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2 pgs
graphs
diagrams

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No. 201 MAHESTAN Building KARGAR Avn. ENGELAB Sqr.



IPEC Co. Final Report (Page 1)

REPORT

CONVERSION OF
IPEC Co.
HOT CHAMBER
FINAL REPORT
Contract No. 2000/013P
UNIDO's PROJECT No. MP/LEB/99/167

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Aug. 2000

Factory Tehran Iran P.Bo. 18915-133 Telefax 0098-21-5253128

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IPEC Co. Final Report (Page 2)

ICRC
Industrial Control
Research Center

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IPEC Co. Final Report (*Page 3*)



SYNOPSIS

Under supreme supervision of UNIDO the CFC phase project has been implemented in Lebanon to phase out 100 % ODS in some Lebanese White Industries.

The project No. MP/LEB/99/167 has been nominated to Lebanon for the Multilateral Fund for the implementation of The Montreal Protocol Financing.

IPEC Co. As a Industrial Refrig. manufacturer in Lebanon the main activities of *IPEC Co.* , is producing refrigerators and freezers,

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Factory Tehran Iran P.Bo. 18915-133 Telefax 0098-21-5253128

INTRODUCTION

According to UNIDO contract No. 2000/013P with Industrial Control Research Center Co. (ICRC) the existing *IPEC Co.* hot chambers facilities shall be converted and modified to phase out CFC-12 and suitable for R134a refrigerant to perform functionality and performance test of converted refrigerators and complying with ISO standards 7173, 8187, and 5155.

- 2 The CFC phase out project in *IPEC Co.* in Lebanon will enable *IPEC Co.* to convert the existing production line facilities and existing hot chambers into Non CFC production line, using R134a refrigerant.
- 3 The converted Hot Chamber Installations will provide more than 20 data points in the refrigeration circuit this means more information and the ability of analyzing refrigeration system and new refrigerant effect.
- 6 The reconstructed Hot Chamber will be able to check and test two refrigerator and /or ref. -freezers units at the same time. The same equipment and data processing system, as will be used at Beirut plant test room will be installed in this chamber.
- 7 The immediate effect of this project at *IPEC Co.* is to perform all required check and tests, suitable for Refrigerator & Freezers using Ozone Friendly Gases. The existing test facilities in *IPEC Co.* are not adequate for check and testing, converted ref. and freezer units, in addition to that the hot rooms are not able to perform Energy Consumption and Optimization Program.

ICRC Hot Chamber Characteristics

In order to convert *IPEC Co.* hot rooms facilities , *ICRC* shall provide following services:

- Supply of new equipment.
- Redesign of old equipment
- Delivery of technical drawings and software.
- Installation and commissioning.
- Start-up of the equipment and the technology.
- On-the-job training of the plant personnel.

With respect to ISO standards test requirements, and for the purpose of functionality and performance tests of the new redesigned Refrigerator and Ref.-Freezers using R134a refrigerants. The existing hot room in *IPEC Co.* is being converted and equipped in such a way to enable *IPEC Co.* to check and test at least one different models of refrigerators and freezers at ambient temperature 32 to 43 degree centigrade at one hot room chambers . In addition to these services is providing. But the hot room is capable to test eight refrigerators and freezers in case of adding more transducers and sensors in the main panel in the hot room:

- a) Procurement of new test measurement and data processing equipment.
- b) Redesign and rebuilding of presently used equipment and installation.
- c) Installation, commissioning, trial operation, start-up and on-the-job training



IPEC HOT CHAMBER TECHNICAL SPECIFICATION

As previously mentioned , *IPEC Co.*'s plant is producing 1870 refrigerator in 1996 . And subsequently the hot chamber should have been able to cover plant daily test requirement as well as other activities. Therefore, the converted hot chamber should respond to all test requirement and be able to meet ISO standards numbers 7371, 5155, 8187 as set forth in the contract and IJISI . The Beirut plant hot chamber technical specification are as follows:

- Hot Chamber Dimension about 4 mt. by 5 mt.
- Refrigerator test ability simultaneously, 3 units inside and 5 units outside
- Ability to perform following operational tests and report:
 - 1 - Pull down test.
 - 2 - Continuous run test.
 - 3 - Cyclic run test.
 - 4 - Ice Freeze test.
 - 5 - Energy consumption test



- 20 Measuring points, including. (for 4 applia.)

- 1 - Humidity, one point for one hot room.
- 2 - Compressor Power, 4 point
- 3 - Motor current, 4 point.
- 4 - Supply Voltage, 4 point.
- 5 - Hot chamber air temperature reading, one point.

- The ability to measure 160 points for eight models .

- Computerized graphical diagram of the refrigerator performance data sheet.

- Test measurement tolerance for temperature reading 0.3 degree centigrade.

- Computerized data processing system.

- Full color test sheet system reporting.



- On screen and data reporting system ability with following characteristics;

- 1 - Test number.
- 2 - Product name.
- 3 - Product model
- 4 - Product internal volume
- 5 - Compressor name
- 6 - Compressor model
- 7 - Compressor cooling capacity
- 8 - Compressor current
- 9 - Thermostat setting
- 10 - Thermostat type.
- 11 - Total test running time.
- 12 - Ambient temperature.
- 13 - Voltage rating
- 14 - Working percentage
- 15 - Evaporator mean air temperature
- 16 - Cabin mean temperature
- 17 - Evaporator bulb temperature
- 18 - Crisper temperature.
- 19 - Actual compressor running time
- 20 - Energy consumption
- 21 - Compressor motor winding temperature
- 22 - Compressor shell temperature.
- 23 - Compressor discharge temperature.
- 24 - Condenser inlet temperature.
- 25 - Condenser out let temperature.
- 26 - Condenser mid temperature
- 27 - Evaporator inlet temperature
- 28 - Evaporator outlet temperature.
- 29 - Freezing temperature.
- 30 - Refrigeration system condition display.

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ACTIVITIES

The following activities were accomplished so far toward achievement of the contract requirement as set forth by UNIDO and the counterpart.

- 1 - Planning for;
 - a) Hot chambers DataLogger system management.
 - b) Hot chambers graphic display management.
 - c) Hot chambers calibration setting parameters.
 - d) Hot chambers test standards management
- 2 - Preparing material requirement list.
- 3 - Component and material supply source evaluation.
- 4 - Technical data collecting.
- 5 - Engineering drawing for electronic and electrical system
- 6 - Hot chamber design review.
- 7 - Data processing software planning.
- 8 - Data processing hardware planning.



- 9 - Thermal amplification electronic cart design
- 10 - Preparation of timer 1 flow chart..
- 11 - Initial test of data loggers electronic cart.
- 12 - Initial connection of data loggers to the computers.
- 13 - Interface electronic cart design for PC and operating system.
- 14 - RTX3 electronic diagram design.
- 15 - RTX electronic diagram design.
- 16 - UNIDO, CRC - 386 design.
- 17 - UNIDO, TC- 100 design.
- 18 - UNIDO, in-out CRC design.
- 19 - Preparation of operating system display flow chart.
- 20 - **First Visits** and coordination;
 - Visiting plant four days , one engineer, one time to Lebanon .
 - Visiting and coordinating with UNDP officer in Lebanon .
 - Technical negotiation with *IPEC Co.* engineers in Beirut headquarters in order to coordinate activities.
 - Visiting hot chamber several times and ordering condition system and electrical cabinet and cooling system in Lebanon.

21 - Second Visits & installation and Start Up

- Visiting plant 7 days , one engineer, Second time to Lebanon . (visit form 22 June to 29 June. 2000)
- Visiting and coordinating with UNDP officer in Lebanon .
- Technical negotiation with *IPEC Co.* engineers in Beirut headquarters in order to coordinate activities.
- Installing Condition controller on hot chamber
- Installing 4 DataLogger0 on the wall of the Hot Chamber
- Installing Heating System
- Installing Cooling System
- Installing Humidifier
- installing Main Electronic Panel
- Installing Electrical Panel
- Installing Computer System With the Version 5 HotRoom Program
- Starting Energy Consumption Test for 7 Hour
- Testing 3 Frizzier and And 2 Refrigerator
- Estimating the operation of samples
- Estimating the Energy for each sample
- Controlling the Temperature
- Reading 64 point Temperature
- Reading 4 point Voltage
- Reading 4 Point Watt
- Reading 4 Point Energy KWh/Day
- Curving all parameters In color Mode



22 - Education And Test

- Education Of Tests :

- 22-1 PERFORMANCE TEST
- 22-2 CYCLING PERFORMANCE TEST
- 22-3 ENERGY CONSUMPTION TEST
- 22-4 ISOLATION ESTIMATION
- 22-5 CONDENSER EVALUATION
- 22-6 EVAPORATOR EVALUATION
- 22-7 HEAT TRANSFER OF COMPRESSOR SHELL
- 22-8 CRISP ISOLATOR INSPECTION

SUPPLY PARTS AND MATERIALS

- DESIGNING AND ASSEMBLING THE MAIN DATA LOGGER**
- ASSEMBLING THE ADC CONVERSION SYSTEM**
- ASSEMBLING THE POWER SUPPLY**
- ASSEMBLING THE DATALOGGER CHANNEL**
- PRODUCING THE LASER TRIMED SENSORS**
- PRODUCING THE SENSORS OF ELECTRICAL**
- STARTING THE SERIAL COMMUNICATION**
- DESIGN AND PRODUCING THE CONDITION MECHANISM**
- MAKING THE CONDITION SENSOR**

In order to fabricate components and electronic kits All necessary material and parts have been purchased and prepared and installed as mentioned in Offer.



Dim Black, Blue, Green
Dim Cyan, red, Magenta, YELLOW
Dim gray, L_Blue, L_Green
Dim L_cyan, L_red, L_Magenta, L_yellow

Dim prn_color As Integer 'False=Black & White ; True=Color

Dim printcolor As Integer
Dim Y, Repstr\$, Rot_Txt_no%
Dim printerdrawwidth As Integer
Dim offset, PageNo
Dim Lb_Tmp As Label
Dim FirstKey

Dim Rec_Max%
Dim SegEn
Dim ActiveFrame As Integer
Dim ActiveLabel As Integer
Dim Seg_n As Integer

Dim PrnPageNo As Integer
Dim ActivePage As Integer

Dim sl%, st%, sw%, sh%, dw%
Dim a30 As String * 30

Dim rr() 'Extracted Results



Sub cmd_click (Index As Integer)

Select Case Index

Case 0 'print
screen.MousePointer = 11
Cmd(0).Enabled = False
Cmd(1).Enabled = False
DoEvents
Call Print_All
Call Save_Spec
screen.MousePointer = 0
Cmd(0).Enabled = True
Cmd(1).Enabled = True
'Unload Me

Case 1 'Save
nn = Variable("Prnt", "Write")
nn = Variable("Prnt", "Read")

Case 2 'cancel
Unload Me

Case 3
Me.Hide
Paper.Show

End Select

Exit Sub

End Sub

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Sub Color_chk_Click (Value As Integer)

```
' If color_chk.Value = False Then
'   prn_color = False
'   color = 0
'   Black = color
'   Blue = color
'   Green = color
'   Cyan = color
'   red = color
'   Magenta = color
'   YELLOW = color
'   gray = color
'   L_Blue = color
'   L_Green = color
'   L_cyan = color
'   L_red = color
'   L_Magenta = color
'   L_yellow = color
'
' Else
'   prn_color = True
'   Black = QBColor(0)
'   Blue = QBColor(1)
'   Green = QBColor(2)
'   Cyan = QBColor(3)
'   red = QBColor(4)
'   Magenta = QBColor(5)
'   YELLOW = QBColor(6)
'   gray = QBColor(8)
'   L_Blue = QBColor(9)
'   L_Green = QBColor(10)
'   L_cyan = QBColor(11)
'   L_red = QBColor(12)
'   L_Magenta = QBColor(13)
'   L_yellow = QBColor(14)
' End If
```

End Sub

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Sub crv (mode\$, Rec1, Rec2)

Select Case mode\$

Case "prn"

printer.ForeColor = Black
printer.FontName = "Arial"
printer.FontSize = 10
obj = ActiveObj

'print x_axis

printer.DrawWidth = 3 * printerdrawwidth
printer.Line (Rec1, 0)-(Rec2, 0)'axis
printer.DrawWidth = 1
printer.DrawStyle = 2'=DOt 3=Dash-Dot 4=Dash_Dot_Dot
For i = -300 To 1000 Step 100
printer.Line (Rec1, i)-(Rec2, i)

Next i

rec = zoom(Seg_n).X1
printer.DrawWidth = 3 * printerdrawwidth
printer.ForeColor = If(prn_color = False, Black, zoom(Seg_n).BorderColor)
printer.Line (rec, -300)-(rec, 1000)
printer.DrawStyle = 0 'Solid
printer.DrawWidth = 1 * printerdrawwidth

printer.CurrentX = rec - RecLb(Seg_n).Width / 2
printer.CurrentY = 1030
printer.Print RecLb(Seg_n).Caption

n = -1

R1 = (Rec1 \ 10 + 1) * 10
R2 = (Rec2 \ 10) * 10

printer.FontSize = 5
printer.ForeColor = Black
For rec = R1 To R2 Step 10

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```
printer.Line (rec, 10)-(rec, -10), Black
n = n + 1
If n Mod 3 = 0 Then
    b$ = Right$("0" & rec \ 60, 2) & ":" & Right$("0" & rec Mod 60, 2)
    printer.CurrentX = rec - 2*offset / 13
    printer.CurrentY = -12
    printer.Print b$
End If
Next rec

'graph
For n = 0 To 1
    For d = 1 To 6
        If curve_Item(n, d) < 50 Then
            z = curve_Item(n, d)
            If curve_color(n, d) = 15 Then col = 0 Else col = curve_color(n, d)
            printer.ForeColor = IIf(prn_color = False, Black, QBColor(col))
            For rec = Rec1 To Rec2 - 1
                bool1 = grf(26, rec) = 789
                bool2 = grf(26, rec + 1) = 789
                If bool1 And bool2 Then
                    Y1 = grf(z, rec)
                    Y2 = grf(z, rec + 1)
                    printer.Line (rec, Y1)-(rec + 1, Y2)
                End If
            Next rec
        End If
    Next d
Next n
Case "grfall"
On Error Resume Next 'Note:Karim
obj = ActiveObj
grafall.Cls
grafall.DrawMode = 7 '(7=xor 13=copy)
RecAll_End = UBound(grf, 2) - 1
If Err = 9 Then
    Rec_Max = 0
Exit Sub
```

End If

```
Rec_Max = RecAll_End
screen.MousePointer = 11
sw = IIf(RecAll_End < 100, 100, RecAll_End)
grafall.ScaleWidth = sw'+ recall_end \ 10
grafall.ScaleLeft = 0
recall_start = 1
grafall.Line (recall_start, 0)-(RecAll_End, 0), QBColor(3)
```

```
For n = 0 To 1
```

```
For d = 1 To 6
```

```
If curve_Item(n, d) < 50 Then
```

```
z = curve_Item(n, d)
```

```
If Hr.lbt(z).Visible = True Then
```

```
grafall.ForeColor = QBColor(curve_color(n, d))
```

```
For rec = recall_start To RecAll_End - 1
```

```
If grf(26, rec) = 789 And grf(26, rec + 1) = 789 Then
```

```
grafall.Line (rec, grf(z, rec))-(rec + 1, grf(z, rec + 1))
```

```
End If
```

```
Next rec
```

```
Else
```

```
curve_Item(n, d) = 50
```

```
Hr.lbt(z).ForeColor = QBColor(0)
```

```
Hr.lbt(z).BackColor = &H202020
```

```
End If
```

```
End If
```

```
Next d
```

```
Next n
```

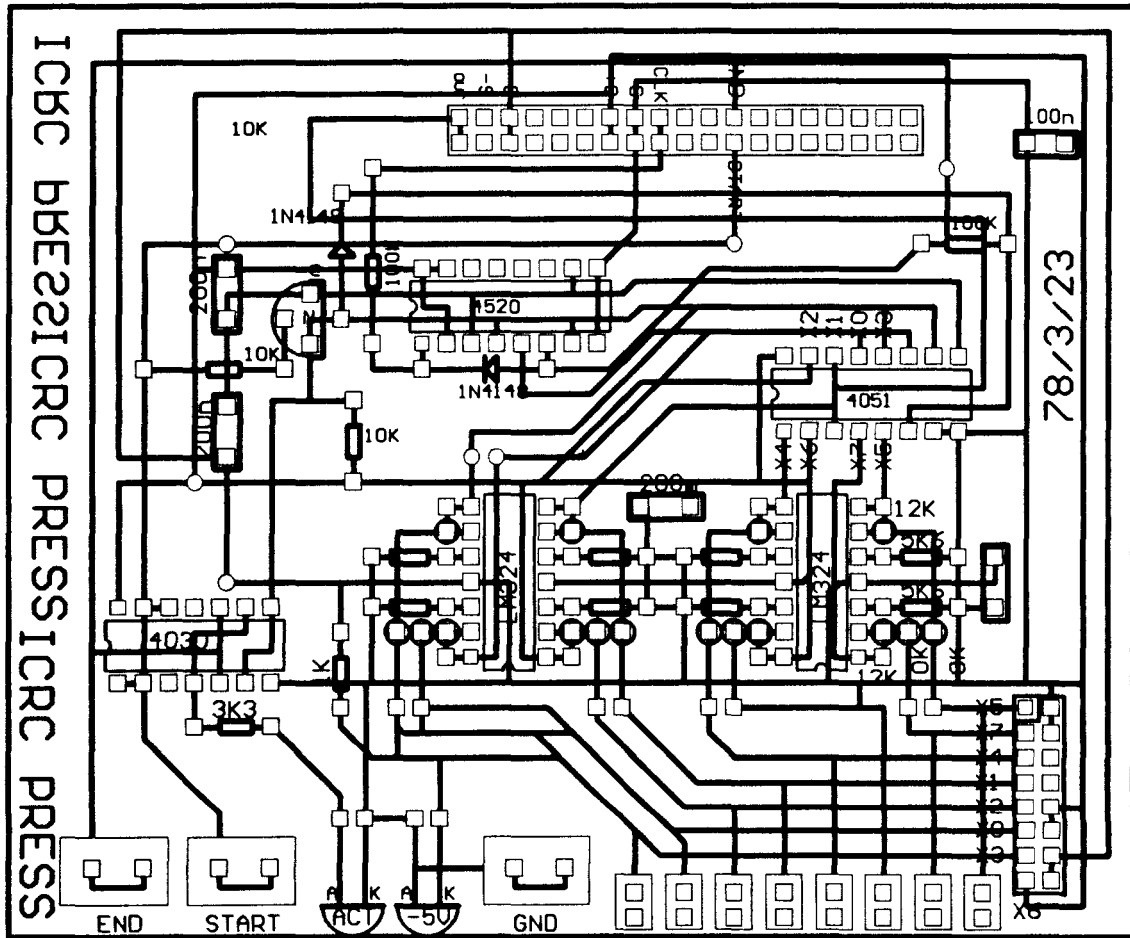
```
screen.MousePointer = 0
```

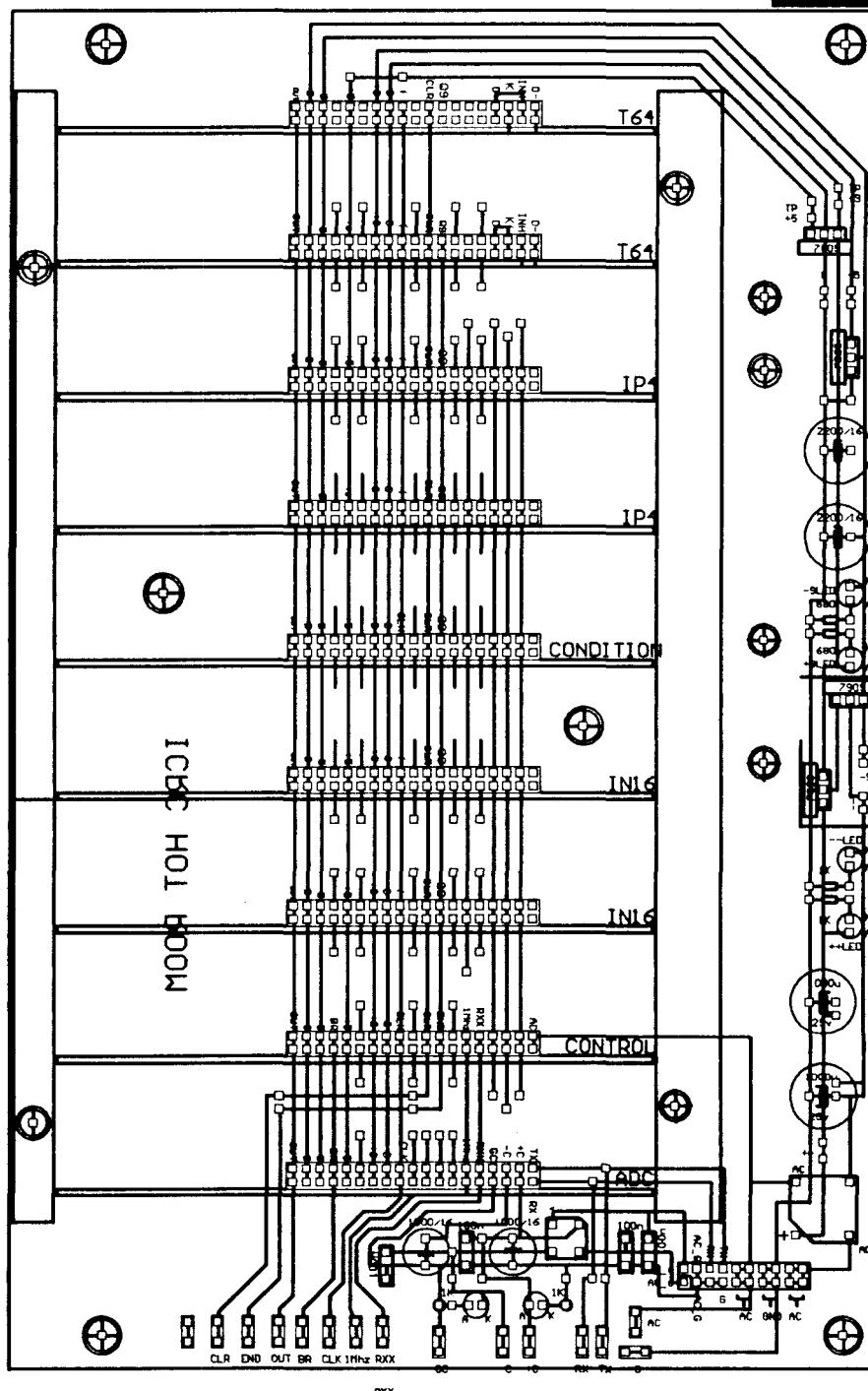
```
Case "grfzoom"
```

```
On Error Resume Next
```

```
obj = ActiveObj
```

```
End Sub
```





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TestDate: 2000/06/24 08:12

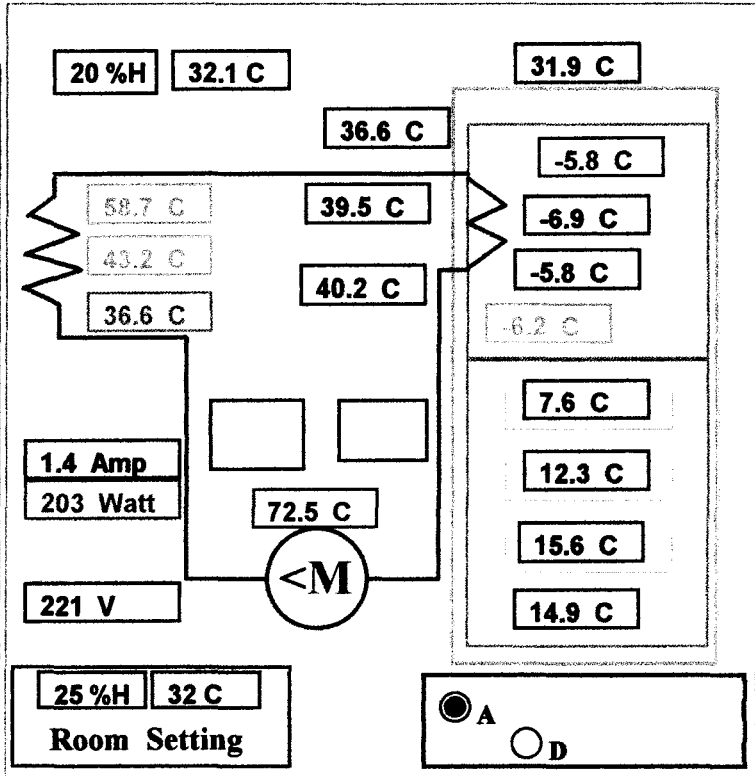
Report No.: () - Page 1

PageTestName: Cycling Performance

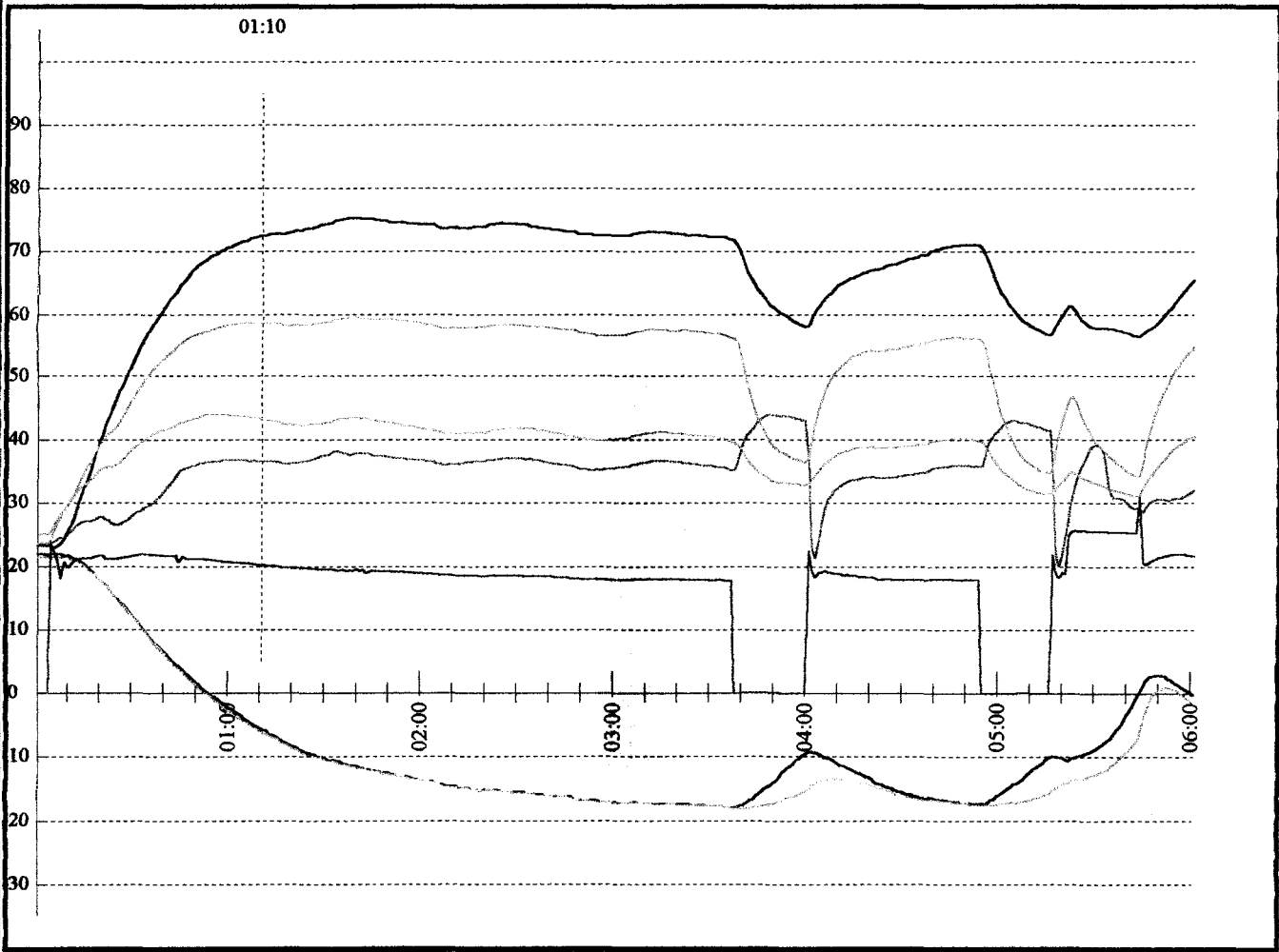
ReportDate: 2000/06/26 10:05

Page Result :

1 - Page Test Time	6 Hours
2 - Working Percent	86 %On
3 - Energy (Accord to page)	2.419 kwh
4 - Zoom Time	1:11 Hour
5 - Compr Current	1.4 Amp
6 - Evaprator Mean Temp	-6.1 C
7 - Cabin Mean Temp	11.8 C
8 - Crisp Temp	14.9 C
9 - Compr Temp	72.5 C
10- Condensor In Temp	36.6 C
11- Condensor Out Temp	58.7 C
12- Condition	32.1 C 20 %H
13- Volt	Max=223 Mean=220 Min=216
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Industrial Control Research Center HotRoom Ver 5





TestDate: 78/08/17 19:05

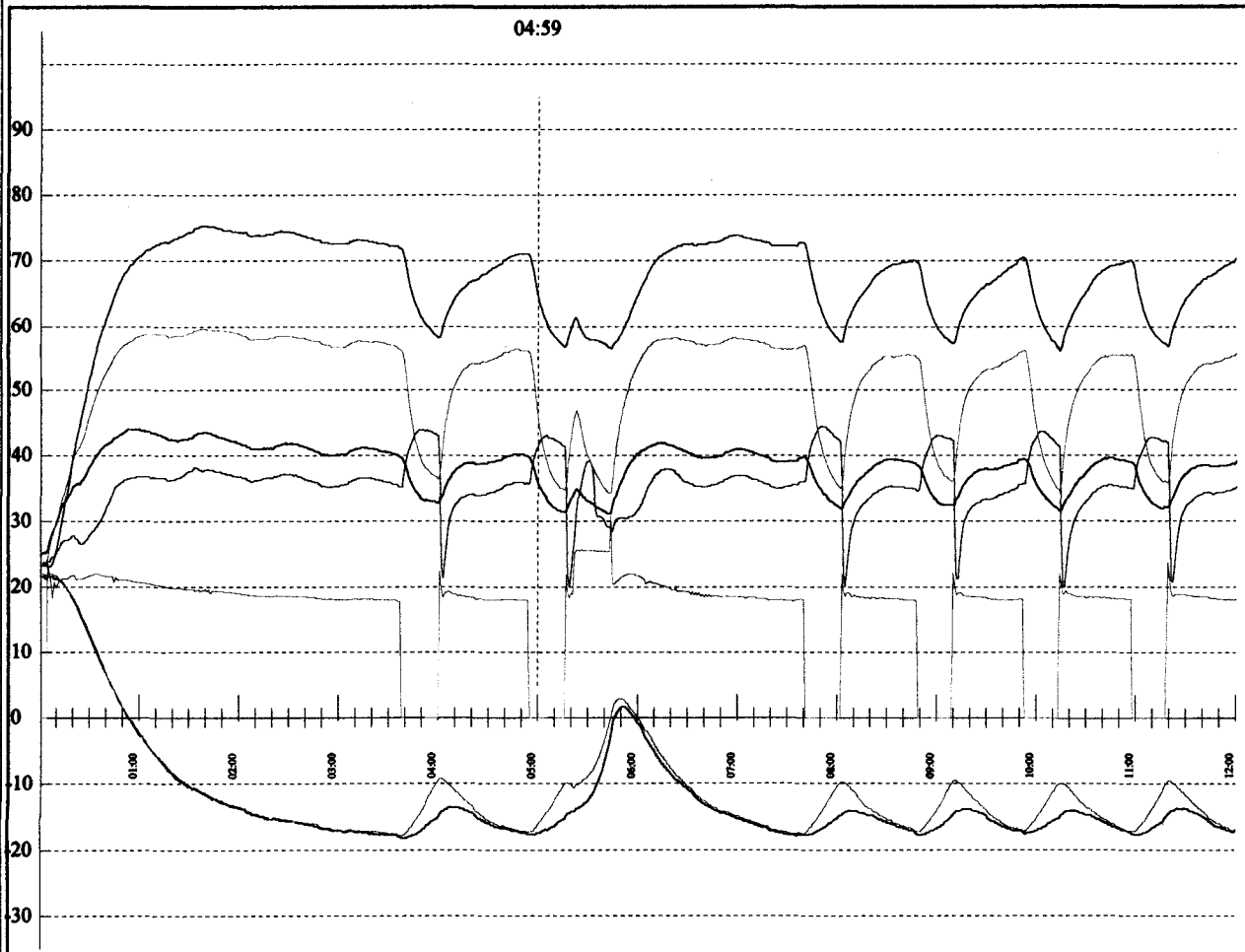
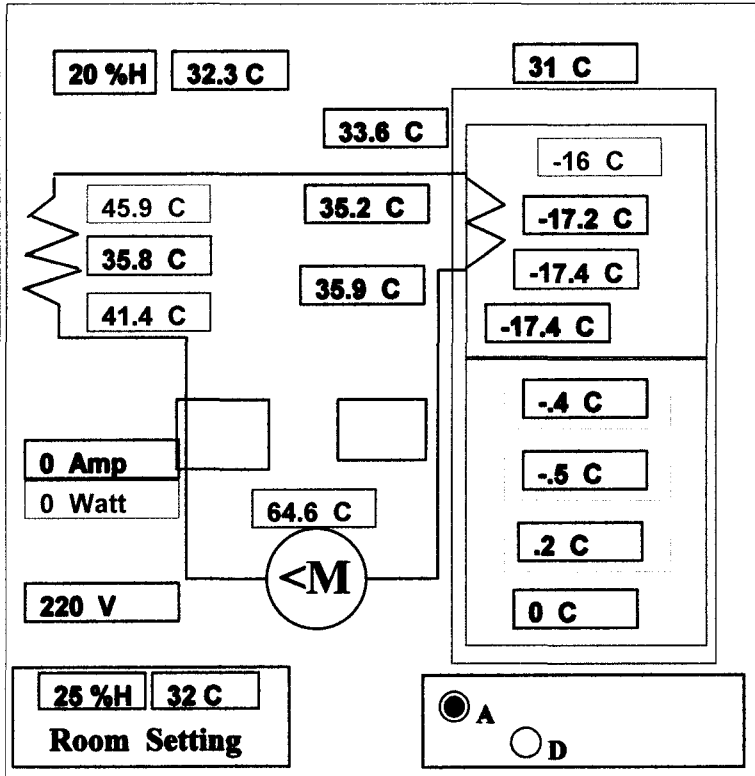
Report No.: () - Page 1

PageTestName: Energy Consumption

ReportDate: 00/06/23 19:56

Page Result :

- 1 - Page Test Time 12 Hours
- 2 - Working Percent 81 %On
- 3 - Energy (Accord to page) 2.537 kwh
- 4 - Zoom Time 5:00 Hour
- 5 - Compr Current 00 Amp
- 6 - Evaprator Mean Temp -17 C
- 7 - Cabin Mean Temp -.2 C
- 8 - Crisp Temp 0 C
- 9 - Compr Temp 64.6 C
- 10- Condensor In Temp 41.4 C
- 11- Condensor Out Temp 45.9 C
- 12- Condition 32.3 C 20 %H
- 13- Volt Max=225 Mean=221 Min=216
- 14-
- 15-
- 16-
- 17-



Industrial Control Research Center HotRoom Ver 5



TestDate: 2000/06/24 08:12
TestName: Cycling Performance

Report No.: Spec & Remark
ReportDate: 2000/06/27 09:05

Total Result :

1 - Total Test Time	13 Hours
2 - Working Percent	70 %On
3 - Energy	1.888 kwh
4 - Zoom Time	12:29 Hour
5 - Compr Current	1.05 Amp
6 - Evaprator Mean Temp	-5.7 C
7 - Cabin Mean Temp	14.7 C
8 - Crisp Temp	14.1 C
9 - Compr Temp	52.8 C
10- Condensor In Temp	30.4 C
11- Condensor Out Temp	34.2 C
12- Condition	31.1 C 20 %H
13- Volt	Max=226 Mean=221 Min=211
14-	
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Product Spec :

1 - File Name	78081719.k05
2 - Test Kind	G UnidoTest
3 - Product Serial	12248
4 - Product Name	Ref.Friz
5 - Product Model	ES.652
6 - Product Capacity	460 Lit
7 - Compressor Name	Mitsushit
8 - Compressor Model	FN91F20G
9 - Compressor Power	1 Hp
10- Compressor Amper	1.5 Amp
11- Thermostat No.	3
12- Thermostat Type	PFN-C171
13-	
14-	

Technical Manager: ICRC

Lab Chief : IMANI

Lab Specialist: IMANI

Remark :

Remark1
Remark2
Remark3

Remark :

sign :



TestDate: 2000/06/24 08:12

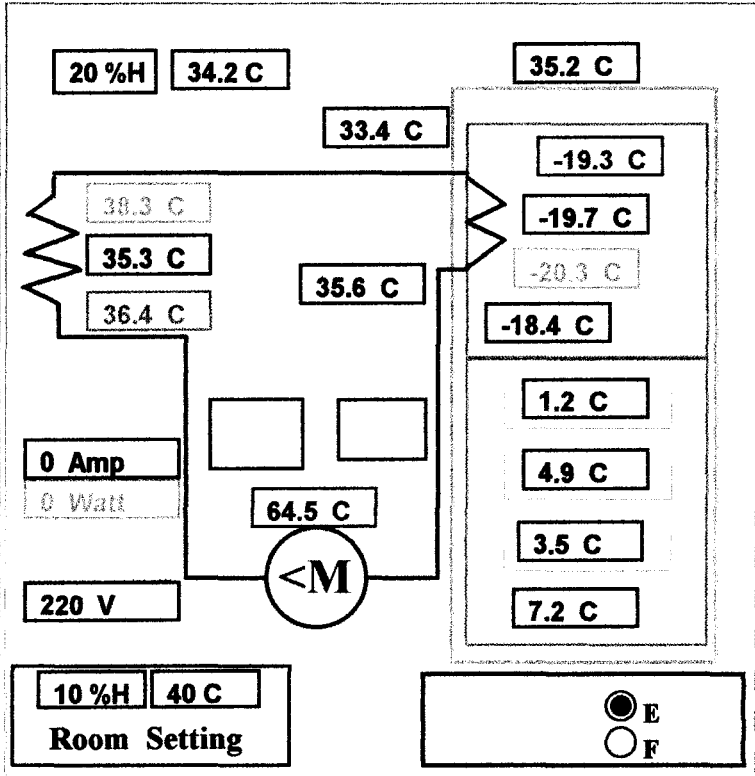
Report No.: () - Page 1

PageTestName: Cycling Performance

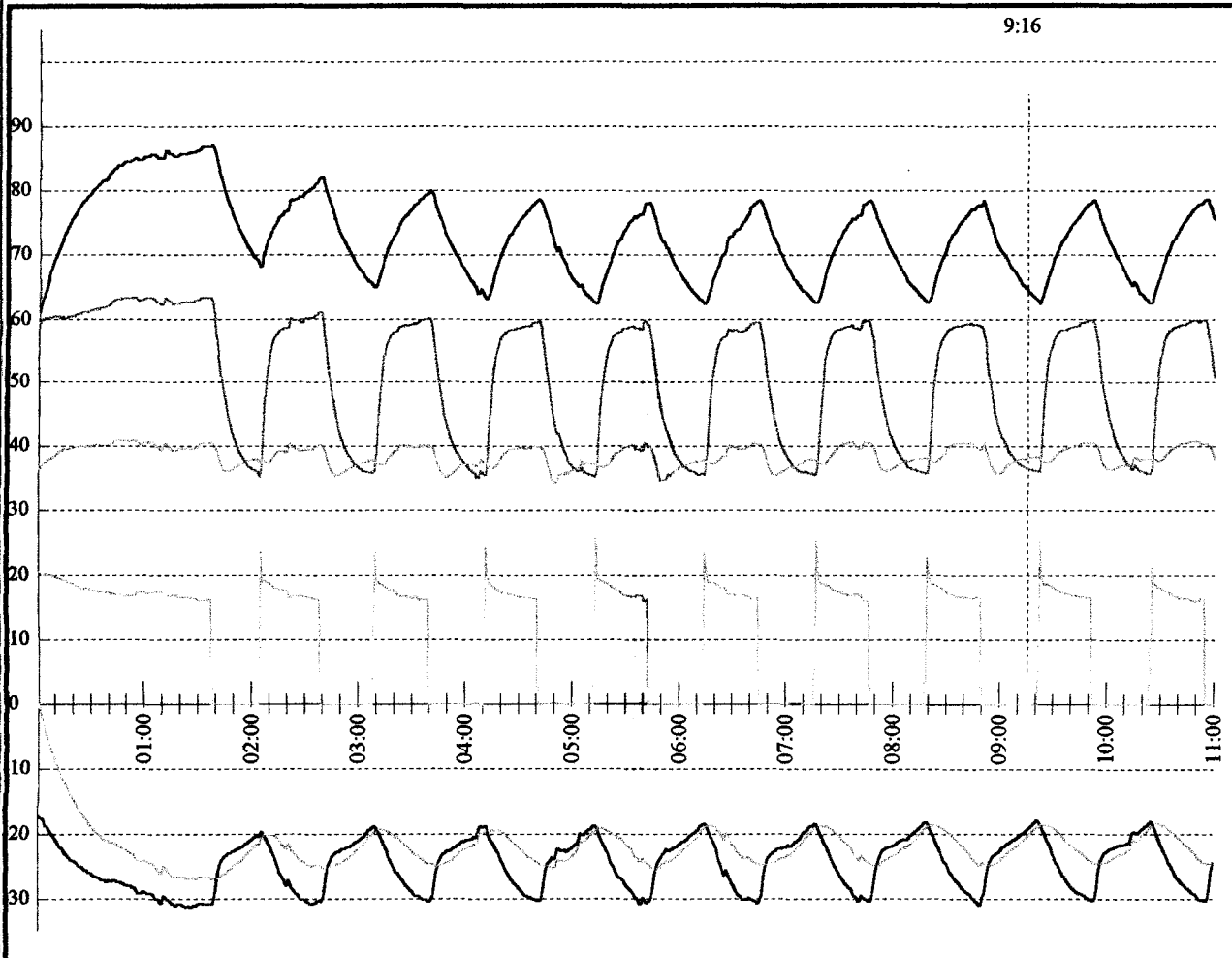
ReportDate: 2000/06/25 19:59

Page Result :

1 - Page Test Time	11 Hours
2 - Working Percent	56 %On
3 - Energy (Accord to page)	2.073 kwh
4 - Zoom Time	9:16 Hour
5 - Compr Current	00 Amp
6 - Evaprator Mean Temp	-19.4 C
7 - Cabin Mean Temp	3.2 C
8 - Crisp Temp	7.2 C
9 - Compr Temp	64.5 C
10- Condensor In Temp	36.4 C
11- Condensor Out Temp	38.3 C
12- Condition	34.2 C 20 %H
13- Volt	Max=225 Mean=221 Min=217
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Industrial Control Research Center HotRoom Ver 5





TestDate: 2000/06/24 08:12

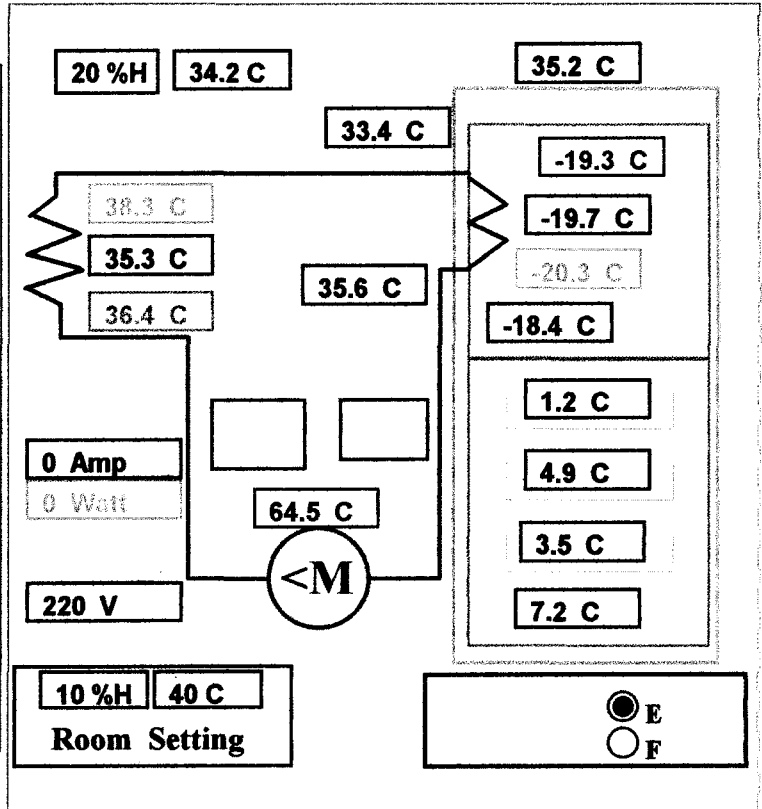
Report No.: () - Page 1

PageTestName: Cycling Performance

ReportDate: 2000/06/25 19:59

Page Result :

- 1 - Page Test Time 11 Hours
- 2 - Working Percent 56 %On
- 3 - Energy (Accord to page) 2.073 kwh
- 4 - Zoom Time 9:16 Hour
- 5 - Compr Current 00 Amp
- 6 - Evaprator Mean Temp -19.4 C
- 7 - Cabin Mean Temp 3.2 C
- 8 - Crisp Temp 7.2 C
- 9 - Compr Temp 64.5 C
- 10 - Condensor In Temp 36.4 C
- 11 - Condensor Out Temp 38.3 C
- 12 - Condition 34.2 C 20 %H
- 13- Volt Max=225 Mean=221 Min=217
- 14-
- 15-
- 16-
- 17-



Industrial Control Research Center HotRoom Ver 5

