Evolution
MOTION SOLUTIONS

Ranger & Stryker Series

Transmitters and Receivers Integration Guide

CE

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Evolution MOTION SOLUTIONS

1. Introduction

1.1. This document is intended to serve as a guide to assist Engineering System Designers for the purpose of understanding system installation and modes of operation of the Evolution Motion Solutions Ranger and Stryker series of wireless remotes.

1.2. It is the responsibility of the User to perform any appropriate risk analysis, evaluations, and testing of Ranger and Stryker products with respect to the relevant intended specific application. As Evolution Motion Solutions is unable to anticipate every application, the User is advised to refer to the applicable regulations regarding safety requirements and machine operation. Evolution Motion Solutions shall not be responsible or liable for the misuse of the information contained within this guide.

2. When to Use

2.1. This guide is intended to be used by engineering professionals for the purpose of initial system set up when commissioning a new machine for off-highway or mobile use.

2.2. This information may also be used by engineering professionals as a guide for retrofitting or replacement of control systems of used or otherwise damaged equipment.

3. Who Should Use

3.1. This guide is meant to be used by OEM (Original Equipment Manufacturer) design engineers including Authorized Aftermarket Manufactures operating with the express written authority of the original manufacturer based on the original manufacturer's designs, formulas, and/or specifications.

3.2. This guide is not intended to be used by third party repair personnel for the purpose of troubleshooting or general maintenance.

3.3. For information related to troubleshooting, please refer to your specific radio model's user manual or spec sheet, which can be found via our website at: https://www.evolutionmotion.com/mobile-controls or by scanning the provided QR code.

4. Safety/ISO/IEC STDS?

4.1. ⚠ Operating Cautions and Warnings

4.1.1 Evolution Motion Solutions' Ranger and Stryker wireless radio control systems are intended as general purpose switches. They are not safety devices. Malfunctions may occur. These products are used to initiate an operation where false operation could be dangerous. Point-of-operation guarding devices must be installed and maintained to meet OSHA and ANSI machine safety standards. Evolution Motion Solutions shall not accept responsibility for installation, application, or safety of systems.

4.1.2. Signal interference resulting in TX malfunctions and undesired machine functions can occur without notice. To limit the occurrence of signal interference, it is recommended to avoid the operation of Evolution wireless radio control devices near high-power electric lines and to avoid the use of walkie-talkies/two-way radios, or other wireless radio transmission sources within close proximity to transmitters.

4.1.3. For reliable radio operation, stay within the recommended working operating range. Transmitter should face toward the receiver antenna and have a clear line of sight between them.

4.1.4. Magnetic fields present in Ranger and Styker wireless control systems can be harmful to pacemaker wearers. Pacemaker wearers are advised to stay back a minimum of 12 inches (30 cm) from these devices.

4.1.5. Make sure machinery and surrounding area is clear before operating. Do not activate the remote system unless it is safe to do so.

4.1.6. The correct and safe use of the system requires that the operator keeps the machine being controlled in sight at all times.

4.1.7. Evolution products contain chemicals, including carbon black, which are known to the State of California to cause cancer or other harm. For more information, visit www.p65warnings.ca.gov.

4.2. ⚡ Safe Care and Handling of Wireless System Components

4.2.1. All Evolution products must be physically disconnected from the machine before welding. Jump starting equipment also has the potential to damage electronics. If practical for the application, disconnect Evolution electronics from the machine prior to attempting a jump start. Failure to do this in either scenario may cause damage to the integrated circuit chips and other electronic components thus voiding the warranty.

4.2.2. Disconnect all power before making any wiring connections to the Receiver to avoid damage.

4.2.3. Do not immerse the remote system in water or expose to excess amounts of water. Do not clean the remote system under high pressure water. If water or other liquids get inside the remote system, immediately dry the unit.

4.2.4. Do not expose the remote system to extreme temperatures or store the transmitter in direct sunlight or wet areas.

4.2.5. Remove the batteries if the remote system is to be stored for long periods of time, e.g., periods in excess of 30 days.

4.2.6. Do NOT attempt to recharge non-rechargeable alkaline batteries or mix battery types.

4.2.7. Do not drop, throw, or subject the transmitter to sever physical shock which may cause damage or malfunction.

4.2.8. Transmitter units should be cleaned after operation. Remove any mud, dirt, concrete, etc. from the unit to prevent clogging of buttons, switches, etc. by using a damp cloth with non-abrasive chemicals.

5. Product Description

5.1. Ranger Model # LXH-900 KP

5.1.1. General Overview

The Ranger Model # LXH-900 KP is a 900 MHz wireless transmitter designed to be small enough for single-handed use. Features and accessories of the transmitter include:

- A membrane keypad with 11 pushbuttons.
- Twist-to-unlock machine stop switch.
- 1.2" sunlight-readable display for engine, sensor and machine feedback or transmitter setup and diagnostics.
- Magnetic base.
- Charging port to accommodate Model # 5044 DC charging cable and Model # 5045 AC charging cable (both included with the system).
- Protective storage and carry case.

5.1.2. System Options

The Ranger can be paired with either of two options of receivers:

- Model # 8212 LXB 900 MHz receiver with 18 discrete outputs and J1939 CAN bus.
- Model # 8213 LXC 900 MHz receiver with J1939 CAN bus only.

5.2. Stryker Model # LXT-24-TS

5.2.1. General Overview

The Stryker Model # LXT-24-TS is a mid-sized 2.4Ghz wireless transmitter with FEX technology and internal dipole antennas. Features and accessories of this transmitter include:

- 13 momentary multi-directional toggle switches.
- Twist-to-unlock machine stop switch.
- 1.2" sunlight-readable display for engine, sensor, and machine feedback or transmitter setup and diagnostics.
- Magnetic base.
- A barrel charging port to accommodate Model # 5044 DC charging cable and Model # 5045 AC charging cable (both included with the system).
- Protective storage and carry case.

5.2.2. System Options

The Stryker can be paired with either of two options of receivers:

- Model # 8210 LXB 2.4 GHz with 18 discrete outputs and J1939 CAN bus.
- Model # 8211 LXC 2.4 GHz with J1939 CAN bus only.

5.3. Stryker Pro Model # LXT-24-JS

5.3.1. General Overview

The Stryker Pro Model # LXT-24-JS is a mid-sized 2.4Ghz wireless transmitter with FEX technology and internal dipole antennas. Features of this transmitter include:

- 2 precision joysticks for smooth proportional control.
- 11 momentary multi-directional toggle switches.
- Twist-to-unlock machine stop switch.
- 1.2" sunlight-readable display for engine, sensor, and machine feedback or transmitter setup and diagnostics.
- Magnetic base.
- A barrel charging port to accommodate Model # 5044 DC charging cable and Model # 5045 AC charging cable (both included with the system).
- Protective storage and carry case.

5.3.2. System Options

The Stryker Pro can be paired with either of two options of receivers:

- Model # 8210 LXB 2.4 GHz with 18 discrete outputs and J1939 CAN bus.
- Model # 8211 LXC 2.4 GHz with J1939 CAN bus only.

5.4. Stryker Pro+ Model # LXL-24-PDL

5.4.1. General Overview

The Stryker Pro+ Model # LXL-24-PDL is a belly box style 2.4 GHz wireless transmitter with FEX technology and internal dipole antennas. Features of this transmitter include:

- 6 single-axis proportional paddles.
- 10 momentary multi-direction toggle switches.
- Twist-to-unlock machine stop switch.
- 2.7" sunlight-readable display for engine, sensor, and machine feedback or transmitter setup and diagnostics.
- Magnetic base.
- A barrel charging port to accommodate Model # 6139 AC charging cable (included with the system).
- Protective storage and carry case.

5.4.2. System Options

The Stryker Pro+ can be paired with either of 2 options of receivers:

- Model # 8210 LXB 2.4 GHz with 18 discrete outputs and J1939 CAN bus.
- Model # 8211 LXC 2.4 GHz with J1939 CAN bus only.

6. Application

6.1. General Overview

Ranger and Stryker wireless radio remote systems are designed with careful consideration to the importance of signal reliability and functionality to enable a wide variety of OEM applications. When properly integrated, wireless remote systems offer a greater level of safety for machine operators, along with enhancing machine operation and efficiency. Our transmitters enable real-time machine diagnostics to assist in solving or avoiding potential problems with quicker and more accurate troubleshooting.

6.2. Application Examples

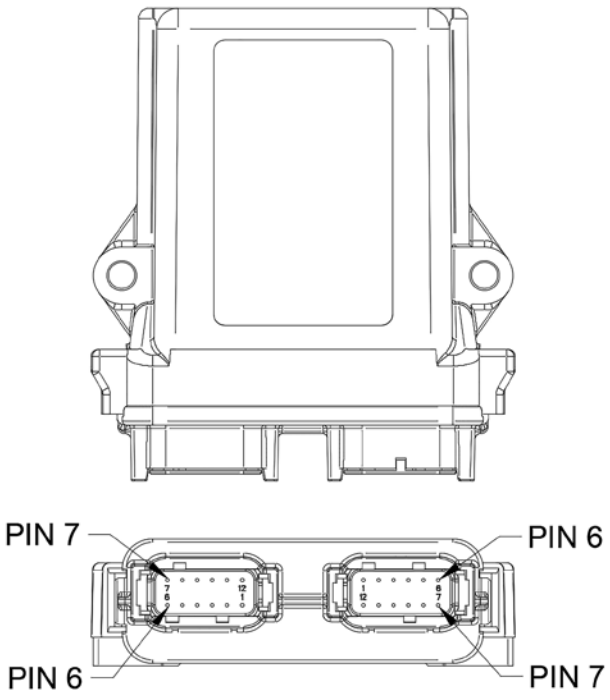
- Mobile/off-highway equipment used in forestry, agriculture, mining, construction, or any industrial application where machine operators could operate equipment remotely and efficiently while helping to avoid personal safety hazards. These might include material handling equipment such as hoists, cranes, lifts, and winches or forestry applications such as stump grinders, woodchippers, and similar applications.
- To provide efficient control and operation of valves, pumps, motors, ground drive systems, and motion controls.

7. Wiring Diagram of System

7.1 The below images depict views of the receiver faces and pin layout inside the header. The corresponding tables show pin numbers, symbols, and primary and secondary functions.

7.1.1. 2.4GHz & 900MHz LXB Pinout

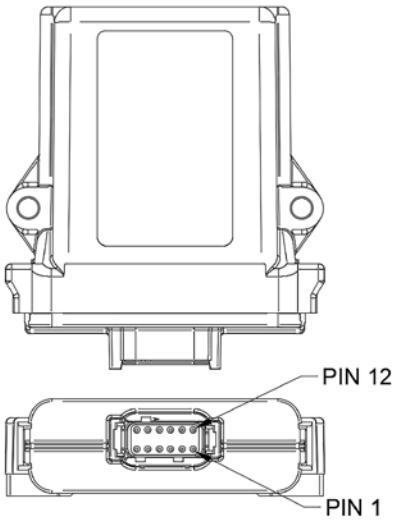
- LXB gray connector mates with Deutsch connector DTM04-12PA. Black connector mates with Deutsch connector DTM04-12SB.



Gray Connector		
Pin	Symbol	Primary Function
1	POWER	System Voltage
2	OUT_09	Analog Output (PWM)
3	OUT_11	Analog Output (PWM)
4	OUT_13	Analog Output (PWM)
5	OUT_15	Analog Output (PWM)
6	OUT_17	Analog Output (PWM)
7	OUT_18	Analog Output (PWM)
8	OUT_16	Analog Output (PWM)
9	OUT_14	Analog Output (PWM)
10	OUT_12	Analog Output (PWM)
11	OUT_10	Analog Output (PWM)
12	NOT USED	N/A
Black Connector		
Pin	Symbol	Primary Function
1	POWER	System Voltage
2	OUT_01	Analog Output (PWM)
3	OUT_03	Analog Output (PWM)
4	OUT_05	Analog Output (PWM)
5	OUT_07	Analog Output (PWM)
6	CAN LO	CAN LO
7	CAN HI	CAN HI
8	OUT_08	Analog Output (PWM)
9	OUT_06	Analog Output (PWM)
10	OUT_04	Analog Output (PWM)
11	OUT_02	Analog Output (PWM)
12	GROUND	System Ground

7.1.2. 2.4GHz & 900MHz LXC Pinout

- LXC connector mates with Deutsch connector DTM04-12SB

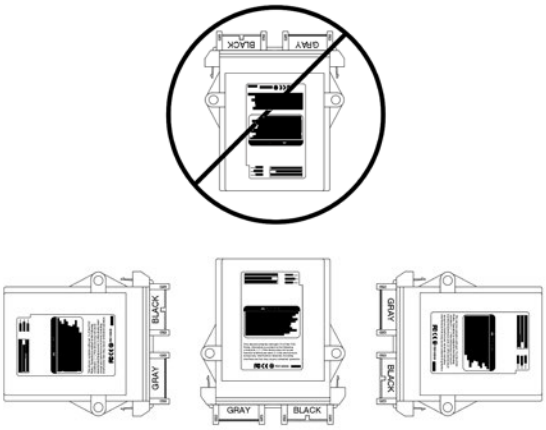


Black Connector		
Pin	Symbol	Primary Function
1	POWER	System Power
2	NOT USED	N/A
3	NOT USED	N/A
4	NOT USED	N/A
5	NOT USED	N/A
6	CAN LO	CAN LO
7	CAN HI	CAN HI
8	NOT USED	N/A
9	NOT USED	N/A
10	NOT USED	N/A
11	NOT USED	N/A
12	GROUND	System Ground

8. System Design/Installation Considerations

8.1. Mounting

8.1.1. The receiver should be mounted in such a way that the cabling will not be folded or crushed. Any pulling or twisting of the cable may cause strain on the connector and reduce the function of the receiver. Always install the receiver in areas that reduce likelihood of impacts, extreme heat, or pressurized water. The receiver may be mounted in any direction except the headers pointing up, see examples below. Caution should be taken for variable frequency drives.



Note: Never mount receiver header facing sky. Optimal installation is header facing down.

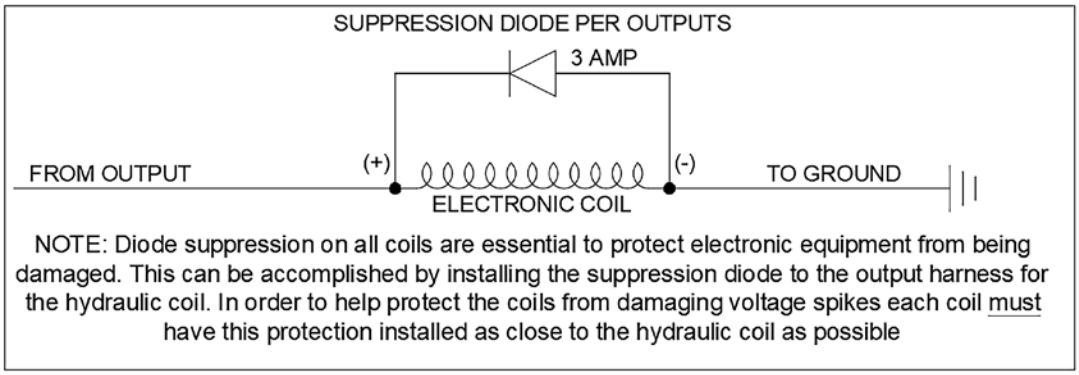
8.2. Isolation

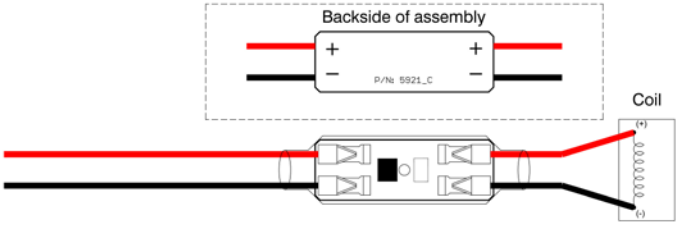
8.2.1. When mounting the receiver, consideration must be taken regarding vibration. Using appropriate vibration isolating mounting will protect the receiver from damage.

8.3. Electrical

8.3.1. Diode Protection

- Electrical systems are susceptible to power surges. It is strongly recommended to use 3 AMP suppression diodes on outputs to prevent damage caused by overvoltage. Pre-built diode suppression circuits are available as part number 6195.





8.3.2. Wire Length & Gauge

- Care should be taken to use the largest gauge wire applicable. Due to the size of the terminals accepted in the connector, 14 & 16 gauge wire cannot be used. The below chart details voltage loss over a distance by wire gauge.

Wire Size	1-ohm error	2-ohm error	5-ohm error	10-ohm error
18 AWG	76.8 ft	153.6 ft	384.0 ft	768.0 ft
20 AWG	48.3 ft	96.6 ft	241.5 ft	483.1 ft
22 AWG	30.4 ft	60.8 ft	151.9 ft	303.8 ft
24 AWG	19.1 ft	38.2 ft	95.5 ft	191.1 ft
28 AWG	7.6 ft	15.1 ft	37.8 ft	75.6 ft

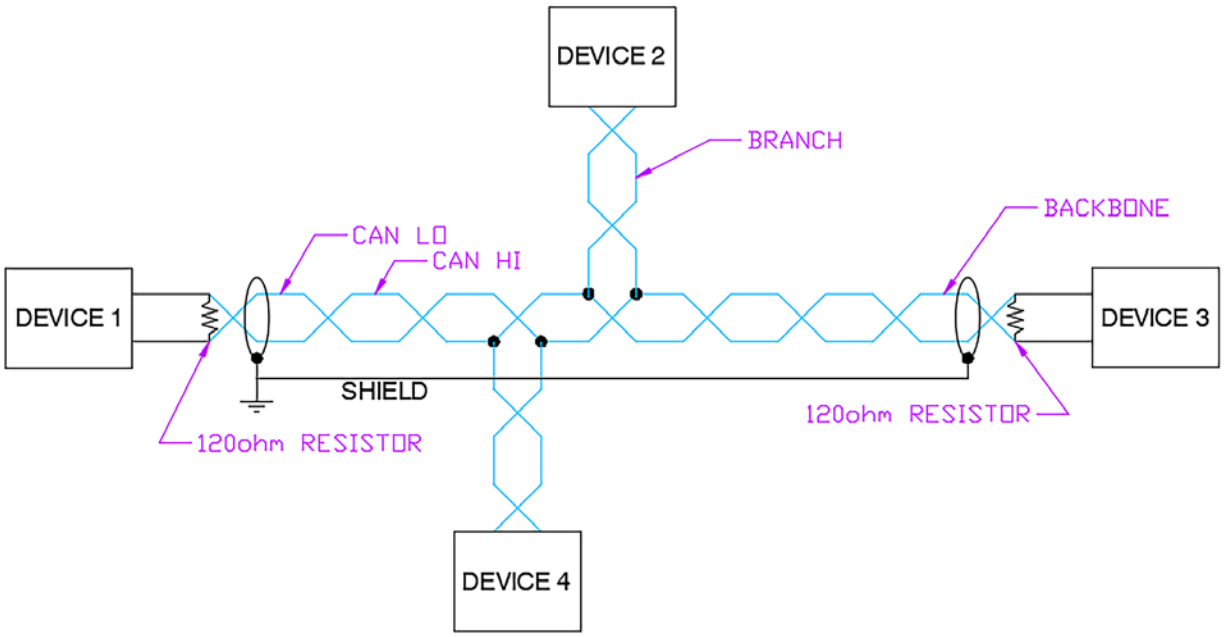
8.3.3. CAN bus Termination & EMI Reduction

8.3.3.1. It is important to install appropriate grounding for CAN bus cabling. 120-ohm termination resistors located at each end of the cabling will prevent signal reflection. Using only one 120-ohm resistor may work temporarily but will cause unreliability and will eventually fail. CAN termination can be verified by measuring the resistance between the high and low wires. Any measurement other than 60-ohm when the system is off, likely signifies a lack of proper termination or a short.

8.3.3.2. CAN bus cabling, also referred to as J1939 cable, consists of a twisted pair known as CAN HI and CAN LO. The twisted pair should have a minimum of one twist per inch. CAN bus harnesses contain a backbone (long) and possibly branches or stubs (short lengths off the backbone). Backbones should be no longer than 131' and branches no longer than 1.5'.

8.3.3.3. Electromagnetic interference (EMI), also known as electrical noise, is caused by outside sources that interfere with an electrical path. CAN bus is hardened against this interference by using a shielded twisted pair cable, but it is not impervious. To diminish EMI, do not install J1939 cabling next to high amperage power/ground wires or other powerful electrical sources like spark plugs. In addition, any extensions or custom harnesses paired with the receiver should utilize a shielded twisted pair that grounds the shield wire on one end only.

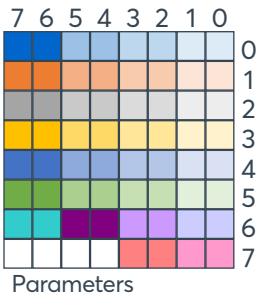
Example: CAN bus harness.



9. J1939 Information

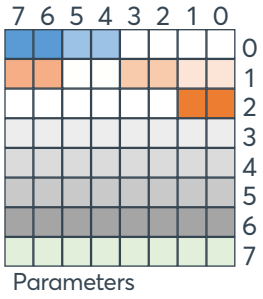
9.1. LXT 8200

PGN	65380	ON	01
Priority	6	Off	00
SA	76	Error	11
Name	LXT 8200	Digital Functions	
Transmit Rate (ms)		250 and on change	



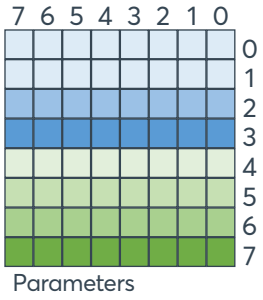
Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
Function 1	0/1	0	2	1	0
Function 2	0/1	2	2	1	0
Function 3	0/1	4	2	1	0
Function 4	0/1	6	2	1	0
Function 5	0/1	8	2	1	0
Function 6	0/1	10	2	1	0
Function 7	0/1	12	2	1	0
Function 8	0/1	14	2	1	0
Function 9	0/1	16	2	1	0
Function 10	0/1	18	2	1	0
Function 11	0/1	20	2	1	0
Function 12	0/1	22	2	1	0
Function 13	0/1	24	2	1	0
Function 14	0/1	26	2	1	0
Function 15	0/1	28	2	1	0
Function 16	0/1	30	2	1	0
Function 17	0/1	32	2	1	0
Function 18	0/1	34	2	1	0
Function 19	0/1	36	2	1	0
Function 20	0/1	38	2	1	0
Function 21	0/1	40	2	1	0
Function 22	0/1	42	2	1	0
Function 23	0/1	44	2	1	0
Function 24	0/1	46	2	1	0
Function 25	0/1	48	2	1	0
Function 26	0/1	50	2	1	0
Function 27	0/1	52	2	1	0
Function 28	0/1	54	2	1	0
E-Stop (N/C)	0/1	56	2	1	0
E-Stop (N/O)	0/1	58	2	1	0
	0/1	60	2	1	0
	0/1	62	2	1	0

PGN	65382	
Priority	6	
SA	76	
Name	LXT 8200	TX Information
Transmit Rate (ms)		250 and on change



Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
	0/1	0	2		0
TX ON	0/1	4	2	1	0
TX OFF	0/1	6	2	1	0
Docked	0/1	8	2	1	0
Charging	0/1	10	2	1	0
Charge Fault	0/1	14	2	1	0
Encoder Button	0/1	16	2	1	0
RSSI	db	24	8	0.5	-125
RSSI Percent	%	32	8	0.5	0
Battery VDC	mV	40	8	200	0
Battery Level	%	48	8	0.5	0
TX Temp.	°C	56	8	1	-40

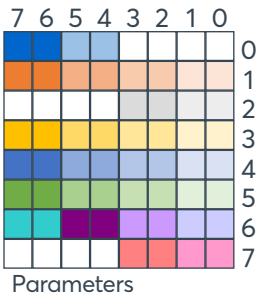
PGN	65383	
Priority	6	
SA	38	
Name	LXT 8200	Screen Information
Transmit Rate (ms)		250 and on change



Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
Main Page Parameter 1	RPM	0	16	0.125	0
Page Parameter 2 - Pressure 1	BAR	16	8	4	0
Page Parameter 3 - Pressure 2	BAR	24	8	4	0
Page Parameter 4 - Degrees 1	°C	32	8	1	-40
Page Parameter 5 - Degrees 2	°C	40	8	1	-40
Page Parameter 6 - Percent 1	%	48	8	0.5	-100
Page Parameter 7 - Percent 2	%	56	8	0.5	-100

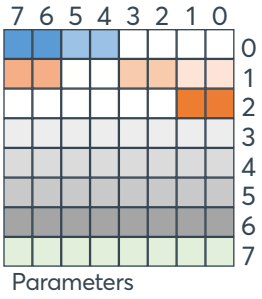
9.2. LXT 8201

PGN	65380	On	01
Priority	6	Off	10
SA	76	Error	11
Name	LXT JS 8201	Digital Functions	
Transmit Rate (ms)		250 and on change	



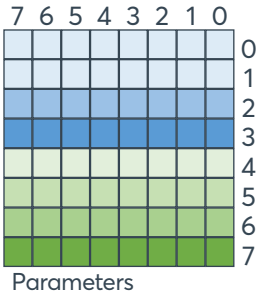
Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
	0/1	0	2	1	0
	0/1	2	2	1	0
Function 3	0/1	4	2	1	0
Function 4	0/1	6	2	1	0
Function 5	0/1	8	2	1	0
Function 6	0/1	10	2	1	0
Function 7	0/1	12	2	1	0
Function 8	0/1	14	2	1	0
Function 9	0/1	16	2	1	0
Function 10	0/1	18	2	1	0
	0/1	20	2	1	0
	0/1	22	2	1	0
Function 13	0/1	24	2	1	0
Function 14	0/1	26	2	1	0
Function 15	0/1	28	2	1	0
Function 16	0/1	30	2	1	0
Function 17	0/1	32	2	1	0
Function 18	0/1	34	2	1	0
Function 19	0/1	36	2	1	0
Function 20	0/1	38	2	1	0
Function 21	0/1	40	2	1	0
Function 22	0/1	42	2	1	0
Function 23	0/1	44	2	1	0
Function 24	0/1	46	2	1	0
Function 25	0/1	48	2	1	0
Function 26	0/1	50	2	1	0
Function 27	0/1	52	2	1	0
Function 28	0/1	54	2	1	0
E-Stop (N/C)	0/1	56	2	1	0
E-Stop (N/O)	0/1	58	2	1	0
	0/1	60	2	1	0
	0/1	62	2	1	0

PGN	65382	
Priority	6	
SA	76	
Name	LXT JS 8201	TX Information
Transmit Rate (ms)		250 and on change



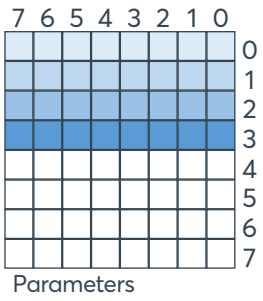
Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
	0/1	0	2		0
TX ON	0/1	4	2	1	0
TX OFF	0/1	6	2	1	0
Docked	0/1	8	2	1	0
Charging	0/1	10	2	1	0
Charge Fault	0/1	14	2	1	0
Encoder Button	0/1	16	2	1	0
RSSI	db	24	8	0.5	-125
RSSI Percent	%	32	8	0.5	0
Battery VDC	mV	40	8	200	0
Battery Level	%	48	8	0.5	0
TX Temp	°C	56	8	1	-40

PGN	65383	
Priority	6	
SA	38	
Name	LXT JS 8201	Screen Information
Transmit Rate (ms)		250 and on change



Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
Main Page Parameter 1	RPM	0	16	0.125	0
Page Parameter 2 - Pressure 1	BAR	16	8	4	0
Page Parameter 3 - Pressure 2	BAR	24	8	4	0
Page Parameter 4 - Degrees 1	°C	32	8	1	-40
Page Parameter 5 - Degrees 2	°C	40	8	1	-40
Page Parameter 6 - Percent 1	%	48	8	0.5	-100
Page Parameter 7 - Percent 2	%	56	8	0.5	-100

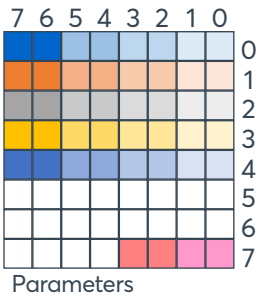
PGN	65381	Center	0
Priority	6	Up/Right	100
SA	76	Down/Left	-00
Name	LXT JS 8201	Analog Functions	
Transmit Rate (ms)		250 and on change	



Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
Left Joystick Y-Axis%	%	0	8	1	-100
Left Joystick X-Axis%	%	8	8	1	-100
Right Joystick Y-Axis%	%	16	8	1	-100
Right Joystick X-Axis%	%	24	8	1	-100
	%	32	8	1	-100
	%	40	8	1	-100
	%	48	8	1	-100
	%	56	8	1	-100

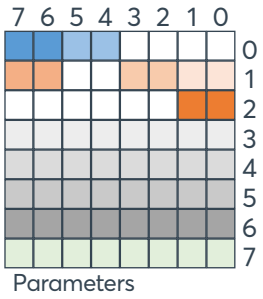
9.3. LXH 8202

PGN	65380	On	01
Priority	6	Off	10
SA	76	Error	11
Name	LXH 8202	Digital Functions	
Transmit Rate (ms)		250 and on change	



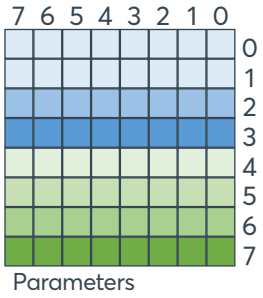
Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
Function 1	0/1	0	2	1	0
Function 2	0/1	2	2	1	0
Function 3	0/1	4	2	1	0
Function 4	0/1	6	2	1	0
Function 5	0/1	8	2	1	0
Function 6	0/1	10	2	1	0
Function 7	0/1	12	2	1	0
Function 8	0/1	14	2	1	0
Function 9	0/1	16	2	1	0
Function 10	0/1	18	2	1	0
Function 11	0/1	20	2	1	0
Function 12	0/1	22	2	1	0
Function 13	0/1	24	2	1	0
Function 14	0/1	26	2	1	0
Function 15	0/1	28	2	1	0
Function 16	0/1	30	2	1	0
Function 17	0/1	32	2	1	0
Function 18	0/1	34	2	1	0
Function 19	0/1	36	2	1	0
Function 20	0/1	38	2	1	0
	0/1	40	2	1	0
	0/1	42	2	1	0
	0/1	44	2	1	0
	0/1	46	2	1	0
	0/1	48	2	1	0
	0/1	50	2	1	0
	0/1	52	2	1	0
	0/1	54	2	1	0
E-Stop (N/C)	0/1	56	2	1	0
E-Stop (N/0)	0/1	58	2	1	0
	0/1	60	2	1	0
	0/1	62	2	1	0

PGN	65382	
Priority	6	
SA	76	
Name	LXH 8202	TX Information
Transmit Rate (ms)		250 and on change



Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
	0/1	0	2		0
TX ON	0/1	4	2	1	0
TX OFF	0/1	6	2	1	0
Docked	0/1	8	2	1	0
Charging	0/1	10	2	1	0
Charge Fault	0/1	14	2	1	0
Encoder Button	0/1	16	2	1	0
RSSI	db	24	8	0.5	-125
RSSI Percent	%	32	8	0.5	0
Battery VDC	mV	40	8	200	0
Battery Level	%	48	8	0.5	0
TX Temp	°C	56	8	1	-40

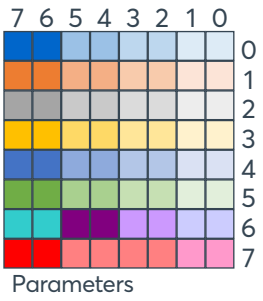
PGN	65383	
Priority	6	
SA	38	
Name	LXH 8202	Screen Information
Transmit Rate (ms)		250 and on change



Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
Main Page Parameter 1	RPM	0	16	0.125	0
Page Parameter 2 - Pressure 1	BAR	16	8	4	0
Page Parameter 3 - Pressure 2	BAR	24	8	4	0
Page Parameter 4 - Degrees 1	°C	32	8	1	-40
Page Parameter 5 - Degrees 2	°C	40	8	1	-40
Page Parameter 6 - Percent 1	%	48	8	0.5	-100
Page Parameter 7 - Percent 2	%	56	8	0.5	-100

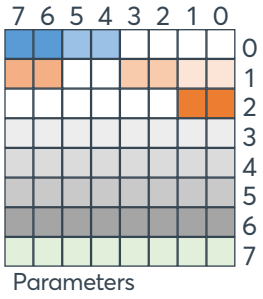
9.4. LXL 8203

PGN	65380	On	01
Priority	6	Off	10
SA	76	Error	11
Name	LXL 8203	Digital Functions	
Transmit Rate (ms)		250 and on change	



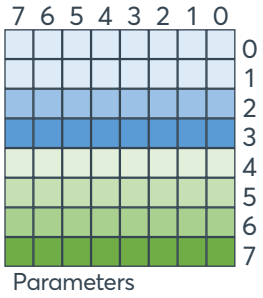
Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
Function 1	0/1	0	2	1	0
Function 2	0/1	2	2	1	0
Function 3	0/1	4	2	1	0
Function 4	0/1	6	2	1	0
Function 5	0/1	8	2	1	0
Function 6	0/1	10	2	1	0
Function 7	0/1	12	2	1	0
Function 8	0/1	14	2	1	0
Function 9	0/1	16	2	1	0
Function 10	0/1	18	2	1	0
Function 11	0/1	20	2	1	0
Function 12	0/1	22	2	1	0
Function 13	0/1	24	2	1	0
Function 14	0/1	26	2	1	0
Function 15	0/1	28	2	1	0
Function 16	0/1	30	2	1	0
Function 17	0/1	32	2	1	0
Function 18	0/1	34	2	1	0
Function 19	0/1	36	2	1	0
Function 20	0/1	38	2	1	0
Function 21	0/1	40	2	1	0
Function 22	0/1	42	2	1	0
Function 23	0/1	44	2	1	0
Function 24	0/1	46	2	1	0
Function 25	0/1	48	2	1	0
Function 26	0/1	50	2	1	0
Function 27	0/1	52	2	1	0
Function 28	0/1	54	2	1	0
E-Stop (N/C)	0/1	56	2	1	0
E-Stop (N/O)	0/1	58	2	1	0
Function 31	0/1	60	2	1	0
Function 32	0/1	62	2	1	0

PGN	65382	
Priority	6	
SA	76	
Name	LXL 8203	TX Information
Transmit Rate (ms)		250 and on change



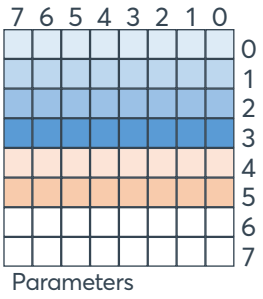
Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
	0/1	0	2		0
TX ON	0/1	4	2	1	0
TX OFF	0/1	6	2	1	0
Docked	0/1	8	2	1	0
Charging	0/1	10	2	1	0
Charge Fault	0/1	14	2	1	0
Encoder Button	0/1	16	2	1	0
RSSI	db	24	8	0.5	-125
RSSI Percent	%	32	8	0.5	0
Battery VDC	mV	40	8	200	0
Battery Level	%	48	8	0.5	0
TX Temp	°C	56	8	1	-40

PGN	65383	
Priority	6	
SA	38	
Name	LXL 8203	Screen Information
Transmit Rate (ms)		250 and on change



Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
Main Page Parameter 1	RPM	0	16	0.125	0
Page Parameter 2 - Pressure 1	BAR	16	8	4	0
Page Parameter 3 - Pressure 2	BAR	24	8	4	0
Page Parameter 4 - Degrees 1	°C	32	8	1	-40
Page Parameter 5 - Degrees 2	°C	40	8	1	-40
Page Parameter 6 - Percent 1	%	48	8	0.5	-100
Page Parameter 7 - Percent 2	%	56	8	0.5	-100

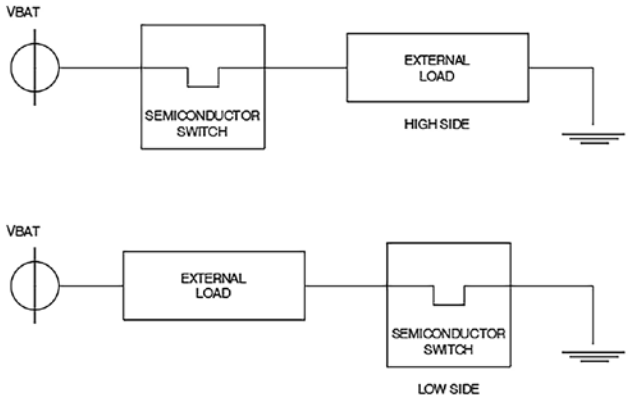
PGN	65381	Center	0
Priority	6	Up/Right	100
SA	76	Down/Left	-100
Name	LXL 8203	Analog Functions	
Transmit Rate (ms)		250 and on change	



Function	Unit	Start Bit	Length (bits)	Resolution (per bit)	Offset
Joystick 1 Y-Axis%	%	0	8	1	-100
Joystick 2 Y-Axis%	%	8	8	1	-100
Joystick 3 Y-Axis%	%	16	8	1	-100
Joystick 4 Y-Axis%	%	24	8	1	-100
Joystick 5 Y-Axis%	%	32	8	1	-100
Joystick 6 Y-Axis%	%	40	8	1	-100
	%	48	8	1	-100
	%	56	8	1	-100

10. Digital & Analog Physical Receiver Outputs

10.1. High side outputs turn on when system voltage is applied and has a value of 1. Low side outputs have a value of 0. Low side outputs should be connected to ground on one side only. The receiver options currently offer high side outputs only.



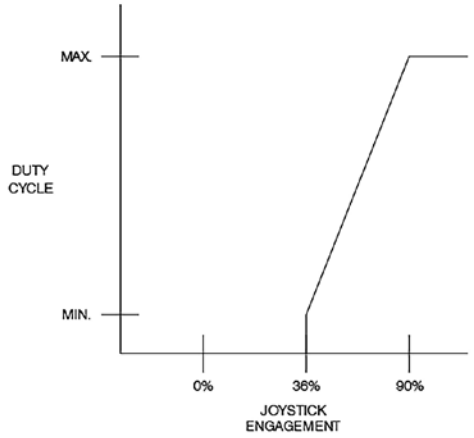
10.2. PWM

10.2.1. The Stryker Pro and Stryker Pro+ systems use pulse width modulation (PWM) to provide proportional outputs. PWM is a technique used to get analog results from a digital output. This uses a rapid on/off signal to generate an average voltage between 0 and system voltage proportional to the joystick inputs . The maximum and minimum range will be between 0 volts and the applied system voltage.

11. Menu Setup Options

11.1. Joystick Duty Cycle

11.1.1. Joysticks on the Stryker Pro and Stryker Pro+ are programmed with a deadband, 0%-35%. The deadband is used to mitigate accidental joystick movements such as a dropping impact. The duty cycle of the joysticks may be adjusted by the OEM to make better use of the full joystick range. The below chart details the joystick deadband and duty cycle.



11.1.2. To adjust joystick duty cycle, follow steps listed below.

1. Turning the transmitter on brings up the "parameter 1" page.

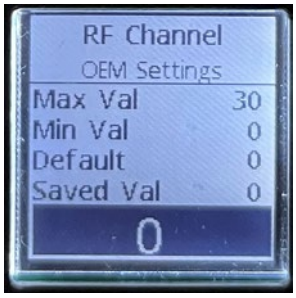
2. Depressing the encoder knob brings up the main menu. Using the dial action of the encoder navigate to "adjust" and depress knob to select.

3. Select "OEM settings."

4. Use encoder to enter OEM pin code. (Default pin code is 0747)

5. After entering pin, the OEM settings menu opens. Select from the list which setting to change.

6. Upon selection, the next page allows for modification of values.



7. The final step is to save, cancel, or reset to factory default.

12. Output Errors

12.1. The below charts show LED diagnostics for the receivers and transmitters.

Receiver LEDs	Red	Blinking Red	Green	Red/Green Flashing	No light
Power LED/MOD	Low Voltage	Overvoltage	Power Normal	N/A	N/A
CAN	No CAN		CAN Normal	N/A	N/A
RF	N/A	No Link	Linked	Link Mode Engaged	N/A

Transmitter LEDs	Red	Yellow
Indication	Error	Warning

13. Conclusion

13.1. This guide was provided as a tool to equip and assist Engineering Professionals with the installation and implementation of the Ranger and Stryker product lines of wireless remote systems to be integrated to the User's specific needs and applications. The information contained herein should help to reduce the likelihood of potential system errors, but it is important that the User fully understands the implications of their specific adaptations, including potential risks and safety hazards.

13.2. If further assistance is needed, first consult your specific radio model's user manual. Downloadable versions of manuals and spec sheets can be found via our website at: https://www.evolutionmotion.com/mobile-controls, or by scanning the provided QR code.

13.3. Additional guidance can be provided by contacting Evolution Motion Solutions via email on our website at: https://www.evolutionmotion.com/service-and-support.

14. Glossary of Terms

Term	Description
Analog Functions	Uses PWM to provide a proportional output.
Deadband	Also known as a neutral zone, is a range of input values that create an output of 0.
Digital Functions	Voltage levels are defined to a mean number, usually 1 or 0.
Electromagnetic interference (EMI)	Undesirable noise in an electrical circuit caused by an outside source.
High Side Outputs	Power supply side.
J1939 Standards	Set of standards that define how the electronic control unit communicates through CAN bus in heavy machinery.
Low Side Outputs	Ground or common side.
Original Equipment Manufacturer (OEM)	Entity that manufactures the machine.
Overvoltage	Excess voltage above the design limit of the circuit.
PGN (Parameter Group Number)	Unique identifier within J1939 standards.
Priority	Scheduling of information in a concurrent real-time programming language.
Pulse Width Modulation (PWM)	Process of rapid on/off switching to create an average voltage .
SA (Source Address)	Address from which a frame or data packet originates.
Shielded Twisted Pair Cable	Cable containing wires twisted together with a shield wire and foil to aid noise reduction.
Suppression Diode	Component used to protect electronics from voltage spikes.
System Voltage	The nominal voltage of the system as a whole.