User Notes

Timpdon Electronics

GigaRad Radio System
Point Controller
Model *GRX4*

This advanced 2.4 GHz ***GigaRad*** Radio Receiver/Controller is designed to be used with any model of ***GigaRad*** transmitter.

It is designed for the radio control of a single point using a standard RC servo as the point motor.

The controller may be user programmed, in-situ for:

- Point activation by any one of the four transmitter Auxiliary switches **Aux 1** to **Aux 4**.
- Point **set** and **reset** servo positions.

The servo rotation rate is pre-programmed to give realistic slow speed point operation.

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

Specification

Frequency	2.4 GHz Radio Control Model Band
RF Sensitivity	-94 dBm
Modulation	Gaussian Frequency Shift Keying
Range	Up to 100 metres with any ***GigaRad*** transmitter, in a normal model railway or garden environment
Size	47 mm [over pins] x 35 mm x 11 mm
Power Supply	4.8 V to 6V d.c. battery supply

Introduction

The ***GRX4*** comprises a 2.4 GHz ***Gigarad*** radio receiver and point controller within a single package.

The receiver will operate with any ***GigaRad*** transmitter and, during setup is bound to a particular transmitter, such that it will respond only to transmissions from that transmitter. It may be re-bound by the user to another transmitter at any time.

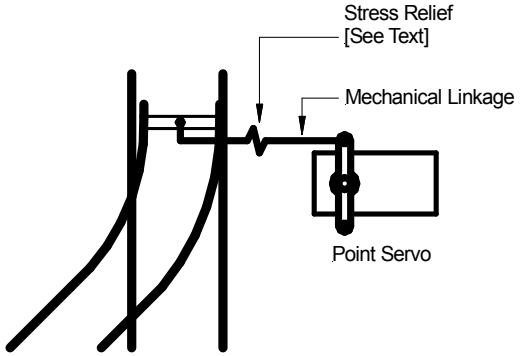
The output from the ***GRX4*** is a standard servo control PWM signal, with two user programmable stable positions [**Set** and **Reset**] and a controlled rotation rate between these two positions.

The activation of the servo output can be user programmed to respond to the operation of any one of the four available **Auxiliary** output switches on any ***GigaRad*** transmitter.

Principles of Operation

The ***GRX4*** is designed to use any standard RC servo as a point motor, with movement of the point blades controlled directly by the servo arm, rotating over a small angle between two fixed positions, **set** and **reset**.

Point setting is controlled by any one of the four transmitter **auxiliary switches**, with the **reset** position corresponding to switch **off** and the **set** position to switch **on**.



Both the **set** and **reset** positions of the servo are user programmable from the transmitter, operating in a special calibration mode.

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The maximum programmable rotation angle of the servo is constrained to approximately 25°, centred around the nominal servo centre position, corresponding to a PWM pulse width of 1.5 ms. This will give a linear point blade movement of approximately 5 mm, when connected by a 12 mm servo arm, adequate for most track. If greater travel is required, a longer servo arm may be used.

The rotation rate of the servo arm during operation is automatically controlled by the ***GRX4*** to give a realistic prototypical rotation period of approximately 1.7 seconds for the maximum 25° rotation, and pro-rata for smaller angles.

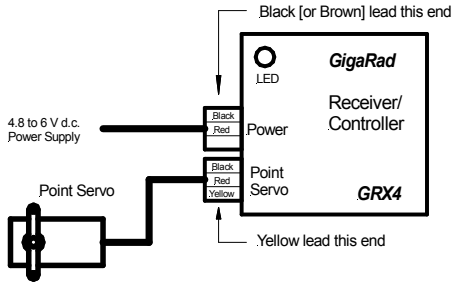
To minimise the load on the servo motor when the point is locked in either end position, you are strongly recommended to fit a stress relief **omega loop** or **Z bend** in the connecting linkage between the servo and the point mechanism. You are also recommended to remove any built-in snap action point locking mechanism.

Binding

Before use, the ***GRX4*** must be bound to the transmitter with which it is to be used. Once bound, this process need not be repeated unless you wish to use a different transmitter.

All binding procedures are undertaken from the transmitter, and no access to the receiver is required. Refer to the user manual of your ***GigaRad*** transmitter for binding instructions.

Wiring and Connections



Notes on Wiring and Connections

1 Connect the servo via its 3 wire plug directly to the ***GRX4*** **Point Servo** connector. Ensure that you observe the correct polarity.

2 Connect a d.c. supply to the ***GRX4*** **Power** connector. Ensure that you observe the correct polarity. The supply voltage must be between 4.8 V and 6 V nominal, to match the operating voltage limits of standard servos.

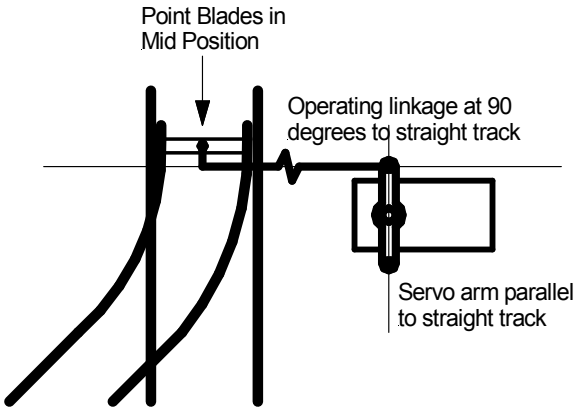
The point system will only draw significant current while the servo is in motion, so 4 x **AA** primary or rechargeable batteries are perfectly adequate, and should give reasonable battery life.

You are recommended to switch off or disconnect the battery supply when your layout is not in use, to avoid draining the batteries unnecessarily.

3 Before use, The ***GRX4*** must be bound to your transmitter, as described above, and programmed for **servo rotation angles** and transmitter **Auxiliary control switch allocation**. The calibration procedure is described below.

Servo Mounting and Mechanical Set Up

For optimum performance and ease of calibration you are strongly recommended to follow the guidelines given here for servo mounting and set up.



Indicator LED

At all times, the ***GRX4*** indicator **LED** shows the current operational status of the unit.

LED Indication	**Interpretation**
LED Off	No power to ***GRX4***.
Fast Flash [5 per second]	No valid radio pulses detected at power up. Transmitter not on, or not bound.
LED On	Bind procedure successful. Normal operation.
Slow Flash [1 per second]	Loss of valid radio pulses following normal operation.

On Power Up

On power up of the ***GRX4***, the point will immediately move to the **reset** position, and remain there until the first valid data packet has been received from the transmitter. It will then assume the position specified by the current position of the appropriate transmitter **Auxiliary** switch.

On loss of Radio Communication

If radio communication is lost, for any reason, during normal operation, the point will remain in its last valid controlled state, until radio communication is restored or until power is removed from the ***GRX4*** and re-applied.

Calibration Procedure continued

4 Now power up the transmitter and **immediately**—**within two seconds**—set the **Aux 1** switch **On** and then **Off**. This instructs the transmitter and ***GRX4*** to enter **Calibration** mode. The **Calibration LED** on the transmitter will go **On**, in addition to the **Transmit LED.**

5 Set switches **Aux2 [C1]** , **Aux 3 [C2]** and **Aux 4 [C3]** to select the calibration function to be performed, as listed in the table above.

6 For **servo position** calibration, use the transmitter **speed** control to set the servo to the required position for the selected function, by visual examination of the point blade positions.

Take care that you do not attempt to move the servo to a position where the point blade is solidly jammed in either the **set** or **reset** position. This will overload the servo as it attempts to reach a position it can not achieve and will result in high power consumption, servo over-heating and, in worst case, servo damage through electrical failure or stripped gears.

7 For **Operating switch** selection, simply select the switch to be used according to the table. Remember that the last switch selection saved will over-ride any previous selection.

8 When the desired SETTING has been completed, turn the **Aux 1** switch **[Save Cal] On** and then **Off**. The current servo position or auxiliary switch setting will be saved to non-volatile memory within the ***GRX4*** and used thereafter during normal operation, until re-calibrated.

9 Repeat Steps **5** to **8**, as required, for any other settings requiring calibration. You need only calibrate those settings which you wish to change.

10 Once all required calibrations have been completed, turn the transmitter **Off** to exit **Calibration** mode.

11 When the transmitter is next turned **On**, the point controller will operate with all new calibrations operational.

1 Mount the servo so that the point operating linkage will be approximately at **90° to the straight track** when in use. At this stage, **do not connect** the operating linkage to the servo.

2 Connect the servo to the ***GRX4***. Power up and bind the ***GRX4*** to the transmitter.

The factory default settings for the ***GRX4***, as shipped, are:

- **Reset** Servo PWM = **1.50 ms** [central]
- **Set** Servo PWM = **1.55 ms** [rotation angle = approx. 10°]
- Transmitter operating switch = **Aux 1**

3 Set the transmitter **Aux 1** switch to **Off** = **Reset**.

The servo will take up the factory default position, corresponding to a servo PWM pulse width of **1.50 ms**—i.e. central.

Fit the servo arm to the servo so that it is **parallel to the straight track**.

4 Now set the transmitter **Aux 1** switch to **On** = **Set**, and check that the servo arm rotates approximately 10°. Do not worry if the servo rotation direction is opposite to that required. This will be corrected during calibration.

5 Reset the transmitter **Aux 1** switch to **Off** = **Reset**, fit the operating linkage between the point and the servo, and adjust its length so that the point blades are roughly midway between the **set** and **reset** position, with the servo arm positioned as described in Step 3.

6 This completes the mechanical set up procedure. You may now proceed to calibrate the ***GRX4*** for final **Set** and **Reset** positions for the point, and assign the transmitter **Auxiliary** operating switch required for operation [if different from **Aux 1**], as described below.

7 You may wish to experiment with calibration before fitting the point operating linkage described in Step **5**, in order to familiarise yourself with the procedure, without risking damaging the servo by accidental mis-setting.

Calibration

The ***GRX4*** incorporates the following user calibration facilities

- Point **Reset** Servo position.
- Point **Set** Servo position.
- Selection of transmitter **Auxiliary switch** to be used for point control.

All calibrations are performed using the ***GigaRad*** transmitter, and no access to the ***GTX4*** is required.

For Point **Set** and **Reset** position calibration, the point setting is adjusted using the transmitter **speed** control knob, and the required setting determined by visual observation of the point blade position.

For operating switch selection, the required **Auxiliary switch** is simply chosen.

Six calibration selections can be made, each selected individually by the setting of transmitter switches **Aux2 [C1]**, **Aux 3 [C2]** and **Aux 4 [C3]**, with the transmitter operating in a special **Calibration** mode.

Once the appropriate selection has been made, it is saved to non-volatile memory by setting the transmitter **Aux 1 [Save Cal]** transmitter switch **On** and then **Off**.

Once set, all calibrations are retained in non-volatile memory and will remain active until changed again, even after power has been removed from the ***GRX4*** and re-applied.

Before attempting any calibration, ensure that there are no other ***GigaRad*** receivers or controllers powered up which are already bound to the transmitter to be used, other than the one to be calibrated.

Calibration Switch Settings

For the ***GRX4***, transmitter calibration switch settings are as follows:

Calibration	**Aux Switches**		
	A4 C3	**A3 C2**	**A2 C1**
Point **Reset** Position	Off	Off	**On**
Point **Set** Position	Off	**On**	Off
Point Operating Switch			
Aux 1	Off	**On**	**On**
Aux 2	**On**	Off	Off
Aux 3	**On**	Off	**On**
Aux 4	**On**	**On**	Off

Calibration Procedure

1 First ensure that the ***GRX4*** is bound to the transmitter and is operating normally.

2 Then turn the transmitter **Off**.

3 Set the transmitter Speed knob to **mid** position.

This is important to ensure that, on entry to calibration, the servo will not attempt to move outside its available operating range, constrained by the point operating linkage, to a position it can not achieve.

4 With the transmitter powered **Off**, set the **Auxiliary** switches as follows:

Aux 1 = Off
Aux 2 = On
Aux 3 = On
Aux 4 = On