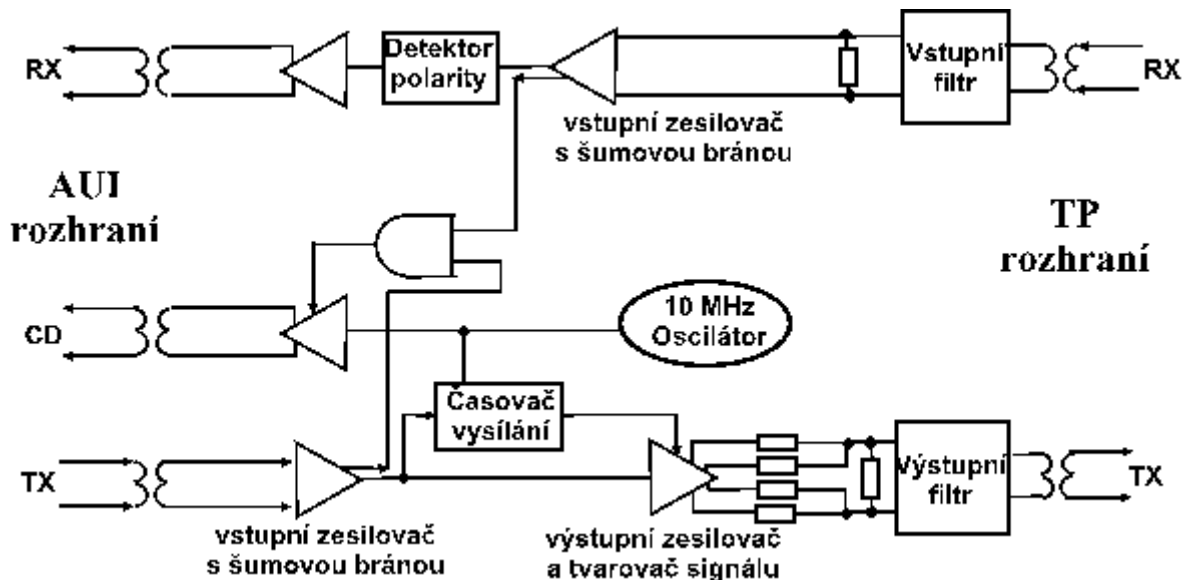


TPEX - Twisted Pair Ethernet Transceiver



Main parts of a TP MAU

The main component of a TP MAU is usually [Am79C98](#) or its clone. The schematic of this TPEX - Twisted-Pair Ethernet Transceiver - is actually fairly simple:



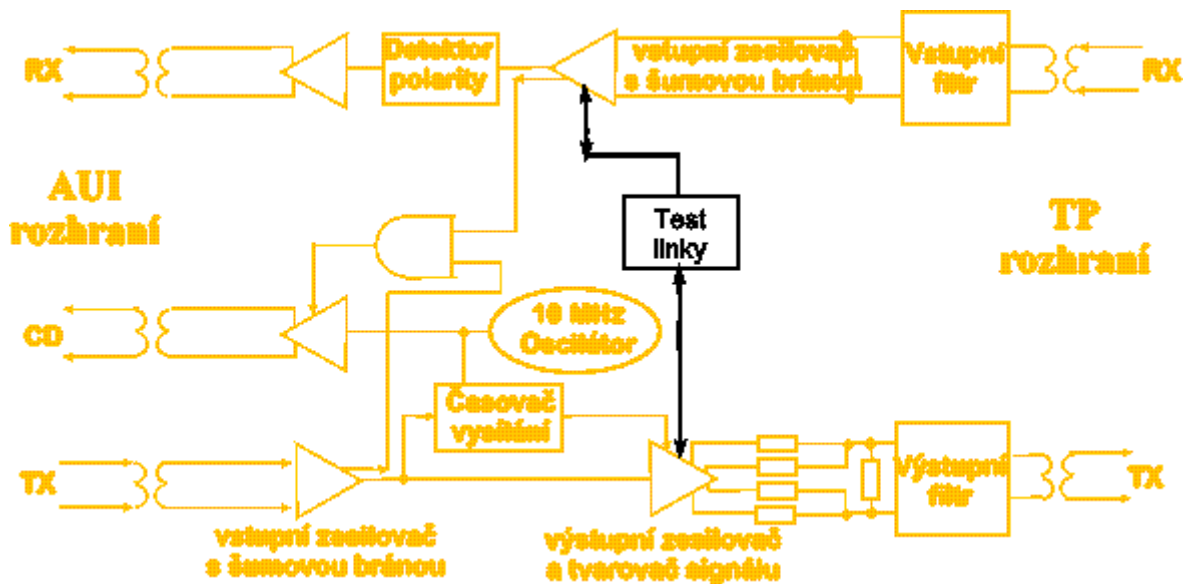
- At the transmitter side, signal coming from AUI is amplified and leads into the output driver that provides two pairs of symmetric signals. One of them is only amplified, the other one is delayed by 50 ns. They are added on external resistors, and a waveform similar to [Figure 3](#) results. This goes into the output hybrid transformer/filter. Whenever no transmission is going on, output TP driver is closed by the noise gate.
- At the receiver side, signal coming through the hybrid transformer/filter is amplified in the input amplifier and leads to AUI drivers through a noise gate circuit. "Polarity detector" shifts the phase by 180 degrees if the cable wiring is wrong (pair polarity reversed).
- Except for these "signal shapers", TPEX contains a collision detector. Collision on TP is detected differently than on coax. Since the line is not shared between several transmitters, DC level cannot be used to detect collisions. However, another principle is used: By definition, whenever someone transmits, others have to be silent. So, if the TPEX detects simultaneous activity of both the transmitting and the receiving parts, a collision is signalled (AUI CD signal).

Supplemental TP MAU functions

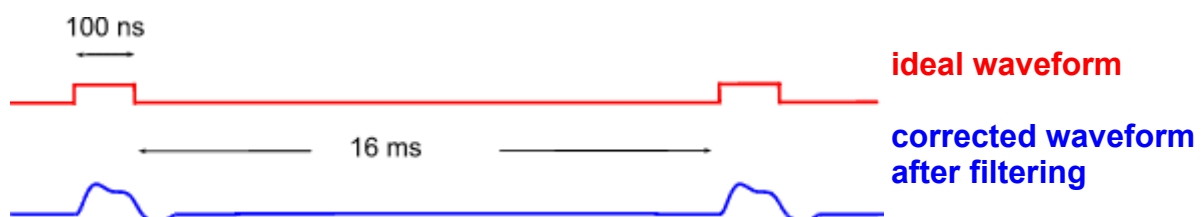
Previously mentioned circuits do not provide any diagnostic functions. Let's take an example. A measuring device is supposed to transmit once per hour. It is clearly not a good idea to wait for a transmission to test the link. Therefore, several diagnostic functions were added to the TP circuitry. One of them is local loopback that returns transmitted data from AUI(TX) to the receiver output AUI(RX). The schematics above assume use of this function in diagnostic mode only; however, quite a number of devices turn this function on by default. Then, during transmission, transmitted data are being received at the same time. However, if a collision occurs, the loopback is turned off, and true received data are on the output. So, the entire circuit behaves as if coax cable was used instead of TP.

1) Link test

Link test is the primary diagnostic function. The following figure shows its block schematic:



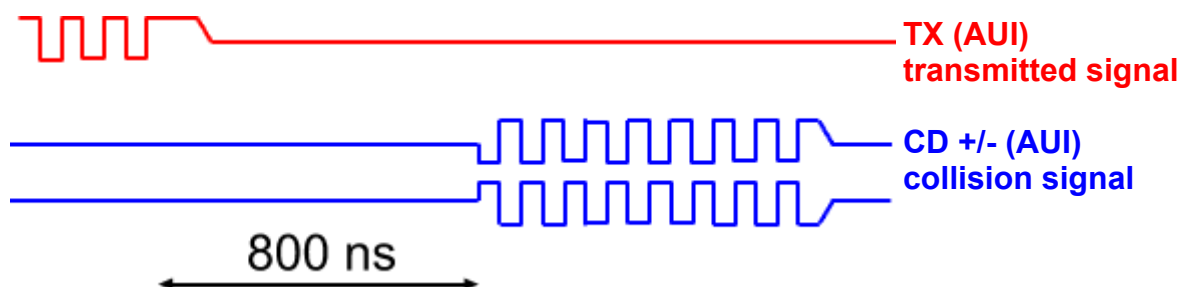
This circuit checks line connection and polarity. The method is simple - whenever there's nothing to transmit for a long time, usually about 16 ms, the following link test pulse is transmitted.



Receiving circuits use a time window specifying the minimum (about 4 ms) and maximum (about 60 ms) times from the previous activity (transmission of data or the previous link pulse) of the other side, where link test pulses may be received. If none are detected within about 64 ms, "connection lost" is signalled. Usually, a "Link" LED on the device turns off. Since the polarity and shape of the link test pulse is known, it can be used to detect whether the wire pair has been reversed, therefore reversing signal polarity. This kind of error is detected by polarity detector that can also correct for it. Receiver does not pass link test pulses to its output. Link test is a standard diagnostic tool and should be turned ON whenever possible. Modified versions are used to detect device capabilities; most important, ability to communicate at 100 Mbps and full-duplex. For example, full-duplex capability is signalled by 16 link test pulses in standard timing followed by one "fast" pulse that is about 5 ms apart from the previous one.

2) SQE (Heartbeat) Test

Signal Quality Test, also called Heartbeat test is a supplemental diagnostic function. It is used to test collision signalization at the AUI. If turned on, collision signal (CD) also signals end of packet transmission, besides collisions. Specifically, the device waits 800 ns (8 bits) after transmission ends, and then sends 8 bits to the collision detection (CD) output. The situation is detailed in the following figure:



SQE is a supplemental test, and its default setting is OFF, unless required otherwise. Using a MAU with SQE test turned on together with a dumb repeater usually leads to problems.

References

-  [Allied Telesyn International CentreCOM Micro Transceivers AT-MX10, AT-MX20, AT210](#) (2 pg.) [\[local copy\]](#)
-  [am79C98 Twisted-Pair Ethernet Transceiver \(TPEX\)](#) (22 pg.) [\[local copy\]](#)
-  [am79C100 Twisted-Pair Ethernet Transceiver Plus \(TPEX+\)](#) (24 pg.) [\[local copy\]](#)
-  [CS8900 High-Integrated ISA Ethernet Controller](#) (132 pg.) [\[local copy\]](#)
-  [CS8900A Product Data Sheet](#) (128 pg.) [\[local copy\]](#)
-  [AN073 - Magnetic Manufacturers for Networking Product Applications](#) (12 pg.) [\[local copy\]](#)
-  [LXT901/907 Universal 10BASE-T and AUI Transceivers](#) (40 pg.) [\[local copy\]](#)
-  [LXT902 Ethernet Twisted-Pair Media Attachment Ethernet Twisted-Pair Media Attachment Unit](#) (40 pg.) [\[local copy\]](#)
-  [LXT908 Universal 3.3V 10BASE-T and AUI Transceiver](#) (40 pg.) [\[local copy\]](#)
-  [MTD213 Ethernet Interface Adapter](#) (12 pg.) [\[local copy\]](#)
-  [MTD214 Ethernet Encoder/decoder and 10BaseT Transceiver with Built-in Waveform Shaper](#) (11 pg.) [\[local copy\]](#)
-  [MTD907 Ethernet Encoder/decoder and 10BaseT Transceiver with Built-in Waveform Shaper](#) (14 pg.) [\[local copy\]](#)
-  [10BaseT Network Components, with filter](#) (6 pg.) [\[local copy\]](#)
-  [10BaseT Network Components, without filter](#) (4 pg.) [\[local copy\]](#)
-  [LAN Isolation Transformer Catalog](#) (10 pg.) [\[local copy\]](#)
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