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Maurice Ind. ICEBERG موريس الصناعية

Date: 14th Feb. 2002

To: ***Mrs. Mounira Latrech***
Contracts Officer
General Services
Financial Performance Control Branch
Field Operation and Administration Division
UINDO, Vienna, Austria
Fax: 00 431 2692 669

Subject: ***Final Report***

Reference: ***Contract Number 01/313, Project Number MP/JOR/01/153***

Dear Mrs. Latrech,

Please find attached herewith our final report.

Please also find enclosed our invoice number 43937 dated 14th February 2002.

Your prompt action in reviewing the final report & proceed the payment of our invoice is highly appreciated.

With regards,

Maryo Al-Deek
Managing Director

ICEBERG
Maurice Ind.

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Maurice Ind. ICEBERG موريس الصناعية

Date: 14th Feb. 2002

To: ***Mrs. Mounira Latrech***
Contracts Officer
General Services
Financial Performance Control Branch
Field Operation and Administration Division
UINDO, Vienna, Austria
Fax: 00 431 2692 669

Subject: ***Invoice no. 42937, Fourth Payment***

Reference: ***Contract Number 01/313, Project Number MP/JOR/01/153***

The amount of (US$ 3,000) three thousand US$, as the fourth payment of contract n. 01/313 (referring to page 9 paragraph 4.03d) upon UNIDO's receipt and acceptance of the contractor's final report , payable to:

Maryo Maurice Al-Deek
Account Number 0152443077
Jordan Kuwait Bank
Abu-Alanda Branch
P.O. Box 341 Abu Alanda
Amman - Jordan

Tel : 00 962 6 4162756
Fax : 00 962 6 4161841

Maryo Al-Deek
Managing Director

ICEBERG
Maurice Ind.

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FINAL REPORT

For

Contract Number 01/313

Abu Khalaf Workshop, Al-Taghwa Factory for Refrigeration, Farough Refrigeration factory, Dawudiah Workshop, Makka Factory and Teck Tack 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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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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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.

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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 01/313 implementation of CFC phase out projects at,

- Abu Khalaf Workshop
- Al- Taghwa Workshop
- Farough Refrigeration
- Dawudiah Workshop
- Makka Refrigeration Factory
- Teck – Tack Workshop

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Load Calculation for Water Cooler
Makka 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
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

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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

Refrigeration Load Calculation
Teck Tack Workshop Soft Drink 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

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Refrigeration Load Calculation
Al- Taghwa 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	80x205	1.64	40mm	27 c
Bottom	70x80	0.56	40mm	27 C
Top	70x80	0.56	40mm	37 c
Doors	80x205	1.64	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.
Therefore:

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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 = 1.64

Q_{doors} = 0.59 x 1.64 x 27 = Watts Q_{doors} = 26 Watts

3- $Q_{top} = [U A (T_a - T_r)]$

U = 0.59 w/sq. Mt. °C,

Ta - Tr= 37 ,

A = 0.56

Q_{top} = 0.59 x 0.56 x 37 = 12 Watts

Q_{top} = 12 Watts

4 -$Q_{back\ panel} = [U A (T_a - T_r)]$

U = 0.59 w/sq. Mt. °C,

Ta - Tr= 27 , A = 1.64

$Q_{back\ panel}$ = 0.59 x 1.64 x 27 = 26 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 = 0.56

$Q_{Bottom\ Surface}$ = 0.59x 0.56 x 27 = 9 Watt

$Q_{Bottom\ Surface}$ = 9 Watts

Total Refrigerator Heat Leak =46 + 26 + 12+ 26 + 9 = 119 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 300 Kg of meet to be stored in this refrigerator therefore we calculate as follow,

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

M = 300 kg

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Tel Showroom : 4653262 - Factory : 4161372 - Fax : 962-6-4160786 - Fax : 962-6-4613340 - P.O.Box : 921940 Amman - Jordan
E-mail: maurice@joinnet.com.jo

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 = 300000x2.8x (25-5) =16800000 jul/86400 = 194 Watt

Internal Load
N/A

Door Opening
Refrigerator Internal Volume 1148 lit.
Number of air change as per ASHREA standard = 70 per day
Heat removed per cubic meter of air 75000 j

Air Change load = 1.148 x70x75000/86400 = 69 Watt

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

$Q_{Total} = 119 + 194 + 69 = 382$

Considering 10 % of Q total for safety factor

Cooling Capacity Required = $Q_{Grand\ Total} = 382 + 10\%(38) = 420$ Watts

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

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

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Tel Showroom : 4653262 - Factory : 4161372 - Fax : 962-6-4160786 - Fax : 962-6-4613340 - P.O.Box : 921940 Amman - Jordan
E-mail: maurice@joinnet.com.jo

$\dot{M}$ = (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

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

Q3 = 0.32 Watts

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

هاتف المعرض : ٤٦٥٣٢٦٢ – المصنع : ٤١٦١٣٧٢ – فاكس : ٤١٦٠٧٨٦-٦-٩٦٢ – فاكس : ٤٦١٣٣٤٠-٦-٩٦٢ – ص.ب : ٩٢١٩٤٠ عمان – الأردن
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Load Calculation for Water Cooler
Farough 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 = 40 liter = 40 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 = 40 x 1 x 21 = 840 Kcal = 630 x 1.163 = 977 Watts/24 hrs

Q1 = 977 /24 water cooler operating time per day = 41 Watts

Q1 = 41 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

هاتف المعرض : ٤٦٥٣٢٦٢ – المصنع : ٤١٦١٣٧٢ – فاكس : ٤١٦٠٧٨٦-٦-٩٦٢ – فاكس : ٤٦١٣٣٤٠-٦-٩٦٢ – ص.ب : ٩٢١٩٤٠ عمان – الأردن
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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

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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 = 41 + 156 + 0.32 = 197.32 + 10% safety factor = 217 Watts

Product Technical Specification ***Mekka refrigertaion Workshop***	
Description	**Specification**
Company Name	Mekka Refrigeration Workshop
Product Name	Water Cooler
Product Model	MR-100
Product Application	Water Cooler
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	41*67*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	30 Litters
Type of Water Storage Tank Cylinder, Cubic, etc.	Cylindrical
Water Fellow per hour for water cooler	80 Liters/H
Water Storage Tank Dimension	45*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.	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 TX
Compressor Manufacturer	Electreloux
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 ***Dawudieh Technical Maintenance Center***	
Description	**Specification**
Company Name	Technical Maintenance Center
Product Name	Water Cooler
Product Model	TMC-75
Product Application	Water Cooler
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	39*39*102 cm
Freezer Compartment Overall Dimension and Wall Thickness	N/A
Refrigerator Compartment Overall Dimension andWall 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	8 Liters
Type of Water Storage Tank Cylinder, Cubic, etc.	Cylindrical
Water Fellow per hour for water cooler	50 Liters
Water Storage Tank Dimension	30*25 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 Kg
Refrigerant Type	R12
Refrigerant Charge Weight Gr.	180 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	Electrolux
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 mm dim, 1800 length

Product Technical Specification ***Abu-Khalaf Workshop***	
Description	**Specification**
Company Name	Abu-Khalaf Workshop
Product Name	Water Cooler
Product Model	KH-100
Product Application	Water Cooler
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	41*67*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	30 Litters
Type of Water Storage Tank Cylinder, Cubic, etc.	Cylindrical
Water Fellow per hour for water cooler	80 Liters/H
Water Storage Tank Dimension	45*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.	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 TX
Compressor Manufacturer	Electreloux
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 ***Farough Refrigertaion Factory***	
Description	**Specification**
Company Name	Farough Refrigeration factory
Product Name	Water Cooler 2 Taps
Product Model	Far.100
Product Application	Water Cooler
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	70*50*129 cm
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	
Freezer Internal Net Volume	N/A
Refrigerator Net Volume	N/A
Product Net Volume	N/A
Product Inside Temperature C	+6 C
Water Storage Tank Capacity, Water Cooler	120 Lit
Type of Water Storage Tank Cylinder, Cubic, etc.	Cubic
Water Fellow per hour for water cooler	80 Liters
Water Storage Tank Dimension	60*40*50 cm
Water Outlet Temperature	+6 C
Water Inlet Temperature	+ 25 C
Freezer Inside Temperature	N/A
Refrigerator Inside Temperature	+6 C
Evaporating Temperature	0 C
Foam Insulation Thickness mm Side Walls, Top, Bottom, Door, Back Panel	50 mm
Type of PU Foam	R 11 Pu Foam
Foam Density, Kg/Cu. Mt.	35-40 Kg/Cu.Mt
Foam Mixture, Percentage Pol% + R11% + Isocyanate%	37% + 13% +50 %
Total amount of Foam Injection, Kg	5 Kg
Refrigerant Type	R 12
Refrigerant Charge Weight Gr.	300 Gr

Type of Compressor, Hermetic, Semi Hermetic, Open	Hermetic
Compressor Cooling System Static, Oil Cooled, Fan Cooled	Fan Cooled
Compressor Cooling Capacity Watt	390 Watt
Compressor input Power, Watt	1/3 HP
Compressor Model Number	SC10B
Compressor Manufacturer	Danfoss Germany
Compressor Mounting Place Top, Bottom, Front, Back	Back
Condenser Type, Static, Fan Cooled	Fan Cooled
Condenser Dimension, Length, Inside Tube Diameter,	Three Rows Tube Coil and Fins
Condenser Material, Aluminum, Copper, Copper Coated, etc,	Copper
Condenser mounting Place, Back Wall, Top, Bottom	Back Wall
Evaporator Type, Fin and Tube, Roll Bond, Wire and Tube, etc.	Fin and Tube
Evaporator Dimension, Length, Surface Area, Inside Tube Diameter	Tube Coil and Fins
Evaporator Material, Aluminum, Copper, Copper Coated, etc,	Copper
Dryer Type,	Cylindrical
Dryer Material, Weight and Size	25 Gr.
Capillary Tube Diameter and Length	1 mm 3050 mm Length

Product Technical Specification ***Al-Taghwa Factory***	
Description	**Specification**
Company Name	Al-Taghwa Factory
Product Name	Water Cooler
Product Model	Tag-100
Product Application	Water Cooler
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	40 * 40 * 105
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	
Freezer Internal Net Volume	N/A
Refrigerator Net Volume	N/A
Product Net Volume	N/A
Product Inside Temperature C	+ 5 C
Water Storage Tank Capacity, Water Cooler	30 Lit.
Type of Water Storage Tank Cylinder, Cubic, etc.	Cubic
Water Fellow per hour for water cooler	20 Lit.
Water Storage Tank Dimension	30*30*30
Water Outlet Temperature	+ 6 C
Water Inlet Temperature	+ 25 C
Freezer Inside Temperature	N/A
Refrigerator Inside Temperature	N/A
Evaporating Temperature	0 C
Foam Insulation Thickness mm Side Walls, Top, Bottom, Door, Back Panel	50 mm
Type of PU Foam	R-11 Pu Foam
Foam Density, Kg/Cu. Mt.	35-40 Kg/Cu. Mt.
Foam Mixture, Percentage Pol% + R11% + Isocyanate%	37% + 13% + 50%
Total amount of Foam Injection, Kg	2 Kg
Refrigerant Type	R 12
Refrigerant Charge Weight Gr.	200 Gr.

Type of Compressor, Hermetic, Semi Hermetic, Open	Hermetic
Compressor Cooling System Static, Oil Cooled, Fan Cooled	Fan Cooled
Compressor Cooling Capacity Watt	280 Watt
Compressor input Power, Watt	¼ Hp
Compressor Model Number	
Compressor Manufacturer	LG
Compressor Mounting Place Top, Bottom, Front, Back	Bottom
Condenser Type, Static, Fan Cooled	Fan Cooled
Condenser Dimension, Length, Inside Tube Diameter,	Two Rows Tube Coil and Fins
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.	Fin and Tube
Evaporator Dimension, Length, Surface Area, Inside Tube Diameter	Tube Coil and Fins
Evaporator Material, Aluminum, Copper, Copper Coated, etc,	Copper
Dryer Type,	Cylindrical
Dryer Material, Weight and Size	20 Gr.
Capillary Tube Diameter and Length	0.8 mm dim. 3000 mm length

Product Technical Specification ***Teck-Tack Workshop***	
Description	**Specification**
Company Name	Teck-Tack
Product Name	Refrigerator, Upright
Product Model	Teck-160PEP
Product Application	Soft Drink Refrigerator
Operating Temperature	32 C
Climatic Condition	Normal
Product Overall Dimension WxLxH mm	65x80x200
Freezer Compartment Overall Dimension and Wall Thickness	N/A
Refrigerator Compartment Overall Dimension and Wall Thickness	40
Product Shape, Double Doors, Upright, Chest, etc	Upright Show case with Double Glass doors
Freezer Internal Net Volume	N/A
Refrigerator Net Volume	600 lit
Product Net Volume	1040 lit
Product Inside Temperature C	+ 10
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	+10 C
Evaporating Temperature	- 5 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 Cm
Foam Mixture, Percentage Pol% + R11% + Isocyanate%	34% + 16% + 50%

Total amount of Foam Injection, Kg	20 Kg.
Refrigerant Type	CFC – 11
Refrigerant Charge Weight Gr.	450 gr.
Type of Compressor, Hermetic, Semi Hermetic, Open	Hermetic
Compressor Cooling System Static, Oil Cooled, Fan Cooled	Fan Cooled
Compressor Cooling Capacity Watt	400 Watts
Compressor input Power, Watt	450 Watts
Compressor Model Number	SC21B
Compressor Manufacturer	Danfoss
Compressor Mounting Place Top, Bottom, Front, Back	Top Roof
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	Top Roof
Evaporator Type, Fin and Tube, Roll Bond, Wire and Tube, etc.	Fin and Tube
Evaporator Dimension, Length, Surface Area, Inside Tube Diameter	Tube Coils and Fins
Evaporator Material, Aluminum, Copper, Copper Coated, etc,	Copper
Dryer Type,	Cylindrical
Dryer Material, Weight and Size	Ranco, 20 gr.
Capillary Tube Diameter and Length	0.8 mm Dim, 3000 mm Length

Printing In Labaratory Of
Maurice Ind. [Jordan]

Maurice Ind. [Jordan]

TestDate: 01/11/08 17:40
TestName: Energy Consumtion

Report No.: Spec & Remark
ReportDate: 2002/02/15 15:58

Total Result :

1 - Total Test Time	*72 Hours*
2 - Working Percent	*17 %On*
3 - Energy	*0.848 kwh*
4 - Zoom Time	*70:47 Hour*
5 - Compr Current	*0.24 Amp*
6 - Evaprator Mean Temp	*40.7 C*
7 - Cabin Mean Temp	*23.6 C*
8 - Crisp Temp	*24.7 C*
9 - Compr Temp	*53.9 C*
10- Condensor In Temp	*39.5 C*
11- Condensor Out Temp	*33.4 C*
12- Condition	*43.8 C 35 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	

Product Spec :

1 - File Name		*01110817.k40*
2 - Test Kind	G	*Perform.*
3 - Product Serial		
4 - Product Name		*Water Cool*
5 - Product Model		*MR-110*
6 - Product Capacity		*100 Lit/h*
7 - Compressor Name		*Electrolux*
8 - Compressor Model		*GL90 AN*
9 - Compressor Power		*1/4 Hp*
10- Compressor Amper		*2 Amp*
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]

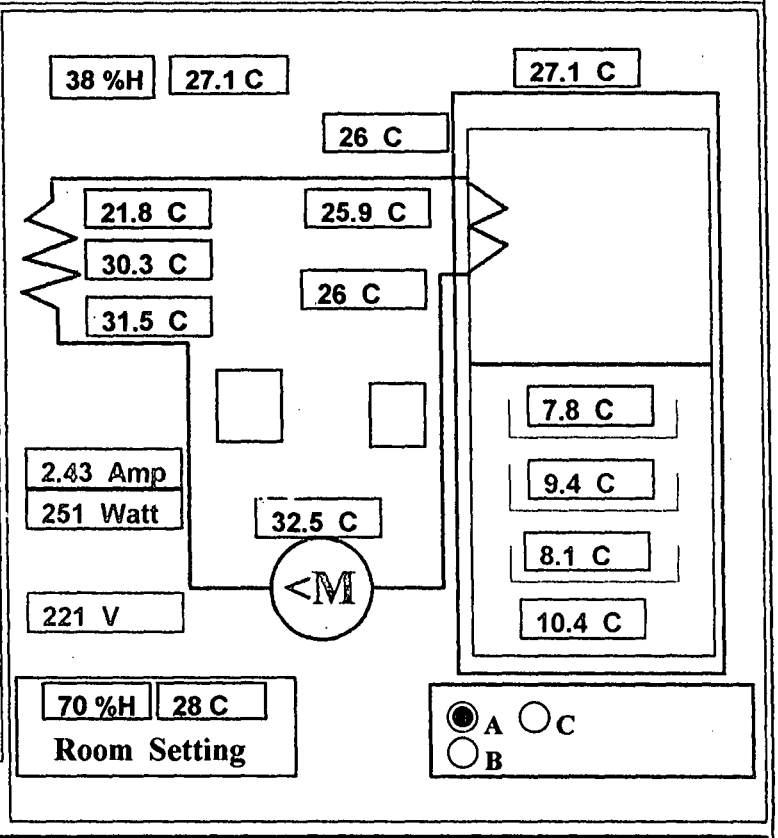
Maurice Ind. [Jordan]

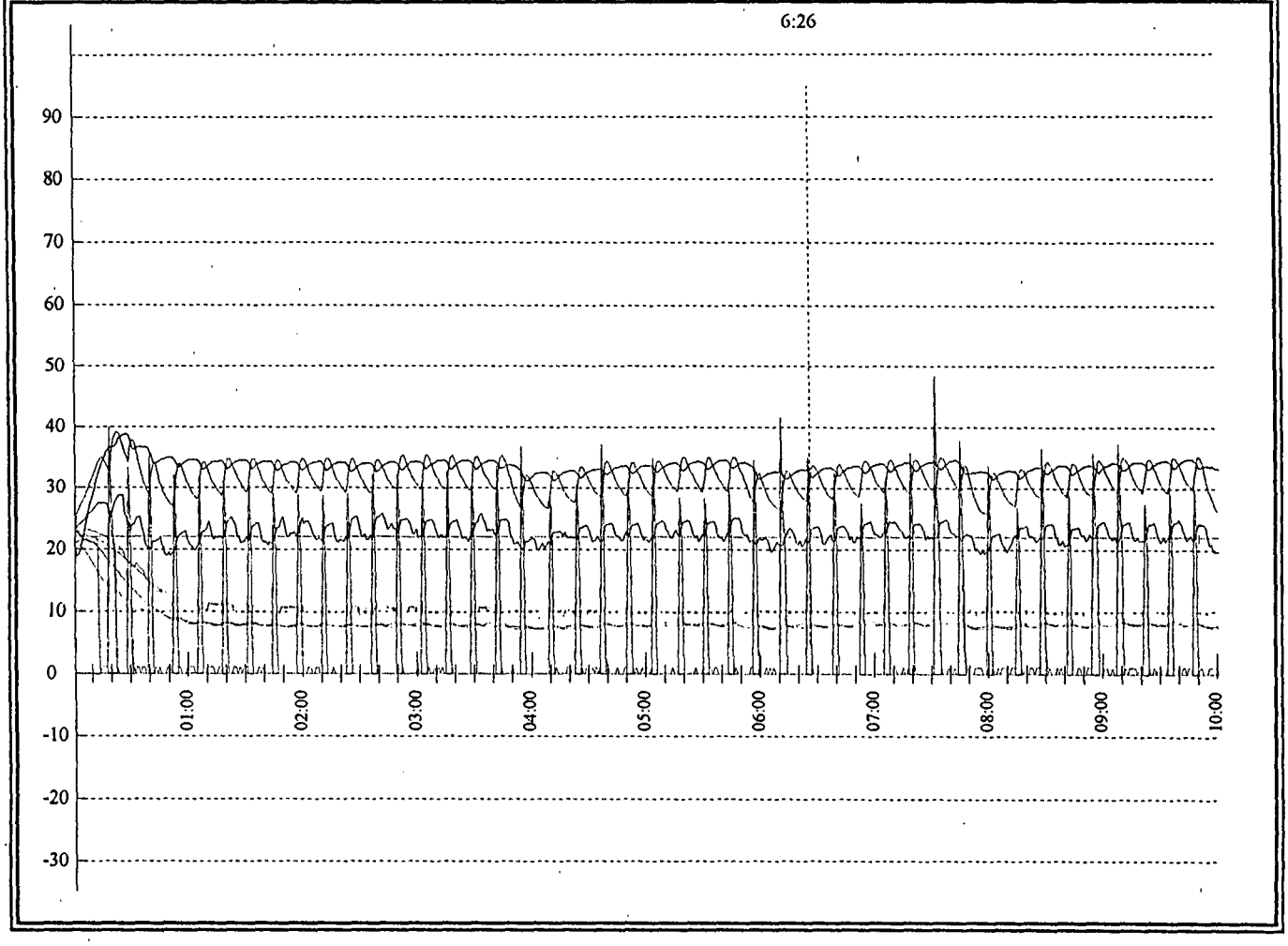
TestDate: 01/11/08 17:40 *Report No.:* ( ) - Page 1

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 15:59

Page Result :

1 - Page Test Time	*10 Hours*
2 - Working Percent	*18 %On*
3 - Energy (Accord to page)	*0.444 kwh*
4 - Zoom Time	*6:26 Hour*
5 - Compr Current	*2.43 Amp*
6 - Evaprator Mean Temp	*27.6 C*
7 - Cabin Mean Temp	*8.4 C*
8 - Crisp Temp	*10.4 C*
9 - Compr Temp	*32.5 C*
10- Condensor In Temp	*31.5 C*
11- Condensor Out Temp	*21.8 C*
12- Condition	*27.1 C 38 %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]

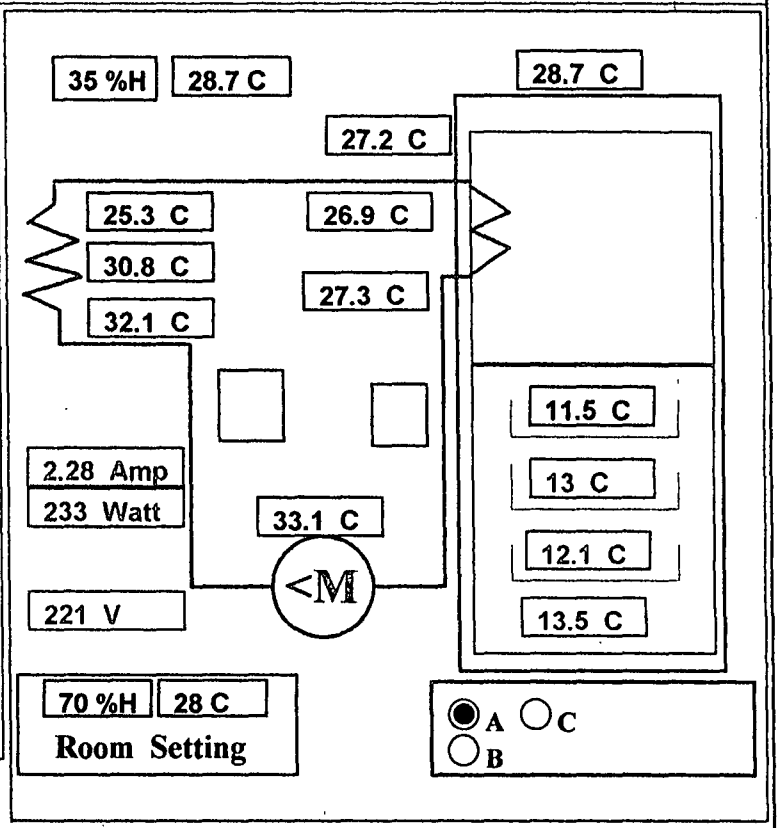
Maurice Ind. [Jordan]

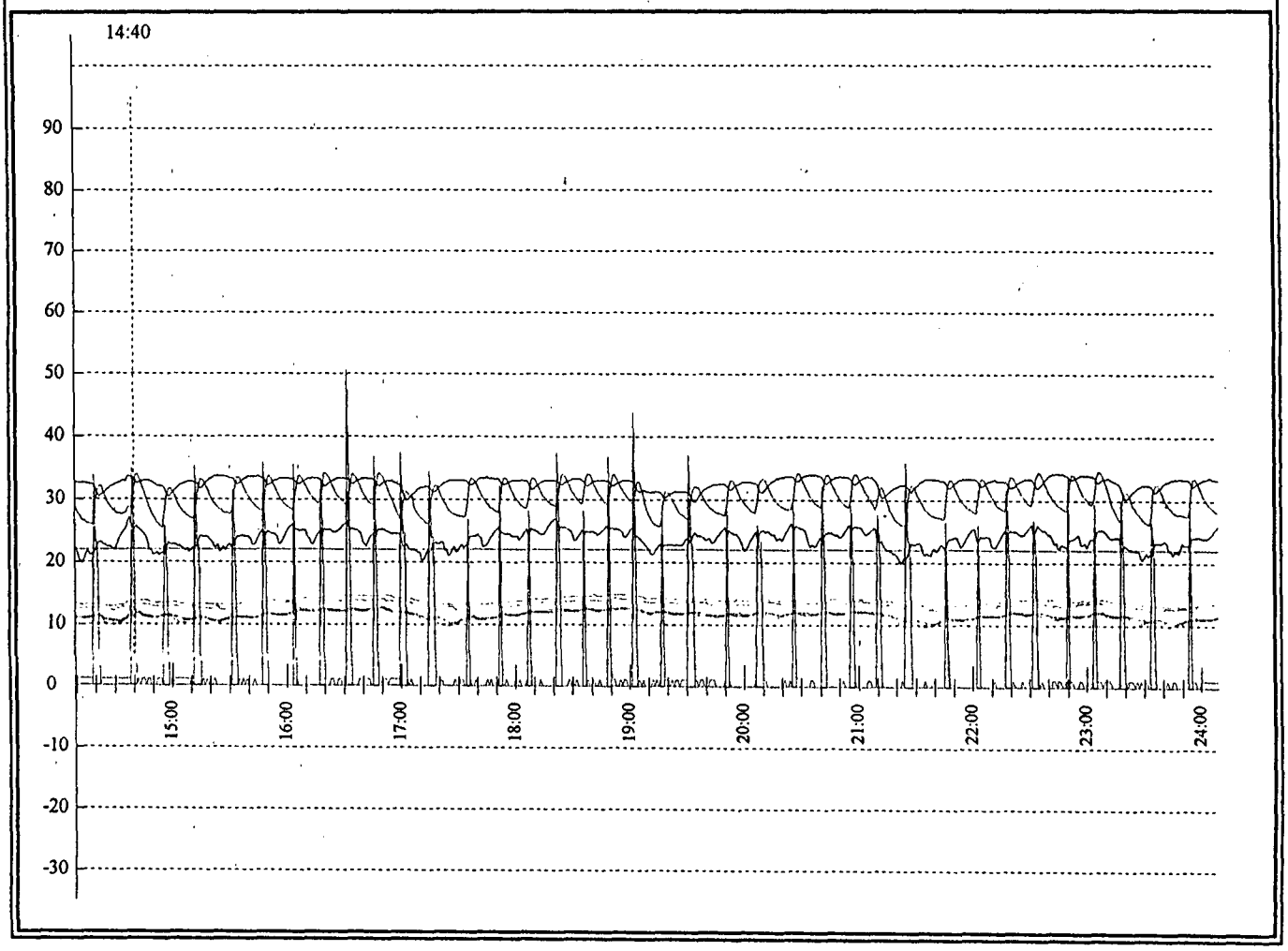
TestDate: 01/11/08 17:40 *Report No.:* ( ) - Page 2

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 15:59

Page Result :

1 - Page Test Time	*10 Hours*
2 - Working Percent	*18 %On*
3 - Energy (Accord to page)	*0.444 kwh*
4 - Zoom Time	*6:26 Hour*
5 - Compr Current	*2.43 Amp*
6 - Evaprator Mean Temp	*27.6 C*
7 - Cabin Mean Temp	*8.4 C*
8 - Crisp Temp	*10.4 C*
9 - Compr Temp	*32.5 C*
10- Condensor In Temp	*31.5 C*
11- Condensor Out Temp	*21.8 C*
12- Condition	*27.1 C 38 %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: 01/10/20 15:13
TestName: Energy Consumtion

Report No.: Spec & Remark
ReportDate: 2002/02/15 15:23

Total Result :

1 - Total Test Time	*98 Hours*
2 - Working Percent	*82 %On*
3 - Energy	*2.889 kwh*
4 - Zoom Time	*97:01 Hour*
5 - Compr Current	*2.38 Amp*
6 - Evaprator Mean Temp	*4.9 C*
7 - Cabin Mean Temp	*4.9 C*
8 - Crisp Temp	*4.4 C*
9 - Compr Temp	*59.9 C*
10- Condensor In Temp	*69.7 C*
11- Condensor Out Temp	*12.3 C*
12- Condition	*38.4 C 35 %H*
13- Volt	*Max=221 Mean=183 Min=221*
14-	
15-	
16-	
17-	

Product Spec :

1 - File Name	*01102015.k13*
2 - Test Kind G	*Perform.*
3 - Product Serial	*Tek Tak W.*
4 - Product Name	*Pepsi Ref.*
5 - Product Model	*TEK-100*
6 - Product Capacity	*450 LIT.*
7 - Compressor Name	*Electr.*
8 - Compressor Model	*GL90AN*
9 - Compressor Power	*1/4 Hp*
10- Compressor Amper	*2 Amp*
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]

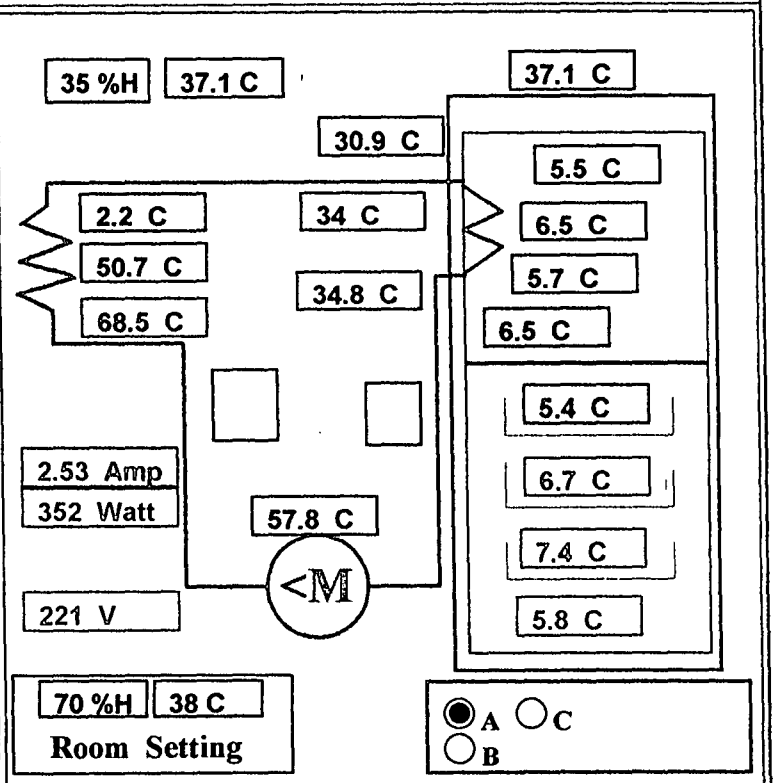
Maurice Ind. [Jordan]

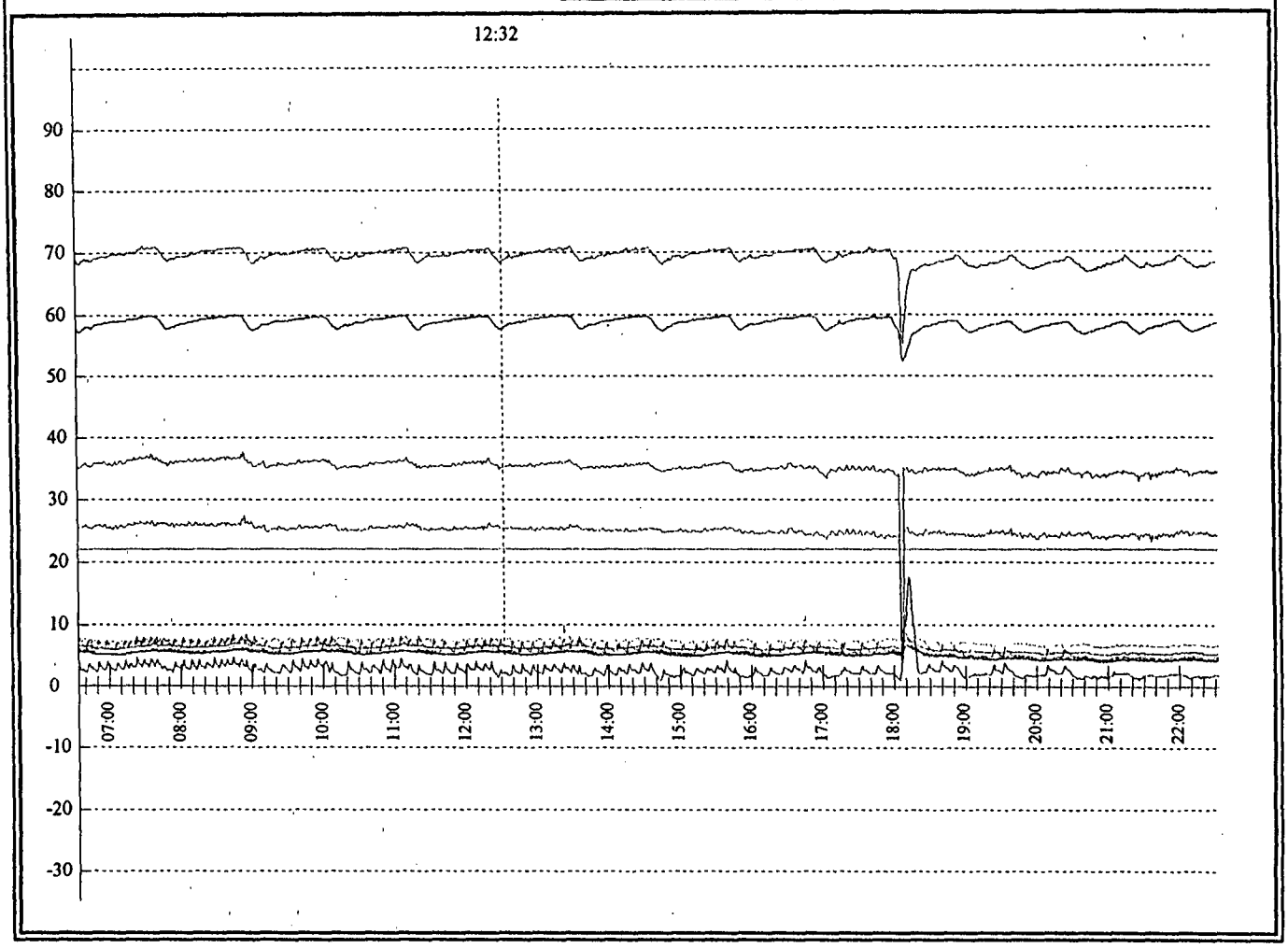
TestDate: 01/10/20 15:13 **Report No.:** ( ) - Page 1

PageTestName: Energy Consumtion **ReportDate:** 2002/02/15 15:23

Page Result :

1 - Page Test Time	98 Hours
2 - Working Percent	82 %On
3 - Energy (Accord to page)	2.889 kwh
4 - Zoom Time	97:01 Hour
5 - Compr Current	2.38 Amp
6 - Evaprator Mean Temp	4.9 C
7 - Cabin Mean Temp	4.9 C
8 - Crisp Temp	4.4 C
9 - Compr Temp	59.9 C
10- Condensor In Temp	69.7 C
11- Condensor Out Temp	12.3 C
12- Condition	38.4 C 35 %H
13- Volt	Max=221 Mean=183 Min=221
14-	
15-	
16-	
17-	





Industrial Control Research Center HotRoom Ver 5

Printing In Labaratory Of
Maurice Ind. [Jordan]

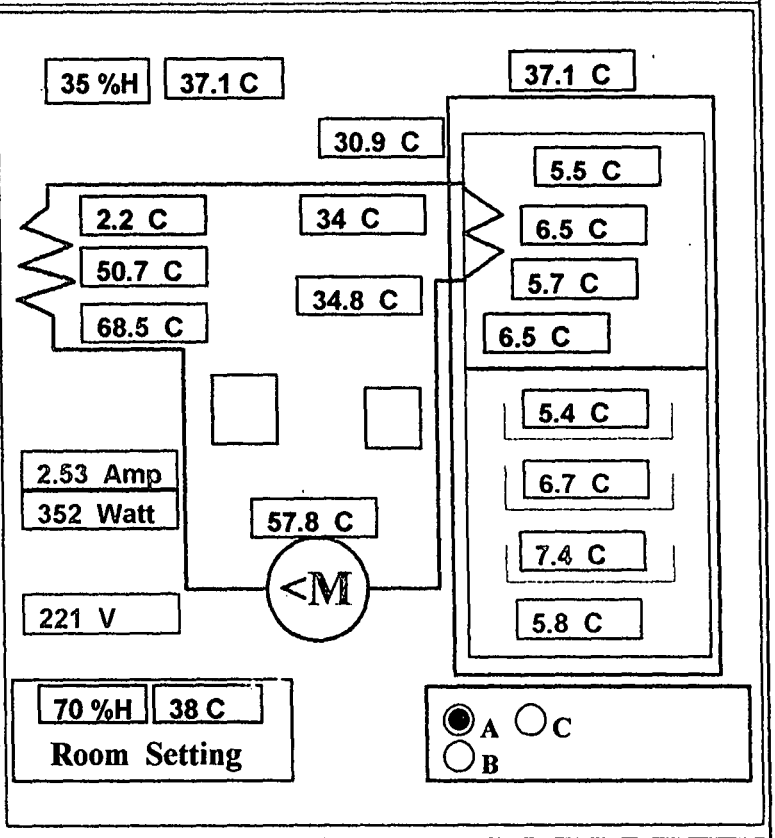
Maurice Ind. [Jordan]

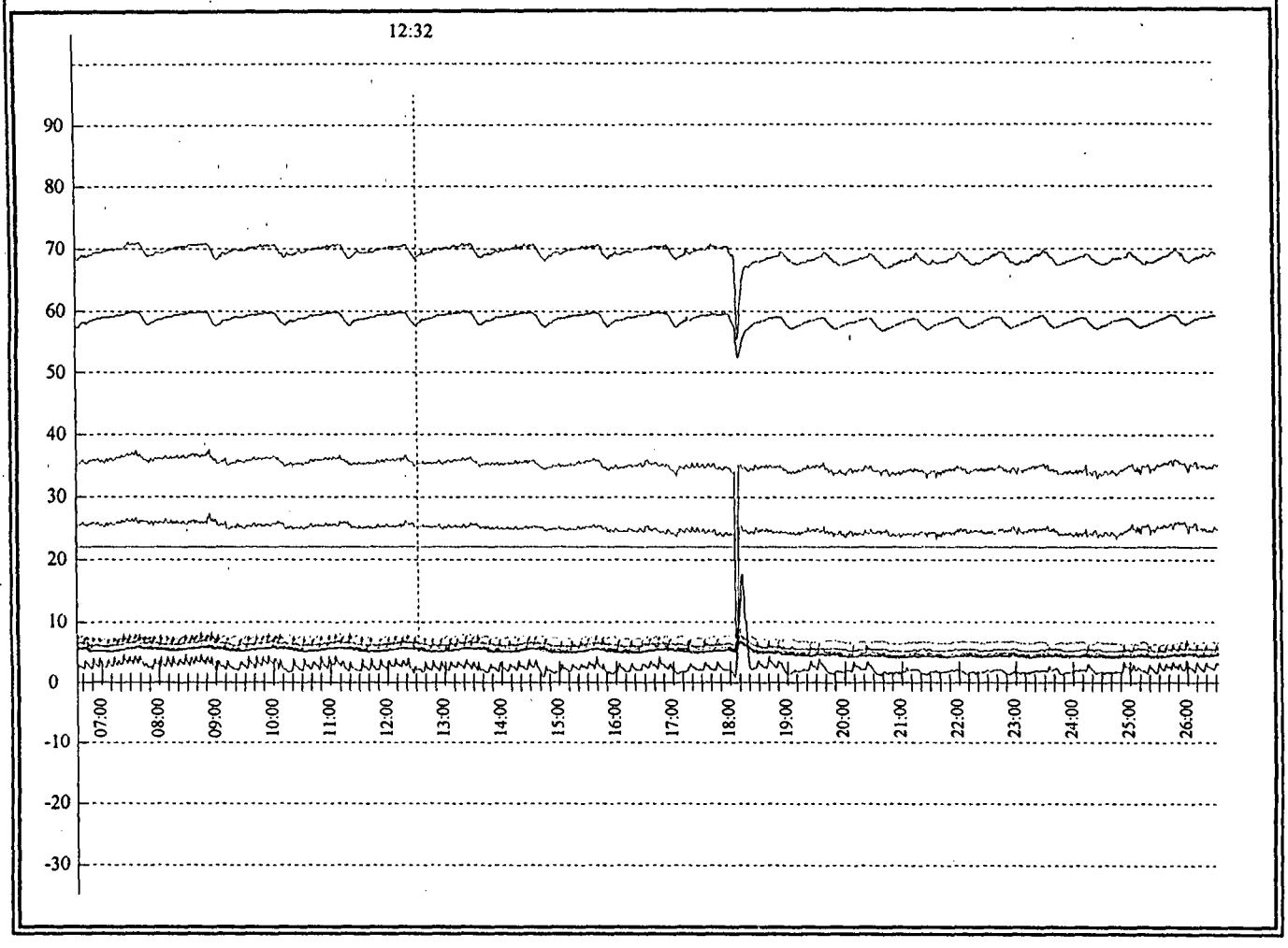
TestDate: 01/10/20 15:13 *Report No.:* ( ) - Page 1

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 15:25

Page Result :

1 - Page Test Time	*20 Hours*
2 - Working Percent	*100 %On*
3 - Energy (Accord to page)	*3.654 kwh*
4 - Zoom Time	*12:32 Hour*
5 - Compr Current	*2.53 Amp*
6 - Evaprator Mean Temp	*6 C*
7 - Cabin Mean Temp	*6.5 C*
8 - Crisp Temp	*5.8 C*
9 - Compr Temp	*57.8 C*
10- Condensor In Temp	*68.5 C*
11- Condensor Out Temp	*2.2 C*
12- Condition	*37.1 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]

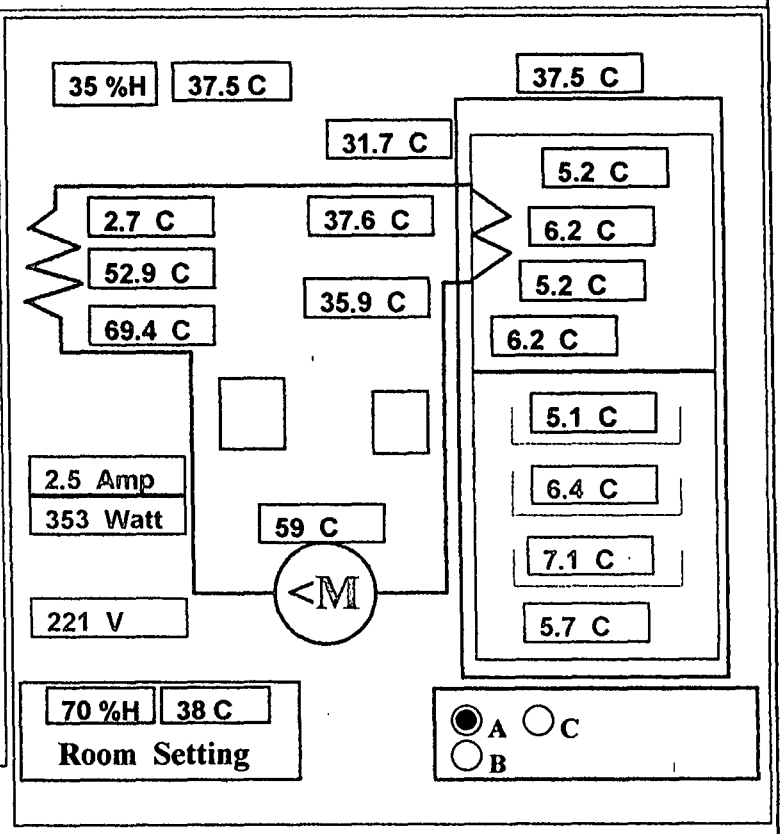
Maurice Ind. [Jordan]

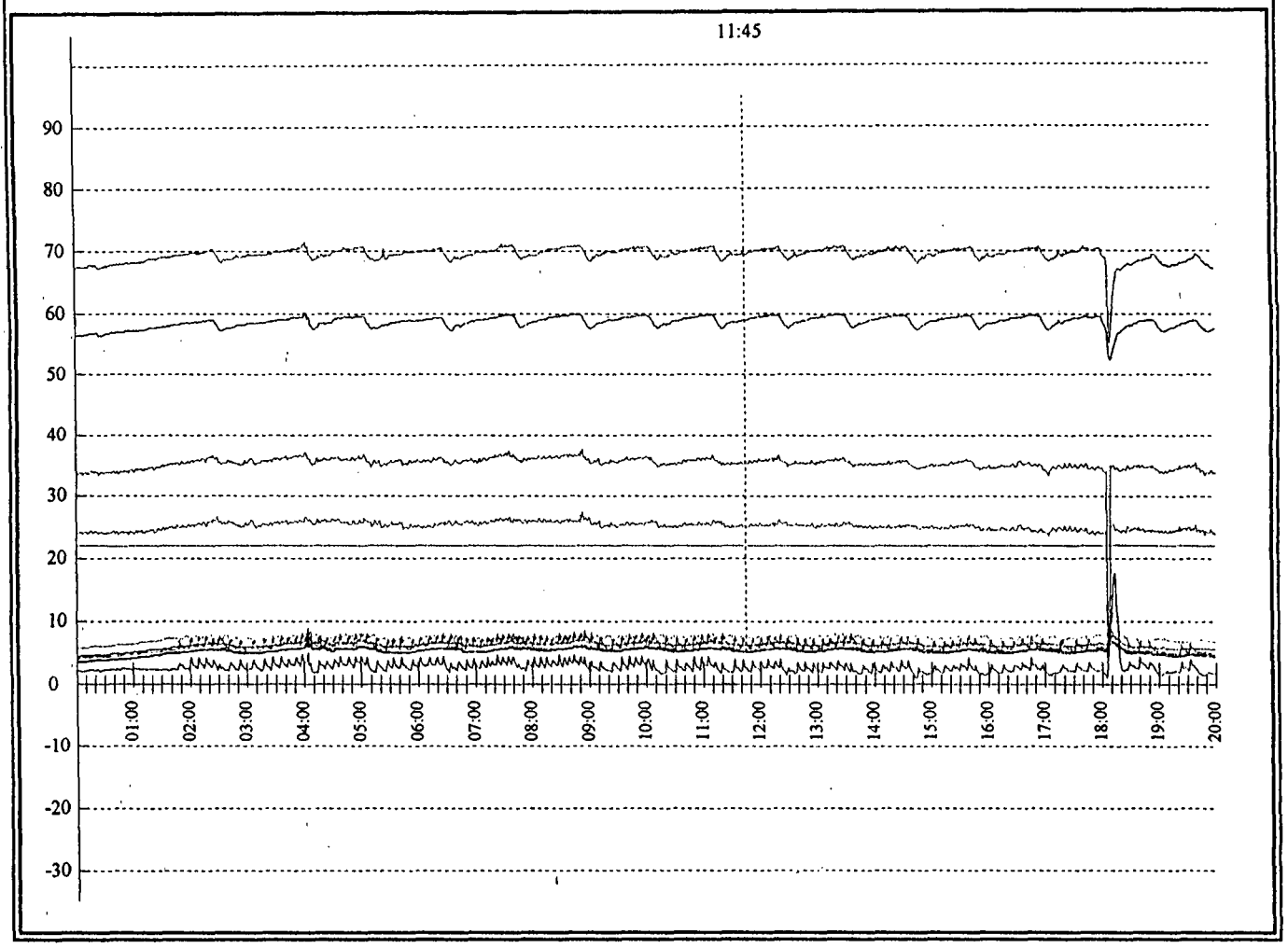
TestDate: 01/10/20 15:13 *Report No.:* ( ) - Page 1

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 15:26

Page Result :

1 - Page Test Time	*20 Hours*
2 - Working Percent	*100 %On*
3 - Energy (Accord to page)	*3.75 kwh*
4 - Zoom Time	*11:45 Hour*
5 - Compr Current	*2.5 Amp*
6 - Evaprator Mean Temp	*5.7 C*
7 - Cabin Mean Temp	*6.2 C*
8 - Crisp Temp	*5.7 C*
9 - Compr Temp	*59 C*
10- Condensor In Temp	*69.4 C*
11- Condensor Out Temp	*2.7 C*
12- Condition	*37.5 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]

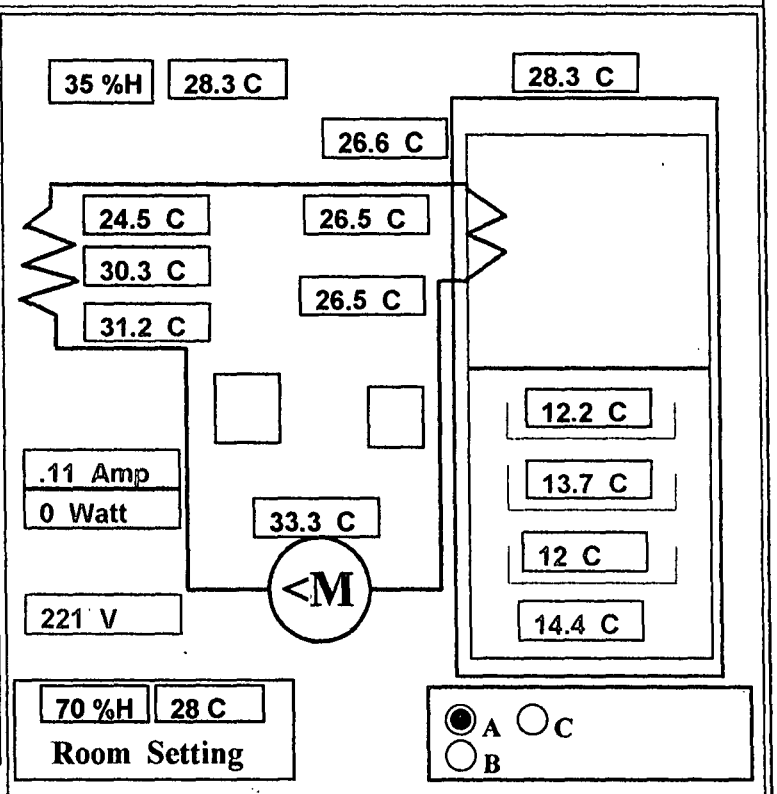
Maurice Ind. [Jordan]

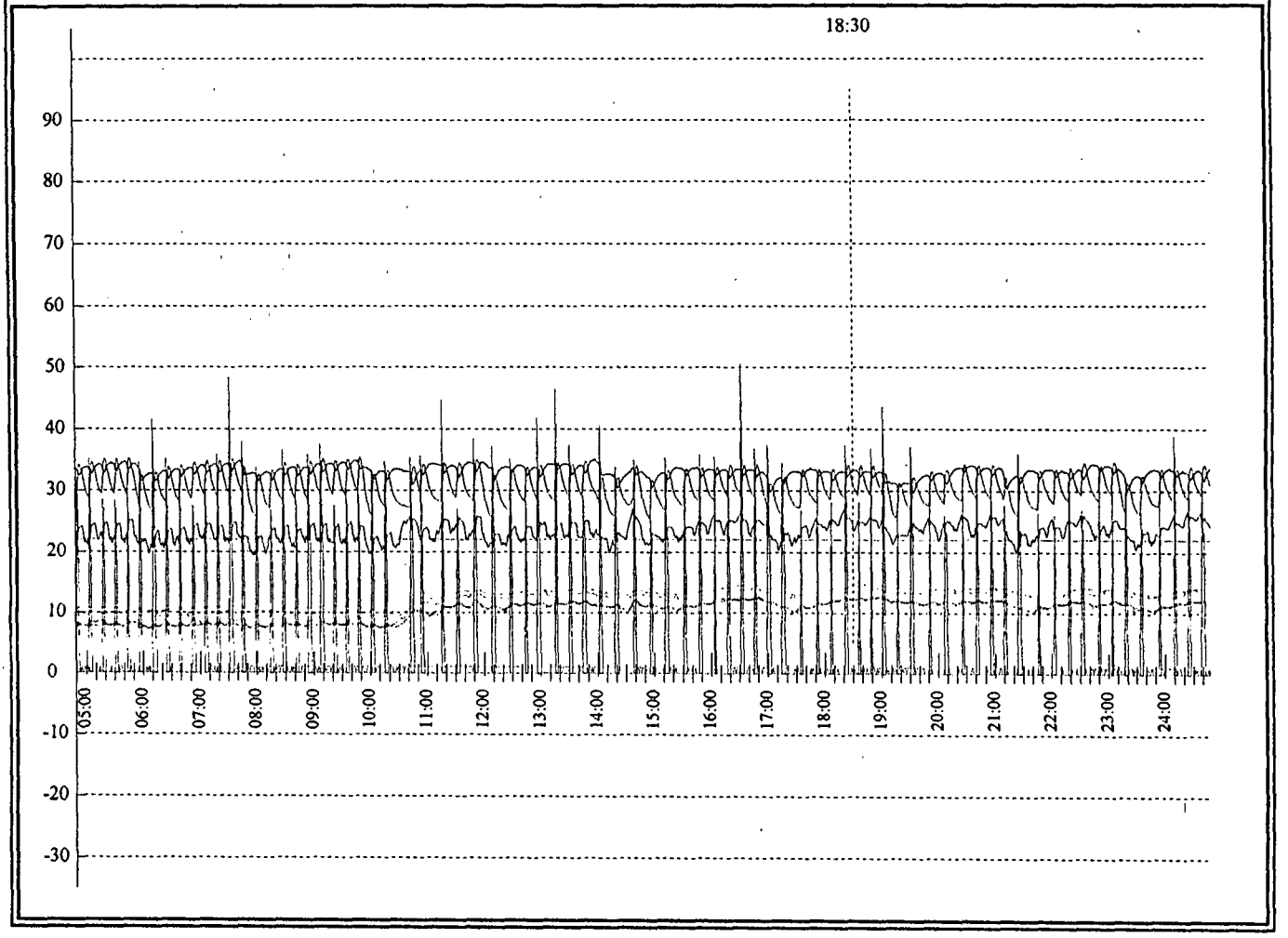
TestDate: 01/11/08 17:40 *Report No.:* ( ) - Page 1

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 15:59

Page Result :

1 - Page Test Time	*20 Hours*
2 - Working Percent	*13 %On*
3 - Energy (Accord to page)	*0.343 kwh*
4 - Zoom Time	*18:30 Hour*
5 - Compr Current	*0.11 Amp*
6 - Evaprator Mean Temp	*28 C*
7 - Cabin Mean Temp	*12.6 C*
8 - Crisp Temp	*14.4 C*
9 - Compr Temp	*33.3 C*
10- Condensor In Temp	*31.2 C*
11- Condensor Out Temp	*24.5 C*
12- Condition	*28.3 C 35 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	





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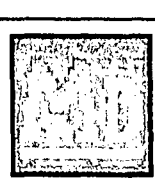
Printing in Labaratory Of
Maurice Ind. [Jordan]

Maurice Ind. [Jordan]



TestDate: 01/10/29 11:15
TestName: Energy Consumtion

Report No.: Spec & Remark
ReportDate: 2002/02/15 16:02

Total Result :

1 - Total Test Time	*73 Hours*
2 - Working Percent	*64 %On*
3 - Energy	*0.876 kwh*
4 - Zoom Time	*72:19 Hour*
5 - Compr Current	*1.51 Amp*
6 - Evaprator Mean Temp	*34.3 C*
7 - Cabin Mean Temp	*7.8 C*
8 - Crisp Temp	*6.6 C*
9 - Compr Temp	*44.3 C*
10- Condensor In Temp	*47 C*
11- Condensor Out Temp	*8.7 C*
12- Condition	*37.5 C 35 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	

Product Spec :

1 - File Name	*01102911.k15*
2 - Test Kind G	*Performanc*
3 - Product Serial	
4 - Product Name	*Water Cool*
5 - Product Model	*ABD 55*
6 - Product Capacity	*100 LIT/H*
7 - Compressor Name	*Danfoss*
8 - Compressor Model	*FR8.5G*
9 - Compressor Power	*1/4*
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]

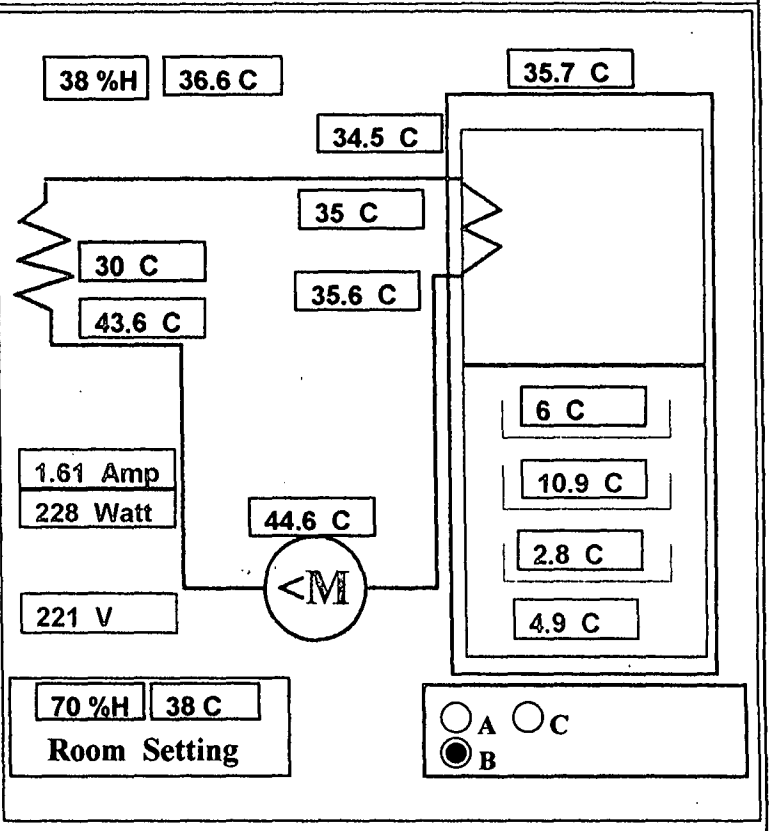
Maurice Ind. [Jordan]

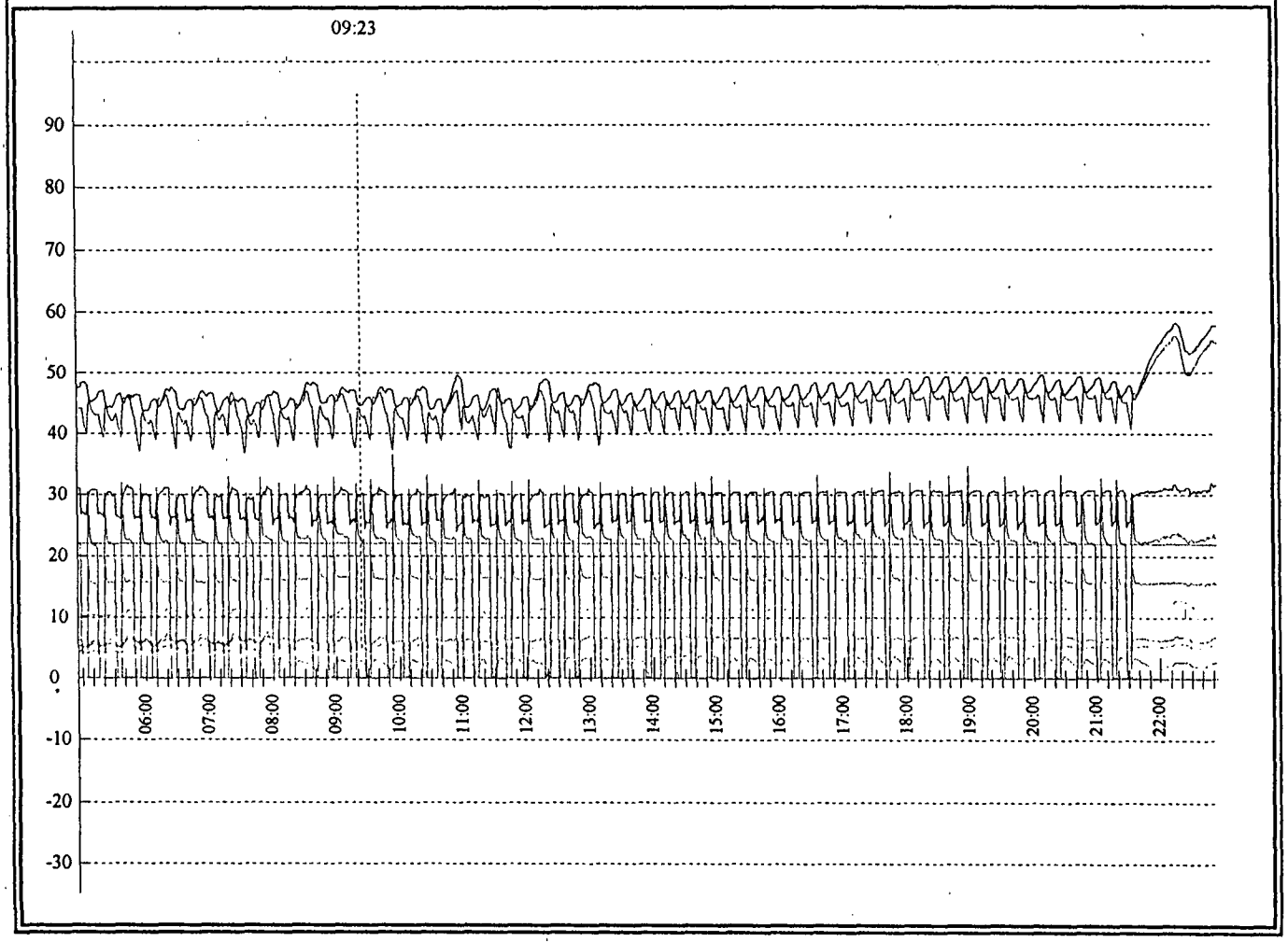
TestDate: 01/10/29 11:15 **Report No.:** ( ) - Page 1

PageTestName: Energy Consumtion **ReportDate:** 2002/02/15 16:02

Page Result :

1 - Page Test Time	73 Hours
2 - Working Percent	64 %On
3 - Energy (Accord to page)	0.876 kwh
4 - Zoom Time	72:19 Hour
5 - Compr Current	1.51 Amp
6 - Evaprator Mean Temp	34.3 C
7 - Cabin Mean Temp	7.8 C
8 - Crisp Temp	6.6 C
9 - Compr Temp	44.3 C
10- Condensor In Temp	47 C
11- Condensor Out Temp	8.7 C
12- Condition	37.5 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]

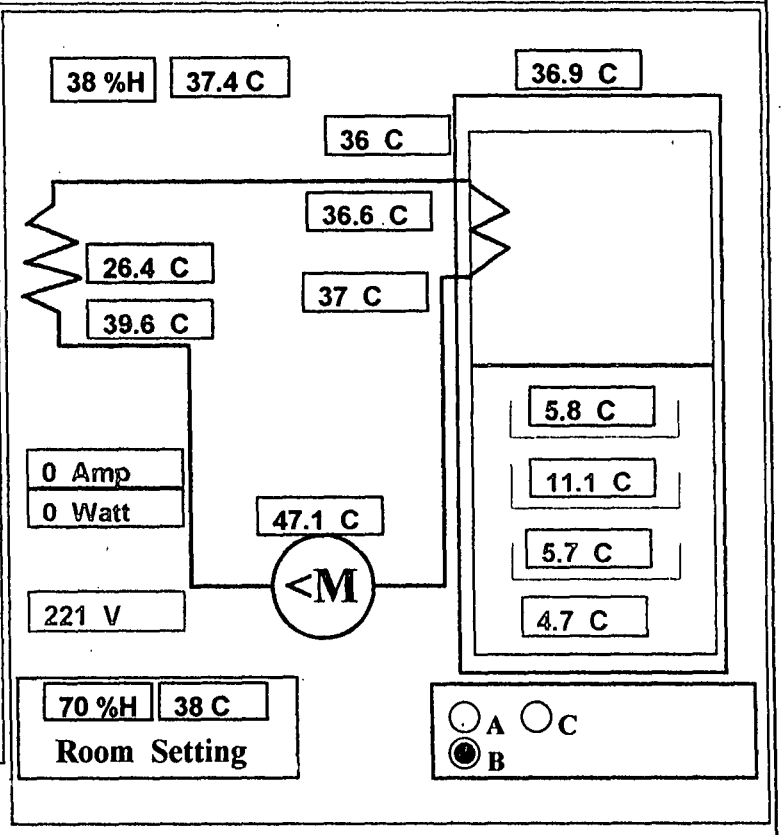
Maurice Ind. [Jordan]

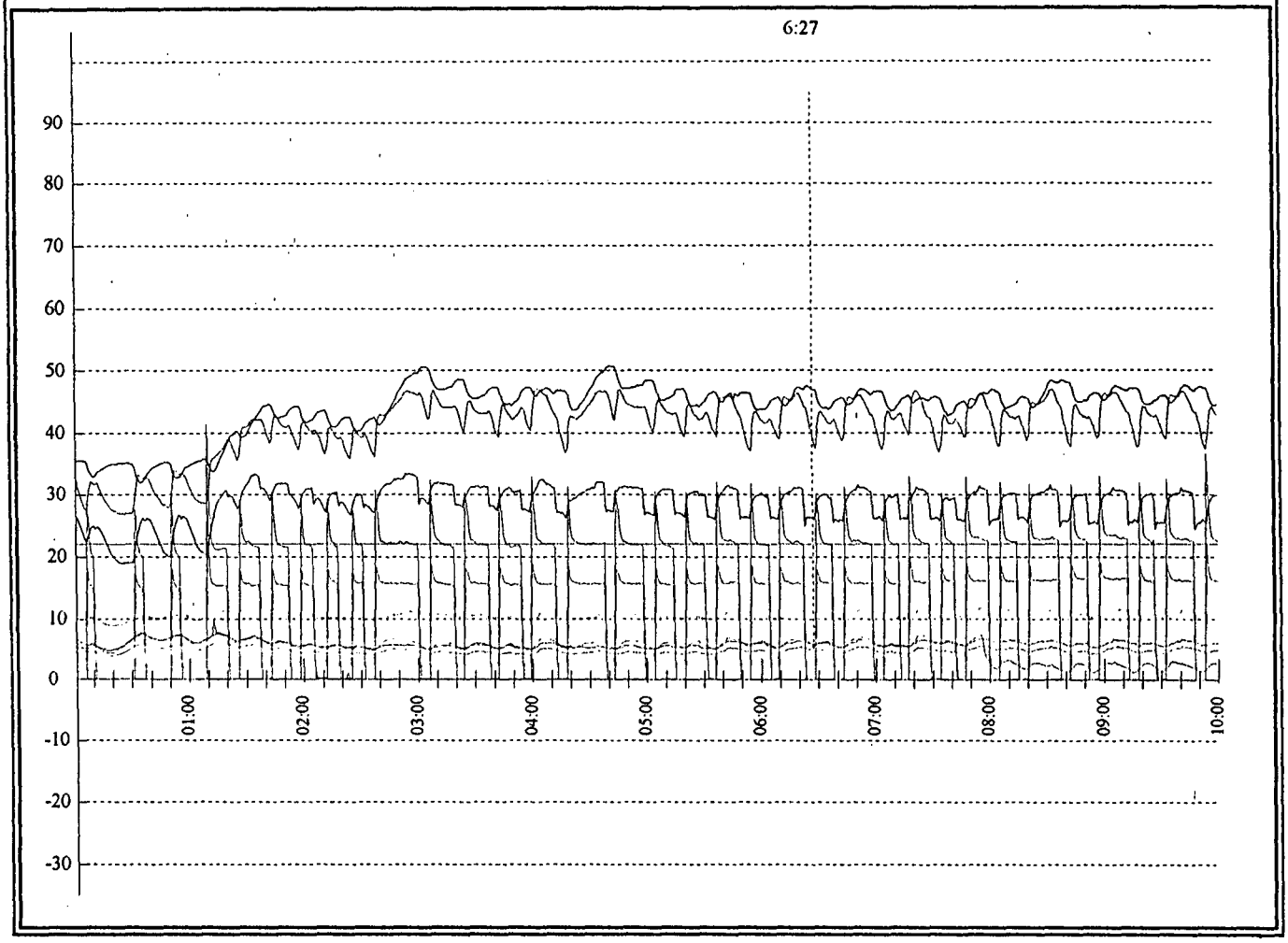
TestDate: 01/10/29 11:15 *Report No.:* ( ) - Page 1

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 16:03

Page Result :

1 - Page Test Time	*10 Hours*
2 - Working Percent	*62 %On*
3 - Energy (Accord to page)	*0.767 kwh*
4 - Zoom Time	*6:27 Hour*
5 - Compr Current	*00 Amp*
6 - Evaprator Mean Temp	*32.1 C*
7 - Cabin Mean Temp	*7.5 C*
8 - Crisp Temp	*4.7 C*
9 - Compr Temp	*47.1 C*
10- Condensor In Temp	*39.6 C*
11- Condensor Out Temp	*11 C*
12- Condition	*37.4 C 38 %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]

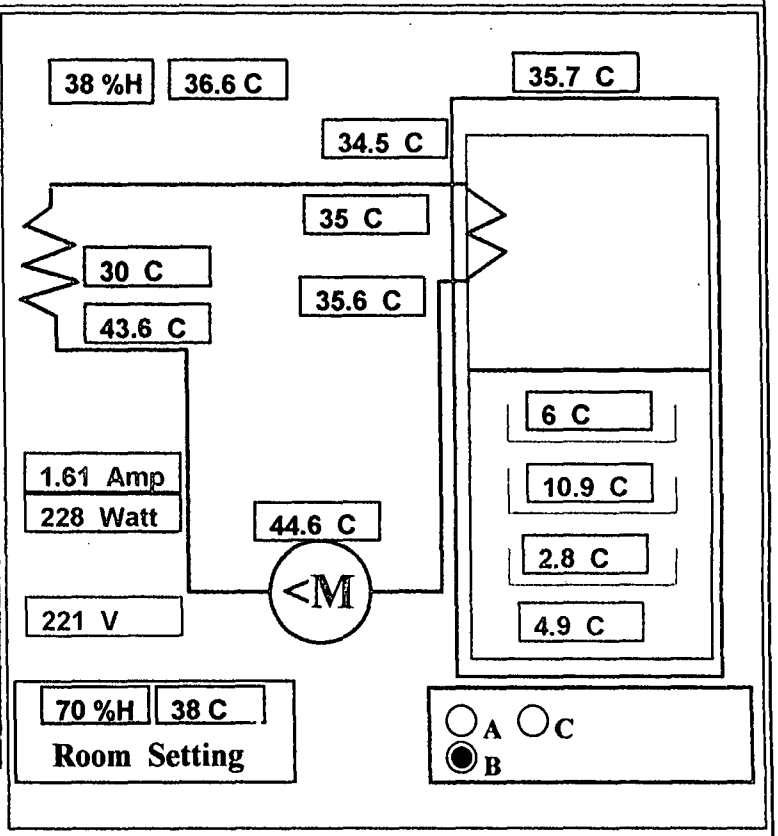
Maurice Ind. [Jordan]

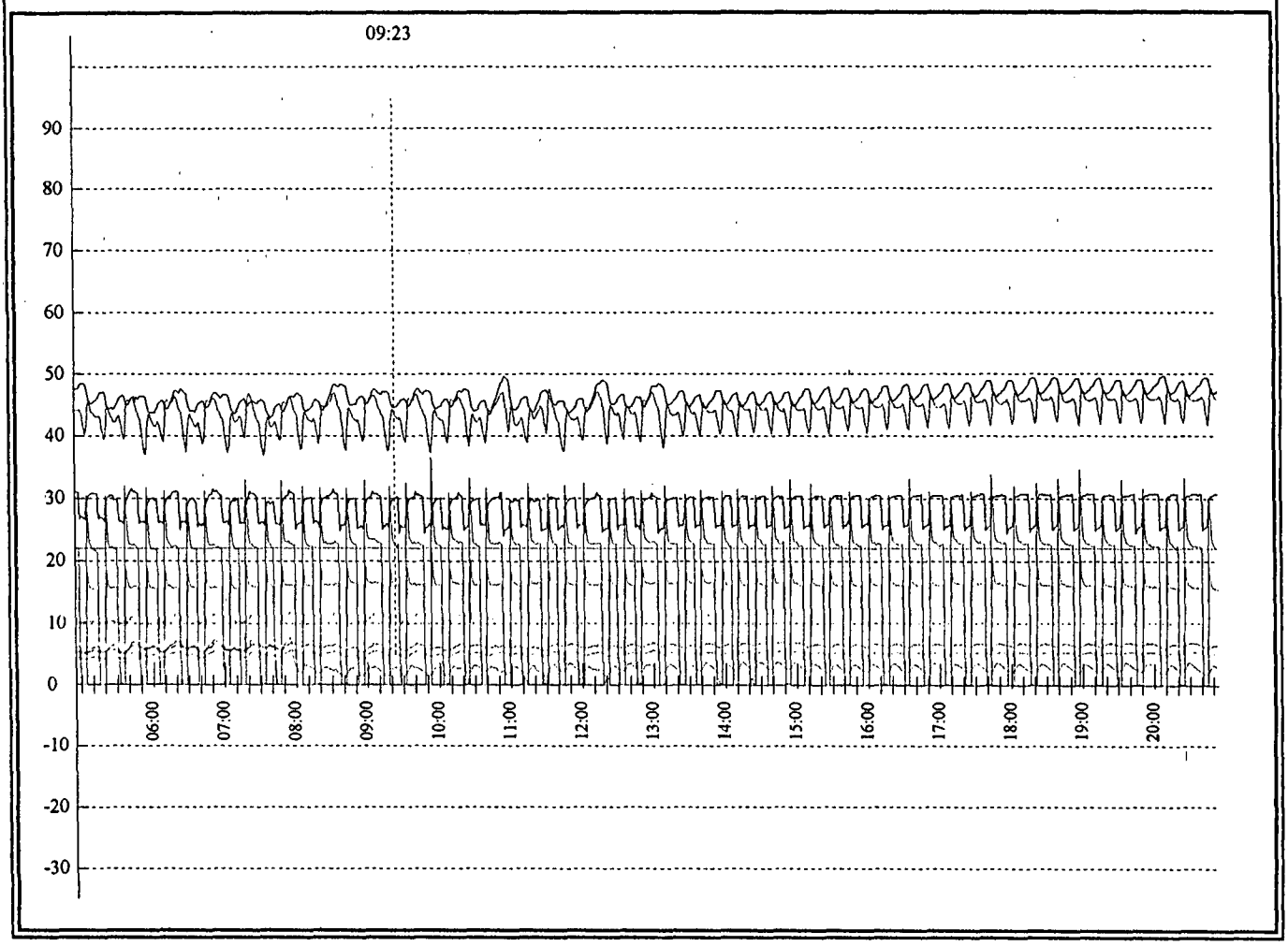
TestDate: 01/10/29 11:15 *Report No.:* ( ) - Page 1

PageTestName: Energy Consumtion *ReportDate:* 2002/02/15 16:03

Page Result :

1 - Page Test Time	*16 Hours*
2 - Working Percent	*66 %On*
3 - Energy (Accord to page)	*0.901 kwh*
4 - Zoom Time	*9:23 Hour*
5 - Compr Current	*1.61 Amp*
6 - Evaprator Mean Temp	*32.5 C*
7 - Cabin Mean Temp	*6.5 C*
8 - Crisp Temp	*4.9 C*
9 - Compr Temp	*44.6 C*
10- Condensor In Temp	*43.6 C*
11- Condensor Out Temp	*-3.1 C*
12- Condition	*36.6 C 38 %H*
13- Volt	*Max=221 Mean=221 Min=221*
14-	
15-	
16-	
17-	





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