EVALUATION OF THE SATURATION RESISTANT CROSSWIND SENSOR.(U)

JUL 79 R RODRIGUEZ, W J VECHIONE

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EVALUATION OF THE SATURATION RESISTANT CROSSWIND SENSOR

July 1979

By
Ruben Rodriguez
William J. Vechione

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**Title:** Evaluation of the Saturation Resistant Crosswind Sensor

**Author:** Ruben Rodriguez and William J. Vecchiome

**Performing Organization:** Atmospheric Sciences Laboratory, White Sands Missile Range, NM 88002

**Central Office:** US Army Electronics Research and Development Command, Adelphi, MD 20783

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**ABSTRACT**

Integrated path crosswinds were measured at Biggs Optical Range, Biggs Army Airfield, Fort Bliss, Texas, during the period of 31 January to 8 March 1978 with the Saturation Resistant Crosswind Sensor, a bistatic system that measures crosswinds by detecting and analyzing the movement of atmospheric scintillations. Data collected with this sensor were compared to integrated path wind averages measured by the calibrated anemometer array. This report presents X-Y scatter plots, derived weighting functions, and wind measurement comparison plots. The results of the tests show that the major weighting (or...
20. ABSTRACT (cont)

A contribution of thermal turbulence to the system optics with a 500-m baseline is centered about 350 m from the receiver and approximates a slope intercept form \( Y = 0.85X - 10.02 \). With a 2,000-m baseline, the weighting function maximum is shifted to about 1400 m and approximates the slope intercept form \( Y = 1.57X - 0.43 \).
ACKNOWLEDGMENT

The authors thank Messrs. Glenn Hoidale, David Favier, and William Hatch of the Atmospheric Sensing Division and Messrs. John Hines and Charles White of the Meteorological Support Division for their assistance in manning the Meteorological Optical Measuring System and the Optical Range at Biggs Army Airfield, Fort Bliss, Texas, during the conduct of the test.
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INTRODUCTION

The state of the atmosphere affects tactical Army operations and the contributing weapons systems employment. To increase the friendly forces' relative combat power, meteorological parameters must be measured at the time and location of the action. An important parameter in atmospheric measurements, particularly for ballistic weapon employment, is the projectile's trajectory integrated path crosswinds.

The purpose of this report is to present the results of the evaluation of the Saturation Resistant Crosswind Sensor (SRCS), a sensor designed to measure average path crosswinds. This evaluation is based on comparative data taken during the test period of 31 January to 8 March 1978 at Biggs Optical Range (BOR), Biggs Army Airfield, Fort Bliss, Texas. Included as part of the report are daily weather summaries of atmospheric parameters prevailing at BOR.

The SRCS is an active optical system designed to measure the average crosswind along a path from the receiver to the transmitter. Although the SRCS was tested under actual field conditions, the evaluation tests were conducted cognizant that the SRCS is presently a research instrument and not yet intended for prolonged field use without proper reconfiguration.

This report presents results of collected data and an evaluation and analysis that determine the accuracy, reliability, and applicability of the SRCS.

This work was accomplished by personnel of the Atmospheric Sensing Division, Atmospheric Sciences Laboratory under DA Task 1L162111AH71A3.

INSTRUMENTATION REQUIREMENT

Crosswinds along a ballistic projectile trajectory contribute significantly to the total weapon error. Walters has shown that direct fire crosswind errors on representative armor projectiles are significantly greater than head and tail wind errors. To increase the first-round-hit probability, crosswinds must be accurately known immediately before firing. Knowledge and application of crosswind information to fire control systems can also increase the standoff range of friendly weapons without degrading weapon accuracy.

Several remote crosswind sensors have been developed in the recent past. Four systems were evaluated at BOR during the test period. The evaluation

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1D. L. Walters, 1975, "Crosswind Weighting Functions for Direct-Fire Projectiles," ECOM Report 5570, Atmospheric Sciences Laboratory, White Sands Missile Range, NM
results of the SRCS are presented in this report. The results of the other system evaluations are reported separately.2

The SRCS, an active bistatic sensor that measures weighted average cross-winds,3 can: (1) be used in research that may improve present wind measurement techniques, (2) aid in the characterization of the atmosphere, especially as related to high energy laser propagation effects, and (3) serve as a baseline system in evaluating and analyzing future wind measurement systems.

A previous experimental prototype of the SRCS4,5 proved the concept of operational feasibility, but was unable to operate under conditions of high integrated refractive index turbulence which can occur on clear sunny days with path lengths over 500 m and less than 10 m above ground. In 1977, an exploratory development prototype of the improved sensor was completed. This is the system evaluated and discussed here. The evaluation of this sensor will contribute to the necessary data base for continued future crosswind sensor development to satisfy stated tactical requirements.

SYSTEM DESCRIPTION

The SRCS consists of a transmitter and a receiver placed at opposite ends of the path to be measured. The transmitter consists of a 55 W quartz-iodine lamp located at the focus of a Fresnel lens, and a power supply for the lamp. The receiver houses an optical section (consisting of a pair of photodiode detectors and situated close to the focal points of two 13 cm Fresnel lenses) and an electronic section that conditions the signals from the photodiodes and determines the slope of their covariance. Table 1 summarizes the SRCS characteristics, and figures 1, 2, and 3 show the unit that was evaluated.


3G. R. Ochs, G. F. Miller, and E. J. Goldenstein, 1976, "A Saturation-Resistant Optical System for Measuring Average Wind," ECOM 76-2, Atmospheric Sciences Laboratory, White Sands Missile Range, NM


**TABLE 1. SATURATION RESISTANT CROSSWIND SENSOR CHARACTERISTICS**

**Receiver**

<table>
<thead>
<tr>
<th>Function</th>
<th>Run and calibrate</th>
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<tr>
<td>Scale Switch</td>
<td>5, 10, 20 m/sec</td>
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<tr>
<td>Aperture Switch</td>
<td>Small, medium, large</td>
</tr>
<tr>
<td>Time Constant Switch</td>
<td>1, 10, 100 sec</td>
</tr>
<tr>
<td>Field of View</td>
<td>0.6 degree</td>
</tr>
<tr>
<td>Optics</td>
<td>Twin apertures with Fresnel lenses</td>
</tr>
<tr>
<td>Detectors</td>
<td>United Detector Technology pin spot 2D Photodiodes (pair)</td>
</tr>
<tr>
<td>Size</td>
<td>25 x 30 x 45 cm</td>
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<tr>
<td>Power Requirements</td>
<td>120 V AC</td>
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</tbody>
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**Transmitter**

<table>
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<tr>
<th>Light Source</th>
<th>Quartz-iodine 55 W 12 V DC at focus of Fresnel lens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Requirements</td>
<td>120 V AC</td>
</tr>
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</table>
Figure 1. Saturation Resistant Crosswind Sensor Receiver (rear and oblique views).
Figure 3. Saturation Resistant Crosswind Sensor Transmitter (oblique view).
The operation of the SRCS is based on detection of the scintillation patterns produced by thermal gradients and transported by the wind. As each one of the photodiodes detects the incoming signal, the fluctuations in irradiance are combined by the analyzer to obtain a covariance function. The slope of this curve, at zero delay time, is proportional to the time needed for a particular scintillation pattern to travel from one detector to the other. Since the distances between photodiodes are constant, the analyzer then derives the wind velocity from the slope of the covariance function. Figure 2, a block diagram of the SRCS, illustrates the electronic circuitry required.

TEST SUPPORT

Biggs Optical Range

The BOR is located approximately 400 m northwest of the main runway at Biggs Army Airfield, Fort Bliss, Texas. The range consists of an instrumented path at a heading of 49 degrees from True North and 2064 m long. Two 3.5-m towers are located at the end points of the path with a 3-m tower aligned at the 500-m point of the path. These towers provide solid test beds for electro-optical instrumentation. A linear array of 3-m high anemometers parallel to the path is offset 3 m to the southeast of the optical path. The anemometers are oriented to measure northwest-southeast winds, i.e., "cross" winds to the optical path. This array consists of 21 anemometers spaced 25 m apart for the first 500 m path length and 15 anemometers spaced 100 m apart for the remaining 1500 m of path length. Figure 4 shows the BOR with the SRCS in the foreground.

The instrumentation path is specifically designed to test optical wind measurement systems because the surrounding terrain features are flat and the optical path has been cleared of natural vegetation to minimize wind flow field characteristics.

Meteorological Optical Measuring System

The Meteorological Optical Measuring System (MOMS) (figure 5) is a mobile, self-contained data collection and reduction system containing analog and digital subsystems specifically engineered for the measurement and recording of atmospheric meteorological data. The system uses an HP 2100 computer system as a controller and is managed by an in-house developed program that samples the various sensors at present rates.

---

stores these data, and then reduces and analyzes these data according to
the program. Output format capabilities are raw scatter graphs, time
averaged plots, printer, limited strip chart, and digital tape.

During these tests, analog wind data from the anemometer array and the
SRCS output were recorded on digital tape. Other meteorological data
simultaneously recorded were atmospheric pressure, temperature, refrac-
tive index structure coefficient, and dew point.

As a part of the data collection and analysis effort, data reduction was
conducted both on and off line by the FORTRAN program shown in appendix
D. The primary results provided were scatter plots and weighting func-
tion diagrams of the SRCS versus the anemometer array.

Remote Sensing Van

The Remote Sensing Van (RSV) is a 5-ton, 6 by 6, M820 expandable van
which contains inherent prime-mover mobility and provides test-bed
facilities. The van "folds" to standard van width for transport and
expands to 4.3 m for in situ operation. The RSV is a stable platform
for optical equipment tests and provides test-bed facilities by housing
test equipment and ancillary dedicated test support equipment. An
environmental isolation screen with two 30- by 45-cm integral glass
plates has been fabricated for use so that the rear doors can be opened
for optics line-of-sight test capability while test environmental condi-
tions are retained inside the RSV. Figure 6 shows a "downrange" view
of the RSV in operating configuration.

TEST DESCRIPTION, CONDUCT, AND PROCEDURES

General

The evaluation mission was twofold: (1) determining the accuracy and
weighting function of the SRCS and (2) testing SRCS operational charac-
teristics for effects due to vibration and weather conditions (i.e.,
rain, overcast).

Range operational setup of the SRCS involved placing the transmitter at
one end of the path and the receiver at the other end. To insure opera-
tion, the transmitter and receiver should be focused accurately toward
each other. The transmitter could be aligned easily and rapidly by
placing a 7.5-cm retroreflector on the receiver. After the transmitter
was aligned, the receiver could be successfully aligned by observing
electrical signals from the "test" outputs while slowly slewing the
receiver in azimuth and elevation until the strongest scintillation
signals were observed from both channels. When the alignment procedure
was completed, both receiver and transmitter units were secured to avoid
any deterioration of the signal-to-noise ratio (SNR) and any "false"
signal generation due to vibration.
Ranges

The SRCS was tested at 500-m and 2000-m path lengths. SNR at 500 m was relatively high and proper lockon was readily obtained. Extending the operating range to 2000 m decreased the SNR, but by proper transmitter-receiver alignment, lockon was achieved.

Weather Conditions

Because the SRCS is an active system, its operation is not limited to daytime use. In fact, the operating range increases at night because of the absence of ambient light (considered extraneous) that tends to degrade the SNR. Operation on clear or overcast days was reliable; however, the operation became erratic during rain and ceased during heavy rain.

A detailed daily summary of weather conditions existing during the test period is shown in appendix C. These data are from the National Weather Service located at the El Paso International Airport approximately 6 km from BOR. A synoptic weather summary for the surface and 500 mb altitude is also shown.

Atmospheric conditions of thermal turbulence ranged from very low or non-existent (during periods of rainfall) to values large enough to cause saturation of other crosswind systems.

DATA COLLECTION AND RESULTS

Mathematical Background

In statistical bivariate analysis, a scatter plot is useful for the evaluation of measured experimental data. During these tests, scatter plots were generated because the resultant comparison values were important for determination of accuracy.

For the scatter plots employed, the average path crosswinds measured by groupings of weighted anemometer outputs from the array are plotted on the abscissa, and the measured average output from the SRCS is plotted on the ordinate. These two values were plotted as an ordered pair. To make this comparison applicable, a large number of these single sets of values had to be compared. This comparison should result in a statistically sound conclusion. The FORTRAN IV program (appendix D) was developed to sample and plot the experimental data.

The usefulness and simplicity of the scatter diagram is readily shown in figure 7. The first scatter plot (plot A) shows a straight line with a 45-degree slope and passing through the origin. In this case, a one-to-one correspondence (complete agreement) exists between the contributing systems. Plot B differs in that the slope of the line is no longer 45 degrees. This case indicates that the ordinate values have to be
Figure 7. Typical scatter plots. Windspeed values measured by the SRCS are plotted versus values measured by a reference, in this case, the analog wind averager.
adjusted by including a constant multiplicative factor \( m \). Plot C shows the resultant line no longer passing through the origin. This signifies the ordinate values have to be further adjusted by including an offset value \( Y_0 \).

Since experimental data rarely yield complete correspondence between test system and "base" systems, data obtained were linearized by employing the least squares fit method. The result was then a line represented as

\[
Y = A_0 + A_1 X,
\]

where

\[
A_0 = \frac{(\Sigma Y)(\Sigma X^2) - (\Sigma X)(\Sigma XY)}{N(\Sigma X^2) - (\Sigma X)^2}
\]

and

\[
A_1 = \frac{N(\Sigma XY) - (\Sigma X)(\Sigma Y)}{N(\Sigma X^2) - (\Sigma X)^2}
\]

\( N \) = number of samples.

The method of least squares allows extreme values to weigh too heavily on the result; therefore, when this technique was used to evaluate the SRCS, as well as other test systems, care was taken to investigate extremely large differences (on actual measurements) to insure that they were legitimate and not caused by mechanical or electrical malfunctions of one of the systems. Subjective caution also allowed for the fact that the mechanical anemometers have a certain amount of inertia which normally results in an erroneous output when the wind velocity is below the threshold value of the anemometers. Therefore, it is necessary to consider the values close to zero carefully and prudently. The anemometers used minimized this anomaly, however, since they are research quality propeller anemometers with a threshold value of 0.2 – 0.3 m/sec.

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Scatter plots can be generated by using either straight average or weighted average values from the analog wind averager (AWA) as the abscissa point input. First, plots were generated by using straight average values; in later tests, after the weighting function of the SRCS had been determined, scatter plots with weighted average values from the AWA were generated.

Both types of plots are illustrated in appendix A; however, more emphasis is given to the weighted value plots.

Before these weighted values could be used, the SRCS weighting function had to be determined. The weighting functions were computed by considering different groups of anemometer outputs as a least squares basis set; that is, the SRCS wind measurements, denoted by \( W_s \), are represented as a linear combination of \( m \) different groups of anemometer outputs, \( W_i \), so that

\[
W_s = \sum_{i=1}^{m} a_i W_i,
\]

where \( a_i \) are the correlation coefficients determined by the \( m \)th order least squares analysis. Various sets of coefficients, \( a_i \), were obtained by employing different groupings of anemometers; and since the range is 2 km long, it was possible to obtain a weighting function out to that distance.

Results of Data Analysis

The weighting function and scatter plots obtained from the collected data are compiled in appendix A for easy reference. Figure 8 is a representative plot that exemplifies the method of data presentation. For this case, the SRCS data closely followed the AWA data, as can be seen by the dashed line which approaches quite well the solid (45-degree) line. The weighting function graph illustrates the preponderance of weighting from 250 m to 400 m with a maximum at approximately 350 m. For the sake of completeness, figure 8 is replicated and included with the rest of the reduced data in appendix A. In summary, for a path length of 500 m the values of the SRCS are related to those of the AWA if the following formula \( Y = 0.85X - 10.02 \) and the weighting function show that cross-winds located from 250 to 400 m are weighed most heavily. For the 2000-m path, the previous results were shifted somewhat to yield \( Y = 1.57X - 0.43 \) and the path length weighed most heavily is from 1000 to 1700 m.

Appendix B contains the comparison graphs of the SRCS versus the AWA as a function of time. Comparison of these values yielded a measure of
Figure 8. SNOCS scatter plot and weighting function at 500 m range.
accuracy. Calculations show that the crosswind values measured by the SRCS were within 8 percent of those measured by the AWA at least 81 percent of the time.

The program included in appendix D was used to collect, reduce, and plot the data presented in this report and is not discussed per se in this report.

Although the weighting function derived for the SRCS with a 500-m range is not exactly the same as the one derived with a 2000-m range, values calculated from them are within 15 percent of each other. To determine the exact cause of the discrepancy, more data than what were collected during the test period would have to be gathered and analyzed statistically.

CONCLUSIONS

Under predominant area weather conditions (no rain, hail, or snow), the SRCS measured crosswind averages within 8 percent of those measured by the AWA. However, under moderate to severe adverse weather conditions, the SRCS was not accurate or reliable in operation, due to a decrease of SNR below its operating threshold. Both units of the SRCS should be solidly attached to a firm foundation to eliminate any vibration, since such vibration will be interpreted as crosswind signal information and thus yield erroneous results.

The calculated SRCS weighting functions indicate that crosswinds closer than 1/5 of the path from the receiver or closer than 1/10 of the path from the transmitter affect its output reading minimally, while crosswinds at the central section of the path affect the output predominately.

The SRCS transmitter can easily be aligned by using a retroreflector at the receiver and a boresighted telescope at the transmitter end. The receiver can then be aligned by observing the signals out of the "test" connectors and minutely slewing the receiver slowly until maximum scintillation readings are obtained at both connectors.

The SRCS can aid in the characterization of the atmosphere, serve as a reference to evaluate future wind measurement systems, and help advance research on wind measurement techniques.

The use of the SRCS is particularly applicable for crosswind measurements during conditions of high thermal turbulence or over long path lengths where other crosswind measurement systems have exhibited optical saturation.

Two weighting functions, instead of one, were derived for the SRCS to have a higher accuracy of values read. However, if only one is desired, an average weighting function could be obtained, with a corresponding decrease in accuracy.
REFERENCES


APPENDIX A. SRCS SCATTER PLOTS AND WEIGHTING FUNCTIONS

Figure A1. SRCS scatter plot and weighting function (range 0000-01).

25
Figure A.1. SBCS scatter plot (range 500 m).
Figure A.4. BES weighting function (range 500 m).
Figure B-1. SRCS wind comparison plot, 13 Feb 78, 0.5 km range, 1015-1115 hours.
Figure B-3. SRCS wind comparison plot, 13 Feb 78, 0.5 km range, 1115-1215 hours.
Figure B-6. SRCS wind comparison plot, 28 Feb 78, 0.5 km range, 1235-1335 hours.
Figure B-8. SRCS wind comparison plot, 28 Feb 78, 0.5 km range, 1435-1535 hours.
Figure B-9. SRCS wind comparison plot, 28 Feb 78, 0.5 km range, 1535-1555 hours.
# APPENDIX C

## DAILY WEATHER PARAMETERS

### PRELIMINARY LOCAL CLIMATOLOGICAL DATA

**Station:** El Paso, International Airport, TX

**Month:** FEBRUARY 1978

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### APPENDIX C

**DAILY WEATHER PARAMETERS**

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### MX,PK,DIET TO MID MPH

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## Preliminary Local Climatological Data

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**Month:** March 1978

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<th>Total Precipitation (in)</th>
<th>Sunshine (hr)</th>
<th>Mean Sea Level (in)</th>
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<td>60°</td>
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**Temperature Data**

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<th>Min. Temp. (°F)</th>
<th>Average Temp. (°F)</th>
<th>Degree Days Above 50°</th>
<th>Degree Days Below 0°</th>
<th>Total Precipitation (in)</th>
<th>Sunshine (hr)</th>
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**Weather Symbols**

- **Clear (C)**
- **Mostly Cloudy (M)**
- **Partly Cloudy (P)**
- **Fog (F)**
- **Snowfall (S)**
- **Ice Pellets (I)**
- **Cloudy (C)**
- **Light Rain (L)**
- **Heavy Rain (H)**
- **Light Snow (S)**
- **Heavy Snow (N)**
- **Tornado (T)**

**Additional Notes**

- **El Paso, International Airport, TX**
- **March 1978**
- **Latitude: 31° 48' N**
- **Longitude: 106° 24' W**
- **Elevation: 2,165 ft**

**Map Reference**

- **Map H-511**
APPENDIX D. FORTRAN IV DATA PLOT PROGRAMS

**WLTMC T=00004 IS ON CR010002 USING 04020 BLKS R=0146**

0001 FTPN4.L
0002 PROGRAM WLTMC,3
0003
0004 COMMON F.S(22).IT(6)
0005 COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0006 COMMON A5(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0007 COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0008 COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0009 COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0010 COMMON P,NB,NN,IS,MS,IMRY
0011 COMMON IW1,IW2,1W3,1W4,1W5,1WZ
0012 COMMON WT(21)
0013 COMMON XC,YC,SN,SY,SXX,SYX,DA,DS
0014 COMMON 1W1,1W2,1W3,1W4,1W5,1WZ
0015 COMMON IO8,N52,1S3,1S4,1S5
0016 COMMON 1W1,1W2,1W3,1W4,1W5,1WZ
0017 DIMENSION ICP(5)
0018 CALL RMPAR(ICP)
0019 DO 11=1,311
0020 IF(LU1.EQ.0)LU1=1
0021 IF(LU2.EQ.0)LU2=1
0022 IF(LU3.EQ.0)LU3=1
0023 IF(LP.EQ.0)LPl=1
0024 DO 1=1,IP(1)
0025 A2(I,J)=0.0
0026 B2(I)=0.0
0027 XP2(I)=0.0
0028 NS2(I)=0
0029 BA2(I)=0.0
0030 IF(I.GT.8.OR.J.GT.8)GO TO 1
0031 A3(I,J)=0.0
0032 B3(I)=0.0
0033 XP3(I)=0.0
0034 NS3(I)=0
0035 BA3(I)=0.0
0036 IF(I.GT.6.OR.J.GT.6)GO TO 1
0037 A4(I,J)=0.0
0038 B4(I)=0.0
0039 XP4(I)=0.0
0040 NS4(I)=0
0041 BA4(I)=0.0
0042 IF(I.GT.8.OR.J.GT.8)GO TO 1
0043 A5(I,J)=0.0
0044 B5(I)=0.0
0045 XP5(I)=0.0
0046 NS5(I)=0
0047 BA5(I)=0.0
0048 IF(I.GT.5.OR.J.GT.5)GO TO 1
0049 A6(I,J)=0.0
0050 B6(I)=0.0
0051 XP6(I)=0.0
0052 NS6(I)=0
0053 BA6(I)=0.0
0054

**This page is a draft quality program.**

**FROM COPY CORRECTED TO DDD**

40
IF(I.GT.4 OR J.GT.4)GO TO 1
A(I,J)=0.0
B(I)=0.0
XP(I)=0.0
HS(I)=0
BA(I)=0.0
CONTINUE
C
ZERO SUMS FOR WLTMI
P=0.0
DA=0.0
DS=0.0
SN=0.0
SX=0.0
SY=0.0
SYX=0.0
SX=0.0
GET CALIBRATION AND WEIGHTS FOR WLTMI.
IF(LP .NE .1)WRITE(LP,199)
199 FORMAT(1X,'CALIBRATION FACTORS FOR REAL TIME ANALYSIS:"
*1H0,,2X,"WEIGHTS FOR ANEMOMETERS ARE"
IF(LP .EQ .1)WRITE(1,99)
99 FORMAT(1H0,'INPUT WEIGHTS"
DO 2 I=1,321
F(I,J) .EQ. 1)WRITE(1398)
READ (LU13 *)WT(I)
IF(LP . NE. 1)WRITE (LP ,198)WT(I)
2 CONTINUE
C
READ (LU13,198)1,WT(I)
198 FORMAT(I20,3X,""
IF(LP .NE .1)WRITE(LP,198)I,WT(I)
198 FORMAT(I20,3X,""
C
READ (LU13,*)X,YC
IF(LP . NE .1)WRITE(LP ,196)X,YC
196 FORMAT(3K,1X,""
READ (LU13,*)IS
IF(LP .NE .1)WRITE(LP,196)IS
196 FORMAT(3K,1X,""
IF(LP .NE .1)WRITE(LP,199)MN
199 FORMAT(1H0,,2X,"LEAST SQUARES READOUT EVERY",13,"
195 FORMAT(1H0,,2X,"LEAST SQUARES READOUT EVERY",13,"
C
Determine IF .5K OR 2K WANTED.
IF(LP .NE .1)WRITE(LP,193)
193 FORMAT(1H0,,2X,""
READ(LU2,**)IARRY
193 FORMAT(1H0,,2X,""
READ(LU2,**)IARRY
READ(LU2,**)IARRY
0119 IF(IARRAY.EQ.0)WRITE(LP,193)
0120 IF(IARRAY.EQ.2)WRITE(LP,200)
0121 193 FORMAT(1X0, "ANALYSIS FOR THE 1/2 K ARRAY")
0122 200 FORMAT(1X0, "ANALYSIS FOR THE 2 K ARRAY")
0123 IF(LU3.EQ.1)WRITE(1,92)
0124 92 FORMAT("INPUT 0 OR 1 FOR SUBS DESIRED"/
0125 "+ OR TO DESIGNATE OTHER PARAMETERS")
0126 IF(LP.NE.1)WRITE(LP,192)
0127 192 FORMAT(1X0, "SUBS DESIRED OR OTHER PARAMETERS")
0128 91 FORMAT("IW1",3X, ")
0129 90 FORMAT("IW2",3X, ")
0130 89 FORMAT("IW3",3X, ")
0131 88 FORMAT("IW4",3X, ")
0132 87 FORMAT("IW5",3X, ")
0133 191 FORMAT(1H0.2X, "IW1",15)
0134 190 FORMAT(1H0.2X, "IW2",15)
0135 189 FORMAT(1H0.2X, "IW3",15)
0136 188 FORMAT(1H0.2X, "IW4",15)
0137 187 FORMAT(1H0.2X, "IW5",15)
0138 IF(LU3.EQ.1)WRITE(1,91)
0139 READ(LU3,*),IW1
0140 IF(LP.NE.1)WRITE(LP,191)IW1
0141 IF(LP.NE.1)WRITE(1,90)
0142 READ(LU3,*),IW2
0143 IF(LP.NE.1)WRITE(LP,190)IW2
0144 IF(LP.NE.1)WRITE(1,89)
0145 READ(LU3,*),IW3
0146 IF(LP.NE.1)WRITE(LP,189)IW3
0147 IF(LP.NE.1)WRITE(1,88)
0148 READ(LU3,*),IW4
0149 IF(LP.NE.1)WRITE(LP,188)IW4
0150 IF(LP.NE.1)WRITE(1,87)
0151 READ(LU3,*),IW5
0152 IF(LP.NE.1)WRITE(LP,187)IW5
0153 WRITE(1,85)
0154 85 FORMAT("ENTER FILE # ON TAPE",3X, ")
0155 READ(1,*),IWZ
0156 IF(LP.NE.1)WRITE(LP,185)IWZ
0157 185 FORMAT(1H0.2X, "TAPE FILE ",12)
0158 WRITE(1,84)
0159 84 FORMAT("INPUT TIME INTERVAL IN SECONDS",3X, ")
0160 READ(1,*),MS
0161 IF(LP.NE.1)WRITE(LP,184)MS
0162 184 FORMAT(1H0.2X, "AVERAGING TIME IS",13," SECONDS")
0163 WRITE(1,83)
0164 83 FORMAT("THAT'S ALL, THANKS")
0165 STOP
0166 END
0167 END$
$ULTMG T=00004 IS ON CR00002 USING 00014 BLKS R=0114

0001  FTM4.L
0002  PROGRAM WLTMG,3
0003  C***********************************************************************
0004  COMMON F,S(22),IT(6)
0005  COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
0006  COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
0007  COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
0008  COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
0009  COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
0010  COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
0011  COMMON F,NI,NS,IA,IRRY
0012  COMMON IW1,IW2,IW3,IW4,IW5,IW2
0013  COMMON WT(21)
0014  COMMON WC,YC,SN,SN,SN,SN,SN,DS
0015  DIMENSION ITM(5),IDT(94),IDATA(100)
0016  DIMENSION ST(37)
0017  DIMENSION NW4(3),MON(2)
0018  EQUIVALENCE (ITM(1),IDATA(1),(IY,IDATA(6)))
0019  *(IDT(1),IDATA(7))
0020  DATA NW4/2HWL,2HTM,2HM /
0021  1 CONTINUE
0022  CALL EXEC(3,611B)
0023  CALL EXEC(13,9,ISTAT)
0024  ISTT=IAND(ISTAT,1B)
0025  IF(ISTT.NE.0)GO TO 1
0026  ISTT=IAND(ISTAT,200B)
0027  IF(ISTT.EQ.0)GO TO 2
0028  CALL EXEC(3,311B)
0029  2 CONTINUE
0030  CALL EXEC(1,111B,IDATA,100)
0031  CALL EXEC(3,211B)
0032  SEC=MS
0033  IF(SEC.EQ.0)SEC=0.5
0034  IDAY=ITM(5)
0035  LIT=ITM(3)
0036  CALL DATE(IDAY,MON,IIY)
0037  WRITE(6,99)IS,SEC,IIW,ITM(4),ITM(3),ITM(2),IDAY,MON,IIY
0038  99 FORMAT(I4,ANALYSIS OF CH #","I3","WITH","F5.1","SEC AVG","/
0039  *1H","WITH SLIDE FACTOR OF","I3/"
0040  *1H","FOR DATA BEGINING","I3",""I2","","I2","ON","I3","1X","2A2","I4"
0041  CALL EXEC(11,ITM,IIY)
0042  IDAY=ITM(5)
0043  CALL DATE(IDAY,MON,IIY)
0044  WRITE(6,98)ITM(4),ITM(3),ITM(2),IDAY,MON,IIY
0045  98 FORMAT(I4,ANALYSIS START","I3","","I2","","I2","ON","I3","1X","2A2","I4"
0046  IF(IW1.EQ.0)GO TO 3
0047  CALL WLTM5
0048  3 CONTINUE
0049  DO 67 IRPT=1,32767
0050  F=0.0
0051  DO 4 I=1,37
0052  4 ST(I)=0.0
0053  DO 6 I=1,1200
0054  CALL EXEC(1,111B,IDATA,100)
0055  CALL EXEC(13,9,ISTAT)
0056  ISTAT=IAND(ISTAT,200B)
0057  IF(ISTAT.NE.0)GO TO 60
0058  F=F+1.

END
DO 5 J = 1, 36
ST(J) = ST(J) + FLOAT(IDT(J))
DO 1 J = 37, 39
ST(J) = ST(J) + FLOAT(IDT(J))
IF(MS.EQ.0) GO TO 7
ISTAT = MOD(ITM(2), MS)
IF (ISTAT.NE.0) GO TO 6
IF (ITM(1).GE.50) GO TO 6
GO TO 7
CONTINUE
CONTINUE
DO 8 J = 1, 6
IF(IDATA(J).GT.1) GO TO 9
8
ISWTM = IT(3) + IT(4)*1000
CALL PSSW(ISWTM)
LIT = IT(3)
CONTINUE
CHECK FOR .5K OR 2K RANGE.
IF(IARRY.LE.1) GO TO 12
K = 0
DO 10 I = 1, 21, 4
IF(IARY.LE.1) GO TO 12
K = K + 1
DO 10 S(K) = ST(I) * XC / F
10 CONTINUE
DO 11 I = 22, 36
IF(IARY.LE.1) GO TO 12
K = K + 1
DO 11 S(K) = ST(I) * XC / F
11 CONTINUE
S(22) = ST(37) * YC / F
SUM ALL POINTS.
P = P + F
IF(IW1.EQ.0) GO TO 15
CALL WLTM1
CONTINUE
CALL WLTM2
IF(MN.EQ.0) GO TO 67
MO = MOD(IT(3), MN)
IF(MO.NE.0) GO TO 67
IF(IT(2).NE.0) GO TO 67
IF(IT(1).GE.50) GO TO 67
CALL WLTM3
CONTINUE
CALL EXE(3, 211B)
CALL EXE(3, 1411B)
GO TO 17
CALL EXE(3, NW4)
CONTINUE
CALL WLTM5
CONTINUE
CALL WLTM3
CALL EXE(10, NW4)
CONTINUE
STOP
END
SUBROUTINE WLM1

C++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
C WLM1 IS USED TO MAKE THE CORRELATION PLOT OF A SENSOR
C VERSUS A WEIGHTED AVERAGE OF 21 ANEMOMETERS FROM DATA
C FROM MAG TAPE.
C+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

COMMON F,S(22),IT(6)

COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
COMMON F,NB,NN,IS,MS,IARRAY

COMMON IW1,IW2,IW3,IW4,IW5,IW2
COMMON WC(21)

COMMON XC,YC,SN,SX,SY,SNX,SYX,DA,DS

CALL PLOTU(10)

CALL SFACT(15,10.)

Y=S(22)

DO 1 I=1,21

X=X+S(I)*WT(I)

SN=SN+1.0

D=(Y-X)/10.

DA=DA+D

DS=DS+D+D

SX=SX+X

SY=SY+Y

SYX=SYX+Y*X

SXX=SXX+X*X

Z=ABS(X)

IF(Z.GE.4.75)X=4.75*X/Z

X=X+5.0

Z=ABS(Y)

IF(Z.GE.4.75)Y=4.75*Y/Z

Y=Y+5.0

CALL PLOT(X,Y,3).

CALL PLOT(X,Y,2)

CALL PLOT(X,Y,3)

69 CONTINUE

RETURN

END
SUBROUTINE ULTM2

COMMON F,S(22),I4(6)
COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
COMMON A5(6,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
COMMON P,NB,MN,IS,MS,IARRAY
COMMON IW1,IW2,IW3,IW4,IW5,IW6
COMMON WI(21)
COMMON XC,YC,SM,DX,SY,SD,DA,DS
DIMENSION D(11),NS(11),XP(11)
IF(IW2.GT.1)GO TO 68
NB=0
HA7=0
HA6=0
HA5=0
HA4=0
HA3=0
HA2=0
DO 67 INW=1,IW5
GO TO (1,2,3,4,5,6),INW
JCHT=4
KCHT=7
GO TO 7
JCHT=5
KCHT=6
GO TO 7
JCHT=5
KCHT=5
GO TO 7
JCHT=6
KCHT=4
GO TO 7
JCHT=8
KCHT=3
GO TO 7
JCHT=11
KCHT=2
CONTINUE
HA=1
DO 9 J=1,JCHT
NS(NA)=0
XP(NA)=0
DO 8 K=1,KCHT
L=(J-1)*KCHT+K+1
GO TO 8
IF(L.LT.1.OR.L.GT.21)GO TO 8
IFLAG=L
NS(NA)=NS(NA)+1
XP(NA)=XP(NA)+FLOAT(L)
CONTINUE
IF(HE(NA) EQ.0)GO TO 9
ADEC=NS(NA)
XP(NA)=XP(NA)/ADEC
HA+NA=1
9 CONTINUE
NA=NA-1
GO TO (10,12,14,16,18,20),NOW
NA=NA
IF(IFLAG.LT.21)NA7=0
NB=NB+NA?
DO 11 J=1, NCNT
XP5(J)=XP(J)
11 NS5(J)=NS(J)
GO TO 67
HA5=NA
IF(1W3.LE.-6)IFLAG=0
IF(IFLAG.LT.21)NA6=0
NB=NB+NA6
DO 13 J=1, NCNT
XP5(J)=XP(J)
13 NS5(J)=NS(J)
GO TO 67
NA4=NA
IF(IFLAG.LT.21)NA5=0
NB=NB+NA5
DO 15 J=1, NCNT
XP5(J)=XP(J)
15 NS5(J)=NS(J)
GO TO 67
HA4=NA
IF(IW3.LE.-3)IFLAG=0
IF(IFLAG.LT.21)NA3=0
NB=NB+NA3
DO 19 J=1, NCNT
XP3(J)=XP(J)
19 NS3(J)=NS(J)
GO TO 67
NA2=NA
IF(IFLAG.LT.21)NA1=0
NB=NB+NA2
DO 21 J=1, NCNT
XP2(J)=XP(J)
21 NS2(J)=NS(J)
CONTINUE
10 NA=NA
IF(IFLAG.LT.21)NA=0
L=0
DO 25 J=1,NA
L=L+1
CONTINUE
112 IF(NA7.LE.0)GO TO 25
113 L=0
114 DO 24 J=1,NA7
115 KJ=NS7(J)
116 D(J)=0.0
117 DO 22 K=1,KJ
118 L=L+1
0119  D(J) = D(J) + S(L)
0120 22  CONTINUE
0121  ADEC = KJ
0122  D(J) = D(J) / ADEC
0123  B7(J) = B7(J) + S(22) * D(J)
0124  DO 23 I = 1, J
0125 23  A7(I, J) = A7(I, J) + D(I) * D(J)
0126 24  CONTINUE
0127 25  CONTINUE
0128  IF(NA6 .LE. 0) GO TO 29
0129  L = 0
0130  DO 28 J = 1, NA6
0131  D(J) = 0.0
0132  KJ = NS6(J)
0133  DO 26 K = 1, KJ
0134  L = L + 1
0135  D(J) = D(J) + S(L)
0136 26  CONTINUE
0137  ADEC = KJ
0138  D(J) = D(J) / ADEC
0139  B6(J) = B6(J) + S(22) * D(J)
0140  DO 27 I = 1, J
0141 27  A6(I, J) = A6(I, J) + D(I) * D(J)
0142 28  CONTINUE
0143 29  CONTINUE
0144  IF(NA5 .LE. 0) GO TO 33
0145  L = 0
0146  DO 32 J = 1, NA5
0147  D(J) = 0.0
0148  KJ = NS5(J)
0149  DO 30 K = 1, KJ
0150  L = L + 1
0151  D(J) = D(J) + S(L)
0152 30  CONTINUE
0153  ADEC = KJ
0154  D(J) = D(J) / ADEC
0155  B5(J) = B5(J) + S(22) * D(J)
0156  DO 31 I = 1, J
0157 31  A5(I, J) = A5(I, J) + D(I) * D(J)
0158 32  CONTINUE
0159 33  CONTINUE
0160  IF(NA4 .LE. 0) GO TO 37
0161  L = 0
0162  DO 36 J = 1, NA4
0163  D(J) = 0.0
0164  KJ = NS4(J)
0165  DO 34 K = 1, KJ
0166  L = L + 1
0167  D(J) = D(J) + S(L)
0168 34  CONTINUE
0169  ADEC = KJ
0170  D(J) = D(J) / ADEC
0171  B4(J) = B4(J) + S(22) * D(J)
0172  DO 35 I = 1, J
0174 36  CONTINUE
0175 37  CONTINUE
0176  IF(NA3 .LE. 0) GO TO 41
0177  L = 0
0178  DO 40 J = 1, NA3
D(J) = 0.0
KJ = HS3(J)
DO 38 K = 1, KJ
L = L + 1
D(J) = D(J) + S(L)
CONTINUE
ADEC = KJ
D(J) = D(J) / ADEC
B3(J) = B3(J) + S(22) * D(J)
DO 39 I = 1, J
A3(I, J) = A3(I, J) + D(I) * D(J)
CONTINUE
CONTINUE
IF (HA2 LE 0) GO TO 69
L = 0
DO 44 J = 1, HA2
D(J) = 0.0
KJ = HS2(J)
DO 42 K = 1, KJ
L = L + 1
D(J) = D(J) + S(L)
CONTINUE
ADEC = KJ
D(J) = D(J) / ADEC
B2(J) = B2(J) + S(22) * D(J)
DO 43 I = 1, J
A2(I, J) = A2(I, J) + D(I) * D(J)
CONTINUE
CONTINUE
RETURN
END
SUBROUTINE WLTM3

C***------------------------------------------------------------------------
C  WLTM3 IS USED TO COMPUTE THE FIT FOR WEIGHTING FACTORS
C***------------------------------------------------------------------------

COMMON F,S(22),IT(6)
COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
COMMON A3(6,6),B3(6),XP3(6),NA3,NS3(6),SB3,BA3(6)
COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
COMMON P,NB,MN,IS,MS,IAARRY
COMMON IW2,IW3, IW4, IW5, IWZ
COMMON WTM(21)
COMMON XX,YY,SN,SX,SY,SSX,SSY,SA,DS
DIMENSION A(11,11)
WRITE(6.99,IT(4),IT(3)),P
FORMAT(1H0, "AT", , , I3, "":",I2, " WITH",F10.0," POINTS")
DO 69 L=1,IW5
GO TO (1,3,5,7,9,11),L
1 CONTINUE
IF(NA7.LE.0) GO TO 69
DO 2 J=1,NA7
BA7(J)=B7(J)
DO 2 I=1,J
2 A(I,J)=A7(I,J)
NG=7
M7S=4
CALL W3SUB(A,B7,XP7,NA7,NS7,SB7,BA7,NG,MTS)
IF(NG.EQ.7) GO TO 69
NB=NB-NA7
NA7=-1
GO TO 69
3 CONTINUE
IF(NA6.LE.0) GO TO 69
DO 4 J=1,NA6
BA6(J)=B6(J)
DO 4 I=1,J
4 A(I,J)=A6(I,J)
NG=6
M7S=5
CALL W3SUB(A,B6,XP6,NA6,NS6,SB6,BA6,NG,MTS)
IF(NG.EQ.6) GO TO 69
NB=NB-NA6
NA6=-1
GO TO 69
5 CONTINUE
IF(NA5.LE.0) GO TO 69
DO 6 J=1,NA5
BA5(J)=B5(J)
DO 6 I=1,J
6 A(I,J)=A5(I,J)
NG=5
GO TO 69
69 CONTINUE
0059  MTS=5
0060  CALL W3SUB(A,B5,XP5,NA5,NS5,SB5,BA5,NG,MTS)
0061  IF(NG.EQ.5)GO TO 69
0062  NB=NB-NA5
0063  NA5=-1
0064  GO TO 69
0065  CONTINUE
0066  IF(NA4.LE.0)GO TO 69
0067  DO 8 J=1,NA4
0068  BA4(J)=B4(J)
0069  DO 8 I=1,1
0070  A(I,J)=A4(I,J)
0071  8 A(J,I)=A4(I,J)
0072  NG=4
0073  MTS=6
0074  CALL W3SUB(A,B4,XP4,NA4,NS4,SB4,BA4,NG,MTS)
0075  IF(NG.EQ.4)GO TO 69
0076  NB=NB-NA4
0077  NA4=-1
0078  GO TO 69
0079  CONTINUE
0080  IF(NM3.LE.0)GO TO 69
0081  DO 10 J=1,NM3
0082  BA3(J)=B3(J)
0083  DO 10 I=1,1
0084  A(I,J)=A3(I,J)
0085  10 A(J,I)=A3(I,J)
0086  NG=3
0087  MTS=8
0088  CALL W3SUB(A,B3,XP3,NA3,NS3,SB3,BA3,NG,MTS)
0089  IF(NG.EQ.3)GO TO 69
0090  NB=NB-NA3
0091  NA3=-1
0092  GO TO 69
0093  CONTINUE
0094  IF(NM2.LE.0)GO TO 69
0095  DO 12 J=1,NM2
0096  BA2(J)=B2(J)
0097  DO 12 I=1,1
0098  A(I,J)=A2(I,J)
0099  12 A(J,I)=A2(I,J)
0100  NG=2
0101  MTS=11
0102  CALL W3SUB(A,B2,XP2,NA2,NS2,SB2,BA2,NG,MTS)
0103  IF(NG.EQ.2)GO TO 69
0104  NB=NB-NA2
0105  NA2=-1
0106  CONTINUE
0107  RETURN
0108  END
0109 **********************************************************************************************
0110  SUBROUTINE W3SUB(A,B,XP,NA,NS,SB,BA,NG,MTS)
0111  DIMENSION A(11,11),B(MTS),XP(MTS),NS(MTS),SB(MTS)
0112  M=NA
0113  SB=0.0
0114  A11=A(1,1)
0115  IF(A11.EQ.0)GO TO 68
0116  DO 1 I=2,M
0117  A(I,1)=A(I,1)/A11
0118  B(A(I,1)=BA(I,1)/A11
DO 5 J=2,M  
J1=J-1  
DO 3 I=J,M  
AS=0.0  
DO 2 K=1,J1  
AS=AS+A(I,K)*A(K,J)  
A(I,J)=A(I,J)-AS  
IF(I.GT.J)A(J,I)=A(I,J)/A(J,J)  
CONTINUE  
BS=0.0  
DO 4 K=1,J1  
BS=BS+A(J,K)*BA(K)  
AJJ=A(J,J)  
IF(AJJ.EQ.0)GO TO 68  
BA(J)=(BA(J)-BS)/AJJ  
M1=M-1  
DO 7 I=1,M1  
BS=0.0  
MI=M-I  
MI1=MI+1  
DO 6 J=MI1,M  
BS=BS+A(MI,J)*BA(J)  
BA(MI)=BA(MI)-BS  
CONTINUE  
WRITE(6,99)NG  
FORMAT(1HO,"FOR GROUPS OF",I3)  
WRITE(6,98)(HS(J),J=1,M)  
FORMAT(1H,"#",11I6)  
WRITE(6,97)(KP(J),J=1,M)  
FORMAT(1H,"K",11F6.1)  
WRITE(6,96)(BA(J),J=1,M)  
FORMAT(1H,"Y",11F6.3)  
DO 8 I=1,M  
SB=SB+BA(I)  
CONTINUE  
WRITE(6,95)SB  
FORMAT(1H,"SUM OF WEIGHTS =",F8.5)  
GO TO 69  
CONTINUE  
WRITE(6,94)NG  
FORMAT(1HO,"FOR GROUPS OF",I3," MATRIX IS SINGULAR")  
NG=-1  
CONTINUE  
END  
RETURN
**ULTM4**

T=00004 IS ON CR00002 USING 00012 BLKS R=0097

0021 COMMON F, S(22), IT(6)
0022 COMMON A7(4,4), B7(4), X7(4), NA7, NS7(4), SB7, BA7(4)
0023 COMMON A6(5,5), B6(5), X6(5), NA6, NS6(5), SB6, BA6(5)
0024 COMMON A5(5,5), B5(5), X5(5), NA5, NS5(5), SB5, BA5(5)
0025 COMMON A4(6,6), B4(6), X4(6), NA4, NS4(6), SB4, BA4(6)
0026 COMMON A3(9,9), B3(9), X3(9), NA3, NS3(9), SB3, BA3(9)
0027 COMMON A2(11,11), B2(11), X2(11), NA2, NS2(11), SB2, BA2(11)
0028 COMMON F, N6, MN, IS, MS, IARRY
0029 COMMON IW(1), IW2, IW3, IW4, IW5, IW6
0030 COMMON W(21)
0031 COMMON X(8,8), Y(8), X(8), S(8), SY, DA(8)
0032 DIMENSION NMG(2), N2M(2)
0033 CALL EXEC(3, 10048)
0034 WRITE(4, 99) N6
0035 DO 7 M=1,1W6
0036 GO TO (1, 2, 3, 4, 5, 6), M
0037 IF(NA7.LE.0) GO TO 7
0038 NG=7
0039 MTS=4
0040 CALL W4SUB(XP7, NA7, NS7, SB7, BA7, NG, MTS)
0041 GO TO 7
0042 IF(NA6.LE.0) GO TO 7
0043 NG=6
0044 MTS=5
0045 CALL W4SUB(XP6, NA6, NS6, SB6, BA6, NG, MTS)
0046 GO TO 7
0047 IF(NA5.LE.0) GO TO 7
0048 NG=5
0049 MTS=6
0050 CALL W4SUB(XP5, NA5, NS5, SB5, BA5, NG, MTS)
0051 GO TO 7
0052 IF(NA4.LE.0) GO TO 7
0053 NG=4
0054 MTS=6
0055 CALL W4SUB(XP4, NA4, NS4, SB4, BA4, NG, MTS)
0056 GO TO 7
0057 IF(NA3.LE.0) GO TO 7
0058 NG=3
0059 MTS=8
0060 CALL W4SUB(XP3, NA3, NS3, SB3, BA3, NG, MTS)
0061 GO TO 7
0062 IF(NA2.LE.0) GO TO 7
0063 NG=2
0064 MTS=11
0065 CALL W4SUB(XP2, NA2, NS2, SB2, BA2, NG, MTS)
0066 CONTINUE
0067 CALL EXEC(11, IT)
0068 WRITE(6, 98) IT(4), IT(3), IT(2)
SUBROUTINE WSUB(XP, HA3N, NS, BA, MTS)

DIMENSION XP(MTS), NS(MTS), BA(MTS)

CALL PLTLU(10)

CALL SFACT(15,10.

CALL LLET

CALL PLOT(0.0,0.0,-1)

CALL PLOT(3.5,31.0,3)

SB, BA = SB, BA

DO 1 I = 1, NA

BA(I) = BA(I) / (SB * FLOAT(IN7(I)))

XV = XP(I) / 2.0 + 3.5

YP = BA(I) * 50.0 + 1.

IF (VP.LE.0.2) YP = 0.2

IF (VP.GE.9.8) YP = 9.8

CALL SVMB(XV, YP, 0.14, NG, 0.9, —1)

1 CONTINUE

WRITE(6,99)

99 FORMAT (1HO., "NORMALIZED WEIGHTS FOR GROUPS OF", 11I6)

WRITE(6,98) (HS(I), I = 1, NA)

98 FORMAT (1H., "*", 11I6)

C** CONTINUE STOP

CALL EXEC(10, MTS)

STOP

END
0119   WRITE(6,97)(XP(I),I=1,NA)
0120  97   FORMAT(1H ,"X",11F6.1)
0121   WRITE(6,96)(BA(I),I=1,NA)
0122  96   FORMAT(1H ,"Y",11F6.3)
0123   WRITE(4,95)(NG,NS(I),XP(I),BA(I),I=1,NA)
0124  95   FORMAT(12,"",13,"","",F5.1,"","",F9.5)
0125   CALL LLEFT
0126   RETURN
0127   END
0128   END*
SUBROUTINE WLTMS

C**********************************************
C WLTMS IS A PROGRAM WHICH WILL REPORT THE NECESSARY
C INFORMATION ON PLOTS AND DRAW THE GRID IF REQUIRED.
C**********************************************

COMMON F.S.X(22),IT(6)
COMMON A7(4,4),B7(4),XP7(4),NA7,NS7(4),SB7,BA7(4)
COMMON A6(5,5),B6(5),XP6(5),NA6,NS6(5),SB6,BA6(5)
COMMON A5(5,5),B5(5),XP5(5),NA5,NS5(5),SB5,BA5(5)
COMMON A4(6,6),B4(6),XP4(6),NA4,NS4(6),SB4,BA4(6)
COMMON A3(8,8),B3(8),XP3(8),NA3,NS3(8),SB3,BA3(8)
COMMON A2(11,11),B2(11),XP2(11),NA2,NS2(11),SB2,BA2(11)
COMMON P,NB,NN,JS,MS,IA,ARY
COMMON IM1,IM2,IM3,IM4,IM5,IM6
COMMON WT(21)
COMMON KX,YC,SN,SK,SY,XX,SYX,DA,DS
DIMENSION NA(2),NS(2),NP(2),NFS(2),NFL(2)
DIMENSION M0N(2),NCXK(2),NSEC(2)
DATA NA/2H1AV,2HG=/,NS/2HSD,2HV=/
DATA NP/2HMP,2HTS/>
DATA NFL/2HF1,2HLE/,NFS/2HFS,2H= /
DATA NSEC/2HE1,2HC /
DATA NCH/2HC1,2HH /
NY=544758
NX=54053B
CALL PLTLU(10)
CALL SFACI(15,10.)
CALL LLET
CALL PLOT(0.,0.,0.,-1)
IF(1IM1).EQ.0.)GO TO 5
CALL PLOT(0.5,5.0,3)
CALL PLOT(9.5,5.0,2)
CALL PLOT(5.0,5.0)
CALL PLOT(5.0,9.5,2)
CALL DASH(0.5,0.5,5.0,5.0,-1)
CALL DASH(0.5,5.0,5.0,9.5,1)
IF(1IM1.LE.1.)GO TO 69
D=SK*SK-SN*SN
A=(SK*SY-SN*SYX)/D
B=(SK*SY-SN*SYX)/D
X=4.0
1 CONTINUE
Y=A*X+B
Z=ABS(Y)
IF(Z.LE.4.75)GO TO 2
X=K+.5
GO TO 1
2 CONTINUE
X=K+.5
Y=Y+.5.
CALL PLOT(X,Y,3)
X=4.0
3 CONTINUE
Y=A*X+B
Z=ABS(Y)
IF(Z.LE.4.75)GO TO 4
X=K-.5
GO TO 3
X=X+5.
Y=Y+5.
CALL PLOT(X,Y,2)
DATT=DA/SN
DSTT=SQR((DS/SN)-DATT*DATT)
CONTINUE
CALL LEFT
CALL PLOT(0.,0.,-1)
IDAY=IT(5)
IYEAR=IT(6)
CALL DATE(IDAY,MON,IYEAR)
DAY=IDAY
YEAR=IYEAR
FILE=IW2
CHN=IS
SEC=MS
IF(MS.EQ.0)SEC=0.5
FS=5.0/(XC*30.)
CALL NUMB(1.0,9.0,0.14,DAY,0.0,-1)
CALL SYMB(1.56,9.0,0.14,MON,0.0,3)
CALL NUMB(2.25,9.0,0.14,YEAR,0.0,-1)
CALL SYMB(1.0,8.5,0.14,NCH,0.0,3)
CALL NUMB(1.56,8.5,0.14,CHN,0.0,-1)
CALL NUMB(2.25,8.5,0.14,SEC,0.0,1)
CALL SYMB(2.85,8.5,0.14,NSEC,0.0,3)
CALL SYMB(3.40,8.5,0.14,NFL,0.0,4)
CALL NUMB(4.10,8.5,0.14,FILE,0.0,-1)
IF(IW1.EQ.0)GO TO 69
CALL SYMB(1.0,8.0,0.14,NFS,0.0,3)
CALL NUMB(999.0,999.0,0.14,FS,0.0,1)
CALL SYMB(1.0,7.5,0.14,NY,0.0,2)
CALL NUMB(999.0,999.0,0.14,A,0.0,3)
CALL SYMB(999.0,999.0,0.14,NX,0.0,2)
CALL NUMB(999.0,999.0,0.14,B,0.0,3)
CALL SYMB(1.0,7.0,0.14,NA,0.0,4)
CALL NUMB(999.0,999.0,0.14,DATT,0.0,3)
CALL SYMB(3.0,7.0,0.14,NS,0.0,4)
CALL NUMB(999.0,999.0,0.14,DSTT,0.0,3)
CALL SYMB(1.0,6.5,0.14,NP,0.0,4)
CALL NUMB(1.60,6.5,0.14,SN,0.0,-1)
CALL LEFT
CONTINUE
IF(IW1.EQ.1)IW1=2
RETURN
END$
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