Burroughs

B 1800/B 1700 Series Generalized Message Control System (GEMCOS)

CAPABILITIES MANUAL

PRICED ITEM

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INTRODUCTION

This manual provides an introduction to and an overview of Burroughs B 1800/B 1700 GEneralized Message COntrol System (GEMCOS). The primary purpose of this manual is to provide data processing managers with enough information about GEMCOS to determine its usefulness in their own environment. What GEMCOS can do and why GEMCOS provides these capabilities are described; very little is said regarding how GEMCOS does these things. The use of technical terminology is minimal. A general data processing or data communications background would be helpful, but not necessary, to understand GEMCOS as described herein.

Section 1 of this manual contains a discussion of the need for and the functions of message control systems (MCSs) in on-line systems in general and in Burroughs B 1800/B 1700 Systems in particular. It is hoped that this section provides the technically uninitiated with a reasonable perspective on how the MCS fits into the total on-line environment and how it relates to other components, such as application programs, the data base management system, and the network controller.

Section 2 describes the general benefits of GEMCOS and the major capabilities of the two versions of GEMCOS. Sections 3 and 4 describe in greater detail the capabilities of the two versions: The Basic Version (style identification numbers B1800 MCB and B1700 MCB), and the Advanced Version (style identification numbers B1800 MCA and B1700 MCA).

The technically oriented reader may learn more about GEMCOS and the B 1800/B 1700 Systems on-line environment in general by referring to the following Burroughs manuals:

a. B 1700 Generalized Message Control System (GEMCOS) User's Manual, form 1093499.

b. B 1700 Systems System Software Operation Guide, form 1068731.

c. B 1700 Systems Network Definition Language (NDL) Reference Manual, form 1073715.

d. B 1700 Systems User Programming Language (UPL) Reference Manual, form 1067170.

e. B 1700 Systems COBOL Reference Manual, form 1057197.

f. B 1700 Systems Report Program Generator (RPG) Reference Manual, form 1057189.

g. B 1700 Systems FORTRAN Reference Manual, form 1081882.

These manuals are listed approximately in order of relative importance with respect to GEMCOS. Those which refer only to the B 1700 system apply equally to the B 1800 System.

SECTION 1

MESSAGE CONTROL SYSTEMS

ON-LINE COMPLEXITIES.

As business data processing has evolved toward on-line processing in a multitask environment (multiple programs running concurrently), programming complexities have increased by an order of magnitude. They involve problems such as:

a. Preventing two or more programs from updating the same record simultaneously.

b. Preventing unauthorized access to programs and/or data bases.

c. Encoding data properly for transmission to or from the network.

d. Maintaining orderly communication between the computer and devices in the network, even when several devices share the same line to cut communications costs.

e. Ensuring that messages from the network and from programs running in the central system are properly routed to their destinations.

f. Auditing (writing to disk or tape) of messages and data base transactions.

g. Recovery of running programs, data bases, and messages or transactions in the event of a failure.

h. Formatting data appropriately for each hardware device in the network.

This list is not exhaustive, but suggests the kind of problems which must be considered in an on-line, multitask environment and which did not even exist in the single program batch systems of the past.

BURROUGHS ON-LINE SOFTWARE.

If application programmers had to address all these problems in their programs, the simplest application would become unbelievably complex. Fortunately, a better way has been found. Software modules specifically designed to relieve the application programmer of these burdens have evolved. These modules and their interrelationships are shown in figure 1-1.

Data base management systems coordinate access to the data base and recover the data base after a failure.

The network controller transmits and receives messages to and from the network. This function often involves code conversion and may involve message auditing. In Burroughs systems, the network controller program is generated from a description of the network in Network Definition Language (NDL).

The message control system (MCS) interfaces with the network controller and with the application programs. As shown in figure 1-2, the MCS exerts control over both the network environment and the program environment. MCS functions may include the following:

a. Message routing.
b. Access control.
c. Audit/message restoration.
d. System management.
e. Message formatting.

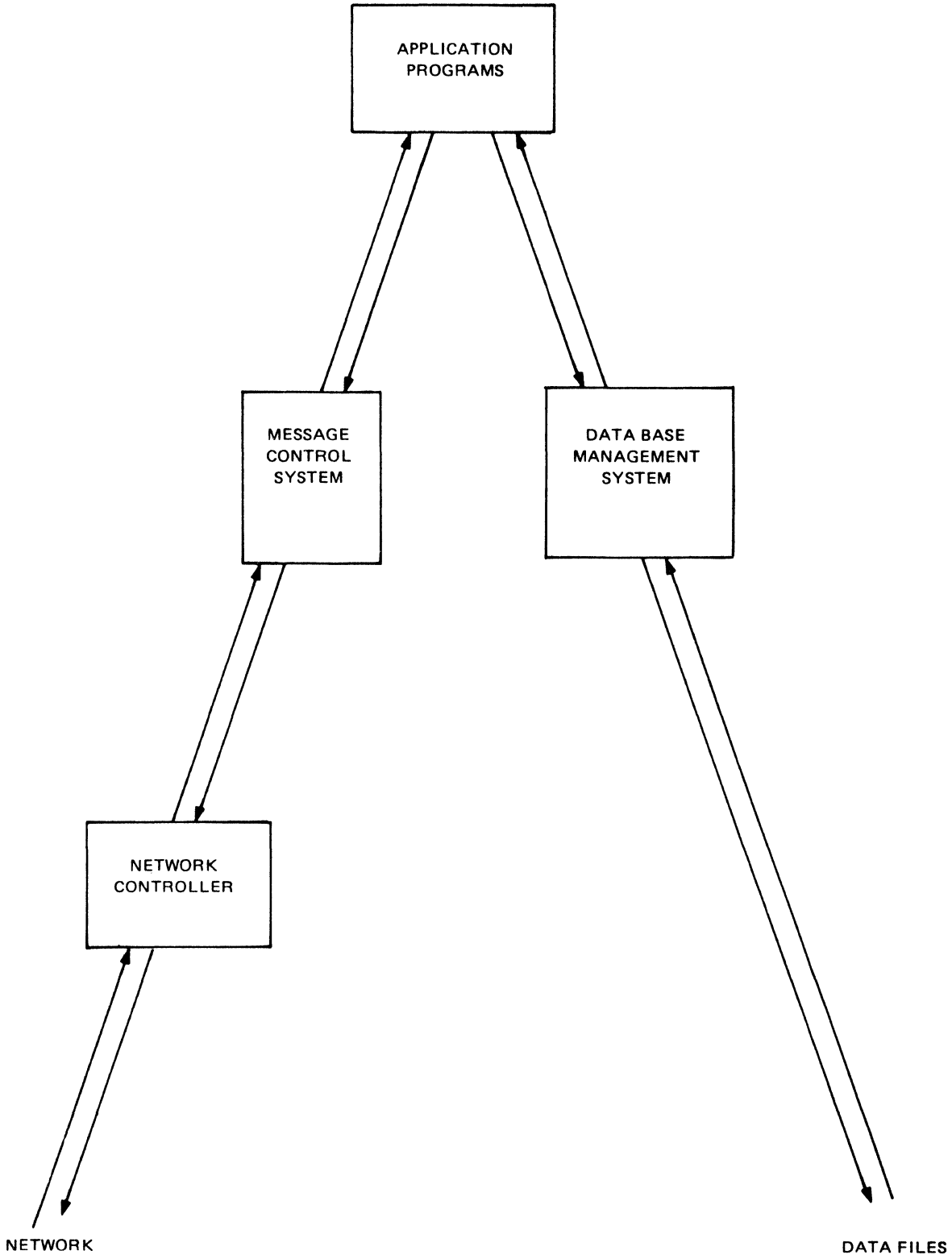


Figure 1-1. On-Line Software

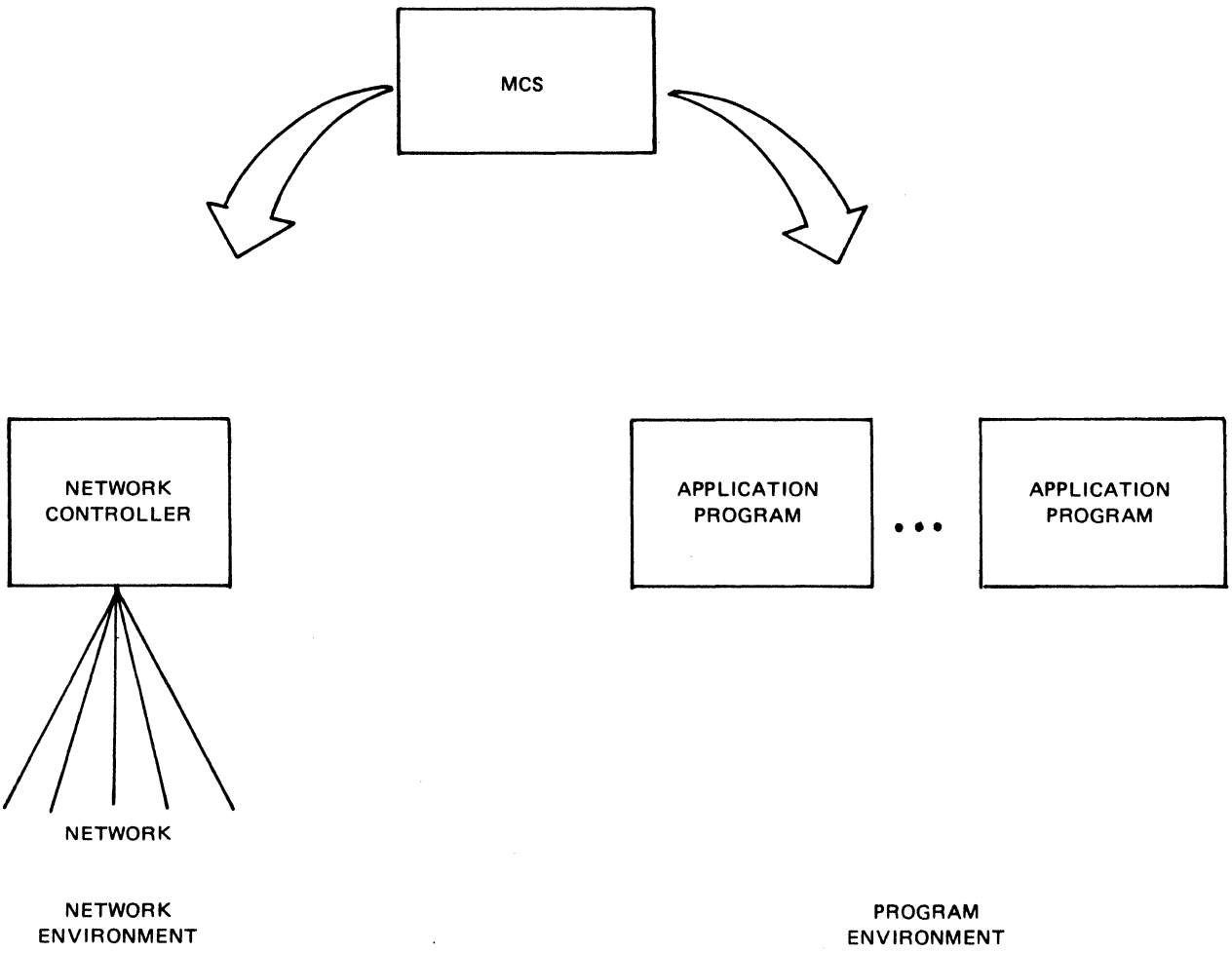


Figure 1-2. The Role of the MCS

The MCS and network controller together relieve the applications programmer of:

a. Line control (e.g., connect/disconnect, polling and addressing, timing, error detection and retransmission).

b. Line buffer allocation and control.

c. Recovery from abnormal conditions.

d. Terminal interfacing.

e. Network control.

f. Message routing.

g. Access control.

h. Message auditing.

i. Message formatting.

In short, all the application programmer must worry about is the requirements of his application and maintaining a simple, standard interface with the MCS.

B 1800/B 1700 SYSTEM MCS'S.
CANDE, RJE, and GEMCOS are examples of MCSs available in the B 1800/B 1700 Systems.

CANDE is a special-purpose MCS which facilitates on-line program development and testing. Using CANDE from a time-sharing terminal, a programmer can enter, edit, compile, debug, and execute a program very conveniently.

RJE (Remote Job Entry) is another special-purpose MCS designed to facilitate running batch jobs from remote locations.

GEMCOS is an MCS which is meant to run in a transaction-oriented, on-line processing environment. Its features and capabilities are described in sections 2 thru 4.

SECTION 2

B 1800/B 1700 GEMCOS

GENERAL BENEFITS.

GEMCOS is a transaction-oriented MCS designed to provide a flexible user interface that does not compromise efficiency:

a. It provides the data communications user with a viable interface between the network controller and the application programs which process transactions from on-line terminals. GEMCOS and the network controller work together to relieve application programs (and programmers) of the numerous complicated considerations inherent in an on-line environment. The design of application programs is thus independent of the environment in which they operate, a feature which protects a user's investment in these programs.

b. As illustrated in figure 2-1, GEMCOS and DMS II can work together to insulate application programs from the complexities of the network and the data base, respectively. Of course, either can operate independently of or without the other.

c. GEMCOS conserves personnel time and effort because it is relatively easy to install and interface.

GEMCOS is also a flexible MCS. It provides users of B 1800/B 1700 Systems with a tool for tailoring network control to meet their specific requirements. GEMCOS accommodates a broad range of throughput and processing requirements. GEMCOS is also an on-going mechanism for continuous network control in the dynamic environment of data communications systems. As application-oriented requirements change or new hardware opportunities arise, the user employs GEMCOS to adapt to changes in:

a. Central site hardware configuration.
b. Central site software structure.
c. Network configuration, including terminal changes.
d. Application/data base design.

GEMCOS VERSIONS.

To accommodate the small user as well as larger, more complex installations, GEMCOS is available in two versions: The Basic Version and the Advanced Version. The major capabilities of each of these versions are:

a. Basic Version GEMCOS:

1) Transaction Control Language.
2) Access control.
3) Message routing.
4) Message auditing.
5) Network control.
6) Message restoration.

7) Non-participating MCS.

b. Advanced Version GEMCOS:

1) All Basic Version capabilities.
2) Message formatting.

More information about GEMCOS capabilities is provided in the remainder of this manual. Section 3 describes Basic Version GEMCOS; sections 3 and 4 describe Advanced Version GEMCOS.

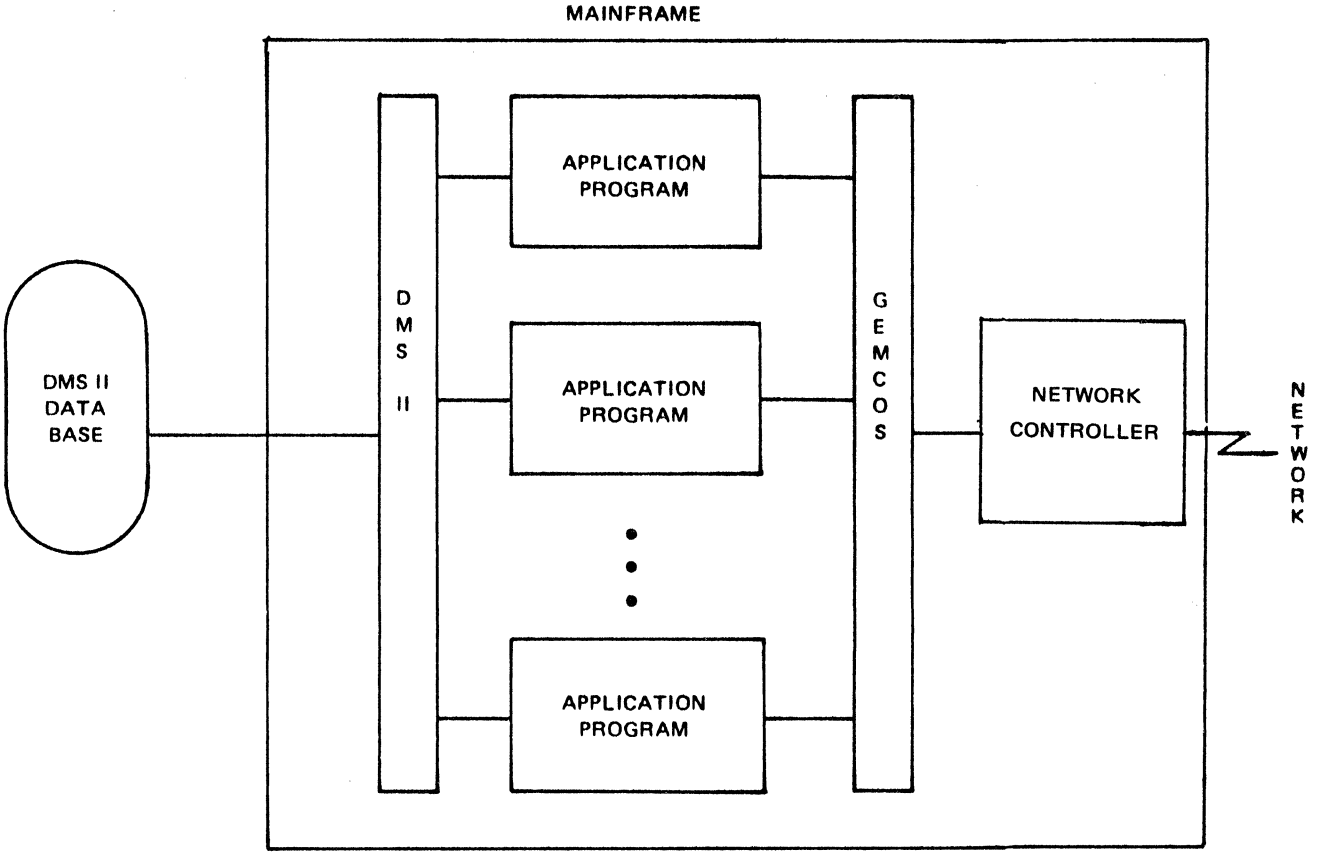


Figure 2-1. GEMCOS/DMS II Relationship

SECTION 3

BASIC VERSION GEMCOS

The following major capabilities of Basic Version GEMCOS are discussed in this section: Transaction Control Language, access control, message routing, message auditing, network control, and message restoration. Other assorted features provided in the Basic Version are also discussed.

TRANSACTION CONTROL LANGUAGE (TCL).

The various environments under which an MCS could operate dictated that a simple method for describing requirements unique to a user's specific environment be developed. Both the requirements and the environment are expected to be dynamic. GEMCOS adapts to differing needs by permitting a user to describe his requirements in TCL.

In all GEMCOS versions, TCL is used to describe criteria ranging from message-routing criteria, and access-control requirements to message formats and a variety of other GEMCOS options.

The language has a free-form structure, using key words to describe both the environment and the requirements of the data communications user. The result of a TCL compilation is a set of customized tables. (The TCL compiler optionally provides a hard-copy record of the data communications system description.) The MCS code which interprets those tables is modular in structure. The GEMCOS design is totally compatible with the virtual-memory concept.

The TCL example shown in figure 3-1 is a complete description of a very simple system consisting of two stations and one program.

ACCESS CONTROL.

Access control is optionally available on a station-by-station basis. If it is declared to be in effect for a given station, the legitimate users of that station can be specified. A valid sign-on procedure at the station must be followed to gain access to the system. Specific limitations on types of transactions entered or programs used by any user signing on may also be specified. Thus, using the standard access control features, GEMCOS may be instructed to allow access to a specific list of transactions and/or programs on a user-by-user basis. Moreover, each user is restricted to a specific set of stations. An example follows.

Suppose "ABC123" is one of several access keys employed in a system. Persons assigned ABC123 are to be restricted to the use of only station STA7. They are to be further restricted to the use of only message keys UPD and INQ. To implement these restrictions, the following two statements would appear in the access control section and station section of the TCL deck, respectively:

```
ACCESSCONTROL =
    ACCESSKEY ABC123 = UPD, INQ.
STATION STA7(7):
    VALIDUSERS = ABC123.
```

```
                                        % COMMENTS
                                        % --------
CONTROL = LIST,                         % CAUSES TCL REPORT TO BE PRINTED.
    GENERATE.                           % CAUSES NEW TABLES AND MCS SOURCE
                                        % CODE TO BE GENERATED.
GLOBAL:
    CONTROL STATIONS = TTY1.            % TTY1 IS PERMITTED TO ENTER NETWORK
                                        % CONTROL COMMANDS.
BEGIN
    PROGRAM PRGM1 USER:                 % PRGM1 IS CLASSIFIED AS A USER
                                        % PROGRAM CAPABLE OF PROCESSING 4
                                        % DIFFERENT TRANCODES.
        TITLE = SAMPLE/USER/PGM.        % SPECIFIES NAME OF CODE FILE.
        TRANCODE = KEY1.                % TRANSACTION CODES WHICH WILL
        TRANCODE = KEY2.                % CAUSE MESSAGES TO BE ROUTED TO
        TRANCODE = INQUIRE.             % PRGM1.
        TRANCODE = UPDATE.              %
    STATION TTY1:                       % THE MCS WILL CONTROL STATIONS
    STATION TD801:                      % TTY1 AND TD801.
END.
```

Figure 3-1. TCL Description of Data Communications Network

MESSAGE ROUTING.

Several types of message routing are provided by the Basic Version of GEMCOS. Messages can be routed from:

a. Station to application program.
b. Application program to station.
c. Station to station.

When a destination station is out of service, an alternate station may be specified by using a network control command.

The three methods available to allow messages to be routed from stations to programs are:

a. A program may attach itself to a set of stations (a remote file) and messages entered at those stations will be routed to the attaching program.

b. A station may attach itself to a program and messages entered at the attaching station will be routed to the program.

c. Transaction codes may be associated with programs so that when a message containing a particular transaction code is entered at a station, the message is routed to the program defined to process that transaction.

User programs can address output to specific stations on a station-by-station basis. If a user program takes no action to specifically route a response, the message is routed to the sender of the input message.

By using a network control command, users at stations can route messages to other stations (or the supervisory console).

MESSAGE AUDITING.
The GEMCOS Basic Version will, if requested, create an audit file of messages as they pass through the MCS. All messages which are entered from stations and are bound for application programs (i.e. messages which could be applied to a data base) can be audited. In addition, all messages bound for stations may be audited. The message auditing function is used by the message restoration function to aid programs during data base recovery.

NETWORK CONTROL.
In order to dynamically control the data communications processing environment, the user may designate a particular station as a network control station. A network control station is priviledged in that it may enter commands which may reconfigure and/or manage the network. For example, a network control station may make stations ready, make stations not ready, change a station maximum retry count, change a station alternate station, change a station address, start and stop programs, bring down the system, etc. GEMCOS notifies the network control station of various exception conditions as they occur. The supervisory console may act as a network control station.

Network control also allows stations in the network to make various inquiries to GEMCOS, route messages to other stations, attach themselves to programs, etc.

The Network Control function accumulates changes made to stations in the network in a disk file. If GEMCOS is halted and then re-executed, GEMCOS automatically reconfigures the network back to its last running state regardless of the fact that the network controller may have forgotten which changes had occurred.

MESSAGE RESTORATION.
In coordination with the message auditing capability, message restoration can aid application programs during data base recovery. The Message Restoration function allows any application program to spe-

specify the last message it has processed. GEMCOS will send all messages which were sent to the program after the last known message to have been processed by the program. If a data base has been rolled back during a recovery process, the application programs can request to be sent all messages which occurred after a particular checkpoint.

A NON-PARTICIPATING MCS.

In certain special instances, an applications environment may not require the routing options available in GEMCOS, but rather a simple, straightforward way to move text between stations and programs. To accommodate such applications, the GEMCOS system also gives the user the option of creating a non-participating system in which the MCS performs the single function of handling network control, sign-on and communications errors, and leaves all message routing to the Master Control Program (MCP).

ADDITIONAL FEATURES.

The following additional features are also provided in the GEMCOS Basic Version:

a. A variety of statistical information concerning stations, programs, and GEMCOS is available to the user in a realtime mode. This data can help the user fine tune the system following initial implementation.

b. GEMCOS detects, diagnoses, and recovers from a variety of data communications error situations.

c. Fixed data relating to a particular transaction type may be automatically passed to application programs by GEMCOS, based upon TCL specifications.

d. A Screen Wraparound function is available in GEMCOS. The function causes output messages which would be too large for the buffer of the destination station to be automatically segmented and sent in several transmissions.

e. Programs may be designated as core or disk resident to allow the user to help the system make more effective use of memory.

f. GEMCOS can run in a simulation mode without a network controller in the mix.

g. Network control commands may be entered via a card reader.

h. GEMCOS is not restricted to any particular set of stations. It can work with any or all of the stations defined in the network controller.

i. GEMCOS contains an optional monitor trace feature. The monitor trace is a very useful debugging aid which creates a listing on a line printer displaying messages as they pass through the MCS, their source, destination, and the procedures of the MCS which were invoked to process them.

j. User written UPL procedures can be merged into GEMCOS to supplement and/or replace standard GEMCOS functions.

k. GEMCOS is capable of interfacing application programs written in COBOL, FORTRAN, RPG, and UPL.

SECTION 4

ADVANCED VERSION GEMCOS

In addition to all the Basic Version capabilities, Advanced Version capabilities include message formatting. Message formatting, unique to the Advanced Version, is discussed in this section.

MESSAGE FORMATTING.

Formatting of messages is independent of user programs. A user writing an application program is not required to know hardware control codes or buffer capacity for the various terminals in the network. Rather, the application programmer can deal with the data strings at the point of program interface. A user independently describes, in TCL, a format description, used by GEMCOS to format those data strings.

GEMCOS retrieves format descriptions, based upon both message identification key and the device class of the station involved, and applies the format to the data. This allows tremendous flexibility at the stations, transparent to the application programmer. For example, the application program can tell GEMCOS to send an identical message to two stations in the network. If those two stations are in different device classes, the output messages may be formatted using two different format descriptions provided in TCL, resulting in drastically different outputs delivered to the stations. Such data-field characteristics as length, sequence, and related form information can vary from station to station for an output message destined for multiple stations. Conversely, two different stations can supply input for the same type of transaction under different formats, and the data will arrive at the application program in a standard format. Such activity is transparent to the application program.

Some of the other capabilities of GEMCOS formatting include:

a. Forms retrieval.

b. Format modification without compilation of application programs.

c. Numeric field verification.

d. Handling of variable length fields, with zero/space fill and right/left justification.

e. Data translation.

The example in figure 4-1 shows how a message which appears fixed in format to a user program may look quite different at each of several stations which may send or receive the message. It is emphasized that this example applies equally well to input (message sent from program to station). A different format would be used for each of the three screens.

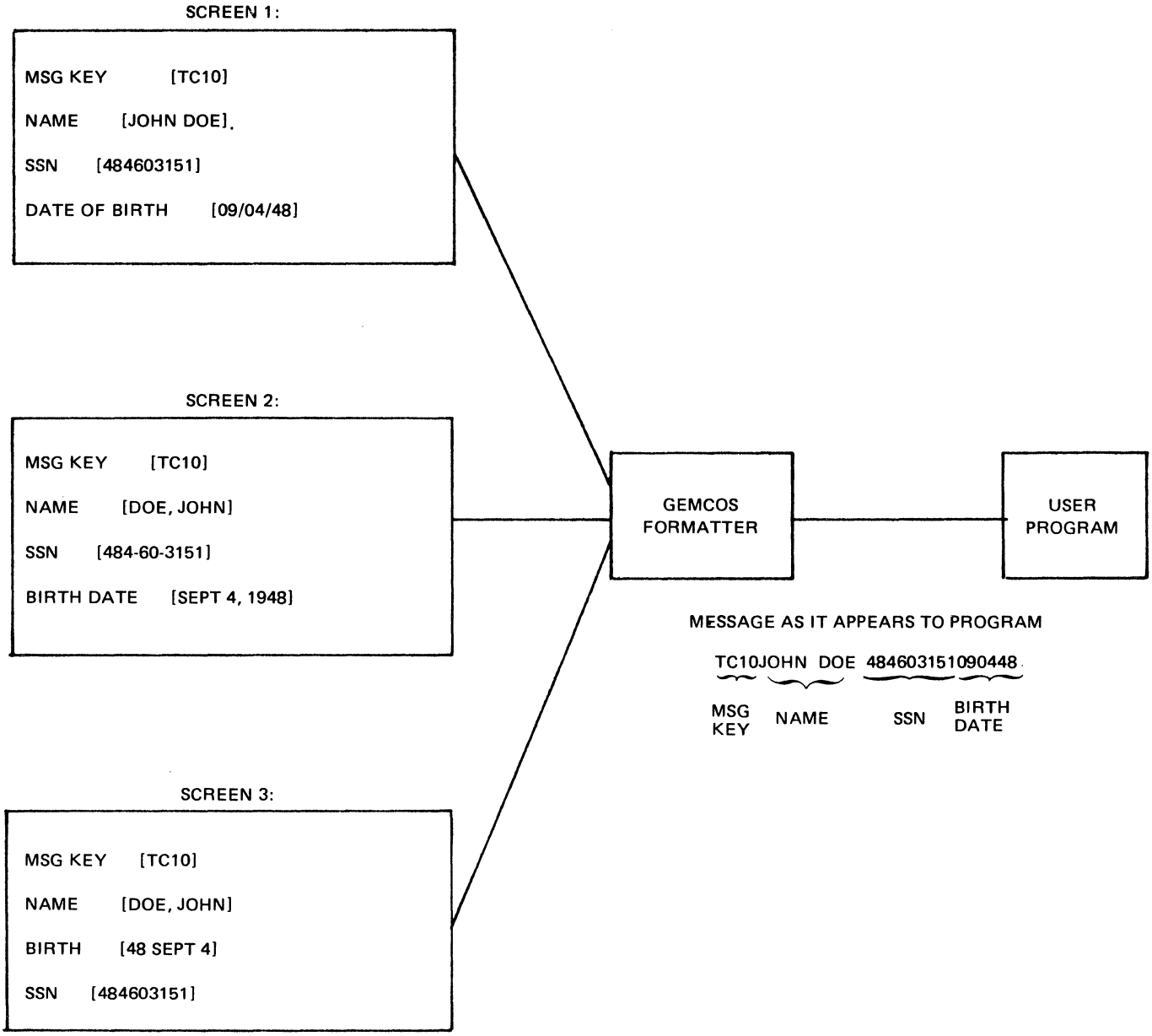
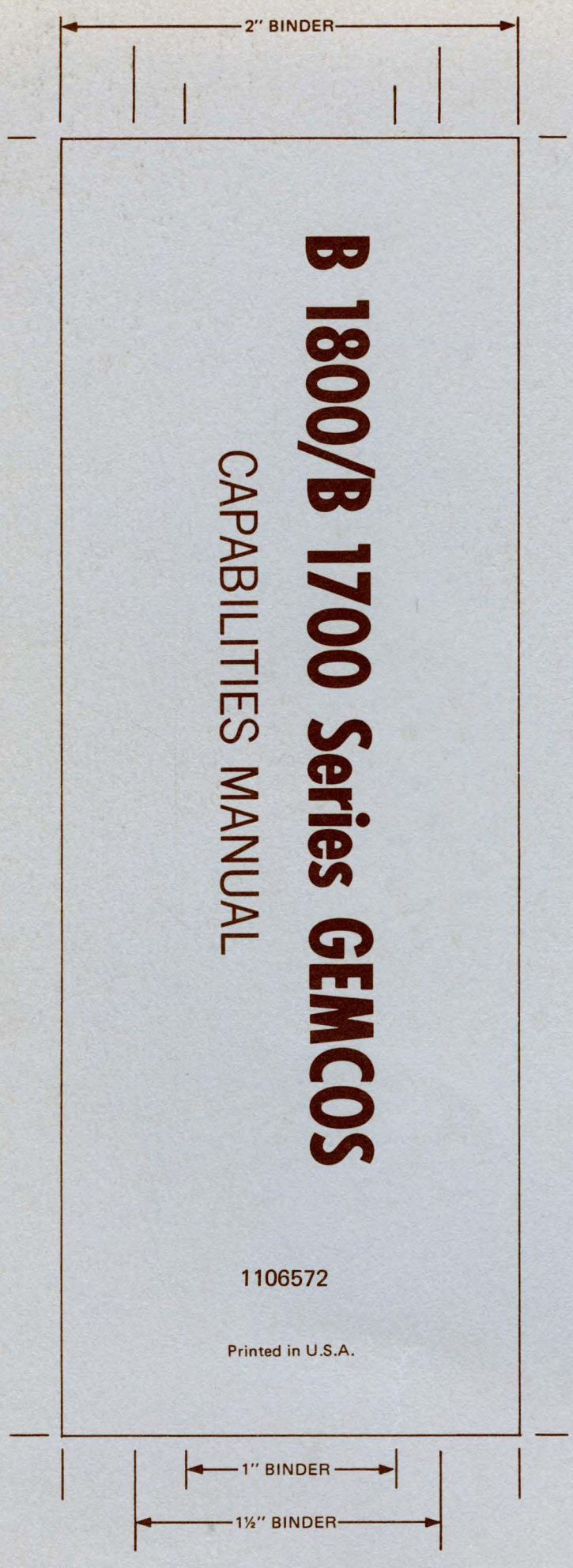


Figure 4-1. Rearrangement of Output Fields



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