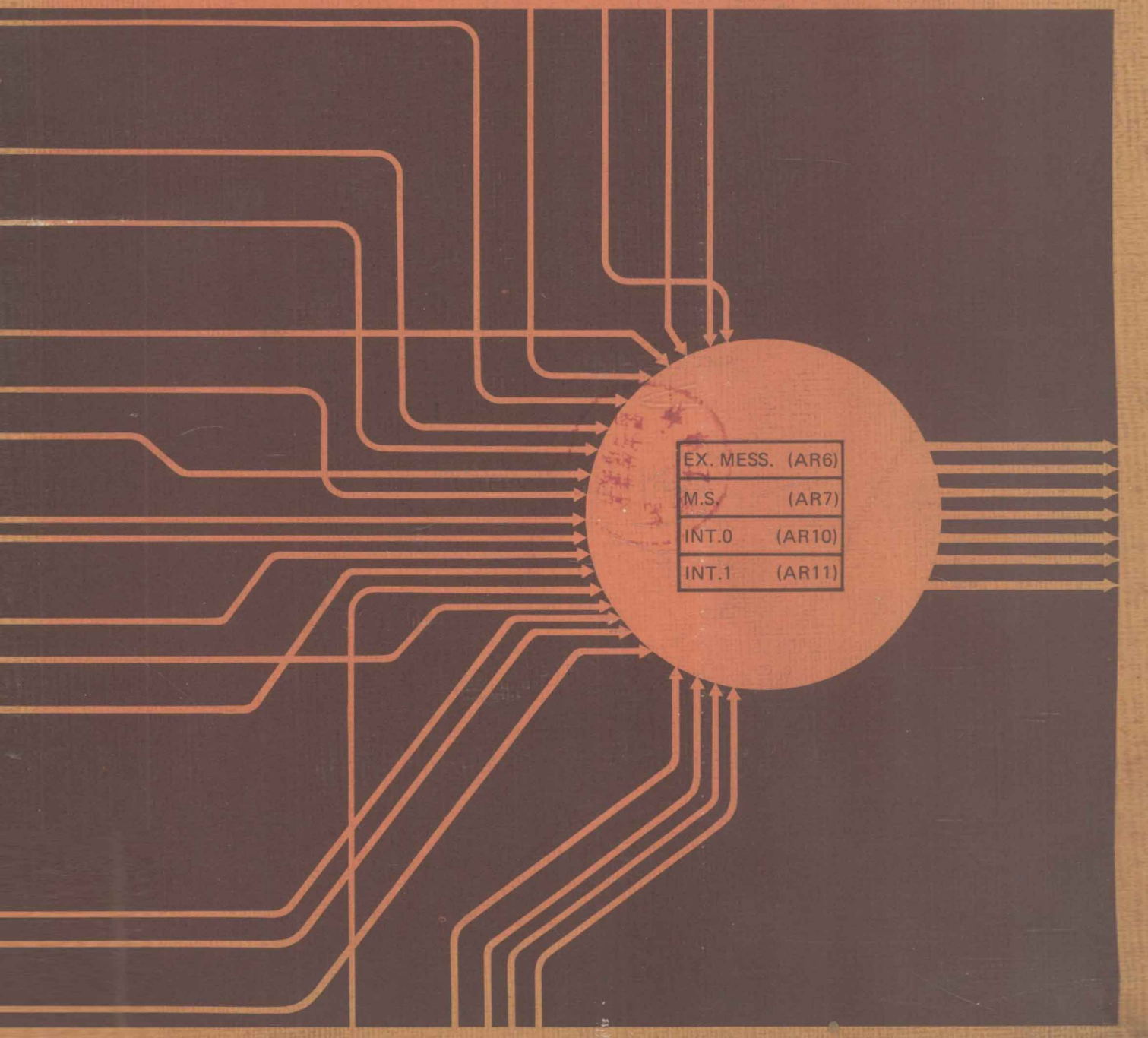
TELEPROCESSING MONITOR PACKAGES

for IBM 370

D Hebditch



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Disclaimer

The material in this book is based on information available at the time of going to press. It should be recognised that the facilities available are subject to modification and enhancement.

Preface

It is now widely appreciated that the development and operational control of teleprocessing (TP) systems impose requirements which, in the traditional batch processing environment, do not apply or are less significant.

The purpose of TP monitor software is to provide a suitable framework and a set of ready-made functions which enable applications to be developed and installed with the minimum of effort, and to operate efficiently. In recent years a significant number of packages have been developed, mainly by software houses. However, there is still a lack of easily accessible information in a format which enables the user to compare and evaluate the facilities which are offered. It is hoped that this book will go some way towards remedying this deficiency.

A description is given of six software packages which are currently available to support TP applications on IBM 370 computers. Each TP Monitor package (MTCS, CICS/VS, Environ/1 Shadow II, Taskmaster, and THIRST) is described to a set pattern under 17 headings to help the reader assimilate and evaluate the information. In addition, each package is briefly assessed.

This book will be of interest to anyone concerned with teleprocessing applications; in particular, to data processing managers, systems programmers, and those concerned with hardware and software selection in a teleprocessing environment.

Other related titles:

Teleprocessing Monitor Packages

Teleprocessing Monitor Packages for ICL 2903/2904

Contents

1 Introduction

OBJECTIVES AND SCOPE

This book indicates the main features of six teleprocessing (TP) monitor packages currently available to support TP applications on IBM 370 computers. No attempt is made to describe in detail the individual TP monitors: there is no intention to discourage detailed discussions with the suppliers. Salient features are listed (under 17 main evaluation headings) in relation to the principal functions required of a TP monitor. This should help people to ask the right questions when investigating available products.

The overall intention is to provide guidance for two categories of user:

- those who are either dissatisfied with the performance of their present TP software, or in the process of changing from batch processing to teleprocessing;
- organisations acquiring their first computer or considering replacing existing hardware.

The quality of software support should be accorded a significant weighting in hardware selection. This has always been an important requirement in traditional batch processing, but it is even more important in the teleprocessing context. The fact that considerable teleprocessing activity is handled by computers not primarily designed to support teleprocessing imposes a heavy responsibility on TP software. Some of the facilities provided by TP monitors could have been incorporated into the executive and operating system in the first place.

This introduction outlines the mainframe software environment with which a TP monitor may have to interface and includes a brief summary of some of the main implications which this has for the TP monitor designer, both in terms of the constraints that it imposes and opportunities for enhanced facilities.

The question of performance is of basic importance: for example, how many terminals can be realistically supported? It is not easy to forecast performance on the basis of a printed package specification, and possibly a limited knowledge of the application. Performance forecasting may be a little easier with single-threaded operation than with multi-threaded; and software experts with low-level teleprocessing experience could make a reasonable assessment. However, many organisations do not possess this level of expertise. Prospective users should ask to see a live demonstration of an application similar to their own. They should then relate this to their own applications environment and also to their medium- and long-term data processing plans.

IBM SYSTEM 370 ARCHITECTURE

The IBM System 370 is a range of general-purpose mainframe computers. Readers who are not already acquainted with this architecture should contact their local IBM branch office for details: only those features directly relevant to the communications function are described here.

The IBM 370 is a microprogrammed computer using solid-state technology for main storage. Input-output (fig. 1) is handled by three types of bus channels:

- byte multiplexor;
- selector;
- block multiplexor.

The *byte multiplexor* is a byte-interleaved channel suitable for interfacing a number of low-speed peripherals (such as card readers, card punches, line printers and low-speed communications devices). A 370 computer can incorporate only one byte multiplexor.

The *selector* channel is a high-speed non-interleaved bus for interfacing storage devices (such as disk, drum and tape, and the more powerful communications controllers such as the 3705).

The *block multiplexor* channel supports the same types of high-speed device as does the selector channel. However, instead of a device occupying the channel for the duration of the data transfer or control operation, the device can be interleaved at a physical block level.

A 370 computer may have a number of selector and/or block multiplexor channels.

IBM 3705 COMMUNICATIONS CONTROLLER

Transmission control units 2701, 2702 and 2703 were marketed with the IBM 360 range. These devices were hardwired and fairly unsophisticated, leaving the cpu software with many functions to perform.

The 2701 could handle low-speed asynchronous lines or two medium-speed (say 2400 bit/s) synchronous circuits; the 2702 up to 32 low-speed start-stop lines; and the 2703 a mixture of synchronous and asynchronous communications facilities. Each circuit had its own sub-channel address and the controller was connected to the byte multiplexor. The use of separate addresses for each line made it impractical to attach the series to the selector channel because the overhead of seizing the channel for each byte transferred would be too high.

When the 370 range superseded the 360, IBM also released the 3705 Communications Controller (fig. 2) and the smaller 3704. The 3705, a powerful controller designed to relieve the central processor of many low-level line-handling functions, has a single sub-channel address. The device can therefore be attached to the selector channel or block multiplexor channel as well as to the byte multiplexor. In addition to its role as the communications controller at the central site of a teleprocessing system, the 3705 can also be installed remotely as a line concentrator.

Although the 3705 controller has an Assembler, the use of this feature is not recommended (even by IBM) other than in exceptional circumstances. It is normally programmed using a high-level interpreter called the Network Control Program (NCP). A standard program, Emulation Program (EP), is available for emulating the series, and this may run instead of an NCP, or alongside it (the Partitioned Emulation Program, PEP). The main features of the 3705 controller may be summarized as follows:

- interface with the IBM 360 via the byte multiplexor (using multiple sub-channel addresses);

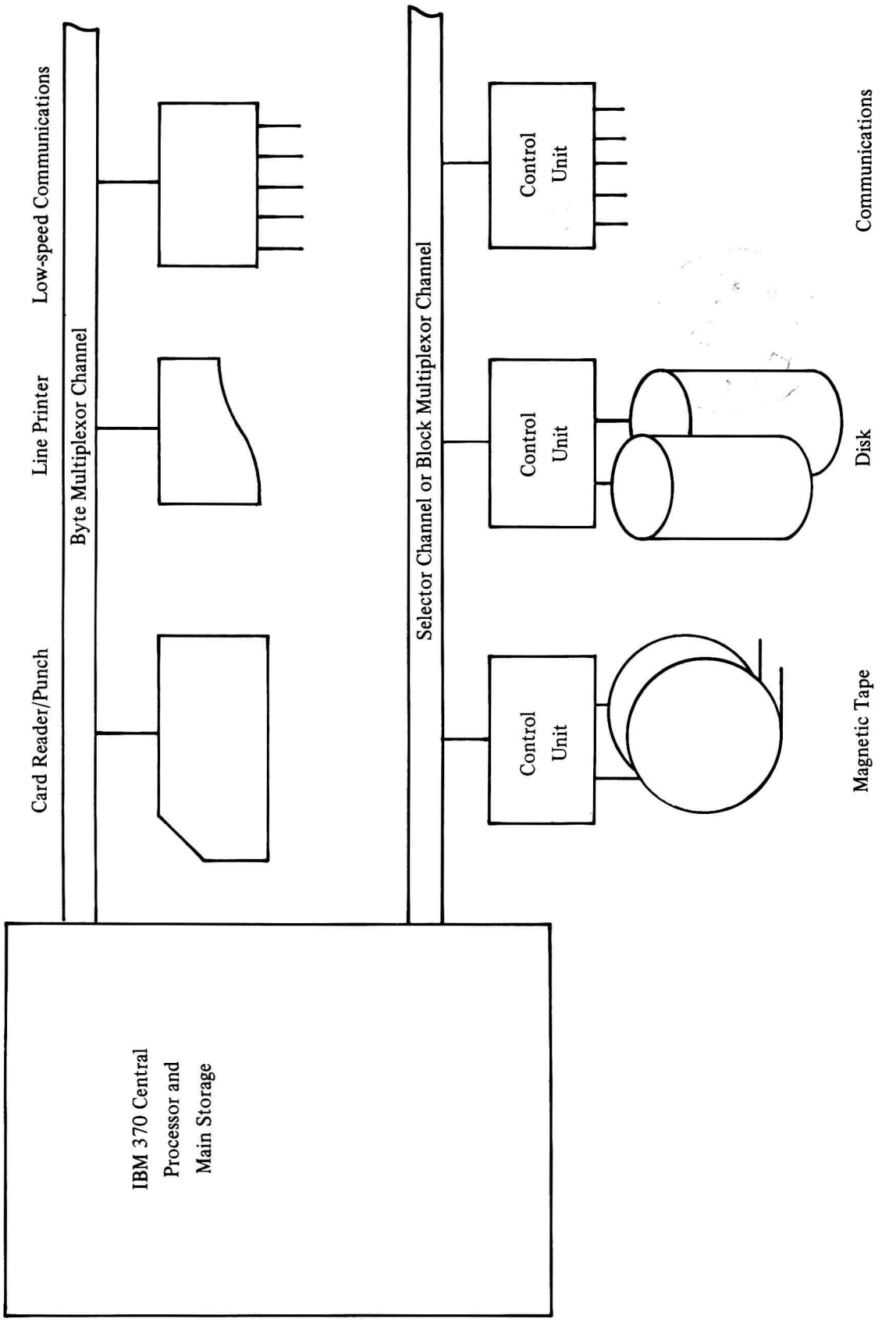

Figure 1: IBM System 370 Input-Output Channels

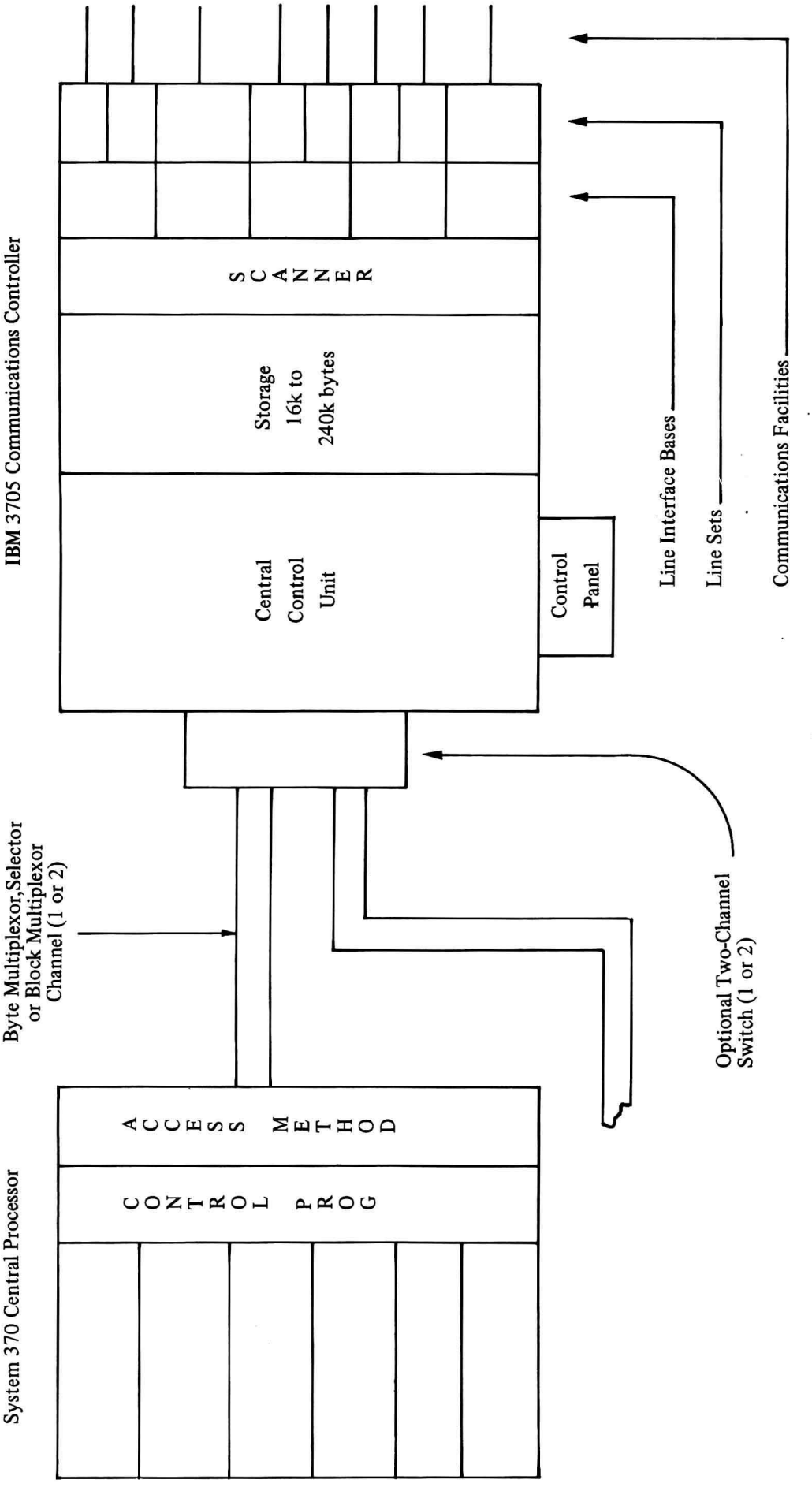

Figure 2: The IBM 3705 Communications Controller

- interface the IBM 370 with the byte multiplexor, selector or block multiplexor channel (using a single sub-channel address);
- emulation for the 2700 series;
- a high-level programming language (Network Control Program);
- capability to attach 352 lines but with overall throughput limit;
- wide variety of codes and speeds (45.5 to 50,000 bits/sec);
- 16k to 240k bytes of storage;
- two types of channel adapter and line scanner;
- optional two-channel switch;
- lines attached singly or in pairs;
- error recovery and diagnostic procedures;
- dynamic buffering;
- code translation.

The interface between the 3705 Central Control Unit and the communications circuits is achieved by means of Line Sets, Line Interface Bases (LIB), and a Scanner. A Line Set can support one or two lines, and a LIB (any of four types) can support up to eight line sets.

LIB type 1 Up to eight Line Sets in any combination of the following:

- low-speed (up to 1200 bits/sec) start-stop modems;
- low-speed (up to 1200 bits/sec) locally attached terminals ;
- start-stop or synchronous lines up to 4800 bits/sec;
- autocall adapters;
- locally attached medium-speed lines (up to 2400 bits/sec);
- one high-speed (19.2, 40.8 or 50k bits/sec) modem interface.

LIB type 2 Up to eight Line Sets, each supporting two single-current telegraph circuits (at 20 ma, 40 ma or 62.5 ma signalling).

LIB type 3 Up to six Line Sets each supporting two IBM low-speed (134.5 bits/sec) limited distance line adapters (2- or 4-wire).

LIB type 4 Up to two Line Sets each supporting two IBM low-speed (600 bits/sec) Line Adapters.

(IBM Line Adapters can be used in place of asynchronous modems over limited distances where such an arrangement is approved by the common carrier concerned.)

The LIB/Line Set arrangement on the 3705 is a simple bit-level hardware interface to the communications channel being used. It does not assemble characters. This function is performed by either the Control Unit or the Scanner according to the type of scanner being used.

The *Type 1 Scanner* is a low-cost, low-performance device which collects bits from (or sends bits to) the Line Sets, interrupting the Control Unit Processor for each bit. The *Type 2 Scanner* is a higher-performance (but higher-cost) device which assembles and disassembles characters, raising interrupts only when character transfer starts or ends. A 3705 may have one Type 1 Scanner or up to four Type 2 Scanners.

Similarly, there are two types of channel adapter available: a low-cost, low-performance version which requires a high level of Control Unit intervention; and a high-performance model which executes the transfer by stealing memory cycles in the 3705. Either one or two channel adapters may be installed, and each can have a two-channel switch operated by a manual control on the 3705 Control Panel. Other functions which can be performed on the panel include:

- display storage and register;
- insert data in storage and registers;
- display power status;
- display controller status;
- operate diagnostic controls;
- operator/controller communications.

Programs are loaded into the 3705 from the 370 host processor via the input/output channel and channel adapter. (The 3704 functions in a similar way to the 3705 but has a lower capacity.)

IBM 3705 NETWORK CONTROL PROGRAM

The facilities of the 3705 can be tailored to the requirements of an individual teleprocessing system through the use of the Network Control Program. This is generated on an IBM 370 mainframe but resides in the 3705. Its main purpose is to control the flow of data between the host processor and the remote communications devices (fig. 3). The Network Control Program (NCP) also enables systems designers to exploit the various features of the controller and to insert their own editing routines.

The NCP contains some facilities which are automatically included at generation time (depending on the network configuration specified) with others inserted at the option of the systems designer (fig. 4).

Standard functions are:

- polling and addressing;
- autodialling and autoconnection;
- character or bit handling (depending on the type of scanner);
- control character insertion or deletion;
- code translation;
- buffering;
- hardware and program failure recording;
- line failure recording;

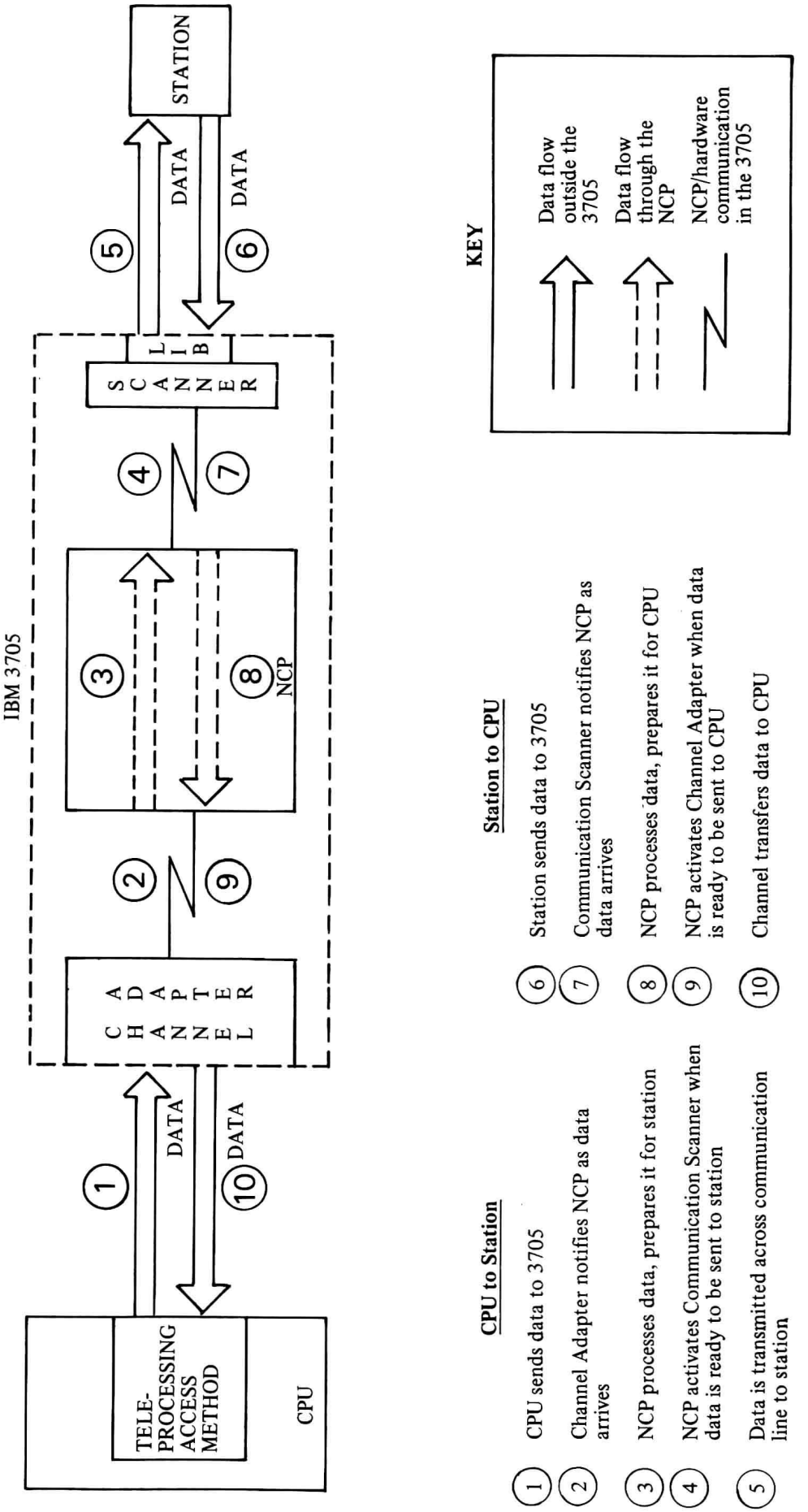

Figure 3: Data Flow between Host Processor and Remote Terminal through the IBM 3705

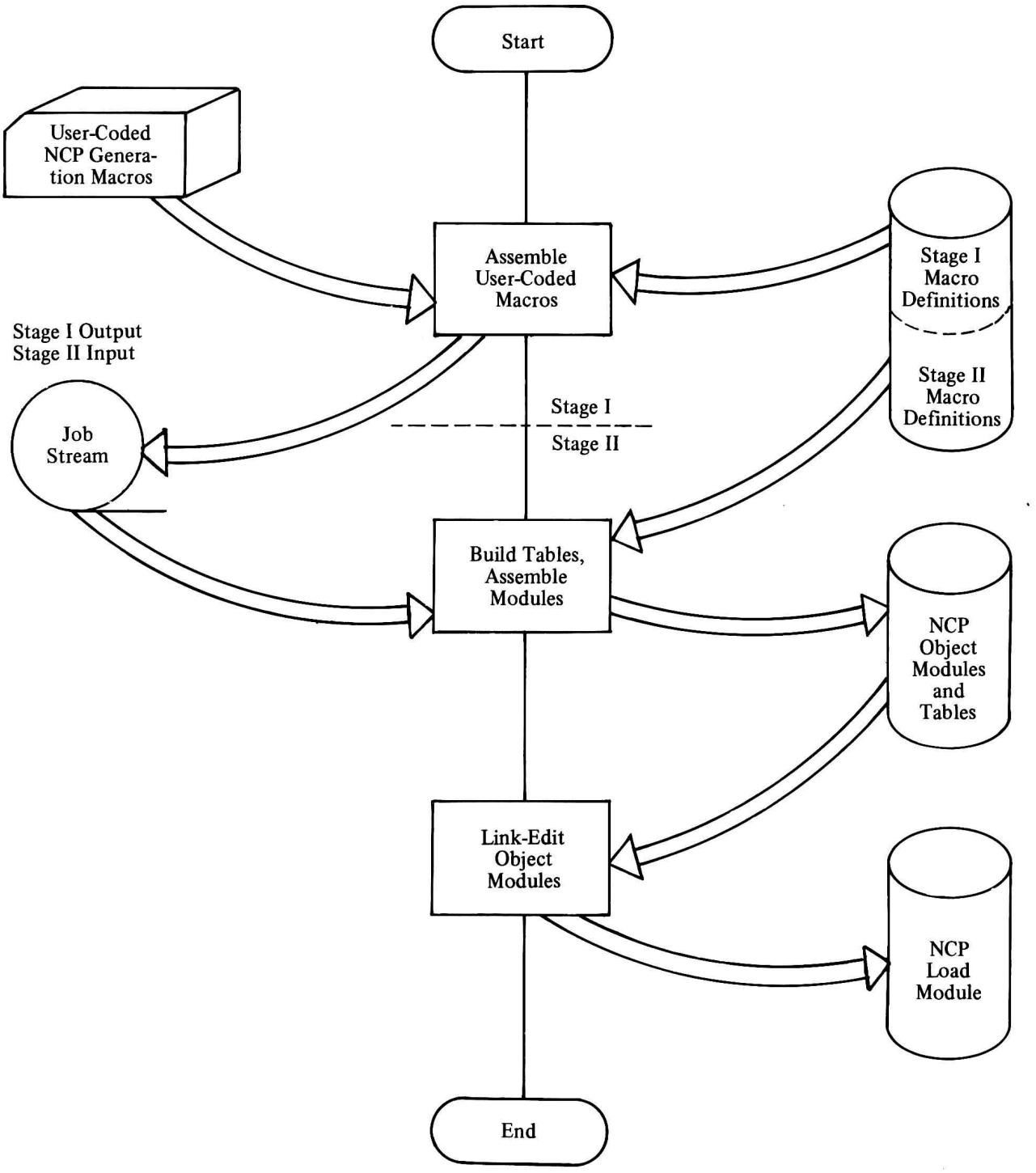

Figure 4: The Network Control Program Generation Procedure

- performance statistics;
- support for the display panel.

Optional functions are:

- automatic broadcast of message to all terminals if the host processor fails;
- diagnostic trace facility;
- checkpoint/restart;
- on-line terminal testing;
- pause/retry following a transmission error;
- alternate path retry (to support alternate routeing to a remote device).

In an operational network, the NCP will be expected to respond to commands from the host requesting it to take various actions determined by changing system requirements. These functions include:

- activation and de-activation of terminals and lines, de-activation causing an orderly closedown;
- obtaining any 32 bytes of 3705 storage and sending to the host;
- requesting status of a line or a terminal;
- switching channel adapters;
- changing polling and addressing characters;
- changing the sequence of a polling list (and the number of negative responses a device may send before being de-activated);
- setting the time and date in the 3705;
- setting a limit on the maximum number of host-terminal exchanges over a multipoint line without servicing other terminals on the same line.

The designer may also specify that processing is to be carried out on blocks of data either prior to transmission or after receipt at the 3705. These routines are written in the 3705 assembler and initiated by the NCP macros. The NCP has two standard 'block handling' macros: one to insert the date and time in a message, and another to correct text which has been amended by a terminal operator using backspace characters.

The NCP languages consist of keyword macros of which there are four types:

- *system macros* specifying the configuration of the 3705;
- *configuration macros* defining the network to be attached to the 3705 and specifying the flow of data between the network and the host processor;
- *block-handling macros* establishing linkages between block types and the standard or user-written routines which are to process them;
- *generation delimiter macros* indicating the end of input to an NCP generation.

For further details of NCP programming, the reader is advised to consult the appropriate IBM manuals.

ACCESS METHODS

Over the years, IBM has provided a wide range of 'access methods' to support teleprocessing systems. These access methods are control programs which provide the application programmer with a low-level and flexible means of handling the transmission control units, telecommunications circuits and attached terminals. Figure 5 shows the relationship of access methods to other software in the system (for simplification, only one partition (or region) of the system is shown).

Of the access methods currently available, three are particularly important:

- BTAM (Basic Telecommunications Access Method);
- TCAM (Telecommunications Access Method);
- VTAM (Virtual Telecommunications Access Method).

BTAM runs under the DOS or OS operating systems providing the means of generating the correct control sequences for each of IBM's standard terminals. It also creates channel programs for passing the control sequences between the network and the CPU via the transmission control unit. BTAM can only be used with the 2700 series, and 3700 series controllers with the emulation program. The application programmer is required to check for and deal with 'exception conditions' at a fairly detailed level.

TCAM runs only under the full Operating Systems but it can be used with any transmission control unit including 3700 series NCR. TCAM performs all the functions of BTAM but also provides the application programmer with additional facilities such as device independence.

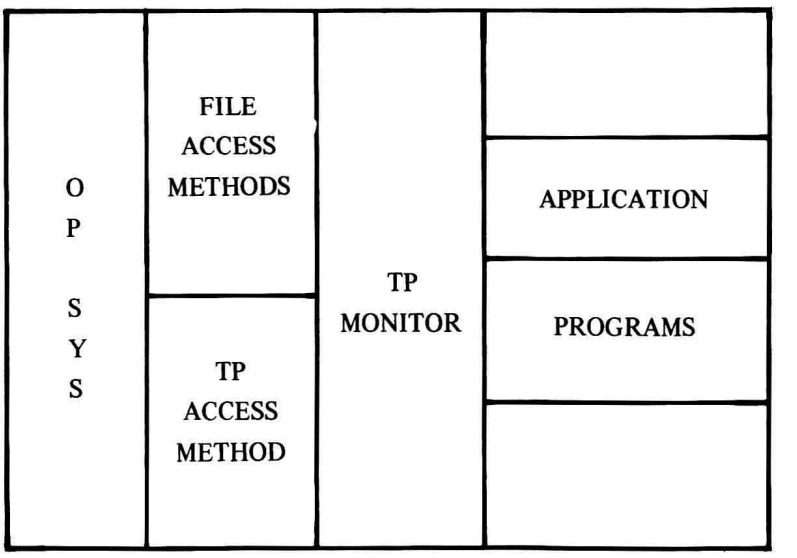

Figure 5: IBM 370 Access Methods and other Software