

## ENGINEERING STATEMENT

In Regard to Measurements on  
NorCross Marine Products, Inc.

MODEL: DF2D/DF2R

FCC ID: PSTDF1000R

### A. INTRODUCTION

Hyak Laboratories, Inc. has been authorized by NorCross Marine Products, Inc., to determine compliance with FCC rules, Part 15, Subpart B.

The device operates in the 903 - 927 MHz band and is intended for use as a remote depth sounder display.

1. The receiver module receives RF signal sent from a DF20 transmitter, demodulates the RF signal and retrieves the digital data.
2. Two different case configurations are used. Both have the same receiver module board and internal antenna:  
  
DF2D: Panel mount, operates from vessel's 12 V dc line.  
  
DF2R: Hand-Held, operates from Nicad batteries.
3. There are two channels to select from, channel selection is done by the micro-controller. The two crystals determine the receiving frequencies which equal to  $(F_c + 10.7)$  MHz.
4. The 2 crystals X1 and X2 can be selected by forward biased the diodes D1 and D2 respectively. The desired receiving can be trimmed by the trimmer capacitor.
5. The heart of the receiver module is a integrated receiver IC RF2917 by RF Micro Devices. The Local Oscillator is a PLL oscillator, its division is 64. The LO frequency is determined by 64 x frequency of the crystal selected.

6. RF at pin 2 is amplified and then mixed with LO frequency and down-converted to 10.7 MHz IF frequency.
7. There are two ceramic filters YL1 and YL2. These filters reject signals other than 10.7 MHz.
8. YL3 is a ceramic discriminator where FM demodulation is done.
9. Demodulated signal is at pin 22.
10. Signal at pin 21 is the Radio Signal Strength Indicator which indicates the signal strength.
11. No external antenna is used.

B. DESCRIPTION OF DEVICE

The device incorporates a super-heterodyne design.

The following information is supplied as requested in FCC Bulletin OCE 24:

1. Service in which the device will be used: Part 15.
2. Function of device: Depth Sounder Display.
3. Tuning range: 903 - 927 MHz.
4. IF used: 10.7 MHz.
5. Fundamental frequency of principal oscillators in the device.

First local oscillator:  $F_c + 10.7$  MHz (PLL).

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C. DESCRIPTION OF MEASUREMENT FACILITIES

A description of the Hyak Laboratories' radiation test facility is a matter of record with the FCC. The facility was accepted for radiation measurements from 30 to 1000 MHz on October 1, 1976, and is currently listed as an accepted site.

D. DESCRIPTION OF MEASUREMENT PROCEDURE: RADIATED EMISSIONS

Measurements of radiated field strength were made using ANSI C63.4 (1992) as the basic procedure. Measurements were made with 3-meter spacing between the device under test and the test equipment antenna. The antenna(s) connected to the device under

test consisted of a internal wire approximately 6 cm long.

The device under test was placed on a rotatable table 80 cm in height.

Measurement of field strength was made through use of Tektronix 494P spectrum analyzer in conjunction with Singer DM-105A series or EMCO 3221 calibrated dipoles or EMCO 3115 DRG horn.

For each spurious emission identified between 30 to 5500 MHz (per Para 15.33(b)(1)), the test sample was rotated for maximum pickup, the test antenna varied in elevation, and the test antenna polarization shifted between horizontal to vertical in order to maximize observed signals.

#### E. REPORT OF RADIATED EMISSIONS

1. Table 1 lists the frequency and amplitude of all signals observed from 30 to 5500 MHz including those 20 dB below the limits of paragraph 15.109 of the FCC Rules.

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TABLE 1a

RADIATED SPURIOUS EMISSIONS  
Measured at 3 meters  
PART 15(B) PARA. 15.109

<u>Frequency To Which Tuned (MHz)</u>	<u>Frequency of Emission (MHz)</u>	<u>Meter Reading (dBm)</u>	<u>Antenna Factor (dB)</u>	<u>Field<sup>1</sup> Intensity uV/m @ 3m</u>	<u>FCC Limit uV/m @ 3m</u>	<u>dB to Limit</u>
903.530	891.699	-93.5	23.2	68.8	200	-9.3
922.950	912.252	-92.4	23.2	77.6	200	-8.2
927.000	916.269	-89.9	23.2	103.5	200	-5.7

Note 1:  $uV/m = \text{Log}^{-1} \frac{-1dBu/m}{20}$

$$\text{dBu} = \text{dBm} + \text{antenna factor} + 107$$

RADIATED SPURIOUS EMISSIONS  
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TABLE 1a, DF2D (Panel Mount)

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TABLE 1b

RADIATED SPURIOUS EMISSIONS  
Measured at 3 meters  
PART 15(B) PARA. 15.109

<u>Frequency To Which Tuned (MHz)</u>	<u>Frequency of Emission (MHz)</u>	<u>Meter Reading (dBm)</u>	<u>Antenna Factor (dB)</u>	<u>Field<sup>1</sup> Intensity uV/m @ 3m</u>	<u>FCC Limit uV/m @ 3m</u>	<u>dB to Limit</u>
903.470	892.891	-95.5	23.2	54.3	200	-11.3
923.869	913.088	-94.9	23.2	58.2	200	-10.7
926.998	916.288	-91.1	23.2	90.2	200	- 6.9

Note 1:  $\text{uV/m} = \text{Log}_{20}^{-1\text{dBu/m}}$

$$\text{dBu} = \text{dBm} + \text{antenna factor} + 107$$

RADIATED SPURIOUS EMISSIONS  
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TABLE 1b, DF2R (Hand-Held)

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F. PROCEDURE - AC LINE CONDUCTED SPURIOUS

The receiver does not operate from the AC line.

G. STATEMENT

Technical test data are from tests performed by me or under my supervision. My qualifications are a matter of record with the Federal Communications Commission. I personally attest to the accuracy of the test data submitted as a part of this engineering statement.

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Rowland S. Johnson

Dated: July 20, 2001

