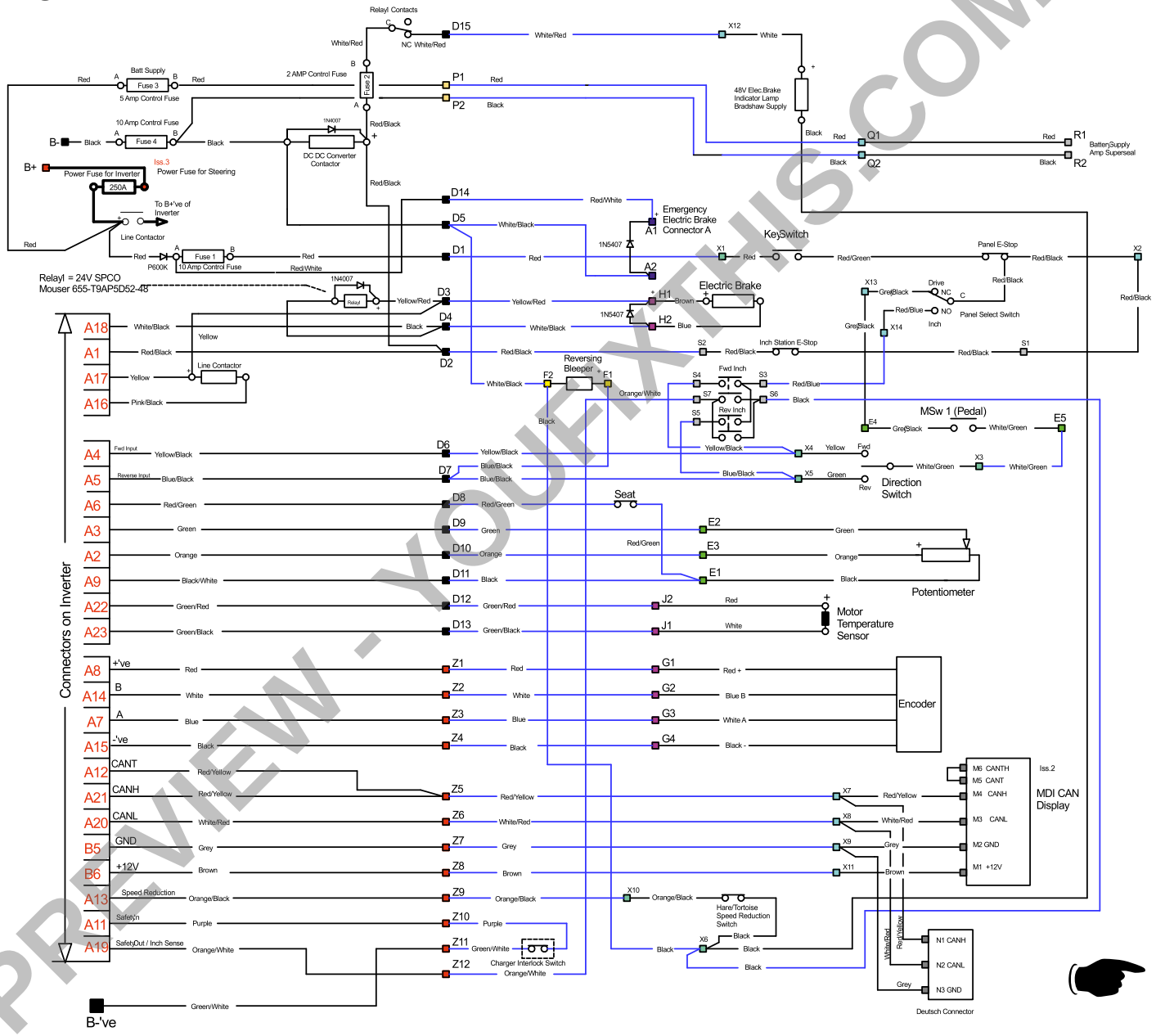
WIRING DIAGRAMS

T7.0HS3 MODEL



The G and J connectors could be coupled into a single connector

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TORQUE SETTINGS FOR SCREWS, NUTS AND FITTINGS

Before disassembling the various parts and nuts and bolts, read the following carefully.

To make the threaded matings secure, *LOCTITE 270* is used for tightening the screws.

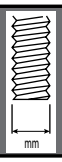
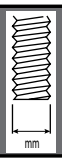
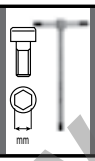
If it is not possible to unscrew the bolts because this product has been used, avoid applying extensions to the tools, instead slightly heat the area (at most 50°C) so as to eliminate the *LOCTITE 270* effect.

In the cases described, reapply *LOCTITE 270* during installation in a moderate quantity (30% of the mating surface).

The torque setting used for tightening the threaded couplings is extremely important to make the coupling secure and the machine safe.

The tables on this page give the classes of bolts normally used with the relevant torque settings.

Nominal diameter	TORQUE SETTING Nm	
	Class 8	Class 10
M3	4	5.2
M4	7	9.15
M5	12.14	14.8
M6	17.2	20.9
M8	31.8	38.1
M10	50.5	60.3
M12	74.2	88.5
M14	101.2	120.8
M16	138.2	164.9
M18	176.6	203.5
M20	225.4	259.7
M22	278.8	321.2
M24	324.8	374.2
M27	422.3	486.5
M30	516.1	594.7

				Pre-load N	TORQUE SETTING Nm					
					Class 5.8		Class 8.8		Class 10.9	
										
M4	0.7	7	3	2400	1.92	1.44	3.07	2.3	4.17	3.13
M5	0.8	8	4	3880	3.88	2.91	6.2	4.65	8.43	6.33
M6	1	10	5	5490	6.58	4.94	10.5	7.9	14.3	10.8
M8	1.25	13	6	9990	16	12	25.6	19.2	34.8	26.1
M8	1	13	6	10700	17.1	12.8	27.4	20.5	37.3	27.9
M10	1.5	16	8	15825	31.7	23.8	51	38	69	52
M10	1.25	16	8	16700	33.4	25.1	53	40.1	73	55
M12	1.75	18	10	23025	55	41.4	88	66	120	90
M12	1.25	18	10	25150	60	45.3	96	72	130	98
M14	2	21	12	31400	88	66	140	105	190	145
M14	1.5	21	12	34125	96	72	155	115	210	155
M16	2	24	14	42850	135	105	220	165	300	225
M16	1.5	24	14	45600	145	110	235	175	320	240
M20	2.5	30	17	66875	270	200	430	320	580	435
M20	1.5	30	17	74250	295	225	475	355	650	485

 = with lubricant

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TROUBLESHOOTING: ACE2 MODULE DIAGNOSIS SYSTEM

The diagnosis system is divided into two main groups:

ALARMS
When an alarm is detected, the current to the motors of the modules involved is cut off. The remote-control switch opens and the electromagnetic brake is activated.
These alarms are connected to:

- breakdowns in the motors/modules, the power system is no longer able to supply current to the motors.
- breakdowns connected with safety.

WARNINGS
When a warning occurs, the module is operating properly but it is found conditions to reduce performance, or to stop the truck, without affecting the power devices.
These warnings are connected to:

- incorrect starting sequences by the operator.
- conditions that require a reduction of performance (as for example high temperatures, ...)

The alarms are shown on the display with the following format xxAyyy, where xx is the node and yyy is the MDI code.

ACE2 - ALARMS MODULE

Alarm	Code MDI	Troubleshooting
WATCHDOG#1	**8**	The watchdog hardware circuit or module are damaged. Replace the module.
Cause: At the start-up the watchdog signal is active even before the software has generated it. In stand-by or operating conditions, the watchdog signal is not active.		
WATCHDOG#2	**8**	The watchdog hardware circuit or module are damaged. Replace the module.
Cause: At the start-up the watchdog signal is active even before the software has generated it. In stand-by or operating conditions, the watchdog signal is not active.		
LOGIC FAILURE #3	**17**	This type of failure is not connected to external components, so when it manifests itself the module needs replacing.
Cause: A hardware problem pertaining to the logic card as a protection against high current values (overload).		
STBY I HIGH	**53**	The current sensor or the current feedback circuit is damaged. Replace the module.
Cause: In standby condition, the sensor detects a current value different from zero		

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PARKING BRAKE RELEASE PROCEDURE IN CASE OF FAILURE

Equipment and tools

In the event that the tractor can not be moved due to a fault, it is necessary to release the parking brake in order to move it.



flat head screwdriver

Procedure

Before starting work, ensure that you are wearing suitable protective clothing. Remove the load and disconnect the battery.



Phase 1

Make sure that the gear selector lever **(ref.A fig.1)** of the tractor is in the neutral position.

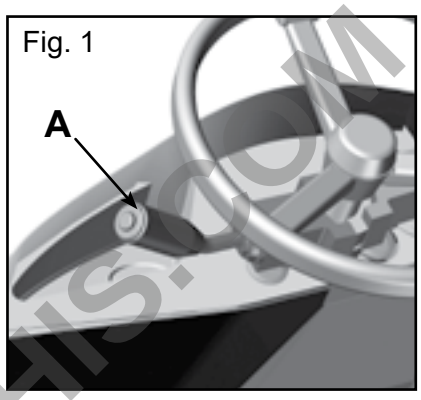


Fig. 1

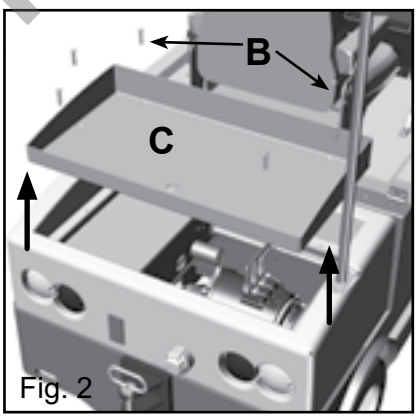


Fig. 2

Phase 2

FLAT HEAD SCREWDRIVER

Use a flat head screwdriver to loosen the 6 screws **(ref.B fig.2)** that secure the load plate **(ref.C fig.2)** to the bodywork and remove it.

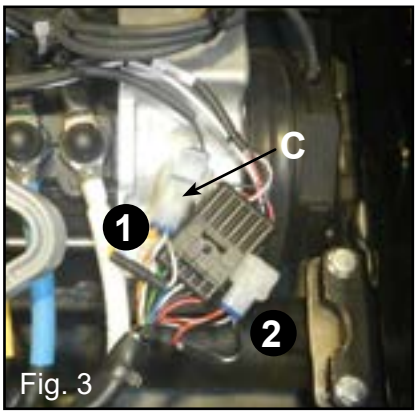


Fig. 3

Phase 3

Turn off the electromagnetic parking brake, disconnecting the connector (1) **(ref.C fig.3)** and connecting it to the connector (2) **(ref.D fig.4)**.

At this point the tractor can be moved.

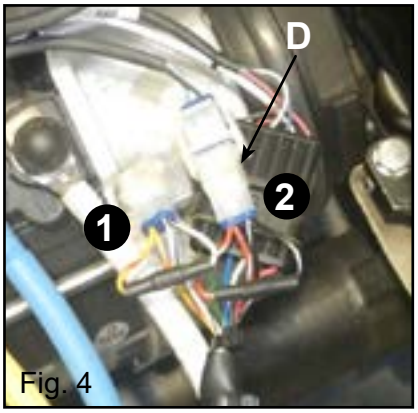


Fig. 4

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Alarm	Code MDI	Troubleshooting
KEY OFF SHORT	**76**	• Check that the battery has the same nominal voltage as the inverter. • Check the battery voltage, if it is out of range, replace the battery. • If the problem persists, replace the logic board.
Cause: The logic board measures a voltage on the key that is constantly out of range below the minimum allowed value.		
CONTACTOR OPEN	**77**	• The cables of the remote-control switch coil are interrupted or not connected, check the coil cabling. • The problem could also be connected to a remote-control switch contact that doesn't work. Try replacing the remote-control switch
Cause: The main remote-control switch coil is activated by the module, but the remote-control switch doesn't close.		
VACC NOT OK	**78**	• Check the wiring • Check the mechanical calibration and the operation of the accelerator potentiometer. • Acquire the maximum and minimum value of the potentiometer through the PROGRAM VACC function. • If the problem persists, replace the logic board.
Cause: The test is carried out with the tractor on, immediately after the traction requests have been disabled. This alarm occurs if the ACCELERATOR parameter reading in the tester menu is 1.0 V greater than the minimum value acquired during the PROGRAM VACC procedure.		
PROG VACC NOT OK	**78**	• Reprogram the VACC settings.
Cause: The accelerator pedal is not set correctly.		
FORW + BACK	**80**	When this warning message appears, the traction is stopped. • Check that the forward and reverse gear requests are not active at the same time. • Check the status of the FW and BW inputs using the TESTER function. • Check the wiring of the FW and BW inputs • Check for any faults with the microswitches. If the problem persists, replace the module.
Cause: This message only appears when both the (forward and backward) motion requests are activated at the same time.		
VACC OUT RANGE	**85**	• Acquire the minimum and maximum value of the potentiometer via the PROGRAM VACC function. If the alarm persists, check the mechanical calibration and the operation of the potentiometer. If the alarm persists, the fault is inside the module that must be replaced.
Cause: The value on the CPOT input read from the module is not included in the Vacc_min_max interval, programmed using the "PROGRAM VACC" function		
SAFETY INPUT	**86**	• Check the CAN#11 input, if it is connected to -Batt and the alarm is generated, the fault is in the SAFETY IN hardware circuit. Replace the module.
Cause: The safety input is open and as a result the main remote control switch is open and the coil of the electromagnetic brake or auxiliary devices is operated.		
POWER MOS. SHORTED	**89**	• Check that the motor phases are connected correctly. • Check that there is no ground dispersion for each phase of the motor. • If the problem persists, replace the module.
Cause: The DC-link voltage drops to zero when a MOSFET is activated.		

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		GENERAL SPECIFICATIONS		
Characteristics	1.1	Manufacturer (initials)		**Hyster**
	1.2	Model designation		**T7.0HS3**
	1.3	Power: electrical (battery or mains), diesel, LPG, petrol		Electric: Battery
	1.4	Operation: manual, pedestrian, standing, seated, order pickers		Seated
	1.5	Rated capacity/rated load	Q (t)	7.0
	1.7	Traction force	F (N)	1400 (6)
	1.9	Wheelbase	y (mm)	1080
Weight	2.1	Weight in service (1) (2) (3)	kg	1243
	2.2	Axle loading, with front/rear load (1) (2) (4)	kg	559 / 884
	2.3	Axle loading, without front/rear load (1) (2)	kg	559 / 684
Wheels, frame	3.1	Wheels: L=pneumatic, V= cushion, SE= superelastic	SE	SE
	3.2	Tyre size, front	ø (mm x mm)	376 x 114
	3.3	Tyre size, rear	ø (mm x mm)	376 x 114
	3.5	Wheel quantity (x= traction) (front/rear)		1/2 (x)
	3.6	Front track width	b_{10} (mm)	-
	3.7	Rear track width	b_{11} (mm)	882
Dimensions	4.7	Upper guard height (cab)	h_6 (mm)	2055
	4.8	Seat height in reference to the SIP (seat index point) specification / platform height	h_7 (mm)	1067
	4.12	Tow hitch height	h_{10} (mm)	345
	4.13	Loading, unloading height	h_{11} (mm)	670
	4.16	Loading surface length	l_3 (mm)	400
	4.17	Protrusion	l_5 (mm)	472
	4.17.1	Protrusion, cab	$l_{5.1}$ (mm)	0
	4.18	Loading surface width	b_9 (mm)	765
	4.19	Total length	l_1 (mm)	1950
	4.21	Overall width	b_1 / b_2 (mm)	1000
	4.32	Ford height, wheelbase centre	m_2 (mm)	120
	4.35	Turning radius	W_a F (mm)	1726
	4.35	Turning radius	W_a R (mm)	1089
	4.36	Internal turning radius	b_{13} (mm)	550
Performance	5.1	Travel speed, with load / without load	km/h	11 / 14
	5.1.1	Traverse speed, with load/without load, in reverse	km/h	5
	5.5	Traction speed, with load / without load	N	10045
	5.6	Maximum traction speed, with load / without load	N	10045
	5.7	Gradeability with/without load	%	6 / 25
	5.8	Maximum gradeability with / without load	%	6 / 25
	5.10	Operating brake		Hydraulic
Motor units	6.1	Drive motor, power S2 60 minutes	kW	4
	6.3	Battery according to DIN 43531/35/36 A,B,C, no		43531 / A
	6.4	Battery voltage/capacity K_5 at 5 hours	(V)/(Ah)	48 / 315 (7)
	6.5	Battery weight (5)	kg	548
	6.6	Consumption per VDI cycle (2012)	kWh/h	3.93
Traction	8.1	Traction control		AC-Controller
Additional data	10.7	Noise level at operator position	dB (A)	50.5

(1) Values referred to the version without cab

(2) Version without cab:

2.1	Weight in service (3)	kg	1414
2.2	Axle loading, with front/rear load (4)	kg	663 / 951
2.3	Axle loading, without front/rear load	kg	663 / 751

(3) With useful load:
T7.0HS3 1489 kg (without cab)
T7.0HS3 1619 kg (with cab)

(4) 200 kg useful load on the rear axle
(5) These values can vary by +/- 5%.
(6) On a flat and dry surface with rolling resistance of 200N / t.
(7) See “Batteries” table “Installation and Settings” section.

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SCHEDULED MAINTENANCE

● = check and maintenance
■ = operator check
x = replacement

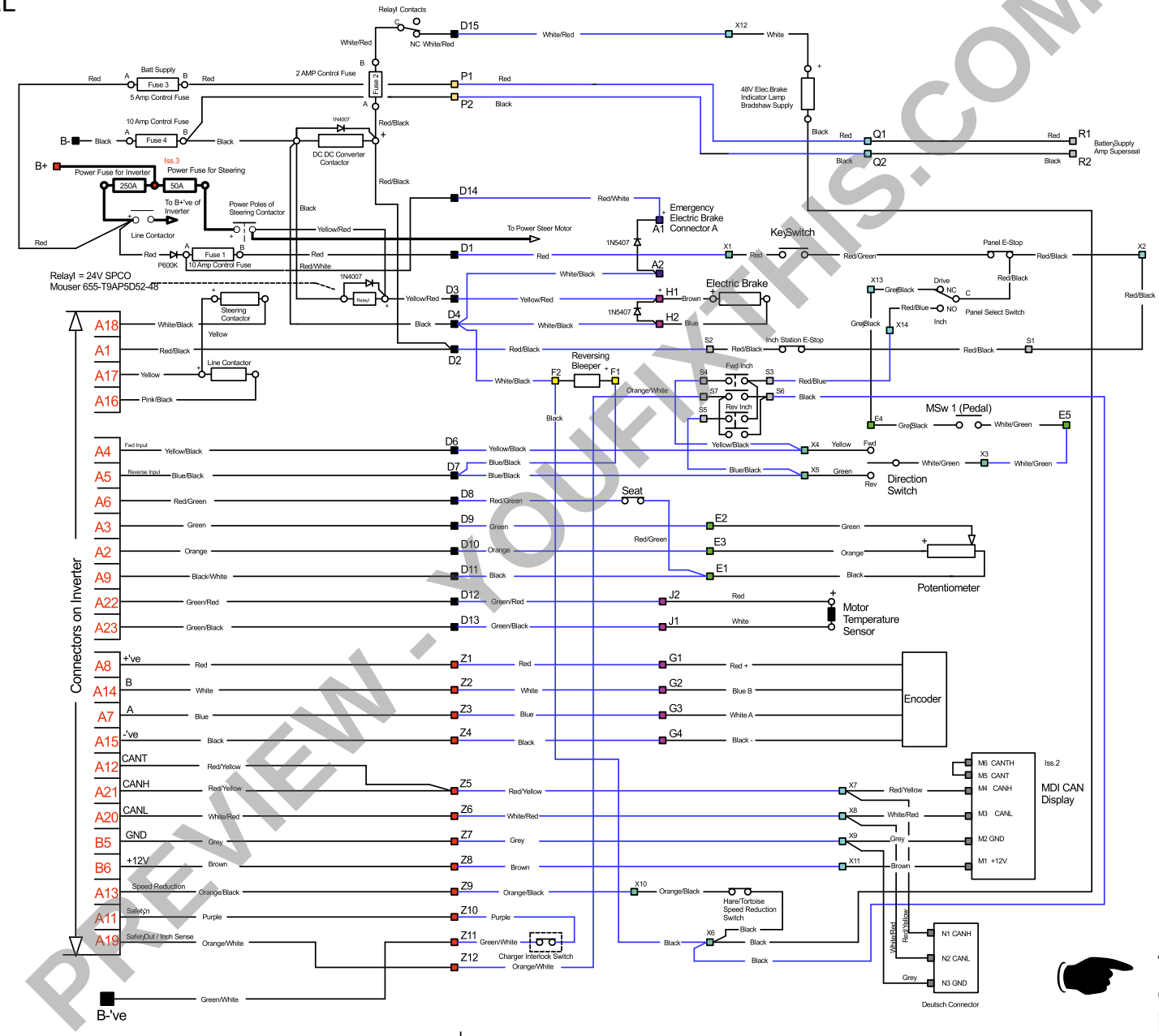
	Operation description	Maintenance intervals: 1 week every 25 hours	1 month every 100 hours	3 months every 300 hours	18 months every 1500 hours
CHASSIS	Chassis and cab check				●
BRAKING SYSTEM	Braking system check (3)			●	
	Braking system adjustment			●	
	Brake pipe check		■		
	Brake fluid level check		■		
	Brake cylinders, shoes and jaws check			●	
WHEEL TRACTION	Traction motor cables check			●	
	Motor/axle installation and tightening check			●	
	Axle pin, springs, bolts check			●	
	Check the rear axle oil level (3)			●	
	Rear axle oil change (1)				x
	Front bearings condition and wear check(2)				●
	Tyres condition, pressure and wear check (3)	■			
	Wheels bearings condition and wear check	■			
GREASING POINTS	Moving parts lubrication with grease			●	
	Greasing points lubrication			●	
STEERING WHEEL	Steering wheel joints, tubes and cylinders check			●	
	Front axle swivel support check (3) (5)			●	
	Electric steering wheel pump fluid check (4)		■		
	Electric steering wheel pump fluid condition (4)				x
	Steering wheel chain wear and tensioning check (5)			●	
SEAT	Seat fastening screws check			■	
	Battery / seat cover hinges check			■	
	Seat /seat belt conditions and operation check	■			
INSTRUMENTATION CONTROLS	Horn operation check	■			
	Emergency button operation check	■			
	Flashing light operation check	■			
	Turn indicator, braking and side lights operation check	■			
	Optional equipment check	■			
ELECTRONIC SYSTEM	Battery plug/socket integrity check	■			
	Contactors tips check			●	
	Control device connections and wiring check			●	
	Cleaning and tightening of all connections check			●	
BATTERY	Battery check and topping up (use only distilled water)	■			

(1) The first oil change must be carried out after the first 150 hours.
(2) Use grease suitable for wheel bearings
(3) The first check must be carried out after the first 30 hours.
(4) Only for model T8.0HS4
(5) Only for model T7.0HS3

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T8.0HS4 MODEL



15 Pole Connector D Panel RS 848-981 with Female Socket.
12 Pole Connector Z Panel RS 848-975 with Female Socket.

15 Pole Connector D. Loom RS 848-903 with Male Pin.
12 Pole Connector Z. Loom RS 848-896 with Male Pin.

The G and J connectors could be coupled into a single connector

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CORRECT METHOD FOR APPLYING FEMALE FITTINGS

To assure a reliable seal between female fittings and the adapters in this manual, it is necessary to observe the following procedure, which differs from the one for assembling rigid pipes.

Female fittings without a gasket (metal/metal joint)

Screw on the nut by hand and then, with the aid of a wrench, tighten by another quarter turn.

Female fittings with O-ring

Screw on the nut by hand and then, with the aid of a wrench, tighten by another half turn.

In every case make sure that the pipe is properly aligned before tightening the nut on the adapter.

TORQUE SETTINGS

METRIC REVOLVING FEMALE			
UNF thread	Outside diameter of the pipe	Torque setting Nm	
		Nominal torque	min / max
M 12x1.5	6	20	15 -25
M 14x1.5	8	38	30 - 45
M 16x1.5	8	45	38 - 52
	10		
M 18x1.5	10	51	43 - 85
	12		
M 20x1.5	12	58	50 - 65
M 22x1.5	14	74	60 - 88
	15		
M 24x1.5	16	74	60 - 88
M 26x1.5	18	105	85 - 125
M 30x2	20	135	115 - 155
	22		
M 36x2	25	166	140 - 192
	28		
M 42x2	30	240	210 - 270
M 45x2	35	290	255 - 325
M 52x2	38	330	280 - 380
	42		

REVOLVING FEMALE jic 37°			
UNF thread	Size	Torque setting Nm	
		Nominal torque	min / max
7/16-20	-4	15	9 - 21
1/2-20	-5	20	13 - 27
9/16-18	-6	30	18 - 42
3/4-16	-8	50	30 - 70
7/8-14	-10	69	44 - 94
1.1/16-12	-12	98	63 - 133
1.3/16-12	-14	118	73 - 163
1.5/16-12	-16	140	90 - 190
1.5/8-12	-20	210	135 - 285
1.7/8-12	-24	290	200 - 380
2.1/2-12	-32	450	300 - 600

BSP REVOLVING FEMALE		
UNF thread	Torque setting Nm	
	Nominal torque	max
G1/4	20	15 - 25
G3/8	34	27 - 41
G1/2	60	42 - 76
G5/8	69	44 - 94
G3/4	115	95 - 135
G1	140	115 - 165
G1.1/4	210	140 - 280
G1.1/2	290	215 - 365
G2	400	300 - 500

ORFS REVOLVING FEMALE			
UNF thread	Size	Torque setting Nm	
		Nominal torque	max.
9/16-18	-4	14	16
11/16-16	-6	24	27
13/16-16	-8	43	47
1-14	-10	60	68
1.3/16-12	-12	90	95
1.3/16-12	-14	90	95
1.7/16-12	-16	125	135
1.11/16-12	-20	170	190
2-12	-24	200	225
2-1/2-20	-32	460	490

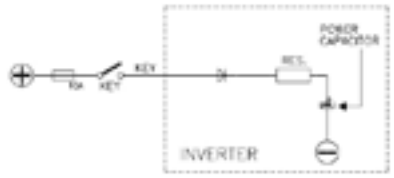
The values given in the tables refer to galvanized steel fittings. Fittings of other materials have other values.

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Alarm	Code MDI	Troubleshooting
LOGIC FAILURE #1	**54**	• The alarm can be caused by a key input signal characterized by a voltage below the threshold that could be due to external loads such as DC/AC converters start, relays or contactors switching on, activation or disabling of the solenoid valves. Remove these loads. • If no voltage is detected on the power supply line and the alarm is present each time the key is turned, the fault is probably in the hardware part of the module. Replace the module. • If the fault is displayed after the motor is started or after an acceleration or following a hydraulic request, check the batteries charge status and the electrical connections.
Cause: This alarm appears when the module detects an under voltage condition. The limit for the under voltage is 11 V for the 36/48V and 30 V modules for the 80V modules.		

LOGIC FAILURE #2	**55**	This type of failure is not connected to external components, so when it manifests itself the module needs replacing.
Cause: A fault in the hardware section of the logic card that oversees the retroaction of the phase voltage.		

CAPACITOR CHARGE	**60**	• Check that there is an external load in parallel with the capacitors, that lowers the module pre-charge circuit current, preventing its charging. Check if a lamp or a dc/dc converter or an auxiliary load is connected. • The charge resistance is open; add a power resistance over the remote-control switch terminals; if the alarm goes off it means that the module's internal charge resistance is damaged. Replace the module. • The charging circuit is faulty inside the module. Replace the module. • There's a problem in the module's power section. Replace the module.
Cause: To get a better understanding of the significance of this alarm, take a look at the following diagram:  When the key is turned on at ON, the inverter tries to load the condenser through the power resistance and check if the condenser has charged within a certain time frame. If the capacitor voltage is less than 20% of the nominal voltage of the battery, an alarm is generate and the general remote control switch is not closed.		

THERMIC SENS. NOT OK	**61**	This alarm is not connected to external components, it is necessary to replace the module.
Cause: The output value of the module heat sensor is out of the interval.		

TH.PROTECTION	**62**	• Check the temperature of the control. • If the alarm appears when the module is cold,there could be a fault in the thermal sensor and a fault in the logic card. In this case the control needs to be replaced.
Cause: This alarm appears if the temperature measured on the control heat sink is above 85°C. When this temperature is reached, the current is reduced proportionally to the increase in temperature up to the value of 0 Ampere corresponding to 105°C.		

MOTOR TEMP	**65**	Check the heat sensor inside the motor; check the ohms value of the sensor and the wiring. If the sensor is OK, improve the motor ventilation. If the alarm is present when the motor is cold, the problem is located inside the module, which must be replaced.
Cause: This warning appears when the temperature sensor is open or if the MAX MOTOR TEMP threshold has been exceeded.		

AUX COIL SHORT	**68**	• Check if a short-circuit or low-impedance occurred between NEB/NAUX (CNA#18) and -BATT • The circuit of the driver of the logic board is damaged. Replace the module.
Cause: The electromechanical brake or auxiliary solenoid coil driver is short-circuited		

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INSTALLATION - BATTERY REPLACEMENT

VERTICAL EXTRACTION

Equipment and tools



bridge crane load capacity 2000 kg



lift belt load capacity 2000 kg

Procedure

Before starting work, ensure that you are wearing suitable protective clothing.
Move the tractor to a safe place, away from areas of transit of other vehicles and pedestrians.



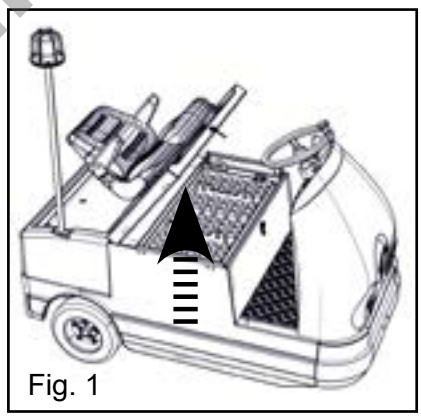


Fig. 1

Phase 1

Open the battery compartment cover **(Fig. 1)**

Phase 2

BRIDGE CRANE - LIFT BELTS

Hook the battery using the dedicated holes **(fig. 2 pos. A).**
Make sure you have disconnected and removed the battery cables
Ensure that the bridge crane **(fig. 2 pos. B)**, is positioned at right-angles to the battery
Lift the battery and position it at right-angles to the battery compartment.
Carefully lower the battery, making sure it is placed on a level surface, then release it.

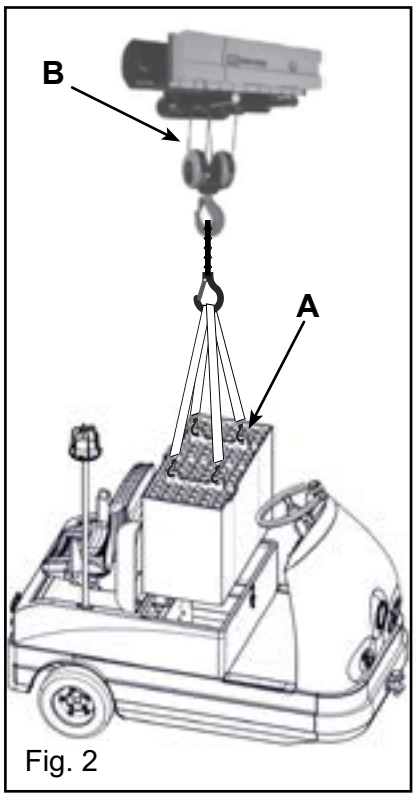


Fig. 2

CAUTION!
Pay attention to the hands when placing the battery in its compartment in order to avoid injury.
During this step, be careful not to pinch the battery cable between the battery and the tractor chassis.

Phase 3

Connect the battery to the electric system of the tractor and close the battery compartment cover

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Alarm	Code MDI	Troubleshooting
CURRENT GAIN	**92**	Check the internal motor connections (ohm continuity) Check the motor power cable connections. Check the leak to the tractor frame If the motor connections are OK, the problem is within the module, which must be replaced.
Cause: At start-up, the VMN feedback is not included in a range of allowed values around 2.5V		
WRONG 0 VOLTAGE	**92**	• Contact the technical support
Cause: The gain parameters of maximum current have default values, therefore the adjustment procedure of the maximum current has not yet been performed.		
ANALOG INPUT	**96**	If the problem appears regularly, the module needs replacing.
Cause: The analog/digital conversion has returned a negative value on all the signals converted for more than 400 msec. The aim of this diagnosis is to find a fault in the A//D converter or a problem in the code that omits the updating of the conversion of the analog signal.		
SLIP PROFILE	**99**	If this error occurs, the control needs to be replaced.
Cause: The deviation parameters of the hardware setting menu are not correct.		

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