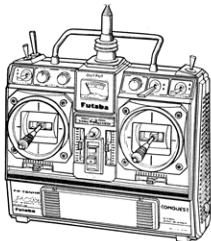


Futaba®

DIGITAL PROPORTIONAL
RADIO CONTROL

PCM



INSTRUCTION MANUAL

FP-6NHP 6 CHANNELS FOR HELICOPTER



FUTABA CORPORATION OF AMERICA
FUTABA CORPORATION

D60402

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

FEATURES

The PCM FP-6NHP is a 6 channel PCM proportional radio control set for helicopters the transmitter has been re-designed in pursuit of easier operation, as well as newly designed sticks for smooth and positive operation. This PCM system feature servo hold & fail safe function, servo reversing switches, aileron and elevator dual rate, throttle hold, pitch control trim, idle up, high & low pitch curve trimmer, and other innovations based on the opinions of many RC helicopter modelers.

TRANSMITTER FP-T6NHP

- An inverted flight ON/OFF switch is provided. The pitch control, elevator, and rudder servos are reversed for inverted flight when this switch is set to ON, inverted flight is then extremely easy.
- Reliability substantially improved by assembly of the PC board by industrial robot.
- Servo reversing switch. Servos are reversed by switching this switch.
- Aileron and elevator dual rate function. Steering angle can be arbitrarily set by switch and trimmer.
- Easy-to-adjust two-knob revolution mixing. Throttle → pitch control → rudder mixing.
- Pitch control trim knob. Since a steering angle of about 30% of the pitch control servo can be trimmed, the best pitch can be set.
- Throttle hold switch and trimmer for auto rotation.
- Idle up switch and trimmer. Since the rotor speed can be held even when the pitch is lowered, more perfect maneuvers are possible.
- New one-chip microcomputer allows setting of the fail safe function with one touch. Development of an automatic transfer system eliminates setting of the fail safe function at each flight and improves safety.
- Built-in power error backup circuit. When the battery nears the completely discharged state, an LED flashes to indicate that the memory circuit (fail safe function) is not operating.
- High & low pitch curve trimmer. Since the high side and low side of the pitch curve can be adjusted to the best position, pitch direction operation is easier.
- Rate gyro output can be switched by channel 5 switch (GEAR CH5).
- Throttle ATL. Adjustable throttle limiter type throttle trim. Since the high side is not changed even when the slow side is adjusted, linkage is extremely convenient.
- Newly designed open gimbal sticks operate smoothly and positively. Adjustment mechanism allows adjustment of the operating feel of the stick lever.
- Nonslip adjustable lever head allows adjustment of the stick length as desired.
- RF PC board inside module system.
- Transmitter has been re-designed in pursuit of easier operation.
- Easy to read square transmitter battery voltage level meter.
- Excellent radiation efficiency, strong 8-stage telescoping antenna.
- Hook is provided as standard. Operation is easier if the transmitter is hung from your neck by using the optional neck strap.

RECEIVER FP-R116GP

- High performance and high reliability miniature PCM receiver. The perfect receiver for radio control achieved by the introduction

of the newest microcomputer technology.

- Miniature PCM receiver with built-in high-speed one-chip micro-computer. Extremely resistant to adjacent band and spark noise interference.
- Computer servo hold function eliminates operation when a dead point is passed, etc.
- Computer fail safe function and battery fail safe function improve safety substantially.
- Error lamp display allows checking of the receiver operating state.
- High sensitivity design with RF amplifier.
- Ultra narrow-band ceramic filter and PCM system increase resistance to adjacent band interference.
- Connectors use plated pins that completely eliminate poor contact. The plastic housing has been specially designed to aid in. Reliability against shock and vibration.

SERVO FP-S128/S130/S131S

- The S128 uses a skew motor. Even one trimming step is faithfully followed by a skew motor that displays a performance near that of a coreless motor. Since the output torque is 3.5 kg-cm (max), it can be used with almost all models. Operating speed is 0.24 sec/60°.
- The S130 is a small, waterproof servo using a high quality five pole motor. Operating torque is 4 kg-cm and operating speed is 0.24 sec/60°.
- The S131S is a high torque and high speed servo using the highest quality coreless motor. It is a 5 kg-cm operating torque, 0.22 sec/60° operating speed waterproof type.
- New indirect drive potentiometer improves vibration and shock resistance and neutral precision.
- Futaba low-power custom IC provides high starting torque, narrow dead band, and excellent trackability.
- Fiberglass reinforced PBT (polybutylene terephthalate) molded servo case is mechanically strong and invulnerable to glou flow.
- Strong polycarbonate 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 gold plated connector points ensure positive contact and improve reliability against shock and vibration. The housing is polarized to prevent reverse insertion.
- Special pad bushings simplify servo installation and have a high vibration damping effect.
- Six special adjustable splined horns.

SET CONTENTS AND RATINGS

(Specifications are subject to change without prior notice.)

	FP-6NHP
Transmitter	FP-T6NHP x 1
Receiver	FP-R116GP x 1
Servo	FP-S128 x 4/S130 x 4/S131S x 4
Battery	NR-4J x 1
Switch	SSW-J x 1
Others	Battery charger, Frequency flag, Spare horn, Mounting screw.

Transmitter FP-T6NH	
Operating system	: Two-stick, 6 channels with servo reverse, aileron & elevator dual rate, helicopter functions
Transmitting frequency	: 72MHz band/50MHz, 53MHz band
Modulation	: PCM FM
Power requirement	: 9.6V Nicad battery (NT-8LP)
Current drain	: 230mA (at 9.6V)
Receiver FP-R116GP	
Receiving frequency	: 72MHz band/50MHz, 53MHz band
Intermediate frequency	: 455kHz
Power requirement	: 4.8V Nicad battery (shared with servo)
Current drain	: 24mA (4.8V reception)
Size	: 2.23 x 1.65 x 0.94 in (57 x 42 x 24mm)
Weight	: 1.85 oz (53g)
Receiving range	: 500m on the ground 1000m in the air When FP-T6NH used. (At the best radio wave condition of environment)

Servo FP-S128/S130/S131S		
Control system	: pulse width control, 1,520µS	
Operating angle	: One side 45° or greater (including trim)	
Power requirement	: 4.8V to 6V	
Current drain	: 6.0V 8mA (at idle)	(FP-S130)
Output torque	: 48.7 oz-in (3.5 kg-cm)	: 55.6 oz-in (4 kg-cm)
Operating speed	: 0.24 sec/60°	: 0.22 sec/60°
Size	: 1.59x0.78x1.59 in (40.5x20x40.5mm)	: 1.52x0.77x1.36 in (38.5x19.5x34.5mm)
Weight	: 1.87 oz (53g)	: 1.47 oz (42g)
Battery Charger FBC 88(4)		
Input voltage	: 120VAC 60Hz	
Output	: TX side 9.6V 50mA	
	: RX side 4.8V 50mA	

Receiver Servo Nicad Battery NR-4J	
Voltage	: 4.8V 4/500MAH
Dimensions	: 2.0 x 2.28 x 0.59 in (51 x 58 x 15mm)
Weight	: 3.34 oz (95g)

TRANSMITTER FP-T6NH CONTROLS

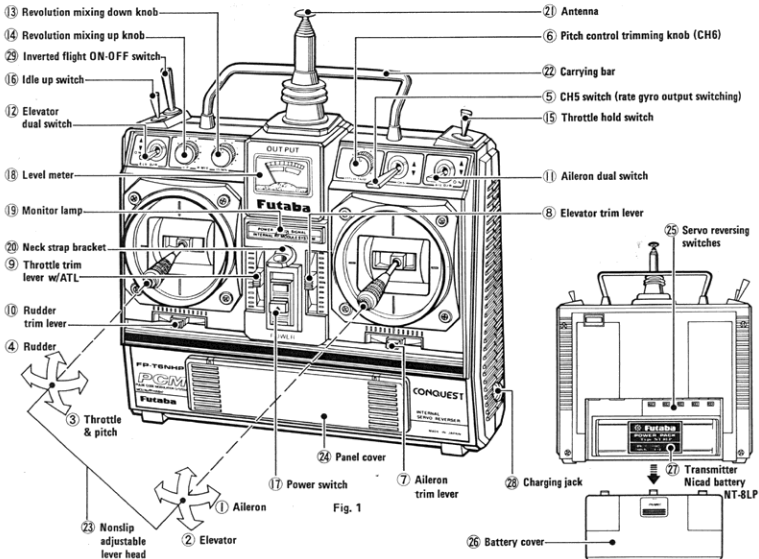


Fig. 1

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

- ① Aileron Aileron operation
- ② Elevator Elevator operation
- ③ Throttle Throttle & pitch control operation
- ④ Rudder Rudder operation
- ⑤ CH5 switch (CH5) Rate gyro output switching or landing gear operation
- ⑥ Pitch control trim knob (CH6)

This is the pitch control servo fine adjustment knob. About 30% of the total servo travel can be adjusted and set. This knob is used in hovering and other fine adjustments.

- ⑦ Aileron trim lever Aileron trimmer.
- ⑧ Elevator trim lever Elevator trimmer.
- ⑨ Throttle trim lever with ATL

This is an adjustable throttle limit (ATL) type trim lever. It operates as a trim lever only when the throttle stick is at the SLOW side as shown in Fig. 2. This lever is extremely convenient during linking, etc. because the HIGH side of the throttle position does not change even if the SLOW side is adjusted.

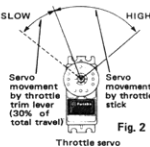


Fig. 2

Throttle servo

- 10 **Rudder trim lever** Rudder trimmer.
- 11 **Aileron dual rate switch**
This switch turns the aileron dual rate function on and off. The upper position is dual rate OFF and the lower position is dual rate ON. The steering angle is set with the trimmer [4] on the trimmer panel.
- 12 **Elevator dual rate switch**
This switch turns the elevator dual rate function on and off. The upper position is dual rate OFF and the lower position is dual rate ON. The steering angle is set with the trimmer [5] on the trimmer panel.
- 13 **Revolution mixing down side ratchet knob (down side knob)**
- 14 **Revolution mixing up side ratchet knob (up side knob)**
- These knobs adjust the pitch control → rudder mixing amount. The mixing amount is approximately 0 to 70% at both the up side and down side.
 - The mixing amount of the low side from the hovering position is adjusted with the down knob [13]. (Hovering position is 1/2 throttle.)
 - The mixing amount of the high side from the hovering position is adjusted with the up knob [14].

This is a mixing device for cancelling the reaction torque of the main rotor and is said to be the minimum mixing necessary for helicopter flight.

- The function of the revolution up side knob [14] and revolution down side knob [13] from the throttle stick neutral position can be adjusted individually.

15 **Throttle hold switch**
When this switch is ON, the throttle servo stops at the position set at trimmer [2] on the trimmer panel and only the pitch servo is operated by the throttle stick. This is used at auto rotation dives. When this switch is OFF, the throttle and pitch control are mixed. The switch is turned on when pulled forward.

16 **Idle-up switch**
When this switch is pulled forward, it is turned on and the throttle servo maximum slow position is set to the position set at the idle-up trimmer [3] on the trimmer panel.

If the idle-up switch and throttle hold switch are turned on at the same time, the throttle hold switch has priority.

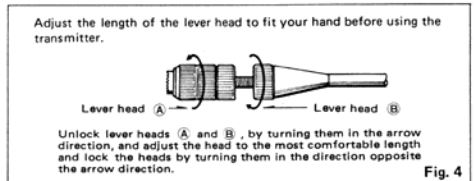
17 **Power switch** The upper position is ON.

18 **Level meter** This meter indicates the transmitter battery voltage.

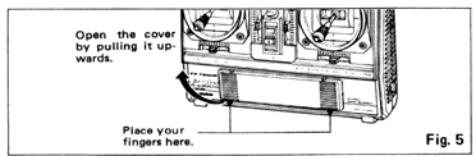
19 **Monitor lamp**
When the power switch is set to ON, the monitor lamp lights and the level meter pointer deflects.

- The monitor lamp goes out for a moment when the power switch is set to ON. This is because data is being transmitted. The lamp goes out once every 60 seconds so that the automatic transmission of the fail safe data can be monitored.
- When switch [8] on the trimmer panel is set to ON and switch [9] is pressed, this lamp goes out and data transmission can be monitored.
- When the battery nears complete discharge (when the transmitter battery is discharged), this lamp flashes to show that the fail safe memory circuit is not operating.

- 20 **Hook** Metal hook for the optional neck strap.
- 21 **Antenna** Strong high load antenna. Extend the antenna to its full length when using the transmitter.
- 22 **Carrying handle**
Use this handle to carry the transmitter from place to place.
- 23 **Non-slip adjustable lever head**
The length of the lever head can be adjusted to fit the operator.



24 **Panel cover**
To operate the trimmer panel switches and trimmers, open this cover as shown in the figure.



TRIMMER PANEL

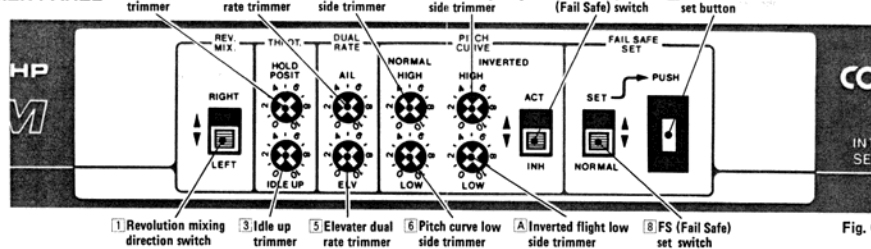


Fig. 6

- 1 **Revolution mixing direction switch**
When the main rotor rotates clockwise, set this switch to the RIGHT position. When the main rotor rotates counterclockwise, set this switch to the LEFT position. (The opposite may also be true, depending on the linkage.)
- 2 **Throttle hold trimmer**
This trimmer sets the throttle servo stop position when the throttle hold switch is set to ON. The total travel can be set.
- 3 **Idle-up trimmer**
This trimmer is effective when the idle-up switch is set to ON. It sets the throttle servo maximum slow position. The idle-up amount can be set as shown in the figure.

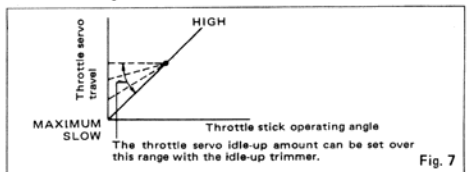


Fig. 7

- 4 **Aileron dual rate trimmer**
This trimmer adjusts the aileron travel when the aileron dual rate switch is set to the ON position. The aileron travel can be adjusted from 40% to 100% of the total travel. When the dual rate switch is set to ON, the servo throw can be set to an arbitrary angle smaller than when the dual rate switch is OFF (normal) as shown in the figure. Use the throw matched to the aircraft and the maneuvers to be performed.

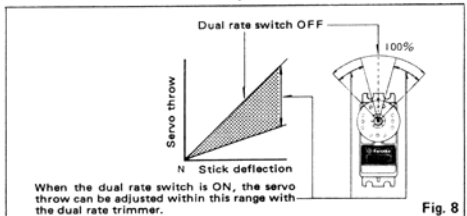


Fig. 8

- 5 **Elevator dual rate trimmer**
This trimmer sets the elevator travel when the elevator dual rate switch is set to the ON position. Its contents are the same as those of the aileron dual rate trimmer.
- 6 **Pitch curve low side trimmer**
This trimmer sets the low side throw of the pitch control servo when the throttle stick was operated.
- 7 **Pitch curve high side trimmer**
This trimmer sets the high side throw of the pitch control servo when the throttle stick was operated.

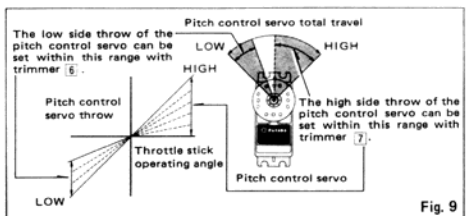


Fig. 9

- 8 **Fail safe set switch**
When memorizing the fail safe position of each servo at the transmitter, set this switch to the SET position.
- 9 **Fail safe set button**
This pushbutton switch is used when setting the fail safe servo position at the transmitter.

Fail Safe Setting

- When switch [8] is set to the SET position and this button is pressed, the positions of the servos the instant the button was pressed are memorized and sent to the receiver.
- Since this data can be sent automatically once every 60 seconds thereafter, this button does not have to be pressed at each flight.
- When this data is being transmitted, the monitor lamp goes out momentarily and transmission of the data can be confirmed.
- To prevent erroneous setting, set switch [8] to the NORMAL position at the end of one setting.
- When the receiver receives interfering signals or strong noise continuously, it enters the fail safe state and the servos move automatically to the positions previously memorized with the fail safe set button.
- When the noise or interference ceases, the fail safe function is reset automatically and operation can be continued.

- A **Inverted flight low-side trimmer**
B **Inverted flight high-side trimmer**
C **Inverted flight FS switch**

INVERTED FLIGHT SPECIFICATIONS

- The inverted flight function can be turned on and off with the [C] inverted flight FS switch on the trimmer panel.
 - * INVERT: Inverted flight function ON
 - * INH: Inverted flight function OFF
- When the [C] switch is in the INVERT (function ON) position normal flight → inverted flight switching can be performed with the [2] Inverted flight ON-OFF switch at the front top corner of the transmitter.
 - * When the [2] switch is pulled back, normal flight is selected. At this time, the pitch can be adjusted with trimmers [6] and [7] as usual.
 - * When the [2] switch is pushed forward, inverted flight is selected. At this time, the pitch control servo, elevator servo, and rudder servo are reversed and the pitch control servo low-side and high-side throws can be adjusted with trimmer [A] and [B].

When the [C] inverted flight FS switch and [2] (Inverted flight ON-OFF switch) are switched, the [A] inverted flight low-side trimmer and [B] inverted flight high-side trimmer operate the pitch control servo (servo connected to channel 6 of the receiver) as shown in the figure.

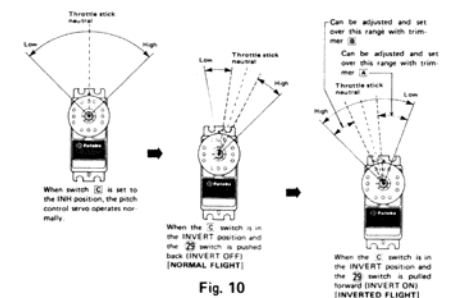


Fig. 10

PCM Proportional HOLD Function

- HOLD is a function which stops the servos at the correct position immediately before the erroneous signal was received when the receiver cannot receive the signal from the transmitter correctly for a short time.
- When the signal are received normally, normal operation can be resumed and flight is not disturbed. This is said to be the greatest feature of the PCM system.

PCM Proportional Fail Safe Function

- FAIL SAFE is a function which moves the servo of each channel (for example, engine slow, etc.) to a position preset on the transmitter when normal radio waves are not received by the receiver from the transmitter for a long time (one second or longer). (When not set, all the channels are set to neutral at fail safe.)
- When the direction of the transmitter antenna is changed or the interference disappears and normal radio waves are received, the fail safe state is released and operation can be resumed.

PCM Proportional Battery Fail Safe Function

- The battery fail safe function moves the throttle servo to a preset position as set by the fail safe function and alerts the operator to the danger when there is only a small amount of power left in the receiver Nicd battery. (If not set, the throttle servo will be set to medium slow automatically.)
- For a description of the battery fail safe setting method, see the fail safe setting method item.
- To release the battery fail safe of the stopped throttle servo, lower the throttle stick in the slow direction. When the throttle stick nears medium slow, battery fail safe is released and the throttle servo can be controlled for 36 seconds. Since battery fail safe will be set again after 36 seconds, quickly land the aircraft.

- 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.

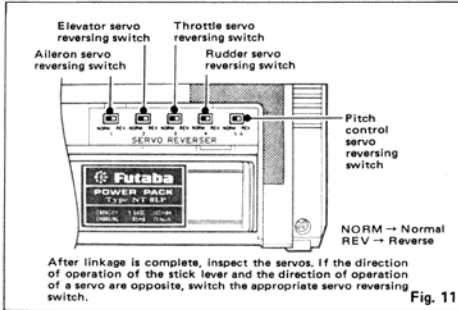


Fig. 11

- 26 **Battery cover**
Remove this cover when switching the servo reversing switches.

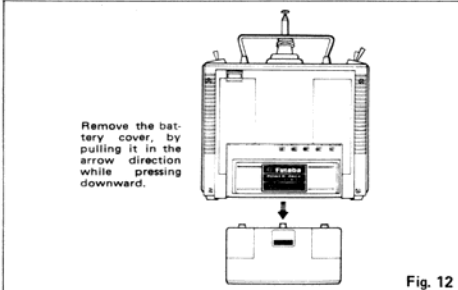
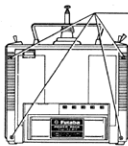


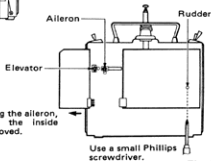
Fig. 12

The tension of the stick lever spring can be adjusted.



When these screws are removed, the back cover can be removed.

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.



When adjusting the aileron, and elevator the inside module is removed.

Use a small Phillips screwdriver.

Fig. 13

27) Transmitter Nicad battery NT-8LP

28) Charging jack Battery charge jack for built-in Nicad battery.

*CHARGING OF TRANSMITTER AND RECEIVER NICAD BATTERIES:

Recharge the receiver and transmitter Nicad batteries as shown in Fig. 14.

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.

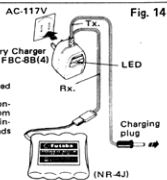
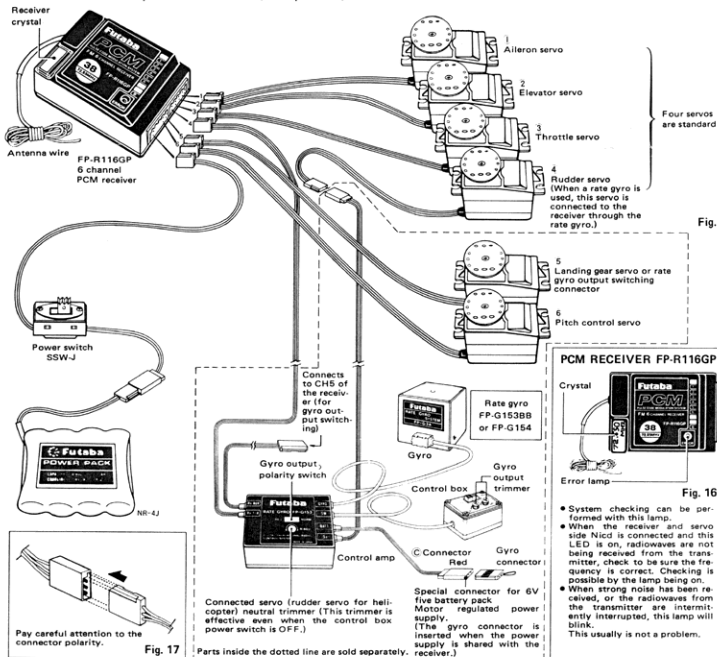


Fig. 14

- Connect the charging plug of the FBC-8B charger 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-R116GP, SERVO FP-S128 (S130, S131S)



PRECAUTIONS

- Connect the servos and switches as shown in the figure. Then extend the transmitter and receiver antennas fully.
- Set the transmitter power switch to ON. Then set the receiver power switch to ON. The servo 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 and check if the direction of travel of each servo matches the direction of operation of its transmitter stick.
- Operate each servo over its full stroke and check if the pushrod binds or is loose. Applying unreasonable force to the servo horn will adversely affect the servo and quickly drain the battery. Always make the stroke of each control mechanism somewhat larger than the full stroke (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.
- Touching of metal parts due to engine vibration, etc. will generate noise and cause the receiver servos to operate erroneously. 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.



Fig. 18 Receiver antenna Scissors

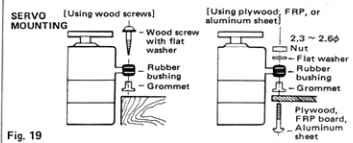


Fig. 19

- Install the servos securely. Refer to the figure.
- A spare horn is supplied. Use it 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 and 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 transmitter stick.
- After mounting and checking are complete, take your model to the shop where you bought the digital proportional set, or to an experienced R/C operator and ask them to inspect your set-up and to teach you how to use your R/C set properly.

AIRCRAFT ADJUSTMENT Make the linkages and adjustments described in the aircraft manufacturer's assembly instructions.

• GENERAL AIRCRAFT ADJUSTMENT METHOD

These adjustments are for main rotor clockwise rotation. Set the revolution mixing direction switch 1 on the trimmer panel to the RIGHT position.

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. 20A. If revolution mixing is applied at this time, the rudder servo operates with the throttle servo as shown in Fig. 20B. This throw is called the mixing amount. This rudder servo throw increases as the number of divisions of the scale increases. The rudder servo is operated as shown in Fig. 20B at the right rudder stick. However, if the throttle (engine control) stick is at SLOW, the neutral position is on the left and if the throttle (engine control) stick is at HIGH, the neutral position is on the right.

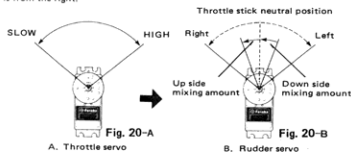


Fig. 20-A

Fig. 20-B

Revolution mixing adjustment

When the main rotor rotates, the aircraft attempts to turn in the opposite direction. To cancel this reaction torque, 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. (Operation is much easier if a rate gyro is used.)

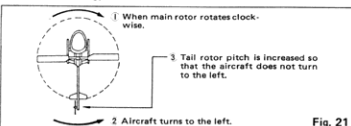


Fig. 21

- 1 Check the direction of operation of each servo. To reverse the direction of operation, switch the reversing switch.
- 2 Always set the idle-up switch 11 and throttle hold switch 15 to off (pushed to the opposite side).
- 3 Make the basic adjustments specified 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 so about the center (medium slow) and install and link the servo horn at the neutral position.
- 6 Set the revolution mixing up side knob 4 to about division 5 and the revolution mixing down side knob 13 to about division 7.
- 7 Check the engine throttle linkage.
- 8 Throttle opened fully at throttle stick HIGH (up).
- 9 Throttle closed fully at throttle MAXIMUM SLOW (down).
- 10 Use ATL (Adjustable Throttle Limiter) trim 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 travel.

For the main rotor variation width, select the servo horn position 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 aircraft linkage.
- 9 Adjust the aircraft linkage so that the rudder trim is neutral position.
- 10 After adjusting all the trimmers, adjust revolution mixing.
- 11 When the helicopter turns to the right while hovering after lift off, turn the revolution mixing down side knob clockwise. When the helicopter turns to the left, turn the knob counterclockwise.
- 12 When the helicopter turns to the left while rising from hovering, increase the mixing amount by turning the revolution mixing up side knob clockwise. When the helicopter turns to the right, reduce the mixing amount by turning the knob to counterclockwise.
- 13 Rate gyro output adjustment (when FP-G153BB is 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.

• IDEL-UP ADJUSTMENT

When the idle-up switch is OFF, the throttle servo operates normally as shown in Fig. 22A. When the switch is ON and the idle-up trimmer 13 is set suitably, the throttle servo changes to the maximum slow position as shown in Fig. 22B.

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

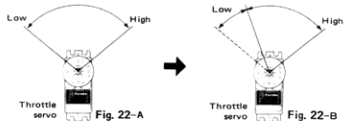


Fig. 22-A

Fig. 22-B

