Project: ARS430 Ethernet

RDI Signal Definition: v1.00

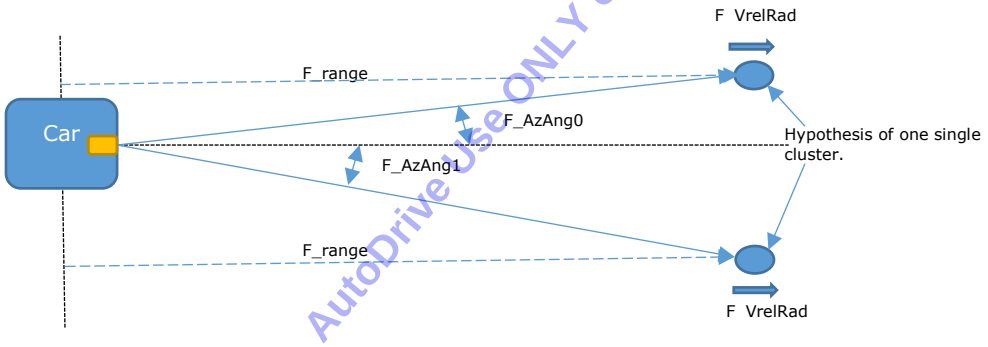
RDI Signal Definition

1. **F_Range**: The range of a target is the radial/longitudinal distance from the **ego** sensor (ego meaning self) to that target. Range is measured in meters and is calculated using frequency shift between the transmitted and the received signals.

Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_Range	0	16	uint16	0	300	0.004577776	m

2. **F_AzAng0 & F_AzAng1**: The azimuth angle is defined as the lateral angle between the targets location and the center of the ego sensor and it's measured in radians. We have two angles denoting two hypothesis for the targets position. As these are raw information, the azimuth angle ambiguity is yet to be resolved. The positive angle denotes that the target resides in the right to the center of the sensor and vice versa.

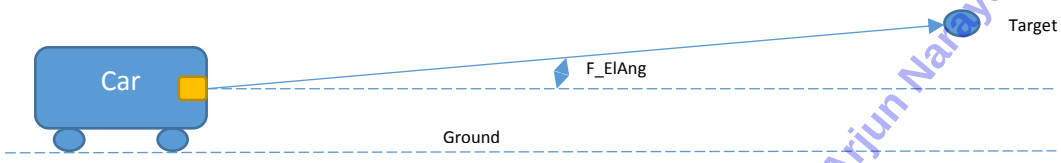
Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_AzAng0 & 1	32	16	sint16	-3.14159	3.141592654	9.58767E-05	rad



3. **F_VrelRad**: Relative radial velocity is defined as relative longitudinal velocity of the target with ego sensor being the center of frame of reference. A relative longitudinal velocity of a target is calculated by the VrelX = VabX – EgosSeed. In another words, the relative speed is calculated as absolute velocity of the target subtracted by the ego vehicle's speed. The absolute velocities of the target is the velocity relative to ground. A positive value represents a target with high velocity than the ego car and a negative value represents a target with lower velocity than the ego car. Relative longitudinal velocity of the object with ego sensor being the center of frame of reference and is measured in meters per second (m/s).

Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_VrelRad	16	16	sint16	-150	150	0.004577776	m/s

4. **F_ElAng**: Denotes the elevation angle of the target from the center of the ego car. The elevation angle is also a signed integer representing if the target is above the center of the car or below the center of the car. It's represented in radians.



Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_ElAng	64	16	sint16	-3.14159	3.141592654	9.58767E-05	Rad

5. **F_ RCS0 & F_ RCS1**: Radar Cross Section id defined as the reflected power from the target in what decibels. RCS is dependent on azimuth angle of the target and hence for each azimuth angle, there corresponding RCS if formed.

Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_RCS0 & 1	80	16	sint16	-100	100	0.003051851	dBm^2

6. **F_Prob0 & F_Prob1**: This prob 0 & 1 signal denotes the probability of the corresponding azimuth hypothesis representing the right location of the target. For a .9 prob0 and 0.1 prob1, the corresponding F_AzAng0 is highly likely to be a true estimation.

Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_Prob0 & 1	112	8	uint8	0	1	0.003937008	

7. **f_RangeVar**: Range variance can be defined as the measure of range divergence. It typically shows how much the range may vary in regards to its absolute value (f_range).

Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_RangeVar	128	16	uint16	0	10	0.000152593	m^2

8. **f_VrelRadVar**: Radial range velocity variance can be defined as the measure of velocity divergence. It typically shows how much the radial range velocity may vary in regards to its absolute value (f_vrelRad).

Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_VrelRadVar	144	16	uint16	0	10	0.000152593	$(m/s)^2$

9. **f_AzAngVar0 & f_AzAngVar1**: Azimuth angle variance can be defined as the measure of angle divergence. It typically shows how much the azimuth angle may vary in regards to its absolute value (f_AzAng0&1).F_ AzAngVar0 & F_AzAngVar1 corresponds to F_ AzAng0 and F_ AzAng1 respectively.

Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_AzAngVar0	160	16	uint16	0	1	1.52593E-05	$(rad)^2$

10. **f_ElAngVar**: Elevation angle variance can be defined as the measure of angle divergence. It typically shows how much the elevation angle may vary in regards to its absolute value (f_ ElAng).

Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_ElAngVar	192	16	uint16	0	1	1.52593E-05	$(rad)^2$

11. **f_Pdh0**: Pdh0 signal is a combination of multiple flags representing the plausibility of a false detection. Pdh0 is calculated based on the raw radar detection properties. Each bit in this 8 bit signal corresponds a particular property in the list below.

	Property	Bit location	Value
1	Probability of false detection for near range.	0	0/1
2	Probability of false detection from inference	1	0/1
3	Probablity of detection being a sidelobe rather than the real detection	2	0/1
4	Bias Correction factor was applied to doppler and it may be less accurate	3	0/1
5	Cluster was not the local maximum detection in range spectrum	4	0/1
6	Difference between beam selected by beam former and monopulse detection(max 8 beams).	5	0/1
7	Difference between beam selected by beam former and monopulse detection(max 8 beams).	6	0/1

An example value of 104 representation in binary is 01101000, which states that this particular cluster has the {7, 6, 4} properties from the above table.

Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_Pdh0	208	8	uint8	0	255		

12. **F_SNR**: Signal to noise ratio is defined as the ration of power of the reflected signal to the power of the reflected background noise.

Signal	BitPos	BitSize	Type	MinPhys	MaxPhys	Resolution	Unit
f_SNR	216	8	uint8	11	36.5	0.1	dBr