

Futaba®

DIGITAL PROPORTIONAL
RADIO CONTROL

MAGNUM JUNIOR

FP-2PKA / FP-2PK

INSTRUCTION MANUAL

Pistol Grip, AM 2-Channel,
2-Servos

Thank you for purchasing a Futaba digital proportional radio control set.
Please read this manual carefully before using your set.



FUTABA CORPORATION OF AMERICA
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D60901



FEATURES OF MAGNUM JUNIOR

The Magnum series are pistol grip type of AM 2 channel digital proportional radio control sets and are the best in their class.

TRANSMITTER FP-T2PKA, (FP-T2PK)

- Newly designed cockpit type control panel
- Human-engineered size and design are easy to use.
- **Steering rate adjuster** The steering servo travel volume (right 81 left evenly from neutral) can be adjusted simultaneously, while running.
- **Throttle ATV** The throttle servo travel volume can be adjusted and set with two trimmers, independently. FP-T2PKA
- **Wheel angle adjuster.** The turning angle of the steering wheel can be increased and decreased. This allows operation at the best angle
- **Neutral adjuster.** The throttle trigger throttle stroke/brake deflection stroke (back stroke) can be freely selected to match the application
- **Servo reversing switch** (steering and throttle) is standard Each servo can be reversed from the outside. This is extremely convenient when connecting the linkages.
- Since a level meter is provided, battery consumption can be seen at a glance.
- Crystal can be changed from the outside. Crystal can be immediately changed during competitions, etc. except 72 MHz and 75 MHz on transmitter.
- Power supply can be changed to a nicad battery system. FP-T2PKA

RECEIVER FP-R102GR

- BEC (Battery Eliminator Circuitry) system allows sharing of the running Nicd battery and eliminates the need for a regulator and diode.
- **Crystal socket uses a new type** of highly reliable subminiature pins. Reliability is increased and the crystal can be changed from the outside.

RECEIVER FP-R104H

- High performance AM 4 channel receiver in which miniature size and light weight have been achieved by using the PC board space to the maximum.
- Short (50cm) antenna designed for miniature models is easy to mount. (27MHz only)
- **Narrow band design using a narrow band ceramic filter resists adjacent channel interference.**
- Noise resistance achieved by using a pulse noise rejection circuit.
- New CMOS miniature 1C used in the data coder increases reliability substantially.
- New type sub miniature, highly reliable pins used at the crystal socket also increase reliability The crystal can be changed from the outside.
- Thick film gold-plated connector pins eliminate **poor contact and improve** reliability against shock and vibration.

SERVO FP-S148, S129, S132H

- Motor uses the newest helical type rotor for improved output torque and smooth operation. (S148, S129)
- These heavy-duty & water/dust tight servos are designed for use with Futaba digital proportional radio control sets (S129)
- **New indirect driver potentiometer** improves vibration and shock resistance and increases neutral precision tremendously.
- Futaba low-power custom 1C provides high starting torque, narrow dead band, and excellent trackability.
- **Fiberglass-reinforced PBT** (polybutylene terephthalate) injection molded servo case is mechanically strong and invulnerable against glow fuel.
- Strong **polyacetal resin ultra-precision servo gear** features smooth operation, positive neutral, and very little backlash.
- **Fiberglass-reinforced epoxy resin PC board with thru-the-hole plating** improves servo amp vibration and shock resistance.
- Thick film gold-plated connector pins eliminate poor contact and improve reliability against shock and vibration.
- Special grommet bushing simplifies servo mounting and improves the cushioning effect.
- Six special **adjustable splined horns** are available.
- Maximum output torque of 48.7oz-in.(3.0kg-cm/3 5kg-cm) allows use in almost any model (S148, S129)
- **High operating speed of 0.13 sec/60°** makes it perfect when especially high speed is necessary. (S132H)

SET CONTENTS AND RATINGS

MAGNUMJUNIOR		
Transmitter	FP-T2PKA	FP-T2PK
Receiver	FP-R102GR or FP-R104H	
Servo	FP-S148 x 2 or FP-S129 or FP-S132H	
Others	Switch, battery holder, etc.	

TRANSMITTER FP-T2PKA. (FP-T2PK)

Operating system : Pistol grip type, 2-channel
Transmitting frequency : 27MHz band 72/75MHz band
Modulation system : AM (amplitude modulation)
Power requirement : 12V, AA penlight battery x 8

Receiver PP-R102GR

Receiving frequency : 75MHz
Intermediate frequency : 455kHz
Selectivity : 3kHz/-3dB
Receiving range : 550 yards (500m) on the ground when used with FP-T2PKA (At the best radio wave condition of environment)
Power supply : 4.8V to 8.4V
Current drain : 7.2V/13mA, 4.8V/33mA
Dimensions : 1.46 x 2.19 x 0.75 in. (37 x 55.5 x 19 mm)
Weight : 1.34 oz (38g)

RECEIVER FP-R4H, (FP-R104H)

Miniature 4 channel AM receiver
Receiving frequency : 27MHz band 72/75MHz band
Intermediate frequency : 455kHz
Power requirement : 4.8V to 6.0V
Current drain : 10mA
Dimensions : 1.26 x 2.05 x 0.77 in. (32 x 52 x 19.4 mm)
Weight : 1.06 oz (30g)
Receiving range : 220 yards(200m) on the ground when used with the FP-T2PKA(At the best radio wave condition of environment)

SERVO PP-S148

Control system : +pulse width control
Operating angle : One side 45° or more
Power requirement : 4.8V-6V
Current drain (IDLE) : 6.0V, 8mA (at idle)
Output torque : 42 oz-in. (3 kg-cm)
Operating speed : 0.22 sec/60°
Dimensions : 1.59 x 0.77 x 1.4in. (40.4 x 19.8 x 36 mm)
Weight : 1.5 oz. (44.4g)

SERVO FP-S129

Control system : +pulse control
Operating angle : Rotary system, one-side 45" or greater (including trim)
Power requirement : 4.8V to 6.0V (shared with receiver)
Current drain : 6.0V, 8mA (at idle)
Output torque : 48.7 oz-in (3.5kg-cm)
Operating speed : 0.25 sec /60°
Dimensions : 1.79 x 0.9 x 1.71 in. (45.5 x 23 x 43.5 mm)
Weight : 2.1 oz (60g)

SERVO FP-S132H

Operating system : +pulse control
Operating angle : Rotary system, one-side 40" or greater (including trim)
Power requirement : 4.8V to 6.0V (shared with receiver)
Current drain : 6.0V, 8mA (at idle)
Output torque : 25.02 oz-in (1.8kg-cm)
Operating speed : 0.13 sec/60°
Dimensions : 1.46 x 0.71 x 1.20 in. (37 x 18 x 30.5 mm)
Weight : 1.13oz(32g)

TRANSMITTER FP-T2PKA (FP-T2PK) HANDLING INSTRUCTIONS

The name of each part of the transmitter is shown in Fig. 1 and Fig. 2. Learn them before operating your set.

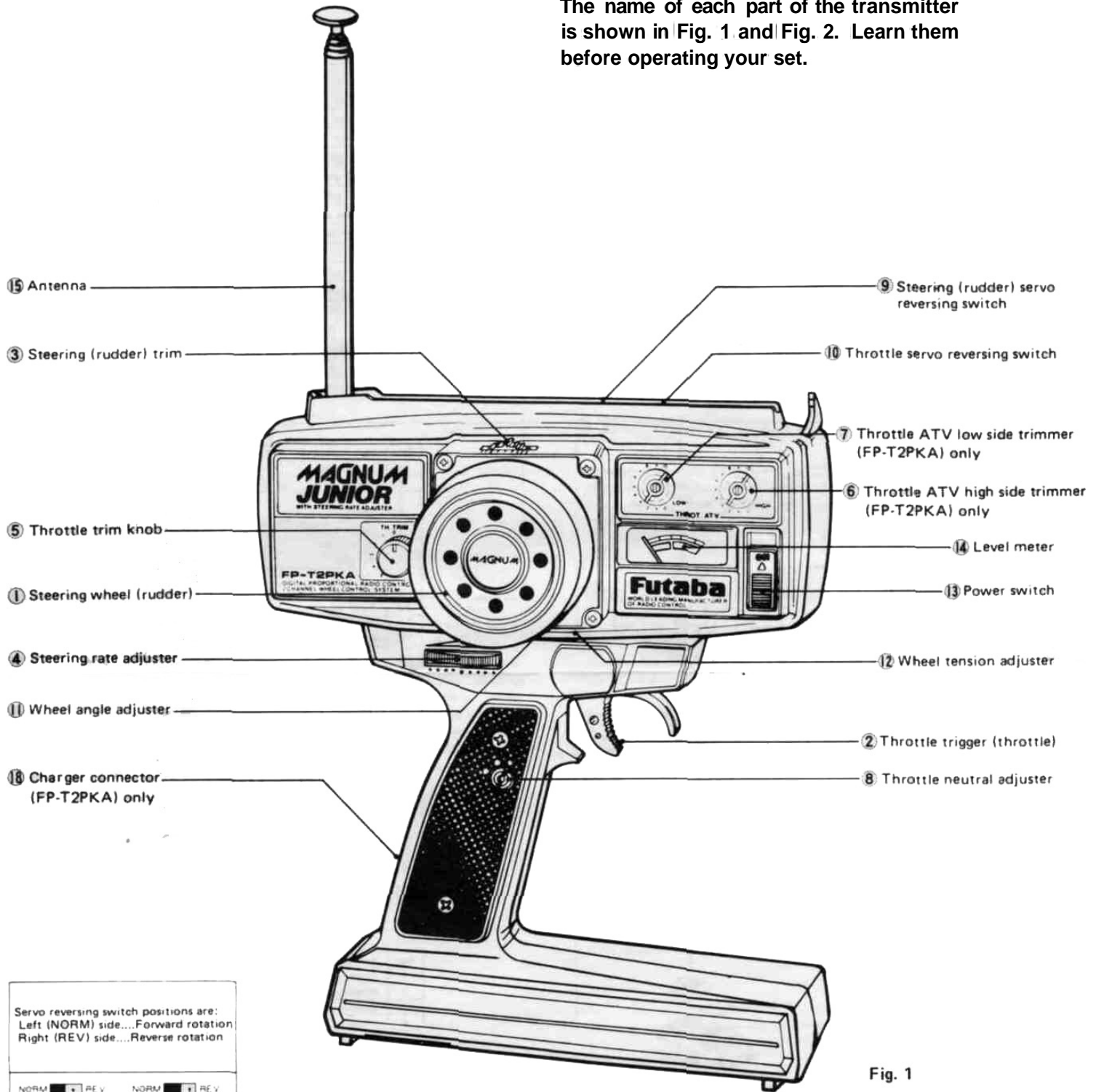


Fig. 1

Servo reversing switch positions are:
Left (NORM) side....Forward rotation
Right (REV) side....Reverse rotation

NORM REV NORM REV

10 Throttle servo reversing switch
9 Steering (rudder) servo reversing switch

Fig. 3

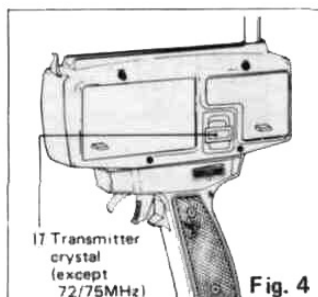


Fig. 4

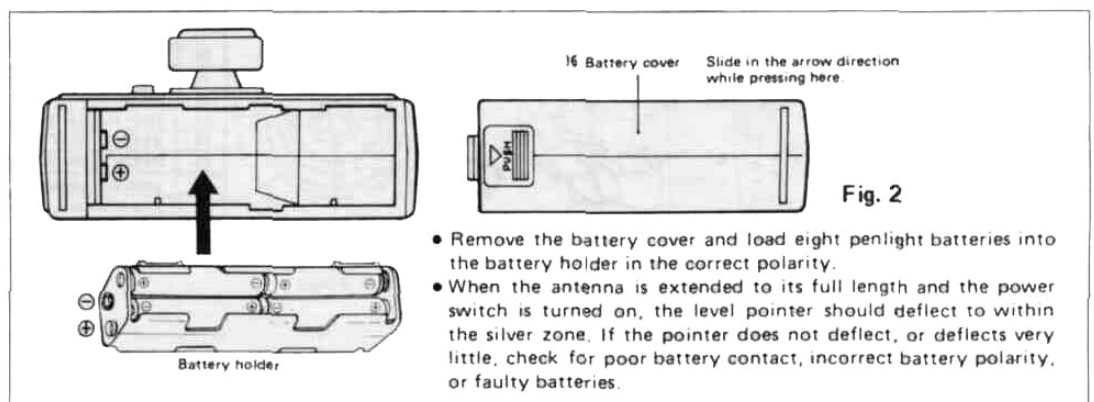


Fig. 2

- Remove the battery cover and load eight penlight batteries into the battery holder in the correct polarity.
- When the antenna is extended to its full length and the power switch is turned on, the level pointer should deflect to within the silver zone. If the pointer does not deflect, or deflects very little, check for poor battery contact, incorrect battery polarity, or faulty batteries.

The servo reversing switches are assumed to be in the normal position in the descriptions in this section. When the servo switches are in the reverse position, operation is the opposite of that described here.

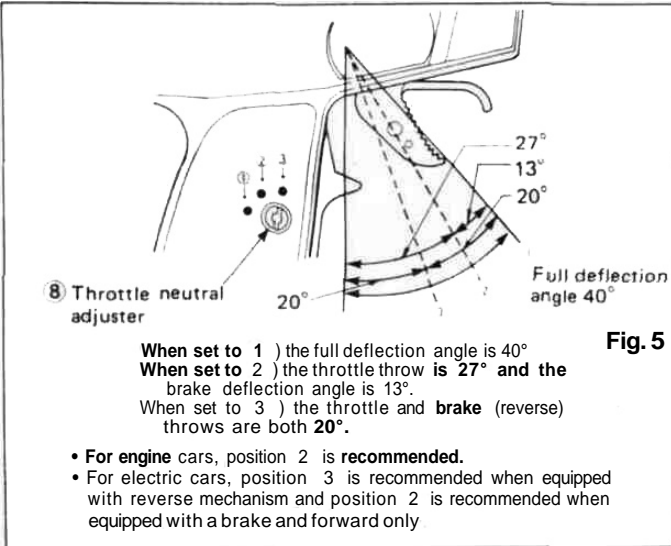
(1) Steering wheel (rudder)

Steering (rudder) operation.

(2) Throttle trigger (throttle lever)

Engine control/motor control operation.

The throttle neutral position can be set to one of three position by turning the 8 throttle neutral adjuster **with** a coin as shown in Fig. 5. Set it to match the application.

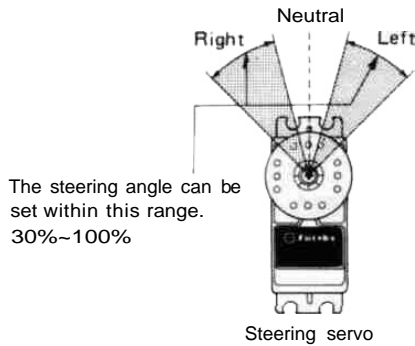


(3) Steering trim

Steering (rudder) trim

(4) Steering rate adjuster

The steering servo steering angle can be freely set as shown in Fig. 6 with a ratcheted adjuster installed which enables you to adjust steering servo travel volume to match a car to the course, even while running.

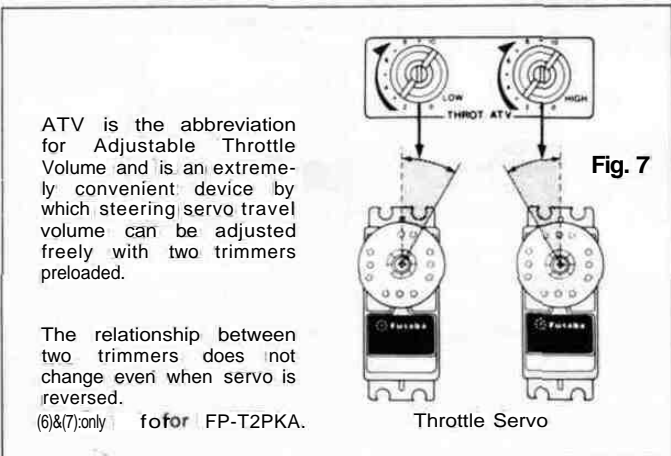


(5) Throttle trim knob

(6) Throttle ATV high side trimmer ATV... Adjustable Travel Volume.

(7) Throttle ATV low side trimmer

Throttle ATV is a device which permits independent adjustment of the throttle servo left and right sides (from neutral) as shown in Fig. 7 with trimmers (6) and (7). (FP-T2PKA)



(8) Throttle neutral adjuster

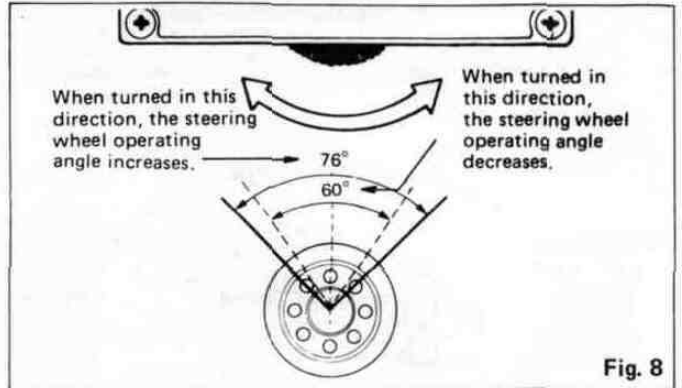
This adjuster sets the throttle trigger neutral point as described in (2) throttle trigger. Set it to the point at which it stops with a click with a screwdriver, coin, etc.

9 Steering (rudder) servo reversing switch

10 Throttle servo reversing switch

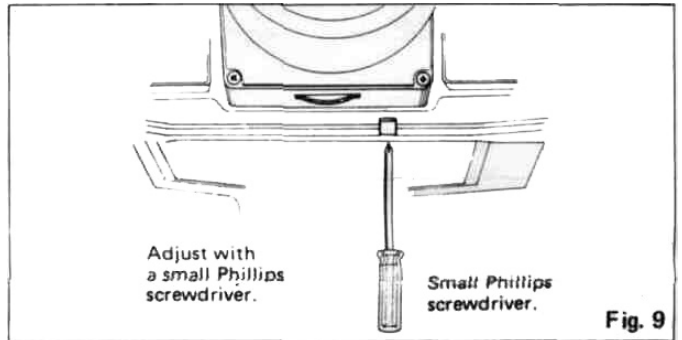
(11) Wheel angle adjuster

The wheel angle adjuster **changes the operating angle of the (1) Steering wheel** as shown in Fig. 8.



(12) Wheel tension adjuster

This is a phillips head screw which adjusts the steering force of the steering wheel.



(13) Power switch

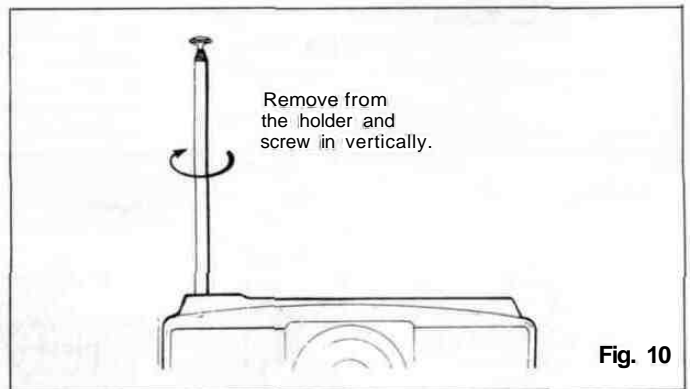
When set in the direction of the A mark (upper position), the switch is turned on and the pointer of the level meter deflects.

(14) Level meter

When the (13) power switch is set to ON, the level meter pointer should deflect to within the silver zone. If the pointer stops near the boundary between the silver and red zones, the battery is low, and the range of the radiowaves will be short. When the level meter pointer drops to the boundary between the silver and red zones, change the battery.

(15) Antenna

95cm antenna. It screws in vertically as shown in Fig. 10.



(16) Battery cover

When loading (or changing) the eight penlight batteries, remove this cover as shown in Fig. 2.

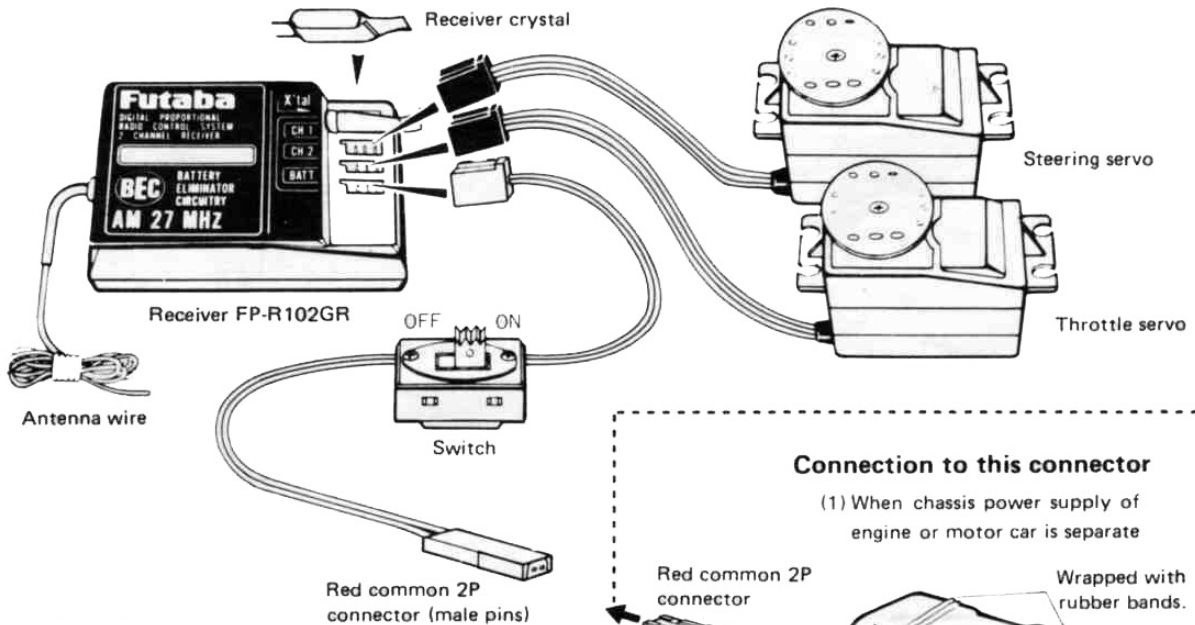
(17) Transmitter crystal

When changing the frequency, replace this crystal. Use the AM crystal set (transmit and receive 1 pair) sold by Futaba. The transmitter crystal is marked TX and the receiver crystal is marked RX. However, you are not allowed to change frequency by merely replacing crystal on both 72 and 75MHz.



The **BEC** mark is displayed on the front of the receiver of BEC (Battery Eliminator Circuitry) system sets with a receiver with shared power supply regulator.

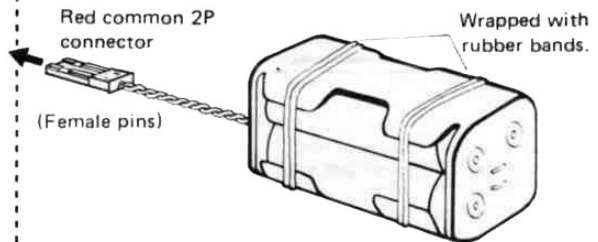
RECEIVER FP-R102GR AND SERVO FP-S148



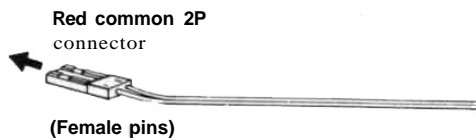
Connect the servo and switch as shown in the figure and extend the transmitter and receiver antenna fully.

Connection to this connector

(1) When chassis power supply of engine or motor car is separate

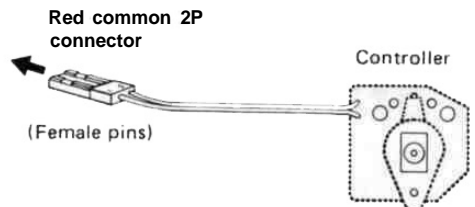


(3) When motor car uses an ordinary common power supply chassis



Buy the red common 2P connector from the kit manufacturer and connect to the controller.
Pin 1: Minus
Pin 2: Plus

(2) When motor car uses a special BEC system chassis (common power supply specifications)



Connect to the red common 2P connector of the controller.

Fig. 11

The Futaba BEC (Battery Eliminator Circuitry) system can also use a common power supply with the conventional four penlight batteries system (separate power supply).

- A common power supply regulator and diode may also be supplied with the speed controller, depending on the vehicle kit. Since they cause a voltage drop, always remove them.

- Set the transmitter power switch to ON, then set the receiver power switch to ON. The servos stop near the neutral position. Operate the transmitter sticks and check if each servo faithfully follows operation of the sticks.
- Connect the pushrod to each servo horn, then check if the direction of travel of each servo matches the transmitter operation.
- Operate each servo over its full travel and check if the pushrod binds or is too loose. Applying unreasonable force to the servo horn will adversely affect the servo and quickly drain the battery. Be especially careful when using 8.4V.
- Always make the full stroke (including trim) of the servo horns

- somewhat larger than the full travel. Adjust the servo horns so that they move smoothly even when the trim lever and stick are operated simultaneously in the same direction.
- Be alert for noise. Always solder a noise killing capacitor to the running motor. If metal pans touch each other due to vibration, noise will be generated and cause the receiver servos to operate erroneously. We recommend the use of noiseless parts.
- Even though the receiver antenna wire is long, do not cut or bundle it. The range of the radiowaves will be shortened.

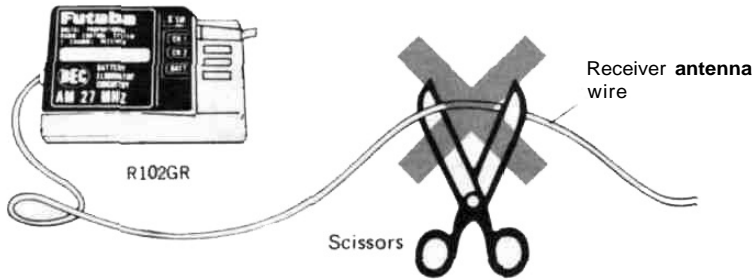


Fig. 13

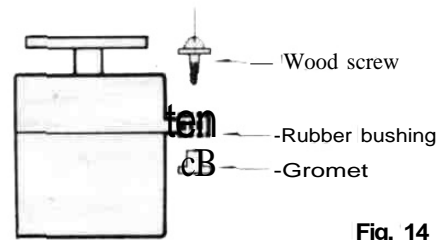


Fig. 14

- Install the servos firmly. Install the servo to the servo tray as shown in the figure. In other cases, install the servo as described in the model manufacturer's manual.

- A spare horn is provided. Use it as required.
- Wrap the receiver in sponge rubber and wrap rubber bands around the sponge rubber. Mount the receiver so it is not exposed to vibration, does not touch the frame, and does not move.
- When the receiver is installed on a board or used where it may be splashed with mud and water, place it in a plastic bag, etc. and wrap a rubber band around the open end of the bag to waterproof and dustproof the receiver. After use, remove the receiver from the bag to prevent condensation.
- Use the rubber bands wrapped around the receiver to hold the

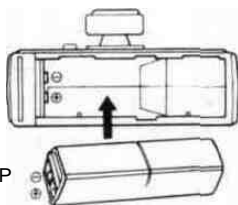
- servo and switch leads.
- After mounting is complete, recheck each part, then check the transmitting range by making the transmitter antenna as short as possible and extending the receiver antenna fully and operating the set from a distance of 20m to 30m. The movement of each servo should follow the movement of the transmitter sticks.
- The crystal can be changed from the outside of the receiver case. Always use a Futaba transmitter and receiver crystal pair as the replacement crystals.

CONVERSION TO NICAD SYSTEM FP-2PKA ONLY

To use a nicad battery with this set, modify the set with the optional PBPB-11 (2PKA nicad battery conversion set).

- (1) Remove the battery cover and disconnect the nine contacts with needle nosed pliers at shown in Fig. 15. Then install the transmitter NT-8LP nicad battery and install the battery cover.

Fig. 15



Transmitter NT-8LP nicad battery.

(2) Charging and how to use

- (a) Connect the power plug of the FBC-8B (4) battery charger to the transmitter charging connector. Connect the 3PC red male connector to the receiver and servo NR-4H nicad battery. Plug the battery charger into a 120 VAC outlet as shown in Fig. 16.
- (b) Normally recharge the battery for about 15 hours. If the battery has not been used for some time or is new, discharge and recharge it 2 or 3 times before use.
- (c) If the battery is left discharged for a long time, its capacity will decrease and the life of the battery will be shortened. After use, recharge the battery before storing it.

- (d) Always recharge the battery before use.
- (e) A fully charged battery can be used for about two hours at 10 minutes/flight.

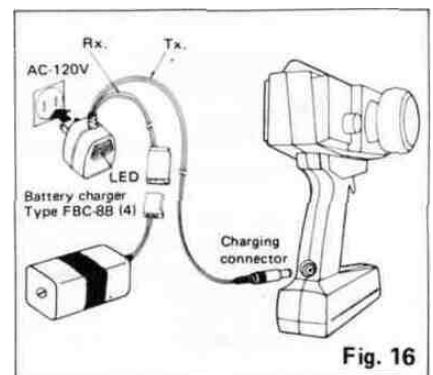


Fig. 16

Notes: FBC-8B (4)

- (1) First, connect to TX Nicd and red lamp goes on.
- (2) Then, connect to RX Nicd after connecting, L,E,D, changes color from red to greenish red (orange) which indicates that both TX and RX Nicds are being charged.
- (3) In case of separate charging, L,E,D, color will be: RX Nicd — Green
TX Nicd - Red

MOTOR CAR

Operation of the throttle (engine control) servo can be set as shown in this figure by 2, throttle trigger operation.

NEUTRAL POSITION

Settable within this range with the (2) throttle trim knob.

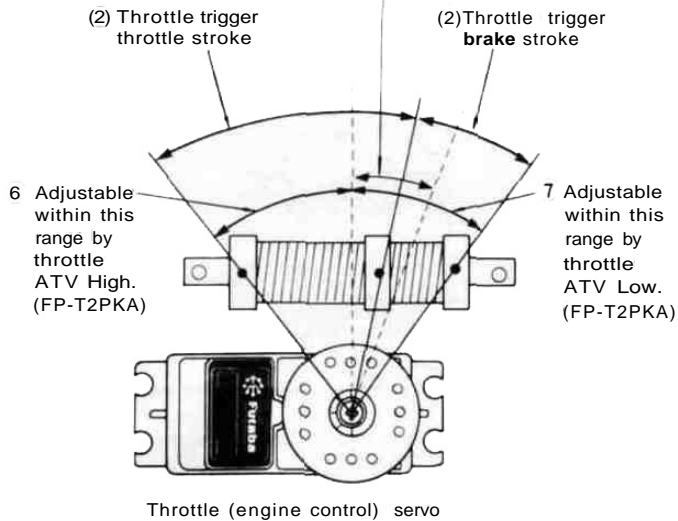


Fig. 17

USING THE ANTENNA FREQUENCY FLAG

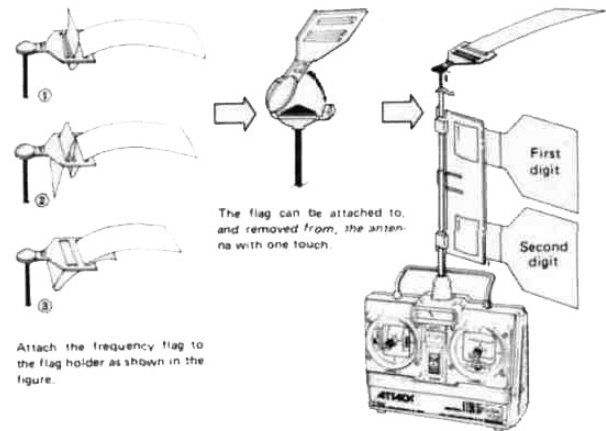


Fig. 19

SPLINED HORNS

This horn permits shifting of the servo neutral position at the servo horn. Setting and shifting the neutral position

a) Angle divisions

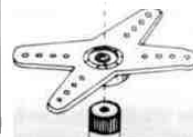


Fig. 20

1) The splined horn has 25 segments. The amount of change per segment is, $360 \div 25 = 14.4^\circ$

2) The minimum adjustable angle is determined by the number of arms or number of the holes. For four arms, the minimum adjustable angle is:

$$360^\circ \div \frac{(25 \times 4)}{\text{Number of divisions}} = 3.6^\circ$$

b) Effect

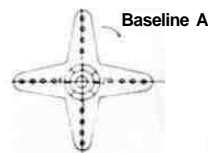


Fig. 21

To shift the holes center line to the right (clockwise) relative to baseline A, shift arm 2 to the position closest to baseline A.

Example For a four arm horn, the angular shift per segment is 14.4° . The shift to the right is $90^\circ - (14.4 \times 6) = 3.6^\circ$

To shift by the same angle in the opposite direction, use the opposite arm number.

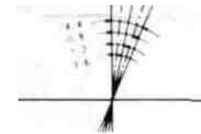


Fig. 22

For a six arm horn, turn the arm counterclockwise and set arm 2 to the position of arm 1. The adjustable angle is $60^\circ - (14.4 \times 4) = 2.4^\circ$.

Arm 3 shift 4.8° to the right, arm 6 shifts 2.4° to the left, and arm 4 shifts 7.2° to the right and left.

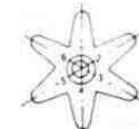


Fig. 23

• See the figure for the motor, battery, and speed controller wiring.

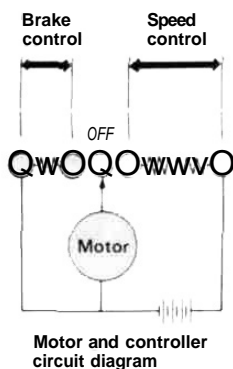
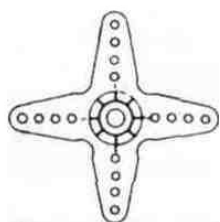


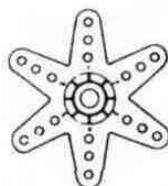
Fig. 18

• When the drive battery is also used as the receiver servo power supply with a motordriven car, pay careful attention to the power supply polarity and voltage. With Futaba proportional R/C power supplies, red represents + and black represents - .

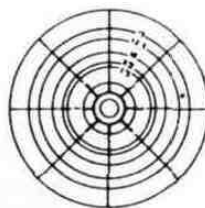
The following splined horns are optional.



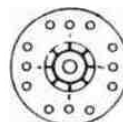
HORN A



HORN B



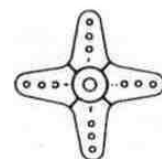
HORN C



HORN D



HORN E



HORN F

Fig. 24

FP-S148

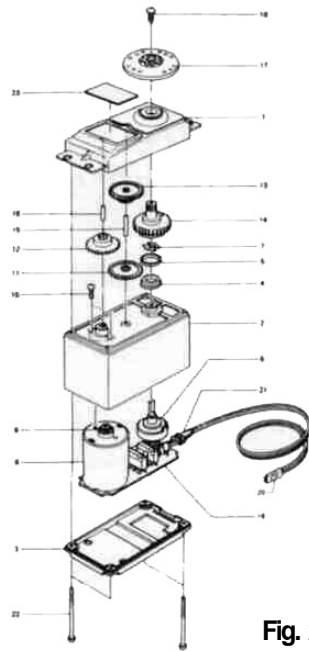


Fig. 25

No.	Part name	Part No.
1.	Upper case	PCS-48
2.	Middle case	PCS-48
3.	Bottom case	PCS-48
4.	Metal bearing	S04137
5.	Metal bearing	S04136
6.	Potentiometer	I39668
7.	Potentiometer drive plate	S02753
8.	Motor	S91239
9.	Motor pinion	802461
10.	Screw	J50002
11.	1st gear	FGS-48
12.	2nd gear	FGS-48
13.	3rd gear	FGS-48
14.	Final gear	FGS-48
15.	Intermediate shaft	S02495
16.	2nd shaft	S02494
17.	Servo horn D	FSH-6W
18.	Binding head tapping screw 2.6 x 8	FSH-4I
19.	Printed wiring board S148	AS1157
20.	3PB-WRB300G	AT2453
21.	w/gum bush	890045
22.	Pan head truss screw	S50360
23.	Nameplate S148	860099

FP-S129

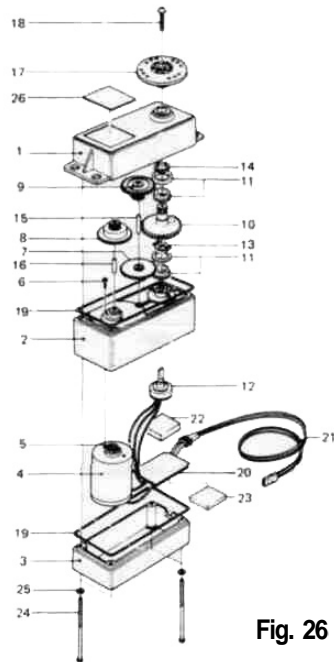


Fig. 26

No.	Part name	Part No.
1.	Upper case	FCS-29
2.	Middle case	
3.	Bottom case	
4.	Motor	S91212
5.	Motor pinion	S05402
6.	Screw 2x3	J50002
7.	1st gear	FGS-29
8.	2nd gear	FGS-29
9.	3rd gear	FGS-29
10.	Final gear	FGS-29
11.	Metal bearing	S04134
12.	Potentiometer	I39995
13.	Potentiometer drive plate	S02753
14.	Seal ring	S90415
15.	Intermediateshaft	S04287
16.	2nd shaft	S01351
17.	Servo horn D	FSH-6W
18.	Binding head tapping screw 2.6x8	FSH-4I
19.	O ring 32.60	S90420
20.	Printed wiring board	AS1206
21.	S129.....3PBWRB300	FPC-8M
22.	Neoseal sponge 5x15x15	S90336
23.	Neoseal sponge 3x15x7	S90333
24.	Phillips pan head screw	J50400
25.	O ring 1.6	S90410
26.	Nameplate	S80702

FP-S132H

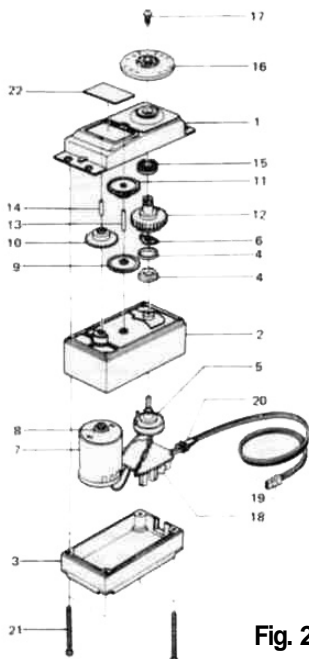


Fig. 27

No.	Part name	Pan No.
1	Upper case	FCS-32H
2	Middle case	
3	Bottom case	
4	Metal bearing	S04133
5	Potentiometer	I39995
6	VR drive plate	S05626
7	Motor	S91249
8	Motor pinion	S02788
9	1st gear	FGS-32H
10	2nd gear	
11	3rd gear	
12	Final gear	
13	Intermediate shaft	S02480
14	2nd shaft	S02481
15	Ball bearing	S04130
16	Servo horn O	FSH6W
17	Horn mounting screw	FSH-4I
18	S132H Printed wiring board	AS1271
19	S132H3PBWRB-300	FPC-8M
20	Lead wire packing	S90045
21	Case mounting screw	J50082
22	S132H Name plate	S60128

GUARANTEE

Your NEW FUTABA Digital Proportional R/C system is guaranteed against defects in workmanship and material for 180 days from the date of purchase when the attached registration card is returned to us within ten days of purchase.

This Guarantee is null and void if the R/C system has been improperly handled, damaged in a crash, or tampered with and does not cover the replacement of plastic housings or electronic components damaged due to the use of improper voltages.

When service is required, please take your equipment to your local authorized service station or ship it directly to us. All postage, shipping, and insurance charges must be paid by the user.

REPAIR SERVICE

- When requesting repair of trouble that has occurred suddenly or from long use, describe the trouble symptoms in as much detail as possible. This will facilitate detection of the trouble point and shorten the repair period greatly.
- Defects caused by faulty materials of workmanship will be corrected free of charge.
- This limited warranty is null and void if the set has been tampered with or disassembled. Refer to warranty statement for details.

Futaba. Digital Proportional Frequencies (For U.S.A.)

- The frequency of Futaba digital proportional sets can be changed within their own band. There are 4 different bands for you to choose from (27 MHZ, 50-53 MHZ, 72 MHZ, and 75 MHZ.) Please see chart listed below for specific frequency and its intended use. Please note there are specific frequencies allocated for aircraft only and surface only use.
- The frequency can be changed within the same BAND by using a precisely matched pair of Futaba crystals. However, Futaba recommends that you return your system to our factory service department for frequency changing, as tuning may be necessary for proper operation. Changing frequency from one band to another is NOT possible.
- Always change frequency flag when frequency is changed. The frequency flag is to be attached to the top of antenna and the channel designation to the base. (See Drawing)
- It is illegal to change crystals of 72-75 MHZ bands in the U.S.A.

Frequency Channel No. Flag Color			
26-27 MHZ - Aircraft/Car/Boat			
26.996	Color	Brown	
27.046	Color	RW	
27.096	Color	Orange	
27.146	Color	Yellow	
27.196	Color	Green	
27.266	Color	Blue	
60/53 MHZ - Aircraft/car/boat - Fcc Amateur License required			
	Channel No.		
50.800	RC00		
60.840	RC02		
50.880	RC04		
50.920	RC06		
50.960	RC08		
	Color		
63.100	Black-Brown		
63.200	Black-Red		
53.300	Black-Orange		
53.400	Black-Yellow		
53.500	Black-Green		
53.600	Black-Blue		
53.700	Black-Violet		
53.800	Black-Grey		
72 MHZ - Aircraft only			
72.030	12	*72.470	34
72.070	14	72.550	36
72.110	16	72.590	40
72.150	18	72.630	42
72.190	20	72.670	44
72.230	22	72.710	46
72.270	24	72.750	48
72.310	26	72.790	GO
72.350	28	72.830	62
72.390	30	72.870	64
72.430	32	72.910	66
75 MHZ - Car/Boat only			
76.430	62	75.750	78
76.470	64	76.790	80
76.510	66	76.830	82
76.550	68	76.870	84
76.590	70	*75.910	86
• 75.630	72	• 76.960	88
76.670	74	*76.990	90
76.710	76		

Effective 1, 1988



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Printed in Taiwan