COMPETITOR BULLETIN 13-2025

RaceLink and CAN Project Pro Units

Description & Technical Specifications

Versions			
v1.0	01-Jan-2020	Scott Smart	Document Creation
v1.1	05-Jan-2020	Scott Smart	Headers
v1.2	19-Jan-2020	Scott Smart	Style
v1.3	15-Mar-2020	Scott Smart	Added Contents, Pinouts, CAN Messaging Details
v1.4	02-June-2020	Scott Smart	Added details to message including compulsory/non compulsory etc
v1.5	16-June-2020	Scott Smart	Added source and target information to message summary table
v1.6	25-Aug-2020	Scott Smart	Added more information indicating whether data should be shown to rider
v1.7	25-Nov-2020	Scott Smart	Appendix 4 spare parts
v1.8	26-Nov-2020	Scott Smart	Flag cancel column
v2.0	20-Mar-2025	Scott Smart	MotoAmerica Pro Revisions
v2.1	18-April-2025	Scott Smart	Wiring Section changes – Superstock/baggers

UPDATED 10/8/24

Contents

Foreword:

This document includes struck out information. It is included here for completeness to show how the system is used in World Championships and because you may have systems that have been derived from World Championship settings.
We are working closely with Mylaps to ensure that the flags and rider messaging are implemented very soon using this common protocol. There 'may' be some small updates due to some ongoing work by MotoGP and WSBK.

1.-Introduction

RaceLink is a new technology developed by MyLaps improving current two-way communication's and adding new features like GPS tracking.
The RaceLink technology consists of a RaceLink Pro ('**RL**') (device installed on the vehicles) and BaseLinks '**BL**' (fixed transceivers placed around the circuit to communicate with the RaceLink Pro). Data transmission is via radio frequency utilising the 2.4GHz band.

RaceLink Pro

BaseLink

2.-Main Purpose

The RaceLink technology improves the current bi-directional communication between the Timing Servers and the vehicles CAN bus and the connection covers the complete circuit instead of just the moments whilst passing the timing loops. This allows Race Control and Timing messages (possibly later Team messages) sent to the bike to be received immediately, at any point of the circuit, opening new opportunities to new types of messages i.e. yellow flags by 'dynamic' sectors and timing messages like session time remaining.

The GPS on the **RL** will provide live data on the real position of every vehicle (bikes, medical and safety cars) with a **RL** installed. It is used for timing purposes and allows Race Control to see the live position of all vehicles at any moment - especially in the case of an interrupted session when is difficult to control all the vehicles on the track. During the races, even if the X2 transponders fail, it is possible to check if bike is stopped and where is it, if it is still on track or if it is being transported back to pit boxes. This will help Race Direction with the automatization of crash detection and procedure. It is also useful for an easy view of a long lap penalty or shortcuts traces and potentially defining virtual crossing points (no timing point) instead of installing a new loop.

The **RL** is NOT used for official timing – the X2 Transponder must remain correctly fitted and operating at all times.

This new system can also provide crash data, speed, position, etc… which will be a great assistance in developing run-off areas, injury statistics and develop rider' protective clothing and so-on.

Live data could later also be used to generate on screen graphics for bikes that are not carrying the onboard camera system.

Having this live communication with all the vehicles simultaneously transmitting data through the bike's CAN bus to the RaceLink Pro, new data analysis can be performed in order to, for example, clarify incidents between riders. TPMS messages and another new data (G forces in an accident) also can be sent using this new technology.

The system has been used since the 2018 season in WSBK. MotoAmerica is the first domestic series to embrace the technology and there will be a staged roll out of the features. We are working closely with Scott Smart of Dorna and MyLaps to ensure we get the best from the system.
Having all the bikes equipped simultaneously but still having coverage all around the track which will permit improving the communications with the bike in terms of Teams, Race Control and Timing messaging, as well as tracking all the bikes and safety/medical cars in real time.

In 2026 we plan to implement this technology in all classes.

As a developing technology updates may be required to equipment and its installation throughout 2025. With the knowledge already gained we aim to disturb teams as little as possible and hope that teams understand this process.

3.-RaceLink Bike Installation

The setup installed on the bike consists in 3 components.

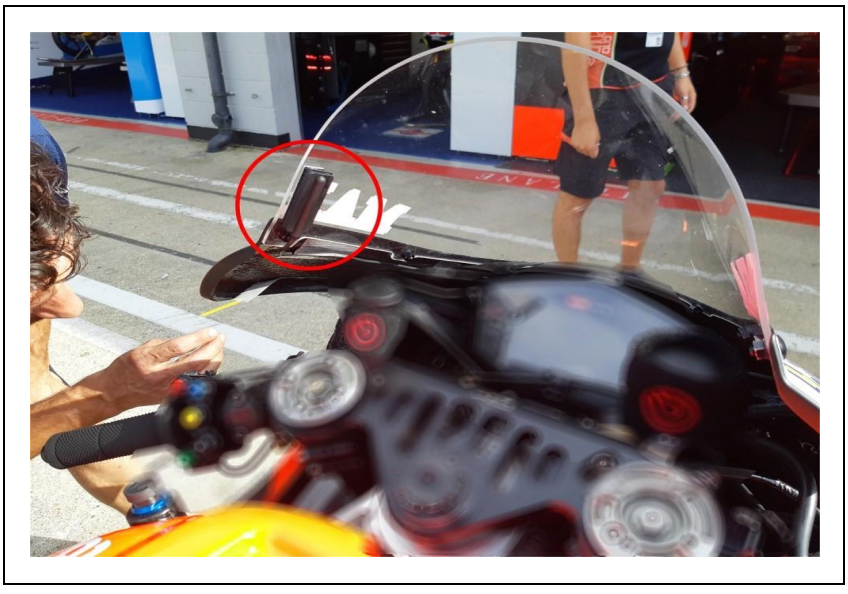
- RaceLink Pro **'RL'**
- RF Antenna
- GPS Antenna

The **RL** should be mounted following **RL** manufacturer suggestions and must be noted that the **RL** needs to be placed as close as possible to the RF antenna in order to make the cable connection shorter and minimise the signal attenuation.

- Make sure the GPS antenna has a clear view to the sky at all times during racing conditions
- GPS CAN be mounted beneath fibreglass bodywork but NOT beneath carbon.
- Neither GPS not RF can be mounted lower or shielded by other metal objects such as the subframe, consider that metal or carbon blocks the signal.
- Make sure the RF antenna is placed as high as possible on the vehicle having a clear view around the vehicle at all times during racing conditions
- Do not place the RF antenna next to other RF antennas. Keep at least 1m distance (for example the onboard camera system or TPMS system)
- You should aim to keep the RF cables as short as possible for both the RF aerial and GPS antenna if they are used.
- Place the device in an area of the vehicle where the temperature does not exceed 60 °C

Considering these requirements the **RL** setup should be installed at the rear of the bike for better performance and to avoid interference.

It is responsibility of the team to ensure that the system is installed on the bike according to these guidelines and that the system is functioning correctly. . If there is no connection to the device or the signal is bad it will be considered in the same way as a transponder that is not functioning.
We will work with you but not define the exact mounting position (eg the front may be a better solution in some cases).



4.-Installation Connections

Superbike (WSBK Electronics), Supersport Next Generation:

The Racelink must be connected to the same CAN bus as the following:

- MyLaps X2 Transponder (when using PRO Transponder)
- ECU
- TPMS system if fitted
- Dashboard
- preferably a data logging system.
    - Normally logged by the race ECU (Yamaha, Suzuki, Kawasaki, Ducati – Marelli) or Dashboard (BMW - Motec).

BMW teams ensure that you have brought the racelink to timekeeping BEFORE installation to apply the correct CAN bus rates

Superstock (including Supestock Electronics on Superbikes):

The Racelink must be connected to the same CAN bus as the following:

- Light bar display or other flag display system (eg TMS or aftermarket dashboard)
- Preferably a data logger (which, if fitted with 2x CAN bus can later act as a bridge for ECU info)
- Do NOT connect to the bikes CAN bus
- If using aftermarket dashboard can be connected to the dashes 'other' CAN bus (if fitted)

Baggers Race ECU (Maxx):

The Racelink must be connected to the same CAN bus as the following:

- Dashboard using CAN bus that is NOT connected to the ECU
- ECU CAN bus may be used in the future and could be reconnected at the Dashboard
- MyLaps X2 Transponder (when using PRO Transponder)
- TPMS system if fitted
- preferably a data logging system.

In ALL cases teams ensure that you have brought the racelink to timekeeping BEFORE installation to apply the correct bus rates and to ensure that we have set the correct addresses for the flag information.

Baggers Race ECU (Street Based ECU):

The Racelink must be connected to the same CAN bus as the following:

- MyLaps X2 Transponder (when using PRO Transponder)
- TPMS system if fitted
- Dashboard or flag display system
- preferably a data logging system.
    - Later the dashboard or Logger will act as the data bridge to the Racelink

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We are working with some Dashboard manufacturers to

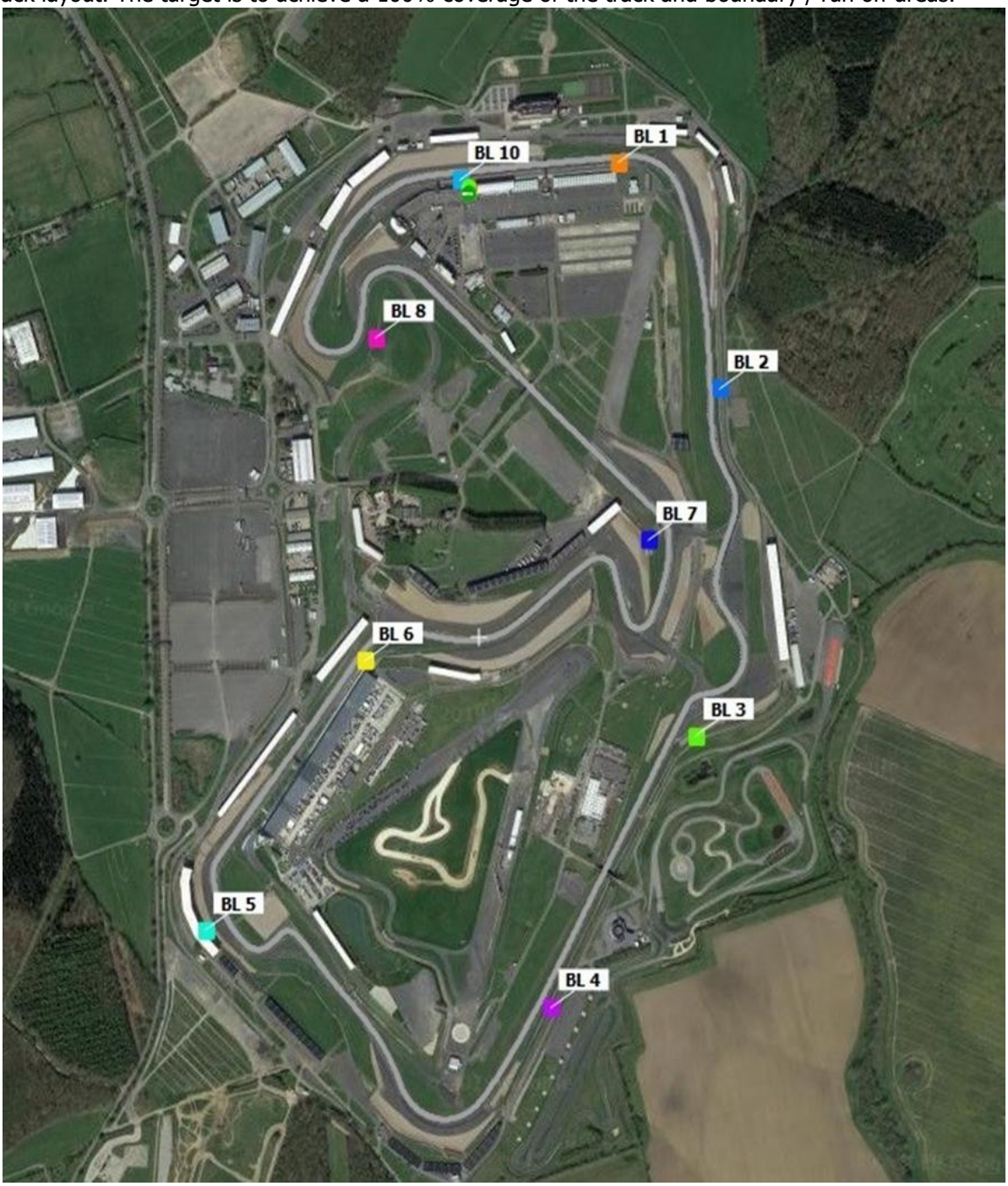
RL must be powered by the bike and remain powered throughout the whole session (this also includes the, MyLaps X2 Transponder and TPMS system). It must not be switched off by the engine kill switch. The **RL** contains a small backup battery – which is in case of crash, it is not to be used for general operation.

If mounted on top / in front of the dashboard inside the screen (but not shielded by carbon fibre fairings) is successful but take care of RF interference caused by switching noise for dash screen backlights.

Do not overtighten the RF connections (take care if using a spanner) you WILL break the unit internally.

5.-BaseLink

The BaseLink will receive the data from those RaceLink Pro's moving around the circuit.
A set of BaseLinks will be installed the previous days of a Grand Prix around the circuit. The number will vary depending on the track layout. The target is to achieve a 100% coverage of the track and boundary / run off areas.



6.- CAN Messages

For 2025 the RaceLink messaging system will become principal communications between the Timing Servers and the vehicles. Software development will oversee the message delivery, so there will be no duplicated messages.

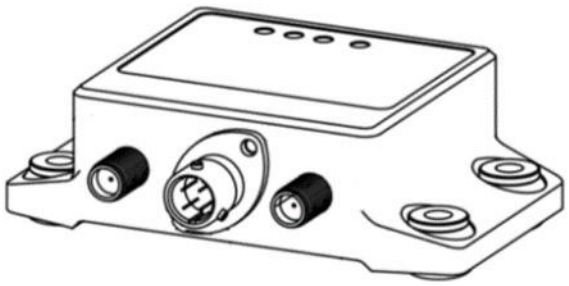
See Appendix for CAN message Info

7.-Appendix 1: Technical Specifications

Link to 3D Model of the Unit: contact bsbtechnical@msvracing.co.uk

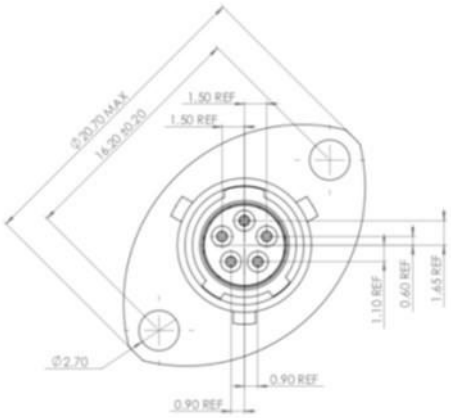
RaceLink Pro:

Dimensions
75x45x24mm / 3x1.8x1in
Weight
85g / 0.19lb
Operating voltage range
7 to 18VDC typical 12V
Power consumption
1.3W, 110mA@12V
Back up battery lifetime
Up to 8 hours
Back up battery charging
1:2 ratio, 4 hours for full charge
Operating temperature range
0 to 60 °C / 32 to 140F
Humidity range
10% to 90% relative
Positioning
3 concurrent GNSS reception
Sensitivity
-167dBm, 72 channels
Update rate
5Hz
GNSS antenna connection
SMA(F), 3.0V active antenna
RF Antenna connection RP-SMA(F)
RF output
+20dBm@2.4GHz ISM



Deutsch connector pin-out

Deutsch ASU003-05PN
P1 = 12VDC
P2 = GND
P3 = CAN L
P4 = CAN H
P5 = Timing signal input – connect to Pin5 of the X2 transponder (for future use)



Harness side connector:
Deutsch ASU603-05SN

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RF Antenna (CVL Covert, Flat, Stick On)

Dimension
2.41" L x 0.65" W (61.1mm x 16.5mm)
Cables
8 ft. long RG-174 standard
Connectors
SMA Plug (Male)
Shock and Vibration
IEEE1478, EN61373, MIL-810G, TIA 329.1-C
Water Ingress IP69
Frequency
2.4-2.5 GHz - 4.9-6.0 GHz
Gain
3 dBi
VSWR
<2:1
Radome Material UV Stable Polyamide
Nominal Impedance
50 Ohm (nominal)
Max power
10 watts
Operating Temp
-40 to +80° C
Color Black

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RF Antenna (Mushroom) **preferred**:

Electrical Specifications:

Center Frequency: 2.45GHz

Recom. Freq. Range: 2.4–2.5GHz

Wavelength: ½-wave

VSWR: ≤ 1.9 typical at center

Peak Gain: 3.5dBi

Impedance: 50-ohms

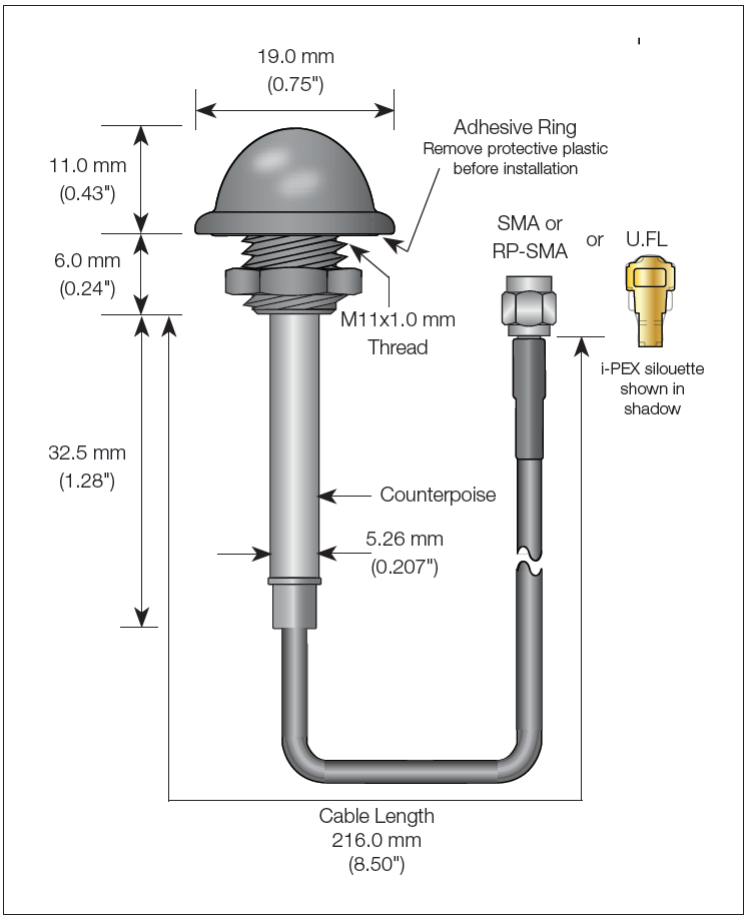
Connector: RP-SMA, SMA or U.FL / MHF

Cable: RG-174, RP-SMA & SMA
1.32 mm U.FL

Oper. Temp. Range: –40°C to +90°C

Max. Recom. Torque: 4.0 kgf-cm

*note that this is not the dome antenna tested in 2019



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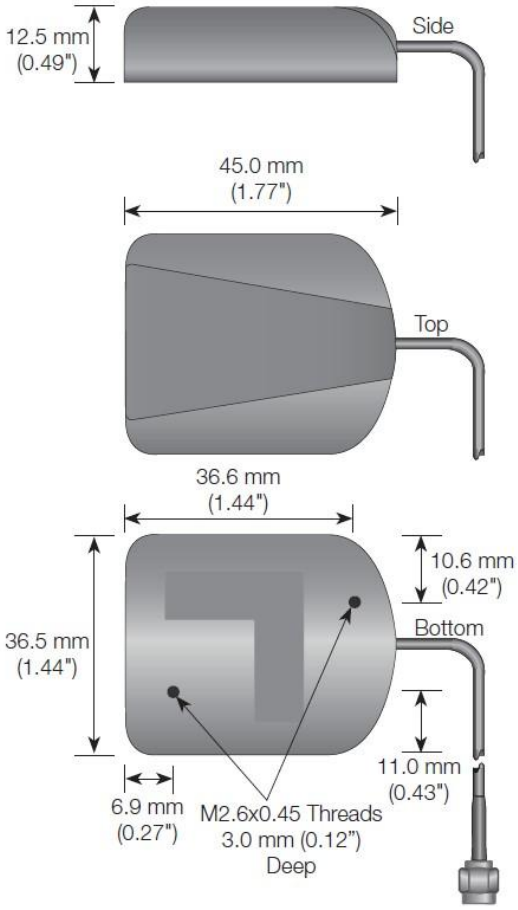
GPS Antenna

https://eu.mouser.com/datasheet/2/238/ant-gps-sh2-ccc-1659160.pdf

Electrical Specifications

Center Frequency
1575.42MHz, 1602MHz
Bandwidth
10MHz @ –3dB point
VSWR
1.5 typ. Antenna Peak Gain: 5.0dB typ.
Impedance
50-ohms
Axial Ratio 1.0dB typ.
Elev. Angle
5–90 degrees
Az. Bearing
360 degrees
Polarization RHCP
System Gain
28±1dB typ. (includes 3m cable & filter loss)
Noise Figure 1.0dB typ.
Input Voltage
+2.5 to +5.5VDC
Current
5–8mA typ. @ 5V
Mounting
Magnetic and/or screw
Cable
117" +/–6" (3m) RG-174U (Low-loss, 0.7dB/m)
Connection SMA, MCX, MMCX [1]
Weight
2.79oz (79g)
Plastic UV Resistance
UL-746C f1
Cable UV Resistance UL-758
Ingress Protection IP66
Temp. Range
–40°C to +85°C [2]



https://eu.mouser.com/datasheet/2/238/ant-gps-sh2-ccc-1659160.pdf

8.-Appendix 2: Pinout Detail

Mylap X2 Pro		
Connector Harness		**ASU603-05SN**
Connector X2		ASU003-05PN
Boot		203W301-25-G02
1	Vbat (8-18v)	Red
2	Gnd	Black
3	CAN_L	Green
4	CAN_H	White
5	Trigger	Free

Mylap X2 RF Link Pro		
Connector Harness		**ASU603-05SN**
Connector X2		ASU003-05PN
Boot		203W301-25-G02
1	Vbat (8-18v)	Red
2	Gnd	Black
3	CAN_L	Green
4	CAN_H	White
5	Open Collector	to TX Pin 5

9.-Appendix 3: CAN Message Detail Key

Messages are little endian unless stated

KEY	
Normal Black	Unchanged not compulsory
Bold Black	Unchanged compulsory
Normal Red	Changed not compulsory
Bold Red	Changed Compulsory
Normal Purple	2021 not compulsory
Bold Purple	2021 compulsory
Normal Italic Blue	For info only

9.-Appendix 3: CAN Message Detail

Summary of Addresses:					
Address	Description	Source	Route	Target	Notes
0x061	**MyLaps Proprietary**	X2 Trans	Local CAN		
~~0x0CC~~	~~**TPMS MotoGP (600, 602/4 2D)**~~	~~X2 Trans~~	-	-	-
0x0CD	**COMM_TRANSMIT_QUEUE_STATUS**	X2 Trans	Local CAN		
0x0CE	**COMM_ID**	X2 Trans	Local CAN		
0x0CF	**COMM_FIRST_CONTACT**	X2 Trans	Local CAN		
0x0D0	**COMM_TIME**	X2 Trans	Local CAN		
0x0D1	*BEACON_SETTING*	X2 Trans	Local CAN		
0x0D2	*BEACON_EVENT*	X2 Trans	Local CAN		
0x0D3	*ACCELEROMETER_XYX*	X2 Trans	Local CAN		
0x0D4					
0x0D5					
0x0D6					
0x0D7					
0x0D8	**HEALTH_INFO (AND HEALTH FLAGS)**	ECU	X2 RL	Race Direction	**Used by solo ECU**
~~0x0D9~~	~~**X2 Link TV**~~	~~ECU~~	~~X2 RL~~	~~Tv Broadcast~~	-
~~0x0DA~~	~~*INFO_MSG*~~	~~*Race Dir*~~	~~*X2 RL*~~	~~*NA*~~	~~*Not used*~~
0x0DB	**FLAGS_MSG_WSBK**	Race Dir	X2 RL	Dashboard	
~~*0x0DC*~~	~~*BOX CALL/CLEAR_GP*~~	~~*Race Dir*~~	~~*X2 RL*~~	~~*NA*~~	**Maybe flag ACK**
0x0DD	TIMING_NOTIFICATION_WSBK	Race Dir	X2 RL	Dash/Team Log	
~~0x0DE~~	~~**REV_REPORTS_WSBK (Low Rate for X2)**~~	~~RevLogger~~	~~X2 RL~~	~~Race Direction~~	-
~~**0x0DF**~~	~~**TPMS WSBK**~~	~~TPMS~~	~~X2 RL/CAN~~	~~Race Direction~~	~~Approved config~~
0x0E0	X2 STATUS	X2 RL	Local CAN	Team Logger	1hz
0x0E1	X2 VERSION	X2 RL	Local CAN	Team Logger	RTR response only
0x0E2	GPS FROM X2	X2 RL	Local CAN	Team Logger	5hz (future 10hz)
0x0E3	GPS TIME FROM X2	X2 RL	Local CAN	Team Logger	1hz (TX on second)
0x0E4	GPS EXT FROM X2	X2 RL	Local CAN	Team Logger	5hz (future 10hz)
~~0x0E5~~	~~Reserved (Heart Rate Etc)~~	-	-	-	-
~~0x0E6~~	-	-	-	-	-
~~0x0E7~~	-	-	-	-	-
~~**0x0E8**~~	~~**REV_CONTROL_WSBK**~~	~~ECU~~	~~Local CAN~~	~~Rev Logger~~	-
~~**0x0E9**~~	~~**REV_CONTROL_WSBK_2**~~	~~ECU~~	~~Local CAN~~	~~Rev Logger~~	-
~~**0x0EA**~~	~~**REV_REPORTS_WSBK**~~	~~RevLogger~~	~~Local CAN~~	~~Team Logger~~	-
0x0EB					
0x0EC					
0x0ED					
0x0EE					
0x0EF					
0x7FD	X2RL GPS old info				
0x7FE	X2RL GPS old info				

HEALTH_INFO (AND HEALTH FLAGS)

Type	*Transmitted Message (By ECU)*	
Source	*ECU*	
ID	***0x0D8***	*(Was 0x0D4-D5)*
Length	*8*	
RTR	*No*	
Rate	*10Hz*	
Note	*This is to begin understanding bike health data for Race Direction and potential future safety functions.*	
For Rider	*Does not have to be displayed to the rider.*	

0	1	2	3	4	5	6	7
Oil Pressure		***Oil Temperature***		***H20 Temperature***		***Health Flags***	***ACK***

Byte	*Signal*		*Multiplier*	*Base Unit*	*Signing*
Byte 0-1:	***Oil Pressure***		***1***	***.1 bar***	***unsigned***
Byte 2-3:	***Oil Temperature***		***1***	***1° c***	***unsigned***
Byte 4-5:	***H20 Temperature***		***1***	***1° c***	***unsigned***

Byte	*Bit*	*ID*
Byte 6	***Bit 0***	***Oil Pressure Warning***
	Bit 1	***Oil Pressure Sensor Failure***
	Bit 2	***Oil Temp Warning***
	Bit 3	***Engine Temp Warning***
	Bit 4	***Other Warning***
	Bit 5	***Crashing Event***
	Bit 6	***Engine Off (by crash Strategy)***
	Bit 7	***Engine Off (Status)***
Byte 7:	*Bit 0*	*Penalty Acknowledge**
	Bit 1	*Reserved*
	Bit 2	*Reserved*
	Bit 3	*Reserved*
	Bit 4	*Reserved*
	Bit 5	*Reserved*
	Bit 6	*Reserved*
	Bit 7	*Reserved*

WSS300 and 600: Penalties should obscure the riders display, to recover the display they should acknowledge the penalty. The CAN message MUST transmit a confirmation TBC (20-8-20)

*** SBK: Not required**

X2-Link-TV

Type Transmitted Message (By ECU)
Source ECU
ID 0x0D9
Length 8
RTR Capable NO
Rate 15- 25Hz Depending on the rates availablle in the system

0	1	2	3	4	5	6	7
Speed		Gear	Fr Brake	Throttle	Lean Angle	RPM	

Byte	Signal	Multiplier	Base Unit	Signing
Byte 0-1	Speed	1	1 km/h	unsigned
Byte 2	Gear	1	1	unsigned
Byte 3	Fr Brake	%, 100% = Team max pres		unsigned
Byte 4	TPS Grip	1	1%	unsigned
Byte 5	Lean Angle, LH -, RH+	1	1°	signed
Byte 6-7	RPM	1	1 rpm	unsigned

Fr Brake, this is to enable a graphical representation of riders brake pressure. Due to different brake systems the manufacturer should individually define max pressure, it should be between 12 bar and 16bar to ensure consistent graphics (FYI MotoGP defines 15 bar as 100%)

FLAGS_MSG_WSBK

Type Received Message
Source X2 Link (Race Control)
ID 0x0DB
Length 8
RTR Capable NO
Note **Flags and messages should occupy different areas and one flag and one message can be simultaneously active.**

0	1	2	3	4	5	6	7
FLAGS 1	**FLAGS 2**	**PENALTY**	**POSITION**	**TIME**			

Race direction sends this message. Only the messages marked as compulsory (Byte 0-4) MUST be displayed to the rider.

In the message any bit set to 1 indicates that the related flag or penalty is active. Any previous active flag or penalty must be deactivated when receiving a message with its specific bit set to 0.

The following groups of flags are grouped as flags that are track sector based and flags that specific to one or more riders.

As with trackside lightboards the aim is to only need one 'light' active at a time. In the case where two flags could be uised trackside only the more important flag signal will be transmitted. For example, Red with Double Yellow when the riders are returning to the pits. In this case only the Red Flag will be transmitted - the double flags will still be used in the relevant sectors trackside.

Byte 0	FLAGS 1	Type = "Flag", for track sector		**CANCEL**
	Bit 0	**Green Flag**		Race Dir
	Bit 1	**Yellow and Red Striped Flag**		Race Dir
	Bit 2	**White Flag with diagonal Red Cross**		Race Dir
	Bit 3	**White Flag**		Race Dir
	Bit 4	**Red flag**		Race Dir
	Bit 5	**Yellow Flag**		Race Dir
	Bit 6	**Yellow Flag Double (can flash)**		Race Dir
	Bit 7	**Safety Car**		Race Dir
Byte 1	FLAGS 2	Type = "Flag", for track sector		
	Bit 0	**Black Flag**		Race Dir
	Bit 1	**Black Flag with Orange disk**		Race Dir
	Bit 2	**Blue Flag**		Race Dir
	Bit 3	**Chequered Black/White flag**		
	Bit 4	Reserved		
	Bit 5	Reserved		
	Bit 6	Reserved		
	Bit 7	**Rain Light (use to switch light, not as message)***	TBC	

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Byte 2	PENALTY	Type = "Message", for rider		
	Bit 0	**Ride Through**		Race Dir
	Bit 1	**Drop Position**		Race Dir
	Bit 2	**Exceeding Track limits* can be overwritten by warnings**		Race Dir
	Bit 3	**Time Penalty* can be overwritten by warnings**		Race Dir
	Bit 4	**Long Lap Penalty**		Race Dir
	Bit 5	**Double Long Lap Penalty**		Race Dir
	Bit 6	**Go to position**		Race Dir
	Bit 7	**Enter Pitlane (grid problem or behind safety)**		Race Dir
Byte 3	POSITION	Type = "Message", for riders		
	Number of positions that must be dropped due to a penalty, for instance, after an overtaking under yellow flag (used on “Drop Position” Penalty). AND used by x minutes board - 5 or 3 minutes			
Byte 4	TIME	Type = "Message", for rider		
	10ths of second that will be added at end of session or race			

Safety Car: Not required for WSBK but required in National Championships

UPDATED 10/8/24

Rain Light: In WSS300 and WSS600 it is compulsory that the rain light is switched by the CAN message (in addition to a button). The CAN message has priority. In WSBK it will be compusory from 2022 and recommended now.

~~TIMING_NOTIFICATION_WSBK (TEAM_NOTIFICATION_GP)~~

~~Type~~ ~~Received Message~~
~~Source~~ ~~X2 Link (Team)~~
~~ID~~ ~~0x0DD~~
~~Length~~ ~~8~~
~~RTR Capable NO~~
~~Note~~ ~~This message is created by timekeeping NOT a team message as in MotoGP~~

~~0~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~	~~6~~	~~7~~
~~Type~~	~~Data1~~	~~Data2~~	~~Data3~~	~~Data4~~	~~Data5~~	~~Data6~~	~~Reserved~~

~~Value~~	~~Type~~	~~-~~
~~1~~	~~Practice Info~~	
~~2~~	~~Race Info~~	
~~3~~	~~Opponent Info~~	
~~4~~	~~Suggested mapping~~	
~~5~~	~~Being followed~~	
~~6~~	~~Racer KO~~	
~~7~~	~~Penalty Warning~~	
~~8~~	~~Bike Ready~~	
~~9~~	~~Tyre Specs~~	

~~Depending on the message type, the following bytes will include specific information.~~
~~Described bit fields will be packed from MSB to LSB, some messages will just use DATA1 while others may use all bytes from DATA1 to DATA6.~~

-	- -	Bit length	Min	Max	Scale/Unit	-	As MGP
Type 1	Practice Information	-	-	-	-	-	-
-	Position	6 bits	1	63	1	Optional	x
-	P1 Time	11 bits	1	2047	.1 second	Optional	x
-	Target Time	11 bits	1	2027	.1 second	Optional	x
-	Remaining Time	12 bits	1	4095	1 second	Optional	x
-	-	-	-	-	-	-	-
Type 2	Race Info	-	-	-	-	-	-
-	Position	6	1	63	1	Future/Opt	x
-	Racer Ahead	7	1	99	#	Future/Opt	x
-	Gap Ahead	10	1	1023	1	Future/Opt	x
-	Racer Behind	7	1	99	#	Future/Opt	x
-	Gap Behind	10	1	1023	1	Future/Opt	x
-	Remaining Laps	6	1	63	1	Optional	x
-	-	-	-	-	-	-	-
Type 3	*Opponent Info*	-	-	-	-	-	-
-	*Racer*	*7*	*1*	*99*	*1*	*Not used*	*x*
-	*Tyre Type*	*2*	*1*	*3*	*1*	*Not used*	*x*
-	*Tyre Front*	*3*	*1*	*5*	*1*	*Not used*	*x*
-	*Tyre Rear*	*3*	*1*	*5*	*1*	*Not used*	*x*
-	*Lap Time*	*11*	*1*	*2047*	*.1s*	*Not used*	*x*
-	*Gap*	*10*	*1*	*1023*	*.1 s*	*Not used*	*x*
-	-	-	-	-	-	-	-
Type 4	*Suggested Mapping*	-	-	-	-	-	-
-	*Map*	*8*	*1*	*10*	*1*	*Not used*	*x*
-	-	-	-	-	-	-	-
Type 5	*Being Followed*	-	-	-	-	-	-
-	*Racer*	*8*	*1*	*99*	*#*	*Not used*	*x*
-	-	-	-	-	-	-	-
Type 6	*Racer Out*	-	-	-	*#*	-	-
-	*Racer Out*	*8*	*1*	*99*	-	*Not used*	*x*
-	-	-	-	-	-	-	-
Type 7	*Penalty Warning*	-	-	-	-	*Not used*	*x*
-	-	-	-	-	-	-	-
Type 8	Bike Specs (Spare)	-	-	-	-	-	-
-	*Tyre Type*	*2*	*1*	*3*	-	*Future/Opt*	*x*
-	*Tyre Front*	*3*	*1*	*5*	-	*Future/Opt*	*x*
-	*Tyre Rear*	*3*	*1*	*5*	-	*Future/Opt*	*x*
-	-	-	-	-	-	-	-
Type 9	Tyre Option (current use rider info)		-	-	-	-	-
-	Tyre Type	2	1	3	-	Future/Opt	x
-	Tyre Front	3	1	5	-	Future/Opt	x
-	Tyre Rear	3	1	5	-	Future/Opt	x
-	Tyre Front # from allocation	6	1	63	-	Future/Opt	-
-	Tyre Rear # from allocation	6	1	63	-	Future/Opt	-

~~REV_REPORTS_WSBK (Low Rate for X2 Link)~~

Type ~~Transmitted Message (Transmitted by Rev logger)~~
Source ~~Rev Logger~~
ID **~~0x0DE~~**
Length ~~8~~
~~RTR Capable NO~~
Rate **~~10Hz~~**

0	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~	~~6~~	7
~~Info bits~~		~~Exceptions~~		~~Time exceeded~~		~~RL Calculated RPM~~	

~~Byte~~	~~Bit~~	~~Signal~~	~~Note~~	~~Signing~~
Bytes 0-1	~~Bit 0 -13~~	**~~RPM Limit~~**	~~rpm limit set point (16383 max)~~	Unsigned
	~~Bit 14~~	**~~Limit Exceed~~**	~~Rev Limit' Exceed momentary~~	Unsigned
	~~Bit 15~~	**~~Max time exceed~~**	~~Race direction flag - max time exceeded~~	Unsigned
Byte 2-3	-	**~~Exception~~**	~~# Times limiter has been exceeded~~	Unsigned
Byte 4-5	-	**~~Time exceeded~~**	~~Milliseconds, maximum 65 seconds~~	Unsigned
Byte 6-7	-	**~~RL Calc RPM~~**	~~The RPM as recorded by the rev limiter~~	Unsigned

TPMS_INFO

Type Transmitted Message
Source TPMS System (not bridged by ECU), example .ldd file available
ID **0x0DF**
Length 8
RTR No
Align Big Endian
Signed All Signed
Rate 3 - 12.5hz

0	1	2	3	4	5	6	7
FR ID		**FR. TEMP**	**FR.PRESS**	**RR ID**		**RR TEMP**	**RR PRESS**

Contact bsbtechnical@msvracing.co.uk to request a 2D .LDD configuration file, this requires the 2D 'MotoGP firmware'. All systems must be from the approved parts list (2D and i2m currently)

X2
Status

Type	Transmitted Message
Source	X2 Racelink
ID	0x0E0
Length	8
RTR	No
Align	Big Endian
Rate	1hz

0	1	2	3	4	5	6	7
X2RL_F RSSI	GPS_X2RL_Sats	Input Volt	Batt Lvl	Flags	GPS_X2RL_HDOP		

Byte	Signal	Multiplier	Base Unit	Signing
Byte 0	RF RSSI	1	dBm	signed
Byte 1	GPS Sat	1		unsigned
Byte 2	Input Voltage	10	Volt	unsigned
Byte 3	Battery Level	1	%	unsigned
Byte 4	Flags	1	b0: GPS Fix Valid	unsigned
Byte 5	GPS HDOP	10		unsigned

X2 Version

Type	Transmitted Message
Source	X2 Racelink
ID	0x0E1
Length	8
RTR	Yes
Align	Big Endian
Signed	All Signed
Rate	RTR only

0	1	2	3	4	5	6	7
Device ID				Firmware	Hardware	Firmware	

Byte	Signal	Signing
Byte 0-3	Device ID	Unsigned
Byte 4	Firmware Minor	Unsigned
Byte 5	Hardware	Unsigned
Byte 6	Firmware Major	Unsigned

X2 Location (GPS)

Type	Transmitted Message
Source	X2 Racelink
ID	0x0E2
Length	8
RTR	No
Align	Big Endian
Signed	All Signed
Rate	5hz

0	1	2	3	4	5	6	7
GPS_X2RL_Latitude				GPS_X2RL_Longitude			

Byte	Signal		Multiplier	Base Unit	Signing
Byte 0-3	GPS_X2RL_Speed		1.00E-07	Degrees	Signed
Byte 4-7	GPS_X2RL_Altitude		1.00E-07	Degrees	Signed

X2 Time (GPS)

Type	Transmitted Message
Source	X2 Racelink
ID	0x0E3
Length	8
RTR	No
Align	Big Endian
Signed	All Signed
Rate	1hz (on the second)

0	1	2	3	4	5	6	7
GPS_X2RL_Time						None	

Byte	Signal	Multiplier	Base Unit	Notes
Byte 0-5	GPS_X2RL_Time	1	second	unified GPS time

X2 Location (Extended) (GPS)

Type	Transmitted Message
Source	X2 Racelink
ID	0x0E4
Length	8
RTR	No
Align	Big Endian
Signed	All Signed
Rate	5hz

0	1	2	3	4	5	6	7
GPS_X2RL_Speed		GPS_X2RL_Heading		GPS_X2RL_Altitude			

	Signal	Multiplier	Base Unit	Signing
Byte 0-1	GPS_X2RL_Speed	1	1 km/h	Unsigned
Byte 2-3	GPS_X2RL_Heading	1	Degrees	Signed
Byte 4-7	GPS_X2RL_Altitude	100	Metres	Signed

~~REV_CONTROL_WSBK~~

~~Type~~	~~Transmitted Message (from ECU) and logged~~
~~Source~~	~~ECU~~
~~ID~~	~~0x0E8~~
~~Length~~	~~8~~
~~RTR Capable NO~~	
~~Rate~~	~~100Hz~~

~~0~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~	~~6~~	~~7~~
~~RPM~~		~~Front speed~~		~~Rear Speed~~		~~Brake Front (Actual)~~	

~~Byte~~	~~Signal~~	~~-~~	~~Multiplier~~	~~Base Unit~~	~~Signing~~
~~Byte 0-1~~	~~RPM~~		~~1~~	~~1 rpm~~	~~Unsigned~~
~~Byte 2-3~~	~~Speed~~		~~1~~	~~1 km/h~~	~~Unsigned~~
~~Byte 4-5~~	~~Speed~~		~~1~~	~~1 km/h~~	~~Unsigned~~
~~Byte 6-7~~	~~Brake~~		~~1~~	~~0.1 bar~~	~~Unsigned~~

REV_CONTROL2_WSBK

Type	Transmitted Message (from ECU) and logged
Source	ECU
ID	0x0E9
Length	8
RTR Capable	NO
Rate	100Hz

0	1	2	3	4	5	6	7
TPS Grip		TPS1		TPS2		Lean	

Byte	Signal	Multiplier	Base Unit	Signing
Byte 0-1	TPS Grip	1	0.10%	Signed
Byte 2-3	TPS 1	1	0.10%	Signed
Byte 4-5	TPS 2	1	0.10%	Signed
Byte 6-7	Lean Angle, LH-, RH+	1	1°	Signed

REV_REPORTS_WSBK

Type	Transmitted Message (Transmitted by Rev logger)
Source	Rev Logger
ID	0x0EA
Length	8
RTR Capable	NO
Rate	100Hz

0	1	2	3	4	5	6	7
Info bits		Exceptions		Time exceeded		RL Calculated RPM	

Byte	Bit	Signal	Note	Signing
Bytes 0-1	Bit 0-13	RPM Lim	rpm limit set point (16383 max)	Unsigned
-	Bit 14	Limit Exceed	Rev Limit' Exceed momentary	Unsigned
-	Bit 15	Max time exceed	Race direction flag - max time exceeded	Unsigned
Byte 2-3	-	Exception	# Times limiter has been exceeded	Unsigned
Byte 4-5	-	Time exceeded	Milliseconds, maximum 65 seconds	Unsigned
Byte 6-7	-	RL Calc RPM	The RPM as recorded by the rev limiter	Unsigned

10.-Appendix 4: Spare Parts

It is the team's responsibility to ensure that they have spare parts and that the system is kept in working order. By managing your own parts you will also be able to customise the lengths of the RF cabling to better suit your machines. The system uses SMA and RP-SMA connectors that are commonly available along with the crimping tools (cheap)

X2 Link Unit:
Mylaps: Alessandro Bianchi (Alessandro.Bianchi@mylaps.com)

GPS Aerial:
Spec: https://eu.mouser.com/datasheet/2/238/ant-gps-sh2-ccc-1659160.pdf

Mouser: 712-ANT-GPS-SH2-SMA
https://www.mouser.co.uk/ProductDetail/Linx-Technologies/ANT-GPS-SH2-SMA?qs=1mbolxNpo8f%252BCn7vpY8sag==

Component-Store: ANT-GPS-SH2-SM
https://www.components-store.com/product/Linx-Technologies/ANT-GPS-SH2-SMA.html

RS: 202-5851
https://uk.rs-online.com/web/p/gps-antennas/2025851?cm_mmc=UK-PPC-DS3A-_-google-_-3_UK_EN_GPS+Antennas_Linx_Exact-_-Linx+-+GPS+Antennas+-+2025851+-+5-_-ant+gps+sh2+sma&matchtype=e&kwd-984674068247&s_kwcid=AL!7457!3!452567429901!e!!g!!ant%20gps%20sh2%20sma&gclid=CjwKCAjw97P5BRBQEiwAGflV6XJa3Kw9J6gShCKK37QT1VTOhl40AcsGdeL4PcOuoFp6hZn5YIzuMxoCfpwQAvD_BwE&gclsrc=aw.ds

Digi-Key: ANT-GPS-SH2-SMA-ND
https://www.digikey.com/en/products/detail/linx-technologies-inc/ANT-GPS-SH2-SMA/7323769

RF Mushroom Antenna:
Digikey: ANT-2.4-WRT-MON-UFL-ND
https://www.digikey.es/product-detail/es/linx-technologies-inc/ANT-2.4-WRT-MON-UFL/ANT-2.4-WRT-MON-UFL-ND/4576776?utm_adgroup=RF%20Antennas&utm_source=google&utm_medium=cpc&utm_campaign=Shopping_Product_RF%2FIF%20and%20RFID&utm_term=&productid=4576776&gclid=Cj0KCQjw-uH6BRDQARIsAI3I-Uc4sXB54r-6Q5mPG89I_enMSTVTaM0SILE74p7Vq-1rO4QPzHZnLDQaAqstEALw_wcB

Mouser: 712-ANT-2.4-WRT-UFL
https://www.mouser.co.uk/ProductDetail/Linx-Technologies/ANT-24-WRT-MON-UFL?qs=M80ie1ekFqNnGafOCwOqvA==