

## **Item KTW-9 solution**

This proposal includes new definitions that correctly explain the turning on and off of fill, the transmit frame operation, the C-Port repeat function for the 4, 16 and 100 Mbit/s operation, and the effect of transmit clock source changes by state machines other than the transmit machine.

This proposal is organized as follows.

1) Items 5, 6 and 7 are repeated from Draft 1 subclause 9.1.1.1 lines 59-99 on pages 9.1-2 and 9.1-3.

- Item 5 is for 4 and 16 Mbit/s operation.
- Item 6 is for 100 Mbit/s operation.

2) The Proposal contains the following.

- Items 5 and 6 - a complete rewrite of 9.1.1.1 lines 59-98.
- Item 7 - a new definition of clock source changes invoked by state machines other than the transmit machine.
- Item 8 - a renumbering of the original item 7 on line 99.

## **Rationale for proposed change**

Draft 1 has the following major problems.

- Subclause 9.1 item 5 on page 9.1-2, talks about the Station changing its transmit clock source, but the Station's Transmit Station Operation Table on pages 9.2-25 through 9.2-27 *never* causes a transmit clock source change. However, the Station *does* change the transmit clock source by means other than the transmit machine (this is not covered).
- A clock source change occurs when the C-Port's Transmit Port Operation Table on page 9.3-24 enters the Repeat state (TS=PRPT) [reference 1207] or leaves the Repeat state [reference 1206] does a clock source change occur, but *only* when supporting 4 and 16 Mbit/s. However, the C-Port *does* change the transmit clock source by means other than the transmit machine (this is not covered).
- The definition of 100 Mbit/s operation is incomplete.

The proposed change combines the 4, 16 and 100 Mbit/s Transmit operation into two items as follows.

- Item 5 is for the C-Port and Station when transmitting a frame.
- Item 6 is for the C-Port when supporting the Repeat state (TS=PRPT).

A new Item 7 is defined for changes in the transmit clock source *not under the control* of the Transmit Port Operation Table 9.3-2 and Station Operation Table 9.2-2.

**Original definition of transmit, contained in 9.1.1.1 lines 59-99, is repeated.**

5. When operating at 4 or 16 Mbit/s, Clock Source changes, Transmit Sequences and the transmission of Fill are started and performed as follows.

After a clock source change, 5.7.1 requires the C-Port and Station to delay at least 1.5 ms before proceeding to allow the attached entity time to synchronize to the new clock source.

- a) When conditions cause the C-Port's Transmit Port Operation Table or the Station's Transmit Station Operation Table to transition from the Transmit Normal state (TS=xTXN) to the Transmit Data state (TS=xTXD), the following order is maintained prior to the transition.

- i) Clock source change.
- ii) Set FxTI=0 (causes PS\_CONTROL.request(Transmit\_mode=No\_fill)).
- iii) Delay by at least 1.5 ms before proceeding.
- iv) Transmit Sequences in the order presented in the FSM.
- v) State Transition.

- b) When conditions cause the C-Port's Transmit Port Operation Table or the Station's Transmit Station Operation Table to transition from the Transmit Data state (TS=xTXD) to the Transmit Normal state (TS=xTXN), the following order is maintained prior to the transition.

- i) Transmit Sequences in the order presented in the FSM.
- ii) Set FxTI=1 (causes PS\_CONTROL.request(Transmit\_mode=Fill)).
- iii) Clock source change.
- iv) Delay by at least 1.5 ms before proceeding.
- v) State Transition.

- c) When conditions cause the C-Port's Transmit Port Operation Table to transition from the Repeat state (TS=PRPT) to the Transmit Normal state (TS=PTXN), the following order is maintained prior to the transition.

- i) Set FPTI=1 (causes PS\_CONTROL.request(Transmit\_mode=No\_fill)).
- ii) Clock source change.
- iii) Delay by at least 1.5 ms before proceeding.
- iv) State Transition.

6. When operating at the High Media Rate, Transmit Sequences and the transmission of Fill are started and performed as follows.

- a) When conditions cause the C-Port's Transmit Port Operation Table or the Station's Transmit Station Operation Table to transition from the Transmit Normal state (TS=xTXN) to the Transmit Data state (TS=xTXD), the following order is maintained prior to the transition.

- i) Transmit Sequences in the order presented in the FSM.
- ii) State Transition.

- b) When conditions cause the C-Port's Transmit Port Operation Table or the Station's Transmit Station Operation Table to transition from the Transmit Data state (TS=xTXD) to the Transmit Normal state (TS=xTXN), the following order is maintained prior to the transition.

- i) Transmit Sequences in the order presented in the FSM.
- ii) State Transition.

7. Evaluation is repeated beginning with Step 1.

**Proposed replacement for 9.1.1.1, lines 59-99 on pages 9.1-2 and 9.1-3.**

5. The transmission of frame data is performed as follows when the C-Port or Station is using the TXI Access Protocol and operating at 4, 16 or 100 Mbit/s.

**Notes and Definitions:**

**1. Clock source change note:**

- No clock source change occurs since the C-Port and Station use the clock source being used by the Transmit Normal state (TS=xTXN).

**2. The following flags are used by the C-Port and Station to control the transmission of idles.**

- FxTI=0: The C-Port or Station *is not* transmitting idles.
- FxTI=1: The C-Port or Station *is* transmitting idles.

The starting point for the transmission of frames is the Transmit Normal state (TS=xTXN). In this state, the C-Port and Station transmit fill by setting FxTI=1 using one of the following interface signals:

- PS\_CONTROL.request(Transmit\_mode=Fill) [C-Port and Station] or
- PM\_CONTROL.request(Transmit\_mode=Fill) [C-Port only].

The following terms are defined.

- *Start-transmit-frame-data*: The C-Port or Station detects the need to transmit a frame.
- *End-transmit-frame-data*: The C-Port or Station detects the end of frame data transmission.

**a) TS=xTXN detects *Start-transmit-frame-data***

When one of the conditions for the *Start-transmit-frame-data* is detected, the C-Port's Transmit Port Operation Table 9.3-2 or the Station's Transmit Station Operation Table 9.2-2 transitions from the Transmit Normal state (TS=xTXN) to the Transmit Data state (TS=xTXD) as follows.

The Transmit Normal state (TS=xTXN) is exited and the following actions shall occur.

- i) The fill being transmitted by TS=xTXN is stopped as follows.
  - (1) The Station stops transmitting fill by setting FSTI=0 using the interface signal:
    - PS\_CONTROL.request(Transmit\_mode=No\_fill).
  - (2) The C-Port stops transmitting fill by setting FPTI=0 using one of the following interface signals:
    - PS\_CONTROL.request(Transmit\_mode=No\_fill) or
    - PM\_CONTROL.request(Transmit\_mode=No\_fill).
- ii) The transmission of the SFS [TX\_SFS(P=x;R=0)] is started.
- iii) When the last octet of the SFS is transmitted, the Transmit Data state (TS=xTXD) is entered and transmit of the frame's data is started.
- iv) The Transmit Data state (TS=xTXD) causes each octet of the frame to be transmitted until one of the following *End-transmit-frame-data* conditions is detected.
  - (1) The frame's end of data (EOD) occurs.
  - (2) A Station Error or C-Port Error occurs.

**b) TS=xTXD detects *End-transmit-frame-data***

When the *End-transmit-frame-data* condition is detected, the C-Port's Transmit Port Operation Table or the Station's Transmit Station Operation Table transitions from the Transmit Data state (TS=xTXD) to the Transmit Normal state (TS=xTXN) as follows.

The Transmit Data state (TS=xTXD) is exited and the following actions shall occur.

- i) The following actions occur if the *End-transmit-frame-data* is caused by the frame's EOD.
  - (1) The transmission of a valid FCS (TX\_FCS) followed by the transmission of the EFS with the I-bit, if present set to 0 and the E-bit set to 0 [TX\_EFS(I=E=0) for 4 and 16 Mbit/s and TX\_EFS(E=0) for the High Media Rate].
  - (2) When the last octet of the EFS is transmitted, the transmission of fill is started as follows.
    - (a) The Station starts transmitting fill by setting FSTI=1 using the interface signal:
      - PS\_CONTROL.request(Transmit\_mode=Fill).
    - (b) The C-Port starts transmitting fill by setting FPTI=1 using one of the following the interface signals:
      - PS\_CONTROL.request(Transmit\_mode=Fill) or
      - PM\_CONTROL.request(Transmit\_mode=Fill).
  - (3) The Transmit Normal state (TS=xTXN) is entered and the transmission of a frame has completed.
- ii) If the *End-transmit-frame-data* is caused by a Station Error or C-Port Error, then one of the following actions occur.
  - (1) If FxASO=0, then the Abort Sequence is supported and the frame is aborted with an Abort Sequence (TX\_AB) as follows.
    - (a) The transmission of the Abort Sequence is started.
    - (b) When the last octet of the Abort Sequence is transmitted, the transmission of fill is started as follows.
      - (i) The Station starts transmitting fill by setting FSTI=1 using the interface signal:
        - PS\_CONTROL.request(Transmit\_mode=Fill).
      - (ii) The C-Port starts transmitting fill by setting FPTI=1 using one of the following the interface signals:
        - PS\_CONTROL.request(Transmit\_mode=Fill) or
        - PM\_CONTROL.request(Transmit\_mode=Fill).
    - (c) The Transmit Normal state (TS=xTXN) is entered and the transmission of a frame has completed.
  - (2) If FxASO=1, then the Abort Sequence is not supported and the frame is aborted with an invalid FCS and the E-bit set to 1 [TX\_INV\_FCS; TX\_EFS(E=1)] as follows.
    - (a) The transmission of the EFS is started.
    - (b) When the last octet of the EFS is transmitted, the transmission of fill is started as follows.
      - (i) The Station starts transmitting fill by setting FSTI=1 using the interface signal:
        - PS\_CONTROL.request(Transmit\_mode=Fill).
      - (ii) The C-Port starts transmitting fill by setting FPTI=1 using one of the following the interface signals:
        - PS\_CONTROL.request(Transmit\_mode=Fill) or
        - PM\_CONTROL.request(Transmit\_mode=Fill).
    - (c) The Transmit Normal state (TS=xTXN) is entered and the transmission of a frame has completed.

6. The C-Port repeat function using the TXI Access Protocol operating at 4, 16 or 100 Mbit/s is performed as follows.

**Notes and Definitions:**

**3. Clock source change notes:**

- At 4 or 16 Mbit/s, 5.7.1 requires the C-Port to delay at least 1.5 ms after a clock source change before proceeding. This delay is required to allow the attached Station's receiver enough time to synchronize to the new clock source.
- At 100 Mbit/s, no clock source change occurs since the C-Port always transmits using signal derived from its internal crystal clock.

**4. The following flags, defined in 9.3, are used to control the C-Port's repeat function.**

- FPRPT=1: The C-Port's Transmit Normal state (TS=PTXN) detects the need to *start* the repeat function.
- FPRPT=0: The C-Port's Repeat state (TS=PRPT) detects the need to *stop* the repeat function.

The starting point for the C-Port repeat function is the Transmit Normal state (TS=xTXN). In this state, the C-Port transmits fill by setting FPTI=1 using one of the following interface signals:

- PS\_CONTROL.request(Transmit\_mode=Fill) or
- PM\_CONTROL.request(Transmit\_mode=Fill).

**a) TS=PTXN detects FPRPT=1**

When the FPRPT=1 condition is detected, the C-Port's Transmit Port Operation Table transitions from the Transmit Normal state (TS=PTXN) to the Repeat state (TS=PRPT) as follows.

The Transmit Normal state (TS=PTXN) is exited and the following actions shall occur.

- i) The C-Port, when operating at 4 or 16 Mbit/s, changes its transmit clock source by setting FPTXC=0 (causes the transmit clock to be derived from the C-Port's received signal).
- ii) The C-Port stops transmitting fill by setting FPTI=0 using one of the following interface signals:
  - PS\_CONTROL.request(Transmit\_mode=No\_fill) *or*
  - PM\_CONTROL.request(Transmit\_mode=No\_fill).
- iii) The C-Port, when operating at 4 or 16 Mbit/s, delays for at least 1.5 ms before proceeding.
- iv) The TS=PRPT state is entered and the following occurs.
 

The data received at the C-Port's receiver is transmitted without change (with the exception of the E-bit which may or may not be set to 1).

**b) TS=PRPT detects FPRPT=0**

When the FPRPT=0 condition is detected, the C-Port's Transmit Port Operation Table transitions from the Repeat state (TS=PRPT) to the Transmit Normal state (TS=PTXN) as follows.

The Repeat state (TS=PRPT) is exited and the following actions shall occur.

- i) The C-Port, when operating at 4 or 16 Mbit/s, changes its transmit clock source by setting FPTXC=1 (causes the transmit clock to be derived from the C-Port's internal crystal clock).
- ii) The C-Port starts transmitting fill by setting FPTI=1 using one of the following interface signals:
  - PS\_CONTROL.request(Transmit\_mode=Fill) *or*
  - PM\_CONTROL.request(Transmit\_mode=Fill).
- iii) The C-Port, when operating at 4 or 16 Mbit/s, delays for at least 1.5 ms before proceeding.
- iv) The Transmit Normal state (TS=PTXN) is entered and the repeat function has completed.

- 205 7. Steps 5 and 6 above cover the operation of the C-Port's Transmit Port Operation Table 9.3-2 and  
206 Station's Transmit Station Operation Table 9.2-2.

207 However, when operating at 4 and 16 Mbit/s, a transmit clock source change (value of FxTXC  
208 changes) can also occur via actions in the C-Port's Join and Monitor Port Operation Tables 9.3-1 and  
209 9.3-3 and the Station's Join and Monitor Station Operation Tables 9.2-1 and 9.2-3. Since this change  
210 in the value of FxTXC *is not* under control of the Transmit Port Operation Table 9.3-2 or Station  
211 Operation Table 9.2-2, enough time for the attached entity to synchronize to the new clock source must  
212 be allowed *before* using the services of these two Transmit tables.

213 Therefore, the following general restriction is put upon *any* transition *outside* the C-Port's Transmit  
214 Port Operation Table and Station's Transmit Station Operation Table that causes the value of FxTXC  
215 to change.

- 216 • The C-Port or Station, when operating 4 or 16 Mbit/s, shall delay at least 1.5 ms *before* attempting  
217 to transmit a frame via the transmit function specified by Port Operation Table 9.3-2 or Station  
218 Operation Table 9.2-2.

- 219 8. Evaluation is repeated beginning with Step 1.