Guide for Installation and Use
For
HOT DISPLAY UNITS

PROPER USE

The hot display as described in this operating manual are mainly intended for presenting and keeping warm many products from chickerns and curries to ready-meals, rice, pizzas and pies..

The siting of Frost-tech cabinets must be carried out by qualified technical personnel.

Do not load the cabinet with products at ambient temperature or use it to heat products. The food must be cooked before loading into a hot display unit.

After cooking the food must immediately be loaded into the hot display at a high temperature (above 65°C) and disposed after two hours from display

The products should be loaded in such a way that the correct rotation of the product is ensured.

Variation in the configuration of the equipment and/or the use of elements added without the authorisation of Frost-Tech Limited, may cause incorrect operation.

Products may be stored for no longer than 2 hours at a minimum temperature of 63°C

Remember: keep hot foods really hot, at 63°C or hotter

Proper use only means the use as described above, adhering to the specifications on installation, operation and service. Any other use is regarded as being contrary to specifications and is prohibited

Keeping Food at Safe Temperatures

Stage of Food Handling	When to Check	Recommended Safe Temps
Delivery	Every time perishable food is delivered	0° to 5°C is ideal for refrigerated food. –22° C to – 18° C is ideal for frozen food
Storage in refrigerator or cold store	Daily, at least	0° to 5° C
Storage in refrigerated counter or display	Daily, at least	0° to 5° C
Deep Freezer	Daily, at least	- 18°C or below
Defrosting frozen meat or poultry	Whenever food is thawed	0° to 5°C
Cooking	Whenever food is cooked	Minimum core temp.of 70° C for 2 mins
Cooling	Whenever food is cooled	5° C or cooler, ideally within 90 minutes
Re-heating	Whenever food is re-heated	Minimum core temp.of 70° C for 2 mins
Hot food on display	Frequently while on display	Minimum core temp of 63° C
Cold food on display	Frequently while on display	0° to 5°C is recommended

The chart above gives the temperatures that are generally accepted as good practice together with the recommended period of time involved where appropriate. Keeping food at these temperatures plays a major part in ensuring that food is safe to eat. Do not leave food standing in a room, or in sunlight (for instance in a shop window)

Cooking at 70° or hotter for sufficient time kills most pathogenic bacteria, although some bacterial spores can survive high temperatures. Food must always be cooked thoroughly, right through to the centre of the thickest part

Remember: Keep cold foods really cold
Keep hot foods really hot, above 63°C

SAFETY REGULATIONS

The plug-in hot display described in this operating manual is designed and manufactured in compliance with the international safety regulations. Like any electrical appliance, it must be handled with all due care, particularly with consideration to ensuring electrical safety.

To ensure safe operation in all service conditions, the following safety precautions must be observed:

- The power plug must be connected in regulation matter and as instructed in this manual
- Contact your service organisation if you are in any doubt about electrical connection, working or safety of your plug-in the display cabinet.
- When disconnecting the power plug, always pull on the plug itself and never the cable.
- Never detach any cover except where specifically instructed in this manual. Doing so might expose live electrical parts
- If any damage occurs to the power cable, pull the plug to disconnect the cabinet
- Never use a water-hose or high-pressure jet to clean the cabinet.
- All work on electrical equipment must be left to a qualified electrician. Safety First!
- Never connect the cabinet to the power supply if it is damaged (in transit or otherwise) When in doubt contact your service organisation or dealer

INSTALLATION

Selecting the Place of Installation

In selecting the place of installation, ensure that the following instructions are observed, this being vital for proper and troublefree working of the cabinet.

- do not install the cabinet outdoors
- do not install the cabinet in the vicinity of heating radiators or other heat sources
- do not install the cabinet where it is exposed to drafts from air conditioners, ventilators or open doors
- do not stack items on top of the unit

Requirements for Electrical Connection

The hot display must be PAT tested (Portable Appliance Test) to the legal requirement. This is to ensure that all electrical connections and components have not been damaged in transit

The cabinet is connected by inserting the power plug into a socket. The plug is fitted with a 13-amp fuse. The cabinet has an ON/OFF switch but we recommend the provision of a remote switch. Ask your electrician

The socket employed must be properly earthed, firmly installed and protected by a 32-amp type C circuit breaker.

Supply voltage and frequency must be in accordance with the data shown on the cabinet type plate. The local utility company's regulations on earth-fault protection must be observed. If in doubt, consult a qualified electrician.

The cabinet must not be plugged into a multiple outlet power strip

Run the power cables so that they are protected from risk of damage and there is no risk of tripping

STARTING

Ensure the means of transporting/positioning used does not damage elements which exist in the lower part of the equipment.

Start the cabinet only if it has been installed as described

- plug power plug into socket
- switch on

SETTING THE TEMPERATURE

The temperature is controlled by the.thermostat which can be set at the required level by turning the dial. It will take a few minutes for the desired temperature to be reached

Regulation which is different from those recommended may be necessary for reasons of non-standard ambient and/or operating conditions
The units are delivered with the regulation already factory-set.

CLEANING

A general shut down of the units must be carried out every 30 days in order to carry out a general cleaning For purposes of hygeine, more frequent cleaning may be necessary..

Turn off power supply to the cabinet by disconnecting the power plug before cleaning.

Do not use any aggressive or abrasive cleaning agents. Never use a water hose or a high-pressure jet to clean the cabinet.

Cleaning the Outer-casing

Wipe the outer casing with a cotton cloth moistened with luke-warm water. The glazed parts of the end walls can be cleaned with a commercial-brand alcohol based glass cleaner

Cleaning the internal surfaces

Remove the merchandise from the display compartment and transfer it to another storage place

Do not start cleaning before the internal surfaces have cooled to near room temperature:

- take accessories out of display compartment
- moisten cotton cloth with luke-warm water and a little detergent
- wipe display compartment and display shelves
- carefully dry all wiped surfaces with a dry cotton cloth

After cleaning, no humidity should remain in the display compartment

Restart cabinet
The cabinet can be reloaded with heated merchandise approximately 40 minutes after putting into operation

MAINTENANCE

Maintenance must be carried out by a qualified electrical engineer every three months.

The positioning and type of defective elements to be repaired or replaced can be seen in the spare parts drawings

In order to prevent accidents: WHERE THE MANIPULATION AND/OR REPLACEMENT OF ELECTRICAL COMPONENTS IS TO BE CARRIED OUT, ALWAYS DISCONNECT THE UNITS FROM THE ELECTRIC MAINS BEFOREHAND

Turn off power supply to the cabinet by disconnecting the power plug before starting any maintenance on the cabinet

In the case of breakdown in the functioning of the unit, the user must carry out the necessary steps to prevent the deterioration of the product. i.e. destocking and removal of the product to an operational storage facility.

- maintenance shall be carried out in such a way that:
  a) accidents to personnel are minimised
  b) damage to goods is prevented
  c) the components of the system remain in good working order
  d) the purpose and availability of the system are maintained
  e) waste of energy is minimized

- During each periodic maintenance and following each repair, the following tasks shall be performed
  a) all safety, control and measurement devices as well as alarm systems shall be checked to verify their correct operation and perfect working order.
  b) functional test of safety devices
- Maintence and repair requiring the assistance of other skilled personnel (such as welders, electricians and other specialist staff) shall be carried out under the supervision of a qualified electrical engineer
- Replacement of components or changes to the system shall be ordered and carried out by a qualified electrical engineer

Adhering to these maintenance procedures will ensure the cabinets work to their optimum efficiency, and will detect any faulty parts before any major breakdown occurs. *Failure to keep to this maintenance schedule will invalidate the manufacturer's warranty and no claim will be accepted*

USERS' RESPONSIBILITY

Card situated near the unit indicating a) name & address of the installer or person responsible for service of the system

b) instructions for shutting down the system in case of emergency

Log book recording a) all details of maintenance and repair work

b) changes and replacements of components to the system

c) results of all periodic routine tests

d) significant periods of non-use

Inspection: a) should be carried out after repair or significant alterations

c) should be carried out afterreinstalling on another site

d) equipment should be PAT tested (Portable Appliance Test to the legal requirements

Maintenance & Repair: the system must be subjected preventative maintenance every three months. The parties concerned for the hot system must ensure that the system is regularly inspected, supervied and maintained in a satisfactory manner

a) the parties concerned shall be responsible when the system is used by another person unless a division of responsibility has been agreed upon

b) regular maintenance or adjustment of the hot system can only be carried out by a qualified engineer

c) the maintenance shall be carried out every three months by a qualified engineer and will include the following procedures

- check all controls and panel
- test Klixon overload
- test transformer
- check all electrical connections and wiring condition
- check fuses and electrical sockets
- check customer's power supply
- check condition of electrical control panel including any signs of overheating of electricalcomponents and wiring loom Repair or replace as neccessary
- check tightness of all terminals
- check integrity of seals on components
- check internal lights
- check shelves & supports

RUN & TEST THAT ALL PARTS ARE WORKING SATISFACTORILY

- maintenance shall be carried out in such a way that:
  a) accidents to personnel are minimised
  b) damage to goods is prevented
  c) the components of the system remain in good working order
  d) the purpose and availability of the system are maintained
  e) waste of energy is minimized
- Repairs on components shall be carried out in the following order:
  a) instructing of the maintenance staff
  b) disconnecting & safeguarding of the components to be repaired
  c) releasing for repair. NOTE: welding or arc/flame-producing apparatus may require a special work permit
  d) carrying out the repair
  e) testing & checking of the repaired component

- During each periodic maintenance and following each repair, the following tasks shall be performed
  - ***f) all safety, control and measurement devices as well as alarm systems shall be checked to verify their correct operation and perfect working order.***
  - g) functional test of safety devices
- Maintence and repair requiring the assistance of other skilled personnel (such as welders, electricians and other specialist staff) shall be carried out under the supervision of a qualified engineer
- Replacement of components or changes to the system shall be ordered and carried out by a qualified engineer

Adhering to these maintenance procedures will ensure the cabinets work to their optimum efficiency, and will detect any faulty parts before any major breakdown occurs. *Failure to keep to this maintenance schedule will invalidate the manufacturer's warranty and no claim will be accepted*

SHUT DOWN

Remove the merchandise from the display compartment and transfer to another storing place

Unplug power plug or switch off control switch

If the cabinet is to be shut down for any length of time, clean cabinet

When stored in a storage room, cover with a cotton sheet.

Do not use plastic tarpaulins as these may encourage formation of moisture and odours inside the cabinet

TROUBLESHOOTING

Any trouble occurring might be due to a minor problem that you can correct yourself following the instructions below. Do not try any further action if the pointers given cannot solve the problem!

Repairs on the cabinet must be made only by a qualified electrical engineer. Incompetent repair work can cause serious personal danger: contact your service organisation for any repairs needed.

Cabinet does not work

Possible Cause:	Corrective Measure:
a) power plug not connected	*Insert plug properly. Switch ON*
b) fuse blown, power plug or socket defective	*Contact your electrician or service organisation*

Temperatuere not high enough

thermostat misadjusted	*Adjust thermostat in small increments*

Cabinet lighting failed

a) lighting not switched on	*Switch lighting on*
b) the lamp or light fitting is defective	R*eplace lamp or complete fitting*

Formation of Odour in Cabinet

Spillage	*Clean*

AT2-5 INSTRUCTIONS FOR USE

Thank you for having chosen a LAE electronic product. Before installing the instrument, please read these instructions carefully to ensure maximum performance and safety.

DESCRIPTION

Fig.1 — Front panel

- Info / Setpoint button.
- Manual defrost / Decrease button.

INDICATIONS

- Thermostat output
- Fan output
- Auxiliary output
- Activation of 2nd parameter set
- Alarm

- Increase / manual activation button.
- Exit / Stand-by button.

INSTALLATION

- Insert the controller through a hole measuring 71x29 mm.
- Make sure that electrical connections comply with the paragraph "wiring diagrams". To reduce the effects of electromagnetic disturbance, keep the sensor and signal cables well separate from the power wires.
- Fix the controller to the panel by means of the suitable clips, by pressingly gently; if fitted, check that the rubber gasket adheres to the panel perfectly, in order to prevent debris and moisture infiltration to the back of the instrument.
- Place the probe T1 inside the room in a point that truly represents the temperature of the stored product.
- Place the probe T2 on the evaporator where there is the maximum formation of frost.

OPERATION

DISPLAY

During normal operation, the display shows either the temperature measured or one of the following indications:

DEF	Defrost in progress	**HI**	Room high temperature alarm
REC	Recovery after defrost	**LO**	Room low temperature alarm
OFF	Controller in stand-by	**E1**	Probe T1 failure
CL	Condenser clean warning	**E2**	Probe T2 failure
DO	Door open alarm		

INFO MENU

The information available in this menu is:

T1	Instant probe 1 temperature	**TLO**	Minimum probe 1 temperature recorded
T2	Instant probe 2 temperature	**CND**	Compressor working weeks
THI	Maximum probe 1 temperature recorded	**LOC**	Keypad state lock

Access to menu and information displayed.

- Press and immediately release button [i].
- With button [▼] or [▲] select the data to be displayed.
- Press button [i] to display value.
- To exit from the menu, press button [✕] or wait for 10 seconds.

Reset of THI, TLO, CND recordings

- With button [▼] or [▲] select the data to be reset.
- Display the value with button [i].
- While keeping button [i] pressed, use button [✕].

SETPOINT (display and modification of desired temperature value)

- Press button [i] for at least half second, to display the setpoint value.
- By keeping button [i] pressed, use button [▼] or [▲] to set the desired value (adjustment is within the minimum **SPL** and the maximum **SPH** limit).
- When button [i] is released, the new value is stored.

STAND-BY

Button [⏻], when pressed for 3 seconds, allows the controller to be put on a standby or output control to be resumed (with **SB**=YES only).

KEYPAD LOCK

The keypad lock avoids undesired, potentially dangerous operations, which might be attempted when the controllers is operating in a public place. In the INFO menu, set parameter **LOC**=YES to inhibit all functions of the buttons. To resume normal operation of keypad, adjust setting so that **LOC**=NO.

SELECTION OF SECOND PARAMETER GROUP

It's possible to select control parameters between two different pre-programmed groups, in order for the fundamental control parameters to be adapted quickly to changing needs. With **IISM**=MAN, changeover from Group I to Group II takes place manually by pressing button [▼] for 2 seconds. The activation of Group II is signalled by the lighting up of the relevant LED on the controller display. If **IISM**=NON, switchover to group II is inhibited.

DEFROST

Timed defrost. Defrosting starts automatically when necessary time has elapsed to obtain the defrosting frequency set with **DFR (IIDF)**. For example, with **DFR**=4 defrosting occurs once every 6 hours. The internal timer is set to zero when power is applied to the controller and at each subsequent defrost start. When the controller is put on a standby, the accumulated time count is "frozen" (is not incremented).

Manual defrost. Defrosting may also be induced manually by keeping the button [▼] pressed for 2 seconds.

Defrost type. Once defrost has started, Compressor and Defrost outputs are controlled according to the parameters **DTY** and **OAU**. The AUX output is associated to defrost function with **OAU**=DEF exclusively.
If **FID**=YES the evaporator fans are active all through defrost.

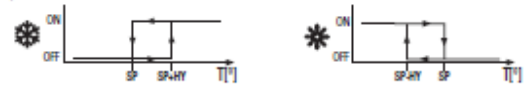
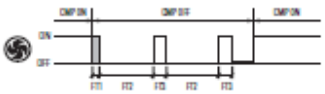
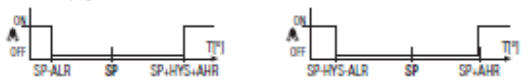
Defrost termination. Defrost lasts as long as time **DTO** but, if the evaporator probe has been enabled (**T2**=YES) and temperature **DLI** is achieved before this time elapses, defrost will be terminated in advance.

Resuming thermostatic cycle. When defrost is over, if **DRN** is greater than 0, all outputs will remain off for **DRN** minutes, in order for the ice to melt completely and the resulting water to drain. Moreover, if probe T2 is active (**T2**=YES), the fans will re-start when the evaporator gets to a temperature lower than **FDD**; Vice versa, if such condition does not occur after 4 minutes following defrost termination, the fans will be switched on anyway.

Caution: if C-H=HEA all defrost functions are inhibited; if DFR=0 the timed defrost function is excluded; during defrost, the high temperature alarm is inhibited.

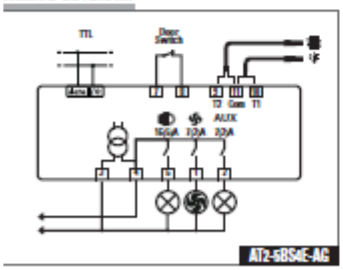
CONFIGURATION PARAMETERS

- The setup menu is accessed by pressing button [✕]+[i] for 5 seconds.
- With button [▼] or [▲] select the parameter to be modified.
- Press button [i] to display the value.
- By keeping button [i] pressed, use button [▼] or [▲] to set the desired value.
- When button [i] is released, the newly programmed value is stored and the following parameter is displayed.
- To exit from the setup, press button [✕] or wait for 30 seconds.

PAR	RANGE	DESCRIPTION
SCL	°C; 2°C; °F	Readout scale. °C (only with **INP**=SN4): measuring range -50/-9.9 ... 19.9/80°C 2°C: measuring range -50 ... 120°C °F: measuring range -55 ... 240°F Caution: upon changing the **SCL** value, it is then absolutely necessary to reconfigure the parameters relevant to the absolute and relative temperatures (**SPL**, **SPH**, **SP**, **ALA**, **AHA**, etc..)
SPL	-50..SPH	Minimum limit for **SP** setting
SPH	SPL.120°	Maximum limit for **SP** setting
SP	SPL... SPH	Setpoint (value to be maintained in the room).
C-H	REF; HEA	Refrigerating (REF) or Heating (HEA) control mode
HYS	1...10°	OFF/ON thermostat differential  Refrigerating control (**C-H**=REF) Heating control (**C-H**=HEA)
CRT	0...30min	Compressor rest time. The output is switched on again after **CRT** minutes have elapsed since the previous switchover. We recommend to set **CRT**=03 with **HYS**<2.0°.
CT1	0...30min	Thermostat output run when probe T1 is faulty. With **CT1**=0 the output will always remain OFF.
CT2	0...30min	Thermostat output stop when probe T1 is faulty. With **CT2**=0 and **CT1**>0 the output will always be ON. Example: **CT1**=4, **CT2**=6: in case of probe T1 failure, the compressor will cycle 4 minutes ON and 6 minutes OFF.
CSD	0...30min	Compressor stop delay after the door has been opened (active only if **DIS**=YES).
DFR	0... 24(1/24h)	Defrost frequency expressed in cycles/24 hours.
DLI	-50...120°	Defrost end temperature.
DTO	1...120min	Maximum defrost duration.
DTY	OFF; ELE; GAS	Defrost type OFF: off cycle defrost (Compressor and Heater OFF). ELE: electric defrost* (Compressor OFF and Heater ON). GAS: hot gas defrost* (Compressor and Heater ON). * The defrost output is active if only **OAU**=DEF.
DRN	0...30min	Pause after defrost (evaporator drain down time).
DDY	0...60min	Display during defrost. If **DDY**=0 during defrost the temperature continues to be displayed. If **DDY**>0, during defrost the display shows DEF, and at the end of defrost it shows REC for **DDY** minutes.
FID	NO/YES	Fans active during defrost.
FDD	-50...120°	Evaporator fan re-start temperature after defrost.
FTC	NO/YES	Optimised fan control enabling. With **FTC** = NO the fans remain on all the time  Fig. 2 Optimised fan control (**FTC**=YES)
FT1	0...180sec	Fan stop delay after compressor stop. See Fig. 2.
FT2	0...30min	Timed fan stop. With **FT2**=0 the fans remain on all the time.
FT3	0...30min	Timed fan run. With **FT3**=0, and **FT2**>0, the fans remain off all the time.
ATM	NON; ABS; REL	Alarm threshold management. NON: all temperature alarms are inhibited (the following parameter will be **ADD**). ABS: the values programmed in **ALA** and **AHA** represent the real alarm thresholds. REL: the values programmed in **ALR** and **AHR** are alarm differentials referred to **SP** and **SP+HY**.  Temperature alarm with relative thresholds, refrigerating control (**ATM**=REL, **C-H**=REF). Temperature alarm with relative thresholds, heating control (**ATM**=REL, **C-H**=HEA).

ALA	-50... 120°	Low temperature alarm threshold.
AHA	-50... 120°	High temperature alarm threshold.
ALR	-12... 0°	Low temperature alarm differential. With **ALR**=0 the low temperature alarm is excluded.
AHR	0... 12°	High temperature alarm differential. With **AHR**=0 the high temperature alarm is excluded.
ATD	0... 120min	Delay before alarm temperature warning.
ADO	0... 30min	Delay before door open alarm warning.
ACC	0...52 weeks	Condensor periodic cleaning. When the compressor operation time, expressed in weeks, matches the **ACC** value programmed, "CL" flashes in the display. With **ACC**=0 the condensor cleaning warning is disabled.
IISM	NON; MAN;	Switchover mode to second parameter set NON: inhibition to use the second parameter group (the following parameter will be **SB**). MAN: button M switches the two parameter groups over.
IISL	-50...IISH	Minimum limit for **IISP** setting.
IISH	IISL...120°C	Maximum limit for **IISP** setting.
IISP	IISL... IISH	Setpoint in mode 2
IIHY	1...10°	OFF/ON differential in mode 2.
IIFT	NO/YES	Optimised fan control enabling in mode 2.
IIDF	0...99hours	Defrost timer set to start a defrost in mode 2.
SB	NO/YES	Stand-by button enabling ⏻.
DS	NO/YES	Door switch input enabling (closed when door is closed).
LSM	NON; MAN; DOR	Light control mode NON : light output not controlled. MAN : light ouput controlled through button M (if **OAU**=LGT). DOR : light ouput switched on when door is opened (if **OAU**=LGT).
OAU	NON; 0-1; DEF; LGT; AL0; AL1	AUX output operation. NON : output disabled (always off). 0-1 : the relay contacts follow the on/standby state of controller. DEF : output programmed for defrost control. LGT : output enabled for light control. AL0 : contacts open when an alarm condition occurs. AL1 : contacts make when an alarm condition occurs.
INP	SN4; ST1	Temperature sensor selection. With **INP** = SN4, the probes must be the LAE models SN4...; with **INP** = ST1, the probes must be the LAE models ST1...
OS1	-12.5...12.5°C	Probe T1 offset.
T2	NO/YES	Probe T2 enabling (evaporator).
OS2	-12.5...12.5°C	Probe T2 offset.
TLD	1...30 min	Delay for minimum temperature (TLO) and maximum temperature (THI) logging.
SIM	0...100	Display slowdown.
ADR	1...255	AT2-5 address for PC communication.

WIRING DIAGRAM



TECHNICAL DATA

Power supply
AT2-5...E 230Vac±10%, 50/60Hz, 3W
AT2-5...U 115Vac±10%, 50/60Hz, 3W
AT2-5...D 12Vac/dc±10%, 3W

Relay outputs
AT2-5.0... Compressor 12(5)A 240vac
AT2-5.S... Compressor 16(5)A 240vac
Evaporator fans 7(2)A 240vac
Auxiliary loads 7(2)A 240vac

AT2-5.0... maximum total current 12A
AT2-5.S... maximum total current 16A

Inputs
NTC 10KΩ@25°C, LAE part No. SN4...
PTC 1000Ω@25°C, LAE part No. ST1...

Measurement Range
-50...120°C, -55...240°F
-50 / -9.9 ... 19.9 / 80°C (NTC10K only)

Measurement accuracy
<0.5°C within the measurement range

Operating conditions
-10 ... +50°C; 15%...80% r.H.

CE - UL (Approvals and Reference Norms)
EN60730-1; EN60730-2-9;
EN55022 (Class B);
EN50082-1
UL 60730-1A

Front protection
IP55

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