

MEGARAY
Searchlights

MR175

MK2

ULTRA HIGH INTENSITY SEARCHLIGHT



OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

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SAFETY SUMMARY



WARNING



CAUTION



NOTE



Highlights an essential operation or maintenance procedure, which, if not strictly observed, could result in injury.



Highlights an essential operation or maintenance procedure, which, if not strictly adhered to, could result in damage to, or destruction of, equipment or loss of mission effectiveness.



Highlights an essential operation or maintenance procedure that deserves additional emphasis, but is not considered essential to the protection of personnel or equipment.



Battery should be inspected for bulging prior to use. If the battery shows signs of bulging, do not use. Battery contains lithium that could emit sulfur dioxide and may explode if handled improperly. DO NOT carry battery loosely or in cases where they could short-circuit and cause damage or injury. Do not replace battery in a potentially explosive atmosphere. Sparking on connecting may occur while installing or removing battery and cause an explosion. Serious injury to personnel may result from failure to comply with this warning. Consult local Property Disposal Officer and DLSC Handbook 41601 for proper battery disposal.



HOT SURFACES: During operation, the bottom heat sink temperature could reach 158°F/70°C. Prolonged contact can cause skin burns.



HIGH VOLTAGE: There are high voltage levels present inside the unit for up to three minutes after switching off.



HIGH PRESSURE: The xenon gas in the lamp is under high pressure. Repair and maintenance technicians should always handle the lamp very carefully. Protective hand and face gear should always be worn when testing the lamp while the unit is open and the lamp is exposed.



Personnel working in close proximity to an operating Megaray should avoid pointing the beam onto exposed skin.



Never point the Megaray beam at anyone, or look into the output lens of the beam whether in the visible mode or with IR filters. Permanent eye damage and blindness could result.



Megaray must not be operated at angles greater than 45° in an upward direction from the horizontal.

CHAPTER 1 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this manual is to provide descriptive information, operating instructions and maintenance procedures for the Megaray 175mk2 portable ultra high intensity searchlight (hereafter referred to as Megaray). The manual will cover the Megaray, all ancillary equipment associated with the standard kit and optional accessories that may be used with the Megaray.

1.2 LIST OF ABBREVIATIONS

The following list of abbreviations may be used in this manual:

A	Amps
DC	Direct Current
ft	Feet
g	Grams
hrs	Hours
Hz	Hertz
In	Inches
IR	Infrared
kg	Kilograms
LED	Light Emitting Diode
Mts	Meters
min	Minutes
mm	Millimeters
Yds	Yards
nm	Nanometers
oz	Ounces
RA#	Return Authorization Number
V	Volts
VAC	Volts, Alternating Current
VDC	Volts, Direct Current

Figure 1. List of Abbreviations

1.3 DESCRIPTION OF THE EQUIPMENT

The standard Megaray is a compact, battery powered, ultra high intensity searchlight system intended for general and specific illumination tasks. General illumination tasks include, but are not limited to:

- General battlefield illumination
- Sniper suppression
- Obstacle illumination
- Crowd control
- Covert illumination for electro optical (EO) sensors
- Search and rescue
- Improvised explosive device (IED) detection
- Traffic control

1.4 MEGARAY STANDARD KIT

The Megaray system consists of the following standard components (Figure 2)

Item	Part Number	Picture	Description
1	MR - SS		Shoulder strap
2	MR - 175SC		Shipping and storage soft case
3	MR – 175MK2		Megaray light unit
4	LB - 175		Lithium polymer battery
5	MR - 175MAN		Operator and Organizational Maintenance Manual
6	MR - 3330		Battery vest including power cable
7	BC - 175		Battery charger
8	MR – PIC1		Picatinny rail

Figure 2. Megaray Standard Kit

1.5 MEGARAY PORTABLE SEARCHLIGHT SYSTEM

1.5.1 Megaray Light Unit



1	Lens housing	6	"Battery Low" LED
2	Picatinny rail	7	"Over - Temperature" LED
3	Air vents	8	"Power On" LED
4	Power connection	9	Mode selector switch
5	Bottom heat sink	10	Main "ON/OFF" switch

Figure 3. Megaray Light Unit

1.6 BATTERY VEST

The battery vest assembly is worn on the torso of the operator and contains pockets for accessories.

1.6.1 Composition

The battery vest consists of one 22.2V 16Amp-hour lithium polymer maintenance-free rechargeable battery housed in the battery vest. The power cable connects to the battery and to the Megaray or charger (Figure 6).

1.6.2 Power Cable

The power cable connects to the battery vest on the right hand side of the battery vest and is secured to the vest with a velcro strap (Figure 6). The battery remains in the battery vest during recharging. The same cable and connector used to connect the Megaray light unit to the battery vest is used to connect to the battery charger (Figure 7).

1.6.3 Battery

The battery charge level can be checked on the “Change level indicator” by touching the touch pad indicator (see Figure 4). The battery power indicator lights will be lit to show how much battery power is left (see Figure 5).



Figure 4. Battery Side Panel

LED's	Indicative lights illuminated	Charge level
5	2 red, 1 yellow and 2 green	100% - fully charged
4	2 red, 1 yellow and 1 green	80%
3	2 red, 1 yellow and 0 green	60%
2	2 red, 0 yellow and 0 green	40%
1	1 red, 0 yellow and 0 green	20% - empty, recharge

Figure 5. Battery Power Indicator LEDS

1.6.4 Battery Vest

The Lithium polymer battery is housed in the battery pouch on the rear of the battery vest. The battery remains in the battery vest during recharging. The Power cable (Figure.7) connects the Battery vest to the Megaray and the Battery Charger.



Figure 6. Battery Vest



Figure.7 Power Cable

1.7 BATTERY CHARGER

The battery charger is provided to recharge the Lithium polymer battery in the battery vest. The battery charger operates on an input voltage range of 100 – 240VAC. It delivers an output current of 4A (max), which allows for a maximum recharge time of five (5) hours from when the battery is completely discharged.

1.7.1 Power Cable

The power cable for connecting the Megaray to the battery vest is situated on the right hand side (in the carrying position) of the battery vest, in front of the battery pouch. When the battery vest requires recharging, the same power cable is used to connect to the Megaray battery charger.

1.7.2 Charging the Lithium Polymer Battery

Charging the Megaray Lithium polymer battery using the custom Megaray battery charger is quick and uncomplicated. On top of the charger there is a LED light, which indicates how far the charging process is:

- ✓ Red LED = Charging
- ✓ Yellow LED = Close to fully charged
- ✓ Green LED = Fully charged (or disconnected from battery)

The charger is equipped with a standard Megaray military type connector for connecting to the Megaray power cable.



Use only the Megaray charger, as supplied with the Megaray, to charge the battery.



Figure 8. Battery Charger

1.8 CARRY STRAP

An adjustable shoulder carry strap attaches with the carry strap hooks on the Megaray MR175 MK2, as illustrated below (Figure 9).



Figure 9. Attachment for Carry Strap Hook

1.9 PICATINNY RAIL

A picatinny universal 6 inch rail. The Picatinny rail allows other equipment to be mounted to the Megaray (Figure. 10).



Figure 10. Picatinny Rail Used to Mount a Night Vision Device or Similar

CHAPTER 2 OPERATING INSTRUCTIONS

2.1 PREPARING THE UNIT FOR OPERATION

The Megaray is ready for immediate use when unpacked and requires no preparation or assembly.

2.2 CONNECTING UNIT TO A POWER SOURCE

2.2.1 Battery Vest

The Megaray system is equipped with military connectors that connect in only one way to ensure proper contact and to prevent accidental reverse polarity connection. The light unit is equipped with a male connector which connects to the female connector of the attachment you are connecting it to as demonstrated below (Figure 11) where the battery vest connects to the Megaray™.

To connect:

- Press the connectors together firmly after insertion while turning cable connector.
- Tighten the female connector until the red band is not visible.

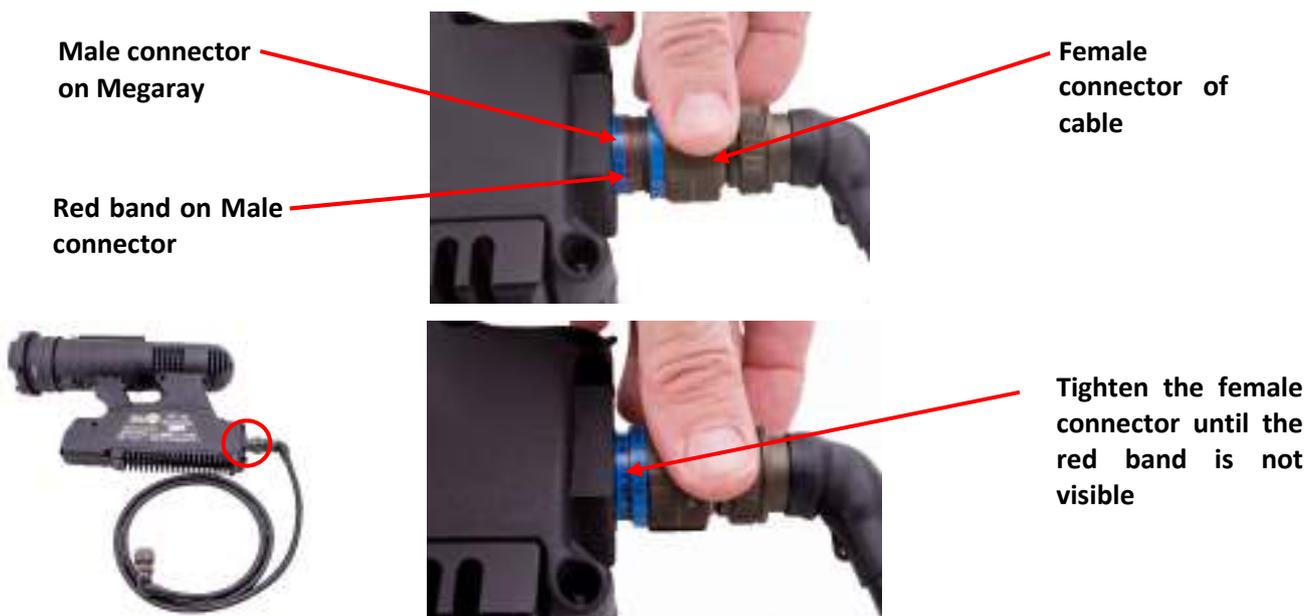


Figure 11. Connecting the Power Cable to the Megaray from the Battery Vest



This method requires a little practice, but once mastered, enables the operator to connect the Megaray light unit power cable to its battery vest swiftly and without having to look at the connectors. This method comes in handy when Megaray needs to be connected in the dark.

2.2.2 External Power Source

The optional extension power cable is used to connect the light to an external power source. The Megaray light unit is equipped with an integral switch mode power supply enabling the unit to function on any DC voltage input between 12VDC and 30VDC. It automatically adjusts itself to the input voltage. Common external power sources are car, truck, boat or aircraft battery. The external power source should deliver at least 20A from a 12V power source, or 9A from a 24V power source. Currents below these levels may not be sufficient to ignite the Megaray's short arc xenon lamp.

2.2.2.1 External Power Cable

The external power cable is equipped with a female connector on the one end (identical to the female connector on the battery vest) and two heavy-duty alligator clips on the other end.



Figure 12. External Power Cable being Connected to Searchlight



The alligator clips are color coded to indicate polarity. Color coding is standard red = positive (+) and black = negative (-).

2.2.2.2 Ensure Polarity

Although the Megaray is reverse polarity protected the unit will not function if incorrectly connected.

2.3 SWITCHING THE UNIT "ON"

The Megaray is equipped with an ON/OFF switch located on the upper front part of the pistol-type handgrip (Figure 13). The light comes on when the switch is pressed once and goes off when the switch is pressed again. When the Megaray is switched on, the red "Power ON" LED (Figure 14) situated inside the label area of the light unit glows indicating that the power supply module and electronic circuit are functioning correctly.



Figure 13. Megaray ON/OFF Switch



Figure 14. Megaray Light Unit Label

2.4 LIGHT MODE SELECTION

The Megaray has two different light modes, which are selected using the mode selector switch. The mode selector switch is situated at the bottom front of the unit (Figure 15). The following modes are selectable:

- a. Strobe: In this mode the light beam flashes at eight cycles/second (8Hz) in high beam mode. Mode switch is in the forward position.
- b. High beam: In this mode Megaray operates at continuous light output. Mode switch is in the backward position.



Figure 15. Light Mode Switch

2.5 ADJUSTING BEAM DIVERGENCE

Megaray's beam divergence (angle) is adjusted by sliding the lens housing (Figure 16) forward or backward.

2.5.1 Decreased Beam Divergence

As the lens housing moves forward (Figure 16 - A), the beam divergence decreases to a minimum of 2°. Maximum light intensity is obtained at this angle.

2.5.2 Increased Beam Divergence

As the lens housing is moved backwards (Figure 16 - B), the beam angle increases until the maximum beam of 6° is achieved.

Lens housing in fully extended position results in minimum beam divergence (2°) with maximum range and beam intensity



Lens housing in fully retracted position results in maximum beam divergence (6°) with reduced range and beam intensity but increased area illumination



Figure 16. Adjusting Beam Divergence

MR 175 - BEAM DIAMETER AT A GIVEN DISTANCE										
Distance		50	100	200	500	800	1000	1500	2000	Mts
		55	109	219	547	875	1094	1640	2187	Yds
Beam Diameter	2°	1.75	3.50	7.00	17.5	28.00	35.00	52.37	70.00	Mts
		1.91	3.82	7.65	19.14	30.62	38.28	57.27	76.55	Yds
	6°	5.25	10.51	21.02	52.5	84.08	105.1	157.65	210.20	Mts
		5.74	11.49	22.99	57.42	91.95	114.94	172.48	229.88	Yds
With CSL 074 lens	74°	75.36	150.72	301.42	753.60	1205.70	1307.20	2260.60	3014.02	Mts
		82.41	164.83	309.64	824.15	1318.57	1429.57	2472.22	3296.17	Yds

Figure 17. Beam Diameter at a Given Distance

2.6 "OVER TEMPERATURE"

The Megaray's lamp generates high operational temperature levels as do a large number of high - power electronic components. When the unit is switched on there is a rapid build-up of heat. If this heat is not dissipated the unit will automatically switch off until it cools off whereupon the operation can then be restarted.

2.6.1 Temperature Control

The Megaray is equipped with two heat sinks and an electric fan to maintain critical temperature levels. There are also two heat sensors that automatically switch the unit off should the temperature rise above a predetermined level. The sensors monitor the temperatures of the xenon lamp and the bottom heat sink.



Operating the light from an external 12V source causes higher temperature levels than at 24V (or higher).

2.6.2 Over Temperature Trip

Although the lamp is forced air cooled by an electric fan assembly, high ambient temperatures may cause the unit to trip when using high beam continuously. If the unit switches off because of overheating it resets itself and is operable as soon as it has cooled down. When the unit trips an LED on the label marked "TEMP" situated alongside the "POWER ON", will illuminate and the lamp will switch off. Care must be taken not to obstruct air movement over air vents and heat sinks.

2.7 TRIPOD MOUNTING

Megaray can be mounted on any standard photographic Gorilla tripod (Figure 18).



Figure 18. Threaded Hole in the Heat Sink

Any standard $\frac{1}{4}$ inch tripod screw fits into the threaded hole at the bottom of the Megaray. The hole is situated on the bottom heat sink directly in front of the cooling fins (Figure 18).

**CHAPTER 3
OPTIONAL ACCESSORIES**

3.1 OPTIONAL ACCESSORIES

The Megaray system offers the following optional accessories (Figure 19) to be used with the Megaray standard kit (Figure 2).

Item	Part Number	Picture	Description
1	MIR - 103		Covert IR filter
2	MIR - 102		Semi covert IR filter
3	CSL - 074		Clear spreading lens
4	EMC - 031		External power cable
5	MRT - Bh0		Tripod with ball head
6	NVD - 804		Night Vision Device
7	HCC - 001		Hard carry case with custom insert (SVA60foam)

Figure 19. Optional Accessories

3.2 IR FILTERS

The Megaray optional accessory kit offers two different infrared filters - the MIR 102 (850 nm) (Figure 20 - A) and MIR 103 (930 nm) (Figure 20 - B). The MIR 103 filter's glass is thicker than that of the MIR 102. The MIR 103 filter also has greater transmission suppression than the MIR 102 filter. Both filters simply clip onto the front of the lens housing to quickly convert the unit into an effective IR illuminator for covert and special applications. The MIR 102 is a semi - covert filter and the MIR 103 is a covert filter. The filters can be stowed in the two small pockets on the battery vest.



Figure 20. IR Filters

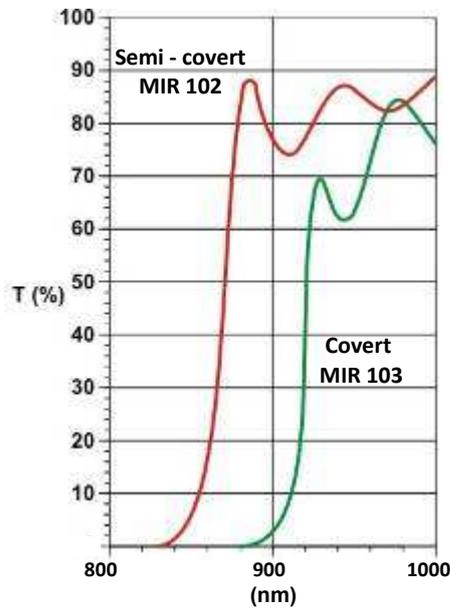


Figure 21. Chart of IR Filter Curves



Figure 22. Installing IR Filter or Clear Spreading Lens on Lens Housing

3.3 HARD CARRY CASE

The customized hard carry case can be used to store the standard Megaray kit together with other optional accessories.

Description	Dimensions
External dimensions	62.7 x 49.7 x 30.3cm / 24.71 x 19.58 x 11.93in
Internal dimensions	55 x 42.2 x 26.8cm / 21.68 x 16.62 x 10.56in
Weight	7.60kg / 16.8lbs



Figure 23. Hard Carry Case



Figure 24. Protective cut-out Foam-liner inside Hard Carry Case

The hard carry case can also be fitted with a custom made protective cut-out foam-liner which is specially designed to fit the full Megaray Kit with optional extras.

CHAPTER 4 MAINTENANCE

4.1 CLEANING

4.1.1 Optical Surfaces

Clean optical surfaces using a soft clean cloth. Wherever possible, clean distilled water should be used as a solvent. Use a lens brush to remove large particle contamination by holding the lens facing downward and gently brushing with a lens brush. Clean smaller particles using cotton tipped swabs and a lens cleaner or distilled water. Start in the center, gently moving in an ever increasing circular pattern to the edge of the lens. Polish using a clean cotton swab or lens paper. The same procedure should be applied to the clear spreading lens and IR filters.

4.1.2 Battery Vest

The battery used in the Megaray battery vest is a Lithium polymer battery and is maintenance free. Materials used in manufacturing the Megaray battery vest are strong and durable. No maintenance is required other than cleaning the vest material periodically.

4.1.3 Inspecting and Cleaning Electrical Connections

Inspect the electrical connections for physical damage such as bent or broken connector pins and sockets. Clean any corrosion with distilled water or alcohol and dry thoroughly before reconnection. Ensure wires are secure in the connector plugs and that the insulation is still intact along the entire trace of the wire.

4.2 CHANGING THE LAMP

This operation is to be carried out only at depot level or higher by suitably trained personnel on Megaray maintenance.

TROUBLE SHOOTING TABLE

SYMPTOMS	POSSIBLE CAUSES	TEST / REPAIR PROCEDURE
Light unit does not switch on	<ul style="list-style-type: none"> a. Battery vest or external power source not connected to the Megaray b. Battery disconnected in battery vest c. Battery voltage too low d. Power source not switched on or reverse polarity e. Light unit faulty 	<ul style="list-style-type: none"> a. Check for secure connection to battery or external power source b. Open battery pocket on battery vest and check for secure connection of cable to battery c. Put battery vest on charge d. Check for correct polarity connection to power source. e. Repair light unit
Light unit switches on (ON LED comes on) but the light does not come on	<ul style="list-style-type: none"> a. Battery or power source too low b. Internal temperature too high (Temp LED on) c. Light unit faulty 	<ul style="list-style-type: none"> a. Put the battery vest on charge or check the power source for correct voltage and current settings. b. Allow the unit to cool down It will restart automatically when the internal temperature reaches a safe level. (Note : In hot ambient conditions or when airflow over the bottom heatsink is low, this shut down will occur more frequently) c. Repair light unit
Light intensity low when switched on	<ul style="list-style-type: none"> a. Battery or power source too low (See BATT LOW LED is on) b. Degraded lamp (Past its lifetime or abused) c. Faulty lamp due to abuse or internal lamp flaws d. Faulty light unit electronics 	<ul style="list-style-type: none"> a. Put the battery vest on charge or check the power source for correct voltage and current settings. b. Repair light unit c. Repair light unit d. Repair light unit

<p>Light strobes when switched on</p>	<ul style="list-style-type: none"> a. Mode switch set to strobe mode b. Faulty mode switch c. Lamp not striking due to faulty electronics d. Lamp not striking due to faulty lamp 	<ul style="list-style-type: none"> a. Check mode switch setting for the desired operation. b. Repair light unit c. Repair light unit d. Repair light unit
<p>Light intensity does not go to STROBE when mode switch is switched to the forward position</p>	<ul style="list-style-type: none"> a. Faulty mode switch b. Faulty electronics 	<ul style="list-style-type: none"> a. Repair light unit b. Repair light unit
<p>Light unit stops operating after some time and Temp LED is on</p>	<ul style="list-style-type: none"> a. Over temperature trip b. Supply voltage too low c. Electronics malfunctioned d. Lamp malfunctioned 	<ul style="list-style-type: none"> a. Allow the unit to cool down It will restart automatically when the internal temperature reaches a safe level. (Note : In hot ambient conditions or when airflow over the bottom heatsink is low, this shut down will occur more frequently) b. Check for secure connection to battery or external power source or put battery vest on charge c. Repair light unit d. Repair light unit

Figure 25. Troubleshooting Table

SPECIFICATIONS

ITEM	DATA			
Light Intensity	4375 Lumens - As per xenon lamp manufacturer, rating at an average of 25 Lumens per Watt			
Light Source and Colour				
Source	175W short arc xenon bulb			
Colour Temperature	5600 Kelvin			
Beam Divergence				
Spot Mode	2°			
Flood Mode	6°			
Power Supply				
Input Voltage Range	12 – 30VDC, 230W (input maximum)			
Current Rating	Std Battery: 16A, Compact: 8A			
Battery				
Battery Type: Lithium Polymer	Standard 16AH, 22.2V			
Temperature range and time for charging				
Charging:	0°C to + 45°C / + 32°F to + 113°F			
Discharging:	-20°C to + 60°C / - 68°F to + 140°F			
Storage (longer than 2 weeks):	-20°C to + 45°C / - 68°F to + 113°F			
Recharge Time:	Standard	5 hours	Compact	4 hours
Battery Life (per cycle) at 23°C / 73°F				
Continuous High Beam	Std	100 min	Compact	35 min
Strobe Beam	Std	180 min	Compact	75 min
Weight				
Light Unit	8.6 lbs / 3.9 kg			
Battery and Vest (Standard)	7.7 lbs / 3.5 kg			
Battery and Belt (Compact)	4.4 lbs / 2.0 kg			
Dimensions: Light Unit				
Length (flood mode)	16.1 in / 410 mm			
Length (spot mode)	19.7 in / 500 mm			
Height	11.8 in / 300 mm			
Diameter (top body)	4.1 in / 104 mm			
Battery Charger				
Input Voltage	100 – 240VAC, 50 – 60Hz			
Output Voltage	25.2VDC at 4.7A			

Figure 26. Specifications

APPENDIX A

WARRANTY INFORMATION

ALL RIGHTS RESERVED

This document contains proprietary information and has been prepared for Megaray customers' use to properly care for and operate the system for which it is written. Neither receipt nor possession thereof confers any right to reproduce, use or disclose, in whole or in part, any such information without written authorization from Megaray Limited (herein after referred to as Megaray Limited).

The warranty for the product purchased is detailed in full in the applicable Megaray Limited contract.

The warranty is valid for 1 year from date of purchase.

No unit will be accepted for repair or replacement under this warranty unless the purchaser has obtained a Return Authorization Number (RA#) from Megaray Limited

If the above condition is fulfilled, Megaray Limited will inspect and/or test the unit in accordance with the applicable specifications. If the inspection or test reveals defects covered by this warranty, Megaray Limited will repair or replace the unit at its discretion.

If Megaray Limited determines that the unit is not defective or not covered by warranty, the purchaser will be notified and the purchaser will be required to prepay an evaluation fee of USD50.00 (this amount maybe revised from time to time).

This warranty does not extend to any unit which: (1) has been subject to misuse, neglect or accident, (2) has been used in violation of instructions provided by Megaray Limited whether or not said instructions are prepared by Megaray Limited or 3rd party manufacturers, (3) which has its serial number or label, or, any part thereof altered, defaced or removed, (4) which has been tampered with, altered or repaired by someone other than Megaray Limited or its nominated repair facilities.

Megaray Limited will not be responsible for the costs of repairs performed by and/or replacement parts or material supplied by anyone other than Megaray Limited. Unapproved repairs may invalidate all warrantees.

Warranty Repair

Warranty repairs are provided at no charge.

Non-Warranty Repair

Non-warranty repair is provided under the following guidelines:

- i. Megaray charges an evaluation fee for each system returned.
- ii. The customer is provided with a price proposal to repair the unit.
- iii. If the customer elects to make the repairs, the evaluation fee is credited to the repair charge, handling and return shipping.
- iv. If the customer elects NOT to make the repairs, the unit will be disposed of as agreed between the parties or returned to the customer at the customer's expense.