RESIDENTIAL DATA VERIFICATION

G. M. STOKES
N. M. LaRIVIERE

FIRST LAW OF ELCAP

IT IS EASIER TO RECOVER FROM
A BAD ANALYSIS THAN
TO RECOVER FROM BAD DATA

SECOND LAW OF ELCAP

1000 >> 10

BASIC SYSTEM RELIABILITY GOALS

- AUTOMATIC DATA ACQUISITION
- AUTOMATIC CONVERSION TO ENGINEERING UNITS
- AUTOMATIC END–USE AGGREGATION
- DATA OF KNOWN AND REASONABLE QUALITY

VERIFICATION MUST ADDRESS ALL SYSTEM COMPONENTS

- HARDWARE
- MEASUREMENT PLAN
- INSTALLATION
- DATA ACQUISITION INTERFACE
- ENGINEERING UNIT CONVERSIONS
- ON-LINE QUALITY CHECKING
- END-USE AGGREGATION EQUATIONS

SYSTEM IS EXTREMELY COMPLEX

e.g. CT INSTALLATION
(1 CURRENT TRANSFORMER)

3 CHOICES OF CURRENT TRANSFORMER
6 CHOICES OF SCALING RESISTOR
5 BINARY CHOICES SUBJECT TO ERROR

10–60 CTs PER INSTALLATION

ELCAP NETWORK STATUS
pilot programs

- Co–instrumentation sites
  2 on–line for SCL comparison

- Residential pilot – 20 sites
  * hardware tests – 10/29 certification
  * installation procedure test – Contractor award
  * verification – 11/13 implementation

- Commercial pilot – 16–1=15 sites
  * installation procedures – continuing review
  * verification – in progress

STEPS IN DATA VERIFICATION

- INSTALLATION CHECK–OUT
- INSTALLATION VERIFICATION
- ONGOING DATA REVIEW

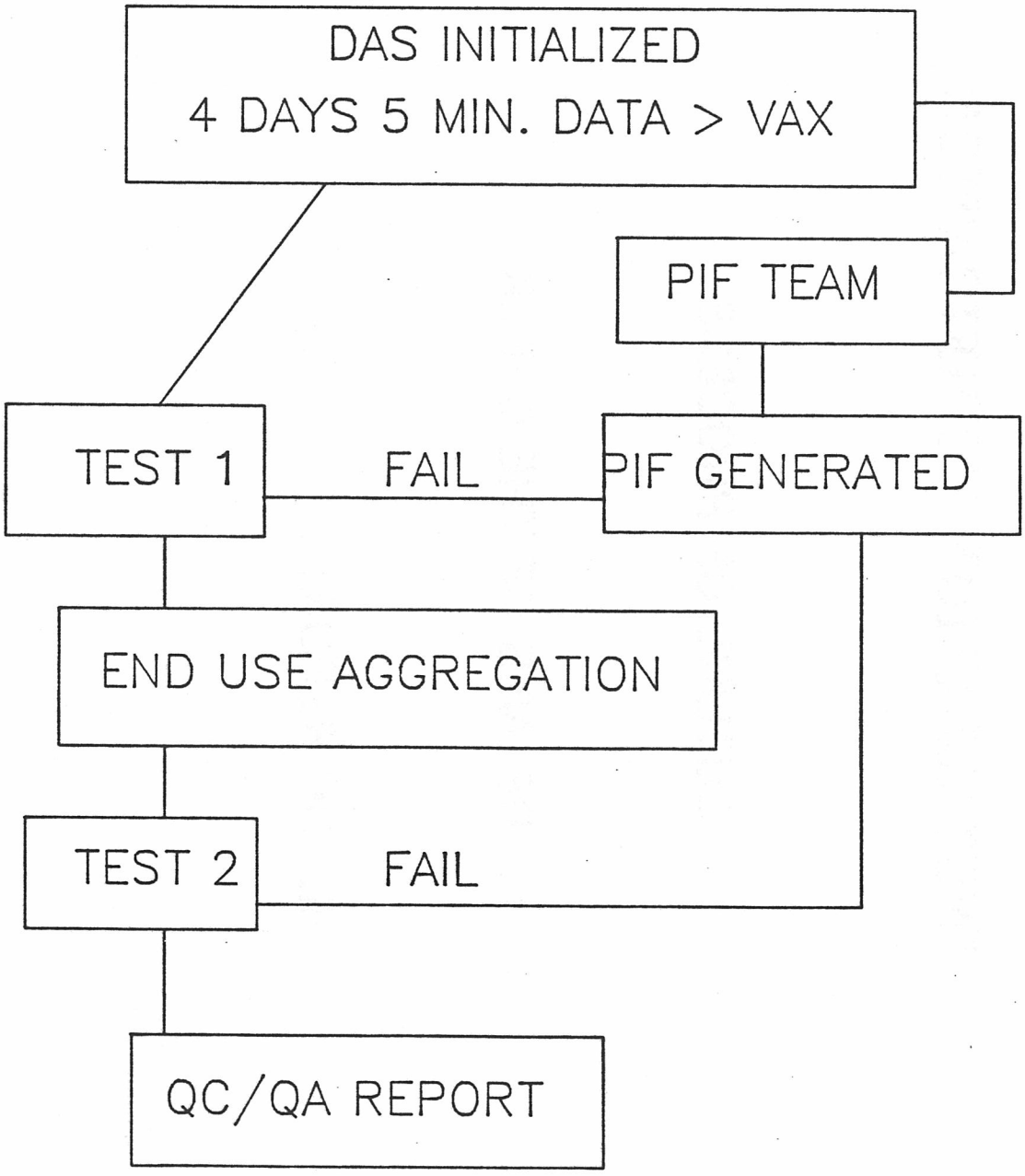
INSTALLATION VERIFICATION

I. OUTLINE OF PROCESS

II. DETAILS OF THE CHECK

III. QC REPORT

VERIFICATION FLOW



CLASSES OF VERIFICATION TEST

- ROBUST TESTS
- REASONABLENESS TESTS

CHECK 1

SUM RULE

$$E_A = e_{1a} + e_{2a} + \cdots + e_{na}$$

SUM CHECK

$$\left| E_A - e_{1a} - e_{2a} - \cdots - e_{na} \right| \leq \hat{E}$$

DIAGNOSIS

WHICH CHANNELS RESPONSIBLE?

OFFSET OR CALIBRATION PROBLEM?

INSTALLATION PROBLEM?

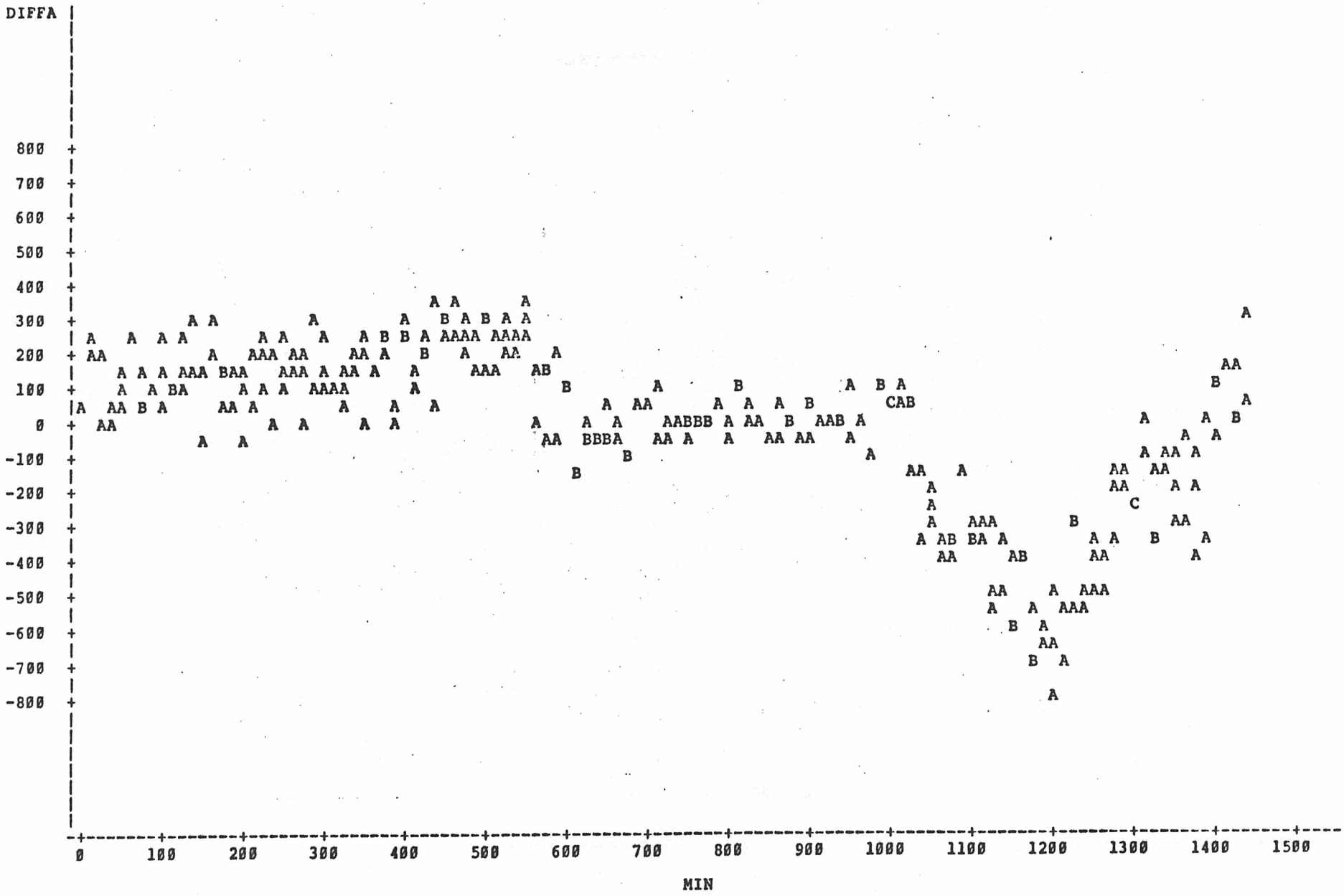
PASSING CRITERION:

NO MORE THAN M% OF THE RECORDS FAIL SUM CHECK

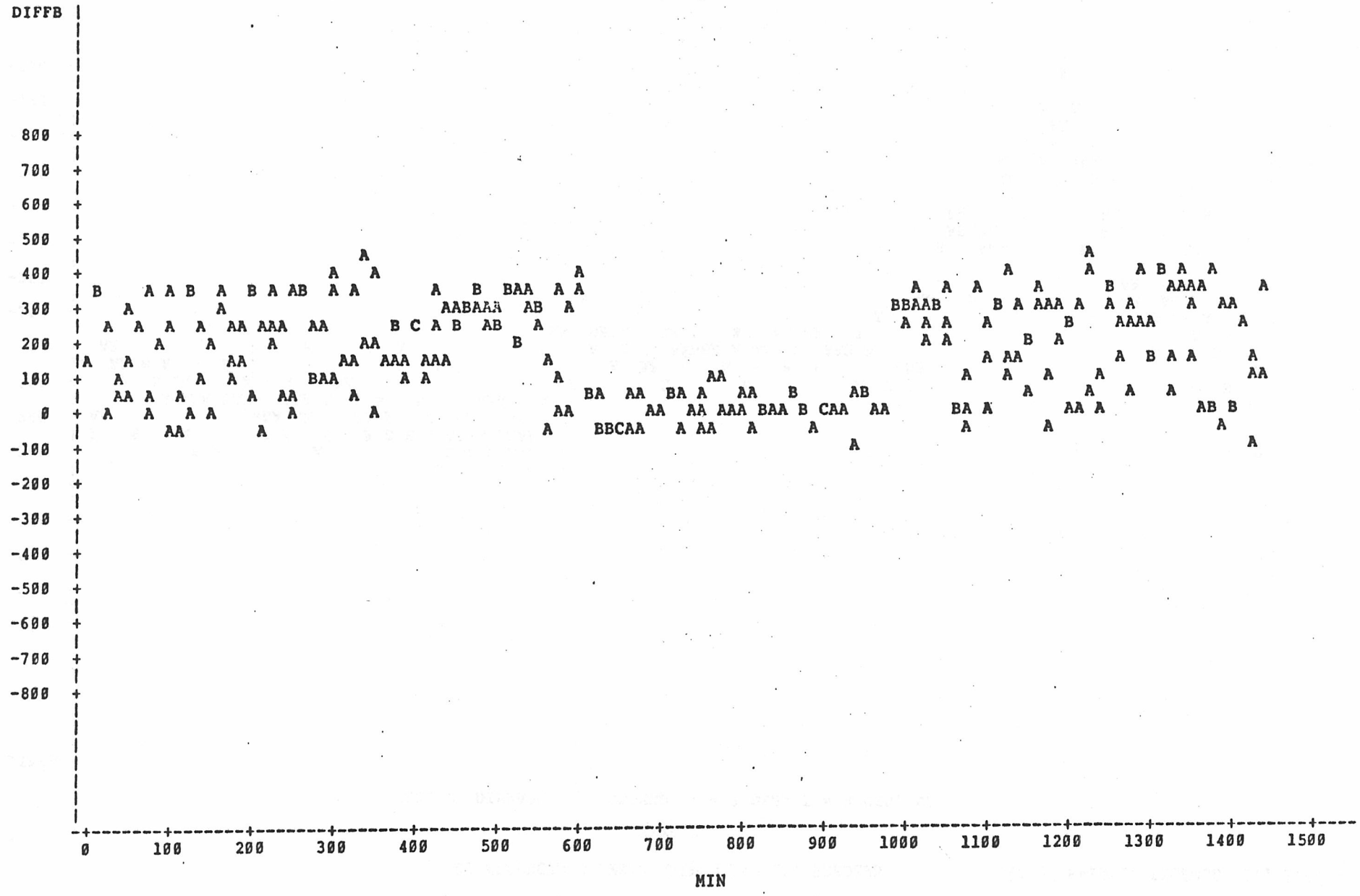
DIFFERENCES BETWEEN MAIN A AND ITS FEEDERS 17:30 FRIDAY, DECEMBER 14, 1984

SITE X

PLOT OF DIFFA*MIN LEGEND: A = 1 OBS, B = 2 OBS, ETC.



PLOT OF DIFFB*MIN LEGEND: A = 1 OBS, B = 2 OBS, ETC.

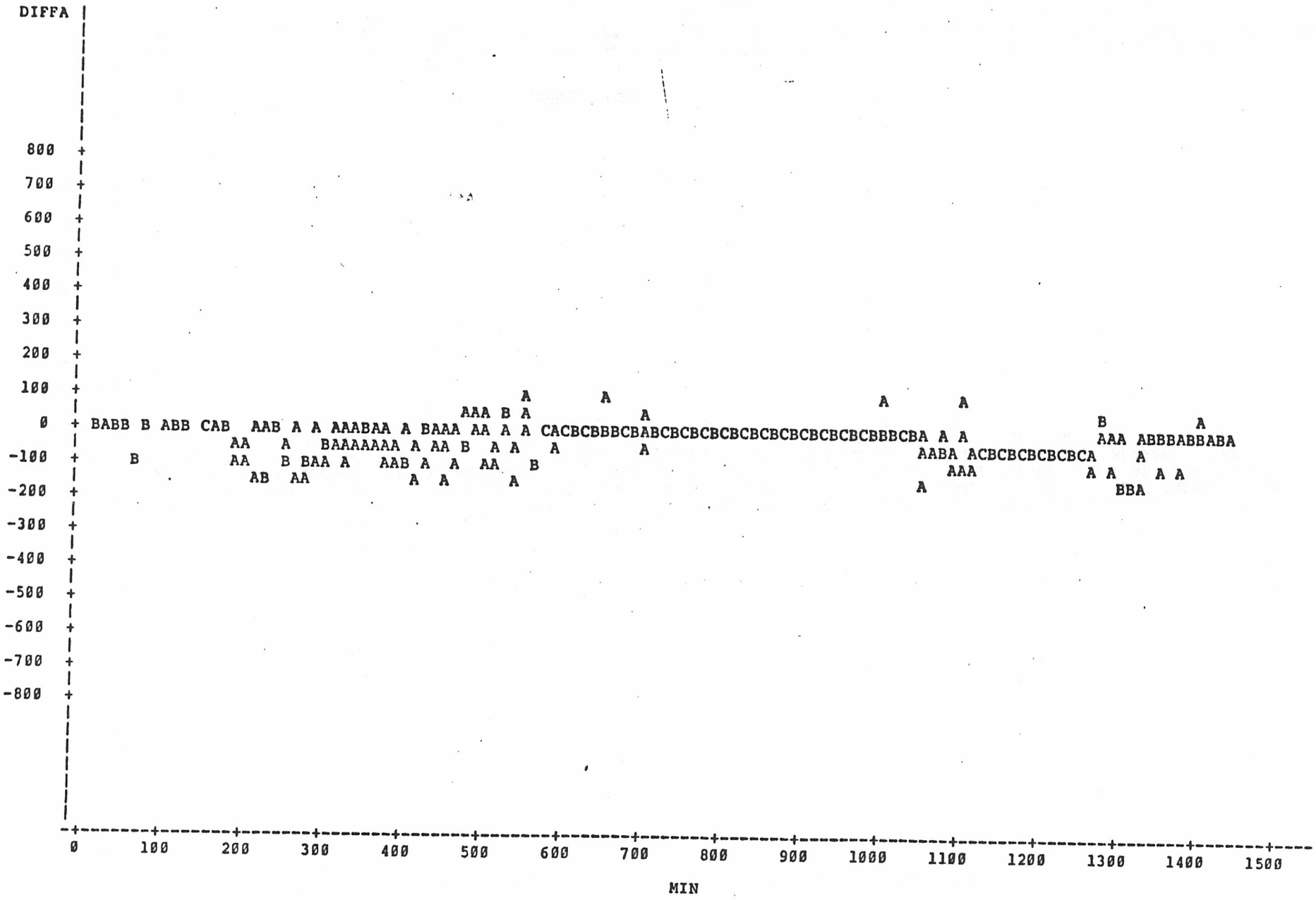


DIFFERENCES BETWEEN MAIN A AND ITS FEEDERS

17:38 FRIDAY, DECEMBER 14, 1984

SITE Y

PLOT OF DIFFA*MIN LEGEND: A = 1 OBS, B = 2 OBS, ETC.



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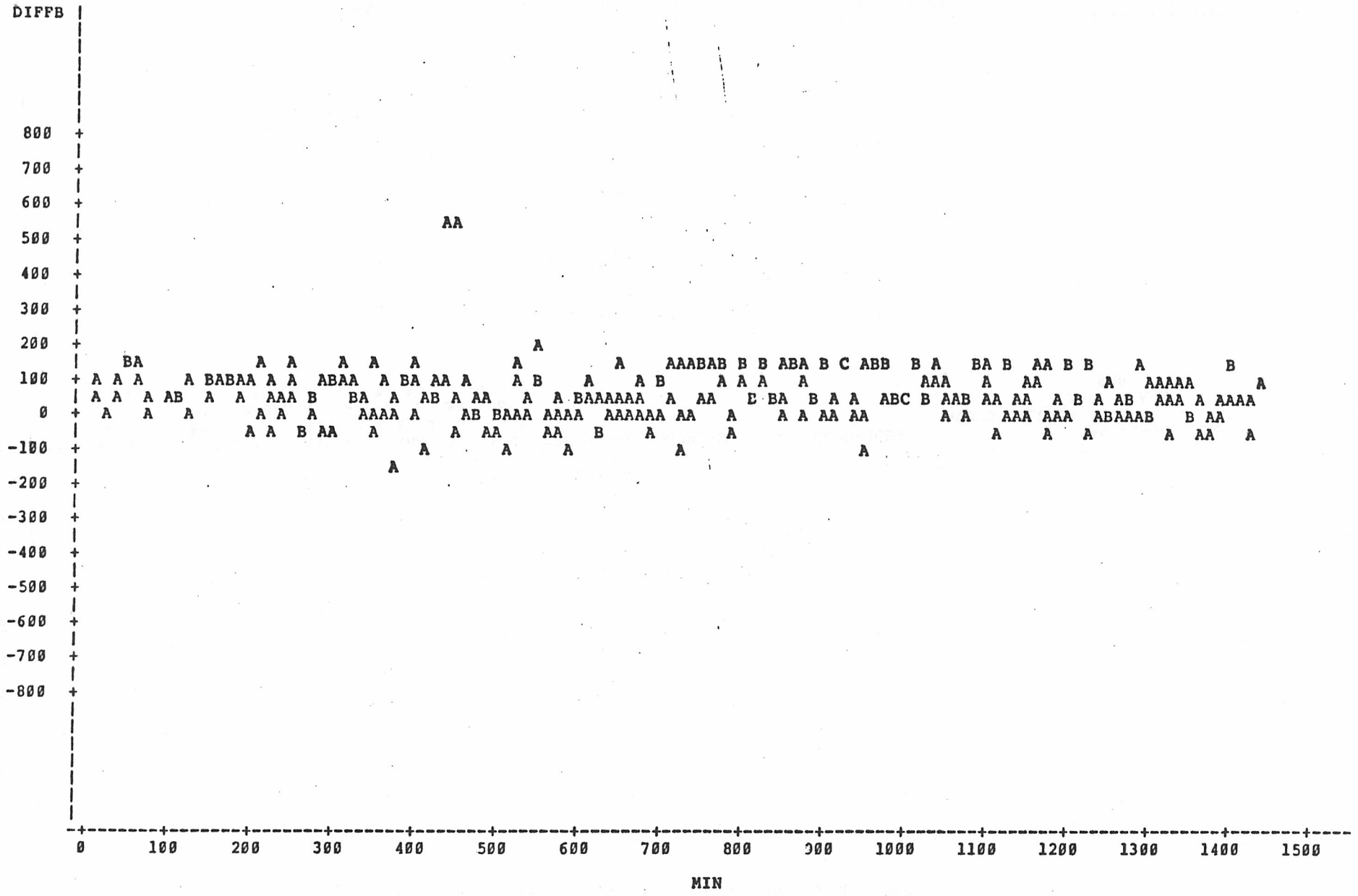

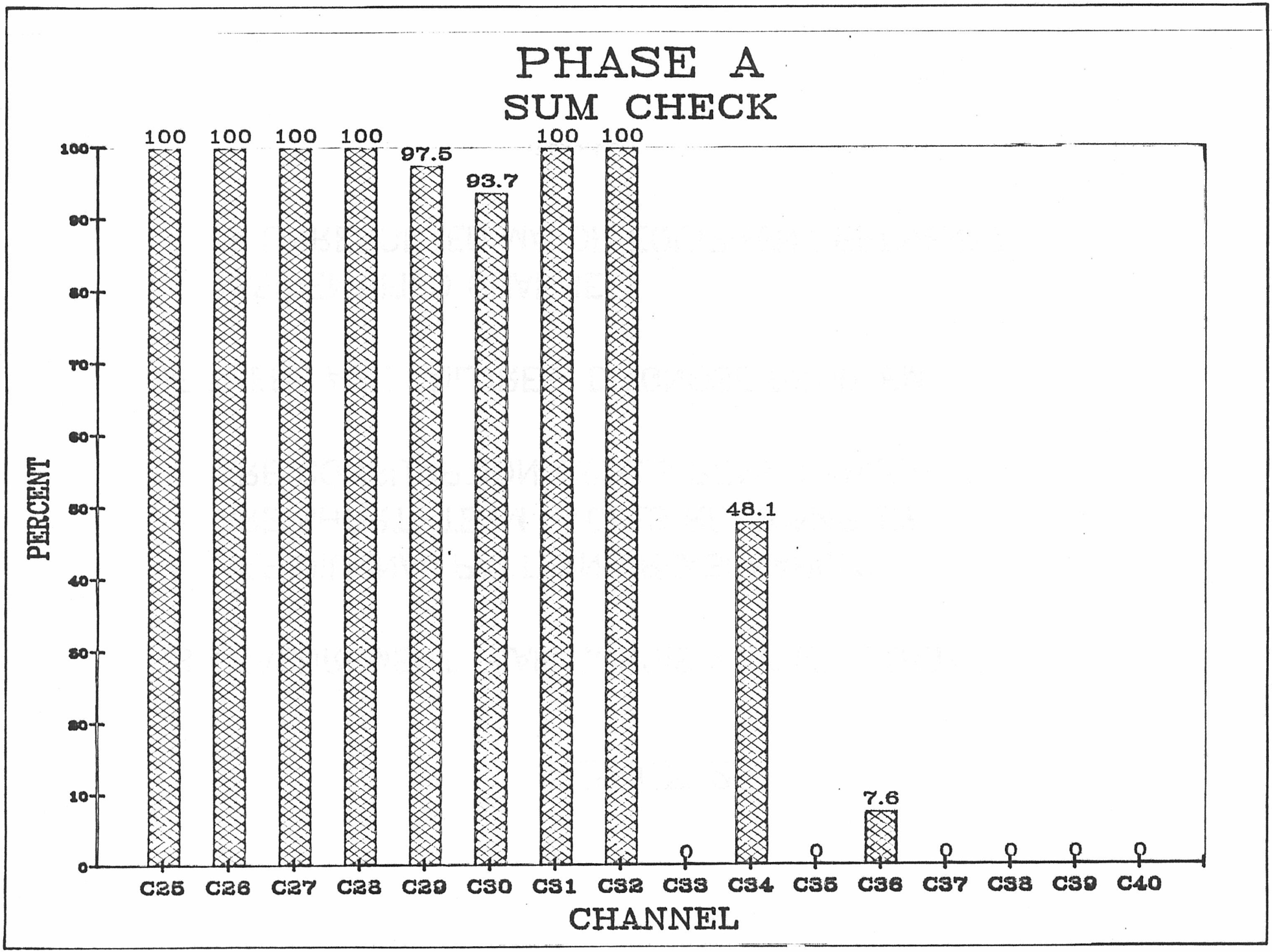
PHASE A
SUM CHECK
100
100
100
100
97.5
93.7
100
100
48.1
7.6
PERCENT
100
90
80
70
60
50
40
30
20
10
0
C25
C26
C27
C28
C29
C30
C31
C32
C33
C34
C35
C36
C37
C38
C39
C40
CHANNEL

CHECK 2

IS MEASUREMENT PLAN CONSISTENT WITH DATA?

ARE DIURNAL PATTERNS REASONABLE?
ARE SHORT–TERM CYCLES REASONABLE?
ARE CONSUMPTION LEVELS REASONABLE?

IF THERE ARE FAILURES, DIAGNOSE PROBLEM

MISIDENTIFIED CHANNEL?
IS UNREPORTED MAJOR EQUIPMENT PRESENT?

QUALITY CONTROL REPORT

1) STATISTICS ON SUM CHECKING

2) PLOTS OF TIME SERIES DATA FOR EACH END USE

3) COMMUNICATIONS STATISTICS

4) PERFORMANCE SUMMARY

LEARNED FROM VERIFICATION DEVELOPMENT

- IMPORTANCE OF ROBUST TESTS
- UNBALANCED 2-PHASE LOADS
- IMPORTANCE OF A/D OFFSET STABILITY

ACCURACY AND PRECISION CONSIDERATIONS

- A/D CONVERSION
  255 BIT – FULL SCALE
- AVERAGED ON–LINE WITH
  TRUNCATION
- CONSTANT PRECISION RELATIVE
  TO FULL SCALE
- ALL CHANNELS LAB CALIBRATED