Pinguely-Haulotte

CE

REPAIR MANUAL

SELF-PROPELLED PLATFORM
STAR 8 - HM10P (STAR 10)

242 031 9680 - E 07.04 GB

ISO 9001
GROUPE PINGUELY HAULOTTE

ARTICULEES MATS TELESCOPIQUES CISEAUX TRACTEES

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L'ACCES A L'ESPACE

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SUMMARY

GENERAL

This manual gives the information required for you to perform servicing and repair operations on certain pieces of equipment yourself.

However, we would like to bring your attention to the importance of:

- respecting the safety instructions concerning the machine itself, its use and its environment,
- use within the limits of its performance,
- correct servicing to ensure long service life.

During and after the guarantee period, our After-Sales service is available to perform any servicing operations you may require.

In this case, contact our local agency or our Plant After-Sales service, specifying the exact type of machine and its serial number.

To order consumables or spare parts, use the "Instructions for use and maintenace" manual and the "Spare parts" catalogue to order original parts, the only guarantee of interchangability and perfect operation.

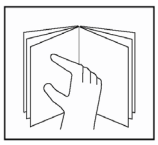
REMINDER: We would like to remind you that our machines comply with the clauses of the "Machines Directive", 89/392/CEE, dated June 14th 1989, modified by directives 91/368/CEE, dated June 21st 1991, 93/44/CEE, dated June 14th 1993, 93/68/CEE (98/37/CE) dated July 22nd 1993 and 89/336 CEE, dated May 3rd 1989; to directive 2000/14/CE and directive EMC/89/336/CE.

Caution!

The technical data in this manual is not binding and we reserve the right to make improvements or modifications without altering this manual.

1 - GENERAL RECOMMENDATIONS - SAFETY

1.1 - GENERAL WARNING



1.1.1 - Manual

This manual aims to help maintenance personnel service and repair the machine. It cannot, however, replace the basic training required by any person working on the site equipment.

The site manager must inform operators of the recommendations in the instruction manual. He is also responsible for application of current "user regulations" in the country of use.

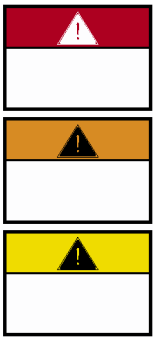
Before operating on the machine, it is essential to be familiar with all the recommendations in this manual and the user manual to ensure personnel and equipment safety.

1.1.2 - Labels

Potential dangers and recommendations for the machine are indicated on labels and plates. Read the instructions on them.

All labels conform to the following colour code:

- Red indicates a potentially fatal danger.
- Orange indicates a danger that may cause serious injury.
- Yellow indicates a danger that may cause material damage or slight injury.



Maintenance pesrsonnel must ensure that these labels and plates are in good conditions and keep them legible. Spare labels and plates can be supplied by the manufacturer on request.

1.1.3 - Safety

Ensure that any person entrusted with the machine is take the safety measures implied by its use.

Avoid any working mode that may affect safety. Any use that does not comply with the recommendations may generate risks and damage to people and equipment.

After intervention, maintenance personnel must check that the operator manual is present. This must be kept by the user throughout the machine's service life, even if it is loaned, rented or sold.

Ensure that all the plates or labels related to safety and danger are complete and legible.

Caution!
To attract the reader's attention, instructions are indicated by this standardised sign.

1.2 - GENERAL SAFETY RECOMMENDATIONS

1.2.1 - Operators

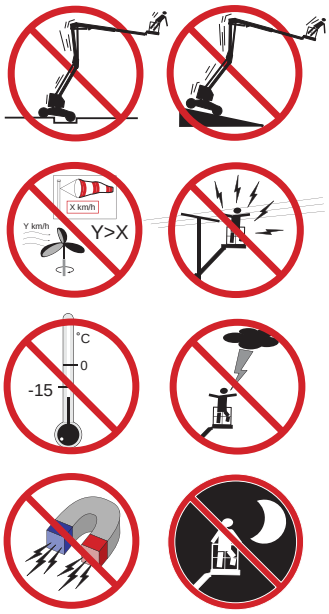
Operators must be aged 18 or over and hold an operating permit issued by the employer after verification of medical aptitude and the practical platform operation test.

Caution!
Only trained operators may use Haulotte self-propelled platforms.

There must be at least two operators present, so that one of them can:

- intervene rapidly if necessary,
- take over the controls in the case of accident or breakdown,
- monitor and prevent machines or people from circulating around the platform,
- guide the platform operator if necessary.

1.2.2 - Environment



Never use the machine:

- On soft, unstable or cluttered floors.
- On a floor with a tilt greater than the allowed limit.
- With a windspeed above the permitted level. In case of outdoor use, check that windspeed is lower or equal to the permitted level using an anemometer.
- Near electric lines (find out about minimum distances according to current). In temperatures of less than -15°C (in particular, in cold rooms); consult our service department if work is required in conditions below -15°C.
- In an explosive atmosphere.
- In an incorrectly ventilated area, as exhaust fumes are toxic.
- During storms (risk of being struck by lightning).
- At night if the machine is not equipped with an optional light.
- In the presence of intense electromagnetic fields (radar, mobile and high current).

DO NOT DRIVE ON THE PUBLIC HIGHWAY.

1.2.3 - Using the machine

It is important to ensure that in normal use, i.e. platform operation, the platform station selection key remains in the the platform position to enable control of the machine from the platform. If a problem occurs on the platform, a person present and trained in emergency/standby manoeuvres can help by putting the key in the ground control position.

Never use the machine with:

- a load greater than the nominal load,
- more people than the authorised number,
- lateral force in the platform greater than the level permitted,
- wind speed higher than the permitted level.

To avoid all risk of serious fall, operators must respect the following instructions:

- Hold the hand rails firmly when climbing onto or operating the platform.
- Wipe any traces of oil or grease off the steps, floor and hand rails.
- Wear protective clothing suited to working conditions and current local legislation, in particular when working in hazardous areas.
- Do not disable the safety system end of stroke contactors.
- Avoid contact with fixed or mobile obstacles.
- Do not increase working height by using ladders or other accessories.
- Never use the hand rails as a means of access for getting onto and off the platform (use the steps provided on the machine).
- Never climb on the hand rails when the platform is raised.
- Never drive the platform at high speed in narrow or cluttered areas.
- Never use the machine without installing the platform protective bar or closing the safety barrier.
- Never climb on the covers.

Caution!
Never use the platform as a crane, goods lift or elevator. Never use the platform or tow or haul.

To avoid risks of tipping over, operators must respect the following instructions:

- Do not disable the safety system end of stroke contactors.
- Avoid moving the steering control levers in the opposite direction, without stopping in the "O" position (to stop during a travel manoeuvre, move the manipulator lever gradually).
- Respect maximum load and maximum number of people authorised on the platform.
- Distribute the load evenly and place in the centre of the platform if possible.
- Check that the floor resists the pressure and load per wheel.
- Avoid contact with fixed or mobile obstacles.
- Do not drive the platform at high speed in narrow or cluttered areas.
- Do not drive the platform in reverse (inadequate visibility).
- Do not use the machine if the platform is cluttered.
- Do not use the machine with equipment or objects hanging from the hand rails.
- Do not use the machine with elements that may increase the wind load (e.g. panels).
- Do not perform machine maintenance operations when the machine is raised without setting up the required safety means (gantry crane, crane).
- Make daily checks and monitor proper operation during periods of use.
- Preserve the machine from any uncontrolled operation when it is not in service.

NB: *Do not tow the platform (it is not designed to be towed and must be transported on a trailer).*

1.3 - RESIDUAL RISKS

1.3.1 - Risks of jerky movements and tipping over

Caution!

The direction of travel can be reversed after a 180° turntable rotation. Take account of the colour of the arrows on the chassis compared with the direction of travel (green = forward, red = reverse) Thus, moving the manipulator in the direction of the green arrow on the control panel will move the machine according to the direction indicated by the green arrow on the chassis. Similarly, moving a manipulator in the direction of the red arrow on the control panel, will move the machine in the direction of the red arrow on the chassis

Risks of jerky movement and tipping over are high in the following situations:

- Sudden action on the controls.
- Overloading of the platform.
- Uneven ground (Be careful during thaw periods in winter).
- Gusts of wind.
- Contact with an obstacle on the ground or at a height.
- Working on platforms, pavements, etc.

Allow sufficient stopping distances:

- 3 meters at high speed,
- 1 meter at low speed.

Allow sufficient stopping distances: 3 metres at high speed and 1 metre at low speed.

Do not alter or neutralise any components connected in any way to the machine's safety or stability.

Do not place or fasten a load so that it overhangs the machine's parts.

Do not touch adjacent structures with the elevator arm.

1.3.2 - Electrical risk

Caution!

If the machine has a 220 V 16A max. plug, the extension must be connected to a mains socket protected by a 30 mA differential circuit breaker.

Electrical risks are high in the following situations:

- Contact with a live line (check safety distances before operation near electricity lines).
- Use during storms.

1.3.3 - Risk of explosion or burning

The risks of explosion or burning are high in the following situations:

- Working in explosive or inflammable atmosphere.
- Filling the fuel tank near naked flames.
- Contact with the hot parts of the motor.
- Use of a machine generating hydraulic leakage.

1.3.4 - Risks of collision

- Risk of crushing people in the machine operation zone (when travelling or manoeuvring equipment).
- The operator must assess the risks above him before using the machine.
- Pay attention to the position of the arms during turntable rotation.
- Adapt movement speed to conditions related to the ground, traffic, slope and movement of people, or any other factor that may cause a collision.
- When driving down the ramp of a truck, ensure sufficient space is available for safe unloading.
- Check brake pad wear regularly to avoid all risk of collision.

1.4 - INSPECTIONS

Comply with the national regulations in force in the country of machine use.

For FRANCE: Order dated 9 June 1993 + circular DRT 93 dated 22 September 1993 which specify:

1.4.1 - Periodic inspections

The machine must be inspected every 6 months in order to detect any defects liable to cause an accident.

These inspections are performed by an organisation or personnel specially designated by the site manager and under his responsibility (whether or not they belong to the company) Articles R 233-5 and R 233-11 of the French Labour Code.

The results of these inspections are recorded in a safety register kept by the site manager and constantly available to the labour inspector and the site safety committee (if one exists) and the list of specially designated personnel (Article R 233-5 of the French Labour Code).

Moreover, before each use, check the following:

- the operator's manual is in the storage compartment on the platform,
- the stickers are placed according to the section concerning "Labels and their positions",
- oil level and any elements in the mainteance operation table
- look out for any danaged, incorrectly installed, modified or missing parts.

NOTE : This register can be obtained from trade organisations, and in some cases from the OPPBTP or private prevention agencies.

The designated persons must be experienced in risk prevention (Articles R 233-11 or order n° 93-41).

No member of personnel is allowed to perform any check whatsoever during machine operation (Article R 233-11 of the French Labour Code).

1.4.2 - Examination of machine suitability

The manager of the site where the machine is operated must ensure the machine is suitable, i.e. capable of performing the work in complete safety, and in compliance with the operating manual. Furthermore, the French order of 9 June 1993 addresses problems relative to leasing, examination of the state of conservation, checking upon operation after repairs, and test conditions (static test coefficient 1.25; dynamic test coefficient 1.1). All users must consult this order's requirements and comply with them.

1.4.3 - State of conservation

Detect any deterioration liable to cause hazardous situations (concerning safety devices, load limiters, tilt sensor, cylinder leaks, deformation, welds, bolt tightness, hoses, electrical connections, tyre state, excessive mechanical gaps).

NOTE : If the machine is rented/leased, the user responsible for the machine must examine its state of conservation and suitability. He must obtain assurance from the leaser that general periodic inspections and pre-operation inspections have been performed.

1.5 - REPAIRS AND ADJUSTMENTS

These cover major repairs, and work on or adjustments to safety systems or devices (of a mechanical, hydraulic or electrical nature).

These must be performed by personnel from or working for PINGUELY-HAULOTTE who will use only original parts.

Any modification not controlled by PINGUELY-HAULOTTE is unauthorised.

The manufacturer cannot be held responsible if non-original parts are used or if the work specified above is not performed by PINGUELY-HAULOTTE-approved personnel.

1.6 - VERIFICATIONS WHEN RETURNING TO SERVICE

To be performed after:

- extensive disassembly-reassembly operation,
- repair affecting the essential components of the machine,
- any accident caused by the failure of an essential component.

It is necessary to perform a suitability examination, a state of conservation examination, a static test, a dynamic test (see coefficient in paragraph (see Chap 1.4.2, page 7).

Caution!
These test must be performed by a competent person.

1.7 - BEAUFORT SCALE

The Beaufort Scale of wind force is accepted internationally and is used when communicating weather conditions. It consists of number 0 - 17, each representing a certain strength or velocity of wind at 10m (33 ft) above ground level in the open.

Description of Wind		Specifications for use on land	MPH	m/s
0	Calm	Calm; smoke rises vertically	0-1	0-0.2
1	Light Air	Direction of wind shown by smoke	1-5	0.3-1.5
2	Light Breeze	Wind felt on face; leaves rustle; ordinary vanes moved by wind	6-11	1.6-3.3
3	Gentle Breeze	Leaves and small twigs in constant motion; wind extends light flag	12-19	3.4-5.4
4	Moderate Breeze	Raises dust and loose paper; small Branches are moved	20-28	5.5-7.9
5	Fresh Breeze	Small trees in leaf begin to sway; crested wavelets form on inland waterways	29-38	8.0-10.7
6	Strong Breeze	Large branches in motion; whistling heard in telephone wires; umbrellas used with difficulty	39-49	10.8-13.8
7	Near Gale	Whole trees in motion; inconvenience felt when walking against wind	50-61	13.9-17.1
8	Gale	Breaks twigs off trees; generally impedes progress	62-74	17.2-20.7
9	Strong Gale	Slight structural damage occurs (chimney pots and slates removed)	75-88	20.8-24.4

2 - PRESENTATION

Self-propelled platforms, models STAR 8 and HM10P (STAR 10) are designed for all types of overhead work within the limits of their characteristics and provided all the safety recommendations specific to the equipment and operating environment are respected.

The main control panel is situated in the platform.

The control panel situated on the tunrtable is to be used in emergencies or cases of machine failure.

technical characteristics

2.1 - STAR 8 / 10 TECHNICAL CHARACTERISTICS

	STAR 8	STAR 10
Load (Indoor / Outdoor)	200 kg -2 people / 160 kg - 1 person.	230 kg -2 people. / 120 kg - 1 person.
Maximum side force (Indoor / Outdoor)	40 kg / 20kg	
Working height	8,73 m	10 m
Floor height	6,73 m	8 m
Maximum reach	2,6 m	2,6 m
Turntable rotation	360° not continuous	
Maximum slope and tilt during operation	3° (approx. 5,2%)	
Platform floor dimensions	670 x 920 mm	
Maximum slope during travel	25%	
Low travel speed	0,7 km/h	
High travel speed	4,5 km/h	
Traction batteries	24V - in 2 trays	
Floor clearance	100 mm max. - (40 mm)	
Tyres	Solid tyres	
Turning radius: * Internal * External	 440 mm 1875 mm	
Mast telescoping stoke	3700 mm	4900 mm
Max. wind speed in operation (indoor / outdoor)	0 km/h / 45 km/h	
Max. pressure on the ground with useful load:concrete	16,5 kg/cm²	17 kg/cm²
Max. force on one wheel	1200 kg	1240 kg
Movement time with one person: * Turntable rotation (360°) * Mast telescoping : extend/retract (approx.) * Jib lifting : up / down (approx.)	 60 s 40 s / 27 s 26 s / 36 s	 60 s 46 s / 30 s 26 s / 36 s
Engine:· * Voltage· * Power * Consumption	separate energising 24V 1,2 kW 63A	
Hydraulic pump in operation volume	1 + 5,5 cm3/tr	
Hydraulic oil tank capacity	25 litres	
Hydraulic operating pressure*: * max steering pressure * max orientation pressure * max mast extension telescoping pressure * max jib lifting pressure	 160 bars 50 bars 45 bars 160 bars	 160 bars 50 bars 45 bars 160 bars
Tightening torque of steering wheel nuts	29 daNm	
Tightening torque of drive wheel nuts	29 daNm	
Tightening torque of slew ring nuts	13,5 daNm	
Weight	2515kg	2575 kg

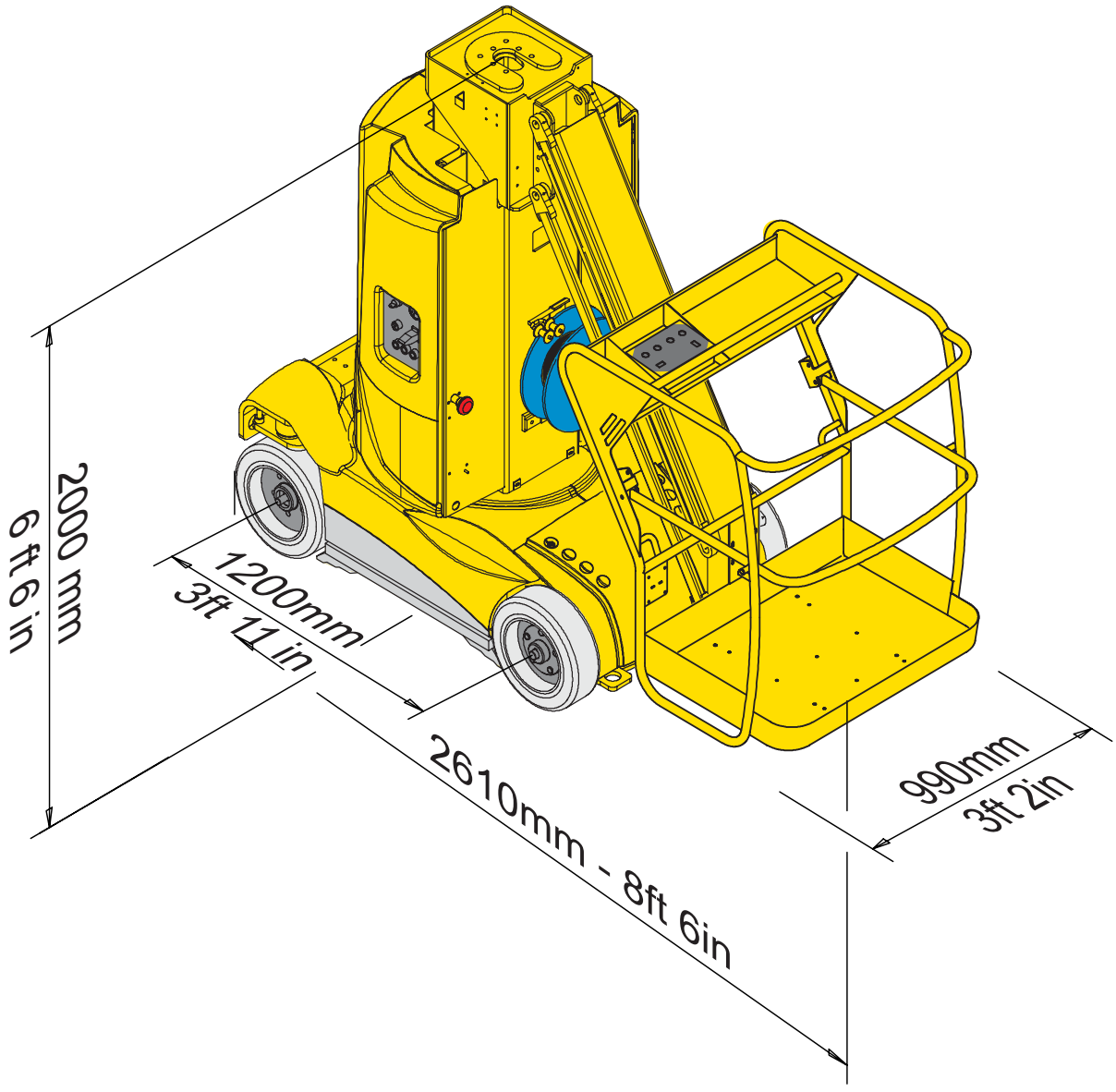
All pressures can be checked by means of a tap.

- Jib movement, lifting, telescoping, orientation : hydraulic electro-pump.
- Steering by electro-distributing valve.

Two drive wheels with braked reducing gears and electric motors controlled by choppers.

2.1.1 - Dimensions

Fig. 1 - Dimensions



2.2 - TIGHTENING TORQUE

2.2.1 - Tightening torque for large thread screws

Nominal diameter	Tightening torque in N.M		
	8.8	10.9	12.9
M 6*1	9 à 11	13 à 14	15 à 17
M 7*1	15 à 19	21 à 24	26 à 28
M 8*1.25	22 à 27	31 à 34	37 à 41
M 10*1.5	43 à 45	61 à 67	73 à 81
M 12*1.75	75 à 94	110 à 120	130 à 140
M 14*2	120 à 150	170 à 190	200 à 220
M 16*2	190 à 230	260 à 290	320 à 350
M 18*2.5	260 à 320	360 à 400	440 à 480
M 20*2.5	370 à 450	520 à 570	620 à 680
M 22*2.5	500 à 620	700 à 770	840 à 930
M 24.3*3	630 à 790	890 à 990	1070 à 1180
M 27*3	930 à 1150	1300 à 1400	1560 à 1730
M 30*3.5	1260 à 1570	1770 à 1960	2200 à 2350

2.2.2 - Tightening torque for fine thread screws

Nominal diameter	Tightening torque in N.M		
	8.8	10.9	12.9
M 8*1	24 à 29	33 à 37	40 à 44
M 10*1.25	46 à 57	64 à 71	77 à 85
M 12*1.25	83 à 100	120 à 130	140 à 150
M 14*1.5	130 à 160	180 à 200	220 à 240
M 16*1.5	200 à 250	280 à 310	340 à 370
M 18*1.5	290 à 360	410 à 450	490 à 540
M 20*1.5	410 à 510	570 à 630	690 à 760
M 22*1.5	550 à 680	780 à 870	920 à 1000
M 24*1.5	690 à 860	970 à 1070	1160 à 1290
M 27*2	1000 à 1300	1400 à 1560	1690 à 1880
M 30*2	1400 à 1700	1960 à 2180	2350 à 2610

2.2.3 - Tightening torque for hydraulic hoses

Description - Drawing N° A14706	*Torque to apply (Nm) min - max*
Ref. 7 - Hose SP 5238 - Lg 2060	10-15
Ref. 8 - Hose SP 5008 - Lg 530	10-15
Ref. 9 - Hose SP 5238 - Lg 1640	10-15
Ref. 10 - Hose SP 2361 - Lg 1450	60-80
Ref. 11 - Hose SP 449 - Lg 670	80-100
Ref. 12 - Hose SP 5025 - Lg 400	80-100
Ref. 13 - Hose SP 5008 - Lg 1300	10-15
Ref. 14 - Hose SP 5008 - Lg 550	10-15
Ref. 47 - Hose SP 5028 - Lg 500	60-80
Ref. 53 - Hose SP 2361 - Lg 700	60-80
Ref. 54 - Hose SP 1663 - Lg 610	40-50
Ref. 68 - Hose SP 1786 - Lg 500	25-35
Ref. 69 - Hose SP 1756 - Lg 350	25-35

2.3 - PRESSURE TABLE (IN BARS)

General	Steering	Rotation	Lifting
160	160	50	45

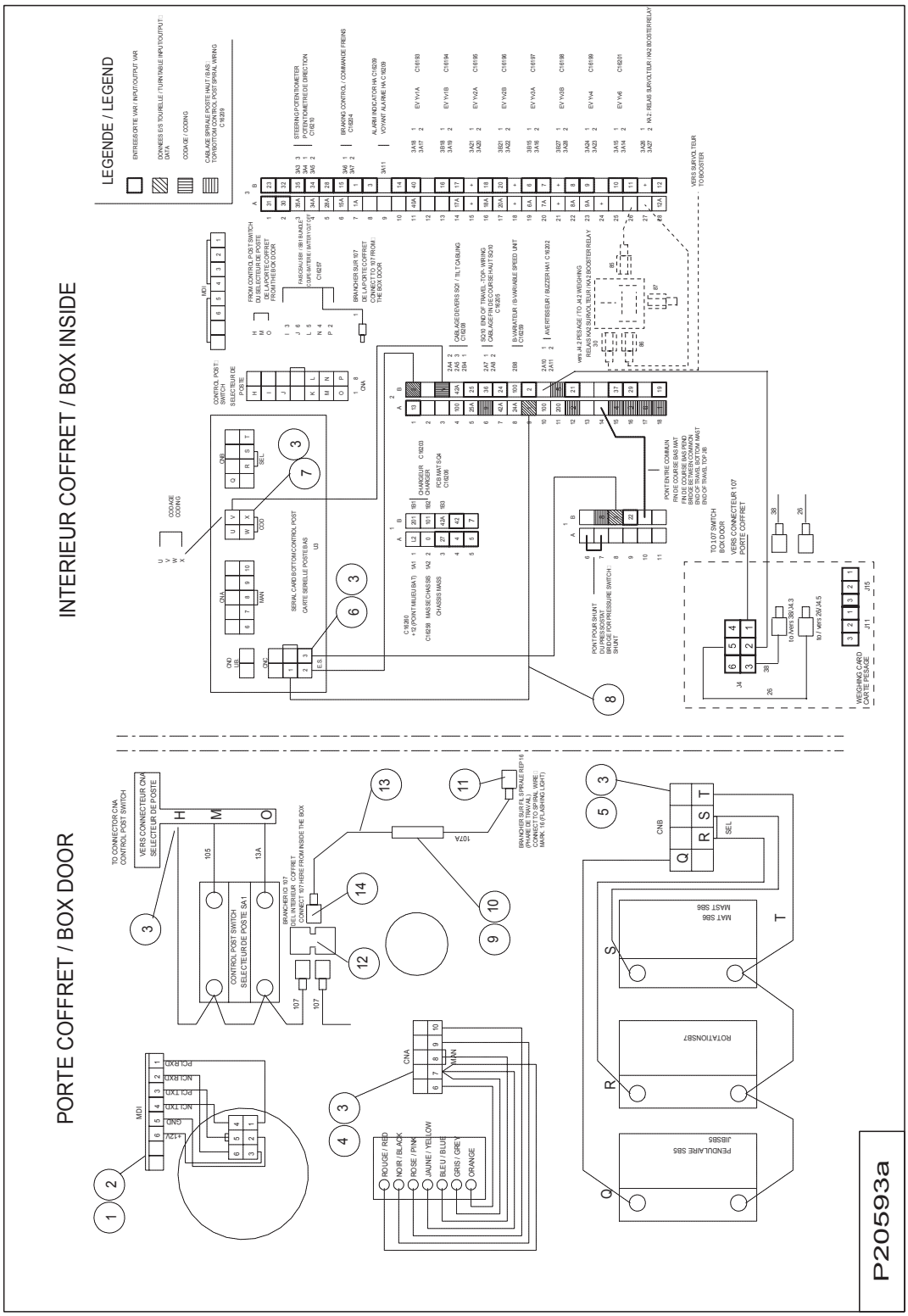
2.4 - TABLE OF ADJUSTMENT TIMES

Movement	*Movement duration*
Micro speed - Mast up	50 s +/- 2s for 10m
Forward gear - High speed - Mast and jib lowered	8 s +/- 1s for 10m
Reverse gear - High speed - Mast and jib lowered	8 s +/- 1s for 10m
Braking distance - High speed - Mast and jib lowered	70cm +/- 20cm
Slew ring orientation - Right to left - Mast and jib lowered	60s +/- 2s
Right to left steering - Mast and jib lowered	4s +/- 1s
Mast lifting with useful load on platform - STAR 8	42s
Mast lifting with useful load on platform - STAR 10	46s +2s / -3s
Jib lifting with useful load on platform	26s +2s / -3s

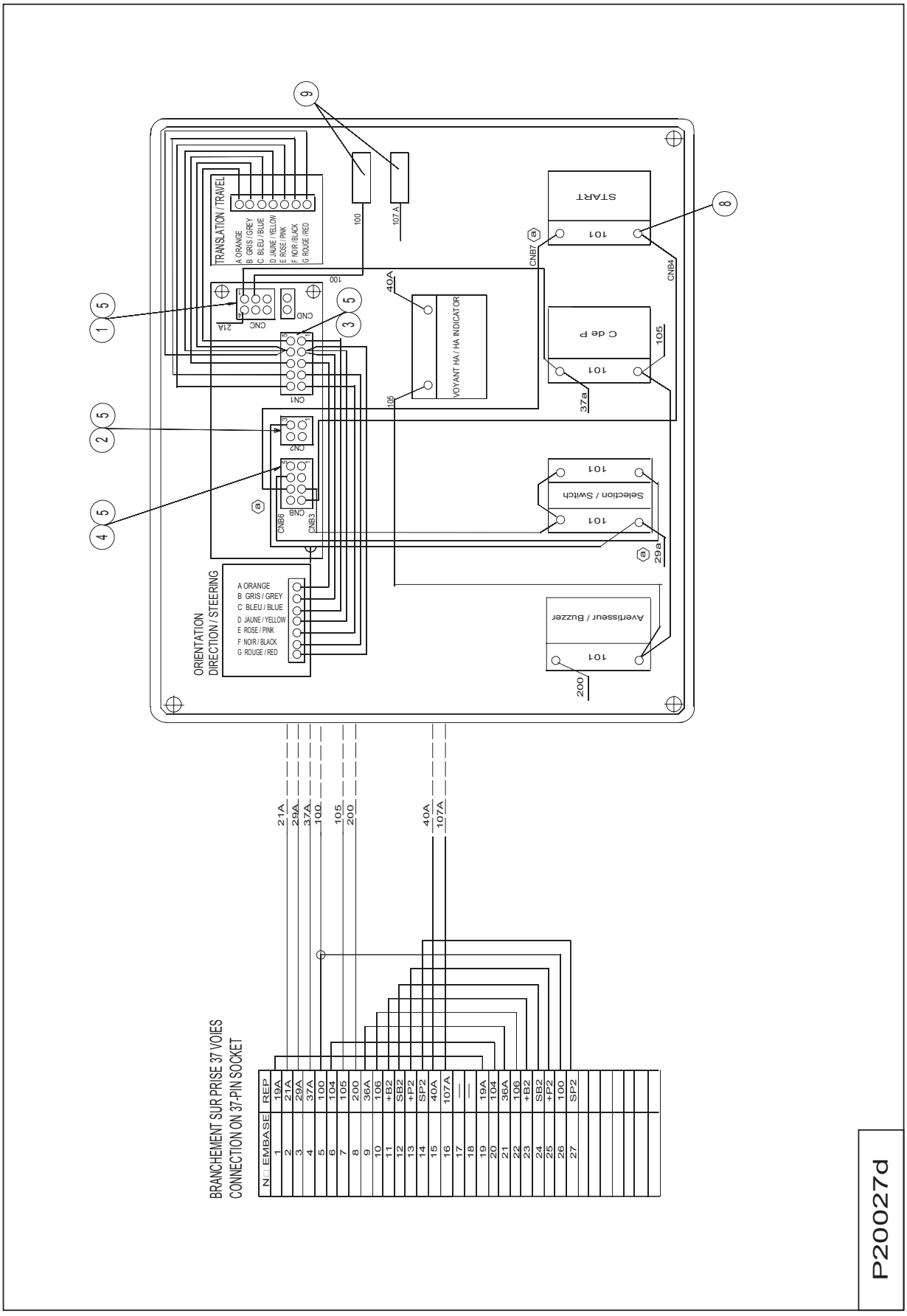
3 - WIRING DIAGRAMS

3.1 - ELECTRIC CASINGS WIRING DIAGRAMS

3.1.1 - Turntable box wiring diagram : P20593a :

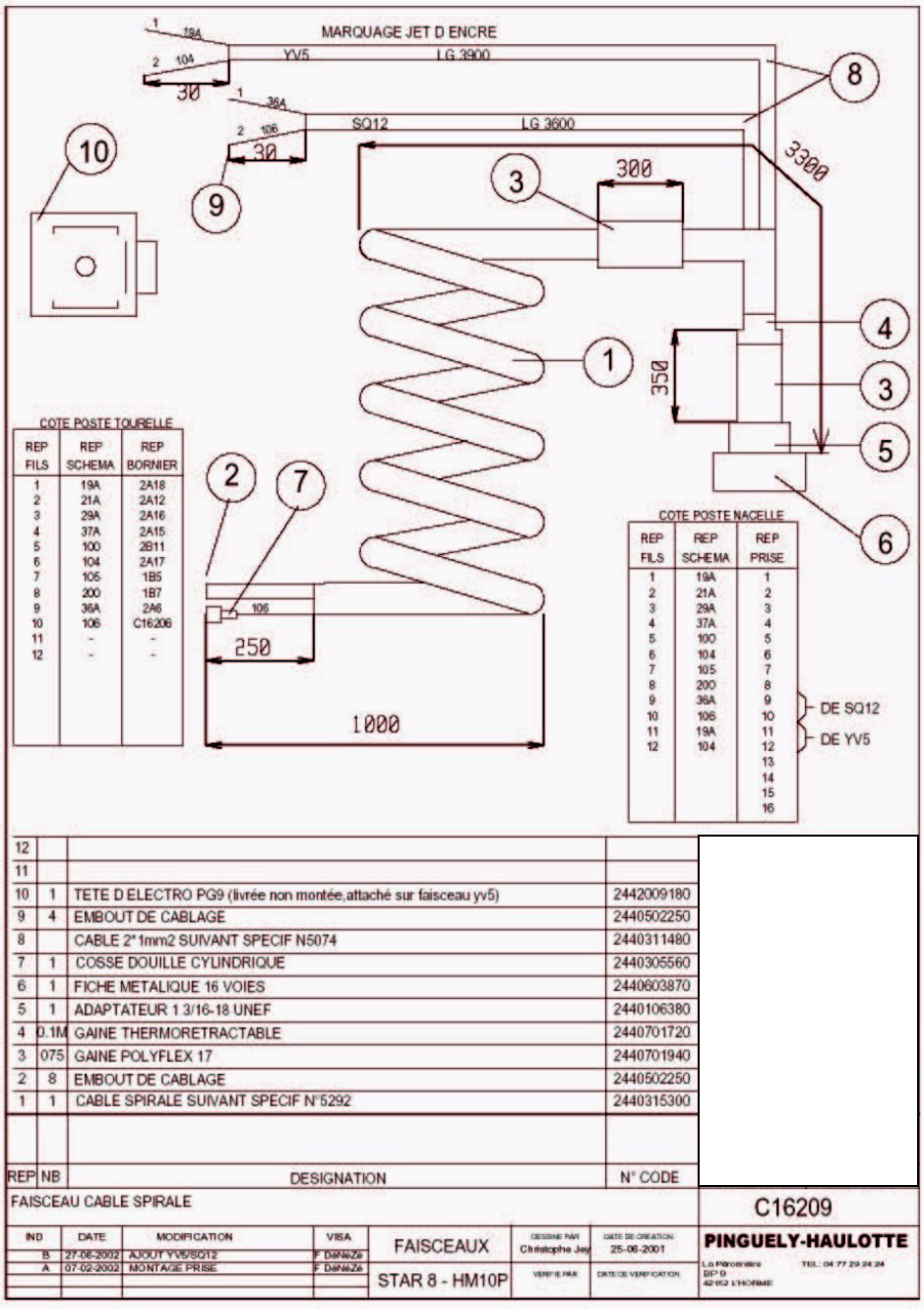


3.1.2 - Platform box wiring diagram: P20027d



The above diagrams along with the list of their components are included in the spare parts manual.

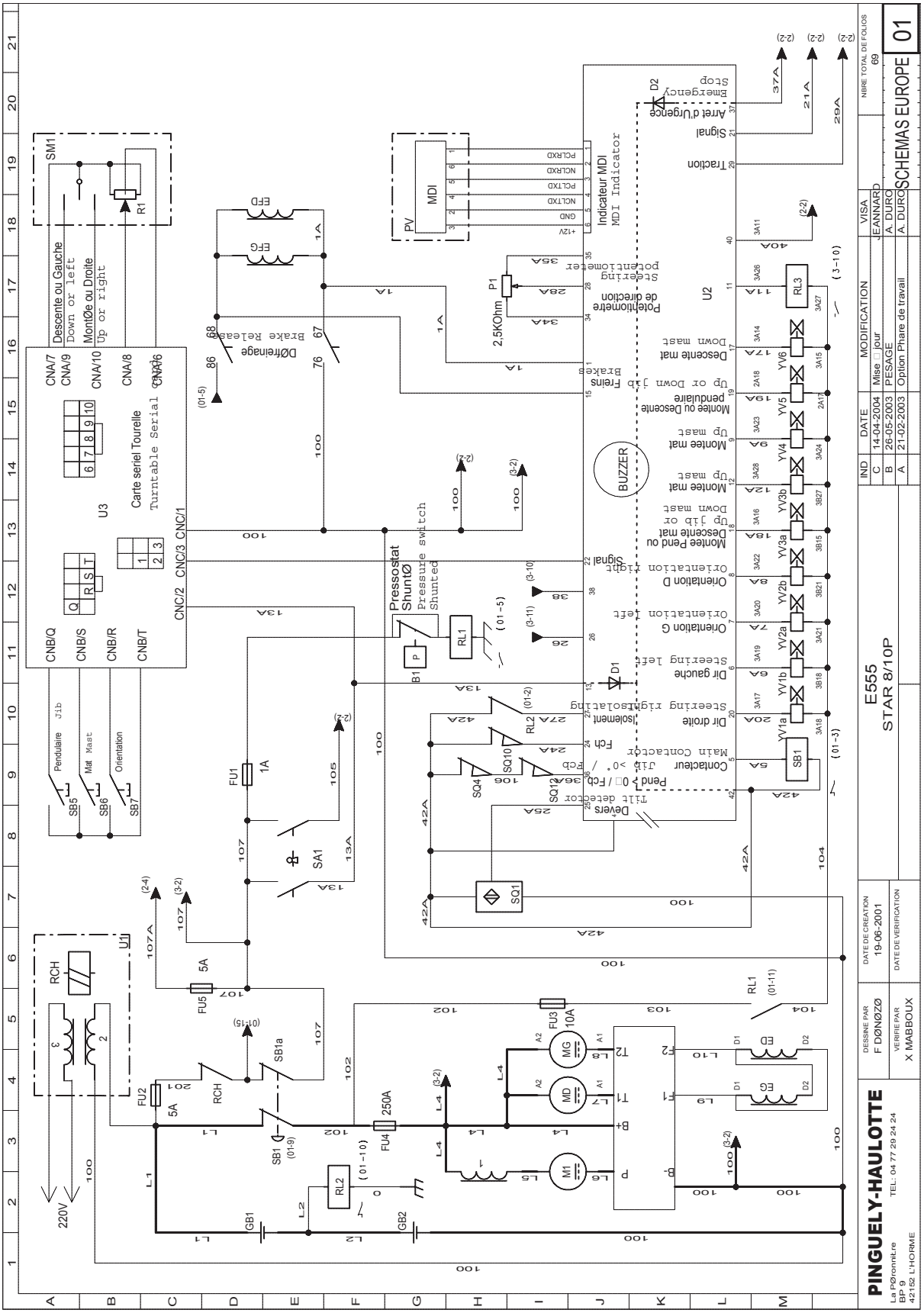
3.2 - BUNDLE : DIAGRAM C16209



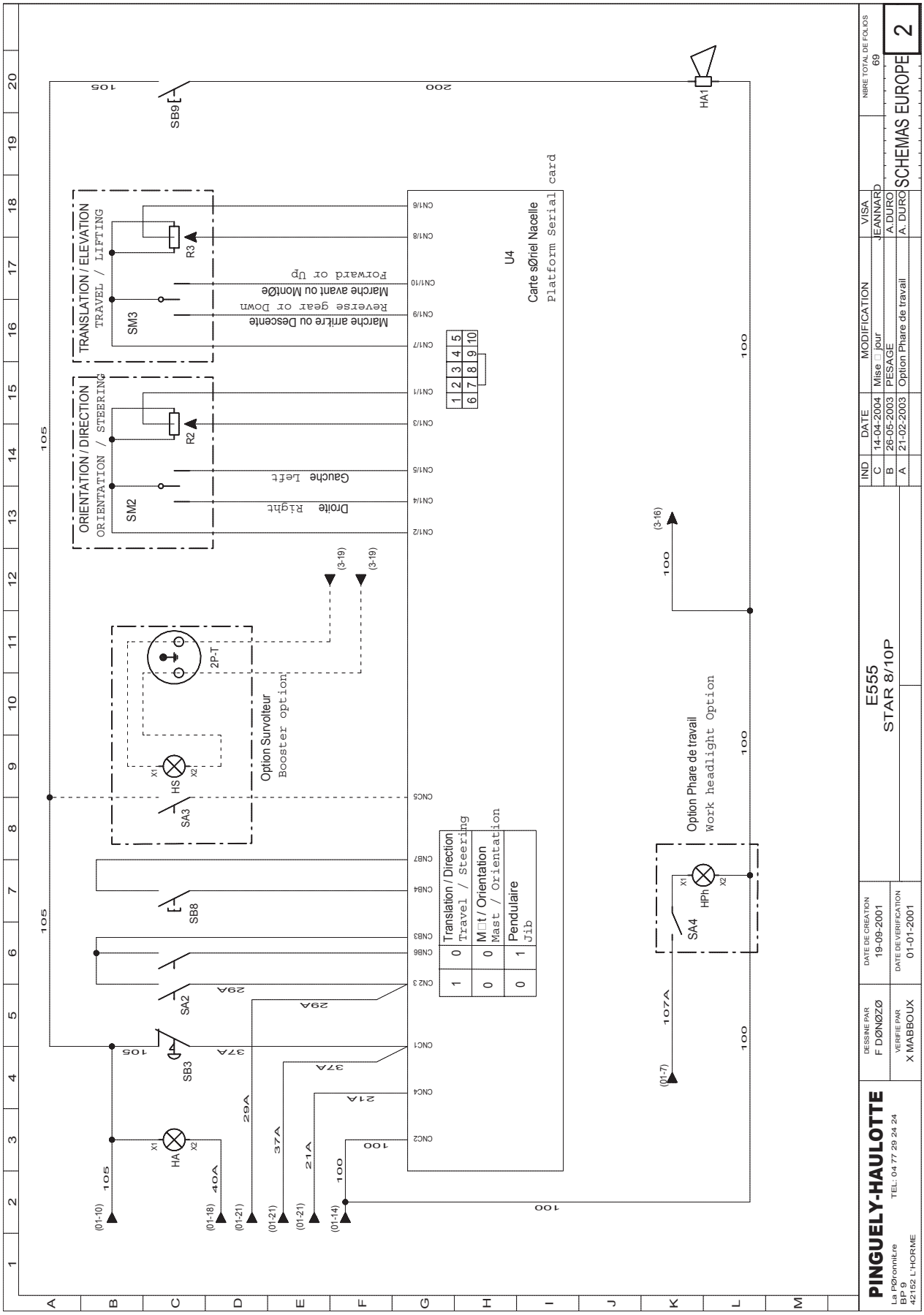
Ref	Qty	Description	Haulotte reference
10	**1**	Electro head (delivered not fitted, tied on YV5 bundle)	2442009180
9	4	Cabling end fittings	2440502250
8		Cable 2*1mm2 according to specification N5074	2440311480
7	1	Cylindrical socket lug	2440305560
6	1	16 pin metal plug	2440603870
5	1	Adaptor 1 3/16-18 UNEF	2440106380
4	1	Thermoretractable sheath (0.31m)	2440701720
3	1	Polyflex 17 sheath	2440701940
2	2	Cabling end fittings	2440502250
1	1	Spiral cable according to specification N°5292	2440315300

3.3 - WIRING DIAGRAMS E555C

3.3.1 - E555C-01



3.3.2 - E555C-02


TRANSLATION / ELEVATION
TRAVEL / LIFTING
ORIENTATION / DIRECTION
ORIENTATION / STEERING
SM3
SM2
R3
R2
Marche arrière ou Descente
Reverse gear or Down
Marche avant ou Montée
Forward or Up
Gauche Left
Droite Right
U4
Carte sÛriel Nacelle
Platform Serial card
Option Survolteur
Booster option
Option Phare de travail
Work headlight Option
Translation / Direction
Travel / Steering
Mât / Orientation
Mast / Orientation
Pendulaire
Jib
E555
STAR 8/10P
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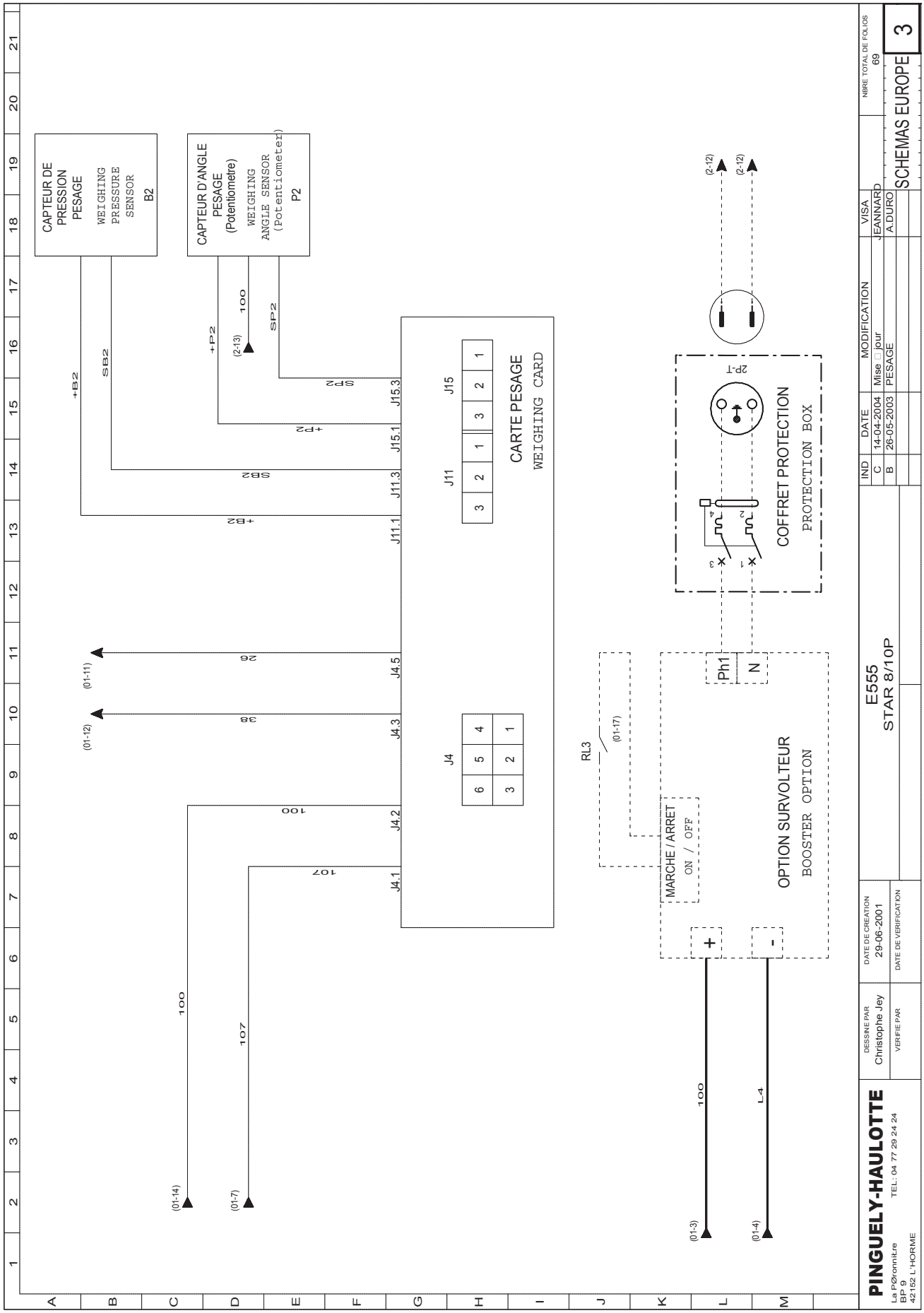
MODIFICATION
VISA
C 14-04-2004 Mise jour JEANNARD
B 26-05-2003 PESAGE A.DURO
A 21-02-2003 Option Phare de travail A. DURO
NBRE TOTAL DE FOLIOS
69
2

3.3.3 - E555C-03


CAPTEUR DE PRESSION PESAGE
WEIGHING PRESSURE SENSOR
B2
CAPTEUR D'ANGLE PESAGE (Potentiometre)
WEIGHING ANGLE SENSOR (Potentiometer)
P2
CARTE PESAGE
WEIGHING CARD
J11
J15
J4
COFFRET PROTECTION
PROTECTION BOX
OPTION SURVOLTEUR
BOOSTER OPTION
MARCHE / ARRET
ON / OFF
RL3
Ph1
N
2P-T
E555
STAR 8/10P
SCHEMAS EUROPE
PINGUELY-HAULOTTE
DESSINE PAR
Christophe Jey
DATE DE CREATION
29-06-2001
VERIFIE PAR
DATE DE VERIFICATION
IND
DATE
MODIFICATION
VISA
C 14-04-2004 Mise à jour J.ANNARD
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NBRE TOTAL DE FOLIOS 69
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4 - SAFETY SYSTEMS

4.1 - MACHINE ELEMENTS

4.1.1 - Motors

M1	Motorpump
MD	Right traction motor
MG	Left traction motor
EFG	Left electro brake
EFD	Right electro brake
ED	Left energising
ED	Right energising

4.1.2 - Power supplies and fuses

FU1 1A	Overload protection
FU2 5A	Control protection
FU3 10A	Electrovalve protection
FU4 250A	Power supply fuse
FU5 5A	Work headlight protection (option)

4.1.3 - Control inputs

SA1	Station selection switch (turntable panel)
SA2	Movement selection switch (platform panel)
SB1	Emergency stop ; line contactor
SB3	Emergency stop ; platform
SB5	Jib control (turntable panel)
SB6	Mast control (turntable)
SB7	Turntable rotation control
SB8	Platform movement validation
SB9	Horn (platform)
SM1	Turntable up/down, orientation manipulator
SM2	Platform orientation, steering manipulator
SM3	Platform travel manipulator
	Brake release control (option)

4.1.4 - Safety inputs

SQ1	Tilt
SQ4	Tilt reset / jib safety system > 0°
SQ10	Top end of travel safety sensor (mast)
SQ12	Tilt reset / Bottom end of travel safety sensor (mast)
B2	Pressure sensor (weighing)
P1	Steering potentiometer
P2	Angle sensor (weighing)

4.1.5 - Relays

RL1	Overload relay (inactive)
RL2	Insulation relay
RCH	Internal charger relay

4.1.6 - Electrovalve logic outputs

YV1a	Right steer
YV1b	Left steer
YV2a	Left orientation
YV2b	Right orientation
YV3a	Jib up or mast down
YV3b	Mast up
YV4	Mast up
YV5	Jib down or jib up
YV6	Mast down

4.1.7 - Management elements

U1	Charger
U2	Chopper
U3	Turntable serial card
U4	Platform serial card

4.1.8 - Sound indicator

H1	Platform buzzer

4.1.9 - Light indicators

PV	Hourmeter : battery indicator
HA	Weighing or tilt light indicator
HPh	Work headlight

5 - WEIGHING DEVICE

Weighing system including :

- - Electronic card – ref: 244 030 9330
- - Angle sensor – ref: 244 030 9350
- - Pressure sensor – ref: 244 030 9340
- - Training control – ref: 244 030 9320

Electronic card able to:

- -detect a single and only threshold at 115% of nominal charge > Visual and sound signalling + cut off of all movements.
- -transmit a piece of information to the chopper in order to slow down jib raising on reaching the upper stop so as to avoid abrupt stops.

5.1 - FUNCTIONING PRINCIPLE

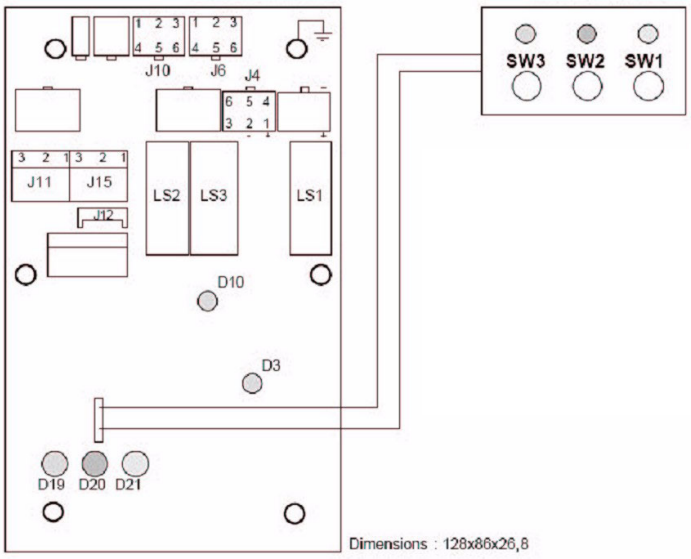
This device measures non-stop 2 physical values:

- -the pressure in the jib cylinder's chamber
- -the chassis/jib angle.

It determines during a training test, the pressure normal value according to the jib angle, without load and loaded at 115%. When detecting a pressure value which is too high compared to the one reported during the first test with105% load, the system interprets it as an overload and gives the alarm to inform the user.

5.2 - WEIGHING CARD

5.2.1 - Characteristics



2 outputs in order to obtain logical combinations interpreted by the chopper
- J 4.3
- J 4.5
J11 : pressure sensor connection
J15 : angle sensor connection

Card supply: 24Vdc

Supplied power: 4-20mA loop for pressure angle.
5Vdc for angle sensor

5.2.2 - Environment

- Varnished card: welding points are insulated.
- Radiated emissions:
  - Radiated emissions must comply with the 95/54/CE European directive.
- Radiated sensitivity:
  - Radiated sensitivity must comply with ISO 11452-5 and ISO 11452-2.

5.2.2.1 -Climatic environment:

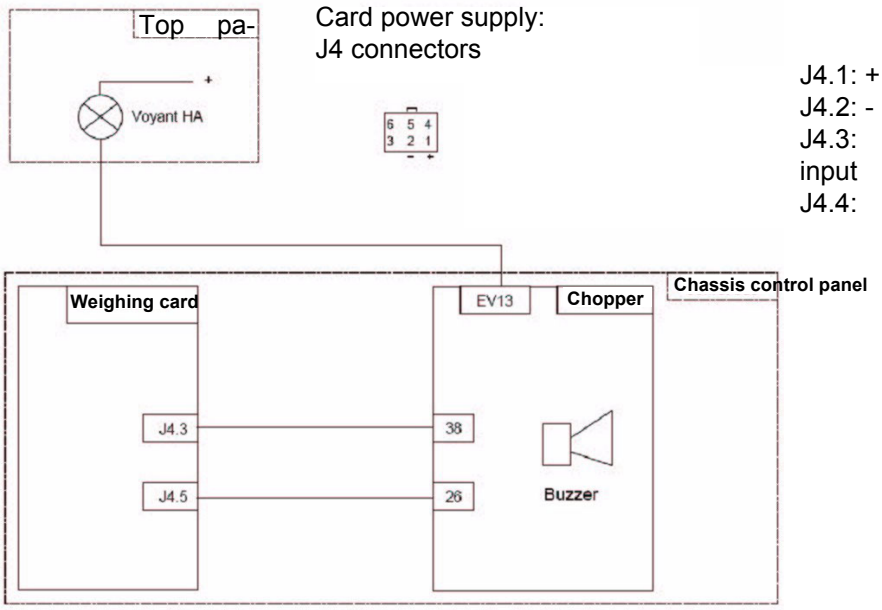
The new system's protective treatment must at least comply with the most demanding features defined by the TH indicator or Pinguely Haulotte's demands.

• Temperature during use:-	• -40°C/+85°C (negotiable)
• Store temperature:	• -40°C/+90°C
• Maximum specific humidity:	• 39g water/kg dry air (±40°C / 80%HR)
• Useful specific humidity:	• +30°C ±5°C / 60% ±10% HR
• Atmospheric pressure:	• 95000 Pa ± 10000 Pa
• Saline fog:	• Must resist saline fog as defined by: - 5% NaCl for 72 hours (NFX 41002)
• Protection indicator:	• IP67
• Chemical aggression:	• The device must resist the following agents: Oil, gasoil, standard acids, solvents and stain removers, standard industrial cleaning products (acetone, white spirit …), human perspiration, etc...

5.2.2.2 -Mechanical environment:

- Vibrations:
  - DIN IEC 68-2-34 (random vibrations), 2 hours in the three directions of an orthostandardized system at 5.58 g, 50Hz to 200 HZ.
- Shocks
  - DIN IEC 68-2-27, 50g for 11m, 3 shocks in each direction of an orthostandardized system for a total of 18 shocks.

5.3 - CABLING



J11			J15		
Terminal	Meaning	Notes	Terminal	Meaning	Notes
1	Positive	Red	1	Positive	Red
2	-	Black	2	Negative	Black
3	4-20 mA signal	White	3	Sensor signal	White

5.4 - SENSORS

5.4.1 - Pressure sensor

- Operating pressure : 250 bars
- Maximum pressure : 1500 bars
- Output : 4-20mA
- Power supply voltage rating : 9-34 Vdc
- Precision : 9 - 34Vdc
- Tolerated temperature range : -40°C / + 85°C
- Protection grade : IP 67
- Construction material : stainless steel

5.4.2 - Angle sensor

- Power supply : 5 to 30 Vdc
- Maximum angle measured : 320°
- Linearity : ± 2.0% FS
- Maximum power draw : 0.18 W
- Resistance : 5 k Ohm
- Working temperature : -20°C à 70°C
- Standard connecting cable : approx. 4 m
- Standard protection grade : IP 65
- Weight : 0.25 kg.

5.5 - OUTPUTS FUNCTIONING

J4.3: 3 state output >> 0V – 16V- 24V

J4.5: 2 state output >> 0V – 24V

J4.5	J4.3	
0V	0V	• Overload > 115%
0V	16V	• Impossible
0V	24V	• Low position end of travel : lowering forbidden
24V	0V	• Top position end of travel : raising forbidden
24V	16V	• Raising at low speed (ramp) : slow down threshold is reached.
24V	24V	• Normal functioning

Overload always has priority.

5.6 - TRAINING

- 1.Read all the paragraphs listed below before starting the procedure.
- 2.Cut off the card's supply.
- 3.Set the J14 adjustment jump.
- 4.Remove all load from the platform.
- 5.Switch the card on and wait for at least 15 seconds.
- **6.Starting the adjustment phase:** Press the SW2 button for at least 3 seconds; the D20 red led comes on.
- 7.Perform at least one complete raising/lowering cycle so as to bring the oil to the normal temperature (ie as during operation).
- 8.Activate the lowering control every now and then in order to completely discharge the hydraulic pressure.
- **9.Sensors' zero:** Press the SW3 button. Meanwhile, the green led comes on as confirmation.
- **10.Maximum height acquisition:** Activate the raising command and reach the top height – *never stop activating the raising control in the mean time*.
- 11.Press the SW1 rapidly (no longer than one second) so as to memorise the maximum height. The yellow led comes on as confirmation while you press the button.
- **12.Pression acquisition - unloaded**: Activate the lowering control up to the rest position. The system must stop at mid-height approximately. Keep activating the lowering control even during the momentary interruption.
- 13.Load the adjustement weight (115% nominal charge).
- **14.Static pressure values acquisition:** Activate the raising control up to the maximum height. The system will automatically perform intermediate stops.
  - ***Caution! Never activate the lowering control before reaching the maximum height.***
- 15.Activate the lowering control and bring once more the platform back to the maximum height.
- 16.Activate the descent control every now and then in order to completely discharge the hydraulic pressure.
- **17.Dynamic pressure values acquisition during lifting**: Activate the raising control up to the maximum height. ***Caution! Do not interrupt this phase!***
- **18.Dynamic pressure values acquisition during lowering**: Activate the lowering control and bring once more the platform back to the maximum height. ***Caution! Do not interrupt this phase!***
- 19.Towards the end of the lowering phase, the system automatically gets out of the previous adjustements and the LD20 red led goes out.
- 20.Switch the card off.

- 21.Remove the adjustment jump.
- 22.Switch the system back on and check that it functions correctly: bring the system to give the alarm and check that the state of J4.3-J4.4 or J4.5-J4.6 changes. Also check that the system stops before the top and the low position end of travel.

5.7 - ERRORS SIGNALLING

5.7.1 - Sensors' errors – D19 green LED

Number of flashes	Meaning
-	• No error.
1	• Sensor n°1 line error (pressure transducer, J11 terminal block).
2	• Sensor n°2 line error (angle transducer, J15 terminal block).
3	• Pressure value is too low.
4	• Angle value is too low.
5	• Pressure value too low compared to the angle.
6	• Pressure value too high at zero angle.

5.7.2 - Card related errors – D21 yellow LED

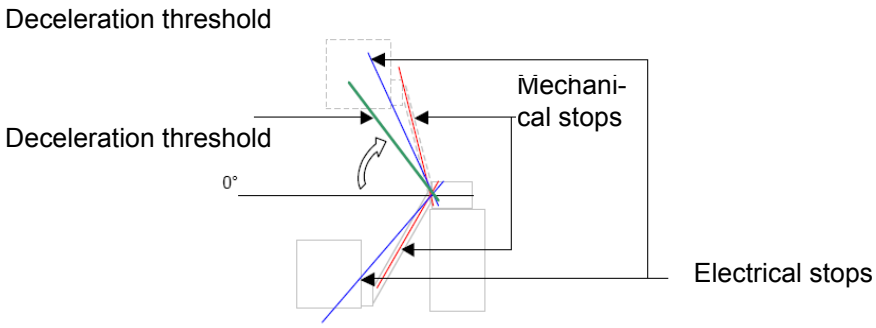
Number of flashes	Meaning
-	• No error.
1	• Card related error: Contact Pinguely-Haulotte.
2	• Card related error: Contact Pinguely-Haulotte..
3	• Check the connections polarity round the relays.
4	• Angle value is too low.
5	• Check that all the card's inputs are connected to service positive inlets and not directly to the batteries' positive.
6	• Replace the card.

5.8 - STARS 8 AND STARS 10 FUNCTIONING

Load <115%	Load>=115%	Deceleration threshold (before upper stop)	Upper stop end of travel	Lower stop end of travel
The system works properly.	All movements as well as lifting and lowering are cut off. The buzzer sounds at regular intervals. The red light indicator flashes.	Lifting is performed at low speed from this threshold up to the top position end of travel.	Jib lifting is deactivated.	Jib lowering is deactivated.

A few degrees (5 to 10°) before the upper stop, a logical combination on the chopper's inlets reports the deceleration for the jib raising instruction. (It is possible to adjust the threshold angle value through the RS232C series connection via PC, parameter: LIMSUP).

$$\text{Jib deceleration speed} = \frac{\text{Jib instruction speed}}{2}$$



5.9 - ALARM SYSTEM MANAGEMENT

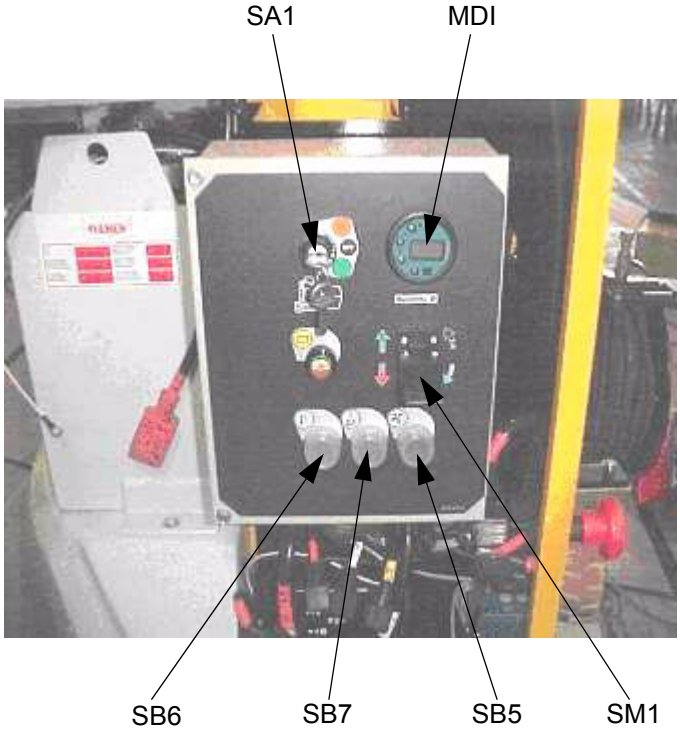
	EUROPE	
	Tilt	**Overload**
Red light indicator	• -	• Flashes
Buzzer	• Continuous	• Irregular

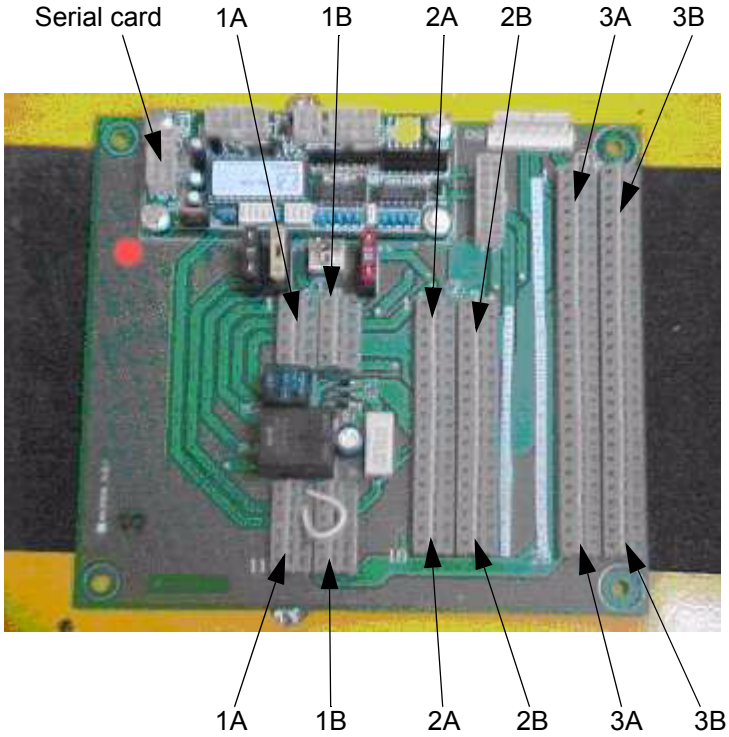
NB: *The overload alarm has priority before the tilt alarm.*

The functioning of the machine along with the weighing device is possible through the following chopper software version: European version TRIPLATB HU 1.06 >> TRI106B.

6 - ELECTRIC COMPONENTS POSITION

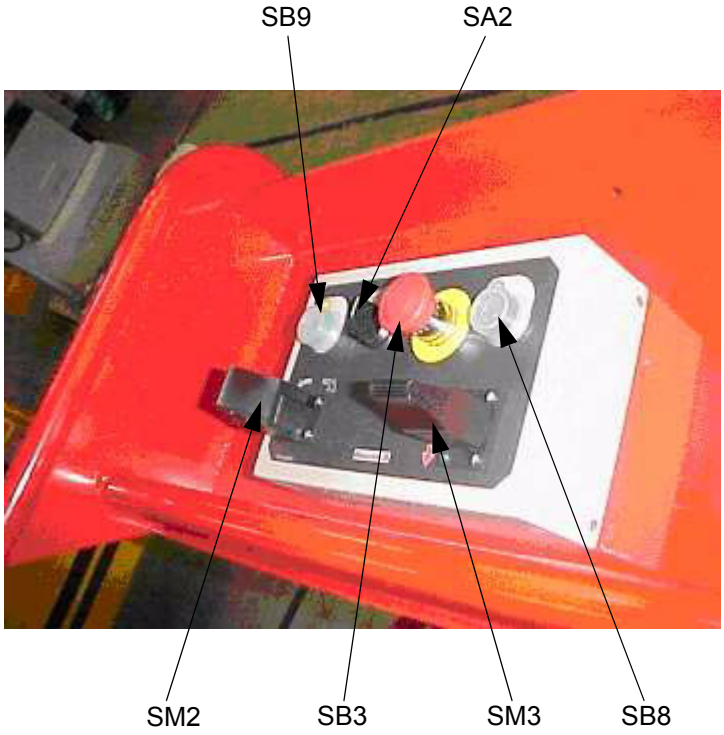
6.1 - TURNTABLE CONTROL PANEL





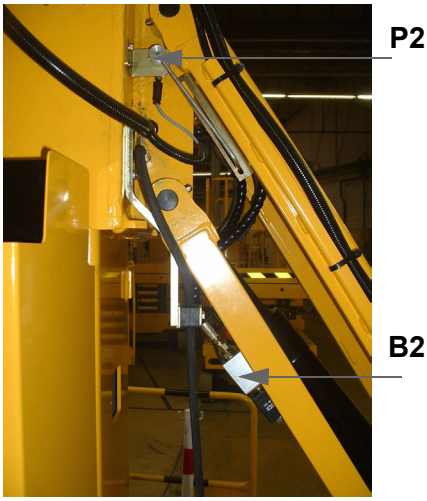
• FU1 :	• 1A Overload protection of the U2 card
• FU2 :	• 5A Protection of the U2 card controls
• FU3 :	• 10A Protection of the solenoid valve on U2 card
• FU4 :	• 250A power fuse
• FU5 : 5A	• Work headlight protection (option)
• HA1 :	• Warning signal 100/2A10, 200/2A11
• M1 :	• Pump motor
• MDI :	• Multifunction indicator
• P1 :	• Steering potentiometer 2.5 Ω
• RCH :	• Battery charger internal relay
• RL1 :	• Security relay fitted on the U2 card. Control of the overload pressure switch circuit.
• RL2 :	• Security relay fitted on the U2 card. Control of the chassis insulation from the machine.
• SA1 :	• Ignition key selector : command selection : either by the upside console or by the downside console
• SB1 :	• Electric equipment main switch.
• SB5 :	• Push button to command the jib. Input Q of the serial card.
• SB6 :	• Push button to command mast lifting. Input S of the serial card.
• SB7 :	• Push button to command the rotary motion. Input R of the serial card.
• SM1 :	• Orientation / lifting / jib joystick
• SQ1 :	• Tilt sensor 100/2A4, 25A/2A5, 42A/2B4
• SQ10 :	• Upper end of travel 42A/2A7, 24A/2A8
• SQ4 :	• Jib lower end of travel, tilt resetting.
• SQ12 :	• Mast lower end of travel, tilt resetting
• U2 :	• Interface card of the downside console
• U3 :	• Serial card of the upside console
• YV1 :	• Steering solenoid valve A = Right 20A / 3A17, B = Left 6A / 3A19 common 3A18 X2
• YV2 :	• Mast rotation solenoid valve. A= left 7A / 3A20, B=right 8A / 3A22 common 3A21X2
• YV3 :	• Up/Down Selection A=lifting of the jib or mast lowering 18A / 3A16 + 3B15, B= mast telescoping 12A / 3A28 + 3B27
• YV4 :	• Mast telescoping 9A/3A23 + 3A24
• YV5 :	• Jib lifting or lowering 19A / 2A18
• YV6 :	• Mast lowering solenoid valve17A / 3A14 + 3A15

6.2 - PLATFORM CONTROL PANEL



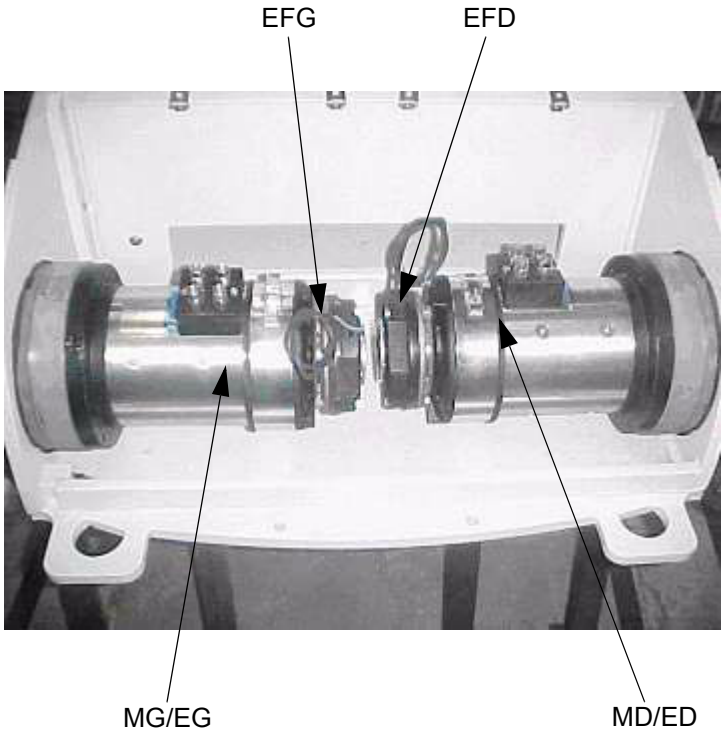
• SA2 :	• Motion selector CNB3 / 29A / CNB6
• SB3 :	• Platform emergency stop 37A / 105
• SB8 :	• Motion selection CNB4 / CNB7
• SM2 :	• Orientation / steering joystick
• SM3 :	• Travel / lifting joystick
• SB9	• Warning signal push button

6.3 - JIB



B2	Angle sensor (weighing)
P2	Pressure sensor (weighing)

6.4 - CHASSIS EQUIPMENT



MD	Right handside travel motor
MG	Left handside travel motor
EFD	Right travel motor electrobrake
EFG	Left travel motor electrobrake
EG	Left handside travel motor inductor
ED	Right handside travel motor inductor
P1	Steering potentiometer
	Brakes connections :15A/3A6, 1A/3A7

7 - OPERATING EQUATIONS

7.1 - START-UP

If SB1=1 and RCH=0 and (SA1=turntable or (SA1=platform and SB3=1)) then chopper active

7.2 - SHUTDOWN

If SB1=0 or RCH=1 or (SA1=0 or (SA1=platform and SB3=0)) then chopper inactive

7.3 - MAST LIFTING

7.3.1 - Turntable

7.3.1.1 - Up

If SA1=turntable and SB6=1 and SM1=1 and (SQ1=1 or machine retracted) and overload =0 then YV3b=1 and YV4=1 and M1=1

overload =1 if inputs 26=0 and 38=0 (26 and 38 ZAPI chopper inputs - 26: jib up blocking - 38: jib down blocking)

Machine retracted -> SQ4=1 and SQ12=1

7.3.1.2 -Down

If SA1=turntable and SB6=1 and SM1=1 and overload =0 then YV3a=1 and YV6=1 and M1=1

overload =1 if inputs 26=0 and 38=0.

Machine retracted -> SQ4=1 and SQ12=1

7.3.2 - Platform

7.3.2.1 -Up

If SA1=platform and SB3=1 and SB8=1 and SA2=Mast and SM3=1 and (SQ1=1 or machine retracted and overload = 0 then YV3b = 1 and YV4=1 and M1=1

overload =1 if inputs 26=0 and 38=0

Machine retracted -> SQ4=1 and SQ12=1

7.3.2.2 -Down

Overload =0 then YV3a=1 and YV6=1 and M1=1

Overload =1 if inputs 26=0 and 38=0

Machine retracted -> SQ4=1 and SQ12=1

7.4 - JIB

7.4.1 - Turntable

7.4.1.1 -Up

If SA1=turntable and SB5=1 and SM1=1 and (SQ1=1 or machine retracted) and overload =0 then YV3a=1 and YV5=1 and M1=1

Overload=1 if inputs 26=0 and 38=0.

Machine retracted -> SQ4=1 and SQ12=1

7.4.1.2 -Down

If SA1= turntable and SB5=1 and SM1=1 and overload=0 then YV5=1

overload=1 if inputs 26=0 and 38=0.

Machine retracted -> SQ4=1 and SQ12=1

7.4.2 - Platform

7.4.2.1 -Up

If SA1=platform and SB8=1 and SA2=jib and SM3=1 and (SQ1=1 or machine retracted) and overload=0 then YV3a=1 and YV5=1 and M1=1

overload=1 if inputs 26=0 and 38=0

Machine retracted -> SQ4=1 and SQ12=1

7.4.2.2 -Down

If SA1=turntable and SB8=1 and SA2=jib and SM3=1 and overload=0 then YV5=1

overload=1 if inputs 26=0 and 38=0

Machine retracted -> SQ4=1 and SQ12=1

7.5 - ROTATION

7.5.1 - Turntable

7.5.1.1 -Left

If SA1=turntable and SB7=1 and SM1=1 and (SQ1=1 or machine retracted) and overload=0 then YV2a=1 and M1=1

overload=1 if inputs 26=0 and 38=0

Machine retracted -> SQ4=1 and SQ12=1

7.5.1.2 -Right

If SA1=turntable and SB5=1 and SM1=1 and (SQ1=1 or machine retracted) and overload=0 then YV2b=1 and M1=1

overload=1 if inputs 26=0 and 38=0.

Machine retracted -> SQ4=1 and SQ12=1

7.5.2 - Platform

7.5.2.1 -Left

If SA1=platform and SB8=1 and SA2=rotation andSM2=1 and (SQ1=1 or machine retracted) and overload=0 then YV2a=1 and M1=1

overload=1 if inputs 26=0 and 38=0

Machine retracted -> SQ4=1 and SQ12=1

7.5.2.2 -Right

If SA1=turntable and SB8=1 and SA2=rotation and SM2=1 and (SQ1=1 or machine retracted) and overload=0 then YV2b=1 and M1=1

overload=1 if inputs 26=0 and 38=0.

Machine retracted-> SQ4=1 and SQ12=1

7.6 - TRAVEL

7.6.1 - Platform

If SQ4=0 or SQ12=0 then Microspeed = 1

7.6.1.1 -Forward

If SA1=platform and SB8=1 and SA2=travel and SM3=1 and (SQ1=1 or machine retracted) and overload=0 then MD=1 and MG=1: full setpoint

overload=1 if inputs 26=0 and 38=0.

Machine retracted -> SQ4=1 and SQ12=1

7.6.1.2 -Reverse

If SA1=turntable and SB8=1 and SA2=travel and SM3=1 and (SQ1=1 or machine retracted) and overload=0 then MD=1 and MG=1: full setpoint

overload=1 if inputs 26=0 and 38=0.

(*option not available at present)

Machine retracted -> SQ4=1 and SQ12=1

7.7 - STEERING

7.7.1 - Platform

7.7.1.1 -Left

If SA1=platform and SB8=1 and SA2=travel and SM2=1 and (SQ1=1 or machine retracted) and overload=0 then M1=1 and YV1b=1

overload=1 if inputs 26=0 and 38=0.

Machine retracted -> SQ4=1 and SQ12=1

7.7.1.2 -Right

If SA1=turntable and SB8=1 and SA2=travel and SM2=1 and (SQ1=1 or machine retracted) and overload=0 then M1=1 and YV1a=1

overload=1 if inputs 26=0 and 38=0.

Machine retracted -> SQ4=1 and SQ12=1

7.8 - HORN

If SA1=platform and SB9=1 then H1=1

7.9 - BUZZER

7.9.1 - Without option

If (SQ1=0 and machine extended) or overload=1 then buzzer=1

7.9.2 - With option on console

If (travel_option=1 and Travel=1) or (movement_option=1 and (mast=1 or jib=1 or rotation=1) then buzzer=1

7.10 - WORKING LIGHT OPTION LIGHT INDICATOR

The working light is electrically wired. To use it, activate the switch.

7.11 - WEIGHING OR TILT ALARM LIGHT INDICATOR

If overload=1 or (SQ1=0 and machine extended) then HA=1

(*option available for Europe)

7.12 - HOUR METER AND BATTERY CHARGE LIGHT INDICATOR

Shows the number of hours of use for the machine and remaining battery charge.

7.13 - OTHER FUNCTIONS

7.13.1 -Platform movement validation button

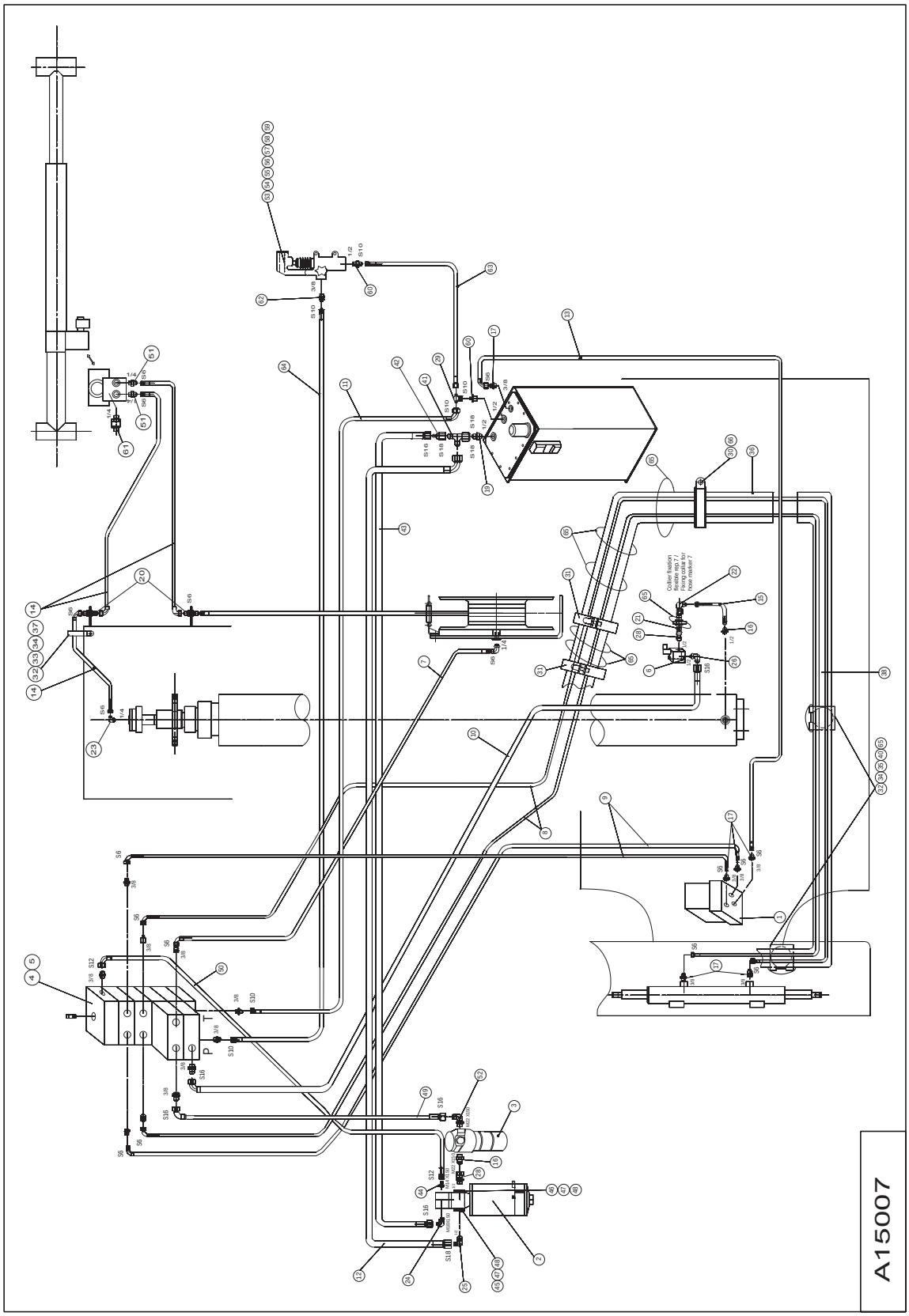
Pressing the button validates platform movements for 5 seconds. This duration is renewed as soon as a movement is made.

8 - MDI CONSOLE PROGRAMING PARAMETERS

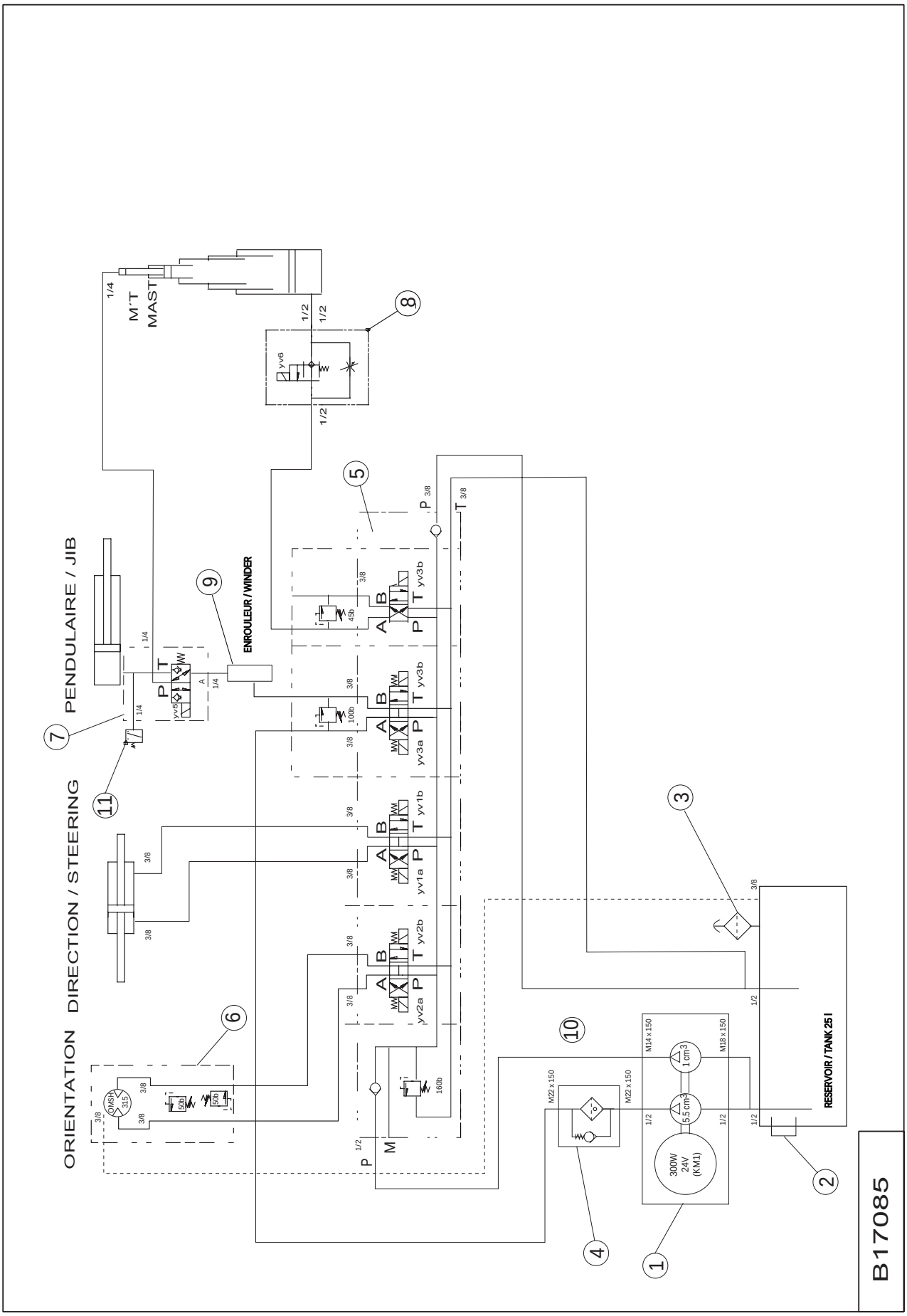
ACCELERATION	0	1	2	3	4	5	6	7	8	9
DECELERATION	0	1	2	3	4	5	6	7	8	9
REL. BRAKING	0	1	2	3	4	5	6	7	8	9
INV. BRAKING	0	1	2	3	4	5	6	7	8	9
CURVE SPEED (% accel)	76	79	81	83	86	89	92	94	97	100
CUTBACK (% accel)	12	14	16	18	20	22	23	25	27	29
CREEP (% pwm)	2	3	5	6	7	8	9	10	12	13
MAX SPEED FWD (% FLD.NOM)	100	90	82	75	69	64	60	56	52	48
MAX SPEED REV (% FLD.NOM)	100	90	82	75	69	64	60	56	52	48
IMAXTR (% MAXA)	82	84	85	87	89	91	93	95	98	100
ARMA NOM. (% MAXA)	33	36	39	42	44	47	50	53	55	58
WEAK DROPOUT (% ARMA NOM)	35	40	45	50	55	60	65	70	75	80
MAXFLD (% FLDMAX)	50	56	61	67	72	78	83	89	94	100
FLD.NOM.(% MAXFLD)	34	38	41	44	47	50	53	56	60	63
ACCPOM (sec)	0.34	0.38	0.42	0.47	0.51	0.55	0.59	0.64	0.68	0.76
DECPOM (sec)	0.03	0.05	0.10	0.15	0.20	0.25	0.31	0.36	0.41	0.46
SPEED BR (% accel)	33	43	53	61	69	72	76	84	92	100
SPEED CE (% accel)	33	43	53	61	69	72	76	84	92	100
ROTAZ SP (% accel)	47	53	59	65	70	76	82	88	94	100
STEER SP (% accel)	21	25	29	33	41	49	61	68	80	90
SPEED 3BR (% accel)	33	43	53	61	69	72	76	84	92	100
CREEPS (% pwm)	2	4	6	8	10	12	14	16	18	20
ACCEVP (sec)	0.25	0.38	0.51	0.64	0.76	0.89	1.02	1.15	1.27	1.53
DECEVP (sec)	0.64	0.76	0.89	1.02	1.15	1.27	1.40	1.53	1.66	1.78
MINEVP (% pwn)	8	12	16	20	23	27	31	35	39	43
MAXEVP (% pwm)	59	63	67	70	74	78	82	88	94	100

9 - HYDRAULIC DIAGRAMS

9.1 - HYDRAULIC INSTALLATION : A15007



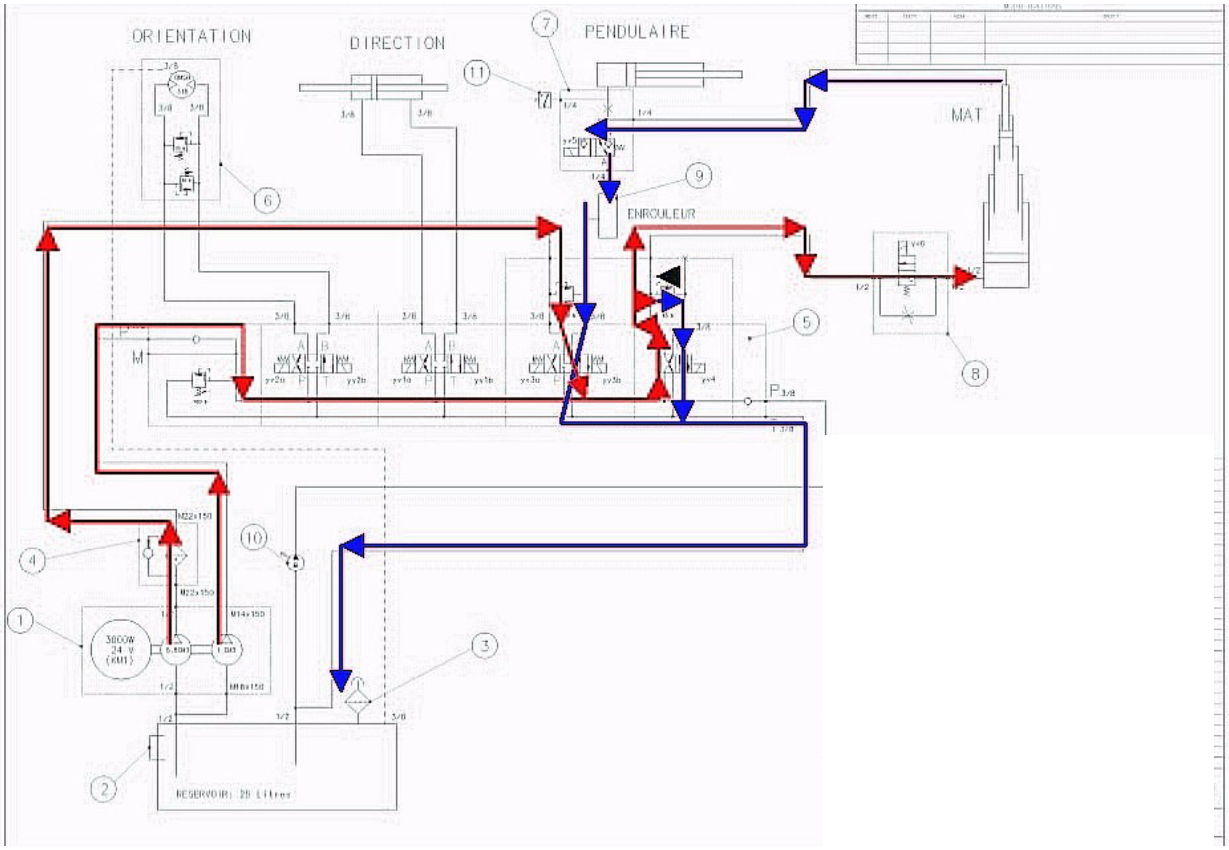
9.2 - HYDRAULIC DIAGRAM: B17085



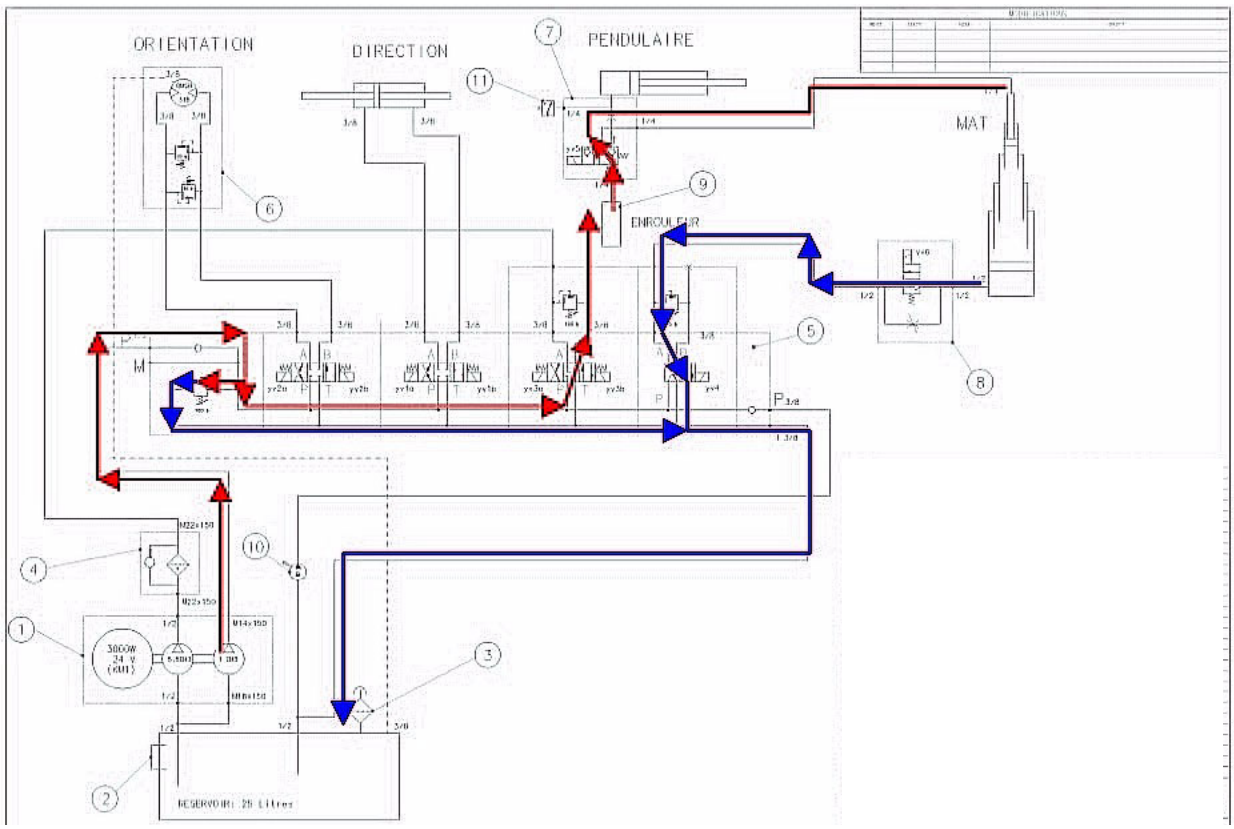
These diagrams can also be found in the spare parts manual, along with the list of their components.

10 - HYDRAULIC FUNCTIONING (B17085 DIAGRAM)

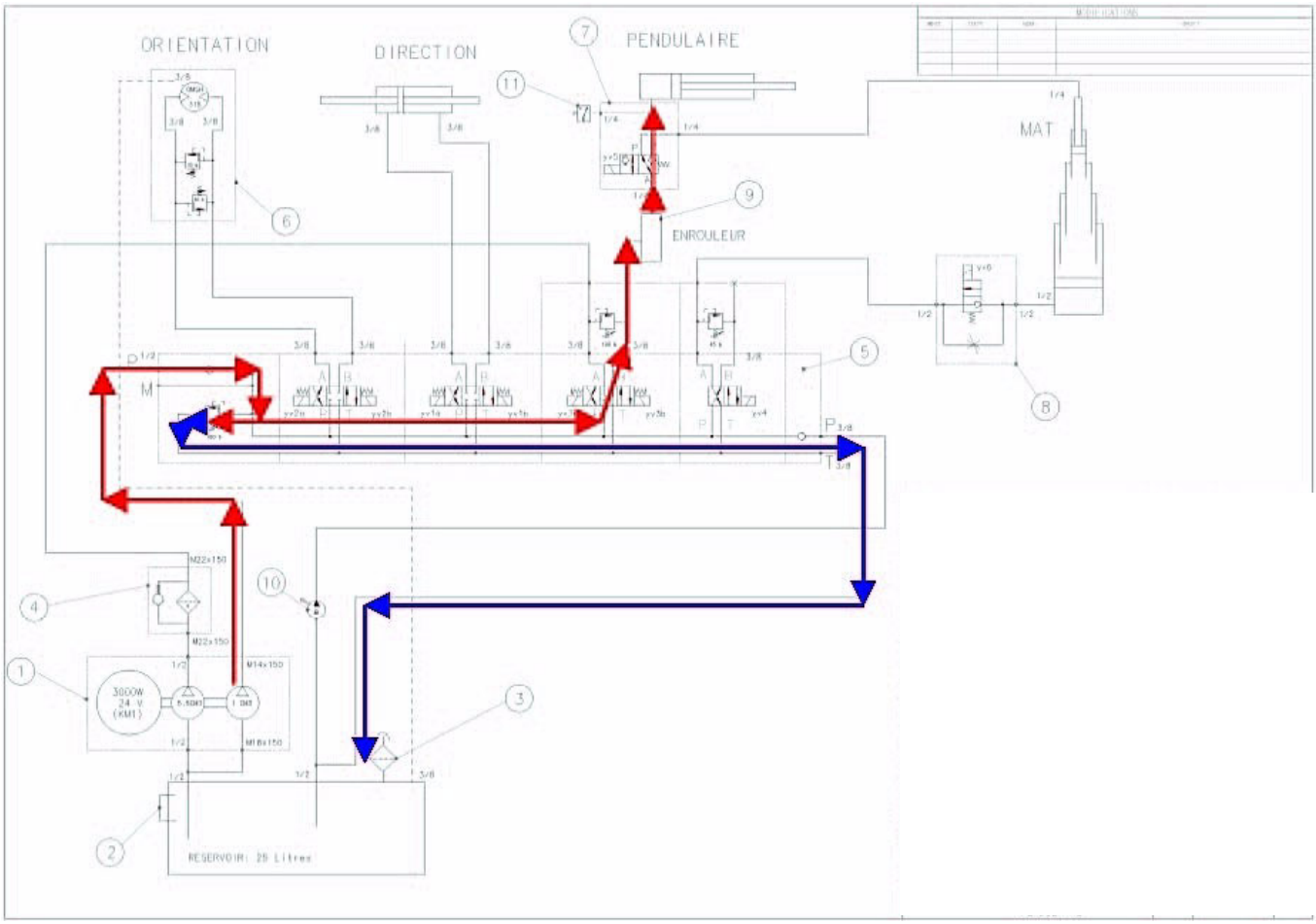
10.1 - MAST RAISING



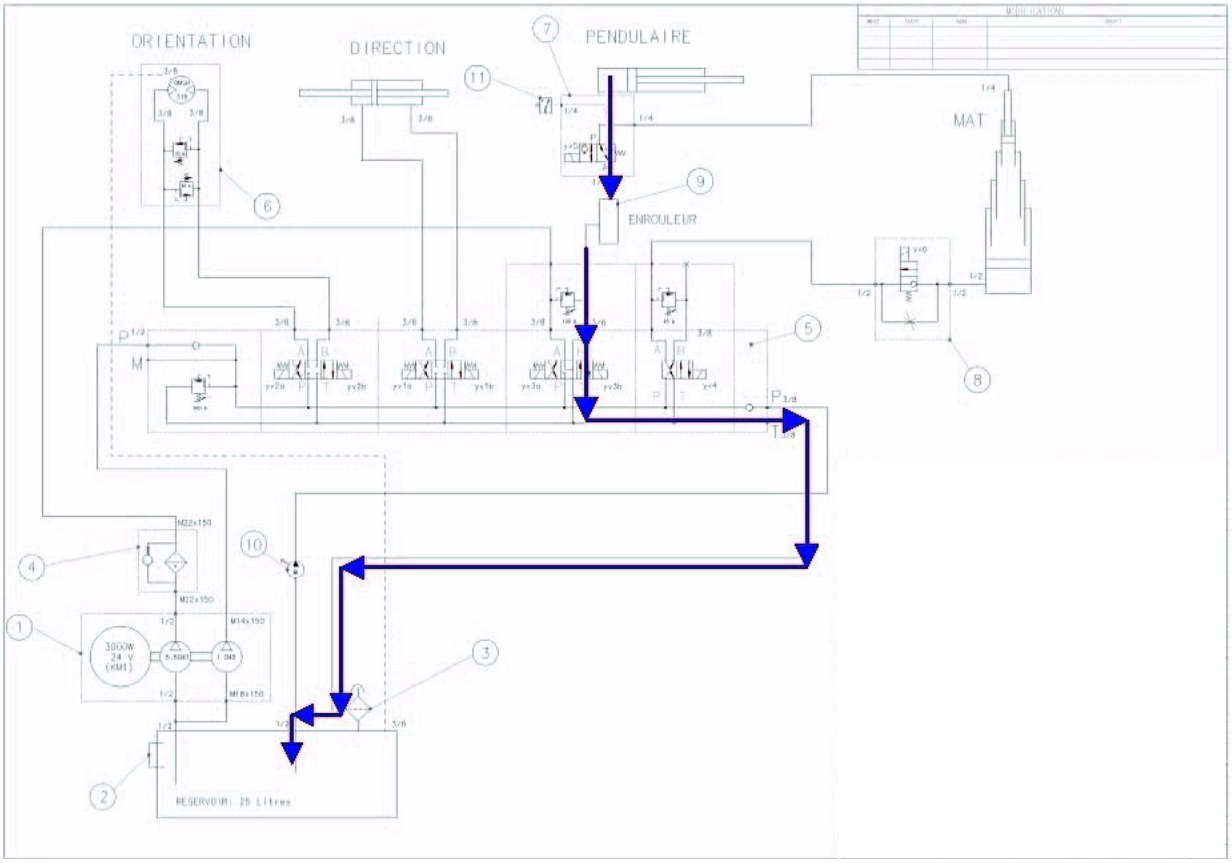
10.2 - MAST LOWERING



10.3 - JIB LIFTING

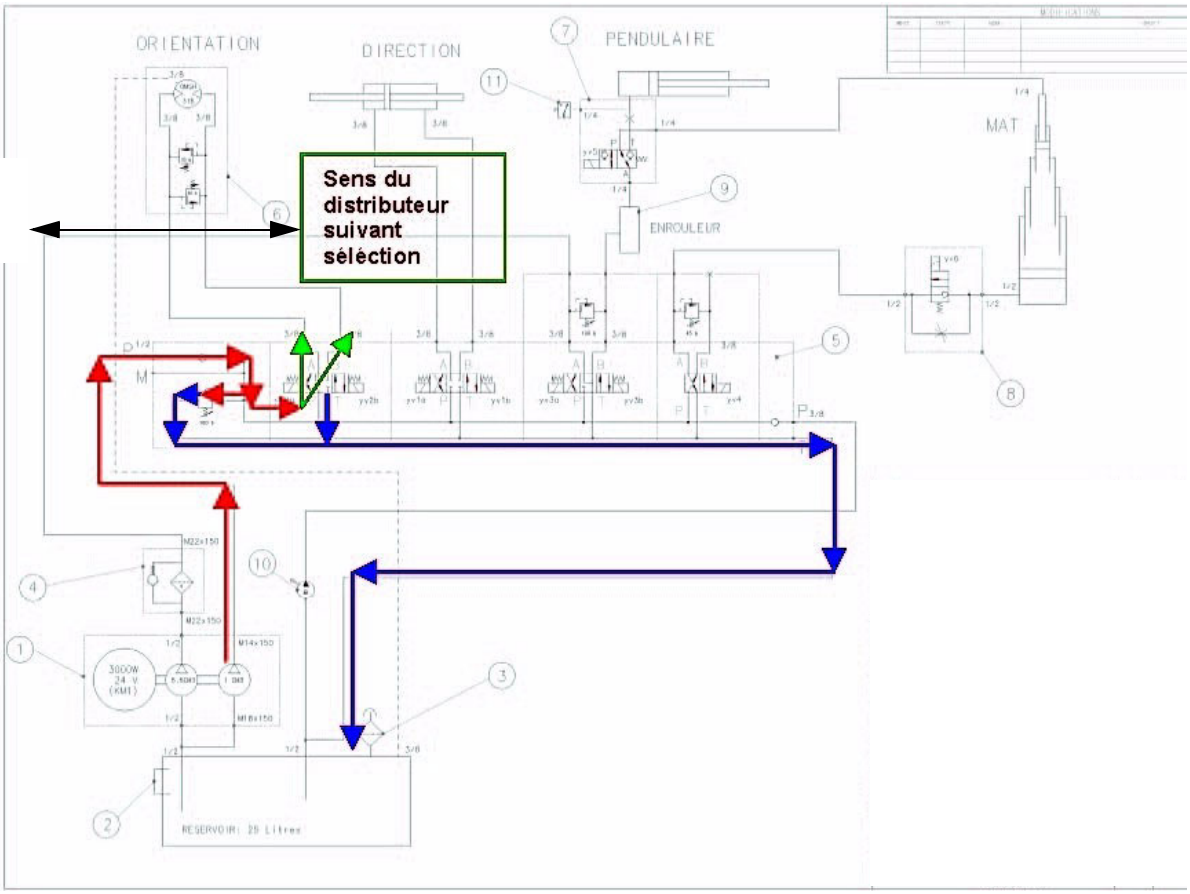


10.4 - JIB LOWERING



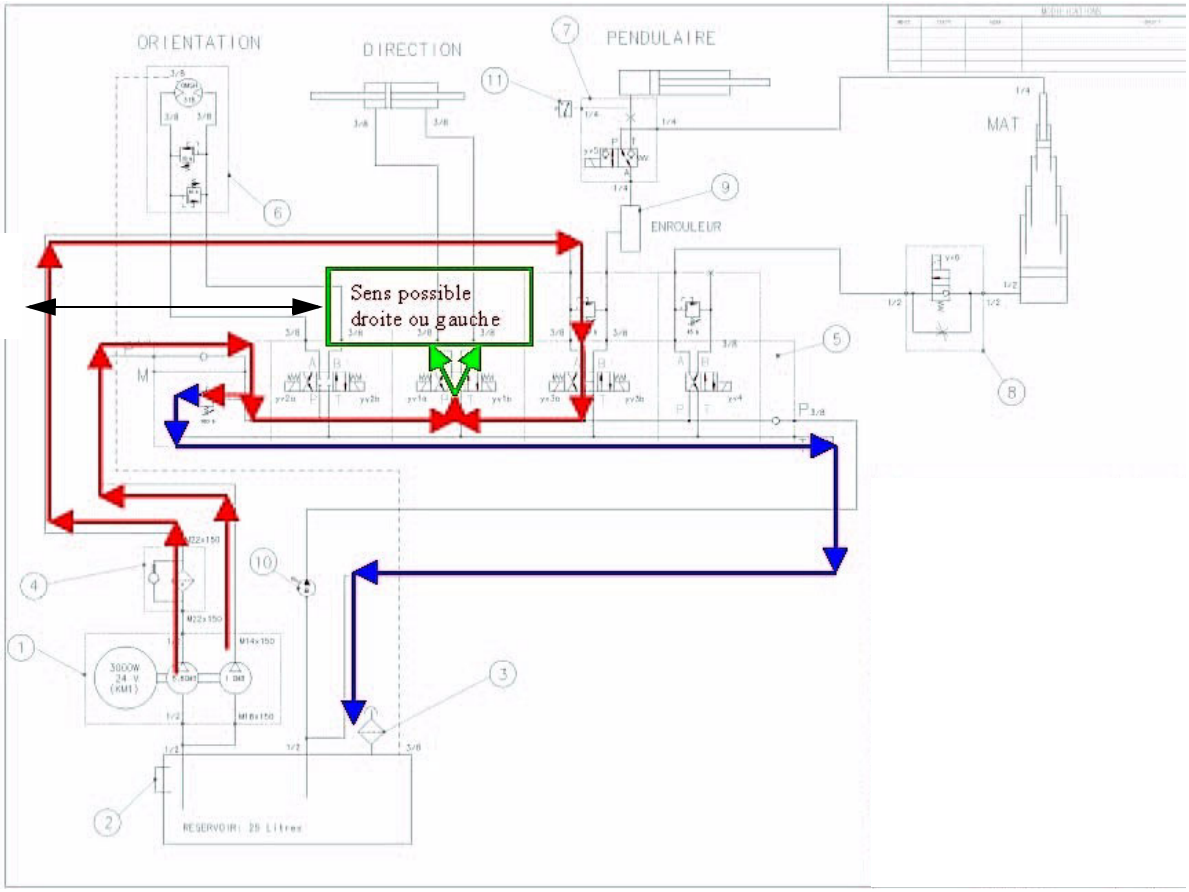
10.5 - TURNTABLE ROTATION

Position valve direction



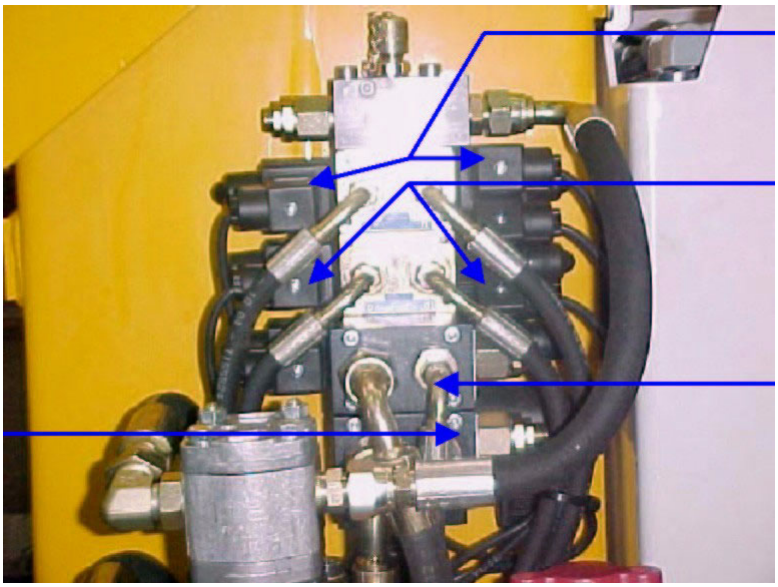
10.6 - STEERING

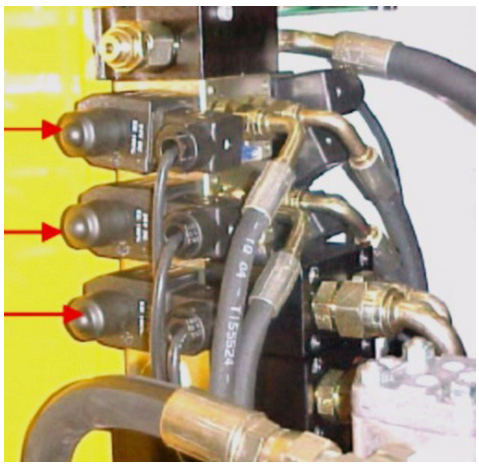
Possible directions: right or left

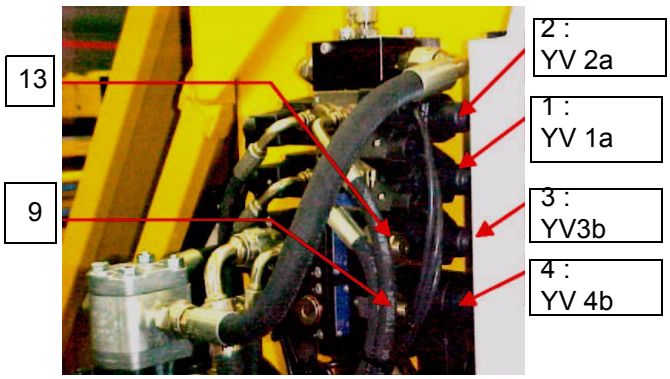


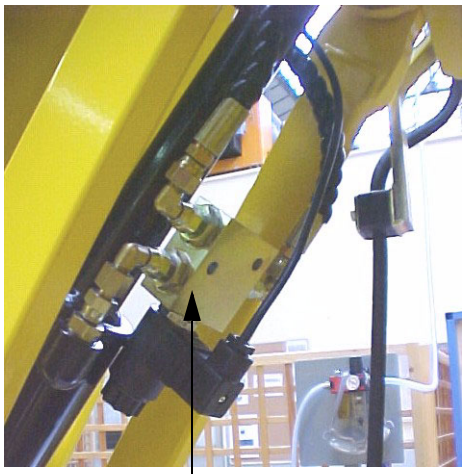
11 - POSITION OF HYDRAULIC COMPONENTS

1	YV1	Steering electrovalve
2	YV2	Turntable rotation motor electrovalve
3	YV3	Pump flow accumulation electrovalve
4	YV4	Electrovalve maintaining lifting or lowering movements At rest, lowering if YV6 = 1
5	YV5	Electrovalve selecting power supply.. At rest: powers the telescopic cylinder small chamber feeding the mast; working, powers the jib.
6		Position valve
7	YV6	Electrovalve maintaining the lifting telescopic cylinder lowering movement.
8		Main pressure regulating valve adjusted at 160 bars.
9		Lifting pressure regulating valve adjusted at 45 bars.
10		Emergency lowering manual tap
11	YV6	Emergency lowering electrovalve
12		Emergency pump
13		Steering pressure regulating valve adjusted at 100 bars.





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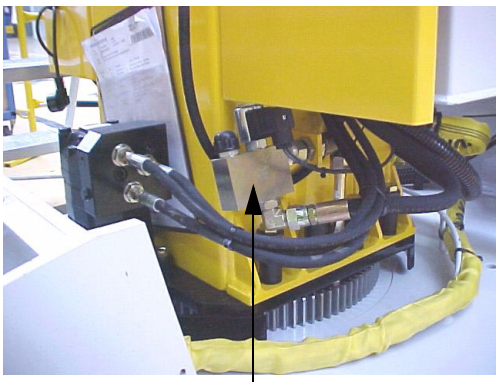
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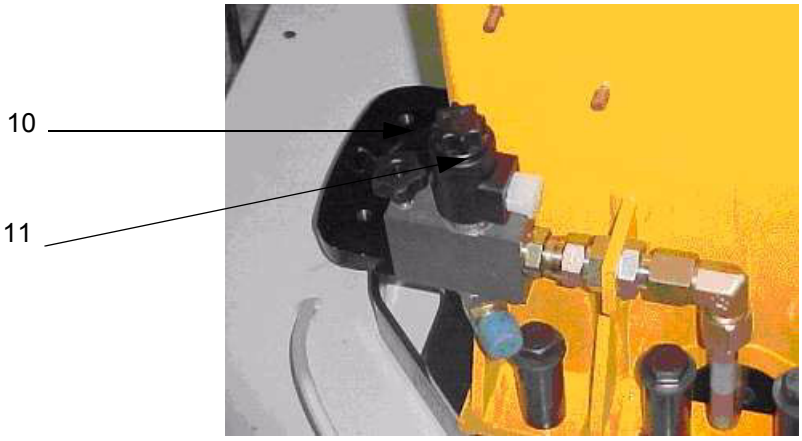

10
11


12

12 - S5682 HYDRAULIC BLOCK

12.1 - CHARACTERISTICS

Description: Movement block STAR 8 10

Haulotte ref : 242 021 2860

12.1.1 -Technical characteristics

Maximum pressure: 160bar

Max. flow: 22l/mm on the P and T line, useful load for mast raising.

Max. flow: 10l/mm for all other movements.

Temperature range: ambient: -20°C to +50°C

hydraulic: -20°C to +80°C

Hydraulic characteristics: Mineral oil – viscosity grade 32cSt, 45cSt and 68cSt.

With biodegradable oil option: SHELL NATUREL HFE

Ports: cylindric gas

Connectors: ISO 4400 24V continuous current

Hydraulic components will be delivered washed and rinsed, following S5093 Pinguely Haulotte specification.

12.1.2 -Fttings

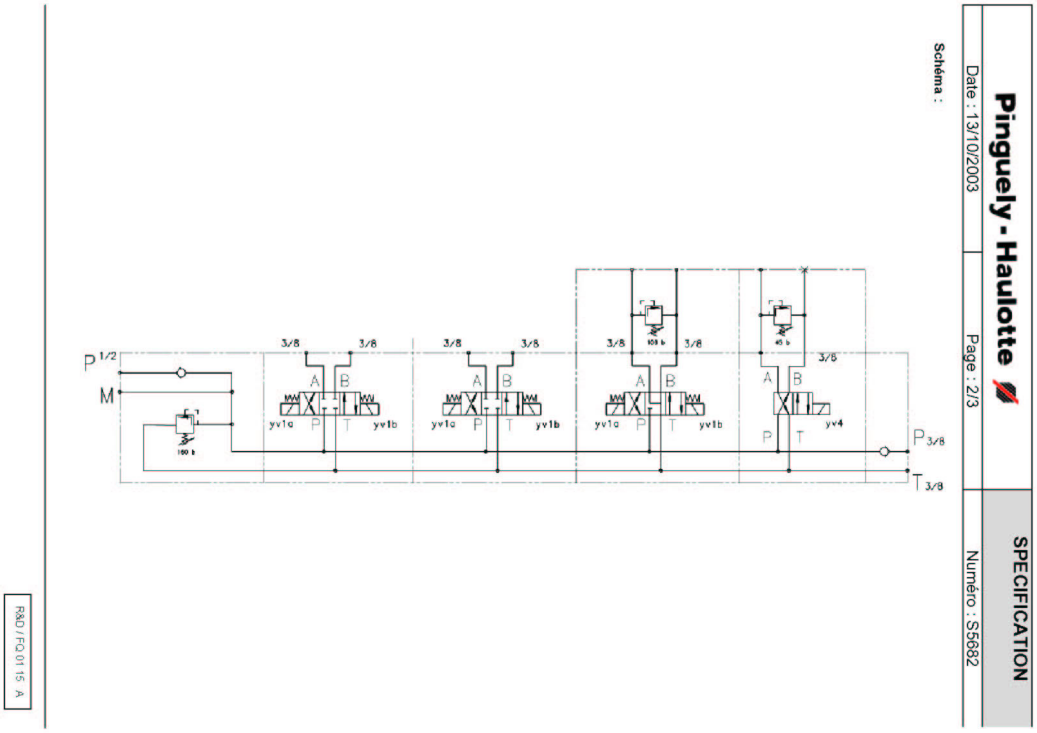
Connections should comply with S5470 Haulotte specification.

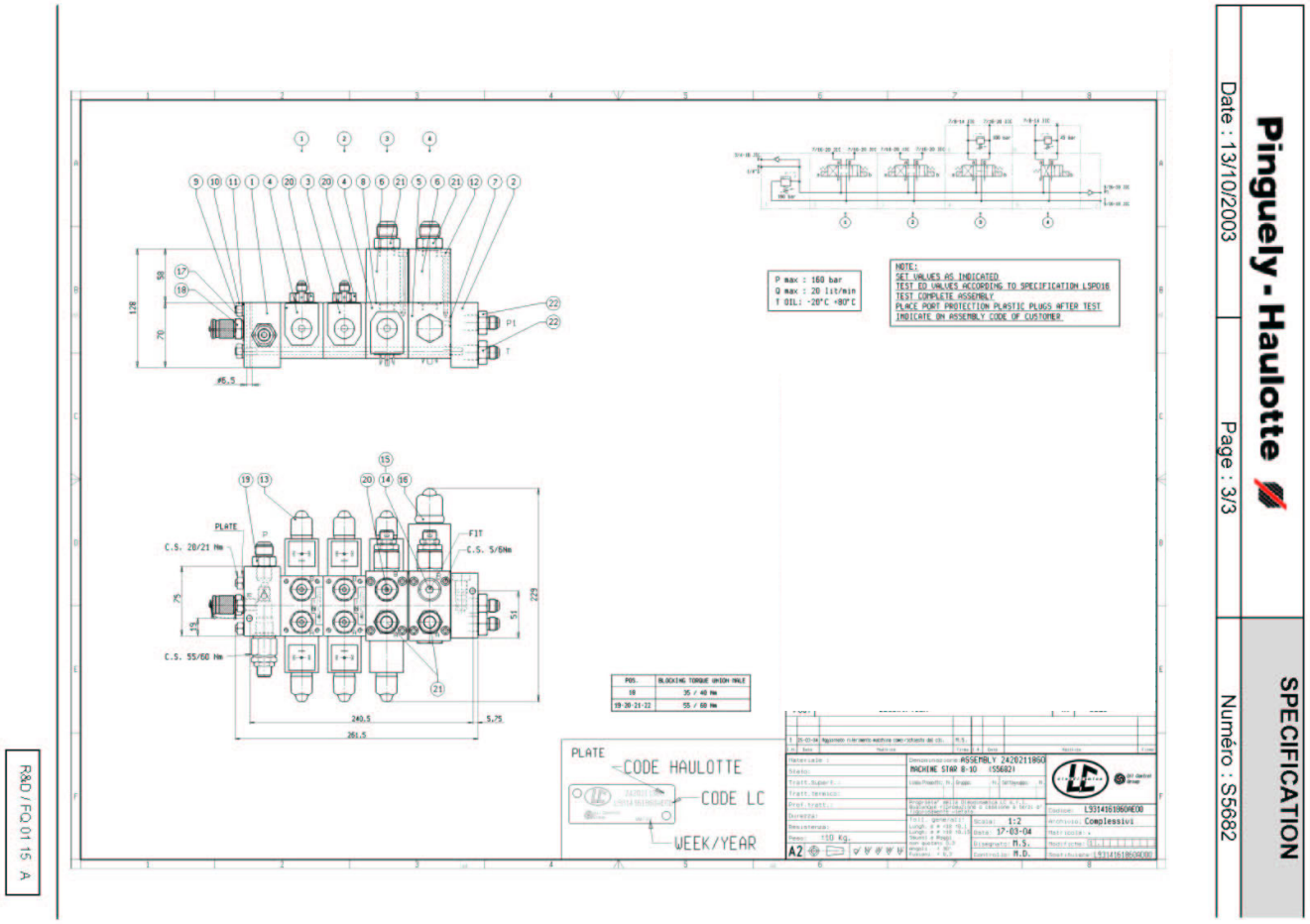
The block must be delivered equipped with fittings tightened to the appropriate torque.

The supplier selected for supplying fittings must be approved by Pinguely Haulotte.

(Extract from R&D / FQ 01 15 A)

12.2 - DIAGRAMS





12.2.1 -List of components

Position	Description	Quantity
1	Entry cap 3/8” gas + UMD1025/SB + RIT	1
2	Closing cap with P+T 3/8” gas	1
3	Mod. Solenoid valve ED1 3/8”	2
4	Mod. Solenoid valve ED1 3/8”	1
5	Mod. Solenoid valve ED2 3/8”	1
6	Modular element ED VM2 A 1F	2
7	O ring	10
8	O ring	4
9	Tie rod M8x245	3
10	Nut M8 Cl.10	3
11	Knurled washer M8	3
12	Kit screws and modular elements 1 EL. (N.4) M5x60	2
13	Push button manual overrride ED1	6
14	Plug DIN 908 3/8” gas	1
15	Washer 3/8“ gas	1
16	Push button manual override ED2	1
17	Washer ¼” gas	1
18	Pressure inlet ¼” BSPP	1
19	Union piece male 3/83”	1
20	Union piece male 3/83” G	5
21	Union piece male 3/83” G	2
22	Union piece male 3/83” G	2

13 - MAINTENANCE

13.1 - GENERAL RECOMMENDATIONS

Servicing operation described in this manual are given for normal conditions of use.

In difficult conditions: extreme temperatures, high hygrometry, polluted atmosphere, high altitude, etc .... certains operations must be carried out more frequently and specific precautions must be taken: consult PINGUELY-HAULOTYTE After-Sales Service for information

Only authorised and competent personel may operate on the machine and must comply with the safety instructions related to Personnel and Environment protection.

Regularly check that the safety systems work properly.

Caution!
Do not use the machine as a welding earth
Do not weld without disconnecting the "+" and "-" terminals of the batteries
Do not start other vehicles with the batteries connected.

IMPORTANT: REMOVE ALL COVERS BEFORE WORKING ON THE TURNTABLE COMPONENTS.

13.2 - PARTICULAR RECOMMENDATIONS

Before any maintenance intervention on the elevating platform, indicate on the turntable and platform control stations that the machine is being serviced. if possible, restrict access to the elevating platform to intervention personnel only.

13.2.1 -Specific tools

Personnel should therefore be familiar with the use of the specific tools used (measurement device, torque tightening device, lifting apparatus, etc and respect the operating limits specified in the documentation that is supplied with the tools..

Incorrect use of a tool (incorrect adjusment after a reading error) may lead to premature deterioration of the elevating platform (or more seruously, an accident), for which PINGUELY-HAULOTTE cannot be held responsible.

13.2.2 -Replacing an element

Before replacing an element, the machine must be put in the maintenance configuration (see corresponding paragraph) and the electric power supply cut off (see corresponding paragraph).

All distributing valves are "with open centre" : breaking the electric circuit therefore decreases pressure in the hydraulic circuits, up to the non-return valves flanged on the cylinders. An element van be replaced safely, if the procedures described in the maintenance sheets are respected (unscrew hydraulic connectors slowly to release residual pressure).

To preserve the integrity of the safety systems ans the technical characteristics of the elevating platform, it is essential to use original parts and to respect the initial setting and tightening torque value (see correspondning paragraph).

13.2.3 -Locating the breakdown

certains checks require the elevating platform to be switch on. In this case, personnel must ensure :

- that the measurement devices used are properly insluated,
- that they do not touch the live parts,
- that they are not wearing or carriyng metal objects that may deteriorate the live components (e.g.: dropping a spanner during an intervention on the batteries).

13.3 - MAINTENANCE SYSTEM

Maintenance configuration

- Position the elevating platform on a firm, horizontal surface.
- If possible, fold the machine completely.

13.4 - ELECTRIC POWER SUPPLY

Instructions

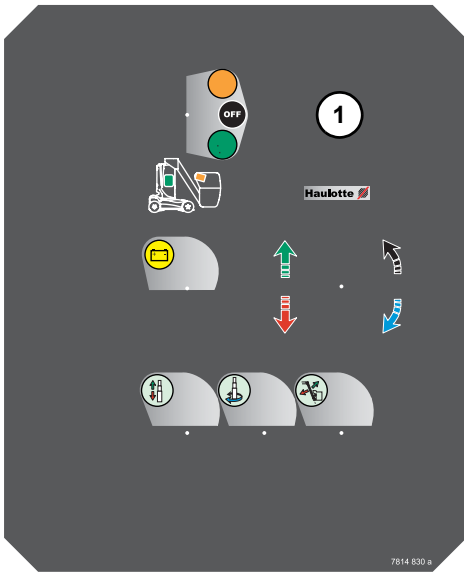
Cutting off the electric power supply :

Press the turntable emergency stop (ref. 1 Photo. 1, page 52).

Photo 1 .

Restoring the electric power supply :

Reset the emergency stop (Photo. 1, page 52).



13.5 - MAINTENANCE PLAN

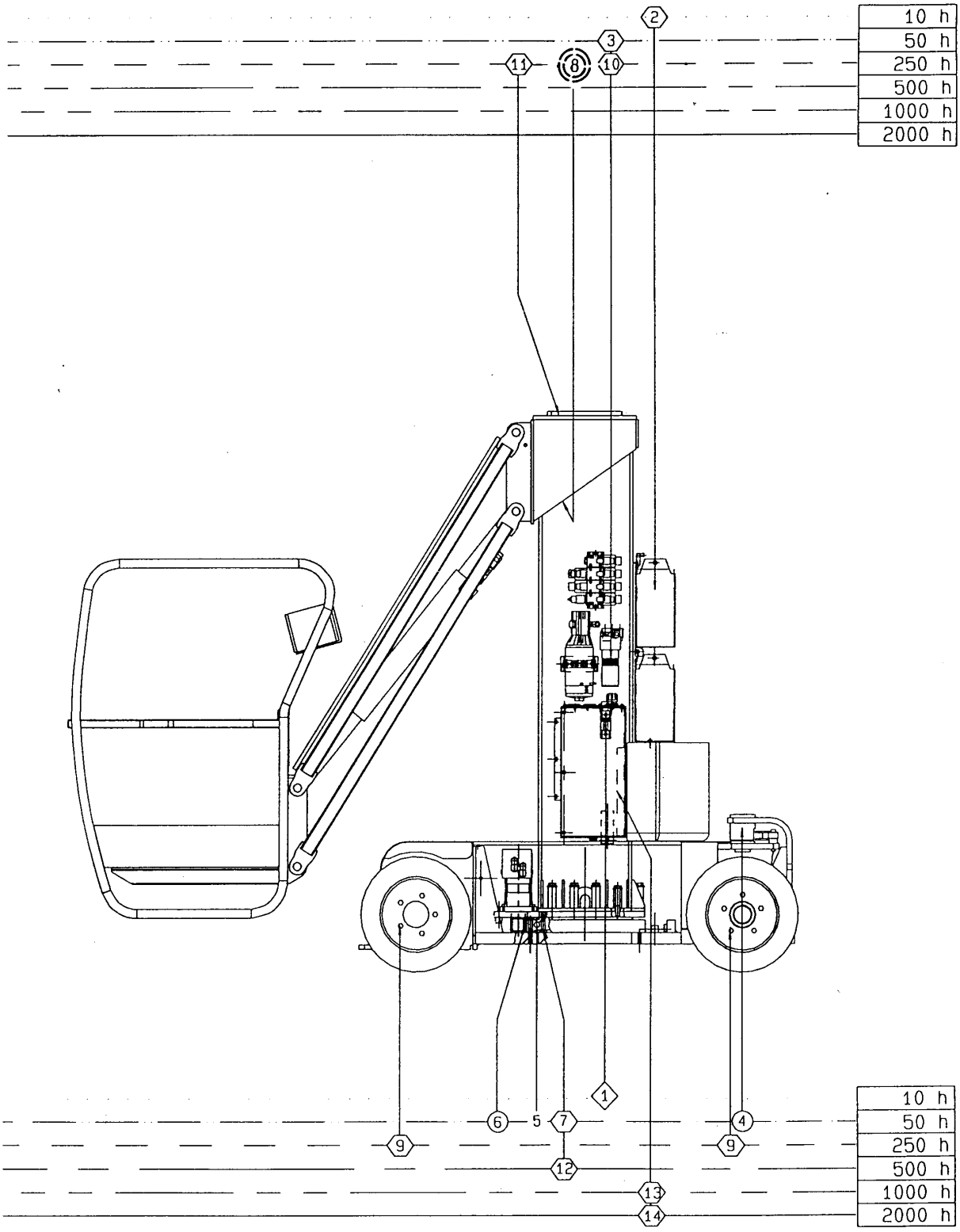
The plan on the following page gives the frequency, servicing operations (device) and consumables to be used.

- The reference in the symbol indicates the servicing point according to frequency.
- The symbole represents the consumable to be used.

13.5.1 -Consumable.

INGREDIENT	SPECIFICATION	SYMBOL	Lubricants used by HAULOTTE	ELF	TOTAL
Hydraulic oil	AFNOR 48 602ISO V G 46	◇	BPSHF ZS 46	HYDRELFDS 46	EQUI-VISZS 46
Extreme pressure lithium grease	ISO - XM - 2	◌		CARDREXA-DC 1	
Lead-free grease	Grade 2 or 3	○	ESSOGP GREASE	MULTIMOTIVE 2	MULTIS EP 2
Exchange or specific operation		⬡			
High pressure lubricant		◌	BARDAHL SUPER TEFLUBE + PTFE		
ORGANIC hydraulic oil(OPTION)		◇			
Extreme cold hydraulic oil (OPTION)	AFNOR 48 602ISO V G 32	◇	SHELL TELLUS T-32		

13.5.2 -Maintenance plan



13.5.3 -OPERATIONS

IMPORTANT: IF ORGANIC OR EXTREME COLD OILS ARE USED, THE PERIODICITIES IN THE TABLE BELOW ARE REDUCED BY HALF.

PERIODICITY	OPERATION	REFERENCE
Every day or before each start of operations	• ·Check: - hydraulic tank level. See chap. 4.3.3. - electrolyte level in the batteries. See chap. 4.3.3.	1 2
Every 50 hours	• Grease: - wheel pivot pins. - ring: bearing. - ring: teeth. CAUTION after first 50 hours: • Change the hydraulic filter cartridge. See chap. 5.3.1. (see 250 hours periodicity) • Check tightness of slew ring screws. (see 500 hour periodicity)	4 5 6 3 7
Every 250 hours	• ·Change the hydraulic filter cartridge See chap. 5.3.1. • ·Grease the friction parts of the mast, check pad wear. • Check the tightness of - wheel nuts. - upper clevis screws	10 8 9 11
Every 500 hours	• Check the tightness of the ring screws. • If using organic oil, empty the hydraulic oil tank.	12
Every 1000 hours	• Empty the hydraulic oil tank (capacity 25 l).See chap. 5.3.3.	13
Every 2000 hours	• Empty the hydraulic oil tank and the whole circuit See chap. 5.3.3.	14

Caution!
It is essential to use the lubricants mentioned in the consumables table Chap. 2.2.1, page 49 as dust sticks to standard grease.

13.6 - PRESENCE OF LABELS

Make sure that the labels and plates informing personnel of the various dangers related to machine use are in good condition.

The labels also inform operators on the use and maintenance of the machine.

An illegible label may result in incorrect or dangerous use of the machine.

Instructions:

Check that the labels are present:

Check that all the labels described in the operator's manual are legible and in place. Replace if necessary (additional copies can be supplied on request).

13.7 - PRESENCE OF MANUALS

It is important to ensure that the manuals supplied with the machine are in good condition and stored in the document holder provided on the platform. An illegible manual may lead to incorrect or dangerous use of the machine.

Instructions:

Check that the manuals are present:

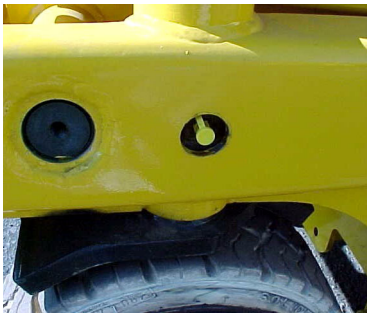
Check that the manuals are legible, complete and stored in the document holder provided on the platform. Replace if necessary (extra copies can be supplied on request by the manufacturer).

14 -PREVENTIVE MAINTENANCE SHEETS

List of preventive maintenance sheets:

Sheet no.	*Description*
P003	Lubricating the steering wheel pivots
P005	Checking - filling the hydraulic oil tank
P006	Changing the hydraulic filter cartridge
P010	Checking - servicing the traction batteries
P011	Lubricating the mast

SHEET P003	PREVENTIVE MAINTENANCE SHEET	Sheet 1/1
	GREASING THE STEERING WHEEL PIVOTS	



Compact, optimum, previous design

Compact, optimum, current design

1 - Greasing the steering wheel pivots

•Cut off the electric power supply (see § 6.3, page 26).
•Grease the pivots.

NOTA : *Only use the grease recommended by the manufacturer.*

•Put the machine back into the operational configuration

.

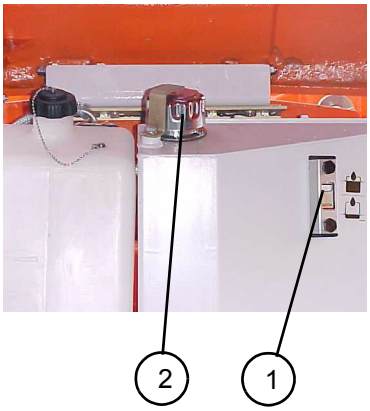
Star 22J / Star 8

	PREVENTIVE MAINTENANCE SHEET	

Sheet P005	PREVENTIVE MAINTENANCE SHEET	Folio 1/1
	CHECKING / FILLING THE HYDRAULIC OIL TANK	

1 - Preliminary operations

- Put the machine in the maintenance configuration (see corresponding paragraph).
- Switch off electric power (see corresponding paragraph).



HA16/18PX - HA46/51JRT

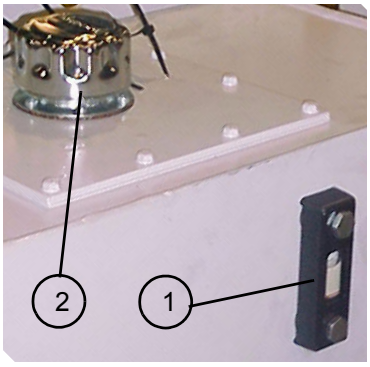
2 - Checking - filling the hydraulic oil tank

NB: This operation must be carried out when the oil is cold, i.e. before starting the machine.

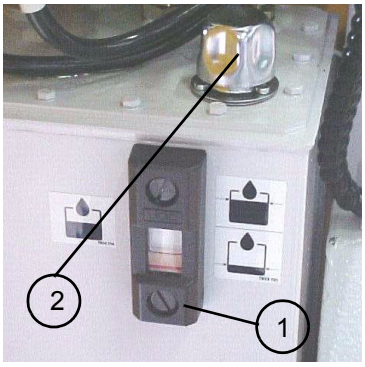
- Check that the level of oil (1) in the tank is between the high and low levels when cold.
- Top up if necessary, by filling via the cap (2).

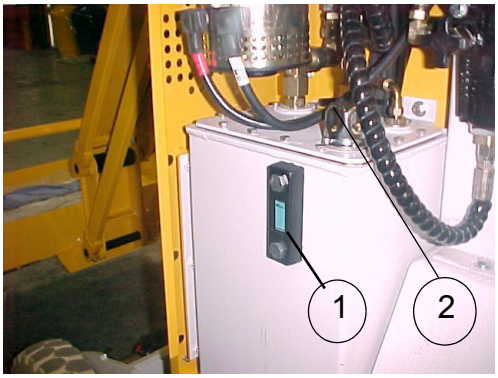
NB: Only use the oil recommended by the manufacturer.

- Put the machine back into the operational configuration.



HA16/18PX New Design
HA46/51JRT New Design





Star 22 J / Star 8

	PREVENTIVE MAINTENANCE SHEET	

Sheet P006	PREVENTIVE MAINTENANCE SHEET	Folio 1/1
	CHANGING THE HYDRAULIC FILTER CARTRIDGE	

Caution!
Use a container to collect oil to prevent pollution of the environment.

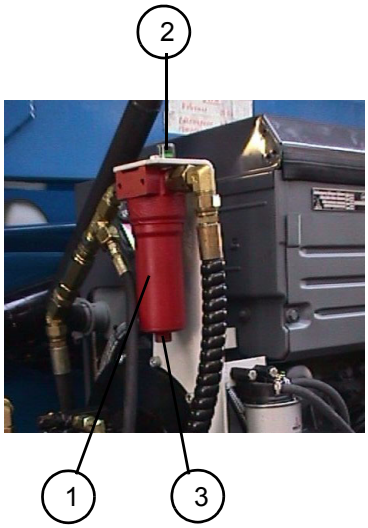
2 - Preliminary operations

- Put the machine in the maintenance configuration (see corresponding paragraph).
- Switch off electric power (see corresponding paragraph).

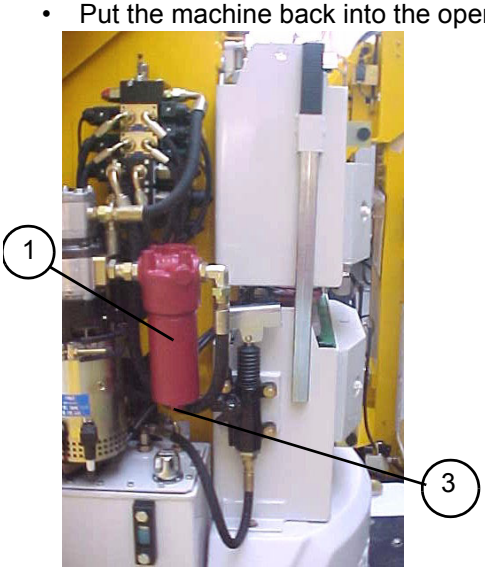
2 - Replacing the hydraulic filter cartridge

NB: The filter has a clogging indicator. Clogging should be checked when the machine is hot, otherwise, the indicator may be visible due to the viscosity of the cold oil.

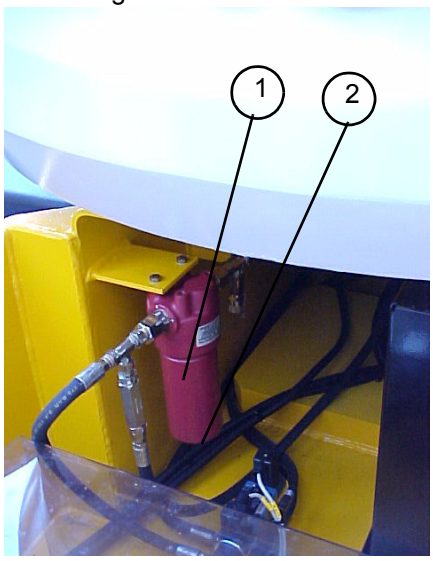
- Change the cartridge (1) if the clogging indicator appears (2).
- Unscrew the base nut (3) and remove the cartridge from the hydraulic filter.
- Screw a new cartridge into place.
- Put the machine back into the operational configuration.



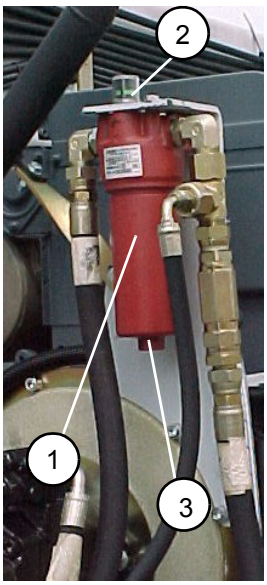
HA16/18 PX
HA46/51JRT
HA20/26 PX
HA61/80JRT



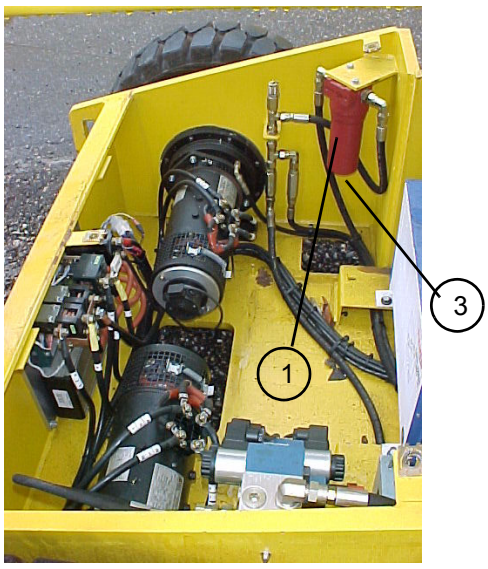
STAR 22 J / Star 8



HA12IP - HA33JE



H14P / H16TP
HB40/44J



HA15I - HA43E

	PREVENTIVE MAINTENANCE SHEET	

Sheet P010	PREVENTIVE MAINTENANCE SHEET	Folio 1/2
	CHECKING / SERVICING THE TRACTION BATTERIES	

Caution!
These operations require safety precautions (wear gloves and protective goggles).

Caution!
Do not electric arc weld on the machine without first disconnecting the batteries.

Caution!
Do not use the batteries to jump start another vehicle.

1 - Preliminary operations

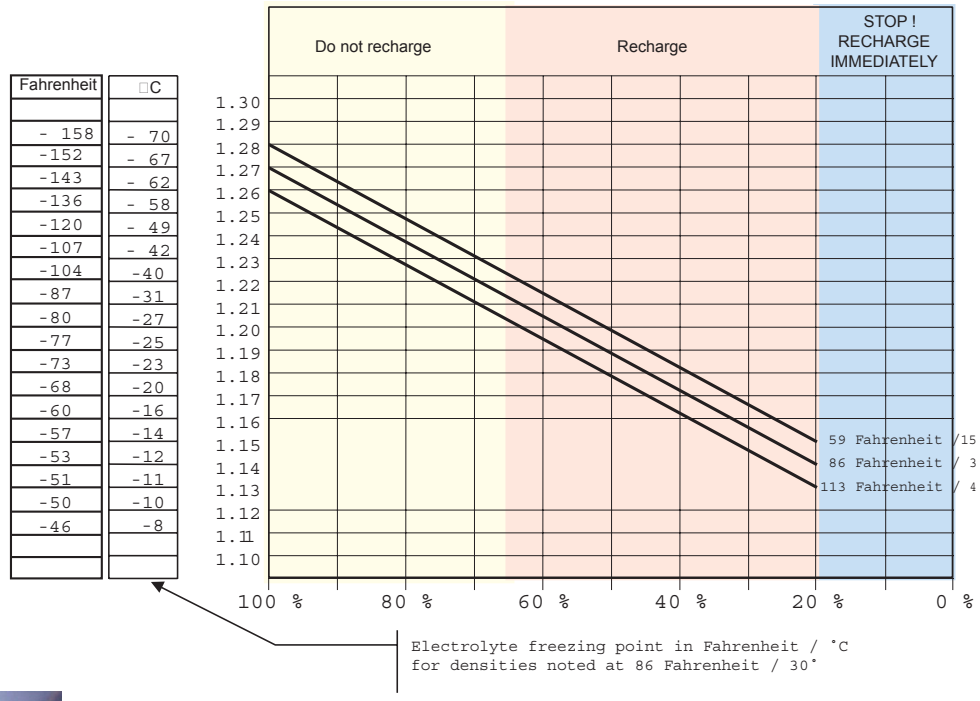
- Put the machine into the maintenance configuration (see relevant section).

2 - Battery servicing

- Check the electrolyte levels before charging once a week in normal use.
- If necessary, top up:
  - with distilled or de-mineralised water,
  - after charging.
- No not add acid (in the event of spillage, contact our After-sales department).
- Do not leave discharged batteries idle.
- Avoid overflow.
- Clean the batteries to avoid salt formation and current deviation.
- Wash the top without removing the caps.
- Dry with compressed air or clean cloths.
- Grease the lugs.

NB: *To enable rapid diagnosis of the state of your batteries, note the density of each element once a month, using a battery hydrometer, as a function of temperature, using the graph below (do not measure directly after filling.*

Fahrenheit	°C
- 158	- 70
-152	- 67
-143	- 62
-136	- 58
-120	- 49
-107	- 42
-104	-40
-87	-31
-80	-27
-77	-25
-73	-23
-68	-20
-60	-16
-57	-14
-53	-12
-51	-11
-50	-10
-46	-8



State of charge of a battery as a function of density and temperature

Sheet P010	PREVENTIVE MAINTENANCE SHEET	Folio 2/2
	CHECKING / SERVICING THE TRACTION BATTERIES	

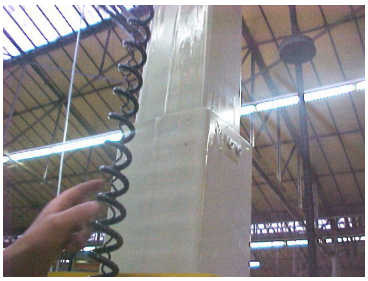
SHEET P011	PREVENTIVE MAINTENANCE SHEET	Folio 1/1
	LUBRICATING THE MAST	

1 - Lubricating the mast

- Extend the mast.
- Switch off the electric power supply (see relevant section).
- Grease the slides, at pad level, using a spatula.
- Grease the pads at the back of the machine.

NB: *Only use lubricants recommended by the manufacturer.*

- Put the machine back into the operational configuration.



	PREVENTIVE MAINTENANCE SHEET	

15 - OPERATING INCIDENTS

REMINDER: Respecting the machine's operating and servicing instructions will enable you to avoid most incidents.

However, certain incidents may arise and before any intervention, it is essential to consult table 6.1. If the incident is listed, simply follow the instructions.

Only common incidents whose solutions can be implemented by an operator are listed. For all other incidents, contact your PINGUELY HAULOTTE representative or the plant's After-sales service.

Before diagnosing a failure, check that:

- the emergency stop "palm buttons" on the turntable and platform are unlocked
- the circuit breakers on the turntable panel are pushed in.

The speed chopper has a failure indication system on the timer display. To diagnose a failure, consult the table below, note the alarm code and pass it onto the After-sales service, who will given you the instructions to follow.

15.1 - TROUBLE-SHOOTING

CODE	ALARM	PROBABLE CAUSES	REMEDIES
1	**POWER FAILURE**	• Short-circuit on an on/off valve: proportional electrovalve, coil main contactor SB1 or electrobrake.	
2	**EEPROM KO**	• Failure in the memory area in which the configured parameters are stored. If the failure remains when the ignition key has been turned on and then off, change the EEPROM. If the alarm stops, the stored parameters may have been cancelled and replaced by default parameters.	• Replace the chopper.
3	**INCORRECT START**	• Forward/reverse gear / jib lowering or lifting / platform lifting or lowering / left/right / steering/ traction authorization is/are ON when the ignition key is turned off or traction is required before traction authorization occurs.	• Machine problem, contact After-Sales service.
4	**CAPACITOR CHARGE**	• The test is executed during the initial diagnosis. The alarm switches on if, 500 m after the ignition key has been turned off, condensers have not started to load. A probable reason for that is a default in the power unit.	• Replace the chopper.
5	**R VMN NOT OK**	• The test is executed at rest, main switch off, and during operation. If the VMN is inferior to the battery voltage, and the machine is at rest, then the chopper switches to an alarm state. While working, the alarm switches ON if the VMN does not follow the duty-cycle of the chopper. • Possible reasons: - Incorrect motor connection - Current leakage to the ground - Default in the power unit.	• Check the right travel motor and its wiring (sock). • If they are correct, replace the chopper.
6	**L VMN NOT OK**	• The test is executed at rest, main switch off, and during operation. If the VMN is inferior to the battery voltage, and the machine is at rest, then the chopper switches to an alarm state. While working, the alarm switches ON if the VMN does not follow the duty-cycle of the chopper. • Possible reasons: - Incorrect motor connection - Current leakage to the ground - Default in the power unit.	• Check the left travel motor and its wiring (sock). • If they are correct, replace the chopper.
7	**VACC NOT OK**	• The alarm shows that the traction accelerator voltage received by the serial card is more than 1V at rest, without any operation request. • Possible reasons (to look for in the serial card): - One of the potentiometer's wires is cut. - The potentiometer is improperly connected. - The potentiometer is defective. - Incorrect serial card programming.	• The code checks the potentiometer voltage value at rest. • Replace the serial card or the joystick.

CODE	ALARM	PROBABLE CAUSES	REMEDIES
8	**VFIELD NOT OK**	• The test is executed at rest. In this condition, the voltage on the 2 connections of the field should be about half of the batteries'. The alarm is given if voltage is different from this value. • Possible reasons for voltage differences: - Motor current leakage to the ground. - The field of the motor is not connected to the chopper. - Default in the section of the power unit related to the field.	• Check the travel motor's inductors and check the F1 and F2 outputs' resistance compared to positive and negative outputs.
9	**STEER SENSOR KO**	• The µP maintains that the signal of the steering potentiometer is not out of the programmed range. • Possible reasons for failure: - Incorrect programming - Steering potentiometer needs readjusting.	• Check the potentiometer, wiring, chopper data (steer sensor adjusting).
10	**RIGHT STBY I HIGH** **LEFT STBY I HIGH**	• The test is executed during the initial diagnosis, at rest. It maintains that the current is superior to a minimum threshold. In the opposite case, the chopper switches the alarm ON while blocking the machine. • Possible reasons for failure: - Sensor is out of order. - Fault in the measure circuit, the logic circuit, or in the power.	• Induction current problem detected on ignition. • Replace the chopper.
11	**RIGHT I = 0 EVER** **LEFT I = 0 EVER**	• The test is executed while working. It checks that the current is superior to a threshold value. In the opposite case, the chopper switches the alarm ON while blocking the machine. • Possible reasons: see STBY HIGH.	• Induction current problem detected during operation. • Replace the chopper.
12	**HIGH FIELD CURRENT**	• Malfunction in the field current. The field current at rest is not nil. • Possible reasons for failure to indicate nil field current: - Malfunction in the current detector - Fault in the power unit of the field.	• Inductor current problem detected on ignition. • Replace the chopper.
13	**NO FIELD CURRENT**	• Malfunction in the field current. While working the field current is nil • Possible reasons: - Malfunction in the current detector - Fault in the power unit.	• Inductor current problem detected on ignition. • Replace the chopper.
14	**DRIVER SHORTED**	• The test is executed with the main switch (SB1) open. Check that the main switch driver is not in short-circuit. • Possible reasons for failure: - Driver in short-circuit. - Malfunction in the measure circuit of the contactor coil voltage. - Incorrect wiring. - Faulty hardware circuit protection (Nota Bene: This alarm is normally overridden by alarm #1 POWER FAILURE).	• Main switch alarm usually overridden by the POWER FAILURE alarm. • Machine related problem ; contact After Sales Service.

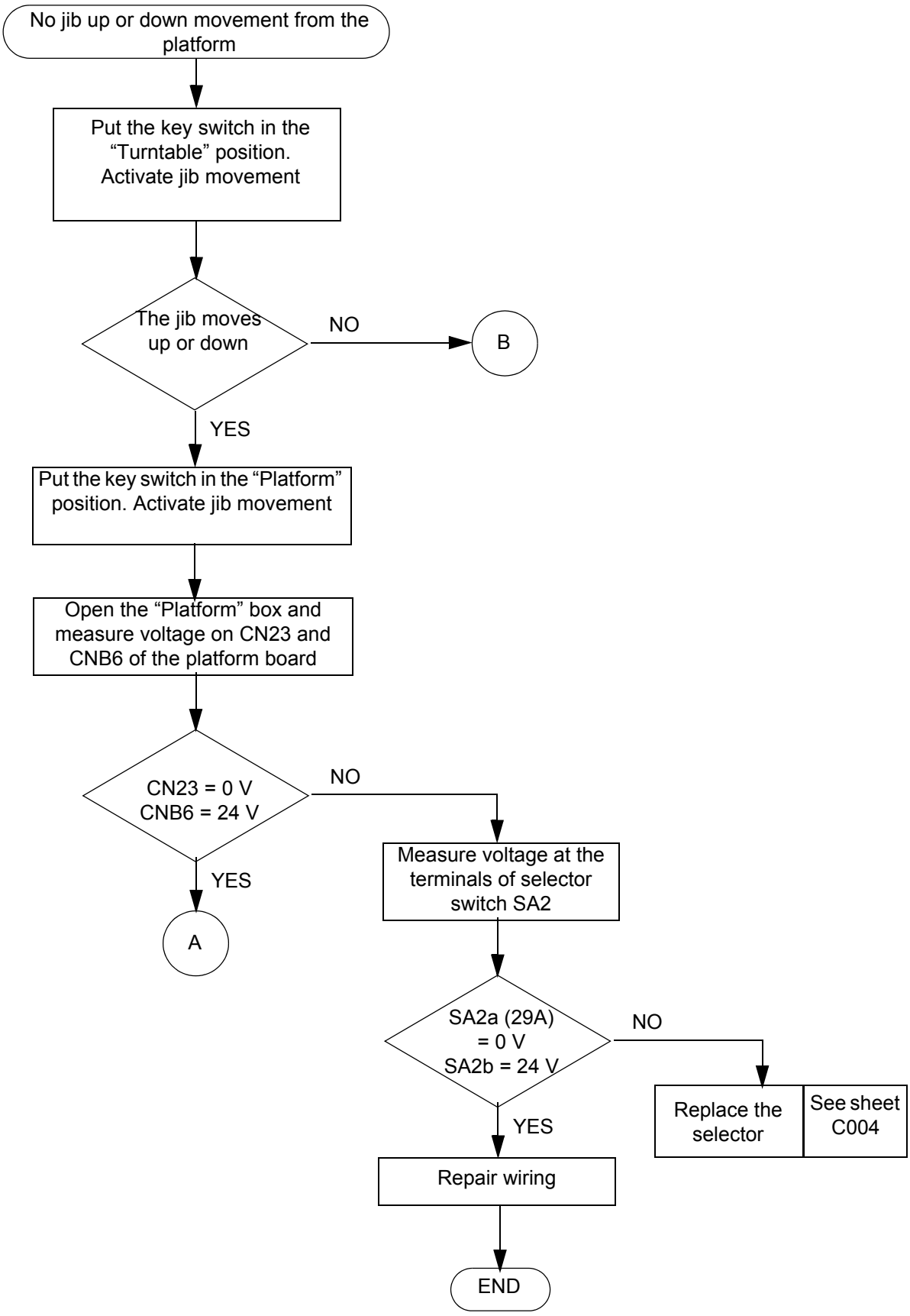
CODE	ALARM	PROBABLE CAUSES	REMEDIES
15	**CONTACTOR DRIVER**	• The test is executed while the main switch is closed. It checks that the driver is not open. • Possible reasons for failure: - Short-circuit in the driver. - Malfunction in the circuit of the contactor coil voltage.	• Alarm given on SB1 driver (main switch in short-circuit). • Replace the chopper.
16	**CONTACTOR CLOSED**	• The test is executed each time before the main switch is closed. It checks that the switch is actually open. • Possible reasons for failure: - The switch contacts are stuck. - A malfunction in the power unit.	• Alarm given due to a problem on the SB1 power contact. • Replace the power sensor or the chopper. • Check F1 and F2 on the chopper.
17	**FORW + BACK**	• The test is performed non stop. The alarm is on if two requests for different operations are simultaneously activated. • Possible reasons: - Mistake in wiring. - Working microswitch stuck. - Wrong operation by the user.	• Replace the serial card or joystick.
18	**BATTERY LOW**	• Stepping down of the traction current and blocking of the pump functions. The battery alarm switches on when there is 10% of residual load left. • If the alarm is on with unloaded batteries, control the battery value read in the TESTER menu of the console. If incorrect, adjust it in the menu CONFIG MENU/ADJUSTMENT.	• Fix the problem selecting the BATT ADJUSTMENT function. It is essential to test the travel movements BEFORE replacing the chopper.
19	**BRAKE DRIVER KO**	• This alarm is on when there is a problem on the electrobrake driver. • Possible reasons: - Short-circuit in the driver - Defect in the driver unable to command the electrobrake. - The measure circuit on the voltage on the electro-brake coil is defective.	• Internal problem related to the chopper QH20 driver. • Replace the chopper.
20	**CONTACTOR OPEN**	• The control microprocessor is broken or has identified a dangerous situation that has not been detected by the main microprocessor.	• Replace the chopper.
21	**MICRO CONTROL KO**	• The µP of the logic control is broken or several connections have been damaged.	• Replace the chopper.
22	**CHECK UP NEEDED**	• Servicing request programmed ; interval of the last maintenance operation >300h. This alarm does not stop the machine but signals the problem. Select the option "CHECK UP DONE" ON to erase the message.	• Cancel the servicing request, reset or service the machine if needed.
23	**NO ISOLATION**	• Maintains that the chassis is not on short circuit with the +BATT or connected to the ground.	• Check the circuit and the chopper's outputs insulation. • Repair the damaged circuit.

CODE	ALARM	PROBABLE CAUSES	REMEDIES
24	**PRESSURE NOT OK**	• The pressure switch can be damaged or disconnected or the emergency stop could have been damaged (it cuts the positive charge at the pressure switch but not at the logic).	• Check the shunt on the serial card and that the voltage on the chopper input is positive.
25	**CHOPPER NOT CONFIGURATED**	• A valid model for the chopper has not been configured. (See the model selection board).	• Check the parameters (shunt on the downside of the serial card).
26	**EVP NOT OK**	• The proportional electrovalve is open at rest. While working, the electrovalve is too open or too closed compared to the PVM applied.	• Check that the controller has been correctly configured with absent EVP.
27	**SERIAL ERROR #1**	• Incomplete or lack of reception by the selected serial card.	• Check the serial card selection by SA1.
28	**THERMAL PROTECTION**	• Heat alarm > 75°C/167°F ; the maximum current on inductors is linearly stepped down to 0 at 90°C/ 194°F. The alarm stops if T<70°C/167°F.	• Check the chopper's temperature using the console or replace the chopper.

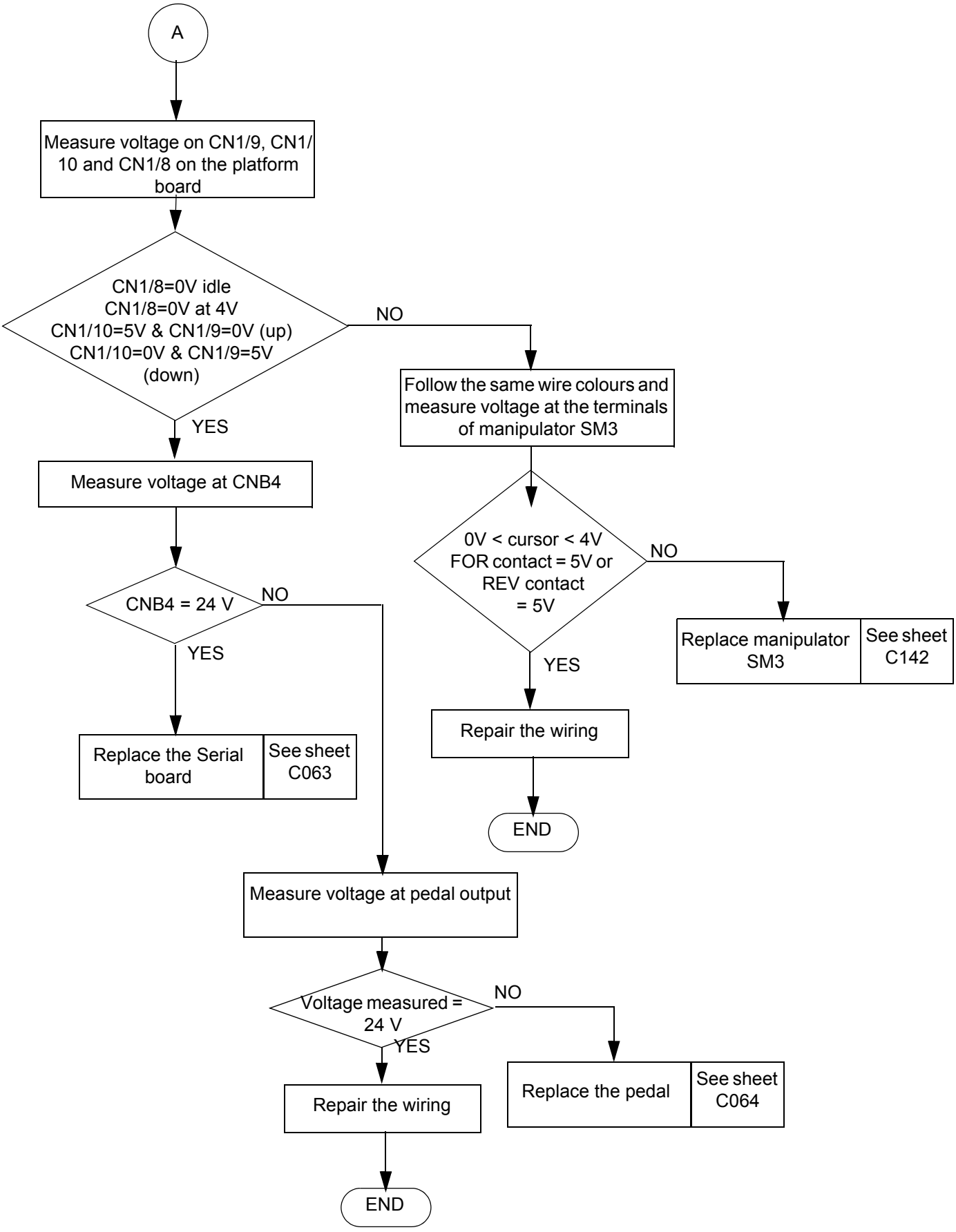
ANOMALY	PROBABLE CAUSE	SOLUTION
No jib up/down movement from the platform	• Defective wiring • Defective serial board • Defective manipulator SM3 • Defective fail-safe pedal • Defective SB5 • Defective or discharged batteries • Defective chopper • Defective coil	Sheet DP075
No jib up/down movement from the turntable	• Defective wiring • Defective selector switch • Defective serial board • Defective manipulator SM1 • Defective fail-safe pedal • Defective or discharged batteries • Defective chopper • Defective coil • Defective SB5	Sheet DP076
No mast up/down movement from the platform	• Defective wiring • Defective selector switch • Defective serial board • Defective manipulator SM3 • Defective fail-safe pedal • Defective SQ10 • Defective or discharged batteries • Defective chopper • Defective coil	Sheet DP077
No mast up/down movement from the turntable	• Defective wiring • Defective serial board • Defective manipulator SM1 • Defective SB6 • Defective SQ10 • Defective or discharged batteries • Defective chopper • Defective coil	Sheet DP078
No right/left rotation movement from the platform	• Defective wiring • Defective selector switch • Defective serial board • Defective manipulator SM2 • Defective fail-safe pedal • Defective chopper • Defective coil	Sheet DP079
No right/left rotation movement from the turntable	• Defective wiring • Defective serial board • Defective manipulator SM1 • Defective SB7 • Defective SQ10 • Defective chopper • Defective coil	Sheet DP080

ANOMALY	PROBABLE CAUSE	SOLUTION
No movement available from the platform	• Defective fuses • Defective wiring • Defective emergency stop button or station selection • Defective chopper • Defective serial board • Defective manipulator SM2 • Defective fail-safe pedal • Defective SB contactor • Defective or discharged batteries	Sheet DP081
No movement available from the turntable	• Defective fuses • Defective emergency stop button or station selection • Defective chopper • Defective serial board • Defective manipulator SM1 • Defective SB contactor • Defective wiring • Defective or discharged batteries	Sheet DP082
No forward or back travel movement	• Defective wiring • Defective selector switch • Defective manipulator SM3 • Defective fail-safe pedal • Defective serial board • Defective chopper	Sheet DP083
Travel only in microspeed	• Defective wiring • Defective chopper • SQ12 incorrectly set or defective • SQ4 incorrectly set or defective	Sheet DP084
No right or left steering movement	• Defective wiring • Defective selector switch • Defective manipulator SM2 • Defective fail-safe pedal • Defective chopper • Defective coil	Sheet DP085

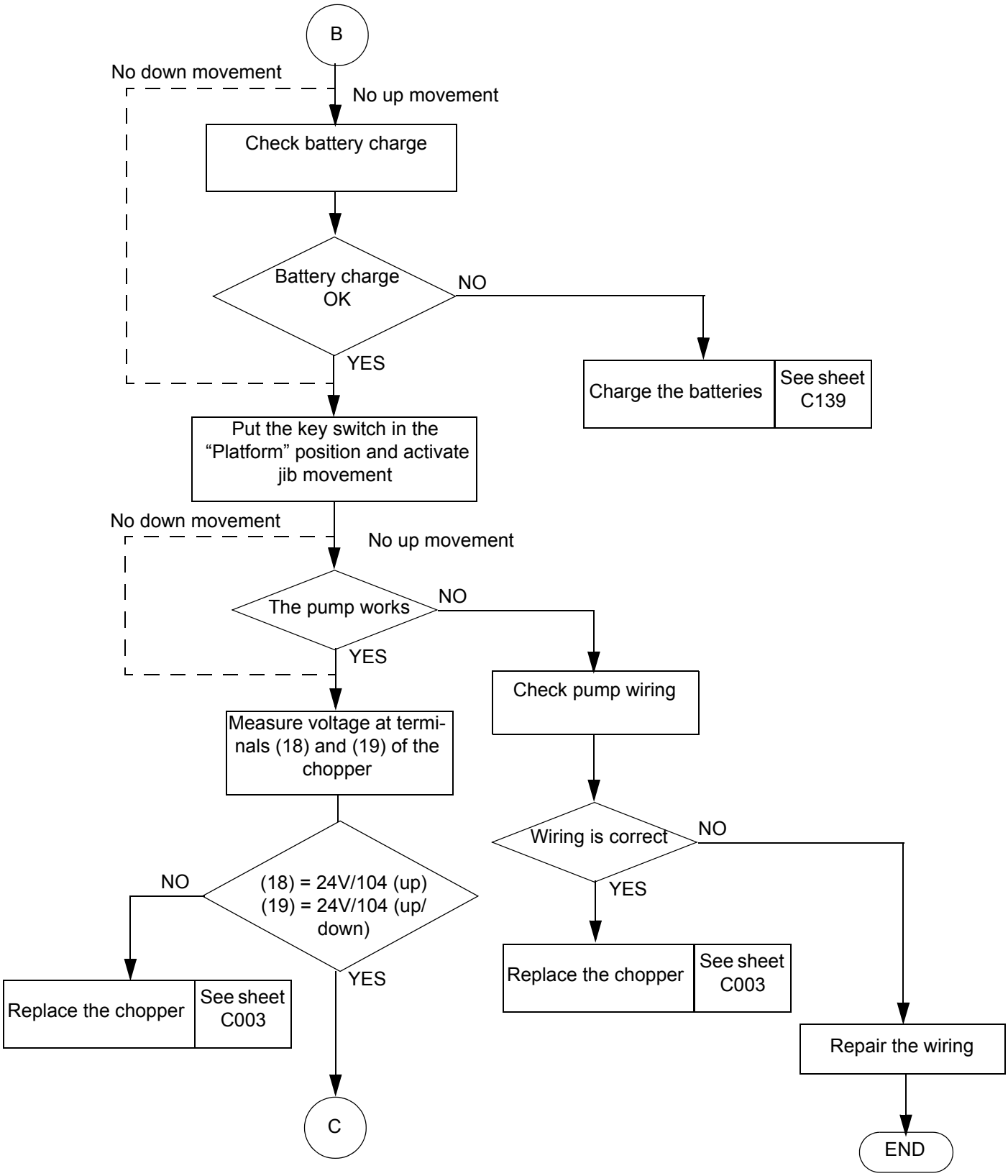
Sheet DP075	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN JIB MOVEMENT FROM THE PLATFORM	Folio 1/6



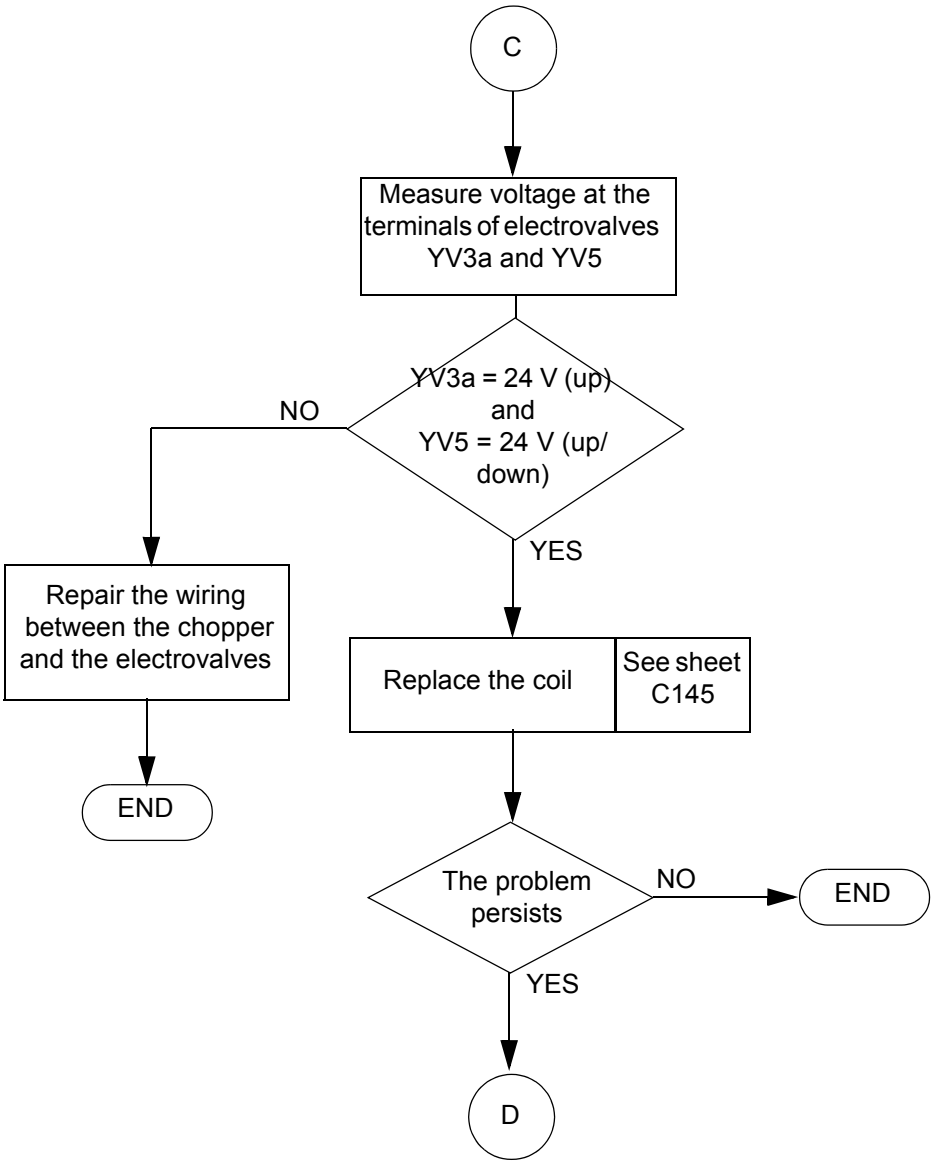
Sheet DP075	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN JIB MOVEMENT FROM THE PLATFORM	Folio 2/6



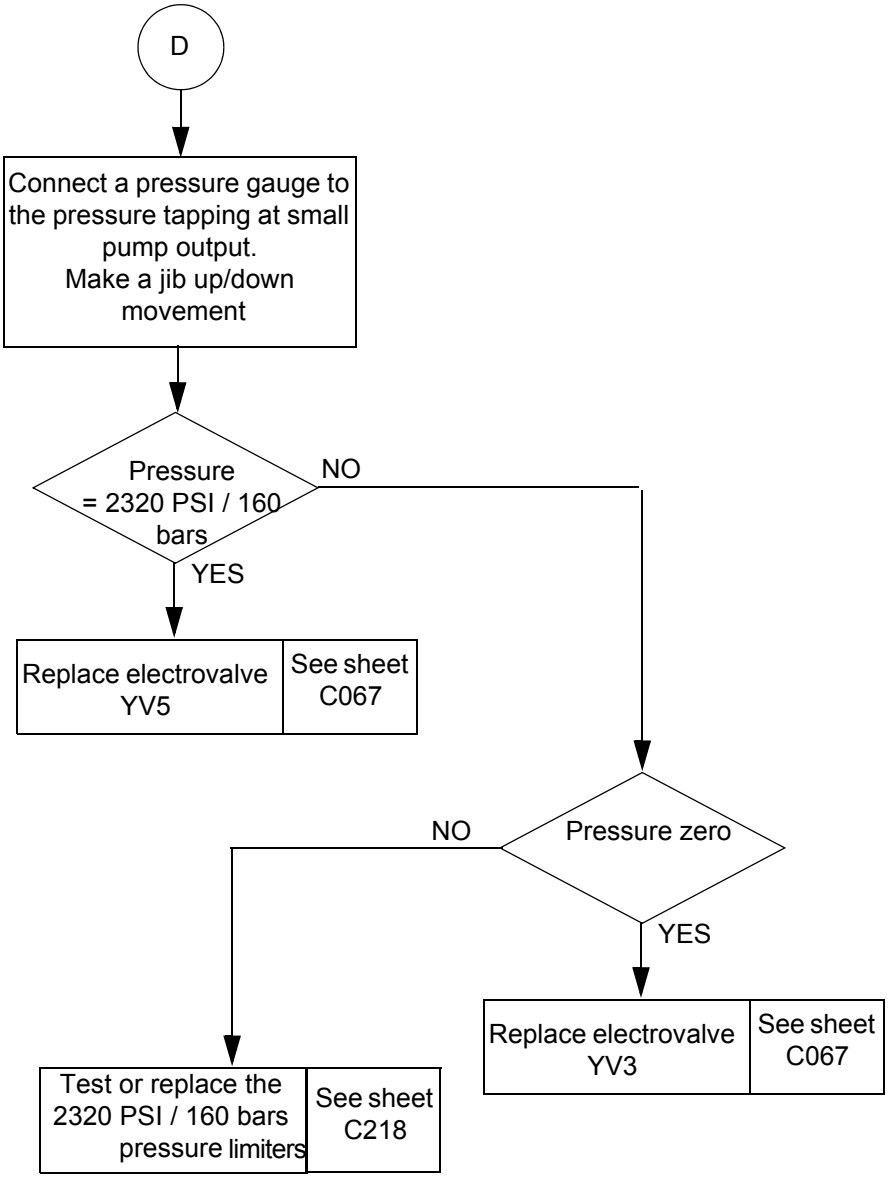
Sheet DP075	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN JIB MOVEMENT FROM THE PLATFORM	Folio 3/6



Sheet DP075	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN JIB MOVEMENT FROM THE PLATFORM	Folio 4/6

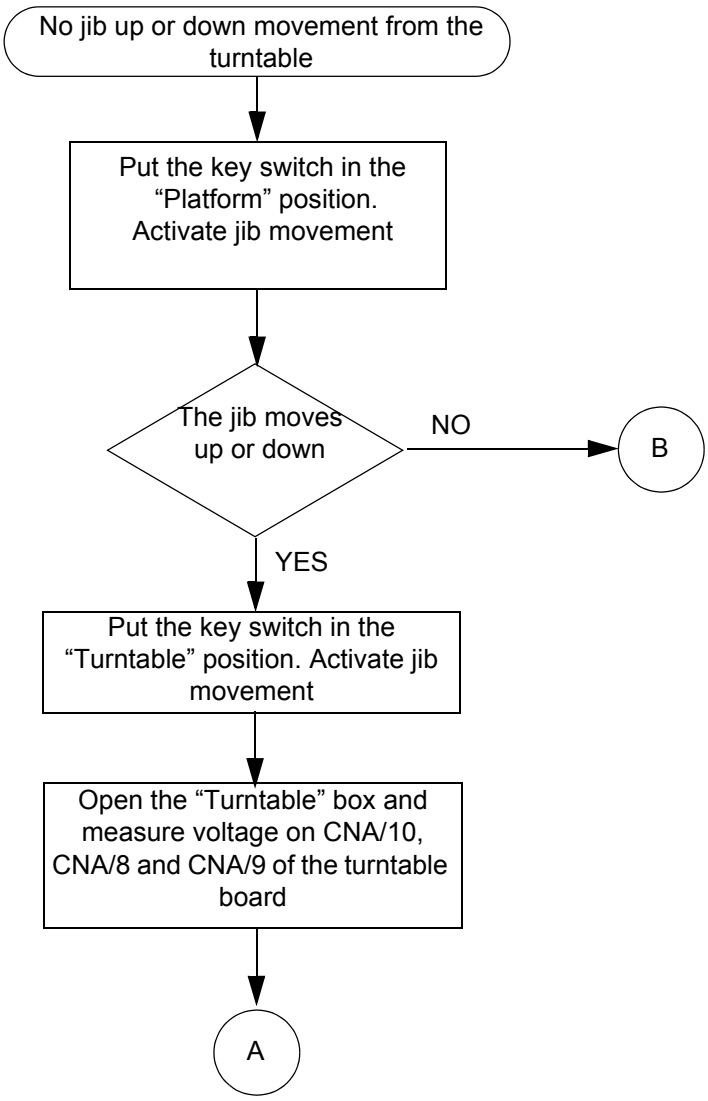


Sheet DP075	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN JIB MOVEMENT FROM THE PLATFORM	Folio 5/6

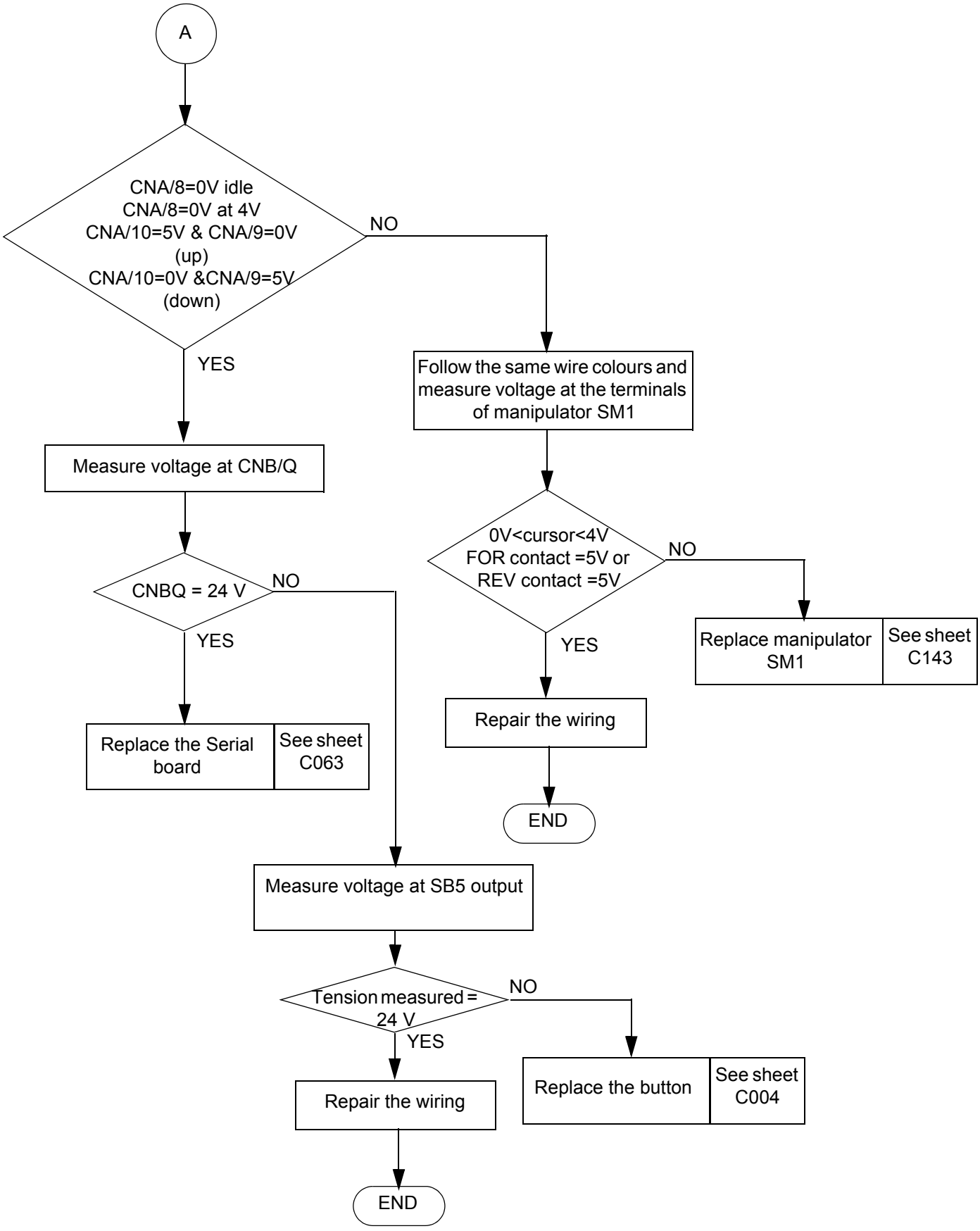


Sheet DP075	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN JIB MOVEMENT FROM THE PLATFORM	Folio 6/6

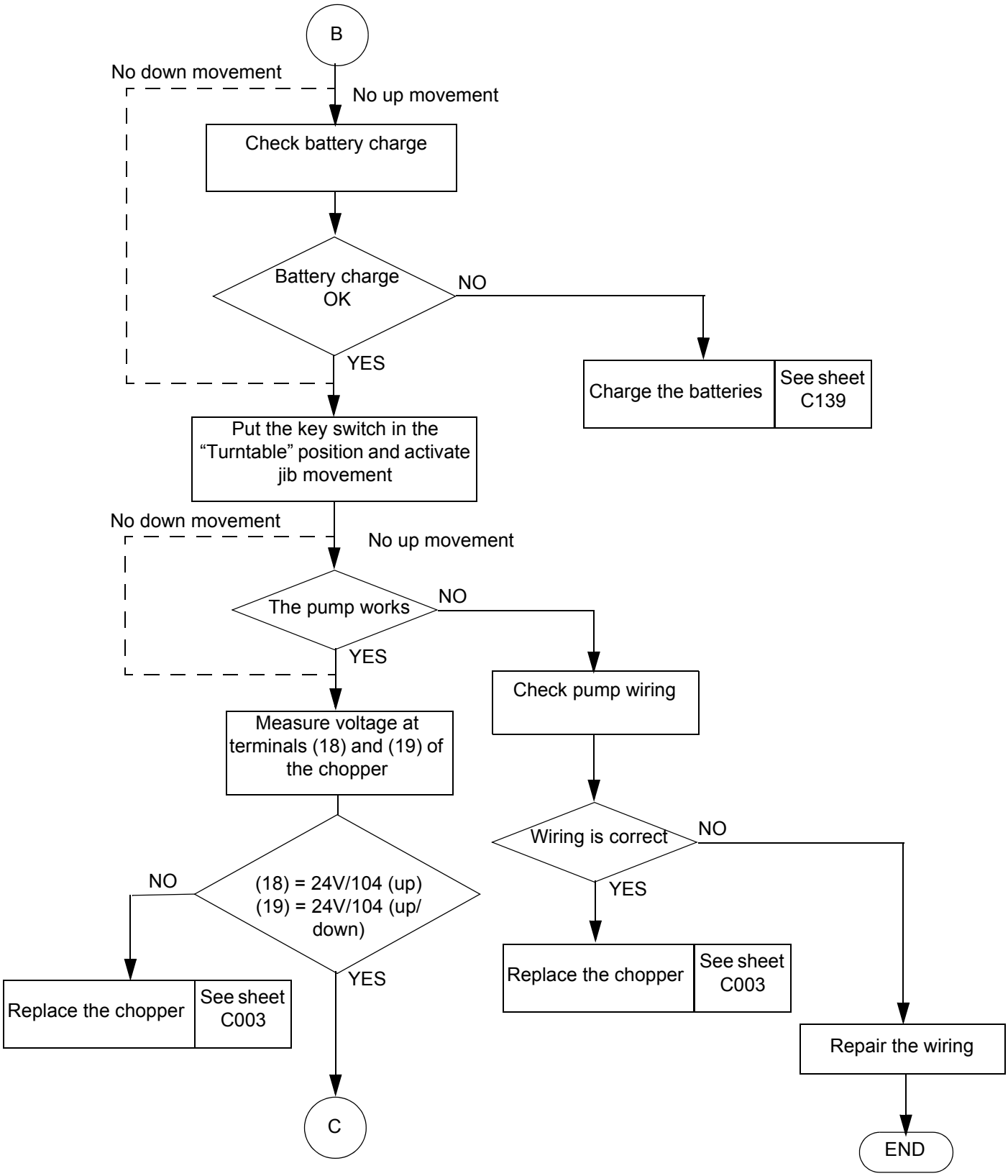
Sheet DP076	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN JIB MOVEMENT FROM THE TURNTABLE	Folio 1/6



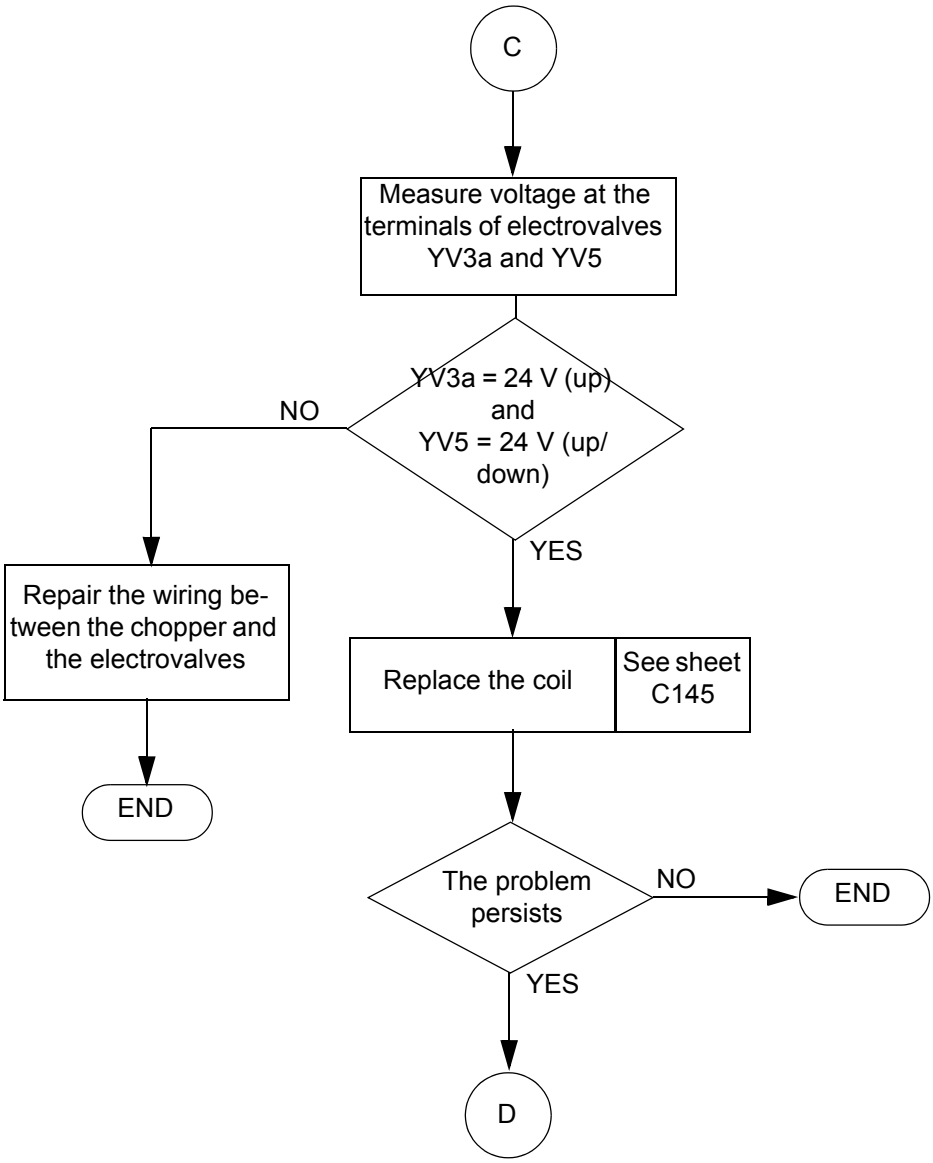
Sheet DP076	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN JIB MOVEMENT FROM THE TURNTABLE	Folio 2/6



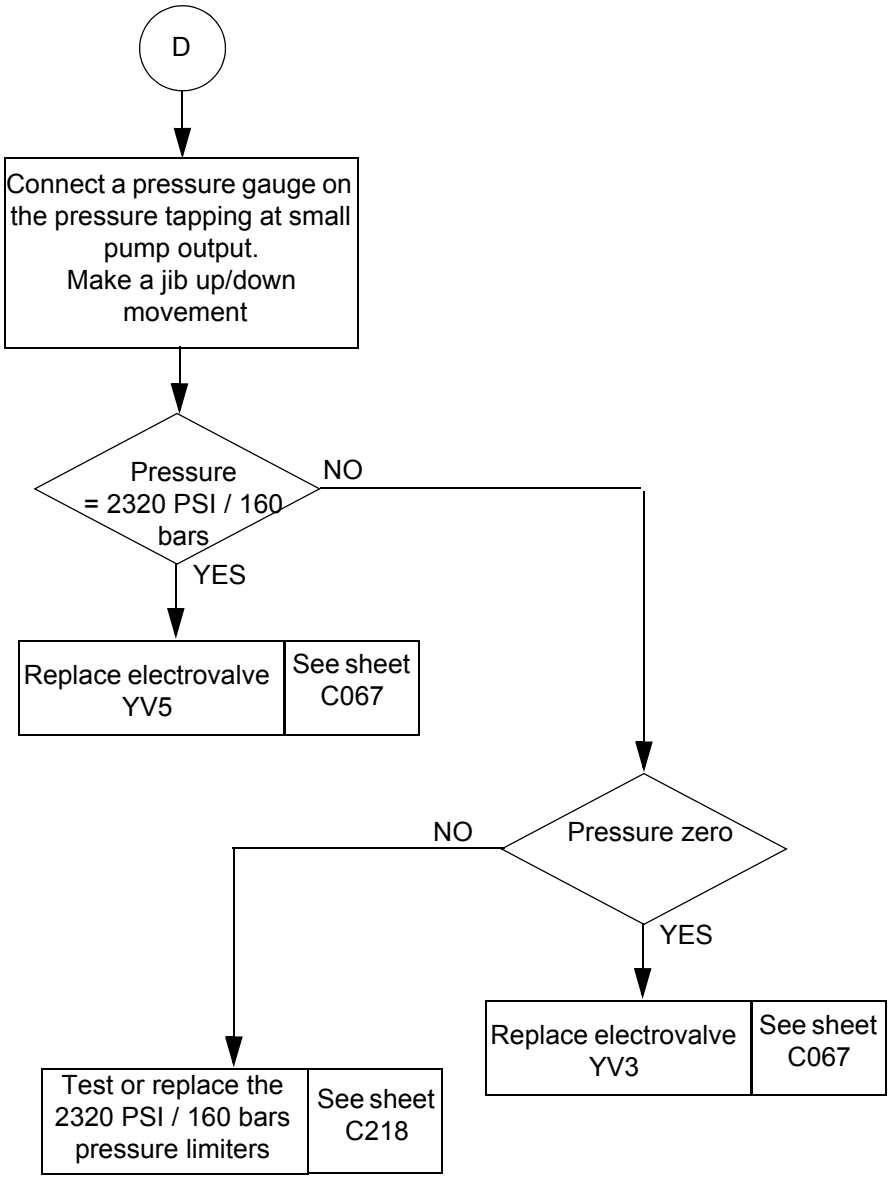
Sheet DP076	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN JIB MOVEMENT FROM THE TURNTABLE	Folio 3/6



Sheet DP076	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN JIB MOVEMENT FROM THE TURNTABLE	Folio 4/6

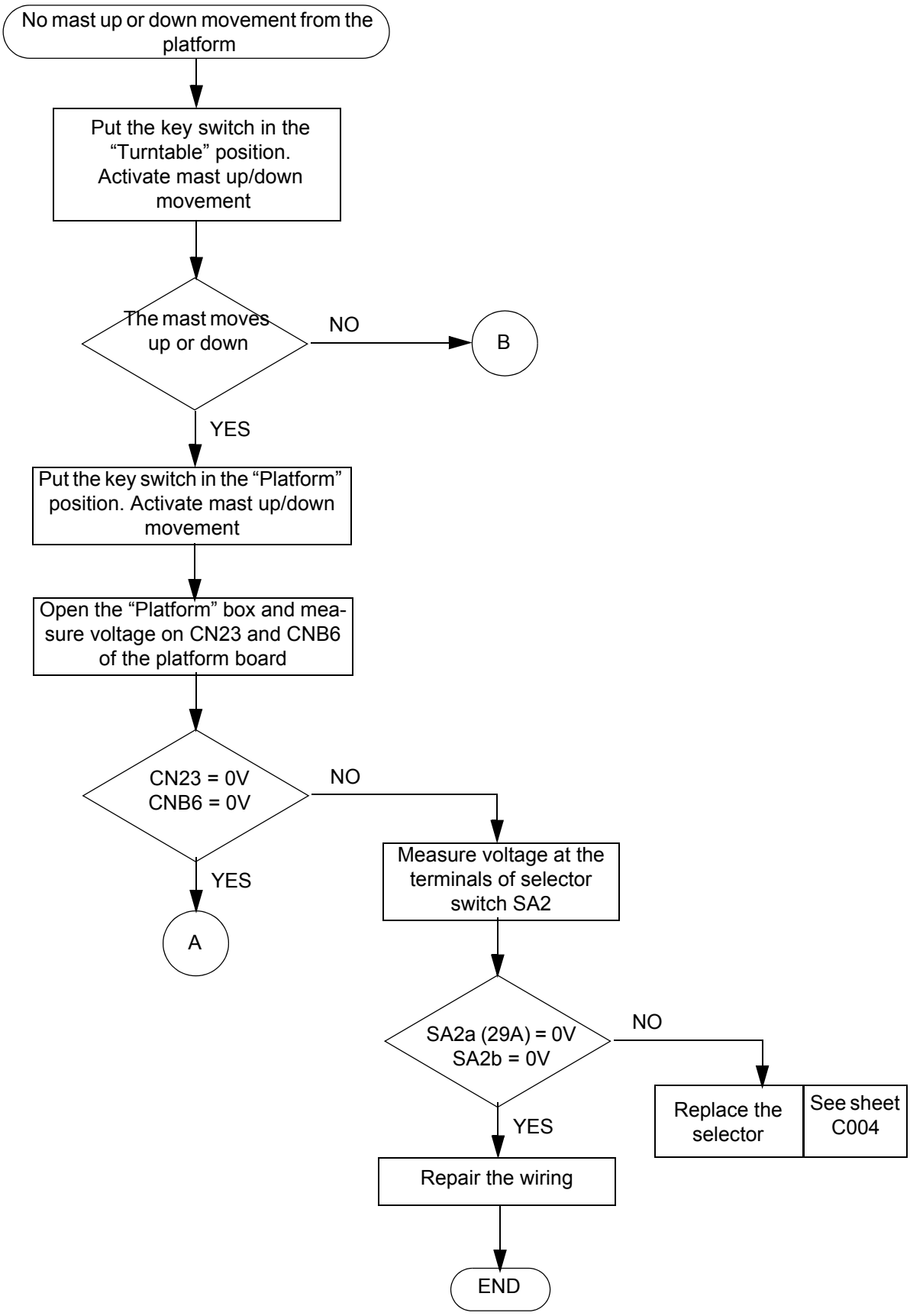


Sheet DP076	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN JIB MOVEMENT FROM THE TURNTABLE	Folio 5/6

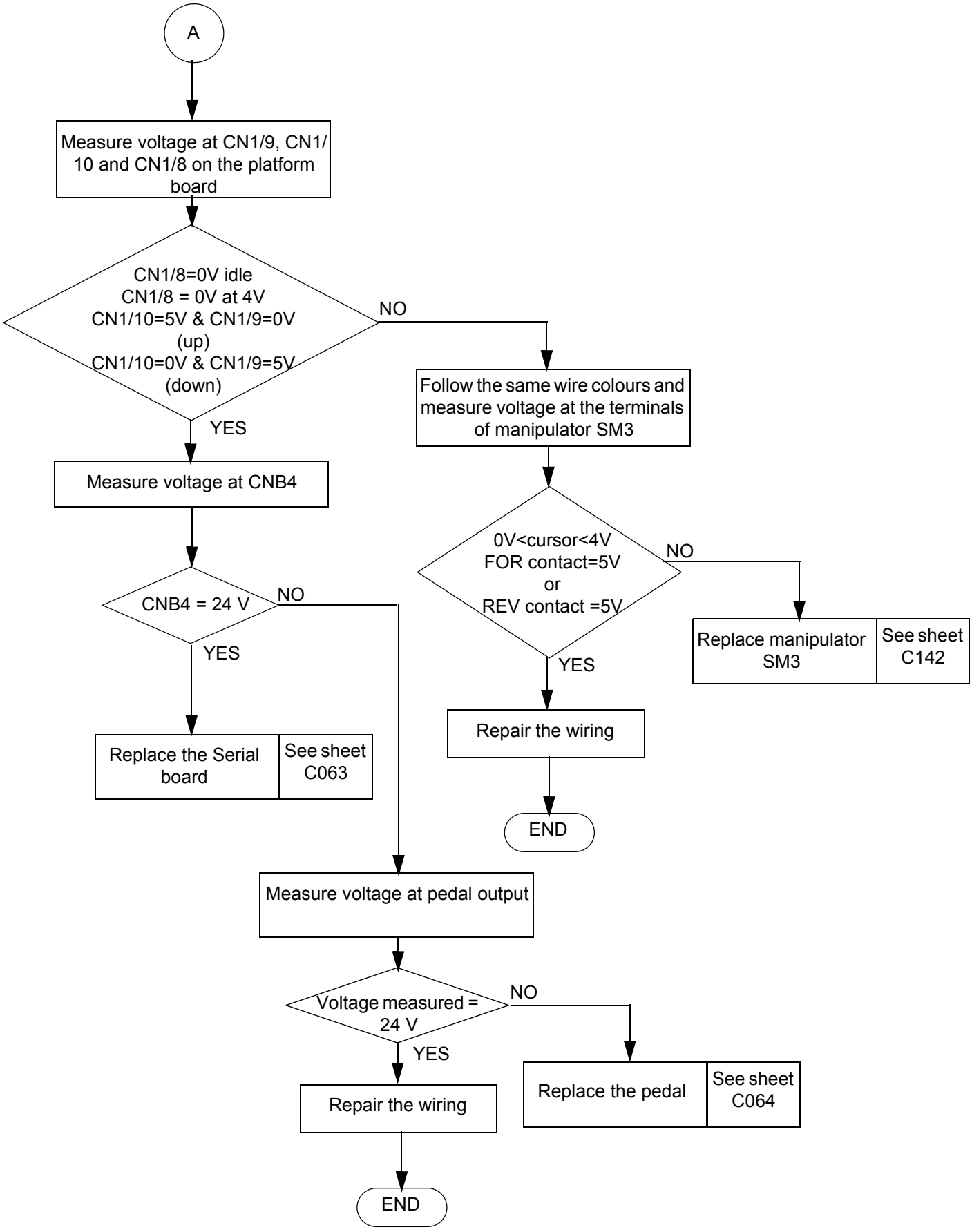


Sheet DP076	BREAKDOWN DETECTION FLOW CHART	Folio 6/6
	NO UP OR DOWN JIB MOVEMENT FROM THE TURNTABLE	

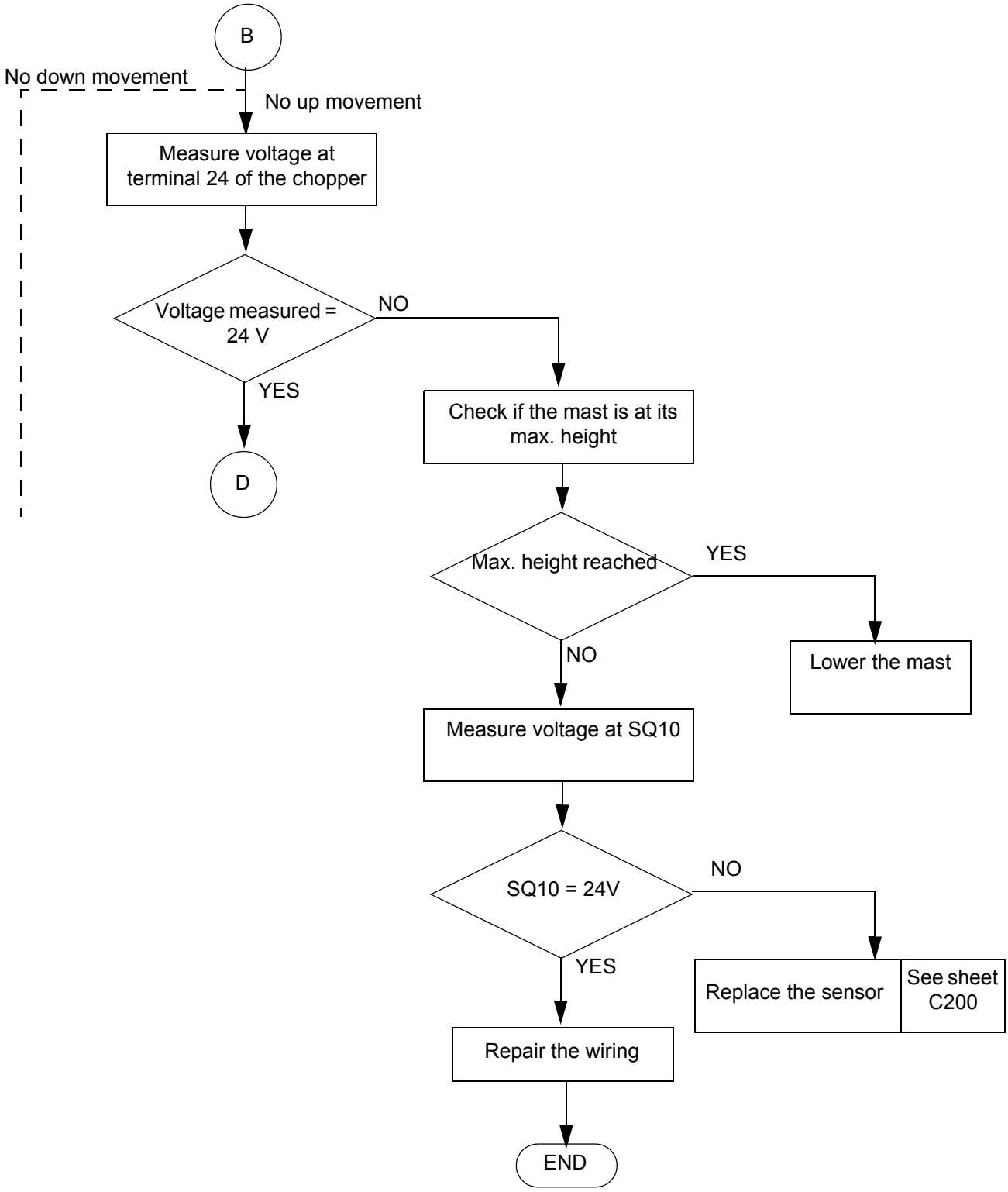
Sheet DP077	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN MAST MOVEMENT FROM THE PLATFORM	Folio 1/6



Sheet DP077	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN MAST MOVEMENT FROM THE PLATFORM	Folio 2/6



Sheet DP077	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN MAST MOVEMENT FROM THE PLATFORM	Folio 3/6



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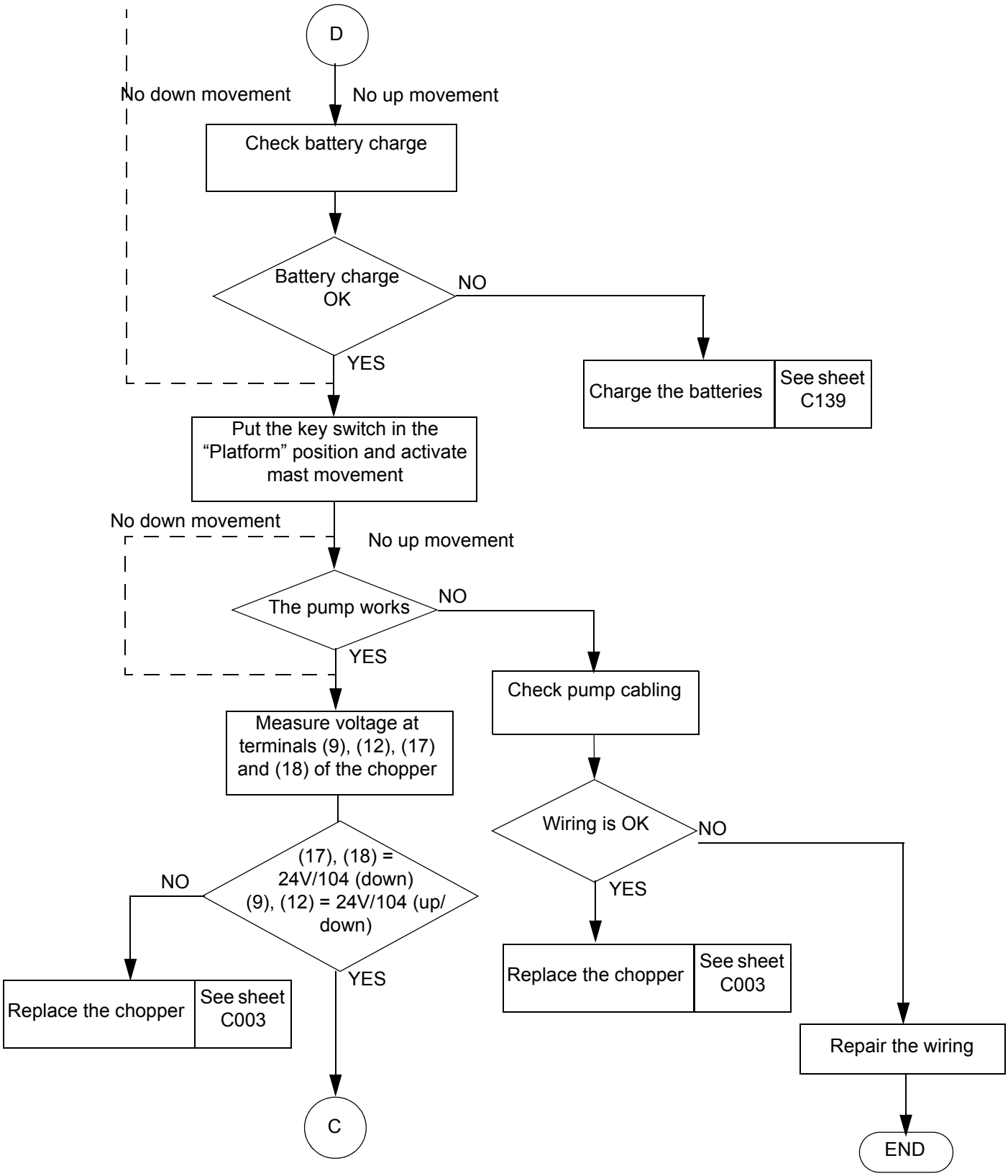
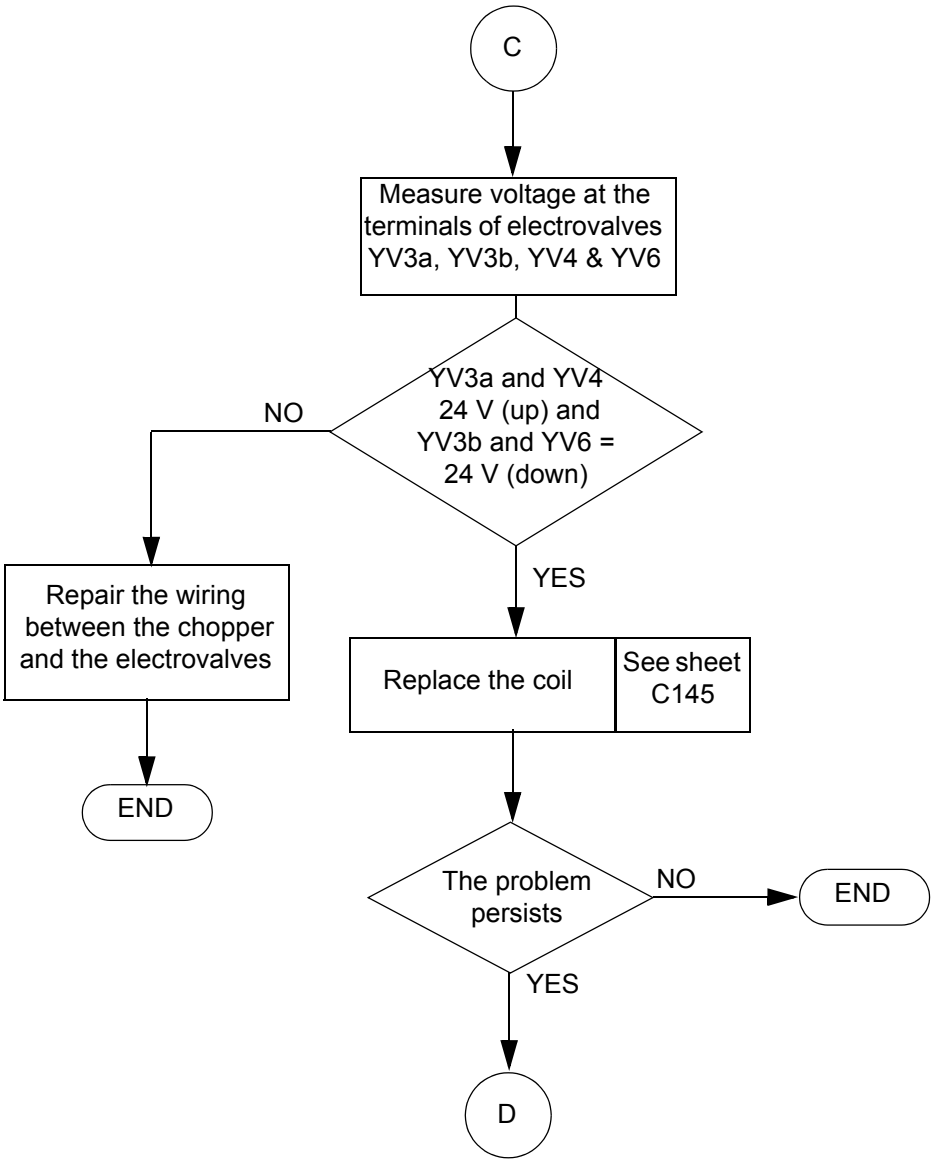


Sheet DP077	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN MAST MOVEMENT FROM THE PLATFORM	Folio 5/6



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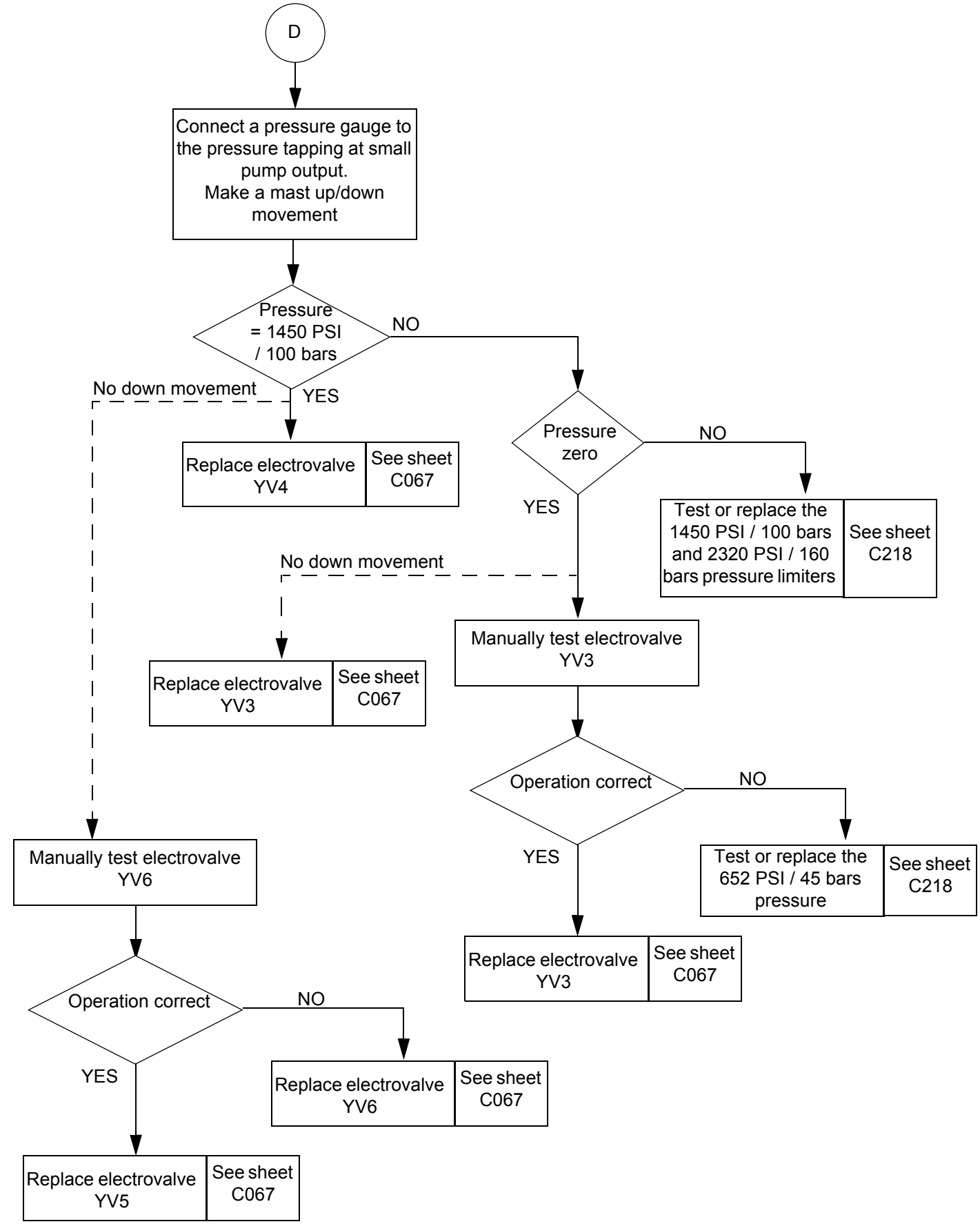

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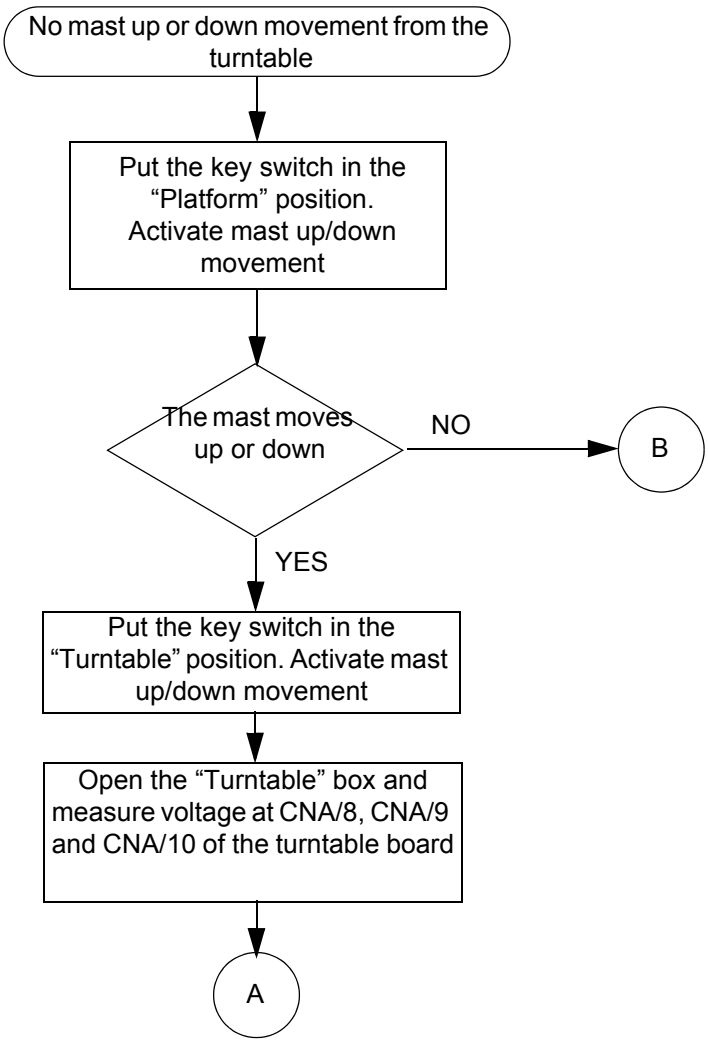

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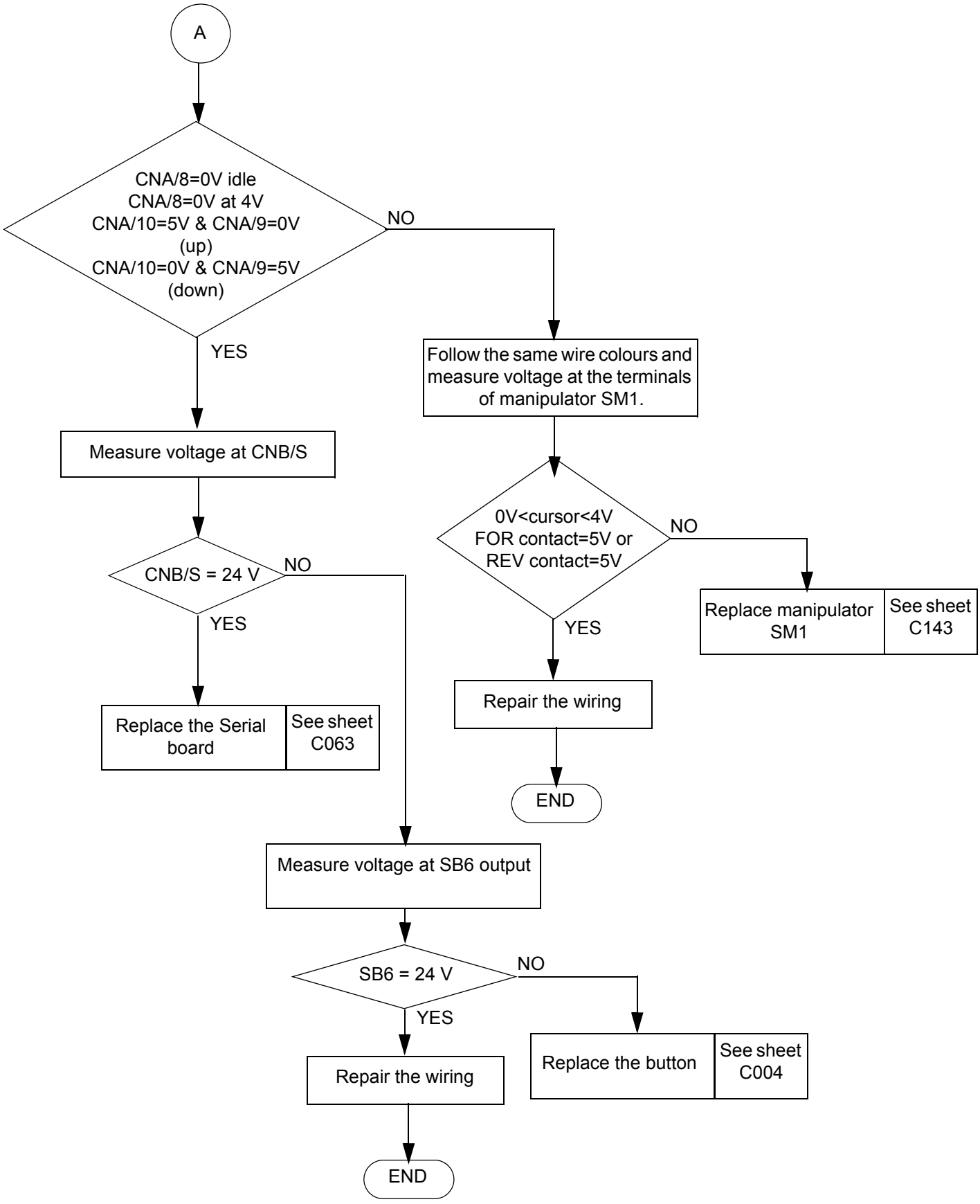

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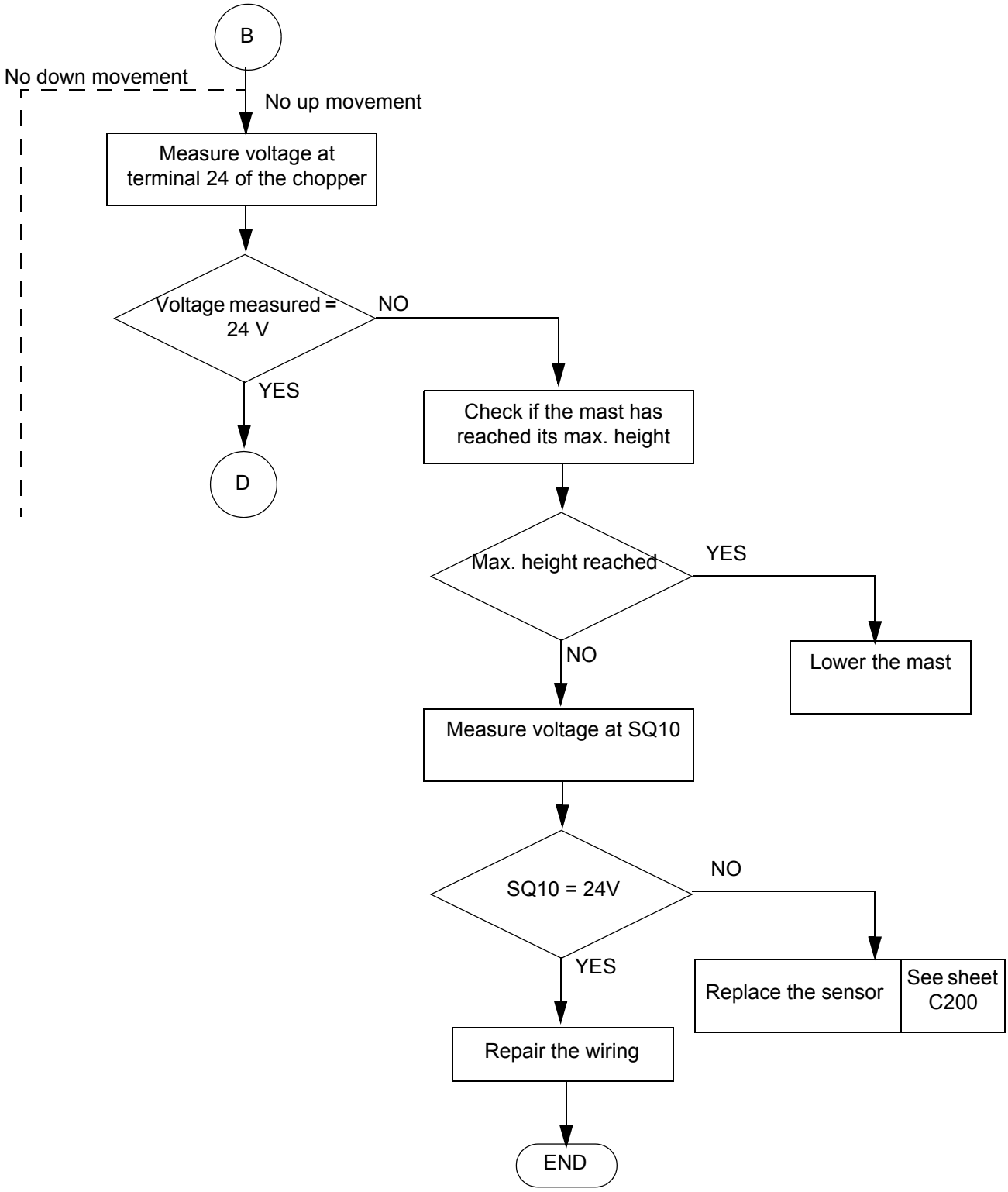

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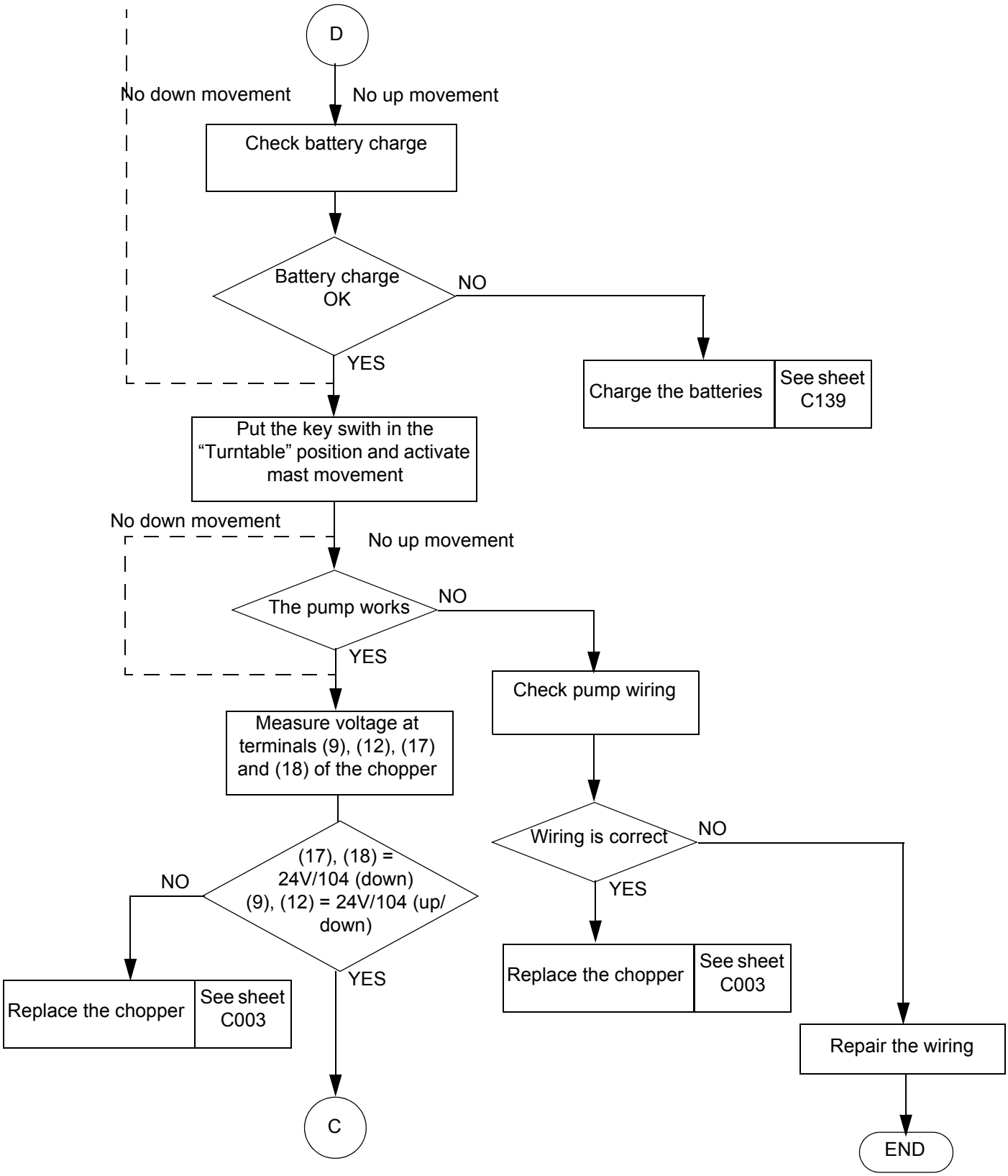
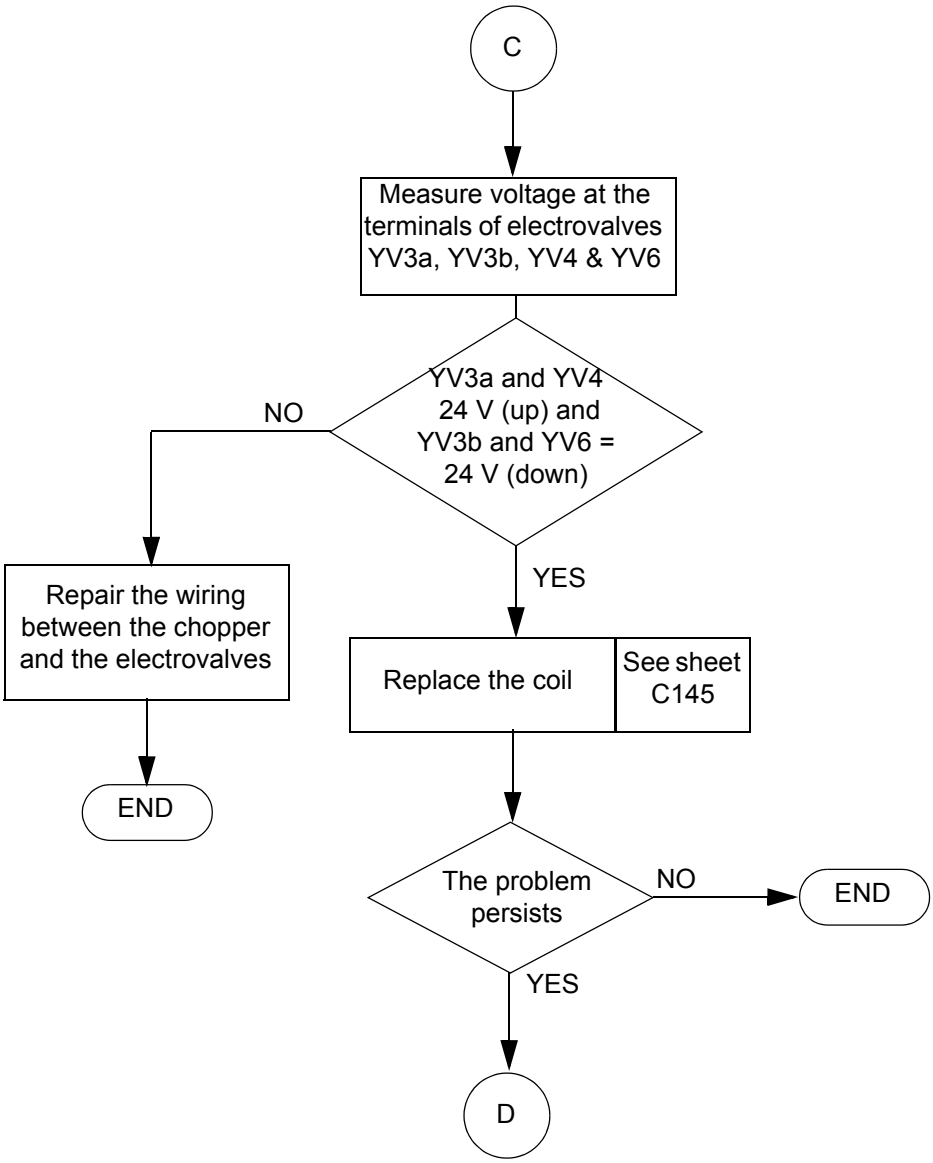
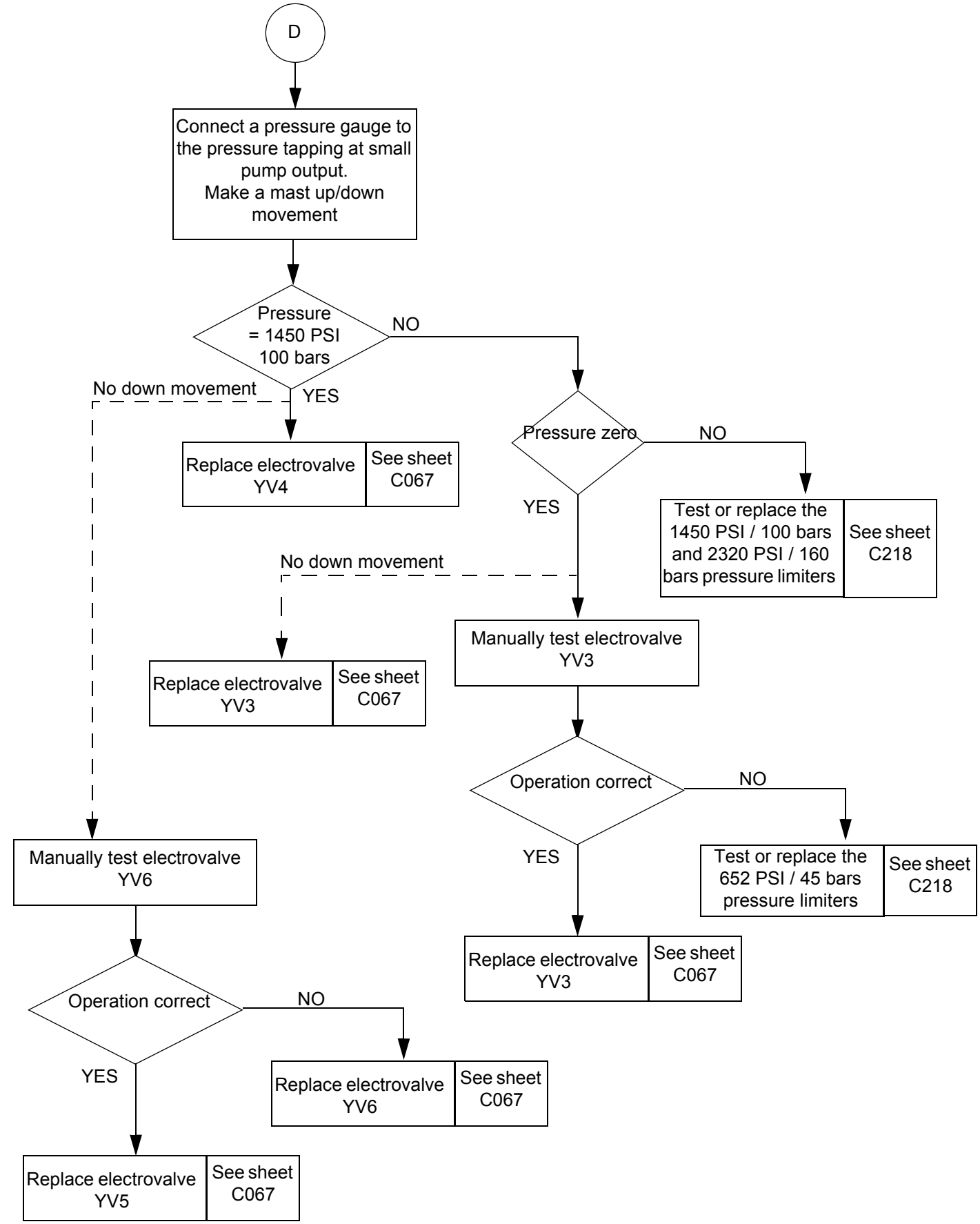


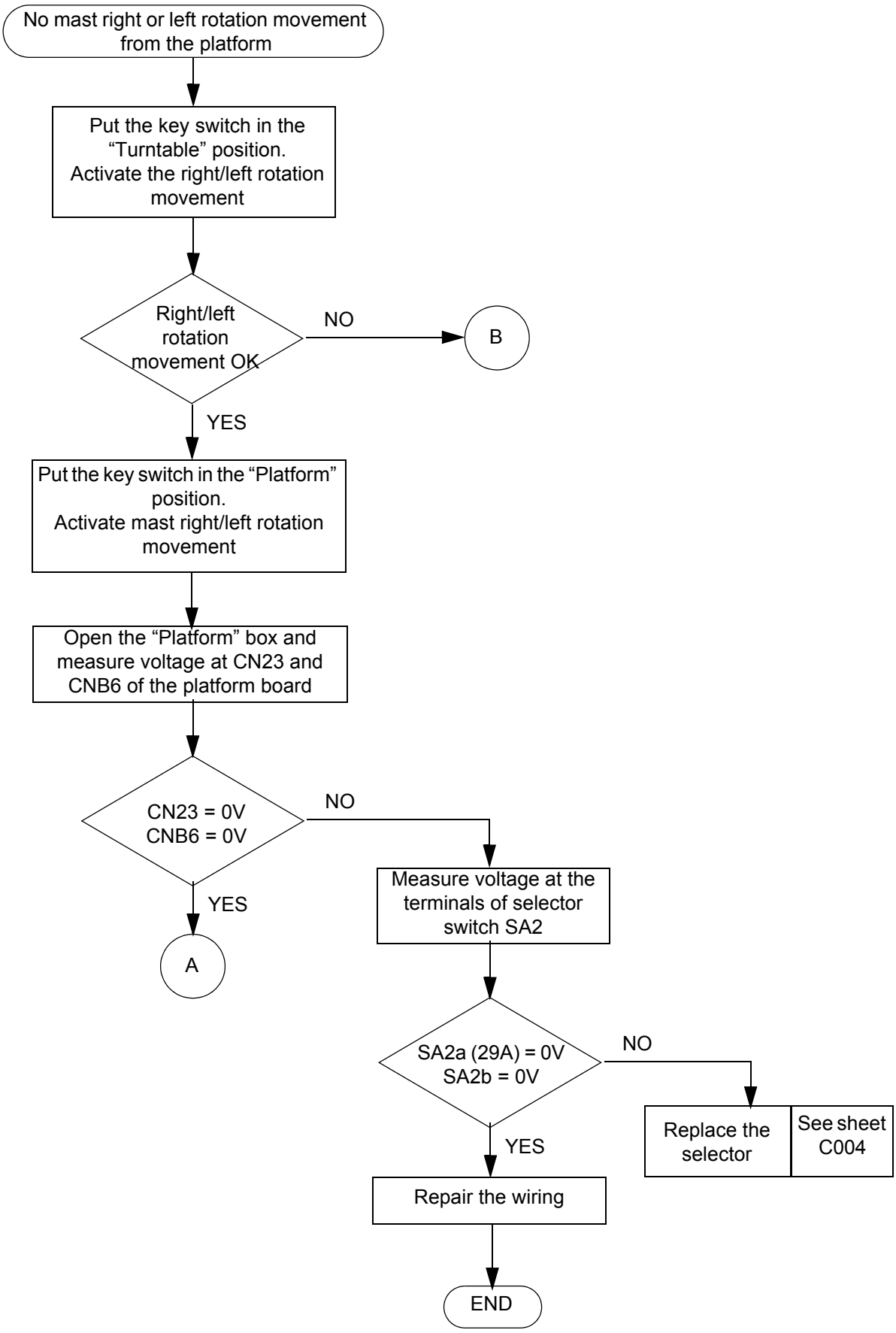
Sheet DP078	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN MAST MOVEMENT FROM THE TURNTABLE	Folio 5/6



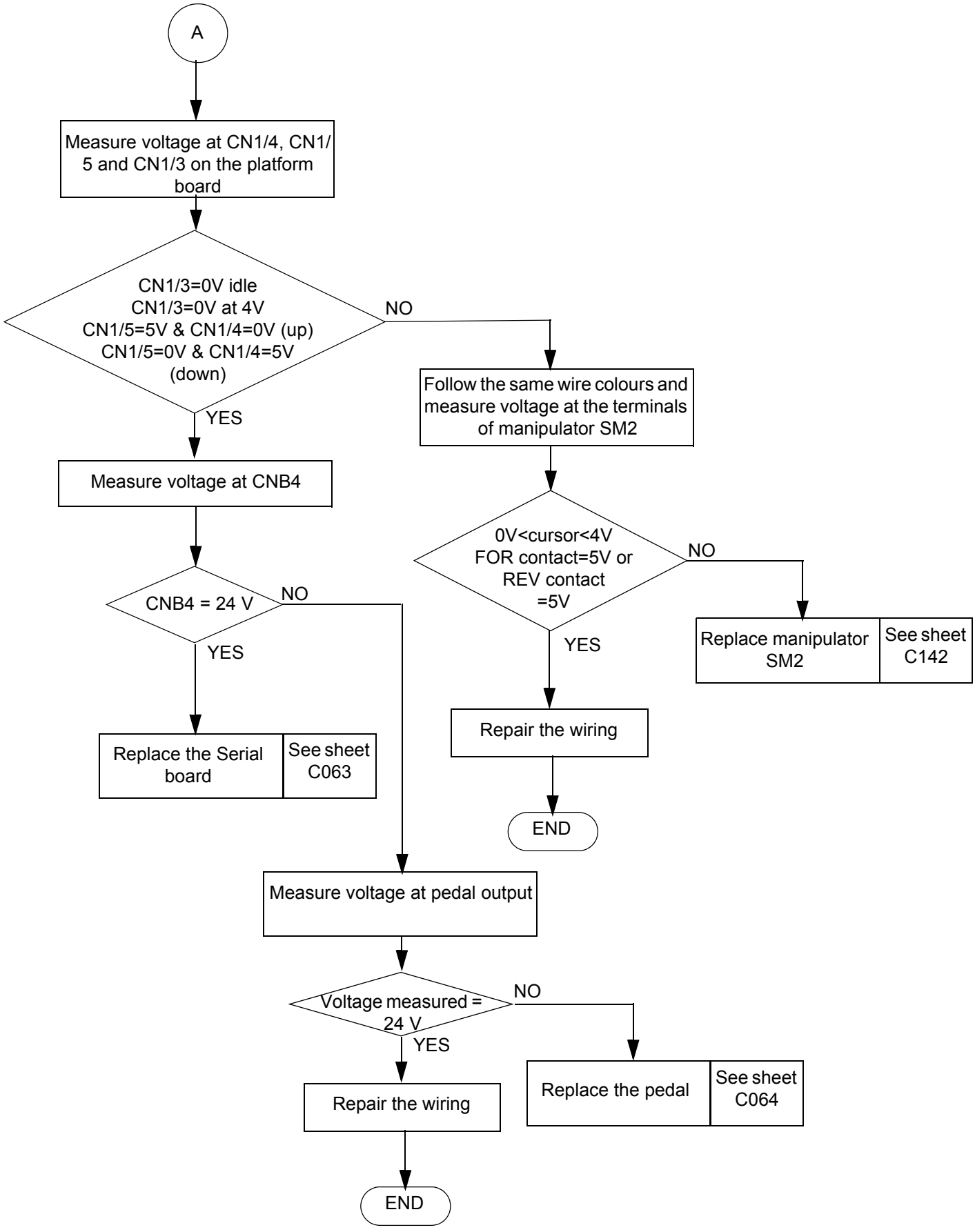
Sheet DP078	BREAKDOWN DETECTION FLOW CHART NO UP OR DOWN MAST MOVEMENT FROM THE TURNTABLE	Folio 6/6



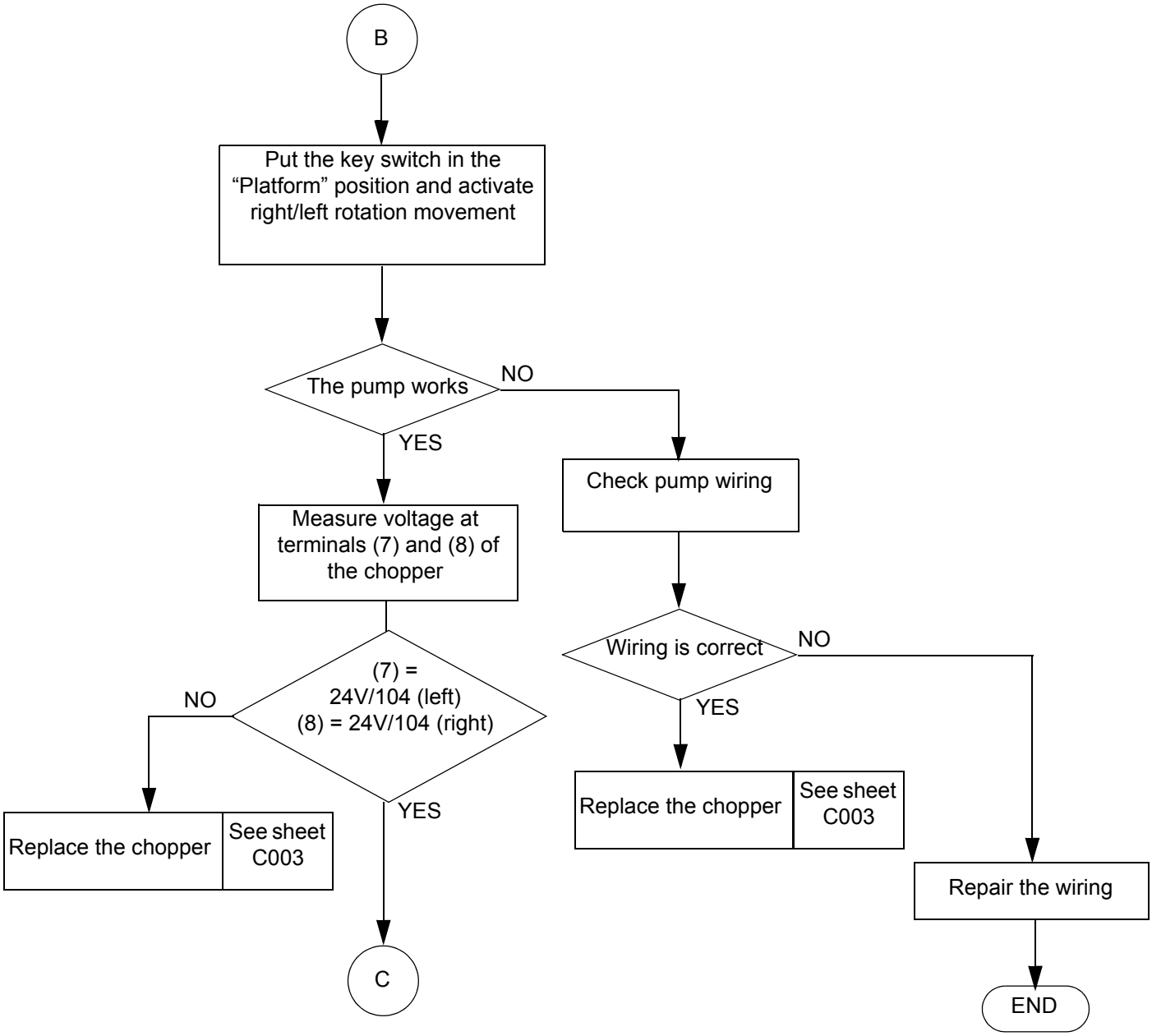
Sheet DP079	BREAKDOWN DETECTION FLOW CHART NO RIGHT OR LEFT ROTATIONAL MAST MOVEMENT FROM THE PLATFORM	Folio 1/6



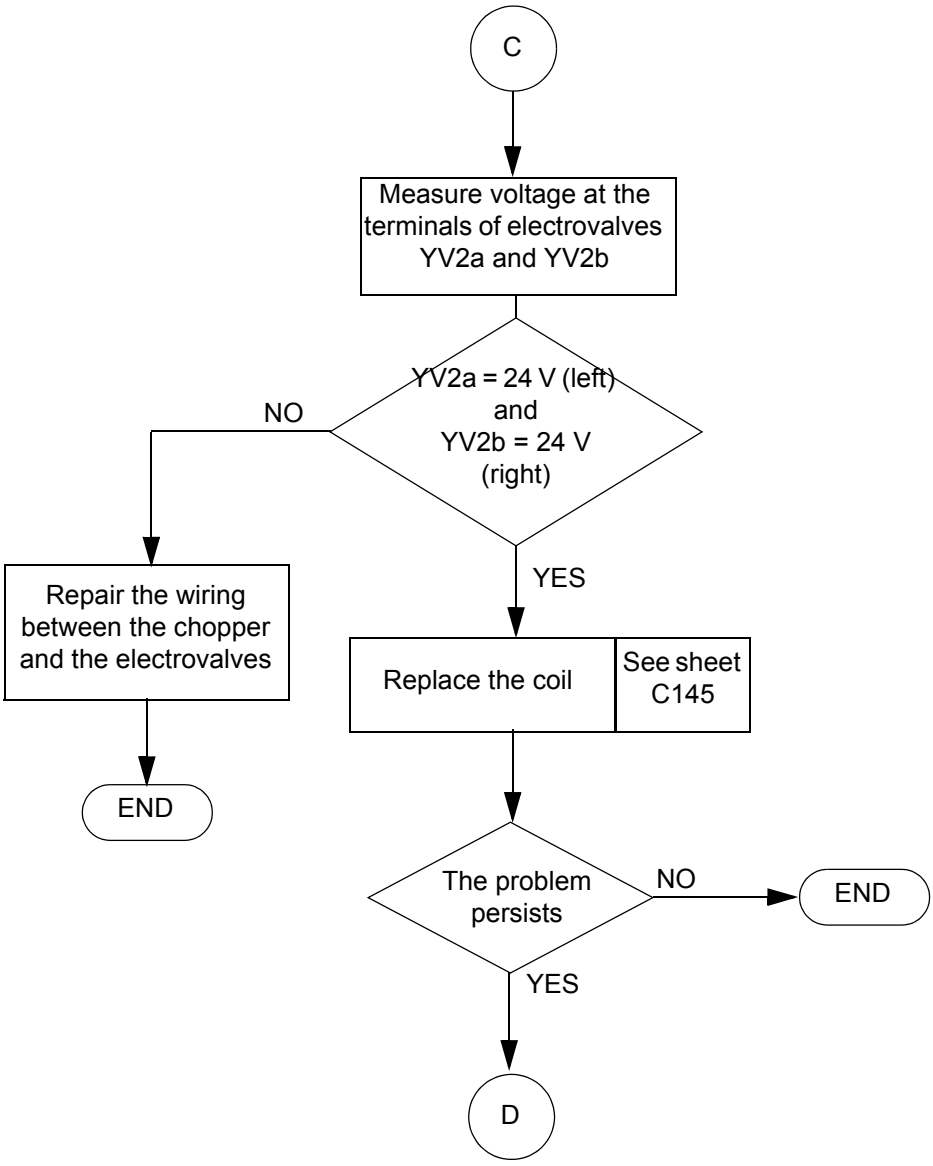
Sheet DP079	BREAKDOWN DETECTION FLOW CHART NO RIGHT OR LEFT ROTATIONAL MAST MOVEMENT FROM THE PLATFORM	Folio 2/6



Sheet DP079	BREAKDOWN DETECTION FLOW CHART NO RIGHT OR LEFT ROTATIONAL MAST MOVEMENT FROM THE PLATFORM	Folio 3/6



Sheet DP079	BREAKDOWN DETECTION FLOW CHART NO RIGHT OR LEFT ROTATIONAL MAST MOVEMENT FROM THE PLATFORM	Folio 4/6



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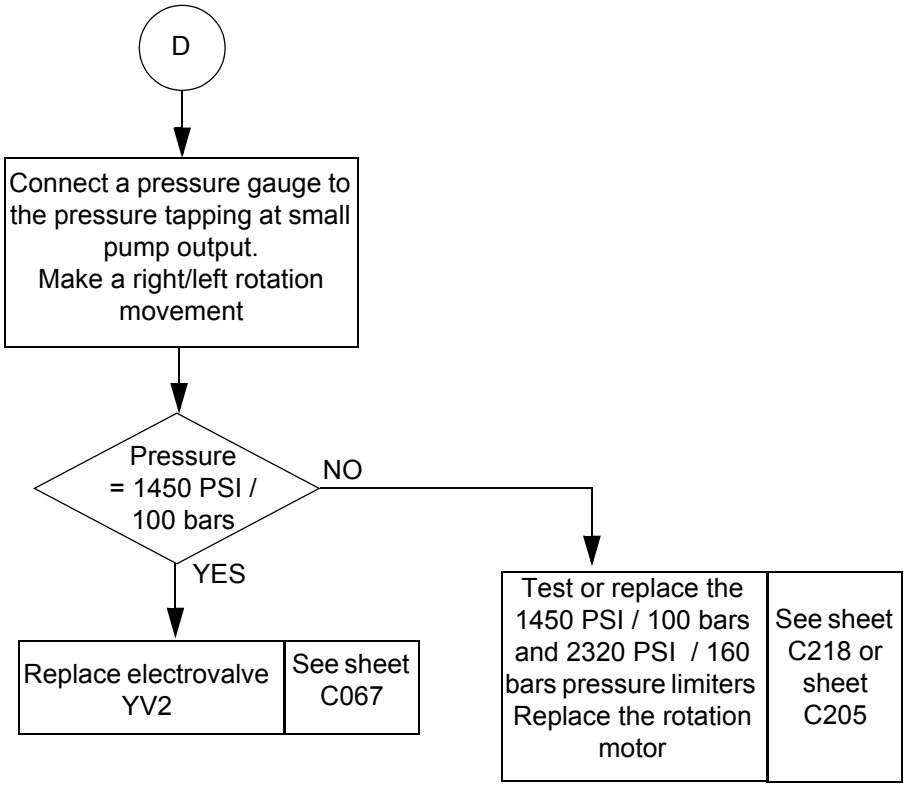
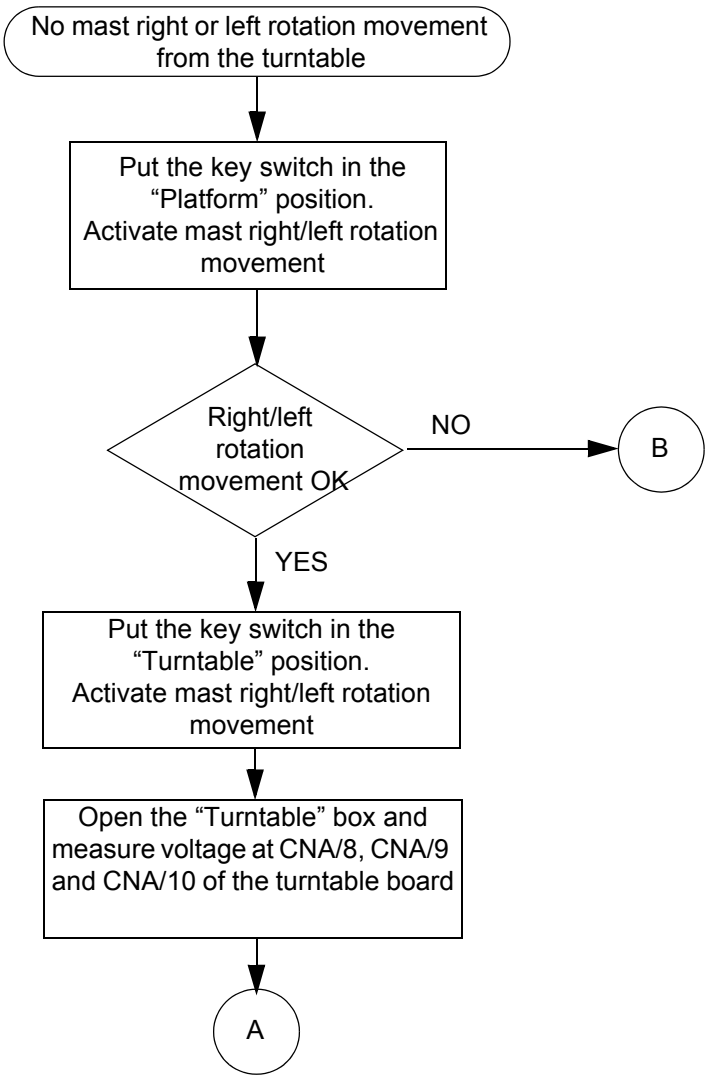
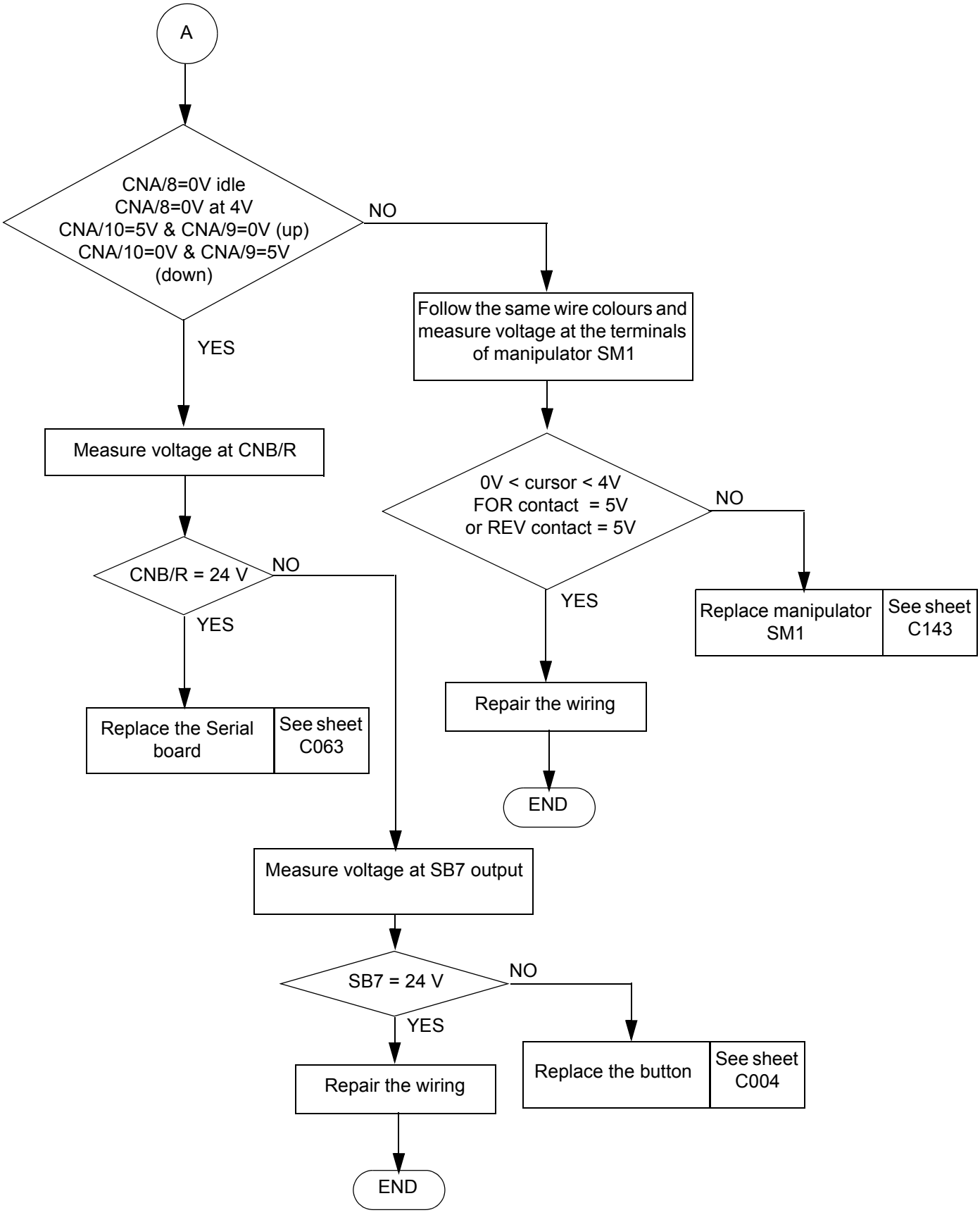


Sheet DP079	BREAKDOWN DETECTION FLOW CHART	Folio 6/6
	NO RIGHT OR LEFT ROTATIONAL MAST MOVEMENT FROM THE PLATFORM	

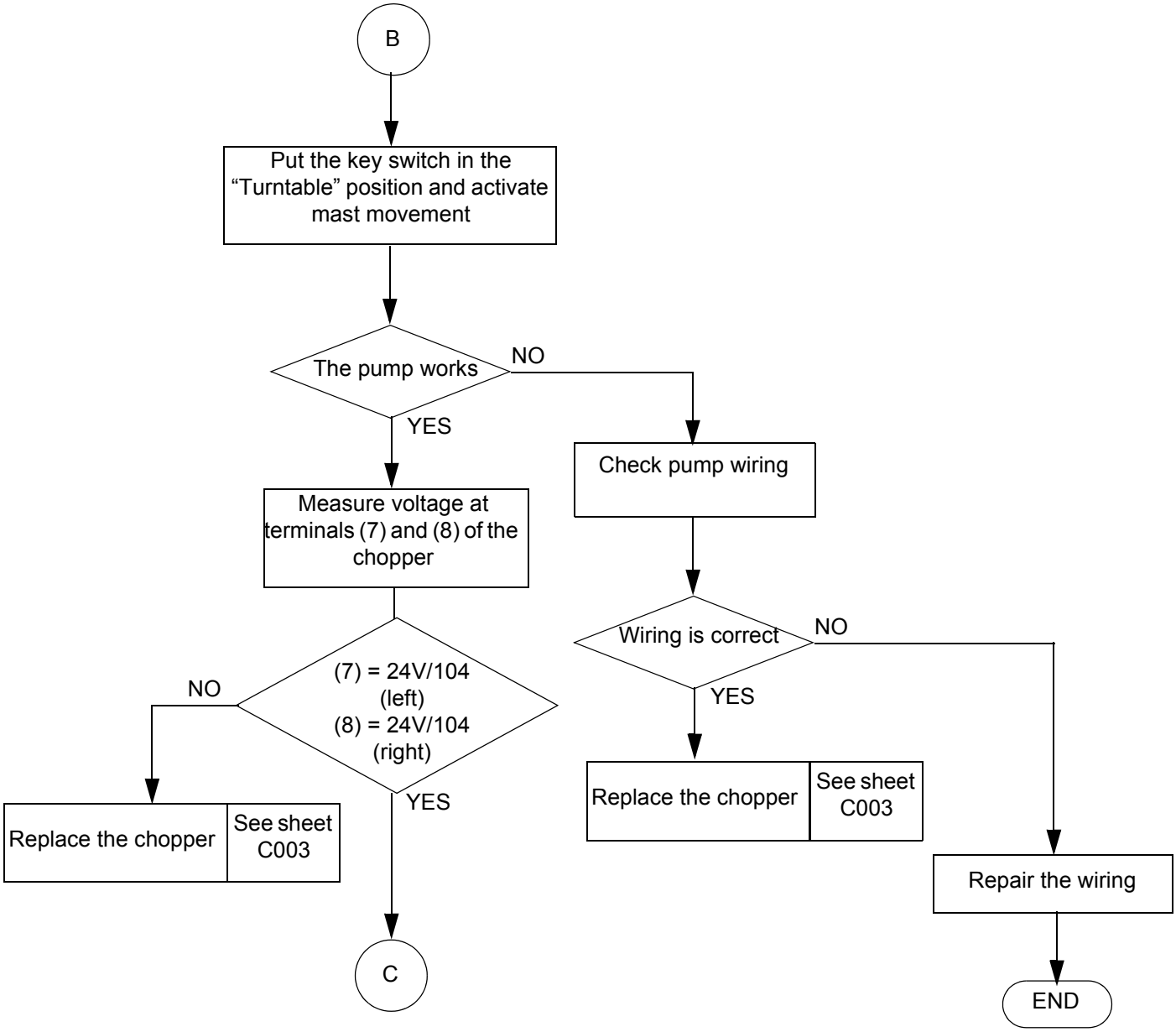
Sheet DP080	BREAKDOWN DETECTION FLOW CHART NO RIGHT OR LEFT ROTATIONAL MAST MOVEMENT FROM THE TURNTABLE	Folio 1/6



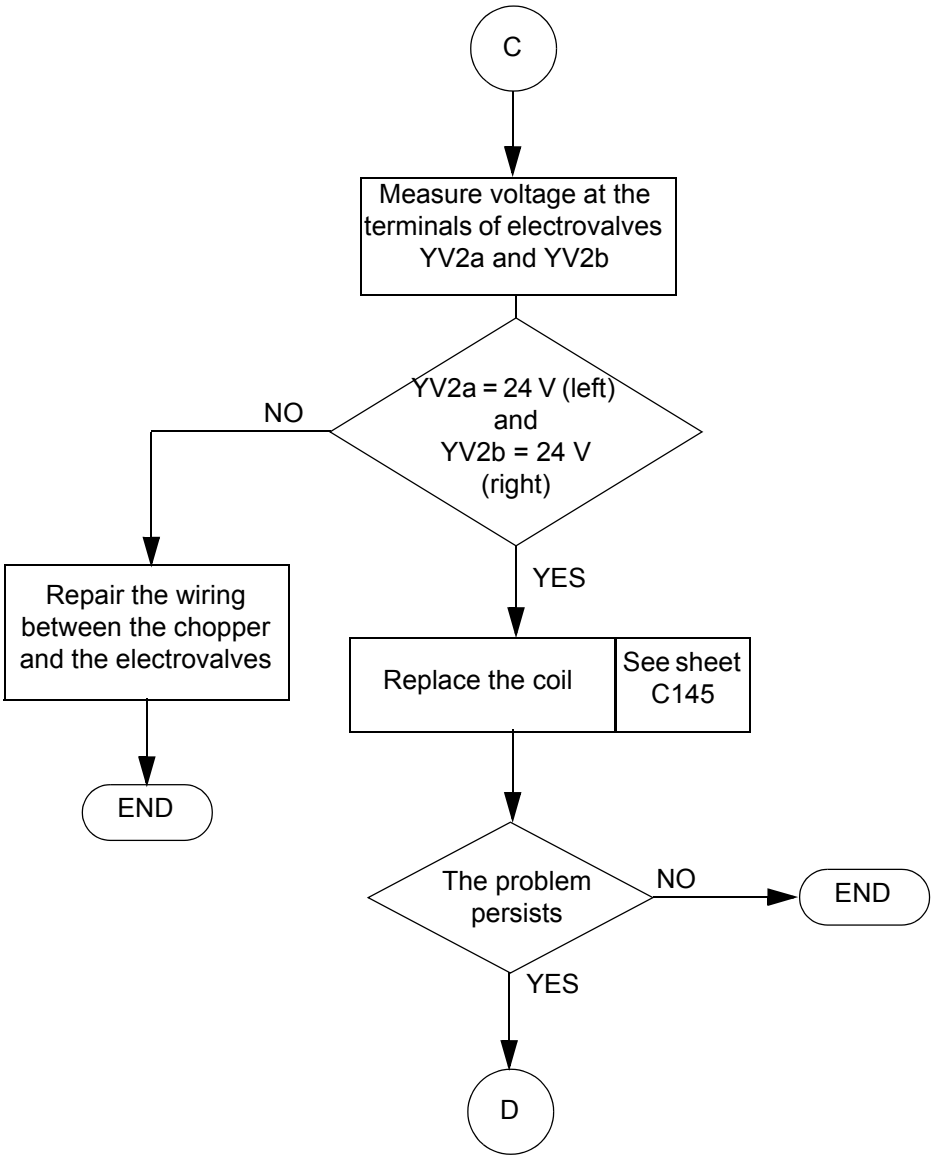
Sheet DP080	BREAKDOWN DETECTION FLOW CHART NO RIGHT OR LEFT ROTATIONAL MAST MOVEMENT FROM THE TURNTABLE	Folio 2/6



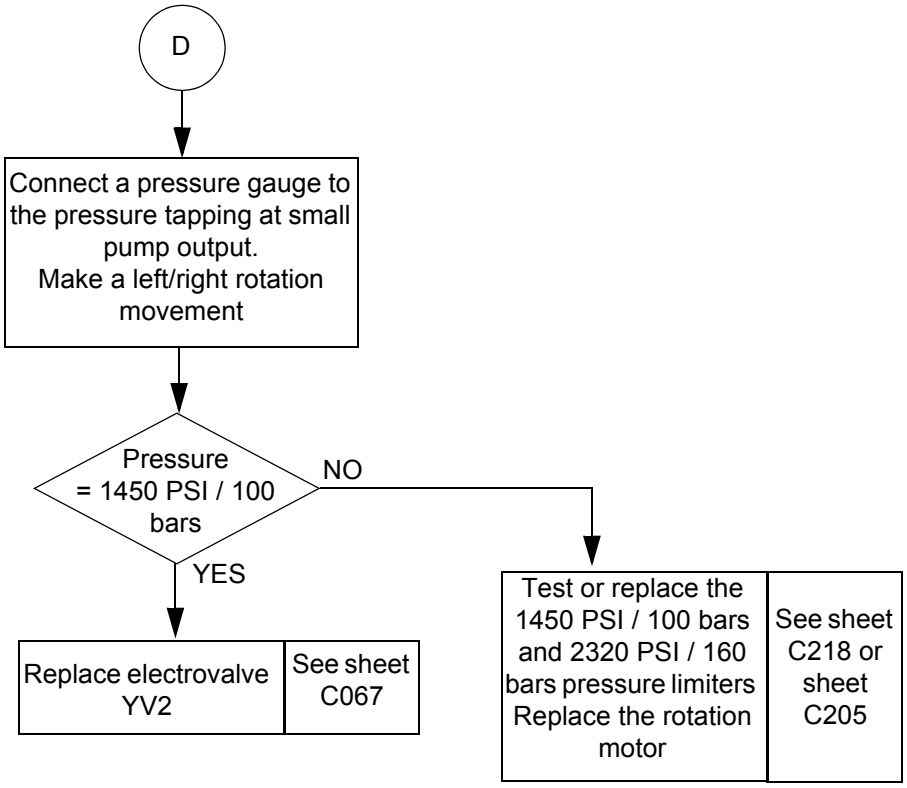
Sheet DP080	BREAKDOWN DETECTION FLOW CHART NO RIGHT OR LEFT ROTATIONAL MAST MOVEMENT FROM THE TURNTABLE	Folio 3/6



Sheet DP080	BREAKDOWN DETECTION FLOW CHART NO RIGHT OR LEFT ROTATIONAL MAST MOVEMENT FROM THE TURNTABLE	Folio 4/6

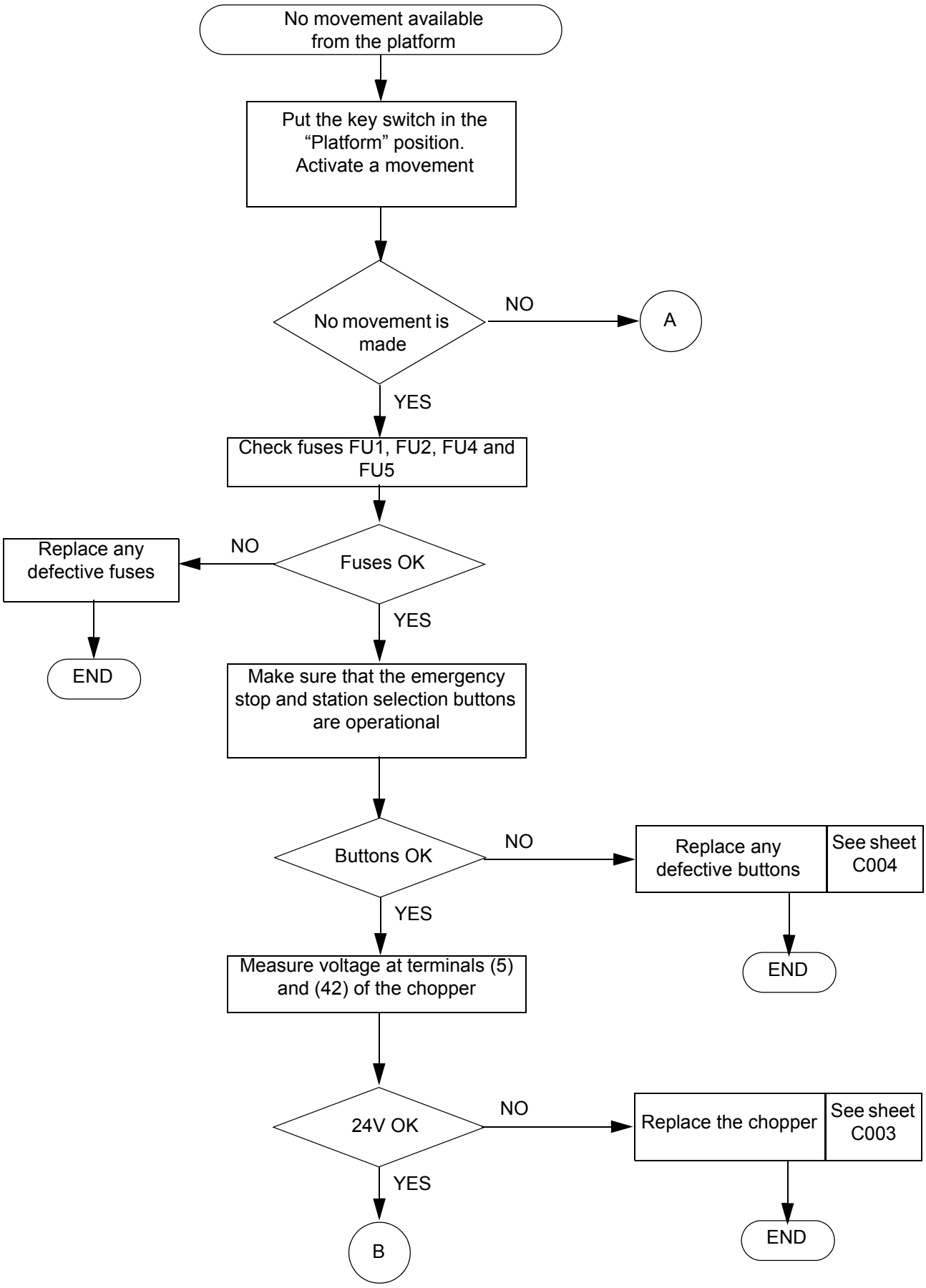


Sheet DP080	BREAKDOWN DETECTION FLOW CHART NO RIGHT OR LEFT ROTATIONAL MAST MOVEMENT FROM THE TURNTABLE	Folio 5/6

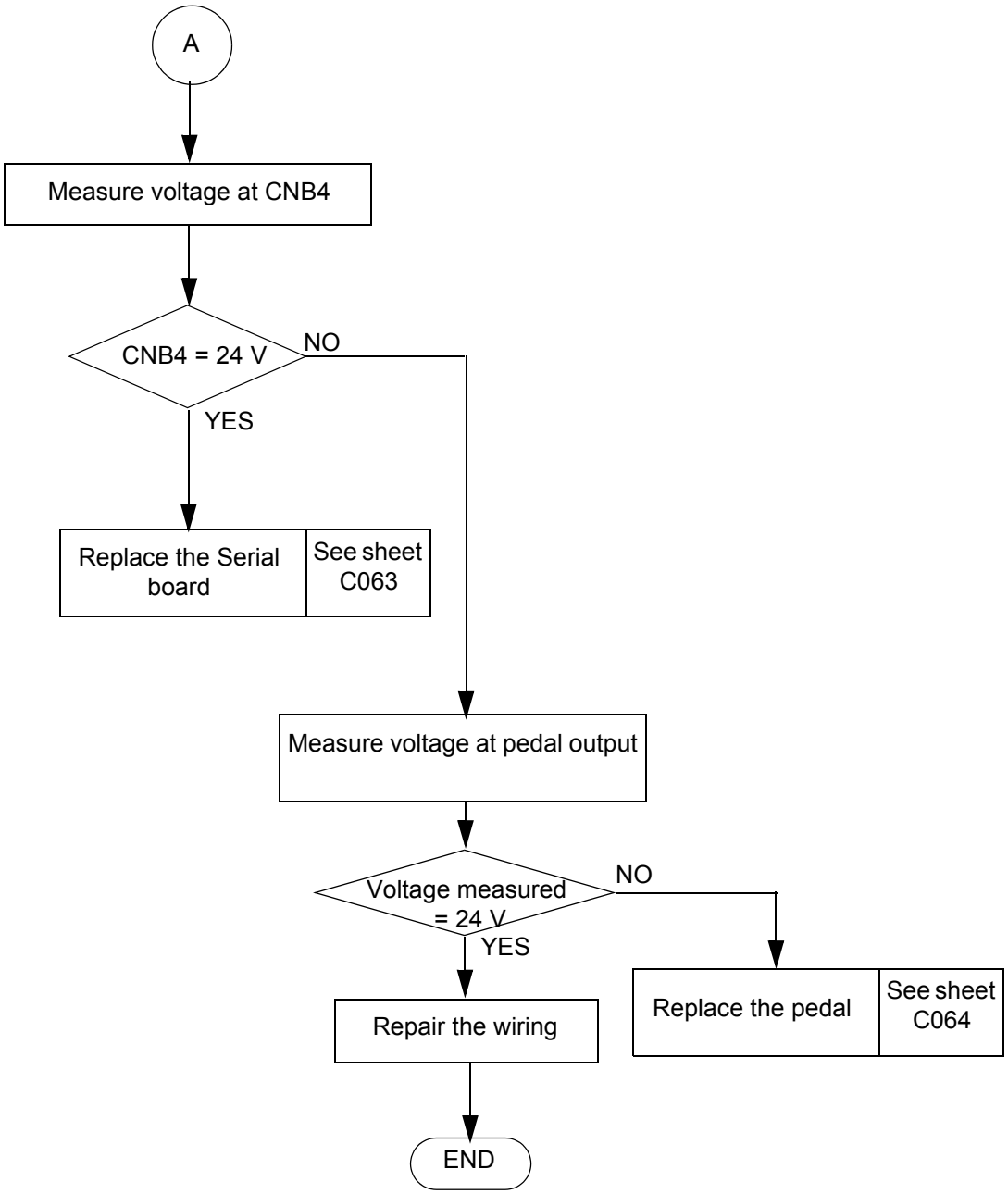


Sheet DP080	BREAKDOWN DETECTION FLOW CHART	Folio 6/6
	NO RIGHT OR LEFT ROTATIONAL MAST MOVEMENT FROM THE TURNTABLE	

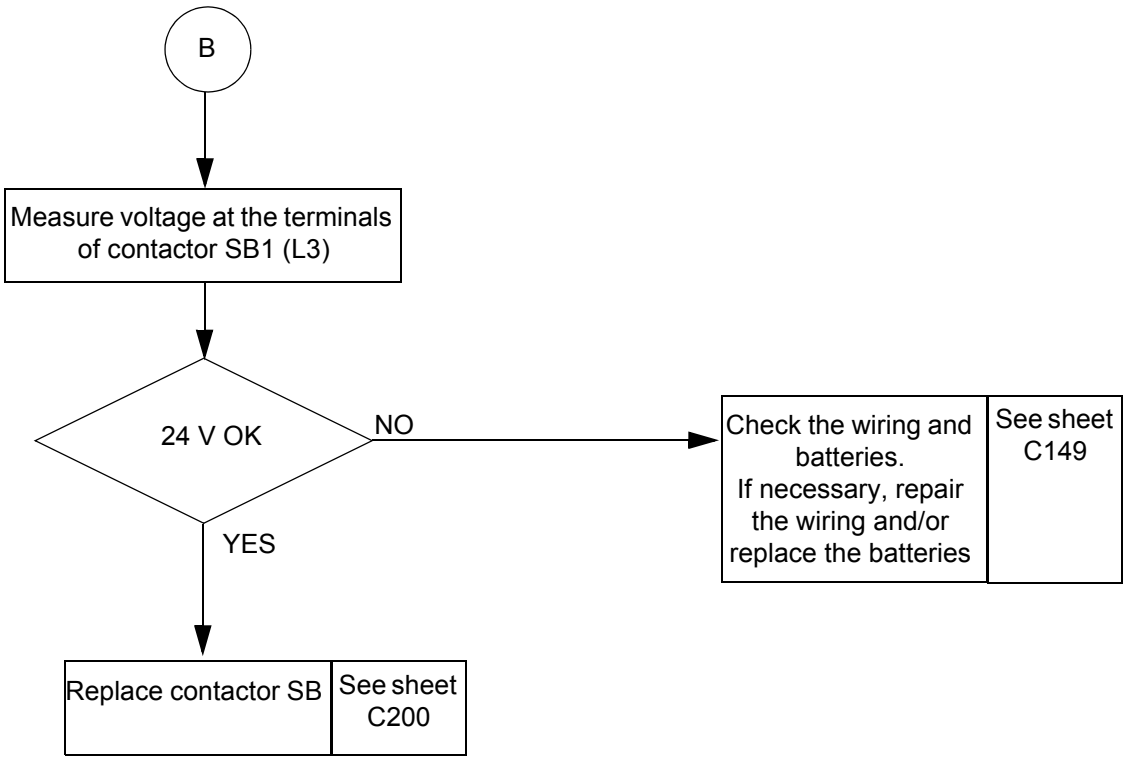
Sheet DP081	BREAKDOWN DETECTION FLOW CHART NO MOVEMENT AVAILABLE FROM THE PLATFORM	Folio 1/4



Sheet DP081	BREAKDOWN DETECTION FLOW CHART NO MOVEMENT AVAILABLE FROM THE PLATFORM	Folio 2/4

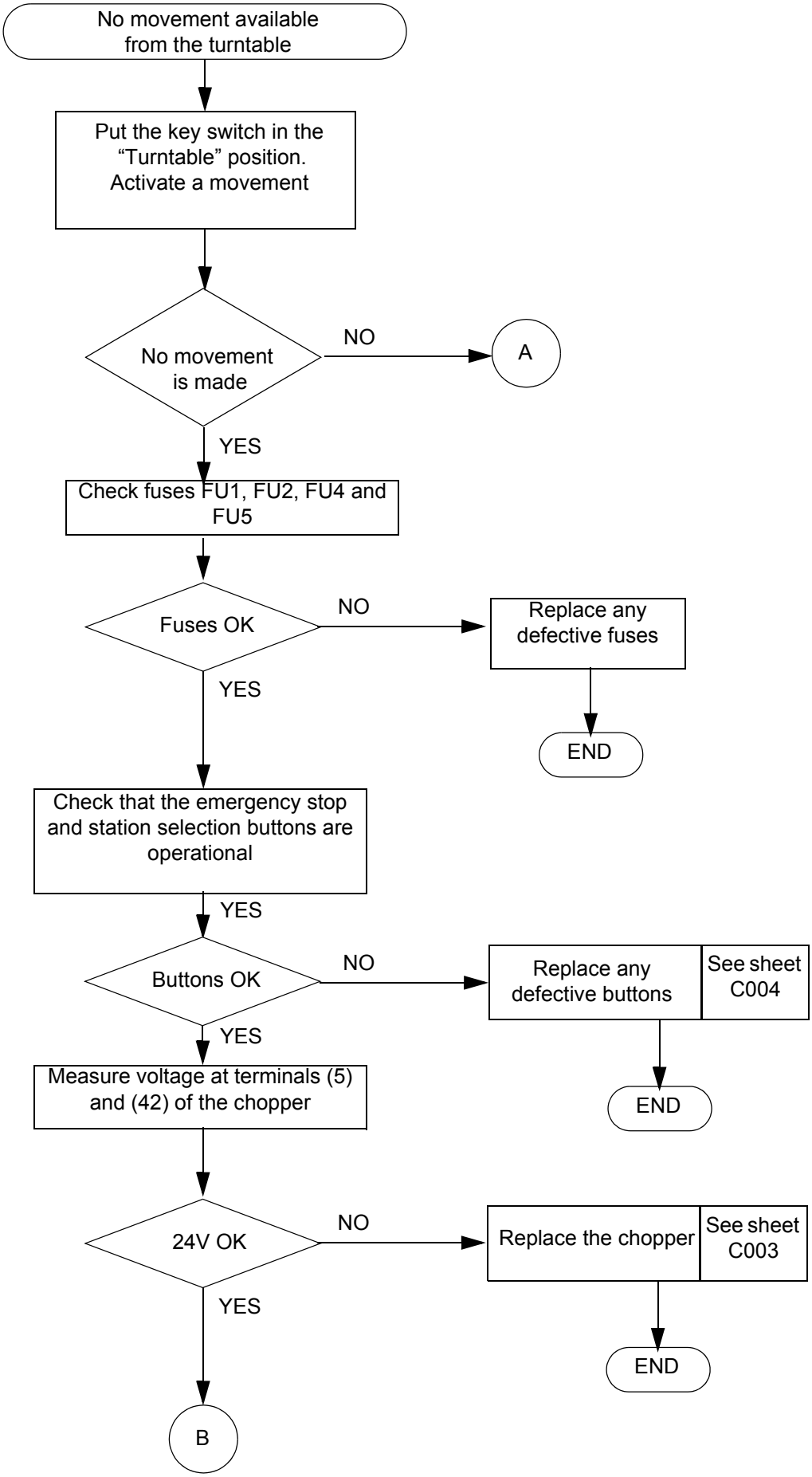


Sheet DP081	BREAKDOWN DETECTION FLOW CHART NO MOVEMENT AVAILABLE FROM THE PLATFORM	Folio 3/4

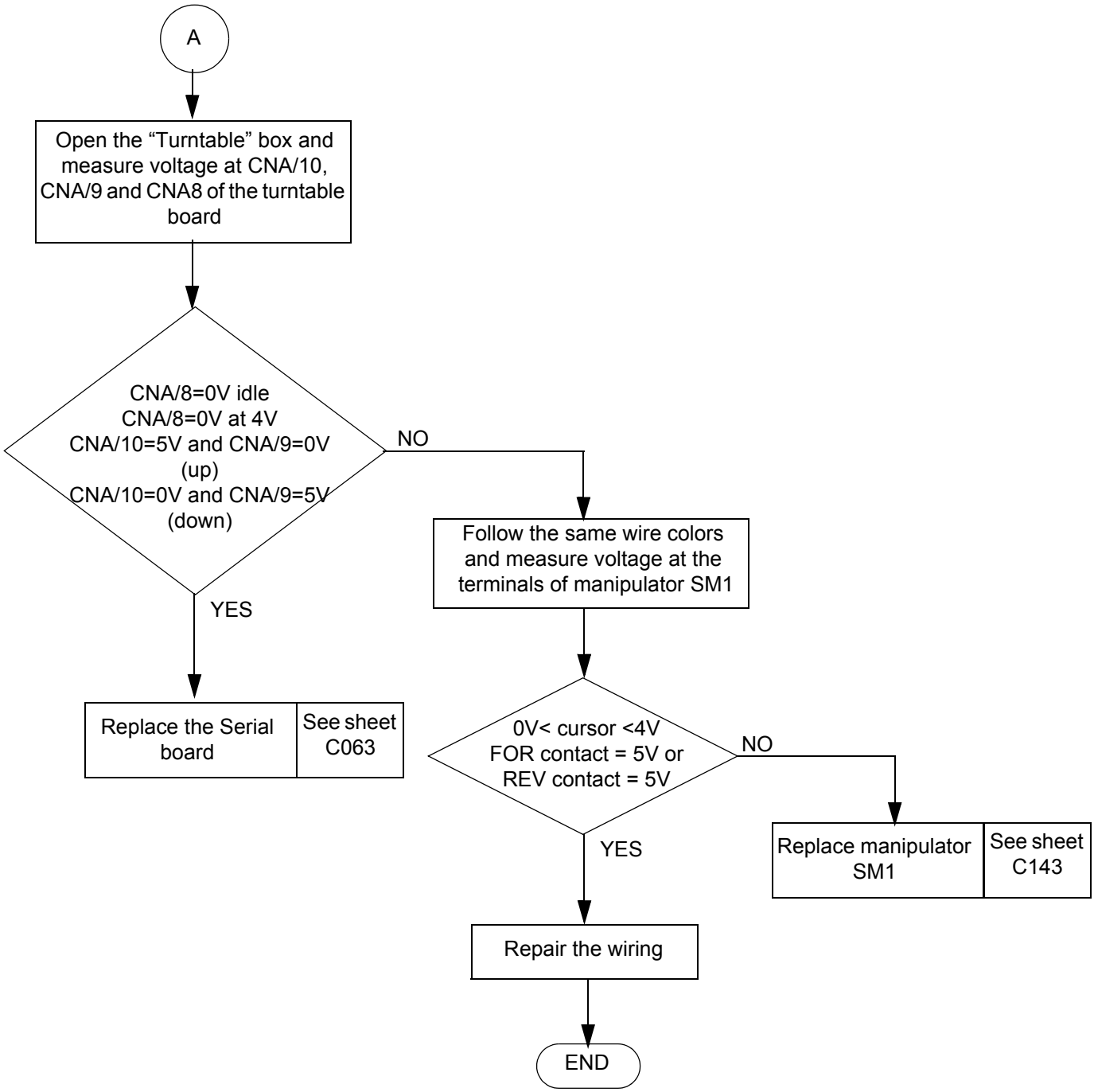


Sheet DP081	BREAKDOWN DETECTION FLOW CHART	Folio 4/4
	NO MOVEMENT AVAILABLE FROM THE PLATFORM	

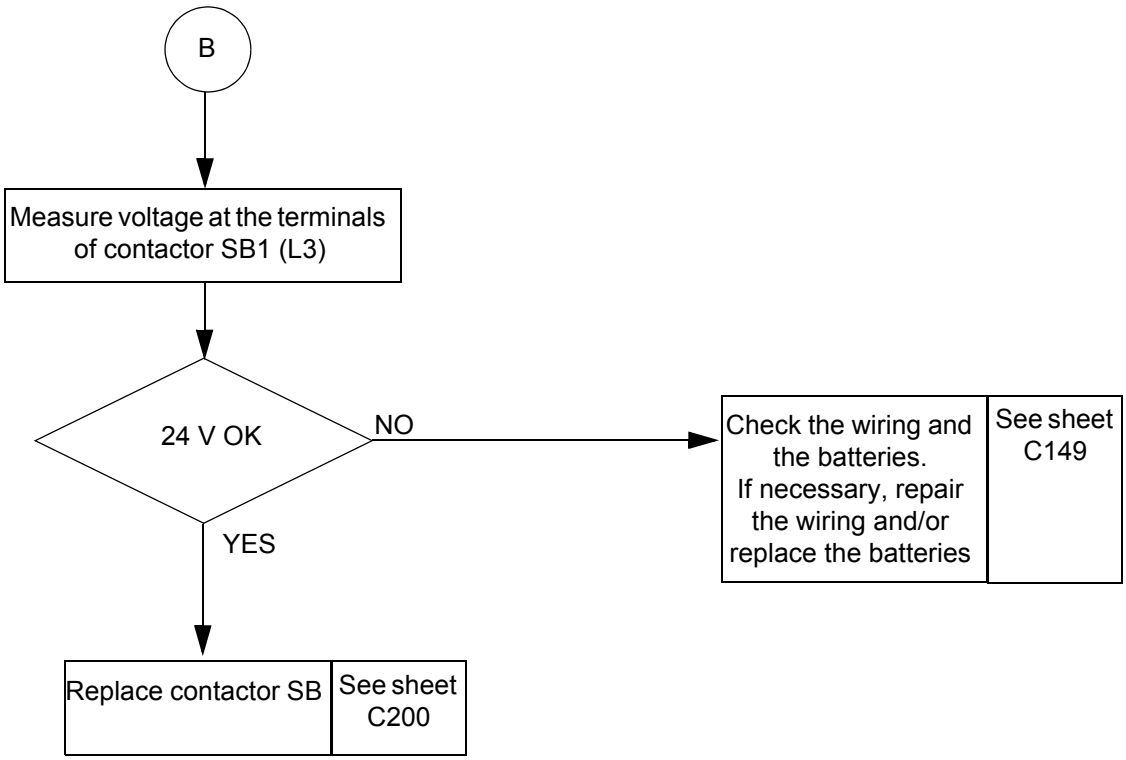
Sheet DP082	BREAKDOWN DETECTION FLOW CHART NO MOVEMENT AVAILABLE FROM THE TURNTABLE	Folio 1/4



Sheet DP082	BREAKDOWN DETECTION FLOW CHART NO MOVEMENT AVAILABLE FROM THE TURNTABLE	Folio 2/4

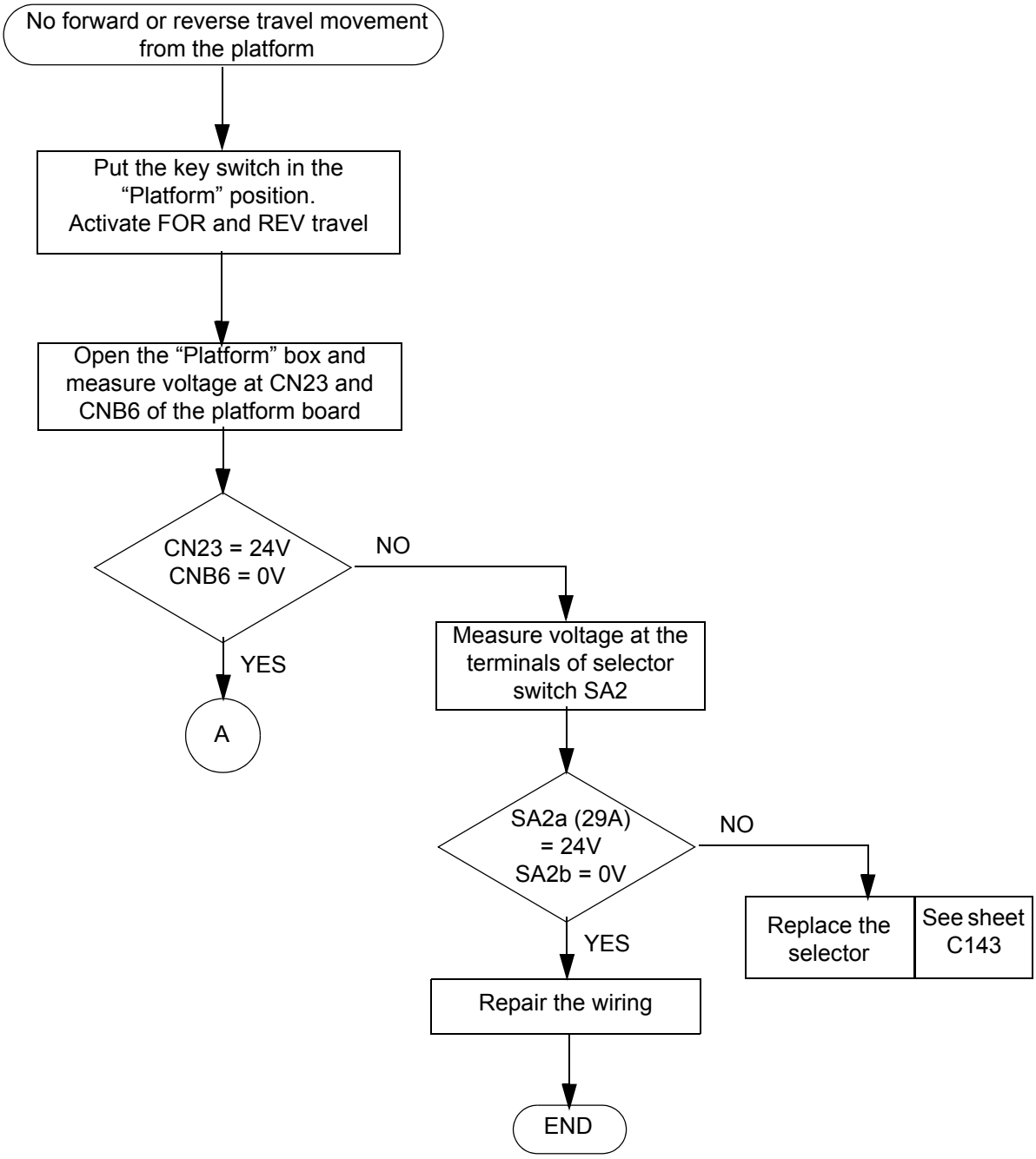


Sheet DP082	BREAKDOWN DETECTION FLOW CHART NO MOVEMENT AVAILABLE FROM THE TURNTABLE	Folio 3/4

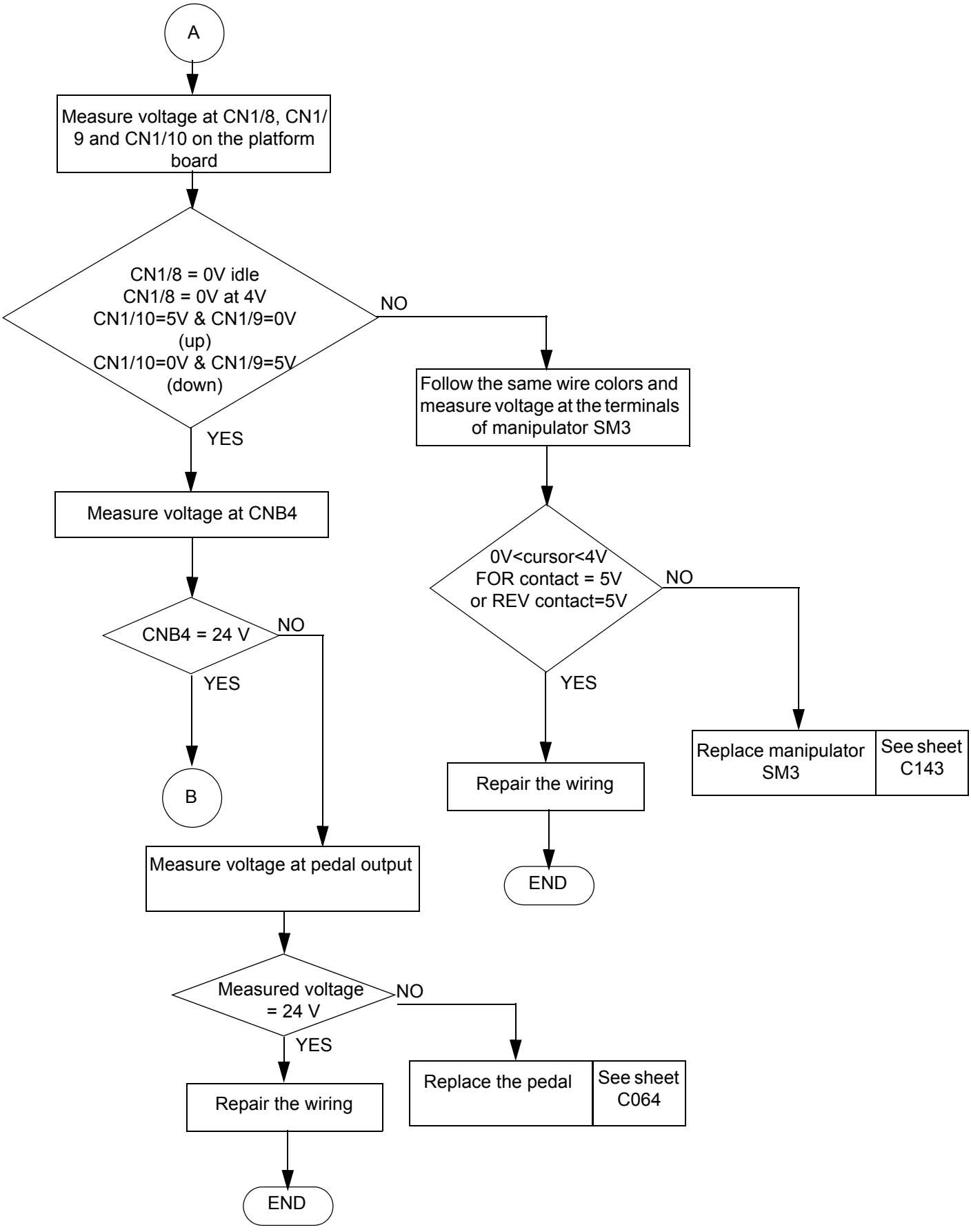


Sheet DP082	BREAKDOWN DETECTION FLOW CHART NO MOVEMENT AVAILABLE FROM THE TURNTABLE	Folio 4/4

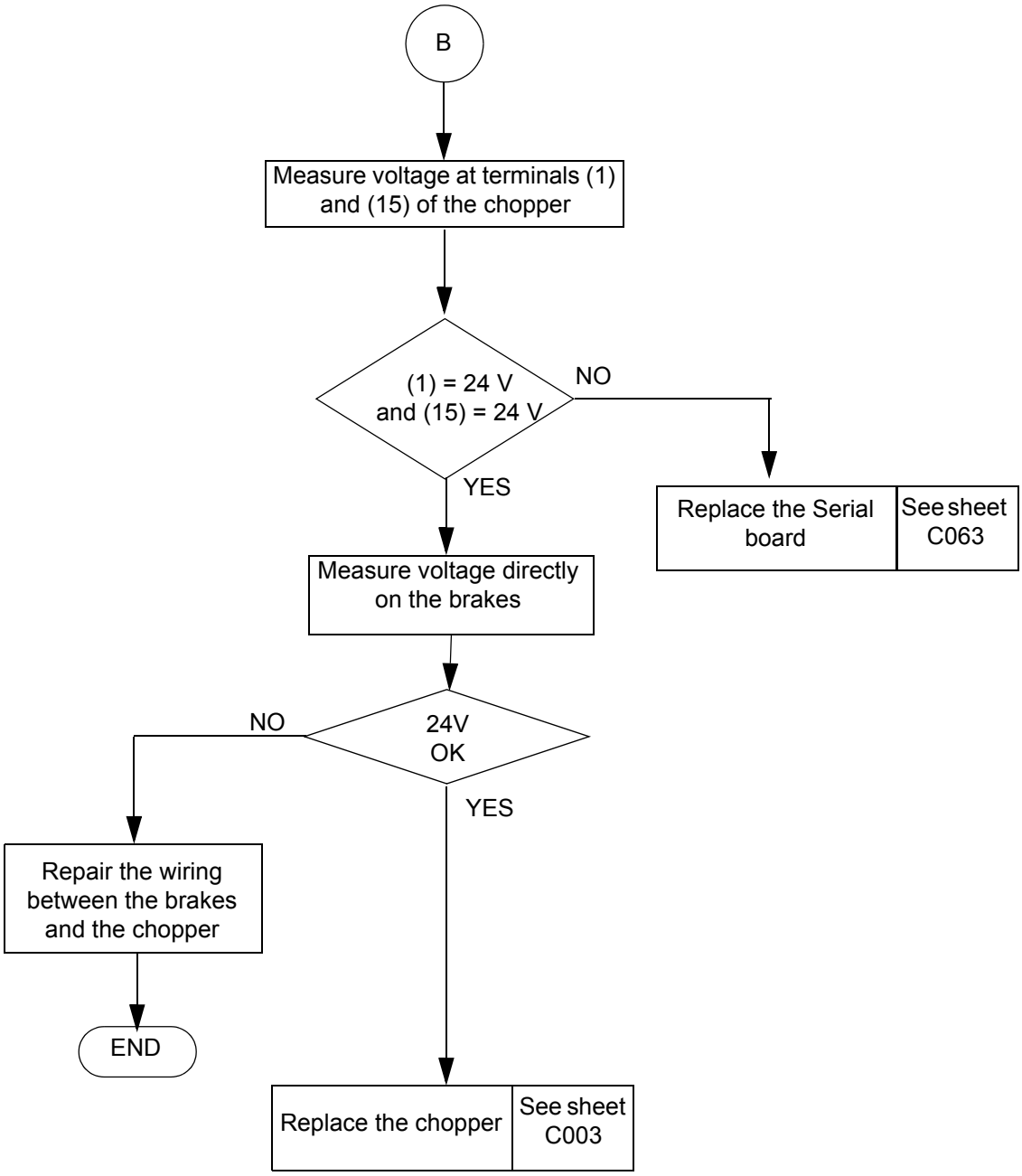
Sheet DP083	BREAKDOWN DETECTION FLOW CHART NO FORWARD OR REVERSE TRAVEL MOVEMENT	Folio 1/4



Sheet DP083	BREAKDOWN DETECTION FLOW CHART NO FORWARD OR REVERSE TRAVEL MOVEMENT	Folio 2/4

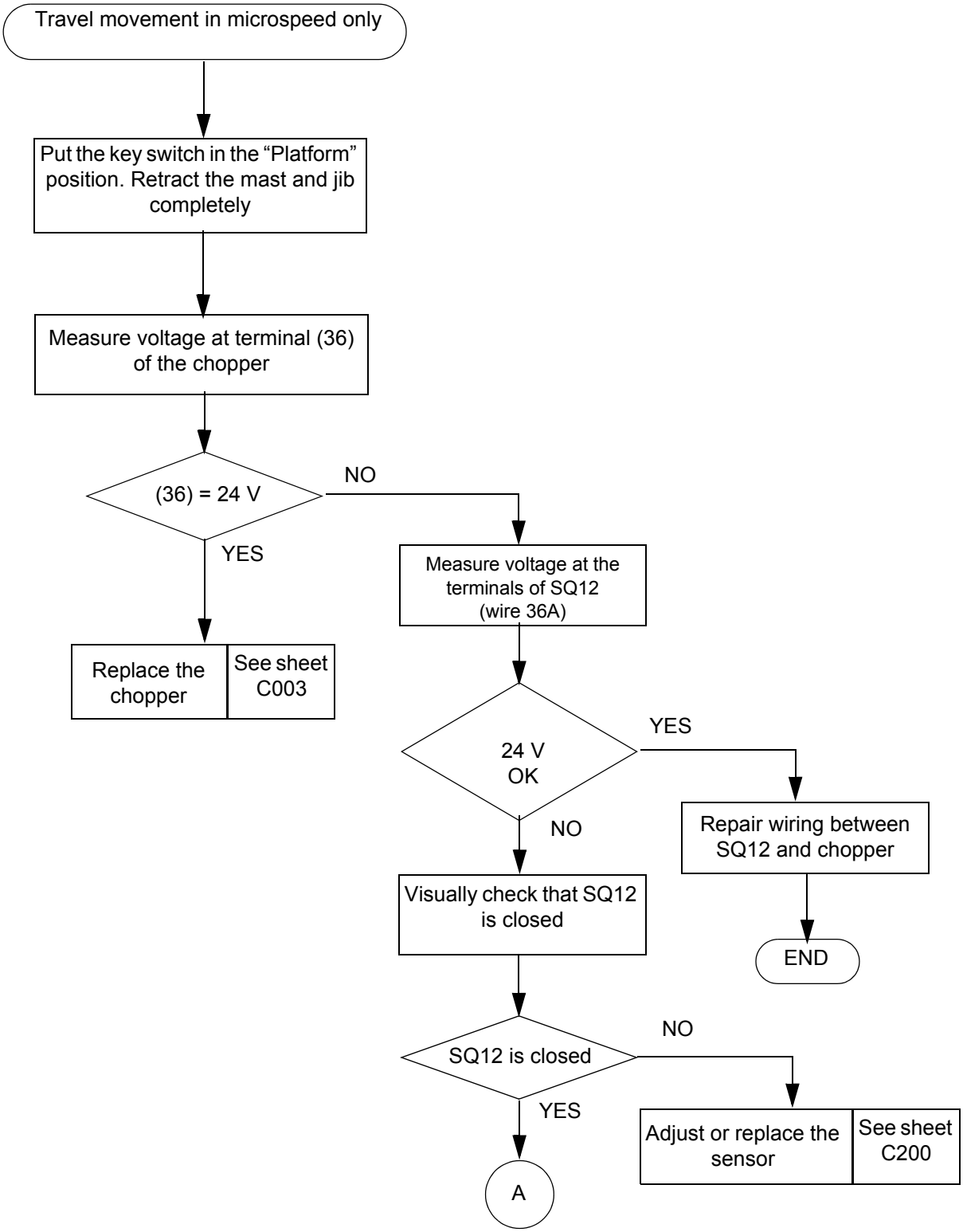


Sheet DP083	BREAKDOWN DETECTION FLOW CHART NO FORWARD OR REVERSE TRAVEL MOVEMENT	Folio 3/4

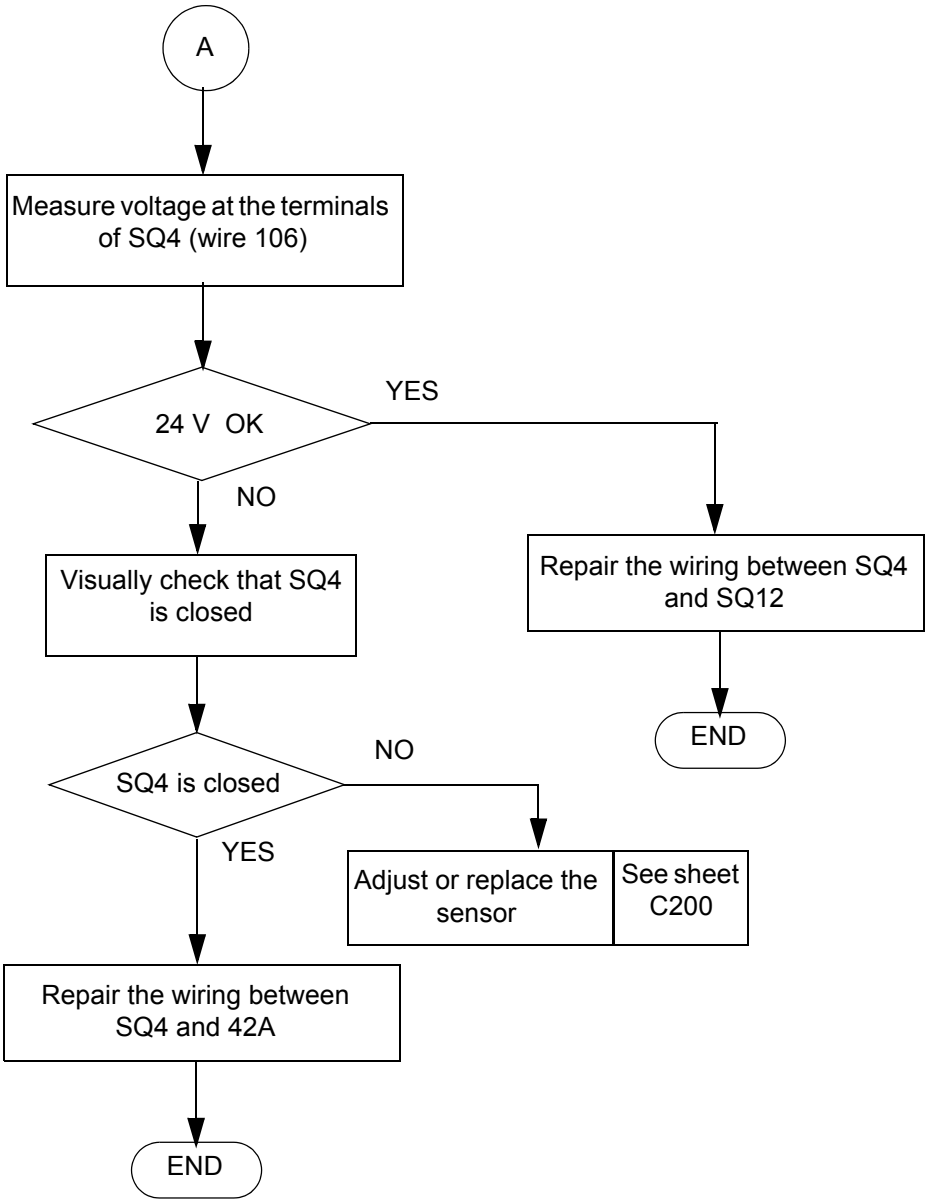


Sheet DP083	BREAKDOWN DETECTION FLOW CHART NO FORWARD OR REVERSE TRAVEL MOVEMENT	Folio 4/4

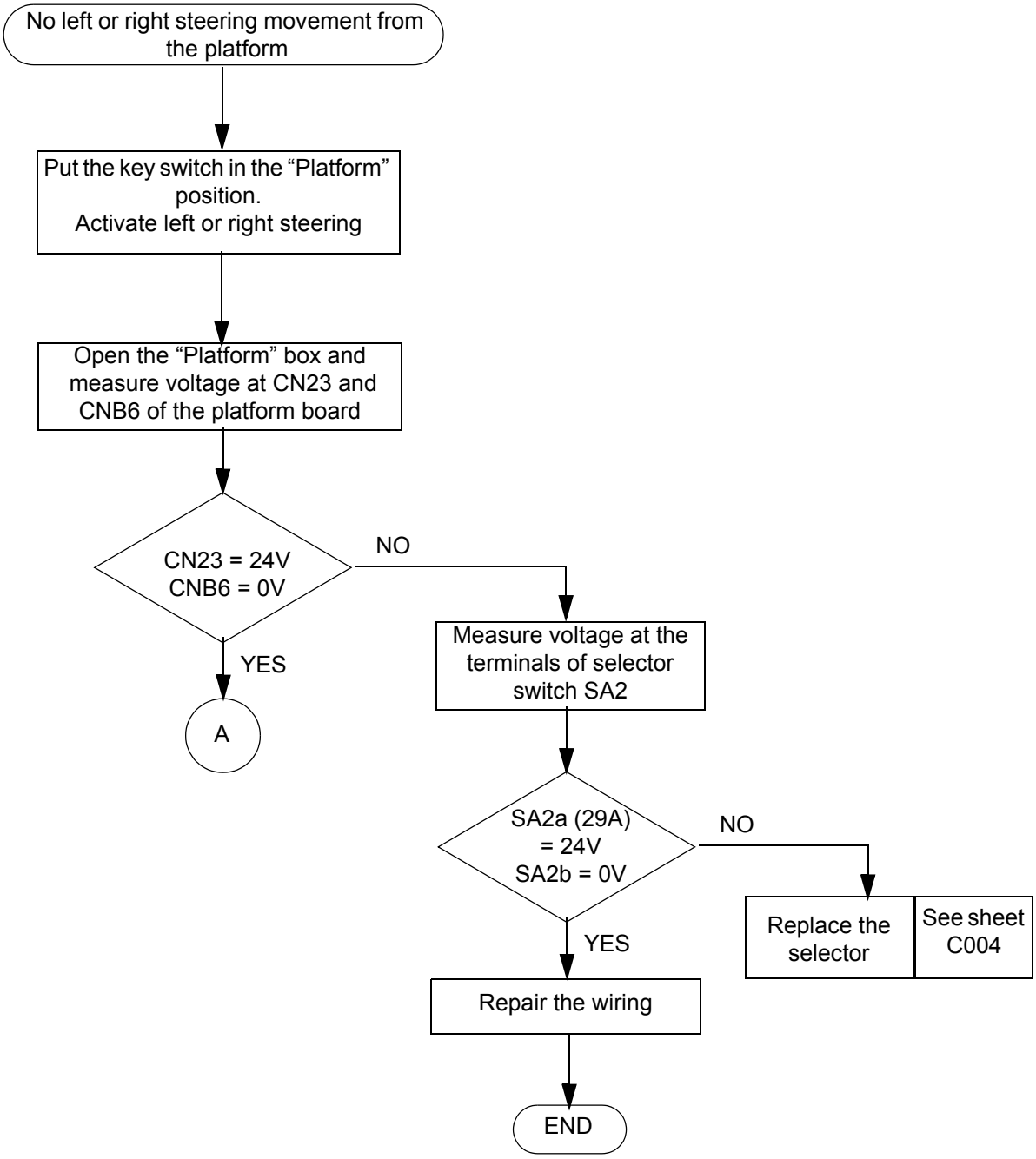
Sheet DP084	BREAKDOWN DETECTION FLOW CHART TRAVEL MOVEMENT IN MICROSPEED ONLY	Folio 1/2



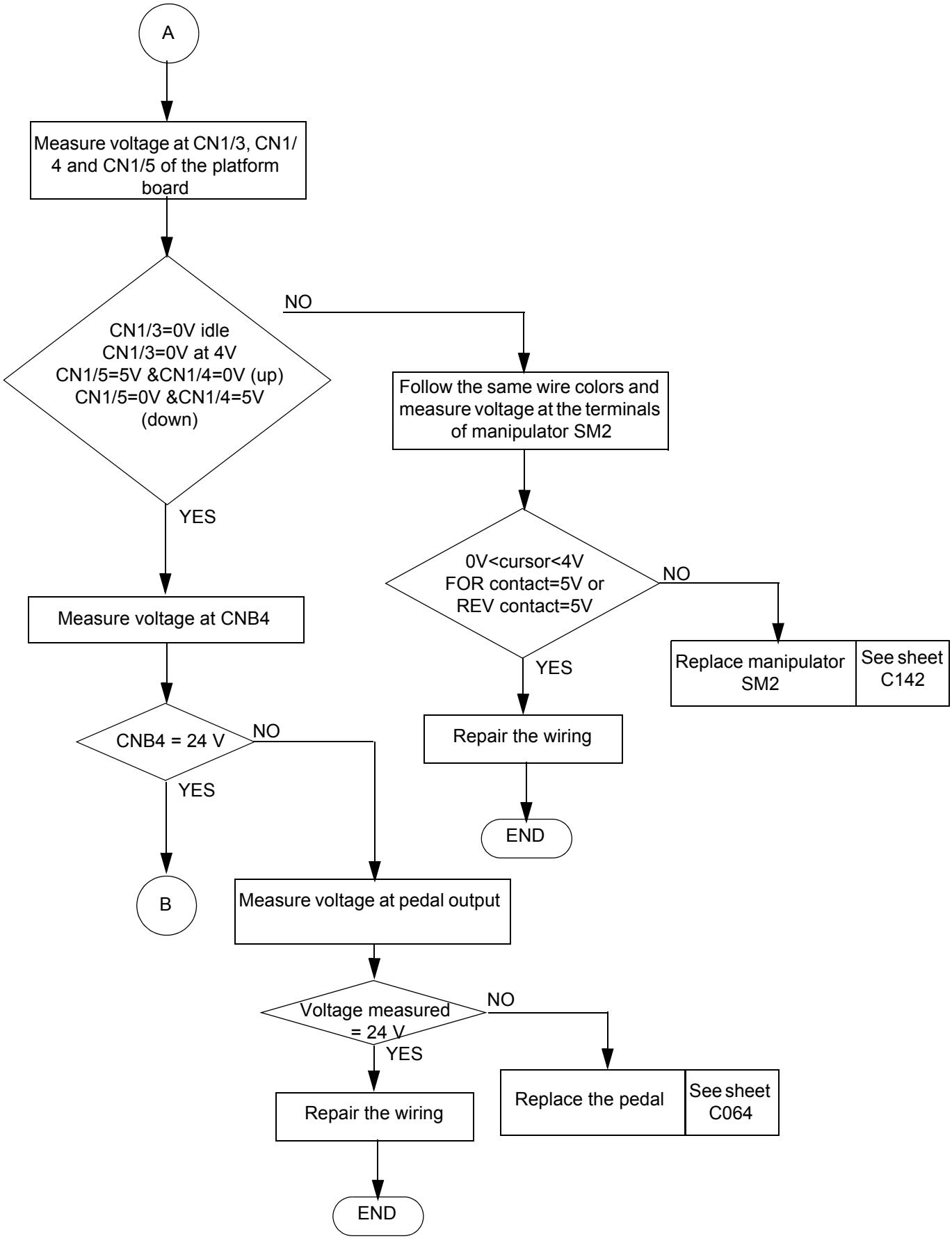
Sheet DP084	BREAKDOWN DETECTION FLOW CHART TRAVEL MOVEMENT IN MICROSPEED ONLY	Folio 2/2



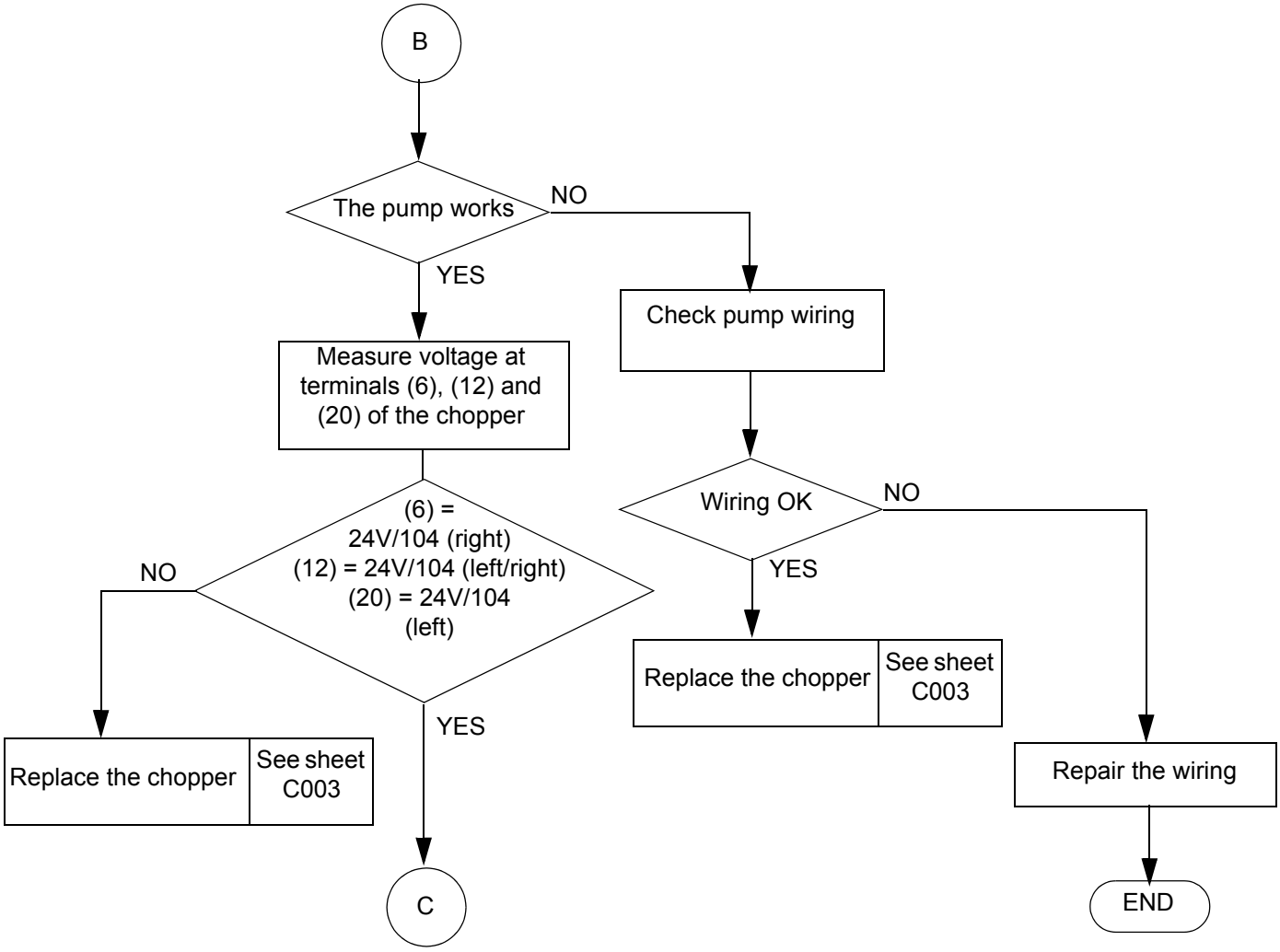
Sheet DP085	BREAKDOWN DETECTION FLOW CHART NO LEFT OR RIGHT STEERING MOVEMENT	Folio 1/4



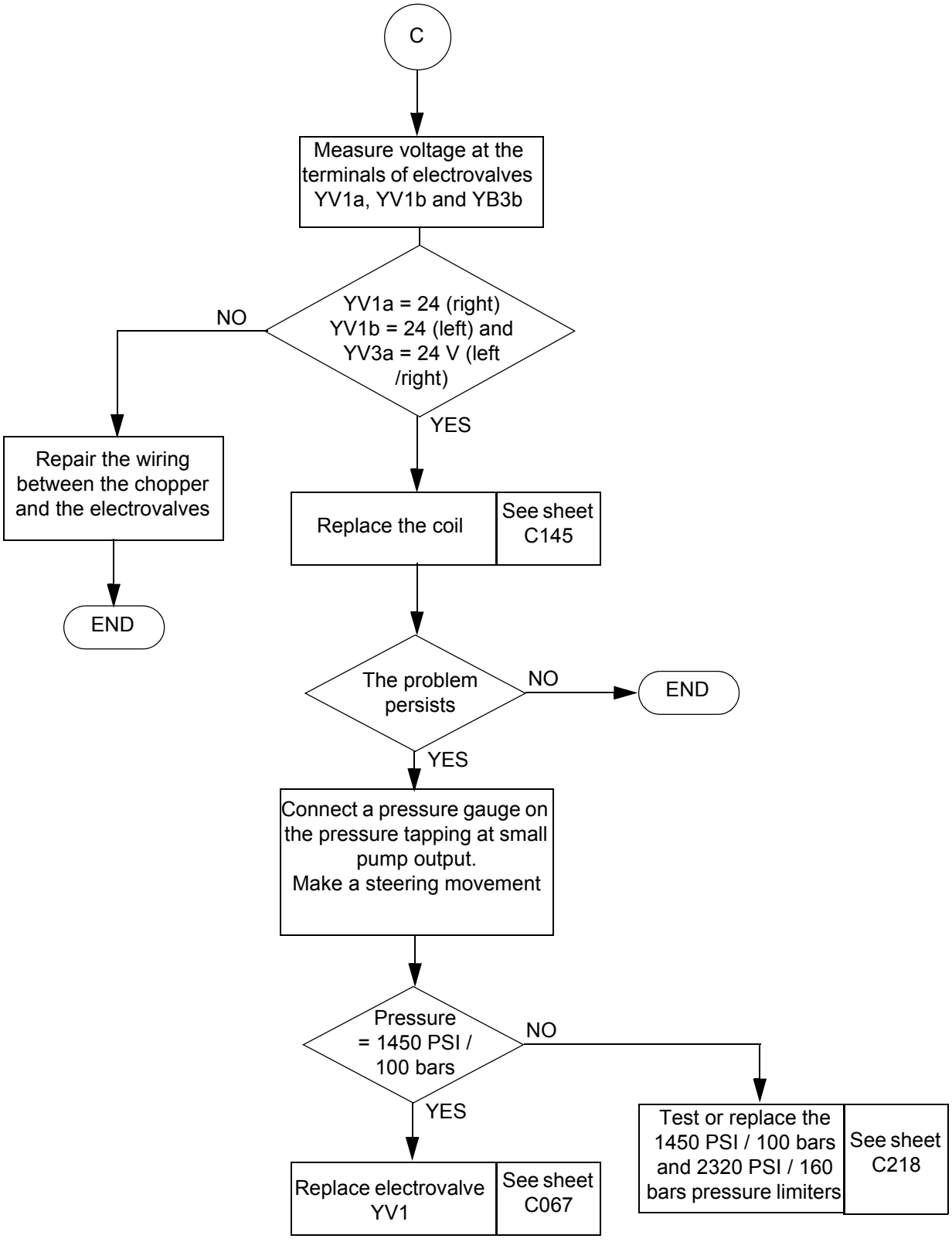
Sheet DP085	BREAKDOWN DETECTION FLOW CHART NO LEFT OR RIGHT STEERING MOVEMENT	Folio 2/4



Sheet DP085	BREAKDOWN DETECTION FLOW CHART NO LEFT OR RIGHT STEERING MOVEMENT	Folio 3/4



Sheet DP085	BREAKDOWN DETECTION FLOW CHART NO LEFT OR RIGHT STEERING MOVEMENT	Folio 4/4



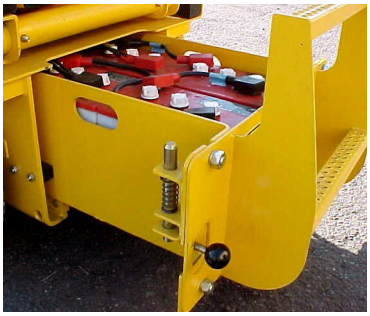
16 - CORRECTIVE MAINTENANCE PROCEDURE

List of corrective maintenance sheets:

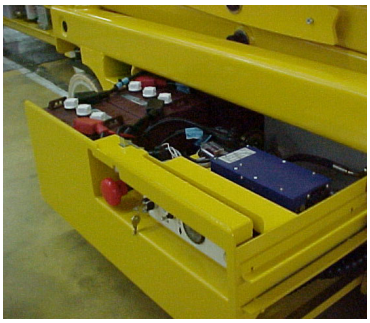
Sheet no.	*Description*
C003	Replacing the chopper
C004	Replacing a component of the platform control station
C010	Replacing a hose
C040	Replacing the horn
C060	Replacing the hand pump
C063	Replacing the printed circuit
C067	Replacing an electrovalve
C139	Charging the traction batteries
C140	Replacing the tilt sensor
C141	Replacing the jib cylinder
C142	Replacing the top panel manipulator
C143	Replacing the bottom panel manipulator
C144	Replacing a steering wheel
C145	Replacing a coil
C146	Replacing the steering potentiometer
C147	Replacing the covers
C148	Replacing the hydraulic winder
C149	Replacing the batteries
C198	Dismantling - reassembling the mast
C200	Replacing an end of travel contactor
C201	Replacing the hydraulic filter
C202	Replacing the hydraulic block
C203	Replacing the motor pump unit
C204	Replacing the hydraulic pump
C205	Replacing the rotation motor
C206	Replacing a drive wheel
C207	Replacing the hydraulic tank
C208	Replacing the turntable emergency stop button
C209	Replacing the battery charger
C210	Replacing the slew ring
C211	Replacing a steering pivot
C212	Replacing a steering cylinder
C213	Replacing the counterweights
C214	Replacing the electric plate
C215	Replacing the jib-platform assembly

Sheet no.	*Description*
C216	Removing - reinstalling the cable sleeve
C217	Replacing a wheel reducer or a hydraulic travel motor
C218	Adjusting a pressure limiter

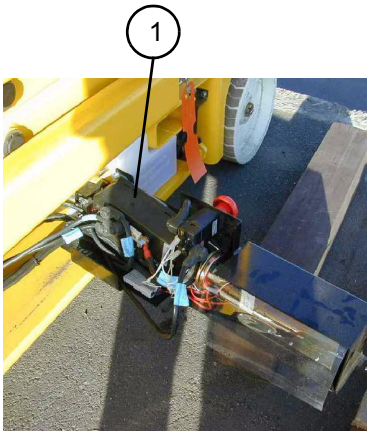
SHEET C003	CORRECTIVE MAINTENANCE SHEET	Sheet 1/2
	REPLACING THE SPEED VARIATOR	



Compact



Optimum



Compact

1 - Preliminary operations

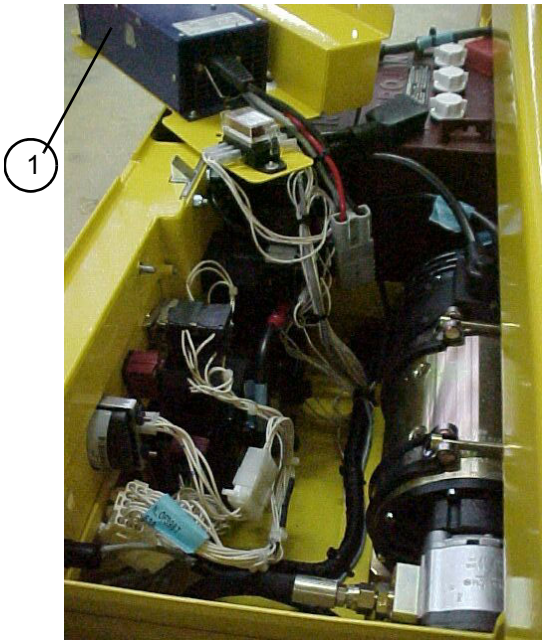
- Put the machine in the low position.
- Cut off the electric power supply (see § 6.3, page 26).
- Disconnect the + and - terminals of the batteries to isolate the electric circuit.

2 - Removing the speed variator

- Disconnect the speed variator's electric connections.
- Remove the speed variator (1).

3 - Replacing the speed variator

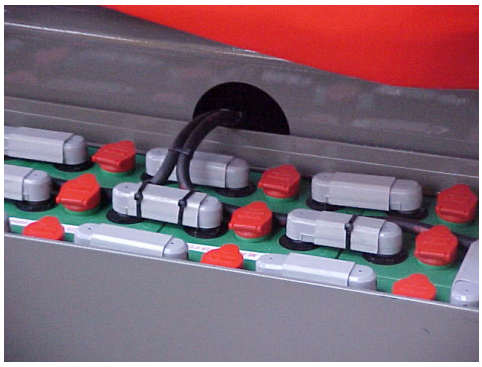
- Put the speed variator back into place and secure with the fixing screws.
- Reconnect the speed variator's electric connections.
- Reconnect the + and - terminals of the batteries.
- Put the machine back in the operational configuration.
-

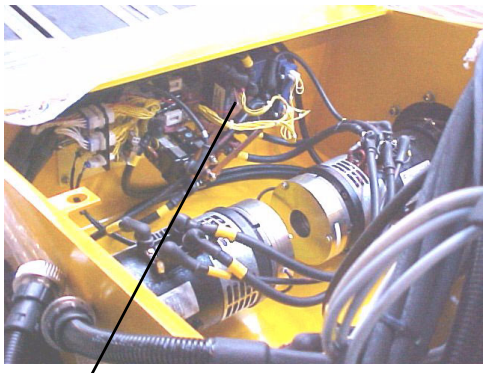


Optimum

SHEET C003	CORRECTIVE MAINTENANCE SHEET	Sheet 2/2
	REPLACING THE SPEED VARIATOR	

Star 22 J / Star 8

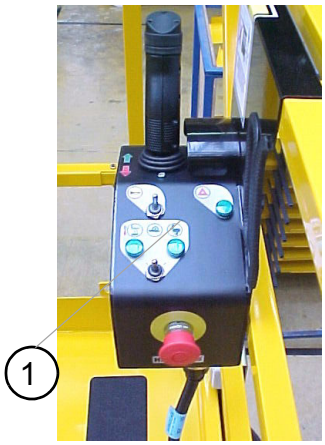




HA12IP / HA33JE

SHEET C004	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING A COMPONENT ON THE PLATFORM CONTROL PANEL	

Caution!
Do not use the machine during maintenance operations.



Compact - Optimum

Star 8 - HM10P (star 10)

1 - Preliminary operations

- Cut off the electric power supply (see § 6.3, page 26).

2 - Removing a component from the platform control panel

- Remove the closing plate (1) by unscrewing the four fixing screws.
- Mark and disconnect the electric connections of the component to be replaced.
- Remove the component.

3 - Replacing a component on the platform control panel

- Put a new component and seal into place on the front of the platform control panel.

NB: *If it is a lever switch, adjust the position of the fixing nut and counter nut so that the switch lever joint axle is on the same level as the seal, to ensure tightness.*

- Reconnect the electric connections according to the marks made when dismantling.
- Fix the closing plate with the four fixing screws.
- Perform the function corresponding to the replaced component to check that it works properly.

	CORRECTIVE MAINTENANCE SHEET	

Sheet C010	CORRECTIVE MAINTENANCE SHEET	Folio 1/1
	REPLACING A HYDRAULIC HOSE	

1 - Preliminary operations

- Put the machine in the maintenance configuration (see § 6.3, page 48).
- Switch off the electric power supply (see § 6.4, page 49).
- If necessary, close the shut-off valve or empty the hydraulic tank.

Caution!
Ensure that the oil is not too hot.

2 - Removing a hydraulic hose

- Disconnect the hose from the equipment to which it is connected.

NB: Unscrew the hose slowly to release residual hydraulic pressure.

Caution!
Use a container to collect the oil to avoid pollution of the environment.

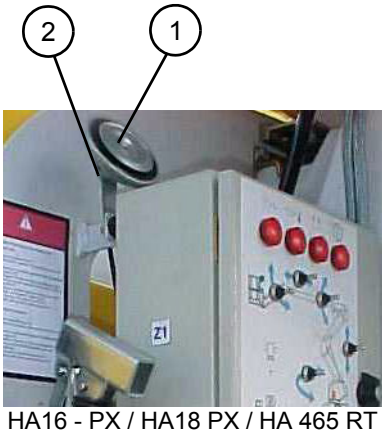
- Protect the equipment holes with caps.

3 - Remounting a hydraulic hose

- Reconnect a new hydraulic hose (§ 2.3.4 - Tightening torque of hydraulic hoses, page 16).
- Put the machine back in the operational configuration.
- Make a few movements implementing the hose in question to purge the hydraulic circuit.
- Check the level of the hydraulic oil tank.

Sheet C040	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	CHANGING THE HORN	

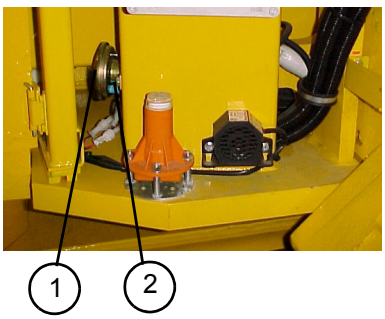
Caution!
Do not use the machine during maintenance operations.



HA16 - PX / HA18 PX / HA 465 RT

Star 22J / Star 8

Caution!
The horn should be audible from the basket.



HA12IP - HA33JE

1 - Preliminary operations
- Switch off electric power (see corresponding paragraph).

2 - Removing the horn
- Mark and disconnect the electric connections from the horn (1).
- Remove the horn, by unscrewing the fixing bolts (2).

3 - Installing the horn
- Put the horn back into place and fix with the fixing bolt.
- Reconnect the electric connections according to the marks made during dismantling.

4 - Test
- Select the top control panel and switch on machine power.
- Put the machine back into the operational configuration.
- Activate the horn switch from the platform control panel and check that the horn sounds.

	CORRECTIVE MAINTENANCE SHEET	

Sheet C060	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	CHANGING THE HAND PUMP	

Caution!
Use a container to collect oil to prevent pollution of the environment.

HA16 PX - HA18 PX / HA 465 RT

1 - Preliminary operations

- Put the machine in the maintenance configuration.

2 - Removing the hand pump

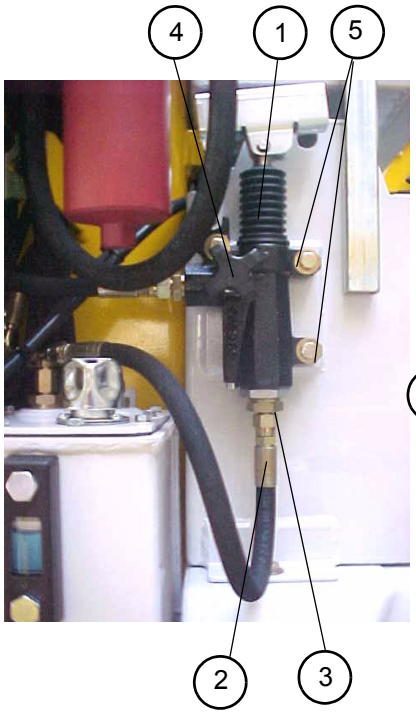
- Mark and disconnect the hydraulic hoses (2) from the hand pump (1).

NB: Unscrew the hoses slowly to release residual hydraulic pressure.

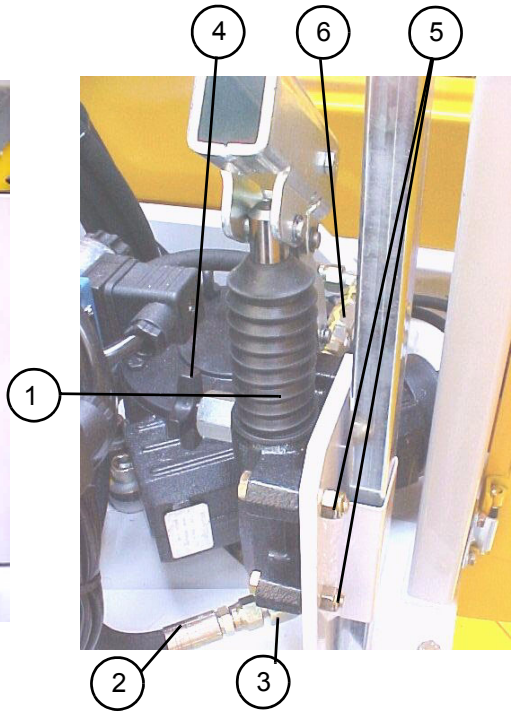
- Fit caps to the hoses.
- Remove the union pieces (3) from the hand pump.
- Remove the hand pump by removing its fixing bolts (5).

3 - Installing the hand pump

- Put a new hand pump into place and fix using the fixing bolts.
- Replace the non-return valve (6) if necessary.
- Install the union pieces on the pump.
- Reconnect the hydraulic hoses, according to the marks made during dismantling.
- Put the machine back into the operational configuration.
- Close the decompression valve (4).
- Perform an emergency operation to check that the hand pump works properly (see «Operation and Maintenance Instructions» manual).
- Open the decompression valve.



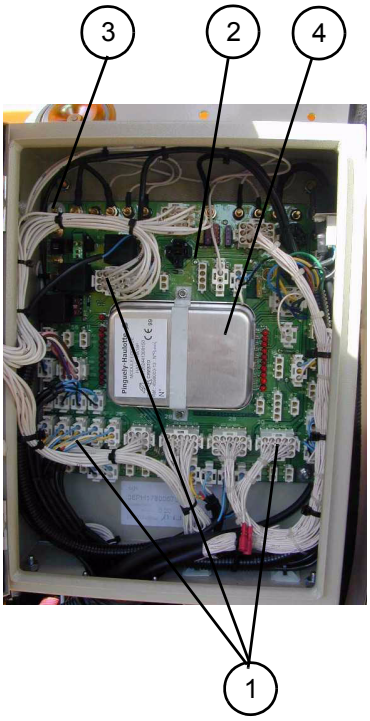
Star 22 J / Star 8



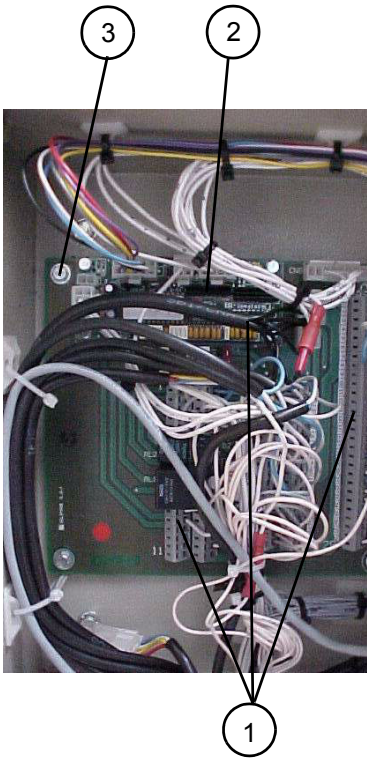
HA12IP / HA33JE

	CORRECTIVE MAINTENANCE SHEET	

Sheet C063	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	CHANGING THE PRINTED CIRCUIT	



HA16 PX - HA18 PX / HA 465 RT



Star 22J / Star 8

1 - Preliminary operations

- Put the machine in the maintenance configuration (see corresponding paragraph).
- Switch off electric power (see corresponding paragraph).
- Disconnect the « - » then « + » terminals of the starter battery.

2 - Removing the printed circuit

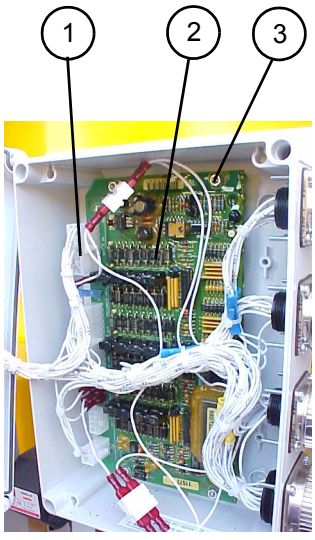
- Open the turntable electric box.
- Carefully mark and disconnect all the electric connections (1) of the printed circuit (2).
- Remove the U1 electronic module (4) (**except STAR, HA12IP and HA33JE**) (see corresponding sheet)
- Remove the bolts (3) fixing the board to the box and their sealing washers.
- Remove the printed circuit and silent-blocks equipping the fixing bolts.
- **STAR only** : disconnect the printed circuit's serial card.

3 - Installing the printed circuit

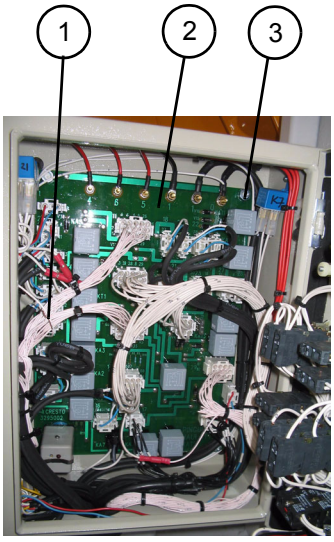
- Put a new printed circuit into place and fix using the bolts equipped with silent blocks, sealing rings and new toothed washers.
- **STAR only :** Install the printed circuit's serial card.
- Install the U1 electronic module (**except STAR, HA12IP and HA33JE**) (see corresponding sheet).
- Reconnect the electric connections according to the marks made during dismantling.
- Close the turntable box.
- Reconnect the « + » then « - » terminals of the starter battery.
- Put the machine back into the operational configuration.
- Test the printed circuit.

4 - Testing the printed circuit

- Perform the computer operating test (see «changing the U1 electronic module» sheet) (**except STAR, HA12IP and HA33JE**).



HA12IP-HA33JE



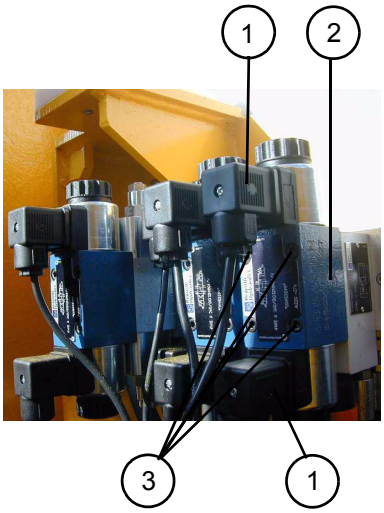
HA15I-HA43E

	CORRECTIVE MAINTENANCE SHEET	

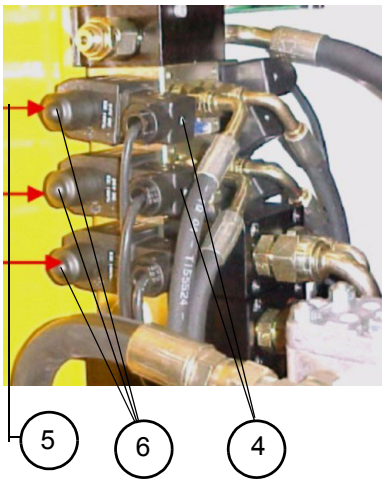
Sheet C067	CORRECTIVE MAINTENANCE SHEET	Sheet 1/2
	CHANGING AN ELECTROVALVE	

Caution!
Ensure that the oil is not too hot.

Caution!
Use a container to collect oil to prevent pollution of the environment.



HA16 PX - HA18 PX / HA 465 RT



Star 22 J / Star 8

1 - Preliminary operations
- Put the machine in the maintenance configuration (see corresponding paragraph).
- Switch off electric power (see corresponding paragraph).

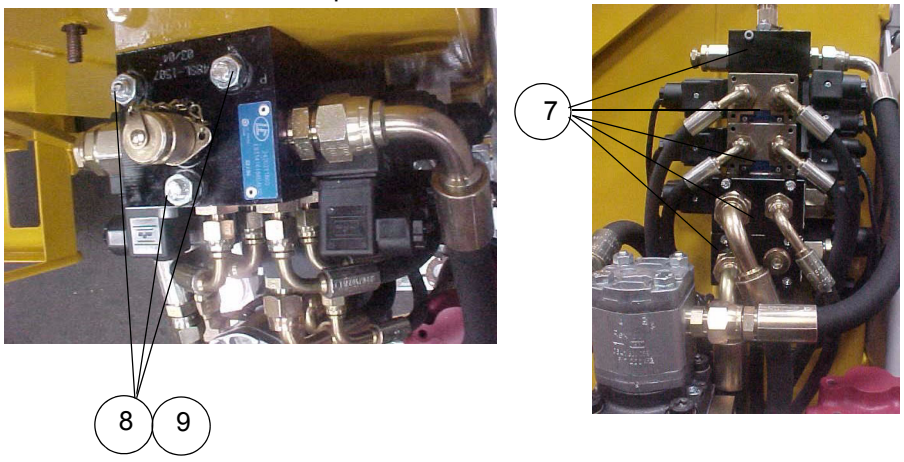
2 - Removing an electrovalve
- Mark and disconnect the electric connections(1) of the coils.
- Mark the installation position of the electrovalve on the block.
- Unscrew the four fixing screws (3) of the electrovalve (2) and remove.

3 - Installing an electrovalve
- Put a new electrovalve equipped with its seals into place and fix using the 4 screws, in the position of the electrovalve on the block. Tighten to the recommended torque (see corresponding paragraph).
- Reconnect the electrovalve's electric connections, according to the marks made during dismantling.
- Put the machine back into the operational configuration.
- Make several movement cycles using the replaced electrovalve to purge the hydraulic circuit.
- Check the level of the hydraulic oil tank.

4 - Dismantling/ reassembling an Oil Control coil
- Mark and disconnect the electric connections of the coils (4).
- Remove the protection (5) (plastic cap) from the end of the coil.
- Unscrew the nut (6) holding the coil and remove.
- Put a new coil into place.
- Put back the nut, protection and then reconnect the electric connections.

5 - Dismantling/reassembling an Oil Control slide valve

The whole section (7) must be replaced, not just the slide valve (mark the defective sections in the stack).
- Disconnect the wiring harnesses and the hydraulic hoses (plug them to prevent contamination).
- Remove the nuts (8) from the end of the three assembling tie rods (9).
- Remove the sections (7) one by one until the defective section is reached.
- Put a new section into place, then reassemble all sections.



Star 8 / Star 22J

- Put the nuts back into place (tightening torque 20 / 21 N.m or 14.75 / 15.49 lb.ft).

Throughout the dismantling/reassembly operation, take great care to preserve cleanliness and place the seals correctly at the interfaces between sections.

	CORRECTIVE MAINTENANCE SHEET	

Sheet C139	CORRECTIVE MAINTENANCE SHEET CHARGING THE TRACTION BATTERIES	Sheet 1/2

Caution!
Do not use the machine during the charging process.

Caution!
Use the machine's on-board charger. Its charge output is suited to the machine.

Caution!
Safety precautions are required for battery servicing operations (wear gloves and protective goggles).

1 - Preliminary operations

- Ensure that the mains supply is suitable for the charger's consumption and voltage.
- Fill to the minimum electrolyte level if an element's level is below this minimum.
- Work in a clean, ventilated area, away from naked flames.

2 - Charging the batteries

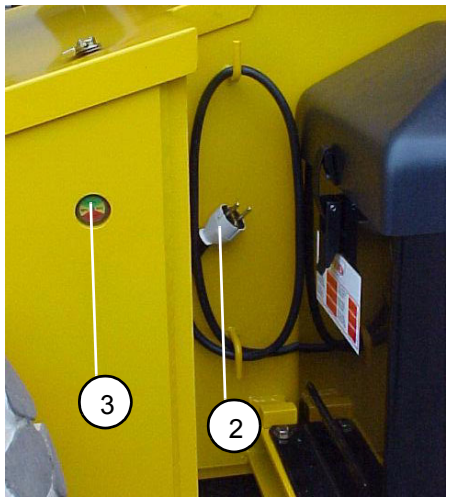
NB: Charging starts automatically as soons as the mains supply is connected. For information: charging time for a battery discharged by 80% is approximately 15 hours.

- Connect the plug (2) to the mains (110V for USA).
- Check the charge state on the light (3) on the bottom control panel.
  - Red zone: machine charging
  - Yellow zone: 80% of charging complete
  - Green zone: batteries charged

Star 8 / Star 22J

Star 8 / Star 22J

Sheet C139	CORRECTIVE MAINTENANCE SHEET	Sheet 2/2
	CHARGING THE TRACTION BATTERIES	



HA12IP - HA33JE

3 - During charging

- Do not remove or close the element caps.
- Ensure that element temperature does not exceed 45°C (be careful in summer or in rooms with high ambient temperature).

4 - After charging

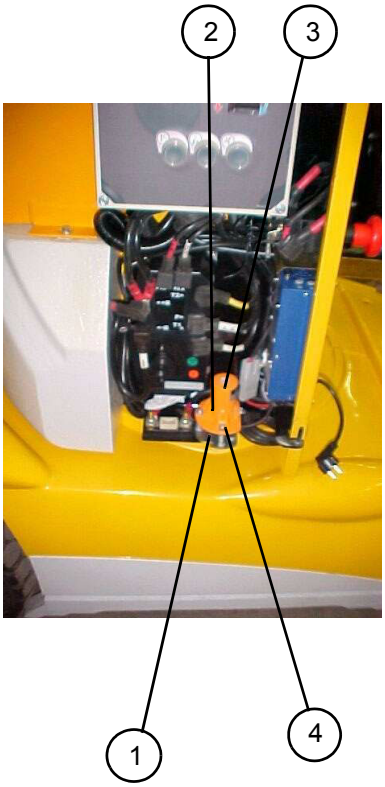
- Top up the electrolyte level if necessary.

4 - Additional operations

- Put the machine back into the operational configuration.

Sheet C140	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING THE TILT SENSOR	

Caution!
Do not use the machine during maintenance operations.



1 - Preliminary operations

- Put the machine on a flat, level surface.
- Put the machine in the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing the tilt sensor

- Mark and disconnect the electric connections of the tilt sensor.
- Remove the tilt sensor (2) by unscrewing the fixing bolts (1).

3 - Re-installing the tilt sensor

- Put a new tilt sensor into place and secure with the fixing bolts (1).
- Reconnect the electric connections according to the marks made during dismantling.
- Set the adjusting screw (4) so that the tilt sensor level is set.
- Put the machine back into the operational configuration.

4 - Tilt sensor operating test

- Extend the machine.
- Tilt the tilt sensor and check that an audible alarm is sounded.
- Make mast up and jib lifting movements to the safety contacts.

	CORRECTIVE MAINTENANCE SHEET	

Sheet C141	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	CHANGING THE JIB CYLINDER	

Caution!
Ensure that the oil is not too hot.

Photo 1

1 - Preliminary operations

- Put the machine in the maintenance configuration (see relevant section).
- Switch off the electric power supply.
- Put the basket in slings to ensure it does not fall (Photo 1) and secure it.
- Slightly lift the drum to facilitate access to the cylinder.

2 - Removing the jib cylinder

- Put the cylinder (1) and the vertical parts (2) and (3) of the jib into slings.
- Mark and disconnect the 2 hydraulic hoses of the jib cylinder.

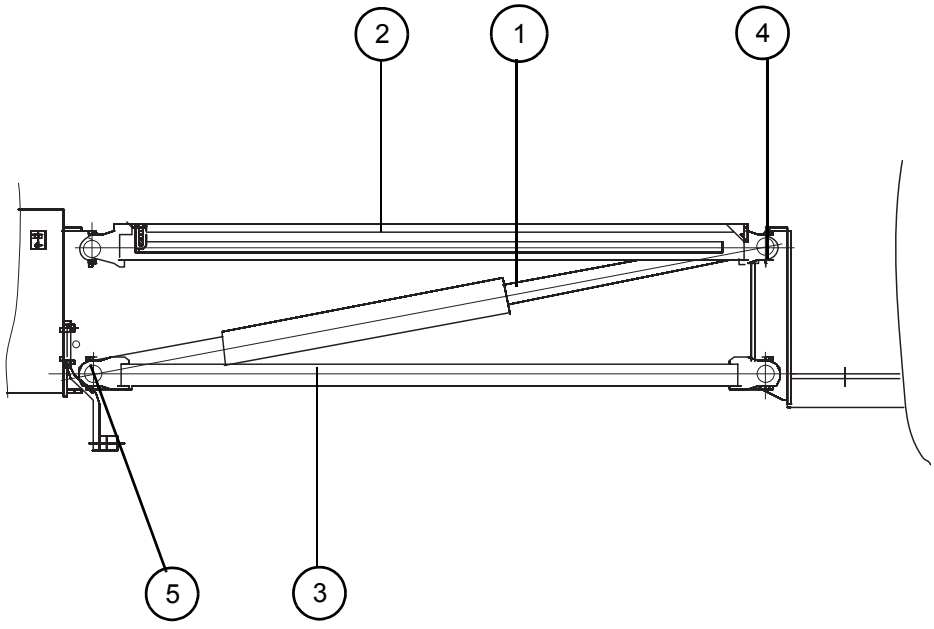
NB: *Unscrew the hoses slowly to release residual hydraulic pressure.*

- Put caps on the hoses.
- Remove the 2 bolts of the cylinder pin (4) on the cylinder body side.
- Remove the pin (4).
- Remove the 2 bolts of the cylinder pin (5) on the rod side.
- Remove the pin (5).
- Remove the jib cylinder (1).

3 - Reinstalling the jib cylinder

NB: *Before reassembly, check the condition of all articulated pin rings, and replace if necessary. Lubricate all bores before reinstalling the pins. Only use lubricants recommended by the manufacturer.*

- Put the jib cylinder into place and reinstall the 2 articulation pins on the cylinder rod and body sides.
- Secure the pins with their bolts.
- Remove the slings.



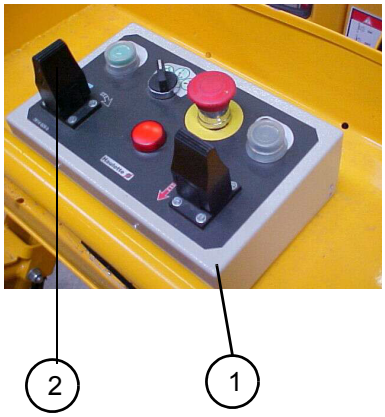
4 - Additional operations

- Put the machine back into the operational configuration.
- Make several jib movements to test operation and purge the hydraulic circuit.
- Check the hydraulic circuit level.

	CORRECTIVE MAINTENANCE SHEET	

SHEET C142	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING THE TOP PANEL MANIPULATOR	

Caution!
Do not use the machine during maintenance operations.



1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing the manipulator (2)

- Remove the closing plate (1) by taking out the four fixing screws.
- Mark and disconnect the electric connections of the manipulator.
- Remove the manipulator by taking out the fixing screws.

3 - Reinstalling the manipulator

- Fix a new manipulator equipped with new seals on the platform control panel.
- Reconnect the electric connections according to the marks made during dismantling.
- Put back the closing place and secure with the four fixing screws.
- Put the machine back into the operational configuration.
- Make several up and down movements from the platform control panel to test manipulator operation.

	CORRECTIVE MAINTENANCE SHEET	

SHEET C143	CORRECTIVE MAINTENANCE SHEET	Sheet1/1
	REPLACING THE BOTTOM PANEL MANIPULATOR	

Caution!
Do not use the machine during maintenance operations.

1 - Preliminary operations

- Put the machine in the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing the manipulator (2)

- Remove the closing plate (1) by taking out the four fixing screws.
- Mark and disconnect the electric connections of the manipulator.
- Remove the manipulator by taking out its fixing screws.

3 - Reinstalling the manipulator

- Fix a manipulator equipped with new seals on the turntable control panel.
- Reconnect the electric connections according to the marks made during dismantling.
- Put the closing plate back into place and secure with the four fixing screws.
- Put the machine back into the operational configuration.
- Make several up and down movements from the turntable control panel to test manipulator operation.

	CORRECTIVE MAINTENANCE SHEET	

SHEET C144	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING A STEERING WHEEL	

1 - Preliminary operations

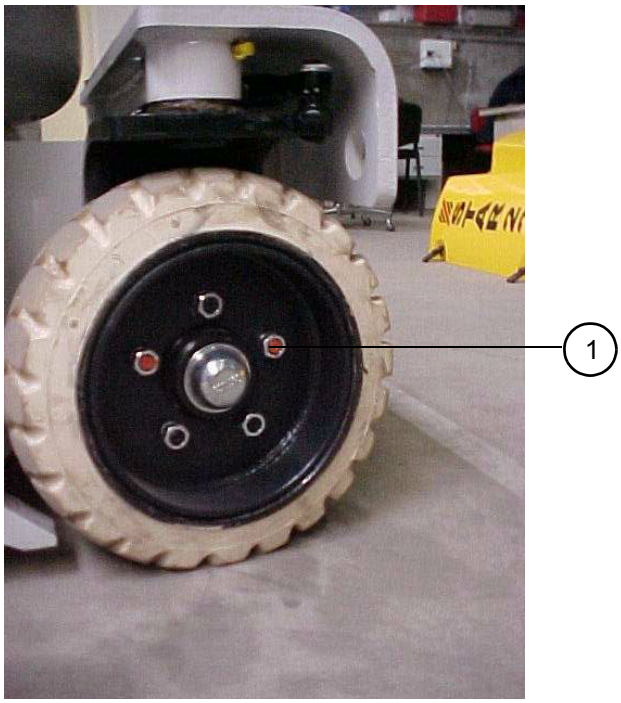
- Put the machine in the low configuration.
- Switch off the electric power supply (see relevant section).

2 - Removing a wheel

- Slacken (without completely unscrewing) the nuts of the wheel to be removed.
- Raise the machine using a jack or hoist.
- Remove the 5 wheel nuts (1) and remove the wheel.

3 - Reinstalling a wheel

- Put a new wheel into place and put back the nuts (1).
- Lower the machine back to the ground.
- Tighten the nuts. Tightening torque for wheel nuts: 213 ft.lb / 29 m dNm
- Put the machine back into the operational configuration.



	CORRECTIVE MAINTENANCE SHEET	

SHEET C145	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING A COIL	

1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing a coil

- Disconnect the electric connector (1) of the coil in question.
- Unscrew the nut (2) and remove the coil (3).

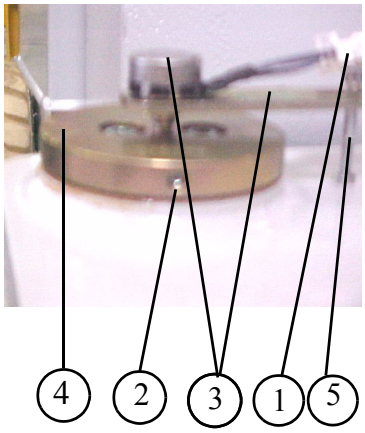
3 - Reinstalling a coil

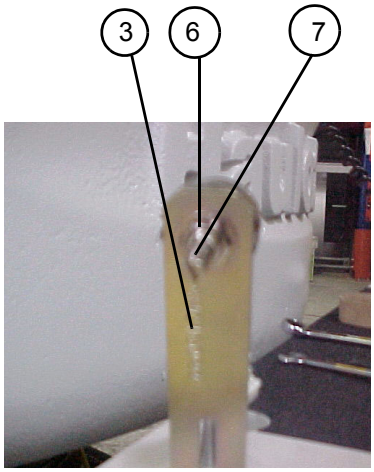
- Put a new coil into place (3) and secure with the nut (2).
- Reconnect the electric connector (1) on the coil.
- Put the machine back into the operational configuration.
- Check correct operation by making the movement corresponding to the replaced coil.

	CORRECTIVE MAINTENANCE SHEET	

SHEET C146	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING AND SETTING THE STEERING POTENTIOMETER	

Caution!
Before final reinstallation of the steering potentiometer, it must be set with a zapi console by a Pinguely Haulotte technician.





1 - Preliminary operations

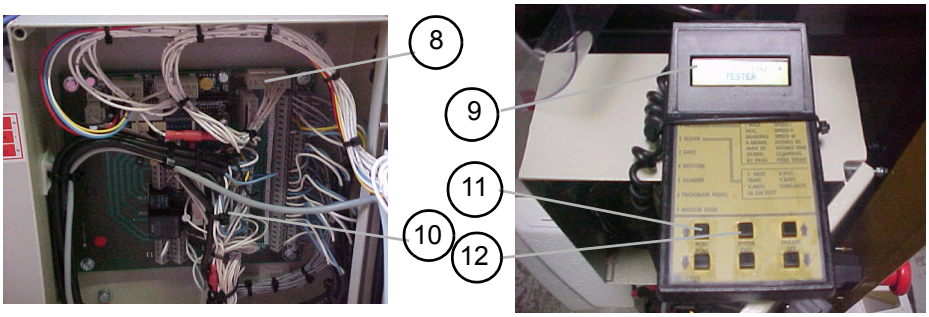
- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).
- Remove the covers (see relevant sheet).

2 - Removing the potentiometer

- Disconnect the electric connection (1).
- Slightly unscrew the screw (5) fixing the potentiometer support (3).
- Slacken the 2 BTR screws (2).
- Lift the potentiometer support (3) to remove the potentiometer from the fixing flat (4) of the wheel pivot.
- Unscrew the nut (6) keeping the potentiometer on its support (3).
- Remove the potentiometer (7).

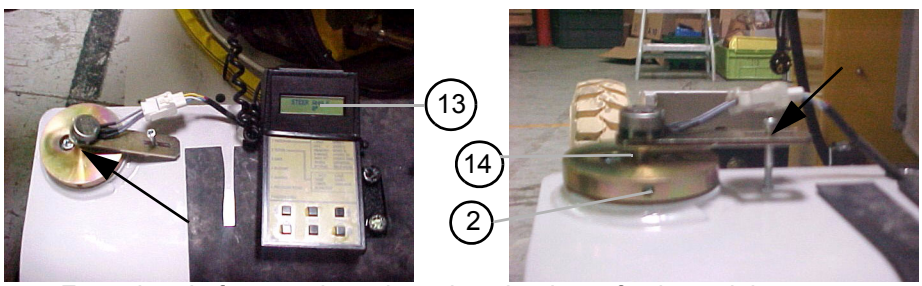
3 - Reinstalling the potentiometer before setting

- Connect the electric connection (1).
- Fix the new potentiometer on its support (3) by screwing the fixing nut (6).
- Connect the calibrater (9) to the MDI socket (8) on the mother board (10).



4 - Adjusting and reinstalling the potentiometer

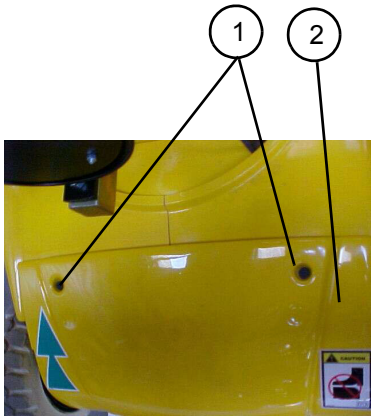
- Switch on the machine in the platform station.
- Using the “Roll” buttons (11), find the “Tester” menu.
- Press “Enter” (12).
- Find the “Steer Angle” parameter.
- The angular value of the potentiometer is displayed on the console.
- Adjust the potentiometer so that the value 0 is displayed on the console (13).

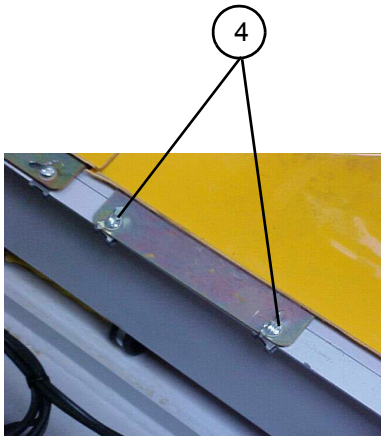


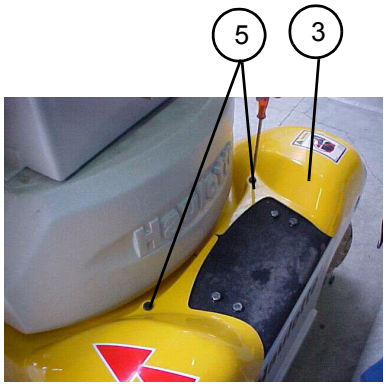
- From the platform station, place the wheels perfectly straight.
- Position the potentiometer, leaving a gap of 0.07 to 0.19 in / 2 to 5 mm (14) between the potentiometer fixing nut and the wheel pivot fixing flat and fix the potentiometer support so that the head of the fixing screw does not touch the support.
- Fix the potentiometer using the BTR screws (2).

	CORRECTIVE MAINTENANCE SHEET	

SHEET C147	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REMOVING - REPLACING THE COVERS	







1 - Preliminary operations
- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing the motor cover (2)
- Unscrew the fixing screws (1).
- Remove the cover (2)

3 - Reinstalling the motor cover (2)
- Reinstall a cover (2).
- Tighten the fixing screws (1).

4 - Removing a side cover (3)
- First remove the motor cover (2)
- Manually unscrew the fins (4).
- Unscrew the screws (5).
- Remove the cover (3).

5 - Reinstalling a side cover (3)
- Put a new side cover into place (3).
- Screw the screws (5) and fins (4) back into place.
- Reinstall the motor cover (2).

6 - Removing a pivoting turntable cover (6)
- Open the cover (6) and put it into slings.
- Take the cover off its hinges (8) and remove.

7 - Reinstalling a pivoting turntable cover (6)
- Put a new cover into place (6).
- Remove the slings

8 - Additional operations
- Check that the cover is properly anchored on the machine.
- Put the machine back into the operational configuration.

	CORRECTIVE MAINTENANCE SHEET	

Sheet C148	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REMOVING - REPLACING THE HYDRAULIC WINDER	

Caution!
Ensure that the oil is not too hot.

Caution!
Use a container to collect the oil to prevent pollution of the environment.

1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

NB: Unscrew the hoses slowly to release residual hydraulic pressure.

2 - Removing the hydraulic winder (1)

- Disconnect the hydraulic hoses (2) and (3).
- Put caps on the hoses.
- Unscrew the two fixing nuts (4) to free the hose (5).
- Remove the winder by taking the fixing nuts (6) off the support.

3 - Reinstalling the hydraulic winder

- Perform dismantling operations in reverse order to reassemble.

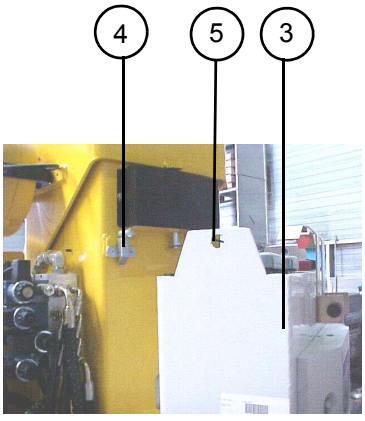
4 - Additional operations

- Put the machine back into the operational configuration.
- Make several movements using the replaced hydraulic winder to purge the hydraulic circuit.
- Check the hydraulic oil tank level.

	CORRECTIVE MAINTENANCE SHEET	

Sheet C149	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REMOVING - REPLACING THE BATTERIES	

Caution!
Battery servicing operations require safety precautions (wear gloves and protective goggles).



1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).
- Remove the standby pump (1) by removing the 3 fixing nuts (2). Removing the hoses (6) is not necessary.
- Disconnect the “-” and then “+” terminals of the batteries.

2 - Removing the upper battery (3)

- Release the lock (4) of the battery support.
- Put the battery support into slings using the lifting rings (5).
- Pivot the support around its axis.
- Using an overhead crane, remove the battery.

3 - Removing the lower battery (6)

- Unscrew the 2 nuts (7).
- Put the battery support into slings using the lifting rings (8).
- Using an overhead crane, remove the battery.

4 - Re-installing the batteries

- Perform the dismantling operations in reverse order to reassembly, starting with re-installation of the lower battery.

6 - Additional operations

- Reconnect the “+” then “-” terminals of the batteries.
- Put the standby pump back into place.
- Put the machine back into the operational configuration.

	CORRECTIVE MAINTENANCE SHEET	

Sheet C198	CORRECTIVE MAINTENANCE SHEET	Sheet 1/6
	DISMANTLING - REASSEMBLING THE MAST	

Caution!
Ensure that the oil is not too hot.

Caution!
Use a container to collect the oil to prevent pollution of the environment.

Caution!
Make sure the lifting means are in good condition and of sufficient capacity.

Photo 1

Photo 2

1 - Preliminary operations

- Put the machine in the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).
- Remove the right and left side covers (see relevant sheet).
- Remove the motor cover (see relevant sheet).
- Remove the lower right and left covers (see relevant sheet).
- Disconnect and remove the batteries (see relevant sheet).
- Disconnect the pump power supply, after marking the supply wires (see relevant sheet).
- Remove the plate covering the end of travel contactors SQ3 and SQ4 and remove them (see relevant sheet).
- Remove the hydraulic winder (see relevant sheet)
- Remove the end of travel contactor SQ12 (see relevant sheet).
- Remove the hydraulic supply hose at the top of the mast.
- Remove the jib (see relevant sheet).
- Remove the circuit breaker (see relevant sheet).
- Remove the charger (see relevant sheet).
- Remove the end of travel contactor SQ10 (see relevant sheet).
- Remove the electric plate (see relevant sheet).
- Remove the hydraulic plate (see relevant sheet).
- Remove the hydraulic filter (see relevant sheet).
- Remove the pump (see relevant sheet).
- Remove the hydraulic tank (see relevant sheet).
- Remove the hydraulic block assembly (see relevant sheet).
- Remove the rotation motor (see relevant sheet).
- Remove the counterweight (see relevant sheet).
- Remove the cable sleeve support (see relevant sheet).

2 - Removing the mast

- Remove the trapdoor in the middle of the mast (ref. 1 Photo 1)
- Unscrew the 12 screws on the ring (replace the screws systematically to reassemble - 8.8c class screws - HM14 x 65/34, then tighten to a torque of 99 ft.lb /135 Nm).
- Put the mast into slings (approx. 94 stones / 600 kg) (Photo 2)
- Place the mast on trestles (Photo 3)

Photo 3

- Unscrew the 3 screws from the cylinder plate at the bottom of the mast, and remove the plate.
- Unscrew the two elbow unions at the bottom of the mast (Photo 4 & Photo 5).

Photo 4 & Photo 5

Photo 6

- Put the ring support (Photo 6) into slings.
- Unscrew the 12 bolts (class 8.8 - HM16x100/38) of the ring support (Photo 7) and remove the ring with an overhead crane.
- Take the circlips off the upper part of the cylinder (Photo 8).
- Put the cylinder into slings and remove it with an overhead crane.
- Put the smallest caisson into slings and remove it with an overhead crane.
- Unscrew the 6 fixing screws on each stop of the 1st elevation caisson and remove the stops.
- Unscrew the 6 screws of the next stop and remove it.
- Put the 3rd caisson into slings and remove it with an overhead crane.
- Put the 2nd caisson into slings and remove it with an overhead crane.
- Put the 1st caisson into slings and remove it with an overhead crane.

Photo 7

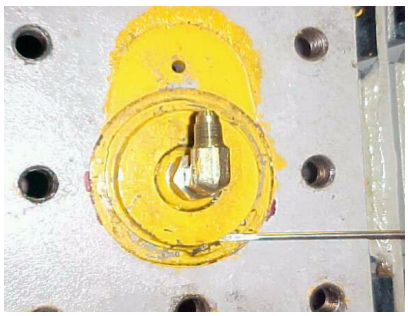


Photo 8

Sheet C198	CORRECTIVE MAINTENANCE SHEET	Sheet 3/6
	DISMANTLING - REASSEMBLING THE MAST	

Gap adjustment at reassembly

3 - Reinstalling the mast

- Place the caissons on trestles.
- Insert the 1st caisson in the bottom of the mast.
- Check the clearance between the 1st caisson and the bottom of the mast (the gap should be between 1 and 2 mm at each end of the mast).
- Adjust the gap with a set of adjustment wedges.
- Check that the caisson works properly by sliding it manually.
- Insert the 2nd caisson into the 1st.
- Check the gap and adjust if necessary.
- Check that the caisson works properly by sliding it manually.
- Put the stops back on the 1st caisson, making it protrude by approximately 5 cm.
- Insert the 3rd caisson in the 2nd.
- Check the gap and adjust if necessary.
- Check that the caisson works properly by sliding it manually.
- Put the stop back on the 2nd caisson, making it protrude by approximately 5 cm.
- Check the gap between the 4th and 3rd caissons (the gap should be between 1 and 2 mm at each end of the mast).
- Adjust the gap with a set of adjustment wedges.
- Check that the caisson works properly by sliding it manually.

Photo 10

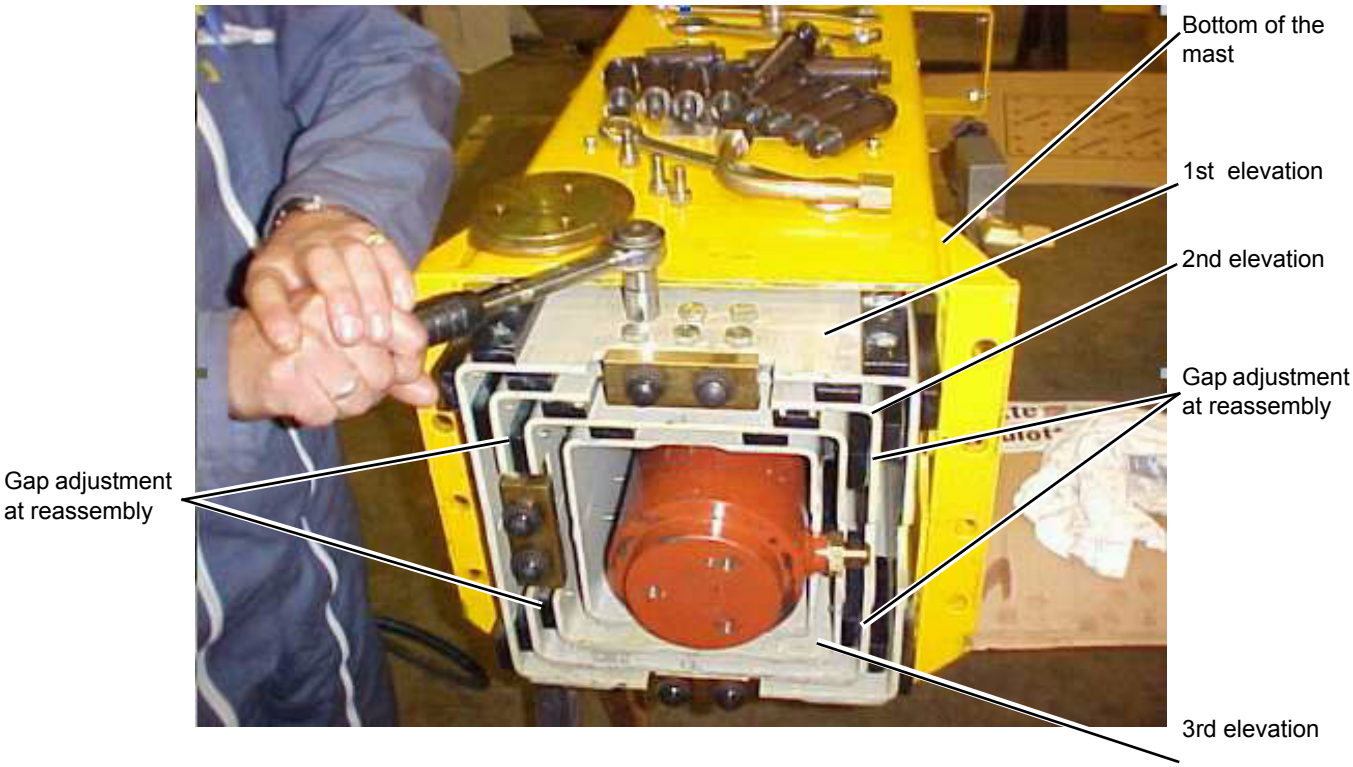


Photo 9

Caution!
After assembling the mast, it is essential to have static and dynamic load tests carried out by a certified organisation.

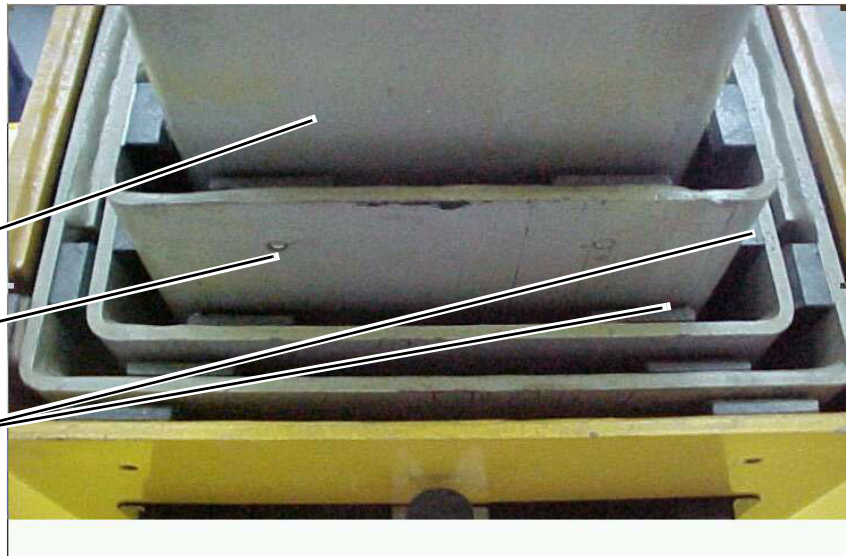
THEN PERFORM THE DISMANTLING OPERATIONS (SECTION 2) IN REVERSE ORDER TO REASSEMBLE

To facilitate caisson sliding, use a synthetic lubricant spray (see section listing consumables recommended by Pinguely-Haulotte).

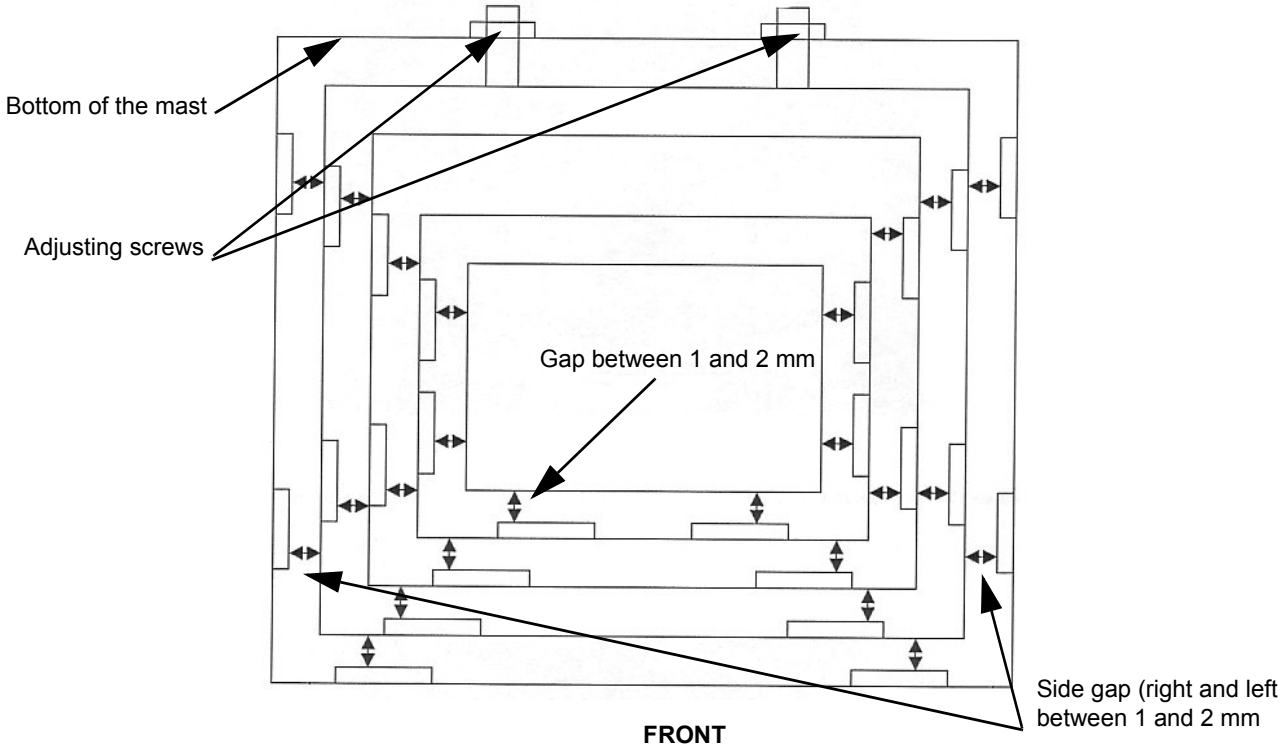
4 - Adjustment of pads after assembling the mast

- Raise the mast to the start of the 3rd caisson.
- Check the gap between the 4th and 3rd caissons (between 1 and 2 mm) using thickness wedges on the front side and right and left sides of the mast.

Photo 11



REAR



FRONT

- If necessary, adjust this gap using the two adjusting screws on the side.

NB: Repeat this operation between the 3rd and 2nd caisson, between the 2nd and 1st caisson and finally between the 1st caisson and the bottom of the mast.

NB: If the side gap is less than 1 mm, there must be a blockage. The mast must be dismantled and reassembled.

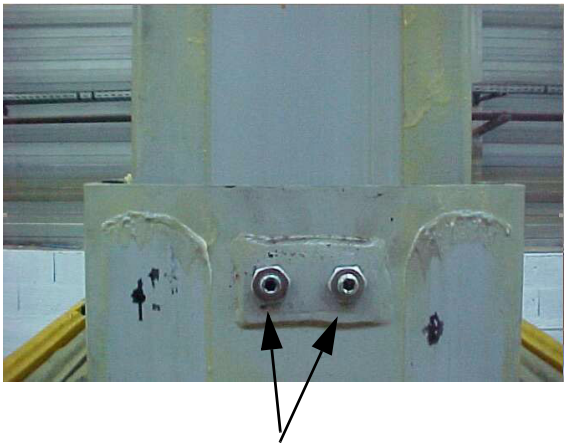


Photo 12

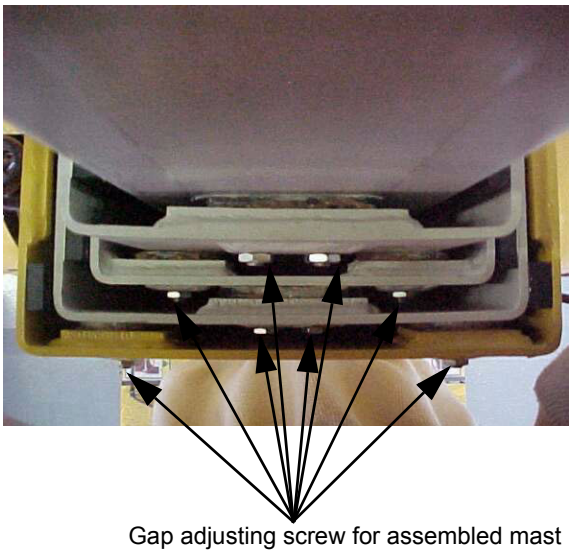


Photo 13

5 - Additional operations

- Reinstall the cable sleeve support (see relevant sheet).
- Reinstall the counterweight (see relevant sheet).
- Reinstall the rotation motor (see relevant sheet).
- Reinstall the hydraulic block assembly (see relevant sheet).
- Reinstall the hydraulic tank (see relevant sheet).
- Reinstall the pump (see relevant sheet).
- Reinstall the hydraulic filter (see relevant sheet).
- Reinstall the hydraulic plate (see relevant sheet).
- Reinstall the electric plate (see relevant sheet).
- Reinstall the end of travel contactor SQ10 (see relevant sheet).
- Reinstall the charger (see relevant sheet).
- Reinstall the circuit breaker (see relevant sheet).
- Reinstall the jib (see relevant sheet).
- Reinstall the end of travel contactor SQ12 (see relevant sheet).
- Reinstall the hydraulic supply hose at the top of the mast.
- Reinstall the hydraulic winder (see relevant sheet)
- Reinstall the end of travel contactors SQ3 and SQ4 and the sheet covering them (see relevant sheet).
- Reconnect pump supply.
- Reinstall and reconnect the batteries (see relevant sheets).
- Reinstall the bottom right and left covers (see relevant sheet).
- Reinstall the motor cover (see relevant sheet).
- Reinstall the right and left side covers (see relevant sheet).
- Put the machine back into the operational configuration.
- Make several movements to check correct machine operation (and safety systems).

Sheet C200	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING AN END OF TRAVEL CONTACTOR	

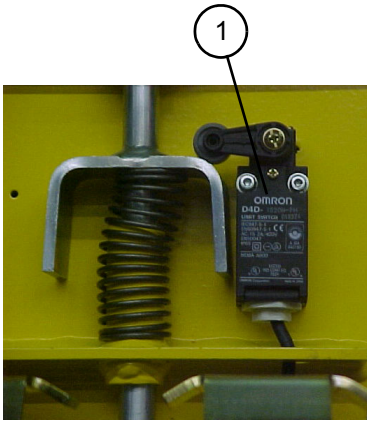
Caution!
Do not use the machine during maintenance operations.

1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing an end of travel contactor

- Mark the position of the end of travel contactor (1).
- Remove the end of travel contactor.
- Open the end of travel contactor, mark and disconnect the electric connections.

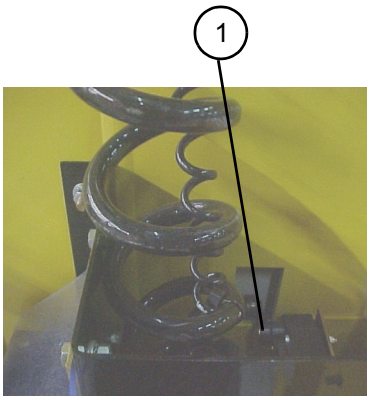


3 - Reinstalling an end of travel contactor

- Open the new end of travel contactor, reconnect the electric connections and close the contactor again.
- Put the end of travel contactor into place according to the position marked during dismantling and fix onto its support.
- Do not tighten the bolts before adjusting.

4 - Adjustment and test

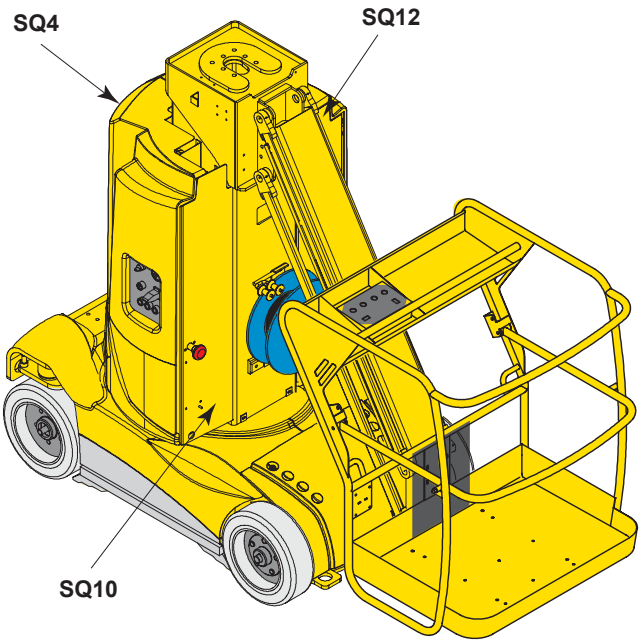
- Put the machine back into the operational configuration.
- Make the movement using the contactor in question and check that it works properly.
- Adjust the position of the contactor if necessary and tighten the fixing bolts.



SQ4 = mast down

SQ10 = high position caisson

SQ12 = jib up

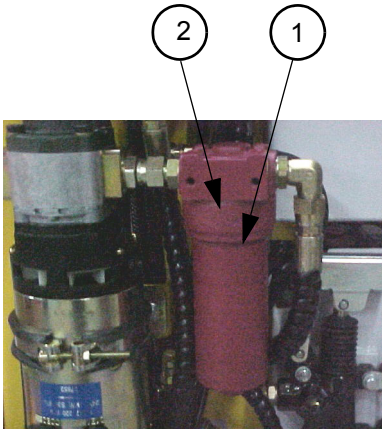


	CORRECTIVE MAINTENANCE SHEET	

Sheet C201	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING THE HYDRAULIC FILTER	

Attention !
Ensure that the oil is not too hot.

Attention !
Use a container to collect the oil to prevent pollution of the environment.



1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing the hydraulic filter

- Unscrew the bowl (1) of the hydraulic filter.
- Place a bowl under the hydraulic filter to collect the oil.
- Take the filtration element out of the base.

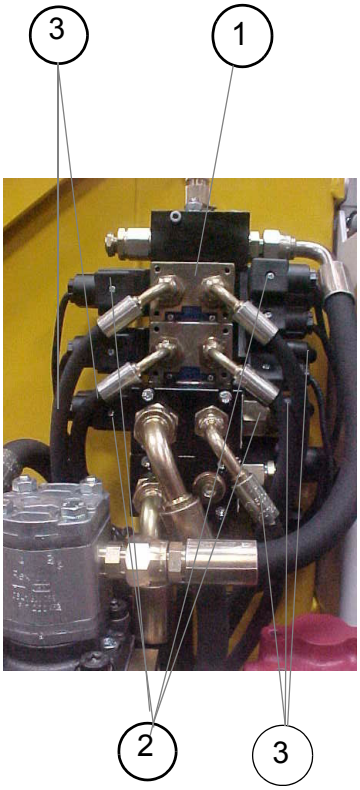
3 - Reinstalling the hydraulic filter

- Clean the filtration element support.
- Replace the filter.
- Screw the base back onto the fixed part of the hydraulic filter (2).
- Put the machine back into the operational configuration.
- Make several lifting cycles to purge the hydraulic circuit.

	CORRECTIVE MAINTENANCE SHEET	

Sheet C202	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING A HYDRAULIC BLOCK	

Caution!
Ensure that the oil is not too hot.



1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing the hydraulic block

- Open the covers to access the components.
- Mark and disconnect the electrovalves (2) of the hydraulic block (1).
- Mark and disconnect the hoses (3) of the hydraulic block.

NB: Unscrew the hoses slowly to release residual hydraulic pressure.

- Put caps on the hoses.
- Remove the union connectors from the hydraulic block.
- Remove the hydraulic block by removing the fixing screws and washers.

3 - Reinstalling the hydraulic block

- Put the hydraulic block into place and fix with screws equipped with new toothed washers.
- Put back the union connectors.
- Reconnect the hydraulic hoses according to the marks made during dismantling.
- Reconnect the electrovalves of the hydraulic block according to the marks made during dismantling.
- Put the machine back into the operational configuration.
- Make several movement cycles using the hydraulic block in question to purge the hydraulic circuit.
- Check the level in the hydraulic oil tank (see relevant sheet).
- Close the covers again

NB: Check the chopper software version when changing the block: up to version 1.03 for blocks with two pressure limiters, from version 1.05 for blocks with three pressure limiters. For US machines, version from 1.04 US.

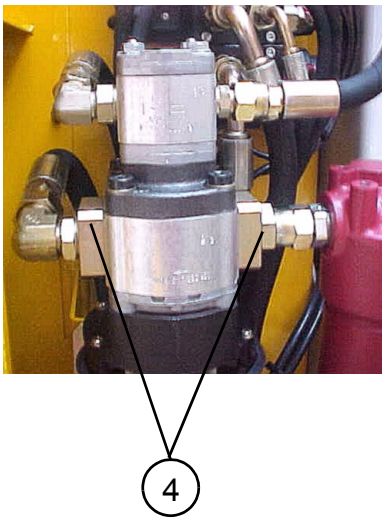
	CORRECTIVE MAINTENANCE SHEET	

Sheet C203	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING THE MOTORPUMP UNIT	

Caution!
Ensure that the oil is not too hot.

Caution!
Use a container to collect the oil to prevent pollution of the environment.

Caution!
It is essential to put the component into slings before dismantling/reassembling it.



1 - Preliminary operations

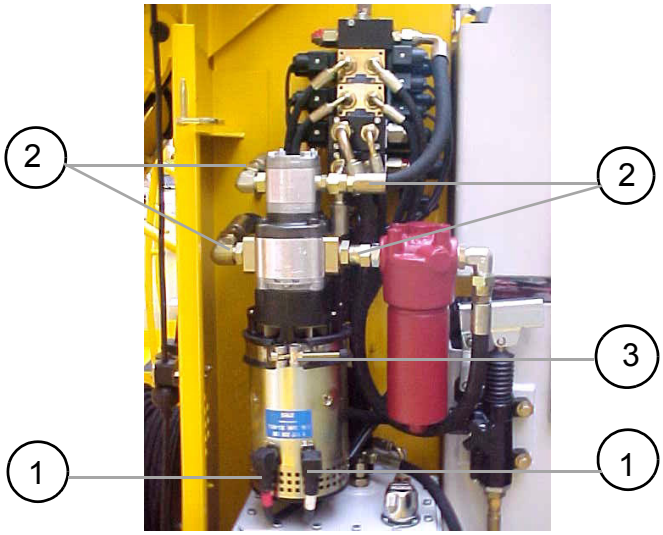
- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing the motorpump unit

- Mark and disconnect the electric connections of the motor pump unit (1).
- Mark and disconnect the four hoses (2) of the hydraulic pumps.
- Put caps on the hoses.
- Remove the fixing collar (3) of the motorpump unit and remove the unit.
- Remove the suction and discharge flanges (4) of the large pump.

3 - Reinstalling the motorpump unit

- Reinstall the suction and discharge flanges (4) equipped with new seals on the motorpump unit.
- Put the motorpump unit into place and secure with the fixing collar (3).
- Reconnect the hydraulic hoses (2) on the pumps according to the marks made during dismantling.
- Reconnect the electric connections (1) on the motor according to the marks made during dismantling.
- Put the machine back into the operational configuration.
- Check motor rotation direction.
- Make several lifting cycles to purge the hydraulic circuit.
- Check the level of the hydraulic oil tank.



	CORRECTIVE MAINTENANCE SHEET	

Sheet C204	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING THE HYDRAULIC PUMP	

Caution!
Ensure that the oil is not too hot.

Caution!
Use a container to collect the oil.

Caution!
It is essential to put the component into slings before dismantling and reassembling it.

1 - Preliminary operations

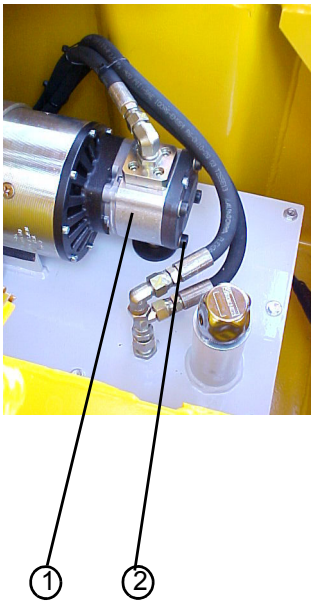
- Put the machine into maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing the hydraulic pump

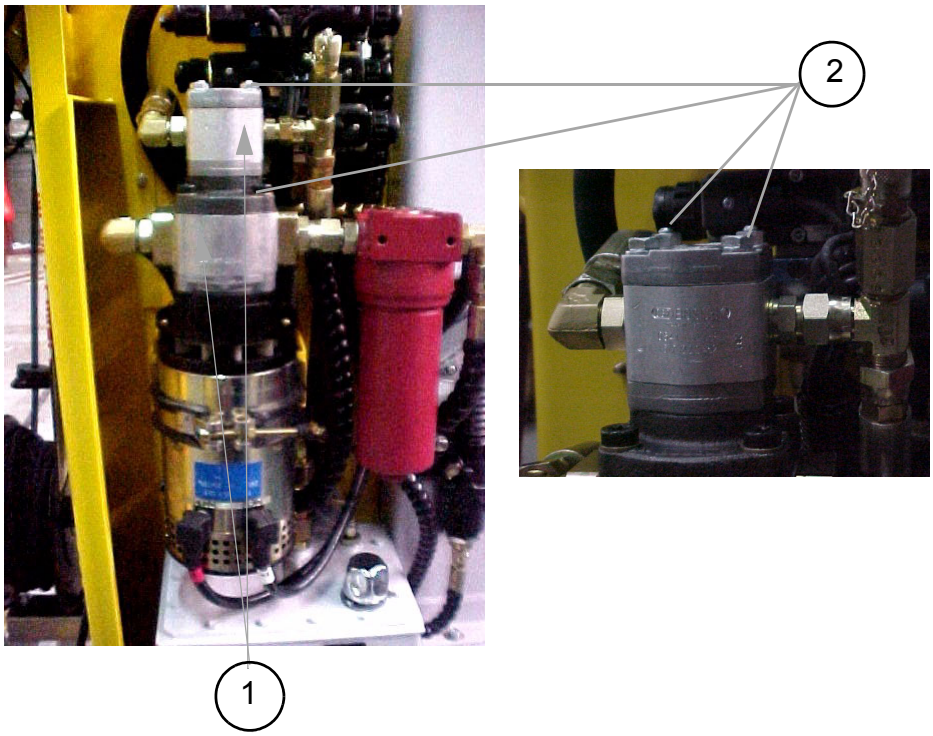
- Remove the motorpump unit (see relevant sheet).
- Remove the screws fixing the pumps (2) to the motor and remove the pumps (1).

3 - Reinstalling the hydraulic pump

- Put new pumps, equipped with new seals, into place on the electric motor and secure with fixing screws.
- Put back the motorpump unit (see relevant sheet).
- Put the machine back into the operational configuration.
- Make several lifting cycles to purge the hydraulic circuit.
- Check the level of the hydraulic oil tank.



HA12IP - HA33JE



STAR 8 / STAR 22J

	CORRECTIVE MAINTENANCE SHEET	

Sheet C205	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING THE ROTATION MOTOR	

Caution!
Ensure that the oil is not too hot.

1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).
- Close the shut-off valve, or empty the hydraulic tank.

2 - Removing the rotation motor

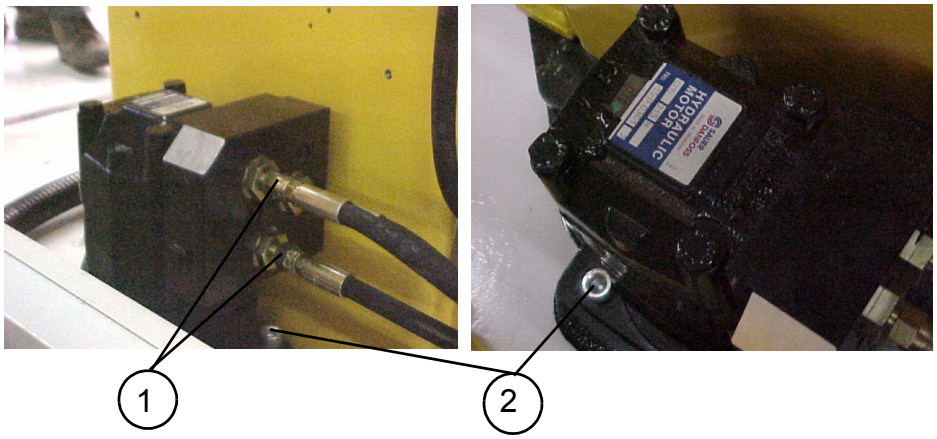
- Mark and disconnect the hoses (1) of the rotation motor.
- Put a cap on the hose.
- Unscrew the four fixing screws (2) of the rotation motor.
- Remove the rotation motor.

Caution!
Use a container to collect the oil to prevent pollution of the environment.

3 - Reinstalling the rotation motor

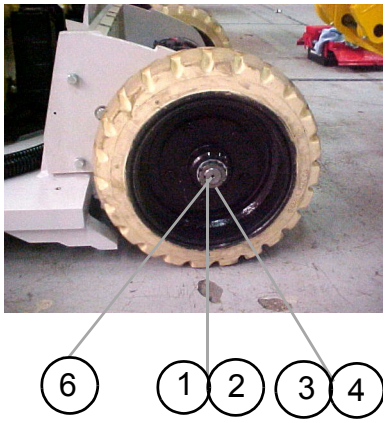
- Put a new motor, filled with oil, into place.
- Reinstall the screws with loctite.
- Reconnect the hydraulic hoses equipped with new seals.
- Put the machine back into the operational configuration.
- Make several operating cycles to purge the hydraulic circuit.
- Check the level of the hydraulic oil tank.

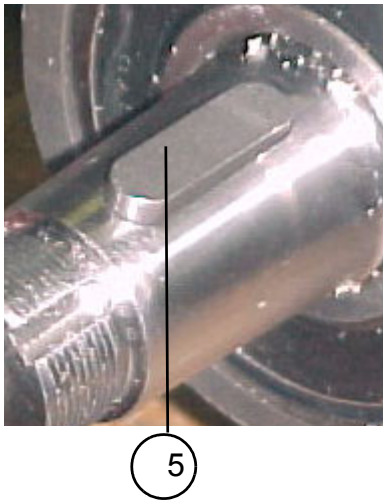
Caution!
It is essential to put the component into slings before dismantling / reassembling it.



	CORRECTIVE MAINTENANCE SHEET	

Sheet C206	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING A DRIVE WHEEL	





1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).
- Raise the machine with a jack or hoist.

2- Removing a drive wheel

- Push back the tab (1) of the toothed washer (2).
- Unscrew the wheel's fixing nut (3).
- Remove the toothed washer (2) then the flat washer (4).
- Remove the wheel.

3- Reinstalling a drive wheel

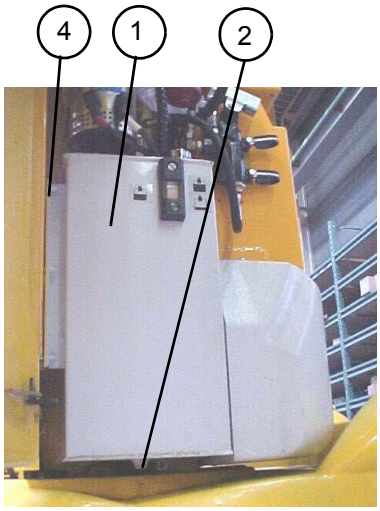
- Replace the key (5) if necessary.
- Put a new wheel into place and secure with the fixing nut (6).
- After tightening, block the nut with the KM washer.
- Put the machine back into the operational configuration.

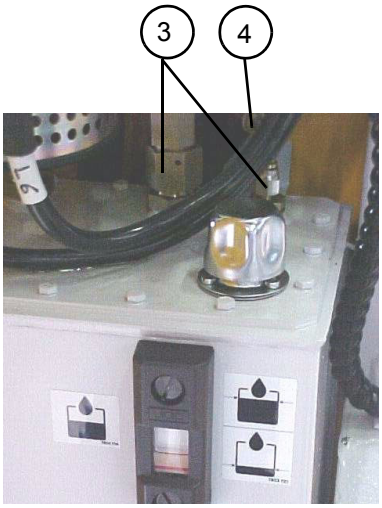
	CORRECTIVE MAINTENANCE SHEET	

Sheet C207	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING THE HYDRAULIC TANK	

Caution!
Ensure that the oil is not too hot.

Caution!
Use a container to collect the oil to prevent pollution of the environment.





1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing the hydraulic tank (1)

- Empty the tank by removing the plug (2).
- Disconnect the hydraulic hoses (3) and remove the hydraulic connectors.
- Put caps on the hoses.
- Remove the tank (1) by removing its fixing nuts (4).

3 - Reinstalling the hydraulic tank

- Reinstall the tank and secure with its nuts.

NB: *Take care with hydraulic hoses passing behind the tank.*

- Put the connectors back into place and connect the hoses (see table of tightening torque values).
- Fill the hydraulic oil tank (use the oil recommended by Pinguely-Haulotte).
- Put the machine back into the operational configuration.
- Make several lifting cycles to purge the hydraulic circuit.
- Check the level of the hydraulic circuit.

	CORRECTIVE MAINTENANCE SHEET	

SHEET C208	CORRECTIVE MAINTENANCE SHEET	Sheet1/1
	REPLACING THE TURNTABLE EMERGENCY STOP BUTTON	

Caution!
Do not use the machine during maintenance operations.

1 - Preliminary operations

- Put the machine into the maintenance configuraiton (see relevant section).
- Switch off the electric power supply (see relevant section).
- Disconnect the “-” then “+” terminals of the batteries to isolate the electric circuit.

2 - Removing the emergency stop button

- Mark and disconnect the electric connections (1) of the emergency stop button.
- Remove the head of the emergency stop button (2) by unscrewing it, having blocked its pin by inserting a rod into the hole (3) provided.
- Remove the emergency stop button by unscrewing its two fixing screws (4).

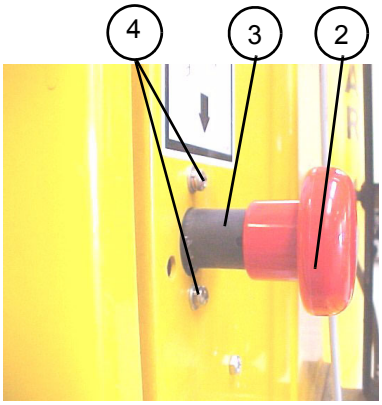
3 - Reinstalling the emergency stop button

- Put a new emergency stop button into place.
- Reconnect the electric connections according to the marks made during dismantling.

4 - Test

- Reconnect the “+” then “-” terminals of the batteries.
- Put the machine back into the operational configuration.
- Check that the emergency stop button works properly.

STAR 8 / STAR 22 J



STAR 8 / STAR 22 J

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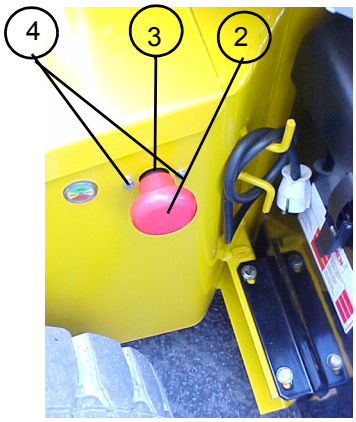
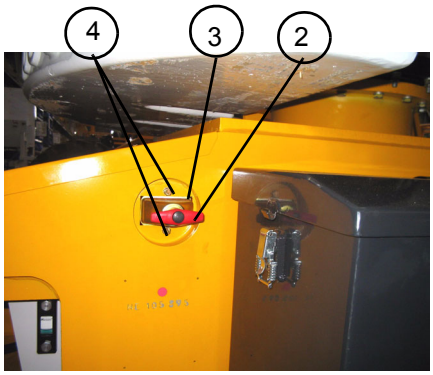
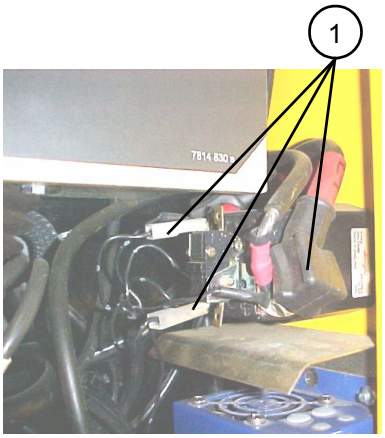


HA15I-HA43E

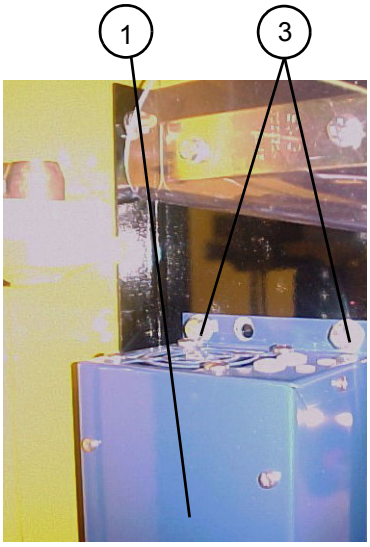


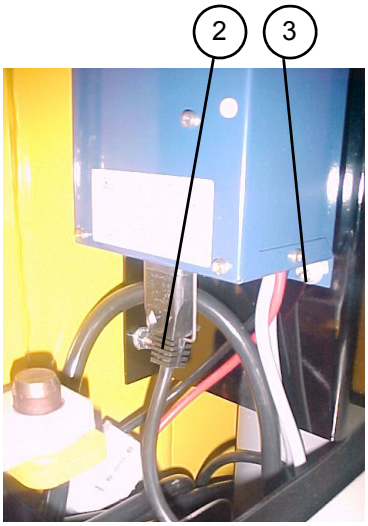


	CORRECTIVE MAINTENANCE SHEET	

Sheet C209	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING THE BATTERY CHARGER	

Caution!
Battery servicing operations require safety precautions (wear gloves and protective goggles).





1 - Preliminary operations
- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing the charger (1)
- Mark and disconnect the electric connections (2).
- Remove the charger by removing its fixing screws and nuts (3).

3 - Reinstalling the charger (1)
- Perform the dismantling operations in reverse order to reassemble.

4 - Additional operations
- Put the machine back into the operational configuration.

	CORRECTIVE MAINTENANCE SHEET	

Sheet C210	CORRECTIVE MAINTENANCE SHEET	Sheet 1/4
	REPLACING THE SLEW RING	

Caution!
It is essential to put the component into slings before dismantling / reassembling it.

Caution!
Ensure that the lifting means are in good condition and of sufficient capacity.

Caution!
Ensure that the oil is not too hot.

Caution!
Use a container to collect the oil to prevent pollution of the environment.

Photo 1

Photo 2

1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).
- Disconnect and remove the batteries (see relevant sheet).
- Remove the covers (see relevant sheet).
- Remove the hand pump (see relevant sheet).
- Remove the end of travel contactors (see relevant sheet).
- Remove the hydraulic winder (see relevant sheet).
- Remove the hydraulic supply hose from the top of the mast.
- Remove the jib plus basket assembly (see relevant sheet).
- Remove the circuit breaker (see relevant sheet).
- Remove the charger (see relevant sheet).
- Remove the electric plate (see relevant sheet).
- Remove the hydraulic filter (see relevant sheet).
- Remove the pump (see relevant sheet).
- Remove the hydraulic tank (see relevant sheet).
- Remove the hydraulic unit (see relevant sheet).
- Remove the rotation motor (see relevant sheet).
- Remove the counterweights (see relevant sheet).
- Remove the cable sleeve support (see relevant sheet).
- Remove the mast (see sheet 198) and place on trestles (Photo 1).

NB: *Unscrew the hydraulic hoses slowly to release residual pressure.*

NB: *Put caps on the hoses.*

NB: *Only use greases and lubricants recommended by the manufacturer (see relevant section).*

2- Removing the slew ring

- Unscrew the 12 screws fixing the ring to the mast (Photo 2).
- Separate the ring assembly from the main mast caisson.

3- Reinstalling a new slew ring

- Screw the slew ring onto its support using new screws (class 8.8 - HM14x65/34) and loctite to a torque of 99 ft.lb /135Nm (photo 3 ref 1).

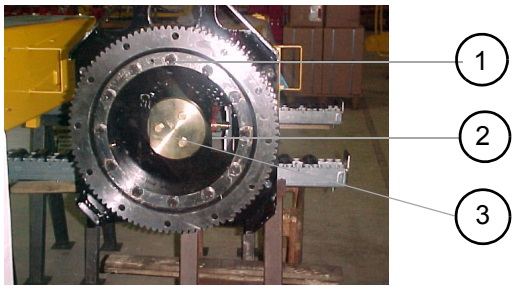


Photo 3

- Grease generously (Photo 3 ref 2).
- Put the assembled slew ring and its support into slings.
- Position the assembly opposite the mast cylinder.
- Screw the fixing plate to the centre of the slew ring (Photo 3 ref. 3)
- Make sure there is no grease on the threads.
- Re-secure the support-ring assembly to the mast with 12 screws (class 8.8 - HM16x100/38) and loctite (Photo 2).

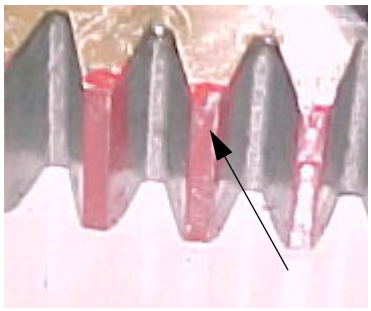


Photo 4

Caution!
Before reassembling the mast rotation motor, check that the cable sleeve is free to move around the whole rotation.

Caution!
If safety parts are replaced, they must be validated with static tests.
CE = 1.25 x nominal
USA= 1.5 x nominal

NB: Start by putting in the screws on one side and adjust the mast position with the sling to adjust the position of the ring assembly.

- Tighten to a torque of 143 lbf.ft / 195Nm for the ring-mast fixture and 99 ft.lb /135Nm for the ring-support fixture using a torque wrench.
- Turn the ring to the Trempe point marked by a red spot on the ring. (Photo 4).
- Put the mast into slings (2 m slings) to put it in the vertical position. (Photo 5).

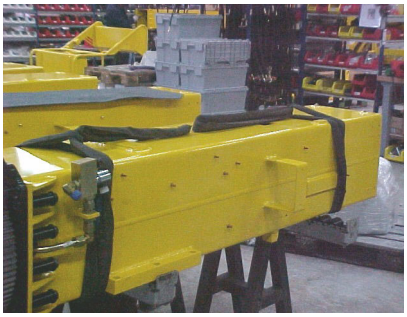


Photo 5

- Prepare planks where the mast will be placed to protect the slew ring.
- Position the mast in the vertical position.

NB: Move the whole assembly forwards by lifting the mast with the hoist control.

- Position the mast using the guides fixed on the chassis (Photo 6) so that the trempe point (Photo 4) is as close as possible to the mechanical stop of the chassis.

Photo 6

- Tighten the screws in diagonally opposite pairs.
- Prepare the screws to fix the ring to the chassis and apply loctite, checking that the thread is clean and totally grease-free.
- Insert two pins in two diagonally opposite screws threads of the chassis.
- Tighten the screws one by one, turning th mast from right to left.
- Replace the pins with screws to fix to the ring to the chassis (Photo 7, ref.1).

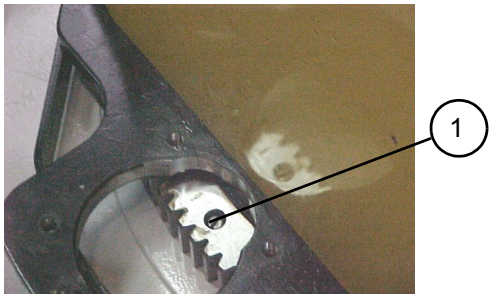


Photo 7

NB: Tighten to a torque of 99 lbf.ft /135Nm. Tighten the screws in diagonally opposite pairs.

- Check that the mast turns properly from stop to stop.

4- Additional operations

- Remove the slings.
- Check that the counterweights are properly secured to the machine.
- Put the machine back into the operational configuration.
- Make several rotation movements to test correct operation of the slew ring and to purge the hydraulic circuit.
- Check the level of the hydraulic tank.

Caution!
After reinstalling the mast, it is essential to have static and dynamic load tests performed by a certified organisation.

Sheet C210	CORRECTIVE MAINTENANCE SHEET	Sheet 4/4
	REPLACING THE SLEW RING	

Sheet C211	CORRECTIVE MAINTENANCE SHEET	Sheet 1/2
	REPLACING A STEERING PIVOT	

Caution !
Ensure that the oil is not too hot.

Caution !
Use a container to collect the oil to prevent pollution of the environment.

Caution !
It is essential to put the component into slings before dismantling / reassembling it.

Caution !
Check that the lifting means are in good condition and of sufficient capacity.

1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Disonnect the batteries
- Switch off the electric power supply (see relevant section).
- Remove the chassis covers (see relevant sheet).
- Remove the wheel in question (see relevant sheet).
- Lift the chassis with a jack or hoist.

2 - Removing a steering pivot

- Remove the pin and washer (Photo 1).
- Unscrew the steering pivot fixing plates (Photo 2).

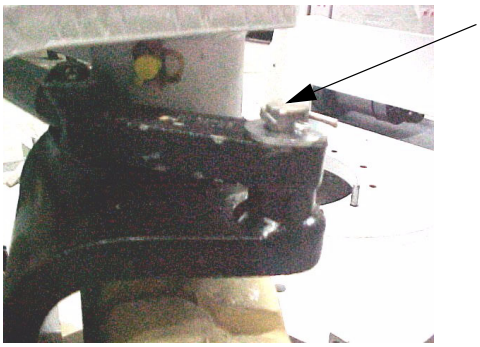


Photo 1

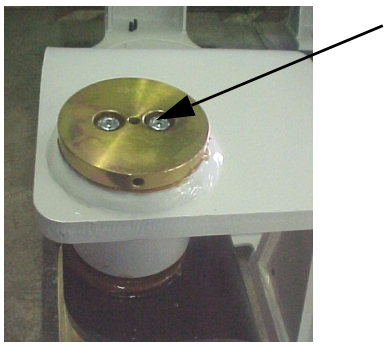


Photo 2

- Lift the chassis. The pivot comes down.
- Hit the pin near the stud on the pivot with a mallet.
- Remove the pivot

3- Reinstalling a steering pivot

- Grease the steering pivot.
- Grease the hub (1).

NB: *Grease the parts added evenly and insert them using a mallet.*

- Place the bearing in the hub (2).
- Push in completely (1).
- Insert a seal (5).
- Push in completely.
- Position the hub after turning it on the pivot (Photo 5).

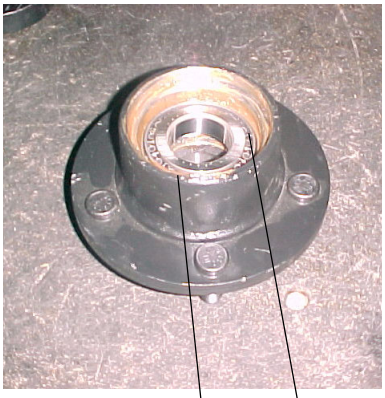


Photo 3

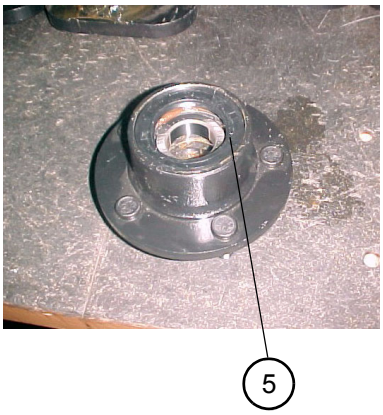


Photo 4

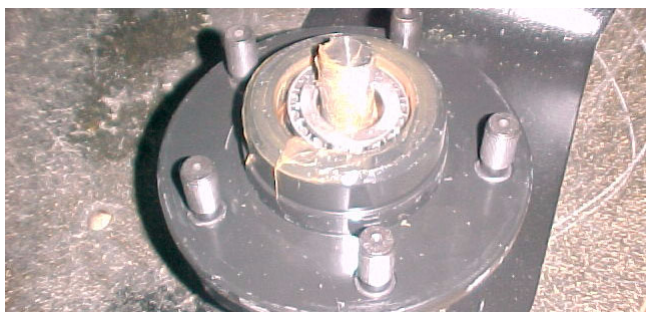


Photo 5

- Lower the pivot.
- Install the conical roller bearing (6).
- Lower it.
- Install a flat washer (8) on the bearing (Photo 6).

- Place the wheel on the pivot.
- Screw the fixing nuts (12) without tightening them too far to avoid blocking the bearings.
- Fix the stud (9) on the nut (10) (Photo 6).

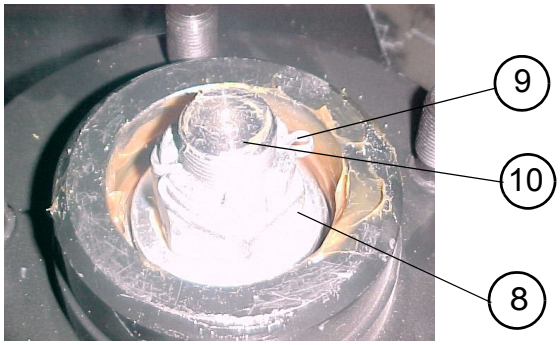


Photo 6

Photo 7

- Put the cap on the wheel and secure (11) (Photo 7)
- Grease generously.

NB: The brake washer must be changed whenever the wheel is replaced.

4- Additional operations

- Remove the slings.
- Put the machine back into the operational configuration.
- Make several travel movements to purge the hydraulic circuit.
- Check the level of oil in the wheel reducer.
- Check the level of the hydraulic oil tank.

Sheet C212	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING A STEERING CYLINDER	

1 - Preliminary operations

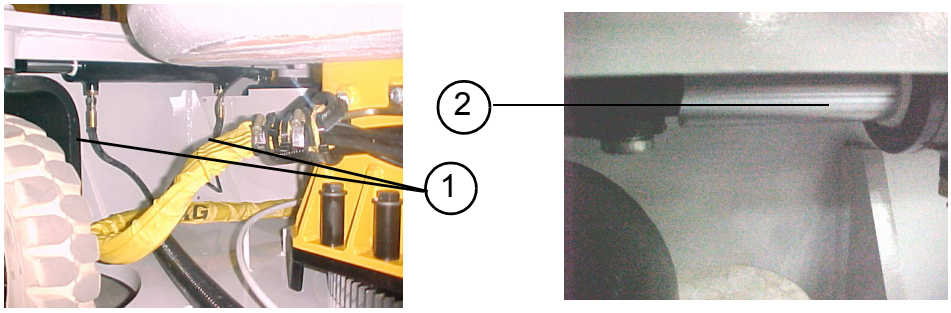
- Put the machine in the low configuration.
- Switch off the electric power supply (see relevant section).

2 - Removing the steering cylinder

Caution!
Ensure that the oil is not too hot.

- Mark and disconnect the two hoses of the steering cylinder (1).

NB: Unscrew the hoses slowly to release residual hydraulic pressure.



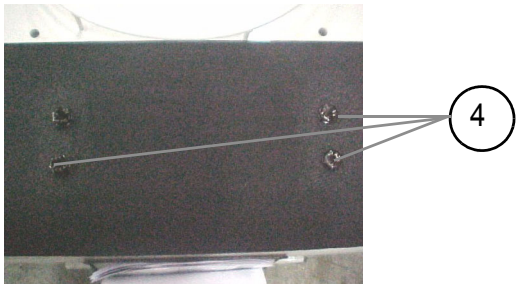
Caution!
Use a container to collect the oil to prevent pollution of the environment.

- Put caps on the hoses.
- Put the cylinder into slings.
- Unscrew the fixing screws of the steering cylinder (2).
- Remove the steering cylinder.

3 - Reinstalling the steering cylinder

- Put a new steering cylinder into place with the fixing screws (4).

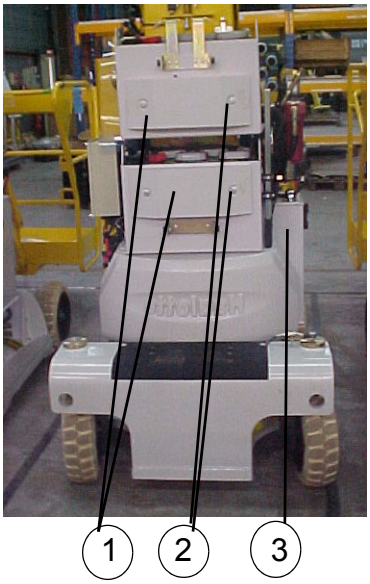
Caution!
It is essential to put the component into slings before dismantling/ reassembling it.

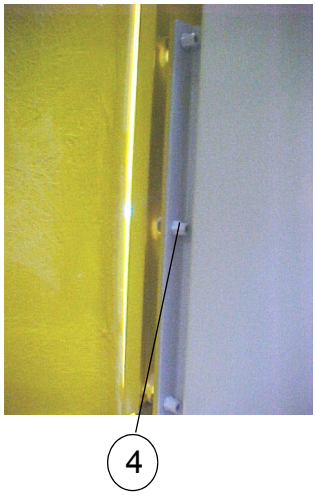


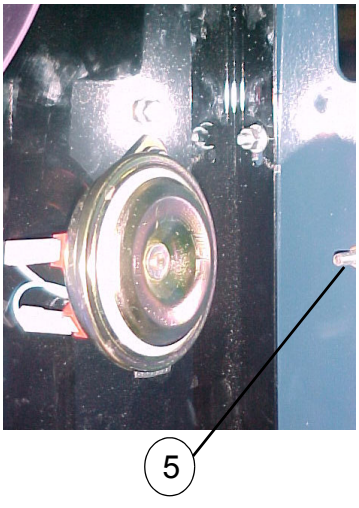
- Reconnect the hydraulic hoses according to the marks made during dismantling (1).
- Put the machine back into the operational configuration.
- Make several steering movements to purge the hydraulic circuit.
- Check the level of the hydraulic oil tank

	CORRECTIVE MAINTENANCE SHEET	

Sheet C213	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING THE COUNTERWEIGHTS	







1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).

2 - Removing the counterweights

- Put the counterweights (1) fixed on the battery trays into slings.
- Unscrew their fixing screws (2).
- Remove the counterweights.
- Remove the bottom battery tray by unscrewing the fixing plates on either side of the tray (see relevant sheet).
- Slacken all the fixing screws (4) of the hydraulic tank (3).
- Unscrew the closing plate fixed to the electric plate to access the fixing screws at the back of the main counterweight.
- Put the main counterweight into slings.
- Unscrew the screws at the back of the 86 stone / 550 kg counterweight.
- Remove the counterweight.

3 - Reinstalling the counterweights

- Vacuum clean the holes drilled on the fixing plate of the main counterweight.
- Put each counterweight into slings.
- Tighten the screws and grower washers at the back of the main counterweight.
- Screw the closing plate for the electric part back onto the electric plate.
- Position the 68 lb / 31kg counterweight opposite each battery tray.
- Insert the battery tray pilot points into the counterbores.
- Fix the counterweights with the fixing screws.

	CORRECTIVE MAINTENANCE SHEET	

Sheet C214	CORRECTIVE MAINTENANCE SHEET	Sheet 1/2
	REPLACING THE ELECTRIC PLATE	

Caution!
Ensure that the oil is not too hot.

Caution!
Use a container to collect the oil to prevent pollution of the environment.

Caution!
It is essential to put the component into slings before dismantling / reassembling it.

Caution!
Make sure that the lifting means are in good condition and of sufficient capacity.

1 - 1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Disconnect the battery terminals, top and bottom trays.
- Switch off the electric power supply (see relevant section).
- Disconnect the two hoses of the steering cylinder (see relevant sheet).
- Disconnect the plug of the steering potentiometer (see corresponding sheet).
- Disconnect the travel motor connections (see relevant sheet).
- Unscrew the cable clamp of the cables inside the sleeve (see relevant sheet).
- Unscrew the cable sleeve fixing cables (see relevant sheet).
- Disconnect the mast lowering electrovalve plug near the rotation motor (see relevant sheet).
- Mark the position of the cables on the electric onnections of the hydraulic distribution block.
- Unscrew the connections and remove the wires (see relevant sheet).
- Disconnect the electric connections of the pump (see relevant sheet).
- Disconnect the mast end of travel contactor (see relevant sheet).
- Disconnect the jib cylinder distribution block (see relevant sheet).
- Disconnect the jib end of travel contactor (see relevant sheet).
- Disconnect the top panel plug (see relevant sheet).
- Unscrew all the cable clamps on the platform.
- Unscrew the collars on the jib.
- Dismount the two bolts above the electric plate.
- Unscrew the spiral cable stop collar (Photo 7 ref.9).

2 - - Removing the electric plate

- Unscrew the two fixing screws of the push button (Photo 1 ref. 1) with a BTR key.

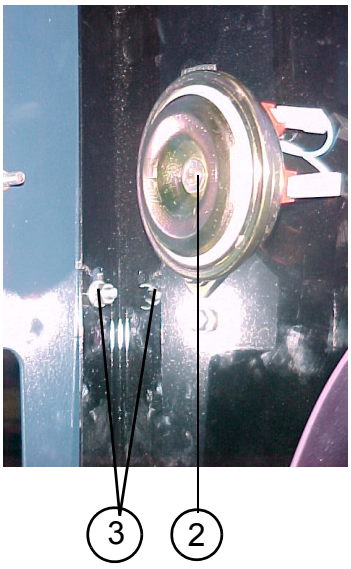


Photo 3

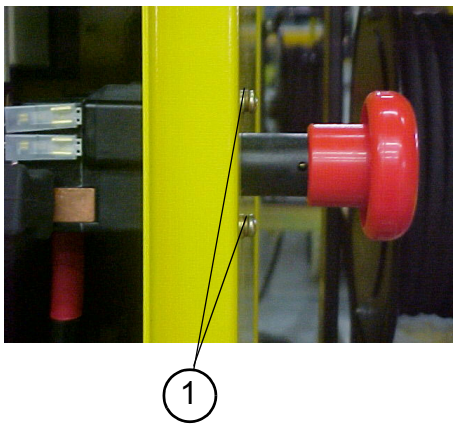


Photo 1

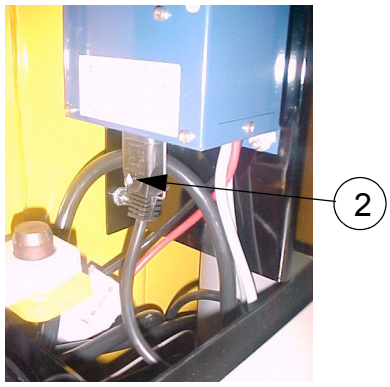


Photo 2

- Pull the wire of the charger's 220V plug (Photo 2 ref.2).
- Unscrew the horn screw (Photo 3 ref.2).
- Unscrew and remove the 4 nuts from the electric plate closing plate (Photo 3 ref.3).
- Unscrew the other screws on the edge of the electric plate (Photo 4).

Sheet C214	CORRECTIVE MAINTENANCE SHEET	Sheet 2/2
	REPLACING THE ELECTRIC PLATE	

Photo 6

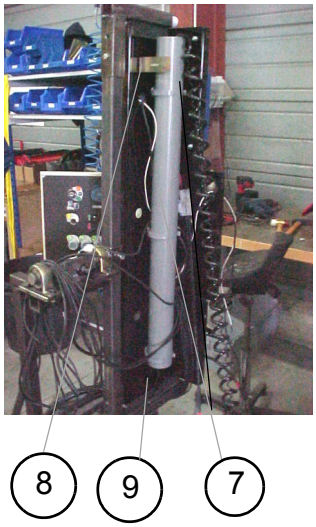


Photo 7

3 - - Reinstalling the electric plate

- Put back the electric plate, checking the cable routes via the plate.
- Fix the various elements (horn (1), chopper (2), battery charger (3), tilt sensor (4), fuse holder (5), turntable box (6), collar and polypropylene tube (7), mast end of travel contactor support (8)) on the plate (Photo 5).
- Screw the stop collar of the spiral cable back into place (Photo 7 ref.9)
- Screw the electric plate at its various fixing points (Photo 6).

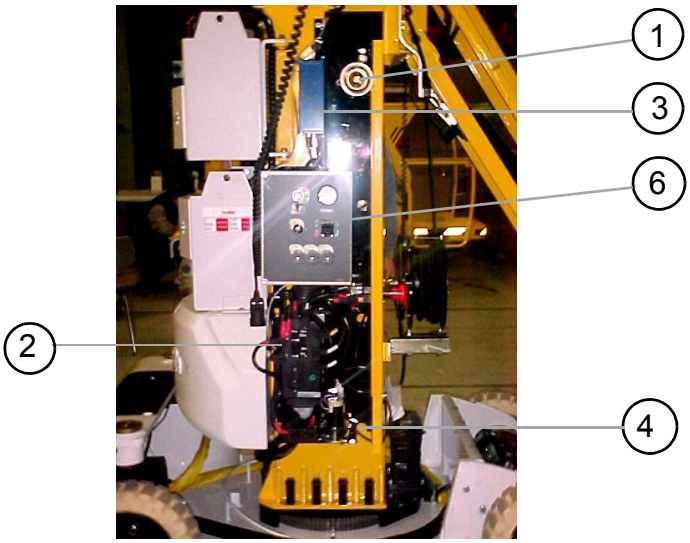


Photo 5

4 - Additional operations

- Reconnect the charger to the socket.
- Reconnect the hydraulic distribution block connections.
- Reconnect the battery terminals.
- Fix all the cables on the platform and jib.
- Tighten all the cable clamps of all cables in the sleeve.
- Tighten the cable sleeve with the fixing collars.
- Reconnect the top panel plug.
- Reconnect the travel motor cables.
- Reconnect the steering cylinder hoses.
- Reconnect the steering potentiometer plug.
- Reconnect the plug of the electrovalve near the rotation motor.
-

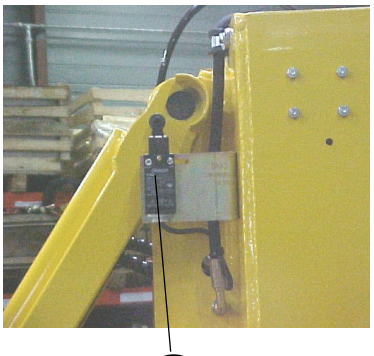
Sheet C215	CORRECTIVE MAINTENANCE SHEET	Sheet 1/1
	REPLACING THE JIB-PLATFORM ASSEMBLY	

Caution!
Ensure that the oil is not too hot.

Caution!
Use a container to collect the oil to prevent pollution of the environment.

Caution!
It is essential to put the component into slings before dismantling / reassembling it.

Caution!
Check that the lifting means are in good condition and of sufficient capacity.

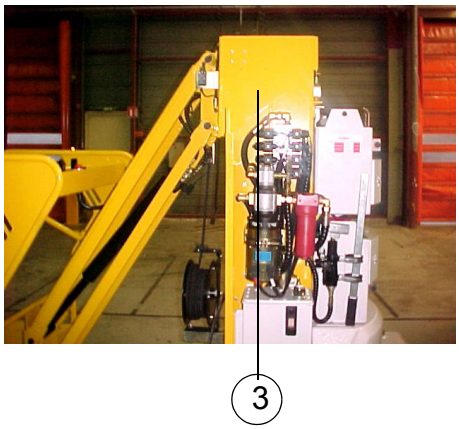


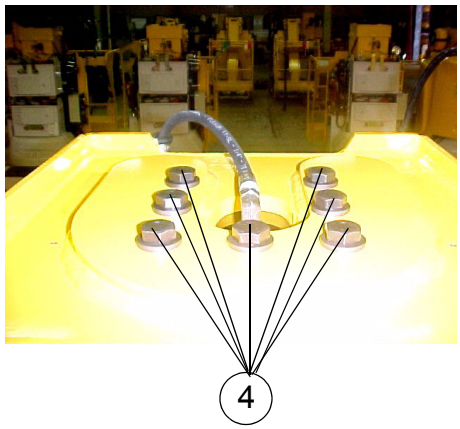
1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).
- Remove the jib end of travel contactor (ref. 1).
- Disconnect the hydraulic distributor (ref. 2) of the jib cylinder.
- Disconnect the hoses of the steering cylinder.
- Put caps on the hoses.

2 - Removing the jib-platform assembly

- Put the jib-platform assembly into slings.
- Unscrew the 7 screws (ref.3) of the top cover (ref.4) of the jib-platform assembly.

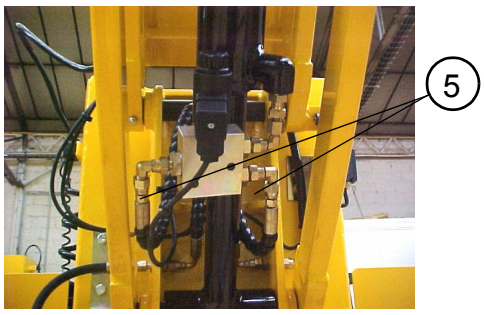




- Remove the assembly using a hoist.

3 - Reinstalling the jib-platform assembly

- Put the jib-platform assembly into slings
- Reinstall the assembly on the mast in order to secure the top cover (ref.4).
- Screw the 7 screws of the jib-platform top cover
- Reinstall the jib end of travel contactor.
- Reconnect the hydraulic distributor of the jib cylinder (ref. 2)
- Reconnect the hoses to the jib cylinder (ref. 5)



4 - Additional operations

- Put the machine back into the operational configuration.
- Make several jib lifting movements to purge the hydraulic circuit.
- Check the level of the hydraulic oil tank.

	CORRECTIVE MAINTENANCE SHEET	

Sheet C216	CORRECTIVE MAINTENANCE SHEET	Sheet 1/2
	REINSTALLING THE CABLE SLEEVE	

Caution!
Check that the cable sleeve is properly positioned and secured each time the machine's systems are removed.

1- Preliminary operations

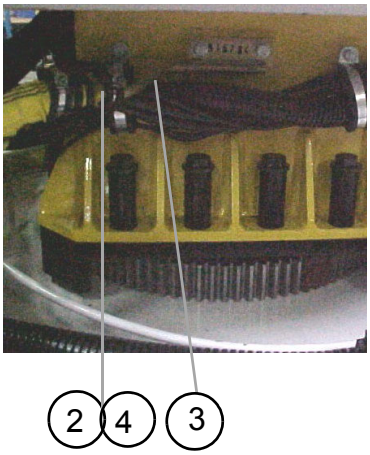
- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).
- Disconnect the two electric cables of the brake control.
- Disconnect the 6 cables of the electric motor.
- Disconnect the 2 hoses of the steering cylinder.
- Disconnect the steering potentiometer connectors.

2 - Removing the cable sleeve

- Unscrew the collars around the support (3), near the rotation motor (5) and the steering cylinder (6).
- Unscrew the rizlans (2) and the collar (4) fixing the cables to the cable sleeve support.
- Remove the cable sleeve from its support (3).
- Remove the cable sleeve.

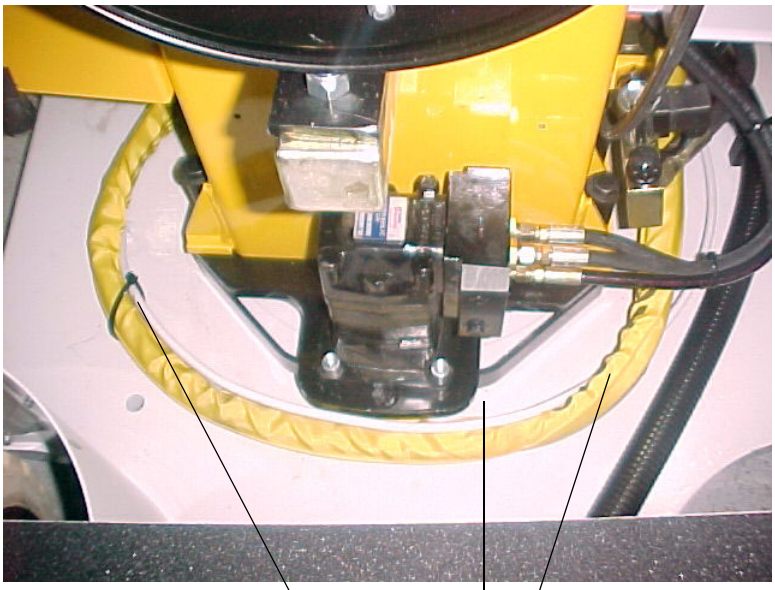
3- Installing the cable sleeve

- The cables inserted into the cable sleeve include:
  - 2 hydraulic hoses on the second row from the top (1)
  - 2 brake cables.
  - 2 travel motor inducer circuits.
  - 2 travel motor induced circuits.
  - 3 steering potentiometer cables
- Tape the cables and tighten with a rizlan (2)
- Fix these cables on the cable sleeve support guide (3)
- Put the cable sleeve back around the cables and at the top of the support-guide.
- Fix the cable sleeve with a fixing collar:
  - near the rotation motor on the rod guide (5)
  - near the steering cylinder (6).



- Operate the machine to stretch the cable sleeve and check its escape limit.

Sheet C216	CORRECTIVE MAINTENANCE SHEET	Sheet2/2
	REINSTALLING THE CABLE SLEEVE	



Sheet C217	CORRECTIVE MAINTENANCE SHEET	Sheet 1/2
	REPLACING A WHEEL REDUCER OR A HYDRAULIC TRAVEL MOTOR	

Caution!
Ensure that the oil is not too hot.

Caution!
Use a container to collect the oil to prevent pollution of the environment.

Caution!
It is essential to put the component into slings before dismantling / reassembling it.

Caution!
Check that the lifting means are in good condition and of sufficient capacity.

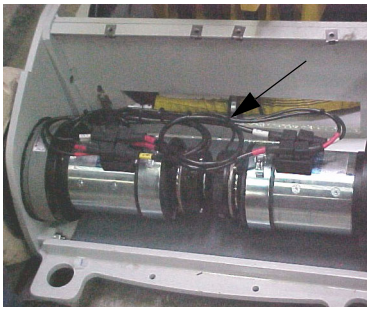


Photo 1

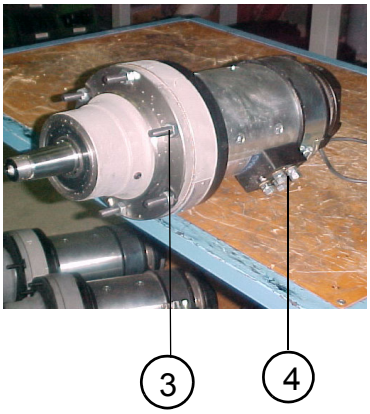


Photo 2

1 - Preliminary operations

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section).
- Raise the chassis with a jack or hoist.
- Remove the wheel corresponding to the element to be removed:
  - left motor: remove the left wheel
  - right motor: remove both wheels.

2 - Removing a wheel reducer or a hydraulic motor

NB: *Figure 1: steering axle.*
fixed axle.

- In the case of a steering axle, uncouple the steering connecting rod from the pivot.
- Mark and disconnect the hoses, then the connectors of the hydraulic motor (Photo 1) and reducing gear (Photo 2).

NB: *Unscrew the hose slowly to release residual hydraulic pressure.*

- Put caps on the hoses.
- Place a wedge under the wheel reducer.
- Remove the reducer / motor assembly by removing the fixing bolts (4).
- Unscrew the screws (3) fixing the hydraulic motor to the wheel reducer.
- Replace the hydraulic motor or defective reducer.

3 - Reinstalling a wheel reducer or hydraulic motor

- Assemble the hydraulic motor on the reducer using the fixing screws equipped with new grower washers (Photo 1).
- Put back the reducer-motor assembly and secure with fixing screws. Tighten to a torque of 33 ft.lb / 45Nm.
- In the case of a steering axle, couple the steering connecting rod with the pivot.
- Reconnect the hydraulic hoses of the hydraulic motor and that of the reducer equipped with a new seal, according to the marks made during dismantling (Photo 2).
- Reconnect the electric brake release cables leaving from the cable sleeve (Photo 3).

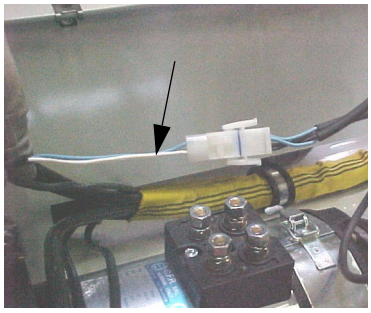


Photo 3

Sheet C217	CORRECTIVE MAINTENANCE SHEET	Sheet 2/2
	REPLACING A WHEEL REDUCER OR A HYDRAULIC TRAVEL MOTOR	

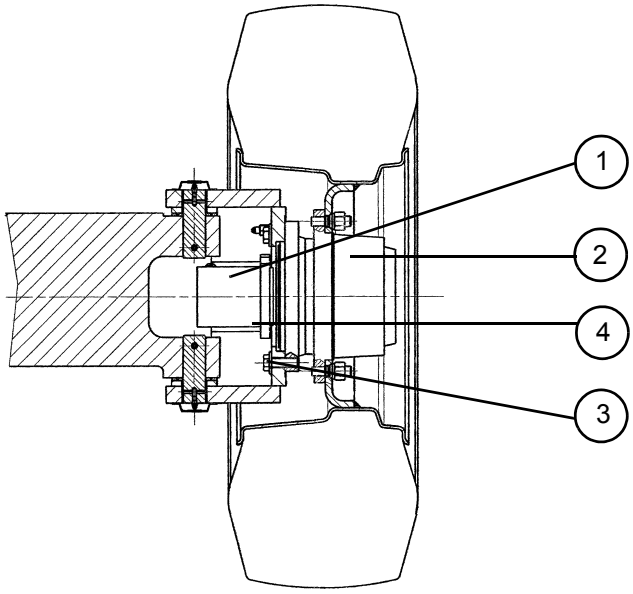


Figure 1

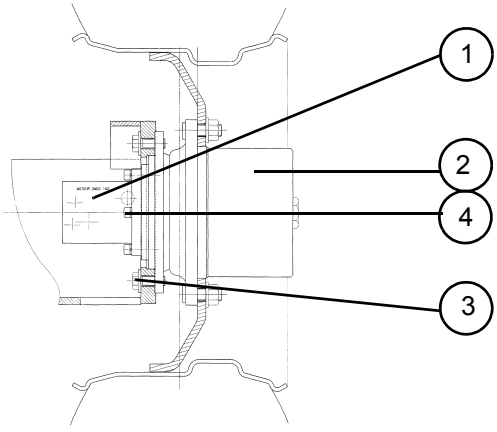


Figure 2

4 - Additional operations

- Top up the wheel reducer with oil.
- Reinstall the wheel (see relevant sheet).
- Put the machine back into the operational configuration.
- Make several travel movements to purge the hydraulic circuit.
- Check the level of the hydraulic oil tank.

Sheet C218	CORRECTIVE MAINTENANCE SHEET	Sheet 1/2
	ADJUSTING A HYDRAULIC PRESSURE LIMITER	

Caution !
Ensure that the oil is not too hot.

Caution !
Use a container to collect the oil to prevent pollution of the environment.

Caution !
It is essential to put the component into slings before dismantling / reassembling it.

1 - Preliminary operations

- Put the machine into the low position.
- Switch off the electric power supply (see relevant section).

2 - Adjusting the main pressure limiter (Photo 3 ref.1)

- Unscrew the cap of the hydraulic pressure tapping marked “MX” on the hydraulic block and connect a pressure gauge of sufficient range to measure the overall pressure (Photo 1).

Photo 1

- Restore the electric power supply (see relevant section)
- Request a steering, rotation or jib lifting movement (Photo 2) and measure the main pressure at 2320 PSI / 160 bar on the pressure gauge.

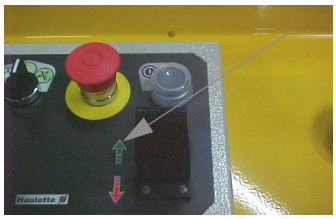


Photo 2

- Switch off the electric power supply (see relevant section)
- Unscrew the pressure gauge and put back the hydraulic pressure tapping cap (Photo 1).
- Put the machine back into the operational configuration.
- Make several movements to check correct machine operation.

NB: *Steering is disabled after a certain time when the machine is at its limit in one direction. Only steering in the opposite direction is poosible and may re-authorise steering in the initial direction. The steering pressure measurement time is therefore limited.*

3 - Adjusting the mast lifting pressure limiter (Photo 3 ref. 2)

- Place a load corresponding to “nominal load + 10%” in the platform
- Unscrew the lifting pressure limiter adjusting screw and connect a pressure gauge of sufficient range to measure the lifting pressure, which should not exceed 652 PSI / 45 bar.
- Lift the mast and tighten the pressure limiter adjusting screw until the movements are disabled by “nominal load +10%”
- Place a load corresponding to nominal load in the platform.
- Check that the lifting movement is not disabled for this load.
- Put the machine back into the operational configuration.
- Switch the electric power supply back on again (see relevant section)

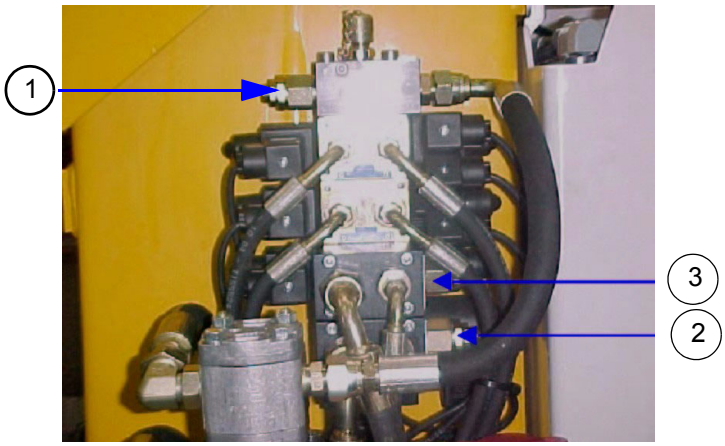


Photo 3

4 - Adjusting the steering pressure limiter (Photo 3 ref.3)

- Unscrew the cap of the hydraulic pressure tapping marked “MX” on the hydraulic block and connect a pressure gauge of sufficient range to measure steering pressure, which should not exceed 1450 PSI / 100 bar.
- Switch the electric power supply back on again (see relevant section)
- Activate the steering control to its left or right limit.
- Maintain the steering control and measure steering pressure on the pressure gauge.

NB: *Steering is disabled after a certain time when the machine is at its limit in one direction. Only steering in the opposite direction is poosible and may re-authorise steering in the initial direction. The steering pressure measurement time is therefore limited.*

- Put the machine into the maintenance configuration (see relevant section).
- Switch off the electric power supply (see relevant section)
- Unscrew the pressure gauge and put back the hydraulic pressure tapping cap.
- Put the machine back into the operational configuration.
- Make several steering movements to check that the machine works properly.