DATING A CRITICAL PATH NETWORK ON THE IBM 1620

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Modifications or revisions to this program, as they occur, will be announced in the appropriate Catalog of Programs for IBM Data Processing Systems. When such an announcement occurs, users should order a complete new program from the Program Information Department.

DECK KEY

1. Sample Problem Input
2. Sample Problem Output Page A-2
3. Sample Problem Output Page A-3
4. Condensed Deck
5. Source Deck

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A. Purpose/Description: The user of 1620 LESS or PERT obtains as output a schedule for starting and finishing jobs. This output is relative to the first day of the project. To make this schedule more meaningful to management, actual dates are often more useful. This program does such a conversion.

B. Method: The user inserts the initial date of the project. The program then generates a calendar in core and uses this to convert relative days to actual dates.

C. Restrictions and Range: Input in days or weeks, in decimal or integer form. A five, six, or seven-day working week. From none to fifty non-working holidays over the span of the project. Up to a four-year project on 20K system; twelve additional years for each 20K thereafter.

D. Accuracy: N/A

E. Machine Configuration: Any 1620 card system.

F. Program Requirements: N/A

G. Source Language: SPS

H. Program Execution Time: About one minute plus the time to punch one card for each activity.

I. Check-Out Status: The program has been used for six months on a production basis. All of the options have been tested.

J. Sample Problem Running Time: Approximately 10 minutes

K. Comments: This program and its documentation were written by an IBM employee. It was developed for a specific purpose and submitted for general distribution to interested parties in the hope that it might prove helpful to other members of the data processing community. The program and its documentation are essentially in the author's original form. IBM serves as the distribution agency in supplying this program. Questions concerning the use of the program should be directed to the author's attention.

DATING A CRITICAL PATH NETWORK ON IBM 1620

PURPOSE: Part of the output from 1620 LESS (10.3.003) or PERT (10 3 006) gives such things as earliest start and earliest finish. These numbers are relative to day zero--the beginning node of the network. The user of these programs may wish to know the actual dates associated with these numbers. The purpose of this program is to take the output from either program and convert relative days (or weeks) to actual dates.

COMPUTER NEEDED: Any 1620 card system.

INPUT: Final output cards from LESS or PERT and the beginning date of the job.

OUTPUT: Same as input cards except actual dates in fields ES, EF, LS, LF, and, for PERT, TS-TE. Because these are five-column fields a date such as October 12, 1963 is punched as 10123.

RANGE OF PROGRAM: Holidays depend on user. From none to fifty may be used.

Normal size of calendar in core is one thousand working days. This may be increased up to about two thousand, or decreased to anything useful.

Input can be in working days or weeks. Input can be in decimal form. When running in days the decimal part is ignored. When running in weeks the decimal part is used.

Either a five, six, or seven-day working week may be called for.

METHOD: The user types in the beginning date and day of week that date occurs. You then enter the number of working days per week. Control then passes to the calendar generation phase.

In this section the first date is placed as entry zero in the calendar. The program then adds one to the date, places this as day one in the calendar and keeps adding till it reaches the end of the calendar area. Before it adds a date to the calendar it checks to see if this is a holiday, a Saturday or Sunday, the end of a month, February in a leap year, or the end of the year.

A calendar thus generated has all the dates which are not holidays, not Saturdays and not Sundays. This is probably the normal situation. For a seven-day working week with no holidays the calendar in core would be just like a normal every-day calendar.

The program then asks for the number of decimals in the input and whether this is PERT or LESS input in days or weeks.

The input is then read alphamerically. Each pertinent field is stored, then extended to the address of the date that pertains. The dates are put in the card fields and the card is punched.

TIMING: Cards are read and punched at punch speed. Time is used to generate the calendar in memory. For one thousand working days (about four years) with twenty-four holidays the time is about fifty seconds.

RUNNING THE PROGRAM

1. Clear core to zeroes.

   Instant Stop, Reset, Insert, type 310000300002, wait, Instant Stop, Reset.

2. Load Program.

   Put cards in reader, Load, Reader Start for last cards.

3. Program asks for beginning date.

   Type this in as shown in instruction.

   NOTE: Whenever you enter something through the typewriter Switch 4 can be used to get around typing errors. Put Switch 4 on, Release and Start, program will retype instruction, turn Switch 4 off. Furthermore---the program makes some checks on the input and will come back again for data. If this happens, reread the instruction on the form of the input.

4. Program asks for day of the week.

   Type in day of the week upon which the beginning date occurs.

   Example: Monday

   NOTE: PERT and LESS consider the first day as day zero, as does this program. The veteran user of critical path gets accustomed to this. Some one may wish to call the first day day one. This can be done here by putting in a beginning date one day before the actual date. The day of the week might then have to be Sunday even though Sunday is not a working day. The program will handle this.

5. Days per Week.

   The program will accept a five, six, or seven-day working week.

6 Computing.

   After Release and Start the program goes into the generation of a calendar. This will take about 50 seconds.

7. Enter number of decimals.

   If input is in integer form type 00. One or two decimal places by also be used.

8. Switch settings.

   Switch One on for PERT cards; off for LESS cards.

   Switch Two on for input that is weeks; off for input that is days.

   Program halts here.

9. Load cards.

   Put cards in reader and punch, push start buttons.

10. Switches.

    If any switches are on the typewriter will log this.

11. End of job.

    This occurs when the last card indicator comes on. Pressing computer Start at this point will restart the entire program. However it is possible to go back to step 7. If the need occurs to bypass the calendar generation phase and process another set of data pertinent to the calendar then in core, you can then put Switch 3 on and press computer Start.

ERROR MESSAGE: "Calendar Exceeded"

With a one thousand day calendar in core any input greater than 999 will give this message. If the calendar size is changed so will the condition when this message would be typed. To continue processing push Start.

OPTIONS

Calendar Size.

This program will generate a calendar in core with 13995-14000 as the location of the first date. The calendar extends to the end of 20K. Each date occupies six positions. Six thousand divided by six gives one thousand working days.

On card 65 of the condensed deck is the constant "CALSIZ" which is normally $\bar{1}4000$, the units position of the first date. This may be altered in the deck to any number from $\bar{0}8000$ up to, say $\bar{1}9000$.

Punching out a job calendar.

There is a small routine which will punch out the calendar. Each card punched has the date and the day number. If allowed to go to completion this routine would normally punch out a thousand cards, so it probably has limited use. The routine starts at location 05948 (OUT-12)---a branch to this address anytime after a calendar has been generated will start the punching.

Checking holidays.

The dates of up to fifty holidays may be entered and considered non-working days. Cards 87-91 of the condensed deck contain the holidays. As the deck stands there are 24 holidays being checked: New Years Day, Christmas, July 4th, Memorial Day, Labor Day, and Thanksgiving--4 years of each. Note that these are in no particular order. Each date scans the 24 entries for a match. You may put in any holidays desired. Manually change cards 87 to as far as you need.

There is another constant (NUMHOL) which should be changed at this time. In columns one and two of card 65 of the condensed deck is $\bar{2}4$. This tells the program to scan just the first 24 entries in the table. Change this to the number desired. To ignore holidays completely set NUMHOL at $\bar{0}1$ and make the first entry in card 87 $\bar{0}00000$.

CONSTANT DICTIONARY

NUMHOL : DC 2,24. Number of holidays to check in the holiday table. This can be manually changed to any number from one to fifty in either the source or object deck.

CALSIZ : DC 5,14000. This is the units position of first date. Normal calendar is put in 13995-19999. Manually changing this constant in the source deck or object deck will change the position of the first date. Calendar will still go to 19999. Five instructions are set up with this constant during initialization.

C : DC 8,0. This is where the date is worked on in the generation phase. It uses two digits each for: Maximum days in month; the month; the date; and the year.

CTR : DC 2,0. Keeps track of day of the week. Monday is 1, Tuesday 2, Wednesday 3, etc.

WECTR : DC 2,0. This is a signal to the program that a month ended on a Saturday.

LOVE : DC 2,0. This holds the number of decimals in the input data. It is used to adjust the addresses (JA-JE) which access the input data.

MULT : DC 2,0. Holds numbers which are used to develop address of an entry in the month table.

HOLD : DC 6,0. An area used as a buffer from the calendar to the output area. Note that for generality the calendar has six-position dates though the program punches only five of these. The tens position of the year is removed in HOLD.

AA-AE : Hold ES, EF, LS, LF, TS-TE.

A : Stripped input is put here first.

CALOUT : DS 80. Output area for the option of punching out the calendar.

FILL : DAC 20 zeroes. Sets up output areas.

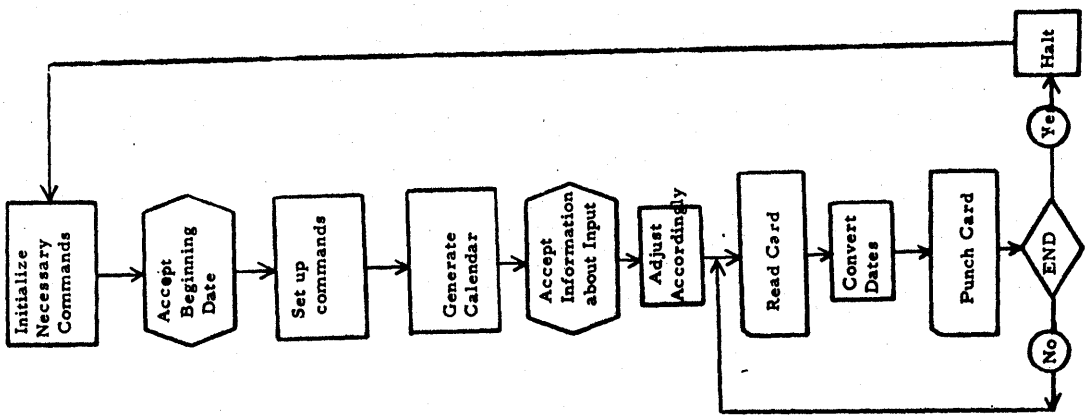
BLK : DAC 27 blanks. Becomes part of output area for special completion date card from LESS.

CHECK : DAS 20. All data coming in from typewriter is put here first to protect areas from serious typing errors.

DORG1001: This is the table of months. These entries contain maximum days in the month, the number of the month, and two zeroes

DORG1995: This is the holiday table. It contains the 24 holidays normally checked, in the form month-date-year. Below these are 26 zero entries which may be used. The program always starts at the first entry and stops after NUMHOL have been checked. This table cannot be relocated.

GENERAL FLOW CHART OF PROGRAM




```
02300                          00010          DORG 2300Z
02300 46 02312 00900 00920     00020          BLC  *812Z
02312 47 02360 00300 00330     00030          BNC3 *648Z
02324 16 03691 000-6 00340     00040          TFM  DAYCOM&11,6,10Z
02336 16 05071 000-6 00350     00050          TFM  WKLY&11,6,10Z
02348 49 02384 00000 00360     00060          B    *636Z
02360 16 03691 000-5 00370     00070          TFM  DAYCOM&11,5,10Z
02372 16 05071 000-5 00380     00080          TFM  WKLY&11,5,10Z
02384 16 03739 00-00 00390     00090          TFM  HOL&11,,9Z
02396 13 06057 000-6 00400     00100          MM   NUMHOL,6,10Z
02408 32 00097 00000 00410     00110          SF   97Z
02420 26 03799 00099 00420     00120          TF   MOHOL&11,99Z
02432 26 03602 06062 00430     00130          TF   S166,CALSIZZ
02444 26 04963 06062 00440     00140          TF   S2611,CALSIZZ
02456 26 05971 06062 00450     00150          TF   OUT&11,CALSIZZ
02468 11 06062 -0006 00460     00160          AM   CALSIZ,6Z
02480 26 03883 06062 00470     00170          TF   S3611,CALSIZZ
02492 26 03830 06062 00480     00180          TF   MOVE&6,CALSIZZ
02504 12 06062 -0006 00490     00190          SM   CALSIZ,6Z
02516 34 00000 00102 00500     00200          RCTY  Z
02528 39 06217 00100 00510     00210          WATY TITLEZ
02540 34 00000 00102 00520     00220 INDTE    RCTY  Z
02552 39 06313 00100 00530     00230          WATY INST1Z
02564 34 00000 00102 00540     00240          RCTY  Z
02576 39 06407 00100 00550     00250          WATY INST2Z
02588 34 00000 00102 00560     00260          RCTY  Z
02600 36 07170 00100 00570     00270          RNTY CHECK-1Z
02612 32 07170 00000 00580     00280          SF   CHECK-1Z
02624 26 06070 07175 00590     00290          TF   C,CHECK&4Z
02636 46 02540 00400 00600     00300          BC4  INDTEZ
02648 32 06067 00000 00610     00310          SF   C-3Z
02660 32 06069 00000 00620     00320          SF   C-1Z
02672 13 06066 000-6 00630     00330          MM   C-4,6,10Z
02684 15 00096 0000J 00640     00340          TDM  96,1,11Z
02696 12 00099 000-4 00650     00350          SM   99,4,10Z
02708 26 02731 00099 00660     00360          TF   MAX&11,99Z
02720 26 06064 -0000 00670     00370 MAX      TF   C-6,,7Z
02732 14 06070 00004 00680     00380          CM   C,64,10Z
02744 47 02792 01200 00690     00390          BNE  *648Z
02756 14 06066 000-2 00700     00400          CM   C-4,2,10Z
02768 47 02792 01200 00710     00410          BNE  *624Z
02780 11 06064 000-1 00720     00420          AM   C-6,1,10Z
02792 14 06066 000J2 00730     00430          CM   C-4,12,10Z
02804 46 02540 01100 00740     00440          BH   INDTEZ
02816 14 06066 000-1 00750     00450          CM   C-4,1,10Z
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02828 47 02540 01300 00460          BL   INDTEZ
02840 24 06068 06064 00470          C    C-2,C-6Z
02852 46 02540 01100 00480          BH   INDTEZ
02864 14 06068 000-1 00490          CM   C-2,1,10Z
02876 47 02540 01300 00500          BL   INDTEZ
02888 34 00000 00102 00510 DAY      RCTY  Z
02900 39 06467 00100 00520          WATY INST3Z
02912 15 06072 00000 00530          TDM  CTR,0Z
02924 34 00000 00102 00540          RCTY  Z
02936 37 07171 00100 00550          RATY CHECKZ
02948 46 02888 00400 00560          BC4  DAYZ
02960 32 07170 00000 00570          SF   CHECK-1Z
02972 14 07173 0N456 00580          CM   CHECK&2,5456,8Z
02984 47 03008 01200 00590          BNE  *&24Z
02996 15 06072 00001 00600          TDM  CTR,1Z
03008 14 07173 00364 00610          CM   CHECK&2,6364,8Z
03020 47 03044 01200 00620          BNE  *&24Z
03032 15 06072 00002 00630          TDM  CTR,2Z
03044 14 07173 00645 00640          CM   CHECK&2,6645,8Z
03056 47 03080 01200 00650          BNE  *&24Z
03068 15 06072 00003 00660          TDM  CTR,3Z
03080 14 07173 00348 00670          CM   CHECK&2,6348,8Z
03092 47 03116 01200 00680          BNE  *&24Z
03104 15 06072 00004 00690          TDM  CTR,4Z
03116 14 07173 0M659 00700          CM   CHECK&2,4659,8Z
03128 47 03152 01200 00710          BNE  *&24Z
03140 15 06072 00005 00720          TDM  CTR,5Z
03152 14 07173 00241 00730          CM   CHECK&2,6241,8Z
03164 47 03212 01200 00740          BNE  *&48Z
03176 14 05071 000-5 00750          CM   WKLY&11,5,10Z
03188 46 03260 01200 00760          BE   CLEARZ
03200 15 06072 00006 00770          TDM  CTR,6Z
03212 14 07173 00264 00780          CM   CHECK&2,6264,8Z
03224 46 03260 01200 00790          BE   CLEARZ
03236 14 06072 000-0 00800          CM   CTR,,10Z
03248 46 02888 01200 00810          BE   DAYZ
03260 33 06069 00000 00820 CLEAR    CF   C-1Z
03272 33 06067 00000 00830          CF   C-3Z
03284 34 00000 00102 00840 DAYWK    RCTY  Z
03296 39 06541 00100 00850          WATY INST4Z
03308 34 00000 00102 00860          RCTY  Z
03320 36 07170 00100 00870          RNTY CHECK-1Z
03332 46 03284 00400 00880          BC4  DAYWKZ
03344 32 07170 00000 00890          SF   CHECK-1Z
03356 14 07171 000-5 00900          CM   CHECK,5,10Z
03368 47 03452 01200 00910          BNE  COMP6Z
03380 16 03691 000-5 00920          TFM  DAYCOM&11,5,10Z
03392 16 05071 000-5 00930          TFM  WKLY&11,5,10Z
03404 16 04293 000J1 00940          TFM  ADD1&1,11,10Z
03416 16 04317 000J1 00950          TFM  ADD2&1,11,10Z
03428 16 03669 000J1 00960          TFM  ADD3&1,11,10Z
03440 49 03596 00000 00970          B    S1Z
03452 14 07171 000-6 00980 COMP6    CM   CHECK,6,10Z
03464 47 03548 01200 00990          BNE  COMP7Z
03476 16 03691 000-6 01000          TFM  DAYCOM&11,6,10Z
03488 16 05071 000-6 01010          TFM  WKLY&11,6,10Z
03500 16 04293 000M1 01020          TFM  ADD1&1,41,10Z
03512 16 04317 000M1 01030          TFM  ADD2&1,41,10Z
03524 16 03669 000J1 01040          TFM  ADD3&1,11,10Z
03536 49 03596 00000 01050          B    S1Z
03548 14 07171 000-7 01060 COMP7    CM   CHECK,7,10Z
03560 47 03284 01200 01070          BNE  DAYWKZ
03572 16 03669 000M1 01080          TFM  ADD3&1,41,10Z
03584 16 05071 000-7 01090          TFM  WKLY&11,7,10Z
03596 26 14000 06070 01100 S1       TF   14000,CZ
03608 32 06069 00000 01110 ENTER    SF   C-1Z
03620 32 06067 00000 01120          SF   C-3Z
03632 24 06064 06068 01130          C    C-6,C-2Z
03644 46 03896 01200 01140          BE   MONTHZ
03656 11 06068 000-1 01150 DATADD   AM   C-2,1,10Z
03668 11 06072 000-1 01160 ADD3     AM   CTR,1,10Z
03680 14 06072 000-5 01170 DAYCOM   CM   CTR,5,10Z
03692 46 04256 01100 01180          BH   WENDZ
03704 33 06069 00000 01190          CF   C-1Z
03716 33 06067 00000 01200          CF   C-3Z
03728 24 06070 02-00 01210 HOL      C    C,2000,9Z
03740 47 03776 01200 01220          BNE  *&36Z
03752 16 03739 00-00 01230          TFM  HOL&11,,9Z
03764 49 03608 00000 01240          B    ENTERZ
03776 11 03739 000-6 01250          AM   HOL&11,6,10Z
03788 14 03739 00J44 01260 NOHOL    CM   HOL&11,144,9Z
03800 47 03728 01200 01270          BNE  HOLZ
03812 16 03739 00-00 01280          TFM  HOL&11,,9Z
03824 26 J4006 06070 01290 MOVE     TF   14006,C,2Z
03836 11 03830 -0006 01300          AM   MOVE&6,6Z
03848 14 03830 J9995 01310          CM   MOVE&6,19995Z
03860 47 03608 01100 01320          BNH  ENTERZ
03872 16 03830 J4006 01330 S3       TFM  MOVE&6,14006Z
03884 49 04340 00000 01340          B    READYZ
03896 14 06066 000J2 01350 MONTH    CM   C-4,12,10Z
03908 46 04160 01200 01360          BE   YRZ
03920 26 06078 06066 01370          TF   MULT,C-4Z
03932 11 06078 000-1 01380          AM   MULT,1,10Z
03944 13 06078 000-6 01390          MM   MULT,6,10Z
03956 15 00096 0000J 01400          TDM  96,1,11Z
03968 26 03991 00099 01410          TF   TRAN&11,99Z
03980 26 06068 00000 01420 TRAN     TF   C-2,0Z
03992 32 06067 00000 01430          SF   C-3Z
04004 32 06065 00000 01440          SF   C-5Z
04016 14 06074 000-1 01450          CM   WECTR,1,10Z
04028 47 04064 01200 01460          BNE  *&36Z
04040 16 06074 000-0 01470          TFM  WECTR,,10Z
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04052 11 06068 000-1 01480        AM   C-2,1,10Z
04064 14 06070 00004 01490        CM   C,64,10Z
04076 46 04112 01200 01500        BE   *&36Z
04088 14 06070 00008 01510        CM   C,68,10Z
04100 47 03656 01200 01520        BNE  DATADDZ
04112 14 06066 000-2 01530        CM   C-4,2,10Z
04124 47 03656 01200 01540        BNE  DATADDZ
04136 11 06064 000-1 01550        AM   C-6,1,10Z
04148 49 03656 00000 01560        B    DATADDZ
04160 11 06070 000-1 01570 YR     AM   C,1,10Z
04172 26 06068 01006 01580        TF   C-2,1006Z
04184 32 06065 00000 01590        SF   C-5Z
04196 14 06074 000-1 01600        CM   WECTR,1,10Z
04208 47 03656 01200 01610        BNE  DATADDZ
04220 16 06074 000-0 01620        TFM  WECTR,,10Z
04232 11 06068 000-1 01630        AM   C-2,1,10Z
04244 49 03656 00000 01640        B    DATADDZ
04256 16 06072 000-0 01650 WEND   TFM  CTR,,10Z
04268 24 06068 06064 01660        C    C-2,C-6Z
04280 47 04316 01200 01670        BNE  *&36Z
04292 11 06074 000-1 01680 ADD1   AM   WECTR,1,10Z
04304 49 03896 00000 01690        B    MONTHZ
04316 11 06068 000-1 01700 ADD2   AM   C-2,1,10Z
04328 49 03608 00000 01710        B    ENTERZ
04340 34 00000 00102 01720 READY  RCTY  Z
04352 39 06587 00100 01730        WATY DECZ
04364 34 00000 00102 01740        RCTY  Z
04376 36 07170 00100 01750        RN Y CHECK-1Z
04388 32 07170 00000 01760        SF   CHECK-1Z
04400 26 06076 07171 01770        TF   LOVE,CHECKZ
04412 46 04340 00400 01780        BC4  READYZ
04424 22 04903 06076 01790        S    JA&11,LOVEZ
04436 22 04915 06076 01800        S    JB&11,LOVEZ
04448 22 04927 06076 01810        S    JC&11,LOVEZ
04460 22 04939 06076 01820        S    JD&11,LOVEZ
04472 22 04891 06076 01830        S    JE&11,LOVEZ
04484 34 00000 00102 01840        RCTY  Z
04496 39 06635 00100 01850        WATY SETSWSZ
04508 34 00000 00102 01860        RCTY  Z
04520 39 06721 00100 01870        WATY LOADZ
04532 48 00000 00000 01880        H     Z
04544 34 00000 00102 01890        RCTY  Z
04556 34 00000 00102 01900        RCTY  Z
04568 47 04592 00100 01910        BNC1 *&24Z
04580 39 06787 00100 01920        WATY SWONEZ
04592 47 04616 00200 01930        BNC2 *&24Z
04604 39 06821 00100 01940        WATY SWTWOZ
04616 32 06956 00000 01950        SF   IN-1Z
04628 37 06957 00500 01960 RDACD  RACD INZ
04640 14 06957 000K0 01970        CM   IN,20,10Z
04652 46 05737 01200 01980        BE   DONEZ
04664 25 -6115 -7057 01990 STRIP  TD   A-19,IN&100,27Z
04676 11 04670 000-1 02000        AM   STRIP66,1,10Z
04688 11 04675 000-2 02010        AM   STRIP&11,2,10Z
04700 14 04670 -6134 02020        CM   STRIP66,AZ
04712 47 04664 01100 02030        BNH  STRIPZ
04724 16 04670 -6115 02040        TFM  STRIP66,A-19,7Z
04736 16 04675 -7057 02050        TFM  STRIP&11,IN&100Z
04748 25 06114 07019 02060        TD   A-20,IN&62Z
04760 25 06113 07017 02070        TD   A-21,IN&60Z
04772 25 06112 07015 02080        TD   A-22,IN&58Z
04784 25 06111 07013 02090        TD   A-23,IN&56Z
04796 25 06110 07011 02100        TD   A-24,IN&54Z
04808 32 06110 00000 02110 SET    SF   A-24Z
04820 32 06115 00000 02120        SF   A-19Z
04832 32 06120 00000 02130        SF   A-14Z
04844 32 06125 00000 02140        SF   A-9Z
04856 32 06130 00000 02150        SF   A-4Z
04868 46 05060 00200 02160        BC2  WKLYZ
04880 26 06109 -6114 02170 JE     TF   AE,A-20,7Z
04892 26 06089 -6119 02180 JA     TF   AA,A-15,7Z
04904 26 06094 -6124 02190 JB     TF   AB,A-10,7Z
04916 26 06099 -6129 02200 JC     TF   AC,A-5,7Z
04928 26 06104 -6134 02210 JD     TF   AD,A,7Z
04940 13 -6089 0-006 02220 YES    MM   AA,6,28Z
04952 11 00099 J4000 02230 S2     AM   99,14000Z
04964 32 00095 00000 02240        SF   95Z
04976 26 05191 00099 02250        TF   GET&11,99Z
04988 14 05191 K0000 02260        CM   GET&11,20000Z
05000 47 05180 01300 02270        BL   GETZ
05012 34 00000 00102 02280        RCTY  Z
05024 39 06859 00100 02290        WATY EXCEEDZ
05036 48 00000 00000 02300        H     Z
05048 49 04628 00000 02310        B    RDACDZ
05060 13 -6114 000-5 02320 WKLY   MM   A-20,5,21OZ
05072 32 00095 00000 02330        SF   95Z
05084 26 -6114 00099 02340 TFD    TF   A-20,99,2Z
05096 11 05066 -0005 02350        AM   WKLY66,5Z
05108 11 05090 -0005 02360        AM   TFD66,5Z
05120 14 05066 -6134 02370        CM   WKLY66,AZ
05132 47 05060 01100 02380        BNH  WKLYZ
05144 16 05066 -6114 02390        TFM  WKLY66,A-20Z
05156 16 05090 -6114 02400        TFM  TFD66,A-20Z
05168 49 04880 00000 02410        B    JEZ
05180 26 06084 -0000 02420 GET    TF   HOLD,,7Z
05192 25 06083 06084 02430        TD   HOLD-1,HOLDZ
05204 26 -6089 06083 02440 HUH    TF   AA,HOLD-1,2Z
05216 14 06957 000K0 02450        CM   IN,20,10Z
05228 46 05840 01200 02460        BE   FINIZ
05240 11 04946 000-5 02470        AM   YES66,5,10Z
05252 11 05210 -0005 02480        AM   HUH66,5Z
05264 46 05312 00100 02490        BC1  *&48Z
```

```
05276 14 05210 -6104 02500          CM   HUH66,ADZ
05288 47 04940 01100 02510          BNH  YESZ
05300 49 05336 00000 02520          B    *&36Z
05312 14 05210 -6109 02530          CM   HUH66,AEZ
05324 47 04940 01100 02540          BNH  YESZ
05336 16 04946 -6089 02550          TFM  YES66,AAZ
05348 16 05210 -6089 02560          TFM  HUH66,AAZ
05360 32 06916 00000 02570          SF   FILL-1Z
05372 26 07095 06955 02580          TF   IN&138,FILL&38Z
05384 46 05624 00100 02590          BC1  PERTZ
05396 25 -7057 -6085 02600 WELL     TD   IN&100,AA-4,27Z
05408 11 05402 000-2 02610          AM   WELL66,2,10Z
05420 11 05407 000-1 02620          AM   WELL&11,1,10Z
05432 14 05407 -6104 02630          CM   WELL&11,ADZ
05444 47 05396 01100 02640          BNH  WELLZ
05456 16 05402 -7057 02650          TFM  WELL66,IN&100Z
05468 16 05407 -6085 02660          TFM  WELL&11,AA-4Z
05480 39 06957 00400 02670          WACD INZ
05492 47 04628 00900 02680          BNLC RDACDZ
05504 34 00000 00102 02690 WOW      RCTY  Z
05516 39 06895 00100 02700          WATY EOJZ
05528 21 04903 06076 02710          A    JA&11,LOVEZ
05540 21 04915 06076 02720          A    JB&11,LOVEZ
05552 21 04927 06076 02730          A    JC&11,LOVEZ
05564 21 04939 06076 02740          A    JD&11,LOVEZ
05576 21 04891 06076 02750          A    JE&11,LOVEZ
05588 48 00000 00000 02760          H     Z
05600 46 04340 00300 02770          BC3  READYZ
05612 49 02300 00000 02780          B    2300Z
05624 14 06114 -0000 02790 PERT     CM   A-20,0,7Z
05636 46 05396 01200 02800          BE   WELLZ
05648 26 07019 06925 02810          TF   IN&62,FILL&8Z
05660 25 07019 06109 02820          TD   IN&62,AEZ
05672 25 07017 06108 02830          TD   IN&60,AE-1Z
05684 25 07015 06107 02840          TD   IN&58,AE-2Z
05696 25 07013 06106 02850          TD   IN&56,AE-3Z
05708 25 07011 06105 02860          TD   IN&54,AE-4Z
05720 49 05396 00000 02870          B    WELLZ
05732 25 06115 07083 02880 DONE     TD   A-19,IN&126Z
05744 25 06116 07085 02890          TD   A-18,IN&128Z
05756 25 06117 07087 02900          TD   A-17,IN&130Z
05768 25 06118 07089 02910          TD   A-16,IN&132Z
05780 25 06119 07091 02920          TD   A-15,IN&134Z
05792 33 06117 00000 02930          CF   A-17Z
05804 39 06957 00400 02940          WACD INZ
05816 46 05504 00100 02950          BC1  WOWZ
05828 49 04808 00000 02960          B    SETZ
05840 32 06916 00000 02970 FINI     SF   FILL-1Z
05852 26 07117 06925 02980          TF   IN&160,FILL&8Z
05864 25 07109 06085 02990          TD   IN&152,AA-4Z
05876 25 07111 06086 03000          TD   IN&154,AA-3Z
05888 25 07113 06087 03010          TD   IN&156,AA-2Z
05900 25 07115 06088 03020          TD   IN&158,AA-1Z
05912 25 07117 06089 03030          TD   IN&160,AAZ
05924 39 07009 00400 03040          WACD IN&52Z
05936 49 05504 00000 03050          B    WOWZ
05948 26 06138 0-000 03060          TF   CALOUT-76,,8Z
05960 26 06146 J4000 03070 OUT      TF   CALOUT-68,14000,7Z
05972 33 06141 00000 03080          CF   CALOUT-73Z
05984 38 06135 00400 03090          WNCD CALOUT-79Z
05996 11 06138 0-001 03100          AM   CALOUT-76,1,8Z
06008 11 05971 -0006 03110          AM   OUT&11,6,7Z
06020 14 05971 K0000 03120          CM   OUT&11,20000Z
06032 47 05960 01300 03130          BL   OUTZ
06044 48 00000 00000 03140          H     Z
06057 00 00002 00000 03150 NUMHOL   DC   2,24Z
06062 00 00005 00000 03160 CALSIZ   DC   5,14000Z
06070 00 00008 00000 03170 C        DC   8,0Z
06072 00 00002 00000 03180 CTR      DC   2,0Z
06074 00 00002 00000 03190 WECTR    DC   2,0Z
06076 00 00002 00000 03200 LOVE     DC   2,0Z
06078 00 00002 00000 03210 MULT     DC   2,0Z
06084 00 00006 00000 03220 HOLD     DC   6,0Z
06089 00 00005 00000 03230 AA       DS   5Z
06094 00 00005 00000 03240 AB       DS   5Z
06099 00 00005 00000 03250 AC       DS   5Z
06104 00 00005 00000 03260 AD       DS   5Z
06109 00 00005 00000 03270 AE       DS   5Z
06134 00 00025 00000 03280 A        DS   25Z
06214 00 00080 00000 03290 CALOUT   DS   80Z
06217 00 00048 00000 03300 TITLE    DAC  48,DAY TO DATE CONVERSION  TO RESTART TYPE 49023002
06313 00 00047 00000 03310 INST1    DAC  47,TYPE BEGINNING DATE OF JOB-MONTH,DATE AND YEARZ
06407 00 00030 00000 03320 INST2    DAC  30,EXAMPLE-JAN 15,1962 IS 011562Z
06467 00 00037 00000 03330 INST3    DAC  37,TYPE IN DAY OF WEEK THAT DATE OCCURSZ
06541 00 00023 00000 03340 INST4    DAC  23,ENTER DAYS PER WEEK OXZ
06587 00 00024 00000 03350 DEC      DAC  24,ENTER NO.OF DECIMALS OXZ
06635 00 00043 00000 03360 SETSWS   DAC  43,SW 1 ON FOR PERT SW2 ON FOR INPUT IN WEEKSZ
06721 00 00033 00000 03370 LOAD     DAC  33,READY CARDS IN READER,PUSH STARTZ
06787 00 00017 00000 03380 SWONE    DAC  17,SWITCH ONE IS ONZ
06821 00 00019 00000 03390 SWTWO    DAC  19,  SWITCH TWO IS ONZ
06859 00 00018 00000 03400 EXCEED   DAC  18,CALENDAR EXCEEDEDZ
06895 00 00011 00000 03410 EOJ      DAC  11,END OF JOBZ
06917 00 00020 00000 03420 FILL     DAC  20,0000000000          Z
06957 00 00080 00000 03430 IN       DAS  80Z
07117 00 00027 00000 03440 BLK      DAC  27,                        Z
07171 00 00020 00000 03450 CHECK    DAS  20Z
01001                    03460      DORG 01001Z
01006 00 00006 00000 03470          DC   6,310100,1006Z
01012 00 00006 00000 03480          DC   6,280200,1012Z
01018 00 00006 00000 03490          DC   6,310300,1018Z
01024 00 00006 00000 03500          DC   6,300400,1024Z
01030 00 00006 00000 03510          DC   6,310500,1030Z
```

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01036 00 00006 00000 03520          DC    6,300600,1036Z
01042 00 00006 00000 03530          DC    6,310700,1042Z
01048 00 00006 00000 03540          DC    6,310800,1048Z
01054 00 00006 00000 03550          DC    6,300900,1054Z
01060 00 00006 00000 03560          DC    6,311000,1060Z
01066 00 00006 00000 03570          DC    6,301100,1066Z
01072 00 00006 00000 03580          DC    6,311200,1072Z
01995                03590          DORG  01995Z
02000 00 00006 00000 03600          DC    6,010163Z
02006 00 00006 00000 03610          DC    6,010164Z
02012 00 00006 00000 03620          DC    6,010165Z
02018 00 00006 00000 03630          DC    6,010166Z
02024 00 00006 00000 03640          DC    6,122562Z
02030 00 00006 00000 03650          DC    6,122563Z
02036 00 00006 00000 03660          DC    6,122564Z
02042 00 00006 00000 03670          DC    6,122565Z
02048 00 00006 00000 03680          DC    6,070462Z
02054 00 00006 00000 03690          DC    6,070463Z
02060 00 00006 00000 03700          DC    6,070464Z
02066 00 00006 00000 03710          DC    6,070465Z
02072 00 00006 00000 03720          DC    6,053062Z
02078 00 00006 00000 03730          DC    6,053063Z
02084 00 00006 00000 03740          DC    6,053064Z
02090 00 00006 00000 03750          DC    6,053065Z
02096 00 00006 00000 03760          DC    6,090362Z
02102 00 00006 00000 03770          DC    6,090263Z
02108 00 00006 00000 03780          DC    6,090964Z
02114 00 00006 00000 03790          DC    6,090865Z
02120 00 00006 00000 03800          DC    6,112262Z
02126 00 00006 00000 03810          DC    6,112163Z
02132 00 00006 00000 03820          DC    6,112664Z
02138 00 00006 00000 03830          DC    6,112565Z
02144 00 00006 00000 03840          DC    6,0Z
02150 00 00006 00000 03850          DC    6,0Z
02156 00 00006 00000 03860          DC    6,0Z
02162 00 00006 00000 03870          DC    6,0Z
02168 00 00006 00000 03880          DC    6,0Z
02174 00 00006 00000 03890          DC    6,0Z
02180 00 00006 00000 03900          DC    6,0Z
02186 00 00006 00000 03910          DC    6,0Z
02192 00 00006 00000 03920          DC    6,0Z
02198 00 00006 00000 03930          DC    6,0Z
02204 00 00006 00000 03940          DC    6,0Z
02210 00 00006 00000 03950          DC    6,0Z
02216 00 00006 00000 03960          DC    6,0Z
02222 00 00006 00000 03970          DC    6,0Z
02228 00 00006 00000 03980          DC    6,0Z
02234 00 00006 00000 03990          DC    6,0Z
02240 00 00006 00000 04000          DC    6,0Z
02246 00 00006 00000 04010          DC    6,0Z
02252 00 00006 00000 04020          DC    6,0Z
02258 00 00006 00000 04030          DC    6,0Z
02264 00 00006 00000 04040          DC    6,0Z
02270 00 00006 00000 04050          DC    6,0Z
02276 00 00006 00000 04060          DC    6,0Z
02282 00 00006 00000 04070          DC    6,0Z
02288 00 00006 00000 04080          DC    6,0Z
02294 00 00006 00000 04090          DC    6,0Z
02300                04100          DEND  2300Z
```

```
361100000100491100000S
371000100500
151015900001
340000000102
391000100100
491100000000S
```

A-1

SAMPLE PROBLEM INPUT

0010020010	LEAD TIME		10		10	*	
0020200001	ASSEMBLE CREWS	10	11	11	12	1	
0020030002	MEASURE-SKETCH	10	12	10	12	*	
0030040001	DEVELOP MATERIAL LIST	12	13	12	13	*	
0040080045	PROCURE PIPE	13	58	13	58	*	
0080110001	PLACE VALVES	58	59	58	59	*	
011012 1	FIT UP	59	60	62	63	3	
0120140001	PRESSURE TEST	60	61	63	64	3	
0140150001	CLEAN UP	64	65	64	65	*	
0010050028	TIME AVAILABLE		28	16	44	16	
0040050000	DUMMY	13	13	44	44	31	1
0050060001	DEACTIVATE LINE	28	29	44	45	16	
0060090006	REMOVE OLD PIPE	29	35	45	51	16	1
0090100006	PLACE NEW PIPE	48	54	51	57	3	
0100110002	WELD PIPE	54	56	57	59	3	
0110130004	INSULATE	59	63	59	63	*	
0130140001	REMOVE SCAFFOLD	63	64	63	64	*	
0120130000	DUMMY	60	60	63	63	3	
0010150060	PROMISED COMPLETION		60	5	65	5	
0040060002	ERECT SCAFFOLD	13	15	43	45	30	1
0060060000	DUMMY	29	29	58	58	29	2
0040070030	PROCURE PIPE	13	43	16	46	3	
0070090005	PREFAB SECTIONS	43	48	46	51	3	
0200030000	DUMMY	11	11	12	12	1	

= PROJECT COST PROJECT COMPLETION 65

THIS IS THE OUTPUT FROM LESS.

Page A-1 shows a listing of the input cards. These are the output cards from LESS. These cards are fed into the program which produces cards as output. A listing of these output cards is shown on page A-2. Notice that all fields are unchanged except those which refer to relative days--these fields contain actual dates.

The top of page A-2 shows the 1620 log obtained when running this data. June 1, 1962 was the beginning date of the project and this date was a Friday. The input was in integer form (Number of decimals was 00) and the number of working days per week was five. Neither console switch was on so input was considered from LESS and in days.

Page A-3 shows the results using the same data but changing some of the conditions. Working week was changed to six days. The input was considered as in weeks with one decimal place. (Changing the conditions this way is not a practical situation--We show this merely to illustrate the different options in the program.)

SAMPLE LOG AND OUTPUT PRINT OUT

```
DAY TO DATE CONVERSION  TO RESTART TYPE 4902300
TYPE BEGINNING DATE OF JOB-MONTH,DATE AND YEAR
EXAMPLE-JAN 15,1962 IS 011562
060162RS
TYPE IN DAY OF WEEK THAT DATE OCCURS
FRIDAYRS
ENTER DAYS PER WEEK OX
05RS
ENTER NO.OF DECIMALS OX
00RS
SW 1 ON FOR PERT SW2 ON FOR INPUT IN WEEKS
READY CARDS IN READER,PUSH START

END OF JOB
```

0010020010	LEAD TIME	060120615206012061 52	*	
0020200001	ASSEMBLE CREWS	061520618206182061 92	1	
0020030002	MEASURE-SKETCH	061520619206156206 192	*	
0030040001	DEVELOP MATERIAL LIST	061920620206192062 02	*	
0040080045	PROCURE PIPE	062020823206202082 32	*	
0080110001	PLACE VALVES	082320824208232082 42	*	
011012 1	FIT UP	082420827208292083 02	3	
0120140001	PRESSURE TEST	082720828208302083 12	3	
0140150001	CLEAN UP	083120904208312090 42	*	
0010050028	TIME AVAILABLE	060120712206252080 32	16	
0040050000	DUMMY	062020620208032082 32	31	1
0050060001	DEACTIVATE LINE	071220713208032082 62	16	
0060090006	REMOVE OLD PIPE	071320723208062081 42	16	1
0090100006	PLACE NEW PIPE	080920817208142082 22	3	
0100110002	WELD PIPE	081720821208222082 42	3	
0110130004	INSULATE	082420830208242083 02	*	
0130140001	REMOVE SCAFFOLD	083020831208302083 12	*	
0120130000	DUMMY	082720827208302083 02	3	
0010150060	PROMISED COMPLETION	060120827206082090 42	5	
0040060002	ERECT SCAFFOLD	062020622208022080 62	30	1
0060080000	DUMMY	071320713208232082 32	29	2
0040070030	PROCURE PIPE	062020802206252080 72	3	
0070090005	PREFAB SECTIONS	080220809208072081 42	3	
0200030000	DUMMY	061820615206192061 92	1	

- PROJECT COST PROJECT COMPLETION 65
PROJECT COMPLETION 65 09042

SAMPLE LOG AND OUTPUT UNDER DIFFERENT CONDITIONS

```
DAY TO DATE CONVERSION  TO RESTART TYPE 4902300
TYPE BEGINNING DATE OF JOB-MONTH,DATE AND YEAR
EXAMPLE-JAN 15,1962 IS 011562
060162RS
TYPE IN DAY OF WEEK THAT DATE OCCURS
FRIDAYRS
ENTER DAYS PER WEEK OX
06RS
ENTER NO.OF DECIMALS OX
01RS
SW 1 ON FOR PERT SW2 ON FOR INPUT IN WEEKS
READY CARDS IN READER,PUSH START

  SWITCH TWO IS ON
END OF JOB
```

0010020010	LEAD TIME	060120608206012060 82	*	
0020200001	ASSEMBLE CREWS	060820608206082060 92	1	
0020030002	MEASURE-SKETCH	060820609206082060 92	*	
0030040001	DEVELOP MATERIAL LIST	060920609206092060 92	*	
0040080045	PROCURE PIPE	060920712206092071 22	*	
0080110001	PLACE VALVES	071220713207122071 32	*	
011012 1	FIT UP	071320714207162071 62	3	
0120140001	PRESSURE TEST	071420714207162071 72	3	
0140150001	CLEAN UP	071720718207172071 82	*	
0010050028	TIME AVAILABLE	060120620206122070 22	16	
0040050000	DUMMY	060920609207022070 22	31	1
0050060001	DEACTIVATE LINE	062020621207022070 32	16	
0060090006	REMOVE OLD PIPE	062120626207032070 72	16	1
0090100006	PLACE NEW PIPE	070520710207072071 22	3	
0100110002	WELD PIPE	071020711207122071 32	3	
0110130004	INSULATE	071320716207132071 62	*	
0130140001	REMOVE SCAFFOLD	071620717207162071 72	*	
0120130000	DUMMY	071420714207162071 62	3	
0010150060	PROMISED COMPLETION	060120714206052071 82	5	
0040060002	ERECT SCAFFOLD	060920612206302070 32	30	1
0060080000	DUMMY	062120621207122071 22	29	2
0040070030	PROCURE PIPE	060920630206122070 32	3	
0070090005	PREFAB SECTIONS	063020705207032070 72	3	
0200030000	DUMMY	060820608206092060 92	1	

- PROJECT COST PROJECT COMPLETION 65
PROJECT COMPLETION 65 07182