Table of Contents

1 GENERAL

1.1 VEHICLE MODEL

Pneumatic Tire Models (Pn)

Classification		Load Capacity	Vehicle Model	Transmis-sion Type	Engine	
Series	Model					
Pn1 ton series	Pn15	3000 lbs	8FGU15	T/C	4YE (4YM)	Gasoline
			8FDU15	T/C	1ZS	Diesel
			62-8FDU15	T/C	1DZ-II	
	Pn18	3500 lbs	8FGU18	T/C	4YE (4YM)	Gasoline
			8FDU18	T/C	1ZS	Diesel
			62-8FDU18	T/C	1DZ-II	
Pn2 ton series	Pn20	4000 lbs	8FGU20	T/C	4YE (4YM)	Gasoline
			8FDU20	T/C	1ZS	Diesel
			62-8FDU20	T/C	1DZ-II	
	Pn25	5000 lbs	8FGU25	T/C	4YE (4YM)	Gasoline
			8FDU25	T/C	1ZS	Diesel
			62-8FDU25	T/C	1DZ-II	
Pn3 ton series	Pn30	6000 lbs	8FGU30	T/C	4YE (4YM)	Gasoline
			8FDU30	T/C	1ZS	Diesel
			62-8FDU30	T/C	1DZ-II	
	Pn32	6500 lbs	*8FGU32	T/C	4YE	Gasoline
			*8FDU32	T/C	1ZS	Diesel

Cushion Tire Models (Cu)

Classification		Load Capacity	Vehicle Model	Transmission Type	Engine	
Series	Model					
Cu2 ton series	Cu20	4000 lbs	8FGCU20	T/C	4YE	Gasoline
	Cu25	5000 lbs	8FGCU25	T/C	4YE	Gasoline
Cu3 ton series	Cu30	6000 lbs	8FGCU30	T/C	4YE	Gasoline
	Cu32	6500 lbs	*8FGCU32	T/C	4YE	Gasoline

*: For USA, CANADA, MEXICO and HAWAII Only

4YM: Option for South America

1DZ-II: Standard for South America

T/C: Model with torque converter

2.2 SPECIFICATIONS

| Item	All models
Steering wheel diameter mm (in)	300 (11.81)
Steering wheel play (at idling) mm (in)	20 to 50 (0.79 to 1.97)
Power steering type	Hydrostatic steering

Hydrostatic steering valve (L/synchronized steering)

|	Pn1 ton series	Pn2 ton series	Pn3 ton series	Cu2 ton series	Cu3 ton series	Pn1 ton series	Pn2 ton series	Pn3 ton series
	1ZS, 4YE	1ZS, 4YE	1ZS, 4YE	4YE	4YE	4YM	4YM	4YM
Manufacturer	IHC	IHC	IHC	IHC	IHC	Sauer Danfoss	Sauer Danfoss	Sauer Danfoss
Delivery cm^3 (in^3)/rev	96 (5.86)	105 (6.41)	115 (7.02)	100 (6.10)	100 (6.10)	100 (6.10)	100 (6.10)	115 (7.02)
Rated flow rate L (US gal)/min	-	-	-	-	-	13.6 (3.59)	13.6 (3.59)	15.8 (4.17)
Relief set pressure MPa (kgf/cm^2) [psi]	7.2 to 7.7 (73.4 to 78.5) [1044 to 1117]	7.8 to 8.3 (79.5 to 84.6) [1131 to 1204]	7.8 to 8.3 (79.5 to 84.6) [1131 to 1204]	6.4 to 6.9 (65.3 to 70.4) [928 to 1001]	8.2 to 8.7 (83.6 to 88.7) [1189 to 1262]	6.4 to 6.9 (65.3 to 70.4) [928 to 1001]	8.2 to 8.7 (83.6 to 88.7) [1189 to 1262]	8.2 to 8.7 (83.6 to 88.7) [1189 to 1262]

Hydrostatic steering valve (W/synchronized steering)

|	Pn1 ton series			Pn2 ton series			Pn3 ton series			Cu2 ton series	Cu3 ton series
	4YM	1ZS, 4YE	1DZ-II	4YM	1ZS, 4YE	1DZ-II	4YM	1ZS, 4YE	1DZ-II	4YE	4YE
Manufacturer	IHC										
Delivery cm^3 (in^3)/rev	96 (5.86)	96 (5.86)	96 (5.86)	105 (6.41)	105 (6.41)	105 (6.41)	115 (7.02)	115 (7.02)	115 (7.02)	96 (5.86)	105 (6.41)
Rated flow rate L (US gal)/min	13.6 (3.59)	-	13.6 (3.59)	13.6 (3.59)	-	13.6 (3.59)	15.8 (4.17)	-	15.8 (4.17)	-	-
Relief set pressure MPa (kgf/cm^2) [psi]	7.5 to 8.0 (76.5 to 81.6) [1088 to 1160]	7.2 to 7.7 (73.4 to 78.5) [1044 to 1117]	7.5 to 8.0 (76.5 to 81.6) [1088 to 1160]	8.1 to 8.6 (82.6 to 87.7) [1175 to 1247]	7.8 to 8.3 (79.5 to 84.6) [1131 to 1204]	8.1 to 8.6 (82.6 to 87.7) [1175 to 1247]	8.1 to 8.6 (82.6 to 87.7) [1175 to 1247]	7.8 to 8.3 (79.5 to 84.6) [1131 to 1204]	8.1 to 8.6 (82.6 to 87.7) [1175 to 1247]	7.5 to 8.0 (76.5 to 81.6) [1088 to 1160]	8.1 to 8.6 (82.6 to 87.7) [1175 to 1247]

With oil cooler
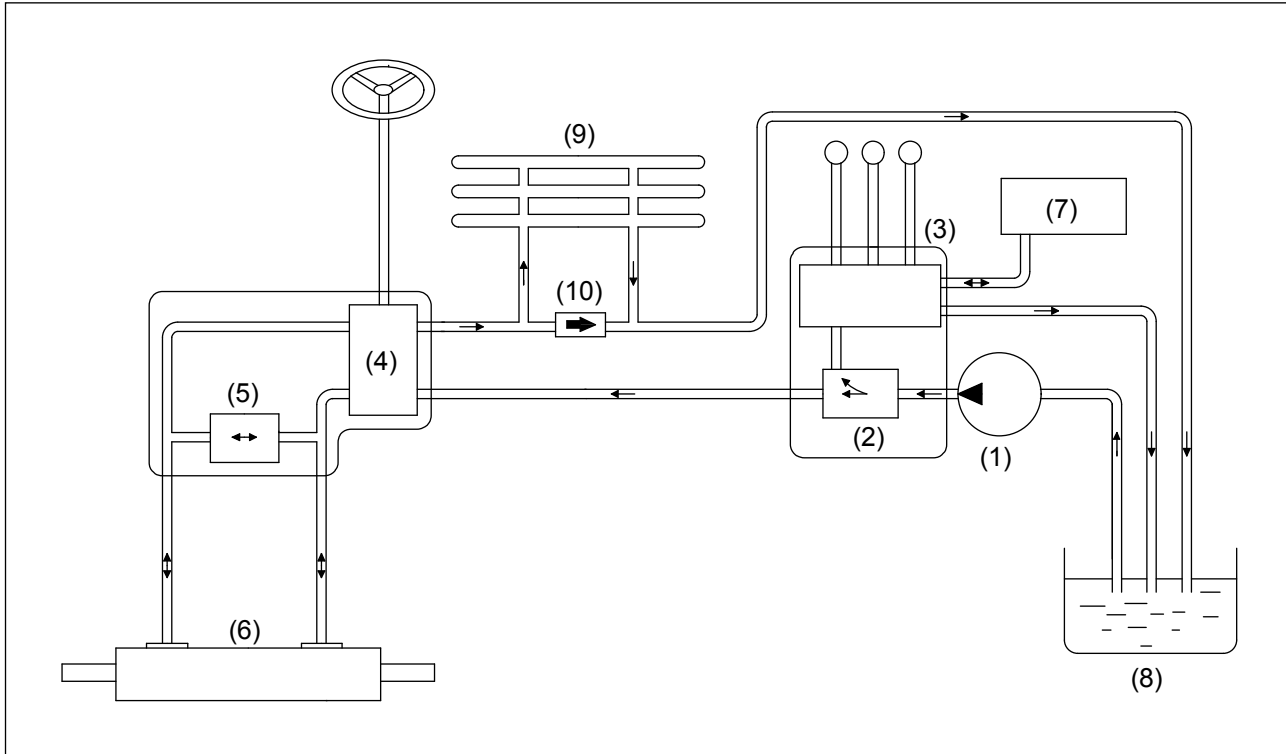
(1) Oil pump
(2) Flow divider
(3) Oil control valve
(4) Steering valve
(5) Solenoid valve (OPT)
(6) Power steering cylinder
(7) Lift, tilt and ATT cylinder
(8) Oil tank
(9) Oil cooler
(10) Relief valve
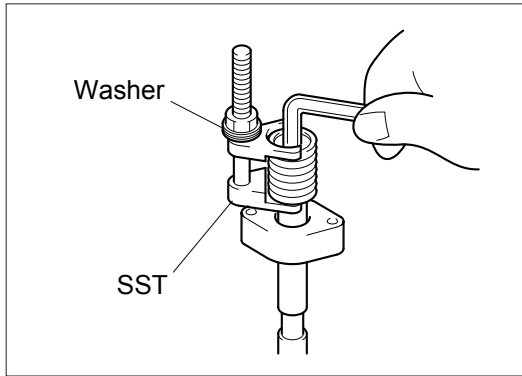
Point 8   Disassembly and Reassembly:
Remove the compression spring from the tilt spool.

SST 09610-10161-71

Use the SST after attaching a washer.
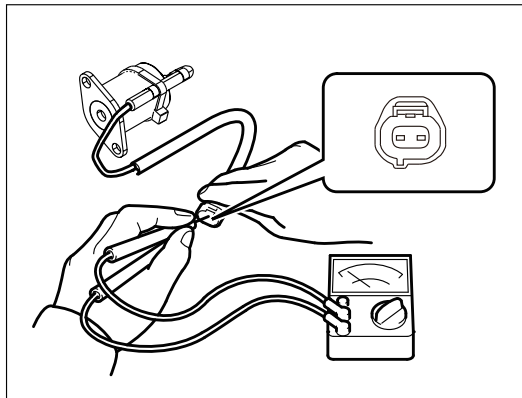
Point 9   Inspection:
Check the proportional reducing valve for continuity.

Measurement terminal: Continuity exists.

**(Reference)
Resistance: 6.5 to 7.2 Ω (at 20 °C)**
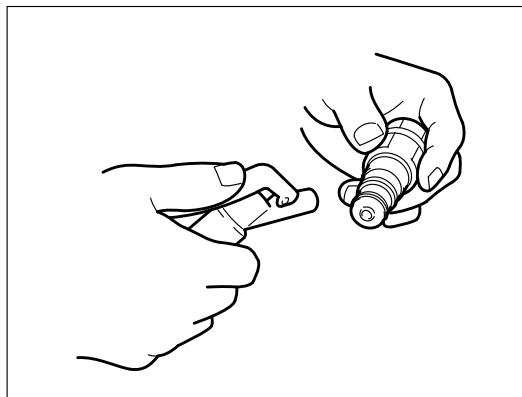
Point 10   Inspection:
Check and clean any clogged filter.
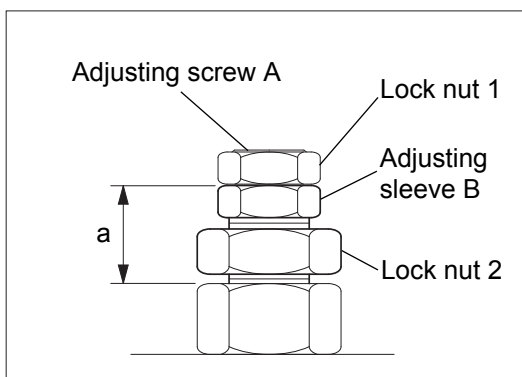
Reassembly:
When the relief valve is disassembled, temporarily in-stall it after fitting the nuts as illustrated.

a = 27.0 mm (1.06 in)

NOTICE:

▪ **Do not loosen the adjusting screw A and the lock nut 1 for tilt relief pressure adjustment because the adjustment is not necessary.**

▪ **When replacing the relief valve, change the setting value (H and L rank) it is necessary. (Refer to chapter of the display for MATCHING EMRV "EMRV")**

5.2.4 DISASSEMBLY, INSPECTION AND REASSEMBLY(1ZS and 4YE engine)

NOTICE

- Work in a clean location.
- Since individual parts are finished with high precision, carefully operate so as not to damage them.
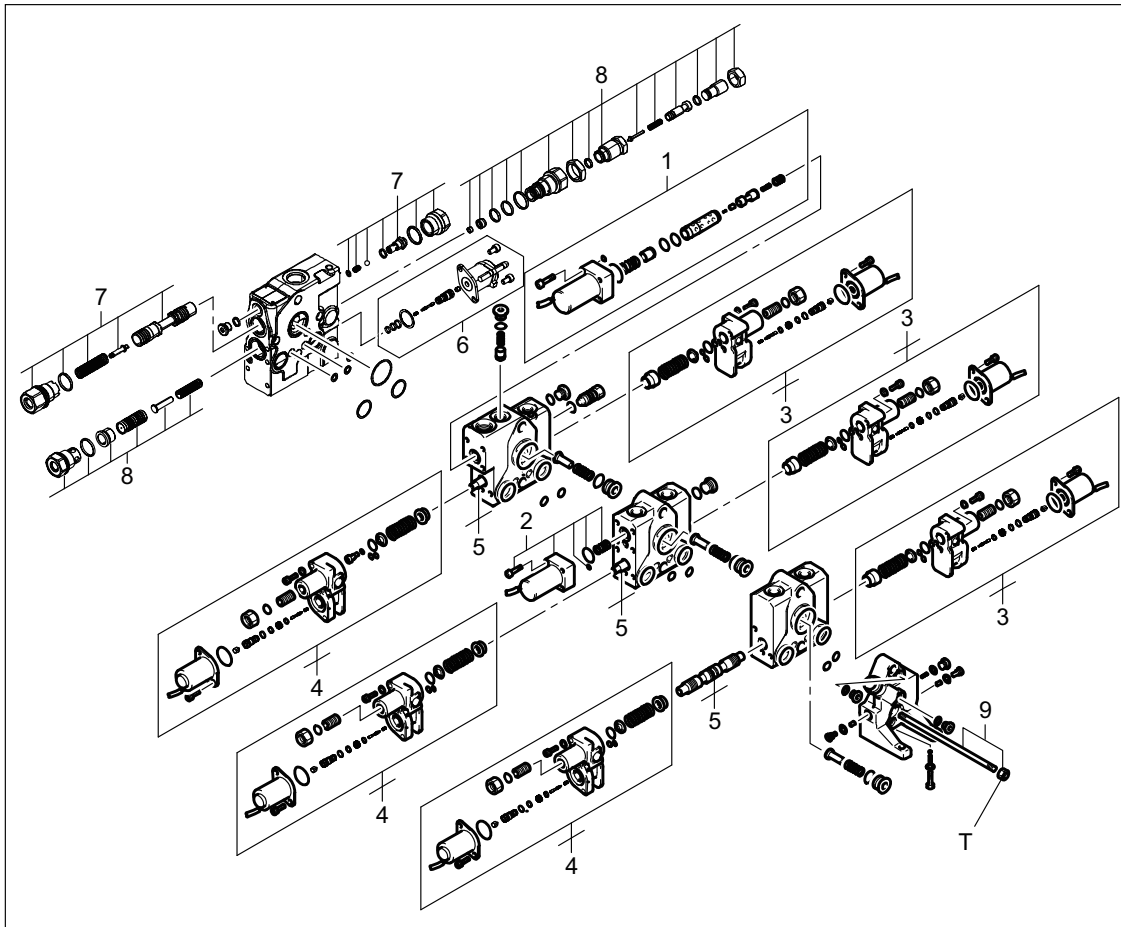
T=39.2 N m (400 kgf-cm) [28.94 ft-lbf]

Disassembly Procedure

Step 1. Remove the lift lock SOL and flow regulator valve. [Point 2]

Step 2. Remove the tilt control SOL. [Point 3]

Step 3. Remove the proportional solenoid (a). [Point 4]

Step 4. Remove the proportional solenoid (b). [Point 5]

Step 5. Remove the lift spool, tilt spool and attachment spool.

Step 6. Remove the electromagnetic relief valve. [Point 6]

Step 7. Remove the priority valve.

Step 8. Remove the relief valve. [Point 7]

Step 9. Remove the rod bolt, and then remove the housing.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

7.1.2 FUNCTION LIST

Multi-function Display DX Function List

○ : Operator available

A : Operator available when menu lock setting is "NO" ,
Administrator available (protected by the administrator password)

B : Administrator only (protected by the administrator password)

Functions		Novelty	-	Auto speed control (OPT)
Status display	Digital speedometer	-	○	○
	Torque converter oil temperature indicator	-	○	○
	Low speed setting indicator	-	○	○
	Auto speed control indicator	-	-	○
	Eco-mode indicator	NEW	○	○
	Planned maintenance hour warning indicator	-	○	○
	Menu lock indicator	NEW	○	○
Meter	Odometer	-	○	○
	Trip meter	-	○	○
	Planned maintenance hour meter	-	○	○
Warning function	Parking brake ON warning	-	○	○
	Parking brake OFF warning	-	○	○
	Torque converter oil temperature overheat warning	-	○	○
	Over speed alarm	-	○	○
	Diagnostic code display	-	○	○
Setting function	Low speed setting	-	A	A
	Travel speed limiter level setting	-	B	B
	Over speed alarm setting	-	A	A
	Planned maintenance hour setting	-	B	B
	Engine auto stop time setting	NEW	B	B
	Second password registration for administrator	NEW	B	B
	Menu lock setting	-	B	B

7.1.6.3 Setting menu for administrator

Use switch (1) to select the desired item and press switch (4) ; each setting screen will appear.

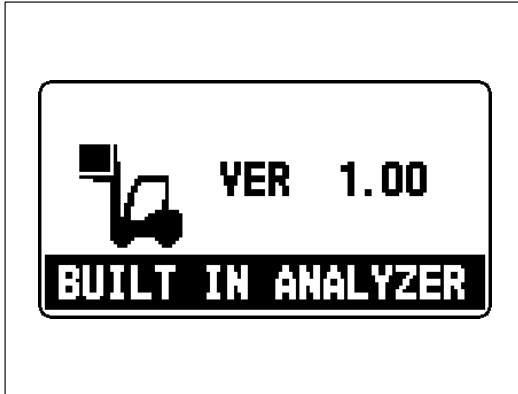Select [END] on the menu and press switch (4) ; the status screen returns.

7
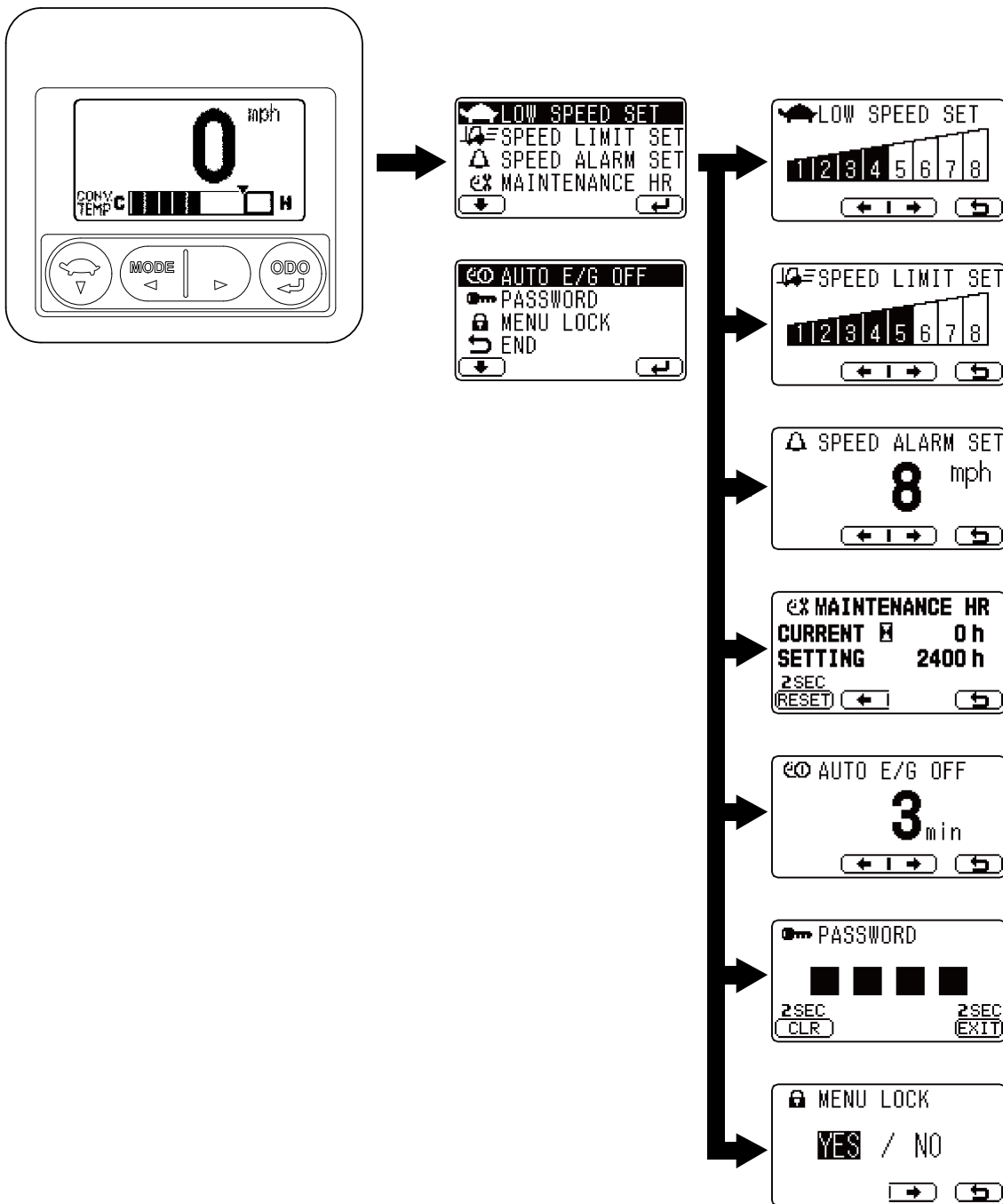
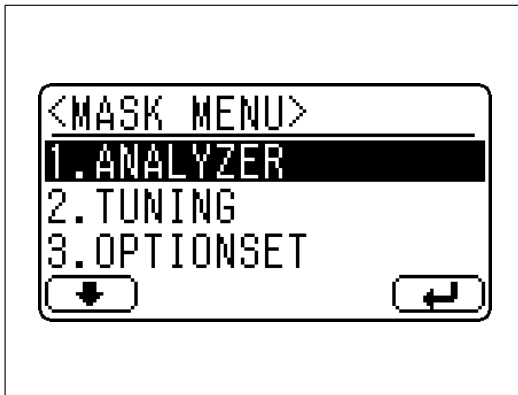## 7.2.2.2 SERVICE FUNCTION "MASK MENU" Screen

NOTICE

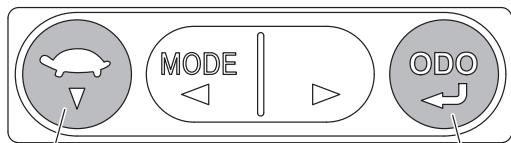**During all the test screen display, the vehicle can be operated normally.**

Operating Procedure

Service function "MASK MENU" initial screen is displayed for 5 seconds.

```
    ■
   ▟▖      YER  1.00
  ▟▐

BUILT IN ANALYZER
```

Step 1 Enter the password on the general screen to display the service function "MASK MENU" screen.

```
<MASK MENU>
1.ANALYZER
2.TUNING
3.OPTIONSET
  ▼              ↵
```

Step 2 Select a desired function using switch (1). Then, press switch (4) (set) to display the function screen or setting screen of the selected function.

Step 3 Press (enter) switch (4) while selecting "9. END" menu to return to the general screen.
Also, in each screen, once the ignition key switch is turned OFF, you can move to the general screen.

MODE   ◁   ▷   ODO

Switch (1)   Switch (4)

```
 I/O ENGINE CTRL  8/10
NE    :   750( 0.0)
PIM  :100.0
INJ  :100.0
OX   :0.15(0)  NEXT
```

- **"I/O ENGINE CTRL 8/10"**

  NE: Engine speed (refer to "I/O ENGINE CTRL 6/10")

  PIM: Intake pipe negative pressure sensor voltage, Intake manifold pressure (refer to "I/O ENGINE CTRL 3/10")

  INJ: Injector correction value (gasoline)
  Displays correction value of the fuel injection amount.

  OX: O_2 sensor voltage (O_2 sensor monitor)
  Displays voltage of O_2 sensor (O_2 sensor monitor).

  O_2 sensor voltage standard: 0 to 1.0 V

  O_2 sensor monitor
  1: rich
  0: lean

  Switch (4): To "I/O ENGINE CTRL 9/10" screen

```
 I/O ENGINE CTRL  9/10
NE    :   750( 0.0)
PIM  :100.0
VF   :2.50
OX   :0.15(0)  NEXT
```

- **"I/O ENGINE CTRL 9/10"**

  NE: Engine speed (refer to "I/O ENGINE CTRL 6/10")

  PIM: Intake pipe negative pressure sensor voltage, Intake manifold pressure (refer to "I/O ENGINE CTRL 3/10")

  VF: VF voltage (LPG/CNG)
  Displays the voltage (V) output from VF terminal.

  Standard: 2.0 to 3.0 V

  OX: O_2 sensor voltage (O_2 sensor monitor) (refer to "I/O ENGINE CTRL 8/10")

  Switch (4): To "I/O ENGINE CTRL 10/10" screen

```
 I/O ENGINE CTRL 10/10
NE    :   750( 0.0)
PIM  :100.0
LINJ :100.0 / 100.0
FCM  :   0        ⏎
```

- **"I/O ENGINE CTRL 10/10"**

  NE: Engine speed (refer to "I/O ENGINE CTRL 6/10")

  PIM: Intake pipe negative pressure sensor voltage, Intake manifold pressure (refer to "I/O ENGINE CTRL 3/10")

  LINJ: Injector correction value (LPG/CNG)
  Displays correction value of the fuel injection amount.

  FCM: Fuel control module correction value (LPG/CNG)
  Displays correction value of the air-fuel ratio motor opening angle.

  Switch (4): To "ANALYZER MENU" screen

7

```
  I/O M.HANDLING    3/7
 POTL :2.31/2.20
 LPSOL:0.00
 LSOL :1
                    (NEXT)
```

7
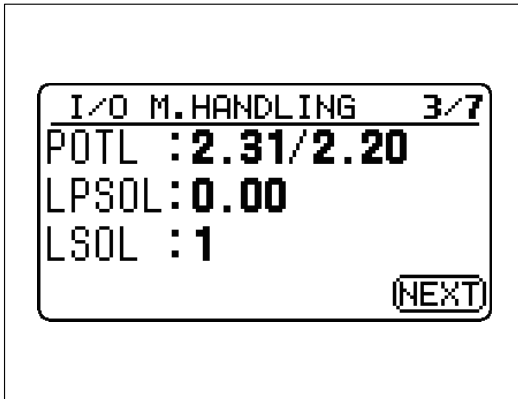
▪ **"I/O M.HANDLING 3/7"**

POTL: Lift lever angle sensor (1) voltage (V)/lift lever angle sensor (2) voltage (V)
Displays input voltage from the lift lever angle sensor (1)/lift lever angle sensor (2) to the controller.

STD lever vehicle:
POTL: - = Always

Mini lever/Joystick vehicle:
Standard:
Lift lever: Rasing
Lift lever angle sensor (1) voltage: 1.8 to 4.1 V
Lift lever angle sensor (2) voltage: 0.3 to 2.9 V
Lift lever: Lowering
Lift lever angle sensor (1) voltage: 0.4 to 2.8 V
Lift lever angle sensor (2) voltage: 1.6 to 4.3 V

LPSOL: Lift proportional valve solenoid current (A)
Displays output current from the controller to the lift proportional valve solenoid.

STD lever vehicle:
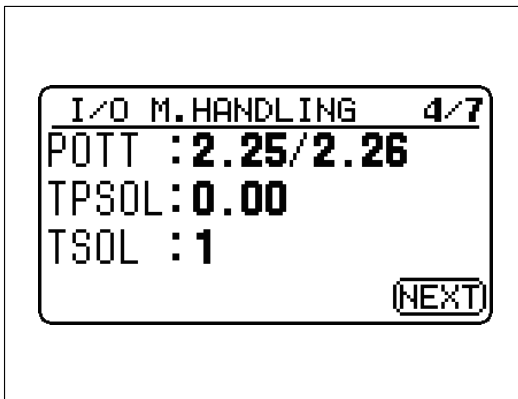LPSOL: - = Always

Mini lever/Joystick vehicle:
Standard when lever is operated: 0.3 to 0.85 A

LSOL: Lift lowering lock solenoid
Refer to "I/O M.HANDLING 1/7"

Switch (4): To "I/O M.HANDLING 4/7" screen

```
  I/O M.HANDLING    4/7
 POTT :2.25/2.26
 TPSOL:0.00
 TSOL :1
                    (NEXT)
```

▪ **"I/O M.HANDLING 4/7"**

POTT: Tilt lever angle sensor (1) voltage (V)/tilt lever angle sensor (2) voltage (V)
Displays input voltage from the tilt lever angle sensor (1)/tilt lever angle sensor (2) to the controller.

STD lever vehicle:
POTT: - = Always

Mini lever/Joystick vehicle:
Standard:
Tilt lever: Forward tilt
Tilt lever angle sensor (1) voltage: 1.8 to 4.1 V
Tilt lever angle sensor (2) voltage: 0.3 to 2.9 V
Tilt lever: Backward tilt
Tilt lever angle sensor (1) voltage: 0.4 to 2.8 V
Tilt lever angle sensor (2) voltage: 1.6 to 4.3 V

TPSOL: Tilt proportional valve solenoid current (A)
Displays output current from the controller to the tilt proportional valve solenoid.

STD lever vehicle:
TPSOL: - = Always

Mini lever/Joystick vehicle:
Standard when lever is operated: 0.3 to 0.85 A
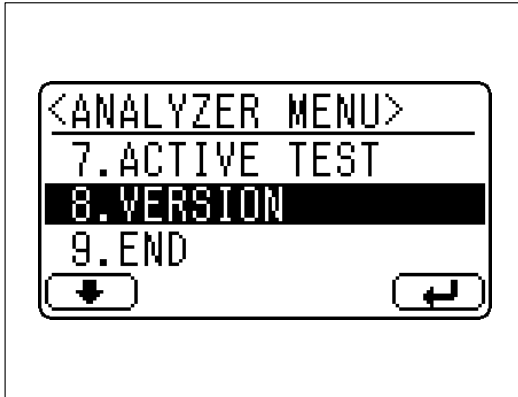
TSOL: Tilt solenoid
Refer to "I/O M.HANDLING 1/7"
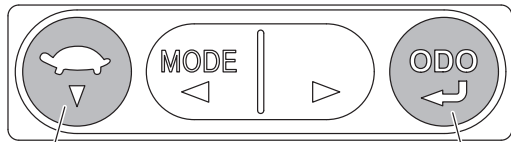
Switch (4): To "I/O M.HANDLING 5/7" screen

7.2.3.7 Program Version "VERSION"

Displays program version of each controller.

Operating Procedure

Step 1   Display the "ANALYZER MENU" screen.

```
<ANALYZER MENU>
 7.ACTIVE TEST
 8.VERSION
 9.END
 ⬇                      ↵
```

Step 2   Press switch (1) 7 times to check that "8. VERSION"
is selected, and press (enter) switch (4) to display
"VERSION" screen.

Switch (4): Returning to "ANALYZER MENU" screen

MODE

ODO

Switch (1)   Switch (4)

NOTICE:

▪ **You cannot move directly from "VERSION"
screen to the screen of the other items. Re-
turn to "ANALYZER MENU" screen once, then
move to screen of each item.**

▪ **"VERSION"**

```
 VERSION
DISPLAY    : 1.00
SAS/OPS ECU: 1.00
ENGINE ECU : 3UK010G
CAN BRIDGE :
                      ↩
```

DISPLAY: Displaying program version Program version of
the multifunction display DX

SAS/OPS ECU: SAS/OPS program version
Program version of SAS/OPS controller

ENGINE ECU: Engine program version
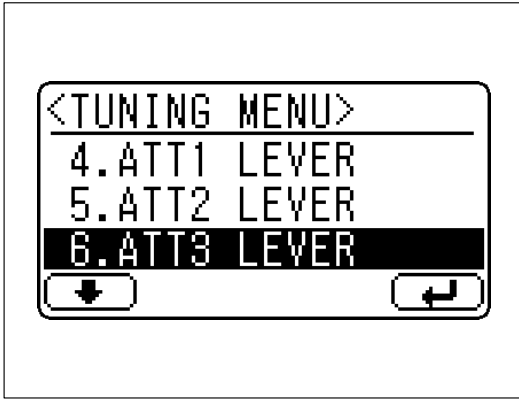Engine controller program version

CAN BRIDGE: Unused

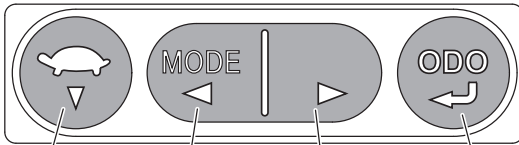Switch (4): Returning to "ANALYZER MENU" screen

7.2.4.9 TUNING ATT3 LEVER "ATT3 PUSH/ATT3 PULL"

Sets tuning levels for attachment (3) lever of mini lever and joy stick vehicles.

### Operating Procedure

Step 1   Display the "TUNING MENU" screen.

<TUNING MENU>
 4.ATT1 LEVER
 5.ATT2 LEVER
 6.ATT3 LEVER

Step 2   Press switch (1) 5 times to check that "6. ATT3 LEVER" is selected, and press (enter) switch (4) to display the "ATT3 PUSH screen.

Switch (1)   Switch (2)   Switch (3)   Switch (4)

NOTICE:

- **You cannot move directly from level setting screen of "ATT3 LEVER" to the screen of the other items. Return to "TUNING MENU" screen once, then move to level setting screen of each item.**
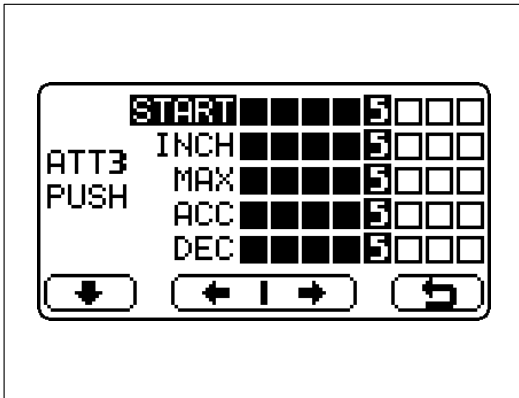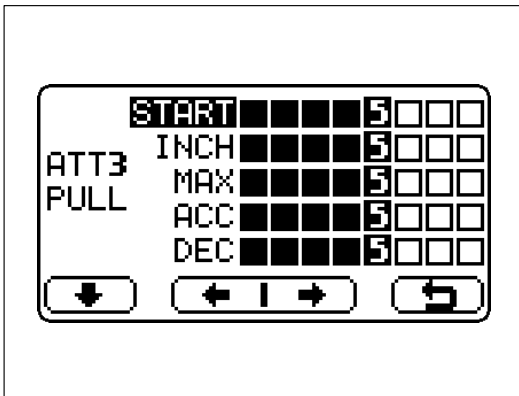
- **"ATT3 PUSH"**

  Attachment (3) lever push operation tuning screen

  Switch (1): Switching selection to next item

  Switch (2): Tuning level down

  Switch (3): Tuning level up

  Switch (4): Returning to "TUNING MENU" screen

ATT3
PUSH

START 5
INCH 5
MAX 5
ACC 5
DEC 5

- **"ATT3 PULL"**

  Attachment (3) lever pull operation tuning screen

  Switch (1): Switching selection to next item

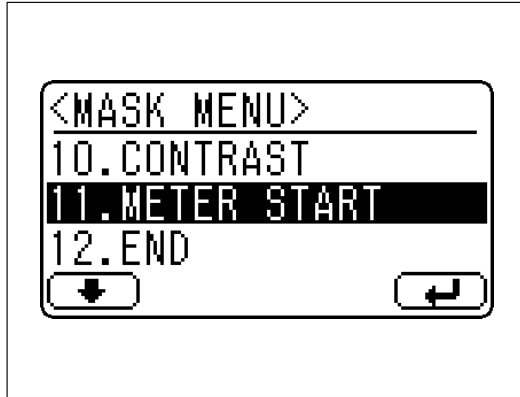 Switch (2): Tuning level down

  Switch (3): Tuning level up

  Switch (4): Returning to "TUNING MENU" screen

ATT3
PULL

START 5
INCH 5
MAX 5
ACC 5
DEC 5

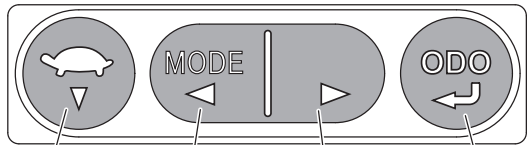## 7.2.7.7 METER START "METER START"

GENERAL

Starts counting the odometer, trip meter and maintenance hour meter.

Operating Procedure

Step 1   Enter the password on the general screen to display the service function "MASK MENU" screen.

<MASK MENU>
10.CONTRAST
11.METER START
12.END

Step 2   Press switch (1) 10 times to check that "11. METER START" is selected, and press (enter) switch (4) to display the "METER START" screen.

Switch (1)   Switch (2)   Switch (3)   Switch (4)

NOTICE:

▪ **The speed limit of the Low speed level setting function is "8OFF" when meter start setting becomes "YES".**
Set the speed limit of the Low speed level setting function on the low speed setting screen when using the Low speed level setting function.
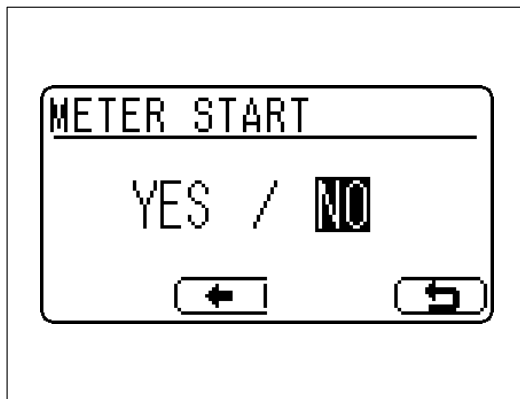
Step 3   **"METER START" Screen**

Press switch (2) for more than 2 seconds to display the right arrow on the screen.

METER START

YES / NO

8

Control type	Phenomenon on vehicle	Malfunction area and mode	Checking method	Corrective action
Active mast function control	Forward tilt automatic fork leveling does not stop. (Stops at the position where the automatic fork leveling switch is pressed)	▪ Load sensor unit: Sensor defect ▪ Load sensor line (Power supply, signal, ground): Disconnection fault (Harness, connector) Short or leak fault (Harness, connector)	Load sensor voltage check: Check that the voltage rises on lift relief.	If there is no change, perform an installation check or replace the sensor.
		▪ Load sensor no-load matching value: Does not match actual status (re-match)	-	Follow matching procedure to rematch.
		▪ Tilt angle sensor unit: Sensor defect ▪ Tilt angle sensor installation: Link, installation part destroyed, damaged	Tilt angle sensor voltage check: Tilt to forward and backward tilt positions and check the voltage change.	If there is no change, perform an installation check or replace the sensor.
		▪ Horizontal matching value for tilt angle sensor: Does not match actual status (re-match)	-	Follow matching procedure to rematch.
		▪ Lifting height switch unit (2200H): Disconnection fault (internal damage, stuck)	ON/OFF check with analyzer.	Harness check or replace switch
		▪ SAS/OPS controller: Controller defect	-	Replace