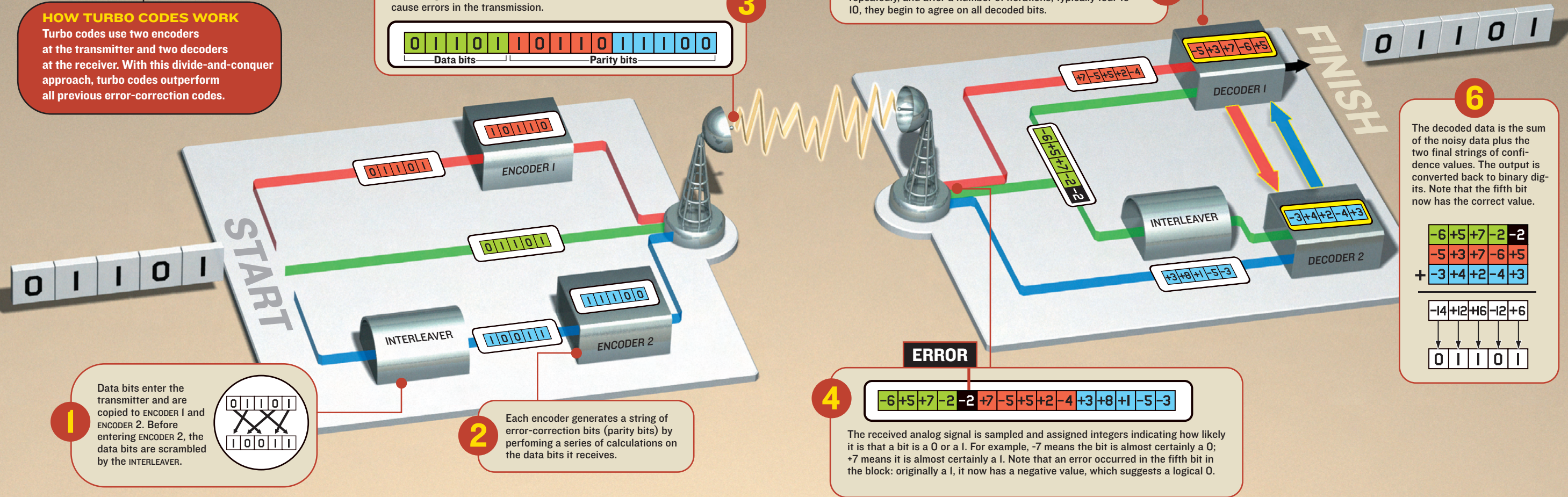
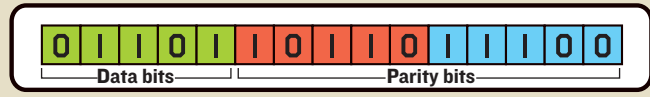


HOW TURBO CODES WORK

Turbo codes use two encoders at the transmitter and two decoders at the receiver. With this divide-and-conquer approach, turbo codes outperform all previous error-correction codes.

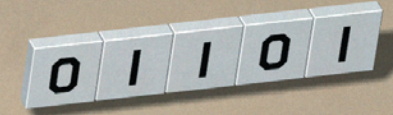


The original data bits plus the two strings of parity bits are combined into a single block and then sent over the channel, where noise can cause errors in the transmission.



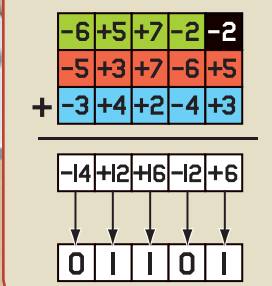
Each decoder takes the noisy data and respective parity information and computes how confident it is about each decoded bit. The two decoders exchange this confidence information repeatedly, and after a number of iterations, typically four to 10, they begin to agree on all decoded bits.

5



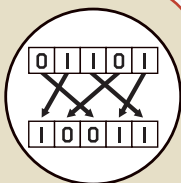
6

The decoded data is the sum of the noisy data plus the two final strings of confidence values. The output is converted back to binary digits. Note that the fifth bit now has the correct value.



1

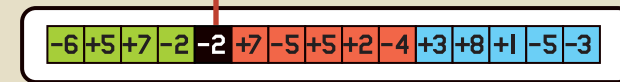
Data bits enter the transmitter and are copied to ENCODER 1 and ENCODER 2. Before entering ENCODER 2, the data bits are scrambled by the INTERLEAVER.



2

Each encoder generates a string of error-correction bits (parity bits) by performing a series of calculations on the data bits it receives.

4



The received analog signal is sampled and assigned integers indicating how likely it is that a bit is a 0 or a 1. For example, -7 means the bit is almost certainly a 0; +7 means it is almost certainly a 1. Note that an error occurred in the fifth bit in the block: originally a 1, it now has a negative value, which suggests a logical 0.