ReACT Operation and User Manual (ReACT NS and ReACT D5)

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1.02	Updated with RS232/RS422 switching commands	15/08/2012
1.03	Information about cable drawings and operation instructions added	09/05/2013
1.04	The setting for selecting COM3 as USB or 232 was corrected for the EDGINTERFACEMODE command.	09/07/2013
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Issue	Author	Authorised by	Date
1.00	C. Mayne	P. Robinson	18/06/2012
1.02	C. Mayne	P. Robinson	15/08/2012
1.03	R. Treffny, Paul Makinson	C. Mayne	09/05/2013
1.04	R. Treffny	C. Mayne	09/07/2013
1.05	P. Makinson	R. Treffny	29/08/2013
1.06	C. Mayne	C. Mayne	05/12/2013
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1.08	R. Treffny	C. Mayne	28/01/2014
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Related Documents

Document No.	Document Title	Issue
OM-20000167	OEM7 Receiver User Documentation	v15A
OM-20000127	OEMStar Firmware Reference	REV 5
A0072-09-0067	ReACT D5 Installation Manual	v1.00

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1 Notices

The following notices apply to the ReACT GNSS receiver.

1.1 CE Notice

The ReACT GNSS system enclosures carry the CE mark in accordance with EN ISO/EC 17050-1 2004.

1.2 Environmental Standards

The ReACT GNSS system has been tested to the following standards:

Temperature Operating Storage	 – 32 °C to +75 °C – 40 °C to +85 °C
Electromagnetic Compatibility (EMC)	European CE, 89/ EEC EN 55022 Class B, EN50082-1
EMC	MIL-STD-461F (Ground, Army), FCC Class A
Immersion	MIL-STD 810F, method 512.4, IEC 60529 IPX7
Humidity	MIL-STD 810F, method 507.4, procedure 1
Salt Spray	MIL-STD 810F, method 509.4
Sand and Dust	MIL-STD 810F, method 510.4
Fluids Susceptibility	MIL-STD-810F, method 504
Vibration	MIL-STD 810F, method 514.5, Category 20 MIL-STD 810E, method 514.4 tbl. 514.4-AXVII
Shock	MIL-STD 810F, method 516.5, Procedure I, IV
Electrostatic Discharge (ESD)	IEC 61000-4-2 level 2 (± 4 KV)
Ultraviolet Light Protection	MIL-STD-810F, method 505.4

1.3 Environmental Standards

The ReACT is compliant with the European Union (EU) Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

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2 Warranty Information

Forsberg Services Ltd Warranty Policy

Forsberg Services Ltd (FSL) warrants that the navigation products manufactured by FSL are free from defects in materials and workmanship, subject to the conditions set forth below, for the following periods of time:

ReACT - One (1) Year from the date of sale
Software Support - One (1) Year from the date of sale

Date of sale shall mean the date of the invoice to the original customer for the product. FSL's responsibility respecting this warranty is solely to product replacement or product repair at an authorized FSL location only.

The FSL warranty does not extend to the following:

I. Non-conformities, defects or errors in the products due to accident, abuse, misuse or negligent use of the products or use in other than a normal and customary manner, environmental conditions not conforming to FSL's specifications, or failure to follow prescribed installation, operating and maintenance procedures.
II. Defects, errors or non-conformities in the products due to modifications, alterations, additions or changes not made in accordance with FSL's specifications or authorised by FSL.
III. Normal wear and tear.
IV. Damage caused by force of nature or act of any third person.
V. Shipping damage; or
VI. Service or repair of product by the user without prior written consent from FSL. In addition, the foregoing warranties shall not apply to products designated by FSL as beta site test samples, experimental, developmental, preproduction, sample, incomplete or out of specification products or to be returned products if the original identification marks have been removed or altered.

The warranties and remedies are exclusive and all other warranties, expressed or implied, written or oral, including the implied warranties of merchantability or fitness for any particular purpose are excluded. FSL shall not be liable for any loss, damage, expense, or injury arising directly or indirectly out of the purchase, installation, operation, use of licensing or products or services. In no event shall FSL be liable for special, indirect, incidental or consequential damages of any kind or nature due to any cause.

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3 ReACT D5 Model – Functionality Notice

3.1 Important Functionality Note

The FSL ReACT D5 model utilizes an internal connection to the GNSS COM2 port. Therefore, any commands sent through GPS COM1 or GPS COM3 that will affect the COM2 configuration could reduce functionality.

When connected to either GPS com port the following commands should be avoided.

UNLOGALL
If UNLOGALL is sent to a GPS com port it will stop the output of commands on all GPS com ports and all of the EDGE com ports.
UNLOG
If UNLOG is sent to a GPS com port it will stop the output of the specific log command on all GPS com ports and all the EDGE com ports. If using this command, ensure either COM1 or COM3 is specified.
COM COM2 or SERIALCONFIG COM2
GPS COM2 has been specifically configured for communicating with the FS-D5 and changing the baud rate of GPS COM2 will disable communications between the micro and the GPS receiver and therefore the micro com ports will no longer function.
FRESET / RESET
These commands will reset the GPS receiver to its original state and will disable communications between the micro and the GPS receiver and therefore the micro com ports will no longer function. A power cycle will recover the unit and allow the FS-D5 to reconfigure the receiver.

Please reference document A0072-09-0067 ReACT D5 Installation Manual for details on ReACT D5 EDGE-WARE firmware.

3.2 Reconfiguring COM2

Functionality can be retained using either of the methods outlined below.

Reconfigure COM2
Connect to GPS COM1 through a PC running Text Terminal Software and send the following commands to the unit.

SERIALCONFIG COM2 9600 8 N 1 N OFF ON
INTERFACEMODE COM2 NOVATEL NOVATEL OFF
SAVECONFIG

Power cycle
If SAVECONFIG has not been applied, remove power from the ReACT unit by removing the connector plug and ensure that the unit is off, then re-apply power. The unit will configure itself for full functionality.

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4 Introduction

4.1 Scope

This manual provides the information required for installation and operation of the ReACT GNSS system. The ReACT can be fitted with multiple GNSS receiver options and therefore an accompanying manual will be provided for specific receiver operation.

4.2 ReACT Overview

The Forsberg Services Ltd (FSL) ReACT (Receiver Antenna Compact Technology) is a compact, rugged enclosure including a high quality GNSS receiver, antenna and optional DSP module. ReACT has been designed for compatibility with NovAtel's OEMStar, OEM719 and legacy OEM615 GNSS receivers. This family of receivers offer a range of functionality that can be controlled through firmware upgrades. The antenna fitted inside the system will be tuned for use with, GPS L1 and GLONASS L1 (R) or GPS L1/L2, GLONASS G1/G2/G3, BeiDou B1/B2 and Galileo E1/E5b (Q). This option is controlled through hardware and is non-upgradeable in the field. Further information about the two different antenna models can be found in the appendix.

The unit is available in three model types:

4.3 ReACT NS

The NS model combines a GNSS receiver and antenna into a single enclosure. This model provides direct comms to the GNSS receiver. A metal 19 pin Fischer connector is provided for access to I/O. FSL provide various cable options with the system.

Note: Selecting the OEMSTAR as the receiver will disable Event-In and COM3.

Connectivity	Strobes
• 1 × configurable RS232/422 serial port • 1 × RS232 serial port • 1 × RS232 or USB (3 × virtual RS232 ports) (Configured at factory) • 1 × CAN NMEA 2000 port	• PPS • Event-in • VARF

4.4 ReACT NSc

The NSc model provides the same functionality as the NS with a centre mount cable. A metal 19 pin Fischer connector is provided for access to I/O.

Note: Selecting the OEMSTAR as the receiver will disable Event-In and COM3.

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Connectivity	Strobes
• 1 × configurable RS232/422 serial port • 1 × RS232 serial port • 1 × RS232 or USB (3 × virtual RS232 ports)	• PPS • Event-in

4.5 ReACT D5

The D5 model is the enhanced model of the ReACT by combining a GNSS receiver and antenna with our FS-D5 processor module. This provides enhanced functionality and additional I/O through our range of EDGE-WARE products. A metal 19-pin Fischer connector is provided for access to I/O. FSL provide various cable options with the system.

Note: Selecting the OEMSTAR as the receiver will disable Event-In and COM3.

Connectivity	Strobes
• 1 × configurable RS232/422 serial port • 1 × RS232 serial port or USB (3 × virtual RS232 ports) • 3 × EDGE RS232 serial ports • 1 × EDGE-CAN port	• PPS • Event-in • VARF

4.6 EDGE-WARE

The ReACT D5 model is capable of running EDGE-WARE, a firmware product developed by FSL. This firmware provides additional functionality and I/O. More details of the EDGE-WARE functionality and modules are provided later in this document.

4.7 Included with the ReACT

The ReACT system comes with:
1 x ReACT GNSS System
1 x USB drive with
1 x ReACT Manual
1 x NovAtel GNSS Firmware Manual and access to on-line OEM7 user manuals (https://docs.novatel.com/oem7/Content/Home.htm).

Due to the range of applications and bespoke requirements the ReACT NS and D5 are supplied with an I/O cable. This may be ordered separately and can be provided as a terminated cable or with flying leads. The standard cable versions are available either with a straight or right-angled Fischer connector.

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5 ReACT Installation and setup

5.1 Power

The ReACT GNSS system requires an input supply voltage between +9 VDC and +36 VDC.

5.2 ReACT NS

5.2.1 Mechanical Dimensions

Dimensions	116 mm x 116 mm x 85 mm
Weight	600 g

5.2.2 Connectivity Overview

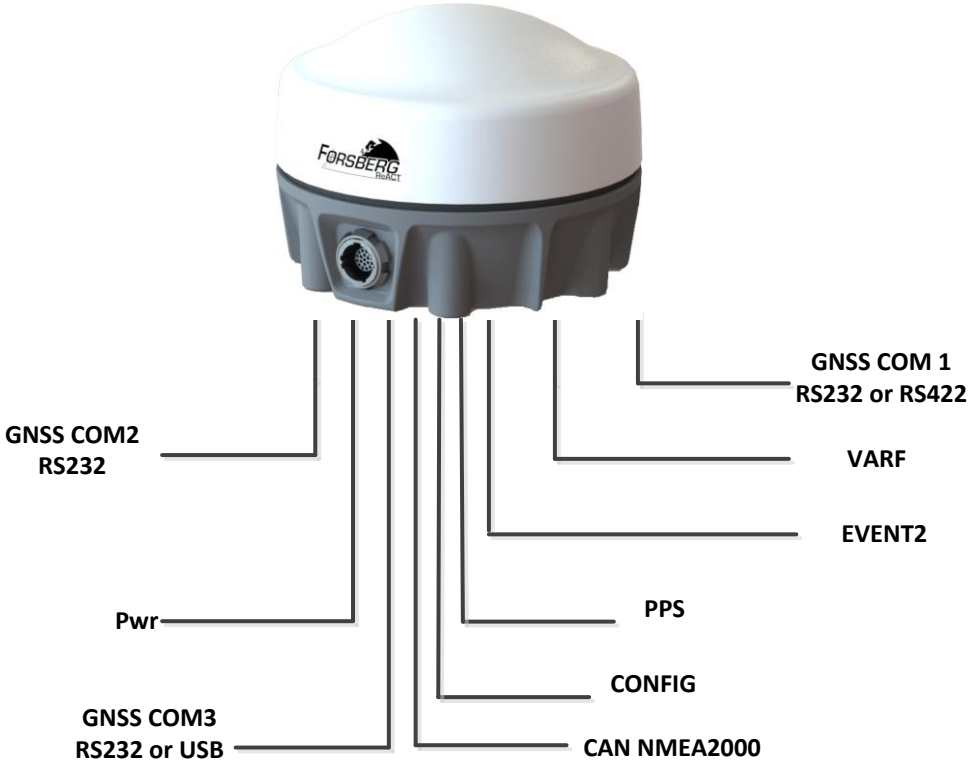

Figure 1 ReACT NS Connectivity Overview

5.2.3 Configuring the com ports: COM1 and USB/COM3

The configuration port allows for the ReACT GNSS COM1 and USB/COM3 to be configured. The following commands can be sent to the ReACT through the configuration port to configure the ReACT GNSS COM1 and USB/GNSS COM3.[1]

[1] The OEMStar receiver only allows for GNSS COM1 RS232/RS422 and USB to be enabled. COM3 is not available on this receiver model.

Default settings for the ReACT are:
COM1 RS232
USB and Event 1 enabled

5.2.3.1 Connect to the configuration port

Using a serial terminal program, connect to the config port (D3) at a baud rate of 9600.

5.2.3.2 COM1 RS232

EDGINTERFACEMODE COM1 232

5.2.3.3 COM1 RS422

EDGINTERFACEMODE COM1 422

5.2.3.4 COM3 configuration

EDGINTERFACEMODE COM3 232

Whilst connected to GPS COM1 enter the commands:
INTERFACEMODE USB1 NONE NONE
INTERFACEMODE USB2 NONE NONE
INTERFACEMODE USB3 NONE NONE
EVENTINCONTROL MARK1 DISABLE
INTERFACEMODE COM3 NOVATEL NOVATEL
SAVECONFIG

5.2.3.5 USB configuration

EDGINTERFACEMODE COM3 USB

Whilst connected to GPS COM1 enter the commands:
INTERFACEMODE COM3 NONE NONE
INTERFACEMODE USB1 NOVATEL NOVATEL
INTERFACEMODE USB2 NOVATEL NOVATEL
INTERFACEMODE USB3 NOVATEL NOVATEL
EVENTINCONTROL MARK1 ENABLE
SAVECONFIG

5.2.4 Mounting Points

The ReACT NS comes with two mechanical mounting options.

3 x M6 screw points for vehicle mounting. The thread depth is 12mm
1 x 5/8” thread for centre/ pole mounting. The thread depth is 22mm

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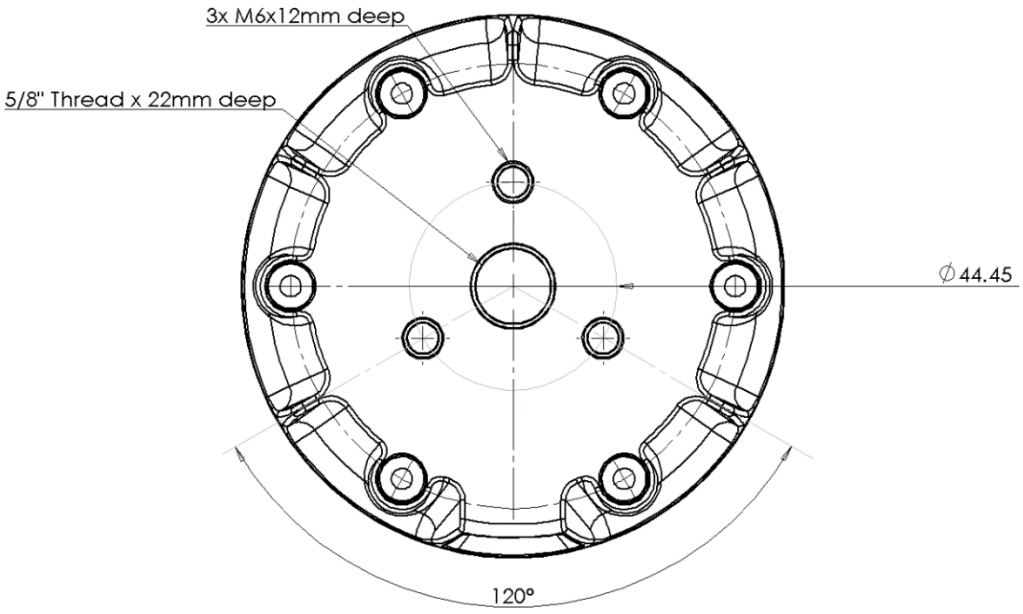

Figure 2 Mounting points for ReACT NS

5.2.5 Connector and Pinout

Description		Fischer Part Number
UltiMate, 19Way Panel Mounted Socket		UR02W11 F019P BK1 E1AA
Pin	**Signal**	**Description**
1	COM3 TXD / USB_D-	GNSS COM3 or USB (OEM719 Model Only)
2	COM3 RXD / USB_D+	
3	GNSS CAN High	CAN NMEA 2000
4	GNSS CAN Low	
5	COM2 TXD	GNSS COM2
6	COM2 RXD	
7	CONFIG TXD*	Com port configuration
8	CONFIG RXD*	
9	NC	Reserved/ Not Connected
10	NC	
11	GNSS PPS	GNSS PPS strobe
12	GNSS EVENT2	GNSS Event In strobe (OEM719 Model Only)
13	GNSS VARF	GNSS Variable frequency strobe
14	COM1 TXD / TX+	GNSS COM1 (RS232 or RS422)
15	COM1 TX-	
16	COM1 RXD / RX+	
17	COM1 RX-	
18	Power Return	Power
19	9-36VDC Power Input	
Shield.		Signal Ground

5.2.5.1 Connector and Pinout

Label	Description
A	Free Plug, Fischer UP01L11
B	USB plug, moulded connector
C	Free plug, 9-way D-type male, moulded connector

D	Free plug, 9-way D-type female, moulded connector
E	Un-terminated wires
F	Vehicle power plug

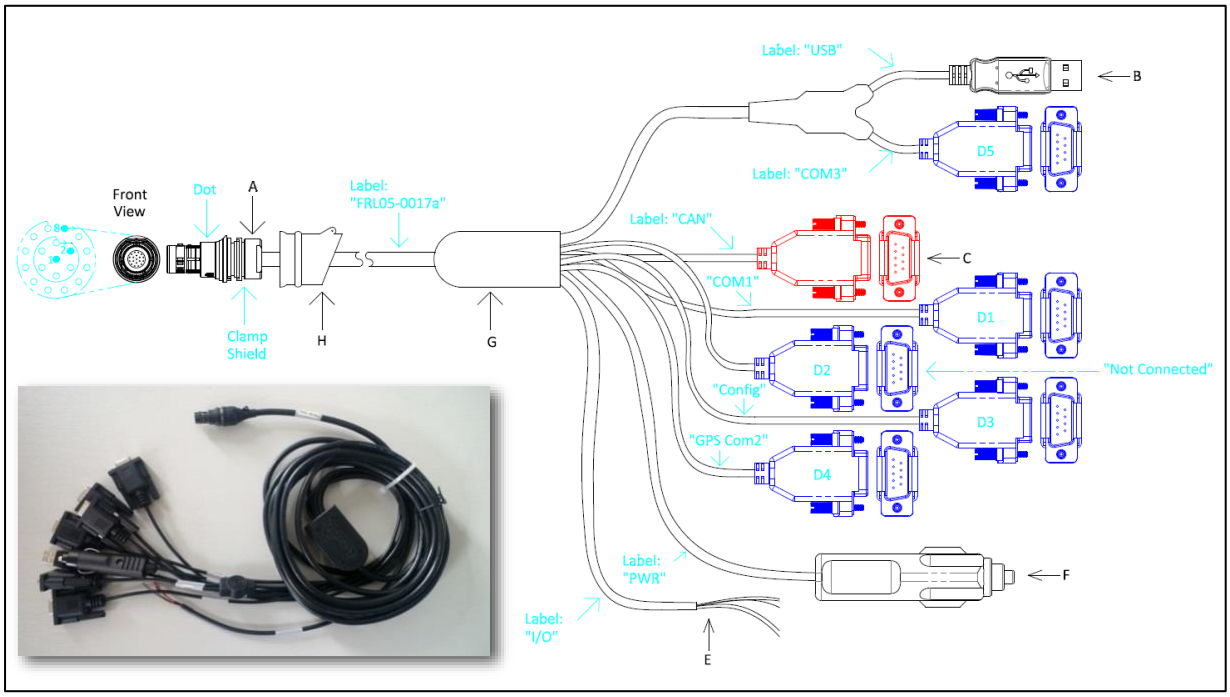

Figure 3 ReACT NS cable assembly

Description			Fischer Part Number	
React NS Cable (5m long)			UP01L11 M019S BK1 Z1ZA	
Pin	**Signal**	**Description**	**Terminated to**	**Flying Lead colours (E)**
1	COM3 TXD / USB_D-	GNSS COM3 RS 232 Or GNSS USB	Connector B pin 2 & D5 Pin 2	
2	COM3 RXD / USB_D+		Connector B Pin 3 & D5 Pin 3	
3	GNSS CAN High	GNSS CAN port	Connector C Pin 7	
4	GNSS CAN Low		Connector C Pin 2	
5	COM2 TXD	GNSS COM2	Connector D4 Pin 2	
6	COM2 RXD		Connector D4 Pin 3	
7	CONFIG TXD*	Com port configuration	Connector D3 Pin 2	
8	CONFIG RXD*		Connector D3 Pin 3	
9	NC	Reserved/ Not Connected	NC	
10	NC		NC	
11	GNSS PPS	GNSS PPS strobe	(E) un-terminated	Red
12	GNSS EVENT2	GNSS Event In strobe	(E) un-terminated	Brown
13	GNSS VARF	GNSS Variable frequency strobe	(E) un-terminated	Black
14	COM1 TXD / TX+	GNSS COM1 (RS232 or RS422)	Connector D-1 Pin 2	
15	COM1 TX-		Connector D-1 Pin 8	
16	COM1 RXD / RX+		Connector D-1 Pin 3	
17	COM1 RX-		Connector D-1 Pin 7	
18	Power Return	Power	Connector F (Ring)	
19	9-36V Power Input		Connector F (Tip)	
Shield. Signal Ground			(E) un-terminated	Orange
			Connector A , Shell	
			Connector B Pin 4	
			Connector C Pin 3	

	Connector D1 Pin 5	
	Connector D3 Pin 5	
	Connector D4 Pin 5	

5.3 ReACT NSc

5.3.1 Mechanical Dimensions

Dimensions	116 mm x 116 mm x 85 mm
Weight	600 g

5.3.2 Connectivity Overview

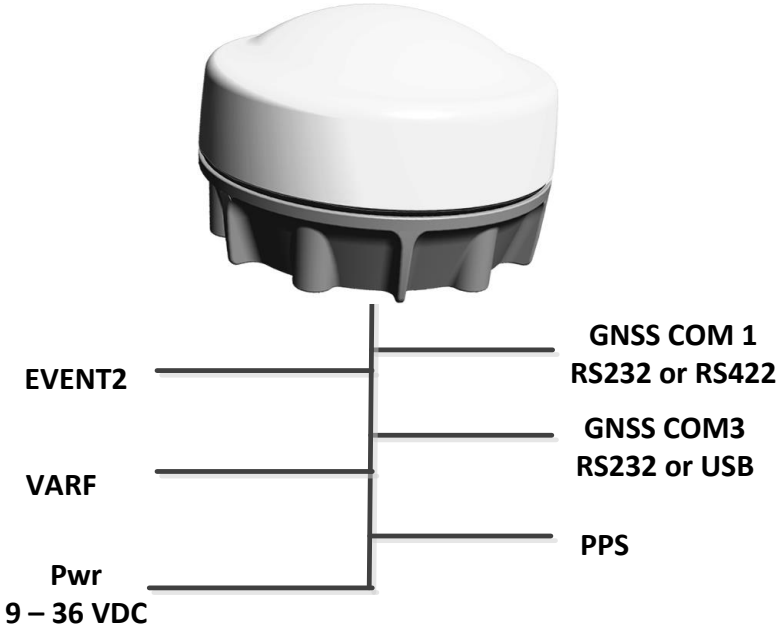

Figure 4 ReACT NSc Connectivity Overview

5.3.3 Mounting Point

The ReACT NS comes with two mechanical mounting options.

3 x M6 screw points for vehicle mounting.

3 x 10-32 UNF screw points for vehicle mounting.

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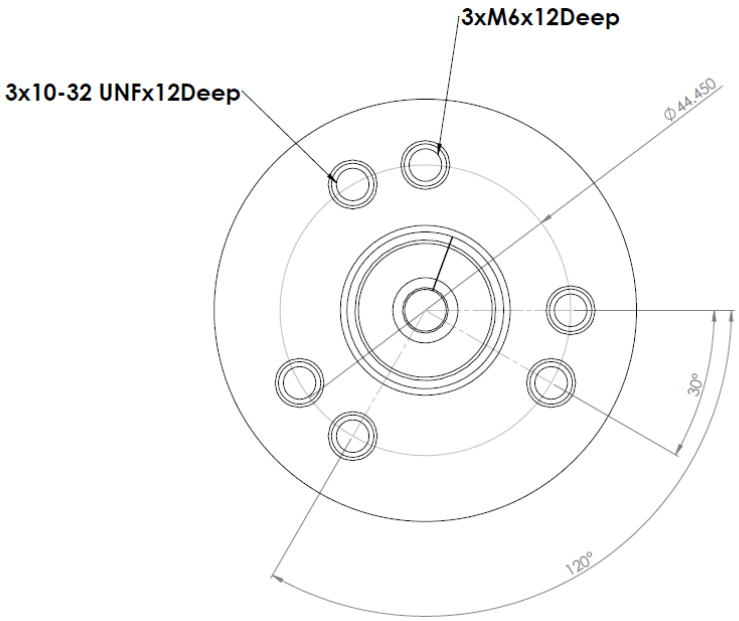

Figure 5 ReACT NSc mounting points

5.4 ReACT D5

5.4.1 Mechanical Dimensions

Dimensions	116 mm x 116 mm x 85 mm
Weight	600 g

5.4.2 Connectivity Overview

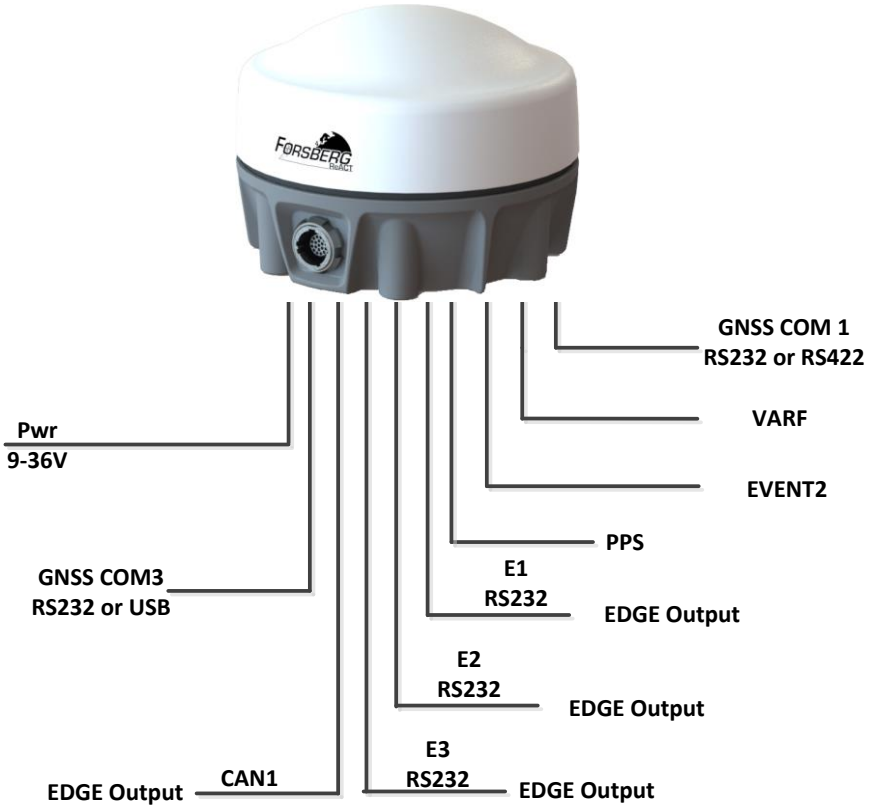

Figure 6 ReACT D5 connectivity overview

5.4.3 Mounting Point

The ReACT NS comes with two mechanical mounting options.

3 x M6 screw points for vehicle mounting.

1 x 5/8” thread for center/pole mounting.

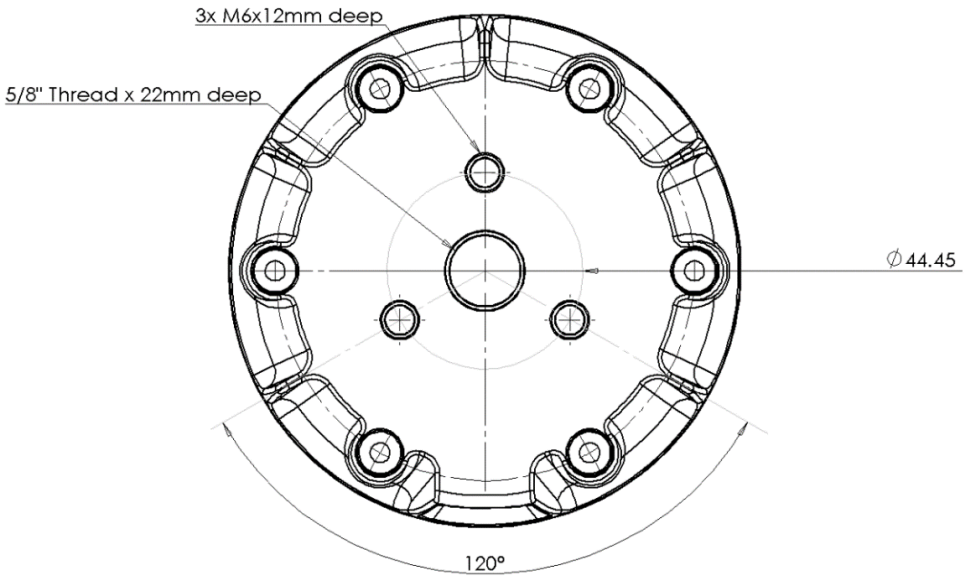

Figure 7 Mounting options for ReACT D5

5.4.4 Connector and Pinout

Description		Fischer Part Number
UltiMate, 19-Way Panel Mounted Socket		UR02W11 F019P BK1 E1AA
Pin	**Signal**	**Description**
1	COM3 TXD / USB_D-	GNSS COM3 or USB (OEM719 Model Only)
2	COM3 RXD / USB_D+	
3	EDGE CAN High	EDGE-WARE CAN port
4	EDGE CAN Low	
5	E3 TXD	EDGE COM3
6	E3 RXD	
7	E2 TXD	EDGE COM2
8	E2 RXD	
9	E1 TXD	EDGE COM1
10	E1 RXD	
11	GNSS PPS	GNSS PPS strobe
12	GNSS EVENT2	GNSS Event In strobe (OEM719 Model Only)
13	GNSS VARF	GNSS Variable frequency strobe
14	COM1 TXD / TX+	GNSS COM1 (RS232 or RS422)
15	COM1 TX-	
16	COM1 RXD / RX+	
17	COM1 RX-	
18	Power Return	Power
19	9-36V Power Input	
Shield.		Signal Ground

5.4.5 ReACT D5 I/O Cable - Terminated

Label	Description
A	Free Plug, Fischer UP01L11
B	USB plug, moulded connector
C	Free plug, 9-way D-type male, moulded connector
D	Free plug, 9-way D-type female, moulded connector
E	Un-terminated wires
F	Vehicle power plug

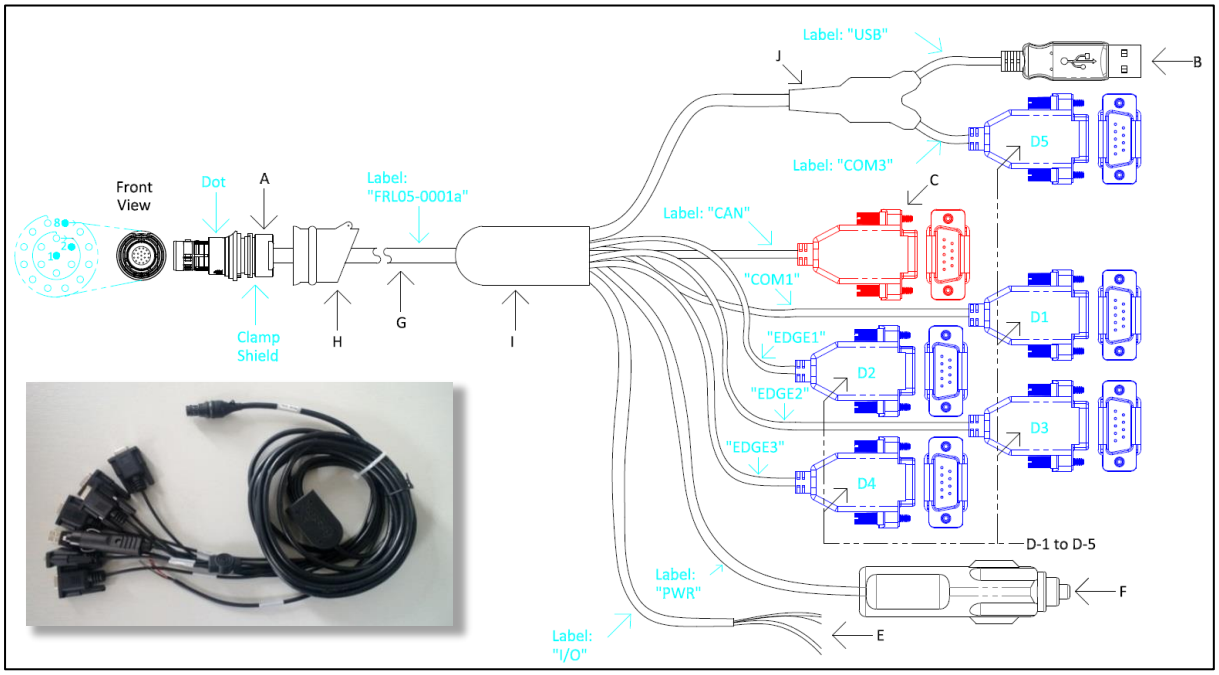

Figure 8 ReACT D5 I/O cable

Description			Fischer Part Number	
React D5 Cable assembly (5m)			UP01L11 M019S BK1 Z1ZA	
Pin	**Signal**	**Description**	**Terminated to**	**Flying Lead colours (E)**
1	COM3 TXD / USB_D-	GNSS COM3 RS 232 Or GNSS USB	Connector B pin 2 & D5 Pin 2	
2	COM3 RXD / USB_D+		Connector B Pin 3 & D5 Pin 3	
3	GNSS CAN High	EDGE-WARE CAN port	Connector C Pin 7	
4	GNSS CAN Low		Connector C Pin 2	
5	EDGE3 TXD	EDGE COM3	Connector D4 Pin 2	
6	EDGE3 RXD		Connector D4 Pin 3	
7	EDGE2 TXD	EDGE COM2	Connector D3 Pin 2	
8	EDGE2 RXD		Connector D3 Pin 3	
9	EDGE1 TXD	EDGE COM1	Connector D2 Pin 2	
10	EDGE1 RXD		Connector D2 Pin 3	
11	GNSS PPS	GNSS PPS strobe	(E) un-terminated	Red
12	GNSS EVENT2	GNSS Event In strobe	(E) un-terminated	Brown
13	GNSS VARF	GNSS Variable frequency strobe	(E) un-terminated	Black
14	COM1 TXD / TX+	GNSS COM1 (RS232 or RS422)	Connector D-1 Pin 2	
15	COM1 TX-		Connector D-1 Pin 8	
16	COM1 RXD / RX+		Connector D-1 Pin 3	
17	COM1 RX-		Connector D-1 Pin 7	
18	DC Power Return	Power	Connector F (Ring)	
19	9-36VDC Power Input		Connector F (Tip)	
Shield. Signal Ground			(E) un-terminated	Orange
			Connector C Pin 3	
			Connector B Pin 4	
			Connector D-1 Pin 5	
			Connector D-2 Pin 5	
			Connector D-3 Pin 5	
			Connector D-4Pin 5	

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6 Appendix

6.1 R-Antenna Model

The antenna element is a lightweight GPS L1 and GLONASS L1 frequency patch with a low noise figure and a high-linearity LNA. This antenna element shows a high reliability in terms of satellite reception while providing a high accuracy output.

Frequency	GPS L1: 1575.42 MHz GLONASS L1: 1609MHz
Polarization	RHCP
DC voltage	2.5 to 5 V
DC current	11mA (max)
Axial ratio	1.5 dB (min)
Impedance	50 Ohm
Operating temperature	from -40°C to 85°C

6.2 Q-Antenna Model

The antenna element is a precision tuned, circular dual feed, stacked patch element with GPS L1/L2, GLONASS G1/G2/G3, BeiDou B1/B2 and Galileo E1/E5b capabilities. The GPS and GLONASS reception capabilities provide the user with a highly reliable and accurate position solution in highly demanding environments.

Frequency	GPS L1: 1575.42MHz GPS L2: 1227.60MHz GLONASS G1: 1609MHz GLONASS G2: 1248 MHz GLONASS G3: 1202.02 MHz BeiDou B1: 1575.42 MHz BeiDou B2: 1207.14 MHz Galileo E1: 1575.42 MHz Galileo E5b: 1207.14 MHz
Polarization	RHCP
DC voltage	2.5V to 16 VDC
DC current	12mA typical
Axial ratio	< 2dB
Impedance	50 Ohm
Operating temperature	from -40°C to 85°C