User's Manual

Raptor 45 & 80-Tx

February 2019

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Introduction

The Raptor-Tx are Ultra-Wide-Band transmitters intended to be used together with the Raptor-Rx receivers for normal GPR-applications and, especially, for applications needing variable Rx-Tx distances.

The nominal center frequency of the units is 450MHz and 800MHz.

Connectors

The unit has 3 external connectors:

1) Power, 12V, 0.4A
2) Trig input 1, coaxial TTL-levels
3) Trig input 2, coaxial TTL-levels

Both trig inputs require some drive capabilities on the trig-unit end, by using receivers from ImpulseRadar, proper drive current is guaranteed. If other trig devices are uses, please refer to further information under the Operations section. Note that both trig inputs are identical, active high-signals on both will cause the unit to output an impulse of electromagnetic energy, however, trigs must always be separated by ate least 3.2us, stipulated by the maximum trig-rate.

Operation

Single-receiver

The unit is protected against water, however, it's not water-proof, for this reason it should be protected from direct exposure to rain.

When operated together with a Raptor®-Rx receiver, proper operation is always guaranteed. If the unit, for some reason, is connected to a function generator or other device capable of delivering trig-signals, means of ensuring that the nominal trig-rate is not exceeded must be taken. The unit is designed, and certified, for operation at 312.5kHz trig-rate, maximum. Higher trig-rates are likely to permanently damage internal circuitry and will in any case not give higher output power, since the internal circuitry will not have time to charge between every trig event.

In normal operation, the unit is connected to power, 12V 0.4A, and one of the coaxial inputs are connected to the trig output of the Raptor®-45 receiver, see figure 1 below.

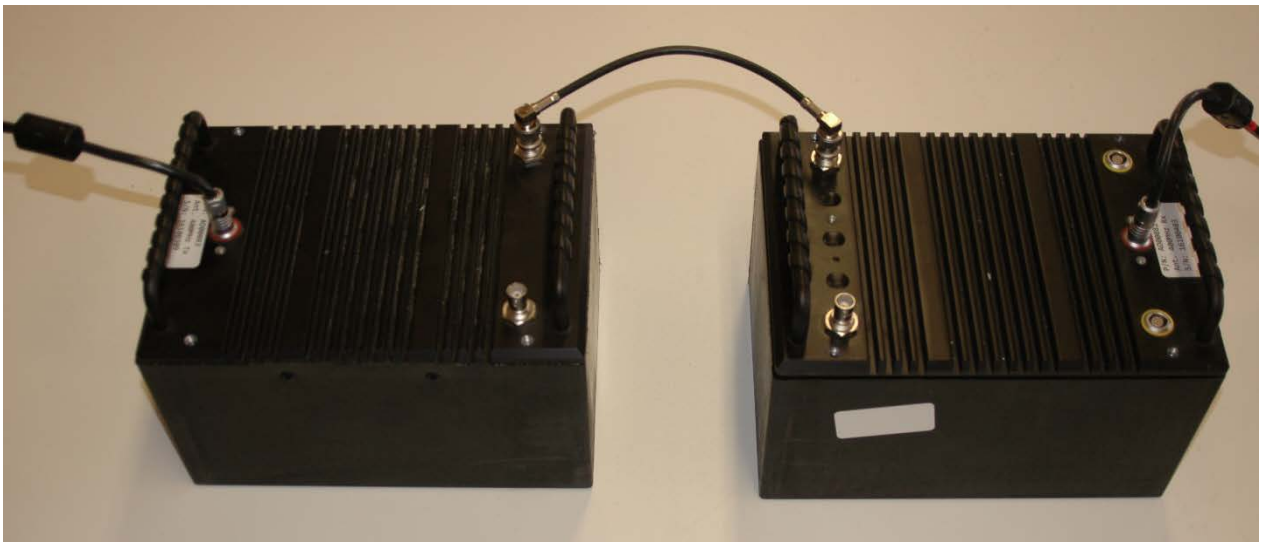

Figure 1, A Raptor®45-Tx connected to a receiver.

The coaxial cable connecting the unit to the receiver can be of any length, however, we have only tested up to 10m, so far. Also, not that by using different length of trig cables the first arrival in the radargram will move, downwards if longer cable is used, and upwards if shorter cables are used.

Normal survey

During normal surveying the combined package of receiver and transmitter is moved over the area of investigation while the receiver controls data collection by means of an attached odometer wheel. Time-controlled data collection including time stamping with GPS-time may also be used as well as manual triggering.

Other survey methods include applications were only one of the units are moved, so called warr-surveys. The primary purpose of these surveys is to gather information about material properties, such as moisture content.

Another type of survey would be tomographic measurements, in which the transmitter and receiver are placed on adjacent sides of the body under investigation. This application, as well as some others described above, are highly specialized and are usually conducted by scientist only.

Shared operation

By using a second receiver and connect one of its trig outputs to the free trig input of the transmitter, two receivers may share the same transmitter. For this to work, the two receivers must be interconnected with a special cable, so that they do not trig the transmitter avertedly. Also, the receivers must now be connected to the PC by means of an Ethernet switch, in order to gather data from both simultaneously.

Note that shared operation can only be done with receivers from ImpulseRadar, as otherwise, the trig-rate and separation in time of the trig signals may not be guaranteed.

Service & Support

Service and repair as well as application support may be obtained from our head office in Sweden. Please contact us at:

support@impulseradar.se

Or call: +46 953 100 08

ImpulseRadar Sweden AB
Storgatan 78
SE-930 70 Malå
Sweden

Specifications

Raptor®45-Tx specifications

Weight:	2.1[kg]
Size:	23x16.5x16[cm]
Power:	0.4A@12V
Temperature range:	-20 - +60 degC
Center frequency:	450MHz
Compatibility:	Raptor®45-Rx receivers

Raptor®80-Tx specifications

Weight:	0.78[kg]
Size:	15x11x12[cm]
Power:	0.4A@12V
Temperature range:	-20 - +60 degC
Center frequency:	800MHz
Compatibility:	Raptor®80-Rx receivers

Regulatory information

General

In Europe, GPR-instruments are operated under the ETSI-standards and emission limits, in the US the FCC-limits apply and in Canada the IC-limits apply. The Raptor45 and 80-Tx meets all requirements for each of these markets.

Common to all these regulations are that GPR-equipment should be used only by professionals and while attending to strict rules for operation, including:

1) The UWB-transmitters should always be used in as proximity to ground, or the material under investigation.
2) When not in use, the data collection should be stopped, and the units switched off.
3) The transmitters should not be directed upwards, only towards the investigation body.

Receivers from ImpulseRadar are passive digital devices, requiring no certifications (FCC part 15.103c).

Additional notes for users in Canada and the US

Operation of this device is restricted to law enforcement, fire and rescue officials, scientific research institutes, commercial mining companies and construction companies. Operation by any other party is a violation of 47U.S.C.301 and the operator may be subject to legal penalties.

Operation is subject to the following conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation of the device.

Operation of this device shall only occur when in contact with or within 1 m of the ground.

RSS 220:

Ce dispositif radar à pénétration du sol ne doit être utilisé qu'en contact avec le sol ou à au plus 1 m du sol.

Ce dispositif radar à pénétration du sol ne doit être utilisé que par des organismes d'application de la loi, des établissements de recherche scientifique, des sociétés minières commerciales, des entreprises de construction, et des organismes d'intervention d'urgence ou de lutte contre les incendies.

RSS GEN :

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;

2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Information to users in the US

Operation of this device is restricted to law enforcement, fire and rescue officials, scientific research institutes, commercial mining companies and construction companies. Operation by any other party is a violation of 47U.S.C.301 and could subject the operator to Serious legal penalties.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

1) **This device may not cause harmful Interferences and**
2) **This device must accept any interference Received. Including interference that may cause undesired operation**

Licensing requirements (US)

§15.50(b)(1) states

Parties operating this equipment must be eligible for lincencig under the provision of part 90 of this chapter.

Caution about modifications

Changes or modifications to this device, not expressly approved by ImpulseRadar Sweden could void the user´s authority to operate the equipment.

GPR Use Coordination (USA)

FCC regulation requires users of GPR equipment to coordinate the use of their GPR equipment as described below:

§15.525 Coordination requirements.

(a) UWB imaging systems require coordination through the FCC before the equipment may be used. The operator shall comply with any constraints on equipment usage resulting from this coordination.

(b) The users of UWB imaging devices shall supply operational areas to the FCC Office of Engineering and Technology, which shall coordinate this information with the Federal Government through the National Telecommunications and Information Administration. The information provided by the UWB operator shall include the name, address and other pertinent contact information of the user, the desired geographical area(s) of operation, and the FCC ID number and other nomenclature of the UWB device. If the imaging device is intended to be used for mobile applications, the geographical area(s) of operation may be the state(s) or county(ies) in which the equipment will be operated. The operator of an imaging system used for fixed operation shall supply a specific geographical location or the address at which the equipment will be operated. This material shall be submitted to Frequency Coordination Branch, OET, Federal Communications Commission, 445 12th Street, SW, Washington, D.C. 20554, Attn: UWB Coordination.

(c) The manufacturers, or their authorized sales agents, must inform purchasers and users of their systems of the requirement to undertake detailed coordination of operational areas with the FCC prior to the equipment being operated.

For your convenience, the information required by the FCC is indicated on the next page, please print and fill in the information and put the letter in the mail. FCC will respond with confirmation of coordination.

Date: _____

To:
Frequency Coordination Branch., OET
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554
ATTN: UWB Coordination
Fax: 202-418-1944

RE: FCC GROUND PENETRATING RADAR COORDINATION NOTICE

COMPANY NAME:

_____
_____
_____

PRIMARY ADDRESS:

_____
_____
_____
_____

CONTACT INFORMATION [CONTACT NAME AND PHONE NUMBER]:

_____
_____
_____

AREA OF OPERATION [COUNTIES, STATES OR LARGER AREAS]:

_____
_____
_____
_____

FCC ID (tic the appropriate box/boxes)

CrossOver 4080: 2ALZQ-CO4080 ☐

CrossOver 1760: 2ALZQ-CO1760 ☐

CrossOver 730: 2ALZQ-CO730 ☐

Raptor 45-Tx: 2ALZQ-RAPTOR45TX ☐

Raptor 80-Tx: 2ALZQ-RAPTOR80TX ☐