Multi Boiler Guide

Kit # 550002186

MULTIPLE BOILER GUIDE

1 - Multiple Boiler Operation

System Setup

- Boiler control can be applied for multiple boiler systems in cascade setup.

- System sensor input is available on low voltage terminal block to measure cascade system supply temperature.

- CH & DHW pump outputs are available on managing boiler.

- When CH supply temperature is calculated based on outdoor sensor, only one outdoor sensor is needed. Sensor is connected to managing boiler and calculates CH setpoint for cascade system.

- In case of cascade in combination with domestic hot water tank DHW pump can be connected to pump output of managing boiler control. Thermostat must be wired to managing boiler.

Cascade boiler pump connections
System configuration for handling DHW store or central heating demand. All boilers handle either DHW storage or CH heating demand at one time.

Figure 1 - Typical Multiple Boiler Piping

DHW Pump

CH/ System Pump

12"/305mm Max. apart

System Temperature Sensor

Size common piping according to maximum heat capacity of entire system

Up to 16 boilers

All heat exchanger ball valves closed

3/8"/10mm Open End Wrench
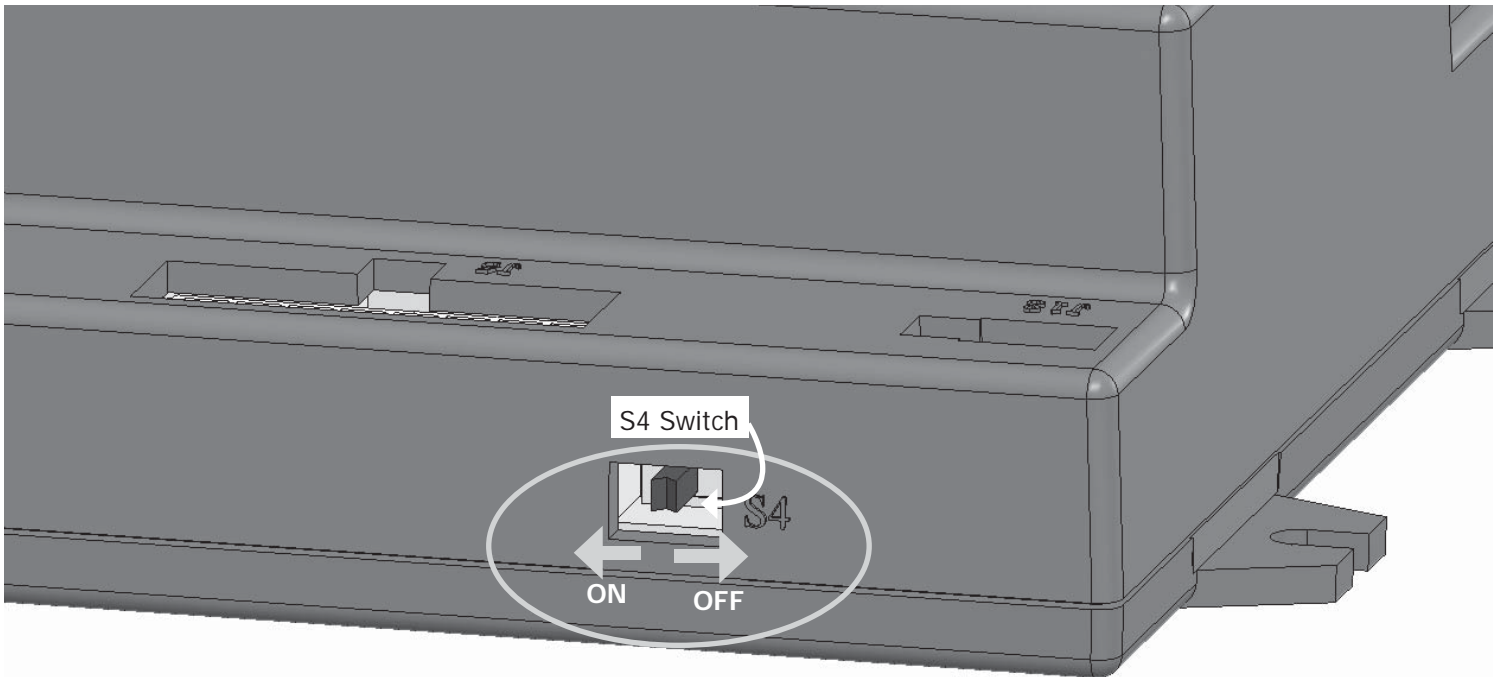
MULTIPLE BOILER GUIDE

2 - Setting Boiler Address

Argus Link Connection And Power Switch S4:

- All boilers must be connected in parallel to Argus Link terminals on low voltage terminal block.
- Maximum wire length is 100' (30m) for 22 gauge, 150' (45m) for 18 gauge.
- Maintain polarity of wires between each boiler.
- Managing boiler control provides power for communication.
- Managing boiler S4 switch has to be in ON position (away from S4 marking).
- All dependent boiler S4 controls must be in OFF position (slider towards from S4 marking).
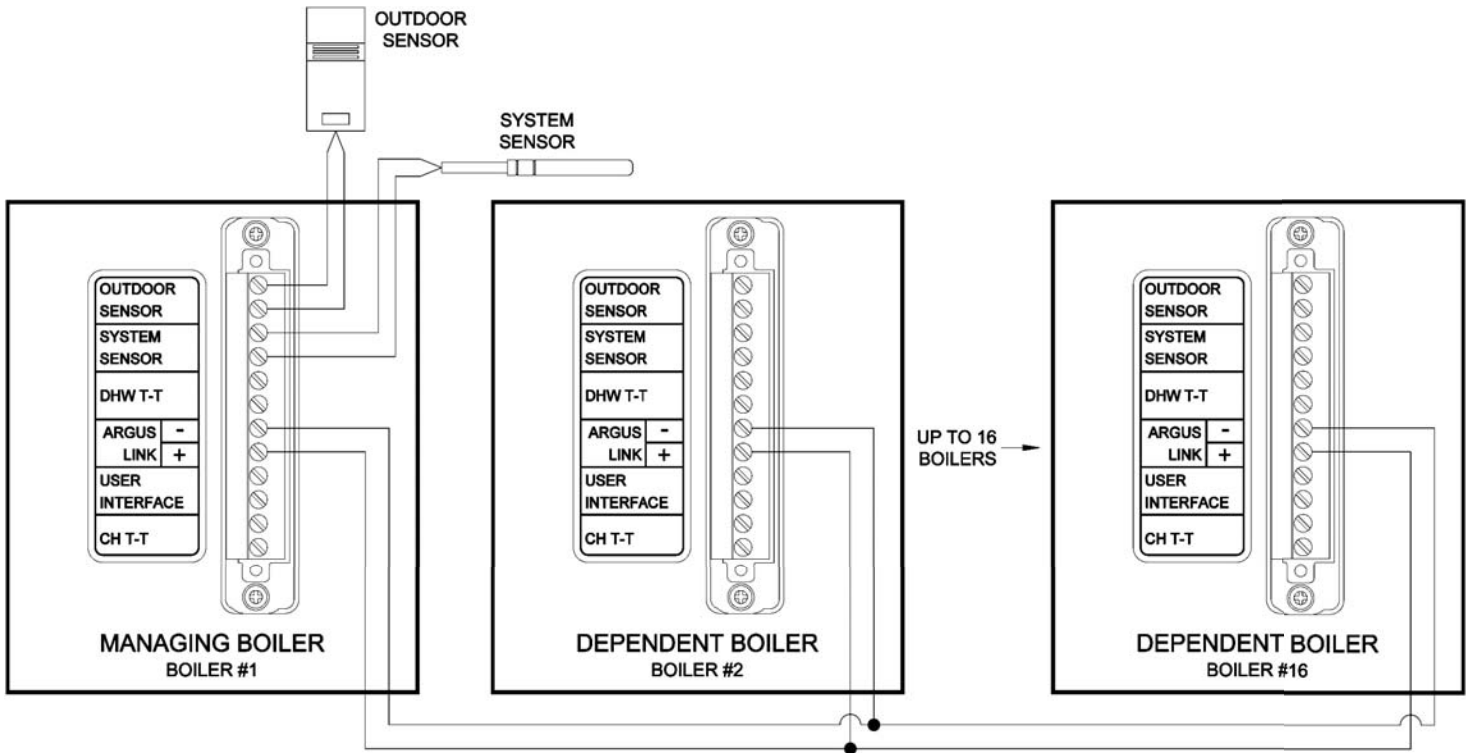
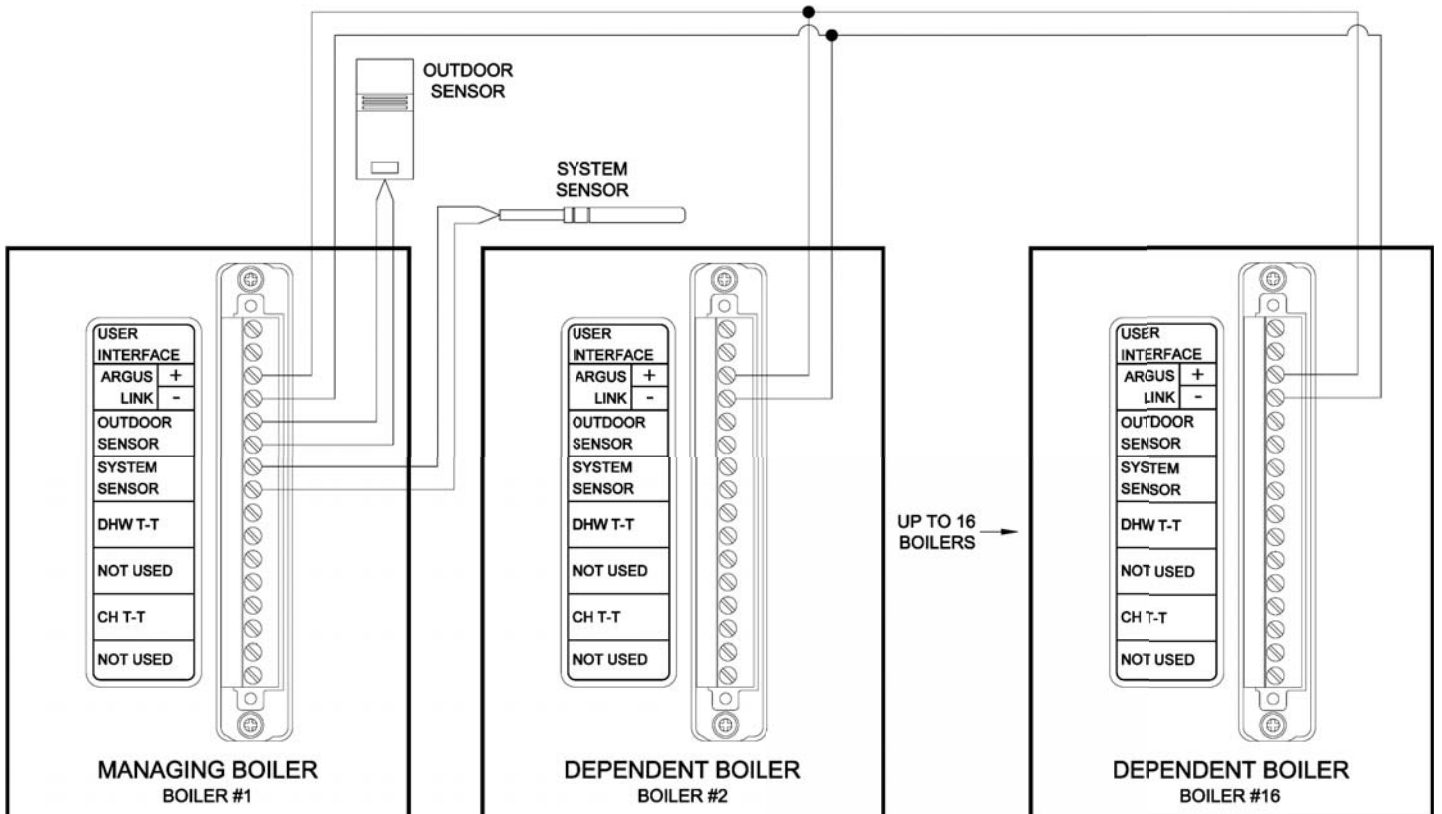| NOTICE |
|---|
| S4 switch is shipped in ON position from manufacturer. Turn OFF on all dependent boilers. |

Figure 2 - Control Module S4 Switch

MULTIPLE BOILER GUIDE

Figure 3 - SSC/VLT Multiple Boiler Wiring

Figure 4 - ECR97 Multiple Boiler Wiring

MULTIPLE BOILER GUIDE

Menu option:

```
B O I L E R   C O N F I G           1
A d d r e s s   S e l e c t i o n :


    B o i l e r   A d d r e s s :    0 ▼
```

Menu option found in installer display menu of each individual boiler. Press menu and enter buttons on user interface simultaneously for 5 second to enter Installer menu. See figure 5.

One boiler is MANAGING (Boiler Address: 1) and all other boilers work as dependent (address 2..16). Each boiler should have its unique address. Manually program each boiler's address.

boiler_ address Parameter Value	Boiler Operation	Function of system sensor input
0 (default)	No cascade boiler	No function
1	1st boiler (MANAGING)	System sensor
2	2nd boiler (dependent)	No function
3	3rd boiler (dependent)	No function
4	4th boiler (dependent)	No function
↓	↓	
16	16th boiler (dependent)	No function

Once boiler is defined as dependent (addresses 2..16) display will show boiler supply temperature and boiler status.

Use managing display (Boiler Address = 1) and managing boiler controls to determine demands for heat or DHW and show system temperature.

Figure 5 - User Interface

3 - Cascade – Heating only

Managing Boiler

Boiler is set as Managing (address = 1), controller of this boiler will drive cascade.

CH mode of managing boiler applies to all other boilers. It is only required to set CH mode on managing boiler.

- Outdoor temperature sensor connected to MANAGING boiler is outdoor sensor for cascade operation

- System sensor connected to MANAGING boiler is control sensor for cascade supply temperature.

- Thermostat connected to MANAGING boiler is CH heat demand input for cascade system.

Managing boiler calculates required boiler setpoint to achieve requested cascade setpoint.

Managing boiler provides calculated setpoint to all dependent boilers.

Power of dependent boilers is Proportional Intergral Derivative (PID) controlled on basis of calculated setpoint and dependent boiler supply temperature.

CH Mode

Set CH mode at managing boiler.

CH Setpoint For Boilers

When system temperature is not high enough, setpoint for all boilers will be adjusted. Boiler setpoint will be increased when system temperature is below cascade setpoint and decreased when it is above cascade setpoint temperature.

This is determined as following:

- PID-control loop over system temperature calculates adjustment of boiler setpoint.

- When system temperature is above cascade setpoint, calculated boiler setpoint will be decreased by a maximum of -10°C (-18°F). In case system temperature is below cascade setpoint, calculated boiler setpoint to all boilers will be increased by a maximum of 20°C (36°F).

- Calculated boiler system setpoint will be limited at 85°C (185°F).

- PID calculation does not start immediately, delay period allows system to stabilize. Delay period is calculated by multiplying Start Time delay setting with Start Modulation Delay Factor (settable).

- Delay period is limited to 60 minutes. Setting Start Modulation Delay to 0 disables this function.

Dependent Boiler

- Dependent boiler (address = 2-16) always receives its setpoint from managing boiler.

- Firing rate of ALL boilers is PID controlled by individual boiler. Individual boiler calculated setpoint is received from managing boiler to control boiler supply temperature.

- Managing boiler will operate in cascade system similar to a dependent boiler, except it will also control external pumps and analyze data collected by system and outdoor sensors.

- Maximum dependent boiler temperature is fixed at 91°C (196°F).

4 - Cascade – Domestic Hot Water

Connections:

Wire external tank thermostat to DHW T-T input on managing boiler terminal block.

Pump for DHW operation is connected to managing boiler DHW pump high voltage terminals.

Settings:

Set DHW setting, in Installer menu of managing boiler control, as follows:

- Set DHW mode at 2.

- Set DHW Boiler Assign to ALL in Installer CASCADE menu of managing boiler.

Control functions as described in boiler's Installation, Operation and Maintenance Manual, when demand for DHW is detected.

Dependent Boiler

Dependent boilers (address =2-16) receive DHW setpoint from managing boiler.

5 - Cascade – Start/Stop Sequence

Following sequence of operation occurs if there is call for heat (CH or DHW) boilers will start as following:

Starting Boilers

1. When demand for CH is present and system temperature is below Cascade CH Setpoint - (minus) Start Boiler Differential setting, first boiler will start.

2. Managing boiler sends calculated setpoint to dependent boilers. Power of boilers is PID controlled on basis of Calculated Setpoint and Supply Temperature.

3. Managing boiler waits for 3 minutes (Default) before next boiler can start.

4. When firing rate of all boilers is 80% (Default, can be adjusted by changing Next Boiler Start Rate setting) or greater and system temperature is below Cascade CH Setpoint, next boiler starts. Start Delay Time starts over.

5. Managing boiler checks power of all operating boilers. If power of all boilers is above 80% rate and wait time has elapsed, Managing boiler starts next boiler.

6. Cycle will continue until conditions below are met.

Stopping Boilers

- When one boiler is below 30% (Default, can be adjusted by changing Next Boiler Stop Rate setting) last boiler is stopped. See Stop Delay Time period below.

- When power of one boiler is below 30% next boiler is stopped.

- Boilers are allowed to stop when system temperature is above Cascade Setpoint + Stop Boiler Differential (can be adjusted). If system termperature is below this point no boilers are stopped.

- All boilers are stopped when system temperature is above Cascade Setpoint + (plus) Stop Boiler Differential.

6 - Cascade – Boiler Rotation

Rotation Interval setting allows user to select frequency lead boiler will be rotated.

Rotation Interval=5 start sequence is as follows (x is last boiler):

Days	Start/Stop sequence
Day 0-1	1-2-3-4-5..x
Day 1-2	2-3-4-5..x-1
Day 2-3	3-4-5..x-1-2
Day 3-4	4-5..x-1-2-3
Day 4-5	5..x-1-2-3-5

When Rotation Interval = 0 boiler rotation is not active.

If one boiler is assigned DHW demand, this boiler will always be last boiler in start/stop queue.

7 - Error handling

7.1 Freeze Protection

Frost protection function for cascade relates to system sensor temperature. When system sensor value is below 10°C (50°F), internal and CH pump of managing boiler start. Display shows "freeze protection".

When there is CH call for heat, freeze protection will be overridden and control will start for CH.

Managing Boiler

- Once cascade freeze protection is activated managing boiler will operate as individual boiler in freeze protection mode.

- If boiler supply temperature drops below 5°C (41°F) burner starts at minimum firing derate and continues firing until lowest of both supply and return temperatures are above 15°C (59°F).

- After burner is switched off, internal and CH pumps run for post purge period.

Dependent Boiler

- If supply temperature of dependent boiler drops below freeze protection function, this boiler also starts and will operate like individual boiler.

7.2 Emergency Mode

Open/Shorted System Sensor

- When system sensor is open or shorted all boilers will go to permanent heat demand operation and use Emergensy Setpoint.

- Managing boiler display shows "EMERGENCY MODE" and system sensor error.

- Emergency mode is default active for each boiler, however individual boiler can be switched off via "Permit Boiler Emergency Mode" setting in User Menu of effected boiler. When not permitted only freeze protection is active.

Loss Of Cascade Communication

- Loss of cascade communication is detected by dependent boilers.

- Individual boilers will show error on display when communication is lost.

- Boiler will go to permanent heat demand operation and use Cascade Setpoint.

- Set parameter per boiler.

Managing boiler error

When managing boiler is in error mode this boiler is not used anymore for cascade system. However dependent on error code pumps connected by managing boiler still can be controlled for cascade system.

Cascade system can NOT operate with following errors:

A04 - Gas valve relay error,
A05 - Safety relay error
E27 - Water pressure error,
E31 - Low water cutoff.

MULTIPLE BOILER GUIDE

Specific Parameters	Level		(Default) Value		Range	
			°C	°F	°C	°F
Permit Boiler Emergency Mode	[-]	1: User	yes		yes/no	
Cascade CH Setpoint	[°C/°F]	1: User	80	160	40..93	104..200
Boiler Address	[-]	2: Installer	0		0..15	0..15
Cascade Emergency Setpoint	[°C/°F]	2: Installer	45	113	20..65	68..149
Start Delay Time	[min]	2: Installer	3		1..15	
Stop Delay Time	[min]	2: Installer	3		1..15	
Start Boiler Diff	[°C/°F]	2: Installer	5	9	0..20	0..36
Stop Boiler Diff	[°C/°F]	2: Installer	2	18	0..20	0..36
Calculated setpoint Max offset down	[°C/°F]	2: Installer	4	36	0..20	0..36
Calculated setpoint Max offset up	[°C/°F]	2: Installer	10	18	0..20	0..36
Start Modulation Delay Factor	[-]	2: Installer	5 0=disabled		1..60	
Next Boiler Start Rate	[%]	2: Installer	80		10..100	
Next Boiler Stop Rate	[%]	2: Installer	30		10..100	
Rotation Interval	[days]	2: Installer	1		0..30 0=disabled	
Boilers for DHW	[-]	2: Installer	all		All,1..16	Not available
System Pump - Post Pump Time	[sec]	2: Installer	30 seconds		1...90	

NOTES

NOTES

Date	Service Performed	Company Name & Tech Initials	Company Address & Phone #

Technical Support @ 800-325-5479
Phone: (315) 797-1310 • Fax: (866) 432-7329
e-mail: info@ecrinternational.com
web site: www.ecrinternational.com

Installer Information

Name:	
Address:	

Phone:	Email: