CERTIFICATION TEST REPORT

FOR THE

MODEL 500 REMOTE PROGRAMER, MMT-500RU

FCC PART 15 SUBPART C

COMPLIANCE

DATE OF ISSUE: MARCH 22, 1999

PREPARED FOR:

MiniMed Inc.
12744 San Fernando Road
Sylmar, CA 91342

P.O. No: 15703
W.O. No: 71069

Report No: FC99-016

PREPARED BY:

Joyce Walker
CKC Laboratories, Inc.
5473A Clouds Rest
Mariposa, CA 95338

Date of test: March 10, 1999

DOCUMENTATION CONTROL:

Tracy Phillips
Documentation Control Supervisor
CKC Laboratories, Inc.

APPROVED BY:

Dennis Ward
Director of Laboratories
CKC Laboratories, Inc.

TABLE OF CONTENTS

CKC Laboratories, Inc. has Certificates of Accreditation from the following agencies:
DATech (Germany); A2LA (USA); FCC (USA); VCCI (Japan); BSMI (Taiwan); HOKLAS (Hong Kong).
CKC Laboratories, Inc. has Letters of Acceptance through an MRA for the following agencies:
ACA/NATA (Australia); SABS (South Africa); SWEDAC (Sweden); TUV Rheinland-Germany; TUV Rheinland-Korea; TUV Rheinland-Russia; Radio Communication Agency (RA); NEMKO (Norway).

ADMINISTRATIVE INFORMATION

DATE OF TEST:	March 10, 1999
PURPOSE OF TEST:	To demonstrate the compliance of the Model 500 Remote Programer, MMT-500RU, with the requirements for FCC Part 15 Subpart C devices.
MANUFACTURER:	MiniMed Inc. 12744 San Fernando Road Sylmar, CA 91342
REPRESENTATIVE:	Jay Yonemoto
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 - 1000 MHz
EQUIPMENT UNDER TEST:	**Model 500 Remote Programer** Manuf: MiniMed Inc. Model: MMT-500RU Serial: Sample 2 FCC ID: (pending)

SUMMARY OF RESULTS

The MiniMed Inc. Model 500 Remote Programer, MMT-500RU, was tested in accordance with ANSI C63.4 1992 for compliance with FCC Part 15 Subpart C devices.

As received, the above equipment was found to be fully compliant with the limits of FCC Part 15 Subpart C. The results in this report apply only to the items tested, as identified herein.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Hand held battery operated RF remote controller.

MEASUREMENT UNCERTAINTY

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

EUT OPERATING FREQUENCY

The EUT was operating at 418.00 MHz.

TEMPERATURE AND HUMIDITY DURING TESTING

The temperature during testing was within +15°C and + 35°C.
The relative humidity was between 20% and 75%.

PERIPHERAL DEVICES

The EUT was not tested with any peripheral devices.

REPORT OF MEASUREMENTS

The following tables report the six highest worst case levels recorded during the tests performed on the Model 500 Remote Programer, MMT-500RU. All readings taken are peak readings unless otherwise noted by a "Q" or "A". The data sheets from which these tables were compiled are contained in Appendix B.

Table 1: Six Highest Fundamental Emission Levels

FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS Ant dB	Amp dB	Cable dB	Dist dB	CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
418.136	70.5	18.2	-27.4	4.1		65.4	79.8	-14.4	H
418.137	78.6	18.2	-27.4	4.1		73.5	79.8	-6.3	V
418.138	75.4	18.2	-27.4	4.1		70.3	79.8	-9.5	H
418.145	78.2	18.2	-27.4	4.1		73.1	79.8	-6.7	V
418.149	80.7	18.2	-27.4	4.1		75.6	79.8	-4.2	HQ
418.150	80.9	18.2	-27.4	4.1		75.8	79.8	-4.0	H

Test Method: ANSI C63.4 1992
Spec Limit : FCC 15.231
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 located on the 80cm table at the center of the Barn's turntable. EUT is continuously transmitting a digital modulated carrier signal and maximized using three axis of orientation. FUNDAMENTAL ONLY.

Table 2: Six Highest Spurious Emission Levels									
	METER	CORRECTION FACTORS				CORRECTED	SPEC		
FREQUENCY MHz	READING dBµV	Horn dB	Amp dB	Cable dB	Dist dB	READING dBµV/m	LIMIT dBµV/m	MARGIN dB	NOTES
1672.310	51.7	26.5	-35.2	6.7		49.7	61.9	-12.2	H
2508.410	46.4	30.0	-31.9	11.2		55.7	61.9	-6.2	H
2926.459	40.5	31.7	-31.6	13.1		53.7	61.9	-8.2	H
3344.499	38.0	31.9	-32.5	12.9		50.3	61.9	-11.6	V
3762.558	37.1	32.7	-33.2	12.8		49.4	61.9	-12.5	V
4180.627	41.1	33.1	-33.4	13.1		53.9	61.9	-8.0	V

Test Method: ANSI C63.4 1992
Spec Limit : FCC 15.231
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 located on the 80cm table at the center of the Barn's turntable. EUT is continuously transmitting a digital modulated carrier signal and maximized using three axis of orientation. SPURIOUS EMISSIONS.

TABLE A

LIST OF TEST EQUIPMENT

VCCI Acceptance No. R-565 & C-580

1. Spectrum Analyzer, Hewlett Packard, Model No. 8566B, S/N 2209A01404. Calibration date: June 12, 1998. Calibration due date: June 12, 1999.

2. Preamp, Hewlett Packard, Model No. 8447D, S/N 1937A01933. Calibration date: April 10, 1998. Calibration due date: April 10, 1999.

3. Preamp, Hewlett Packard, Model No. 8449B, S/N 3008A00301. Calibration date: October 15, 1998. Calibration due date: October 15, 1999.

4. Quasi-Peak Adapter, Hewlett Packard, Model No. 85650A, S/N 2811A01267. Calibration date: June 12, 1998. Calibration due date: June 12, 1999.

5. Biconical Antenna, A & H Systems, Model No. SAS-200/542, S/N 156. Calibration date: June 9, 1998. Calibration due date: June 9, 1999.

6. Log Periodic Antenna, A & H Systems, Model No. SAS-200/512, S/N 154. Calibration date: June 9, 1998. Calibration due date: June 9, 1999.

7. Horn Antenna, EMCO, Model No. 3115, S/N 4683. Calibration date: February 17, 1999. Calibration due date: February 17, 2000.

8. Site B (Barn) Calibration date: June 18, 1998. Site B (Barn) Calibration due date: June 18 1999.

9. Test software, EMI Test 2.91.

EUT SETUP

The equipment under test (EUT) was set up in a manner that represented its normal use. Any special conditions required for the EUT to operate normally are identified in the comments that accompany Table 1 for fundamental radiated emissions and Table 2 for spurious emissions. Additionally, a complete description of all the ports and I/O cables is included on the information sheets contained in Appendix A.

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 collect the radiated emissions data for the Model 500 Remote Programer, MMT-500RU. 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 dBµV, 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	42 GHz	1 MHz

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in Tables 1 and 2 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 the appropriate table. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the Model 500 Remote Programer, MMT-500RU.

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 Quasi-Peak Adapter for the HP 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 Model 500 Remote Programer, MMT-500RU, 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 C 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. 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 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.

A thorough final 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 and antenna height. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

FCC Part 15.231(c) - Occupied Bandwidth Measurements

In accordance with Part 15.231(c), the bandwidth was kept within 0.25% of the center frequency.

SAMPLE CALCULATIONS

The basic spectrum analyzer reading was converted using correction factors as shown in the emissions readings in Tables 1 and 2. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula:

Meter reading (dBµV)
+ Antenna Factor (dB)
+ Cable Loss (dB)
- Distance Correction (dB)
- Pre-amplifier Gain (dB)

= Corrected Reading(dBµV/m)

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

A typical data sheet will display the following in column format:

#	Freq MHz	Rdng dBuV	Cable	Amp.	Bicon	Horn	Log	Dist	Corr dBuV/m	Spec	Margin	Polar

means reading number
Freq MHz is the frequency in MHz of the obtained reading.
Rdng dBuV is the reading obtained on the spectrum analyzer in dBµV.
Amp. is short for the preamplifier factor or gain in dB.
Bicon is the biconical antenna factor in dB.
Log is the log periodic antenna factor in dB.
Horn is the horn antenna factor in dB.
Cable is the cable loss in dB of the coaxial cable on the OATS.
Dist is the distance factor (in dB). It is used when testing at a different test distance than the one stated in the spec.
Corr dBµV/m is the corrected reading which is now in dBµV/m (field strength).
Spec is the specification limit (dB) stated in the agency's regulations.
Margin is the closeness to the specified limit in dB; + is over and - is under the limit.
Polar is the Polarity of the antenna with respect to earth.

APPENDIX A

INFORMATION ABOUT THE EQUIPMENT UNDER TEST

INFORMATION ABOUT THE EQUIPMENT UNDER TEST	
Test Software/Firmware:	**N/A**
CRT was displaying:	**N/A**
Power Supply Manufacturer:	**N/A**
Power Supply Part Number:	**N/A**
AC Line Filter Manufacturer:	**N/A**
AC Line Filter Part Number:	**N/A**
Line voltage used during testing:	**N/A**

I/O PORTS	
Type	#
N/A	**N/A**

CRYSTAL OSCILLATORS	
Type	Freq. In MHz
Crystal	1.8432

PRINTED CIRCUIT BOARDS				
Function	Model & Rev	Clocks, MHz	Layers	Location
500 Remote PCB	D6053117-001 Rev -	1.8432	2	**N/A**

REQUIRED EUT CHANGES TO COMPLY:
None

PHOTOGRAPH SHOWING RADIATED EMISSIONS

Radiated Emissions - Front View

NOTES:

PHOTOGRAPH SHOWING RADIATED EMISSIONS

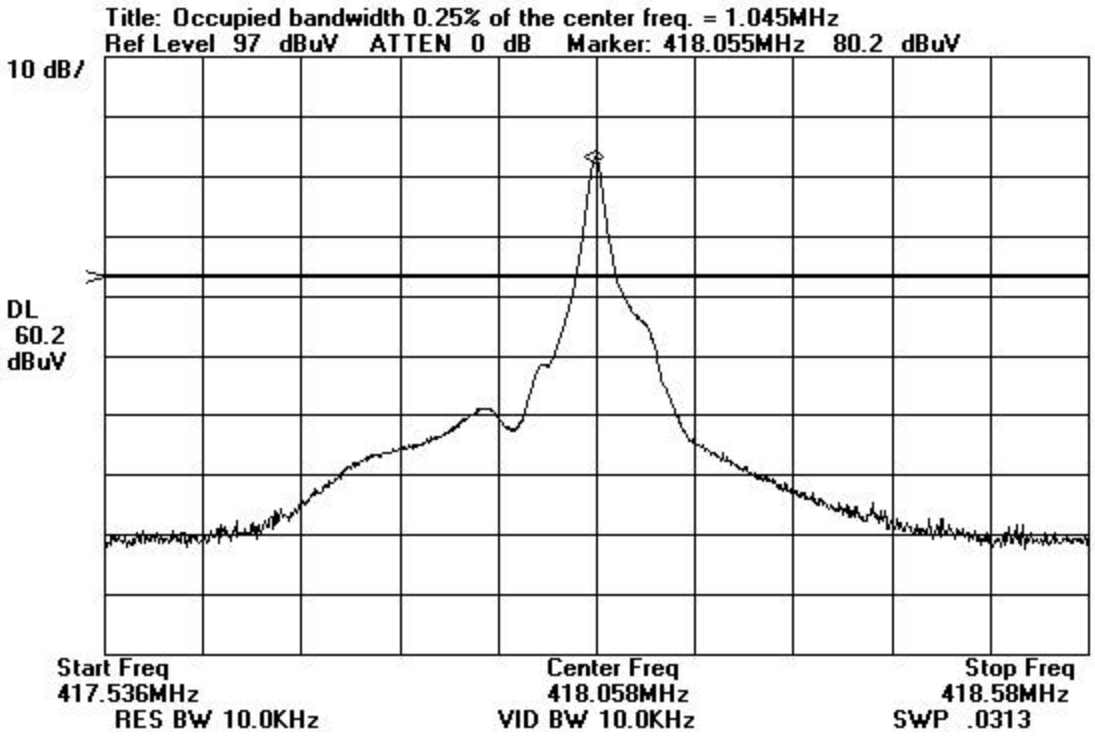
Radiated Emissions - Back View

NOTES:

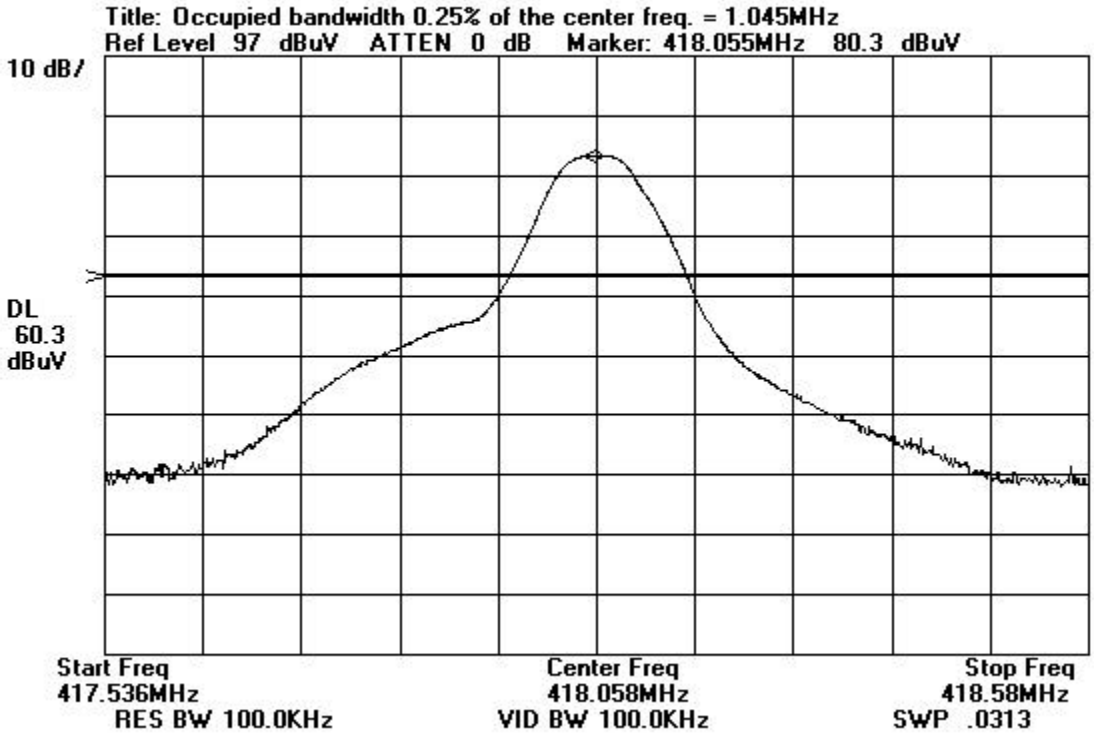
APPENDIX B

MEASUREMENT DATA SHEETS

Occupied Bandwidth Plot



Occupied Bandwidth Plot



Test Location:	CKC Laboratories, Inc. • 5473A Clouds Rest Rd, Barn • Mariposa, CA 95338 • (800)-500-4EMC		
Customer:	**MiniMed**	Date:	Mar-11-99
Specification:	**FCC 15.231**	Time:	10:37
Test Type:	**Maximized Emissions**	Sequence#:	1
Equipment:	**Transmitter**		
Manufacturer:	MiniMed	Tested By:	Skip Doyle
Model:	MMT-500RU		
S/N:	Sample 2		

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Transmitter	MiniMed	MMT-500RU	Sample 2

Support Devices:

Function	Manufacturer	Model #	S/N
None			

Test Conditions / Notes:

EUT is located on the 80cm table at the center of the Barn's turntable. EUT is continuously transmitting a digital modulated carrier signal and maximized using three axis of orientation. FUNDAMENTAL ONLY.

Measurement Data: Sorted by Margin Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	Amp dB	Log dB	Cable dB	dB	Dist dB	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar
1	418.149	80.7	-27.4	+18.2	+4.1		+0.0	75.6	79.8	-4.2	Horiz
	Quasi Peak										
	Flat										
^	418.150	80.9	-27.4	+18.2	+4.1		+0.0	75.8	79.8	-4.0	Horiz
	Flat										
^	418.138	75.4	-27.4	+18.2	+4.1		+0.0	70.3	79.8	-9.5	Horiz
	Side										
^	418.136	70.5	-27.4	+18.2	+4.1		+0.0	65.4	79.8	-14.4	Horiz
	End										
5	418.137	78.6	-27.4	+18.2	+4.1		+0.0	73.5	79.8	-6.3	Vert
	End										
6	418.145	78.2	-27.4	+18.2	+4.1		+0.0	73.1	79.8	-6.7	Vert
	Side										
7	418.134	70.4	-27.4	+18.2	+4.1		+0.0	65.3	79.8	-14.5	Vert
	Flat										

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

Customer: **MiniMed** Date: Mar-11-99
Specification: **FCC 15.231 Spurious Emission** Time: 10:38
Test Type: **Maximized Emissions** Sequence#: 3
Equipment: **Transmitter**
Manufacturer: MiniMed Tested By: Skip Doyle
Model: MMT-500RU
S/N: Sample 2

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Transmitter	MiniMed	MMT-500RU	Sample 2

Support Devices:

Function	Manufacturer	Model #	S/N
None			

Test Conditions / Notes:

EUT is located on the 80cm table at the center of the Barn's turntable. EUT is continuously transmitting a digital modulated carrier signal and maximized using three axis of orientation. SPURIOUS EMISSIONS

Measurement Data: Sorted by Margin Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	Amp Horn dB	Log Amp dB	Cable Cable dB	dB	Dist dB	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar
1	2508.410	46.4	+0.0	+0.0	+0.0		+0.0	55.7	61.9	-6.2	Horiz
			+30.0	-31.9	+11.2						
	6TH HARM										
2	2508.410	44.9	+0.0	+0.0	+0.0		+0.0	54.2	61.9	-7.7	Vert
			+30.0	-31.9	+11.2						
	6TH HARM										
3	4180.627	41.1	+0.0	+0.0	+0.0		+0.0	53.9	61.9	-8.0	Vert
			+33.1	-33.4	+13.1						
	10TH HARM										
4	2926.459	40.5	+0.0	+0.0	+0.0		+0.0	53.7	61.9	-8.2	Horiz
			+31.7	-31.6	+13.1						
	7TH HARM										
5	4180.628	40.3	+0.0	+0.0	+0.0		+0.0	53.1	61.9	-8.8	Horiz
			+33.1	-33.4	+13.1						
	10TH HARM										
6	2926.455	38.3	+0.0	+0.0	+0.0		+0.0	51.5	61.9	-10.4	Vert
			+31.7	-31.6	+13.1						
	7TH HARM										
7	3344.499	38.0	+0.0	+0.0	+0.0		+0.0	50.3	61.9	-11.6	Vert
			+31.9	-32.5	+12.9						
	8TH HARM										
8	3344.530	37.5	+0.0	+0.0	+0.0		+0.0	49.8	61.9	-12.1	Horiz
			+31.9	-32.5	+12.9						
	8TH HARM										
9	1672.310	51.7	+0.0	+0.0	+0.0		+0.0	49.7	61.9	-12.2	Horiz
			+26.5	-35.2	+6.7						
	4TH HARM										
10	3762.558	37.1	+0.0	+0.0	+0.0		+0.0	49.4	61.9	-12.5	Vert
			+32.7	-33.2	+12.8						
	9TH HARM										
11	3762.558	35.1	+0.0	+0.0	+0.0		+0.0	47.4	61.9	-14.5	Horiz
			+32.7	-33.2	+12.8						
	9TH HARM										

12	1672.300	48.1	+0.0	+0.0	+0.0	+0.0	46.1	61.9	-15.8	Vert
			+26.5	-35.2	+6.7					
	4TH HARM									
13	1254.249	48.2	+0.0	+0.0	+0.0	+0.0	43.3	61.9	-18.6	Horiz
			+24.9	-35.7	+5.9					
	3RD HARM									
14	2090.360	40.5	+0.0	+0.0	+0.0	+0.0	42.6	61.9	-19.3	Horiz
			+28.5	-34.4	+8.0					
	5TH HARM									
15	836.183	39.8	-27.7	+22.7	+5.9	+0.0	40.7	61.9	-21.2	Horiz
			+0.0	+0.0	+0.0					
	2ND HARM									
16	2090.349	37.2	+0.0	+0.0	+0.0	+0.0	39.3	61.9	-22.6	Vert
			+28.5	-34.4	+8.0					
	5TH HARM									
17	836.201	34.3	-27.7	+22.7	+5.9	+0.0	35.2	61.9	-26.7	Vert
			+0.0	+0.0	+0.0					
	2ND HARM									
18	1254.255	39.1	+0.0	+0.0	+0.0	+0.0	34.2	61.9	-27.7	Vert
			+24.9	-35.7	+5.9					
	3RD HARM									