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Fariz Iran. Final Report (Page 1)

REPORT

CONVERSION OF

FARIZ IRAN Co.

HOT CHAMBER

FINAL REPORT

Contract No. 97/332P

UNIDO's PROJECT No. MP/IRA/96/041

Dec 1998

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SYNOPSIS

Under supreme supervision of **UNIDO** the **CFC** phase project has been implemented in Iran to phase out 100 % ODS in some Iranian White Industries

The project No. **MP/IRA/96/041** has been nominated to Islamic Republic of Iran for the Multilateral Fund for the implementation of The Montreal Protocol Financing.

The project was approved by Montreal Protocol Multilateral Fund executive committee. The project was actually started in November 1994, but the implementation of the project has been already started from January 1994, by recommendation of Montreal Protocol and request of Government of Islamic Republic of Iran, the refrigerant R134a was finally approved and selected by **UNIDO** as an alternative for refrigerant R12.

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INTRODUCTION

According to **UNIDO** contract No. **97/332P** with Industrial Control Research Center Co. (**ICRC**) the existing **Fariz Iran 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.

- 1 This project has been prepared based on the requirements of Islamic Republic of Iran indicated in the country program no **UNEP/OZL.PRO/EX COM/10/24** dated 27 May 1993 prepared by **UNDP**.
- 2 The **CFC** phase out project in **Fariz Iran Co..** will enable **Fariz Iran 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 three refrigerator and/or ref.-freezers units at the same time. The same equipment and data processing system, as will be used at Tehran plant test room will be installed in this chamber.
- 7 The immediate effect of this project at **Fariz Iran Co..** is to perform all required check and tests, suitable for Refrigerator & Freezers using Ozone Friendly Gases. The existing test facilities in **Fariz Iran 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.

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ICRC Hot Chamber Characteristics

In order to convert *Fariz Iran 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 *Fariz Iran Co.* is being converted and equipped in such a way to enable *Fariz Iran 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

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FARIZ IRAN HOT CHAMBER TECHNICAL SPECIFICATION

As previously mentioned , *Fariz Iran Co.*'s plant is producing 200 refrigerator daily . 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, Iranian standards numbers 254, 2482, 2818. The plant hot chamber technical specification are as follows:

- Hot Chamber Dimension about 3.5 mt. by 4 mt.
- Refrigerator test ability simultaneously, 2 units
- 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

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

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

160 points for eight models in case of improving the system by spending very low costs.

- 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.

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- 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 the first interim report

1 - Planning for

- a) Hot chambers system management.
- b) Hot chambers graphic display management.
- c) Hot chambers calibration setting parameters.
- d) Hot chambers test standards management

2 - Preparing all material .

3 - Installing Component and material and Data Logger Panel .

4 - Technical data collecting.

5 - Engineering testing of electronic and electrical system

6 - Hot chamber design review.

7 - Data processing software installing.

8 - Data processing hardware installing.

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- 9 - Thermal amplification electronic cart installing
- 10 - installing of timer 1 flow chart..
- 11 - Last test of data loggers electronic cart.
- 12 - Last 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 - Visits and coordination;
 - Visiting plant four days, two engineers, one time.
 - Visiting and coordinating with UNDP office .
 - Technical negotiation with *Fariz Iran Co.* engineers in order to coordinate activities.
 - Visiting hot chamber several times in order to coordinate activities.

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21 - Activities On Hot Chamber

- a) Hot Chamber Heat Control Design
- b) Hot Chamber Heat Capacity
- c) Hot Chamber Heat Leak
- d) System Control Planning
- e) Cooling System Ordering

22 - Following steps were taken to manufacture hot chamber hoods

- a) Designing
- b) Fabricating
- c) Preparing
- d) Hood Installing
- e) Sensors preparation
- f) Sensor check and test
- g) Sensor installing
- h) Wiring
- i) Wiring Control
- j) Selecting Blower and Fan
- k) Blower check and test
- l) Blower installation

23- Following Component and Parts were Designed and manufactured

- a) Complete Data Logger System
- b) Thermal Amplifier
- c) Electrical Control Panel
- d) Electronic Control Panel
- e) Complete Heat control system
- f) Hot Air Circulation System

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SUPPLY PARTS AND MATERIALS

In order to fabricate components and electronic kits following material and parts have been purchased so far and fabricated .

- 1 - Semiconductor sensors for measuring temperature from - 30 to + 110 degree centigrade. 16 each
- 2 - Electronic humidity measurement sensor 1 each
- 3 - Electronic data logger cart for temperature measurement 2 each
- 4 - Electronic data logger cart for humidity Calibration 1 each
- 5 - ADC912 Converter IC for system conversion management.
- 6 - Electronic parts consist of resistor. IC, capacitor, and diode.
- 7 - Data Logger Panel

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```
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
```

```
'-----
'
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
```

```
'-----
'
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 = IIf(prn_color = False, Black, zoom(Seg_n).Bord
      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
        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
```



```
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 = curv
      printer.ForeColor = IIf(prn_color = False, Black, QBColor)
      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

  zoomarea = 30
  zoomarea2 = zoomarea \ 2
  grafzoom.ScaleWidth = zoomarea
  'X = Int(zoom.X1 + .5)
  'If X > Rec_Max Then Stop
  grafzoom.ScaleLeft = X - zoomarea2

  Rec_Start = IIf(X - zoomarea2 > 0, X - zoomarea2, 0)
  Rec_end = IIf(X + zoomarea2 < Rec_Max, X + zoomarea2, Rec_Max)

  'Rec_Start = Seg(ActiveSeg).Left
  'Rec_End = Rec_Start + Seg(ActiveSeg).Width
  'grafzoom.ScaleWidth = Seg(ActiveSeg).Width
  'grafzoom.ScaleLeft = Rec_Start

grafzoom.Cls
grafzoom.DrawMode = 7 ' (7=xor 13=copy)
grafzoom.Line (Rec_Start, 0)-(Rec_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
      grafzoom.ForeColor = QBColor(curve_color(n, d))
      For Rec = Rec_Start To Rec_end - 1
        If grf(26, Rec) = 789 And grf(26, Rec + 1) = 789 Then
          grafzoom.Line (Rec, grf(z, Rec))-(Rec + 1, grf(z, Rec + 1))
        End If
      Next Rec
    End If
  End If
Next d
Next n
```

```
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
Call ResultsGrf_click
End Select
```

End Sub

,
,

Sub CrvZoom ()

```
On Error Resume Next
obj = activeobj
zoomarea = 30
zoomarea2 = zoomarea \ 2
grafzoom.ScaleWidth = Val(PrnLb(27)) * 60
grafzoom.ScaleLeft = Seg(ActivePage).Left
Rec_Start = grafzoom.ScaleLeft + 1
Rec_end = Rec_Start + grafzoom.ScaleWidth - 1
If Rec_end > UBound(grf, 2) Then Rec_end = UBound(grf, 2)
grafzoom.Cls
grafzoom.DrawMode = 7 '(7=xor 13=copy)
grafzoom.Line (Rec_Start, 0)-(Rec_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
                grafzoom.ForeColor = QBColor(curve_color(n, d))
                If Rec_Start < 1 Then Rec_Start = 1
                For Rec = Rec_Start To Rec_end - 1
                    bol1 = (grf(26, Rec) = 789)
                    bol2 = (grf(26, Rec + 1) = 789)
                    If bol1 And bol2 Then
                        Y2 = grf(z, Rec + 1)
                        Y1 = grf(z, Rec)
                        grafzoom.Line (Rec, Y1)-(Rec + 1, Y2)
                    End If
                Next Rec
            End If
        End If
    Next d
Next n
```

```
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
z = Int(zoom(ActivePage).X1)
zoomzoom.X1 = z
zoomzoom.X2 = z
zoomzoom.BorderColor = zoom(ActivePage).BorderColor
Grfzoom_pnl.BackColor = zoomzoom.BorderColor
a$ = Right$("0" & z \ 60), 2 & ":" & Right$("0" & z Mod 60), 2)
RecLb(ActivePage).Caption = a$
Call ResultsGrf_click

End Sub

'
'
Sub Extract_Results ()

ReDim rr(0 To 4, 0 To 4)
    'rr(main,p1,p2,p3,p4;;;TTT,work_on,work_off,Julc)
Const main = 0, TTT = 0 'TTT=Total Test Time
Const workon = 1, workoff = 2, Julc = 3
Const CMT = 4 'CMT=Cabin Mid. Temperature
x0 = 1
n_cmt_main = 0
For Page = 1 To PrnPageNo
    n_cmt_Seg = 0
    Rec1 = Int(Seg(Page).Left + .5)
    Rec2 = Rec1 + Int(Seg(Page).Width + .5)
    For Rec = x0 To Rec1
        If grf(26, Rec) = 789 Then
            If grf(18, Rec) < 30 Then
                rr(main, workoff) = rr(main, workoff) + 1
            Else
                rr(main, workon) = rr(main, workon) + 1
            End If
            rr(main, Julc) = rr(main, Julc) + grf(20, Rec)
            rr(main, CMT) = rr(main, CMT) + grf(4, Rec) + grf(5, Rec)
            n_cmt_main = n_cmt_main + 3'4
        End If
    Next Rec
    x0 = Rec1 + 1
End Sub
```

```
For Rec = Rec1 + 1 To Rec2
  If grf(26, Rec) = 789 Then
    If grf(18, Rec) < 30 Then
      rr(i, workoff) = rr(i, workoff) + 1
      rr(main, workoff) = rr(main, workoff) + 1
    Else
      rr(i, workon) = rr(i, workon) - 1
      rr(main, workon) = rr(main, workon) + 1
    End If
    rr(i, Jule) = rr(i, Jule) + grf(20, Rec)
    rr(main, Jule) = rr(main, Jule) + grf(20, Rec)

    rr(i, CMT) = rr(i, CMT) + grf(4, Rec) + grf(5, Rec) + grf(
    n_cmt_Seg = n_cmt_Seg + 3
    rr(main, CMT) = rr(main, CMT) + grf(4, Rec) + grf(5, Rec)
    n_cmt_main = n_cmt_main + 3

  End If
Next Rec
rr(i, TTT) = Rec2 - Rec1
rr(i, CMT) = Int(rr(i, CMT) / n_cmt_Seg + .5)
x0 = Rec2 + 1
Next Page
Rec1 = RecEnd0
For Rec = x0 To Rec1
  If grf(26, Rec) = 789 Then
    If grf(18, Rec) < 30 Then
      rr(main, workoff) = rr(main, workoff) + 1
    Else
      rr(main, workon) = rr(main, workon) + 1
    End If
    rr(main, Jule) = rr(main, Jule) + grf(20, Rec)
    rr(main, CMT) = rr(main, CMT) + grf(4, Rec) + grf(5, Rec) + gr
    n_cmt_main = n_cmt_main + 3
  End If
Next Rec
rr(main, TTT) = RecEnd0
rr(main, CMT) = Int(rr(main, CMT) / n_cmt_main + .5)

End Sub

Sub Form_Activate ()
'Call Prnlb_Mousedown(0, 0, 0, 0, 0)
End Sub

'-----
'
Sub Form_Load ()
```

```
If Dir("c:\hr1.exe") <> "" Then Exit Sub
nn = Variable("Prnt", "Read")
'PrnLb(2).Caption = Operator0
'PrnLb(3).Caption = Chief0
```

```
PrnPageNo = 0
Cmd(0).Enabled = True
Cmd(1).Enabled = True
Call Color_chk_Click(True)
'Set Lb_Tmp = TestName0
```

```
grafzoom.ScaleHeight = -1450
grafzoom.ScaleTop = 1100
grafall.ScaleHeight = -1450
grafall.ScaleTop = 1100
```

```
Call crv("grfall", 0, 0)
ActivePage = 1
SegEn = -1
```

End Sub

```
'-----
'
```

```
Sub Form_QueryUnload (Cancel As Integer, UnloadMode As Integer)
```

```
    hr.Visible = True
```

End Sub

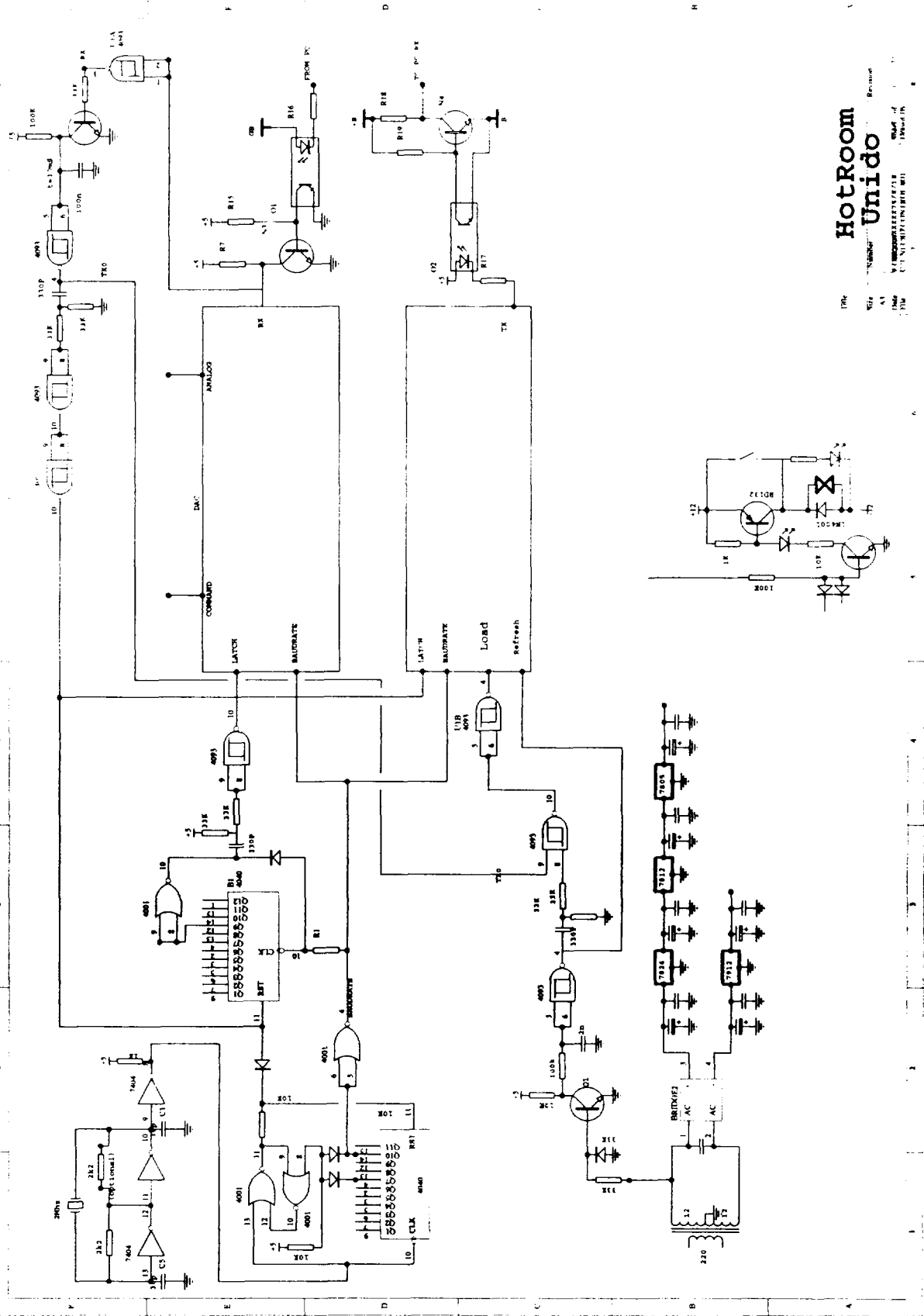
```
'-----
'
```

```
Sub Grafall_KeyDown (keycode As Integer, Shift As Integer)
```

```
    X = Int(X)
    ShiftDown = (Shift And 1) <> 0
    ww = PageWidth * 60
    Select Case keycode
        Case 49, 50, 51, 52, 53, 54
            Page = keycode - 48
            If Page > PrnPageNo Then Exit Sub
            ActivePage = Page
            Call PrnPageGrf_click
            DoEvents
            Exit Sub
        Case Key_Up
            Call PrnPageSpin_SpinUp
```

```
Exit Sub
Case Key_Down
    Call PrnPageSpin_SpinDown
    Exit Sub
Case KEY_LEFT
    n = -5
Case KEY_RIGHT
    n = 5
Case KEY_NUMPAD4
    n = -30
Case KEY_NUMPAD6
    n = 30
End Select
If ActivePage = 1 And n < 0 Then
    If Seg(1).Left + n < 0 Then n = -Seg(1).Left
ElseIf ActivePage = PrnPageNo And n > 0 Then
    X1 = Seg(ActivePage).Left + Seg(ActivePage).Width + n
    If X1 > RecEnd0 Then
        n = RecEnd0 - (Seg(ActivePage).Left + Seg(ActivePage).Width)
    End If
ElseIf n > 0 Then
    If Seg(ActivePage).Left + ww + n >= Seg(ActivePage + 1).Left Then
        n1 = Seg(ActivePage + 1).Left
        n2 = (Seg(ActivePage).Left + ww)
        n = n1 - n2 - 3
    End If
ElseIf n < 0 Then
    If Seg(ActivePage - 1).Left + ww > Seg(ActivePage).Left + n Then
        n = Seg(ActivePage - 1).Left + ww - Seg(ActivePage).Left + 1
    End If
End If
'DoEvents
Seg(ActivePage).Left = Seg(ActivePage).Left + n
zoom(ActivePage).X1 = zoom(ActivePage).X1 + n
zoom(ActivePage).X2 = zoom(ActivePage).X2 + n
'DoEvents
RecLb(ActivePage).Left = RecLb(ActivePage).Left + n
RecLb(ActivePage).Caption = Val(RecLb(ActivePage).Caption) + n
Call CrvZoom

DoEvents
End Sub
```



HotRoom Unido

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