NOAA Technical Memorandum NWS WR-170

AN ENHANCED PLOTTER FOR SURFACE AIRWAYS OBSERVATIONS

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Western Region Headquarters
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This publication has been reviewed
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FIGURES AND TABLES

AN ENHANCED PLOTTER FOR SURFACE AIRWAYS OBSERVATIONS

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I. General Information

A. Summary:

The enhanced plotter consists of two programs, PLTGEN and PLTSELECT, which are used to generate plot files from surface airways observations. These two programs, along with some modifications to the SAO decoder, provide the following enhancements over previous plotting programs.

1) Plotting on either the United States or North America map background.

2) Plotting most parameters in their correct station model positions.

3) Plotting single parameters.

4) Highlighting significant weather using the GDM zoom capabilities.

5) Producing additional plots from an SAODATA file quickly.

6) Running the SAO decoder and plotter in a procedure.

7) Using an edited station directory file to reduce clutter.

B. Environment:

The program runs in less than 9K in the background of a Data General Eclipse 230. It interfaces with AFOS using the FSTORE and FORK subroutines (BGLB).

The main programs, PLTGEN and PLTSELECT, and the subroutines, BNSCH, CC, VV, and OUTPUT, are written in Data General Fortran IV. Three subroutines, MSND, MASC, and WW, are written in assembly language.

C. References:

1) Generalized Plot File Format for Stations Model Graphics

APPENDIX V-5 AFOS User's Guide For Meteorological and Hydrologic Operations. U.S. Department of Commerce June 1978.

2) Surface Airways Observation Decoder. Rich Thomas, NMC.

3) Master Station ID DIrectory File. Rich Thomas, NMC.

*SSD Student Employees - Summer 1981.

II. Application

A. Complete Program Description:

PLTGEN, the intermediate program in the decoding and plotting sequence, is designed to give the user control over the appearance of the surface map generated from surface airways observations. It uses the data file SAODATA and the switch file SAOXXX, both produced by the SAO decoder, to generate a plot file NMCPLTSAO. This file is then turned into an AFOS graphic using the program MODELUGF.

PLTGEN uses two switches from the SAO decoder. The /B switch is used to choose between the United States and North America map backgrounds. The /P switch is used to choose which parameter or combination of parameters to plot. A list of the options for these two switches is given in Table 1.

PLTGEN plots most parameters in their correct location in the station model (see Figure 1). Weather symbols are generated for rain, sleet, hail, shower, freezing precipitation, thunderstorms, haze, and fog. All symbols except fog show the intensity of the precipitation. The comment field of the station model is used to plot three parameters on a priority basis: precipitation, wind gusts, and visibility.

Plots of all the single parameters listed in Table 1 can be produced (Figure 2). These parameters are put in their respective station model locations. To aid in hand analysis, all single parameter plots include weather, cloud cover, and wind flags.

The enhanced plotter uses the AFOS GDM zoom levels to highlight significant weather (Figure 3). All stations reporting significant weather (any obstruction to vision except haze and fog) appear at 1 to 1 zoom. On the U.S. map background, the stations with haze and fog are added at 4 to 1 and all the remaining stations are added at 9 to 1 zoom. On the North American map background, all stations are visible from 4 to 1 zoom and higher. To reduce clutter on the North American map background, the station IDs, which would appear at 9 to 1, are omitted.

PLTSELECT, the other new program in the enhanced plotter, is used to product additional plots from a pre-existing SAODATA file. It changes the background (/B) and plotting (/P) switches in the SAOXXX file, then chains to PLTGEN to produce the plot file. Once an SAODATA file for the desired observations exists, new plots can be generated in about 45 seconds, a considerable time savings over the six to eight minutes needed to generate the first plot using the SAO decoder.

In addition to the background and plot switch changes referred to above, the SAO decoder's time switch has been altered so the program can be run in a procedure. The program now defaults to the most recent hour rather than the current time. The time window has also been changed

to extend from 30 minutes before, to 15 minutes after the given time. The /T switch can now be omitted when running on current data. When plotting a previous hour's data, the time should be entered as HHØØ/T where HH is the hour desired. A sample Procedure plotting the default parameters in product NMCGPHSAO and altimeter setting only in product NMCGPH56I is given in Table 2.

Because of the high density of observations in populous areas such as the Los Angeles basin, the plotter now reads the necessary file size parameters directly from the station direction file STDIR.MS. This allows the user to reduce the number of stations plotted in these areas by editing them out of the STDIR.MS file. The file can be edited using the SDEDIT.SV program found in the station directory file documentation. A backup copy of the unedited STDIR.MS file should be made before editing.

B. Machine Requirements:

The program PLTGEN requires less than 9K of core and approximately 40 seconds to execute. It requires a maximum of three channels at one time. Using PLTSELECT to produce an additional plot of a single parameter requires about 45 seconds.

C. Software Structure:

The subroutines MASC, MSND, and OUTPUT are simple functions repeated many times. MASC converts a string of two-digit integers into packed ASCII for output to the plot file. MSND converts any length signed integer into packed ASCII for output to the plot file. OUTPUT does a write sequential of a string of ASCII characters to the output file GP, adding a trailing comma or semicolon if desired.

The subroutines VV, WW, and CT are complicated functions called once for each station. VV converts the visibility into an ASCII string. WW generates the synoptic code for present weather, in ASCII, and the correct code word (PSOWD) needed by the plot file to control the zoom threshold. CT generates the packed ASCII could type for output.

D. Database:

Three files are accessed by PLTGEN and one file is created for output. SAOXXX is used for the background and plot switch information. SAODATA is read for the surface observations. STDIR.MS, the station information file, is searched by BNSCH to locate a station's X and Y coordinates on the GDM screen. GP, the file created by PLTGEN, contains the output plot file that is stored in the database under NMCPLTSAO.

The formats of all files except SAOXXX remain unchanged from the documentation listed in the references. Words 9-13 of the SAOXXX file, originally unused, now contain the plotting switch array. The values of this array for the various switch options are shown in Table 3. The rest of SAOXXX remains the same as documented previously.

III. Procedures

A. Initiation of Program:

The plotter can be run in three ways from the AFOS ADM.

A new surface plot on current data can be produced by the commands:

```
RUN:@SAO@          RUN:@SAO@ 02/B
              or
RUN:@LCLSFC@       RUN:@LCLNAM@
```

The indirect @SAO@ runs the SAO decoder which chains to PLTGEN to create a plot file of current observations. The indirects @LCLSFC@ and @LCLNAM@ run MODELUGF to produce a graphic from the plot file on the United States and North America map backgrounds respectively.

The type of plot produced is determined by the /B and /P switches (see Table 1). The choice of @LCLSFC@ or @LCLNAM@ depends on the background switch used. For example, the following commands would produce a map of wind barbs only on the North America map background.

```
RUN:PLTSELECT  2/B  W/P
RUN:@LCLNAM@
```

A procedure, like the one shown in Table 2, can be set up to run the decoder once each hour. A basic graphic is produced which can be displayed on the GDM. If additional graphics of single parameter plots are desired they can be produced quickly by PLTSELECT.

B. Output:

The output from PLTGEN is the plot file NMCPLTSAO. Examples of the first pages of two plot files are shown in Figure 4. The exact appearance of the plot file varies as the plotting switch is changed. The plot file format is given in the referenced documentation.

C. Cautions and Restrictions:

1) Fog is always shown as ≡ regardless of actual reported intensity. The visibility, in the comment field, can be used to tell the intensity of fog.

2) PLTSELECT can only be run if an SAODATA file exists from the decoder.

3) A bug in MODELUGF results in a misrepresentation of the thunderstorm symbol as a thunder snowstorm when certain single parameter plots are produced.

4) The indirect @LCLNAM@ should only be used when the Ø2 or 2 option is used for the background switch.

Table 1: Background and plotting switches for the SAO decoder and PLTSELECT.

Switch	Option	Description
/B	2	United States map background for PLTSELECT
	3	North America map background for PLTSELECT
	02	United States map background for PLTGEN
	03	North America map background for PLTGEN
/P	Q	All parameters including pressure (default)
	B	All parameters including altimeter
	A	Altimeter setting only
	P	Sea level pressure only
	T	Temperature only
	D	Dew point only
	C	Pressure tendency (valid on synoptic times only)
	W	Wind direction and speed barbs only

Table 2: Sample procedure "SAO" for running the SAO decoder. The output will consist of a map of all parameters and altimeter setting on the North America map background and a map of pressure only on the U.S. map background.

```
INIT:DPØF:APL
RUN:@SAO@ 02/B B/P
RUN:@LCLNAM@
WAIT 6Ø
RUN:PLTSELECT 3/B P/P
RUN:@LCLSFC@
```

Table 3: Configuration of words 9-13 of the file SAOXXX for the various plot switches.

Switch	Words 9-13 of SAOXXX
Q	1 1 1 0 1
B	0 1 1 0 1
A	0 0 0 0 0
P	1 0 0 0 0
T	-1 1 0 0 0
D	-1 0 1 0 0
C	-1 0 0 0 1
W	-1 0 0 1 0

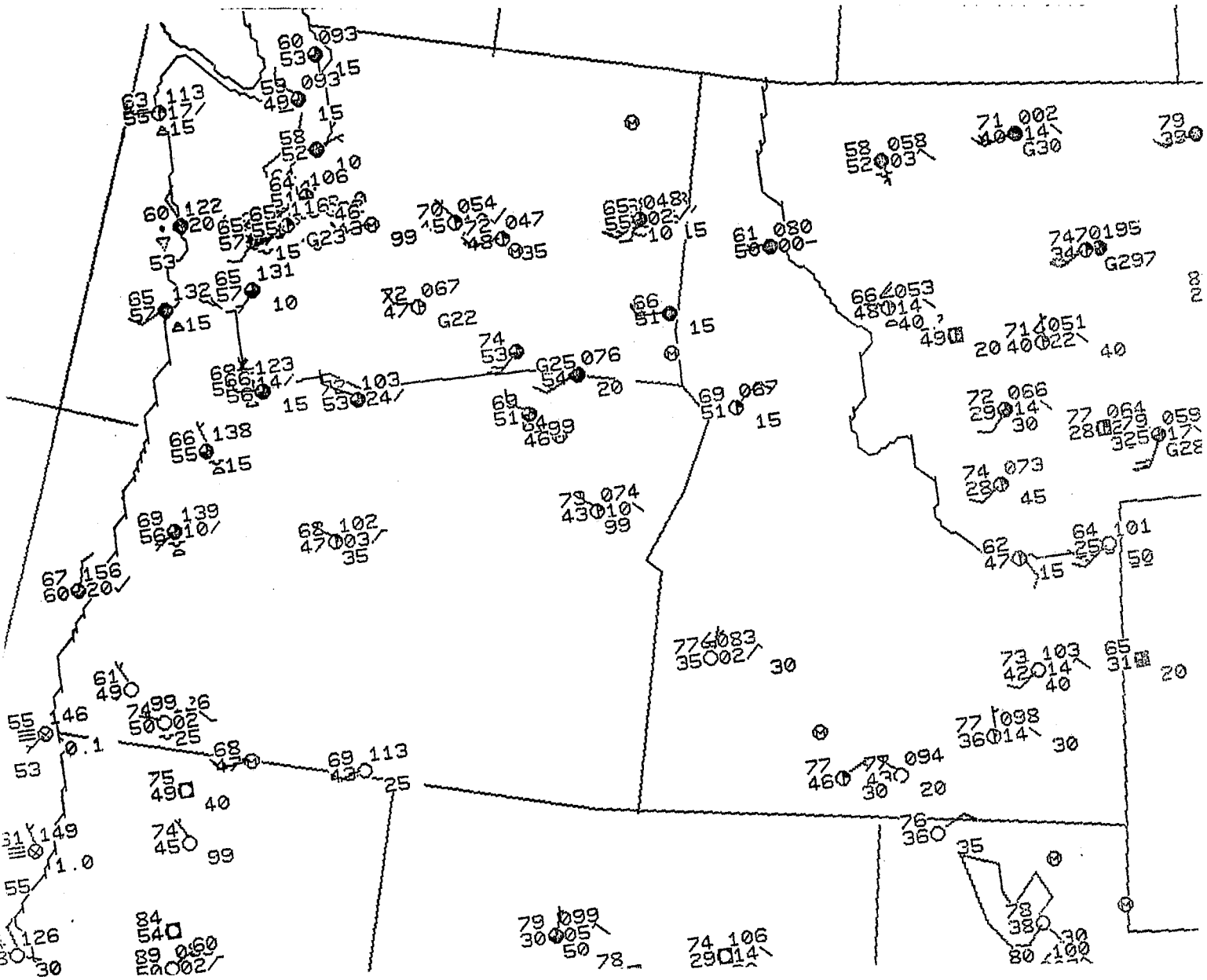

Figure 1: Surface Aviation Observation plot produced by the enhanced plotter. All parameters except visibility are in their correct locations. The comment field of the station model is used to plot precipitation, wind gusts, and visibility on a priority basis.

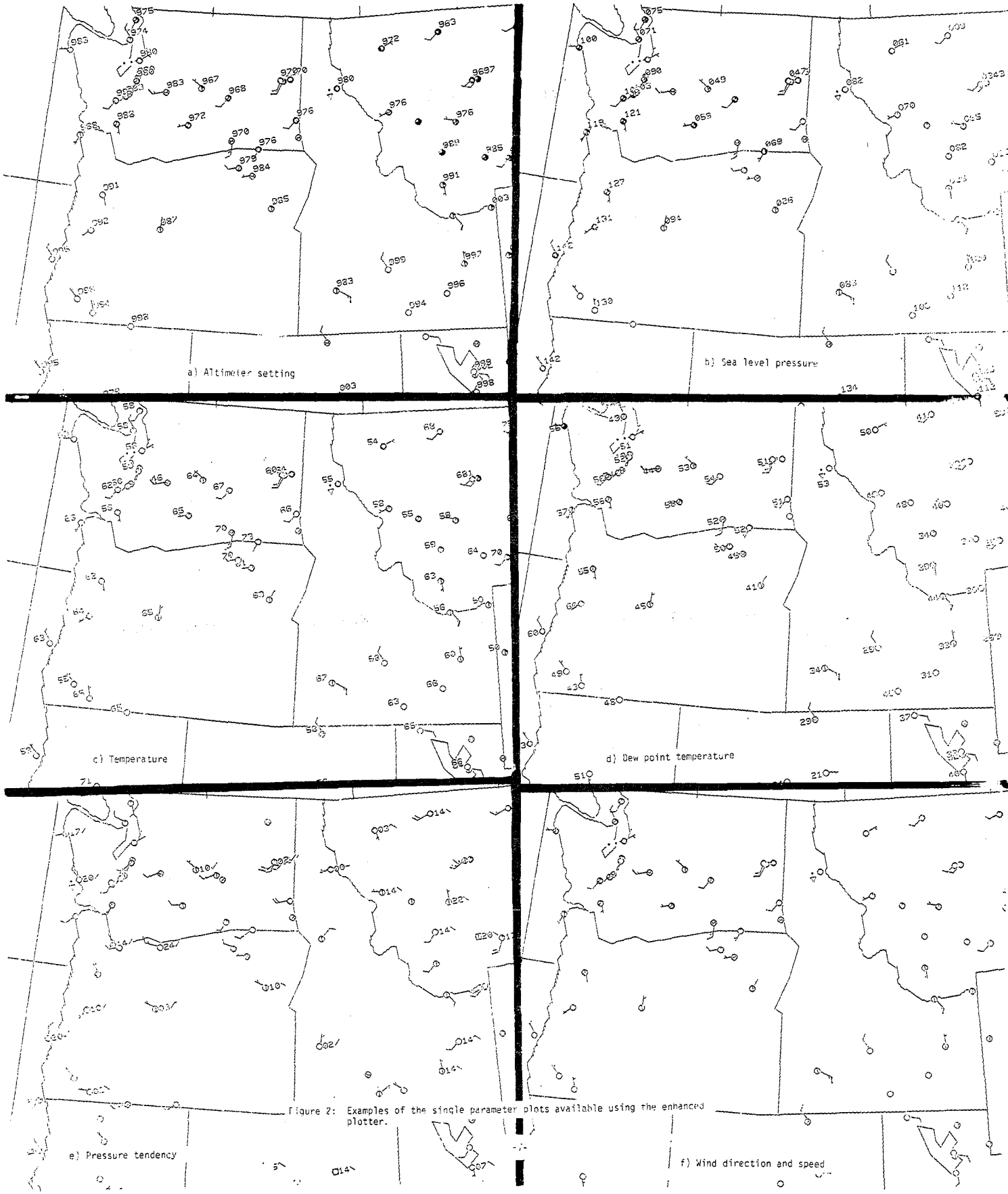

Figure 2: Examples of the single parameter plots available using the enhanced plotter.

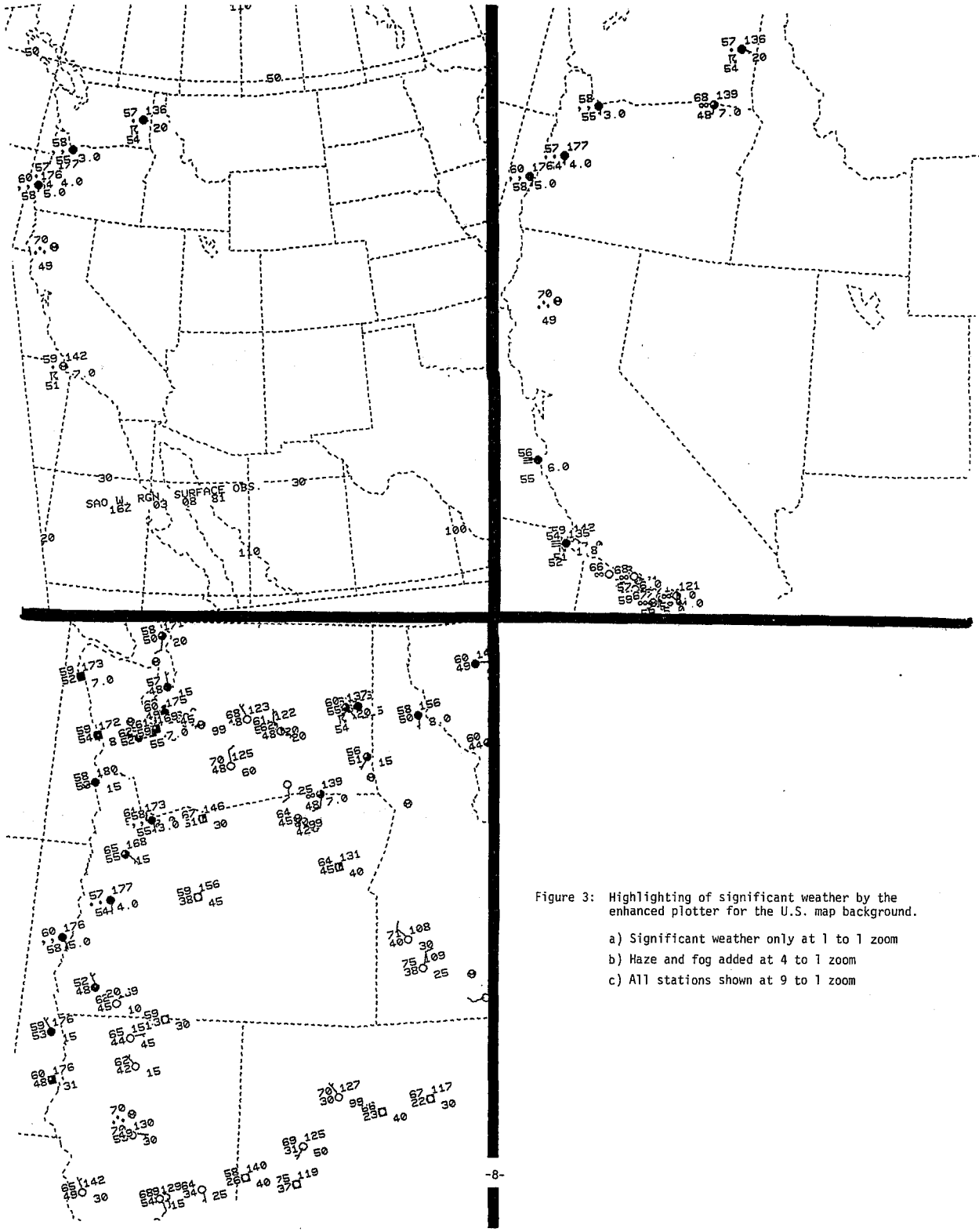

Figure 3: Highlighting of significant weather by the enhanced plotter for the U.S. map background.

a) Significant weather only at 1 to 1 zoom

b) Haze and fog added at 4 to 1 zoom

c) All stations shown at 9 to 1 zoom

```
NMCPLTSAO
NMCPLTSAO00010100020481536405018O0+0750+3000210208810000
119,290,10000Z,SAO W. RGN. SURFACE OBS.;
119,270,10000Z,   21Z   02  08  81 ;
450,938,200002,,4SV,0,32015,,84,40.......35 ;
360,1030,200002,,BOI,0,34011,126,83,33,,,12,8,100,,30 ;
437,966,200002,,BYI,0,30012,113,88,38,,,17,8,,,30 ;
404,990,200002,,GNG,M,,,,,,,,,,;
503,1005,200002,,IDA,0,20016,129,84,42,,,08,8,,,40 ;
360,1168,200002,,LWS,M,,,,,,,,,,;
486,941,200002,,MLD,0,23005,109,92,31,.......15 ;
367,1004,200002,,MUO,3,02003,118,90,29,,,14,8,,,G14;
480,978,200002,,PIH,0,25011,122,87,37,,,12,7,100,,40 ;
409,1210,200002,,S06,6,23007,160,77,49,.......8.0 ;
385,1140,200002,,S80,M,,,,,,,,,,,;
411,968,200002,,TWF,3,30014,,,,,,,,,20 ;
736,953,200002,,4DG,0,24007,083,94,40,.......35 ;
567,952,200002,,BPI,M,25017,,83,25,.......;
613,1043,200002,,COD,3,02010,,85,45,.......75 ;
698,961,200002,,CPR,3,24012,076,95,24,,,19,7,200,,50 ;
757,874,200002,,CYS,3,14008,120,84,48,,,08,7,300,,60 ;
732,1030,200002,,GCC,3,12010,,89,47,.......20 ;
550,1004,200002,,JAC,3,25010,,81,35,.......20 ;

725,882,200002,,LAR,3,20008,110,86,25,,,17,7,,,50 ;
617,960,200002,,LND,0,24012,078,93,17,,,10,7,200,,40 ;
628,971,200002,,RIW,3,28008,,93,22,.......40 ;
601,902,200002,,RKS,3,24010,122,83,27,,,17,7,,,60 ;
670,908,200002,,RWL,3,23011,,86,35,.......60 ;
683,1051,200002,,SHR,3,01004,090,86,54,,,17,7,100,,60 ;
647,1014,200002,,WRL,3,01007,061,94,52,.......40 ;
818,826,200002,,AKO,0,20007,115,87,61,.......15 ;
715,699,200002,,ALS,6,24006,132,83,49,.....301,,50 ;
678,779,200002,,ASE,3,24008,,83,39,.......30 ;
760,802,200002,,BKF,3,09007,111,90,41,,,12,7,,,70 ;
603,686,200002,,CEZ,3,00000,,88,.......60 ;
761,758,200002,,COS,6,08012,120,86,49,.......G17;
755,805,200002,,DEN,3,17010,096,92,39,,,14,8,101,,45 ;
638,677,200002,,DRO,3,00000,,87,59,.......75 ;
677,801,200002,,EGE,3,26005,106,90,44,,,29,7,,,40 ;
613,777,200002,,GJT,3,28009,093,93,43,,,25,7,100,,99 ;
675,746,200002,,GUC,3,00000,,81,59,.......30 ;
809,720,200002,,LHX,6,10011,100,91,64,,,07,8,,,35 ;
637,745,200002,,MTJ,3,22006,,89,51,.......40 ;
769,731,200002,,PUB,3,12016,092,95,59,,,14,8,,,99 ;
777,679,200002,,TAD,3,13006,103,88,47,,,10,7,,,40 ;
486,1159,200002,,3DU,3,29012,,78,46,.......20 ;
```

a) All parameters to be plotted.

```
NMCPLTSAO
NMCPLTSAO00102000204815362850142500975016881
119,290,10000Z,SAO W. RGN. SURFACE OBS.;
119,270,10000Z,   16Z   03  08  81 ;
825,657,100002,,,0,00000,,72,.....;
780,703,100002,,,0,31008,,71,.....;
818,670,100002,,,0,00000,,70,.....;
802,682,100002,,,M,.........;
851,690,100002,,,0,04005,,62,.....;
780,771,100002,,,M,.........;
843,658,100002,,,0,00000,,68,.....;
783,689,100002,,,0,01011,,75,.....;
840,677,100002,,,0,24004,,68,.....;
804,793,100002,,,8,18004,,58,.....;
793,758,100002,,,M,.........;
805,671,100002,,,0,25012,.......;
968,664,100002,,,0,10004,,70,.....;
884,663,100002,,,M,23003,,63,.....;
906,709,100002,,,0,27001,,71,.....;
949,668,100002,,,3,29007,,70,.....;
979,625,100002,,,0,35009,,71,.....;
966,703,100002,,,0,14003,,77,.....;
875,689,100002,,,0,00000,,62,.....;

962,629,100002,,,0,11005,,73,.....;
909,667,100002,,,0,33010,,69,.....;
914,673,100002,,,0,00000,,72,.....;
901,638,100002,,,6,29007,,72,.....;
935,641,100002,,,0,12005,,72,.....;
942,713,100002,,,3,06003,,72,.....;
924,694,100002,,,0,00000,,73,.....;
954,560,100002,,,0,36005,,69,.....;
921,586,100002,,,M,.........;
937,561,100002,,,M,.........;
1009,11353,100002,,,0,18005,,81,.....;
958,532,100002,,,0,00000,,68,.....;
939,577,100002,,,3,32007,,77,.....;
980,589,100002,,,3,33004,,82,.....;
981,566,100002,,,0,18005,,75,.....;
978,590,100002,,,0,01009,,82,.....;
919,526,100002,,,0,00000,,73,.....;
938,588,100002,,,0,00000,,70,.....;
973,611,100002,,,0,07005,,81,.....;
980,563,100002,,,3,00000,,77,.....;
906,576,100002,,,3,13010,,81,.....;
937,561,100002,,,3,00000,,65,.....;
933,609,100002,,,0,00000,,72,.....;
```

b) Temperature only.

Figure 4: Examples of the plot files output by the enhanced plotter.

```
C*************************************************************************
C
C       PLOTGEN.FR
C
C WESTERN REGION SAO PLOT-FILE GENERATOR.  THIS PROGRAM READS THE SAODATA
C FILE GENERZATED BY THE SAO-DECODER AND THE SAOXXX FILE CONTAINING
C THE SWITCH INFORMATION.  AN OUTPUT PLOT FILE NMCPLTSAO IS GENERATED.
C-------------------------------------------------------------------------
C       NECESSARY SUBROUTINES.
C               BNSCH - BINARY SEARCH ROUTINE TO LOCATE STATIONS IN STATION
C                       DIRECTORY FILE.
C               WW    - WEATHER SYMBOL GENERATING SUBROUTINE.  GENERATES
C                       SYNOPTIC CODE AND THE CORRECT CODE WORD IN ASCII.
C               CT    - CLOUD TYPE SUBROUTINE CREATES PACKED ASCII CLOUD
C                       TYPE CODE WITH A TRAILING COMMA.
C               VV    - VISIBILITY GENERATOR. CONVERTS INTEGER TO ASCII WITH
C                       TRAILING COMMA.
C               MASC  - CONVERTS ANY POS INTEGER LESS THAN 100 TO ASCII.
C               MSND  - CONVERTS ANY SIGNED INTEGER INTO AN ASCII STRING
C                       WITH A TRAILING COMMA.
C               OUTPUT- OUTPUT AN ASCII STRING WITH THE SELECTED
C                       TRAILER. OPTIONS ARE ",", ";", OR NOTHING.
C-------------------------------------------------------------------------
C       DATA SET USAGE.
C               SAOXXX   - SWITCH FILE GENERATED BY EITHER SAODEC OR PLTSELECT.
C               SAODATA  - FORMATTED SURFACE DATA FILE GENERATED BY THE
C                          SAO-DECODER.
C               STDIR.MS - STATION INFORMATION FILE.
C-------------------------------------------------------------------------
C       SWITCHES USED BY PLTGEN, ENTERED IN EITHER PLTSELECT OR SAO-DECODER.
C               /B - BACKGROUND SWITCH.
C                       LOCATION: WORD SIX IN SAOXXX.
C                       POSSIBLE VALUES:
C                               2 - NORTH AMERICAN BACKGROUND.
C                               3 - UNITED STATES BACKGROUND.
C               /P - PLOTTING SWITCH.
C                       LOCATION: WORDS 9-13 IN SAOXXX.
C                       POSSIBLE VALUES:
C                               Q - ALL PARAMETERS WITH PRESSURE (DEFAULT).
C                               B - ALL PARAMETERS WITH ALTIMITER.
C                               A - ALTIMETER ONLY.
C                               P - PRESSURE ONLY.
C                               T - TEMPERATURE ONLY.
C                               D - DEWPOINT ONLY.
C                               C - PRESSURE TENDENCY ONLY.
C                               W - WIND DIRECTION AND SPEED BARBS.
C       NOTE: ALL SINGLE PARAMETER PLOTS INCLUDE THE WIND DIRECTION AND SPEED
C             AND SKY COVER.
C-------------------------------------------------------------------------
C       ANDREW J. SPRY
C       WESTERN REGION SSD
C       6/23/81
C-------------------------------------------------------------------------
C       PARAMETERS NECESSARY FOR USE OF STATION DIRECTORY FILE STDIR.MS
C       PARAMETER NR                    ; NUMBER OF RECORDS IN STDIR.MS
C       PARAMETER LR                    ; LENGTH OF EACH RECORD IN BYTES.
C       PARAMETER IS                    ; STARTING POINT OF FIRST RECORD.
        PARAMETER IFLDP=1               ; POINTER TO FIELD IN EACH RECORD.
        PARAMETER IFLD=6                ; SIZE IN BYTES OF THE TARGET FIELD.
C*************************************************************************
```

```
      INTEGER BS,SW(8),IBUF(48),ITEST(3),IC1(33),FLAG,IPAR(3)
      INTEGER IAD(2),MP(5),IEND(4),PSOWD(4),INA(10)
C
      COMMON  /OUT/ INA,IPAR
      COMMON  /ONE/ IBUF,IC1,IEND,PSOWD
      COMMON  /SWTCHS/ SW
C
      EQUIVALENCE     (IPAR,NR),(IPAR(2),LR),(IPAR(3),IS)
C
      DATA IBUF/"NMCPLTSA0000",177777K,177777K,2400K,142600K/
      DATA IBUF(11)/"NMCPLTSA000101000204815364050180O+0750+3000 "/
      DATA IBUF(33)/0,0,0,0,"0000",6412K,"119,290,10000Z,SA0"/
      DATA IC1/" W. RGN. SURFACE OBS.;",6412K/
      DATA IC1(13)/"119,270,10000Z,     Z               ;",6412K/
      DATA INA/"6285014250097501688 "/
      DATA IEND/5105K,"ND",142400K,203K/
      DATA PSOWD/"    02,,"/
C
C OPEN THE SWITCH FILE SAOXXX AND READ IN THE SWITCH INFORMATION.
      CALL    GCHN(ICHN,IER)
      CALL    OPENN(ICHN,"SAOXXX",0,IER)
      N=16
      CALL    RDS(ICHN,SW,N,IER)
      BS=SW(6)                ; SAVE THE BACKGROUND NUMBER.
      CALL    RDS(ICHN,SW,N,IER)
      CALL    KLOSE(ICHN,IER)
C
C DETERMINE IF THIS IS A SINGLE PARAMETER PLOT. IF SO "FLAG" IS GREATER THAN
C TWO.
      FLAG=0
      DO 99 MM=1,5
      IF(SW(MM).GT.0) FLAG=FLAG+1
99    CONTINUE
C
C OPEN THE FILES GP., SAODATA, AND STDIR.
      CALL DFILW("GP.",IER)
      CALL CFILW("GP.",2,IER)
      CALL GCHN(LCHN,IER)
      CALL OPENN(LCHN,"GP.",0,IER)
      CALL GCHN(ICHN,IER)
      CALL OPENN(ICHN,"SAODATA",0,IER)
      CALL GCHN(KCHN,IER)
      CALL OPENN(KCHN,"STDIR.MS",0,IER)
C
C READ IN THE FIRST THREE PARAMETERS FOR THE STDIR.MC FILES.
      NBYTES=6
      CALL    RDS(KCHN,IPAR,NBYTES,IER)
      IAD(1)=0
      IAD(2)=0
      CALL    SPOS(KCHN,IAD,IER)      ; RESET POINTER TO START.
C
C READ IN TIME, COMPLETE HEADER (AFOS) AND LEGEND.
      NBYTES=8
      CALL RDS(ICHN,MP,NBYTES,IER)
      CALL ERROR(IER,"5")
```

```
C MOVE THE TIME AND DATE TO IBUF AND CONVERT TO ASCII ( NOTE: THIS PUTS
C IT DIRECTLY IN THE AFOS HEADER).
        IBUF(33)=MP(4)/100
        IBUF(34)=MP(2)
        IBUF(35)=MP(1)
        IBUF(36)=MP(3)
        IF(IBUF(33).EQ.24) IBUF(33)=0
        CALL MASC(IBUF(33),4)
C COPY TIME TO PRODUCT LEGEND.
        IC1(22)=IBUF(33)
        IC1(25)=IBUF(34)
        IC1(27)=IBUF(35)
        IC1(29)=IBUF(36)
C USE SWITCH TO SELECT THE CORRECT BACKGROUND.
        MB=10
        IF(BS.EQ.3) GO TO 3
C FOR NORTH AMERICAN BACKGROUND THE IBUF NEEDS TO BE UPDATED WITH INA.
                MB=8
                IBUF(17)="02"
        DO 2 M=1,10
        IBUF(M+22)=INA(M)
2       CONTINUE
3       CALL WRS(LCHN,IBUF,63,IER)
        CALL WRS(LCHN,IBUF(33),94,IER)
C
C DO EACH LINE OF GP FILE IN A LOOP.
        DO 1 I=1,300
        NBYTES=96
C
C READ IN A RECORD FROM SAODATA (LENGTH IS 48 WORDS.)
        CALL RDS(ICHN,IBUF,NBYTES,IER)
        IF(IER.NE.1) GO TO 50
        CALL ERROR(IER,"6")
        IF(IBUF(3).EQ.1)GO TO 4
        IF(IBUF(3).LT.5.OR.IBUF(3).EQ.7) GO TO 1        ; UNRECOVERABLE ERRORS.
C
C ENCODE THE CURRENT WEATHER NOW AND GET THE PROPER PSOWD.
C*****************************************************************
C*****************************************************************
        IF(IBUF(3).EQ.6) IBUF(27)=20040K        ; WEATHER IS BAD.
4       IF(IBUF(27).EQ."LR".AND.IBUF(26).EQ." C") IBUF(27)="  ";FIX FOR DEC.
        IF(IBUF(27).EQ."CT".AND.IBUF(26).EQ." S") IBUF(27)="  ";FIX FOR DEC.
C******** NOTE: NO FIX IS NEEDED FOR OVC SINCE WW WILL NOT INTERPERET IT
C******** AS WEATHER.*************************************************
C*****************************************************************
C*****************************************************************
        CALL WW(IBUF(23),MM,PSOWD)
C****************** CHANGES NECESSARY FOR MODELUGF   IN SINGLE PARAMETER
C***************** MODE AND BACKGROUND CHANGES.*****************************
        IF(IBUF(23).NE."05") GOTO 5
        IBUF(23)="5,"                   ; CHANGE THE HAZE.
        MM=MM-1
        PSOWD(1)="10"
        PSOWD(2)="01"
5       IF(BS-3)        7,8,7           ; CHECK FOR LOWER THRES. FOR N.AM.
7       IF(FLAG.LT.3.AND.PSOWD(1).NE."00") PSOWD(1)="10"        ; FOR N.
                                        ; AM. DEFAULT ZOOM IS 1 TO 1.
C*****************************************************************
```

```
C*******************************************************************************
C
C USE BNSH TO LOCATE THE X,Y COORDINATES OF STATION, LOCATE THEM,
C CONVERT TO ASCII THEN WRITE THEM TO CP.
8       IBUF(3)=20040K
        CALL BNSCH(KCHN,NR,LR,IS,IFLDP,IFLD,IBUF,IAD,IC1,IC1(12),IC1(23),IC)
        IF(IC.EQ.0)GO TO 1
        IC=(IC-1)*11+MB
        MP(1)=IC1(IC)
        MP(3)=IC1(IC+1)
        CALL MSND(MP,N)
        CALL OUTPUT(LCHN,MP,N,0,IER)
        CALL MSND(MP(3),N)
        CALL OUTPUT(LCHN,MP(3),N,0,IER)
C
C PUT FLAG/INDICATOR GROUP AND STATION NAME IN GP.
        CALL OUTPUT(LCHN,PSOWD,8,0,IER)
        N=3
        IF(BS.EQ.2) N=0          ; FOR N. AM. NO ID IS INCLUDED.
        CALL OUTPUT(LCHN,IBUF,N,1,IER)
C
C FIND CLOUD COVER AMOUNT AND PUT IN GP.
        N=115K
        IF(IBUF(9).EQ.103K) N=60K
        IF(IBUF(9).EQ.123K) N=63K
        IF(IBUF(9).EQ.102K) N=66K
        IF(IBUF(9).EQ.117K) N=70K
        IF(IBUF(9).EQ.130K) N=71K
        N=ISHFT(N,8)+54K
        CALL OUTPUT(LCHN,N,2,0,IER)
C
C GENERATE WIND SPEED AND DIRECTION GROUP, PUT INTO GP.
        IND=1
        IF((IBUF(32).GE.0).AND.(IBUF(33).GE.0)) GO TO 13
                N=0
                GO TO 12
13      IDIR=IBUF(32)
        ISPD=IBUF(33)*10
        MP(1)=IDIR/10
        MP(2)=ISPD/100
        MP(3)=ISPD-MP(2)*100
        N=5
        CALL MASC(MP,3)
12      CALL OUTPUT(LCHN,MP,N,IND,IER)
C
C GENERATE LAST THREE DIGITS OF PRESSURE IN ASCII AND PUT IN GP.
        IF(SW(1)) 54,53,52
52      MP(1)=9000                      ; PRESSURE.
        N=28
        GO TO 14
53      MP(1)=2000                      ; ALTIMETER.
        N=35
14      IF(IBUF(N).GT.0) GO TO 55
54              N=0     ; NONE.
                GO TO 56
```

```
55      MP(3)=IBUF(N)-MP(1)
        IF(MP(3).GE.1000)MP(3)=MP(3)-1000
        MP(1)=MP(3)/10
        MP(2)=(MP(3)-MP(1)*10)*10
        CALL MASC(MP,2)
        N=3
56      CALL OUTPUT(LCHN,MP,N,IND,IER)
C
C GET TEMPERATURE AND DEWPOINT IN ASCII AND PUT IN GP.
        IND=0
        IF(IBUF(29).NE.-99.AND.SW(2).NE.0) GO TO 57
                MP(1)=",,"
                N=1
                GO TO 59
57      MP(1)=IBUF(29)
        CALL MSND(MP,N)
59      CALL OUTPUT(LCHN,MP,N,IND,IER)
        IF(IBUF(30).NE.-99.AND.SW(3).NE.0) GO TO 58
                MP(1)=26000K
                N=1
                GO TO 60
58      MP(1)=IBUF(30)
        CALL MSND(MP,N)
60      CALL OUTPUT(LCHN,MP,N,IND,IER)
C
C WRITE THE WEATHER NOW, INCLUDES A "," FOR VISIBILITY.
        CALL OUTPUT(LCHN,IBUF(23),MM,IND,IER)
        IF(SW(4).EQ.1) GO TO 100
C
C GET TENDENCY AND TRACE.
        IF(SW(5).EQ.0) GO TO 69
        IF((IBUF(42).NE.-99).AND.(IBUF(41).NE.-99)) GO TO 70
69              IBUF(41)=",,"
                N=2
                GO TO 76
70      MP(1)=IBUF(42)
        CALL MSND(MP(1),N)
        CALL OUTPUT(LCHN,MP(1),N,IND,IER)
        IBUF(41)=(IBUF(41)*400K)+30054K
76      CALL OUTPUT(LCHN,IBUF(41),2,IND,IER)
C
C ENCODE THE CLOUD TYPE WITH CT.
        IF(FLAG.LT.3) GO TO 100
        CALL CT(IBUF(44),N)
        CALL OUTPUT(LCHN,IBUF(44),N,IND,IER)
C
C PRECIP AMOUNT.
        IND=-1          ; INDICATES  A ;<CR><LF>.
        IF(IBUF(43).LT.0) GO TO 79
        MP(1)=IBUF(43)
        CALL MSND(MP,N)
        CALL OUTPUT(LCHN,MP,N,IND,IER)
        GO TO 1
C
```

```
C PUT THE VISIBILITY IN THE COMMENT FEILD.
79      CALL OUTPUT(LCHN,MP,0,1,IER)
        IF(IBUF(34).GT.0) GO TO 71      ; GUSTS HAVE PRIORITY
        CALL VV(IBUF(21),MP,N)
        CALL OUTPUT(LCHN,MP,N,IND,IER)
        GO TO 1
C
C PUT GUSTS IN COMMENT FIELD (IF AVAILABLE).
71      MP(1)=43400K
        CALL MSND(IBUF(34),N)
        MP(1)=MP(1)+ISHFT(IBUF(34),-8)
        MP(2)=ISHFT(IBUF(34),8)
        N=3
        CALL OUTPUT(LCHN,MP,N,IND,IER)
        GO TO 1
C
C END LINE WITH ;<CR><LF>.
100     CALL OUTPUT (LCHN,MP,0,-1,IER)
C
C
 1      CONTINUE
 50     CONTINUE
C
C WRITE THE END OF FILE AND CLOSE THE FILES.
        CALL WRS(LCHN,IEND,8,IER)
        CALL KLOSE(LCHN,IER)
        CALL KLOSE(ICHN,IER)
        CALL KLOSE(KCHN,IER)
        CALL FSTORE('GP.',0,IER)
        CALL FORKP('SAO','NMCPLTSAO',IER)
        STOP
        END
```

```
C     PROGRAM: PLTSELECT  6/26/81  ANDERSON  WRH/SSD
C     ALLOWS THE INPUT OF SWITCHES TO PLOTGEN WITHOUT THE RUNNING
C     OF THE SAODECODER.
C
C     B SWITCH (MAP BACKGROUND):
C        2- N. AMERICAN
C        3- U.S. (DEFAULT)
C     P SWITCH
C        Q- ALL WITH PRESSURE (DEFAULT)
C        B- ALL WITH ALTIMETER SETTING
C        A- ALTIMETER SETTING
C        P- PRESSURE
C        C- PRESSURE TENDENCY
C        W- WINDS
C        D- DEW POINT
C        T- TEMPERATURE
C
C     VARIABLES:
C        IBUF- INPUT--OUTPUT ARRAY
C        IPS- SWITCH P VALUE ARRAY
C        KPS- ASCII VALUES FOR SWITCH P SEARCH
        DIMENSION IBUF(15),IDAT(7),JBUF(14),ISW(2),IPS(5),KPS(5)
        EXTERNAL ISWSET
        COMMON/FOUR/KPS,IPS
        DATA KPS/80,84,68,87,67/
        DATA IPS/1,1,1,0,1/
```

```
C
        N=30
        CALL GCHN(ICHN,IER)
        CALL ERROR(IER,"ERROR GETTING CHANNEL")
        CALL OPENN(ICHN,'SAOXXX',0,IER)
        IF(IER.EQ.13)GO TO 10
        CALL ERROR(IER,"ERR OPENNING FILE")
        CALL RDS(ICHN,IBUF,N,IER)
        CALL ERROR(IER,"ERR READING SAOXXX")
        CALL KLOSE(ICHN,IER)
        CALL ERROR(IER,"ERR KLOSING ICHN")
        GO TO 20
C     CREATING SAOXXX FOR NONEXISTENT FILE
 10     CALL CREAT('SAOXXX',IER)
        CALL ERROR(IER,"ERR CREATING SAOXXX")
C     READ SWITCHES
 20     CALL FCOM(IC,IER)
 40     CALL COMCM(IC,IDAT,NN,ISW,IER)
        IF(IER.EQ.9)GO TO 50
        CALL UNPACK(IDAT,NN,JBUF)
        IF(ISWSET(ISW,"B"))GO TO 60
        IF(ISWSET(ISW,"P"))GO TO 70
        GO TO 40
C     P SWITCH DECISIONS
 70     IF(JBUF(1).EQ.81)GO TO 40
        IF(JBUF(1).NE.66)GO TO 80
        IPS(1)=0
        GO TO 40
 80     DO 90 LJI=2,5
        IPS(LJI)=0
 90     CONTINUE
        IPS(1)=-1
        IF(JBUF(1).EQ.65)IPS(1)=0
        DO 100 MM=1,5
        IF(JBUF(1).EQ.KPS(MM))IPS(MM)=1
 100    CONTINUE
        GO TO 40
C     B SWITCH
 60     IF(IBUF(6).NE.0)IBUF(6)=JBUF(1)-43
        GO TO 40
 50     IF(IBUF(6).NE.2)IBUF(6)=3
        DO 110 LJI=1,5
 110    IBUF(LJI+8)=IPS(LJI)
C     OUTPUT
        CALL DELETE('SAOXXX',IER)
        CALL CREATE('SAOXXX',IER)
        CALL GCHN(ICHN,IER)
        CALL ERROR(IER,"ERR GETTING CHANNEL")
        CALL OPENN(ICHN,'SAOXXX',0,IER)
        CALL ERROR(IER,"ERR OPENNING SAOXXX")
        CALL WRS(ICHN,IBUF,N,IER)
        CALL ERROR(IER,"WRS ERR")
        CALL KLOSE(ICHN,IER)
        CALL ERROR(IER,"ERR KLOSING SAOXXX")
        CALL FCHAN("PLTGEN.SV")
        STOP
        END
```

```
C       SUBROUTINE VV.FR
        SUBROUTINE VV(IVV,MP,N)
        DIMENSION MP(3)
C
C GET THE VISIBILITY IN TENTHS OF MILES.
        IF(IVV.EQ.-99) GO TO 100        ; MISSING.
        IF(IVV.GT.0) GO TO 3
        IDIS=-1*IVV/100                 ; NEG IS IN THOUSANDS OF MILES.
        GO TO 4
3       IDIS=IVV*10
C DETERMINE IF THE VISIBILITY EXCEEDS 10KM.
4       IF(IDIS.GE.800) IDIS=990
        M=IDIS/10
        IF(M.LT.10) GO TO 7             ; VISIBILITY IN TENTHS OF KM.
C THE VISIBILITY IS GREATER THAN TEN KM.
        M=IDIS/100                      ; THE TENS DIGIT.
        N=3
        MP(1)=(IDIS-M*100)/10   ; THE ONES DIGIT.
        MP(1)=MP(1)+ISHFT(M,8)+30060K   ; CONVERT TO ASCII.
        MP(2)=20000K                    ; ADD THE SPACE.
        RETURN
C THE VISIBILITY IS LESS THAN TEN KM.
7       MP(1)=IDIS
        CALL MSND(MP(1),N)
        MP(2)=ISHFT(MP(1),8)+40K
        MP(1)=MP(1)-ISHFT(MP(2),-8)+56K
        N=4
        RETURN
100     N=0
        RETURN
        END
```

```
        SUBROUTINE CT(MNT,N)
        DIMENSION MNT(3)

        IF(MNT(1).NE.40K) GO TO 3
        IF((MNT(2).NE.40K).OR.(MNT(3).NE.40K)) GO TO 3
        MNT(1)=26000K
        N=1
        RETURN
        MNT(1)=ISHFT(MNT(1),8)+MNT(2)
        MNT(2)=ISHFT(MNT(3),8)+54K
        N=4
        RETURN
        END
```

```
      SUBROUTINE BNSCH(ICHN,NREC,LREC,ISTAR,IFLDP,IFLD,ITEST,
     1   IAD,IC1,IC2,IC3,IC)
C     BINARY SEARCH ROUTINE:
C
C     PROGRAMMER - RICH THOMAS SXB,ISL,SDO 11/79
C
C     ICHN=CHANNEL WHICH FILE HAS BEEN OPENNED TO
C     NREC=NUMBER OF RECORDS
C     LREC=LENGTH OF EACH RECORD (BYTES)
C     ISTAR=BYTE OF FIRST RECORD (0=BEGINNING)
C     IFLDP=WORD POINTER TO FIELD IN RECORD
C     IFLD=LENGTH OF FIELD IN BYTES
C     ITEST=ARRAY CONTAINING TEST FIELD
C     IAD=RETURNED TWO WORD ARRAY CONTAINING ADDRESS ITEST RECORD
C       SHOULD BEGIN AT-
C       IC= 1,2,3 IN SECOND WORD INDICATING RECORD WAS FOUND AND
C       IS IN ARRAY IC1,IC2, OR IC3
C     THOSE THREE ARRAYS SHOULD BE DIMENSIONED LREC/2 WORDS
      DIMENSION ITEST(1),IC1(1),IC2(1),IC3(1),IAD(2)
      DIMENSION IAD1(2),IAD2(2),IAD3(2)
      DIMENSION D1(2),D2(2)
      INTEGER D1,D2
      IC=0
      IAD1(1)=0
      IAD1(2)=ISTAR
      CALL SPOS(ICHN,IAD1,IER)
      CALL ERROR(IER,'I1')
      CALL RDS(ICHN,IC1,LREC,IER)
      CALL ERROR(IER,'RDS - IC1')
      D2(1)=0
      D2(2)=LREC
      CALL DSUB(D2,D2,IAD1)
      CALL DMPY(D1,NREC,LREC)
      CALL DSUB(IAD2,D1,D2)
      CALL SPOS(ICHN,IAD2,IER)
      CALL ERROR(IER,'I2')
      CALL RDS(ICHN,IC2,LREC,IER)
      CALL ERROR(IER,'RDS-IC2')
      CALL BCOMP(IC1(IFLDP),ITEST,IFLD,IER1)
      IF(IER1.GT.1)GO TO 100
      CALL BCOMP(IC2(IFLDP),ITEST,IFLD,IER2)
      IF(IER2.NE.2)GO TO 125
```

```
  5 CALL DSUB(D1,IAD2,IAD1)
    CALL DDVD(INC,IR,D1,LREC)
    IF(INC.GE.32767)GO TO 900
    IF(INC.LT.1)GO TO 150
    INC=(INC-1)/241
    CALL DMPY(D1,INC,LREC)
    CALL DADD(IAD3,IAD1,D1)
    CALL SPOS(ICHN,IAD3,IER)
    CALL ERROR(IER,'I5')
    CALL RDS(ICHN,IC3,LREC,IER)
    CALL ERROR(IER,'I6')
    CALL BCOMP(IC3(IFLDF),ITEST,IFLD,IER3)
    IF(IER3.EQ.1)GO TO 50
    IF(IER3.EQ.2)GO TO 60
    IF(IER3.NE.3)GO TO 900
    IAD(1)=IAD3(1)
    IAD(2)=IAD3(2)
    IC=3
    RETURN
 50 IAD1(1)=IAD3(1)
    IAD1(2)=IAD3(2)
    GO TO 5
 60 IAD2(1)=IAD3(1)
    IAD2(2)=IAD3(2)
    IF(INC.EQ.1)GO TO 150
    GO TO 5
100 IAD(1)=IAD1(1)
    IAD(2)=IAD1(2)
    IF(IER1.NE.3)GO TO 101
    IC=1
    IAD(1)=IAD1(1)
    IAD(2)=IAD1(2)
101 RETURN
125 D1(1)=0
    D1(2)=LREC
    CALL DADD(IAD,D1,IAD2)
    IF(IER2.NE.3)GO TO 126
    IAD(1)=IAD2(1)
    IAD(2)=IAD2(2)
    IC=2
126 RETURN
150 IAD(1)=IAD3(1)
    IAD(2)=IAD3(2)
    RETURN
900 CALL ERROR(IER3,'IER3')
    IER=2
    CALL ERROR(IER,'TOO MANY RECORDS IN FILE')
    STOP
    END
```

```
C*************************************************************************
C
C       OUTPUT.FR
C
C OUTPUT IS A UTILITY SUBROUTINE FOR USE BY PLOTGEN.  IT OUTPUTS THE
C INDIVIDUAL ASCII FIELDS TO THE FILE WITH THE DESIRED TRAILING CHARACTER.
C THE CHOICE OF ",", ";", OR NOTHING IS SELECTED BY AN INDICATOR FLAG.
C-------------------------------------------------------------------------
C                           ARGUMENTS
C       ICHN   -  CHANNEL NUMBER TO OUTPUT FILE.
C       IBUF   -  ARRAY CONTAINING THE STRING.
C       N      -  LENGTH OF STRING IN BYTES.
C       IND    -  INDICATOR FLAG.
C       IER    -  ERROR RETURN.
C-------------------------------------------------------------------------
C                           FLAG VALUES
C       IND = -1   - ADD A SEMI COLEN ";".
C           =  0   - ADD NOTHING.
C           =  1   - ADD A COMMA ",".
C-------------------------------------------------------------------------
C       ANDREW J. SPRY
C       WESTERN REGION SSD
C       6/23/81
C*************************************************************************
        SUBROUTINE OUTPUT(ICHN,IBUF,N,IND,IER)
C
        DIMENSION IBUF(1),ISEMI(2)
C
        COMMON  /ENDOF/  ISEMI
C
        DATA    ISEMI/35415K,5000K/
C
C CHECK THE TRAILER AFTER OUTPUTOING STRING.
        IF(N.EQ.0) GO TO 5
        M=N
        CALL    WRS(ICHN,IBUF,M,IER)
5       IF(IND) 10 ,30,20
10      M=3
        CALL    WRS(ICHN,ISEMI,M,IER)
        GO TO 30
20      M=1
        CALL    WRS(ICHN,",",M,IER)
30      RETURN
        END
```

```
TYPE WW.SR
        .TITL   WW
        .ENT    WW
        .EXTD   .CPYL,.FRET
        .TXTM   1
        .NREL
;
        IB=-167
        N=-166
        PSOWD=-165
        FS.=3
        FS.
;
; GET ADDRESS OF STRING.
WW:     JSR     @.CPYL
        SUB     0,0
        ESTA    0,TMP                   ; GET RID OF OLD VALUE.
        ADI     2,0
        STA     0,@N,3
        ESTA    0,CNT

        LDA     2,PSOWD,3
        LDA     0,A20                   ; PUT IN DEFAULT VALUES FOR NO WX.
        STA     0,0,2
        LDA     0,A00
        STA     0,1,2
        LDA     0,IB,3                  ; GET ADDRESS.
        ADI     4,0                     ; ADDRESS OF END OF STRING.
        MOVOL   0,3                     ; MAKE IT A BYTE POINTER.
        ELDA    2,.10                   ; SIZE OF STRING.

        ESTA    2,CNT                   ; SET UP COUNTER.

ENC:    LDB     3,2                     ; GET A CHARACTER.
        SBI     1,3                     ; MOVE POINTER.
        ELDA    0,SPACE                 ; IS IT A SPACE???

        SUB#    2,0,SNR
        JMP     @ADRF
        LDA     1,.3                    ; MODERATE DEFAULT.
        ELDA    0,MINUS                 ; CHECK FOR LIGHT.

        SUB#    0,2,SZR
        JMP     PLUS                    ; NO MATCH.
        LDA     1,.1                    ; VALUE FOR LIGHT.
        JMP     STUP
ADRF:   FINI
PLUS:   SBI     2,0                     ; CHECK FOR HEAVY.
        SUB#    0,2,SZR
        JMP     MAIN                    ; NO MATCH
        LDA     1,.5                    ;VALUE FOR HEAVY.
STUP:   DSZ     CNT
        LDB     3,2
        SBI     1,3                     ; MOVE POINTER.
MAIN:   LDA     0,HAZE                  ; HAZE CHECK.
        SUB#    0,2,SNR
        JMP     HZE                     ; GO TO HAXE TREATMENT.
        LDA     0,FOG                   ; CHECK FOR FOG.
        SUB#    0,2,SNR
        JMP     FILL                    ; TREATMENT FOR FOG.
        LDA     0,.50                   ; VALUE FOR DRIZZLE.
```

```
        ADD     0,1                     ; SUM ON THE + OR -.
        LDA     0,DRZL                  ; CHECK FOR DRIZZLE.
        SUB#    0,2,SNR
        JMP     CHKZ                    ; CHECK FOR FREEZING!!!!!!!
        ADDI    10.,1                   ; VALUE FOR RAIN.
        LDA     0,RAIN                  ; CHECK FOR RAIN.
        SUB#    0,2,SNR
        JMP     CHKZ                    ; CHECK FOR FREEZING.
        ADDI    10.,1
        LDA     0,SNOW
        SUB#    0,2,SNR
        JMP     COMP
        LDA     0,SHW                   ; CHECK FOR SHOWERS.
        SUB#    0,2,SNR
        JMP     W                       ; GO TO SHOWER TREATMENT.
        LDA     0,TRW                   ; CHECK FOR THUNDER.
        SUB#    0,2,SNR
        JMP     TRC                     ; THUNDER TREATMENT.
        SUB     1,1
        DSZ     CNT
        JMP     ENC
        JMP     FINI
CHKZ:   DSZ     CNT
        JMP     OK
        JMP     COMP            ; LAST ONE GO COMPARE.
OK:     LDB     3,2             ; GET THE CHARACTER TO SEE.
        LDA     0,FZN           ; GET A Z FOR COMPARISON.
        SUB#    0,2,SZR
        JMP     COMP
        SBI     1,3             ; NEXT CHARACTER.
        SUB     0,0
        LDA     2,.10
        DIV
        STA     0,HOLD                  ; SAVE THE "+OR-".
        LDA     0,.6                    ; OFFSET OF FROZEN.
        MUL
        LDA     0,HOLD                  ; GET THE "+OR-".
        LDA     2,.1                    ; VALUEFOR LIGHT.
        SUB#    0,2,SZR                 ; DON'T INCREMENT IF LIGHT.
        INC     1,1
        JMP     COMP                    ; GO COMPARE.
FILL:   LDA     1,.45
        JMP     COMP
HZE:    LDA     1,.5
        JMP     COMP
TRC:    SUB     0,0                     ; THUNDERSTORM HANDLER.
        SUB     0,0
        LDA     2,.10                   ; FIND INTENSITY.
        DIV
        LDA     1,.5
        SUB#    0,1,SZR
        JMP     LT
        LDA     1,.97
        JMP     COMP
LT:     LDA     1,.95
        JMP     COMP
```

```
W:      DSZ     CNT
        JMP     NXT
        JMP     COMP
NXT:    LDA     2,.10
        SUB     0,0
        DIV
        LDA     1,.1                    ; IS IT LIGHT.
        LDA     2,.80
        SUB#    0,1,SZR                 ; IF NOT MODIFY.
        INC     2,2
        MOV     2,1
        LDB     3,2                     ; IS IT SNOW OR RAIN.
        SBI     1,3                     ; MOVE POINTER.
        LDA     0,SNOW                  ; CHECK FOR SNOW.
        SUB#    0,2,SZR
        JMP     COMP
        ADDI    5,1                     ; MODIFY.

        JMP     COMP
COMP:   LDA     0,TMP
        SUBZ#   0,1,SZC
        STA     1,TMP                   ; HOLD IT
        DSZ     CNT
        JMP     ENC
        JMP     FINI
; DATA AREA.
A00:    .TXT    "00"

A20:    .TXT    "20"

CNT:    0
.1:     1
.2:     2
.3:     3
.4:     4
.5:     5
.6:     6.
.10:    10.
.45:    45.
.25:    25.
.50:    50.
.80:    80.
.95:    95.
.97:    97.
```

```
SPACE:  40
MINUS:  55
HAZE:   110
FOG:    106
DRZL:   114
RAIN:   122
SNOW:   123
TRW:    124
FZN:    132
SHW:    127
CON:    30060
COMMA:  26054
HOLD:   0
TMP:    0
OWF:    .
        2
        0
        3
        0
        4
        2
        2
FINI:   LDA     3,USP
        LDA     2,IB,3
        LDA     1,COMMA
        STA     1,0,2
        LDA     1,TMP
        SUB     0,0
        SUB#    1,0,SNR
        JMP     DONE
        LDA     2,.10                   ; VALUE FOR DIVIDE.
        LDA     0,.50
        SUBZ#   0,1,SNC
        JMP     C1                      ; LESS THAN 50 IS EASY.
        LDA     0,.80
        SUBZ#   0,1,SNC
        JMP     C2                      ; BETWEEN 50 AND 80 USE TABLE.
L3:     LDA     0,.3                    ; THIS VALUE FOR >80.
        JMP     PS
C1:     LDA     0,.25
        SUB#    0,1,SNR                 ; 25 IS ONLY STAND OUT.
        JMP     L3
        LDA     0,.45
        SUB#    0,1,SNR
        JMP     L3
        ADI     3,1
        SUB     0,0
        DIV
        MOV     1,0                     ; USE QUOTENT FOR OW.
        JMP     PS
```

```
C2:     SUB     0,0
        DIV
        LDA     3,OWP                   ; POINTER FOR OW.
        ADD     0,3
        LDA     0,0,3
PS:     LDA     1,CON
        ADD     1,0
        STA     0,HOLD
        LDA     1,TMP                   ; GET VALUE AND FIND PS OF PSOWD.
        LDA     0,.1
        LDA     2,.10
        SUBZ#   2,1,SNC                 ; IS IT LESS THAN 10?
        LDA     0,.2
        LDA     2,.50
        SUBZ#   1,2,SNC                 ; IS IT GREATER THAN 50?
        SUB     0,0
        LDA     2,CON                   ; CONVERSION.
        ADDS    2,0
        LDA     3,USP                   ; GET STACK POINTER.
        LDA     2,PSOWD,3               ; ADDRESS OF ARRAY.
        STA     0,0,2
        LDA     0,HOLD
        STA     0,1,2
        LDA     1,TMP
        SUB     0,0
        LDA     2,.10                   ; DIVIDE FOR CONVERSION.
        DIV
        LDA     2,CON
        ADDS    2,1                     ; CONVERT AND SWAP BYTES.
        ADD     1,0
        LDA     2,.4                    ; NUMBER OF BYTES RETURNED.
        STA     2,@N,3
        LDA     2,IB,3
        STA     0,0,2
        LDA     1,COMMA
        STA     1,1,2
DONE:   JSR     @.FRET
        .END
```

```
        .TITL   MASC
        .ENT    MASC
        .EXTD   .CPYL,.FRET
        .NREL
;
        BUF=-167
        LEN=-166
        FS.=2
        FS.
;
; CONVERT A STRING OF INTEGER NUMBERS ( <100 EACH ) INTO A
; PACKED ASCII STRING.
MASC:   JSR     @.CPYL
        LDA     1,@LEN,3                ; GET # OF NUMBERS.
        STA     1,CNT                   ; PUT IT IN LOCAL MEMORY.
        LDA     1,BUF,3                 ; GET BUFFER ADDRESS.
        MOV     1,3                     ; PUT IT IN AC3.
LOOP:   LDA     1,0,3                   ; GET  A VALUE.
        SUB     0,0                     ; BE SURE AC0=0.
        LDA     2,.10                   ; DIVISOR = 10.
        DIV
        ADDI    60,0                    ; CONVERT TO ASCII.
        ADDI    60,1                    ;    "      "    ".
        MOVZL   3,2                     ; GET BYTE POINTER.
        STB     2,1                     ; BUT BYTE IN BUFFER.
        INC     2,2                     ; INCREMENT POINTER.
        STB     2,0                     ; BUT SECOND BYTE IN BUFFER.
        INC     3,3                     ; INCREMENT WORD POINTER.
        DSZ     CNT                     ; DECREMENT COUNTER.
        JMP     LOOP
        JSR     @.FRET
;
; DATA AREA.
.10:    10.
CNT:    0
        .END
        .TITL MSND
        .ENT    MSND
        .EXTD   .CPYL,.FRET
        .NREL
;
        IBUF=-167
        N=-166
        FS.=2
        FS.
;
; CONVERT A SIGNED INTEGER INTO A SIGNED ASCII STRING.
MSND:   JSR     @.CPYL
        LDA     1,@IBUF,3
        LDA     0,IBUF,3                ; GET ADDRESS OF BUFFER.
        SUB     2,2                     ; CLEAR AC2.
        STA     2,CNT                   ; PUT INTO COUNTER.
        STA     2,IS                    ; SKIP COUNTER.
        MOVZL   0,3                     ; MAKE AC3 A BYTE POINTER.
        STA     3,STAP                  ; PUT IN LOCAL MEMORY.
        MOVL#   1,1,SNC                 ; CHECK AC1 FOR SIGN,SKIP IF N
        JMP     POS
        NEG     1,1                     ; MAKE IT POSITIVE.
        LDA     2,MINUS                 ; GET THE SIGN IN AC2
        STB     3,2                     ; PUT SIGN IN BUFFER.
        ISZ     STAP                    ; INCREMENT THE BYTE POINTER.
        ISZ     CNT                     ; INCREMENT COUNTER.
POS:    LDA     3,WBUF                  ; SPACE FOR WORKING.
```

```
LOOP:   SUB     0,0                     ; CLEAR AC0.
        ISZ     IS                      ; INCREMENT IT FOR EACH DIGIT.
        LDA     2,.10                   ; DIVISOR IS 10.
        DIV
        STA     0,0,3                   ; STORE REMAINDER.
        INC     3,3                     ; INCREMAENT POINTER.
        SUBL#   2,1,SNC                 ; IS VALUE < 10?
        JMP     LOOP
        STA     1,0,3                   ; SAVE FINAL DIGIT.
        ISZ     IS                      ; INCREMENT THE COUNTER.
        LDA     1,STAP                  ; DESTINATION BYTE POINTER.
        LDA     2,.60                   ; GET CONVERSION.
LOOP1:  LDA     0,0,3                   ; GET WORD.
        ADD     2,0                     ; MAKE IT ASCII.
        STB     1,0                     ; STORE THE CHARACTER.
        INC     1,1                     ; INCREMENT POINTER.
        SBI     1,3                     ; DECREMENT SOURCE.
        ISZ     CNT                     ; INCREMENT COUNTER.
        DSZ     IS                      ; NOW DECREMENT IT!!!.
        JMP     LOOP1
        LDA     3,COMMA                 ; ADD A TRAILING COMMA.
        STB     1,3
        LDA     2,CNT                   ; GET COUNT IN AC2.
        INC     2,2                     ; COUNT THE COMMA.
        LDA     3,USP                   ; RESTORE STACK POINTER.
        STA     2,@N,3                  ; PUT VALUE IN ARGUMENT LIST.
        JSR     @.FRET
;
; DATA AREA.
.10:    10.
.60:    60
COMMA:  54
MINUS:  55
STAP:   0
CNT:    0
IS:     0
WBUF:   .+1
        .BLK 5
        .END
        .TITL   WW
        .ENT    WW
        .EXTD   .CPYL,.FRET
        .TXTM   1
        .NREL
;
        IB=-167
        N=-166
        PSOWD=-165
        FS.=3
        FS.
;
```

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