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### Title

"Preliminary Description of an Automated Trading System"

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### Author

Sandor, Richard L

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PRELIMINARY DESCRIPTION OF  
AN AUTOMATED TRADING SYSTEM

Richard L. Sandor  
California Commodity  
Advisory and Research Project  
University of California, Berkeley

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## Introduction

One of the major purposes of the California Commodity Advisory and Research Project is to examine the feasibility of instituting automated trading on a commodity exchange. The specific purpose of this preliminary writeup is to describe the major elements in such a system. The report contains a description of the programs, specification of the files and a preliminary description of the telecommunication needs of the system.

The trading mechanism will initially be designed to handle six options of a single commodity. There should be sufficient flexibility in the hardware and programming so that nine additional commodities, each with six options, could easily be added. It is important to indicate that this report is simply a preliminary description of a system of automated trading. Subsequent refinements and additions are necessary to make this a complete document.

## Description of the System

The system contains six different programs. There is a pre-trading program which performs various functions related to initializing values such as volume, removing expiring contracts, etc. There are three programs which are performed in the post-trading day. These are related to closing, clearing, and auditing. At this point it is not possible to designate the size of either the pre-trading program or the post-trading programs.

During the course of trading there are two ongoing programs. The purpose of one program is to edit and the function of the other is to

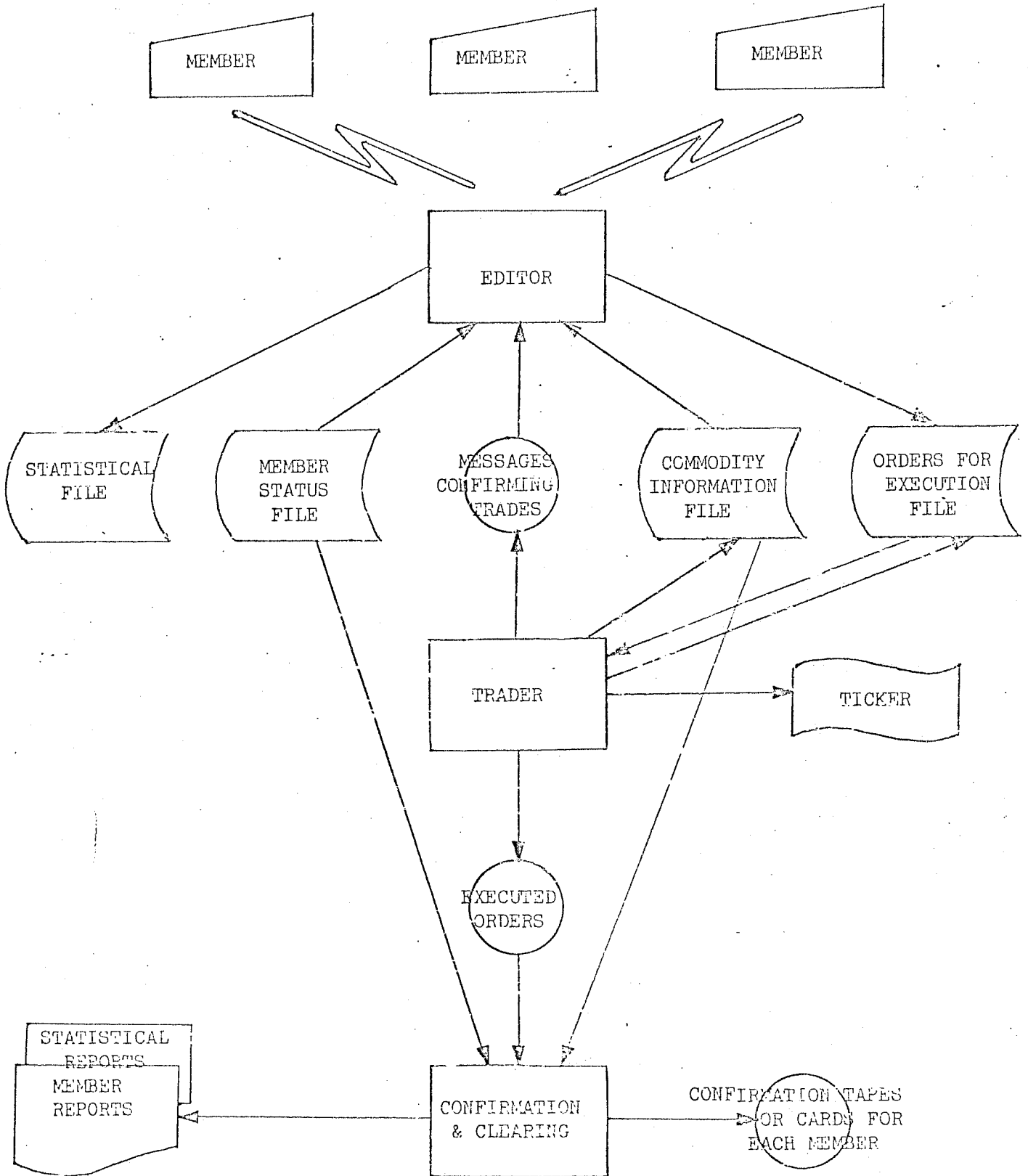
trade. The Editor is responsible for accepting information from the members. There are several types of communications which it performs. The first is related to receiving an order, the second related to obtaining quotations and the third is related to confirming trades. It is not possible at this time to specify the size of this program. The trading program is essentially an algorithm which is designed to match and consummate trades. The size of this program is also presently unknown. The Editor and Trader will simultaneously be operating with the former having priority.

In order for the Editor and Trader programs to operate, it will be necessary for certain files to be created and referenced. The Editor will have to obtain information from the Commodity Information file in order to accept an order. This file will describe various characteristics of the commodity and will have to store approximately 2,000 characters. The file can be kept on tape and during the operation of the pre-trading program be read into core and be stored there for the trading day. At the end of the trading day, it can be updated so that it can be used in the next generation of trading. The Editor will also have to consult with the Member file. This file will be accessed by the Editor in order to verify identification of the members, etc. It will store approximately 50,000 characters. The Editor will create a Statistical file which is sequential. This file will simply record the different types of inquiries and orders which the members are placing. The system also contains an Orders for Execution file. This file is created and referenced by the Editor and is read in sections, by commodity, by the Trader. Any section has to be unavailable for other functions when it

is being used by the Trader. In certain cases, such as a straddle, orders in several sections may be linked to each other. The file can be divided into six distinct units; one for each of the different options of the commodity. It will be necessary for this file to store up to four million characters. After the Trader performs its function, a sequential file confirming the trades will be created. This file will be referenced and used by the Editor to send hard copy confirmations of trades. After trades are consummated, the information relevant to the trade will be put out on a news wire such as Reuters, etc. The system also contains an Executed Order file. This is sequential and will eventually be used by the confirmation and clearing programs. In addition, the post-trading programs of clearing and auditing will have to put out certain reports. The system also contains five other sequential files. These files are not represented on the flowchart on page 4. The pre-trading program is also not represented and some of the post-trading programs are absent. The flowchart is an abridged version of the system and meant only to highlight some of the more essential elements of the system. The flowchart also indicates that there will be confirmation tapes or cards for each member. The purpose of this is to generate revenues for the exchange. It is hoped that the members would be interested in purchasing some statement of the day's activities which is in a form that can be immediately used by their EDP departments. This will avoid the necessity of them having to transfer their hard copy confirmations and orders into tapes or cards.

The reliability of the hardware which will be ordered to make this system operational is essential. It would be disastrous if trading

# SYSTEM FLOWCHART FOR TRADING AND CLEARING



were halted for anything more than a very short period of time. In the case of a minor breakdown, a delay of five or ten minutes in trading would be allowable. For a major breakdown, a delay of approximately one hour is allowable. Therefore, it is essential to have a backup system. The safest way would probably be to duplicate the entire system. This would also probably be the most costly way. It is, therefore, hoped that some arrangement can be made whereby one system is leased on a regular basis and another system is leased just during the trading day. Perhaps the manufacturers could rent the second machine out for batch processing during the rest of the day or could arrange to have some service bureau perform a similar function.

If a power failure results in the initial system becoming inoperable, it is necessary that the files and the information being operated on be preserved. The hardware should have the capability of preventing the information from being destroyed.

#### Telecommunications

It is obvious that an essential element of the system is the Editor-Member communication network. The Editor-Member communication will consist of several types of messages. The Editor-Member communications can consist of a member placing an order, the retransmission of orders for error control, request for quotations and issuing of quotations and messages confirming the trade. The orders will contain approximately forty characters. There are two distinct types of quotations; one containing fifty characters and the other containing twenty-five characters. The confirmation slip will contain forty characters.

The communication from members to Editor must be in hard copy. This could probably be accomplished on some type of teletype with a keyboard specifically designed to meet the special needs of this system. Each member must have at least one telecommunications device and some will probably want more than one. The number of telecommunication devices will probably range from five hundred to two thousand and the system should initially be able to accept a total of twenty thousand orders in a four to five hour period. The busiest member may place twenty percent of the total orders or approximately eight thousand forty-character messages. It is not possible at this point to estimate the total number of requests for quotations. The total number of requests might be as large or larger than the total number of orders. However, this communication would have less of a priority from the point of view of the Member. It seems reasonable to assume that in most instances he will be using a quotation board in his office. The system could conceivably be designed so that the keyboard entering trades and receiving retransmissions for error control and the printer confirming trades would be separated. A backup system must be available for the telecommunication devices. If the leased lines fail, it should be possible by means of an acoustic coupler to tie into the system from any telephone. Similarly, there must be backup devices for the modem as well as the lines from the modem to the teletype and the teletype itself. The backup system must also have the same mechanisms which will allow for retransmission of orders for error control.

It is initially planned to limit the geographical dispersion of the telecommunication devices to the San Francisco Bay Area. It is



hoped that eventually the network could be expanded to include the state of California and eventually the entire United States. It is essential that the exchange create a place where members who do not have their own telecommunication devices can trade. In addition to some sort of personnel protecting the misuse of these machines, it might be necessary or helpful to provide some other safety mechanism such as a key, etc. for the individual devices.

#### Response Time

The present system of trading allows approximately five minutes for the cycle from placing a trade to a confirmation. The system designed here should hopefully have a response time of somewhere between ten and forty seconds.

The automated trading system described in the earlier sections of this report should be designed in order to ensure continuous trading at a minimum cost. The decision of which equipment to be used will be based on the reliability of the equipment and backup system being used as well as the cost of the hardware.