Fig. 1 DISTRIBUTION OF ACTUAL AND CALCULATED VOLTAGE (1984) Unit : kV (230) : CALCULATION VALUE
230 : ACTUAL VALUE

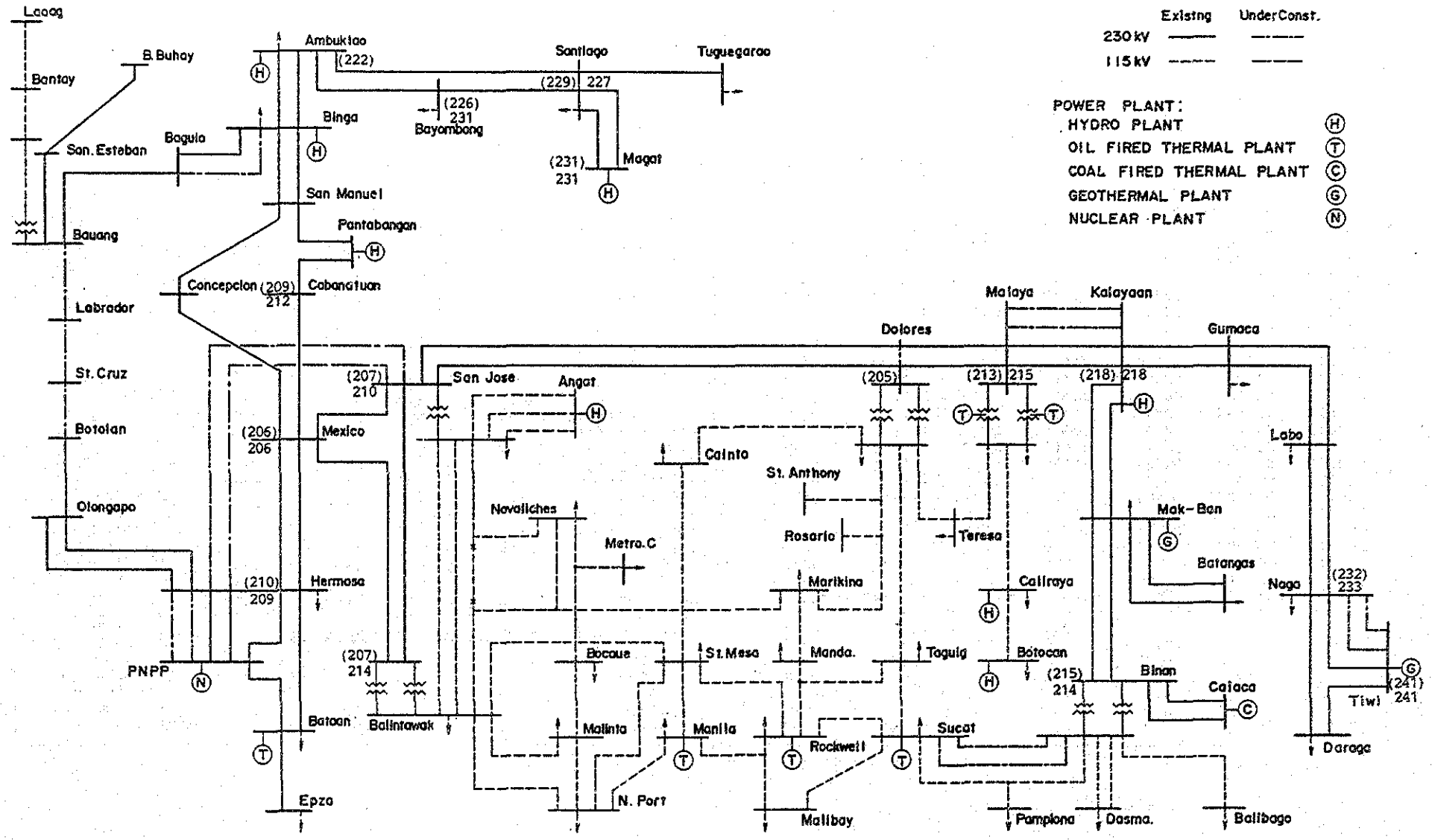


Fig. 2 POWER FLOW and VOLTAGE DISTRIBUTION (1985) WET . LOOP . PNPP IN . NIGHT

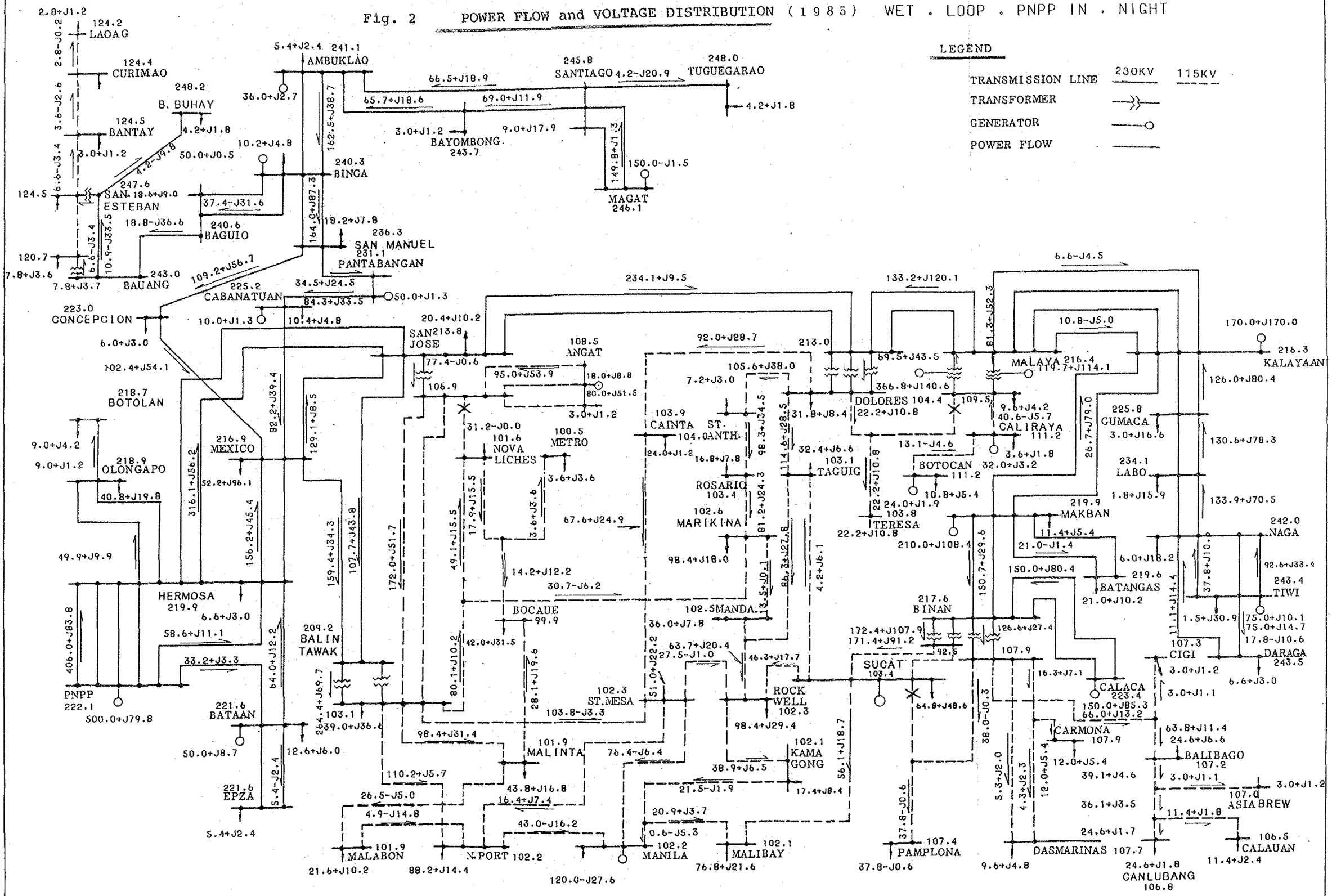


Fig. 3 POWER FLOW and VOLTAGE DISTRIBUTION (1985) WET . SEPARATE . PNPP IN

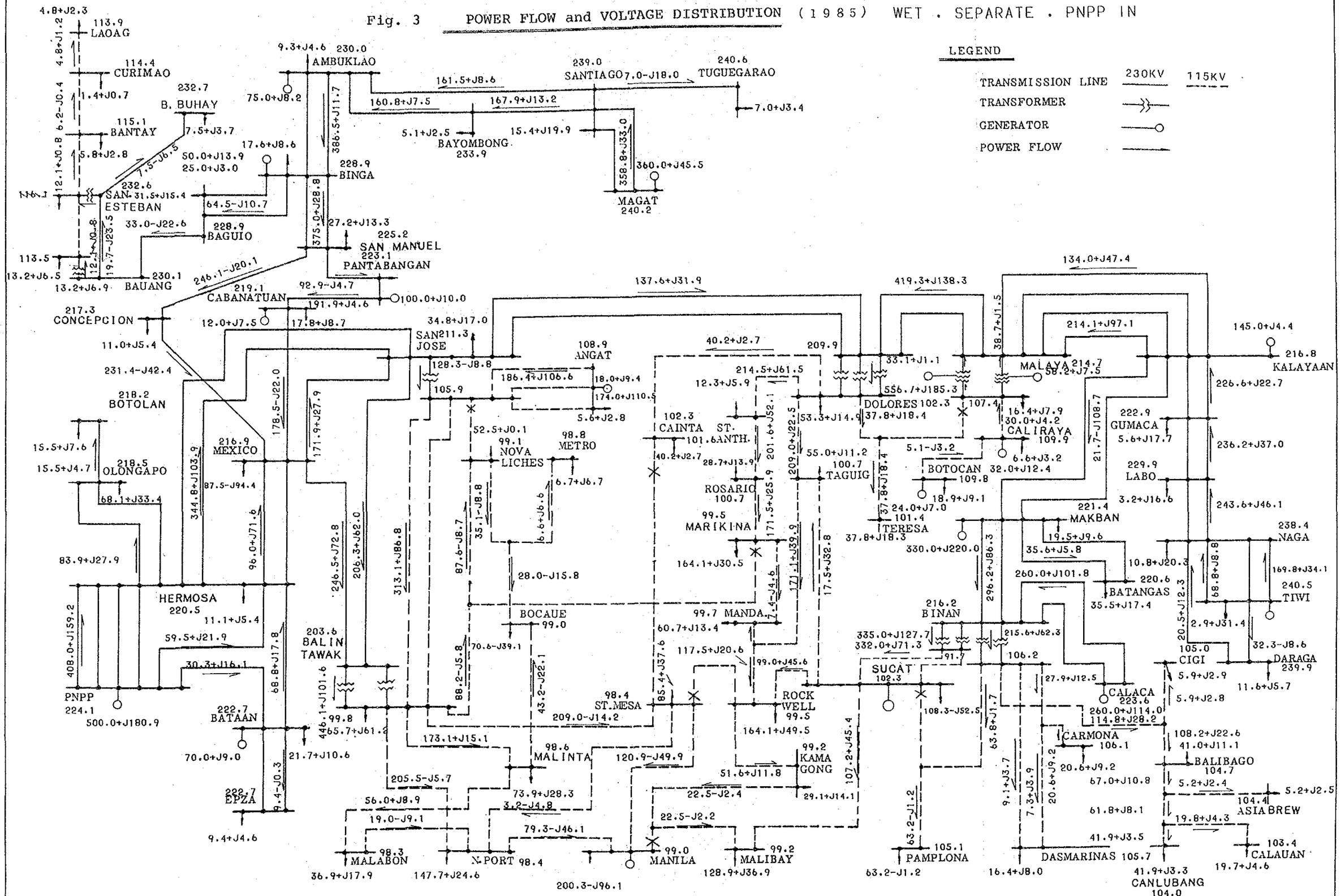


Fig. 4 POWER FLOW and VOLTAGE DISTRIBUTION (1985) DRY . LOOP . PNPP IN

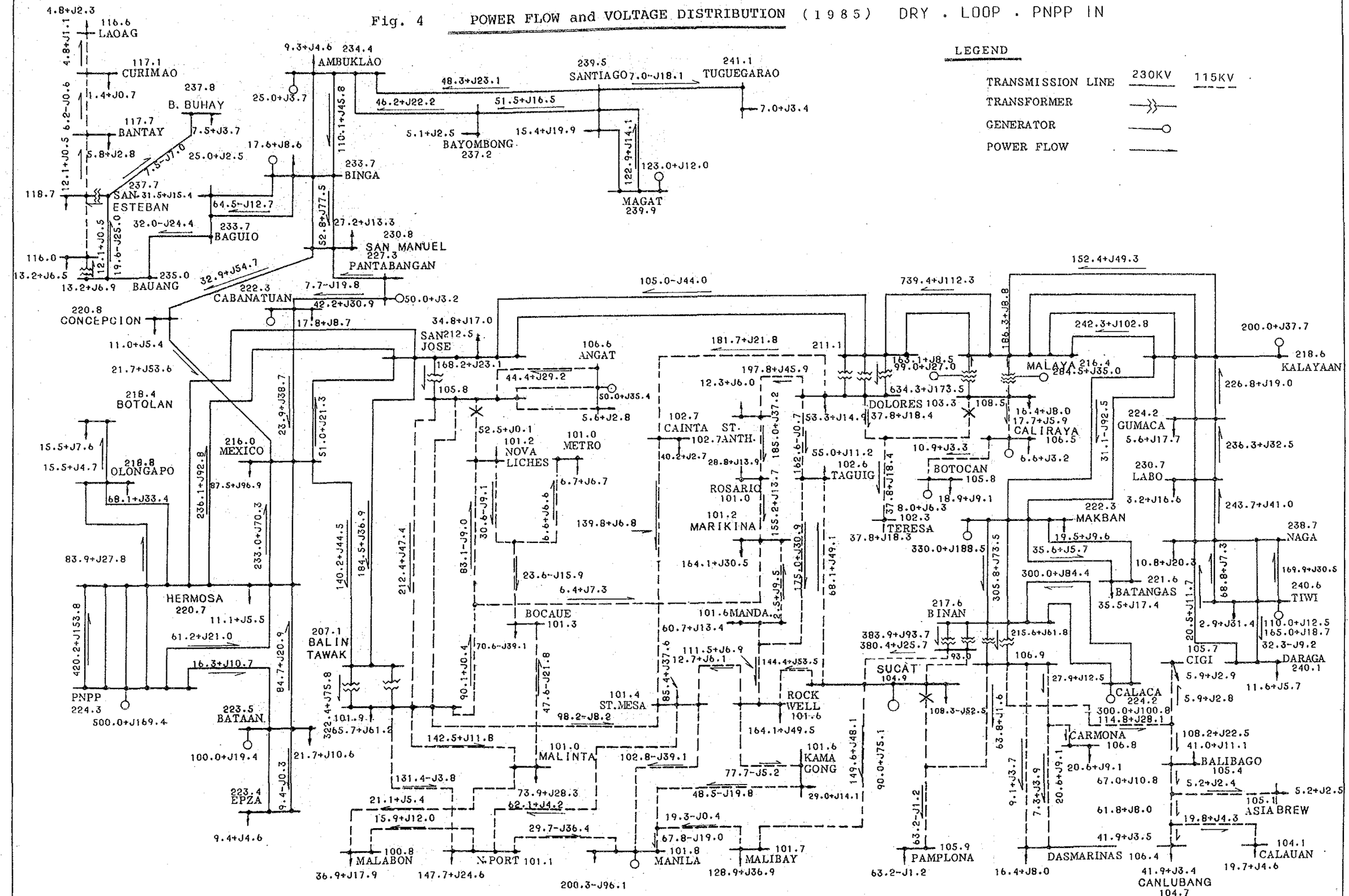


Fig. 5 POWER FLOW and VOLTAGE DISTRIBUTION (1985) DRY . SEPARATE . PNPP IN

LEGEND

TRANSMISSION LINE 230KV 115KV

TRANSFORMER

GENERATOR

POWER FLOW

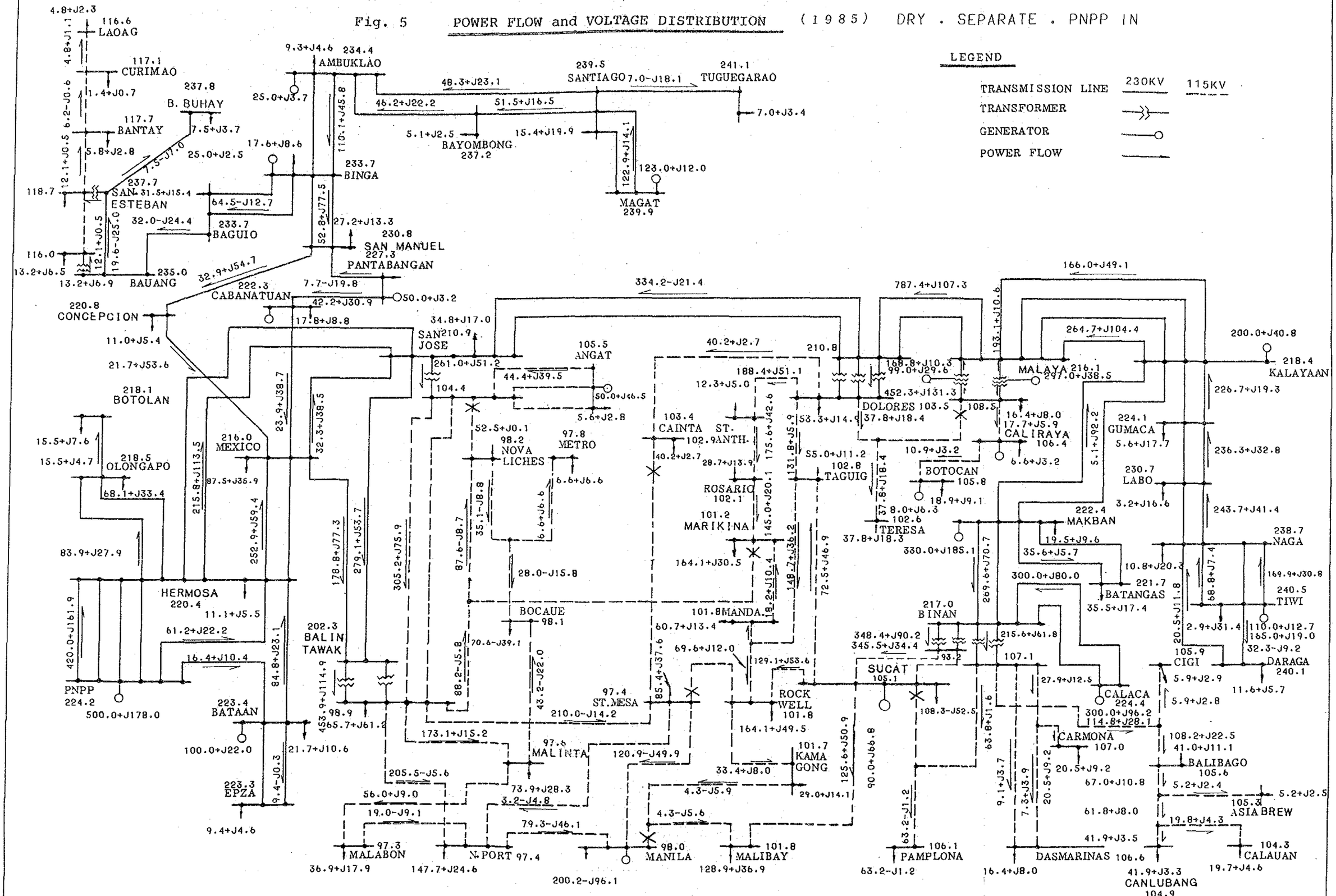


Fig. 6 POWER FLOW and VOLTAGE DISTRIBUTION (1985) DRY . LOOP . PNPP OUT

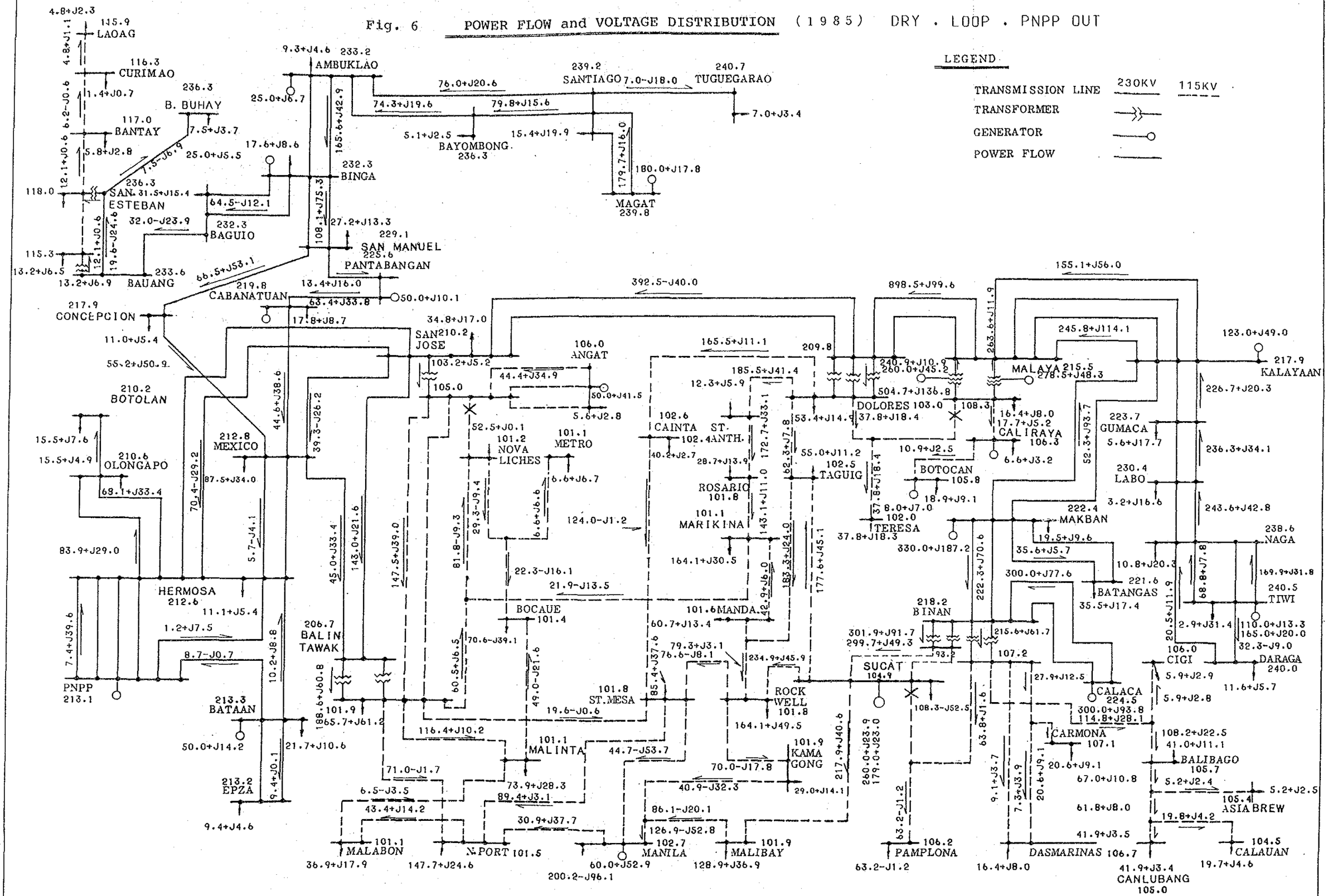


Fig. 7-1 POWER FLOW and VOLTAGE DISTRIBUTION (1985) WET . LOOP . PNPP OUT

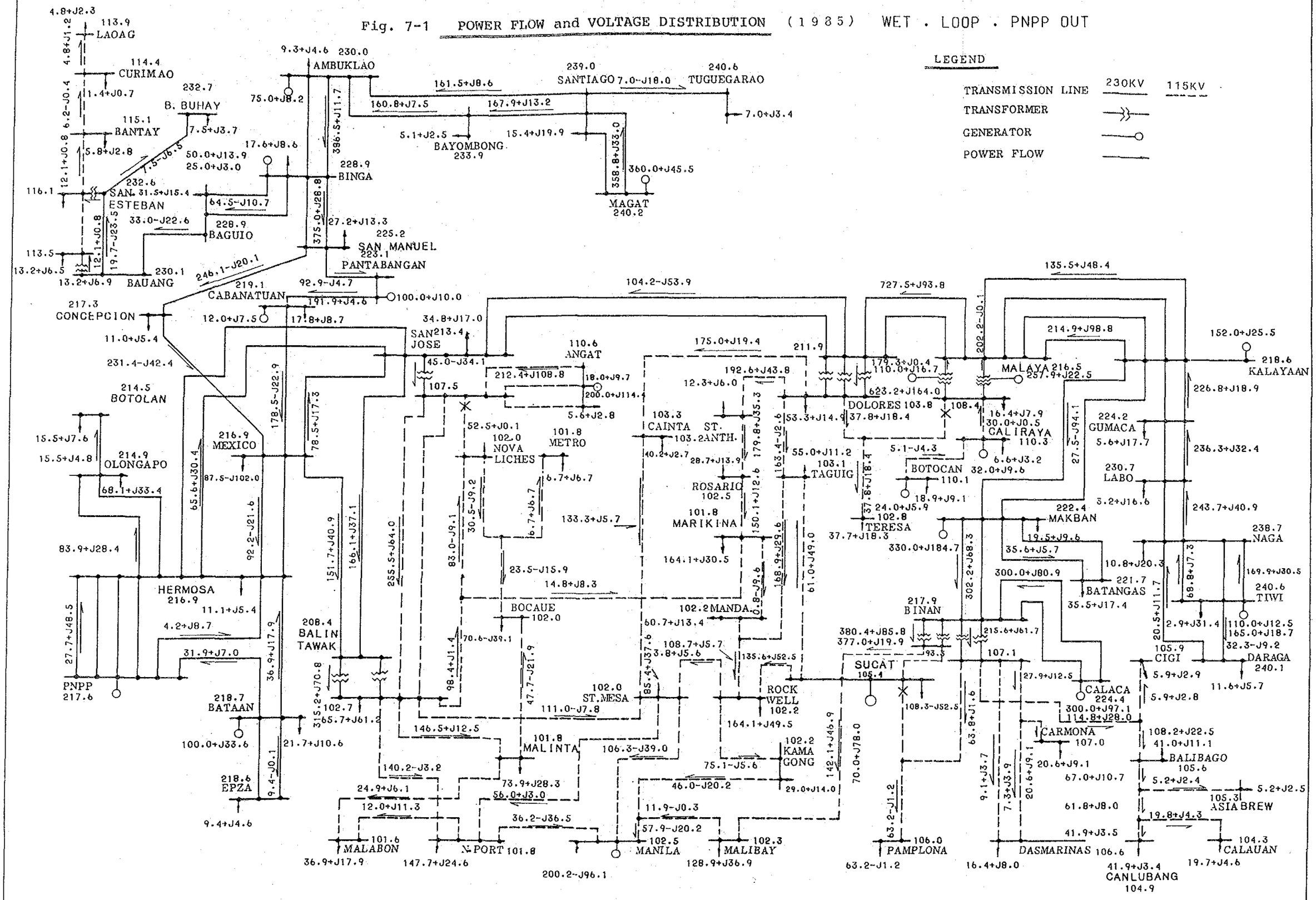


Fig. 7-2 POWER FLOW and VOLTAGE DISTRIBUTION (1985) WET . SEPARATE . PNPP OUT

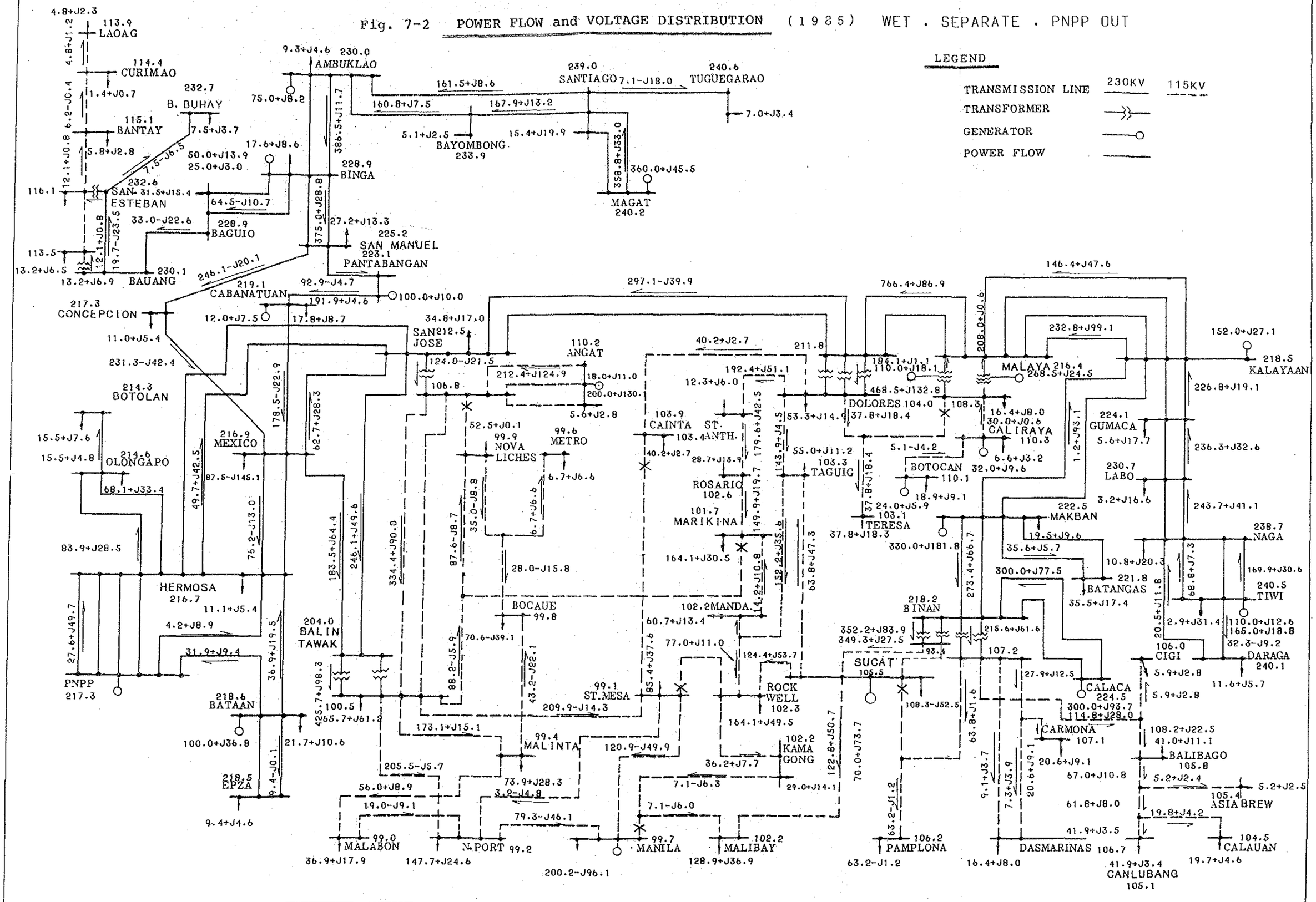


Fig. 8 POWER FLOW and VOLTAGE DISTRIBUTION (1987) WET . LOOP . PNPP IN

LEGEND

TRANSMISSION LINE 230KV 115KV

TRANSFORMER

GENERATOR

POWER FLOW

LAOAG 113.9
CURIMAO 114.4
B. BUHAY 233.7
BANTAY 115.2
SAN ESTEBAN 233.6
BAUANG 231.3
BAGUIO 230.8
AMBUKLAO 231.8
BINGA 230.9
SANTIAGO 239.7
TUGUEGARAO 241.2
BAYOMBONG 235.2
MAGAT 240.7
SAN MANUEL 228.0
PANTABANGAN 226.0
CABANATUAN 221.4
CONCEPCION 219.5
LABRADOR 226.0
BOTOLAN 221.9
OLONGAPO 220.7
MEXICO 216.9
HERMOSA 221.1
PNPP 224.4
BATAAN 222.0
EPZA 222.9
SAN JOSE 212.7
ANGAT 108.0
NOVA LICHES 98.6
METRO 97.7
CAINTA 101.5
ANTH. 101.6
ROSARIO 100.7
MARIKINA 99.4
PARANG 98.9
MANDA. 99.5
N.G.C. 98.7
BOCAUE 96.9
BALIN TAWAK 204.8
P.D.R. 98.0
ST.MESA 99.0
ROCK WELL 99.2
KAMAGONG 99.0
MALINTA 97.8
MALABON 98.0
N.PORT 98.6
MANILA 99.2
MALIBAY 99.0
SUNVALLEY 100.7
DOLORES 102.3
TAGUIG 100.6
TERESA 101.4
BOTOCAN 110.5
CALIRAYA 110.9
MALAYA 219.6
SUCAT 101.9
BINAN 213.3
SAN. PED 103.6
PAMPLONA 102.4
MAKBAN 222.0
BATANGAS 221.2
CALACA 222.5
CARMONA 100.8
ROSARIO 101.7
DASMARINAS 101.6
CANLUBANG 101.2
KALAYAAN 222.7
GUMACA 229.0
LABO 234.2
NAGA 238.4
TIWI 240.4
CIGI 102.3
DARAGA 239.8
BALIBAGO 102.0
ASIA BREW 101.6
CALAUAN 100.6

Fig. 9 POWER FLOW and VOLTAGE DISTRIBUTION (1987) WET . SEPARATE . PNPP IN

LEGEND

TRANSMISSION LINE 230KV 115KV

TRANSFORMER

GENERATOR

POWER FLOW

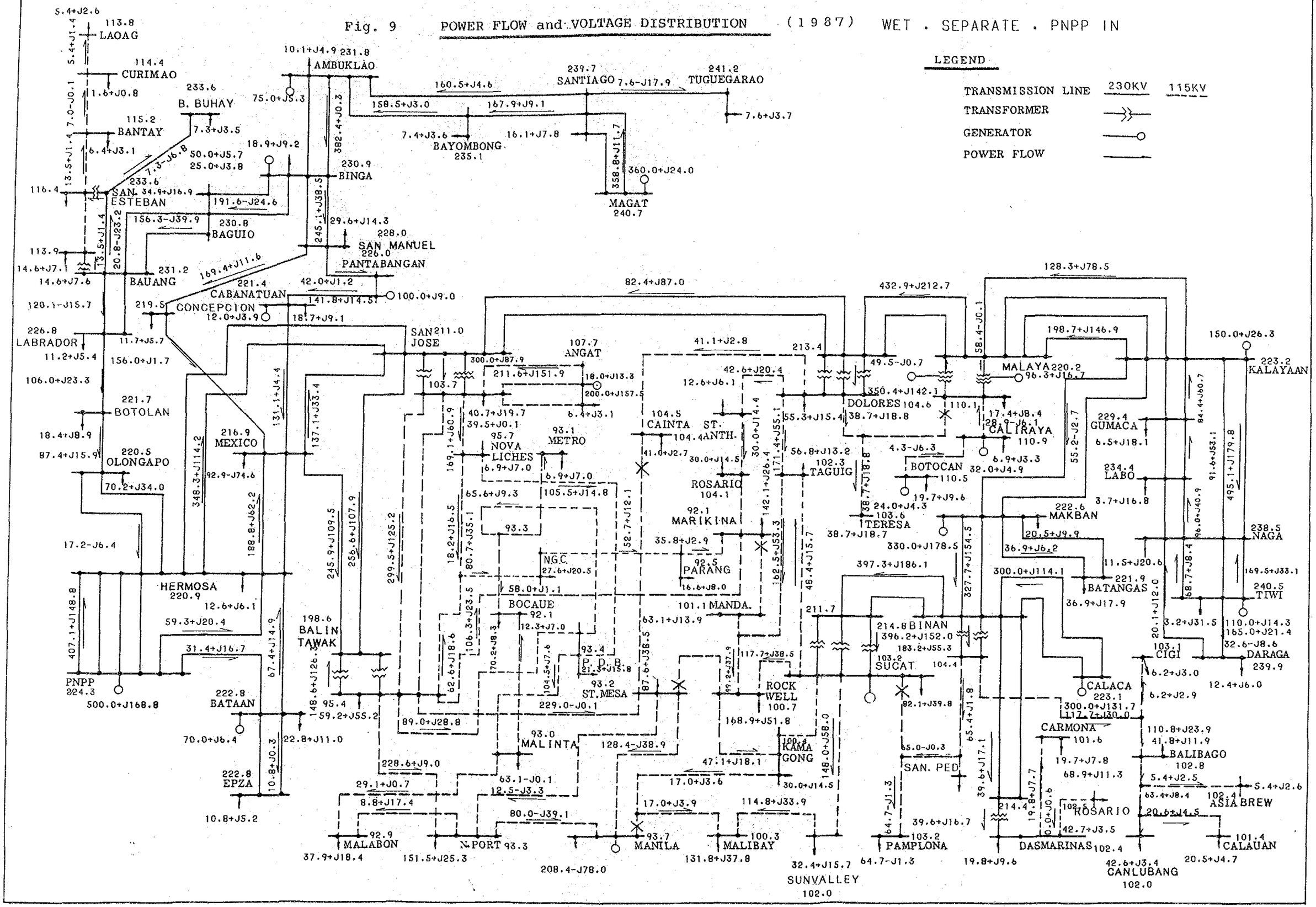


Fig. 10-1 POWER FLOW and VOLTAGE DISTRIBUTION (1987) DRY . SEPARATE . PNPP IN

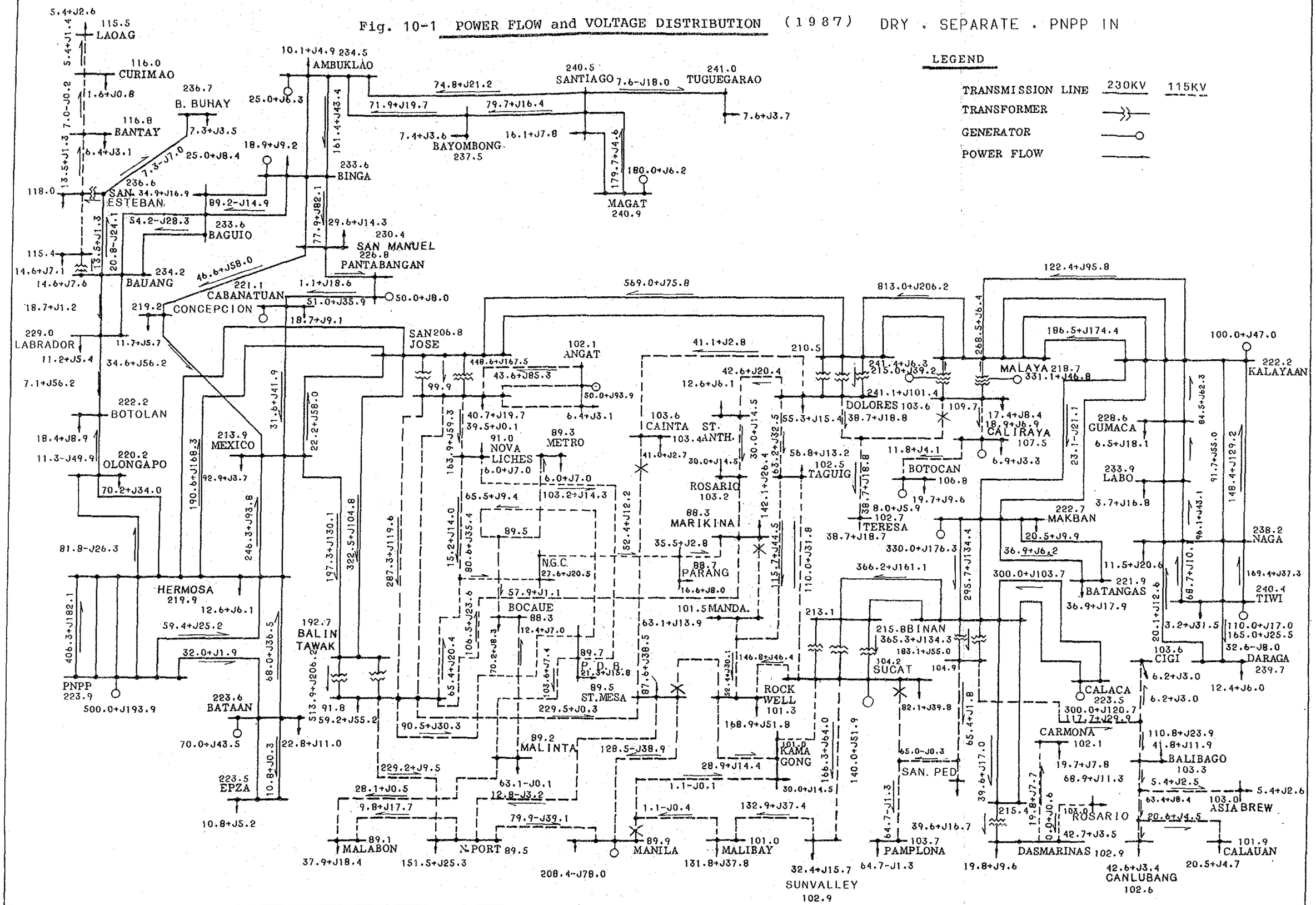


Fig. 10-2 POWER FLOW and VOLTAGE DISTRIBUTION (1987) DRY . LOOP . PNPP IN

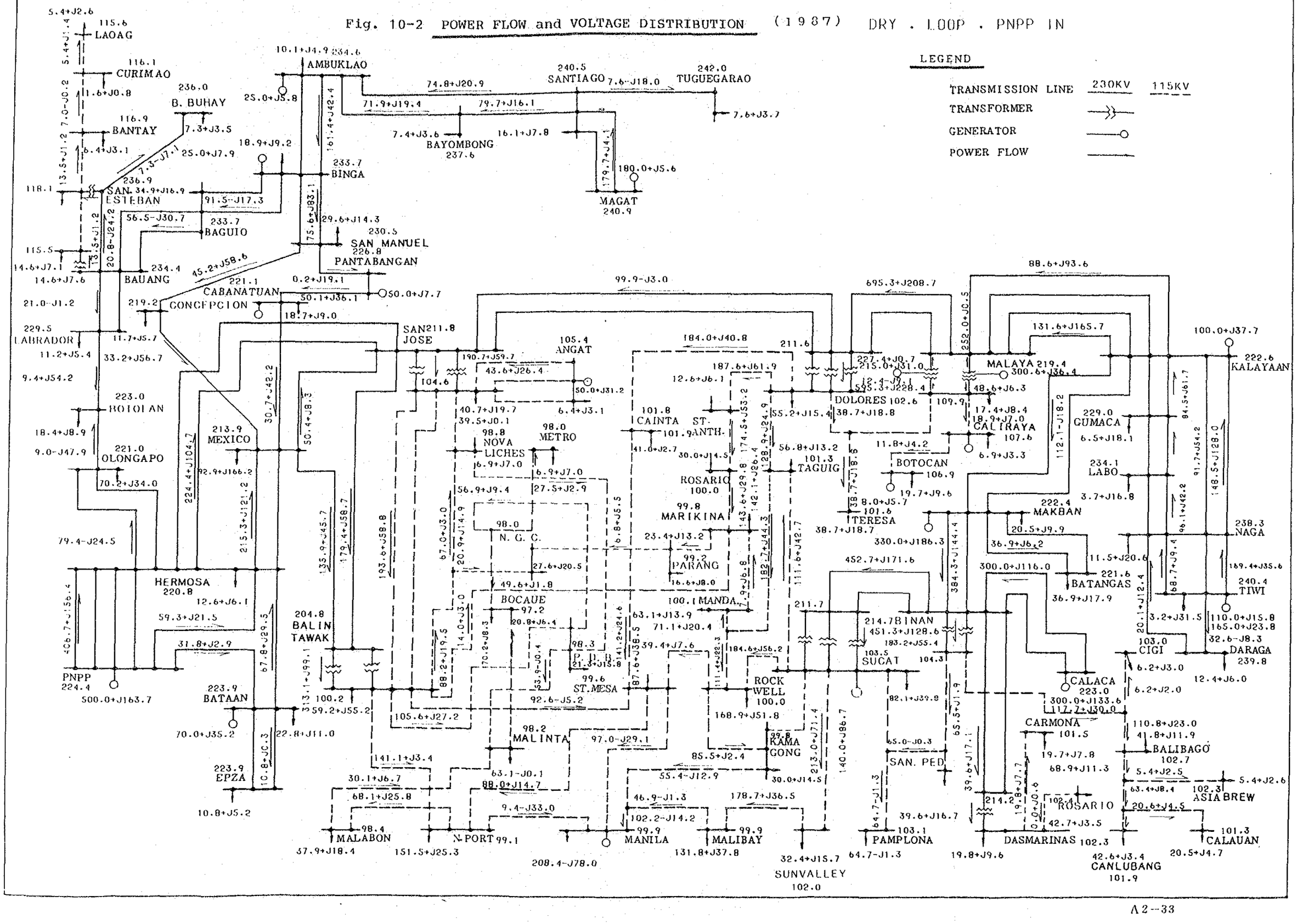


Fig. 10-3 POWER FLOW and VOLTAGE DISTRIBUTION (1987) DRY . SEPARATE . PNPP OUT

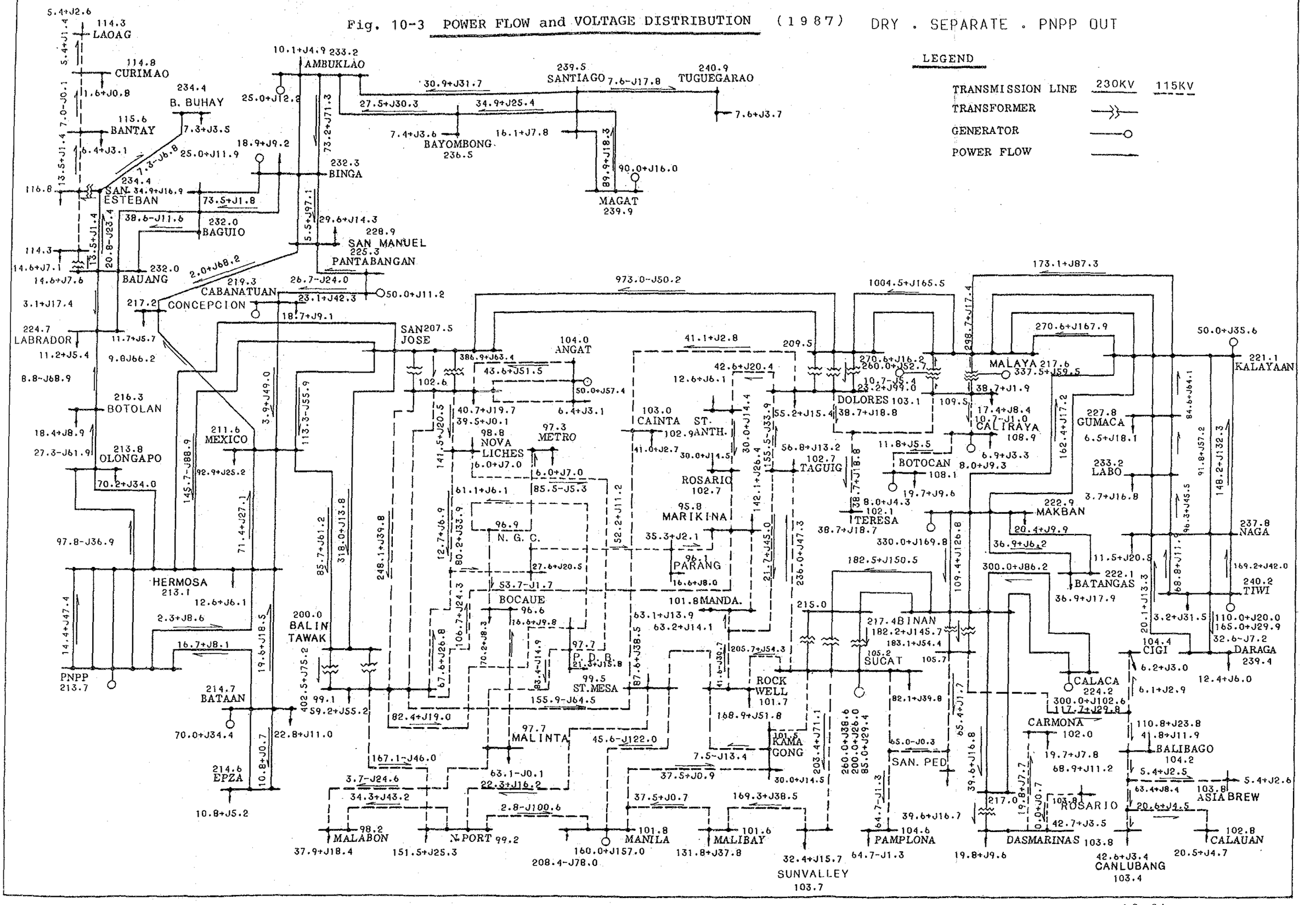


Fig. 10-4 POWER FLOW and VOLTAGE DISTRIBUTION (1987) DRY . LOOP . PNPP OUT

LEGEND

TRANSMISSION LINE 230KV 115KV

TRANSFORMER

GENERATOR

POWER FLOW

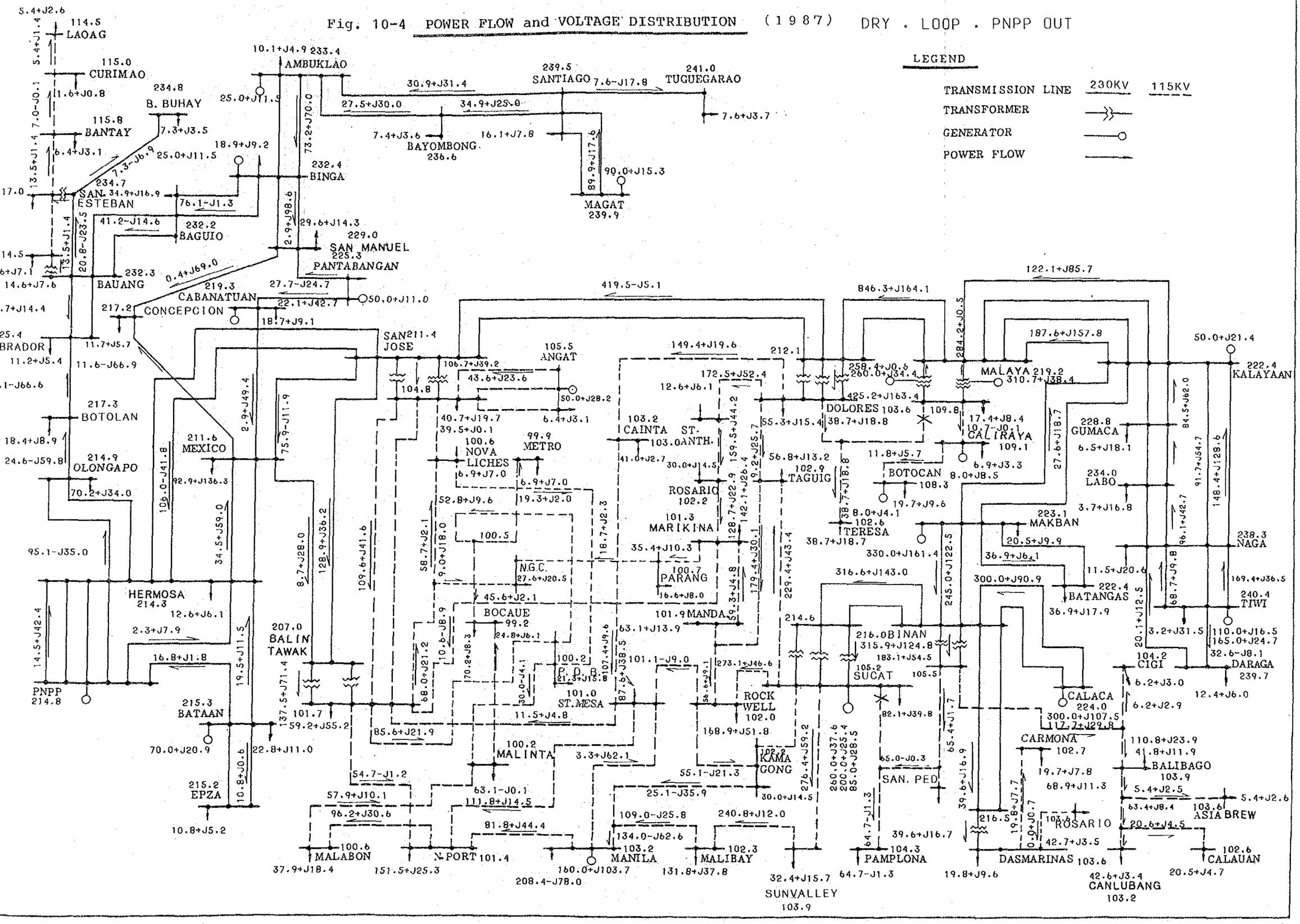


Fig. 11 POWER FLOW and VOLTAGE DISTRIBUTION (1990) WET . LOOP . PNPP IN

LEGEND

TRANSMISSION LINE 230KV 115KV

TRANSFORMER

GENERATOR

POWER FLOW

LAOAG 111.0
CURIMAO 111.8
B. BUHAY 231.8
BANTAY 113.1
AMBUKLAO 231.3
BINGA 230.4
SAN ESTEBAN 231.8
BAGUIO 230.2
BAUANG 230.4
SAN MANUEL 227.5
PANTABANGAN 225.7
CABANATUAN 221.1
CONCEPCION 219.3
LABRADOR 226.1
BOTOLAN 221.3
OLONGAPO 220.3
HERMOSA 221.3
PNPP 224.5
BATAAN 222.9
EPZA 222.8
MEXICO 216.9
SAN JOSE 214.3
ANGAT 109.1
METRO 97.4
NOVA 98.7
LICHES
BOCAUE 96.4
BALIN TAWAK 205.0
P.D.B. 97.8
ST.MESA 99.1
MALINTA 97.5
MALABON 97.7
N.PORT 98.7
MANILA 99.9
NGC. 98.6
SANTIAGO 239.5
BAYOMBONG 234.7
MAGAT 240.6
TUGUEGARAO 240.8
CAINTA 101.4
ANTH. 101.4
CUBAO 99.7
ROSARIO 100.5
MARIKINA 99.3
PARANG 98.7
MANDA. 99.5
ROCK WELL 99.4
KAMA GONG 99.7
MALIBAY 99.5
SUNVALLEY 101.2
DOLORES 102.2
TAGUIG 100.5
SUCAT 102.5
BINAN 212.7
PAMPLONA 99.6
MALAYA 219.1
CALIRAYA 110.7
BOTOCAN 110.2
TERESA 101.0
MAKBAN 221.3
BATANGAS 220.4
CALACA 222.2
CARMONA 100.1
SAN. PED 100.9
ROSARIO 100.9
DASMARINAS 100.8
CANLUBANG 98.4
KALAYAAN 221.5
GUMACA 227.6
LABO 232.0
NAGA 237.9
TIWI 240.4
DARAGA 242.1
MANITO 244.7
CIGI 99.6
BALIBAGO 99.3
ASIA BREW 98.9
CALAUAN 100.8

Fig. 12 POWER FLOW and VOLTAGE DISTRIBUTION (1990) WET . SEPARATE . PNPP IN

LEGEND

TRANSMISSION LINE 230KV 115KV

TRANSFORMER

GENERATOR

POWER FLOW

FIG. 13 '85 WET KALAYAAN-DUMACA 3LG OPEN LOOP.

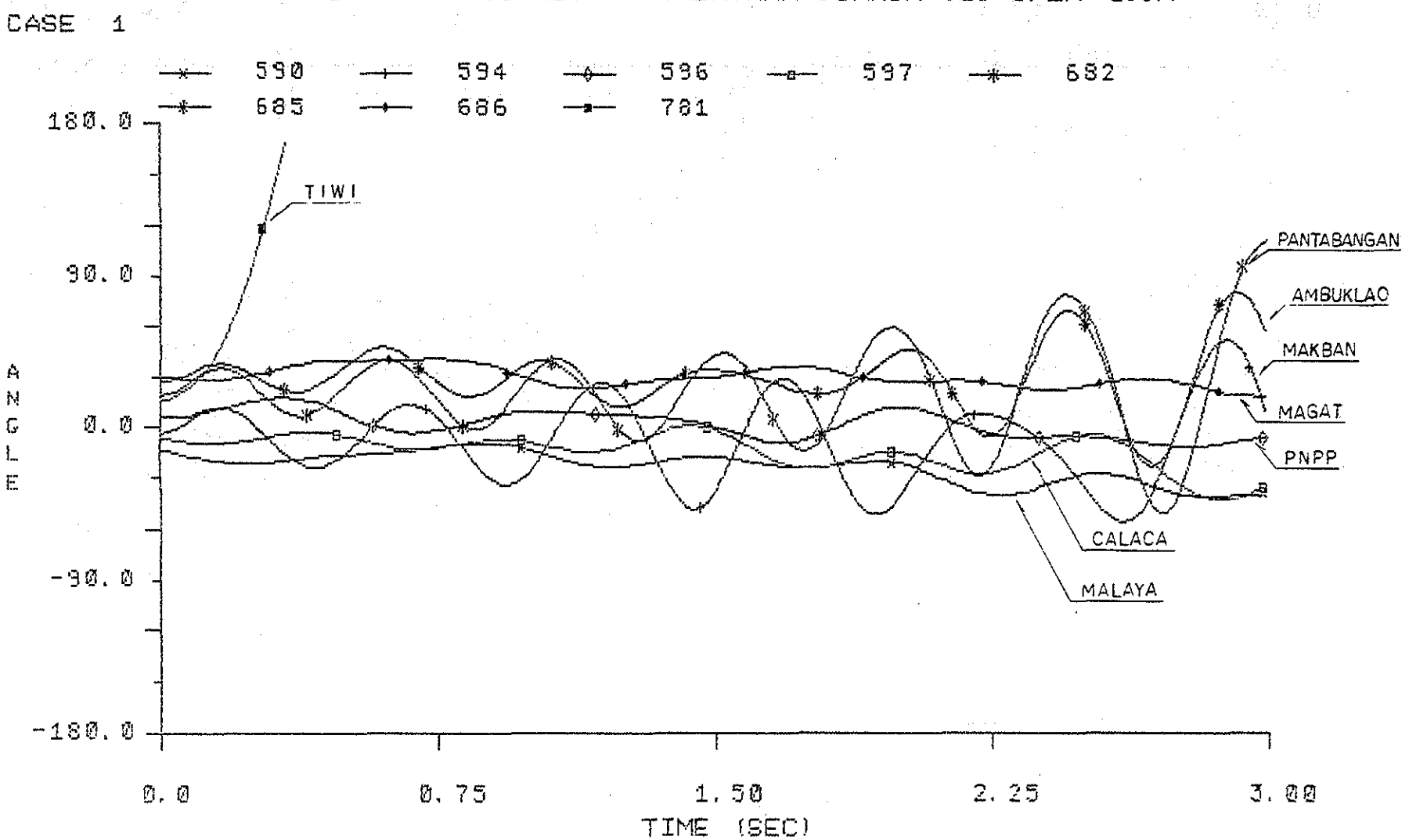


FIG. 14 '85 WET SANMANUEL CONCEPTION FAULT LOOP.

CASE 2

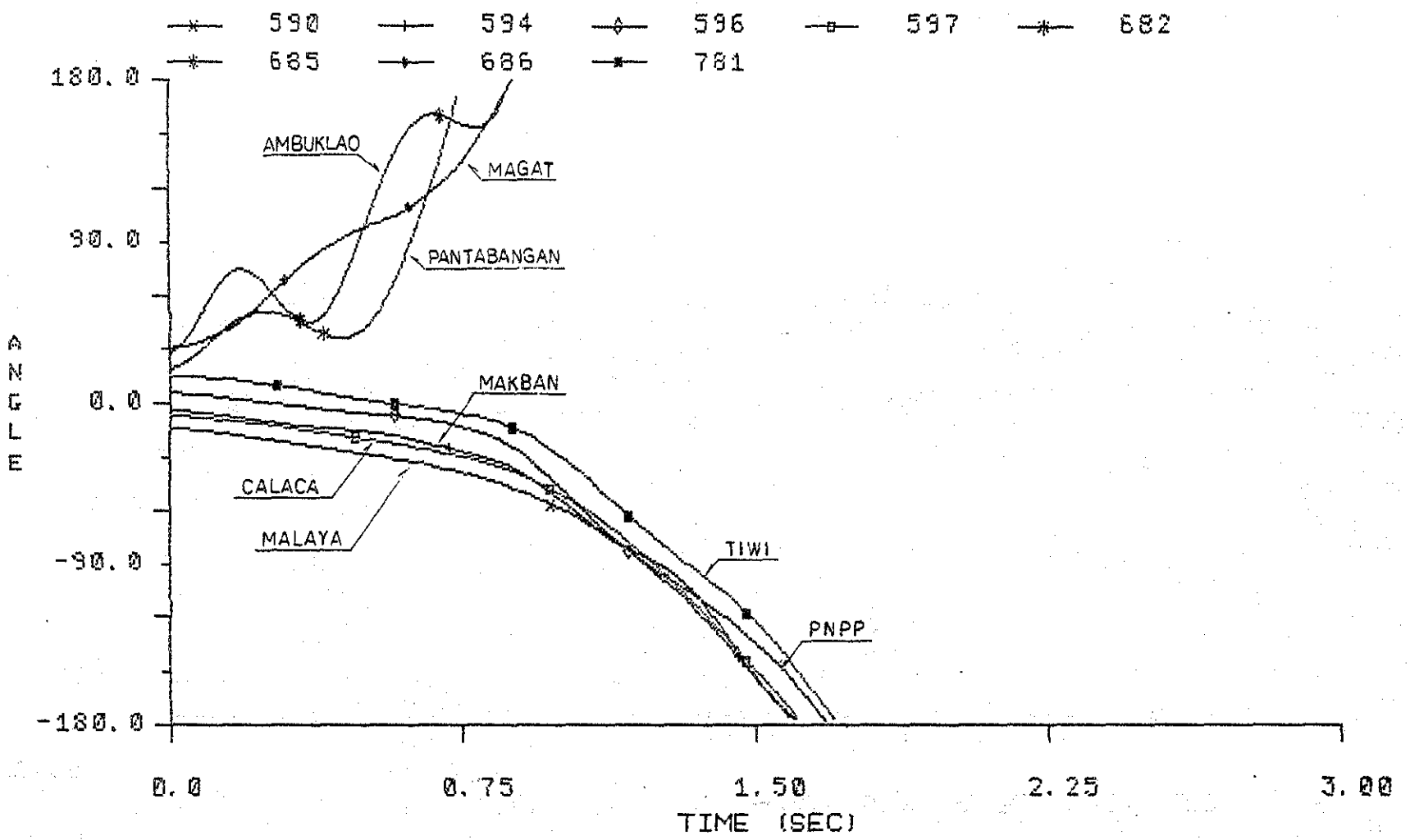


FIG. 15 '85 WET . HERMOSA SANJOSE FAULT LOOP.

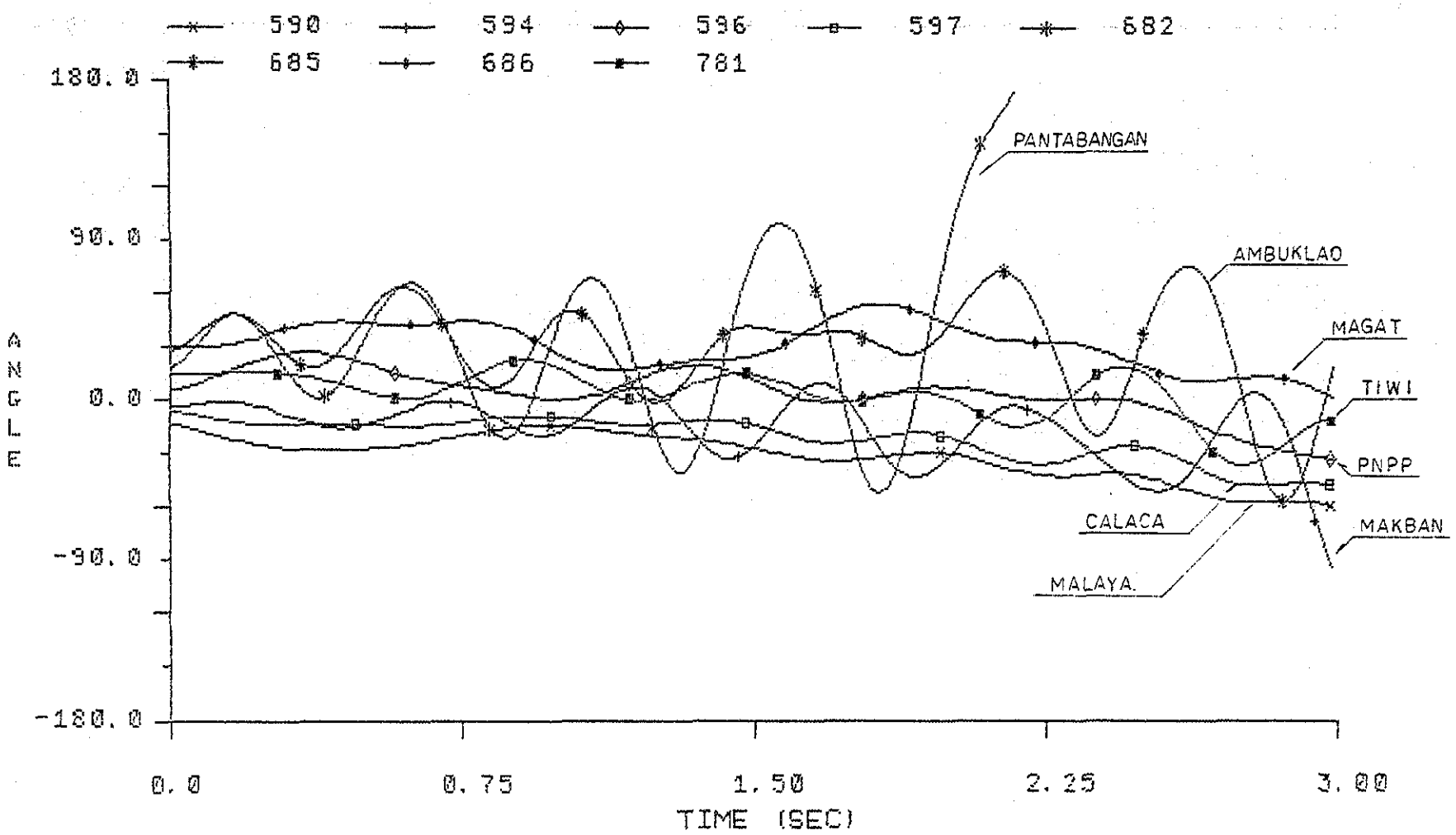
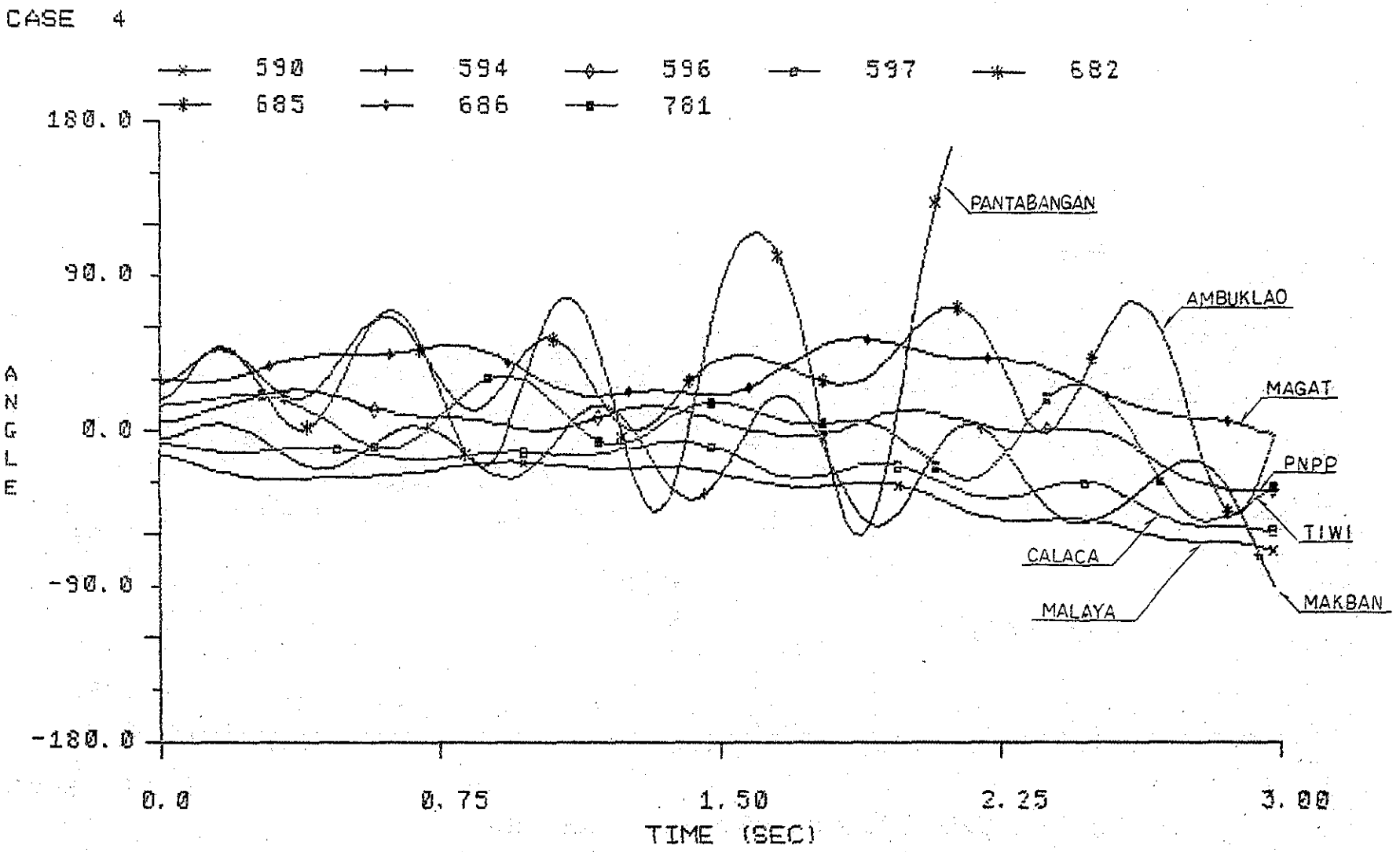


FIG. 16 '85 WET SANJOSE DOLORES FAULT LOOP.



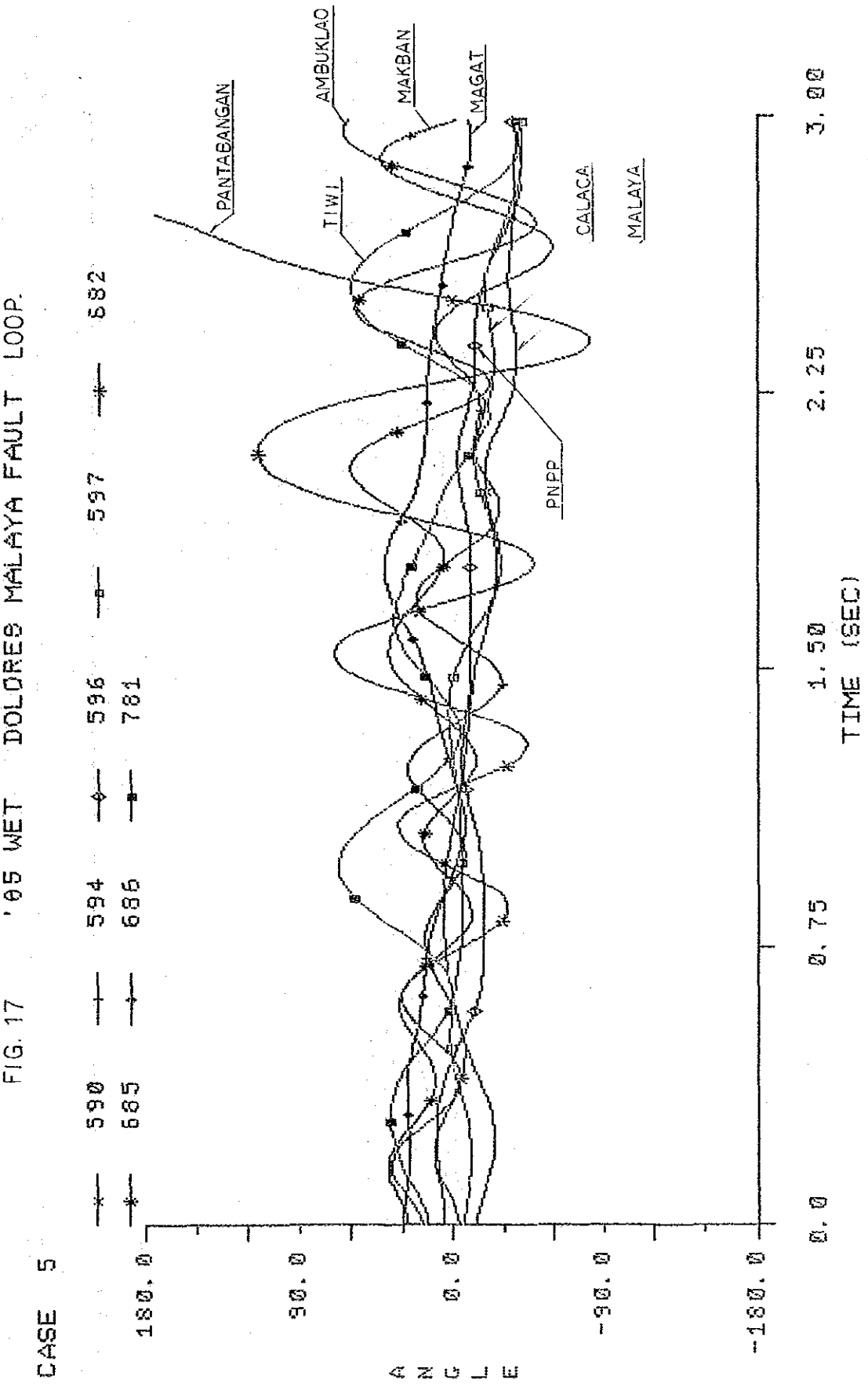


FIG. 17 '05 WET DOLORES MALAYA FAULT LOOP.
CASE 5
590
685
594
686
596
781
597
582
PANTABANGAN
TIWI
AMBUKLAO
MAKBAN
MAGAT
PNPP
CALACA
MALAYA
180.0
90.0
0.0
-90.0
-180.0
ANGLE
0.0
0.75
1.50
2.25
3.00
TIME (SEC)

FIG.18 '85 WET KALAYAAN-GUMACA 3LG OPEN

CASE 1

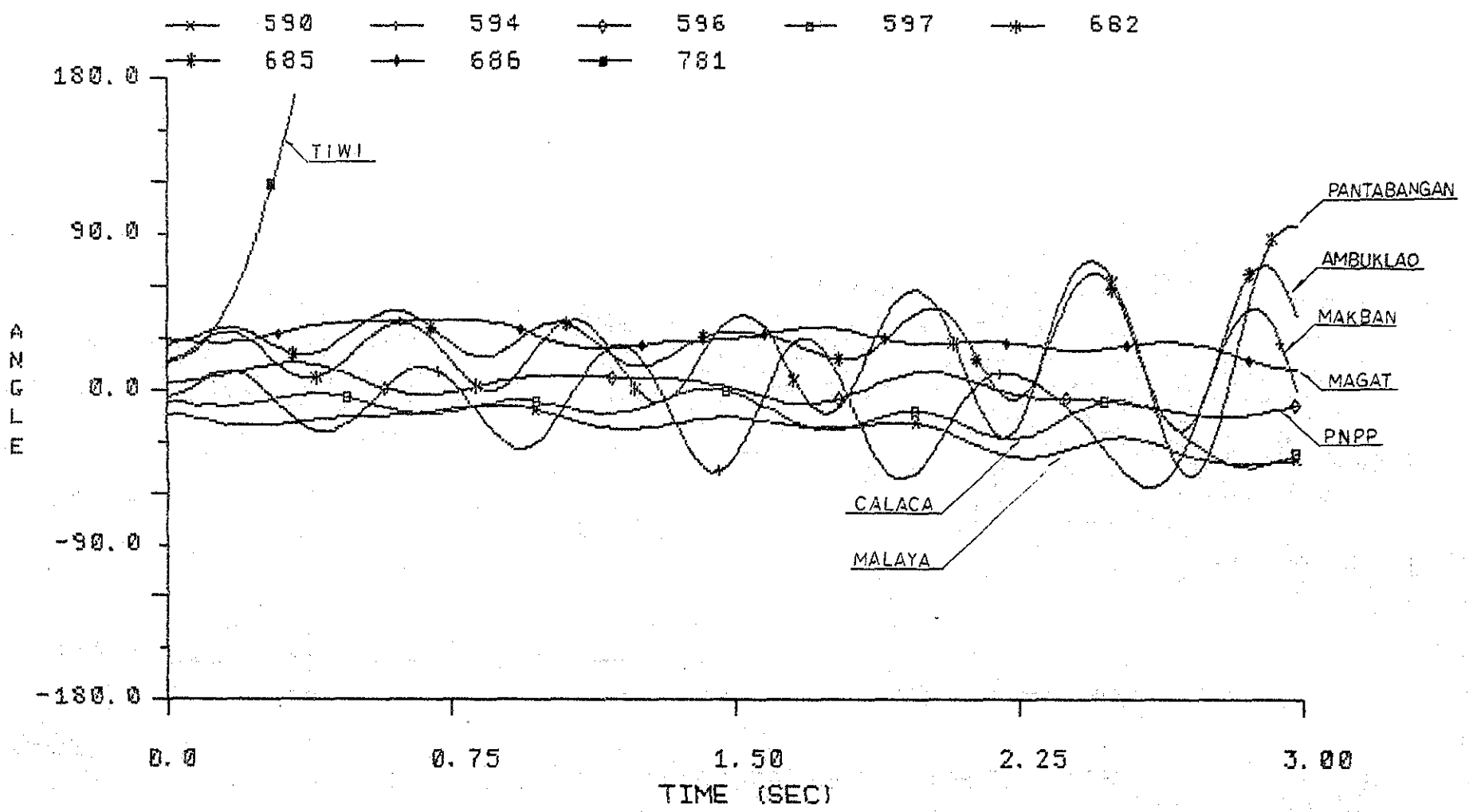


FIG. 19 '85 WET SAN. MANUEL CONCEPTION FAULT

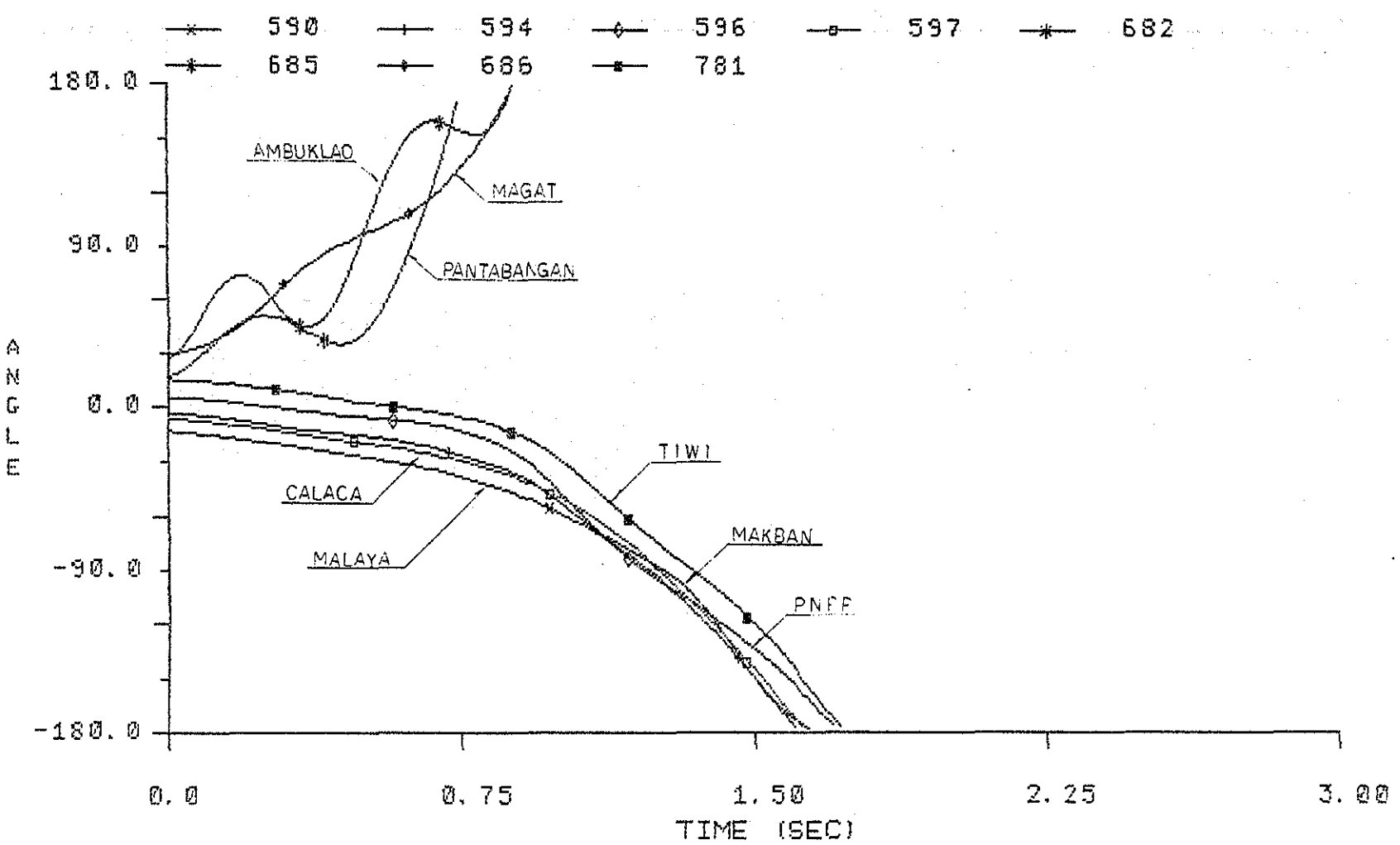


FIG. 20 '85 WET HERMOSA SANJOSE FAULT

CASE 3

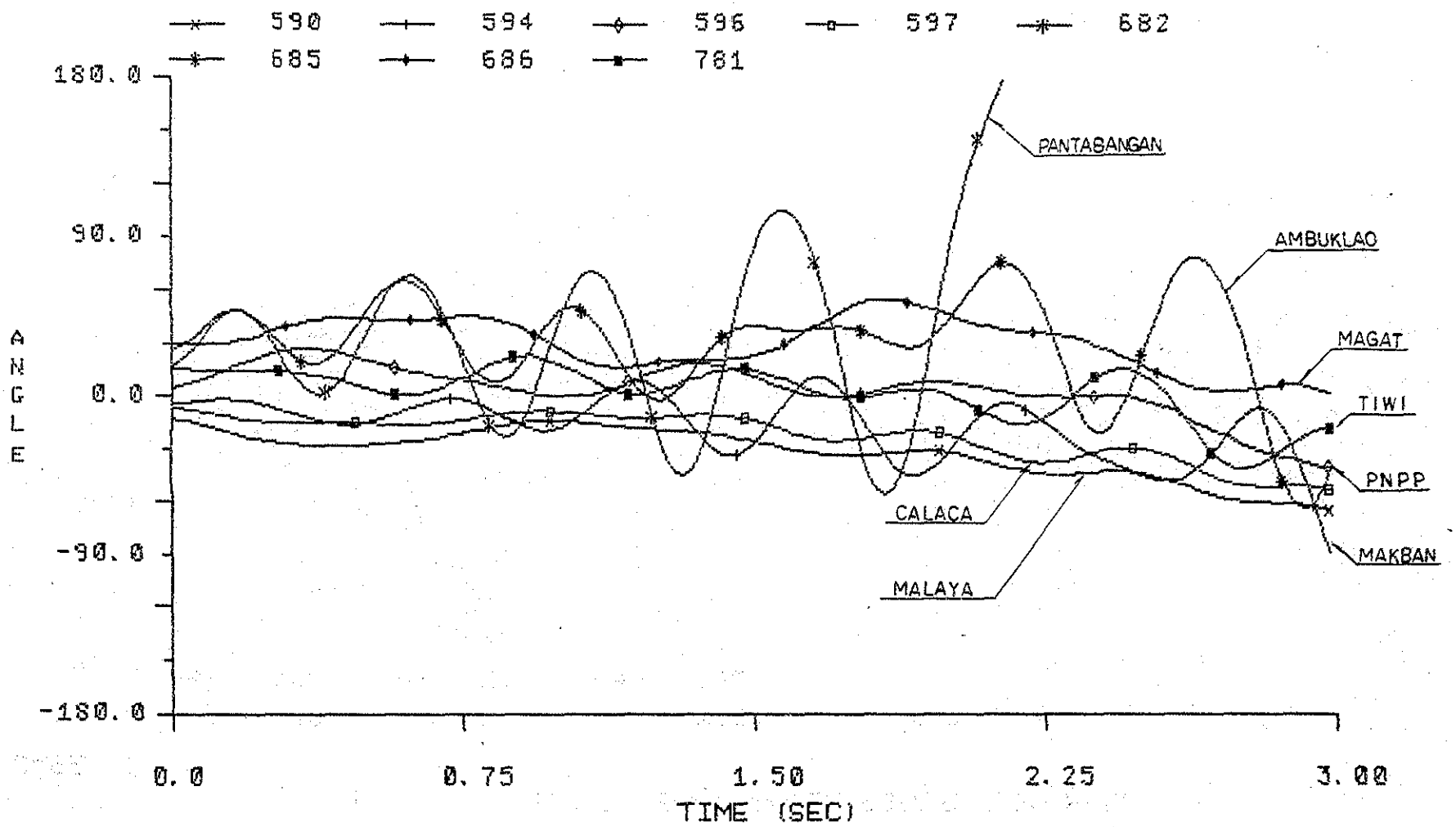


FIG. 21 '85 WET SANJOSE DOLORES FAULT

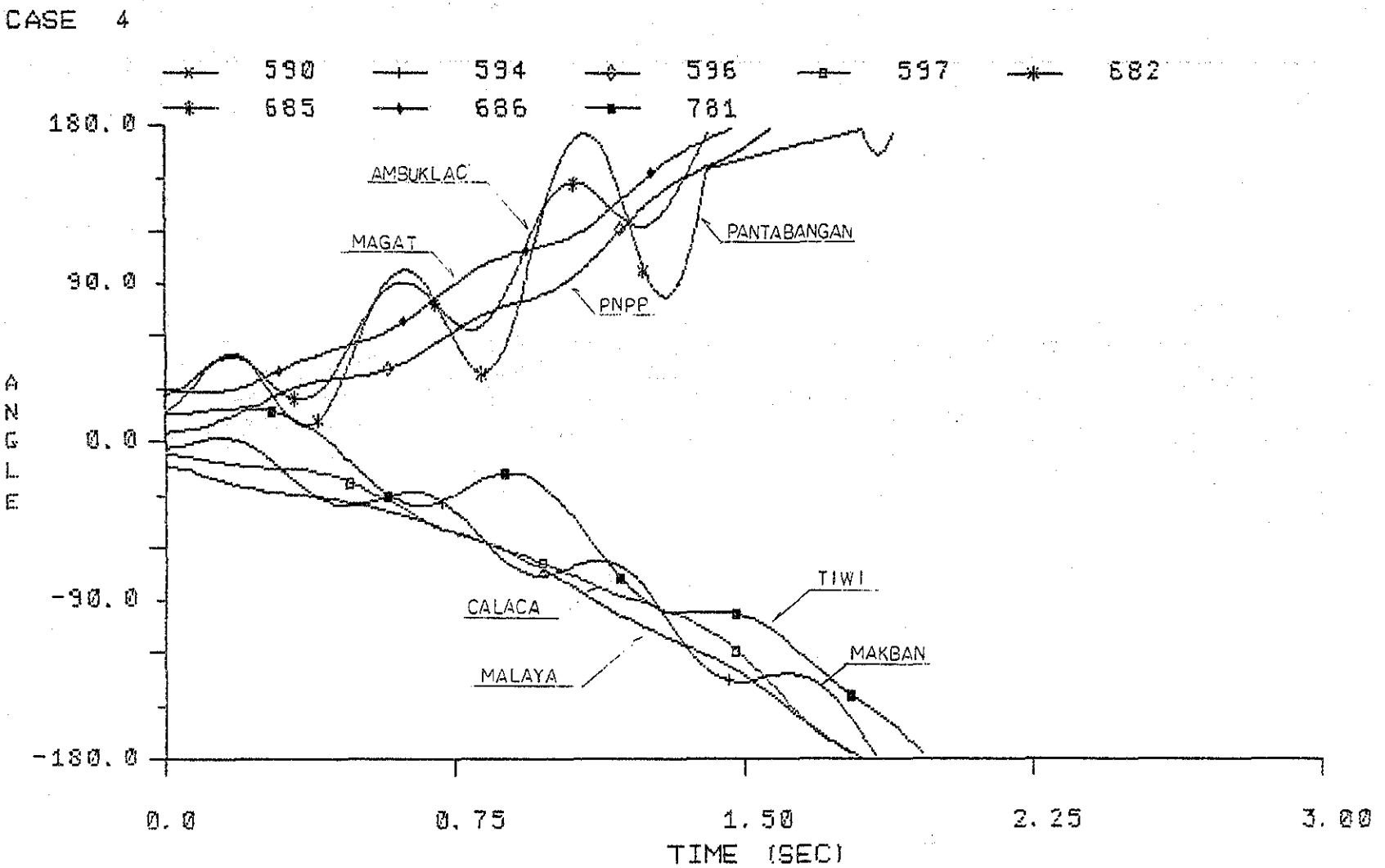


FIG. 22 '85 WET DOLORES MALAYA FAULT

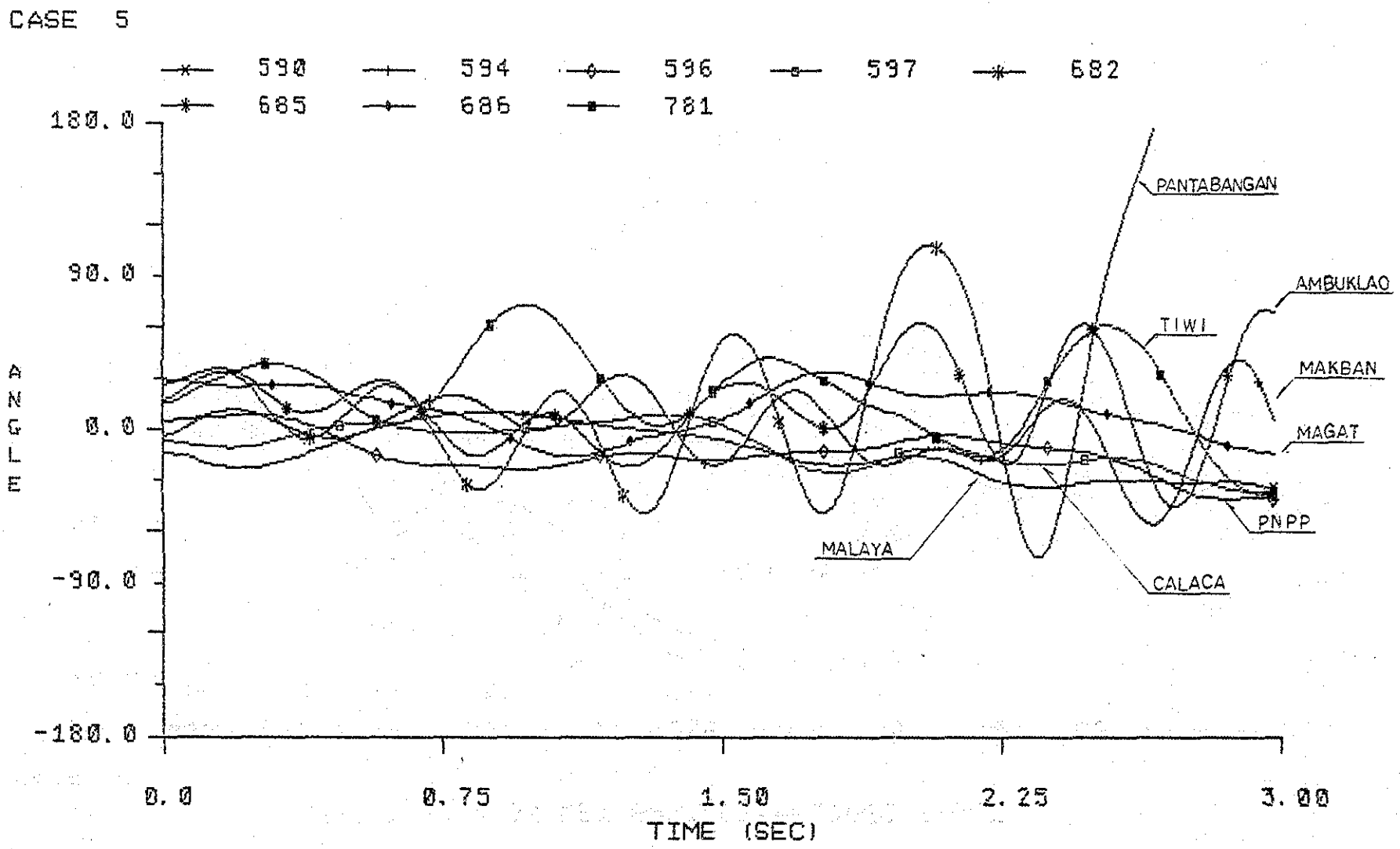


FIG. 23 '05 DRY KALAYAAN-GUMACA 3LG OPEN LOOP.

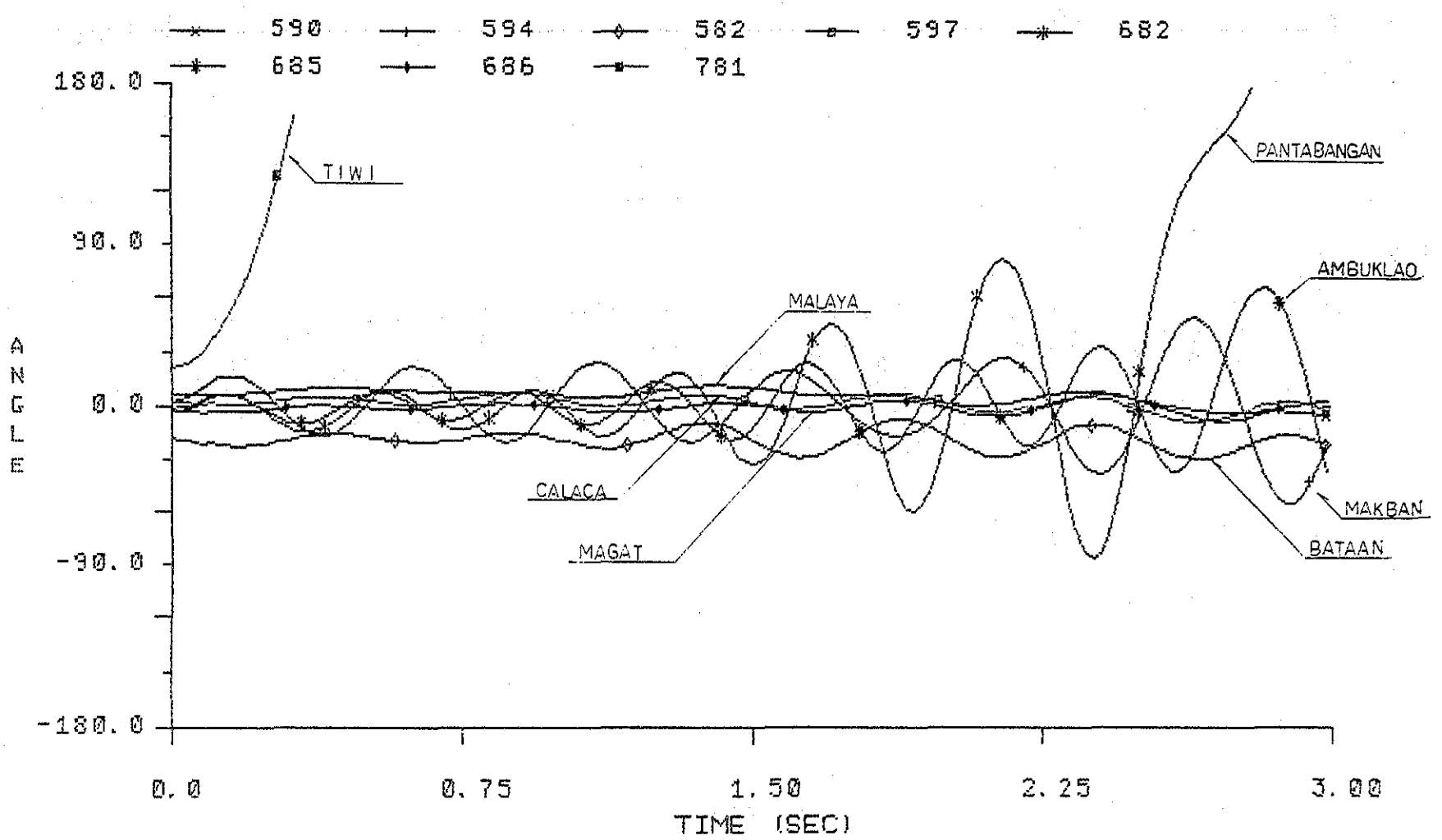


FIG. 24 '85 DRY SANMANUEL CONCEPTION FAULT LOOP.

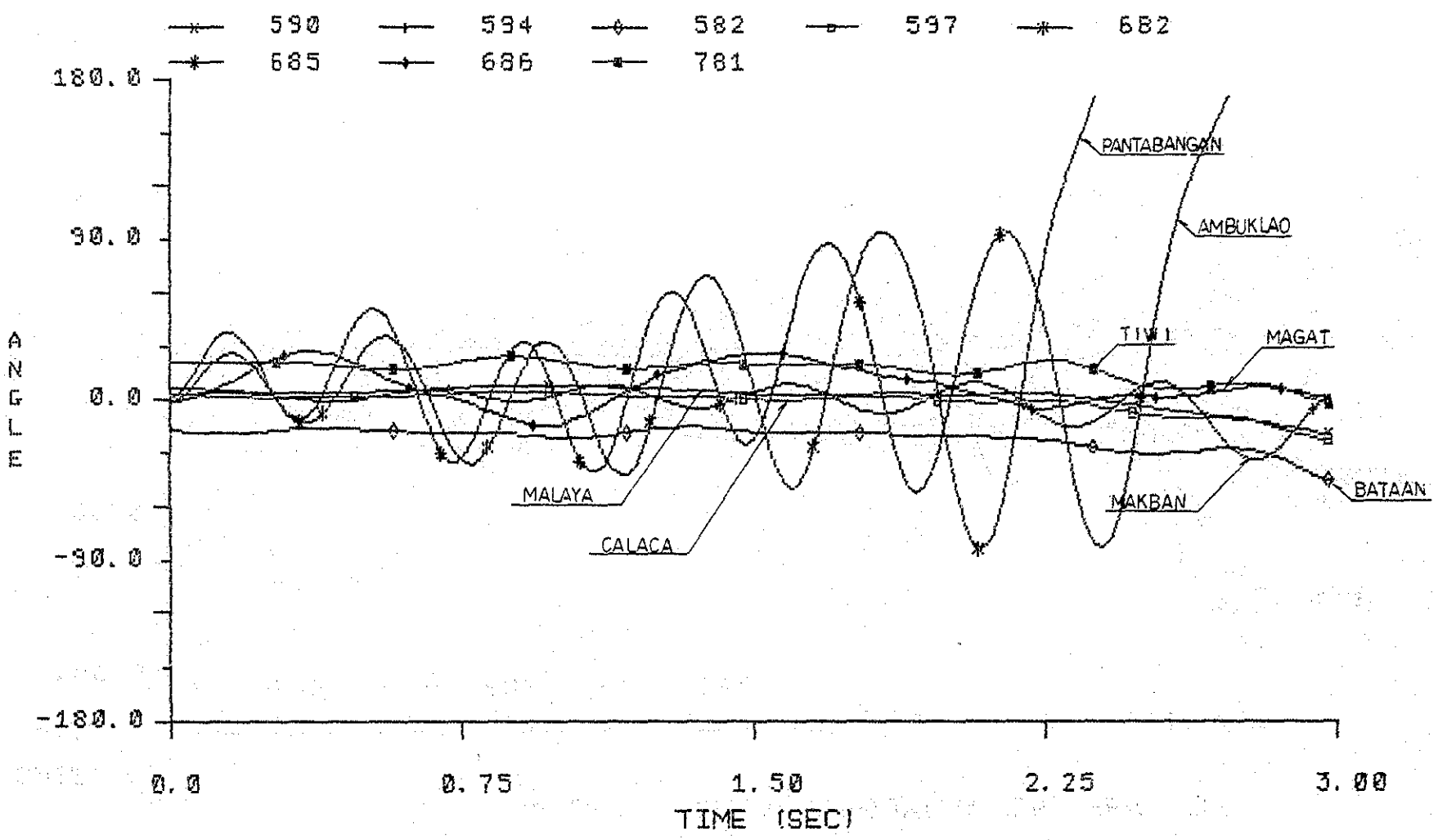


FIG. 25 '85 DRY HERMOSA SANJOSE FAULT LOOP.

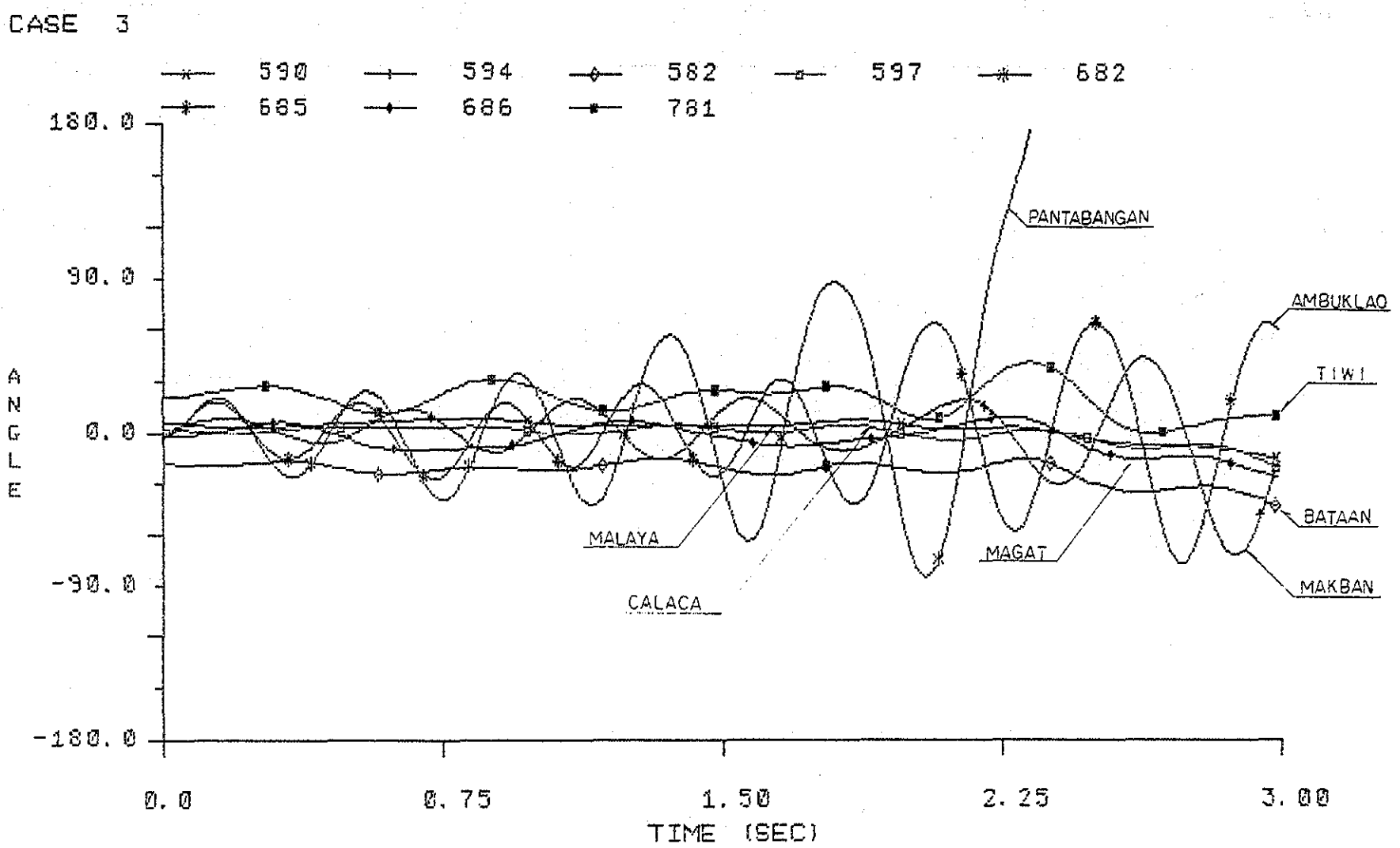


FIG. 26 '85 DRY SANJOSE DOLORES FAULT LOOP.

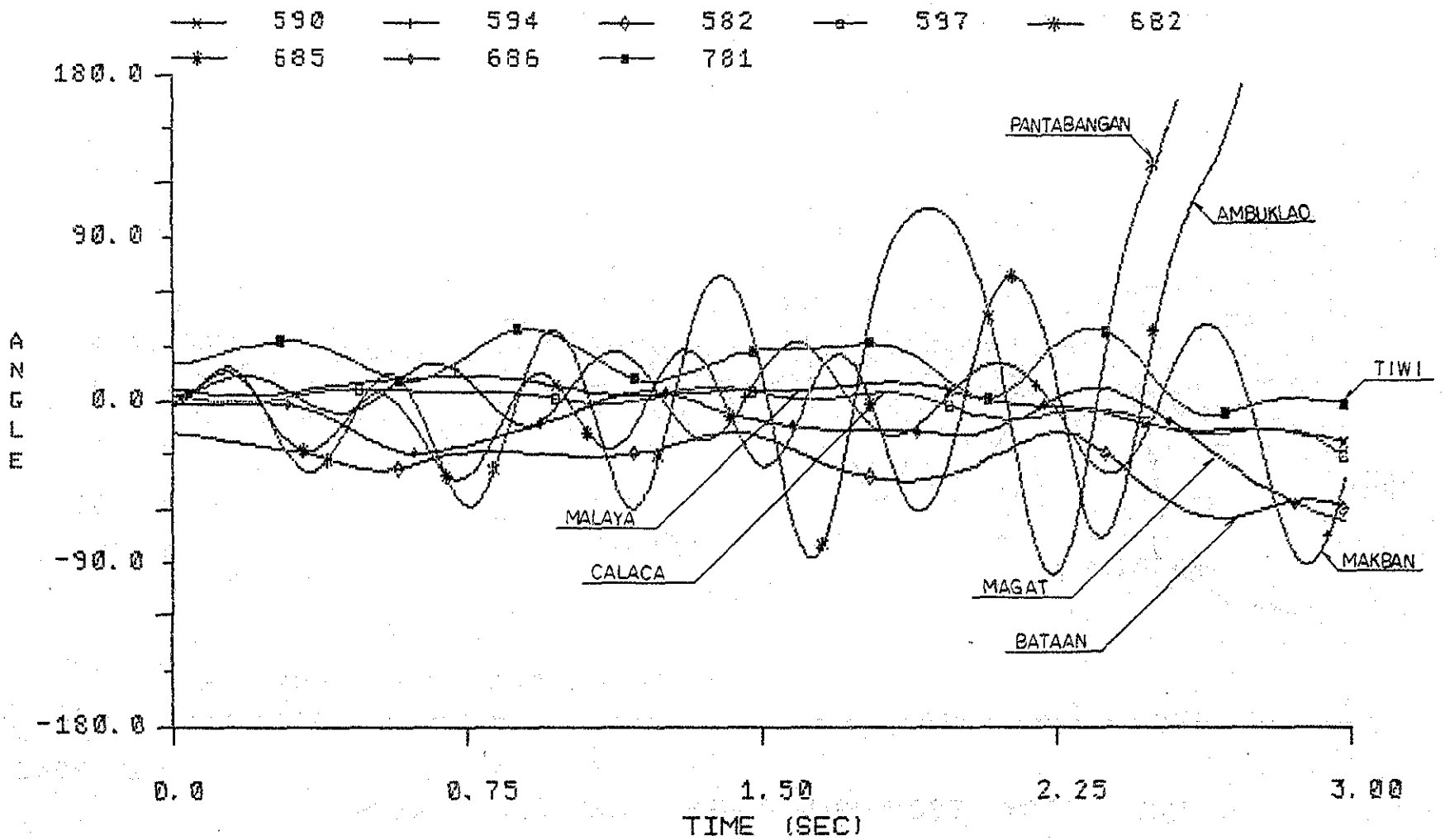


FIG. 27 '05 DRY DOLORES MALAYA FAULT LOOP

CASE 5

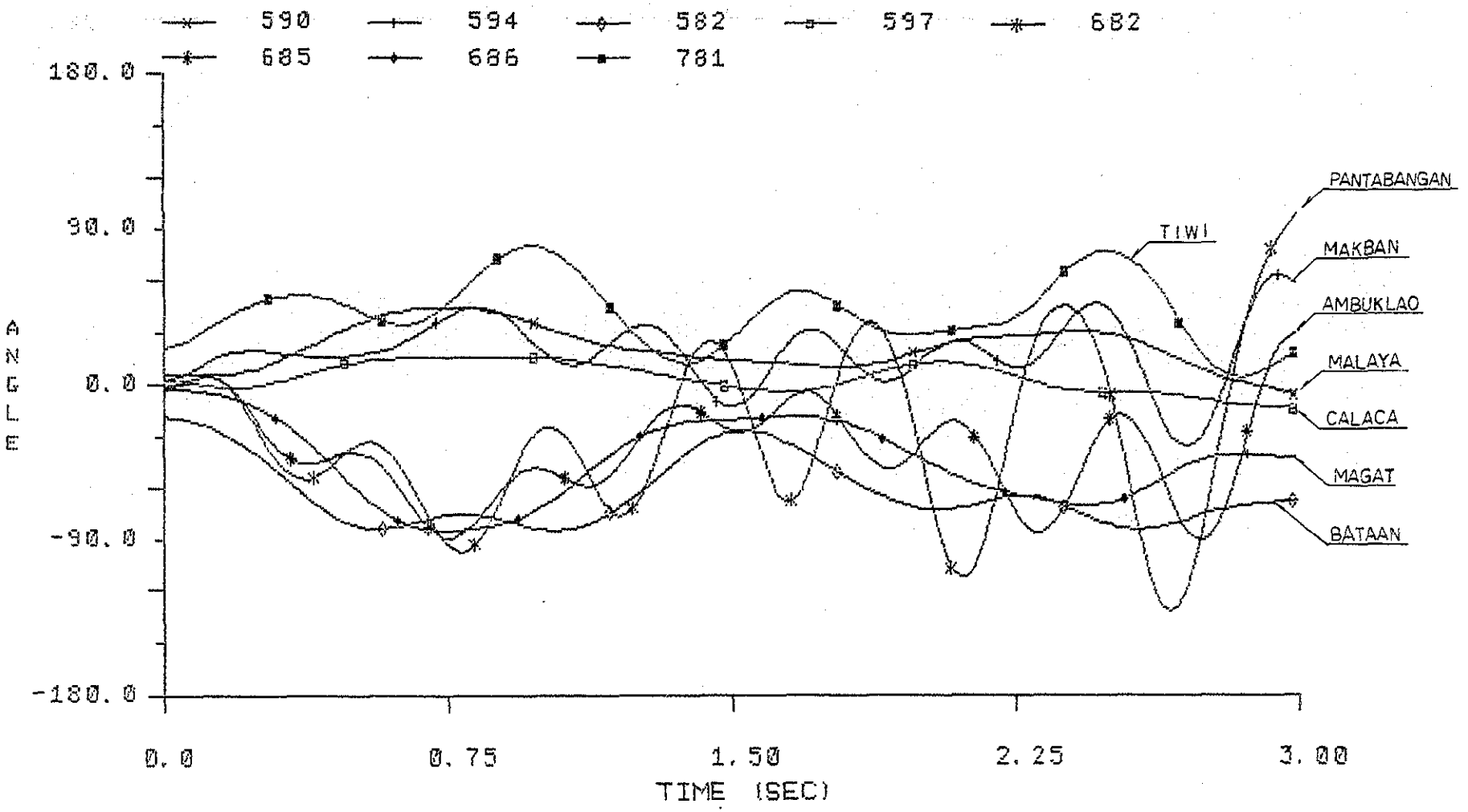


FIG. 28 '87 WET KALAYAAN-DUMACA 3LG OPEN LOOP

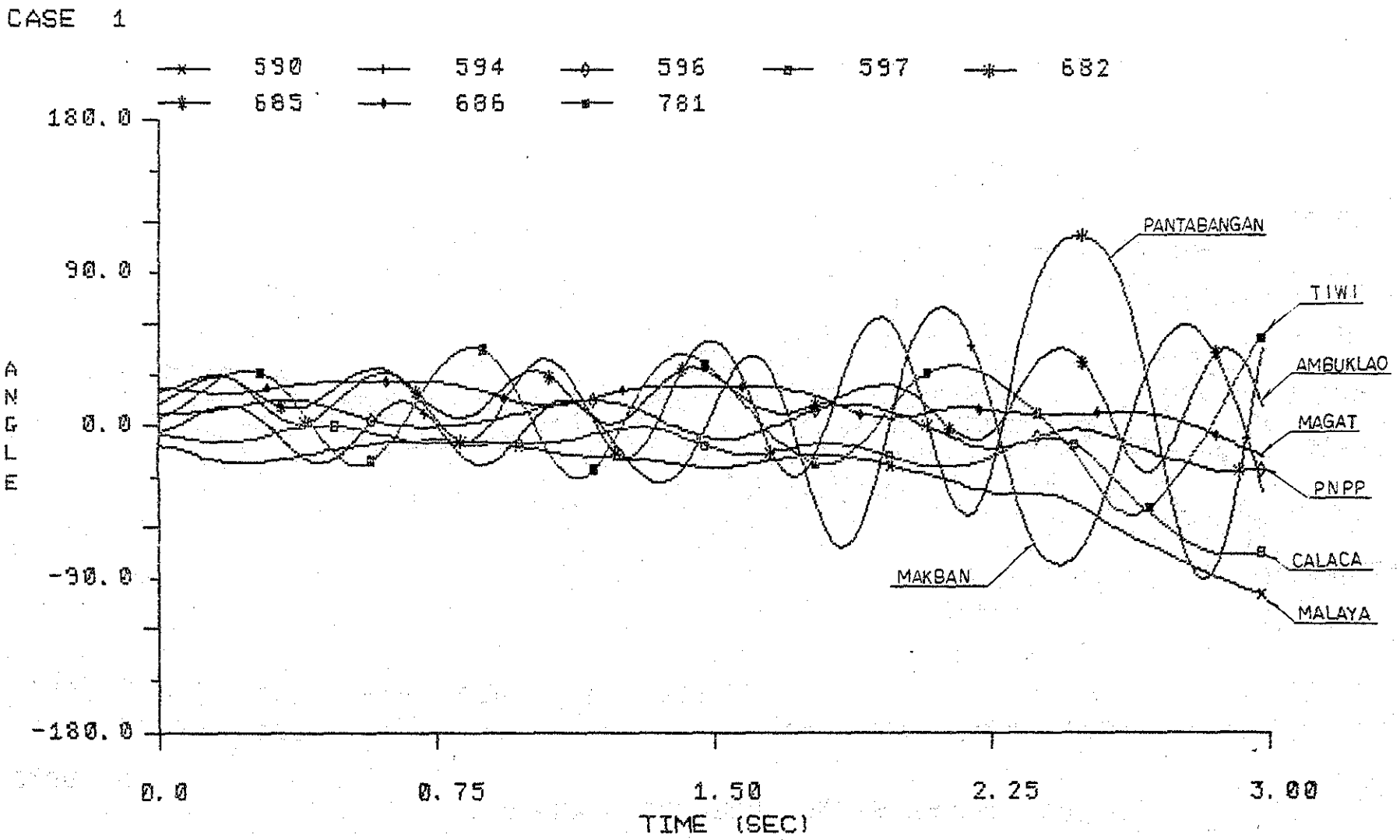


FIG. 29 '07 WET SANMANUEL CONCEPTION FAULT LOOP

CASE 2

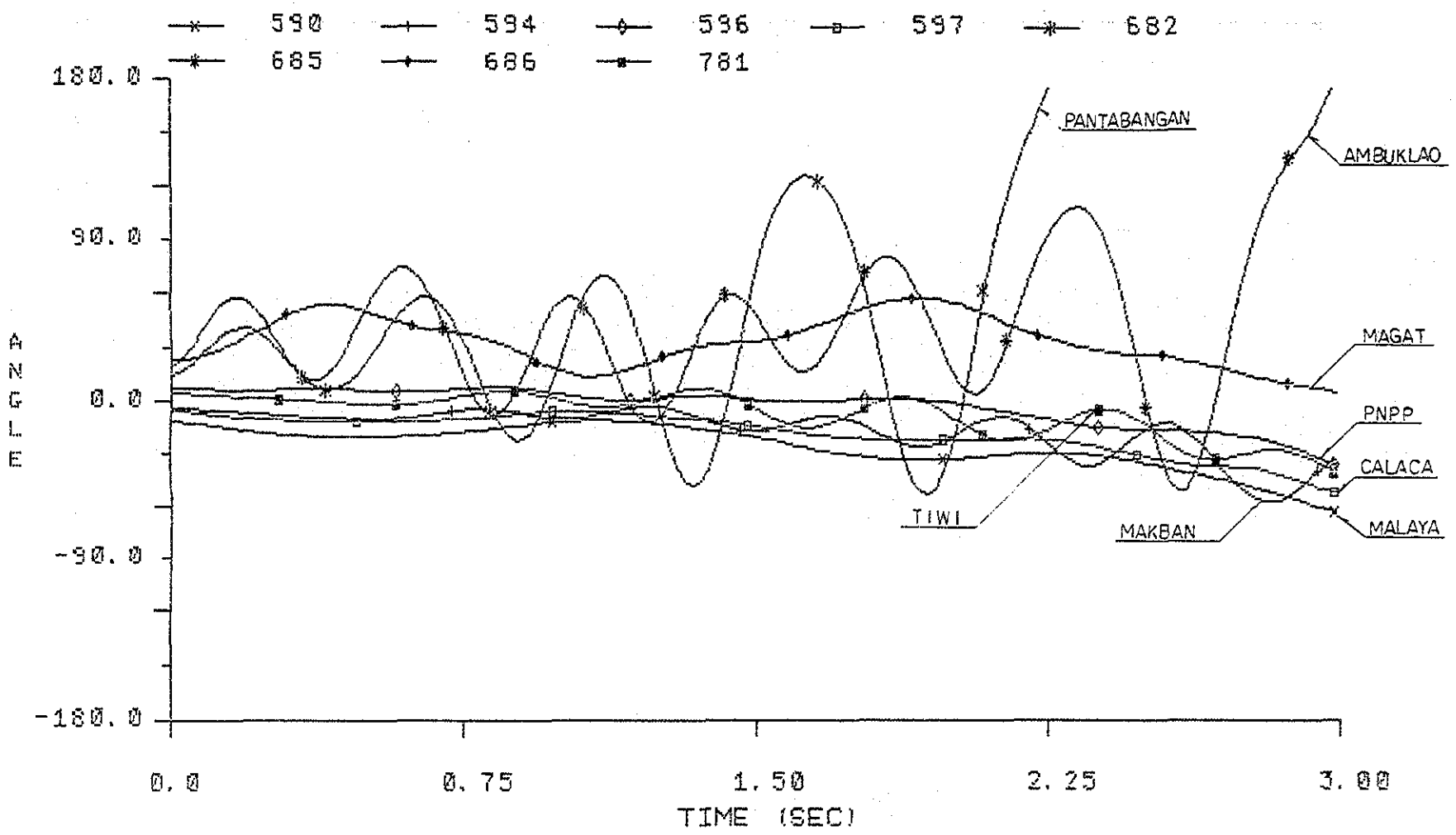


FIG. 30 '87 WET HERMOSA SANJOSE FAULT LOOP.

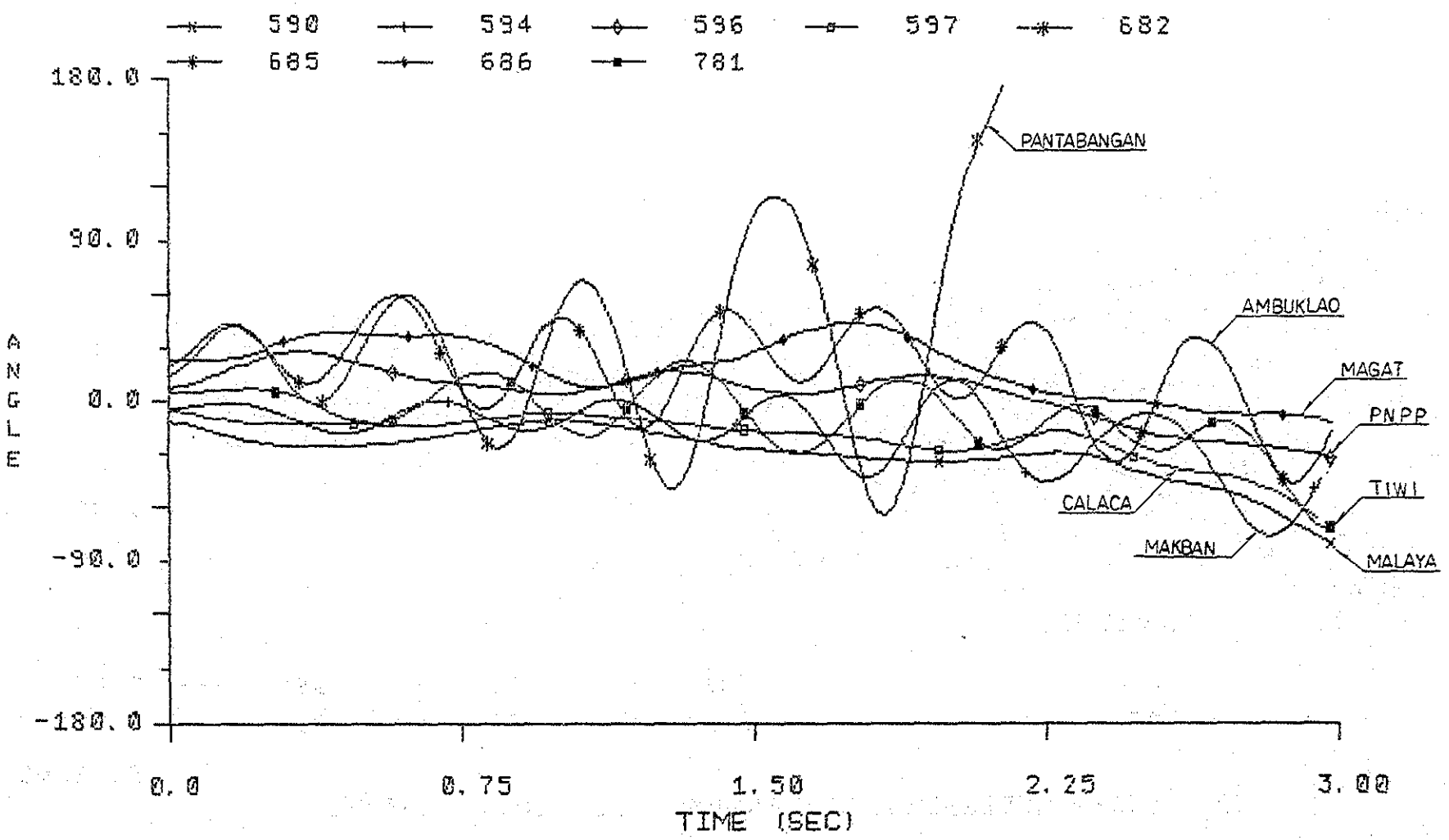


FIG. 31 '07 WET SANJOSE DOLORES FAULT LOOP.

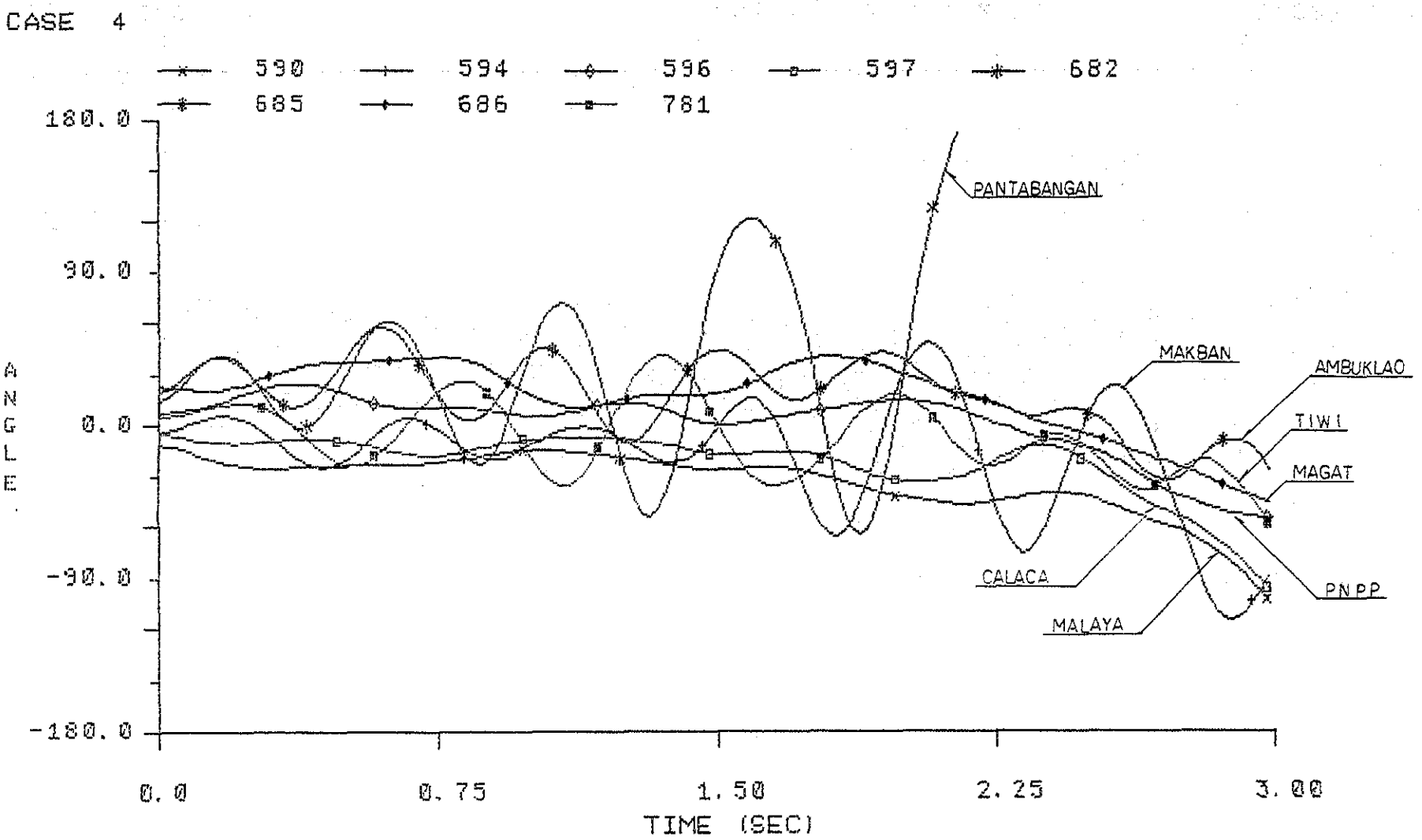


FIG. 32 '87 WET DOLORES MALAYA FAULT LOOP.

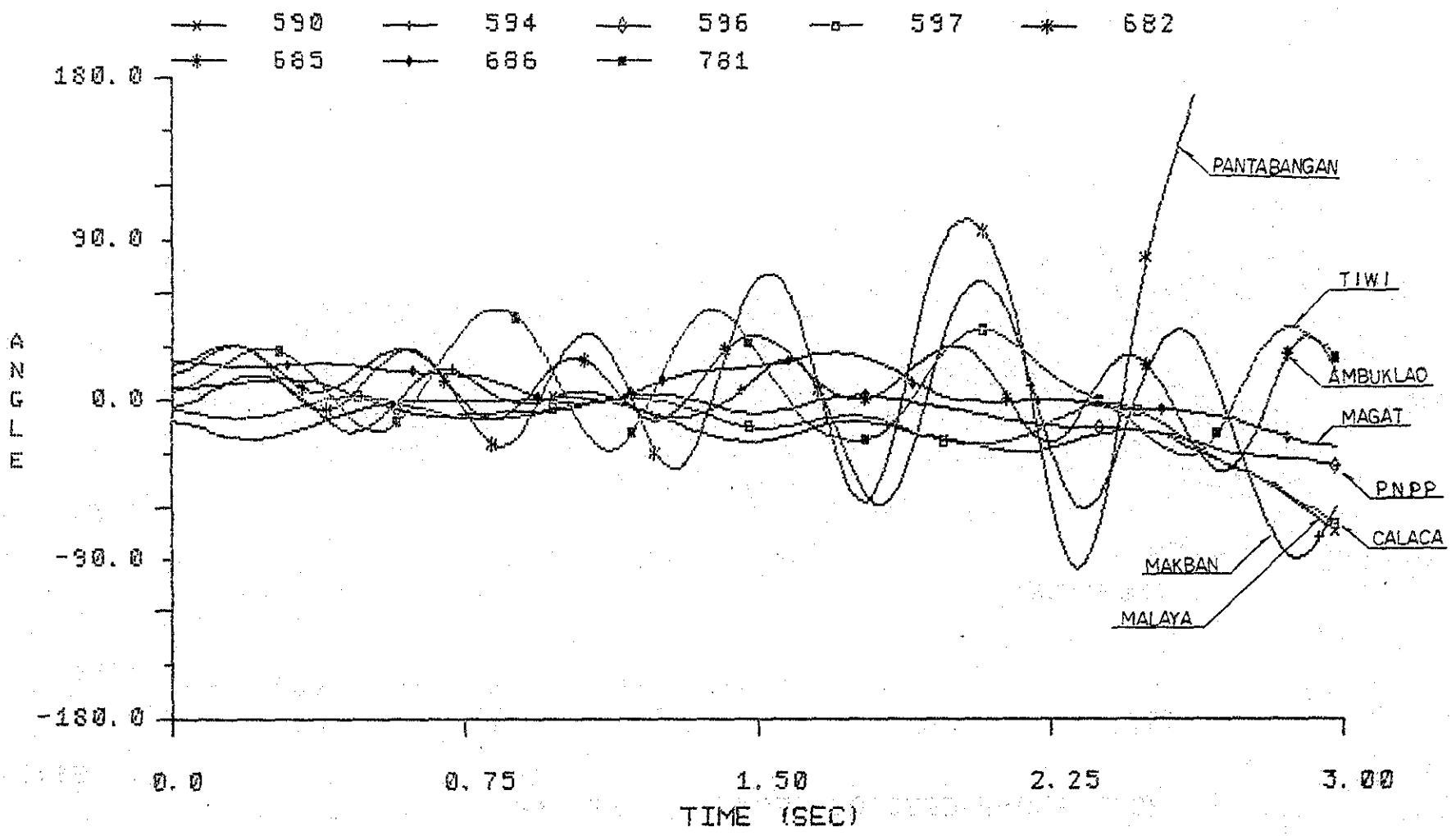


FIG. 33 '90 WET 230KVBINAN-SUCAT FAULT LOOP

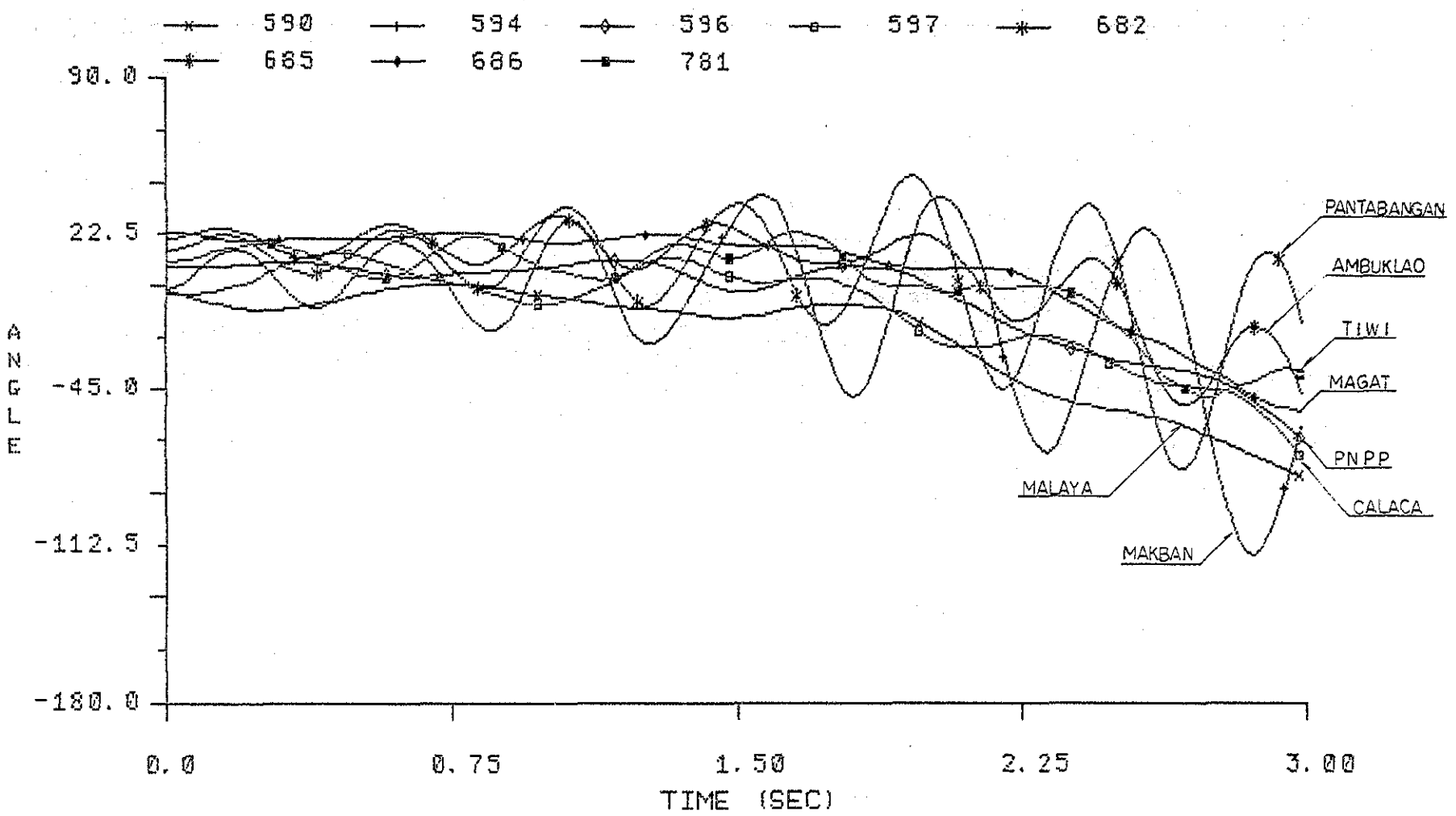


FIG. 34 '90 WET SANMANUEL CONCEPTION FAULT LOOP.

CASE 2

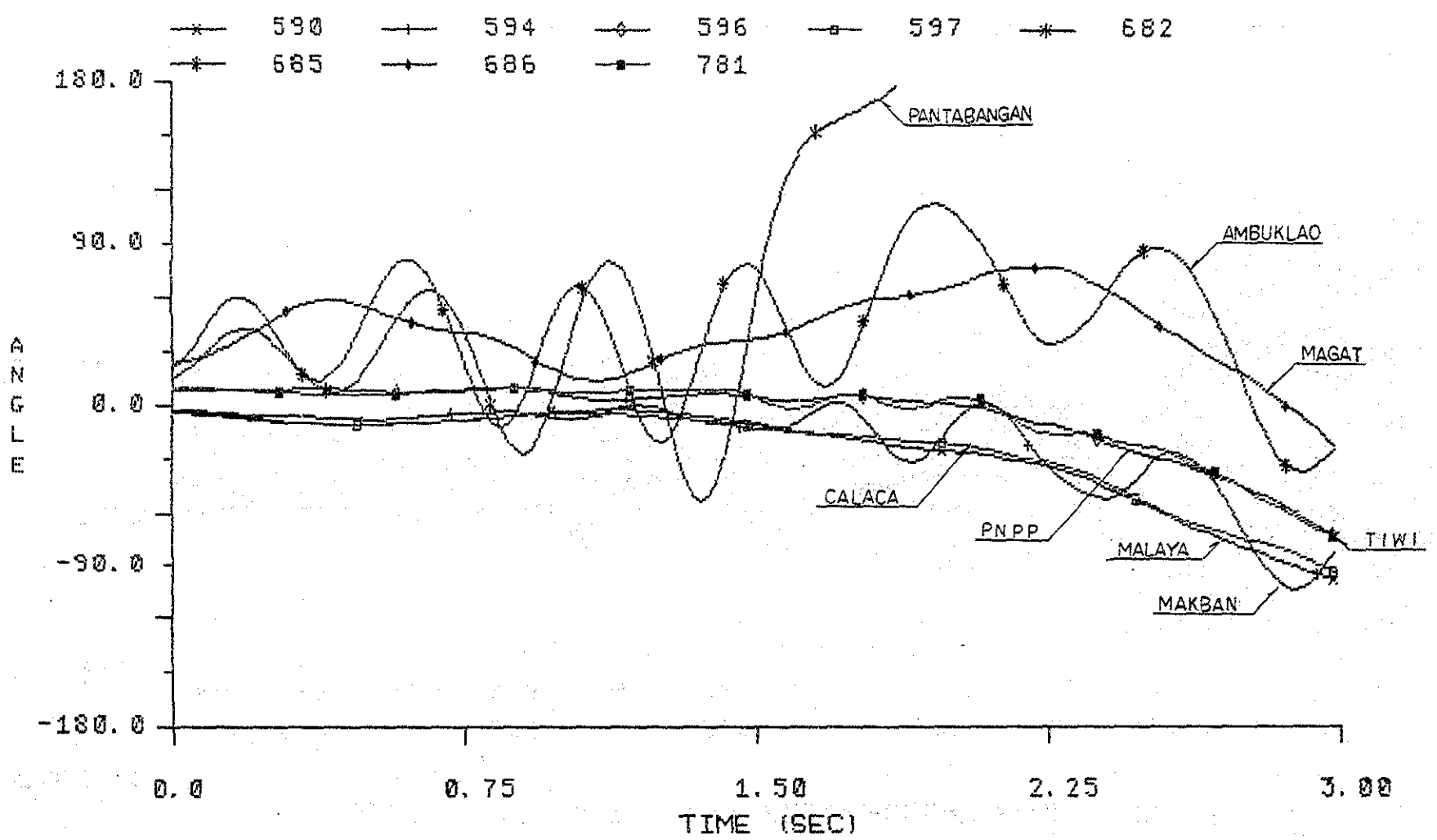


FIG. 35 '90 WET HERMOSA SANJOSE FAULT LOOP.

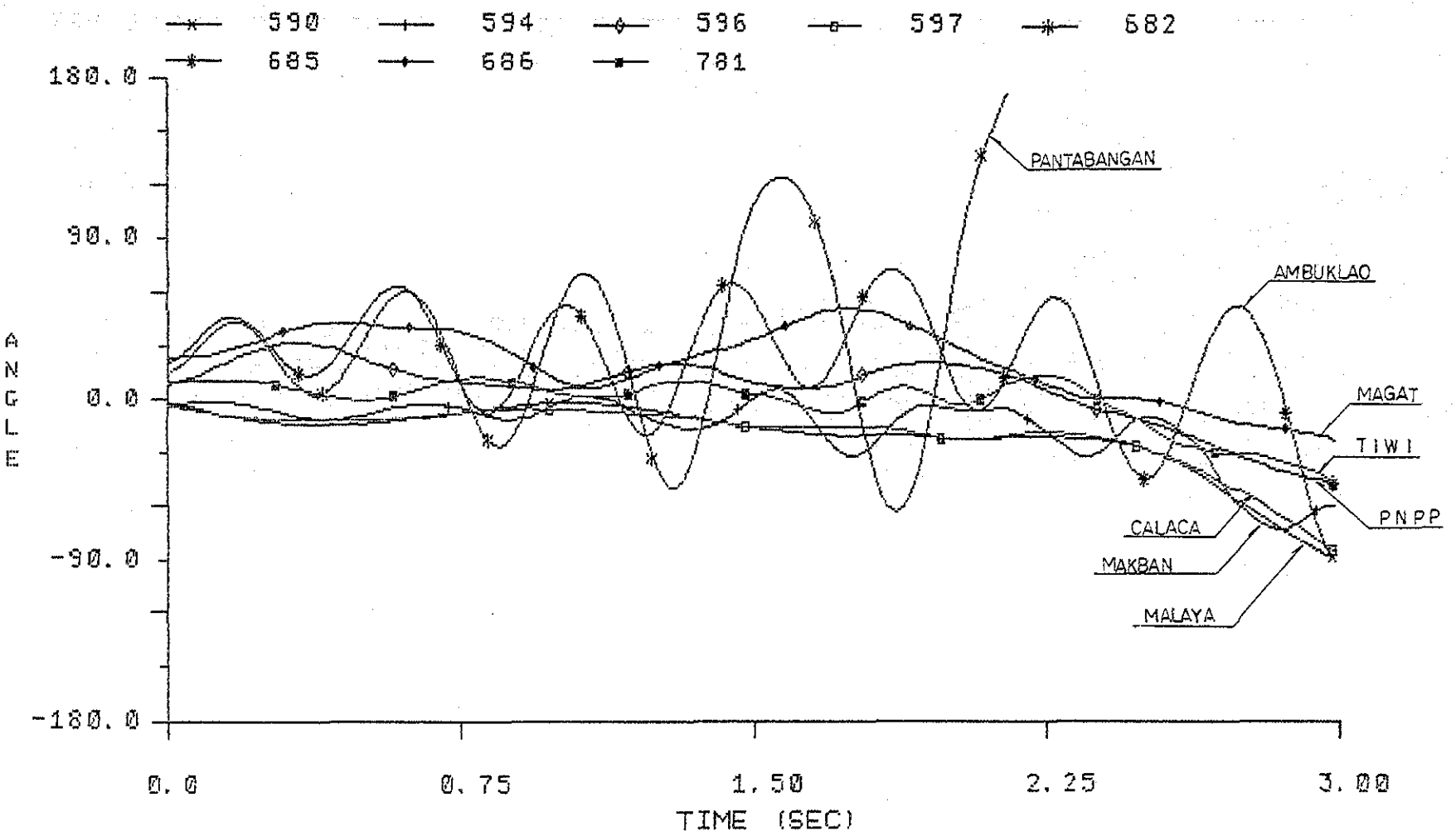


FIG. 36 '90 WET KALAYAAN SANJOSE FAULT LOOP.

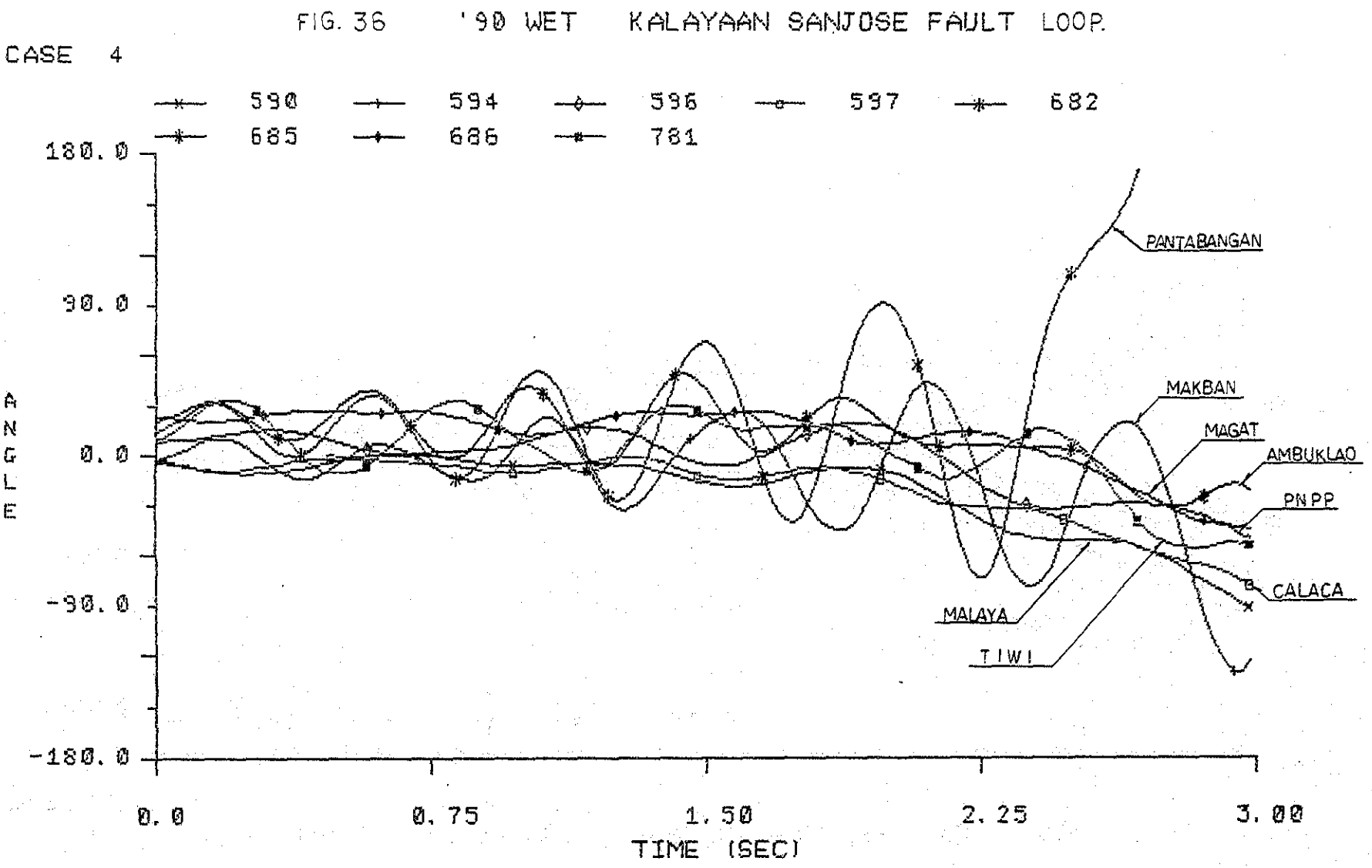


FIG. 37 '90 WET DOLORES MALAYA FAULT LOOP.

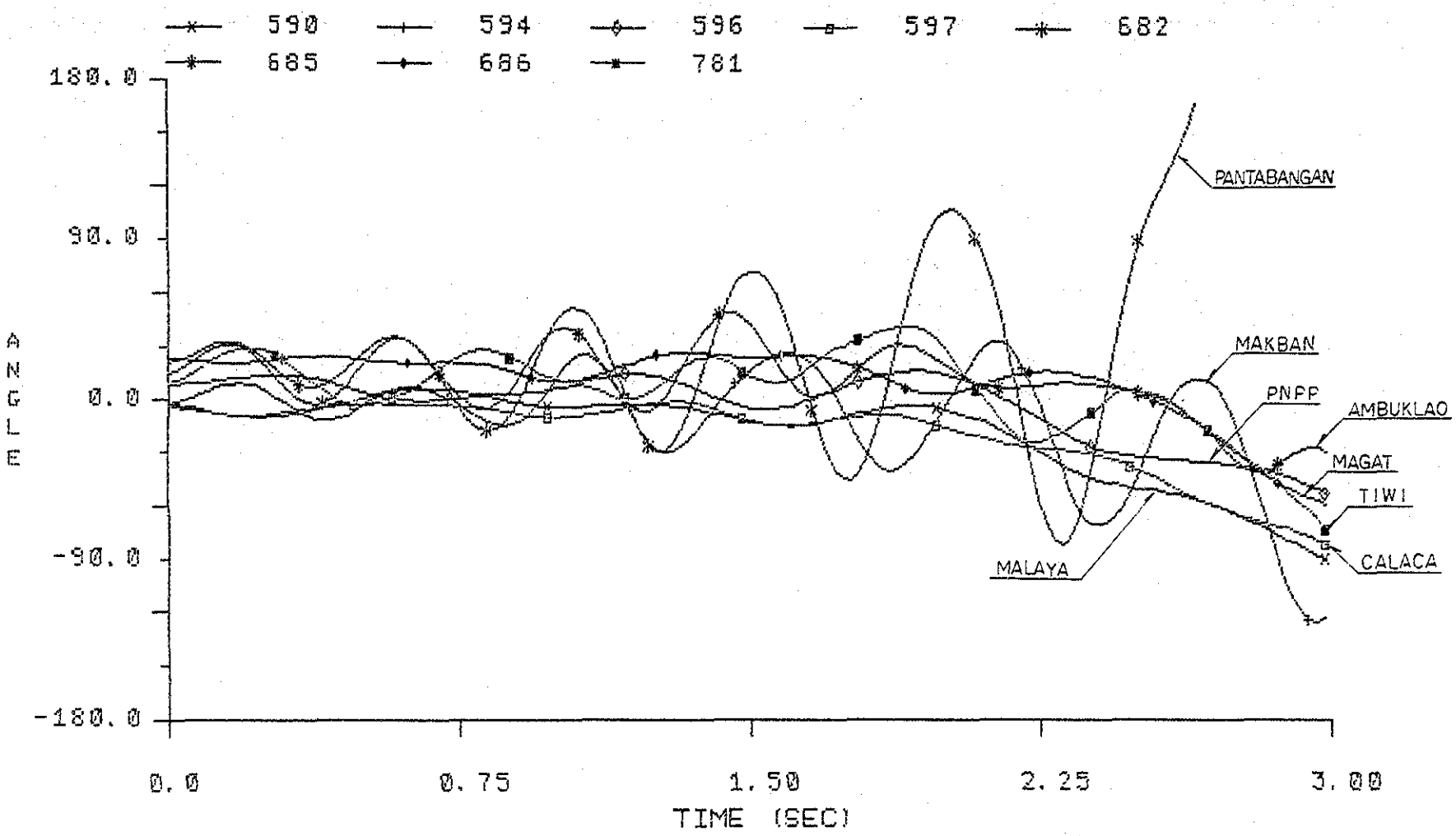
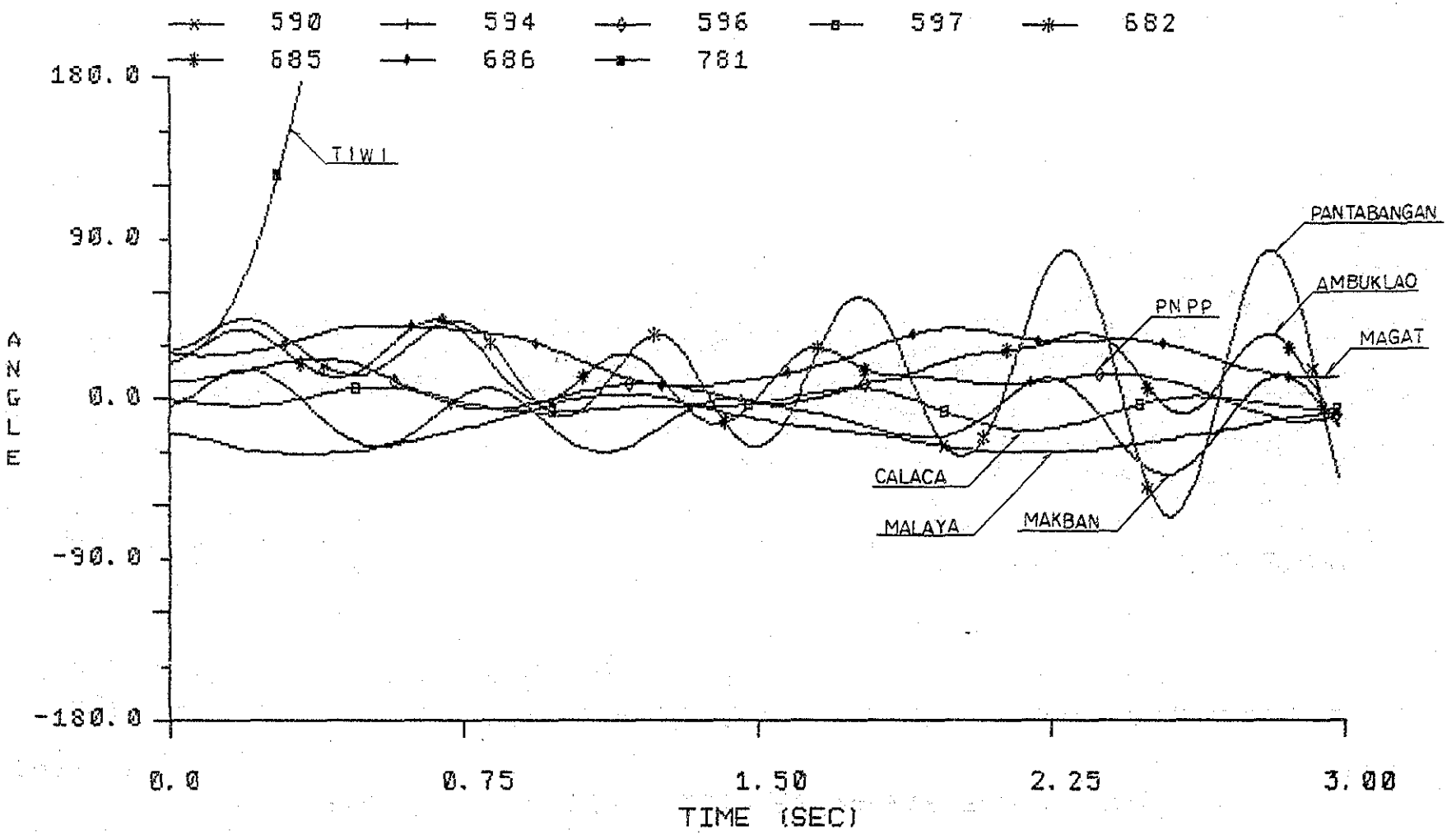


FIG. 38 '85 WET KALAYAAN-GUMACA 3LG OPEN



Appendix 3

NAPOCORの技術教育内容

Technical Development Programs - Engineering Training - (1)

Course	Course Content	Suggested Participants
1. Junior Engineers Program	Lecture/each-one-teach-one, On-the-Job Training, Buzz Discussion, Rotational Assignment (1 Year) . Project Development . Engineering Design . Construction Management . Operations and Maintenance of Power Plant	Newly Hired Junior Engineers
2. Advanced Power Systems Analysis	Lecture/Lecturette, Individual/Large Group Exercises, Problem Solving, Illustrations . Module A (110 hours) - Mathematical Tools, Loadflow Studies, Fault Studies, Transient Stability Studies . Module B (120 hours) - Reliability of Generation, Economic Operation of Power Plants, Transmission Planning, Generation Planning	Electrical Engineers who are involved in System Planning, Operation Planning and Mechanical Engineers Designing of Power System

Technical Development Programs - Engineering Training - (2)

Course	Course Content	Suggested Participants
3. Basic Planning and Scheduling with CPM	Lecture, Individual/Group Exercises, Open-Forum (2 Days) . Introduction to CPM . Network Rules . Network Details . Activity Duration . Early Start Dates . Late Start Dates . Event Slack Time . Critical Path . Application of CPM . Time Schedule Network	Project Managers Principal Engineers Specialists Senior Engineers who are involved in Planning, Scheduling and Controlling Activities of Programs and/or Project
4. Project and Construction Management Course	Lecture, Group Discussion, Individual/ Group Exercises, Case Analysis, Simulation (1) Module I - Project Management Organization, Life Cycle & Its Human Side (1 week) (2) Module II - Project Construction Management (6 Days) (3) Module III - Project Estimating and Control (4) Module IV - Contracts and Specification, Material Management and Close out Procedures (1 week)	(1) Project Managers, Project Engineers (2) Engineering Personnel (3) Project Managers, Principal Engineers (4) Project Managers, Project Engineers

Technical Development Programs - Engineering Training - (3)

Course	Course Content	Suggested Participants
5. Abra River Basin Hydroelectric Development Project Training Program	Individual/Group Reporting, Lectures/ Seminars, On-the-Job Training (14 Months) . Hydrology . Hydraulic Engineering . Structural Engineering . Geology and Geotechnics . Geotechnical Engineering . Hydro Planning	Civil Engineers/Geologists
6. Echo-Seminar in Hydro Power Development	Lecture-Discussions, Slide Presentations . Hydro Power Theory - Hydrology, Engineering Geology, Hydraulics, Soil Mechanics, Theory of Structures, Water Turbines and Electrical Equipment . Hydro Power Design and Construction - Overall Project Planning, Collection of Required Data, Feasibility Study, Power Plant Lay-Out and Design, Choice of Electrical and Mechanical Equipment, Transmission Lines, Organization and Management Construction Site, Tender and Evaluation of Contract	Project Development and Design Engineers

Technical Development Programs - Engineering Training - (4)

Course	Course Content	Suggested Participants
7. Short Courses on Power Projects (Mechanical Design)	Lecture, Case Studies, Film Showing (18 Days) . Steam Power Plant . Hydroelectric Power Plant . Internal Combustion Engine power Plant . Fuels and Combustion . Water Treatment for Power Plant . Fire Protection . Power Plant Economics	Mechanical Planning/Design Engineers
8. Seminar-Workshop for the Civil Design Division Staff	Lecture-Discussion, Workshop & Individual Exercises, Computer Applications (1) Module I - Fundamentals of Statics, Strength of Materials and Hydraulics (2) Module II-A - Structural Engineering (3) Module II-B - Geotechnical and Foundation Engineering (4) Module III - Workshop on Specific Problems in: . Embankment Dam . Foundations for Spillways and other Hydraulic Structures . Buried Structures . Machinery Foundations & Systems . Soil/Rock Improvement . Transmission Towers . Structures of Elevated Concentrated Mass	Civil Design Engineers

Technical Development Programs - Engineering Training - (5)

Course	Course Content	Suggested Participants
9. Orientation on Nuclear Power	Lecture, Film Showing, Group Discussion (5 Days) . Basic Principle of Nuclear Power Plant Operation . Nuclear Power Plant Systems . Safety Aspects of Nuclear Plant . Reactor Operation and Maintenance . Nuclear Fuel Cycle and Waste Disposal . Why Go Nuclear?	Any NPC Employee
10. Self-Study Technical Training Series on Nuclear Power Plant Operation	Self-Sutdy, Examination, Group Discussion/Review (4 Months) . Introduction . Licensing & Regulation of Nuclear Power Plant . Fundamentals of Nuclear Energy and Reactor Operation . Nuclear Plant heat Transfer . Reactor & Reactor Coolant Systems Design . Reactor Auxiliary . Steam and Power Conversion Systems . Plant Electrical Systems . Plant Structural Design . Radiation Protection . Radioactive Waste Treatment . Test Program . Nuclear Codes and Standards . Quality Assurance for Design Construction & Operation . Nuclear power Plant materials	21 NPC Site-based Engineers

Technical Development Programs - Engineering Training - (6)

Course	Course Content	Suggested Participants
11. Instrumentation and Control Engineer/Technicians' Course	Lecture, Laboratory Sessions, Group Discussion (1 Month) . Introduction to Basic Nuclear Systems . Process Instrumentation . Rod Control . Reactor Protection . Rod Position Indication . Nuclear Instrumentation	Instrumentation and Control Engineers/Technicians
12. Health Physics Course	Lecture, Laboratory Sessions, Group Discussion (1) Module I - 2 Weeks Radiation, Its Uses, Effect and Control with Respect to PWR Power Plant (2) Module II - 1 Week Laboratory Session on the Practical and Analytical Aspect of Surveys, Water Sampling, Radiation Dose Control, Contamination and Decontamination (3) Module III - 4 Weeks On-the-Job Training at a PWR Type of Plant	Health Physicist Technicians

Technical Development Programs - Operations Training - (1)

Course	Course Content	Suggested Participants
1. Basic Course on Thermal Power Plant	Lecture Portion (1 Month) . Thermal Power Plant Fundamentals & Terminology . Plant Systems, Their Purpose/Function and Equipments . Major Plant Equipment and Its Associated Auxiliaries - Purpose/Function, Principle of Operation, Construction Features, Start up and Shutdown Procedure, Tending and Routine Maintenance . Water Conditioning . Basic Instrumentation & Control . Lubrication . System/Equipment Troubles and Its Remedial Measures . Safety Rules & Practices On-the-Job Training (4 Months) . Auxiliary Equipment Operation . Boiler Operation . Turbo-Generator Operation	Newly Hired Plant Operator

Technical Development Programs - Operations Training - (2)

Course	Course Content	Suggested Participants
2. Hydroelectric Power Plant Operation	Lecture-Discussion, Brainstorming, Movie Presentation-Discussion, Plant Tour/ Inspection, Simulation, Demonstration, On-the-Job Training . Dam and Hydraulic Structure . Hydroplant Equipment . Systems - Accessories, Components . Operating Procedures - Stream Flow Regulation, Cleaning of Intake, Watering and Dewatering the Tunnel . Tending the Hydroplant Equipment & Hydraulic Structures in accordance with Established Procedures - Hydraulic Structure, Water Trubine, Generator and Excitor . Reacting Quickly and Correctly to Troubles	Newly Hired Hydroelectric Plant Operating Personnel
3. On-Shift Refresher Course on Thermal Power Plant Operation	Lecture-Discussion, Group Discussion, Case Study, Demonstration, Simulation . Auxiliary Equipment Operation . Boiler Operation . Turbo-Generator Operation . Operational Monitoring . Instrumentation & Control . Emergency Procedures	Regular Plant Operators

Technical Development Programs - Operations Training - (3)

Course	Course Content	Suggested Participants
4. Geothermal Power Plant Operation & Maintenance Course	Lecture-Discussion, Buzz Group, Movie Presentation On-the-Job Training, Demonstration, Simulation (1.5 Month) . Operation - Geothermal Steam Generation, Major Components, Auxiliaries Systems, Operating Procedures, Tending, Logging & Recording, Emergency . Maintenance - Importance/Kinds of Maintenance, Maintenance Scheduling, Machine Shop Practice, Use of Precision & Hand Tools, Reading/Understanding Blueprints, Rigging, Maintenance Procedures, Lubrication, Safety Rules & Practices	Plant Operations and Maintenance Personnel

Technical Development Programs - Operations Training - (4)

Course	Course Content	Suggested Participants
5. Diesel Power Plant Operation & Maintenance Course	Lecture-Discussion, On-the-Job Training, Case Study, Demonstration, Simulation (2 Weeks) . Operation - Engine Proper & Accessories Parts and Functions, Cooling Water System, Compressed Air System, Lubricating Oil System, Air Intake and Exhaust System, Power Switchboard Operation, Electrical System, Relay Protection, Starting & Shutting Down Procedures, Logging and Reporting, Emergency Operation, Fuel/Oil and Water Analysis & Interpretation, Safety Rules & Procedures . Maintenance - Importance/Kinds of Maintenance, Scheduling, Machine Shop Practice, Use of Precision Tools, Reading & Understanding Blueprints, Rigging, Maintenance Procedures, Lubrication, Safety Rules & Practices	Diesel Power Plant Operation and maintenance Personnel

Technical Development Programs - Operations Training - (5)

Course	Course Content	Suggested Participants
6. Instrumentation & Control Training Course	Lecture-Discussion, Guided Plant Tour, Demonstration, Simulation (1 Month) . Basic Principle and Calibration Procedures of Measuring Instruments . Basic Principle of Pneumatic/ Electronic Controls . Trouble Shooting, Repair and Calibration Procedures of Pneumatic/ Electronic Measuring Instruments and Controls . Servicing and Fine Tuning Procedures for Proportional, Integral and Derivative Action Controls (Pneumatic/Electronic) . The Plant Interlocking System (BII) . Basic Principle of a Close Loop Control System	Instrument Engineers/ Technicians
7. Substation Operation and Maintenance	Lecture-Discussion, Individual-Group Exercises, Case Study, Practicum (1/2 Month) . Substation Working Diagram . Circuits & Connection of Different Substation Equipment & Instruments . Substation Trouble Shooting . Analysis of power Meters Operation . VHF Radios . Metering & Protective Relay Control Circuits . Standard Switching Procedures . PERT/CPM	Substation Operators and Control Engineers

Technical Development Programs - Operations Training - (6)

Course	Course Content	Suggested Participants
8. Electrical Maintenance Course	Lecture-Discussion, On-the-Job Training . Importance/Kinds of Maintenance . Maintenance Scheduling . Electric Circuits . Principle of Operation and Construction of Electrical Equipment and Instruments . Interpretation of Electrical Prints and Reading Wiring Diagram . Electrical Testing and Measurements . Overhauling, Inspection, Repair and Maintenance Method and Procedures of Different Electrical Equipment . Relay Protection . Electrical Trouble Shooting . Miscellaneous - Balancing and Vibration Analysis, Coupling Alignment, Bearings . Electrical Safety	Electrical Maintenance Personnel

Technical Development Programs - Operations Training - (7)

Course	Course Content	Suggested Participants
9. Mechanical Maintenance Course	Lecture-Discussion, Demonstration-Simulation, Critical Incident, Workshop, On-the-Job Training (2 Months) . Machine Shop Equipment & Tools . Maintenance Processes and Materials . Reading/Understanding Blueprints . Repair/Preventive Maintenance of Bearings . Common Equipment Troubles . Preventive Maintenance of Specific Equipment and Accessories . Inspection/Repair/Maintenance of Boiler/Turbine/Auxiliary Equipment and Accessories . Industrial Safety	Mechanical Maintenance Personnel

Technical Development Programs - Operations Training - (8)

Course	Course Content	Suggested Participants
10. Basic Lineman's Course	Lecture-Discussion, Practicum, Individual-Group Work (1 Month) . Theoretical Input - Lineman Role/Responsibility in the NPC Organization, First Aid Treatment, Identification/Uses/ Handling of Tools/Equipment, Guys/ Installation/Tensioning Clearance, Pole Loading and Hauling, Conductors, Line Maintenance, Construction of Dummy Line . Practicum - Individual/Group Exercise, Preparation of Line Materials, Working on Actual Transformer, Making Splices/Joints/Sleeves, Construction/Dismantling Types A-E Lines, Erecting Poles, Climbing/ Descending Poles, Conductor Riding, Replacement of Crossarms and Insulators	Lineman A Members of Line Gang

Technical Development Programs - Operations Training - (9)

Course	Course Content	Suggested Participants
11. Hotline Maintenance Course	. Lecture Portion - Live Line Toll Identification and Uses, Live Line Job Planning and Safety, Routine Live Line Work Proceeders, Live Line Maintenance, Pole Replacement, Live Line Maintenance of Insulators . Practicum/Field Work Portion - Construction of Dummy Lines, Replacement of Pin-Type Insulator, Replacement of Suspension-Type Insulator, Maintenance of 69 kV Lines, Maintenance of 230 kV Lines (1 Month)	First Priority - Linemen B and Foremen Second Priority - Linemen A (Requirement: Completion of Basic Lineman's Course)
12. Chemical Technician's Course	Lecture-Discussion, Workshop, Laboratory (1 Month) . Chemistry of Water . The Chemical Examination of Water . Primary Water Treatment . Trouble Shooting and Solutions . Secondary Water Treatment . Fuel Oil Analysis and Additive Application - Physical & Chemical Properties of Oil, Fuel Oil Tests in Thermal Plant Laboratory, Instruments used in Oil Analysis, Fuel Oil Treatment by Additive	Chemical Operations Personnel

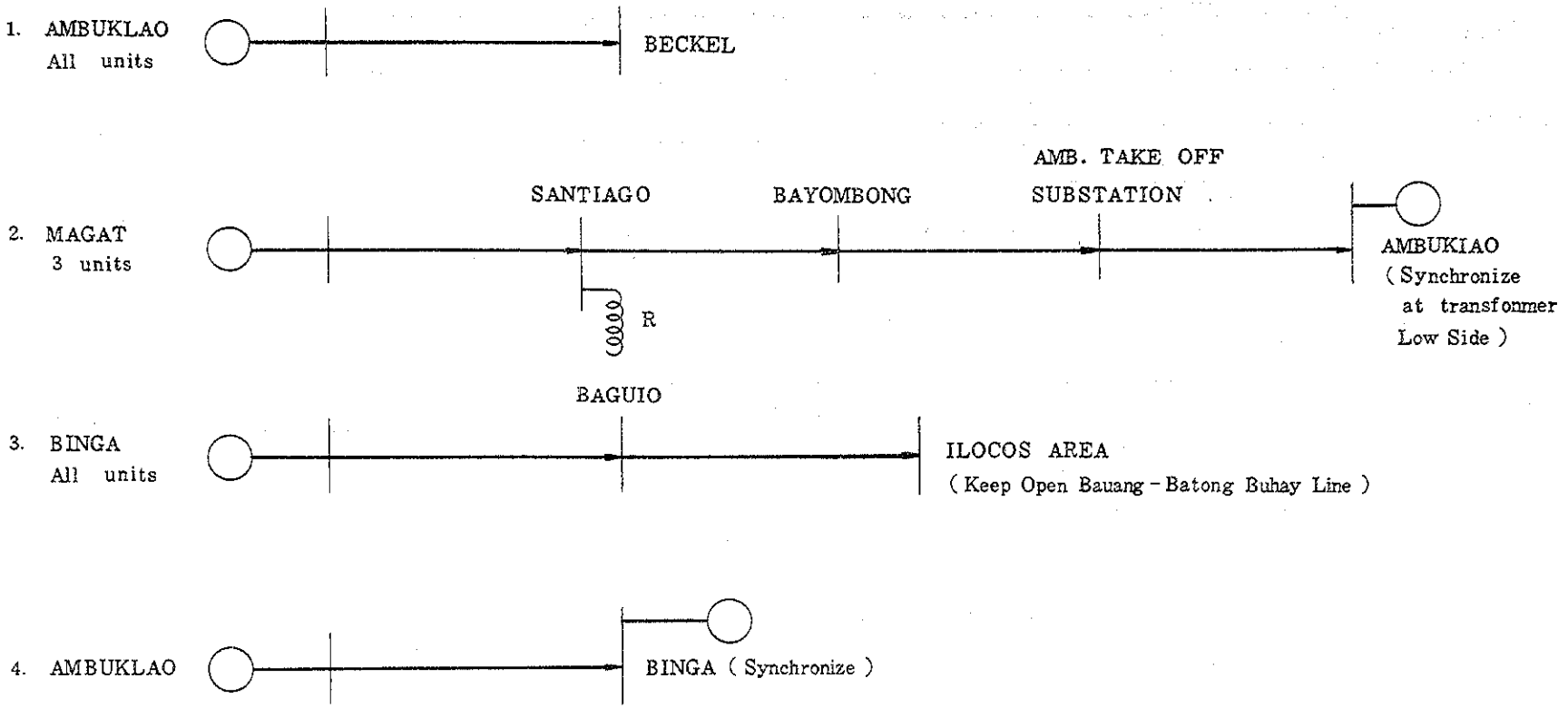
Technical Development Programs - Operations Training - (10)

Course	Course Content	Suggested Participants
13. Corrosion and Pollution Course	Lecture-Discussion, Case Study, Workshops, Experimentation, Demonstration (1 Month) . Corrosion - Introduction to Corrosion, Fundamental Process of Corrosion, General Types of Corrosion, Corrosion Control Methods . Pollution - General and Working Environment, Pollution Appraisal, Types of Pollutants, Methods of Air Pollution Control, Waste Disposal, Methods of Noise Pollution Control, Water Purification and Treatment	Design and Operation Engineers
14. Basic Welding Course	Lecture-Discussion, Practicum, Workshop, Demonstration (1 Month) . Overview of the Welding Process . Oxy Acetylene Welding . Direct Current Arc Welding . AC Arc Welding . Inert Gas Arc Welding . Soldering . Brazing, Barbe Welding . Metal Surfacing . Inspection and Testing Welds . Metal Properties, Identification . Heat Treatment of Metals	New Welders

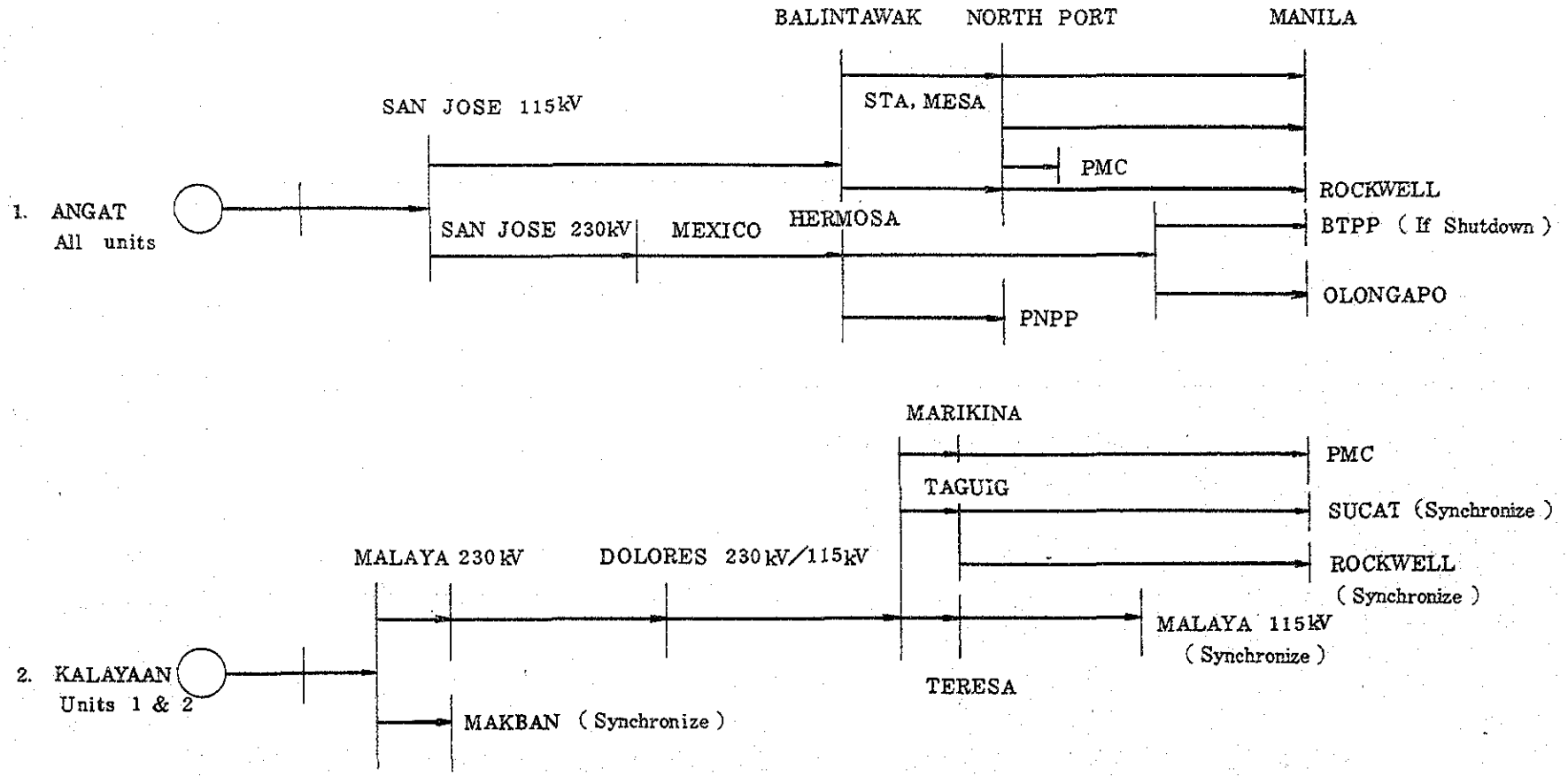
Appendix 4

NAPOCOR及びMERALCOの系統操作法

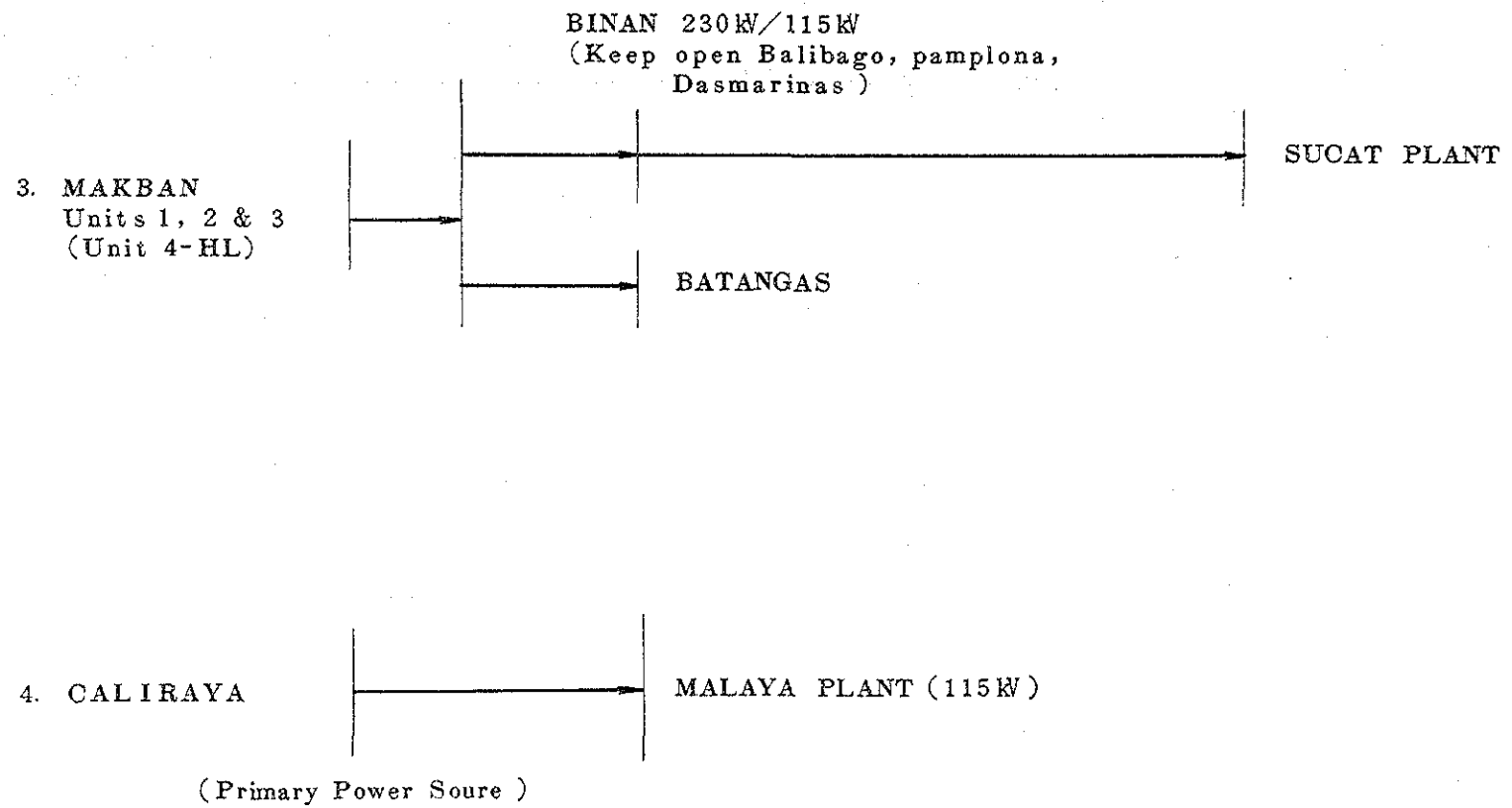
BLACKOUT OPERATION FLOW DIAGRAM OF NORTHERN LUZON GRID



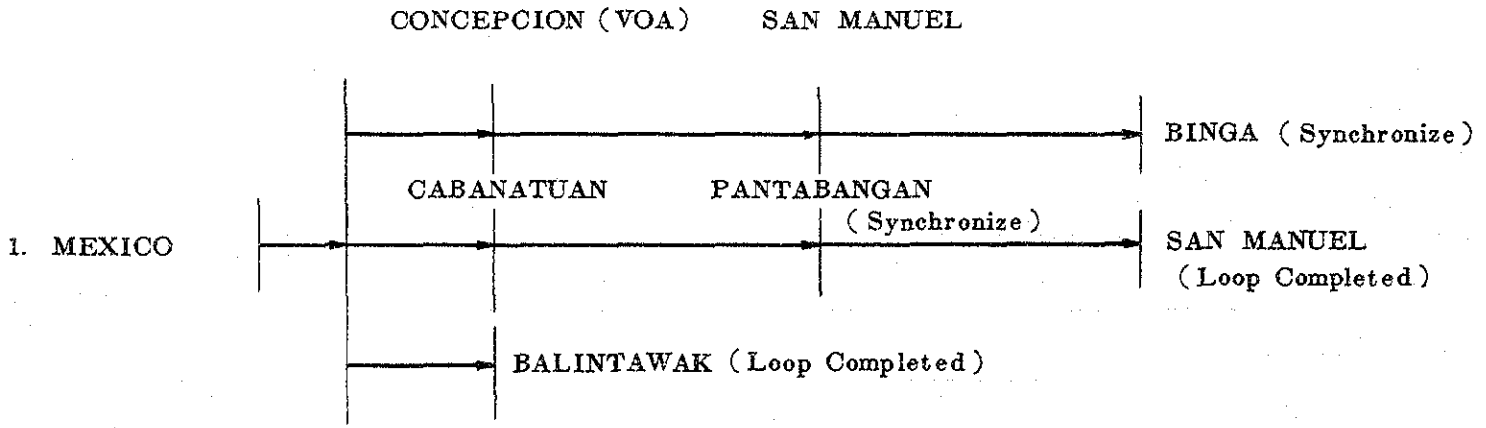
BLACKOUT OPERATION FLOW DIAGRAM OF CENTRAL AND SOUTHERN LUZON GRID

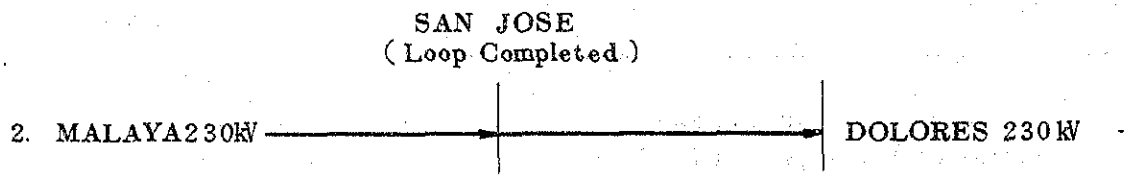


BLACKOUT OPERATION FLOW DIAGRAM OF CENTRAL AND SOUTHERN LUZON GRID



BLACKOUT OPERATION FLOW DIAGRAM -NORMALIZATION OF THE GRID-





3. SUCAT CONNECTS WITH MERALCO SYSTEM { MALIBAY, ROCKWELL, TAGUIG }

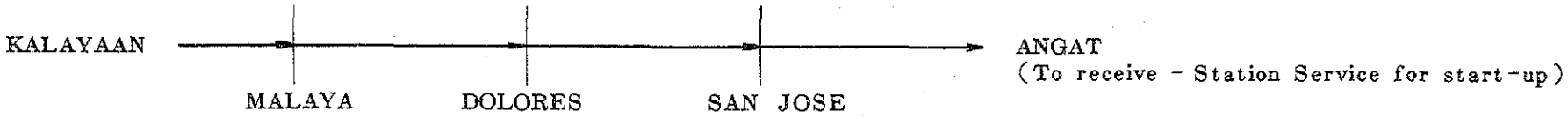
4. START LOADING

5. ALL 2ND LINES OF DOUBLE CIRCUIT LINES ENERGIZED

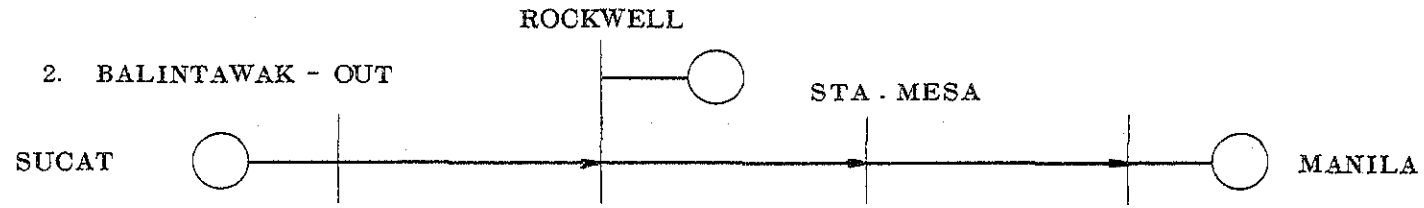
BLACKOUT OPERATION FLOW DIAGRAM - CONTINGENCY PLANS -

A. ALTERNATIVE GENERATION SOURCES

1. ANGAT - OUT



2. BALINTAWAK - OUT



B. WHEN SYSTEM VOLTAGE IS HIGH (greater than 10% of rated)

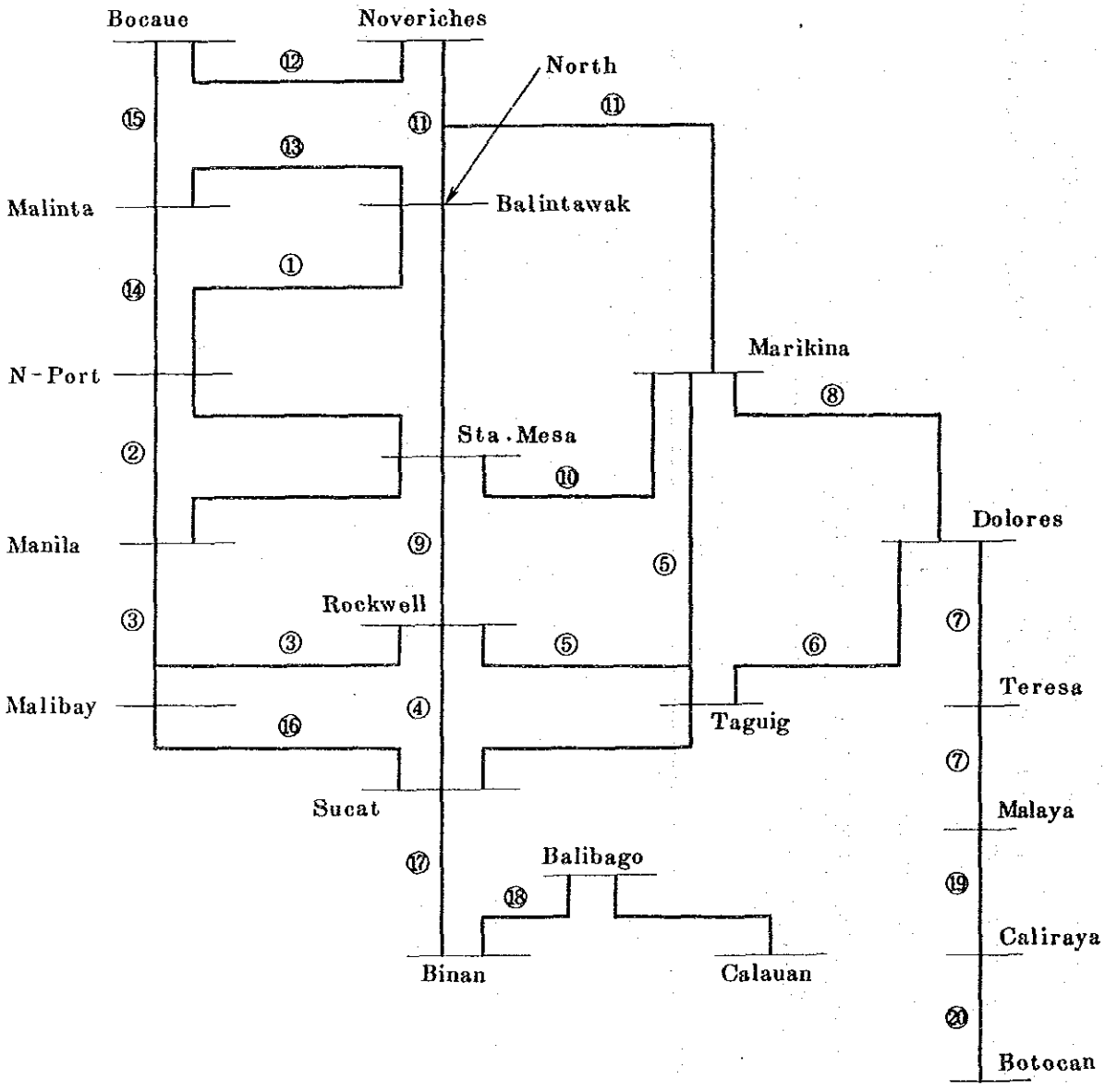
1. Open Bauang - Batong Buhay line
2. Open Ambuklao - Santiago lines, both ends

NOTE : Overvoltage relays at Ambuklao & Santiago set 265kV, 3 secs.

BLACKOUT OPERATION FLOW DIAGAM OF MERALCO GRID

Case I — A All generating stations out.

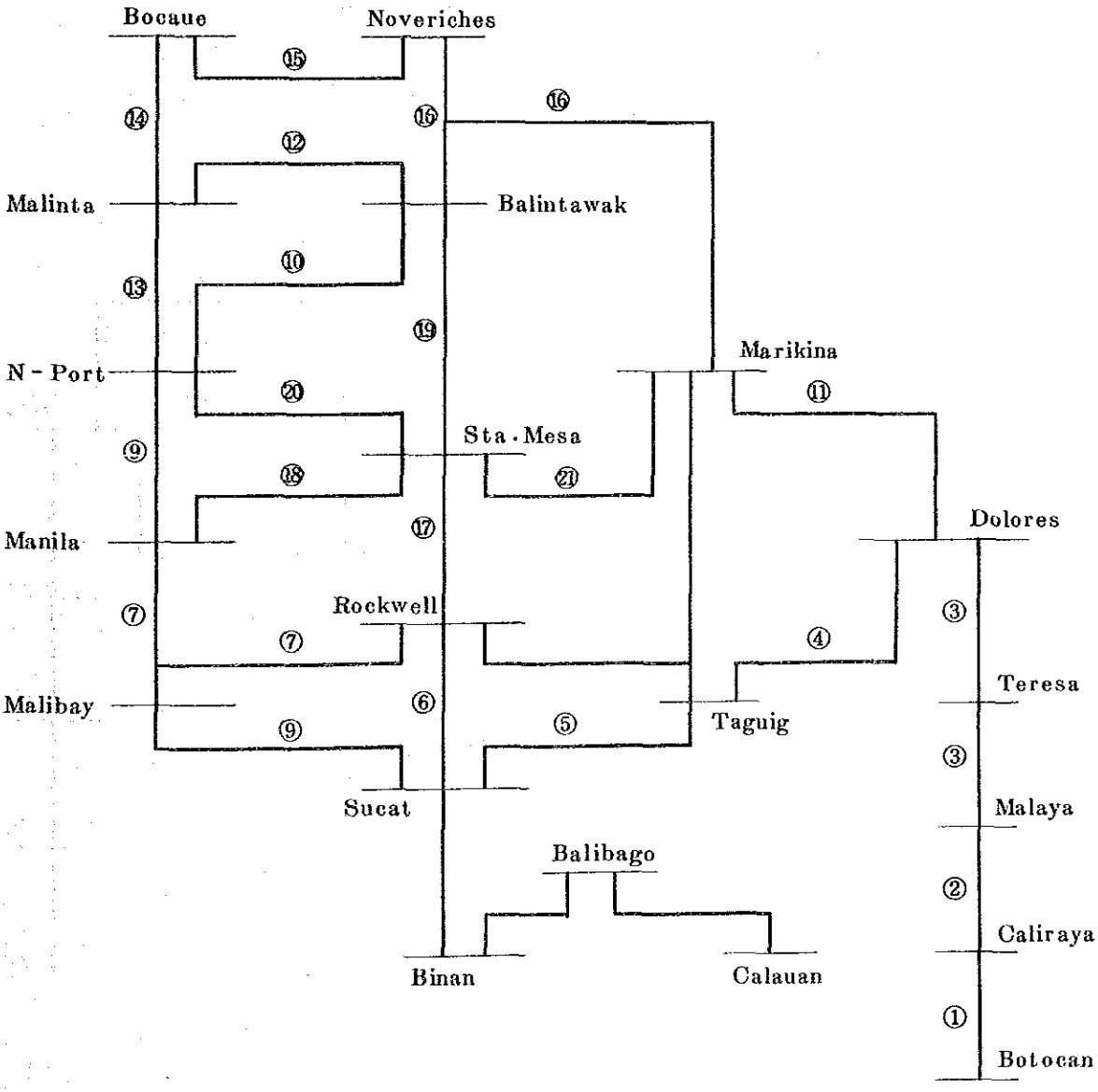
Start - up power available from North Hydro.



BLACKOUT OPERATION FLOW DIAGRAM OF MERALCO GRID

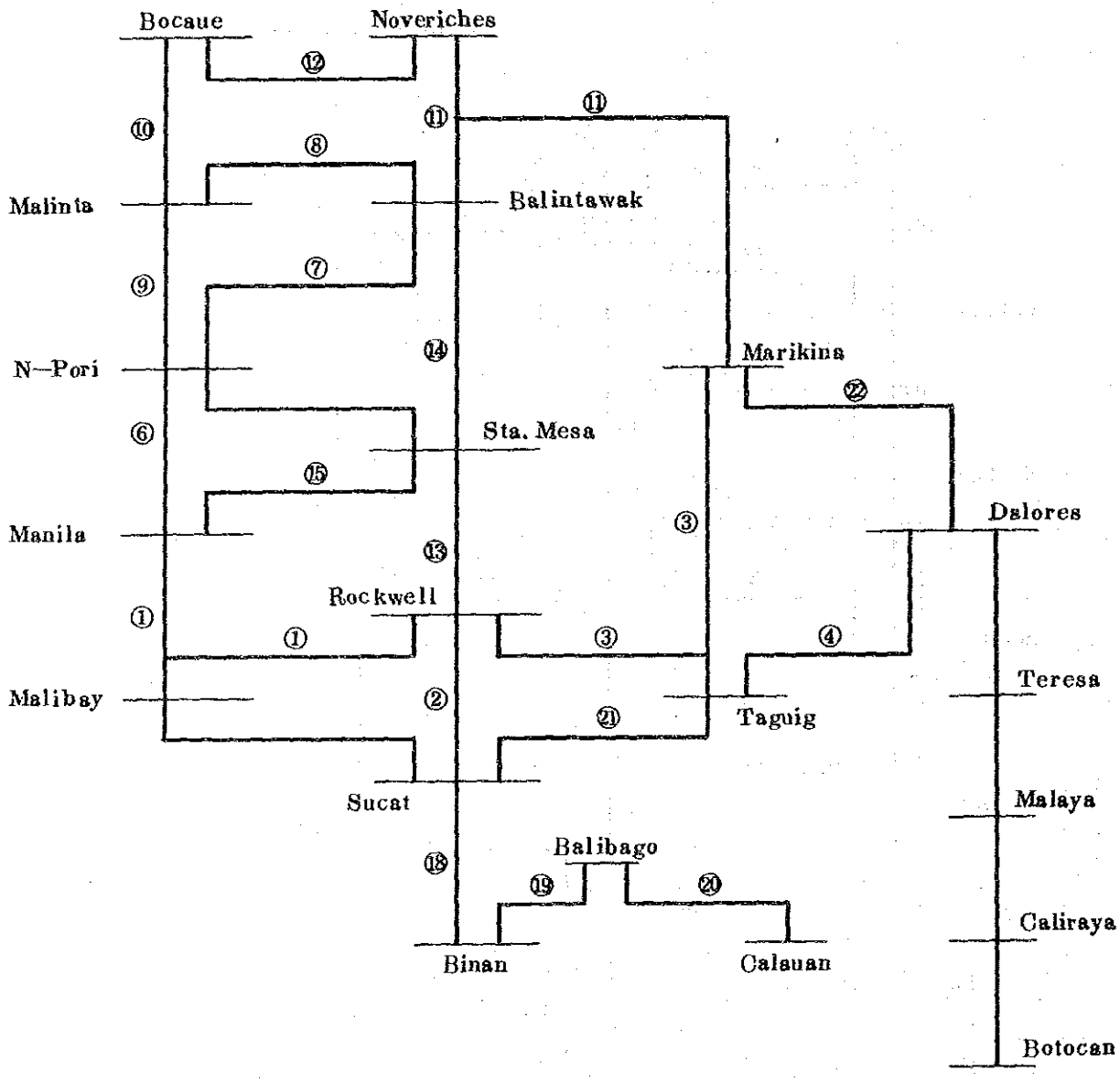
Case Ⅰ－B　All generating stations out.

Start-up power available from South Hydro.
(Caliraya and Botocan)



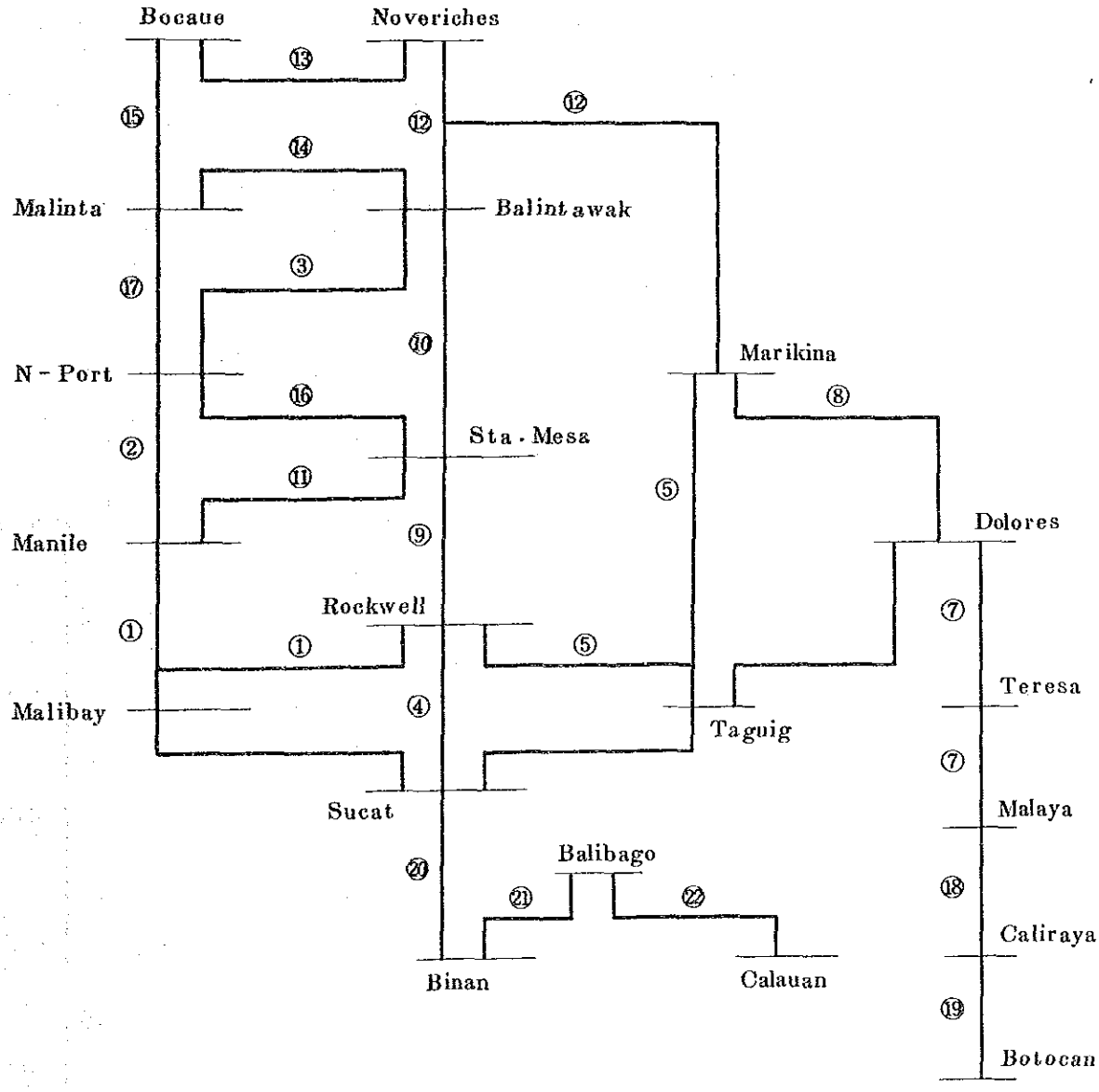
BLACKOUT OPERATION FLOW DIAGRAM OF MERALCO GRID

Case Ⅱ　All generating stations are out except Rockwell Station



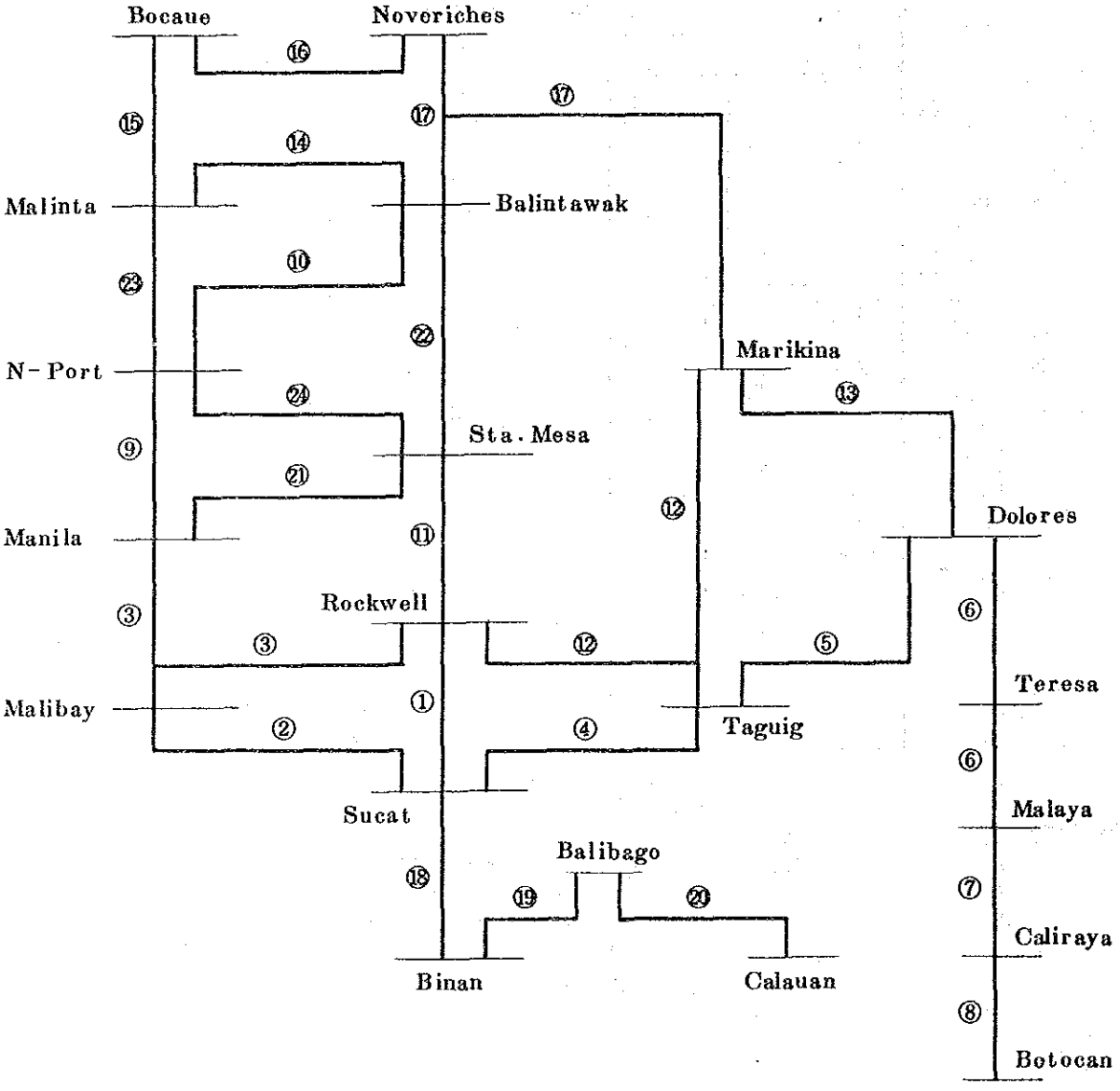
BLACKOUT OPERATION FLOW DIAGRAM OF MERALCO GRID

Case Ⅲ　　All generating stations are out except Manila Station



BLACKOUT OPERATION FLOW DIAGRAM OF MERALCO GRID

Case Ⅳ　　All generating stations are except Sucat Station



BLACKOUT OPERATION FLOW DIAGRAM OF MERALCO GRID

Case V All generating stations are out except Malaya Station