

Radiated Emissions Test Report

Product Tested:

Name: Match Play Timer - Timer/Display Unit
Model: MI052-2

Prepared for:

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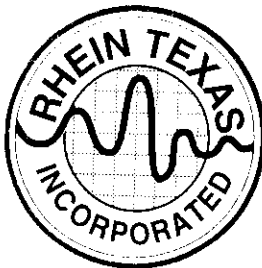
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Report Number: 98030018-1A
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*Accredited by the National Voluntary Laboratory Accreditation Program for the specific scope of
accreditation under lab code 200245-0*



EMC Engineering and Testing Services

Report Number: 98030018-1A

Product Name: Match Play Timer - Timer/Display Unit

Model : MI052-2

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this attached test record. The modifications listed in the Executive Summary were made during testing to the equipment in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to or exclusions from the ANSI 63.4 1992 test methodology.

Signature:

Date: 9 April, 1998

Full Name: Michael P. Cantwell, PE

Director of Engineering

Location: Plano, Texas

Title: NVLAP Signatory

Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

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1. Executive Summary

The following report for EMC compliance of a receiver is prepared on behalf of *FarmTek, Inc.* in accordance with the rules of the Federal Communications Commission (47 CFR 15).

This report covers testing for the *Match Play Timer - Timer/Display Unit* and all testing was performed on 27 March and 30 March 1998.

All equipment configurations and measurements contained in this report were conducted in accordance with the revision of the standards listed in this report. Also, the instrumentation and facilities utilized for the measurements conform with all appropriate standards. Calibration checks are performed yearly on the instruments by a local calibration lab. with traceability to the National Institute of Standards and Technology (NIST).

All radiated and conducted emission and immunity measurements are performed manually at RheinTexas, Inc. The radiated emission measurements required by the rules were performed on a 10m open area test site (OATS) maintained by RheinTexas, Inc., 1701 East Plano Parkway, Suite 150, Plano, Texas 75074, USA. Complete site descriptions and site attenuation measurement data are maintained at the test facility and can be made available upon request. The Power Line Conducted Emission Measurements were performed in a shielded enclosure also located at the same facility. The radiated and conducted measurement sites have been listed with the Federal Communications Commission (FCC) 5-Jun-97.

1.1 Modifications to EUT

No modifications were implemented.

1.2 Special Accessories

No special accessories were found necessary as a result of this testing.

2. Test Facility

The open area test site used to collect the emissions data is located at RheinTexas, Inc. remote facility at 1717 Capital Avenue, Plano, Texas 75074. This site has been fully described in reports submitted to and approved by the Federal Communication Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

3. EUT Configuration

3.1 Technical Description

The Timing/Display unit contains the RF Receiver unit. The main timing unit performs both the timing and display functions. Time is displayed on a four digit, liquid crystal display (LCD), with 3-inch tall digits. The timing unit is automatically started and stopped by the start and finish line photosensors via a one-way radio link to the timing unit. Two 9-volt alkaline batteries power the unit. The batteries can provide a minimum of 80 hours of operation. The FSK receiver operates at 418 MHz and utilizes SAW stabilization. A six-inch, flexible antenna exits ~~through~~ the top of the case.

3.2 Test Configuration(s)

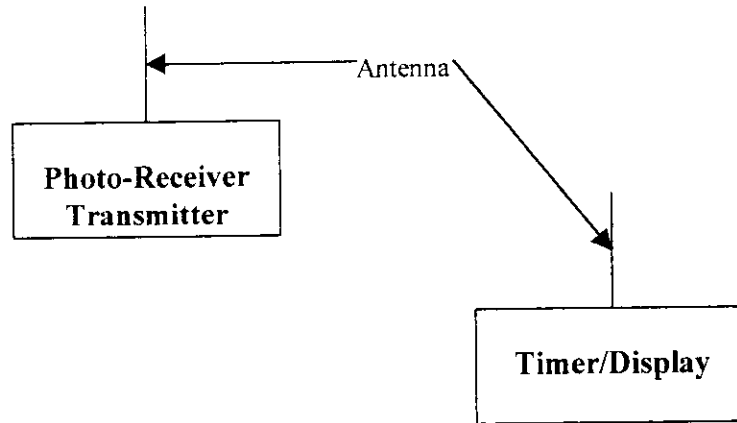


Figure 1 - Block Diagram of System Configuration

The system was configured for testing in a typical fashion (as a customer would normally use it). A list of the equipment under test (EUT) and its support equipment is found below.

Table 1 - Components in Block Diagram

| Description | Manufacturer | Model | Serial No | FCC I.D. |
|--------------------|---------------|---------|-----------|--------------|
| Photo-Receiver | FarmTek, Inc. | MI050-2 | None | Applying for |
| Timer/Display Unit | FarmTek, Inc. | MI052-2 | None | Applying for |

3.3 Mode of Operation

The Timer was activated by using the Photo-Receiver/Transmitter to start the timer. It was then continuously displaying the elapsed time.

RheinTexas, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the RheinTexas quality manual. RheinTexas implements these procedures to minimize errors that may occur: The highlights of the procedures are yearly as well as daily calibrations, technician training, and emphasis to employees on avoiding error.

4.1.1 Deviations from Test Methodology

There were no deviations from the test methodology during this test

4.2 Radiated Emissions Measurements

The limits utilized are from FCC Part 15.

4.2.1 Test Methodology

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at a three meter distance (or one meter distance if necessary) in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to insure that maximum emission amplitudes were obtained.

Final radiated emissions measurements were made on the 10 meter, open-field test site. The EUT was placed on a nonconductive turntable approximately 0.8 meters above the ground plane. The spectrum was examined from 30 MHz to 1000 MHz using a Hewlett Packard 8546 EMI Receiver.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations. The receiver's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. When any clock exceeds 108 MHz but less than 500 MHz, the emissions of the EUT are also measured between 1 to 2 GHz using an average detector with the resolution bandwidth set at 1 MHz. For clocks greater than 500 MHz and less than 1 GHz, the emissions of the EUT are also measured between 1 and 5 GHz. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

4.2.2 Test Limits

The tables below list the FCC Part 15 radiated emission limits. The EUT to antenna distance used at RheinTexas was 3 meters for this testing.

Table 2 - FCC Class A Radiated Emissions

| Frequency (MHz) | Limit (dB μ V/m) | |
|--------------------|----------------------|------|
| | 10m | 3 m |
| 30 to 88 | 39.0 | 48.5 |
| 88 to 216 | 43.5 | 53.0 |
| 216 to 960 | 46.4 | 55.9 |
| > 960 | 49.5 | 59.0 |

Table 3 - FCC Class B Radiated Emissions

| Frequency (MHz) | Limit (dB μ V/m) | |
|--------------------|----------------------|------|
| | 10m | 3m |
| 30 to 88 | 29.5 | 40.0 |
| 88 to 216 | 33.0 | 43.5 |
| 216 to 960 | 35.5 | 46.0 |
| > 960 | 43.5 | 54.0 |

4.2.3 Radiated Emissions Data

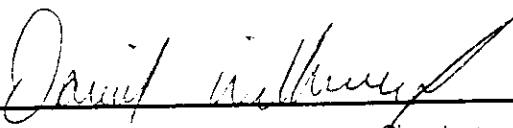
All readings are quasi-peak unless stated otherwise. The pk notation in the receiver reading denotes that this measurement was taken using the peak detector. No emissions were found or measured above 2 GHz.

Table 4 - Radiated Data

| Emission Frequency (MHz) | Det | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Antenna Height (m) | Analyzer Reading (dB μ V) | Site Correction Factor (dB) | Emission Level (dB μ V/m) | FCC Limit (dB μ V/m) | FCC Margin (dB μ V/m) | Pass/Fail | Comments |
|--------------------------|-----|------------------------|-------------------------|--------------------|-------------------------------|-----------------------------|-------------------------------|--------------------------|---------------------------|-----------|----------|
| 196.900 | Qp | V | 210 | 1.0 | 10.2 | 11.6 | 21.8 | 43.5 | 21.7 | Pass | |
| 433.940 | Qp | H | 210 | 1.0 | 26.3 | 18.8 | 45.1 | 55.9 | 10.8 | Pass | |
| 433.945 | Qp | V | 140 | 1.0 | 27.0 | 18.8 | 45.8 | 55.9 | 10.1 | Pass | |
| 1301.835 | Av | H | 215 | 1.3 | 8.2 | 29.1 | 37.3 | 54.0 | 16.7 | Pass | |
| 1301.850 | Av | V | 70 | 1.1 | 7.8 | 29.1 | 36.9 | 54.0 | 17.7 | Pass | |
| 1735.745 | Av | H | 270 | 1.4 | 7.2 | 31.4 | 38.6 | 54.0 | 15.4 | Pass | |
| 1735.800 | Av | V | 230 | 1.0 | .6 | 31.4 | 32.0 | 54.0 | 22.0 | Pass | |
| 1976.800 | Av | H | 180 | 4.0 | 7.1 | 33.8 | 40.9 | 59.0 | 18.1 | Pass | |
| 1978.500 | Av | H | 140 | 4.0 | 5.9 | 33.8 | 39.7 | 59.0 | 19.3 | Pass | |

I, the undersigned, declare that the above radiated emissions data has, to the best of my knowledge, been measured in accordance with the methods and procedures detailed in this report.

Daniel Wilkerson
Test Technician


Signature

9-Apr-98
Date

5. Test Equipment

The following test equipment was used to perform the radiated and conducted emissions testing. Competent calibration laboratories traceable to NIST calibrate all the equipment.

The Test column indicates which equipment was utilized to perform the radiated and conducted testing. An "R" in this column indicates that it was used for radiated emissions testing and a "C" in this column indicates that it was used for conducted emissions testing.

Table 5 - Test Equipment List

| Test | Manufacturer | Model | Description | Serial Number | Last Calibration | Next Calibration |
|------|-----------------|------------------|----------------------|--------------------------|------------------|------------------|
| R | Hewlett Packard | 8546A | EMI Receiver | 3265A00348 3448A00288 | 6-Nov-96 | 6-Nov-97 |
| | Hewlett Packard | 8591E | Spectrum Analyzer | 3325A01823 | 29-Sep-97 | 29-Sep-98 |
| | Hewlett Packard | 8567A | Spectrum Analyzer | 2602A00153 2542A11108 | 7-Apr-97 | 7-Apr-98 |
| | Hewlett Packard | 85650A | Quasi-Peak Adapter | 3303A01832 | 7-Apr-97 | 7-Apr-98 |
| | Solar | 9252-50-R-24-BNC | LISN | 961023 | 21-Nov-96 | 21-Nov-97 |
| | Chase | CBL6112A | Bilog Antenna | 2149 | 3-Oct-96 | 3-Oct-97 |
| R | Chase | CBL6112A | Bilog Antenna | 2150 | 28-Aug-97 | 28-Aug-98 |
| R | EMCO | 3147 | Log-Periodic Antenna | 1129 | 23-Aug-95 | 23-Aug-98 |
| | RheinTexas | Conducted Cables | Coaxial Cables | C001 | 14-Aug-97 | 14-Aug-98 |
| R | RheinTexas | Radiated Cable | Coaxial Cable | R002 | 29-Jan-98 | 29-Jan-99 |