

RadaScan® Responder Buying Guide

Introduction

This document gives advice on which 'colours' of responder should be purchased for a given scenario. The colour denotes the differing modulation frequencies used by the responders. There are 4 different colours available. This document explains how to make the right choice of responder.

Background

There are two formats of RadaScan® and Mini RadaScan® (microwave) targets currently in field, transponders and responders. Responders are much smaller, lighter and give better performance than transponders.

The transponder (Figure 1) and series 1, 2 and 3 responders (Figure 2) are shown below.



The transponder and the earliest version of responder (series 1) used Frequency Shift Keyed (FSK) modulation techniques to uniquely identify the target. In this document FSK is used to describe the Van Atta and series 1 targets as a sub-group.

The latest series 2 and series 3 responders use a Phase Shift Keyed (PSK) modulation technique. In this document PSK is used to describe the series 2 and series 3 responders as a sub-group.

The PSK responders also modulate the radar signal by using one of four different frequencies. These are identified as colours (Red, Yellow, Green and Blue), representing their position in the frequency spectrum. Responders are much smaller, lighter and give better performance than the earlier transponders.

The series 3 responder is recognisable by its flat front.

The first generation of Mk1 RadaScan sensor will only detect FSK responders . The Mk2 RadaScan and Mini RadaScan manufactured up to end 2014 are capable of detecting ALL types of RadaScan responder; however, RadaScan/Mini RadaScan sensors manufactured in 2015 will not support the FSK responders.

An End of Life document for the transponder and series 1 responder can be found [here](#).

Very early versions of Mk2 RadaScan cannot detect PSK responders due to early hardware capabilities; these sensors however, can be upgraded. Contact Guidance Marine for further details.

Multiple Target Type Rules

When using multiple targets, because of the differing modulation types, certain rules must be adhered to; these form the basis of this buying guide.

The detection of all targets is automatic and transparent to the user, but when using multiple target types certain rules must be considered.

1. Two FSK targets used together **must have** at least 7 degrees of angular separation.

Note: Angular separation is the subtended angle between the responders from the position of the sensor. This can be determined by the distance between the sensors for a given detection range. For example, 8 degrees of separation is achieved at 100m if the responders are 14 metres apart. Therefore at 200m the responders must be 28m apart. Rule: For every 10m range to the responder a separation of 1.4m between responders is required.

2. Two (PSK) responders of the **same** colour used together **must have at least** 7 degrees of angular separation. Guidance Marine do not recommend having two of the same colours used together, which is why we have a variation of colour responders.
3. Two responders of **different** colours **do not need** any angular separation.
4. A (PSK) blue or red responder used with a FSK responder **must have** 7 degrees of angular separation.
5. A yellow or green responder used with a FSK responder **does not need** any angular separation.
6. The Radascan sensor (Mk2 or Mini RadaScan) must be at the correct software level to support all four responder colours. (See version limitations later in this document).

Contact Guidance Marine if a mixture of FSK and PSK responders is a likely operational situation.

Purchasing Recommendations

Single Responder

By default, when supplying a single responder Guidance Marine will normally supply the latest generation blue responder.

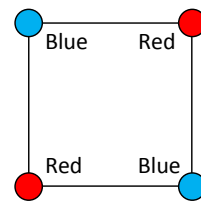
Two Responders

When supplying a pair of responders for installation on the same platform, Guidance Marine recommends that these are different colours, e.g. Blue and Red, in order to maximise frequency separation.

More than 2 Responders

If more than two responders are required on a single platform the angular separation of same-colour **MUST** be more than 7 degrees.

If more than two responders are required on a single platform Guidance recommends purchase of the colours **NOT** currently on the platform. Initial supply is normally Red and/or Blue responders, therefore supply of Yellow and/or Green is recommended.



Platforms and assets that have permanent responder installations typically have Green/Yellow responders.

Responder Power Requirements

The responder is supplied in a number of different formats to accommodate the operating conditions within which it must function. The different formats are based upon the power requirements of the responder and are aimed to suit the operational requirements of the user.

The 3 available formats are:

Rechargeable

Under normal conditions with a fully charged battery, the rechargeable responder will operate continuously for up to 528 hours before it needs recharging. Typically used by vessels holding their own test responder. Used on oil rigs where the responder has favourable access and is frequently visited by personnel to facilitate recharge.

Primary Cell

The primary cell pack has a nominal 24/7 use expected life-time of 12 months under average temperature conditions. Typically used on oil rigs (poor access) and remote locations that are not frequently visited by personnel.

Mains Powered

The wired responder can be powered via an intrinsically safe 5V to 30V DC supply, maximum current 400mA and maximum power output 1.2W. Typically used on static locations with mains available locally.

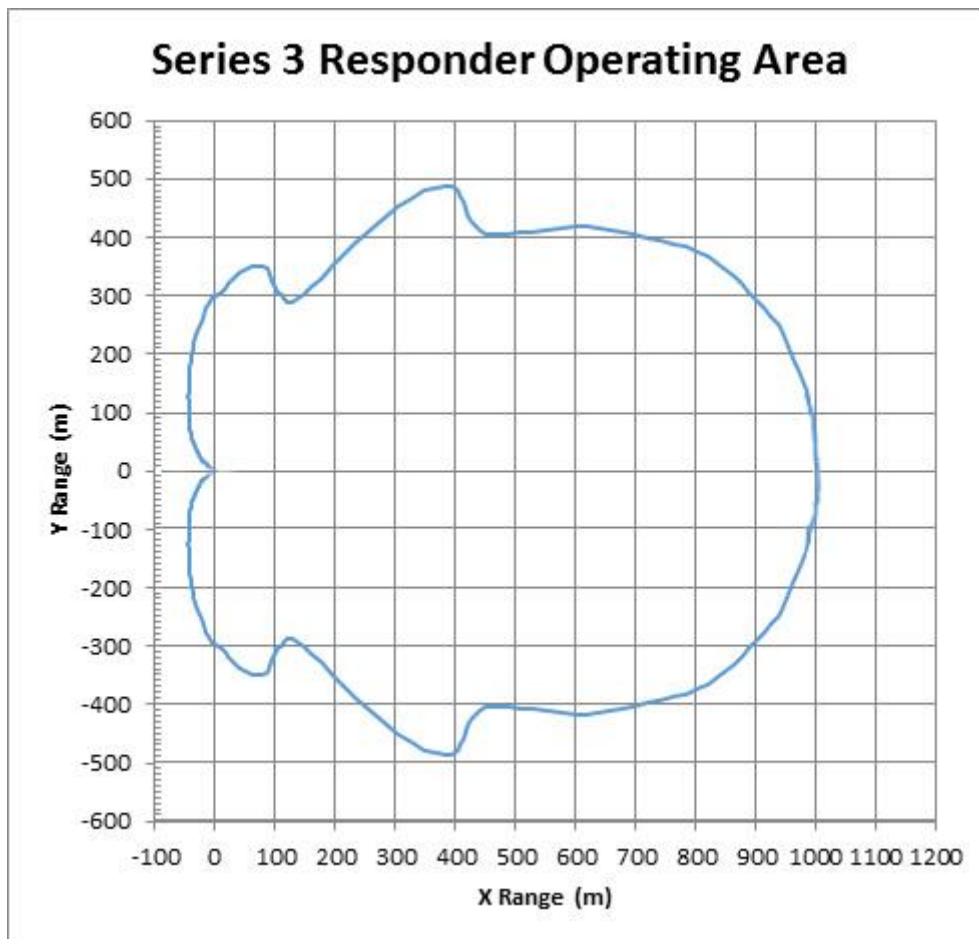
Deployment Recommendations

Responder Reception Pattern

The series 3 responder has a distinctive reception pattern (it receives no signals from the rear of the unit).

The reception pattern dictates how the responder is positioned on the asset to cover the approach and operations of the vessel against the asset.

A typical responder reception pattern is:

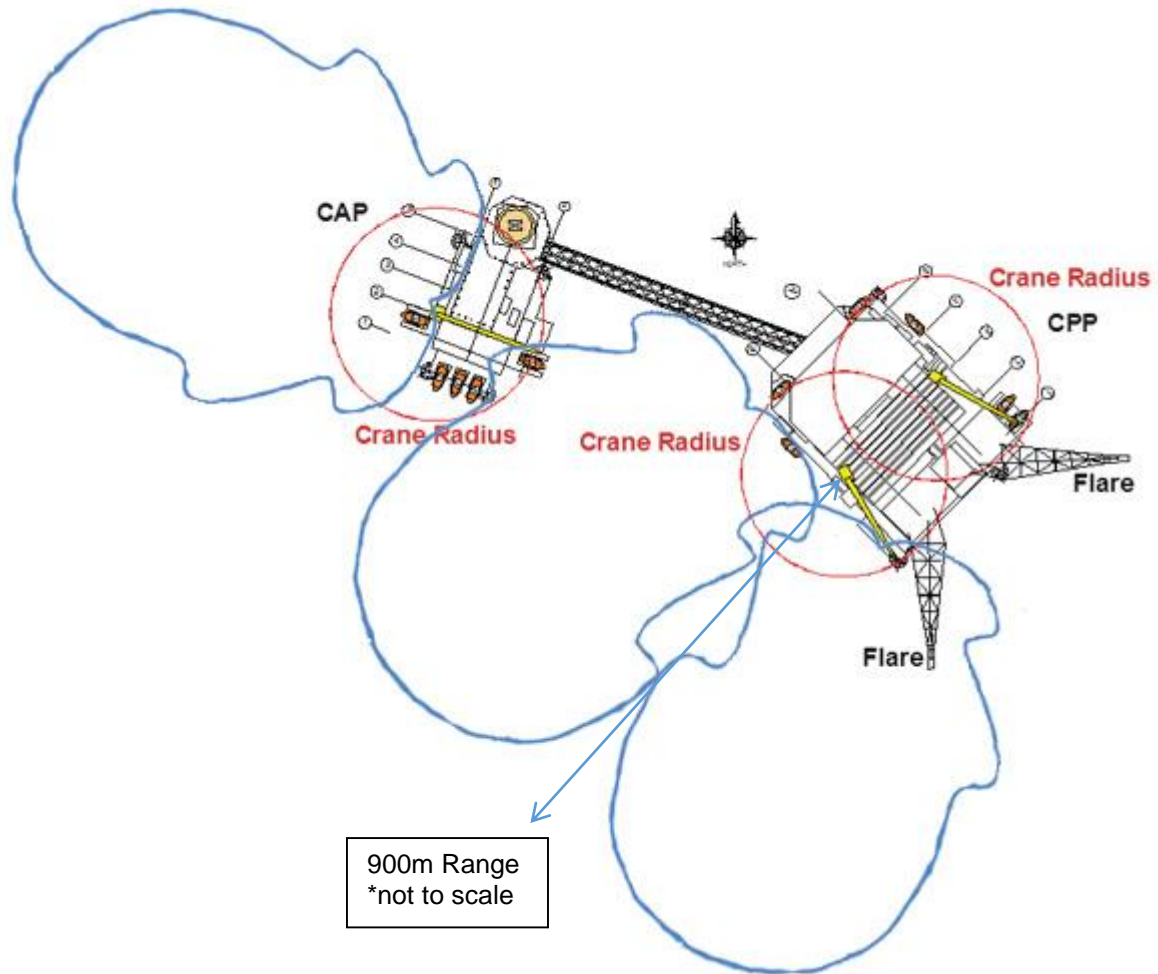


From the response pattern we can see that the responder gives the best reception signal when it is pointed towards the operating area or approach of the vessels. The recommended incident angle of the incoming signal from the vessel is less than +/- 45 degrees from the centreline of the responder. This recommendation is based upon the reception response of the responder (as above) and the operational requirements of the user (detection at more than 500m from asset).

The responder can detect almost 180 degrees at close ranges (less than 100m range to target).

From the pattern it can be seen that a vessel can be approximately 400m to the left or right of a responder and will detect it up to 1000m away. The above pattern is affected by local conditions and should be used as a guide only to positioning the responders.

Typical deployment over the operating area



Positioning responders – Best Practice

- ❖ Wherever possible responders should be located where the line of sight from the vessel to the responder is open space beyond the responder, however this is not always possible.
- ❖ Responders should not be positioned under overhangs. There should be no flat metallic surfaces directly above the responder, as much clear space as possible above the responder is recommended.
- ❖ The responders should be positioned where they can be safely and easily reached to facilitate adjustment and to change batteries or take away to be charged.
- ❖ Responders should be mounted on the Guidance Marine responder bracket supplied.
- ❖ Responders should be vertical (not mounted at an angle).
- ❖ Responders should be angled towards the intended area of operations.

System Software (SW) Version Limitations

The system software version of the RadaScan/Mini RadaScan is displayed at the user interface and on the display of the sensor.

System Version 3.5.1

System version 3.5.1 (referred to as the RadaScan dashboard) is the latest hardware and sensor software package and is compatible with the PSK targets only. It does not support FSK target types.

System Version 2.11 to 2.13

System version 2.11 is the minimum requirement for using all four colours of the responder and supports FSK targets.

System Version 2.8/2.10

System versions 2.8 – 2.10 support Red and Blue PSK responders. If vessels installed with these versions are to visit the platform then only Red or Blue responders should be purchased. If other colours (green/ yellow) are required to be detected then an upgrade to the system software is recommended (2.13).

System Version 2.7 and below

System versions 2.7 and below do not support PSK responders. The first recommendation is a software upgrade, in some cases this may mean the replacement of the sensor's controller PCB. If RadaScan cannot be upgraded (because of hardware constraints) then only series 1 responders or series 1 transponders should be used.

System Version 1.18 and below

System version 1.18 or below is a Mk1 RadaScan system which is obsolete and should be replaced immediately.

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Guidance Marine Ltd, 4 Dominus Way, Meridian Business Park, Leicester, LE19 1RP, United Kingdom
Tel: +44 116 229 2600 **Fax:** +44 116 229 2604 **Web:** www.guidance.eu.com

Company Registered in England No. 05231840 VAT No. GB 108 2469 21