

How many bytes is TCP header? What are the different fields? How are the field values set?

Verify in Wireshark.

The size of the TCP header is minimum 20 bytes (160 bits). It can be larger if options are included.

The different fields are:

1. Source Port (2 bytes): Port number of the sending application.
2. Destination Port (2 bytes): Port number of the receiving application.
3. Sequence Number (4 bytes): Sequence number of the first byte in this segment (used for ordering).
4. Acknowledgment Number (4 bytes): Sequence number of the next byte that the sender of the ACK expects.
5. Data Offset (4 bits): Size of the TCP header in 32-bit words.
6. Reserved (3 bits): Reserved for future use; should be set to zero.
7. Control Flags (9 bits): Control flags (URG, ACK, PSH, RST, SYN, FIN).
8. Window Size (2 bytes): Size of the sender's receive window (flow control).
9. Checksum (2 bytes): Error-checking value for the header and data.
10. Urgent Pointer (2 bytes): Pointer to the urgent data if the URG flag is set.
11. Options (variable length): Used for additional features like Maximum Segment Size, window scaling.

Transmission Control Protocol (TCP) Header 20-60 bytes

source port number 2 bytes				destination port number 2 bytes			
sequence number 4 bytes							
acknowledgement number 4 bytes							
data offset 4 bits		reserved 3 bits		control flags 9 bits		window size 2 bytes	
checksum 2 bytes				urgent pointer 2 bytes			
optional data 0-40 bytes							

Wireshark interface showing a packet capture on the 'tcp' filter. The packet list shows a TCP segment (No. 27) from 192.168.15.134 to 157.240.242.14, Seq=33, Ack=29, Len=0. The packet details pane shows the following information:

```

Frame 27: 62 bytes on wire (496 bits), 62 bytes captured (496 bits) on interface \Device\NPF...
Ethernet II, Src: LCFCElectron_34:0d:77 (88:a4:c2:34:0d:77), Dst: Routerboardc_3a:5e:23 (cc:2d:e0:00:10:00)
PPP-over-Ethernet Session
Point-to-Point Protocol
Internet Protocol Version 4, Src: 192.168.15.134, Dst: 157.240.242.14
Transmission Control Protocol, Src Port: 51778, Dst Port: 443, Seq: 33, Ack: 29, Len: 0
  Source Port: 51778
  Destination Port: 443
  [Stream index: 1]
  [Conversation completeness: Incomplete (12)]
  [TCP Segment Len: 0]
  Sequence Number: 33 (relative sequence number)
  Sequence Number (raw): 3294685646
  [Next Sequence Number: 33 (relative sequence number)]
  Acknowledgment Number: 29 (relative ack number)
  Acknowledgment number (raw): 1038366895
  0101 .... = Header Length: 20 bytes (5)
  Flags: 0x010 (ACK)
  Window: 1024
  [Calculated window size: 1024]
  [Window size scaling factor: -1 (unknown)]
  Checksum: 0x5ae6 [unverified]
  [Checksum Status: Unverified]
  Urgent Pointer: 0
  [Timestamps]
  [SEQ/ACK analysis]

```

The packet bytes pane shows the raw data of the TCP segment, including the header and application data.

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Transmission Control Protocol, Src Port: 51778, Dst Port: 443, Seq: 33, Ack: 29, Len: 0
  Source Port: 51778
  Destination Port: 443
  [Stream index: 1]
  [Conversation completeness: Incomplete (12)]
  [TCP Segment Len: 0]
  Sequence Number: 33 (relative sequence number)
  Sequence Number (raw): 3294685646
  [Next Sequence Number: 33 (relative sequence number)]
  Acknowledgment Number: 29 (relative ack number)
  Acknowledgment number (raw): 1038366895
  0101 .... = Header Length: 20 bytes (5)
  Flags: 0x010 (ACK)
  Window: 1024
  [Calculated window size: 1024]
  [Window size scaling factor: -1 (unknown)]
  Checksum: 0x5ae6 [unverified]
  [Checksum Status: Unverified]
  Urgent Pointer: 0
  [Timestamps]
  [SEQ/ACK analysis]

```