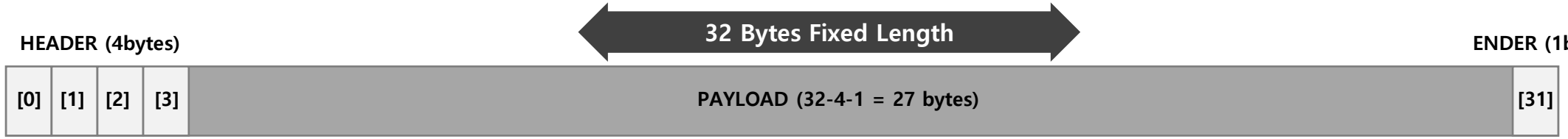
XRP-2000

Native Data Protocol
(ver: 0.21)

2024.09.16

[XRP-Binary] Data Structure



HEADER (4bytes)

[0] INTERFACE Class

Interface Class	
UDP (ETH & WiFi)	**0x27**
BlueTooth	**0x28**
Serial (RS232)	**0x29**
CAN	**0x31**

[1] MESSAGE Class

Message Class	
None	0x00
Command	0x3C
Configuration	0x3D
Data	**0x3E**

[2] DEVICE ID : XRP-2000 Device ID (0~63)

[3] MESSAGE ID

ENDER (1bytes)

[31] check sum

: XOR of [3]~[30]

```
byte chk = 0;
for(int i=3; i<31; i++) chk ^= buff[i];
buff[31] = chk;
```

Message ID		Description	Contents	Output Config
SOLUTION CORE	0x30	Solution Location Data	Solution Type, LAT, LON, Height, Heading...	Default (Always)
SOLUTION TIME	0x31	Solution Time Data	Time, Speed, Velocity, System Hz...	
GNSS STATE1	0x32	States of GNSS 0 and 1	Fixed Mode, RTK Mode, Num of SV, GPS Hz...	CFG_OUTMSG_GNSS_STATE
GNSS STATE2	0x33	States of GNSS 0 and 1	GNSS Accuracy, Movement Speed...	
GNSS0 RAW	0x34	Location of GNSS 0	LAT, LON, Height, Heading...	CFG_OUTMSG_GNSS_RAW
GNSS1 RAW	0x35	Location of GNSS 1	LAT, LON, Height, Heading...	
IMU STATE	0x36	Attitude of IMU 0 and 1	Roll, Pitch, Yaw, YawRate...	CFG_OUTMSG_IMU_ATT
IMU0 RAW	0x37	Raw of IMU 0	Accel, Gyro	CFG_OUTMSG_IMU_RAW0
IMU1 RAW	0x38	Raw of IMU 1	Accel, Gyro	CFG_OUTMSG_IMU_RAW1
SOLUTION GT	0x39	Location of GT	LAT, LON, Height, Heading...	CFG_OUTMSG_SOL_GT

[XRP-Binary] MSG_ID_DAT_SOL_CORE

MSG_ID_DAT_SOL_CORE									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
SOL_TYPE	BYTE	1	4	4	-	-	0~6	Solution Type	0: Not Valid, 1: Only Single GNSS1, 2: Only Single GNSS0, 4: Double Fixed GNSS, 6: DR
SOL_LAT	DOUBLE	8	5	12	-	deg	-	Latitude	
SOL_LON	DOUBLE	8	13	20		deg	-	Longitude	
SOL_HEIGHT	FLOAT	4	21	24	-	m	-	Height above ellipsoid	
SOL_HEAD_DEG	FLOAT	4	25	28	-	deg	-360.0 ~ 360.0	Heading	
SYS_ISTATE	BYTE	1	29	29	-		-	Input System State Bits	0: ICAMERA, 1: IESP32, 2: IOBD, 3: INTRIP, 4: IEBIMU, 5: IEXIMU, 6: ICARCAN, 7: IEBIMU
SYS_OSTATE	BYTE	1	30	30	-		-	Output System State Bits	0: POWER, 1: OESP32, 2: OETH, 3: OCAN, 4: ORS232, 5: OADIS, 6: OWIFI, 7: OBT

[XRP-Binary] MSG_ID_DAT_SOL_TIME

MSG_ID_DAT_SOL_CORE									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
SYS_DT_MS	BYTE	1	4	4	-	ms	-	Timer time between step	
SYS_FT_MS	BYTE	1	5	5	-	ms	-	Timer time between logic	
SYS_RDT_MS	BYTE	1	6	6	-	ms	-	Real-time time between step	
SYS_RFT_MS	BYTE	1	7	7	-	ms	-	Real-time time between logic	
SOL_time_year1	BYTE	1	8	8	-	Year	0~24~	Year (last two digit)	Year = SOL_time_year1 + 2000;
SOL_time_month	BYTE	1	9	9	-	Month	-	Month	
SOL_time_day	BYTE	1	10	10	-	Day	-	Day	
SOL_time_hour	BYTE	1	11	11	-	Hour	-	Hour	
SOL_time_min	BYTE	1	12	12	-	Min	-	Minute	
SOL_time_sec	BYTE	1	13	13	-	Sec	-	Second	
SOL_time_msec	UINT16	2	14	15	-	ms	-	Milli-second	
SOL_VEL_N	INT16	2	16	17	/100	m/s	-	NED north velocity	SOL_VEL_N = (float)_ival / 100.0;
SOL_VEL_E	INT16	2	18	19	/100	m/s	-	NED east velocity	SOL_VEL_E = (float)_ival / 100.0;
SOL_VEL_D	INT16	2	20	21	/100	m/s	-	NED down velocity	SOL_VEL_D = (float)_ival / 100.0;
SOL_UTM_SPD	INT16	2	22	23	/100	m/s	-	XRP UTM Speed (2-D)	SOL_UTM_SPD = (float)_ival / 100.0;
SOL_PVT_SPD	INT16	2	24	25	/100	m/s	-	UBX Ground Speed (2-D)	SOL_PVT_SPD = (float)_ival / 100.0;
SOL_CAR_SPD	INT16	2	26	27	/100	m/s	-	Vehicle Speed (2-D)	SOL_CAR_SPD = (float)_ival / 100.0;
CARSPD_CAN_MS	INT16	2	28	29	/100	m/s	-	CAN Speed Data	CARSPD_CAN_MS = (float)_ival / 100.0;
SOL_CAR_SPD_SRC	BYTE	1	30	30	-	-	-	0:OBD-II, 1:WheelTick, 2:WheelCounter, 3:CARCAN	

[XRP-Binary] MSG_ID_DAT_GNSS_STATE1

MSG_ID_DAT_GNSS_STATE1								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION
GPS0_MYSTATE	BYTE	1	4	4	-	-	-	0: NO_SIGNAL, 1: JUST_RECOVERED, 2: RECOVERED_NORTK, 3: RECOVERED_RTK
GPS0_SENSED	BYTE	1	5	5	-	-	-	This data is sensed (not extrapolated)
GPS0_fixType	BYTE	1	6	6	-	-	-	0: no fix, 1: dead reckoning only, 2: 2D-fix, 3: 3D-fix, 4: GNSS + dead reckoning combined, 5: time only fix
GPS0_gnssFixOK	BYTE	1	7	7	-	-	-	1 = valid fix (i.e within DOP & accuracy masks)
GPS0_diffSoln	BYTE	1	8	8	-	-	-	1 = differential corrections were applied
GPS0_carrSoln	BYTE	1	9	9	-	-	-	Carrier phase range solution status: 0 = no solution, 1 = floating solution, 2 = fixed solution
GPS0_NUMSV	BYTE	1	10	10	-	-	-	Number of satellites used in Nav Solution
GPS0_rtcmEnabled	BYTE	1	11	11	-	-	-	1 = Currently RTCM data corrects GNSS singal
GPS0_DT_MS	UINT16	2	12	13	-	ms	-	DT between previous signal
GPS0_rawState	BYTE	1	14	14	-	-	-	0: I2C Online, 1:CallBack Online, 2: HPPOS Online
GPS1_MYSTATE	BYTE	1	15	15	-	-	-	0: NO_SIGNAL, 1: JUST_RECOVERED, 2: RECOVERED_NORTK, 3: RECOVERED_RTK
GPS1_SENSED	BYTE	1	16	16	-	-	-	This data is sensed (not extrapolated)
GPS1_fixType	BYTE	1	17	17	-	-	-	0: no fix, 1: dead reckoning only, 2: 2D-fix, 3: 3D-fix, 4: GNSS + dead reckoning combined, 5: time only fix
GPS1_gnssFixOK	BYTE	1	18	18	-	-	-	1 = valid fix (i.e within DOP & accuracy masks)
GPS1_diffSoln	BYTE	1	19	19	-	-	-	1 = differential corrections were applied
GPS1_carrSoln	BYTE	1	20	20	-	-	-	Carrier phase range solution status: 0 = no solution, 1 = floating solution, 2 = fixed solution
GPS1_NUMSV	BYTE	1	21	21	-	-	-	Number of satellites used in Nav Solution
GPS1_rtcmEnabled	BYTE	1	22	22	-	-	-	1 = Currently RTCM data corrects GNSS singal
GPS1_DT_MS	UINT16	2	23	24	-	ms	-	DT between previous signal
GPS1_rawState	BYTE	1	25	25	-	-	-	0: I2C Online, 1:CallBack Online, 2: HPPOS Online
NTRIP_BYTES	UINT16	2	26	27	-	-	-	RTCM Byte Counts
OBD_SPD_KMHx100	INT16	2	28	29	-	-	-	(ref) OBD Speed
CAL_STATE_BITS	BYTE	1	30	30	-	-	-	(ref) CAL State Bits

[XRP-Binary] MSG_ID_DAT_GNSS_STATE2

MSG_ID_DAT_GNSS_STATE2									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
GPS0_UTM_SPD	INT16	2	4	5	/100	m/s	-	XRP UTM Speed (2-D)	GPS0_UTM_SPD = (float)_ival / 100.0;
GPS0_PVT_SPD	INT16	2	6	7	/100	m/s	-	UBX Ground Speed (2-D)	GPS0_PVT_SPD = (float)_ival / 100.0;
GPS0_ACC_Hozt	INT16	2	8	9	/100	m	-	Horizontal accuracy estimate	GPS0_ACC_Hozt = (float)_ival / 100.0;
GPS0_ACC_Vert	INT16	2	10	11	/100	m	-	Vertical accuracy estimate	GPS0_ACC_Vert = (float)_ival / 100.0;
GPS0_ACC_PvtHead	INT16	2	12	13	/100	deg	-	Heading of Motion accuracy estimate	GPS0_ACC_PvtHead = (float)_ival / 100.0;
GPS0_PDOP	INT16	2	14	15	/100	m	-	Position DOP	GPS0_PDOP = (float)_ival / 100.0;
GPS1_UTM_SPD	INT16	2	16	17	/100	m/s	-	XRP UTM Speed (2-D)	GPS1_UTM_SPD = (float)_ival / 100.0;
GPS1_PVT_SPD	INT16	2	18	19	/100	m/s	-	UBX Ground Speed (2-D)	GPS1_PVT_SPD = (float)_ival / 100.0;
GPS1_ACC_Hozt	INT16	2	20	21	/100	m	-	Horizontal accuracy estimate	GPS1_ACC_Hozt = (float)_ival / 100.0;
GPS1_ACC_Vert	INT16	2	22	23	/100	m	-	Vertical accuracy estimate	GPS1_ACC_Vert = (float)_ival / 100.0;
GPS1_ACC_PvtHead	INT16	2	24	25	/100	deg	-	Heading of Motion accuracy estimate	GPS1_ACC_PvtHead = (float)_ival / 100.0;
GPS1_PDOP	INT16	2	26	27	/100	m	-	Position DOP	GPS1_PDOP = (float)_ival / 100.0;

[XRP-Binary] MSG_ID_DAT_GNSS0_RAW, MSG_ID_DAT_GNSS1_RAW

MSG_ID_DAT_GNSS0_RAW

NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
GPS0_LAT	DOUBLE	8	4	11	-	deg	-	Latitude	
GPS0_LON	DOUBLE	8	12	19	-	deg	-	Longitude	
GPS0_Height	FLOAT	4	20	23	-	m	-	Height above ellipsoid	
GPS0_HMSL	INT16	2	24	25	/100	m	-	(DIFF) Height above mean sea level	GPS0_HMSL = GPS0_HEIGHT + (float)_ival / 100.0;
GPS0_UTM_HEAD	INT16	2	26	27	/5200	rad	-	Direction from SPD_Y / SPD_X	GPS0_UTM_HEAD = (float)_ival / 5200.0;
GPS0_PVT_HEAD	INT16	2	28	29	/5200	rad	-	Heading of Motion (NAV_PVT)	GPS0_PVT_HEAD = (float)_ival / 5200.0;

MSG_ID_DAT_GNSS1_RAW

NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
GPS1_LAT	DOUBLE	8	4	11	-	deg	-	Latitude	
GPS1_LON	DOUBLE	8	12	19	-	deg	-	Longitude	
GPS1_Height	FLOAT	4	20	23	-	m	-	Height above ellipsoid	
GPS1_HMSL	INT16	2	24	25	/100	m	-	(DIFF) Height above mean sea level	GPS1_HMSL = GPS1_HEIGHT + (float)_ival / 100.0;
GPS1_UTM_HEAD	INT16	2	26	27	/5200	rad	-	Direction from SPD_Y / SPD_X	GPS1_UTM_HEAD = (float)_ival / 5200.0;
GPS1_PVT_HEAD	INT16	2	28	29	/5200	rad	-	Heading of Motion (NAV_PVT)	GPS1_PVT_HEAD = (float)_ival / 5200.0;

[XRP-Binary] MSG_ID_DAT_IMU_STATE

MSG_ID_DAT_IMU_STATE									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
EBIMU_ROLL	INT16	2	4	5	/90	deg	-	Vehicle Roll	EBIMU_ROLL = (float)_ival / 90.0;
EBIMU_PITCH	INT16	2	6	7	/90	deg	-	Vehicle Pitch	EBIMU_PITCH = (float)_ival / 90.0;
EBIMU_YAW	INT16	2	8	9	/90	deg	-	Vehicle Yaw	EBIMU_YAW = (float)_ival / 90.0;
EBIMU_YAWRATE_DEG	INT16	2	10	11	/90	dps	-	Vehicle yaw rate from IMU	EBIMU_YAWRATE_DEG = (float)_ival / 90.0;
EBIMU_WHEEL_DEG	INT16	2	12	13	/90	deg	-	Vehicle wheel angle from IMU	EBIMU_WHEEL_DEG = (float)_ival / 90.0;
VEHICLE_SPEED_KMHx100	INT16	2	14	15	-	Kmh	-	Vehicle Speed	float spd = (float)VEHICLE_SPEED_KMHx100 / 100.0
VEHICLE_STEER_DEGx10	INT16	2	16	17	-	Deg	-	Vehicle Steer Angle	float steer = (float)VEHICLE_STEER_DEGx10 / 10.0
VEHICLE_ACCEL_RATIOx100	INT16	2	18	19	-	-	-	Vehicle Accel Ratio	float acc = (float) VEHICLE_ACCEL_RATIOx100 / 100.0
VEHICLE_BRAKE_RATIOx100	INT16	2	20	21	-	-	-	Vehicle Brake Ratio	
VEHICLE_RESRV_RATIOx100	INT16	2	22	23	-	-	-	Vehicle Reserved Ratio	
VEHICLE_TRANS	BYTE	1	24	-	-	-	-	Vehicle Transmission ID	
ANL_INPUT_0	INT16	2	25	26	-	-	0~1023	Analog Input Value	
ANL_INPUT_1	INT16	2	27	28	-	-	0~1023	Analog Input Value	
ANL_INPUT_2	INT16	2	29	30	-	-	0~1023	Analog Input Value	

[XRP-Binary] MSG_ID_DAT_IMU0_RAW / MSG_ID_DAT_IMU1_RAW

MSG_ID_DAT_IMU0_RAW								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
EBIMU_DT_MS	UINT16	2	4	5	-	ms	-	Time between imu signals	
EBIMU_ACC_X	FLOAT	4	6	9	-	m/s^2	-	Acceleration X	
EBIMU_ACC_Y	FLOAT	4	10	13	-	m/s^2	-	Acceleration Y	
EBIMU_ACC_Z	FLOAT	4	14	17	-	m/s^2	-	Acceleration Z	
EBIMU_GYRO_X	FLOAT	4	18	21	-	dps	-	Gyro X	
EBIMU_GYRO_Y	FLOAT	4	22	25	-	dps	-	Gyro Y	
EBIMU_GYRO_Z	FLOAT	4	26	29	-	dps	-	Gyro Z	

MSG_ID_DAT_IMU1_RAW								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
BNIMU_DT_MS	UINT16	2	4	5	-	ms	-	Time between imu signals	
BNIMU_ACC_X	FLOAT	4	6	9	-	m/s^2	-	Acceleration X	
BNIMU_ACC_Y	FLOAT	4	10	13	-	m/s^2	-	Acceleration Y	
BNIMU_ACC_Z	FLOAT	4	14	17	-	m/s^2	-	Acceleration Z	
BNIMU_GYRO_X	FLOAT	4	18	21	-	dps	-	Gyro X	
BNIMU_GYRO_Y	FLOAT	4	22	25	-	dps	-	Gyro Y	
BNIMU_GYRO_Z	FLOAT	4	26	29	-	dps	-	Gyro Z	

XRP-2000

CAN Data Protocol
(ver: 0.21)

2024.09.16

[XRP-CAN] CAN ID (Real XRP ID = Base ID + XRP CAN ID)

CAN ID		Description	Contents	Output Config
CAN_ID_SOL_INFO	0x01	Solution Information	Solution Type, System State, System Hz...	Default (Always)
CAN_ID_SOL_LAT	0x02	Solution LAT	Latitude	
CAN_ID_SOL_LON	0x03	Solution LON	Longitude	
CAN_ID_SOL_HHD	0x04	Solution Height & Heading	Height, Heading...	
CAN_ID_SOL_TIME	0x05	Solution Time	Timestamp	
CAN_ID_SOL_SPEED	0x06	Solution Speed	NED Vel, Vehicle Speed	
CAN_ID_GNSS0_STATE	0x07	GNSS 0 State	Fixed Mode, RTK Mode, Num of SV, GPS Hz...	CFG_OUTMSG_GNSS_STATE
CAN_ID_GNSS0_ACCR	0x08	GNSS 0 Accuracy	GNSS Accuracy, Movement Speed...	
CAN_ID_GNSS1_STATE	0x09	GNSS 1 State	Fixed Mode, RTK Mode, Num of SV, GPS Hz...	
CAN_ID_GNSS1_ACCR	0x0A	GNSS 1 Accuracy	GNSS Accuracy, Movement Speed...	
CAN_ID_GNSS_RTCM	0x0B	GNSS RTCM Bytes	Current RTCM bytes injected into XRP	
CAN_ID_GNSS0_LAT	0x0C	GNSS 0 LAT	Latitude	CFG_OUTMSG_GNSS_RAW
CAN_ID_GNSS0_LON	0x0D	GNSS 0 LON	Longitude	
CAN_ID_GNSS0_HHD	0x0E	GNSS 0 Height & Heading	Height, Heading...	
CAN_ID_GNSS1_LAT	0x0F	GNSS 0 LAT	Latitude	
CAN_ID_GNSS1_LON	0x10	GNSS 0 LON	Longitude	
CAN_ID_GNSS1_HHD	0x11	GNSS 0 Height & Heading	Height, Heading...	
CAN_ID_IMU0_ATT	0x12	IMU 0 Attitude	Roll, Pitch, Yaw, DT...	CFG_OUTMSG_IMU_ATT
CAN_ID_IMU1_ATT	0x13	IMU 1 Attitude	Roll, Pitch, Yaw, DT...	
CAN_ID_IMU0_ACC	0x14	IMU 0 Accel	Acceleration, WheelAngle...	CFG_OUTMSG_IMU_RAW0
CAN_ID_IMU0_ROT	0x15	IMU 0 Rotation	Gyro, YawRate...	
CAN_ID_IMU1_ACC	0x16	IMU 1 Accel	Acceleration, WheelAngle...	CFG_OUTMSG_IMU_RAW1
CAN_ID_IMU1_ROT	0x17	IMU 1 Rotation	Gyro, YawRate...	

[XRP-CAN] SOLUTION

CAN_ID_SOL_INFO									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
SOL_TYPE	BYTE	1	0	0	-	-	-	Solution Type	0: Not Valid, 1: Only Single GNSS1, 2: Only Single GNSS0, 4: Double Fixed GNSS, 6: DR
SYS_ISTATE	BYTE	1	1	1	-	-	-	Input System State Bits	0: ICAMERA, 1: IESP32, 2: IOBD, 3: INTRIP, 4: IEBIMU, 5: IEXIMU, 6: ICARCAN, 7: IEBIMU
SYS_OSTATE	BYTE	1	2	2	-	-	-	Output System State Bits	0: POWER, 1: OESP32, 2: OETH, 3: OCAN, 4: ORS232, 5: OADIS, 6: OWIFI, 7: OBT
SYS_DT_MS	BYTE	1	3	3	-	-	-	Timer time between step	
SYS_FT_MS	BYTE	1	4	4	-	-	-	Timer time between logic	
GPS0_MYSTATE	BYTE	1	5	5	-	-	-	GNSS 0 Processed State	0: NO_SIGNAL, 1: JUST_RECOVERED, 2: RECOVERED_NORTK, 3: RECOVERED_RTK
GPS1_MYSTATE	BYTE	1	6	6	-	-	-	GNSS 1 Processed State	0: NO_SIGNAL, 1: JUST_RECOVERED, 2: RECOVERED_NORTK, 3: RECOVERED_RTK

CAN_ID_SOL_LAT									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
SOL_LAT	DOUBLE	8	0	7	-	deg	-	Latitude	

CAN_ID_SOL_LON									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
SOL_LON	DOUBLE	8	0	7	-	deg	-	Longitude	

[XRP-CAN] SOLUTION

CAN_ID_SOL_HHD								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
SOL_HEIGHT	FLOAT	4	0	3	-	m	-	Height above ellipsoid	
SOL_HEAD_DEG	FLOAT	4	4	7	-	deg	-360.0 ~ 360.0	Heading	

CAN_ID_SOL_TIME								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
SOL_time_year1	BYTE	1	0	0	-	Year	0~24~	Year (last two digit)	Year = SOL_time_year1 + 2000;
SOL_time_month	BYTE	1	1	1	-	Month	-	Month	
SOL_time_day	BYTE	1	2	2	-	Day	-	Day	
SOL_time_hour	BYTE	1	3	3	-	Hour	-	Hour	
SOL_time_min	BYTE	1	4	4	-	Min	-	Minute	
SOL_time_sec	BYTE	1	5	5	-	Sec	-	Second	
SOL_time_msec	UINT16	2	6	7	-	ms	-	Milli-second	

CAN_ID_SOL_SPEED								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
SOL_VEL_N	INT16	2	0	1	/100	m/s	-	NED north velocity	SOL_VEL_N = (float)_ival / 100.0;
SOL_VEL_E	INT16	2	2	3	/100	m/s	-	NED east velocity	SOL_VEL_E = (float)_ival / 100.0;
SOL_VEL_D	INT16	2	4	5	/100	m/s	-	NED down velocity	SOL_VEL_D = (float)_ival / 100.0;
SOL_CAR_SPD	INT16	2	6	7	/100	m/s	-	Vehicle Speed (2-D)	SOL_CAR_SPD = (float)_ival / 100.0;

[XRP-CAN] GNSS 0 STATE

CAN_ID_GNSS0_STATE								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION
GPS0_fixType	BYTE	1	0	0	-	-	-	0: no fix, 1: dead reckoning only, 2: 2D-fix, 3: 3D-fix, 4: GNSS + dead reckoning combined, 5: time only fix
GPS0_gnssFixOK	BYTE	1	1	1	-	-	-	1 = valid fix (i.e within DOP & accuracy masks)
GPS0_diffSoln	BYTE	1	2	2	-	-	-	1 = differential corrections were applied
GPS0_carrSoln	BYTE	1	3	3	-	-	-	Carrier phase range solution status: 0 = no solution, 1 = floating solution, 2 = fixed solution
GPS0_NUMSV	BYTE	1	4	4	-	-	-	Number of satellites used in Nav Solution
GPS0_rtcmEnabled	BYTE	1	5	5	-	-	-	1 = Currently RTCM data corrects GNSS singal
GPS0_DT_MS	UINT16	2	6	7	-	ms	-	DT between previous signal

CAN_ID_GNSS0_ACCR									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
GPS0_ACC_Hozt	INT16	2	0	1	/100	m	-	Horizontal accuracy estimate	GPS0_ACC_Hozt = (float)_ival / 100.0;
GPS0_ACC_Vert	INT16	2	2	3	/100	m	-	Vertical accuracy estimate	GPS0_ACC_Vert = (float)_ival / 100.0;
GPS0_PDOP	INT16	2	4	5	/100	m	-	Position DOP	GPS0_PDOP = (float)_ival / 100.0;
GPS0_UTM_SPD	INT16	2	6	7	/100	m/s	-	XRP UTM Speed (2-D)	GPS0_UTM_SPD = (float)_ival / 100.0;

[XRP-CAN] GNSS 1 STATE

CAN_ID_GNSS1_STATE								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION
GPS1_fixType	BYTE	1	0	0	-	-	-	0: no fix, 1: dead reckoning only, 2: 2D-fix, 3: 3D-fix, 4: GNSS + dead reckoning combined, 5: time only fix
GPS1_gnssFixOK	BYTE	1	1	1	-	-	-	1 = valid fix (i.e within DOP & accuracy masks)
GPS1_diffSoln	BYTE	1	2	2	-	-	-	1 = differential corrections were applied
GPS1_carrSoln	BYTE	1	3	3	-	-	-	Carrier phase range solution status: 0 = no solution, 1 = floating solution, 2 = fixed solution
GPS1_NUMSV	BYTE	1	4	4	-	-	-	Number of satellites used in Nav Solution
GPS1_rtcmEnabled	BYTE	1	5	5	-	-	-	1 = Currently RTCM data corrects GNSS singal
GPS1_DT_MS	UINT16	2	6	7	-	ms	-	DT between previous signal

CAN_ID_GNSS1_ACCR									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
GPS1_ACC_Hozt	INT16	2	0	1	/100	m	-	Horizontal accuracy estimate	GPS1_ACC_Hozt = (float)_ival / 100.0;
GPS1_ACC_Vert	INT16	2	2	3	/100	m	-	Vertical accuracy estimate	GPS1_ACC_Vert = (float)_ival / 100.0;
GPS1_PDOP	INT16	2	4	5	/100	m	-	Position DOP	GPS1_PDOP = (float)_ival / 100.0;
GPS1_UTM_SPD	INT16	2	6	7	/100	m/s	-	XRP UTM Speed (2-D)	GPS1_UTM_SPD = (float)_ival / 100.0;

CAN_ID_GNSS_RTCM									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
NTRIP_BYTES	UINT16	2	0	1	-	-	-	RTCM Byte Counts	-

[XRP-CAN] GNSS 0 RAW

CAN_ID_GNSS0_LAT								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
GPS0_LAT	DOUBLE	8	0	7	-	deg	-	Latitude	

CAN_ID_GNSS0_LON								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
GPS0_LON	DOUBLE	8	0	7	-	deg	-	Longitude	

CAN_ID_GNSS0_HHD								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
GPS0_HEIGHT	FLOAT	4	0	3	-	m	-	Height above ellipsoid	
GPS0_HMSL	INT16	2	4	5	/100	m	-	(DIFF) Height above mean sea level	GPS0_HMSL = GPS0_HEIGHT + (float)_ival / 100.0;
GPS0_UM_HEAD	INT16	2	6	7	/5200	rad	-	Heading	GPS0_HEAD_DEG = (float)_ival / 5200.0;

[XRP-CAN] GNSS 1 RAW

CAN_ID_GNSS1_LAT								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
GPS1_LAT	DOUBLE	8	0	7	-	deg	-	Latitude	

CAN_ID_GNSS1_LON								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
GPS1_LON	DOUBLE	8	0	7	-	deg	-	Longitude	

CAN_ID_GNSS1_HHD								
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
GPS1_HEIGHT	FLOAT	4	0	3	-	m	-	Height above ellipsoid	
GPS1_HMSL	INT16	2	4	5	/100	m	-	(DIFF) Height above mean sea level	GPS1_HMSL = GPS1_HEIGHT + (float)_ival / 100.0;
GPS1_UM_HEAD	INT16	2	6	7	/5200	rad	-	Heading	GPS1_HEAD_DEG = (float)_ival / 5200.0;

[XRP-CAN] IMU 0

CAN_ID_IMU0_ATT									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
EBIMU_DT_MS	INT16	2	0	1	-	ms	-	Time between imu signals	
EBIMU_ROLL	INT16	2	2	3	/90	deg	-	Vehicle Roll	EBIMU_ROLL = (float)_ival / 90.0;
EBIMU_PITCH	INT16	2	4	5	/90	deg	-	Vehicle Pitch	EBIMU_PITCH = (float)_ival / 90.0;
EBIMU_YAW	INT16	2	6	7	/90	deg	-	Vehicle Yaw	EBIMU_YAW = (float)_ival / 90.0;

CAN_ID_IMU0_ACC									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
EBIMU_WHEEL_DEG	INT16	2	0	1	/100	deg	-	Time between imu signals	EBIMU_WHEEL_DEG = (float)_ival / 100.0;
EBIMU_ACC_X	INT16	2	2	3	/100	m/s^2	-	Acceleration X	EBIMU_ACC_X = (float)_ival / 100.0;
EBIMU_ACC_Y	INT16	2	4	5	/100	m/s^2	-	Acceleration Y	EBIMU_ACC_Y = (float)_ival / 100.0;
EBIMU_ACC_Z	INT16	2	6	7	/100	m/s^2	-	Acceleration Z	EBIMU_ACC_Z = (float)_ival / 100.0;

CAN_ID_IMU0_ROT									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
EBIMU_YAWRATE_DEG	INT16	2	0	1	/10	dps	-	Time between imu signals	EBIMU_YAWRATE_DEG = (float)_ival / 10.0;
EBIMU_GYRO_X	INT16	2	2	3	/10	dps	-	Gyro X	EBIMU_GYRO_X = (float)_ival / 10.0;
EBIMU_GYRO_Y	INT16	2	4	5	/10	dps	-	Gyro Y	EBIMU_GYRO_Y = (float)_ival / 10.0;
EBIMU_GYRO_Z	INT16	2	6	7	/10	dps	-	Gyro Z	EBIMU_GYRO_Z = (float)_ival / 10.0;

[XRP-CAN] IMU 1 (Depreciated)

CAN_ID_IMU1_ATT (Depreciated)									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
BNIMU_DT_MS	INT16	2	0	1	-	ms	-	Time between imu signals	
BNIMU_ROLL	INT16	2	2	3	/90	deg	-	Vehicle Roll	EBIMU_ROLL = (float)_ival / 90.0;
BNIMU_PITCH	INT16	2	4	5	/90	deg	-	Vehicle Pitch	EBIMU_PITCH = (float)_ival / 90.0;
BNIMU_YAW	INT16	2	6	7	/90	deg	-	Vehicle Yaw	EBIMU_YAW = (float)_ival / 90.0;

CAN_ID_IMU1_ACC (Depreciated)									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
BNIMU_WHEEL_DEG	INT16	2	0	1	/100	deg	-	Time between imu signals	EBIMU_WHEEL_DEG = (float)_ival / 100.0;
BNIMU_ACC_X	INT16	2	2	3	/100	m/s^2	-	Acceleration X	EBIMU_ACC_X = (float)_ival / 100.0;
BNIMU_ACC_Y	INT16	2	4	5	/100	m/s^2	-	Acceleration Y	EBIMU_ACC_Y = (float)_ival / 100.0;
BNIMU_ACC_Z	INT16	2	6	7	/100	m/s^2	-	Acceleration Z	EBIMU_ACC_Z = (float)_ival / 100.0;

CAN_ID_IMU1_ROT (Depreciated)									
NAME	DATA TYPE	SIZE	INDEX		COEFF	UNIT	RANGE	DESCRIPTION	CODE SAMPLE
BNIMU_YAWRATE_DEG	INT16	2	0	1	/10	dps	-	Time between imu signals	EBIMU_YAWRATE_DEG = (float)_ival / 10.0;
BNIMU_GYRO_X	INT16	2	2	3	/10	dps	-	Gyro X	EBIMU_GYRO_X = (float)_ival / 10.0;
BNIMU_GYRO_Y	INT16	2	4	5	/10	dps	-	Gyro Y	EBIMU_GYRO_Y = (float)_ival / 10.0;
BNIMU_GYRO_Z	INT16	2	6	7	/10	dps	-	Gyro Z	EBIMU_GYRO_Z = (float)_ival / 10.0;