REMOTE-CONTROL SYSTEMS FOR BROADCASTING PRODUCTION EQUIPMENT SYSTEM SERVICE AND COMMON MESSAGES

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Introduction

Document Tech. 32 45 describes the specification of a digital remote control system for broadcasting production equipment. It defines completely the electrical/mechanical level (level 1) and the supervisory level (level 2) of the interface. The remaining two levels - the system service level (level 3) and the virtual machine level (level 4) - are defined in terms of function and control message syntax only.

Part 1 of this supplement to Tech. 3245 completes the definition of the system service level by detailing the system service messages. Part 2 defines those virtual machine messages which are common to all types of virtual machine - the common messages. Type-specific virtual machine messages are defined in other supplements to Tech. 3245.

In order to implement a complete network, the system designer therefore requires:

Document Tech. 3245: the general specification
Supplement 1: system service and common messages

and one or more other supplements appropriate to the category or categories of equipment to be used.

The specification described in this supplement has been developed jointly with the SMPTE, and is functionally identical to that to be published as an SMPTE Recommended Practice.

Part 1

System service messages

Chapter 1

General concepts

This chapter contains a general explanation of some of the concepts used in the formulation of the system service message set. It constitutes tutorial information, and is intended to assist in the understanding of the specification in Chapter 2.

1. System service tasks

System service messages can affect all participants on the bus, tributaries as well as the bus controller; their effect, however, differs as between tributaries and the bus controller.

- Some system service messages address the bus controller only. These originate in a tributary and cause the bus controller to set up a new internal condition, or to originate further messages.

  Examples: ASSIGN LINKAGE,
  DEASSIGN LINKAGE,
  ASSIGN SUPERVISORY LEVEL GROUP
  DEASSIGN SUPERVISORY LEVEL GROUP,
  ASSIGN VIRTUAL GROUP,
  DEASSIGN VIRTUAL GROUP.

- Other system service messages are sent by the bus controller to accomplish linkage tasks in tributaries.

  Examples: VIRTUAL GROUP ATTACHE,
  VIRTUAL GROUP DISCONNECT,
  VIRTUAL MACHINE/GROUP SELECT.

- Finally there are system service messages which accompany virtual machine messages from source to destination and have no practical effect on the bus controller. These are simply relayed by the bus controller.

  Examples: BLOCK,
  INITIAL SEGMENT,
  SUBSEQUENT SEGMENT.

Notes in the system service message list indicate the effect of the messages or the tributary and the bus controller respectively, and give detailed information about their effect.

2. Blocking and segmenting

Detailed information about blocking and segmenting of virtual machine messages by the use of the corresponding system service messages is given in Tech. 3245, Chapter 4.

3. Addressing virtual machines

Since more than one virtual machine may be connected logically to a tributary, the address of every virtual machine to in two parts:

- the tributary address,
- the virtual machine number which identifies the virtual machine connected to this tributary.

Messages which specify a virtual machine must carry both tributary address and virtual machine number as joint parameters. When a single virtual machine only is attached to a tributary address, the virtual machine number defaults to zero (00h).

4. Assigning, linkages

In order to establish a linkage it is necessary to make an entry in the linkage directory of the bus controller. Unless the bus controller is very simple (setting up linkages by thumbwheels or a local keyboard only), system service messages originating In any tributary may be used to establish a linkage entry.

The relevant messages are

ASSIGN LINKAGE and DEASSIGN LINKAGE.

Either message carries parameters which specify the tributary address and virtual machine number of both source and destination; each such message assigns/deassigns a unidirectional linkage only, from one source to one destination.

In the assignment of groups the tributary address may be replaced by a supervisory level group address, and/or the virtual machine number may be replaced by a virtual group number.

Application details, examples of tributary linkage, and a sample linkage directory are given in Tech. 3245, Chapter 4.

The linkage of groups is described below.

5. Assigning groups

The operational requirement for the grouping of virtual machines may come from individual tributary, or from an "assignment" virtual machine. However, only the bus controller is able to establish groups, and system service messages are required therefore to instruct the bus controller to take the necessary actions.

6. Supervisory level groups

In order to set up a controlled supervisory level group, two actions need to be taken by the "assigning" virtual machine:

- to direct the bus controller to assign a linkage between the controlling virtual machine and the newly defined supervisory group;

- to direct the bus controller to assign all tributaries that are to be members of the new group.

Linkage assignment is initiated by an ASSIGN LINKAGE message to the bus controller as described above, but using the desired supervisory level group address and virtual group number, instead of a tributary address and virtual machine number.

Where a single virtual machine only is attached to each and every tributary within a supervisory level group, the virtual group number defaults to zero (00h).

Assignment of the required tributaries to the group is initiated by multiple system service messages, using the command:

ASSIGN SUPERVISORY LEVEL GROUP

to the bus controller. In reaction to each of these massages the bus controller generates a supervisory level GROUP ASSIGN message for the appropriate tributary.

The ASSIGN SUPERVISORY LEVEL GROUP message carries two parameters:

- the tributary select address, which identifies the appropriate tributary; - the desired supervisory level group select address.

Deassignment is performed similarly using the messages:

DEASSIGN LINKAGE and DEASSIGN SUPERVISORY LEVEL GROUP.

7. Virtual groups

In order to set up a controlled virtual group, two actions need to be taken by the assigning virtual machine:

- to direct the bus controller to assign a linkage between the controlling virtual machine and the newly defined virtual group;

- to direct the bus controller to assign all virtual machines that are to be members of the new group.

Linkage assignment is initiated by an ASSIGN LINKAGE message to the bus controller as described above, but using the desired virtual group number instead of the virtual machine number following the tributary supervisory level SELECT or GROUP SELECT address.

Assignment of the required virtual machines to the group is initiated by multiple system service messages using the command ASSIGN VIRTUAL GROUP to the bus controller.

In reaction to each of these messages the bus controller generates the system service message VIRTUAL GROUP ATTACH and sends it to the system service level of the tributary serving the required virtual machine.

Where a virtual group comprises virtual machines spread across several tributaries, it is the responsibility of the assigning station to direct the bus controller to construct the appropriate supervisory level group using the ASSIGN SUPERVISORY LEVEL GROUP command.

Each ASSIGN VIRTUAL GROUP message carries the following parameters:

- the tributary select address and virtual machine number of the virtual machine,
- the desired virtual group number.

Deassignment is performed similarly using the messages DEASSIGN LINKAGE and DEASSIGN VIRTUAL GROUP. The message used by the bus controller to cancel the group assignment of an individual virtual machine is VIRTUAL GROUP DISCONNECT.

8. Assignment messages overview

The following tables summarize all system service messages which are used for assigning/deassigning linkages and groups, together with their parameters and their effects.

8.1. Messages to bus controller

Message	Parameters		Action by bus controller
ASSIGN/ DEASSIGN LINKAGE	Source	tributary address	set up internal linkage directory
		virtual machine number	
	Destination	tributary address/group address	
		virtual machine number/ virtual group number	
ASSIGN/ DEASSIGN SUPERVISORY LEVE	Tributary address		Send supervisory level GROUP ASSIGN/DEASSIGN
	Supervisory level group address		
ASSIGN/ DEASSIGN VIRTUAL GROUP	Virtual machine	tributary address	send VIRTUAL GROUP ATTACH/ VIRTUAL GROUP DISCONNECT to appropriate virtual machine
		number	
	Virtual group number		

8.2. Messages from the bus controller

Message	Parameters	Action by tribut
VIRTUAL GROUP ATTACH/ DISCONNE	Virtual machine number	commence/cease to react to messages for the specified virtual group number
	Virtual group number	

9. Selecting virtual machines/groups

To switch the data flow path to a specified virtual machine/group within the system service level of the tributary, or to select the correct virtual circuit linkage for the-indicated virtual machine within the bus controller,

VIRTUAL MACHINE/GROUP SELECT

is used. Details are described in Tech. 3245, Chapter 4.

10. Information fields (I/F) within the bus controller

In a manner similar to virtual machines the bus controller contains information which is arranged in information fields (for details of the information field concept, see Part 2, Chapter 1 of this document).

The bus controller information field comprises

- a table of all linkages currently established,
- a table of all supervisory level groups,
- a table of all virtual groups,
- status information for the bus controller.

11. The bus clock

Many applications require a common time scale across several virtual machines. This is usually implemented as a (software) clock, the "machine internal clock", which must be synchronized by a simultaneous command to all appropriate virtual machines.

Of all the bus participants only the bus controller can guarantee a simultaneous transmission of a preset command for those clocks. Therefore, the bus controller is designated as the keeper of a bus clock that is used to synchronize the timelines in all appropriate tributaries.

To support this general concept, the following assumptions are made:

11.1. Bus clock

If present in the system, the bus clock is resident in the bus controller.

The bus clock is set by means external to the control bus.

The bus clock is incremented by an external, unspecified signal ("ticks") common to all virtual machines.

11.2. Machine internal clock

The machine internal clock is resident in the virtual machine level of the tributary.

The machine internal clock is preset by messages carried on the control bus.

The machine internal clock is incremented by the same external, unspecified signal ("ticks") as the bus clock.

The machine internal clock may be selected as the source of the machine TIMELINE.

11.3. Time synchronization

Machine internal clocks are preset by the bus controller.

The bus controller, using the supervisory level message GROUP SELECT ALL CALL, transmits, to all virtual machines connected to the bus, the common message TIMELINE RUN, with the time value from the bus clock.

The bus controller is responsible for transmitting the time consistent with the common external "tick" signal and the intended use of time in the system.

The bus controller performs synchronization of the system In response to the system service message REQUEST TIME TRANSMISSION.

Chapter 2

System service messages

1. Index of* keywords, mnemonics and information field names

Hex	Keyword	(mnemonic)	Hex	Information field name	(mnemonic)
00	SYSTEM SERVICE NO OPERATION	(SNOP)			
01	reserved for BEGIN	(RBGN)			
02	reserved for END	(REND)			
03	SYSTEM SERVICE RESET	(SRST)			
04	INITIAL SEGMENT	(ISGT)			
05	SUBSEQUENT SEGM M	(SSGT)			
06	BLOCK	(BLCK)			
07	VIRTUAL MACHINE/GROUP SELECT	(VMGS)			
08	SYSTEM SERVICE ERROR	(SERR)			
09	VIRTUAL GROUP ATTACH	(VGAT)			
OA	VIRTUAL GROUP DISCONNECT	(VGDT)			
OB					
OC					
OD					
OE					
OF					
10	ASSIGN LINKAGE	(ALNK)	10	LINKAGE	(LINK)
11	DEASSIGN LINKAGE	(DLNK)	11	STATUS	(STAT)
12	ASSIGN SUPERVISORY LEVEL GROUP	(ASGP)	12	SUPERVISORY LEVEL GROUP	(SGRP)
13	DEASSIGN SUPERVISORY LEVEL GROUP	(DSGP)	13	VIRTUAL GROUP	(VGRP
14	ASSIGN VIRTUAL GROUP	(AVGP)	14		
15	DEASSIGN VIRTUAL GROUP	(DVGP)	15		
16	BC READ	(BCRD)	16		
17	BC I/F ITEM RESPONSE	(BIRE)	17		
18	REQUEST TIME TRANSMISSION	(RQTT)	18		
19	BUS CONTROLLER USER DEFINED	(BCUD)	19		
1A			1A		
1B			1B		
1C			1C		
1D			1D		
1E			1E		
1F	EXTENSION	(SEXT)	FF	EXTENSION	(SIEX)

Notes: 1. *Information field names 03h-0Fh are reserved.*

2. *The following convention is used in all messages - system service, common and type-specific:*
   - most-significant byte (MSB) is transmitted first;
   - least-significant bit (lsb) Is transmitted first.

2. Keywords

In the following definitions, the different effect of the message when received by a tributary, compared with the effect when received by a bus controller, is shown:

trib - (effect at tributary)
bc - (effect at bus controller).

Messages which are relayed by the bus controller are so indicated.

Hex Keyword

00 SYSTEM SERVICE NO OPERATION
trib - & - bc System service no operation

relayed by bc

Format: <SYSTEM SERVICE NO OPERATIN>

01 reserved for BEGIN These codes are reserved for BEGIN and
02 reserved for END END delimiters. They are used in the form:
<BEGIN>
<command or I/F list>
<END>

relayed by bc

03 SYSTEM SERVICE RESET
trib - System service reset. Resets all system service level functions to the power-up default state:

Virtual machine select - 0
Virtual groups disconnected
Segmentation off

bc - Select virtual circuit 0 for the addressed tributary.

Sent by bc

Format: <SYSTEM SERVICE RESET>

04 INITIAL SEGMENT
trib - Directs the system service level to commence segment assembly.

bc - Do not parse message further.

relayed by bc

Format: <INITIAL SEGMENT>
<SEGMENT COUNT> 8-bit binary unsigned number; count zero is the final segment.
<SEGMENT DATA . . .>

Note: The final byte of a data segment shall be the final byte of a supervisory level block.

05 SUBSEQUENT SEGMENT

trib - Directs the system service level to continue segment assembly.

bc - Do not parse massage further

relayed by bc

Format: <SUBSEQUENT SEGMENT>
<SEGMENT COUNT> 8-bit binary unsigned number; count zero is the final segment.
<SEGMENT DATA . . . >

Note 1: The final byte of a data segment shall be the final byte of a supervisory 1evel block.
Note 2: A tributary with multiple virtual machines attached must provide separate segmentation facilities for each virtual machine.

06 BLOCK

trib - Directs the system service level to disassemble virtual machine messages which have been concatenated within a single supervisory level frame. The BLOCK command shall be employed to delimit messages on every occasion where message concatenation is employed.

bc - Look at end of block for system service message

relayed by bc

Format: <BLOCK>
<BYTE COUNT> 8-bit binary unsigned number. Specifies the length of the individual blocked message, in bytes, not including the byte count
<BLOCK DATA . . .>

07 VIRTUAL MACHINE/GROUP SELECT

trib - Directs the system service level to select the specified virtual machine or group.

bc - Selects the virtual circuit linkage for the indicated virtual machine.

Format: <VIRTUAL MACHINE/GROUP SELECT>
<VIRTUAL MACHINE/GROUP NUMBER> 8-bit binary unsigned number in the range 00h-EFh (machine), F0h-FFh, (group). 00h is default.

08 SYSTEM SERVICE ERROR

trib - & be - Advises that the system service command in the last frame received had not been understood, or could not be performed. Following receipt of a SYSTEM SERVICE ERROR, no further processing will take place on the supervisory level frame, although any virtual machine message(s) encountered up to that point will still be forwarded to their destination(s).

relayed by bc

Format: <SYSTEM SERVICE ERROR>
<EXEC CODE> 8 bits

00 - parse error
01 - cannot do by design
02 - insufficiently equipped
03 - buffer overflow
04 - invalid keyword argument
05- destination trib. unavailable

<BYTE COUNT> 8 bits; not including the byte count
<OFFENDING COMMAND>

09 VIRTUAL GROUP ATTACH

trib - Directs the system service level to attach the specified virtual machine to the specified virtual machine group.

bc - Never received

sent by bc

Format: <VIRTUAL GROUP ATTACH>
<VIRTUAL MACHINE NUMBER> 8-bit binary unsigned number in the range 00h to EFh. 00h is default.
<VIRTUAL GROUP NUMBER> 8-bit binary unsigned number In the range F0h to FFh only.

0A VIRTUAL GROUP DISCONNECT

trib - Disconnects the specified virtual machine from the specified virtual machine group.

bc - Never received

sent by bc

Format: as VIRTUAL GROUP ATTACH. 00h removes all group assignments for a particular virtual machine.

10 ASSIGN LINKAGE

trib - Never received

bc - Directs the bus controller system service level to establish a unidirectional linkage.

Format <ASSIGN LINKAGE>
<SOURCE>
<DESTINATION>

Where: SOURCE = Supervisory level select address + virtual machine number (default is 00h)

and: DESTINATION = Supervisory level select address + virtual machine number OR virtual group number (default is 00h)
or = Supervisory level group select address + virtual group number (default is 00h)

11 DEASSIGN LINKAGE
trib - Never received

bc - Directs the system service level to terminate to terminate the specified unidirectional linkage.

Format: as ASSIGN LINKAGE.

12 ASSIGN SUPERVISORY LEVEL GROUP
trib - Never received

bc - Directs the bus controller to assign a tributary to the designated group.

Format: <ASSIGN SUPERVISORY LEVEL GROUP>
<TRIBUTARY SELECT ADDRESS>
<SUPERVISORY LEVEL GROUP SELECT ADDRESS>

13 DEASSIGN SUPERVISORY LEVEL GROUP
trib - Never received

bc - Directs the bus controller to remove a tributary from a designated group.

Format: as ASSIGN SUPERVISORY LEVEL GROUP

14 ASSIGN VIRTUAL GROUP
trib - Never received

bc - Directs the bus controller to assign a virtual machine to a virtual group.

Format: <ASSIGN VIRTUAL GROUP>
<MACHINE>
<VIRTUAL GROUP>

Where <MACHINE> = Tributary select address + virtual machine number

15 DEASSIGN VIRTUAL GROUP
trib - Never received

bc - Directs the bus controller to remove a virtual machine from a virtual group.

Format: as ASSIGN VIRTUAL GROUP

16 BC READ
trib - Never received

be - Directs the bus controller to transmit the instantaneous contents of the information field.

Format: <BC READ>
<I/F NAME>

Note: The I/F NAME may be replaced by several names wrapped in a BEGIN/END construct.

17 BC I/F ITEM RESPONCE
trib - Contains the I/F data in response to a <BC READ> command.

bc - Never received.

Format: <BC I/F ITEM RESPONSE>
<I/F NAME>
<I/F VALUE>

Note: Several I/F NAMES/VALUES may be wraped in a BEGIN/END construct.

18 REQUEST TIME TRANSMISSION
trib - Never received

bc - Directs the bus controller to transmit the value of the master system clock to all virtual machines using the common message TIMELINE RUN.

Format: <REQUEST TUM TRANSMISSION>

19 BUS CONTROLLER USER DEFINED
trib - Never received

bc - Directs the bus controller to enter the user-defined command state. On entry to such a state the specific bus controller parses the data bytes which follow. This will be manufacturer-, operator-, and/or installation-dependent.

Format: <BUS CONTROLLER USER DEFINED>
<BYTE COUNT> 8-bit binary unsigned number. Specifies the length of the command in bytes. not including the byte count itself.
<RAW DATA>

1F EXTENSION
trib - & bc - Directs the tributary or bus controller to enter the extension command set for the following single command only. They shall then resume execution of the basic command set.

Format: <EXTENSION>
<EXTENSION SET COMMAND> (one or more bytes)

3. Information fields

10 LINKAGE
Contains all the linkage information.

Format: <LINKAGE>
<BEGIN>
<SOURCE>
<DESTINATION>
<SOURCE>
<DESTINATION>
. . . . . .
<END>

Where SOURCE = Supervisory level select address + virtual machine number (default is 00h).
and DESTINATION = Supervisory level select address + virtual machine or group number (default is 00h)
or Supervisory level group select address + virtual group number (default is 00h)

When necessary, the linkage information may be segmented.

11 STATUS
Tallies the system service level status.

Format: <STATUS>
<STATUS REPORT> 00h Linkage directory established; clock available
01h No linkage directory; clock available
10h Linkage directory established; no clock available
11h No linkage directory: no clock available

12 SUPERVISORY LEVEL GROUP
Contains all active supervisory level (SIL) groups, excluding All Call, with the associated tributary addresses.

Format: <SUPERVISORY LEVEL GROUP>
<S/L GROUP IDENTIFIER> 16-bit binary unsigned number
<BEGIN>
<S/L SELECT ADDRESS>
<S/L SELECT ADDRESS>
<S/L SELECT ADDRESS ... >
<END>

Multiple groups may be heated with BEGIN/END.

When necessary, the message may be segmented.

13 VIRTUAL GROUP
Contains all active virtual groups with the associated virtual machine identifiers.

Format: <VIRTUAL GROUP>
<VIRTUAL GROUP NUMBER> 8-bit binary unsigned nunber in the range F0h to FFh.
<BEGIN>
<supervisory level select address>
<VIRTUAL MACHINE NUMBER> 8-bit binary unsigned number in the range 00h to EFh.
<supervisory level select address>
<VIRTUAL MACHINE NUMBER>
<supervisory level select address>
.
.
.
<END>

Multiple groups may be nested with BEGIN/END.

When necessary, the message may be segmented.

FF EXTENSION
Indicates that the next information field name is a zember of the extension set.

Format: <EXTENSIM
<EXTENSION SET I/F NAME>

Part 2

Common messages

Chapter 1

General concepts

This chapter contains a general explanation of some of the concepts used in the formulation of the common message set. It constitutes tutorial information, and is intended to assist in the understanding of the specification in Chapter 2.

1. Commands and responses

The message language is subdivided into two types of message, which differ only in the direction of information flow between controlling and controlled virtual machines.

- COMMANDS are messages from a controlling to a controlled virtual machine;
- RESPONSES are messages from a controlled to a controlling virtual machine; responses are mostly transmitted in reaction to a command.

2. State machine and information transfer

The virtual machine controlled by the message language is considered as a STATE MACHINE. The message set can be regarded as being of two types:

- Messages which change the state of the virtual machine (e.g. the VTR messages STOP and PLAY). These commands reside mainly in the type-specific message set and comprise commands which are mutually exclusive (e.g. the tape motion commands (TMCs) in the VTR set).

- Messages (commands and responses) which do not change the state, but which only carry information to or from the virtual machine. An Information-transfer is a general requirement of all types of virtual machine, general principles are applied to these tasks; these messages, therefore reside mainly in the common message set.

3. Information fields (I/F)

Items of information which are maintained by, and held within a controlled virtual machine, and which may be needed by its controlling virtual machine, are arranged in a virtual array of information fields, which is similar in concept to a data-base.

Each information field is identified by a unique descriptor called the information field name. This name, coded as a binary value, is used as an address within all commands referencing the field. The information field name is used, therefore, as a parameter name in these commands.

The format of information field data, within each message, as transmitted over the remote control system, is predefined for each item by the Information field now.

Each message set requires its own array of information fields; the complete field array of a specific virtual machine comprises the field array specified in the common message set, together with that of the type-specific message set.

A typical example of a command requiring an information field is READ, which directs the virtual machine to transmit the content of one or more information field(s), as specified within the command.

The SIMULTANEOUS READ command directs the virtual machine to read, simultaneously, the instantaneous values of a number of specified information fields. In response to this command, all the specified fields will be read as a "snapshot", and will be "locked", therefore, during the READ period.

It is essential to be able to PRESET the values of certain items held within information fields. However, since the preset function could (indirectly) change the state of the virtual machine (e.g. presetting a tape timer), the PRESET command is contained within the type-specific command set; information fields to which it relates are then individually specified.

4. Error and failure messages

An ERROR message advises a controlling virtual machine that the command, as identified, cannot be performed. The reason for the inability to perform the action is contained within an EXEC CODE transmitted as a parameter to the ERROR keyword.

The string which caused the error message is then appended to the EXEC CODE, preceded by a byte count.

In the event of failure of the specific machine (i.e. a failure requiring the attendance of an operator), a single byte FAILURE message is transmitted.

5. Enquiry concept

Although, ideally, every virtual machine should respond to the complete message set, it is the responsibility of each manufacturer to determine the degree of conformance of his product.

To enable a controlling virtual machine to determine the facilities supported by a remote-controlled virtual machine, two enquiry commands are provided:

- FUNCTION POLL to identify supported commands;
- FIELD POLL to identify supported information fields.

The associated responses are FUNCTION POLL RESPONSE and FIELD POLL RESPONSE.

Virtual machines that do not support these enquiry commands must respond to any unknown command with ERROR.

6. Standard and extension keywords

Due to the limited code-space available, each message set (system service, common, type-specific) contains an extension keyword, which opens an additional code space of 256 additional keywords.

Frequently used keywords will preferably reside in the standard set. For keywords that are used less frequently, the additional overhead of one byte is acceptable; such keywords have been put in the extension set from the beginning, thus leaving room in the standard set for future applications.

7. Procedures

A group of commands which are to be executed in sequence on one or more occasions may be combined into a procedure using the command DEFINE PROCEDURE.

Once defined, a procedure can be called simply by the command EXECUTE PROCEDURE, as often as wanted, until cancelled by the DELETE PROCEDURE command.

It is possible to define more than one procedure at a tine using different procedure names, coded as binary numbers.

The command RECALL PROCEDURE and the associated response PROCEDURE RESPONSE may be used to inspect currently-defined procedures.

8. The timeline concept

In order to allow for synchronous processes in and among several virtual machines, a time-scale common to all virtual machines is provided which my be referenced by certain commands. This time-scale is called TIMELINE.

The timeline may be derived externally by a locally-defined reference time (e.g. derived from a central timecode generator and distributed over separate lines), or it may be generated internally by a built-in clock, the "machine internal clock", that gets only its "ticks" from an external source available to all machine internal clocks of the system (e.g. the vertical pulse, in television applications).

Either of the two possibilities may be selected by the TIMELINE SOURCE command.

When the machine internal clock is selected as the timeline source, the timeline may be stopped by the TIMELINE STOP command and restarted by the TIMELINE RUN command, which also specifies the start value.

The TIMELINE RUN command is also issued by the bus controller in response to the system service command REQUEST TIME TRANSMISSION; this allows for exact synchronization of all timelines of the system.

The current status of the timeline may be accessed through the Information field TIMELINE.

9. Events

An event specifies a command that will he executed on the occurrence of a specified trigger condition. The trigger condition arises when a specified trigger value coincides with the content of a specified trigger source. Any information field of the specific virtual machine may serve as a trigger source.

The most important trigger source, however, is the timeline. This allows for time-synchronous events in different virtual machines (e.g. synchronizing the transports of several VTRs).

The command DEFINE EVENT is used to specify an event. The event is cleared by the occurrence of the trigger condition, or by a CLEAR EVENT command.

The command RECALL EVENT and the associated response EVENT RESPONSE may be used to inspect pending events.

Using EXECUTE PROCEDURE as the command within an event specification allows for a sequence of commands to be programmed for execution on a trigger condition.

It is important to note that the controlled virtual machine, once programmed with an event, is responsible for taking care of all necessary actions for the correct execution of that event; even if actions have to be taken in advance of the occurrence of the trigger condition (e.g. in the case of an event that programs an edit entry on the timeline the virtual machine must apply the necessary switch commands for the erase head a certain number of frames in advance of the trigger time).

10. Tasks with repeated responses

In order to reduce overhead on the remote-control system, commands are provided which may be used to instruct a controlled virtual machine to transfer the content of an information field repeatedly; either whenever the content changes (UPDATE command), or when a specified time-period is over (CYCLE command).

Caution must be exercised, however, in the use of multiple UPDATE commands where the values of the specified information fields are changing rapidly; bus congestion may occur.

Additionally, where an information field value has changed a number of times in the period between bus controller polls, only the most recent value is transmitted at the next poll, in response to either the UPDATE or CYCLE commands; this will minimize the risk of bus congestion.

(Note: Repeated transmissions must be consistent with the requirements of the supervisory protocol, i.e. a transmission can take place only following a tributary poll and a subsequent service request to the bus controller.)

11. Dialect identification

The information field VIRTUAL MACHINE TYPE-of the common message set contains a code which defines the type of the type-specific message set. Every dialect has an associated code which is defined in the specification of that manage set.

The type of virtual machine, and the dialect understood by it, can be interrogated by READing this information field.

Chapter 2

Common messages

1. Index of keywords mnemonics and information field names

Hex	Keyword	(Mnemonic)	Hex	Information field name	(Mnemonic)
20	CNOP	(CNOP)	20		
21	CRESET	(CRST)	21	VIRTUAL MACHINE TYPE	(VTYP)
22	READ	(READ)	22	EQUIPMENT TYPE	(ETYP)
23	I/F ITEM RESPONSE	(IFRE)	23	TIME STANDARD	(TIME)
24	TIMELINE SOURCE	(TSCE)	24	TIMELINE TIME	(TTIM)
25			25		
26	EXECUTE PROCEDURE	(EXPR)	26	EVENT BUFFER STATUS	(EBST)
27	DEFINE EVENT	(DEEV)	27	VIRTUAL MACHINE STATUS	(VMST)
28	CLEAR EVENT	(CLEV)	28		
29	ERROR	(CERR)	29		
2A			2A		
2B			2B		
2C			2C		
2D	FAILURE	(FAIL)	2D		
2E			2E		
2F	TIMELINE STOP	(TSTP)	2F		
30	TIMELINE RUN	(TRUN)	30		
3E	USER DEFINED	(UDEF)	3E	USER DEFINED	(UDND)
3F	EXTENSION	(CEXT)	3F	EXTENSION	(CIEX)

Note: The ability to perform command 29h (ERROR), above, is mandatory for every virtual machine.

EXTENSION SET

Hex	Keyword	(Mnemonic)
00		
01		
02		
03	FUNCTION POLL	(FNPL)
04	FUNCTION RESPONSE	(FNRE)
05	FIELD POLL	(FDPL)
06	FIELD RESPONSE	(FDRE)
07	UPDATE	(UDAT)
08	CYCLE	(CYCL)
09	MUTE	(MUTE)
OA	SIMULTANEOUS READ	(SIRD)
OB	DEFINE PROCEDURE	(DEPR)
OC	DELETE PROCEDURE	(DLPR)
OD	RECALL PROCEDURE	(REPR)
OE	PROCEDURE RESPONSE	(PRRE)
OF	RECALL EVENT	(REEV)
10	EVENT RESPONSE	(EVRE)
11	SIMULTANEOUS READ RESPONSE	(SRDR)
FF	EXTENSION	(EXEX)

2. Keywords

In the following definitions, parameter names and parameter values are 8-bit binary, unless otherwise noted.

Multi-byte values, where Used,are ordered with the most-significant byte first in the message; the least-significant bit ia transmitted first.

Hex Keywords

20 CNOP
Virtual machine no operation

Format: <CIROP>

21 CRESET
Directs the destination virtual machine to assume standard values of all preselectable functions. (Same status as power-up)

Format: <CRESET>

22 READ
Directs the virtual machine to transmit the instantaneous content of the specified information field

Format: <READ>
<I/F NAME>

Note. Several I/F NAMS may be wrapped in a BEGIN/END construct.

23 I/F ITEM RESPONSE
Response to READ, UPDATE or CYCLE commands

Format <117 ITEM RESPONSE>
<I/F NAME>
<I/F VALUE> (length varies according to the I/F NAME)
Note: Several I/F NAME and I/F VALUE pairs may be wrapped in a BEGIN/END construct.

24 TIMELINE SOURCE
Directs the virtual machine to select the source of the timeline

Format: <TIMELINE SOURCE>
<SOURCE IDENT> <00> INTERNAL - Internal clock Incremented by an unspecified source ("tick")
<0l> EXTERNAL - External reference time

26 EXECUTE PROCED
Directs the virtual machine toexecute immediately the procedure named.

Format: <EXECUTE PROCEDURE>
<PROCEDURE NAME> NAME is in the range 01h to FFh, 0h is reserved

27 DEFINE EVENT
Prepares an "event" i.e. a function which shall be executed at the Instant of coincidence of a specified trigger time with the content of a specified I/F time

Format: <DEFINE EVENT>
<EVENT NAME> 8 bits
<I/F NAME OF TRIGGER SOURCE>
<TRIGGER VALUE> (type TIME)
<COMMAND> specifies the function

Notes: 1. To implement a procedure in an event, "EXECUTE PROCEDURE" shall be used for the COMMAND, and the procedure shall have been pre-defined.
2. The TRIGGER SOURCE I/F NAME is a TIMELINE or a type-specific time information field.
3. All functions contained within a procedure defined as an event must be executed by the virtual machine at the trigger time specified by the event.
4. Events are limited to type-specific messages, and the common message READ.
5. The virtual machine shall clear an event on execution.
6. The EVENT NAME is unique for each event.
7. Where mutually exclusive commands are given inadvertently at the same time through the use of events constructs, such events shall be cleared by the virtual machine and an error message returned.

28 CLEAR EVENT
Clears one or all events previously established

Format: <CLEAR EVENT>
<EVENT NAME> (<00h> is all events)

29 ERROR

Advises the controlling virtual machine th&t7the previous string has not been understood by, or cannot be performed by the controlled virtual machine

Format: <MC CODE> 8 bits:

00	Parse error
01	Cannot do by design
02	Insufficiently equipped
03	Buffer overflow
04	Invalid keyword
05	Invalid keyword argument
FF	Unspecified

<BYTE COUNT> 8 bits, not including the byte count

<OFFENDING STRING> truncated not to exceed an overall message length of 256 bytes

2D FAILURE

Warns of a catastrophic failure of the specific machine; i.e. a failure which requires intervention by the local operator

Format: <FAILURE>

2F TIMELINE STOP

If the timeline is internal, stops the timeline from increment

Format: <TIMELINE STOP>

30 TIMELINE RUN

If the timeline is internal, starts the timeline incrementing from the time indicated

Format: <TIMELINE RM

<TIMELINE VALUE> (type TIME)

3E USER,DEFINED

Identifies USER DEFINED commands

Format: <USER DEFINED>

<BYTE COUNT> 16-bit~binary unsigned number. Specifies the length of the command, in bytes, not including the byte count itself.

<RAW DATA> (length varies according to the byte count)

3F EXTENSION

Directs the virtual machine to enter the common message extens on act following single command only. The virtual machine shall then resume execution of the basic command set.

Format: <EXTENSION>

<EXTENSION SET COMMAND> (one or more bytes)

EXTENSION SET

00 ⎫
01 ⎬ RESERVED
02 ⎭

03 FUNCTION POLL
Directs the virtual machine to indicate which of the keywords contained in the command set are supported by its type-specific machine. BEGIN and END are excluded from the keywords. The existence of the function poll command assumes the existence of the BEGIN/END construct.
5

Format: <FUNCTION POLL>
<BEGIN>
<KEYWORD l>
<KEYWORD 2>
<KEYWORD . . .>
<END>

04 FUNCTION RESPONSE
Contains the list of supported keywords in response to a FUNC

Format: <FUNCTION REPONSE>
<BEGM
<KEYWORD l>
<KEYWORD 2>
<KEYWORD . . .>
<END>

05 FIELD POLL
Directs the virtual m~chine to indicate which I/F names contained in the parameter list are supported by the type-specific machine information field

Format: <FIELD POLL>
<BEGIN>
<I/F NAME l>
<I/F NAME 2>
<I/F NAME . . .>
<END>

06 FIELD RESPONSE
Contains the list of supported I/F names from those indicated by a FIELD POLL command

Format: <FIELD RESPONSE>
<BEGIN>
<I/F NAME l>
<I/F NAME 2>
<I/F NAME . . .>
<END>

07 UPDATE
Directs the virtual machine to respond immediately with the contents of the information field, and then, automatically, whenever its contents change.

Format: <UPDAATE>
<I/F NAME> (Hex,)

Notes: 1 The single I/F NAME may be replaced by several names wrapped in a BEGIN/END construct.
2. The default condition is MUTEd.
3. Where an information field value has changed a number of times in the period between bus-controller polls, only the most recent value is transmitted at the next poll.

08 CYCLE
Directs the virtual machine to transmit periodically, as specified, the instantaneous contents of the specified information field.

Format: <CYCLE>
<TIME INTERVAL> (type TIME)
<I/F NAME> (Hex)

Notes: 1. The single I/F NAME may be replaced by several names wrapped In a BEGIN/END construct.
2. The default condition is MUTEd.
3. Where an information field value has changed a number of times in the period between bus-controller polls, only the most recent value Is transmitted at the next poll.

09 MUTE
Directs the virtual machine to switch off all responses previously initiated by CYCLE or UPDATE commands

Format: <MUTE>

0A SIMULTANEOUS READ
Directs the virtual machine to read simultaneously the contents of the specified information fields

Format: <SIMULTANEOUS READ>
<BEGIN>
<I/F NAME>
<I/F NAME>
<END>

0B DEFINE PROCEDURE
Directs the virtual machine to assemble a block of virtual machine commands for subsequent execution

Format: <DEFINE PROCEDURE>
<PROCEDURE NAME> (Hex) in the range 0lh-FFh. 00h is reserved.
<BYTE COUNT> 16 bits; not including the byte count
<COMMAND l> ⎫
<COMMAND 2> ⎬ The procedure
<COMMAND . . .> ⎭

Notes: 1. All functions contained within a procedure which is used within an event must be executed by the virtual machine at the trigger time specified by the event, even if actions must be taken in advance.

2. Procedures are retained until receipt of a DELETE PROCEDURE or CRESET command.

0C DELETE PROCEDURE

Directs the virtual machine to delete a command block previously defined

Format: <DELETE PROCEDURE>
<PROCEDURE NAME> (<00h> deletes all procedures)

0D RECALL PROCEDURE

Directs the virtual machine to transmit, but not execute or delete, the specified procedure for checking

Format: <RECALL PROCEDURE>
<PROCEDURE NAME> (<00h> recalls all procedures)

0E PRECEDURE RESPONSE

Response to RECALL PROCEDURE command

Format: <PROCEDURE RESPONSE>
<PROCEDURE NAMW
<BYTE COUNT> 16 bits not including the byte count
<C011MAND l>
<COMMAND 2>
<COMMAND . . .>

0F RECALL EVENT

Causes an EVENT RESPONSE from the controlled virtual machine containing the data of an event already established

Format: <RECALL EVENT>
<EVENT NAME> (<00h> recalls all events)

10 EVENT RESPONSE

Contains the data of an event already established

Format: <EVENT RESPONSE>
<EVENT NAME>
<I/F NAME of TRIGGER SOURCE>
<TRIGGER VALUE> (type TIME)
<COMMAND> function caused by trigger condition

11 SIMULTANEOUS READ RESPONSE 5,2

Response to SIMULTANEOUS READ with all specified information fields

Format: <SIMULTANEOUS READ RESPONSE>,
<BEGIN>
<I/F NAME l>
<I/F VALUE l>
<I/F NAME 2>
<I/F VALUE 2>
.
.
<END>

FF EXTENSION

Directs the virtual machine to enter the further extension sat for the following single command only. The virtual machine shall then resume execution of the basic set.

Format: <EXTENSION>
<EXTENSION SET COM~

3. Information fields

20 Not used

21 VIRTUAL MACHINE TYPE

Contains the virtual machine name and hence defines the type specific machine command set

Format: <VIRTUAL MACHINE TYPE>
<VIRTUAL MACHINE NAME> (8-bit binary unsigned number)

The content of VIRTUAL MACHINE NAME shall be defined explicitly in each virtual machine dialect; the virtual machine name for a wholly USER DEFINED virtual 01h.

22 EQUIPMENT TYPE

Contains the data to identify the specific product, including hardware/software revision level

Format: <EQUIPMENT TYPE>
<BYTE COUNT> 8 bits, not including the byte count itself
<ISO 646 printing characters>

Note: The ISO characters shall contain three fields, namely:
1. Manufacturer Identification
2. Product identification
3. Revision level
in that order. Each field shall be terminated by <0Dh>.

23 TIME STANDARD

Contains the nominal field rate to be used, or in use

Format: <TIME STANDARD>
<NAME> 8-bit binary unsigned number
<00h> is undefined
<01h> is "48
<02h> is "50"
<03h> is "60"

24 TIMELINE TIME

Contains the timeline time value

Format: <TIMELINE TIME>
<TIMELINE TIME VALUE> the resolution shall be consistent with the timecode in use.

26 EVENT BUFFER STATUS

Tallies the event buffer status

Format:	<EVENT BUFFER STATUS>	
	<STATUS REPORT>	Space remaining In bytes 16-bit number

27 VIRTUAL MACHINE STATUS

Tallies the virtual machine status

Format:	<VIRTUAL MACHINE STATUS>	
	<STATUS REPORT>	<00h> off <0lh> not available <02h> available

3E USER DEFINED

Identifies USER DEFINED information fields

Format:	<USER DEFINED>	
	<BYTE COUNT>	16-bit binary unsigned number. Specifies the length of the information field in bytes, not including the byte count itself
	<RAW DATA>	(Length varies according to the byte count)

3F EXTENSION

Directs the virtual machine to enter the common message I/F name extension set for the following single I/F name only. The virtual machine shall then resume access to the basic I/F name set

Format: <EXTENSION>

REMOTE-CONTROL SYSTEMS
FOR BROADCASTING PRODUCTION EQUIPMENT
VIDEO TAPE-RECORDER TYPE-SPECIFIC MESSAGES

Tech. 3245-E - Supplement 2 November 1986

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Introduction

Document Tech. 3245 describes the specification of a digital remote-control system for broadcasting production equipment. It defines completely the electrical/mechanical level (level 1), and the supervisory level (level 2), of the interface. The two remaining levels - the system service level (level 3), and the virtual machine level (level 4) - are defined only in terms of function and control message syntax.

Supplement 1 to Tech. 3245 completes the definition of the system service level by detailing the system service messages and, in addition, defines the virtual machine messages which are common to all types of virtual machine - the common messages.

The present Supplement defines the type-specific virtual machine messages which are applicable to video tape recorders. Type-specific messages applicable to other categories of equipment are defined in other supplements to Tech. 3245.

In order to implement a complete network, the system designer therefore requires:

Document Tech. 3245 - the general specification

Supplement 1 - system service and common messages

and one or more other supplements appropriate to the category or categories of equipment to be used.

The specification described in this Supplement has been developed jointly with the SMPTE, and is functionally identical to that to be published as an SMPTE Recommended Practice.

Chapter 1
General concepts

This chapter contains a general explanation of some of the concepts used in the formulation of the VTR type-specific message set. It constitutes tutorial information, and is intended to assist in the understanding of the specification in Chapter 2.

1. Transport machine states

The transport mechanism of a VTR is considered as an independent state machine. Therefore the commands which control transport functions form a subset within the VTR-specific message set. These commands are called Tape Motion Commands ("TMC"). Each TMC causes a transition from one specific transport state to another and cancels the previous state, i.e. these functions are mutually exclusive.

TMCs include: STOP, STD PLAY, SHUTTLE, PREROLL SEARCH, SYNC, etc.

All tape motion commands are marked as such in the command description.

2. Electrical machine states

Other VTR commands affect states of the electrical environment of the VTR. The functions controlled by them are not necessarily mutually exclusive.

3. Transport speeds

Some commands require a speed specification which is carried by the command in the form of a three-byte parameter. This parameter is intended to define the direction and absolute value of the desired speed that should be achieved as closely as possible by the real machine.

All commands with a speed parameter use the same format and coding. This in a three-byte signed number with a scale range defined so that

000000hex	represents still
010000hex	represents standard play-speed forward.
7F0000hex	represents approximately 127 times standard play-speed forward
FF0000hex	represents standard play-speed reverse
800000hex.	represents 128 times standard play-speed reverse.

It allows, theoretically, for speeds between -128 and approximately +127 times standard speed and a resolution of 1/65,536th of standard speed.

4. Record control

The recording function of the tape machine is fully controlled by the command pair ENTRY/EXIT. The form of record entry or exit is predefined by the command RECORD MODE. The tracks/channels affected by the command are defined by a parameter contained within the ENTRY/EXIT command.

5. Track and channel selection

Some commands and information fields refer to one or more tracks (or the associated channels) of the tape machine. The format used is the same in all cases and is defined in the description of the ENTRY and EXIT commands. The format allows for up to 16 audio tracks for future applications.

6. VTR information fields

The VTR dialect makes extensive use of the information field concept; some specific items of the VTR information field are described in the following sections.

6.1. TMC tallies

This Information field indicates the current state of the transport. As all possible states are commanded by TMCs, the code of the corresponding TMC keyword in used to identify them individually.

An additional byte indicates (tallies) the level of success, i.e. whether the commanded function is still in progress or already finished, and whether successfully or not.

6.2. Other command tallies

Commands which cause changes in any electrical machine state (non-TMCs) have a corresponding information field. When the information field is read, the response is tallied in the same format as that of the command.

Example: The command RECORD MODE SELECT is intended to preset the state of the recording electronics. The information field RECORD MODE TALLY may be read to obtain information about the record mode status, which will be tallied in the same format as that contained within the RECORD MODE SELECT command itself.

6.3. Tape code

There are several scales that may be used to identify a tape position, for example:

- longitudinal timecode,
- vertical interval timecode,
- tape timer 1,
- tape timer 2.

For tape search, editing and other automatic procedures one of these scales must be used. The selected scale is referred to as the TAPE CODE, and can be chosen by the TAPE CODE SELECT command. The functions mentioned above then refer to the TAPE CODE rather than directly to timecode.

There is a separate information field for each of the codes and timers mentioned above; the tape code actually selected, however, can also be read from the information field TAPE CODE.

7. Synchronization

Synchronization is one of the fundamental requirements of a tape machine. Synchronization means that the machine is programmed to pass:

- a specified point on the tape (*'where"),

- at a specified point in time ("when'), and

- locked to a specified speed ("how").

"Where": The point on the tape is called SYNC POINT. It is specified in terms of TAPE CODE, and is maintained in the information field SYNC POINT. The sync point is specified by applying a PRESET command to this information field.

"When": The point in time is defined by the instant of issue of the SYNC command. At a specified time period after the arrival of the SYNC command, the SYNC POINT must be reached. This time period is called PREROLL DURATION; it is maintained in the information field PREROLL DURATION, and is specified by applying a PRESET command to this information field.

Note that the PREROLL DURATION is reserved mainly for synchronization purposes; a greater PREROLL DURATION than required by the real machine may, however, be chosen for operational reasons (e.g., extended preview time).

"HOW" The speed at the SYNC POINT is defined by a value maintained in the information field SYNC VELOCITY; it is specified by applying a PRESET command to this information field.

As a prerequisite for the use of the SYNC command, the tape must be placed at a park position which is calculated from the SYNC POINT and the SYNC VELOCITY as follows:

$$\text{SYNC POINT} - \frac{\text{PREROLL DURATION X SYNC VELOCITY}}{\text{STANDARD VELOCITY}}$$

To achieve this park position the PREROLL SEARCH command is used and the VTR virtual machine must make the calculation automatically.

7.1. The SYNC command in the case of an "Ideal machine"

A better understanding of the function of the SYNC command can be had if it is considered in the case of an "ideal" machine.

- On the arrival of a SYNC command an ideal VTR would start immediately with no delay, fully locked and with the specified speed. Under these ideal conditions the machine would, at the PREROLL DURATION time later, be precisely at the SYNC POINT.

- A real VTR cannot start and synchronize immediately; it is therefore the responsibility of the virtual machine, and hence of the virtual machine manufacturer, to control the real machine in such a manner that the result is the same.

Measures taken in order to correct synchronization following the PREROLL DURATION period may include:

- on the receipt of a PREROLL SEARCH command, parking a few frames down the tape to match the average number of frames lost while coming up to play speed, and

- on the SYNC command, overriding the specified velocity using the tape speed override facility of the real machine to eliminate the remaining offset from the appropriate lock condition.

7.2. The CHASE command: an alternative means of maintining synchronism

While the PREROLL SEARCH/SYNC commands may be used to run several machines in continuous synchronism (without changing their states and/or speed), the CHASE command is used to maintain synchronism as closely as possible where dynamic changes of the machines' state and/or speed occur.

This operation, however, requires one of the synchronous machines to be the master, while the others perform as slaves, and emulate all the movements of the master, even when in the SHUTTLE state.

The slaves must therefore be given precise information about the movement of the master. Such information is, in general, transferred by means of timecode, which is distributed continuously from the master to all slaves over a separate line. The bus cannot be used for this purpose due to its unpredictable delays.

The CHASE command specifies an offset between the timecode of the chasing machine and a reference. The reference is the timeline, which, in this case, will usually be programmed to use an "external reference time" as its source (i.e. the timecode of the master). See also the common message TIMELINE SOURCE.

8. Immediate and timeline modes

All VTR commands can be used in the "immediate mode", which causes their instantaneous execution; in this way they can be used to control even time-critical functions. As the transfer of a message over the bus within a given time slot cannot be guaranteed, however, the immediate mode is not recommended for such applications.

Wherever possible, time-critical commands should be queued on the timeline, using the command facilities provided by the common message set. Activities requiring synchronous operations between several VTRs are best suited to the "timeline mode" of operation, which allows for the pre-programming of sequences of time-critical functions (e.g. SYNC, ENTRY and EXIT commands). In general, time-critical functions refer to the timelines of the individual virtual machines, which themselves are synchronized by a system time transmission from the bus controller in response to a REQUEST TIME TRANSMISSION command.

For certain time-critical applications (for example, editing), it is essential that all machine internal clocks are synchronized to the station field phase sequence. In order to achieve this phasing, the machine internal clock will be advanced by as many frames as necessary following receipt of the TIMELINE RUN command. When all virtual machines in a session achieve this in the same way (for example, when they are all VTRs), there is no difficulty.

A problem does arise, however, if there are non-VTR participants within a session (ATRs, for example). They would have no reason to advance the machine internal clock is accordance with a video sequence and a mixed operation of VTRs and non-VTRs would therefore not necessarily run synchronously.

There are two approaches which might be taken to resolve this problem.

If the bus clock which resides in the bus controller runs synchronously with the video phase sequence, no correction of a machine internal clock following a TIMELINE RUN command need take place.

Alternatively, if this approach is not possible, the controlling device may gain information about any correction of the clocks within the system by READing the information field TIMELINE CORRECTION TALLY from all virtual machines involved and comparing them with each other. If this results in differing tallies, the controlling device can take that into account when calculating events for the timeline.

In the case of a known synchronous bus clock the TIMELINE CORRECTION TALLY may be used by the controlling device for fault diagnosis on the machine internal clocks.

9. Sample command sequences

The following sections show samples of typical command sequences in immediate mode as well as in timeline mode. These sequences describe only some of the applications of the command set; there is no obligation on the part of system designers to use precisely these sequences.

9.1. Immediate mode

9.1.1. Search and play

some time before initial action:

<PRESET> <PREROLL DURATION> <time value>

<PRESET> <SYNC POINT> <time value>

initial action:

<PREROLL SEARCH>

final action (not earlier than when TMC TALLY has been "SEARCHed, successfully"):

<STD PLAY>

On the STD PLAY command the VTR starts. It reaches the SYNC POINT after approximately the PREROLL DURATION.

If the VTR is required to start at the SYNC POINT location (using no preroll) the TARGET SEARCH command should be used. Synchronization is not then guaranteed.

Note that the PREROLL DURATION and the SYNC POINT once loaded, need not be reloaded until changed.

9.1.2 Search and synchronize

some time before initial action:

<PRESET> <PREROLL DURATION> <time value>

<PRESET> <SYNC POINT> <time value>

<PRESET><SYNC VELOCITY><speed value>

initial action:

<PREROLL SEARCH>

final action (not earlier than when TMC TALLY has been "SEARCHed, successfully"):

<SYNC>

On the SYNC command the VTR starts. It reaches the SYNC POINT after precisely the PREROLL DURATION.

Under control of the virtual machine, the TSO function of the VTR may be used to find the appropriate lock.

Synchronization of the VTR in response to the SYNC command is guaranteed; however:

- in PAL the VTR will be advanced by one frame, when necessary to be in accordance with the P-phase, and
- the colour framer will advance the VTR by as many frame a as necessary.

This sequence can be used for the synchronous operation of multiple VTRs only when delivery of the SYNC command can be guaranteed within a reasonable time slot (e.g. one field).

Note that the PREROLL DURATION, once loaded, need not be reloaded until changed.

9.1.3. Search, synchronize and insert edit

some time before initial action:

<PRESET> <PREROLL DURATION> <time value>

<PRESET <SYNC POINT> <time value>

<PRESET><SYNC VELOCITY><speed value>

<RECORD MDE> <"insert">

initial action:

<PREROLL SEARCH>

final action (not earlier than when the TMC TALLY has been "SEARCHed successfully"):

<SYNC>

at ("entry point" - "record delay"):

<ENTRY> <appropriate channels>

at ("exit point" - "record delay"):

<EXIT> <appropriate channels>

The controlling virtual machine must "know" the record delays of the VTR9 and correct for them.

In "assemble", edits and previews differ only in the RECORD MODE parameter.

This sequence can be used for the synchronous operation of multiple VTRs only on the condition that the transfer of the SYNC, ENTRY, and EXIT commands is guaranteed within a reasonable time slot (e.g. one field).

9.2. Timeline mode

9.2.1. Search and play

some time before initial action:

<PRESET> <PREROLL DURATION> <time value>

<CLEAR EVENT> <0>

<STOP TIMELINE> (optional)

<PRESET> <SYNC POINT> <time value>

<PRESET><SYNC VELOCITY><speed value>

initial action:

<PREROLL SEARCH>

final action (not earlier than when TMC TALLY has been "SEARCHed, successfully"):

<REQUEST TIME TRANSMISSION>

<DEFINE EVENT>

<TIMELINE> <"timeline sync point" - "preroll duration">

<STD PLAY>

Note that the "timeline sync point" in the value of the timeline when the SYNC POINT has been reached approximately; it must be calculated from the instantaneous timeline value transmitted by the bus controller in response to the preceding REQUEST TIME TRANSMISSION command.

In this case it is actually easier to use the immediate mode which allows for VTR PLAY at a specific time from commands given much earlier.

9.2.2. Search and synchronize

some time before initial action:

<PRESET> <PREROLL DURATION> <time value>

<CLEAR EVENT> <0>

<STOP TIMELINW (optional)

<PRESET> <SYNC POINT> <time value>

<PRESET><SYNC VELOCITY><speed value>

initial action:

<PREROLL SEARCH>

final action (not earlier than when TMC TALLY has been "SEARCHed successfully"):

<REQUEST TIME TRANSMISSION>

<DEFINE EVENT>

<TIMELINE> <"timeline sync point" - "preroll duration">

<SYNC>

Note that the "timeline sync point" is the value of the timeline when the SYNC POINT has been reached precisely; it must be calculated from the instantaneous timeline value transmitted by the bus controller in response to the preceding REQUEST TIME TRANSMISSION command. For editing it is generally desirable to introduce no unnecessary waiting times; therefore it is suggested that ("timeline sync point" - "preroll duration") be substituted in the DEFINE EVENT command by (instantaneous timeline value + some frames to compensate for transmission delay).

It is the responsibility of the controlling virtual machine to ensure that the SYNC command is placed on the timeline at a point such that the SYNC POINT and the timeline SYNC POINT coincide in respect of the colour framer and/or the P-phase (in PAL).

If this is not done, the situation described in 9.1.2 will occur, which may result in inexact edits.

This implies preference for a system in which the system time, which presets all timelines, is synchronized to reference colour frame (or in PAL, at least to P-phase).

9.2.3. Search, synchronize, and Insert edit

some time before initial action

<PRESET> <PREROLL DURATION> <time value>

<CLEAR EVENT> <0>

<STOP TIMELINE> (optional)

<PRESET> <SYNC POINT> <time value>

<PRESET><SYNC VELOCITY><speed value>

<RECORD MODE> <"insert">

initial action

<PREROLL SEARCH>

final action (not earlier than when TNC TALLY has been "SEARCHed, successfully"):

<REQUEST TIME TRANSMISSION>

<DEFINE EVENT>

<TIMELINE> <"timeline sync point" - "preroll duration">

<SYNC>

<DEFINE EVENT>

<TIMELINE> <required timeline value>

<ENTRY> <appropriate channels>

<DEFINE EVENT>

<TIMELINE> <required timeline value>

<EXIT> <appropriate channels>

The VTR virtual machine is responsible for the compensation of any inherent delays, so that the specified functions happen on the designated field. This allows the controlling virtual machine to talk to the VTR in a generic fashion. Thus type C, type B, U-matic, and Quad VTRs will all be set by exactly the same commands, and will all edit on the same field.

Split edits require multiple ENTRY and/or EXIT commands stacked on different points of the timeline by using multiple DEFINE EVENT c ends.

In "assemble", edits and previews differ only in the RECORD MODE parameter.

Chapter 2
VTR type-specific messages
(virtual machine type is 02h)

1. Index of keywords, mnemonics and information field names

Hex	Message keyword	(mnemonic)	Hex	Information field name	(mnemonic)
40	not used		40	not used	
41	STOP	STOP	41	LTC FROM TAPE	LTFT
42	VARIABLE PLAY	VAPL	42	VITC FROM TAPE	VIFT
43	STD PLAY	STPL	43	SELECTED TAPE CODE	SETC
44	STEP	STEP	44	USERBITS FROM TAPE LTC	UFTL
45	VISIBLE FAST	VFST	45	USERBITS FROM TAPE VITC	UFTV
46	SHUTTLE	SHUT	46	T T 1 (tape timer 1)	TTON
47	TAPE SPEED OVERRIDE	TSPO	47	T T 2 **(tape timer** 2)	TTW
48	READY SELECT	REDS	48	READY TALLY	REDT
49	SERVO REFERENCE SELECT	SRES	49	SERVO REFERENCE TALLY	SRET
4A	RECORD MODE SELECT	REMS	4A	RECORD MODE TALLY	RENT
4B	ENTRY	ENTY	4B	CHANNEL RECORD STATUS	CRES
4C	EXIT	EXIT	4C	CHANNEL RECORD MASK	CREM
4D	TAPE CODE SELECT	TACS	4D	TAPE CODE SELECTION TALLY	TACT
4E	TARGET SEARCH	TASE	4E	SYNC VELOCITY	SVTY
4F	PREROLL SEARCH	PRSE	4F	PREROLL DURATION	PRDU
50	SYNC	SYNC	50	SYNC POINT	SPNT
51	COLOUR FRAMER SELECT	CFRS	51	COLOUR FRAMER TALLY	CFRT
52	EDIT FIELD SELECT	EDFS	52	EDIT FIELD TALLY	EDFT
53	CHASE	CHAS	53	not used	
54	TCG LTC TIME SOURCE SEL	TLTS	54	TCG LTC TIME SOURCE TALLY	TLTT
55	TCG VITC TIME SOURCE SEL	TWS	55	TCG VITC TIME SOURCE TALLY	TWT
56	TCG LTC UB SOURCE SEL	TLUS	56	TCG LTC UB SOURCE TALLY	TLUT
57	TCG VITC UB SOURCE SEL	TWS	57	TCG VITC UB SOURCE TALLY	TVUT
58	EJECT/UNTEREAD	EJCT	58	not used	
59	not used		59	not used	
SA	not used		5A	TAPELENGTH	TLTH
5B	not used		5B	PARKING ACCURACY	PARK
5C	not used		5C	SYNCHRONISM ACCURACY	SYAC
5D	not used		5D	not used	
SE	TRACKING SELECT	TRKS	SE	TRACKING SELECTION TALLY	TRKT
SF	ANTI-CLOG CONTROL	ANCC	SF	ANTI-CLOG CONTROL TALLY	ANCT
60	PRESET	PRST	60	not used	
61	not used		61	TMC TALLY	TMCT
62	not used		62	VELOCITY TALLY	VELT
63	not used		63	TIMELINE CORRECTION TALLY	TLCT
64	not used		64	not used	
65	PLAYBACK CHANNEL SELECT	PLCS	65	PLAYBACK CHANNEL TALLY	PLCT
66	CHANNEL MUTE SELECT	CMUS	66	CHANNEL MUTE TALLY	CMUT
67	TAPE/EE SELECT	TEES	67	TAPE/EE TALLY	TEET
68	not used		68	TIMECODE TO TAPE LTC	TTTL
69	not used		69	TIMECODE TO TAPE VITC	TTTV
6A	not used		6A	USERBITS TO TAPE LTC	UTTL
6B	not used		6B	USERBITS TO TAPE VITC	UTTV
6C	not used		6C	PRESETTABLE TIME SRC LTC	PTSL
6D	not used		6D	PRESETTABLE TIME SRC VITC	PTSV
6E	not used		6E	PRESETTABLE UB SOURCE LTC	PUSL
6F	not used		6F	PRESETTABLE UB SOURCE VITC	PUSV

2. Keywords

General notes: 1. All tape motion commands (Indicated below as "TMC") are mutually exclusive.

2. in all cases, the temporal order of entries and exits must be preserved.. Thus an entry received later in time at the same position on timeline will cancel an existing exit.

40 not used

41 STOP (TMC command)
causes the controlled VTR to stop as soon as possible; indeterminate picture.

Format: <STOP>

42 VARIABLE PLAY (TMC command)
causes the controlled VITR to enter continuously variable playback mode with specified direction and speed.

Format: <VARIABLE PLAY>
<SPEED> 3-byte signed binary number: 2's complement

scale: 000000hex - still
010000hex - standard play-speed forward.
7F0000hex = approximately 127 times standard play-speed forward
FF0000hex - standard play-speed reverse
800000hex - 128 times standard play-speed reverse.

43 STD PLAY (TMC command)
causes the controlled VTR to enter field-locked real time playback mode, colour framed as selected, with specified direction and speed.

Format: <STD PLAY>

44 STEP (TMC command)
causes the controlled VTR to move the tape a specified number of fields forward or backward, with respect to its current position, only while in TMCs: STEP, TSO, VISIBLE FAST (STILL) or VARIABLE PLAY (STILL).

Successive commands are cumulative until next TMC other than STEP.

Format: <STEP>
<FIELD NUMBER> 1-byte signed number; range: -128 ... +127

45 VISIBLE FAST (TMC commend)
causes the controlled VTR to enter fact tape motion with visible but not, necessarily broadcastable picture with specified direction and speed.

Format: <VISIBLE PAST>
<SPEED> 3-byte signed binary number; same format an in VARIABLE PLAY

46 SHUTTLE (TMC command)
causes the controlled VTR to travel at specified direction and speed without necessarily reproducing picture or sound.

Format: <SHUTTLE>
<SPEED> 3-byte signed binary number; same format as in VARIABLE PLAY

47 TAPE SPEED OVERRIDE (TMC command)
causes the controlled VTR to override instantaneous play speed for synchronizing purposes.

Format: <TAPE SPEED OVERRIDE>
<SPEED> 3-byte signed binary number; same format as in VARIABLE PLAY

48 READY SELECT
establishes the VTR in a state to minimize start-up time.

Format: <READY SELECT>
<SWITCH> boolean value: 00h = OFF (= default)
01h = ON

49 SERVO REFERENCE SELECT
selects the input switch for video reference source.

Format: <SERVO REFERENCE SELECT>
<MODE> 1-byte special binary code:

00h = auto select (= default)
01h = video in
02h = external ref input
FFh = - as selected locally

4A. RECORD MODE SELECT
selects the mode of the subsequent recording(s) or edit(s).

Format: <RECORD MODE SELECT>
<MODE> 1-byte special binary code:

00h = record disable (= default)
01h = insert
02h = assemble; all channels
03h = assemble; channel selectable
04h = rehearsal
05h = crash record

4B ENTRY

cause a start of insertion on the specified channel(s) [track(s)]

Format: <ENTRY>
<CHANNELS> 3-byte bit mask:

bit 0 (lsb) = video
bit 1 = sync track
bit 2 = VITC
bit 3 = reserved
bit 4 = reserved
bit 5 = reserved
bit 6 = reserved
bit 7 = LTC
bits 8 - 23 - audios 1 16 respectively

Logic: 0 = channel not affected
1 = channel turned on or stays on

Notes: 1. In "assemble; all channels" mode the channel bits have no meaning.
2. Bits 0-7 form the least-significant byte; this byte is transmitted last.

4C EXIT

causes a termination of an insertion on the specified channels(a) track(a)

Format: <EXIT>
<CHANNELS> 3-byte bit mask:

bit 0 (lsb) = video
bit 1 = sync track
bit 2 = VITC
bit 3 = reserved
bit 4 = reserved
bit 5 = reserved
bit 6 = reserved
bit 7 = LTC
bits 8 - 23 = audios 1 - 16 respectively

Logic: 0 = channel not affected
1 = channel turned off or stays off

Notes: 1. In "assemble; all channels" mode the channel bits have no meaning.
2. Bits 0-7 form the least-significant byte; this byte is transmitted last.

4D TAPE CODE SELECT

selects the type of code for all succeeding messages that refer to "TAPE CODE".

Note: As LTC, VITC, T T 1 and T T 2 are also contained in an item of the VTR-specific INFORMATION FIELD, they may be accessed by READ command at any time, even if not selected as TAPE CODE by the command TAPE CODE SELECT.

Format: <TAPE CODE SELECT>
<CODE TYPE> 1-byte special binary code:

00h = longitudinal timecode (= default)
01h = vertical interval timecode
02h = T T 1
03h = T T 2
04h = auto TC
FFh = as selected locally

4E TARGET SEARCH (TMC command)
causes the controlled VTR to move to a defined tape position in accordance with the TAPE CODE.

Format: <TARGET SEARCH>
<TAPE CODE> (type TIME; field referenced)

Note: The type of TAPE CODE is selected by the command TAPE CODE SELECT.

4F PREROLL SEARCH (TMC command)
causes the controlled VTR to move to a tape position determined from the duration of the PREROLL TIME in advance of the SYNC POINT and the SYNC VELOCITY, in accordance with the TAPE CODE.

Note. PREROLL TIME, SYNC POINT and SYNC VELOCITY are part of the VTR-specific INFORMATION FIELD.

Format: <PREROLL SEARCH>

50 SYNC (TMC command)
causes the controlled VTR to start, and synchronize after the PREROLL DURATION when the tape will be at the SYNC POINT and travelling at the SYNC VELOCITY.

Notes: 1. SYNC POINT and SYNC VELOCITY are part-of the VTR-specific INFORMATION FIELD, and must be predefined by a PRESET command before execution.

2. The tape must be positioned and tallied previously by a PREROLL SEARCH command.

3. If the SYNC VELOCITY is standard play speed, the VTR reverts to STD PLAY after attaining sync.

4. In PAL the VTR will be ADVANCED by one frame when necessary, to be in accordance with the P-phase, and the colour framer will ADVANCE the VTR by as many frames as necessary.

Format:<SYNC>

51 COLOUR FRAMER SELECT
selects the colour framer mode

Format: COLOUR FRAMER SELECT>
<MODE> 1-byte special binary code:

bit 7 (msb): 0 = OFF - 2 field lock NTSC
- 4 field lock PAL/SECAN
1 = ON - 4 field lock STSC
- 8 field lock PAL/SECAM

bit 6: 0 = normal lock
1 = inverted lock

bits 3 - 0: nibble contains binary number, which specifies an offset from the lock specified above in units of fields

Exception: FFh = as selected locally

52 EDIT FIELD SELECT
selects the edit field.

Format: <EDIT FIELD SELECT>
<MODE> 1-byte special binary code:

00h = start of field 1 always
01h = start of field 2 always
02h = at next vertical in immediate mode, or determined by field bit of timeline if in timeline mode
FFh = as selected locally

53 CHASE (TMC command)
maintains a given time offset between the selected tape code of the machine and the specified timeline using appropriate transport mode as determined by the timeline (usually with "external reference time" source; see common message TIMELINE SOURCE).

Format: <CHASE>
<OFFSET TIME> (type TIME); definition:

offset - slave - master

e.g.: if slave is to lead by one minute send:
00 01 00 00;
if slave is to lag by one minute send:
23 59 00 00;
i.e. '24 hours complement' notation.

54 TCG LTC TIME SOURCE SELECT
selects the time source for the LTC timecode generator of the controlled VTR.

Format: <TCG LTC TIME SOURCE SELECT>
<TIME SOURCE> 1-byte special binary code:

00h = hold
01h = run independently, starting with the value contained in information field item PRESETTABLE TIME SOURCE LTC
02h = run with external unspecified source
03h = run with tbe regenerated value of the LTC timecode as source (also contained in information field LTC FROM TAPE) until a record ENTRY of the LTC track; then continue independently, running with the time value most recently read from tape; i.e. "Jam-sync" function
04h = run with regenerated VITC timecode from tape as source (also contained in information field VITC FROM TAPE); i.e. "copy" function
05h = run with TAPE CODE as source (also contained in information field TAPE CODE)

55 TCG VITC TIME SOURCE SELECT
selects the time source for the VITC timecode generator of the controlled VTR.

Format: <TCG VITC TIME SOURCE SELECT>
<TIME SOURCE> 1-byte special binary code:

00h = hold
01h = run independently, starting with the value contained in information field item PRESETTABLE TIME SOURCE VITC
02h = run with external, unspecified source
03h = run with the regenerated value of the VITC timecode as source (also contained in the information field VITC FROM TAPE) until a record ENTRY of-the VITC track; then continue, independently, running with the time value most recently read from tape; i.e. "Jam sync" function
04h = run with regenerated LTC timecode from tape as source (also contained in information field LTC FROM TAPE); i.e. "copy" function
05h = run with TAPE CODE as source (also contained in information field TAPE CODE)

56 TCG LTC USERBIT SOURCE SELECT
selects the userbit source for the LTC timecode generator of the controlled device.

Format: <TCG LTC USERBIT SOURCE SELECT>
<USERBIT SOURCE> 1-byte special binary code:

00h = no userbits; i.e. all set to zero (= default)
01h = userbits from information field item PRESETTABLE USERBIT SOURCE LTC, which may be preset by a PRESET command
02h = userbits from external, unspecified source
03h = userbits continuously copied from the LTC timecode from tape (also contained in information field USERBITS FROM TAPE LTC)
04h userbits continuously copied from VITC timecode from tape (also contained in information field USERBITS FROM TAPE

57 TCG VITC USERBIT SOURCE SELECT
selects the userbit source for the VITC timecode generator of the controlled device.

Format: <TCG VITC USERBIT SOURCE SELECT>
<USERBIT SOURCE> 1-byte special binary code:

00h = no userbits; i.e. all set to zero (= default)
01h = userbits from information field item PRESETTABLE USERBIT SOURCE VITC, which may be preset by a PRESET command
02h = userbits from external, unspecified source
03h userbits continuously copied from the VITC timecode from tape (also contained in information field USERBITS FROM TAPE VITC)
04h userbits continuously copied from the LTC timecode from tape (also contained in information field USERBITS FROM TAPE

58 EJECT/UNTHREAD (TMC command)
eject for cassette or unthread where applicable.

Format: <EJECT/UNTEREAD>

59 not used

5A not used

5B not used

5C not used

5D not used

5E TRACKING SELECT

selects tracking mode.

Format: <TRACKING SELECT>
<MODE> 1-byte special binary code:

00h = FIXED (= default)
01h = AUTO
FFh = as selected locally

5F ANTI-CLOG CONTROL

switches the anti-clog mechanism on/off.

Format: <ANTI-CLOG CONTROL>
<MODE> 1-byte special binary code:

00h = ON (= default)
01h = OFF
02h = extended
03h = immediate tension release
FFh = as selected locally

60 PRESET

presets the named information field to the given value.

Format: <PRESET>
<PERMITTED INFORMATION FIELD NAME>
<VALUE> format and coding defined by the INFORMATION NAME (see Section 3: Information fields)

Permitted information field names for VTRs are:

T T 1
T T 2
SYNC VELOCITY
PREROLL DURATION
SYNC POINT
TAPELENGTH
PARKING ACCURACY
SYNCHRONISM ACCURACY
CHANNEL RECORD MASK
PRESETTABLE TIME SOURCE LTC
PRESETTABLE TIME SOURCE VITC
PRESETTABLE UB SOURCE LTC
PRESETTABLE UB SOURCE VITC

61 not used

62 not used

63 not used

64 not used

65 PLAYBACK CHANNEL SELECT
selects the playback/monitoring channels.

Format: <PLAYBACK CHANNEL SELECT>
<CHANNELS> 3-byte bit mask:

bit 0 (lsb) = video
bit 1 = sync track
bit 2 = VITC
bit 3 = reserved
bit 4 = reserved
bit 5 = reserved
bit 6 = reserved
bit 7 = LTC
bits 8 - 23 = audios 1 - 16 respectively

Logic: 0 = playback channel (= default for all channels)
1 = monitor channel (audio)
record channel (video)

Note: Bits 0-7 form the least-significant byte; this byte is transmitted last.

66 CHANNEL MUTE SELECT
selects auto mute function.

Format: <CHANNEL MUTE SELECT>
<CHANNELS> 3-byte bit mask:

bit 0 (lsb) = video
bit 1 = sync track
bit 2 = VITC
bit 3 = reserved
bit 4 = reserved
bit 5 = reserved
bit 6 = reserved
bit 7 = LTC
bits 8 - 23 = audios 1 - 16 respectively

Logic: 0 = mute enabled
1 = mute disabled

Note: Bits 0-7 form the least-significant byte; this byte is transmitted last.

67 TAPE/EE SELECT
selects the tape/electronics switch.

Format: <TAPE/EE SELECT>
<MODE> 1-byte special binary code:

00h = AUTO (- default)
01h = TAPE
02h = EE
FFh = - as selected locally

68 not used

69 not used

6A not used

6B not used

6C not used

6D not used

6E not used

6F not used

3. Information fields

Note: The items of the INFORMATION FIELD are accessed by the common messages READ, UPDATE, CYCLE or SIMULTANEOUS READ.

They are tallied by the common messages
INFORMATION FIELD ITEM RESPONSE or SIMULTANEOUS READ RESPONSE.

These commands use the format:
<KEYWORD><PARAMETER NAME>
and
<KEYWORD><PARMETER NAME><PARAMETER VALUE>

where the PARAMETER NAME uses the FIELD NAME specified below
and the PARAMETER VALUE carries the FIELD CONTENTS specified below.

Several names/values may be grouped together by means of a BEGIN/END construct.

At power-up the content of information fields is not specified.

40 not used

41 LTC FROM TAPE
contains the longitudinal timecode value most recently read from tape.

Format: <LTC FROM TAPE>
<CODE VALIDITY> 1-byte special binary code:

00h = valid LTC
01h = derived LTC
FFh = not valid LTC

<TIME VALUE> standard "time" format

42 VITC FROM TAPE
contains the vertical interval timecode value most recently read from tape.

Format: <VITC FROM TAPE>
<CODE VALIDITY> 1-byte special binary code:

00h = valid VITC
01h = derived VITC
FFh = not valid VITC

<TIME VALUE> standard "time" format

43 SELECTED TAPE CODE
contains the time value of that code (LTC, VITC, etc.) which has been most recently selected by the TAPE CODE SELECT command.

Format: <SELECTED TAPE CODE>
<IDENTIFIER> 1-byte special binary code:

00h = LTC
01h = VITC
02h = T T 1
03h = T T 2
04h = auto TC
FFh = invalid

<TIME VALUE> standard "time" format

44 USERBITS FROM TAPE LTC
contains the LTC userbit contents most recently read from tape.

Format: <USERBITS FROM TAPE LTC>
<UB SPECIFICATION> 1-byte special code:

bits 0,1: 0,0 - content of userbits unspecified
1,0 - content of userbits is eight-bit character set conforming to ISO 646 and ISO 2022
0,1 - unassigned
1,1 - unassigned
bit 2: 0 - unassigned
1 - content of userbits is secondary time data in standard time format
bits 3-7: 0 - set to 0 until assigned

<UB GROUP 8/UB GROUP 7> 4 bytes, each consisting of two
<UB GROUP 6/UB GROUP 5> 4-bit nibbles, each containing one
<UB GROUP 4/UB GROUP 3> UB group
<UB GROUP 2/UB GROUP l>
(MSnibble)

Note: UB 1 is the UB group which comes first on the tape.

45 USERBITS FROM TAPE VITC
contains the VITC userbit contents most recently read from tape.

Format: <USERBITS FROM TAPE VITC>
<UB SPECIFICATION> for format description, see
<UB GROUP 8/UB GROUP 7> "USERBITS FROM TAPE LTC"
<UB GROUP 6/UB GROUP 5>
<UB GROUP 4/UB GROUP 3>
<UB GROUP 2/UB GROUP l>

46 T T 1 (tape timer 1)
contains the instantaneous counting status of tape timer 1.

Format: <T T l>
<TIME VALUE> standard "time" format

47 T T 2 (tape timer 2)
contains the instantaneous counting status of tape timer 2.

Format: <T T 2>
<TIME VALUE> standard "time" format

48 READY TALLY
tallies the status set by the READY SELECT command.

Format: <READY TALLY>
<SWITCH> boolean value: 00h = OFF
01h = ON

49 SERVO REFERENCE TALLY
tallies the status set by the SERVO REFERENCE SELECT command.

Format: <SERVO REFERENCE TALLY>
<MODE> 1-byte special binary code:
00h = auto select
01h = video in
02h = external ref input

4A RECORD MODE TALLY
tallies the status set by the RECORD MODE SELECT command.

Format: <RECORD MODE TALLY>
<MODE> 1-byte special binary code:

00h = record disable
01h = insert
02h = assemble; all channels
03h = assemble; channel selectable
04h = rehearsal
05h = crash record

4B CHANNEL RECORD STATUS

tallies the status of the recording channels controlled by the ENTRY and EXIT commands.

Format: <CHANNEL RECORD STATUS>
<CHANNELS> 3-byte bit mask:

bit 0 (lsb) = video
bit 1 = sync track
bit 2 = VITC
bit 3 = reserved
bit 4 = reserved
bit 5 = reserved
bit 6 = reserved
bit 7 = LTC
bits 8 - 23 = audios 1 - 16 respectively

Logic: 0 = not recording
1 = recording

Note: Bits 0-7 form the least-significant byte; this byte is transmitted last.

4C CHANNEL RECORD MASK

tallies the status of a record mask that enables/disables a single channel, or all channels, for recording.

Format: <CHANNEL RECORD MASK>
<CHANNELS> 3-byte bit mask:

bit 0 (lsb) = video
bit 1 = sync track
bit 2 = VITC
bit 3 = reserved
bit 4 = reserved
bit 5 = reserved
bit 6 = reserved
bit 7 = LTC
bits 8 - 23 = audios 1 - 16=respectively

Logic: 0 = enabled (= default)
1 = disabled

Note: Bits 0-7 form the least-significant byte; this byte is transmitted last.

4D TAPE CODE SELECTION TALLY

tallies the code currently selected by the most recent TAPE CODE SELECT command.

Format: <TAPE CODE SELECTION TALLY>
<CODE TYPE> 1-byte special binary code:

00h = longitudinal timecode
01h = vertical interval timecode
02h = T T 1
03h = T T 2
04h = auto TC

4E SYNC VELOCITY
contains a velocity used as the synchronization velocity for the SYNC command

Format: <SYNC VELOCITY>
<SPEED> 3-byte signed binary number; 2's complement
scale: 000000hex = still
010000hex = standard play-speed forward
7F0000hex = approximately 127 times standard play-speed forward
FF0000hex = standard play-speed reverse
800000hex = 128 times standard play-speed reverse.

This is the same coding as in the argument of the VARIABLE PLAY command.

Default is standard play-speed forward.

4F PREROLL DURATION
contains the preroll time used in advance of synchronizing processes.

Format: <PREROLL DURATION>
<TIME VALUE> standard "time" format

50 SYNC POINT
contains a TAPE CODE value used as the SYNChronization POINT for the SYNC command.

Format: <SYNC POINT>
<TIME VALUE> standard "time" format

51 COLOUR FRAMER TALLY
tallies the status of the colour framer selected by the COLOUR FRAMER SELECT command.

Format: <COLOUR FRAMER TALLY>
<MODE> 1-byte special binary code:

bit 7: 0 = OFF - 2 field lock NTSC
(msb) - 4 field lock PAL/SECAM

1 - ON - 4 field lock NTSC
- 8 field lock PAL/SECAM

bit 6: 0 = normal lock
1 = inverted lock

bits 3 - 0 = nibble contains binary number, which specifies an offset from the lock specified above, in units of fields

52 EDIT FIELD TALLY.
tallies the status act by the EDIT FIELD SELECT command.

Format: <EDIT FIELD TALLY>
<MODE> 1-byte special binary code:
00h = start of field 1 always
01h = start of field 2 alwys
02h = at next vertical in i~diate mode, or determined by field bit of timeline if in timeline mode
FFh = as selected locally

53 not used

54 TCG LTC TIME SOURCE TALLY
tallies the status of the timecode generator for the longitudinal timecode selected by the TCG LTC TIME SOURCE SELECT command.

Format: <TCG LTC TIME SOURCE TALLY>
<TIME SOURCE> 1-byte special binary code:
00h = hold
01h = running independently, started with the value contained in information field item PRESETTABLE TIME SOURCE LTC
02h = running with external, unspecified source
03h = running with the regenerated value of the LTC timecode as source (also contained in the information field LTC FROM TAPE) until a record ENTRY of the LTC track; then continuing independently, running with the time value most recently read from tape, i.e. "jam=sync" function
04h = running with regenerated VITC timecode from tape as source (also contained in information field VITC FROM TAPE); i.e. "copy" function
05h = running with TAPE CODE as source (also contained in information field TAPE CODE)

55 TCG VITC TIME SOURCE TALLY
tallies the status of the timecode generator for the vertical interval timecode selected by the TCG VITC TIME SOURCE SELECT command.

Format: <TCG VITC TIME SOURCE TALLY>
<TIME SOURCE> 1-byte special binary code:
00h = hold
01h = running independently, started with the value contained in information field item PRESETTABLE TIME SOURCE VITC
02h = running with external, unspecified source
03h = running with the regenerated value of the VITC timecode as source (also contained in the information field VITC FROM TAPE) until a record EMY of the VITC track; then continuing independently, running with the time value most recently read from tape, i.e. "Jam=sync" function

04h = running with regenerated LTC timecode from tape assource (also contained in information field LTC FROM TAPE); i.e. "copy" function
05h = running with TAPE CODE as source (also contained in information field TAPE CODE)

56 TCG LTC USERBIT SOURCE TALLY
tallies the status of the timecode generator for the longitudinal timecode selected by the TCG LTC UB SOURCE SELECT command.

Format: <TCG LTC USERBIT SOURCE TALLY>
<USERBIT SOURCE> 1-byte special binary code:

00h = no userbits; i.e. all set to zero
01h = userbits from information field item PRESETTABLE USERBIT SOURCE LTC, which may be preset by a PRESET command
02h = userbits from external, unspecified source
03h = userbits continuously copied from the LTC timecode from tape (also contained in information field USERBITS FROM TAPE LTC)
04h = userbits continuously copied from the VITC timecode from tape (also contained in information field USERBITS FROM TAPE =VITC)

57 TCG VITC USERBIT SOURCE TALLY
tallies the status of the timecode generator for the vertical interval timecode selected by the TCG VITC UB SOURCE SELECT command.

Format: <TCG VITC USERBIT SOURCE TALLY>
<USERBIT SOURCE> 1-byte special binary code:

00h = no userbits; i.e. all set to zero
01h = userbits from information field item PRESETTABLE USERBIT SOURCE VITC, which may be preset by a PRESET command
02h = userbits from external, unspecified source
03h = userbits continuously copied from the VITC timecode from tape (also contained in information field USERBITS FROM TAPE VITC)
04h. = userbits continuously copied from the LTC timecode from tape (also contained in information field USERBITS FROM TAPE LTC)

58 not used

59 not used

5A TAPELENGTH
contains the length of the loaded tape.

Format <TAPELENGTH>
<TIME VALUE> standard "time" format

5B PARKING ACCURACY
contains a time value that determines the accuracy of parking processes performed by certain commands, e.g. TARGET SEARCH, PREROLL SEARCH

Format: <PARKING ACCURACY>
<FIELDS> 1-byte unsigned number

Note: FFh (as locally specified) shall be used in the PRESET command only. It shall not be used in an INFORMATION FIELD ITEM RESPONSE.

5C SYNCHRONISM ACCURACY
contains a time value that determines the accuracy of synchronizing processes, i.e. it specifies the maximum allowed offset error at the SYNC POINT.

Format: <SYNCHRONISM ACCURACY>
<FIELDS> 1-byte unsigned number

Note. FFh (as locally specified) shall be used in the PRESET command only. It shall not be used in an INFORMATION FIELD ITEM RESPONSE.

5D not used

SE TRACKING SELECTION TALLY
tallies the status act by the TRACKING SELECT command.

Format: <TRACKING SELECTION TALLY>
<MODE> 1-byte special binary code:

00h = FIXED
01h = AUTO

5F ANTI-CLOG CONTROL TALLY
tallies the status of the anti-clog mechanism, which is controlled by the ANTI-CLOG CONTROL command.

Format: <ANTI-CLOG CONTROL TALLY>
<SWITCH STATUS> 1-byte special binary code:

00h = ON
01h = OFF
02h = extended
03h = immediate tension release

60 not used

61 TMC TALLY
tallies the current transport motion command of the VTR, and specifies its success in accomplishing the command.

Format: <TMC TALLY>
<KEYWORD> 1-byte value that contains the keyword of the last commanded TMC from either immediate or timeline mode.

<SUCCESS LEVEL> 1-byte special binary code:

00h = trying; transition in process
01h = successful
02h = failure; this tally should be supplemented by an ERROR message as appropriate

62 VELOCITY TALLY
tallies the current transport velocity. Note that this is the true velocity in all TMC modes.

Format: <VELOCITY TALLY>
<SPEED> 3-byte signed binary number; 2's complement
scale: 000000h = still
010000h = standard play-speed forward.
7F0000h = approximately 127 times standard play-speed forward
FF0000h = standard play-speed reverse
800000h = 128 times standard play-speed reverse.

this is the same coding as in the argument of the VARIABLE PLAY command.

63 TIMELINE CORRECTION TALLY
tallies the number of fields advanced by the-machine internal clock following a TIMELINE RUN command.

Format: <TIMELINE CORRECTION TALLY>
<FIELDS> 1-byte signed binary number

64 not used

65 PLAYBACK CHANNEL TALLY
tallies the status of the playback channels selected by the PLAYBACK CHANNEL SELECT command.

Format: <PLAYBACK CHANNEL TALLY>
<CHANNELS> 3-byte bit mask:
bit 0 (lsb) = video
bit 1 = sync track
bit 2 = VITC
bit 3 = reserved
bit 4 = reserved
bit 5 = reserved
bit 6 = reserved
bit 7 = LTC
bits 8 - 23 = audios 1 - 16 respectively

Logic: 0 = playback channel
1 = monitor channel (audio)
record channel (video)

Note: Bits 0=7 form the least-significant byte; this byte is transmitted last.

66 CHANNEL MUTE TALLY
tallies the status of the auto mute function selected by the CHANNEL MUTE SELECT command.

Format: <CHANNEL MUTE TALLY>
<CHANNELS> 3-byte bit mask:

bit 0 (lab) = video
bit 1 = sync track
bit 2 = VITC
bit 3 = reserved
bit 4 = reserved
bit 5 = reserved
bit 6 = reserved
bit 7 = LTC
bits 8 - 23 = audios 1 - 16 respectively

Logic: 0 = mute enabled
1 = mute disabled

Note: Bits 0=7 form the least-significant byte; this byte is transmitted last.

67 TAPE/EE TALLY
tallies the status of the tapelelectronics switches controlled by the TAPEIEE select command.

Format: <TAPE/EE>
<SWITCH> 1-byte special binary code:

00h = AUTO
01h = TAPE
02h = EE

68 TIMECODE TO TAPE LTC
contains the current longitudinal timecode value being generated by the timecode generator.

Format: <TIMECODE TO TAPE LTC>
<TIME VALUE> standard "time" format

69 TIMECODE TO TAPE VITC
contains the current vertical interval timecode value being generated by the timecode generator.
Format: <TIMECODE TO TAPE VITC>
<TIME VALUE> standard "time,, format

6A. USERBITS TO TAPE LTC
contains the current userbits contents being generated by the timecode generator to go with the longitudinal timecode.

Format: <USERBITS TO TAPE LTC>
<UB SPECIFICATION> for format description, see
<UB GROUP 8/UB GROUP 7> "USERBITS FROM TAPE LTC"
<UB GROUP 6/UB GROUP 5>
<UB GROUP 4/UB GROUP 3>
<UB GROUP 2/UB GROUP l>

6B USERBITS TO TAPE VITC
contains the current userbit contents being generated by the timecode generator to go with the vertical interval timecode.

Format: <USERBITS TO TAPE VITC>
<UB SPECIFICATION> for format description, see
<UB GROUP 8/UB GROUP 7> "USERBITS FROM TAPE LTC"
<UB GROUP 6/UB GROUP 5>
<UB GROUP 4/UB GROUP 3>
<UB GROUP 2/UB GROUP 1>

6C PRESETTABLE TIME SOURCE LTC
contains a time value that can be PRESET and be used to start the LTC timecode generator by selecting it in a TCG LTC TIME SOURCE SELECT command.

Format: <PRESETTABLE TIME SOURCE LTC>
<TIME VALUE> standard "time" format

6D PRESETTABLE TIME SOURCE VITC
contains a time value that can be PRESET and be used to start the VITC timecode generator by selecting it in a TCG VITC TIME SOURCE SELECT command.

Format: <PRESETTABLE TIME SOURCE VITC>
<TIME VALUE> standard "time" format

6E PRESETTABLE UB SOURCE LTC
contains a userbit pattern that can be PRESET and be used by the LTC timecode generator by selecting it in a TCG LTC UB SOURCE SELECT command.

Format: <PRESETTABLE UB SOURCE LTC>
<UB SPECIFICATION> for format description. see
<UB GROUP 8/UB GROUP 7> "USERBITS PROM TAPE LTC"
<UB GROUP 6/UB GROUP 5>
<UB GROUP 4/UB GROUP 3>
<UB GROUP 2/UB GROUP l>

6F PRESETTABLE UB SOURCE VITC
contains a userbit pattern that can be PRESET and be used by the VITC timecode generator by selecting it in a TCG VITC UB SOURCE SELECT command.

Format: <PRESETTABLE UB SOURCE VIM
<UB SPECIFICATION> for format description, ace
<UB GROUP 8/UB GROUP 7> "USERBITS FROM TAPE LTC"
<UB GROUP 6/UB GROUP 5>
<UB GROUP 4/UB GROUP 3>
<UB GROUP 2/UB GROUP l>

REMOTE CONTROL SYSTEM
FOR BROADCASTING PRODUCTION EQUIPMENT
AUDIO TAPE-RECORDER TYPE-SPECIFIC MESSAGES

Tech 3245-E Supplement 3 3 February 1989

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Introduction

Document Tech. 3245 describes the specification of a digital remote-control system for broadcasting production equipment. It defines completely the electrical/mechanical level (level 1), and the supervisory level (level 2), of the interface. The two remaining levels - the system service level (level 3), and the virtual machine level (level 4) - are defined only in terms of function and control message syntax.

Supplement 1 to Tech. 3245 completes the definition of the system service level by detailing the system service messages and, in addition, defines the virtual machine messages which are common to all types of virtual machine - the common messages.

The present Supplement defines the type-specific virtual machine messages which are applicable to audio tape-recorders. Type-specific messages applicable to other categories of equipment are defined in other supplements to Tech. 3245.

In order to implement a complete network, the system designer therefore requires:

- Document Tech. 3245 - the general specification
- Supplement 1 - system service and common messages

and one or more other supplements appropriate to the category or categories of equipment to be used.

The specification described in this Supplement has been developed jointly with the SMPTE, and is functionally identical to that to be published as an SMPTE Recommended Practice.

Chapter 1

General concepts

This chapter contains a general explanation of some of the concepts used in the formulation of the ATR type-specific message set. It constitutes tutorial information, and is intended to assist in the understanding of the specifications in Chapter 2 of this document. A working knowledge of the following ESbus topics, which have been covered by earlier publications in this series, is assumed:

- ESbus system overview

- Control message architecture

- Supervisory protocol

- Tributary interconnection

- Electrical and mechanical characteristics

- System service and common messages

The ATR type-specific dialect shares many conceptual constructs with the VTR type-specific dialect; however there are significant differences in the form and function of their command structures. The reader is cautioned not to assume that a transparency of control messages between the dialects has been provided.

Conventions:

- Acronyms and abbreviations are shown in upper-case characters.

e.g. Audio tape-recorder: ATR
Tape motion state: TMS
Information field. I/F

- Message keywords and names of information fields are shown in upper-case characters.

e.g. RECORD STROBE
REQUESTED OFFSET

- These command keywords and information field names are used within the text of this document to imply requested action, information field identity, and in turn the information field contents of the virtual machine. To assist the readability of this document, these terms are used in the context of the presentation material.

e.g. :

"There are six modes available for LOCK MODE SELECTion".

(LOCK MODE SELECT is a keyword)

"This point in time is defined by the specification of the LOCK TIME I/F".

("LOCK TIME I/F" in this context identifies an information field)

"The ACTUAL OFFSET is maintained independent of the synchronization status".

("ACTUAL OFFSET" in this context refers to the content of an information field.)

- Terms having special meanings in this or related documents are shown with leading upper-case characters :

e.g. Tape Motion Process
Local Lock Point

1. Command Keywords and Information Fields

ATR-specific commands affect conditions or selection of characteristics particular to the ATR virtual machine. Commands that produce non-mutually-exclusive conditions have individual information fields. In order to ascertain the existing state, a " Tally " message corresponding to a particular command may be sent; the response information field is in the same format as that of the corresponding command. Commands that produce mutually-exclusive conditions may have the same information field.

2. Transport Motion Process and State Control

The transport mechanism of an ATR is considered as a separate State Machine. The commands which control transport functions are in a subset of the ATR-specific message set. These are called the Tape Motion Process and State commands (TMPs and TMSs). Each TMS command causes a transition into a transport state and cancels the previous state. Tape Motion Processes (indicated below as " TMP ") are overriding control commands that cause the controlled device to enter the appropriate Tape Motion State automatically so as to achieve the desired result. This Tape Motion State will be reported in the TMS tally as though that TMS had been issued.

2.1. TMP commands

TMP command include:

TARGET SEARCH, PREROLL SEARCH, CHASE

All Tape Motion Process commands are marked "TMP" in the index list and in the command description.

2.2. TMS commands

TMS commands include:

STOP, PLAY, SHUTTLE, LOCK, etc.

All Tape Motion State commands are marked "TMS" in the index list and in the command description.

2.3. TMP I/F tallies

These information fields indicate the current state of Tape Motion Process. As these processes are mutually-exclusive and commanded by TMP commands, the code of the corresponding TMP keyword is used to identify each information field individually. An additional byte indicates (tallies) the level of success, i.e. whether the commanded process is still in progress, has been completed, and whether successfully or not.

2.4. TMS I/F tallies

These information fields indicate the current state of the transport. As these states are mutually-exclusive commanded by TMS commands, the code of the corresponding TMS keyword is used to identify each information field individually. An additional byte tallies the level of success, i.e. whether the commanded state function is still in progress or has been completed, and whether successfully or not.

3. Audio Record Corn and (ARCs) and Tallies

The recording function of the tape machine is controlled **and tallied by the following keywords and** I/Fs, respectively:

REHEARSE SELECT	REHEARSE TALLY
RECORD STROBE	CHANNEL RECORD STATUS
RECORD EXIT	-
RECORD READY SELECT	RECORD READY TALLY

RECORD READY SELECT provides a means to designate the channels that will enter (or exit) a recording condition upon the receipt of a RECORD STROBE.

RECORD EXIT terminates the recording condition on any channels where this condition exists.

REHEARSE SELECT provides a means to designate the channels that will, when subsequently commanded to enter a recording condition, simulate a recording operation, in accordance with the corresponding pending Audio Monitor Commands (AMCs).

4. Audio Monitor Commands (AMCs) and Tallies

The manner in which the Audio Line Output Source selections are made is controlled and tallied by the following keywords and I/Fs, respectively:

GLOBAL MONITOR SELECT	GLOBAL MONITOR TALLY
EXCLUSIVE SYNC SELECT	EXCLUSIVE SYNC TALLY
SYNC INPUT SELECT	SYNC INPUT TALLY

GLOBAL MONITOR SELECT controls whether Playback, Synchronous Playback (sync), or input signals are fed to the respective line outputs. of all audio channels.

EXCLUSIVE SYNC SELECT provides a means to select the individual audio channels that will, in the absence of any GLOBAL MONITOR SELECTion, feed synchronous playback to the Line Output in accordance with the SYNC-INPUT I/F.

SYNC INPUT SELECT provides a means to choose the monitor switching configuration used during record-related functions. These monitor switching configurations apply only to those channels selected for Synchronous Playback.

5. Velocity Arguments

Some commands include a speed specification which is carried in the form of an accompanying three-byte parameter block. This parameter defines the direction and absolute value of the desired speed that should be achieved as closely as possible by the real machine. This speed is expressed in terms of the current nominal play speed as defined by the FIXED SPEED SELECT I/F.

Commands having a velocity parameter in the form of a three-byte 2's complement signed number have a scale-range defined such that:

000000 h represents a stationary condition*[*]
010000 h represents the speed currently defined in I/F FIXED SPEED, forward direction
7F0000 h represents approximately 127 times FIXED SPEED, forward direction
FF0000 h represents FIXED SPEED, reverse direction
800000 h represents 128 times FIXED SPEED, reverse direction.

This format thus has, theoretically, a resolution of 1/65,536th of nominal speed, i.e. an effective speed range of - 128.0000 to + 127.99998 times FIXED SPEED (rounded to five decimal places).

6. Track Selection Arguments

Some commands and information fields refer to one or more channels (or tracks) of the tape machine. The format used is the same in all cases and it consists of an eight-byte bit map. This allows for up to 64 channels to be controlled. The command keywords and I/Fs that utilize this channel-specific mapping are:

REHEARSE SELECT	REHEARSE TALLY
RECORD READY SELECT	RECORD READY TALLY
EXCLUSIVE SYNC SELECT	EXCLUSIVE SYNC TALLY
	CHANNEL RECORD STATUS

[*] The letter h appended to a number indicates that it is expressed in hexadecimal notation.

7. Tape Code Identity

At present, points on the tape can be identified by two means:

These are :

- INTERNAL LTC (longitudinal timecode from tape)

- TAPETIMER

The INTERNAL LTC and the TAPETIMER each have a separate information field. The content of the SELECTED TAPE CODE I/F, which designates which of these means is selected, is determined by the TAPE CODE SELECT command.

TARGET SEARCH, SYNC PREROLL SEARCH and LOCK PREROLL SEARCH cause the controlled device to locate a position on the tape, referenced to the SELECTED TAPE CODE.

8. Achieving and Maintaining Synchronisation

8.1. LOCK Operations

Synchronisation requires the controlled device to achieve and maintain a particular time relationship between its INTERNAL LTC and some external reference. The maintenance of this relationship is usually restricted to within some speed range around the nominal FIXED SPEED.

The external reference signal to which synchronisation is achieved and maintained may be selected from a number of alternative sources; the LOCK MODE SELECT command is used to select this signal.

The LOCK command establishes synchronisation. The following additional information is normally required:

- A specified EXTERNAL TIMECODE ("when")

- A specified point on the tape ("where")

- A selected external reference signal ("how").

"When": This point in time is dermed by the contents of the LOCK TIME I/F. This specifies the time, expressed in term of the EXTERNAL TIMECODE, at which synchronism is assured between the EXTERNAL TIMECODE and the controlled device's INTERNAL LTC.

"Where": This is a point on the tape called the Local Lock Point". The Local Lock Point may be expressed by two independent specifications. These are the aforementioned LOCK TIME I/F, and the REQUESTED OFFSET I/F.

The REQUESTED OFFSET I/F specifies the longitudinal time relationship between the EXTERNAL TIMECODE, and the controlled device's INTERNAL LTC. This REQUESTED OFFSET is maintained during successful synchronous operation.

Note: A related information field, the ACTUAL OFFSET I1F, is provided such that tallies of INTERNAL LTC minus the EXTERNAL TIMECODE may be facilitated.

The Local Lock Point may be calculated as the sum of the LOCK TIME I/F and the REQUESTED OFFSET I/F.

"How": The LOCK MODE SELECT command allows a choice in the manner in which synchronisation is achieved and maintained. Two different classes of synchronisation may be selected: " Absolute " and " Free ". There are four Absolute modes and two Free modes available for LOCK MODE SELECTion.

8.1.1. Absolute Modes of LOCK

-Absolute Standard Mode

Achievement and maintenance of the lock to EXTERNAL TIMECODE is data-dependent. External LTC is selected as the source of EXTERNAL TIMECODE.

Absolute Resolve Mode

Achievement of the lock to EXTERNAL TIMECODE is data-dependent; maintenance of lock is data-independent. External LTC is selected as the source of EXTERNAL TIMECODE.

- Absolute video Mode

Achievement of the lock to EXTERNAL TIMECODE is data-dependent; maintenance of the lock is by reference to external video. External LTC is selected as the source of EXTERNAL TIMECODE.

- *Absolute VITC Mode*

Achievement of the lock is by reference to external video with VITC, data-dependent; maintenance of the lock is by reference to external video. The external video VITC signal is selected as the source of EXTERNAL TIMECODE.

8.1.2. Free Modes of LOCK

- *Free Resolve Mode*

Achievement and maintenance of the lock is by reference to EXTERNAL TIMECODE dataindependent. External LTC is selected as the source of EXTERNAL TIMECODE.

- *Free Video Mode*

Achievement and maintenance of the lock is by reference to external video signal. The source of EXTERNAL TIMECODE is undefined.

8.1.3. LOCK Operation in Absolute Modes

Three important concepts must be established before any of the absolute modes of LOCK may be represented.

a) PREROLL DURATION

This specifies the time used or needed in advance of achieving synchronisation. The PREROLL DURATION I/F specifies the exact real-time period between the start of tape movement and the moment of encountering the specified LOCK TIME. It is assumed that EXTERNAL TIMECODE is presented to the device in a real-time manner during the preroll period. The PREROLL DURATION I/F may not be set to a value lower than the device-dependent lower limits.

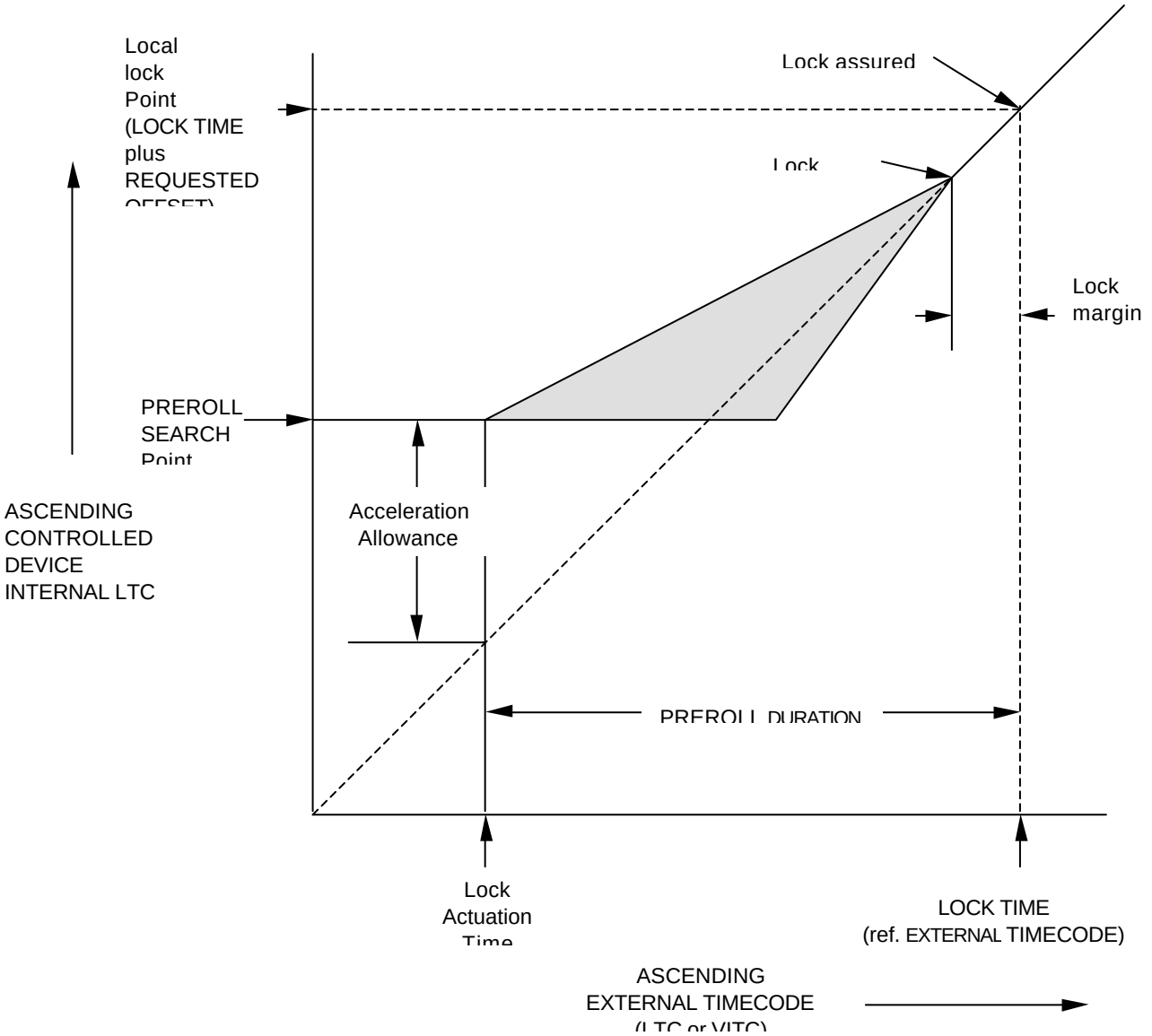
b) LOCK PREROLL SEARCH

This TMP causes the tape on the controlled ATR to move until the position on it specified by the Local Lock Point minus the pre-defined PREROLL DURATION plus any device-specific "Acceleration Allowance" (see diagram) is correctly located. This position may be described as the PREROLL SEARCH Point.

c) "Lock Actuation "

In all absolute modes of the LOCK command, the condition which causes the start of tape movement intended to achieve and maintain synchronisation is always the coincidence of the EXTERNAL TIMECODE value with that of the pre-defined LOCK TIME I/F minus the pre-defined PREROLL DURATION I/F. The time (with reference to EXTERNAL TIMECODE) at which this occurs may be termed the Lock Actuation Time.

The source of the EXTERNAL TIMECODE that triggers the Lock Actuation may be either LTC or VITC. This choice is specified by the LOCK MODE SELECT.



LOCK OPERATION (Absolute Modes)

All LOCK commands issued in any absolute mode require pre-defined PREROLL DURATION, REQUESTED OFFSET and LOCK TIME I/Fs, and must be preceded with a LOCK PREROLL SEARCH command.

After the PREROLL DURATION, REQUESTED OFFSET and LOCK PREROLL SEARCH have been specified, an absolute LOCK command may be issued. When the EXTERNAL TIMECODE coincides with the Lock Actuation Time, the controlled device will accelerate and adjust its speed until its INTERNAL LTC coincides with the EXTERNAL TIMECODE, thereafter maintaining synchronism. For a LOCK to be successful, synchronism must be achieved prior to the LOCK TIME. Synchronous operation with the external reference (as specified by LOCK MODE SELECT I/F) will be maintained from the LOCK TIME onwards.

8.1.4. LOCK Operation in Free Modes

All LOCK commands issued in any free mode ignore any predefined PREROLL DURATION, REQUESTED OFFSET and LOCK TIME I/Fs and need not be prededed with a PREROLL SEARCH command. These LOCK facilities provide the means for achieving synchronisation immediately, without reference to a particular EXTERNAL TIMECODE.

If a change in LOCK MODE from any m ode to the ABSOLUTE STANDARD during a successful LOCK TMC, then the ACTUAL OFFSET I/F data is automatically transferred to the REQUESTED OFFSET I/F. LOCK is thereby maintained.

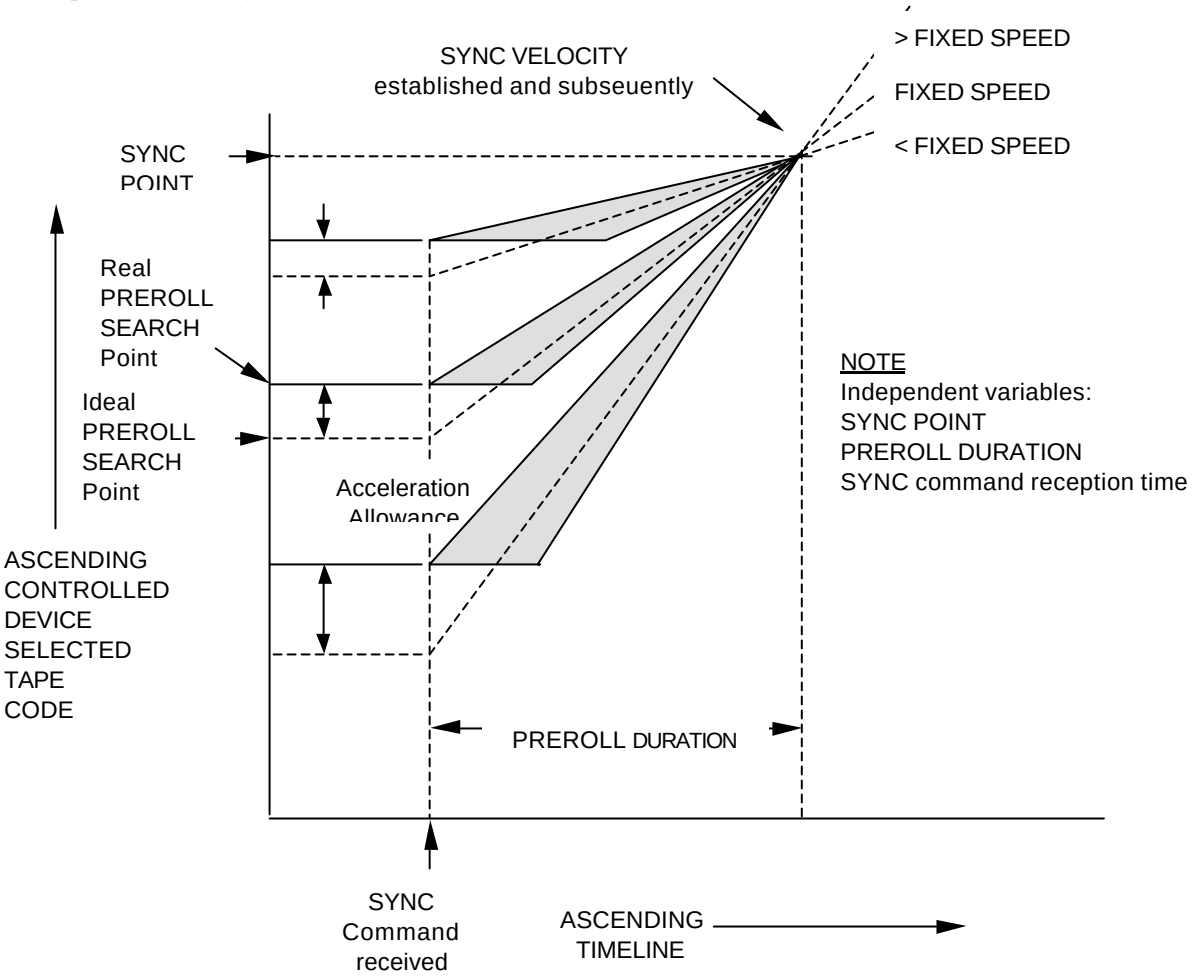
8.2. SYNC Operations

The external reference to which SYNC synchronization is to be achieved and maintained is prescribed by the common message TIMELINE SELECT.

The SYNC command establishes synchronization. Synchronization means that the machine is programmed to pass:
- a specified point on the tape ("where")

- at a specified instant in time ("when"), and

- at a specified velocity ("how").



"Where": This is a point on the tape, defined by the SYNC POINT I/F, at which synchronization is assured between the selected TIMELINE and the controlled device's SELECTED TAPE CODE.

"When": This is defmed as the point in time at which the SYNC command is received plus the PREROLL DURATION time. (As the ESbus may not, by nature, be deterministic in the delivery timing of commands, it is advisable to use the common message " Event " construct to define the timing of this command.)

"How": The velocity at the SYNC POINT is defined by the SYNC VELOCITY I/F.

As a prerequisite for the use of the SYNC command, the tape must be placed at a park position which is calculated from the SYNC POINT and the SYNC VELOCITY as follows:

$$\text{PREROLL SEARCH POINT} = \text{SYNC POINT} - \frac{\text{PREROLL DURATION} \times \text{SYNC VELOCITY}}{\text{FIXED SPEED}}$$

where FIXED SPEED is the speed defined in the FIXED SPEED I/F.

To achieve this park position the PREROLL SEARCH command is used and the ATR virtual machine must make the calculation automatically.

The SYNC Command in the Case of an "Ideal" Machine

A better understanding of the function of the SYNC command is possible if it is considered in the case of an "ideal" machine.

- On the arrival of a SYNC command an ideal ATR would start immediately with no delay, fully locked and at the specified speed. Under these ideal conditions the machine would, at the PREROLL DURATION time later, be precisely at the SYNC POINT.

- A real ATR cannot start and synchronize immediately; it is therefore the responsibility of the virtual machine, and hence of the virtual machine manufacturer, to control the real machine in such a manner that the result is the same.

Measures taken in order to correct synchronization following the PREROLL DURATION period may include:

- On the receipt of a PREROLL SEARCH command, parking at a PREROLL SEARCH point a few frames down the tape from the "ideal" PREROLL SEARCH point in order to match the average number of frames lost while coming up to play speed. This "Acceleration Allowance" is likely to be proportional to the SYNC VELOCITY.

- On the SYNC command, overriding the specified velocity using the tape speed override facility of the real machine to eliminate the remaining offset from the appropriate lock condition.

After establishing a PREROLL DURATION, and commanding a SYNC PREROLL SEARCH, a SYNC command may be issued. The controlled device will accelerate and synchronise to its SELECTED TAPE CODE to the TIMELINE reference.

For a SYNC to be successful, SYNC VELOCITY must be achieved relative to the TIMELINE reference, at the SYNC POINT, at precisely the PREROLL DURATION after the receipt of the SYNC command.

8.3. The CHASE Command

The CHASE command is an alternative means of maintaining synchronism.

While the PREROLL SEARCH and LOCK commands may be used to achieve and maintain synchronism among several machines continuously (without changing their states and/or speeds), the CHASE command is used to maintain synchronism in a dynamic manner as closely as possible, even during changes of the machine's state and/or velocity.

This operation, however, requires one of the synchronously running machines to be a "master", while the others have to act as " slaves " that follow the movement of the master, even in the SHUTTLE mode.

For this purpose the slaves must have information about the movement of the master; this information is distributed in the form of the master device's timecode. This timecode stream must be distributed continuously to all slaves over a separate line (the bus cannot be used for this purpose because of its indeterminate delay characteristics).

The CHASE command utilises the REQUESTED OFFSET I/F to establish any required longitudinal position relationships between the master and the controlled device. Synchronism is always established and maintained in a data-dependent manner, independent of the current LOCK MODE TALLY I/F.

9. The TIMELINE and other Event Triggers

All ATR commands can be used in an " immediate " manner in which they are executed as soon as they are received. In the case of some of the more time-critical applications, unacceptable delays may occur because the time between initiating a command and its reception via the bus is indeterminate. In these cases an alternative command method is recommended.

Wherever possible, time-critical commands should be prepared using the " Event " command facilities provided by the common message set. The common message DEFINE EVENT allows any type-specific message or the common message READ to be executed by the virtual machine at a specified Trigger Time. This trigger time may be specified by the common TIMELINE I/F, or by some type-specific Time I/Fs.

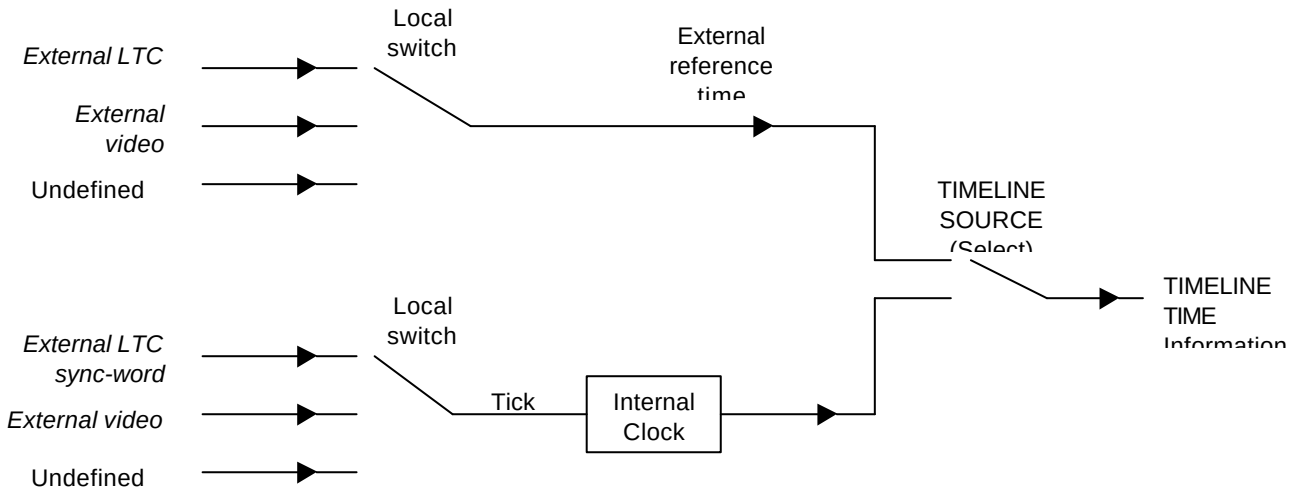
The ATR type-specific Time I/Fs that may be used as Event triggers are:

INTERNAL LTC	TAPETIMER
SELECTED TAPE CODE	EXTERNAL TIMECODE

ATR type-specific Time I/Fs that are not permitted for use as Event triggers are:

TAPELENGTH	REQUESTED OFFSET
LOCK DEVIATION	ACTUAL OFFSET

This common message TIMELINE SOURCE may be selected to be an internal dock, or an external reference time. There is no restriction as to the source of this external reference time. Should the external reference time be chosen as the intended TIMELINE SOURCE, it might be conceivable to configure a controlled device locally to use an external LTC signal or an external video with VITC signal as the TIMELINE TIME. Alternatively, when the internal clock is the intended TIMELINE SOURCE, the external " tick " which increments the internal clock might be derived locally from the sync-word of an external LTC signal, or an external video signal. These are only examples of what might be selected as external references or ticks; there are no restrictions on external reference signals (see diagram below).



TIMELINE SOURCE Selection

For activities requiring simultaneous operations by several controlled devices, the Event mode of command delivery, which allows sequences of time-critical functions (e.g. RECORD STROBE) to be pre-programmed, may be the most suitable.

Events may be referred to the TIMELINE of the individual virtual machines. These individual TIMELINE TIMEs are synchronised by a system the transmission from the bus controller in response to the system service REQUEST TIME TRANSMISSION command.

10. Sample Command Sequences

The following sections shows examples of typical command sequences including time-deferred Event constructs. These sequences describe only some of the applications of the command set; there is no obligation on the part of the system designer to use precisely these sequences. READ commands of the related I/Fs for system confidence are not shown; they should be an integral part of any reasonable controlling tributary's typical sequence.

10.1. Selective Record Entries and Exits

Some time before initial record action...

< RECORD READY SELECT> < 00000000 >
< 00000000 >
< 00000000 >
< 00000000 >
< 00000000 >
< 00000000 >
< 00000000 >
< 00000000 >
< 01010101 >

(channels 1, 3, 5, 7 are record-enabled)

<PLAY>

some time later...

<RECORD STROBE >

(the already-selected channels enter the recording condition)

some time later...

<RECORD READY SELECT> < 00000000 > (64-bit map)
,
,
,
,
< 10101010>

(channels 1, 3, 5, 7 are record-disabled. Channels 2, 4, 6, 8 are record-enabled. No change is made to the recording status of these tracks)

some time later...

<RECORD STROBE>

(channels 1, 3, 5, 7 stop recording. Channels 2, 4, 6, 8 start recording)

some time later...

<RECORD EXIT

(the channels still recording, 2, 4, 6, 8 cease recording)

10.2. Event-Triggered Record Entries and Exits

Exactly the same actions as above may be accomplished through the use of the Event construct, although with more precise control of the RECORD STROBE times:

<RECORD READY SELECT> <00000000> (64-bit map)
,
,
,
<01010101>
(channels; 1, 3, 5, 7 are record-enabled)

<PLAY>

any time before the required record action sequence :

<DEFINE EVENT>	<event name 1 >	(user assigned)
	<INTERNAL. LTC >	(I/F name of trigger)
	<TRIGGER VALUE l>	(standard "time" value)
	<RECORD STROBE>	
<DEFINE EVENT>	< event name 2 >	(user assigned)
	<INTERNAL LTC>	(I/F name of trigger)
	<TRIGGER VALUE 2>	(standard "time" value)
	<RECORD READY SELECT>	<00000000>
		,
		,
		,
		<10101010>

(channels 2, 4, 6, 8 are record-enabled)

<DEFINE EVENT>	<event name 3 >	(user-assigned)
	<INTERNAL LTC>	(I/F name of trigger)
	<TRIGGER VALUE 3>	(standard "time" value)
	<RECORD STROBE>	
<DEFINE EVENT>	<event name 4 >	(user-assigned)
	<INTERNAL LTC>	(I/F name of trigger)
	<TRIGGER VALUE 4>	(standard "time" value)
	<RECORD EXIT>	

Notes: The above TRIGGER VALUES 1-4 are assigned with suitable ascending values respectively. These Events are established with the assumption that the controlled device will encounter these INTERNAL LTC triggers in ascending order

The controlling virtual machine need not "know" the device-specific record-initiation delays of the ATRs. It is the job of the virtual machine to resolve any internal, time dependent idiosyncrasies.

Example: An IEC centre-track format ATR is required simultaneously to enter record on track (channel) 1, and exit record on track 2 at an INTERNAL LTC of 12:26:00:02. The TIMECODE ATTRIBUTE I/F of the INTERNAL LTC indicates " 25 frame count code ".

Given an INTERNAL LTC I/F triggered ' RECORD STROBE Event, and working with an EBU/SMPTE timecode, the machine must:

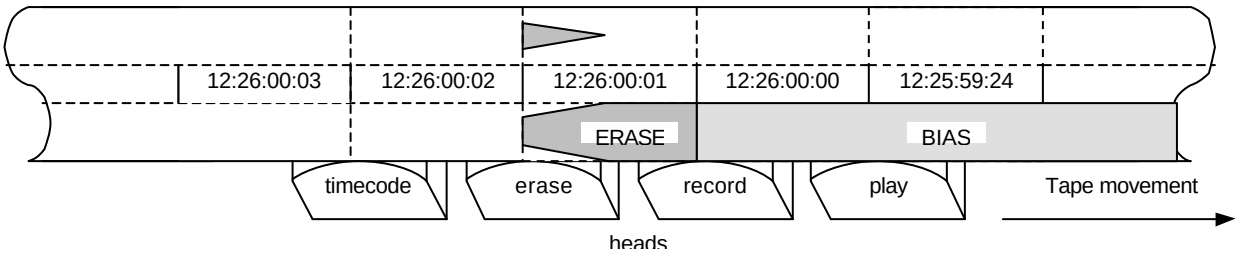
- compensate for any longitudinal offsets of the controlled device's timecode playback head;

- control the transitions of the erase signal in advance of the virtual machine's INTERNAL LTC trigger point, to ensure that the erase signal starts and stops at the correct points on the tape.

Graphically represented:

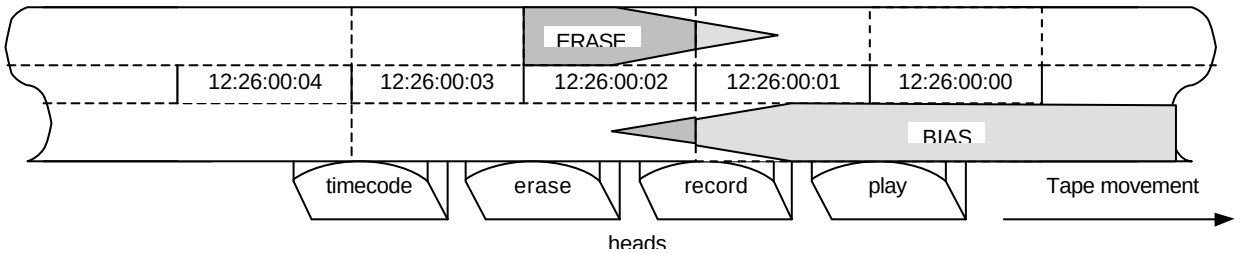
Event time minus one frame

<VIRTUAL MACHINE INTERNATAL LTC >
< 12:26:00:01 >
<RECORD sequence begins >
< track 1 erase begins ramp up >
< track 2 erase begins ramp down >



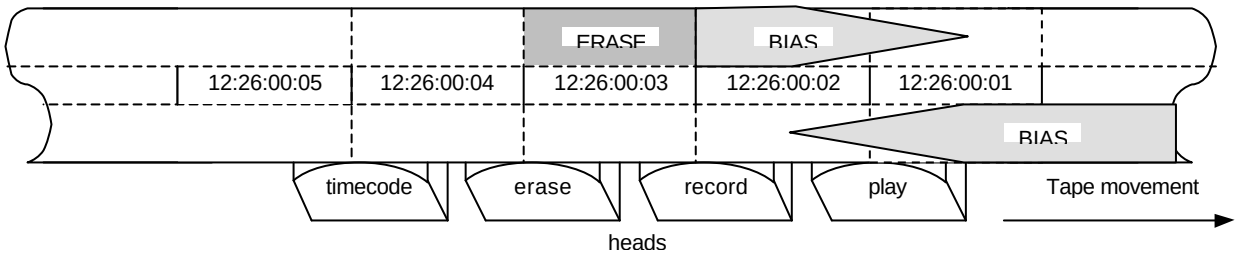
Event time

<VIRTUAL MACHINE INTERNAL LTC >
< 12:26:00:02 >
<RECORD sequence in progress >
<track 1 record begins ramp up >
<track 2 erase exit completed >



Event time

<VIRTUAL MACHINE INTERNAL LTC >
< 12:26:00:03 >
<RECORD sequence completed >



If the above example were to include a RECORD STROBE Event triggered by the TIMELINE TIME I/F or EXTERNAL TIMECODE I/F, the requirements of the virtual machine would be basically unchanged. The record Event must occur at the Event time, regardless of any device-dependent preliminary process.

10.3. Search and Synchronise

Some time before the required synchronisation action:

<PRESET>	<PREROLL DURATION>	(time value)
<PRESET>	<LOCK POINT>	(time value)
<PRESET>	<REQUESTED OFFSET>	(high-resolution time value)
<LOCK MODE SELECT>	<ABSOLUTE STANDARD MODE>	

Note: After the PREROLL DURATION, LOCK POINT, REQUESTED OFFSET and LOCK MODE SELECT have been specified, they need not be retransmitted until a change is required.

<LOCK PREROLL SEARCH>

(not before a TMP TALLY has indicated that the LOCK PREROLL SEARCH has been successfully accomplished):

<LOCK>

On the receipt of the LOCK command, the ATR will monitor the longitudinal EXTERNAL TIMECODE. When the EXTERNAL TIMECODE coincides with "lock actuation time" calculated by the controlled device, the controlled device will accelerate and synchronise its INTERNAL LTC with the EXTERNAL TIMECODE. For a LOCK to be successful, synchronism must be achieved prior to the LOCK TIME.

Chapter 2

ATR type-specific messages
(Virtual Machine type is 03h)

General notes

1. Commands which have a related information field for tally purposes (". . . SELECT" -". . . TALLY" pairs) are identified by a " >> " sign in the list below.

2. All Tape Motion State commands (indicated below as " TMS ") are mutually exclusive.

3. Tape Motion Process commands (indicated below as " TMP are overriding control commands that cause the controlled device to enter automatically the appropriate Tape Motion States to achieve the desired result. The Tape Motion State will be reported in the TMS tally, as though that TMS command had been issued. TMPs are also mutually exclusive.

4. All Audio Record Commands (indicated below as " ARC ") affect the manner in which tracks are selected and subsequently sequenced through record Entries and Exits.

5. All Audio Monitor Commands (indicated below as " AMC ") affect the manner in which audio line output source selections are made.

6. In all cases, the temporal order of Events must be preserved. Commands actuated by the Event construct, if placed on the Event cue at the same trigger point, will execute preserving the temporal order of the delivery of the commands.

7. All hex codes listed as " reserved " are specifically retained for possible future expansion of the range of common use between YTR and ATR dialects. In particular, it should be noted that this includes a number of commands concerned with presetting and operating a timecode generator which are already defined in the VTR dialect.

1. Index of keywords, mnemonics and information field names

1.1. Numerical index

Function	hex	/Message Keyword	(mnemonic)		Information field name	(mnemonic)
	40h	not used		40h	not used	
TMS	41h	STOP	STOP	41h	INTERNAL LTC	INTC
TMS	42h	VARIABLE PLAY	VAPI,	42h	not used	
TMS	43h	PLAY	STPL	43h	SELECTED TAPE CODE	SETC
TMS	44h	STEP	STEP	44h	INTERNAL LTC USERBITS	INUB
TMS	45h	AUDIBLE FAST	AFST	45h	not used	
TMS	46h	SHUTTLE	SHUT	46h	TAPETIMER	TATI
	47h	not used		47h	not used	
	48h	reserved		48h	reserved	
	49h	CAPSTAN REF SELECT	CAPS	49h	CAPSTAN REF TALLY	CRET
ARC	4Ah	REHEARSE SELECT	REHS >>	4Ah	REHEARSE TALLY	REHT
ARC	4Bh	RECORD STROBE	RSTB	4Bh	CHANNEL RECORD STATUS	CRES
ARC	4Ch	RECORD EXIT	REEX	4Ch	not used	
	4Dh	TAPE CODE SELECT	TACS >>	4Dh	TAPE CODE SEL TALLY	TACT
TMP	4Eh	TARGET SEARCH	TASE	413h	SYNC VELOCITY	SYTY
TMP	4FH	SYNC PREROLL SEARCH	SPRS	417h	PREROLL DURATION	PRDU
TMS	50h	SYNC	SYNC	50h	SYNC POINT	SPNT
TMS	51h	LOCK	LOCK	51h	LOCK TIME	LKIT
TMP	52h	LOCK PREROLL SEARCH	LPRS	52h	not used	
TMP	53h	CHASE	CHAS	53h	not used	
	54h	reserved		54h	reserved	
	55h	reserved		55h	reserved	
	56h	reserved		56h	reserved	
	57h	reserved		57h	reserved	
TMS	58h	TAPE RELEASE	TARL	58h	not used	
	59h	FIXED SPEET SELECT	FISS >>	59h	FIXED SPEED TALLY	FIST

	5Ah	not used		5Ah	TAPELENGTH	TLTH
	5Bh	not used		5Bh	not used	
	5Ch	not used		5Ch	SYNC/LOCK ACCURACY	SLAC
	5Dh	not used		5Dh	LOCK DEVIATION	UDE
	5Eh	not used		5Eh	not used	
	5Fh	not used		5Fh	not used	
	60h	PRESET	PRST	60h	TMP TALLY	TMPT
TMS	61h	FAST FORWARD	FFOR	61h	TMS TALLY	TMST
TMS	62h	FAST REVERSE	FREV	62h	VELOCITY TALLY	VELT
	63h	not used		63h	not used	
ARC	64h	RECORD READY SELECT	RECS >>	64h	RECORD READY TALLY	RECT
	65h	not used		65h	not used	
	66h	AUTO ATTENUATE SEL	AUAS >>	66h	AUTO ATTENUATE TALLY	AUAT
	67h	LIFTER DEFEAT SELECT	TLDS >>	67h	LIFTER DEFEAT TALLY	TLDT
	68h	not used		68h	reserved	
	69h	not used		69h	reserved	
	6Ah	not used		6Ah	reserved	
	6Bh	not used		6Bh	reserved	
	6Ch	not used		6Ch	reserved	
	6Dh	not used		6Dh	reserved	
	6Eh	not used		6Eh	reserved	
	6Fh	not used		6Fh	reserved	
	70h	LOCK MODE SELECT	LKMS >>	70h	LOCK MODE TALLY	LKMT
AMC	71h	GLOBAL MONITOR SEL	MONS >>	71h	GLOBAL MONITOR TALLY	MONT
AMC	72h	EXCLUSIVE SYNC SEL	ESYS >>	72h	EXCLUSIVE SYNC TALLY	ESYT
AMC	73h	SYNC INPUT SELECT	SYIS >>	73h	SYNC INPUT TALLY	SYIT
	74h	not used		74h	EXTERNAL TIMECODE	EXTC
	75h	not used		75h	EXTERNAL USERBITS	EXUB
	76h	not used		76h	SLEW RATE	SLRT
	77h	not used		77h	REQUESTED OFFSET	ROFT
	78h	not used		78h	ACTUAL OFFSET	AOFT
	79h	not used		79h	STRIDE LENGTH	STLT
	7Ah	LOCAL LOCKOUT SEL	LLOS	7Ah	LOCAL LOCKOUT TALLY	LLOT
	7Bh	not used		7Bh	TIMECODE ATTRIBUTE	TCAT
	7Ch	PLAY MODE SELECT	PLMS >>	7Ch	PLAY MODE TALLY	PLMT

1.2. Functional Index

Hex	Message Keyword	(mnemonic)		**information field name**	(mnemonic)
System Utility					
7Ah	LOCAL LOCKOUT SEL	LLOS	7Ah	LOCAL LOCKOUT TALLY	LLOT
Tape Motion Processes (TMP)					
413h	TARGET SEARCH	TASE ~			
4Fh	SYNC PREROLL SEARCH	SPRS	60h	TMP TALLY	TMPT
52h	LOCK PREROLL SEARCH		LPRS		
53h	CHASE	CHAS			
Tape Motion States (TMS)					
41h	STOP	STOP	61h	TMS TALLY	TMST
58h	TAPE RELEASE	TARL			
43h	PLAY	STPL			
61h	FAST FORWARD	FFOR			
62h	FAST REVERSE	FREV			
44h	STEP	STEP			
62h	VELOCITY TALLY	VELT			
42h	VARIABLE PLAY	VAPI			
45h	AUDIBLE FAST	AFST			
46h	SHUTTLE	SHUT			
50h	SYNC	SYNC			
51h	LOCK	LOCK			
Tape Motion References					
59h	FIXED SPEED SELECT	FISS >>	59h	FIXED SPEED TALLY	FIST
49h	CAPSTAN REF SELECT	CAPS >>	49h	CAPSTAN REF TALLY	CRET
60h	PRESET	PRST	79h.	STRIDE LENGTH	STLT
Synchronization Parameters					
70h	LOCK MODE SELECT	LKMS >>	70h	LOCK MODE TALLY	LKMT
7Ch	PLAY MODE SELECT	PLMS >>	7Ch	PLAY MODE TALLY	PLMT

			50h	SYNC POINT	SPNT
			51h	LOCK TIME	LKTT
			4Eh	SYNC VELOCITY	SVTY
			4Fh	PREROLL DURATION	PRDU
60h	PRESET	PRST	77h	REQUESTED OFFSET	ROFT
			5Ch	SYNC/LOCK ACCURACY	SLAC
			76h	SLEW RATE	SLRT
			78h	ACTUAL OFFSET	AOFT
			5Dh	LOCK DEVIATION	LKDE

Position and Synchronization References

4Dh	TAPE CODE SELECT	TACS >>	4Dh	TAPE CODE SELECT TALLY	TACT
60h	PRESET	PRST	46h*	TAPETIMER	TATI
			41h*	INTERNAL LTC	INTC
			43h*	SELECTED TAPE CODE	SETC
			74h*	EXTERNAL TIMECODE	EXTC

Position and Timecode Utilities

60h	PRESET	PRST	5Ah	TAPELENOTH	TLTH
			7Bh	TIMECODE ATTRIBUTES	TCAT
			44h	INTERNAL LTC USERBITS	INUB
			75h	EXTERNAL USERBITS	EXUB

Audio Record Control (ARC)

64h	RECORD READY SELECT	RECS >>	64h	RECORD READY TALLY	RECT
4Ah	REHEARSE SELECT	REHS >>	4Ah	REHEARSE TALLY	REHT
4Bh	RECORD STROBE	RSTB	4Bh	CHANNEL REC STATUS	CRES
4Ch	RECORD EXIT	REEX			

Audio Monitor Control (AMC)

71h	GLOBAL MONITOR SEL	MONS >>	71h	GLOBAL MONITOR TALLY	MONT
72h	EXCLUSIVE SYNC SEL	ESYS >>	72h	EXCLUSIVE SYNC TALLY	ESYT
73h	SYNC INPUT SELECT	SYIS >>	73h	SYNC INPUT TALLY	SYIT
66h	AUTO ATTENUATE SEL	AUAS >>	66h	AUTO ATTENUATE TALLY	AUAT
67h	LIFTER DEFEAT SEL	TLDS >>	67h	LIFTER DEFEAT TALLY	TLDT

* - Time I/Fs which may be used as Event triggers.

2. Keywords

40h not used

41h STOP (TMS command)
Causes the controlled ATR to stop as soon as possible ; all recording channels automatically exit from record operation prior to execution.
Format: <STOP>

42h VARIABLE PLAY (TMS command)
Causes the controlled ATR to enter capstan-controlled variable forward playback mode with specified velocity, relative to the FIXED SPEED. If the controlled ATR is recording, all recording channels will exit record mode.
Format: <VARIABLE PLAY>
<SPEED> 3-byte signed binary number; 2's complement
scale: 000000h stationary
010000h FIXED SPEED, forward direction
7F0000h approximately 127 times FIXED SPEED, forward direction
FF0000h FIXED SPEED, reverse direction
800000h 128 times FIXED SPEED, reverse direction

Note: The argument does not imply that the controlled device has equivalent resolution.

43h PLAY (TMS command)
Causes the controlled ATR to enter playback at the speed determined by the value in the FIXED SPEED I/F. If the controlled ATR is recording, all recording channels will exit record mode.
Format: <PLAY>

44h STEP (TMS command)
Causes the controlled ATR to move the tape a specified number of STRIDE LENGTHs forward or backward, with respect to its current position, only while in STOP or STEP. Successive commands are cumulative until next TMS or TMP (other than STEP). The number argument refers to the quantity and direction of STRIDE LENGTHs of tape movement requested. The longitudinal STRIDE LENGTH is defined in the STRIDE LENGTH I/F
Format: <STEP>
<NUMBER> 3-byte signed binary number;
range: 127 to + 127

45h AUDIBLE FAST (TMS command)
Causes the controlled ATR to enter fast tape motion giving an output of audible but not necessarily broadcastable audio, at specified direction and velocity relative to the FIXED SPEED. All recording channels automatically exit from record operation prior to execution.
Format: <AUDIBLE FAST>
<SPEED> 3-byte signed binary number;
same format as in VARIABLE PLAY command

46h SHUTTLE (TMS command)
Causes the controlled ATR to move the tape at the specified direction and velocity relative to FIXED SPEED, without necessarily giving audio playback. All recording channels automatically exit from record operation prior to execution.
Format: <SHUTTLE>
<SPEED> 3-byte signed binary number;
same format as in VARIABLE PLAY command.

47h not used

48h reserved

49h CAPSTAN REFERENCE SELECT

Causes the controlled ATR to select a capstan reference. This command is meaningful only when not in CHASE TMP, SYNC or LOCK TMS. These operations will cause a return to the default condition.

Format: <CAPSTAN REFERENCE SELECT>
<MODE> 1-byte special binary code:
00h = internal crystal
01h = external capstan reference
FFh = as selected locdk

4Ah REHEARSE SELECT (ARC COMMAND)

During all subsequent record Entries and Exits, related output switching functions will mimic Record operation as defined by the SYNC-INPUT SELECT I/F without actually erasing or applying bias and audio signal to tape.

Format: <REHEARSE SELECT>
<MODE> 1-byte special binary code
00h = rehearse true
04h = rehearse true
FFh = as selected locally
all other codes record enabled

Note: Two hex codes are designated corresponding to Rehearse True in order to achieve conformity with the VTR type specific message RECORD MODE SELECT

4Bh RECORD STROBE

Causes record entry on the currently RECORD READY-enabled channel(s), causes record exit on any currently recording channels that have had RECORD READY enablement withdrawn.

Format: <RECORD STROBE>

4Ch RECORD EXIT

Causes a record exit on all currently recording channels.

Format: <RECORD EXIT>

4Dh TAPE CODE SELECT

Selects the source of timecode for all succeeding messages that refer to the selected tape code.

Format: <TAPE CODE SELECT>
<CODE TYPE> 1-byte special binary code:
00h = INTERNAL LTC (longitudinal timecode)
01h = reserved
02h = TAPETIMER
03h = reserved
04h = reserved
FFh = as selected locally

4Eh TARGET SEARCH (TMP command)

Causes the controlled ATR to move the tape to a defined position in accordance with the selected tape code (selected by the command TAPE CODE SELECT).

Format: <TARGET SEARCH>
<TAPE CODE> (type TIME)

4Fh SYNC PREROLL SEARCH command)
Cause the controlled ATR to move the tape to a position (reference the selected tapecode) determined by the PREROLL DURATION I/F minus any device-specific acceleration allowance in advance of the LOCK POINT I/F. All recording channels automatically exit from record operation prior to execution.
Format: <SYNC PREROLL SEARCH>

50h SYNC (TMS command)
Causes the controlled device immediately to establish synchronism with the selected timeline source at the prescribed SYNC POINT with the prescribed SYNC VELOCITY, and after the prescribed PREROLL DURATION period.

Notes: 1. This command is styled to conform functionally to the VTR dialect SYNC command.
2. PREROLL DURATION I/F and SYNC POINT I/F must be predefined before both SYNC PREROLL SEARCH and SYNC command execution. The controlled device must be cued to the correct preroll position before execution of the SYNC command.
3. This command establishes synchronism independently of any previously preset REQUESTED OFFSET, because the offset at the instant of SYNC POINT is dependent upon the time of the command's delivery and the prescribed SYNC VELOCITY. As a function of SYNC operation, REQUESTED OFFSET may be changed in order to maintain SYNC VELOCITY relative to the selected timeline source.

Format: < SYNC >

51h LOCK (TMS command)
Causes the controlled ATR to establish synchronism in the manner defined by the LOCK MODE I/F and causes a LOCK PREROLL SEARCH operation should the controlled device not be cued to the correct preroll position.
Format: <LOCK>

Note: PREROLL, DURATION, REQUESTED OFFSET and LOCK TIME I1F must be predefined be_fore LOCK tion.

52h LOCK PREROLL SEARCH (TMP command)
Causes the controlled ATR to move the tape to a position (reference the selected tapecode) determined by the PREROLL DURATION I/F minus any device-specific acceleration allowance in advance of the LOCK TIME I/F as adjusted by the REQUESTED OFFSET. All recording channels automatically exit from record operation prior to execution.
Format: <LOCK PREROLL SEARCH>

53h CHASE (TMP command)
Causes the controlled device to attempt to follow, establish and maintain synchronism with the external timecode in a data-dependent manner. All recording channels automatically exit from record operation prior to any " follow " action which is independent of the capstan servo.
Format: <CHASE>

54h reserved

55h reserved

56h reserved

57h reserved

58h TAPE RELEASE (TMS command)
Releases the tape tension mechanism of the controlled ATR. All recording Channels exit from record operation prior to exectition. 71m TMS is reset by STOP.

Format: <TAPE RELEASE>

59h FIXED SPEED SELECT
Causes the controlled device to select the nominal tape speed.

Format: <FIXED SPEED SELECT>
<SPEED> 1-byte special binary code:

10h = 1.875 inch/s = 4.7625 cm/s
20h = 3.750 inch/s = 9.525 cm/s
30h = 7.500 inch/s = 19.05 cm/5
37h = 9.606 inch/s = 24.40 cm/s
40h = 15.00 inch/s = 38.10 *CM/8*
50h = 30.00 inch/s = 76.20 cm/s
FFh = as selected locally

5Bh not used

5Ch not used

5Dh not used

5Eh not used

5Fli not used

The following command is used to preset items whose contents are represented in an information field:

60h PRESET
Presets the named information field to the given value.

Format: <PRESET>
<PERMITTED INFORMATION FIELD NAME>
<VALUE> format and coding defined by the I/F NAME
(see section 3: Information Fields)

Permitted information field names for ATRs are:

TAPETIMER
SYNC VELOCITY
PREROLL DURATION
SYNC POINT
LOCK TD4E
TAPELENGTH
SYNC/LOCK ACCURACY
STRIDE LENGTH
SLEW RATE
REQUESTED OFFSET

61h FAST FORWARD (TMS command)
Causes the controlled ATR to run forward at its maximum speed without necessarily giving audio playback . All recording channels automatically exit from record operation prior to execution.
Format: <FAST FORWARD>

62h FAST REVERSE (TMS command)
Causes the controlled ATR to rewind at its maximum speed without necessarily giving audio playback. All recording channels automatically exit from record operation prior to execution.
Format: <FAST REVERSE>

63h not used

64h RECORD READY SELECT (ARC command)
Controls which channels are to be record-enabled. These enabled channels enter record upon receipt of a RECORD STROBE command. A channel that has had its enablement withdrawn by RECORD READY will exit the recording condition upon receipt of a RECORD STROBE or RECORD EXIT command.
Format: <RECORD READY SELECT>
<CHANNELS> 8-byte bitmap:
Bits 0-63: audio channels 1-64
logic 1 = record ready true

Note: Bits 0-7 form the least significant byte; this byte is transmitted last.

65h not used

66h AUTO ATTENUATE SELECT (AMC command)
Causes the audio outPuts of the controlled ATR to be attenuated.

Note: Any channels locally-defined for carrying timecode may be excluded from. this function.

Format: <AUTO ATTENUATE>
<MODE> 1-byte special binary code:
00h = OFF
01h = ON
FFh = as selected locally

67h LIFTER DEFEAT SELECT (AMC command)
Defeats the tape lifter mechanism of the controlled ATR, thus allowing full tape contact with the heads at all times.
Format: <LIFTER DEFEAT SELECT>
<MODE> 1-byte special binary code:
00h = OFF
01h = ON
FFh = as selected locally

68h not used

69h not used

6Ah not used,

6Bh not used

6Ch not used

6Dh not used

6Eh not used

6Fb, not used

70h LOCK MODE SELECT

Selects the manner in which the controlled device achieves, and maintains synchronization, as commanded by the LOCK command.

Format: <LOCK MODE SELECT>
<MODE> 1-byte special binary codi

00h Absolute Standard Mode:
Achievement of lock to EXTERNAL TIMECODE is data-dependent; maintenance of lock is data-dependent. External LTC is selected as the source of EXTERNAL TIMECODE.

0.1h Absolute Resolve Mode:
Achievement of lock to EXTERNAL TIMECODE is data-dependent; maintenance of lock is data-independent. External LTC is selected as the source of EXTERNAL TIMECODE.

02h Absolute Video Mode:
Achievement of lock to EXTERNAL TIMECODE is data-dependent; maintenance of lock is by reference to external video. External LTC is selected as the source of EXTERNAL TIMECODE.

03h Absolute VITC Mode:
Achievement of lock to external video with VITC is data-dependent; maintenance of lock is by reference to external video. The external video VITC signal is selected as the source of EXTERNAL TIMECODE.

11h Free Resolve Mode:
Achievement of lock to EXTERNAL TIMECODE is data-independent; maintenance of lock is data-independent. External LTC is selected as the source of EXTERNAL TIMECODE.

12h Free Video Mode:
Achievement of lock is by reference to external video signal; maintenance of lock is by reference to external video. The source of EXTERNAL TIMECODE is undefined.
FFh As selected locally

Notes: 1. All LOCK commands ~ in any Absolute Mode require predefined PREROLL DURATION, REQUESTED OFFSET, and LOCK TIME I/Fs, and must be preceded by a LOCK PREROLL SEARCH command.
2. All LOCK commands issued in any Free Mode ignore any predefined PREROLL DURATION, REQUESTED OFFSET, and LOCK TIME I/Fs, and need not be preceded by a LOCK PREROLL SEARCH command.
3. If a change in lock mode from any Free Mode to the Absolute Mode is performed following a successful LOCK operation, then the ACTUAL OFFSET I/F data is automatically transferred to the REQUESTED OFFSET I/F. LOCK is maintained.
4. Smooth operation in Absolute Video Mode is assured only if the EXTERNAL TIMECODE is framed correctly with respect to the video reference signal, i.e. the leading edge of bit zero must begin at the start of the appropriate line of the video.

71h GLOBAL MONITOR SELECT (AMC command)
Controls which of the listed signals is selected for the output of all audio channels.
Format. <GLOBAL MONITOR SELECT>
<MODE> 1-byte special binary code:

01h = Playback
02h = Synchronous Playback
03h = Input
FFh = As selected locally

72h EXCLUSIVE SYNC SELECT (AMC command)
Controls which, if any, audio channels will, notwithstanding any GLOBAL MONITOR SELECTion, provide synchronous playback on Line Output, in accordance with the SYNC INPUT I/F.

Format: <EXCLUSIVE SYNC SELECT>
<CHANNELS> 8-byte bit map:

Bits 0-63 = Audio channels 1-64

Note: Bits 0- 7 form the least significant byte; this byte is transmitted last.

73h SYNC INPUT SELibf~(iAMC- command)
Selects the conditions under which Line Input is presented to Line Output, for those channels selected for Synchronous Playback. This function affects all audio channels, except for the designated timecode channel.

Format: <SYNC INPUT SELECT>
<MODE> 1-byte special binary code:
00h = Record Only
01h = Record or Non-Play
02h = Record or Record-Ready
FFh = As selected locally

Notes: 1. "Record Only
All channels that are set to monitor Synchronous Playback will monitor input only when recording. Upon the conclusion of a record operation, those channels will revert back of Synchronous Play.
2. "Record or Non-play l.:
All channels that are set to monitor Synchronous Playback will monitor input when recording. Upon the conclusion of a record operation, those channels will revert back to Synchronous Playback. In addition, all Record Ready channels will monitor Input when not in PLAY mode.
3. -Record or Record-Ready ":
All channels that are set to monitor Synchronous Playback, and are set to Record Ready (or are still recording), will monitor Input.

74h not used

75h not used

76h not used

77h not used

78h not used

79h not used

7Ah LOCAL LOCKOUT SELECT
Causes the controlled device to disable all local controls.

Format: <LOCAL LOCKOUT SELECT>
<MODE> 1-byte special binary code:

logic: 00h = local control not disabled
01h = local control disabled

7Bh not used

7Ch PLAY MODE SELECT'
Selects the manner in which the controlled device establishes its nominal, FIXED SPEED forward operation, as directed by the PLAY command.
Format: <PLAY MODE SELECT>
<MODE> 1-byte special binary code:
00h Normal:
Achieve PLAY as defined by the CAPSTAN REFERENCE SELECT. No relationship is implied to any timecode or video reference.

11h Free Resolve Mode:
Achieve PLAY in a manner that resolves to EXTERNAL TIMIECODE data-independent; maintain resolve data-independent. External LTC is selected as the source of EXTERNAL TIMECODE.

12h Free Video Mode:

Achieve PLAY in a manner that resolves to external video signal; maintain resolve to external video reference. The source of EXTERNAL TIMECODE is undefined.

FFh As selected locally

3. Information Fields

Note: The items of the INFORMATION FIELD are accessed by the common messages:
READ, UPDATE, CYCLE or SIMULTANEOUS READ,
which are tallied by the common messages:

I/F ITEM RESPONSE or SIMULTANEOUS READ RESPONSE
These commands use the format
<KEYWORD> <PARAMETER NAME>
and
<KEYWORD> <PARAMETER NAME> <PARAMETER VALVE>
where
PARAMETER NAME uses the information field name specified below,
and
PARAMETER VALUE carries the information contents specified below.

40h not used

41h INTERNAL LTC

This contains the longitudinal timecode value most recently read from tape.

Format: <INTERNAL LTC >

<CODE VALIDITY> 1-byte special binary code:

00h = valid LTC
01h = derived LTC
02h = non valid LTC

<TIME VALUE> standard "time" format

43h SELECTED TAPE CODE

Contains the time value of the timecode (INTERNAL LTC, TAPETIMER, etc.) that has been selected most recently by the TAPE CODE SELECT command.

Format: <SELECTED TAPE CODE>

<IDENTIFIER> 1-byte special binary code:

00h = INTERNAL LTC
01h = reserved
02h = TAPETIMER
03h = reserved
FFh = invalid

<TIME VALUE> standard " time " format

44h INTERNAL LTC USERBITS

Contains the LTC userbit contents most recently read from tape.

Format: <INTERNAL LTC USERBITS>.

<UB SPECIFICATION> 1-byte special code:

bits 0,1:
- 0,0 Content of userbits unspecified
- 1,0 Content of userbits is eight-bit character set conforming to ISO 646 and ISO 2022 (ASCII)
- 0,1 Unassigned
- 1,1 Unassigned

bit 2:
- 0 Unassigned
- 1 Content of userbits is secondary time data in standard time format

bit 3-7:
- 0 Set to 0 until assigned

<UB GROUP 8/IUB GROUP 7>
<UB GROUP 6/UB GROUP 5>
<UB GROUP 4/UB GROUP 3>
<UB GROUP 2/UB GROUP 1 >
(MSnibble)

4 bytes, each consisting of two 4-bit nibbles, each containing one UB group

Note: UB 1 is the UB group which occurs first on tape (transmitted last in this format).

45h not used

46h TAPETIMER
Contains the instantaneous counting status of tapetimer.
Format: <TAPETIMER>

modified standard "time" format:
MSB (i.e. 80h position of "hours" byte) = sign

Note: tapetimer count through zero technique must be as follows: -4 -3- 2 -1 -0 + 0 + 1 + 2 + 3 + 4 ….

47h not used

48h reserved

49h CAPSTAN REFERENCE TALLY
Tallies the status set by the CAPSTAN REFERENCE SELECT command.
Format: <CAPSTAN REFERENCE TALLY>
<MODE> 1-byte special binary code

00h = internal crystal (= default)
01h = external ref input

4Ah REHEARSE TALLY
Tallies the status set by the REHEARSE SELECT command.
Format: <REHEARSE TALLY>
<MODE> 1-byte special binary code:
01h = rehearse true (= default)
04h = rehearse true
05h = record enabled

4Bh CHANNEL RECORD STATUS
Contains a 64-bit map of the channels that are currently recording.
Format: <CHANNEL RECORD STATUS>
<CHANNELS> 8-byte bit map:

Bits 0-63 = audio channels 1-64

Note: Bits 0-7 form the least significant byte; this byte is transmitted last.

4Ch not used

4Dh TAPE CODE SELECTION TALLY
Tallies the code currently selected by the most recent TAPE CODE SELECT command.
Format: <TAPE CODE SELECTION TALLY>
<CODE TYPE> 1-byte special binary code:

00h = INTERNAL LTC (= default)
01h = reserved
02h = TAPETIMER
03h = reserved
04h = reserved

4Eh SYNC VELOCITY
Contains a velocity used as the synchronization velocity for the SYNC command.
Format: <SYNC VELOCITY>

< SPEED > 3-byte signed binary number; same format as in VARIABLE PLAY command.
Default is FIXED SPEED forward.

4Fh PREROLL DURATION
Contains the desired real-time preroll duration used in advance of the synchronising process.

For use with the LOCK command, the PREROLL DURATION specifies the exact real-time period between Lock Actuation Time, and the moment of encountering the LOCK POINT (see Chapter 1 for concept). It is assumed that EXTERNAL TIMECODE is presented to the device in a real-time manner during the PREROLL period. PREROLL DURATION may not be set to a value lower than the device-dependent lower limit.

For use with the SYNC command, the PREROLL DURATION specifies the exact real-time period between the receipt of the SYNC command, and the moment of synchronizing with the SYNC/LOCK POINT at the SYNC VELOCITY. It is assumed that the selected TIMELINE SOURCE is presented to the device in a real-time manner during this preroll period. PREROLL DURATION may not be set to a value lower than the device-dependent lower limit, which may change dependent upon prescribed SYNC VELOCITY and other factors.

Format: <PREROLL DURATION>
<TIME VALUE> standard "time" format

50h SYNC POINT
Contains the specified point on tape, by reference to SELECTED TAPECODE, at which synchronism to the selected TIMELINE SOURCE is assured.
Format: <SYNC POINT>
<TIME VALUE> standard " time " format.

51h LOCK TIME
Contains the last specified point in time, by reference to EXTERNAL TIMECODE, at which synchronism to the INTERNAL LTC is assured. The manner in which the device Maintains synchronous operation from this point on is defined by the LOCK MODE SELECT I/F.
Format: <LOCK TIME>
<TIME VALUE> standard "time" format

52h not used

53h not used

54h reserved

55h reserved

56h reserved

57h reserved

58h not used

59h FIXED SPEED TALLY
Tallies the current play speed.

Format: <FIXED SPEED TALLY>
<SPEED> 1-byte special binary code:

10h =	1.875 inch/s =	4.7625	cm/5
20h =	3.750 inch/s =	9.525	cm/s
30h =	7.500 inch/s =	19.05	cm/s
37h =	9.606 inch/s =	24.40	cm/s
40h =	15.00 inch/s =	38.10	cm/s
50h =	30.00 inch/s =	76.20	cm/s

5Ah TAPELENGTH
Contains the length of the loaded tape.

Format: <TAPELENGTH>
<TIME VALUE> standard time format

5Bh not used

5Ch SYNC/LOCK ACCURACY
Contains a time value that determines the accuracy of synchronizing processes, i.e. it specifies the maximum allowed error before negation of the LOCK or SYNC successful tallies (see TMS TALLY I/F).

Format: <SYNC/LOCK ACCURACY>
<LTC BIT PERIODS> 1-byte unsigned number

Argument range

0	less than 1/80 frame period
255	less than 255/80 frame periods

5Dh LOCK DEVIATION
Contains the time difference between the position of the tape on the controlled ATR and the external timecode adjusted by the REQUESTED OFFSET.

This is computed as follows:

INTERNAL LTC
minus REQUESTED OFFSET
minus EXTERNAL TIMECODE

Format: <LOCK DEVIATION>
<TIME VALUE> high resolution time format

5Eh not used

5Fh, not used

60h TMP TALLY
Tallies the current Transport Motion Process of the ATR, and reports how successfully that process has been accomplished.

Format <TMP TALLY>
<KEYWORD> 1 value that contains the keyword of the last active TMP command.
<SUCCESS LEVEL> 1-byte special binary code:

00h = trying; transition in progress
01h = successful
02h = failure; this tally should be supplemented by an ERROR message as appropriate

61h TMS TALLY

Tallies the current Transport Motion State of the ATR, and reports how successfully this state has been reached.

Format: <TMS TALLY>
<KEYWORD> 1 -byte value that contains the keyword of the last active TMS command.
SUCCESS LEVEL> 1-byte special binary code:

00h = trying; transition in progress
01h = successful
02h = failure; this tally should be supplemented by an ERROR message as appropriate

62h VELOCITY TALLY

Tallies the current transport velocity. Note that this is the true velocity in all modes.

Format: <VELOCITY TALLY>
<SPEED> 3-byte signed binary number; same format as in VARIABLE PLAY command.

63h not used

64h RECORD READY TALLY

Contains a 64-bit map of the channels that are ready to record.

Format: <RECORD READY TALLY>
<CHANNELS> 8-byte bit map:
Bits 0-63: audio channels 1-64

Note: Bits 0-7 form the least significant byte; this byte is transmitted last.

65h not used

66h AUTO ATTENUATE TALLY (AMC TALLY)

Tallies the status of the auto attenuate function selected by the AUTO ATTENUATE SELECT command.

Format: <AUTO ATTENUATE TALLY>
<MODE> 1-byte special binary code:
00h = OFF (= default)
01h = ON

67h LIFTER DEFEAT TALLY (AMC tally)

Tallies the status selected by the LIFTER DEFEAT SELECT command.

Format: <LIFTER DEFEAT TALLY>
<MODE> 1-byte special binary code:
00h = OFF (= default)
01h = ON

68h reserved

69h reserved

6Ah reserved

6Bh reserved

6Ch reserved

6Dh res~

6Eh reserved

6Flh reserved

70h LOCK MODE TALLY

Tallies the mode in which synchronism is established and maintained.

Format: <LOCK MODE TALLY>
<MODE> 1-byte special b~ code:

00h Absolute Standard Mode
01h Absolute Resolve Mode
02h Absolute Video Mode
03h Absolute VITC Mode
11h Free Resolve Mode
12h Free Video Mode

71h GLOBAL MONITOR TALLY (AMC tally))

Tallies the status of the monitor channels selected by the GLOBAL MONITOR SELECT command.

Format: <GLOBAL MONITOR TALLY>
<MODE> 1-byte special binary code:
01h = Playback (= default)
02h = Synchronous Playback
03h = Input.

72h EXCLUSIVE SYNC TALLY (AMC tally)

Tallies the status of the audio channels defined by the EXCLUSIVE SYNC SELECT command.

Format: <EXCLUSIVE SYNC TALLY>
<CHANNELS> 8-byte bit map:

Bits 0-63 = Audio channels 1-64

Note: Bits 0-7 form the least significant byte; this byte is transmitted last.

73h SYNC INPUT TALLY (AMC tally)

Tallies the conditions selected by the SYNC INPUT SELECT command.

Format: <SYNC INPUT TALLY>
<MODE> 1-byte special binary code:
00h Record (= default)
01h Record or Non-Play
02h = Record or Rec-Ready

74h EXTERNAL TIMECODE

Contains the timecode value most recently received from an external timecode source.

Format: <EXTERNAL TIMECODE>
<CODE VALIDITY> 1-byte special binary code:

00h - valid timecode
01h - not valid timecode

<TIME VALUE> standard "time" format

75h EXTERNAL USERBITS

Contains the userbit contents most recently received from an external timecode source.

Format: <USERBITS>
<UB SPECIFICATION> (format as
<UB GROUP 8/UB GROUP 7> INTERNAL LTC USERBITS)
<UB GROUP 6/UB GROUP 5>
<UB GROUP 4/UB GROUP 3>
<UB GROUP 2/UB GROUP 1>

76h SLEW RATE

Contains the maximum rate at which the position of the tape on the controlled machine may be changed during an attempt to re-establish synchronism following a loss of synchronism.

Format: <SLEW RATE>
<RATE> 2-byte unsigned binary number
scale: 0000h = no slew
0001h = 1/10 frame/sec
FFFFh = maximum machine-dependent slew rate

77h REQUESTED OFFSET

Contains the desired time offset between the external timecode and the internal tape timecode for use with LOCK and CHASE commands.

Format: <REQUESTED OFFSET>
<OFFSET TIME> high-resolution timecode

definition: offset = internal timecode minus external timecode

e.g.: If the controlled device is to lead the external reference by 1 minute, then
<OFFSET TIME> = <00 01 00 00.00 00>

78h ACTUAL OFFSET

Contains the actual time offset between the external timecode and the internal tape timecode.

Format: <ACTUAL OFFSET>
<OFFSET TIME> high-resolution timecode

definition: offset = internal timecode minus external tim~e
e.g.: If the controlled device leads the external reference by 1 minute, then
<OFFSET TIME> = <00 01 00 00.00 00>

79h STRIDE LENGTH

Contains the period of each unit, in terms of LTC bits, for the STEP TMS argument.

Format: <STRIDE LENGTH>
<NUMBER LTC BITS> 1-byte unsigned binary number

7Ah LOCAL LOCKOUT TALLY

Tallies the status of the local control capability of the controlled device.

Format: <LOCAL LOCKOUT TALLY>
<MODE> 1-byte q~ binary code:
logic: 00h = local control not disabled
01h = local control disabled

7Bh TIMECODE ATTRIBUTE

Contains the attributes of the timecodes presented to the controlled device.

Format: <TIMECODE ATTRIBUTE>
<ATTRIBUTE OF TAPE TIMECODE> 1-byte special binary code
<ATTRIBUTE OF EXTERNAL TIMECODE> 1-byte special binary code
coding (both cases): 00h = 24-frame-count code
01h = 25-frame-count code
02h = 30-frame-count code
12h = 30-frame-count code, compensated

7Ch PLAY MODE TALLY

Tallies the manner in which the controlled device is selected to establish its nominal, FIXED SPEED forward operation, as directed by the PLAY command.

Format: <PLAY MODE TALLY>
<MODE> 1-byte special binary code:

00h = normal (= default)
11h = Free Resolve Mode
12h = Free Video Mode

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REMOTE-CONTROL SYSTEM
FOR BROADCASTING PRODUCTION EQUIPMENT
TELECINE TYPE-SPECIFIC MESSAGES

Tech. 3245 - Supplement 4 December 1989

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Introduction

Document Tech. 3245 describes the specification of a digital remote-control system for broadcasting production equipment. It defines completely the electrical/mechanical level (level 1), and the supervisory level (level 2), of the interface. The two remaining levels - the system service level (level 3), and the virtual machine level (level 4) - are defined only in terms of function and control message syntax.

Supplement 1 to Tech. 3245 completes the definition of the system service level by detailing the system service messages and, in addition, defines the virtual machine messages which are common to all types of virtual machine - the common messages.

The present Supplement defines the type-specific virtual machine messages which are applicable to telecines. Type-specific messages applicable to other categories of equipment are defined in other supplements to Tech. 3245.

In order to implement a complete network, the system designer therefore requires:

Document Tech. 3245 - the general specification,

Supplement 1 - system service and common messages

and one or more other supplements appropriate to the category or categories of equipment to be used.

The specification described in this Supplement has been developed jointly with the SMPTE, and is functionally identical to that to be published as an SMPTE Recommended Practice.

Chapter 1

General concepts

This chapter contains a general explanation of some of the concepts used in the formulation of the TK type-specific message set. It constitutes tutorial information and is intended to assist in the understanding of the specifications in Chapter 2 of this document. A working knowledge of the following ESbus topics is assumed:

ESbus system overview

Control message architecture

Supervisory protocol

Tributary interconnection

Electrical and mechanical characteristics

System service and common messages

The TK type-specific dialect shares many conceptual constructs with the VTR type-specific dialect. As far as possible comparable functions of both machine types are controlled with commands of the same code and format; there are, however, also some differences.

In respect of the control of analogue functions in particular, the message set and the Information Field array of the telecine are much more developed than those of the VTR.

Conventions:

- Acronyms and abbreviations are shown in upper-case characters.

e.g. Telecine TK
Transport Motion State TMS
Information Field I/F

- Message keywords and names of information fields are shown in upper-case characters.

e.g. FIXED PLAY

PREROLL DURATION

These command keywords and information field names are used within the text of this document to imply requested action, information field identity, and in turn the information field contents of the virtual machine. To assist in readability of this document, these terms are used in the context of the presentation material.

e.g. "If the SYNC VELOCITY is standard play speed ....
("SYNC VELOCITY" in this context refers to the content of an Information Field.)

- Terms having special meanings in this or related documents are shown with leading upper-case characters :

e.g. Virtual Machine
Transport Motion Process

I. Transport Motion States

The transport mechanism of a TK is considered as a separate state machine. Therefore the commands which control transport functions form a subset within the TK type-specific message set. These commands are called Transport Motion State commands ("TMS" commands). Each TMS command causes a transition into a transport state and ceases the previous state, i.e. these functions are mutually exclusive.

TMS commands include:

STOP, VARIABLE PLAY, FIXED PLAY, STEP, VISIBLE FAST, SHUTTLE.

All TMS commands are marked as such in the command description.

2. Transport Motion Processes

Transport Motion Process commands (" TMP " commands) are overriding control commands that cause the controlled device automatically to choose it's own Transport Motion States to achieve the desired result.

TMPs include:

TARGET SEARCH, PREROLL SEARCH, SYNC.

All TMP commands are marked as such in the command description.

3. Electrical machine states

Other TK commands affect states of the electrical environment of the TK. The functions controlled by them are not necessarily mutually exclusive.

4. Transport speeds

Some commands require a speed specification which is carried by the command in the form of a three-byte parameter. This parameter is intended to define the direction and absolute value of the desired speed that should be achieved as closely as possible by the real machine.

All commands with a speed parameter use the same format and coding. This is a three-byte signed number with a scale range defined such that:

000000h	represents	stationary*[1],
010000h	represents	FIXED SPEED, forward direction,
7F0000h	represents	approximately 127 times FIXED SPEED, forward direction,
FF0000h	represents	FIXED SPEED, reverse direction,
800000h	represents	128 times FIXED SPEED, reverse direction.

It allows, theoretically, for speeds between - 128 and approximately + 127 times FIXED SPEED and a resolution of 1/65,536th of FIXED SPEED.

5. TK Information Fields

The TK dialect makes extensive use of the Information Field concept. Some specific features of the TK Information Fields are described in the following sections.

[1] the letter "h" appended to a number indicates that it is expressed in hexadecimal notation.

5.1. TMS tallies

These Information Fields indicate the current state of the transport. As these mutually exclusive states are commanded by TMS commands, the code of the corresponding TMS keyword is used to identity them individually. An additional byte tallies the level of success, i.e. whether the commanded state function is still in transition or has been achieved, successfully or not.

5.2. TMP tallies

These Information Fields indicate the current Transport Motion Processes. As these mutually exclusive processes are commanded by TMP commands, the code of the corresponding TMP keyword is used to identify them individually. An additional byte tallies the level of success, i.e. whether the commanded process is still in progress, or has already accomplished its respective goal, successfully or not.

During processes, the Transport Motion State will be reflected in the TMS TALLY I/F, as though that TMS command had been issued.

5.3. Other command tallies

Commands which cause changes in any electrical machine state (non-TMSs) have a corresponding Information Field. When the Information Field is read, the response is tallied in the same format as that of the command.

Example: The command ASPECT SELECT is intended to choose the aspect ratio of the reproduced picture. The Information Field ASPECT TALLY may be read to obtain information about the currently selected aspect ratio, which will be tallied in the same format as that used in the ASPECT SELECT command itself.

5.4. Film Code

There are several ways to identify a film position, by using for example:

- film time-code.

- frame counter 1,

- frame counter 2.

For a search, and for other automatic procedures, only one scale is used. The selected scale is referred to as the FILM CODE, and can be chosen by the FILM CODE SELECT command. The functions mentioned above then refer to the FILM CODE rather than to a frame counter directly.

There is a separate Information Field for each of the codes and timers mentioned above; nonetheless, the film code actually selected can also be read from the Information Field FILM CODE.

6. Synchronization

Synchronization means that the machine is programmed to pass:

- a specified point on the film ("where")
- at a specified point in time ("when"), and
- locked to a specified speed ("how").

"Where" : The point on the film is called SYNC POINT. It is specified in terms of FILM CODE, and is maintained in the Information Field SYNC POINT. The sync point is specified by applying a PRESET command to this Information Field.

"When" : The point in time is defined by the instant of issue of the SYNC command. At a specified time period after the arrival of the SYNC command, the SYNC POINT must be reached. This time period is called PREROLL DURATION; it is maintained in the Information Field PREROLL DURATION, and is specified by applying a PRESET command to this Information Field.

Note: the PREROLL DURATION is reserved mainly for synchronization purposes; a greater PREROLL DURATION than that required by the real machine may, however, be chosen for operational reasons (e.g. extended preview time).

"How" : The speed at the sync point is defirted by a value maintained in the Information Field SYNC VELOCITY; it is specified by applying a PRESET command to this Information Field.

As a prerequisite for the use of the SYNC command the film must be placed at a park position which is calculated from the SYNC POINT and the SYNC VELOCITY as follows:

$$\text{SYNC POINT} - \frac{\text{PREROLL DURATION} \times \text{SYNC VELOCITY}}{\text{FIXEDSPEED}}$$

To achieve this park position the PREROLL SEARCH command is used and the TK virtual machine must make the calculation automatically.

The SYNC Command in the case of an "Ideal" Machine

A better understanding of the function of the SYNC command is possible if it is considered from the viewpoint *of an " ideal " machine.

- On the arrival of a SYNC command an ideal TK would start immediately with no delay, fully locked and with the specified speed. Under these ideal conditions the machine would, at the PREROLL DURATION time later, be precisely at the SYNC POINT.

- A real TK cannot start and synchronize immediately; it is therefore the responsability of the virtual machine, and hence of the virtual machine manufacturer, to control the real machine in such a manner that the result is the same.

Measures taken in order to correct synchronization during the preroll duration period may include:

- on the receipt of a PREROLL SEARCH command, parking a few frames down the film to match the average number of frames lost while coming up to play speed;

- on the SYNC command, overriding the specified velocity using the play speed override facility of the real machine to eliminate the remaining offset from the appropriate lock condition.

7. Immediate and Timeline Modes

All TK commands can be used in the "immediate mode" which causes their instantaneous execution. In this way they could, theoretically, be used to control even time-critical functions. As the transfer of a message over the bus within a given time slot cannot be guaranteed, however, the immediate mode is not recommended for such applications.

Wherever possible, time-critical commands should be queued on the timeline, using the command facilities provided by the common message set. Activities requiring synchronous operations between several machines are best suited to the " timeline mode " of operation which allows for the pre-programming of sequences of time-critical functions (e.g. SYNC command). All time-critical functions refer to the timelines of the individual virtual machines, which themselves are synchronized by a system time transmission from the bus controller in response to a REQUEST TIME TRANSMISSION command.

For certain time-critical applications, (e.g. editing), it is essential that all machine internal clocks are synchronized to the station field phase sequence. In order to achieve this phasing, the machine internal clock will be ADVANCED by as many frames as necessary following receipt of the TIMELINE RUN command.

8. Sample command sequences

The following sections show samples of typical command sequences in immediate mode as well as in timeline mode. These sequences describe only some of the applications of the command set; there is no obligation on the part of system designers to use precisely these sequences.

8.1. Immediate Mode

8.1.1. Search and Play

Some time before initial action:

<PRESET> <PREROLL DURATION> < time value >

<PRESET> < SYNC POINT > < time value >

initial action:

<PREROLL SCHEARCH>

final action (not earlier than when the TMC TALLY has been "SEARCHed, successfully"):

<FIXED PLAY>

On the FIXED PLAY command the TK starts and reaches the sync point approximately after the preroll duration.

If the TK is required to start at the sync point location (using no preroll) the TARGET SEARCH command should be used.

synchronzation is not then guaranteed.

Note that the preroll duration and the sync point, once loaded, need not be reloaded until changed.

8.1.2. Search and Synchronbs

Some time before initial action:

<PRESET> <PREROLL DURATION> < time value >

<PRESET> <SYNC POINT> < time value>

<PRESET> <SYNC VELOCITY> <speed value>

initial action:

<PREROLL SEARCH>

final action (not earlier than when the TMC TALLY has been SEARCHed successfully):

<SYNC>

On the SYNC command the TK starts and reaches the sync point precisely after the preroll duration.

Under control of the virtual machine the play speed override function of the TK may be used internally to find the appropriate lock.

This sequence can be used for the synchronous operation of multiple TKs only when delivery of the SYNC command can be guaranteed within a reasonable time slot (e.g. one field).

Note that the preroll duration, once loaded, need not be reloaded until changed.

8.2. Timeline Mode

8.2.1. Search and Play

Some time before initial action:

<PRESET> <PREROLL DURATION> <time value>

<CLEAR EVENT> <0>

<STOP TIMIELINE> (optional),

<PRESET> <SYNC POINT> <time value>

<PRESET> <SYNC VELOCITY> < speed value>

initial action:

<PREROLL SEARCH>

final action (not earlier than when the TMC TALLY has been SEARCHed, successfully

<REQUEST TIME TRANSMISSION>

<DEFINE EVENT>

<TIMELINE> <"TL sync point" — "preroll duration">

<FIXED PLAY>

Note that the " TL sync point " is the value of the timeline when the sync point has been reached approximately; it must be calculated from the instantaneous timeline value transmitted by the bus controller in response to the preceding REQUEST TIME TRANSMISSION command.

In this case it is in fact easier to use the immediate mode which allows for FIXED PLAY at a specific time from commands given much earlier.

8.2.2. Search and Synchronize

Some time before initial action:

<PRESET> <PREROLL DURATION> < time value >

<CLEAR EVENT> <0>

<STOP TIMELINE> (optional)

<PRESET> <SYNC POINT> <time value>

<PRESET> <SYNC VELOCITY> < speed value>

initial action:

<PREROLL SEARCH>

final action (not earlier than when the TMC TALLY has been SEARCHed, successfully

<REQUEST TIME TRANSMISSION>

<DEFINE EVENT>

< TIMELINE > < "TL sync point" - " preroll duration ">

<SYNC>

Note that the " TL sync point " is the value of the timeline when the sync point has been reached precisely; it must be calculated from the instantaneous timeline value transmitted by the bus controller in response to the preceding REQUEST TIME TRANSMISSION command. For editing it is generally desirable to avoid introducing unnecessary waiting times; therefore it is suggested that (TI, sync point - preroll duration) be substituted in the DEFINE EVENT command by (instantaneous timeline value plus some frames) to compensate for transmission delay.

9. Analogue magnitudes

There are many analogue magnitudes to be controlled in a TK. In order to facilitate remote-control of these magnitudes in a variety of modes, a special structure of Information Fields and some additional commands applicable to these Fields are provided.

9.1. Information Fields related to analogue magnitudes

All analogue magnitudes have two related Information Fields:

- One " ACTUAL Field that represents the instantaneous value of the magnitude, and

- One " TARGET Field that contains a possible future value of the magnitude.

Writing to an ACTUAL Field by a PRESET command changes the magnitude immediately.

Writing to a TARGET Field has no immediate effect on the magnitude.

The TARGET value, however, may become the ACTUAL value when one of the appropriate TRANSITION commands is applied to the TARGET Field.

9.2. TRANSITION commands

The TRANSITION commands cause a transition of the magnitude from the value present before the advent of the command, reflected by the ACTUAL Field, to the value specified by the TARGET Field.

There is a choice of several kinds of transition:

The TRANSITION IMMEDIATE command causes an immediate change from the ACTUAL to the TARGET value.

The TRANSITION CONTINUOUS command switches to a mode where the ACTUAL value follows the TARGET value continuously all the time.

The following TRANSITION commands cause controlled transitions from the ACTUAL value to the TARGET value with a specified duration; each of these commands causes a special kind of transition

- TRANSITION LINEAR command: linear transition

- TRANSITION POS-LOG command: positive-logarithmic transition

- TRANSITION S-CURVE command: S-curve transition

- TRANSITION USER-DEFINED command: user-defined transition.

As long as a transition is still in progress it may be stopped by a CANCEL TRANSITION command. This command is also used to cease the status caused by a TRANSITION CONTINUOUS command.

9.3. The CHANGE I/F command

The CHANGE I/F command for a continuous change of the value of an ACTUAL Field with specified direction and speed (incremental/decremental operation).

This command enables the user to increment or decrement an analogue magnitude without knowing the exact absolute value. This may be useful when an analogue magnitude is adjusted manually according to a visual effect. An example would be the focus adjustment controlled by applying the CHANGE I/F command to the Information Field FOCUS ACTUAL.

9.4. The NORMALIZE I/F command

The NORMALIZE I/F command causes the addressed Information Field to assume its standard value.

This command may also be applied to TARGET Fields. Then a smooth transition to the standard value can be managed by applying one of the TRANSITION commands.

Interrogating the Information Field NORMALIZED FIELDS gives a list of the names of all those Information Fields that are currently in the normalized condition.

9.5. The AUTO CONTROL I/F command

The AUTO CONTROL I1F command the addressed Information Field to a mode in which the value of the Field is controlled automatically.

In many cases this command may also be applied to TARGET Fields. Thus a smooth transition to the auto mode can be arranged by applying one of the TRANSITION commands, and, as soon as the transition has ended, by sending another ALTTO CONTROL I/F command, applied to the ACTUAL Field.

While in the Auto Control mode, changes caused by PRESET and/or CHANGE commands will modify the automatically-generated value by shifting the control target.

Interrogating the Information Field AUTO CONTROLLED FIELDS gives a list of the names of all those Information Fields that are currently in the auto-controlled condition.

9.6. Multiple I/F operation

All commands operating on I/Fs representing analogue magnitudes may address just one Information Field or several of them at the same time (using a BEGIN/END construct), thus reducing the bus load and transmission time required.

Chapter 2

Telecine (TK) type-specific messages
(Virtual Machine type is 04h)

General Notes

1. *Commands which have a related information field for tally purposes ("...SELECT"-"... TALLY" pairs) are identified by a ">>" sign in the list below.*
2. *All Transport Motion State commands (indicated below as " TMS") are mutually exclusive.*
3. *Transport Motion Process commands (indicated below as "TMP") are overriding control commands that cause the controlled device to enter automatically the appropriate Transport Motion States to achieve the desired result. The Transport Motion State will be reflected in the TMS tally, as though that TMS command had been issued. TMPs are mutually exclusive.*
4. *In all cases, the temporal order of EVEN75 must be preserved. Mutually exclusive commands actuated by the EVENT construct, that are placed on the EVENT cue at the same trigger point, will cause both events to cancel.*

1. Index of keywords, mnemonics and information field names

	Hex	Message keyword	(mnemonic)		Hex	Information field name	(mnemonic)
	40	not used			40	not used	
TMS	41	STOP	STOP		41	TIME CODE FROM FILM	TCFF
TMS	42	VARIABLE PLAY	VAPI,		42	not used	
TMS	43	FIXED PLAY	FIPL		43	SELECTED FILM CODE	SEFC
TMS	44	STEP	STEP		44	USERBITS FROM FILM	UBFF
TMS	45	VISIBLE FAST	VFST		45	not used	
TMS	46	SHUTTLE	SHUT		46	FRAMECOUNTER 1	FCON
TMS	47	PLAY SPEED OVERRIDE	PSPO		47	FRAMECOUNTER 2	FCTW
	48	READY SELECT	REDS	>>	48	READY TALLY	REDT
	49	SERVO REF SELECT	SRES	>>	49	SERVO REF TALLY	SRET
	4A	FREEZE SELECT	FRES	>>	4A	FREEZE TALLY	FRET
	4B	WETGATE SELECT	WEGS	>>	4B	WETGATE TALLY	WEGT
	4C	AREA MARKER SWITCH	ARMS		4C	not used	
	4D	FILM CODE SELECT	FICS	>>	4D	FILM CODE TALLY	FICT
TMP	4E	TARGET SEARCH	TASE		4E	SYNC VELOCITY	SVTY
TMP	4F	PREROLL SEARCH	PRSE		4F	PREROLL DURATION	PRDU

TMP	50	SYNC	SYNC		50	SYNC POINT	SPNT
	51	SYNC SHIFT	SYSH		51	not used	
	52	GATE BLAST	GABL		52	not used	
	53	DIRT CONCEAL SELECT	DICS	>>	53	DIRT CONCEAL TALLY	DICT
	54	TCG TIME SOURCE SEL	TrSS	>>	54	TCG TIME SOURCE TLY	TTST
	55	reserved			55	reserved	
	56	TCG UB SOURCE SEL	TUSS	>>	56	TCG UB SOURCE TLY	TUST
	57	reserved			57	reserved	
	58	reserved			58	not used	
	59	FIXED SPEED SELECT	FISS	>>	59	FIXED SPEED TALLY	FIST
TMS	5A	FIXED PLAY RESERVE	FIPR		5A	not used	
	5B	not used			5B	reserved	
TMS	5C	ROCK	ROCK		5C	SYNCHRONISM ACCURAC	SYAC
	5D	EMULSION IN/OUT SEL	EMUS	>>	5D	EMULSION IN/OUT TLY	EMUT
	5E	SEQUENCE SELECT	SEQS	>>	5E	5EQUENCE TALLY	SEQT
	5F	LAMP SELECT	LAMS	>>	5F	LAMP TALLY	LAMT
	60	PRESET	PRST		60	TMP TALLY	TMPT
TMP	61	FREEZE START	FRST		61	TMS TALLY	TMST
	62	not used			62	VELOCITY TALLY	VELT
	63	not used			63	FIELD DOMINANCE	FIDO
	64	TELECINE SOURCE SEL	TESS	>>	64	TELECINE SOURCE TLY	TEST
	65	AUDIO SOURCE SELECT	AUSS	>>	65	AUDIO SOURCE TALLY	AUST
	66	CHANNEL MUTE SELECT	CMUS	>>	66	CHANNEL MUTE TALLY	CMUT
	67	SUBTITLE SELECT	SUBS	>>	67	SUBTITLE TALLY	SUBT
	68	not used			68	TIMECODE TO FILM	TTFI
	69	FRAMING CONTROL	FRAC		69	reserved	
	6A	not used			6A	USERBITS TO FILM	UBFI
	6B	not used			6B	reserved	
	6C	not used			6C	PRESETTABLE TIME SRC	PTSR
	6D	not used			6D	reserved	
	6E	not used			6E	PRESETTABLE UB SRC	PUSR
	6F	not used			6F	reserved	
	70	MONOCHROME SELECT	MONS	>>	70	MONOCHROME TALLY	MONT
	71	NEGATIVE SELECT	NEGS	>>	71	NEGATIVE TALLY	NEGT
	72	B/STRETCH/COMPR SEL	BSCS	>>	72	B/STRETCH/COMPR TLY	BSCT
	73	GRAIN REDUCTION SEL	GRES	>>	73	GRAIN REDUCTION TLY	GRET
	74	GAIN SELECT	GAIS	>>	74	GAIN TALLY	GAIT
	75	SATURATION STEP SEL	SASS	>>	75	SATURATION STEP TLY	SAST
	76	FILM FORMAT SELECT	FIFS	>>	76	FILM FORMAT TALLY	FIFT
	77	AUDIO NR SELECT	ANRS	>>	77	AUDIO NR TALLY	ANRT
	78	FPN ALIGNMENT	FPNA		78	MATRIX	MTRX
	79	SHIFT SOUND FOLLOWER	SHSF		79	MASKING	MSKG
	7A	LOCAL LOCKOUT SEL	LLOS	>>	7A	LOCAL LOCKOUT TALLY	LLOT
	7B	not used			7B	TIMECODE ATTRIBUTES	TCAT
	7C	TEST PATTERN SWITCH	TEPA		7C	LOOP RANGE	LORA
	7D	REF FRAME SELECT	REFS	>>	7D	REF FRAME TALLY	REFT
	7E	VIDEO STANDARD SEL	VISS	>>	7E	VIDEO STANDARD TLY	VIST
	7F	ON AIR SELECT	ONAS	>>	7F	ON AIR TALLY	ONAT

80	NORMALIZE I/F	NORI	80	NORIMLALIZED FIELDS	NORF
81	AUTO CONTROL I/F	AUTI	81	AUTO CONTR'D FIELDS	AUTF
82	CHANGE I/F	CHAI	82	FOCUS ACTUAL	FOCA
83	not used		83	FOCUS TARGET	FOCT
84	not used		84	FRAMING ACTUAL	FRAA
85	not used		85	FRAMING TARGET	FRAT
86	not used		86	AUDIO OUT LEVEL ACT	AOLA
87	not used		87	AUDIO OUT LEVEL TAR	AOLT
88	not used		88	SCANNING WIDTH ACT	RWIA
89	not used		89	SCANNING WIDTH TARG	RWIT
8A	not used		8A	SCANNING HEIGHT ACT	RHEA
811	not used		8B	SCANNING HEIGHT TAR	RHET
8C	not used		8C	SCANNING H POS ACT	RHPA
8D	not used		8D	SCANNING H POS TARG	RHPT
8E	not used		8E	SCANNING V POS ACT	RVPA
8F	not used		8F	SCANNING V POS TARG	RVPT
90	TRANSITION IMM	TIMM	90	REPROD WIDTH ACT	RWIA
91	TRANSITION CONT	TCON	91	REPROD WIDTH TARG	RWIT
92	TRANSITION LINEAR	TLIN	92	REPROD HEIGHT ACT	RHEA
93	TRANSITION POS/LOG	TPOL	93	REPROD HEIGHT TARG	RHET
94	TRANSITION S-CURVE	TSCU	94	REPROD H POS ACT	R11PA
95	TRANSITION USER-DEF	TUSD	95	REPROD H POS TARG	RHPT
96	not used		96	REPROD V POS ACT	RVPA
97	not used		97	REPROD V POS TARG	RVPT
98	CANCEL TRANSITION	TCAN	98	SCANNING ROTAT ACT	RROA
99	not used		99	SCANNING ROTAT TARG	RROT
9A	not used		9A	not used	
9B	not used		9B	not used	
9C	not used		9C	not used	
9D	not used		9D	not used	
9E	not used		9E	not used	
9F	not used		9F	not used	
A0	not used		A0	MASTER LIFT ACTUAL	MLIA
A1	not used		A1	MASTER LIFT TARGET	MLIT
A2	not used		A2	LUM LIFT ACTUAL	LLIA
A3	not used		A3	LUM LIFT TARGET	LLIT
A4	not used		A4	R-Y LIFT ACTUAL	RLIA
A5	not used		A5	R-Y LIFT TARGET	RLIT
A6	not used		A6	B-Y LIFT ACTUAL	BLIA
A7	not used		A7	B-Y LIFT TARGET	BLIT
A8	not used		A8	MASTER GAMMA ACTUAL	MGAA
A9	not used		A9	MASTER GAMMA TARGET	MGAT
AA	not used		AA	LUM GAMMA ACTUAL	LGAA
AB	not used		AB	LUM GAMMA TARGET	LGAT
AC	not used,.		AC	R-Y GAMMA ACTUAL	RGAA
AD	not used		AD	R-Y GAMMA TARGET	RGAT
AE	not used		AE	B-Y GAMMA ACTUAL	BGAA
AF	not used		AF	B-Y GAMMA TARGET	BGAT
B0	not used		B0	MASTER GAIN ACTUAL	MGNA
B1	not used		B1	MASTER GAIN TARGET	MGNT
B2	not used		B2	LUM GAIN ACTUAL	LGNA
B3	not used		B3	LUM GAIN TARGET	LGNT
B4	not used		B4	R-Y GAIN ACTUAL	RGNA
B5	not used		B5	R-Y GAIN TARGET	RGNT
B6	not used		B6	B-Y GAIN ACTUAL	BGNA
B7	not used		B7	B-Y GAIN TARGET	BGNT

B8	not used	
B9	not used	
BA	not used	
BB	not used	
BC	not used	
BD	not used	
BE	not used	
BF	not used	
C0	not used	
C1	not used	
C2	not used	
C3	not used	
C4	not used	
C5	not used	
C6	not used	
C7	not used	
C8	not used	
C9	not used	
CA	not used	
CB	not used	
CC	not used	
CD	not used	
CE	not used	
CF	not used	
D0	not used	
D1	not used	
D2	not used	
D3	not used	
D4	not used	
D5	not used	
D6	not used	
D7	not used	
D8	not used	
D9	not used	
DA	not used	
DB	not used	
DC	not used	
DD	not used	
DE	not used	
DF	not used	
E0	not used	
El	not used	
E2	not used	
E3	not used	
E4	not used	
E5	not used	
E6	not used	
E7	not used	
E8	not used	
E9	not used	
EA	not used	
EB	not used	
EC	not used	
ED	not used	
EE	not used	
EF	not used	

B8	not used	
B9	not used	
BA	not used	
BB	not used	
BC	not used	
BD	not used	
BE	not used	
BF	not used	
C0	not used	
C1	not used	
C2	RED LUM ACTUAL	RLUA
C3	RED LUM TARGET	RLUT
C4	GREEN LUM ACTUAL	GLUA
C5	GREEN LUM TARGET	GLUT
C6	BLUE LUM ACTUAL	BLUA
C7	BLUE LUM TARGET	BLUT
C8	MAGENTA LUM ACTUAL	MLUA
C9	MAGENTA LUM TARGET	MLUT
CA	CYAN LUM ACTUAL	CLUA
CB	CYAN LUM TARGET	CLUT
CC	YELLOW LUM ACTUAL	YLUA
CD	YELLOW LUM TARGET	YLUT
CE	not used	
CF	not used	
D0	SATURATION ACTUAL	SATA
D1	SATURATION TARGET	SATT
D2	RED SAT ACTUAL	RSAA
D3	RED SAT TARGET	RSAT
D4	GREEN SAT ACTUAL	GSAA
D5	GREEN SAT TARGET	GSAT
D6	BLUE SAT ACTUAL	BSAA
D7	BLUE SAT TARGET	BSAT
D8	MAGENTA SAT ACTUAL	MSAA
D9	MAGENTA SAT TARGET	MSAT
DA	CYAN SAT ACTUAL	CSAA
DB	CYAN SAT TARGET	CSAT
DC	YELLOW SAT ACTUAL	YSAA
DD	YELLOW SAT TARGET	YSAT
DE	DARK SAT ACTUAL	DSAA
DF	DARK SAT TARGET	DSAT
E0	not used	
E1	not used	
E2	RED HUE ACTUAL	RHUA
E3	RED HUE TARGET	RHUT
E4	GREEN HUE ACTUAL	GHUA
E5	GREEN HUE TARGET	GHUT
E6	BLUE HUE ACTUAL	BHUA
E7	BLUE HUE TARGET	BHUT
E8	MAGENTA HUE ACTUAL	MHUA
E9	MAGENTA HUE TARGET	MHUT
EA	CYAN HUE ACTUAL	CHUA
EB	CYAN HUE TARGET	CHUT
EC	YELLOW HUE ACTUAL	YHUA
ED	YELLOW HUE TARGET	YHUT
EE	not used	
EF	not used	

F0	not used	F0	H CORR IN/BAND ACT	HINA
F1	not used	Fl	H CORR INIBAND TARG	HINT
F2	not used	F2	H CORR OUT/BAND ACT	HOUA
F3	not used	F3	H CORR OUTIBAND TARG	HOUT,
F4	not used	F4	H CORING ACTUAL	HCOA
F5	not used	F5	H CORING TARGET	HCOT
F6	not used	F6	V CORR INIBAND ACT	VI?4*
F7	not used	F7	V CORR IN/BAND TARG	VINT
F8	not used	F8	V CORR OUT/BAND ACT	VOUA
F9	not used	F9	V CORR OUT/BAND TARG	VOUT
FA	not used	FA	V CORING ACTUAL	VCOA
FB	not used	FB	V CORING TARGET	YCOT
FC	not used	FC	not used	
FD	not used	FD	not used	
FE	not used	FE	not used	
FF	EXTENSION	FF	EXTENSION	

EXTENSION SET

00	not used	00	not used	
01	not used	01	not used	
02	not used	02	NEG RED LIFT ACTUAL	NRLA
03	not used	03	NEG RED LIFT TARGET	NRLT
04	not used	04	NEG GRN LIFT ACTUAL	NGLA
05	not used	05	NEG GRN LIFT TARGET	NGLT
06	not used	06	NEG BLU LIFT ACTUAL	NBLA
07	not used	07	NEG BLU LIFT TARGET	NBLT
08	not used	08	NEG RED GAIN ACTUAL	NRGA
09	not used	09	NEG RED GAIN TARGET	NRGT
OA	not used	OA	NEG GRN GAIN ACTUAL	NGGA
OB	not used	OB	NEG GRN GAIN TARGET	NGGT
OC	not used	OC	NEG BLU GAIN ACTUAL	NBGA
OD	not used	OD	NEG BLU GAIN TARGET	NBGT
OE	not used	OE	not used	
OF	not used	OF	REF FRAME WIPE	REFW

2. Keywords

40 not used

41 STOP (TMS command)
causes the controlled TK to stop as soon as possible; indeterminate picture.

Format: <STOP>

42 VARIABLE PLAY (TMS command)
causes the controlled TK to enter continuously variable playwith specified direction and speed

Format: <VARIABLE PLAY>
<SPEED> 3-byte signed binary number; 2's complement

scale:
000000h = stationary
010000h = FIXED SPEED, forward direction
7F0000h = approximately 127 times FIXED SPEED, forward direction
FF0000h = FIXED SPEED, reverse direction
800000b. = 128 times FIXED SPEED, reverse direction

Note: FIXED SPEED is the value of the ~ defined in the FIXED SPEED I1F

43 FIXED PLAY (TMS command)
causes the controlled TK to enter playback at the speed determined by the value in the FIXEDSPEED TALLY I/F.

Format: <FIXED PLAY>

44 STEP (TMS command)
causes the controlled TK to move the film a specified number of frames forward or backward, with respect to its current position; this command is applicable only in the following Tape Motion States: STOP, STEP, VISIBLE FAST (stationary) or VARIABLE PLAY (stationary). Successive commands are cumulative until the next TMS (other than STEP).
Format: <STEP>
<NUMBER OF FRAMES> 1-byte signed number;
range: - 128 to + 127

45 VISIBLE FAST (TMS command)
causes the controlled TK to enter fast film motion with visible but not necessarily broadcastable picture, with specified direction and speed.
Format: <VISIBLE FAST>
< SPEED > 3-byte signed binary number;
same format as in VARIABLE PLAY

46 SHUTTLE (TMS command)
causes the controlled TK to travel at specified direction and speed without necessarily reproducing picture or sound.
Format: <SHUTTLIl>
<SPEED> 3-byte signed binary number;
same format as in VARIABLE PLAY

47 PLAY SPEED OVERRIDE (TMS command)
causes the controlled TK to override instantaneous play speed for synchronising purposes.
Format: <PLAY SPEED OVERRIDE>
<SPEED> 3-byte signed binary number;
same format as in VARIABLE PLAY

48 READY SELECT
establishes the TK in a state to minimize start-up time.

Format: <READY SELECT>
<SWITCH> boolean value:
00h = OFF
01h - READY

49 SERVO REFERENCE SELECT
selects the input switch for video reference source.

Format: <SERVO REFERENCE SELECT>
<MODIl> 1-byte special binary code:
00h = auto select
01h = external video input
02h = external reference input
FFh = as selected locally

4A FREEZE SELECT
cause the controlled TK to provide a frozen broadcastable picture.

Format: <FREEZE SELECT>
<SWITCH> boolean value:
00h = OFF
01h frozen

48 WETGATE SELECT
selects wetgate mode.

Format: <WETGATE, SELECT>
<MODE 1-byte special binary code:
00h = OFF
01h = dry
02h = wet
FFh = as selected locally

4C AREA MARKER SWITCH
switches markers on/off.

Format: <AREA MARKER SWITCH>
<SWITCH> boolean value:
00h = OFF
01h = ON

4D FILM CODE SELECT
selects the type of code for all succeeding messages that refer to FILM CODE.

Note: As TIMECODE FROM FILM, FRAME COUNTER 1 and 2 are also contained in an item of the TK-specific INFORMATION FLELD, they may be accessed by a READ command at any time, even if not selected as F7LM CODE by the command FILM CODE SELECT

Format: <FILM CODE SELECT>
<CODE TYPE> 1-byte special binary code:
01h = TIMECODE FROM FILM
02h = FRAMECOUNTER 1
03h = FRAMECOUNTER 2
FFh = as selected locally

4E TARGET SEARCH UMP command)
causes the controlled TK to move to a defined filmm position m accordance with the SELECTED FILM CODE.
Format: <TARGET SEARCH>
<FILM CODE> (type TIME; frame referenced)

Note: The type of SELECTED FILM CODE *is selected by the command FILM* CODE *SELECT.*

4F PREROLL SEARCH (TMP command)
causes the controlled TK to move to a film position (reference the SELECTED FILM CODE) in advance of the SYNC POINT determined by PREROLL DURATION and SYNC VELOCITY.

Note: PREROLL DURA TION, SYNC POINT and SYNC VELOCITY are part of the TK-specific INFORMA TION FIELD.
Format: <PREROLL, SEARCH>

50 SYNC (TMP command)
causes the controlled TK to start and synchronize so that PREROLL DURATION later, the film will be at the SYNC POINT and travelling at the SYNC VELOCITY.

Notes: 1. SYNC POINT and SYNC VELOCITY are part of the TK-specific INFORMATION FIELD, and must be predefined by a PRESET command before execution.
2. The film must be positioned and tallied previously by a PREROLL SEARCH command.
3. If the SYNC VELOCITY is FIXED SPEED, the Tape Motion State reverts to FIXED PLAY after the TK has attained sync.
Format: < SYNC >

51 SYNC SHIFT
advances/retards the film phase by the specified number of frames, while in FIXED PLAY or in SYNC.
Format: <SYNC SHIFT>
<NUMBER OF FRAMES> 1-byte signed number;
range 128 to + 127

52 GATE BLAST
operates air blast in film gate.
Format: <GATE BLAST>

53 DIRT CONCEAL SELECT
switches dirt concealment.
Format: <DIRT CONCEAL SELECT>
<MODE> 1-byte binary number:
00h = OFF
FEh = maximum concealment
FFh = as selected locally

54 TCG TIME SOURCE SELECT
selects the time source for the time code generator of the controlled TK.
Format: <TCG TIME SOURCE SELECT>
<TIME SOURCE> 1-byte special binary code:
00h = hold
01h = run independently, starting with the value contained in I/F PRESETTABLE TIME SOURCE
02h = run with external, unspecified source
05h = run with SELECTED FILM CODE as source(contained in I/F SELECTED FILM CODE)

55 reserved

56 TCG USERBIT SOURCE SELECT
selects the userbit source for the time code generator of the controlled device.
Format: <TCG USERBIT SOURCE SELECT>
<USERBIT SOURCE> 1-byte special binary code:
00h = no userbits; i.e. all set to zero
011 = userbits from I/F PRESETTABLE USERBIT SOURCE, which may be presd by a PRESET command
02h = userbits from external, unspecified source

57 reserved

58 reserved

59 FIXED SPEED SELECT
causes the controlled device to select the nominal play speed.
Format: <FIXED SPEED SELECT>
<SPEED> 1-byte special binary code:
10h = 6 frames/sec
20h = 6 1/4 frames/sec
30h = 12 frames/sec
40h = 12 1/2 frames/sec
50h = 16 2/3 frames/sec
60h = 17 1/7 frames/sec
70h = 18 frames/sec
80h = 24 frames/sec
90h = 25 frames/sec
A0h = 30 frames/sec
B0h = 48 frames/sec
C0h = 50 frames/sec
D0h = 60 fraffies/sec

5A FIXED PLAY REVERSE (TMS command)
causes the controlled TK to enter reverse playback at the nominal speed determined by the value in the FIXED SPEED TALLY I/F.
Format: <FIXED PLAY REVERSE>

5B not used

5C ROCK (TMS command)
causes the-controlled TK to enter the "rock mode".
Format : <ROCK>

5D EMULSION IN/OUT SELECT
moves objective lens to predetermined position, according to the emulsion side of the film.
Format: <EMULSION IN/OUT SELECT>
<MODE> 1-byte special binary code:
00h = emulsion in
01h = emulsion out
FFh = as selected locally

5E SEQUENCE SELECT
defines in-phase-locked servo start.
Format: <SEQUENCE SELECT>
<MODE> 1-byte special binary code:
00h = 2 field start
01h = 4 field start
02h = 8 field start (PAL only)

5F LAMP SELECT
controls the lamp power.
Format: <LAMP SELECT>
<MODE> 1-byte special binary code:
00h = off
01h = reduced power
02h = full power
FFh = as selected locally.

The following command is used to preset items whose contents are represented in an Information Field:

60 PRESET
presets the named Information Field to the given value.
Format: <PRESET>
<PERMITTED INFORMATION FIELD NAME>
<VALUE> format and coding defined by the I/F NAME
(see Section 3: Information Fields)
Permitted Information Field names or TKs are:

FRAMECOUNTER 1
FRAMECOUNTER 2
SYNC VELOCITY
PREROLL DURATION
SYNC POINT
SYNCHRONISM ACCURACY
FIELD DOMINANCE
PRESETTABLE TIME SOURCE
PRESETTABLE UB SOURCE
MATRIX
MASKING
TIMECODE ATTRIBUTES
LOOP RANGE

Plus all I/Fs used for analogue magnitudes
(named as ... ACTUAL and ... TARGET respectively)

61 FREEZE START (TMP command)
causes the controlled TK to output a frozen picture of the instantaneous film position and to park PREROLL DURATION in advance of this point, pending a FIXED PLAY or VARIABLE PLAY command in order to start the film motion and to take over from the frozen to the moving picture without disturbances.
Format: <FREEZE START>

62 not used

63 not used

64 TELECINE SOURCE SELECT
selects the telecine change-over in case of integrated multiplexing.
Format: <TELECINE SOURCE SELECT>
<MODE> 1-byte special binary code:
meaning of left nibble:
lxh = video of telecine 1
2xh = video of telecine 2
meaning of right nibble:
xlh = audio of telecine 1
x2h = audio of telecine 2

65 AUDIO SOURCE SELECT
selects the available audio channels

Format: <AUDIO SOURCE SELECT>
<CHANNEL 1 > 1-byte special binary code:
01h = magnetic sound head(s)
02h = optical sound head(s)
03h = mag & opt sound heads mixed
04h = separate sound 1 from sound follower
05h = separate sound 2 from sound follower
06h = test tone
FFh = as selected locally

<CHANNEL 2> 1-byte special binary code:
01h = magnetic sound head(s)
02h = optical sound head(s)
03h = mag & opt sound heads mixed
04h = separate sound 1 from sound follower
05h = separate sound 2 from sound follower
06h = test tone
FFh = as selected locally

66 CHANNEL MUTE SELECT
selects auto mute function.
Format: <CHANNEL MUTE SELECT>
<SWITCH> 1-byte boolean value:
00h = OFF
01h = ON

67 SUBTITLE SELECT
switches the caption blanking on/off.

Format: <SUBTITLE SELECT>
<SWITCH> 1-byte boolean value:
00h = OFF
01h = ON

68 not used

69 FRAMING CONTROL
controls shifts in the framing in perforation steps.

Format: <FRAMING CONTROL>
<MODE> 1-byte signed binary number specifying direction and number of the steps.

Note: Fine adjustment of framing is controlled by the 1/F FRAMING ACTUAL.

6A not used

6B not used

6C not used

6D not used

6E not used

6F not used

70 MONOCHROME SELECT
switches to monochrome.
Format: <MONOCHROME SELECT>
<SWITC1l> 1-byte special binary code:
00h = colour
01h = standard black and white monochrome
02h = adjustable monochrome
FFh = as selected locally

Note: When "adjustable monochrome - is selected, the output picture colour may be adjusted.

71 NEGATIVE SELECT
switches to negative scanning.
Format: <NEGATIVE SELECT>
<SWITCH> 1-byte special binary code:
00h = positive
01h = intermediate positive
02h = black and white negative
03h = colour negative
FFh = as selected locally

72 BLACK STRETCH/COMPRESSION SELECT
selects and controls the black stretch and compression functions.
Format: <BLACK STRETCH/COMPRESSION SELECT>
<MODE> 1-byte special binary code:
00h = linear
01h = stretch function 1
02h = stretch function 2
03h = compression function 1
04h = compression function 2
05h = user defined function 1
06h = user defined function 2
FFh = as selected locally

73 GRAIN REDUCTION SELECT
selects and controls the film grain reducer.
Format: <GRAIN REDUCTION SELECT>
<MODE> 1-byte special binary code:
00h = switched off
11h = automatic
meaning of right nibble:
x2h = grain size 1 (fine)
x4h = grain size 2
x6h = grain size 3
x8h = grain size 4 (coarse)

meaning of left nibble:
3xh = reduction by 3 dB
5xh = reduction by 5 dB
7xh = reduction by 7 dB
Axh = reduction by 10 dB
FFh = as selected locally

74 GAIN SELECT
switches the gain control.
Format: <GAIN SELECT>
<GAIN> 1-byte binary number:
00h = 0 dB
06h = 6 dB
0Ah = 10 dB etc.
<MODE> 1-byte special binary code:
00h = AGC off
01h = AGC fast
02h = AGC delayed
FFh = as locally selected

75 SATURATION STEP SELECT
selects the colour saturation.

Format: <SATURATION STEP SELECT>
<MODE> 1-byte special binary code:
00h = OFF
01h = 0.75 75 % colour saturation
02h = 1.00 100 % colour saturation
03h = 1.25 125 % colour saturation
04h = 1,50 150 % colour saturation
FFh = as locally selected

Note: The saturation magnitude selected by this command is the base to which the adjustment controlled by the I/1F SATURATION ACTUAL is added.

76 FILM FORMAT SELECT
selects the film format.
Format: <FILM FORMAT SELECT>
< MODE > 1-byte special binary code:

01h = Super 8
02h = Super 16
03h = 16 mm
04h = Super 35
05h = 35 mm, 2 perforations
06h = 35 mm, 3 perforations
07h = 35 ram, 4 perforations
08h = 2-position slide gate
09h = 16-position slide gate
FFh = as selected locally

Note: Remote-controlled transitions between some of the choices are obviously not possible.

77 AUDIO NR SELECT
controls the none reduction System.

Format: <AUDIO NR SELECT>
<MODE> 1-byte s~ binary code:
00h = NR off
01h = NR stereo
02h = NR mono
FFh = as selected locally

78 FPN ALIGNMENT
activates the fixed pattern noise alignment.

Format: <FPN ALIGNMENT>

79 SHIFT SOUND FOLLOWER
advances/retards the phase of a sound follower attached to the telecine by the specified number of frames relative to the film, while the telecine is in FIXED PLAY or in SYNC.
Format: <SHIFT SOUND FOLLOWER>
<NUMBER OF FRAMES> 1-byte signed number

7A LOCAL LOCKOUT SELECT
causes the controlled device to disable all local control.

Format: <LOCAL LOCKOUT SELECT>
<SWITCH> boolean value:
00h = local control not disabled
01h = local control disabled

7B not used

7C TEST PATTERN SWITCH
controls the built-in test pattern generator on/off.

Format: <TEST PATTERN SWITCH>
<MODE> 1-byte special binary code:
00h OFF
01h staircase
02h sawtooth
03h - colour bar
XXh - pattern no. XX (user defined)
FFh = as selected locally

7D REFERENCE FRAME SELECT
selects source and mode of reference frames.

Format: <REFERENCE FRAME SELECT>
<SOURCE> 1-byte special binary code:
meaning of right nibble:
x0h = normal
x1h = internal source
x2h = external source
meaning of left nibble:
0xh = normal
lxh = instantaneous grab
2xh = continuous grab
FFh = as selected locally

<DISPLAY> 1-byte special binary code:
00h = off
01h = on
FFh = as seleced locally

7E VIDEO STANDARD SELECT
determines the video standard used.
Format: <VIDEO STANDARD SELw r>
< SWITCH > 1-byte special binary code:
00h = 525 lines/60Hz
01h = 625 lines/50Hz
xxh = user defined
FFh = as selected locally

7F ON AIR SELECT
determines the on-air condition, if required.
Format: <ON AIR SELECT>
<SWITCH> 1-byte special binary code:
00h = on air off
01h = on air on
FFh = as selected locally

The following commands may be applied to Information Fields that represent analogue magnitudes only. These are the Information Fields with codes from 80h to FEh. It is indicated below whether the command can address ACTUAL or TARGET type of fields or both.

80 NORMALIZE I/F
causes the addressed Information Field to assume its standard value.

Addressed to a TARGET I/F, only the TARGET I/F assumes the standard value, while the corresponding ACTUAL I/F and the analogue magnitude remain unchanged.

Addressed to an ACTUAL I/F, the analogue magnitude that is associated with this Information Field assumes the standard value immediately, and the ACTUAL I/F will reflect this value from now, while the content of the corresponding TARGET I/F will remain unchanged.
Format: <NORMALIZE I/F>
<PERMITTED I/F NAME>

Notes: 1. Permitted Information Fields are all ACTUAL and TARGET
2. Several I1F names may be wrapped in a BEGINIEND construct.

81 AUTO CONTROL I/F
switches the automatic control of the addressed 1/17, where applicable.

Addressed to a TARGET I/F, only the TARGET I/F assumes the automatically generated values, while the corresponding ACTUAL I/F and the analogue magnitude remain unchanged.

Addressed to an ACTUAL I/F, the analogue magnitude is controlled directly from now, and the ACTUAL I/F will reflect the instantaneous value, while the content of the corresponding TARGET I/F will remain unchanged.
Format: <AUTO CONTROL I/F>
<SWITCH I/F> 1-byte boolean value:
00h = auto control off
01h = auto control on
<PERMITTED I/F NAME>

Notes: 1 permitted Information fields are all ACTUAL and TARGET Fields.
2. Several I/F names may be wrapped in a BEGIN/END construct.
3. Default condition for all permitted I/Fs is "auto control off".
4. When switched off the last I/F content will be maintained until another command affects the field.
5. This command applied to a TARGET I/F and combined with an appropriate TRANSITION command allows a smooth transition from normal mode to auto mode (if applicable)o

82 CHANGE I/F

controls a continuous change of the contents of an Information Field.

Format: <CHANGE I/F>
<SPEED> 2-byte signed binary number:
scale: 0000h = off (no change) Ah
0001h = 1 bit/sec increasing
FFFFh= 1 bit/sec decreasing
<PERMITTED I/F NAME>

Notes: 1. Permitted Information Belds are all ACTUAL F7elds.
2. Several JIF names may be wrapped in a BEGINIEND construct.

not used

84 not used

86 not used

87 not used

88 not used

89 not used

8A not used

8B not used

8C not used

8D not used

8E not used

8F not used

90 TRANSITION IMMEDIATE

causes the contents of the addressed TARGET I/F to be transferred immediately to the corresponding ACTUAL I/F, thus causing the analogue magnitude as~ed with this I/F also to assume this value.

Format: <TRANSITION IMMEDIATE>
<PERMITTED I/F NAME>

Notes: 1. Permitted Information F7elds are all TARGET fyelds.
2. Several Ilf nam5 ma be d in a BEGINIEND construct.

91 TRANSITION CONTINUOUS

causes the contents of the addressed TARGET I/F to be transferred continuously to the corresponding ACTUAL I/F, thus causing the analogue magnitude associated with this I/F also to assume this value.

Format: <TRANSITION CONTINUOUS>
<PERMITTED I/F NAME>

Notes: 1. Permitted Information Fields are all TARGET fields.
2. Several I/F names may be wrapped in a BEGIN/END construct.
3. The continuous status entered by this command will be ceased upon the arrival of any other TRANS177ON 11F command or the CANCEL TRANSITION command.

92 TRANSITION LINEAR

causes the analogue magnitude associated with the addressed Information Field to execute a linear transition from its instantaneous value, which is also reflected in the associated ACTUAL I/F, to the value contained in the corresponding TARGET I/F, using the specified duration.

Format: <TRANSITION LINEAR>
<DURATION> 2-byte binary number; specifies the transition duration in units of frames
<PERMITTED I/F NAME>

Notes: 1. Permitted Information Fields are all TARGET Fields.
2 Several I/F names may be wrapped in a BEGIN/END construct.

93 TRANSITION POS-LOG

causes the analogue magnitude associated with the addressed Information Field to execute a positive-logarithmic transition from its instantaneous value, which is also reflected in the associated ACTUAL I/F, to the value contained in the corresponding TARGET I/F, using the specified duration.

Format: <TRANSITION POS-LOG>

<DURATION> 2-byte binary number;
specifies the transition duration in units of frames

<PERMITTED I/F NAME>

Notes: 1. Permitted Information Fields are all TARGET Fields.
2. Several I1F names may be wrapped in a BEGINIEND construct.

94 TRANSITION S-CURVE

causes. the analogue magnitude associated with the addressed Information Field to execute an S-curve transition from its instantaneous value, which is also reflected in the associated ACTUAL I/F, to the value contained in the corresponding TARGET I/F, using the specified duration.

Format: <TRANSITION S-URVE>

<DURATION> 2-byte binary number;
specifies the transition duration in units of frames

<PERMITTED I/F NAME>

Notes.. 1. Permitted Information Fields are all TARGET Fields.
2. Several I/F names may be wrapped in a BEGINIEND construct.

95 TRANSITION USER-DEFINED
causes the analogue magnitude associated with the addressed Information Field to execute a user-defined transition from its instantaneous value, which is also reflected in the associated ACTUAL I/F, to the value contained in the corresponding TARGET II/, using the specified duration.

Format: <TRANSITION USER-DEFINED>
<DURATION> 2-byte binary number;
specifies the transition duration in units of frames
<PERMITTED I/F NAME>

Notes: 1. Permitted Information Fields are all TARGET Fields.
2. Several I/F names may be wrapped in a BEGIN/END construct.

96 not used

97 not used

98 CANCEL TRANSITION
ceases transitions still in progress with the specified I/F(s).
Format: <CANCEL TRANSITION>
<PERMITTED I/F NAME>
Notes: 1. Permitted Information Fields are all TARGET Fields.
2. Several I1F names may be wrapped in a BEGINIEND construct.

3. Information fields

Notes

1. The item of the INFORMATION FIELD are accessed *by the Common* messages:
READ, UPDATE, CYCLE or SIMULTANEOUS READ

and are tallied by the Common messages:

I/F ITEM RESPONCE or SIMULTANEOUS READ RESPONSE.

These commands use the format::

<KEYWORD> <PARAMETER NAME>

and

<KEYWORD> <PARAMETER NAME> <PARAMETER VALUE>

where

- the *PARAMETER NAME* uses the Information Field Name specified *below,*
- *the PARAMETER VALUE* carries the Information *Field* contents specified below.

Several names/values may be grouped together *by* means *of* a *BEGIN/END* construct.

2. At power-up *the content of* Information Fields is not specified, but it is recommended that Information F1elds which are associated with analogue magnitudes assume 'standard' values.

40 not used

41 TIMECODE FROM FILM
contain any kind of longitudinal timecode coded on the film.
Format: <TIMECODE FROM FILM>
<CODE VALIDITY> 1-byte special binary code:

00h = valid LTc
01h = derived LTC
FFh = not valid LTC

<TIME VALUE> standard "time" format

42 not used

43 SELECTED FILM CODE
contains the time value of the code (TIMECODE FROM FILM, FRAMECOUNTER 1, FRAMECOUNTER 2), which has been most recently selected by the FILM CODE SELECT command.

Format: <SELECTED FILM CODE>
<IDENTIFIER> 1-byte special binary code:
00h = TIMECODE FROM FILM
02h = FRAMECOUNTER 1
03h = FRAMECOUNTER 2
FFh = invalid
<TIME VALUE> standard "time" format

44 USERBITS FROM FILM
contains the userbit contents most recently read from flim.
Format: <USERBITS FROM FILM>
<UB SPECIFICATION> 1-byte special code:
bits 0, 1
0,0 = content of userbits unspecified
1,0 = content of userbits is eight-bit character set conforming to ISO 646 and ISO 2022
0,1 = unassigned
1,1 = unassigned
bit 2
0 = = unassigned
1 = = content of userbits is secondary time data in standard time format
bits 3-7
0 = set to 0 until assigned
<UB GROUP 8/UB GROUP 7> 4 bytes, each consisting
<UB GROUP 6/UB GROUP 5> of two 4-bit nibbles,
<UB GROUP 4/UB GROUP 3> each containing
<UB GROUP 2/UB GROUP 1> one UB group
(MSNibble)
Note: UB 1 is the UB group which comes first on the film.

45 not used

46 FRAMECOUNTER 1
contains the instantaneous counting status of the framecounter 1.
Format: <FRAMECOUNTER 1 >
<TIME VALUE> standard "time" format

47 FRAMECOUNTER 2
contains the instantaneous counting status of the framecounter 2.

Format: <FRAMECOUNTER 2>
<TIME VALUE> standard "time" format

48 READY TALLY
tallies the status set by the READY SELECT command.

Format: <READY TALLY>
<SWITC1l> boolean value:
00h = OFF
01h = ON

49 SERVO REFERENCE TALLY
tallies the status set by the SERVO REFERENCE SELECT command.

Format: <SERVO REFERENCE TALLY>
<MODE> 1-byte special binary code:
00h = auto select
01h = external video input
02h = external reference input

4A FREEZE TALLY
tallies the status set by the FREEZE SELECT command.

Format: <FREEZE TALLY>
<SWITCH> boolean value:
00h = OFF (= default)
01h = frozen

4B WETGATE TALLY
tallies the status set by the WETGATE SELECT command.

Format: <WETGATE TALLY>
<MODE> 1-byte special binary code:
00h = OFF default)
01h = dry
02h = wet

4C not used

4D FILM CODE TALLY
tallies the code currently selected by the most recent FILM CODE SELECT command.

Format: <FILM CODE TALLY>
<CODE TYPE> 1-byte special binary code:
00h = TIMECODE FROM FILM
02h = FRAMECOUNTER 1
03h = FRAMECOUNTER 2

4E SYNC VELOCITY
contains a velocity used as the synchronization velocity for the SYNC command.

Format: <SYNC VELOCITY>
<SPEED> 3-byte signed binary number; 2's complement

000000h = stationary
010000h = FIXED SPEED, forward direction
7F0000h = approximately 127 times FIXED SPEED, forward direction
FF0000h = FIXED SPEED, reverse direction
800000h = 128 times FIXED SPEED, reverse direction

Notes: 1 FIXED SPEED is the value of the speed defined in the FIXED SPEED I/F.
2. This is the same coding as in the argument of the VARLABLE PLAY command.

4F PREROLL DURATION
contains the preroll time used in advance of sychronizing processes.

Format: <PREROLL DURATION>
<TIME VALUE> standard "time" format

50 SYNC POINT
contains a FILM CODE value used as the synchronization point for the SYNC command.

Format: <SYNC POINT>
< TIME VALUE > standard time format

not used

52 not used

53 DIRT CONCEAL TALLY
tallies the status set by the DIRT CONCEAL SELECT command.
Format: <DIRT CONCEAL TALLY>
<MODE> 1-byte binary number:
00h = OFF (= default)
FEh = maximum concealment

54 TCG TIME SOURCE TALLY
tallies the status set by the TCG TIME SOURCE SELECT command.

Format: <TCG TIME SOURCE TALLY>
<TIME SOURCE> 1-byte special binary code:
00h = hold
01h = run independently, starting with the value contained in I/F PRESETTABLE TIME SOURCE LTC
02h = run with external, unspecified source
05h = run with FILM CODE as source (contained in I/F TIMECODE FROM FILM)

55 reserved

56 TCG USERBIT SOURCE TALLY
tallies the status set by the TCG USERBIT SOURCE SELECT command.

Format: <TCG USERBIT SOURCE TALLY>
<USERBIT SOURCE> 1-byte special binary code:
00h = no userbits; i.e. all set to zerodefault)
01h = userbits from I/F PRESETTABLE USERBIT SOURCE, which may be pre-set by a PRESET command
02h = userbits from external, unspecified source

57 reserved

58 not used

59 FIXED SPEED TALLY
tallies the status set by the FIXED SPEED SELECT command.
Format: <FIXED SPEED TALLY>
<SPEED> 1-byte special binary co&:
10h = 6 frames/sec
20h = 6 1/4 frames/sec
30h = 12 frames/sec
40h = 12 1/2 frames/sec
50h = 16 2/3 frames/sec
60h = 17 1/7 frames/sec
70h = 18 frames/sec
80h = 24 frames/sec
90h = 25 frames/sec
A0h = 30 frames/sec
B0h = 48 frames/sec
C0h = 50 frames/sec
D0h = 60 frames/sec

5A not used

5B reserved

5C SYNCHRONISM ACCURACY
contains a time value that determines the accuracy of synchronizing processes, i.e. it specifies the maximum allowed offset error at the SYNC POINT.
Format: <SYNCHRONISM ACCURACY>
<FIELDS> 1-byte unsigned number

5D EMULSION IN/OUT TALLY
tallies the status set by the EMULSION IN/OUT SELECT command.
Format: <EMULSION IN/OUT TALLY>
<MODE> 1-byte special binary code:
00h = emulsion in
01h. = emulsion out

5E SEQUENCE TALLY
tallies the status set by the SEQUENCE SELECT command.
Format: <SEQUENCE TALLY>
<MODE> f-byte special binary code:
00h = 2 field start (= defauk)
01h = 4 field start
02h = 8 field start (PAL only)

5F LAMP TALLY
tallies the status of the lamp.
Format: <LAMP TALLY>
<MODE> 1-byte special binary code:
00h = off
01h = reduced power
02h = full power
F0h = lamp failure

60 TMP TALLY

tallies the current Transport Motion Process of the controlled TK, and spedM its success in accomplishing that process.

Format: <TMP TALLY>
<KEYWORD> 1 -byte value, that contains the keyword of the last commanded TMP.
<SUCCESS LEVEL> 1-byte special binary code:
00h = trying; transition in process
01h = successful
02h = failure; this tally should be supplemented by an ERROR message as appropriate

61 TMS TALLY

tallies the current Transport Motion State of the controlled TK, and specifies its success in accomplishing that process.

Format: <TMS TALLY>
<KEYWORD> 1-byte value, that contains the keyword of the last active commanded TMS command.
<SUCCESS LEVEL> 1-byte special binary code:
00h = trying; transition in process
01h = successful
02h = failure; this tally should be supplemented by an ERROR message as appropriate

62 VELOCITY TALLY

tallies the current transport velocity. Note that this is the true velocity in all TMS modes.

Format: <VELOCITY TALLY>
< SPEED > 3-byte signed binary number; 2's complement
same coding as in the argument of the VARIABLE PLAY command

63 FIELD DOMINANCE

contains the value specifying the field-coincidence with film frame.

Format: <FIELD DOMINANCE>
<MODE> 1 -byte special binary code:
00h = field 1 (= default)
01h = field 2
02h = field 3
03h = field 4
04h = field 5 (PAL only)
05h = field 6 (PAL only)
06h = field 7 (PAL only)
07h = field 8 (PAL only)

64 TELECINE SOURCE TALLY

tallies the status set by the TELECINE SOURCE SELECT command.

Format: <TELECINE SOURCE TALLY>
<MODE> 1-byte special binary code:
meaning of left nibble:
lxh = video of telecine 1
2xh = video of telecine 2
meaning of right nibble:
xlh = audio of telecine 1
x2h = audio of telecine 2

65 AUDIO SOURCE TALLY
tallies the status set by the AUDIO SOURCKS8Wr coo~

Format: <AUDIO SOURCE TALLY>
<CHANNEL 1 > 1-byte special binary code:
01h = magnetic sound head(s)
02h = optical sound head(s) (= default)
03h = mag & opt sound heads mixed
04h = separate sound 1 from sound follower
05h = separate sound 2 from sound follower
06h = test tone

<CHANNEL 2 > 1-byte special binary code:
01h = magnetic sound head(s)
02h = optical sound head(s) (default)
03h = mag & opt sound heads mixed
04h = separate sound 1 from sound follower
05h = separate sound 2 from sound follower
06h = test tone

66 CHANNEL MUTE TALLY
tallies the status set by the CHANNEL MUTE SELECT command.
Format: <CHANNEL MUTE TALLY>
<SWITCH> boolean value:
00h = OFF (= default)
01h. = ON

67 SUBTITLE TALLY
tallies the status set by the SUBTITLE SELECT command.

Format: <SUBTITLE TALLY>
<SWITCH> 1-byte boolean value:
00h = OFF (= default)
01h = caption blanking ON

68 TIMECODE TO FILM
contains the current timecode value being generated by a timecode generator.
Format: <TIMECODE TO FILM>
<TIME VALUE> standard "t ime" format

69 reserved

6A USERBITS TO FILM
contains the current userbit contents being generated by a timecode generator to go with the longitudinal timecode.
Format: <USERBITS TO FILM>
<UB SPECIFICATION> for format description
<UB GROUP S/UB GROUP 7> see USERBIT FROM FILM"
<UB GROUP 6/UB GROUP 5 >
<UB GROUP 4/UB GROUP 3 >
<UB GROUP 2/UB GROUP 1 >

6B reserved

6C PRESETTABLE TIME. SOURCE
contains a time value that can be PRESET and be used to start a timecode generator by selecting it in a TCG TIME SOURCE SELECT command.

Format: <PRESETTABLE TIME SOURCE>
<TIME VALUE> standard "time" format

6D reserved

6E PRESETTABLE UB SOURCE
contains a userbit pattern that can be PRESET and be used by a timecode generator by selecting it in a TCG UB SOURCE SELECT command.
Format: <PRESETTABLE UB SOURCE>
<UB SPECIFICATION> for format description
<UB GROUP 8/UB GROUP 7> see "USERBIT FROM FILM"
<UB GROUP 6/UB GROUP 5>
<UB.GROUP 4/UB GROUP 3>
<UB GROUP 2/UB GROUP 1>

6F reserved

70 MONOCHROME TALLY
tallies the status set by the MONOCHROME SELECT command.
Format: <MONOCHROME TALLY>
<SWITCH> 1-byte special binary code:
00h = colour (= default)
01h = standard black and white monochrome
02h = adjustable monochrome

71 NEGATIVE TALLY
tallies the status act by the NEGATIVE SELECT command.
Format: <NEGATIVE TALLY>
< SWITCH > 1-byte special binary code:
00h. = positive (= default)
01h = intermediate positive
02h = black and white negative
03h = colour negative

72 BLACK STRETCH/COMPRESSION TALLY
tallies the status set by the BLACK STRETCH/COMPRESSION SELECT command.
Format: <BLACK STRETCH/COMPRESSION TALLY>
<MODE> 1-byte special binary code:
00h = linear (= default)
01h = stretch function 1
02h = stretch function 2
03h = compression function 1
04h = compression function 2
05h = user defined function 1
06h = user defined function 2

73 GRAIN REDUCTION TALLY
tallies the status act by the GRAIN REDUCTION SELECT command.
Format: <GRAIN REDUCTION TALLY>
<MODE> 1-byte special. binary code:
00h = switched off (= default)
11h = automatic
meaning of right nibble:
x2h = grain size 1 (fine)
x4h = grain size 2
x6h = grain size 3
x8h = grain size 4 (coarse)
meaning of left nibble:
3xh = reduction by 3 dB
5xh = reduction by 5 dB
7xh = reduction by 7 dB
Axh = reduction by 10 dB

74 GAIN TALLY
tallies the status set by the GAIN SELECT command.
Format: <GAIN TALLY>
<GAIN> 1-byte binary number:
00h = 0 dB (= default) 06h = 6 dB 0Ah = 10 dB etc.

<MODE> 1-byte special binary code:
00h = AGC off (= default)
01h = AGC fast
02h = AGC delayed

75 SATURATION STEP TALLY
tallies the status set by the SATURATION STEP SELECT command.
Format: <SATURATION STEP TALLY>
<MODE> 1-byte special binary code
00h = OFF (= default)
01h = 0.75 75% colour saturation
02h = 1.00 10001o colour saturation
03h = 1.25 125% colour saturation
04h = 1.50 150% colour saturation

76 FILM FORMAT TALLY
tallies the film format in use; this status may be set partly by the FILM FORMAT SELECT command.
Format: <FILM FORMAT TALLY>
<MODE> 1-byte special binary code:
01h = Super 8
02h = Super 16
03h = 16 mm
04h = Super 35
05h = 35 mm, 2 perforations
06h = 35 mm, 3 perforations
07h = 35 mm , 4 perforations
08h = 2-position slide gate
09h = 16-position slide gate

77 AUDIO NR TALLY

tallies the status set by the AUDIO NR SELECr com~.

Format: <AUDIO NR TALLY>

<MODE> 1-byte special binary code:

00h = NR off (= default)

01h = NR stereo

02h = NR mono

78 MATRIX

contains the value specifying one of several linear matrix coefficients.

Format: <MATRIX>

<SELECTION> 1-byte special binary code:

00h = matrix OFF default)

01h = matrix 1

02h = matrix 2

03h = matrix 3

etc.

79 MASKING

contains the value specifying one of several logarithmic masking coefficients.

Format: <MASKING>

<SELECTION> 1-byte special binary code:

00h = masking OFF default)

01h = masking 1

02h = masking 2

03h = masking 3

etc.

7A LOCAL LOCKOUT TALLY

tallies the status set by the LOCAL LOCKOUT SELECT command.

Format: <LOCAL LOCKOUT TALLY>

<SWITCH> 1-byte Boolean value:

00h = local control not disabled

01h = local control disabled

7B TIMECODE ATTRIBUTES

contains the attributes of the film timecode and the frame counters.

Format: <TIMECODE ATTRIBUTES>

<ATTRIBUTE> 1-byte special binary code:

00h = 24 frame count code

01h = 25 frame count code

02h = 30 frame count code

12h = 30 frame count code compensated

7C LOOP RANGE

defines the boundaries of the loop executed in "rock" operations, where applicable.

Format: <LOOP RANGE>

<UPPER LIMIT> 1 -byte unsigned binary number:
specifies the number of frames in forward direction, counted from the starting position

<LOWER LIMIT> 1-byte unsigned binary number:
specifies the number of frames in reverse direction, counted from the starting position

7D REFERENCE FRAME TALLY
tallies the status set by the REFERENCE FRAME SELECT command.
Format: <REFERENCE FRAME TALLY>
<SOURCE> 1-byte special binary code:
meaning of right nibble:
x0h = normal (= default)
x1h = internal source
x2h = external source
meaning of left nibble:
x0h = normal (= default)
x1h = instantaneous grab
x2h = continuous grab
<DISPLAY> 1-byte special binary code:
00h = off (= default)
01h = on

7E VIDEO STANDARD TALLY
tallies the status set by the VIDEO STANDARD SELECT command.
Format: <VIDEO STANDARD TALLY>
<SWITCH> 1-byte special binary code:
00h = 525 lines/60 Hz
01h = 625 lines/50 Hz
xxh = user defined

7F ON AIR TALLY
indicates the on-air condition, if required.
Format: <ON AIR TALLY>
<SWITCH> 1-byte special binary code:
00h = 'on air' off (= default)
01h = 'on air' on

80 NORMALIZED FIELDS
indicates the names of all I/Fs that are currently in their normalized condition.
Format: <NORMALIZED FIELDS>
<BEGIN>
<I/F NAME>
<I/F NAME>
<END>

Note: If no I/F is in this condition. BEGIN is immediately followed by END.

81 AUTO CONTROLLED FIELDS
indicates the names of all I/Fs that are currently automatically controlled.

Format: <AUTO CONTROLLED FIELDS>
<BEGIN>
<I/F NAME>
<I/F NAME>
<END>

Note: If no 1/F is in this condition, BEGIN is immediately followed by END.

The following Information Fields represent Analogue Magnitudes; all these have the following characteristics in common.

1. Every magnitude has two associated Information Fields, one for the ACTUAL value, the other for a TARGET value.

2. All these Information Fields can be loaded by a PRESET command.

3. In order to cause a variety of transitions of the magnitudes, "activate" commands (e.g. CHANGE, TRANSITION) may be applied.

4. All these Information Fields use the same format:

Format:	<I/F NAME>	
	<MAGNITUDE>	2-byte unsigned binary number scale marks: 0000h = minimum value FFFFh= maximum value

The hexadecimal codes and Information Field Names are:

82 FOCUS ACTUAL
83 FOCUS TARGET
84 FRAMING ACTUAL
85 FRAMING TARGET
86 AUDIO OUT LEVEL ACTUAL
87 AUDIO OUT LEVEL TARGET

88 SCANNING WIDTH ACTUAL
89 SCANNING WIDTH TARGET
8A SCANNING HEIGHT ACTUAL
8B SCANNING HEIGHT TARGET
8C SCANNING H POSITION ACTUAL
8D SCANNING H POSITION TARGET
8E SCANNING V POSITION ACTUAL
8F SCANNING V POSITION TARGET

90 REPRODUCTION WIDTH ACTUAL
91 REPRODUCTION WIDTH TARGET
92 REPRODUCTION HEIGHT ACTUAL
93 REPRODUCTION HEIGHT TARGET
94 REPRODUCTION H POSITION ACTUAL
95 REPRODUCTION H POSITION TARGET
96 REPRODUCTION V POSITION ACTUAL
97 REPRODUCTION V POSITION TARGET
98 SCANNING ROTATION ACTUAL
99 SCANNING ROTATION TARGET

A0 MASTER LIFT ACTUAL
A1 MASTER LIFT TARGET
A2 LUMINANCE LIFT ACTUAL
A3 LUMINANCE LIFT TARGET
A4 R-Y LIFT ACTUAL
A5 R-Y LIFT TARGET
A6 B-Y LIFT ACTUAL
A7 B-Y LIFT TARGET

A8 MASTER GAMMA ACTUAL
A9 MASTER GAMMA TARGET
AA LUMINANCE GAMMA ACTUAL
AB LUMINANCE GAMMA TARGET
AC R-Y GAMMA ACTUAL
AD R-Y GAMMA TARGET
AE B-Y GAMMA ACTUAL
AF B-Y GAMMA TARGET

B0 MASTER GAIN ACTUAL
B1 MASTER GAIN TARGET
B2 LUMINANCE GAIN ACTUAL
B3 LUMINANCE GAIN TARGET
B4 R-Y GAIN ACTUAL
B5 R-Y GAIN TARGET
B6 B-Y GAIN ACTUAL
B7 B-Y GAIN TARGET

C2 RED LUMINANCE ACTUAL
C3 RED LUMINANCE TARGET
C4 GREEN LUMINANCE ACTUAL
C5 GREEN LUMINANCE TARGET
C6 BLUE LUMINANCE ACTUAL
C7 BLUE LUMINANCE TARGET
C8 MAGENTA LUMINANCE ACTUAL
C9 MAGENTA LUMINANCE TARGET
CA CYAN LUMINANCE ACTUAL
CB CYAN LUMINANCE TARGET
CC YELLOW LUMINANCE ACTUAL
CD YELLOW LUMINANCE TARGET

D0 SATURATION ACTUAL
D1 SATURATION TARGET
D2 RED SATURATION ACTUAL
D3 RED SATURATION TARGET
D4 GREEN SATURATION ACTUAL
D5 GREEN SATURATION TARGET
D6 BLUE SATURATION ACTUAL
D7 BLUE SATURATION TARGET
D8 MAGENTA SATURATION ACTUAL
D9 MAGENTA SATURATION TARGET
DA CYAN SATURATION ACTUAL
DB CYAN SATURATION TARGET
DC YELLOW SATURATION ACTUAL
DD YELLOW SATURATION TARGET
DE DARK SATURATION ACTUAL
DF DARK SATURATION TARGET

E2 RED HUE ACTUAL
E3 RED HUE TARGET
E4 GREEN HUE ACTUAL
E5 GREEN HUE TARGET
E6 BLUE HUE ACTUAL
E7 BLUE HUE TARGET
E8 MAGENTA HUE ACTUAL
E9 MAGENTA HUE TARGET
EA CYAN HUE ACTUAL
EB CYAN HUE TARGET

EC YELLOW HUE ACTUAL
ED YELLOW HUE TARGET

F0 H CORRECTION IN-BAND ACTUAL
F1 H CORRECTION IN-BAND TARGET
F2 H CORRECTION OUT-OF-BAND ACTUAL
F3 H CORRECTION OUT-OF-BAND TARGET
F4 H CORING ACTUAL
F5 H CORING TARGET
F6 V CORRECTION IN-BAND ACTUAL
F7 V CORRECTION IN-BAND TARGET
F8 V CORRECTION OUT-OF-BAND ACTUAL
F9 V CORRECTION OUT-OF-BAND TARGET
FA V CORING ACTUAL
FB V CORING TARGET

FF02 NEGATIVE RED LIFT ACTUAL
FF03 NEGATIVE RED LIFT TARGET
FF04 NEGATIVE GREEN LIFT ACTUAL
FF05 NEGATIVE GREEN LIFT TARGET
FF06 NEGATIVE BLUE LIFT ACTUAL
FF07 NEGATIVE BLUE LIFT TARGET
FF08 NEGATIVE RED GAIN ACTUAL
FF09 NEGATIVE RED GAIN TARGET
FF0A NEGATIVE GREEN GAIN ACTUAL
FF0B NEGATIVE GREEN GAIN TARGET
FF0C NEGATIVE BLUE GAIN ACTUAL
FF0D NEGATIVE BLUE GAIN TARGET
FF0E not used
FF0F REFERENCE FRAME WIPE

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REMOTE CONTROL SYSTEMS FOR BROADCASTING PRODUCTION EQUIPMENT
Routing switcher type–specific messages

Tech. 3245–E – Supplement 5 October 1992

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Introduction

Document Tech. 3245 describes the specifications of a digital remote–control system for broadcasting production equipment. It defines completely the electrical/mechanical level (level 1), and the supervisory level (level 2), of the interface. The two remaining levels – the system service level (level 3), and the virtual machine level (level 4) – are defined only in terms of function and control message syntax.

Supplement 1 to Tech. 3245 completes the definition of the system service level by detailing the system service messages and, in addition, defines the virtual machine messages which are common to all types of virtual machine – the common messages.

The present Supplement defines the type–specific virtual machine messages which are applicable to routing switchers. Type–specific messages applicable to other categories of equipment are defined in other supplements to Tech. 3245.

In order to implement a complete network, the system designer therefore requires:

Document Tech. 3245	– the general specification
Supplement 1	– system service and common messages

and one or more other supplements appropriate to the category or categories of equipment to be used.

The specification described in this Supplement has been developed jointly with the SMPTE, and is functionally identical to that to be published as an SMPTE Recommended Practice.

Chapter 1
General concepts

This *Chapter* contains a general explanation of some of the concepts used in the formulation of the Routing Switcher Type–Specific message set. It constitutes tutorial information, and is intended to assist in the understanding of the specifications in *Chapter 2* of this document. A working knowledge of the following ESbus topics is assumed:

ESbus system overview
Control Message architecture
Supervisory protocol
Tributary interconnection
Electrical and mechanical characteristics
System Service and Common Messages

Conventions

Acronyms and abbreviations are shown in upper–case characters.

e.g. Information Field – I/F

Message Keywords and names of Information Fields are shown in upper–case characters

e.g. CONNECT CROSSPOINT
SOURCE POINTER

These command Keywords and Information Field names are used within the text of this document to imply requested action, Information Field identity, and in turn the Information Field contents of the Virtual Machine. To assist in readability of this document, these terms are used in the context of the presentation material.

e.g. "If this I/F is PRESET, ..."

("PRESET" in this context refers to a command contained within the Type–specific Message set.)

Terms with special meaning to this or related documents are shown with leading upper–case characters:

e.g. Virtual Machine
Common Messages.

1. Scope of this Dialect

This dialect is intended for a remote–control system to be used as a link between a routing switcher control system (as the controlling device) and its associated routing switcher matrices (as controlled device(s)).

It is not intended for controlling the routing switcher control system itself from other places.

2. Multidimensional Information Fields

The controlled elements in a routing switcher are the crosspoints. The crosspoints are arranged in a multidimensional way, i.e. to identify an individual crosspoint, it is usually necessary to specify the following characteristics of its location:

– its row (1st dimension);

– its column (2nd dimension);

– its level (3rd dimension);

– its matrix (4th dimension) – applies only to a switcher consisting of several matrices.

In ESbus dialects all kinds of status data are maintained in Information Fields (I/Fs). Each type of information has its corresponding I/F associated with a unique I/F Name.

In routing switcher systems nearly all status data are related to crosspoints. Due to the fact that crosspoints are arranged in a multidimensional way, and that each crosspoint is the carrier of status data, the I/Fs describing routing switcher data must also be multidimensional. The particular item of information belonging to one crosspoint is just an element of the whole Information Field of a certain type.

This requires additional descriptors which point to the “location” of this element within the field, i.e. to the row , column, level, and matrix.

When such an element of an I/F is tallied, these descriptors are simply carried as parameters in the format.

When such an element is accessed, however, a different mechanism is required due to the fact that the Common commands which access I/Fs (e.g. READ, UPDATE, CYCLE) allow only for specifying the I/F name; no additional descriptor information is permitted in the format.

Such additional information must therefore be transmitted in advance by presetting one or more “pointers”, which predefine the parameters necessary for multidimensional access.

The pointers themselves also reside in Information Fields of their own and thus can be PRESET as any other presettable I/F. This gives the advantage that the pointer information need only be transmitted when it really changes, not in advance of every I/F access.

The names of the relevant pointers are:

– MATRIX POINTER,

– LEVEL POINTER,

– SOURCE POINTER,

– DESTINATION POINTER.

Note: In order to PRESET a multidimensional I/F no pointers are required, since the whole format of an I/F appears within the PRESET command, including the descriptors.

Due to special requirements of routing switchers, one of these dimensions may not be specified, e.g. the I/F DESTINATIONS–TO–SOURCE does not use the DESTINATION POINTER, because it shows all connections between a specified source and any destination in the form of a list.

3. Wildcard Characters

In order to facilitate access to a whole array (row, column, level, matrix) of one type of a multidimensional status information, a “wildcard” character is introduced (FFh or FFFFh).

A pointer, preset to the wildcard, indicates (when an I/F access requiring this pointer is made), that the information corresponding to the full available range of the pointer is desired.

For example, if the LEVEL POINTER is preset to FFh, a subsequent READ of the I/F CROSSPOINT STATUS will result in a multiple I/F RESPONSE message (either in many single messages or in one message using the BEGIN/END construct or in any combination) tallying the crosspoint status of all existing levels.

A second application of the wildcard concerns certain commands (e.g. CONNECT CROSSPOINT), where it can be used as a normal parameter with the same effect.

The description of the commands and information fields in *Chapter 2* contains detailed instructions as to when and how wildcards can be used.

4. Procedures and Events

As with all Dialects the complete Routing Switcher Dialect consists, by definition, of both Common Messages and the Routing Switcher Type–specific Dialect described in this document.

The elements of the Common Messages prove very useful for switcher applications, and are therefore recommended.

The concept of Procedures, provided by the Common Messages, can be used to predefine a lengthy set of commands (by the DEFINE PROCEDURE command) pending the arrival of the EXECUTE PROCEDURE command, which causes the entire Procedure to be performed.

The concept of Events, provided by the Common Messages, can be used to predefine a command (by the DEFINE EVENT command) to be executed at a certain point in time. As the time scale, usually the Timeline, is used, an individual software clock running in each controlled Virtual Machine is preset by the bus controller (by the System Service command REQUEST TIME TRANSMISSION).

Both concepts can easily be combined by first defining a procedure, then defining an Event with EXECUTE PROCEDURE as the command to be carried out on the Timeline.

Details about these facilities are described in the documents about System Service and Common Messages mentioned above.

5. Sample Command Sequences

The following message sequences show the application of the dialect (including the Common Messages). The commands are also shown encoded into their hex codes.

The PRESET commands signed with a "*" sign may be omitted if the corresponding I/F already has been preset by a preceding PRESET command.

5.1. Disconnecting all crosspoints in level #10 of matrix #2

<DISCONNECT CROSSPOINT>		<43>
<MATRIX = 2>		<02>
<LEVEL = 10>		<0A>
<SOURCE = wildcard>		<FFFF>
<DESTINATION = wildcard>		<FFFF>

5.2. Requesting the status of all crosspoints in level #2 of matrix #1

<PRESET>	*	<60>
<MATRIX POINTER>		<41>
<MATRIX = 1>		<01>
<PRESET>	*	<60>
<LEVEL POINTER>		<42>
<LEVEL = 2>		<02>
<PRESET>	*	<60>
<SOURCE POINTER>		<43>
<SOURCE = wildcard>		<FFFF>
<READ>		<22>
<DESTINATIONS–TO–SOURCE>		<46>

The response from the controlled Virtual Machine may be:

<I/F ITEM RESPONSE>	<23>
<BEGIN>	<01>
<DESTINATIONS–TO–SOURCE>	<46>
<MATRIX = 1>	<01>
<LEVEL = 2>	<02>
<SOURCE = 0>	<0000>
<PARAMETER COUNT = 1> (one connection)	<0001>
<DESTINATION = 3>	<0003>
<DESTINATIONS–TO–SOURCE>	<46>
<MATRIX = 1>	<01>
<LEVEL = 2>	<02>
<SOURCE = 1>	<0001>
<PARAMETER COUNT = 0> (no connection)	<0000>
<DESTINATIONS–TO–SOURCE>	<46>
<MATRIX = 1>	<01>
<LEVEL = 2>	<02>
<SOURCE = 2>	<0002>
<PARAMETER COUNT = 4> (multiple connections)	<0004>
<DESTINATION = 2>	<0002>
<DESTINATION = 4>	<0004>
<DESTINATION = 9>	<0009>
<DESTINATION = 17>	<0011>
<DESTINATIONS–TO–SOURCE>	<46>
<MATRIX = 1>	<01>
<LEVEL = 2>	<02>
<SOURCE = 31>	<001F>
<PARAMETER COUNT = 1>	<0001>
<DESTINATION = 1>	<0001>
<END>	<02>

5.3. Instructing the controlled Virtual Machine to tally any changes in the crosspoint status of matrix #3

<PRESET>	*	<60>
<MATRIX POINTER>		<41>
<MATRIX = 3>		<03>
PRESET>	*	<60>
<LEVEL POINTER>		<42>
<LEVEL = wildcard>		<FF>
<PRESET>	*	<60>
<DESTINATION POINTER>		<44>
<DESTINATION = wildcard>		<FFFF>
<UPDATE>		<3F07>
<SOURCES–TO–DESTINATION>		<47>

On a change, the response from the controlled Virtual machine may be:

<I/F ITEM RESPONSE>	<23>
<SOURCES–TO–DESTINATION>	<47>
<MATRIX = 3>	<03>
<LEVEL = 2>	<02>
<DESTINATION = 9>	<0009>
<PARAMETER COUNT = 1>	<0001>
<SOURCE = 11>	<000B>

5.4. Defining a procedure that establishes a default configuration of connections

<DEFINE PROCEDURE>	<3F0B>
<NAME = 1>	<01>
<BYTE COUNT = XX>	<00XX>
<CONNECT CROSSPOINT>	<42>
<MATRIX = 1>	<01>
<LEVEL = 1>	<01>
<SOURCE = 0>	<0000>
<DESTINATION = 12>	<000C>
<CONNECT CROSSPOINT>	<42>
<MATRIX = 1>	<01>
<LEVEL = 1>	<01>
<SOURCE = 1>	<0001>
<DESTINATION = 10>	<000A>
<CONNECT CROSSPOINT>	<42>
<MATRIX = 1>	<01>
<LEVEL = 1>	<01>
<SOURCE = 2>	<0002>
<DESTINATION = 2>	<0002>
<CONNECT CROSSPOINT>	<42>
<MATRIX = 1>	<01>
<LEVEL = 1>	<01>
<SOURCE = 3>	<0003>
<DESTINATION = 7>	<0007>
...	

Once defined, the procedure may be carried out as often as desirable simply by commanding:

<EXECUTE PROCEDURE>	<26>
<NAME = 1>	<01>

5.5. Setting a crosspoint at 09:00 on the timeline

<DEFINE EVENT>	<27>
<NAME = 3>	<03>
<I/F NAME OF TRIGGER SOURCE = TIMELINE>	<24>
<TRIGGER VALUE = 09:00:00:00>	<09000000>
<CONNECT CROSSPOINT>	<42>
<MATRIX = 1>	<01>
<LEVEL = 1>	<01>
<SOURCE = 3>	<0003>
<DESTINATION = 7>	<0007>

Chapter 2
Routing Switcher Type–specific Messages
(virtual machine type is 05h)

General notes

1. *All parameters described below as "1–byte number" or "2–byte number" are binary coded unsigned numbers.*
2. *Parameters which can be used with Wildcard Characters are indicated by "FFh = all" or "FFFFh = all".*
3. *In all cases, the temporal order of EVENTS must be preserved. Mutually exclusive commands actuated by the EVENT construct, that are placed on the EVENT cue at the same trigger point, will cause both events to cancel.*

1. Numerical Index of Keywords, Information Field Names, and Mnemonics

Hex	Message Keyword	(mnemonic)	Hex	Information Field Name	(mnemonic)
40h	not used		40h	not used	
41h	not used		41h	MATRIX POINTER	MPOI
42h	CONNECT CROSSPOINT	CONC	42h	LEVEL POINTER	LPOI
43h	DISCONNECT CROSSPOINT	DISC	43h	SOURCE POINTER	SPOI
44h	not used		44h	DESTINATION POINTER	DPOI
45h	not used		45h	not used	
46h	SPECIFIC MUTE		46h	DESTINATIONS–TO–SOURCE	DTOS
47h	not used		47h	SOURCES–TO–DESTINATION	STOD
48h	TEST CROSSPOINTS	TESC	48h	CROSSPOINT STATUS	CSTA
49h	not used		49h	SOURCE SIGNAL STATUS	SSTA
4Ah	not used		4Ah	LEVEL CONFIGURATION	LECO
4Bh	not used		4Bh	LEVEL BLOCK STATUS	LEBS
4Ch	not used		4Ch	not used	
4Dh	not used		4Dh	not used	
4Eh	not used		4Eh	SOURCE NAME	SNAM
4Fh	not used		4Fh	DESTINATION NAME	DNAM
. . .			. . .		
60h	PRESET	PRST	60h	not used	

2. Keywords

40h not used

41h not used

42h CONNECT CROSSPOINT
causes the crosspoint between the specified source (row) and the specified destination (column) in the specified level of the specified matrix to be connected.

Format:	<CONNECT CROSSPOINT>		
	<MATRIX>	1–byte number	(FFh = all)
	<LEVEL>	1–byte number	(FFh = all)
	<SOURCE>	2–byte number	
	<DESTINATION>	2–byte number	(FFFFh = all)

Notes: 1. If the matrix is addressed with the wildcard FFh, the crosspoints between specified source and destination in the specified level of all available matrices are connected.

2. If the level is addressed with the wildcard FFh, the crosspoints between specified source and destination in all available levels of the specified matrix are connected.

3. If the destination is addressed with the wildcard FFFFh, the crosspoints between the specified source and all available destinations in the specified level of the specified matrix are connected.

4. More than one parameter may use the wildcard at the same time.

43h DISCONNECT CROSSPOINT
causes the crosspoint between the specified source (row) and the specified destination (column) in the specified level of the specified matrix to be disconnected.

Format:	<DISCONNECT CROSSPOINT>		
	<MATRIX>	1–byte number	(FFh = all)
	<LEVEL>	1–byte number	(FFh = all)
	<SOURCE>	2–byte number	(FFFFh = all)
	<DESTINATION>	2–byte number	(FFFFh = all)

Notes: 1. If the matrix is addressed with the wildcard FFh, the crosspoints between specified source and destination in the specified level of all available matrices are disconnected.

2. If the level is addressed with the wildcard FFh, the crosspoints between specified source and destination in all available levels of the specified matrix are disconnected.

3. If the source is addressed with the wildcard FFFFh, a crosspoint that might be set between a source and the specified destination in the specified level of the specified matrix is disconnected.

4. If the destination is addressed with the wildcard FFFFh, all crosspoints that might be set between the specified source and all available destinations in the specified level of the specified matrix are disconnected.

5. More than one parameter may use the wildcard at the same time, e.g. if both source and destination are addressed with the wildcard FFFFh, all crosspoints in the specified level of the specified matrix are disconnected.

44h not used

45h not used

46h SPECIFIC MUTE
directs the controlled Virtual Machine to switch off all responses previously initiated by a CYCLE or UPDATE command for the specified Information Field.

Format: <SPECIFIC MUTE>
<I/F NAME>

Notes: 1. This command supplements the MUTE command of the Common Message set, which is a general mute for all I/Fs.

2. *This command requires the same pre–definitions of the pointers as the UPDATE or CYCLE command it is intended to cancel.*

47h not used

48h TEST CROSSPOINT
causes the crosspoint between the specified source (row) and the specified destination (column) in the specified level of the specified matrix to be tested; the test result may be interrogated by READing the Information Field CROSSPOINT STATUS.

Format:

<TEST CROSSPOINT>		
<MATRIX >	1–byte number	(FFh = all)
<LEVEL >	1–byte number	(FFh = all)
<SOURCE>	2–byte number	(FFFFh = all)
<DESTINATION>	2–byte number	(FFFFh = all)

Notes: 1. If the matrix is addressed with the wildcard FFh, the crosspoints between specified source and destination in the specified level of all matrices are tested.

2. *If the level is addressed with the wildcard FFh, the crosspoints between specified source and destination in all levels of the specified matrix are tested.*

3. *If the source is addressed with the wildcard FFFFh, the crosspoints between all sources and the specified destination in the specified level of the specified matrix are tested.*

4. *If the destination is addressed with the wildcard FFFFh, the crosspoints between the specified source and all destinations in the specified level of the specified matrix are tested.*

5. *More than one parameter may use the wildcard at the same time, e.g. if both source and destination are addressed with the wildcard >FFFFh, all crosspoints in the specified level of the specified matrix are tested.*

50h to 5Fh } not used

60h PRESET
presets the named Information Field to the given value.

Format:
<PRESET>
<PERMITTED INFORMATION FIELD NAME>
<VALUE> format and coding defined by the I/F NAME
(see Section 3: Information Fields)

Permitted Information Field names for Routing Switchers are:

MATRIX POINTER
LEVEL POINTER
SOURCE POINTER
DESTINATION POINTER
SOURCE NAME
DESTINATION NAME

3. Information Fields

Notes: 1. The items of the Information Field are accessed by the Common messages:

READ, UPDATE, CYCLE or SIMULTANEOUS READ

These commands use the format:

<KEYWORD><PARAMETER NAME>

where the PARAMETER NAME uses the Information Field Name specified below.

Though several Parameter Names may be grouped together by means of a BEGIN/END construct, the command does not allow for carrying additional parameters in order to specify which item of a multidimensional Information Field shall be accessed.

Such additional information must therefore be transmitted in advance by presetting one or more pointers e.g. MATRIX POINTER, LEVEL POINTER, SOURCE POINTER, DESTINATION POINTER.

2. The items of the Information Field are tallied by the Common Messages:

I/F RESPONSE or SIMULTANEOUS READ RESPONSE

These commands use the format:

<KEYWORD><PARAMETER NAME><PARAMETER VALUE>

where the PARAMETER VALUE carries the Information Field contents specified below.

The parameters that subdefine the individual item of a multidimensional Information Field, e.g. MATRIX POINTER, LEVEL POINTER, etc., are carried within the Parameter Values. Therefore the content of the Pointers is of no effect in the instant when an Information Field is tallied.

Several names/values may be grouped together by means of a BEGIN/END construct.

3. Multidimensional Information Fields and their corresponding Pointers are individually noted in the description below.

40h not used

41h MATRIX POINTER
defines a pointer to a matrix.

Format: <MATRIX POINTER>
<MATRIX> 1–byte number (FFh = all matrices)

Note: If this field is PRESET to the wildcard FFh, a READ command referring to this pointer will result in multiple I/F RESPONSES for all available matrices.

42h LEVEL POINTER
defines a pointer to a level of the matrix specified in the MATRIX POINTER I/F.

Format: <LEVEL POINTER>
<LEVEL > 1–byte number (FFh = all levels)

Note: If this field is PRESET to the wildcard FFh, a READ command referring to this pointer will result in multiple I/F RESPONSES for all available levels.

43h SOURCE POINTER
defines a pointer to a source (row) in the level (specified in the LEVEL POINTER I/F) of the matrix (specified in the MATRIX POINTER I/F).

Format: <SOURCE POINTER>
<SOURCE> 2–byte number (FFFFh = all sources)

Note: If this field is PRESET to the wildcard FFFFh, a READ command referring to this pointer will result in multiple I/F RESPONSES for all available sources.

44h DESTINATION POINTER
defines a pointer to a destination (column) in the level (specified in the LEVEL POINTER I/F) of the matrix (specified in the MATRIX POINTER I/F).

Format: <DESTINATION POINTER>
<DESTINATION> 2–byte number (FFFFh = all destinations)

Note: If this field is PRESET to the wildcard FFFFh, a READ command referring to this pointer will result in multiple I/F RESPONSES for all available destinations.

45h not used

46h DESTINATIONS–TO–SOURCE
indicates all destinations (columns) in a specified level of a specified matrix that are currently connected to a specified source (row).

Format: <DESTINATIONS–TO–SOURCE>
<MATRIX > 1–byte number
<LEVEL > 1–byte number
<SOURCE> 2–byte number specifying the source
<PARAMETER COUNT> 2–byte number specifying the number *n* of parameters following
<DESTINATION 1> 2–byte number specifying the 1st destination connected to the source
...
<DESTINATION *n*> 2–byte number specifying the *n*th destination connected to the source

Notes: 1. Parameter Count = 0 means: no connection.

2. Accessing this I/F requires the I/Fs MATRIX POINTER, LEVEL POINTER, and SOURCE POINTER to be PRESET in advance.

47h SOURCES–TO–DESTINATION
indicates all sources (rows) in a specified level of a specified matrix that are currently connected to a specified destination (column).

Format: <SOURCES–TO–DESTINATION>
<MATRIX> 1–byte number
<LEVEL> 1–byte number
<DESTINATION> 2–byte number specifying the destination
<PARAMETER COUNT> 2–byte number specifying the number *n* of parameters following
<SOURCE 1> 2–byte number specifying the 1st source connected to the destination
...
<SOURCE *n*> 2–byte number specifying the *n*th source connected to the destination

Notes: 1. Parameter Count = 0 means: no connection.

2. Accessing this I/F requires the I/Fs MATRIX POINTER, LEVEL POINTER, and DESTINATION POINTER to be PRESET in advance.

48h CROSSPOINT STATUS
gives a list of the bad crosspoints corresponding to a specified destination (column) in a specified level of a specified matrix.

Format:

<CROSSPOINT STATUS>	
<MATRIX>	1–byte number
<LEVEL>	1–byte number
<DESTINATION>	2–byte number
<PARAMETER COUNT>	2–byte number specifying the number *n* of parameters following
<SOURCE 1>	2–byte number specifying the 1st of a list of bad crosspoints
...	
<SOURCE *n*>	2–byte number specifying the *n*th and last one of a list of bad crosspoints

Notes: 1. Parameter Count = 0 means: no bad crosspoints.

2. Accessing this I/F requires the I/Fs MATRIX POINTER, LEVEL POINTER, and DESTINATION POINTER to be PRESET in advance.

49h SOURCE SIGNAL STATUS
indicates the signal quality of a specified source in a specified level of a specified matrix.

Format:

<SOURCE SIGNAL STATUS>	
<MATRIX>	1–byte number
<LEVEL>	1–byte number
<SOURCE>	2–byte number
<CODE>	1–byte special binary code: 00h = good else = bad (details may be reported using user–defined codes)

Note: Accessing this I/F requires the I/Fs MATRIX POINTER, LEVEL POINTER, and SOURCE POINTER to be PRESET in advance.

4Ah LEVEL CONFIGURATION
describes the start–up configuration in the specified level of the specified matrix by first defining the rectangular limits of the level and then detailing crosspoint blocks (typically card–related) which do not exist.

Format:

<LEVEL CONFIGURATION>		
<MATRIX>	1–byte number	
<LEVEL>	1–byte number	
<FIRST SOURCE>	2–byte number	} rectangular limits of the level
<LAST SOURCE>	2–byte number	
<FIRST DESTINATION>	2–byte number	
<LAST DESTINATION>	2–byte number	
<PARAMETER GROUP COUNT>	1–byte number specifying the number *n* of parameter groups following	
<SOURCE# OF BLOCK BEG>	2–byte number	} data of 1st non–existent block
<SOURCE# OF BLOCK END>	2–byte number	
<DEST# OF BLOCK BEG>	2–byte number	
<DEST# OF BLOCK END>	2–byte number)	
...		
<SOURCE# OF BLOCK BEG>	2–byte number	} data of *n*th non–existent block
<SOURCE# OF BLOCK END>	2–byte number	
<DEST# OF BLOCK BEG>	2–byte number	
<DEST# OF BLOCK END>	2–byte number	

Note: Accessing this I/F requires the I/Fs MATRIX POINTER and LEVEL POINTER to be PRESET in advance.

4Bh LEVEL BLOCK STATUS
reports blocks of crosspoints (typically card–related) in the specified level of the specified matrix that are detected by the controlled Virtual Machine as missing relative to the start–up configuration.

Format:

<LEVEL BLOCK STATUS>		
<MATRIX>	1–byte number	
<LEVEL>	1–byte number	
<PARAMETER GROUP COUNT>	1–byte number specifying the number *n* of parameter groups following	
<SOURCE# OF BLOCK BEG>	2–byte number	data of 1st faulty block
<SOURCE# OF BLOCK END>	2–byte number	
<DEST# OF BLOCK BEG>	2–byte number	
<DEST# OF BLOCK END>	2–byte number	
...		
<SOURCE# OF BLOCK BEG>	2–byte number	data of *n*th faulty block
<SOURCE# OF BLOCK END>	2–byte number	
<DEST# OF BLOCK BEG>	2–byte number	
<DEST# OF BLOCK END>	2–byte number	

Notes: 1. Parameter Group Count = 0 means: no faulty blocks

2. Accessing this I/F requires the I/Fs MATRIX POINTER and LEVEL POINTER to be PRESET in advance.

4Ch not used

4Dh not used

4Eh SOURCE NAME
contains the name of the specified source in the specified level of the specified matrix.

Format:

<SOURCE NAME>	
<MATRIX>	1–byte number
<LEVEL>	1–byte number
<SOURCE>	2–byte number
<CHARACTER COUNT>	2–byte number specifying the number *n* of characters following
<CHARACTER 1>	1–byte ASCII code; 1st character
...	
<CHARACTER *n*>	1–byte ASCII code; *n*th character

Notes: 1. This I/F can be PRESET by the controlling Virtual Machine and is to be used only for displaying the names at the switcher, where applicable.

2. Accessing this I/F requires the I/Fs MATRIX POINTER, LEVEL POINTER, and SOURCE POINTER to be PRESET in advance.

4Fh DESTINATION NAME
contains the name of the specified destination in the specified level of the specified matrix.

Format:

<DESTINATION NAME>	
<MATRIX>	1–byte number
<LEVEL>	1–byte number
<DESTINATION>	2–byte number
<CHARACTER COUNT>	2–byte number specifying the number *n* of characters following
<CHARACTER 1>	1–byte ASCII code; 1st character
...	
<CHARACTER *n*>	1–byte ASCII code; *n*th character

Notes: 1. This I/F can be PRESET by the controlling Virtual Machine and is to be used only for displaying the names at the switcher, where applicable.

2. Accessing this I/F requires the I/Fs MATRIX POINTER, LEVEL POINTER, and DESTINATION POINTER to be PRESET in advance.

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