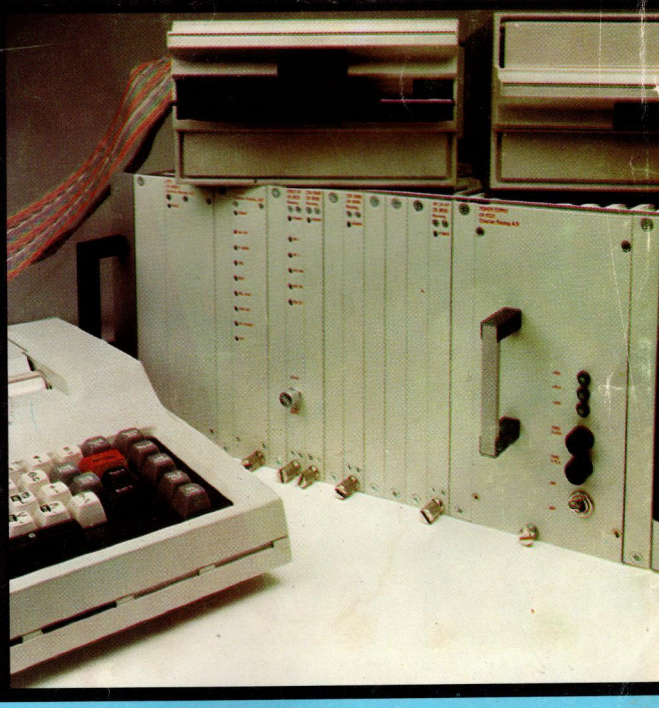
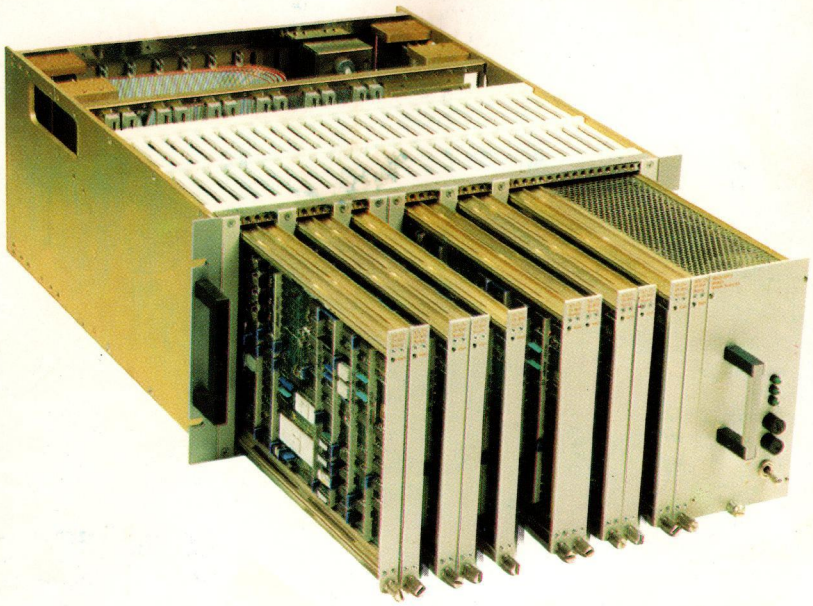
CR80

minicomputer



CHRISTIAN ROVSING A/S
Copenhagen . Denmark

CR80 minicomputer



```
AU001198 1 001E          LDM   Z#100                ;   Z#100=>PSW(15:13), DISABLE TIMER ;
         1 001F ;-------------------------------------------------------------------------;
AU001199 1 001F ;
AU001200 1 001F ; ESG LONGITUDINAL REDUNDANCY CHECK (LRC) PROCESSING (ESG STATE 1)
AU001201 1 001F ;
         1 001F ;-------------------------------------------------------------------------;
AU001202 1 001F ESP030:                               ; ESG LRC PROCESSING:
AU001203 1 001F          MOV   ESGVSM          R0     ;
AU001204 1 0020          IEQ           R0  ESGPVS     ;   IF PRIMARY_ESG ACTIVE
AU001205 1 0021          MOVC  SYSESP1         R5     ;     THEN PVS_ADDR=>ADDR
AU001206 1 0023          IEQ           R0  ESGSVS     ;   ELSE
AU001207 1 0024          MOVC  SYSESP2         R5     ;     SVS_ADDR=>ADDR
AU001208 1 0026          SUB   XBASE           R5     ;   ADDR-BASE=>ADDR
AU001209 1 0028          MOV   -X+NAME+X+SSIZ.X5  R0  ;   TOTAL_SIZE=>N
AU001210 1 0029          ADDC  -1              R0     ;   N-1=>N
AU001211 1 002A          MOD                   R0     ;
AU001212 1 002B          MOVX  0.      X5      R1     ;   N.ADDR=>PLRC
AU001213 1 002C          MOV   R1  PLRC        R2     ;
AU001214 1 002D          MOVC  #FFFF           R2     ;   #FFFF=>LRC
AU001215 1 002E                                       ;   WHILE N:=N-1 <> 0 DO
AU001216 1 002E ESP031:                               ;   BEGIN
AU001217 1 002E          XOR           X5      R2     ;     LRC XOR ADDR.ESG=>LRC
AU001218 1 002F          ADDC  1               R5     ;     ADDR+1=>ADDR
AU001219 1 0030          SOB           R0  ESP031     ;   END
AU001220 1 0031          MOV           R2  CLRC       ;   LRC=>CLRC
AU001221 1 0032          CME           R1      R2     ;   IF CLRCC>PLRC
AU001222 1 0033          JMP                   ESP100 ;E    THEN GOTO ESG_RECOVER
         1 0034 ;-------------------------------------------------------------------------;
AU001223 1 0034 ;
AU001224 1 0034 ; ESG 'PREP'/'START' PROCESSING (ESG STATE 1)
AU001225 1 0034 ;
         1 0034 ;-------------------------------------------------------------------------;
AU001226 1 0034 ESP040:                               ; ESG PREPARATION:
AU001227 1 0034          LDM   Z#111                  ;   Z#111=>PSW(15:13), DISABLE INT
AU001228 1 0035          MOVC  DAESCP>Z        R2     ;   ESCCP_DEVICE_ADDR=>DA
AU001229 1 0036          SIO           R0      R2     ;   READIO(DA,STATUS)
AU001230 1 0037          IBN           R0  BESCCPSTART;  IF ESCCP_START
AU001231 1 0038          JMP                   ESP050 ;     THEN GOTO ESG_START
AU001232 1 0039          IBZ           R0  BESCCPPREP ;  IF ESCCP_PREP
AU001233 1 003A          JMP                   ESP010 ;     THEN GOTO INT_RESERVATION
AU001234 1 003B          MOVC  MESCCPPREP      R0     ;
AU001235 1 003C          CIO           R0      R2     ;   WRITEIO.(DA,PREP=1)
AU001236 1 003D          MOV   LETPTR          R5     ;   LET_ADDR=>LET
AU001237 1 003E          SOZ       -SYSESR+LTMS1.X5   ;   IF LTMS1.LET <> 0
AU001238 1 0040          JMP               ESP010     ;     THEN GOTO INT_RESERVATION
AU001239 1 0041                                       ;   ELSE
AU001240 1 0041                                       ;   BEGIN
AU001241 1 0041          INC       -SYSESR+LTMS1.X5   ;     INCREMENT MESSAGE1.LET
AU001242 1 0043          MOVC  30000/10        R0     ;
AU001243 1 0045          MOV   R0  -SYSESR+LTMS4.X5   ;     30 SECONDS=>MESSAGE4.LET
AU001244 1 0047          MON   SLET                   ;     SEND_LETTER (TO RTC)
AU001245 1 0048          JMP               S4  ESPE50 ;E    LETTER ERROR, GOTO ERROR5
AU001246 1 0049          JMP               ESP010     ;     GOTO INT_RESERVATION
AU001247 1 004A                                       ;   END
         1 004A ;-------------------------------------------------------------------------;
AU001248 1 004A ;
AU001249 1 004A ; ESG 'START' PROCESSING (ESG STATE 0)
AU001250 1 004A ; (ESG STATE 0 -> 2 PROCESSING)
AU001251 1 004A ;
         1 004A ;-------------------------------------------------------------------------;
```

Hardware

The CR80 mini is a modern, high speed, general purpose minicomputer designed by CHRISTIAN ROVSING A/S and produced since 1975.

The emphasis has been on a modular and reliable hardware configuration, utilizing state of the art LSI's (Large Scale Integration) and fast Schottky TTL technology.

The philosophy behind the hardware architecture is that of interfacing completely selfcontained, two-ported modules (building blocks) via two types of ultra high speed backplane Bus's; the Main-Bus connecting all modules, and Sub-Bus's for local processing by a group of modules without loading the Main-Bus.

The CR80 mini standard catalogue shown overleaf now contains nearly one hundred different modules.

A complete range of processors, memories, I/O modules and application oriented modules ensures technically and economically correct solutions and extension capabilities in accordance with future needs, without lengthy interrupts of computer operations.

Outstanding among the CR80 minicomputer building blocks are:

- A peripheral processor file management system, connecting data bases of up to 16 disk drives of 300 megabytes capacity via multicomputer ports to one or more CR80 minicomputers, relieving the main CPU's completely of disk and file related processing
- A fast serial I/O bus, the TDX-Bus (Time Divisioned Multiplexed), which extends the standard parallel I/O bus to several kilometers from the computer, and provides high speed communication at 1.6384 Mb/s between several hundreds of I/O devices, communication ports, terminals and computers. This greatly reduces the number of separate circuits required in many systems, so that many large and expensive multicore cables can be replaced by a single cable-pair.
- X-net, an upwards compatible serial multidrop TDX-Bus which can connect several thousand terminals, via wall outlets to one or more Host computers and central printing stations. The X-net makes it possible to access central computing power from every room in a building complex covering several kilometers in area, via a single cable-pair.
- An extensive range of microcoded communication ports covering most common line protocols.

Software

Like the CR80 hardware, the CR80 software follows a completely modular concept. This policy enables the user to select a number of existing modules, create a few special purpose modules and integrate them all into a customized system, which is easy to implement, to test, and to maintain.

The System Software package used on the CR80 computer is the CR80 SYSTEM ONE.

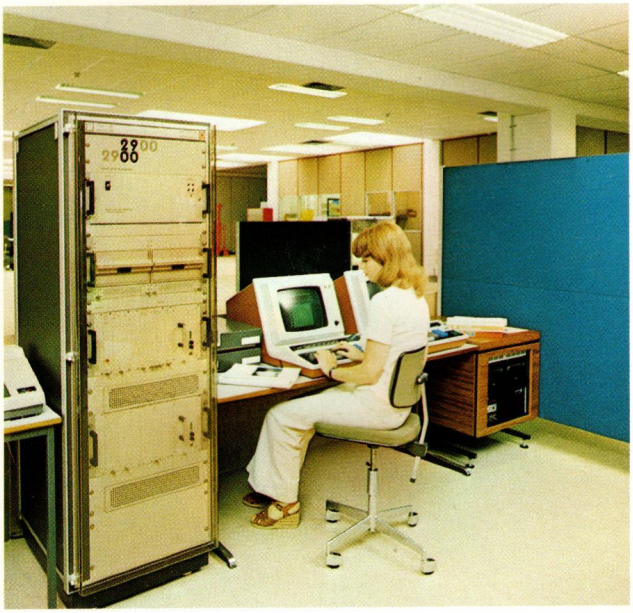
CR80 SYSTEM ONE supports interrupt handling, multiprocessing in up to 8 CPU's and time shared multiprogramming in each single CPU. Process communication is available either as message handshake communication or as an extremely fast data buffer exchange facility.

The CR80 SYSTEM ONE FILE MANAGEMENT SYSTEM enables manipulation of disk files, virtual cardreaders and line printers. The File Management System supports random (direct) access and sequential access. The access method as well as the record-size is a file-open parameter.

Software development on the CR80 is fully supported by the CR80 SYSTEM ONE UTILITY PACKAGE which includes such standard facilities as editor, assembler, binder and patch programmes. Furthermore, the package includes a PASCAL compiler providing the facility of programming the CR80 in one of the most advanced high-level languages of the future.

The CR80 SYSTEM ONE DRIVER PACKAGE supports the standard peripherals plus a wide range of special units interfacing the CR80. Especially in the area of handling communication lines, CHRISTIAN ROVSING A/S has developed an extensive set of System Modules.

To support the highly reliable hardware modules, CHRISTIAN ROVSING A/S has designed an advanced system of on-line and off-line Diagnostic Software giving fast error detection and thereby further improved system availability.



Systems

The flexible architecture of the CR80 mini, together with fast interrupt handling capabilities and the comprehensive instruction set, enables the CR80 mini to cover a wide range of applications in the field of fast data processing and data manipulation, process control, intelligent terminal applications, administration systems etc. Furthermore, the CR80 mini covers the area of more specialised systems when used as a front-end processor, concentrator or array processor.

Due to the modularity of the CR80 mini, simple low cost processors can be configured for less demanding applications, and high throughput rate and processing power requirements can be met by means of its multiprocessing facilities.

For applications requiring high reliability, such as node processors in data communication networks, the CR80 mini can be dualized using the Watchdog module to control the switch over from the failed branch to the hot standby. This is based on on-line diagnostic programmes running in both halves with the status regularly transmitted to the Watchdog module. The lines carrying the information between the nodes, interface through Line Termination Units connected to the CR80 mini via I/O or TDX bus's.

Utilizing the TDX bus all line multiplexing is done by interleaving of packets on the bus without loading of the CR80 minicomputer.

Since its introduction in 1975, the CR80 mini has been implemented successfully in many systems. The CR80 mini has proven itself in over 50 different applications:

- Node Processor in data communication networks.
- Message Editing and Distribution Processor for terminal clusters.
- Array Processor handling satellite data in real time.
- Data Network Control Centre Computer incl. 300 Mb. disks.
- Fast Formatter/Control Processor for High Density Digital Tape Stations.
- Color Image Manipulation System.
- Laser Plotter Controller.
- Front-End Computer for Mainframes (IBM & others).
- Traffic Analysis Systems.
- Process Control Systems.
- Data Communication Concentrator and Message Switcher.
- Telemetry Systems.
- Automation of TV-studios.

CHRISTIAN ROVSING A/S

CR80 minicomputer features.

THE CR80 IS AN EXTREMELY FAST MULTIPROCESSING AND MULTIPROGRAMMABLE MINICOMPUTER BASED ON SCHOTTKY-LSI TECHNOLOGY.

- 16 bit words, 2's complement processing.
- Bidirectional Main Bus and local Sub Busses, max. transfer speed: 4M words/sec.
- Addressing range: Main Bus 256K words or 512K bytes
  Sub Bus 256K words or 512K bytes
- 274 instructions, fixed length 16 bits, extendable by MODIFY to double length.
- Execution: 0.5 to 1 million instructions per second with standard memory (in multiprocessing mode up to 5.0 Mips).
- CPU clock rate: 8MHz.
- 12 addressing modes: Immediate, base relative, program relative, location relative, register, and indexed.
  Word (16 bits, 2's complement) and byte (8 bits) addressing.
- 6 types of vectorized prioritized interrupts, 3 maskable, 64 vectors and 4 priority levels.
- 14 internal registers: 8 accumulators, BASE pointer, MODIFY register, PROGRAM pointer, PROGRAM counter, TIMER register, and PROGRAM STATUS register.
- Automatic loading and saving of all CPU registers with programs during multiprogram execution.
- User accessible CPU microcode RAM, dynamically alterable user extensions of instruction set during execution.
- Special instructions make CPU microcode available on local Sub Busses for direct fast execution by function module (up to 8 FUNC modules per Sub Bus), e.g. fast fourier transform, floating point etc.
- Max. 8 CPU's in a CR80 System, safe hardware based multiprocessing.
- Max. 63 I/O devices (DMA & FUNC devices excepted).
- Direct Memory Addressing (DMA) devices to 2.6 Mw/sec. with standard memory.
- Wide range of peripheral and communications interfaces, incorporating LSI's and bipolar microprocessors for further distribution of computing power.
- Hardware and firmware have taken over many functions previously done by system software.

CR80 minicomputer

STANDARD MODULES

CR 8000	Main Bus Controller
CR 8000/2	Main Bus Controller
CR 8001	CPU
CR 8001/1	CPU
CR 8002	4K Random Access Memory
CR 8003	Programmable Read Only Memory
CR 8004	RAM/ROM Memory
CR 8005	16K Random Access Memory
CR 8006	32K Random Access Memory
CR 8010	Mult/ADD
CR 8011	Floating Point Add
CR 8012	Floating Point Multiply
CR 8013	Floating Point MULT/ADD
CR 8014	Floating Point Arithmetic
CR 8022	Power Supply
CR 8030	AV24 I/F
CR 8031	S330 DMA I/F
CR 8032	Bidirectional Parallel I/F
CR 8033	Floppy disk I/F
CR 8034	Dual Parallel I/F
CR 8035	ESCCP I/F
CR 8036	L3050 I/F
CR 8037	NOVA I/F
CR 8038	Keyboard
CR 8039	Keyboard
CR 8040	Color Dishplay Generator (CDG)
CR 8041	External Asynchronous LTU
CR 8042	Synchronous Line Termination Unit
CR 8043	Internal Line Termination Unit
CR 8044	Disk Storage System
CR 8045	VDU
CR 8046	CR 80 DMA
CR 8047	BIT SYNCHRONIZER
CR 8048	Frame Synchronizer
CR 8049	Hamming Calculator
CR 8050	Diskette Drive 140
CR 8051	Diskette Formatter 1140
CR 8052	Floppy Disk Controller
CR 8053	Vizir I/F
CR 8054	Varian V77 I/F
CR 8055	HDTR Controller
CR 8056	TLM I/F
CR 8057	IBM I/F
CR 8058	ICL 2900 I/F
CR 8059	HP I/F
CR 8060	Card Reader CB 105-B
CR 8061	Line Printer 8396
CR 8064	Watchdog
CR 8065	Async. LTU (internal 300 baud generator)
CR 8068	CPU Simulator
CR 8070	Tape I/F
CR 8071	Crypto I/F
CR 8072	Disc I/F
CR 8081/1	Active Bus Ext. (Transmitter)
CR 8081/2	Active Bus Ext. (Receiver)
CR 8082	Memory Mapping Bus Ext.
CR 8088	Serial I/O
CR 8090	TDX I/F
CR 8092	Analog I/F
CR 8095	LTU, for TDX I/F
CR 80100	SCM
CR 80101	CPU (Mainbus)
CR 80102	CPU (Subbus)

TDX Modules:

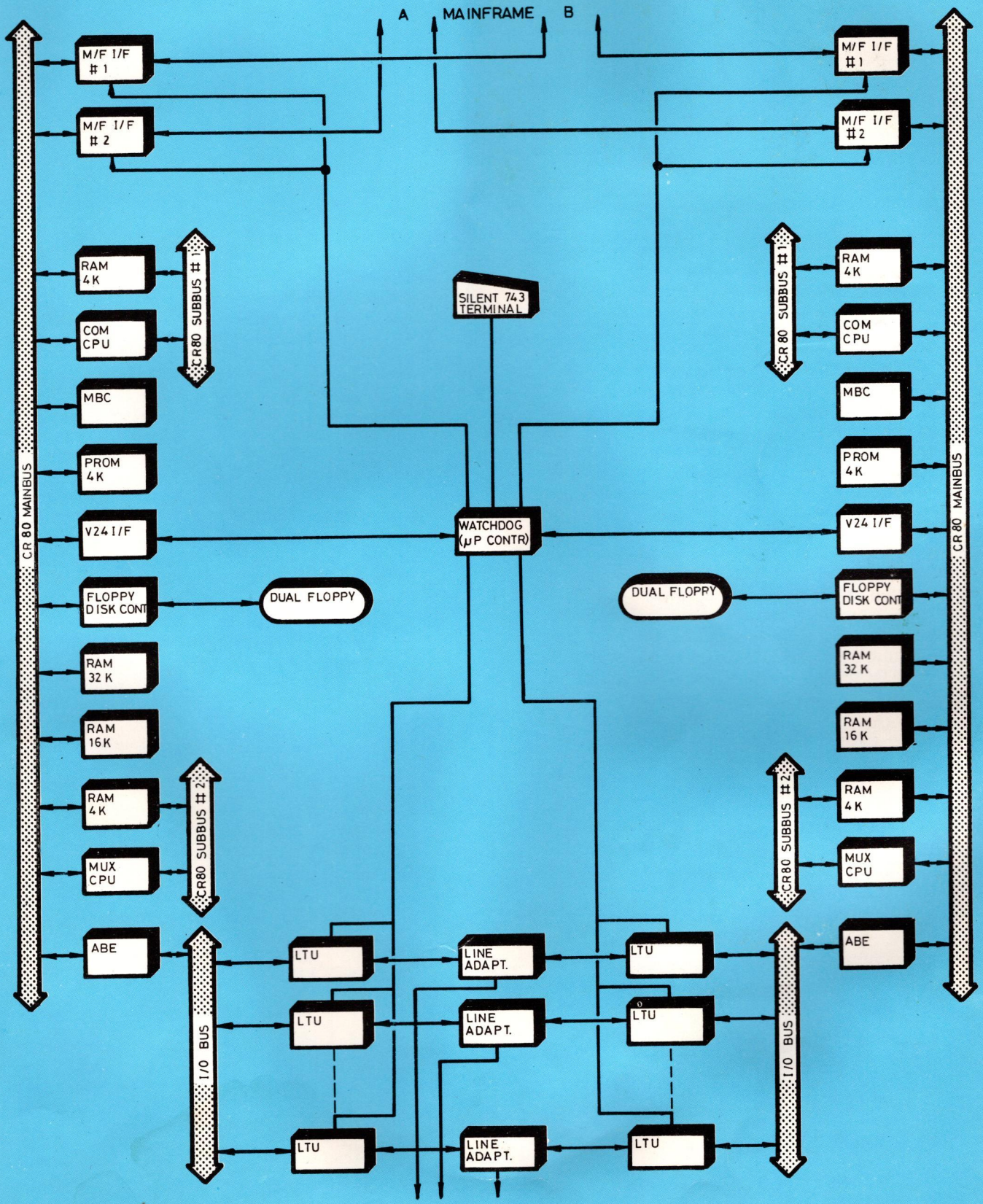
CR 1070	TDX CDMA
CR 1071	TDX RD
CR 1072	TDX CDSP
CR 1060	LTUX, 9.6kb
CR 1061	LTUX, X21
CR 1062	LTUX, Sync.
CR 1063	LTUX, Async. A
CR 1064	LTUX, 9.6kb Internal
CR 1065	LTUX, 32kb
CR 1066	LTUX, Async. B
CR 1067	LTUX, Async. B Special
CR 1068	LTUX, NBS Crypto
CR 1090	LTUX, MM master module
CR 1091	LTUX, GIO General I/O
CR 1092	LTUX, PIO Parallel I/O
CR 1093	LTUX, ADC AD-conv.
CR 1094	LTUX, DAC DA-conv.
CR 1095	LTUX, MBI Main Bus I/F
CR 1096	LTUX, IOPU I/O Protection unit

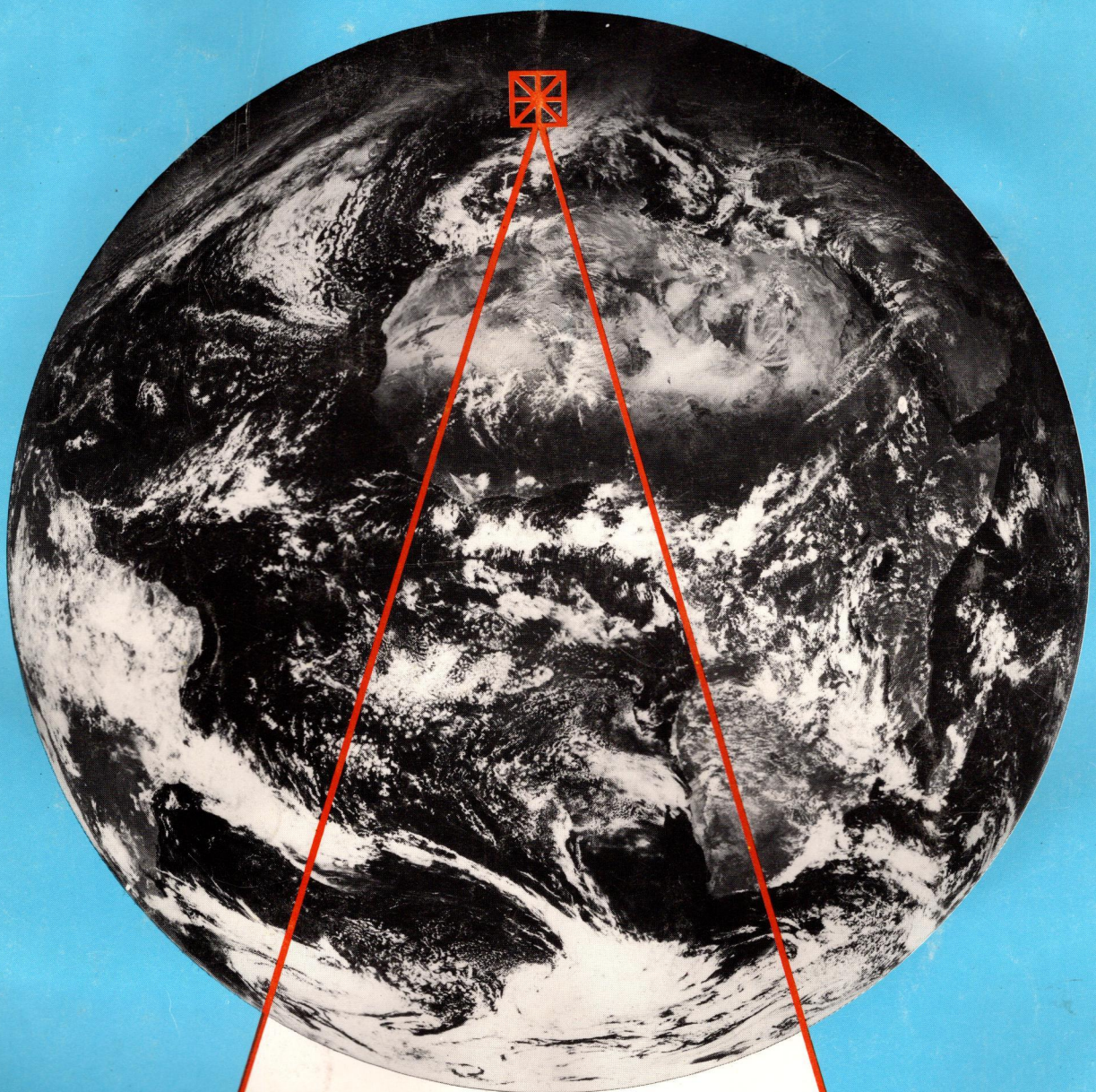
X-Net modules:

CR 2510	Terminal wall outlet
CR 2520	Amplifier and splitter
CR 2530	Terminal
CR 2540	X-net Controller
CR 2541	X-net output driver
CR 2550	Terminal adapter
CR 2551	ID-Card reader
CR 2552	V24 Terminal interface
CR 2553	Modem interface

CR80

Redundant front-end processor configuration. Up to 80K character throughput between communication lines and main frame.





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