Timpdon Electron-

GigaRad Radio Points System
Transmitter Model *GPTX10*

This advanced 2.4 GHz ***GigaRad*** Radio Transmitter, is designed specifically for use with the ***GigaRad*** Radio Points System.

It will control up to 12 individual sets of points, and up to 12 routes, using ***GigaRad*** point controllers with standard RC servos as point machines.

All system settings are fully user programmable from the transmitter.

It complies fully with all UK legislation for licence free operation.

Specification

Frequency	2.4 GHz Radio Control Model Band
Radiated Power	+20 dBm [100 mW]
Modulation	Gaussian Frequency Shift Keying
Duty Cycle	1% maximum
Range	Up to 100 metres with any ***GigaRad*** Point Controller, in a normal model railway or garden environment.
Size	170mm x 85mm x 48mm
Weight	277g
Batteries	2 x 1.5 V AA primary cells

Introduction

The ***GPTX10*** 2.4 GHz transmitter is custom designed solely for use with the ***GigaRad*** Points Control System

Each transmitter has with a unique **ID** number to which any ***GigaRad*** Point Controller may be bound by the user via the **Bind** procedure described below. Any transmitter can be re-bound to any Point Controller, at any time.

All point control system settings can be programmed directly from the transmitter, and no physical access to either point controllers or servos is required, other than observation of servo and point operating mechanism motion.

The following system functions can be calibrated from the transmitter:

- Binding of a point controller to a specific transmitter.
- Allocation of any point controller to a specific point number, in the range 1 to 12. More than one point controller may be allocated to a single point number, to accommodate, for example, a number of interlinked points, always operating together.
- Setting of each point controller servo end points to correspond to the required **Set** and **Reset** positions of the point mechanism.
- Setting of each required route. For each of 12 routes, any or all point controllers can be individually programmed to **Set**, **Reset** or **Take no action** when a particular route is **Set**, and vice versa. Once programmed, changing any route state will cause all points allocated to that route to be changed simultaneously.

Once programmed, operation requires only:

- Selecting **Point** or **Route** control.
- Selecting the appropriate **Point** or **Route** number.
- Pressing and releasing the **Set** or **Reset** switch.

Factory Defaults

When shipped from the factory, the ***GPTX10*** is set to a factory default state, as follows:

- The current state of all **points** is **Reset.**
- All Route Programming settings are cleared. For all **routes**, every **point** is set to **No Change on Route Set**.

If at any time you wish to return a transmitter to its factory default state, you may do so, using the procedure below.

Warning: A factory reset is irreversible. All previously user programmed settings will be permanently lost !

Factory Reset Procedure

1 Power **off** the transmitter.

2 Remove the case rear by unscrewing the four case fixing screws.

3 Locate the **Factory Reset** jumper pins, at the bottom of the PCB, to the left of the large microcontroller chip.

4 Fit a jumper link, or other temporary shorting link, across these two pins. **Make sure you do not short out any other components**.

5 Power **on** the transmitter. It will immediately erase all previously programmed or saved settings data, and commence normal operation.

6 Power **off** the transmitter, remove the temporary link, and refit the case rear.

Point Status LEDs

Each of the twelve **Point Status LED**s indicates either the current state of the relevant **point**, or a **route programming** setting for that **point**, as described below:

Normal Operation

For both **Point** and **Route** control, each **LED** shows the current point setting status:

On	Point **Set**
Off	Point **Reset**

In **Route Control** only, if the **Settings** switch is pressed, each **LED** shows the programmed status for that **point** for the current **Route**.

On	Point **Set** on route **Set**
Flashing	Point **Reset** on route **Set**
Off	**No change** on route **Set** or **Reset**

Bind and Point Number Allocation

Only one **LED** will be on, indicating the **point number** to be allocated when a point controller is bound to the transmitter.

Route Programming

During **Route Programming**, only one **LED** will normally be illuminated, indicating the programmed setting for that **point** on the selected **route**:

On	Point **Set** on route **Set**
Long Flash	Point **Reset** on route **Set**
Short Flash	**No change** on route **Set** or **Reset**

However, if the **Settings** switch is pressed during **Route Programming**, the **Point Status LED**s will show the programmed status [as yet unsaved] of all **points** for that **route**:

On	Point **Set** on route **Set**
Flashing	Point **Reset** on route **Set**
Off	**No change** on route **Set** or **Reset**

Operation

Data is transmitted in serial digital packets, each of which incorporates details of the **Set/Reset** state of all twelve points, the unique **ID** number of the transmitter and CRC checksum data to permit the data integrity to be verified automatically by the each point controller

A new data packet is transmitted every 65 ms, including data for all points, permitting extremely fast point response times, and automatic recovery from occasional loss of data packets.

Each time a new data packet is transmitted, the **Tx** indicator **LED** flashes once.

A point controller will respond only to transmissions from one specific transmitter, to whose **ID** number it has been bound, and to the specific point number to which it has been programmed.

During normal operation, the **Point Status LED**s indicate the current status of each point:

- **On = Set**
- **Off = Reset**

Batteries

The ***GPTX10*** is designed to operate from 3V battery supplies, using two 1.5V AA primary cells mounted within the case. **Operation from re-chargeable cells is not permitted**, as these only provide a voltage of 1.2V per cell.

In normal use, battery life is in excess of 50 hours of continuous operation.

The ***GPTX10*** is shipped with batteries not fitted, to avoid battery discharge if the power switch is accidentally operated during transit, and with the two halves of the case not fastened. Fixing screws are supplied loose.

To fit or change batteries, proceed as follows:

1 Remove the four case fixing screws on the rear of the case, if already fitted.

Batteries continued

2 Carefully separate the two halves of the case.

3 Locate the battery holder at the right hand end of the case front.

4 Carefully remove the old batteries, if fitted, and replace with two new 1.5 V size AA primary [non-rechargeable] cells, checking that you have installed them with the correct polarity.

5 Refit the battery holder in the case and re-assemble the front panel to the case rear and finally fit or refit the four fixing screws. Ensure that the case rear is oriented correctly, so hat the access hole to the Calibration switch is not obscured.

Aerial and Range

To achieve the specified maximum range from the ***GPTX10***, the aerial supplied must be fitted to the connector on the top of the case.

However, for short range indoor applications, up to about 5 metres, adequate performance can normally be achieved without an aerial.

Note, however, that maximum range may be affected if any point controller is mounted within a metal housing, or adversely shielded from line of sight to the transmitter.

Binding and Point Number Allocation

Before the transmitter can be used with a ***Gigarad*** point controller, they must be bound together, so that the point responds only to one specific transmitter, and processes data only for its allocated point number.

Any point controller may be bound to any ***GPTX10*** transmitter at any time and, once bound, remains bound until binding is performed again with another transmitter.

All binding and point number allocation procedures are initiated from the transmitter, require no access to the point controller and may be performed with other ***GigaRad*** transmitters operating nearby.

You are recommended to perform binding and point allocation procedures on the bench, before final installation of point controllers.

Normal Operation

On Power up, the ***GPTX10*** will enter **Normal Operation** mode, with two options, selected by the **Point/Route** switch. You can switch between either option at any time.

Single Point Operation

A single selected point only is controlled.

- Set the **Point/Route** switch to **Point**.
- Select the **point** to be controlled using the **rotary** switch.
- Press and Release the **Set** switch to **Set** the **point**.
- Press and release the **Reset** switch to **Reset** the **point**.

Route Operation

For each selected **route**, all **points** that have been programmed for that **route** will be **Set** or **Reset**, as programmed, or left unchanged. A **route** must have been programmed by the user before it is active.

- Set the **Point/Route** switch to **Route**.
- Select the **route** to be controlled using the **rotary** switch.
- Press and release the **Set** switch to **Set** the **route**.
- Press and release the **Reset** switch to **Reset** the **route**.

Notes:

1 For both **Point** and **Route** operation, the **Point Status LED**s normally show the current state of all **points** at all times.

2 Every time a change is made to any **point** setting, the new setting state is saved in non-volatile memory. Thus, whenever power is removed and re-applied to the system, all **point** positions will be restored to their settings immediately before power was last removed.

Route Programming Procedure

1 Energise the transmitter, and set the **Point/Route** switch to **Point**. Then press and release the recessed **calibration** switch mounted on the top of the case to the left of the aerial. The use of a small rod is recommended. The transmitter will enter **route programming** mode, with the **Program LED on** and the **Tx LED off**.

2 Set the **rotary** switch to **Route 1**. Press and hold the **Settings** switch. The **Point Status LED**s will display the current programmed state of **all points** for the selected **Route**:

LED On	**Set** for Route = **Set**	**Reset** for Route = **Reset**
LED Flashing	**Reset** for Route = **Set**	**Set** for Route = **Reset**
LED Off	**No Change** when Route **Set or Reset**	

3 Release the **Settings** switch. The **Point Status LED**s will show the current status of the currently selected point, as follows:

On	**Set** for Route = **Set**	**Reset** for Route = **Reset**
Long Flash	**Reset** for Route = **Set**	**Set** for Route = **Reset**
Short Flash	**No Change** when Route **Set or Reset**	

All other **LED**s will be **off**.

4 If required, change the programmed state for the selected **point** for the current **route** by pressing and releasing the **Set** switch. On each switch operation, the point will change to the next selection [**No Change** to **Reset** to **Set**, and then back to **No Change**].

5 Once the first point has been programmed, select the next and subsequent points using the **Up** or **Down** switches, and repeat Step **4**.

6 Finally, when all **points** for the selected **route** have been programmed, press and release the **Save** switch to save the new settings to non-volatile memory.

Caution: No new route settings will be saved until the **Save** switch is pressed. If you change the **rotary** switch to another route before saving, all changes will be lost.

7 Repeat Steps **2** to **6**, as required for the remaining routes

8 Finally, to exit **Route Programming** mode, set the **Point/Route** switch to **Point**. The transmitter will immediately enter normal operation mode, and transmissions will re-commence.

Binding and Point Number Allocation Procedure

1 Ensure that the **transmitter** and all **point controllers** are powered off.

2 Press and hold the recessed **Calibration** switch mounted on the top of the case to the left of the aerial. The use of a small rod is recommended.

3 Power up the transmitter and then release the **Calibration** switch. The **Program LED** will flash rapidly, and one **Point Status LED** will be on, indication the current point selection.

4 Now power up the **point controller** to be bound. The **LED** on the point controller will flash slowly.

5 Using the **rotary** switch, select the point number to which the controller is to be allocated, indicated by the **Point Status LED**.

6 Then press the **Save** switch. The **Tx LED** will flash and the transmitter will transmit binding and point number allocation data to the point controller.

7 As soon as the point controller binds to the transmitter, the **LED** on the **point controller** will go fully **on**. You may now release the **Save** switch.

8 This completes the binding and point number allocation procedures for a single **point controller**. Repeat Steps **4** to **7**, as required for the remaining **point controllers**. You do not need to power down any **point controller** which has already been bound.

9 Finally, press and release the **Settings** switch to return the transmitter and **point controllers** to normal operation.

The **LED**s on all bound **point controllers** will immediately flash in synchronism with the **Tx LED**, indicating successful communication, and each **point controller** will take up the **Set/Reset** state indicated by its **Point Status LED**.

Once bound and allocated to a specific point number, the settings will be stored in non-volatile memory within the point controller, until changed again.

Calibrating Point Controller Servo Positions

Calibration or re-calibration of any Point Controller Servo physical **Set** and **Reset** positions may be performed at any time during normal operation.

However, you are recommended to perform the initial calibration, on first installation, with mechanical linkages between the servo arm and the point mechanism disconnected, to avoid the risk of jamming the point mechanism if initial settings are outside its normal operating range.

Following initial calibration to establish an approximate operating range, re-calibrate for final positions with the point mechanism connected.

Once calibrated, all servo position calibrations are stored in non-volatile memory within the point controller, and retained until changed again.

Servo Position Calibration Procedure

1 Ensure that the point controller to be calibrated has been bound to the transmitter, and allocated the correct point number.

2 Power up the transmitter and point controller normally. The **Tx LED** will be flashing rapidly. Make sure the **Point/Route** switch is set to **Point**.

3 Press and release the recessed **Calibration** switch mounted on the top of the case to the left of the aerial. The use of a small rod is recommended. The **Program LED** will illuminate to indicate calibration mode.

4 Select the required point number using the **rotary** switch.

5 Press and release the **Set** switch. The **Point Status LED** for the selected point will go **on**, and the point servo will move to its current **Set** position.

6 Using the **Up** and **Down** switches, set the actual position of the servo arm and point mechanism to correspond to the required **Set** position. Make sure that you do not force the point mechanism against an end stop.

7 When the correct position of the point mechanism has been found, press and release the **Save** switch to store the new setting.

Servo Position Calibration Procedure continued

8 Now change the point setting to **Reset**, by pressing and releasing the **Reset** switch. The **Point Status LED** for the selected point will go **off**, and the point servo will move to its current **Reset** position.

9 Using the **Up** and **Down** switches, set the actual position of the servo arm and point mechanism to correspond to the required **Reset** position. Make sure that you do not force the point mechanism against an end stop.

10 When the correct position of the point mechanism has been found, press and release the **Save** switch to store the new setting.

11 This completes the servo calibration procedure for a single **point controller**. Repeat Steps **4** to **10**, as required for other **point controllers**. When all have been completed, press and release the **Settings** switch to exit calibration mode and return to normal operation, with all new calibrations operational.

Setting Route Control

In **Route** control, any number of points can individually be automatically **Set** or **Reset** by a single switch operation. The ***GPTX10*** can accommodate up to 12 separate **routes**, selected by the **rotary** switch.

For each **route**, any number of point controllers can be programmed to independently perform one of three actions when a route is **Set**, and vice versa for **Reset**.

- Set the point
- Reset the point
- Take no action

Each required **Route** must first be programmed. All **route programming** settings are held within the transmitter, and during **route programming** procedures, no transmissions are made. **Route programming** may therefore be performed in isolation, on the bench.

In all **route programming**, The **route** to be programmed is selected using the **rotary** switch, the **point** selection for that **route** is controlled using the **Up** and **Down** switches, and the programmed **state** of that **point** is changed using the **Set** switch.