ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

STANDARD ECMA-26

FOR

RECOVERY PROCEDURES

An Extension of the Basic Mode Control Procedures
for Data Communication Systems
According to Standard ECMA-16

April 1971

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BRIEF HISTORY

Technical Committee TC9 of ECMA, issued in May 1968 their Standard ECMA-16 for Basic Mode Control Procedures for Data Communications Systems using the ECMA 7 bit Coded Character Set. Further work was undertaken on recovery procedures. A proposal by ECMA was filed in June 1970 with ISO/TC97/SC6 and approved by the various delegations.

This Standard ECMA-26 corresponds to this proposal. It is an extension of the Basic Mode Standard ECMA-16. It defines the recovery procedures to be executed by the various stations on a data transmission link.

It has been accepted by the General Assembly of ECMA on Dec. 11, 1970.

1. SCOPE

The following Standard is an optional extension of the Standard ECMA-16 on Basic Mode Control Procedures for Data Communication Systems.

This means that:

i) those systems which conform to Standard ECMA-16 do not necessarily have to include the functions described in the present Standard,

ii) systems implementing the function described hereafter must comply with the present Standard to conform to Standard ECMA-16 on Basic Mode Control Procedures.

This Standard specifies recovery procedures to be executed by the various stations on a data transmission link to automatically return the system to an operational status after a fault condition has occured. It is based upon recovery procedures defined in ECMA-16, section 2.3.3.

These procedures are system guidelines which should be used by all stations, as applicable. It is recognized that the implementation of the timers and counters and their absolute value may vary with applications and communication facilities and that a given timer can cover more than one function.

In some cases, these recovery procedures can only detect the abnormal condition and then notify the operator or the processor program or both. In more sophisticated cases, automatic recovery is partially or completely possible. In other cases, only operators can perform the recovery procedures. However, the operator may do such things as retry "N" more times, establish voice communications to the distant station in order to determine trouble, etc.

For a good system, the functions of Timers A, B and C defined below, must be utilized. It is recognized that in some systems additional timers may be required for such purposes as aiding synchronization procedures and added reliability, etc.

2. DEFINITIONS

2.1 Timers

Timers are primarily used as aids in recovery procedures when recognition of specific events

does not occur. The action taken after a time-out occurs is one or more of those listed. They are specified in general terms to provide system protection. The absolute values of the timers are dependent upon such things as maximum block length, manual use, non manual data entry, speed of transmission, type of data source/sink, etc.

2.2 Counters

Counting is primarily used as an aid in determining what recovery alternative is applicable in each error condition. The number of consecutive negative or invalid replies and the number of consecutive attempts to recover using one recovery procedure before an alternative is chosen will depend upon the network configuration, quality of channel, and application.

3. DESCRIPTION OF RECOVERY PROCEDURES

3.1 Timer A (No Response Timer)

Where implemented: Control Station and Master Station

Purpose: To protect against an invalid response or no no response.

Start: After transmitting any ending character where a reply is expected; e.g. ENQ, ETB, ETX, DLE ETB, DLE ETX.

Stop: Upon receipt of a valid reply from the communication line; e.g. ACK, NAK, STX, EOT, DLE STX.

When Time-Out occurs:

1a. Retransmit some information (up to N times)* or

1b. Transmit different information, e.g. ENQ, different polling/selection sequence.

2. Transmit EOT, when Station Abort procedures are used.

3. Notify operator or processor program, or both.

3.2 Timer B (Receive Timer)

Where Implement: Slave Station

* Retransmission of a data block can result in duplication of a block at the receiving location if a block numbering or other protective scheme is not used.

Purpose: To protect against non-recognition of any block terminating character, e.g. ETB, ETX, or ENQ received from the communication line.

Start: Receipt of SOH, STX (if not preceded by SOH), DLE SOH, DLE STX, other opening characters or defined sequence as required.

Restart: Upon receipt of any valid character. This facilitates receipt of variable length blocks.

Stop: Upon receipt of a valid terminating character or defined sequence; e.g. ETB, ETX, ENQ, DLE ETB, DLE ETX.

When Time-Out occurs:

1. Remain in Slave Status and initiate search for character synchronization in synchronous systems.

2. Prepare to receive another transmission.

3. Notify operator or processor program or both, and discard the incomplete blocks.

4. Return to Basic Mode (code dependent).

NOTE: For maximum system efficiency, the duration of the No-Response Timer (Timer A) should be short and Receive Timer (Timer B) should be time-out before the Response Timer (Timer A).

3.3 Timer C (No-Activity Timer)

3.3.1 Switched Lines

Where implemented: All stations.

Purpose: To facilitate disconnection procedures of the communication line if data transmission stops due to not recognizing DLE.EOT, or due to remote station or communication facility problems.

Start or Restart: Upon receipt of indication of Circuit Connection; e.g. receipt of ON condition of circuit 107 (Data Set Ready*) or circuit 125 (Calling Indicator*) and circuit 108.2 (Data Terminal Ready*).

Upon receipt or transmission of any valid character including sync. sequence.

* CCITT - V 24 designation.

Stop: 1. Upon receipt or transmission of DLE.EOT or

2. Loss of circuit 107 (Data Set Ready*).

When Time-Out occurs:

1. Disconnect communication circuit.

2. Notify operator or processor program, or both.

3. Prepare for Data Link reestablishment.

3.3.2 Non-switched lines

Where implemented: Control Station.

Purpose: To serve as a "no-activity" time-out for all stations in a system.

Start or Restart: Upon receipt or transmission of any valid character.

Stop: Upon receipt or transmission of EOT.

When Time-Out occurs:

1. Notify operator or processor program, or both.

2. Return to Control Mode.

3. Return to Non-Transparent Mode.

4. RECOVERY PROCEDURES

Some recovery procedures are outlined in the following with their linkage to the appropriate phase diagrams in clause 2.3.2 of Standard ECMA-16 and to the Timers A, B and C described in this document.

In all cases, after the appropriate time-out periods, it shall be the final responsibility of either the Control station or the Master station to take action.

4.1 Recovery Procedures by Control Station

R 1 - In the case of:

i) Invalid or absence of Termination Supervisory Sequence detected by time-out of either Timer A or Timer C, the Control station must transmit EOT or DLE.EOT whichever is appropriate.

* CCITT - V 24 designation.

ii) Invalid or no response to a Polling Supervisory Sequence detected by time-out of Timer A, the Control station may transmit a different polling/selecting sequence following the transmission of an EOT and/or notify operator or processor program, or both.

R 2 - In the case of:

Repeated unsuccessful polling of one, several or all stations, the Control station should notify operator or processor program, or both.

4.2 Recovery Procedures by Master Station

R 3 - In the case of:

i) Invalid or no response to a Selecting Supervisory Sequence detected by the time-out of Timer A the Master station may:

a. terminate by transmitting EOT; or

b. transmit another Selecting Supervisory Sequence (up to "N" times); or

c. notify operator or processor program, or both.

ii) Invalid or no response to Information Message detected by time-out of Timer A the Master station may:

- Repeat the previous transmission (up to "N" times). This procedure can lead to duplication of blocks.

- Transmit prefix ENQ (up to "N" times) which requests the Slave station to repeat its previous response (ACK or NAK). This procedure can lead to loss of blocks unless used in conjunction with a response numbering scheme to ensure that blocks are neither added nor deleted.

R 4 - In the case of:

i) Repeated negative replies (NAK) or invalid or no response to a Selecting Supervisory Sequence, the Master station should notify the operator or processor program, or both.

ii) Repeated negative replies (NAK) or failure to receive a valid reply for an Information Block, the Master station may transmit an EOT (if Master station Abort is used) and/or notify the operator or processor program, or both.

Recovery Procedures by a Slave Station

Recovery Procedures by a Slave station are explained by the functions of Timer B (see 3.2).