

MODEL R182 AND TR182 SERVICE MANUAL

SECTION 10

RUDDER AND RUDDER TRIM CONTROL SYSTEMS

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- 10-1. RUDDER CONTROL SYSTEM. (Refer to figure 10-1.)
- 10-2. DESCRIPTION. Rudder control is maintained through use of conventional rudder pedals which also control nosewheel steering. The system is comprised of the rudder pedals, cables and pulleys, bellcranks and the nosewheel steering bungee.
- 10-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 10-11.

TROUBLE	PROBABLE CAUSE	REMEDY
RUDDER DOES NOT RESPOND TO PEDAL MOVEMENT.	Broken or disconnected cables.	Open access plates and check visually. Connect or replace cables.
BINDING OR JUMPY MOVEMENT OF RUDDER PEDALS.	Cables too tight.	Refer to figure 10-1 for cable tension. Rig system in accordance with paragraph 10-11.
	Cables not riding properly on pulleys.	Open access plates and check visually. Route cables correctly over pulleys.
	Binding, broken or defective pulleys or cable guards.	Open access plates and check visually. Replace defective pulleys and install guards properly.

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10-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
	Pedal bars need lubrication.	Refer to Section 2.
	Defective rudder bar bearings.	If lubrication fails to eliminate binding. Replace bearing blocks.
	Defective rudder hinge bushings.	Check visually. Replace defective bushings.
	Clevis bolts too tight.	Check and readjust bolts to eliminate binding.
	Steering rods improperly adjusted.	Rig system in accordance with paragraph 10-11.
LOST MOTION BETWEEN RUDDER PEDALS AND RUDDER.	Insufficient cable tension.	Refer to figure 10-1 for cable tension. Rig system in accordance with paragraph 10-11.
INCORRECT RUDDER TRAVEL.	Incorrect rigging.	Rig in accordance with paragraph 10-11.

10-4. RUDDER PEDAL ASSEMBLY.

10-5. REMOVAL AND INSTALLATION. (Refer to figure 10-2.)

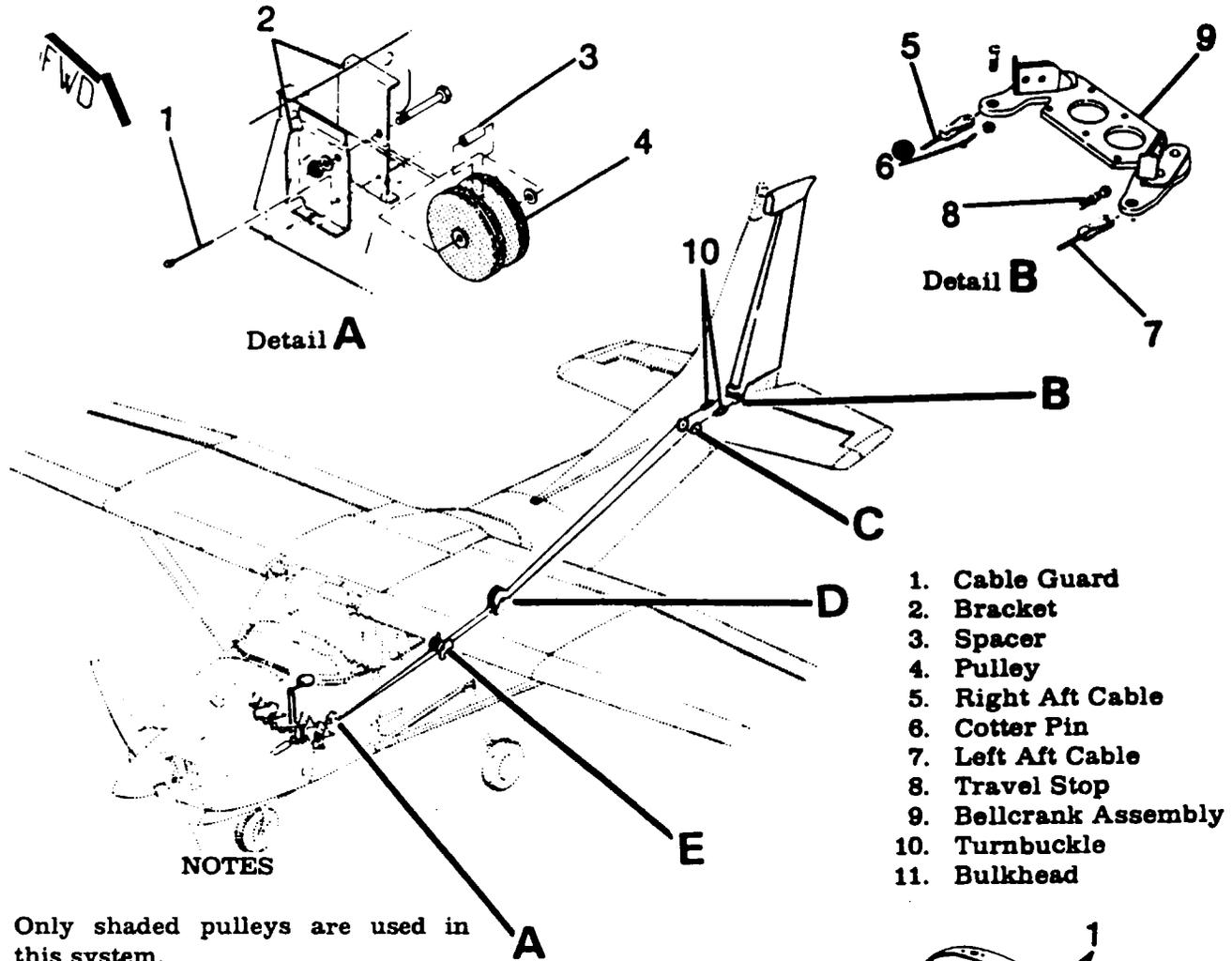
- a. Remove carpeting, shields and soundproofing from the rudder pedal and tunnel areas as necessary for access.
- b. Disconnect brake master cylinders (15) and parking brake cables at pilot's rudder pedals.

NOTE

Brake links (5), bellcranks (17), brake torque tubes (14) and attaching parts are not required unless dual controls ARE installed. When dual controls ARE NOT installed, hubs (18) are attached to each end of rudder bars.

- c. Remove rudder pedals (2) and brake links (5).
- d. Remove fairing from either side of vertical fin, remove safety wire and relieve cable tension by loosening turnbuckles (index 10, figure 10-1).
- e. Disconnect cables (6 and 7) from rudder bar arms (8).
- f. Disconnect steering bungee rod end (12) from rudder bar arm (13) (figure 10-5).
- g. Remove bolts securing bearing blocks (10) and carefully work rudder bars out of tunnel area.

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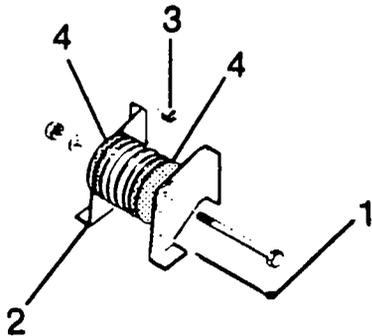


1. Cable Guard
2. Bracket
3. Spacer
4. Pulley
5. Right Aft Cable
6. Cotter Pin
7. Left Aft Cable
8. Travel Stop
9. Bellcrank Assembly
10. Turnbuckle
11. Bulkhead

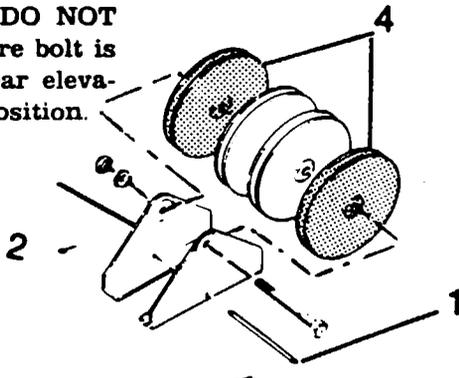
NOTES

Only shaded pulleys are used in this system.

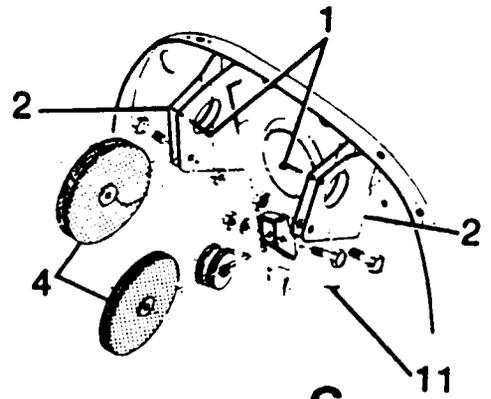
- Trim cotter pin (6) at rudder bellcrank (9) to clear elevator torque tube in UP position. DO NOT cut pin too short. Make sure bolt is proper length and will clear elevator torque tube in the UP position.



Detail E



Detail D



Detail C

CAUTION

MAINTAIN SPECIFIED CONTROL CABLE TENSION.

CABLE TENSION:
 30 LBS ± 10 LBS (AT AVERAGE TEMPERATURE FOR THE AREA.)
 REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 10-1. Rudder Control System

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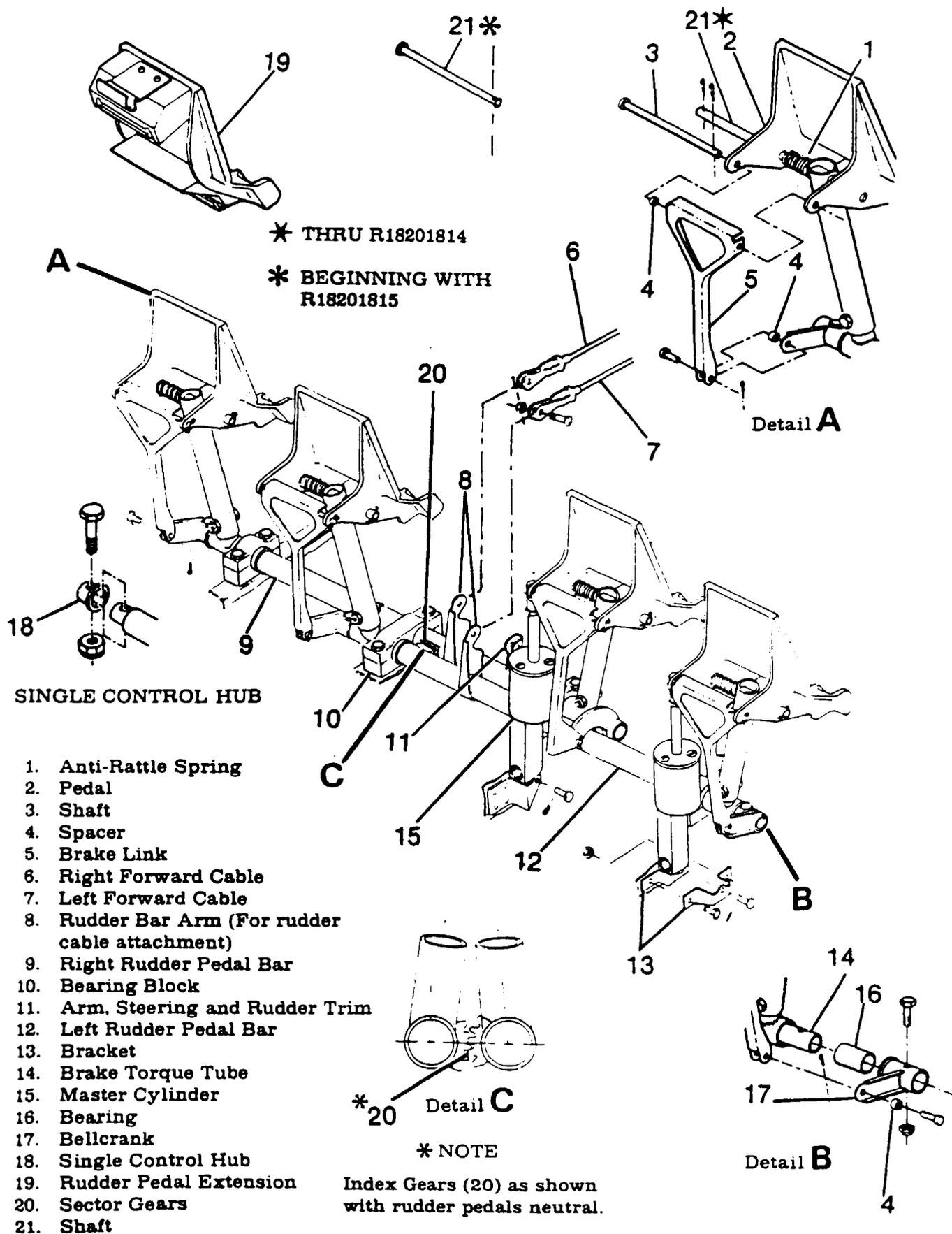
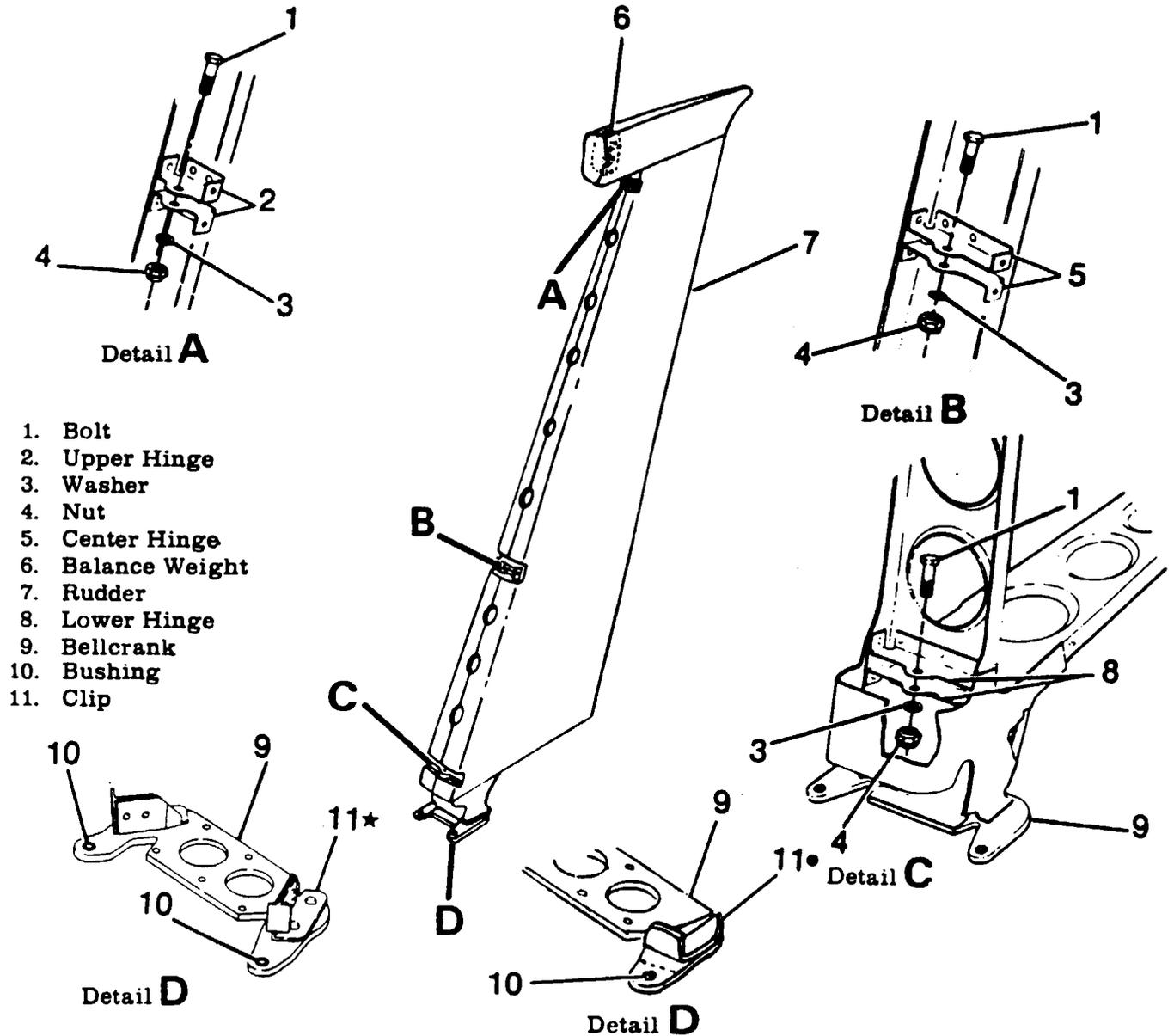


Figure 10-2. Rudder Pedals Installation

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1. Bolt
2. Upper Hinge
3. Washer
4. Nut
5. Center Hinge
6. Balance Weight
7. Rudder
8. Lower Hinge
9. Bellcrank
10. Bushing
11. Clip

★ THRU R18201254 AND FR18200045

Figure 10-3. Rudder Installation

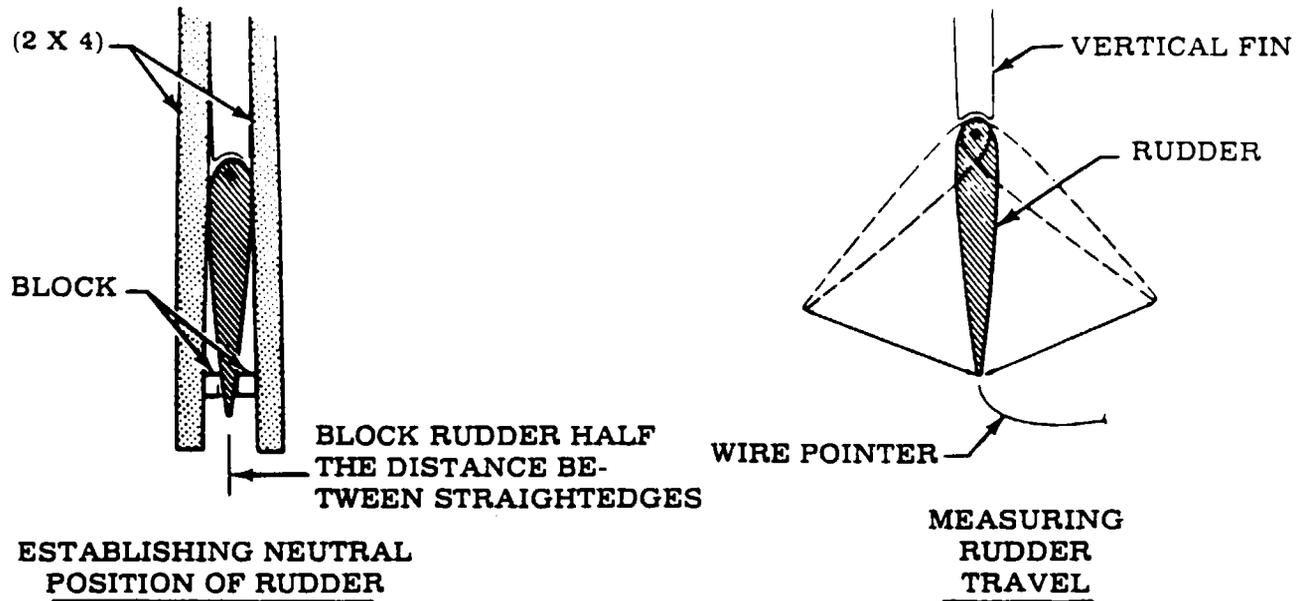
- BEGINNING WITH R18201255
AND FR18200046 THRU FR18200070

NOTE

The two inboard bearing blocks contain clearance holes for the rudder bars at one end and a bearing hole at the other. Tag these bearing blocks for reference on reinstallation.

- h. Reverse the preceding steps for reinstallation. Lubricate rudder bar assemblies as outlined in Section 2. Rig system in accordance with paragraph 10-11. safety turnbuckles and reinstall all items removed for access.

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1. Establish neutral position of rudder by clamping straightedge (such as a wooden 2 x 4) on each side of fin and rudder and blocking trailing edge of rudder half the distance between straightedges as shown.
2. Tape a length of soft wire to the stinger in such a manner that it can be bent to index at the lower corner of the rudder trailing edge.
3. Using soft lead pencil, mark rudder at point corresponding to soft wire indexing point (neutral).
4. Remove straightedges and blocks.
5. Hold rudder against right, then left, rudder stop. Measure distance from pointer to pencil mark on rudder in each direction of travel. Distance should be between 8.12" and 8.72".

Figure 10-4. Checking Rudder Travel

10-6. RUDDER.

10-7. REMOVAL AND INSTALLATION. (Refer to figure 10-3.)

- a. Disconnect tail navigation light.
- b. Remove stinger from tailcone.
- c. Remove fairing from either side of vertical fin, remove safety wire and relieve cable tension by loosening turnbuckles (index 10, figure 10-1.)
- d. Disconnect cables (index 5 and 7, figure 10-1) from rudder bellcrank.
- e. With rudder supported, remove all hinge bolts, and using care, lift rudder free of vertical fin.
- f. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall all items removed for access.

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- 10-8. REPAIR. Repair may be accomplished as outlined in Section 18.
- 10-9. CABLES AND PULLEYS. (Refer to figure 10-1.)
- 10-10. REMOVAL AND INSTALLATION.
- Remove seats, upholstery and access plates as necessary.
 - Relieve cable tension at turnbuckles (10) and disconnect cables.
 - Disconnect cables (index 6 and 7, figure 10-2) from rudder bar arms.
 - Remove cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

To ease routing of cables, a length of wire may be attached to end of the cable before being withdrawn from aircraft. Leave wire in place, routed through structure; then attach cable being installed and pull the cable into position.

- Reverse the preceding steps for reinstallation.
- After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley grooves before installing guards.

NOTE

Trim cotter pin (6) at rudder bellcrank (9) to clear elevator torque tube in UP position. DO NOT cut pin too short. (Refer to figure 10-1.)

- Re-rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall items removed in step "a".
- 10-11. RIGGING. (Refer to figure 10-5).
- Establish neutral position of rudder by clamping straightedge (such as wooden 2 x 4) on each side of fin and rudder and blocking trailing edge of rudder half the distance between strightedges as shown in figure 10-4.
 - Tape a length of soft wire to the stinger in such a manner that it can be bent to index at the lower corner of the rudder trailing edge.
 - Using soft lead pencil, mark rudder at point corresponding to soft wire indexing point (neutral).
 - Remove strightedges and blocks.
 - Hold rudder against right, then left, rudder stop. Measure distance from pointer to pencil mark on rudder in each direction of travel. Distance should be between 8.12" and 8.72".
 - Adjust travel stop bolts (index 8, figure 10-1) to attain correct rudder travel as specified in figure 1-1.
 - Disconnect steering bungee adjustable rod end (12) from arm (13).
 - Disengage chain (10) from sprocket (15).
 - Remove fairing from either side of vertical fin, remove safety wire and relieve cable tension at turnbuckles (index 10, figure 10-1).
 - With rudder pedals clamped in neutral position, adjust turnbuckles (index 10, figure 10-1) to specified tension with the rudder offset one degree to the right, (5 16 inch at lower trailing edge). Safety turnbuckles. Remove rudder pedal clamps.
 - Operate system and check for proper travel and freedom of movement.

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NOTE

After completing the preceding steps, the rudder control system is rigged. The rudder system **MUST** be correctly rigged prior to rigging the rudder trim and nosewheel steering system. Refer to paragraph 10-15 for rigging the rudder trim and nosewheel steering system.

- 10-12. **RUDDER TRIM AND NOSEWHEEL STEERING SYSTEM.** (Refer to figure 10-5.)
- 10-13. **DESCRIPTION.** A sprocket-operated screw mechanism to provide rudder trim is incorporated at the aft end of the steering bungee (19). The trim system is operated by a trim control wheel (4), mounted in the pedestal. Nosewheel steering is accomplished through use of the rudder pedals. The steering bungee (19) links the nose gear to the rudder bar arm (13).

NOTE

The rudder control system, rudder trim control system and nosewheel steering systems are interconnected. Adjustments to any one of these systems will affect the others. For maintenance to the nose gear steering, other than rigging, refer to Section 5.

- 10-14. **TROUBLE SHOOTING.**

NOTE

This trouble shooting chart should be used in conjunction with the trouble shooting chart in paragraph 10-3.

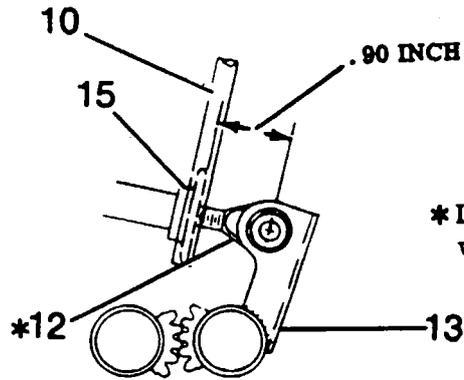
NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system. refer to paragraph 10-15.

TROUBLE	PROBABLE CAUSE	REMEDY
FALSE READING ON TRIM POSITION INDICATOR.	Improper rigging.	Refer to paragraph 10-15.
	Worn, bent or disconnected linkage.	Check visually. Repair or replace parts as necessary.
HARD OR SLUGGISH OPERATION OF TRIM WHEEL.	Worn, bent or binding linkage.	Check visually. Repair or replace parts as necessary.
	Incorrect rudder cable tension.	Check and adjust rudder cable tension.
FULL TRIM TRAVEL NOT OBTAINED.	Rudder trim system improperly rigged.	Refer to paragraph 10-15.

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1. Chain Tension Spring
2. Indicator
3. Bushing
4. Rudder Trim Wheel
5. Trim Wheel Sprocket
6. Aft Trim Shaft Sprocket
7. Pedestal Structure
8. Trim Shaft Bearing
9. Forward Trim Shaft Sprocket
10. Chain
11. Pivot Bolt
12. Rod End
13. Rudder Bar Arm
14. Bearing Mount
15. Sprocket
16. Steering Bellcrank
17. Strut Assembly
18. Indicator Positioning Arm
19. Bungee
20. Clamp

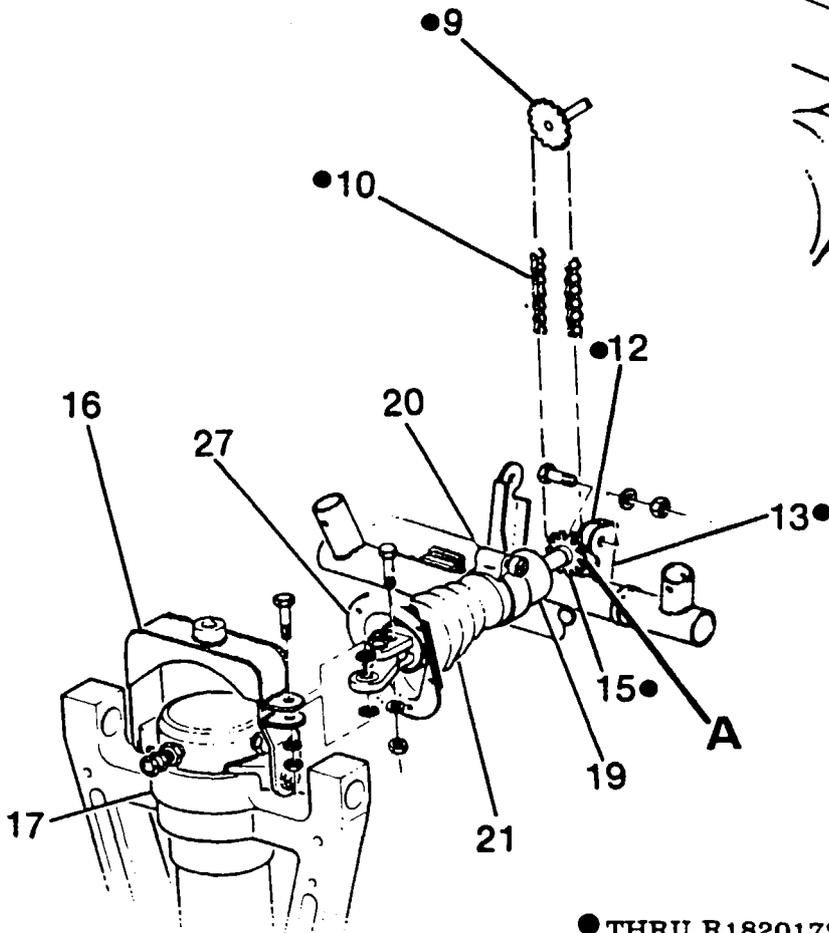
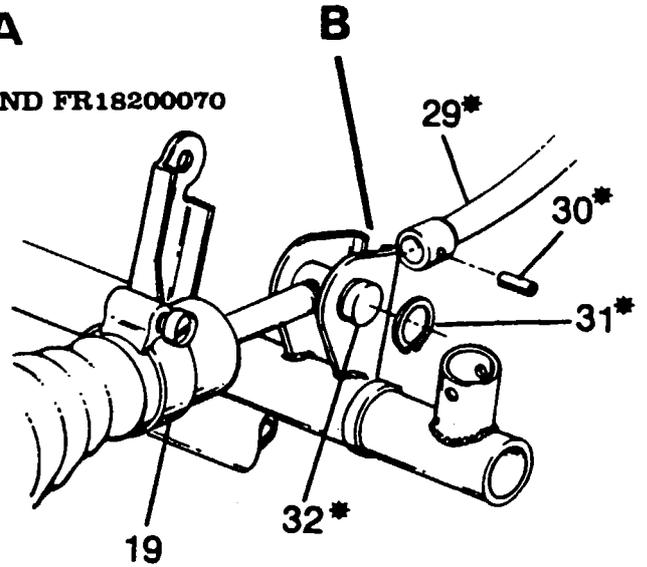


NOTE

* Lube Threads on rod end (12) with MIL-G-21164.

Detail A

THRU R18201798 AND FR18200070



21. Boot
22. Cotter Pin
23. Roll Pin
24. Universal Joint
25. Washer
26. Spacer
27. Retainer
28. Rivet
29. Flexible Shaft
30. Roll Pin
31. Snap Ring
32. Shaft
33. Screw
34. Grommet

● THRU R18201798 AND FR18200070

* R18201799 AND ON

Figure 10-5. Rudder Trim Control System (Sheet 1 of 3)

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* THRU R18200578 AND FR18200020

* BEGINNING WITH R18200579 AND FR18200021

● THRU R18201798 AND FR18200070

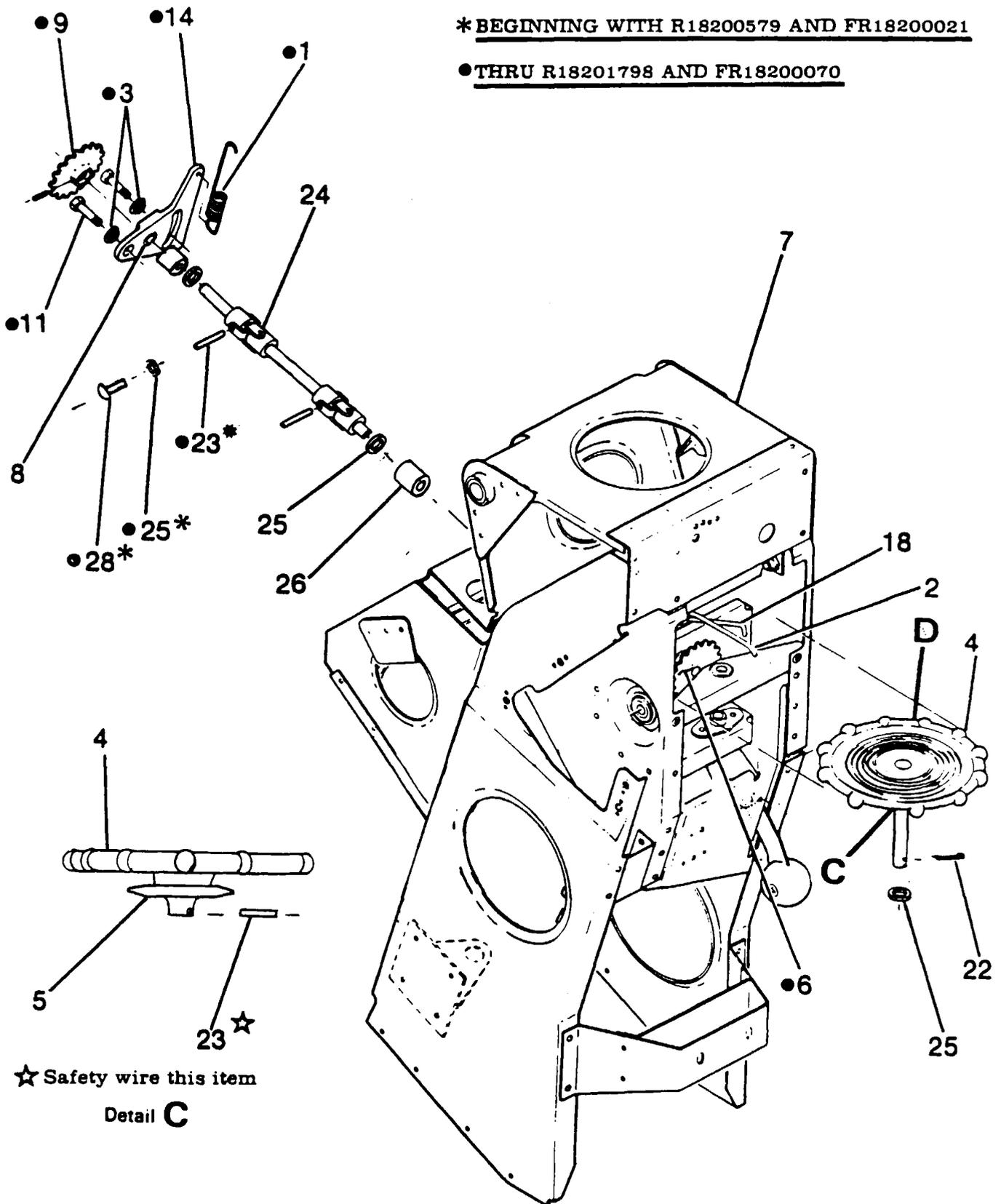
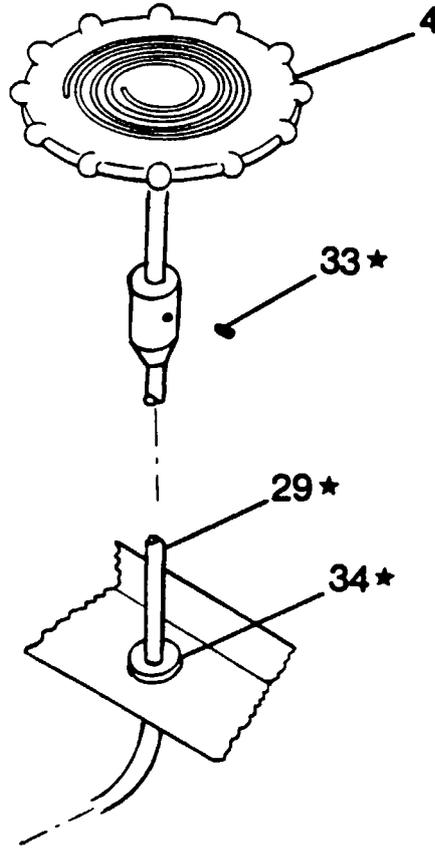


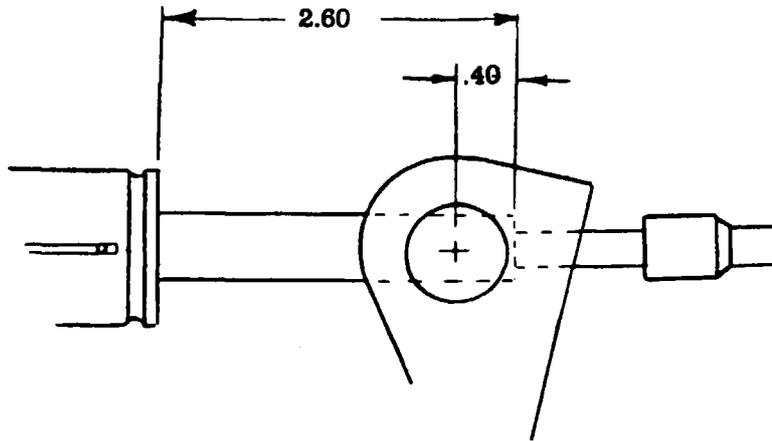
Figure 10-5. Rudder Trim Control System (Sheet 2 of 3)

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★ R18201799 AND ON



Detail **D**



Detail **B**

R18201799 AND ON

Figure 10-5. Rudder Trim Control System (Sheet 3 of 3)

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10-15. RIGGING. (Refer to figure 10-5.)

a. THRU 1981 MODELS.

NOTE

The rudder control system **MUST** be rigged in accordance with paragraph 10-11 prior to rigging the rudder trim and nosewheel steering system.

1. After completing step "j" of paragraph 10-11, tie down or weight tail to raise nosewheel free of ground.
2. Extend strut and ensure nose gear is centered against external centering stop. (Refer to Section 5.)
3. Rotate trim control wheel (4) until indicator (2) is centered in pedestal slot (neutral).
4. With rudder pedals clamped in neutral position, adjust steering bungee rod end (12) .90 inch from bolt hole center to aft face of sprocket (15). Maintaining this adjustment, rotate sprocket (15) IN or OUT as required to align rod end (12) with attaching hole in rudder bar arm (13).

NOTE

When connecting rod end (12) to arm (13) with chain (10) engaged, it is necessary to pull rod end (12) down with enough force to overcome tension on spring (1).

5. Without rotating sprocket (15) or moving trim indicator (2) engage chain (10) on sprocket (15) and connect rod end (12) to rudder bar arm (13).
6. Lower nose wheel to ground, remove clamps from rudder pedals, tighten all jam nuts and reinstall all items removed for access.

NOTE

Make sure rudder moves in the correct direction when operated by the rudder pedals and the trim control wheel.

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b. BEGINNING WITH 1982 MODELS.

1. After completing step "j" of paragraph 10-11, tie down or weight tail to raise nosewheel free of ground.
2. Extend strut and ensure nose gear is centered against external centering stop. (Refer to Section 5.)
3. With rudder pedals clamped in neutral position, adjust bungee shaft and barrel nut to dimensions shown in detail B. Maintaining this position, slip flex shaft end on bungee rod end and secure with roll pin. Safety roll pin.
4. Loosen setscrew (33) and position rudder trim wheel so that indicator is in center track and aligned with ends of outer and inner tracks.
5. Install setscrew (33) so dog engages hole in shaft of trim tab control wheel. Seal with Loctite 242 or equivalent.
6. Center indicator with respect to console cover by bending wire pointer. Do not cause wire to "jump tracks."
7. Lower nosewheel to ground, remove clamps from rudder pedals, tighten all jam nuts, and reinstall all items removed for access.

WARNING

Make sure rudder moves in the correct direction when operated by the rudder pedals and the trim control wheel.