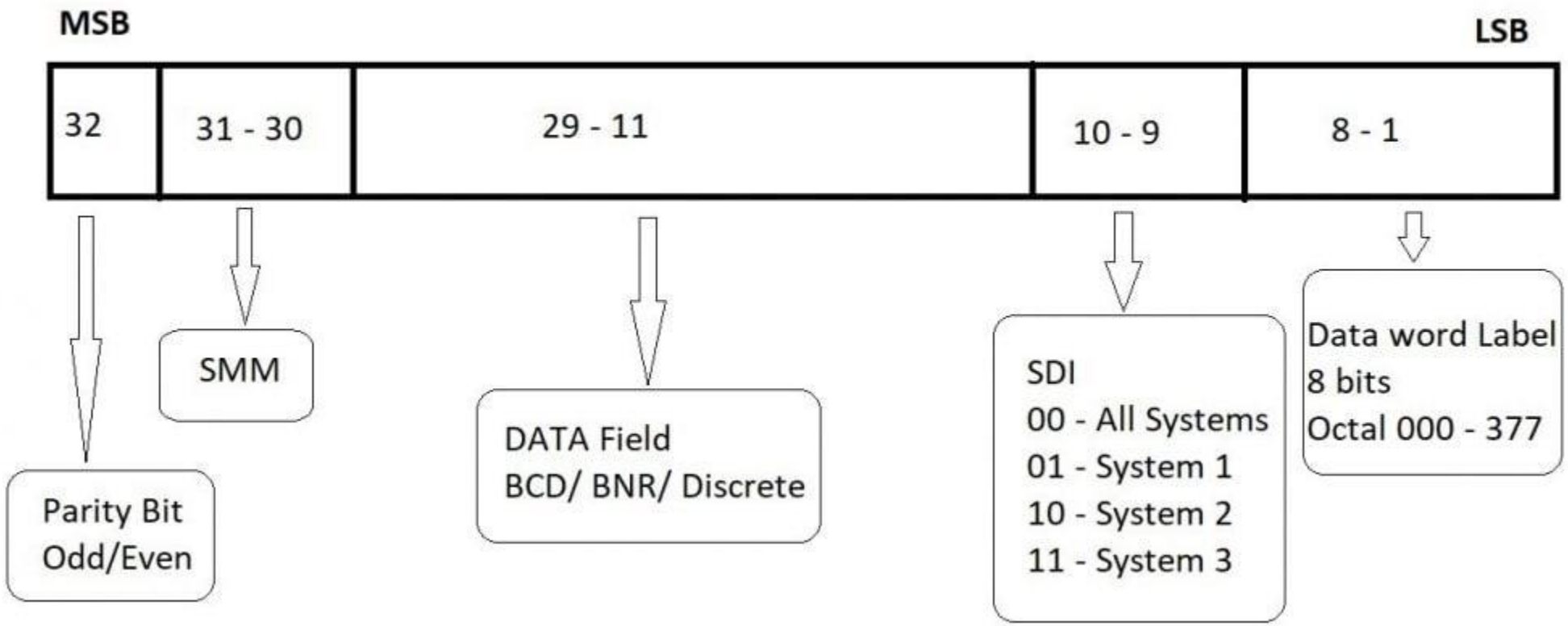
ARINC-429 Data Encoding

Homework 4

What is ARINC-429?

- Data transfer standard for aircraft avionics
- Used to exchange position, velocity, and other important info
- 32-bit data word – each message is 4 bytes in length
- Message is in Big Endian format – most significant byte is first
- 5 fields in each message
  1. P – parity
  2. SSM – Sign / Status Matrix
  3. Data
  4. SDI – Source / Destination Identifier
  5. Label – identifies the data type.



Note that the bits are numbered from 1 instead of 0

Parity

Helps detect transmission errors

Single bit field

Parity is “odd”

Parity is set to result in an odd number of 1’s in the message

SSM – Sign / Status Matrix

2 bit field

For Binary Data Messages (the ones we will be using) the encoding is:

00 – Failure Warning
01 – No Computed Data
10 – Functional Test
11 – Normal Operations

We will only encode messages for Normal Operations

Data

19 bit field

2’s compliment format

Scaled value – the scaling factor, or resolution, is dependent upon the specific message

For example:

- Altitude is in increments of 1/8 foot
- Pitch, roll, and azimuth are in increments of 180 / 2 ^ 15 degrees, 15 of the 19 bits are used
- North and east velocity are in increments of 1/64 of a knot
- Down velocity is in increments of 1/8 feet per second

SDI – Source / Destination Identifier

2 bit field

Use 00 to indicate “all systems”

Label

8 bit field

Value traditionally shown in octal

Examples:

- 261 – Altitude
- 266 – Velocity in north direction
- 267 – Velocity in east direction
- 345 – Velocity in down direction
- 324 – Pitch angle

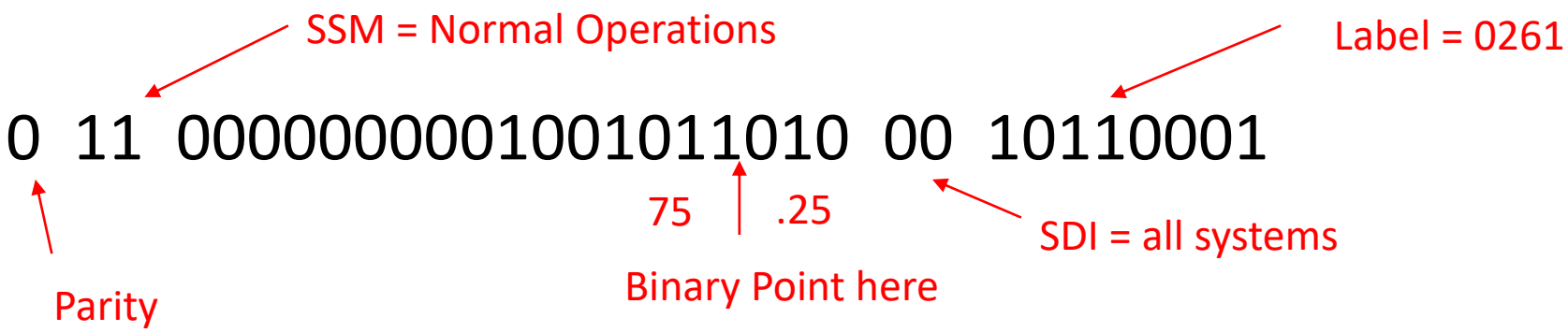
Altitude Message – Label 0261

- The altitude has a resolution of 0.125 (1/8)
- 3 of the 19 data bits are to the right of the binary point

Example: 75.25

Message is: 60 09 68 b1

01100000 00001001 01101000 10110001



The Problem

- Write a function that encodes a specified height into an ARINC altitude message
- Print the 4 bytes of the message in hex
  - Put a space between each byte of the message
- Demonstrate your conversion with the following values:

Value	Expected Result
1.0	60 00 20 b1
-0.5	7f ff f0 b1
75.25	60 09 68 b1

Submission of Homework

- Homework due on Wednesday October 5
- Submit printout of source code
- Submit screenshot of results – all three required test cases

- Style matters – make sure your code is easy to read

Requirements

Threshold

- The 3 specified test cases produce the correct output

Objective

- Follow style guide
- Submitted on time