



CERTIFICATION TEST REPORT

FOR THE

TIMING DEVICE, MATCH PLAY TIMER

FCC PART 15, SUBPART B

CLASS B COMPLIANCE

DATE OF ISSUE: AUGUST 27, 1998

PREPARED FOR:

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Sachse, TX 75048

P.O. No: Check #8155
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Date of test: September 14, 1998

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ADMINISTRATIVE INFORMATION

DATE OF TEST:	September 14, 1998
PURPOSE OF TEST:	To demonstrate the compliance of the Timing Device, Match Play Timer, with the FCC Part 15, Subpart B requirements for Class B devices.
MANUFACTURER:	FarmTek, Inc. 5113 Heritage Sachse, TX 75048
REPRESENTATIVE:	Mike Douglas
TEST LOCATION:	CKC Laboratories, Inc. 5473A Clouds Rest Mariposa, CA 95338
TEST PERSONNEL:	Skip Doyle
TEST METHOD:	ANSI C63.4 1992
FREQUENCY RANGE TESTED:	30 MHz - 10 GHz
EQUIPMENT UNDER TEST:	<u>Timing Device</u> Manuf: FarmTek, Inc. Model: Match Play Timer Serial: 10000019807 FCC ID: NWNMI052-2RB

SUMMARY OF RESULTS

The FarmTek, Inc. Timing Device, Match Play Timer, was tested in accordance with ANSI C63.4 1992 for compliance with the Class B requirements of Part 15, Subpart B of the FCC Rules.

As received, the above equipment was found to be fully compliant with the Class B limits of FCC Part 15, Subpart B for radiated emissions.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Electronic timer for track events (RF receiving unit) with remote photo-sensors for automatic start/stop (RF transmitting unit).

MEASUREMENT UNCERTAINTY

Associated with data in this report is a ± 4 dB measurement uncertainty.

PERIPHERAL DEVICES

The EUT was not tested with peripheral devices.

REPORT OF MEASUREMENTS

The following Table 1 reports the six highest radiated emissions levels recorded during the tests performed on the Timing Device, Match Play Timer. The data sheet from which this table was compiled are contained in Appendix B.

Table 1: Six Highest Radiated Emission Levels									
FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
918.146	37.4	23.6	-27.4	6.3		39.9	46.0	-6.1	VQ
924.054	38.8	23.7	-27.4	6.3		41.4	46.0	-4.6	HQ
927.056	37.0	23.7	-27.3	6.4		39.8	46.0	-6.2	H
927.056	36.3	23.7	-27.3	6.4		39.1	46.0	-6.9	V
936.055	36.9	23.8	-27.3	6.4		39.8	46.0	-6.2	H
936.055	36.7	23.8	-27.3	6.4		39.6	46.0	-6.4	V

Test Method: ANSI C63.4 1992
Spec Limit : 15.109 Class B
Test Distance: 3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
N = No Polarization
D = Dipole Reading
Q = Quasi Peak Reading
A = Average Reading

COMMENTS: EUT is a Match Play Timer that contains a superhetrodyne scanning receiver with four channels of operation. Frequencies are: 918.13, 924.13, 927.13 and 936.13MHz. EUT uses two 9V batteries and is continuously transmitting an intermittent unmodulated signal. Maximized emissions per FCC 15.109 Class B 30MHz - 10GHz.

TABLE A

LIST OF TEST EQUIPMENT

1. Spectrum Analyzer, Hewlett Packard, Model No. 85662A, S/N 2403A08241.
2. Preamp, Hewlett Packard, Model No. 8447D, S/N -1937A02604.
3. Quasi-Peak Adapter, Hewlett Packard, Model No. 85650A, S/N 2811A01267.
4. Biconical Antenna, A & H Systems, Model No. SAS-200/542, S/N 156.
5. Log Periodic Antenna, A & H Systems, Model No. SAS-200/512, S/N 154.
6. Horn Antenna, EMCO, Model No. 3115, S/N 4683
7. LISN (FCC), Solar Electronics, S/N 855996, 992.
8. LISN, Solar Electronics, S/N 8144793, 474.
9. Test software, EMI Test 2.91.

EUT SETUP

The equipment under test (EUT) listed was setup in a manner that represented its normal use, as shown in the setup photographs in Appendix A. Any special conditions required for the EUT to operate normally are identified in the comments that accompany Table 1 for radiated emissions.

During radiated emissions testing, the EUT was mounted on a nonconductive, rotating table 80 cm above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters. This configuration is typical for radiated emissions testing of table top devices.

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Table A were used to the radiated and emissions data for the Timing Device, Match Play Timer. For radiated measurements below 300 MHz, the biconical antenna was used. For frequencies from 300 to 1000 MHz, the log periodic antenna was used. For frequencies above 1000 MHz, the horn antenna was used. All antennas were located at a distance of 3 meters from the edge of the EUT

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB μ V, and a vertical scale of 10 dB per division.

TABLE B : ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	10 GHz	1 MHz

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in Table 1 indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the six highest readings, this is indicated as a "Q" or an "A" in Table 1. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the Timing Device, Match Play Timer.

Peak

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP 85650A Quasi-Peak Adapter for the HP 8568B Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

Average

When the frequencies exceed 1 GHz, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

TEST METHODS

The radiated emissions data of the Timing Device, Match Play Timer, was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the "Sample Calculations". The corrected data was then compared to the FCC Part 15, Subpart B, Class B emissions limits to determine compliance.

Preliminary and final measurements were taken in order to better ensure that all emissions from the EUT were found and maximized.

Radiated Emissions Testing

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode facing the antenna. The frequency range of 30 MHz - 88 MHz was then scanned with the biconical antenna located about 1.5 meter above the ground plane in the vertical configuration. During this scan, the turntable was rotated and all peaks which were at or near the limit were recorded. The frequency range of 100 - 300 MHz was scanned with the biconical antenna in the same manner, and the peaks recorded. Lastly, a scan of the FM band from 88 - 110 MHz was made, using a reduced resolution bandwidth and a reduced frequency span. The biconical antenna was changed to the horizontal polarity and the above steps were repeated. After changing to the log periodic antenna in the horizontal configuration, the frequency range of 300 - 1000 MHz was scanned. The log periodic antenna was changed to the vertical polarity and the frequency range of 300 - 1000 MHz was again scanned. The horn antenna was used to scan for frequencies above 1000 MHz. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

For the final radiated scan, the equipment was again facing the antenna. A thorough scan of all frequencies was manually made using a small frequency span, rotating the turntable as needed. Comparison with the previously recorded measurements was then made.

Using the peak readings from both scans as a guide, the test engineer then maximized the readings with respect to the table rotation antenna height and configuration of the EUT. Maximizing of the EUT was achieved by monitoring the spectrum analyzer on a closed circuit television monitor while the EUT was being moved and rearranged on the EUT table for maximum emissions. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

SAMPLE CALCULATIONS

The basic spectrum analyzer reading was converted using correction factors as shown in the six highest emissions readings in Table 1. For radiated emissions in dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula:

$$\begin{aligned} &\text{Meter reading (dB}\mu\text{V)} \\ &+ \text{Antenna Factor (dB)} \\ &+ \text{Cable Loss (dB)} \\ &- \text{Distance Correction (dB)} \\ &- \text{Pre-amplifier Gain (dB)} \\ &= \text{Corrected Reading (dB}\mu\text{V/m)} \end{aligned}$$

This reading was then compared to the applicable specification limit to determine compliance.

APPENDIX A

INFORMATION ABOUT THE EQUIPMENT UNDER TEST

INFORMATION ABOUT THE EQUIPMENT UNDER TEST	
Test Software/Firmware: CRT was displaying: Power Supply Manufacturer: Power Supply Part Number: AC Line Filter Manufacturer: AC Line Filter Part Number:	
The EUT has no power cord.	

I/O PORTS	
Type	#

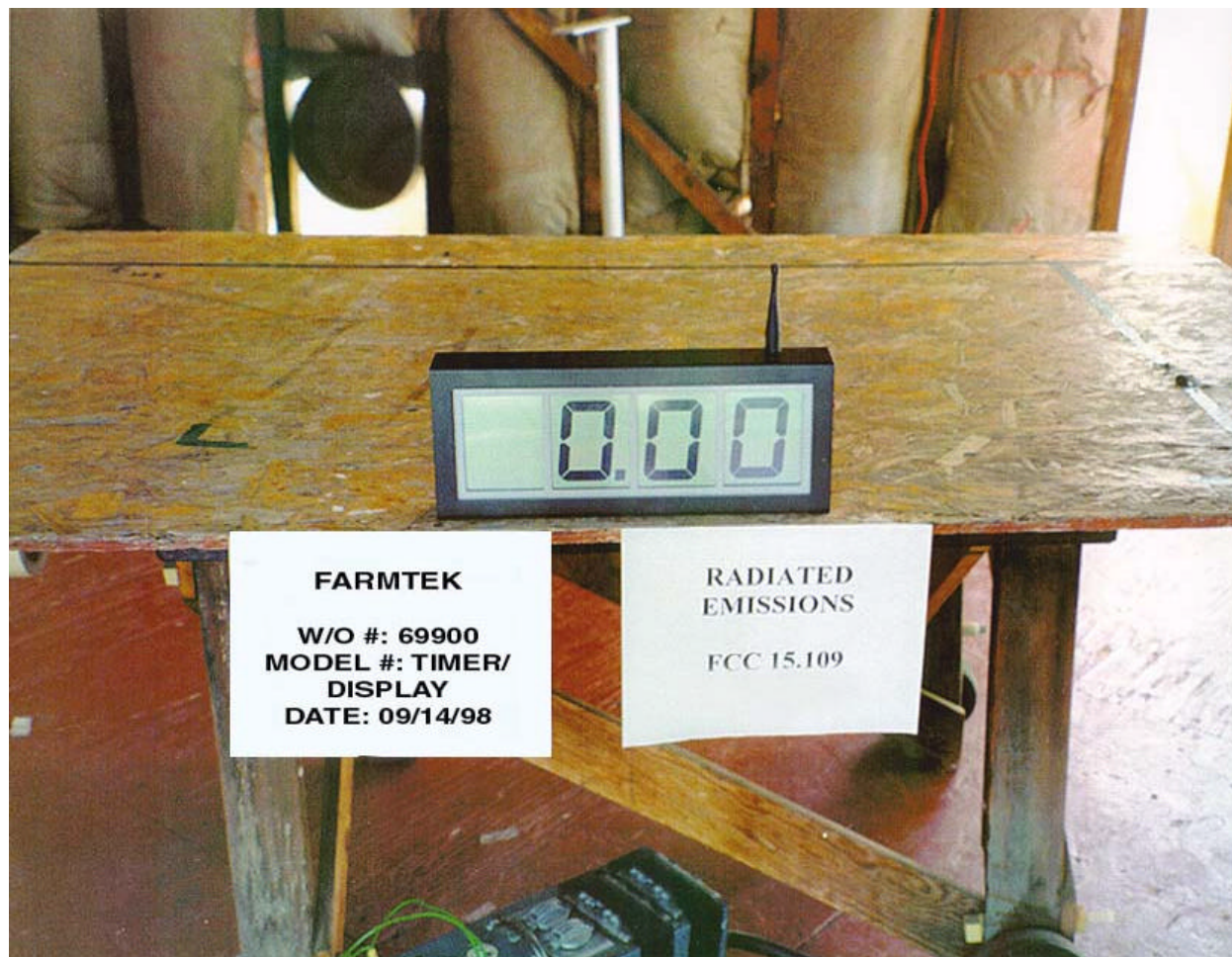
CRYSTAL OSCILLATORS	
Type	Freq. In MHz
Microprocessor	4.0

PRINTED CIRCUIT BOARDS				
Function	Model & Rev	Clocks, MHz	Layers	Location
Timing Unit	PC032, Rev B	4.0	2	Timer

REQUIRED EUT CHANGES TO COMPLY:
None

PHOTOGRAPH SHOWING RADIATED EMISSIONS

Applicant: FarmTek, Inc.
Equipment: Timing Device
Model Number: Match Display Timer



Radiated Emissions - Front View

NOTES:

PHOTOGRAPH SHOWING RADIATED EMISSIONS

Applicant: FarmTek, Inc.
Equipment: Timing Device
Model Number: Match Display Timer

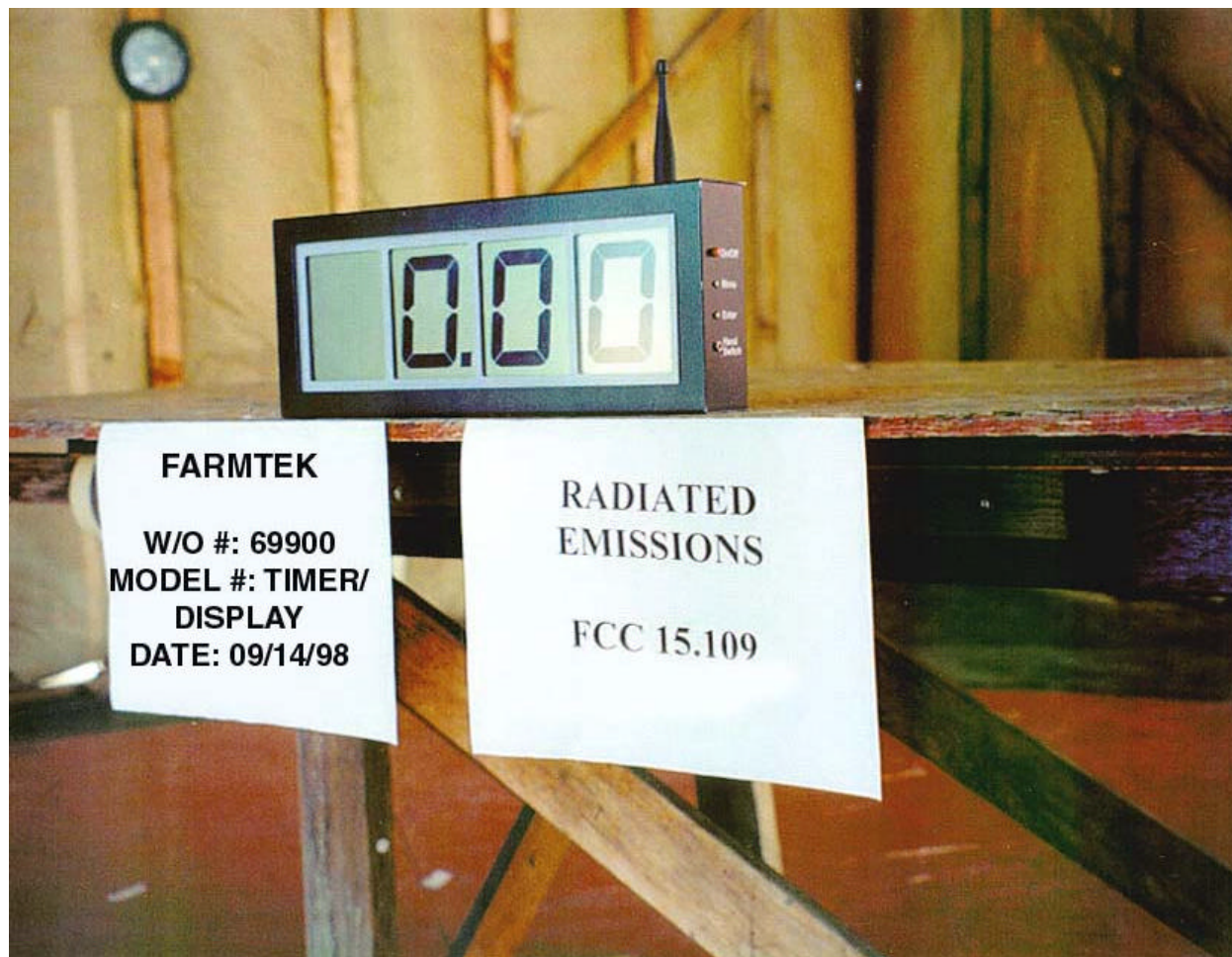


Radiated Emissions - Back View

NOTES:

PHOTOGRAPH SHOWING RADIATED EMISSIONS

Applicant: FarmTek, Inc.
Equipment: Timing Device
Model Number: Match Display Timer



Radiated Emissions

NOTES:

APPENDIX B
MEASUREMENT DATA SHEETS

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-500-4EMC

Customer: **FarmTek, Inc.** Date: Sep-14-98
 Specification: **FCC B RADIATED** Time: 18:46
 Test Type: **Maximized Emissions** Sequence#: 2
 Equipment: **Reciever – Timer/Display Unit**
 Manufacturer: FarmTek Tested By: Skip Doyle
 Model: Timer/Display
 S/N: 10000019807

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Transmitter	Farmtek	Timer/Display	10000019807

Support Devices:

Function	Manufacturer	Model #	S/N
None			

Test Conditions / Notes:

EUT is a Match Play Timer that contains a superhetrodyne scanning receiver with four channels of operation. Frequencies are: 918.13, 924.13, 927.13 and 936.13MHz. EUT uses two 9V batteries and is continuously transmitting an intermittent unmodulated signal. Maximized emissions per FCC 15.109 Class B 30MHz - 10GHz.

Measurement Data:

Sorted by Margin

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	Barn dB	Pream dB	Log S dB	Dist dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar
1	924.054	38.8	+6.3	-27.4	+23.7	+0.0	41.4	46.0	-4.6	Horiz
	Quasi Peak									
^	924.062	40.6	+6.3	-27.4	+23.7	+0.0	43.2	46.0	-2.8	Horiz
3	918.146	37.4	+6.3	-27.4	+23.6	+0.0	39.9	46.0	-6.1	Vert
	Quasi Peak									
^	918.144	39.8	+6.3	-27.4	+23.6	+0.0	42.3	46.0	-3.7	Vert
5	936.055	36.9	+6.4	-27.3	+23.8	+0.0	39.8	46.0	-6.2	Horiz
6	927.056	37.0	+6.4	-27.3	+23.7	+0.0	39.8	46.0	-6.2	Horiz
7	936.055	36.7	+6.4	-27.3	+23.8	+0.0	39.6	46.0	-6.4	Vert
8	927.056	36.3	+6.4	-27.3	+23.7	+0.0	39.1	46.0	-6.9	Vert
9	924.060	36.2	+6.3	-27.4	+23.7	+0.0	38.8	46.0	-7.2	Vert
10	918.060	36.2	+6.3	-27.4	+23.6	+0.0	38.7	46.0	-7.3	Horiz
	Quasi Peak									
^	918.055	38.5	+6.3	-27.4	+23.6	+0.0	41.0	46.0	-5.0	Horiz