

Introduction to RC700 Micro-Computer System



RC COMPUTER
A/S REGNECENTRALEN af 1979

INTRODUCTION

The RC700 Micro-Computer System has been developed and implemented by combining the most modern techniques with RC's experience within the construction of mini-computer systems, modular software systems, and communications systems. The result has been one of the highest performance and most flexible micro-computer systems on the market.

Apart from being a large-scale supplier to commercial and industrial undertakings, RC COMPUTER has since 1970 supplied more than 75 per cent of the data equipment used at schools in Denmark. These systems have been based on the RC3600 mini-computer and the RC8000 medium-scale computer, and from the beginning of 1980 also on the new RC700 Micro-Computer which is intended to take over a large part of the market for small systems (until June, 1980, more than 100 RC700 systems was sold in Denmark).

One of the most important design goals for the RC700 Micro-Computer was to develop a micro computer system which should not be restricted to stand-alone operation (this restriction in fact is actual for most microprocessors on the market to-day), but which should be able to communicate with other computers. This design goal has been fulfilled by implementing communications interface in the RC700, together with software modules for batch transfer of diskette files (programs or data), and for enabling the RC700 to function as an interactive terminal connected to a host computer.

Another design goal was to allow several RC700 Micro-Computers to share a number of peripheral units. This requirement becomes more and more evident as prices on CPU-hardware ("non-mechanical" hardware) decreases, so that the "mechanical" peripheral devices such as disc drives and printers, for which the prices do not decrease so rapidly, will take a still increasing part of the total budget for EDP equipment. Especially for systems in the low-range area (micro-computer systems) it will give a very cost-effective solution to implement peripheral units of high quality and to share these units between several CPUs. This is in fact what has been done with the RC700 System by implementing a Line Selector which enables up to 8 RC702 CPUs to share access to diskette drives, printer, and communication line.

The RC700 Micro-Computer can operate either in stand-alone mode (structured BASIC, PASCAL, and MACRO-ASSEMBLER available for programming) or connected to a host computer (interactive terminal via TTY emulating program, or batch terminal via File-Transfer routines). Further several RC700 systems can be connected in a cluster to an RC791 Line Selector and share resources. The shared resources can consist of diskette drive(s) which are connected to one of the RC700 Processors (the MASTER), and of printer and communications line, which are connected to the Line Selector. If required, some of the RC700 Processors in a cluster can have their own diskette drives for local storage, in addition to the common program library on the Master Diskette.

The following list gives some of the features of the RC700 Micro-Computer System:

SOFTWARE

- Structured BASIC (COMAL 80)
- PASCAL (UCSD compatible)
- MACRO-ASSEMBLER
- Advanced catalog system
- TTY emulating program
- File-Transfer routines
- Configuration module

HARDWARE

- Powerful 4 MHz micro-processor (Z80A).
- 48 K bytes RAM memory (expandable to 64 KB). Access time 480 nanosec.
- 2 K bytes ROM memory for autoload routines, etc.
- 12 inch CRT screen (24 lines by 80 char.).
- Semi-graphic character set.
- Micro-processor controlled, detachable keyboard.
- Mini (500 KB) or Maxi (1 MB) diskettes (single or dual drives, giving max. 2 MB diskette capacity per system).
- Matrix Printer, 100 cps print speed and 80 characters per line.
- Two V.24 serial, asynchronous interfaces (for printer and/or communications line, or for other purposes).
- One 8-bit parallel input/output port (for future use or for user-specific purposes).
- Device-sharing possible by including optional 8-line Line Selector for connection of up to 8 RC702 CPUs and sharing of diskette drives, printer, and communications line.

RC700 MICRO-COMPUTER SYSTEM - HARDWARE

DIAGRAM OF RC700 SYSTEM

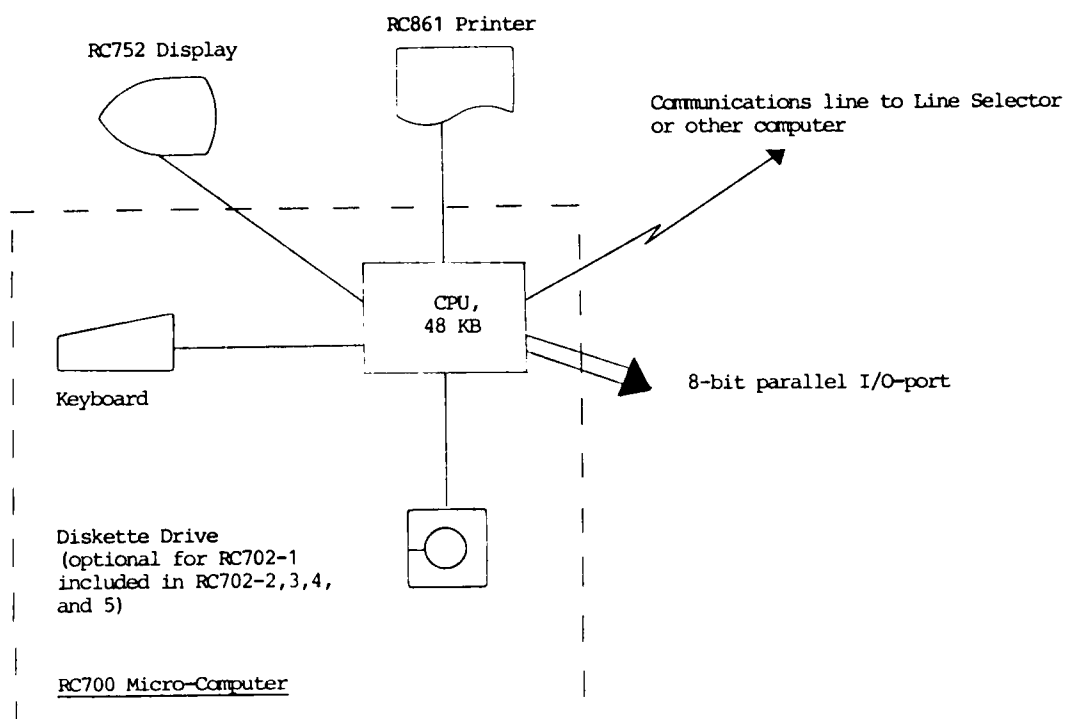


Figure 1

RC700 System

The RC702 is available in five versions:

- RC702-1: CPU + keyboard
- RC702-2: CPU + keyboard + one 0.5 MB diskette drive
- RC702-3: CPU + keyboard + two 0.5 MB diskette drives
- RC702-4: CPU + keyboard + one 1.0 MB diskette drive
- RC702-5: CPU + keyboard + two 1.0 MB diskette drives

RC702 CENTRAL UNIT AND MEMORY

The RC702 is built around one of the most advanced micro-processors on the market, the Z80A. The CPU has a set of 158 different instructions, and it utilizes a 4 MHz clock frequency.

As standard the RC702 is equipped with 48 K bytes RAM memory (expandable to 64 KB) with an access time of 480 nanoseconds, and with 2 KB PROM memory for holding the autoloading routines. The PROM part of the memory does not occupy any addresses in the address space of the working system, which means, that full 48 KB (or 64 KB) RAM memory can be utilized.

The operating system, compilers, and other programs are stored on diskette and transferred to the RAM memory when required. At system start-up the operating system and selected programs are automatically transferred to the RAM memory and initiated. This transfer takes approximately three seconds.

RC761 and RC762 Flexible Disc Drives

Two types of diskette drives are available for connection to the RC700 Micro-Computer, the RC761 mini-diskette drive (capacity 0.5 M bytes) and the RC762 diskette drive (capacity 1.0 M bytes). Up to two diskette drives can be connected to an RC702 CPU, giving a maximum on-line capacity of 2.0 M bytes.

The diskette is used for storing of system and user programs and data files. Program files as well as data files are stored and retrieved by their name, and all file operations are handled by the operating system in connection with an advanced catalog system.

The diskette drives support IBM3740 and IBM System 34 formats, and in order to secure program and data files the diskette can be write protected.

To reduce wear on the equipment, two valuable long-life features are included on the diskette drives: After one second the read/write heads are automatically pulled away from the diskette surface, and after one minute the rotation of the diskette is stopped. These features are activated by measuring the time elapsed since the latest diskette access.

KEYBOARD AND DISPLAY

The keyboard is included under the RC702 designation together with the CPU, while the display unit is delivered under a separate designation, RC752.

The keyboard is a self-contained unit, connected to the RC700 CPU by a single wire, and it is controlled by its own microprocessor. The standard character set is ASCII, and the keyboard layout includes cursor controlling keys.

The RC752 Display Unit is based on a 12-inch CRT screen with a display capacity of 24 lines by 80 characters. The characters are built up by a 5 x 7 dot matrix (contained in a 7 x 10 dot matrix) and they are generated by a semi-graphic character generator. The standard character set is 96-character ASCII (upper-and lower-case). The cursor is displayed as flashing underlining and features for blinking text fields and inverse video are included. The following control functions are implemented:

- line feed
- carriage return
- back space
- cursor UP/DOWN/LEFT/RIGHT
- home
- clear screen
- erase from cursor to end of screen
- erase line
- roll up feature
- XY addressing

RC861 PRINTER

The RC861 is a matrix printer with a printing speed of 100 characters per second and with 80 printing positions on each line. The printer uses standard paper, either fan-fold paper for sprocket feed, or paper roll.

The RC861 Printer is connected to the RC702 CPU via one of the two V.24 interface ports.

PARALLEL I/O PORT

The RC702 Micro-Computer includes one 8-bit parallel input/output interface port through which data under program control can be transferred to or from a peripheral unit. This port could be used for future connections of parallel-interfaced devices to the RC702 Computer, or for user-specific applications.

RC791 LINE SELECTOR

The RC791 Line Selector is used to facilitate resource sharing between several RC700 systems. Up to eight RC700 systems could be connected to a Line Selector, allowing diskette drive(s), printer and communication line to be shared between the attached systems.

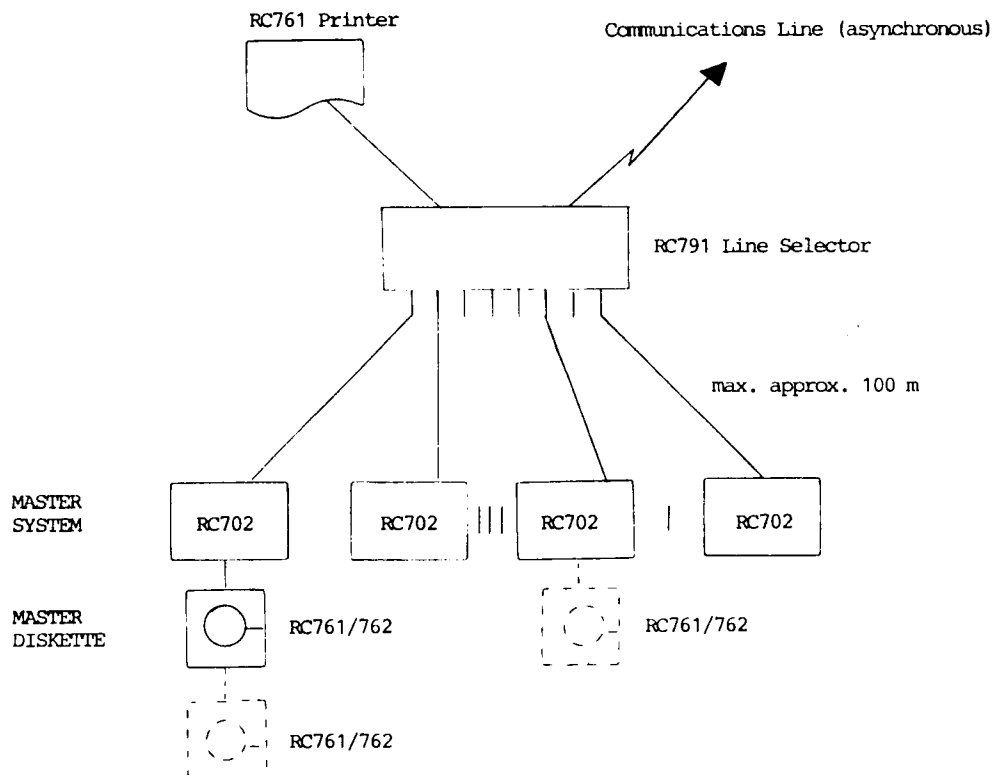


Figure 2

RC700 cluster connected via
Line Selector

The MASTER SYSTEM is equipped with one or two diskette drives which function as a program library for the systems attached via the Line Selector, and programs and data can be transferred between the MASTER SYSTEM and any of the other systems. These could have their own local diskette storage if this is found feasible in the actual situation, and they all function as independent micro-computers.

In a configuration where several RC700 systems are connected to a Line Selector, the RC700 Master System is (automatically) loaded from the Master Diskette, and the remaining RC700 Processors are loaded (automatically) either from local diskette (provided they are equipped with a diskette drive) or from the Master diskette (provided the Down-Line Load Feature is implemented).

At a local office where several RC700 Processors are installed, they could be connected via Line Selector or via Concentrator (RC800/20, RC800/21, or RC3600). If simultaneous communication with the RC8000 system from several RC700 Processors at the branch office is a requirement, the solution with a concentrator should be chosen. If simultaneous communication is not necessary, the Line Selector solution will possibly be the most feasible.

COMMUNICATIONS INTERFACE

The RC702 Micro-Computer is equipped with two serial, asynchronous, V.24 interface ports. Normally one of the ports is used for connection of printer, and the other V.24 port could be used for communication to for instance another RC700 system or a larger computer.

The RC700 Terminal System can be built as a hierarchical structured network, where the local RC700 Micro-Computer can be connected to the mainframe system in the following ways (see figure 3):

- direct connection (asynchronous).
- connection via Line Selector for sharing of program library diskette (on RC700 Master), printer, and communications line. Up to 8 RC700 Processors can be connected to one Line Selector and share devices, and the host communications line from a line selector can go via another line selector and in this way enable cascade coupling of clusters of RC700 systems.
- connection via RC800/20 or RC800/21 concentrators or via RC3600 system functioning as a concentrator for a number of RC700 systems.
- combinations of the above methods.

When communicating with an RC3600 or RC8000 system the RC700 can function in the following two ways:

- RC702 functioning as an ordinary TTY-compatible terminal for the host computer.
- RC702 functioning as an intelligent terminal with batch transfer of programs and data between the RC700 and the host computer.

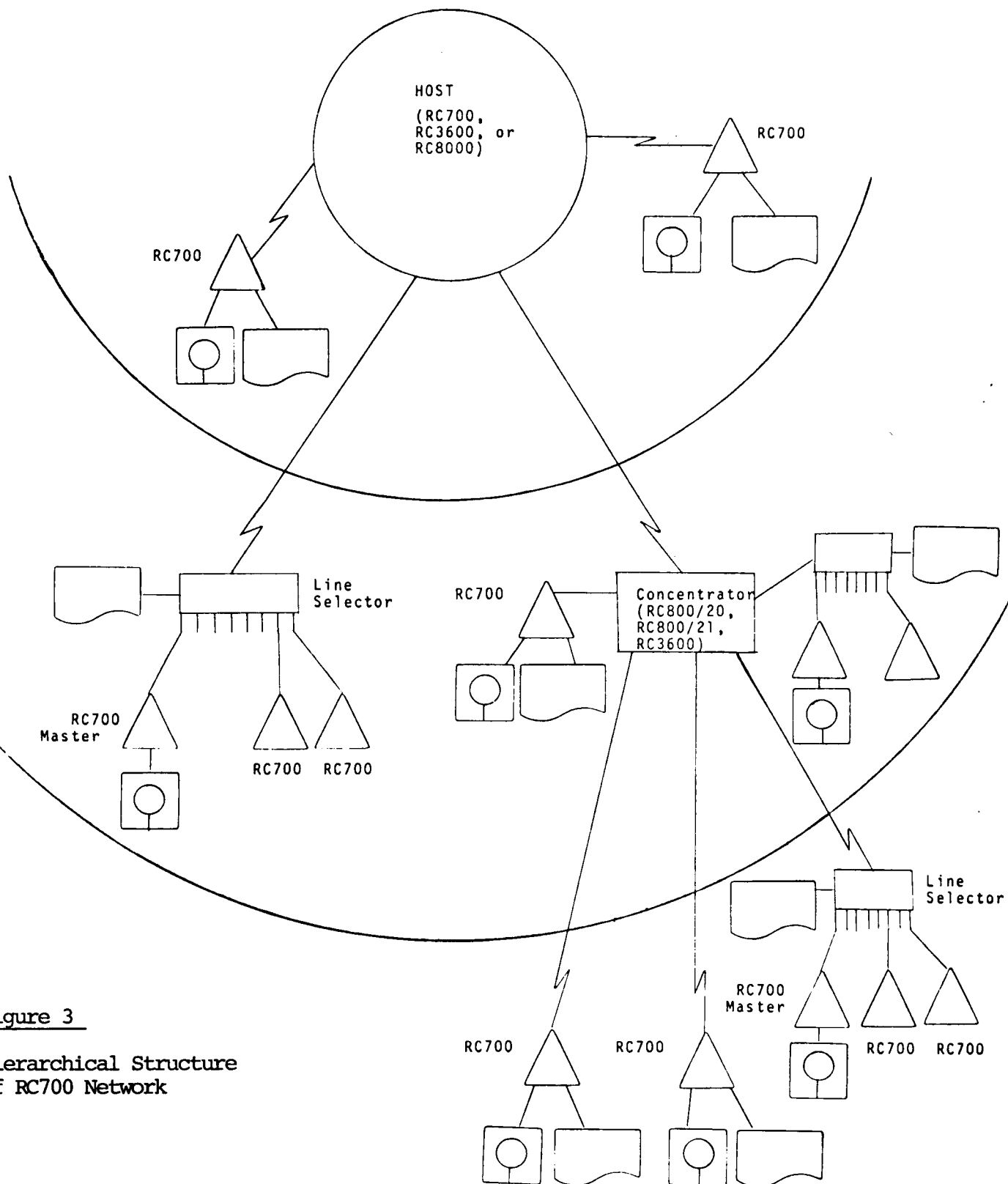


Figure 3

Hierarchical Structure of RC700 Network

RC700 MICRO-COMPUTER SYSTEM - SOFTWARE

Available for the RC700 Micro-Computer System are several programming languages, together with operating system, catalog system, and other basis system routines. Furthermore different programs have been developed for communication with other computers.

BASIS SYSTEM SOFTWARE

As support for the running of other programs and to facilitate the daily work with the system, a number of basis system programs and utility routines have been developed, including:

- System MONITOR and Operating System for control of system operation and handling of peripheral devices.
- CONFIGURATION MODULE which automatically at system start-up provides the system with information about the actual configuration.
- Advanced CATALOG SYSTEM for the handling of files on diskette.
- System Generation Program for generation of system diskettes.
- Diskette Copying Program.

BASIC / COMAL80

COMAL80 (Structured BASIC) is an extended version of the original standard BASIC. The extensions include among other things the following facilities:

- "IF - THEN - ELSE", "REPEAT - UNTIL", "WHILE - ENDWHILE", "CASE - OF" and "LOOP -ENDLOOP" constructs to allow structured program design.
- Procedure call by name
- Inclusion of Assembler Coded Subroutines
- User-defined FUNCTIONS
- Advanced File-Handling Capabilities
- Labelled GOTO

- String variables and string arrays
- 13 decimal digits precision
- TRAP facility on ESCAPE or ERROR
- HELP command

PASCAL

PASCAL is a language which in the last few years has gained wide-spread use all over the world. PASCAL greatly enhances the possibilities for structured programming and for easy and secure handling of complex file structures. The PASCAL version implemented on the RC700 is based on the CP/M operating system and is compatible with the standard UCSD PASCAL.

MACRO ASSEMBLER

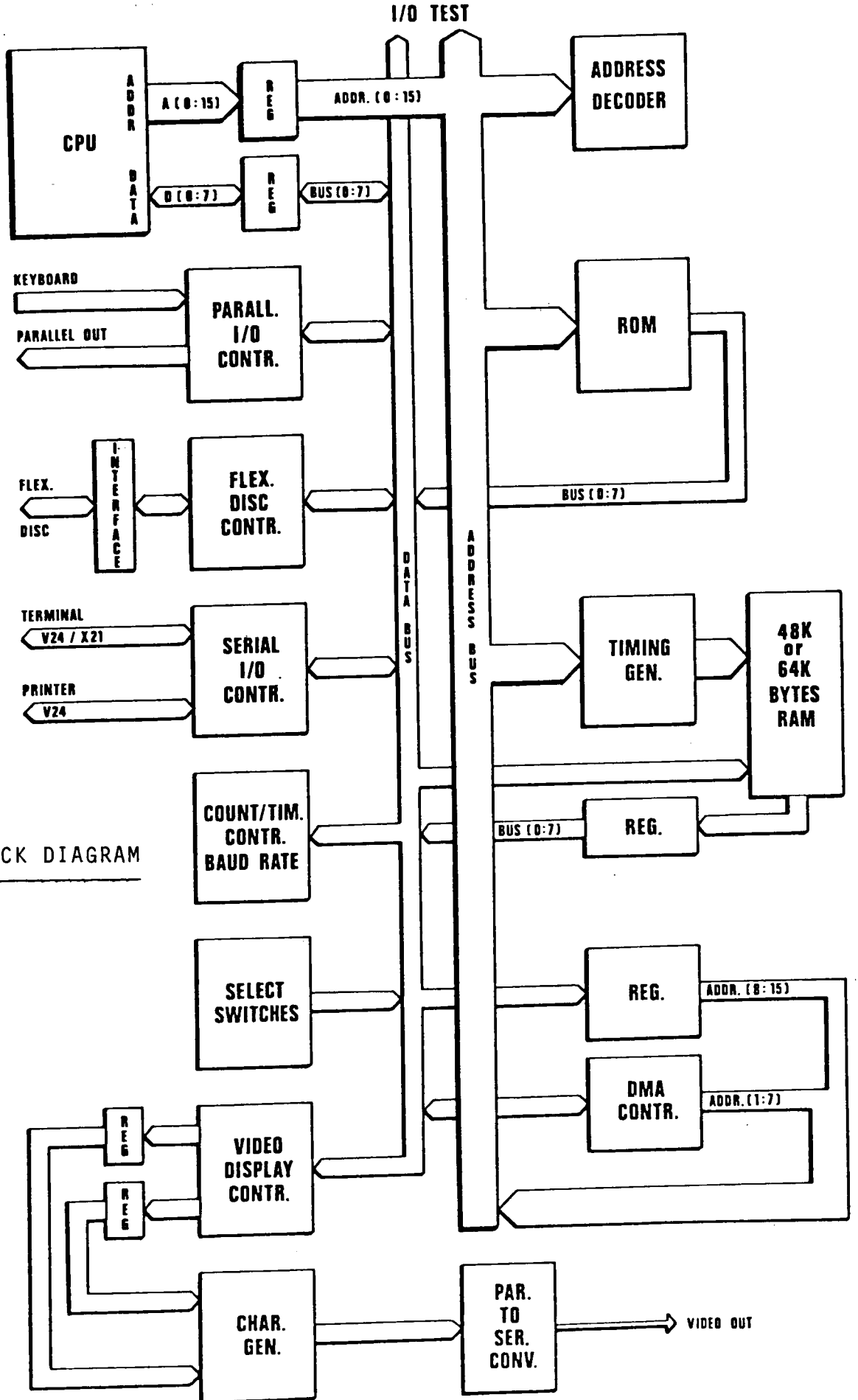
The MACRO ASSEMBLER available for RC700 could be used for programming special routines, for instance routines where low execution time is essential.

TTY EMULATING PROGRAM

The TTY emulating program makes the RC700 work as an ordinary V.24 TELETYPE compatible VDU terminal. The transmission rate can be selected from 50 to 9600 bps. If required (for instance, if the primary usage of the RC700 is as an RC8000 terminal) the functioning of the RC700 as a TTY compatible terminal can be made to occur automatically at system start-up.

FILE TRANSPORT ROUTINES

The File Transport Routines enable the transfer of programs and data between RC700 and another computer (RC3600 or RC8000, for instance).



RC700 BLOCK DIAGRAM

RC COMPUTER

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