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SOCIO-ENGINEERING PROBLEMS NO. 84

"COMMUNICATION THEORY in the Cause of MAN; Part IX: Cybernetics and General Systems Theory."

12. Feedback Loops
    - 34) Feedback Loops
    - 35) Negative Feedback Amplifier
    - 36) Electro-Mechanical Feedback Loop
    - 37) Transient Response
    - 38) TOTE Unit
13. Capitalist and Socialist Systems
    - 39) Capital Production Analog
    - 40) Production Analog
    - 41) Simulation of Colonial Socio-Economic System
14. Social Planetaria
    - 42) Lasswell's Social Planetaria
15. Computing Power as a Tool for Democracy
    - 43) Engelbart "Computers and the Challenges of Man"
    - 44) Computing Power and Democracy
16. Computer-Data Communication Systems & Economic Systems
    - 45) Problems?

5-17-62

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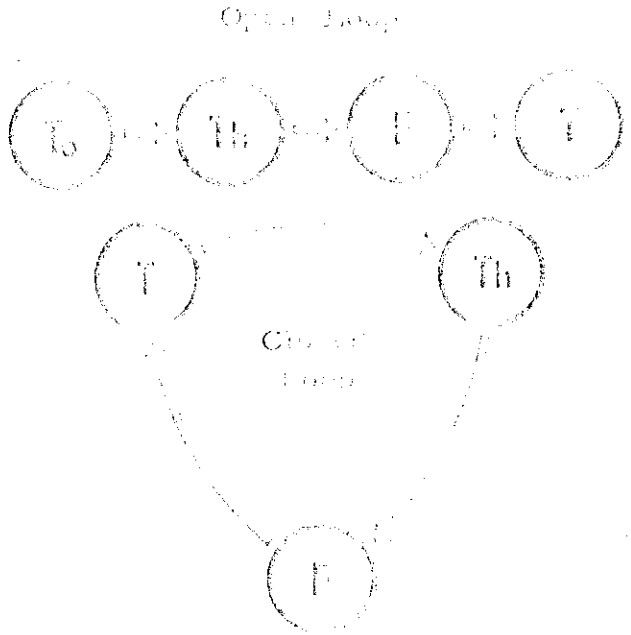
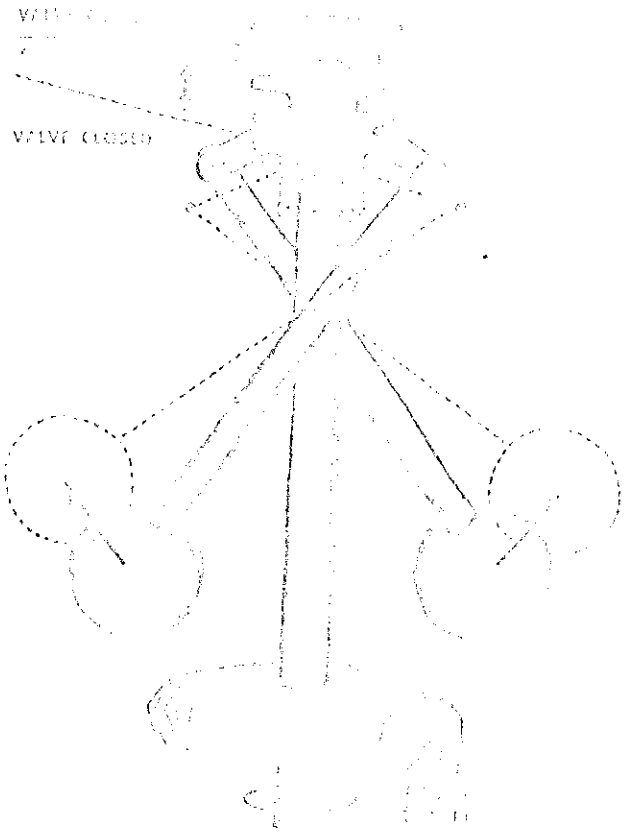




THERMAL

MECHANICAL

FEEDBACK LOOPS

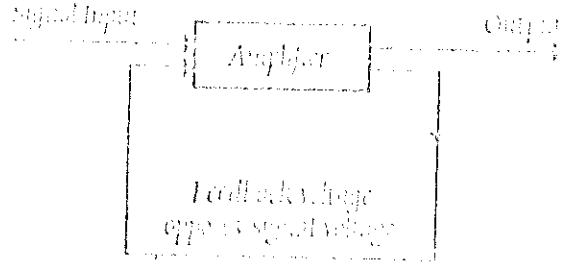
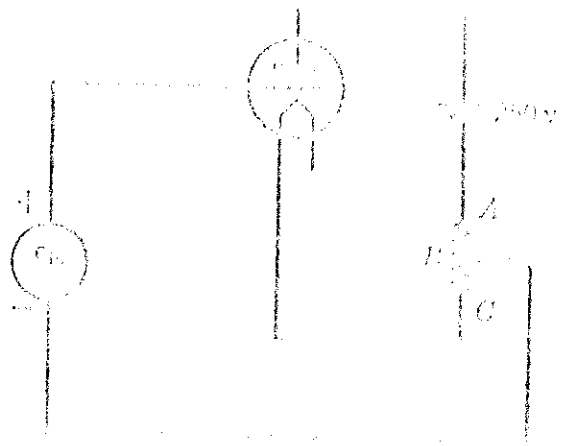


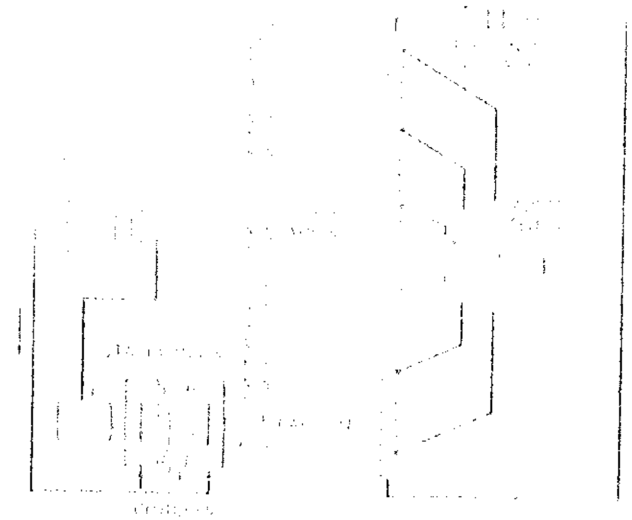
Fig. 3 — Schematic Representation of the Negative Feedback Amplifier

NEGATIVE FEEDBACK AMPLIFIER

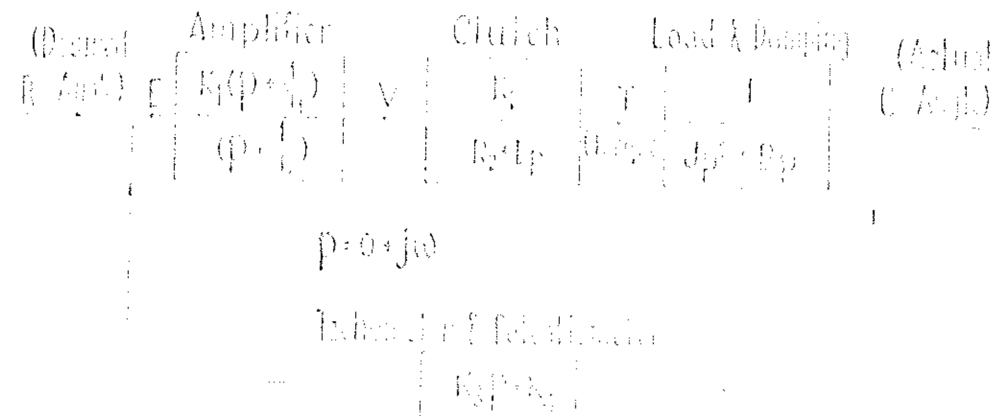


A portion of the output voltage is connected in series with the input to provide negative feedback.

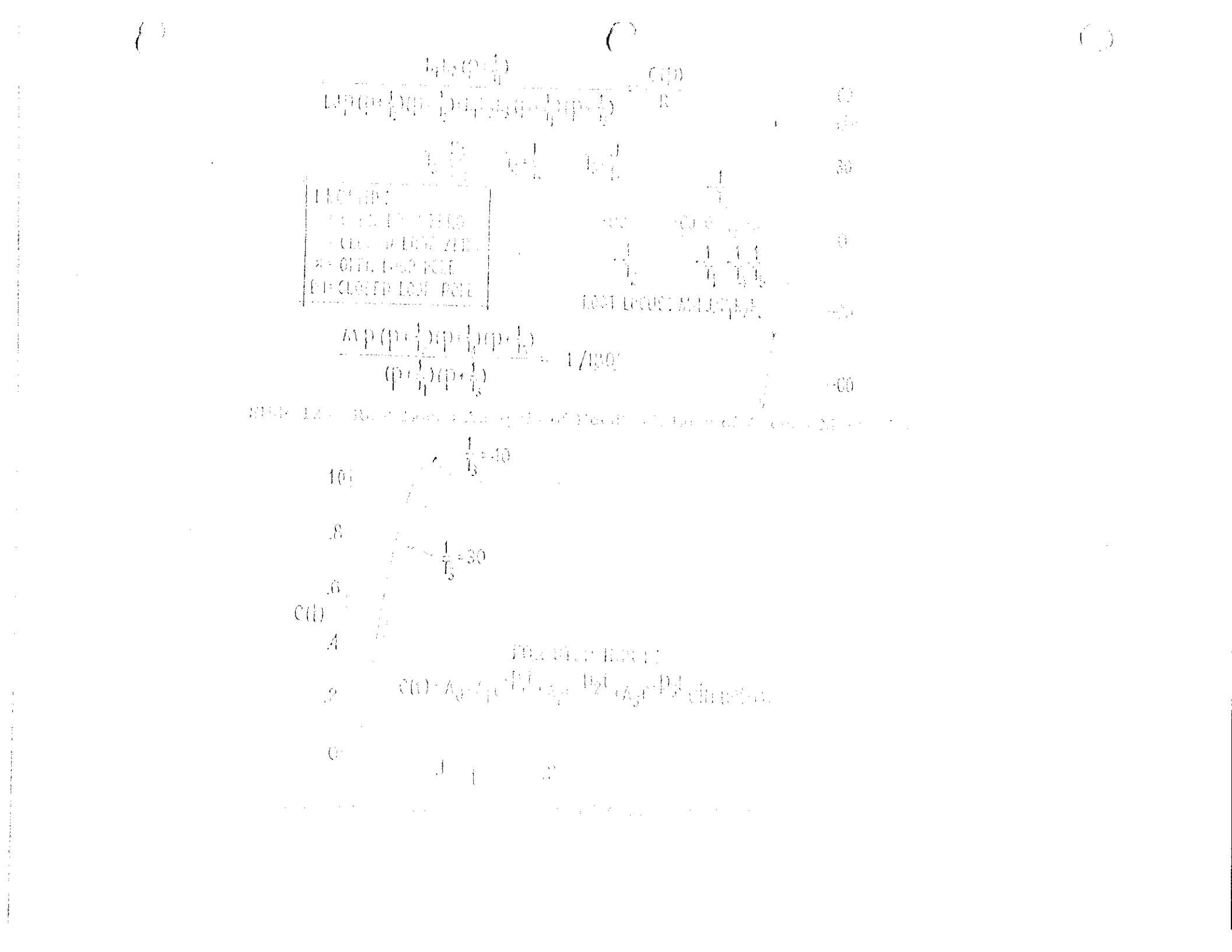
CATHODE FOLLOWER



Functional schematic for either horizontal or vertical positioning by access mechanism.

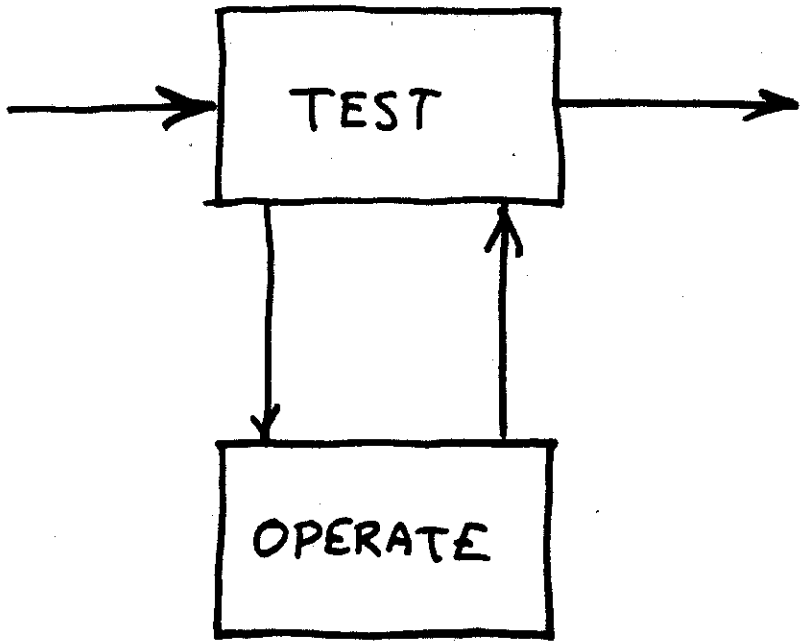


ELECTRO - MECHANICAL FEEDBACK LOOP



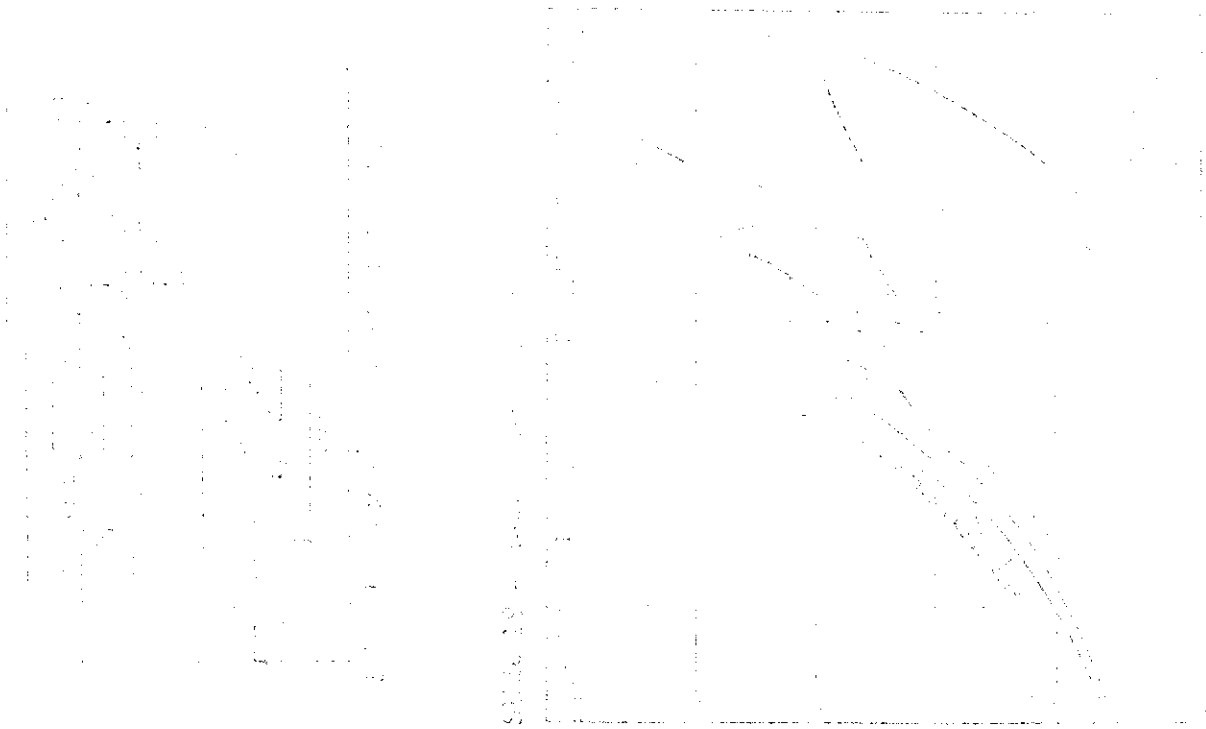
TOTE* UNIT

(Test - Operate - Test - Exit)

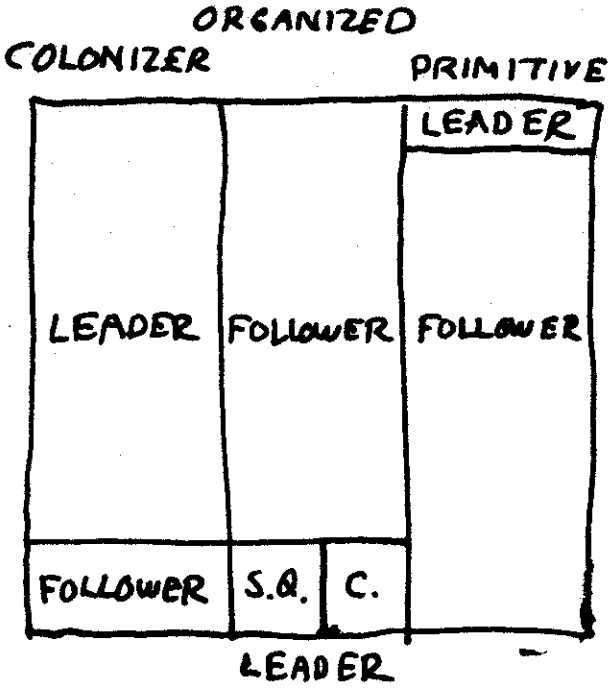


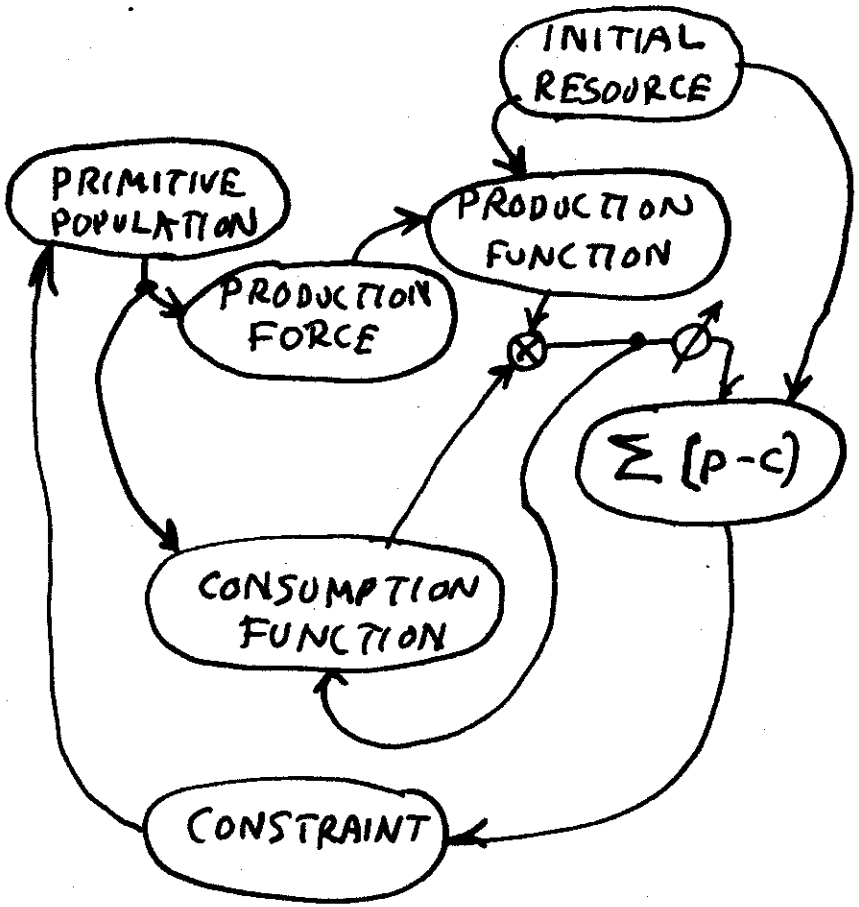
(1) energy flow
(2) information flow
(3) control

* MILLER, GALANTER, & PRIBRAM (1960)



COMPUTER SIMULATION OF A COLONIAL SOCIO-ECONOMIC SYSTEM *

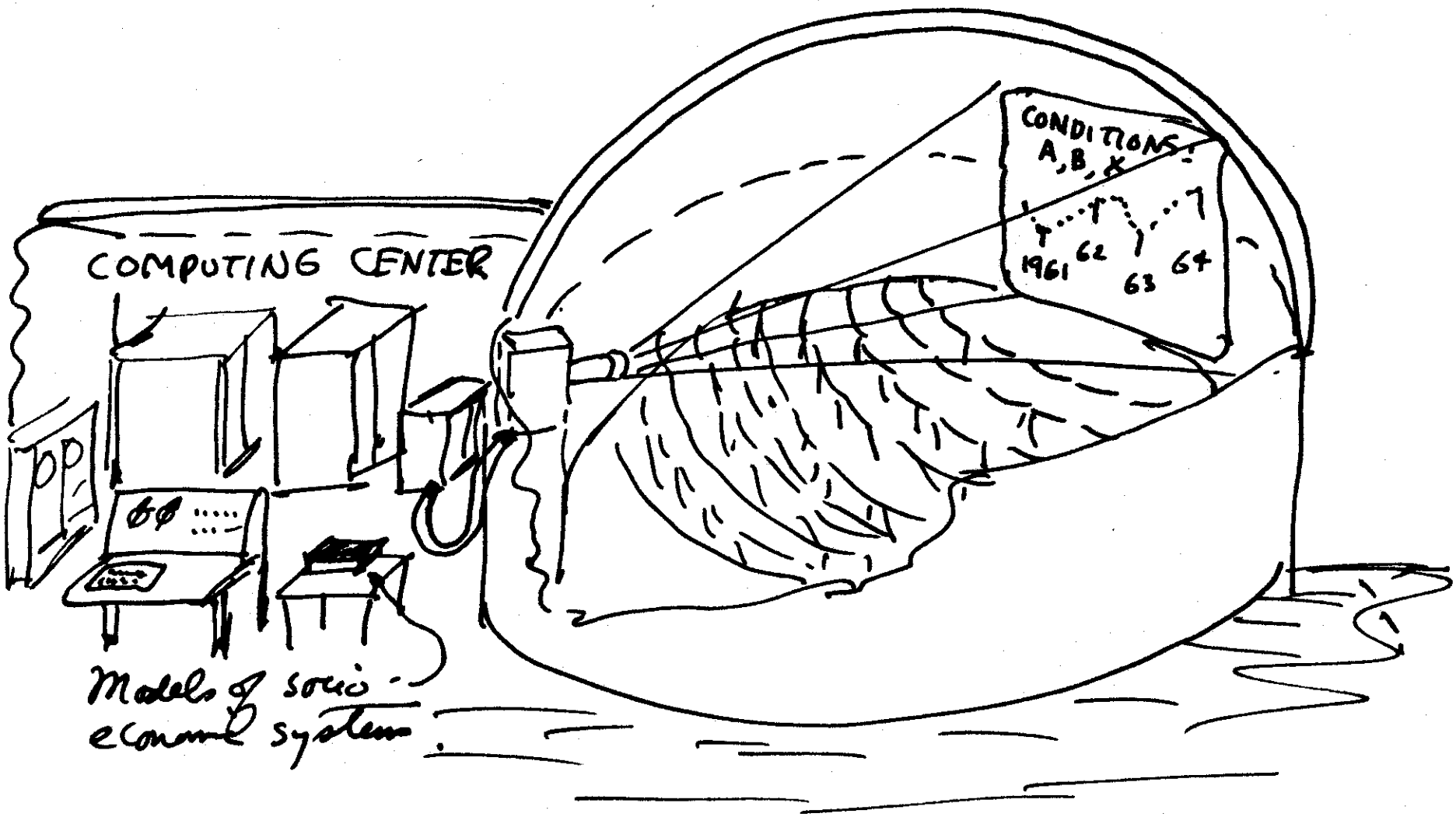




* W. D. HOWARD, WJCC (1961) #15.1

SOCIAL PLANETARIA (PROPOSED)

(H. D. Lasswell)



SLIDE 42

COMPUTERS AND THE CHALLENGES OF MAN

We see man as a creature of certain attributes and abilities. Facing him is the universe of problems – the host of things to be done, or of things he wishes, the accomplishment or attainment of which he regards as a challenge. His whole history has been characterized by the invention or development of tools which match him to the environment so that he can more efficiently or enjoyably cope with these challenges. Of these tools, the computer is one of the most potent.

Considered this way, with man "here" and his challenges represented as a remoter "there," the question becomes: What needs to be done to get there from here?

Researchers postulate a possible future in which computational power will be available in a wall socket, like electrical power; or where every man who wants one can buy a small computer as he may one day buy his own nuclear generator for power. Perhaps the computer builder of 1961 finds it hard to comprehend the development of individually available computer power. He might concede that we could develop suitable equipment and effective means for intercommunication between human and helper; but can he imagine all the changes this would cause in our everyday environment and ways of doing things? Can he visualize the tremendous upsurge in intellectual mobility and power that we might experience, and its potential good? Such a development might be inevitable; intelligent effort could hasten it and direct it into desirable channels.

Another line of machine history from which I like to extract fortifying considerations is the harnessing of automotive engines for transportation. When these engines first became available, their application to the transportation of goods and people was in the large-machine, formal-schedule class. Ships and railroads provided tremendous service if your problem happened to be amenable to their capabilities and programming. The impact of such machines was great; but I wonder if the people who celebrated them as the acme of human progress saw the huge potential of automotive machines designed to help individuals? Our cars, trucks, fork-lifts, bulldozers, have had an impact on society that would have confounded the engine builder of 1861.

Could he have accepted that ordinary people could learn the rules and skills needed to operate a car in heavy traffic, or that ordinary communities would put up the capital for today's road systems, or that children would learn the complex skills of operation as a natural part of their cultural inheritance? Probably not; and our computermakers today are in the same spot.

DOUGLAS C. ENGELBART
Senior research engineer
Stanford Research Institute

SLIDE 43

COMPUTING POWER & DEMOCRACY

Are there conditions relating to the distribution of computing power which support or retard democratic processes?

If so, do these conditions require governmental regulation? Or can computer manufacturers design and market families of computers which make computer power available equitably to all potential customers in a diversified society?

Can a galaxy of computer systems in free enterprise system provide the composite feedback needed to nourish democratic institutions?

Can such a loosely coupled system compete with a tightly integrated socialist system like the U.S.S.R.?

SLIDE 44

COMPUTER-DATA COMMUNICATION SYSTEMS & ECONOMIC SYSTEMS.

What problem started the generation of socialist alternatives to the capitalist system? Was it the lack of stability due to the inadequate feedback loops in the economic system?

Is not the consumer cooperative movement a technique of putting a delayed feedback loop in the system for stability?

Do socialist systems reach unstable conditions when overcontrolled, so that channel capacity of feedback loops are exceeded?

What configurations of computer-data communication systems can stabilize capitalist economies, socialist systems, and cooperative sub-systems?