THE DOE–2 USER NEWS

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DOE-2: A COMPUTER PROGRAM FOR BUILDING ENERGY SIMULATION

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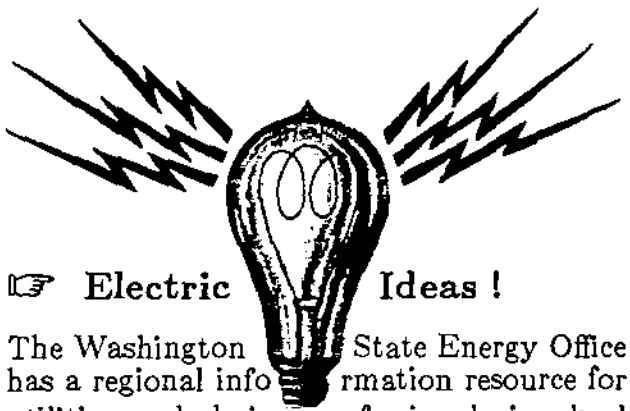
☞ ☞ HANDS ON ☜ ☜

☞ Correction to the BDL Summary

We have reprinted page 42 of the 2.1D BDL Summary on the inside back cover of this User News. There was an error in the **ENERGY-COST** command under the keyword **RESOURCE**. The second line of code-words available for the **RESOURCE** command was inadvertently dropped. Sorry for the inconvenience!

This work was supported by the Assistant Secretary for Conservation and Renewable Energy, Office of Buildings Technology, Building Systems and Materials Division of the U. S. Department of Energy, under Contract No. DE-AC03-76SF00098.



☞ Electric Ideas !

The Washington State Energy Office has a regional information resource for utilities and design professionals involved in energy efficient new commercial buildings in the Pacific Northwest. From design stage to implementation, the **Electric Ideas Clearinghouse** covers topics such as architecture and design, electrical systems, HVAC, motors, insulation, process equipment, computer simulations, boilers, pumps, lighting, refrigeration, renewable resources, training programs, etc. The **Electric Ideas Clearinghouse** may be accessed through a network of phone lines and a computerized bulletin board (toll-free numbers in the Pacific Northwest only). To access the Clearinghouse by computer, call 206-586-6854, 24 hours a day; by phone, call the information hotline at 206-586-8588 from 8am to 5pm PST; by FAX, call 206-586-8303 to order technical information, articles, reports, and product literature. If your utility or project is located outside Washington, Oregon, Idaho or Montana, call 206-586-8588 for special access instructions. For additional information on the Clearinghouse or how your state energy agency can set up its own facility, please contact Mike Harrison, P.E., Washington State Energy Office, 809 Legion Way S.E., FA-11, Olympia, WA 98504-1211.

DOE-2.1D Basic Manual: Excerpt

The Simulation Research Group has prepared a *Basic Manual*, which covers the essentials of preparing standard DOE-2 inputs. In late July, the *Basic Manual* was sent out for review; November is the targetted printing date. Availability of this new piece of documentation will be announced in the User News.

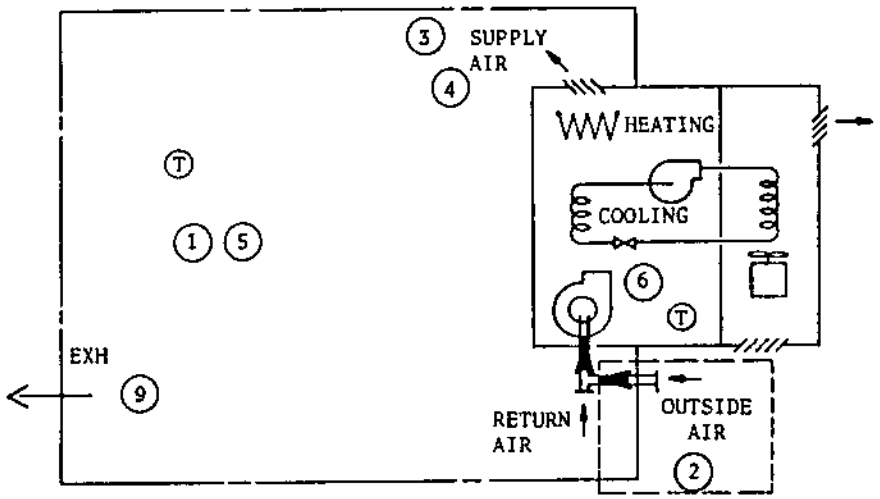
This is the last excerpt from the *Basic Manual* we will print in the User News. In this issue we present system types PTAC, TPFC, and RESYS. In case you missed any of the excerpts, we presented system type SZRH in Vol. 10, No. 4 [Winter 1989], system types VAVS, PIU, and HP in Vol. 11, No. 1 [Spring 1990], and system types PSZ, PMZ and PVAV in Vol. 11, No. 2 [Summer 1990].

Packaged Terminal Air Conditioner (PTAC)

Packaged Terminal Air Conditioners (PTAC) are designed primarily for commercial installations to provide the total heating and cooling function for a room or zone, and are specifically designed for through-the-wall installation. The units (which are hybrid systems/plants) are mostly used in hotel and motel guest rooms, apartments, hospitals, nursing homes, and office buildings. All PTAC units discharge air directly into the space without ductwork.

PTAC with DX Cooling and Electric Resistance Heating: This unit, shown below, provides cooling by direct expansion of a refrigerant and heating by an electric resistance heater. In its most basic configuration this PTAC consists of a compressor, an air-cooled condenser with a fan discharging heat to the outdoors, an evaporator with a two-speed fan supplying cooled air to the indoors, an electric heater, a filter (not shown), and a thermostat. The unit may be specified with outside ventilation air. This PTAC unit has no return fan option; supply fan is assumed to be a blowthrough with the fan motor located inside the airstream. Optionally, the unit may be specified with a thermostat with night setback.

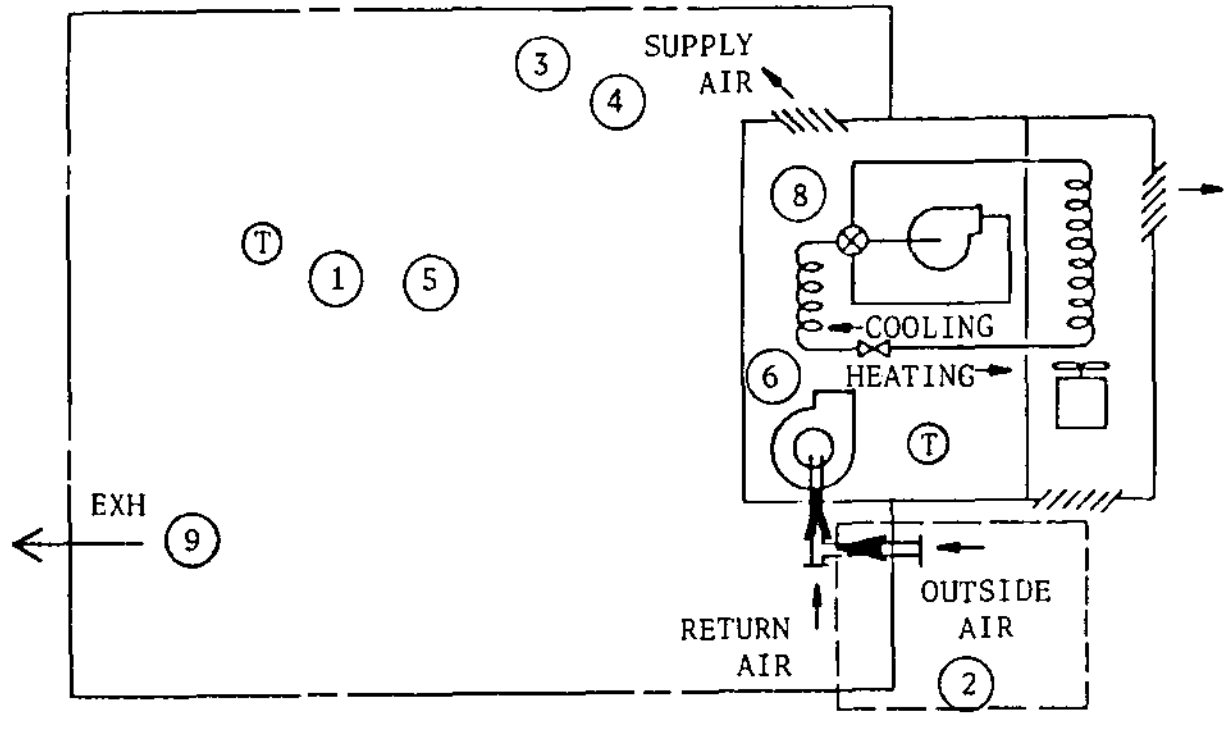
Items shown in dashed boxes are optional components



PTAC with DX Cooling

PTAC with Air-to-Air Heat Pump: This type of PTAC unit provides year-round forced-air heating and cooling. This system consists of a single air-to-air heat pump. In its basic configuration the heat pump unit consists of a compressor, a four-way valve for reversing the refrigerant flow direction, a condenser with a fan, an evaporator usually with a two-speed fan, a filter (not shown), and a thermostat. The condenser also serves as an evaporator and the evaporator also serves as a condenser, depending upon whether the unit is in the heating or cooling mode of operation. The unit may be specified with outside ventilation air, in which case the supply fan runs continuously rather than cycling with the compressor. This PTAC has no return fan option and the supply fan is assumed to be a two-speed blowthrough fan with the fan motor located inside the air-stream. Optionally, the unit may be specified with a thermostat with night setback.

Items shown in dashed boxes are optional components



PTAC with Air-to-Air Heat Pump

Suggested Minimal Input for PTAC

```
INPUT SYSTEMS  ..

                    $ SYSTEMS SCHEDULES

FANS-ON =     SCHEDULE THRU DEC 31 (WD)   (1,7)(0) (8,18)(1)
                                          (19,24)(0)
                                   (WEH)  (1,24)(0)  ..

COOLSETPT =   SCHEDULE THRU DEC 31 (WD)   (1,7)(99) (8,18)(76)
                                          (19,24)(99)
                                   (WEH)  (1,24)(99)  ..

HEATSETPT =   SCHEDULE THRU DEC 31 (WD)   (1,7)(55) (8,18)(72)
                                          (19,24)(55)
                                   (WEH)  (1,24)(55)  ..

OFFICE = ZONE       DESIGN-HEAT-T      =   72
                    DESIGN-COOL-T      =   74
                    HEAT-TEMP-SCH      =   HEATSETPT \
                    COOL-TEMP-SCH      =   COOLSETPT /  (1)
                    OA-CFM/PER         =   15 .. (2)

AC-SYST = SYSTEM    SYSTEM-TYPE        =   PTAC
                    MAX-SUPPLY-T       =   110 (3)
                    MIN-SUPPLY-T       =   55 (4)
                    NIGHT-CYCLE-CTRL   =   CYCLE-ON-ANY (5)
                    FAN-SCHEDULE       =   FANS-ON (6)          (8)
                    HEAT-SOURCE        =  (7)ELECTRIC $ alt. HEAT-PUMP
                    ZONE-NAMES         =   (OFFICE) ..

SYSTEMS-REPORT      SUMMARY            =   (SS-A,SS-H,SS-O)

END ..
COMPUTE SYSTEMS ..
INPUT PLANT ..
PLANT-REPORT SUMMARY = (BEPS) ..
SHW = PLANT-EQUIPMENT    TYPE = DHW-HEATER    SIZE = -999 ..
END ..
COMPUTE PLANT ..
```

Additional Capability for PTAC:

1) To enable an exhaust fan add the keywords EXHAUST-CFM = Value (CFM) and EXHAUST-KW = Value (.0001 is typical) to the ZONE keyword list. (9)

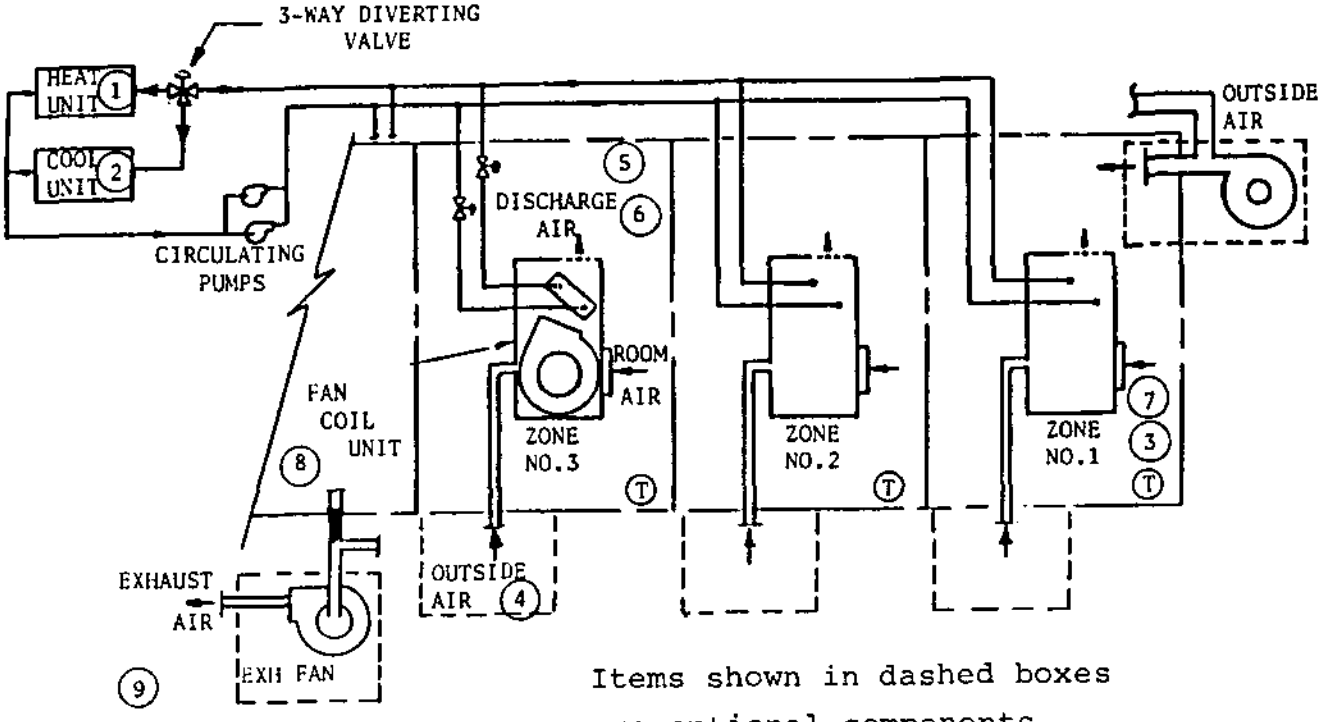
Two-Pipe Fan Coil System (TPFC) The Two-Pipe Fan Coil system can provide both heating and cooling to a number of individually controlled zones. However, all zones served by the system must be operating in the same mode (i.e., either heating or cooling) at any given time.

The fan coil unit consists of a filter (not shown), a combination heating/cooling coil, and a fan. The coil is connected to a piping system that can provide either hot or cold water (according to the prevailing mode of operation as defined by the HEATING–SCHEDULE and COOLING–SCHEDULE). The unit can provide a fixed quantity of outside ventilation air or merely recirculate conditioned air. Exhaust fan(s) are optional for any or all zones.

Temperature control is achieved by throttling the flow of water through the heating/cooling coil. The control thermostat commonly used for this type of system has separate heating and cooling set points.

The pumping energy associated with this system is accounted for in the PLANT program, rather than in the SYSTEMS program.

The fan coil units, particularly the smaller direct-drive units, may not be available with a fan capacity that matches the calculated value. Therefore, assignment of the fan capacity of a specific, commercially available unit is recommended for improved simulation accuracy.



Two-Pipe Fan Coil System (TPFC)

Suggested Minimal Input for TPFC

```
INPUT SYSTEMS  ..
                    $ SYSTEMS SCHEDULES

FANS-ON =     SCHEDULE THRU DEC 31 (WD)   (1,7)(0) (8,18)(1)
                                          (19,24)(0)
                                   (WEH)  (1,24)(0)  ..

COOLSETPT =  SCHEDULE THRU DEC 31 (WD)   (1,7)(99) (8,18)(76)
                                          (19,24)(99)
                                   (WEH)  (1,24)(99)  ..

HEATSETPT =  SCHEDULE THRU DEC 31 (WD)   (1,7)(55) (8,18)(72)
                                          (19,24)(55)
                                   (WEH)  (1,24)(55)  ..


HEAT-ON = SCHEDULE   THRU   MAY 15   (ALL)   (1,24)   (1)
      (1)            THRU   SEP 15   (ALL)   (1,24)   (0)
                     THRU   DEC 31   (ALL)   (1,24)   (1) ..

COOL-ON = SCHEDULE   THRU   MAY 15   (ALL)   (1,24)   (1)
      (2)            THRU   SEP 15   (ALL)   (1,24)   (0)
                     THRU   DEC 31   (ALL)   (1,24)   (1) ..


OFFICE = ZONE        DESIGN-HEAT-T      =   72
                     DESIGN-COOL-T      =   74
                     HEAT-TEMP-SCH      =   HEATSETPT
                     COOL-TEMP-SCH      =   COOLSETPT (3)
                     OA-CFM/PER         =   15 .. (4)

AC-SYST = SYSTEM     SYSTEM-TYPE        =   TPFC
                     HEATING-SCHEDULE   =   HEAT-ON (1)
                     COOLING-SCHEDULE   =   COOL-ON (2)
                     MAX-SUPPLY-T       =   110 (5)
                     MIN-SUPPLY-T       =   55 (6)
                     NIGHT-CYCLE-CTRL   =   CYCLE-ON-ANY (7)
                     FAN-SCHEDULE       =   FANS-ON (8)
                     ZONE-NAMES         =   (OFFICE) ..
SYSTEMS-REPORT       SUMMARY            =   (SS-A,SS-H,SS-O)

END ..
COMPUTE SYSTEMS ..
INPUT PLANT ..
PLANT-REPORT SUMMARY = (BEPS) ..
```

```
SHW = PLANT-EQUIPMENT    TYPE = DHW-HEATER      SIZE = -999 ..
HWG = PLANT-EQUIPMENT    TYPE = HW-BOILER       SIZE = -999 .. (1)
CHR = PLANT-EQUIPMENT    TYPE = HERM-REC-CHLR   SIZE = -999 .. (2)

PLANT-PARAMETERS    BOILER-FUEL = NATURAL-GAS
                    HERM-REC-COND-TYPE = AIR ..

END ..
COMPUTE PLANT ..
```

Additional Capability for TPFC:

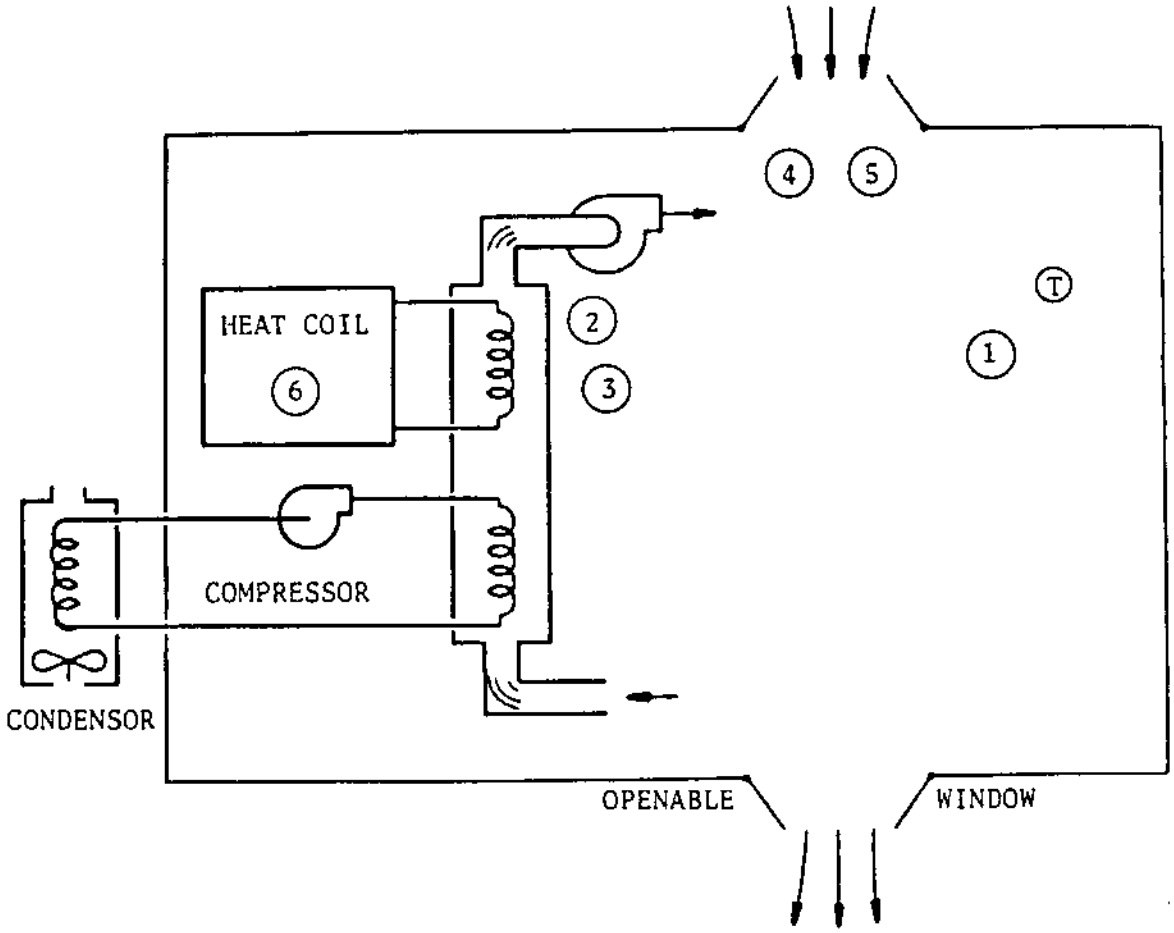
1) To enable an exhaust fan add the keywords EXHAUST-CFM = Value (CFM) and EXHAUST-KW = Value (.0001 is typical) to the ZONE keyword list. (9)

Residential System (RESYS)

The Residential System models a split system with a direct expansion air-cooled condensing unit. Residences that do not include unconditioned zones, such as crawl spaces and attics, can be simulated as a single zone served by one system.

This is the only system in DOE-2 that simulates openable windows for natural ventilation and cooling by outdoor air. The ventilation is simulated through the keywords NATURAL–VENT–SCH, VENT–TEMP–SCH, and NATURAL–VENT–AC.

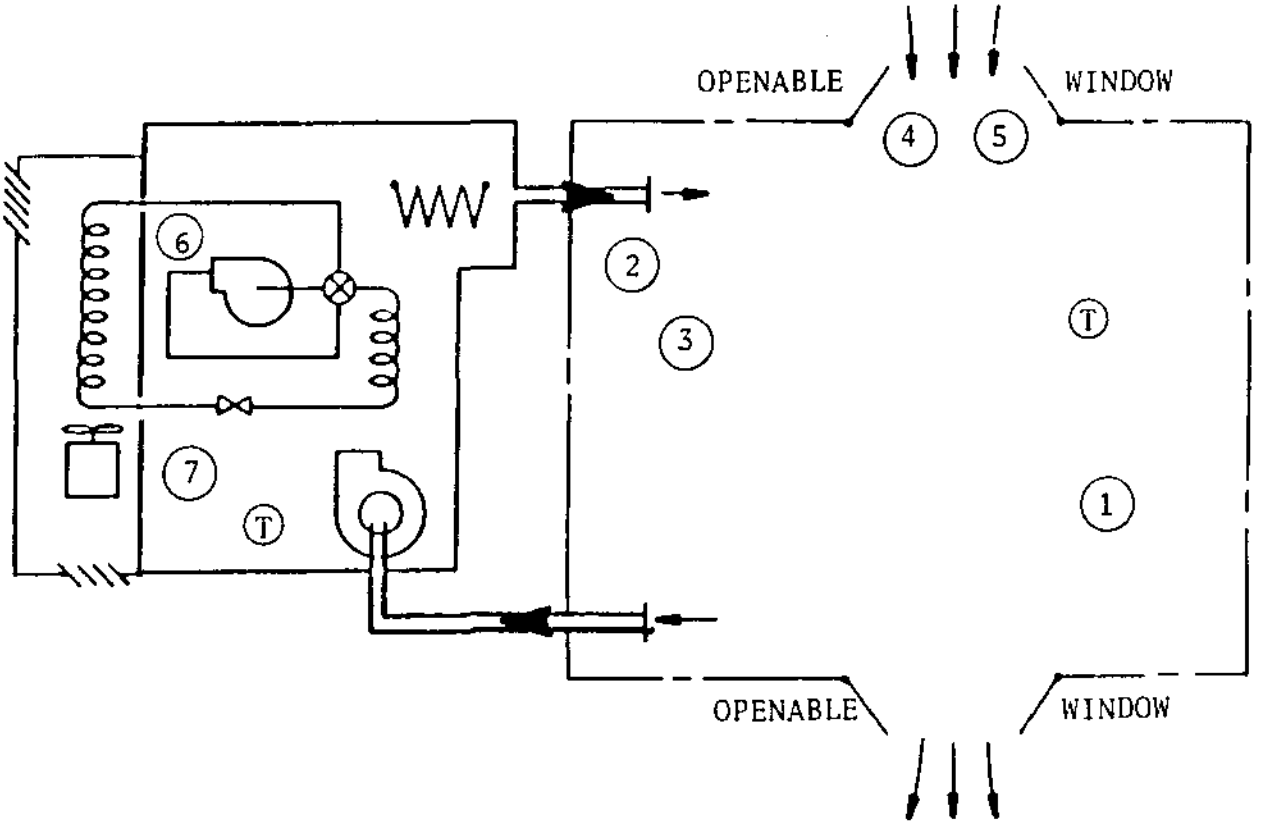
DX Cooling with a Heating Coil: This version of RESYS provides heating through a choice of hot water coil, electric heater, gas furnace or oil furnace. The system also includes a cooling coil connected to an air-cooled condensing unit, a supply fan, and openable windows to provide natural ventilation and cooling with outside air. Ordinarily, the electric load for both the supply fan and compressor are included in the cooling EIR.



Residential System — DX with Heating Coil

Heat Pump: This version of RESYS, the Residential Air-to-Air Heat Pump, is a single-zone split system intended for homes but often used for small offices. This unit provides forced-air heating and cooling. In its basic configuration the Residential Heat Pump consists of a compressor, a four-way valve for reversing the refrigerant flow direction, an air-cooled condenser with fan, an evaporator with fan, a filter (not shown), and a thermostat. The condenser also serves as an evaporator and the evaporator also serves as condenser, depending on whether the unit is in the heating or cooling mode of operation. The supply (indoor air) fan and the outdoor fan operate in a cycling mode. The unit may be specified with an auxiliary electrical heater. To specify this type of RESYS, specify HEAT–SOURCE = HEAT–PUMP (plus the other keywords appropriate to a heat pump, if desired).

Items shown in dashed boxes are optional components



Residential Air-to-Air Heat Pump

Suggested Minimal Input for RESYS

```
WINDOWS-OPENABLE = SCHEDULE   THRU   APR 15   (ALL)   (1,24)   (1)
                              THRU   OCT 15   (ALL)   (1,24)   (0)
                              THRU   DEC 31   (ALL)   (1,24)   (1) ..

OFFICE = ZONE          DESIGN-HEAT-T      =   72
                       DESIGN-COOL-T      =   74
                       HEAT-TEMP-SCH      =   HEATSETPT  (1)
                       COOL-TEMP-SCH      =   COOLSETPT ..

AC-SYST = SYSTEM       SYSTEM-TYPE        =   RESYS
                       MAX-SUPPLY-T       =   110 (2)
                       MIN-SUPPLY-T       =   55  (3)
                       NATURAL-VENT-AC    =   10  (4)
                       NATURAL-VENT-SCH   =   WINDOWS-OPENABLE (5)
                       HEAT-SOURCE        =   GAS-FURNACE (6)
                                                $alternatively,
                                                $HEAT-PUMP (7)
                       ZONE-NAMES         =   (OFFICE) ..

END ..
COMPUTE SYSTEMS ..
INPUT PLANT ..
PLANT-REPORT SUMMARY = (BEPS) ..
SHW = PLANT-EQUIPMENT  TYPE = DHW-HEATER  SIZE = -999 ..
END ..
COMPUTE PLANT ..
```

Additional Capability for RESYS:

1) To disable the availability of either cooling or heating, insert schedules like that shown for TPFC; however, you may enter values representing outside air temperatures above and below which the cooling and heating is "on", as follows:

```
HEAT-ON = SCHEDULE   THRU MAY 15 (ALL) (1,24)(70)
                     THRU SEP 15 (ALL) (1,24)(0)
                     THRU DEC 31 (ALL) (1,24)(70) ..

COOL-ON = SCHEDULE   THRU DEC 31 (ALL) (1,24)(60)
                     THRU SEP 15 (ALL) (1,24)(1)
                     THRU DEC 31 (ALL) (1,24)(60) ..
```

2.1D BUG FIXES

Printed below are changes to the original release version of DOE-2.1D (Version 001), as of September 25, 1990. Note that the phrase "old bug" means a problem existing in test versions previous to Version 001. Let us know if you want to swap an early "D" tape for a later version. PC program users should contact their vendors for updates.

```
================== Version Number ==================
*/
*/ Edit this every time the version number changes!  This is
*/ a modification to BDL which sets the version number that
*/ is printed out on every output just after the disclaimer.
*/
*IDENT VER
*D bdl1.5
      cversn = '-007'
*/
================== End of Version Number Change ==================

================== Version 002 Changes ==================

************ Bug #1: make the following change to LOADS ****************
*/-----------------------------------------------------------------
*/
*IDENT VER002
*/
*/ This fixes Bug #1.  The program incorrectly calculated the sky
*/ and ground form factors for windows and doors in exterior walls
*/ for which the form factors were input by the user.  This could
*/ have resulted in overflows in the diffuse solar radiation values
*/ for these windows and doors.  (FOW 10-31-89)
*/
*D FFDIF.112,113
*I FFDIF.179
C             SKIP IF FORM FACTORS INPUT FOR THIS WALL
      IF(<EWSKYFF>.NE.UNFILD.AND.<EWGNDFF>.NE.UNFILD) GO TO 4300
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/ End of fix
*/
*/-----------------------------------------------------------------
================== End of Version 002 Changes ==================

================== Version 003 Changes ==================

************ Bug #2: make the following change to SYSTEMS ****************
*/-----------------------------------------------------------------
*/
*IDENT VER003
*/
*/ This fixes bug #2.
```

```
*/ For SYSTEM-TYPE=PIU with NIGHT-CYCLE-CTRL= ZONE-FANS-ONLY,
*/ the zone coil heating when the zone fans cycled on at night
*/ was being subtracted rather than added to the heating load.
*/ The amount was also incorrect.  Other night cycle options work
*/ correctly.  Note that in 2.1c no zone coil heating was added for
*/ night cycling zone fans, and the fan kw was also not summed.
*/
*I PIU.405
      IF (ZFONLY .EQ. 1.)  GO TO 450
*D PIU.360
      ZQH = <QNOW>
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/-----------------------------------------------------------------
********** Bug #3: make the following change to PLANT ****************
*/ -----------------------------------------------------------------
*/
*IDENT VER003
*/
*/ This fixes bug #3.  Comparison of Sample 2 run 5 on VAX-VMS and
*/ a SUN 4 revealed some significant differences in PS-A (total
*/ heat load and recovered energy in April-May and Sep-Aug) and
*/ some lesser differences in BEPS.  Examination of hourly reports
*/ led to the discovery of 2 problems in the subroutine OPCOOL.
*/ This routine allocates the cooling load between compression
*/ and absorption chillers when the user has not done so with
*/ LOAD-ASSIGNMENT and LOAD-MANAGEMENT commands.  In particular,
*/ when a generator is present, the routine attempts to optimally
*/ balance the use of the generator and the two kinds of chillers.
*/ The first problem is that the routine was sometimes trying to do
*/ this optimal balancing even when there was a very small cooling
*/ load.  The second problem is that the optimal balancing algorithm
*/ doesn't work unless the generator is tracking the electrical
*/ demand.  If it is tracking thermal load, the results are wildly
*/ wrong - the chillers greatly oversatisfy the cooling load,
*/ resulting in subsequent hours' cooling load getting zeroed due
*/ to carry over.  The monthly results end up being not too badly
*/ wrong (around 6%), but the hourly results are totally wrong.
*/ The following mods fix these two problems.  This is an old bug.

*/
*D OPCOOL.54
      RNDERR = AMAX1(1.,ECOOLT*1.0E-6)
*I OPCOOL.196
      IF( (NTRACK .EQ. 3) .OR. (NTRACK .EQ. 4) )  GO TO 40
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/ -----------------------------------------------------------------
********** Bug #4: make the following change to SYSTEMS  ****************
*/ -----------------------------------------------------------------
*/
*/ This fixes bug #4.  An improvement in DOE2.1D was to make sure
*/ that heatpump heating and cooling capacities are compatible.
*/ This change was not made correctly, and this bug fix corrects
```

```
*/ it.  This fix also resets the sensible capacity whenever the
*/ total cooling capacity is reset.  JJH 12/24/89
*/
*D DESIGN.850,DESIGN.858
C           SAVE INFO ABOUT USER SPECIFIED HEATPUMP CAPACITY
C           IHPQF = 0 USER DID NOT SPECIFY ANYTHING
C                   1 HEATING CAP SPECIFIED
C                   2 COOLING
C                   3 BOTH HEATING AND COOLING
C             SAVE INFO ABOUT HEATING HEATPUMP CAP SPECIFIED
      IF(<HEATCAPZ> .LT. 0.0)  THEN
         IHPQF = 1
      ELSE
         IHPQF = 0
      ENDIF
*I DESIGN.952
C             SAVE INFO ABOUT COOLING HEATPUMP CAP SPECIFIED
      IF(<COOLCAPZ> .GT. 0.0)  THEN
         IF(IHPQF .EQ. 0) THEN
            IHPQF = 2
         ELSE
            IHPQF = 3
         END IF
      END IF
*I DESIGN.1025
              R1 = <COOLSHZ>/(<COOLCAPZ>+1.)
              IF(R1 .LE. 0.0) R1 = .8
*I DESIGN.1026
              <COOLSHZ> = R1*<COOLCAPZ>
*I DESIGN.1030
                  R1 = <COOLSHZ>/(<COOLCAPZ>+1.)
                  IF(R1 .LE. 0.0) R1 = .8
*I DESIGN.1031
                  <COOLSHZ> = R1*<COOLCAPZ>
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/ ---------------------------------------------------------------
************ Bug #5: make the following change to SYSTEMS  ****************
*/ ---------------------------------------------------------------
*/
*/ This fixes bug #5.  Flags are passed hourly from SYSTEMS to PLANT
*/ to indicate if heating or cooling are available so that the
*/ boiler or chiller can operate (or if on standby that the loop
*/ pumps should be running even if no load is present).  This
*/ fix sets the flags if heating or cooling is scheduled on
*/ (as before) but also checks if the cooling or heating source
*/ is chilled or hot water.  For the heating flag this means
*/ checking all the various system-type dependent components
*/ (main coils, zone coils, preheat, humidifier, baseboards,
*/ and hp supplemental). This is an old bug.  JJH 12/24/89
*/
*D DAYCLS.407
C             CHECK IF NO HEATING POSSIBLE IN PLANT BEFORE SETTING
C             FLAG.  THIS REQUIRES LOOKING AT EACH HEATING SOURCE
```

```
C             BY SYSTEM-TYPE TO SEE IF PLANT HEATING POSSIBLE
       IF( HON .NE. 0.0)  THEN
         IF(<HEAT-SOURCE>        .LE. 0)  PHON = PHON + 1.0
         IF(<BASEBOARD-SOURCE> .LE. 0)  PHON = PHON + 1.0
         IF((((ICODE.GE. 2).AND.(ICODE.LE. 5)) .OR.
      2       ((ICODE.GE.11).AND.(ICODE.LE.14))).AND.
      3       ((<ZONE-HEAT-SOURCE>.LE.0).OR.(<PREHEAT-SOURCE>.LE.0)
      4         .OR.(<HUMIDIFIER-TYPE>.LE.0)) ) PHON = PHON + 1.0
         IF( (ICODE.EQ.16).AND.
      2       ((<ZONE-HEAT-SOURCE>.LE.0).OR.
      3        (<HUMIDIFIER-TYPE>.LE.0)) ) PHON = PHON + 1.0
         IF( ((ICODE.EQ.18).OR.(ICODE.EQ.23)) .AND.
      2       ((<ZONE-HEAT-SOURCE>.LE.0).OR.(<PREHEAT-SOURCE>.LE.0)
      3         .OR.(<HUMIDIFIER-TYPE>.LE.0)) ) PHON = PHON + 1.0
         IF( (ICODE.EQ.17).AND.
      2       (<SUPP-SOURCE>.LE.0) ) PHON = PHON + 1.0
         IF( (ICODE.EQ.19).AND.
      2       ((<ZONE-HEAT-SOURCE>.LE.0).OR.
      3        (<SUPP-SOURCE>.LE.0)) ) PHON = PHON + 1.0
         IF((((ICODE.GE.18).AND.(ICODE.LE.21)).OR.
      2        (ICODE.EQ.23)).AND.
      3        (<HUMIDIFIER-TYPE>.LE.0)          ) PHON = PHON + 1.0
         IF( ((ICODE.EQ.21).OR.(ICODE.EQ.22)) .AND.
      2        (<SUPP-SOURCE>.LE.0)    ) PHON = PHON + 1.0
         IF( ((ICODE.EQ.21).OR.(ICODE.EQ.23)) .AND.
      2        (<ZONE-HEAT-SOURCE>.LE.0) ) PHON = PHON + 1.0
       END IF
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/  check cooling next
*D DAYCLS.408
C             CHECK IF NO COOLING IN PLANT BEFORE SETTING FLAG
       IF( CON .NE. 0.0) THEN
         IF( ((ICODE.GE. 6).AND.(ICODE.LE. 8)) .OR.
      1       ((ICODE.GE.15).AND.(ICODE.LE.17)) .OR.
      2       ((ICODE.GE.19).AND.(ICODE.LE.21)) ) THEN
           PCON = PCON + 0.0
         ELSE
           PCON = PCON + 1.0
         END  IF
       END IF
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/ ------------------------------------------------------------------------
********** Bug #6: make the following change to SYSTEMS  ****************
*/ ------------------------------------------------------------------------
*/
*/ This fixes bug #6.  For DX units at low cooling part load, DOE-2
*/ overestimates the amount of moisture removal.  The units are
*/ acting as if they are on for the entire hour with minimum supply
*/ temperature.  This fix introduces an estimate of the fraction of
*/ the hour the unit is on and corrects the moisture calculation.  As
*/ a bonus, the fix eliminates the source of a too large difference
*/ between the SUN and VAX versions of DOE-2.  This is an old bug.
*/
```

```
*D SDSF.165,182
C               Calculate the coil surface temperature.  Set
C               the coil exit temperature for when the coil is
C               on.  For chilled water coils this is always TC.
      T = TC
C               But DX units can cycle on and off.  Initialize
C               the fraction of the hour the unit is on.
      FRACON = 1.0
C               To decide if a unit is cycling, we need to estimate
C               the sensible part load.
      EWB = AMAX1(<PASTMIXW>,60.)
      EDB = TM
C               If a DX unit
      IF ( (ICODE .EQ. 19) .OR. (ICODE .EQ. 21) ) EDB = DBT
      QCM2 = CVAL(<COOL-SH-FT>,EWB,EDB)
      QCS = <COOL-SH-CAP>*QCM2
      IF ( (ICODE .EQ. 19) .OR. (ICODE .EQ. 21) )  QCS = QCS +
     1 CONS(1)*CFM*(1.-CBF)*AMAX1(-20.,AMIN1(20.,TM-80.))
      PLRCS = CONS(1)*CFM*(TM-TC)/QCS
      PLRCS = AMAX1(0.,PLRCS)
C               For DX units, estimate the coil exit temperature
C               when the unit is in the on phase of cycling on/off.
      IF ( (ICODE .EQ. 19) .OR. (ICODE .EQ. 21) ) THEN
          FRACON = PLRCS/AMAX1(<MIN-HGB-RATIO>,.01)
          FRACON = AMAX1(0.,AMIN1(FRACON,1.0))
C               If the unit is on most of the hour, the exit
C               temperature will approach TC.  If it is on only a
C               small fraction of the hour, the exit temperature
C               will approach the minimum.
          IF (FRACON .LT. 1.0) T = TCMIN-<DUCT-DELTA-T> + FRACON*
     1     (TC-(TCMIN-<DUCT-DELTA-T>))
          IF (<FAN-PLACEMENT> .EQ. 1) T = T - DTS
      END IF
      TSURF = (T-CBF*TM)/(1.-CBF)
*I SDSF.193
      IF (FRACON .LE. 0.)  GO TO 25
*I SDSF.253
      IF (FRACON .LT. 1.0) THEN
          WROFF = (PO*WOA + F*HUMRAT + DW + GW)/(F+G+PO)
          WMOFF = PO*WOA + (1.-PO)*WR
          WCOILO = WMOFF
          WR = FRACON*WR + (1.-FRACON)*WROFF
          WM = FRACON*WM + (1.-FRACON)*WMOFF
          WCOIL = FRACON*WCOIL + (1.-FRACON)*WCOILO
      END IF
*D DDSF.167,182
C               Calculate the coil surface temperature.  Set
C               the coil exit temperature for when the coil is
C               on.  For chilled water coils this is always TC.
      T = TC
C               But DX units can cycle on and off.  Initialize
C               the fraction of the hour the unit is on.
      FRACON = 1.0
C               To decide if a unit is cycling, we need to
```

```
C                estimate the sensible part load.
      EWB = AMAX1(<PASTMIXW>,60.)
      EDB = TM
C                If a DX unit
      IF ( ICODE .EQ. 20 )  EDB = DBT
      QCM2 = CVAL(<COOL-SH-FT>,EWB,EDB)
      QCS = <COOL-SH-CAP>*QCM2
      IF ( ICODE .EQ. 20 )  QCS = QCS +
     1 CONS(1)*CFM*(1.-CBF)*AMAX1(-20.,AMIN1(20.,TM-80.))
      PLRCS = CONS(1)*CFM*(TM-TC)/QCS
      PLRCS = AMAX1(0.,PLRCS)
C                For DX units, estimate the coil exit temperature when
C                the unit is in the on phase of cycling on/off.
C                For DX units, estimate the coil exit
C                temperature when the unit is in the on
C                phase of cycling on/off.
      IF ( ICODE .EQ. 20 ) THEN
          FRACON = PLRCS/AMAX1(<MIN-HGB-RATIO>,.01)
          FRACON = AMAX1(0.,AMIN1(FRACON,1.0))
C                If the unit is on most of the hour, the exit
C                temperature will approach TC.  If it is on only a
C                small fraction of the hour, the exit temperature
C                will approach the minimum.
          IF (FRACON .LT. 1.0) T = TCMIN-<DUCT-DELTA-T> + FRACON*
     1     (TC-(TCMIN-<DUCT-DELTA-T>))
          IF (<FAN-PLACEMENT> .EQ. 1) T = T - DTS
      END IF
*I DDSF.194
      IF (FRACON .LE. 0.)  GO TO 25
*I DDSF.257
      IF (FRACON .LT. 1.0) THEN
          WROFF = (PO*WOA + F*HUMRAT + DW)/(F+PO)
          WMOFF = PO*WOA + (1.-PO)*WR
          WCOILO = WMOFF
          WR = FRACON*WR + (1.-FRACON)*WROFF
          WM = FRACON*WM + (1.-FRACON)*WMOFF
          WCOIL = FRACON*WCOIL + (1.-FRACON)*WCOILO
      END IF
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/ ------------------------------------------------------------------------
************ Bug #7: make the following change to SYSTEMS  ****************
*/ ------------------------------------------------------------------------
*/
*/ This fixes bug #7.  For OA-CONTROL=TEMP in SYSTEM-AIR, the
*/ outside air quantity was returning to minimum when the outside
*/ air temperature became greater than the return temperature
*/ (this should only happen when the outside temperature is greater
*/ than the ECONO-LIMIT-T).  This is an old bug.  JJH 12/24/89
*/
*D ECONO.47
  300 IF( TR .NE. DBT )  PO3 = (TAPP-TR)/(DBT-TR)
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
```

```
*/ ------------------------------------------------------------------------
************ Bug #8: make the following change to BDL  ****************
*/-------------------------------------------------------------------
*/
*IDENT VER003
*/
*/ This fixes bug #8.  This is a bug in the section of BDL
*/ that calculates the custom weighting factors.  The problem
*/ was discovered when implementing DOE-2 on an 80386-based
*/ IBM-PC compatible machine.
*/
*/ WFINV (the matrix inversion subroutine) can give incorrect
*/ and unpredictable results (machine dependent)  when finding
*/ the determinant of matrix.  This can cause the resultant
*/ load profiles for the unit input pulses to be unphysical or
*/ the determinant of the input matrix to be singular.  This
*/ is caused by the equivalence of a single precision value to
*/ a double precision sum, such that when the single precision
*/ value is referenced some machines (compiler and floating
*/ point format dependent) get a strange number (only half the
*/ bytes of the actual number).
*/
*/ This problem seems to always cause 80x86 based machine to
*/ get bad results since the format of floating point values is
*/ much different than that in 680x0, VAX and SPARC-based IEEE
*/ machines.  This is an old bug.       12/23/89  JJH
*D WFINV.7
      DOUBLE PRECISION WFDOT,S,SS
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/ ------------------------------------------------------------------------
************ Bug #9: make the following change to LOADS  ****************
*/ ------------------------------------------------------------------------
*/
*IDENT VER003
*/
*/ This fixes bug #9.  A misplaced 2.1D mod caused the building
*/ electrical to be incorrect when hourly reports (in LOADS)
*/ were requested.          12/28/89 JJH
*/
*D DAYCLC.639
C             MOVE BUILDING LEVEL DATA INTO REPORT BLOCK BUFFER
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/ ------------------------------------------------------------------------
************ Bug #10: make the following change to DRLC  ****************
*/ -------------------------------------------------------------------
*/
*IDENT VER003
*/
*/ This fixes bug #10.  This change just increases the width
*/ of some hourly report formats and corrects the units
*/ (printed as part of the column headings in hourly reports)
*/ for humidity ratio to lbs/lb.
```

```
*/
*D HRPCRD.266,HRPCRD.282
  2 20 32 13,1X,F12.0     HEATING BY COILS     4
  2 20 33 13,1X,F12.0     COOLING BY COILS     4
  2 20 34 13,1X,F12.4     UNIT     SUP TEMP    8
  2 20 35 13,1X,F12.0     UNIT     HEATING     4
  2 20 36 13,1X,F12.0     UNIT     COOLING     4
  2 20 37 13,1X,F12.4     UNIT     FAN PWR     4
  2 20 38 13,1X,F12.2     UNIT     MIX TEMP    8
  2 20 39 13,1X,F12.4     UNIT     WR OR TC   24
  2 20 40 13,1X,F12.4     UNIT     MIX HUM    24
  2 20 41 13,1X,F12.4     UNIT     COIL HUM   24
  2 20 42 13,1X,F12.2     UNIT     OA-RATIO   22
  2 20 43 13,1X,F12.0     UNIT     LAT COOL    4
  2 20 44 13,1X,F12.4     UNIT     COOL PLR   22
  2 20 45 13,1X,F12.4     UNIT     HEAT PLR   22
  2 20 46 13,1X,F12.4     UNIT     EIR        46
  2 20 47 13,1X,F12.4     UNIT     WETBULB     8
  2 20 48 13,1X,F12.0     UNIT     SUPP HT     4
*D HRPCRD.63,HRPCRD.105
 1103  3 15,1X,F14.0     WALL     HTG LOAD    4
 1103  4 15,1X,F14.0     ROOF     HTG LOAD    4
 1103  5 15,1X,F14.0     GLS CONDHTG LOAD     4
 1103  6 15,1X,F14.0     GLS SOL HTG LOAD     4
 1103  7 15,1X,F14.0     INFILTRNSENS-HTG     4
 1103  8 15,1X,F14.0     INT WALLCOND-HTG     4
 1103  9 15,1X,F14.0     UNDERGNDCOND-HTG     4
 1103 10 15,1X,F14.0     LIGHTINGLOAD-HTG     4
 1103 11 15,1X,F14.0     DOORCONDLOAD-HTG     4
 1103 12 15,1X,F14.0     ELEC-EQPSENS-HTG     4
 1103 13 15,1X,F14.0     SOURCE   SENS-HTG    4
 1103 14 15,1X,F14.0     PEOPLE   SENS-HTG    4
 1103 15 15,1X,F14.0     PEOPLE   LAT-HTG     4
 1103 16 15,1X,F14.0     ELEC-EQPLAT-HTG      4
 1103 17 15,1X,F14.0     SOURCE   LAT-HTG     4
 1103 18 15,1X,F14.0     INFILTRNLAT-HTG      4
 1103 19 15,1X,F14.0     SENSIBLECLG LOAD     4
 1103 20 15,1X,F14.0     LATENT   CLG LOAD    4
 1103 21 15,1X,F14.0     WALL     CLG LOAD    4
 1103 22 15,1X,F14.0     ROOF     CLG LOAD    4
 1103 23 15,1X,F14.0     GLS CONDCLG LOAD     4
 1103 24 15,1X,F14.0     GLS SOL CLG LOAD     4
 1103 25 15,1X,F14.0     INFILTRNSENS-CLG     4
 1103 26 15,1X,F14.0     INT WALLCOND-CLG     4
 1103 27 15,1X,F14.0     UNDERGNDCOND-CLG     4
 1103 28 15,1X,F14.0     LIGHTINGCLG LOAD     4
 1103 29 15,1X,F14.0     DOORCONDCLG LOAD     4
 1103 30 15,1X,F14.0     ELEC-EQPSENS-CLG     4
 1103 31 15,1X,F14.0     SOURCE   SENS-CLG    4
 1103 32 15,1X,F14.0     PEOPLE   SENS-CLG    4
 1103 33 15,1X,F14.0     PEOPLE   LAT-CLG     4
 1103 34 15,1X,F14.0     ELEC-EQPLAT-CLG      4
 1103 35 15,1X,F14.0     SOURCE   LAT-CLG     4
 1103 36 15,1X,F14.0     INFILTRNLAT-CLG      4
```

```
  1103 37 17,1X,F16.0    BUILD    ELEC TOT     4
  1103 38 15,1X,F14.0    BUILD    GAS TOT      4
  1103 39 15,1X,F14.0    BUILD    HW TOT       4
  1103 40 17,1X,F16.0    BUILD-EQELEC TOT      4
  1103 41 17,1X,F16.0    BUILD-LTELEC TOT      4
  1103 42 15,1X,F14.0    B-R ELEC              4
  1103 43 15,1X,F14.0    B-R GAS               4
  1103 44 15,1X,F14.0    B-R HW                4
  1103 45 15,1X,F14.0    B-R      ELEVATOR     4
*D HRPCRD.11
  1102 10 12,1X,F11.4    HUMIDITYRATIO        45
*D HRPCRD.333,335
  2 10 35 10,1X,F9.4     RETURN   HUMIDITY     45
  2 10 36 10,1X,F9.4     MIX      HUMIDITY     45
  2 10 37 12,1X,F11.4    HUMIDITYLVG COIL      45
*D HRPCRD.350,351
  2 10 52 13,1X,F12.5    SURFACE HUMIDITY      45
  2 10 53 13,1X,F12.5    SURFACE MIN HUM       45
*D HRPCRD.370,371
  2 10 72 12,1X,F11.4    MAX-HUMDSETPOINT      45
  2 10 73 12,1X,F11.4    MIN-HUMDSETPOINT      45
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/ ---------------------------------------------------------------
```

End of Version 003 Changes

Version 004 Changes

```
************ Bug #11: make the following change to LOADS  ****************
*/ ---------------------------------------------------------------------
*/
*IDENT VER004
*/
*/ This fixes bug #11.  The LOAD2 Loads input in Sample 2 produces
*/ different results depending on whether it is run as part of
*/ Sample 2 (i.e., after LOAD1) or by itself.  This is due to
*/ failing to initialize the random number algorithm correctly.
*/ The random numbers are used to decide whether a shade is open
*/ or closed at a given hour if the user has input values for
*/ OPEN-SHADE-SCH, SUN-CTRL-PROB, or GLARE-CTRL-PROB; and whether
*/ the lighting is set to the correct level if daylighting is
*/ being used and LIGHT-CTRL-PROB is input.  This is an old bug.
*/
*D DATLDS.27
*I INITLZ.15
*CALL /DAYLT/
*I INITLZ.74
      XRAN = 0.5
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/ ---------------------------------------------------------------------
************ Bug #12: make the following change to SYSTEMS  ****************
```

```
*/
*IDENT VER004
*/
*/ This fixes bug #12.  For SYSTEM-TYPE=PTAC, when there is no
*/ outside air and a very small heating load, the program may
*/ calculate an unphysical mixed humidity ratio and zone wet bulb
*/ temperature.  Since the wet bulb temperature is used next hour
*/ for the initial cooling capacity estimates, the result can be
*/ an incorrect cooling load.  This is an old bug.
*/
*I PTAC.246
      WMMAX = WFUNC(TM,100.,PATM)
      WM = AMIN1(WMMAX,WM)
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/ ---------------------------------------------------------------------
*/
*/ Fix an error in bug fix #6.
*/
*D VER003.74
          WMOFF = PO*WOA + (1.-PO)*WROFF
*D VER003.143
          WMOFF = PO*WOA + (1.-PO)*WROFF
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/ -------------------------------------------------------------
************ Bug #13: make the following change to HRP  ****************
*/ ---------------------------------------------------------------------
*/
*IDENT VER004
*/
*/ Fix Bug #13.  Delete a line of debug output that appears
*/ just before the first page of hourly report output.
*/
*D READDR.22
*/
*/ -------------------------------------------------------------
************ Bug #14: make the following change to BDL  ****************
*/
*IDENT VER004
*/
*/ This fixes bug #14.  These mods clean up some minor problems
*/ with the new parser.
*/
*/
*/ --- in functions parser, expressions w constants like 1. instead
*/ --- of 1.0 cause junk error messages
*/
*I FIOPCK.25
          if ( iltmp(3) .eq. KCSP )     iltmp(3) = KCDOLR
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/ --- clarify the error message
*/
*D MSG2.110,111
```

```
  121 WRITE(IOUTPT,1021) ERRPX, (I2(i), i=1,4), I1(1)
 1021 FORMAT(3A4,'SYMBOL ',4a4,' PREVIOUSLY DEFINED ON LINE',I5)
*D SYMDEF.56
  120 CALL MSG2 (21, ISYMTB(6,JS), ISYMTB(1,JS), DUM, DUM)
*/
*/ --- correct bad 'missing terminator' error msg
*/
*D MSG.63,64
     1    11, 4HMISS,4HING ,4HTERM,4HINAT,4HOR F,4HOR P,4HREV ,
     2        4HCOMM,4HAND ,4H     ,
*D SCAN0.32
                call  BKSPAC
               ITERM = 1
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
*/
*/ ------------------------------------------------------------------------
```

═══════ End of Version 004 Changes ═══════

═══════ Version 005 Changes ═══════

```
************ make the following change to SYSTEMS  ****************
*/
*/-------------------------------------------------------------------
*/
*IDENT VER5-6
*/
*/ Fix another error in bug fix #6.
*/
*I VER003.131
C               TCMINX is the minimum coil exit temperature
      TCMINX = TCMIN - <DUCT-DELTA-T>
      IF (<FAN-PLACEMENT> .EQ. 1)  TCMINX = TCMINX - DTS
*D VER003.135,137
      IF (FRACON .LT. 1.0) T = TCMINX + FRACON*(TC-TCMINX)
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
```

═══════ End of Version 005 Changes ═══════

═══════ Version 006 Changes ═══════

```
************ make the following change to SYSTEMS  ****************
*/
*/-------------------------------------------------------------------
*/
*/ Beautify the common blocks!
*/
*D /SYSTD/.6
     4                  FTEMP,TCR,QHR,SYSTD1,SGAS,SKWQH,SKWQC,QCLAT,
*D /SYSTD/.10,14
     8                  WRMAX,WRMIN,CFMRAT,SSAVE1,SSAVE2,SSAVE3,QHT,
     9                  TPCMIN,PCMIN,QHSUP,QRSENS,QRLAT,QRREC,QRREJ,
```

```
     1                    RCOMKW,RDEFKW,RAUXKW,ECFMP,CFMIN,CINFP,DT,DW,
     2                    EWB,IC,NATTSP,Q,RETR,SLOAD,QLSUMP,T,TCHUM,TEND,
     3                    TS,IDEAD
*D /WEATH/.2,6
      COMMON  /WEATH /  IWDID(5),LRECX,WLAT,WLONG,LTIMZ,IFX,IWSIZ,
     1                    CLRNES,TGNDR,WBT,DBT,PATM,CLDAMT,ISNOW,IRAIN,
     2                    IWNDDR,HUMRAT,DENSTY,ENTHAL,DIFSOL,DIRSOL,SOLRAD,
     3                    ICLDTY,WNDSPD,IDUMMY,DPT,WNDDRR,CLDCOV,RDNCC,
     4                    BSCC,SKYA,DBTR,GTEMP(12),CLR(12)
*D /ZONED/.5,6
     3                    ERMAXM,ERMINM,THR,CSSCND,CSSVEC,HENOW,QGWIN,
     4                    QSNABT,QGOPWL,QGVEC,CFMCVT,SSFPT,CFMVNT,ZFANKW,
     5                    ZKWCBT,ZKWHBT
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--

************ Bug #15: make the following change to SYSTEMS  ****************
*/
*/-------------------------------------------------------------------------
*/
*/ This fixes bug #15
*/ For packaged single zone systems, we are seeing cooling even when
*/ the control zone temperature is in the deadband, and in very close
*/ to the heating band.  To fix this, we give a better estimate for TC
*/ for systems having only one zone, and also force cooling to be off
*/ by setting the cooling flag to zero.
*/
*I VARVOL.178
      IF ((<RETURN-AIR-PATH> .EQ. 1) .AND. (<EXHAUST-CFM>
     1 .LT. CFMZ)) TC = TC + (1.-PCMIN)*<QLIGHTRETURN>/(CONS(1)*(CFMZ-
     2 <EXHAUST-CFM>))
*I VARVOL.181
      CON = 0.0
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--

************ Bug #16: make the following change to SYSTEMS  ****************
*/
*/-------------------------------------------------------------------------
*/
*/ This fixes bug #16.  For sunspaces the venting and forced convection
*/ fan KW was not accounted for properly.  For conditioned sunspaces,
*/ no vent or forced fan kw was added in to the total system kw or
*/ the fan kw.  For unconditioned sunspaces, system kw was
*/ incremented properly but fan kw was not, resulting in the BEPS
*/ sum not agreeing with total site energy.
*/
*D SSFCOR.313,314
      IF (<ISUNSP>.EQ.1.AND.IFLG.EQ.1) THEN
          SSFPT = <SSFPT>
          ZKW = ZKW + SSFPT
          FANKW = FANKW + SSFPT
      END IF
*I SSFCOR.876
      FANKW = FANKW + SSFPT
*D VARVOL.227
```

```
      ZKW = ZKW + <EXHAUST-KW>
*D DOUBLE.130
      ZKW = ZKW + <EXHAUST-KW>
*D SZCI.101
      ZKW = ZKW + <EXHAUST-KW>
*D FCOIL.104
      ZKW = ZKW + <EXHAUST-KW>
*D INDUC.95
      ZKW = ZKW + <EXHAUST-KW>
*I PTAC.123
      ZKWS = ZKW
*D PTAC.312
      ZKW = <ZKW> + ZFANKW + ZKW + ZKWS
*I HTPUMP.107
      ZKWS = ZKW
*D HTPUMP.258
      ZKW = <ZKW> + ZFANKW + ZKW + ZKWS
*D PIU.402
      ZKW = ZKW + <EXHAUST-KW> + <ZONE-FAN-KW>*<ZFONF>*<ZFCFMD>
*D DESICC.136
      ZKW = ZKW + <EXHAUST-KW>
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
```

End of Version 006 Changes

Version 007 Changes

```
********** make the following change to SYSTEMS  ***************
*/
*/-----------------------------------------------------------------
*/
*/ This fixes a divide by zero problem introduced by bug fix #6.
*/ The divide by zero will happen in subroutine SDSF or DDSF for
*/ packaged systems whenever both the infiltration and the outside
*/ air cfm are zero.  The problem can be worked around in the BDL
*/ input by using a small (.0001 for instance) but non zero minimum
*/ cfm ratio.
*/
*D VER003.73
          IF ( (F+PO) .GT. 0.0001) THEN
              WROFF = (PO*WOA+F*HUMRAT+DW)/(F+PO)
          ELSE
              WROFF = HUMRAT + DW
          END IF
*D VER003.142
          IF ( (F+G+PO) .GT. 0.0001) THEN
              WROFF = (PO*WOA+F*HUMRAT+DW+GW)/(F+G+PO)
          ELSE
              WROFF = HUMRAT + DW
          END IF
----+----1----+----2----+----3----+----4----+----5----+----6----+----7--
```

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■ ■ User News ■ ■

To be put on the newsletter distribution list, to submit articles, corrections or updates to documentation, or for DOE-2 program questions, please call or write:

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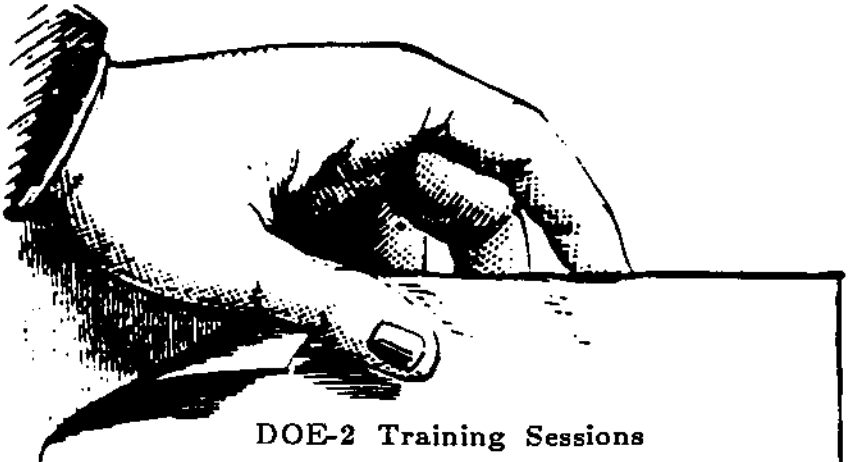

DOE-2 Training Sessions

The Washington State Energy Office plans to offer basic training in DOE-2.1D in late November and early December of 1990. These two sessions are intended to acquaint the beginning user with DOE-2, demonstrate its capability and provide an opportunity for hands-on exercises. Marlin Addison of Energy Simulation Specialists will conduct the sessions. For registration information contact Pete Gonzales at the the Washington State Energy Office (206) 956-2044.

Portland Energy Resource Center	November 27 and 28
Tyee Hotel, Olympia, WA	November 29 and 30
The Tower Inn, Richland, WA	December 3 and 4

Cost: BPA region $250 — outside BPA area $495.

An advanced training session is planned for March, 1991; it will provide special instruction for DOE-2 users who need to model larger, more complex buildings. An exact date has not yet been fixed for the March session, so keep in touch with the Washington State Energy Office if you are interested in taking this course. Dates will also be printed in the User News.

ECONOMICS SUMMARY

INPUT ECONOMICS
Required for Economics input

PARAMETRIC-INPUT ECONOMICS
Replaces INPUT ECONOMICS for parametric runs

TITLE
See LOADS

ABORT
(Only needed when overriding LOADS input)

DIAGNOSTIC(LIST)
(Only needed when overriding LOADS input)

PARAMETER(DEFINE)
See LOADS

= **DAY-CHARGE-SCH**(D-C-SCH,80)
[Note: Accepts a list of hourly values and up to two u-names of CHARGE-ASSIGNMENTs for each set of values.]

= **WEEK-SCH**(W-SCH,60)
See LOADS

= **SCHEDULE**(SCH,60)
See LOADS

ENERGY-COST(E-C,5)
- **RESOURCE**(R)(—;ELECTRICITY,DIESEL-OIL,NATURAL-GAS, FUEL-OIL,STEAM,CHILLED-WATER,LPG,COAL,METHANOL,BIOMASS)

UNIT(U)(†;0.+ to 10^8 Btu/unit)
UNIFORM-COST(U-C)(†;0.0 to 10^5 $/unit)
ESCALATION(E)(†;0.0 to 100.0 %/yr)
MIN-MONTHLY-CHG(M-M-C)(**0.0**;0.0 to 10^5 $/month)
FIXED-MONTH-CHG1(F-M-C1)(**0.0**;0.0 to 10^5 $/month)
FIXED-MONTH-CHG2(F-M-C2)(**0.0**;0.0 to 10^5 $/month)
RATE-LIMITATION(R-L)(**10000.0**;0.0 to 10^5 $/units
ASSIGN-CHARGE(A-C) u-name of up to two CHARGE-ASSIGNMENTs††
ASSIGN-SCHEDULE(A-SCH) u-name of schedule

† See Supplement for default values.
†† Maximum of two per ENERGY-COST command.

*****Corrected September 12, 1990*****