Data Link control → Error control + flow control.
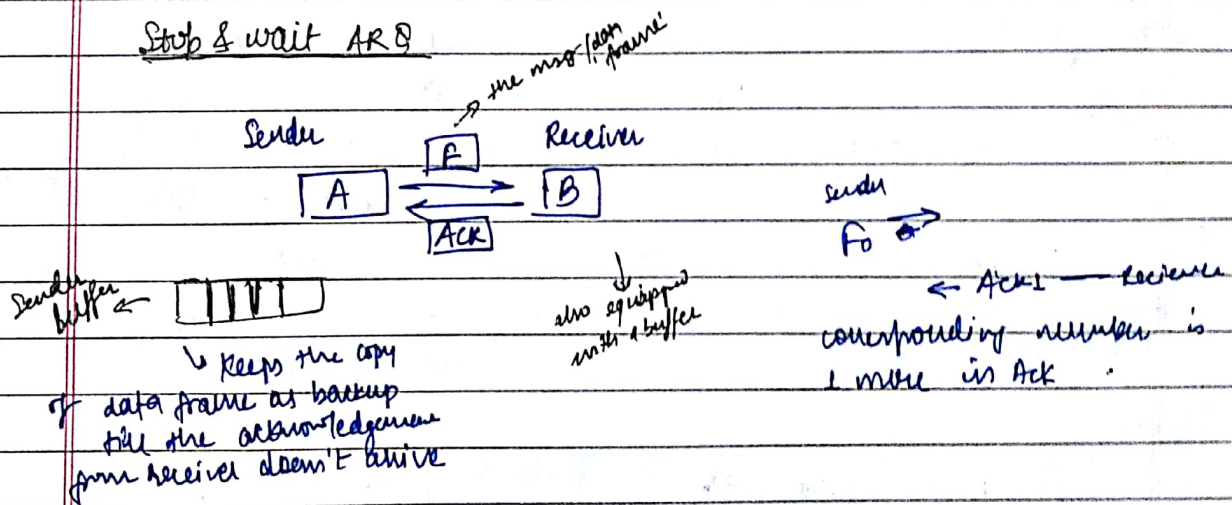
$$A \xrightarrow{\quad L \quad} B$$
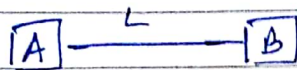
Error control by retransmission

Flow control -

• Transmission of message from sender to receiver whenever there is substantial speed difference b/w sender and receiver.
• Usually very fast sender and very slow receiver.
• There should be a mechanism of feedback from receiver to sender, so that sender can be notified to slow down the transmission then the data loss can be reduced. The solution to this is Automatic Repeat request (ARQ).

Stop & wait ARQ

Sender   Receiver
the msg/data frame

$$A \rightleftarrows B$$
      ACK

Sender buffer ← □ | | | |

↳ keeps the copy of data frame as backup till the acknowledgement from receiver doesn't arrive

also equipped with a buffer

Sender
fo →

← ACK1 — Receiver
corresponding number is 1 more in Ack.

For a discarded msg and for a lost msg both, receiver doesn't send acknowledgement.
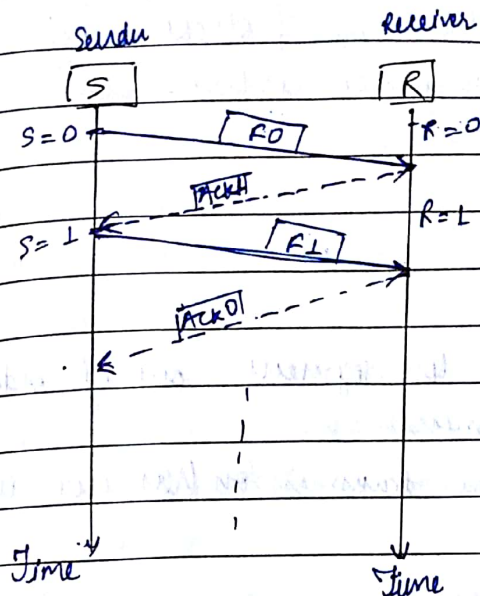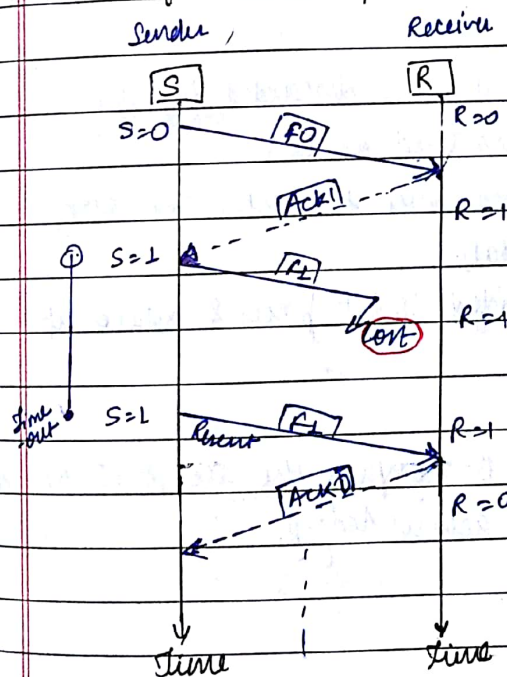
Control variable

S   R   → value of R denotes the value of next frame expected.
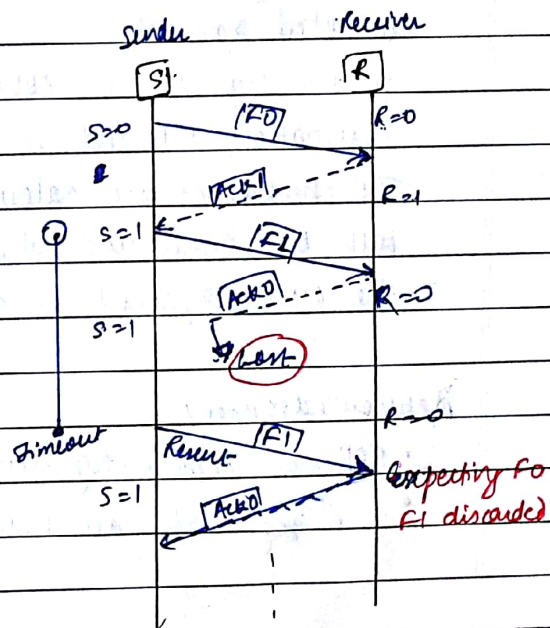0 or 1   0 or 1   → value of R is changed when receiver successfully receives the frame.

Normal operation

Sender   Receiver

S
S=0   F0   R=0
      Ack1   R=1
S=1   F1
      Ack0
Time   Time

Damaged or lost frame   Lost acknowledgement

Sender ,   Receiver   Sender   Receiver

S   R   S   R
S=0   F0   R=0   S=0   F0   R=0
      Ack1   R=1   Ack1   R=1
① S=1   F1   ② S=1   F1
         Lost R=1   Ack0   R=0
Time out S=1 Resent F1 R=1   Lost
              Ack0   R=0   Timeout Resent F1 R=0
Time   Time   S=1   Ack0   Expecting f0
                                                F1 discarded

Sender resends F1, thinking
it was not received. But
receiver expected P0, so it
discards F1. To prevent an
infinite loop, receiver sends
Ack 0, so sender understands
the prev transmission was
successful.