DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

M48 AND M60 SERIES TANKS

PARKING BRAKE SYSTEM

MAINTENANCE

HEADQUARTERS, DEPARTMENT OF THE ARMY
SEPTEMBER 1982

TA 173237

TECHNICAL BULLETIN

Headquarters,
Department of the Army
Washington, D.C. 25 November 1982

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SECTION I. GENERAL

1. PURPOSE

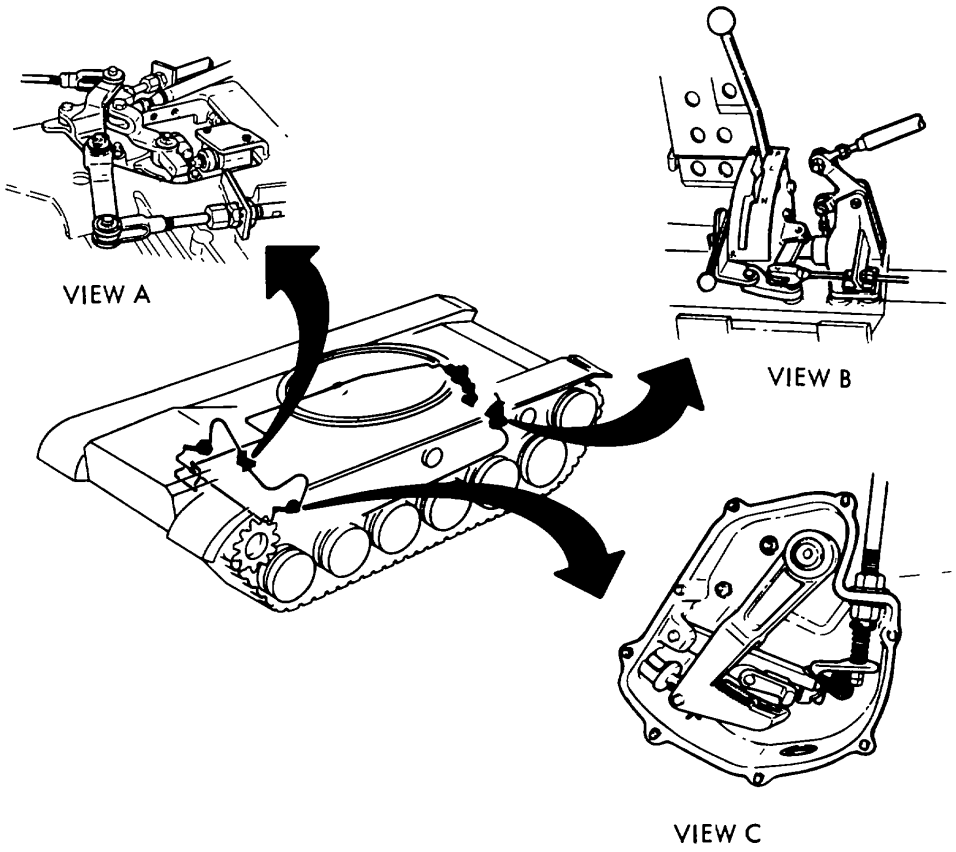
The purpose of this bulletin is to provide instructions to organizational maintenance personnel for the maintenance of the parking brake systems of M60 and M48 series combat tanks.

2. SCOPE

This bulletin provides procedures for inspection, replacement, and adjustment of the parking brake system, which are to be used in place of the procedures presently given in the applicable vehicle organizational maintenance manuals.

3. DESCRIPTION

The parking brake lever and cam are attached to the shifting pedestal. It actuates a cable to transmission fittings which then lock the brake levers when the shifting lever is moved into P (park) position with the hydraulic brake applied.



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A Bellcrank and associated parts.
B Front control and associated parts.
C Brake housing and associated parts.

SECTION II. PARKING BRAKE CONTROL INSPECTION PROCEDURES

TOOLS: 1/2 inch socket with 3/8 inch drive
7/16 inch socket with 3/8 inch drive
6-inch rule
Adjustable wrench
Diagonal cutting pliers
Ratchet with 3/8 inch drive
Screwdriver

SPECIAL TOOLS: None

SUPPLIES: Locating pin (welding rod 1/8-inch diameter x 4-inches long)

PERSONNEL: Two

After performing the three inspection procedures you will know if:

1) The two-piece parking brake control assembly is correctly located.

2) The parking brake control assembly is adjusted correctly.

3) The service brake system and parking brake locking mechanism functions correctly.

NOTE

If vehicle passes all three inspection procedures your task is completed. The parking brake system will function correctly.

PARKING BRAKE CONTROL INSPECTION PROCEDURES - Continued

INSPECTION I

DETERMINE IF TWO-PIECE PARKING BRAKE CONTROL ASSEMBLY IS CORRECTLY LOCATED.

BOTH MECHANICS (REAR GRILLE DOOR)
- BLOCK VEHICLE TRACKS
- OPEN GRILLE DOORS
- REMOVE TRANSMISSION SHROUD
- REMOVE REAR DECK

MECHANIC A (REAR-RIGHT SIDE)

- VISUALLY INSPECT FRONT CONTROL (A) TO MAKE SURE REAR CLAMP (B) IS SECURING FRONT CONTROL (A) AROUND METAL CASING (C) APPROXIMATELY ONE-INCH FORWARD OF THE DISCONNECT (D). Figure 1

IS REAR CLAMP (B) SECURING FRONT CONTROL (A) AROUND METAL CASING (C)?

YES → **PROCEED TO INSPECTION II**

NO → **PERFORM THE FOLLOWING:** Figure 1

MECHANIC A (REAR - RIGHT SIDE)
- LOOSEN REAR CLAMP (B) AT PAD (E).

MECHANIC B (DRIVER'S COMPARTMENT)
- LOOSEN FRONT CLAMP (F) (FORWARD OF BULKHEAD).
- LOOSEN RETAINER (G) AT BULKHEAD

BOTH MECHANICS (SAME PREVIOUS POSITIONS)
- PUSH/PULL ON CONTROL ASSEMBLY (A) UNTIL METAL CASING (C) SLIDES INTO REAR CLAMP (B) AND IS POSITIONED APPROXIMATELY ONE-INCH FORWARD OF THE DISCONNECT NUT (D).

MECHANIC B (DRIVER'S COMPARTMENT)
- TIGHTEN FRONT CLAMP (F) (FORWARD OF BULKHEAD).
- TIGHTEN RETAINER (G) AT BULKHEAD.

MECHANIC A (REAR-RIGHT SIDE)
- TIGHTEN REAR CLAMP (B)

WHEN REAR CLAMP (B) SECURES FRONT CONTROL (A) AROUND METAL CASING (C) PROCEED TO INSPECTION II.

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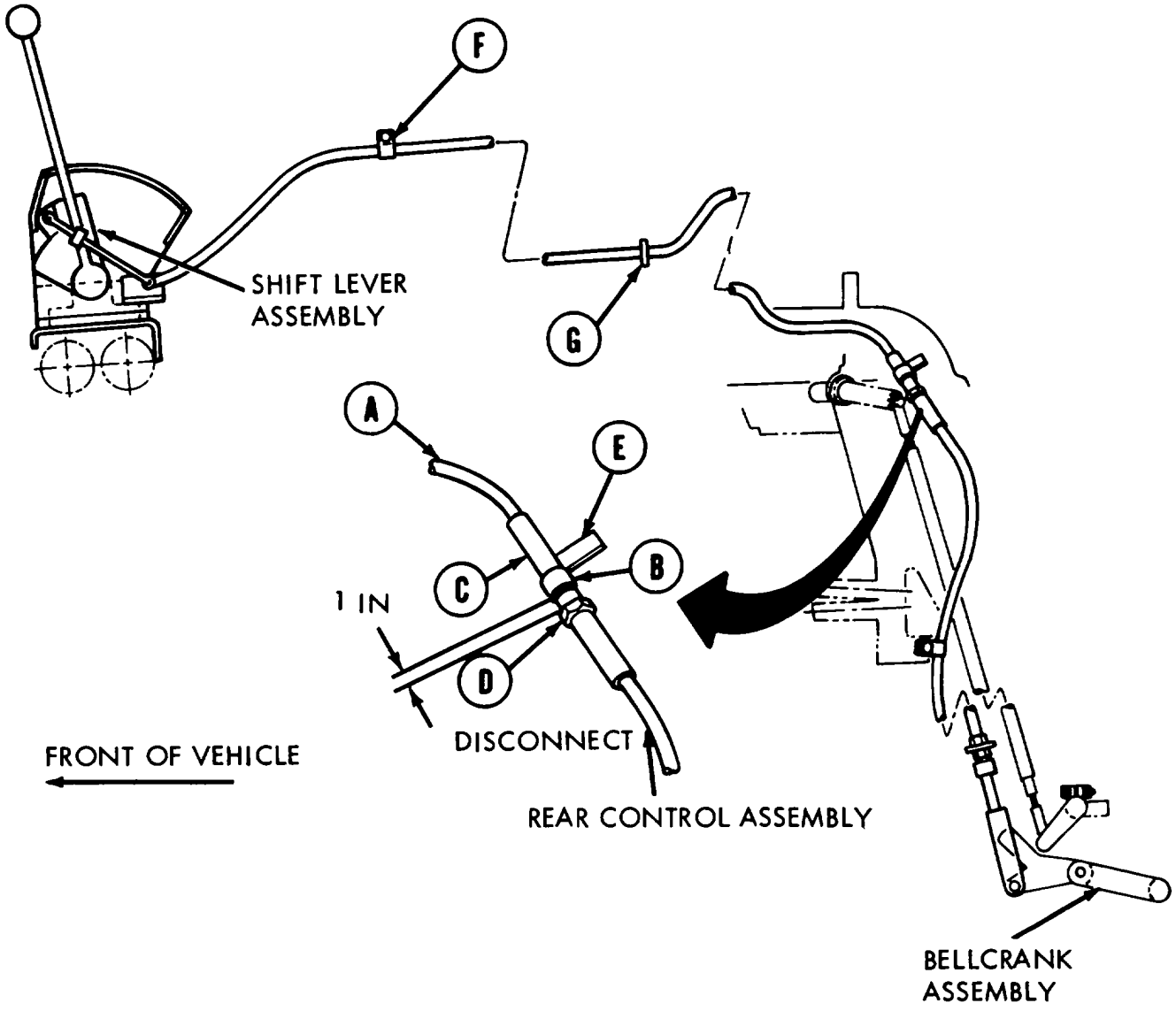

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LEGEND

A - FRONT CONTROL
B - REAR CLAMP
C - CASING
D - DISCONNECT
E - PAD
F - CLAM[
G - RETAINER

Figure 1. Checking Positioning of Two-Piece Control.

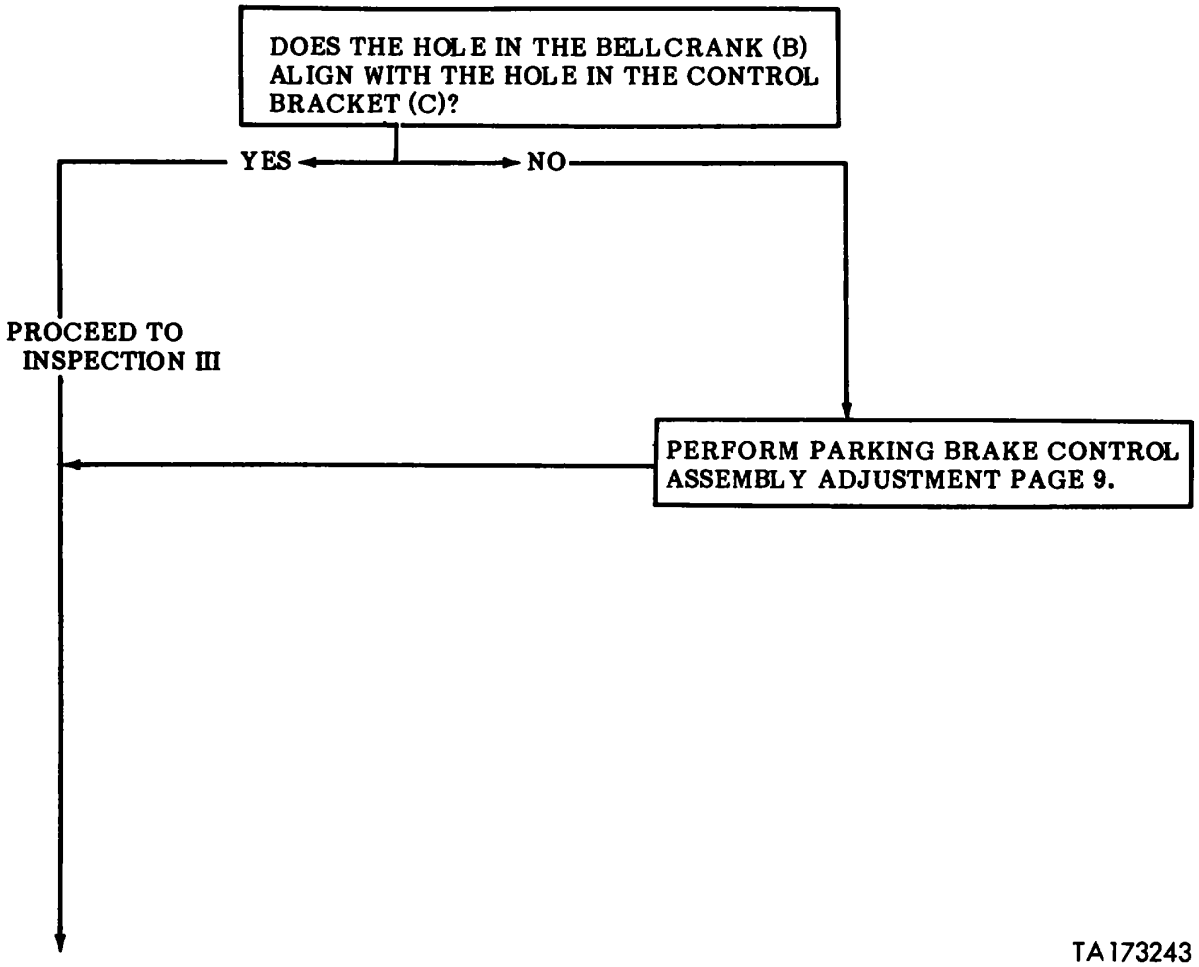
PARKING BRAKE CONTROL INSPECTION PROCEDURES - Continued

INSPECTION II

DETERMINE IF PARKING BRAKE CONTROL ASSEMBLY, SHIFT QUADRANT TO BELLCRANK, IS CORRECTLY ADJUSTED.

MECHANIC A (DRIVER'S COMPARTMENT)
- PLACE SHIFT LEVER IN PARK POSITION

MECHANIC B (REAR OF TANK)
- INSERT 1/8 x 4 INCH LONG LOCATING PIN (A) THROUGH HOLE IN BELLCRANK (B) AND CONTROL BRACKET (C). Figure 2



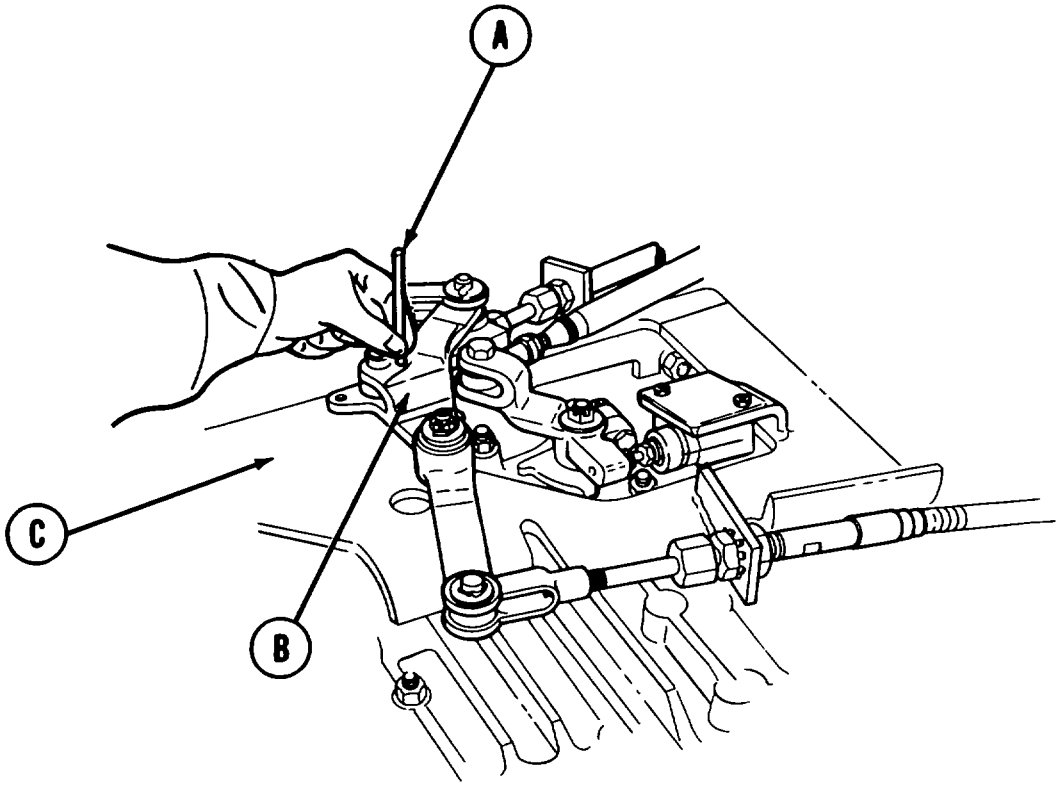


Figure 2. Checking Adjustment from Shift Quadrant to Bellcrank.

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PARKING BRAKE CONTROL INSPECTION PROCEDURES - Continued

INSPECTION III

DETERMINE IF SERVICE BRAKES AND PARKING BRAKE LOCKING MECHANISM ARE FUNCTIONING CORRECTLY.

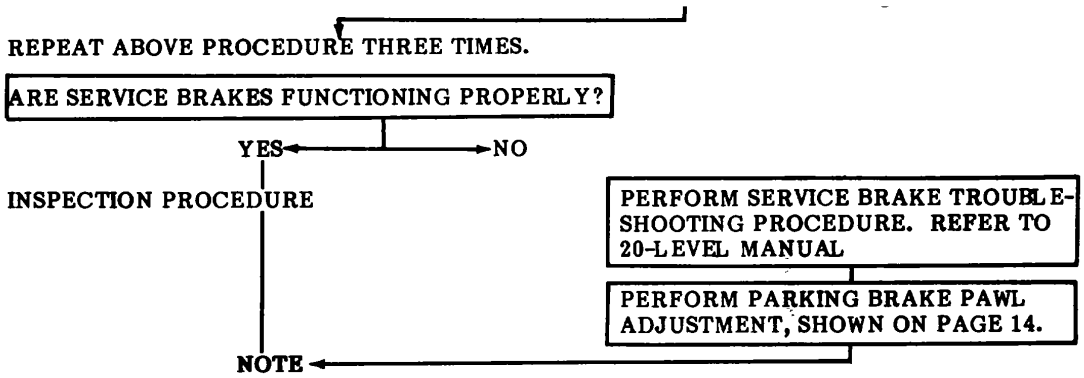
MECHANIC A (OUTSIDE TANK-REAR)
- REMOVE TRANSMISSION ACCESS COVERS (A)
- REMOVE LOCKWIRES (B) AND PLUGS (C) (ONE LOCATED ON EACH SIDE OF TRANSMISSION REAR HOUSING) FROM BRAKE INSPECTION HOLES. Figure 3, view A.

MECHANIC B (DRIVER'S COMPARTMENT)
- PLACE SHIFT LEVER IN PARK POSITION (P).
- PRESS BRAKE PEDAL AND HOLD FOR 30 SECONDS WHEN PRESSURE OF 750-900 PSI IS ATTAINED ON THE BRAKE PRESSURE GAUGE.

MECHANIC A (REAR GRILLE DOORS)
- A RATCHETING SOUND SHOULD HAVE BEEN HEARD AND INDEX LINE (D) MARKED A (APPLIED) SHOULD ALIGN WITH INDEX MARK (E), LOCATED ON EDGE OF BRAKE INSPECTION HOLE. Figure 3, view B.

MECHANIC B (DRIVER'S COMPARTMENT)
- PL ACE SHIFT L EVER IN NEUTRAL POSITION (N).

MECHANIC A (REAR GRILLE DOORS)
- A DISTINCT "KLUNK" SOUND SHOULD HAVE BEEN HEARD AND INDEX LINE (F) MARKED R (RELEASED) SHOULD ALIGN WITH INDEX MARK (G), LOCATED ON EDGE OF BRAKE INSPECTION HOLE. Figure 3, view C.



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AS A FINAL TEST, POSITION TANK ON STEEP INCLINE AND ENGAGE PARKING BRAKE. CHECK TO ASSURE PARKING BRAKE HOLDS FOR TWO MINUTES WHEN BRAKE PEDAL IS RELEASED.

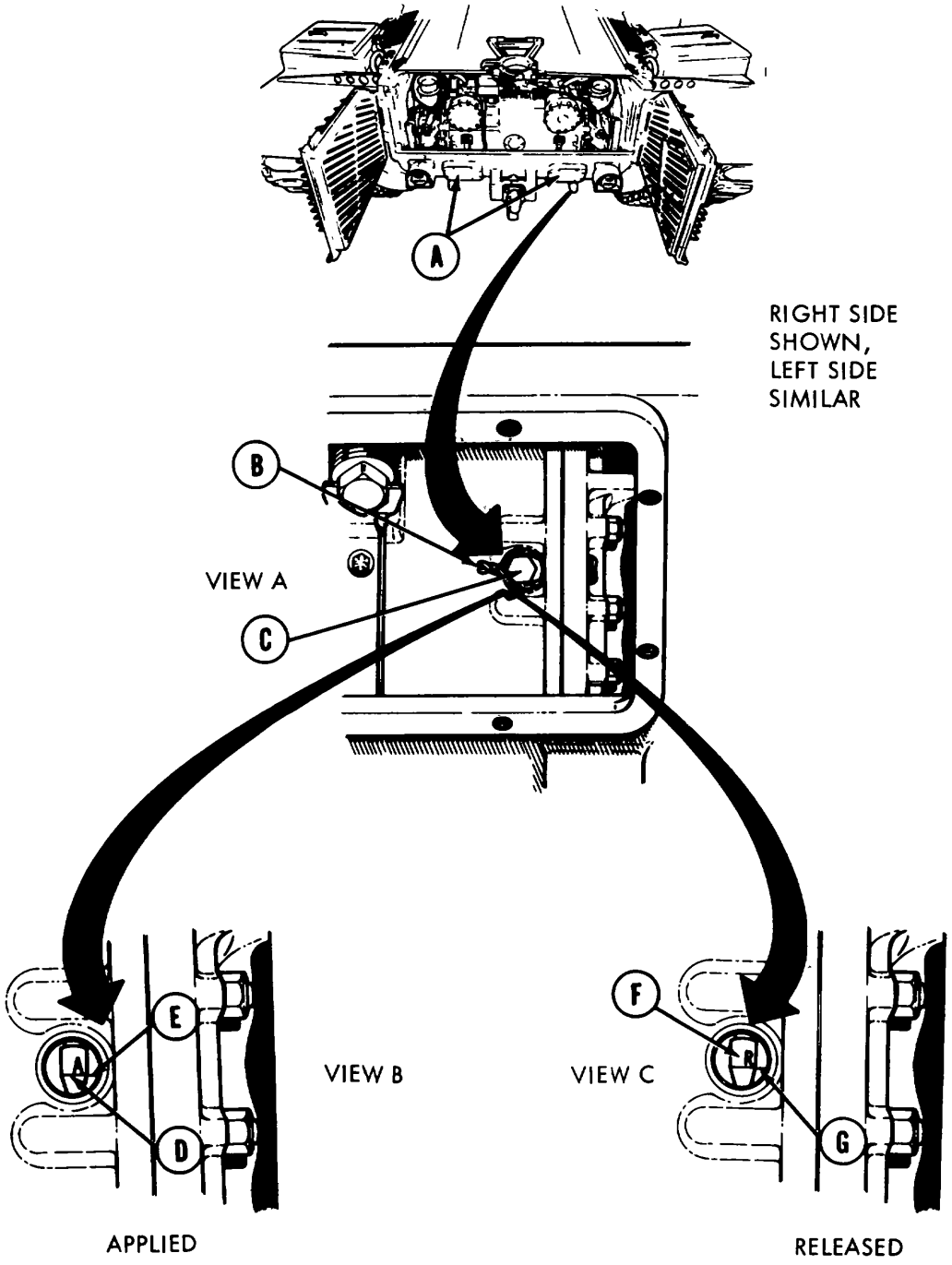

Figure 3. Checking for Proper Brake Operation.

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SECTION III. PARKING BRAKE CONTROL ASSEMBLY ADJUSTMENT

TOOLS: 15/16 inch combination wrench (two required)
6 inch rule
Grinder
Slip joint pliers

SPECIAL TOOLS: None

SUPPLIES: Cotter pins
Pencil
Locating pin (welding rod 1/8 in. diameter x 4 inches long)

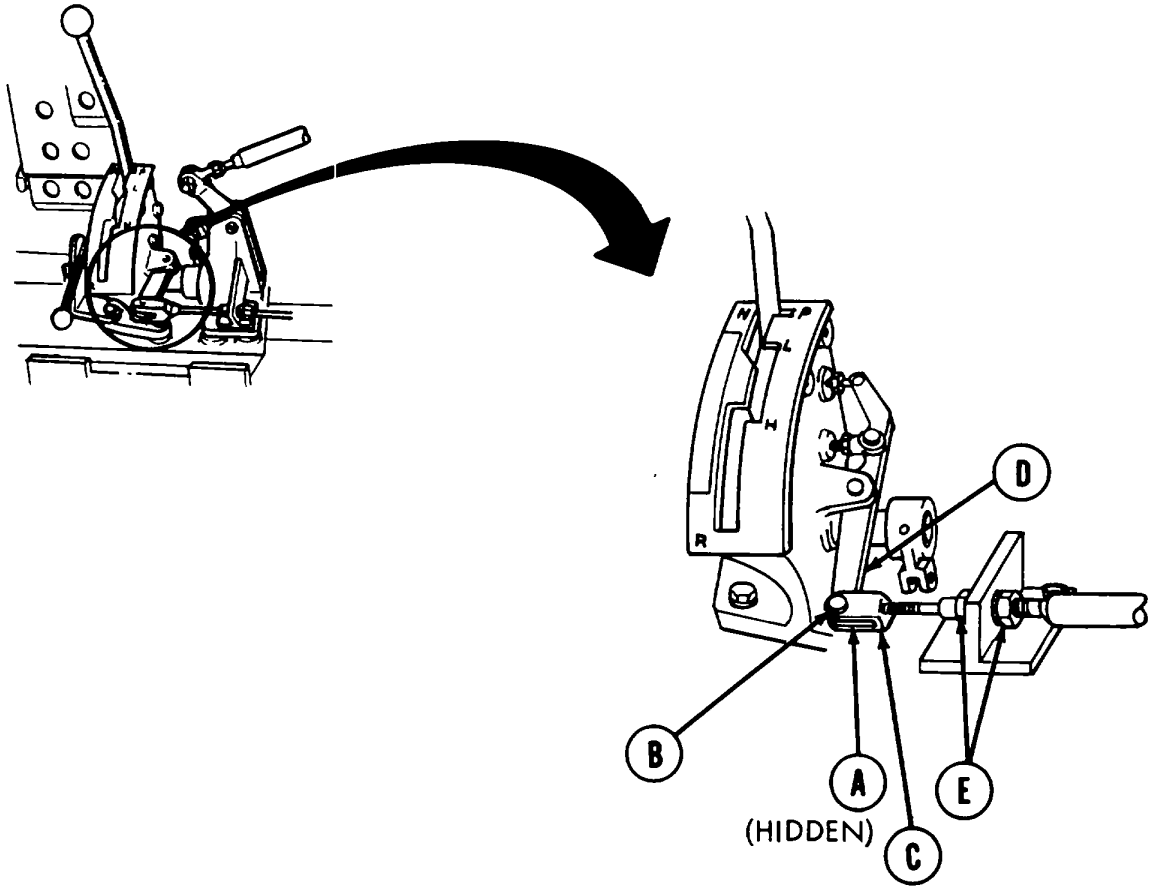
PRELIMINARY PROCEDURES: Block vehicle tracks

APPLICATION: Adjustment to be performed on vehicles equipped with one-piece or two-piece parking brake control assembly.

PARKING BRAKE CONTROL ASSEMBLY ADJUSTMENT - Continued

CONTROL ASSEMBLY ADJUSTMENT:

1. Set transmission shift lever to N (neutral) position.
2. Using pliers, remove cotter pin (A) and pin (B) holding clevis (C) to parking brake lever (D). Throw away cotter pin.
3. Using two 15/16 inch combination wrenches, loosen two nuts (E). This will permit full cable travel for steps 6 and 7 when performed.



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PARKING BRAKE CONTROL ASSEMBLY ADJUSTMENT - Continued

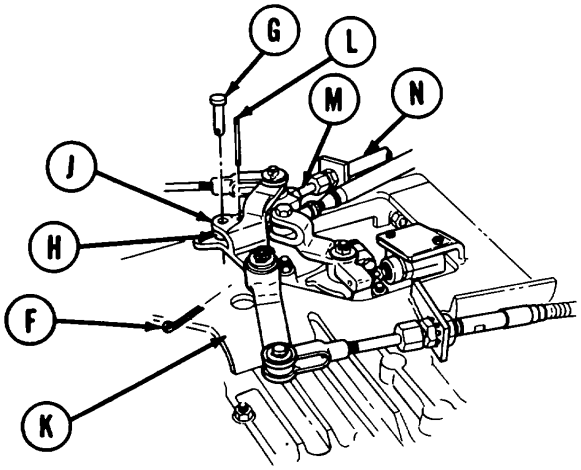
4. At transmission using pliers, remove clip (F) and pin (G) holding connector (H) to bell crank (J).

5. Rotate bellcrank (J) to aline hole in bellcrank with hole in bracket (K). Insert 1/8 inch locating pin (L) through bellcrank and bracket.

NOTE

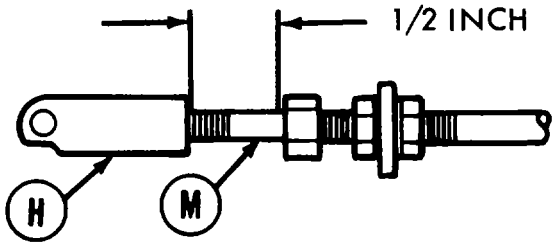
Locating pin (L) must slide up and down freely while performing the remaining adjustment.

6. Push shaft (M) into control housing (N) until it stops.



NOTE

Connector (H) must be positioned on shaft (M) with no more than 1/2 inch thread showing.



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PARKING BRAKE CONTROL ASSEMBLY ADJUSTMENT - Continued

7. Using rule, measure distance between nut (P) and connector (H) after shaft (M) is pushed inward as far as possible. Record reading.

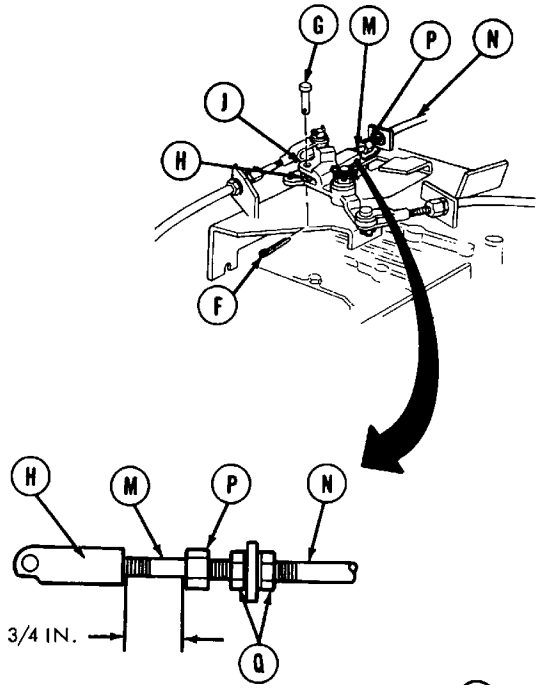
8. Pull shaft (M) out 3/4 inch farther than reading taken in step 7.

NOTE

Do not change 3/4 inch position when performing steps 9 and 10.

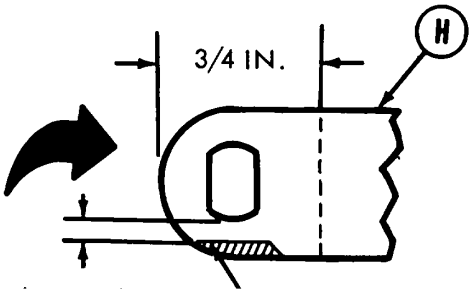
9. Check to see if pin (G) can be freely inserted through holes in bellcrank (J) and connector (H). If holes do not line up, loosen two nuts (Q), using two 15/16 inch open end wrenches. Adjust control housing (N) until pin can be freely inserted. Tighten nuts (Q).

10. Install pin (G) and clip (F) in bellcrank (J) and connector (H).



NOTE

An interference may exist between the connector (H) and the locating pin. If this occurs, it will be necessary to grind the connector as shown to eliminate this interference.



3/32 TO 1/16 IN. GRIND OFF

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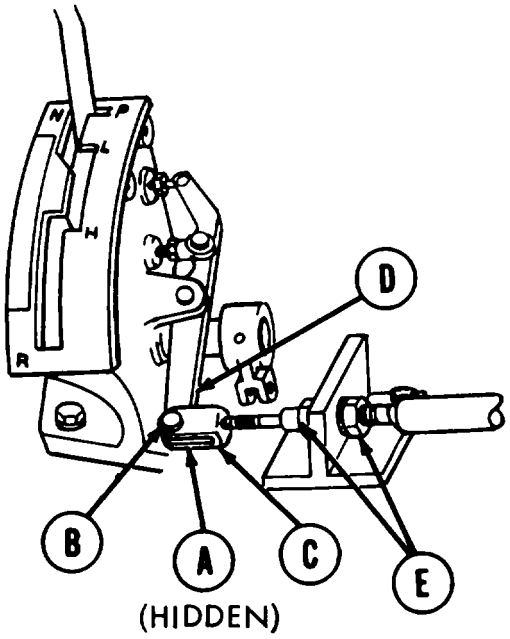
PARKING BRAKE CONTROL ASSEMBLY ADJUSTMENT - Continued

11. Place shift lever in P (park) position.

12. Aline clevis (C) with parking brake lever (D), by adjusting nuts (E) with two 15/16 inch combination wrenches. Install pin (B) and new cotter pin (A).

13. Remove locating pin from bellcrank, installed in step 5.

14. Check parking brake for normal operation.



NOTE

Upon completion of control assembly adjustment, proceed to INSPECTION III page 7.

END OF TASK

SECTION IV. PARKING BRAKE PAWL ADJUSTMENT

TOOLS: 9/16 inch combination wrench (two required)
15/16 inch combination box and opened box wrench (two required)
7/16 inch socket with 3/8 inch drive
6 inch steel rule
Pry bar
Ratchet with 3/8 inch drive
Slip joint pliers

SPECIAL TOOLS: None

FABRICATED TOOLS: Gage blocks (three required)
(fabricate as shown on page 22).

SUPPLIES: Cotter pins (NSN 5315-00-842-3044) (P/N MS24665-283)
Gasket, housing cover (two required) (NSN 5330-00-888-9403) (P/N 10911888)
Locating pin (welding rod 1/8 inch diameter by 4 inches long)

PARKING BRAKE PAWL ADJUSTMENT - Continued

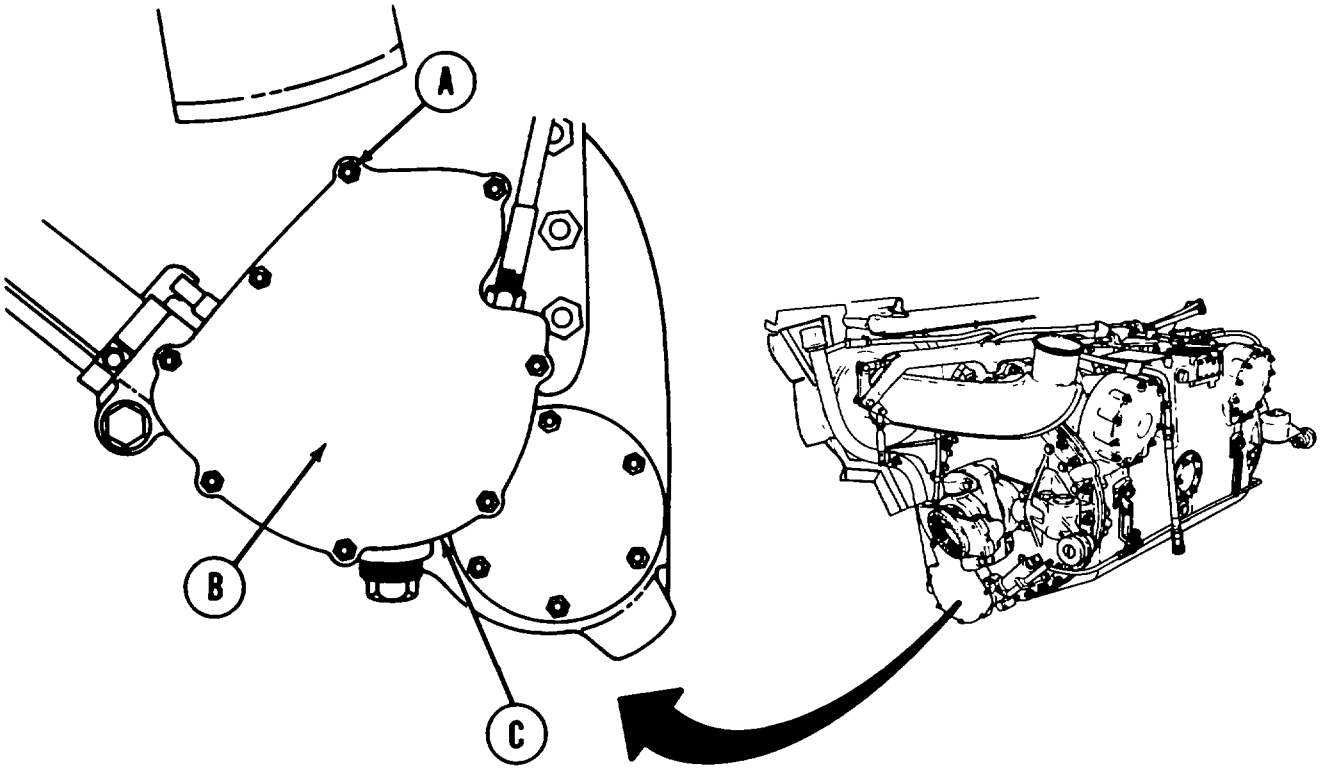
PRELIMINARY PROCEDURES: Remove powerplant (refer to applicable 20-level manual)

NOTE

If your vehicle is equipped with the two-piece parking brake control assembly, it must be separated at the disconnect (page 50).

ADJUSTMENT:

1. Using 7/16 inch socket, remove eight nuts and washers (A) securing cover and gasket (B) to brake housing assembly (C). Remove cover and gasket. Throw gasket away.



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PARKING BRAKE PAWL ADJUSTMENT - Continued

2. At top of transmission using pry bar, move bellcrank (D) counterclockwise to park position.

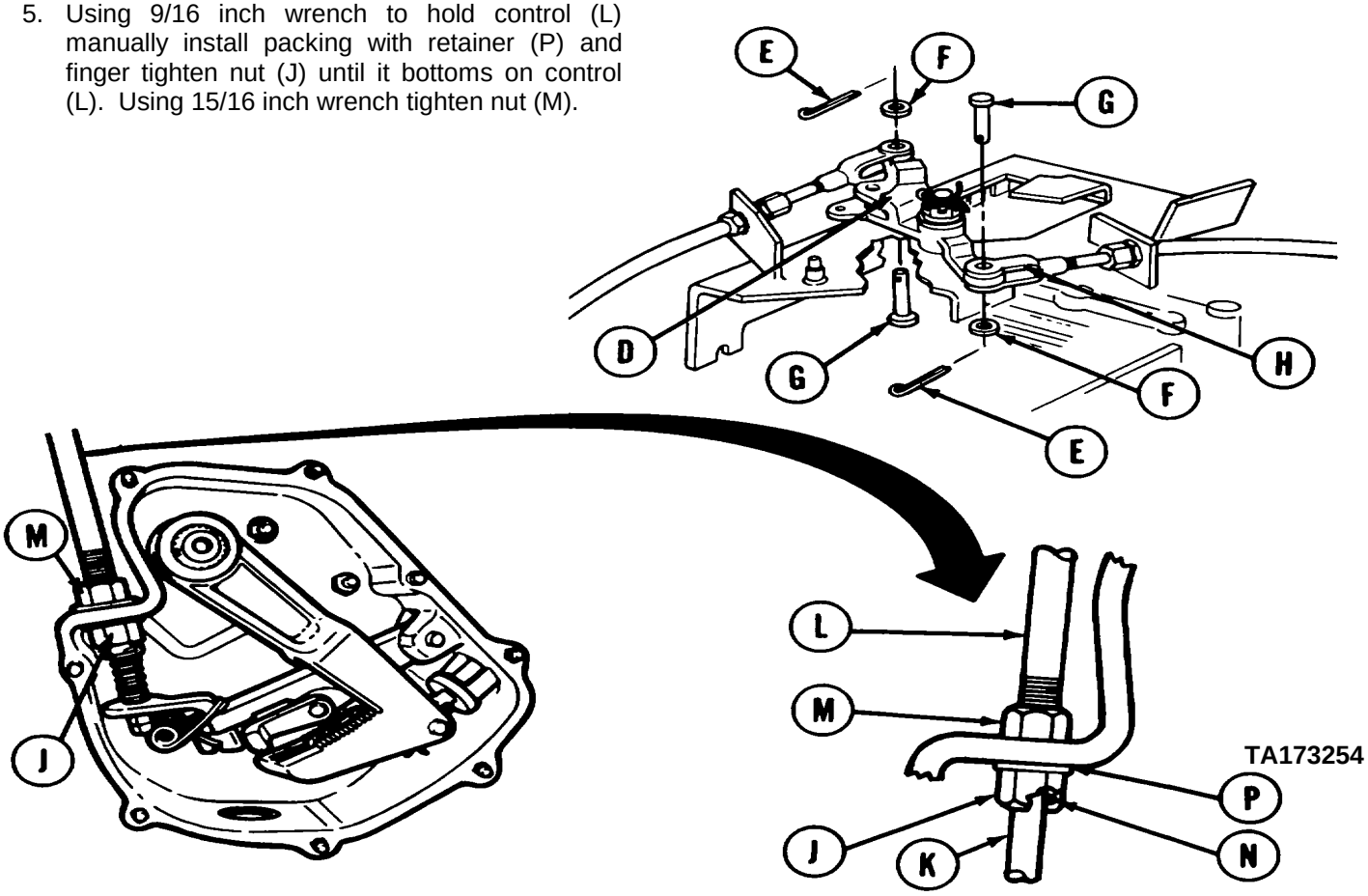
3. Using slip joint pliers, remove two cotter pins (E), washer (F), and pins (G) holding clevis (H) to bellcrank (D). Throw cotter pins away. Remove each clevis (H) from bellcrank (D).

CAUTION

Do not tighten nut (J) with wrench as shaft (K) to control (L) binding will occur. Finger tighten nut (J) only.

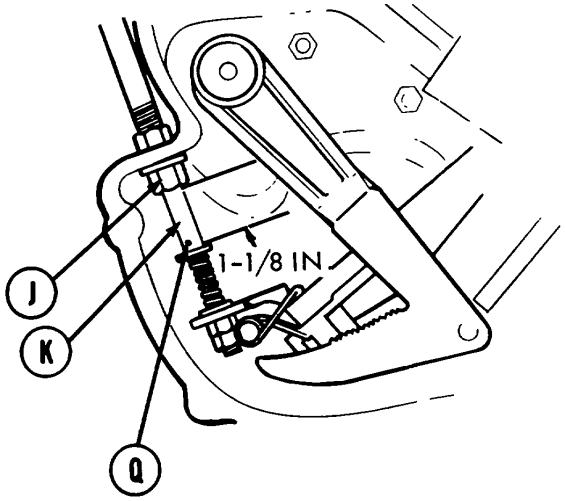
4. At side housing assembly, hold control (L) at flats using 9/16 inch wrench and loosen nut (M) with 15/16 inch wrench. Continue holding control (L). Manually remove nut (J), packing (N) and packing retainer (P). Throw packing away and do not replace it.

5. Using 9/16 inch wrench to hold control (L) manually install packing with retainer (P) and finger tighten nut (J) until it bottoms on control (L). Using 15/16 inch wrench tighten nut (M).



PARKING BRAKE PAWL ADJUSTMENT - Continued

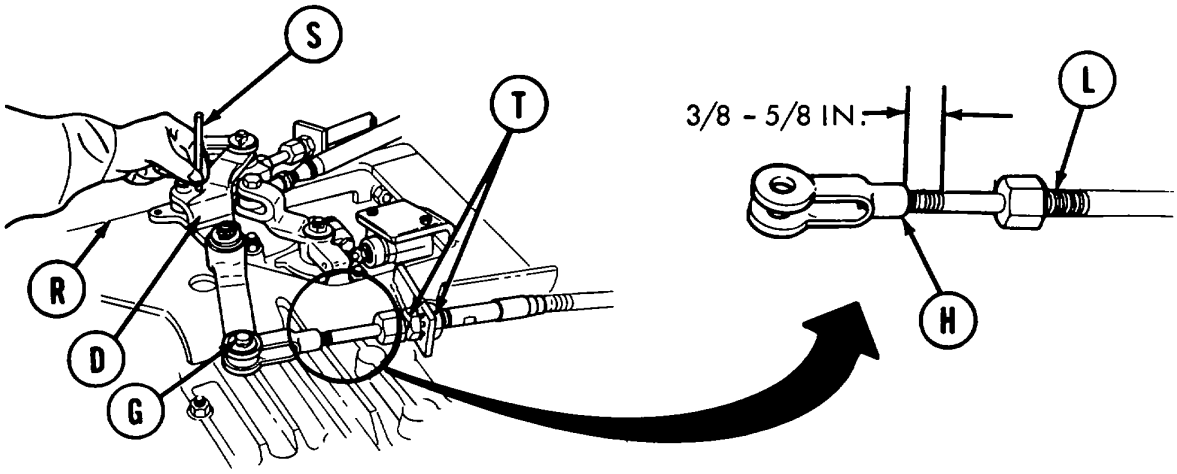
6. Push/pull shaft (K) until 1-1/8 inch gage block just fits between cotter pin (Q) and nut (J). (15/16 inch gage block for one-piece lever and pawl).



7. At top of transmission, rotate bellcrank (D) to aline holes in bellcrank (D) and bracket (R). Insert 1/8 inch locating pin (S) through holes in bellcrank (D) and bracket (R).

NOTE

While performing steps 8 and 9, locating pin (S) must slide up and down freely in alinement holes. Clevis (H) must be positioned on control (L) so that 3/8 to 5/8 inch thread is remaining.



8. Using two 15/16 inch wrenches loosen two nuts (T) and adjust control (L) until pin (G) slides freely in the respective holes. If clevis (H) binds at bellcrank, rotate clevis (H) until bind no longer occurs.

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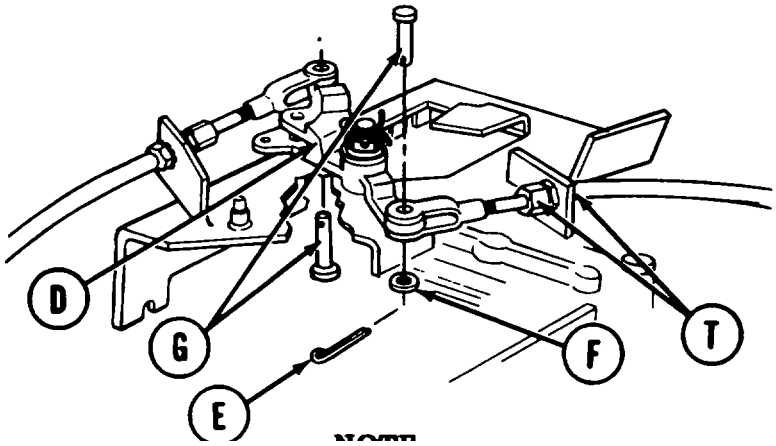
PARKING BRAKE PAWL ADJUSTMENT - Continued

9. Using two 15/16 inch combination wrenches, tighten nuts (T), install pin (G) and using pliers, install washer (F) and new cotter pin (E) on pin (G).

10. Remove 1-1/8 inch gage block from side housing assembly.

NOTE

Before proceeding, bellcrank (D) must be free of binding. Remove 1/8 inch locating pin. Rotate (left-right) to check for free movement. Then re-insert locating pin for steps 11 thru 24.



NOTE

For vehicles equipped with the one-piece lever and pawl with two jamnuts, do steps 11 thru 14, and 25 thru 28.

For vehicles equipped with the multi-piece lever and pawl with two jamnuts, do steps 15 thru 19, and 25 thru 28.

For vehicles equipped with the multi-piece lever and pawl with interlocking jamnut, do steps 20 thru 28.

To retrofit vehicles to single interlocking jamnut, obtain the following parts:

1. Interlocking jamnuts (two required) P/N 12291049.

2. Spring (two required) P/N 12291048.

3. Washer (two required) P/N MS27183-18. TA 173256

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PARKING BRAKE PAWL ADJUSTMENT- Continued

CAUTION

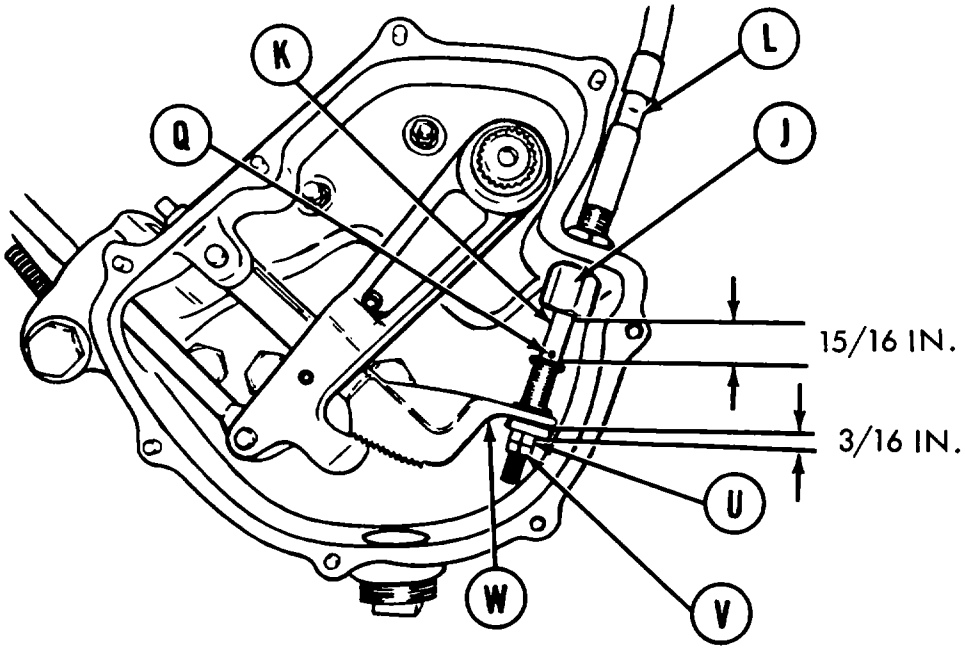
Do not allow shaft (K) to turn or damage to control (L) will result.

11. Using two 9/16 inch wrenches, loosen two nuts (U) and (V) on end of shaft (K).
12. Push or pull shaft (K) until a 15/16 inch gage block fits between cotter pin (Q) and bottom face of nut (J).
13. Adjust upper nut (U) to allow a 3/16 inch gage block to be placed between the lower face of lever (W), and upper nut (U).
14. Using two 9/16 inch wrenches hold nut (U) and lock lower nut (V) securely against upper nut (U).

NOTE

Proceed to step 25.

RIGHT SIDE SHOWN,
LEFT SIDE SAME



ONE-PIECE LEVER AND
PAWL WITH TWO JAMNUTS

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PARKING BRAKE PAWL ADJUSTMENT - Continued

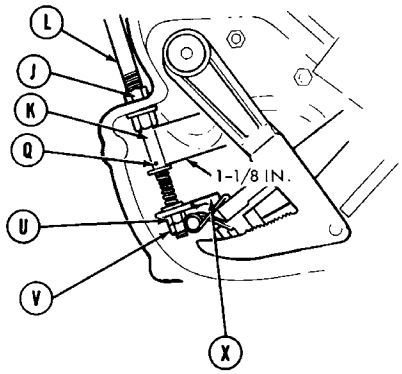
CAUTION

Do not allow shaft (K) to turn or damage to control (L) will result.

15. Using two 9/16 inch combination wrenches, loosen two nuts (U) and (V) on end of shaft (K).
16. Push or pull shaft (K) until 1-1/8 inch gage block just fits between cotter pin (Q) and nut (J).
17 With gage block in place, rotate upper nut (U) until metal to metal contact exists between upper nut (U) and lever assembly (X).
18. Using 9/16 inch wrench, back off upper nut (U) 1-1/2 turns.
19. Using two 9/16 inch wrenches hold nut (U) and lock lower nut (V) securely against upper nut (U).

NOTE

Proceed to step 25.



MULTI-PIECE LEVER AND PAWL
WITH TWO JAM NUTS

LEFT SIDE SHOWN
RIGHT SIDE SAME

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PARKING BRAKE PAWL ADJUSTMENT - Continued

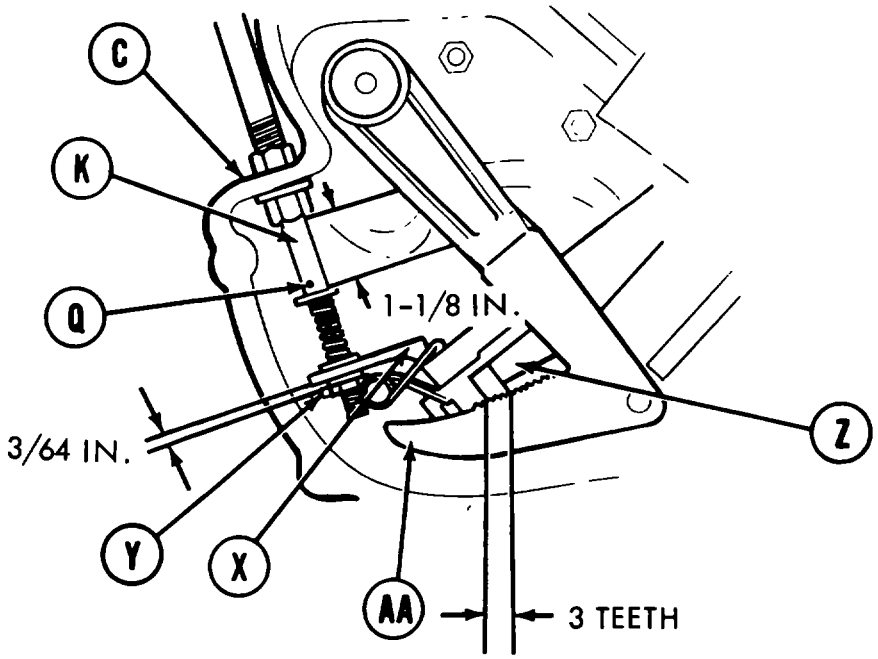
20. In brake housing assembly (C), remove cotter pin (Q).

21. Remove 1-1/8 inch gage block from brake housing assembly (C).

22. Lift lever assembly (X) up enough to disengage the lever from the vertical flats on nut (Y). Turn nut (Y) on shaft (K) until it just makes contact with lever assembly (X) when lever assembly is let fully down, and is in contact with pawl (Z), and pawl is in contact with nonserrated portion of brake lever (AA). When properly adjusted, pawl (Z) will be loosely touching top of brake lever (AA).

23. Using pry bar between housing and brake lever (AA), move brake lever (AA) until the first three teeth on the brake lever (AA) are fully engaged with the three teeth on pawl (Z). Note distance between lever assembly (X) and shoulder nut (Y): nut will clear lever assembly by 3/64 inch when proper adjustment has been made. If measurement is not as stated, go back to step 22 and readjust.

24. Install cotter pin (Q) through hole in shaft (K).



MULTI-PIECE LEVER AND PAWL
WITH INTETLOCKING JAMNUT

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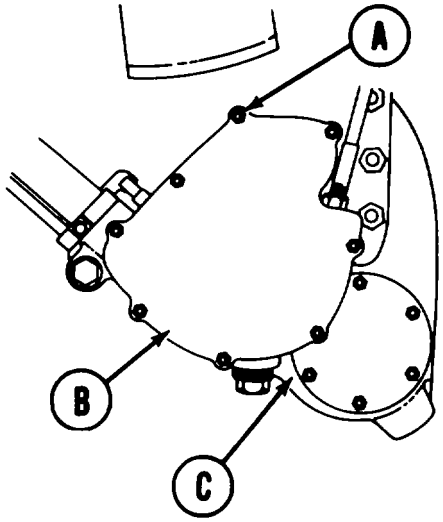
PARKING BRAKE PAWL ADJUSTMENT - Continued

NOTE

Repeat steps 1 thru 24 for opposite side brake.

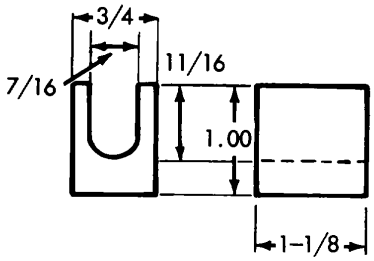
25. At top of transmission, remove locating pin from hole in bellcrank assembly.
26. Using a pry bar, rotate bellcrank clockwise to release brakes.
27. Position new gasket and cover (B) on studs of brake housing assembly (C). Using 7/16 inch socket, install eight washers and screws (A).
28. Install powerplant.



END OF TASK

NOTE

Figure below provides all dimensions needed to fabricate a 1-1/8 inch gage block as shown. To fabricate the 15/16 inch and 3/16 inch gage block, all dimensions remain the same except the 1-1/8 inch. Substitute the 15/16 and 3/16 inch dimension as required. Fabricate at DIRECT SUPPORT MACHINE SHOP.



1. Material - mild steel
2. TOL + 1/32 inch (.032 inch)
3. Remove burrs and break sharp edges.
4. All dimensions in inches.

FABRICATED TOOL - GAGE BLOCKS TA 173260

SECTION V. PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (ONE-PIECE)

TOOLS: 7/16 inch combination box and open box wrench
9/16 inch combination box and open end box wrench
15/16 inch combination box and open end box wrench
1/2 inch socket with 3/8 inch drive
9/16 inch socket with 3/8 inch drive
5 inch extension with 3/8 inch drive
Adjustable wrench
Flat-tip screwdriver
Ratchet with 3/8 inch drive
Slip joint pliers

SPECIAL TOOLS: Adapter, sleeve nut (NSN 5340-00-655-9704) (P/N 8762655)

SUPPLIES: Cotter pins
Dry cleaning solvent PD-680 (NSN 6850-00-281-1985)
Packing
Sealing compound (NSN 8030-00-275-8110)

PERSONNEL: Two

PRELIMINARY PROCEDURES: Remove right bulkhead access cover (applicable TM 20-1)

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (ONE-PIECE)- Continued

NOTE

Two mechanics are required to remove/install control assembly from tank, one mechanic inside driver's compartment and one mechanic outside rear of tank.

REMOVAL:

1. Using pliers, remove cotter pin (A) and pin (B) securing clevis (C) to lever (D).

Throw cotter pin away.

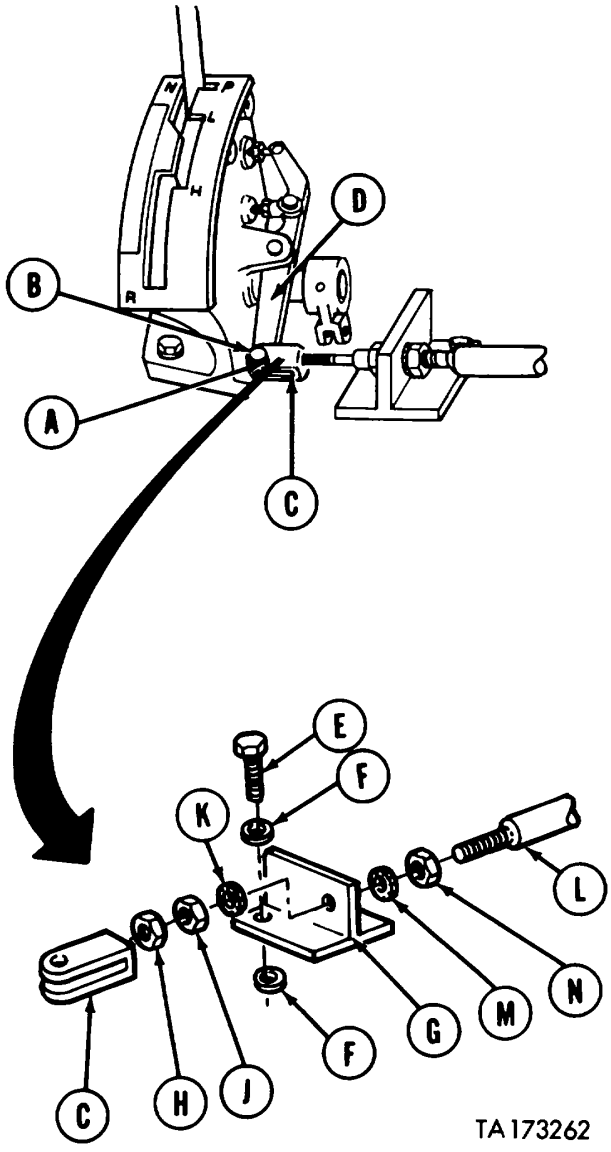
2. Using 9/16 inch socket and extension, remove two screws (E) four washers (F) from bracket (G).

3. Using 9/16 inch wrench on nut (H) and adjustable wrench remove clevis (C) and nut (H). Throw nut away.

4. Using 15/16 inch wrench, remove nut (J), lockwasher (K).

5. Remove bracket (G) from control assembly.

6. Hold control assembly (L) at flats with an adjustable wrench, using a 15/16 inch wrench, remove lockwasher (M) and nut (N).



TA173262

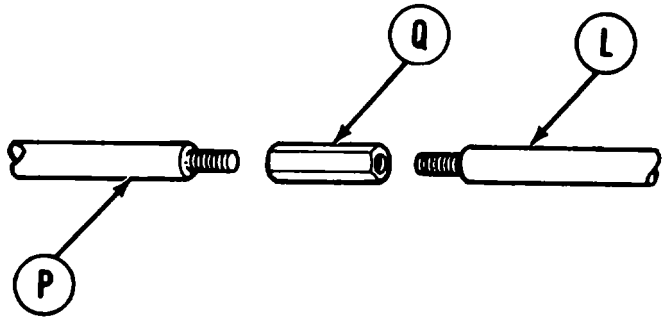
PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (ONE-PIECE) - Continued

CAUTION

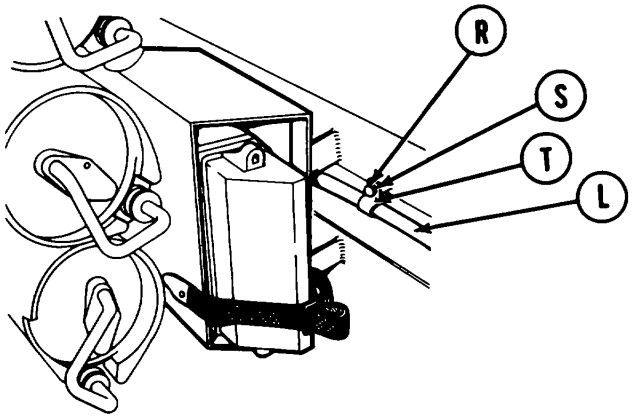
DO NOT ALLOW CONTROL ASSEMBLY (L) OR NEW CONTROL ASSEMBLY (P) TO TURN, AS DAMAGE WILL OCCUR.

DO NOT HOLD SHAFT PORTION OF EITHER CONTROL ASSEMBLY WITH PLIERS/VISE GRIPS.

7. Attach adapter (Q) to shift lever of control assembly (L).
8. Thread end of adapter (Q) 1 inch on to control assembly.



9. Attach rear end of new control assembly (P) to open end of adapter (Q). Make sure two control assemblies (L and P) ends are joined securely.



10. Using 1/2 inch socket, remove screw (R), washer (S), and clamp (T) that secure control assembly (L) to hull wall.
11. Using screwdriver, remove clamp (T).

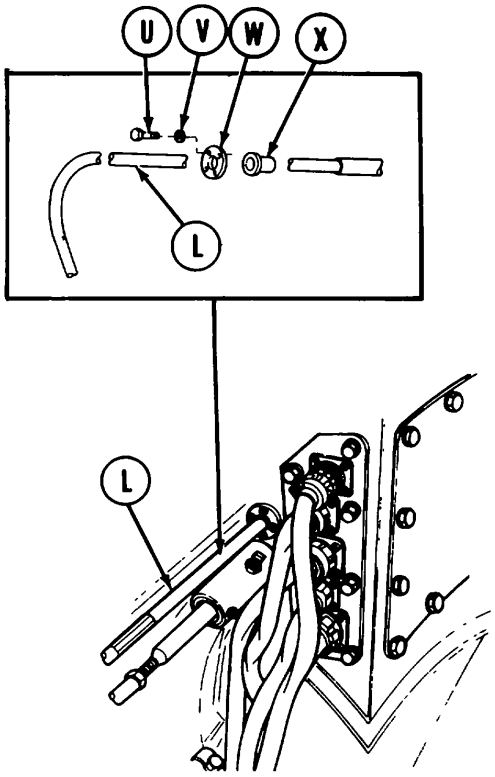
PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (ONE-PIECE)- Continued

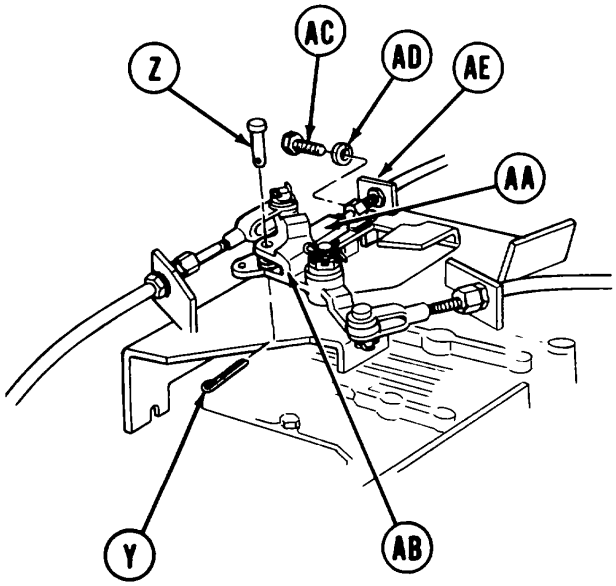
12. Using screwdriver, remove four screws (U) and washers (V) securing retainer (W) and control assembly (L) to bulkhead.

13. Grasp control assembly (L) with both hands and pull forward 1 to 2 inches. Remove split bushing (X). Throw bushing (X) away.

14. At transmission bellcrank assembly, using slip joint pliers, remove clip (Y) and pin (Z) securing connector (AA) to bellcrank (AB). Throw clip (Y) away.

15. Using a 9/16 inch socket and extension, remove two screws (AC), washers (AD), and support bracket (AE) from bracket assembly.





TA173264

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (ONE-PIECE)- Continued

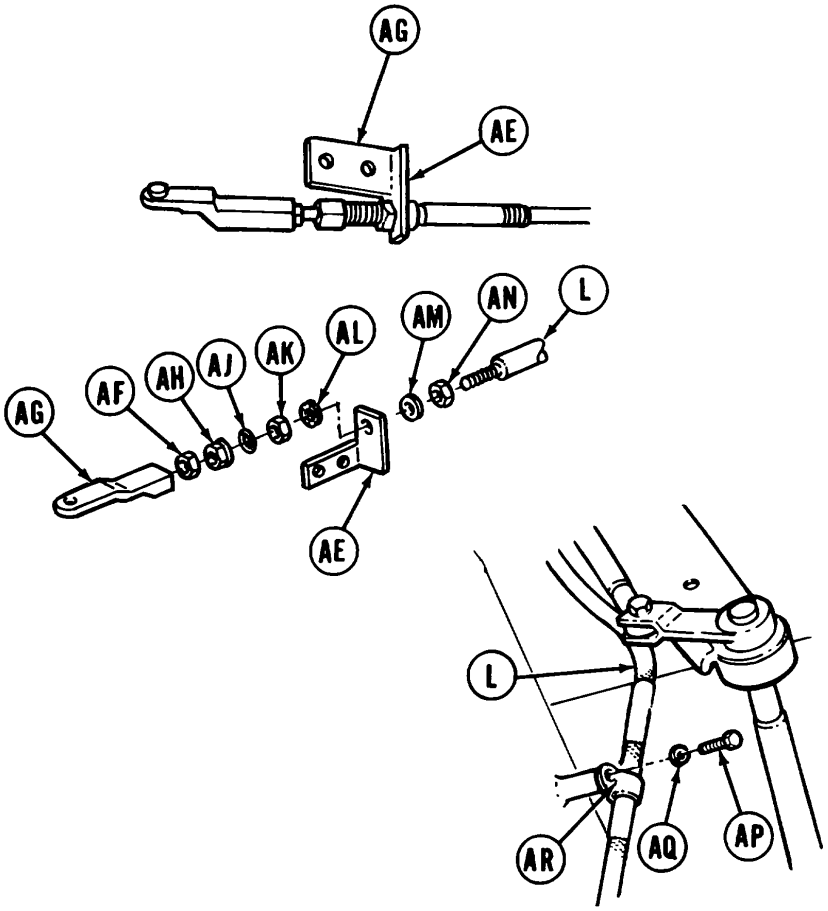
16. Using 7/16 inch wrench on nut (AF) arid an adjustable wrench remove connector (AG) and nut (AF). Throw nut (AF) away.

17. Use an adjustable wrench to hold support bracket (AE). Using 15/16 inch wrench, remove nut (AH) and preformed packing (AJ).

18. Using a 15/16 inch wrench, remove nut (AK) and lockwasher (AL).

19. Remove support bracket (AE).

20. Using 15/16 inch wrench, remove lockwasher (AM) and nut (AN).



21. Using 7/16 inch wrench, remove screw (AP) lockwasher (AQ) from clamp (AR) that secure control assembly (L) to hull wall.

22. Using screwdriver, remove clamp (AR).

TA173265

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (ONE-PIECE)- Continued

CLEANING AND INSPECTION:

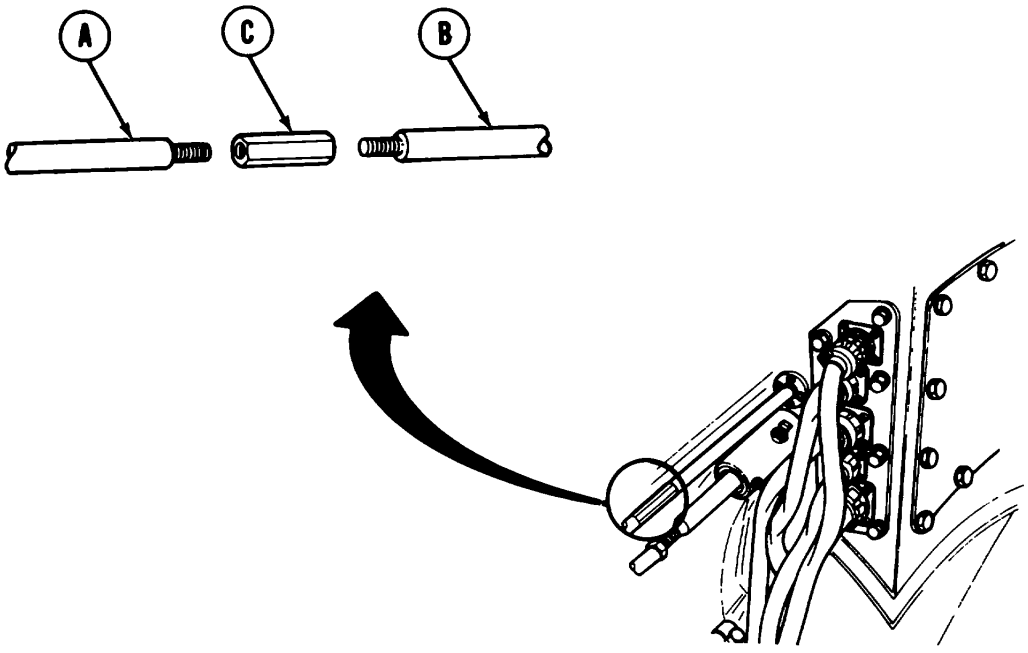
Inspect all mounting hardware for cracks in brackets, worn pivot pins, and damaged threads on screws and nuts. Replace any damaged parts. Clean parts, using dry cleaning solvent, if necessary.

INSTALLATION:

NOTE

Once new control (A) has been guided into the tank, mechanic in driver's compartment should position himself in turret, near the bulkhead.

1. Mechanic at rear of tank, grasp control (B) with both hands and slowly pull old control (B) out rear of tank while mechanic in driver's compartment feeds in new control assembly (A).
2. When adapter (C) is near bulkhead as shown, disconnect adapter from both control assemblies (A and B).

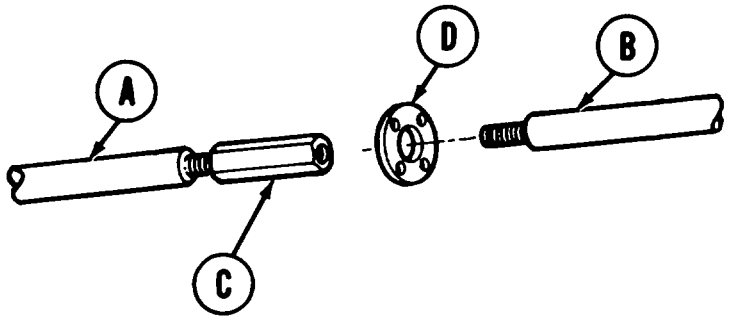


TA173266

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (ONE-PIECE)- Continued

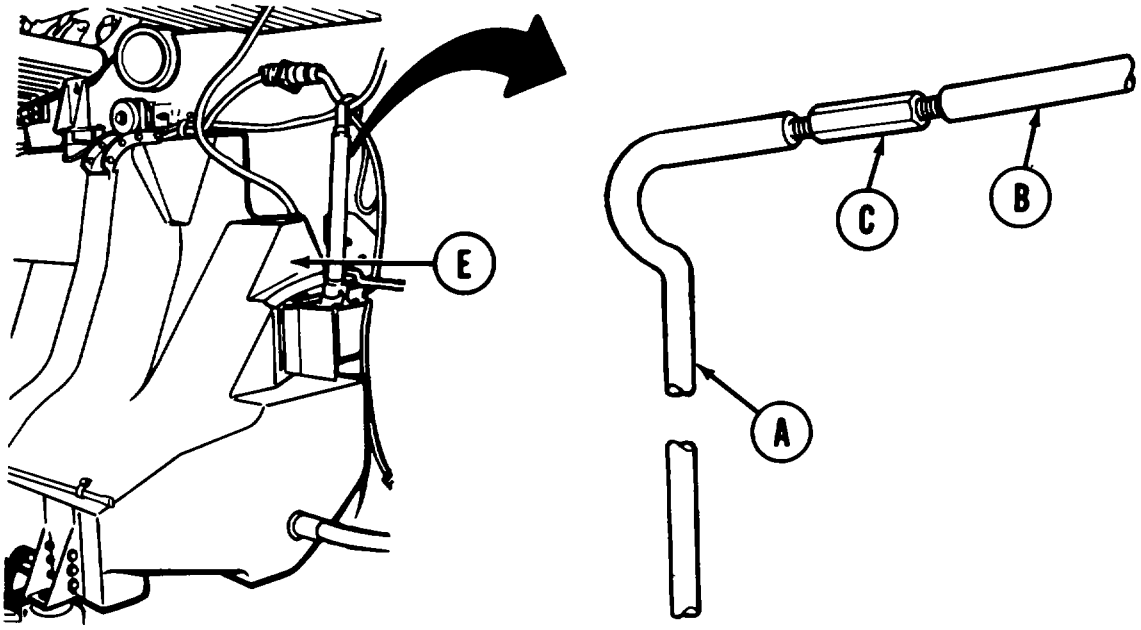
3. Remove retainer (D) from control assembly (B) and place it on control assembly (A).

4. Rejoin old control assemblies (A and B) with adapter (C).



5. Mechanic at rear of tank, continue pulling old control assembly (B) out rear of vehicle, while mechanic in turret guides new control (A) into vehicle.

6. When adapter (C) is visible beyond fuel tank (E) disconnect adapter (C) from both control assemblies (A and B).



TA173267

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (ONE-PIECE)- Continued

7. Position new control assembly (B) near bell crank on top of transmission.

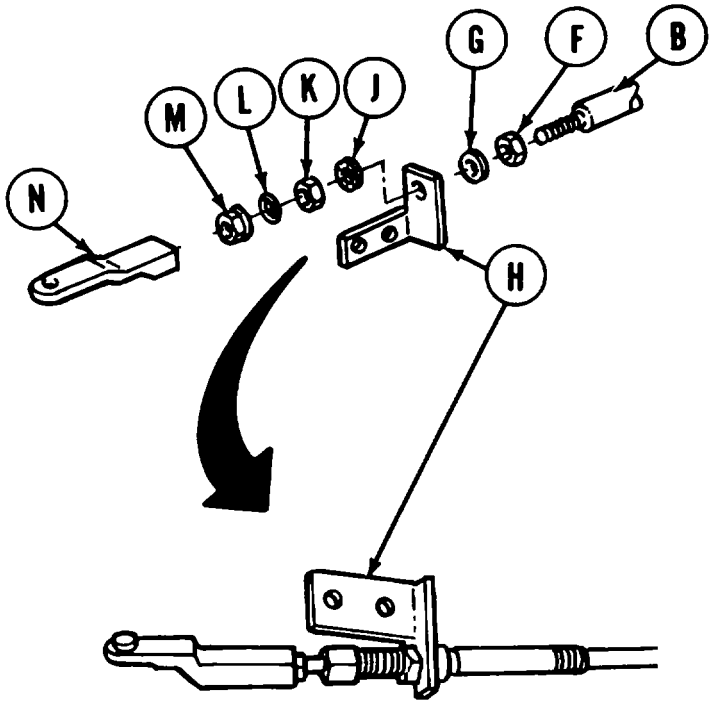
8. Using 15/16 inch wrench, install nut (F) and lockwasher (G) on control assembly (B).

9. Place bracket (H) on control assembly (B).

10. Using 15/16 inch wrench, install lockwasher (J) and nut (K).

11. Install new packing (L) in nut (M), using a 15/16 inch wrench install nut (M) on control assembly (B).

12. Use an adjustable wrench to install connector (N) on end of control assembly (B).



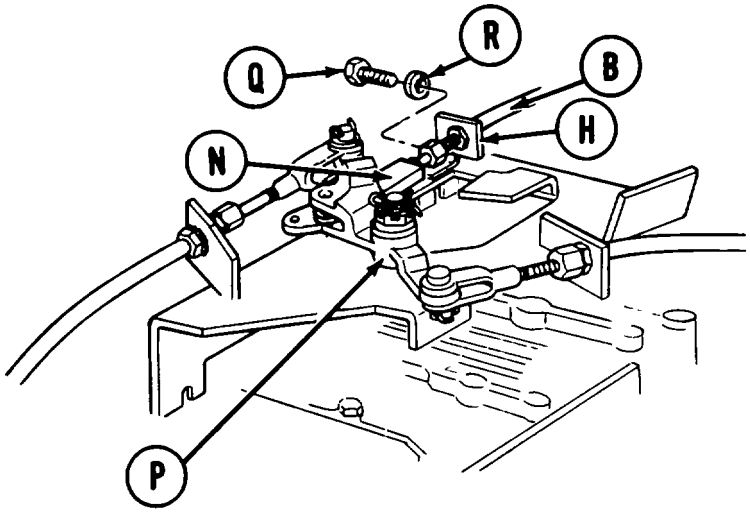
TA173268

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (ONE-PIECE) - Continued

13. Position connector (N) in bellcrank (P).

NOTE

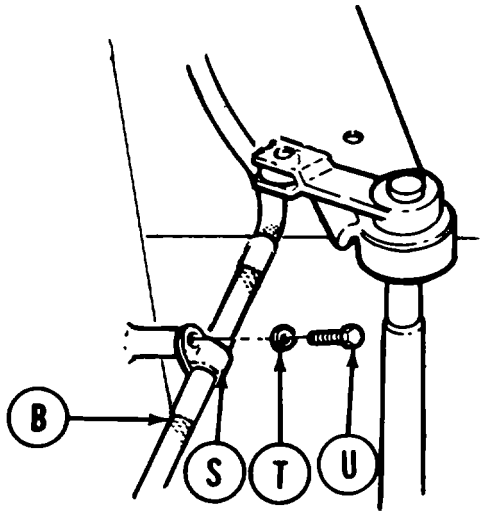
Pin and clip securing connector (N) to bellcrank (P) need not be installed until adjustment procedure is performed.



14. Using a 9/16 inch socket and extension, install two screws (Q), washers (R), and support bracket (H) to bracket assembly.

15. At hull wall, install clamp (S) around casing of control assembly (B).

16. Using 7/16 inch combination wrench, install lockwasher (T) and screw (U).



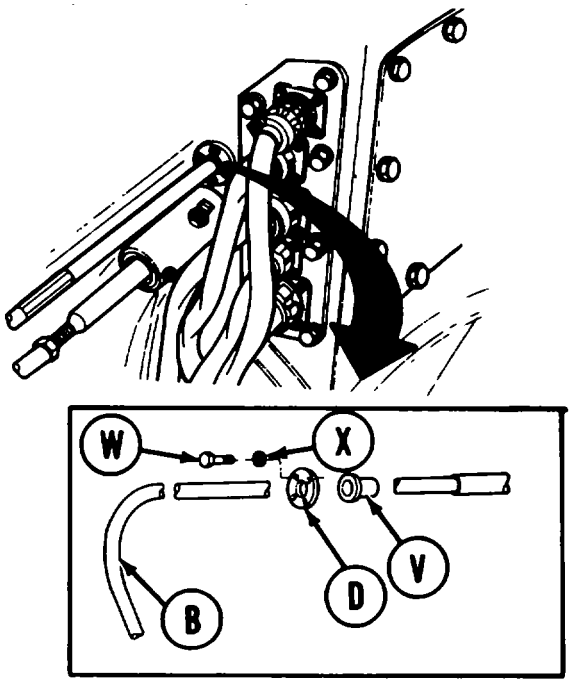
TA173269

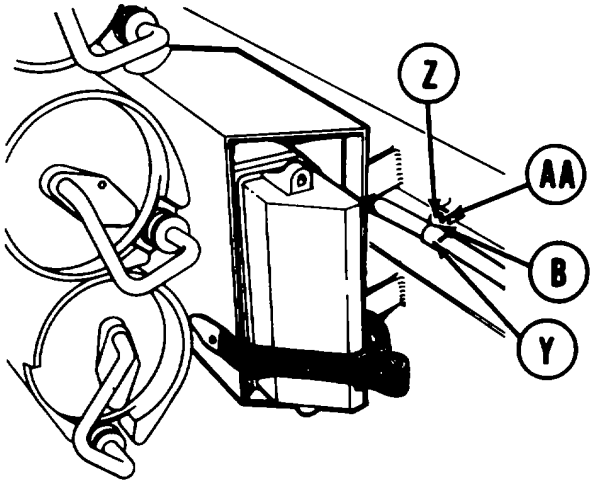
PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (ONE-PIECE) - Continued

17. Apply sealing compound on new split bushing (V) and allow 20 minutes to dry.

18. Position new split bushing (V) over control assembly (B) then push bushing (V) into bulkhead.

19. Slide retainer (D) into place. Using screwdriver, install retainer (D) to bulkhead with four screws (W), and flat washers (X).





TA173270

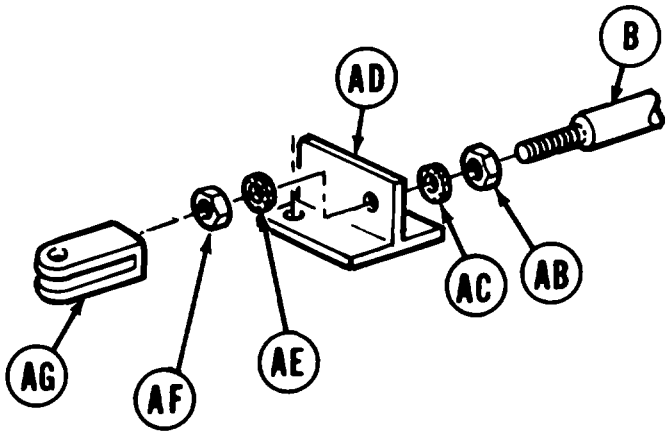
PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (ONE-PIECE)- Continued

22. At shift lever, using 15/16 inch wrench, install nut (AB) and lockwasher (AC) on control assembly (B).

23. Slide control assembly (B) through support bracket (AD).

24. Using 15/16 inch wrench, install lockwasher (AE) and nut (AF).

25. Using adjustable wrench, install clevis (AG) 3/8 to 5/8 inch onto shaft.

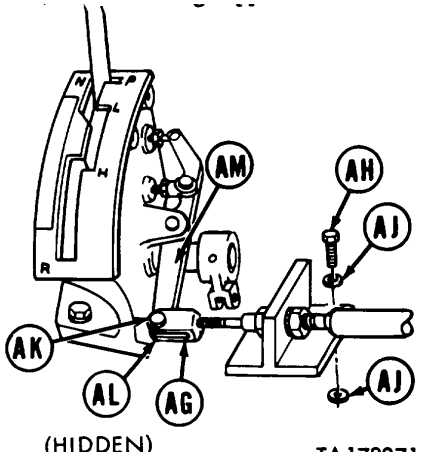


26. Using 9/16 inch socket and extension, install bracket (AD) to bearing support bracket with two screws (AH) four washers (AJ).

NOTE

Pin (AK) and new cotter pin (AL) securing clevis (AG) to lever (AM) need not be installed until adjustment procedure is performed.

27. Perform parking brake control assembly adjustment page 9.



TA173271

END OF TASK

SECTION VI. PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (FRONT ONLY OF TWO-PIECE)

TOOLS: 7/16 inch combination box and open end wrench
9/16 inch combination box and open end wrench
7/8 inch combination box and open end wrench
15/16 inch combination box and open end wrench
7/8 inch crowfoot wrench with 3/8 inch drive
1/2 inch socket with 3/8 inch drive
9/16 inch socket with 3/8 inch drive
5 inch extension with 3/8 inch drive
Adjustable wrench
Flat-tip screwdriver
Ratchet with 3/8 inch drive
Slip Joint Pliers
Torque wrench with 3/8 inch drive

SPECIAL TOOLS: None

SUPPLIES: Cotter pins
Dry cleaning solvent (NSN 6850-00-281-1985)
Sealing compound (NSN 8030-00-275-8110)
Masking tape
Control assembly - front
(NSN 2590-01-061-4289) (P/N 12257897)
Safety Wire

PERSONNEL: Two

PRELIMINARY PROCEDURES: Remove right bulkhead access cover (applicable TM 20-1)
Position shift lever in P (park)

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (FRONT ONLY OF TWO-PIECE) - Continued

NOTE

Two mechanics are required to remove control assembly (L) from tank, one mechanic inside driver's compartment and one mechanic outside rear of tank.

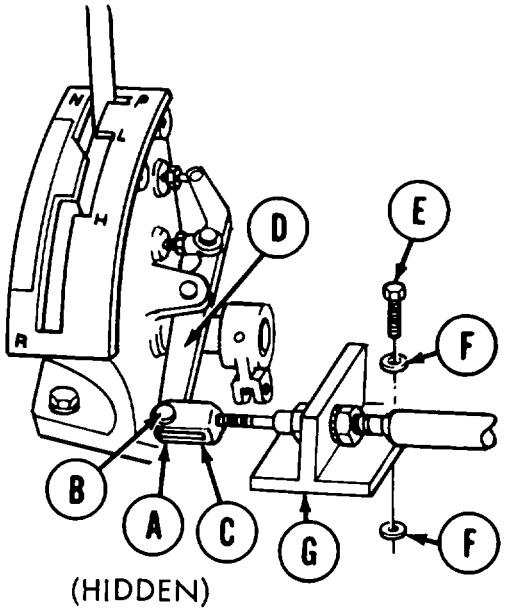
REMOVAL:

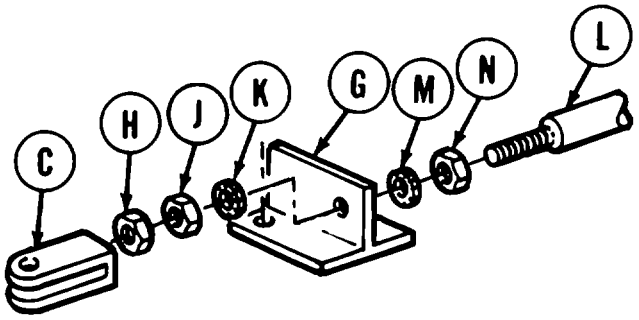
1. Using pliers, remove cotter pin (A) pin (B) securing clevis (C) to lever (D). Throw cotter pin (A) away.

2. Using 9/16 inch socket and extension, remove two screws (E), four washers (F), and bracket (G) from bearing support bracket.

3. Using 9/16 inch wrench on nut (H) and adjustable wrench remove clevis (C) and nut (H). Throw nut (H) away.

4. Using a 15/16 inch wrench, remove nut (J), lockwasher (K), and bracket (G).



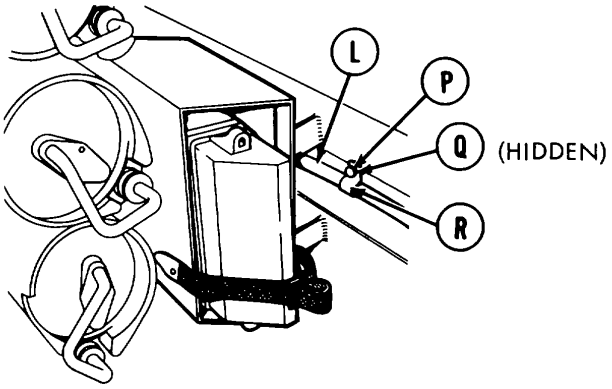


5. Hold control assembly (L) at flats with an adjustable wrench, using a 15/16 inch wrench, remove lockwasher (M) and nut (N).

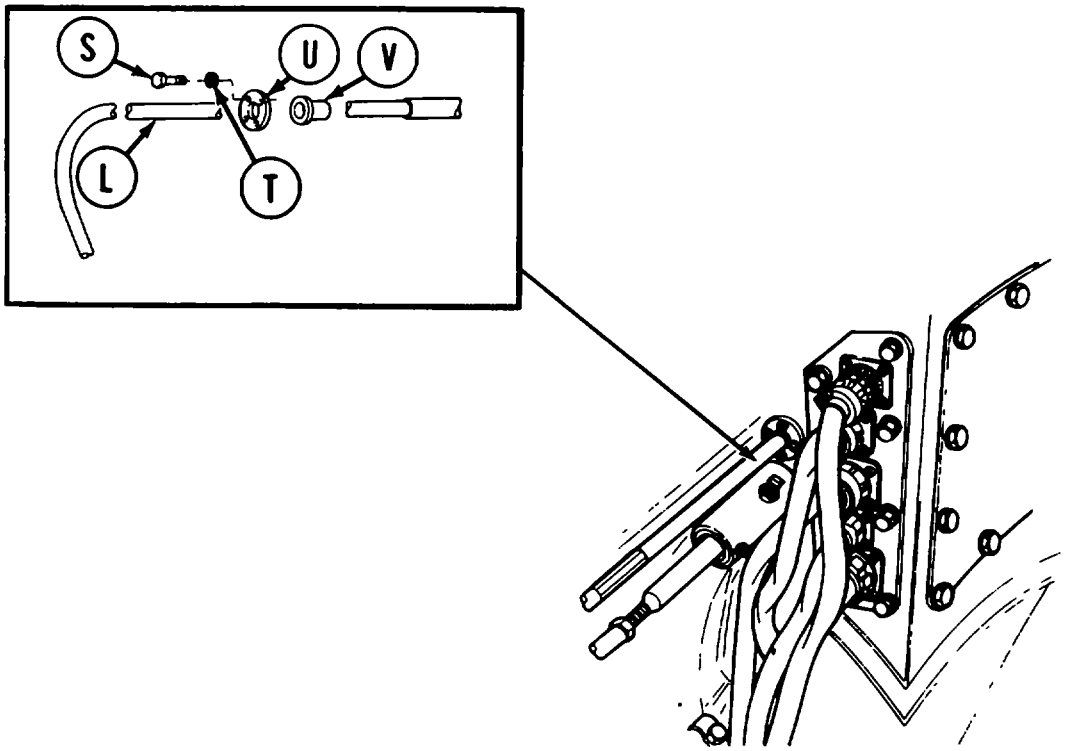
TA173273

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (FRONT ONLY OF TWO-PIECE)-Continued

6. Using 1/2 inch socket, remove screw (P) washer (Q) and clamp (R) that secure control assembly (L) to hull wall.



7. Using screwdriver, remove four screws (S) and four washers (T) securing retainer (U) and control assembly (L) to bulkhead. Sliding retainer (U) forward on control assembly (L) away from bulkhead.

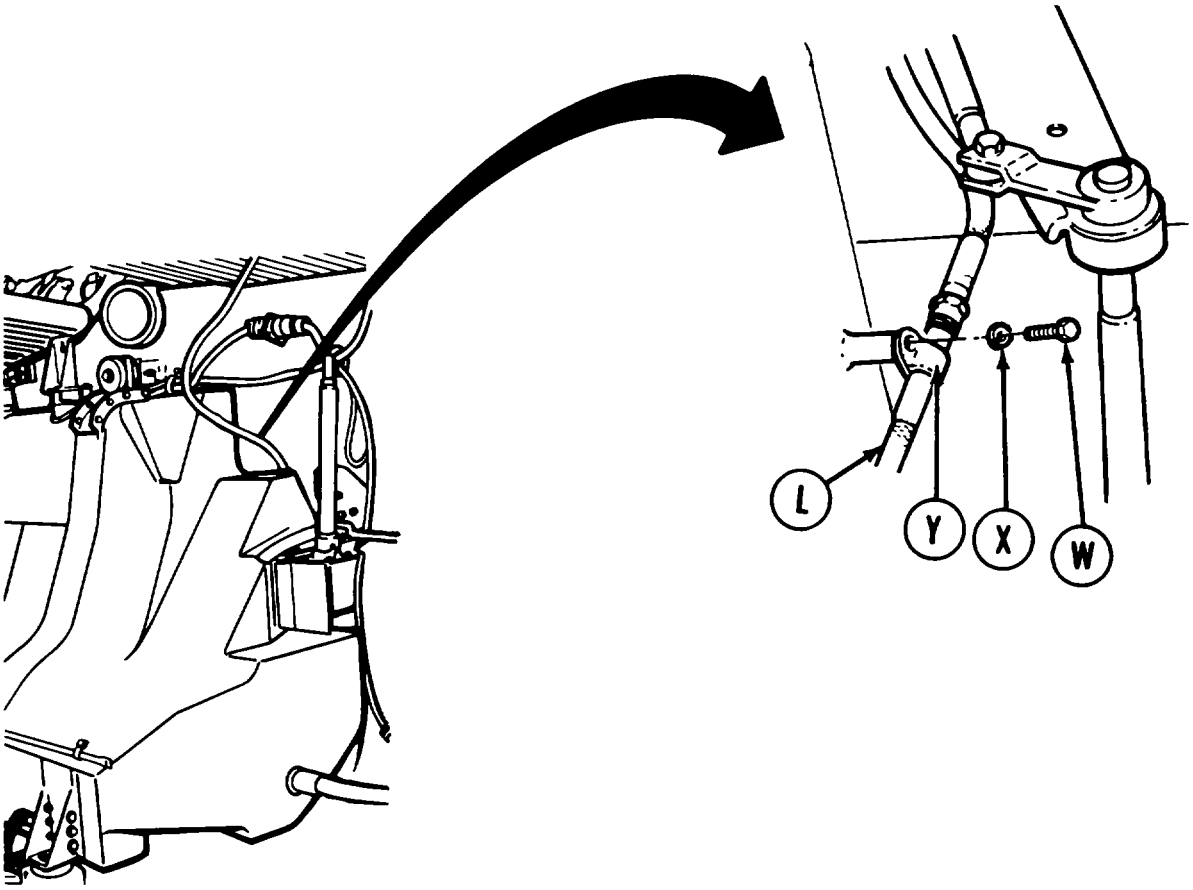


8. Grasp control assembly (L) with both hands and move about 1 inch toward front of tank. Remove split bushing (V) and throw it away.

TA173274

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (FRONT ONLY OF TWO-PIECE)-Continued

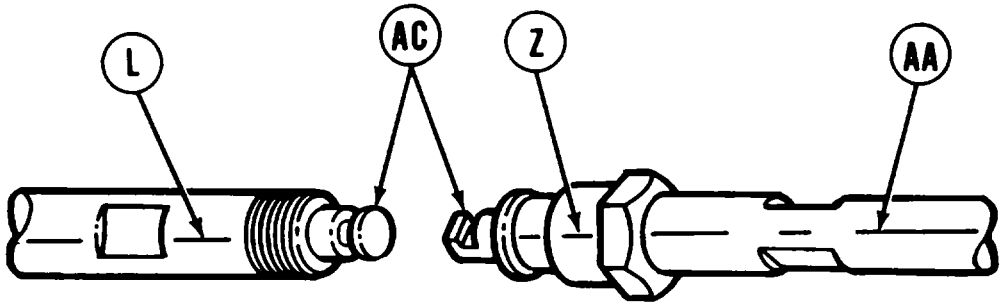
9. Using a 7/16 inch combination wrench, remove capscrew (W), lockwasher (X), and clamp (Y) that secure control assembly (L) to hull.



TA173275

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (FRONT ONLY OF TWO-PIECE)-Continued

10. Using an adjustable wrench, hold control assembly (L) at flats, use 7/8 inch combination wrench to loosen disconnect nut (Z) on control assembly (AA).



11. With shift lever in P (park) position, manually move bellcrank at top of transmission to the N (neutral) position (turn clockwise).

NOTE

This will force the two control assemblies (L and AA) to open up at the disconnect point.

12. Manually disconnect the inner pushrod (AC) of the control assemblies (L and AA) and displace rear control.

13. Attach 15 feet of safety wire to shift lever end of control assembly (L) located inside driver's station. Make sure safety wire is wrapped several times around end of control assembly.

NOTE

Once safety wire is attached to control assembly, mechanic in driver's compartment should position himself in turret near bulkhead.

14. Mechanic in engine compartment grasps control assembly with both hands and pulls toward rear of tank, while mechanic inside turret makes sure that control assembly and safety wire feed through hole in bulkhead and tube. Insure that retainer slides freely off control assembly and free end of safety wire; secured to a wrench or unmovable object when free-end is visible beyond ammunition racks. The wrench will not allow free-end of safety wire to pass through bulkhead.

15. When control assembly (L) is clear of tube located behind fuel tank, mechanic in engine compartment should disconnect safety wire from control assembly and remove front control assembly from tank.

NOTE

Make sure safety wire is secured to a wrench or other object so that safety wire will remain in tube for installation of new front control assembly.

TA173276

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (FRONT ONLY OF TWO-PIECE)-Continued

CLEANING AND INSPECTION:

Inspect all mounting hardware for cracks in brackets, worn pivot pins, and damaged threads on screws and nuts. Replace any damaged parts. Clean parts, using dry cleaning solvent, if necessary.

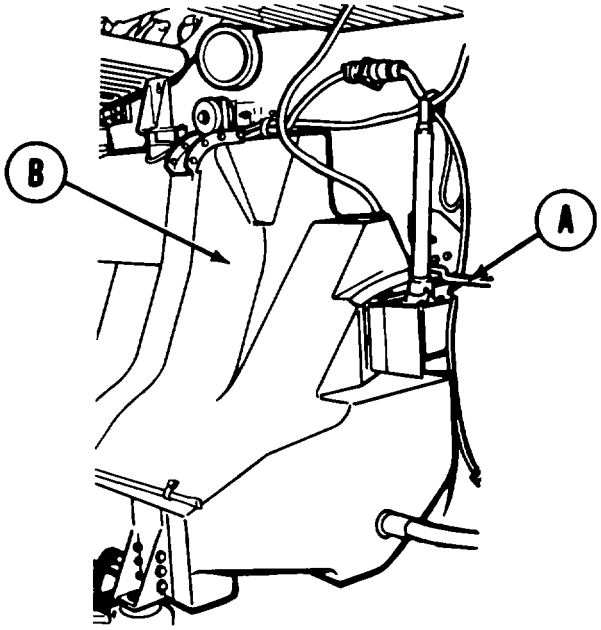
INSTALLATION:

1. Go to engine compartment. Using safety wire extending behind fuel tank, wrap threads of shift lever end of new control assembly several times. Make sure that safety wire is tight around control assembly (A).

NOTE

Wrap free end (disconnect point) of new control assembly (A) with tape to protect inner shaft from dirt.

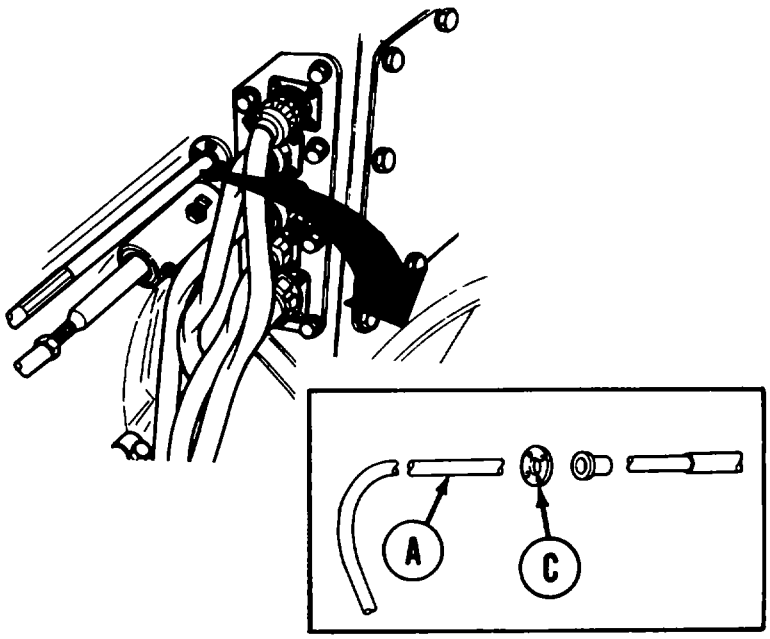
2. With one person inside turret pulling safety wire extending from bulkhead, second person carefully thread control assembly (A) through tube located behind fuel tank (B).



TA173277

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (FRONT ONLY OF TWO-PIECE) - Continued

3. When shift lever end of control assembly (A) is visible at bulkhead slip retainer (C) on control assembly.
4. Hold retainer (C) in place while feeding control assembly (A) forward.

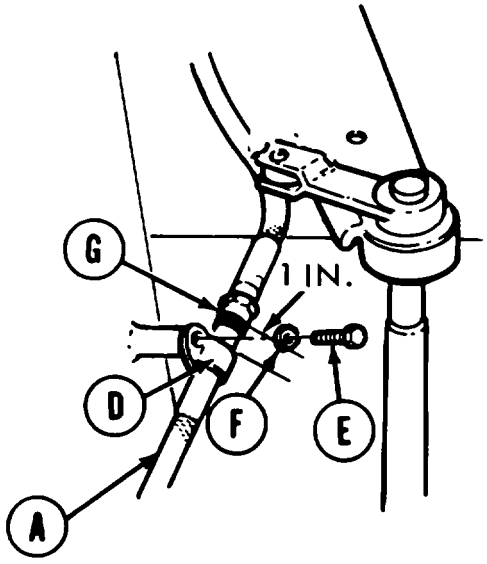


5. Route control assembly (A) along right side of hull behind periscope box and ammunition rack and down into driver's station to base of transmission shift control.

NOTE

Make sure control assembly is secured to hull wall with clamp (D) located on metal casing 1 inch below disconnect nut (G).

6. Mechanic at rear of tank, install clamp (D) over metal casing of control assembly (A) 1 inch from threads. Using 7/16 inch combination wrench, secure control to hull with screw (E) and lockwasher (F).

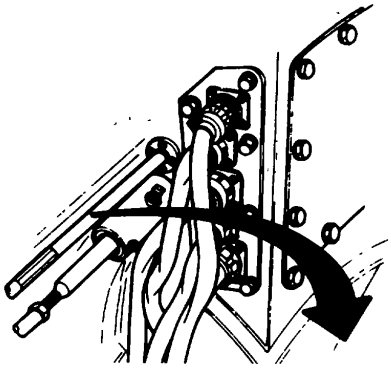


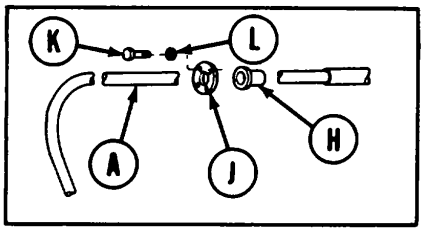
TA173278

PARKING BRAKE*CONTROL ASSEMBLY REPLACEMENT (FRONT ONLY OF TWO-PIECE)- Continued

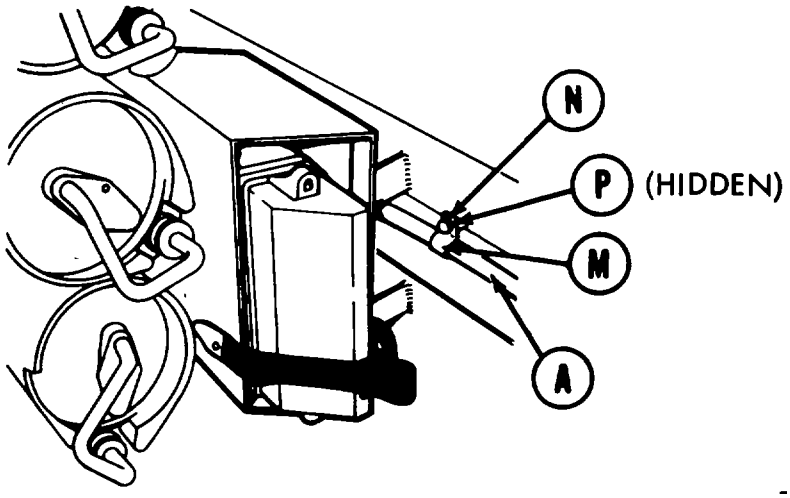
7. At bulkhead, position new split bushing (H) on control assembly (A). Apply sealing compound. Allow 20 minutes to dry, then put bushing into bulkhead.

8. Using screwdriver, secure retainer (J) to bulkhead with four screws (K) and four washers (L).





9. Position lamp (M) over control assembly (A). Using 1/2 inch socket, secure to hull with screw (N) and washer (P).



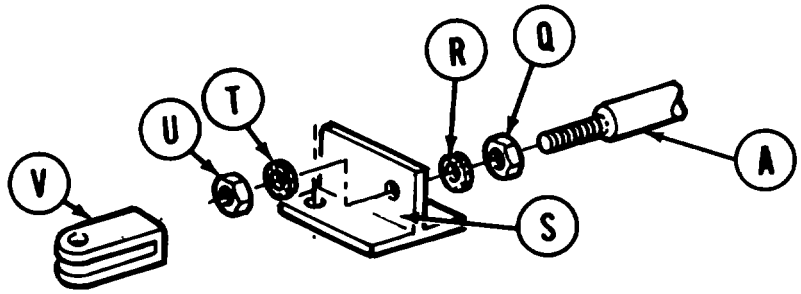
TA173279

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (FRONT ONLY OF'TWO-PIECE)-Continued I

10. Locate control assembly (A). Using 15/16 inch combination wrench, install nut (Q) on control assembly.

11. Position lockwasher (R) bracket (S) lockwasher (T) on control assembly (A). Using 15/16 inch combination wrench, install nut (U) on control assembly. If necessary, hold control assembly with adjustable wrench at flats.

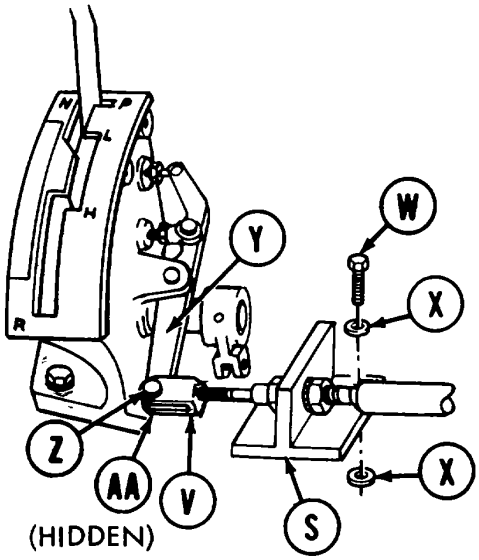
12. Using adjustable wrench, install clevis (V).



13. Using 9/16 inch socket and extension, install bracket (S) to bearing support bracket with two screws (W) and four washers (X).

14. Position clevis (V) on lever (Y) and insert pin (Z) through clevis and lever.

15. Install cotter pin (AA) in pin (Z).



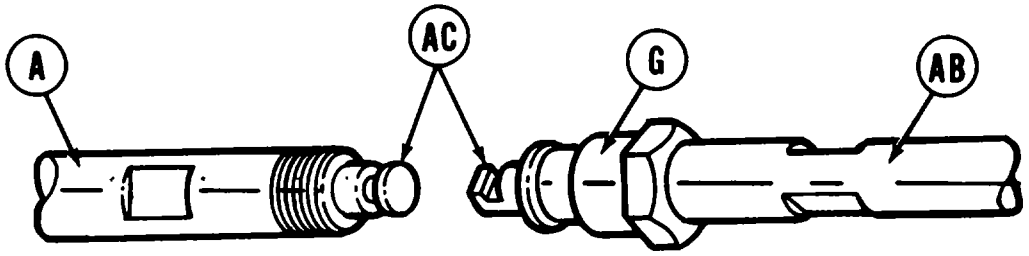
TA173280

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (FRONT ONLY OF TWO-PIECE) - Continued

CAUTION

Make sure the metal casing of control assembly (AB) (rear) is free to rotate at both ends so as not to cause binding of the inner pushrod.

16. Connect the inner push rods (AC) of control assemblies (A) and (AB) and slide disconnect nut (G) over connection. Manually tighten disconnect nut (G) on control assembly finger tight.



17. Using adjustable wrench on flats of control assembly (AB), and torque wrench with 7/8 inch crowfoot tighten disconnect nut (G) to 35-50 lb-in (8.9 to 12.7 N•m).

18. Perform parking brake control assembly adjustment (page 9).

END OF TASK

TA173281

SECTION VII. PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (REAR ONLYOF TWO PIECE)

TOOLS: 7/16 inch combination box and open end wrench
9/16 inch combination box and open end wrench
7/8 inch combination box and open end box wrench
15/16 inch combination box and open end box wrench
7/8 inch crowfoot wrench with 3/8 inch drive
9/16 inch socket with 3/8 inch drive
5 inch extension with 3/8 inch drive
Adjustable wrench
Ratchet with 3/8 inch drive
Slip joint pliers
Torque wrench with 3/8 inch drive (0-600 lb-in)

SPECIAL TOOLS: None

PERSONNEL: Two

SUPPLIES: Control assembly - rear
(NSN 2590-01-061-4290) (P/N 12257898)

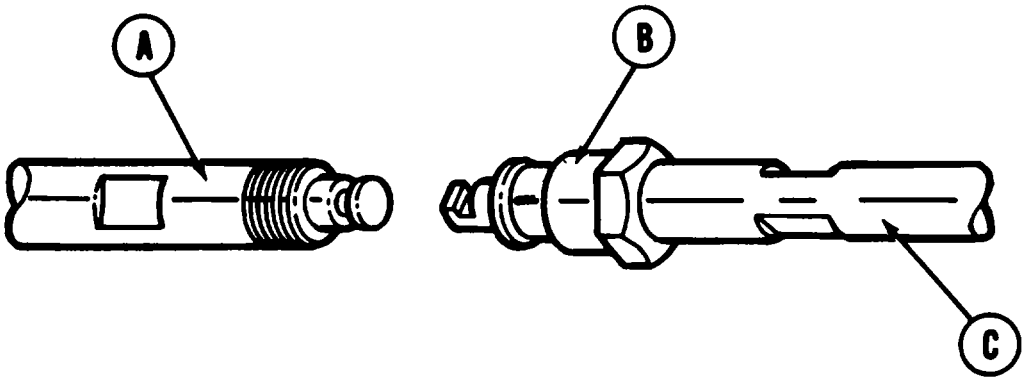
PRELIMINARY PROCEDURES: Place shift lever in P (park) position.

TA173282

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (REAR ONLY OF TWO-PIECE) -Continued

REMOVAL:

1. At flats, use an adjustable wrench to hold control assembly (A), use 7/8 inch wrench to loosen disconnect nut (B) on control assembly (C).



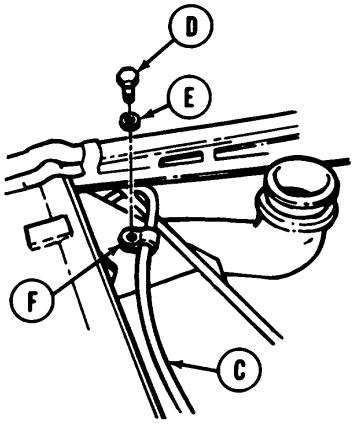
2. With shift lever in P (park) position, manually move bellcrank at top of transmission to the N (neutral) position (turn clockwise).

NOTE

This will force the two control assemblies (A and C) to open up at the disconnect point.

3. Manually disconnect the inner pushrods of the control assemblies (A and C).

4. Using 7/16 inch wrench, remove screw (D), washer (E), and clamp (F) securing control assembly (C) to the boss on top of transmission.

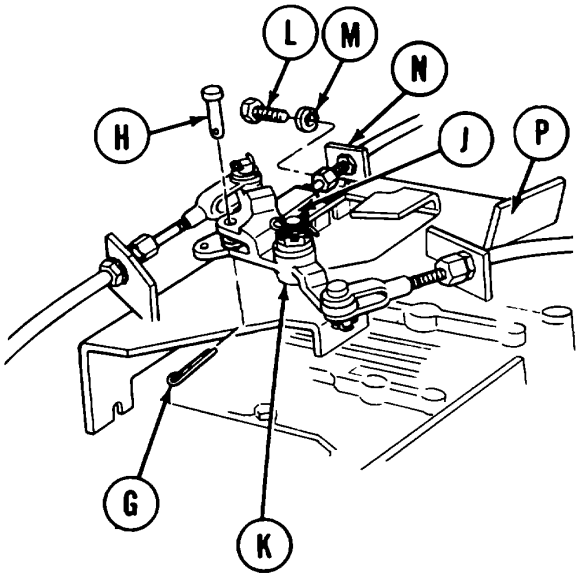


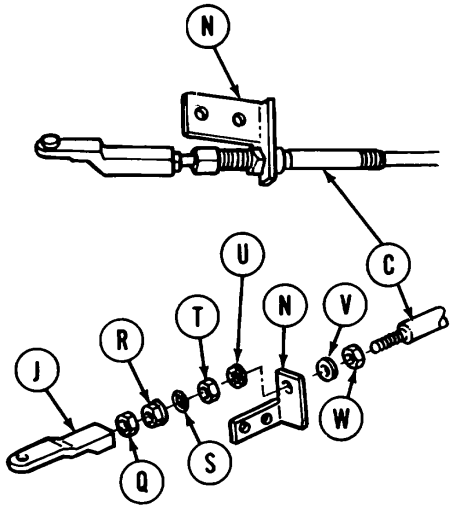
TA173283

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (REAR ONLY OF TWO-PIECE)-Continued

5. At transmission bellcrank assembly using pliers, remove clip (G) and pin (H) securing connector (J) to bellcrank (K)

6. Using a 9/16 inch socket and extension, remove two screws (L), washers (M) and bracket (N) from bracket assembly (P).





7. Using 9/16 inch wrench on nut (Q) and adjustable wrench, remove connector (J) and nut (Q).

8. Use an adjustable wrench to hold support bracket (N). Using a 15/16 inch wrench, remove nut (R) and preformed packing (S).

Throw away packing (S)

9. Using a 15/16 inch wrench, remove nut (T) and lockwasher (U) from control assembly (C). Remove support bracket (N) and lockwasher (V).

10. Using a 15/16 inch wrench, remove nut (W) from control assembly (C).

TA173284

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (REAR ONLY OF TWO-PIECE)-Continued

REPLACING REAR-CONTROL ASSEMBLY (SHORT)

INSTALLATION:

CAUTION

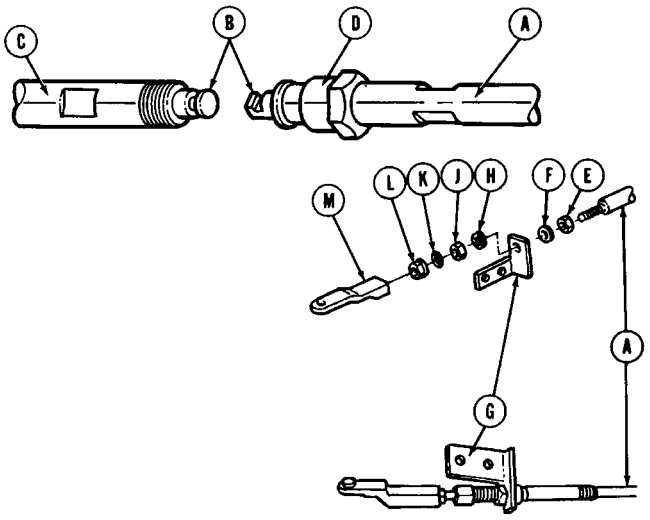
Make sure the metal casing of control assembly (A) is free to rotate at both ends so as not to cause binding of the inner pushrod.

1. With the shift lever in P (park) position and the bellcrank in the N (neutral) position, place the inner pushrods (B) of the control assemblies (A and C) in connected position and hold, while second mechanic manually moves bellcrank to the P (park) position.

NOTE

Moving the bellcrank to the P (park) position will close the gap between the control assemblies (A and C).

2. Manually tighten disconnect nut (D) on control assembly (A) finger tight.



3. Using a 15/16 inch wrench, install nut (E).
4. Install lockwasher (F) bracket (G) and lockwasher (H) on control assembly (A).
5. Using 15/16 inch wrench install nut (J).
6. Install new packing (K) in nut (L).
7. Using a 15/16 inch wrench, install new nut (L).
8. Using an adjustable wrench, install connector (M) on end of control assembly (A).

TA173285

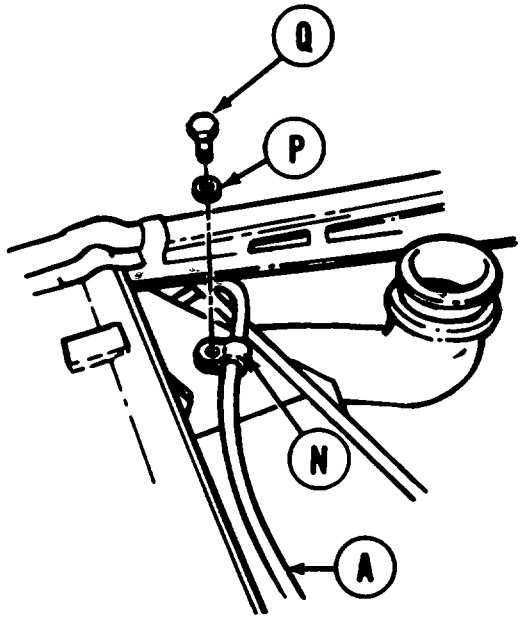
PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (REAR ONLY OF TWO-PIECE)-Continued

CAUTION

Do not force control (A) to rotate on top of transmission. Gently twist control (A) at metal casing until it lays smoothly. Forcing control (A) will cause damage.

9. Position control assembly (A) on top of transmission.

10. Position clamp (N) on control assembly (A). Using 7/16 inch wrench secure clamp (N) to boss on transmission with washer (P) and screw (Q).



TA173286

PARKING BRAKE CONTROL ASSEMBLY REPLACEMENT (REAR ONLY OF TWO-PIECE)-Continued

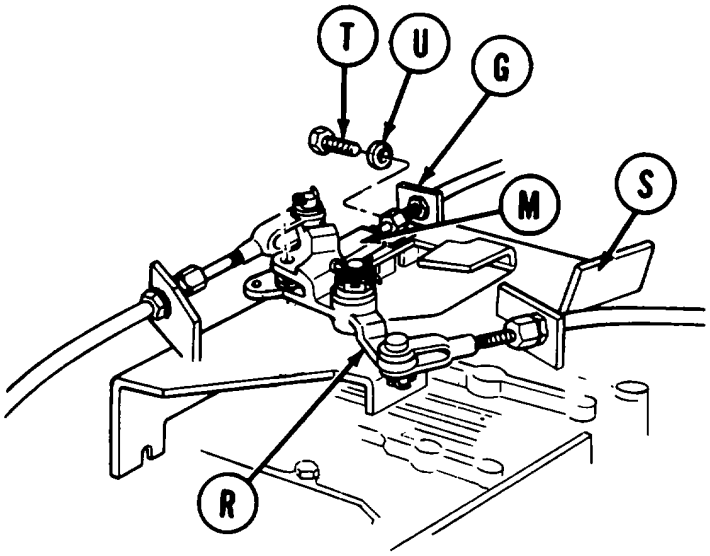
11. Position connector (M) in bellcrank assembly (R). Using a 9/16 inch socket and extension, install bracket (G) to bracket assembly (S) with two screws (T) and lockwashers (U).

NOTE

Pin and clip securing connector (M) to bellcrank (R) need not be installed until adjustment procedure is performed.

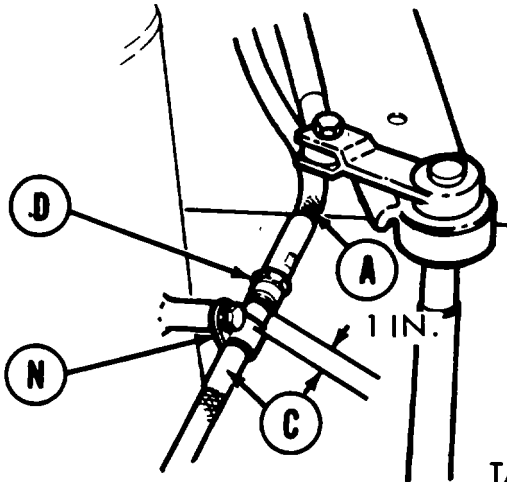
CAUTION

Make sure control assembly (C) is secured to hull wall with clamp (N) located on metal casing, 1 inch below disconnect nut (D).



12. Using adjustable wrench on flats of control assembly (A), and torque wrench with 7/8 inch crowfoot tighten disconnect nut (D) to 35-50 lb-in (8.9 to 12.7 N•m).

13. Perform parking brake control assembly adjustment (page 9).



TA173287

END OF TASK

SECTION VIII. DISCONNECTING/CONNECTING PARKING BRAKE FOR POWERPLANT REPLACEMENT TWO PIECE CONTROL

TOOLS: 7/8 inch combination box and open end wrench
7/8 inch crowfoot with 3/8 inch drive
12 inch adjustable wrench
Long round nose pliers
Torque wrench with 3/8 inch drive (0600 lb-in)

SPECIAL TOOLS: None

PERSONNEL: Two

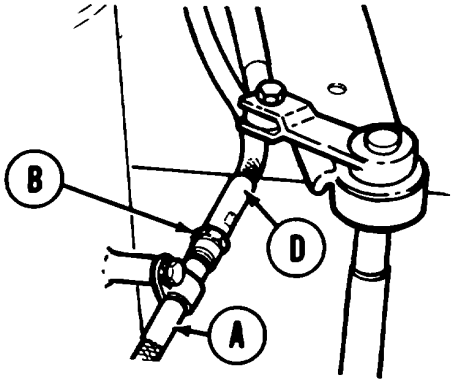
NOTE

This section covers only vehicles with two piece parking brake control system. For vehicles with one piece systems

DISCONNECT:

1. Using an adjustable wrench on the flats of control assembly (A), and 7/8 inch wrench on disconnect nut (B), loosen nut.

2. With shift lever in P (park) position, manually move bellerank (C) at top of transmission to the N (neutral) position (turn clockwise).



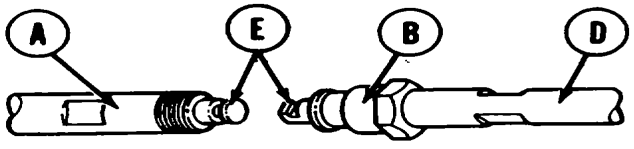
NOTE

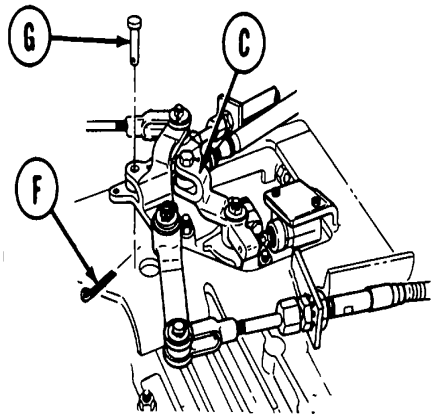
This will force the two control assemblies (A and B) to open up at the disconnect point.

3. Manually disconnect the inner pushrods (E) of the control assemblies (A and B) and displace

NOTE

It may be necessary to use pilers to remove clip (F) and pin (G) to release pushrods (E).





TA173288

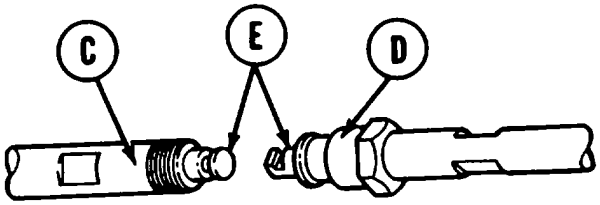
DISCONNECTING/CONNECTING PARKING BRAKE FOR POWERPLANT REPLACEMENT TWO PIECE CONTROL - Continued

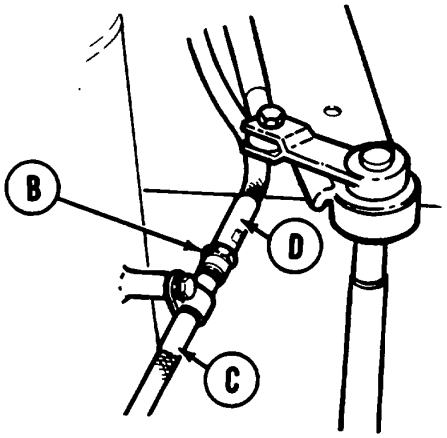
CONNECT:

1. With the shift lever in P (park) position, and the bellcrank (A) in the N (neutral) position, place the inner pushrods (E) of the control assemblies (C and D) in connected position and hold, while second mechanic manually moves bellcrank to the P (park) position.

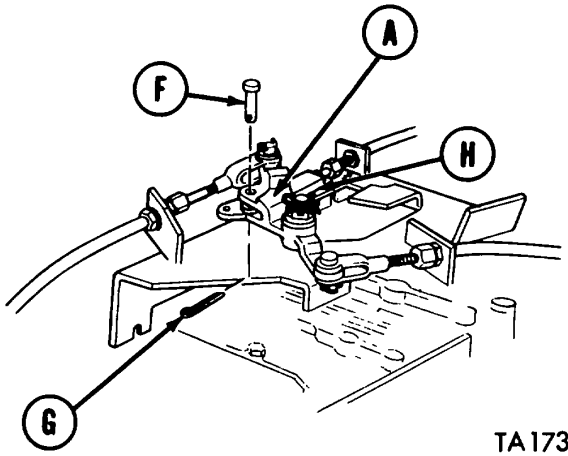
NOTE

Moving the bellcrank to the P (park) position will close the gap between the control assemblies (C and D).





2. Manually tighten disconnect nut (B).
3. Using adjustable wrench on flats of control assembly (C) and torque wrench with 7/8 inch crowfoot, tighten disconnect nut (B) to 35-50 lb-in (8.9 12.7 N•m).
4. If pin (F) and clip (G) were removed, insert pin (F) through bellerank (A) and connector (H).
5. Using pliers install clip (G) on pin (F).



END OF TASK

SECTION IX. REPLACEMENT OF ONE PIECE CONTROL ASSEMBLY WITH TWO PIECE

TOOLS: Center punch
Ball peen hammer
Measuring tape
Slip joint pliers
Welding machine

SPECIAL TOOLS: None

SUPPLIES: Cotter pins
Dry cleaning solvent PD-680 (NSN 6850-00-281-1985)
Sealing compound (NSN 8030-00-275-8110)
Masking tape
Pencil
Safety wire

NOTE

In addition to the above supplies you will need the parts listed in table on page 53.

PERSONNEL: Two

PRELIMINARY PROCEDURES: Remove powerplant (applicable vehicle TM -20-1)
Remove transmission shift linkage dust seal at right fuel tank
Remove right bulkhead access cover

REPLACEMENT OF ONE PIECE CONTROL ASSEMBLY WITH TWO PIECE - Continued
PARTS NECESSARY FOR RETROFIT

NOMENCLATURE	NSN	PART NO.	QUANTITY
Control Assembly (long)	2500-01-061-4289	12257897	1
Control Assembly (short)	2590-01-061-4290	12257898	1
Clamp, Loop	5340-00-775-5909	7755909	1
Clip	5340-00-264-7716	7703692	1
Screw, Cap	5305-00-225-3838	MS90725-4	1
Screw, Cap	5305-00-068-0512	MS90726-4	1
Lockwasher	5310-00-582-5965	MS35338-44	2
Split Bushing	5365-01-079-8363	12270206	1
FABRICATED PARTS (see appendix A, page 59)			
Boss		8689413	1
Pad		7970352	1

TA173291

REPLACEMENT OF ONE PIECE CONTROL ASSEMBLY WITH TWO PIECE - Continued

REMOVAL:

1. Remove one piece cable assembly using procedure given in Section V page 23 steps 1 thru 6 and 9 thru 22.

2. Attach 15 foot of safety wire to shift lever end of control assembly located inside driver's station. Make sure wire is wrapped several times around end of control assembly.

NOTE

Once safety wire is attached to control assembly, mechanic in driver's compartment should position himself in turret near bulkhead.

3. Mechanic in engine compartment grasps control assembly with both hands and pulls toward rear of tank, while mechanic inside turret makes sure that control assembly and wire feed through hole in bulkhead and tube. Insure that retainer slides freely off control assembly and free end of wire is secured to a wrench or unmovable object when free-end is visible beyond ammunition racks. The wrench will not allow free-end of wire to pass through bulkhead.

4. When control assembly is clear of tube located behind fuel tank, mechanic in engine compartment should disconnect wire from control assembly and remove control assembly from tank.

NOTE

Make sure wire is secured to a wrench or other object so that wire will remain in tube for installation of new front control assembly.

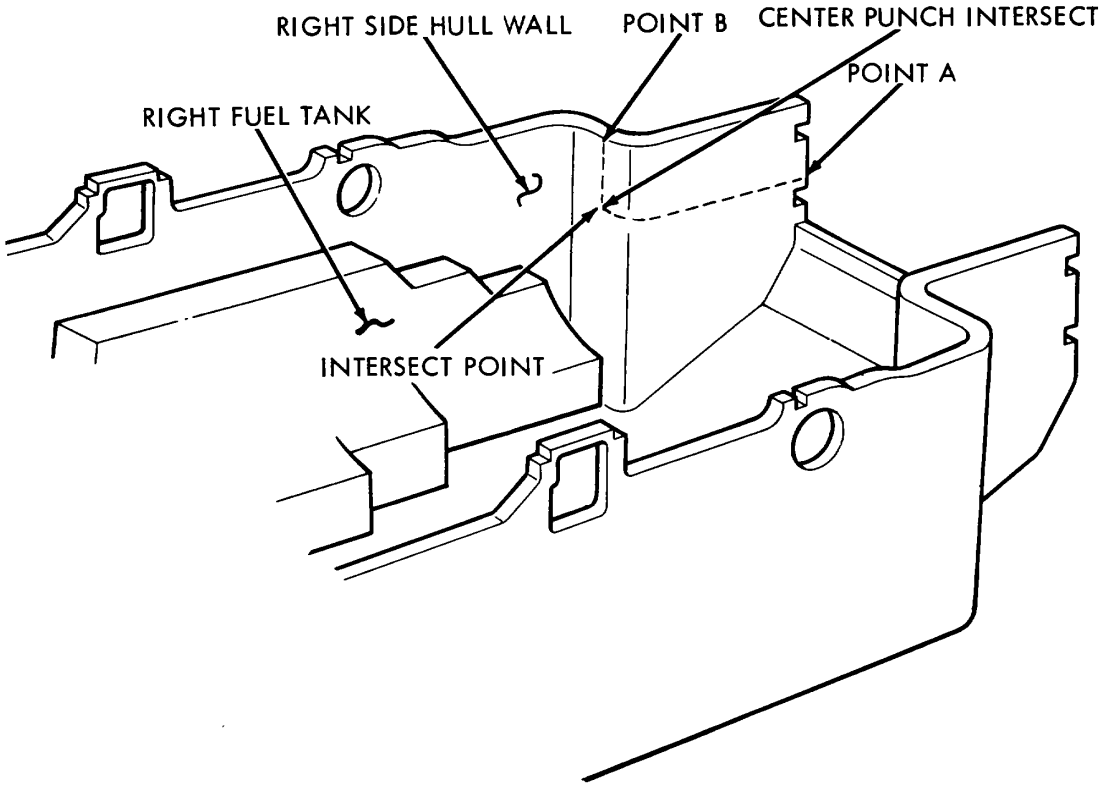
REPLACEMENT OF ONE PIECE CONTROL ASSEMBLY WITH TWO PIECE - Continued

REWORK:

NOTE

Pad 7970352 and boss 8689413 must be correctly located and welded in place. The pad locates the front control assembly to the right hull wall. The boss locates the rear control assembly on top of the transmission support bracket.

1. Using rags and solvent, clean the general area of new wall.
2. Using tape measure forward in vehicle from point (A) 29 ± 1/4 inches. Lay tape measure against hull wall from point (A). Following contour of hull wall, scribe a vertical line 29 ± 1/4 inches forward from point (A).
3. Measure from point (B) at top edge of hull wall. Measure down 13 ± 1/4 inches from top edge.
4. Scribe a horizontal line where point (B) intersects the vertical line.
5. Using hammer and punch, centerpunch at intersect point of lines.



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REPLACEMENT OF ONE PIECE CONTROL ASSEMBLY WITH TWO PIECE - Continued

6. Using rags and solvent, clean the general area of the shifting control bracket at top of transmission.

7. Using tape, measure rearward in vehicle from point (A) 1 inch, and scribe a line.

8. Measure from point (B) to the right in vehicle 5/16 inch and scribe a line at intersection of point (A) line.

9. Using hammer and punch, centerpunch point of lines.

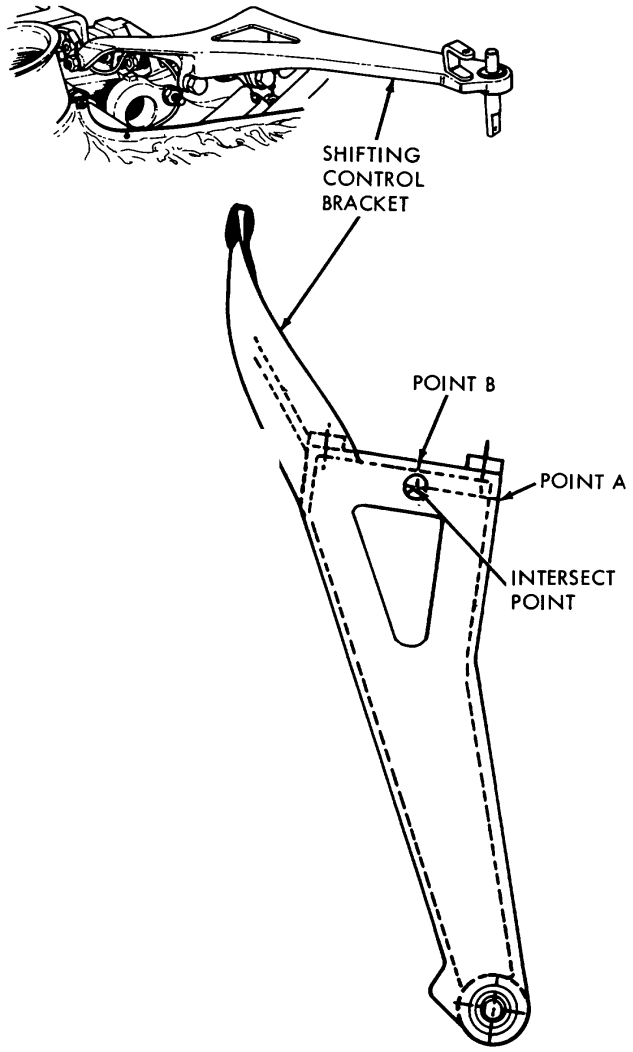
NOTE

Location tolerances is ± 1/8 inch.

10. Once the pad and boss locations have been determined, you must prepare the vehicle for welding operations.

WARNING

WELDING IN THE VICINITY OF FUEL, OIL AND HYDRAULIC FLUID IS DANGEROUS. PLACE FLAMEPROOF MATERIAL BETWEEN WELDING AREA AND FUEL TANKS. SURROUND COMPONENTS WITH WET RAGS OR CANVAS TO PROTECT AGAINST WELD SPLATTER. STATION A HELPER IN THE IMMEDIATE AREA WITH AN APPROVED FIRE EXTINGUISHER BEFORE BEGINNING WELDING OPERATIONS. FAILURE TO ADEQUATELY PROTECT AGAINST FIRE CAN CAUSE DEATH, INJURY, AND DAMAGE TO EQUIPMENT



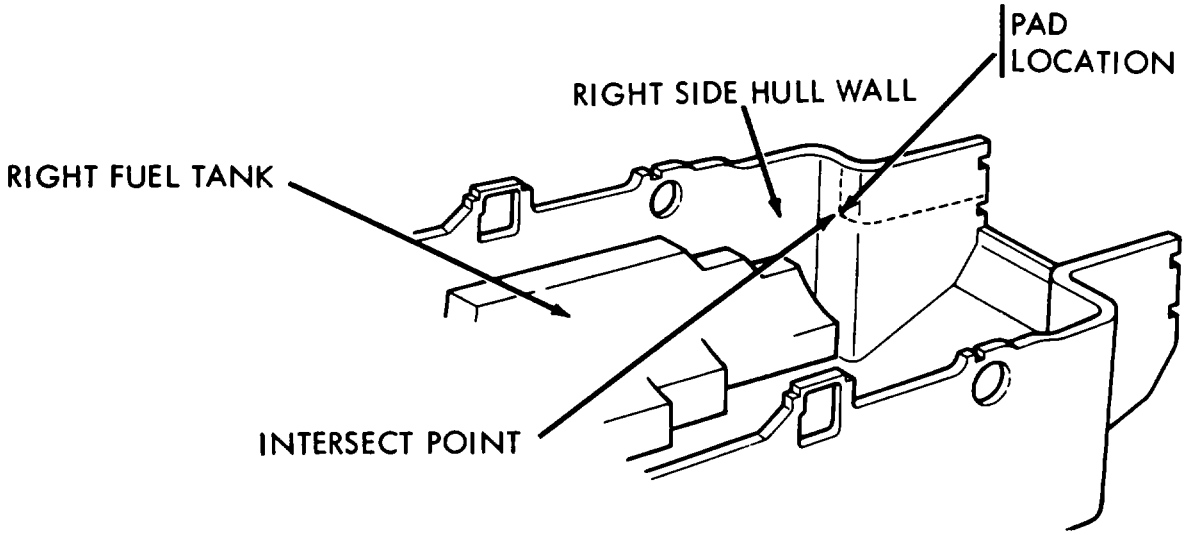
TA173294

REPLACEMENT OF ONE PIECE CONTROL ASSEMBLY WITH TWO PIECE - Continued

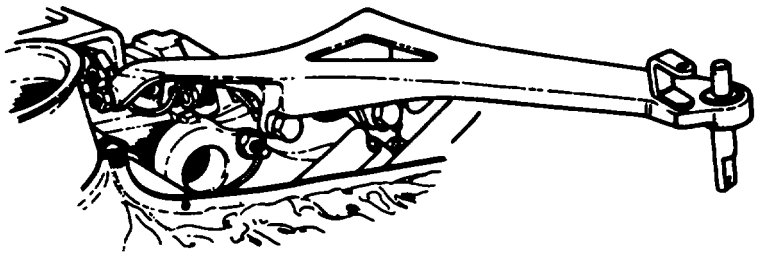
NOTE

When the pad and boss have been properly located, weld in position according to specification MIL-W-46086, method 1. Welding will be in accordance with the general procedures of TM 9-237. All welded areas will be cleaned in accordance with procedures contained in FMS-20. MIL-E-1803X austenitic electrodes will be used for these procedures.

11. Hold pad 7970352 against hull wall at intersect point with pliers.
12. Apply tack welds around pad at hull wall.
13. Complete welding around entire pad diameter.



14. Hold boss 8689413 on shifting control bracket at intersect point with pliers.
15. Apply tack welds around boss.
16. Complete welding around entire boss diameter.



17. When welding is completed and areas have cooled, prime and paint welded areas in accordance with procedures contained in FMS-20.

TA173295

REPLACEMENT OF ONE PIECE CONTROL ASSEMBLY WITH TWO PIECE - Continued

INSTALLATION:

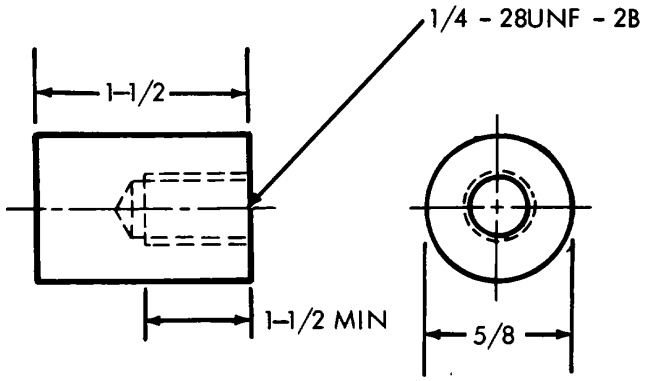
1. Install new front control assembly in accordance with Section VI page 39 (installation steps 1 thru 15).
2. Install new rear control assembly in accordance with Section VII page 47 (installation steps 1 thru 12).

END OF TASK

APPENDIX A

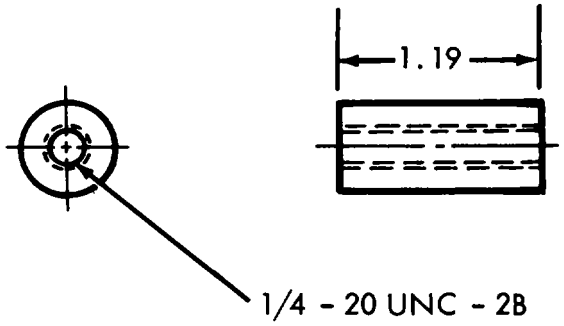
FABRICATED PARTS

MATERIAL:
STEEL 1015 TO 1025
SPEC QQ-S631 OR QQ-S-634
ALL DIMENSIONS IN INCHES



BOSS P-N 8689413

MATERIAL:
STEEL, C1015 TO C1025
SPEC QQ-633
1/2 DIA
ALL DIMENSIONS IN INCHES



PAD P-N 7970352

TA173297

By Order of the Secretary of the Army:

E.C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Brigadier General, United States Army
The Adjutant General

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

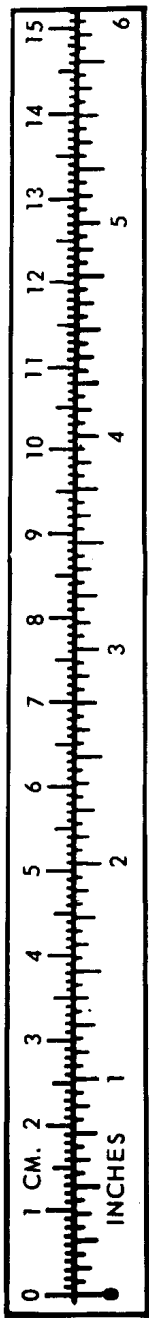
TEMPERATURE

5/9 (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 (°C + 32) = °F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



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