EMC Measurement / Technical Report

FCC Test Specification **:** FCC Part 15, Subpart B - Class B Certification for Scanning Receiver

Manufacturer **:** Tal Scan

Equipment Under Test **:** TAL400

Test Report No. **:** FR1157

Purchase Order No. **:** TAL060999A

Document History					
Revision	**Issue Date**	**Affected Pages**	**Description of Modifications**	**Revised By**	**Approved By**
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EMC Measurement / Technical Report
Document No. FR1157
From
Garwood Laboratories Inc.
World Compliance Center

Test for
TAL SCAN
TAL400

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Test Personnel	***Test Dates***
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MEASUREMENT / TECHNICAL REPORT SUMMARY

Manufacturer Company	TAL SCAN
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Country	USA
Contact Name	David Dominguez
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Type of Authorization	Certification for Scanning Receiver
Applicable FCC Rules	PART 15 - RADIO FREQUENCY DEVICES Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 (10-1-95 Edition). The following subparts are applicable to the results in this test report: Part 15, Subpart B - Unintentional Radiators Paragraph 15.107 – Conducted limits Paragraph 15.109 - Radiated emission limits
Equipment Under Test	TAL400
Summary of Data	The EUT complies with the following sections of 47 CFR Ch.1 (10-1-95 Edition): Subpart B - Paragraph Unintentional Radiators Paragraph 15.107 – Conducted limits Paragraph 15.109 - Radiated emission limits Note: The EUT is battery operated; therefore, the conducted emission requirements do not apply.

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1. GENERAL INFORMATION

1.1 Product Description

Equipment Under Test	Scanner/Receiver
Model Number	TAL400
Description	The TAL Scan model TAL400 is a configurable scanning receiver designed primarily for use at automobile racing events but can also be used as a conventional scanner. The scanning frequency ranges for the TAL400 are listed in Table 1. The TAL400 consists of a radio receiver module, a single board computer for controlling the radio receiver, and a removable memory card for configuring the radio. The EUT derives its operating voltage from four AA batteries. To build the TAL400, TAL Scan removes the radio receiver module from a Uniden scanning receiver, model no. BC0XLT-1, and connects it to a single board computer module developed by TAL Scan. This assembly is the packaged in a plastic enclosure created by TAL Scan for the TAL400. The computer module is designed and setup to not allow access to the cellular phone bands or other restricted bands.
Clock Frequencies	20 MHz, 5MHz, 2kHz, and 500 kHz

Table 1: Scanning Frequency Ranges

Frequency (MHz)	***Step Size (kHz)***	***Description***
29.0-29.7	5	10 Meter Amateur Band
29.7-50.0	5	VHF Low Band
50-54	5	6 Meter Amateur Band
137-144	5	Military Land Mobile
144-148	5	2 Meter Amateur Band
148-174	5	VHF High Band
406-420	12.5	Federal Government
420-450	12.5	70cm Amateur Band
450-470	12.5	UHF Standard Band
470-512	12.5	UHF "T" Band

1.2 Related Submittal(s)/ Grant(s)

The radio receiver used in the TAL400 is a commercial off-the-shelf scanning radio manufactured by Uniden. The FCC has previously certified the scanning receiver.
Manufacturer: Uniden America Corporation
Scanning Receiver Model No.: BC60XLT-1
FCC ID: AMWUB257

1.3 Tested System Description

The Tested System was configured with all typical peripherals and operated to generate the maximum emissions during the test. Refer to Section 3.5 Tested System configuration and Section 3.6 table lists all the details for the tested system components and cabling information. FCC ID numbers are included if available for a tested system component.

1.4 Test Methodology

The conducted emissions test was performed according to the general provisions of ANSI C63.4-1992 (American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz).

The Equipment Under Test (EUT) was setup in a shielded enclosure to perform the conducted emissions measurements in a typical installation configuration. The EUT was powered from the 50μH/50Ω Line Impedance Stabilization Networks (LISN). The LISN's unused connections were terminated with a 50-ohm load. The amplitude level (dBμV) of the emissions were maximized by varying the modes of operation of the EUT and its cables. The frequency range of 150 kHz to 30 MHz was measured with the receiver in peak detection. The peak measurements within 5 dB of the specification limits were re-measured with the receiver in either quasi-peak or average detection as required.

Radiated emissions tests were performed according to the general provisions of ANSI C63.4-1992 (American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz). The radiated emissions test was performed at an antenna to EUT distance of 3 meters.

The preliminary radiated emissions scan was performed in the semi-ferrite and anechoic shielded enclosure at a distance of 3 meters. The amplitude level (dBμV) of the emissions were maximized by varying the modes of operation of the EUT and its cables. The frequency range of 30 to 200 MHz was measured with a Biconical antenna, and a Log-Periodic antenna was used to measure the frequency range of 200 to 1000 MHz. The final radiated emissions test was performed at a EUT to receiving antenna distance of 3 meters in the Open Area Test Site. Rotating the turntable 360 degrees and varying the antenna height from 1 to 4 meters maximized the emissions. The frequency range of 30 to 1000 MHz was measured utilizing a BiLog antenna. Measurements were made in both vertical and horizontal antenna polarizations.

2. Product Labeling

2.1 FCC ID Label

FCC ID: OOF400QED01

2.2 Location of Label on the EUT

The label shall be located in a conspicuous place on the device consistent with the requirements of Section §15.19 of FCC CFR 47. Please refer to the Attachment section of this report, Exhibit 2, for the FCC ID Label and its location.

2.3 Information to the User

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/ TV technician for help.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The EUT was used in a system configured for testing in a typical fashion as a customer would normally use it.

3.2 EUT Exercise Software/Equipment

The following operating mode was used to exercise the functions of the EUT.

1. The TAL400 was scanning through the various bans of operation. The unit would occasionally stop on one frequency and then continue on scanning.

3.3 Special Accessories

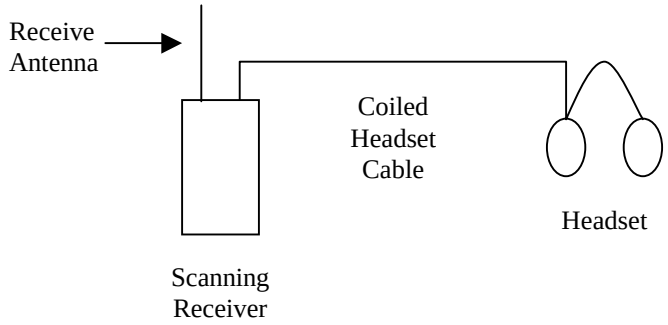
The EUT requires no special accessories to comply with the Class B limits.

3.4 Equipment Modifications

The following modification was made to achieve the required specification limits.

1. Connecting a headset to the accessory jack on the radio module used in the TAL400 resulted in a common-mode current flow that made the cord of the headset a radiating antenna. To correct this problem, a balun or common-mode choke was added to the radio module between the output of the audio signal amplifier and the headset jack. The common-mode choke was created by using a ferrite toroid core (FT50-A-43 Amidon, Inc.) and winding RG-178 coax cable around the core. The shield of the coax cable was attached to the radio module ground at both ends of the cable while the center conductor was attached to the audio amplifier output at one end and the other end to R1 located near the headset jack. The audio signal trace on the printed circuit board to the surface mount resistor R1 is bypassed by turning R1 away from the surface mount pad on the signal trace and attaching the center conductor of the coax cable to the open terminal of R1. The other terminal of R1 remains connected to its original surface mount pad.

3.5 Configuration of Tested System



The EUT was placed on a non-conductive table. The headset was connected to the EUT via a coiled headset cable with a 3.5mm jack connector.

3.6 Details of Tested System

Item No.	***Manufacturer***	***Description***	***Identification Numbers***
1	Pilot Avionics	Headset	Model No: PA 11-00 Serial No.: Not Available

The following table lists all of the cabling details for the tested system. Refer to 3.5 configuration of tested system.

Cabling of The Tested System					
Item No.	***Description***	***Length (m)***	***Type Shielded-S Unshielded-US***	***Connected From***	***Connected To***
A	Coiled Headset Cable	2.0 Uncoiled	US	Headset	Scanning Receiver

4. BLOCK DIAGRAM(S) OF EUT

Please refer to the Attachment section of this report for the EUT's Block Diagram.

5. TEST MEASUREMENT PHOTOS

5.1 Photo: Radiated Emissions (Front View)

5.2 Photo: Radiated Emissions (Rear View)

6. TEST DATA

6.1 Conducted Emissions Limits

FCC Part 15, Subpart B, Conducted Emissions Limits	
Frequency Range (MHz)	***Class B Limit (dBμV)***
0.45 to 1.705	48
1.705 to 30.0	48

6.2 Summary Table for Highest Conducted Emissions Levels

The EUT derives its operating voltage from four AA batteries. The EUT will never be powered from the AC power line; therefore, the conducted emission limits do not apply.

6.3 Radiated Emissions Limits

FCC Part 15, Subpart B, Class B Radiated Emissions Limits	
Frequency Range (MHz)	***3 Meter Test Limit (dBμV)***
30 to 88	40.0
88 to 216	43.5
216 to 960	46.0
above 960	54.0

6.4 Summary Table for Highest Radiated Emissions Levels

The following data lists the significant emission frequencies, measured levels, correction factor (includes cable, preamplifier and antenna corrections), the corrected reading, plus the limit.

EUT: Scanning Receiver Model No. TAL400 Margin: –0.9dB

Frequency (MHz)	***Polarity (V/H)***	***Detection Mode***	***Receiver* Reading (dBμV)***	***Correction Factor (dB)***	***Corrected Reading (dBμV/m)***	***3 Meter Limit (dBμV/m)***
45.011	H	Quasi – Peak	51.1	-12.0	39.1	40.0
305.032	H	Quasi – Peak	48.5	-7.0	41.5	46.0
300.250	H	Quasi – Peak	48.2	-7.3	40.9	46.0
152.998	V	Peak	48.9	-10.6	38.3	43.5
457.790	H	Peak	43.8	-3.3	40.5	46.0
40.009	H	Peak	46.2	-12.0	34.2	40.0

Εξηιβιτ 2 All readings are peak with specified CISPR bandwidth unless stated otherwise.

Test Personnel:
Arnulfo Tapia – EMC Sr. Technician

6.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF – AG

Where: FS = Field strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier gain

Example:

Assume a receiver reading of 52.5 dBµV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBµV/m.

FS = 52.5 + 7.4 + 1.1 – 29 = 32 dBµV/m

APPENDIX A - TEST EQUIPMENT USED

The absolute performance calibration of equipment requiring calibration is performed on an as needed basis in accordance with ANSI/NCSL Z540-1-1994, which supersedes MIL-STD 45662A. However, calibration periods do not exceed one (1) year. The test equipment is capable of making measurements within tolerances of at least +/- 2 dB amplitude and +/- 2% frequency deviation. Equipment certifications showing traceability to NIST (National Institute of Standards and Technology) are maintained on file at Garwood Laboratories, Inc. offices in Placentia CA. All equipment is checked and verified for proper operation before and after each series of tests.

A.1 Specific Equipment Used

Test Instrument	*Mfg. / Model No.*	*Serial No.*	*Cal. Due Date*
Radiated Emissions Test			
EMI Receiver System	Hewlett Packard / 8574A	3010A01156	10/14/99
BiLog Antenna	Chase / CBL6111A	1823	04/12/00
Preamplifier	ISCI / ZFL-2000	017	03/05/00
RF Coax Cable	Pasternack /RG223	020	03/05/00
RF Coax Cable	Times Microwave / LMR-600	030	03/05/00

A.2 Test Facility

The open area test site (OATS) and measurement facilities used to collect the test data are located at Garwood Laboratories, Inc. World Compliance Division test facility in Placentia, CA. This facility has been fully described in a report submitted to the FCC and accepted in a letter dated 29 January 1999 (31040/SIT 1300F2) registration #90681.

The test facility is also recognized and accredited from following accreditation organizations:

Acemark Europe, Ltd.	Laboratory Number: 0007 *ISO Guide 25, EN45001, and relevant parts of ISO 9002*	Dated: 03/17/97
Industry Canada	Reference: IC 3298	Dated: 03/11/99
I^2T (*Interference Tech International*)	Certificate Number: 99-051 CE Mark for European Country	Dated: 05/05/99
NVLAP (*NIST)*	NVLAP Lab Code: 200119-0 CISPR, FCC, AUSTEL	Effective Through 12/31/99
VCCI	Registration #'s C574, C575, C576, R561	Effective Through 02/04/00

(Voluntary Control Council for Interference by Information Technology Equipment)

APPENDIX B – SUPPLEMENTAL TEST DATA

Test Type	*Basic Standard*	*Details*	*Data Format*	*Page No.*
Radiated Emissions	FCC Pt.15 Class B	None	Tabulated	B1

ATTACHMENTS

INDEX OF ATTACHMENTS