

COMMERCIAL DATA VERIFICATION

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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

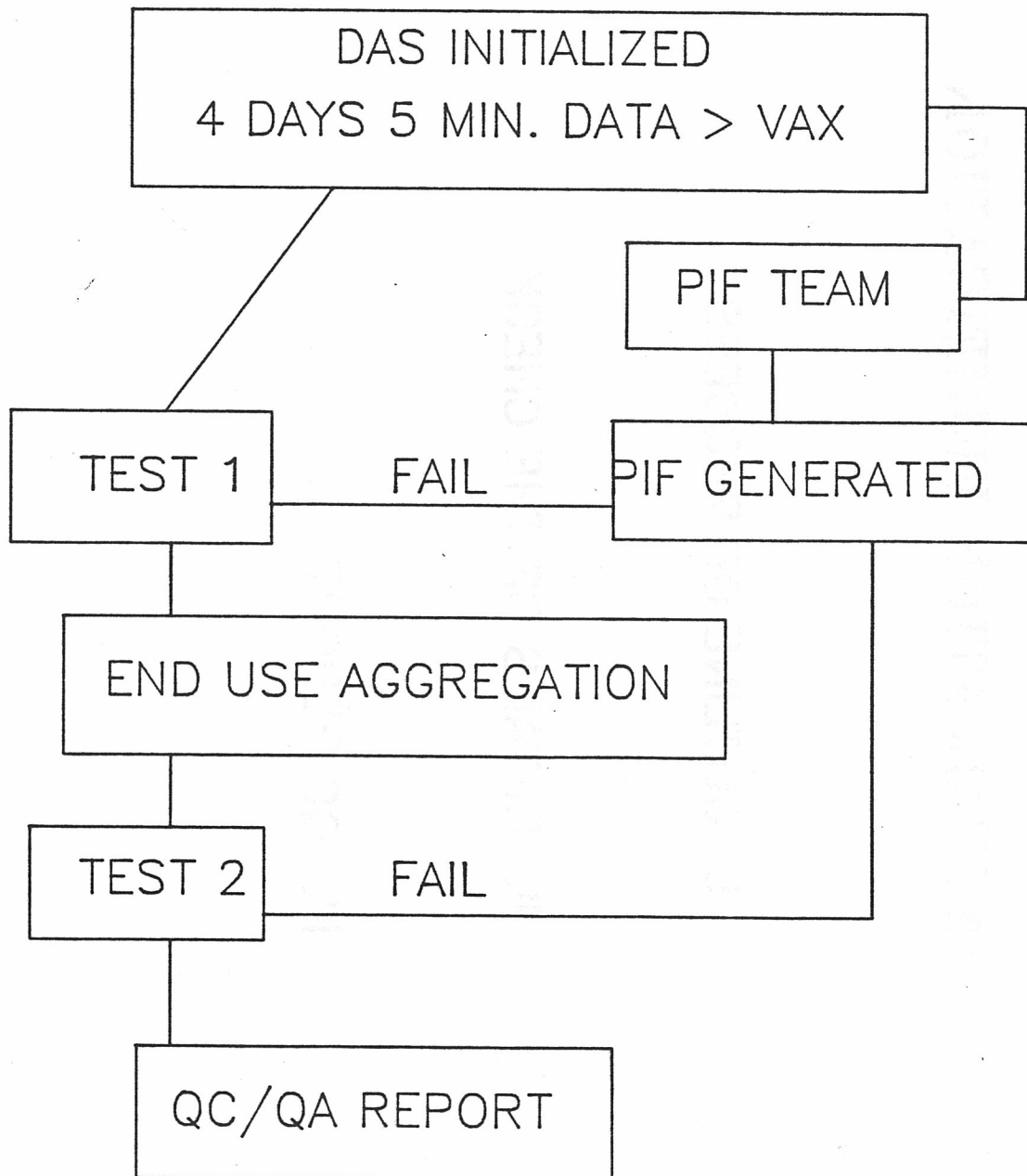
INSTALLATION VERIFICATION

I. OUTLINE OF PROCESS

II. DETAILS OF THE CHECK

III. QC REPORT

VERIFICATION FLOW



CLASSES OF VERIFICATION TEST

- o ROBUST TESTS
- o REASONABLENESS TESTS

CHECK 1

SUM RULE

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

SUM CHECK

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

DIAGNOSIS

WHICH CHANNELS RESPONSIBLE?

OFFSET OR CALIBRATION PROBLEM?

INSTALLATION PROBLEM?

PASSING CRITERION:

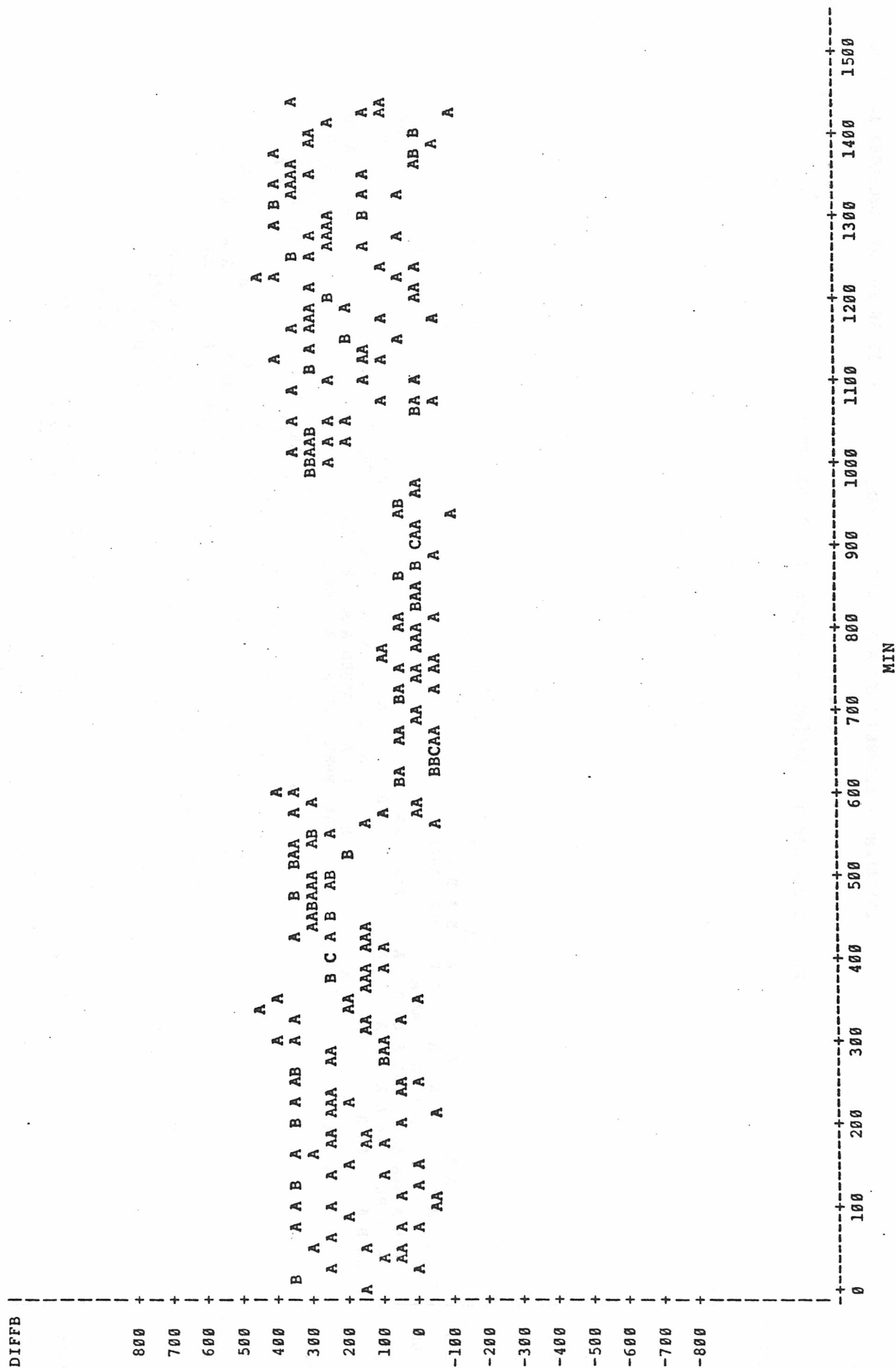
NO MORE THAN M% OF THE RECORDS

FAIL SUM CHECK

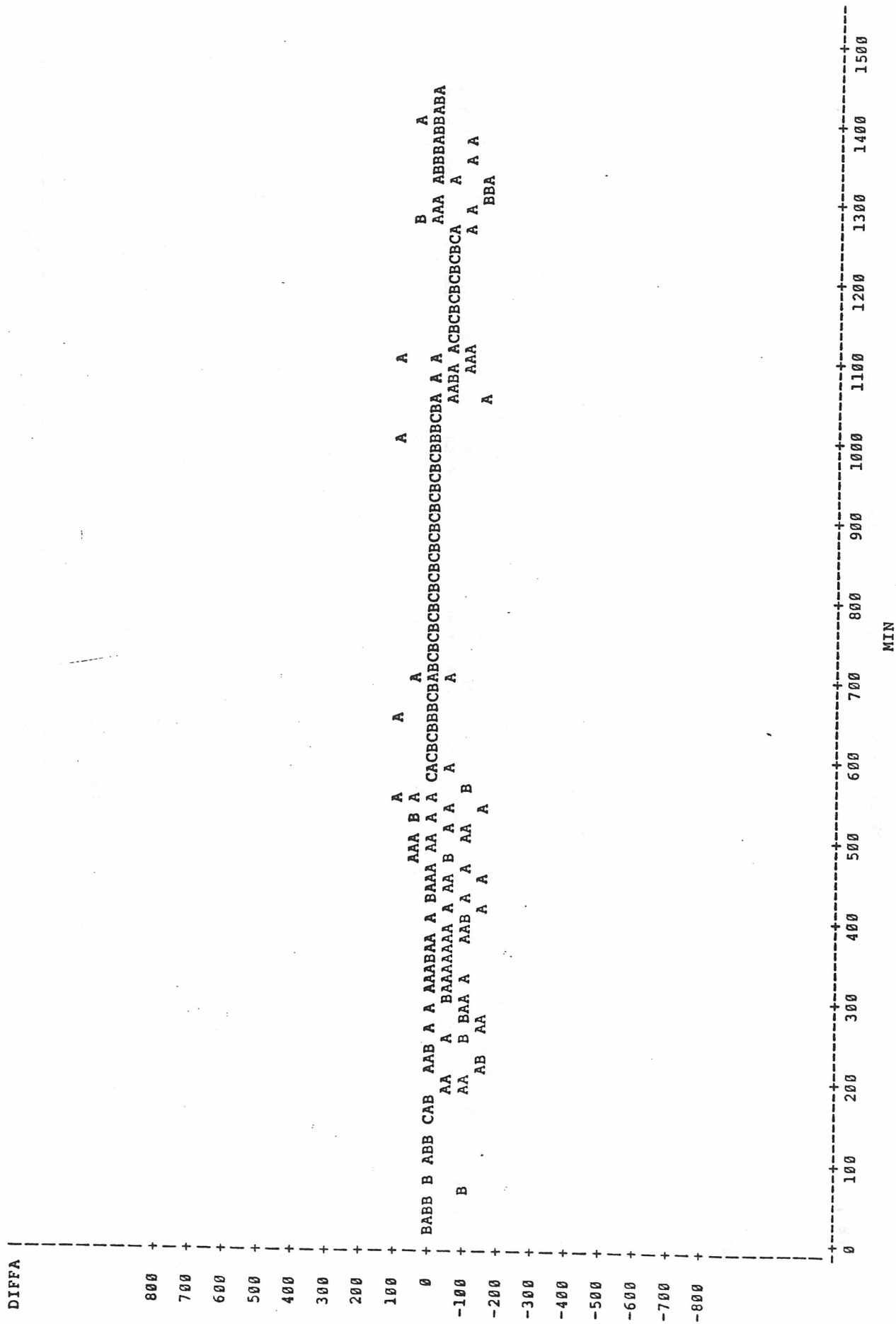
17:30 FRIDAY, DECEMBER 14, 1984 2

DIFFERENCES BETWEEN MAIN B AND ITS FEEDERS
SITE X

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



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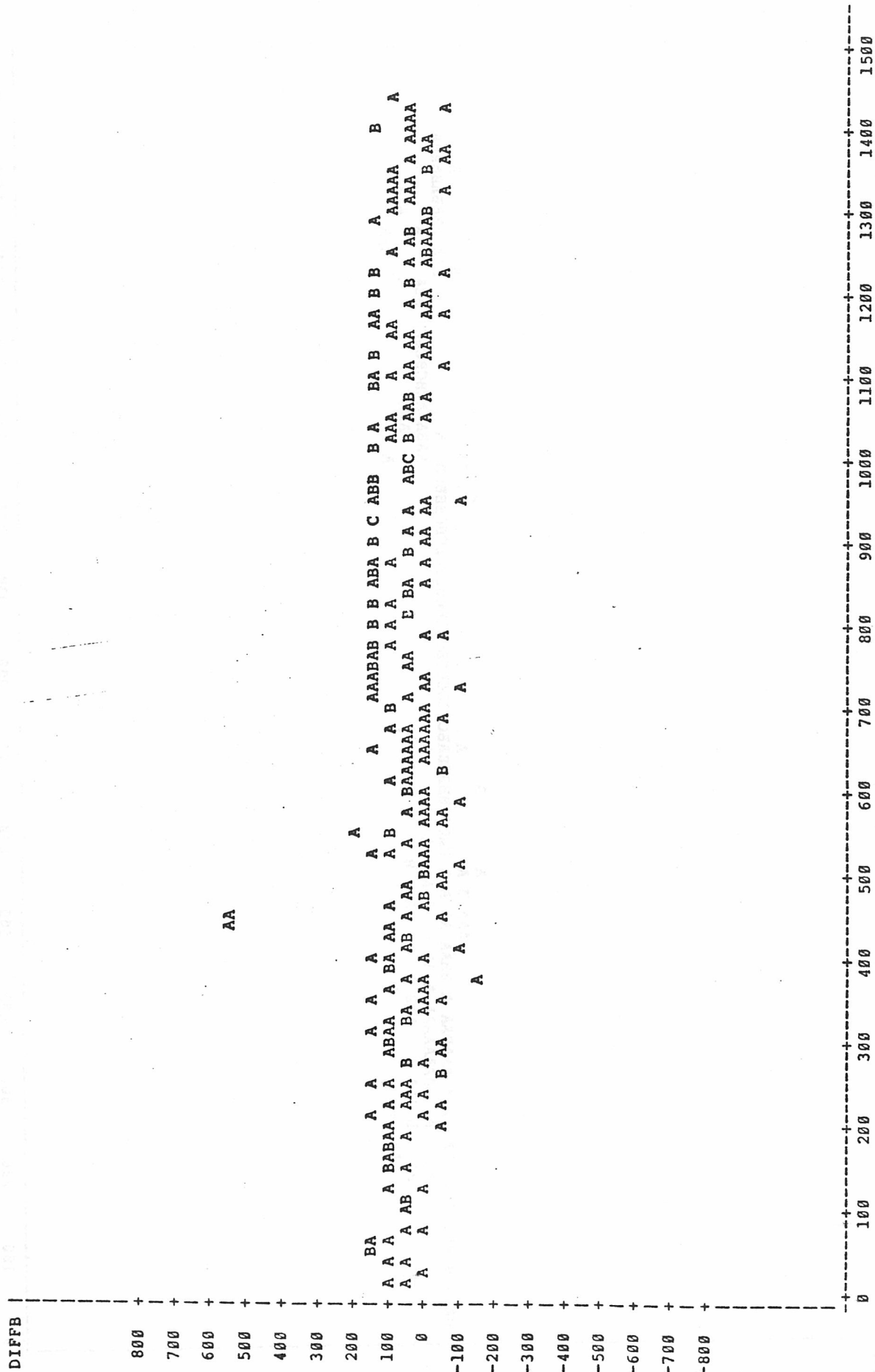


DIFFERENCES BETWEEN MAIN B AND ITS FEEDERS

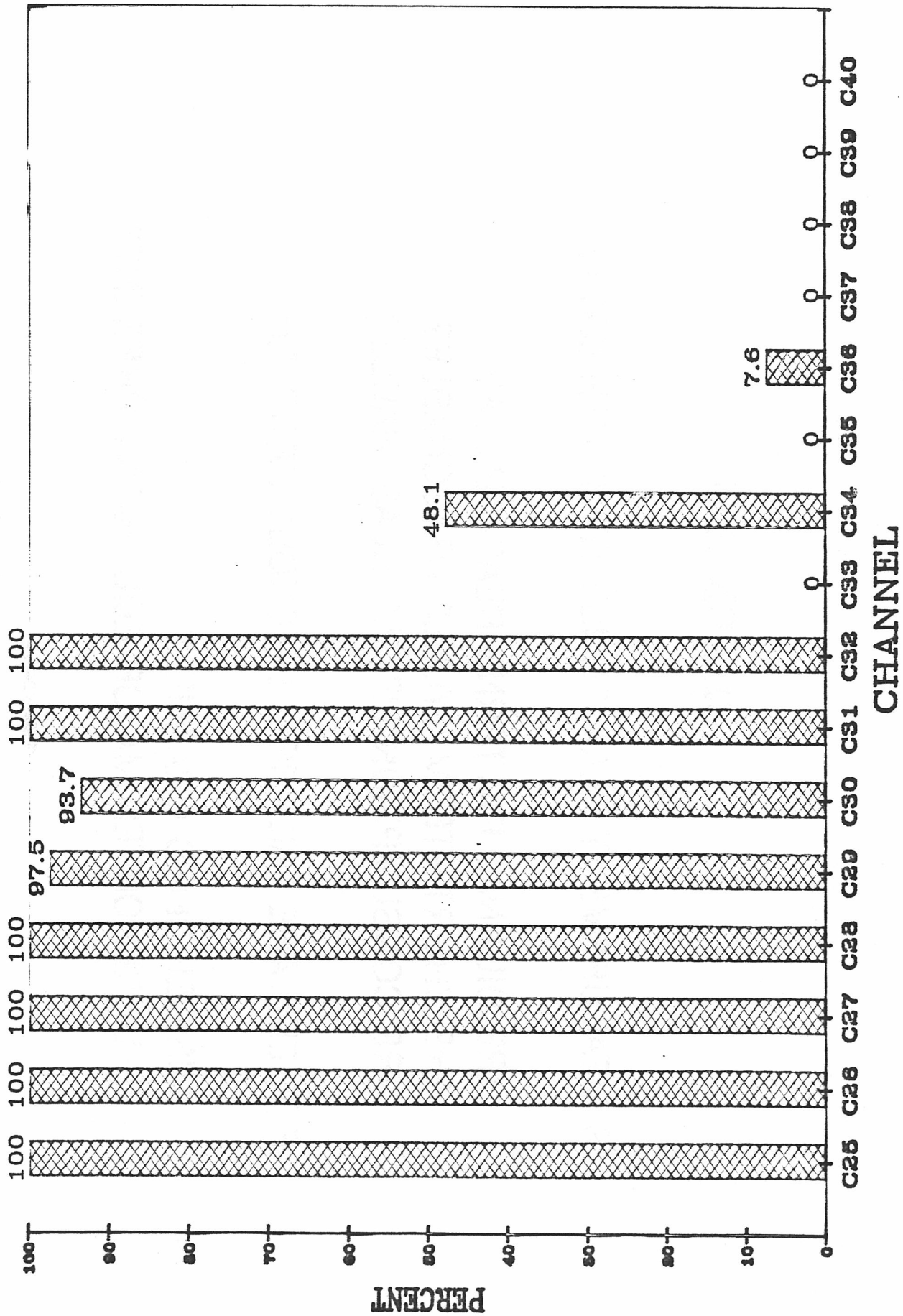
SITE Y

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



PHASE A SUM CHECK



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

RESIDENTIAL VS. COMMERCIAL VERIFICATION

- SUM CHECK MUCH MORE DIFFICULT
TO IMPLEMENT AT INSTALLATION
- REASONABLENESS CHECKS FAR
MORE BUILDING SPECIFIC
- USE OF AUDIT INFORMATION
CRITICAL TO VERIFICATION

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