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FINAL REPORT

For

Contract Number 01/314

Abdoullah Factory for Refrigeration & Cooling, Emad Addin Al-Sareegy Establishment, Ma'nna Workshop, Al- Mansour workshop, Al Ostath Workshop and Raed Workshop

In this final report we describe our activities as well as providing all documents prepared from our previous reports. Some test sheets results are attached to this report for your evaluation and any suggestion to improve the performance criteria of the prototypes manufactured by the counterpart. This report could be used as a guideline for counterparts for future use, especially on selection of new components. Special consideration must be taken to select proper R134a compressor to replace with conventional R12 compressor. It is also important to adjust refrigerant charge balance to the existing refrigeration cycle with any major changes to the evaporator and condenser. In high back pressure type compressor it might needed to adjust capillary tube to balance pressure increase into the refrigeration system. All necessary advises were given to the counterparts during our several visit to their premises and conduction of technical course.

Since these companies are the same in nature and usually do not have any testing facility to test their new and existing models during changing compressor models. It is seriously recommended to use one of existing hot chamber in the city, to assure safe and economical operation of refrigeration system.

We are proud to have the opportunity to be UNIDO's team member to phase out OSD from many companies. We will attempt to use our experience and capabilities to continue assisting UNIDO and small commercial refrigerator sector to improve

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

INTER-OFFICE MEMORANDUM

To: Ms. H. Yalcindag, Director
SES/MPR

Date: 19 February 2002

Attn.: Mr. A. Malayeri

From: M. Latrech, Contracts Officer
for General Services/FPC/FOA

Ref.: ML/sb

Subject: **Final Report** - MP/JOR/01/152 – Development of Prototypes at Abu Azmi Factory, Hasoumi Refrigeration Factory and Majdi Factory - Contract No. 01/315

1. In accordance with the stipulations of paragraph 2.10 c) of Contract No. 01/315, Maurice Industries (Maurice Al-Deek Co.), Hashemite Kingdom of Jordan, has provided this Office with five (5) copies, in English, of their final version of their Report, on the subject project, and three (3) copies are forwarded herewith, for your review and comments.

2. We would appreciate your reviewing this Report as soon as feasible and your advising this Service of its acceptability.
..... If acceptable, please sign the attached invoice and return it to us.

3. If the Contractor's Report is acceptable, copies should be distributed in accordance with the instructions contained in the UNDP Policies and Procedures Manual (UNDP/PPM/TL/2 of 27 January 1978, Section 4.0, paragraph 5, pages 9-14).

4. Please note that:

   a) one (1) copy of the Contractor's Report is being sent to Registry for their own records, and that

   b) one (1) copy is being sent to Ms. K. Puff, who upon perusal, will transfer it to the Library for micro-filming.

5. We would also appreciate your completing and returning the enclosed copy of the "Evaluation of Contractor's Performance" form.

cc.: Registry (with one (1) copy of the report under consideration)
Ms. K. Puff (with one (1) copy of the report under consideration)

their technical awareness, and count us as a focal point to access to up to date information and technical assitance.

Activities

1- Visiting counterparts premises several times to assure precise technical data for providing necessary information for calculating refrigeration load calculation.
2- Assisting counterparts to select most common and well selling prototype models to be made and test under new circumstances.
3- Supervising related activities concerning making prototypes.
4- Conducting several briefing meeting and training session at our classroom located beside our hot chamber at our factory and counterparts premises to familiarize the counterparts technical staff with new refrigerant physical, chemical and operation properties and behavior.
5- Contacting UNDP and Ozone office in several occasion to plan for implementation of the project in time.
6- Coordinating with UNIDO staff and Ozone office staff in Beirut for execution of different activities foreseen in the contract.
7- Storing and preserving charging equipment at our warehouse to assure safe and trustful stocking as requested by UNIDO's project manager and Ozone Office.
8- Deliver all charging equipment to counterparts as they were received in accordance with packing list and project documents.
9- Assuring safe handling and equipment free of any defects by visual inspection due to possible mechanical damages, before delivery to the counterparts.
10- Explaining to the counterparts operation purposes and application of each machines as purchased and supplied by UNIDO and manufacturer.

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Attn.: Mr. A. Malayeri

From: M. Latrech, Contracts Officer
for General Services/FPC/FOA

Ref.: ML/sb

Subject: **Final Report** - MP/JOR/01/152 – Development of Prototypes at Abdoulah Factory for Refrigeration & Cooling, Emad Addin Al-Sareegy Establishment, Ma'nna Workshop, Al-Mansour Factory for Refrigeration, Al-Ostath Workshop and Raed Workshop - Contract No. 01/314

1. In accordance with the stipulations of paragraph 2.10 c) of Contract No. 01/314, Maurice Industries (Maurice Al-Deek Co.), Hashemite Kingdom of Jordan, has provided this Office with five (5) copies, in English, of their final version of their Report, on the subject project, and three (3) copies are forwarded herewith, for your review and comments.

2. We would appreciate your reviewing this Report as soon as feasible and your advising this Service of its acceptability.
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11-Conducting an orientation course for technical staff of counterparts to be familiarized with application of equipments and use of them.

12-Testing Performance test on all prototypes to assure accomplishment of contract to fulfill new R134a refrigerant.

13-Evaluation on performance test results of prototypes to adjust and do necessary changes to refrigeration cycle in retrofit program foreseen in the contract.

14-Advise the counterpart to do necessary changes to all models produced. These changes could be defined as proper amount of refrigerant weight and proper compressor selection, using cooling capacity calculated in this program.

15- This to notice that amount of cooling capacity could be used as guidance, obviously it is almost impossible to find a compressor model to fit excite cooling capacity. There are a lot of factors which should be into consideration while selecting compressor.

16-The counterparts were advised to do performance test on all new compressor models selected to replace the old model, regardless of performance and technical characteristics defined by the manufactures.

17-A comprehensive explanation given to the counterparts to use different compressor manufacturers brochure and technical data.

In this report we explain our activities and technical data gathered for component selection and also determine proper configuration for new design criteria.

We spent a lot of time in market to suggest to the counterparts the new component replacement to fit R134a ozone friendly refrigerant system circuit.

Compressor selection was the main concern in this regard due to certain limitation of compressor capacity availability in Jordan market.

Our main concern in implementation of project is testing prototypes which are the most important part of project.

Counterparts showed good role and cooperat5ion to make prototypes and testing them are on process, the test results will be submitted to you whenever they are completed and pass performance test requirement.

The new criteria is defined as new operating condition under usage of R134a Ozone friendly refrigerant. As we learnt through our experience, following components have significant role to be adapted for new environmental and technical circumference.

- Compressor
- Drier
- Capillary tube
- Refrigerant Charge

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Introduction

Please find below our first progress report, concerning calculation and redesign of the prototypes to be made by the counterparts and they will be tested at our hot chamber, at our site in Amman. These prototypes are to be manufactured under our engineering supervision and will be tested in accordance with appropriate ISO standard test procedure and relevant performance test characteristics for functionality and performance of the new Ozone friendly R134a refrigerant. We hope that this first report could have satisfied the UNIDO in order to comply with our contract. In the second progress report we will provide you more technical details of all prototypes to be made by the counterparts.

The refrigeration load calculation is made here for following companies subjected to the UNIDO contract number 01/314 implementation of CFC phase out projects at,

- Abdullah Workshop
- Emad Addin Al-Sareegy Workshop
- M'nna Workshop
- Al- MansourFactory for Refrigeration
- Al- Ostath Workshop
- Raed Workshop

Load Calculation for Water Cooler
Abdullah Workshop

Q1 = m C ΔT, Where:

Q1 Total heat removed from total drinking water tank volume capacity (lit.) during specific period, related to compressor cooling capacity power in Watts, at initial compressor start up, and early in the morning. When the water temperature is 28 C.

m total weight of original water in the water cooler storage tank in Kg. Considering that one litter of water at 25 C is equal to approximately one Kg.

Tank Volume = 30 lit

M = 70 liter = 30 Kg.

C Specific heat factor of water in Kcal/Kg °C = 1

ΔT Temperature difference (Ti–Tc), where, Ti is inlet water temperature, and Tc is final cooled water.

Ti = 28 °C and Tc = 7 °C

Ti – Tc = 28-7 = 21 °C

Q1 = m C ΔT = 70 x 1 x 21 = 1470 Kcal = 1470 x 1.163 = 1710 Watts/24 hrs

Q1 = 1710 /24 water cooler operating time per day = 71.2 Watts

Q1 = 71.2 Watts

$Q2 = \dot{M}\ C\ \Delta T$

Q2 Total heat removed from total drinking water flow (lit.) during specific period, 16 hours. In Kcal.

$\dot{M}$ total weight of water flow during 16 hours. in Kg. = H x N x M where:
H = Total Water Cooler Usage Time (Hours) = 16
N = Number of Glass of Drinking Water per Hour = 20
M = Kg weight of water in one Glass of Water = 0.2 Kg

$\dot{M}$ = (16 x 20 x 0.2) = lit. +20% Waste Water = 77

C Specific heat factor of water in Kcal/Kg °C = 1

ΔT Temperature d(Ti – Tc), where, Ti is inlet water temperature, and Tc is final cooled water temperature.

Ti = 28 °C and T= 7 °C

Ti – Tc = 28-7 = 21 °C

Q2 = m C ΔT = 77 x 1 x 21 = 1617 Kcal = 1617 x 1.163 = 1880 Watts/16 hrs

Q2 = 1880/12 compressor operating time per day = 156 Watts

Q2 = 156 Watts

Q3 = UA ΔT, Where:

Q3 Total Leak, gained through side wall of drinking water storage tank by conduction in Kcal..

U Heat Resistance Coefficient Factor in Kcal/Sq. mt. C

K = 0.0178 W/mt.K

$$U = \frac{1}{1/hi + x1/K1 + x2/k2 \cdots\cdots 1/ho} = 0.40$$

hi = ho = 9.37 W/m^2. K

A Total Area which heat is transmitted by. In Sq. Mt.

A= [(3.14x0.3x0.3)/4]x0.8 = 0.56 Sq.mt.

ΔT Temperature difference (Ta – Tc), where, T is ambient temperature, and Tc is final cooled water temperature.

Ta = 32 °C and Tc = 7 °C

Ta – Tc = 32-7 = 25 °C

Q3 = (UA_1 ΔT) = (0.40 x 0.0.56 x 25)= 1.4 Watts

Q3 = 1.4 Watts

Qt = Q1 + Q2 + Q3 = 71.2 + 156 + 1.4 = 228 + 10% safety factor = 251.5 Watts

Refrigeration Load Calculation
Emad Alddin Workshop Meat Upright Refrigerator

a) Transmission load calculation

Refrigerator Compartment	Dimension Cm.	Area (sq.mt.)	Insulation Thickness	Temp. Difference
Side Walls	2 x (70x205)	2.87	40mm	27 c
Back Panel	140x205	2.87	40mm	27 c
Bottom	70x140	0.98	40mm	27 C
Top	70x140	0.98	40mm	37 c
Doors	140x205	2.87	40mm	27 c

Insulation Type: Pu Foam with R141b blowing agent.
Thermal Conductivity for Foam = 0.027 W/ mt. ° C
Temperature Difference Refrigerator Compartment:
$\Delta T = 32 - (+5) = 27$ ° C
Ambient Temperature = 32 °C
Refrigerator Air Temperature = +5 °C

Calculation :

Heat Leak For Refrigerator Compartment.

$$Q_{TL} = Q_{SW} + Q_{Back\ Panel} + Q_{door} + Q_{Bottom} + Q_{top}$$

$$Q = U A (T_a - T_r)$$

$$U = \frac{1}{1/h_i + x1/K1 + x2/k2 \cdots\cdots 1/h_o}$$

Where :

U = Heat Resistance Coefficient Factor
K_1 = Foam Thermal Conductivity
$h_i = h_o$ = Air Convection Factor = 9.37 Watt/Mt^ K

Due to the short thickness of cabinet out side panel and Metal inner liner heat resistance of these materials have been considered negligible.

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Therefore:

1- $Q_{SideWalls} = [U A (T_a - T_r)]$
T_a = Ambient Temperature 32
T_r = refrigerator air Temperature 5
U = 0.59 W/ sq.m °C
A = 2.87Sq. Mt., T_a = 32 °C, T_f = +5 °C
therefore
$Q_{SideWalls}$ = 0.59x 2.87 x 27 = 46 Watts
$Q_{SideWalls}$ = 46 Watts

2- $Q_{doors} = [U A (T_a - T_r)]$
U = 0.59 W/ sq.m °C , $T_a - T_r$ = 27, A = 2.87
Q_{doors} = 0.59 x 2.87 x 27 = Watts Q_{doors} = 46 Watts

3- $Q_{top} = [U A (T_a - T_r)]$
U = 0.59 w/sq. Mt. °C,
Ta - Tr= 37 ,
A = 0.98
Q_{top} = 0.59 x 0.98 x 37 = 21 Watts
Q_{top} = 21 Watts

4 -$Q_{back\ panel} = [U A (T_a - T_r)]$
U = 0.59 w/sq. Mt. °C,
Ta - Tr= 27 , A = 2.87
$Q_{back\ panel}$ = 0.59 x 2.87 x 27 = 46 Watts
$Q_{back\ panel}$ = 46 Watts

5 -$Q_{Bottom} = [U A (T_a - T_r)]$
U = 0.59 w/sq. Mt. °C,
Ta - Tr= 27, A = 0.98
$Q_{Bottom\ Surface}$ = 0.59x 0.98 x 27 = 16 Watt
$Q_{Bottom\ Surface}$ = 16 Watts

Total Refrigerator Heat Leak =46 + 46 + 21+ 16 + 46 = 175 W

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Product Load

A product placed in a refrigerator at a temperature higher than the storage temperature will lose heat until it reaches the storage temperature. The quantity of heat to be removed may be calculated from knowledge of the product, including its state upon entering the refrigerator, its final state, its weight, specific heat above and below freezing point, its freezing temperature and latent heat.

When a definite weight of product is cooled from one state and temperature to another state and temperature, some or all of the following calculations must be made:

Heat removal from initial temperature to some lower temperature above freezing.

$$Q = mc(T_1-T_2)$$

Heat removal from initial temperature to freezing point of product.

$$Q = mc(T_i-T_f)$$

Heat removal to freeze product.

$$Q = mh_{if}$$

Heat removal from freezing point to final temperature below freezing.

$$Q = mc(T_f-T_3)$$

Where

Q = heat removed, Kj
M = weight of product, kg
C = specific heat of product above freezing point, Kj/Kg. K
T_1 = initial temp. C
T_2 = lower temperature above freezing, C
T_f = freezing temperature of product, C
H_{if} = latent heat of fusion, kj per kg

Since this product is mainly used for storing fresh Lamb meet and beef above

freezing point at +5 C, we consider 600 Kg of meet to be stored in this refrigerator therefore we calculate as follow,

$$Q = mc(T_1-T_2)$$

M = 600 kg

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C = 0.67 Btu/(lb)F deg = 0.67 x 4.184 = 2.8 j/g K
T_1 = 25 C
T_2 = 5 C
Q = 600000x2.8x (25-5) =33600000 jul/86400 = 389 Watt

Internal Load
N/A

Door Opening
Refrigerator Internal Volume 2000 lit.
Number of air change as per ASHREA standard = 70 per day
Heat removed per cubic meter of air 75000 j

Air Change load = 2x70x75000/86400 = 121 Watt

$Q_{Total} = Q_{heat\ leak} + Q_{product\ load} + Q_{internal\ load} + Q_{air\ change}$

$Q_{Total} = 175 + 389 + 121 = 685$

Considering 10 % of Q total for safety factor

Cooling Capacity Required = $Q_{Grand\ Total} = 685 + 10\%(68) = 753$ atts

Refrigeration Load Calculation
Ma'nna Chest Freezer

a) Transmission load calculation

Freezer Compartment	Dimension Cm.	Area (sq.mt.)	Insulation Thickness	Temp. Difference
Side Walls	2 x (65x88)	1.444	40mm	55 c
Back Panel	125x88	1.1	40mm	55 c
Bottom	65x88	0.572	40mm	65 C
Top	65x88	0.572	40mm	55 c
Doors	125x88	1.1	40mm	55 c

Insulation Type: Pu Foam with R141b blowing agent.
Thermal Conductivity for Foam = 0.027 W/ mt. ° C
Temperature Difference Refrigerator Compartment:
$\Delta T = 32 - (-23) = 55$ ° C
Ambient Temperature = 32 °C
Freezer Air Temperature = -23 °C

Calculation :

Heat Leak For Freezer Compartment.

$$Q_{TL} = Q_{SW} + Q_{Back\ Panel} + Q_{door} + Q_{Bottom} + Q_{top}$$

$$Q = U A (T_a - T_r)$$

$$U = \frac{1}{1/h_i + x1/k1 + x2/k2 \ldots\ldots 1/h_o}$$

Where :

U = Heat Resistance Coefficient Factor
K_1 = Foam Thermal Conductivity
$h_i = h_o$ = Air Convection Factor = 9.37 Watt/Mt^ K

Due to the short thickness of cabinet out side panel and Metal inner liner heat resistance of these materials have been considered negligible.
Therefore:

1- $Q_{SideWalls} = [U A (T_a - T_r)]$
T_a = Ambient Temperature 32
T_r = refrigerator air Temperature -23
U = 0.59 W/ sq.m °C
A = 1.444 Sq. Mt., T_a = 32 °C, T_f = -23 °C
therefore
$Q_{SideWalls}$ = 0.59 x 1.444 x 55 = 48.9 Watts
$Q_{SideWalls}$ = 48.9 Watts

2- $Q_{Top\ door} = [U A (T_a - T_r)]$
U = 0.59W/ sq.m °C ,$T_a - T_r$=55, A = 0.572,
Q_{doors} = 0.59 x 0.572 x 55 = Watts Q_{doors} = 18.6 Watts

3- $Q_{Front\ Panel} = [U A (T_a - T_r)]$
U = 0.59 w/sq. Mt. °C,
Ta - Tr= 55 ,
A = 1.1
$Q_{Front\ Panel}$ = 0.59 x 1.1 x 55 = 35.7 Watts
$Q_{Front\ Panel}$ = 35.7 Watts

4 -$Q_{back\ panel} = [U A (T_a - T_r)]$
U = 0.59 w/sq. Mt. °C,
$T_a - T_r$= , A = 1.1
$Q_{back\ panel}$ = 0.59x 1.1 x 55 = 35.7 Watts
$Q_{back\ panel}$ = 35.7 Watts

5 -$Q_{Bottom} = [U A (T_a - T_r)]$
U = 0.59 w/sq. Mt. °C,
Ta - Tr= 65, A = 0.572
$Q_{Bottom\ Surface}$ = 0.59x 0.572 x 65 = 22 Watt
$Q_{Bottom\ Surface}$ = 22 Watts

Total Refrigerator Heat Leak =46.9+35.7+18.6+35.7+22 = 158.8 W

Product Load

A product placed in a refrigerator at a temperature higher than the storage temperature will lose heat until it reaches the storage temperature. The quantity of heat to be removed may be calculated from knowledge of the product, including its state upon entering the refrigerator, its final state, its weight, specific heat above and below freezing point, its freezing temperature and latent heat.

When a definite weight of product is cooled from one state and temperature to another state and temperature, some or all of the following calculations must be made:

Heat removal from initial temperature to some lower temperature above freezing.

$$Q = mc(T_1-T_2)$$

Heat removal from initial temperature to freezing point of product.

$$Q = mc(T_i-T_f)$$

Heat removal to freeze product.

$$Q = mh_{if}$$

Heat removal from freezing point to final temperature below freezing.

$$Q = mc(T_f-T_3)$$

Where

Q = heat removed, Kj
M = weight of product, kg
C = specific heat of product above freezing point, Kj/Kg. K
T_1 = initial temp. C
T_2 = lower temperature above freezing, C
T_f = freezing temperature of product, C
H_{if} = latent heat of fusion, kj per kg

Since this product is mainly used for storing fresh Lamb meet and beef above

freezing point at -23 C, we consider 30 Kg of meet to be stored in this Freezer therefore we calculate as follow,

$$Q_1 = mc(T_1-T_2)$$

M = 30 kg
$C_{\text{Above Freezing}}$ = 3.2 Kj/kg K
T_1 = 25 C

$T_2 = 0$ C
Q = 30000x3.2x [25-0] =2400000 jul/86400 = 28 Watt

$Q_2 = mc(T_1-T_2)$
M = 40 kg
$C_{\text{Below Freezing}}$ = 1.61 Kj/(kg. K)
$T_1 = 0$ C
$T_2 = -23$ C
Q = 30000x1.61x [(0-(-23)] =1110900 jul/86400 = 12.8 Watt

$Q_3 = mh$

$Q_3 = 30000 \times 204/86400 = 71$

$Q_{\text{total for product loaded}} = 28 + 13 + 71 = 112$

Internal Load
N/A

Door Opening
Refrigerator Internal Volume 400 lit.
Number of air change as per ASHREA standard = 70 per day
Heat removed per cubic meter of air 75000 j

Air Change load = 0.4x20x75000/86400 = 6.9
Watt

$Q_{\text{Total}} = Q_{\text{heat leak}} + Q_{\text{product load}} + Q_{\text{internal load}} + Q_{\text{air change}}$

$Q_{\text{Total}} = 159 + 112 + 7 = 278$ Watts

Considering 10 % of Q total for safety factor

Cooling Capacity Required = $Q_{\text{Grand Total}} = 278 + 10\%(81) = 306$ watts

Load Calculation for Water Cooler
Al- Mansour Workshop

Q1 = m C ΔT, Where:

Q1 Total heat removed from total drinking water tank volume capacity (lit.) during specific period, related to compressor cooling capacity power in Watts, at initial compressor start up, and early in the morning. When the water temperature is 28 C.

m total weight of original water in the water cooler storage tank in Kg. Considering that one litter of water at 25 C is equal to approximately one Kg.

Tank Volume = 30 lit

M = 30 liter = 30 Kg.

C Specific heat factor of water in Kcal/Kg °C = 1

ΔT Temperature difference (Ti–Tc), where, Ti is inlet water temperature, and Tc is final cooled water.

Ti = 28 °C and Tc = 7 °C

Ti – Tc = 28-7 = 21 °C

Q1 = m C ΔT = 30 x 1 x 21 = 630 Kcal = 630 x 1.163 = 733 Watts/24 hrs

Q1 = 733 /24 water cooler operating time per day = 30.54 Watts

Q1 = 30.54 Watts

$Q2 = \dot{M}\ C\ \Delta T$

Q2 Total heat removed from total drinking water flow (lit.) during specific period, 16 hours. In Kcal.

$\dot{M}$ total weight of water flow during 16 hours. in Kg. = H x N x M where:
H = Total Water Cooler Usage Time (Hours) = 16
N = Number of Glass of Drinking Water per Hour = 20
M = Kg weight of water in one Glass of Water = 0.2 Kg

$\dot{M}$ = (16 x 20 x 0.2) = lit. +20% Waste Water = 77

هاتف المعرض : ٤٦٥٣٢٦٢ – المصنع : ٤١٦١٣٧٢ – فاكس : ٩٦٢-٦-٤١٦٠٧٨٦ – فاكس : ٩٦٢-٦-٤٦١٣٣٤٠ – ص.ب : ٩٢١٩٤٠ عمان – الأردن
Tel Showroom : 4653262 - Factory : 4161372 - Fax : 962-6-4160786 - Fax : 962-6-4613340 - P.O.Box : 921940 Amman - Jordan

C Specific heat factor of water in Kcal/Kg °C = 1

ΔT Temperature d(Ti – Tc), where, Ti is inlet water temperature, and Tc is final cooled water temperature.

Ti = 28 °C and T= 7 °C

Ti – Tc = 28-7 = 21 °C

Q2 = m C ΔT = 77 x 1 x 21 = 1617 Kcal = 1617 x 1.163 = 1880 Watts/16 hrs

Q2 = 1880/12 compressor operating time per day = 156 Watts

Q2 = 156 Watts

Q3 = UA ΔT, Where:

Q3 Total Leak, gained through side wall of drinking water storage tank by conduction in Kcal..

U Heat Resistance Coefficient Factor in Kcal/Sq. mt. C

K = 0.0178 W/mt.K

$$U = \frac{1}{1/hi + x1/K1 + x2/k2 \cdots\cdots 1/ho} = 0.40$$

hi = ho = 9.37 W/m^2. K

A Total Area which heat is transmitted by. In Sq. Mt.

A= [(3.14x0.3x0.3)/4]x0.45 = 0.32 Sq.mt.

ΔT Temperature difference (Ta – Tc), where, T is ambient temperature, and Tc is final cooled water temperature.

Ta = 32 °C and Tc = 7 °C

Ta – Tc = 32-7 = 25 °C

$Q3 = (UA_1 \Delta T) + (UA_2 \Delta T = (0.40 \times 0.0.32 \times 25) = 0.32$ Watts

Q3 = 0.32 Watts

Qt = Q1 + Q2 + Q3 = 30.54 + 156 + 0.32 = 186 + 10% safety factor = 205.5 Watts

Load Calculation for Water Cooler
Al- Raed Workshop

Q1 = m C ΔT, Where:

Q1 Total heat removed from total drinking water tank volume capacity (lit.) during specific period, related to compressor cooling capacity power in Watts, at initial compressor start up, and early in the morning. When the water temperature is 28 C.

m total weight of original water in the water cooler storage tank in Kg. Considering that one litter of water at 25 C is equal to approximately one Kg.

Tank Volume = 30 lit

M = 30 liter = 30 Kg.

C Specific heat factor of water in Kcal/Kg °C = 1

ΔT Temperature difference (Ti–Tc), where, Ti is inlet water temperature, and Tc is final cooled water.

Ti = 28 °C and Tc = 7 °C

Ti – Tc = 28-7 = 21 °C

Q1 = m C ΔT = 30 x 1 x 21 = 630 Kcal = 630 x 1.163 = 733 Watts/24 hrs

Q1 = 733 /24 water cooler operating time per day = 30.54 Watts

Q1 = 30.54 Watts

$Q2 = \dot{M}$ C ΔT

Q2 Total heat removed from total drinking water flow (lit.) during specific period, 16 hours. In Kcal.

$\dot{M}$ total weight of water flow during 16 hours. in Kg. = H x N x M where:
H = Total Water Cooler Usage Time (Hours) = 16

هاتف المعرض : ٤٦٥٣٢٦٢ – المصنع : ٤١٦١٣٧٢ – فاكس : ٤١٦٠٧٨٦-٦-٩٦٢ – فاكس : ٤٦١٣٣٤٠-٦-٩٦٢ – ص.ب : ٩٢١٩٤٠ عمان – الأردن
Tel Showroom : 4653262 - Factory : 4161372 - Fax : 962-6-4160786 - Fax : 962-6-4613340 - P.O.Box : 921940 Amman - Jordan

N = Number of Glass of Drinking Water per Hour = 20
M = Kg weight of water in one Glass of Water = 0.2 Kg

$\dot{M}$ = (16 x 20 x 0.2) = lit. +20% Waste Water = 77
C Specific heat factor of water in Kcal/Kg °C = 1
ΔT Temperature d(Ti – Tc), where, Ti is inlet water temperature, and Tc is final cooled water temperature.

Ti = 28 °C and T= 7 °C
Ti – Tc = 28-7 = 21 °C

Q2 = m C ΔT = 77 x 1 x 21 = 1617 Kcal = 1617 x 1.163 = 1880 Watts/16 hrs
Q2 = 1880/12 compressor operating time per day = 156 Watts

Q2 = 156 Watts

Q3 = UA ΔT, Where:

Q3 Total Leak, gained through side wall of drinking water storage tank by conduction in Kcal..
U Heat Resistance Coefficient Factor in Kcal/Sq. mt. C
K = 0.0178 W/mt.K

$$U = \frac{1}{1/hi + x1/K1 + x2/k2 \ldots\ldots 1/ho} = 0.40$$

hi = ho = 9.37 W/m^2. K
A Total Area which heat is transmitted by. In Sq. Mt.
A= [(3.14x0.3x0.3)/4]x0.45 = 0.32 Sq.mt.
ΔT Temperature difference (Ta – Tc), where, T is ambient temperature, and Tc is final cooled water temperature.

Ta = 32 °C and Tc = 7 °C
Ta – Tc = 32-7 = 25 °C
Q3 = (UA_1 ΔT) + (UA_2 ΔT = (0.40 x 0.0.32 x 25)= 0.32 Watts

Q3 = 0.32 Watts
Qt = Q1 + Q2 + Q3 = 30.54 + 156 + 0.32 = 186 + 10% safety factor = 205.5 Watts

Load Calculation for Water Cooler
Al-Ostath Workshop

Q1 = m C ΔT, Where:

Q1 Total heat removed from total drinking water tank volume capacity (lit.) during specific period, related to compressor cooling capacity power in Watts, at initial compressor start up, and early in the morning. When the water temperature is 28 C.

m total weight of original water in the water cooler storage tank in Kg. Considering that one litter of water at 25 C is equal to approximately one Kg.

Tank Volume = 20 lit

M = 20 liter = 20 Kg.

C Specific heat factor of water in Kcal/Kg °C = 1

ΔT Temperature difference (Ti–Tc), where, Ti is inlet water temperature, and Tc is final cooled water.

Ti = 28 °C and Tc = 7 °C

Ti – Tc = 28-7 = 21 °C

Q1 = m C ΔT = 20 x 1 x 21 = 410 Kcal = 410x 1.163 = 477 Watts/24 hrs

Q1 = 477 /24 water cooler operating time per day = 20 Watts

Q1 = 20 Watts

$Q2 = \dot{M}$ C ΔT

Q2 Total heat removed from total drinking water flow (lit.) during specific period, 16 hours. In Kcal.

$\dot{M}$ total weight of water flow during 16 hours. in Kg. = H x N x M where:

H = Total Water Cooler Usage Time (Hours) = 16
N = Number of Glass of Drinking Water per Hour = 20
M = Kg weight of water in one Glass of Water = 0.2 Kg

$\dot{M}$ = (16 x 20 x 0.2) = lit. +20% Waste Water = 77
C Specific heat factor of water in Kcal/Kg °C = 1
ΔT Temperature d(Ti – Tc), where, Ti is inlet water temperature, and Tc is final cooled water temperature.

Ti = 28 °C and T= 7 °C
Ti – Tc = 28-7 = 21 °C

Q2 = m C ΔT = 77 x 1 x 21 = 1617 Kcal = 1617 x 1.163 = 1880 Watts/16 hrs
Q2 = 1880/12 compressor operating time per day = 156 Watts

Q2 = 156 Watts

Q3 = UA ΔT, Where:

Q3 Total Leak, gained through side wall of drinking water storage tank by conduction in Kcal..
U Heat Resistance Coefficient Factor in Kcal/Sq. mt. C
K = 0.0178 W/mt.K

$$U = \frac{1}{1/hi + x1/K1 + x2/k2 \cdots\cdots 1/ho} = 0.40$$

hi = ho = 9.37 W/m^2. K
A Total Area which heat is transmitted by. In Sq. Mt.
A= [(3.14x0.3x0.3)/4]x0.45 = 0.32 Sq.mt.
ΔT Temperature difference (Ta – Tc), where, T is ambient temperature, and Tc is final cooled water temperature.

Ta = 32 °C and Tc = 7 °C
Ta – Tc = 32-7 = 25 °C
Q3 = (UA_1 ΔT) + (UA_2 ΔT = (0.40 x 0.0.32 x 25)= 0.32 Watts

Q3 = 0.32 Watts
Qt = Q1 + Q2 + Q3 = 20 + 156 + 0.32 = 176.32 + 10% safety factor = 194 Watts

Product Technical Specification ***Al-Mansour Workshop***	
Description	**Specification**
Company Name	Al-Mansour Workshop
Product Name	Water Cooler
Product Model	ST100
Product Application	Water Cooler
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	65*44*139 cm
Freezer Compartment Overall Dimension andWall Thickness	N/A
Refrigerator Compartment Overall Dimension and Wall Thickness	N/A
Product Shape, Double Doors, Upright, Chest, etc	Stand
Freezer Internal Net Volume	N/A
Refrigerator Net Volume	N/A
Product Net Volume	N/A
Product Inside Temperature C	+ 7 C
Water Storage Tank Capacity, Water Cooler	35 Litters
Type of Water Storage Tank Cylinder, Cubic, etc.	Cylindrical
Water Fellow per hour for water cooler	80 Liters/H
Water Storage Tank Dimension	40*30 cm
Water Outlet Temperature	+7 C
Water Inlet Temperature	+28 C
Freezer Inside Temperature	N/A
Refrigerator Inside Temperature	N/A
Evaporating Temperature	-23 C
Foam Insulation Thickness mm Side Walls, Top, Bottom, Door, Back Panel	40 mm
Type of PU Foam	R11 Pu Foam
Foam Density, Kg/Cu. Mt.	40 Kg/Cu. Mt.
Foam Mixture, Percentage Pol% + R11% + Isocyanate%	37% + 13% + 50%
Total amount of Foam Injection, Kg	6 Kg
Refrigerant Type	R 12
Refrigerant Charge Weight Gr.	250 Gr.
Type of Compressor, Hermetic, Semi Hermetic, Open	Hermetic

Compressor Cooling System Static, Oil Cooled, Fan Cooled	Fan Cooled
Compressor Cooling Capacity Watt	250 Watts
Compressor input Power, Watt	¼ Hp, 184 Watts
Compressor Model Number	
Compressor Manufacturer	Tecumseh
Compressor Mounting Place Top, Bottom, Front, Back	Bottom
Condenser Type, Static, Fan Cooled	Fan Cooled
Condenser Dimension, Length, Inside Tube Diameter,	Two Rows , 5/16 inch
Condenser Material, Aluminum, Copper, Copper Coated, etc,	Copper and Aluminum
Condenser mounting Place, Back Wall, Top, Bottom	Bottom
Evaporator Type, Fin and Tube, Roll Bond, Wire and Tube, etc.	Copper Tubes Surrounding the Tank
Evaporator Dimension, Length, Surface Area, Inside Tube Diameter	15 m. Length
Evaporator Material, Aluminum, Copper, Copper Coated, etc,	Copper
Dryer Type,	Ranco
Dryer Material, Weight and Size	Silica, Cylindrical, 15 Gr.
Capillary Tube Diameter and Length	1 mm , 1800 mm length

Product Technical Specification ***Ma-nna Workshop***	
Description	**Specification**
Company Name	Ma-nna Workshop
Product Name	Chest Freezer,
Product Model	KH-300
Product Application	Freezer
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	140x64x85
Freezer Compartment Overall Dimension and Wall Thickness	N/A
Refrigerator Compartment Overall Dimension and Wall Thickness	50 mm
Product Shape, Double Doors, Upright, Chest, etc	Chest Freezer
Freezer Internal Net Volume	600 liter
Refrigerator Net Volume	N/A
Product Net Volume	650 liter
Product Inside Temperature C	- 18 C
Water Storage Tank Capacity, Water Cooler	N/A
Type of Water Storage Tank Cylinder, Cubic, etc.	N/A
Water Fellow per hour for water cooler	N/A
Water Storage Tank Dimension	N/A
Water Outlet Temperature	N/A
Water Inlet Temperature	N/A
Freezer Inside Temperature	N/A
Refrigerator Inside Temperature	N/A
Evaporating Temperature	- 23.3 C
Foam Insulation Thickness mm Side Walls, Top, Bottom, Door, Back Panel	50 mm
Type of PU Foam	R11 PU Foam
Foam Density, Kg/Cu. Mt.	40 Kg/ Cu Cm
Foam Mixture, Percentage Pol% + R11% + Isocyanate%	37% + 13% + 50%

Total amount of Foam Injection, Kg	15 Kg.
Refrigerant Type	R12
Refrigerant Charge Weight Gr.	500 gr.
Type of Compressor, Hermetic, Semi Hermetic, Open	Hermetic
Compressor Cooling System Static, Oil Cooled, Fan Cooled	Fan Cooled
Compressor Cooling Capacity Watt	400Watts
Compressor input Power, Watt	450 Watts
Compressor Model Number	L88 TX
Compressor Manufacturer	Electrelux
Compressor Mounting Place Top, Bottom, Front, Back	Bottom
Condenser Type, Static, Fan Cooled	Fan Cooled
Condenser Dimension, Length, Inside Tube Diameter,	Four Rows Tube Coil, and Fins
Condenser Material, Aluminum, Copper, Copper Coated, etc,	Copper
Condenser mounting Place, Back Wall, Top, Bottom	Bottom
Evaporator Type, Fin and Tube, Roll Bond, Wire and Tube, etc.	Tube
Evaporator Dimension, Length, Surface Area, Inside Tube Diameter	Tube Coils 40 mt.
Evaporator Material, Aluminum, Copper, Copper Coated, etc,	Copper
Dryer Type,	Cylindrical
Dryer Material, Weight and Size	Ranco, 30 gr.
Capillary Tube Diameter and Length	0.8 mm Dim, 3000 mm Length

Product Technical Specification ***Al-Ostath Workshop***	
Description	**Specification**
Company Name	Al-Ostath Workshop
Product Name	Water Cooler
Product Model	OS-WC75
Product Application	Water Cooler
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	35*35*95 cm
Freezer Compartment Overall Dimension andWall Thickness	N/A
Refrigerator Compartment Overall Dimension andWall Thickness	N/A
Product Shape, Double Doors, Upright, Chest, etc	Stand, Two water Tabs
Freezer Internal Net Volume	N/A
Refrigerator Net Volume	N/A
Product Net Volume	N/A
Product Inside Temperature C	+ 7 C
Water Storage Tank Capacity, Water Cooler	8 Litters
Type of Water Storage Tank Cylinder, Cubic, etc.	Cylindrical
Water Fellow per hour for water cooler	60 Liters/H
Water Storage Tank Dimension	21*32 cm
Water Outlet Temperature	+7 C
Water Inlet Temperature	+28 C
Freezer Inside Temperature	N/A
Refrigerator Inside Temperature	N/A
Evaporating Temperature	-23 C
Foam Insulation Thickness mm Side Walls, Top, Bottom, Door, Back Panel	40 mm
Type of PU Foam	R11 Pu Foam
Foam Density, Kg/Cu. Mt.	40 Kg/Cu. Mt.
Foam Mixture, Percentage Pol% + R11% + Isocyanate%	37% + 13% + 50%
Total amount of Foam Injection, Kg	4.5 Kg
Refrigerant Type	R 12

Refrigerant Charge Weight Gr.	240 Gr.
Type of Compressor, Hermetic, Semi Hermetic, Open	Hermetic
Compressor Cooling System Static, Oil Cooled, Fan Cooled	Fan Cooled
Compressor Cooling Capacity Watt	250 Watts
Compressor input Power, Watt	¼ Hp, 184 Watts
Compressor Model Number	L88 FW
Compressor Manufacturer	Electrelux
Compressor Mounting Place Top, Bottom, Front, Back	Bottom
Condenser Type, Static, Fan Cooled	Fan Cooled
Condenser Dimension, Length, Inside Tube Diameter,	Two Rows , 5/16 inch
Condenser Material, Aluminum, Copper, Copper Coated, etc,	Copper and Aluminum
Condenser mounting Place, Back Wall, Top, Bottom	Bottom
Evaporator Type, Fin and Tube, Roll Bond, Wire and Tube, etc.	Copper Tubes Surrounding the Tank
Evaporator Dimension, Length, Surface Area, Inside Tube Diameter	15 m. Length
Evaporator Material, Aluminum, Copper, Copper Coated, etc,	Copper
Dryer Type,	Ranco
Dryer Material, Weight and Size	Silica, Cylindrical, 15 Gr.
Capillary Tube Diameter and Length	1 mm , 1800 mm length

Product Technical Specification ***Abdullah Factory for Air-cond & Refrigeration***	
Description	**Specification**
Company Name	Abdullah Factory for air-cond. & ref.
Product Name	Water Cooler
Product Model	Abd.50
Product Application	Water Cooler
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	43*76*127 cm
Freezer Compartment Overall Dimension and Wall Thickness	N/A
Refrigerator Compartment Overall Dimension and Wall Thickness	N/A
Product Shape, Double Doors, Upright, Chest, etc	Stand
Freezer Internal Net Volume	N/A
Refrigerator Net Volume	N/A
Product Net Volume	N/A
Product Inside Temperature C	+7 C
Water Storage Tank Capacity, Water Cooler	25 Liters
Type of Water Storage Tank Cylinder, Cubic, etc.	Cylindrical
Water Fellow per hour for water cooler	100 Liters
Water Storage Tank Dimension	80*35 cm
Water Outlet Temperature	+7 C
Water Inlet Temperature	+28 C
Freezer Inside Temperature	N/A
Refrigerator Inside Temperature	N/A
Evaporating Temperature	-23 C
Foam Insulation Thickness mm Side Walls, Top, Bottom, Door, Back Panel	40 mm
Type of PU Foam	R11 Pu Foam
Foam Density, Kg/Cu. Mt.	40 Kg/Cu. Mt.
Foam Mixture, Percentage Pol% + R11% + Isocyanate%	37% + 13% + 50%
Total amount of Foam Injection, Kg	8 Kg
Refrigerant Type	R12
Refrigerant Charge Weight Gr.	250 Gr.

Type of Compressor, Hermetic, Semi Hermetic, Open	Hermetic
Compressor Cooling System Static, Oil Cooled, Fan Cooled	Fan Cooled
Compressor Cooling Capacity Watt	250 Watts
Compressor input Power, Watt	¼ Hp, 184 Watts
Compressor Model Number	FR8.5B
Compressor Manufacturer	Danfoss
Compressor Mounting Place Top, Bottom, Front, Back	Bottom
Condenser Type, Static, Fan Cooled	Fan Cooled
Condenser Dimension, Length, Inside Tube Diameter,	Two Rows, 5/16 Inch
Condenser Material, Aluminum, Copper, Copper Coated, etc,	Copper and Aluminum Fins
Condenser mounting Place, Back Wall, Top, Bottom	Bottom
Evaporator Type, Fin and Tube, Roll Bond, Wire and Tube, etc.	Tubes Surrounding the Tank
Evaporator Dimension, Length, Surface Area, Inside Tube Diameter	15 M. Copper Tubes
Evaporator Material, Aluminum, Copper, Copper Coated, etc,	Copper
Dryer Type,	Ranco
Dryer Material, Weight and Size	Silica, 15 Gr. Cylindrical
Capillary Tube Diameter and Length	1.5 mm dim, 3000 length

Product Technical Specification ***Emad Addin Al-Sareegy Est.***	
Description	**Specification**
Company Name	Emad Addin Al-Sareegy Est.
Product Name	One Door Refrigerator
Product Model	EMD 100
Product Application	Food Storage
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	800*700*2300 mm.
Freezer Compartment Overall Dimension and Wall Thickness	N/A
Refrigerator Compartment Overall Dimension and Wall Thickness	40 mm
Product Shape, Double Doors, Upright, Chest, etc	Upright with one Door
Freezer Internal Net Volume	N/A
Refrigerator Net Volume	1148 Lit.
Product Net Volume	600 Lit.
Product Inside Temperature C	+5 C
Water Storage Tank Capacity, Water Cooler	N/A
Type of Water Storage Tank Cylinder, Cubic, etc.	N/A
Water Fellow per hour for water cooler	N/A
Water Storage Tank Dimension	N/A
Water Outlet Temperature	N/A
Water Inlet Temperature	N/A
Freezer Inside Temperature	N/A
Refrigerator Inside Temperature	+5 C
Evaporating Temperature	-10 C
Foam Insulation Thickness mm Side Walls, Top, Bottom, Door, Back Panel	40 mm
Type of PU Foam	R11 Pu Foam
Foam Density, Kg/Cu. Mt.	40 Kg/Cu. Mt.
Foam Mixture, Percentage Pol% + R11% + Isocyanate%	37% +13% + 50%
Total amount of Foam Injection, Kg	17 Kg
Refrigerant Type	R12
Refrigerant Charge Weight Gr.	400 Gr.

Type of Compressor, Hermetic, Semi Hermetic, Open	Hermetic
Compressor Cooling System Static, Oil Cooled, Fan Cooled	Fan Cooled
Compressor Cooling Capacity Watt	450 Gr.
Compressor input Power, Watt	400
Compressor Model Number	SC10B
Compressor Manufacturer	Danfoss
Compressor Mounting Place Top, Bottom, Front, Back	Bottom
Condenser Type, Static, Fan Cooled	Fan Cooled
Condenser Dimension, Length, Inside Tube Diameter,	3 Rows Tube Coils and Fins
Condenser Material, Aluminum, Copper, Copper Coated, etc,	Copper
Condenser mounting Place, Back Wall, Top, Bottom	Top
Evaporator Type, Fin and Tube, Roll Bond, Wire and Tube, etc.	Fin and Tube
Evaporator Dimension, Length, Surface Area, Inside Tube Diameter	
Evaporator Material, Aluminum, Copper, Copper Coated, etc,	Copper
Dryer Type,	Cylindrical
Dryer Material, Weight and Size	20 Gr
Capillary Tube Diameter and Length	1 mm 2500 mm

Product Technical Specification ***Raed Workshop***	
Description	**Specification**
Company Name	Raed Workshop
Product Name	Water Cooler
Product Model	Raed 50
Product Application	Water Cooler
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	
Freezer Compartment Overall Dimension and Wall Thickness	N/A
Refrigerator Compartment Overall Dimension and Wall Thickness	60*40*90 Cm
Product Shape, Double Doors, Upright, Chest, etc	
Freezer Internal Net Volume	N/A
Refrigerator Net Volume	60 Liters
Product Net Volume	315 Liters
Product Inside Temperature C	18
Water Storage Tank Capacity, Water Cooler	60 Liters
Type of Water Storage Tank Cylinder, Cubic, etc.	Cubic
Water Fellow per hour for water cooler	60 Lit/H
Water Storage Tank Dimension	60 Liters
Water Outlet Temperature	18 C
Water Inlet Temperature	25 C
Freezer Inside Temperature	N/A
Refrigerator Inside Temperature	18 C
Evaporating Temperature	-10 C
Foam Insulation Thickness mm Side Walls, Top, Bottom, Door, Back Panel	40 mm
Type of PU Foam	R11 Pu Foam
Foam Density, Kg/Cu. Mt.	40 Kg/Cu. Mt.
Foam Mixture, Percentage Pol% + R11% + Isocyanate%	37% + 13% + 50%
Total amount of Foam Injection, Kg	6 Kg
Refrigerant Type	R 12
Refrigerant Charge Weight Gr.	250 Gr.

Type of Compressor, Hermetic, Semi Hermetic, Open	Hermetic
Compressor Cooling System Static, Oil Cooled, Fan Cooled	Fan Cooled
Compressor Cooling Capacity Watt	200 Watt
Compressor input Power, Watt	180 Watt
Compressor Model Number	SC8.5b
Compressor Manufacturer	Danfoss
Compressor Mounting Place Top, Bottom, Front, Back	Bottom
Condenser Type, Static, Fan Cooled	Fan Cooled
Condenser Dimension, Length, Inside Tube Diameter,	2 Rows
Condenser Material, Aluminum, Copper, Copper Coated, etc,	Copper
Condenser mounting Place, Back Wall, Top, Bottom	Bottom
Evaporator Type, Fin and Tube, Roll Bond, Wire and Tube, etc.	Roll Tube
Evaporator Dimension, Length, Surface Area, Inside Tube Diameter	
Evaporator Material, Aluminum, Copper, Copper Coated, etc,	Copper Coated
Dryer Type,	Cylindrical
Dryer Material, Weight and Size	10 Gr.
Capillary Tube Diameter and Length	0.7 mm diameter 2500 mm length

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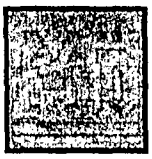

TestDate: 02/01/16 11:57
TestName: Energy Consumtion

Report No.: Spec & Remark
ReportDate: 2002/02/15 15:08

Total Result :

1 - Total Test Time	*96 Hours*
2 - Working Percent	*22 %On*
3 - Energy	*0.766 kwh*
4 - Zoom Time	*96:34 Hour*
5 - Compr Current	*00 Amp*
6 - Evaprator Mean Temp	*33.4 C*
7 - Cabin Mean Temp	*15.1 C*
8 - Crisp Temp	*12.9 C*
9 - Compr Temp	*51.7 C*
10- Condensor In Temp	*54 C*
11- Condensor Out Temp	*2.2 C*
12- Condition	*42.6 C 35 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	

Product Spec :

1 - File Name	*02011611.k57*
2 - Test Kind G	*Performanc*
3 - Product Serial	
4 - Product Name	*Water Cool*
5 - Product Model	*ST-100*
6 - Product Capacity	*100 LIT/h.*
7 - Compressor Name	*Electrolux*
8 - Compressor Model	*GL 90 AN*
9 - Compressor Power	*1/4*
10- Compressor Amper	*2*
11- Thermostat No.	*3*
12- Thermostat Type	*Ranco*
13-	
14-	

Technical Manager: *ICRC*

Lab Chief : *MARIO AL-DEEK*

Lab Specialist: *ZIAD*

Remark :

Remark1
Remark2
Remark3

Remark :

sign :

Industrial Control Research Center HotRoom Ver 5

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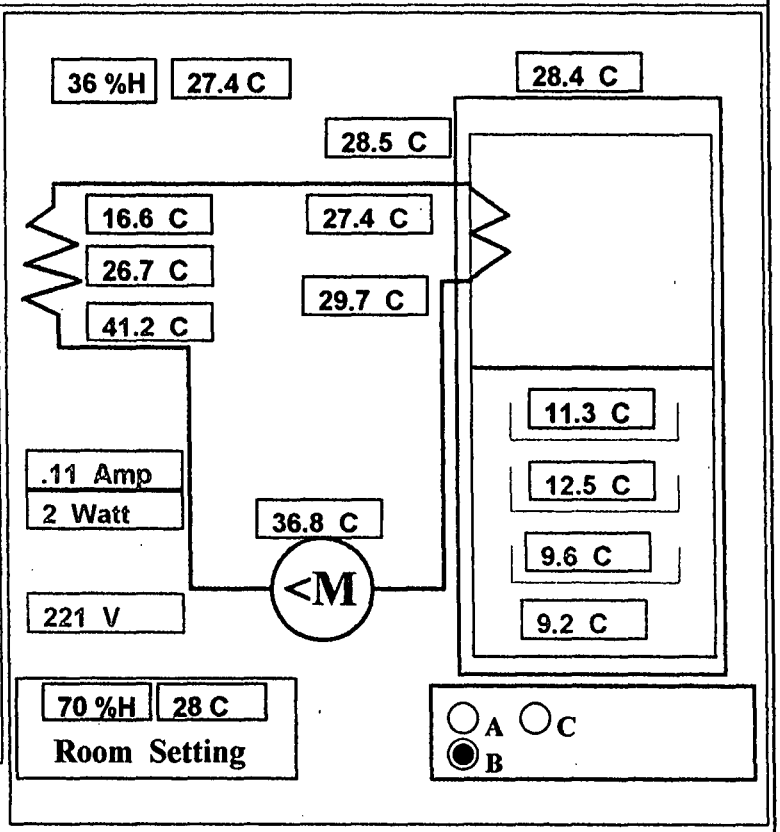
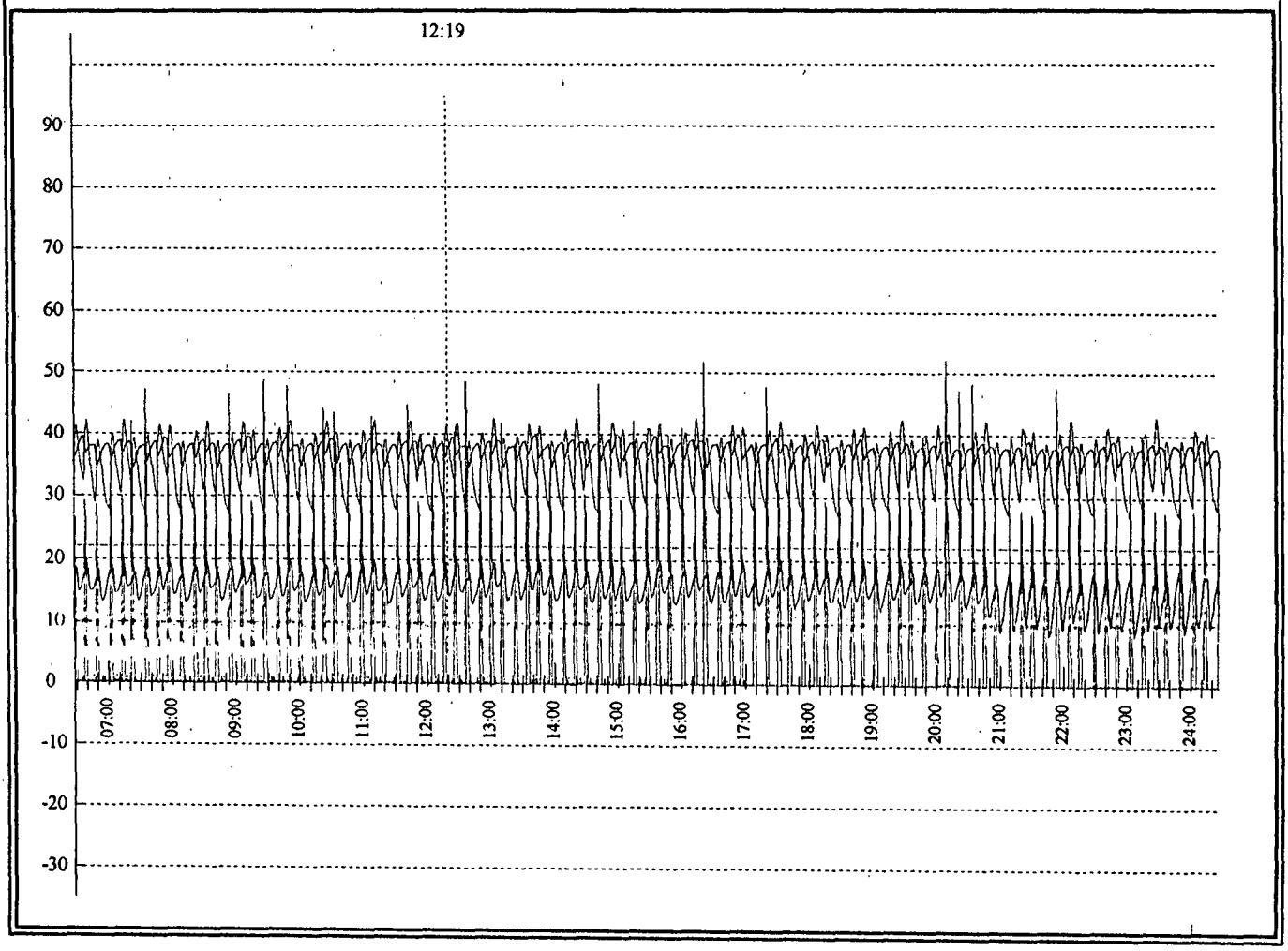
TestDate: 02/01/16 11:57 **Report No.:** ( ) - Page 1

PageTestName: Energy Consumtion **ReportDate:** 2002/02/15 15:08

Page Result :

1 - Page Test Time	96 Hours
2 - Working Percent	22 %On
3 - Energy (Accord to page)	0.766 kwh
4 - Zoom Time	96:34 Hour
5 - Compr Current	00 Amp
6 - Evaprator Mean Temp	33.4 C
7 - Cabin Mean Temp	15.1 C
8 - Crisp Temp	12.9 C
9 - Compr Temp	51.7 C
10- Condensor In Temp	54 C
11- Condensor Out Temp	2.2 C
12- Condition	42.6 C 35 %H
13- Volt	Max=221 Mean=221 Min=221
14-	
15-	
16-	
17-	





Industrial Control Research Center HotRoom Ver 5

Printing In Labaratory Of
Maurice Ind. [Jordan]

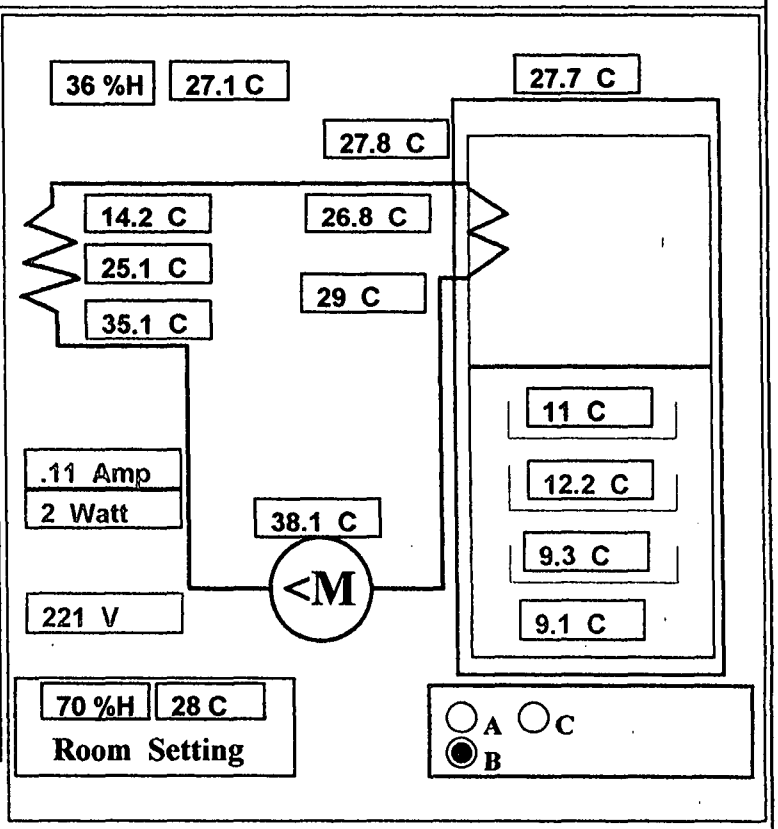
Maurice Ind. [Jordan]

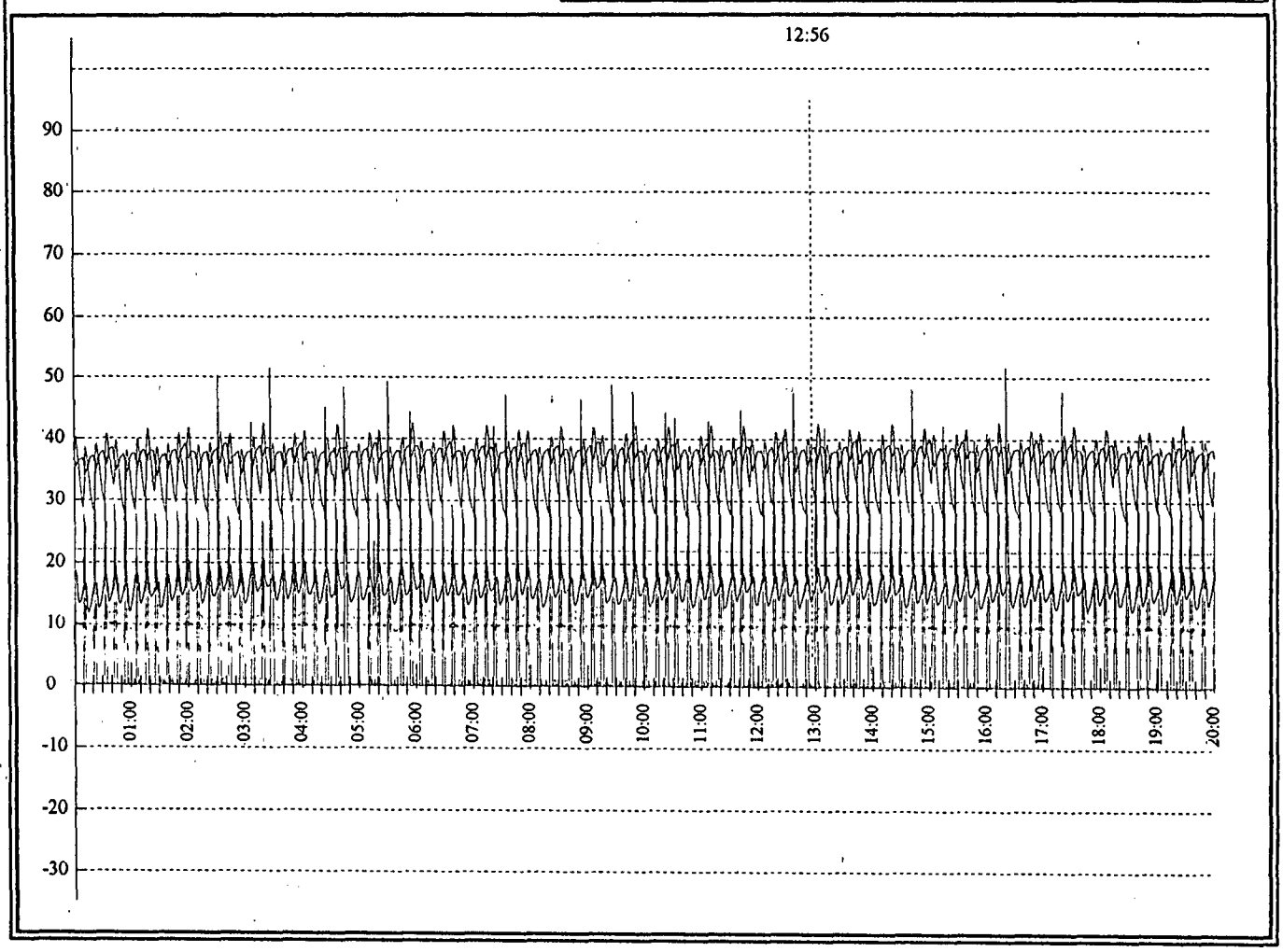
TestDate: 02/01/16 11:57 *Report No.:* ( ) - Page 1

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 15:09

Page Result :

1 - Page Test Time	*20 Hours*
2 - Working Percent	*17 %On*
3 - Energy (Accord to page)	*0.594 kwh*
4 - Zoom Time	*12:56 Hour*
5 - Compr Current	*0.11 Amp*
6 - Evaprator Mean Temp	*21.6 C*
7 - Cabin Mean Temp	*10.8 C*
8 - Crisp Temp	*9.1 C*
9 - Compr Temp	*38.1 C*
10- Condensor In Temp	*35.1 C*
11- Condensor Out Temp	*14.2 C*
12- Condition	*27.1 C 36 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	





Industrial Control Research Center HotRoom Ver 5

Printing In Labaratory Of
Maurice Ind. [Jordan]

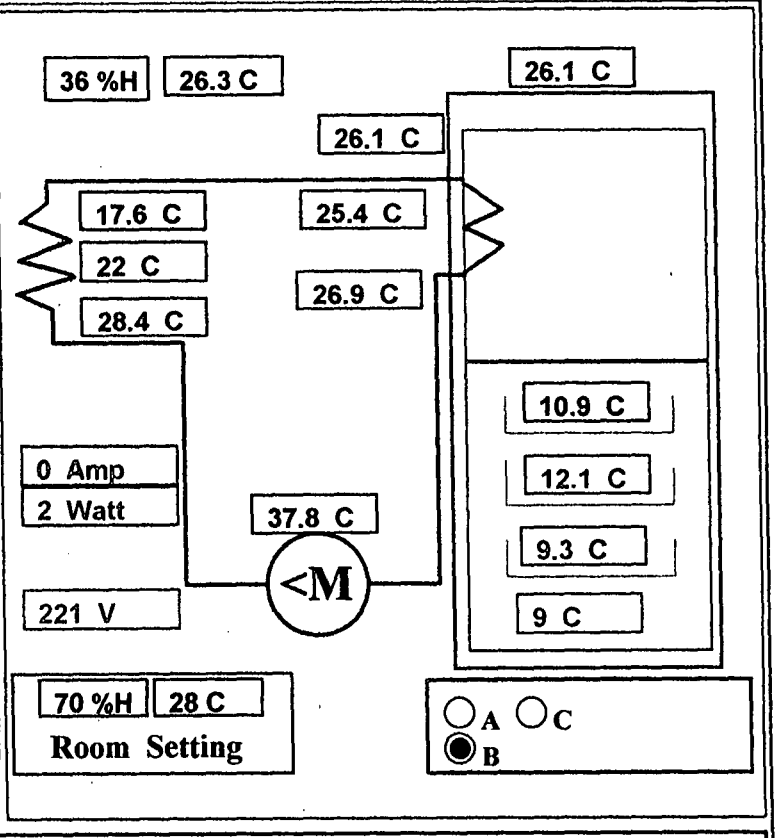
Maurice Ind. [Jordan]

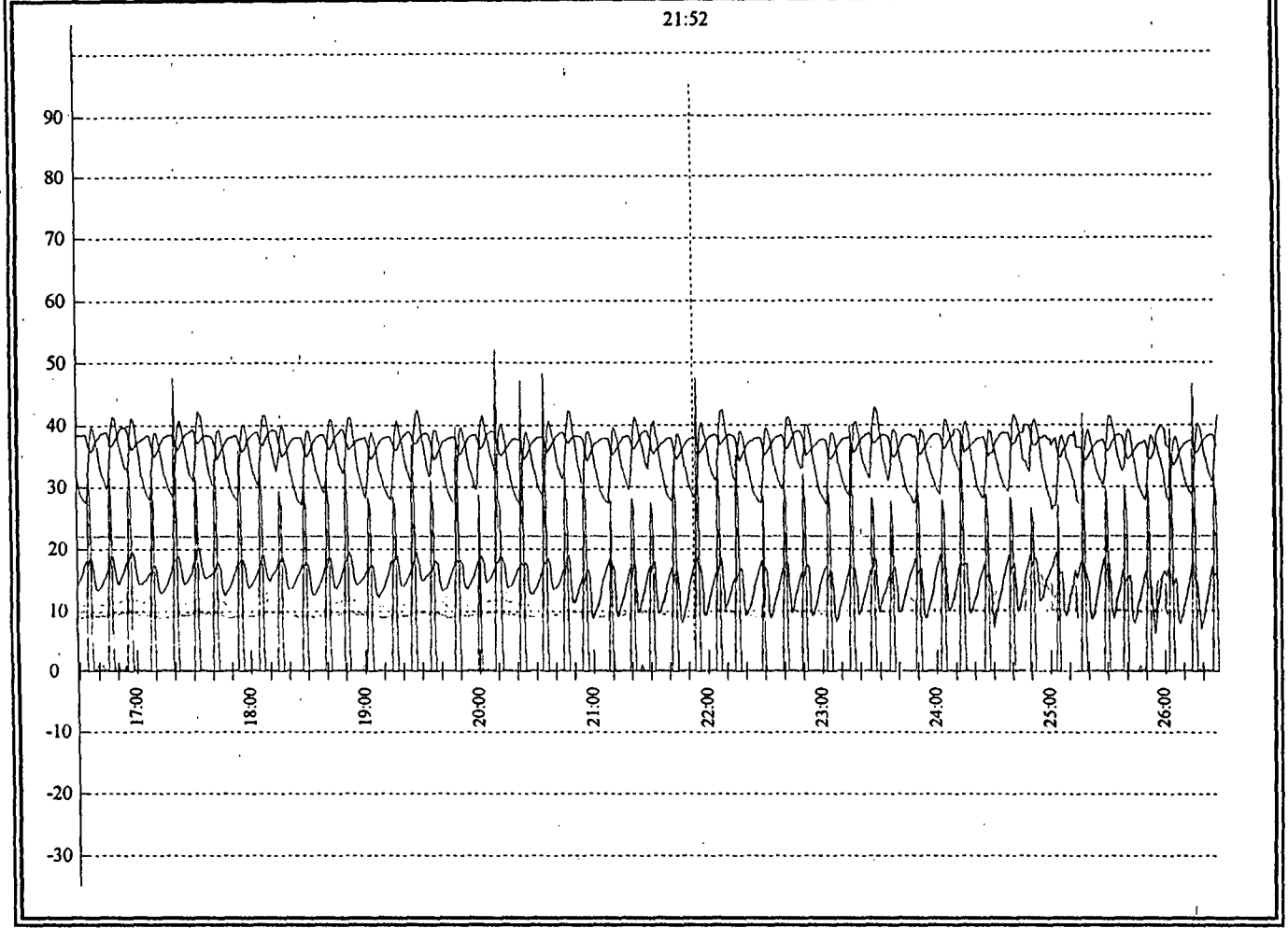
TestDate: 02/01/16 11:57 *Report No.:* ( ) - Page 1

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 15:12

Page Result :

1 - Page Test Time	*10 Hours*
2 - Working Percent	*17 %On*
3 - Energy (Accord to page)	*0.553 kwh*
4 - Zoom Time	*21:53 Hour*
5 - Compr Current	*00 Amp*
6 - Evaprator Mean Temp	*21 C*
7 - Cabin Mean Temp	*10.7 C*
8 - Crisp Temp	*9 C*
9 - Compr Temp	*37.8 C*
10- Condensor In Temp	*28.4 C*
11- Condensor Out Temp	*17.6 C*
12- Condition	*26.3 C 36 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	





Industrial Control Research Center HotRoom Ver 5

Printing In Labaratory Of
Maurice Ind. [Jordan]

Maurice Ind. [Jordan]

TestDate: 01/11/15 10:38
TestName: Energy Consumtion

Report No.: Spec & Remark
ReportDate: 2002/02/15 15:28

Total Result :

1 - Total Test Time	*77 Hours*
2 - Working Percent	*58 %On*
3 - Energy	*1.538 kwh*
4 - Zoom Time	*76:00 Hour*
5 - Compr Current	*1.96 Amp*
6 - Evaprator Mean Temp	*.1 C*
7 - Cabin Mean Temp	*-10.2 C*
8 - Crisp Temp	*-12.1 C*
9 - Compr Temp	*60.5 C*
10- Condensor In Temp	*61.1 C*
11- Condensor Out Temp	*-3.7 C*
12- Condition	*43.2 C 35 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	

Product Spec :

1 - File Name		*01111510.k38*
2 - Test Kind	G	*Perform.*
3 - Product Serial		
4 - Product Name		*Meat Ref.*
5 - Product Model		*EM-310*
6 - Product Capacity		*700 Lit.*
7 - Compressor Name		*Electrolux*
8 - Compressor Model		*GP12 FB*
9 - Compressor Power		*1/3 Hp*
10- Compressor Amper		*3 Amp*
11- Thermostat No.		*3*
12- Thermostat Type		*Ranco*
13-		
14-		

Technical Manager: *ICRC*

Lab Chief : *MARIO AL-DEEK*

Lab Specialist: *ZIAD*

Remark :

Remark1
Remark2
Remark3

Remark :

sign :

Industrial Control Research Center HotRoom Ver 5

Printing In Laboratory Of
Maurice Ind. [Jordan]

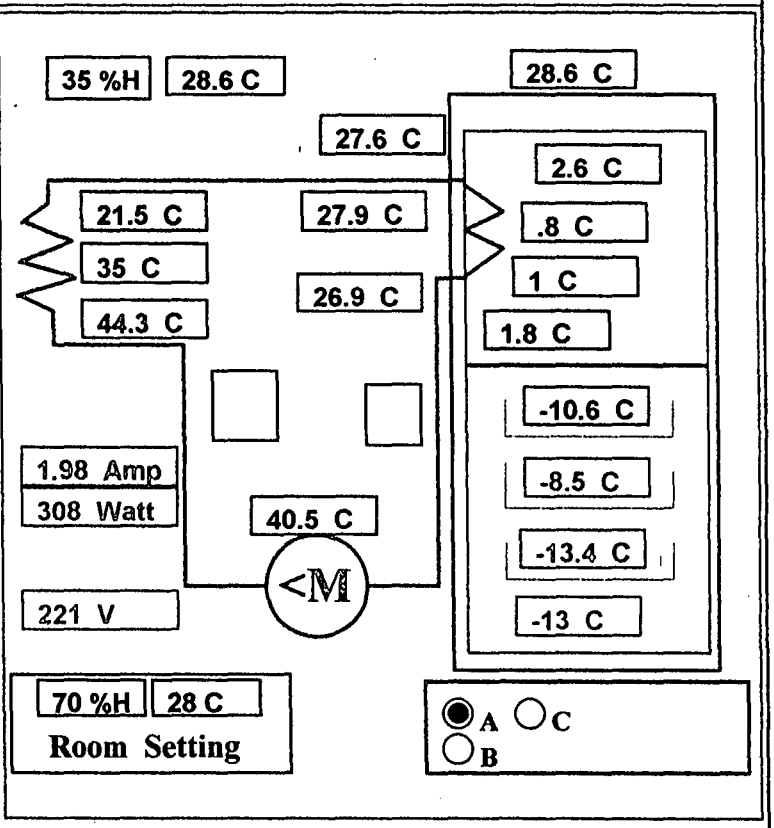
Maurice Ind. [Jordan]

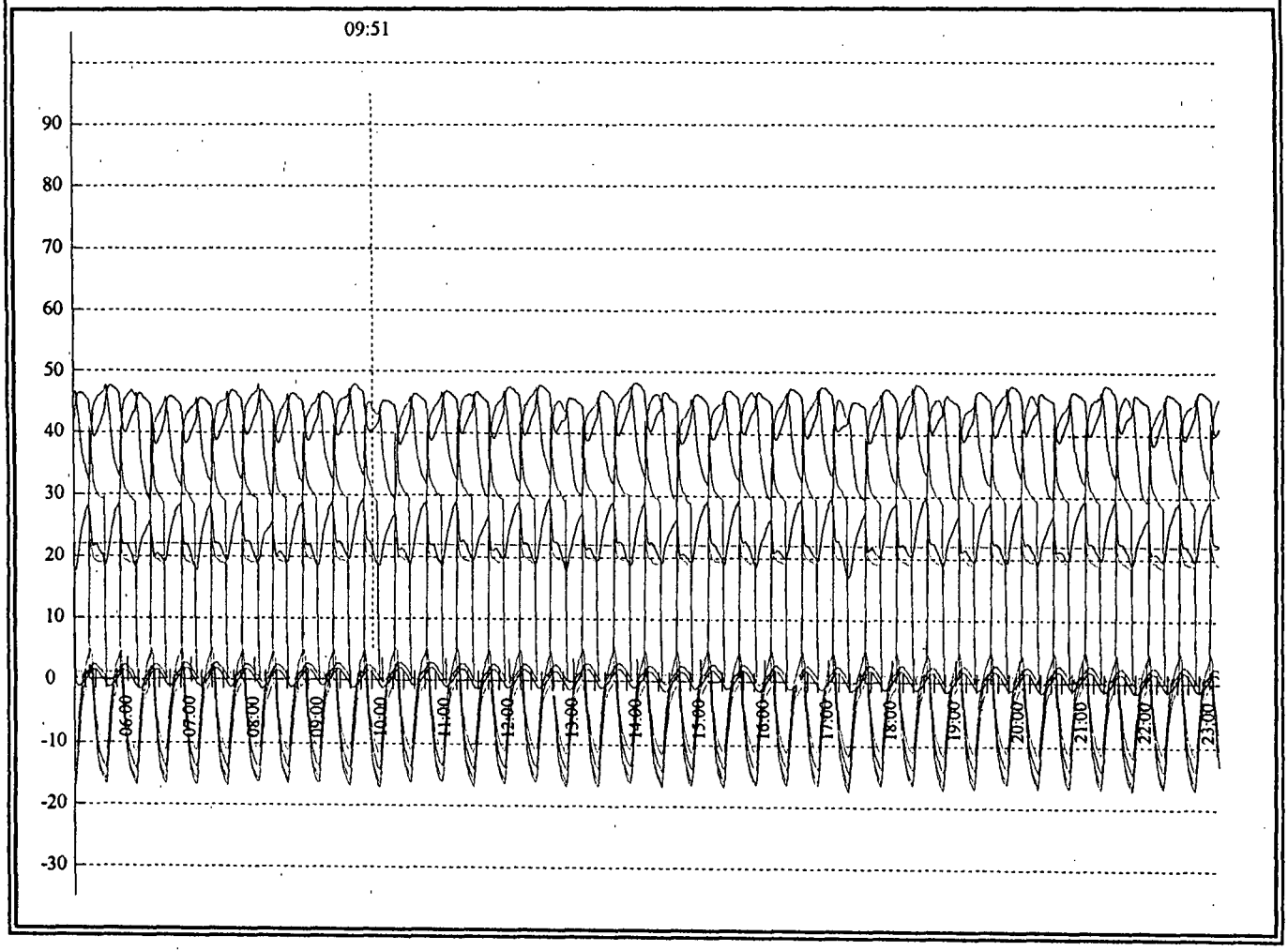
TestDate: 01/11/15 10:38 **Report No.:** ( ) - Page 1

PageTestName: Energy Consumtion **ReportDate:** 2002/02/15 15:28

Page Result :

1 - Page Test Time	77 Hours
2 - Working Percent	58 %On
3 - Energy (Accord to page)	1.538 kwh
4 - Zoom Time	76:00 Hour
5 - Compr Current	1.96 Amp
6 - Evaprator Mean Temp	.1 C
7 - Cabin Mean Temp	-10.2 C
8 - Crisp Temp	-12.1 C
9 - Compr Temp	60.5 C
10- Condensor In Temp	61.1 C
11- Condensor Out Temp	-3.7 C
12- Condition	43.2 C 35 %H
13- Volt	Max=221 Mean=221 Min=221
14-	
15-	
16-	
17-	





Industrial Control Research Center HotRoom Ver 5

Printing In Labaratory Of
Maurice Ind. [Jordan]

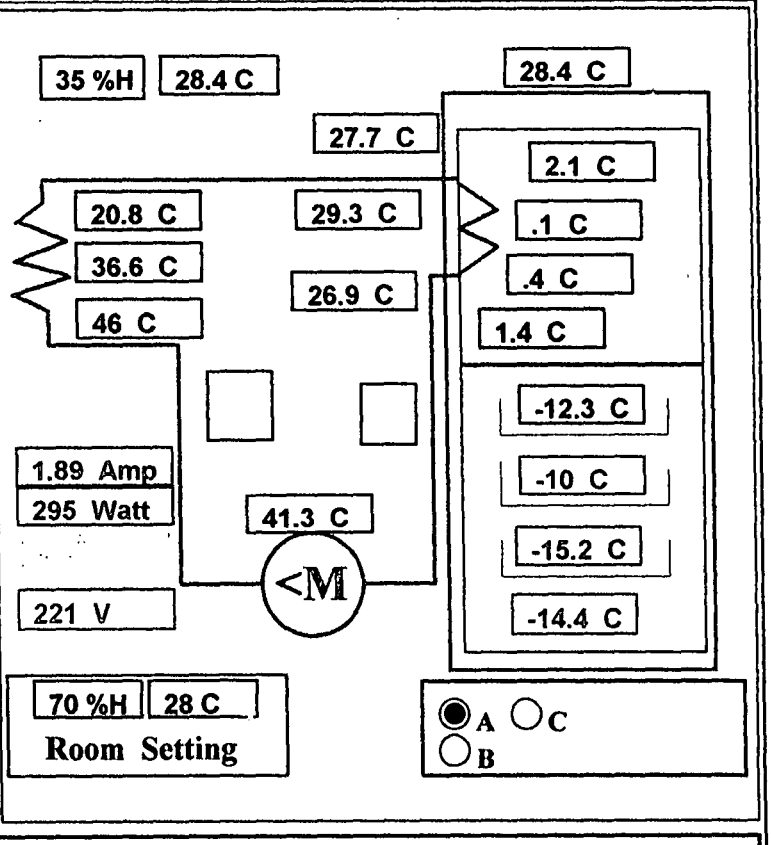
Maurice Ind. [Jordan]

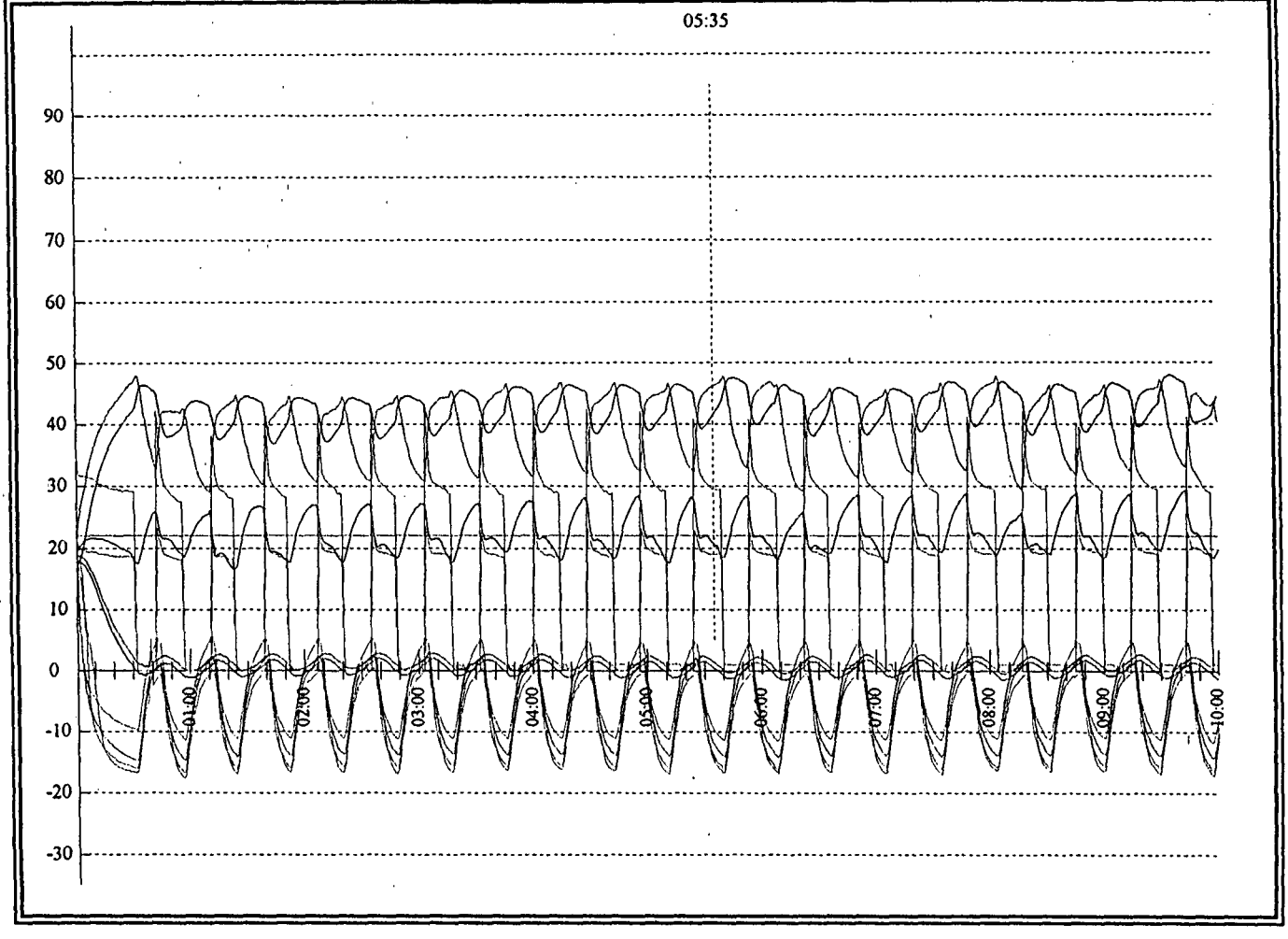
TestDate: 01/11/15 10:38 *Report No.:* ( ) - Page 1

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 15:30

Page Result :

1 - Page Test Time	*10 Hours*
2 - Working Percent	*50 %On*
3 - Energy (Accord to page)	*1.323 kwh*
4 - Zoom Time	*5:35 Hour*
5 - Compr Current	*1.89 Amp*
6 - Evaprator Mean Temp	*1 C*
7 - Cabin Mean Temp	*-12.5 C*
8 - Crisp Temp	*-14.4 C*
9 - Compr Temp	*41.3 C*
10- Condensor In Temp	*46 C*
11- Condensor Out Temp	*20.8 C*
12- Condition	*28.4 C 35 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	





Industrial Control Research Center HotRoom Ver 5

Printing In Labaratory Of
Maurice Ind. [Jordan]

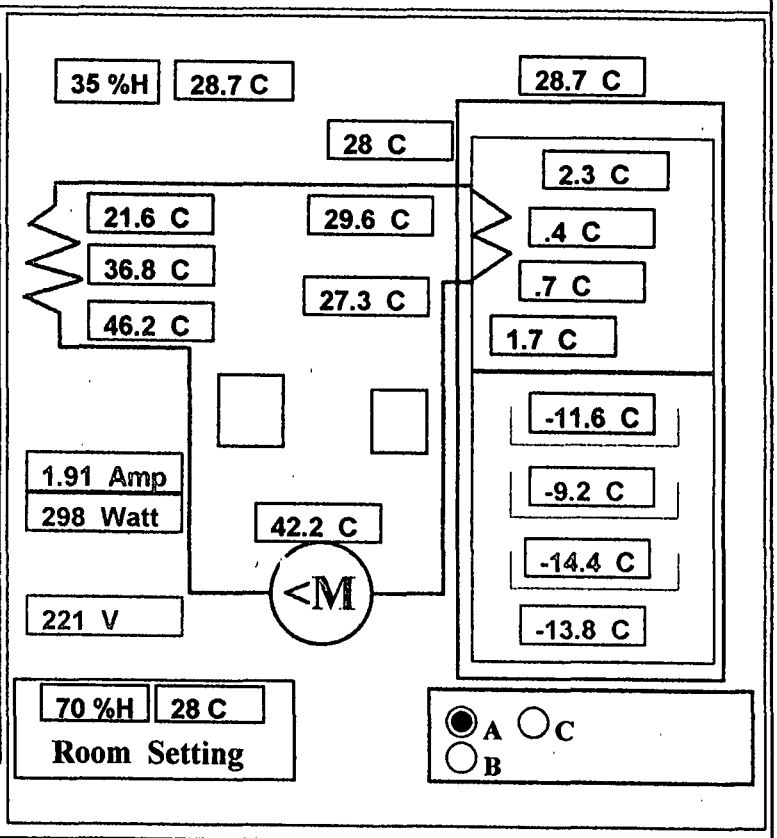
Maurice Ind. [Jordan]

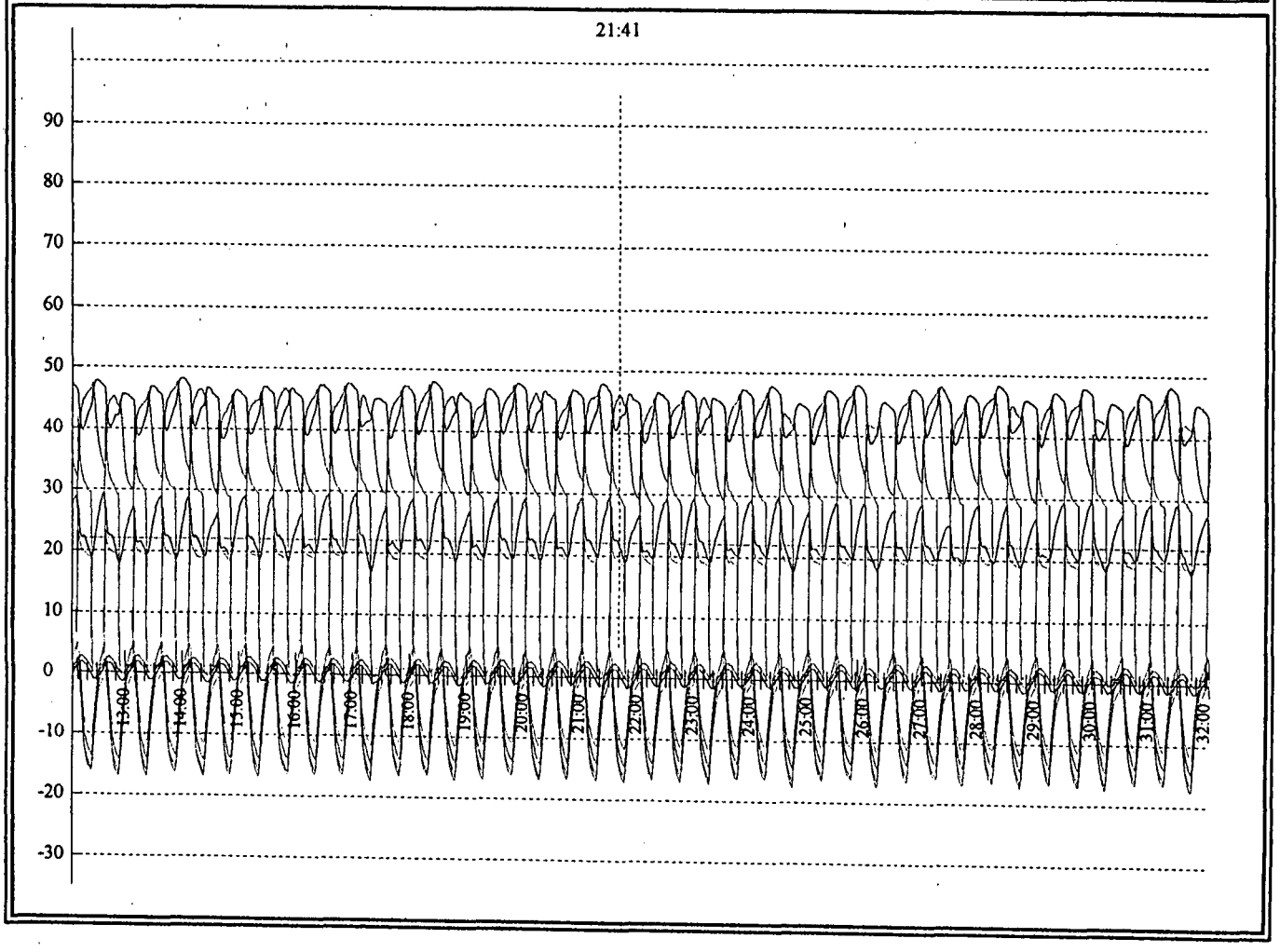
TestDate: 01/11/15 10:38 *Report No.:* ( ) - Page 1

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 15:31

Page Result :

1 - Page Test Time	*20 Hours*
2 - Working Percent	*48 %On*
3 - Energy (Accord to page)	*1.316 kwh*
4 - Zoom Time	*21:41 Hour*
5 - Compr Current	*1.91 Amp*
6 - Evaprator Mean Temp	*1.2 C*
7 - Cabin Mean Temp	*-11.7 C*
8 - Crisp Temp	*-13.8 C*
9 - Compr Temp	*42.2 C*
10- Condensor In Temp	*46.2 C*
11- Condensor Out Temp	*21.6 C*
12- Condition	*28.7 C 35 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	





Industrial Control Research Center HotRoom Ver 5

Printing in Labaratory Of
Maurice Ind. [Jordan]

Maurice Ind. [Jordan]

TestDate: 01/11/15 10:38
TestName: Energy Consumtion

Report No.: Spec & Remark
ReportDate: 2002/02/15 15:33

Total Result :

1 - Total Test Time	*77*	*Hours*
2 - Working Percent	*84*	*%On*
3 - Energy	*0.927*	*kwh*
4 - Zoom Time	*76:00*	*Hour*
5 - Compr Current	*2.12*	*Amp*
6 - Evaprator Mean Temp	*-14.2*	*C*
7 - Cabin Mean Temp	*-14.9*	*C*
8 - Crisp Temp	*-14.2*	*C*
9 - Compr Temp	*73.8*	*C*
10- Condensor In Temp	*76.7*	*C*
11- Condensor Out Temp	*41.8*	*C*
12- Condition	*43.2 C*	*35 %H*
13- Volt	*Max=221 Mean=221 Min=221*	
14-		
15-		
16-		
17-		

Product Spec :

1 - File Name		*01111510.k38*
2 - Test Kind	G	*Perform.*
3 - Product Serial		
4 - Product Name		*Chest Fre.*
5 - Product Model		*KH-310*
6 - Product Capacity		*500 Lit*
7 - Compressor Name		*Electrolux*
8 - Compressor Model		*GL90 AN*
9 - Compressor Power		*1/4 Hp*
10- Compressor Amper		*2*
11- Thermostat No.		*4*
12- Thermostat Type		*Ranco*
13-		
14-		

Technical Manager: *ICRC*

Lab Chief : *MARIO AL-DEEK*

Lab Specialist: *ZIAD*

Remark :

Remark1
Remark2
Remark3

Remark :

sign :

Industrial Control Research Center HotRoom Ver 5

Printing In Labaratory Of
Maurice Ind. [Jordan]

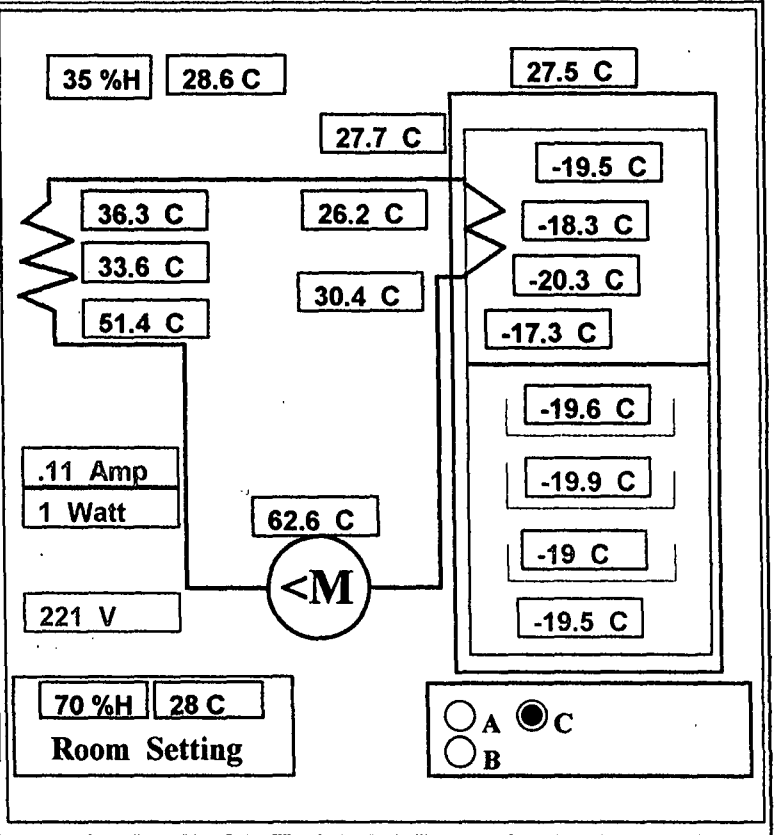
Maurice Ind. [Jordan]

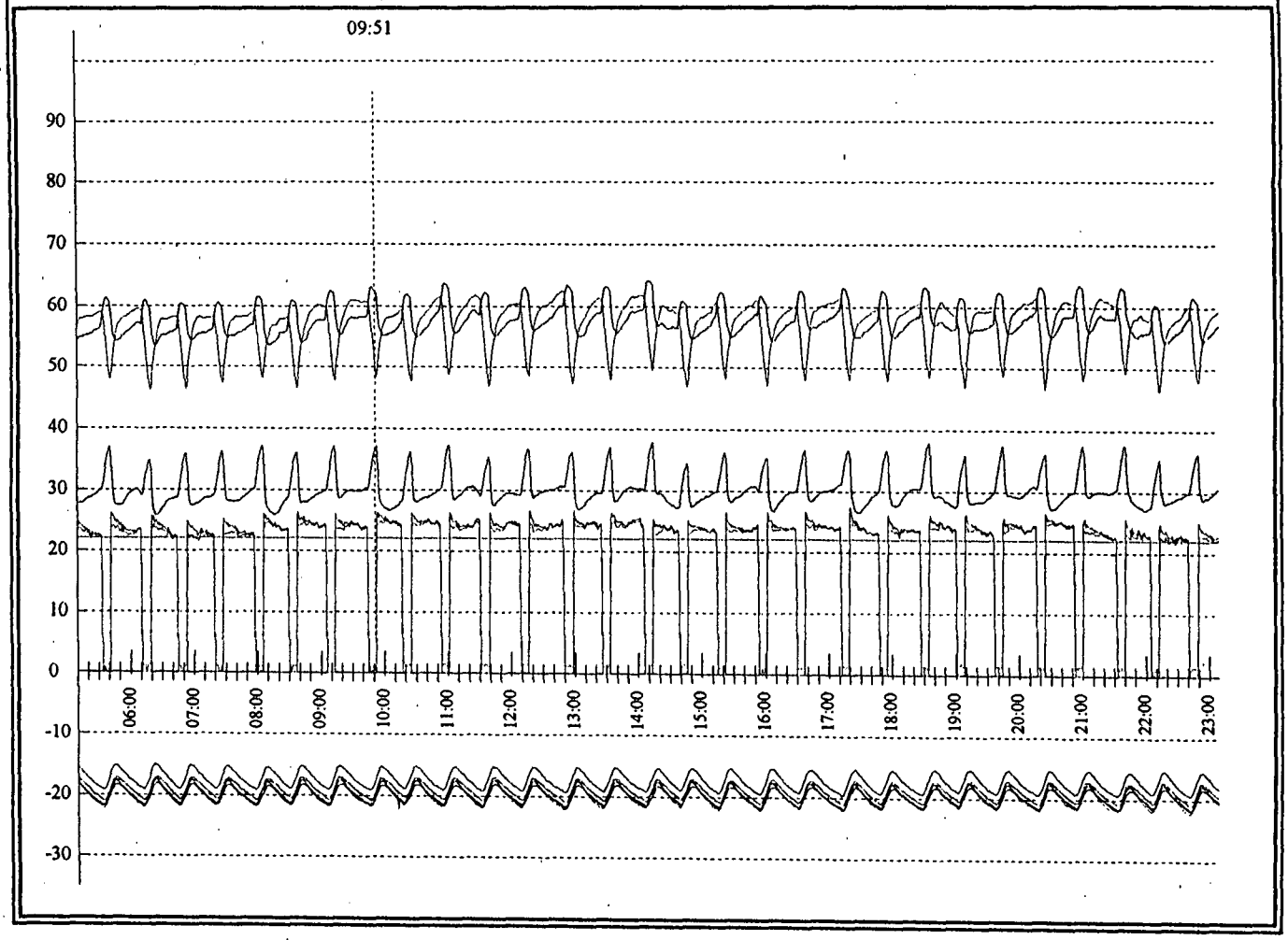
TestDate: 01/11/15 10:38 **Report No.:** ( ) - Page 1

PageTestName: Energy Consumtion **ReportDate:** 2002/02/15 15:33

Page Result :

1 - Page Test Time	77	Hours
2 - Working Percent	84	%On
3 - Energy (Accord to page)	0.927	kwh
4 - Zoom Time	76:00	Hour
5 - Compr Current	2.12	Amp
6 - Evaprator Mean Temp	-14.2	C
7 - Cabin Mean Temp	-14.9	C
8 - Crisp Temp	-14.2	C
9 - Compr Temp	73.8	C
10- Condensor In Temp	76.7	C
11- Condensor Out Temp	41.8	C
12- Condition	43.2 C	35 %H
13- Volt	Max=221 Mean=221 Min=221	
14-		
15-		
16-		
17-		





Industrial Control Research Center HotRoom Ver 5

Printing in Labaratory Of
Maurice Ind. [Jordan]

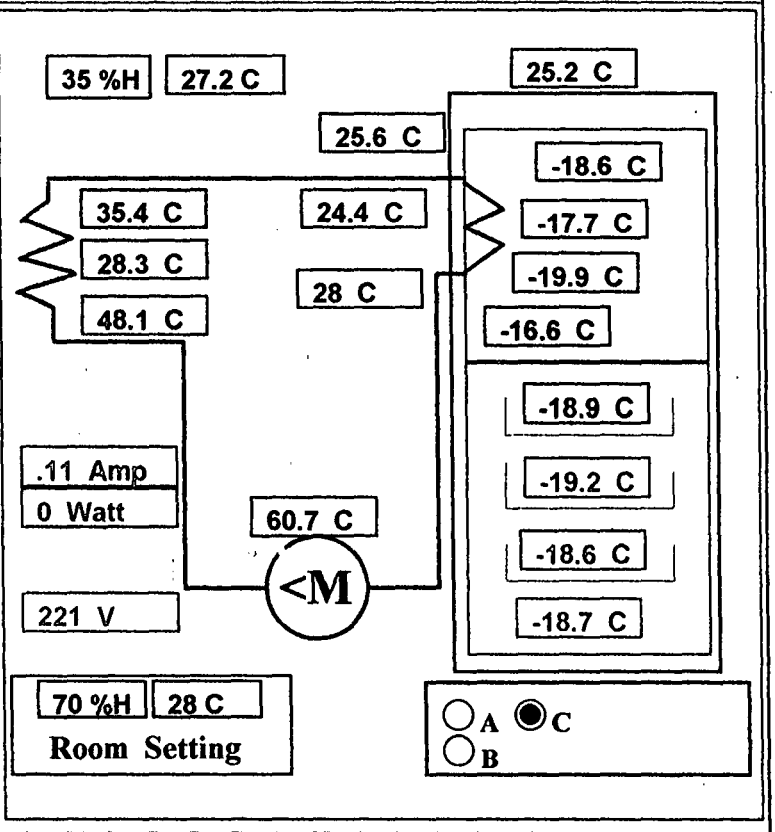
Maurice Ind. [Jordan]

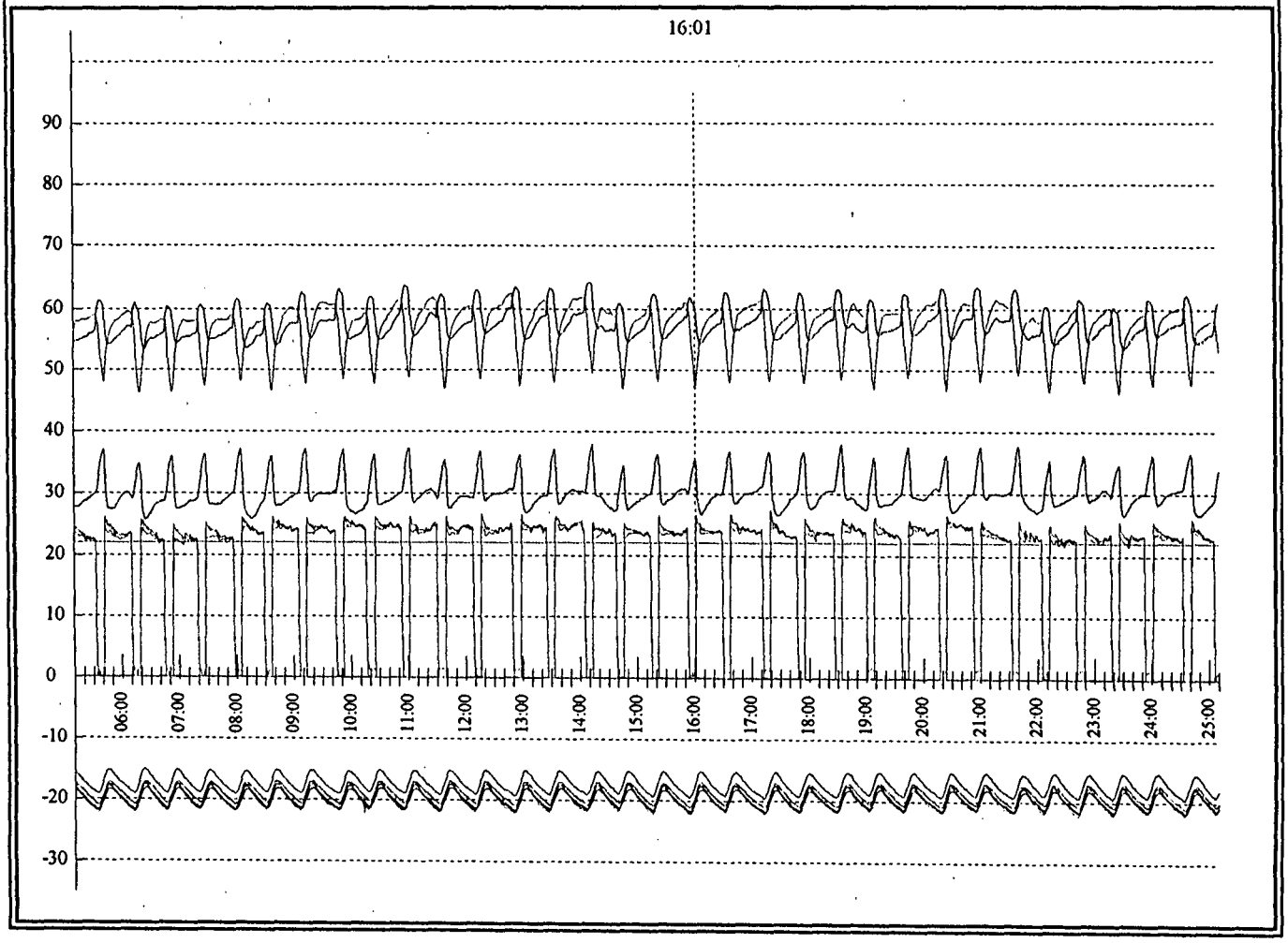
TestDate: 01/11/15 10:38 *Report No.:* ( ) - Page 1

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 15:33

Page Result :

1 - Page Test Time	*20 Hours*
2 - Working Percent	*77 %On*
3 - Energy (Accord to page)	*0.907 kwh*
4 - Zoom Time	*16:01 Hour*
5 - Compr Current	*0.11 Amp*
6 - Evaprator Mean Temp	*-18.2 C*
7 - Cabin Mean Temp	*-18.9 C*
8 - Crisp Temp	*-18.7 C*
9 - Compr Temp	*60.7 C*
10- Condensor In Temp	*48.1 C*
11- Condensor Out Temp	*35.4 C*
12- Condition	*27.2 C 35 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	





Industrial Control Research Center HotRoom Ver 5

Printing In Laboratory Of
Maurice Ind. [Jordan]

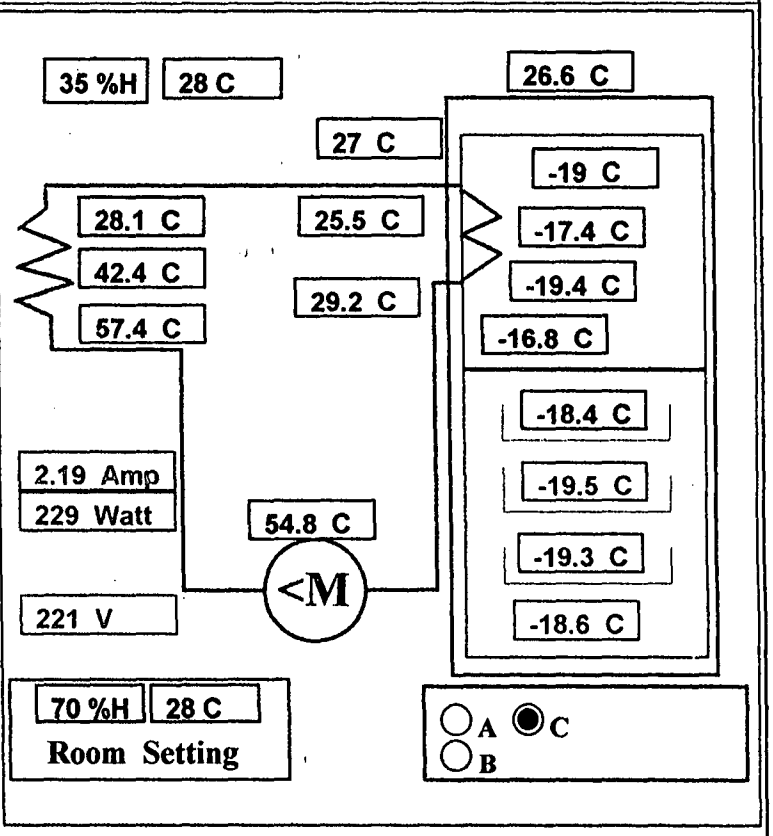
Maurice Ind. [Jordan]

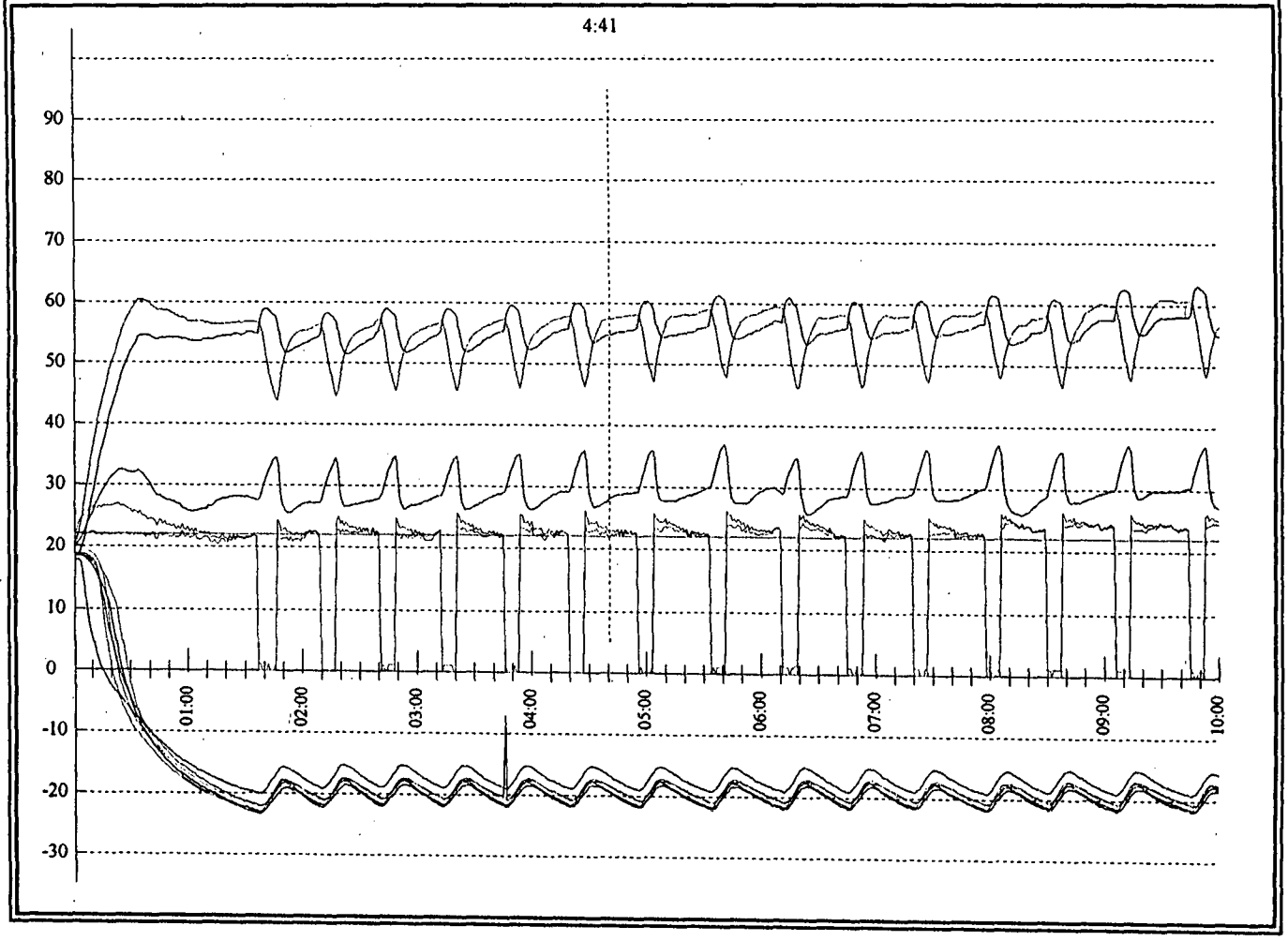
TestDate: 01/11/15 10:38 **Report No.:** ( ) - Page 1

PageTestName: Energy Consumtion **ReportDate:** 2002/02/15 15:34

Page Result :

1 - Page Test Time	*10 Hours*
2 - Working Percent	*79 %On*
3 - Energy (Accord to page)	*0.924 kwh*
4 - Zoom Time	*4:41 Hour*
5 - Compr Current	*2.19 Amp*
6 - Evaprator Mean Temp	*-18.1 C*
7 - Cabin Mean Temp	*-19 C*
8 - Crisp Temp	*-18.6 C*
9 - Compr Temp	*54.8 C*
10- Condensor In Temp	*57.4 C*
11- Condensor Out Temp	*28.1 C*
12- Condition	*28 C 35 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	





Industrial Control Research Center HotRoom Ver 5