Service Manuals

Manuals Available For C841 (MP13 MP16)

Manual	Manual Title
524177679	Service Repair Manual
524181955	Electronic Controller MPB

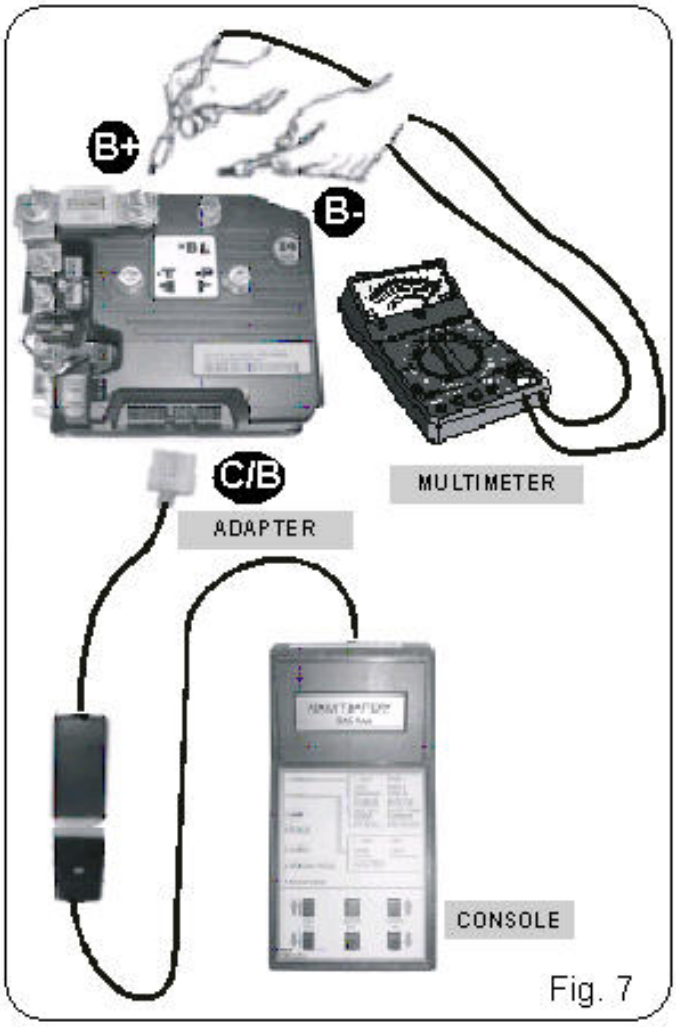


Fig. 7

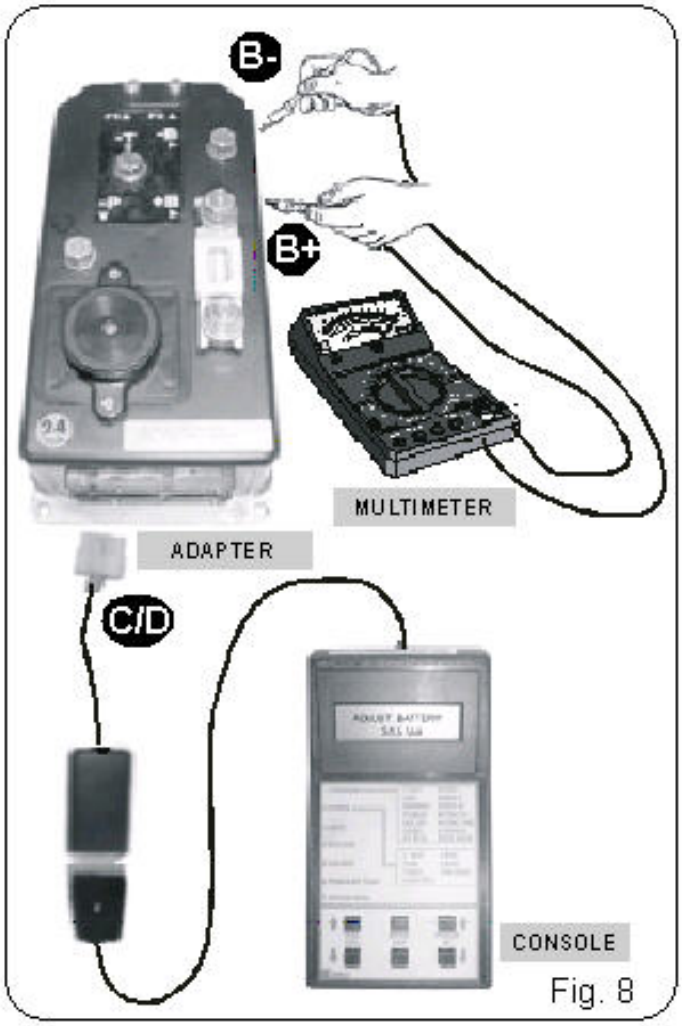
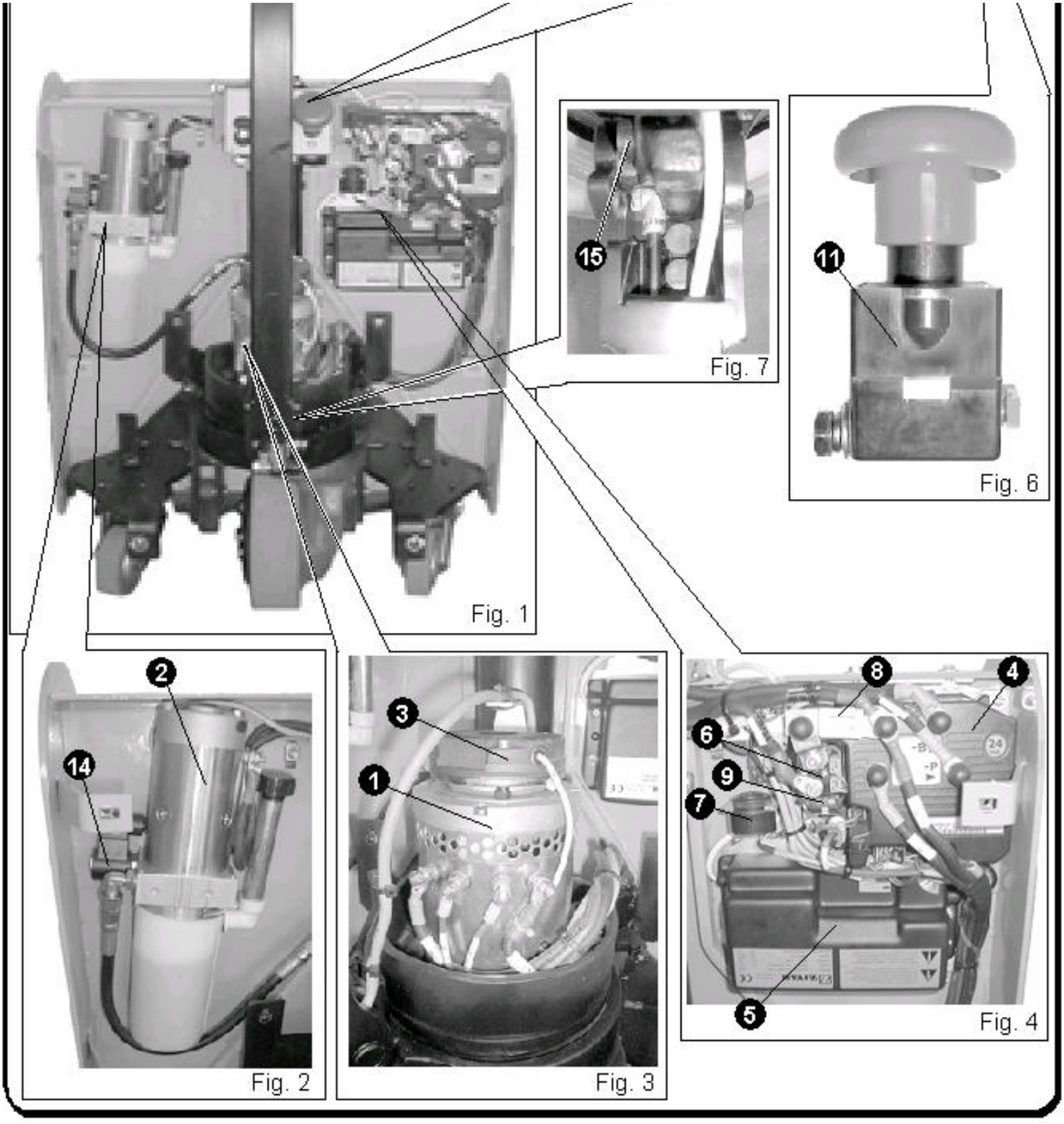


Fig. 8

1.00 KEY TO ELECTRICAL DIAGRAMS MODEL MP16



2.01 TABLE OF ELECTRICAL COMPONENTS MODEL MP16

The electrical components illustrated on the facing page with references to the electrical diagram are described in the following table.

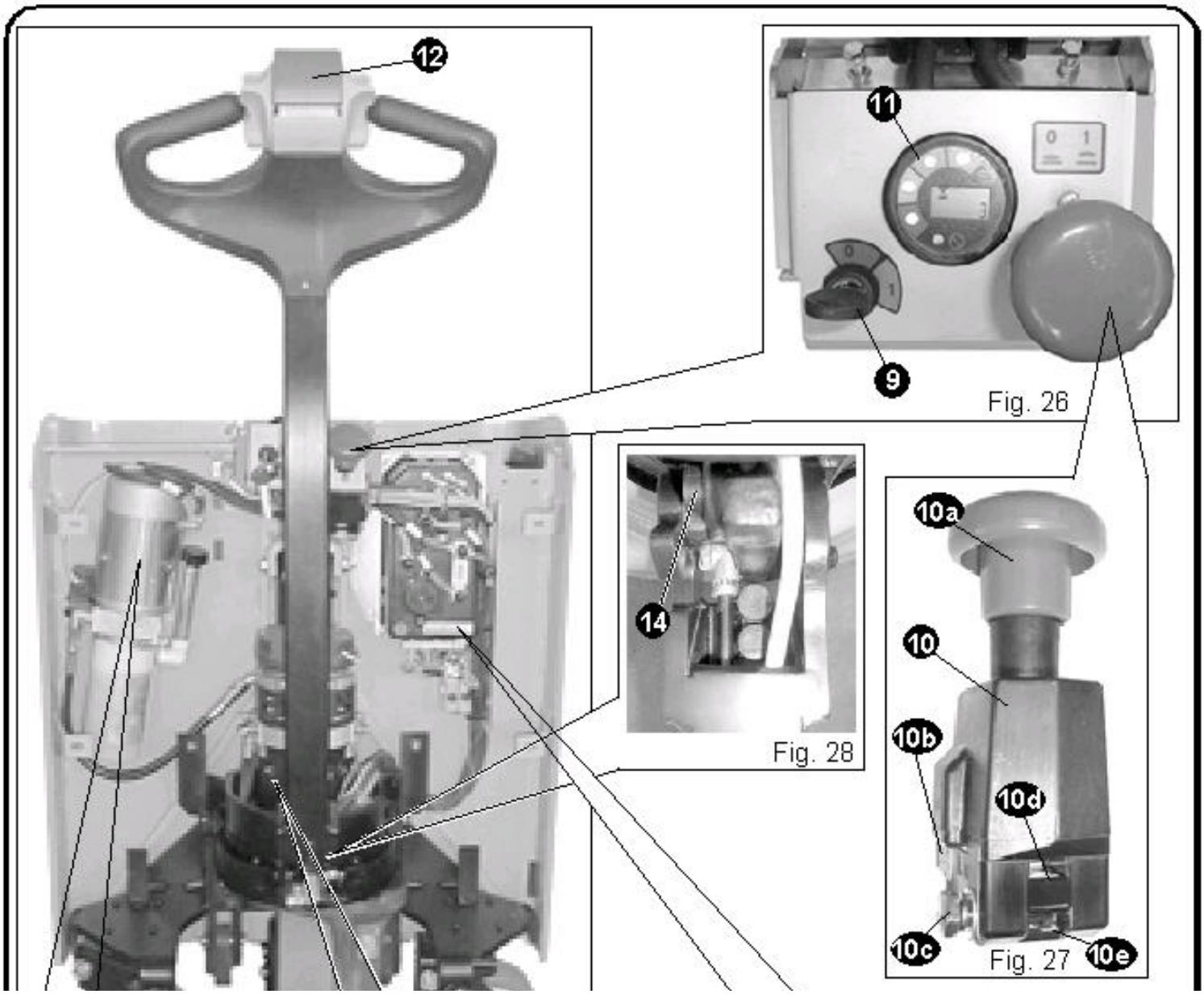
Key

Ref. Component reference in exploded view
Ref. Diagram Reference to the component on the electrical diagram
Component Description Function of component

Ref.	Ref. Diagram	Component description
1	MTR	1.5 kW traction motor
2	PM	2.0 kW pump motor
3	EMB	Electromagnetic brake
4	MPB	150+150A Combi controller
5	TI	Main contactor
6	HORN	Audible sounder
7	FU1	175A main power circuit fuse
8	FU2	5A control circuits fuse
9	KEY SWITCH	Keyswitch
10		Emergency pushbutton
11	PILOT LAMP	Power On and Fault indicator LEDs
12	TILLER CONTROL BOX	Steer handle (tiller) control box
13	EV1	Lowering solenoid valve
14	TILLER SENSOR	Tiller enable sensor

NOTE: All Yale replacement parts for these components can be found in the parts catalogue

2.06 ELECTRICAL COMPONENTS MODEL MP22



PARAMETER "MPB 150+150A"			LEVEL		
			MP16	MP18	MP20
"MAIN MENU"	PARAMETER CHARGE	ACCELERATION DELAY	5	5	5
		FLD ACCELERATION	5	5	5
		DECELERATION DELAY	6	6	6
		RELEASE BRAKING	6	6	6
		INVERS. BRAKING	7	7	7
		CUTBACK SPEED 1	9	9	9
		SOFT WORKING LEVEL	5	5	5
		MAX SPEED FORW.	9	9	9
		MAX SPEED BACK	9	9	9
		CREEP SPEED	2	2	6
		EMB INSERTION DELAY	5	5	5
		TRACTION IMAX	9	9	9
		ARMA NOM CURR	9	9	5
		WEAK DROPOUT	5	5	5
		FIELD NOM CURRENT	8	8	9
		FIELD CURR. MAX	9	9	8
		PU ACC. DELAY	5	5	5
		PU DECELERATION DELAY	5	5	5
		1ST SPEED COARSE	9	9	9
		FORK LIFT SPEED	9	9	9
		PUMP CREEP	5	5	5
		EVP ACC. DELAY	5	5	5
		EVP DEC. DELAY	5	5	5
		LIFT MAX TIME	5	5	5

3.01 “COMBI” CONTROLLER PARAMETERS TABLE MODEL MP22

To access the various programming menus from the console (handset) adhere to the procedure described in the “COMBI” service manual P/N 272486700.
The factory parameters of the controllers for each model are given below.
We recommend always maintaining the factory settings in order to obtain the best possible compromise between performance and lifetime of the components.

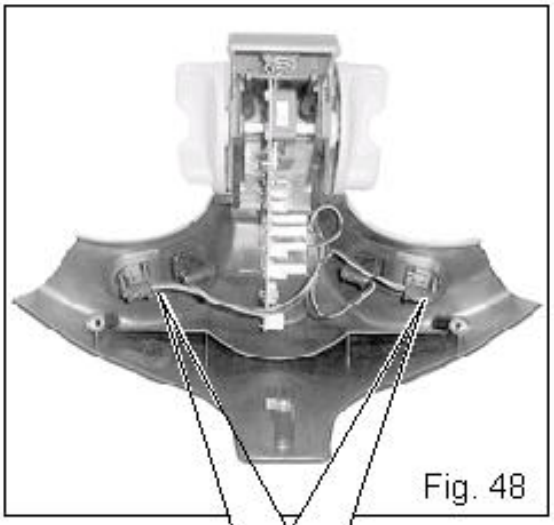


Fig. 48

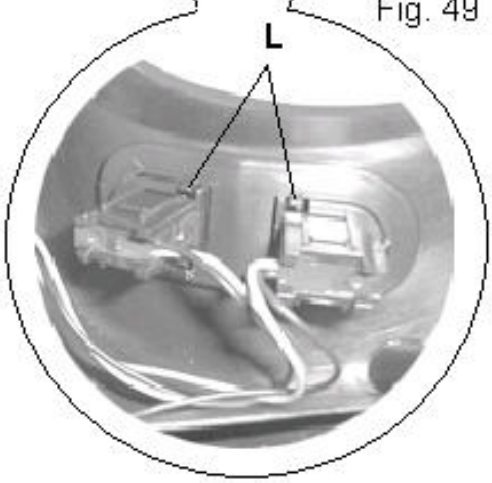


Fig. 49

4.04 REPLACEMENT OF THE BUTTERFLY CONTROL SPRING

1) Remove the tiller control box top shell half.

2) 2.5 mm ALLEN WRENCH - Unscrew the left hand butterfly control fixing screw (Ref. E Fig. 43) and extract the complete butterfly control (note that the spring is fitted under the right hand butterfly control). Remove the guide bush that also functions as a retaining bush for the spring (Ref. M Fig. 50) and change the spring, removing the original spring from its location using the screwdriver (Ref. N Fig. 51). Reassemble the tiller control box.

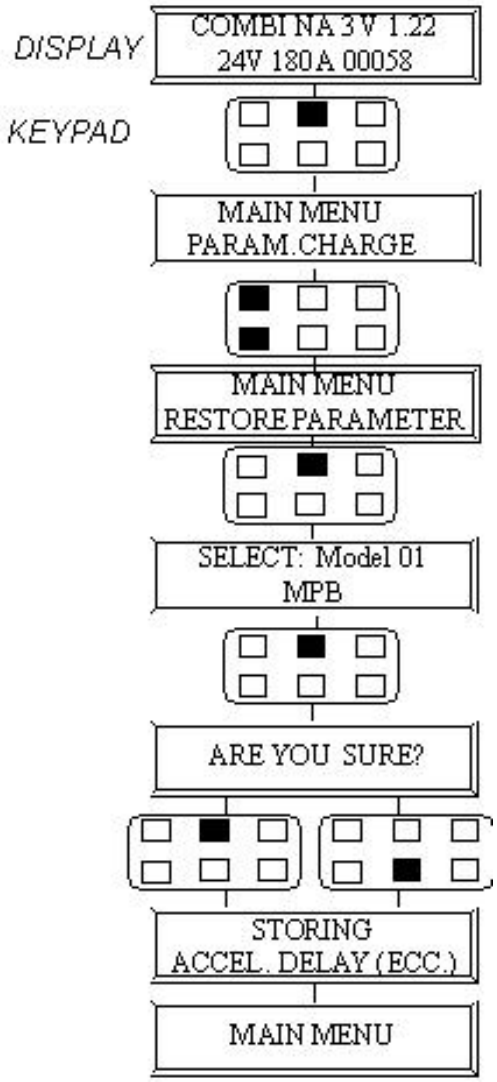
truck frame (Ref. Z Fig. 57), remove the controller and renew.

To reassemble, perform the disassembly steps in reverse order.

IMPORTANT: After you have renewed the controller the working hours saved in the memory will be out of sync with the MDI because the new controller will show 0 hours while the MDI will contain the hours saved on the original controller. When the truck is switched on the MDI will display Alarm 94 for 60 seconds while traction is inhibited; this warns the operator of the imminent deletion of the working hour value stored in the memory. Execute the data transfer procedure to prevent the hours from being erased.

OPERATING HOURS TRANSFER FROM "MDI" TO "COMBI"
With the truck switched off, before connecting the MDI, first connect the console complete with adapter, switch on the truck and enter the **"CONFIG MENU SET OPTIONS"**, select the heading **"AUX FUNCTION 1"** and set **"ON"** (OFF is default), confirm the value and then power off the truck. Disconnect the console, connect the MDI and then switch the truck on again; the operating hours stored on the MDI will now be transferred to the new controller. After overwriting the hours the **"AUX FUNCTION 1"** parameter will automatically default to **"OFF"** status.

After connecting the controller download the data previously saved on the console using the "RESTORE PARAMETER" function and proceeding as outlined below.



1) Header.

2) Press ENTER to access main menu.

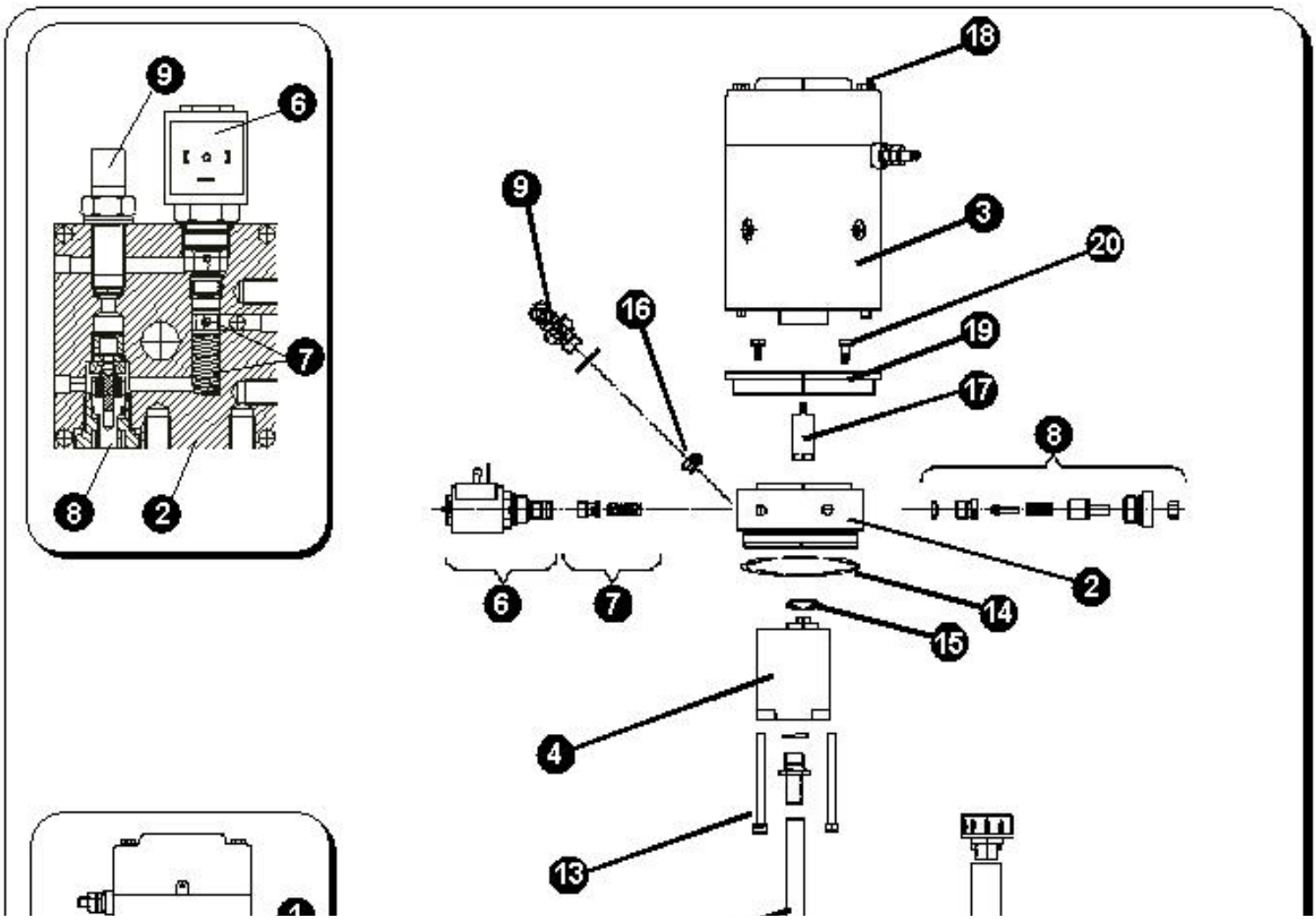
3) The first item in the list is displayed.

Ref.	Component Description
1	Complete pump unit assy.
2	Hydraulic power unit body
3	Pump motor (1200W)
4	Pump body (1.22cc)
5	Oil tank
6	ON/OFF solenoid valve (torque to 20 Nm) (magnet nut to 6 Nm)
7	Lowering flow control valve
8	Pressure relief valve (torque to 10 Nm)
9	Cylinder pressure line union (torque to 20 Nm)
10	Oil filter complete with pipe
11	Oil filler pipe with cap
12	Steel strap securing tank to power unit body
13	Pump body to hydraulic power fixing screws (torque to 8 Nm)
14	Oil tank to power unit sealing O-ring
15	Pump body to power unit sealing O-ring
16	Hydraulic union reduction (torque to 5 Nm)
17	Rotor to hydraulic power unit coupling joint
18	Motor to power unit fixing screws (torque to 5 Nm)

Table 12

NOTE: All Yale Part Numbers are given in the parts catalogue

2.03 COMPONENTS OF HYDRAULIC UNIT WITH 2000W MOTOR MODELS MP18 - MP20 - MP20L - MP22



C-SPANNER
Ø 60-80 mm

SMALL SLOTTED
SCREWDRIVER

PROCEDURE

Before starting work, make sure you are wearing suitable safety clothing.

1) C-SPANNER - Place the cylinder in the vice taking care not to deform the barrel. Using the c-spanner, unscrew the seal bush (Ref. D Fig. 10). Remove the bushing from the rod and then extract the rod from the cylinder barrel. Use the screwdriver to remove the seals from their seat in the bushing and then fit new seals (Ref. E Fig. 10). Before fitting the seals, clean and oil the seal seating to facilitate assembly.

To reassemble, perform the disassembly steps in reverse order.

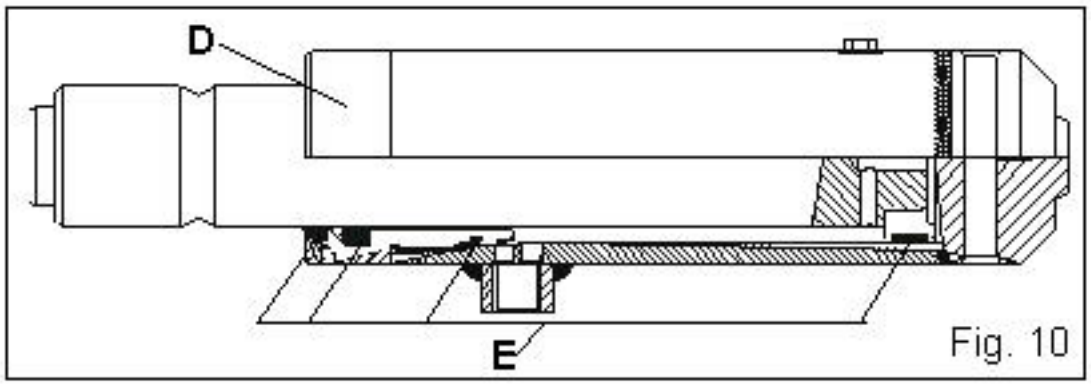


Fig. 10

NOM SIZE	TENSILLE	PROPERTY CLASS 5.8			PROPERTY CLASS 8.8			PROPERTY CLASS 10.9		
X	STRESS	CLAMP	TORQUE (N.m		CLAMP	TORQUE (N.m)		CLAMP	TORQUE (N.m)	
PITCH	AREA	LOAD	DRY	LUBEET	LOAD	DRY	LUBED	LOAD	DRY	LUBED
	As (mm)	W (N)	K=0.20	K=0.15	W (N)	K=0.20	K=0.15	W (N)	K=0.20	K=0.15
M4 x 0.5	8.78	2 400	1.92	1.44	3 830	3.07	2.30	5 220	4.17	3.13
M5 x 0.8	14.20	3 880	3.88	2.91	6 200	6.20	4.65	8 430	8.43	6.33
M6 x 1	20.10	5 490	6.58	4.94	8 770	10.50	7.90	11 950	14.30	10.80
M8 x 1.25	36.60	9 990	16.00	12.00	15 975	25.60	19.20	21 750	34.80	26.10
M8 x 1	39.20	10 700	17.10	12.80	17 100	27.40	20.50	23 275	37.30	27.90
M10 x 1.5	58.00	15 825	31.70	23.80	25 325	51.00	38.00	34 450	69.00	52.00
M10 x 1.25	61.20	16 700	33.40	25.10	25 725	53.00	40.10	36 350	73.00	55.00
M12 x 1.75	84.30	23 025	55.00	41.40	36 800	88.00	66.00	50 075	120.00	90.00
M12 x 1.25	92.10	25 150	60.00	45.30	40 200	96.00	72.00	54 700	130.00	98.00
M14 x 2	115.00	31 400	88.00	66.00	50 200	140.00	105.00	68 300	190.00	145.00
M14 x 1.5	125.00	34 125	96.00	72.00	54 550	155.00	115.00	74 250	210.00	155.00
M16 x 2	157.00	42 850	135.00	105.00	68 525	220.00	165.00	93 250	300.00	225.00
M16 x 1.5	167.00	45 600	145.00	110.00	72 900	235.00	175.00	99 200	320.00	240.00
M20 x 2.5	245.00	66 875	270.00	200.00	106 950	430.00	320.00	145 550	580.00	435.00
M20 x 1.5	272.00	74 250	295.00	225.00	118 750	475.00	355.00	161 550	650.00	485.00

Table 1

NOTE: The truck is assembled using screws and bolts of PROPERTY CLASS 8.8 - LUBED

2.00 DRIVE WHEEL REPLACEMENT PROCEDURE MODEL ALL MODELS

SPECIAL TOOLS REQUIRED

- 2 Wooden blocks 100x100x220 mm

STANDARD TOOLS REQUIRED

MEDIUM CROSSHEAD SCREWDRIVER

6 mm ALLEN WRENCH

19 mm SOCKET WRENCH

HYDRAULIC JACK

PROCEDURE

Before starting work, make sure you are wearing suitable safety clothing.

hammer and pin punch to drive out the dowel downwards in order to free the pivot pin.

4) STEEL HAMMER, DRIFT - Position the drift on one side of the tiller (Ref. W Fig. 22) and use the tools to drive out the tiller pivot pin. Recover the tiller and fit a new unit.

To reassemble, perform the disassembly steps in reverse order.

4.00 TRACTION MOTOR REPLACEMENT PROCEDURE MODEL ALL MODELS

STANDARD TOOLS REQUIRED

PROCEDURE

Before starting work, make sure you are wearing suitable safety clothing.

Park the truck in a safe place away from moving vehicles and pedestrians. Lower the forks to the ground, turn the keyswitch to OFF and disconnect the battery.

1) CROSSHEAD SCREWDRIVER, 6 mm ALLEN WRENCH - Use the screwdriver to remove the motor compartment hood. Use the Allen wrench to remove the wheels fairing. Use the screwdriver to unscrew the fixing screws of the traction motor protection apron.

2) 10-13 mm HEX WRENCH, SCISSORS - Use the scissors to free the cables from the cable ties. **(1500W motor)**. Use the 10 mm wrench to unscrew the right hand motor power cable fixing nuts (Ref. X Fig. 24). Use the 13 mm wrench to unscrew the left hand motor power cable fixing nuts (Ref. K Fig. 24). **(800/1000W motor)**. Use the 10 mm wrench to unscrew the four nuts fixing the motor power cables. Disconnect the electric brake power cable connector.

MEDIUM CROSSHEAD SCREWDRIVER

6 mm ALLEN WRENCH

SPRING TENSIONER

PROCEDURE

Before starting work, make sure you are wearing suitable safety clothing.

Park the truck in a safe place away from moving vehicles and pedestrians. Lower the forks to the ground, turn the keyswitch to OFF and disconnect the battery.

800/1000W TRACTION MOTOR

1) CROSSHEAD SCREWDRIVER, 6 mm ALLEN WRENCH - Use the screwdriver to remove the motor compartment hood. Use the Allen wrench to remove the wheels fairing to gain access to the traction motor.

2) CROSSHEAD SCREWDRIVER, SPRING TENSIONER - Use the screwdriver to unscrew and remove the brushes protection band (Ref. Z Fig. 61) in order to gain access to the motor brushes. Use the same screwdriver to unscrew and remove the screws fixing the rear part of the brush to the brush-holder (Ref. X Fig. 62) then use the tensioner to lift the brush spring (Ref. K Fig. 62); remove the brush and then perform the same sequence of operations for the other three brushes. At this point renew the brushes.

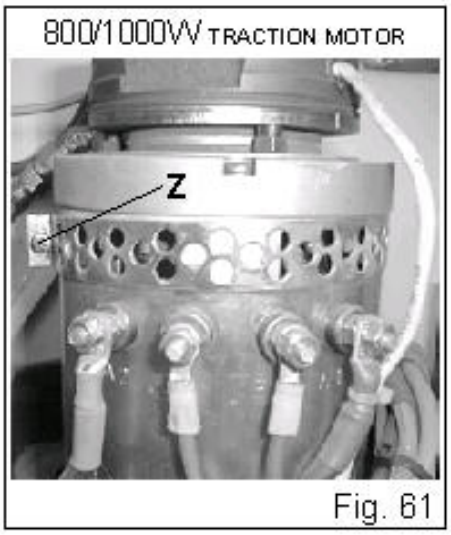


Fig. 61

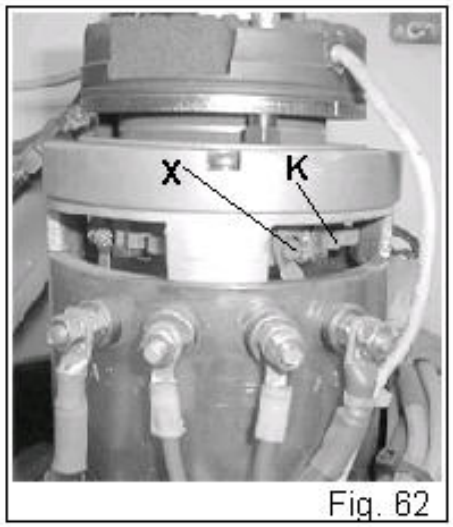


Fig. 62

To reassemble, perform the disassembly steps in reverse order.

1500W TRACTION MOTOR

1) CROSSHEAD SCREWDRIVER, 6 mm ALLEN WRENCH - Use the screwdriver to remove the motor compartment hood. Use the Allen wrench to remove the wheels fairing to gain access to the traction motor.

2) CROSSHEAD SCREWDRIVER, SPRING TENSIONER - Remove the brushes protection covers. Use the screwdriver to unscrew and remove the screws fixing the rear part of the brush to the brush-holder (Ref. J Fig. 64) then use the tensioner to lift the brush spring (Ref. Y Fig. 64); remove the brush and then perform the same sequence of operations for the other three brushes. At this point renew the brushes.

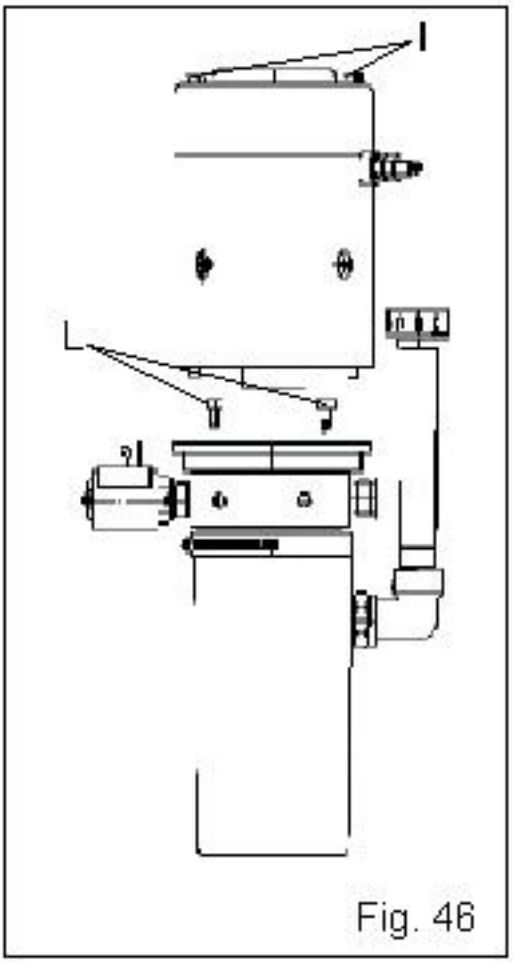


Fig. 46

To reassemble, perform the disassembly steps in reverse order.

5.07 PUMP BODY REMOVAL PROCEDURE

2) CROSSHEAD SCREWDRIVER, 5 mm ALLEN WRENCH - Use the screwdriver to loosen the fixing screw of the metal band that secures the hydraulic oil tank to the power unit (Ref. M Fig. 47) and remove the tank, taking care to avoid spilling its contents of oil. Unscrew and remove the filter (Ref. O Fig. 47).

c) EVERY 2000 DUTY HOURS
- Change the oil

CHARACTERISTICS OF THE OIL TO USE

- In ambient temperatures of between 0 and + 40°C **SHELL SPIRAX 80W-90**
- In ambient temperatures down to -30°C **SHELL TRANSAXLE OIL 75W-90**
- Quantity required **1.4 litres**

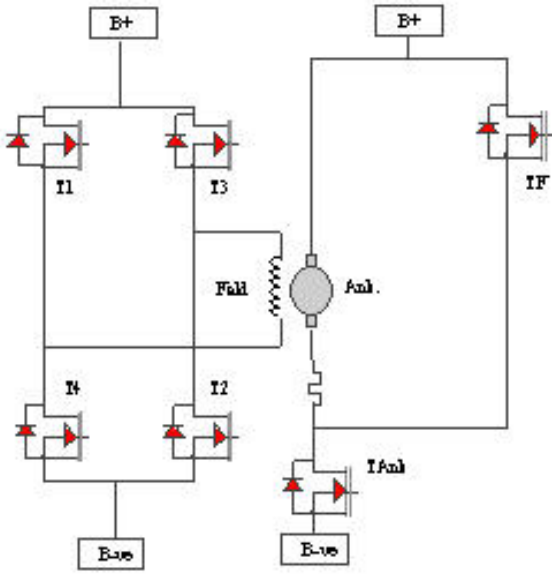
2.04 TROUBLESHOOTING GUIDE

Fault	Possible cause	Corrective action
Noise at speed	Gear damaged when installing motor	Remove traction motor and check for damage to gear; renew if necessary
Humming during tra	a) Incorrect motor connection	a) Connect cables correctly
	b) Defective motor shaft bearing	b) Remove motor and renew bearings
Oil leakage		
Breather valve	Excess oil level	Check oil level; remove oil if level is too high
Oil in motor	Bearing O-ring defective	Remove motor and renew bearing O-ring
Motor to reduction gear coupling	Flange O-ring defective	Remove motor and renew flange O-ring
Wheel axle	Defective oil seal on axle	Remove drive wheel and renew oil seal
Reduction gear overheating	a) Oil level too high	a) Drain off excess oil to correct level
	b) Oil level too low	b) Top up oil to correct level

Basic motor power supply circuit.

- As can be seen in the diagram alongside, the field and the armature are controlled by two separate circuits. The field is powered by a mosfet circuit designated “H-circuit” in which the mosfets are activated in pairs according to the selected direction of travel.

- Circuit when drive is not selected.



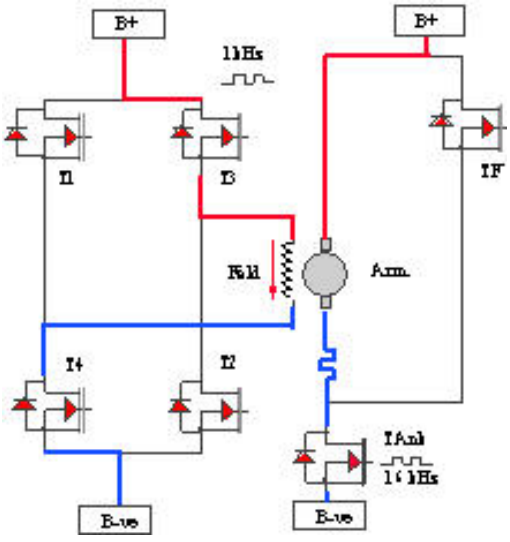
- The diagram alongside shows the mosfets activated for forward travel.

- The forward travel power circuit is enabled via control of the mosfets:

TARM. switching frequency of 16 KHz (ARMATURE circuit).

T3-T4 switching frequency of 0.800 KHz (field circuit).

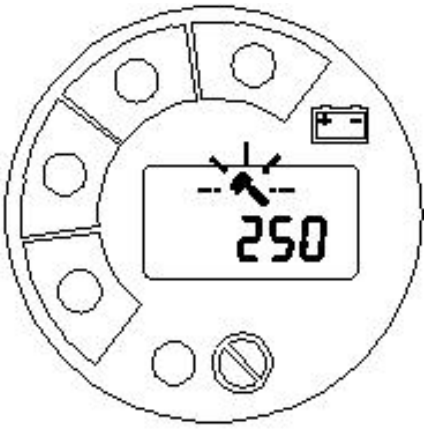
T4 in total conduction (field circuit).



- The diagram alongside shows the mosfets activated for reverse travel.
The reverse travel power circuit is enabled via control of the mosfets:

TARM. switching frequency of 16 KHz (ARMATURE circuit).

T2-T1 switching frequency of 1 KHz (field circuit).



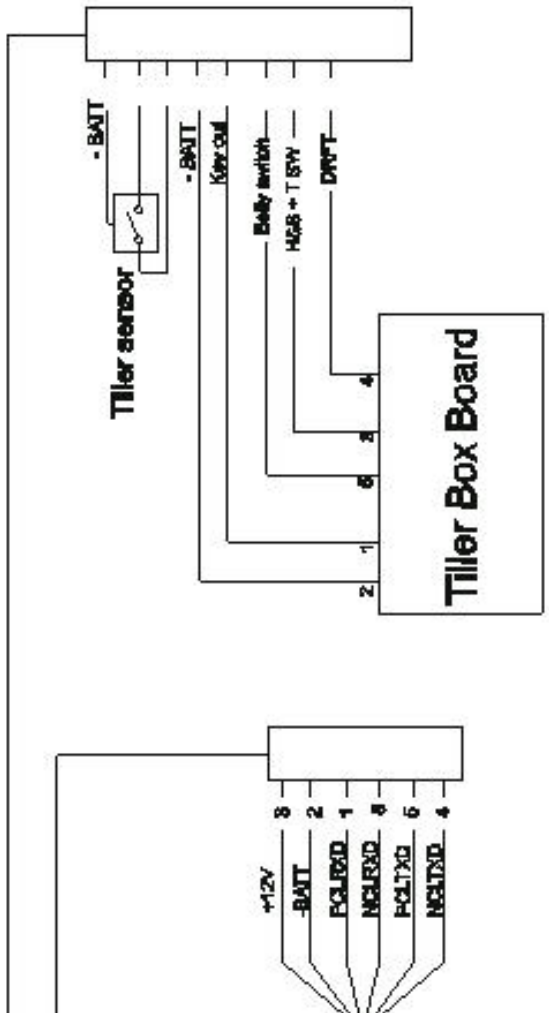
5.03 HOUR METER MEMORY "AL 94"

The MDI can maintain a copy of the hour meter in its own internal memory.
This means that replacement units can be installed without losing count of the number of truck operating hours.
After you have renewed the controller the working hours saved in the memory will be out of sync with the MDI because the new controller will show "0" hours while the MDI will contain the hours saved on the original controller. When the truck is switched on the MDI displays "**Al 94**" for 60 seconds while traction is inhibited; this warns the operator of the imminent deletion of the operating hour value stored in the memory. Execute the data transfer procedure to prevent the hours from being erased.

OPERATING HOURS TRANSFER FROM "MDI" TO "COMBI"

With the truck switched off, before connecting the MDI, first connect the console complete with adapter, switch on the truck and enter the "**CONFIG MENU' SET OPTIONS**", select the heading "**AUX FUNCTION 1**" and set "**ON**" (OFF is default), confirm the value and then power off the truck. Disconnect the console, connect the MDI and then switch the truck on again; the operating hours stored on the MDI will now be transferred to the new controller. After overwriting the hours the "**AUX FUNCTION 1**" parameter will automatically default to "**OFF**" status.

6.00 WIRING HARNESSES CONNECTION DIAGRAM



6) Press ENTER to access the menu.

7) The first menu option is displayed (to change the value, press SET UP or SET DOWN).

8) Press ROLL UP or ROLL DOWN to scroll through the options.

9) A new option is displayed.

10) Press SET UP or SET DOWN to modify the configuration.

11) The new configuration setting is displayed.

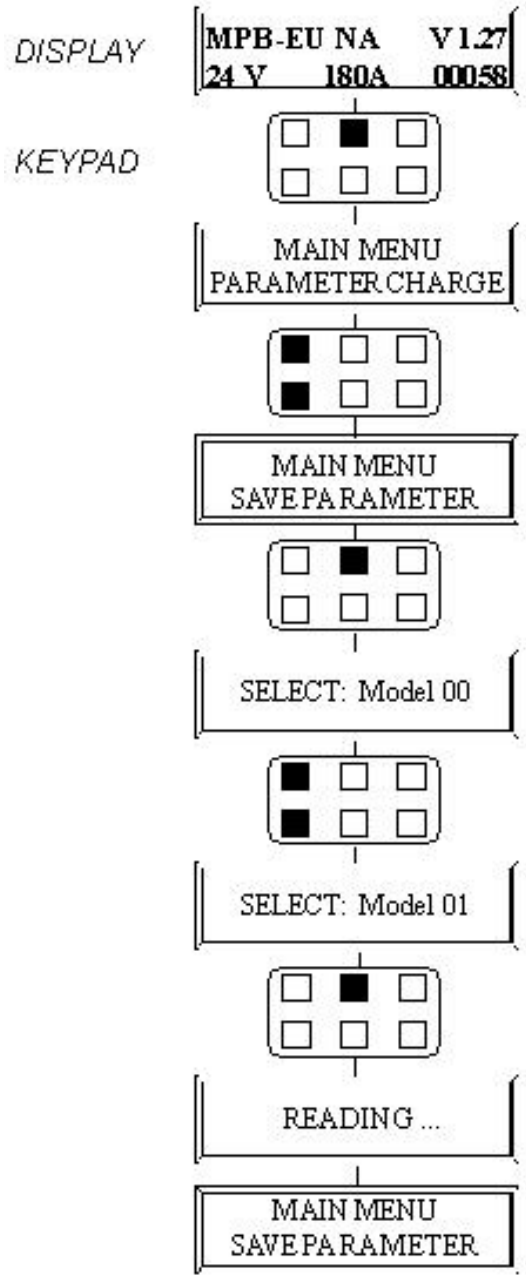
12) Press OUT to exit the menu.

13) A prompt asking you to confirm the change is displayed.

14) Press ENTER to confirm the change, or press OUT to cancel.

15) The heading of the ADJUSTMENTS menu is displayed.

16) Press OUT to return to the initial display.



Instructions for using the SAVE PARAM. function from the console:

1) Heading.

2) Press ENTER to access the main menu.

3) The first item in the list is displayed.

4) Scroll through the list using ROLL UP or ROLL DOWN and select SAVE PARAM.

5) The selected option is displayed (SAVE PARAM.).

6) Press ENTER to access the SAVE function.

7) The top line displays the selected model code while the bottom line either shows the message FREE, if the code has not been assigned to a model, or the name of the model associated with the code.

8) Use ROLL UP and ROLL DOWN to select the required model code.

9) A new code is displayed along with the relative status (FREE / “Model Name”).