FOREWORD

This manual contains maintenance and repair procedures for Nissan FORKLIFT, model 1N1 series.

In order to assure your safety and the efficient functioning of the lift truck, this manual should be read thoroughly. It is especially important that the PRECAUTIONS in the GI section be completely understood before starting any repair task.

All information in this manual is based on the latest product information at the time of publication. The right is reserved to make changes in specifications and methods at any time without notice.

IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the technician and the efficient functioning of the lift truck.
The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.
Service varies with the procedures used, the skills of the technician and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first be completely satisfied that neither personal safety nor the lift truck's safety will be jeopardized by the service method selected.

NISSAN FORKLIFT CORPORATION

- Carefully check all removed oil seals, gaskets, packing materials, O-rings, lock washers, cotter pins and self-locking nuts against the instructions on each section to see whether or not they can be reused. If they cannot be reused, they must be replaced with new ones. If replacement parts are required, refer to the Parts Catalog distributed by Nissan Motors. Be sure that the replacement parts have the correct part number. Use only genuine Nissan parts.
- When replacing taper roller bearings or needle bearings, always replace their inner races and outer races as a set.
- Use only the specified lubricants and sealants.
- Be careful not to splash the brake fluid on the body or other painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, immediately wipe it and wash the area with water.
- Never reuse drained brake fluid.
- Following repair of any system containing oil or brake fluid, carefully check the system for fluid leakage.
- Do not carelessly dispose of discarded oil from oil changes and part cleaning operations. Dispose of the oil following established procedures.

PRECAUTIONS FOR ELECTRICAL SYSTEM INSPECTION

WARNING:

- **Always raise drive tires OFF floor before working on electrical system.**
- Turn the key switch to the OFF position and disconnect the battery plugs when disconnecting or connecting the print board connectors. Disconnecting and/or connecting the main print board or meter print board connectors with the key switch ON and the battery plugs in place can damage the print board. Exercise care.
- Avoid twisting and turning the print board connectors when connecting and/or disconnecting them. This can result in poor connector connections.
- When disconnecting connectors, do not pull on the wire attached to the connector. Always hold the connector body.
- When using a circuit tester, be very careful not to use the wrong range (A, V or Ω) and/or polarity.
- Static electricity can damage the main and meter print boards. Be sure to eliminate static electrical charges when handling the print boards.
- Following completion of the inspection procedure, once again check that all of the leads are connected to their original terminals.

CAUTION:

- **Before changing any components (i.e. lamps, fuses, meter panel) or disconnecting any wiring. Always turn OFF key switch and disconnect battery. This will reduce the possibility of damage to controller system.**

Maintenance Schedule

The following tables list the servicing required to keep your forklift operating in good mechanical condition.

- Do not inspect any part of the system while the battery is being charged.
- Before checking any part of the system, be sure to disconnect the battery plug.
- When it is necessary to check with the battery connected, raise the drive wheels. Be extremely careful to prevent electric shocks.

NOTE:
The inspection/service timings shown below are based on the assumption that the vehicle is operated for 200 hours in a month. When determining the inspection/service timing, take into account the actual working conditions of the vehicle.

(1) CONTROL SYSTEM MAINTENANCE

MAINTENANCE OPERATION	MAINTENANCE INTERVAL												Page
Periodic maintenance should be performed after specified intervals have elapsed in months or hours, whichever comes first.	Months	1	2	3	4	5	6	7	8	9	10	11	12	
	Hundreds of hours	2	4	6	8	10	12	14	16	18	20	22	24	
CONTROL SYSTEM MAINTENANCE														
1. Dust from traction and pump motor							C						C	MA-10
2. Rotor							I						I	MA-10
3. Resistance between forklift body and negative/positive terminals				I			I			I			I	MA-8
4. Operation of contactor points and plungers													I	MA-9
5. Resistance of contactor coils													I	MA-9
6. Controller surface		C		C			C			C			C	MA-9
7. Operation of low-voltage detecting circuit							I						I	MA-9
8. Wiring, bolts and nuts		I		I			I			I			I	MA-9

Abbreviations: I = Inspect. Correct or replace if necessary.
C = Clean

Tires and Road Wheels

(1) GENERAL SPECIFICATIONS

Except North America

●···standard ○···option

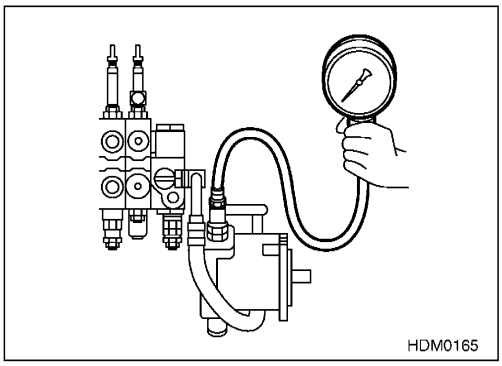
Tire \ Model				S1N1		1N1		G1N1		
				13	15	15	18	16	18	20
Front	Single	Tire size (Pneumatic solid)		18×7-8		18×7-8		18×7-8	200/50-10	
		Rim size (Pneumatic solid)		4.33R-8		4.33R-8		4.33R-8	6.50F-10	
		Tire size (Cushion)		18×7×12-1/8		18×7×12-1/8		18×7×12-1/8		
		Tread (Pneumatic solid) mm (in)		913 (35.94)		913 (35.94)		933 (36.73)	930 (36.61)	
		Tread (Cushion) mm (in)		930 (36.61)		930 (36.61)		930 (36.61)		
		Type	Pneumatic solid	●	●	●	●	●	●	●
			Pneumatic solid (White)	○	○	○	○	○	○	○
			Cushion	○	○	○	○	○	○	○
Rear	-	Tire size (Pneumatic solid)		15×4.5-8		15×4.5-8	140/55-9	140/55-9		
		Rim size (Pneumatic solid)		3.00D-8		3.00D-8	4.00E-9	4.00E-9		
		Tire size (Cushion)		15×5×11-1/4		15×5×11-1/4		-		
		Tread mm (in)		176 (6.93)		176 (6.93)		176 (6.93)		
		Type	Pneumatic solid	●	●	●	●	●	●	●
			Pneumatic solid (White)	○	○	○	○	○	○	○
			Cushion	○	○	○	○	–	–	–

North America only

●···standard ○···option

Tire \ Model				1N1		G1N1
				15	18	20
Front	Single	Tire size (Pneumatic solid)		18×7-8		200/50-10
		Rim size (Pneumatic solid)		4.33R-8		6.50F-10
		Tire size (Cushion)		18×7×12-1/8		18×7×12-1/8
		Tread (Pneumatic solid) in (mm)		35.9 (913)		36.6 (930)
		Tread (Cushion) in (mm)		36.6 (930)		36.6 (930)
		Type	Pneumatic solid	○	○	○
			Cushion	●	●	●
Rear	-	Tire size (Pneumatic solid)		15×4.5-8	140/55-9	140/55-9
		Rim size (Pneumatic solid)		3.00D-8	4.00E-9	4.00E-9
		Tire size (Cushion)		15×5×11-1/4		15×5×11-1/4
		Tread in (mm)		6.9 (176)		6.9 (176)
		Type	Pneumatic solid	○	○	○
			Cushion	●	●	●

Hydraulic System (Cont'd)



2. Attach the adapter to the port and connect a pressure gauge to the adapter.
3. Turn key switch to ON and operate control lever for hydraulic system and turn steering wheel fully right or left for power steering system and check the pressure referring to Table below.

Standard pressure

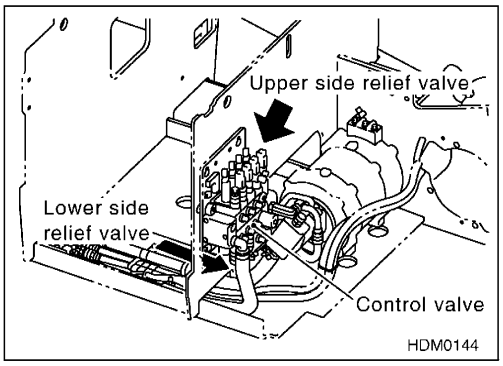
MPa (bar, kg/cm^2, psi)

Main relief pressure	16.7 (167.0, 170.34, 2,421)
Tilt relief pressure	9.3 (93.0, 94.86, 1,348)
3rd, 4th relief pressure	11.8 (118.0, 120.36, 1,711)
Power steering relief pressure	6.9 (69.0, 70.38, 1,000.5)

4. If out of specification, adjust the pressure.

(6) ADJUSTMENT OF HYDRAULIC PRESSURE

- Turn key switch to OFF, and then disconnect the battery connection.
- Disconnect seat switch harness connection, and then connect the seat switch harnesses on body harness side.
- Relief valve on control valve upper side



1. Remove control valve switch (for mechanical).
2. Loosen lock nut of relief valve assembly.
3. Connect battery cable, and then turn key switch to ON.
4. Push control valve switch to ON (for mechanical). Operate control lever (for joystick).
5. Turn adjusting screw of relief valve to set standard pressure.

- If lower than the standard, turn clockwise.
- If greater than the standard, turn counterclockwise.

⚠ **CAUTION:**

- **One rotation of the adjusting screw corresponds to a pressure change of 6.9 - 7.8 MPa (68.6 - 78.5 bar, 70 - 80 kg/cm^2, 995 - 1,138 psi), so do not turn carelessly.**
- **Carefully adjust pressure, observing the pressure gauge reading.**

6. After completing adjustment, hold adjusting screw in place and tighten lock nut.
7. Implement the pressure test again to check whether the set pressure is correct.

- Relief valve on control valve lower side

1. Remove battery from the vehicle.
2. Connect battery cable to the vehicle using an extension cable.
3. Turn key switch to ON and operate control lever.
4. Turn adjusting screw of relief valve to set standard pressure.

- If lower than the standard: Turn clockwise.
- If greater than the standard, turn counterclockwise.

⚠ **CAUTION:**

- **One rotation of the adjusting screw corresponds to a pressure change of 6.9 - 7.8 MPa (68.6 - 78.5 bar, 70 - 80 kg/cm^2, 995 - 1,138 psi), so do not turn carelessly.**
- **Carefully adjust pressure, observing the pressure gauge reading.**

CONTROL SYSTEM

SECTION CS

CONTENTS

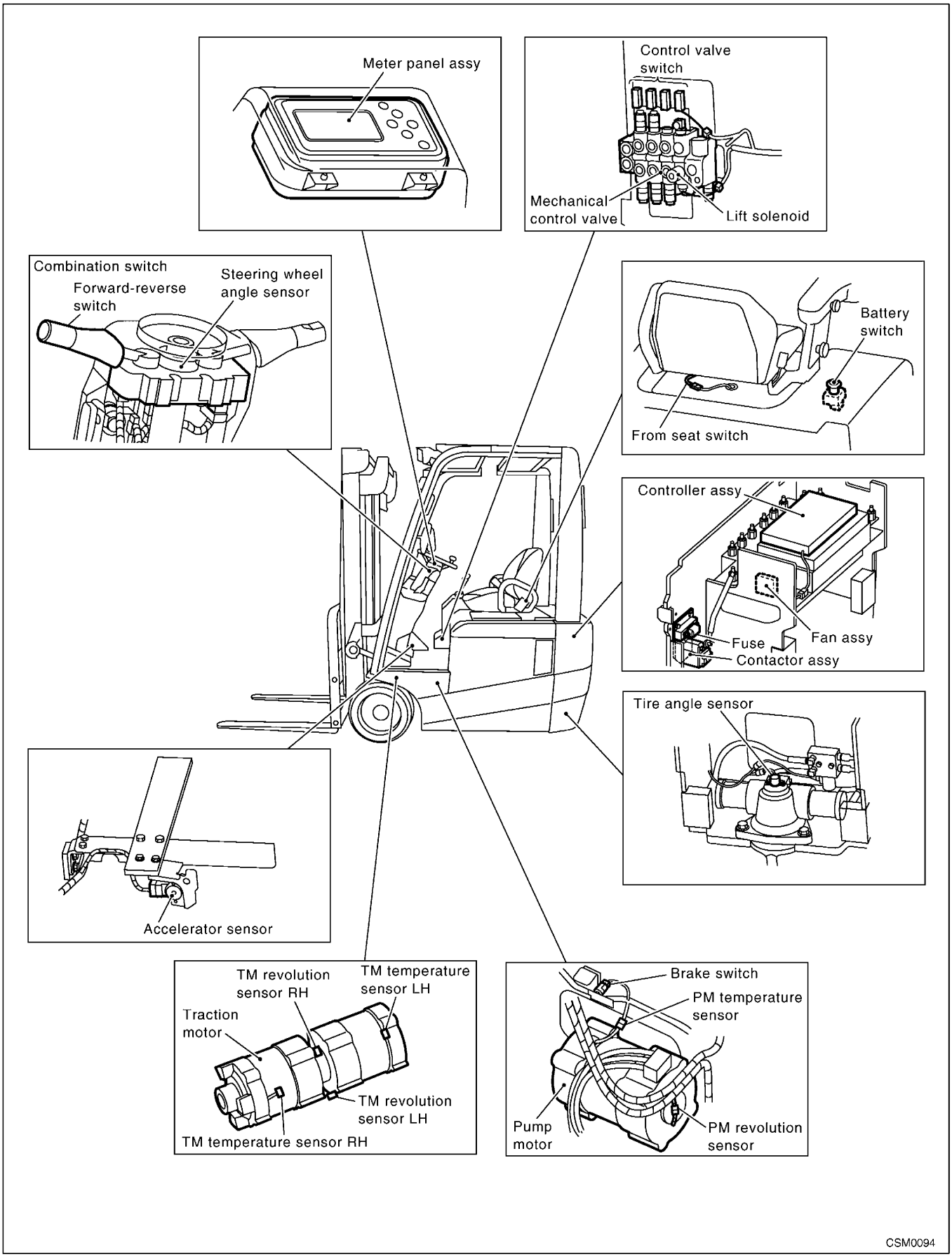
⚠ **CAUTION:**

- **Before changing any components (i.e. lamps, fuses, meter panels) or disconnecting any wiring. Always turn OFF the key switch and disconnect battery. This will reduce the possibility of damage to controller system.**

⚠ **CAUTION:**

- **Whenever towing this truck always ensure key is in OFF position and battery is disconnected (unplugged) to reduce possible damage to electrical system.**

Standard Equipment



Meter Panel Explanation (Cont'd)

MALFUNCTION INDICATIONS

Affected system or area	Indication	Malfunction description	
Control system (Traction, Cargo-handling, Power steering): Units, Sensors, Motors, Switches, FETs	D-FET SHORT	A malfunction has occurred in the forklift traction system. Further operation of the forklift is not possible.	NOTE: A display example is shown on the left.
	P-FET OPEN	A malfunction has occurred in the forklift cargo-handling system. Further lifting (lifting and tilting) operation is not possible. The forks cannot be raised or tilted.	
	TIRE ANGLE SENSOR LOW	A malfunction has occurred in the forklift power steering system. Forklift steering control is possible.	
	D/CONT TEMP SENSOR HIGH TEMP	Either the controller or the motor is overheating. Immediately stop forklift operation. Park the forklift in a safe area where there is no pedestrian or vehicular traffic. Allow the controller and/or the motor to cool.	**WARNING** • **Ignoring the warning indication and continuing to operate the forklift can result in serious motor damage. Always stop operation immediately after the warning indication appears. Have the forklift inspected.** • **Check the specifications of the forklift you are using before operation as this function is not available on some forklifts.**
	P/MO TEMP SENSOR HIGH TEMP	Either the controller or the motor is overheating. Immediately stop forklift operation. Park the forklift in a safe area where there is no pedestrian or vehicular traffic. Allow the controller and/or the motor to cool.	
Essential fluid	BRAKE FLUID LEVEL DOWN	The brake fluid level has fallen below the specified level.	-

Diagnostic Mode (Cont'd)

There are two types of diagnostic method. One type is self-diagnosis and the other is interactive diagnosis. Self-diagnosis allows for controller diagnosis of a system, while the interactive diagnosis is used for diagnosing switches and sensors. When malfunctions occur in systems or components, check and eliminate probable causes of the malfunction using either self-diagnostic or interactive diagnostic techniques. After the malfunctioning area has been repaired, confirm the malfunction has been eliminated by using the appropriate diagnostic method.

NOTE:
When checking each component, operate each component if necessary.

Table of Error Code

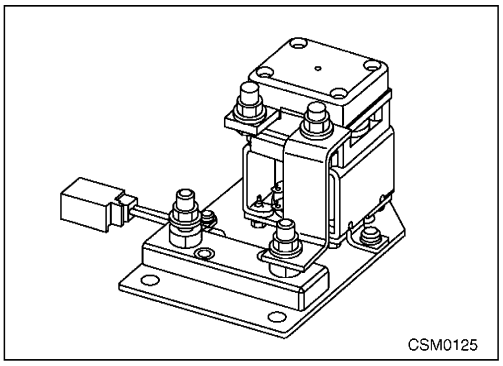
Failure part		Fail mode	Error code	Detect mode		Reference page	Remarks
				Work	Self		
CONTROLLER							
Main contactor		Short	400	○	-	CS-51	-
		Open	401	○	-		
Main fuse		Open	403	○	○	CS-52	-
Battery voltage		Low voltage	404	○	-	-	-
		Over voltage	405	○	-		
CONT capacitor		Abnormal	406	○	-	-	-
Drive FET		Short	408	○	○	CS-48	-
		Open	409	○	○		
Drive FET left		Short	410	○	○		
		Open	411	○	○		
Pump FET		Short	412	○	○	CS-49	-
		Open	413	○	○		
Drive current sensor	U	Low output	414	○	○	CS-50	-
		High output	415	○	○		
	V	Low output	416	○	○		
		High output	417	○	○		
Drive current sensor left	U	Low output	418	○	○		
		High output	419	○	○		
	V	Low output	420	○	○		
		High output	421	○	○		
D/Mo TEMP* sensor		Abnormal	422	○	○	CS-53	-
		Overheat	423	○	-		
D/Mo TEMP* sensor left		Abnormal	424	○	○		
		Overheat	425	○	-		
D/CONT TEMP sensor		Abnormal	426	○	○	-	-
		Overheat	427	○	-		
D/CONT TEMP sensor left		Abnormal	428	○	○	-	-
		Overheat	429	○	-		
Pump current sensor	U	Low output	430	○	○	CS-50	-
		High output	431	○	○		
	V	Low output	432	○	○		
		High output	433	○	○		
P/Mo TEMP* sensor		Abnormal	434	○	○	CS-53	-
		Overheat	435	○	-		
P/CONT TEMP sensor		Abnormal	436	○	○	-	-
		Overheat	437	○	-		
D/Mo REV sensor		Abnormal	438	○	-	CS-53	-
D/Mo REV sensor left		Abnormal	440	○	-		
P/Mo REV sensor		Abnormal	442	○	-		
CONT communication		Abnormal	444	○	-	-	-
CONT type select		Abnormal	446	○	○	-	-
Meter							
Meter communication		Abnormal	558	○	-	-	-

Failure part		Fail mode	Error code	Detect mode		Reference page	Remarks
				Work	Self		
ACTUATOR							
Lift down valve		Short	500	○	○	CS-65	-
		Open	501	○	○		
PS correction valve		Short	502	○	○	CS-73	Knob position control (Option)
		Open	503	○	○		
Tilt Horizontal valve		Short	504	○	○	Not equipped	
		Open	505	○	○		
Lift valve	Pull	Short	506	○	○	CS-67	Joystick control (Option)
		Open	507	○	○		
	Push	Short	508	○	○		
		Open	509	○	○		
Tilt valve	Pull	Short	510	○	○		Joystick control (Option)
		Open	511	○	○		
	Push	Short	512	○	○		
		Open	513	○	○		
3rd valve	Pull	Short	514	○	○		Joystick control (Option)
		Open	515	○	○		
	Push	Short	516	○	○		
		Open	517	○	○		
4th valve	Pull	Short	518	○	○		Joystick control (Option)
		Open	519	○	○		
	Push	Short	520	○	○		
		Open	521	○	○		
5th valve	Pull	Short	522	○	○		Joystick control (Option)
		Open	523	○	○		
	Push	Short	524	○	○		
		Open	525	○	○		
C1 solenoid valve		Short	526	○	○		Joystick control (Option)
		Open	527	○	○		
SENSOR							
F/R Switch		Same ON	450	○	-	CS-57, 68	-
Accel sensor		Low output	452	○	○	CS-60	-
		High output	453	○	○		
Tire angle sensor		Low output	454	○	○	CS-59	-
		High output	455	○	○		
Tilt angle sensor		Low output	456	○	○	Not equipped	
		High output	457	○	○		
Lift sensor		Low output	458	○	○	CS-68, 69	Joystick control (Option)
		High output	459	○	○		
Tilt sensor		Low output	460	○	○		
		High output	461	○	○		
3rd sensor		Low output	462	○	○		
		High output	463	○	○		
4th sensor		Low output	464	○	○		
		High output	465	○	○		
LIFT ACCEL		Low output	466	○	○	Not equipped	
Tilt H switch		Short	468	○	○	Not equipped	
		Open	469	○	○		
Steer Angle sensor		Abnormal	470	○	-	CS-58	-
Weight sensor		Low output	472	○	○	Not equipped	
		High output	473	○	○		

*Under these 3 error codes, when temperature sensor reaches 130 degrees C (266 degrees F) the controller will slow the motor down until motor cools.

Controller Element Inspection (Cont'd)

CONTACTOR ASSEMBLY

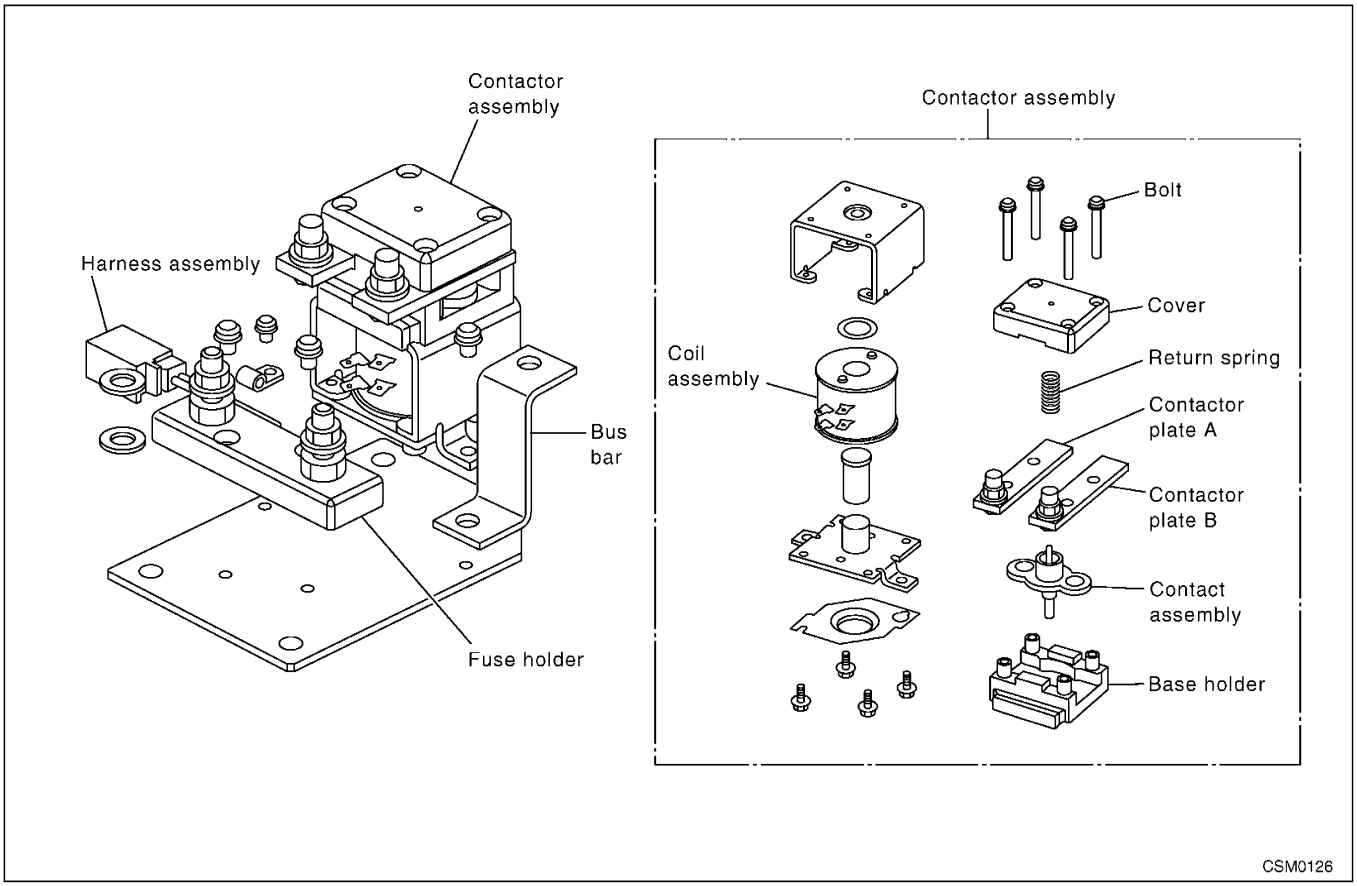


Specifications

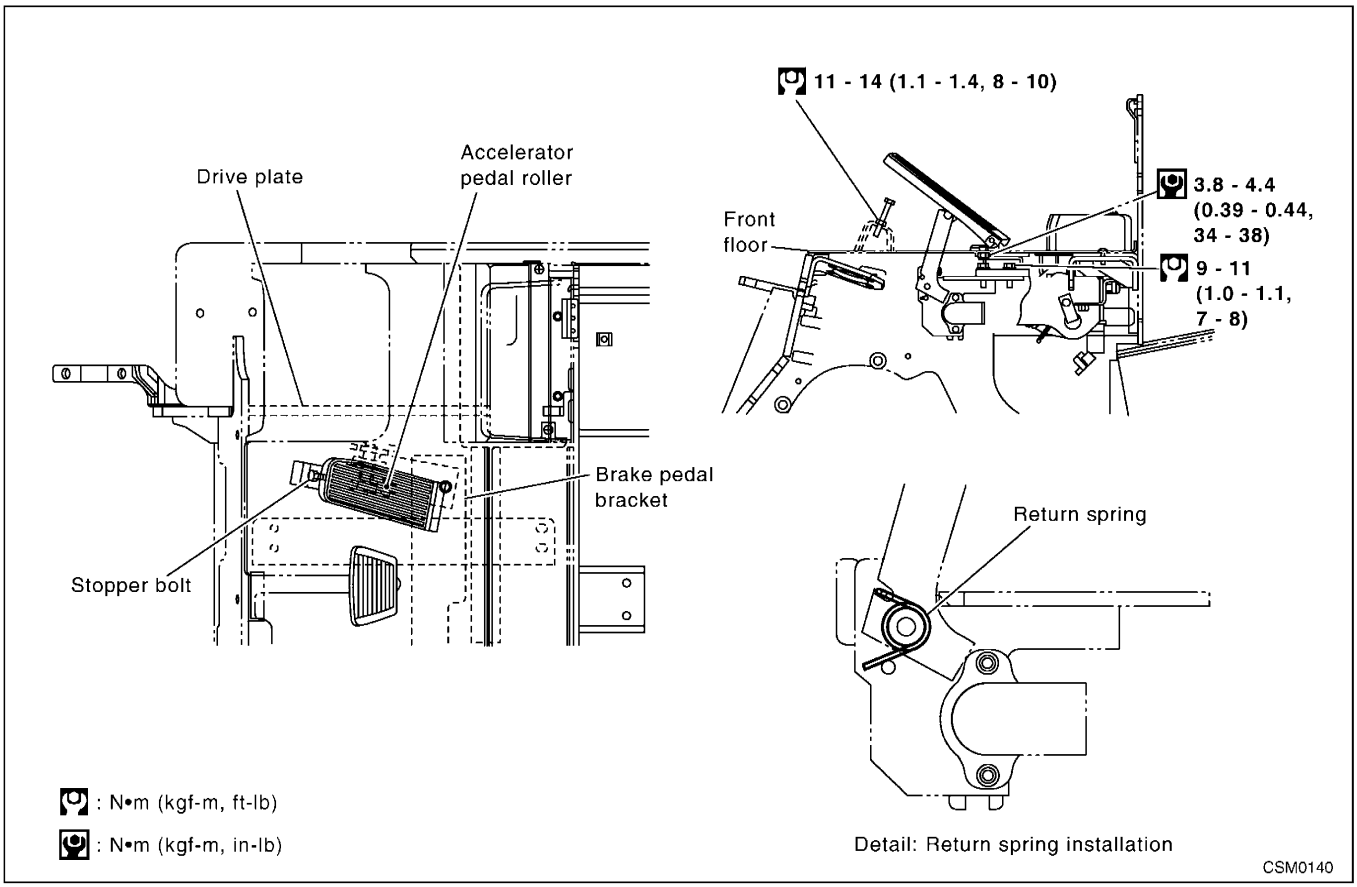
Item	Specification
Rated current	300A
Cutout current	2500A
Mechanical life	100 M cycle

Service data

Item	Normal	NG
Coil resistance	30 ~ 70Ω	Abnormal contact
Contact wear limit	Movable/fixed 0.7 mm (.028 in) Max	



Control System (Cont'd)



Linkage stroke adjustment

Fully-closed position adjustment

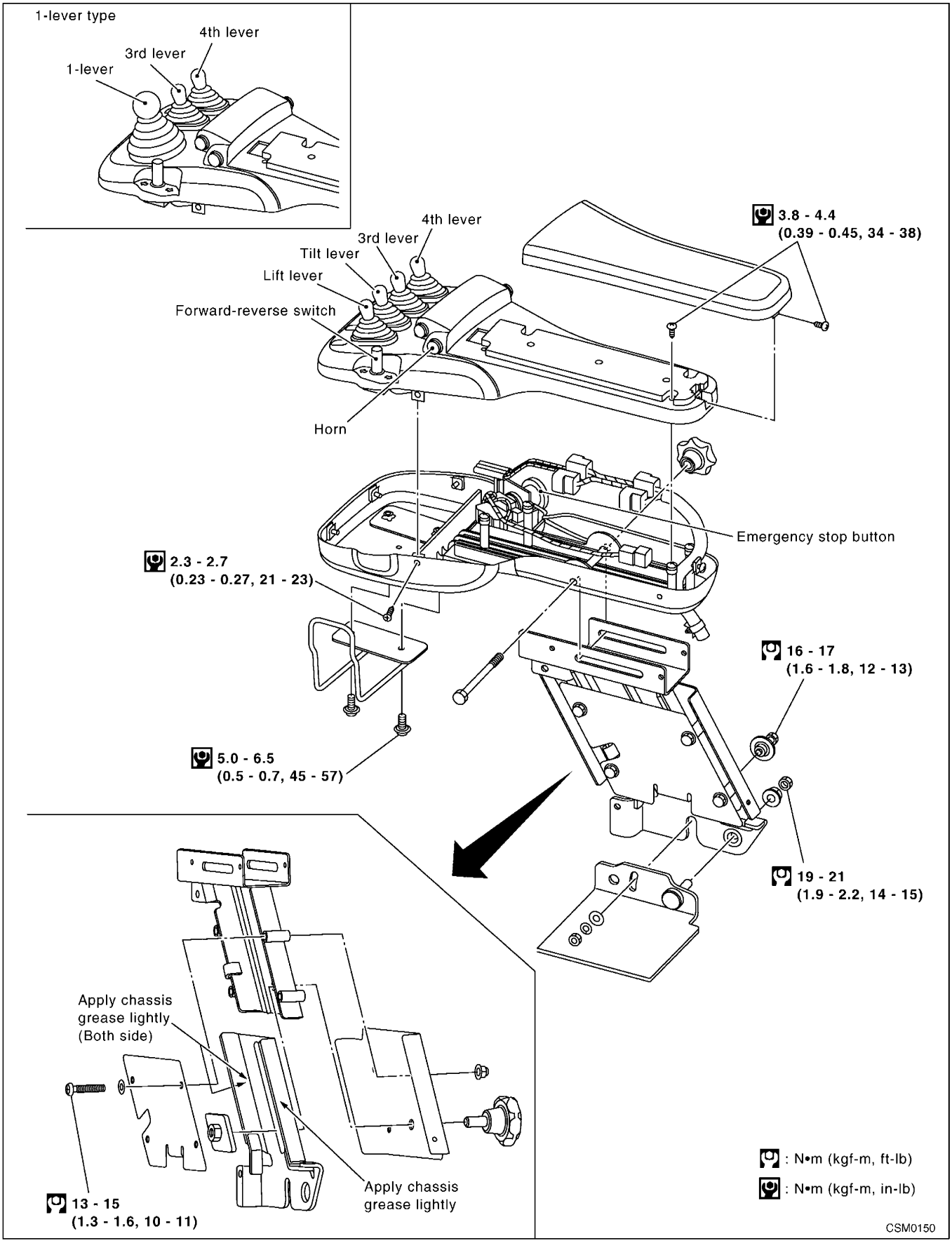
1. Depress the accelerator pedal until the accelerator linkage is fully opened.
2. Rotate the stopper bolt counterclockwise by 180 degrees, and then tighten the nut.

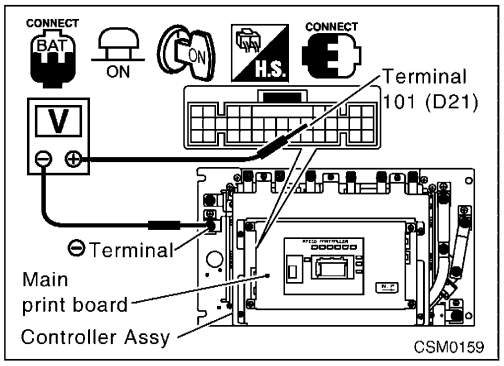
CAUTION:

- **The accelerator linkage operation should move smoothly with no binding. When releasing the pedal, immediately return it to the fully-closed position.**
- **The return spring should be securely installed as shown in the figure.**
- **Move the accelerator pedal, and then check that the accelerator pedal roller moves smoothly in the groove.**

Joystick Control System (Option) (Cont'd)

REMOVAL AND INSTALLATION





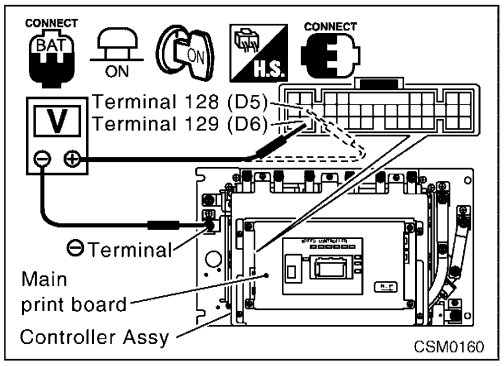
Ⓑ

When the key switch is ON, measure the voltage between controller terminal 101 (D21) and (-) terminal. — V 100

Is the battery voltage normal?

NO → Check the harness between battery switch and controller terminal 101 (D21).
Check the harness connection condition.

YES

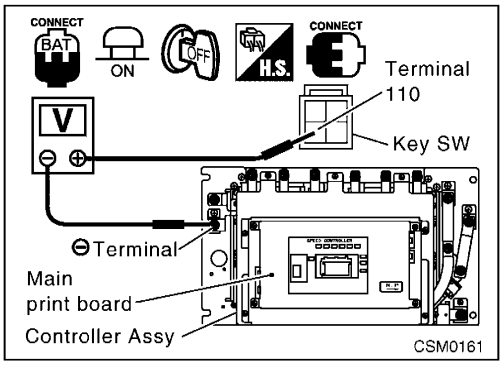


When the key switch is ON, measure the voltage between controller terminals 129 (D5), 128 (D6), and (-) terminal. — V 100

Is the battery voltage normal?

NO → Check Fuse 10A (IGN side). (Refer to page 16 in EL section)
Check the key switch. (Refer to page 20 in EL section)
Check the harness condition.

YES



Measure the voltage between key switch terminal (110) and (-) terminal. — V 100

Is the battery voltage normal?

NO → Check Fuse 10A (BAT side). (Refer to page 16 in EL section)
Check the harness condition.

YES

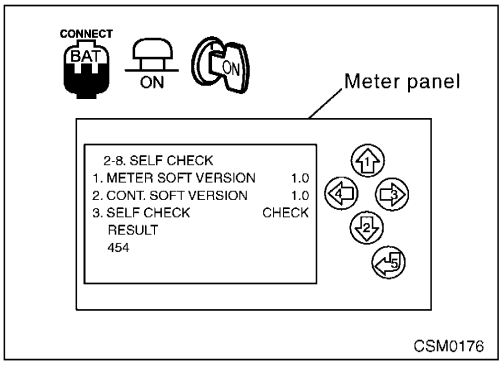
Replace the main print board.

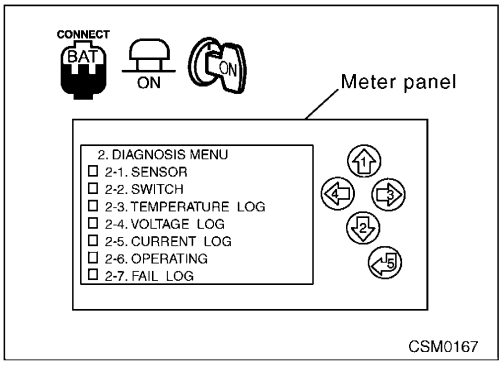
SYMPTOM:
Straight-line instability

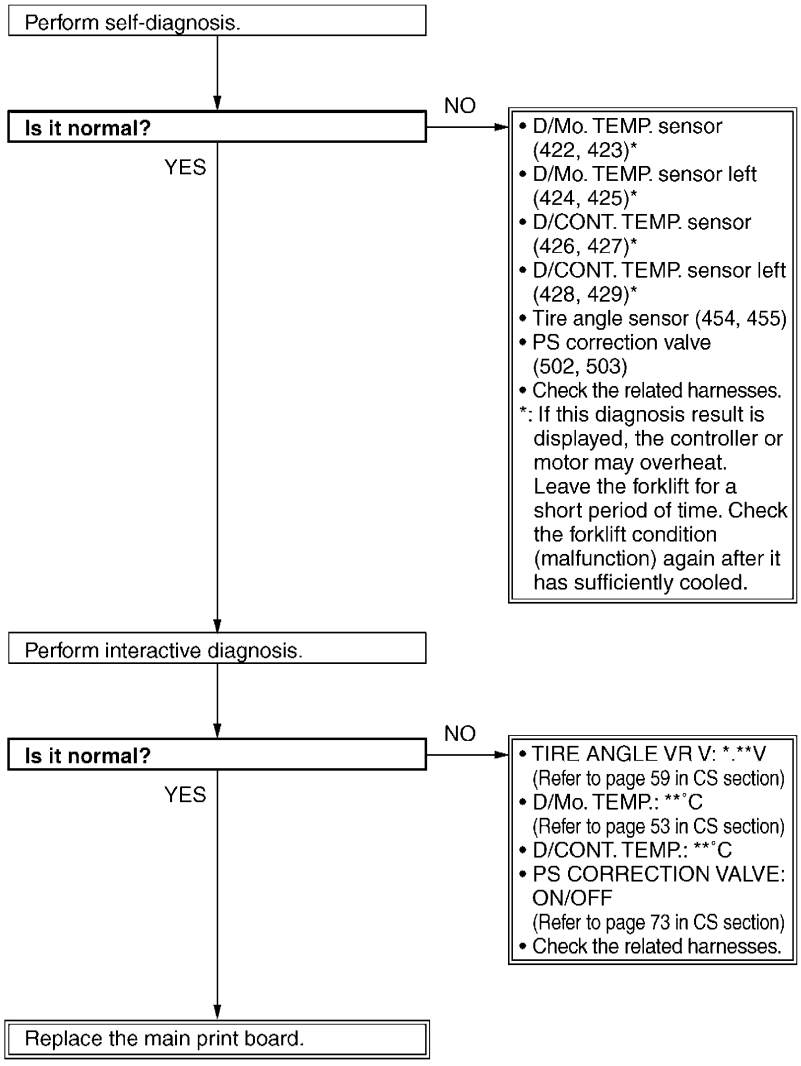
PROBABLE TROUBLE AREAS CAUSING MALFUNCTIONS

D/Mo. TEMP. sensor, D/CONT. TEMP. sensor, Tire angle sensor, PS correction valve, Main print board and Harness

CAUTION:
The self-diagnosis results in flowchart describe the possible parts (error code), but all of them are not always displayed.
Only the parts that can be checked with interactive diagnosis are displayed from these parts as the interactive diagnosis item. Always check the malfunctioning parts of interactive diagnosis even if it is a unit. Then, check the related harness condition.





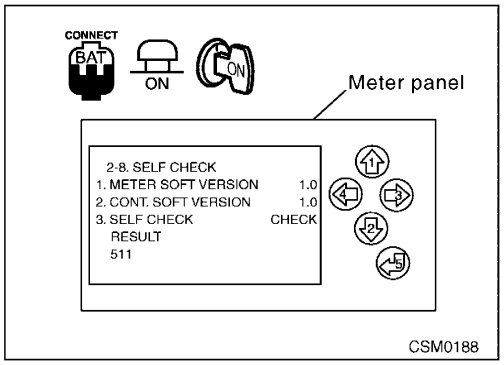


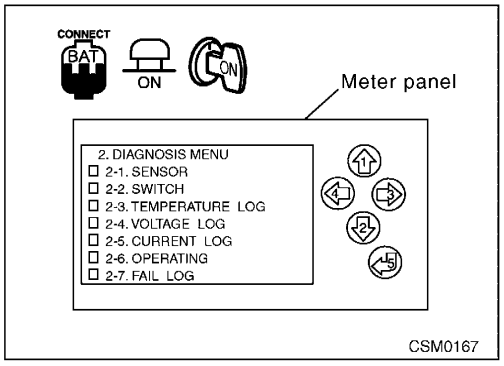
SYMPTOM:
An operation of lift/tilt/attachment (3rd/4th) does not operate.

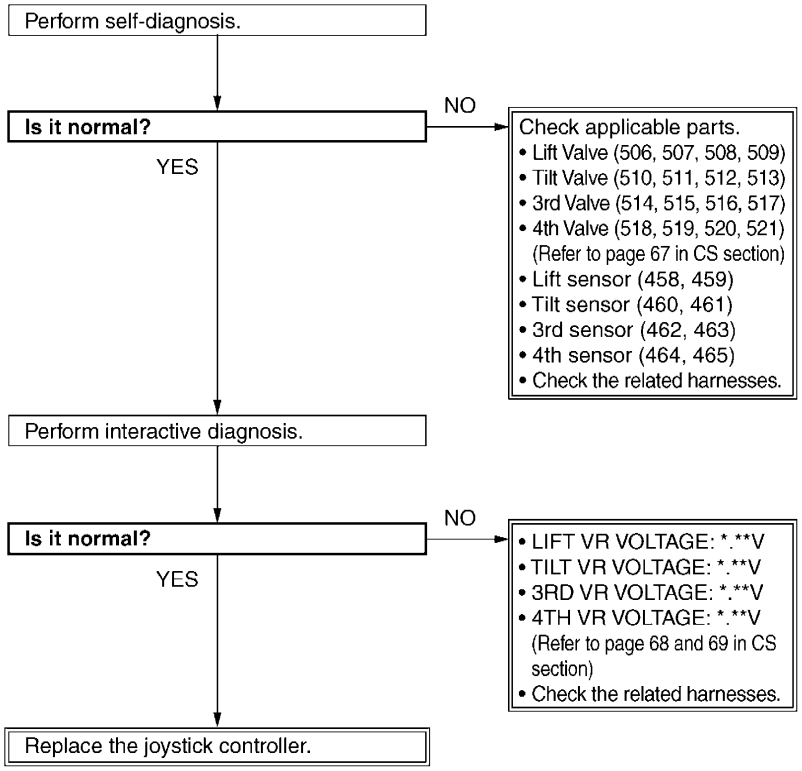
PROBABLE TROUBLE AREAS CAUSING MALFUNCTIONS

HYD-control valve solenoid, HYD-control valve switch, Joystick controller and Harness

CAUTION:
The self-diagnosis results in flowchart describe the possible parts (error code), but all of them are not always displayed.
Only the parts that can be checked with interactive diagnosis are displayed from these parts as the interactive diagnosis item. Always check the malfunctioning parts of interactive diagnosis even if it is a unit. Then, check the related harness condition.







Traction Condenser Board

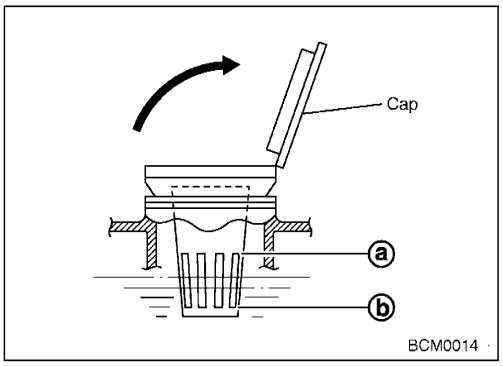
Terminal No. (Print board side)	Items	Characteristic/Specification	Possible error mode/Related symptom	Related trouble diagnosis
E1	Batt+	• VB level (E1-E2) (contactor input)	• The controller does not operate	• CONT condenser malfunction: 406 • Main contactor short: 400 • Main contactor open: 401 • Main fuse open: 403
E2	Batt-			
E13	Batt+	• VB level (E13-E14) (contactor input)		
E14	Batt-			

Loading Condenser Board

Terminal No. (Print board side)	Items	Characteristic/Specification	Possible error mode/Related symptom	Related trouble diagnosis
E16	Batt+	• VB level (E16-E15) (contactor input)	• The controller does not operate	• CONT condenser malfunction: 406 • Main contactor short: 400 • Main contactor open: 401 • Main fuse open: 403
E15	Batt-			
F1A	Controller cooling fan 1 power supply	Voltage between F1* and F2* At fan driving: 24.0±3V	• Controller internal cooling fan malfunction	• Right Drive Cont. temperature sensor malfunction: 426 • Loading Pump Cont. temperature sensor malfunction: 436
F1B	Controller cooling fan 2 power supply			
F1C	Controller cooling fan 3 power supply			
F1D	Controller cooling fan 4 power supply			
F1E	Controller cooling fan 5 power supply			
F1F	Controller cooling fan 6 power supply			
F2A	Controller cooling fan 1 GND			
F2B	Controller cooling fan 2 GND			
F2C	Controller cooling fan 3 GND			
F2D	Controller cooling fan 4 GND			
F2E	Controller cooling fan 5 GND			
F2F	Controller cooling fan 6 GND			

Inspection (Cont'd)

ELECTROLYTE LEVEL



⚠ **CAUTION:**
Fill distilled water when battery electrolyte level drops.

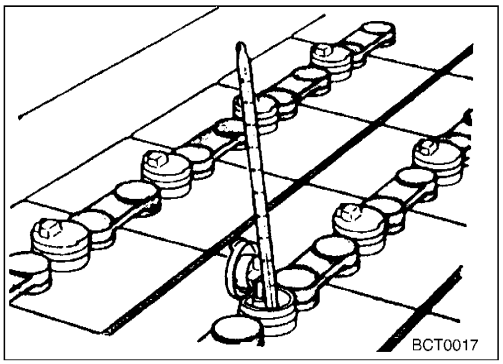
1. Open the cap and check the electrolyte level. If electrolyte level is in between ⓐ - ⓑ in left figure, it is OK.

⚠ **CAUTION:**
Be careful because battery specifications may vary with each maker.

2. If inspection finds a cell in which electrolyte level is too low, check if there is any leakage and fill with distilled water. Continue filling up with cap opened until electrolyte level rises to ⓐ position. However, be careful, for it may vary with each maker.

NOTE:
- Probable causes of leakage are as follows:
- Damage to cap
- Excessive filling with distilled water
- High electrolyte temperature during charging, leading to electrolyte overflow

⚠ **CAUTION:**
- **Use care not to fill distilled water excessively. It may cause short or leakage.**
- **Electrolyte lid is pushed into battery cell and needs to be secured to prevent leakage.**
- **If there are any cracks in electrolyte lid, replace with new one.**
- **Be careful because battery specifications may vary with each maker.**

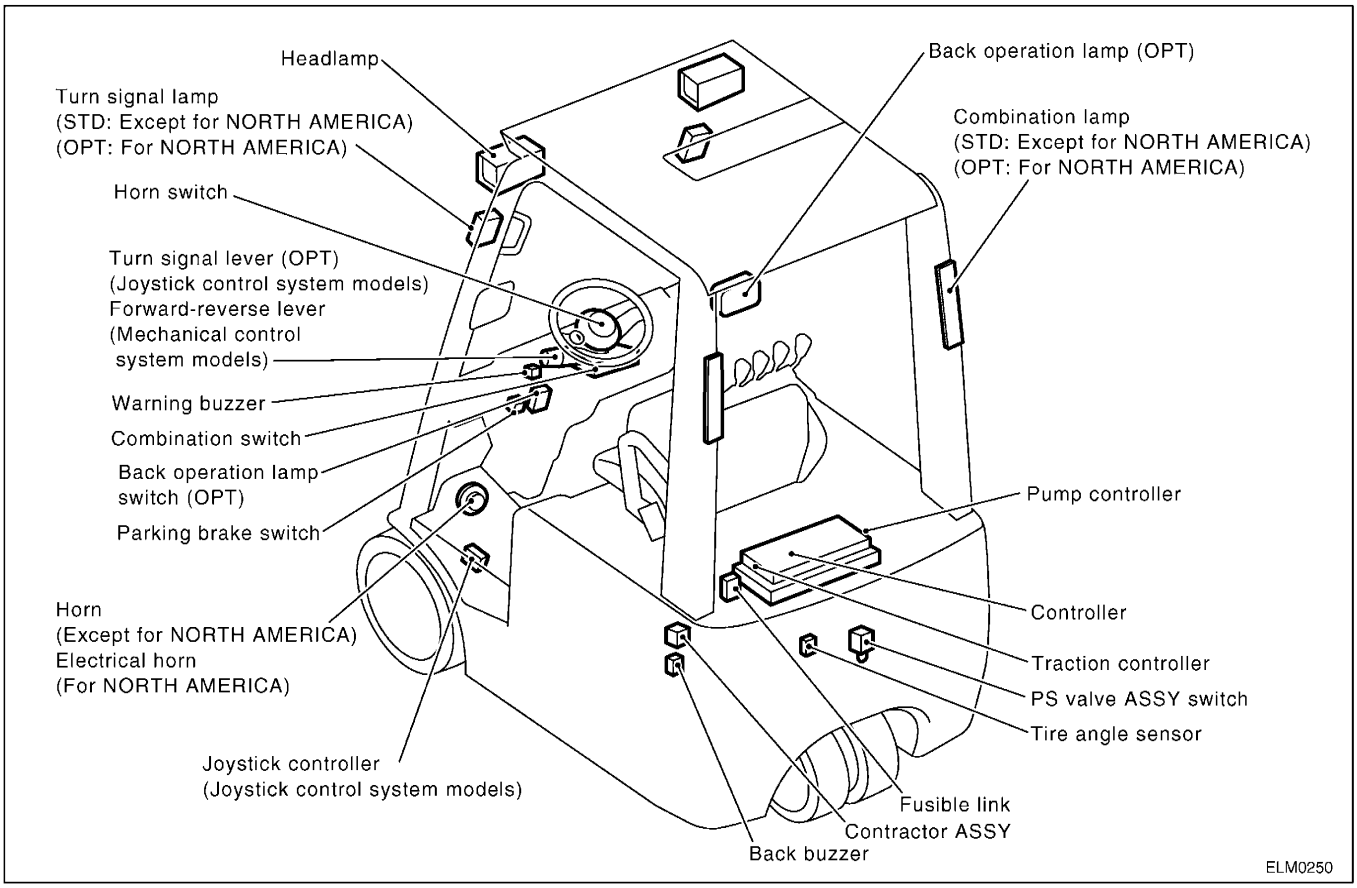


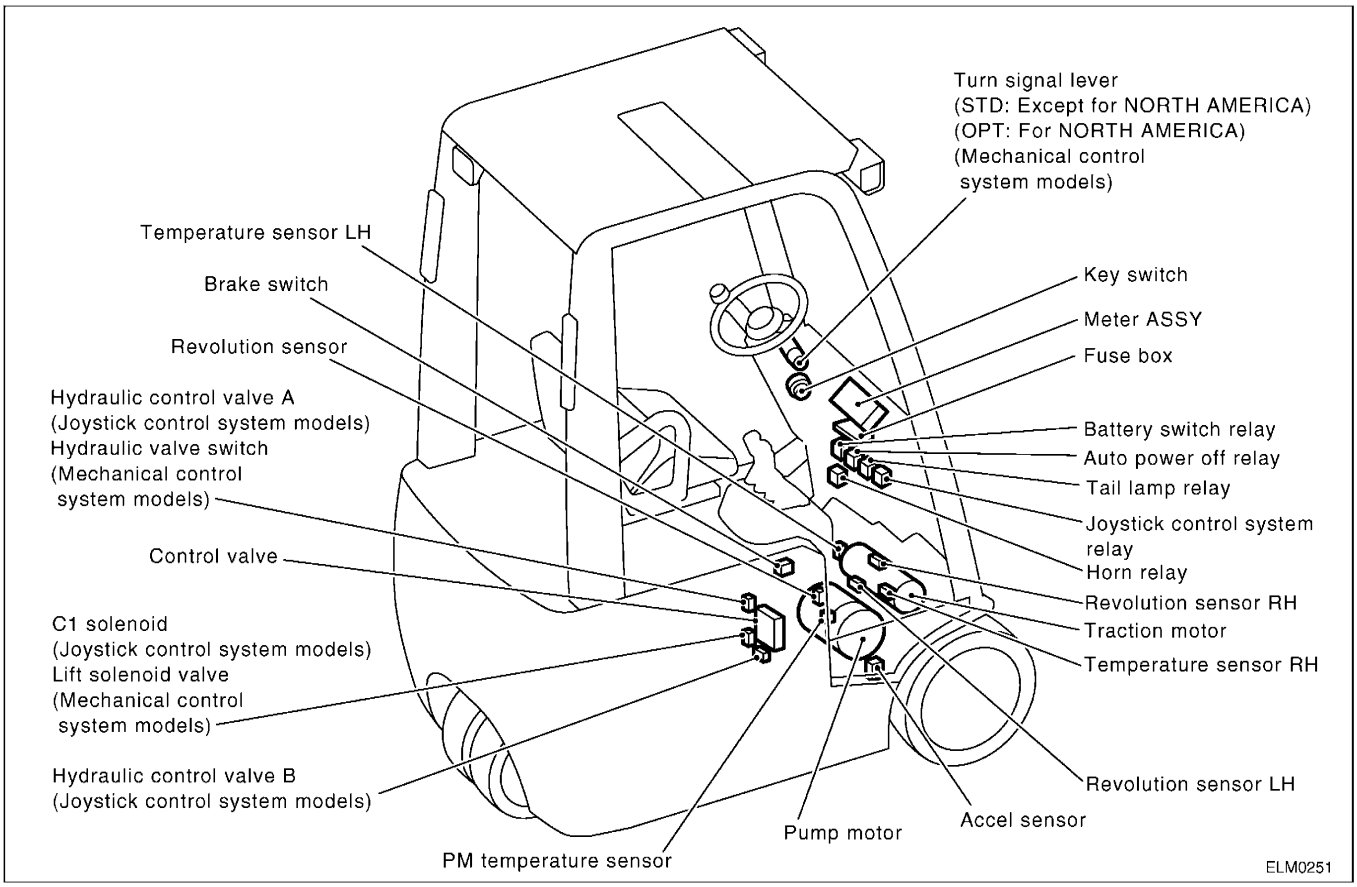
ELECTROLYTE TEMPERATURE

Measure electrolyte temperature of each battery cell with a thermometer.

NOTE:
When battery electrolyte temperature rises, electrolyte and capacity of the battery expand. However, specific gravity decreases because there is no change in weight. Contrary when electrolyte temperature drops, specific gravity increases. Thus, when measuring specific gravity, evaluate result by converting electrolyte temperature at 20°C (68°F). (Refer to "SPECIFIC GRAVITY" section.)

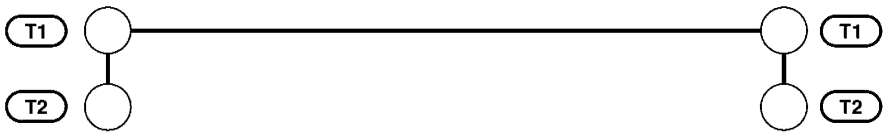
Electrical Component Parts





Tail Harness

T1 : To body harness B77
T2 : To body harness B76
T1 : To back operation lamp
T2 : To back operation lamp

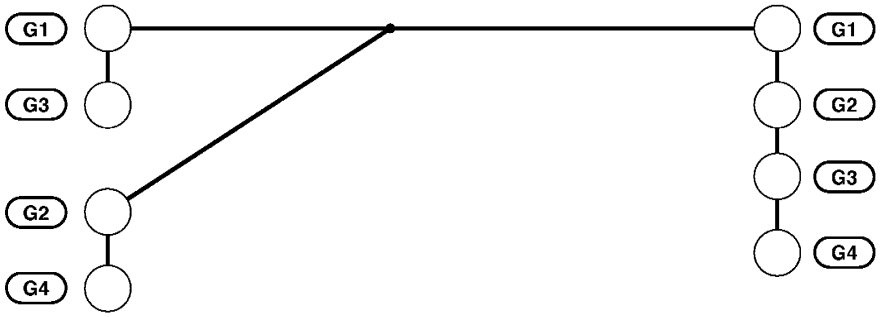


ELM0257

Guard Harness

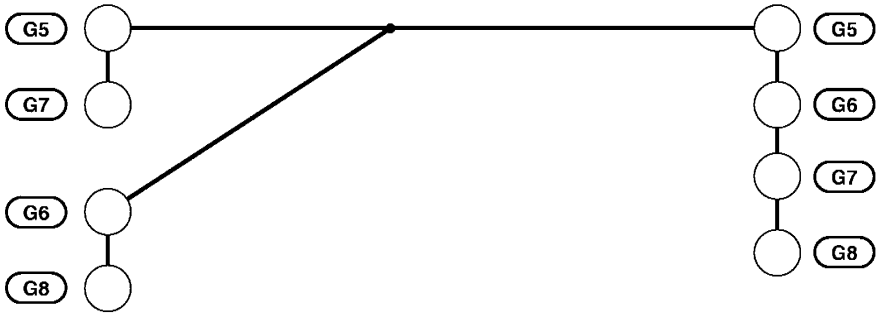
RH

G1 : To headlamp RH
G3 : To headlamp RH
G2 : To turn signal lamp RH
G4 : To turn signal lamp RH
G1 : To body harness B1
G2 : To body harness B2
G3 : To body harness B3
G4 : To body harness B4

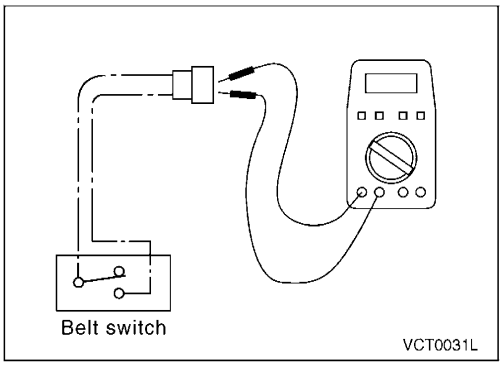


LH

G5 : To headlamp LH
G7 : To headlamp LH
G6 : To turn signal lamp LH
G8 : To turn signal lamp LH
G5 : To body harness B19
G6 : To body harness B20
G7 : To body harness B21
G8 : To body harness B22



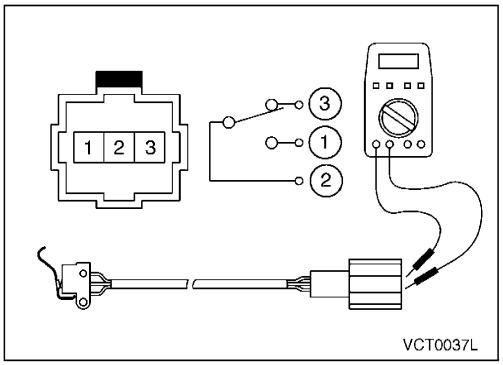
ELM0258



Seat Belt Switch

INSPECTION

Check continuity.
When insert buckle: Continuity should exist.
When disconnect buckle: Continuity should not exist.



Parking Brake Switch

INSPECTION

Check continuity between terminals using circuit tester (Ω range).

Terminal	Parking brake lever	
	Applied	Released
1		○
2	○	○
3	○	

CAUTION:

- **The following tables list only typical examples. To perform an accurate diagnosis, carefully listen to the user's complaints and check the actual vehicle to fully understand under what conditions the symptoms occur.**
- **The same symptoms as the following may occasionally be caused by the control system. Perform the trouble diagnosis for not only mechanical cause but also control system cause. For the trouble diagnosis of control system, refer to the CS section.**

Condition			Probable cause	Corrective action
Motor with load (on the vehicle)	Speed suddenly drops		• Single-phase drive	• Check by measuring the voltage of controller output terminal or motor cable terminal.
			• Voltage drops	• Check battery charge condition, and charge.
			• Overload	• Stop overload drive.
	Motor overheats		• Voltage drops	• Check battery charge condition, and charge.
			• Overload	• Stop overload drive.
			• Air flow orifice plugged with dust	• Check and clean.
	Motor stops	At motor unit, axis cannot be rotated manually.	• Burnout bearing	• Disassemble and replace with new ones.
		Nasty smell from motor	• Malfunction of resistance balance or insulation on each phase (with cable terminal disconnected)	• Disassemble and check. Repair or replace as necessary.
	Motor stops		• Open circuit or short circuit in motor cable	• Disassemble and check. Repair or replace as necessary.
			• Controller malfunction	• Check controller. (Refer to CS section.)
	Noise/vibration while driving		• Single-phase drive	• Check by measuring the voltage of controller output terminal or motor cable terminal.
			• Looseness of each assembly part	• Check and retighten.
	Bearing overheats, noise from bearing (check by proper tools)		• Bearing malfunction	• Disassemble and replace with new ones.
If it is no-load condition, motor turns	The rev direction is opposite		• Misconnection	• Connect the cable terminals while adjusting to each phase (replace 2 out of 3).
	Whining noise		• Gap between stator iron core and rotor iron core is unbalanced	• Disassemble and check. Repair or replace as necessary.
	Yoke overheats		• Partially short circuit in stator coil	• Disassemble and check. Repair or replace as necessary.
	Bearing noise		• Bearing malfunction	• Disassemble and replace with new ones.

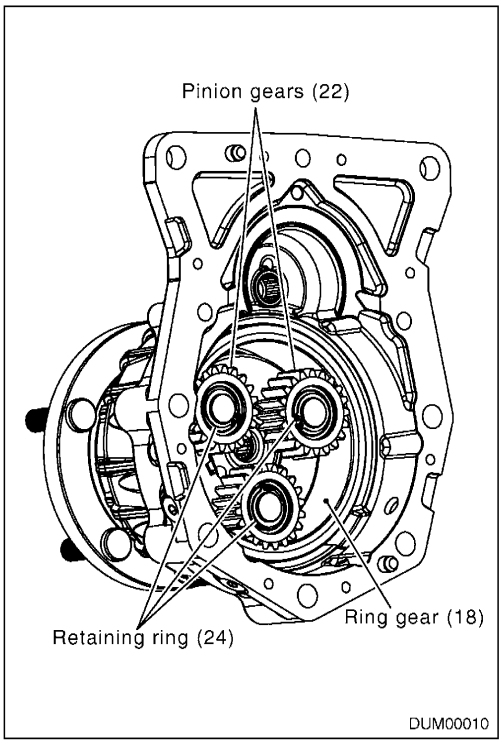
DRIVE UNIT

SECTION DU

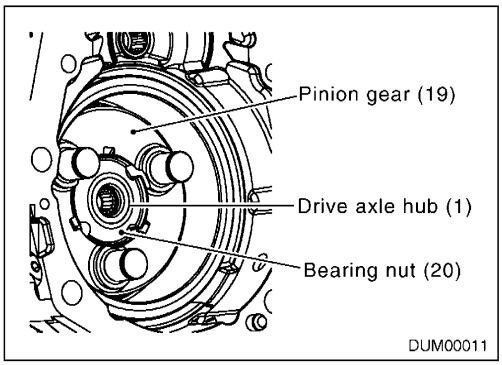
CONTENTS

Disassembly (Cont'd)

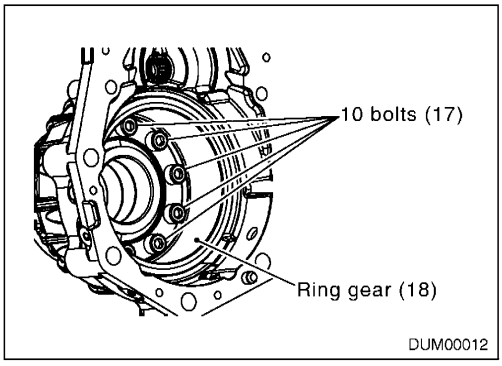
DISASSEMBLY OF THE RING GEAR (18) AND OF THE DRIVE AXLE HUB (1)



1. In order to pull out the pinion gears (22) and their bearings (23), remove the retaining ring (24) and use a special extractor.



2. To unscrew the bearing nut (20) a special service tool (99513GA10A) is required; this tool is described on page DU-4. To remove the drive axle hub (1) place a pipe [diameter = 32 mm (1.26 in) and diameter = 40mm (1.57 in)] on the centre of the M30 thread of the hub, and carefully press it out. At this point slip off the pinion gear (19).

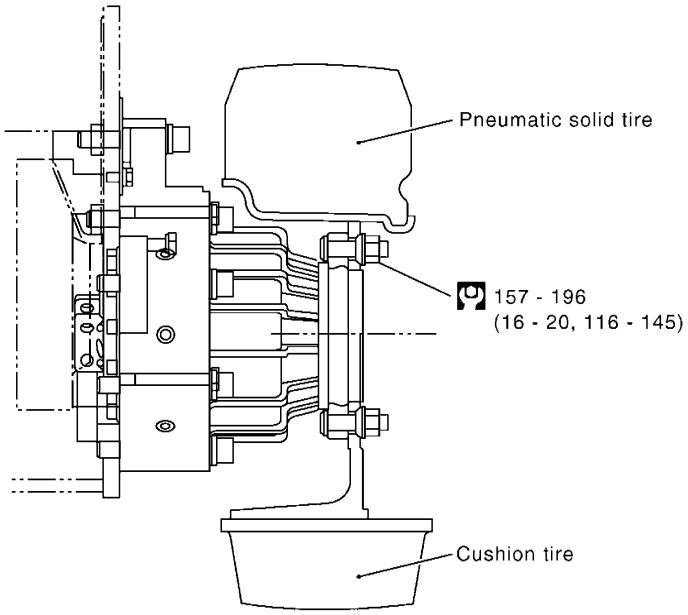


3. Unscrew the 10 bolts (17) and pull out the ring gear (18).

Tire and Road Wheel Assembly

FRONT TIRE

Front view

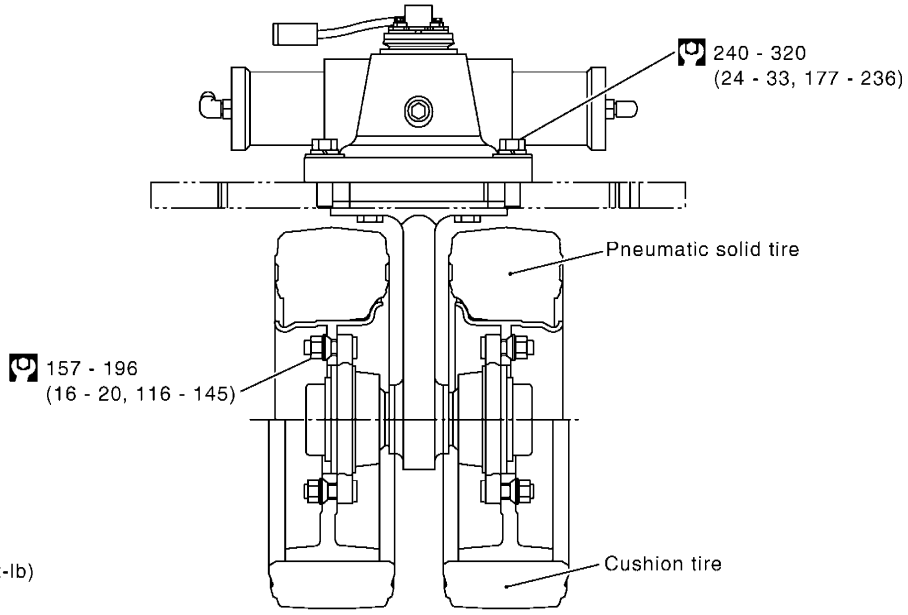


: N•m (kg-m, ft-lb)

TRM0001

REAR TIRE

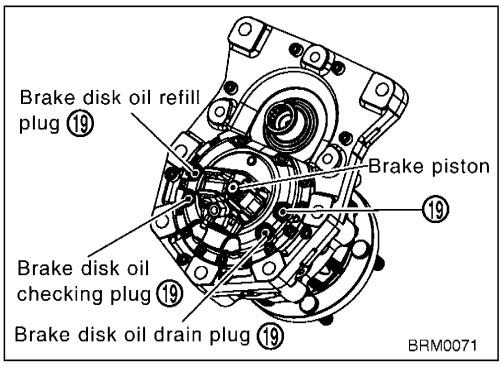
Rear view



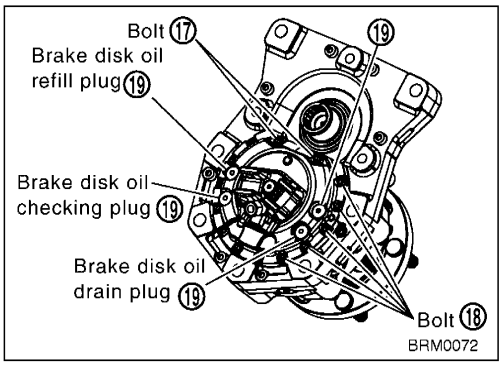
: N•m (kg-m, ft-lb)

TRM0002

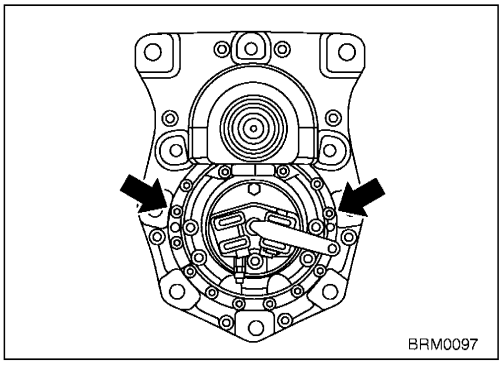
Disassembly



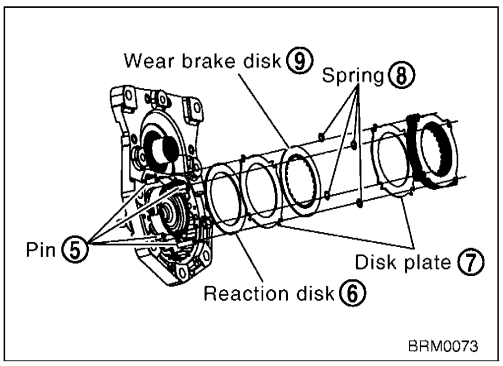
1. On the gear cover of the brake cartridge four hexagon socket headcup plugs ⑲ are symmetrically placed. These plugs may be used for any possible topping-up/checking of the brake disk oil level. The level is indicated by the top plug.



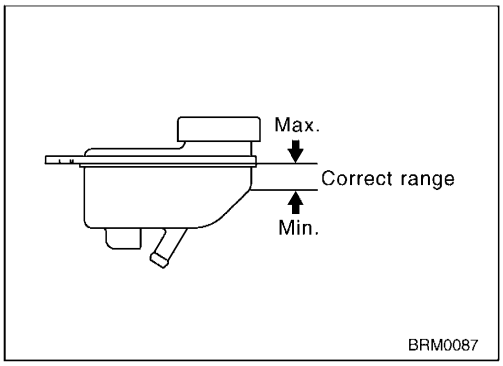
2. Remove the plugs ⑲ and drain the oil off, at least in part; unscrew the 14 bolts ⑰ and ⑱.



3. Two of the holes where the screws are located have a M8 thread: screw in two bolts (M8 × 1.25, ℓ = 25 mm (0.98 in)), until the brake housing ⑯ is extracted.



4. The brake disk unit is made of 7 disk plates ⑦ and 6 wear brake disks ⑨, ordered in an alternate way (the first one and the last one must be smooth). Between every couple of disk plates four springs ⑧ are inserted, one spacer on each locking pin ⑤.
   Remove first the 2 snap rings ④ from the pins ②, then the disk pusher device ⑩ + ⑪ and all 13 brake disks. Pull the springs ③ out from the pins ②. Remove the aluminum reaction disk ⑥.

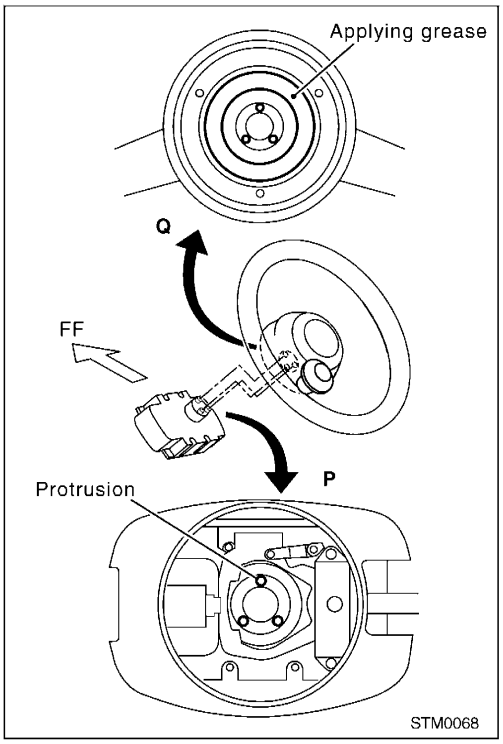


Brake Fluid Level

Check brake fluid level in brake reservoir tank. If it is between MAX (upper limit) and MIN (lower limit) marks on the reservoir tank, fluid level is correct. If it is lower than MIN (lower limit) mark, refill specified brake fluid up to MAX (upper limit) mark.

CAUTION:

- **Do not overfill brake fluid.**
- **Be careful not to allow foreign matter to enter reservoir tank.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage.**
- **If brake fluid decreases abnormally, check for leaks in brake line. Eliminate the cause of problem.**
- **Only use the authorized genuine brake fluid. Do not mix different types of brake fluids.**

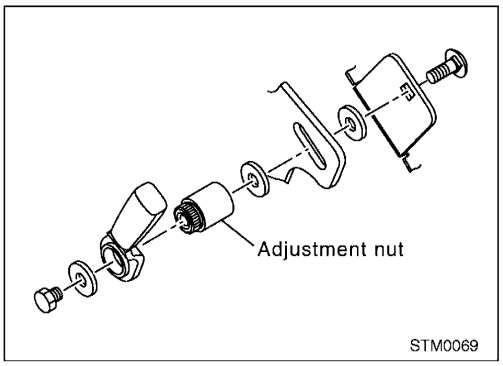


Installation

COMBINATION SWITCH AUTO RETURN FUNCTION

Combination switch auto return function is operated by the steering wheel operation.
In addition, a full hydraulic steering system is adopted, which features a function that corrects the knob position by detecting the steering wheel rotation and road wheel steering angle (knob position control system as an option). It is necessary to retain steering wheel and steering wheel angle sensor. The following paragraphs explain that procedure.

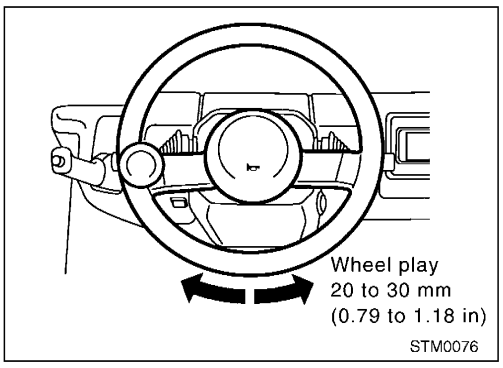
1. Position the P section of the combination switch as shown and apply grease (NAV-1) to the Q section (bottom of steering wheel boss).
2. With the vehicle front wheels set in the straight-ahead position (the wheels should be directly straightforward), locate the steering wheel in the position as shown and align its projections to the switch holes by turning left and right several times.
   To check if the projections are correctly aligned to the switch holes, verify that the combination switch's auto return function operates normally.
3. If the auto return function does not operate correctly, repeat steps above.
4. After ensuring that the projections and holes are aligned correctly, tighten the steering wheel nut.
   Tightening torque [N•m (kg-m)]: 18 - 22 (1.8 - 3.3)
5. Install the horn pad on the steering wheel.



TILT LOCK OPERATION

1. Insert a bolt and washers into the steering column bracket as shown.
2. Tighten adjustment nut.
   Tightening torque [N•m (kg-m)]: 11 - 15 (1.2 - 1.5)
3. Adjust position of the adjusting lever by serration and insert it as shown. Then, tighten the adjusting lever.
   Tightening torque [N•m (kg-m)]: 8 - 11 (0.9 - 1.1)
4. Make sure that the steering column slides smoothly over entire tilt angle by releasing the adjusting lever.
5. Make sure that the steering column locks securely when the adjusting lever sets to its locking position.

Inspection After Installation

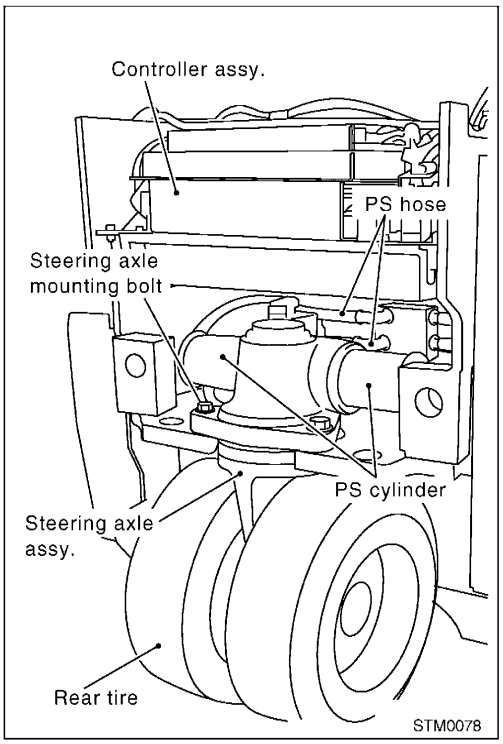


INSPECTION OF STEERING WHEEL FOR PLAY

Make sure that the steering wheel play is within the standard on the circumference with key switch turned off.

Play: 20 - 30 mm (0.79 - 1.18 in)

CAUTION:
- **Before removing hydraulic lines or piping, the oil pressure remaining in hydraulic lines is completely bled off.**
- **To prevent foreign material from entering, always maintain a clean workplace.**
- **When disconnecting pipes, cover the surrounding area with waste cloths and ensure that oil does not contaminate other parts.**
- **Never allow foreign material to enter pipes when connecting.**
- **Put disassembled parts on clean paper or waste cloths and use care so as not to contaminate, scratch or dent them.**
- **Turn the key switch to OFF and disconnect the battery cables before removal.**



Removal

1. Jack up and support the bottom of the frame around the steering axle assy.. (Refer to the GI section.)
2. Remove the battery. (Refer to the BC section.)
3. Remove the counterweight. (Refer to the BF section.)
4. Remove the controller assembly. (Refer to the CS section.)
5. Remove the rear tire. (Refer to the TR section.)
6. Disconnect the tire angle sensor harness connector.
7. Disconnect the PS piping connection.
8. Remove the steering axle mounting bolt.
9. Remove the steering axle assy. from the vehicle.

NOTE:
The rear tire interferes with the frame if it is removed together with the steering axle assy.. Therefore, the steering axle assy. cannot be removed.

10. Disconnect the PS hose from the PS cylinder and drain the oil.

Installation

Install in the reverse order of removal.

Steering axle mounting bolt

Tightening torque

[N•m (kg-m)]: 240 - 320 (25 - 32) 177 - 236 ft-lb

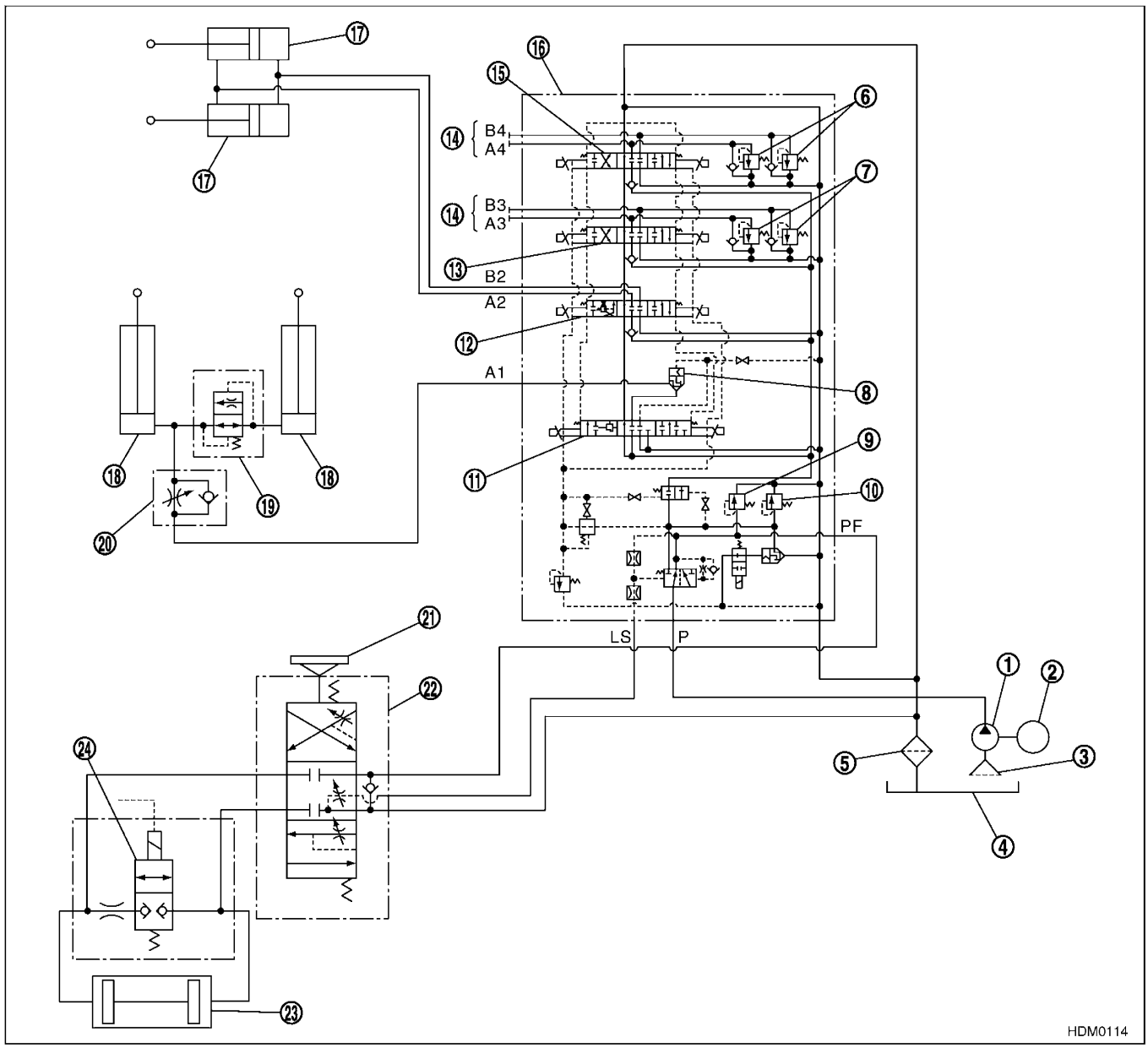
HYDRAULIC SYSTEM

SECTION HD

CONTENTS

Hydraulic Circuit Diagram (Cont'd)

JOYSTICK CONTROL VALVE

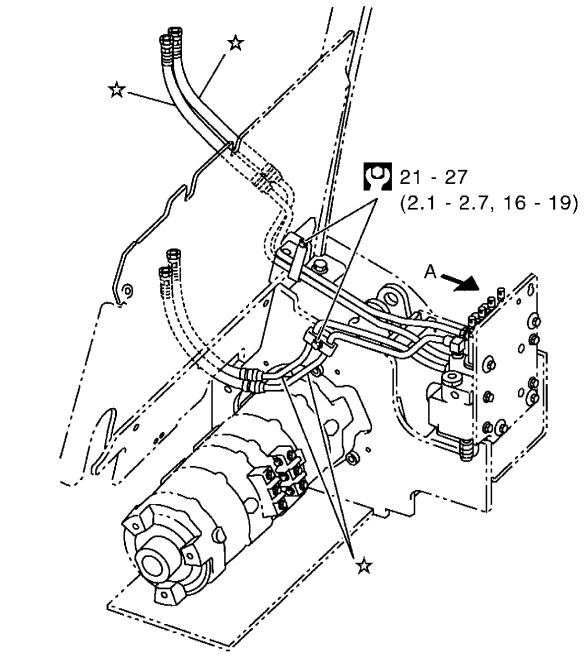


① Hydraulic oil pump
② Hydraulic pump motor
③ Suction filter
④ Hydraulic oil tank
⑤ Micron filter
⑥ Relief valve for 4th valve
⑦ Relief valve for 3rd valve
⑧ Shut-off valve
⑨ PS relief valve
⑩ Main relief valve
⑪ Lift valve
⑫ Tilt valve
⑬ 3rd valve
⑭ To attachment
⑮ 4th valve
⑯ Control valve
⑰ Tilt cylinder
⑱ Lift cylinder
⑲ Down safety valve
⑳ Flow regulator valve
㉑ Steering wheel
㉒ PS valve
㉓ PS cylinder
㉔ Knob position correction solenoid valve (OPT)

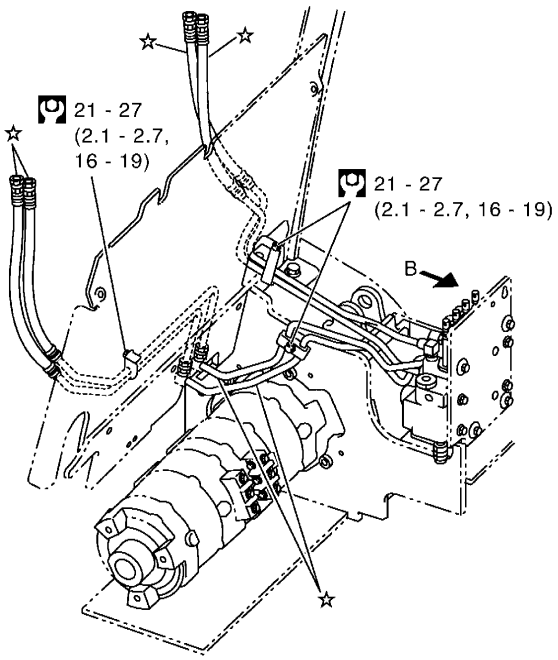
Disassembly and Assembly (Cont'd)

ATTACHMENT PIPING

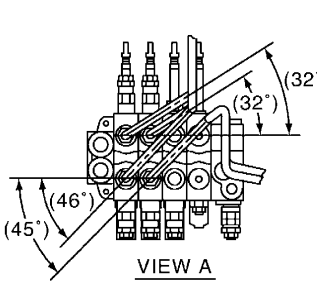
Control valve - mast



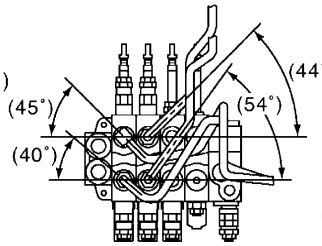
2W, 2F ,3F mast



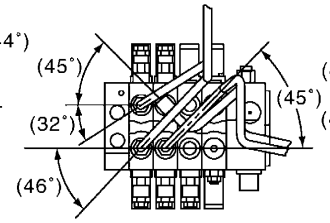
3V mast



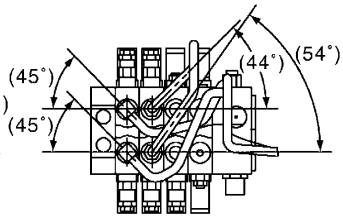
VIEW A
2W, 2F ,3F MC



VIEW B
3V MC



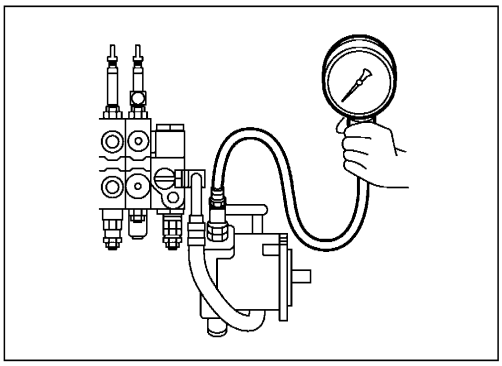
VIEW A
2W, 2F ,3F JC



VIEW B
3V JC

☆: 30 - 58 (3 - 6, 22 - 43)
MC: Mechanical control system
JC: Joystic control system
: N•m (kg-m, ft-lb)

HDM0123



Test Procedures (Cont'd)

After installing oil pump, follow test procedures as follows:

1. Check that oil level in tank is OK and install pressure gauge to control valve.

⚠ **CAUTION:**
For installing pressure gauge and adjusting oil pressure, refer to "Hydraulic Test and Adjustment" in "CONTROL VALVE".

2. With pump running, turn adjusting screw on relief valve to gradually raise pressure from 0 to 16.7 MPa (0 to 167.0 bar, 0 to 170.34 kg/cm^2, 0 to 2,421 psi). Place hand on pump body to check for temperature rise.
   If temperature of pump body is excessively higher than that of hydraulic oil, disassemble oil pump to make sure it is assembled correctly.
3. Reset relief valve to specified pressure.

Relief valve set pressure

MPa (bar, kg/cm^2, psi)

Main relief set pressure	16.7 (167.0, 170.34, 2,421)
Tilt relief set pressure	9.3 (93.0, 94.86, 1,348)
3rd, 4th relief set pressure	11.8 (118.0, 120.36, 1,711)
Power steering relief set pressure	6.9 (69.0, 70.38, 1,000)

4. Perform pump delivery test.
   Measure fork lifting speed without load. If the speed is within standard value, pump delivery is correct.

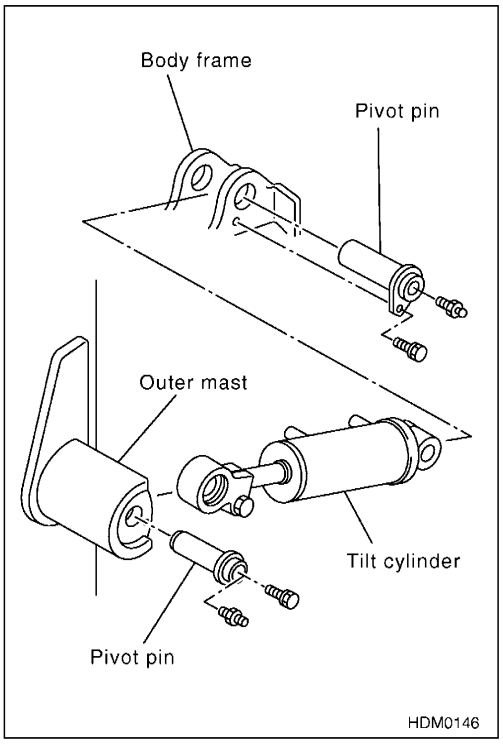
Model		Lifting speed without load (2W mast) mm/s (in/s)	Lowering speed without load (2W mast) mm/s (in/s)
S1N1	L13Q	500 (19.69)	550 (21.65)
	L15Q		
1N1	L15Q	500 (19.69)	550 (21.65)
	L18Q		
G1N1	L16Q	600 (23.62)	550 (21.65)
	L18Q		
	L20Q	580 (22.83)	
1N1 (36V)	L15V	515 (20.28)	550 (21.65)
	L18V		
	L20V		
1N1 (48V)	L15V	600 (23.62)	550 (21.65)
	L18V		
	L20V	580 (22.83)	

5. Move fork up and down with and without load, and check that it operates correctly.

Removal (Cont'd)

1. Lower fork fully.
2. Remove pivot pin attaching bolt from the joint of outer mast and pull out pivot pin.
3. Turn key switch to ON and set tilt cylinder to the maximum backward tilt, then tilt forward to extend cylinder by about 10 mm (0.39 in). Turn key switch to OFF and disconnect battery plug.
4. Disconnect two pipes connected to tilt cylinder at pipe connectors.

⚠ **CAUTION:**
- **Since oil tends to spill when pipes are disconnected, cover the surrounding area with rag.**
- **Stuff stoppers into disconnected pipes to prevent oil spills.**

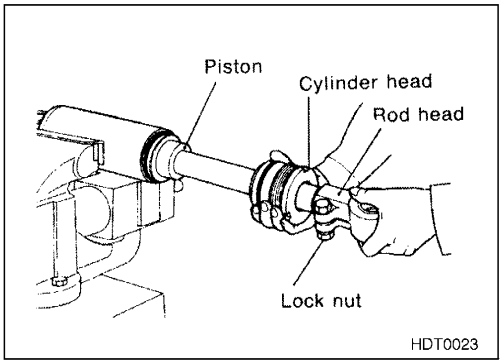


5. Remove pivot pin attaching bolt from joint of body frame and pull out pivot pin to remove tilt cylinder.

NOTE:
To separate left tilt cylinder on body side, first remove tilt cylinder cover, then go to next step.

Disassembly

1. Hold cylinder in a vise with piping port down and put a plate under port. Apply compressed air alternately to two ports and activate piston rod to discharge oil from cylinder.



2. Loosen head lock nut, then remove rod head from piston rod assembly.
3. Loosen cylinder head, then remove cylinder head from cylinder tube assembly.

⚠ **CAUTION:**
Use care not to damage O-ring.

4. Remove piston rod assembly from cylinder tube assembly.

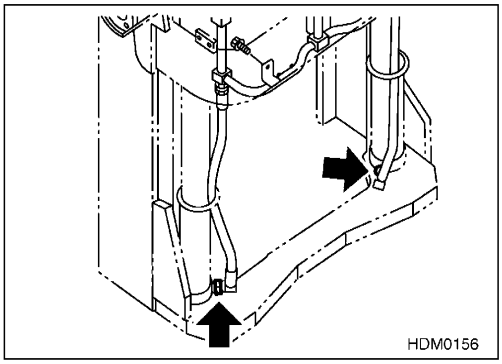
⚠ **CAUTION:**
Use care not to damage O-ring.

Removal (Cont'd)

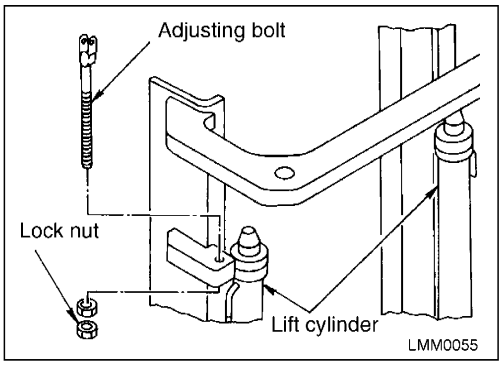
3V LIFT CYLINDER

1. Remove the mast assembly from the forklift.

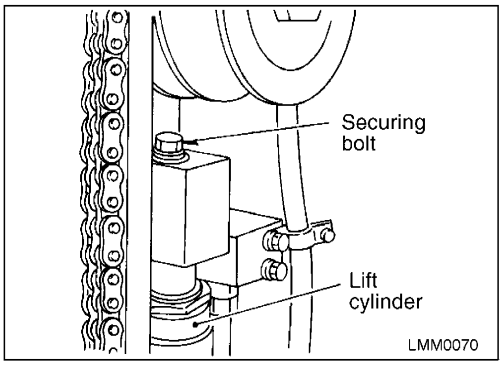
WARNING:
After removing the mast assembly, the middle and inner rails will easily slide. Use ropes to firmly fasten the outer, middle and inner rail top beams together.



2. Disconnect the high pressure hose at the lower end of the lift cylinder.



3. Remove the lift chain at the chain adjusting bolt.



4. Remove the securing bolt from the upper end of the lift cylinder.

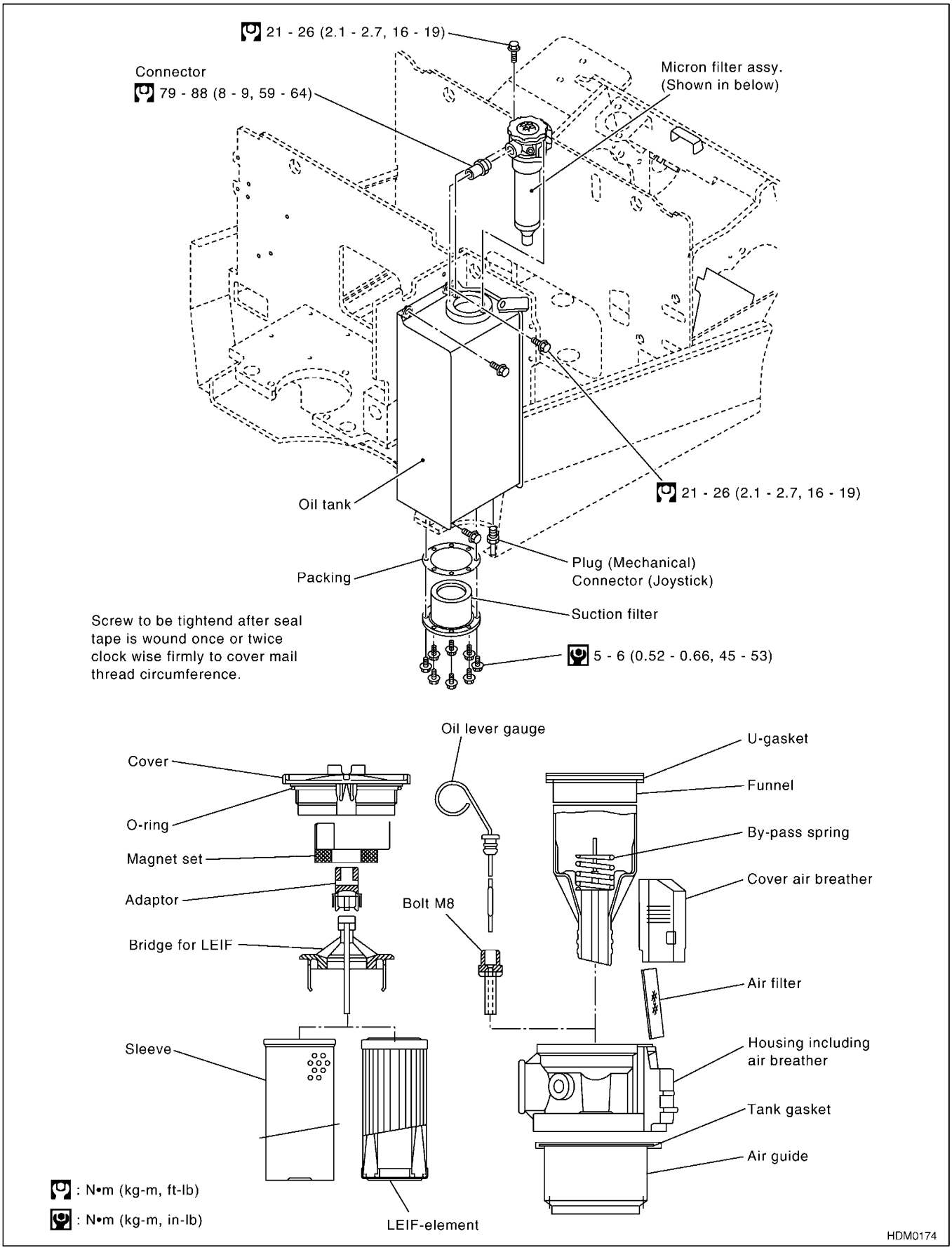
WARNING:
After removing the mast assembly, the middle and inner rails will easily slide. Use ropes to firmly fasten the outer, middle and inner rail top beams together.

5. Slide the middle rail together with the inner rail 250 mm (9.84 in) in the upper direction.

CAUTION:
Record the thickness and location of the adjusting shim used to adjust the lift cylinder height in advance. The adjustment shim is installed to the upper end of the lift cylinder.

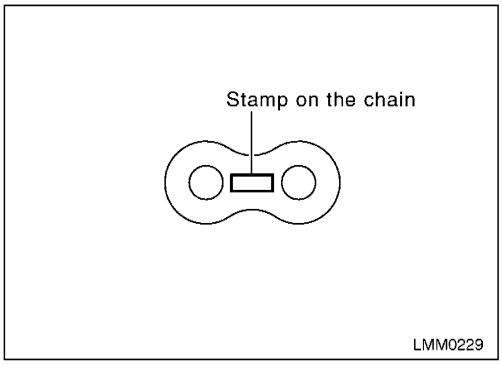
WARNING:
The middle and inner rails easily slide. Use ropes to firmly fasten the outer, middle and inner rail top beams together.

Disassembly



Inspection (Cont'd)

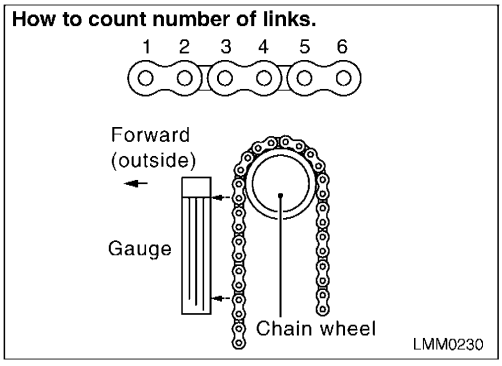
NOTE:
- Balance the tension between left and right chains.
- Cracks or breakages often occur at the ends of the lift chains. If necessary, replace both chains as a unit.
- Elongation often occurs in portions of the lift chain which experiences contact with the chain wheel.



HOW TO INSPECT THE LIFT CHAIN (REFERENCE)

1. Tilt the mast to vertical position.
2. Lift the fork to above 5 cm from the ground.
3. Confirm the chain type.
   The type of the chain is stamped on the side of the chain.
   However, special care is needed for the following chain as the number stamped on the chain is different from the chain type number.

Stamp on the chain	Chain type
BL5	BL534
BL6	BL634
BL8	BL834
BL10	BL1034
BL12	BL1234

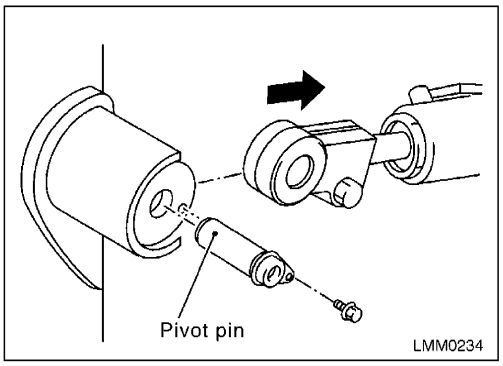


4. Apply the chain gauge and measure the chain length counting the appropriate number of links for the chain type.

Replace the fork chain when the length exceeds the limit.

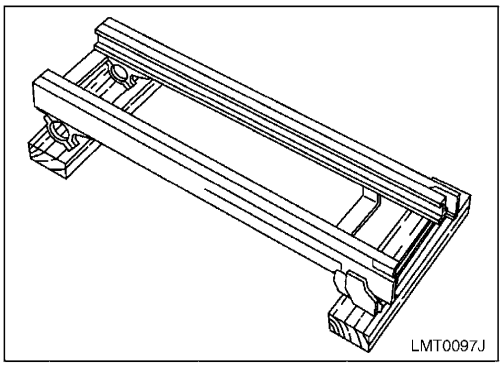
BL834 (14 links), RS40 (28 links), RS80 (14 links):
Standard length:
355.6 mm (14.000 in)
limit length:
364.4 mm (14.346 in)
BL534 (22 links), BL1034 (11 links), RS50 (22 links), RS100 (11 links):
Standard length:
349.2 mm (13.748 in)
limit length:
358.0 mm (14.094 in)
BL634 (18 links), BL1234 (9 links), RS60 (18 links), RS120 (9 links):
Standard length:
342.9 mm (13.500 in)
limit length:
351.4 mm (13.835 in)

Removal (Cont'd)



4. Remove the pivot pin lock bolts, then remove the pivot pins securing the tilt cylinder to the mast assembly.
5. Turn the key switch to the ON position, retract the tilt cylinder all the way (tilting the mast assembly backward).

CAUTION:
Be sure to retract the tilt cylinder all the way, failure to do so may interfere with the tilt bracket when installing the mast assembly.



6. Using a hoist, lift the mast assembly up and away from the vehicle, then lower it horizontally onto blocks.

CAUTION:
- **Be careful not to damage brake pipes, etc. while lifting or moving the mast assembly away from the vehicle.**
- **When removing the mast assembly and carriage assembly from the vehicle as a unit, securely fasten the tilt beam and carriage assembly (finger bar) with a rope or wire. This prevents carriage assembly movement when mast assembly is transferred to the ground.**
- **Always ensure the mast assembly rests on a flat and solid surface after it has been removed.**
- **When positioning the mast assembly on the block, be careful not to damage the mast support.**

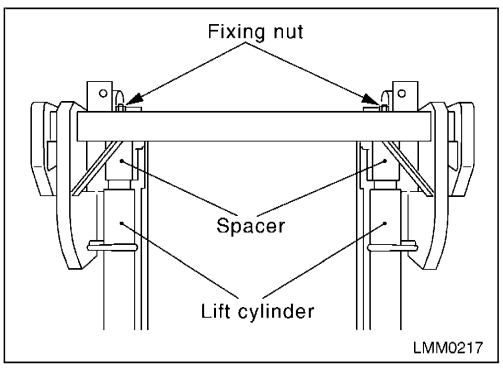
7. When the mast assembly and carriage assembly are removed as a unit, remove the carriage assembly from the mast assembly as follows:

- Attach a lifting wire or nylon sling to the carriage assembly and lift using a hoist.
- Disengage the lift chains at the lift joint link and adjustment bolt on the mast side, then place the disengaged lift chains on the carriage.
- Slide the carriage down and extract it from the lower side of the inner mast.

CAUTION:
Do not allow the mast assembly to snag or catch the lift chain when removing the carriage assembly from the inner mast.

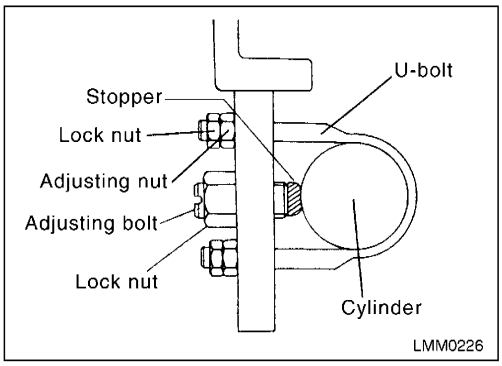
Disassembly

2W MAST

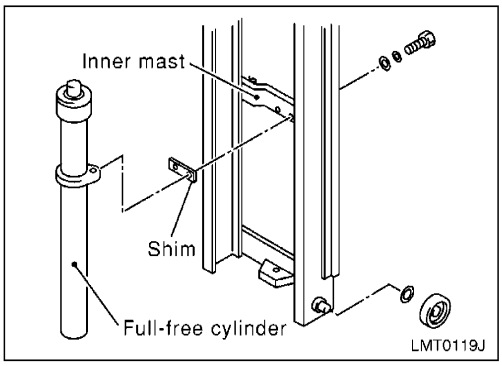


1. Remove the hydraulic lines from the lift cylinders.
2. Remove the fixing nuts from the upper ends of the lift cylinders.

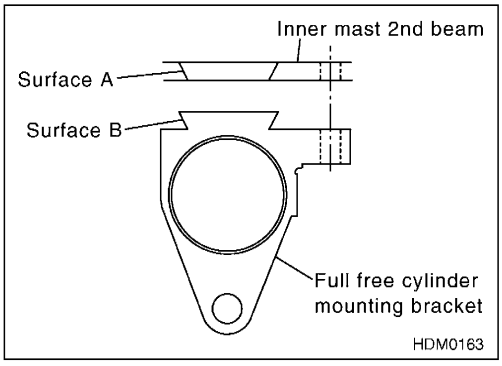
Assembly (Cont'd)



8. Tighten the adjusting bolt, and check that the stopper contacts with the cylinder. Then, further tighten for 1/2 to 1 turn and tighten the lock nut.
   : 74 - 94 N•m (7.5 - 9.6 kg-m, 55 - 69 ft-lb)
- **When tightening the lock nut, make sure that the adjusting nut does not turn.**
9. Install the piping to the mast cylinder.
10. Install the chain wheel and mast chain (3F/3V mast).



11. Install the full-free cylinder. At this time, perform the shim adjustment so that the inner mast and full-free cylinder become parallel (2F/3F mast).
    Shim: 1.0 mm (0.039 in)
    : 128 - 156 N•m (13 - 16 kg-m, 94 - 115 ft-lb)



Mounting bracket of full free cylinder to be inserted into the notch of inner mast 2nd-beam. After surface A of 2nd-beam touches surface B of mounting bracket, bolt is to be tightened. (3V mast)
: 44 - 54 N•m (4.4 - 5.6 kg-m, 32 - 40 ft-lb)

12. Install the piping of the head block (with the chain wheel) and full-free cylinder.
13. When the mast assembly is removed with the carriage mounted, adjust the lift roller of the carriage, lift the carriage assembly by a nylon sling or wire, then install to the inner mast. (As for the adjustment of the lift roller, refer to "CARRIAGE ASSEMBLY".)
14. Pass the lift chain in the chain wheel, connect the adjusting bolt to the chain joint linking section, and then install it to the full-free cylinder.

CAUTION:
Replace the cotter pin with a new one.

Installation

1. Attach a lifting wire or nylon sling to the mast assembly, then lift the mast assembly using a hoist.

CAUTION:
- **Before lifting the mast assembly (if equipped with the carriage assembly), lower the carriage assembly all the way down. Securely fasten the carriage finger bar to the tilt beam.**
- **Make sure the lift chains are placed on the chain wheels.**
- **Make sure the lift chains are not twisted.**