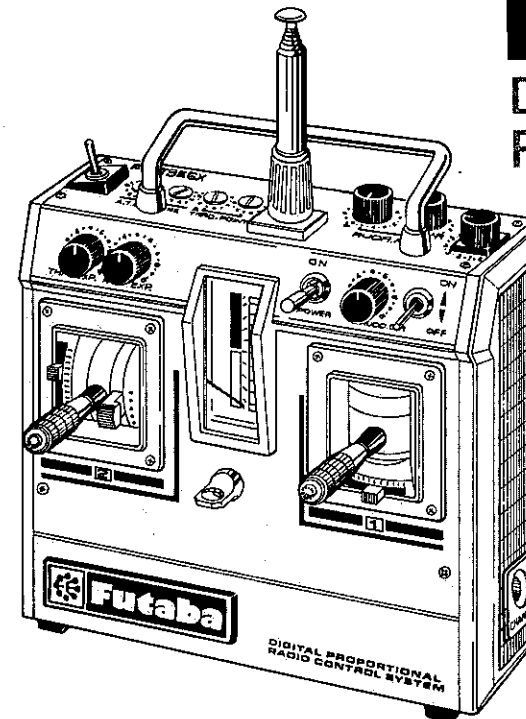


Futaba®

DIGITAL PROPORTIONAL
RADIO CONTROL



FUTABA CORPORATION

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FUTABA CORPORATION

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

CONTENTS

FEATURES ①
 CONTENTS AND RATINGS ②
 TRANSMITTER MODEL FP-T3EGX..... ③
 OPERATION ④-⑦
 FP-R3L RECEIVER, FP-S31S SERVO. . ⑧-⑨
 FP-S31S EXPLODED VIEWS..... ⑩

● FEATURES

The FP-3EGX is the best AM 3-channel expert digital proportional set in its class. The receiver and servo power supply uses a five battery (6V) nicad pack. The servo also has the highest speed and torque of its class.

TRANSMITTER FP-T3EGX

- Ratcheted rudder dual rate knob permits selection of the desired deflection angle.
- Ratcheted rudder exponential knob permits adjustment of rudder servo deflection on an exponential curve.
- Ratcheted rudder ATV (Adjustable Travel Volume) knobs permits separate adjustment of the rudder servo left and right travel.
- Ratcheted throttle exponential knob allows arbitrary adjustment of the throttle servo deflection on an exponential curve.
- Servo reversing switches on rudder and throttle channels.
- Warm-up switch. The engine can be automatically warmed-up by setting this switch to on.
- Throttle trim ATL (Adjustable Throttle Limiter) adjusts only the low side of the throttle stick, thus making throttle linkage extremely easy.
- Throttle high side ATL trimmer simplifies throttle linkage.
- RF module system.
- Crystal can be changed from the outside 27 MHz only.
- Three-channel AM transmitter with channel 3 ratcheted knob is extremely useful as an auxiliary channel.
- Throttle lever neutral position adjuster permits quick modification to a ratchet system.
- Semi-open gimbal sticks provide maximum feel.
- Standard neck strap makes the set easier to use by handing it from your neck.
- High-quality extruded aluminum case.
- Human-engineered exterior is designed for maximum ease of use.

RECEIVER FP-R3L

- Small, high-performance AM 3channel receiver.
- Replaceable crystal.
- Compatible connector permits use of existing Futaba servos with mini 3P connector.

SERVO FP-S31S

- High-torque, high-speed servo with high-quality coreless motor and two ball bearings water-tight type. Output torque 5kg-cm
- New indirect drive potentiometer improves vibration and shock resistance while maintaining neutral precision.
- Futaba low-power custom IC provides high starting torque, narrow dead band, and superior reliability.
- Fiberglass-reinforced PBT (polybutylene terephthalate) injection molded servo case is mechanically strong and invulnerable to glow fuel.
- Strong polyacetal ultra-precision servo gear features smooth operation, position 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 pins ensure positive contact and improve reliability against shock and vibration.
- 3P mini connector is compatible with existing sets.
- Four special adjustable splined horns are available.

● SET CONTENTS AND RATINGS

(Specifications are subject to change without prior notice.)

Set name	FP-3EGX
Transmitter	FP-T3EGX x 1
Receiver	FP-R3L x 1
Servo	FP-S31S x 2
Switch	R4-SWH
NiCd battery	NR-5
Others	Charger, frequency flag, hook band, horn, servo tray, etc.

TRANSMITTER FP-T3EGX

Operating system	: 2 stick system 6 knobs, 3-channel
Transmitting frequency	: 27, 29, 35, 40, 54/60 & 72MHz
Modulation system	: AM (amplitude modulation)
Power supply	: 9.6V
Current drain	: 240mA

RECEIVER FP-R3L

3-channel AM receiver	
Receiving frequency	: 27, 29, 35, 40, 54/60 & 72MHz
Intermediate frequency	: 455kHz
Power supply	: 4.0 - 6.0V, shared with servo
Current drain	: 10mA
Dimensions	: 1.46 x 2.09 x 0.75in (37x53x19mm)
Weight	: 1.3oz (38g)
Receiving range	: 500m on the ground, 1000m or greater in the air when used with the FP-T3EGX (At the best radio wave condition of environment)

SERVO FP-S31S

Control system	: +pulse width control, 1310μS/N
Operating angle	: One side 45° or more (including trim)
Power supply	: 4.0-6.0V, shared with receiver
Current drain	: 6.0V, 8mA (at idle)
Output torque	: 69.5 oz.in (5kg.cm)
Operating speed	: 0.22 sec/60°
Dimensions	: 1.6 x 0.79 x 1.4in (40.5x20x35.5mm)
Weight	: 1.75oz (50g)

CHARGER FBC-2

Input voltage	: AC-110V, 50/60Hz
Output	: TX: 9.6V, 45mA RX: 6.0V, 45mA

NiCd BATTERY NR-5

Capacity	: 6.0V, 5/500mAh
Dimensions	: 2.02x2.85x0.59in (51x72x15mm)
Weight	: 4.2oz (120g)

● TRANSMITTER FP-T3EGX

The name of each part of the transmitter is shown below. Memorize the position and operation of each switch and control before using the transmitter.

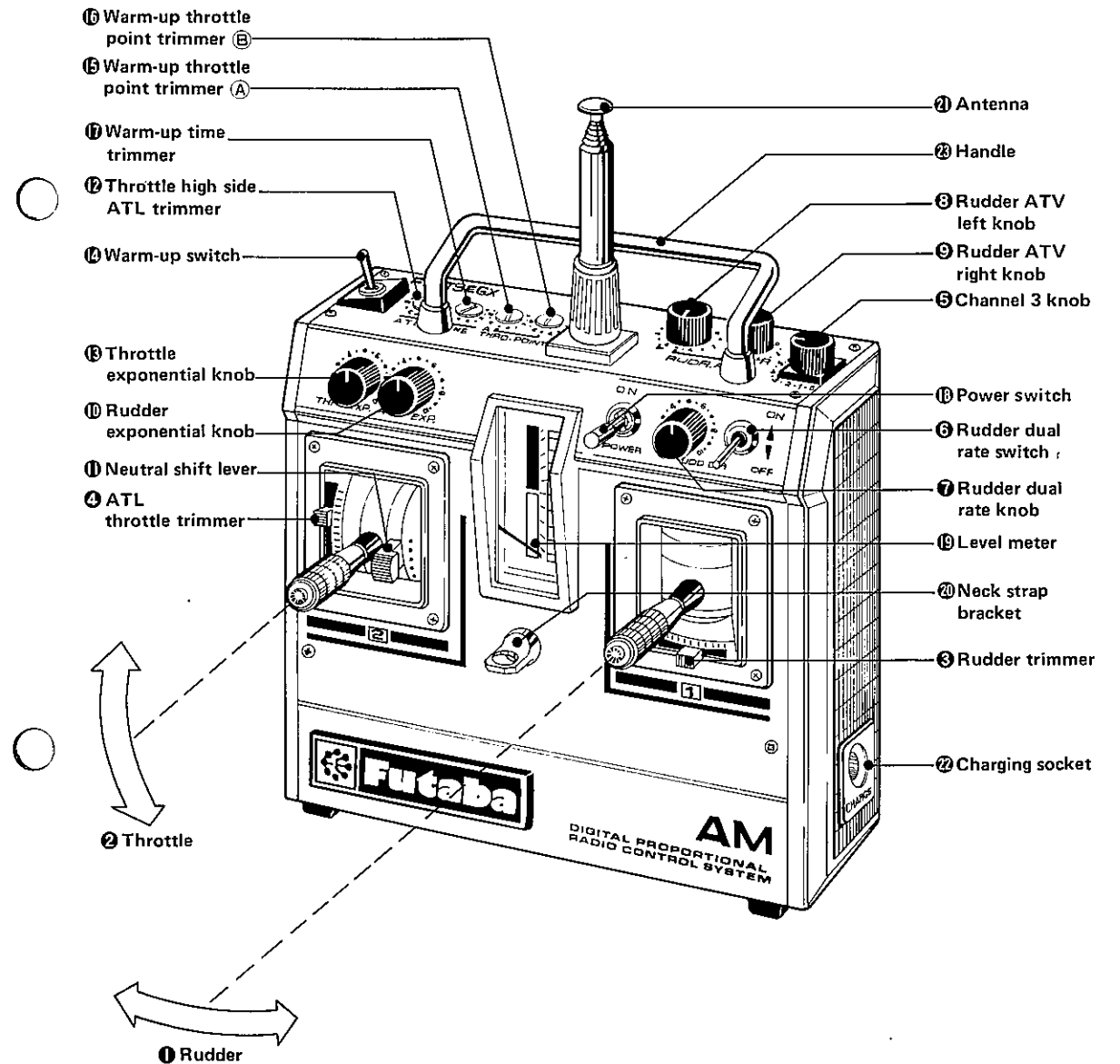
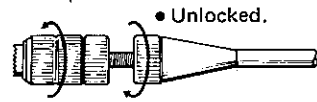


Fig. 1

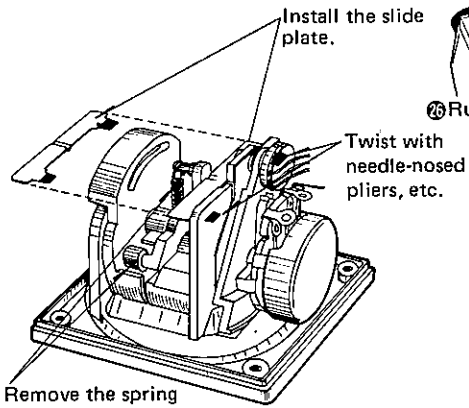
Adjustable knob



- Unlocked.
- Set to the desired length by turning the knob, then lock it in that position.

Fig. 2

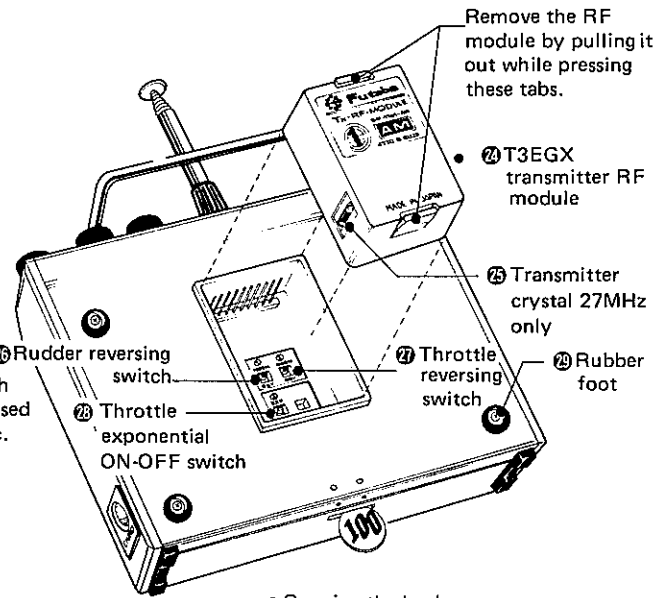
[Modification from self-neutral system to ratchet system]



- 4 Remove the spring and swing arm.

Fig. 3

The servo reversing switches can be accessed by removing the RF module.



- Opening the back cover Release the back cover stopper while inserting a coin into this slot.

Fig. 4

● OPERATION

All the servo reversing switches are assumed to be in the normal position in the following description. Operation is the opposite that described below if the reversing switch is in the reverse position.

- 1 Rudder Rudder operation.
- 2 Throttle Engine control or elevator operation.
- 3 Rudder trimmer Rudder trimming.
- 4 ATL throttle trimmer Adjustable throttle limiter trim lever. This lever only adjusts the low side of the throttle stick as shown in Fig. 5. It is extremely convenient because the high stick remains unchanged during slow adjustment.

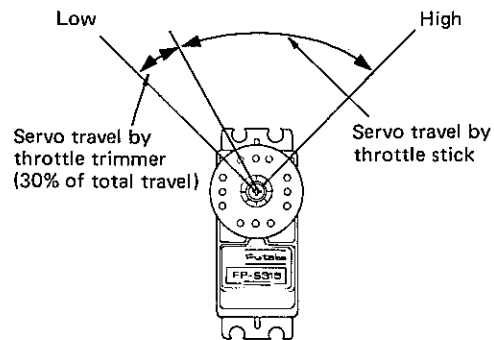
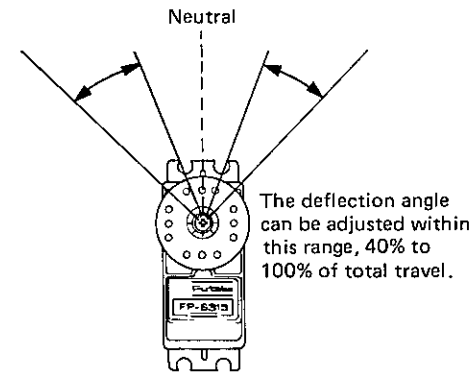


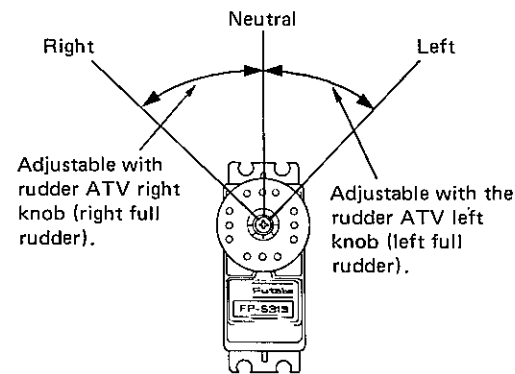
Fig. 5

- 5 Channel 3 knob This ratcheted knob can be used for needle control, etc.
- 6 Rudder dual rate switch Turns the rudder dual rate function on and off. When the dual rate function is on, the servo deflection can be adjusted with the rudder dual rate knob 7.
- 7 Rudder dual rate knob When the rudder dual rate switch 6 is in the on (left) position, the servo deflection angle can be made small as shown in Fig. 6. by adjusting the rudder dual rate knob.



Rudder servo Fig. 6

- 8 Rudder ATV left knob
- 9 Rudder ATV right knob "ATV" is the abbreviation for Adjustable Travel Volume. It is a device which allows separate adjustment of the rudder servo travel to the left and right without changing the neutral position. Because of the relationship with the engine torque, the pre-



Rudder servo Fig. 7

cision of the model finish, and other reasons, the radius of left and right turns will be different even if the left and right deflection angles are perfectly matched. The ATV displays its true worth when the left angle is good but the right angle is bad. In this case, left and right turns of the same radius can be made and operation facilitated by turning the right knob counterclockwise and shifting the right deflection angle of the rudder servo.

- 10 Rudder exponential knob Rudder exponential (called rudder EXP hereafter) is a system in which the rudder servo follows the movement of the rudder stick on an exponential curve as shown in Fig. 8. If rudder EXP is properly set, the rudder servo deflection angle changes very little near the rudder neutral position even if the rudder stick is moved slightly and a straight line can be easily control. If the rudder stick is fully deflected, the rudder servo will deflect to its full travel.

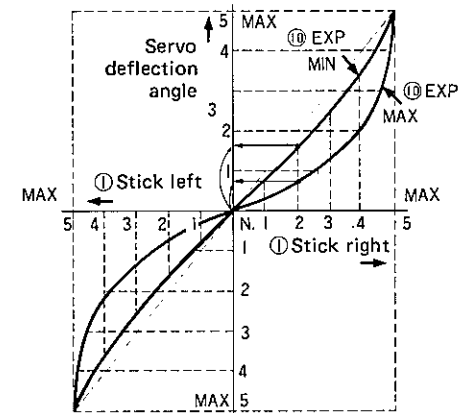
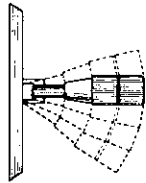


Fig. 8

Even if the rudder EXP knob is set to 0 (EXP MIN), a little EXP is applied as shown in Fig. 8. When the knob is set to 10 (EXP MAX), EXP is corresponding relaxed near the neutral position and the servo movement is more severe near the end of the stick operation as shown in Fig. 8.

① Neutral shift lever

[Neutral lever operation]



When the neutral lever is operated, the stick lever neutral position can be adjusted in five steps as shown here.

Fig. 9

⑫ Throttle high side ATL trimmer

This trimmer adjusts only the high side of the throttle stick. It is extremely convenient when connecting the linkage, since the low side remains unchanged even when the throttle high side is adjusted with this trimmer.

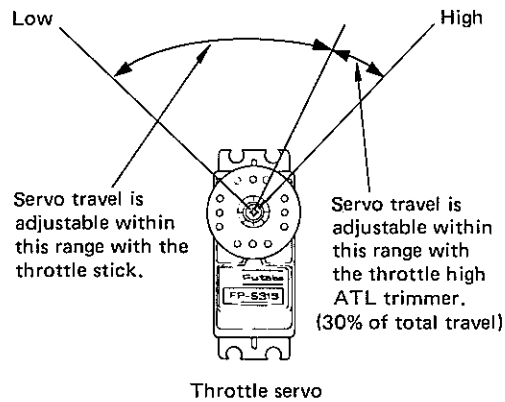


Fig. 10

⑬ Throttle exponential knob

Throttle exponential (throttle EXP) is a system in which the throttle servo follows the movement of the throttle stick on an exponential curve as shown in Fig. 11. When throttle EXP is properly set, especially when the engine has a drum type throttle with round intake port, the relationship between stick operation and engine low and high speeds is well matched. This system can be reset with the throttle EXP ON-OFF switch ⑳. The EXP circuit is operating when the switch is in the ON position. EXP is OFF when switch is in the NORM position. A little EXP is applied as shown in Fig. 11 even when the throttle

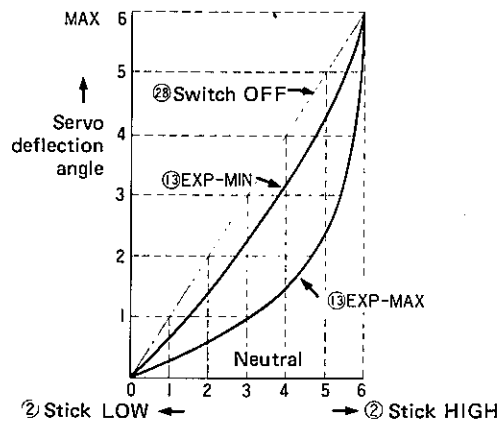


Fig. 11

EXP knob is set to 0 (EXP MIN). When the knob is set to ⑩ (EXP MAX), servo operation is less severe near the stick LOW side and is more severe at the stick HIGH side as shown in Fig. 11.

- ⑭ Warm-up switch
- ⑮ Warm-up throttle point trimmer (A)
- ⑯ Warm-up throttle point trimmer (B)
- ⑰ Warm-up time trimmer

Throttle warm-up is a device which automatically cycles the throttle servo low ↔ medium low (high). When the warm-up switch ⑭ (called switch ⑭ hereafter) is turned on, this device operates, and the throttle servo is cycled back and forth between the position set at the warm-up throttle point trimmer (A) ⑮ (called trimmer (A) hereafter) and the position set at the warm-up throttle trimmer (B) ⑯ (called trimmer (B) hereafter) at the period set at the warm-up time trimmer ⑰ (called time trimmer ⑰ hereafter). At this time, the throttle stick is disconnected and has no effect on the servo. Throttle servo can be set over its total travel with trimmers (A) and (B). If trimmers (A) and (B) are set to points (A) and (B) as shown in Fig. 12, the throttle servo can be automatically cycled back and forth between (A) and (B) by setting the warm-up switch ⑭ to ON. If points (A) and (B) overlap, the servo will stop at that position and will not cycle even if the warm-up switch ⑭ is set to ON.

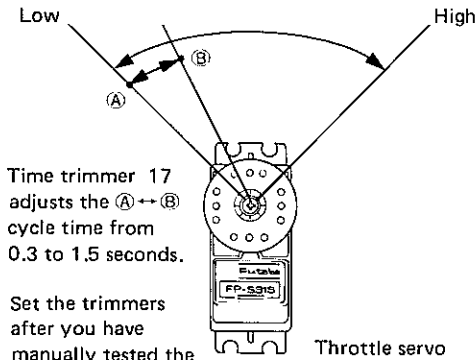


Fig. 12

- ⑱ Power switch
Lock type switch. To turn the switch on and off, unlock it by pulling the knob forward.
- ⑲ Level meter
When the power switch ⑱ is set to ON, the level meter pointer should deflect to the green zone. If it deflects to the boundary between the green and red zones, the internal nicad battery is low and the range of the radiowaves will be short.
- ⑳ Hook
The accessory neck band hooks to this bracket.

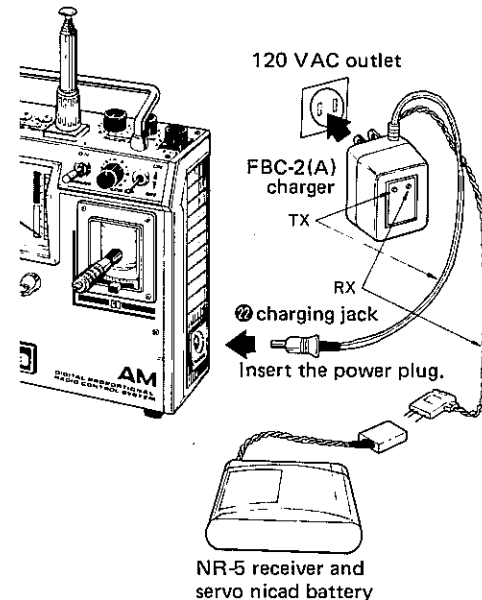


Fig. 13

- ㉑ Antenna
Strong rod antenna that extends to a full length of 102cm in eight steps.
- ㉒ Charging jack
Power jack to charge the transmitter NT-8CG (9.6V/500 mA) nicad battery.
 - Connect the power plug of the FBC-2 (A) charger into the transmitter charging jack, connect the 3P connector to the NR-5 receiver and servo nicad battery, and plug the charger into a 120 VAC outlet. The charging TX and RX LEDs light to indicate that the battery is being charged. (Be sure the TX indicator glows when connected to the transmitter, RX when connected to NR-5, do not reverse.)
 - Normally charge the transmitter battery for at least 15 hours and the receiver and servo battery for at least 20 hours. If the battery has not been used for some time, discharge and recharge it two or three times.
 - The transmitter and receiver nicad batteries can be charged simultaneously or separately.
 - A fully charged battery can be used for about 12 flights of 10 minutes each.
- ㉓ Handle
Convenient when carrying the transmitter.
- ㉔ T3EGX transmitter RF module.
- ㉕ Transmitter crystal 27MHz only
When changing the band, use Futaba matched AM crystal (transmitter/receiver 1 pair). The transmitter crystal is marked TX and the receiver crystal is marked RX.
- ㉖ Rudder servo reversing switch
This switch reverses the direction of operation of the rudder servo. The upper position is normal and the lower position is reverse.
- ㉗ Throttle servo reversing switch
This switch reverses the direction of operation of the throttle servo. The upper position is normal and the lower position is reverse.
- ㉘ Throttle exponential ON-OFF switch
This switch turns the function of the throttle exponential knob ⑬ ON and OFF. The upper position is ON and the lower position is OFF.
- ㉙ Rubber feet
These feet protect the back of the transmitter when the transmitter is layed down.

● RECEIVER FP-R3L AND SERVO FP-S3IS

- Connect the servos and switch firmly as shown in Fig. 14. 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 should stop near the neutral position. Operate the transmitter sticks and check that each servo follows the movement of the stick.
- After connecting the pushrods to the servos, check if the direction of operation of the servos matches the direction of operation of the transmitter sticks.
- 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 levers and stick are operated simultaneously in the same direction.

- Be alert for noise. If engine vibration causes metal parts to touch, noise will be produced and the receiver and servos may operate incorrectly. 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 it moves smoothly from ON to OFF. If the switch is mounted inside the fuselage and is turned ON and OFF with a piece of wire, install it in the same fashion. Install the switch where it will not come into direct contact with engine oil, dust, etc.
- Even though the receiver antenna may seem to be too long, do not cut or bundle it.
- Install the servos securely. Refer to Fig. 15.
- A spare horn is provided. Use it as needed.
- Wrap the receiver in sponge rubber. Water- and dustproof 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 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 make the transmitter antenna as short as

RECEIVER, SERVO, SWITCH, AND NR-5 CONNECTION

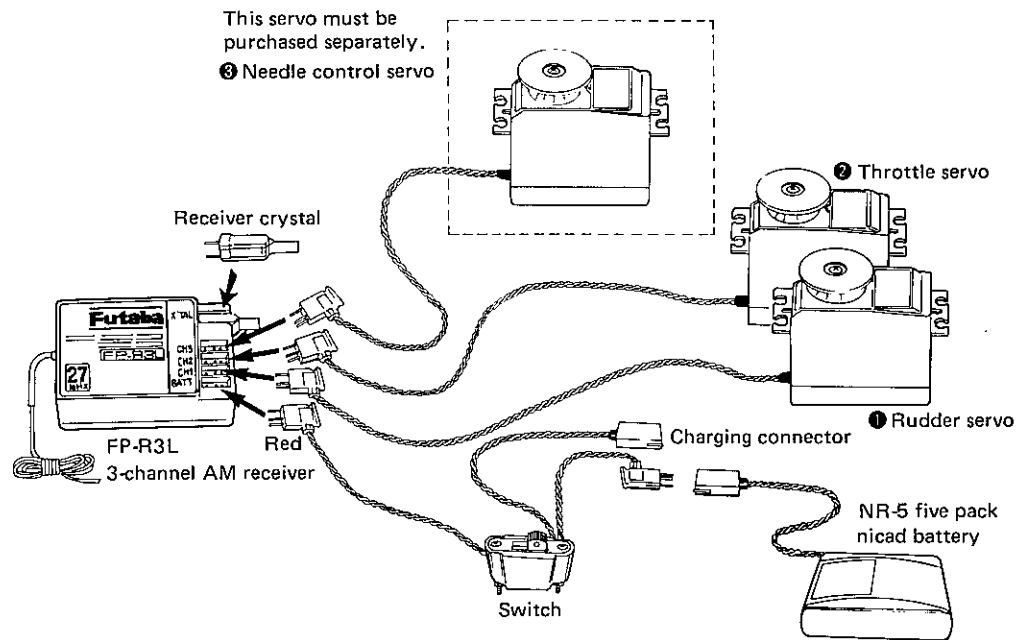


Fig. 14

possible, extend the receiver antenna fully, and operate the transmitter from a distance of 20m to 30m from the receiver. The movement of each servo should follow the movement of the transmitter sticks.

- Futaba three-wire servos operate with Futaba transmitters and receivers. Use them according to the application. (Except the J, M, and SG Series)
- After the installation has been mounted and checked, ask the dealer from whom you purchased the set, or an experienced radio control fan, to inspect your installation and tell you how to use your set correctly.
- When flying your RC model, observe all safety precautions under the guidance of an experienced RC flyer.

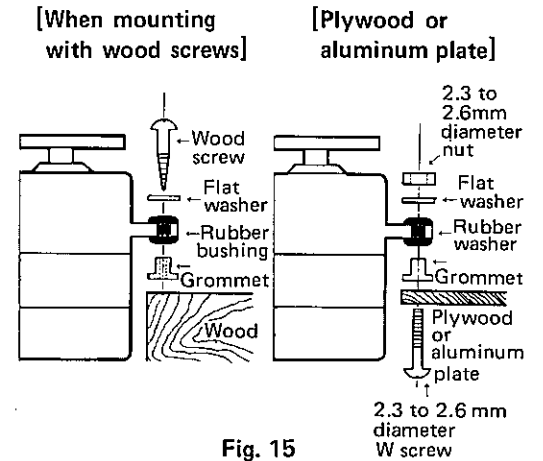
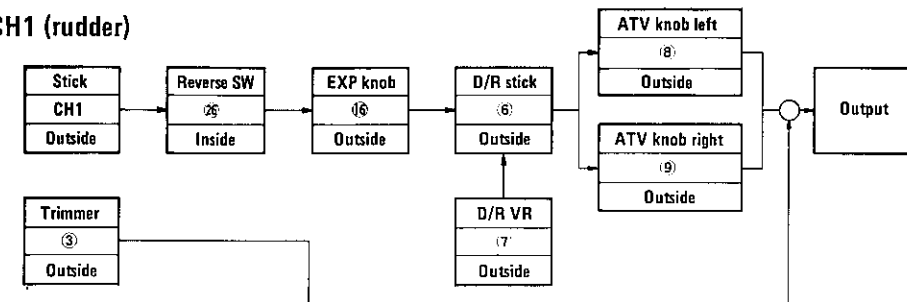


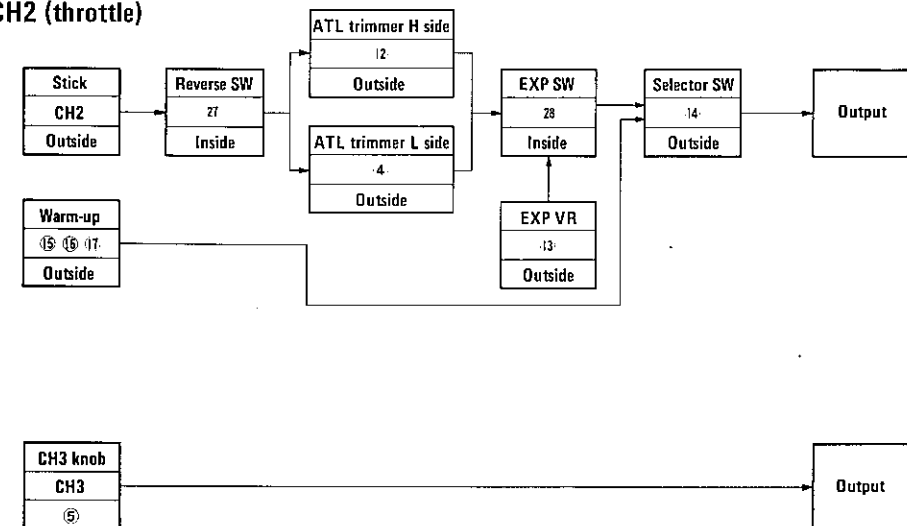
Fig. 15

T3EGX BLOCK DIAGRAM

CH1 (rudder)



CH2 (throttle)



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

Band (1)	26.995MHz	Brown
Band (2)	27.045MHz	Red
Band (3)	27.095MHz	Orange
Band (4)	27.145MHz	Yellow
Band (5)	27.195MHz	Green

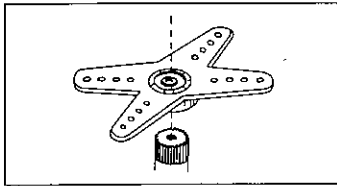
72.080MHz	Brown/White
72.160MHz	Blue/White
72.240MHz	Red/White
72.320MHz	Violet/White
72.400MHz	Orange/White
72.960MHz	Yellow/White
75.640MHz	Green/White
Aircraft use only.	

- The frequency of Futaba digital proportional sets can be changed among bands (1)~(5) 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 in the left. The frequency flag is intended for identification 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 72-76 MHz bands in the U.S.A.

SPLINED HORN

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

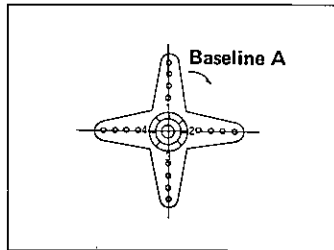
a) Angle divisions



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

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

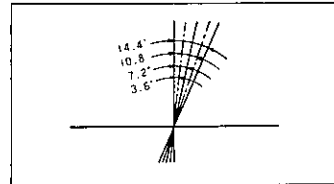
b) Effect



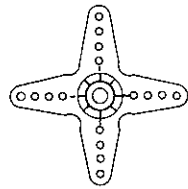
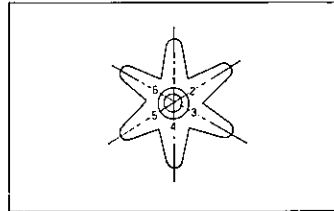
To shift the holes center line to the right (clockwise) relative to baseline A, shift arm 2 to the position of arm 1 and set it to the position closest to baseline A.

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

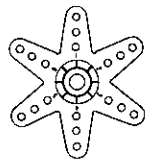
To shift by the same angle in the opposite direction, use the opposite arm number.



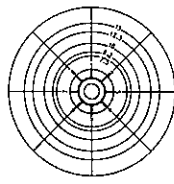
For a six arm horn, turn the arm counterclockwise and set arm 2 to the position of arm 1. The adjustable angle is $60^\circ - (14.4 \times 4) = 2.4^\circ$. Arm 3 shift 4.8° to the right, arm 6 shifts 2.4° to the left, and arm 4 shifts 7.2° to the right and left.



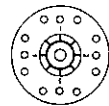
horn A (FSH-6X)



horn B (FSH-6S)



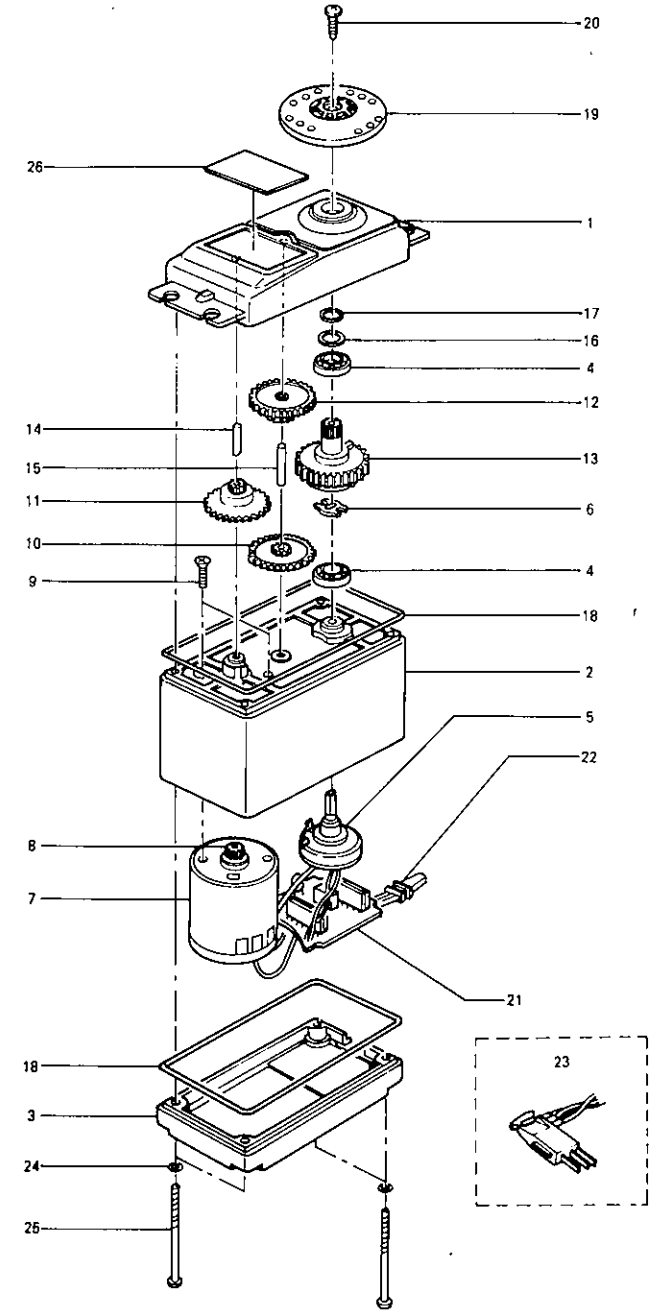
horn C (FSH-6R)



horn D (FSH-6W)

[FP-S31S EXPRODED VIEWS]

No.	Part Name	Part No.
1.	Upper case	FCS-31
2.	Middle case	FCS-31
3.	Bottom case	FCS-31
4.	Ball bearing L 1060	S04130
5.	VR	139995
6.	VR drive plate	S02753
7.	Coreless motor	S91209
8.	Pinion gear	S05530
9.	Iron truss screw 1.6x2.5	J51008
10.	1st gear	FGS-31
11.	2nd gear	FGS-31
12.	3rd gear	FGS-31
13.	Final gear	FGS-31
14.	2nd shaft	S01351
15.	Intermediate shaft	S04287
16.	Spacer washer	S02486
17.	Seal ring	S09415
18.	O-ring 20x0.9φ, black	S90426
19.	Splined horn D	FSM-6W
20.	Horn mounting screw	FSM-41
21.	Printing wiring board	AS1219
22.	Grommet	S90045
23.	3PC, with cord	FPC-3M
24.	1.6φ O-ring for the screw	S90410
25.	Truss pan head screw, 2x27.5	J50085
26.	Name plate	S80711



GUARANTEE

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

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

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

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

FACTORY REPAIR SERVICE

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

1. Charge the batteries for at least 18 hours prior to shipment.
2. Return the system only. Not your complete installation. Remove the servos from their mounts and remove the foam padding from the receiver.
3. Plugs or other modifications which interfere with factory test procedures will be returned to factory standard at your expense.
4. Carefully pack all components individually, using sufficient packing material to prevent damage during shipment.
5. Include a brief but thorough explanation of all problems and service required and tape it to the back of the transmitter. Place a label describing the functions of the servo on each servo.
6. Be sure to include your full address and zip code inside the box as well as on the outside.
7. Include a packing list of all items being returned, and double check to make sure that all items are packed.
8. Upon receipt of damaged equipment at the FUTABA factory, an estimate of the cost of repair will be sent to you. Your equipment will then be repaired and returned to you upon receipt of payment.

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

