CE

Genesis
80cm Boat

1N00-510 User Manual

Note
This unit is fitted with an updated (2013) design for console steering and forward/reverse. Please quote 'OPTICAL' set up when discussing parts or service. For parts, page 2 has substitutions for items 2 and 24. New part numbers to be advised shortly.

Self Tuning Loop Output Board

Your Serial Number is:

Please quote this number when ordering parts or seeking telephone assistance.

Company Information.

	Telephone	Fax	
Technical Help	+44(0)121-773-1827	(0)121-772-6056	Ask for Technical Help
Parts & Accessories	+44(0)121-773-1827	(0)121-772-6056	Ask for the Parts Dept
Unit Sales	+44(0)121-773-1827	(0)121-772-6056	Katie Roberts
Comments:	+44(0)121-773-1827		Stuart Bland

Addresses:

Head Office, Sales Office & Production

Tornado International Ltd
Unit 26 Green Lane Industrial Estate
Second Avenue
Birmingham
B9 5QP
England
Tel: +44 (0)121-773-1827
Fax: +44 (0)121-772-6056

A Member of the Tornado International Leisure Group

Conventions used in this Manual

For clarity the following conventions are used in this manual:

Paragraph Heading	Meaning
Tip!	Information which will assist in the operation of the product
Note!	Information which is important for the correct operation *of the product.*
Caution!	Information which is **VITAL** to avoid injury to persons or damage to the product.
Warning!	Information which is **VITAL** to avoid ***serious injury*** to personnel or the public.

Please take note of the information in shaded areas. If you have any questions with regard to the correct installation or operation of the product please contact Tornado International Ltd.

Important – Please Read This!
This manual is provided in good faith and is believed to be accurate. Because Tornado International have no control over the manner in which the product is used, users should satisfy themselves that any information or instruction contained in this manual is appropriate for the conditions under which the product is being installed and operated.

In the interest of product development, Tornado International reserves the right to alter or modify the product as necessary.

Introduction

Thank you for purchasing this quality product from Tornado International Ltd. It will give you many years of trouble free service and if used in a suitable site will provide consistent profits.

Please read and understand this manual before using the equipment.

This manual contains the following sections.

1.00 Operating Procedures

1.01 Opening Instructions
1.02 Closing Instructions

2.00 Detail Overview of the System

Here you will find detailed information about each part of the system with hints and cautions about the correct operation of the equipment.

3.00 Periodic Service

Little is required in the way of periodic service. However time spent in following these procedures will pay dividends in improved reliability and service life.

1.00 Operating Procedures

1.01 Opening Instructions

1. Remove the console covers; visually check the consoles for any damage.
2. Turn the Power Supply on and check that the red lights are illuminated on each playing position.

   Note!
   The power supply must always be turned on before the batteries are connected to the models.
3. Check the charge meters on the battery chargers. The needle should be between 0 & 1 when the battery is fully charged.
4. Remove the batteries from the chargers and insert the spare batteries if they are not fully charged.
5. With the boat near to the operating area and keeping the boat propellers clear of any obstructions, carefully slide the battery into the boat. The propellers will rotate briefly.
6. Attach the boat top and lock it into position. Ensure it is the correct number for the receiver.
7. Carefully place the boat on the water inside the operating area.

   Caution! Place the boat on the water. Never launch or throw the boat onto the water, as this will cause the hull to fracture around the battery holder.
8. Repeat operations 5 to 7 for each model.
9. Coin and test each playing position in turn to ensure the console and boat operate correctly.

The unit is now ready for use.

1.02 Closing Instructions

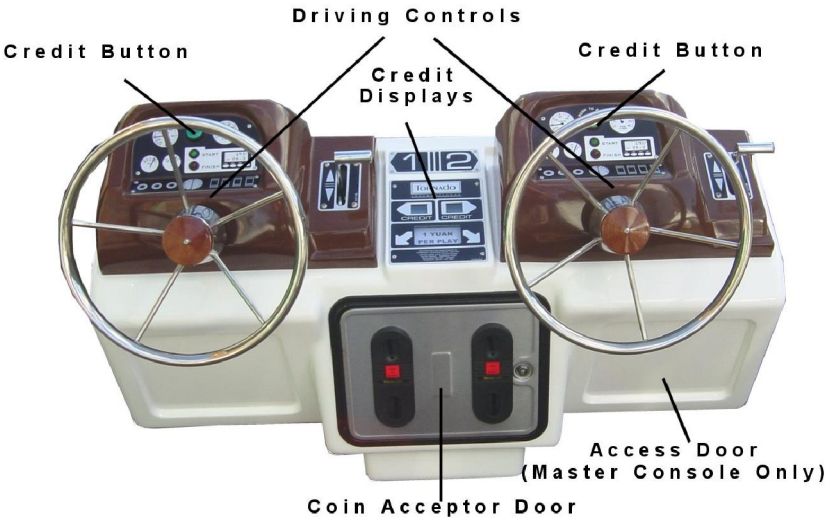
1. Trigger the playing position and drive the boat to the edge of the area and remove it from the water.
2. Place the boat on the stand supplied, remove the top and slide the battery out of the hull.
3. Inspect the propellers for damage or debris around the shaft.
4. Using polish and a cloth thoroughly clean the outside of the hull and top.
5. Place the boat vertically with the bows up in its storage position

   Caution!
   It is vital that the boat is stored vertically with the bows up to ensure that any water in the hull and water in the outer propeller shafts drains out of the rear. Storing the boat in any other position will allow water to enter the motors leading to their premature failure.
6. Repeat operations 1 to 4 for each model.
7. Turn off the Power Supply and check that all of the lights on the consoles are off.
8. Open the cash doors (remove the pad locks if fitted) and remove the cash. Note the coin counter readings.

9. Lock the cash doors and thoroughly clean and polish the consoles and playing positions. Place the covers over the consoles.
10. Place the used batteries in the charger. Check the charging meter readings. The needle should be between 2 and 10.

2.00 Detail Overview of the System

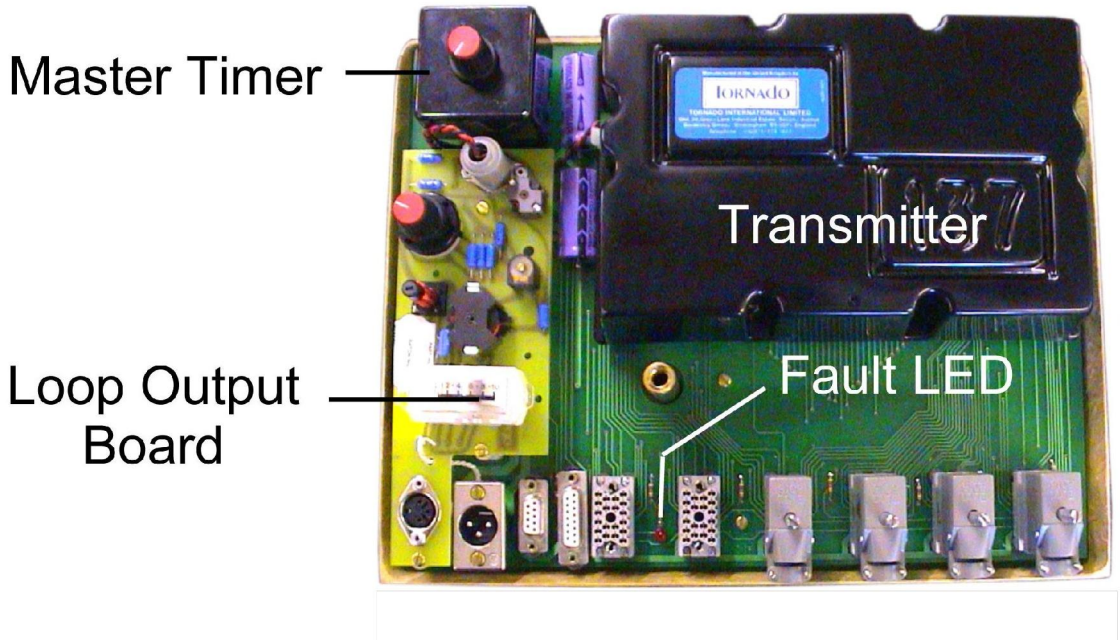
2.01 Consoles



The consoles are made from glass fibre with a blockboard reinforcing for the back wall. Regular application of a quality proprietary polish will reduce the harmful effects of sunlight. The console should be thoroughly cleaned at the end of the operating period and before any soiling is allowed to dry. Never use any abrasive cleaner on the console. Housed in every console are the following components:

Driving Controls
- Coin Acceptors
- Credit Displays
- Console Mother Board (& coin counters)
- Cash Box
- Slave Timer

Additionally the master console contains:



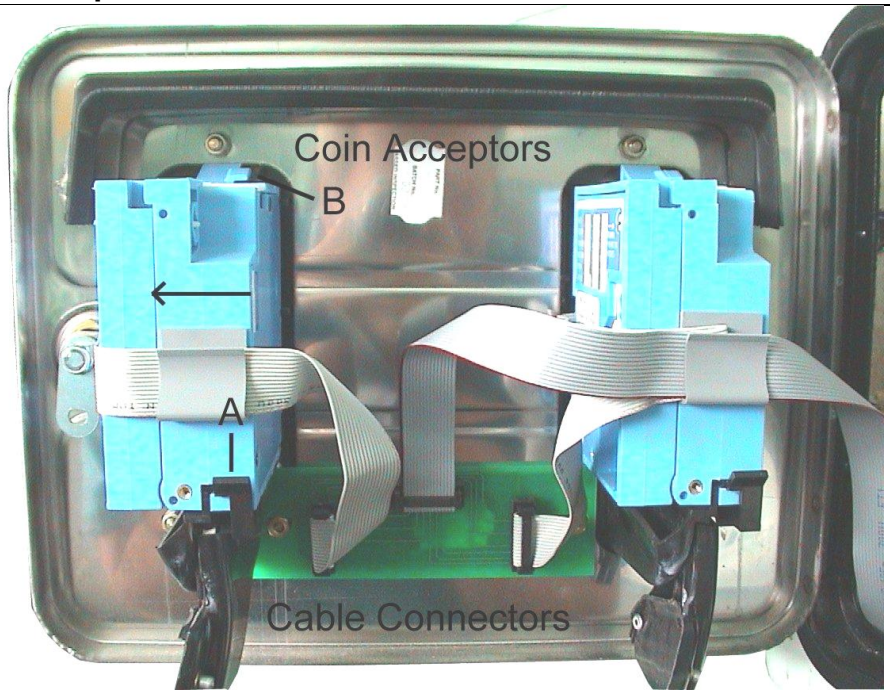
The Transmitter Mother Board
The Transmitter
The Loop Output Board
The Master Timer

The master console can be identified by the provision of an additional door to the right of the coin acceptor door. It is usually console number 5/6.

The consoles are provided with covers, which should be used over night and if it rains during the day. A canopy over the consoles is advised to allow your customers to use the attraction during inclement weather or provide shade if the equipment is sited in sunny climates.

The coin acceptor doors and the transmitter access door are all fitted with radial pin tumbler locks. They all open with the same key. Provision is made for the use of your own padlock to secure the cash box if required.

2.02 Coin Acceptors



Microcoin electronic coin acceptors are fitted to the unit. These can be reprogrammed by the operator using a hand held programmer. This is available from Tornado either to purchase or on loan. Please contact the Service Department for details. There are no user serviceable parts in the coin acceptors. They should be returned to Tornado for service.

2.03 Credit Display

The credit display is mounted between the driving controls. It will show “0” on power up and will then display the number of credits purchased by the customer. The cost of each game and any bonus games are displayed in accordance with the settings programmed in the coin acceptors. As soon as one or more credits are available the green play button will flash and the credit display will flash. When the play button is pressed 1 will be subtracted from the credit display, the display will stop flashing, the play button will be illuminated and a signal will be sent to the slave timer to start the game. Whilst the game is in play, pressing the green play button has no effect. At the end of the game the green play button and the credit display flash, if credits are available.

Any over payment which does not reach the next vend price is stored and added to the next payment. For example, if the vend price is 75p and a customer inserts 100p one credit will be displayed and 25p stored. The

excess payment is kept in store until either some more money is inserted or the unit is turned off.

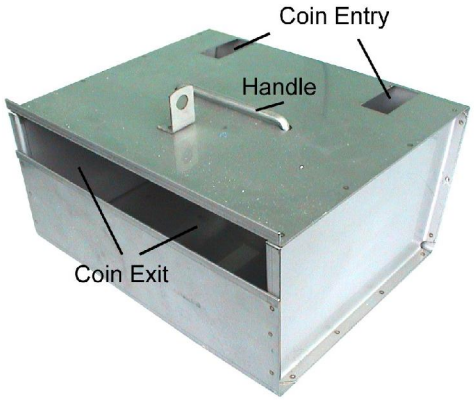
Note!
Removing power from the system when credits are available will result in the credits being lost.

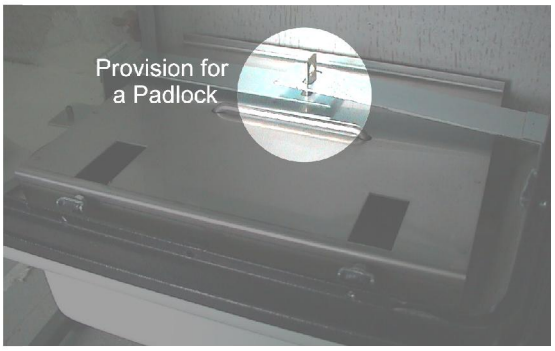
2.04 Coin Counters

The coin counters (Diagram 2.06) are mounted on the console motherboard. They can be seen when the coin acceptor door is open. The counter is advanced by one digit for the value of the smallest coin the coin acceptors are programmed to accept. So if the smallest coin is a 5p the coin counters will count in multiples of 5p.
The coin counters are non re-settable.

Note!
Although each coin counter counts the coins for its own acceptor, the cash box serves two acceptors and is not separated.

2.05 Cash Box





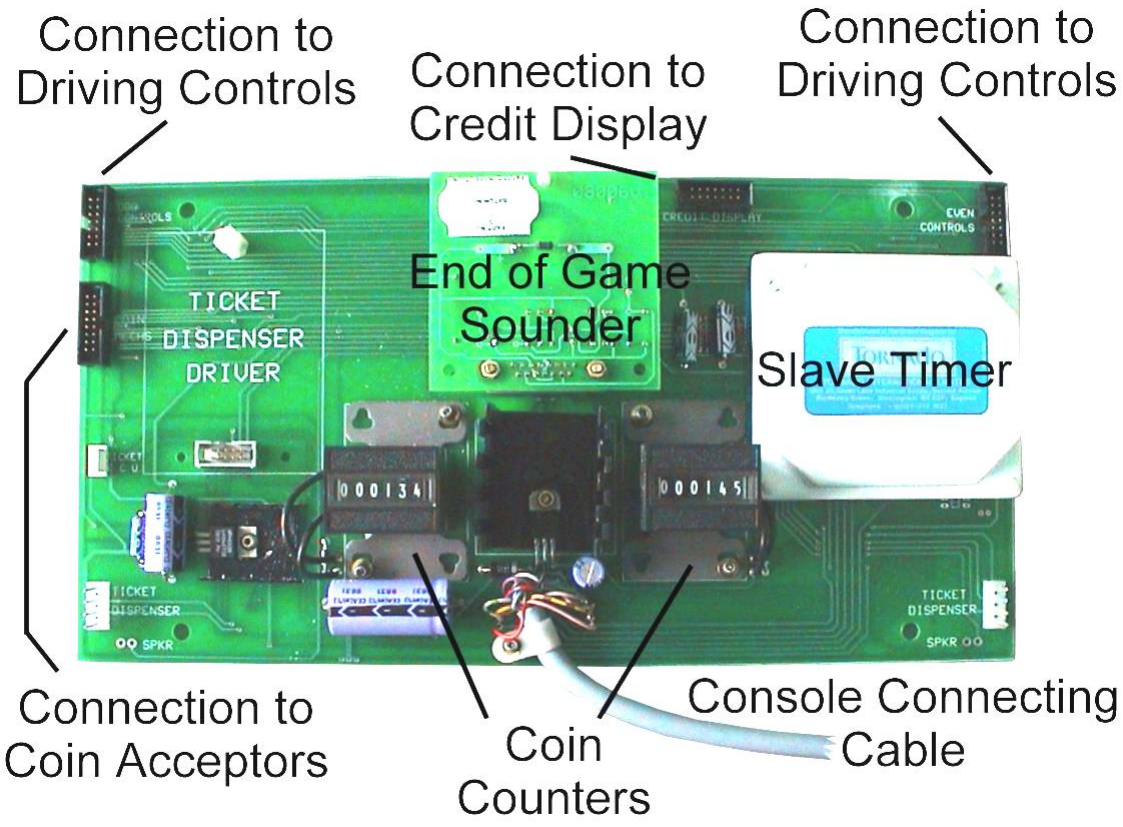
The cash box is mounted in the centre of the console behind the coin acceptor door. There is provision to fit your own pad lock for added security. The cash box is removed from the console by opening the coin acceptor door, removing the padlock if fitted and lifting out using the handle.

Caution!
Care should be taken to avoid damage to the console motherboard or coin acceptors when removing or replacing the cash box.

The coins can be poured out of the cash box into a suitable container by use of the slot in the rear of the box.

Caution!
When replacing the cash box, ensure it is correctly located before closing the Coin Acceptor door.

2.06 Console Motherboard



The console motherboard is mounted in the centre of the console and is accessed by opening the coin acceptor door. It is the distribution centre for the console and has the following parts mounted on it.

Slave Timer
End of Go Sounder
Coin Counters

And connections for the following

Console Connecting Cable
Driving Controls
Credit Display
Coin Acceptors

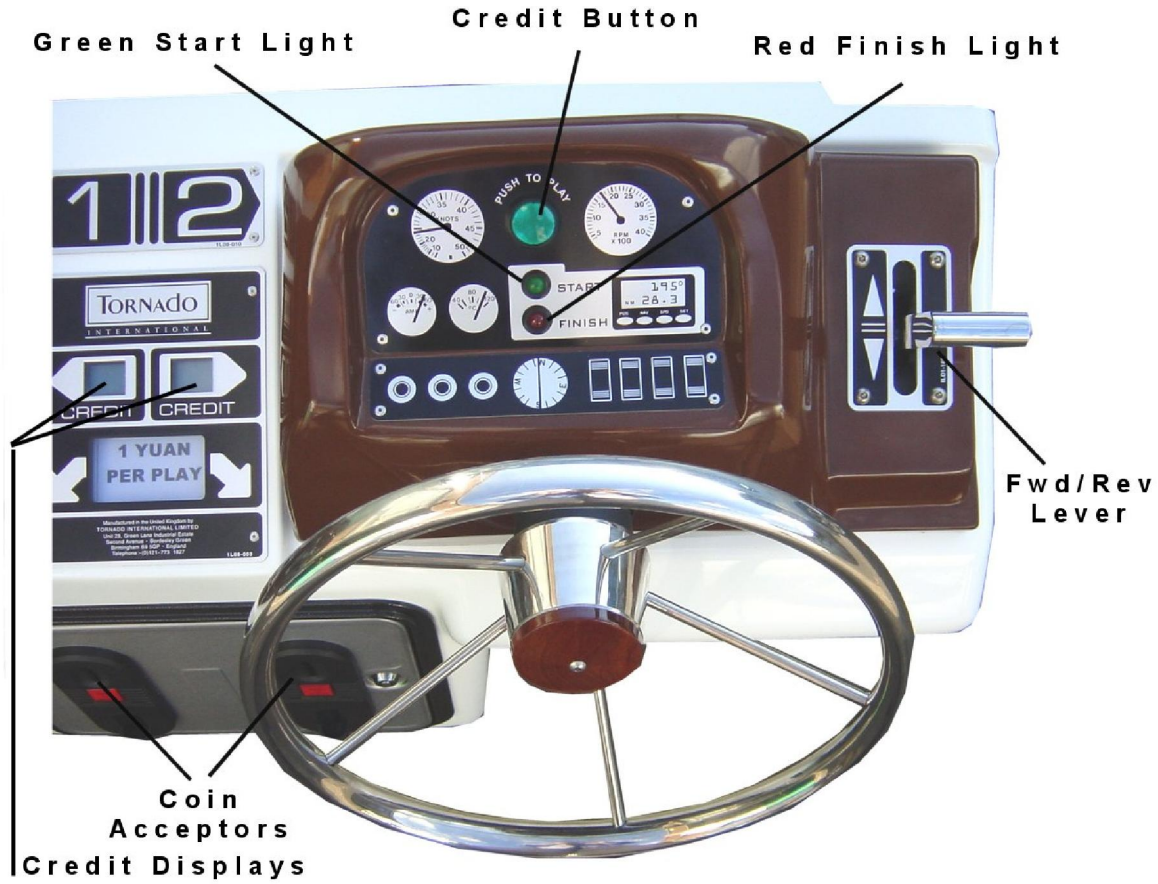
2.07 Slave Timer

The slave timer (Diagram 2.06) is mounted on the console motherboard. Each slave timer serves two playing positions. It is essentially two timers in one case. The slave timer performs the following functions.

Receives the signal from the credit display to start the game.
Turns the red stop light off and the green start light on.
Transfers model control from internal fixed resistors to the driving controls
Counts the timing pulses generated by the master timer and distributed by the console connecting cable.
When it has received the required number of pulses, control is removed from the driving controls, the end of go sounder isoperated, the lights are reversed and a signal is sent to the credit display.

Note!
If the unit is switched off during play, the game will be lost.

2.08 Driving Controls



The driving controls are mounted on top of the console and comprise of a control for each function of the model. Each boat uses two channels of the transmitter for its operation. One for the left hand motor and one for the right. Because we use the direction of rotation of the motors to control the direction

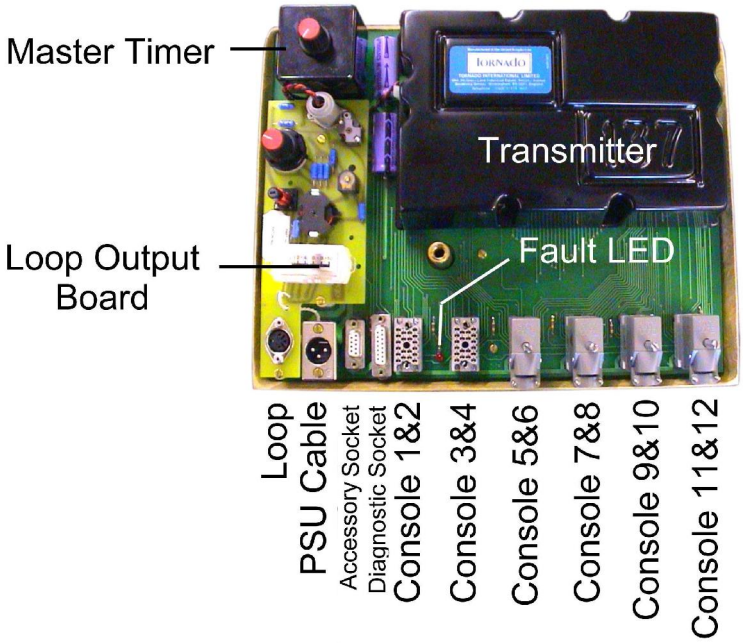
of the boat, some mixing of the control signals is required. The driving control assembly carries out this mixing. All of the controls effect the operation of the model by altering the resistance across one or more channels of the transmitter.

Caution!

For correct operation of the model it is vital that the receiver and drive motors in the boat are connected correctly with the correct polarity.

With the steering wheel in the centre position (and the console in the play state) moving the forward/reverse control to the forward position alters both of the models channels to forward. If the steering wheel is turned half way to the right the right motor is stopped. This causes the boat to make a gentle turn. If the steering wheel is turned completely to the right the right motor is set to reverse causing the boat to turn in a decreasing arc until it is turning in its own length. For a left turn the opposite actions occur. It should be noted that if the steering wheel is turned to the right with the forward/reverse selector in reverse the left hand motor is stopped or reversed. (The opposite to forward). This arrangement makes the boat easier to control.

2.09 The Transmitter Mother Board



The transmitter motherboard is housed in the master console behind a glass fibre cover. It is accessed by opening the door under the driving controls and removing the glass fibre cover, through the coin acceptor door. Mounted on the transmitter motherboard are the following components

The Transmitter
The Loop Output Board
The Master Timer
The Console Connection Sockets & LED Fault Indicator
24 volt Power Supply (PSU) Cable Socket
Diagnostic Socket

Accessory Socket

2.10 The Transmitter (TX)

The TX (Diagram 2.09) runs all of the time that the system is turned on. The transmitter repeatedly broadcasts frames of information. Each frame consists of one long sync pulse followed by 48 shorter pulses. Each of the shorter pulses length is determined by the position of the driving controls (or fixed resistors in the slave timer if the model is not in use). One pulse is transmitted for each channel and four channels are allocated for each model. Only two channels are used, the other two are available for future product development. All channels are transmitted even if your particular set has less than 12 models.

Note!

If your set has less than 12 models it is essential that shorting plugs are fitted to all unused console sockets on the transmitter motherboard. The red “fault” LED will light if any socket is empty.

The signal produced by the transmitter is fed to the Loop Output Board to be matched to the length of the loop wire. The transmitter is a mature and reliable design. It is often tempting to assume the TX is the culprit during fault finding, experience shows this is rarely the case.

Caution!

Always turn the power off at the power supply before removing the transmitter. Failure to do so will lead to serious damage to the transmitter.

Note!

If you operate more than one type of Tornado equipment, you may have transmitters for the other equipment which look very similar. All items supplied in the spares pack should only be used with the equipment for which they were supplied.

2.11 Loop Output Board

The loop output board (Diagram 2.09) is located next to the transmitter, on the transmitter motherboard. To operate efficiently all transmitters have to have an aerial which is of a specific length. (Or equal divisions of that length). Normally the manufacturer determines the length during development and makes the aerial accordingly. In the case of our equipment however, the length of the aerial is determined by the perimeter of the model area. Clearly there is a conflict of requirements and this is overcome by the use of the loop output board. This assembly matches the length of loop wire (the aerial) to the transmitter. This is achieved by changing the capacitance of the circuit. The procedure of matching the length of the loop wire to the transmitter is called "Tuning the Loop" and should only be required during installation, if the size of the operating area is changed or exceptionally if the loop wire is changed. Tuning the loop is not required if the transmitter is changed for the supplied spare.

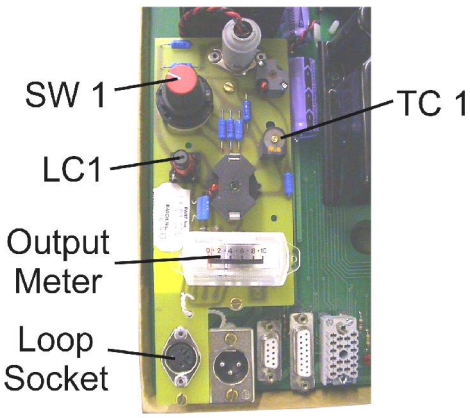
Caution!
Operating the system with the loop partially or incorrectly tuned will lead to poor model performance and damage to the transmitter and receivers.

The loop output board has a secondary function, that of providing a loop output meter which is used to tune the loop and check on the performance of the transmitter during service.

2.12 Tuning the Loop

Caution!
This procedure is *vital* to the operation of the equipment. It should only be carried out by a technician who is fully conversant with the principal behind the procedure and has read and understood the following instructions. Operating the system with the loop partially or incorrectly tuned will lead to poor model performance and damage to the transmitter and receivers.

1. Remove the cover from the transmitter motherboard.
2. Locate the adjusters SW1 & TC1.
3. Check that the loop plug is securely connected to the loop socket.
4. Check that every playing position has a red light showing and that each credit display is showing "0".
5. Check that the fault LED in the master console is not on. If it is check to ensure that every console socket has a plug connected.



6. Rotate SW1 fully anti-clockwise and observing the loop output meter select each clockwise position in turn, noting the loop output meter reading at each position.
   Note: If the loop output meter should read over 10 during this procedure adjust LC1 to return the needle to 5. Please read the note and instructions below before doing this.

7. Select the position of SW1 corresponding to the highest reading and note that reading.
8. Using a screwdriver, rotate TC1 through 360^0 and note the action of the loop meter. If when rotating TC1 through one complete revolution, the loop meter does not raise above the reading obtained at stage 6, rotate SW1 one position anti-clockwise and again continue from step 8.
9. When rotating TC1 through one complete revolution the loop meter should show 2 positions when the meter is at its highest.
10. Rotate TC1 to obtain the highest reading on the loop meter.

The next operation is carried out to adjust the loop output meter to read 8. This is to provide a datum reading for any future evaluation of transmitter performance.

Note!

It should be understood that although the reading of the loop output meter is being adjusted during this operation, the actual output of the transmitter and the loop tuning is not being affected in any way. The only thing that is being changed is the coupling of the output meter to the transmitter.

It is important that this is understood and that this operation is only carried out during installation or replacement/re-siting of the loop. The core of LC1 is made of carbon. It is very brittle so adjust it with care.

1. Locate LC1 (See Diagram 2.12).
2. Using a small screwdriver carefully rotate LC1 to adjust the loop meter to give a reading of 8.

2.13 The Master Timer

The master timer (Diagram 2.09) is mounted on the transmitter motherboard. It produces a constant stream of pulses whilst the unit is turned on. The gap between the pulses is controlled by the knob mounted on the front of the unit. The slave timer (mounted in each console) counts a fixed number of pulses to determine when to end the game. By varying the gap between pulses the time taken to send (and therefore count) a given number of pulses also varies. In this way the length of the game is altered. Rotating the knob fully anti-clockwise sets the shortest time and clockwise the longest. Changing the setting during play will lead to a proportional change in that (or those) games. The pulses are distributed to the slave timers via the console connection cables. If the pulses should not be sent (or not arrive) the slave timer will not end the game.

2.14 The Console Connection Sockets

These are mounted along the bottom of the transmitter motherboard (Diagram 2.09). They are numbered to correspond with the console numbers.

Note!

If your set has less than 12 models it is essential that shorting plugs are fitted to all unused console sockets on the transmitter motherboard. The red “fault” LED will light if any socket is empty.

2.15 24V Power Socket

This is mounted at the bottom of the transmitter motherboard (Diagram 2.09). It is the connection for the power supply lead. The power is distributed to the rest of the system via the console cables.

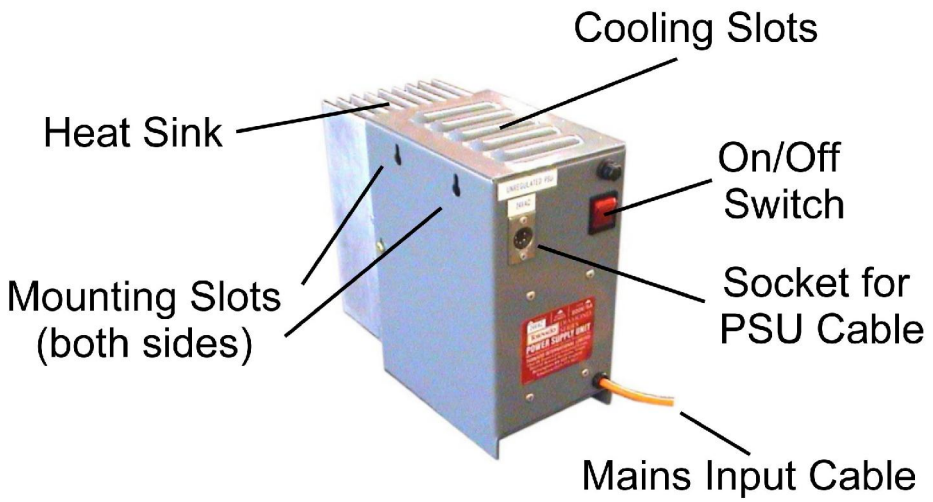
2.16 Diagnostic Socket

This is provided for the use of Tornado service engineers. Do not connect to this socket.

2.17 Accessory Socket

This is provided for the attachment of Tornado accessories. Instructions will be provided with the accessory.

2.18 The Power Supply Unit



The power supply converts local mains voltage (100-120v or 220-240v AC) to 24volts AC. This to ensure the safety of the players. A power switch, fuse and output socket are located on the front of the unit. It is this power switch which is used to turn the set on and off.

Warning!

Risk of personal injury or damage to the equipment. Only use the power supply supplied by Tornado for this equipment.

Caution!

Always replace the power supply fuse with one of identical type and rating.

The power supply is designed to be operated only in locations which are protected from water.

Caution!

Ingress of water will lead to severe damage to the power supply.

Caution!

It is important to ensure that there is sufficient ventilation to provide an adequate flow of cooling air over the heat sink at the rear of the unit.

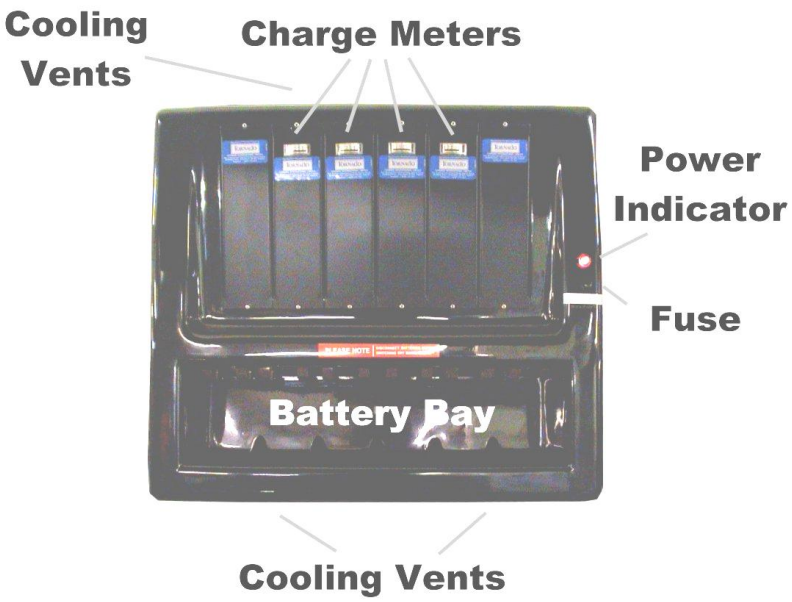
2.19 The Power Supply Lead

The PSU lead is used to connect the power supply to the transmitter motherboard in the master console. It is fitted with a different socket at each end. The socket at each end must be fully inserted into the plug and the catch checked to ensure it is correctly latched. A damaged power supply lead should be replaced.

Caution!

The power supply lead must not be lengthened without reference to the Tornado technical department.

2.20 The Battery Chargers



The battery charger is constructed from an outer case to which a number of charging modules are fitted. The case is used to house the modules, distribute power to them and hold the batteries during the charge cycle. The case has cooling vents at the top and bottom.

Caution!

It is important to ensure that there is sufficient ventilation to provide an adequate flow of cooling air through the vents on the top and bottom of the battery charger case.

The battery chargers are designed to be wall mounted. The battery chargers are fully automatic and require no setting by the operator. There is a fuse on the case and a charging meter on each module.

Caution!

Always replace the battery charger fuse with one of identical type and rating.

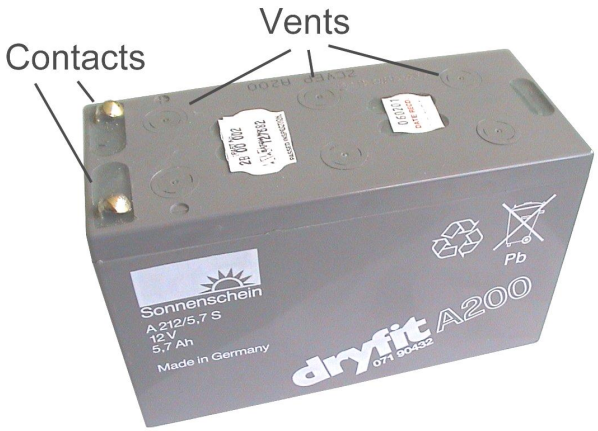
To improve reliability the modules are fully independent. When a discharged battery is inserted into the charger the charging meter will read between 4 and 10 depending how discharged the battery is. The more discharged the battery the closer the meter will be to 10. During the charging process the meter will slowly descend towards 0. When the battery is almost charged the charger changes to trickle charge. The meter will then be between 0 and 1.

Tip!

Before removing the batteries from the charger or when placing the batteries on charge, always check the meter reading. This ensures that the batteries are ready for service or are connected to the charger as required.

Inserting the battery into the charger case automatically connects the battery.

2.21 The Batteries



The batteries are of the sealed lead acid type. Please read the following information before use.

Warning!

Risk of fire. The batteries are capable of producing very high currents for a considerable time. Never place the batteries in a position which might allow the terminals to be shorted by a conducting material.

Warning!

Risk of personal injury. The batteries contain lead and a gel which contains sulphuric acid. Never use a battery with a damaged case.

Caution!

A damaged battery must be treated with care. Handle only with protective clothing. Dispose of in accordance with local laws.

Caution!

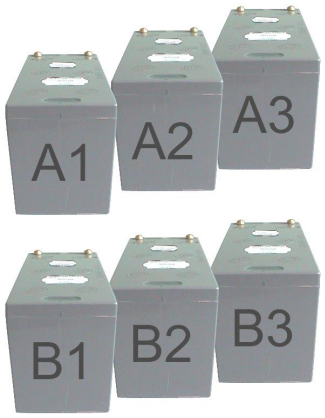
The battery vents must not be removed for any reason. The battery is maintenance free and water must not be added. Removal of the vents or the addition of water to the cells will invalidate the warranty.

Always treat a battery with respect. Not only is it expensive, it is vital to the correct operation and therefore profitability of the equipment. It should be considered as an energy store and like any concentration of energy it is only safe when used correctly. A battery should only be used for its intended purpose. It should never be used as a doorstop or support block etc. Staff should be given training to recognise and deal with a damaged battery.

There are two batteries supplied with each model. This allows one to be used whilst the other is on charge.

Tip!

Before use, separate the batteries into two sets. On the end opposite the connectors, label one set “A” and the other “B”. Then number the A and B sets, 1 to 12 (or however many models are in your set). Always use set A or set B together and place the battery in the model and charger with the same number. There are two advantages to this system. If the batteries need to be changed during the operating day it is easy to see which batteries have been changed. Additionally if there is a battery problem the possible culprit is narrowed to one battery, one boat and one charger.



Always keep the battery contacts clean. The next section deals with charging the batteries and the associated subject of battery life.

It must be understood that batteries are an expendable item and in this respect are similar to the tyres and brakes on your car. They will benefit from correct use and be permanently damaged by misuse or inappropriate charging regimes. There are three areas where you can have a direct effect on the overall life of the battery. These are: Charging, Use and Storage.

Before we examine the factors relating to battery life, this vital fact must be appreciated.

Every rechargeable battery leaves the manufacturer with a finite life!

This life is usually expressed in terms of charge/discharge cycles. Each time a battery is charged and discharged a part of the battery life is used up and cannot be replaced.

Charging

It is vital to use a quality charger. The Tornado charger supplied with your unit has been tested by the battery manufacturer and is approved by them for use with the dry-fit batteries supplied. Do not charge the batteries with any other charger and do not use the Tornado chargers on other batteries. The batteries should be charged at the end of each operating period even if the unit has only had a little use.

Repeated under charging will lead to reduced battery capacity and premature failure. With this in mind it is important to charge the battery fully after each use and this will normally be achieved by overnight charging. Incomplete charging can be diagnosed by charger meters which are not at “0 or 1” at the start of the operating period and a gradual and progressive reduction of the batteries capacity, as evidenced by a reduction in the number of games the batteries achieve. If these symptoms are accompanied by late closing and early opening times then steps must be taken to avoid the premature failure of the batteries due to undercharging. Always monitor the models performance and change the batteries if the models speed is visibly reduced. Place the used batteries on charge immediately. The charging regime you use will depend on your specific site and pattern of use. However the goal is the

same, to ensure that the batteries are fully charged before the next time they are used. As a rule the most discharged set of batteries should be charged overnight. During the operating season there should always be one set of batteries in the charger.

Use
When fitting and removing the batteries handle them with care. Avoid dropping them into the model or onto the floor. Dropping the battery will cause the plates to deform with the result that some cells will become useless. Do not allow the model to be used with discharged batteries. Customer satisfaction will be reduced as will the battery life. Change the battery or remove the model from service as soon as the boat speed is visibly reduced. Do not part charge and re-use the batteries as this will lead to premature failure.

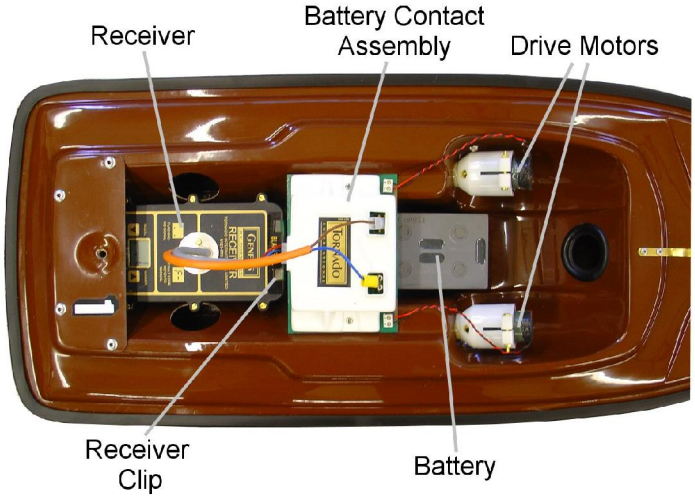
Storage
If the unit is to be removed from service the correct storage of the batteries is vital. As soon as the batteries are removed from service they should be charged for 24hours. They should then be stored in a FROST-FREE place and be charged for 24hours each month of storage.

Caution!
Failure to follow these instructions will result in permanent damage to the batteries.

Summary
1. Only use the chargers supplied.
2. Charge the batteries at the end of each operating period.
3. Do not allow repeated undercharging.
4. Remove batteries from service before they are completely discharged and recharge immediately.
5. Charge for 24hours before storage and recharge for 24hours for each month of storage.
6. Store in a FROST-FREE place.
7. Handle the batteries with care.
8. Keep the terminals clean.
9. Do not remove the vents, or add water to the cells.

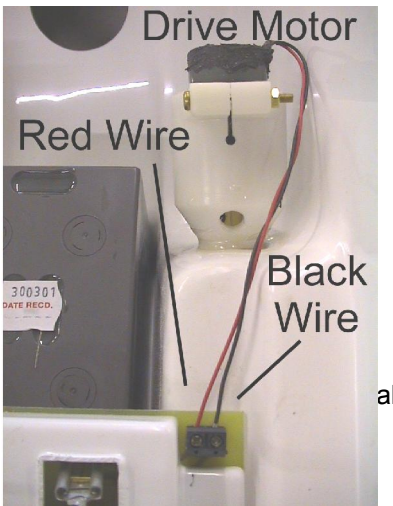
The batteries are expensive. It pays to look after them!

2.22 The Models



The model boats are built from glass fibre. The tops are produced from UV stabilised PVC. Regular application of a quality proprietary polish will reduce the harmful effects of sunlight. The boat should be thoroughly cleaned as soon as it is removed from the water and before any soiling is allowed to dry. Never use any abrasive cleaner on the hull or top. The top is removed by unscrewing the catch located at the rear of the top, see above. The top is then moved forward to disengage the front fixing and lifted clear. The model contains the following components:

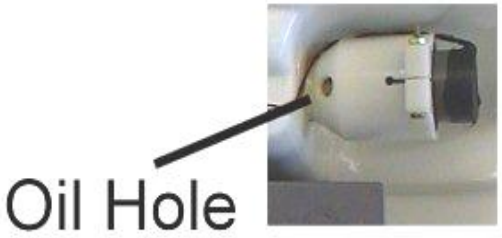
The Motors and Propeller Shafts.
The Battery Contact Assembly
The Battery
The Receiver



The boat is propelled and steered by the use of the motors. There is no rudder. This system is

mechanically less complex, allows good manoeuvrability and removes the need for “push off” blocks around the pool. When the boat is travelling straight-ahead both motors rotate anticlockwise (as viewed from the rear). If the boat is required to turn to the right, the right motor is either stopped or reversed depending on the radius of turn required. The opposite is true for a left turn. From the above it is apparent that the connection and correct polarity of the motors is vital for the correct operation of the boats.
The propeller shafts are made of stainless steel and are supported by only one bearing. It is at the bottom of the shaft immediately in front of the propeller. The motor serves as the upper bearing. The bottom bearing is lubricated by the application of a small drop of light machine oil introduced through the motor cup at weekly intervals.

Note!
Do not over oil the shaft bearing. Apply one drop once a week at the end of the operating period. The boat must then be stored vertically with the bows up to allow the oil to run down to the bearing. If the boat is stored in any other position oil might enter the motor causing irreparable damage to the motor.



When the boat is not in service it must be stored vertically with the bows up. This allows the water in the outer shaft and any water in the boat to drain away.

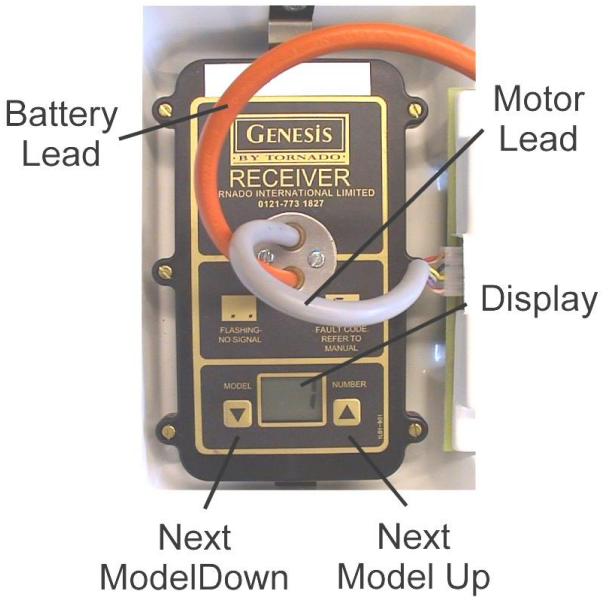
Caution!
Never store the boat bows down. Water in the outer shaft will run out of the shaft and into the motor, causing irreparable damage to the motor.

The motors are high quality and very expensive. They are of the ironless rotor type to reduce current consumption and allow instant reversing. Reduced current consumption prolongs battery life and therefore reduces the management time required by the attraction.
The propellers are retained by a locknut. For correct operation it is important that the propellers are free to rotate and no debris is allowed to collect around the shaft. The propellers should be inspected regularly (at the end of each operating period) and any debris removed.
The battery contact assembly is mounted above the battery housing. It carries the battery contacts, receiver plug and motor connections. The battery contacts should be kept clean and lightly lubricated with petroleum jelly.

2.23 The Receiver (RX)

The receiver is mounted in the rear of the boat. For increased reliability it is produced using surface mount components on an automatic production line. It is housed in a custom designed water-resistant case.

Its function is to receive the signal from the transmitter, interpret the signal and control the movement of the boat via the motors. It does this by inspecting each frame of information sent by the transmitter. Each frame starts with a long synchronisation pulse. The receiver sees this and starts counting the control pulses. There is one control pulse for each channel, and four channels allocated to each model. It counts the control pulses ignoring them until it arrives at the pulses for the model it is controlling. It then switches the left and right motors according to the length of the relevant pulses. Genesis 80cm Boats do not use the other two pulses allocated to each model so the receiver ignores them. The receiver than shuts down until the next sync pulse is received when the procedure is repeated. This happens 15 times every second.



Mounted on the top of the receiver are the model selector buttons and a display. During use the display will show the number of the model the receiver is set to control, or fault codes if a fault has been detected. It will also indicate if the receiver is not receiving a signal from the transmitter.

The receiver can be set to operate any model by pressing the up or down model selector buttons during use. The display will roll round when it reaches 1 or 12. On powerup the display will show the receiver type followed by the number the receiver was last set to.

Due to its modular design and custom designed case the receiver may be repaired in the field by competent technicians.

Note!

To comply with the terms of the guarantee any part or assembly which requires repair or replacement must be returned to Tornado International Ltd. without being opened or disassembled. The guarantee period is 1 year from the date of shipment.

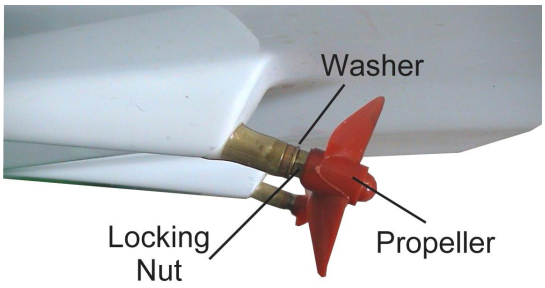
3.00 Periodic Service

3.01 Daily

Follow the procedures in “Operating Procedures – Opening and Closing instructions”.

3.02 Weekly

Inspect the propeller shafts. Check that the propellers rotate freely and that there are no signs of the propellers hitting any obstruction in the water.
Remove any accumulation debris around the propeller shafts.
Put one drop of light machine oil on each propeller shaft through the hole in the motor housing.



Note!
Do not over oil the shaft bearing. Apply one drop once a week at the end of the operating period. The boat must then be stored vertically with the bows up to allow the oil to run down to the bearing. If the boat is stored in any other position oil might enter the motor causing irreparable damage to the motor.

Thoroughly clean all of the boats and consoles taking care to remove any stubborn marks which daily cleaning has missed.

3.03 Monthly

Clean and lightly lubricate with petroleum jelly the battery contact studs, battery charger contacts and battery contacts in the boat.
Using light machine oil, lightly lubricate all of the locks and coin acceptor door hinges.

3.04 Annually

Check and clean if required the coin path through the coin acceptors.

Caution!
Do not immerse the coin acceptors in any fluid. Clean only the coin path using a cotton bud and a mild solvent.

Inspect the heat sink on the back of the power supply unit. Ensure that it is clean and there is no restriction to the flow of cooling air.
Inspect the vents on the battery charger case. Ensure that they are clean and there is no restriction to the flow of cooling air.
Inspect the power supply, console connecting cables and loop wire for any damage.
Check all fasteners on the console and boats and tighten or replace as necessary.

3.05 To Remove from Service

1. Follow the “Operating Procedures – Closing Instructions”.
2. In all cases perform all Weekly and Monthly maintenance checks.
3. Perform the Annual maintenance check if appropriate.
4. It is preferable to dismount the consoles for prolonged storage. If this is not possible fit the console covers making sure that they will not be dislodged by wind. Exposed locations may require additional covering to ensure adequate protection.
5. If the consoles are dismounted protect the loop plug by applying a coat of spray preservative oil and wrapping a plastic bag around the plug. Secure with insulation tape.
6. If the power supply lead cannot be removed, (It might be routed underground) apply a coat of spray preservative oil to the exposed plug and wrap a plastic bag around it. Secure with insulation tape.
7. As soon as the batteries are removed from service they should be charged for 24hours. After charging remove the batteries from the charger and unplug the charger. The batteries should then be stored in a FROST-FREE place and be charged for 24hours each month of storage.

Caution!
Failure to follow these instructions will result in permanent damage to the batteries.

3.06 To Return to Service

1. Charge all of the batteries for 24 hours.
2. If the consoles were dismounted, remount them. Take care not to damage any of the internal components or looms.
3. Route the console connecting leads to the master console and connect the plugs to their numbered sockets.
4. Inspect the loop wire and plug. Reconnect the plug to the socket on the loop output board.
5. Inspect the power supply lead and reconnect the lead to the plug on the transmitter motherboard and the power supply.
6. Turn the power supply on.
7. Check all of the red stop lights are on. Replace any failed bulbs.
8. Check the operation of the coin acceptors by introducing coins. Check that each acceptor takes all of the programmed coins and that the credit display functions correctly.
9. Trigger each playing position in turn by pressing the green play button. Check that the credit display is reduced by one, and the red stop light is replaced by the green go light. Allow the playing positions to time out. Note the time and check to see that they all time out.
10. Place a boat on the stand supplied. Check the propellers are free to rotate. Place a fully charged battery in the boat. Check the propellers rotate briefly as the battery is connected.
11. Place the boat on the water, trigger the playing position and drive the boat. Repeat for each boat.
12. Turn the power supply off, wait 30 seconds and turn it back on to reset all of the credit displays to zero.
13. Note the new coin counter start numbers.

The unit is now ready to use.