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Abnormal Event Detection On-Line Information Flow

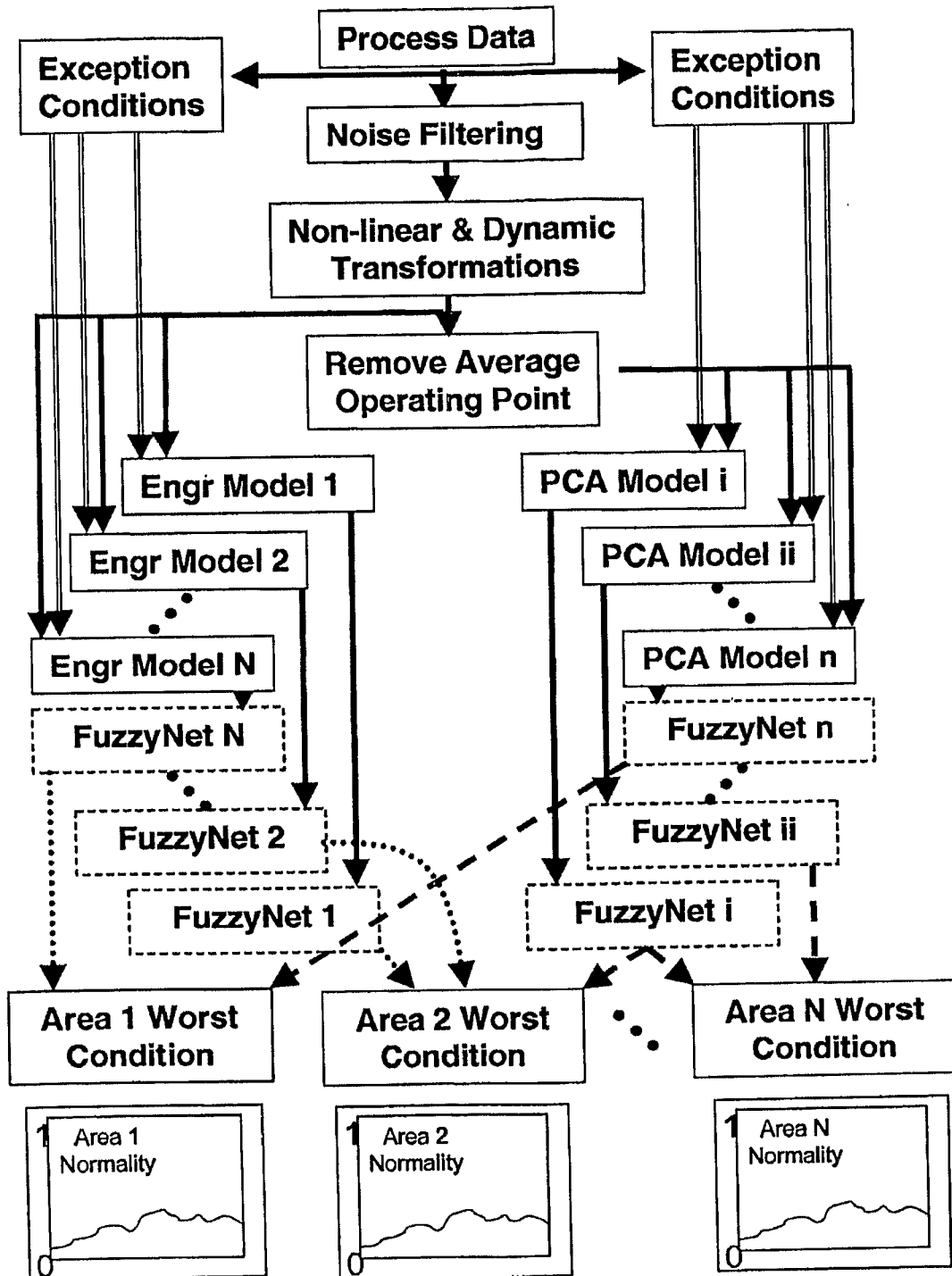
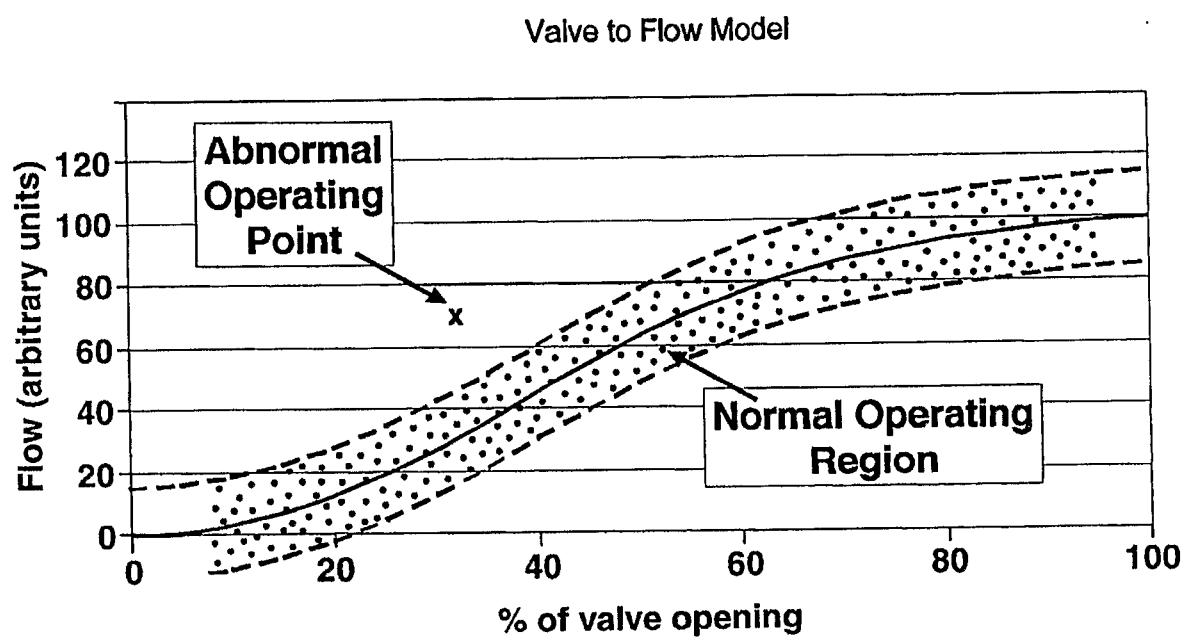


FIG. 1

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**FIG. 2**

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Three Dimensional Redundancy Expressed as a PCA Model

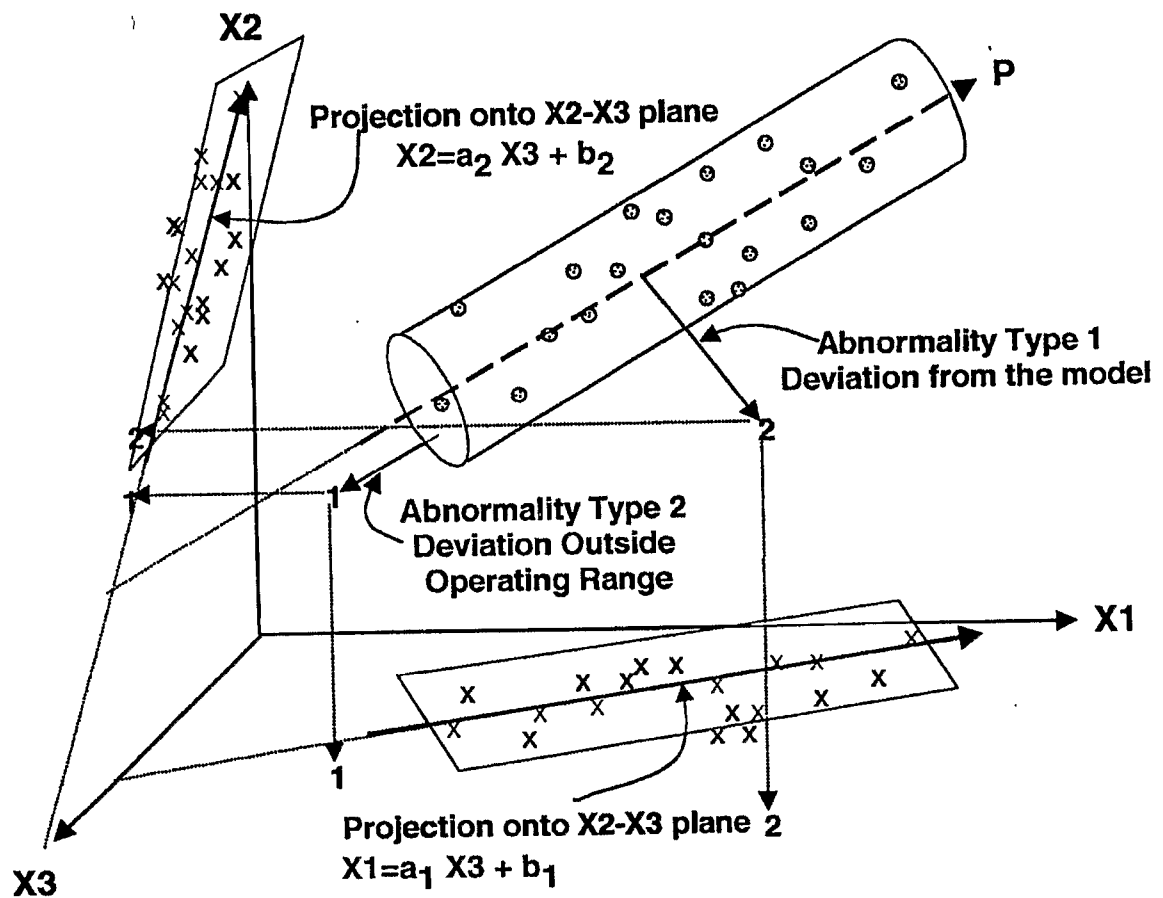
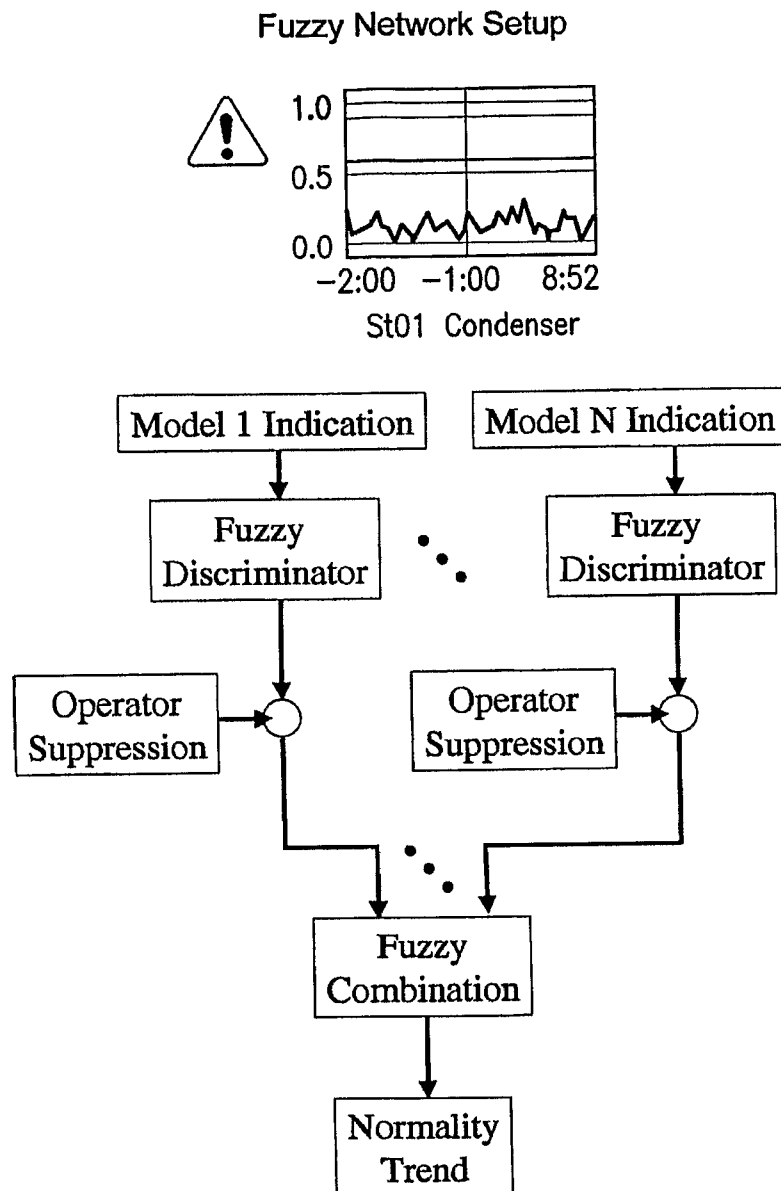


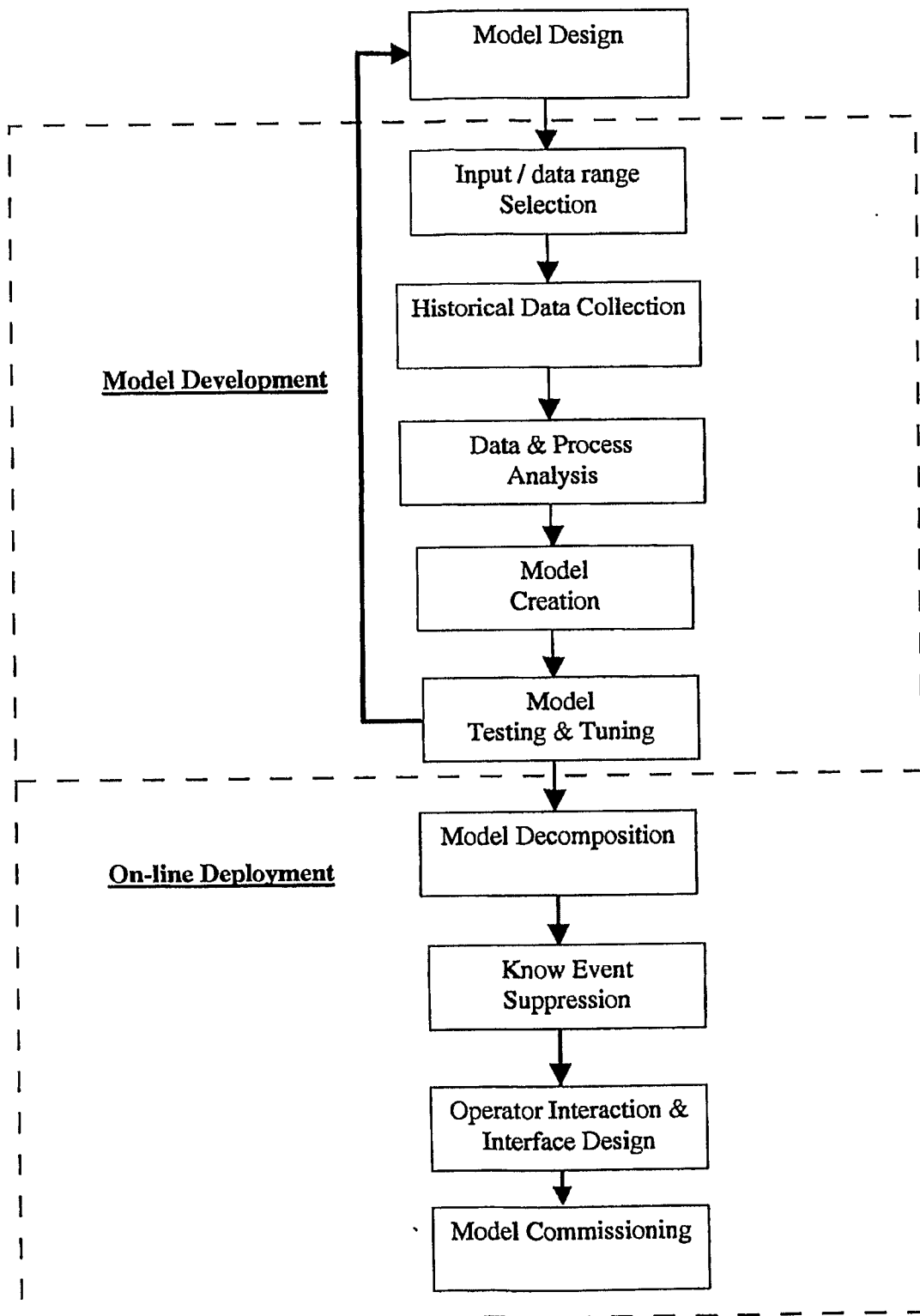
FIG. 3

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**FIG. 4**

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Process For Developing a PCA Abnormal Event Detector

**FIG. 5**

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Anatomy of a Process Control Cascade

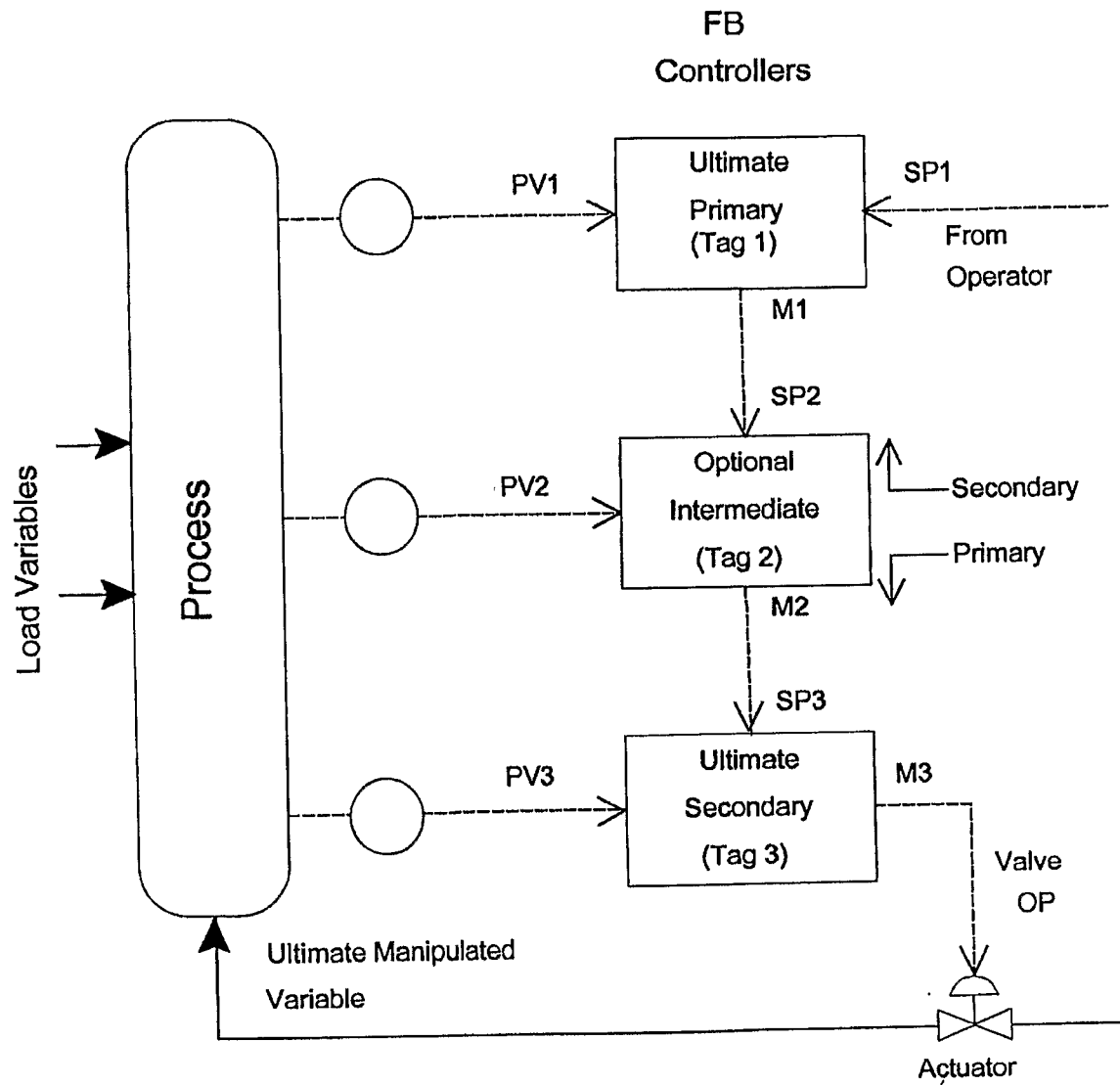


FIG. 6

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Anatomy of a Multivariable Constraint Controller, MVCC

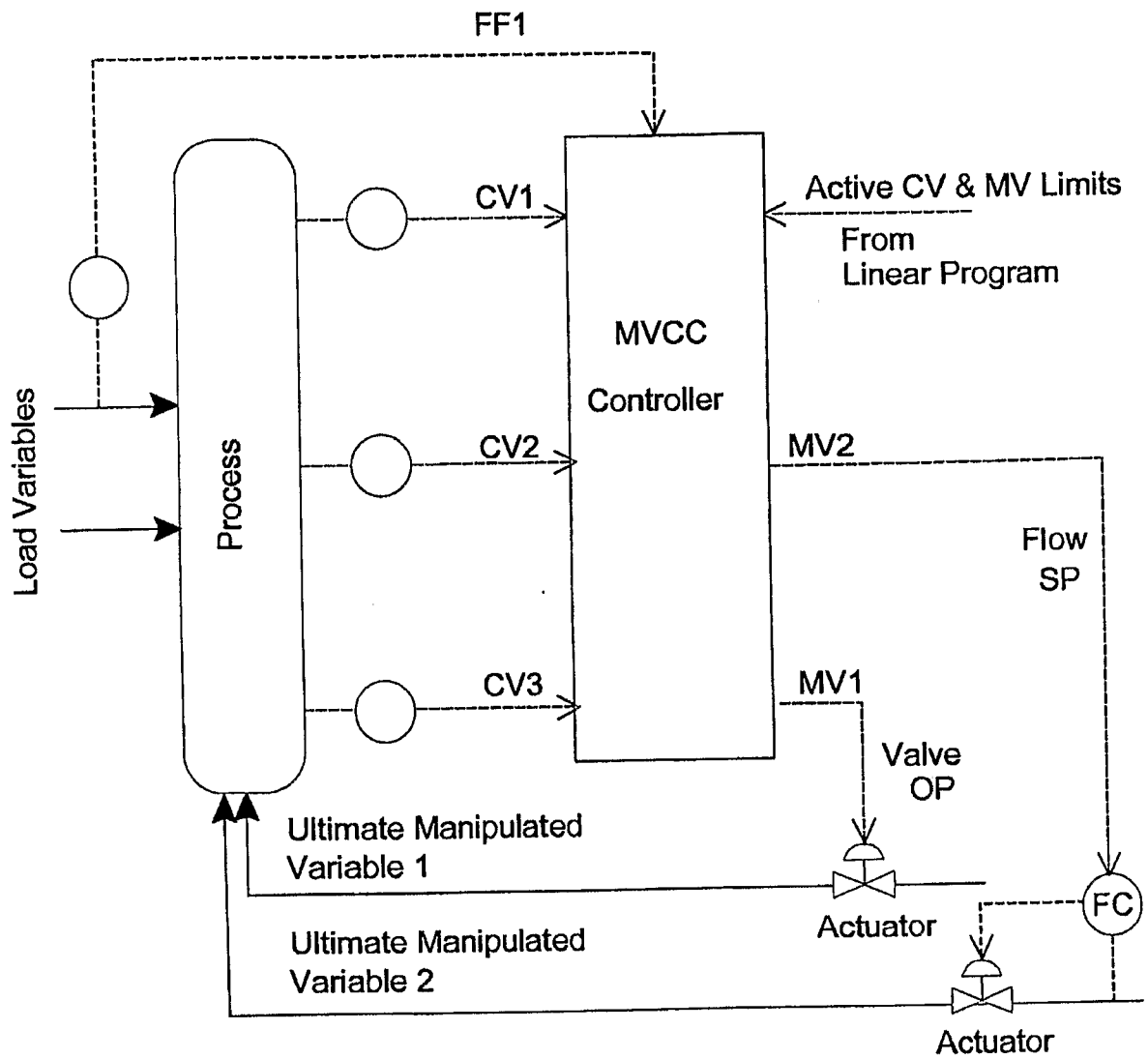
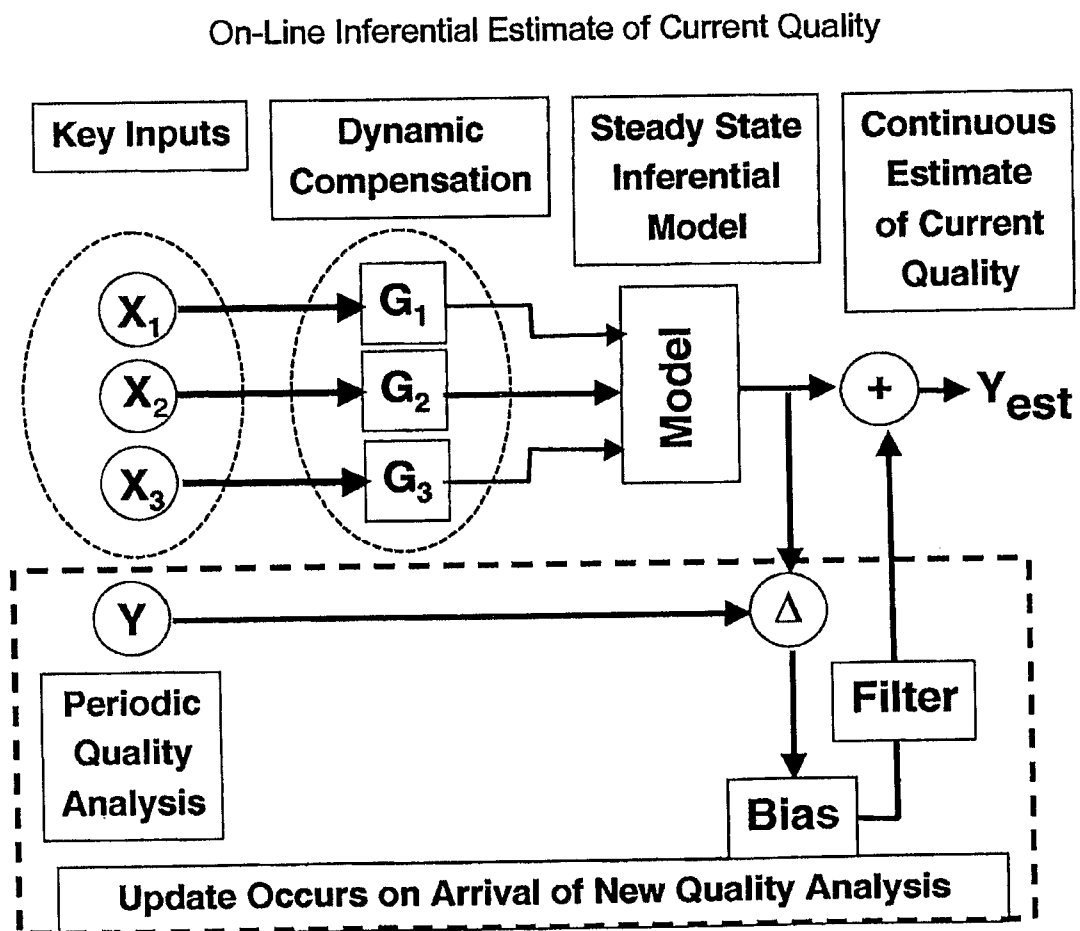


FIG. 7

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**FIG. 8**

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KPI Analysis of Historical Data

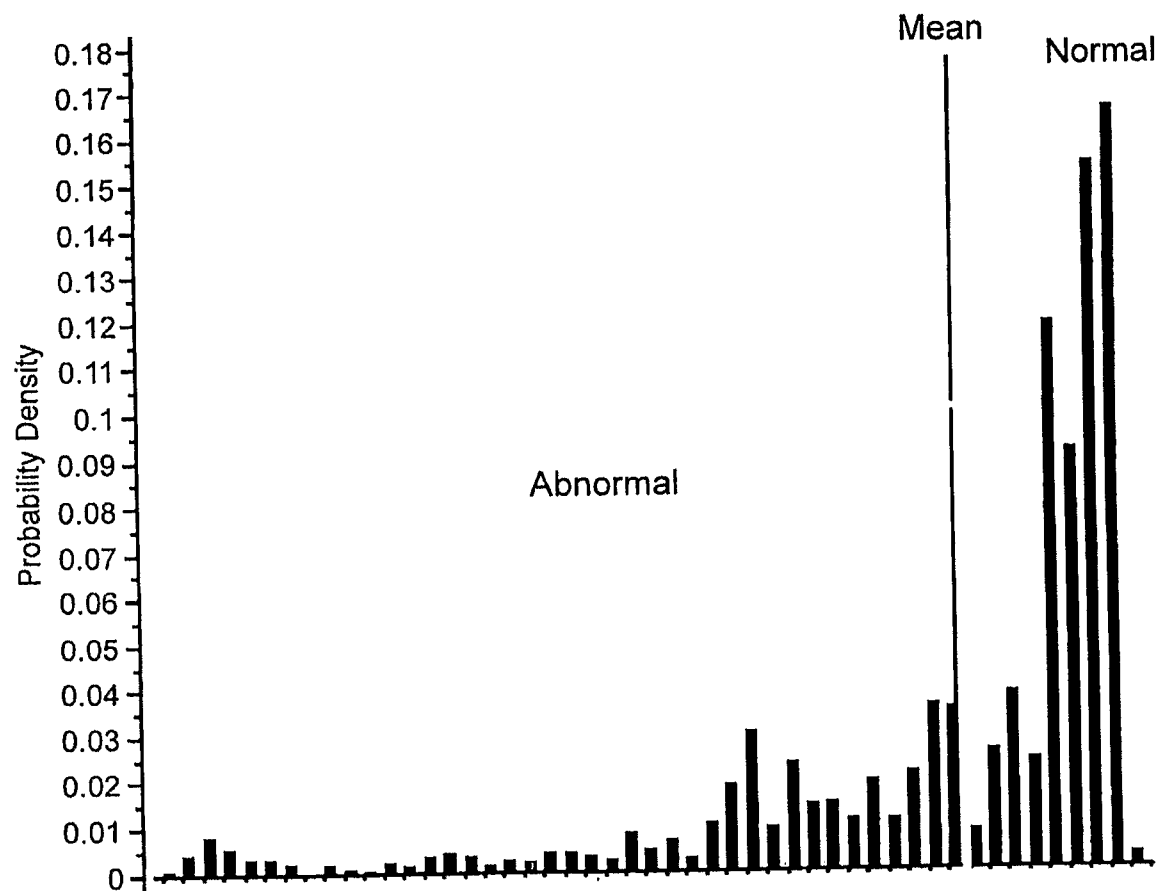
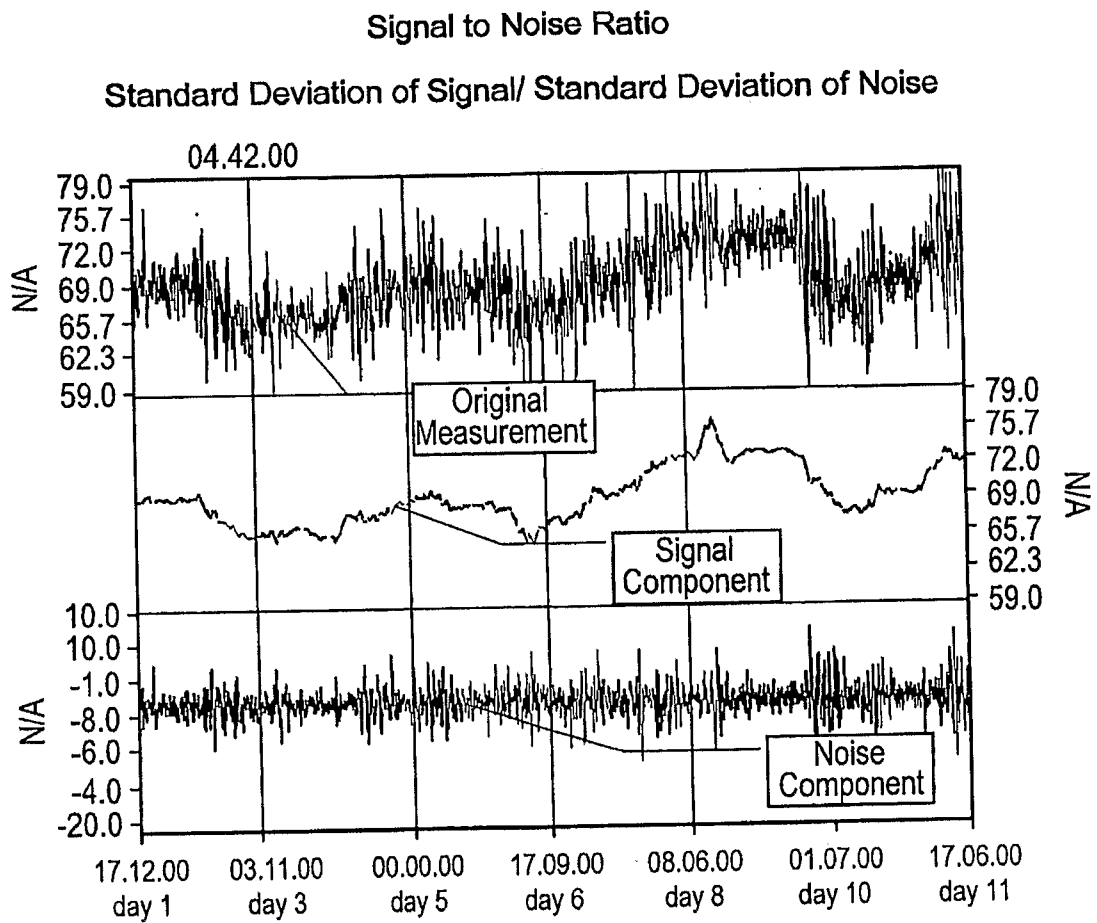
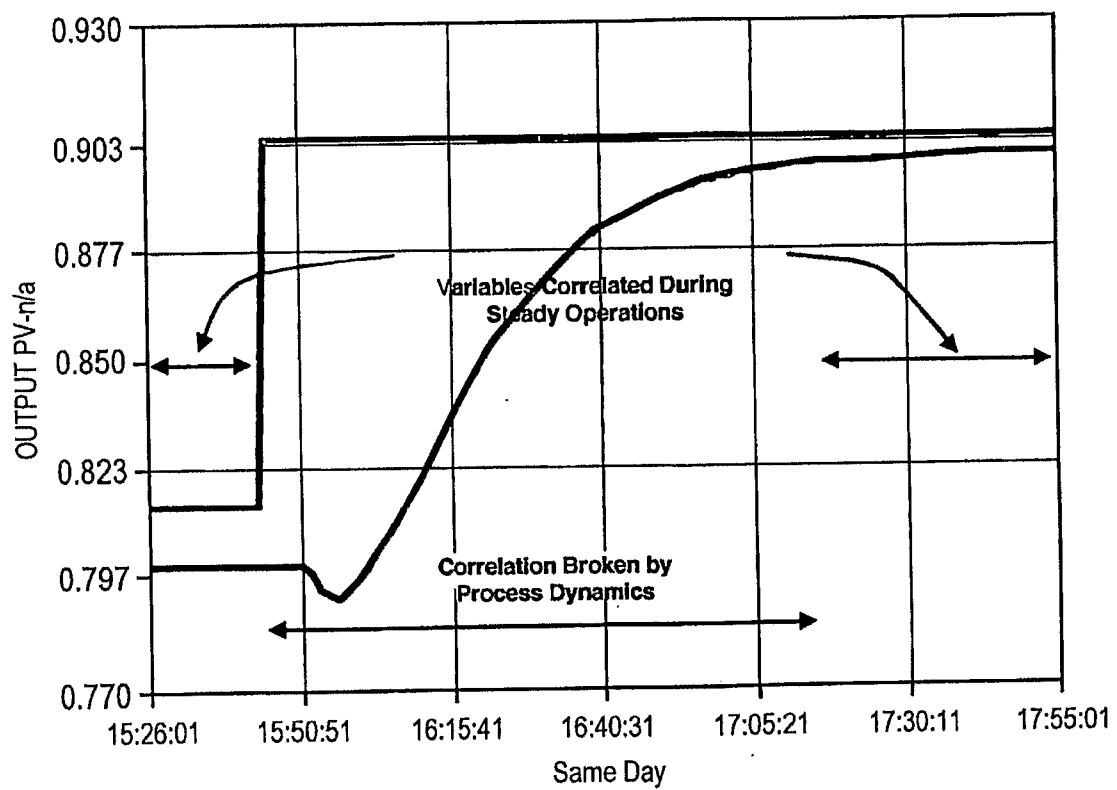


FIG. 9

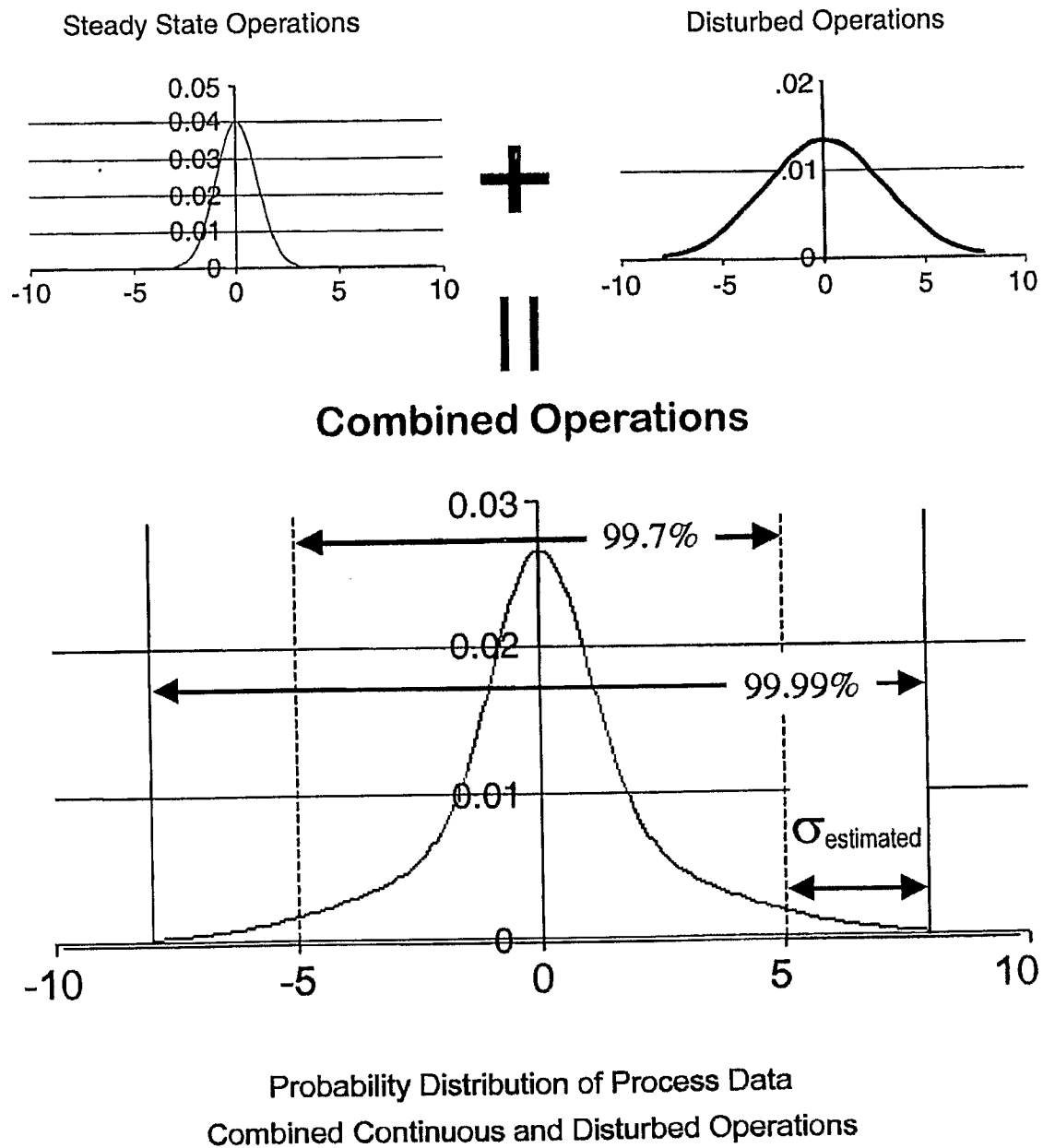
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**FIG. 10**

Example of the Need for Dynamic Reconciliation

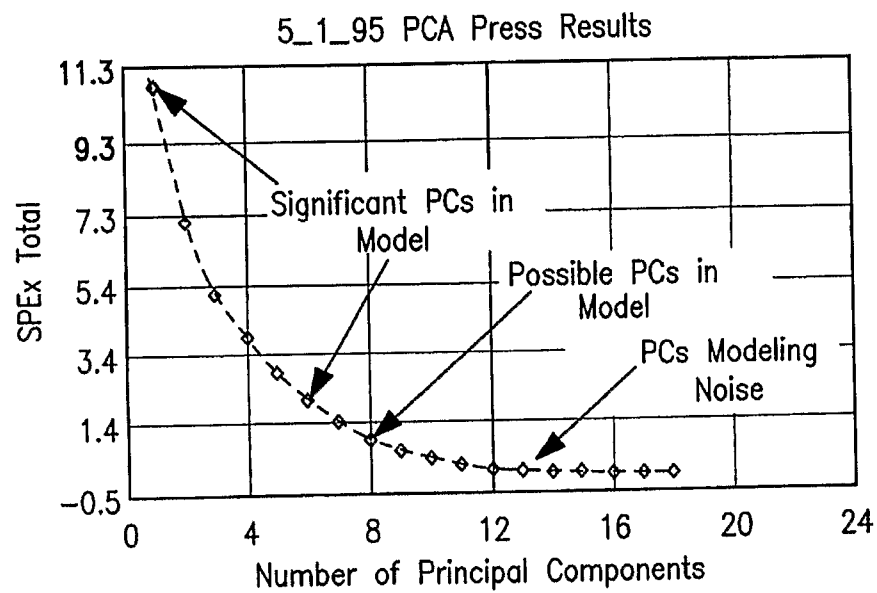
**FIG. 11**

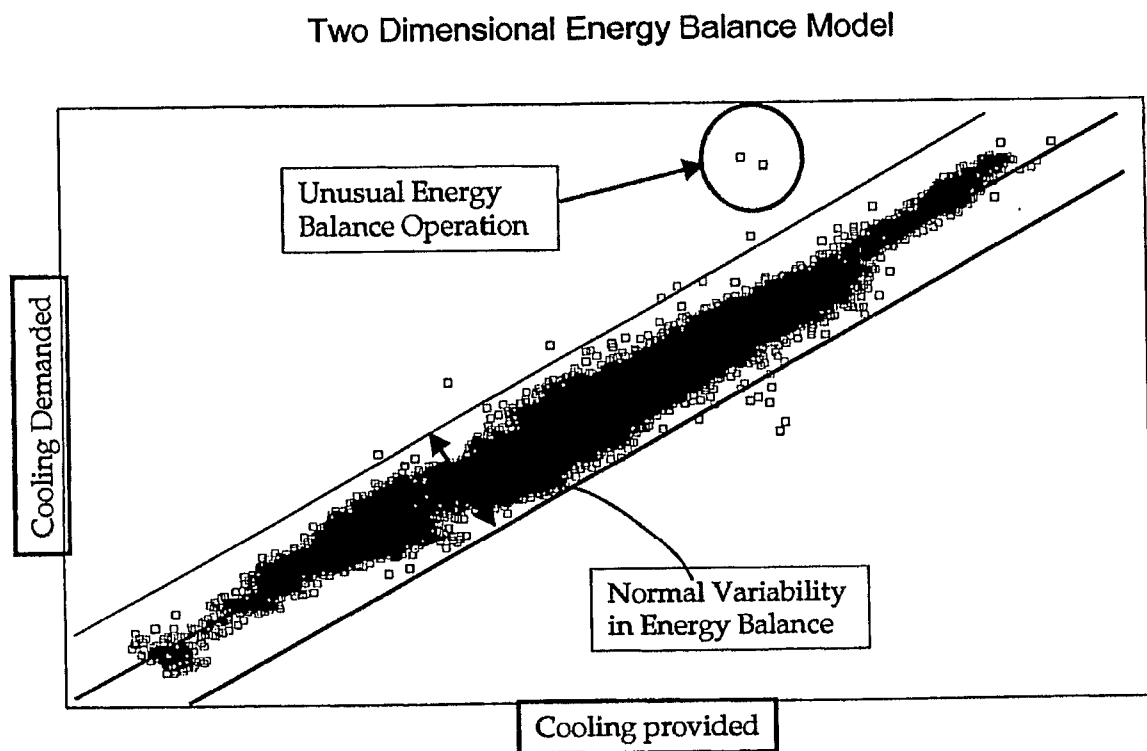
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**FIG. 12**

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An Illustration of the Press Statistic

**FIG. 13**

**FIG. 14**

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Valve to Flow Data

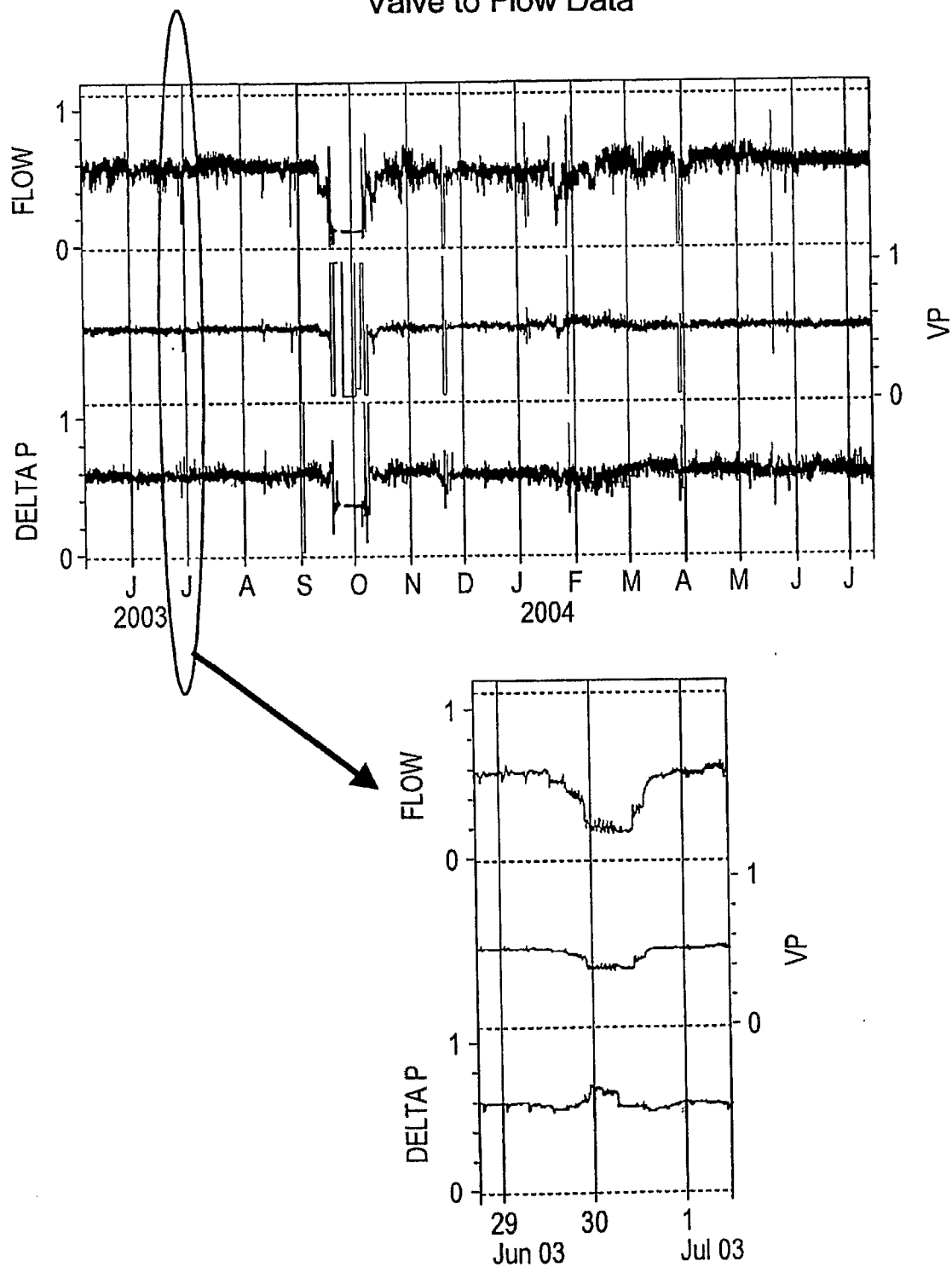


FIG. 15

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Fuzzy Discriminators

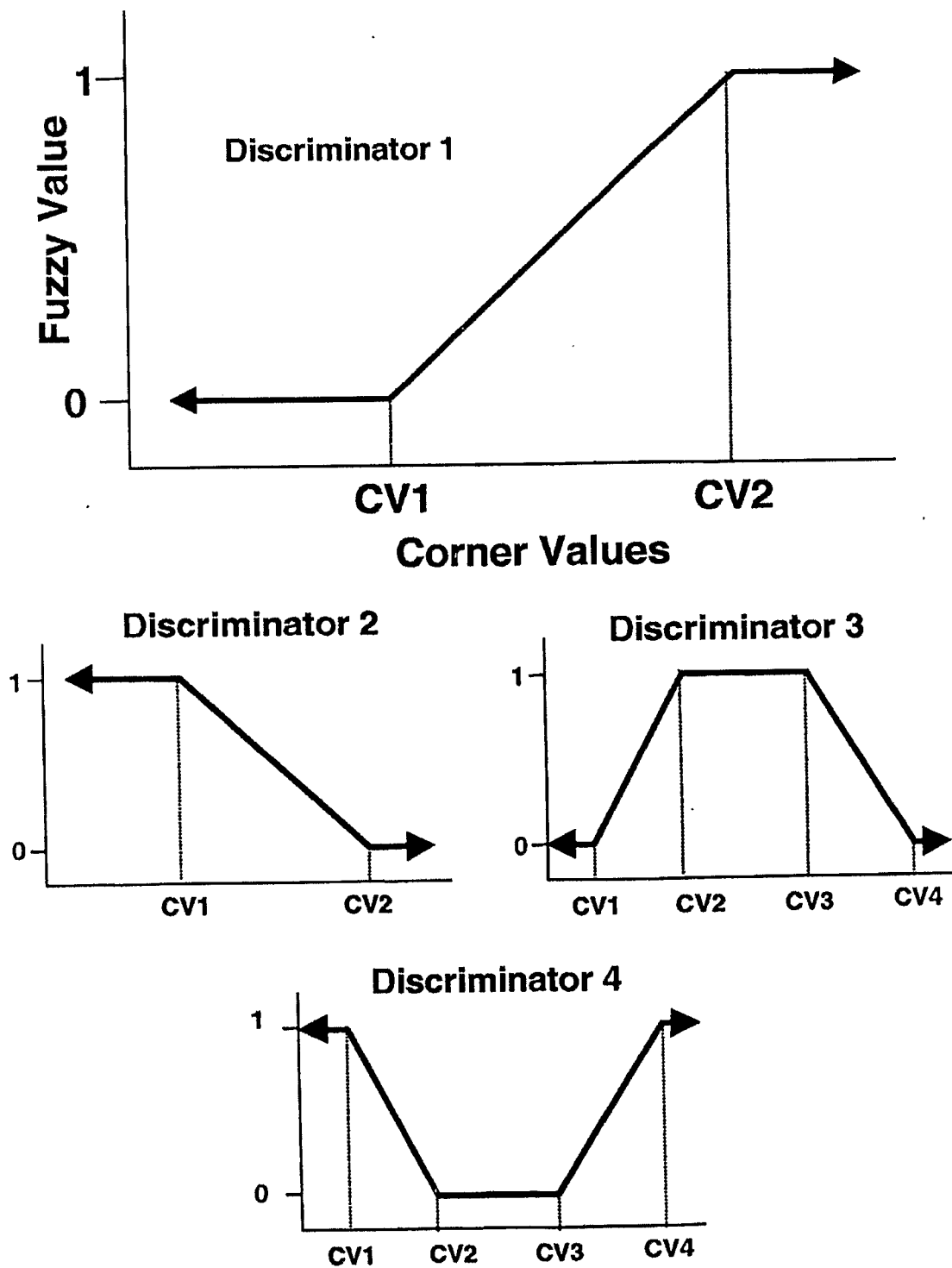


FIG. 16

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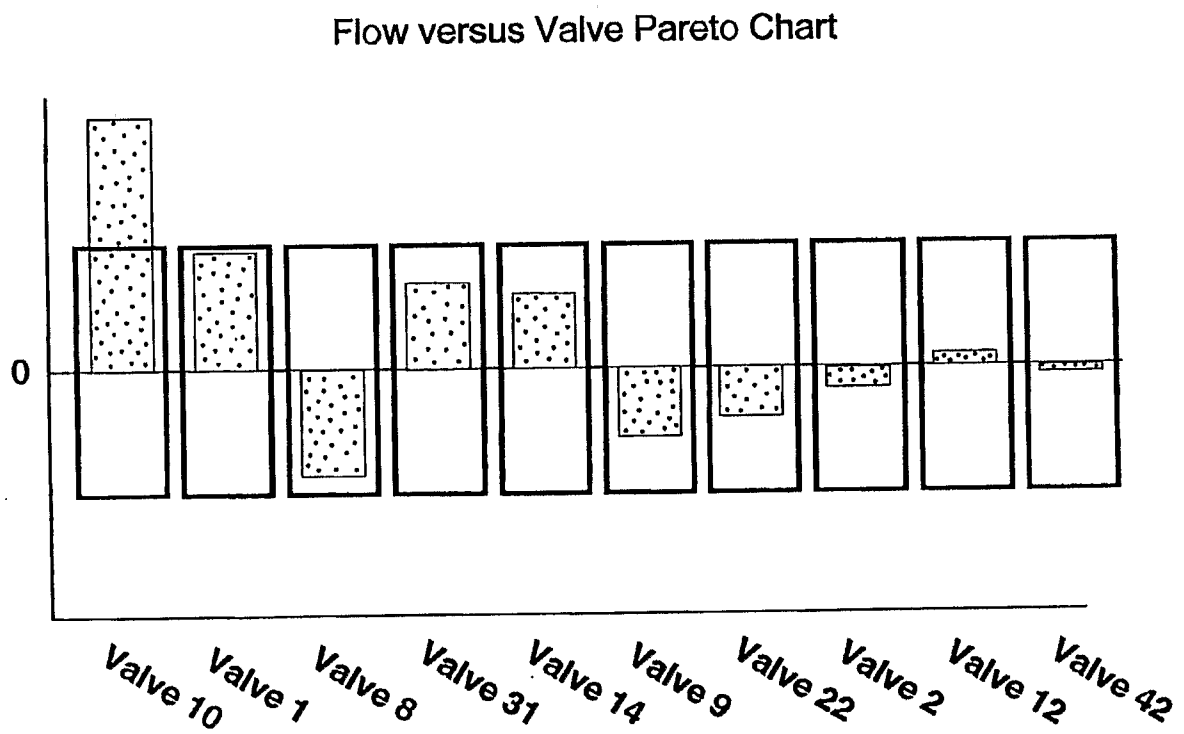


FIG. 17

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Operator Suppression Logic

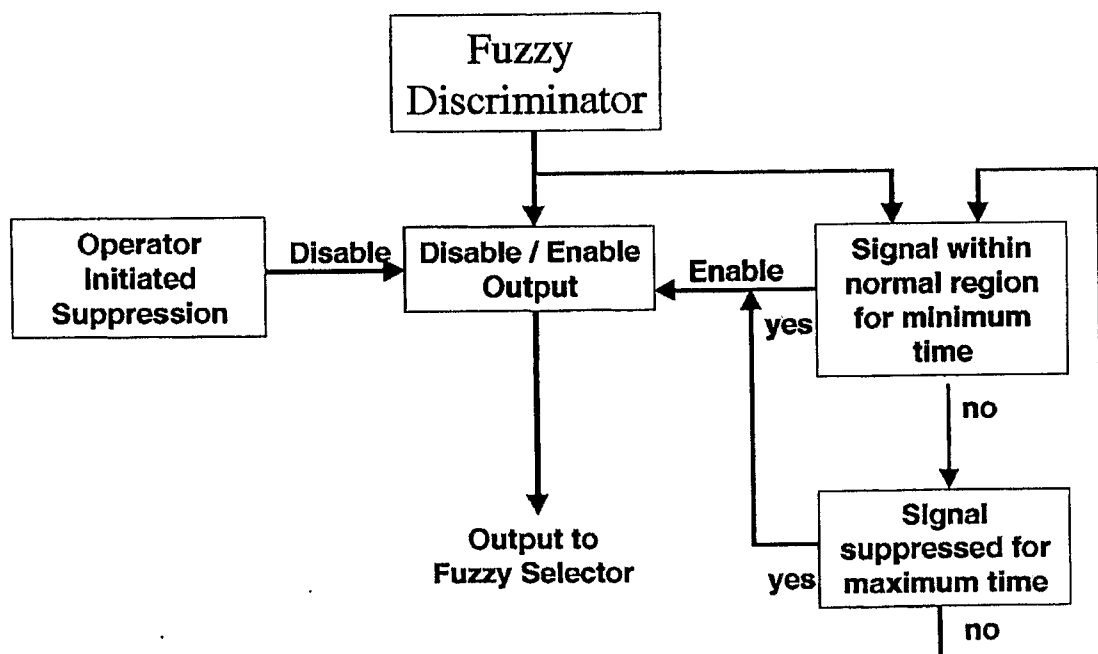


FIG. 18

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Event Suppression Logic

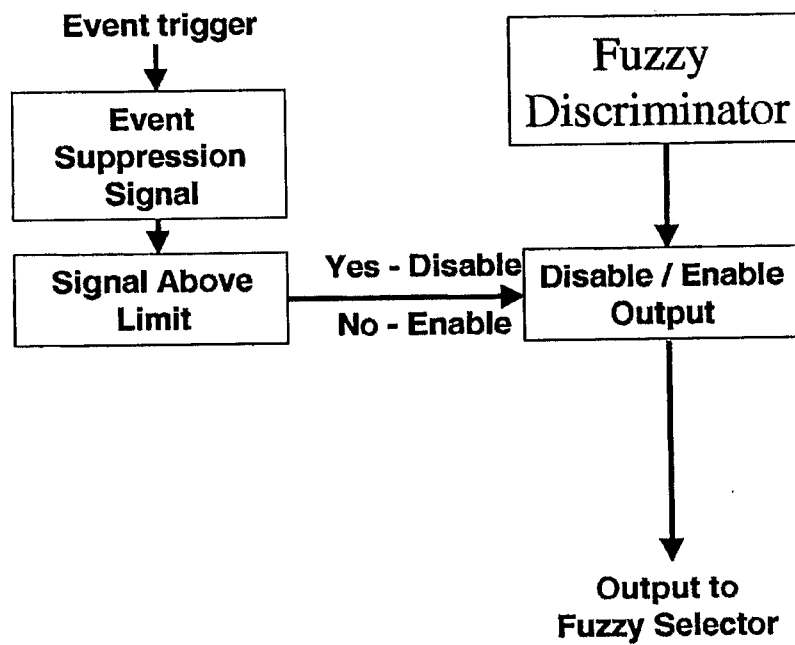


FIG. 19

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Setting the Duration of Event Suppression

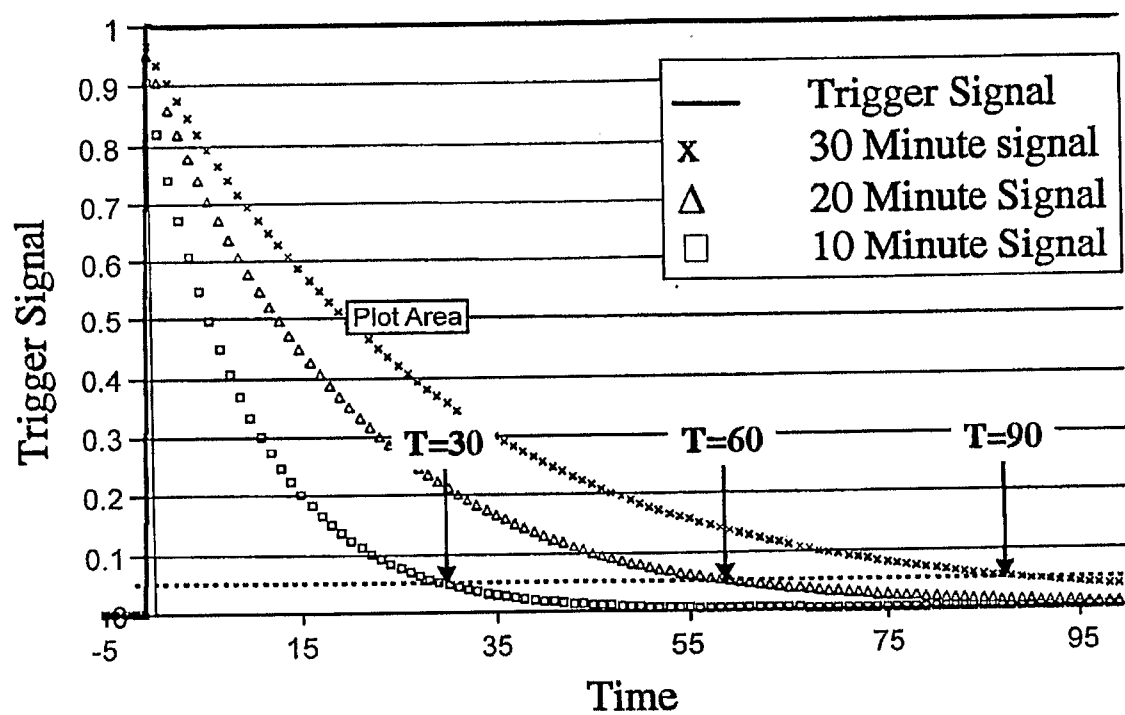


FIG. 20

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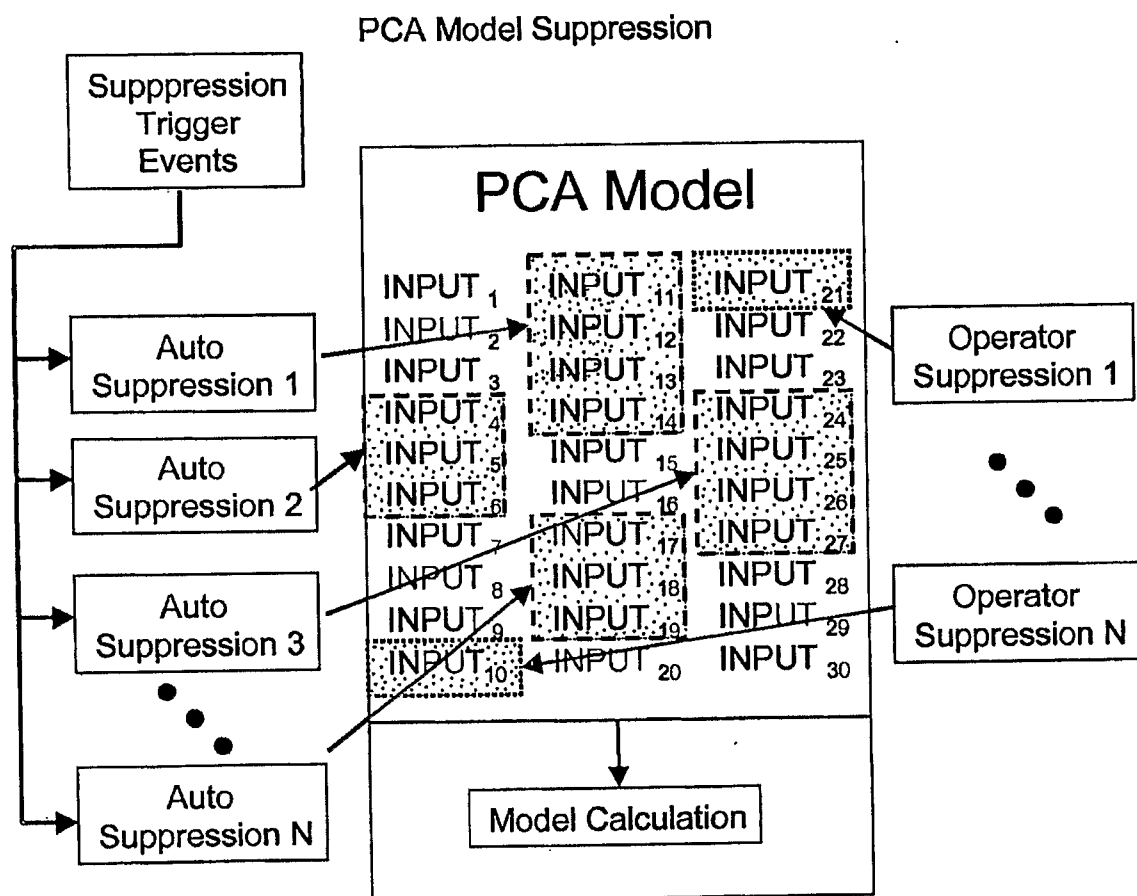


FIG. 21

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Primary Operator Interface Design

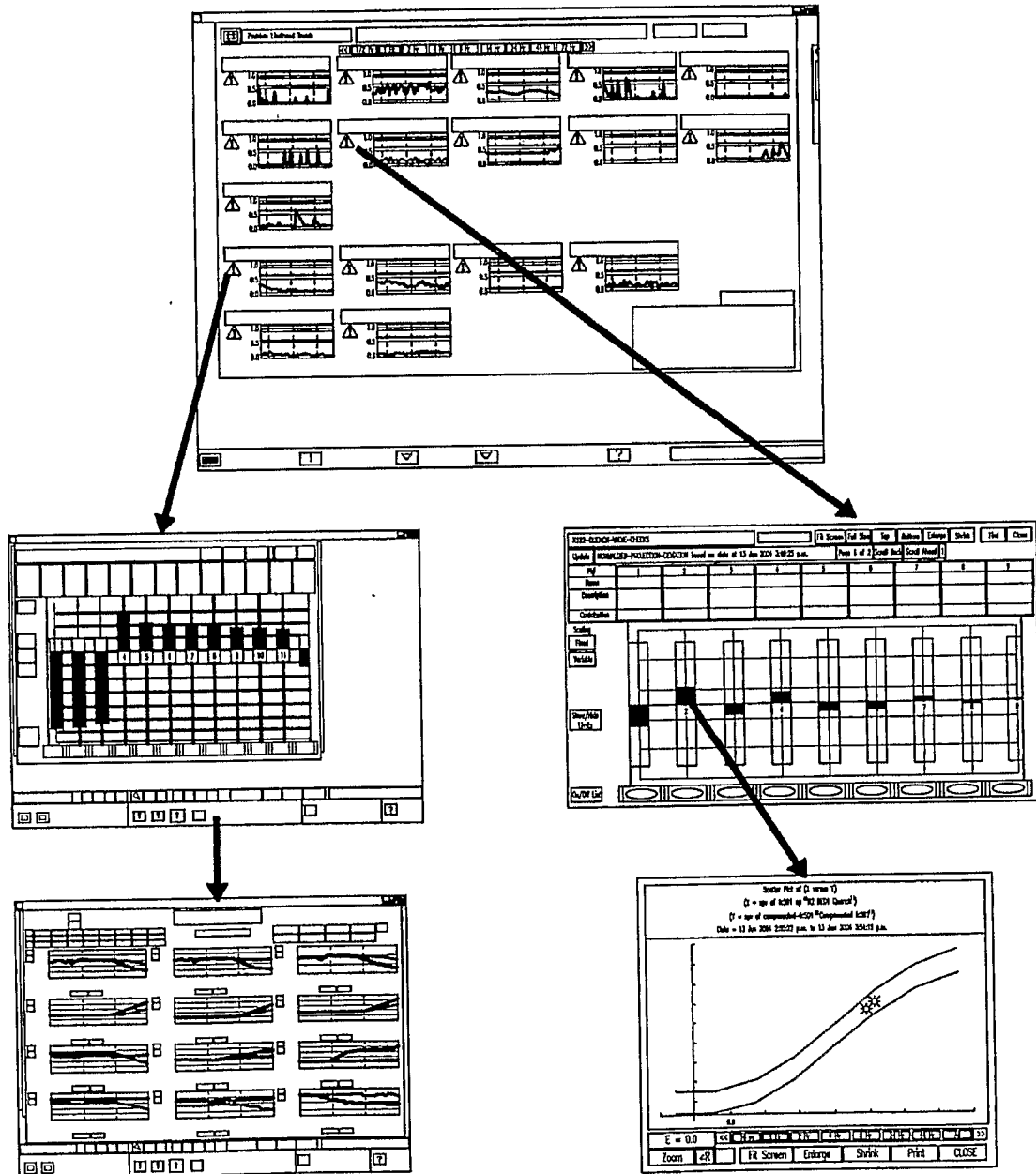


FIG. 22

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PP Schematic Layout

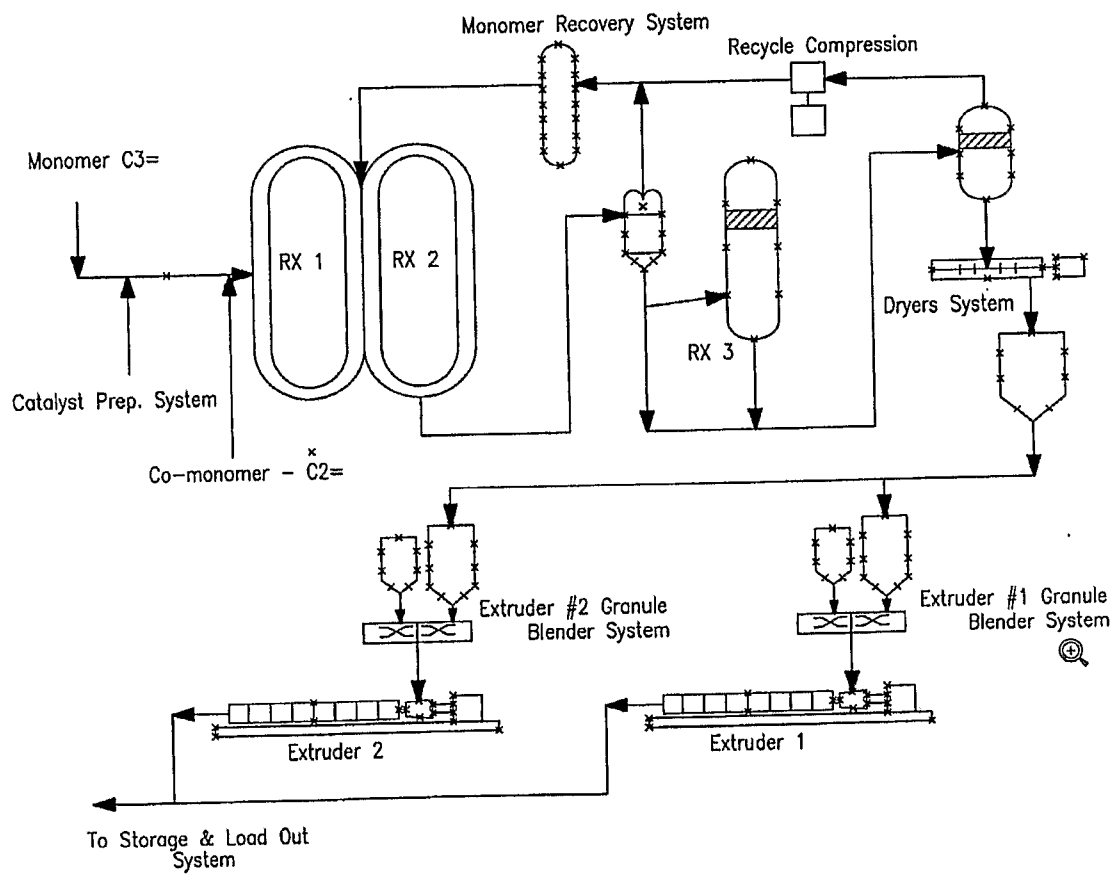


FIG. 23

AED OVERVIEW OF PP PROCESS

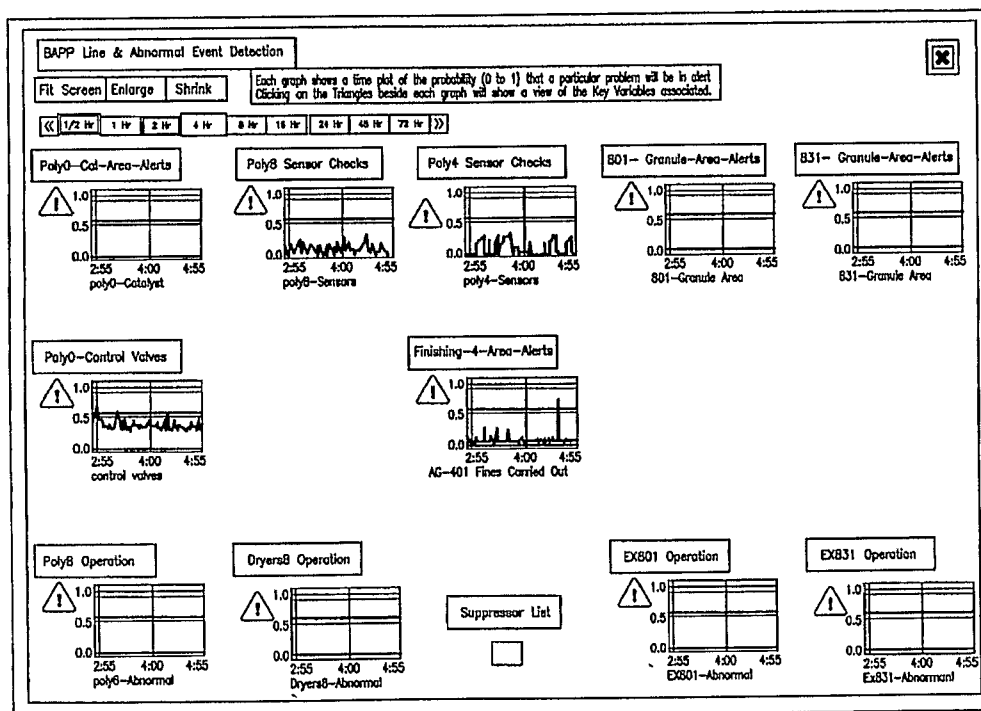
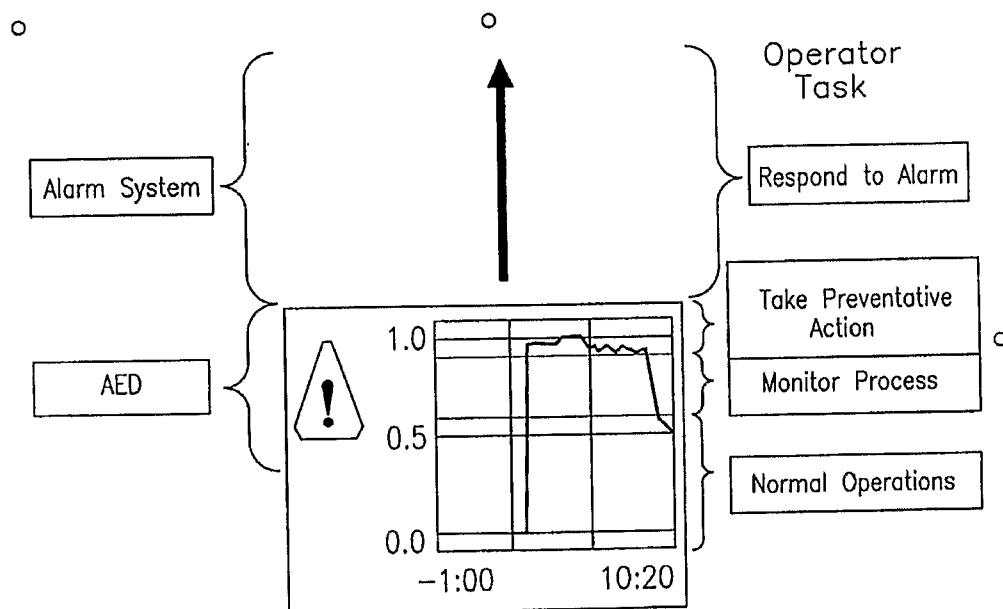


FIG. 24

FUZZY LOGIC BASED CONTINUOUS ABNORMALITY INDICATORS

**FIG. 25**

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PP AED DETECTS CATALYST PLUGGING PROBLEM IN THE POLY8 OPERATION AND POLY8 CAT AREAS AREA ABNORMALITY MONITORS

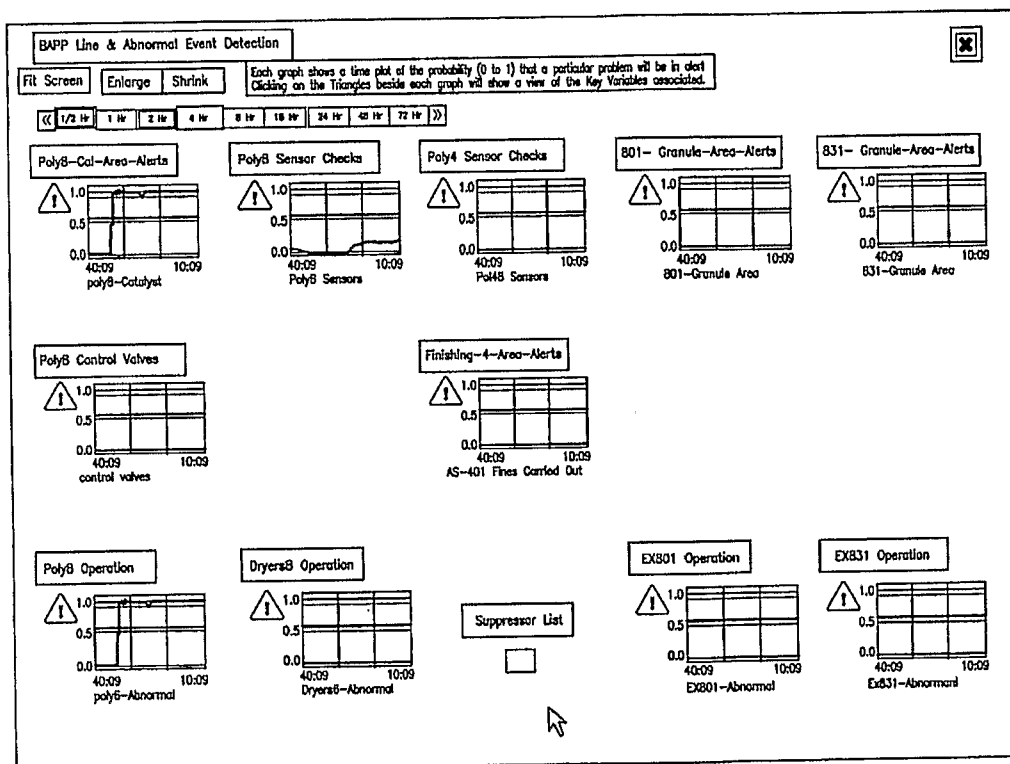


FIG. 26

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COMPLETE DRILL DOWN OF THE CATALYST PLUGGING PROBLEM IN POLY8 OPERATION AREA

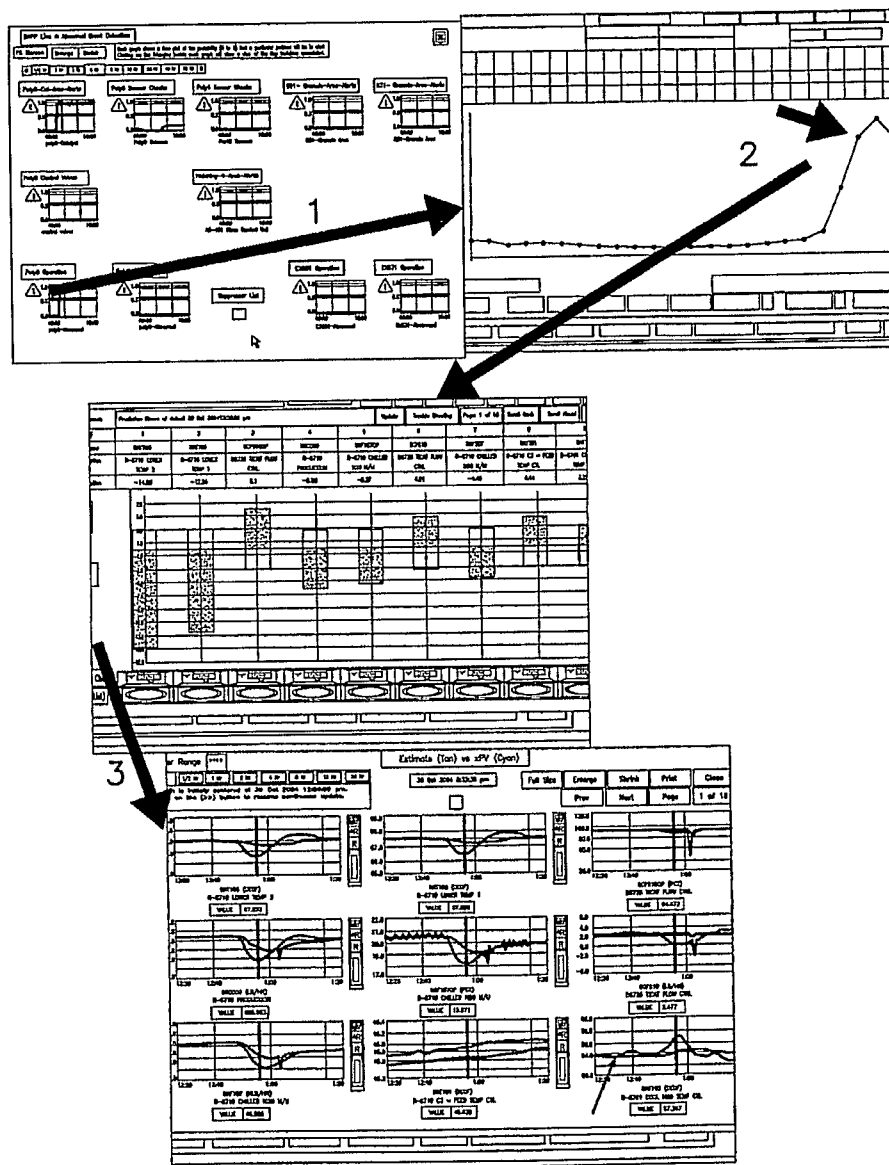


FIG. 27

Catalyst Plugging Problem Also Seen in Poly8Cat Area Abnormality Monitor

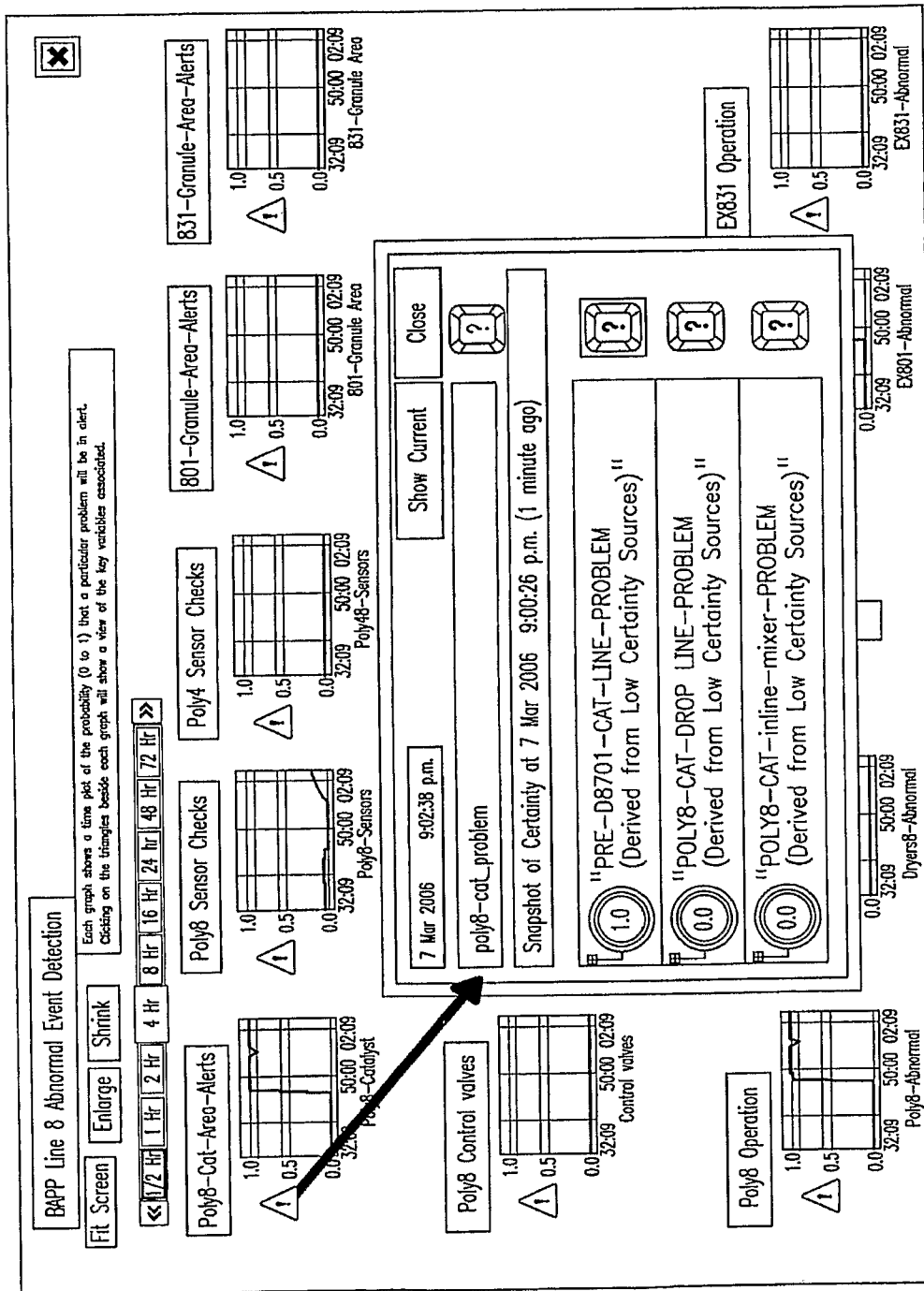


FIG. 28

Fuzzy Logic Network for Catalyst Plugging Problem in Poly8cat Area

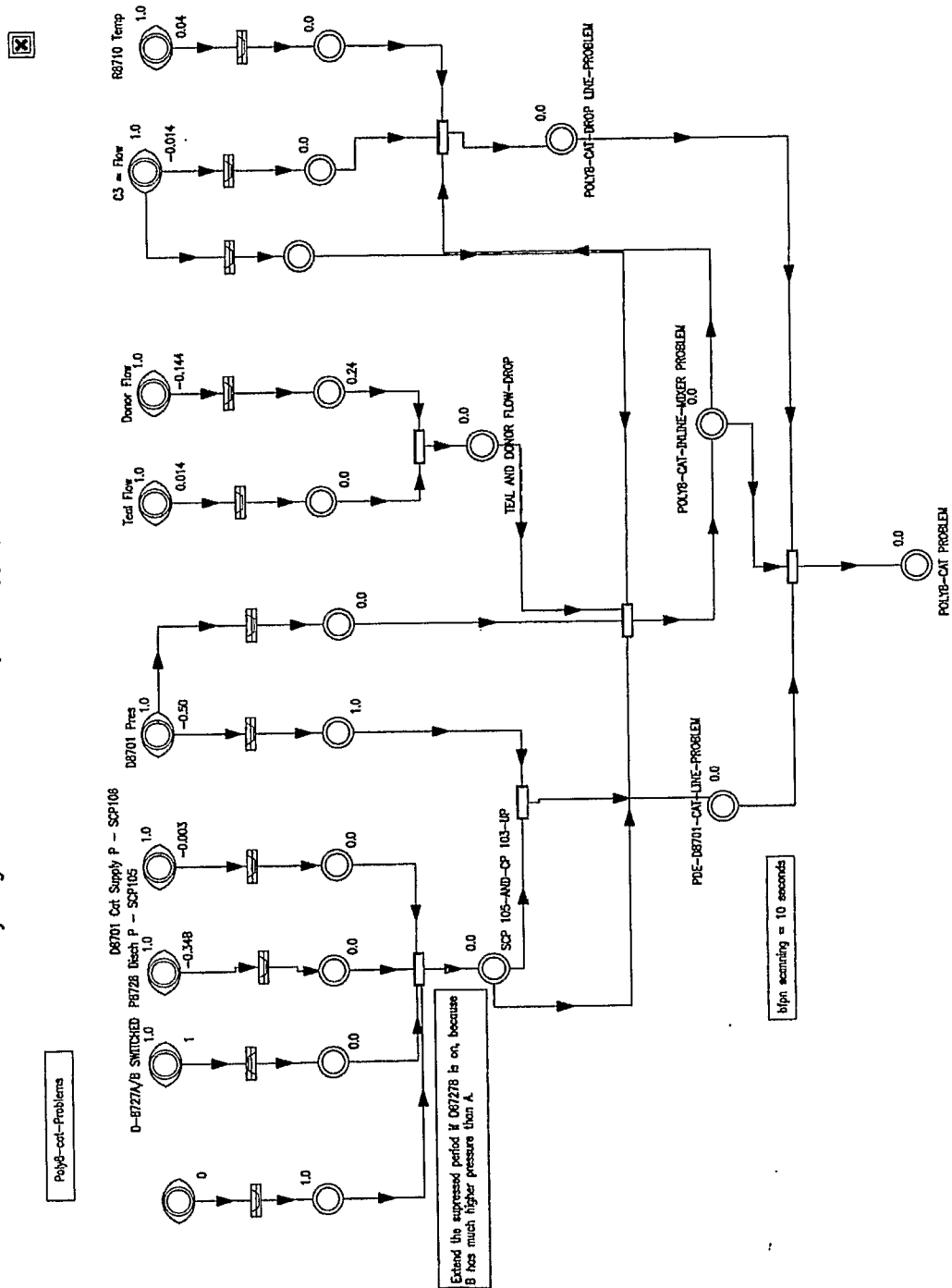


FIG. 29

Fuzzy Logic Network Couple With Rules Developed for Automatic Switching PCA
Models Underlying Poly 8 Operation

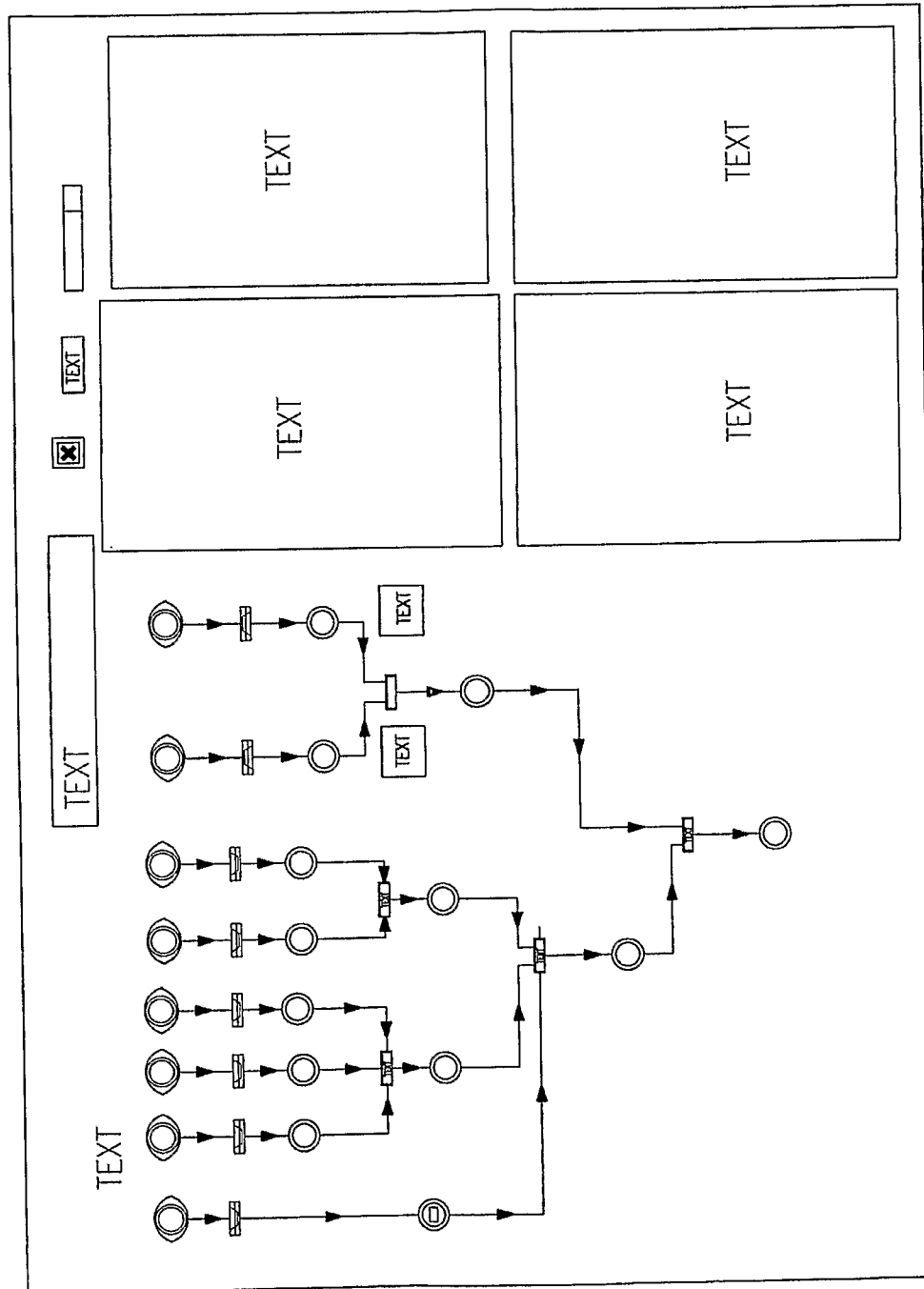


FIG. 30

Fuzzy Logic Network Developed for Automatic Detection of Grade Switches and for Setting Transitional Duration

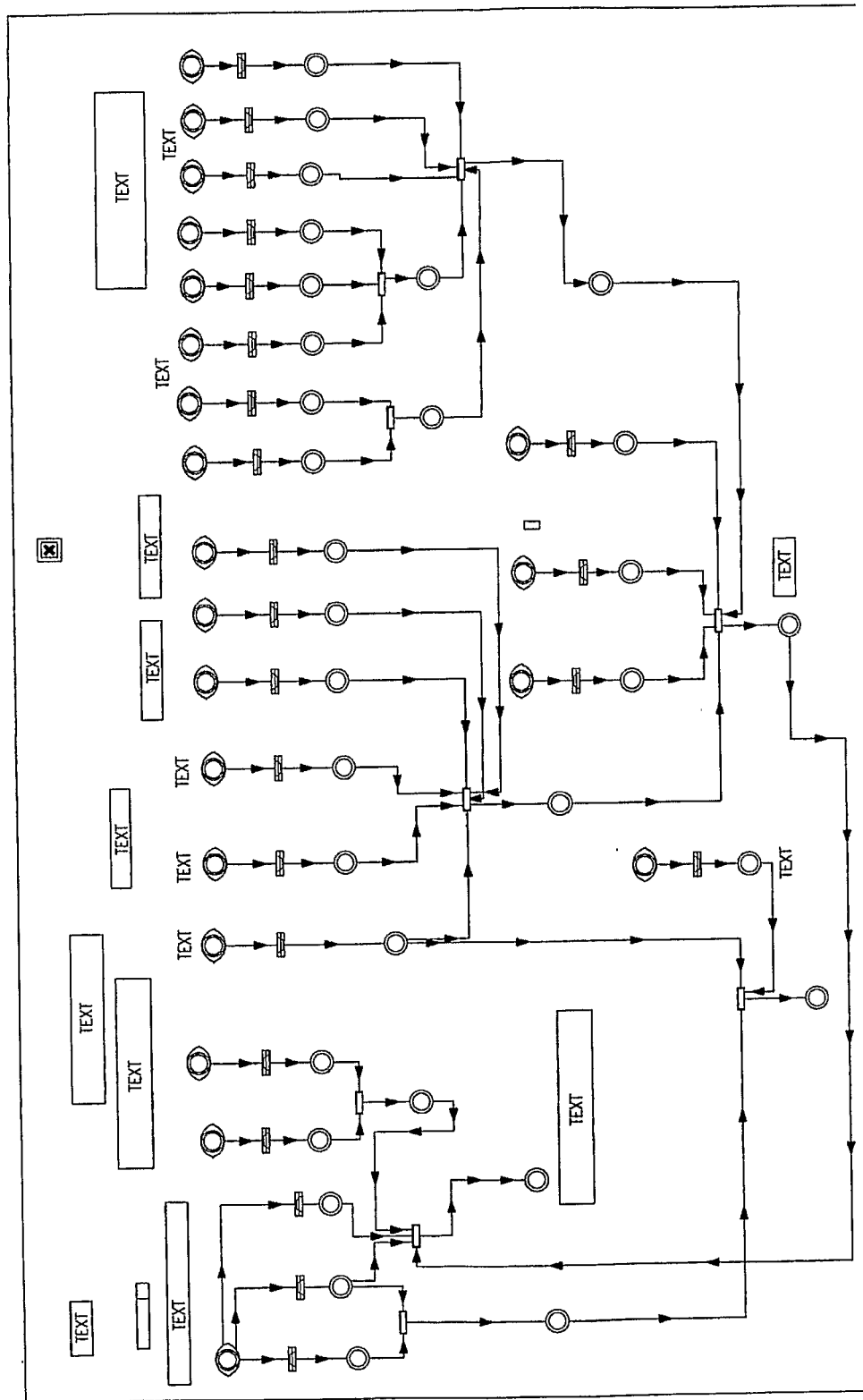


FIG. 31

A PARETO CHART DISPLAYING THE RESIDUALS OF THE DEVIATING SENSORS CORRESPONDING TO THE CATALYST PLUGGING PROBLEM

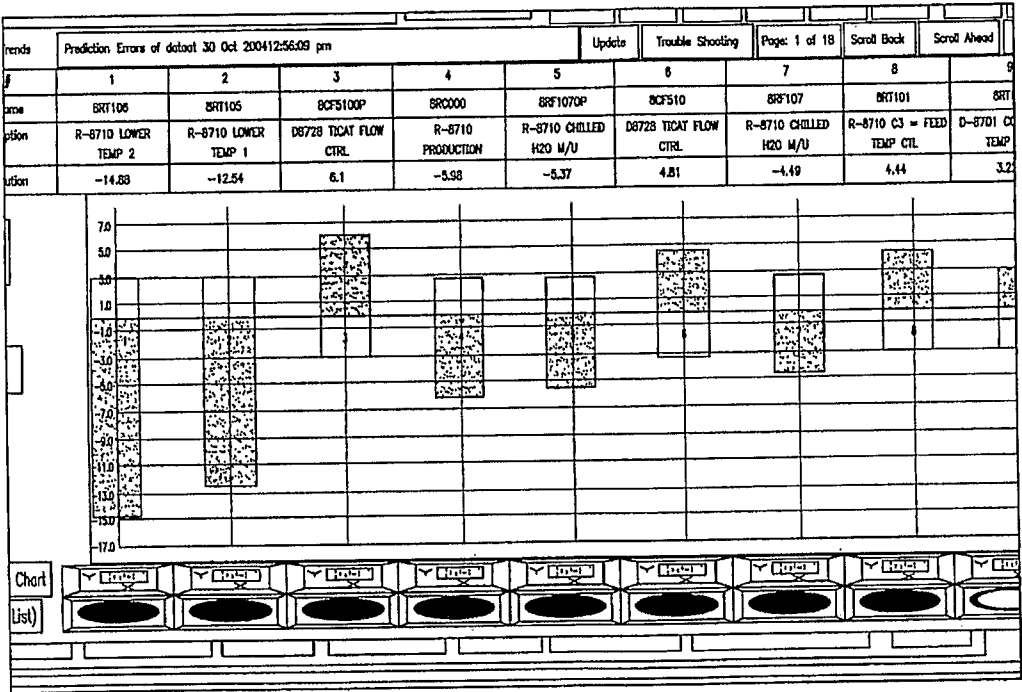


FIG. 32

Trends of the value and model predications of the sensors
in the Pareto chart of FIG 32

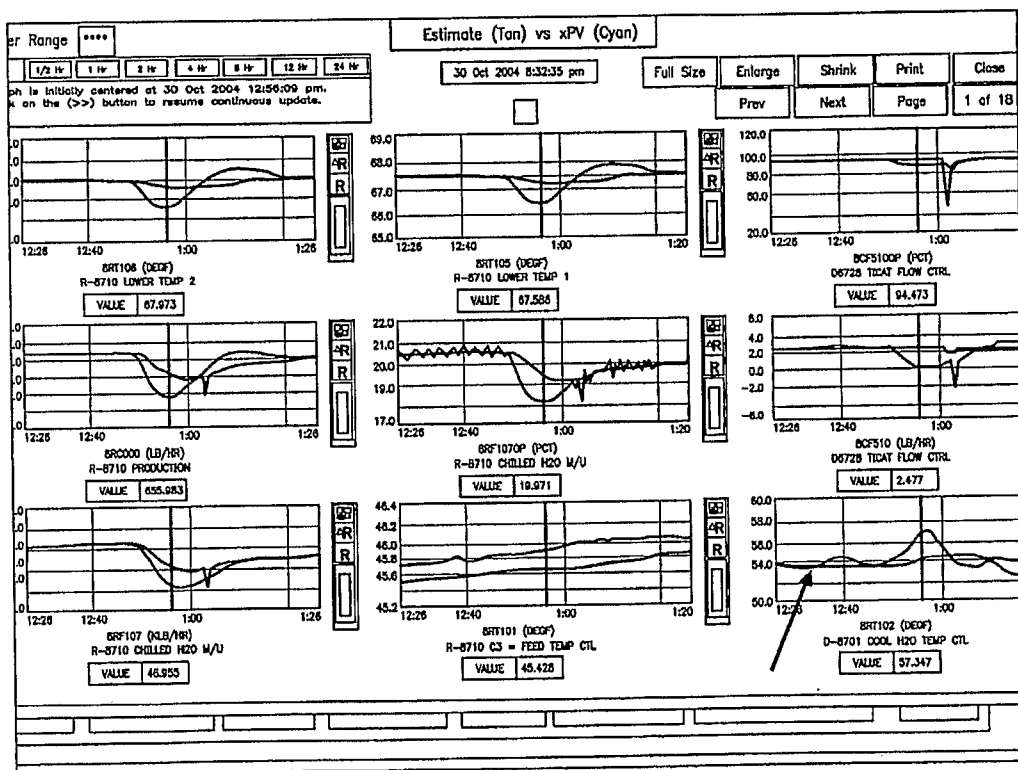


FIG. 33

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PARETO CHART OF THE VALVE FLOW MODELS

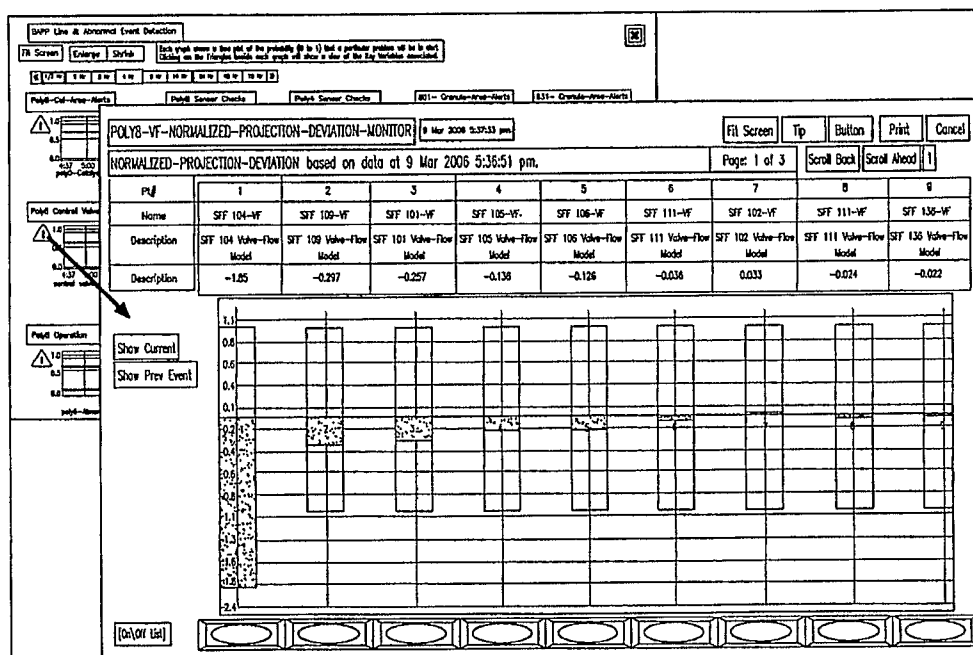


FIG. 34

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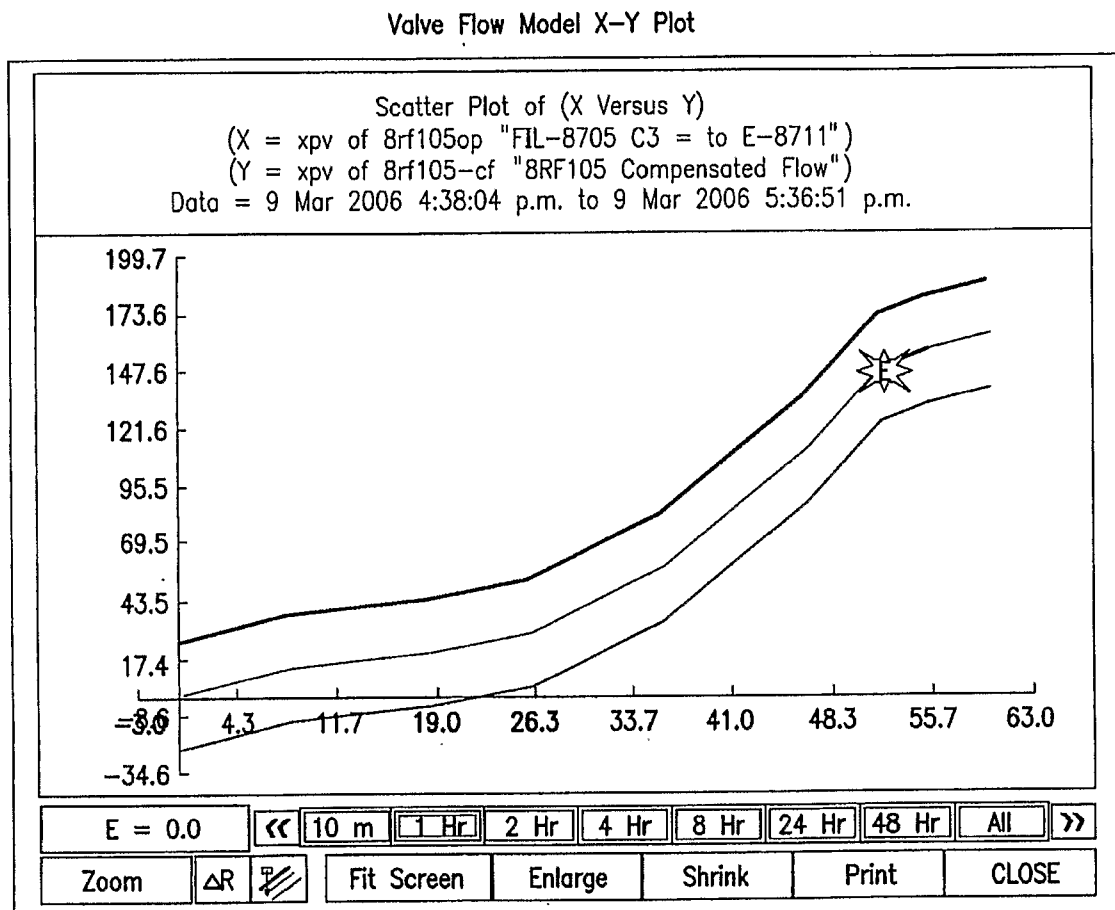


FIG. 35

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Drill Down For Controller Monitors and Sensor Checks

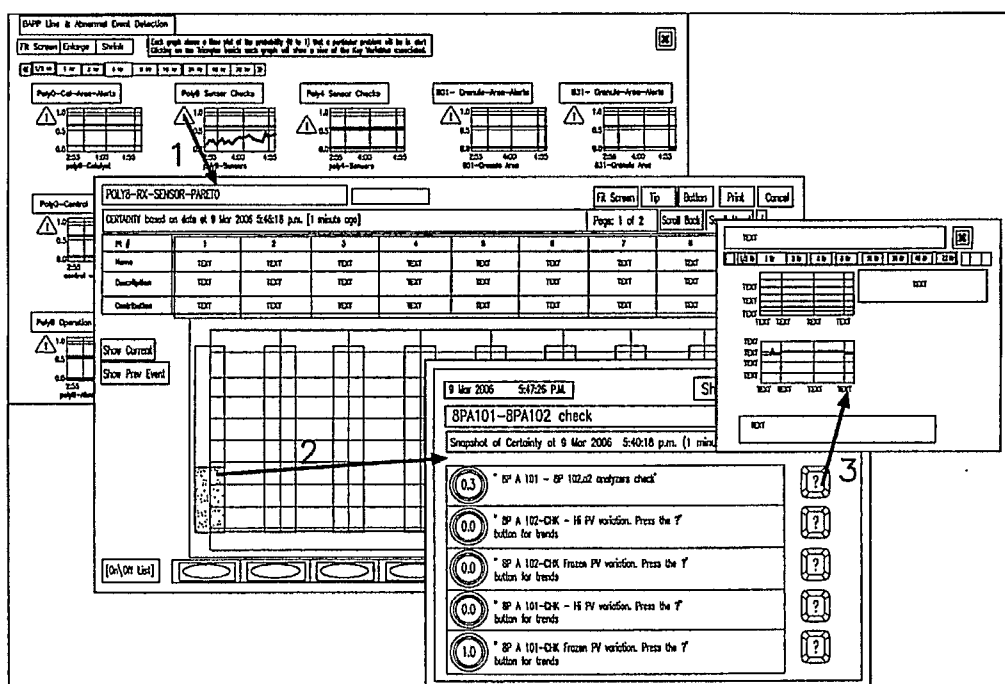
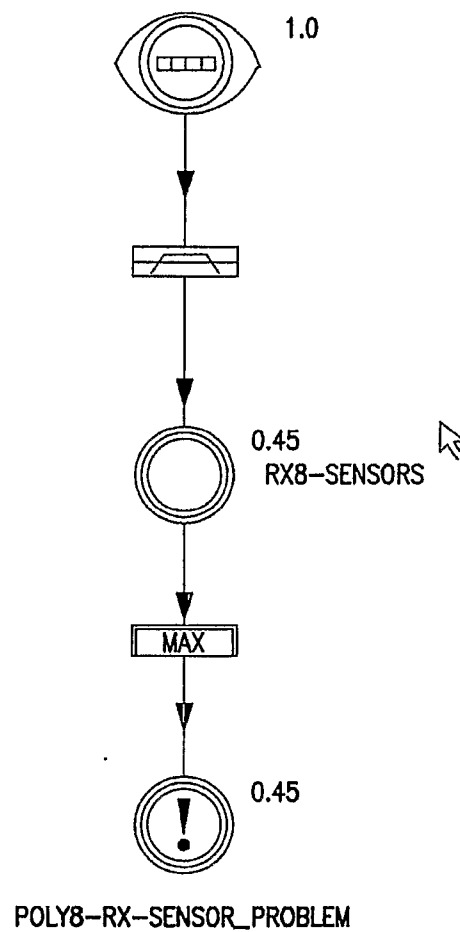


FIG. 36

Fuzzy Logic Network for Controller Monitors and Sensor Checks

**FIG. 37**

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Drill Down for Heuristic Models

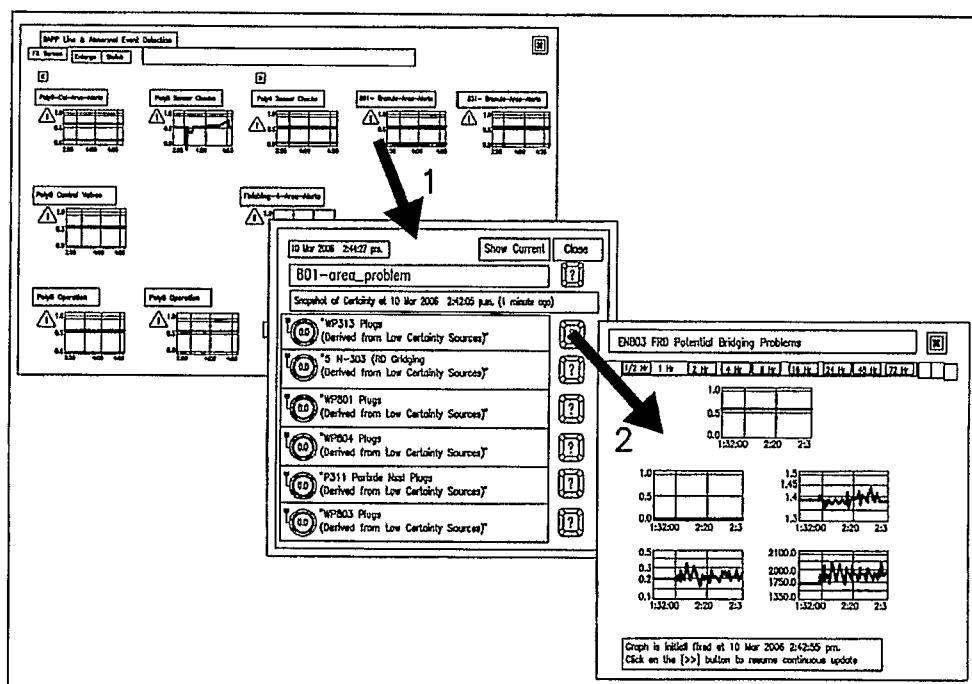


FIG. 38

Fuzzy Logic Network for Heuristic Models

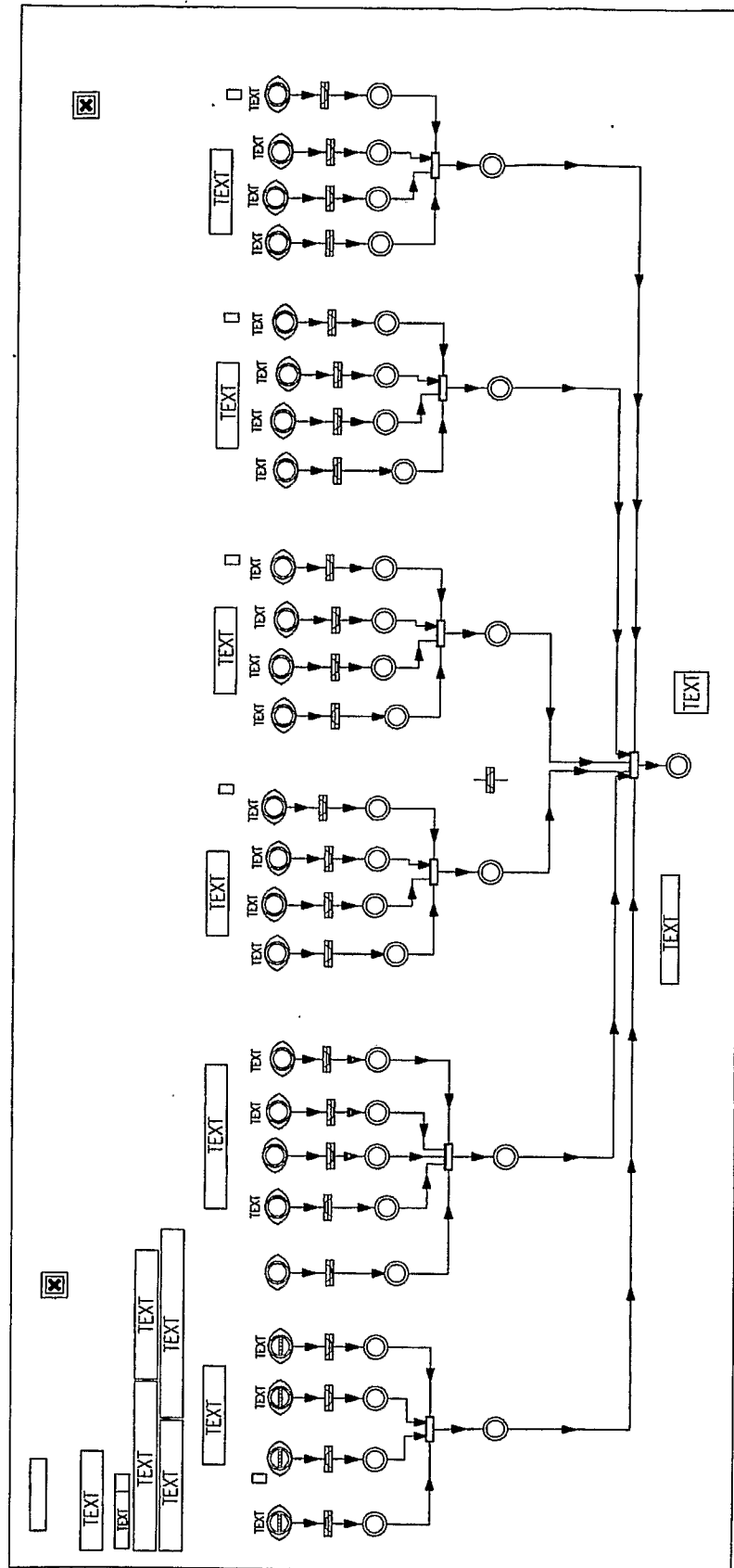


FIG. 39

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Example of Valve Out of Controllable Range

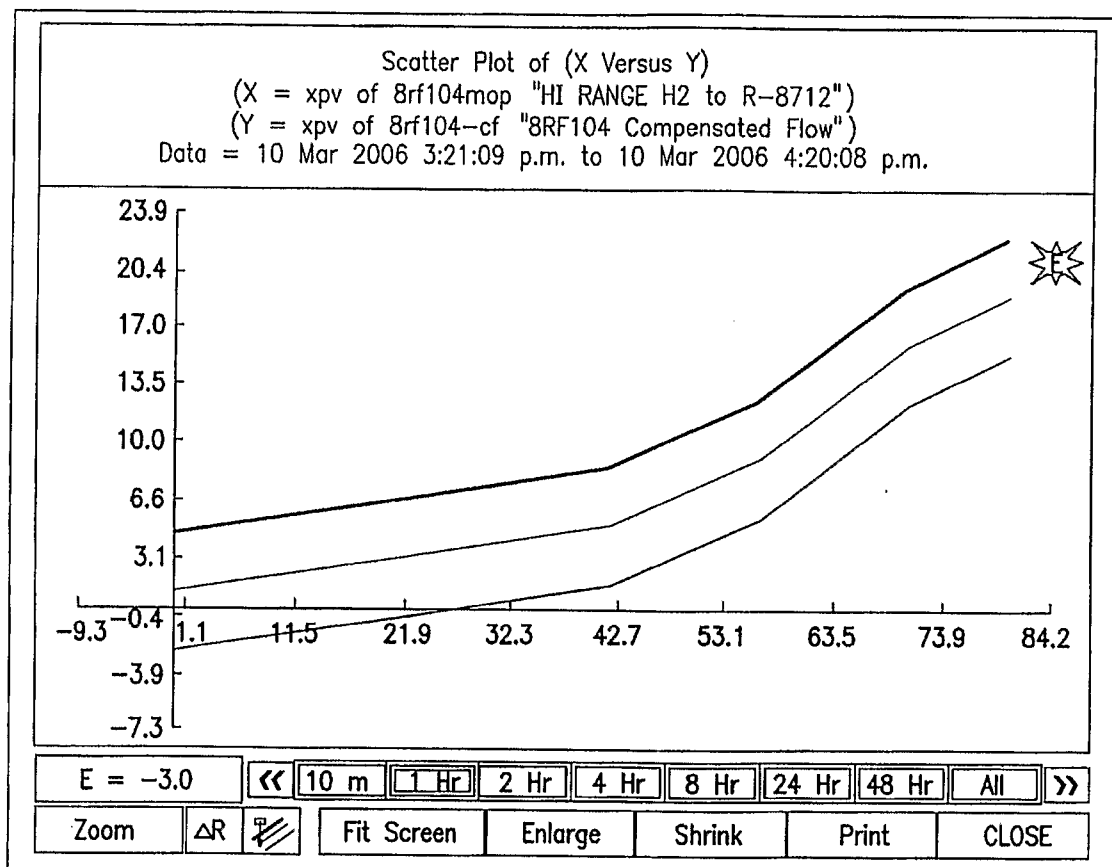


FIG. 40

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Valve Flow Model Fuzzy Network

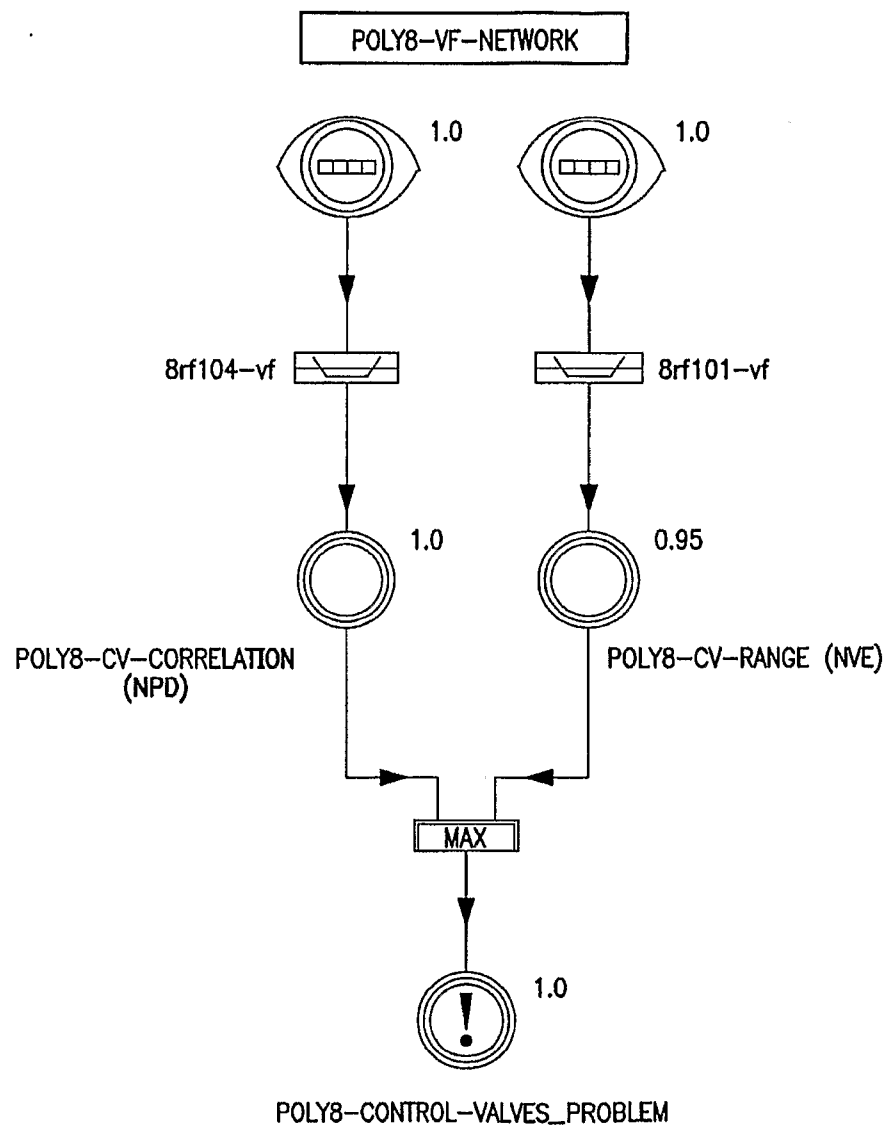


FIG. 41

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Building PCA model –Distribution of Principal Components

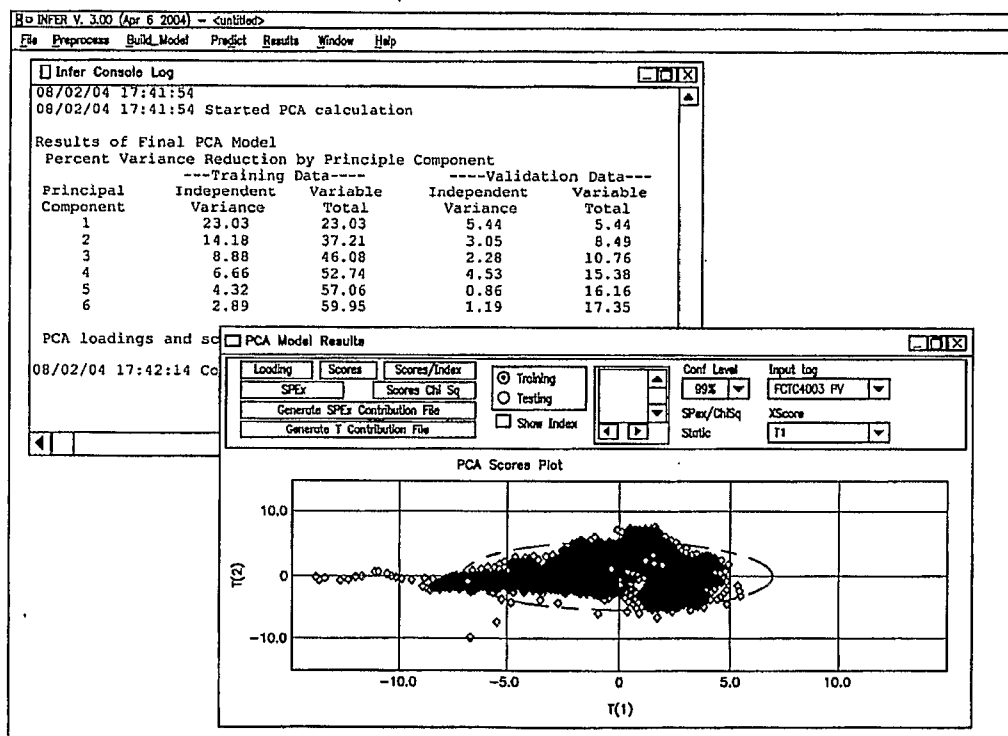


FIG. 42

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List of Current Automatic Suppressors

Current Suppressors	
1. 8CH1150P-Sup	9. None
2. 8CH1110P-Sup	10. None
3. ICP-Sup	11. None
4. 8RF112-Sup	12. None
5. 8RF140-Sup	13. None
6. C8754 Sup	14. None
7. 8RF141-Sup	15. None
8. D8727AB Switching	16. None

FIG. 43

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AED Event Form

AED Event Log

Date			Time		
<u>Check appropriate box</u>					
Poly8_TCR			EX801		
Poly8_ICP			EX831		
Dryers8			801 Granule		
Poly8 Control Valves			831 Granule		
Poly8 Cat			803 Granule		
Poly8 Sensor Checks			804 Granule		
Poly4 Sensor Checks					
Alert Severity	☐ Yellow ☐ Red				
Alert Notification	☐ Important ☐ Useful ☐ Redundant				
Agree w/ indication?	☐ Yes ☐ No		If no, provide comment		
Comments					
List key tags involved					
Corrective action taken?					
Suggestions for improvement?					
Name					

FIG. 44