TCNet Boiler Controller
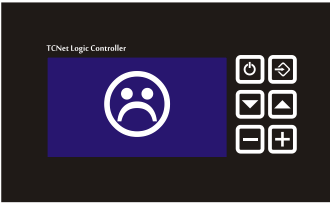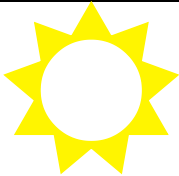
User and Service Manual

Developed and assembled in Turkey.

Türkiye'de geliştirilmiş ve üretilmiştir.

User and Service Manual

Safety Instructions

⚠	**Caution! Schock Hazard!** **Risk of electrical schock which may cause serious injuries or death. Please disconnect the mains before servicing this equipment.**
⚠	**Caution! Hot Surfaces!** **The boiler assembly and/or the temperature sensors may be extremely hot!**
⚠	**Caution! Moving Parts!** **Watch your hands while servicing the moving parts such as auger and grate cleaning assembly which may cause serious injuries.**
⚠	**Caution!** **This device is intended to be professionally installed. Incorrect installation and/or operating parameters may cause dangerous conditions.**
	Please do not expose the control panel directly to sunlight.
	Please avoid any liquid contacts to control panel and/or cable assemblies.

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Overview to Control Panel

TCNet Logic Controller

LCD Display   Keypad
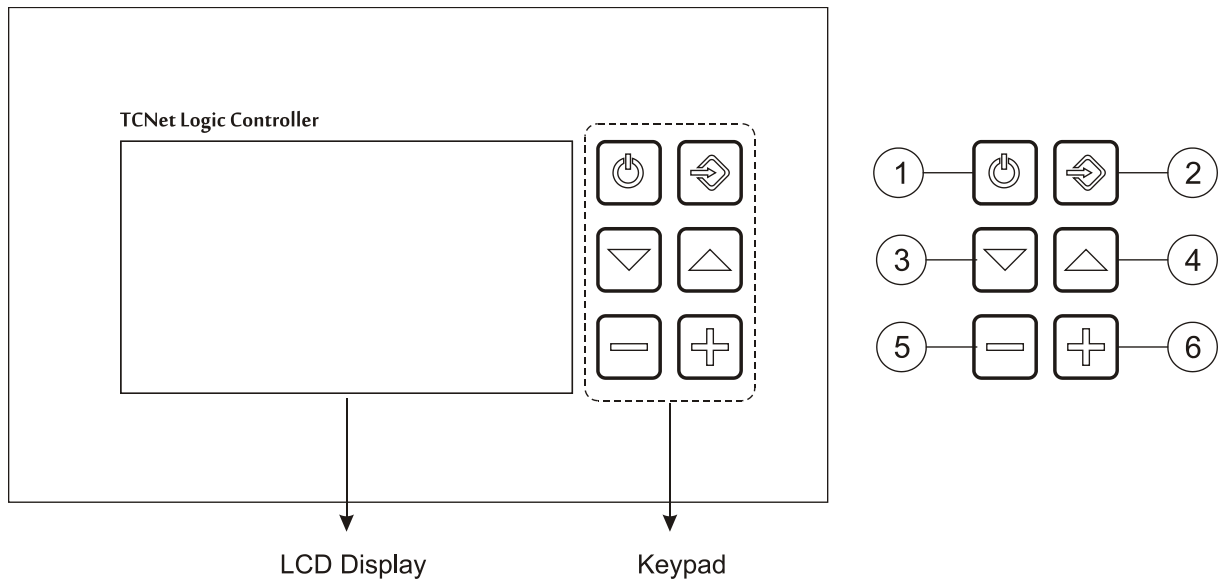
1. Power key.
2. Input key.
3. Menu navigation key.
4. Menu navigation key.
5. Decrease parameter key.
6. Increase parameter key.

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Quick Reference

Starting and Stopping Your Boiler
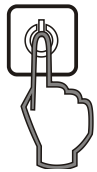
5 sec.

Please hold the power key to either run or stop your boiler.

The power state will be highlighted when you press the power key.

RUN

Setting up The Temperature of Boiler or Utility Water

Press the Input key to enter the Temperature Setup menu.

```
Temperature Setup

Boiler Temp  75°C
(Compensated:75°C)

Utility Water 40°C


<Return              Next>
```
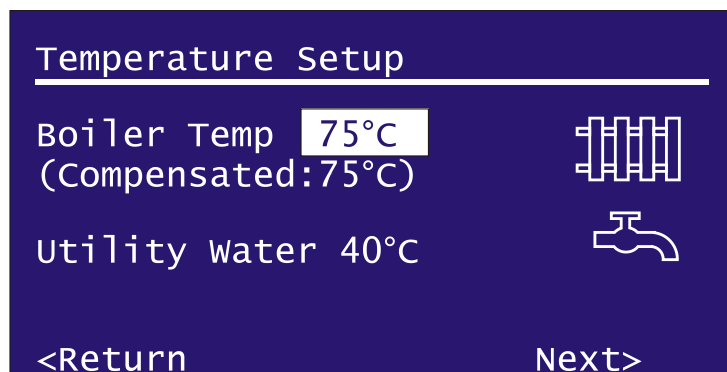
Press navigation keys to highlight boiler temperature or utility water temperature.

Press adjust keys to change the temperature.

To return operation menu, navigate to "<Return" with navigation keys and press Input key.

To jump User Preferences Menu, navigate to Next> and pres input key.

User and Service Manual
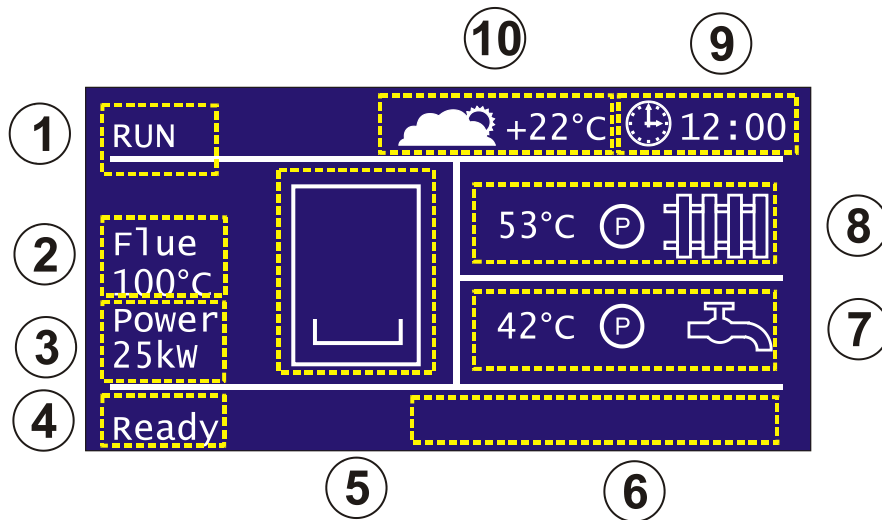
Operation Menu

The operation menu indicates current process values of your boiler. Large LCD display allows the control panel to show almos all temperatures measured by sensors and the calculated output power.

1. Power state: Indicates the current power state of your boiler. When it set to RUN, boiler will opeate if any heat demand. When it set to STOP, boiler will complete the current cycle of process and jump to deflating and cleaning sequences immediately.
2. Flue Temperature: Indicates the flue gas temperature.
3. Output Power: Indicates the calculated output power of the boiler.
4. Status display: Indicates the current process of your boiler
    -   Ready/Idle: No operation or the boiler reached the set point temperature
    -   Flame check: In this state, boiler checks the sensor if any flame exists on the grate.
    -   Ignition: Boiler is performing ignition cycle.
    -   Heating: Boiler is in normal burning cycle.
    -   Cleaning: Boiler is either deflating the flame or cleaning the grate and internal flue gas pipes.
5. Grate Display: In this are of screen, control panel shows the curent state of your boiler.

⌴ Idle/No operation

⸮ Flame check

Ignition Cycle

Boiler is operating at 20% or less of its rated power.

Boiler is operating at 20%-40% of its rated power.

Boiler is operating at 40%-60% of its rated power.

Boiler is operating at 60%-80% of its rated power.

7

⬨ Boiler is operating at 80%-100% of its rated power.

✕ Boiler is either performing the deflating sequence or grate cleaning sequence.

6. Device Icons:

〰 Auger is operating.

☞ Blower is operating.

▽ External fuel refilling system is operating.

I Ignition heater is operating.

C Cleaning mechanism is operating.

7. Utility water circuit status display:

42°C ⓟ 🚰 This section indicates the measured temperature of the utility water circuit. ⓟ icon indicates that the circulation pump of the utility water circuit is operating.

8. Building heating circuit status display:

53°C ⓟ ⊞ This section indicates the building heating circuit's data as same as utility water circuit.

9. System clock in 24-hour format.
10. Measured weather temperature.

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Menu Structure

TCNet controller has three menu schemes for quick setup, user preferences and the service settings.
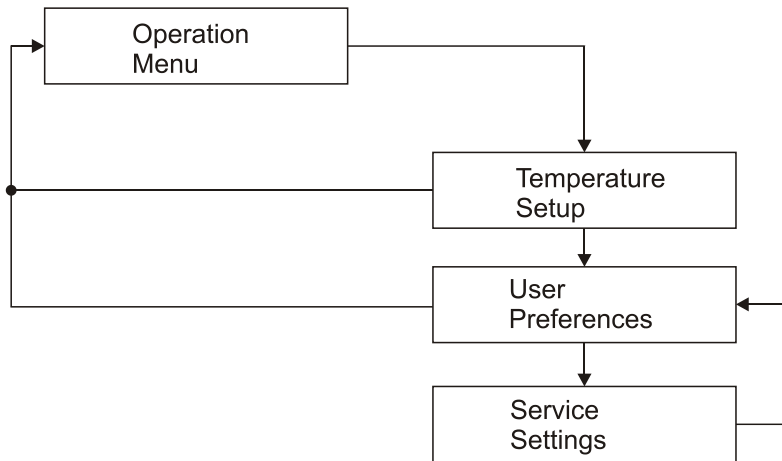
The most common settings are grouped together.

```
        ┌─────────────┐
   ┌───▶│  Operation  │───────────────┐
   │    │    Menu     │               │
   │    └─────────────┘               ▼
   │                          ┌──────────────┐
   ●──────────────────────────│ Temperature  │
   │                          │    Setup     │
   │                          └──────────────┘
   │                                  │
   │                                  ▼
   │                          ┌──────────────┐   ◀──┐
   └──────────────────────────│    User      │      │
                              │  Preferences │      │
                              └──────────────┘      │
                                      │             │
                                      ▼             │
                              ┌──────────────┐      │
                              │   Service    │──────┘
                              │   Settings   │
                              └──────────────┘
```

1. Temperature Setup: Basic temperature adjust of your boiler
2. User Preferences: Operation mode, timer and temperature compensation options
3. Service Settings: Advanced settings of your boiler. This settings are intended to be adjusted by a service engineer.

User Preferences Menu

Next>

To enter the User Preferences menu, Press the ⬦ Input key and navigate to "Next>" with ▽ △ navigation keys than press the ⬦ input key again.

```
   ┌──────────────┐
   │    User      │──────────────┐
   │ Preferences  │              │
   └──────────────┘              ▼
          ▲              ┌─────────────────┐
          │              │ Operation Mode  │
          │              └─────────────────┘
          │                       │
          │                       ▼
          │              ┌─────────────────┐
          │              │  Weather Comp.  │
          │              └─────────────────┘
          │                       │
          │                       ▼
          │              ┌─────────────────┐
          │              │ Day-Night Comp. │
          │              └─────────────────┘
          │                       │
          │                       ▼
          │              ┌─────────────────┐
          │              │    Date-Time    │
          │              └─────────────────┘
          │                       │
          │                       ▼
          │              ┌─────────────────┐
          │              │   Week Timer    │
          │              └─────────────────┘
          │                       │
   ┌──────────────┐     ◀───●───▶  ┌─────────────────┐
   │  Return to   │               │    Jump to      │
   │Operation Menu│               │  Service Menu   │
   └──────────────┘               └─────────────────┘
```
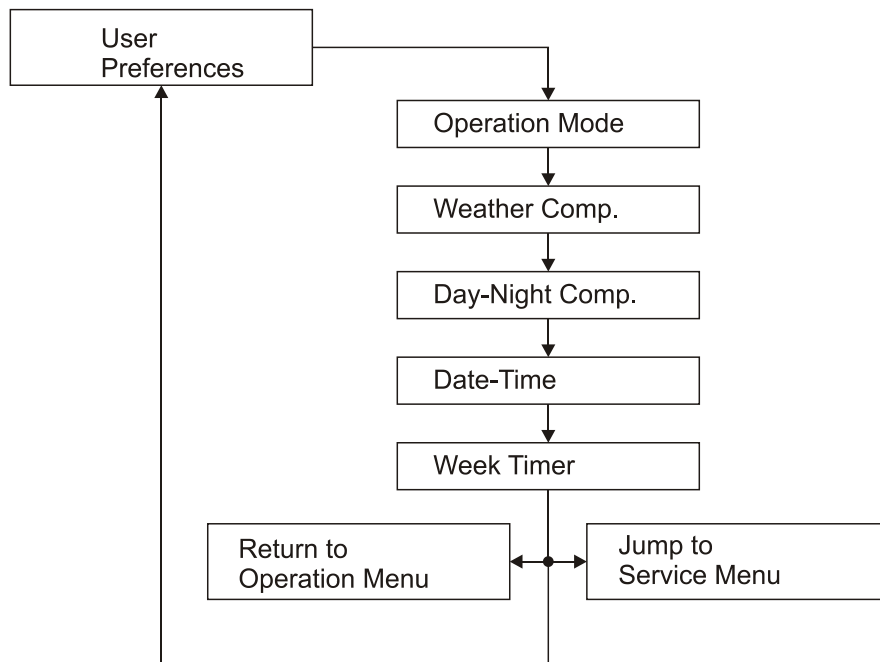
User Preferences menu has five settings.

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Operation Mode

```
Operation Mode

⊞⊞⊞  Building heating   ON

  ⌐⌐     Utility Water       ON



<Return
```
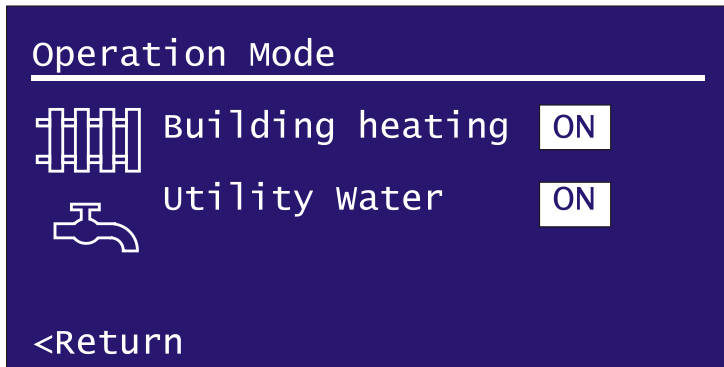
To change the operation mode press ⊟⊞ adjust keys. Navigate to <Return with ▽△ navigation keys and press ◈ Input key to return the User Preferences menu.

There are three operation modes of your boiler.

Mode	Building Heating	Utility Water	
1	ON	ON	Both circulation pumps will operate according to heat demand.
2	OFF	ON	Only the utility water circuit's circulation pump will operate. (Summer mode)
3	ON	OFF	Only the building heating circuit's circulation pump will operate. (Utility water is not necessary or not available in the boiler system)

Weather Compensation

Your boiler is able to adjust the temperature setpoint according to the weather temperature.

```
Weather Comp.

 ☁☀  Weather    🌡  Corr.

     -20...-17°C      +5°C

<Return
```
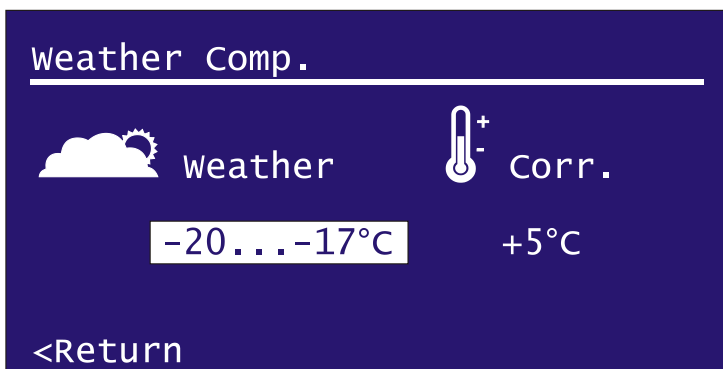
To setup the weather compensation, first navigate to temperature range with ▽△ navigation keys and select the temperature range with ⊟⊞ adjust keys. After selecting the temperature range, navigate to Correction value and set the offset temperature of your boiler for this temperature range. To adjust another temperature range, navigate back to temperature range with ▽△ navigation keys and select the range that you want. After all settings have been completed, navigate to <Return and press ◈ Input key to return to the User Preferences Menu.

There are eleven temperature ranges for adjusting.

Range	Adjust
-20 … -17°C	-/+ 10°C
-16 … -13°C	-/+ 10°C
-12 … -9°C	-/+ 10°C

-8 … -5⁰C	-/+ 10⁰C
-4 … -1⁰C	-/+ 10⁰C
0 … 3⁰C	-/+ 10⁰C
4 … 7⁰C	-/+ 10⁰C
8 … 11⁰C	-/+ 10⁰C
12 … 15⁰C	-/+ 10⁰C
16 … 19⁰C	-/+ 10⁰C
>20 ⁰C	-/+ 10⁰C

If the compensated temperature setpoint exceeds the temperature limits of the boiler, controller will increase or decrease the setpoint in between minimum and maximum temperature limits.

Day-Night Compensation

Your boiler is olso able to adjust the temperature setpoint according to different time slices in a day.

```
Day-Night Comp.

       Time        Corr.

    00:00..02:59    +5°C

 <Return
```
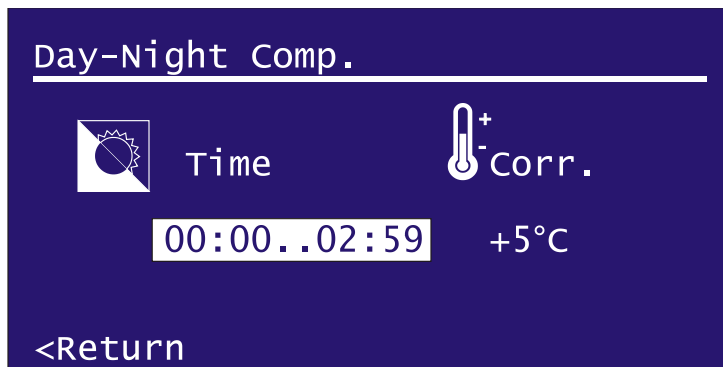
To setup the day-night compensation, first navigate to time slice with ▽△ navigation keys and select the time slice with ⊟⊞ adjust keys. After selecting the time slice, navigate to Correction value and set the offset temperature of your boiler for this time slice. To adjust another time slice, navigate back to time slice with ▽△ navigation keys and select the time slice that you want. After all settings have been completed, navigate to <Return and press ⬦ Input key to return to the User Preferences Menu.

There are eight time slices to adjust.

00:00 – 02:59
03:00 – 05:59
06:00 – 08:59
09:00 – 11:59
12:00 – 14:59
15:00 – 17:59
18:00 – 20:59
21:00 – 23:59

If the compensated temperature setpoint exceeds the temperature limits of the boiler, controller will increase or decrease the setpoint in between minimum and maximum temperature limits.

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Date-Time

The controller panel has a realtime clock calendar.

```
Date-Time

Time (hh:mm)
12:00:00
Date (dd/mm/yyyy)
01:01:2000 Mon


<Return
```
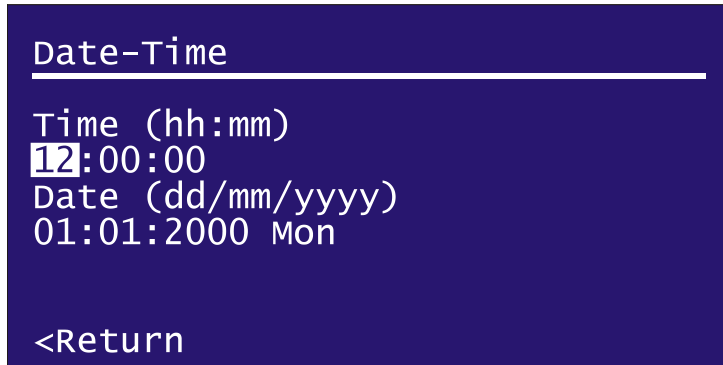
To adjust the system time and date, navigate to hour, minute, date, month, year or day of week with ▽△ navigation keys. ⊟⊞ Press adjust keys to change. Controller accepts 24-hour hh:mm time format and dd/mm/yyyy date format. Incorrect date setting may halt the clock (i.e. 30/02/2011).

The realtime clock has a backup battery at the back side of the control panel. If your boiler resets the date-time settings after AC mains power loss, replace the backup battery. The backup battery is CR2032 type lithium battery. Please insert the battery with correct polarity. The overal life of backup battery is about two years.

⚠️ The chemistry of the battery may be harmful to the environment. Please dispose the old battery properly according to the instructions on the battery's package.

Week Timer

The week timer allows you to set three programs for each day of the week to turn on or turn off your boiler.

```
Week Timer

Day: Mon    OFF
Pr  Start  Stop
1   00:00  00:00
2   00:00  00:00
3   00:00  00:00

<Return
```
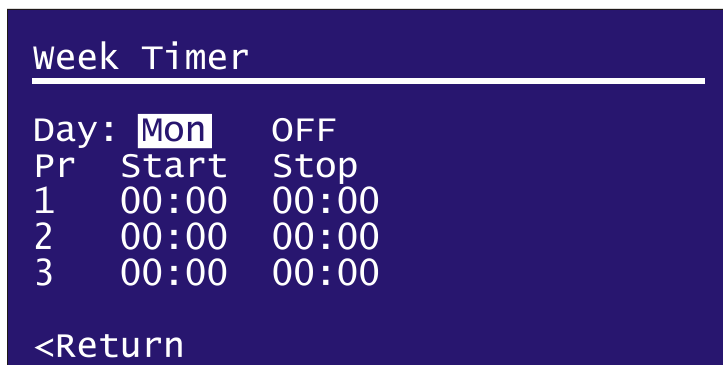
To set up the week timer, first select the desired day with ⊟⊞ adjust keys than navigate to ON/OFF ▽△ with navigation keys. If you select OFF, all of three programs will be ignored by the controller for that day. Select the start-up and stop times with ▽△ navigation keys and adjust the hour and minute with ⊟⊞ adjust keys. After all programs are completed, navigate to <Return with ▽△ navigation keys and press ◈ Input key to return to the User Preferences Menu.

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Internet Connectivity

The controller has an onboard Ethernet port to directly connect to the Internet or your local area network.

RJ45
Boiler Side

RJ45
Router Side

CAT5 UTP Cable
(CAT6 FTP for longer
than 100m of wiring)
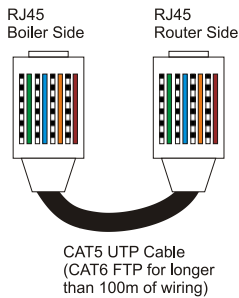
The LAN connector of the boiler is depends on the boiler model. Please refer to the instruction manual of your boiler fort he location of the LAN connector.

Use a straight patched network cable for connecting your boiler to your DSL modem, router or computer.

The default IP address of your boiler is 192.168.1.127. If you have changed the IP address or enabled the DHCP service, you may learn the controllers IP address from Service>Network Status menu.

To connect the control panel, your computer or device which has internet connectivity must be in the same subnet.

Open your Internet browser software and type the IP address of your boiler.

TCNET Boiler Controller - Windows Internet E

http://192.168.1.127/
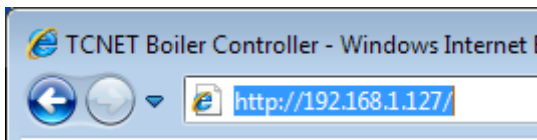
If the network connection is OK, you should see the login window. The username of the boiler is "**admin**" and the password is "**boiler"**

Windows Security

The server 192.168.1.127 at Protected requires a username and password.

Warning: This server is requesting that your username and password be sent in an insecure manner (basic authentication without a secure connection).

User name

Password

☐ Remember my credentials

OK   Cancel

13

After login, you should see the status page of the boiler
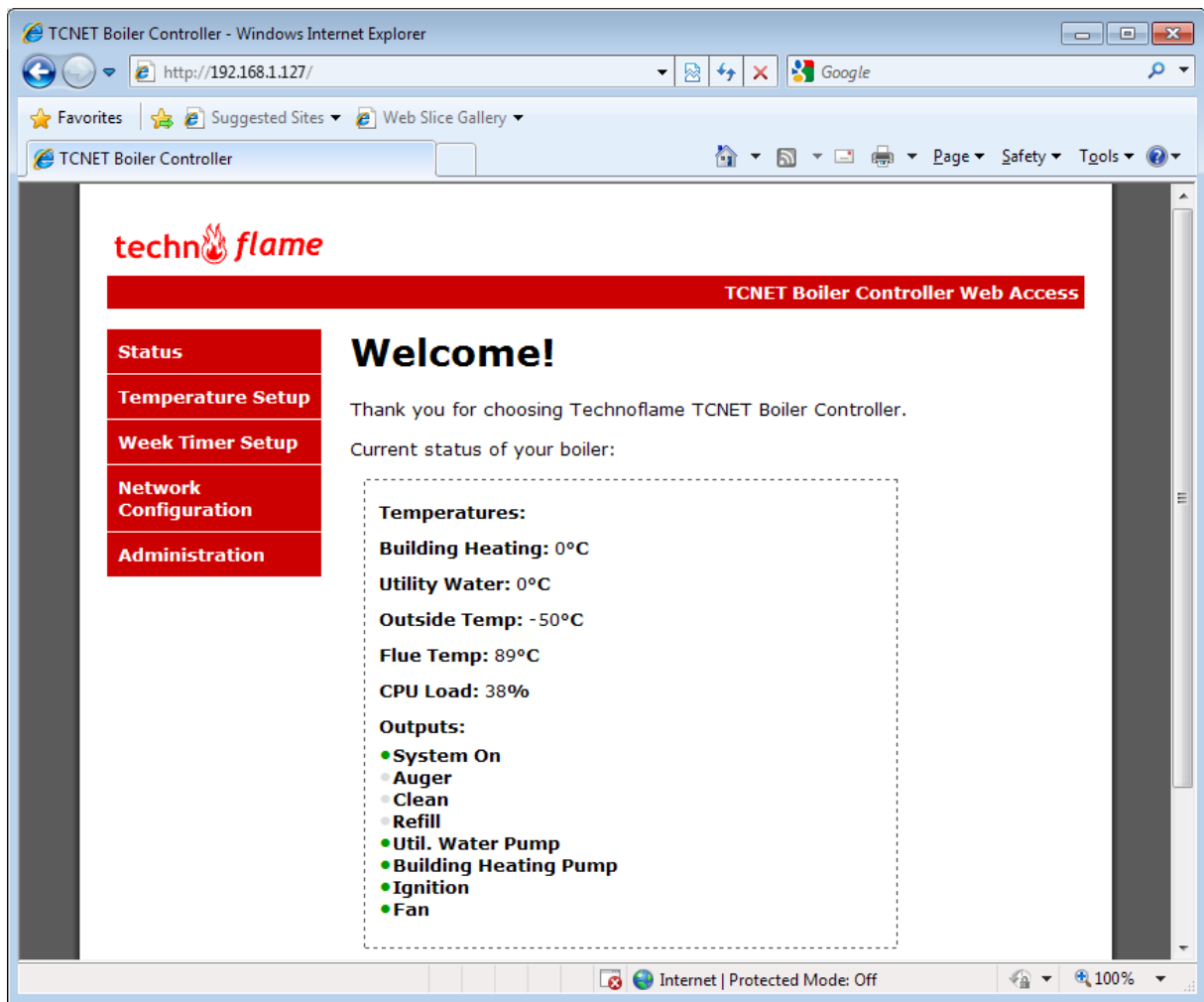
The Status Page

All measured temperatures and the device status are shown on this page. CPU load indicates the current utilization of the control panel's processor.

Adjust the Temperatures and Operation Mode From Internet

Click the "Temperature Setup" on the menu box.
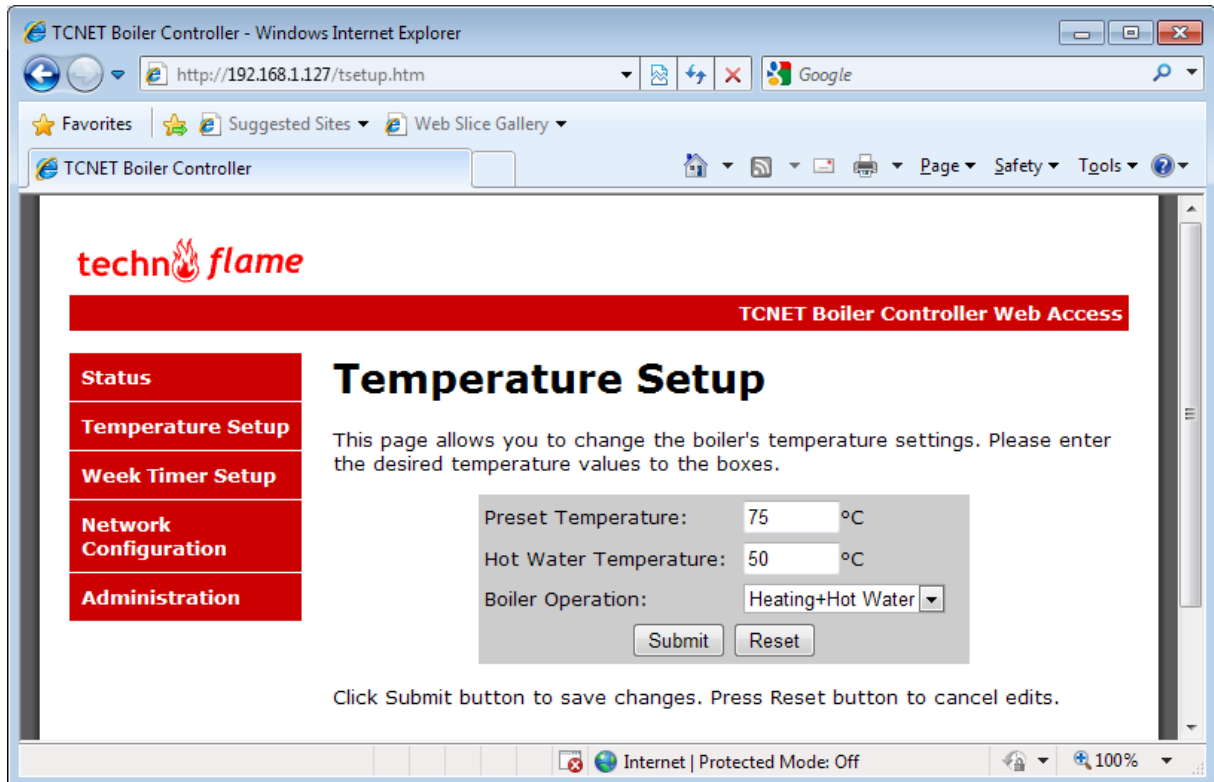
Adjust the temperatures and click "Submit" button.

If you don't want to make any adjustments, click "Administration" from the menu and click the "Save Settings to FLASH" button to make adjustmens permanent.

Setting up The Week Timer from Internet

Click the "Week Timer" on menu box.
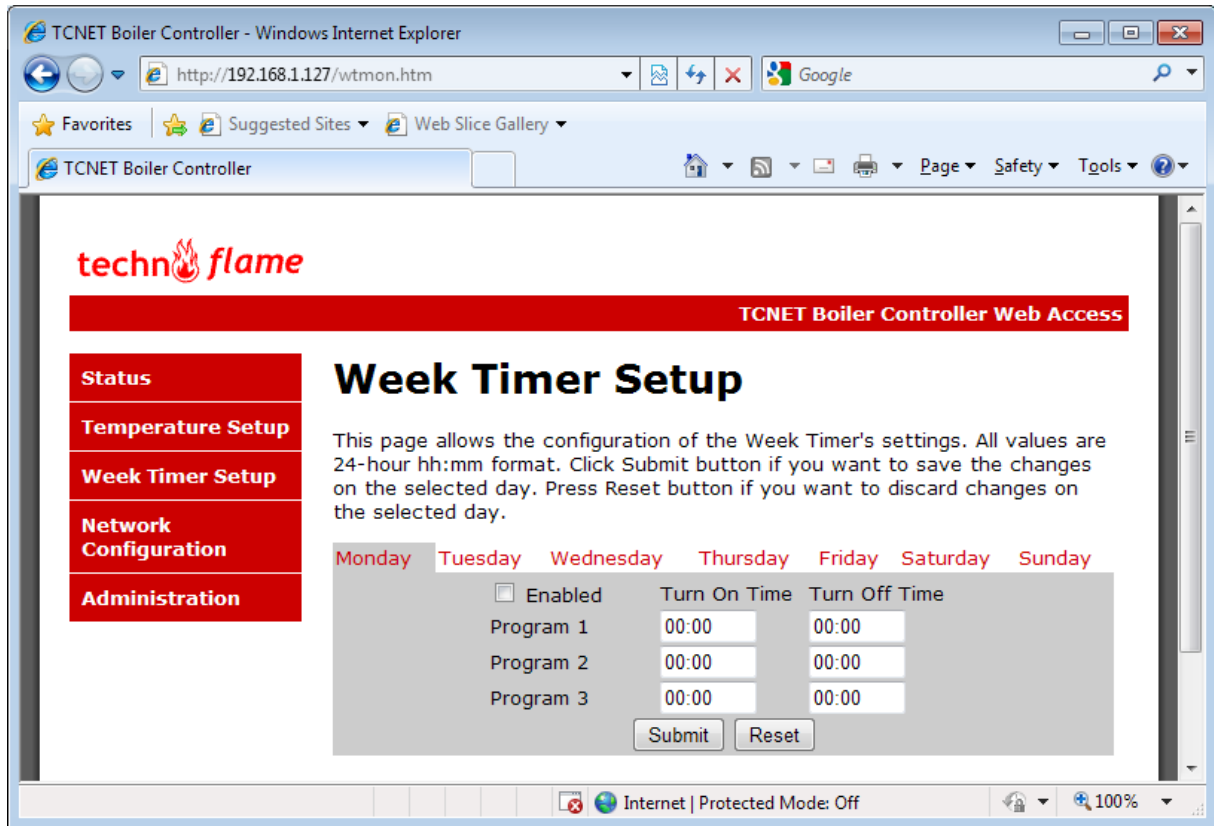
Set up your desired start up and shut down times for each day.

If you don't want to make any adjustments, click "Administration" from the menu and click the "Save Settings to FLASH" button to make adjustmens permanent.

Changing the Network Settings

Click the "Network Configuration" on menu box.
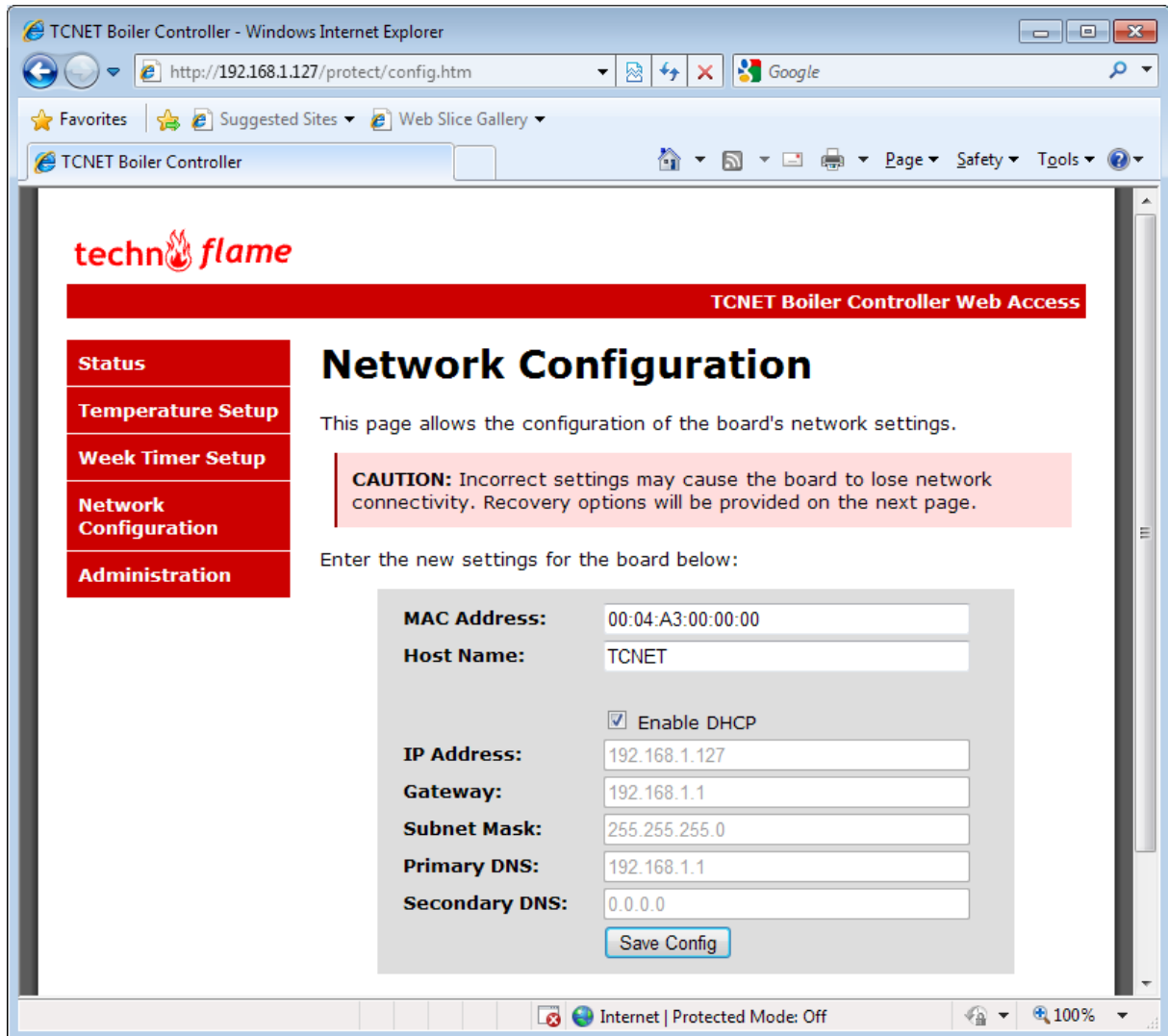
Make all required changes on network configuration and click "Save Config" button.

Please note that the controller should reboot after changing the network settings and perform the AC Power loss sequences at startup.

Turning On and Turning Off your Boiler From Internet

Click "Administration" on menu box.
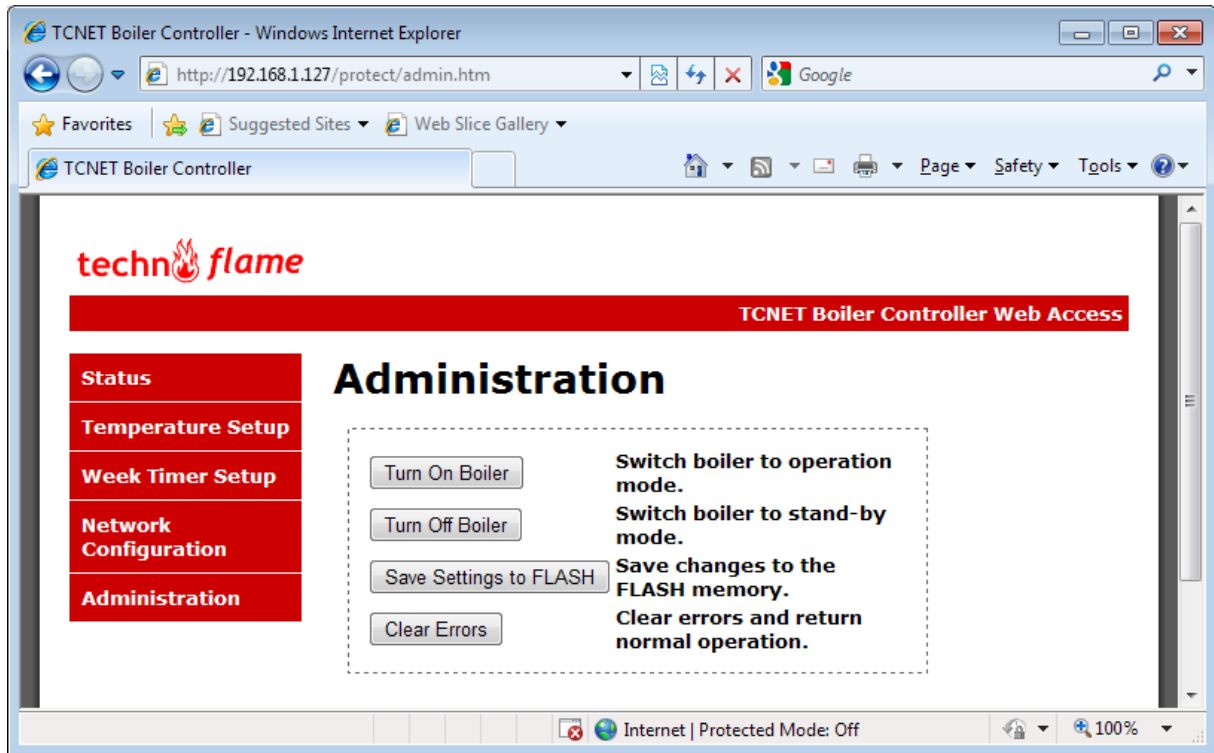
Click "Turn On Boiler" button to turn on your boiler.

Click "Turn Off Boiler" button to turn of your boiler.

Clearing Errors From Internet
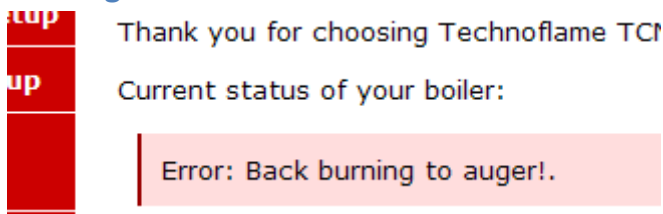
If you see any error messages on the status page, you may clear the error by clicking the "Clear Errors" button on the Administration page.

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Service Menu

⚠	Caution! This settings are intended to be adjusted by a well trained service technician or a service engineer. Incorrect settings may cause dangerous conditions.

Service> To enter the Service menu, navigate to Service> with ▽ △ navigation keys and press ◈ Input key.

Service Menu Structure

```
  ┌─────────────────┐
  │  Service Menu   │──────────────┐
  └─────────────────┘              │
        ▲                          ▼
        │                 ┌─────────────────┐
        │                 │   Boiler Setup  │
        │                 └─────────────────┘
        │                          ▼
        │                 ┌─────────────────┐
        │                 │ Combustion Data │
        │                 └─────────────────┘
        │                          ▼
        │                 ┌─────────────────┐
        │                 │  Ignition Data  │
        │                 └─────────────────┘
        │                          ▼
        │                 ┌─────────────────┐
        │                 │ Circulation Data│
        │                 └─────────────────┘
        │                          ▼
        │                 ┌─────────────────┐
        │                 │  Network Status │
        │                 └─────────────────┘
        │                          ▼
        │                 ┌─────────────────┐
        │                 │   Pellet Refill │
        │                 └─────────────────┘
        │                          ▼
        │                 ┌─────────────────┐
        │                 │  Digital Inputs │
        │                 └─────────────────┘
        │                          ▼
        │                 ┌─────────────────┐
        │                 │  Analog Inputs  │
        │                 └─────────────────┘
        │                          ▼
        │                 ┌─────────────────┐
        │                 │   Test Devices  │
        │                 └─────────────────┘
        │                          ▼
        │                 ┌─────────────────┐
        │                 │   Extensions    │
        │                 └─────────────────┘
        │                          ▼
        │                 ┌─────────────────┐
        │                 │ Factory Defaults│
        │                 └─────────────────┘
        │                          ▼
        │                 ┌─────────────────┐
        │                 │    Error Log    │
        │                 └─────────────────┘
        │                          ▼
        │       ┌─────────────────┐
        └───────│    Return to    │
                │ User Preferences│
                └─────────────────┘
```
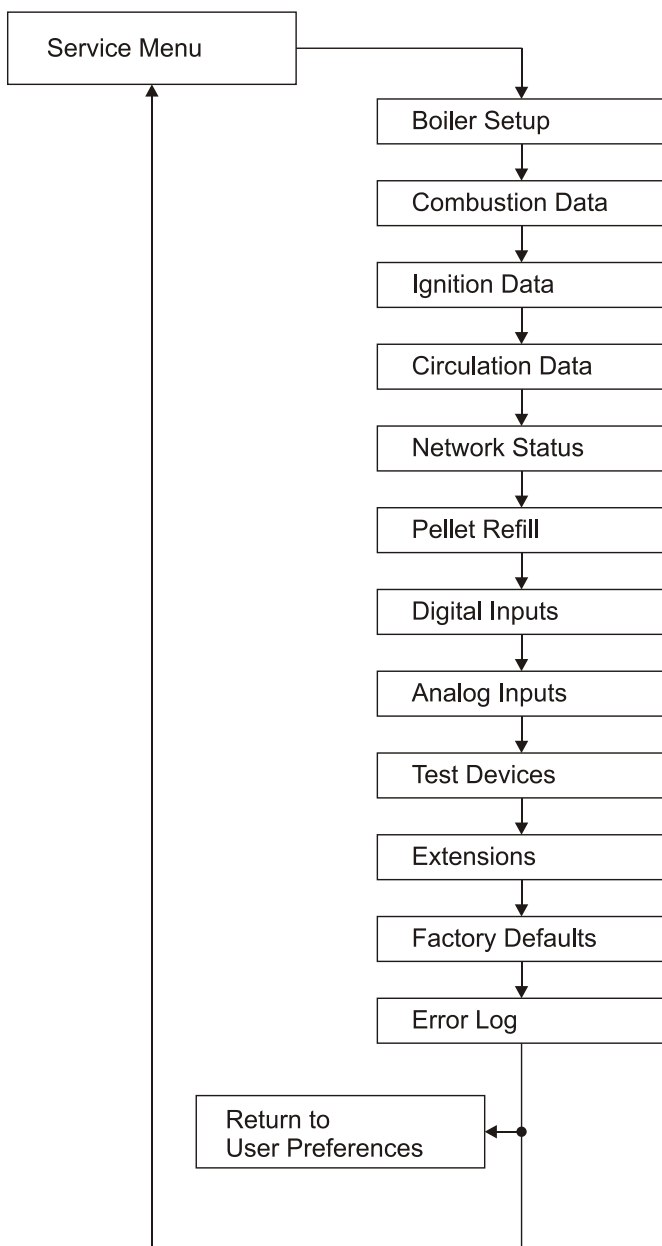
Boiler Setup

| Max. Power kW	25	The maximum power of the boiler
Min. Power kW	5	The minimum power of the boiler
Feed rate gr/min	380	The pellet feed amount for a minute of the auger or other fuel feeding system.
Efficiency %	91	The total efficiency of the boiler
Max auger Curr. A	0.5	The maximum allowable current drawn by the auger excitation motor.
Curr. Detect latency sec	2	The time delay for the auger current limit alarm
Grate Open T s	190	The run time of the grate open/close actuator.

Combustion Data

Fuel Energy kW/kg	4.88	The energy of a kilogram of used pellet. (Please refer to the information on your pellet package)
Modulator	PID	The power regulation metod of the boiler. There are three modes for power regulation. (PID [Graph1], 5STEP [Graph2] or fixed power [Graph3])
Mod. Delta ^{o}C	10	The power regulation to reduce the power of the boiler. **Eg. :** The boiler temp. 50 C Mod.Delta : 10 C Boiler begins to slow down when it is reached to 40 C.
Hysteresis ^{o}C	2	The temperature overlimit. **E.g :** The temp.of the boiler is : 50 C If the hysteresis is set 2 C. the boiler operates between 50-51 C. If it exceeds the 51 C ,it deflates the flame.
Feed Period ^{o}C	15	The fuel consumption to reach the capacity : **E.g :** If the feed period is set 15 it feeds 5 gr in every 15 sec. If the feed period is set 20 it feeds 7 gr. If the feed period is set 25. It feeds 9 gr.fuel in every 25 sec

Power and Fan speed settings for 5STEP modulation or Fixed power.

Mod1	5kW	Fan:	33
Mod2	10kW	Fan:	37
Mod3	15kW	Fan:	40
Mod4	20kW	Fan:	43
Mod5	25kW	Fan:	46

Exh. Limit °C	150	Maximum allowable flue temperature. In case of flue gases exceed the limit, controller will reduce the power to regulate the flue gas temperature.

Graph 1 PID Modulation

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Hysteresis   Boiler Temperature
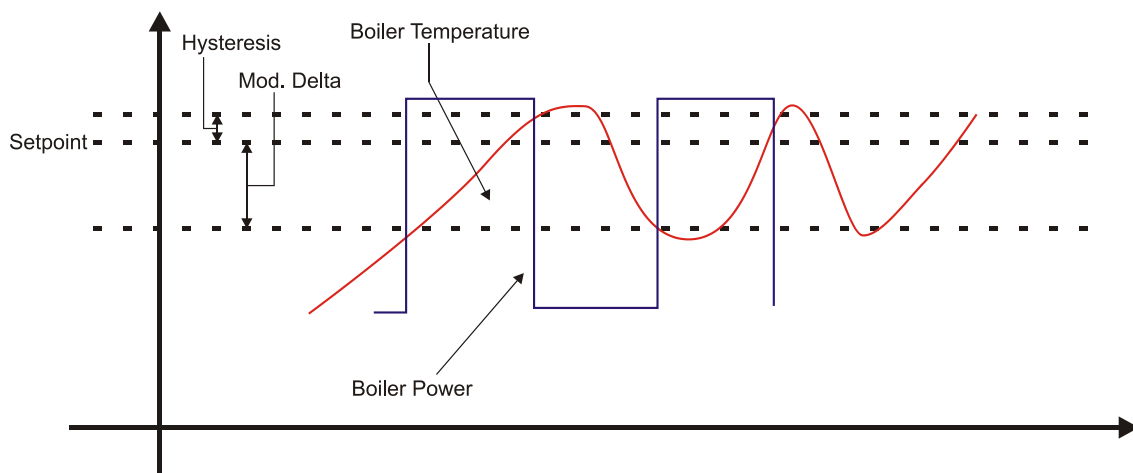
Mod. Delta
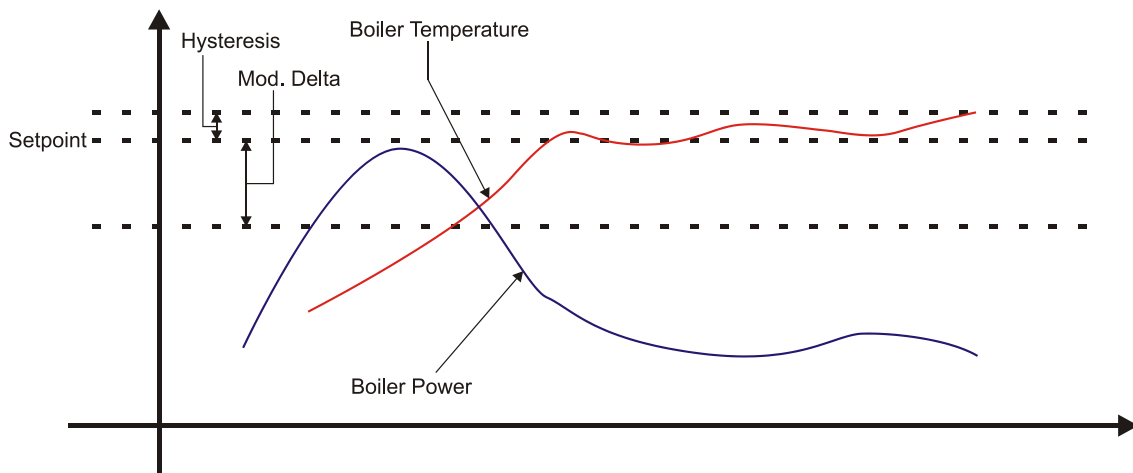
Setpoint
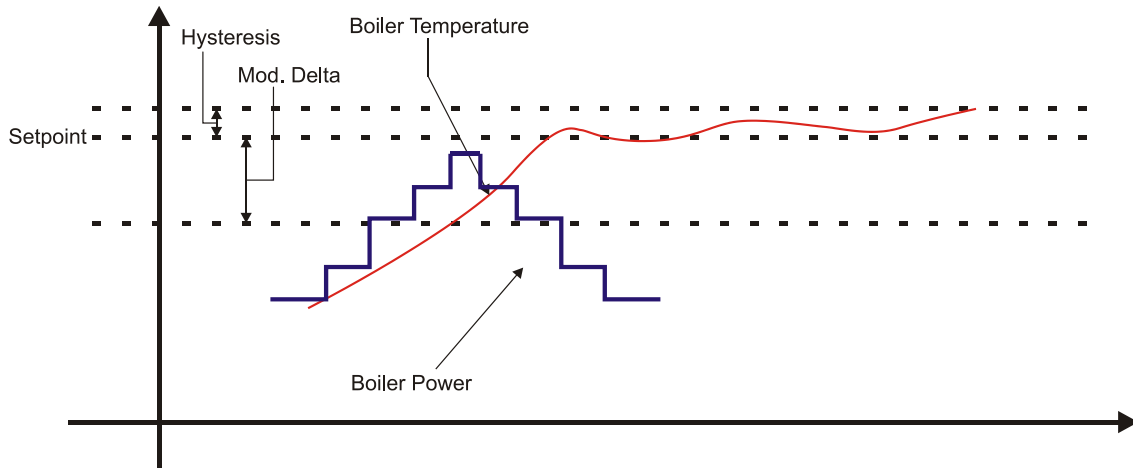
Boiler Power

Graph 2 5 Step Modulation

Hysteresis   Boiler Temperature

Mod. Delta

Setpoint

Boiler Power

Graph 3 Fixed Power Regulation

Tuning the PID modulation:

- If your boiler never reaches the setpoint, Increase the Mod1 Power level.
- If your boiler exceeds the setpoint more than the hysteresis value, Decrease the Mod1 Power Level.
- If your heating circuit(s) power demand is too low for the boiler (for example only utility water heating in summer) you may decrease the Mod5 Power level to avoid overshoot the temperature setpoint.
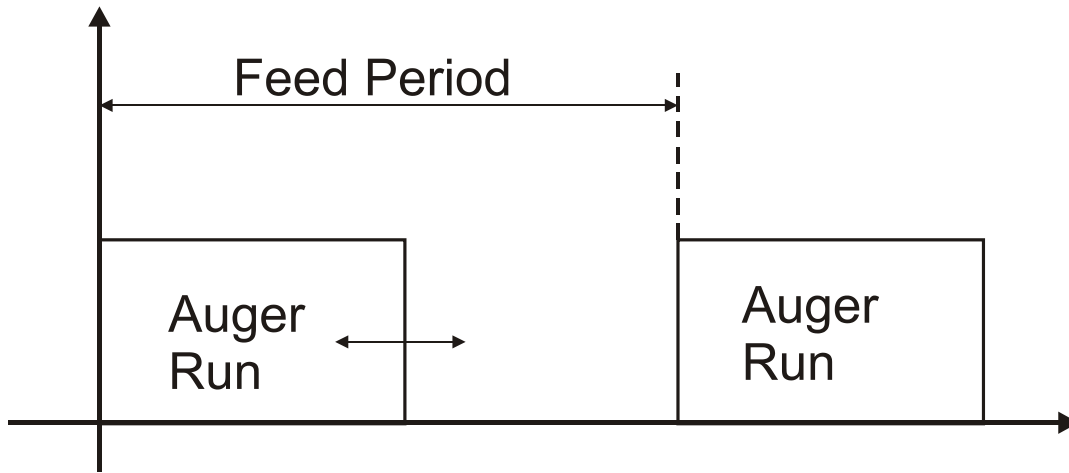
Graph 4 Feed Period

Ignition Data

Feed Time sec	60	
Timeout min	10	
Retries	3	
Burn. Detect Temp ^oC	100	
Burn. Detect Delta ^oC	7	[Graph5]
Auger Filling min	3	
First run	0	
Fan Speed	50	
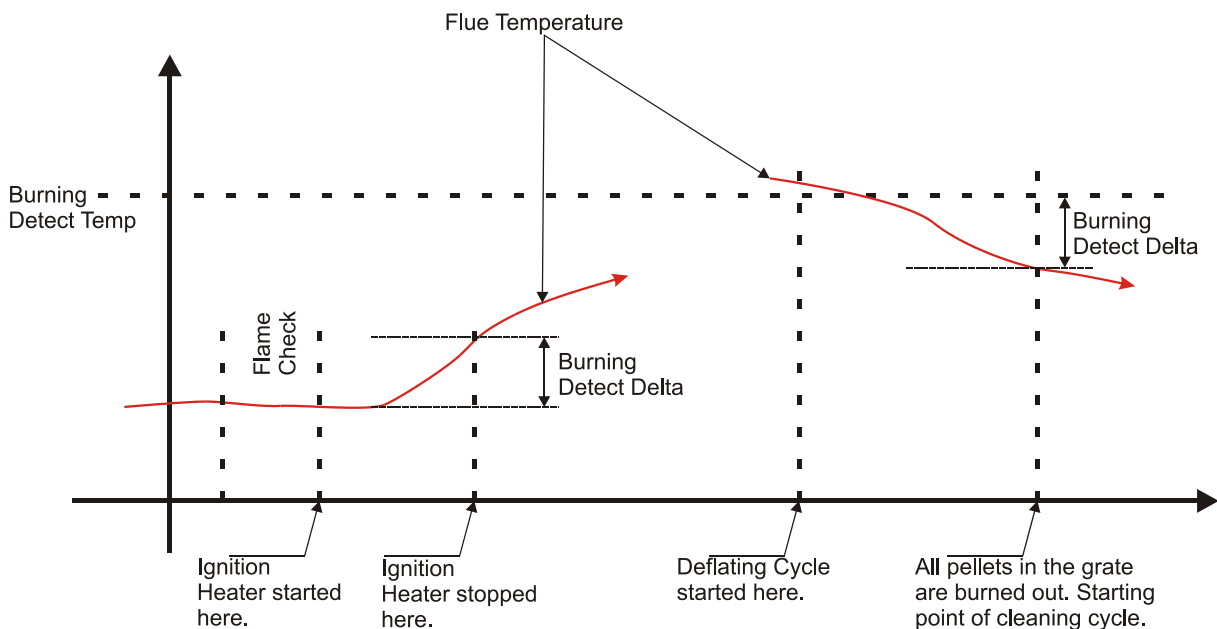
Graph 5 Burning Detection and Deflating Cycle

Circulation Data

Heating Circuit		
Threshold	35	

Hysteresis	2	

Util. Water Circuit		
Threshold	35	
Hysteresis	2	

Network Status

IP Address 192.168.1.127	The IP address of the controller
Subnet Mask 255.255.255.0	The subnet mask of the controller
Default Gateway 192.168.1.1	The default gateway address (DSL modem router etc.)

Pellet Refill

Machine Type	None-> Auger -> Suction	The type of the refill system.
Run duration (minutes)	10	The run time of the refill system in case of detection of low pellet level from the bunker.

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Digital Inputs

IN0: OFF	IN4:OFF	The input signals of the controller.
IN1: OFF	IN5: OFF	OFF : No signal / Open
IN2: OFF	IN6: OFF	ON: Signal / Close
IN3: OFF	IN7: OFF	

Analog Inputs

T3 (boiler temp. Sensor)	LM (Lambda sensor)*	The measured values of the Analog-to-digital converter of the controller
T1 (Util. Water temp. Sensor)	PC (Photocell)*	
T2 (Weather temp. Sensor)		
TC (Flue temp. Sensor)		

(*) Lambda sensor and photocell may not be implemented on your system.

Test Devices

⚠️ Warning! This menu is only for testing the outputs of the boiler for a short time. Leaving the boiler in Test Devices menu may cause dangerous conditions.

IGN	FAN1	Select the device with navigation keys to test.
PUMPH	FAN2	+ adjust key: RUN
PUMPU	FAN3	_ adjust key: STOP
AUGER		
CLEAN		
REFILL		

Factory Defaults

Restores all parameters to the Factory defaults.

Error Log

Controller stores the last five errors.

Record format is DD/MM/YYYY HH:MM – Error code