DTH Ultra *Electric Boilers*

Models ranging from 45 kW to 144 kW :
480 and 600 Volts (3 phases).

INSTALLATION AND OPERATION MANUAL

Your *DTH Ultra Electric Boiler* has been carefully assembled and factory tested to provide years of trouble-free service. In order to ensure performance, the following information and safety precautions are provided to enable proper installation, operation, and maintenance of this product.

It is imperative that all persons who are expected to install, operate or adjust this electric boiler should read these instructions carefully to fully understand how to do so.

Any questions regarding the operation, maintenance, service or warranty of this electric boiler should be directed to the supplier.

When all installation steps have been completed, insert this installation manual in its original envelope, and keep in a safe place (close to the boiler) for future reference.

THERMO 2000 INC. Revision June 2014
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Section 1 : Dimensions & Specifications

Table 1: Electric spécifications

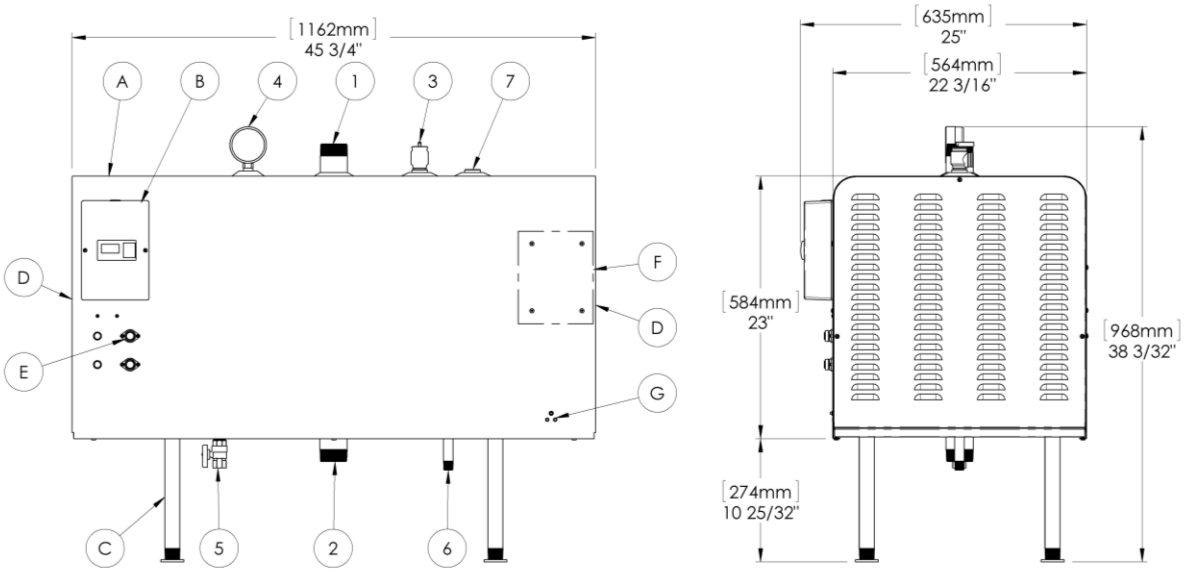
Model	P Kw	Amp 480v/3ph	Amp 600v/3ph	Élements 277V (480)or 347V (600)	Stages Not modulating	Stage modulating SCR	Main contactor	Power Relay	SCR Relay»
DTHU 45	45	54	43	9 X 5KW	2x15kW	1 x 15kW	2	2	1
DTHU 54	54	65	52	9 X 6KW	2x18kW	1x18kW	2	2	1
DTHU 60	60	72	58	12 X 5KW	3x15kW	1x15kW	2	3	1
DTHU 72	72	87	69	12 X 6KW	3x18kW	1x18kW	2	3	1
DTHU 78	78	94	75	12 X 5KW 3 X 6KW	4x15kW	1x18kW	3	4	1
DTHU 90	90	108	87	15 X 6KW	4x18kW	1x18kW	3	4	1
DTHU 99	99	119	95	9 X 5KW 9 X 6KW	3x15kW 2x18kW	1x18kW	3	5	1
DTHU 102	102	123	98	12 x 6KW 6 x 5Kw	2x15kW 3x18kW	1x18kW	3	5	1
DTHU 108	108	130	104	18 x 6 KW	5x18kW	1x18kW	3	5	1
DTHU 120	120	144	115	24 X 5KW	3x15kW 2x30kW	1x15kW	4	7	1
DTHU 132	132	159	127	12 X 5KW 12 X 6KW	3x15kW 2x36kW	1x15kW	4	7	1
DTHU 144	144	173	139	24 X 6KW	3x18kW 2x36kW	1x18kW	4	7	1

Operating temperature range: de 50°F à 190°F

Maximum operating pressure :

45 à 72 kW : 30 psi. or 60psi (See on boiler identification plate)
78 à 144kW ::60 psi

Figure 1 : Dimensions & Component identification



BOILER CONNECTIONS		
1	Boiler outlet	2" NPT M
2	Boiler inlet	2" NPT M
3	Pressure relief valve	3/4" NPT F
4	Temperature & pressure indicator 3 po.	1/2" NPT F
5	Drain Valve	3/4" NPT F
6	Water supply	1/2" NPT M
7	Opening for optional accessories	3/4" NPT F

MIN. CLEARANCE FOR SERVICE	
Left & Right side	14"/ 356mm
Rear	0" / 0mm
Front	24" / 610mm
Bottom	10" / 254mm
Top	7" / 178mm

COMPONENT IDENTIFICATION	
A	Electrical supply
B	Boiler controller
C	Floor support 1"pipe
D	Electrical compartment
E	Fuses for controls
F	SCR modulating relay
G	Low water cut off lamps and test button
	(Optional on models 45 to 108)

BOILER INFORMATION	
Weight	395lbs / 180kg
Water content	36 usgal./ 136 liters
Max. operating pressure (see table below)	30 ou 60psi 207 ou 414kPa

General Safety Precautions

Be sure to read and understand the entire Use & Care Manual before attempting to install or to operate this electric boiler. Pay particular attention to the following General Safety Precautions. Failure to follow these warnings could cause property damage, bodily injury or death. Should you have any problems understanding the instructions in this manual, STOP, and get help from a qualified installer or technician.

Section 2 : Introduction

WARNING

The important safeguards and instructions appearing in this manual are not meant to cover all possible conditions and situations that may occur. It should be understood that common sense, caution and care are factors which cannot be built into every product. They are the responsibility of the person(s) caring for and operating the unit.

2.1 LOCAL INSTALLATION REGULATIONS

This electric boiler must be installed in accordance with these instructions and in conformity with local codes, or in the absence of local codes, with the National Plumbing Code and the National Electric Code current edition. In any case where instructions in this manual differ from local or national codes, the local or national codes take precedence.

2.2 CORROSIVE ATMOSPHERE

The electric boiler should not be located near an air vent containing a corrosive atmosphere or high humidity. The limited warranty is void when the failure of the electric boiler is due to a corrosive atmosphere.

2.3 SHIPMENT INSPECTION

Inspect the electric boiler for possible shipping damage. The manufacturer's responsibility ceases upon delivery of goods to the carrier in good condition. Consignee must file any claims for damage, shortage in shipments, or non-delivery immediately against carrier.

2.4 CHECK LIST

Please check the identification tag on the unit to make sure you have the right model and appropriate voltage.

List of components shipped with the unit :

- **Pressure relief valve**
- **Drain valve.**
- **Tridicator (temperature & pressure gage).**

CAUTION

The electric boiler should not be located in an area where leakage of the tank or water connections will result in damage to the adjacent area or to lower floors of the structure. When such areas cannot be avoided, a suitable drain pan or non-flammable catch pan, adequately drained, must be installed under the boiler. The pan must be connected to a drain.
NOTE: Auxiliary catch pan MUST conform to local codes.

Section 3 : INSTALLATION

! WARNING

The manufacturer's warranty does not cover any damage or defect caused by installation, or attachment, or use of any special attachment other than those authorized by the manufacturer, into, onto, or in conjunction with the boiler. The use of such unauthorized devices may shorten the life of the boiler and may endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized devices

3.1 SECURITY CONSIDERATIONS

Domestic and commercial installations have a maximum design operating pressure limited to 30 psi (207 kPa) or 60psi (414kPa) by a safety relief valve.

Boiler maximum operating temperature is 190°F by design. This boiler is designed **to be used only** in a hot water heating system.

! CAUTION

The heat transfer medium must be water or other non-toxic fluid. An antifreeze solution with propylene glycol specially formulated for heating system could be used up to a maximum concentration of 50%,

3.2 LOCATION

The electric boiler should be installed in a clean, dry location. Long hot water lines should be insulated to conserve energy. The electric boiler and water lines should be protected from exposure to freezing temperatures.

The electric boiler must be installed horizontally directly on the floor or wall. Supporting legs are included but wall mounting brackets are not.

The electric boiler must be located or protected so as not to be subject to physical damage, for example, by moving vehicles, area flooding, etc. All models can be installed on combustible floors and in alcoves. Ambient temperature must not exceed 80°F or 27°C.

3.3 CLEARANCE

Minimum clearances for adequate inspection and servicing are listed in the following table:

Table 2: Boiler clearance

Sides	14 inches
Ground	10 inches
Top	7 inches
Front	24 inches
Back	0 inch

3.4 SYSTEM SETUP

Typical piping arrangements are shown in Figures 2,3 and 4.

3.4.1 Boiler connections

The boiler outlet is located on the top side, and the boiler inlet is located on the bottom side of the boiler. These are steel pipes (male 2"NPT threaded connection)

Installing a union is recommended on the boiler water supply and return lines to facilitate boiler disconnection for servicing.

Dielectric unions are required for protection of the boiler and piping if dissimilar pipe material such as galvanized steel and copper are present.

Use only clean, new piping for boiler water lines. Local codes or regulations shall govern the exact type of material to be used.

Insulate all pipes containing hot water, especially in unheated areas.

Install shutoff (ball) valves for servicing convenience. Thermometer(s) should be installed on the boiler water supply and return lines.

Cap or plug unused connections on the boiler. **Do not cap the pressure relief valve** on the boiler since it will damage and shorten the life of the boiler and may endanger life and property.

3.4.2 Auxiliary boiler connection

When an auxiliary boiler used as back up is twinned to the DTH Ultra boiler to act as a back up controlled by the DTH Ultra, the auxiliary boiler shall preferably be installed downstream of the electric boiler as shown on fig. 4 below.

3.4.3 Pressure relief valve

An automatic pressure relief valve must be installed during boiler setup. The pressure rating of the relief valve must not exceed the pressure design of the boiler as shown on the pressure vessel name plate. The safety relief valve must meet the requirements of the *ASME Boiler and Pressure Vessel Code* and limit the maximum operating boiler pressure. It is a safety device, not an operating control.

The BTU per hour rating of the relief valve must equal or exceed the BTU per hour input of the boiler(s) or heat source(s) as marked on the boiler(s) rating plate.

Connect the outlet of the relief valve to a discharge line with its lower tip at the most 6" above a floor drain, well clear of any live electrical parts. The discharge line must pitch downward from the valve to allow complete draining by gravity of the relief valve and discharge line, and be of a diameter no smaller than that of the valve outlet. The tip of the discharge line should not be threaded or concealed and should be protected from freezing. No valve of any type, restriction or reducer coupling should be installed on the discharge line. Local codes shall govern the installation of relief valves.

3.4.4 System pressure control and expansion tank

Pressure control devices within the system ensure that each component operates within minimum and maximum allowable pressures and maintain minimum pressure for all normal operating temperatures. They also allow air bleeding, prevent cavitation at the pump inlet and prevent water from boiling within the system; all this is accomplished with minimal addition of new water.

The increase in boiler water volume resulting from higher temperature is stored in the expansion tank during periods of high operating temperature and is returned to the system when the temperature decreases.

The expansion tank must be able to store the required volume of boiler water during maximum design operating temperature without exceeding the maximum allowable operating pressure, and to maintain the required minimum pressure when the system is cold. Contact your installing contractor, plumbing supply house, or local plumbing inspector for assistance.

The point where the expansion tank is connected should be carefully selected to avoid the possibility that normal operation of automatic check or manual valves will isolate the tank from a hot boiler or any part of the system. Pre-charged diaphragm expansion tanks are preferable to air control (see section 3.4.6).

These tanks incorporate a balloon-like bladder or diaphragm. It is inflated, prior to filling the system, to a pressure equal to the setting of the water pressure make-up regulator.

The expansion tank should preferably be located on the suction or intake side of the pump.

3.4.5 Water pressure makeup regulator

Make-up systems **must be employed** as required by codes. An a**utomatic fill valve (automatic pressure regulator)** must be used with a backflow preventer as required, to maintain minimum system pressure by supplying water to make up for leakage.

3.4.6 Air bleeder

Oxygen should be excluded from the system to prevent corrosion.

Installation of manual or automatic air vent devices prevents air from accumulating in the system. Air vents should be installed at all high points to remove trapped air during initial setup and to ensure that the system is tight. Regularly purge the air out of the system while taking care to avoid personal injuries or property damage caused by hot boiler water spray.

3.4.7 Circulating Pump

The pump can be located either just upstream or just downstream from the boiler.

On installation where the operating pressure is high, the preferred location of the circulator pump is upstream of the boiler in such a way as to lower the pressure on the boiler when the pump will be in operation

The capacity of the pump required shall be determined in relation with the capacity of the boiler installed and the type of heating

distribution system on which it will be connected. They are generally designed for an operation at a differential of temperature (Delta $T^{0)}$ of 10 to 20F between the supply and return temperature to the boiler.

Use the following equation to determine the required water flow.

Pump flow rate = Boiler output ÷ BWTD ÷ 500

- Pump flow rate is expressed in US gallons per minute or GPM.
- The Boiler output (in net BTU per hour) is the maximum amount of heat to be transferred through the heating loop to meet the heating load.
- Delta T^0 is the boiler water temperature drop

For example, an electric boiler rated at 144KW has an output capacity of 491,328 BTU per hour. The system is designed for a temperature drop of 20°F.

Required pump flow rate = 491,328 ÷ 20 ÷ 500 = 49.1 GPM

The following table lists the required pump flow rate in relation to the boiler capacity and Delta T^0.

Table 3: Temperature rise vs flow rate (GPM)

Model	KW	DELTA T^0			
		10^oF	20^oF	30^oF	40^oF
DTH 42	42	28,8	14,4	9,6	7,2
DTH 45	45	30,8	15,4	10,3	7,7
DTH 48	48	32,9	16,4	11,0	8,7
DTH 54	54	37,0	18,5	12,3	9,2
DTH 60	60	41,1	20,6	13,7	10,3
DTH 66	66	45,2	22,6	15,1	11,3
DTH 72	72	49,3	24,7	16,4	12,3
DTH 78	78	53,4	26,7	17,8	13,4
DTH 84	84	57,6	28,8	19,2	14,3
DTH 90	90	61,7	30,8	20,6	15,4
DTH 96	96	65,8	32,9	21,9	16,4
DTH 99	99	67,8	33,9	22,6	17,0
DTH 102	102	69,6	34,8	23,2	17,4
DTH 108	108	73,7	36,8	24,6	18,4
DTH 120	120	82,2	41,1	27,4	16,1
DTH 132	33	90,5	45,2	30,2	22,6
DTH 144	36	98,7	49,3	32,9	24,7

Figure 2: General basic piping

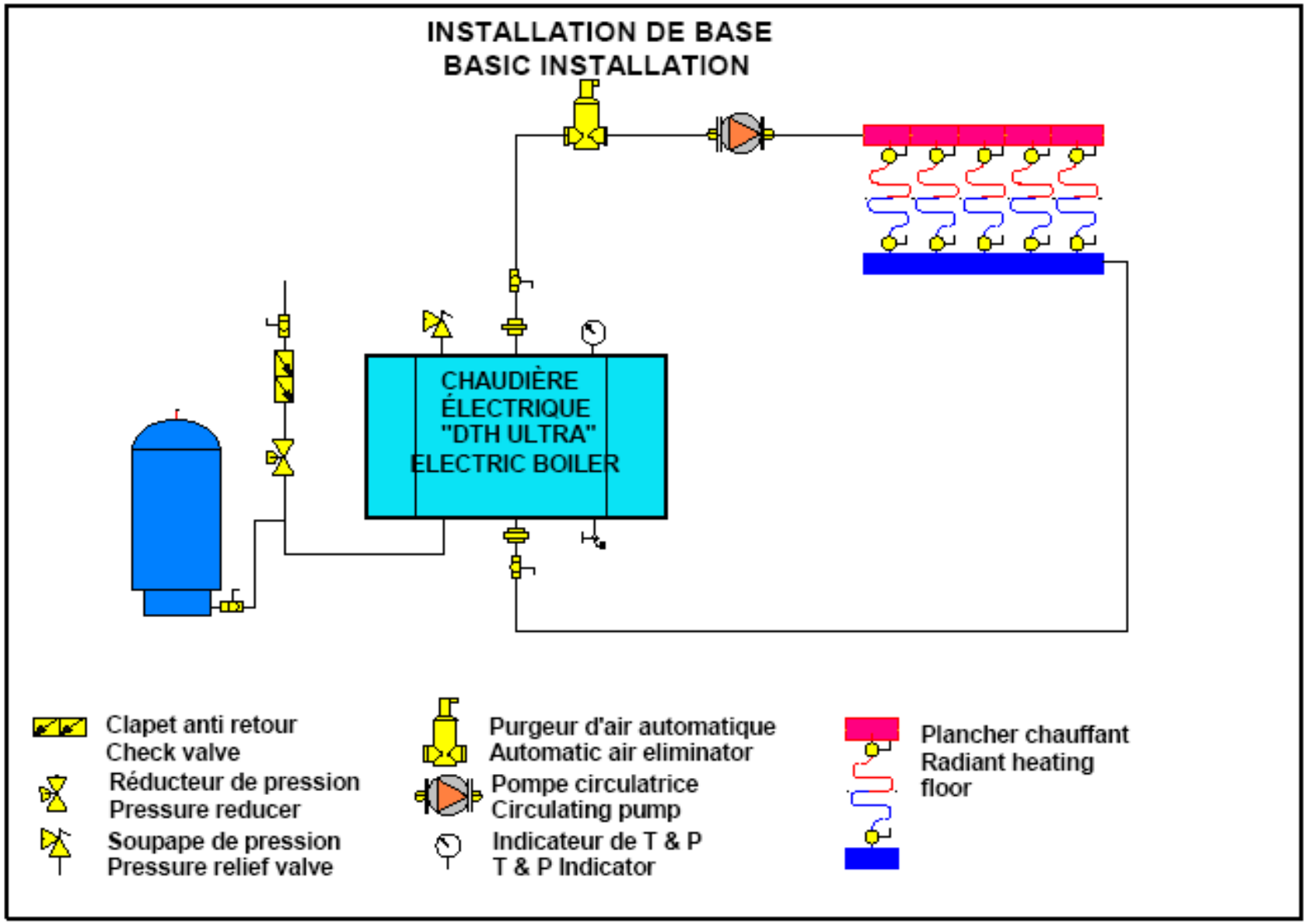


Figure 3 Typical installation for heating and domestic hot water production

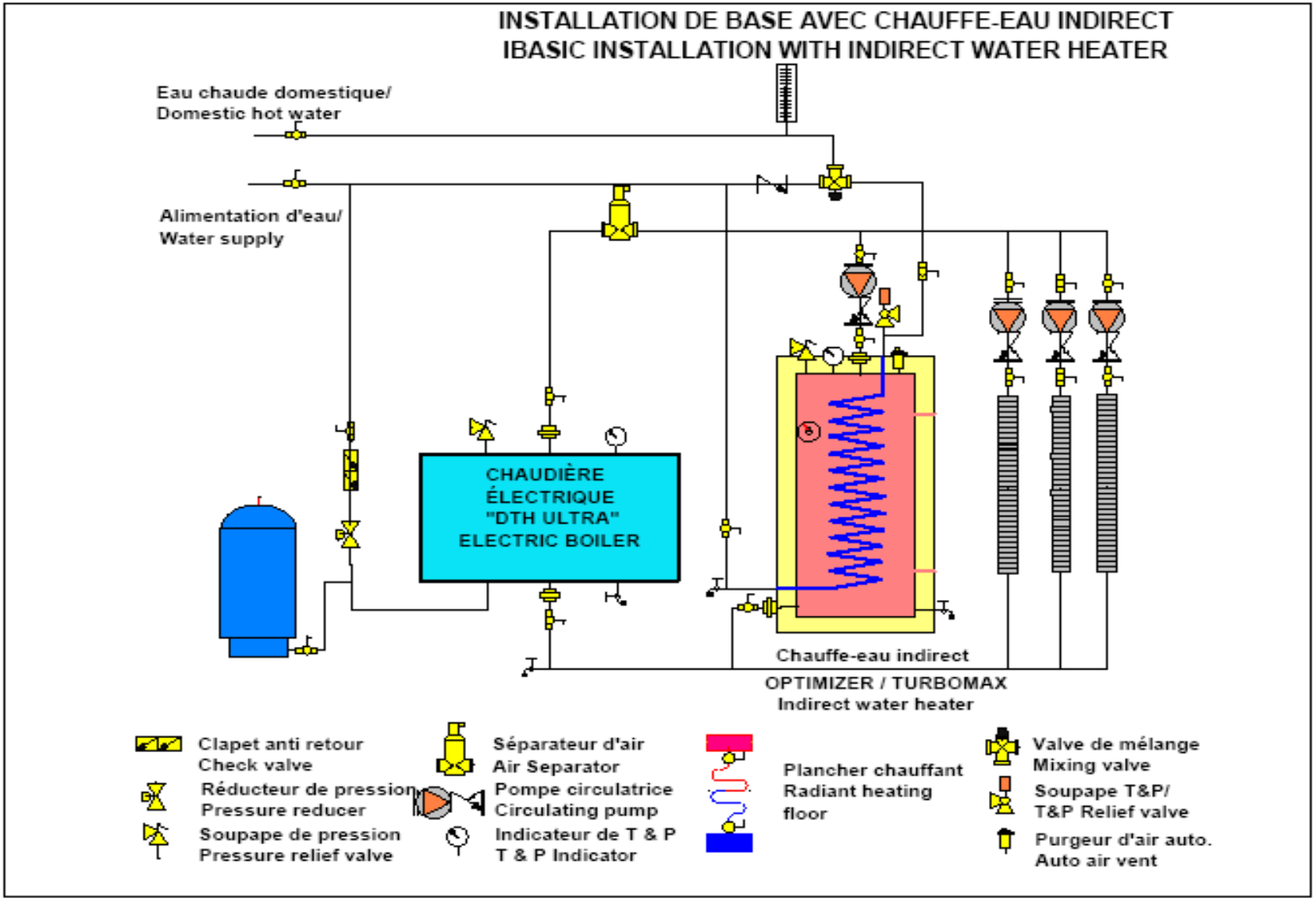
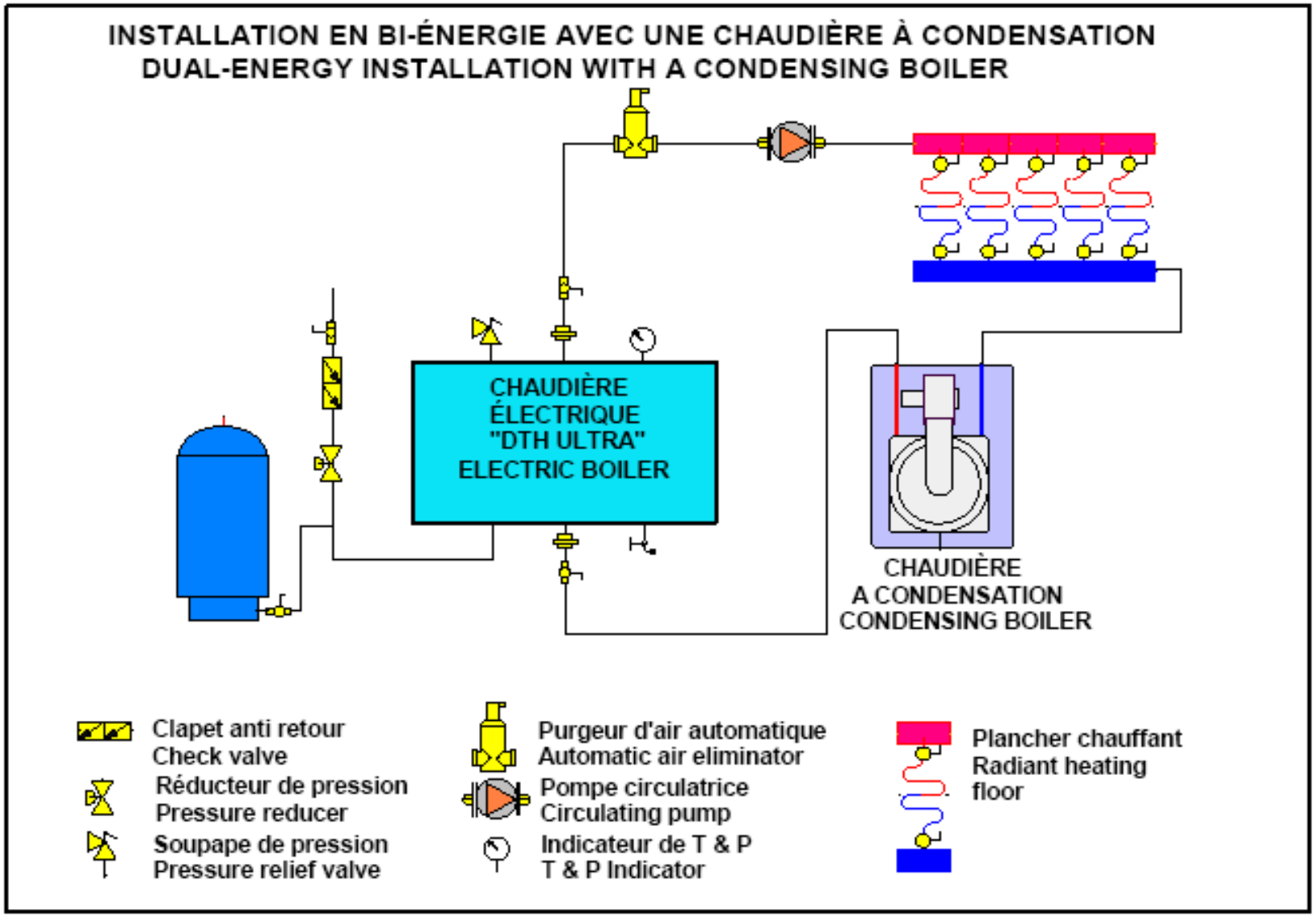


Figure 4: Typical installation diagram with an auxiliary boiler



3.5 ELECTRICAL CONNECTIONS

Wiring must conform to the National Electrical Code and to state or local code requirements.

The electric boiler must be electrically grounded in accordance with local codes, or, in the absence of local codes, with the National Electrical Code.

3.5.1 Main electrical supply

Line wiring must be from a 480 or 600 Volt (3 phase, 60 Hz) circuit protected by a properly sized breaker. Wire gage (3 wires+ground) must be properly sized. Consult the boiler rating plate to select the proper breaker and wire gage.

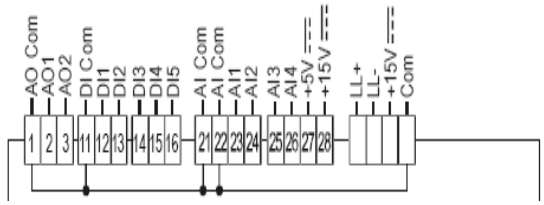
3.5.2 Pump supply

The DTH Ultra boiler does not control the pump(s) on the heating distribution system. Use appropriate pump relays for the application.
If the boiler is to be activated only on heat demand, pump relay(s) shall be equipped with an auxiliary contact connected to the boiler to let it know when a heat demand is present.
N.B.: The DTH Ultra is not designed to operate without a water flow in its tank.

3.5.3 Connection of external signals to the controller.

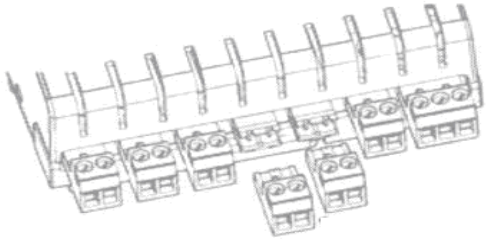
The connection of all external signals are made directly on the boiler controller on terminals located on top of it. See the connection diagram on figures 5 & 6 together with the figure below to get the location and the type of signal required.

Key: **AI**: Analog Input; **AO**: Analog Output; **DI**: Digital (Binary) Input; **DO**: Digital (Binary) Output; **LL**: Local Link



Cables used for the connections shall resist temperature up to 90C and be physically separated from the main electrical circuit
and other electrical and electro-mechanical devices located in boiler electrical panel.

Note that to facilitate these connections, the green terminals of the controller are numbered and are detachable



Bornier de raccordement détachable /Detachable terminal connector

3.5.3.1 Connecting the building heat demand signal

The boiler shall not receive a demand if the pump(s) in the heating distribution system is not in operation.

On heating systems designed to operate with continuous pump operation, The building heat demand control (Dry contact) can be connected directly on the boiler controller on terminals **DIcom (11) et DI1 (12)**. The heating elements will then be activated only upon reception of a heat demand.

If the heating distribution system is designed to be maintained hot with a continuous circulation, a jumper must be installed between **DIcom (11) et DI1 (12)** to maintained the heat demand. The boiler will then try to maintain the boiler water temperature around the established target temperature.

An operation at a superior SetPoint value W2 can be made by connecting the signal (dry contact) from an auxiliary heating demand (ex: a second stage heating from a thermostat) to the terminals **DI com (11)et DI2 (13)** of the controller.

In all operating modes of the controller, an heat demand on W1 and W2/DHW (close contact) must be present to DI1 or DI2 to allow the operation of the boiler. The only exception being in a domestic hot water mode DHW with an indirect water heater where a minimum boiler temperature shall be maintained.

3.5.3.2 Connecting an auxiliary boiler

The boiler controller is designed to allow the operation of a second boiler or an auxiliary gas or oil fired boiler according to two different mode of operation “Auxiliary Backup” or Dual-Energy”.

To do so, connect the TT terminals of the auxiliary boiler to terminals **39-40** of the controller (models 45 to 90kW) or "**AUX-AUX**" located inside the plastic box containing the controller (models 99 to 144kW). The maximum capacity of this contact is 3A/120Vac.

3.5.3.3 Connection of an "Unoccupied signal" of the building.

This function allows to drop the boiler temperature during periods where the building is not used and this without having to lower all the room thermostats of the building.

To do so, a signal (dry contact) will have to be connected to terminals **DIcom (11)**et **DI3 (14).**
The contact shall be close during the periods of temperature drop.

3.5.3.4 Connection of an indirect domestic hot water heater
The DTH Ultra can be used not only to fill the heating requirements of the building but also to fill its domestic hot water needs by the use of an indirect domestic hot water heater such as our "Turbomax" series.

To do so, connect the signal (dry contact) of indirect water heater temperature control to a relay that will activate the circulating pump supplying the water heater. This relay shall be equipped with an auxiliary contact that shall be connected to terminals **DIcom** et **DI2 (13.**
When it is possible that a heat demand and a domestic hot water demand occurs simultaneously, it is recommended to give priority to the domestic hot water demand.
To do so, cut the heating circulating pump when the domestic hot water heater is in demand. This way the full capacity of the boiler will be used for the production of domestic hot water and the heating supply will be re-established afterward.

3.5.3.5 Connection of a dual-energy controller.
The DTH Ultra can be operated in a dual-energy mode with an auxiliary boiler.

To do so, connect the normally close contact of the dual energy controller to terminals **DIcom(11) and DI5(16)** to operate with the electric boiler. See section 4.3.2.2 for more details on the sequence of operation in dual energy.

3.5.3.6 Connection of an outdoor temperature sensor
If you wish to modulate the boiler water temperature according to the outdoor temperature (Outdoor Reset, ORST) and also wish to stop the operation of the boiler when the outdoor temp. reaches a selected value (See section 4.3.2.1), then the outdoor sensor supplied with the unit or a corresponding signal coming from the network system shall be connected to terminals **AIcom (22)** et **AI2 (24)** of the controller.
This sensor does not need to be connected if the boiler application is for a fixed SetPoint operation.
N.B. Do not install a jumper if the outside sensor is not used.

3.5.3.7 Remote controller used to determine the target boiler temperature
An external controller (such as a central building energy management system) can be used to determine the boiler target temperature required for the building.
To do so, the external controller shall give a 0 to 10VDC signal connected to terminals **AIcom (22)**et **AI3 (25)** of the controller.

3.5.3.8 Power limiting device
An external controller providing a 0-10Vdc signal could be used to manage the capacity (kW) of the boiler.
Example: An application where the main electrical service supply of the building is limited or when the electricity rate is billed according to the maximum peak loads of the building.
To do so, The external controller shall be connected to terminals **AIcom (22)** et **AI4 (26**).
The capacity of the boiler could be manually limited by adjusting some of the controller parameters. See section 4.3.2.7 for more details

3.5.3.9 Alarm
An alarm signal (dry contact) is available on the boiler to advise the user of an alarm situation.
The capacity of the contact is 3A resistive/1A inductive and its connecting terminals are located in the plastic box on the left side of the controller.

Fig.5 ELECTRICAL CONNECTIONS OF THE INPUT AND OUTPUT SIGNALS TO THE « FX-07 » CONTROLLER ON A « DTH ULTRA 45 to 90KW »

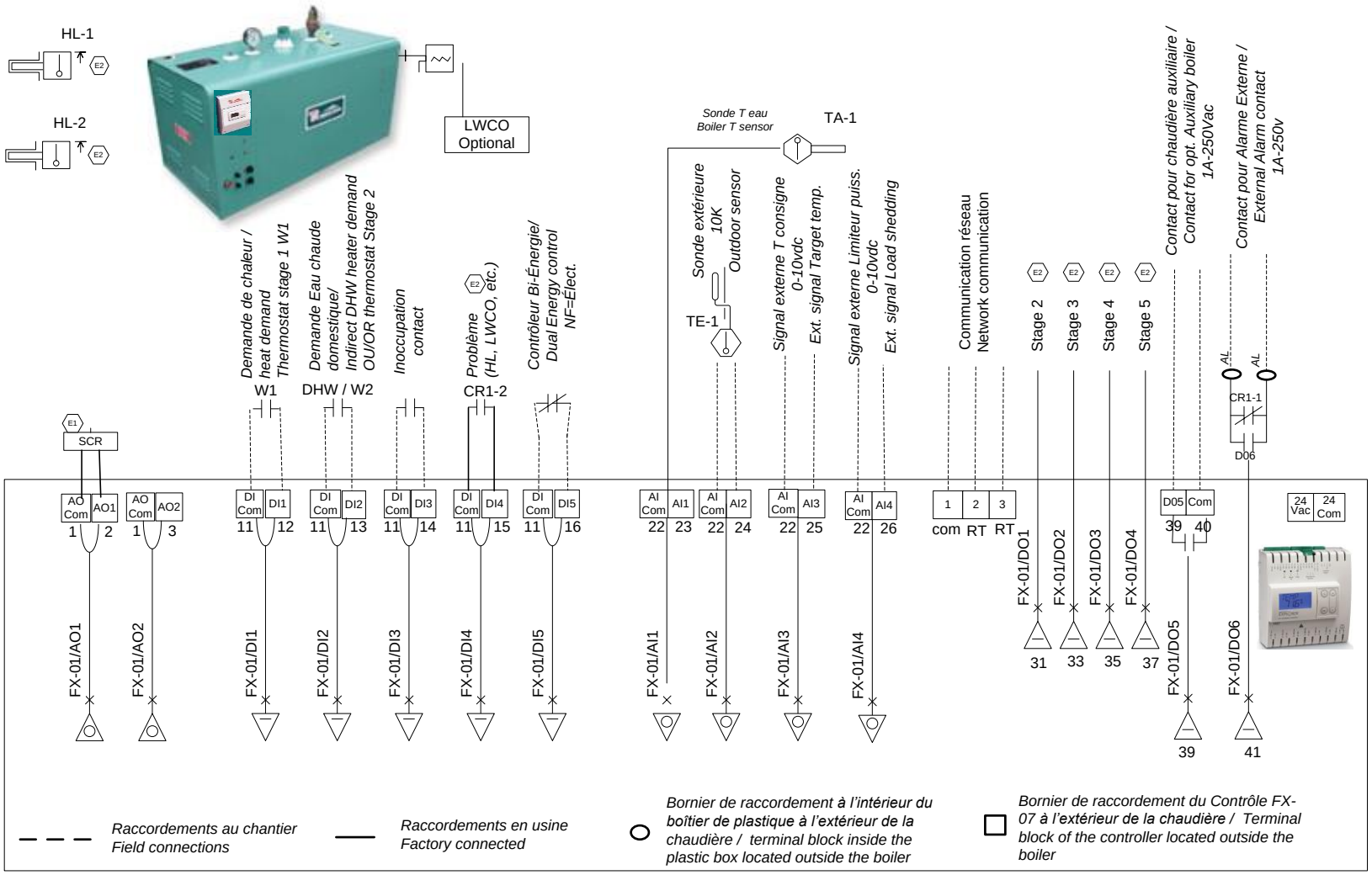


Fig.6 ELECTRICAL CONNECTIONS OF THE INPUT AND OUTPUT SIGNALS TO THE « FX-07 » CONTROLLER ON A « DTH ULTRA 99 to 144KW »

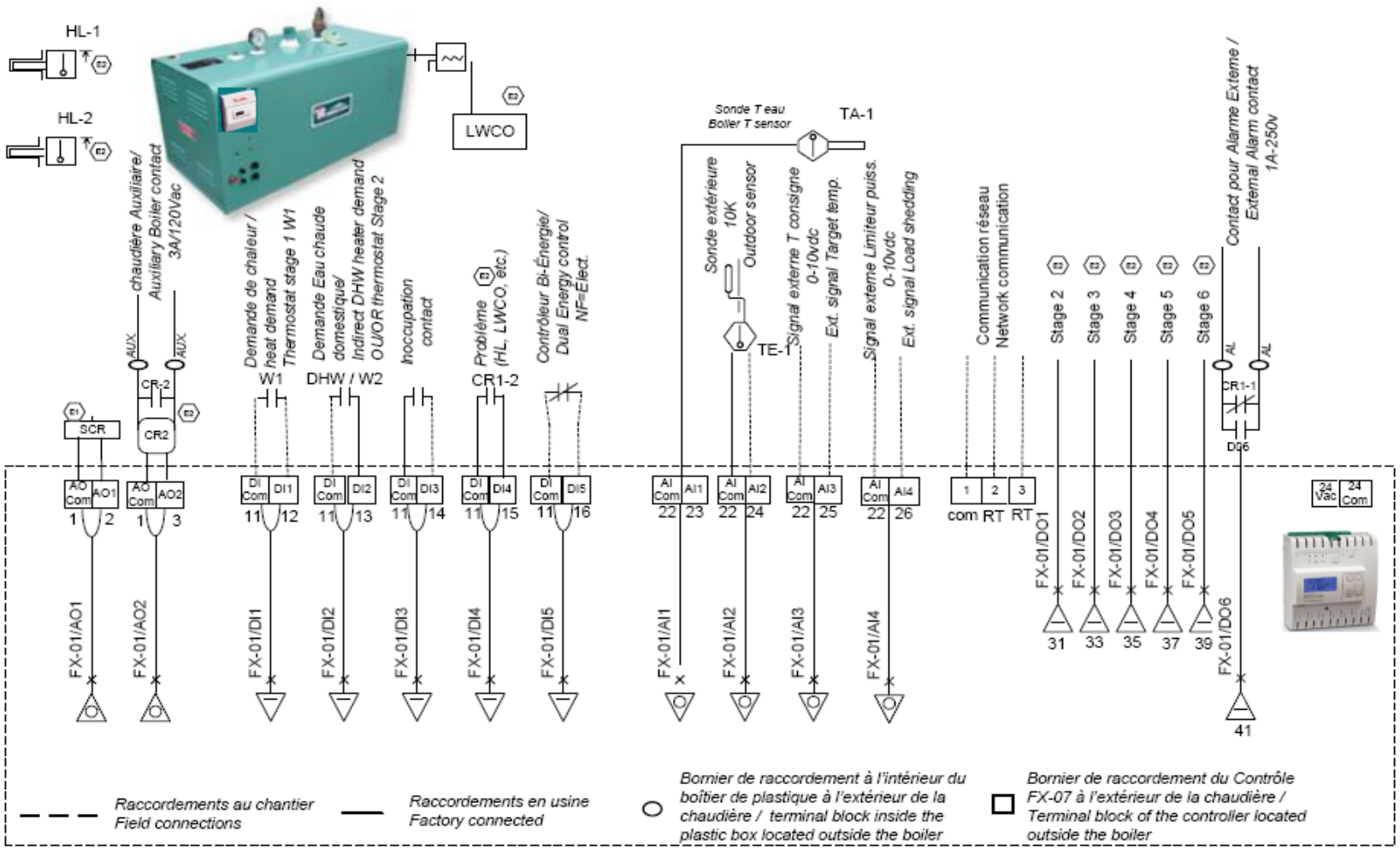
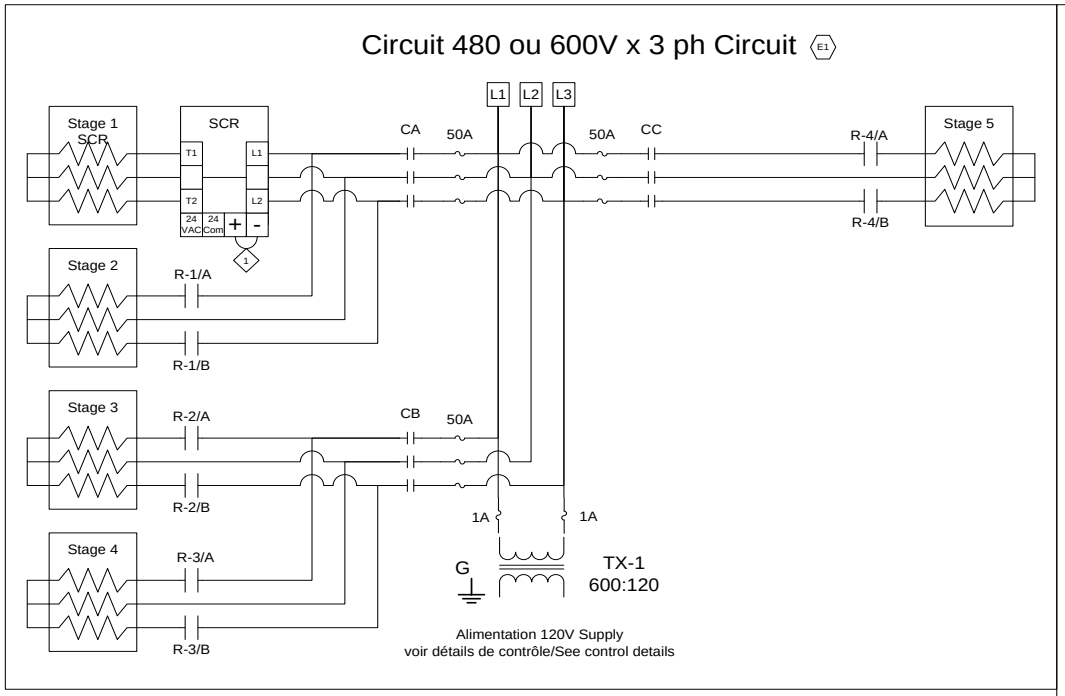


Figure 7 INTERNAL BOILER WIRING DIAGRAM OFF A « DTH ULTRA 78 to 90kW »



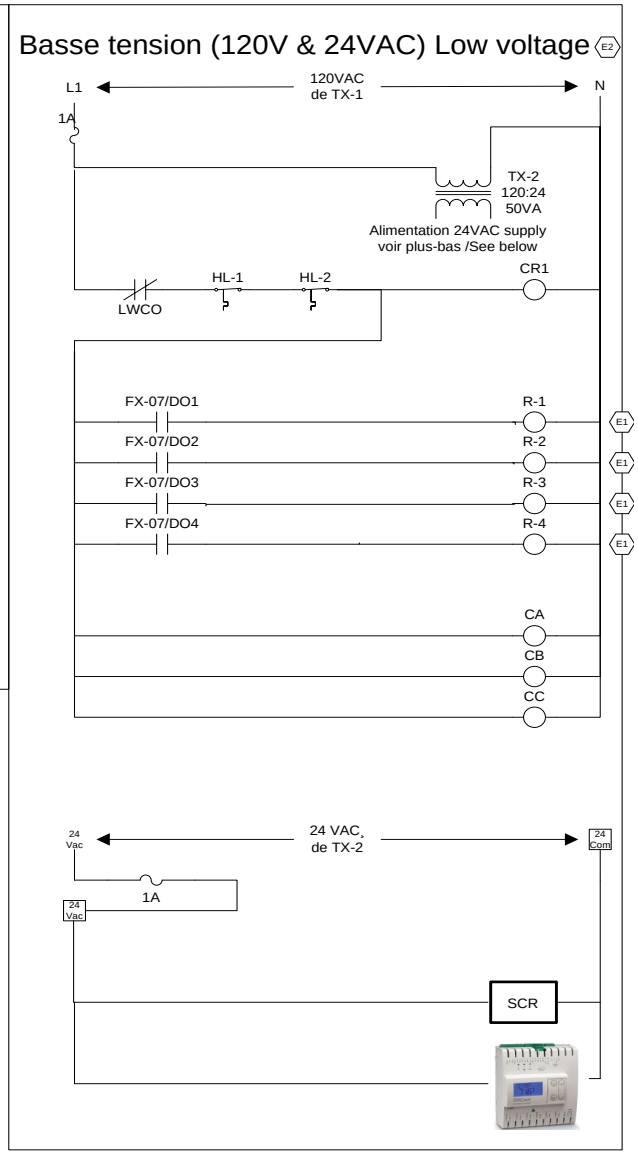
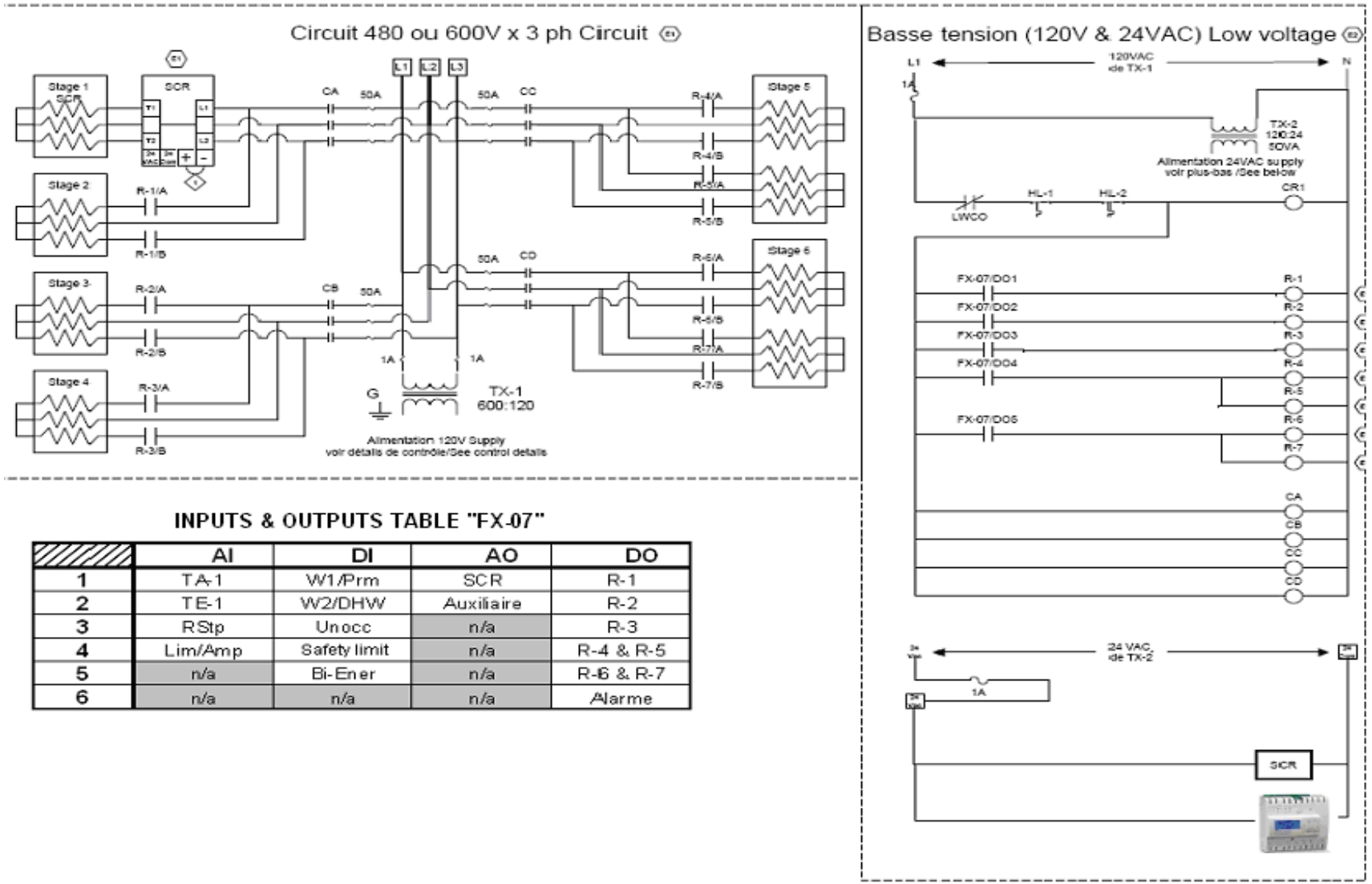


Tableau des entrées et sorties du contrôleur FX-07
Inlets and outlets FX-07 data table

	AI	DI	AO	DO
1	TA-1	W1/Prm	SCR	R-1
2	TE-1	W2/DHW	Auxiliaire	R-2
3	RStp	Unocc	n/a	R-3
4	Lim/Amp	Safety limit	n/a	R-4
5	n/a	Bi-Ener	n/a	Aux. boiler
6	n/a	n/a	n/a	Alarme

Figure 8 INTERNAL BOILER WIRING DIAGRAM OFF A « DTH ULTRA 120 to 144kW »



INPUTS & OUTPUTS TABLE "FX-07"

	AI	DI	AO	DO
1	TA-1	W1/Prm	SCR	R-1
2	TE-1	W2/DHW	Auxiliaire	R-2
3	RStp	Unocc	n/a	R-3
4	Lim/Amp	Safety limit	n/a	R-4 & R-5
5	n/a	Bi-Ener	n/a	R-6 & R-7
6	n/a	n/a	n/a	Alarme

Section 4: OPERATION OF THE CONTROLLER

4.1 USER INTERFACE

The operation of the boiler is insured by an FX-07 controller from "Johnson Controls". The controller LCD display and the 4 buttons of the controller allows the configuration and the display of the different operating parameters of the boiler.

An optional communication module allows you to incorporate the controller to an intelligent managing building system (Communication language BACnet or N2 or LonWorks available).

The navigation through the display is made with four (4) buttons at the right of the display. The navigation between the elements is made with the up and down arrows. The "C" button brings you to the menu. The "OK" button confirm the selection and edit the parameter or a setpoint.

Graphic status icons will appear to inform the user of the actual state of operation of the boiler.

The display can be set to display the information in imperial or metric units. The background lighting becomes blue when a adjustment button is pushed and turns to red when an alarm condition is present.

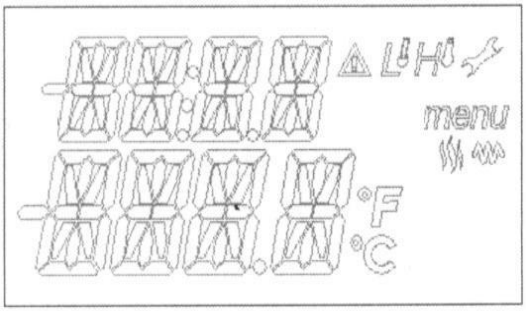


Figure 9: Illustration of the display

Description of the symbols

	An alarm condition is present
	A derogation is present
	An heat demand is present
	The heating elements are in operation
	Low Limit (Lack of capacity)
	High limit temperature present.

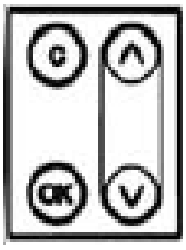
4.2 MENUS

The majority of the information on the state of operations of the boiler are available on the first page of the display. The **"UP" and "DOWN" arrows buttons** allows the navigation on this page.

Available information

BOILER TEMP ACTUAL	Water temperature at the boiler outlet
BOILER SET POINT ACTUAL	Actual Boiler target
BOILER STATUS	Actual operation mode
HEATING DEMAND	Heat demand ON/OFF
SCR (PCT)	Actual percentage of the maximum capacity of the modulating SCR relay.
STAGE 1	State of operation of stage 1 (ON/OFF)
STAGE 2	State of operation of stage 2 (ON/OFF)
STAGE 3 (Modèle 60-72)	State of operation of stage 3 (ON/OFF)
STAGE 4 (Model 78-90)	State of operation of stage 4 (ON/OFF)
STAGE 5 (Model 99à144)	State of operation of stage 5 (ON/OFF)
AUX **(**Model 45à90)	State of operation of an optional auxiliary boiler (ON/OFF)
ACTUAL OUTPUT CAP (PCT))	Actual percentage of the maximum capacity of the boiler
UNITS	US ou Metric
PROGRAM IDENTIFICATION	Identification number of the program used by the controller

Other information and parameters are available in the menus accessible by pressing the "C" button. The navigation between the menus is done by pressing the arrows. To enter into the selected menu, press the OK button.



4.2.1 Menus available to the USER
(no access code required)

Menus	Contenu
ACCESS CODE Menu-01-	Allows access to the INSTALLER menus (default code 1111).
EVENTS Menu-02-	Alarms summary
SCHEDULERS Menu-03-	Time scheduling of boiler temperature drops.

4.2.2 Menus available to the INSTALLER (INST) or an authorised person.

Un code d'accès est requis (**Voir 4.3.1)**

Menus	Contient
ACCESS CODE Menu -01-	Access to the INSTALLER or an authorised person to change password
CONFIG SYSTEM Menu-02-	Configuration of the operating mode of the boiler in relation to the type of application desired (See section 4.3.2)
FIXD Menu-03-	Specific configuration of the **fixed setpoint** (Selection of SetPoints) operation that as been selected in menu 02 CONFIG.
ORST Menu-03-	Specific Configuration of « **outdoor reset** » operation (Modulation of the boiler setpoint in relation to the outdoor temperature) that as been selected in menu 02 CONFIG.
RMSP Menu-03-	Specific Configuration of « **remote setpoint** » operation (Boiler setpoints established by an external 0-10Vdc signal on AI3) that as been selected in menu 02 CONFIG.
ALARM & BCKP Menu-04-	Configuration of the alarms and the auxiliary boiler operation.
EVENTS Menu-05-	Alarms Summary
SCHEDULERS Menu-06-	Time scheduling of boiler temperature drops.
DATE Menu-07-	Date and hour settings

4.3 ADJUSTMENTS

To make the adjustment of a setpoint or a parameter, use the arrows to reach the appropriate menu Press OK. Press the arrows again to show the information you whish to change and press OK (the item will blink for 5 sec. if it is adjustable) use the arrows again to change the item of the value and press OK to make the selection.

If the 'C' button is pressed, you will return to menu 01 or to the first page of the display giving you the state of operation of the boiler.

4.3.1 Menu 01 « ACCESS CODE »

To authorise the individual to modify the configuration of the boiler, it is required to validate its status with an access code for **installer « INST » or Factory « FACT » .**

The default access code "**INST"** when the unit is manufacture is 1111 and can be modified in this menu.

The "**FACT"** access code gives access to advanced operating parameters that are not available to the installer or the user.

4.3.2 Menu 02 « CONFIG SYSTEM »

Configuration of the controller in relation to the type of application.

4.3.2.1 « Select heating mode »

In this menu, you must choose an operating mode specific to the application. This selection will then be activated in **menu-03** and will allow you to enter the required parameters for your application.

You will find below the different modes available:

FIxD	Fixed Setpoint
RMSP	Remote Setpoint
ORST	Outdoor Reset
STOP	Stop

See section 4.4 and table 4 below for more details.

4.3.2.2 « Auxiliary boiler »

The controller has been designed to allow the operation of a second boiler or an auxiliary gas or oil fired boiler according to two mode of operation "Dual Energy" or "Auxiliary backup" .

« Backup »
When a lack of capacity is detected, the auxiliary boiler is started to compensate. The activation parameters of the auxiliary boiler are defined in the “Alarms and Back Up” menu.
The lack of capacity is detected when the outlet temperature of the boiler is lower than X degree “tmp drop to start aux” (nciAlrmDiffLL) from the actual boiler temp. setpoint during a period of X seconds “delay to start aux” (ncidelayCmdBackup). The status of this command « act aux boiler cmd »(nvoBLTAliCmdBackup) indicates that the boiler needs help to get to the target setpoint. The auxiliary boiler is then called for heat for a minimum of X seconds « aux boiler min on time »(nciTOnMinAux). If this state of operation is maintained for a determined period « lack cap delay for alm » (nciLackCapacityDelay) and that this contact is allowed to be activated « use alrm output », it will be close to activate an alarm for example.
When the outlet boiler temperature increases to a determined value « T increase to stop aux » after the auxiliary boiler has been activated, this one will then be stopped.
Once the lack of capacity has been satisfied by the previous sequence, a second delay has been included before re-starting the aux. boiler (nciDelaiCmdAux) . This delay is optional an can be set at “0”.
In order for the controller of the DTH Ultra to register the increase of temperature resulting from the operation of the auxiliary boiler, the piping installation of the two boilers must be in series. I.E. The heating return of the system shall first pass through the auxiliary boiler before entering into the electric boiler.
N.B.: The auxiliary boiler operating temperature is not controlled by the electric boiler. Its own operating and safety control are still required.
See table 4 & 9 for more details on specific parameters of this application.

Dual Energy
When the signal (Dry contact) is closed on DI5, the electric boiler is allowed to operate but not the auxiliary boiler.
When the contact is open on DI5 and a heat demand is made on DI1 or /and DI2, the contact will then close between terminals “AUX” “AUX” which will activate the auxiliary boiler but the electric boiler will be turned off.
In Electric mode, if a lack of capacity is detected when the electric elements are totally engaged, the auxiliary boiler will be activated to help the electric boiler to reach it target temperature according to the operating parameters explained previously in “BackUp” mode. The electric elements will remain in operation during the operation of the auxiliary boiler.

« None »
No auxiliary boiler installed in the heating system.

4.3.2.3 « W2/DHW HEATING DEMAND »
Allows to use the input signal on DI2 to receive a command (Dry contact) from a second stage of heating or from an indirect water heater DHW.
When the contact closes on DI2, the fixed target temperature changes to the determined value and this even if there is no demand on W1. See table 8 below for more details on specific parameters.
Select “NONE” if not used.

4.3.2.4 « USE ALARM OUTPUT »
An alarm contact is available from the boiler for the connection of an external alarm. Select YES if you wish to use this contact to activate an alarm and NO to cancel its operation.
The contact has a capacity of 3A res./1A inductive amp.
The activation conditions of the alarms are:

- Electric supply interruption
- Hi-limit temperature
- Low water level (in Option on model 45 to 108kW)
- Sustained lack of capacity
- Defective boiler water temp. sensor
- Defective outdoor temperature sensor

See table 9 for the specific parameters of this menu.

High limit:
If the boiler outlet temperature becomes higher than the setting of the HL alarm (nciDishTmpHLStpt), the letters HL will appear and blink on the display. If this condition remains for a one minute period, the display will turn to red to indicate an abnormal condition, and this event will be registered in the controller memory EVENTS menu. If this condition is maintained, a general alarm will be activated causing a lock out of the boiler.
To deactivate this lock out: Maintain the C button during 10 seconds or simply turn OFF the power to the unit and set it back ON after.

4.3.2.5 «UNOCCUPIED TEMP. DIFF»

This function allows to lower the boiler target temperature established by the controller when the contact connected to DI3 closes.
The value of the temp. decrease shown can be modified by pressing the OK button first and then the arrows until the desired temperature is reached and then by pressing OK to confirm.
This function allows for example to lower the building temperature when it is not occupied.

4.3.2.6 « CAPACITY LIMITING

Allow to use an analogical input signal connected at AI4 on the controller to limit the power capacity of the boiler. To do that, an external 0-10Vdc signal is required. If an auxiliary boiler is installed as a backup and the electric boiler cannot maintain the required target temperature, the auxiliary boiler will be activated according to the operating parameters set in the Alarm & backup menu.
Select "Yes" or "NO" according to the application.
N.B. An external controller designed to control the boiler stage relays must not be used because it will interfere with the sequence PID of the controller.
The boiler capacity can be manually limited at a fixed value (% of its maximum capacity) without using an external 0-10VDC signal. To do so just follow the following directives:

- Select "YES" at the parameter "Capacity limiting AI4"
- Mark "0" at parameter "Volt AI$ for min. cap"
- Mark the percentage value corresponding to the maximum capacity required at parameter "Min cap if limited %"

4.3.2.7 «LOAD LIMITING SET-UP» MIN VOLT AI4 / MAX VOLT AI4

If your answer has been «YES» in the CONFIG menu under **«Capacity limiting AI4»,** then operating parameters will be required in relation to the external controller sending the signal to the boiler controller.
This menu allows to configure the external power limitation input signal. This signal is considered as an authorisation percentage of the maximum power capacity of the boiler such as. 0V=100%, 10V=0%.
Ex: If the external controller used can generate 6Vdc when the application is suitable to provide the total capacity of the boiler and 9Vdc when 0 capacity is required, then the parameters values shall be as follow;
"Volt AI4 for max cap" = 6
"Volt AI4 for min cap = 9
As a result, when AI4 will receive a signal from 0 to 6Vdc, the electric boiler will be authorised to work at its full capacity and when the signal will be from 6.1 to 9Vdc, the available capacity will gradually drop to become 0 when the value will reach 9Vdc
If you would like the unit to maintain a minimum capacity even if the external signal tells the unit to go lower, this could be done by setting the **"Min cap if limited"** to a percentage value of the maximum boiler capacity you wish to operate.

How to limit the maximum capacity of the boiler without an external 0-10Vdc controller:
If we wish to operate the boiler at a maximum capacity lower than it nominal maximum capacity (ex. We do not wat the boiler capacity of a 144kW unit to exceed 50kW) la way to proceed is as follow:

1. Select "YES" in configuration menue 02 "**Capacity limiting AI4**
2. Adjust to 0Vdc the value of both **"Volt AI4 for max cap"** and **"Volt AI4 for min. cap"**
3. Select the value of the maximum desired capacity (in % of the max. capacity of the actual boiler ex: 50kw on a 144kW boiler will be 50/144=35%) at **"Min cap if limited**"

N.B.: It is not recommended to disconnect some power relays to accomplish this function.

4.4 Menu-03 : « XXXXX mode setting » Setting of the operating parameters specific to the mode selected in menu-02 "Config"

Fixed Setpoints in Menu 03
The target boiler temperature at the outlet of the boiler will be FIXED.
Two modes are available:
If the unit is controlled by a one or two stage thermostat providing a demand on W1 or W2, the boiler will use the corresponding target temperature according to the established parameters value in the menu Fixed Stpt.
See table 4 & 7 for more specific details.

Remote setpoint in Menu 03
This mode of operation allows the modulation of the target temperature at the outlet of the boiler in relation to an external 0 to 10 Vdc signal applied to AI3. For example, this signal could be provided by a building energy management controller.
A heat demand must be present at W1 and/or W2/DHW to allow the operation of the boiler. When a demand on W2 or DHW is made, the target temperature becomes fixed at the selected value.
See table 4 & 6 for more specific details on this application.

Outdoor Reset in Menu 03
This mode of operation allows to modulate the boiler outlet target temperature in relation to the outdoor temperature. The outdoor temperature signal could be provided by the 10K ntc temperature sensor provided with the unit which shall be connected to AI2. This signal (nviOutdoorTemp) can also be provided from the network if the unit is equipped with the appropriate network printed circuit board.
A heat demand signal must be applied to W1 or/and W2/DHW to allow the unit to operate.
When a demand is applied to W2 or DHW, the target temperature becomes fixed at the selected value.
See table 4&5 for more specific details.

Stop
The boiler remains OFF even if heat demand is made.

4.5 Menu "EVENTS"
The FX-07 controller registers the abnormal events generated by the operation of the system in relation to the operating parameters that have been set into the controller.
When an event become active, the backlight of the display will become red and a message will appear. The event is cleared from the display and the backlight will get back to blue when the "C" key is pressed and the problem has been corrected. The event is registered in the "Summary" and "Historic" data with the date and time of activation.
The "summary" and "Historic" of these events could be seen on the display by going to the "Events" menu accessible to the user.

4.6 Menu "SCHEDULERS"
Time scheduling for boiler temperature drops.
This characteristic allow the user to establish weekly periods of boiler temperature drops. The controller will then use its internal clock provided with a rechargeable capacitive battery capable of maintaining the schedules for a minimum period of 10 days after a power shut down.

Table 4 : Installer menu 02- Configuration of the application

Display	Variable	Description	Selectable parameters	Default
Choose Sequence	nciSequence	Choose operating mode according to the application or select Stop to cancel the operation fo the boiler.	0, Stop 1, Outdoor_Rst (ORst) 2, Remote_Stp (RmSp) 3, Fixed_Stpt (Fixd)	3, Fixed stpt
AUX BOILER	nciModeChaudAux	Use of an auxiliary boiler.	0, Back up (BCKP) 1, Dual Energy (Bi-E) 2, None	2, None
W2 used for	nciUsageW2	Operation of the W2/DHW second stage of heating.	0, 2nd_Stage (W2) 1, Domestic water (DHW) 2 Not used (none)	2,none
Use Alarm Relay	nciOptAlrmRly	Use or not use of the boiler alarm contact.	0, NO 1, YES	0, NO
Unoccupied Delta T	nciUnoccDischStpt	Adjustment of Boiler temperature drop value during « unoccupied » signal on DI3	Degree F or C	0
		*****LOAD LIMITING SET UP*****		
Capacity limiting - AI4	nciModeDelestageOn	Limit the boiler capacity in relation to an external 0-10Vdc controller connected to AI4	0, NO 1, YES	0, NO
Volt Ai4 for Max Cap	nciMaxVoltAI4	Voltage value (V) for Maximum boiler capacity	0-10V	10 V
Volt AI4 for Min Cap	nciMinVoltAI4	Voltage value (v) for boiler capacity of 0	0-10V	00V
Min Cap if limited		Minimum boiler capacity required (pct)	0-100%	0%

Table 5 : Installer Menu 03 - Sélection « Outdoor reset »

This mode of operation allows to modulate the boiler outlet target temperature in relation to the outdoor temperature. The outdoor temperature signal could be provided by the 10K NTC temperature sensor provided with the unit which shall be connected to AI2. This signal (nviOutdoorTemp) can also be provided from the network if the unit is equipped with the appropriate network printed circuit board. An heat demand signal must be applied to W1 or/and W2/DHW to allow the unit to operate.

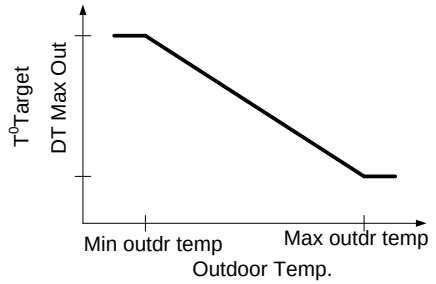


Figure 10 : Outdoor reset operation

Specific Pprameters in « Outdoor reset »

Display	Variable	Description	Selectable Parameters	Default
FX Outdoor Temp	nvoAI2	Value of the outdoor temperature read by the sensor connected to AI2. The display will show -- -- -- if the temperature value is provided by the network or if no sensor is connected on AI2	---	---
Network Outdr Temp	nviOutdoorTemp	Value of the outdoor temperature coming from the network building controller . The display will show-- -- -- if the value in not coming from the network.	degC or degF	---
Outdoor Temp Source	nciOutdoorTempFX	Provenance of the outdoor temperature used by the controller.	0, NET 1, FX	1, FX
Actual Outdoor Temp	nvoActualOutdoorTemp	Actual temperature used by the controller.	---	---
		*****SETTINGS*****		
Min Outdoor Stpt	nciMinOutdoorTemp	Minimum Outdoor Temp. (average coldest outdoor temp. according to the areas)	degC or degF	-10 deg F^0
Max Outdoor Stpt	nciMaxOutdoorTemp	Maximum Outdoor Temp. at which the building will require heat.	degC or degF	65 deg F^0
Disch Temp Min Outdoor	nciDischTemp_MinOutd	Boiler Target temp when the outdoor temp. will get to its minimum value (Min Oudoor Stpt)	degC or degF	175 deg F^0
Disch Temp Max Outdoor	nciDischTemp_MaxOutd	Boiler Target temp. when the outdoor temp. will get to its maximum value (Max Oudoor Stpt).	degC or degF	130 deg F^0
Dishc Temp HL Stpt	nciDischTmpHLStpt	High limit boiler temperature value to generate an alarm signal on the display	degC or degF	200 deg F^0

Low Limit Alarm Diff	nciAlrmDiffHL	Temperature differential (Delta T) required under the target temperature to be considered as a lack of capacity	degC or degF	-20 deg F^0
Min Boiler Temp	nciFixedStptW0	Discharge setpoint to maintain if no demand	degC or degF	32degF
Max outdr temp for htg	nciOutTmpMaxHtg	If the outdoor temperature exceed this value, the boiler target temp. is maintained min. at W0 unless a DHW demand is applied on DI2	Deg C or F	68F
W2 fixedstpt		Fixed target boiler temperature used by the controller when a demand is applied on W2	Deg.C or F	175F

On mode ORST, si la sonde extérieure n'est pas raccordée ou si son circuit est ouvert, un signal d'alarme s'affichera à l'écran de l'afficheur et la température de consigne deviendra la température de consigne sélectionnée lorsque la température extérieure est à son minimum.

Table 6 : Installer Menu 03 -« Remote Setpoint»

Specific parameters in "Remote setpoint" mode

This operating mode will modulate the boiler target temperature set point in relation to an external 0-10Vdc signal applied to AI3.

An heat demand signal (Close contact or jumper on W1) must be applied to DI1 to allow the operation of the heating elements.

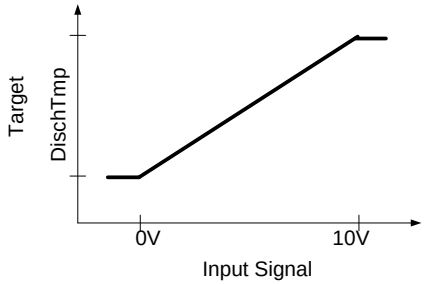


Figure 11 : Reset schedule

Diplay	Variable	Description	Parameters	Default setting
Min Volt AI3	nciMinVoltAI3	Minimum applied voltage (0 to10Vdc)	Volts	0Vdc
Max Volt AI3	nciMaxVoltAI3	Maximum applied voltage (0 to 10Vdc)	Volts	10Vdc
RemStpt_MinVolts	nciRemStpt_MinVolt	Boiler target temperature at Minimum applied voltage on AI3	degC ou degF	175 $degF^0$
RemStpt_MaxVolts	nciRemStpt_MaxVolt	Boiler target temperature at Minimum applied voltage on AI3	degC ou degF	130 deg F^0
Dishc Temp HL Stpt	nciDischTmpHLStpt	High limit boiler temperature generating an alarm.	degC ou degF	200 deg F^0
Low Limit Alarm Diff	nciAlrmDiffLL	Delta T under the target boiler temperature that will be considered as a lack of capacity.	degC ou degF	-20 deg F^0
W2 fixed set point		Fixed target temp. when a close contact is applied on W2	degC ou degF	175degF

Table 7 : Installer Menu 03 -Sélection « Fixed Setpoint »

This operating mode allows the boiler to operate with up to two different fixed target temperatures related to the contact signals on W1 (DI1) and W2 (DI2) coming from a two stage thermostat. W2 can also be configured as an input contact signal from an indirect domestic hot water heater.
A heat demand must appear (Close contact on W1 or/and W2/DHW) to allow the boiler to operate.

Spécific Parameters in Fixed Setpoint mode

Display	Variable	Description	Parameters	Default
W1 Stpt	nciFixedStptW1	Target boiler temperature to maintain when a demand is applied on W1(DI1)	Degree	160 deg F^0
W2 Stpt	nciFixedStptW2	Target boiler temperature to maintain when a demand is applied on W2 (DI2)	Degree	175deg F^0
Dishc Temp HL Stpt	nciDischTmpHLStpt	High limit boiler temperature generating an alarm.	Degree	200 deg F^0
Low Limit Alarm Diff	nciAlrmDiffHL	Delta T under the target boiler temperature that will be considered as a lack of capacity.	Degree	-20 deg F^0

Table 8 : Installer Menu 04 -DHW Domestic hot water (Indirect water heater)

Spécific Parameters in DHW mode

Display	Variable	Description	Parameters	Default
DHW Stpt	nciDHWStpt	Boiler target temperature in DHW mode	Degree	$175F^0$
Min Boiler Temp	nciOptW0FixedStpt	Minimum boiler temperature to maintain even if there is no heat demand on W1	Degree	$150F^0$

Table 9: Installer Menu 05 -Alarmes & Back up »

Spécific Parameters

Display	Variable	Description	Parameters	Default
Disch Temp	nvoAI1	Boiler outlet temperature	---	---
Act Disch Stpt	nvoActualDischStpt	Actual boiler target temperature	---	---
HL stpt	nciDischTmpHLStpt	High Limit boiler temp. generating an alarm		200F
High Limit Shut Down	nvoHauteLimiteSD	Status of High limit generating a boiler safety shut down	---Normal /Activ	---
Cmd Backup delay	nciDelaiCmdBackup	Delay before considering a lack of capacity	Minutes	60
Cmd Backup	nvoBLTAliCmdBackup	Lack capacity status	-Normal/Activ--	---
.	.	****BACK UP SETTINGS****		
Tmpdrop to start aux		Temperature drop to start auxiliary boiler	Deg C ou deg F	-20F
Delay to start aux	nciDelaiCmdBackup	Delay in a low limit capacity before activating the auxiliary boiler	Min	10min
Backup Min On time	nciTOnMinAux	Minimum On time of the auxiliary boiler operation	sec	30sec
T increase to stop aux		Temperature increase required to stop auxiliary boiler	degC ou degF	10F
Act Aux Boiler Cmd	nvoDO05	Actual auxiliary boiler Cmd	-ON /OFF--	---

Table 10 PID Staging sequence

This menu is not accessible to the installer and the user. Changes of these parameters could generate an improper operation of the boiler

Spécific Parameters

Display	Variable	Description	Parameters	Default
Output	nvoPIDTAli	Output (%) of the PID supply heating loop	---	---
Disch temp	nvoAI1	Boiler outlet temp	---	---
Actual Disch Stpt	nvoActualDischStpt	Actual boiler target temp setpoint	---	---
		*****Heating settings*****		
PB	nciPIDTAliPB	Proportional band	degC / degF	50F
TI	nciPIDTAliTI	Integral time	sec	150sec
Diff		Differential	sec	30sec
		*****DHW Settings*****		
Output	nvoPIDDHW	Output (%) of the PID supply for the DHW Loop	---	---
PB	nciPIDTAliDHWPB	Proportional band	degC / degF	30F
TI	nciPIDTAliDHWTI	Integral time	Sec	100sec
Diff		Differential time	Sec	40sec

Section 5 : BOILER START UP

⚠ SAFETY PRECAUTIONS

Before operating this boiler, be sure to read and follow these instructions, as well as the warnings printed in this manual. Failure to do so can result in unsafe operation of the boiler resulting in property damage, bodily injury, or death. Should you have any problems reading, following or difficulty in understanding the instructions in this manual, STOP, and get help from a qualified person.
Do not turn on the boiler unless it is filled with water. Do not turn on the boiler if the cold water supply shut-off valve is closed.

After the boiler has been plumbed and wired, it is now ready to be set for automatic operation.

5.1 FILLING THE BOILER

- Open the service valves at the outlet of the boiler and the cold water supply valve (fill or makeup water valve) to boiler.
- Open the relief valve on top of the boiler in order to purge the air out of the boiler tank during the fill process
- Leave all shutoff valves open.
- Check system for leaks and repair. Purge air from all the heating distribution zones.
- Check boiler pressure gage reading. The indicated pressure should be lower than the pressure relief valve design rating.

5.2 ADJUSTMENT OF THE CONTROLLER OPERATING PARAMETERS

- After the system has been manually purged of air, and all components (valves, vents, controllers) have been set properly, the boiler can be started. Never operate this boiler until this has been done.
- Safety and energy conservation are factors to be considered when setting the boiler water operating temperature . The most energy-efficient operation will result when the temperature setting of the controller is the lowest that satisfies the heating needs.
- Check the parameters settings that have been entered in the boiler controller and the setting of the adjustable boiler high limit so that they correspond to the application requirements.
- The mechanical adjustable hi-limit is located in the electrical left panel of the boiler and shall be set from 15 to 20F higher than the maximum boiler operating temperature.

5.3 STARTUP PROCEDURE

- Before starting the boiler, make sure that the heating distribution design is made so that the heating elements will come on only when water is circulating in the boiler.

1. Fill the boiler as described in section 5.1.
2. Set the boiler operating temperature as described in section 4
3. Cancel all heating demand from the distribution system.
4. Turn on the boiler power breakers and switch.
5. The main contactors should be activated in sequence and the controller display shall be lighted. The heating elements shall not come on because there is no heat demand applied to the controller (open contact between terminal 11&12 or 11&13) and if there is no water circulation in the unit.
6. Apply a heat demand (Close contact between terminal 11&12 of the controller). The circulating pump shall be in operation (This pump is not controlled by the boiler controller). If the boiler target temperature is higher than the boiler water temperature, the heating elements shall come on in sequence more or less rapidly depending on the differential between the values. N.B. It is normal that the elements be activated very rapidly during the boiler startup since this temperature differential is generally high at this moment.
7. When the boiler capacity has reached 100% as displayed on the controller, measure the amperage and voltage values drawn by the unit. These values shall be close to those shown on the boiler name plate.
8. Slow down the heat demand from the heating system. The boiler temperature shall gradually increase and the boiler capacity shall drop gradually and stabilize when the boiler temperature will reach a temperature near the target temperature.
9. When the heat demand has been completed (if an external controller is connected to terminals 11&12) the circulating pump could remain in operation or stop but the heating elements shall all come OFF.
10. Check the operation of the adjustable hi-limit mechanical control.
11. Check the operation of the Low Water Cut OFF by pressing its test button during 5 sec. This control is optional on models 45 to 108.

Section 6 : TROUBLE SHOOTING

6.1 TROUBLE IDENTIFICATION CODES

6.1.1 EXT FAUL LWC HL :
Means “External fault from Low Water Cut Off or High Limit.
This fault happens when an open contact appears between terminals 11 &15 on the controller. Look for the cause of that open contact which should normally come from the LWCO (low water cut off if used on your unit), or the two hi-limit temp. controls or the relay activated by these accessories. When such conditions happen, the display will turn red and the triangle symbol will appear. The alarm contact will close if it has been activated.
If this condition persist, the unit will be completely turn off (hard lock-out). The “C” button will have to be pressed for 10sec or the power turned off and on to reset the unit.

6.1.2 DISH TM WARNING :
Means « Discharge temperature warning » which represent a warning of non adequate boiler temperature.

If the “H” symbol and a triangle are shown on the display which has turn to Red
This indicate that the boiler temperature has get to a temperature above the HL value set in menu “Alarm & Back-up” of the controller. The heating elements will be deactivated. They will be reactivated and the screen will return to blue if the boiler temperature comes back to normal. If the hi-limit condition remains, the boiler will completely stop in hard lock out. The “C” button will have to be pressed for 10sec or the power turned off and on to reset the unit.

If the “L” symbol and a triangle are shown on the display
This indicate that the boiler temperature has get to a temperature below the target temperature from a value equal to the low limit differential value set in the Alarm & Backup menu at the parameter “temp. drop to start aux” and that this condition is present since the time set at “delay to start aux” in the “alarm & back up setting”. When this happens, the elements keep on working and the auxiliary boiler (if used) is activated. The warning will disappear when the boiler temp. will get near the target temperature.
If the boiler temperature remains too low for a period equal to the the “Lack cap delay for alarm” corresponding to the “lack cap delay for alarm” the alarm will be activated and the display will be turned to red.

6.1.3 DISH TEMP LL
Means that the boiler temperature is below the actual target temperature minus the value of “Low limit diff” since more than the value selected on parameter “Lack cap. delay for AUX” in the adjustments of the Back Up parameters.

6.1.4 ALARM OUT ON
Means that the alarm contact between the two “AL” terminals in the controller box is close allowing the alarm to be activated

6.1.5 LACK CAP TOO LOW
Means that the time duration of the boiler operation “lack cap delay for alarm” where the boiler temperature was below the value of the target temperature minus the Low Limit differential has expired.

6.1.6 DISCH TE PROBLEM
Means a problem with the boiler temperature reading of the electronic sensor connected to the controller (generally an open or short circuit). This sensor is located in an immersion well located in the upper section of the main electrical panel. Check the value of the resistance in ohm of the sensor. It should be around 10kohm at room temperature.

6.1.7 FX OUT T PROBLEM
This will happen when the ORST (outdoor reset target temp. mode) has been selected and the controller can not read the value of the outdoor temperature (open or close circuit). The alarm contact closes, the screen turns to red, the triangle fault appears and the error code is shown.
The boiler remains in operation but at the maximum target temperature set in the Outdoor Reset parameters when the outdoor temp. is the lowest.

Table 11 : Resistance value of the temp. sensors

Temperature		Resistance	Temperature		Resistance	Temperature		Resistance	Temperature		Resistance
°F	°C	Ω	°F	°C	Ω	°F	°C	Ω	°F	°C	Ω
-50	-46	490,813	20	-7	46,218	90	32	7,334	160	71	1,689
-45	-43	405,710	25	-4	39,913	95	35	6,532	165	74	1,538
-40	-40	336,606	30	-1	34,558	100	38	5,828	170	77	1,403
-35	-37	280,279	35	2	29,996	105	41	5,210	175	79	1,281
-30	-34	234,196	40	4	26,099	110	43	4,665	180	82	1,172
-25	-32	196,358	45	7	22,763	115	46	4,184	185	85	1,073
-20	-29	165,180	50	10	19,900	120	49	3,760	190	88	983
-15	-26	139,402	55	13	17,436	125	52	3,383	195	91	903
-10	-23	118,018	60	16	15,311	130	54	3,050	200	93	829
-5	-21	100,221	65	18	13,474	135	57	2,754	205	96	763
0	-18	85,362	70	21	11,883	140	60	2,490	210	99	703
5	-15	72,918	75	24	10,501	145	63	2,255	215	102	648
10	-12	62,465	80	27	9,299	150	66	2,045	220	104	598
15	-9	53,658	85	29	8,250	155	68	1,857	225	107	553

Section 6: Maintenance

Properly maintained, your boiler will provide years of dependable, trouble free service. It is recommended that a regular routine maintenance program be established and followed by the user. Components are subject to eventual failure that requires service. Failure to use the correct procedures or parts in these circumstances may make the unit unsafe or reduce the life of the boiler.

The owner should have the following inspection and maintenance procedures performed:

6.1 BOILER WATER PIPING:

- ❑ Yearly visual inspection.

Check all piping for signs of leakage near joints, unions and shut-off valves. Repair as needed.

6.2 PRESSURE RELIEF VALVE

- ❑ Twice a year.

Check for possible leak at the outlet of the safety relief valve. If a leak is detected and the pressure at the indicator is less than 28psi, change the safety relief valve with a new one having similar characteristics. If the pressure is higher than 28psi, ask your heating service agency to determine the cause of the high pressure and have it corrected rapidly. Do not plug the outlet of this valve if a dripping condition occurs.

6.3 AIR PURGE

- ❑ Twice a year

Check for proper operation of the automatic air purgers and activate manual air vents to eliminate air present.

6.4 ELECTRIC INSPECTION:

- ❑ Annually

It is recommended to perform a visual inspection of the boiler electric compartment annually, during the heating season, to ensure it is watertight and that there are no signs of component or wiring overheating. Repair as soon as possible if necessary. Defective components should always be replaced with the Original Manufacturer's parts.

⚠ WARNING

The manufacturer's warranties DO NOT cover tank failure due to improper installation or maintenance. If the pressure relief valve on the heater discharges periodically, this may be due to thermal expansion. Immediately call a qualified service technician to inspect and to remedy as needed.

NOTE: To prevent premature tank failure, the air trapped inside the tank must be purged periodically.

⚠ DANGER

Before manually operating the relief valve, make certain no one will be sprayed with the hot water released by its opening. The water may be hot enough to create a SCALD hazard. The water released should be directed to a suitable drain to prevent injury or damage.

Figure 12: External components location

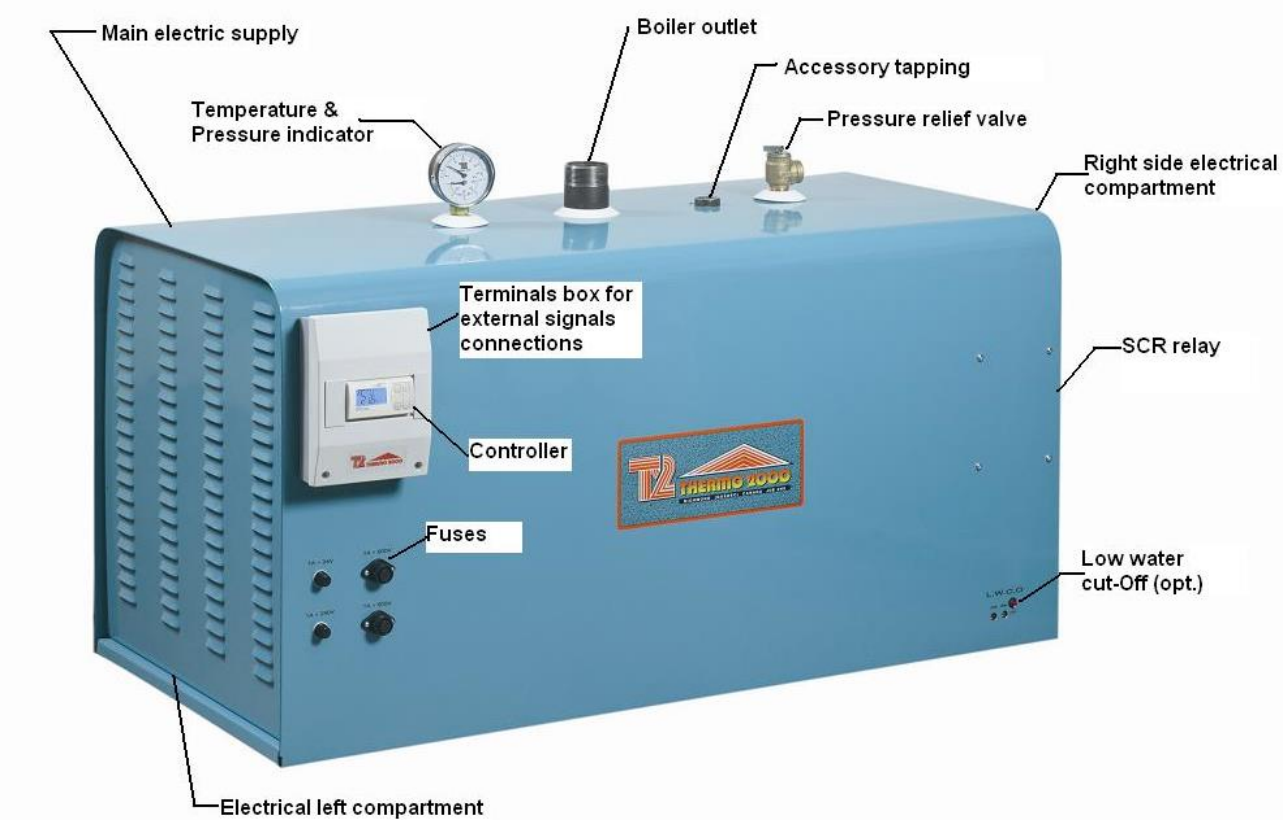


Figure 13 Electrical components location in the left electrical compartment

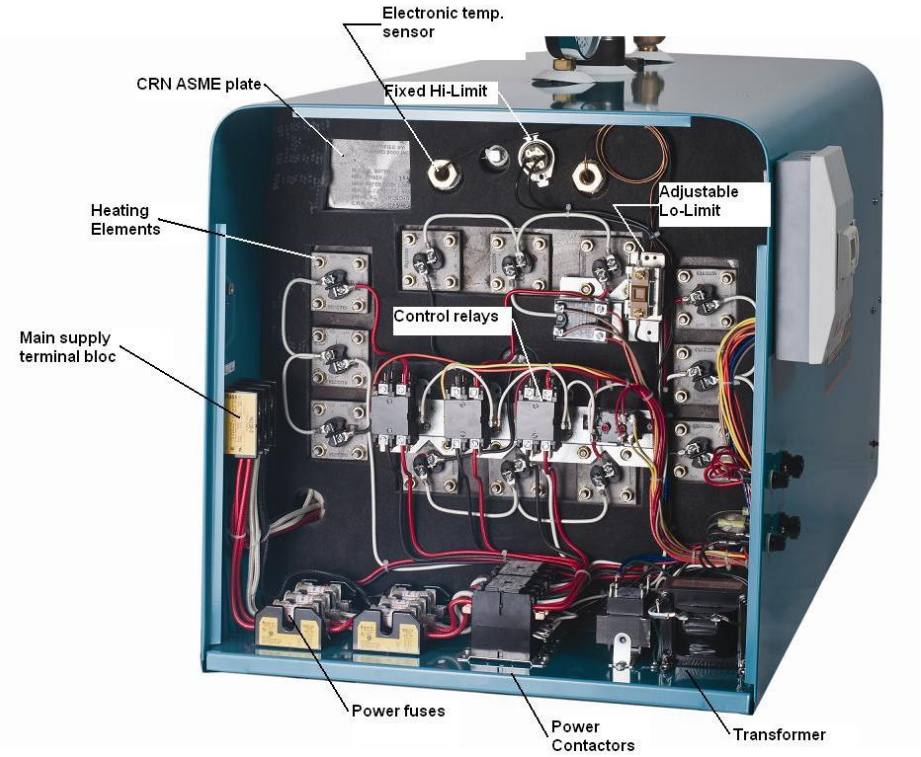
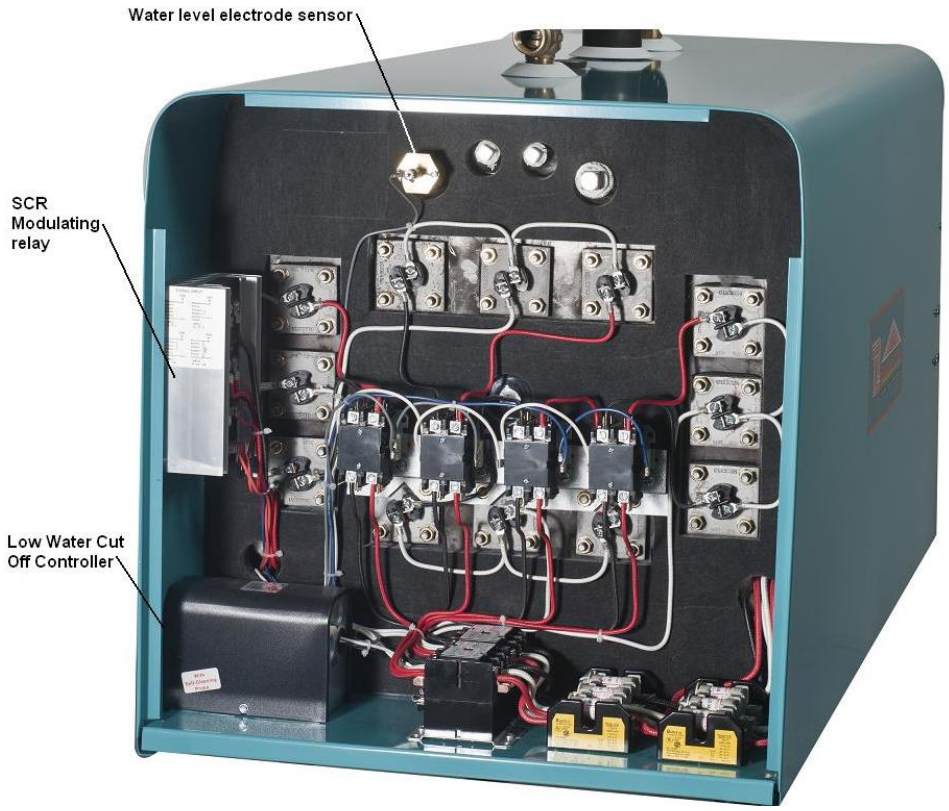


Figure 14 Electrical components location in the right electrical compartment



DTH ULTRA a LIMITED WARRANTY

Warranty Coverage for Residential Installation.

Thermo 2000 Inc. hereby warrants to the original residential purchaser that the DTH Ultra tank installed in a residential setting shall be free of leaks during normal use and service for a period of fifteen (15) years from the date of purchase as long as the original residential purchaser owns the home in which the unit was originally installed. Residential setting shall mean usage in a single-family dwelling in which the consumer resides on a permanent basis. Also, residential setting shall mean use in multiple family dwellings in which one (1) DTH Ultra tank is to be use in only one (1) dwelling. In the event that a leak should develop and occur within this limited warranty period due to defective material or workmanship, such leak having been verified by an authorized company representative, Thermo 2000 inc. will repair or replace at our sole option the failed unit with the nearest comparable model at the time of replacement.

The original residential purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from manufacturing plant. The replacement unit will be warranted for the remaining portion of the original Warranty.

Warranty Coverage for Commercial Installation.

Thermo 2000 Inc. warrants to the original purchaser that the DTHUltra tank installed in a commercial setting for fifteen (15) years.
Commercial setting shall mean use in other than residential setting stated above in the residential setting definition. In the event that a leak should develop and occur within this limited warranty period due to defective material or workmanship, such leak having been verified by an authorized company representative, Thermo 2000 inc. will repair or replace at our sole option the failed unit with the nearest comparable model at the time of replacement.

The original purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from Manufacturer. The replacement unit will be warranted for the remaining portion of the original Warranty.

*Limited two years warranty on all D*TH ULTRA *components & parts*

All other DTHUltra components & parts are warranted for a period of two (2) years against defects due to defective material or workmanship. The original purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from Manufacturer. The components, repaired or replaced are warranted for the residual period of the initial warranty on the unit.

Exclusions.

This warranty is void and shall not apply if:

1. Defects or malfunctions resulting from installation, repair, maintenance and/or usage that are not done in conformity with the manufacturer's installation manual; or
2. Defects or malfunctions resulting from installation, maintenance, or repair that are not done in accordance with regulations in force; or
3. Defects or malfunctions resulting from improper installation, maintenance or repair done carelessly or resulting from consumer damage (improper maintenance, misuse, abuse, accident or alteration); or
4. Installation in which a relief valve (pressure) is not installed or if it is not functioning properly, or when it is not connected to a drain to avoid damage to the property; or
5. Installation in which liquid circulating in the tank does not remain in closed circuit or installation in which piping is leaking; or
6. A polybutylene pipe or radiant panel installation without an oxygen absorption barrier is used; or
7. Installation where the acidity of water is not within the normal Environmental Protection Agency (EPA) (between pH 6.5 – 8.5) guidelines or the water contains abnormal levels of particulate matter or water exceeding 10.5 gpg; or
8. Your home contains any type of water softener system and the unit is not installed and maintained in accordance with the manufacturer specifications; or
9. The DTH Ultra unit is being subject to non authorized modifications; or
10. Defects or malfunction resulting of storing or handling done elsewhere than Thermo 2000's manufacturing plant; or
11. Units on which the serial number is removed or obliterated.

Limitations.

Thermo 2000 shall not be responsible for any damage, loss, and inconvenience of any nature whatsoever, directly or indirectly, relating to the breakdown or malfunction of the unit. This warranty limits its beneficiary's rights. Nevertheless, the beneficiary may have other rights, which vary from state to state.

This warranty replaces any other expressed or implicit warranty and constitutes the sole obligation of Thermo 2000 towards the consumer. The warranty does not cover cost of removal, reinstallation or shipping to repair or replace the unit, nor administration fees incurred by the original consumer purchaser.

Thermo 2000 reserves its rights to make changes in the details of design, construction, or material, as shall in its judgment constitute an improvement of former practices.

This warranty is valid only for installations made within the territorial limits of Canada and the United States.

Warranty service procedure

Only authorized DTH Ultra dealers are permitted to perform warranty obligations. The owner or its contractor must provide Thermo 2000's head office or authorized depot with defect unit together with the following information: DTH Ultra model and serial number, copy of the original sales receipt and owner's identification certificate.

THERMO 2000 INC.

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