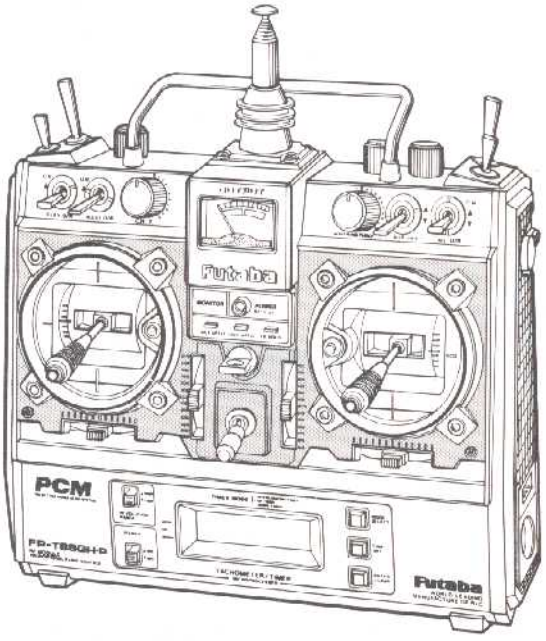
Futaba

DIGITAL PROPORTIONAL
RADIO CONTROL



PCM

PULSE CODE MODULATION SYSTEM

INSTRUCTION MANUAL

FP-8SGHP

FP-8SGHP PCM 8 CHANNELS
4 SERVOS FOR F3C HELICOPTER

FUTABA CORPORATION OF AMERICA
FUTABA CORPORATION

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

When reading this manual, refer to the foldout at the end of this manual.

CONTENTS

●FEATURES

The FP-8SGHP is a digital proportional R/C set with PCM (Pulse Code Modulation) for helicopters.
The system is extremely noise and dead-point resistant digital proportional R/C sets with a microprocessor in the transmitter and receiver.
The FP-8SGHP was specially developed for FAI RC aerobatics F3C use.
Please read this manual before using your set.

TRANSMITTER FP-T8SGHP

- RF module system. The frequency band can be changed with one touch.
- DSC (Direct Servo Controller). The servos can be operated without turning on the transmitter.
  Wire operation is also possible by using the special cord supplied with the set. (FSC-1)
- Servo reversing switch on all channels. The direction of operation of each servo can be reversed with the flip of a switch.
- Dual rates or non linear VTR (variable trace ratio) on the aileron, elevator, and rudder channels. Aileron and elevator dual rate can be switched simultaneously, or independently.
- Slantable newly developed open gimble sticks provide maximum operation feel. Stick angle and spring strength can be adjusted.
- Non-slip adjustable lever head. The stick length can be adjusted to match your hand.
- Easy-to-adjust two-knob revolution mixing. Pitch control → rudder and throttle → pitch control mixing.
- Acceleration mixing.
- Throttle hold function for auto-rotation.
- Throttle hold delay. The pitch servo operating time at throttle hold can be freely set with a built-in delay circuit.
- Four (4) pitch-curve trimmers for best pitch for hovering and maneuvering.
- Hovering throttle permits independent adjustment of the hovering point throttle position.
- Hovering pitch lever permits independent adjustment of the hovering point pitch without regard to the throttle.
- Two idle up functions used for static and dynamic aerobatics.
- Hovering memory reproduces the best mixing point at any throttle position & even during performance of flight.
- Throttle ATL (Adjustable Throttle Limiter) allows simple and reliable throttle linkage hook-up.
- Rudder button with timer is convenient in 540* stall turns.
- Tachometer/timer with built-in tachometer, up timer, down timer, integrating timer, and battery alarm.
- New ATV (Adjustable Travel Volume) on all channels allows independent pushbutton adjustment of servo left, right, up, and down throw.
- Second ATV. Besides new pushbutton ATV on aileron and elevator, conventional trimmer ATV is also installed.
- Monitor lamp glows when two idle up systems or throttle hold is set and flashes when they are working.
- Fail safe switch (safety switch). Internal switches that turn the throttle hold, idle up, and other functions on and off. If the internal switch is set to off beforehand, when that function is not used, it will not operate even if the switch on the transmitter is set to on.
- Built-in power error back-up circuit. When the internal Nicd battery approaches the fully discharged state, an LED blinks to indicate that the memory circuit (memory, ATV, FS, etc.) is not working.
- Two servo test functions. A slow sweep to check neutral characteristic, trackability and to cycle servo to test servo operation.
- Highest quality aluminum case with sophisticated design. The transmitter fits easily in your hand.
- Neck strap supplied as a standard accessory. The numerous functions of the transmitter can be easily performed by supporting the transmitter from your neck.
- Optional CCPM (Cyclic Corrective Pitch Mixing).

RECEIVER FP-R118GP

- The receiver is a miniature PCM receiver in which the highest reliability has been pursued. It is the first R/C receiver in the world to use the newest computer technology.
- Miniature PCM receiver with hi-speed single-chip microprocessor. Resistance against adjacent band and spark noise interference has been increased by one full order of magnitude.
- Microprocessor-controlled servo hold function eliminates erroneous operation when the "dead point" area is entered.
- Microprocessor provides fail-safe and battery fail-safe functions for greater safety.
- Error lamp display allows checking of the receiver operating state.
- DC-DC converter in the power supply improves the low-voltage operation characteristic.
- High sensitivity design with RF amplifier circuit.
- Ultra narrow-band ceramic filter and PCM system are practically invulnerable to adjacent band interference.
- Gold-plated connector pins eliminate poor contact. Polarized housing increases reliability against shock and vibration.
- DSC circuit. Each servo can be controlled from the transmitter without turning on the transmitter by connecting the transmitter directly to the C terminal.

SERVO FP-S130

- New indirect-drive potentiometer improve vibration and shock resistance and improves neutral precision tremendously.
- Futaba low-power custom IC provides high starting torque, narrow dead band, and excellent trackability.
- 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.
- Thick-film gold plated connector pins ensure positive contact and greater reliability against shock and vibration. The connector housing is polarized to prevent reverse insertion.
- Four special adjustable splined horns are available.

● CONTENTS AND RATINGS

Ratings and specifications are subject to change without prior notice.

Model	FP-8SGHP
Transmitter	FP-T8SGHP x 1 with module FP-TF-FM
Receiver	FP-R118GP x 1
Servo	FP-S130 x 4
Switch	SWH-5 (R4-SWJ) x 1
Nicd battery	NR-4J x 1
Accessories	Charger, extension cord, DSC cord (FSC-1), CHG adaptor, DSC-CHG cord, frequency flag, spare horn, neck strap, mounting screws, tachometer sensor (FTA-3)

Transmitter FP-T8SGHP

Operating system : Two-stick, 8 channels for helicopter
Transmitting frequency : 50/53MHz BANDS } Chosen
72/75MHz BANDS } band
53MHz ⟷ 72MHz
Frequency change to any of above bands is possible by merely changing RF module.
Modulation : PCM (FM)
Power requirement : 9.6V 8/500mAH internal Nicd battery (NT-8H)
Current drain : 250mA

Receiver FP-R118GP

Receiving frequency : 50/53MHz BANDS } Chosen
72/75MHz BANDS } band
Intermediate frequency : 455kHz
Power requirement : 4.8V Nicd battery (NR-4J-shared with servo)
Current drain : 42mA (at 4.8V reception)
Dimensions : 2.23 x 1.65 x 0.94 in (57 x 42 x 24mm)
Weight : 1.85oz (53g)
Receiving range : 500m on the ground
1000m in the air
When FP-T8SGHP used

Servo FP-S130

Control system : + pulse width control 1520μS.N
Operating angle : One side 45° or more (including trim)
Power requirement : 4.8V (shared with receiver)
Current drain : 5mA (at idle)
Output torque : 55.6oz-in (4kg-cm)
Operating speed : 0.24sec/60°
Dimensions : 1.52 x .77 x 1.36 in (38.5 x 19.5 x 34.5mm)
Weight : 1.47oz (42g)

Charger FBC-2A

Input voltage : 120VAC, 50/60Hz, 4VA
Output : Tx side 9.6V, 45mA
Rx side 4.8V, 45mA

Receiver and servo Nicd battery NR-4J

Voltage : 4.8V, 4/500mAH
Dimensions : 2.01 x 2.28 x 0.59 in (51 x 58 x 15mm)
Weight : 3.35oz (95g)

●TRANSMITTER

This section explains the operation of the transmitter controls when the servo reversing switches are in the normal position. When the reversing switches are in the reverse position, servo operation is the opposite of that described here.

①Aileron stick Controls the ailerons.
②Elevator stick Controls the elevators.
③Throttle stick Controls the throttle.
④Rudder stick Controls the rudders.
⑤CH5 switch Controls the rate gyro output.

⑥Hovering pitch lever Left side of transmitter

- The hovering point pitch can be independently adjusted without affecting the throttle.
- When the throttle stick ③ is near the center, the pitch servo can be adjusted over approximately 20% of its total travel with this lever.
- When the throttle stick ③ is at the Low or High side, this lever has no affect on the pitch servo, even if it is moved.

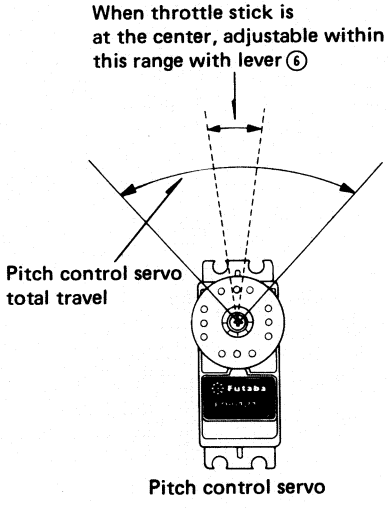


Fig. 4

⑦CH7 knob Spare channel.
⑧CH8 switch Spare channel.
⑨Aileron trim lever Aileron trimmer.
⑩Elevator trim lever Elevator trimmer.

⑪Throttle trim lever w/ATL

Adjustable travel trim lever. This lever acts as a trimmer only when the throttle stick is at the low side as shown in Fig. 5. It is very convenient because the high side of the throttle position remains unchanged even when the low side is adjusted.

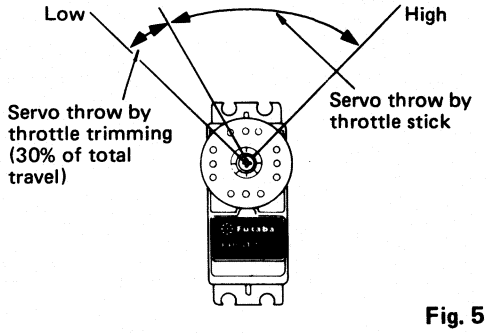


Fig. 5

⑫Rudder trim lever

Rudder trimmer.

⑬Pitch control HIGH side trim lever (CH6), Right side of transmitter

Pitch control servo High pitch trimmer. The servo throw can be adjusted from 0 to 30% of the total servo travel. Set this lever for optimum pitch during normal flight.

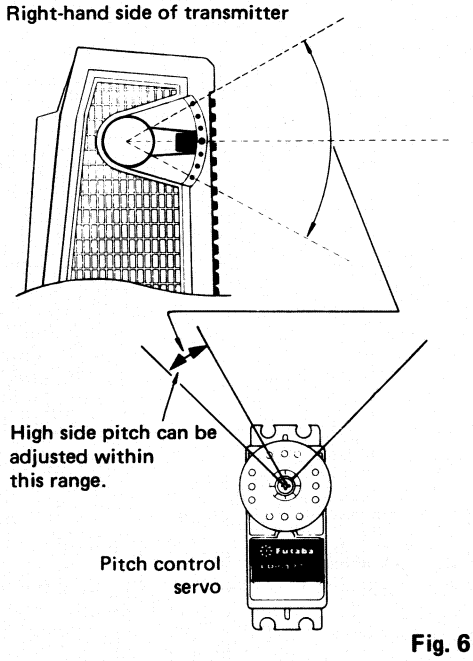


Fig. 6

⑭Aileron dual rate switch

Aileron dual rate ON-OFF switch. When set to the upper position, dual rate is turned on, and when set to the lower position, dual rate is turned off. At dual ON, the deflection can be set as shown in Fig. 7 with the [1] aileron dual rate trimmer located on the trimmer panel at the back of the transmitter. At dual OFF, the operating linearity can be switched as shown in Fig. 8 with the [2] LINEAR-VTR switch also located on the trimmer panel.

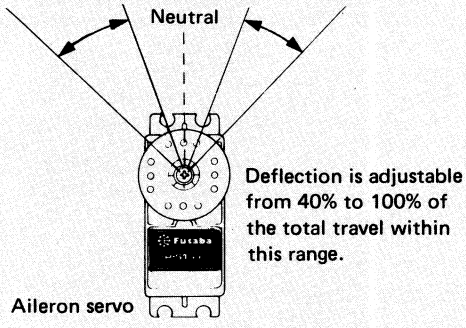


Fig. 7

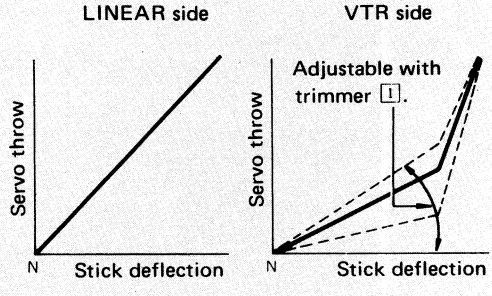


Fig. 8

⑮ Elevator dual rate switch

- Elevator dual rate ON-OFF switch
  Similar to aileron dual rate, the elevator deflection can be adjusted with the elevator dual rate trimmer [23] and LINEAR-VTR switching can be performed with switch [24]. Other functions are the same as elevator dual rate.
- Aileron dual rate and elevator dual rate can be switched ON and OFF simultaneously (combination ON-OFF) or separately by setting switch [25] on the trimmer panel at the back of the transmitter. In the simultaneous ON-OFF mode, aileron dual rate and elevator dual rate are turned on and off with the aileron dual rate switch ⑭.

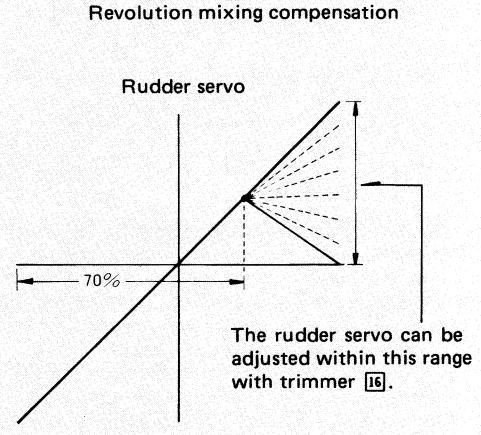
⑯ Rudder dual rate switch

Rudder dual rate ON-OFF switch. Similar to aileron dual rate, the rudder deflection can be adjusted with the rudder dual rate trimmer [20] and LINEAR-VTR switching can be performed with switch [21]. Other functions are the same as aileron dual rate.

⑰ Revolution mixing up side ratcheted knob (UP knob)

⑱ Revolution mixing down side ratcheted knob (DOWN knob)

- These knobs vary the pitch control — rudder mixing amount from 0 to 70% of the total travel at the up and down sides. This mixing is performed when the hovering memory switch ㊱ on the back of the transmitter is set to ON, when switch ㊱ is set to OFF, mixing is not performed even if knobs ⑰ and ⑱ are turned. The UP knob ⑰ adjusts the high side mixing amount from the memorized throttle stick hovering position. The DOWN knob ⑱ adjusts the low side mixing amount from the memorized throttle stick hovering position.
- Switch [22] on the trimmer panel changes the mixing direction and releases the mixing function.
- The mixing amount to the rudder (pitch control → rudder) is controlled by adjusting the revolution mixing compensation with trimmer [16] in Fig. 9.



When this compensation is suitably applied, the high speed linearity in the air is improved and power loss is minimized.

Fig. 9

⑲ Idle up ① switch (① switch)

This switch is turned on when pulled forward and is turned off when pushed back.

⑳ Idle up ① ratcheted knob (① knob)

- When the ① switch ⑲ is set to ON, the throttle servo "stop position" (idle up amount) can be adjusted with this knob.
- If fail safe switch [13] on the trimmer panel at the back of the transmitter is set to the INH position, the idle up ①function is inoperative. Light goes out to indicate that. When switch [13] is set to the IDLE1 position, monitor lamp Ⓑ comes on to indicate that the idle up 1 function is operative. If the switch ⑲ is then set to ON, lamp B flashes to indicate that the idle up ① function is operating.

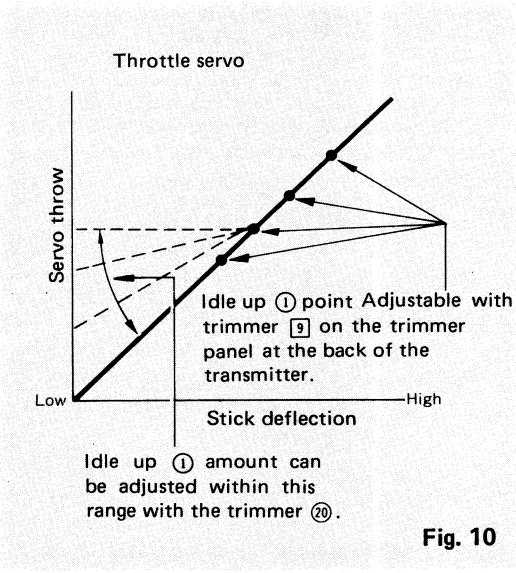


Fig. 10

㉑ Idle up ② switch (② switch)

This switch is turned on when pulled forward and is turned off when pushed back.

- When the ② switch ㉑ is set to ON, the throttle servo idle up point can be adjusted with trimmer [10] on the trimmer panel at the back of the transmitter. The idle up ② point can also be adjusted with trimmer [11].
- When fail safe switch [14] on the trimmer panel at the back of the transmitter is set to the INH position, the idle up ② function is inoperative. When the switch is set to the IDLE2 position, monitor lamp Ⓒ comes on to indicate that the idle up ② function is operative. If the ② switch ㉑ is then set to ON, lamp Ⓒ goes out to indicate that the idle up ② function is operating.

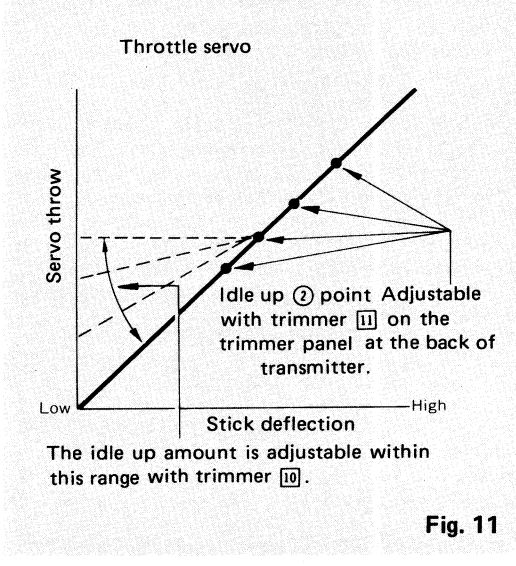


Fig. 11

- The pitch control servo low side can also be adjusted with trimmer [6] (when idle up switch ② is ON). This is convenient in rolls and other aerobatics.

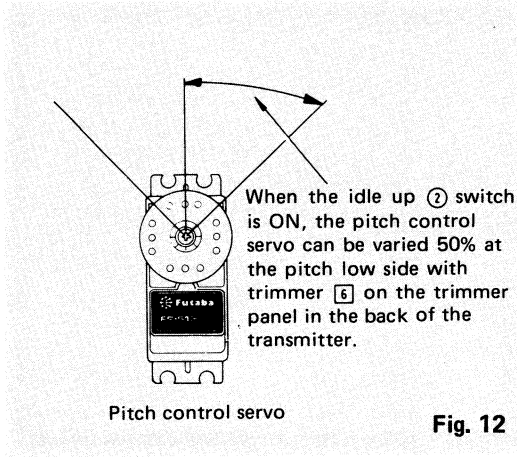


Fig. 12

㉒ Hovering throttle ratcheted knob

- Trims the throttle servo independently from the pitch control servo (without regard to mixing). Since the throttle servo can be trimmed without interfering with other mixing, this knob is very convenient when trimming the throttle while hovering.
- When the throttle stick ③ is at about the center, the throttle servo throw can be adjusted about 25% of the total travel with this knob.
- When the throttle stick ③ is at the low or high sides, the throttle servo does not operate even if this knob is turned.

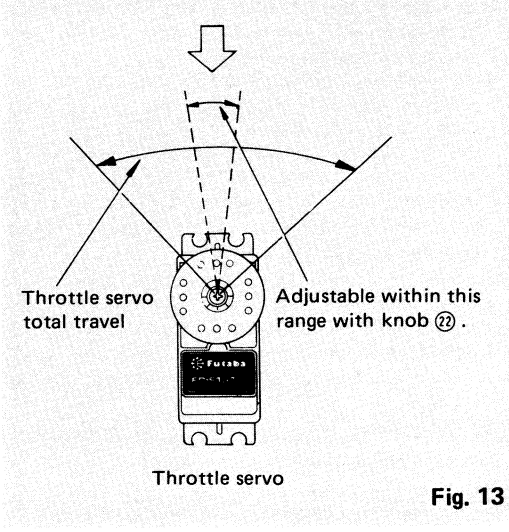


Fig. 13

㉓ Throttle hold switch (TH switch)

This switch is turned on when pulled forward and is turned off when pushed backward.

- This switch is used during auto-rotation. If this switch is set to ON when the throttle switch ③ is in the maximum slow position, the throttle servo will stop at the position (idling or engine stop) set at trimmer [8] on the trimmer panel at the back of the transmitter. At this time, the time set at trimmer [7] (throttle hold delay) is applied and the pitch control servo is set to the optimum pitch for auto-rotation set with trimmer [5]. This setting can be made without regard to the position of the pitch control high side trimmer lever ⑬.
- When fail safe switch [12] on the trimmer panel at the back of the transmitter is set to the INH position, the throttle hold function is inoperative. When it is set to the T.HOLD position, monitor lamp Ⓓ comes on to indicate that the throttle hold function is set.
  If the TH switch ㉓ is then set to ON, lamp Ⓓ goes out to indicate that throttle hold is being performed.

㉔ Monitor lamps

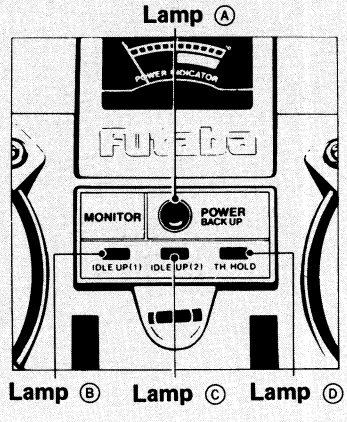


Fig. 14

Lamp Ⓐ
When the power switch ㉚ is set to ON, this lamp comes on and the level meter pointer simultaneously deflects. When the internal Nicd battery approaches full discharge, this lamp goes out to indicate that the memory circuit (memory, ATV, FS, etc.) is not working.

Lamp Ⓑ
When fail safe switch [13] on the trimmer panel at the back of the transmitter is to the IDLE1 position (idle up ① function ON), this lamp lights. When the idle up ① switch ⑲ is set to ON, this lamp goes out.

Lamp Ⓒ
When fail safe switch [14] on the trimmer panel at the back of the transmitter is set to the IDLE2 position (idle up ② function ON), this lamp comes on. When the idle up ② switch ㉑ is set to ON, this lamp goes out.

Lamp Ⓓ
When fail safe switch [12] on the trimmer panel at the back of the transmitter is set to the T.HOLD position (throttle hold function ON), this lamp comes on. When the throttle hold switch ㉓ is set to ON, this lamp goes out.

Functions priority
Lamp Ⓑ (Idle up ①)
Lamp Ⓒ (Idle up ②)
Lamp Ⓓ (Throttle hold)
The function priority is hold → idle up ② → idle up ①. Lamps Ⓑ, Ⓒ, and Ⓓ come on when the pertinent fail safe switch ([13], [14], [12]) is set to the ON position. When the idle up ① switch ⑲ is set to ON, lamp Ⓑ goes out. Keeping the idle ① switch ⑲ in the ON position, try setting the idle up ② switch ㉑ to ON. Lamp Ⓑ comes on and lamp Ⓒ goes out, indicating that the idle up ② function has priority. Similarly, if the throttle hold switch ㉓ is set to on while the ① switch ⑲ and ② switch ㉑ are ON, lamps Ⓑ and Ⓒ go out, indicating that the throttle hold function has priority.

㉕ Slantable stick

The tilt of the stick lever can be adjusted.

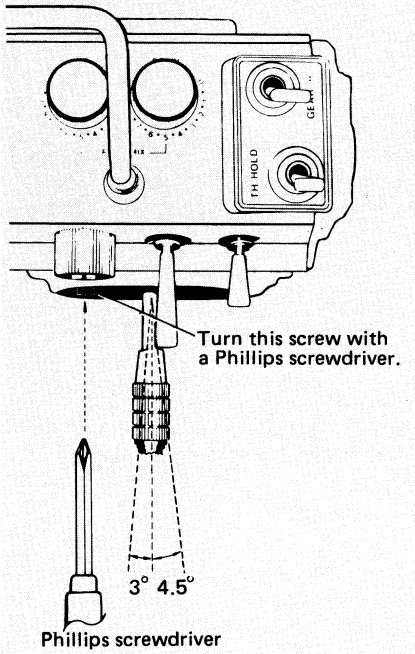
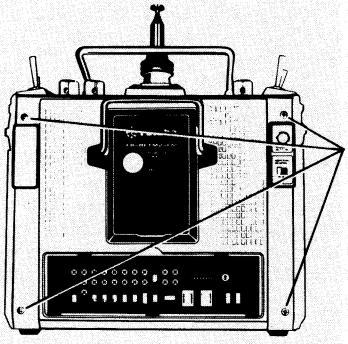


Fig. 15

The open gimbal slantable stick mechanism allows adjustment of the stick lever to any angle between 3° to the inside and 4.5° to the outside by turning the adjusting screw as shown in Fig. 16. Set the lever to the angle at which it is easiest to use.

The strength of the stick lever spring can be adjusted.



MODE I

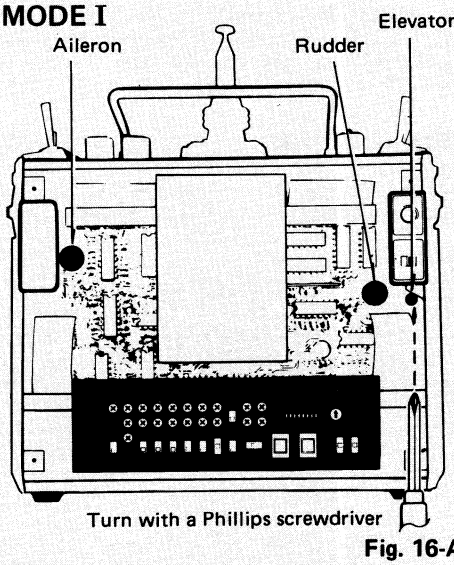


Fig. 16-A

The desired spring force can be obtained by removing the rear cover and turning the screw of the desired stick as shown in Fig. 16-A. Adjust the spring force for easiest operation and best feel.

㉖ Non-slip adjustable lever head

The length of the lever head is adjusted to suit the operator.

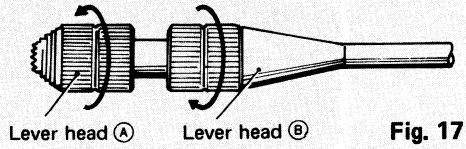
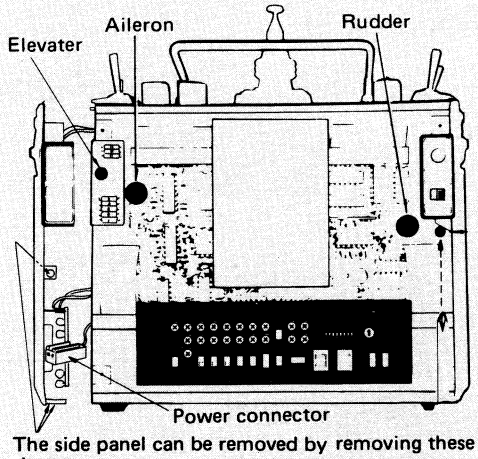


Fig. 17

Unlock lever head Ⓐ and Ⓑ , by turning them in the arrow direction, set head Ⓐ to the desired length, then relock the heads.

MODE II

① Remove the three screws shown and remove the transmitter righthand side panel as shown in Fig. 16-B.
② Displace the side panel away from the case. (slide down-off)
③ Disconnect the power connector.
④ Adjust the spring tension.
⑤ Cautions
- Be sure that the PC board attached to the side panel does not touch the transmitter case.
- Disconnect the power connector before side panel completely off, while side down-ward, to avoid touching with TX case.
- When the power connector is disconnected, the memorized contents (ATV, FS, etc.) are cleared. When flying again, reset the contents.



The side panel can be removed by removing these three screws.

Fig. 16-B

㉗ Tachometer/timer

The tachometer/timer has the following functions:

① Tachometer

- **Measurement by external sensor.**
- **Two blade propeller specifications.**
- **LOW range** — **100 to 30,000 rpm, Error ±100 rpm**
- **HIGH range** — **100 to 60,000 rpm, Error ±200 rpm**

② UP TIMER

- **0 to 60 minutes with seconds displays.**

③ DOWN TIMER

- 60 to 0 minutes with seconds display

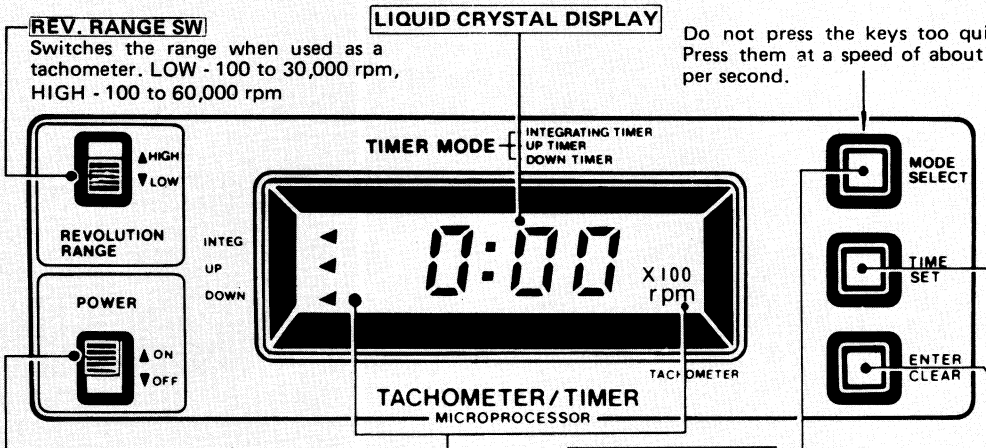
④ INTEGRATING TIMER

- 0 to 60 hours with minutes display

⑤ Battery alarm

- This alarm sounds when the transmitter nicd battery approaches its limit.

NOMENCLATURE AND FUNCTIONS



POWER SW
Tachometer/timer power switch.

MODE SEL KEY SW
Selects the tachometer/timer mode.

The INTEGRATING TIMER mode is selected and 0:00 is displayed when the power is turned on.

The first time this switch is pressed, the UP TIMER mode is selected and 0:00 is displayed.

The second time it is pressed, the DOWN TIMER mode is selected and 0:00 is displayed.

The third time it is pressed, the TACHOMETER mode is selected and 0 is displayed.

The fourth time this switch is pressed, the tachometer/timer returns to the INTEGRATING TIMER mode and 0:00 is displayed.

MODE DISPLAY
◂ is displayed at the mode selected at the MODE SEL key switch.

- 0:00 — INTEGRATING TIMER. Blinks during counting and stops blinking when counting stops.
- 0:00 — UP TIMER
- 0:00 — DOWN TIMER
- 0 — TACHOMETER

TIME SET KEY SW
This switch sets the alarm time in the UP TIMER and DOWN TIMER modes. One minute is set each time this key is pressed. If it is pressed and held for two seconds or longer, the time is set in 5 minute steps.
A beeping signal begins 10 seconds before the dot time. A beep is produced every minute to indicate the lapse of time.

ENTER KEY SW
This switch is used for memorization, starting, stopping, and clearing in the UP TIMER and DOWN TIMER modes. In the INTEGRATING TIMER mode, this switch acts as the reset switch.

Do not expose the display to direct sunlight for a long time.

Fig. 18

OPERATING INSTRUCTIONS

① Tachometer

Set the tachometer/times POWER switch to ON. [0:00] appears on the display. Next, press the MODE SEL key switch at the upper-right corner three times. The display changes to [0.2] and the tachometer mode is selected. Hold the sensor about 20 to 30 cm from the rotating propeller (two blade). The propeller speed is displayed on the LCD.

[123] indicates that the propeller is rotating at 12,300 rpm. For propeller speeds up to 30,000 rpm, set the REVOLUTION RANGE switch at the upper left-hand corner to LOW and for propeller speeds above 30,000 rpm, set the REVOLUTION RANGE switch to HIGH.

The speed of a three blade propeller is displayed value ÷ 3 x 2.

The speed of a four blade propeller is ½ the displayed value.

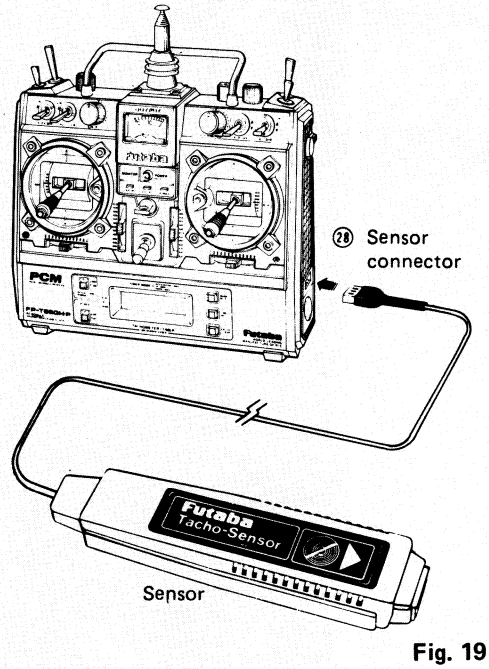
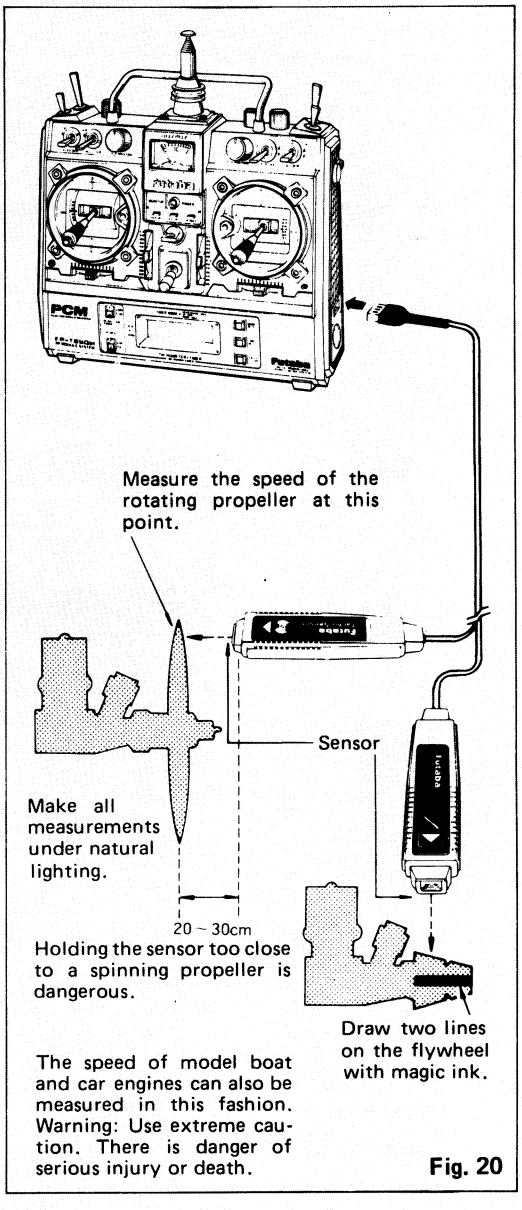


Fig. 19

Connect the accessory tachometer sensor to the sensor connector ㉘ as shown above.

Make all speed measurements outdoors under natural lighting. Accurate speed measurements cannot be made indoors under artificial lighting because of the affect of the 50 or 60 Hz power.



The speed of model boat and car engines can also be measured in this fashion. Warning: Use extreme caution. There is danger of serious injury or death.

Fig. 20

To measure the speed of the main rotor of a model helicopter, measure the speed of the tail rotor as shown in Fig. 21 and calculate the exact speed from the equation.

$$\text{Main rotor speed} = \frac{\text{Tail rotor speed}}{\text{Main rotor and tail rotor gear ratio}}$$

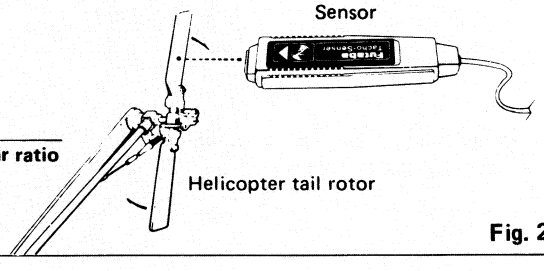


Fig. 21

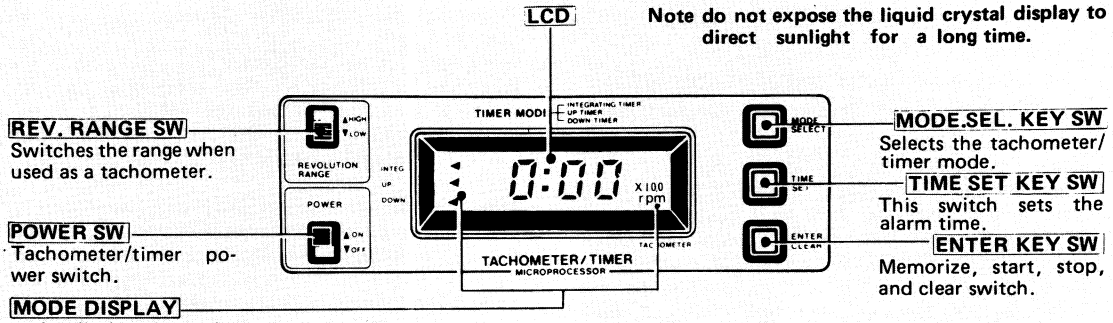


Fig. 22

② UP TIMER

Set the tachometer/timer POWER switch to ON. 0:00 is displayed. Next, press the MODE.SEL key switch at the upper right-hand corner one time. The display changes to ◂ 0:00, and the UP TIMER mode is selected. When the ENTER key switch at the bottom right-hand corner is pressed, a beep is head and the timer starts and the second digit of the display changes every second. A beep is produced every minute to indicate the passage of time. To stop counting, press the ENTER key switch again. The usage time is displayed on the display. For example, ◂ 12:05 means that 12 minutes 05 seconds had elapsed. The UP TIMER mode can be used as a second stop watch. To clear the display, press the ENTER key switch again.

ALARM SETTING

The alarm can be set with the TIME SET key. Clear the display, by pressing the ENTER key, then press the TIME SET key twice.

◂ 2:00 appears on the display indicating that two minutes was set. Next, press the ENTER key once to memorize this two minutes. The display changes to ◂ 0:00 and is memorized. Start the timer by pressing the ENTER key. The display changes every second. When the display reaches ◂ 1:51, the timer keeps ten times. every once a second, to indicate that two minutes have elapsed. Thereafter the timer continues to count up to 60 minutes. If the TIME SET key is pressed and held for two seconds or longer when memorizing the alarm time, the time is set in five minute steps and the set alarm times are memorized until the power is turned off or reset. If the timer is started without setting the time after the display has been cleared, the previously set alarm time remains effective. An arbitrary alarm time up to 59 minutes can be set.

③ DOWN TIMER

Set the tachometer/timer POWER switch to ON and press the MODE SEL key twice.

0:00 appears on the display to indicate that the DOWN TIMER mode was selected. Next, press the ENTER key. The timer keeps. 60:00 appears on the display, and the display begins to count down every second. The timer keeps every second from 10 seconds before the end of the count-down, the same as the UP TIMER.

TIME AND ALARM SETTING

Set the time and alarm with the TIME SET key, the same as the UP TIMER. To set the alarm to 3:00 at the display, clear the display by pressing the ENTER key, then press the TIME SET key three times. Next, memorize this time by pressing the ENTER key again. The display begins to count down in seconds. When the display begins to count down in seconds. When the display reaches 0:09, the timer begins to keep every second to indicate that three minutes have elapsed. If the TIME SET key is pressed and held for two or more seconds, the time is set in five minute steps, the same as the UP COUNTER, and the alarm can be set to any desired time up to 33 minutes.

④ INTEGRATING TIMER

Set the tachometer/timer POWER switch and the transmitter power switch to ON. The ◂ blinks, counting begins, and the elapsed time is displayed in minutes. For example, 0:03 indicates that three minutes have elapsed. If the transmitter power switch is set to OFF, counting stops. When the transmitter power switch is turned back on, counting continues. The integrating timer function can be started and stopped as long as the tachometer/timer POWER switch is on even if another mode is selected with the MODE.SEL key. This can be used to monitor the transmitter operating time. If the ENTER key is pressed in the INTEGRATING TIMER mode, the old integrating time is cleared and a new count begins. This can be used to forecast the remaining Nicd battery capacity and other applications.

㉘ Tachometer sensor connector

The tachometer sensor connects to this connector as described in the preceding item.

When this connector and charging connector ㉙ are not in use, cover them with the rubber-backed cover supplied.

㉙ Charging and DSC (Direct Servo Controller) connector

This connector is used as both the internal Nicad battery charging connector and the DSC connector.

Always charge the battery before use.

- Connect the DIN connector of the FBC-2 charger to the transmitter charging connector and the 3P connector to the receiver/servo NR-4J battery, and plug the charger into a 120 VAC outlet as shown in Fig. 23. The charger Tx and Rx LEDs light to indicate that the battery is charging. The battery can also be charged through the DSC-CHG cord by installing the CHG adaptor to the charger as shown in Fig. 23. The NR-4J receiver/servo Nicad battery can be charged while inside the aircraft.
- Normally charge the battery for about 15 hours. When the battery has not been used for some time, discharge it 2 to 3 times before charging. (Leaving the battery discharged for a long time will lower the battery capacity and shorten the battery life.)
- The transmitter and receiver Nicad batteries can be charged simultaneously or independently.
- A fully charged transmitter battery can be used for about 10 flights of 10 minutes each. The receiver and servo NR-4J Nicad battery can be used for about 4 flights when used as a common power supply with the rate gyro and for about 6 flights when a separate rate gyro power supply is used.

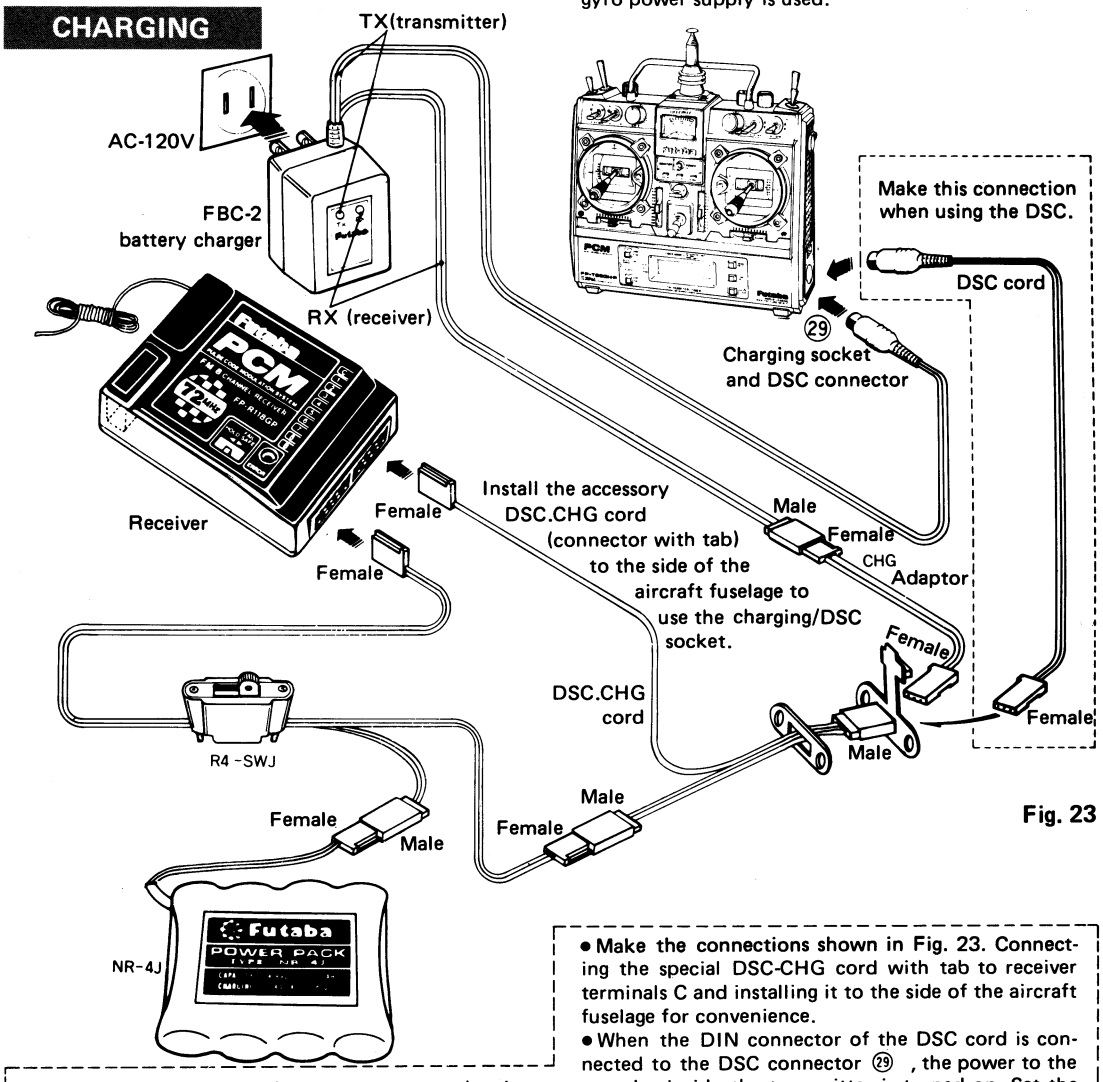


Fig. 23

- The direct servo control system connects the signals from the transmitter directly to terminal C of the receiver through a wire and controls the servos without turning on the transmitter. It is extremely convenient when flying on the same band during competitions, etc.

- Make the connections shown in Fig. 23. Connecting the special DSC-CHG cord with tab to receiver terminals C and installing it to the side of the aircraft fuselage for convenience.
- When the DIN connector of the DSC cord is connected to the DSC connector ㉙, the power to the encoder inside the transmitter is turned on. Set the transmitter power switch to OFF.
- When not using the DSC, disconnect the DIN connector.
- To operate the servos, turn on the receiver and servo switches.

㉚ Power switch

Transmitter lock-type power switch. To turn the switch on and off, pull the knob forward and set it to the desired position.

㉛ Hook

Metal hook for the accessory neck strap.

㉜ Antenna

Strong 1m 10cm telescoping antenna. Extend the antenna to its full height when using the transmitter. The antenna will lock in place with a click when pulled up to its full height.

㉝ Carrying bar

Use this handle when carrying the transmitter from place to place.

㉞ Level meter

- This meter indicates the transmitter battery voltage and output power (power meter).
- When the antenna ㉜ is fully extended and the power switch ㉚ is set to ON, the pointer should deflect to the white zone.
- If the transmitter RF module ㊲ is removed, the level meter pointer will not deflect even if the power switch ㊲ is set to ON.
- If the meter pointer deflects to the red zone, indicating that the Nicd battery voltage is low, the range of the radiowaves will become shorter and the tachometer/timer ㉗ battery alarm ⑤ will operate. If the meter pointer deflects to the boundary between the white and red zones, recharge the battery.

㉟ Rudder button

- While this button is being pressed, the rudder moves to the deflection angle preset at trimmer [17] on the trimmer panel at the back of the transmitter. After the time set at trimmer [18] elapses, the rudder servo returns to the neutral position. This is convenient when making 540° turns.
- The rudder servo left and right throw can be set with trimmer [17]. When fail safe switch [19] is set to the INH position, the rudder button ㉟ becomes inoperative. When the fail safe switch is set to the RUD.REV position, the rudder button becomes operative.

㊱ Hovering memory switch

- This switch turns the memory function which memorizes the rudder mixing hovering point on and off. When it is set to OFF, the revolution mixing knobs ⑰ and ⑱ become inoperative.
- When this switch is set to ON when hovering, the position of the throttle stick ③ is memorized.
- The revolution mixing up knob ⑰ and revolution mixing down knob ⑱ can be independently adjusted and set from the throttle stick ③.

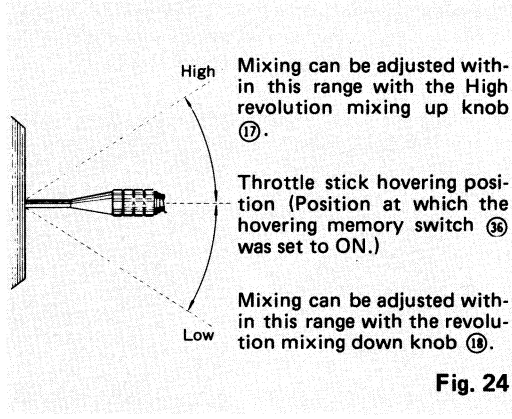


Fig. 24

㊲ Transmitter RF module

Change this module to switch frequency among different bands.

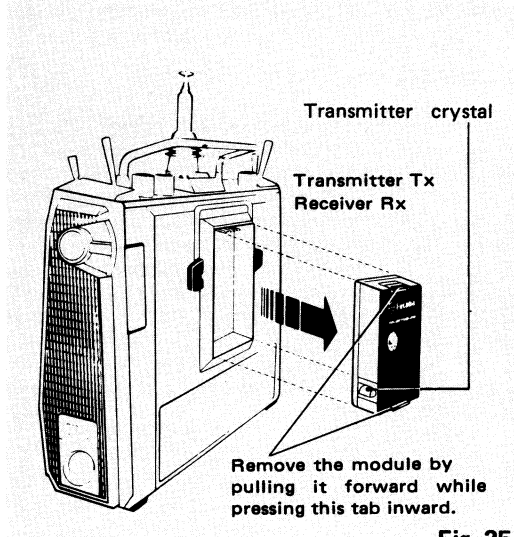


Fig. 25

㊳ Mini stand

Raise this stand as shown in Fig. 26 when laying down the transmitter. This stand makes operation easier and protects the back cover of the transmitter when the transmitter is laying it on its back.

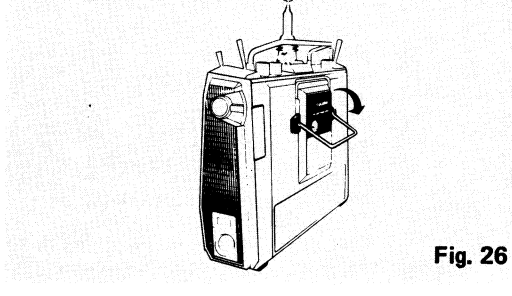
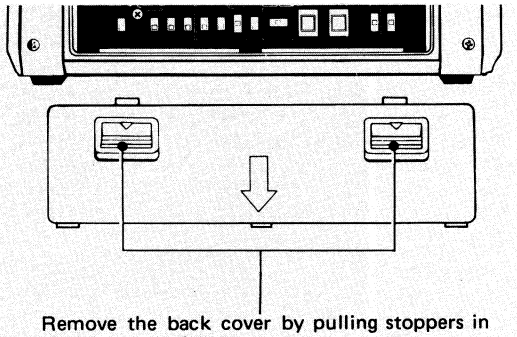


Fig. 26

㊴ Back cover

To operate the trimmers and switches on the trimmer panel ㊵, remove this cover as shown in Fig. 27.



Remove the back cover by pulling stoppers in the direction of arrows.

Fig. 27

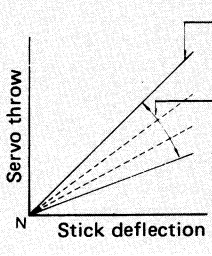
㊵ Trimmer panel

Switch and adjust the trimmers and switches on this panel with the small flat blade screwdriver supplied.

Ⓐ Ailerons

Fig. 28

1 Ailerons dual rate trimmer
This trimmer sets the aileron deflection angle when the aileron dual rate switch ⑭ is set to the ON (upper) position. The deflection angle is adjustable 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 that when the dual rate switch is OFF (normal) as shown in Fig. 29. Use the throw matched to the helicopter and maneuvers to be performed.



Dual rate switch OFF (Switch 2 in LINEAR position)

When the dual rate switch is ON, the servo throw can be adjusted (within this range) with the dual rate trimmer.

Fig. 29

Fig. 30

2 LINEAR↔VTR switch
This switch switches the travel linearity of the aileron servo when the aileron dual rate switch ⑭ is in the OFF position.

- When this switch is set to the LINEAR position, servo tracking is directly proportional to the deflection of the transmitter stick as shown by curve B of Fig. 29.
- When this switch is set to the VTR (Variable Trace Ratio) position, the maximum servo throw is the same as LINEAR shown in Fig. 31. However, servo tracking is the same as the dual rate switch ON up to about 80% of the total travel. Servo tracking then increases abruptly up to the same throw as dual rate OFF. This tracking method resembles exponential operation and is easy to use.

Fig. 31 shows the servo tracking operation when dual rate switch is OFF and when switch is set to the VTR position.

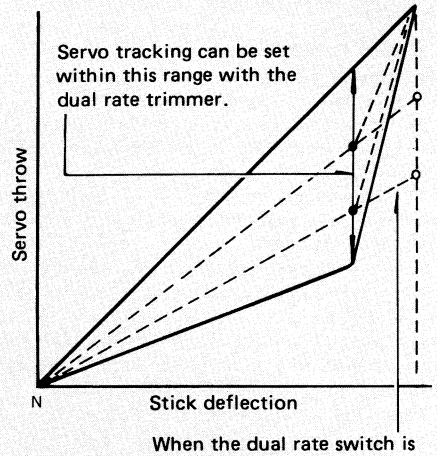


Fig. 31

Ⓑ Pitch

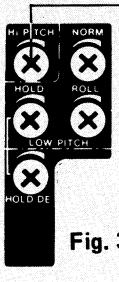


Fig. 32

3 High side pitch trimmer.
Adjusts the high side pitch from about 60% of the full throw of the pitch control servo as shown in Fig. 33.

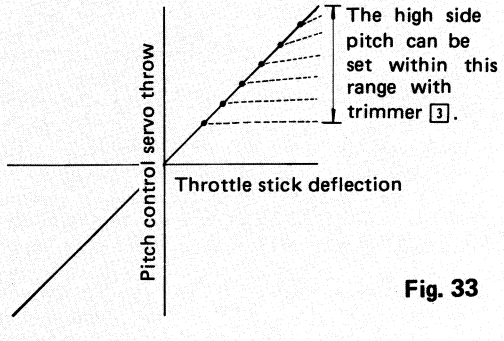


Fig. 33

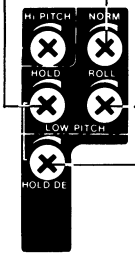


Fig. 34

4 Normal pitch trimmer
Adjusted to match normal flight.

5 This trimmer sets the low pitch (minus pitch) when the throttle hold switch ㉓ is ON. It is adjusted to the auto-rotation pitch.

6 This trimmer adjusts the low pitch (minus pitch) when the idle up ② switch ㉑ is ON. It is used during rolls, etc.

7 Hold delay trimmer. This trimmer adjusts the delay time the pitch servo operates when the throttle hold switch ㉓ is set to ON. An operating time of 0 to about 2 seconds can be set.

©Throttle

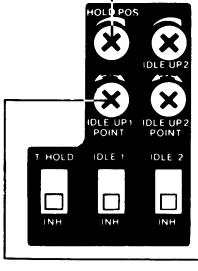


Fig. 35

8 This trimmer sets the throttle servo stop point when the throttle hold switch ㉓ is set to ON. The stop point can be set as described in the throttle hold switch ㉓ section on on page 6. When the trimmer is turned clockwise, the throttle servo moves to the slow side.

9 Idle up ① point trimmer. For a description of this trimmer, see page 5 and Fig. 10. When the trimmer is turned counterclockwise, the idle point moves to the low side.

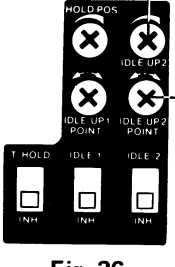


Fig. 36

10 This trimmer adjusts the idle up amount of the throttle servo when the idle up ② switch ㉑ is set to ON. The idle up amount can be set as described in the idle up ② switch ㉑ section on page 6 and in Fig. 11. When the trimmer is turned counterclockwise, the idle up amount decreases.

11 Idle up ② point trimmer. For a description of this trimmer, see the page 6 and Fig. 11. When the trimmer is turned counterclockwise, the idle up point moves to the low side.

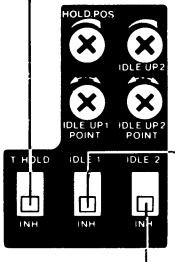


Fig. 37

12 Throttle hold switch ㉓ fail safe switch
- When this switch is set to the T.HOLD position, the throttle hold function operates and the TH.HOLD monitor lamp comes on.
- When this switch is set to the INH side, the throttle hold function does not operate even if the throttle hold switch ㉓ is set to ON.

13 Idle up ① switch ⑲ fail safe switch
- When this switch is set to the IDLE1 position, the idle up ① function operates and the IDLE UP ① monitor lamp comes on.
- When this switch is set to the INH side, the idle up ① function does not operate even if the idle up ① switch ⑲ is set to ON.

14 Idle up ② switch ㉑ fail safe switch
- When this switch is set to the IDLE2 side, the idle up ② function operates and the IDLE UP ② monitor lamp comes on.
- When this switch is set to the INH side, the idle up ② function does not operate even if the idle up ② switch ㉑ is set to ON.

ⒹRudder

15 Rudder servo acceleration amount trimmer
- When hovering is stable, but the tail yaws a little during takeoff, reduce the acceleration with this trimmer until the tail no longer yaws.
- The acceleration amount differs with fixed pitch helicopters. The acceleration amount can be set to a maximum of amount 50% by turning this trimmer clockwise and to a minimum of 0% by turning this trimmer counterclockwise.

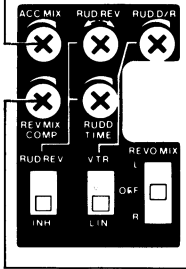


Fig. 38

16 Revolution mixing compensation trimmer
The revolution mixing (pitch control → rudder mixing) can be set in the direction in which the mixing amount decreases as shown in Fig. 39 with this trimmer.

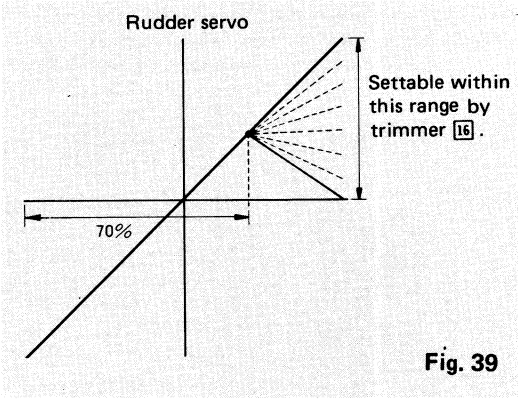
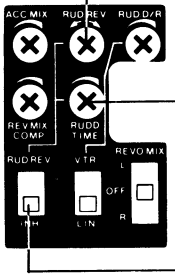


Fig. 39



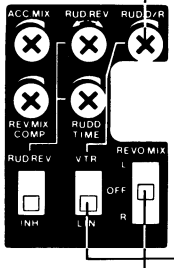
17 This trimmer sets the rubber servo throw and direction when the rudder button ㉟ is set to ON (pressed). The servo throw can be adjusted up to the total travel.

18 Rudder time trimmer
This trimmer sets the time the rudder servo stops at a fixed deflection when the rudder button ㉟ is pressed. A time from 0 to about 3 seconds can be set.

19 Rudder button fail safe switch
When this switch is set to the RUD.REV position, the rudder button operates. When it is set to the INH side, the rudder button becomes inoperative.

Fig. 40

Fig. 41



20 Rudder dual rate trimmer
This trimmer adjusts the rudder servo throw when the rudder dual rate switch ⑯ is set to ON. It has the same functions as the aileron dual rate trimmer 1 described on page 14.

21 LINEAR ↔ VTR switch.
This switch has the same functions as the aileron LINEAR ↔ VTR switch described on page 14.

22 Revolution ⑰ and ⑱ and acceleration mixing trimmer 15 direction switching and function OFF switch

- When the main rotor turns clockwise, set this switch to the R position. If the main rotor rotates counter-clockwise, set this switch to the L position. (The linkage may also be reversed.)
- When the switch is set to the center position, the revolution 17 and 18 and acceleration 15 functions are turned off.

Ⓔ Elevator

23 Elevator dual rate trimmer
This trimmer adjusts the elevator servo throw when the elevator dual rate switch ⑮ is set to ON. It has the same functions as the aileron dual rate trimmer 1 described on page 14.

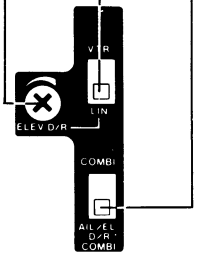


Fig. 42

24 LINEAR ↔ VTR
This switch has the same functions as the aileron LINEAR ↔ VTR switch 2 described on page 14.

25 This switch is used to select aileron dual rate and elevator dual rate simultaneous ON-OFF or separate ON-OFF.

- When this switch is set to the lower position, the aileron dual rate switch ⑭ and elevator dual rate switch ⑮ can be turned on and off separately.
- When this switch is set to the COMB position, the aileron and elevator dual rates can be turned on and off simultaneously with the aileron dual rate switch ⑭. Set it to the position you like best.

Ⓕ 2nd ATV

ATV is the abbreviation of Adjustable Travel Volume. It is a device which allows independent adjustment of the servo left and right (up and down) throw without affecting the neutral position. Because of the engine torque, precision of the model, and for other reasons, the radius of left and right turns is always different even if the left and right steering throws are perfectly matched. The ATV is most convenient when left turns are good, but right turns are to sharp. In this case, left and right turns of the same radius can be easily made by reducing the servo right throw slightly. The aileron and elevator 2nd ATV is the conventional trimmer type ATV.

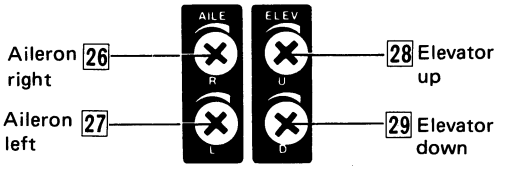
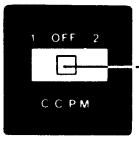


Fig. 43

When the ATV trimmer is turned clockwise, the throw increases. When it is turned counter-clockwise, the throw decreases.

Ⓖ Cyclic Corrective Pitch Mixing (optional)

CCP mixing is performed after the helicopter corrective pitch and cyclic pitch control systems are electrically mixed. Since direct linkage from the servo to the swash plate is possible by using CCP mixing, the model can be made lighter by eliminating the intermediate mechanism. Linkage rattle is also minimized.



30 CCPM switch
1 and 2 turn MIX ON-OFF and switch the pitch direction when the CH2 (elevator) servo is operated as the pitch servo.

Fig. 44

- When mounting the servos in the fuselage, mount the CH1 servo (aileron servo) at the right side facing the front and the CH6 servo (pitch servo) at the left side facing the front.
- Set the CH2 (elevator) up and down directions with the reversing switch. Next, set CH2 elevator to pitch operation and set the switching and pitch direction with CCPM SW1 and 2.
- Check if the high, low, aileron left and right, and elevator up and down directions are correct by pitch operation.
- Set aileron CH1, elevator CH2, pitch CH6, ATV, and 2nd ATV to maximum.
- Set the CCPM switch from OFF to 1 or 2 (ON). When the CCPM switch is set to ON, the CH1, CH2, and CH6 servos throw is automatically set to 50% of the total travel.
- The CH1 and CH6 deflection width is set so that the left and right throws of the two servos at each ATV are the same.
- Adjust the aileron left and right throws using the 2nd ATV when CH1 and CH6 operate with mixing ON. (CH1 and CH6 can be adjusted simultaneously.)
- Check the aileron direction when CH1 & CH6 operate. Use the reversing switches to correct the aileron direction.
- The CH2 deflection can be adjusted with ATV or 2nd ATV.

When mixing is used, the swash plate is moved up and down. Use a coaxial swash plate.
Since the servo throw is about one half of the total travel, so that the servo horn throw must be adjusted to make larger at the servo horn side.

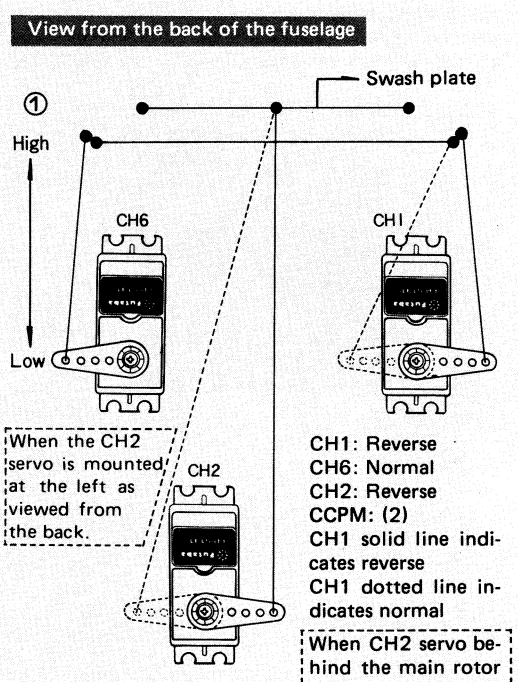


Fig. 45

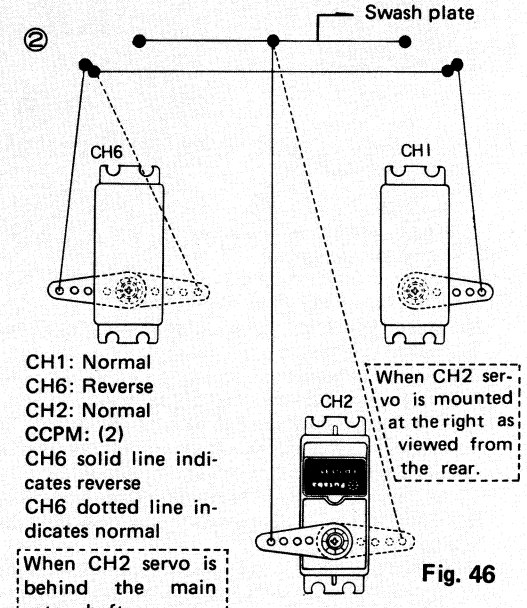


Fig. 46

Ⓗ Servo reversing switches

These switches reverse the direction of the servos. They are very convenient when connecting the linkage.

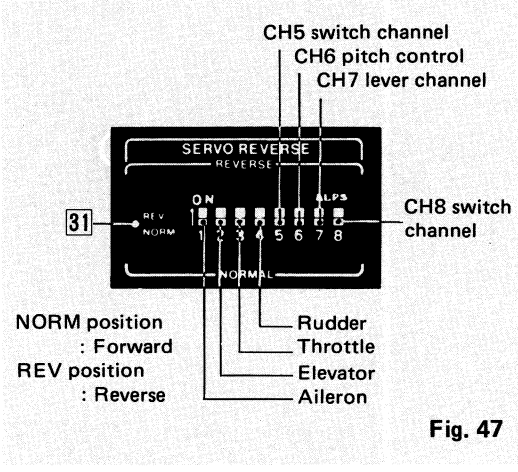


Fig. 47

Ⓘ ATV/FS set buttons

ATV (Adjustable Travel Volume)
FS (Fail Safe)

32 This pushbutton is used to increase the servo throw at ATV. It is also the FS (Fail Safe) setting button at FS.

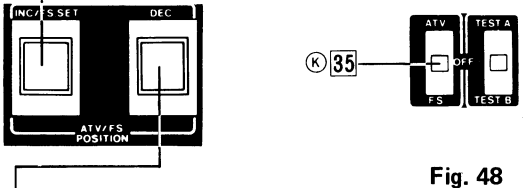


Fig. 48

33 This pushbutton switch is used to decrease the steering angle at ATV.

- These two pushbutton switches set the ATV servo throw and FS set buttons.
- Using ATV (Aileron ATV taken as an example)

① First, set switch Ⓚ ㉟ to the ATV side.
② Next, set CHANNEL SELECT switch Ⓙ 34 to the 1 (aileron) position.
③ Set the transmitter and receiver power switches to ON, and check the operation of the servos.
④ Set the aileron stick for full right rudder, hold it in that position, and set the aileron right throw to the desired angle by pressing buttons 33 and 32.
⑤ To set aileron left, hold the aileron stick in the full left position and set the servo throw with buttons 33 and 32.
(ATV can be adjusted in 64 steps. ATV can be continuously varied by pressing and holding the button for more than 1.5 seconds.)
⑥ For the other channels, select the channel with the CHANNEL SELECT switch Ⓙ 34 and operate ATV.
⑦ At the end of adjustment, set switch Ⓚ 35 to the center OFF position and set switch Ⓙ 34 to OFF position.
⑧ This ATV function is memorized even if the power switch is set to off, the ATV function is lost if the transistor Nicd is fully discharge.

ATV SETTING

Switch switches Ⓙ 34 and Ⓚ 35

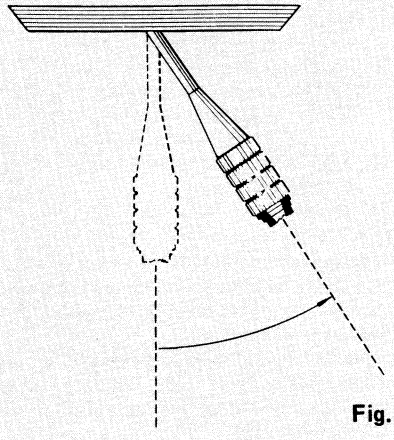


Fig. 49

Press button 32 while holding the aileron stick in the full position.

●USING FS (FAIL SAFE) (Throttle taken as an example.)

① First, set switch Ⓚ 35 to FS.
② Next, set CHANNEL SELECT switch Ⓙ 34 to 3 (throttle).
③ Set the switch at the top of the receiver to FAIL SAFE.
④ Set the transmitter and receiver power switches to ON, and check the operation of the servos.
⑤ Set the throttle stick to maximum slow, and press pushbutton 32.
⑥ This sets the FS function throttle slow. Set Ⓚ 35 and Ⓙ 34 to OFF, then set the transmitter power switch to OFF. The servos should return to the neutral position and the throttle servo should move to the slow position set here.
⑦ The FS function can be set for all the channels and all the steering angles in this way.
⑧ Since the FS function is cleared when the receiver power switch is turned off at the end of one flight, reset it before that flight.

FS OPERATION

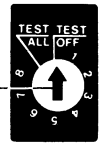
FS is a function which moves the servo of each channel to the preset position with the transmitter when the receiver receives continuous strong noise for more than one second. (When not set, the servos of all the channels are moved to the neutral position.) during the one second that noise or interference is received, the set operates in the hold mode.

BFS (Battery Fail Safe function) OPERATION

The BFS function moves the throttle channel servo to the position preset by FS and locks it in that position when the receiver servo Nicd battery capacity drops. (Medium slow position if not set.) If the throttle stick is set to maximum slow under this state, fail safe is released and the throttle channel can be controlled for 36 seconds. After 36 seconds, the set returns to the BFS mode. Whenever the set enters the BFS mode, immediately land the aircraft.

Ⓙ CHANNEL SELECT switch

- This switch selects the channel in which the ATV or FS functions to be set, refer to item "ATV/FS set button". It is also used when the servo test function is utilized.



34 Channel selector switch

34 Channel selector switch No. and servo

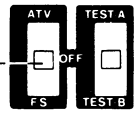
Fig. 50

1. Aileron
2. Elevator
3. Throttle
4. Rudder
5. CH5 switch
6. Pitch control
7. CH7 knob
8. CH8 switch

TEST ALL Described later.
TEST OFF Normally set to the OFF position.

Ⓚ ATV/FS switch

- This switch switches between ATV and FS.
- Normally set it to OFF.

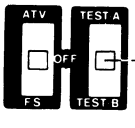


35 ATV/FS switch

Fig. 51

Ⓛ Servo test function switch

- The operation of the servos can be checked by setting the transmitter and receiver power switch to ON.
- When this switch is set to the TEST-A position, the servos are sequentially moves about the neutral position in channel 1 to channel 8 order. (At this time, set the CHANNEL SELECT switch 34 to the TEST-ALL position.) The servo of the channel selected at the channel selector does not operate. (Example, when 5 is selected, the landing gear servo does not operate.)
- When this switch is set to the TEST-B position, all the servos are operated linearly over their full throw. (At this time, set the CHANNEL SELECT switch 34 to the TEST-ALL position.) The servo of the channel set at the channel selector does not operate.



36 Servo test function switch

Fig. 52

● RECEIVER AND SERVOS

Receiver, servo switch, and battery connections

PCM RECEIVER FP-R118GP

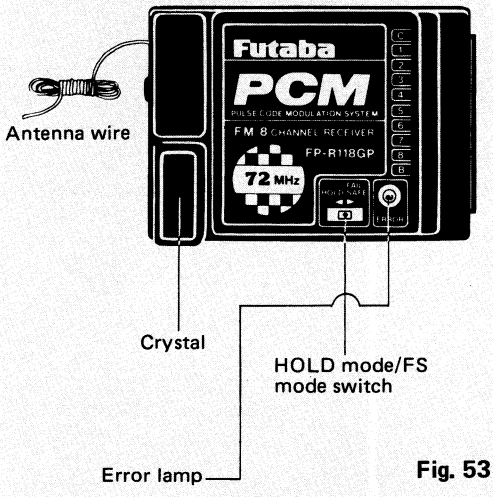
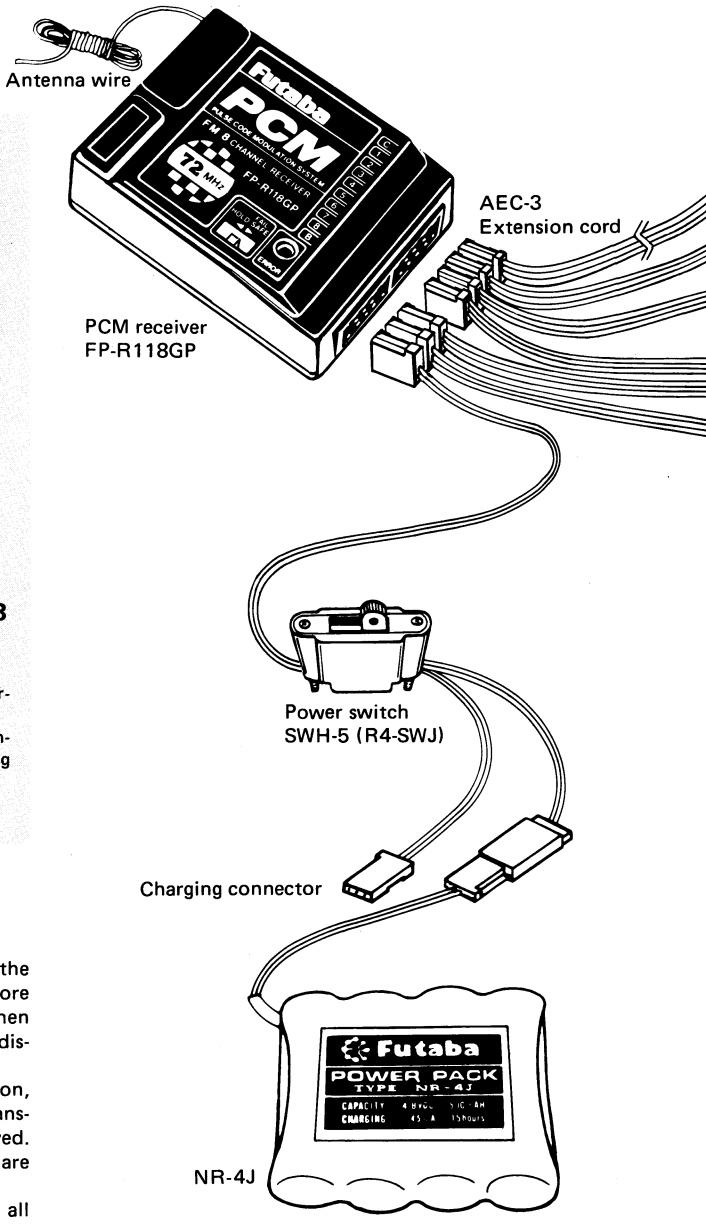


Fig. 53

- System checking can be performed with this lamp.
- This LED comes on when the receiver operates erroneously.
- When the receiver and servo Nicd battery is connected and this LED is on, radiowaves are not being received, the wrong crystal is being used, etc.



HOLD MODE/FS MODE switch

- When this switch is set to the HOLD position, all the servos are held at the position immediately before the erroneous operation position was received. When the signal return to normal or the interference disappears, hold is released.
- When this switch is set to the FAIL SAFE position, the servos are moved to the position set at the transmitter one second after interference is received. When the interference disappears, the servos are released.
  (When the position is not set at the transmitter, all the servos are set to the neutral position.)
- As also described in the transmitter section, FS (Fail Safe) is a function which moves the servo of each channel to the position preset at the transmitter when the receiver receives continuous strong noise for more than one second. (When the position is not set at the transmitter, the servos of all the channels are moved to the neutral position.) During the one second that noise or interference is being received the set operates in the hold mode.
- Normally, this switch should be set to the HOLD position.

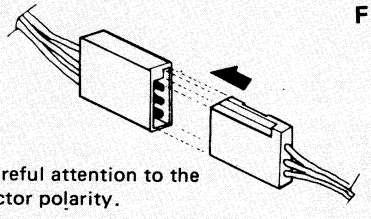


Fig. 54

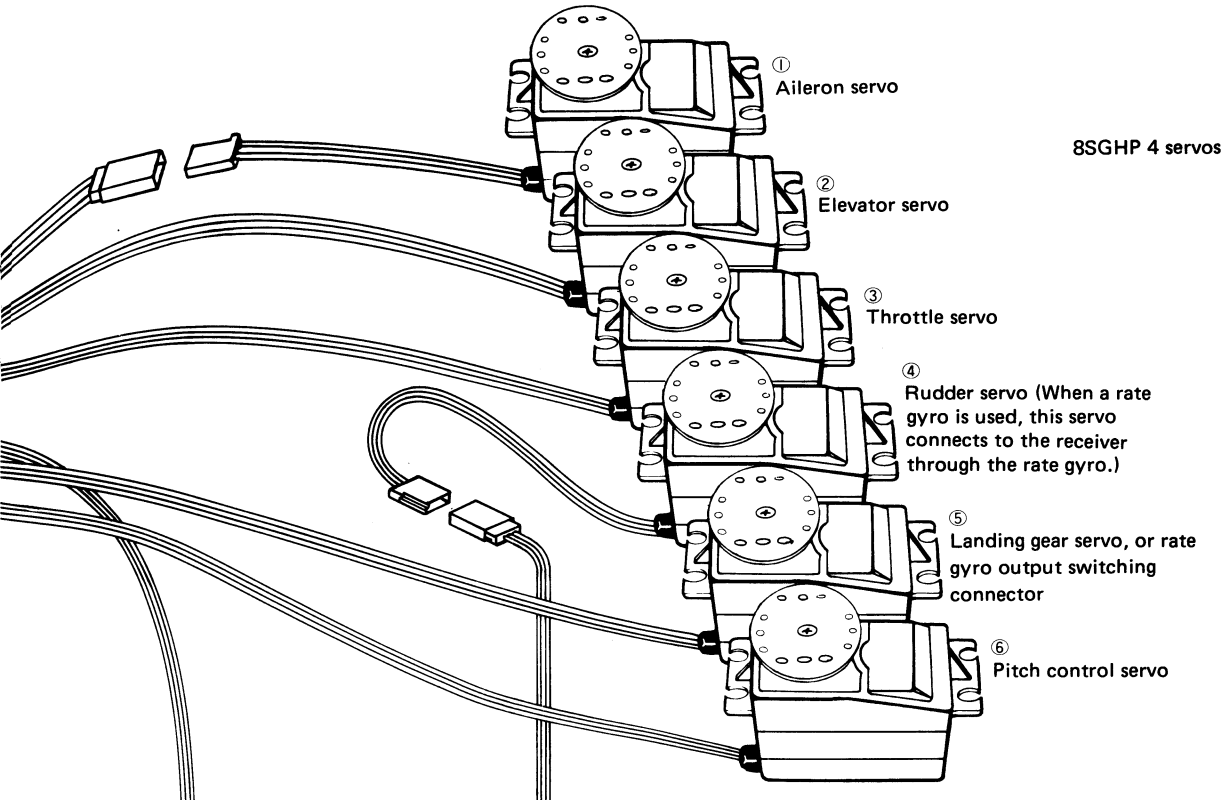

①
Aileron servo
8SGHP 4 servos
②
Elevator servo
③
Throttle servo
④
Rudder servo (When a rate gyro is used, this servo connects to the receiver through the rate gyro.)
⑤
Landing gear servo, or rate gyro output switching connector
⑥
Pitch control servo

Fig. 55

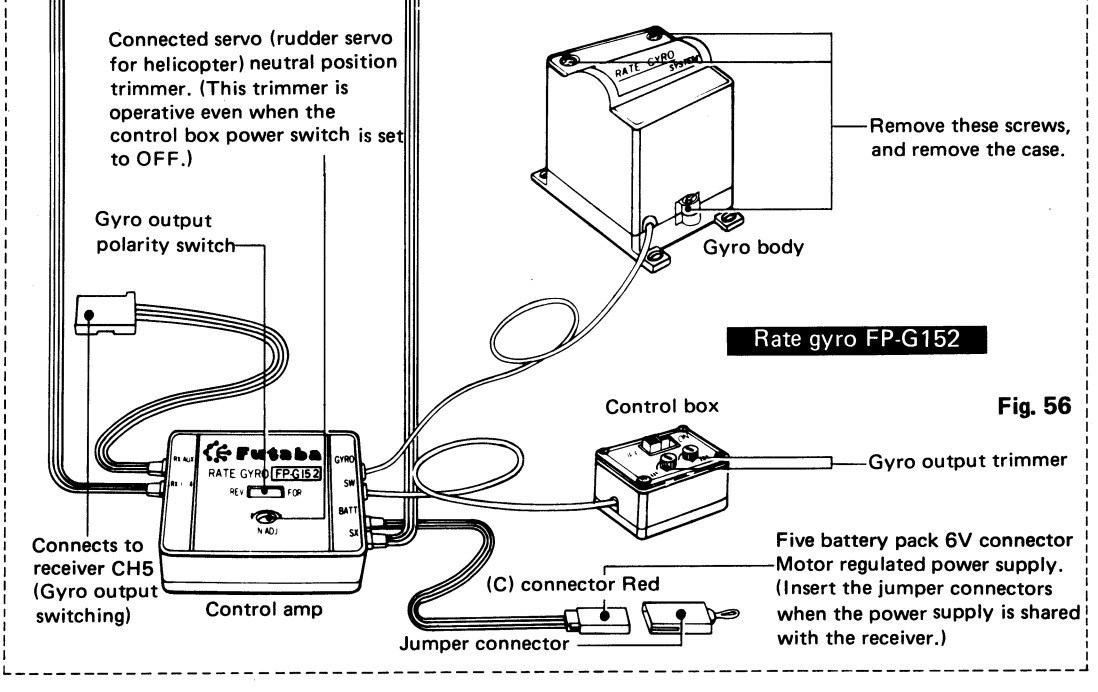

Connected servo (rudder servo for helicopter) neutral position trimmer. (This trimmer is operative even when the control box power switch is set to OFF.)
Gyro output polarity switch
Remove these screws, and remove the case.
Gyro body
Rate gyro FP-G152
Control box
Gyro output trimmer
Connects to receiver CH5 (Gyro output switching)
Control amp
(C) connector Red
Jumper connector
Five battery pack 6V connector
Motor regulated power supply.
(Insert the jumper connectors when the power supply is shared with the receiver.)

Fig. 56

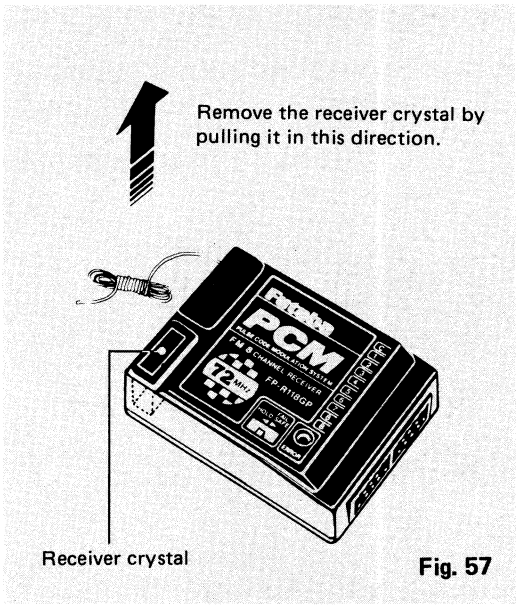


Fig. 57

PRECAUTIONS

- Connect the receiver, servo switch, and battery firmly as shown in Fig. 55. Then extend the transmitter and receiver antennas to their full length.
- Set the transmitter power switch to ON, then set the receiver 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. If the direction of servo travel is opposite the desired direction, switch the servo reversing switch.
- Operate each servo to its full stroke and check if the pushrod binds or is loose. Unreasonable force applied to the servo horns is not only bad for the horns, but will also cause the battery to run down quickly. Always make the stroke of each control mechanism somewhat larger than the full stroke (including the trim component) of the servo horn. Adjust the servo horns so they move smoothly even when the trim lever and stick are operated simultaneously in the same direction.
- Be alert for noise.

This set has noise rejection circuits, however, noiseless parts are recommended.

- When installing the switch harness, cut a rectangular hole somewhat larger than the full stroke of the switch, and install the switch so it moves smoothly from ON to OFF. Install the switch inside the fuselage and attach a piece of wire to the switch so it can be turned on and off from the outside. Install the switch where it will not be exposed to engine oil, dust, etc.
- Even though the receiver antenna may appear to be too long, do not cut or bundle it.
- Install the servos securely. Tighten the mounting screws until the rubber damper is slightly crushed. If the screws are too tight, the cushioning affect of the rubber damper will be lost.
- 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.
- A spare servo horn is supplied with the set. Use this horn as needed.
- Use extension cords as needed.
- Wrap the receiver in sponge rubber. Water- and dust-proof the receiver by placing it in a plastic bag and wrapping a rubber band around the mouth 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 transmitting range by making the transmitter antenna as short as possible, extending the receiver antenna to its full length, and operating the transmitter from a distance of 20m to 30m from the receiver. The movement of each servo should follow the movement of each transmitter stick.

BFS (Battery Fail Safe function)

The BFS function moves the throttle channel servo to the position preset by FS and locks it in that position when the receiver servo Nicd battery capacity is low. (Medium slow position when not set.) If the throttle stick is set to maximum slow under this state, the throttle servo can be controlled for 36 seconds.
After 36 seconds, the set returns to the BFS mode. Whenever the set enters the BFS mode, immediately land the aircraft.

• General adjustments

Make the basic fuselage linkages and adjustments according to the helicopter manufacturer's assembly and adjustment instructions.

① Check the direction of operation of each servo. If the servo rotates in the wrong direction, switch the setting of the pertinent servo reserving switch.

② Set the idle up ① switch ⑲, idle up ② switch ㉑, and throttle hold switch ㉓ to OFF (to the opposite side).

③ Set the hovering pitch lever ⑥ and hovering throttle knob ㉒ to about the center of the scale.

④ Check the left and right (up and down) throw of each servo. If the throw is wrong, correct it with the ATV trimmer and by changing the hole position of the servo horn, etc.

⑤ Set the throttle stick ③ to about the center medium slow position and set the hovering memory switch ㊱ to ON.
Set the compensation setting amount to 0 by turning the hovering mix compensation setting trimmer [16] on the trimmer panel at the back of the transmitter.

⑥ Set the revolution mixing up knob ⑰ to about division 5 and the revolution mixing down knob ⑱ to about division 7.

⑦ Check the pitch control → rudder mixing direction. If the direction is wrong, correct it with switch [22] on the trimmer panel on the back of the transmitter.

⑧ Recheck the operating and mixing directions of each servo, and set the hovering memory switch ㊱ to OFF.

⑨ Check the engine and throttle linkage.
- ○ Full throttle when throttle stick in high (upper) position
  Zero throttle when throttle stick in maximum slow (lower) position and throttle trim in maximum slow position.
- ○ Set the ATL (Adjustable Throttle Limiter) to the maximum limit. This is very convenient because the high side does not change even if the slow side is adjusted.

⑩ Turn the normal pitch trimmer [4] (high side pitch trimmer [3]) at the pitch trimmer Ⓑ on the trimmer panel at the back of the transmitter and set the pitch control high side trimmer ⑬ to the maximum (upper) position. Set for maximum pitch control servo throw when the throttle stick is operated over its full stroke. Set the maximum pitch width and set the pitch control high side trimmer lever ⑬ to about the center.

> Connect the linkage so the main rotor pitch variation width is somewhat larger than that recommended by the helicopter manufacturer.

⑪ Start the engine. After needle adjustment, hover the helicopter, trim the ailerons and elevators, and make the main rotor pitch larger during the next hovering with the fuselage linkages. Then trim with the hovering throttle knob ㉒ and pitch control trimmer ⑥. Adjust the throttle stick position at hovering to 50% to 55% of its full stroke.

⑫ Trim the rudder by adjusting the linkage so the rudder is in the neutral position when hovering.

⑬ After adjusting all the trim levers, hover and set the hovering memory switch ㊱ to ON. The memorized hovering point remains memorized even when the transmitter power is turned off. It is cleared when the hovering memory switch ㊱ is set to OFF.

⑭ If the helicopter slips to the right when hovering, increase the mixing amount by turning the revolution mixing down side knob ⑱ clockwise. If the helicopter slips to the left, turn the knob counterclockwise.

⑮ If the helicopter slips to the left when climbing from hovering, turn the revolution mixing up knob ⑰ clockwise. If the helicopter slips to the right, turn the knob counterclockwise.

⑯ Next adjust the acceleration amount with trimmer [15] of the rudder trimmers Ⓓ on the trimmer panel at the back of the transmitter. Although it depends on the helicopter, it should have some effect because of the interaction with the rate gyro output. For fixed pitch helicopters, a pitch of about 0 is usually suitable.

⑰ Adjust the normal pitch trimmer [4] of the pitch trimmers Ⓑ on the trimmer panel of the ideal pitch at takeoff. Although it depends on the helicopter, a pitch of about 0 is usually suitable.

⑱ Rate gyro output adjustment (when FP-G152 used)
- • Hovering
  Set the rate gyro control box scale to about 40% to 80% of full scale, depending on the helicopter. Increase the gyro output within the range at which the tail does not swing back and forth.
- • Maneuvering
  Set the rate gyro control box to about 30 to 50% of full scale, depending on the helicopter. Adjustment within the range at which the tail does not swing during high speed level flight is suitable.

⑲ Adjust the pitch control high side trim lever [3] so the pitch is reduced during high speed level flight so that the main rotor does not load the engine. When flying in a strong wind, increase the pitch slightly with this lever. Adjust to the conditions for the time of day while flying.

• Revolution Mixing Compensation Adjustment

When high speed level flight is performed with a helicopter, the tail rotor reverse torque required is small, however the high side revolution mixing amount is large, the fuselage will veer to the right. The power loss by the tail rotor becomes large. (Opposite when the main rotor rotates counterclockwise.)
If only the mix amount "up side" is reduced at the high side about 70% of the throttle stick at this time, maneuverability also improves and the power loss is also reduced.

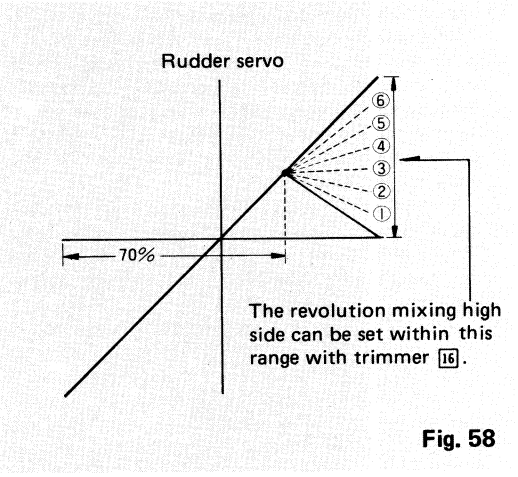


Fig. 58

① Fly in level flight at full speed.
② When the speed does not increase at high speed flying, or when the helicopter swings to the right, when the speed does not increase while the helicopter rises vertically, etc., the revolution mixing amount is probably excessive.
③ Adjust the compensation setting amount with trimmer [16] and set it so that the revolution mixing amount is reduced at throttle stick maximum.
④ The compensation setting amount should normally be about ③ ~ ④ of Fig. 58 for fuselage system and ④ ~ ⑤ for frame system.
⑤ Fly at full speed again to adjust the trimmer [16] maximum for highest acceleration at high speed and vertical moving up.
⑥ Since the set value depends on the diameter and shape of the tail rotor, adjust repeatedly for maximum linearity and power.

• IDLE UP ① ADJUSTMENT

① Hover and check the throttle stick hovering position.
② Stop the engine, set the throttle stick to the hovering position, and set the idle up ① knob ⑳ to division 10 (maximum). Adjust the idle up point up and down with trimmer [9] of the throttle trimmers Ⓒ on the trimmer panel at the transmitter. Make this adjustment so that the throttle servo does not operate when switch ⑲ is turned ON and OFF. Idle up is maximum at this point.
③ When the idle up ① switch ⑲ is set to ON, the throttle servo operates up to the position set at the idle up ① knob ⑳.
④ Set the idle up ① knob ⑳ to 0, start the engine, and set the throttle stick to maximum slow.
⑤ Next, set switch ⑲ to ON and turn knob ⑳ slowly clockwise. While slowly accelerating the engine, set the rotor speed to the same speed as when hovering.
⑥ With this setting, the change in the main rotor and tail rotor speed from takeoff to hovering is small, the change in the effect of the rate gyro and servos is also small, and aerobatics are extremely easy.

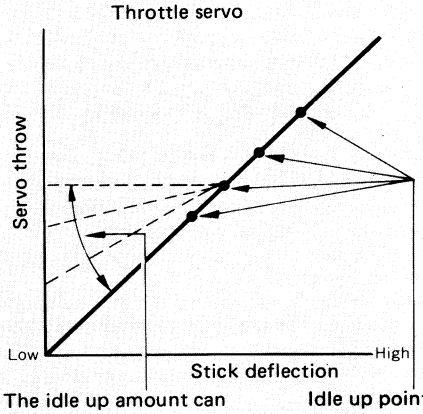


Fig. 59

• IDLE UP ② ADJUSTMENT

① When the idle up ② switch ㉑ is set to ON, the idle up amount (throttle servo stop position) can be adjusted with trimmer [10] of the throttle trimmers Ⓑ on the trimmer panel at the back of the transmitter. The low side pitch can be adjusted with trimmer [6] of the pitch trimmers Ⓑ on the trimmer panel on the back of the transmitter.
② When trimmer [10] is turned clockwise, idle up is applied. (See Fig. 59.)
③ Set the idle up ② point trimmer [11] for dynamic patterns.
④ Adjust the low side pitch to match rolls and other dynamic pattern with trimmer [6].

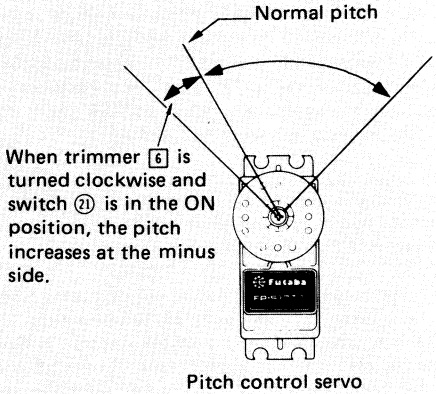


Fig. 60

• Throttle hold and throttle hold delay adjustment for auto-rotation

① When the throttle hold switch ㉓ is set to ON, the throttle circuit is disconnected from the throttle stick and only pitch control can be performed with the stick.

② The auto-rotation pitch can be adjusted with trimmer [5] of the pitch trimmers Ⓑ and the auto-rotation throttle servo stop position can be adjusted with trimmer [8] of the throttle trimmers Ⓒ on the trimmer panel at the back of the transmitter.

③ Adjust trimmer [5] for a pitch of about minus 2 when switch ㉓ is ON and the throttle stick is in the maximum position. (This pitch differs somewhat with the helicopter.)

④ Adjust trimmer [8] so the engine stops (throttle fully closed) when entering auto-rotation and when switch ㉓ is in the ON position and idles (throttle slightly open) during practice.

⑤ Adjust the maximum pitch when switch ㉓ is set to ON with the ATV button.
The pitch servo moves to the position set at the ATV button without regard to the position of the pitch control high side trim lever ⑬.

⑥ Throttle hold delay adjustment
Set the hold delay trimmer [7] full counterclockwise to the 0 position.
- Next, perform auto-rotation. When the drop is fast the instant throttle hold is applied, turn the hold delay trimmer [7] and set it for a constant drop.
- Set the hold delay trimmer [7] to the minimum required time. Normally, about 0.7 second. This is about 30% to 40% by trimmer position.

⑦ When performing auto-rotation using hold delay, set the throttle stick to maximum slow, then immediately turn on throttle hold switch ㉓.
- If you are not familiar with auto-rotation, use the set with the hold delay trimmer [7] turned fully counterclockwise to 0 hold delay.

[Fail safe switches]

After you have become completely familiar with your set, set switches [12], [13], [14], and [19] on the trimmer panel at the back of the transmitter to the ON position. When first using your set, practice with the switches in the OFF (INHIB) position.

• Rudder button adjustments

① When the rudder button ㉟ is pressed, the rudder servo moves in the direction and to the angle set at trimmer [17] of the rudder trimmers Ⓓ on the trimmer panel at the back of the transmitter.

② The time the rudder is operated can be set with the rudder time trimmer [18] on the trimmer panel at the back of the transmitter.

③ Set the rudder servo throw to the direction and angle matched to 540* for stall turns and other spinning maneuvers.

●TRANSMITTER CONTROLS (MODE II)

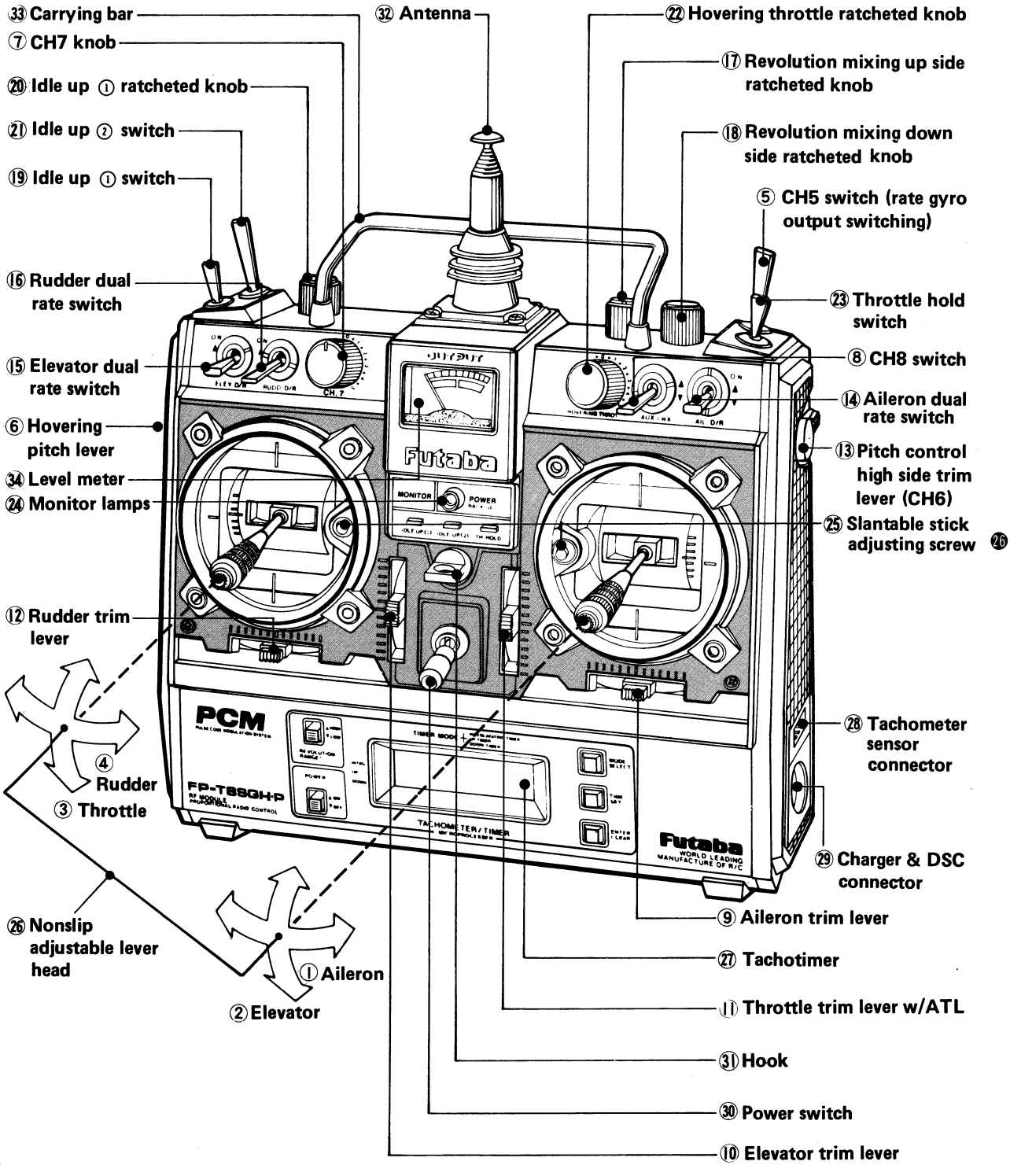


Fig. 1

●TRANSMITTER CONTROLS

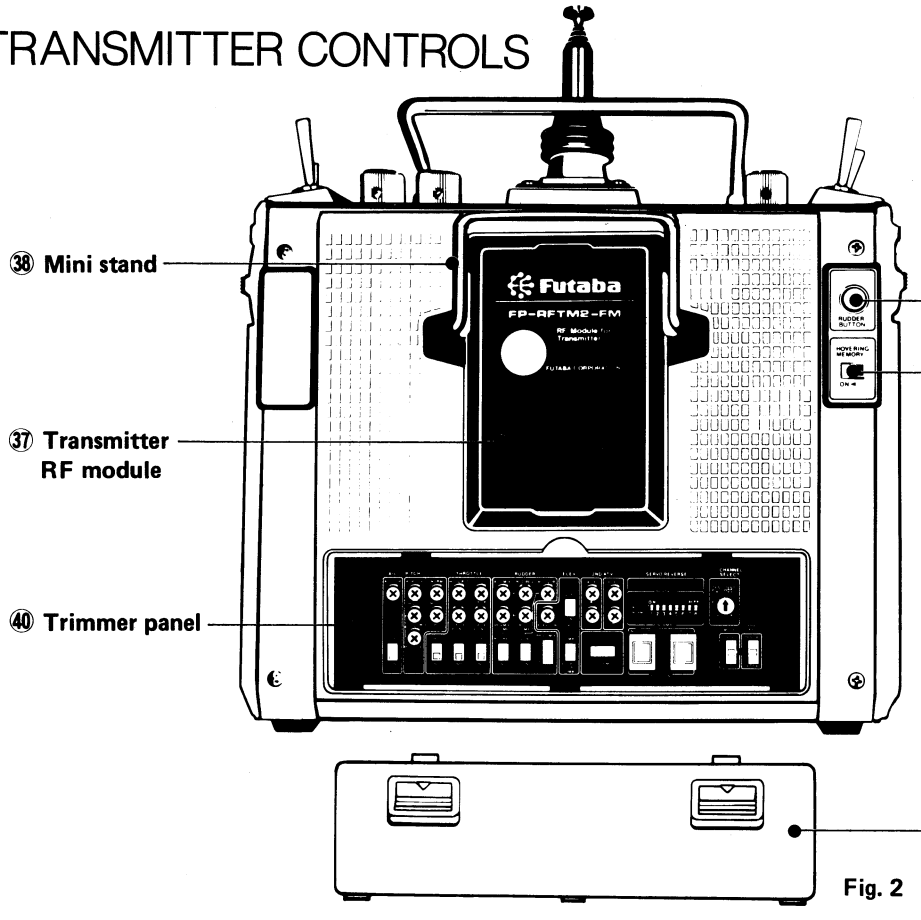


Fig. 2

Use your set with fail safe switches 12, 13, 14, and 19 in the INH (function OFF) position until you become completely familiar with it.

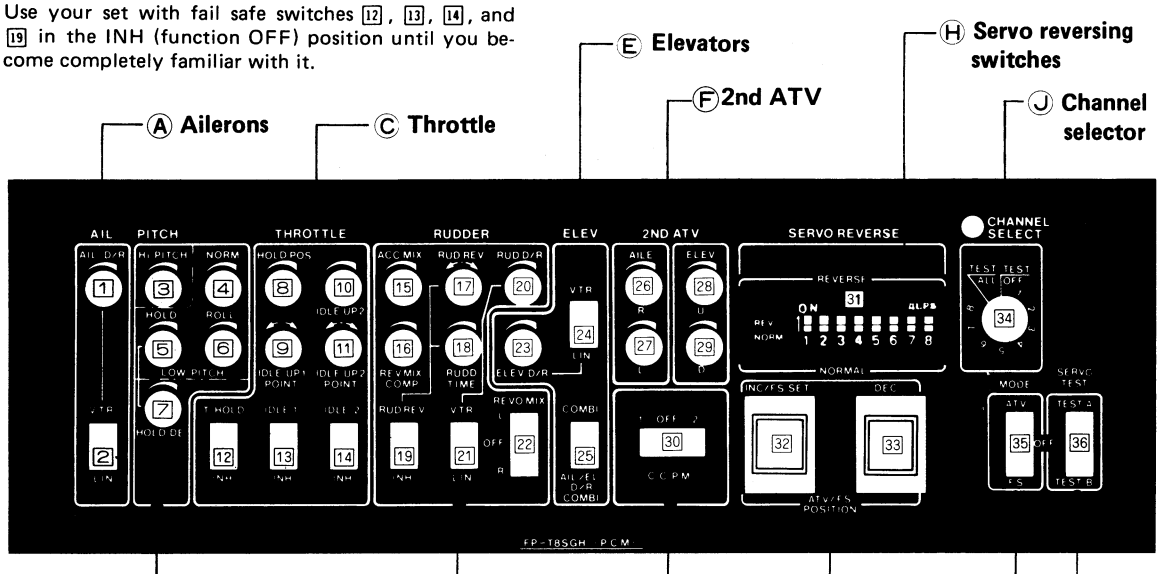


Fig. 3

SPLINED HORNS

The splined horns allow shifting of the servo neutral position at the servo horn.

Setting and shifting the neutral position

a) Angle divisions

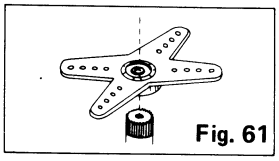


Fig. 61

1) The splined horn has 25 segments. The amount of change per segment is; 360 ÷ 25 = 14.4°
2) The minimum adjustable angle is determined by the number of arms or number of the holes in the shaft. For four arms, the minimum adjustable angle is:

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

b) Effect

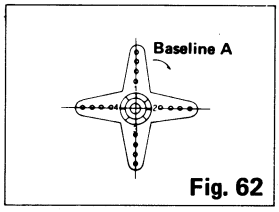


Fig. 62

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° − (14.4 x 6) = 3.6°

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

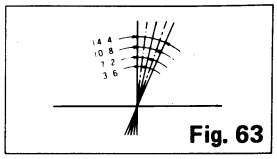


Fig. 63

For a six arm horn, turn the arm counterclockwise and set arm 2 to the position of arm 1. The adjustable angle is 60° − (14.4 x 4) = 2.4°.
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.

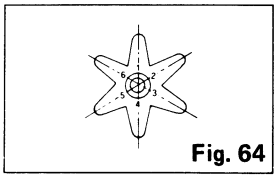


Fig. 64

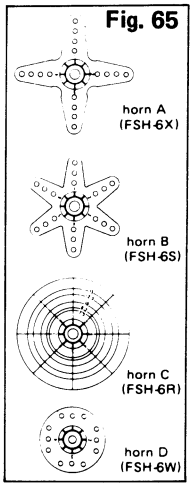


Fig. 65

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

- The frequency of Futaba digital proportional sets can be changed among bands (1)~(6) on the 27MHz band only.
- However, a 27MHz band set cannot be changed to 72MHz band, and vice versa.
- Therefore, always attach the correct frequency flag to the end of the transmitter antenna. Each frequency band has its own designated color, as stated above. The frequency flag is intended for identificantion purposes.
- Also change the frequency flag when frequency is changed.
- Futaba paired crystals are precisely matched. Always use a Futaba crystal set (transmitter, receiver) when changing the frequency.
- It is illegal to change crystals of transmitter on the 72-75MHz bands in the U.S.A.

Frequency	Channel No.	Flag Color
26-27MHz - Aircraft/Car/Boat		
26.995	–	Brown
27.045	–	Red
27.095	–	Orange
27.145	–	Yellow
27.195	–	Green
27.255	–	Blue
72/75MHz - Aircraft only *Shared		
72.030	12	Brown-Red (Top Flag/Ribbon-Bottom Flag/Ribbon)
72.080	–	White/Brown
72.160*	–	White/Blue
72.240	–	White/Red
72.320*	–	White/Purple
72.400	–	White/Orange
72.550	38	Orange-Grey
72.590	40	Yellow-Black
72.630	42	Yellow-Red
72.670	44	Yellow-Yellow
72.710	46	Yellow-Blue
72.750	48	Yellow-Grey
72.790	50	Green-Black
72.830	52	Green-Red
72.870	54	Green-Yellow
72.910	56	Green-Blue
72.960*	–	White/yellow
75.640	–	White/Green
75MHz - Car & Boat only		
75.430	62	Blue-Red (Top Flag/Ribbon-Bottom Flag/Ribbon)
75.470	64	Blue-Yellow
75.510	66	Blue-Blue
75.550	68	Blue-Grey
75.590	70	Purple-Black
75.670	74	Purple-Yellow
75.710	76	Purple-Blue
75.750	78	Purple-Grey
75.790	80	Grey-Black
75.830	82	Grey-Red
75.870	84	Grey-Yellow
53MHz - Aircraft/Car/Boat - FCC Amatuer License Required		
53.100	–	Black/Brown
53.200	–	Black/Red
53.300	–	Black/Orange
53.400	–	Black/Yellow
53.500	–	Black/Green
53.600	–	Black/Blue (Not generally in use)
53.700	–	Black/Purple (Not generally in use)
53.800	–	Black/Grey (Not generally in use)

FP-S130 EXPLODED VIEWS

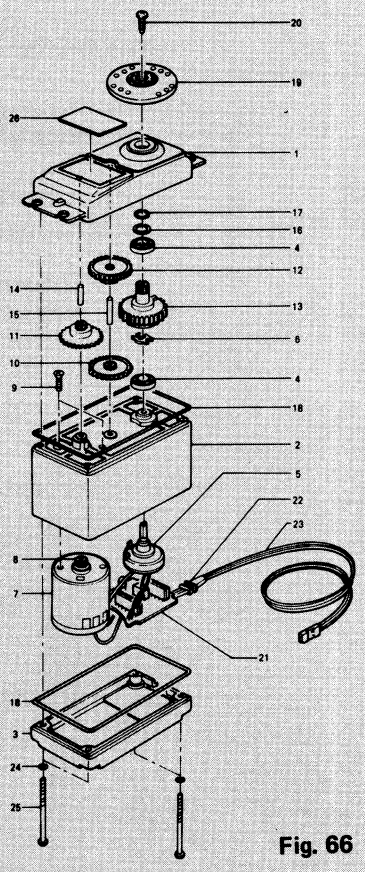


Fig. 66

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	I39995
6.	VR drive plate	S02753
7.	Motor	S91243
8.	Motor pinion	S02464
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 mouting screw	FSH-41
20.	Printed wiring board S130	AS1220
21.	Lead wire packing	S90045
22.	S130 3PB-WRB-300	FPC-8M
23.	Screw O-ring	S90410
24.	Case mounting screw	J50085
25.	S130 Nameplate	S60101

GUARANTEE

Your NEW FUTABA Digital Proportional R/C system is guaranteed against defacts 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 changes must be paid by the user.

This guarantee only applies to the continental U.S.A., Hawaii, and Alaska.