**Note: This document contains short form instructions for experienced users. Use last column in List of Parameters to document your individual settlings. More detailed information can be found in the User Manual.**

The **EC3-332** is a dedicated controller for refrigerated coldrooms with superheat control and a driver for an Alco Controls Electrical Control Valve EX4...EX8. In addition the EC3-332 controls air temperature and manages defrost and fan(s).
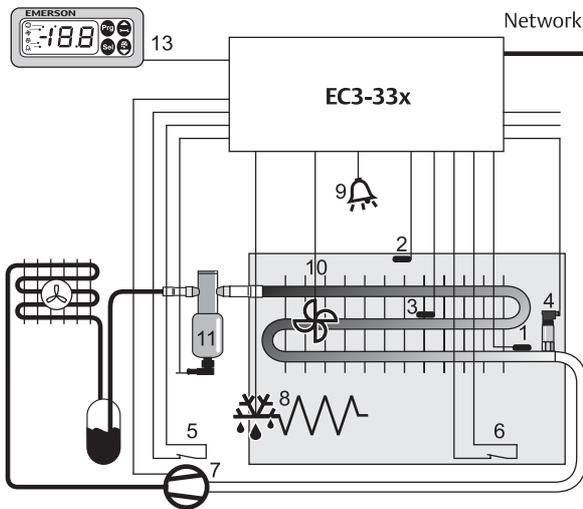
A PT4 pressure transmitter (4) and an ECN-Pxx pipe temperature sensor (1) measure saturated suction gas pressure and suction gas temperature at the evaporator outlet and feed the signals into the superheat control loop. The superheat controller output modulates the opening of the EX4…EX8 Electrical Control Valve (11) thus optimising the refrigerant mass flow through the evaporator. The ECN-Sxx air temperature sensor (2) measures air-in temperature at the evaporator and feeds a signal into the air temperature thermostat. The ECN-Fxx fin sensor (3) is used for defrost termination. Digital input (5) should be connected to the serial control loop of a compressor (where applicable) and digital input (6) should be connected to the coldroom door contact. The controller has 4 relay outputs to control the compressor (7), defrost heater (8) evaporator fan (10) and an external alarm device (9). Please consult the technical data (right) for input and output ratings.

The EC3-332 features an integral backup battery to close the electrical control valve in case of power loss. Due to the positive shut-off characteristics of the EX4…EX8 Electrical Control Valves, a liquid line solenoid valve is not needed to prevent flooding of the compressor.

The optional ECD-001 Display Unit (13) can be connected to the EC3-332 for local display of control parameters and for controller setup without the use of a PC. Because the EC3-332 is fully functional without display unit the ECD-001 may be removed at any time.

⚠ **Safety instructions:**

- **Read installation instructions thoroughly. Failure to comply can result in device failure, system damage or personal injury.**
- **The product is intended for use by persons having the appropriate knowledge and skills.**
- **Ensure electrical ratings per technical data are not exceeded.**
- **Disconnect all voltages from system before installation.**
- **Keep temperatures within nominal limits.**
- **Comply with local electrical regulations when wiring**
- **The EC3 series contains a lead, acid gel rechargeable battery. The battery must NOT be disposed of with other commercial waste. Instead, it is the users responsibility to pass it to a designated collection point for the safe recycling of batteries (harmonised directive 98/101/EEC). For further information, contact your local environmental recycling centre.**

Technical Data
EC3 Series Controller

Power supply	24VAC ±10%; 50/60Hz; Class II 6.3mm spade earth connector
Power consumption	25VA max. including EX4 … EX7 28VA max. including EX8
Communication	RJ45 TCP/IP Ethernet 10MBit/s
Plug-in connector size	Removable screw terminals, wire size 0.14…1.5 mm^2
Ambient temperature range	0 … 60°C 1 … 25°C (for best battery life time) > 35°C battery life time < 2 years
⚠ In order to provide system protection in the event of power loss, it is recommended to change the battery annually.	
Humidity	0…80% r.h. non condensing
Protection class	IP20
Pressure transmitter input	24VDC, 4…20mA
4-20 mA Analog output	For connection to any 3rd party controller with 12/24VDC power supply and appropriate burden.
Deviation from input signal	±8% max
Digital Inputs	24VAC/DC
Output relays (4)	Inductive (AC15) 250V/2A
Alarm, Comp	SPDT contacts, AgNi, resistive (AC1) 250V/8A
Heater, Fan	SPST contacts, AgNi, resistive (AC1) 250V/6A
⚠ If the alarm relay is not utilized, the user must ensure appropriate safety precautions are in place to protect the system against damage caused by a power failure.	
Stepper motor output	For EX4…EX8 Electrical Control Valves

ECD-001 Display Unit

Power Supply	From EC3-332 via connecting cable
Display	2½-digit red LED with decimal point switchable between °C and °F
LED indicators	Compressor, Fan, Defrost, Alarm, IR status
Temp & Humidity	Identical to EC3-332 specifications above
Protection class	IP65 (front protection with gasket)
Connecting cable	ECC-N10 (1,0m) or CAT5 cable with RJ45 connectors

Mounting
The EC3-332 is designed to be mounted onto a standard DIN rail. Mounting position: on vertical walls, with stepper motor connector on top side only.
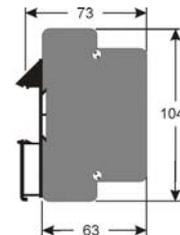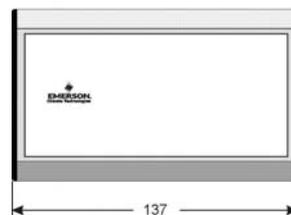
The ECD-001 can be mounted in panels with a 71 x 29 mm cutout. See dimensional drawing below for space requirements including rear connectors. Push controller into panel cutout (1).
Make sure that mounting lugs are flush with outside of controller housing
Insert Allen key into front panel holes and turn clockwise. Mounting lugs will turn and gradually move towards panel (2)
Turn Allen key until mounting lug barely touches panel. Then move other mounting lug to the same position (3)
Tighten both sides very carefully until controller is secured. Do not over tighten as mounting lugs will break easily.
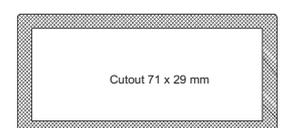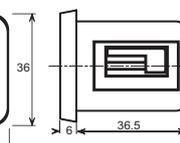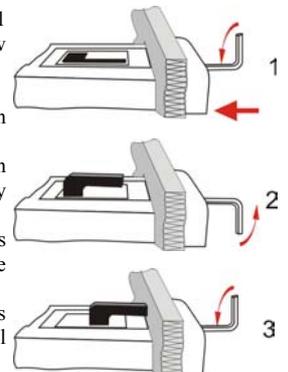
Electrical Installation

Refer to the electrical wiring diagram (below) for electrical connections. A copy of this diagram is labeled on the controller. Use connection wires/cables suitable for 90°C operation (EN 60730-1). Ground the metal housing with a 6.3mm spade connector.
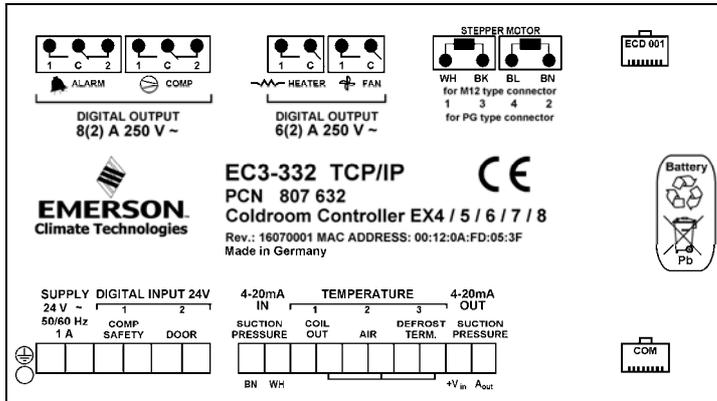
EC3 analog inputs are for dedicated sensors only and should not be connected to any other devices. Digital inputs should only be connected to 24VAC/DC. Connecting any EC3 inputs to mains voltage will permanently damage the EC3.
Important: Keep controller and sensor wiring well separated from mains wiring. Minimum recommended distance 30mm..
Warning: Use a class II category transformer for 24VAC power supply (EN 61558). Do not ground the 24VAC lines. We recommend to use one transformer per EC3 controller and to use separate transformers for 3rd party controllers, to avoid possible interference or grounding problems in the power supply. Connecting any EC3 inputs to mains voltage will permanently damage the EC3.

Recommended Sensor Positions for Cold Room Applications
(see diagram on page 1)

ECN-Pxx coil-out temperature sensor (1): Position directly after the evaporator on the common suction line as shown below. Insure proper thermal contact by using a metallic pipe clamp or temperature resistant plastic straps. Do not use standard plastic tie wraps (as used for electrical wiring) as they may become loose over time, which could result in faulty temperature measurements and poor superheat control performance. It is recommended to insulate the coil-out temperature sensor with ARMAFLEX™ or equivalent. The recommended position of the pipe sensors is between 9 and 3 o'clock as shown in the picture.
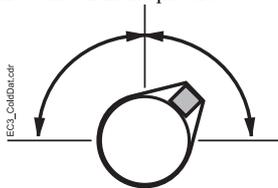
PT4-07M suction pressure transmitter (4): Position on the common suction line close to coil-out temperature sensor (1)
ECN-Sxx air temperature sensor (2): Should be mounted on spacers in the middle of the air duct so that there is airflow around and positioned on the inlet of the evaporator as high as possible close to the ceiling.
ECN-Fxx fin temperature sensor (3): Position on the evaporator, asymmetric closer to the expansion valve.

Setup and Parameter Modification Using the Display Unit ECD-001

For convenience, an infrared receiver for the optional **IR remote control unit** is build-in, enabling quick and easy modification of the system parameters when a computer interface is not available.
Alternatively, the parameters can be accessed via the 4-button keypad. The configuration parameters are protected by a numerical password. The default password is "12". To select the parameter configuration:
- Press the **PRG** button for more than 5 seconds, a flashing "0" is displayed
- Press ▲ or ▼ until the password is displayed (default = "12"),
  if password was changed select the new password
- Press **SEL** to confirm password
  The first modifiable parameter code is displayed (/1).
- To modify parameters see Parameters modification below.

Parameter Modification: Procedure
- Press ▲ or ▼ to show the code of the parameter that has to be changed;
- Press **SEL** to display the selected parameter value;
- Press ▲ or ▼ to increase or decrease the value;
- Press **SEL** to temporarily confirm the new value and display its code;
- Repeat the procedure from the beginning "*press* ▲ or ▼ *to show...*"

To exit and save the new settings:
- Press **PRG** to confirm the new values and exit the parameters modification procedure.

To exit without modifying any parameter:
- Do not press any button for at least 60 seconds (TIME OUT).
- Press "**ESC**" on IR remote control.

Defrost Activation:
A defrost cycle can be activated locally from the keypad:
- Press the ▼ button for more than 5 seconds, a flashing "0" is displayed
- Press ▲ or ▼ until the password is displayed (default = "12")
- Press **SEL** to confirm password
The defrost cycle is activated.

Special Functions:
The Clear Alarm function has been replaced by the Special Functions mode. The Special Functions can be activated by:
- Press ▲ and ▼ together for more than 5 seconds, a flashing "0" is displayed.
- Press ▲ or ▼ until the password is displayed (default = "12"). If password was changed, select the new password.
- Press **SEL** to confirm password, a "0" is displayed and the Special Function mode is activated.
- Press ▲ or ▼ to select the function. The number of special functions is dynamic and controller dependent. See list below.
- Press **SEL** to activate the function without leaving the special function mode.
- Press **PRG** to activate the function and leave the special function mode.

Most of the Special Functions work in a toggle mode, the first call activates the function, and the second call deactivates the function.
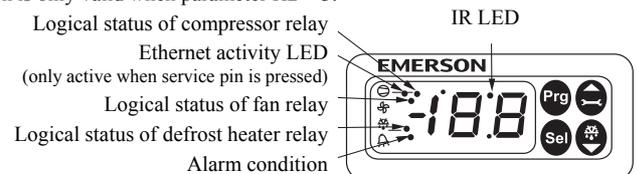The indication of the function can only be displayed after exiting the special function mode.
- 0: Display test function
- 1 :Clear alarm messages
- 2: Cleaning mode. The cleaning mode is effectively a manual defrost with the option of the fans on/off. The cleaning mode should not be used in order to isolate the application for maintenance purposes.
- 3: Fans only
- 4: Set the electronic control valve to 100% open
- 5: Displays the current TCP/IP address
- 6: Set the controller's TCP/IP address to 192.168.1.101 (default value). This change is only temporary. A power down will reset the previous address.
- 7: Resets all parameters to the factory default setting. The controller will indicate "oF" during the reset and the valve will close.

Display of Data:
The data to be permanently shown on the display can be selected by the user (parameter /1). In case of an alarm, the alarm code is displayed alternately with the selected data. The user can inhibit the alarm code.
It is possible to temporarily display these values. This is a useful feature when initially setting-up the system without the aid of the WebPages. Press the **SEL** button to scroll through all possible displayable data. The display will show for one second the numerical identifier of the data (see /1 parameter) and then the selected data. After two minutes the display will return to the by parameter /1 selected data. This action is only valid when parameter H2 = 3.

Logical status of compressor relay
Ethernet activity LED
(only active when service pin is pressed)
Logical status of fan relay
Logical status of defrost heater relay
Alarm condition
IR LED

List Of Parameters

/	DISPLAY PARAMETERS	Min	Max	Unit	Def.	Custom
/1	Value to show	0	6	-	0	
	0 = Thermostat control temperature with Temp. alignment /C					
	1 = Defrost termination temperature °C					
	2 = Coil-in temperature °C calculated from the pressure					
	3 = Coil-out temperature °C					
	4 = Calculated superheat °K					
	5 = Valve opening in %					
	6 = Displays defrost status					
/2	Alarm suppression 0= off,1= on	0	1	-	0	
/5	Temperature Unit 0 = °C, 1 = °F	0	1		0	
/6	Decimal point 0 = yes, 1 = no	0	1		0	
/7	ECD display during defrost	0	2		0	
	0 = dF (= defrost mode); 1 = dF + defrost termination temp.					
	2 = dF + control temperature					
/C	Temperature alignment for /1=0	20.0	20.0	K	0.0	

A	ALARM PARAMETERS	Min	Max	Unit	Def.	Custom
A1	Low temp alarm delay	0	180	min	5	
A2	High temp alarm delay	0	180	min	5	
A3	Alarm delay after defrost	0	180	min	10	
Ad	Door alarm delay	0	180	min	2	
AH	High temp alarm limit	AL	70	°C / K	40	
AL	Low temp alarm limit	-55	AH	°C / K	-50	
At	Alarm limit type	0	1	-	0	
	0=absolute temperatures °C; 1= relative temperatures K to setpoint					

r	THERMOSTAT PARAMETERS	Min	Max	Unit	Def.	Custom
r0	Door contact function (see page 4)	0	15	-	6	
r1	Min setpoint	-50	r2	°C	-50	
r2	Setpoint max	r1	60	°C	40	
r3	Day/night control 0 = off, 1 = on	0	1	-	1	
r4	Thermostat mode	0	4	-	1	
	0 = off, no thermostat function, continues cooling air in sensor					
	monitoring off, no temp. alarms generated					
	1 = cooling, deadband control					
	cut in = set-point + difference / cut out = set-point					
	2 = cooling, modulating thermostat					
	cut in = set-point / cut out = set-point – difference /2					
	3 = heating, deadband control					
	cut in = set-point – difference / cut out = set-point					
	4 = on, external control using nvi Valve via SNMP. Air sensor					
	monitoring off. Temperature alarms will be generated					
r6	Setpoint night	r1	r2	°C	4.0	
r7	Differential night	0.1	20.0	K	2.0	
rd	Differential day	0.1	20.0	K	2.0	
St	Setpoint day	r1	r2	°C	2.0	

d	DEFROST PARAMETERS	Min	Max	Unit	Def.	Custom
d0	Defrost mode	0	2	-	1	
	0 = natural defrost, defrost heater not activated					
	pulsed defrost not possible					
	1 = forced defrost, defrost heater activated, pulsed					
	defrost possible					
	2 = forced defrost, defrost heater activated, pulsed defrost					
	possible, defrost termination using nviStartUp					
d1	Termination by:	0	3	-	0	
	0 = termination by temperature,					
	termination by time will generate an alarm					
	1 = termination by time,					
	termination by temperature will generate an alarm					
	2 = first, what ever comes first time or temperature, no alarm					
	3 = last, by time and temperature, no alarm					
d3	Pulsed defrost	0	1	-	0	
	0 = off, no pulsed defrost, heaters switched off at defrost termin-					
	ation temperature dt or max. time dP whatever is selected					
	1 = on, pulsed defrost, heaters are switched off at					
	dH and switched on again at dH – dd					
d4	Defrost at startup 0 = no, 1 = yes	0	1	-	0	
d5	Delay power up defrost	0	180	min	0	
d6	Pump down delay	0	180	sec	0	
	Compressor will run during pump down delay while valve is closed					
d7	Drain delay	0	15	min	2	
d8	Injection delay	0	180	sec	0	
	Valve is open during injection delay while compressor is not running					

		Min	Max	Unit	Def.	Custom
dd	Pulsed defrost differential	1	20	K	2	
dH	Pulsed defrost setpoint	-40	dt	°C	5	
dt	Defrost termination temperature	-40	90	°C	8	
dP	Max. defrost duration	0	180	min	30	
dI	Defrost interval	0	192	h	8	
du	Start up delay after synch	0	180	min	30	

F	FAN PARAMETERS	Min	Max	Unit	Def.	Custom
F1	Fan startup by: 0 = on	0	4	-	0	
	1 = delayed by time Fd, error on temperature					
	2 = by temperature Ft, error on time					
	3 = first, whatever comes first time or temperature, no alarm					
	4 = last, time and temperature must come, no alarm					
F2	Fan during no cooling	0	3	-	0	
	0 = on; 1 = off; 2 = delayed by F4; 3 = off, when door open					
F3	Fan during defrost 0 = on,1 = off	0	1	-	0	
F4	Stop delay time	0	30	min	0	
F5	Fan during cleaning 0 = off, 1 = on	0	1	-	0	
Fd	Fan delay after defrost	0	30	min	0	
Ft	On temp after defrost	-40	40	°C	0	

C	COMPRESSOR PARAMETERS	Min	Max	Unit	Def.	Custom
C0	Delay first start after power up	0	15	min	0	
C1	Cycle time	0	15	min	0	
C2	Min. stop time it	0	15	min	0	
C3	Min. run time	0	15	min	0	

u	SUPERHEAT PARAMETERS	Min	Max	Unit	Def.	Custom
u0	Refrigerant 0 = R22 1 = R134a	0	7	-	3	
	2 = R507 3 = R404A 4 = R407C					
	5 = R410A 6 = R124 7 = R744A					
u1	Correction glide / dp	-20.0	20.0	K	0.0	
	Glide = positive values					
	Pressure drop = negative values					
u2	MOP control	0	1	-	0	
	0 = MOP off, 1 = MOP on					
u3	MOP temperature	-40	40	°C	0	
u4	Superheat mode	0	4	-	1	
	0 = off, 1 = fixed superheat, 2 = adaptive superheat (Rev >=130),					
	3 = fixed superheat slow, 4 = adaptive superheat slow					
u5	Superheat init setpoint	u6	u7	K	6	
u6	Superheat setpoint min.	3	u7	K	3	
u7	Superheat setpoint max.	u6	20	K	15	
u9	Start opening delay	0	60	10sec	1	
uu	Start opening	10	100	%	30	
ut	Valve type	0	3	-	0	
	0 = EX4 / EX5, 1 = EX6, 2 = EX7, 3 = EX8					
uF	Valve scaling factor	20	100	%	100	
	uF = 100%, max. valve opening =100%, ECD display =100%					
	uF = 50%, max. valve opening = 50%, ECD display =100%					

P	ANALOG SENSOR PARAMETERS	Min	Max	Unit	Def.	Custom
P1	Pressure sensor type selection	0	2	-	0	
	0 = PT4-07M; 1 = PT4-18M; 2 = PT4-30M					

	LOGIC PARAMETERS	Min	Max	Unit	Def.	Custom
i0	Logic for comp. safety loop input	0	1	-	0	
	0 = 24V input voltage means failure; 1 = 0V input voltage means failure					
i1	Logic for door contact input	0	1	-	0	
	0 = 24V means door open; 1 = 0V means door open					
o0	Logic for alarm relays activated	0	1	-	1	
	0 = positive logic; 1 = negative logic					
o1	Logic for compressor relays activated	0	1	-	0	
	0 = positive logic; 1 = negative logic					
o2	Logic for heater relays activated	0	1	-	0	
	0 = positive logic; 1 = negative logic					
o3	Logic for fan relays activated	0	1	-	0	
	0 = positive logic; 1 = negative logic					

H	OTHER PARAMETERS	Min	Max	Unit	Def.	Custom
H2	Display access	0	3	-	3	
	0 = all disabled (Caution: access to controller only via TCP/IP network)					
	1 = Keyboard enabled; 2 = IR remote control enabled;					
	3 = Keyboard and IR remote control. enabled					
H3	IR access code	0	199	-	0	
H5	Password	0	199	-	12	

Remarks: r0 Door contact function

r0	Cooling	Temp. alarm	Function after delay time Ad
0 = 8	on	on	
1 = 9	off	on	
2 = 10	on	off	
3 = 11	off	off	
4 = 12	on	on	door alarm
5	off	on	door alarm
6 = 14	on	off	door alarm and temperature alarm on
7	off	off	door alarm and temperature alarm on
13	off	on	door alarm and cooling on
15	off	off	door alarm and cooling on and temperature alarm on

Alarm Codes

E0 **Pressure transmitter alarm**
E1 **Coil out sensor alarm**
E2 **Air sensor alarm**
E3 **Fin sensor alarm**
No sensor connected or the sensor and/or the sensor cable is broken or short-circuited.

Er **Data error display - out of range**
Data send to the display is out of range.

Ab **Battery health failure**
Battery potentially does not have enough charge to close valve in an emergency. Only reset by replacing battery (Replacement kit: 807 790).

⚠ The use of the relay is essential to protect the system in case of power failure if the communications interface or the ECD-002 are not utilized.

AC **Alarm status of the compressor serial loop feedback**
External compressor is active. Serial safety loop is open circuit

Ad **Door open alarm**
AE **Thermostat emergency operation**
Air sensor failure, system is in continuous cooling mode

AF **Valve Status**
Valve closed due to compressor safety loop active

AH **High temperature alarm**
AL **Low temperature alarm**
AM **ECV connection error**
Check connections to EX4…8 Electrical Control Valve

Ao **Superheat, emergency operation**
Sensor(s) failure

Au **Valve open 100% for more than 10 minutes**
dt **Forced defrost termination (time or temperature)**
Ft **Forced fan startup (time or temperature)**

Messages

--- **No data to display**
The display will show an "---" at node start up and when no data is send to the display.

In **Reset to default values activated**
The display will show an "In" when the factory default configuration data set is initialized.

Id **Wink request received**
The display will show a flashing "Id" when the wink request was received. The flashing "Id" will be shown on the display until the service button will be pressed, or a 30 min delay timer will expire or a second wink request is received. This function is action only when using SNMP protocol

OF **Node is offline**
The node is offline and no application is running. This is the result of a network management command and will happen for example during node installation.

dS **Defrost standby**
dP **Pump down**
df **Defrost cycle**
dd **Defrost drain delay**
dI **Defrost injection delay**
du **Defrost start-up delay**
Cn **Cleaning**
CL **Alarms are cleared**
IP0 **IP adress received from DHCP Server**
IP2 **no IP adress received from DHCP Server or fixed IP adress**

Visualising Data: WebPages

A **TCP/IP Controller-Readme** file is available on the www.emersonclimate.eu website to provide detailed information about TCP/IP Ethernet connectivity. Please refer to this file if you need information beyond the contents of this instruction sheet.

The **EC3-332** has a TCP/IP Ethernet communication interface enabling the controller to be directly connected to a PC or network via the standard Ethernet port. The **EC3-332** controller has embedded WebPages to enable the user to easily visualise the parameter lists using real text labels.

No special software or hardware is required.

Connect the **EC3-332** using the optional ECX-N60 cable assembly to a network or hub that enables the controller to receive a dynamic TCP/IP address. If a DHCP server is not available, the controller can be connected to a computer using a crossover cable plugged directly into the Ethernet port. In this case, the TCP/IP address of the computer must be manually modified to be compatible with the default address of the controller. Refer to the **TCP/IP Controller-Readme** file for more details.

Open the Internet browser program on the computer and enter the default TCP/IP address of the controller into the address line of the Internet browser: **192.168.1.101** or the dynamic address from the DHCP server. Refer to the **TCP/IP Controller-Readme** file if a specific port is required.

After a few moments, the default monitoring page should be displayed. If the browser does not open the default page or display active data, the user should check the Internet browser "Option" configuration. Refer to the **TCP/IP Controller-Readme** file.
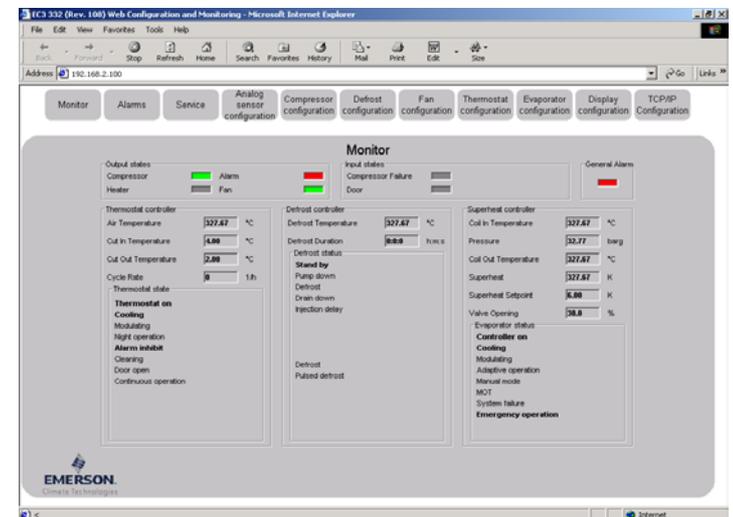
The Monitoring and Alarm WebPages are read only and therefore it is not necessary to enter a username or password. A username and password will be requested upon the initial request to any of the other WebPages. The factory default settings are:

Username: EmersonID   **Password: 12**

The default settings may be modified in the Display configuration page.

Press the tabs at the top of the Monitoring page with a left click of the mouse button to enter the respective Webpage. The parameters will be visualised in real text together with the program code as defined in the parameter list below.

After the parameters have been modified, the complete list of settings can be saved to the memory of the computer and used later to upload into another controller. This can save a considerable amount of time when using multiple controllers and over a period of time, a library can be created containing the parameter lists for equipment for different applications.

It is also possible to display live graphical data from the controller. In addition, a permanent 30 days log file containing the control temperature at 15 minutes intervals is stored in the non-volatile memory to be later transferred using FTP to the computer. The log file can be imported into a standard spreadsheet program such as Excel. Refer to the **TCP/IP Controller-Readme** file for a complete description of the features available for the TCP/IP series of controllers.