DORA SYSTEM SUMMARY

INTEGRATED BROADCAST SYSTEM

CR CERT



integrated broadcast system.

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DORA SYSTEM SUMMARY

INTEGRATED BROADCAST SYSTEM

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LIST OF CONTENTS

1. INTRODUCTION

2. SYSTEM DESCRIPTION
2.1 PHYSICAL DESCRIPTION
2.2 FUNCTIONAL DESCRIPTION
2.2.1 REMOTE CONTROL SUBSYSTEM
2.2.2 RESOURCES MANAGEMENT SUBSYSTEM
2.2.3 PROGRAM CONTROL SUBSYSTEM
2.2.4 EDITING SUBSYSTEM
2.3 COMMUNICATION BETWEEN SUBSYSTEMS
2.4 DATA STRUCTURES AND COMMANDS
2.4.1 IDENTIFICATION OF DATA ELEMENTS
2.4.2 COMMANDS
2.4.3 SCHEDULES AND FORMS
2.5 ERROR HANDLING

3. SUBSYSTEM DESCRIPTION
3.1 REMOTE CONTROL SUBSYSTEM
3.1.1 FUNCTIONAL DESCRIPTION
3.1.2 THE TDX BUS
3.1.3 THE MASTER TIME CODE
3.1.4 THE ROUTING SWITCHER
3.1.5 THE DELEGATION PANEL
3.1.6 INTERFACES TO OTHER SUBSYSTEMS
3.2 RESOURCES MANAGEMENT SUBSYSTEM
3.2.1 FUNCTIONAL DESCRIPTION
3.2.2 INTERFACES TO THE OTHER SUBSYSTEMS
3.2.3 BOOKING PROCESS FOR FACILITIES
3.2.4 BOOKING PROCESS FOR COUPLINGS
3.2.5 COUPLING AND DELEGATION PROCESS
3.3 PROGRAM CONTROL SUBSYSTEM
3.3.1 FUNCTIONAL DESCRIPTION
3.3.2 INTERFACES TO THE OTHER SUBSYSTEMS
3.3.3 PROGRAM PLANNING
3.3.4 PROGRAM CONTROL PROCESS
3.4 EDITING SUBSYSTEM
3.4.1 FUNCTIONAL DESCRIPTION
3.4.2 INTERFACES TO THE OTHER SUBSYSTEMS
3.4.3 RECORDING PROCESS
3.4.5 REPLAY PROCESS

1. INTRODUCTION

The DORA system is a computer assisted production system which will be used by the Danish Broadcasting Corporation (Danmarks Radio) for recording, editing and automated transmission of television news and sports broadcasts. The system consists of a dualized bus system (TDX-bus) which integrates a number of VDU's and video/audio facilities with a CR80 computer system within a wide area.

The purpose of the system is to provide for better and more efficient working conditions for the production staff during preparation, editing and broadcasting. This goal is achieved in two ways:

- During the working process a large amount of information has to be distributed among the studios and editorial offices. The user may access these data from a terminal, connected to the CR80 system via the TDX-bus.

- During program transmission, the computer takes care of all critical functions.

The computer system assists the user during the production process in the following ways:

- Remote control of facilities

- Editing of broadcast programs from attached video sources

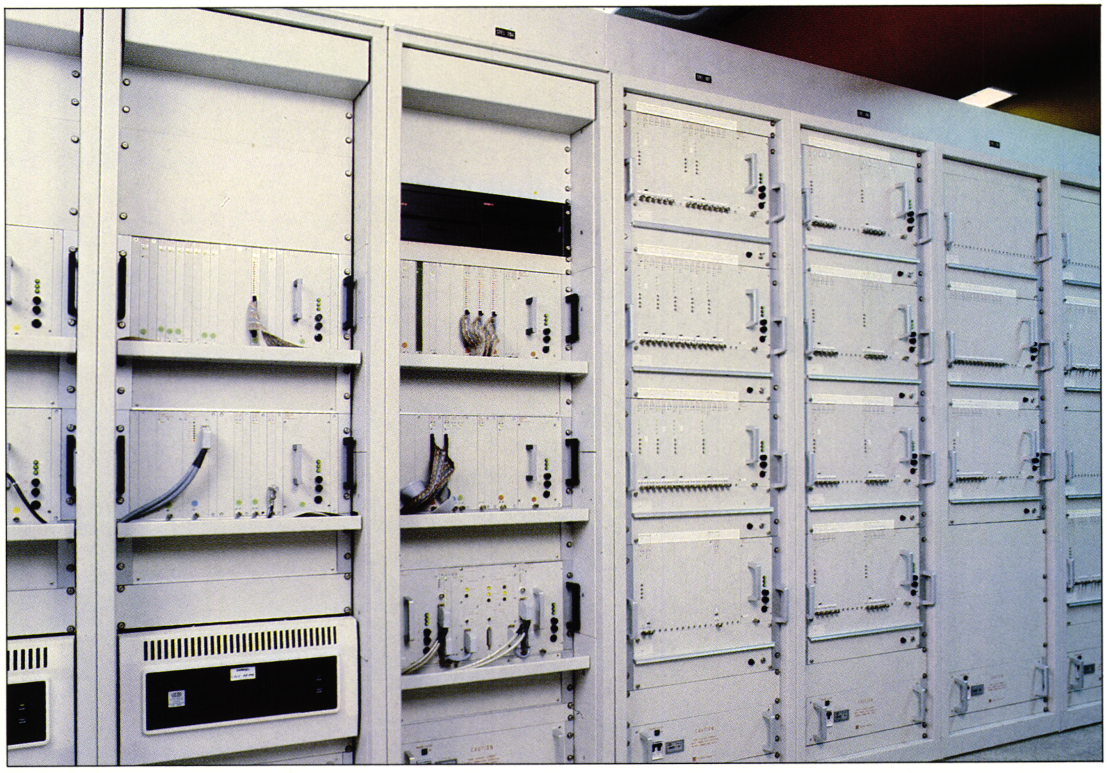
- Real time control of video sources during studio transmission

- Booking of facilities.

Each interface connected to the TDX-bus contains its own microprocessor,

which controls the facility, whereas the CR80 system is responsible for the superior system control.


1
BOSCH
2



The CR80 minicomputers and machine interfaces in the central machine room.



The central VTR pool.

2. SYSTEM DESCRIPTION

2.1 PHYSICAL DESCRIPTION

The DORA computer system consists of

- Video and audio facilities
- VDU terminals and printers
- Remote control panels
- Computers and microprocessors
- A dualized communication line (TDX-bus) for exchange of data between facilities, remote control panels and processors.

The connection between a machine/facility/panel/terminal is implemented in a microprocessor based interface (denoted LTUX). The total system configuration is outlined on the next page.

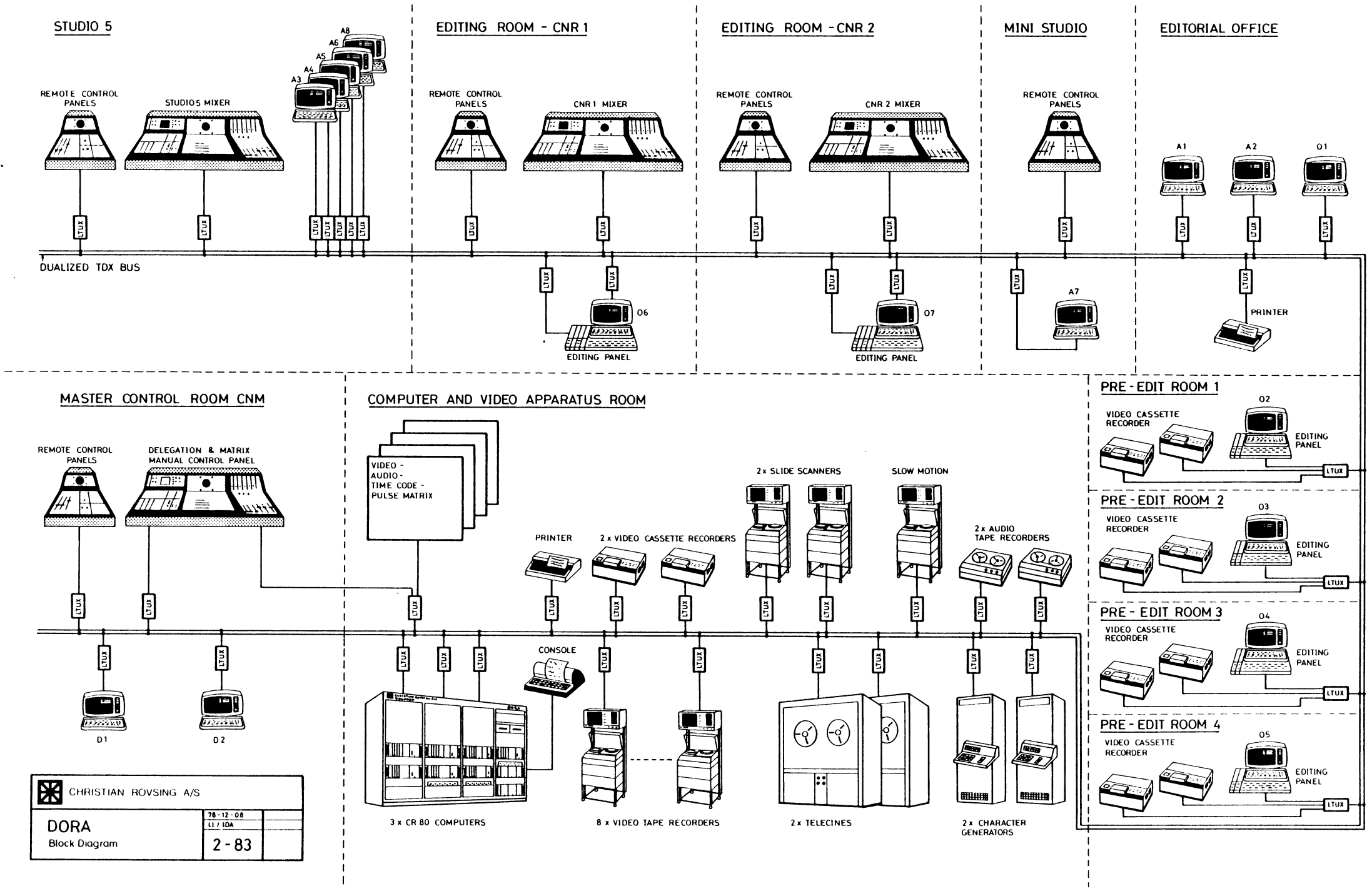
VIDEO- AND AUDIO FACILITIES

The facilities controlled by the DORA system include machines of the following kinds:

- Video tape recorder (VTR)
- Audio tape recorder (ATR)
- Telecine
- Still-picture machine

- Character Generator
- Slow motion machine
- Video casette machine
- Editing switcher
- Production switcher
- Matrix (routing switcher)

A number of external facilities are connected to the matrix, e.g. a digital frame store and a text machine. These facilities are of course not controlled by the system.


STUDIO 5
REMOTE CONTROL PANELS
STUDIO5 MIXER
A3
A4
A5
A6
A8
LTUX
DUALIZED TDX BUS
EDITING ROOM - CNR 1
REMOTE CONTROL PANELS
CNR 1 MIXER
06
EDITING PANEL
EDITING ROOM - CNR 2
REMOTE CONTROL PANELS
CNR 2 MIXER
07
EDITING PANEL
MINI STUDIO
REMOTE CONTROL PANELS
A7
EDITORIAL OFFICE
A1
A2
01
PRINTER
MASTER CONTROL ROOM CNM
REMOTE CONTROL PANELS
DELEGATION & MATRIX MANUAL CONTROL PANEL
D1
D2
COMPUTER AND VIDEO APPARATUS ROOM
VIDEO - AUDIO - TIME CODE - PULSE MATRIX
PRINTER
2 x VIDEO CASSETTE RECORDERS
2 x SLIDE SCANNERS
SLOW MOTION
2 x AUDIO TAPE RECORDERS
CONSOLE
3 x CR 80 COMPUTERS
8 x VIDEO TAPE RECORDERS
2 x TELECINES
2 x CHARACTER GENERATORS
PRE - EDIT ROOM 1
02
VIDEO CASSETTE RECORDER
EDITING PANEL
PRE - EDIT ROOM 2
03
VIDEO CASSETTE RECORDER
EDITING PANEL
PRE - EDIT ROOM 3
04
VIDEO CASSETTE RECORDER
EDITING PANEL
PRE - EDIT ROOM 4
05
VIDEO CASSETTE RECORDER
EDITING PANEL
CHRISTIAN ROVSING A/S
DORA
Block Diagram
78 - 12 - 08
LI / IDA
2 - 83

TERMINALS

The system contains the following equipment intended for reading/writing data from/to the system:

- o VDU terminals
- o Printers
- o Operator's console
- o Floppy disk drives

Terminals and printers are connected to TDX-bus via interfaces, whereas the operator's console and the floppy disk drives are connected directly to the computer system.

VDU TERMINALS

The terminals are separated into 3 types corresponding to their function:

- o Recording/editing terminals
- o Program control terminals
- o All purpose terminals

Some of the editing terminals are equipped with editing keyboard.

PRINTERS

The printers are intended for print-out of the various schedules of the system.

OPERATOR's CONSOLE

The operator's console is used for start-up, close-down and supervision of the CR80 computer system.

FLOPPY DISK DRIVES

The floppy disk drives are used for

- Bootstrap of the system from floppy disk
- Storage of editing and program control schedules on floppy disk for archival purposes

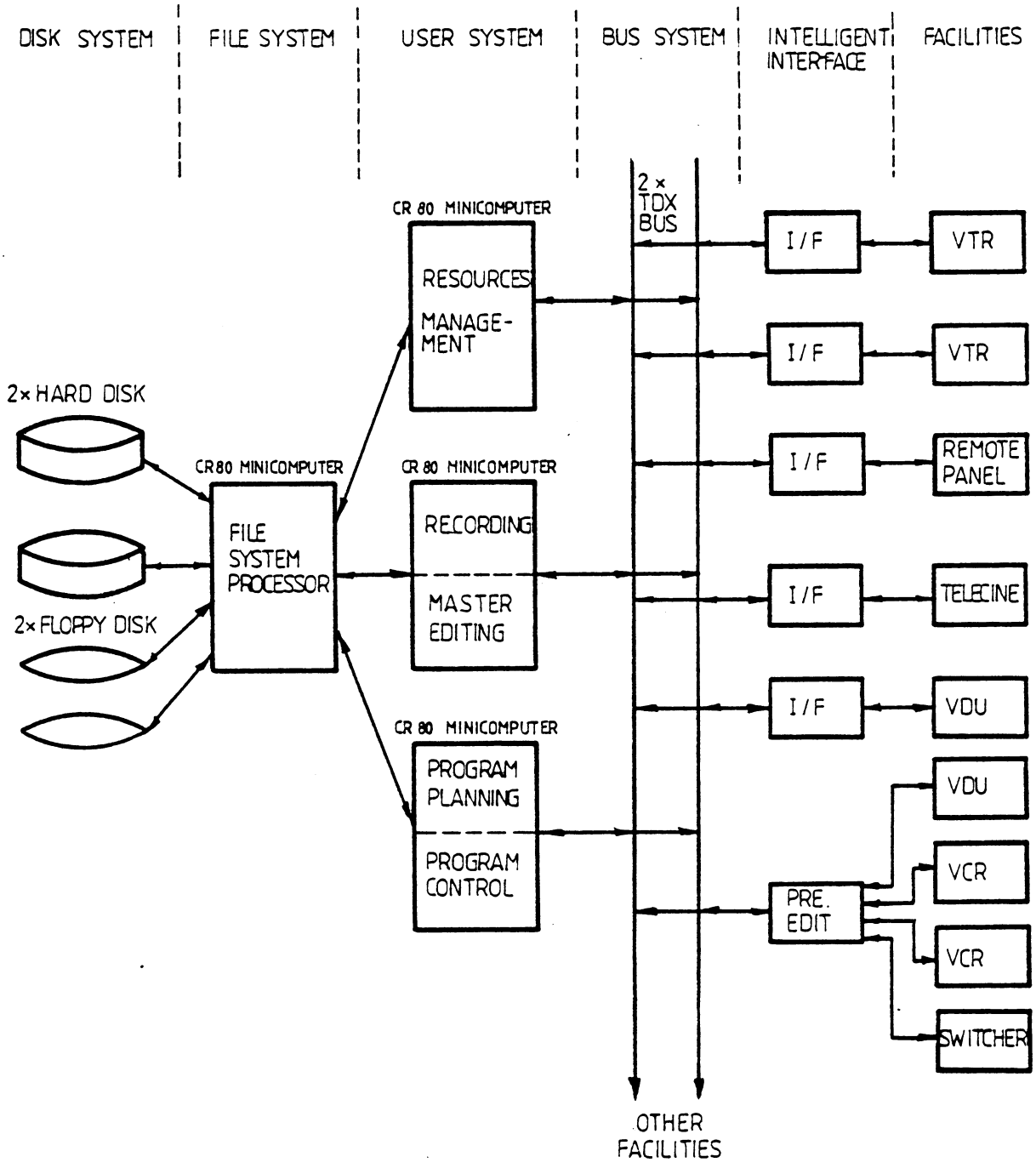
REMOTE CONTROL PANELS

Each of the facilities listed under "Video- and audio facilities" may be operated from a remote control panel. Remote control panels exist in the editing rooms, the mini-studio and studio 5.

COMPUTERS AND MICROPROCESSORS

The system contains 4 identical computers of type CR80 as shown at the figure on the next page. These 4 CR80's contain:

- Editing Subsystem
- Resources Management Subsystem
- Program Control Subsystem
- File system which manages the data base of system on hard disk


DISK SYSTEM
FILE SYSTEM
USER SYSTEM
BUS SYSTEM
INTELLIGENT INTERFACE
FACILITIES
2× HARD DISK
2× FLOPPY DISK
CR80 MINICOMPUTER
FILE SYSTEM PROCESSOR
CR 80 MINICOMPUTER
RESOURCES MANAGE-MENT
CR 80 MINICOMPUTER
RECORDING
MASTER EDITING
CR 80 MINICOMPUTER
PROGRAM PLANNING
PROGRAM CONTROL
2× TDX BUS
I/F
VTR
I/F
VTR
I/F
REMOTE PANEL
I/F
TELECINE
I/F
VDU
VDU
VCR
PRE. EDIT
VCR
SWITCHER
OTHER FACILITIES

Each system is implemented on its own machine. This configuration satisfies the following requirements:

- The 3 user systems are completely independent of each other, i.e. each user system is a stand-alone system

- If a machine breaks down, the system running in that computer may be restarted in another machine.

- If an interface or device breaks down, the failure will not have any effect on other system components

The file system processor is connected to a dual disk system which contains the data base. The disks contain identical data. If one disk breaks down, the system will automatically use the other one.

The microprocessors in the interfaces perform all time critical operations on the facilities, e.g. reading of time codes on VTRs and start/stop operations. The operation of the facilities is controlled by the CR80 system during editing and telecasting.

TDX-BUS

The TDX-bus is a dualized data transmission line intended for high speed exchange of data. The TDX-bus has the following characteristics:

- Dualization:
  If e.g. one bus-line breaks down, all interfaces are automatically switched to the other bus-line

- Facilities are able to communicate via the TDX-bus without loading the CR80 computer system.

2.2 FUNCTIONAL DESCRIPTION

The DORA system may be subdivided into the below mentioned subsystems:

- o Remote Control Subsystem
- o Resources Management Subsystem
- o Program Control Subsystem
- o Editing Subsystem

2.2.1 REMOTE CONTROL SUBSYSTEM

The purpose of the Remote Control Subsystem is to support manual remote operation of a facility from a remote control panel corresponding to the facility. Remote control of a facility includes the following procedures:

- o Coupling:
  Creation, in the matrix organized routing switcher, of a physical connection between a signal source and a signal destination, i.e. all signals from the source are passed on to the destination.

- o Delegation:
  Using the TDX-bus, a logical line is set up between a machine interface and a remote control panel interface.

Couplings/delegations may be set up manually from the coupling/delegation panel in the Master Control Room or automatically by the Resources Management Subsystem.

2.2.2 RESOURCES MANAGEMENT SUBSYSTEM

The Resources Management Subsystem is designed to perform reservations of facilities for recording, editing and program control purposes. The facilities may be reserved for any specified period, e.g. some day in next week or a period later on today.
The actual reservations of the various facilities within the day or week are shown in the facility schedules, which are maintained by the Resources Management Subsystem. A facility schedule specifies for each time slot of the day the tasks to which the facilities are reserved. Using the information of the facility schedule, the Resources Management Subsystem maintains a coupling schedule which indicates the signal couplings to be set up at a given time in the matrix.
Couplings and associated delegations may be controlled by the computer.

Facilities may be reserved either directly by manual updating of the booking schedules, or indirectly via the Editing or Program Control Subsystems.

2.2.3 PROGRAM CONTROL SUBSYSTEM

The purpose of the Program Control Subsystem is to build up data for television news and sports broadcasts and to telecast according to these data.

The planning of the specific program is performed by building up a program schedule. A program schedule consists of a number of events, each event being subdivided into a number of sequences. Thus all material to be broadcasted is registered in the program schedules, and the data contained in these schedules are controlled by the computer.

In a sequence it may be stated that some material has to be recorded on VTR. The corresponding recording is marked as "not recorded" in the recording schedule and in the program schedule. Within the day the material

may be recorded on VTR or edited, and the recording will change status to "recorded" or "editing" in the relevant schedules.

When the VTR material has been recorded or edited it is registered in the replay schedule, and the sequence is marked as "ready" in the program schedule. When all sequences in the program schedule are ready, the system is ready to telecast according to the data of the program schedule.

2.2.4 EDITING SUBSYSTEM

The Editing Subsystem is designed to assist the user during recording on VTR, editing of the VTR material and registration of new material. The material resulting from editing or recording may be used in a program schedule, or it may be intended for later use.

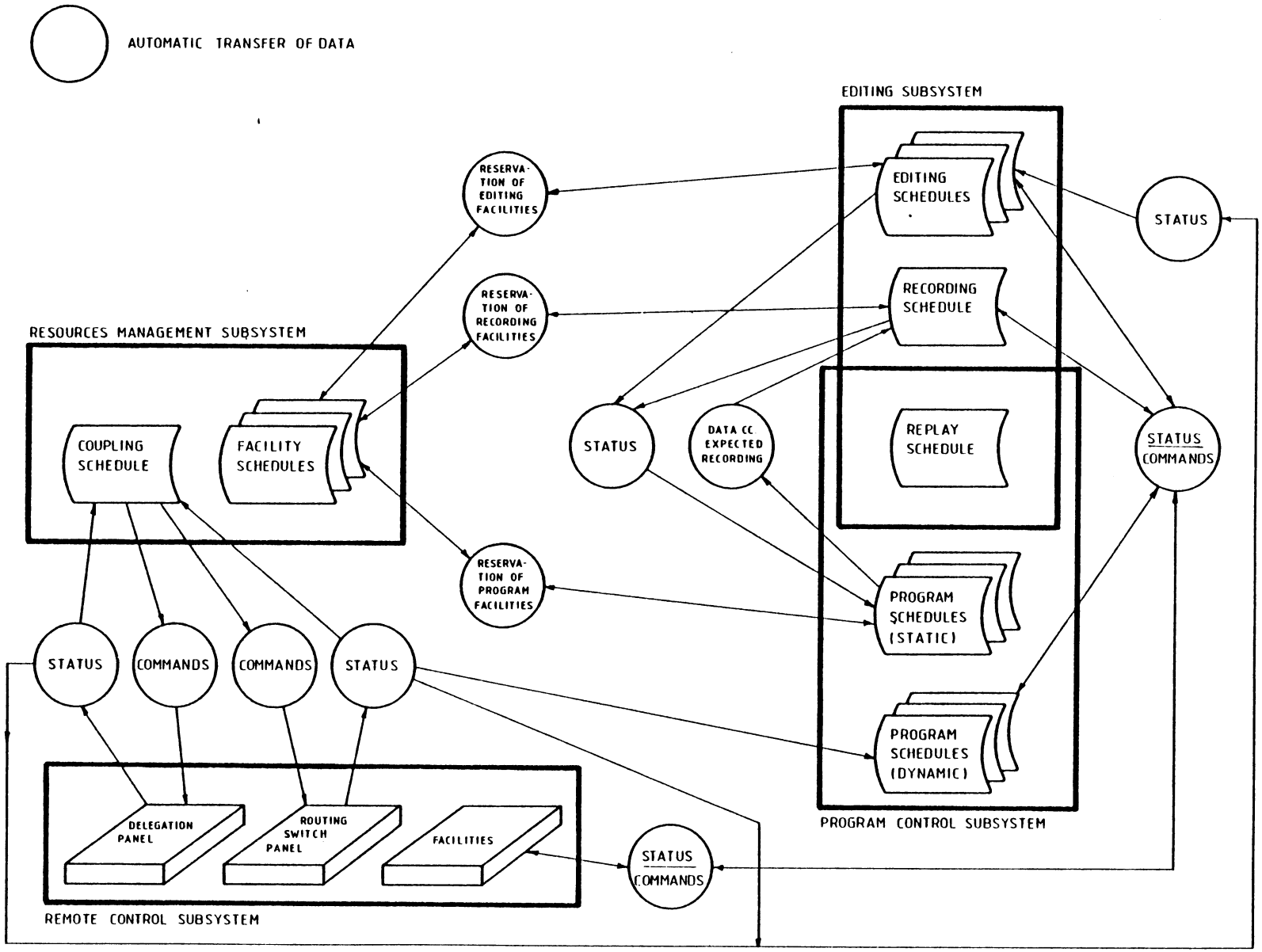
The recordings are registered in the recording schedule, which describes both recordings already performed and recordings which have not yet been undertaken. An expected VTR recording may be associated to an event-sequence in a program schedule if the sequence specifies that VTR material has to be used. Recordings are produced as a result of a manual process (original recording) or an editing process (master/on-air recording).

- The facilities which are reserved to a recording task are indicated in the recording schedule too. The material which has been recorded on VTR may be edited. The editing procedure consists of selection and integration of material which may be either original or come from other sources than VTR. The procedure makes use of an editing schedule intended for the editing task. This schedule registers all data which are input to the editing process, and are produced during this process (e.g. facilities reserved for the task, tape time codes for the resulting master recording).

Original or edited VTR material which is to be used in a program schedule is registered in the replay schedule.

2.3 COMMUNICATION BETWEEN SUBSYSTEMS

The interfaces between the Editing, Resources Management and Program Control Subsystems are illustrated on the next page. Data are exchanged between the subsystems by the TDX-bus or by the common data base. The interfaces within the subsystems are described in the subsystem sections.


AUTOMATIC TRANSFER OF DATA
EDITING SUBSYSTEM
EDITING SCHEDULES
RECORDING SCHEDULE
REPLAY SCHEDULE
PROGRAM SCHEDULES (STATIC)
PROGRAM SCHEDULES (DYNAMIC)
PROGRAM CONTROL SUBSYSTEM
RESERVATION OF EDITING FACILITIES
RESERVATION OF RECORDING FACILITIES
RESERVATION OF PROGRAM FACILITIES
STATUS
DATA CC EXPECTED RECORDING
STATUS COMMANDS
RESOURCES MANAGEMENT SUBSYSTEM
COUPLING SCHEDULE
FACILITY SCHEDULES
STATUS
COMMANDS
COMMANDS
STATUS
DELEGATION PANEL
ROUTING SWITCH PANEL
FACILITIES
STATUS COMMANDS
REMOTE CONTROL SUBSYSTEM

2.4 DATA STRUCTURES AND COMMANDS

2.4.1 IDENTIFICATION OF DATA ELEMENTS.

In the DORA computer system the following basic data elements are identified:

1. **Recording number** corresponding to a VTR recording. These numbers are allocated by the Editing Subsystem.

2. **Event sequence number** corresponding to a sequence of an event of a program schedule. These numbers are allocated by the Program Control Subsystem.

3. **Work code** which identifies a recording or an editing schedule. A work code is used for temporary or unplanned identification of material which e.g. is to be applied in an event of a program schedule. If the material is incorporated in the program schedule, it will be identified by an event sequence number.

A number of recordings, but at most one editing schedule, may be associated with a specific event sequence or work code.

Any of the identifications 1,2, and 3 may be applied by booking of facilities, and data from the facility schedule are automatically transferred to the recordings and the editing schedule having the same identification and purpose as the reservations.

Booking of facilities may be performed indirectly via recording, editing, or program schedules. The identification of the schedule will be entered into the facility schedule under the actual facilities.

Recording data will automatically be transferred to the editing schedule

which has the same identification, and if the editing schedule is identified by an event-sequence-number, data of the schedule will be passed on to the relevant program schedule.

2.4.2 COMMANDS

The top line of the VDU is the command line. Commands designed for insertion or updating of data are generally composed as follows:

COMMAND, possibly followed by one or more PARAMETERS and RETURN.

For some commands an updating form will be displayed on the VDU.

This form consists of a number of unprotected fields where the user is allowed to insert/correct data and a number of protected fields containing key texts, and information not to be updated by the user.

When the user has finished updating of the form, he may send it to the system. If the data are accepted, the form disappears, otherwise the erroneous fields of the form will be highlighted and an error text displayed in the top line of the VDU.

2.4.3 SCHEDULES AND FORMS

The data of the system are represented in schedules and forms.

The schedules may be updated both automatically and manually. An automatic updating will take place when a manual change/insertion of some data implies that the corresponding data of the schedule have to be updated.

The forms of the system are intended for manual change/insertion of data. A form is shown on the VDU as a result of a general command. The form itself consists of a number of protected fields containing informative text

and a number of unprotected fields in which the user may introduce his changes directly from the VDU. The VDU keyboard is designed so that the user may easily introduce the desired modifications of the data fields of the form by using the VDU editing facilities. When the data fields have been updated, the user may send the form to the computer. Data of the form will then be controlled for syntax and semantic. If erroneous data fields are found, the form will be returned on the VDU, and incorrect data fields are highlighted.

If all data fields are correct, the form will be accepted by the system, and all schedules concerned will be updated accordingly.

2.5 ERROR HANDLING

Errors may be divided into four categories, operation of errors, system errors, machine errors, and resource errors.

Operator generated errors may be caused either by misoperation of the system or by introduction of syntactic/semantic errors in the data fields or in commands. These errors will imply an error text to be displayed, informing the user where the error is detected and, if possible, how to correct it.

Resource errors will occur if more resources than actually controlled by the system are required. If e.g. the user attempts to use more recording numbers than the maximum number, which the system allows, an error text will inform the user that he has to wait until the required resources are free.

System errors may be hardware errors, or faults in system software. Interface and terminal errors will also be considered as belonging to this category. System errors may result an error text on the VDU or on the operator's console.

Machine errors may be caused by incorrect functioning of the equipment. If e.g. a play VTR is asynchroneous during editing, the takes are automatically re-recorded. These errors will normally be detected by the system, since the system is able to perform automatic operation of machines.

3. SUBSYSTEM DESCRIPTION

3.1 REMOTE CONTROL SUBSYSTEM

The purpose of the Remote Control Subsystem is to support manual remote operation of a facility from a remote control panel associated with the facility.

3.1.1 FUNCTIONAL DESCRIPTION

The Remote Control Subsystem offers distributed use of centralized placed facilities. Both video/audio signals and remote control are totally switchable.

The flexibility of the Remote Control Subsystem allows the same facility to be used for different purposes, e.g. the same VTR may be used for recording, editing, and telecasting.

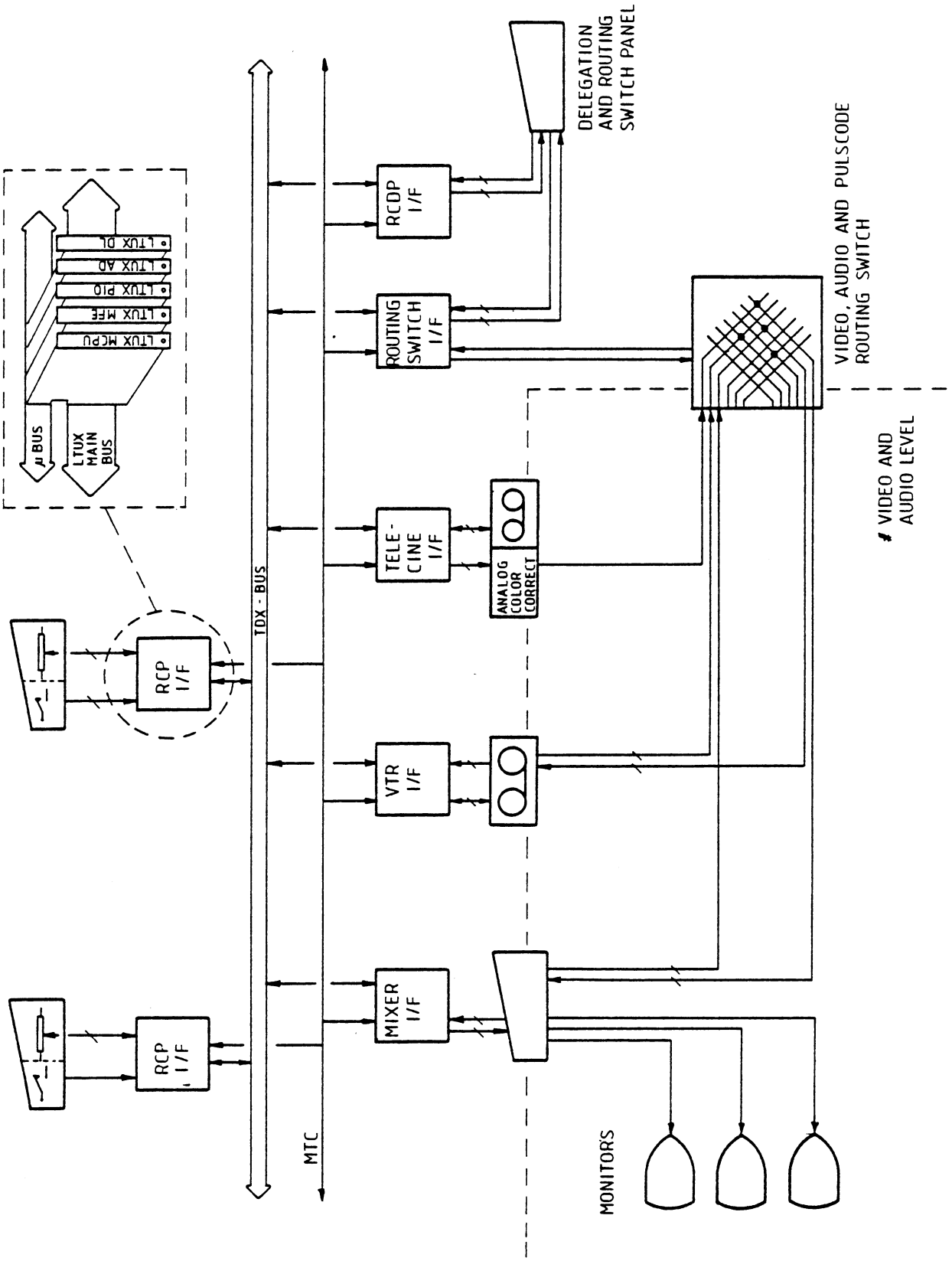
The remote control signals and tallies are routed by the TDX-bus between the panel or the computer system and the devices.

The video/audio time code and pulse signals are distributed by a routing switcher.
A subsystem overview is shown on the next page.

3.1.2 THE TDX BUS

The TDX system (Telecommunication Data Exchange) is based on a serial coaxial cable connecting a range of TDX devices, which makes up a high performance front-end local network integrated with input/output system of the CR80 minicomputer.

The TDX network highlights easy connection of different data communication equipment and makes future extensions and changes of installations easy to do without having to move or install new cables.


LTUX DL
LTUX AD
LTUX P10
LTUX MFE
LTUX MCPU
µ BUS
LTUX MAIN BUS
RCP I/F
RCP I/F
TDX - BUS
MTC
MIXER I/F
VTR I/F
TELE-CINE I/F
ANALOG COLOR CORRECT
ROUTING SWITCH I/F
RCDP I/F
DELEGATION AND ROUTING SWITCH PANEL
VIDEO, AUDIO AND PULSCODE ROUTING SWITCH
VIDEO AND AUDIO LEVEL
MONITORS

4-3024

The TDX protocol is a totally error detecting and correcting full duplex HDLC-like protocol. A very fault tolerant system is obtained, since all critical components are dualized.

Each interface connected to the TDX bus contains its own microprocessor. The division of control between the microprocessors and the CR80 is so that the intricate time critical control of the device is executed by the microprocessor, whereas the superior system control is carried out by the CR80.

3.1.3 THE MASTER TIME CODE

Real time operation and synchronization in the system is obtained by the distribution of a Master Time Code (MTC) signal, derived from the unit pulse in the master time generator, to the CR80 minicomputers and to most interfaces. All time critical commands and status are referred to the MTC signal.

3.1.4 THE ROUTING SWITCHER

The video/audio time codes and pulses are distributed by a matrix organized routing switcher controlled by the routing switcher interface, which is connected to the routing switcher panel (display and keys) and to the TDX bus.

Couplings may be created either from the Resources Management Subsystem (automatic assignment), or from the routing switcher panel (manual assignment).

The couplings are displayed in the coupling panel and on the video monitors by insertion of characters decoded from the invisible source identification signal within the video signal (part of the EBU dataline, also containing userbit and time codes which are inserted on the monitors too).

The coupling status in the routing switcher is always supervised by the Resources Management Subsystem and during editing and telecasting, by the other CR80 subsystems too.

3.1.5 THE DELEGATION PANEL

Remote control signals (commands) and requested as well as unrequested status information are routed by the TDX bus.

Physical connection between the computers, the devices and the remote control panels (RCP) always exist, but the possibility of controlling a certain device from a certain panel is made by setting up a logical data line between the device and the panel. The set-up is performed by the delegation interface which is connected to the delegation panel (display and keys) and to the TDX-bus.

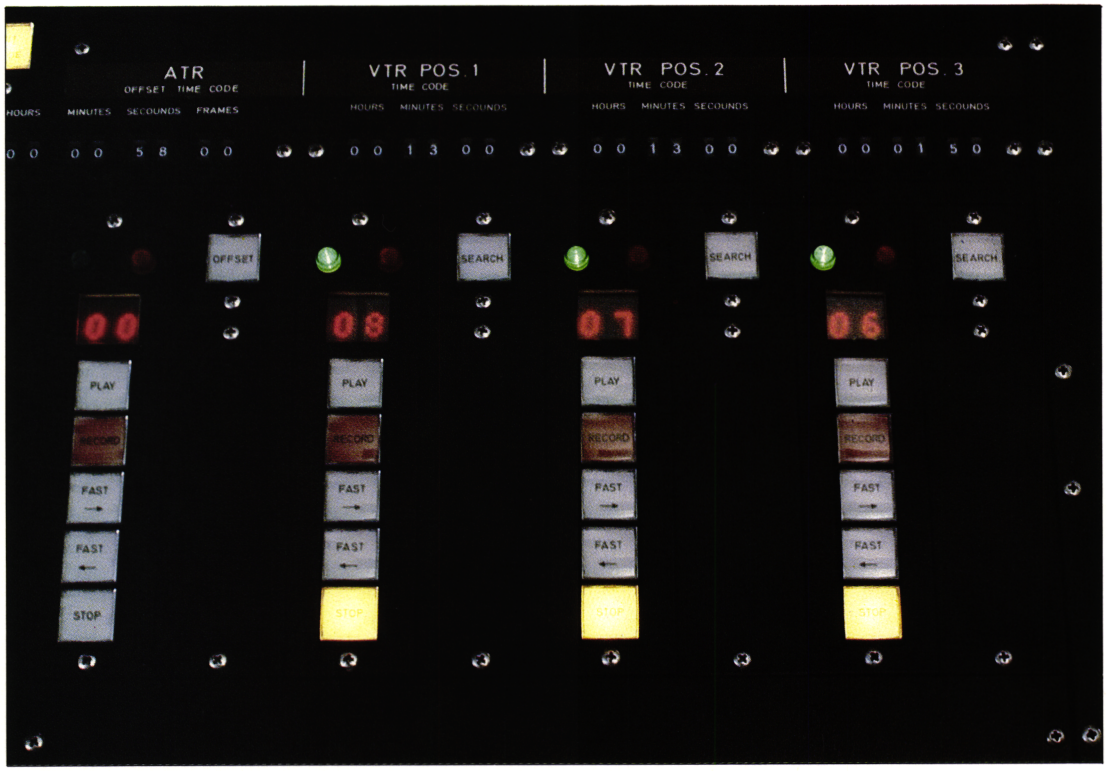
Delegation is made from the panel (manual assignment) or from the Resources Management Subsystem (automatic assignment).

Delegation is shown in the delegation panel display and in a display in the RCP.

Automatic assignment of remote control is performed by the Resources Management Subsystem in parallel to both automatic and manual couplings. Data lines between the CR80 minicomputers and the devices are created by the computers in parallel to the possible RCP device lines. According to the editing process or the program control process the computers send commands to the devices. The device sends status change to both the CR80 and the panel so that correct status always is available at both places.



The routing switcher and delegation panel.



ATR and VTR remote control panel in editing room.



Telecine remote control panel with CCU (colour correction unit)

3.1.6 INTERFACES

A large number of interfaces for different video/audio data devices and panels are implemented in the DORA system. The interfaces are basically identical, except for the microprocessors' firmware and the number of types of input/output channels.

The communication between panels or computers and device interfaces are based on high level commands. The VTR interface e.g. may be commanded to search a certain timecode or to play or record from a specified tape time code at a specified master time code.

Signals to be transferred may be of the following types:

- o parallel digital
  e.g. push buttons, on air and other status lamps and routing switcher commands

- o serial
  e.g. V24 for VDU and character generators

- o analogue
  e.g. joystick operation of colour correction unit for telecine

3.2 RESOURCES MANAGEMENT SUBSYSTEM

The Resources Management Subsystem performs reservations of facilities and controls the couplings and associated delegations of facilities.

3.2.1 FUNCTIONAL DESCRIPTION

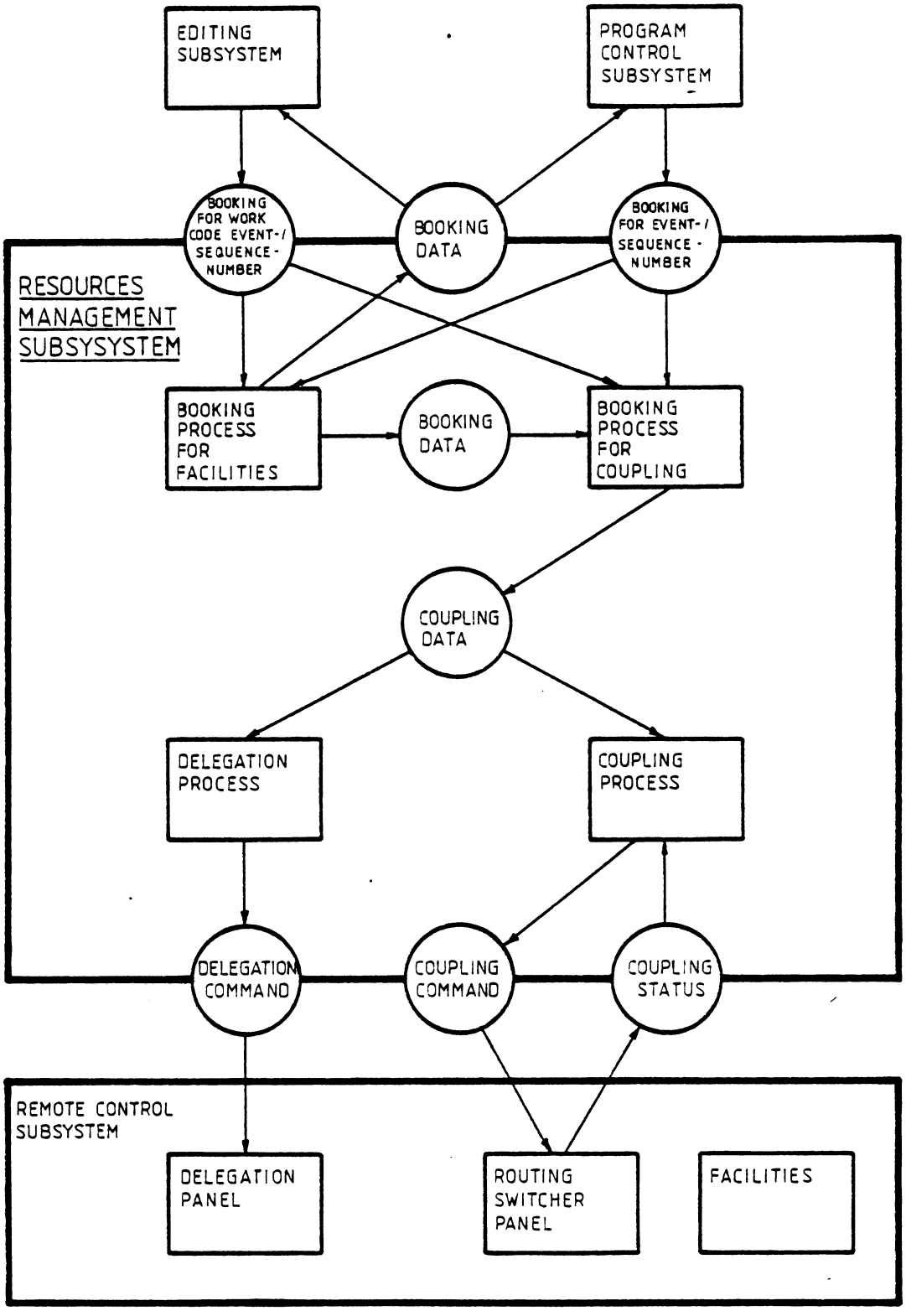
The Resources Management Subsystem maintains the below mentioned functions:

- Booking of facilities.
  This booking process maintains the facility schedules. There exists a facility schedule for the current day and one schedule for the next 8 days. 7 facility schedules corresponding to the days of the week and a summary schedule for the whole week are also maintained by this process.

- Booking of couplings.
  This booking process maintains the coupling schedule for the current day.

- Coupling process.
  This process is designated to supervise the data of the coupling schedule and to make decisions for control of the routing switcher panel which is part of the Remote Control Subsystem.

- Delegation process.
  This process issues delegation commands to the delegation panel belonging to the Remote Control Subsystem. Delegation commands are issued when couplings have been made either by the coupling process or by manual operation of the coupling panel.


EDITING SUBSYSTEM
PROGRAM CONTROL SUBSYSTEM
BOOKING FOR WORK CODE EVENT-/ SEQUENCE-NUMBER
BOOKING DATA
BOOKING FOR EVENT-/ SEQUENCE-NUMBER
RESOURCES MANAGEMENT SUBSYSYSTEM
BOOKING PROCESS FOR FACILITIES
BOOKING DATA
BOOKING PROCESS FOR COUPLING
COUPLING DATA
DELEGATION PROCESS
COUPLING PROCESS
DELEGATION COMMAND
COUPLING COMMAND
COUPLING STATUS
REMOTE CONTROL SUBSYSTEM
DELEGATION PANEL
ROUTING SWITCHER PANEL
FACILITIES

4-3022

3.2.2 INTERFACES TO THE OTHER SUBSYSTEMS

The interfaces shown on the preceding page are:

- Before a recording is undertaken the Editing Subsystem may issue a booking request for relevant facilities.

- The Editing Subsystem may issue a booking request for facilities for an editing schedule.

- The Program Control Subsystem may issue a booking request for facilities for a program schedule.

  For all booking requests sent to the Resources Management Subsystem an updated status of the booked facilities is returned.

- The Remote Control Subsystem issues upon changes of the state of the couplings between facilities a coupling status to the Resources Management Subsystem.

- The Resources Management Subsystem issues delegation commands to the Remote Control Subsystem.

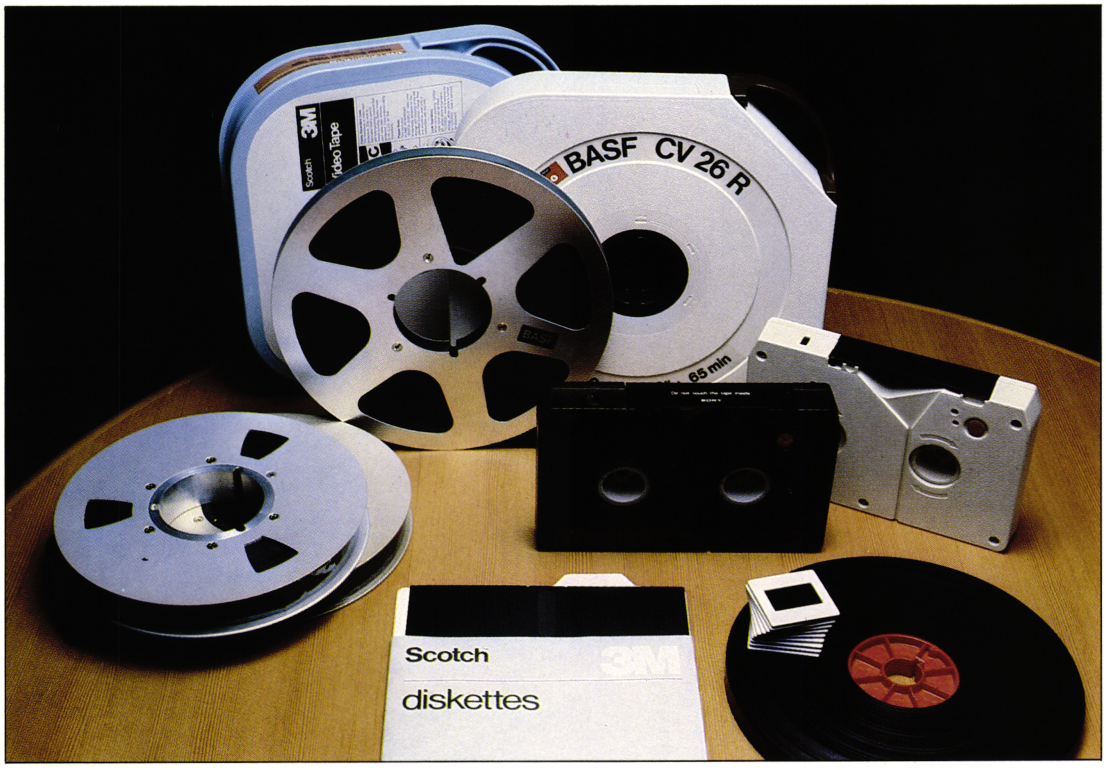
3.2.3 BOOKING PROCESS FOR FACILITIES

The facility schedules are maintained by this process. A facility schedule specifies for each facility in the system the reservation information for 24 hours, which is divided into 144 time slots of 10 minutes each. The reservation information consists of an identification, a purpose, and a pool specification.


Computerized
Editing
Recording
Transmission
Integrated Broadcast System



The master control room.



The identification may be either an event sequence number, a work-code, or a recording number.

The purpose specifies the usage of the facility and may e.g. be recording, editing, broadcasting, or service.

The pool specification may be used for long-term planning for the usage of the facility.

The booking process for facilities offers a number of user commands whereby the data in the facility schedules can be entered, modified, manipulated, or cancelled.

The booking command enables the user to enter a reservation for a number of facilities for any time interval of the day. The cancellation command makes it possible for the user to delete any part of an existing reservation. The exchange command enables the user to exchange facilities in existing reservations.

The move commands enable the user to move an entire reservation to another time of the day. The transfer command is used for transferring a reservation from one user to another. The pool information is entered or cancelled by special commands.

3.2.4 BOOKING PROCESS FOR COUPLINGS

The coupling schedule is maintained by this process. The coupling schedule is a survey of the time of creation and deletion of signal couplings throughout the current day.

The reservation of couplings is normally performed automatically upon reservation of the corresponding facilities in the facility schedule. The coupling schedule will contain the creation and deletion time for these

couplings. Besides the automatic updating of the coupling schedule, when the contents of the facility schedule for today are changed, the booking process for couplings offers commands enabling the user to manipulate directly the information of the coupling schedule.

3.2.5 THE COUPLING AND DELEGATION PROCESS

The signal couplings are controlled by the coupling process and the delegation of the control panels are controlled by the delegation process.

The signal coupling and delegation are automatically created at the time specified in the coupling schedule. If the creation of the coupling is not possible, the operator in the master control room will be notified.

3.3 PROGRAM CONTROL SUBSYSTEM

The purpose of the Program Control Subsystem is to build-up data for television news and sports broadcasts and to telecast according to these data.

3.3.1 FUNCTIONAL DESCRIPTION

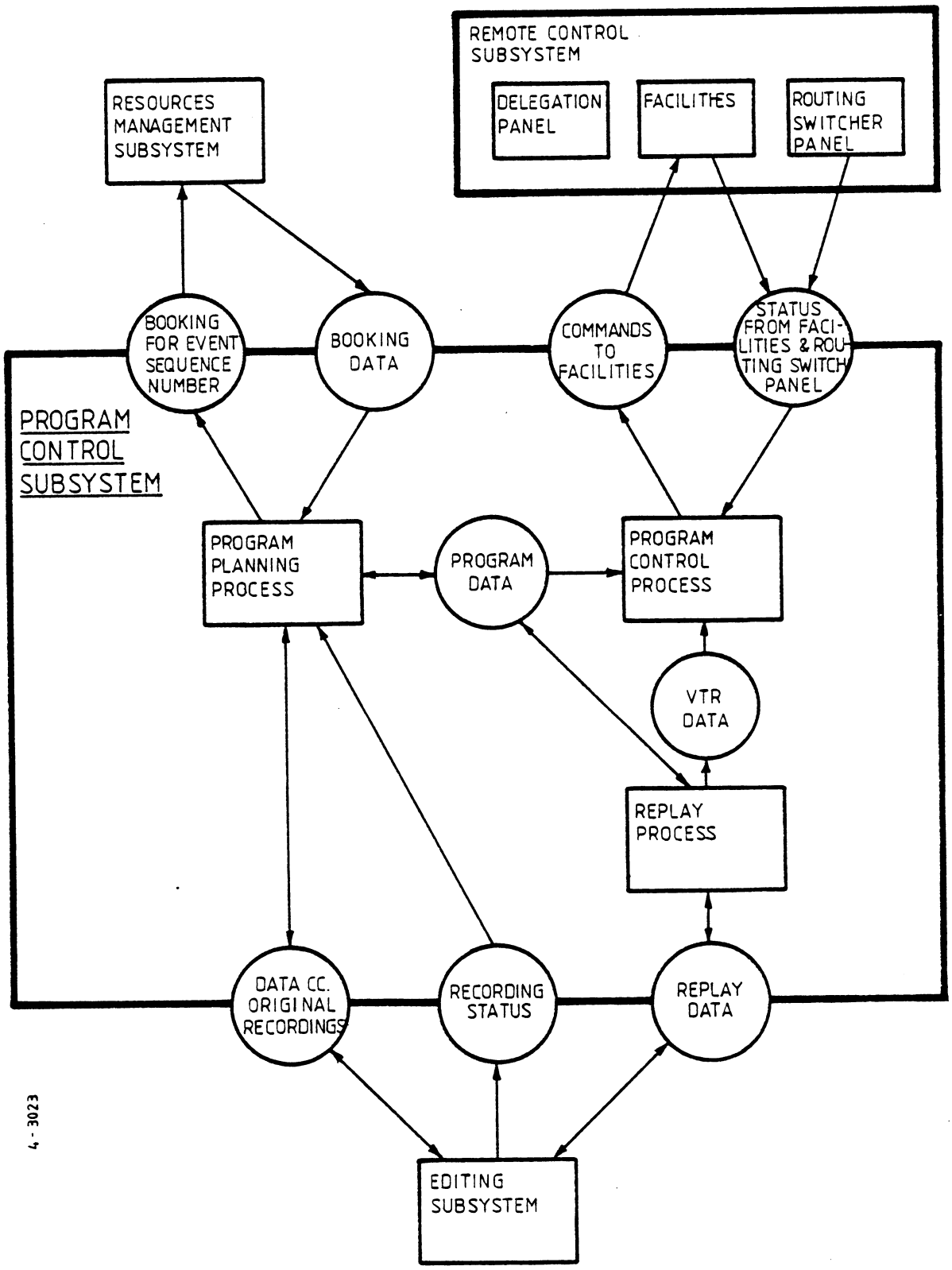
The Program Control Subsystem is designed to assist the users in the planning of the contents of the television programs and to perform the actual telecasting in accordance with the plans. Finally, the subsystem will print a report on the actual progress of the program.

The use of the subsystem is split into two parts:

- The program planning process.
  A program schedule is built-up on a terminal (VDU). The schedule describes the program to such a detail that the system is able to assist the users during the telecasting.

- The program control process.
  During the telecasting the system will perform many of the functions involved. The system will give warnings if it detects problems that will impede an error-free telecasting. The system will also prepare the sources for the next use, preselect the next source in the mixer and perform a necessary preroll before a transition takes place. All these functions are done in accordance with the program schedule and the replay schedule.

  Although the program is fully planned before telecasting commences, the producer still has ample opportunities to change the program with the assistance of the system during the actual telecasting. Sequences (e.g. live interviews) may be handled fully manually if desired.


REMOTE CONTROL SUBSYSTEM
DELEGATION PANEL
FACILITIES
ROUTING SWITCHER PANEL
RESOURCES MANAGEMENT SUBSYSTEM
BOOKING FOR EVENT SEQUENCE NUMBER
BOOKING DATA
COMMANDS TO FACILITIES
STATUS FROM FACILITIES & ROUTING SWITCH PANEL
PROGRAM CONTROL SUBSYSTEM
PROGRAM PLANNING PROCESS
PROGRAM DATA
PROGRAM CONTROL PROCESS
VTR DATA
REPLAY PROCESS
DATA CC. ORIGINAL RECORDINGS
RECORDING STATUS
REPLAY DATA
EDITING SUBSYSTEM
4-3023

3.3.2 INTERFACES TO OTHER SUBSYSTEMS

The interfaces are shown on the preceding page.

- Planning of a VTR sequence in a telecast program will result in the registration of a recording in the recording schedule of the Editing Subsystem. The recording will be marked as 'not-recorded'.

- The current status of requested recordings on VTRs are received from the Editing Subsystem and registered in the relevant program schedules.

- Replay data (time codes, tape number, etc.) for VTR sequences are exchanged with the Editing Subsystem.

- Facilities applied in program schedules will be booked in the Resources Management Subsystem.

- Booking status for facilities is received from the Resources Management Subsystem and is displayed in the relevant program schedules.

- During telecasts commands will be sent to the facilities of the Remote Control Subsystem in accordance with the program schedule being broadcasted.

- During telecasts status messages are received from the facilities and the routing switcher panel of the Remote Control Subsystem.

3.3.3 PROGRAM PLANNING PROCESS

In the program planning phase a program schedule is built up. The program schedule contains a detailed description of the program giving all information needed for a computer controlled broadcasting.

The schedule is broken down into a number of events. An event corresponds to a single news item and is further broken down into a number of sequences. Each sequence describes a single video main source (e.g. CAM1, VTR4, or ENG2) and (possibly) an inlay source, mixer transition type, duration, etc.

Updating of the program schedule may be performed from any terminal and may be done by several users working at the same time on different events of the same program schedule. Entering of data is mainly performed by requesting a form to be displayed and filling out/changing the appropriate fields. Finally the form is returned to the system for validation and accept.

A program schedule may be set in check-mode. In this mode every change in the schedule will result in a check of the consistency of data.

Examples of inconsistencies are:

- A VTR is used twice the intermediate interval being so short that it cannot shuttle into position in time for the second use.
- The same video tape is to be used on two different VTRs.
- Two different video tapes are to be used on the same VTR.
- A facility specified in the schedule is booked for another purpose in the Resources Management Subsystem.



Studio video control room.



Studio audio control room.



Studio.

3.3.4 PROGRAM CONTROL PROCESS

During the telecast the system will perform many of the functions involved including:

- o Control of mixer functions
- o Control of signal sources
  - VTR
  - Telecine
  - Still picture facility
  - Character generator
  - ENG
- o Constant up-to-date display of status of event/sequence currently being broadcasted and events/sequences to follow.
- o Registration of progress of the broadcasting.

Some sequences will have a fixed duration (e.g. VTR sequences). The user will for such sequences specify a 'fixed' duration, other sequences will have an 'estimated' duration (e.g. a speaker announcement). At the end of a fixed duration sequence the system will automatically procede to the next sequence, while in the 'estimated' case the mixer operator must request the transition by activating a take-button at the proper time.

After a transition to a new source, the system will automatically prepare the old source for its next use.

A special type of sequence is the one that uses the VTRA group consisting of three VTRs with identical material recorded on their tapes. In an editing session a number of takes are registered and automatically transferred to the Program Control Subsystem. During the telecast of such a sequence the computer will control the three VTRs and the mixer will perform an on-air editing. This facility greatly improves the ability of the procedures to make last minute changes in the order of the events.

At any time a manual intervention is possible, some examples are:

- A sequence may be cut short by just pressing the take button.

- An unprogrammed sequence may be included by just preselecting the source in the mixer and activating the take button. After the transition to this source the system will reprepare for the next sequence according to the schedule.

- The next sequence may be skipped by just pressing a skip button.

- The system may be commanded to proceed the telecast from a specified point in the schedule.

3.4 EDITING SUBSYSTEM

The Editing Subsystem is designed to assist the user during recording on VTR, editing of the VTR material and registration of new material.

3.4.1 FUNCTIONAL DESCRIPTION

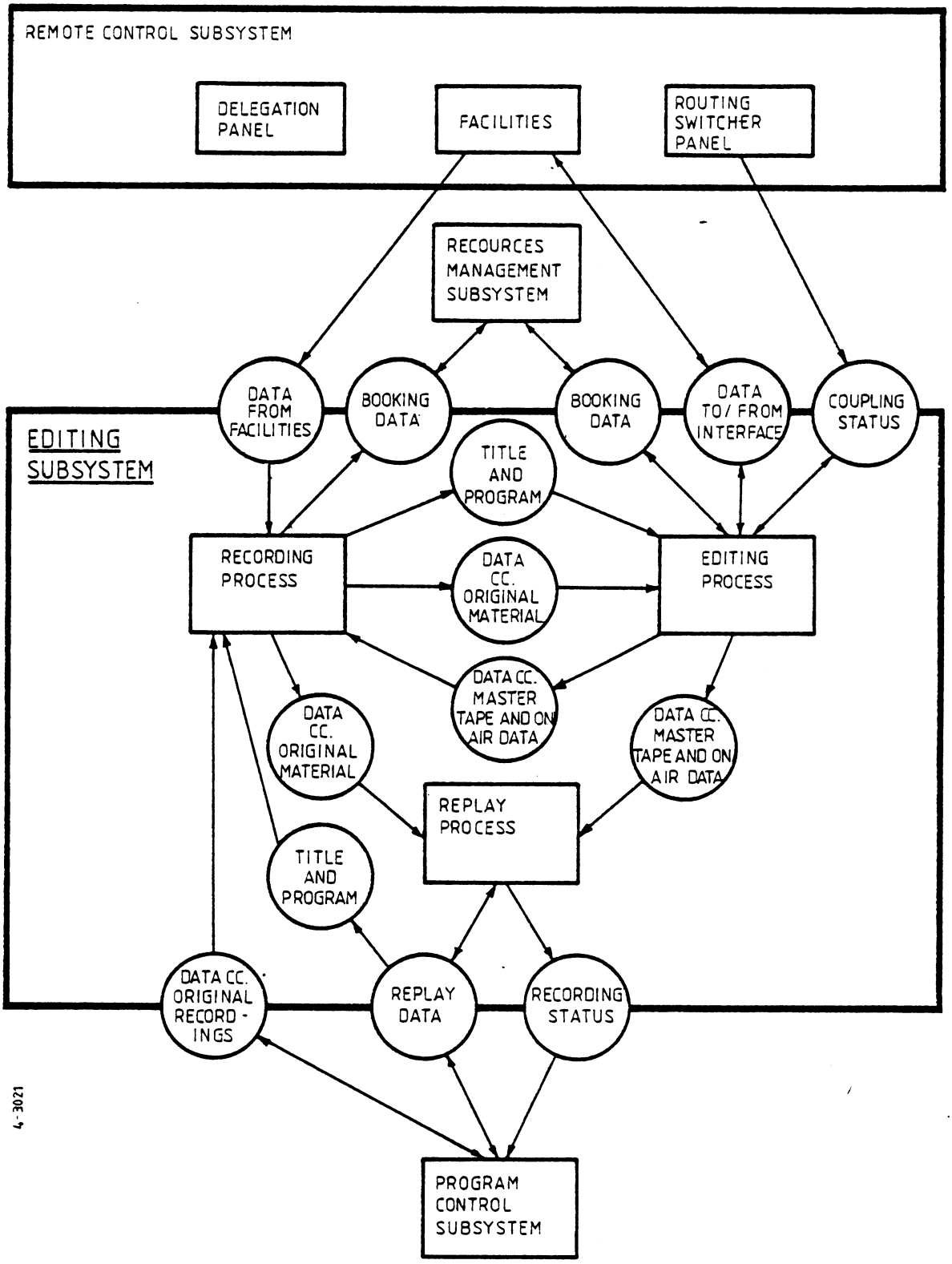
The editing subsystem is used for registration of recordings on VTR, editing of VTR material and for registration of VTR material ready for transmission.

The system maintains the below mentioned functions:

- **Recording**
  This process is used to registrate wanted and finished VTR recordings. The process maintains the recording schedule.

- **Editing**
  This process is used for VTR time code editing in the two CNR editing rooms (MASTER EDIT) and as host for the four PRE EDITING rooms. A large number of editing schedules are maintained.

- **Replay**
  This process is used as a link between the Program Control Subsystem and the editing and the recording process. The replay schedule is maintained by this process and by the Program Control Subsystem.


REMOTE CONTROL SUBSYSTEM
DELEGATION PANEL
FACILITIES
ROUTING SWITCHER PANEL
RECOURCES MANAGEMENT SUBSYSTEM
DATA FROM FACILITIES
BOOKING DATA
BOOKING DATA
DATA TO/ FROM INTERFACE
COUPLING STATUS
EDITING SUBSYSTEM
TITLE AND PROGRAM
RECORDING PROCESS
DATA CC. ORIGINAL MATERIAL
EDITING PROCESS
DATA CC. MASTER TAPE AND ON AIR DATA
DATA CC. ORIGINAL MATERIAL
DATA CC. MASTER TAPE AND ON AIR DATA
REPLAY PROCESS
TITLE AND PROGRAM
DATA CC. ORIGINAL RECORD - INGS
REPLAY DATA
RECORDING STATUS
4-3021
PROGRAM CONTROL SUBSYSTEM

3.4.2 INTERFACES TO THE OTHER SUBSYSTEMS

The interfaces which are shown on the preceding page, are:

- Planning of a VTR sequence in a telecast in the Program Control Subsystem implies the registration of data of a recording in the recording schedule. The recording will be marked as 'not recorded'. The recording is identified by an event sequence number.

- Facility booking in the Resources Management Subsystem for a recording or an editing schedule causes the booking data to be transferred to the recording schedule or to an editing schedule.

- The registration of time codes of a recording identified by an event sequence number will lead to an existing recording and the status in the Program Control Subsystem for the sequence will change from not-recorded to recorded.

- Editing of material to a sequence in a program schedule will cause an editing status to be transferred to the Program Control Subsystem. A final status is transferred in the same way when the editing is finished.

- The editing process gets information from the delegation panel about assignments in the two master editing rooms. The physical and logical connections specified in the editing schedule are controlled before the editing system sends commands to the facilities.

- The editing process gets information from the routing switching panel about the couplings of facilities to the effect switcher in the editing room, used during editing to select the right editing switcher entry.

- The editing process sends commands to facilities for recording and simulation purposes. Commands such as record and play contain a specification of tape time codes and master time codes to eliminate time critical operation from the CR80.

- The editing and recording processes receive status information from facilities, unrequested when the machine status is changed, and requested if needed for instance for reading of tape time codes and the corresponding master time codes and status.

3.4.3 RECORDING PROCESS

The recording schedule is a catalogue of today's expected and performed recordings.
This schedule is separated in two parts, one consisting of finished recordings, sorted by tape numbers, and the other holding the expected recordings, normally got by request from the Program Control Subsystem.

The recording VTR is controlled locally or by a remote control panel. The schedule may be updated from an arbitrary terminal by using a recording form. The recording identification, VTR name, title, etc. are entered from the terminal keyboard, time codes and tape numbers are read from the VTR by function keys. Single or double recordings may be registered on all VTRs, including the three machine VTRA group. Also finished editings and on air editings are registered in the recording schedule.

The system maintains a catalogue of tape time codes which is used to tell the user where to place a new recording or an editing on a certain tape.



Pre editing room with local VCR.



Master editing room.

3.4.4 EDITING PROCESS

In the DORA system there are two different frame accurate time code editing systems.

- o The pre-editing system which is a two VCR stand-alone system. It is connected to the TDX-bus, and thereby to the master editing system, which acts as a host for exchange of editing schedules.

- o The master editing system, which is a more sophisticated system for three or more VTRs and other sources, such as still picture machines and character generators. The sources are mixed through a system controlled effect switcher.

The pre-editing system may be used either for ENG editing on 3/4" cassette or for pre-editing of VCR copies made in parallel to the VTR recording. After pre-editing the schedule is transferred to the master editing system and possibly (but not necessarily) after further work recorded from the original VTR tapes. An editing based on one part of a double recording may be split up into both parts by a simple command, allowing crossfading or other effects to be realized. Apart from this the commands in master and pre-edit systems are identical.

ON AIR editing

The system also offers the possibility of editing without recording new master tapes. The recording of the original material is undertaken on the VTRA group, which is composed of three VTRs.

During the editing process takes from the A-group are established. While simulation and broadcasting the system will use the three VTRs individually to realize replay of the sequence by playing from one and searching at the others in turn.

The editing schedule is composed of three parts:

- A survey page for defining actual VTR and default values together with information about recordings for the editing.

- The body containing the currently specified takes.

- The work field in which takes are created and modified.

As it appears from this the editing is based on a number of takes, which describe the source material, the transition form and speed for the video and/or the audio and when and how to be recorded. The system allows both assemble and insert takes to be used in the editing process, and the schedule is maintained so it is possible to re-record and obtain the same result. Manual operation of the effect switcher during the editing process is possible.

Data entry is performed at the terminals and in the editing rooms too by function keys (schedules may be updated from different terminals, but of course not at the same time).

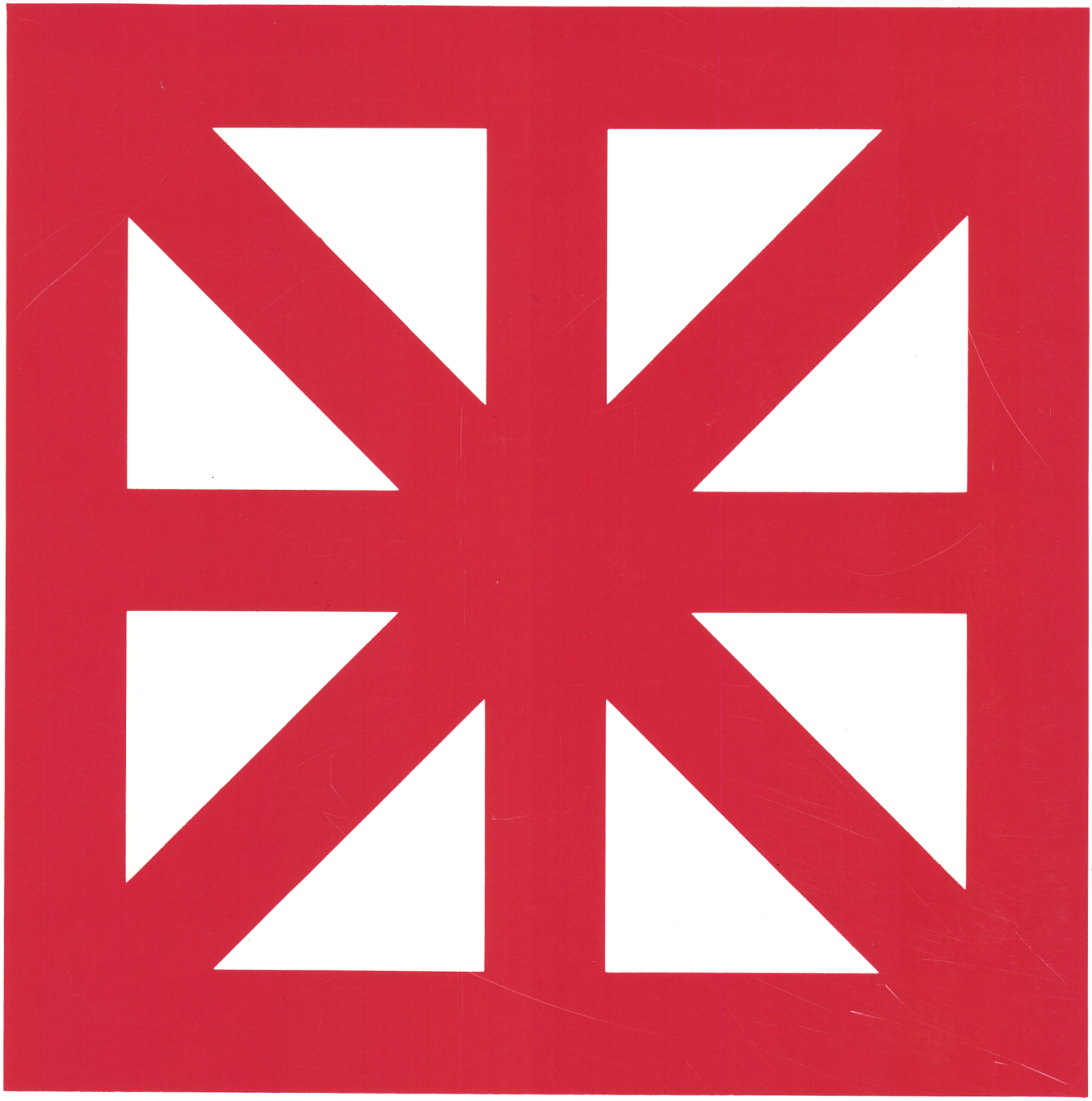
There are function keys for in and out time code reading from the VTR, in master edit for the ATR too, and for trimming of the time code, besides keys for the most common commands. The process accepts a number of commands:

- Control of machines
- Creation and definition of takes
- Updating of the takes and their order
- Recording of takes
- Simulation of takes
- Simulation of transitions between takes and between black and a take.

3.4.5 REPLAY PROCESS

The purpose of this process is to maintain the replay schedule used in the Program Control Subsystem during broadcasting for the VTR control.

Normally, the schedule is automatically updated by data transfer from the editing process, but it is also possible by commands to enter data from the recording schedule or by a replay form from the terminals. The manual updating and editing of the schedule is possible from both the Editing and the Program Control Subsystem; in this way it is possible to maintain all information used for the broadcasting within the Program Control Subsystem.



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