

Futaba

DIGITAL PROPORTIONAL
RADIO CONTROL

FM

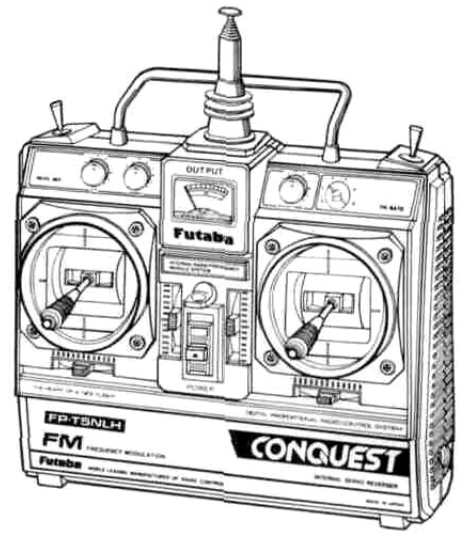
INSTRUCTION MANUAL

FP-5NLH for Helicopters



FUTABA CORPORATION OF AMERICA
FUTABA CORPORATION

D60400



Thank you for purchasing a Futaba digital proportional radio control set.

Please read this manual carefully before using your set.

FEATURES OF FP-5NLH

The FP-5NLH for helicopters is an FM proportional radio control set for helicopters with an ergonomic case created as a result of the exhaustive pursuit of easier operation. Newly designed sticks for smooth and positive operation, servo reversing switches for all channels, aileron and elevator AST (Adjustable Servo Throw), pitch control trim, idle up, and other innovations based on the opinions of many RC modelers.

TRANSMITTER FP-T5NLH

- Reliability substantially improved by using industrial robots to assemble the PC board.
- Servo reversing switch for each channel. **Servos are reversed by using this switch**
- Aileron and elevator AST (Adjustable Servo Throw). Servo throw can be set as desired.
- Easy-to-adjust two **knob type revolution mixing**. **Throttle pitch control** rudder mixing.
- Pitch control trimmer. Approximately 30% of the pitch control servo throw can be trimmed, this allows optimum pitch control of the model.
- Throttle hold switch and trimmer for auto rotation.
- This allows the Rotor r.p.m. to be maintained at an effective control speed, even when the pitch is reduced, allowing maneuvers which were impossible in the past to be performed.
- Newly designed open gimbal sticks operate smoothly and reliably. Spring tension mechanism allows adjustment of the operating feel of the stick lever.
- Nonslip adjustable lever head allows adjustment of the stick length as desired.
- Throttle **ATL. Adjustable** throttle limiter **type throttle** trim. As the high side does not change even when the trim is **altered**, it is **very** convenient when connecting the linkage, etc.
- RF PC board module system.
- Functional case, created as a result of the exhaustive pursuit of easier operation, has evolved a thick case which fits into the palm of the hand.
- Square level meter at the transmitter indicates the power supply voltage.
- Excellent radiation efficiency, strong 8-stage telescoping antenna.
- Neck strap bracket provided as standard. Operation is easier if the transmitter is hung from your neck by using the optional neck strap.
- Built-in NiCad battery.

RECEIVER FP-R107N

- Compact, high performance FM 7-channel receiver with PC board space reduced to a minimum.
- Special IF amp for radio communications improves the effective receiving range stability.
- Narrow band ceramic filter improves rejection of adjacent channel interference.
- Futaba original squelch circuit reduces erroneous operation by **weak** signals (when passing a dead point, etc.) and erroneous operation by natural noise when no signals are being received.
- Large capacitor copes with voltage changes when a **battery is used**.
- Vibration-resistant pin connectors.
- Fiberglass epoxy PC board with thru-the-hole plating is vibration and shock resistant.

SERVO FP-S130

SMALL, RUGGED, HIGH NEUTRAL SERVO

- Small, double ball bearing, water-tight & dusttight servo. High output torque 55.6 oz-in (4kg-cm), high-speed 0.24sec/60°
- New indirect drive potentiometer improves vibration and **shock** resistance and neutral accuracy.
- Futaba low-power custom **1C provides extremely high torque, narrow** dead band, and superior tracking.
- Fiberglass reinforced PBT (polybutylene terephthalate) injection molded servo case is mechanically strong and invulnerable to 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.
- Three pin connector eliminates faulty contact and improves reliability against vibration and shock. Housing has a reverse insertion prevention mechanism.
- Special grommet mounting of the servo and has an excellent cushioning effect.
- Six special adjustable splined horns.

SET CONTENTS AND RATINGS

(Specifications are subject to change without prior notice.)

	PCM FP-5NLH
Transmitter	FP-T5NLH x 1
Receiver	FP-R107N x 1
Servo	FP-S130 x 4
NiCad battery	NR-4J x 1
Switch	SSW-J
Others	Charger, Ribbon, Spare horn. Mounting screw.

TRANSMITTER FP-T5NLH

- Operating system** 2 stick, 5 channels w/servo reverse, aileron and elevator AST, helicopter mechanism
- Transmitting frequency** 72MHz band .53MHz band
- Modulation system** FM (Frequency modulation)
- Power requirement** 9.6 volts NiCad battery (NT-8LP)
- Current drain** 170mA (at 12V)

RECEIVER FP-R107N

- Receiving frequency** 72MHz band .53MHz band
- Intermediate frequency** 455kHz
- Power requirement** 4.8V, NiCad battery (common use with servo)
- Current drain** 13.5mA (4.8V reception)
- Dimensions** 1.38 x 2.42 x 0.8 in (35.2 x 61.7 x 20.3mm)
- Weight** 1.55oz (43g)
- Receiving range** 550 yards (500m) on the ground, **1,100 yard** (1000m) in the air. [FP-T5NLH] (at the best conditions)

SERVO FP-S130

- Control system** +pulse width control
- Operating angle** One side 45° or more (at idle)
- Power requirement** 4.8V (Shared with receiver)
- Current drain (IDLE)** 5.0V, 8mA
- Output torque** **55.6 oz.in (4kg-cm)**
- Operating speed** 0.24sec/60°
- Dimensions** 1.52 x 0.77 x 1.36 in (38.5 x 19.5 x 34.5mm)
- Weight** 1.47oz (42g)

TRANSMITTER FP-T5NLH CONTROLS

Fig. 1 shows the name of each part of the transmitter. Memorize the position and operation of each switch and control.

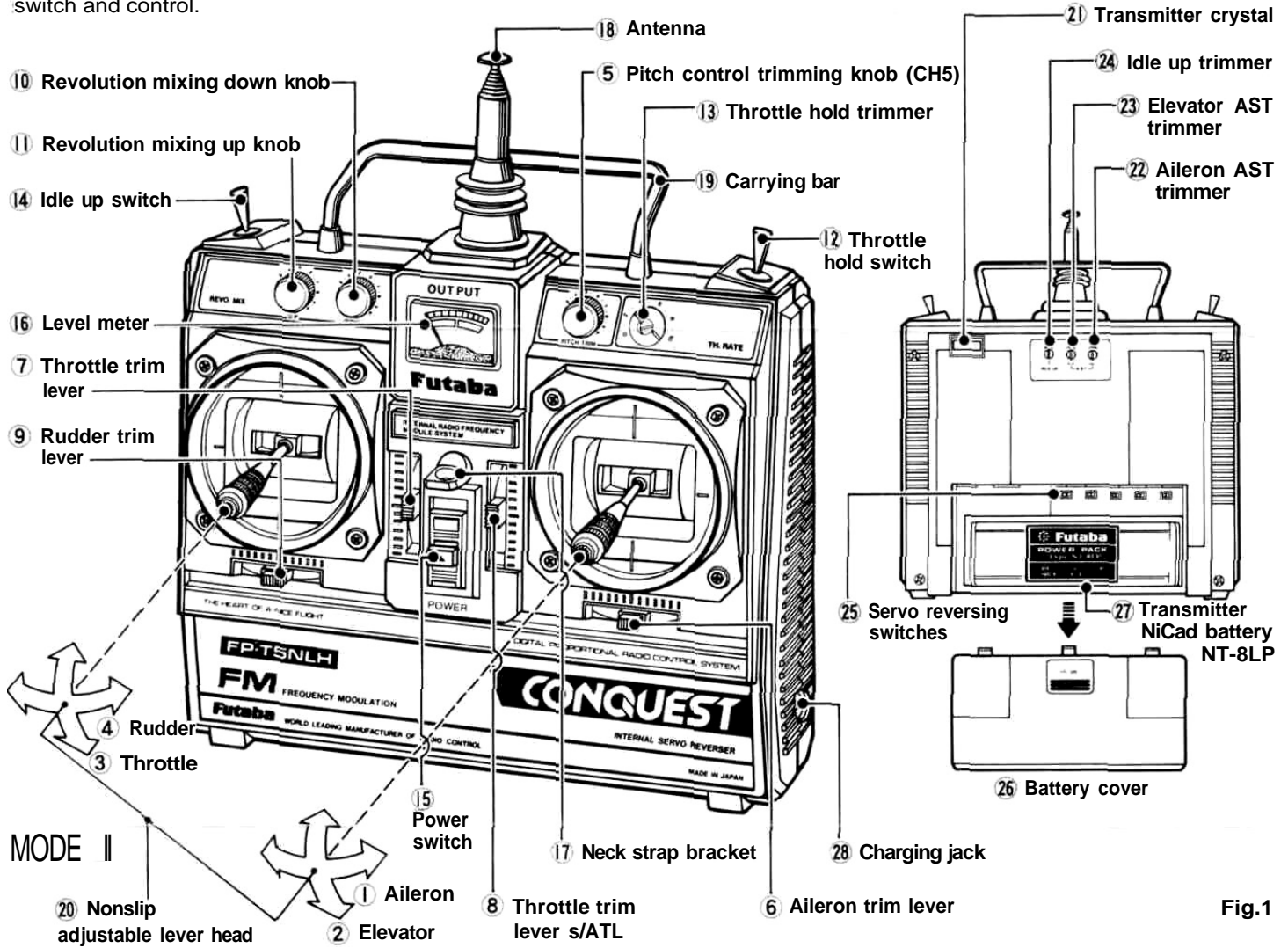
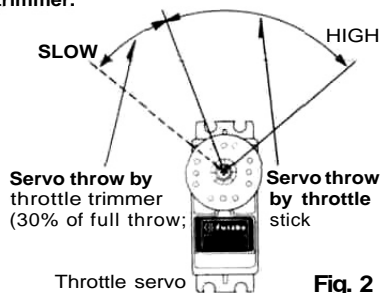


Fig.1

In the following descriptions, all the servo reversing switches are assumed to be in the normal position. When they are in the reverse position, operation is the opposite of that described.

- ① **Aileron** Aileron operation
- ② **Elevator** Elevator operation
- ③ **Throttle** Throttle operation
- ④ **Rudder** Rudder operation
- ⑤ **Pitch control trimming knob (CH5)**
Pitch control trimming knob. Approximately 30% of the full throw of the servo can be adjusted and set. Normally, it is set for the best pitch during flight.
- ⑥ **Aileron trim lever Aileron trimmer.**
- ⑦ **Elevator trim lever Elevator trimmer.**
- ⑧ **Throttle trim lever w/ATL**
Adjustable throttle limiter type trim lever. Operates as a trim lever only when the throttle stick is at the SLOW side as shown in Fig. 2.
As the HIGH side does not change even when the trim is altered, it is extremely convenient when connecting the linkage, etc.
- ⑨ **Rudder trim lever Rudder trimmer.**
- ⑩ **Revolution mixing down side ratchet knob (down side knob)**
- ⑪ **Revolution mixing up side ratchet knob (up side knob)**
• Knob which adjusts the throttle rudder mixing amount. Approximately 70% mixing at the up and down sides. Exclusively for rotor clockwise rotation.
The LOW side mixing amount from mid throttle (hovering point) position is adjusted and set with the down side knob ⑩.
The HIGH side mixing amount from mid throttle (hovering point) position is adjusted and set with the up side knob ⑪.



Mixing circuit is used for cancelling the torque reaction of the main rotor. The controls for set the minimum mixing necessary for helicopter flight.

- The amount of the revolution mixing up side knob 11 and down side knob 10 begins individually set from the neutral position of the throttle stick ③.

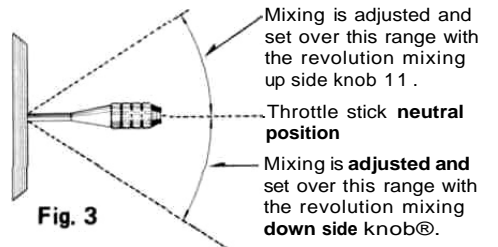
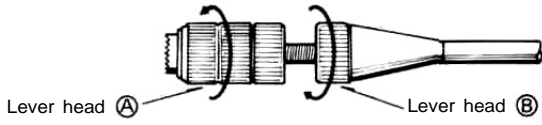


Fig. 3

- ⑫ **Throttle hold switch**
When this switch is ON, the throttle servo stops at the position set with trimmer ⑬ and only the pitch servo is controlled by the throttle stick. It is used for auto rotation landings. When this switch is OFF, the throttle and pitch servos are mixed. The switch is turned on when pulled forward.
- ⑬ **Throttle hold trimmer**
Trimmer which sets the throttle servo stop position when the throttle hold switch is ON. Full travel setting is possible.
- ⑭ **Idle up switch**
When this switch is pulled forward, it is turned on and the position set with the idle up trimmer ⑳ on the back of the transmitter becomes the maximum slow position of the throttle servo. When this switch is set to OFF, the normal slow position of the stick becomes the maximum slow position of the throttle servo.
- ⑮ **Power switch** The upper position is ON.
- ⑯ **Level meter** This level meter indicates the transmitter battery voltage
- ⑰ **Neck strap bracket** Bracket for the neck strap (optional).
- ⑱ **Antenna**
Strong telescoping antenna. Extend it to its full length when using the transmitter.
- ⑲ **Handle** Use this bar to carry the transmitter.

- 20 Nonslip adjustable lever head**
The length of the lever head can be adjusted to fit the operator.

Adjust to the length of your hand



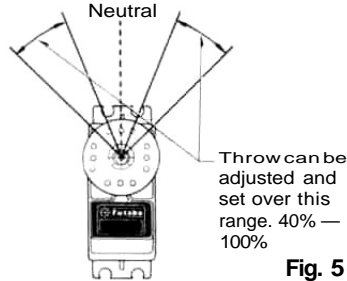
Unlock lever heads (A) and (B) by turning them in the arrow direction, and adjust the head to the most comfortable length, then lock it by turning it in the direction opposite the arrows.

Fig. 4

- 21 Transmitter crystal**
22 Aileron AST trimmer
23 Elevator AST trimmer

AST is the abbreviation of Adjustable Servo Throw. The servo throw can be adjusted and set as shown in the figure.

Trimmer (22) is for the aileron and trimmer (23) is for the elevator.

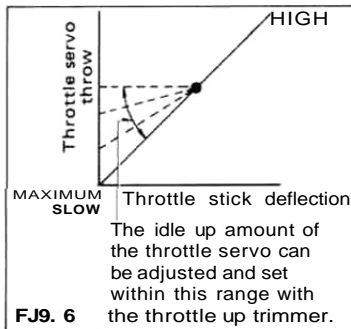


Throw can be adjusted and set over this range. 40% — 100%

Fig. 5

- 24 Idle up trimmer**

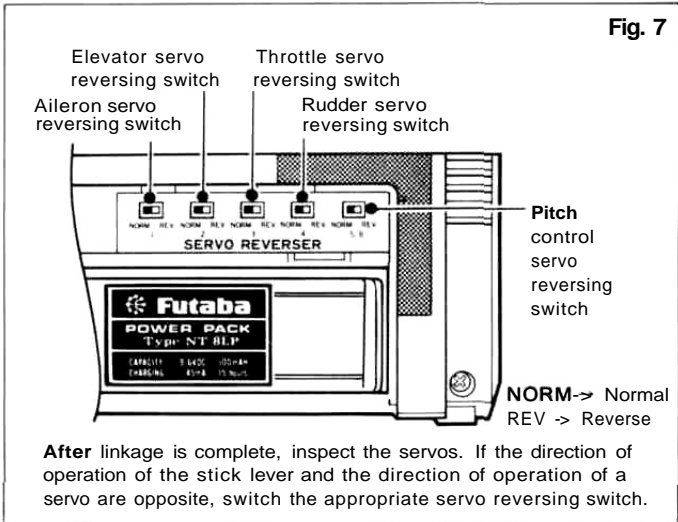
This trimmer is effective when the idle up switch (14) is ON. It adjusts and sets the throttle hold maximum slow position, and can be set as shown in the figure.



- 25 Servo reversing switches**

Using the servo reversing switches

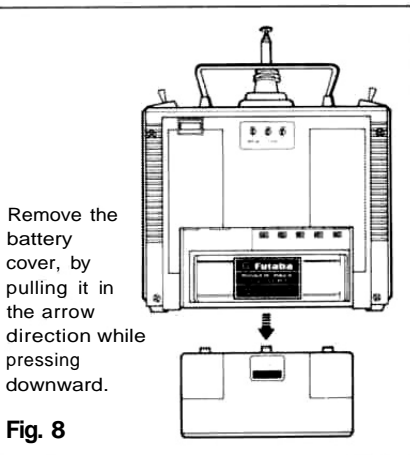
- The left side of each switch is the normal position.
- The servo reversing switches reverse the direction of operation of the servos.



After linkage is complete, inspect the servos. If the direction of operation of the stick lever and the direction of operation of a servo are opposite, switch the appropriate servo reversing switch.

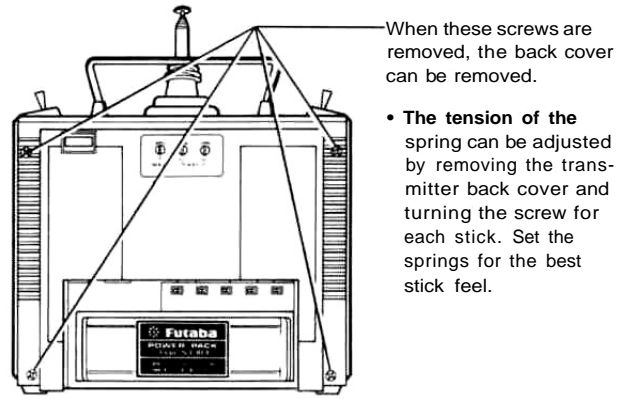
- 26 Battery cover**

Remove this cover when switching the servo reversing switches.



- 27 Transmitter NiCad battery NT-8LP**

The tension of the stick lever spring can be adjusted.



- The tension of the spring can be adjusted by removing the transmitter back cover and turning the screw for each stick. Set the springs for the best stick feel.

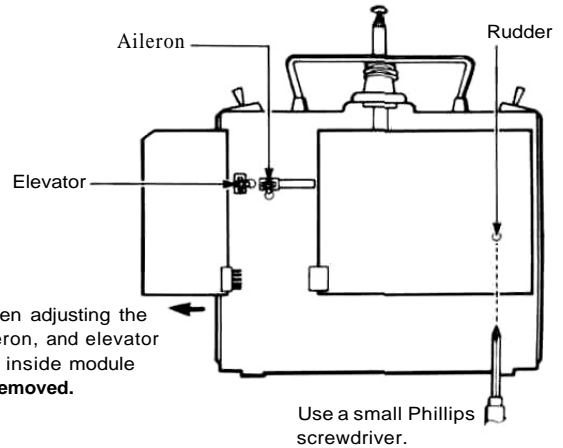
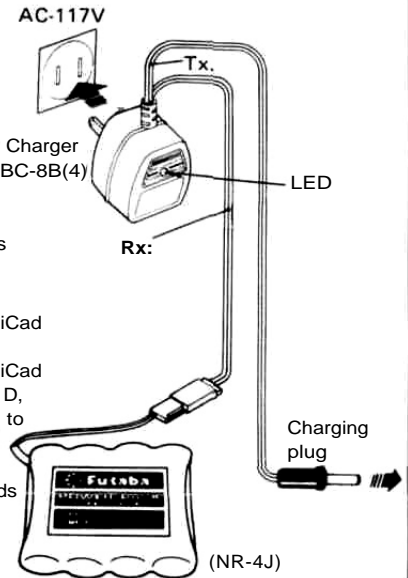


Fig. 9

- 28 Charging jack**

Battery charge jack for built-in NiCad battery.

- CHARGING OF TRANSMITTER AND RECEIVER NI-CAD BATTERIES:



Recharge the receiver and transmitter NiCad batteries as shown in Fig. 10.

Notes:

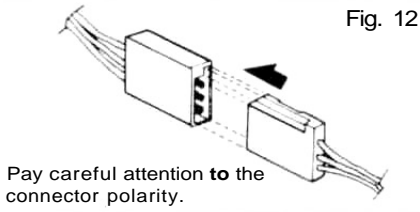
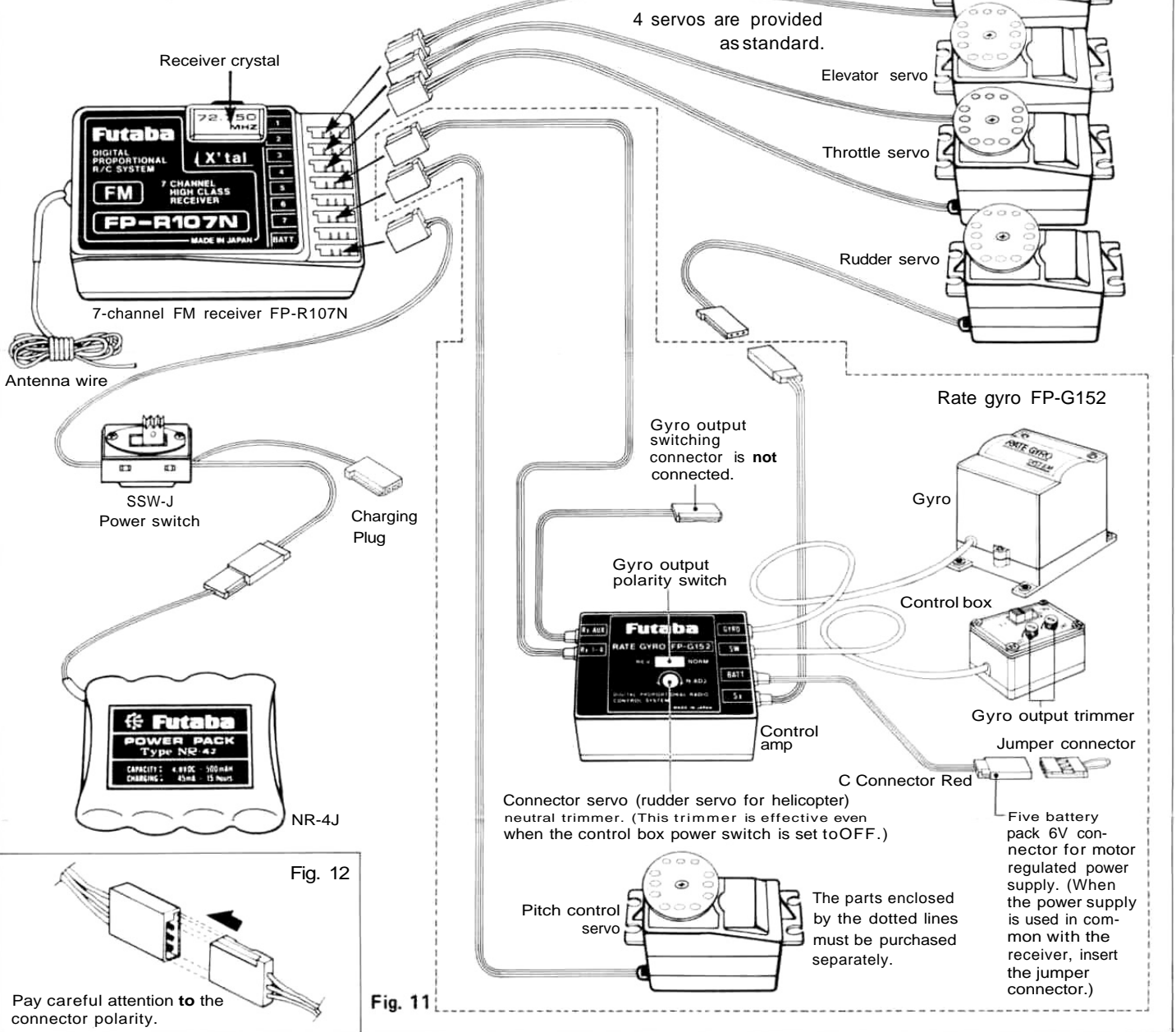
- 1) First, connect to TX NiCad and red lamp goes on.
- 2) Then connect to RX NiCad after connecting, L, E, D, changes color from red to greenish red (orange) which indicates that both TX and RX NiCads are being charged.
- 3) In case of separate charging L, E, D, color will be:
RX NiCad - Green.
TX NiCad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

Fig. 10

- Connect the charging plug of the FBC-8B charge to the transmitter charging jack, connect the 3P connector of the FBC-8B to the receiver NiCad battery (NR-4J), and plug the FBC-8B to a 117VAC outlet as shown in this figure.
- The Receiver battery can be used about 10 times at 10 minutes per flight between rechargings.
- Charge the batteries for about 15 hours. When the set is not in use for some time, repeat discharge and charge two to three times before use. (If the batteries are not used for a long time, their capacity will go down).
- FBC-8B charges transmitter and receiver NiCad batteries independently or simultaneously.

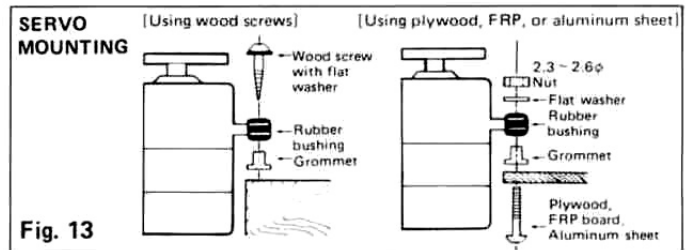
RECEIVER FP-R107N & SERVO FP-S130

Receiver, servos, switches, and battery connections



PRECAUTIONS

- Connect the receiver, servos, switches, and battery firmly as shown in Fig.11. Then extend the transmitter and receiver antennas fully.
- 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 that each servo follows the movement of the stick.
- Connect the pushrod to each servo horn, then check if the direction of travel of each servo matches the direction of operation of its transmitter stick. To reverse the direction of servo travel, switch the servo reversing switch.
- Operate each servo over its full stroke, 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. Always make the travel of each control mechanism somewhat larger than the full travel (including trim) of the servo horn. 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.
This set is noise-resistant, but is not completely immune to noise. We recommend the use of noiseless parts.
- When installing the switch harness, cut a rectangular hole somewhat larger than the full stroke of the switch and install the switch so that it moves smoothly from ON to OFF. This also applies to the switch mount when the switch is installed inside the fuselage and is turned on and off from the outside with a piece of wire, etc. Install the switch where it will not be exposed to engine oil, dust, etc.
- Even though the receiver antenna is long, do not cut or bundle it.
- Install the servos securely. Tighten the mounting screws until the rubber grommet is crushed slightly. If the screws are too tight, the cushioning effect will be adversely affected.



- The crystal can be changed from the outside of the receiver case. Always use the Futaba transmitter/receiver matched crystal set to change the band.
- Spare servo horns are supplied. Use them as needed.
- Wrap the receiver in sponge rubber. Waterproof and dustproof the receiver by placing it in a plastic bag and wrapping a rubber band around the open end of the bag. Do the same with the receiver/servo battery.
- 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 range by making the transmitter antenna as short as possible, 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 each stick of the transmitter.
- After mounting and checking are complete, take your model to the shop where you purchased the set, or to an experienced radio control modeler, and ask them to teach you how to handle your radio control set in the proper manner and to inspect your set-up carefully.
- To enjoy radio control models fully, be sure to observe all safety standards.

HELICOPTER ADJUSTMENTS

• General adjustment

Make the linkages and adjustments as described in the model manufacturer's instruction manual.

• Revolution mixing

When the throttle (engine control) stick is set from the SLOW side to the HIGH side, the throttle servo operates as shown in Fig. 14A. If revolution mixing is applied at this time, the rudder servo operates together with the throttle servo as shown in Fig. 14B. This operating width is called the mixing amount. The rudder stick operating width becomes larger as the number of divisions of the scale become larger. The rudder servo is operated as shown in Fig. 14B at right rudder stick. However, if the throttle (engine control) stick is at SLOW, the neutral position is from the left and if the throttle (engine control) stick is at HIGH, the neutral position is from the right.

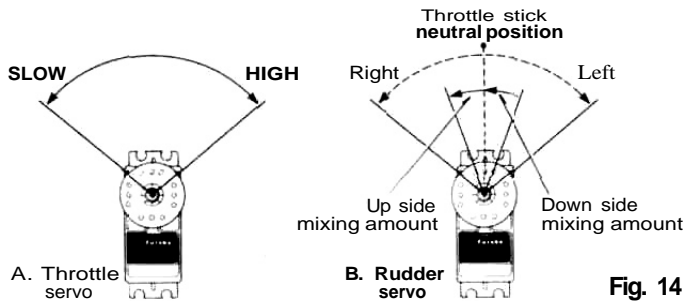


Fig. 14

• Revolution mixing adjustment

When the main rotor rotates, the helicopter attempts to turn in the opposite direction. To cancel this torque reaction, the pitch of the tail rotor (rudder) is increased. Revolution mixing performs this operation simultaneously with the throttle (engine control), and is necessary to fly a helicopter. (If used with a rate gyro, operation is much easier.)

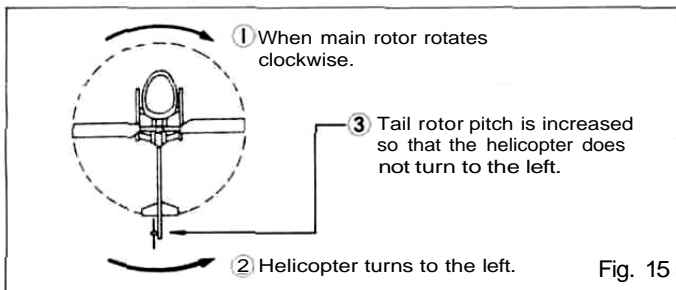


Fig. 15

- 1 Check the direction of operation of each servo. To reverse the direction of operation, switch the reverse switch.
- 2 Always set the idle up switch 14 and throttle hold switch 12 to OFF (pushed to the opposite side).
- 3 Make the basic adjustments described by the model helicopter manufacturer.
- 4 Check the left and right (up and down) throw of each servo. If the throw is incorrect, correct it by changing the position of the servo horn hole, etc.
- 5 Set the throttle stick 3 to about the center (medium slow) and install and link the servo horn at the neutral position.
- 6 Set the revolution mixing up side knob 11 to about divisor 5 and revolution mixing down side knob 10 to about divisor 7.
- 7 Check the engine throttle linkage.

- Throttle opened fully at throttle stick HIGH (up). Throttle closed fully at throttle MAXIMUM SLOW (down).
- Use ATL (Adjustable Throttle Limiter) trimming as much as possible.

This is convenient because the HIGH side does not change even if the LOW side is changed. Then set the throttle stick to its full operating width and set so that the pitch control servo operates over its maximum throw.

Regarding the main rotor variation width, select the servo horn position as specified by the model manufacturer.

- 8 After starting the engine and adjusting the needle, hover and adjust the aileron and elevator trim. Next, make the main rotor pitch at hovering somewhat large with the linkage.
- 9 Adjust the linkage so that the rudder trim is neutral at hovering.
- 10 After adjusting all the trim levers, adjust revolution mixing.
- 11 If the helicopter turns to the right during hovering after lift off, turn the revolution mixing down side knob clockwise. If the helicopter turns to the left, turn the knob counterclockwise.

12 If the helicopter turns to the left during hovering, turn the revolution mixing up side knob clockwise. If the helicopter turns to the right, turn the knob counterclockwise.

13 Rate gyro output adjustment (when FP-G153 used)

A position about 40% to 80% of the rate gyro control box scale should be sufficient. (Differs somewhat with the model.)

If the tail of the helicopter whips back and forth, the gyro output should be increased.

• Idle up adjustment

When the idle up switch is OFF, the throttle servo operates normally as shown in Fig. 16A. When the switch is ON, when the idle up trimmer is suitably set, the throttle servo changes to the maximum slow position as shown in Fig. 16B.

When idle up is used, hovering is stable and the rotor speed can be held even when the pitch is reduced during rolls and prettier maneuvers are possible.

- 1 Set the transmitter throttle (engine control) stick to maximum slow and set the idle up switch to ON and set the idle up trimmer to about 20 to 25%.
- 2 Next, set the idle up switch to OFF, start the engine, hover, and decide the speed at hovering. Set the idle up switch to ON, hover, and adjust the idle up trimmer so that the speed is about the same as, or somewhat slower than, that when the idle up switch is OFF. When the idle up trimmer is turned clockwise, the speed increases. When starting the engine and after use, always set the idle up switch to OFF.

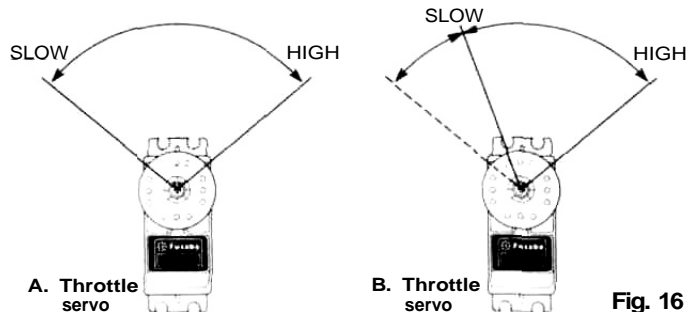


Fig. 16

• Aileron and elevator AST (Adjustable Servo Throw)

The servo throw is changed within the range shown by the hatched lines in Fig. 17 with the aileron & elevator AST trimmer. The throw can be adjusted from a maximum 100% to a minimum 40% by turning each trimmer with a flat blade screwdriver. Set to the throw matched to the model.

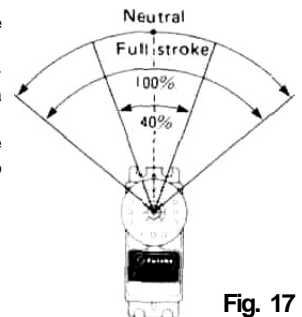


Fig. 17

• Throttle hold adjustment

When the throttle hold switch is pulled on, the throttle servo stops at the position set with the throttle trimmer. Trimmer scale division 0 is maximum slow. Setting to the high side is possible as the number of divisions increases. When the switch is OFF, the throttle servo is controlled by the transmitter throttle (engine control) stick. This device is used at auto rotation take off. After the engine is cut or at maximum slow (during practice), only the pitch control servo is operated (pick up) and safe take off is possible.

- 1 Set the throttle (engine control), throttle (engine control) switch and throttle (engine control) trimmer so that the engine throttle is fully closed at maximum slow.
- 2 Set the throttle trimmer so that the engine throttle becomes maximum slow when the throttle hold switch is set to ON (pulled forward) at autorotation practice. (Set so that the throttle is fully closed when the engine is cut.)
- 3 When the throttle hold switch is set to OFF (pushed back), the throttle (engine control) servo and pitch control servo mixing is performed. When the switch is set to ON, the throttle servo is held (maximum slow set by the throttle trimmer or fully closed) and only the pitch control servo operates.
- 4 When the hold switch is used at take off, etc., always hold switch to OFF after setting the transmitter throttle stick to slow. Also, before starting the engine, check if the idle up switch and throttle hold switch are OFF.

SPLINED HORNS

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

a) Angle divisions

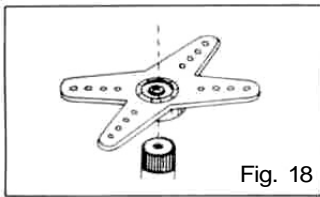


Fig. 18

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

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

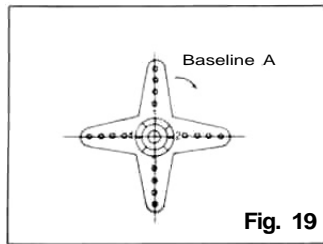


Fig. 19

To shift the holes center line to the right (clockwise) relative to baseline A, shift arm 2 to the position of arm 1 and set it 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.

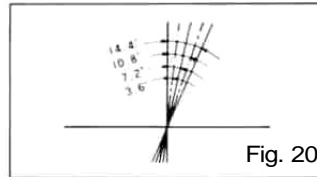


Fig. 20

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.

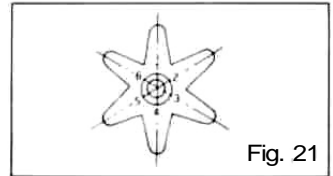
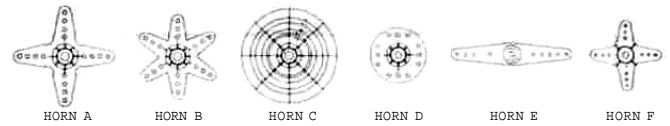


Fig. 21

The following splined horns are optional.

Fig. 22



FP-S130

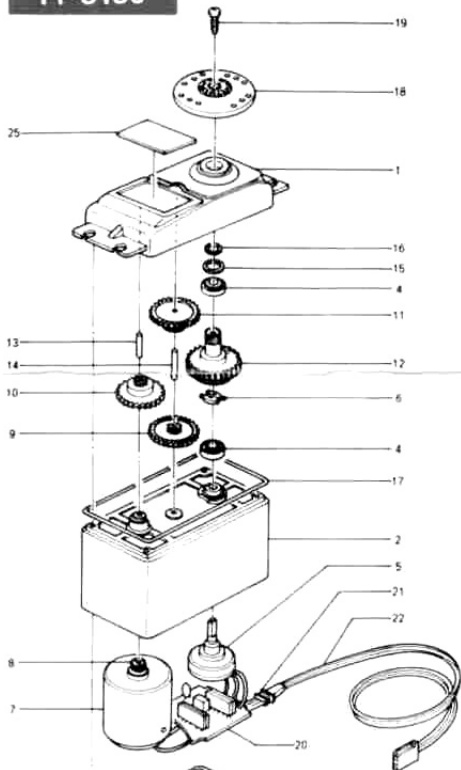
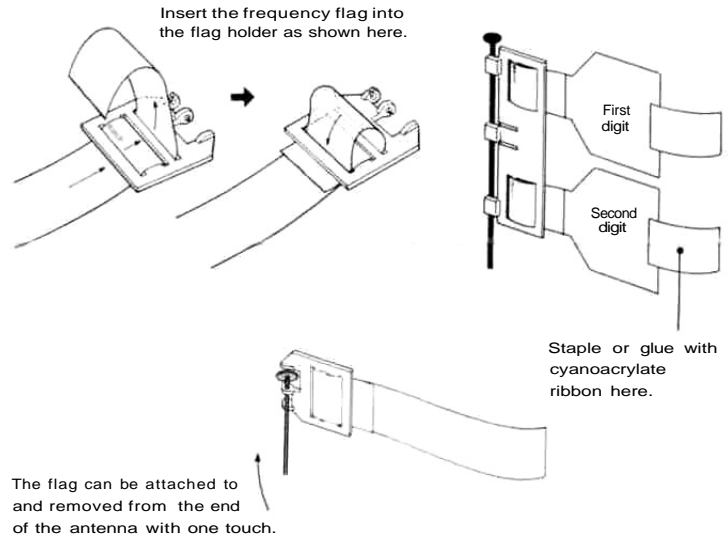


Fig. 23

No.	Part Name	Part No.
1.	Upper case	FCS-30
2.	Middle case	FCS-30
3.	Bottom case	FCS-30
4.	Ball bearing	S04130
5.	Potentiometer	139995
6.	VR drive plate	S02753
7.	Motor	S91243
8.	Motor pinion	S02461
9.	1st gear	FGS-30
10.	2nd gear	FGS-30
11.	3rd gear	FGS-30
12.	Final-gear	FGS-30
13.	2nd shaft	S02481
14.	Intermediate shaft	S02480
15.	Spacer washer 0.3T	S02486
16.	Seal ring	S90415
17.	O-ring	S90426
18.	Servo horn D	FSH-6W
19.	Horn mounting screw	FSH-41
20.	S130 printed wiring board	AS1220
21.	Lead wire packing	S90045
22.	S1303PB WRB.300	FPC.8M
23.	Screw O-ring	S90410
24.	Case mounting screw	J50085
25.	S130 Nameplate	S6010

USING THE ANTENNA FREQUENCY FLAG

Fig. 24



The flag can be attached to and removed from the end of the antenna with one touch.

REPAIR SERVICE

To insure prompt service, please follow the instructions given below.

1. Charge the batteries for at least 18 hours prior to shipment.
2. Return the system only. Not your complete initial/ation. Remove the servos from their mounts and remove the foam padding from the receiver.
3. Plugs or other modifications which interfere with factory test procedures will be returned to factory standard at your expense.
4. Carefully pack all components individually, using sufficient packing material to prevent damage during shipment.
5. Include a brief but thorough explanation of all problems and service required and tape it to the back of the transmitter. Place a label describing the function of the servo on each servo-
6. Be sure to include your full address and tel No., zip code inside the box as well as on the outside.
7. Include a packing list of all items being returned, and double check to make sure that all items are packed.
8. Upon receipt of your equipment at the Futaba factory, an estimate of the cost of repair (over \$25 00 only) will be sent to you. Your equipment will then be repaired and returned to you upon receipt of payment or C O D (cash)

This factory repair service applies only to the continental U.S.A., Hawaii, and Alaska.



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