

COMMUNICATION CONTROL DEVICE IN A DUPLEX
TRANSMISSION NETWORK

The present invention relates to a communication control device for a station in a duplex message transmission network in which coded numeral messages are transmitted between stations in time slots within respective frame structures on a same feeder including at least two transmission channels.

In a duplex message transmission network, transmission is effected simultaneously in both directions. As a result of this the slave station called by the master station during a given time slot within a repetitive frame structure can reply to the question asked only during the next time slot during which the two stations will be connected once more. Generally speaking, in order to verify the correct functioning of the transmissions, each message transmitted by a station to another station includes an acknowledgement signal of the message received during the last time slot when these stations were connected.

As a function of this acknowledgement, the previous message must, or need not, be retransmitted.

In order to avoid having to generate such an acknowledgement signal for each time slot, it is known to group the messages into packages containing only one acknowledgement signal. However, in the case of poor reception of a package, obviously the whole of the package must be retransmitted afterwards and this results in a prohibitive occupation of the transmission channels, particularly if only one of the messages in the package was incorrectly received. Moreover, where the slave stations on watch on the same feeder are relatively numerous, such retransmissions slow down the rhythm of transmissions and substantially increase the scrutiny time of these stations.

2.

In order to avoid these disadvantages, it is preferable to generate an acknowledgement signal for the message transmitted during each time slot.

5 It is an object of the present invention to process this acknowledgement signal so that the retransmission time if any is limited to two time slots.

According to the present invention there is provided a communication control device for a station in a duplex message transmission network in which coded
10 numerical messages are transmitted between stations in time slots within respective frame structures on a same feeder including at least two transmission channels, each message transmitted by a station to another station including an acknowledgement signal of the last message
15 received originating from this other station, each station including: a receiver circuit having a message processing device and a coder of the acknowledgement signal of reception to be transmitted; and a transmitter circuit having a transmission control device and a first
20 memory connected thereto for storing the messages to be chronologically transmitted, the output of the coder also being connected to the transmission control device; wherein said communication control device includes in the receiver circuit: an acknowledgement signal detector
25 connected to the transmission control device; an erroneous messages received detector; a switch connected to the output of the erroneous message received detector for placing the messages processing device out of service during successive time slots of the erroneous message and
30 of the following message received originating from the same station, the coder also being connected to the output from the erroneous message detector for the purpose of modifying the said next message to be transmitted to the station which transmitted the received
35 erroneous message; and wherein said communication control

device includes in the transmitter circuit: a second memory connected to the said first memory, and the transmission control device, said second memory storing the two last messages transmitted to the same station, the operation of said communication control device being such as to command the retransmission of the said two last messages in the chronological order in response to the detection of a modified acknowledgment signal indicating the reception of an erroneous message.

The receiver circuit of each station may further include: a transmission channel change-over control device, and a pair of counters whose outputs are connected to the channel change-over control device, the counters being respectively in series with the erroneous messages received detector and with the acknowledgement signal detector, in such manner that the transmission channels are changed if the messages are received erroneously during two consecutive transmissions with the same station.

The present invention will now be described in greater detail by way of examples with reference to the accompanying drawing, wherein:

Figure 1 is a block circuit diagram of one preferred form of communication control device for a station in a duplex message transmission network; and

Figure 2 is a block circuit diagram of a modified communication control device, in which some additional elements having been added.

According to the transmission procedure customarily employed, the master station performs a cyclic scrutiny of the slave stations so as to converse with each of the latter consecutively. With this

object, during the time when the master station is connected to one of the slave stations in a state of watch on the transmission feeder, the master station transmits on a so-called outward channel a single
5 message containing successively between two blocking signals, a signal containing the address of the slave station for which the message is intended, an identification call signal, character signals if required, and a raster control signal, whereas the subordinate
10 station in turn transmits, on a so-called return channel, as soon as its address is received, and whilst it is receiving the rest of the message, a single message containing successively, between two blocking signals, a signal containing its own address, a signal indicating
15 its state, character signals if required and a time slot control signal.

This transmission procedure is known under the name "H D L C" ("High Level Data Link Control"), the structure of which is determined by Standard I SO 3309 -
20 1976.

The signals transmitted during each time slot also include elements permitting any error in the whole of the message to be detected, and also an acknowledgement signal for the last message received from the same
25 station.

The control device according to the invention is responsible for these signals.

Referring now to Figure 1, any station is connected to the two transmission channels 1,2 of the

feeder. The station comprises a transmitter circuit, on the right-hand side of the figure, and a receiver circuit, on the left-hand side of the figure, where they are separated by a chain-dotted line 3. The station thus represented is more particularly, e.g., a slave station, it being understood that the master station, which does not appear in the drawing in that case, comprises the same circuits, but in greater number as will be seen subsequently.

10 In the receiver circuit of the slave station, connected to the channel 2, we find at the input, in parallel, an erroneous message detector 4 and an acknowledgement signal detector 5 for the last message which this station had transmitted towards the same
15 other station. When the slave station illustrated receives an erroneous message from this other station, the detector 4 so informs the coder 6 of the next acknowledgement signal to be transmitted to this other station to which it will then be connected and, simultaneously, a switch 7 places out of service the
20 message processing device to which it is connected by the line 8, so that no erroneous message is processed. Moreover, since the acknowledgement signal issued by the coder 6 can be transmitted only during the next time
25 slot during which the receiver signal will receive a fresh message, the switch 7 must likewise place the message processing device out of service during the next time slot, so that the messages are processed in chronological order. In fact, it is only during the

second time slot after the time slot when the message was erroneous, that the other station will be able to re-transmit the message which was erroneous.

When the station illustrated has itself transmitted a message which has been received erroneously by another station, the latter so informs the former by means of the acknowledgement signal detected by the detector 5 which is connected to the transmission control device 9 of the transmitter circuit connected to the transmission channel 1. This detection therefore takes place during the time slot following the time slot when the message was received erroneously by the other station and during which the station illustrated has transmitted a fresh message. The station illustrated must therefore retransmit chronologically and consecutively during the next two time slots, the message received erroneously and the next message, both of which could not be processed by the other station which includes a switch identical to the switch 7.

With this object, the messages to be transmitted, which are stored in the memory 10 whilst awaiting the transmission time slot, are transferred into the memory 11 at the time of transmission. This memory 11 contains the two last messages transmitted so that if the acknowledgement signal detector 5 informs the control device 9 that a message has been received erroneously, the device 9 can retransmit the two last messages chronologically.

Obviously, the control device 9 is likewise connected to the coder 6 of the acknowledgement signal.

to be transmitted during the next time slot.

A master station of course includes the same elements, but in greater number, since it must have, e.g., as many "memories" as there are slave stations
5 connected to the transmission feeder, and since it must also associate the address of the slave station with the acknowledgement signals so as not to confuse the latter.

The device illustrated in Figure 1 may be
10 improved if the transmission feeder contains a plurality of transmission channels 1, 12, 2, 22.... as shown in Figure 2.

It is in fact then possible to add to it, connected to the erroneous messages received detector 4,
15 a counter 13 for the erroneous messages received during successive time slots during which the station illustrated is connected to the same other station, so that if, e.g., two messages originating from the same station are consecutively received erroneously, a control
20 device 14 commands the changing of the transmission channel used by means of change-over switches 15 and 16, since if two messages have consecutively been received erroneously, there is a strong probability that only the transmission channels used are defective.

25 Such an addition presents the advantage of not necessitating the whole of the network being placed out of service if a transmission channel is defective.

Obviously, in this case, the acknowledgement signal detector 5 must likewise be connected to a

counter 17 and to the control device 14 so that the change of transmission channels occurs simultaneously in both connected stations. The master station may then also order all the slave stations to change transmission channels likewise.

Although only one embodiment of the invention has been described, it is clear that any modification made by the expert in the same spirit would not exceed the scope of the present invention, which finds its application in data transmission and telephony networks.

21



9.

Claims:

1. A communication control device for a station
in a duplex message transmission network in which
coded numerical messages are transmitted between
stations in time slots within respective frame
structures on a same feeder including at least two
transmission channels, each message transmitted by a
station to another station including an
acknowledgement signal of the last message received
originating from this other station, each station
including: a receiver circuit having a message
processing device and a coder of the acknowledgement
signal of reception to be transmitted; and a
transmitter circuit having a transmission control
device and a first memory connected thereto for
storing the messages to be chronologically
transmitted, the output of the coder also being
connected to the transmission control device;
wherein said communication control device includes
in the receiver circuit: an acknowledgement signal
detector connected to the transmission control
device; an erroneous messages received detector; a
switch connected to the output of the erroneous
message received detector for placing the messages
processing device out of service during successive



10.

time slots of the erroneous message and of the following message received originating from the same station, the coder also being connected to the output from the erroneous message detector for the purpose of modifying the said next message to be transmitted to the station which transmitted the received erroneous message; and wherein said communication control device includes in the transmitter circuit: a second memory connected to the said first memory, and the transmission control device, said second memory storing the two last messages transmitted to the same station, the operation of said communication control device being such as to command the retransmission of the said two last messages in the chronological order in response to the detection of a modified acknowledgment signal indicating the reception of an erroneous message.

2. A communication control device according to claim 1, wherein the receiver circuit of each station further includes: a transmission channel change-over control device, and a pair of counters whose outputs are connected to the channel change-over control device, the counters being respectively in series with the erroneous messages received

23



11.

5 detector and with the acknowledgement signal
detector, in such manner that the transmission
channels are changed if the messages are received
erroneously during two consecutive transmissions
with the same station.

3. A communication control device for a station in
a duplex message transmission network, constructed
and arranged to operate substantially as herein
described with reference to and as illustrated in
Fig. 1 or Fig. 2 of the accompanying drawings.

The text of the specification has been reproduced by photocopying the applicants original
typescript. It may contain a few amendments which are difficult to read. The original
typescript containing these amendments may be inspected on the premises of the Patent Office