

HIGHER TECHNICAL INSTITUTE

ELECTRICAL ENGINEERING COURSE

DIPLOMA PROJECT

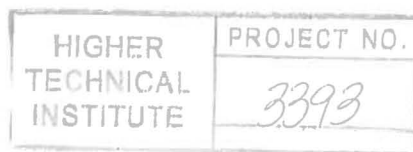
CONCERT SOUND SYSTEMS (CONVERTIONAL  
& COMPUTERISED)

E/1312

EFTHYMIU SPYROS

JUNE 2003

<b>PART I: CONCERT SOUND SYSTEMS (CONVERSIONAL)</b> -----	<b>8</b>
INTRODUCTION TO CONCERT SYSTEMS -----	8
<b>CHAPTER 1</b> -----	<b>9</b>
INTRODUCTION TO THE TOURING CONCERT-----	9
The Touring Party: Who's Who -----	9
<b>CHAPTER 2</b> -----	<b>12</b>
<b>POWER</b> -----	<b>12</b>
Metering Three-phase Power -----	13
Laying Power Cables -----	14
Chain Motor Power -----	14
Sound-Power Distribution System-----	14
Loading a Three-phase Distribution Board -----	15
Lighting-Power Distribution Board-----	16
Electrical Safety-----	18
<b>CHAPTER 3</b> -----	<b>19</b>
<b>RIGGING</b> -----	<b>19</b>
Rigging of Points -----	19
Chain Motors -----	20
<b>PART II: SOUND SYSTEMS</b> -----	<b>22</b>
<b>CHAPTER 4</b> -----	<b>22</b>
<b>SPEAKER SYSTEMS</b> -----	<b>22</b>
Type of Speakers-----	22
Crossover-----	23
Stacking Speakers-----	24
Flying Speakers-----	25
How Speakers Works-----	26
<b>SOUND BASICS</b> -----	26
<b>MAKING SOUND</b> -----	27
Delay Systems-----	29
<b>USE</b> -----	29
<b>SETTING DELAY TIME</b> -----	29
Center Clusters-----	30
Analyzing Speaker Systems-----	30
<b>PINK NOISE</b> -----	31
<b>USING THE ANALYZER</b> -----	31



<b>CHAPTER 5</b>	<b>34</b>
<b>POWER AMPLIFIERS</b>	<b>34</b>
Patching Amplifier Racks	35
Fault Finding	38
Turn ON-Turn OFF Procedure	38
<b>CHAPTER 6</b>	<b>39</b>
<b>MULTICORE SYSTEM</b>	<b>39</b>
Signal Distribution	40
Splitters Systems	41
<b>CHAPTER 7</b>	<b>43</b>
<b>DRIVE SYSTEM</b>	<b>43</b>
Graphic Equalizer	44
Crossovers	44
Limiters	46
Drive Multicore Cables	46
<b>CHAPTER 8</b>	<b>48</b>
<b>HOUSE MIXING CONSOLES</b>	<b>48</b>
Input Channel	49
INPUT	49
MICROPHONE OR LINE SWITCH	49
INPUT GAIN	49
PAD	49
PHASE REVERSE SWITCH	49
GROUP SELECT SWITCHES	49
EQUALIZER SECTION	49
PEAKING	50
SHELVING	50
HIGH-PASS FILTER	50
EQUALIZER ON AND OFF	50
INSERT POINT	50
AUXILIARY SENDS	50
PAN NOT	51
PREFADE LISTEN SWITCH	51
PHANTOM POWER	51
MUTE SWITCH	51
FADER	51
VOLTAGE-CONTROL AMPLIFIER CONTROLS	51
MUTE ASSIGN	52
Output	52
Talkback module	52
Power Supply	55
Gain Structure	55
Console Care	56
Mixing	56
<b>CHAPTER 9</b>	<b>58</b>

<b>EFFECTS UNITS</b> .....	<b>58</b>
<b>Digital Delays</b> .....	58
<b>Reverberation Units</b> .....	59
<b>Musical Instrument Digital Interface</b> .....	59
<b>Use of Effects</b> .....	59
<b>CHAPTER 10</b> .....	<b>60</b>
<b>INSERTS</b> .....	<b>60</b>
<b>Limiters</b> .....	60
<b>Noise Gates</b> .....	61
<b>CHAPTER 11</b> .....	<b>62</b>
<b>MONITOR SYSTEMS</b> .....	<b>62</b>
<b>Monitor Consoles</b> .....	62
<b>Monitor Speakers</b> .....	64
<b>In-Ear Monitor</b> .....	64
<b>Mix Contents</b> .....	64
<b>CHAPTER 12</b> .....	<b>67</b>
<b>MICROPHONE AND DIRECT BOXES</b> .....	<b>67</b>
<b>Types of Microphones</b> .....	67
<b>Direct Boxes</b> .....	70
<b>Microphone Placement</b> .....	70
<b>CHAPTER 13</b> .....	<b>73</b>
<b>SOUND SYSTEM SETUP PREPARATION</b> .....	<b>73</b>
<b>Preparation</b> .....	73
<b>Setup</b> .....	75
<b>UNLOADING THE TRUCK</b> .....	75
<b>RIGGING</b> .....	76
<b>POWER CONNECTION</b> .....	77
<b>HANGING THE SPEAKERS</b> .....	78
<b>STACKING SPEAKER</b> .....	79
<b>FLYING SPEAKERS</b> .....	80
<b>AMPLIFIERS</b> .....	80
<b>FRONT OF HOUSE CONTROL EQUIPMENT</b> .....	81
<b>MONITOR SYSTEM</b> .....	82
<b>MIKING UP</b> .....	83
<b>SOUND CHECK</b> .....	83
<b>AFTER SOUND CHECK</b> .....	83
<b>SHOW TIME</b> .....	84
<b>LOAD OUT</b> .....	84
<b>DIVISION OF DUTIES</b> .....	84
<b>SYSTEM CHECK</b> .....	85

<b>PART II: CONCERT SOUND SYSTEM (ADVANCED)</b>	<b>86</b>
<b>CHAPTER 14</b>	<b>86</b>
<b>SIM SYSTEM II</b>	<b>86</b>
Acoustic Test and Measurement System	86
Features and Benefits	89
Applications	89
Physical Model	89
Frequency Response	90
The three different frequency response measurements	90
Delay Finder	92
Spectrum	92
<b>PART III: CONCERT LIGHTING SYSTEMS</b>	<b>94</b>
<b>CHAPTER 15</b>	<b>94</b>
<b>TRUSSES AND GRIDS</b>	<b>94</b>
Rigging Trusses and Grids	94
Ground Supports	95
Lifting Grids	95
<b>CHAPTER 16</b>	<b>97</b>
<b>LAMPS</b>	<b>97</b>
Types of Instruments	97
<b>CHAPTER 17</b>	<b>101</b>
<b>DIMMERS</b>	<b>101</b>
How a Dimmer Works	101
Ramps	101
Type of Dimmers	102
Dimmer Patching	102
<b>CHAPTER 18</b>	<b>103</b>
<b>CONTROL CABLES</b>	<b>103</b>
Care of Multicore Cables	103
<b>CHAPTER 19</b>	<b>106</b>
<b>CONTROL CONSOLES</b>	<b>106</b>
Manual Consoles	106
Computer Consoles	108

<b>CHAPTER 20</b>	<b>109</b>
INTERCOM SYSTEMS	109
<b>CHAPTER 21</b>	<b>110</b>
SMOKE MACHINES	110
Foggers	110
Dry Ice Machines	110
Pyrotechnics	110
<b>CHAPTER 22</b>	<b>111</b>
FOLLOW SPOTS	111
Operating Follow Spots	111
<b>CHAPTER 23</b>	<b>114</b>
LIGHTING PLOTS	114
Reading Lighting Plot	114
Circuit Coding	119
Putting Together a System	119
<b>CHAPTER 24</b>	<b>123</b>
LIGHTING SYSTEM SETUP PROCEDURE	123
Setup	123
Unloading the Truck	123
Rigging	123
Power Connection	124
ASSEMBLING THE TRUSSES	125
LOOMING	125
HANGING THE LAMPS	125
DRAPES	126
RAISING THE GRID	126
DIMMERS	127
FOLLOW SPOTS	127
FLOOR LAMPS	127
FOCUS	128
SHOW TIME	128
LAOD OUT	128
<b>PART IV: CONSTRUCTION</b>	<b>129</b>
CONSTRUCTION 1: Concert at G.E.T.E.	129
Equipment Used	129
Instruments Used	129
Block Diagram of the Concert	130
Pictures oh the Concert	130
CONSTRUCTION 2: Concert at Night Rock Club in Limassol	133
Equipment Used	133

<b>Block Diagram of the Concert</b> -----	134
<b>Pictures</b> -----	135

# **PART I: CONCERT SOUND SYSTEMS (CONVERSIONAL)**

## **INTRODUCTION TO CONCERT SYSTEMS**

In a music concert there are two main parts which can create interest and command attention. These two parts are used to produce good sound and lighting which are the foundation of any concert. Poor sound ruins the audience's enjoyment of the concert, and poor lighting destroys the dramatic impact of the performance. However, to have an excellent production, is not easy to achieve.

The aim of this project is to provide a foundation for sound and lighting equipment and to offer necessary information on subjects associated with concert production. No fixed rules exist for operating sound and lighting consoles. Once you learn how the equipment works, your imagination is free to realize its full potential.

In a concert installation the more prepared you are, the easier and more enjoyable the job will be. After each show, there is always the question of, "Could I have done better?" The answer is "Yes." There is always more to learn, and each show provides you with the chance to grow, as you face different problems. Professionals are needed to maintain and operate today's concert equipment. It's not enough for someone to have the technical knowledge require to set-up, operate, and maintain the equipment. He or she is responsible for the well being of everyone present. The concert production environment is potentially dangerous, and mistakes can harm the crew, the performers, or even the audience. There is no room for mistakes with heavy loads suspended overheads and complex, expensive electrical equipment all around.

The larger the crew, the more complex a setup becomes. Teamwork is therefore necessary. As we are going to see in the next chapter many people are involved in concert production, and as I said before everyone must work together. The technical success of the show is as important as the performance.

This project will be divided into four main parts; sound systems, lighting systems, studio, and a demonstration of a concert of a rock band in Limassol. Before I tackle these subjects, however, I will discuss power and rigging, both of which are common to sound and lighting systems. A good understanding of power and rigging is important, because your life and the lives of the crew, performers, and audience may depend on it.