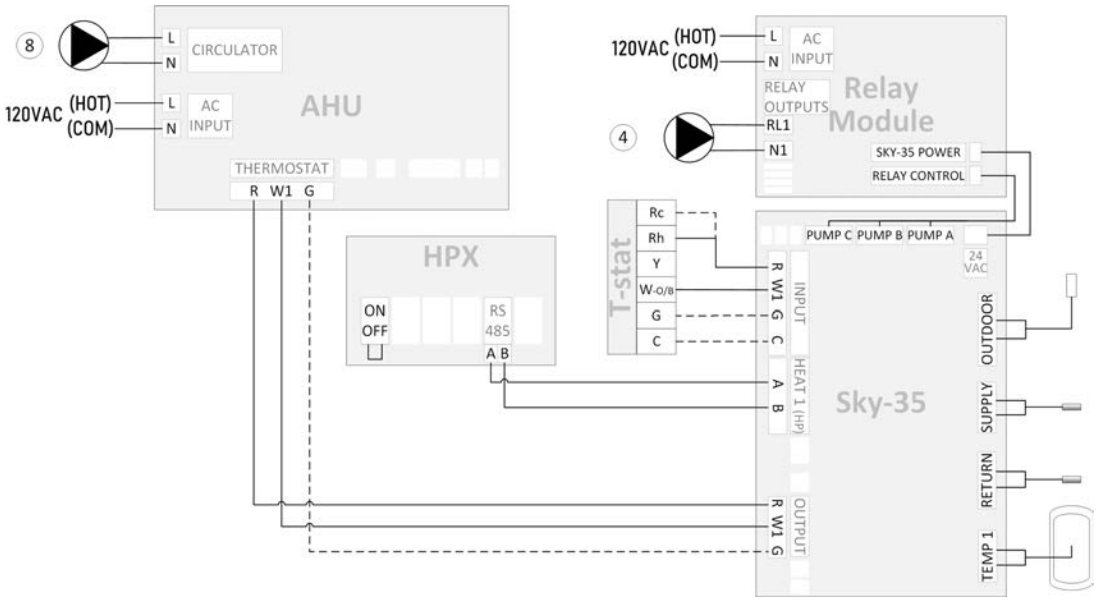
9.11 HPX heat pump with air handler



1	IBC Heat Pump	6	Supply sensor to Sky-35
2	Outdoor sensor located on north face of building	7	Return sensor to Sky-35
3	Pump Relay Module and Sky-35	8	Air handling unit circulator, controlled by AHU
4	Heat pump circulator controlled by Sky-35	9	IBC AHU air handler
5	Buffer tank		

Figure 40 *Concept drawing: Heat pump with air handler*

Wiring



Programming (see also *Setting a target temperature on page 61*)

HEAT SOURCES		**NOTES**
Add Heat Source	Follow prompts for IBC Heat Pump	
	Add pump **A**, rename e.g. *HPX-p*	Pump (4) in drawings
SYSTEM SETTINGS > SITE > HEAT PUMPS		
Minimum Cycle Time	E.g. **10** minutes	
Compressor Delay	E.g. **0** minutes	HPX has a built-in 4 min. delay
Load Control Output	**0 - Passthrough**	Default
O/B Output	**0 - Passthrough**	Default
SYSTEM SETTINGS > SENSORS		
Temp 1 or other	Rename, e.g. *buff*	
SYSTEM SETTINGS > TANKS > ADD TANKS		
Select named sensor	Define tank as *Heating*	

Intentionally left empty

10.0 Start-up

> **Note**
>
> For a heat source to fire, it needs an "enabler" such as a zone valve end switch, thermostat, or a buffer tank temperature sensor.

When a Sky-35 controller is first energized, it runs through a power-up sequence that takes approximately one minute. During this time, the controller completes a self-diagnostic, and loads all previous settings. When power is restored after a power interruption, the Sky-35 automatically resumes operation with all the previously stored values.

10.1 Start-up checklist

Start-up Checklist	Check
Tested the pressure relief valve. For instructions, refer to the heat source's *Installation and Operating Instructions* manual.	☐
Check that all heat sources are configured and communicating with the controller.	☐
Review system settings.	☐
Check sensor temperatures for poor contact or mislabeling.	☐
Test run each pump to verify correct wiring.	☐
Tested the flow by observing the supply and return delta temperature.	☐

Intentionally left empty

11.0 Setup for Internet access

At a site, you can set up internet access to enable you to monitor and edit one or more Sky-35 controllers remotely through IBC's Portal.

To set up remote access to a Sky-35 via the V10 portal, you must connect a controller to an IP network (see instructions below). Then you can register a Sky-35 for the V10 portal. For steps on how to register for access to the V10 portal, scan the adjacent QR code.

11.1 Connecting a Sky-35 controller to an IP network

The controller must be properly connected to an IP network to enable web browser capability. You can do this by using a router to connect the Sky-35's local area network to the internet. The connection for the Sky-35's controller to an IP network is through the Ethernet jack located on the underside of the controller (see *Installation and Wiring on page 21*). The controller supports standard 100 Base T data rates over typical CAT5 or CAT6 wiring.

> **Note**
>
> Remote access via the Internet typically requires that the router have its port forwarding settings configured to forward port 80 to the Sky-35's local IP address.

When connecting to the Sky-35 within the local area network, the Sky-35's IP address will be the same as listed on the controller's Network Information screen.

There are three methods for connecting the Sky-35 to an IP network:

1. Installing an Ethernet cable that connects from the Sky-35 (RJ 45 Ethernet Jack) to the router.
2. The Sky-35 can plug into a network switch that plugs into a router.
3. Purchasing and installing a wireless access point device connected to the Ethernet jack. The wireless access point device must be configured to operate in client mode (to enable the router to function as a wireless client).

There are many wireless access point devices on the market such as the TP-LINK AV500 Nano Powerline Adapter Starter kit. The adapter plugs into an electrical wall socket, and connects to a router via an Ethernet cable.

Once an IP network connection is established, using one of the above methods, the router automatically requests the IP address, Net Mask, Net Mask, and the default gateway as part of the TCP/IP protocol configuration settings.

Warning

Ensure the Sky-35 controller is configured with a "local" network IP address, with access to the Internet through a properly configured and enabled firewall device. IBC Technologies Inc. does **not** approve connecting the Sky-35 controller directly to the Internet using a "public" IP address, or connecting without a secure firewall device.

On the controller's "Network Settings" screen (●●● > **Network Settings**), the TCP/IP group of parameters includes the basic settings required to connect to an IP network. By default DHCP is selected.

- When DHCP is activated the other four entries (IP address, the gateway, DNS server, and Net Mask) are not required, and their entry boxes are disabled.
- When assigning a Sky-35 with a fixed IP address, tap "Manual" and manually enter the Sky-35's IP Address, Net Mask, DNS Server address and Gateway address.

Set up access to the IBC Portal

Now that you have set up the Sky-35's connection to an IP network, you can register the Sky-35 via the Portal to enable you or another representative to monitor operation for a particular Sky-35.

If a V-10 boiler controller has been registered to the IBC Portal and is then connected to the Sky-35, no conflict will be created by also registering the Sky-35 to the Portal.

To complete the setup, you need to:

1. Register a Sky-35 with IBC.
2. Register as a user to access IBC's Portal website.
3. Access the IBC Portal with a user name and password.

Accessing the IBC Portal

When IBC has set up your access to the IBC Portal, you will receive an automated message with your password.

To log in to the Portal:

1. Go to portal.ibcboiler.com.
2. In the **Username** box, enter your username.

3. In the **Password** box, enter the password.
4. Select the **Login** button.

You can change your password by going to the Welcome drop-down list>Profile.

Intentionally left empty

12.0 Troubleshooting

This section provides a list of controller error messages and possible way to resolve the errors. Errors clear automatically when the error circumstances are resolved. For information on the types of errors, ses chart below. Note that disconnected wires or defective sensors may be the cause of the error. Always check connections and wiring first.

Warning

Do not attempt to repair the control module (circuit board). If the control module is defective, replace it immediately. Please contact IBC technical support (see back cover) for assistance.

12.1 Viewing errors

If one or more errors are displaying on the status bar, you can view more details by going to the Error Logs screen.

1. Go to [Status] > **Error Logs**.
2. Tap an error log, and then tap the **Details...** button. The Error log displays all the errors present at the time of the error event such as minor errors, major errors, and system faults.

   Each error type is displayed as a dropdown that you can select to view the types of errors.

Tip

Once the errors have been resolved, it is not necessary to wait for the lockout period to end. See "Clearing Errors" below.

12.2 Clearing errors

When you clear an error, the system clears any error states and forces the controller to reassess the boiler's error status and to determine if any error state is still present.

To clear the error(s), go to > **Clear Errors** > **Yes**.

12.3 List of touchscreen controller error messages

The Error Log page lists two kinds of errors: those relayed from IBC Heat Sources and those specific to the Sky-35. An error relayed from a heat has is tagged by the model, e.g. *Error 2: EBX 32* (see the example to the right). A suffix number (if present) is only the MODbus address, which will be useful if there are multiple such models connected to the Sky-35. In the table below, we've included a list of error messages that you may encounter on a controller as well as diagnostic steps to help you troubleshoot.

Error Text	Diagnosis & Recommended Troubleshooting
Delayed	Information only: compressor or other normal heating/cooling delay
Inlet Temp Sensor	Check Inlet temperature sensor
Outlet Temp Sensor	Check Outlet temperature sensor
Aux [#] Temp Sensor	Check Aux [# / assigned-name] temperature sensor
Outdoor Temp Sensor	Check Outdoor temperature sensor
Thermostat Fault	Simultaneous calls detected for heating and cooling
Mode Fault	Sky-35 could not determine mode from given sources
MODbus [#] Fault *Shows up as a warning status for the affected heat source. MODbus faults are not recorded in the error log.*	MODbus # 1 / 2 / 3 is not indicative of terminal #
	Check MODbus wiring connections
	Check A/B polarity
Settings Fault	Error loading settings
	Power cycle
	Factory reset
	Software update
	Contact Tech Support
IP Network Fault	Check ethernet connection. Check presence of network switch
	Power cycle Sky-35 and/or network switch
	Reset router (if used)
RTOS Fault	Software fault or bad data from connected device.
	Reset to the system defaults
	Update firmware
WiFi/BT Module	Power Cycle
	Reset to the system defaults
	Update firmware
No Serial Number	Contact Tech Support
No Model Set	Possible faulty EEPROM: contact Tech Support
Delayed	Information only - compressor or other normal heating / cooling delay

Tip

If resetting the controller by applying a power cycle, keep power removed for a full minute for best results.

12.4 Deleting or clearing an error log

Deleting will delete all entries in an error log.

Go to > **Error Logs** > Choose an error log (link) > **Delete all** > **Yes** to clear all entries in the error log.

Intentionally left empty

13.0 Appendices

Appendix A: Controller Board Layout

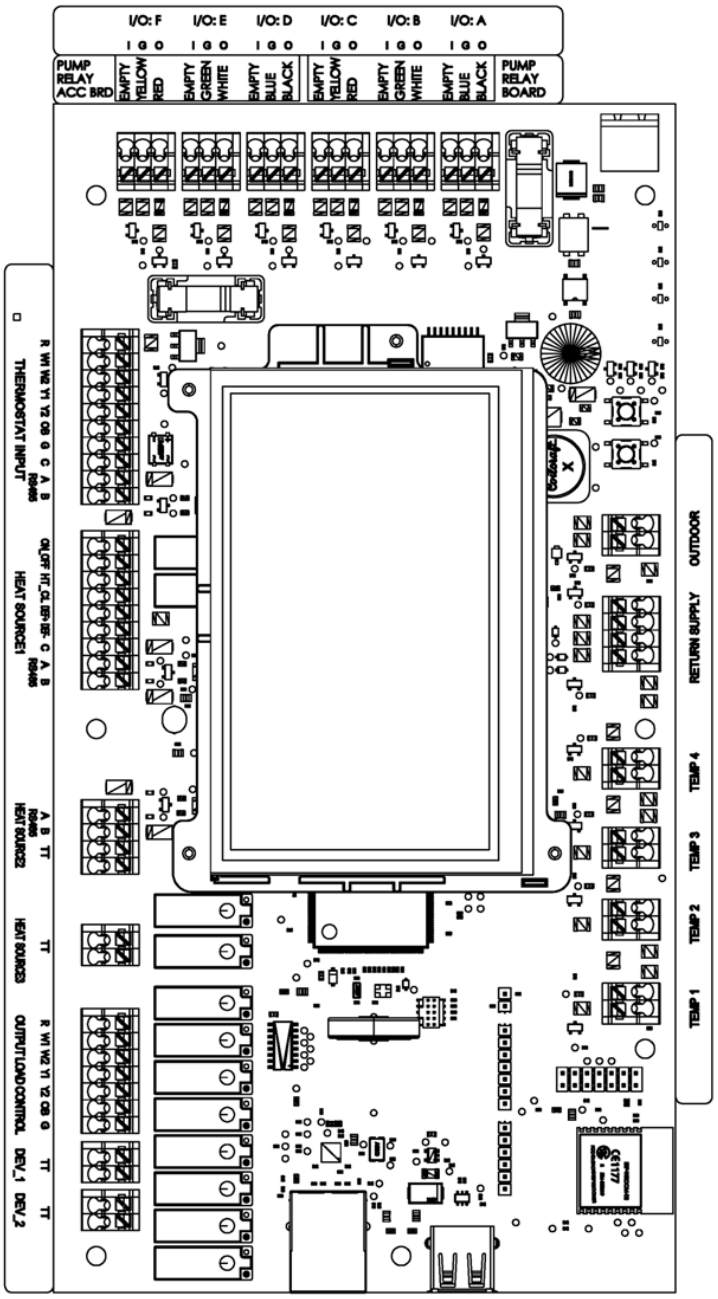


Figure 41 *Controller board layout*

Appendix B: Board layouts for related IBC products

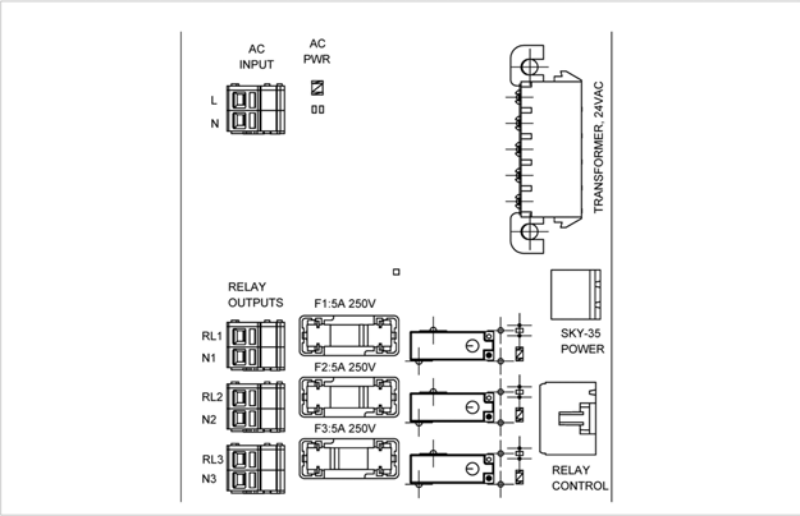


Figure 42 *Relay Module layout*

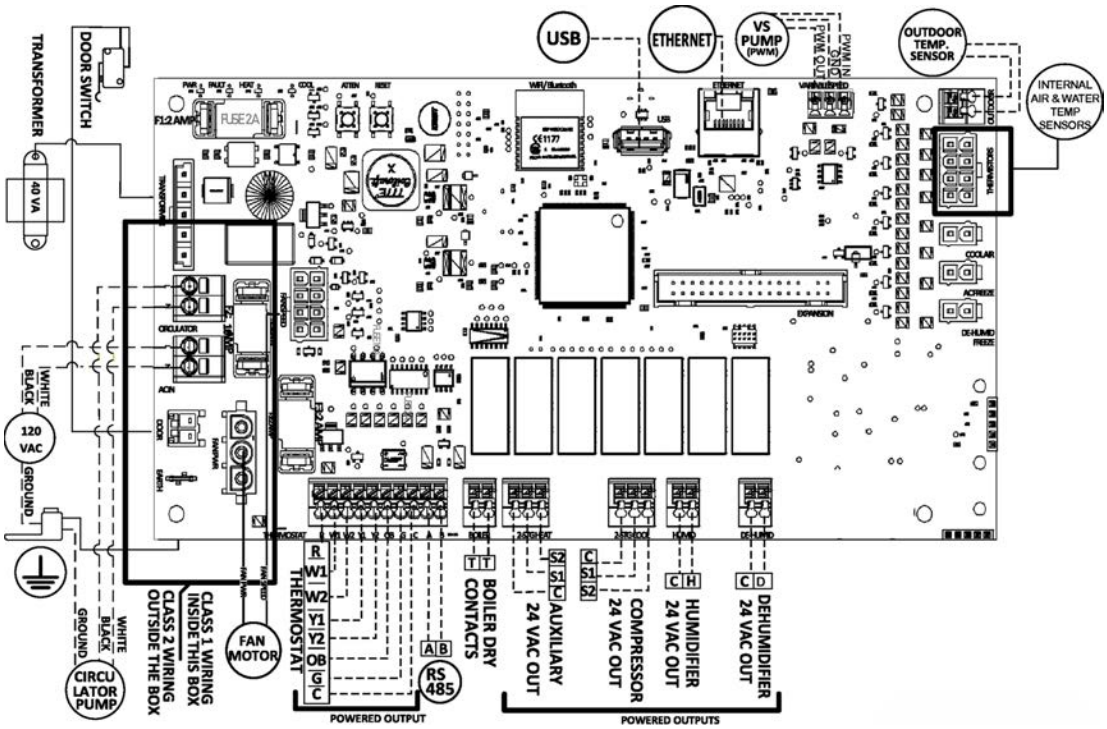


Figure 43 *Air handler unit (AHU) board layout*

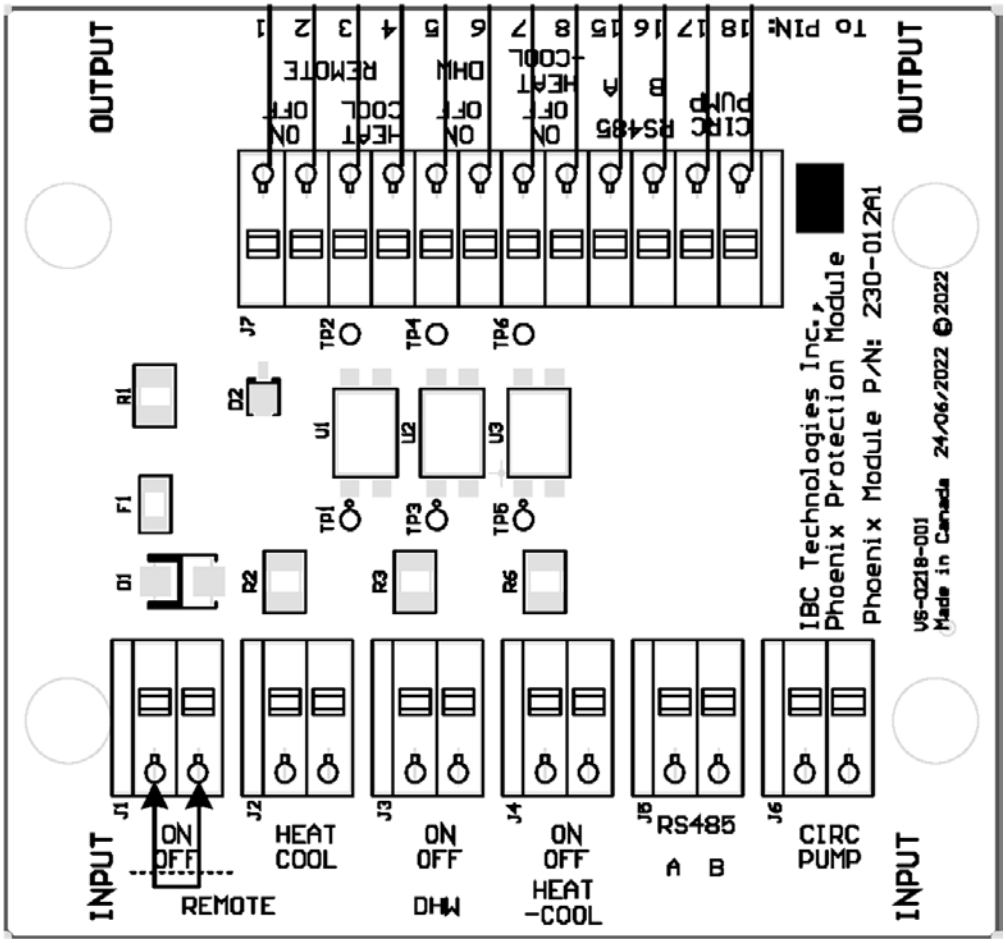


Figure 44 *HPX heat pump board layout*

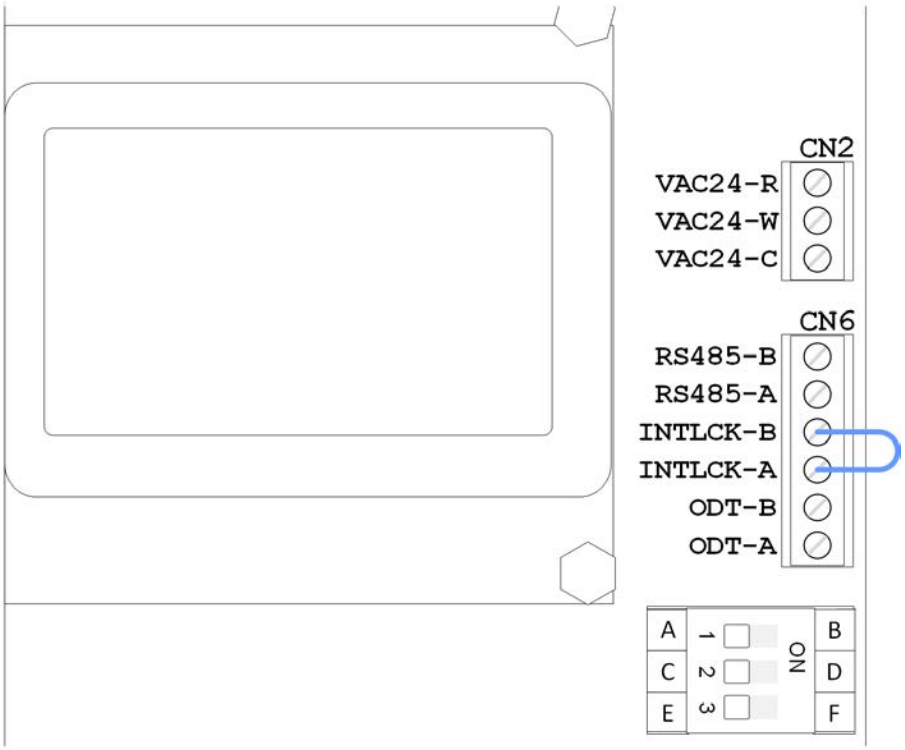


Figure 45 *EBX electric boiler board layout*

Appendix C: Installer log for Site Settings

Site Name:_____ Setup Date:_____ Revision Date: _____

Name	Options, Ranges and Defaults	IBC Notes	Installer Notes
Heating Mode	Heating Only, Cooling Only,**Heating / Cooling**, Off		
Heating Target	Min: 30°C (86°F) Max: 85°C (185°F) Default: **43°C (109.5°F)**		
Tank Heat Target	Min: 30°C (86°F) Max: 80°C (176°F) Default: **40°C (104°F)**	Must be lower than HeatTargetT	
Reset Heating	**0 - Off** 1 - On	Requires Outdoor T; if On both “HeatTargetT” and “TankHeatT” will be adjusted.	
Reset Design T	Min: -35°C (-31°F) Max: 15°C (59°F) Default: **-10°C (14°F)**		
Cooling Target	Min: 10°C (50°F) Max: 30°C (86°F) Default: **13°C (55.5°F)**		
Tank Cool Target	Min: 5°C (41°F) Max: 20°C (68°F) Default: **13°C (55.5°F)**	Must be higher than CoolTargetT	
Heat / Cool Cycle	Min: 0 Max: 3000 Default: **10**	Minimum time for switching between heating and cooling cycles.	
Minimum Cycle Time	Min: 0 Max: 60 Default: **0**	Minimum run time for a heating or cooling cycle	
Compressor Delay	Min: 0 Max: 10 Default: **0**	Most HP and A/C units have a built-in compressor delay	
Stage 1 / 2 Delay	Min: 0 Max: 10 Default: **0**	Minimum interval between thermostat Stage1/Stage2 heating	

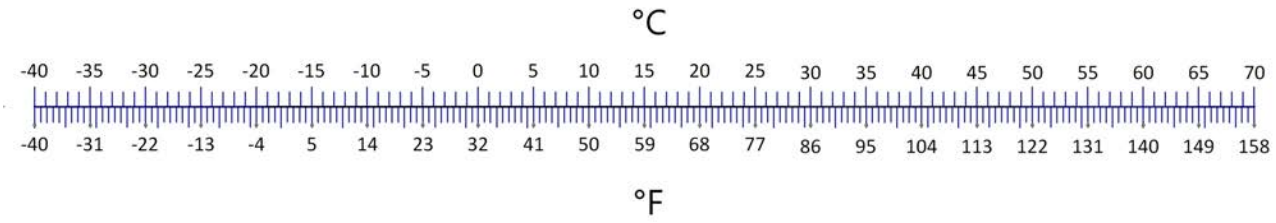
Name	Options, Ranges and Defaults	IBC Notes	Notes
Balance Point	Min: -30°C (-22°F) Max: 15°C (59°F) Default: **-4°C (25°F)**	Requires Outdoor T	
Heat Pump Min T	Min: -30°C (-22°F) Max: 0°C (32°F) Default: **-10°C (14°F)**	Must be lower than BalanceT	
Load Control Outputs	0 - Passthrough 1 - Controlled		
O/B Output	**0 - Passthrough** 1 - Active Cooling 2 - Active Heating	Must select 1 or 2 if thermostat does not provide O/B	
Summer Shutdown T	Min: 10°C (50°F) Max: 45°C (113°F) Default: **45°C (113°F)**	Default setting of 45°C effectively disables Summer Shutdown	
Freeze Guard	0 - Off **1 - On**	Requires Outdoor T	
HPX Staging Time	Min: 5 Max: 60 Default: **10**		
EBX Staging Time	Min: 5 Max: 60 Default: **5**		
Pump Exercise Interval	Min: 0 Max: 96 Default: **48**		
Pump Exercise Time	Min: 1 Max: 10 Default: **1**		

Figure 46 *Installer site settings log*

Accessories

Sky-35 Controller Board Replacement	P-2000
Sky-35 Pump Relay Board Replacement	P-2001
Sky-35 Power Transformer	P-2002
Sky-35 Power Cable	P-2003
Sky-35 Pump Control Cable	P-2004
Supply / Return (Secondary Loop / DHW) Temperature Sensor	P-9073
Outdoor Temperature Sensor	P-9067

Temperature Conversions

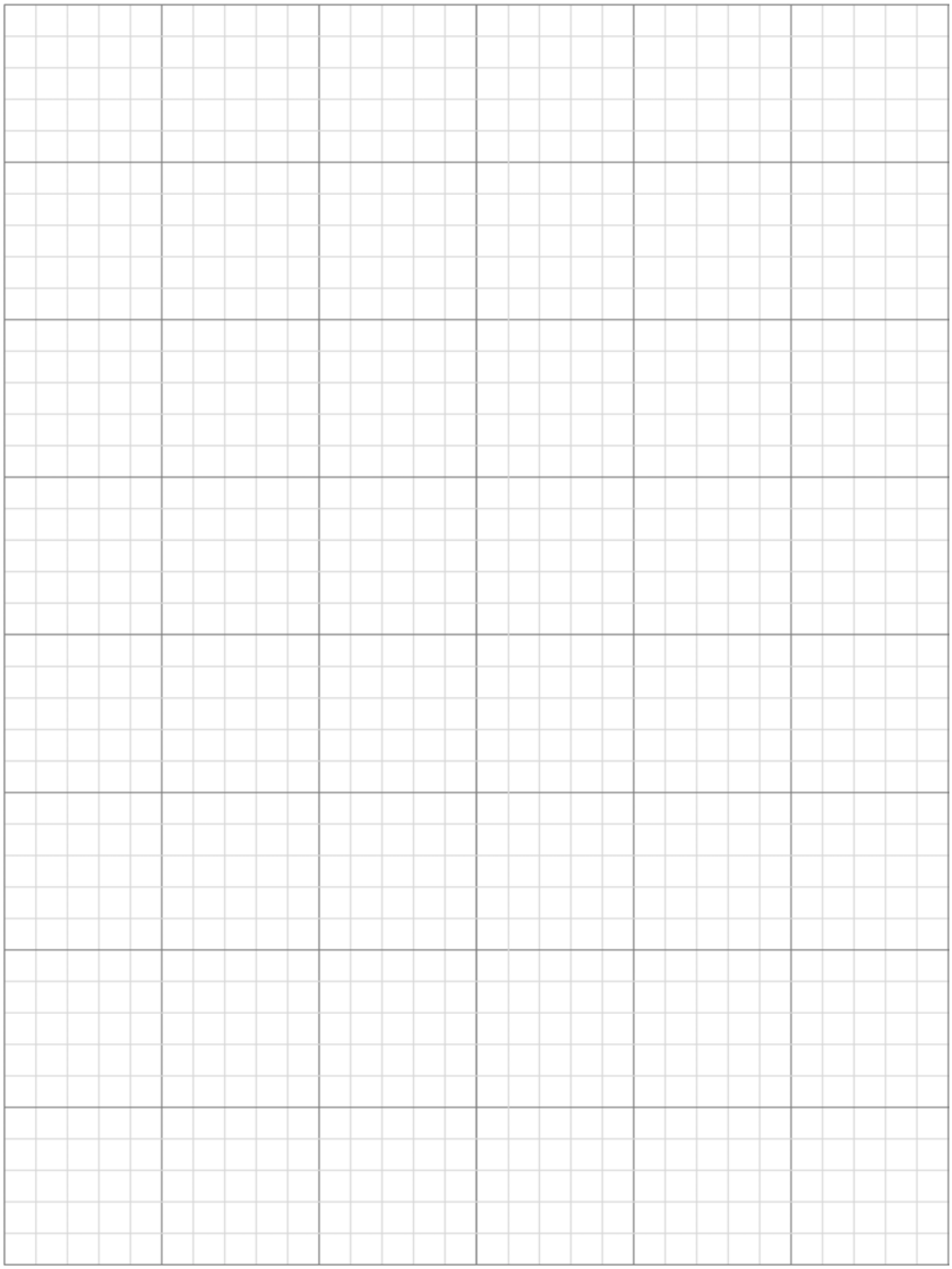


Temperature differences:

$\Delta T°C = 5/9 * (\Delta T°F)$

$\Delta T°F = 9/5 * (\Delta T°C)$

NOTES



For Tech Support, call toll-free **1-844-432-8422**. For Technical Information online, scan:

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