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HYDRAULICS EXCAVATORS

788 & 988

Update 06-2000



Case

Cre 7-80403GB

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CRAWLER AND WHEELED EXCAVATORS
788, 788 PLUS, 988, 988 PLUS
SCHEMATIC SET

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NOTE: CASE Company reserves the right to make changes in the specification and design of the machine without prior notice and without incurring any obligation to modify units previously sold.

The description of the models shown in this manual has been made in accordance with the technical specifications known as of the date of design of this document.

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Section

1001

SAFETY, GENERAL INFORMATION AND TORQUE SPECIFICATIONS

Case

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SAFETY

WARNING: *This symbol means WARNING ! BE VIGILANT ! YOUR SAFETY IS AT RISK. The message that follows the symbol contains important safety information. Read it carefully. Be sure you understand the possible risks of injury or even death.*

To avoid all risks, always follow the safety notes contained in this section and throughout this manual.

Put the warning tag shown below on the key for the keyswitch when servicing or repairing the machine. One warning tag is supplied with each machine. Additional tags, Part Number 321-4614, are available from your service parts supplier.



PDG0328

WARNING: *Read the Operator's Manual carefully and make sure you understand how to operate the controls correctly.*

WARNING: *Never operate the machine and attachment controls unless you are seated in the operator's seat. If you are not in the operator's seat, you run the risk of serious injury.*

WARNING: *The machine is built to carry the operator only. Do not allow passengers to ride on the machine.*

WARNING : *Prior to starting up the engine read the safety messages contained in the operator's manual carefully. Read all safety stickers on the machine. Have people move back from the machine. Learn how to use the controls before starting up the machine. It is your responsibility to follow the manufacturer's instructions on how to operate and maintain the machine. It is your responsibility to follow applicable rules and regulations. Service and Operator's Manuals are available from your J.I. Case Dealer.*

WARNING: *If you wear loose clothing or if you omit to use safety equipment for your work, you risk injury. Always wear clothes that do not risk getting caught in the machine. Other safety equipment may be necessary, in particular : helmets, safety shoes, ear plugs, safety glasses, protection mask, thick gloves and reflecting clothes.*

WARNING: *When working close to the fan with the engine running, avoid wearing loose clothing and operate with extreme caution.*

WARNING: *When checking the hydraulic circuits, follow procedures to the letter. DO NOT CHANGE procedures.*

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WARNING: *Prior to operating the hydraulic cylinders of this machine for setting or to bleed the circuit, have all people standing around the machine move away.*

WARNING: *Wear gloves or insulated mittens when working on hot parts.*

WARNING: *Lower all attachments to the ground or rest them on stands before carrying out maintenance jobs.*

WARNING: *Fine sprays of hydraulic oil under pressure can penetrate the skin and cause serious infection. If hydraulic oil under pressure penetrates the skin, see a doctor immediately. Maintain all hoses and pipes in good condition. Make sure that all connections are properly tightened. Change all hoses or pipes that have been damaged or that are suspect. DO NOT CHECK for leaks with bare hands. Use a piece of cardboard or wood.*

WARNING: *To remove a hardened pin such as a pivot pin, or a hardened shaft, use a soft head hammer (brass or bronze) or a brass or bronze strip and a steel head hammer.*

WARNING: *When using a hammer to remove or reassemble pivot pins, or when using compressed air, or when using a grinder make sure to wear safety glasses that protect the eyes from all sides.*

WARNING: *Use proper lifting/hoisting equipment to lift wheels or tracks and always work on safe ground. Prevent the machine from moving using correct safety chocks.*

WARNING: *When performing maintenance or repair operations on the machine, make sure that the work shop floor, the cab and the steps of the excavator are free from oil, water, grease, tools etc. Use oil absorbing material or rags as necessary. Always think safety.*

WARNING: *Certain components of this machine are very heavy. Use hoisting tools or additionnal assistance as recommended in this manual.*

WARNING: *Exhaust fumes can cause death. If it is necessary to start up the engine in a closed building, evacuate exhaust fumes using an exhaust pipe extension. Open the doors and let fresh air into the building.*

WARNING: *When battery liquid is frozen, the battery can explode if : (1) you try to charge the battery or (2) you try to start the engine by connecting an auxiliary power source. To prevent battery electrolyte from freezing keep the battery fully charged. If you do not follow these instructions, you or others nearby may be injured.*

WARNING: *Batteries contain acid and explosive gases. A spark, a flame or an improper cable connection may cause an explosion. For proper connection of cables to the battery of this machine see the Operator's Manual. If you do not follow these instructions, you risk severe injury.*

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TWIN WHEELS

Safety rules

WARNING: *In all cases, before removing twin wheels, always deflate both tyres completely.*

WARNING: *If a tyre bursts it can cause serious injury. Check tyres regularly to see that they are in good condition and always be sure to inflate them to the correct pressure.*

WARNING: *Never face a tyre when checking pressure or adding air. Always stand in front of the tread. Use an inflation cage if the wheel has been removed from the machine. Make sure all people standing in the area move well away.*

WARNING: *Never weld near a tyre.If this can not be avoided, it is mandatory to remove the tyre before performing any welding operations.*

WARNING: *Make sure that all decals on the machine are perfectly legible, clean them regularly and replace any decals which are damaged, missing or painted over, with new ones.*

Safety instructions

- Use appropriate, good quality tools to disassemble the various wheel components. Never use a hammer. Use a rubber, plastic or copper-faced mallet.

IMPORTANT: *Never remove the inner tyre valve extension, as this will be necessary afterwards for inflating and deflating the tyre.*

IMPORTANT: *If the valve or the valve extension are no longer accessible, take the necessary precautions and then, imperatively, puncture the tyre.*

- Use suitable grease to facilitate the installation and removal of the tyre.
- Never re-inflate a tyre on the machine which has been used at a pressure lower than 5.6 bar.
- Check the various components: tyre, rim, shoulder, retaining ring and replace any defective items.
- Never reuse a retaining ring which is distorted or rusty.

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GENERAL INFORMATION

CLEANING

Clean all metal parts except bearings with white spirit or steam. Do not use caustic soda when steam cleaning. After cleaning, dry and lubricate all parts. Clean hydraulic lines with compressed air. Clean bearings with kerosene, then dry them and lubricate them.

INSPECTION

Check all parts when disassembled. Change all parts showing wear or damage. Scratches that are not too deep can be removed by honing or with a rag dipped into buffing compound. A full visual inspection to detect wear and pitting and subsequent changing of parts will prevent premature failure.

BEARINGS

Check that bearings rotate freely. If their adjustment is too loose or if they do not run regularly, change them. Wash bearings with a good solvent or kerosene and let them dry. DO NOT DRY BEARINGS WITH COMPRESSED AIR.

NEEDLE BEARINGS

Before inserting needle bearings into a bore, remove all metal particles from the edge of the bore. Prior to mounting bearings with a press, coat the inside and the outside of the bearing with vaseline.

GEARS

Check all the gears for wear or damage. Change worn or damaged gears.

SEAL RINGS, O-RINGS, GASKETS

Always use new seal rings. O-rings and gaskets. Coat sealing rings and O-rings with vaseline.

SHAFTS

Check all shafts showing signs of wear or damage. Check that the surface of a shaft running in a bearing is not damaged.

SPARE PARTS

Always use original CASE spare parts. To order spare parts, see the Spare Parts Catalogue to indicate the proper reference of original CASE spare parts. Failures caused by the use of parts that are not original CASE spare parts are not covered by the warranty.

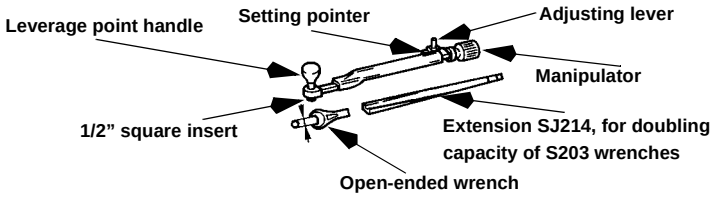
LUBRICATION

Use only oils and lubricants specified in the Operator's and Service Manuals. Failures due to the use of oils and lubricants not specified are not covered by the warranty.

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CORRECT USE OF TORQUE WRENCHES

TORQUE WRENCHES



PDG0315

CORRECT USE

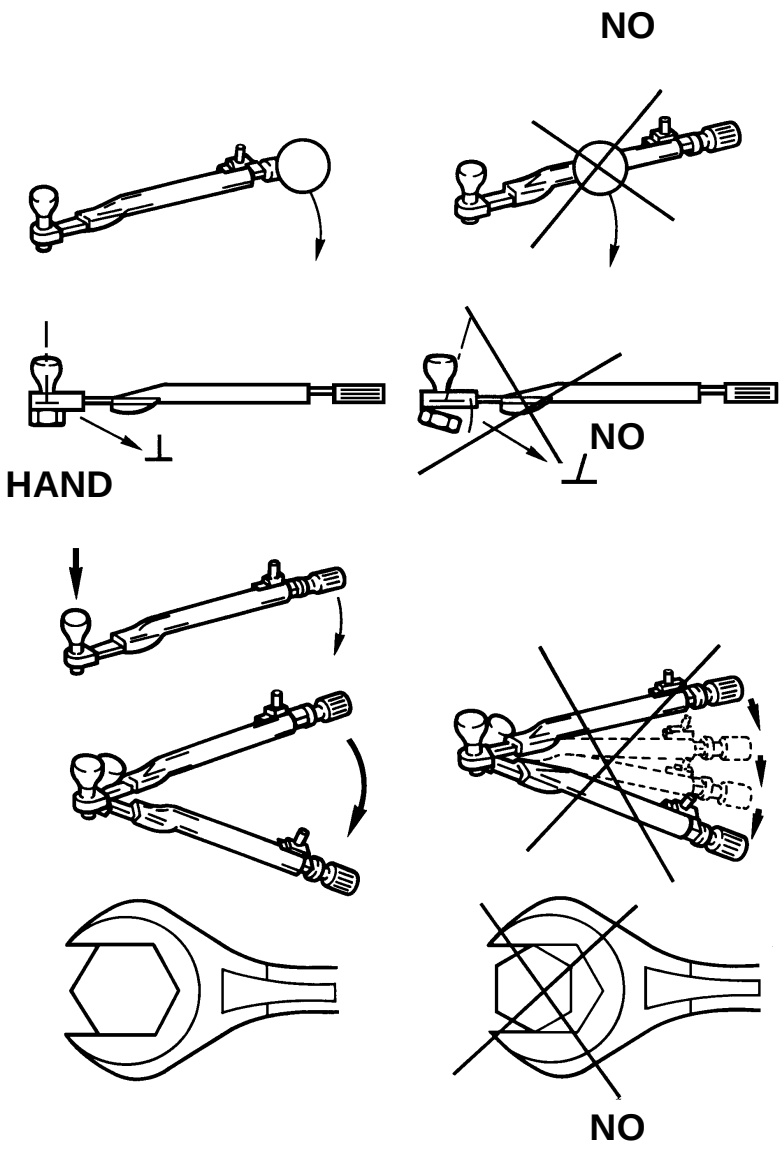
a - Hold the wrench by the handle provided.

b - When tightening, always keep the wrench perpendicular to the screw.

c - Keep one hand on the leverage point handle on the wrench.

d - Tighten progressively in one movement.

e - Position a correctly dimensioned socket or open-ended wrench on the flats of the screw head.

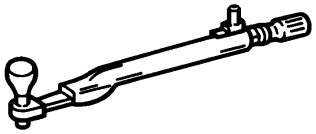


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HARDWARE TIGHTENING ORDER

TORQUE WRENCHES



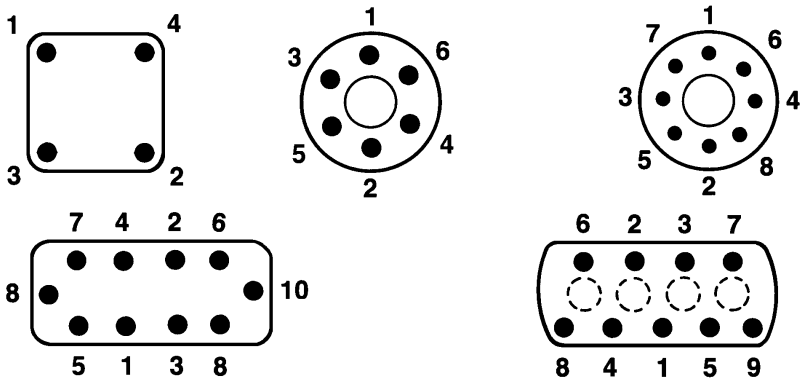
PDG0317

INITIAL TORQUE

a - Torque wrench.

- Follow the correct order of procedure when tightening.

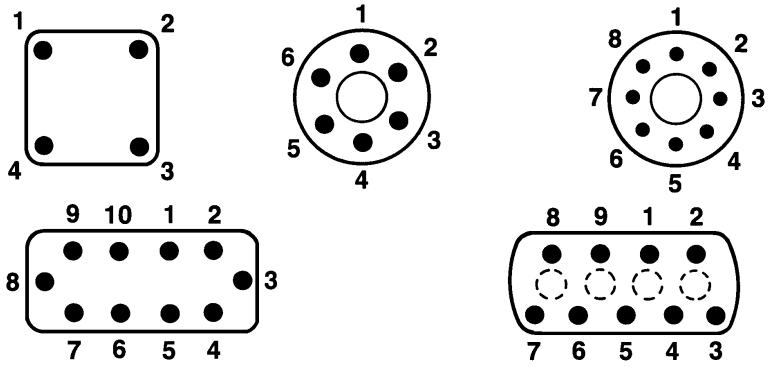
- Cross or diagonal pattern tightening.



PDG0318

FINAL TORQUE

Always tighten in clockwise order.

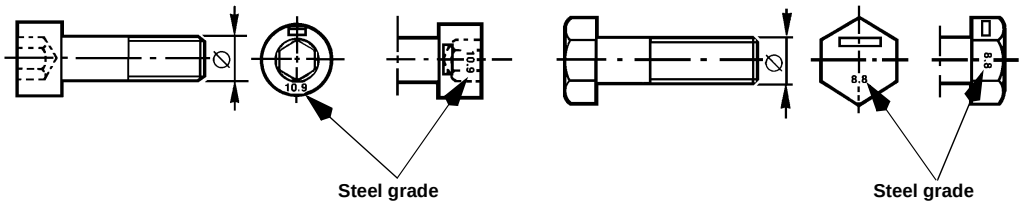


PDG0319

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STANDARD SCREW A TORQUE SPECIFICATIONS

Correct screw identification



PDG0320

	Diameter x thread size Grade 8.8	Key		Torque Nm		Torque lb.ft	
				□	■	□	■
Two-part hydraulic connector (to SAE J518 specifications)	M5 x 0.8	4	8	5.5	5.5	4.1	4.1
	M6 x 1	5	10	9	9	6.7	6.7
	M8 x 1.5	6	13	22.5	22.5	16.6	16.6
	M10 x 1.5	8	17	45	45	33.2	33.2
	M12 x 1.75	10	19	70	80	51.6	59
	M14 x 2	12	22	100	120	73.8	88.6
	M16 x 2	14	24	170	200	125.5	147.6
	M18 x 2.5	14	27	250	300	184.5	221.4
	M20 x 2.5	17	30	350	400	258.3	295.2
	M22 x 2.5	17	32	500	600	369	442.8
	M24 x 3	-	36	600	700	442.8	516.6
	M27 x 3	-	41	900	1000	664.2	738
	M30 x 3.5	-	46	1200	1400	885.6	1033.2
Components assembled by screws and bolts **SCREW** **BOLT**	**Grade 10.9**						
	M5 x 0.8	4	8	75	75	5.6	5.6
	M6 x 1	5	10	12.5	12.5	9.3	9.3
	M8 x 1.5	6	13	35	35	25.8	25.8
	M10 x 1.5	8	17	60	70	44.3	51.6
	M12 x 1.75	10	19	100	120	73.8	88.6
	M14 x 2	12	22	170	200	125.5	147.6
	M16 x 2	14	24	250	300	184.5	221.4
	M18 x 2.5	14	27	350	400	258.3	295.2
	M20 x 2.5	17	30	500	600	369	442.8
	M22 x 2.5	17	32	700	800	516.6	442.8
	M24 x 3	-	36	900	1000	664.2	738
	M27 x 3	-	41	1200	1400	885.6	1033.6
	M30 x 3.5	-	46	1700	1900	1254.6	1402.2

PDG0321

PDG0322

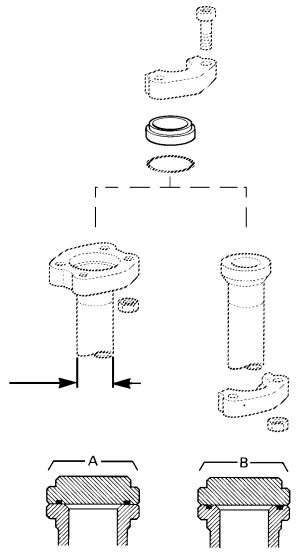
□ Zinc bichromate

■ Phosphate

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METAL CAP REFERENCES

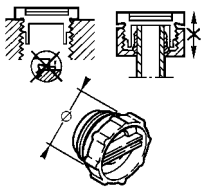
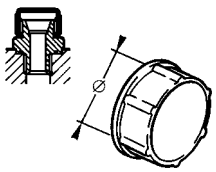
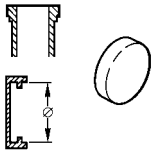
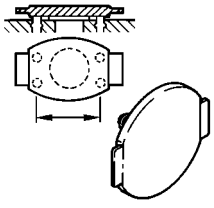
To SAE J518 specifications

	NP 250 bar Ø ND	NP 400 bar Ø ND	Part number	
			A	B
 PDG0323	13 mm	-	D5327838	E5327839
	19 mm	-	F5327840	G5327841
	25 mm	-	H5327842	J5327843
	32 mm	-	K5327844	L5327845
	38 mm	-	M5327846	N5327847
	-	13 mm	U5327830	V5327831
	-	19 mm	W5327832	X5327833
	-	25 mm	Z5327834	A5327835
	-	32 mm	B5327836	C5327837

NP = Nominal pressure
NP = Nominal diameter

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PLASTIC PLUG AND CAP REFERENCE CHART

	Dia. x pas	Part number	Dia. x pas	Part number
Tapped orifices and connectors with tightening nuts = screw-type plugs  PDG0324	M10 x 1.5 M12 x 1.5 M14 x 1.5 M16 x 1.5 M18 x 1.5	F3237416 G3237417 H3237418 J3237419 K3237420	M20 x 1.5 M22 x 1.5 M24 x 1.5 M27 x 2	L3237421 M3237422 N3237423 Q3237448
Unions = Screw-type plugs  PDG0325	M12 x 1.5 M14 x 1.5 M16 x 1.5 M18 x 1.5	X3237409 Z3237410 A3237411 B3237412	M20 x 1.5 M22 x 1.5 M30 x 1.5	C3237413 D3237414 E3237415
S.A.E tube or hose collars = external plugs  PDG0326	NP 250 bar 30.2 38.1 44.5 50.8 60.4	 J2537460 K2537461 L2537462 M2537463 N2537464	NP 400 bar 31.8 41.3 47.6 54 63.6	 P2537465 Q2537466 R2537467 S2537468 T2537469
S.A.E orifices = caps for installation into tapped fitting orifices  PDG0327	NP 250 bar L = 38.1 47.65 52.35 58.07 69.85	 A2340480 B2340481 C2340482 D2340483 E2340484	NP 400 bar L = 40.5 50.8 57.15 66.7 79.4	 K1640415 R1640421 S1640422 T1640423 Z1640479

NP = Nominal pressure
ND = Nominal diameter

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Section

1002

SPECIFICATIONS
Crawler excavators

Case

Cre 7-80071GB

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WARNING: *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

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FLUIDS AND LUBRICANTS

Lubricants must have the correct properties for each application.

WARNING: *The conditions of use for individual fluids and lubricants must be respected.*

Hydraulic fluid

CASE hydraulic fluid is specially designed for high pressure applications and for the CASE hydraulic system. The type of fluid to be used depends on the ambient temperature.

Temperate climates

-20°C to +40°C
Fluid type ISO VG 46
CASE reference: POHYDR

Hot climates

0°C to +60°C
Fluid type ISO VG 100
CASE reference: POHYDC

Cold climates

-40°C to +20°C
Fluid type ISO VG 22
CASE reference: POHYPF

These various grades of fluid must be in conformity with CASE France specification P9903201Z.

Temperate climate biodegradable fluid:
This yellow fluid is compatible with standard fluid. If adopted, it is advisable to drain the circuit completely.
Fluid type ISO VG 46
CASE reference: CASYNTH46

This grade of fluid must be in conformity with CASE France specification P9903203B

Transmission component oil

Extreme pressure oil used for transmission components inside sealed housings.
Extreme pressure oil TYPE API GL5 GRADE 80W90 or ISO VG 150

Grease

The type of grease to use depends on ambient temperature.

Temperate and hot climates

-20°C to +60°C
Extreme pressure grease EP NLGI grade 2 with molybdenum disulphide.

Cold climates

-40°C to +20°C
Extreme pressure grease EP NLGI grade 0.

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Engine oil

CASE engine oil N°1 is recommended for your engine. This oil ensures correct lubrication of your engine in all working conditions.

If CASE N°1 Multiperformance or Performance engine oil is not available, use oil corresponding to category API/CG/CF.

NOTE: *Do not put any Performance Additive or other additive in the sump. Oil change intervals shown in this manual are based on tests carried out on CASE lubricants.*

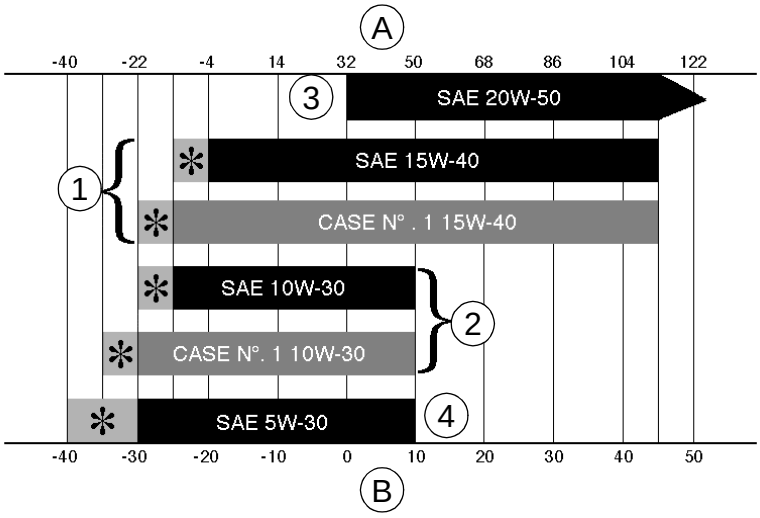


RF97F136



RB97F100

Oil viscosity/Oil range



CS98M561

(A) FAHRENHEIT TEMPERATURE
(B) CELSIUS TEMPERATURE
(1) ALL-SEASONS
(2) WINTER
(3) TROPICAL
(4) ARCTIC
(*) SHOWS THAT AN ENGINE OIL HEATER OR ENGINE COOLANT SOLUTION HEATER MUST BE USED.

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Fuel

Use fuel that is to ASTM (American Society for Testing and Materials) D975 standard.

Use Grade No N°2 fuel. The use of other types of fuel can result in a loss of power and may cause high fuel consumption.

In cold weather, the use of a mixture of fuels N°1 and N°2 is temporarily permitted. Consult your fuel supplier.

If the temperature falls below the fuel cloud point (point at which wax begins to form) the wax crystals will cause power loss or will prevent the engine from starting.

IMPORTANT: *In cold weather, fill the fuel tank at the end of the day's work, in order to prevent the formation of condensation.*

Fuel storage

Long storage can lead to the accumulation of impurities and condensation in the fuel. Engine trouble can often be traced to the presence of water in the fuel.

The storage tank must be placed outside and the temperature of the fuel should be kept as low as possible. Drain off water and impurities regularly.

Anti-freeze/Anti-corrosion

Use anti-freeze in all seasons to protect the cooling system from corrosion and all risk of freezing.

In environments with a temperature higher than -36°C, use a mixture of 50% ethylene-glycol based anti-freeze.

For areas where the temperature is below -36°C, it is advisable to use a blend of 40% water and 60% anti-freeze.

Environment

Before carrying out any servicing operation on this machine and before disposing of used fluids or lubricants, always think of the environment. Never throw fluid or oil on the ground and never keep them in leaking receptacles.

Consult your local ecological recycling centre to obtain information on the appropriate means of disposing of these substances.

Components made from plastic or resin

When cleaning polycarbonate windows, the console, the instrument panel, the gauges, etc., do not use petrol (gasoline), paraffin (kerosene), paint solvents, etc. Use only water, soap and a soft cloth.

The use of petrol (gasoline), paraffin (kerosene), paint solvents, etc, will cause discoloration, cracking or deformation of these components.

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GENERAL MACHINE SPECIFICATIONS

Engine

(788 and 788 "Plus")

	788	788 "Plus"
Make and type	CASE 4T 390	CASE 4TA 390
4 stroke, 4 cylinder	turbo-charged diesel	
Capacity	3920 cm^3	
Bore	102 mm	
Stroke	120 mm	
Cooling	water-cooled	
Staring: 2 x 12 volt batteries, 24 V	120 A/h	

Working specifications

Engine speed		2000 rpm	
Horsepower:	SAE J1995	68.6 kW (93 hp)	81 kW (110 hp)
	DIN 70020 - DIN 6271	65 kW (88 hp)	76 kW (103 hp)
	EEC 80/1269 - ISO 9249	65 kW (88 hp)	76 kW (103 hp)

Specifications maintained up to an altitude of 3000 m at a temperature of 25°C.

Capacities:	Engine oil sump	10 L	
	Fuel tank	249 L	
Electric fuel filler pump		optional equipment	
Average consumption per hour	10 L/h		14.5 L/h

Engine and pump assembly mounted on rubber blocks.
Heavy-duty dust filtration.

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(988 and 988 "Plus")

	988	988 "Plus"
Make and type	CASE 6T 590	
Total SAE horsepower at 2800 rpm	126.4 kW (172 hp)	
4 stroke, 6 cylinder	turbo-charged diesel	
Capacity	5880 cm^3	
Bore	102 mm	
Stroke	120 mm	
Cooling	water-cooled	
Staring: 2 x 12 volt batteries, 24 V	120 A/h	

Working specifications

		988	988 "Plus"
Engine speed		2000 rpm	
Horsepower:	SAE	91 kW (124 hp)	92 kW (125.7 hp)
	DIN 70020 - DIN 6271	86 kW (116 hp)	90 kW (122 hp)
	EEC 80/1269 - ISO 9249	86 kW (116 hp)	90 kW (122 hp)

Specifications maintained up to an altitude of 3000 m at a temperature of 25°C.

Capacities:	Engine oil sump	14.3 L	
	Fuel tank	249 L	
Electric fuel filler pump		optional equipment	
Average consumption per hour	13 L/h		16.2 L/h

Engine and pump assembly mounted on rubber blocks.
Heavy-duty dust filtration.

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Hydraulic system

Variable output system with independent and simultaneous operation of all functions.
Electronic regulation of hydraulic power ("Powersensor" system) for optimal use of engine power.

3 regulation modes:

"FINE": For jobs requiring high precision.

"ECO": For normal jobs.

"MAX": In this position, the operator has the full power of the machine at his disposal.

Engine automatically reverts to idle speed if the operator wishes.

(788 and 788 "Plus")

	788	788 "Plus"
Working pressure	350 bar	
Capacity of hydraulic reservoir	115 L	
Total system capacity	184 L	187 L

Double body pump:

Variable displacement body for travel and attachment functions.

Flow	210 L/min	214 L/min

Fixed displacement body for upperstructure swing function.

Flow	44 L/min	41.7 L/min
Installed hydraulic power	60 kW (81.5 hp)	73.5 kW (100 hp)

(988 and 988 "Plus")

	988	988 "Plus"
Working pressure	350 bar	
Capacity of hydraulic reservoir	180 L	
Total system capacity	288 L	

Pumps:

One double-body variable displacement pump for supplying travel motors and attachments.

Flow	320 L/min

A fixed displacement pump for supplying the upperstructure swing function.

Flow	56 L/min	54.9 L/min
Installed hydraulic power	81 kW (110 hp)	86.3 kW (117 hp)

(788, 788 "Plus", 988 and 988 "Plus")

Fixed pumps for pilot systems.
Parallel, closed centre type attachment and travel control valves.
Flow rates per function, independent of pressures.

Oil cooler with air cooling from engine.
Multispiral high pressure hoses with minimum safety factor of 2 to 4 times the working pressure
Self-lubricating hydraulic swivel.

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Electrical system

Circuit voltage circuit ..... 24 volt, negative earth
Batteries .....two low-maintenance 12 volt batteries
All electrical system safety functions are grouped in an electrical cabinet with a printed circuit.
Instrument panel with printed circuit.
Automatic instrument panel lamp testing.
Two-stage alarm system.
Upperstructure electrical power connection (24 V, 15 Amp.).
Battery master switch.

Upperstructure

All welded frame

Modular structure.
Transverse walkway giving access to the various components.
Sound-proofed, lockable cowling meeting all current regulations.
Tool box with tool set.

Swing

Hydraulic motor with reduction gear and automatic static brake.

	788, 788 "Plus", 988 "Plus"	988
Rotational speed	7.7 rpm	8.8 rpm
Turntable	Alternating rollers and internal teeth	

Centralised bearing surface and tooth lubrication

Cab

Removable, sound-proofed, on flexible mounting blocks.
Up and over windshield.
Tinted windshield.
Pre-fitted for radio installation.
Transparent roof hatch ..... optional equipment
Sliding door window.....standard since November 1999
Polycarbonate windows..... optional equipment
Cab safety guards .....available on request
Elevated cab.....available on request
Ant-vandal cab..... optional equipment

Operation

De-luxe seat with armrests and multi-position adjustment (vibration level III/ISO 7096).
Hydraulically assisted controls.
Attachment and swing ..... 2 control levers
Travel..... 2 pedals
Speed programmer which also automatically changes speed range on the two-speed version.
Single-speed windshield wiper, plus intermittent action, windshield washer, heating, de-frosting, two-speed ventilation, cab light, cigarette lighter, sun shield.
Working lights:
- On upperstructure .....2 x 70/75 W
- On attachment ..... 70 W
- Front and rear (on cab) ..... optional equipment
- Rear (on cab) ..... 70 W

Air conditioning ..... optional equipment
Cab sun-shield..... optional equipment
Cab blower ..... optional equipment

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Undercarriage (depending on version)

One-piece undercarriage chassis with welded components.
Lifetime lubricated rollers.
Tractor type tracks; grease cylinder type track tension; shock absorber for shock absorption.
Removable sprocket tooth rings.
Front chain guide (optional rear).

Safety devices

In the event of engine failure, the attachment can be lowered, under control, to the ground.
Cancellation of controls by lifting the left-hand control arm.
Tinted safety glass, horn.
Cab safety guards .....available on request
Safety valves ..... optional equipment
Overload indicator ..... optional equipment
Roller type seat belt..... optional equipment
Fire extinguisher..... optional equipment
Rotary light ..... special for certain countries

Indicators

Engine coolant solution temperature, hydraulic fluid temperature, fuel level and hourmeter.

Warning and indicator lamps

Engine oil pressure, battery charge, hydraulic and engine air filter start of restriction indicator.
Warning/indicator lamp test.

Attachments

Sealed linkages, greasing of all linkages possible from the ground, double acting cylinders fitted with end-of-stroke shock absorbers.
Bucket linkage with side-play compensation system **(988 Series only)**.

Noise level

Certified by the manufacturer.
In accordance with European directive 86/662/EEC.

	788	**788 "Plus"**	**988**	**988 "Plus"**
Inside operator’s compartment (LpA)	79	76	81	78 decibels
Outside machine (LwA)	105	103	108	103 decibels

Vibration level in operator’s compartment

Upper members.....level lower than 2.5 m/s^2
Body .....level lower than 0.5 m/s^2

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Ground pressure

(788 and 788 "Plus")

	788	788 "Plus"
With attachment: 4.30 m boom, 2.10 m dipper and 560 L bucket		
Machine with 0.50 m track width	0.455 bar	0.466 bar
Machine with 0.60 m track width	0.385 bar	0.395 bar
Machine with 0.70 m track width	0.335 bar	0.344 bar
Machine with 0.85 m track width	0.280 bar	0.289 bar

(988 and 988 "Plus")

	988	988 "Plus"
With attachment: 4.80 m boom, 2.10 m dipper and 760 L bucket		
Machine with 0.50 m track width	0.505 bar	0.520 bar
Machine with 0.60 m track width	0.425 bar	0.425 bar
Machine with 0.70 m track width	0.370 bar	0.370 bar
Machine with 0.90 m track width	0.295 bar	0.305 bar

Travel

Sprockets driven by hydraulic motors.
Independent drive to each track.
Manual controlled travel block providing precise adjustment of travel speed regardless of pressure exerted on travel pedals.
Braked motors (automatic static brake).
Hydraulic speed limiter, automatic when descending slopes.

(788 and 788 "Plus")

Travel speeds:
(single speed machine), max. speed ..... from 0 to 3.6 kph
(two-speed machine), max. speed ..... First speed: from 0 to 3.6 kph
Second speed: from 0 to 5.5 kph
Gradeability 74%
Tractive force ..... 10,310 daN

(988 and 988 "Plus")

Travel speeds:
(single speed machine), max. speed ..... from 0 to 3.3 kph
(two-speed machine), max. speed ..... First speed: from 0 to 3.3 kph
Second speed: from 0 to 5.5 kph
Gradeability 77%
Tractive force ..... 13,500 daN

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WEIGHTS

Machine

(788 CK)

Boom	Dipper	Track pads			
		0.50 m	0.60 m	0.70 m	0.85 m
Monoblock	1.50 m	14 090	14 300	14 510	14 830
	2.10 m	14 110	14 320	14 530	14 850
	2.65 m	14 165	14 375	14 585	14 905
Adjustable	1.50 m	14 315	14 525	14 735	15 055
	2.10 m	14 335	14 545	14 755	15 175
	2.65 m	14 390	14 600	14 810	15 130
Backhoe offset	1.50 m	14 440	14 650	14 860	15 180
	2.10 m	14 460	14 670	14 880	15 200
	2.65 m	14 515	14 725	14 935	15 255
Articulated	1.50 m	14 425	14 635	14 845	15 165
	2.10 m	14 445	14 655	14 865	15 185
	2.65 m	14 500	14 710	14 920	15 240

NOTE: *These values are given in kg, with 560 L backhoe bucket.*

(788 CK "Plus")

Boom	Dipper	Track pads			
		0.50 m	0.60 m	0.70 m	0.85 m
Monoblock	1.50 m	14 490	14 720	14 945	15 280
	2.10 m	14 505	14 730	14 955	15 295
	2.65 m	14 560	14 785	15 010	15 350
Adjustable	1.50 m	14 725	14 950	15 175	15 515
	2.10 m	14 740	14 965	15 190	15 525
	2.65 m	14 795	15 020	15 245	15 580
Backhoe offset	1.50 m	14 855	15 080	15 305	15 640
	2.10 m	14 865	15 090	15 320	15 655
	2.65 m	14 920	15 145	15 375	15 710
Articulated	1.50 m	14 825	15 050	15 275	15 615
	2.10 m	14 840	15 065	15 290	15 625
	2.65 m	14 895	15 120	15 345	15 680

NOTE: *These values are given in kg, with 560 L backhoe bucket*

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(788 LC "Plus")

Boom	Dipper	Track pads			
		0.50 m	0.60 m	0.70 m	0.90 m
Monoblock	1.50 m	15 415	15 655	15 895	16 375
	2.10 m	15 425	15 665	15 910	16 390
	2.65 m	15 480	15 720	15 965	16 445
Adjustable	1.50 m	15 645	15 885	16 130	16 610
	2.10 m	15 660	15 900	16 140	16 625
	2.65 m	15 715	15 955	16 195	16 680
Backhoe offset	1.50 m	15 775	16 015	16 255	16 740
	2.10 m	15 785	16 025	16 270	16 750
	2.65 m	15 840	16 080	16 325	16 805
Articulated	1.50 m	15 745	15 985	16 230	16 710
	2.10 m	15 760	16 000	16 240	16 725
	2.65 m	15 815	16 055	16 295	16 780

NOTE: *These values are given in kg, with 760 L backhoe bucket*

(988 CK)

Boom	Dipper	Track pads			
		0.50 m	0.60 m	0.70 m	0.90 m
Monoblock	1.60 m	16 925	17 150	17 375	17 825
	2.10 m	16 970	17 195	17 420	17 870
	2.70 m	17 095	17 320	17 545	17 995
Adjustable	1.60 m	17 260	17 485	17 710	18 160
	2.10 m	17 305	17 530	17 755	18 205
	2.70 m	17 430	17 655	17 880	18 330
Backhoe offset	1.60 m	17 435	17 660	17 885	18 335
	2.10 m	17 480	17 705	17 930	18 380
Articulated	1.60 m	17 505	17 730	17 955	18 405
	2.10 m	17 550	17 775	18 000	18 450
	2.70 m	17 675	17 900	18 125	18 575

NOTE: *These values are given in kg, with 760 L backhoe bucket.*

Boom	Dipper	Track pads			
		0.50 m	0.60 m	0.70 m	0.90 m
Handling	4.50 m	17 025	17 250	17 475	17 925

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(988 CK "Plus")

Boom	Dipper	Track pads			
		0.50 m	0.60 m	0.70 m	0.90 m
Monoblock	1.60 m	17 490	17 715	17 940	18 390
	2.10 m	17 535	17 760	17 985	18 435
	2.70 m	17 655	17 880	18 105	18 560
	3.10 m	17 690	17 915	18 140	18 595
Backhoe offset	1.60 m	17 955	18 180	18 405	18 860
	2.10 m	18 000	18 225	18 450	18 905
Articulated	1.60 m	18 080	18 305	18 530	18 985
	2.10 m	18 130	18 355	18 580	19 030
	2.70 m	18 250	18 475	18 700	19 150
	3.10 m	18 285	18 510	18 735	19 185

NOTE: *These values are given in kg, with 760 L backhoe bucket.*

Boom	Dipper	Track pads			
		0.50 m	0.60 m	0.70 m	0.90 m
Handling	4.50 m	17 025	17 250	17 475	17 925

(988 CKE "Plus")

Boom	Dipper	Track pads		
		0.50 m	0.60 m	0.70 m
Monoblock 5.20 m	1.50 m	17 460	17 685	17 910
	2.10 m	17 505	17 730	17 955
	2.70 m	17 625	17 850	18 075
	3.10 m	17 690	17 885	18 110
Backhoe offset	1.60 m	17 925	18 150	18 375
	2.10 m	17 975	18 200	18 425
Articulated	1.60 m	18 055	18 280	18 505
	2.10 m	18 100	18 325	18 550
	2.70 m	18 220	18 445	18 670
	3.10 m	18 255	18 480	18 705

NOTE: *These values are given in kg, with 760 L backhoe bucket.*

Boom	Dipper	Track pads		
		0.50 m	0.60 m	0.70 m
Handling	4.50 m	16 995	17 220	17 445

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Attachments

(788 and 788 "Plus")

Booms (with dipper cylinder)
- One-piece ..... 1035 kg
- Adjustable ..... 1335 kg
- Backhoe-offset ..... 1460 kg
- Articulated ..... 1610 kg

Dipper (with yoke, connecting link and bucket cylinder)
- 1.50 m ..... 545 kg
- 2.10 m ..... 560 kg
- 2.65 m ..... 615 kg

(988 and 988 "Plus")

Booms (with dipper cylinder)
- One-piece ..... 1375 kg
- Adjustable ..... 1600 kg
- Backhoe-offset ..... 1840 kg
- Articulated ..... 1970 kg

Handling boom ..... 1350 kg

Dipper (with yoke, connecting link and bucket cylinder)
- 1.60 m ..... 650 kg
- 2.10 m ..... 735 kg
- 2.70 m ..... 860 kg
- 3.10 m ..... 895 kg

Handling dipper ..... 515 kg

Counterweight

(788) 2950 kg

(788 "Plus") 3150 kg

(988) 3550 kg

(988 "Plus") 3550 kg

Cab

295 kg

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788 AND 788 "PLUS" BUCKETS

NOTE: *The selection of bucket capacity depends on the density of the material and the attachment configuration in addition to the compactness and structure of the ground (See "Density of various spoils and materials").*

Earthmoving buckets

Width	SAE heaped capacity	Weight
0.60 m	380 L	390 kg
0.75 m	505 L	420 kg
0.85 m	590 L	445 kg
0.95 m	675 L	475 kg
1.05 m	765 L	520 kg
1.20 m	900 L	770 kg

All earthmoving buckets are equipped with teeth with removable tooth tips and pins with side play take-up system.
Heavy duty supplement optional (add 5% to the capacity shown).
Side cutters optional (add 8 cm to the width shown).

Trench buckets with ejector

Width	SAE heaped capacity	Weight
0.35 m	195 L	375 kg
0.45 m	270 L	410 kg

Ditch cleaning buckets equipped with teeth

Width	CECE heaped capacity	Weight
1.25 m (2)	420 L	340 kg
1.80 m (2)	620 L	455 kg
2.40 m (1)	280 L	395 kg

Ditch cleaning buckets equipped with reversible blade (notched or smooth)

Width	CECE heaped capacity	Weight
1.25 m (2)	420 L	375 kg
1.80 m (2)	620 L	500 kg
2.20 m (1)	260 L	430 kg
2.40 m (1)	280 L	450 kg

V-shaped bucket

Width	CECE heaped capacity	Weight
0.35 - 2.10 m	340 L	330 kg
0.50 - 2.60 m	400 L	395 kg

(1) Small profile
(2) Large profile

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988 AND 988 "PLUS" BUCKETS

NOTE: *The selection of bucket capacity depends on the density of the material and the attachment configuration in addition to the compactness and structure of the ground (See "Density of various spoils and materials").*

Earthmoving buckets

Width	SAE heaped capacity	Weight
0.60 m	430 L	450 kg
0.75 m	570 L	510 kg
0.85 m	670 L	535 kg
0.90 m	710 L	545 kg
1.00 m	810 L	575 kg
1.15 m	960 L	625 kg
1.30 m	1100 L	675 kg

All earthmoving buckets are equipped with teeth with removable tooth tips and pins with side play take-up system.
Heavy duty supplement optional (add 5% to the capacity shown).
Side cutters optional (add 8 cm to the width shown).

Trench buckets with ejector

Width	SAE heaped capacity	Weight
0.35 m	225 L	465 kg
0.45 m	315 L	465 kg

Ditch cleaning buckets equipped with teeth

Width	CECE capacity	Weight
2.20 m (1)	310 L	550 kg
2.40 m (1)	340 L	530 kg
1.80 m (2)	800 L	560 kg

Ditch cleaning buckets equipped with reversible blade (notched or smooth)

Width	CECE capacity	Weight
2.40 m (1)	340 L	585 kg
1.80 m (2)	800 L	600 kg

V-shaped bucket

Width	CECE capacity	Weight
0.50 - 3.00 m	670 L	615 kg

(1) Small profile
(2) Large profile

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788 AND 788 "PLUS" CLAMSHELLS

Trench clamshell with ejector

Width	Opening	Capacity	Weight
0.32 m	1.45 m	100 L	430 kg
0.47 m	1.45 m	145 L	490 kg
0.65 m	1.45 m	210 L	660 kg

Earthmoving clamshells

Width	Opening	Capacity	Weight
0.79 m	1.36 m	250 L	535 kg
0.96 m	1.48 m	400 L	635 kg

Rehandling clamshells

Width	Opening	Capacity	Weight
0.97 m	1.40 m	400 L	525 kg
1.08 m	1.47 m	550 L	530 kg
1.22 m	1.64 m	800 L	605 kg

Cylindrical boring clamshell

Opening diameter	Capacity	Weight
1.23 m	175 L	565 kg

Rectangular boring clamshells

Width	Opening	Capacity	Weight
0.43 m	0.69 m	70 L	430 kg
0.60 m	1.11 m	130 L	465 kg

Sugar beet clamshell

Width	Opening	Capacity	Weight
1.33 m	2.50 m	1450 L	1100 kg

5-tine stone grab with removable tine tips

Opening diameter	Weight
1.55 m	820 kg
1.56 m (1)	940 kg

(1) With heart-shaped tines

5-tine scrap grab (tines controlled by central cylinder)

Opening diameter	Weight
1.35 m	600 kg

Timber grab

Width	Opening	Capacity	Weight
0.72 m	2.30 m	0.1 - 0.9 m^2	650 kg

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988 AND 988 "PLUS" CLAMSHELLS

Trench clamshell with ejector

Width	Opening	Capacity	Weight
0.45 m	1.57 m	180 L	670 kg
0.65 m	1.57 m	240 L	740 kg

Earthmoving clamshells

Width	Opening	Capacity	Weight
0.85 m	1.57 m	400 L	760 kg
1.05 m	1.57 m	550 L	810 kg

Rehandling clamshells

Width	Opening	Capacity	Weight
1.34 m	1.60 m	800 L	850 kg
1.34 m	1.77 m	1000 L	925 kg

Boring clamshell

Opening diameter	Capacity	Weight
1.20 m	160 L	770 kg

Sugar beet clamshell

Width	Opening	Capacity	Weight
1.57 m	2.50 m	1750 L	1240 kg
1.81 m	2.50 m	2050 L	1305 kg

5-tine stone grab with removable tine tips

Opening diameter	Weight
1.90 m	1100 kg
1.90 m (1)	1200 kg

(1) With heart-shaped tines

Scrap metal 5 tine grab

Opening diameter	Weight
2.00 m	1025 kg

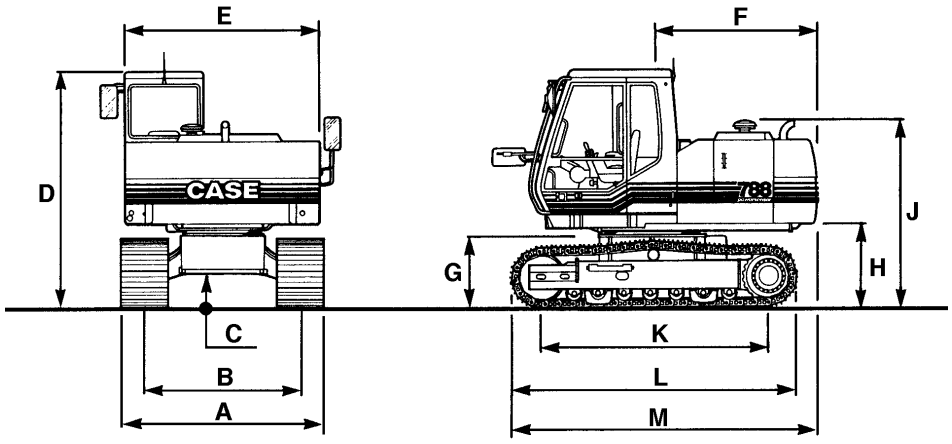
Timber grab

Width	Opening	Capacity	Weight
0.70 m	2.75 m	1.2 m^2	1050 kg

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MACHINE OVERALL DIMENSIONS

(788 and 788 "Plus")

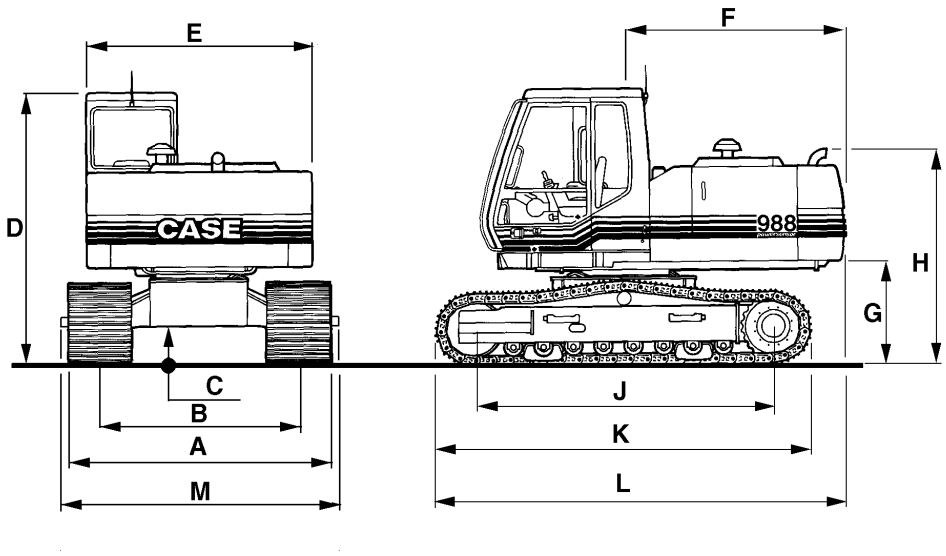


CS95N446

	(Type CK)	(Type LC)
A (with 0.50 m track pads)	2.47 m	2.65 m
A (with 0.60 m track pads)	2.57 m	2.75 m
A (with 0.70 m track pads)	2.67 m	2.85 m
A (with 0.85 m track pads)	2.92 m	
A (with 0.90 m track pads)	3.05 m	
B	1.97 m	2.15 m
C	0.43 m	0.45 m
D	2.94 m	2.95 m
E	2.44 m	2.44 m
F (radius)	2.05 m	2.05 m
G	0.86 m	0.87 m
H	0.96 m	0.97 m
J	2.49 m	2.50 m
K	2.78 m	3.03 m
L	3.55 m	3.82 m
M	3.82 m	3.96 m
N (steps lowered)	2.60 m	2.78 m

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(988 and 988 "Plus")

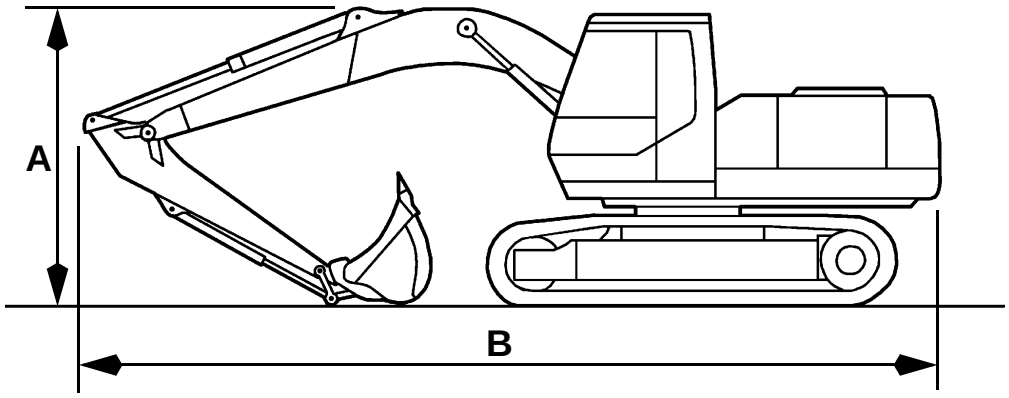


PDH1162

	Type CK	Type CKE
A (with 0.50 m track pads)	2.65 m	2.47 m
A (with 0.60 m track pads)	2.75 m	2.57 m
A (with 0.70 m track pads)	2.85 m	2.67 m
A (with 0.90 m track pads)	3.05 m	
B	2.15 m	1.97 m
C	0.45 m	0.45 m
D	2.98 m	2.98 m
E	2.44 m	2.44 m
F (radius)	2.42 m	2.42 m
G	0.99 m	0.99 m
H	2.42 m	2.42 m
J	3.03 m	3.03 m
K	3.82 m	3.82 m
L	4.32 m	4.32 m
M (steps lowered)	2.88 m	2.70 m

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TRANSPORTATION OVERALL DIMENSIONS



PDH0256

NOTE: *For top of cab to ground, see "Overall dimensions".*

788 and 788 "Plus"

Boom	Dipper	A	B
Monoblock	1.50 m	2.50	7.70
	2.10 m	2.70	7.55
	2.65 m	3.00	7.50
Adjustable	1.50 m	2.65	7.75
	2.10 m	2.75	7.65
	2.65 m	2.95	7.65
Backhoe offset	1.50 m	2.50	7.70
	2.10 m	2.70	7.55
	2.65 m	3.00	7.50
Articulated	1.50 m	2.75	8.00
	2.10 m	2.85	7.85
	2.65 m	2.95	7.80

988 and 988 "Plus"

Boom	Dipper	A	B
Monoblock	1.60 m	2.95	9.45
	2.10 m	3.05	9.10
	2.70 m	3.35	9.00
	3.10 m	3.60	8.90
Backhoe offset	1.60 m	3.00	9.05
	2.10 m	3.15	8.70
Articulated	1.60 m	3.15	9.20
	2.10 m	3.15	8.85
	2.70 m	3.55	8.80
	3.10 m	3.45	8.70
Handling	Handling	2.80	9.55

NOTE: *These values are given in metres.*

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Section

1002

SPECIFICATIONS
Wheeled excavators

Case

Cre 7-80062GB

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WARNING: *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

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FLUIDS AND LUBRICANTS

Lubricants must have the correct properties for each application.

WARNING: *The conditions of use for individual fluids and lubricants must be respected.*

Hydraulic fluid

CASE hydraulic fluid is specially designed for high pressure applications and for the CASE hydraulic system. The type of fluid to be used depends on the ambient temperature.

Temperate climates

-20°C to +40°C
Fluid type ISO VG 46
CASE reference: POHYDR

Hot climates

0°C to +60°C
Fluid type ISO VG 100
CASE reference: POHYDC

Cold climates

-40°C to +20°C
Fluid type ISO VG 22
CASE reference: POHYPF

These various grades of fluid must be in conformity with CASE France specification P9903201Z.

Temperate climate biodegradable fluid:
This yellow fluid is compatible with standard fluid. If adopted, it is advisable to drain the circuit completely.
Fluid type ISO VG 46
CASE reference: CASYNTH46

This grade of fluid must be in conformity with CASE France specification P9903203B

Transmission component oil

Extreme pressure oil used for transmission components inside sealed housings.
Extreme pressure oil TYPE API GL5 GRADE 80W90 or ISO VG 150

Grease

The type of grease to use depends on ambient temperature.

Temperate and hot climates

-20°C to +60°C
Extreme pressure grease EP NLGI grade 2 with molybdenum disulphide.

Cold climates

-40°C to +20°C
Extreme pressure grease EP NLGI grade 0.

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Engine oil

CASE engine oil N°1 is recommended for your engine. This oil ensures correct lubrication of your engine in all working conditions.

If CASE N°1 Multiperformance or Performance engine oil is not available, use oil corresponding to category API/CG/CF.

NOTE: *Do not put any Performance Additive or other additive in the sump. Oil change intervals shown in this manual are based on tests carried out on CASE lubricants.*

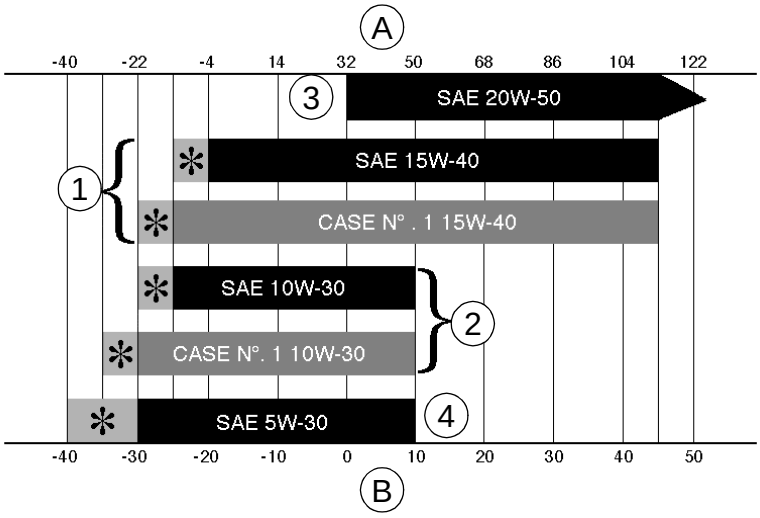


RF97F136



RB97F100

Oil viscosity/Oil range



CS98M561

(A) FAHRENHEIT TEMPERATURE
(B) CELSIUS TEMPERATURE
(1) ALL-SEASONS
(2) WINTER
(3) TROPICAL
(4) ARCTIC
(*) SHOWS THAT AN ENGINE OIL HEATER OR ENGINE COOLANT SOLUTION HEATER MUST BE USED.

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Fuel

Use fuel which is to ASTM (American Society for Testing and Materials) D975 standard.

Use Grade No N°2 fuel. The use of other types of fuel can result in a loss of power and may cause high fuel consumption.

In cold weather, the use of a mixture of fuels N°1 and N°2 is temporarily permitted. Consult your fuel supplier.

If the temperature falls below the fuel cloud point (point at which wax begins to form) the wax crystals will cause power loss or will prevent the engine from starting.

IMPORTANT: *In cold weather, fill the fuel tank at the end of the day's work, in order to prevent the formation of condensation.*

Fuel storage

Long storage can lead to the accumulation of impurities and condensation in the fuel. Engine trouble can often be traced to the presence of water in the fuel.

The storage tank must be placed outside and the temperature of the fuel should be kept as low as possible. Drain off water and impurities regularly.

Anti-freeze/Anti-corrosion

Use anti-freeze in all seasons to protect the cooling system from corrosion and all risk of freezing.

In environments with a temperature higher than -36°C, use a mixture of 50% ethylene-glycol based anti-freeze.

For areas where the temperature is below -36°C, it is advisable to use a blend of 40% water and 60% anti-freeze.

Environment

Before carrying out any servicing operation on this machine and before disposing of used fluids or lubricants, always think of the environment. Never throw fluid or oil on the ground and never keep them in leaking receptacles.

Consult your local ecological recycling centre to obtain information on the appropriate means of disposing of these substances.

Components made from plastic or resin

When cleaning polycarbonate windows, the console, the instrument panel, the gauges, etc., do not use petrol (gasoline), paraffin (kerosene), paint solvents, etc. Use only water, soap and a soft cloth.

The use of petrol (gasoline), de paraffin (kerosene), paint solvents, etc, will cause discoloration, cracking or deformation of these components.

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GENERAL MACHINE SPECIFICATIONS

Engine

(788 and 788 "Plus")

	788	788 "Plus"
Make and type	CASE 4T 390	CASE 4TA 390
4-stroke, 4-cylinder	turbo-charged diesel	
Cubic capacity	3920 cm^3	
Bore	102 mm	
Stroke	120 mm	
Cooling	water-cooled	
Starting: 2 x 12 volt batteries, 24 V	120 A/h	

Working specifications

Engine speed		2000 rpm	
Horsepower:	SAE J1595	68.6 kW (93 hp)	81 kW (100 hp)
	DIN 70020 - DIN 6271	65 kW (88 hp)	76 kW (103 hp)
	EEC 80/1269 - ISO 9249	65 kW (88 hp)	76 kW (103 hp)

Specifications maintained up to an altitude of 3000 m at a temperature of 25°C.

Capacities:	Engine oil sump	10 L	
	Fuel tank	249 L	
Electric fuel tank filler pump		optional equipment	
Average consumption per hour	10 L/h		14.5 L/h

Engine and pump assembly mounted on rubber blocks.
Heavy-duty dust filtration.

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(988 and 988 "Plus")

	988	988 "Plus"
Make and type	CASE 6T 590	
Total SAE horsepower at 2800 rpm	126.4 kW (172 hp)	
4 stroke, 6 cylinder	turbo-charged diesel	
Capacity	5880 cm^3	
Bore	102 mm	
Stroke	120 mm	
Cooling	water-cooled	
Staring: 2 x 12 volt batteries, 24 V	120 A/h	

Working specifications

Engine speed		2000 rpm	
Horsepower:	SAE	91 kW (124 hp)	92.5 kW (126 hp)
	DIN 70020 - DIN 6271	86 kW (116 hp)	90 kW (122 hp)
	EEC 80/1269 - ISO 9249	86 kW (116 hp)	90 kW (122 hp)

Specifications maintained up to an altitude of 3000 m at a temperature of 25°C.

Capacities:	Engine oil sump	14.3 L	
	Fuel tank	249 L	
Electric fuel filler pump		optional equipment	
Average consumption per hour	13 L/h		16.2 L/h

Engine and pump assembly mounted on rubber blocks.
Heavy-duty dust filtration.

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Hydraulic system

Variable output system with independent and simultaneous operation of all functions.
Electronic regulation of hydraulic power ("Powersensor" system) for optimal use of engine power.

3 regulation modes:

"FINE": For jobs requiring high precision.

"ECO": For normal jobs.

"MAX": In this position, the operator has the full power of the machine at his disposal.

Engine automatically reverts to idle speed if the operator wishes.

(788 and 788 "Plus")

	788	788 "Plus"
Working pressure	350 bar	
Capacity of hydraulic reservoir	115 L	
Total system capacity	184 L	187 L

Double body pump:

Variable displacement body for travel and attachment functions.
Flow ..... 210 L/min

Fixed displacement body for upperstructure swing function.
Flow ..... 41.7 L/min

Installed hydraulic power ..... 60 kW (81.5 hp) ..... 73.5 kW (97 hp)

(988 and 988 "Plus")

	988 and 988 "Plus"
Working pressure	350 bar
Capacity of hydraulic reservoir	180 L
Total system capacity	288 L

Pumps:

One double-body variable displacement pump for supplying travel motors and attachments.
Flow ..... 320 L/min

A fixed displacement pump for supplying the upperstructure swing function.
Flow ..... 54.9 L/min
Installed hydraulic power ..... 86.3 kW (117 hp)

(788, 788 "Plus", 988 and 988 "Plus")

Fixed pumps for pilot systems.
Parallel, closed centre type attachment and travel control valves.
Flow rates per function, independent of pressures.

Oil cooler with air cooling from engine.
Multispiral high pressure hoses with minimum safety factor of ..... 2 to 4 times the working pressure
Self-lubricating hydraulic swivel.

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Electrical system

Circuit voltage circuit ..... 24 volt, negative earth
Batteries .....two low-maintenance 12 volt batteries
All electrical system safety functions are grouped in an electrical cabinet with a printed circuit.
Instrument panel with printed circuit.
Automatic instrument panel lamp testing.
Two-stage alarm system.
Upperstructure electrical power connection (24 V, 15 Amp.).
Battery master switch.

Upperstructure

All welded frame

Modular structure.
Transverse walkway giving access to the various components.
Sound-proofed, lockable cowling meeting all current regulations.
Tool box with tool set.

Swing

Hydraulic motor with reduction gear and automatic static brake.

	788, 788 "Plus", 988 "Plus"	988
Rotational speed	7.7 rpm	8.8 rpm
Turntable	Alternating rollers and internal teeth	

Centralised bearing surface and tooth lubrication

Cab

Removable, sound-proofed, on flexible mounting blocks.
Tilting steering column.
Up and over windshield.
Tinted windshield.
Pre-fitted for radio installation.
Transparent roof hatch ..... optional equipment
Sliding door window.....standard since November 1999
Polycarbonate windows..... optional equipment
Cab safety guards .....available on request
Elevated cab.....available on request
Ant-vandal cab..... optional equipment

Operation

De-luxe seat with armrests and multi-position adjustment (vibration level III/ISO 7096).
Hydraulically assisted controls.
Attachment and swing ..... 2 control levers
Hydraulically assisted steering .....Orbitrol system
Single-speed windshield wiper, plus intermittent action, windshield washer, heating, de-frosting, two-speed ventilation, cab light, cigarette lighter, sun shield.
Working lights:
- On upperstructure .....2 x 70/75 W
- On attachment ..... 70 W
- Front (on cab)..... 70 W
- Rear (on cab) ..... 70 W

Air conditioning ..... optional equipment
Cab sun-shield..... optional equipment
Cab blower ..... optional equipment

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Undercarriage (depending on version)

Modular load design which enables a dozer blade or two stabilizers to be installed at the front.
Stabilizers with articulated pads which can be locked for uneven ground.
Oscillating front axle ..... + or - 7°
Automatic hydraulic front axle locking can be disengaged when required.
Automatically locking dozer blade and stabilizers with check valves.
Two drive axles with planetary reduction gears.
Tool boxes.

Tyres

4 wheels 18-19.5XF
8 wheels 10.00-20 (with dual wheel spacer)

Brakes

Single-disc, oil-bath brakes.
Service brakes: double rear circuit, controlled hydraulically by foot pedal.
Parking and working brake: manual control by electro-hydraulic action on all 4 wheels.
Hydrostatic engine brake.

Safety devices

For travel or transport, the upperstructure can be locked from the driving position.
In the event of engine failure, the attachment can be lowered, under control, to the ground.
Cancellation of controls by lifting the left-hand control arm.
Tinted safety-glass windows, horn, flashing marker light.
Cab safety guards ..... available on request
Safety valves ..... optional equipment
Overload indicator ..... optional equipment
Roller type seat belt ..... optional equipment
Fire extinguisher ..... optional equipment
Rotary light ..... special for certain countries

Indicators

Engine coolant solution temperature, hydraulic fluid temperature, fuel level and hourmeter.

Warning and indicator lamps

Engine oil pressure, battery charge, hydraulic oil filter and engine air filter restriction, brake minimum pressure, parking brake, steering assistance warning.
Warning/indicator lamp test.

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Travel

Hydro-mechanical transmission with variable displacement hydraulic motor and range selector providing infinite speed variation ..... from 0 to 7.5 kph (work-site range)
from 0 to 25 kph (road range)
from 0 to 20 kph (special for Germany)

Control by pedal and manual inverter with gradual action, enabling any desired speed to be set.
Hydraulic speed limiter, automatic when descending slopes.

	788	**788 "Plus"**	**988**	**988 "Plus"**
Gradeability (continuous)	40%	38%	43%	49%
Outer turning radius	6.18 m	6.50 m	6.44 m	7.28 m

Hydraulically assisted steering with safety system.

Attachments

Sealed linkages, greasing of all linkages possible from the ground, double acting cylinders fitted with end-of-stroke shock absorbers.
Bucket linkage with side-play compensation system **(988 Series only)**.

Noise level

Certified by the manufacturer.
In accordance with European directive 86/662/EEC.

	788	**788 "Plus"**	**988**	**988 "Plus"**
Inside operator's compartment (LpA)	79	76	81	78 decibels
Outside machine (LwA)	105	103	108	103 decibels

Vibration level in operator's compartment

Upper members	level lower than 2.5 m/s^2
Body	level lower than 0.5 m/s^2

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WEIGHTS

Machine

788						
Boom	**Dipper**	**Versions**				
		P	**PL**	**P2A**	**P2AL**	**P2A+2A**
Monoblock	1.50 m	13240	13855	14470	15085	15700
	2.10 m	13255	13870	14485	15100	15715
	2.65 m	13310	13925	14540	15155	15770
Adjustable	1.50 m	13465	14080	14695	15310	15925
	2.10 m	13480	14095	14710	15325	15940
	2.65 m	13535	14150	14765	15380	15995
Backhoe offset	1.50 m	13590	14205	14820	15435	16050
	2.10 m	13605	14220	14835	15540	16065
	2.65 m	13660	14275	14890	15505	16120
Articulated	1.50 m	13575	14190	14805	15420	16035
	2.10 m	13590	14205	14820	15435	16050
	2.65 m	13645	14260	14875	15490	16105

NOTE: *Loads shown are in kg for machine in 4 wheel configuration 18-19.5XF with 560 L backhoe bucket (for 8 wheel configuration 10.00-20: add 355 kg).*

788 "Plus"						
Boom	**Dipper**	**Versions**				
		P	**PL**	**P2A**	**P2AL**	**P2A+2A**
Monoblock	1.50 m	13 575	14 240	14 830	15 490	16 080
	2.10 m	13 590	14 250	14 840	15 505	16 090
	2.65 m	13 645	14 305	14 895	15 560	16 145
Adjustable	1.50 m	13 810	14 470	15 060	15 725	16 310
	2.10 m	13 825	14 485	15 075	15 735	16 325
	2.65 m	13 880	14 540	15 130	15 790	16 380
Backhoe offset	1.50 m	13 940	14 600	15 190	15 850	16 440
	2.10 m	13 950	14 615	15 200	15 865	16 455
	2.65 m	14 005	14 670	15 265	15 920	16 510
Articulated	1.50 m	13 910	14 570	15 160	15 825	16 410
	2.10 m	13 925	14 585	15 175	15 835	16 425

NOTE: *Loads shown are in kg for machine in 4 wheel configuration 18-19.5XF with 560 L backhoe bucket (for 8 wheel configuration 10.00-20: add 355 kg).*

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Machine weight (continued)

988						
Boom	Dipper	Versions				
		P	PL	P2A	P2AL	P2A+2A
Monoblock	1.60 m	14925	15535	16230	16845	17540
	2.10 m	14970	15580	16275	16890	17585
	2.70 m	15095	15705	16400	17015	17710
Adjustable	1.60 m	15260	15870	16565	17180	17875
	2.10 m	15305	15915	16610	17225	17920
	2.70 m	15430	16040	16735	17350	18045
Backhoe offset	1.60 m	15435	16045	16740	17355	18050
	2.10 m	15480	16090	16875	17400	18095
Articulated	1.60 m	15505	16115	16810	17425	18120
	2.10 m	15550	16160	16855	17470	18165
	2.70 m	15675	16285	16980	17595	18290

NOTE: *Loads shown are in kg for machine in 4 wheel configuration 18-19.5XF with 760 L backhoe bucket (for 8 wheel configuration 10.00-20: add 400 kg).*

988 "Plus"						
Boom	Dipper	Versions				
		P	PL	P2A	P2AL	P2A+2A
Monoblock	1.60 m	15 155	15 815	16 505	17 170	17 860
	2.10 m	15 200	15 860	16 550	17 215	17 905
	2.70 m	15 320	15 985	16 675	17 335	18 025
	3.10 m	15 355	16 020	16 710	17 370	18 060
Backhoe offset	1.60 m	15 620	16 285	16 975	17 635	18 325
	2.10 m	15 670	16 330	17 020	17 680	18 370
Articulated	1.60 m	15 750	16 410	17 100	17 760	18 450
	2.10 m	15 795	16 455	17 145	17 810	18 500
	2.70 m	15 915	16 580	17 270	17 930	18 620
	3.10 m	15 950	16 615	17 305	17 965	18 655

NOTE: *Loads shown are in kg for machine in 4 wheel configuration 18-19.5XF with 760 L (575 kg) backhoe bucket (for 8 wheel configuration 10.00-20: add 400 kg).*

988 "Plus"						
Boom	Dipper	Versions				
		P	PL	P2A	P2AL	P2A+2A
Handling	4.50 m	14 640	15 300	15 990	16 650	17 340

NOTE: *Loads shown are in kg for machine in 4 wheel configuration 18-19.5XF (for 8 wheel configuration 10.00-20: add 400 kg).*

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Attachments

788 and 788 "Plus"

Booms (with dipper cylinder)
- Monoblock ..... 1035 kg
- Adjustable ..... 1335 kg
- Backhoe-offset ..... 1460 kg
- Articulated ..... 1610 kg

Dipper (with yoke, connecting link and bucket cylinder)
- 1.50 m ..... 545 kg
- 2.10 m ..... 560 kg
- 2.65 m ..... 615 kg

988 and 988 "Plus"

Booms (with dipper cylinder)
- Monoblock ..... 1375 kg
- Adjustable ..... 1600 kg
- Backhoe-offset ..... 1840 kg
- Articulated ..... 1970 kg

Handling boom ..... 1530 kg

Dipper (with yoke, connecting link and bucket cylinder)
- 1.60 m ..... 690 kg
- 2.10 m ..... 735 kg
- 2.70 m ..... 860 kg
- 3.10 m ..... 895 kg

Handling dipper (with standard universal joint) ..... 655 kg

Counterweight

(788) 2900 kg

(788 "Plus") 3150 kg

(988) 3150 kg

(988 "Plus") 3550 kg

Cab

295 kg

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788 AND 788 "PLUS" BUCKETS

NOTE: *The selection of bucket capacity depends on the density of the material and the attachment configuration in addition to the compactness and structure of the ground.*

Earthmoving buckets

Width	SAE heaped capacity	Weight
0.60 m	380 L	390 kg
0.75 m	505 L	420 kg
0.85 m	590 L	445 kg
0.95 m	675 L	475 kg
1.05 m	765 L	520 kg
1.20 m	900 L	600 kg

All earthmoving buckets are equipped with teeth with removable tooth tips.
Heavy duty supplement optional (add 5% to the capacity shown).
Side cutters optional (add 8 cm to the width shown).

Trench buckets with ejector

Width	SAE heaped capacity	Weight
0.35 m	195 L	375 kg
0.45 m	270 L	410 kg

Ditch cleaning buckets equipped with teeth

Width	CECE heaped capacity	Weight
1.25 m (2)	420 L	340 kg
1.80 m (2)	620 L	455 kg
2.40 m (1)	280 L	395 kg

Ditch cleaning buckets equipped with reversible blade (notched or smooth)

Width	CECE heaped capacity	Weight
1.25 m (2)	420 L	375 kg
1.80 m (2)	620 L	500 kg
2.20 m (1)	260 L	430 kg
2.40 m (1)	280 L	450 kg

V-shaped bucket

Width	CECE heaped capacity	Weight
0.35 - 2.10 m	340 L	330 kg
0.50 - 2.60 m	400 L	395 kg

(1) Small profile
(2) Large profile

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988 AND 988 "PLUS" BUCKETS

NOTE: *The selection of bucket capacity depends on the density of the material and the attachment configuration in addition to the compactness and structure of the ground (See "Density of various spoils and materials").*

Earthmoving buckets

Width	SAE heaped capacity	Weight
0.60 m	430 L	450 kg
0.75 m	570 L	510 kg
0.85 m	670 L	535 kg
0.90 m	710 L	545 kg
1.00 m	810 L	575 kg
1.15 m	960 L	625 kg
1.30 m	1100 L	675 kg

All earthmoving buckets are equipped with teeth with removable tooth tips and pins with side play take-up system.
Heavy duty supplement optional (add 5% to the capacity shown).
Side cutters optional (add 8 cm to the width shown).

Trench buckets with ejector

Width	SAE heaped capacity	Weight
0.35 m	225 L	465 kg
0.45 m	315 L	465 kg

Ditch cleaning buckets equipped with teeth

Width	CECE capacity	Weight
2.20 m (1)	310 L	550 kg
2.40 m (1)	340 L	530 kg
1.80 m (2)	800 L	560 kg

Ditch cleaning buckets equipped with reversible blade (notched or smooth)

Width	CECE capacity	Weight
2.40 m (1)	340 L	585 kg
1.80 m (2)	800 L	600 kg

V-shaped bucket

Width	CECE capacity	Weight
0.50 - 3.00 m	670 L	615 kg

(1) Small profile
(2) Large profile

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788 AND 788 "PLUS" CLAMSHELLS

Trench clamshell with ejector

Width	Opening	Capacity	Weight
0.32 m	1.45 m	100 L	430 kg
0.47 m	1.45 m	145 L	490 kg
0.65 m	1.45 m	210 L	660 kg

Earthmoving clamshells

Width	Opening	Capacity	Weight
0.79 m	1.36 m	250 L	535 kg
0.96 m	1.48 m	400 L	635 kg

Rehandling clamshells

Width	Opening	Capacity	Weight
0.97 m	1.40 m	400 L	525 kg
1.08 m	1.47 m	550 L	530 kg
1.22 m	1.64 m	800 L	605 kg

Cylindrical boring clamshell

Opening diameter	Capacity	Weight
1.23 m	175 L	565 kg

Rectangular boring clamshells

Width	Opening	Capacity	Weight
0.43 m	0.69 m	70 L	430 kg
0.60 m	1.11 m	130 L	465 kg

Sugar beet clamshell

Width	Opening	Capacity	Weight
1.33 m	2.50 m	1450 L	1100 kg

5-tine stone grab with removable tine tips

Opening diameter	Weight
1.55 m	820 kg
1.56 m (1)	940 kg

(1) With heart-shaped tines

5-tine scrap grab (tines controlled by central cylinder)

Opening diameter	Weight
1.35 m	600 kg

Timber grab

Width	Opening	Capacity	Weight
0.72 m	2.30 m	0.1 - 0.9 m^2	650 kg

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988 AND 988 "PLUS" CLAMSHELLS

Trench clamshell with ejector

Width	Opening	Capacity	Weight
0.45 m	1.57 m	180 L	670 kg
0.65 m	1.57 m	240 L	740 kg

Earthmoving clamshells

Width	Opening	Capacity	Weight
0.85 m	1.57 m	400 L	760 kg
1.05 m	1.57 m	550 L	810 kg

Rehandling clamshells

Width	Opening	Capacity	Weight
1.34 m	1.60 m	800 L	850 kg
1.34 m	1.77 m	1000 L	925 kg

Boring clamshell

Opening diameter	Capacity	Weight
1.20 m	160 L	770 kg

Sugar beet clamshell

Width	Opening	Capacity	Weight
1.57 m	2.50 m	1750 L	1240 kg
1.81 m	2.50 m	2050 L	1305 kg

5-tine stone grab with removable tine tips

Opening diameter	Weight
1.90 m	1100 kg
1.90 m (1)	1200 kg

(1) With heart-shaped tines

Scrap metal 5 tine grab

Opening diameter	Weight
2.00 m	1025 kg

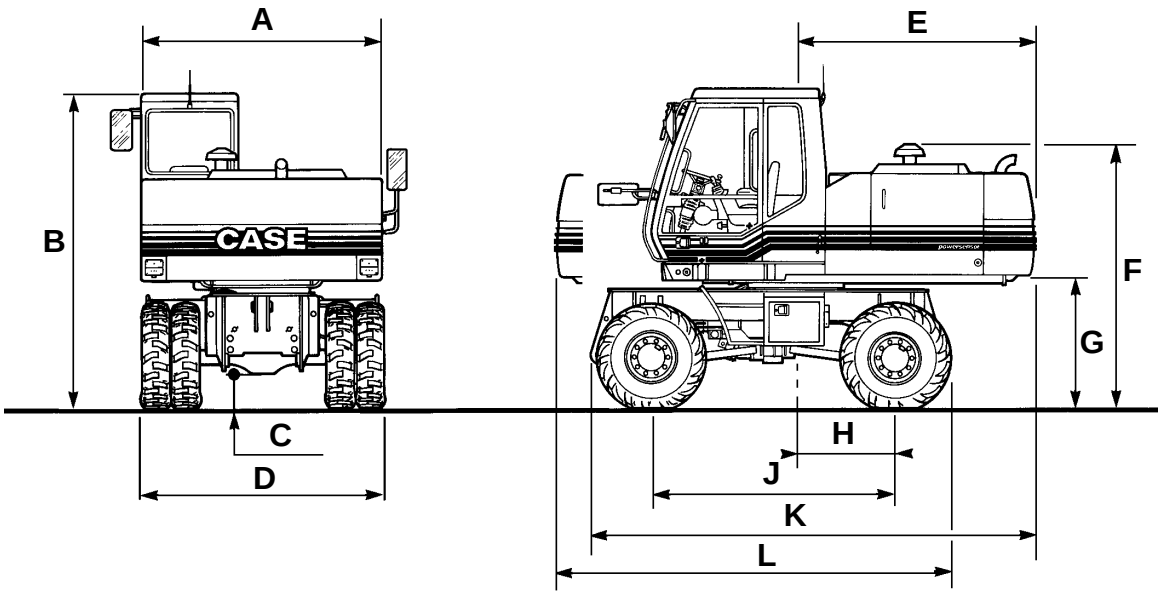
Timber grab

Width	Opening	Capacity	Weight
0.70 m	2.75 m	1.2 m^2	1050 kg

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MACHINE OVERALL DIMENSIONS

P Version

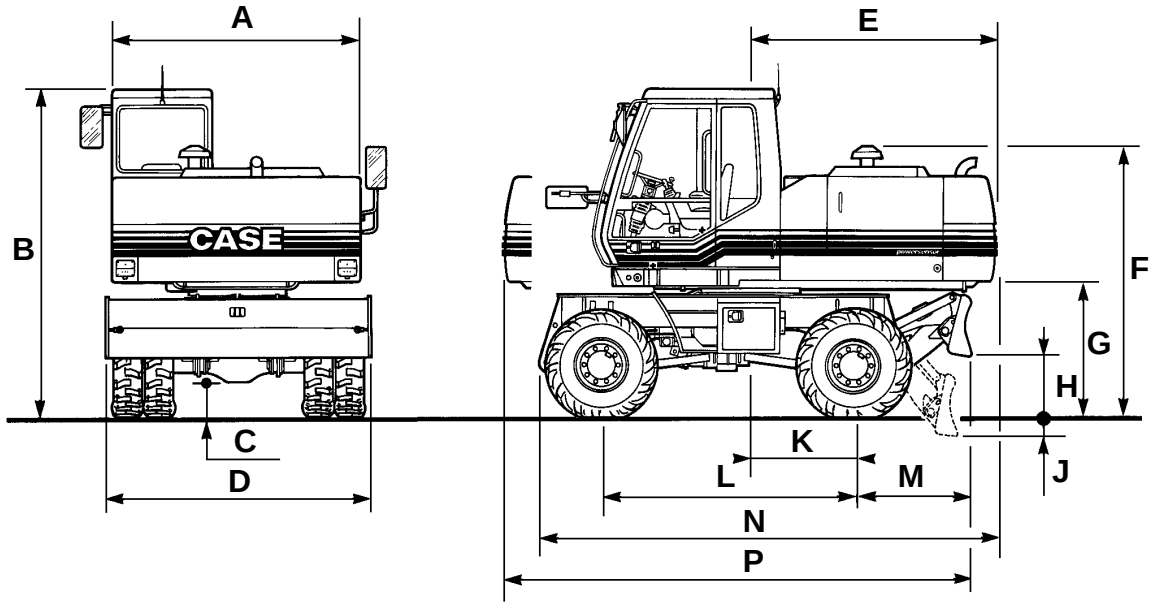


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	788	788 "Plus"	988	988 "Plus"
A	2.44 m	2.44 m	2.44 m	2.44 m
B	3.23 m	3.23 m	3.24 m	3.25 m
C	0.34 m	0.34 m	0.33 m	0.33 m
D	2.47 m	2.47 m	2.46 m	2.46 m
E (radius)	2.05 m	2.08 m	2.40 m	2.45 m
F	2.67 m	2.79 m	2.66 m	2.68 m
G	1.26 m	1.26 m	1.47 m	1.26 m
H	0.95 m	0.95 m	1.03 m	1.13 m
J	2.30 m	2.30 m	2.50 m	2.60 m
K	4.01 m	4.04 m	4.48 m	4.53 m
L	3.53 m	3.55 m	3.96 m	4.09 m

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PL Version

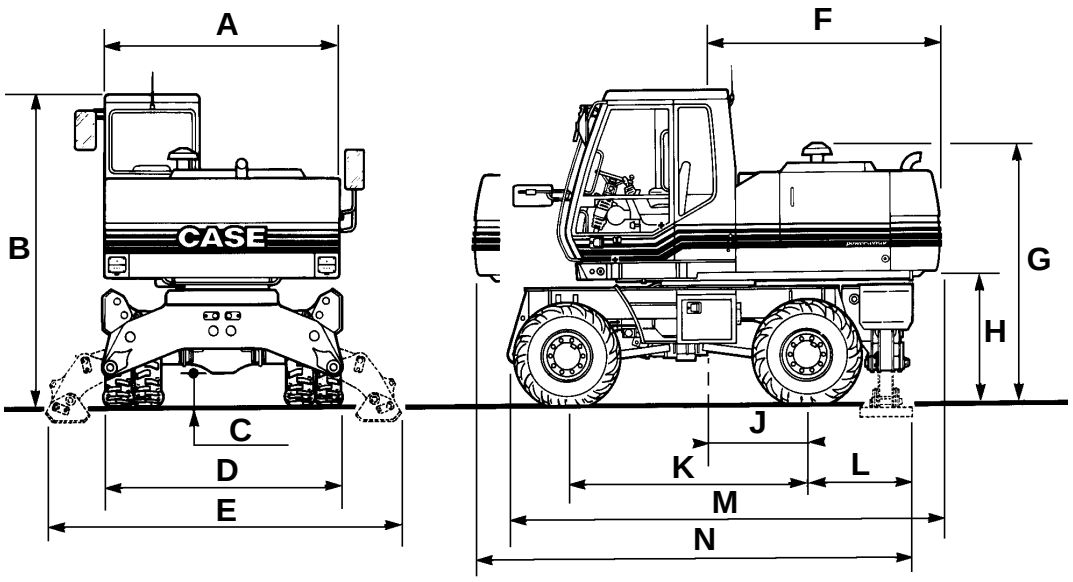


CS95N243

	788	788 "Plus"	988	988 "Plus"
A	2.44 m	2.44 m	2.44 m	2.44 m
B	3.23 m	3.23 m	3.24 m	3.25 m
C	0.34 m	0.34 m	0.33 m	0.33 m
D	2.48 m	2.48 m	2.48 m	2.46 m
E (radius)	2.05 m	2.08 m	2.40 m	2.45 m
F	2.67 m	2.79 m	2.66 m	2.68 m
G	1.26 m	1.26 m	1.47 m	1.26 m
H	0.59 m	0.59 m	0.59 m	0.49 m
J	0.18 m	0.18 m	0.18 m	0.18 m
K	0.95 m	0.95 m	1.03 m	1.13 m
L	2.30 m	2.30 m	2.50m	2.60 m
M	1.15 m	1.15 m	1.15 m	1.23 m
N	4.06 m	4.14 m	4.48 m	4.53 m
P	4.15 m	4.26 m	4.58 m	4.81 m

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P2A Version

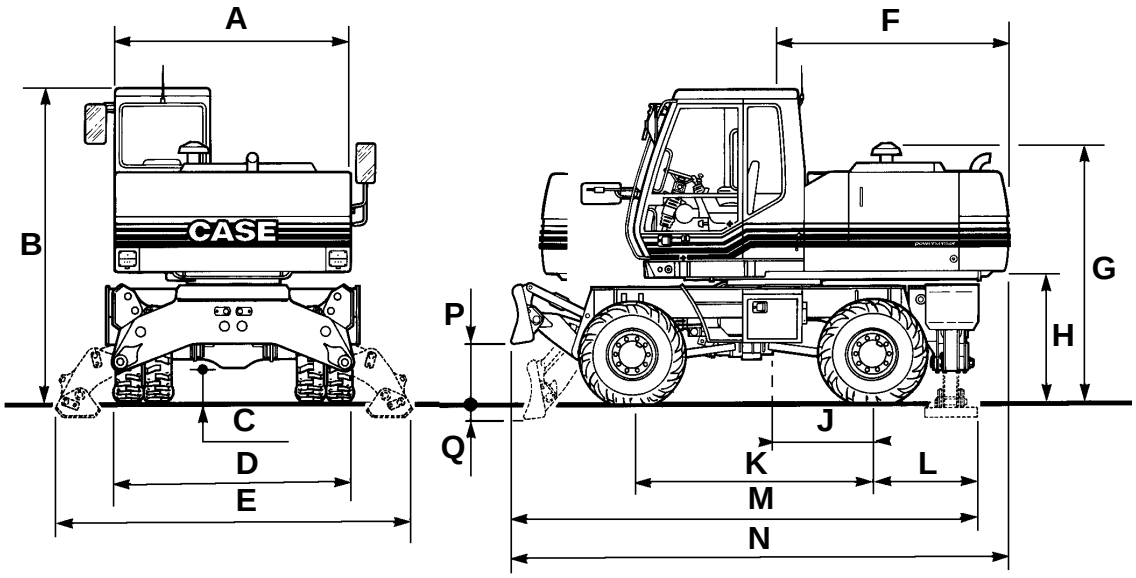


CS95N244

	788	788 "Plus"	988	988 "Plus"
A	2.44 m	2.44 m	2.44 m	2.44 m
B	3.23 m	3.23 m	3.24 m	3.25 m
C	0.34 m	0.34 m	0.33 m	0.33 m
D	2.49 m	2.49 m	2.49 m	2.49 m
E	3.70 m	3.71 m	3.70 m	3.71 m
F (radius)	2.05 m	2.08 m	2.40 m	2.45 m
G	2.67 m	2.79 m	2.66 m	2.68 m
H	1.26 m	1.26 m	1.47 m	1.26 m
J	0.95 m	0.95 m	1.03 m	1.13 m
K	2.30 m	2.30 m	2.50 m	2.60 m
L	1.07 m	1.07 m	1.07 m	1.07 m
M	4.01 m	4.04 m	4.48 m	4.53 m
N	4.07 m	4.10 m	4.50 m	4.65 m

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P2AL Version

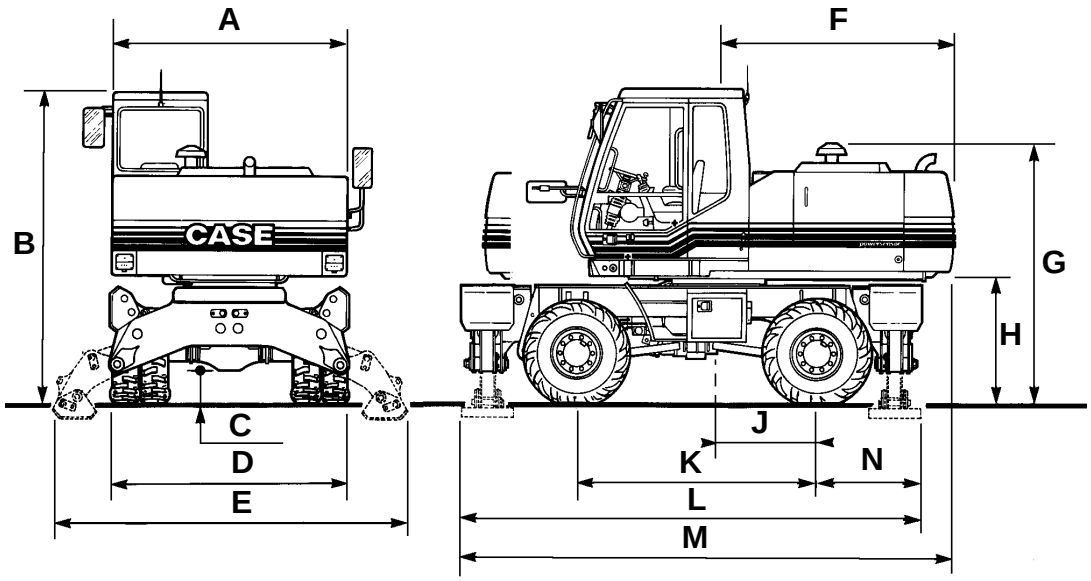


CS95N245

	788	788 "Plus"	988	988 "Plus"
A	2.44 m	2.44 m	2.44 m	2.44 m
B	3.23 m	3.23 m	3.24 m	3.25 m
C	0.34 m	0.34 m	0.33 m	0.33 m
D	2.49 m	2.49 m	2.49 m	2.49 m
E	3.70 m	3.71 m	3.70 m	3.71 m
F (radius)	2.05 m	2.08 m	2.40 m	2.45 m
G	2.67 m	2.79 m	2.66 m	2.68 m
H	1.26 m	1.26 m	1.47 m	1.26 m
J	0.95 m	0.95 m	1.03 m	1.13 m
K	2.30 m	2.30 m	2.50 m	2.60 m
L	1.07 m	1.07 m	1.07 m	1.07 m
M	4.63 m	4.70 m	4.83 m	5.00 m
N	4.65 m	4.76 m	5.12 m	5.25 m
P	0.59 m	0.52 m	0.59 m	0.49 m
Q	0.18 m	0.18 m	0.18 m	0.18 m

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P2A+2A Version

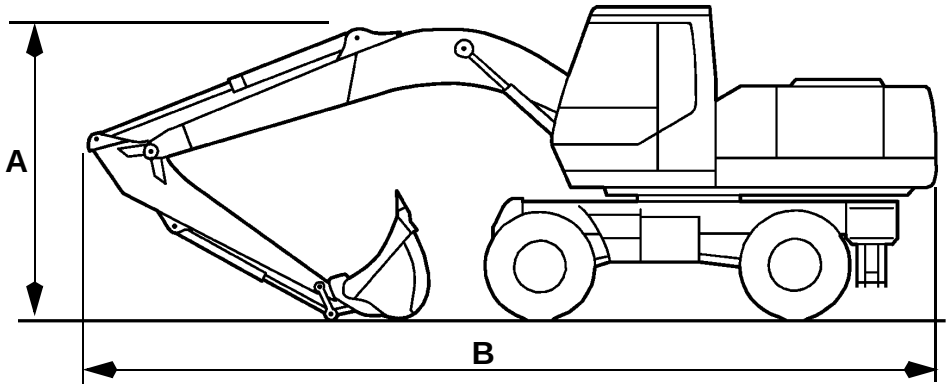


CS95N246

	788	788 "Plus"	988	988 "Plus"
A	2.44 m	2.44 m	2.44 m	2.44 m
B	3.23 m	3.23 m	3.24 m	3.25 m
C	0.34 m	0.34 m	0.33 m	0.33 m
D	2.49 m	2.49 m	2.49 m	2.49 m
E	3.70 m	3.71 m	3.70 m	3.71 m
F (radius)	2.05 m	2.08 m	2.40 m	2.45 m
G	2.67 m	2.79 m	2.66 m	2.68 m
H	1.26 m	1.26 m	1.47 m	1.26 m
J	0.95 m	0.95 m	1.03 m	1.13 m
K	2.30 m	2.30 m	2.50 m	2.60 m
L	4.55 m	4.55 m	4.75 m	4.85 m
M	4.57 m	4.60 m	5.05 m	5.09 m
N	1.07 m	1.07 m	1.07 m	1.07 m

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TRANSPORTATION OVERALL DIMENSIONS



PDH0126

NOTE: *For top of cab to ground, see "Overall dimensions".*

788

P - PL and P2A Versions

Boom	Dipper	A	B
Monoblock	1.50 m	2.85	7.85
	2.10 m	2.85	7.65
	2.65 m	3.10	7.65
Adjustable	1.50 m	3.45	7.05
	2.10 m	3.70	6.75
	2.65 m	3.85	6.65
Backhoe offset	1.50 m	2.90	7.85
	2.10 m	3.00	7.70
	2.65 m	3.15	7.65
Articulated	1.50 m	3.05	7.80
	2.10 m	3.10	7.60
	2.65 m	3.65	7.70

P2AL and P2A+2A Versions

Boom	Dipper	A	B
Monoblock	1.50 m	2.85	7.85
	2.10 m	3.10	7.60
	2.65 m	3.25	7.55
Adjustable	1.50 m	3.60	6.90
	2.10 m	3.80	6.85
	2.65 m	3.90	6.50
Backhoe offset	1.50 m	2.90	7.85
	2.10 m	3.10	7.65
	2.65 m	3.45	7.55
Articulated	1.50 m	3.05	7.80
	2.10 m	3.10	7.65
	2.65 m	3.30	7.55

NOTE: *These values are given in metres.*

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788 "Plus"

P - PL and P2A Versions

Boom	Dipper	A	B
Monoblock	1.50 m	2.65	7.60
	2.10 m	2.80	7.55
	2.65 m	3.10	7.55
Adjustable (retracted)	1.50 m	3.30	6.85
	2.10 m	3.60	6.60
	2.65 m	3.80	6.45
Backhoe offset	1.50 m	2.65	7.65
	2.10 m	2.75	7.55
	2.65 m	3.00	7.55
Articulated (retracted)	1.50 m	4.25	6.20
	2.10 m	4.20	6.00
	2.65 m	4.00	6.30

P2AL Version

Boom	Dipper	A	B
Monoblock	1.50 m	2.75	7.70
	2.10 m	3.05	7.45
	2.65 m	3.40	7.35
Adjustable (retracted)	1.50 m	3.50	6.80
	2.10 m	3.75	6.65
	2.65 m	3.95	6.45
Backhoe offset	1.50 m	2.80	7.70
	2.10 m	3.00	7.45
	2.65 m	3.45	7.35
Articulated (retracted)	1.50 m	4.25	6.10
	2.10 m	4.15	6.10
	2.65 m	4.00	6.30

P2A+2A Version

Boom	Dipper	A	B
Monoblock	1.50 m	2.70	7.65
	2.10 m	3.00	7.50
	2.65 m	3.35	7.40
Adjustable (retracted)	1.50 m	3.50	6.85
	2.10 m	3.70	6.60
	2.65 m	3.95	6.40
Backhoe offset	1.50 m	2.80	7.70
	2.10 m	2.95	7.50
	2.65 m	3.35	7.40
Articulated (retracted)	1.50 m	4.25	6.10
	2.10 m	4.15	6.05
	2.65 m	4.00	6.30

NOTE: *These values are given in metres.*

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988

P - PL and P2A Versions

Boom	Dipper	A	B
Monoblock	1.60 m	3.10	8.90
	2.10 m	3.00	8.60
	2.70 m	3.30	8.70
Adjustable	1.60 m	3.90	7.00
	2.10 m	3.95	6.85
	2.70 m	4.00	6.50
Backhoe offset	1.60 m	3.20	9.00
	2.10 m	3.30	8.70
Articulated	1.60 m	3.35	8.70
	2.10 m	3.35	8.50
	2.70 m	3.45	8.50

P2AL and P2A+2A Versions

Boom	Dipper	A	B
Monoblock	1.60 m	3.10	8.90
	2.10 m	3.00	8.60
	2.70 m	3.50	8.60
Adjustable	1.60 m	3.90	6.70
	2.10 m	4.00	6.65
	2.70 m	4.20	6.70
Backhoe offset	1.60 m	3.20	9.00
	2.10 m	3.30	8.70
Articulated	1.60 m	3.35	8.70
	2.10 m	3.35	8.50
	2.70 m	3.50	8.45

NOTE: *These values are given in metres.*

988 Plus

P - PL and P2A Versions

Boom	Dipper	A	B
Monoblock	1.60 m	3.05	9.45
	2.10 m	3.10	9.05
	2.70 m	3.40	9.05
	3.10 m	3.65	9.00
Backhoe off-set	1.60 m	3.10	9.05
	2.10 m	3.15	8.65
Articulated (retracted)	1.60 m	3.35	9.20
	2.10 m	3.30	8.80
	2.70 m	3.40	8.85
	3.10 m	3.50	8.80
Handling	4.50 m	2.60	9.60

P2A+2A Version

Boom	Dipper	A	B
Monoblock	1.60 m	3.05	9.45
	2.10 m	3.10	9.05
	2.70 m	3.40	9.05
	3.10 m	3.65	8.95
Backhoe offset	1.60 m	3.10	9.05
	2.10 m	3.65	8.95
Articulated (retracted)	1.60 m	3.35	9.20
	2.10 m	3.30	8.80
	2.70 m	3.50	8.80
	3.10 m	3.80	8.65
Handling	4.50 m	2.60	9.60

P2AL Version

Boom	Dipper	A	B
Monoblock	1.60 m	3.05	9.45
	2.10 m	3.10	9.05
	2.70 m	3.40	9.05
	3.10 m	3.75	8.90
Backhoe offset	1.60 m	3.10	9.05
	2.10 m	3.75	8.90
Articulated (retracted)	1.60 m	3.35	9.20
	2.10 m	3.30	8.80
	2.70 m	3.55	8.75
	3.10 m	3.85	8.60
Handling	4.50 m	2.60	9.60

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Section

4001

ELECTRICAL SCHEMATICS

788/988 Crawler Excavators

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SPECIFICATIONS

System voltage	24 Volts negative earth and 12 Volts negative earth
Batteries	2 x 12 Volt 120 A/hour low maintenance batteries
Alternator	BOSCH, 28 Volts, 45 Amps
Starter motor	BOSCH, 24 Volts, 4.0 kW

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SCHEMATIC SYMBOLS

A (n) Radio/housings
B (n) Indicators/pressure switches/loudspeakers/pressostats/senders/heat sender/gauge
E (n) Lighting components
F (n) Fuses
G (n) Electrical supply generators
H (n) Warning devices (visible and audible)
K (n) Relays
M (n) Motors
P (n) Instruments
R (n) Resistors/heater plugs
S (n) Switches/battery master switch
Sh (n) Shunt resistors
V (n) Diodes
X (n) Supply line connections
Y (n) Solenoid valves, solenoids

NOTE : *The (n) shows the component number.*
Example : K2 is relay N°2.

(n) Supply on printed circuit

(n) Battery terminal

(n) Printed circuit connection terminal

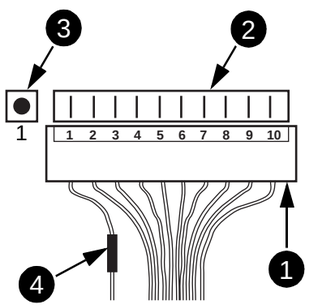
Printed circuit earth connector

A1 Instrument panel connector

1 or 1 or 1 Harness identification

1(1) or 1(1) or 1 (1) Harness identification followed by path identification number

(1) or (1) Printed circuit earth connectors



The installation position for the harness connector (1) on connector (2) of the printed circuit is identified by a red mark (3) followed by the figure 1 on the printed circuit. This identification corresponds to the position of path 1 of the harness connector (1). This position is completed when the path 1 line is shown by a red ring (4) located on line 1 wire, or by red paint marking.

Local earth

Wire number

NC Closed circuit

NO Open circuit

Intersection of two wires with connection point

Intersection of two wires without connection point

Link with following plate

Link with preceding plate

Return to another plate with the same letter

Bulbs

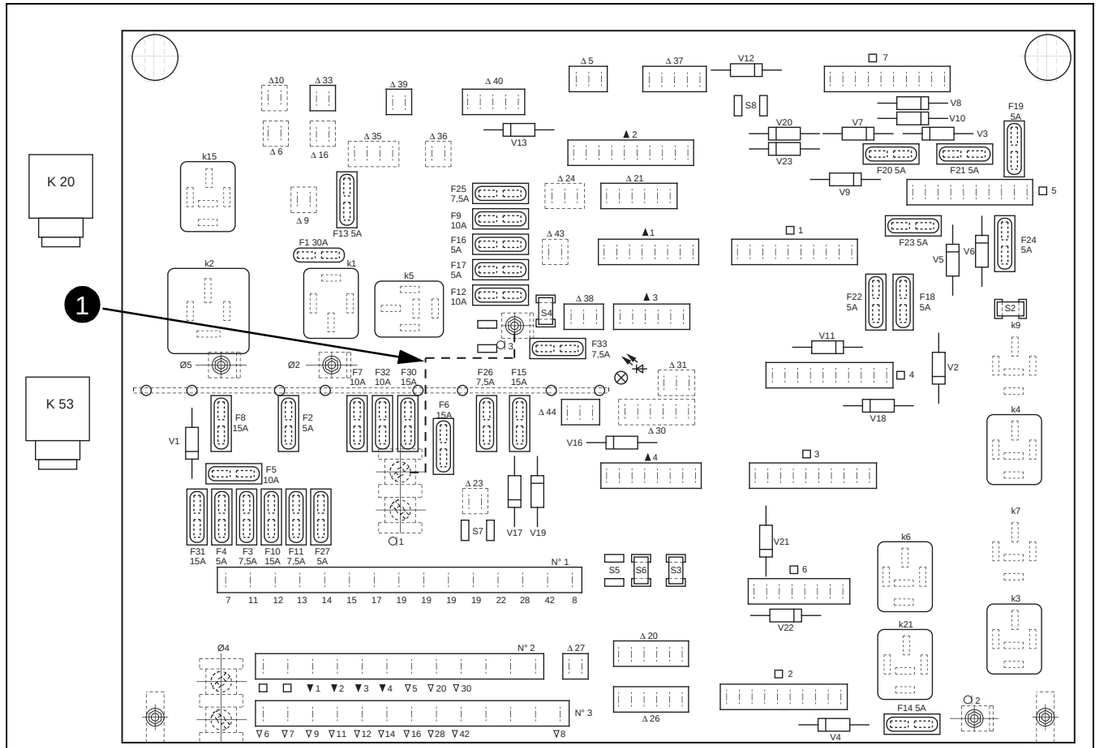
Test bulb

Light emitting diode (LED)

Regulator

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DESCRIPTION OF ELECTRICAL CABINET PRINTED CIRCUIT (STANDARD EQUIPMENT)



PDH0231

- ○ **1** 24 Volts supply before contact
- ○ **2** 12 Volts supply before contact (radio)
- ○ **3** Not used
- **F2** 5A Fuse, starter switch
- **F3** 7.5A Fuse, instrument panel
- **F4** 5A Fuse, driving position lighting, horn relay
- **F6** 15A Fuse, upperstructure working lights
- **F7** 10A Fuse, horn
- **F8** 15A Fuse, upperstructure power point
- **F9** 10A Fuse, windshield washer, windshield wiper
- **F10** 15A Fuse, ventilation, heater, Fuel heater
- **F11** 7.5A Fuse, cigar lighter
- **F12** 10A Fuse, pilot safety
- **F15 F16** Not used
- **F31** 15A Fuse, windshield wiper intermittent action
- **F32** 10A Fuse, not used
- **F33** 7.5A Fuse, supply to electronic control box
- **H14** Diagnostic LED

- **K1** Starter motor relay
- **K2** General contact relay
- **K3** Hourmeter relay
- **K4** Electrical control box supply relay
- **K5** Horn relay
- **K6** Upperstructure and attachment working light relay
- **K20** Windshield wiper intermittent action
- **K21** LH control arm pilot safety relay
- **K53** Fuel heater relay
- **Sh2, Sh3, Sh4** Shunt
- **Sh1, Sh5, Sh6, Sh7, Sh8** Not used
- **V1** General contact diode
- **Ø 2** Starter connection
- **Ø 4** Printed circuit earth
- **Ø 5** Upperstructure power line connection

- **1** Electronic control box supply wire

ELECTRICAL CABINET PRINTED CIRCUIT WIRING (STANDARD EQUIPMENT)

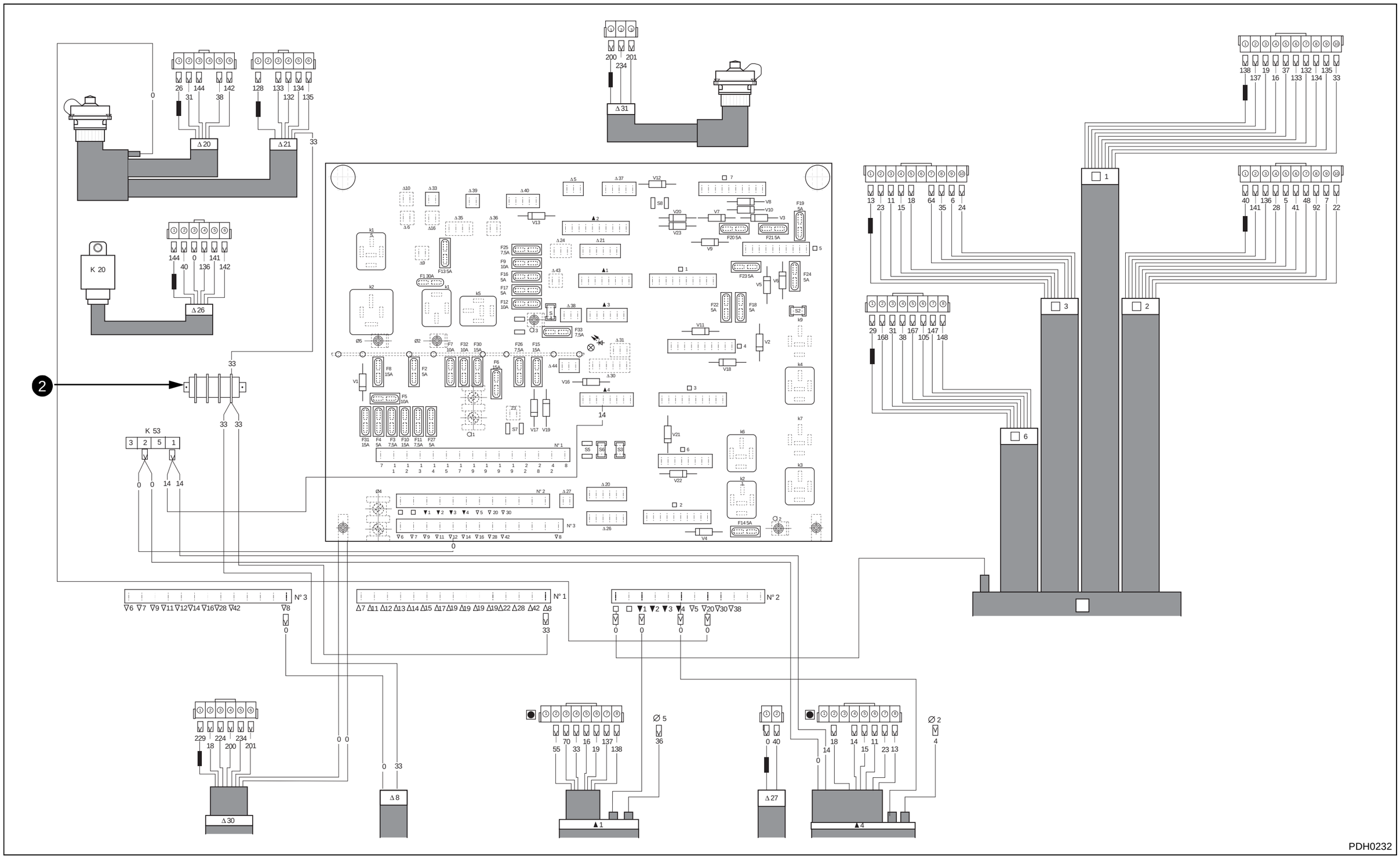
2 4 terminal bar

- □ **1** Harness 10-way connector, floor harness
- □ **2** Harness 10-way connector, floor harness
- □ **3** Harness 10-way connector, floor harness
- □ **6** Harness 8-way connector, floor harness

- △ **8** Safety clips, upperstructure working light
- △ **20** Harness, 6-way connector, cab power connection
- △ **21** Harness, 6-way connector, cab power connection
- △ **26** Harness, 6-way connector, windshield wiper (K20 intermittent action)
- △ **27** Harness, 2-way connector, windshield washer
- △ **30** Harness, 6-way connector, electronic control box
- △ **31** Harness, 3-way connector, troubleshooting test socket

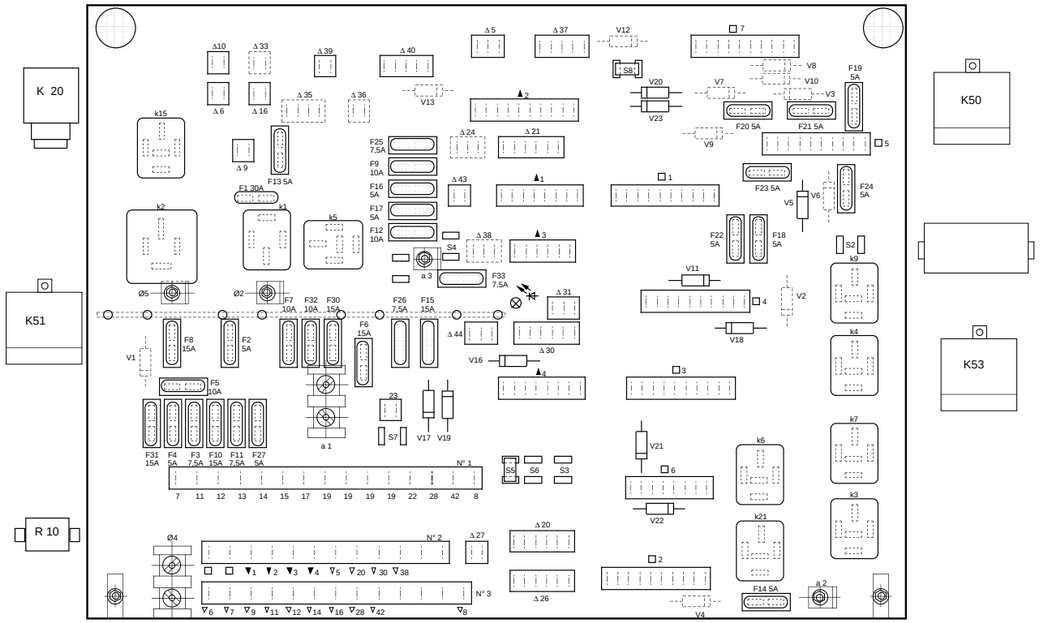
- ▲ **1** Harness, 8-way connector, common harness
- ▲ **4** Harness, 8-way connector, engine

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DESCRIPTION OF ELECTRICAL CABINET PRINTED CIRCUIT (OPTIONAL EQUIPMENT)



PDH0245

F1 30A Fuse, cold start assistance (optional)
F5 10A Fuse, working lights and rotary light relay (specific to certain countries)
F13 5A Fuse, overload indicator (optional)
F14 5A Fuse, radio (optional)
F27 5A Fuse, adjustable or articulated boom (optional)
F30 15A Fuse, cab working lights (optional)
K15 Cold start assistance relay (optional)
K50 Adjustable boom raising height limiter relay (optional)
K51 Adjustable boom lowering range limitation relay
K53 Fuel heater relay
R10 0.85 ohm Resistor
V4 Radio LED (optional)
V21 Overload indicator lamp (optional)
V22 Rotary light indicator lamp (specific to certain countries)

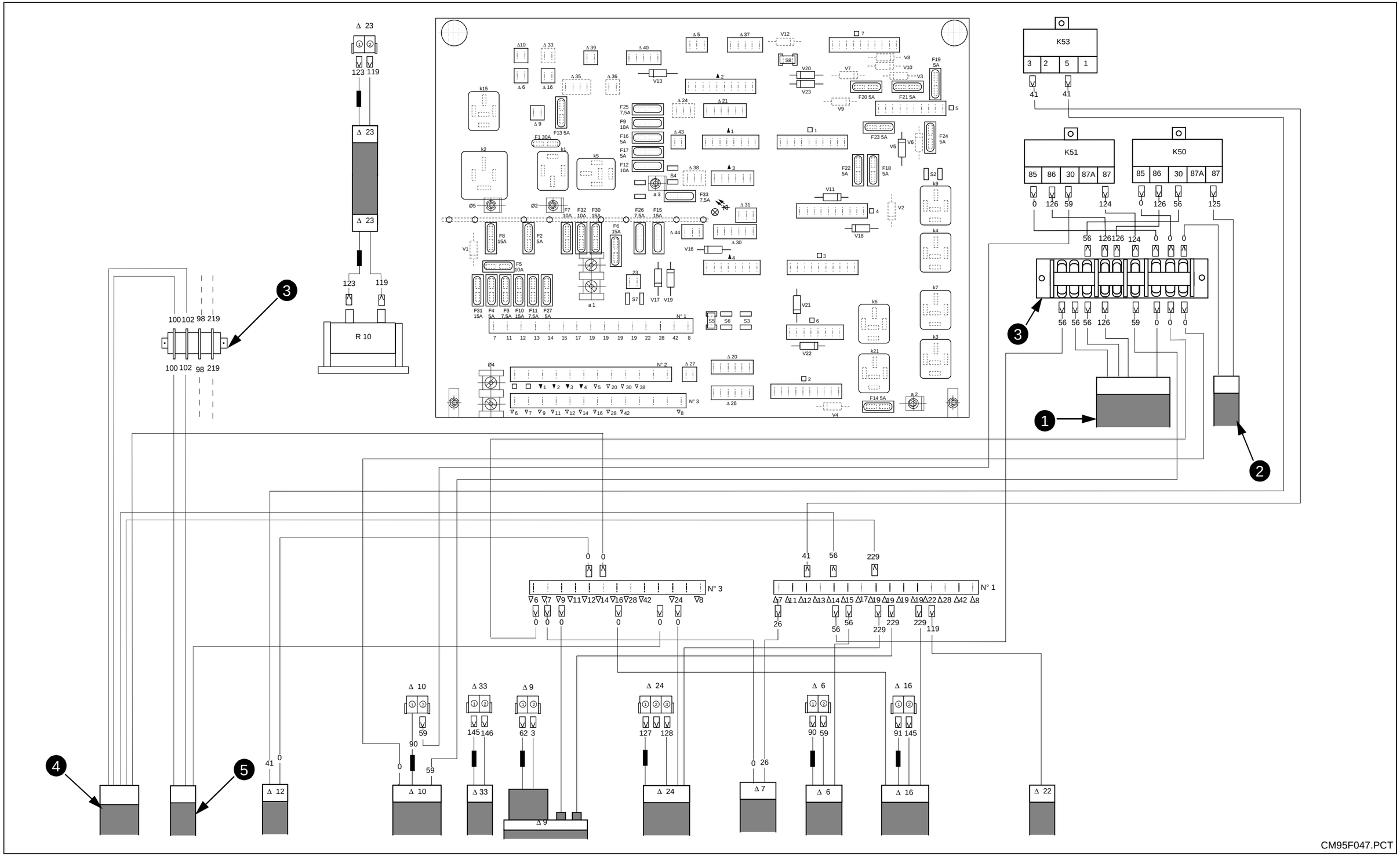
ELECTRICAL CABINET PRINTED CIRCUIT WIRING (OPTIONAL EQUIPMENT)

1 Adjustable boom raising and lowering range limitation detector cable (specific to certain countries)
2 Harness, adjustable boom raising and lowering range limitation electro-control (specific to certain countries)
3 Bars (specific to certain countries)
4 Harness quick-attach control
5 Harness quick-attach control switch

▽ Cable adjustable boom raising height limiter (to terminal N°3)

△**6** Harness, adjustable boom, (specific for Germany)
△**7** Harness, hood lighting (optional)
△**9** Harness, cold start assistance (optional)
△**10** Harness, adjustable boom, (specific for Germany)
△**12** Harness, fuel heating device (optional)
△**15** Wire, adjustable boom raising and lowering range limitation (specific to certain countries)
△**16** Harness, overload indicator (optional)
△**22** Harness, cold start assistance glow plug (optional)
△**23** Harness, cold start assistance heating element (optional)
△**24** Harness, cab front working lights and rear working light (optional)
△**33** Harness, overload indicator (optional)

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PRINTED CIRCUIT SCHEMATIC GUIDE

ↀ **1** 24 volts supply before contact
ↀ **2** 12 volts supply before contact radio
ↀ **3** Electronic control box 24 volt supply and troubleshooting test socket

F1 30A Fuse, cold start assistance (optional)
F2 5A Fuse, starter switch
F3 7.5A Fuse, instrument panel
F4 5A Fuse, cab lighting, horn relay
F5 10A Fuse, working lights and rotary light relay (specific to certain countries)
F6 15A Fuse, uperstructure working lights
F7 10A Fuse, horn
F8 15A Fuse, upperstructure power point
F9 10A Fuse, windshield wiper, windshield washer
F10 15A Fuse, ventilation, heater, fuel oil heating
F11 7.5A Fuse, cigarette lighter
F12 10A Fuse, pilot safety
F13 5 A Fuse, overload indicator (optional)
F14 5A Fuse, radio (optional)
F15 Not used
F16 Not used
F17 Not used
F18 Not used
F19 Not used
F20 Not used
F21 Not used
F22 Not used
F23 Not used
F24 Not used
F25 Not used
F26 Not used
F27 5A Fuse, adjustable and articulated boom (optional)
F30 15A Fuse, cab working lights (optional)
F31 15A Fuse, Windshield wiper intermittent action
F32 10A Fuse, Not used
F33 7.5A Fuse, electronic control box

H14 Diagnostic LED

K1 Starter motor
K2 24V, 50A General contact relay
K3 Hourmeter relay
K4 Electrical control box supply relay
K5 Horn relay
K6 Working light relay
K7 Not used
K9 Not used
K10 Not used
K15 Cold start assistance relay (optional)
K20 Windshield wiper intermittent action
K21 Left-hand control arm pilot safety relay
K52 Not used

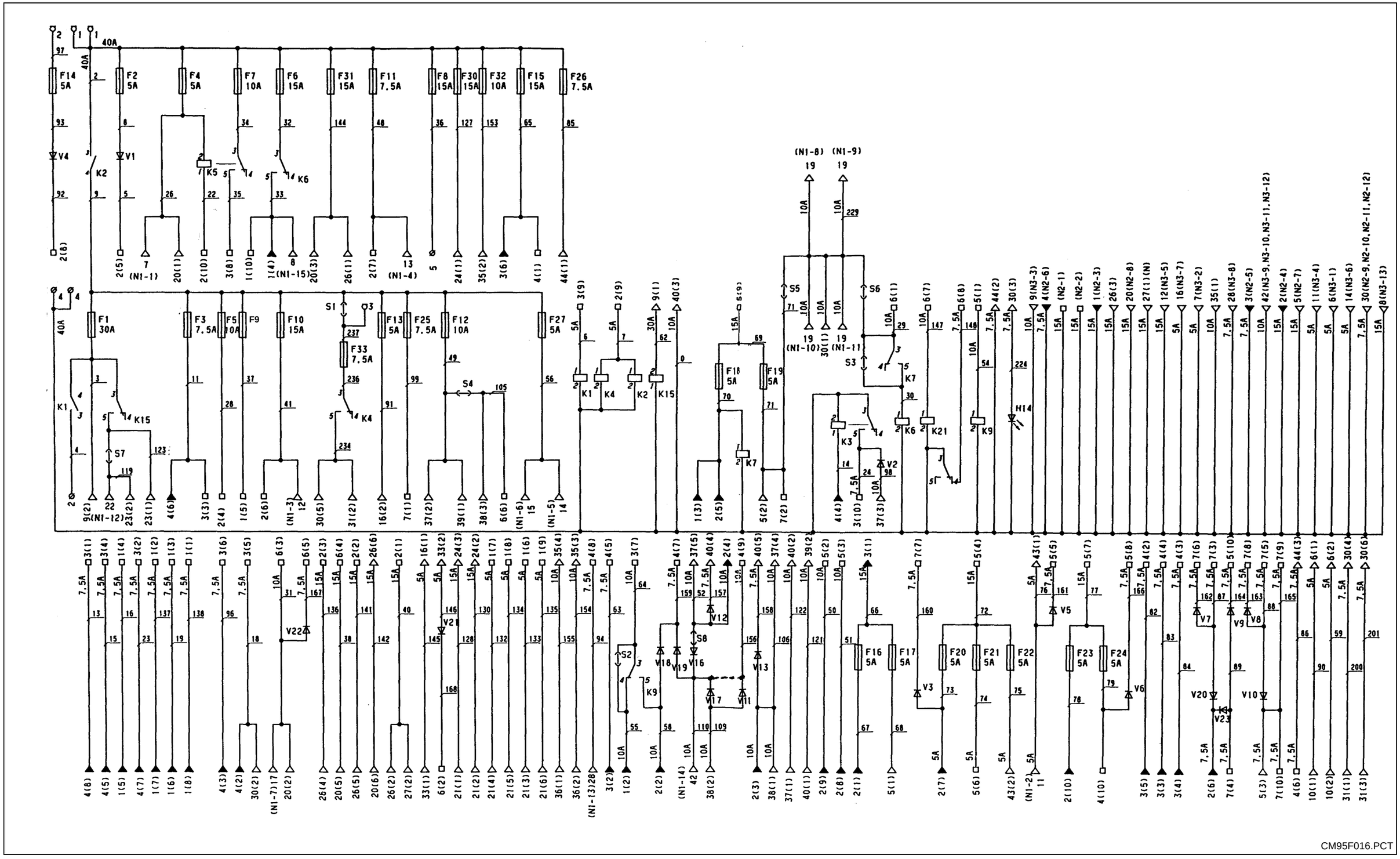
Sh2 Shunt
Sh3 Shunt
Sh4 Shunt
Sh6 Shunt
Sh1, Sh5, Sh7, Sh8 Not used

V1 General contact diode
V2 Diode, Not used
V3 Not used
V4 Radio diode (optional)
V5 Diode, Not used
V6 Diode, Not used
V7 Diode, Not used
V8 Diode, Not used
V9 Diode, Not used
V10 Diode, Not used
V11 Diode, Not used
V16, V17, V18, V19 Diode, Not used
V20 Diode, Not used
V21 Overload indicator diode (optional)
V22 Rotary light diode (specific to certain countries)
V23 Diode, Not used

Ø 2 Starter connection
Ø 4 Printed circuit earth
Ø 5 Upperstructure power line connection

□ △ ▽ ▲▼ : see page 4

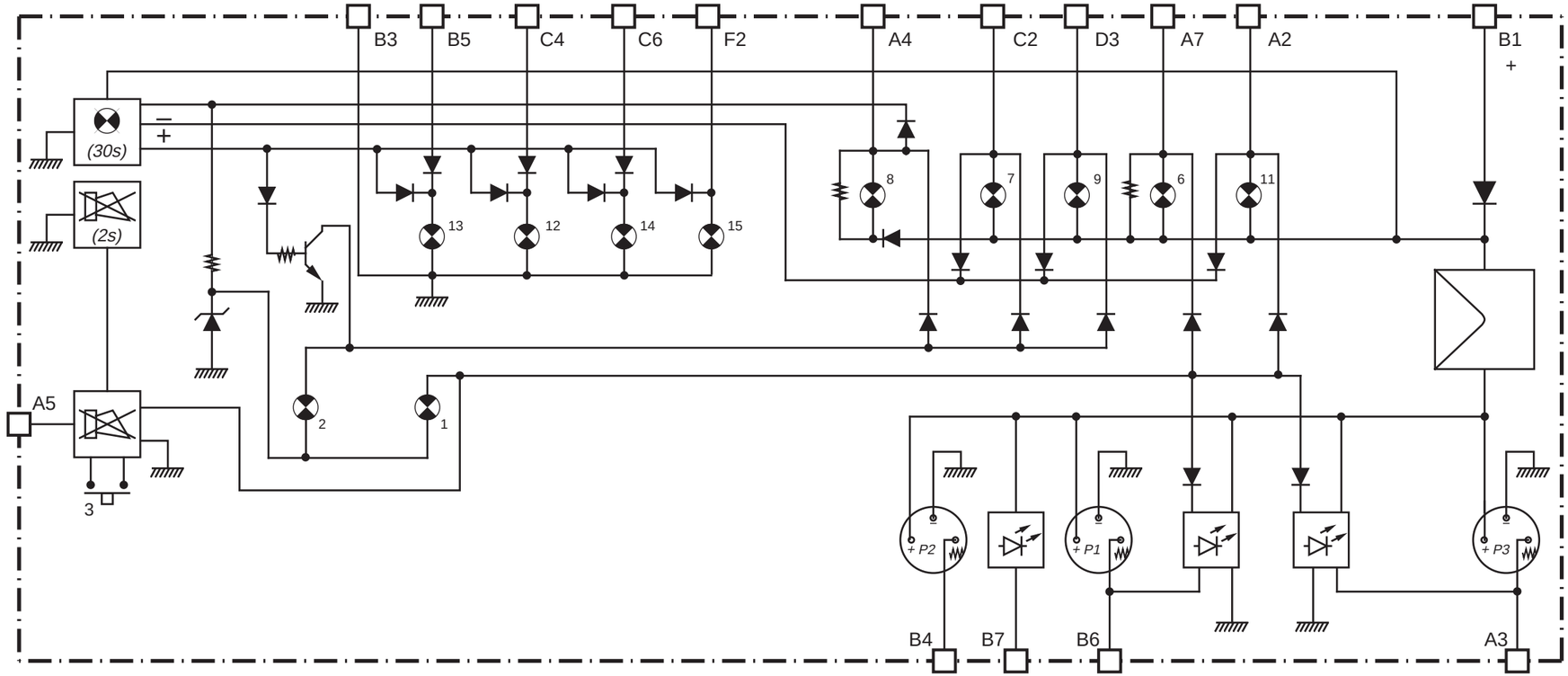
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P10 INSTRUMENT PANEL ELECTRICAL SCHEMATIC (PLATE 1)



A2 Minimum pilot pressure red warning lamp connector
A3 Hydraulic oil temperature indicator connector
A4 Battery charge red warning lamp connector
A5 Audible warning red, orange indicator lamp connector
A7 Engine oil pressure red warning lamp connector

B1 24 Volt supply
B3 Earth
B4 Fuel level indicator connector
B5 Gauge lighting connector
B6 Engine coolant temperature indicator connector
B7 Fuel minimum level connector

C2 Air filter restriction red warning lamp connector
C4 Overload indicator orange warning lamp connector (optional)
C6 Connector Not used

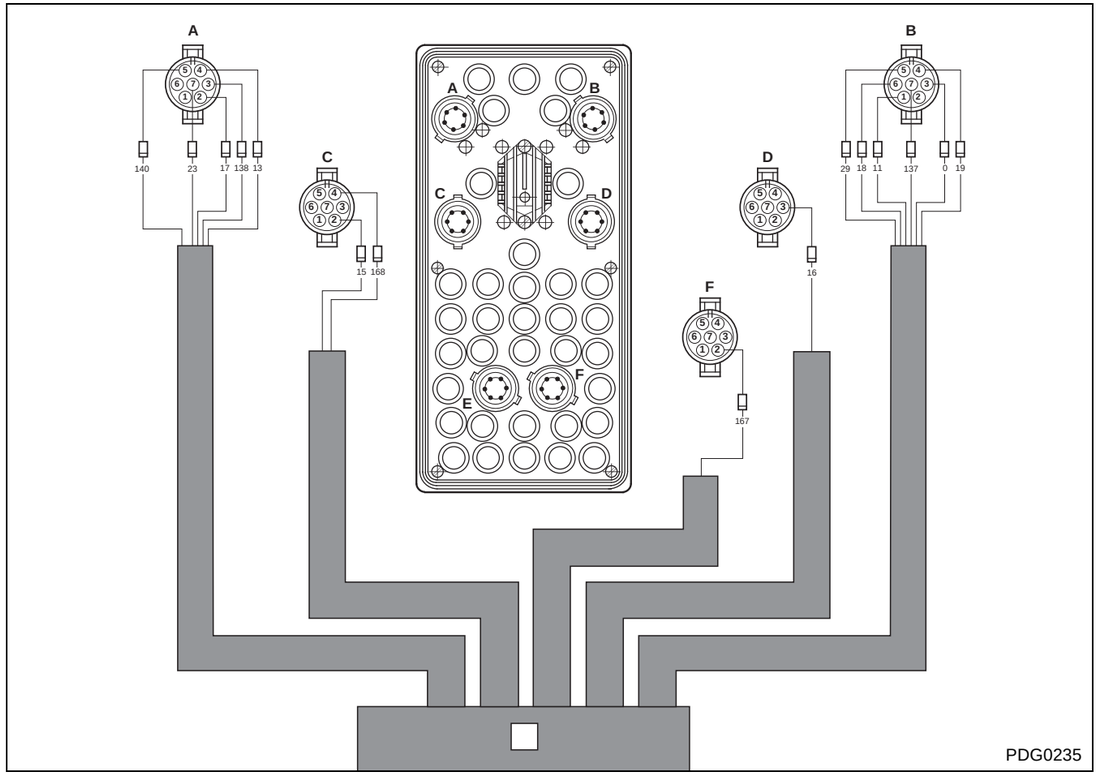
D3 Hydraulic oil filter restriction red warning lamp connector
F2 Rotary light orange indicator lamp connector (optional)

P1 Engine coolant temperature indicator
P2 Fuel level gauge
P3 Hydraulic oil temperature indicator

1 Stop alarm red warning lamp
2 Alarm orange warning lamp
3 Audible warning stop push button
6 Engine oil pressure red warning lamp
7 Air filter restriction red warning lamp
8 Battery charge red warning lamp
9 Hydraulic oil filters restriction red warning lamp
11 Minimum pilot pressure red warning lamp
12 Overload indicator orange warning lamp (optional)
13 Indicator lighting lamp
14 Not used
15 Rotary light orange indicator lamp (optional)

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INSTRUMENT PANEL WIRING



A 7-way connector : minimum pilot pressure red warning lamp, hydraulic oil temperature indicator, battery charge red warning lamp, audible warning cut-out push button, engine oil pressure red warning lamp, alarm orange warning lamp, stop alarm red warning lamp.

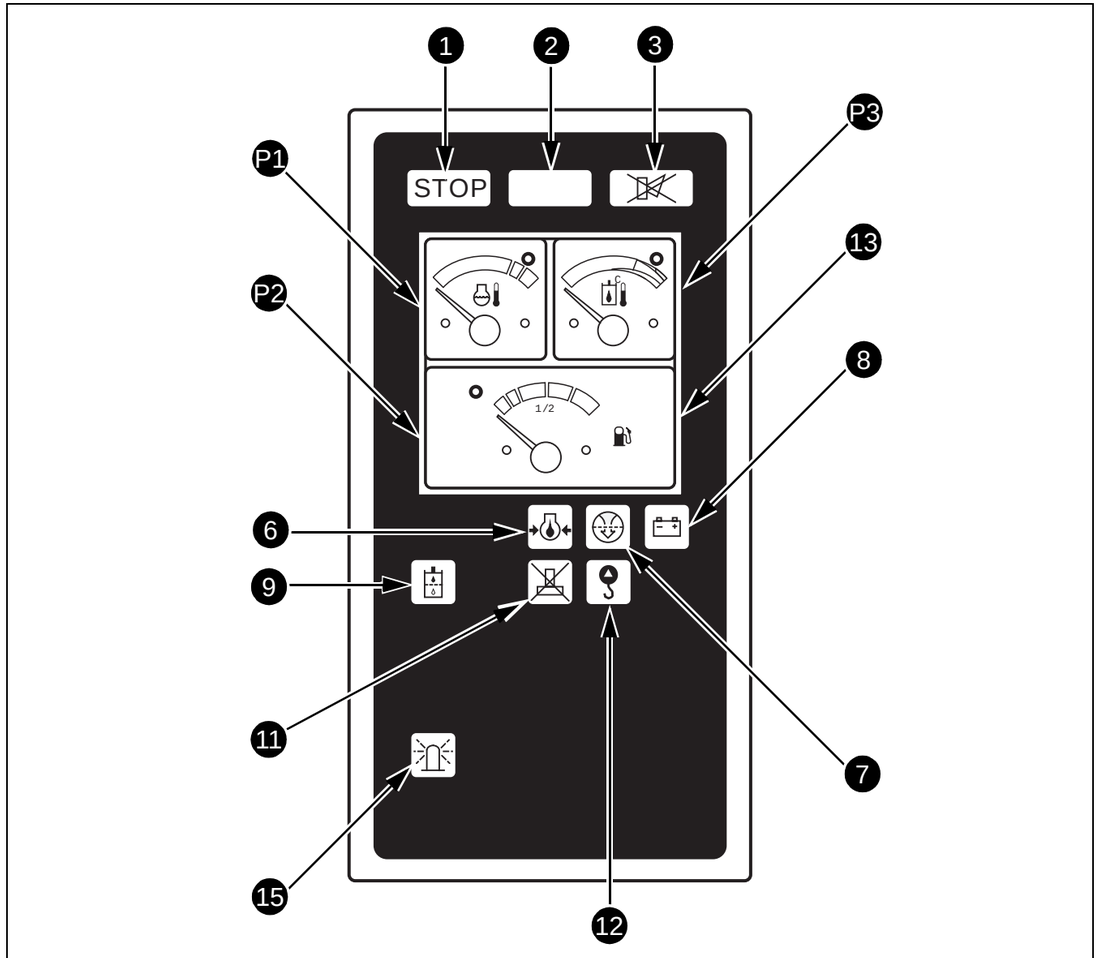
B 7-way connector : 24 Volt supply, earth, fuel level gauge, indicator lighting, engine coolant temperature indicator.

C 7-way connector : air filter restriction red warning lamp, overload indicator orange warning lamp (optional).

D 7-way connector : hydraulic oil filter restriction red warning lamp.

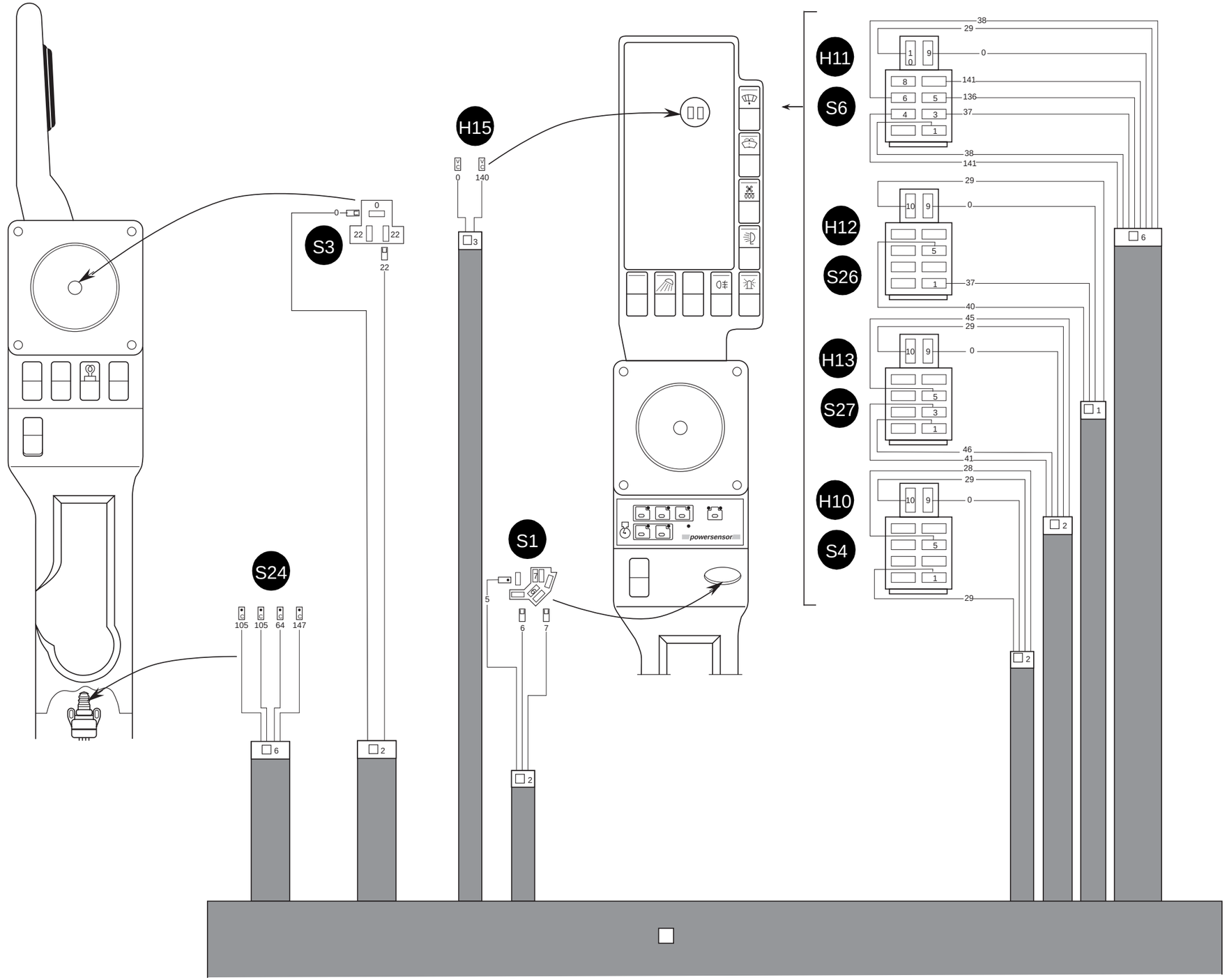
F 7-way connector : rotary light orange indicator lamp (optional).

INSTRUMENT PANEL (FRONT FACE)



1 Stop alarm red warning lamp
2 Alarm orange warning lamp
3 Audible warning cut-out push button
6 Engine oil pressure red warning lamp
7 Air filter restriction red warning lamp
8 Battery charge red warning lamp
9 Hydraulic oil filter restriction red warning lamp
11 Minimum pilot pressure red warning lamp
12 Overload indicator orange warning lamp (optional)
13 Indicator lighting lamp
15 Rotary light orange indicator lamp (optional)

P1 Engine coolant temperature indicator
P2 Fuel level indicator
P3 Hydraulic oil temperature indicator


H15
S3
S24
S1
H11
S6
H12
S26
H13
S27
H10
S4
powersensor
0
140
105
105
64
147
22
22
38
29
0
141
136
37
40
45
46
41
28

PDH0236

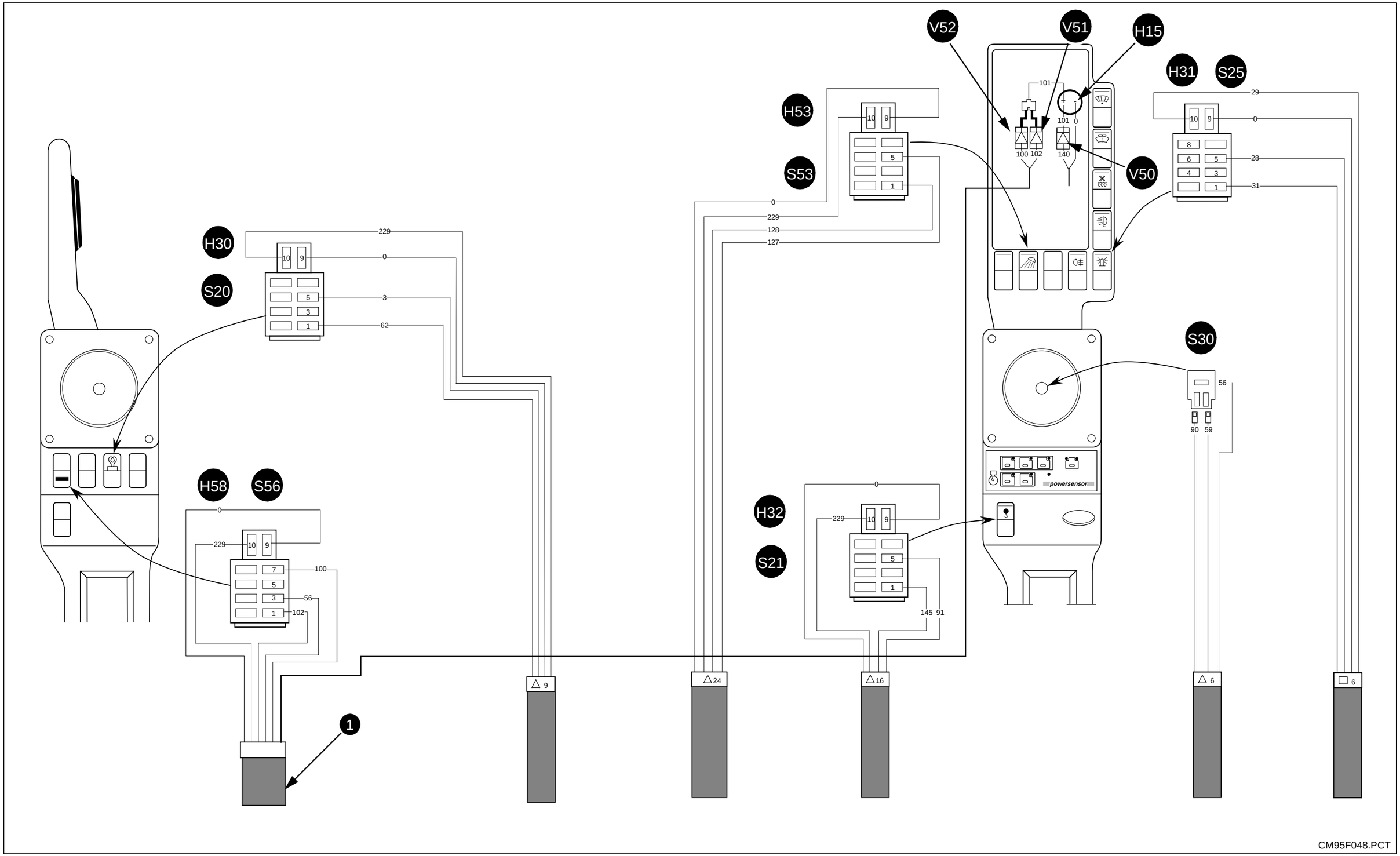
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RIGHT-HAND CONTROL ARM, LEFT-HAND CONTROL ARM (STANDARD EQUIPMENT)

H10 Working light switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lighting
H13 Heater blower switch lighting
H15 Instrument panel audible warning
S1 Key switch
S3 Horn switch
S4 Working light switch
S6 Windshield wiper switch
S22 Control panel (see Section 4002)
S24 Pilot safety switch
S26 Windshield washer switch
S27 Heater blower switch

□ Floor harness

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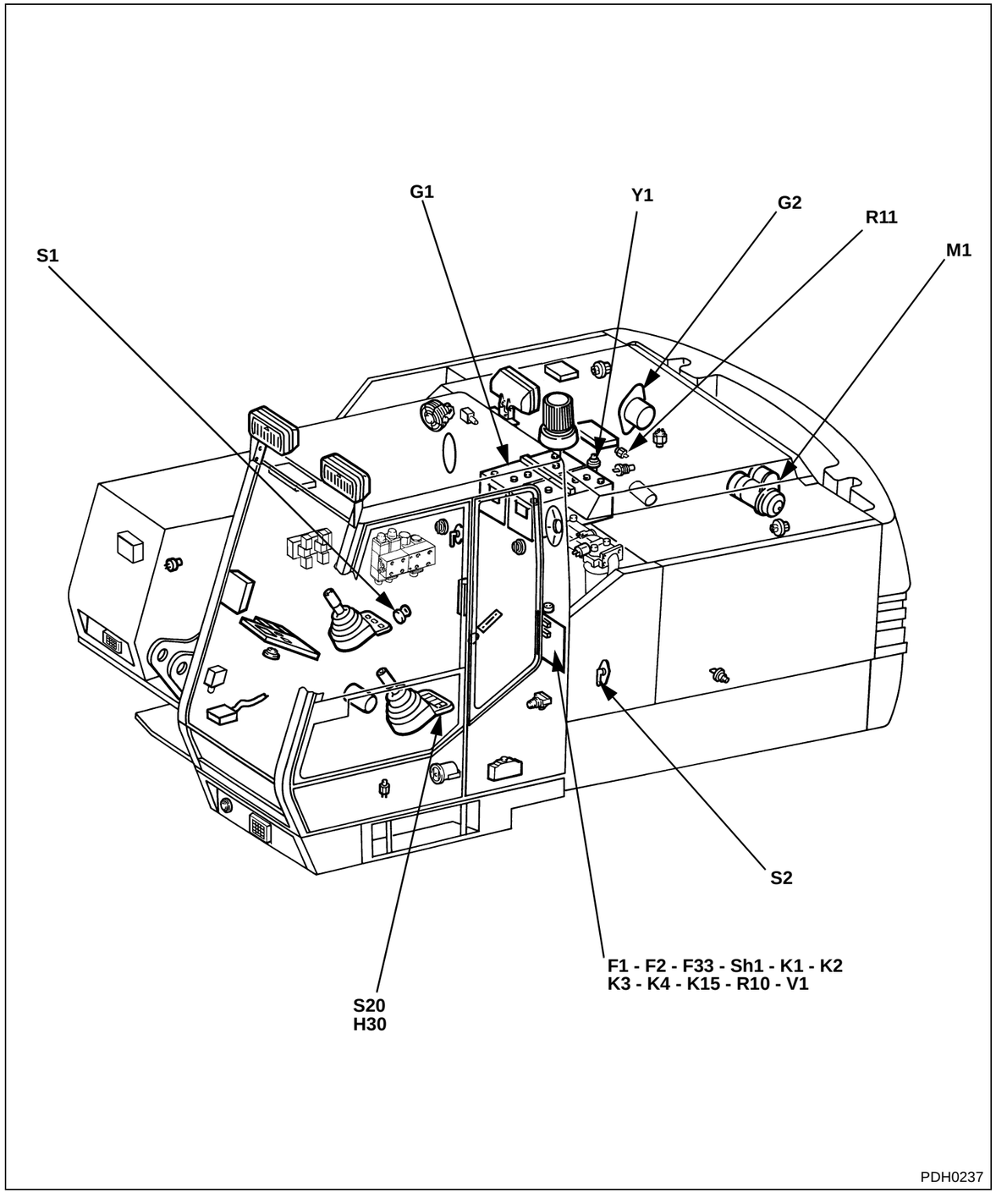
RIGHT-HAND AND LEFT-HAND CONTROL ARM WIRING (OPTIONAL EQUIPMENT)

H30 Cold start assistance switch lighting (optional)
H31 Rotary light switch lighting (optional)
H32 Overload indicator switch lighting (optional)
H53 Front working light switch lighting (optional)
H58 Quick-attach switch lighting (optional)
H15 Audible alarm
S20 Cold start assistance switch (optional)
S21 Overload indicator switch (optional)
S25 Rotary light switch (optional)
S30 Adjustable or articulated boom switch
S53 Front working light switch (optional)
S56 Quick-attach control switch (optional)
V50 Quick-attach diode (optional)
V51 Quick-attach diode (optional)
V52 Quick-attach diode (optional)
1 Quick-attach harness (optional)

□ **6** Rotary light harness (optional)

△ **6** Adjustable boom control harness (specific to certain countries)
△ **9** Cold start assistance harness (optional)
△ **16** Overload indicator harness (optional)
△ **24** Front working lights, rear working light harness (optional)

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ELECTRICAL SCHEMATIC (PLATE 2)

ELECTRICAL CABINET

F1 30A Fuse, cold start assistance
F2 5A Fuse, starter switch
F33 7.5A Fuse, supply to electronic control box
K1 Starter motor relay
K2 General contact relay 24 Volts, 50A
K3 Hourmeter relay
K4 Electronic control box supply relay
K15 Cold start assistance relay
R10 0.85 Ohm Resistor
Sh1 Shunt not used
V1 General contact diode

FLOOR

H30 Cold start assistance switch lighting (optional)
S1 Key switch
S20 Cold start assistance momentary switch (optional)

□ △ ▽ ▲ : see page 4.

UPPERSTRUCTURE

G1 Batteries
S2 Battery master switch

ENGINE

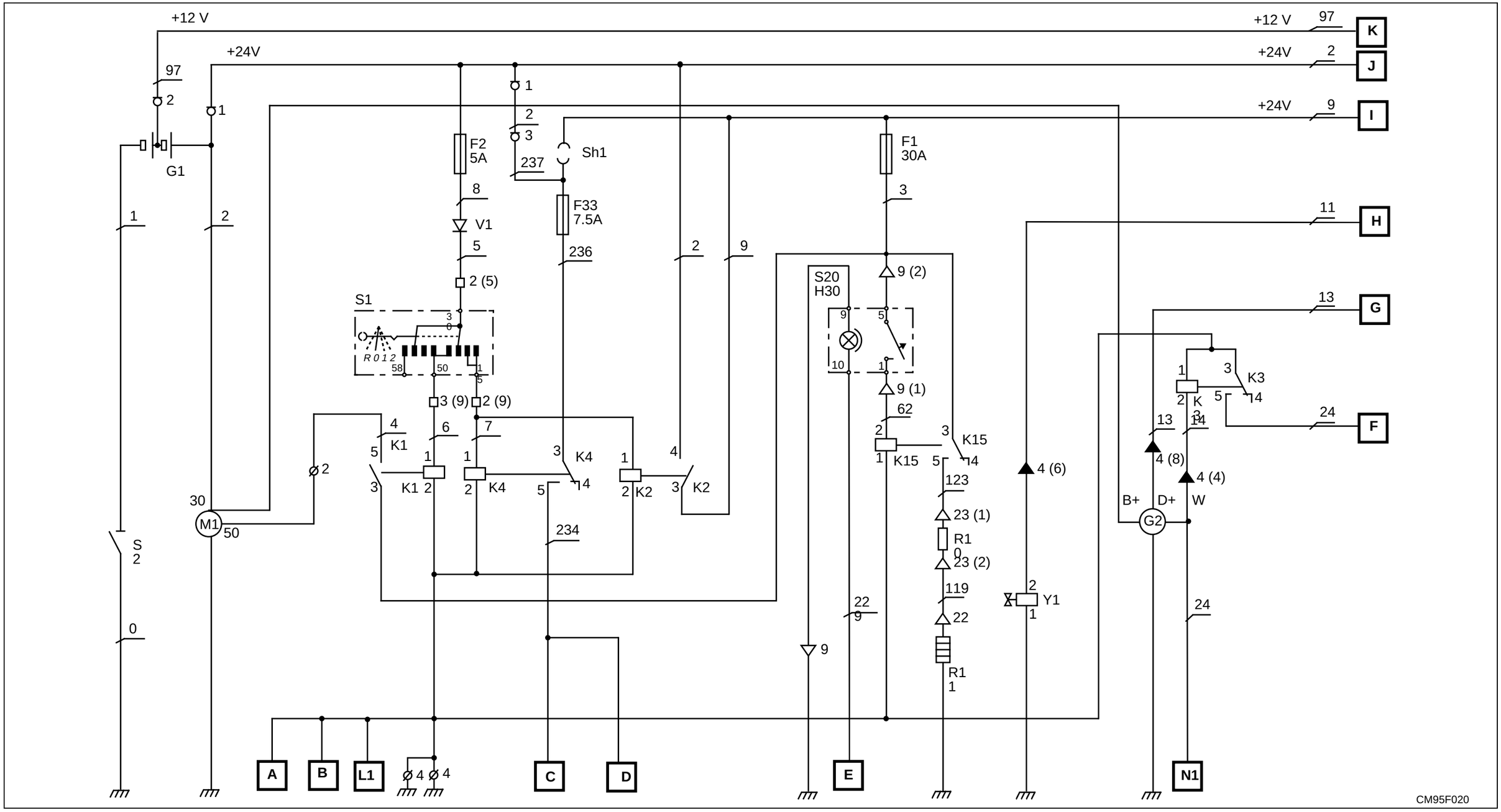
G2 Alternator
M1 Starter motor
R11 Cold start assistance glow plug
Y1 Engine shut-down solenoid valve

WIRING CONNECTIONS BETWEEN SCHEMATICS

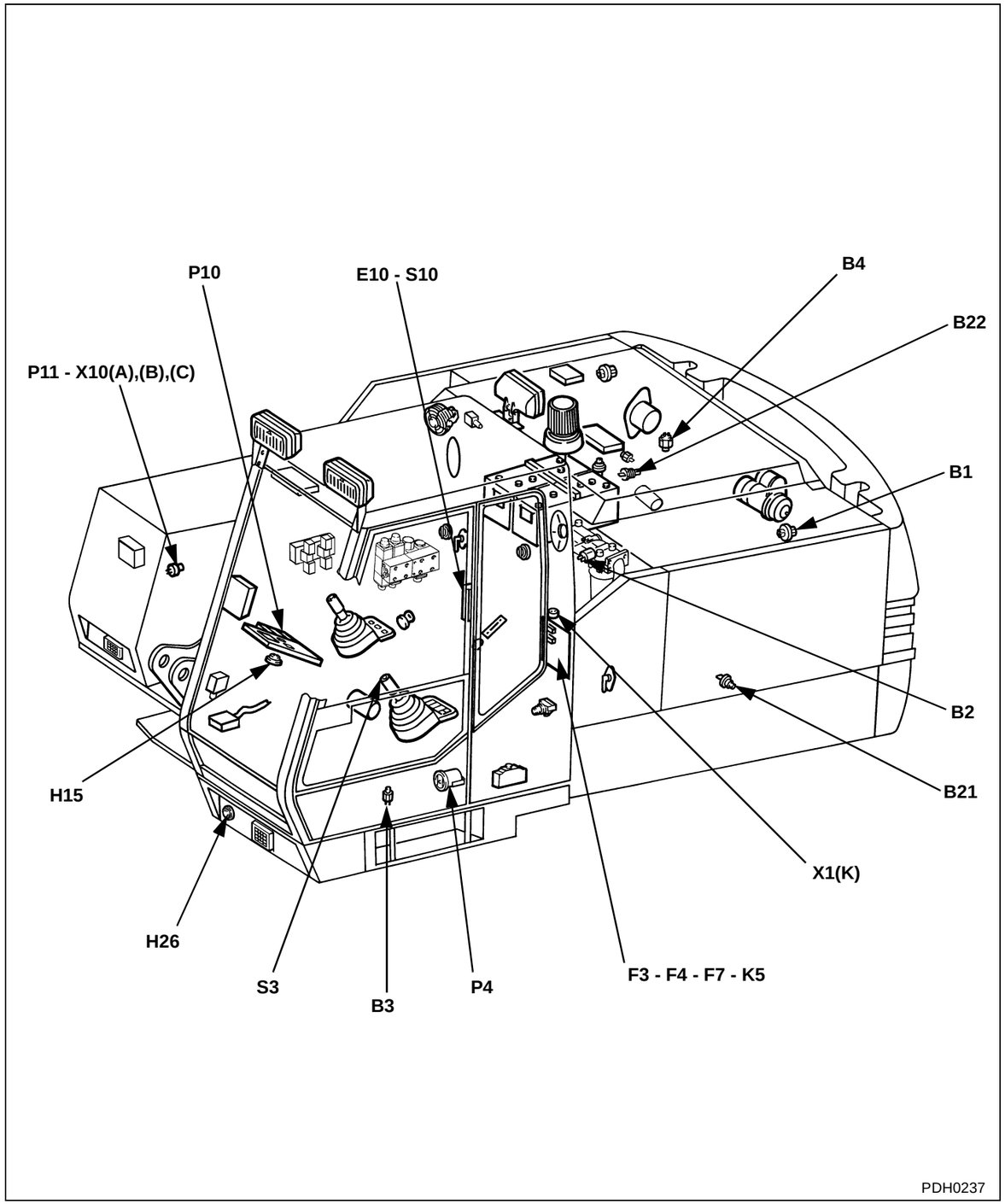
A	See schematic plate 6 page 24	**H**	See schematic plate 3 page 18
B	See schematic plate 4 page 20	**I**	See schematic plate 3 page 18
C	See schematic plate 7 page 26	**J**	See schematic plate 3 page 18
D	See schematic plate 7 page 26	**K**	See schematic plate 5 page 22
E	See schematic plate 4 page 20	**L1**	See schematic plate 7 page 26
F	See schematic plate 3 page 18	**N1**	See schematic plate 6 page 24
G	See schematic plate 3 page 18		

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BATTERY MASTER SWITCH | BATTERIES MOTOR STARTER | CONTACT SWITCH BATTERY RELAY | DIAGNOSTIC SOCKET | ELECTRONIC BOX | THERMOSTART COLD START ASSISTANCE | ENGINE SHUT-DOWN CONTROL | ALTERNATOR



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ELECTRICAL SCHEMATIC (PLATE 3)

INSTRUMENT PANEL

P10 Instrument panel (See schematic plate 1)

ELECTRICAL CABINET

F3 7.5A Fuse, instrument panel
F4 5A Fuse, cab lighting, horn relay
F7 10A Fuse, horn
K5 Horn relay

CAB

E1 Cab lighting
S10 Cab lighting switch
X1(K) Cab/cab floor, cab lighting connector

□△▼▲ : see page 4.

FLOOR

B3 Pilot pressure pressostat
H15 Instrument panel audible warning
P4 Hourmeter
S3 Horn relay

UPPERSTRUCTURE

B1 Air filter restriction pressostat
B2 Hydraulic oil filter restriction pressostat
B21 Hydraulic oil temperature sensor
H26 Horn
P11 Fuel level indicator
X10 (A),(B),(C) Fuel level indicator connectorsl

ENGINE

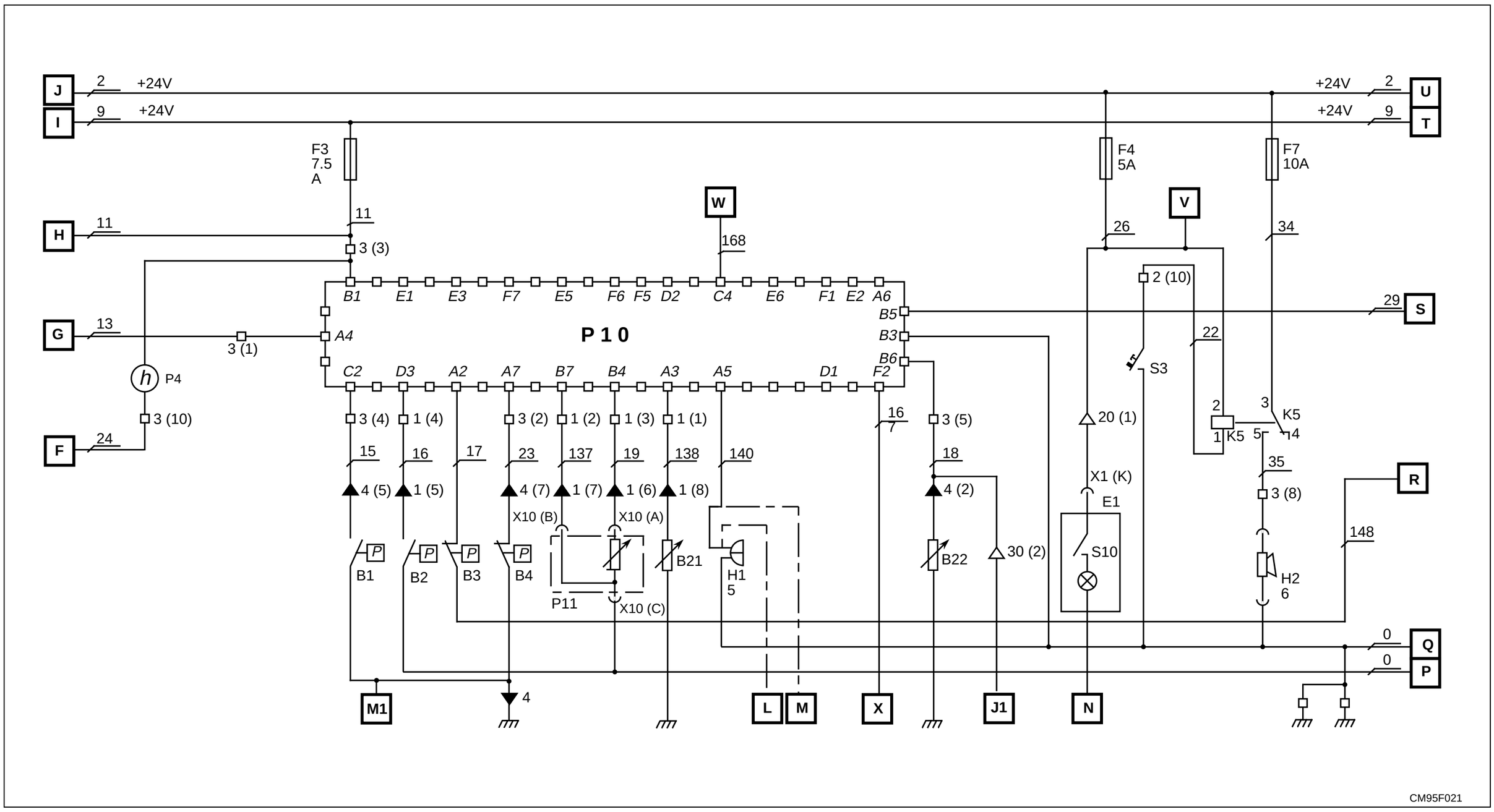
B4 Engine oil pressure pressostat
B22 Engine coolant temperature sensor

WIRING CONNECTION BETWEEN SCHEMATICS

F	See schematic plate 2 page 16	M	See schematic plate 5 page 22	T	See schematic plate 4 page 20
G	See schematic plate 2 page 16	N	See schematic plate 4 page 20	U	See schematic plate 4 page 20
H	See schematic plate 2 page 16	P	See schematic plate 4 page 20	V	See schematic plate 5 page 22
I	See schematic plate 2 page 16	Q	See schematic plate 4 page 20	W	See schematic plate 5 page 22
J	See schematic plate 2 page 16	R	See schematic plate 6 page 24	X	See schematic plate 3 page 20
L	See schematic plate 5 page 22	S	See schematic plate 4 page 20	J1	See schematic plate 7 page 26
				M1	See schematic plate 6 page 24

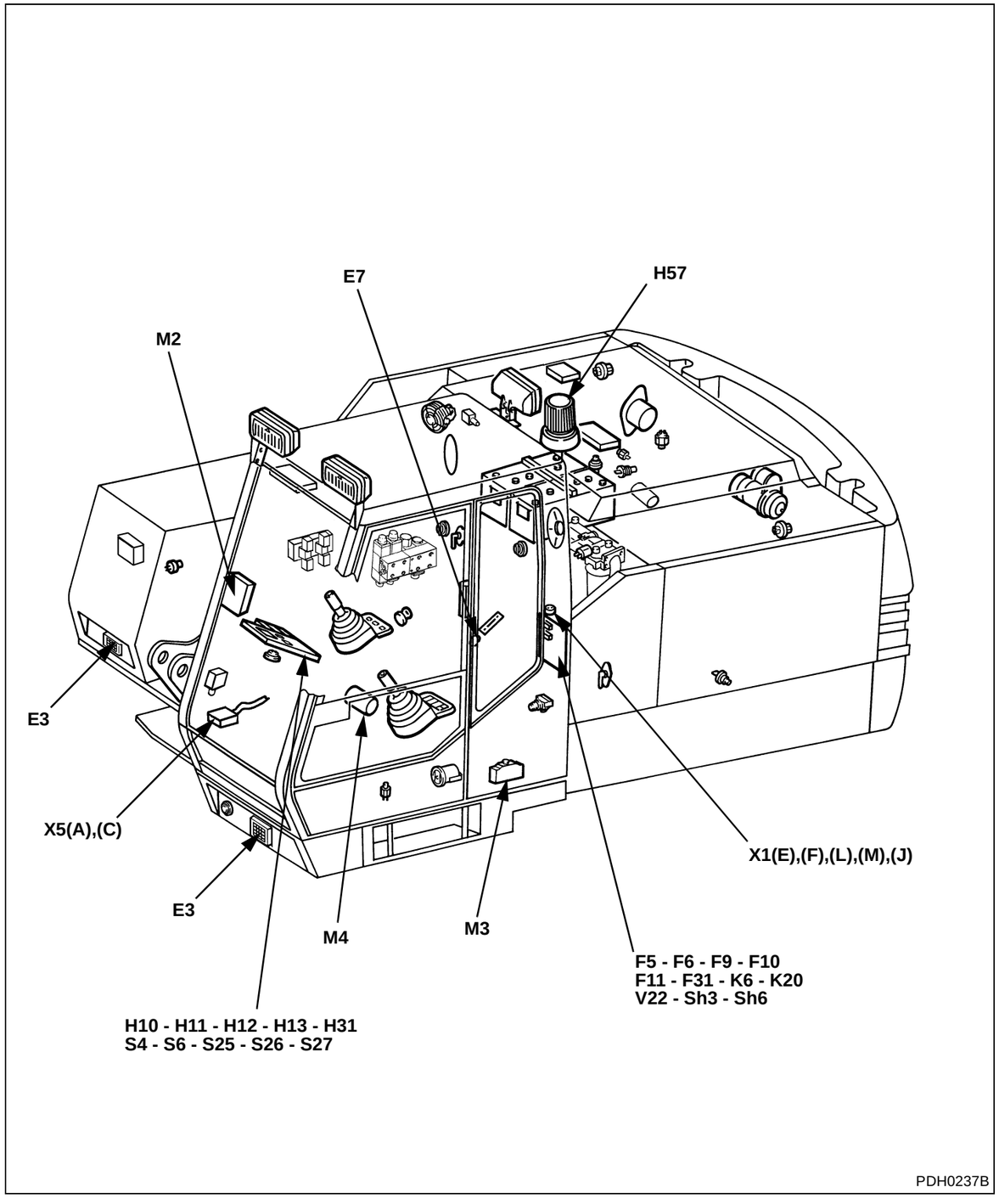
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HOURMETER	INSTRUMENT PANEL									ENGINE TEMPERATURE	CAB LIGHTING	HORN
	BATTERY CHARGE WARNING LAMP	AIR FILTER RESTRICTION	HYDR. OIL FILTER RESTRICT.	PILOT PRESSURE	ENGINE OIL PRESSURE	FUEL RESERVE WARNING LIGHT	HYDRAULIC OIL TEMPERATURE	INSTRUMENT PANEL AUDIBLE ALARM				



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ELECTRICAL SCHEMATIC (PLATE 4)

INSTRUMENT PANEL

H10 Working light switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lighting
H13 Heater blower switch lighting
H31 Rotary light switch lighting (optional)
S4 Working light switch
S6 Windshield wiper switch
S25 Rotary light switch (optional)
S26 Windshield washer switch
S27 Heater blower switch

ELECTRICAL CABINET

F5 10A Fuse, working light, rotary light relay (optional)
F6 15A Fuse, upperstructure working lights
F9 10A Fuse, windshield washer, windshield wiper
F10 15A Fuse, ventilation, heater
F11 7.5A Fuse, cigarette lighter
F31 15A Fuse, windshield wiper intermittent action
K6 Working light relay
K20 Windshield wiper intermittent action
Sh3 Shunt
Sh6 Shunt
V22 Rotary light indicator lamp (optional)
1 Strip

□ △ ▽ ▲ ▼: see page 4.

WIRING CONNECTION BETWEEN SCHEMATICS

B	See schematic plate 2 page 16
E	See schematic plate 2 page 16
N	See schematic plate 2 page 16
P	See schematic plate 3 page 18
Q	See schematic plate 3 page 18
S	See schematic plate 3 page 18
T	See schematic plate 3 page 18
U	See schematic plate 3 page 18
X	See schematic plate 3 page 18
Y	See schematic plate 6 page 24
Z	See schematic plate 5 page 22
A1	See schematic plate 6 page 24
B1	See schematic plate 5 page 22
C1	See schematic plate 5 page 22
D1	See schematic plate 5 page 22
E1	See schematic plate 6 page 24
F1	See schematic plate 5 page 22
K1	See schematic plate 2 page 16
P1	See schematic plate 5 page 22

CAB

H57 Rotary light (optional)
M2 Windshield wiper motor
E : Blue
J : White
L : Grey
M : Black
X1 (F) Rotary light cab floor/cab connector (optional)
X1 (E), (L), (M), (J) Windshield wiper motor cab floor/cab connector

FLOOR

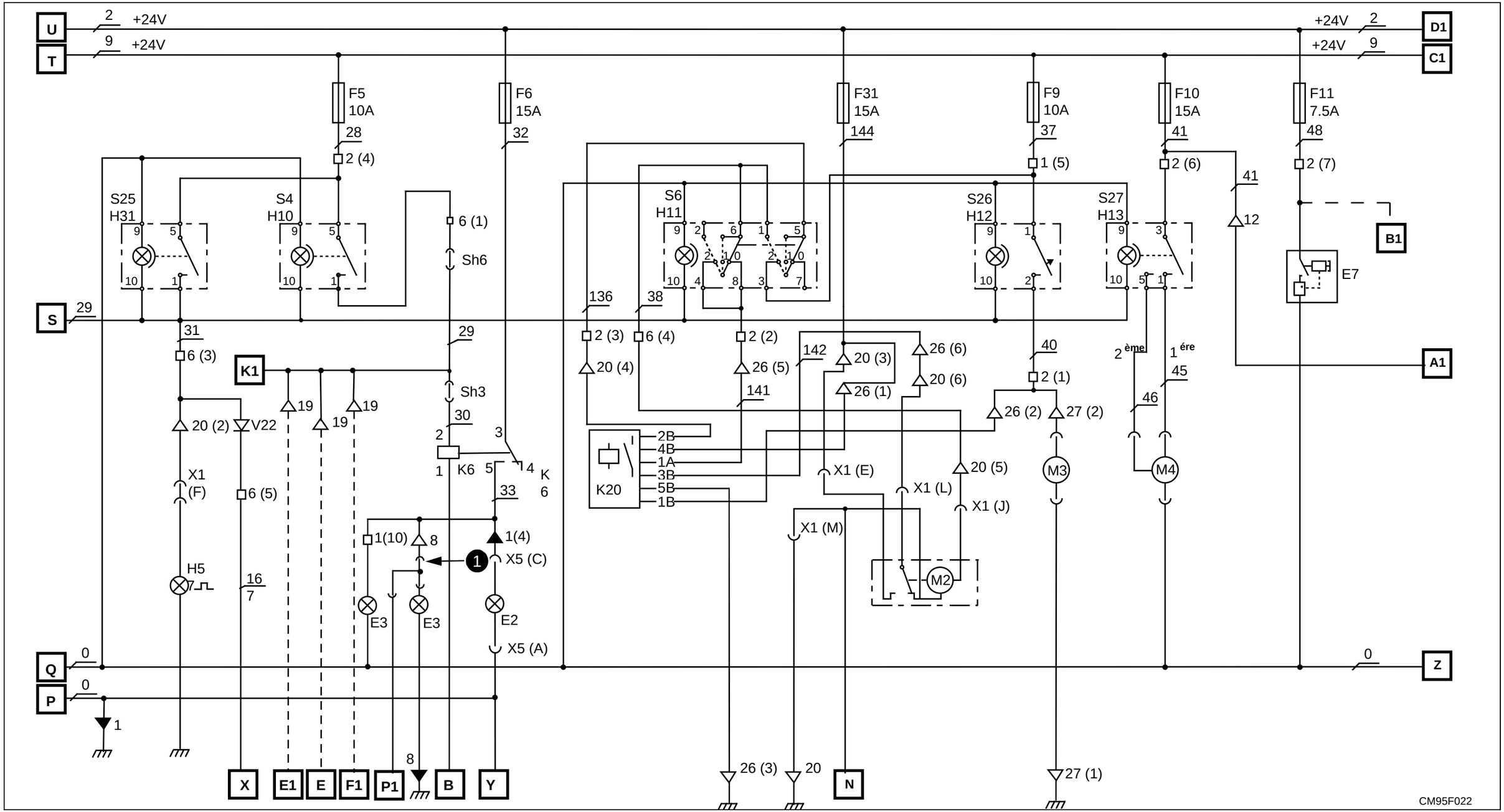
E7 Cigarette lighter
M3 Windshield washer motor
M4 Heater blower motor

UPPERSTRUCTURE

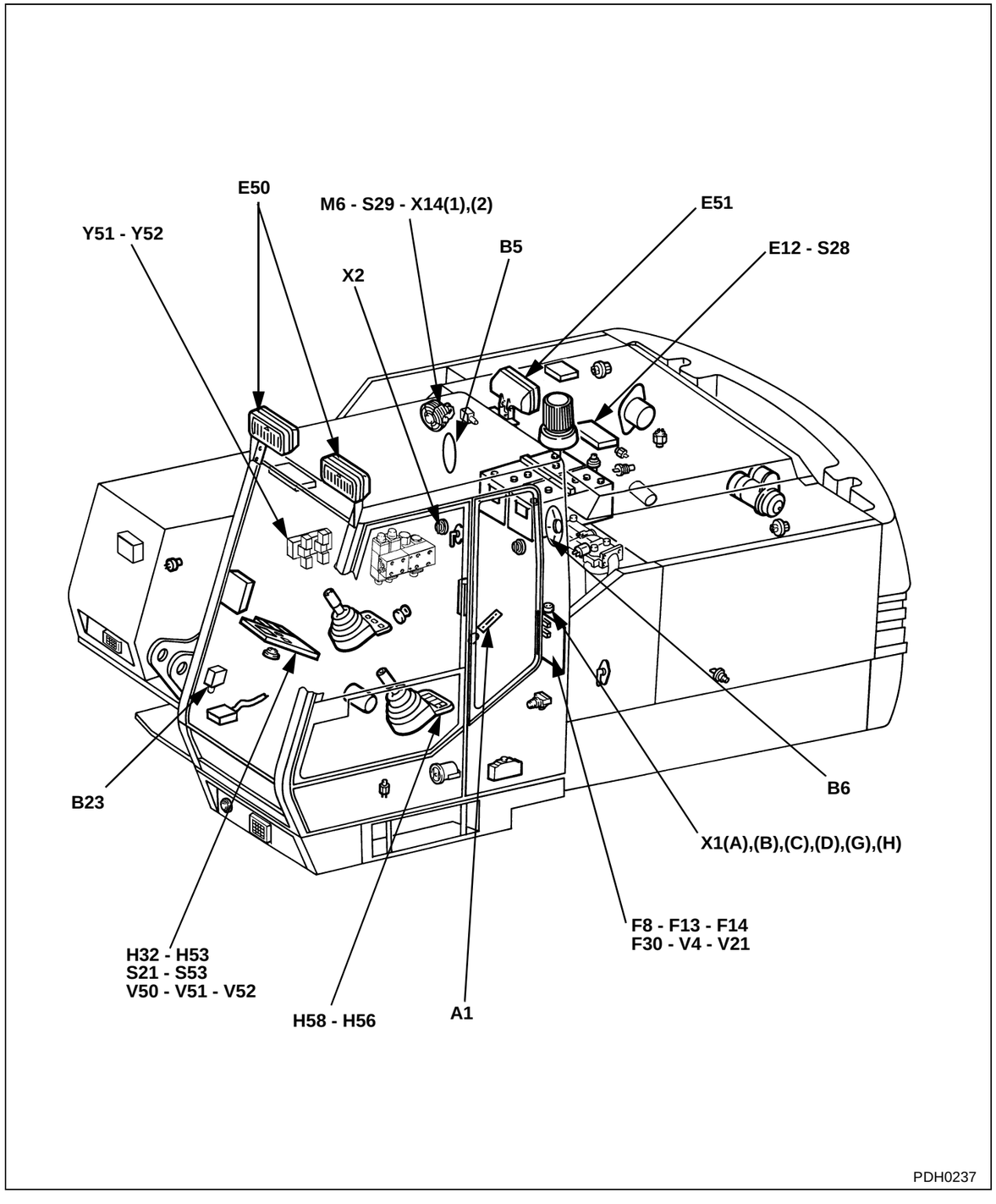
E2 Attachment working light (on boom)
E3 Upperstructure working light
X5 (A), (C) Attachment working light connector

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ROTATING LIGHT (OPTIONAL) | WORKING LIGHTS: UPPERSTRUCTURE | ATTACHMENT | WINDSHIELD WIPER | WINDSHIELD WASHER | BLOWER HEATER AIR CONDITIONING | CIGARETTE LIGHTER



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ELECTRICAL SCHEMATIC (PLATE 5)

INSTRUMENT PANEL

F8 15A Fuse, upperstructure power line connection
F13 5A Fuse, overload indicator (optional)
F14 5A Fuse, radio
F30 15A Fuse, cab working lights (optional)
V4 Radio diode (optional)
V21 Overload indicator diode (optional)

INSTRUMENT PANEL

H32 Overload indicator switch lighting (optional)
S21 Overload indicator switch (optional)

FLOOR

A1 Radio (optional)
H53 Front working light switch lighting (optional)
H58 Quick-attach control switch lighting (optional)
S53 Front working light switch (optional)
S56 Quick-attach control switch (optional)
V50 Quick-attach diode (optional)
V51 Quick-attach diode (optional)
V52 Quick-attach diode (optional)
1 4 terminal bar

□ △ ▽ ▲ : voir page 4.

CAB

B5 RH loudspeaker (optional)
B6 LH loudspeaker (optional)
E50 Front working lights (optional))
E51 Rear working light (optional)
M6 Blower motor (optional)
S29 Blower switch (optional)
X1(A),(B),(C),(D) RH and LH loudspeaker connector (optional)
X1(H),(G) Front working light, rear working light connectors (optional)
X14 (1),(2) Blower motor connectors (optional)

UPPERSTRUCTURE

B23 Overload indicator pressostat on boom foot (optional)
X2 Upperstructure power line connection
Y51 Quick attach solenoid valve (optional)
Y52 Quick-attach solenoid valve (optional)

ENGINE

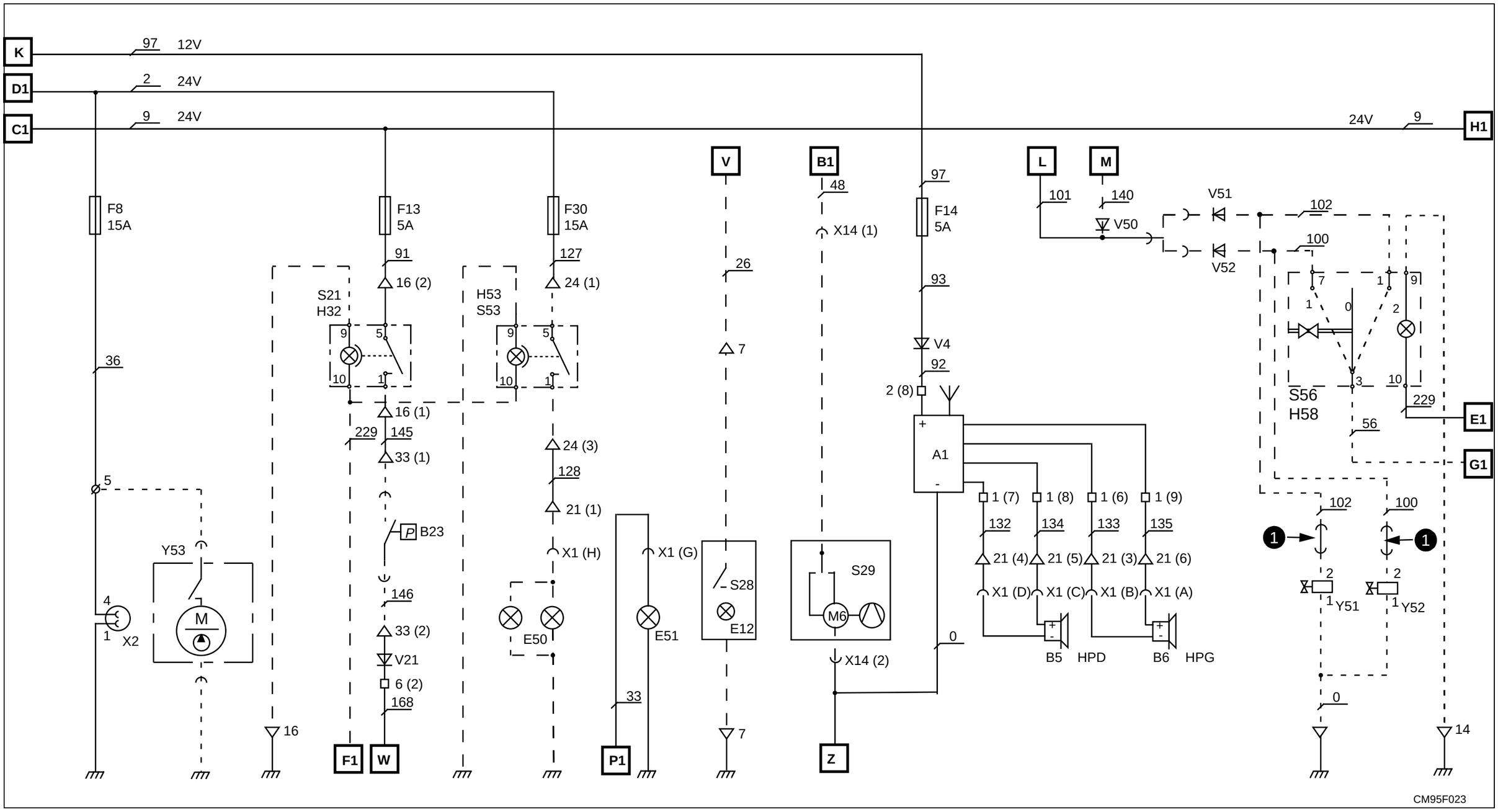
E12 Engine compartment light (optional)
S28 Engine compartment lighting switch (optional)

WIRING CONNECTION BETWEEN SCHEMATICS

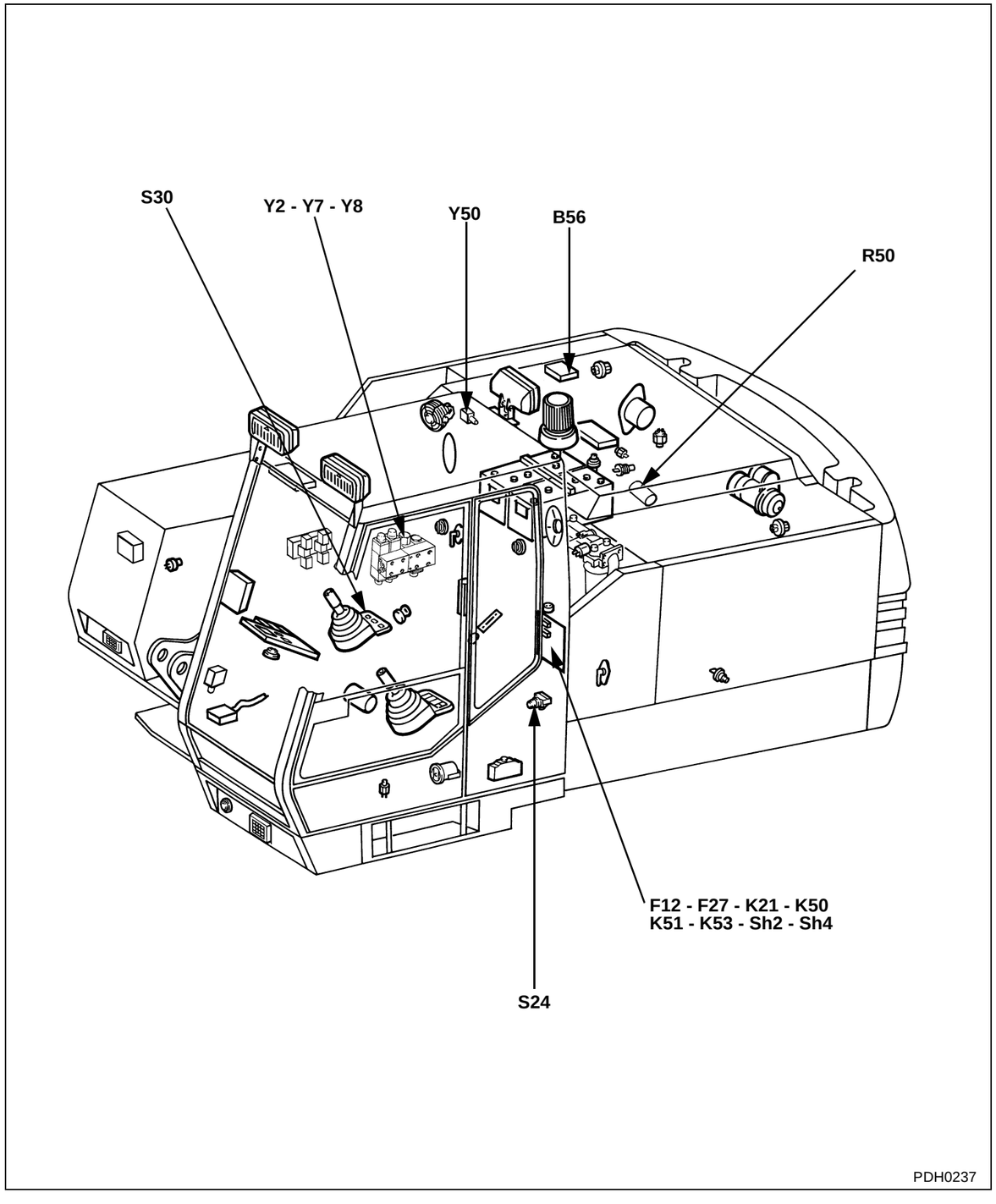
K	See schematic plate 2 page 16	**C1**	See schematic plate 4 page 20
L	See schematic plate 3 page 18	**D1**	See schematic plate 4 page 20
M	See schematic plate 3 page 18	**E1**	See schematic plate 4 page 20
V	See schematic plate 3 page 18	**F1**	See schematic plate 4 page 20
W	See schematic plate 3 page 18	**G1**	See schematic plate 6 page 24
Z	See schematic plate 4 page 20	**H1**	See schematic plate 6 page 24
B1	See schematic plate 4 page 20	**P1**	See schematic plate 4 page 20

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UPPERSTRUCTURE POWER LINE CONNECTION | FUEL FILLER PUMP | OVERLOAD INDICATOR (OPTIONAL) | CAB WORKING LIGHTS: FRONT | CAB WORKING LIGHTS: REAR | HOOD LIGHTING (OPTIONAL) | CAB VENTILATION (OPTIONAL) | RADIO | QUICK-ATTACH



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ELECTRICAL SCHEMATIC (PLATE 6)

ELECTRICAL CABINET

F12 10A Fuse, pilot safety
F27 5A Fuse, adjustable and articulated boom (optional)
K21 Pilot safety relay
K50 Adjustable boom raising range limitation relay (optional)
K51 Adjustable boom lowering range limitation relay (optional)
K53 Fuel heater relay
Sh2 Shunt, Pilot safety relay
Sh4 Shunt, Pilot safety relay

□ △ ▽ ▲ : see page 4

CAB

S30 Adjustable or articulated boom switch

FLOOR

S24 Pilot safety switch
Y2 Pilot safety solenoid valve

UPPERSTRUCTURE

B56 Adjustable boom raising range limitation detector (optional)
Y7 Adjustable or articulated boom extending electro-valve
Y8 Adjustable or articulated boom retracting electro-valve
Y50 Adjustable boom raising range limitation solenoid valve (optional)

ENGINE

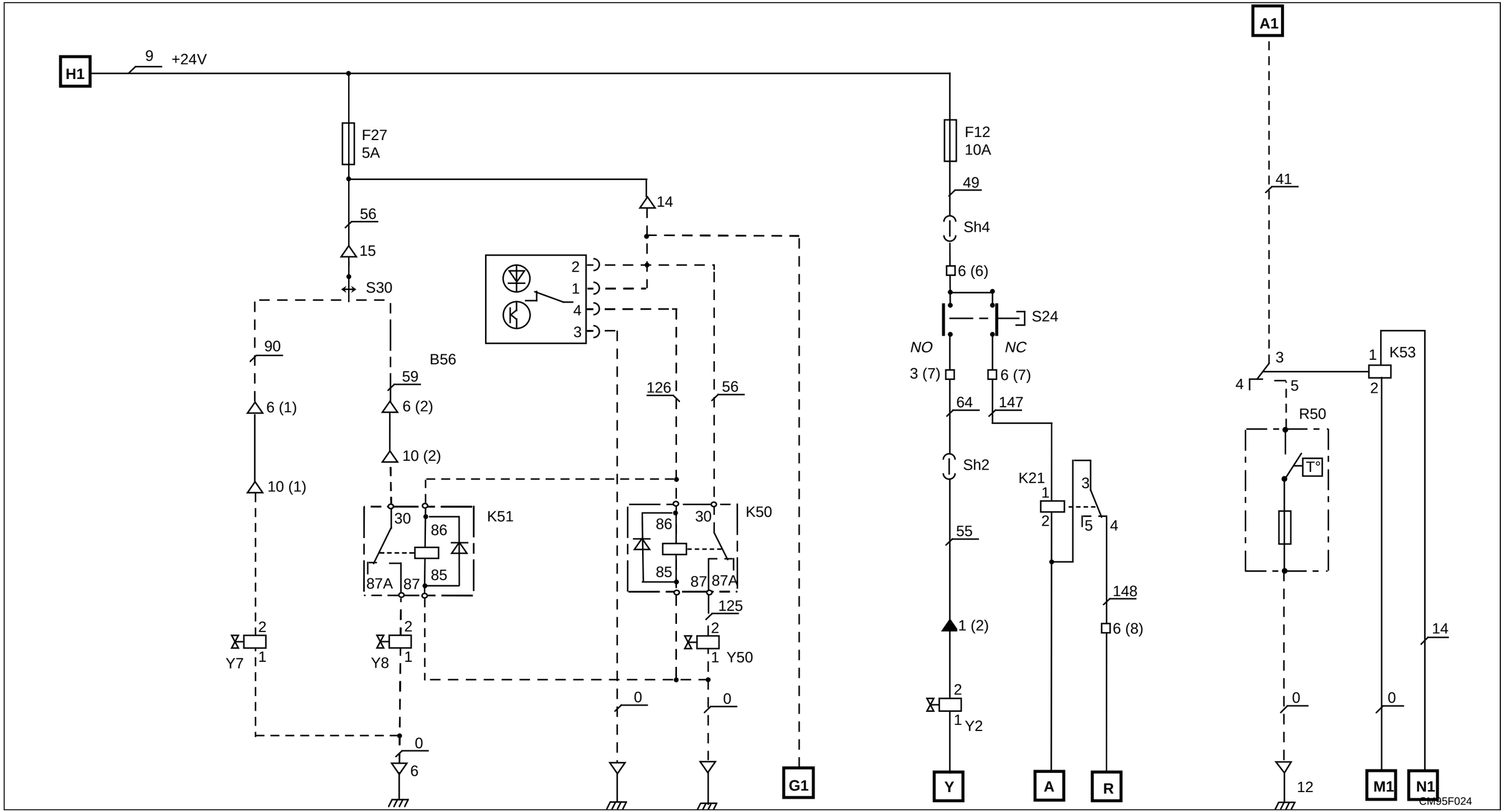
R50 Fuel oil heating device

WIRING CONNECTION BETWEEN SCHEMATICS

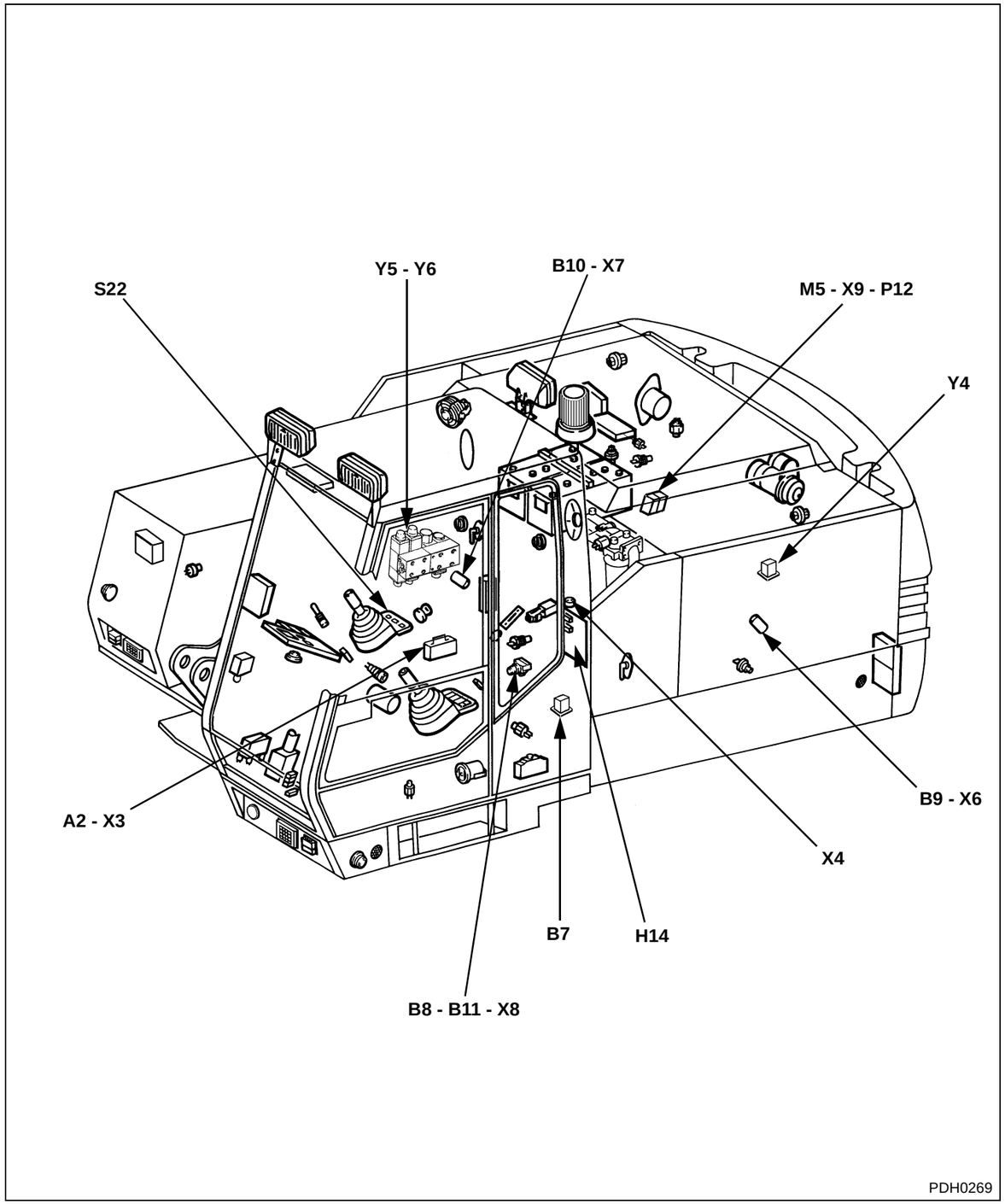
A	See schematic plate 2 page 16
R	See schematic plate 3 page 18
Y	See schematic plate 4 page 20
A1	See schematic plate 4 page 20
G1	See schematic plate 5page 22
H1	See schematic plate 5 page 22
M1	See schematic plate 3 page 18
N1	See schematic plate 2 page 16

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ADJUSTABLE OR ARTICULATED BOOM | BOOM RAISING HEIGHT LIMITER (OPTIONAL) | PILOT SAFETY | FUEL OIL HEATING



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ELECTRICAL SCHEMATIC (PLATE 7)

ELECTRICAL CABINET

H14 Diagnostic lamp (LED)

CAB

A2 Electronic control box
S22 Control panel
X3 35-way Connector
X4 Diagnostic socket

FLOOR

B8 Travel detection pressostat

UPPERSTRUCTURE

B7 Swing detection pressostat
B10 Swing motor speed detector
B11 Hydraulic pressure sender
Y5 Upperstructure swing brake release control solenoid valve
Y6 Travel motor displacement change solenoid valve (two-speed excavators only)

ENGINE

B9 Engine speed detector
M5 Injection pump servo-motor
P12 Servo-motor potentiometer
X6 Engine speed detector connector
X7 Engine speed connector
X8 Hydraulic pressure sender connector
X9 Injection pump servo-motor connector
Y4 DRE4 proportional pressure reduction valve

NOTE : *For cab, cab floor, upperstructure and engine module wiring, see Section 4002.*

WIRING CONNECTION BETWEEN SCHEMATICS

C See schematic plate 2 page 16

D See schematic plate 2 page 16

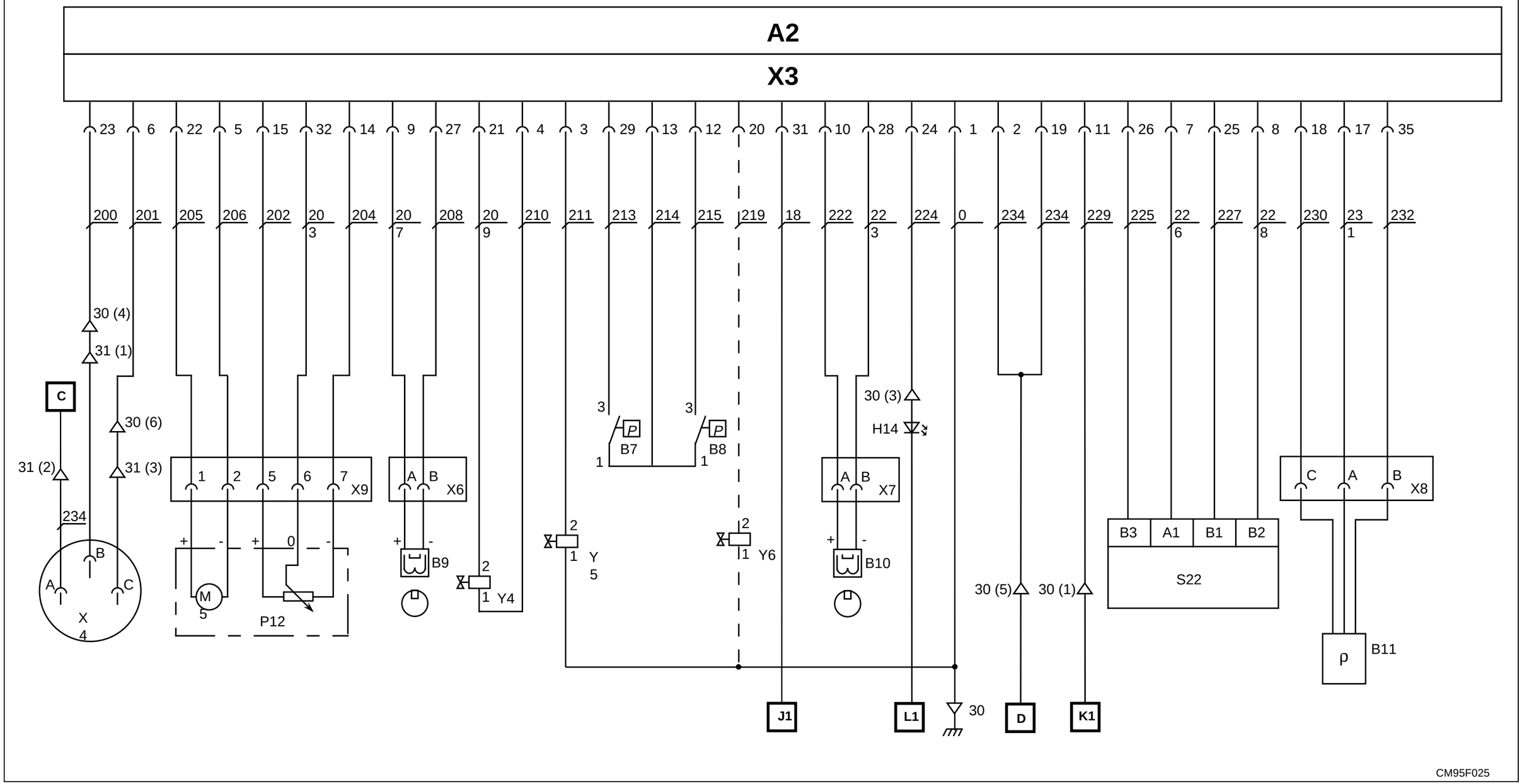
J1 See schematic plate 3 page 18

K1 See schematic plate 4 page 20

L1 See schematic plate 2 page 16

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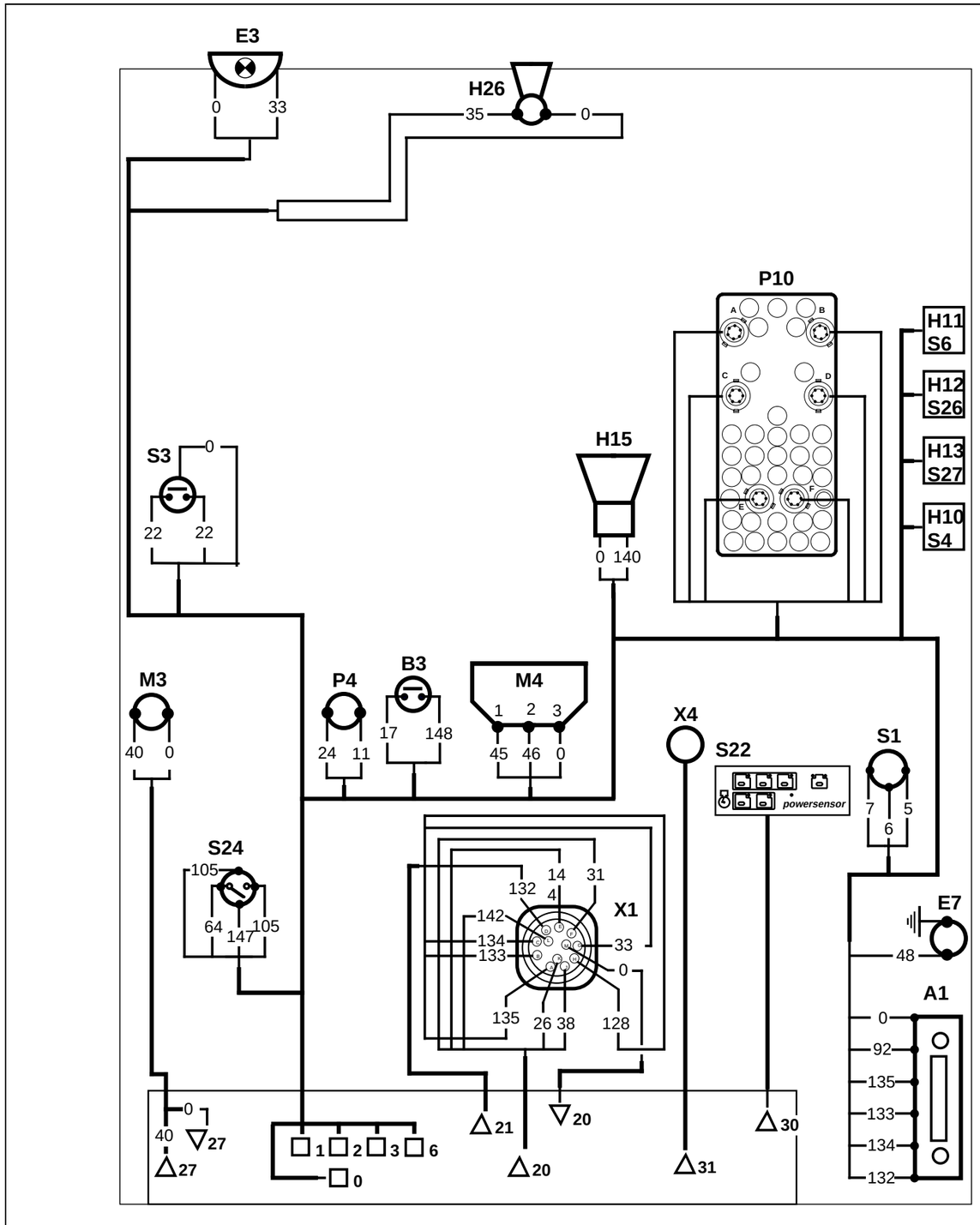
TROUBLESHOOTING TEST SOCKET	INJECTION PUMP SERVO-MOTOR	ENGINE SPEED DETECTOR	SWING PRESURE REDUCER DRE4	SWING BRAKE RE-LEASE SO-LENOID VALVE	PRESSURE SWITCH		TRAVEL DISP. CHANG.	WA-TER T°	UPPERSTRUC-TURE SWING SPEED DETEC-TOR	DIA-GNOS-TIC LAMP (LED)	0V BATT.	+28V BATT.	+28V INSTRU-MENT PA-NEL LIGHTING	CONTROL PANEL	PRESSURE SENDER
					SWING	TRAVEL									

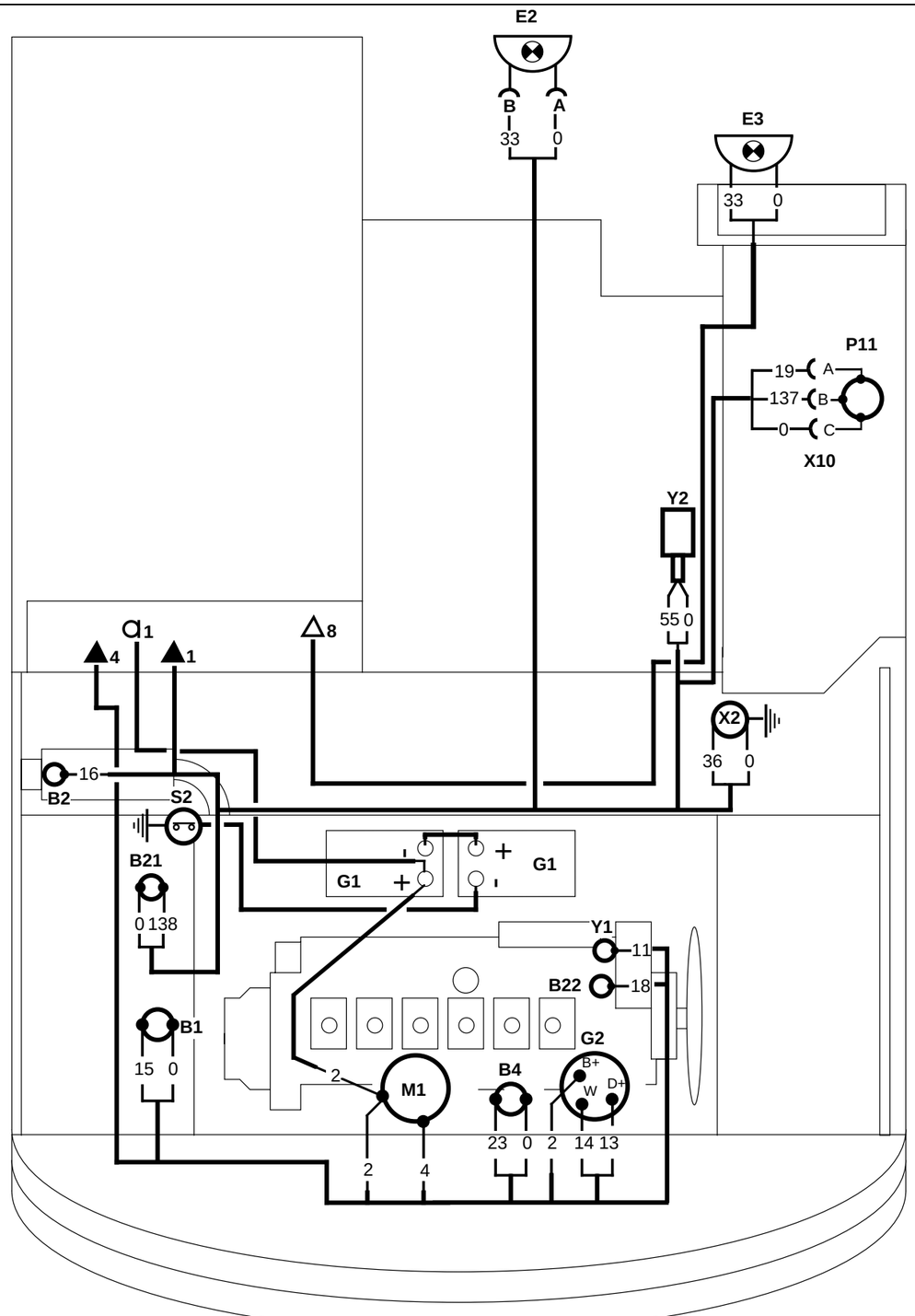


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CAB FLOOR WIRING (STANDARD EQUIPMENT)

ENGINE MODULE AND UPPERSTRUCTURE WIRING (STANDARD EQUIPMENT)





PDH0238

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CAB FLOOR WIRING (STANDARD EQUIPMENT)

ELECTRICAL CABINET

△ **20,** ▽ **20,** △ **21,** ▽ **27,** △ **27,** △ **31,** △ **30 :** see page 4

☐ **1,** ☐ **2,** ☐ **3,** ☐ **6** ☐ **0 :** see page 4

FLOOR

A1 Radio (optional)
B3 Pilot pressure pressostat
E3 Upperstructure working light
E7 Cigarette lighter
H10 Working light switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lighting
H13 Heater blower switch lighting
H15 Instrument panel audible warning
H26 Horn
M3 Windshield washer motor
M4 Heater blower motor
P4 Hourmeter
P10 Instrument panel
S1 Key switch
S3 Horn switch
S4 Working light switch
S6 Windshield wiper switch
S22 Control panel
S24 Pilot safety switch
S26 Windshield washer switch
S27 Heater blower switch
X1 Cab floor/cab power connector
X4 Troubleshooting test socket

ENGINE MODULE AND UPPERSTRUCTURE WIRING (STANDARD EQUIPMENT)

ELECTRICAL CABINET

Ol 24 Volts supply before contact

▲ **1,** ▲ **4** △ **8** : see page 4

UPPERSTRUCTURE

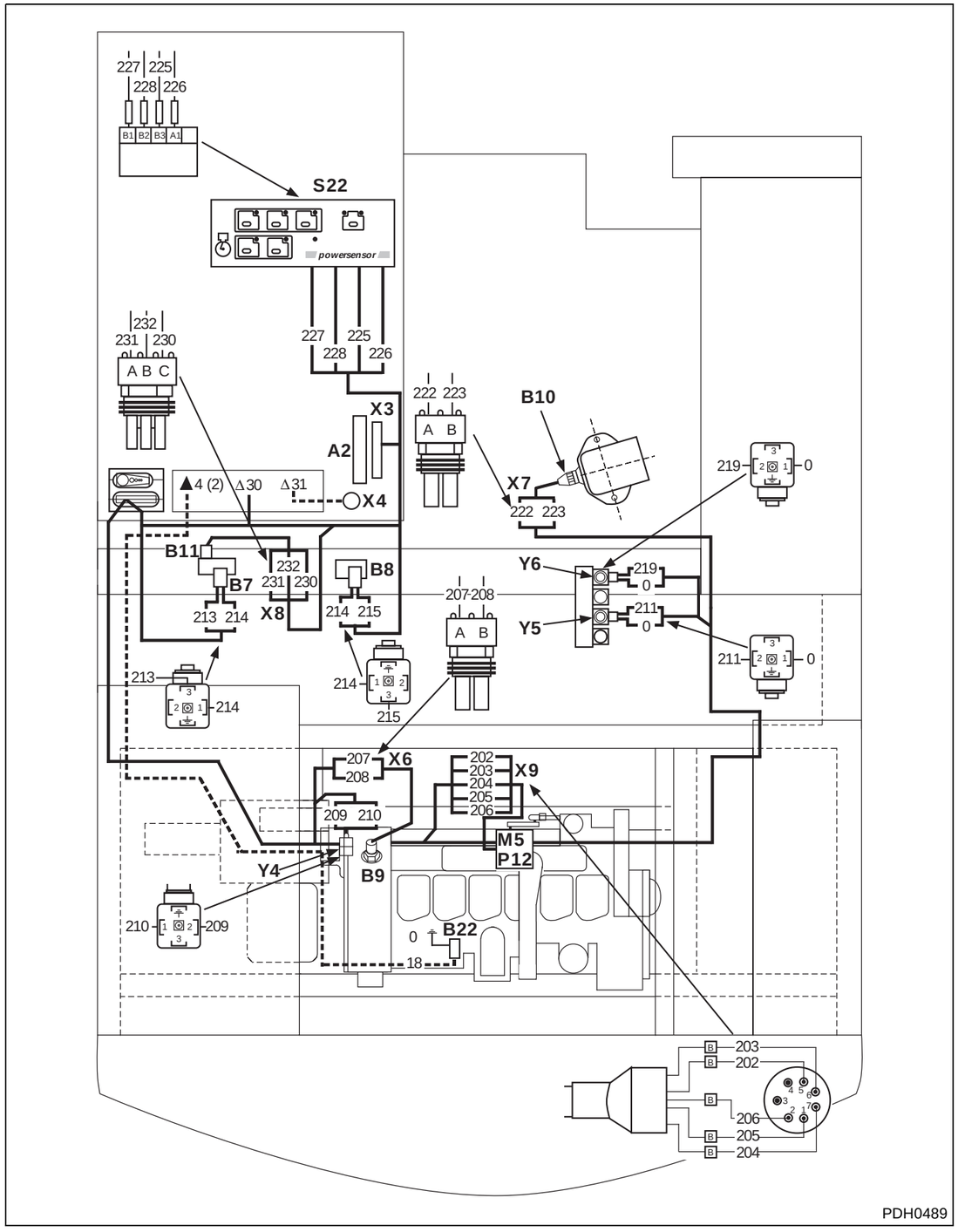
B1 Air filter restriction pressostat
B2 Hydraulic oil filter restriction pressostat
B21 Hydraulic oil temperature sender
E2 Attachment working light
E3 Upperstructure working light
G1 Batteries
P11 Fuel level indicator
S2 Battery master switch
X2 Upperstructure power line connection
X5 Attachment working light power connection
X10 Fuel level indicator connector
Y2 Pilot safety solenoid switch

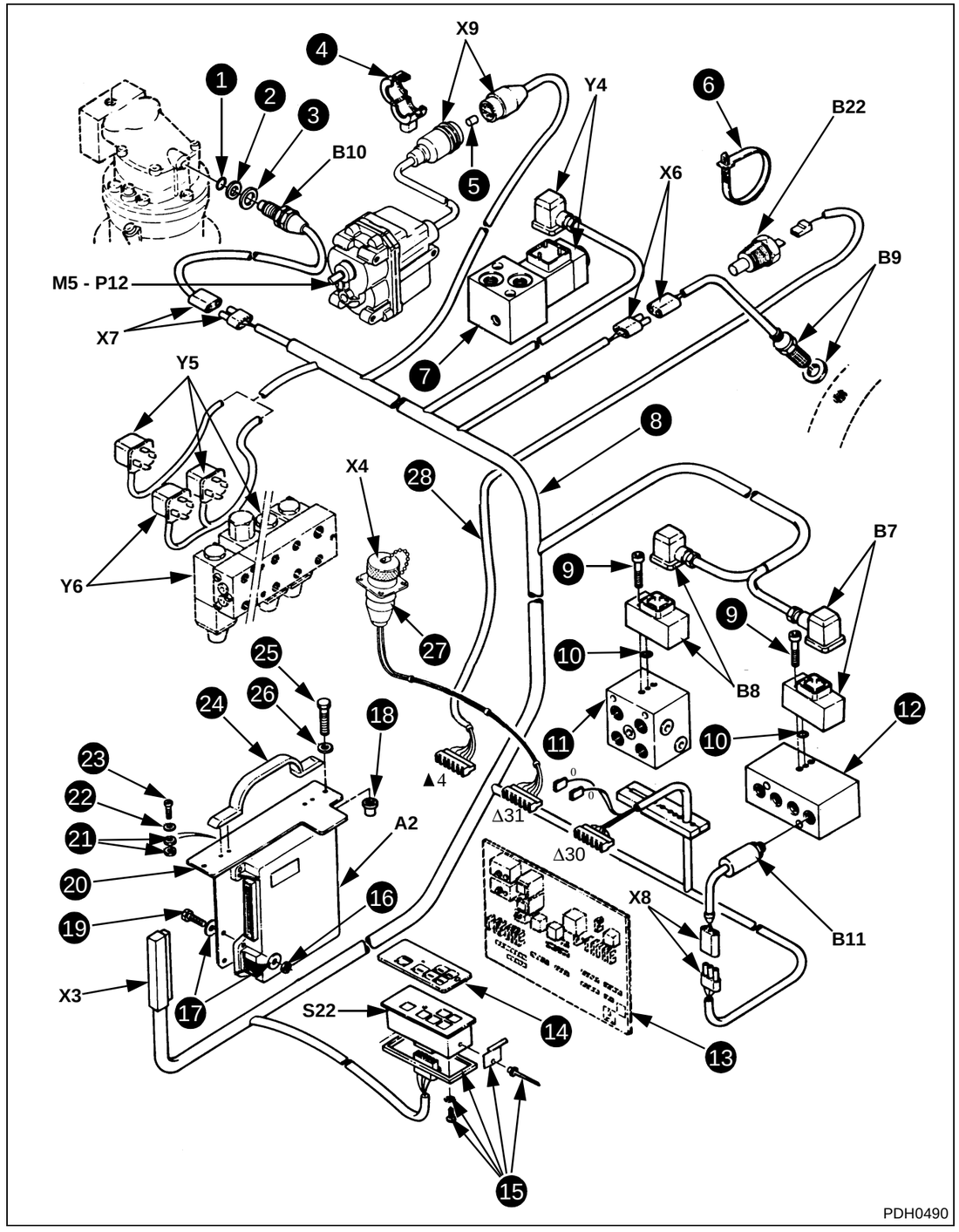
ENGINE

B4 Engine oil pressure pressostat
B22 Engine coolant temperature sender
G2 Alternator
M1 Starter motor
Y1 Engine shut-down solenoid valve

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ELECTRONIC SYSTEM WIRING





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ELECTRONIC SYSTEM WIRING

A2 Electronic control box
B7 Swing detection pressostat
B8 Travel detection pressostat
B9 Engine speed detector
B10 Swing motor speed detector
B11 Hydraulic pressure sender
B22 Engine coolant temperature sender
M5 Injection pump servo-motor
P12 Servomotor potentiometer
S22 Control panel
X3 35-way Connector
X4 Troubleshooting socket
X6 Connector
X7 Connector
X8 Connector
X9 Connector
Y4 DRE4 proportional pressure reduction valve
Y5 Travel motor upperstructure brake release control solenoid valve
Y6 Displacement change solenoid valve (two-speed excavators only)

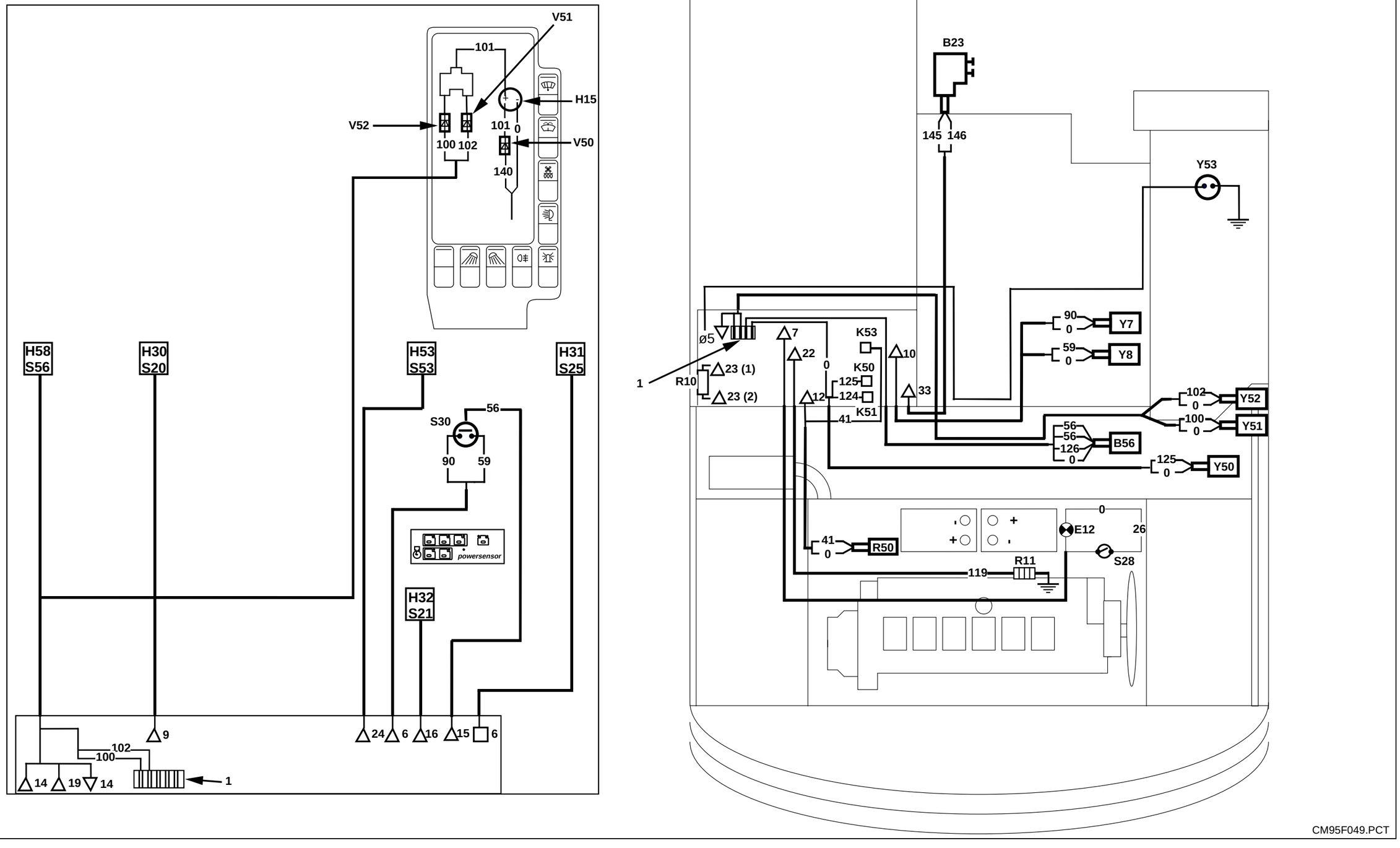
∆**30** Electronic control box six-way connector harness
∆**31** Troubleshooting socket three-way connector harness
▲ **4(2)** Engine eight-way connector harness

1 O ring
2 Bushing
3 Washer
4 Lock
5 Plug
6 Clamp
7 Pressure reduction valve
8 Electronic harness
9 Screw
10 O ring
11 Travel block
12 Swing block
13 Printed circuit card
14 Decal
15 Control panel fixing hardware
16 Nut
17 Washer
18 Rivet
19 Screw
20 Support
21 Nuts
22 Washers
23 Screws
24 Handle
25 Screw
26 Washer
27 Troubleshooting socket harness
28 Engine harness

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CAB FLOOR WIRING (OPTIONAL EQUIPMENT)

ENGINE MODULE AND UPPERSTRUCTURE WIRING (OPTIONAL EQUIPMENT)



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CAB FLOOR WIRING (OPTIONAL EQUIPMENT)

ELECTRICAL CABINET

1 4 unit strip

△ 6, △ 9, △ 14, △ 16, △ 19, △ 24, △ 15, ▽ 14 □ 6

INSTRUMENT PANEL

H30	Cold start assistance switch lighting
H31	Rotary switch lighting
H32	Overload indicator switch lighting
H53	Front working light switch lighting
H58	Quick-attach switch lighting
S20	Cold start assistance switch
S21	Overload indicator switch
S25	Rotary light switch (specific to certain countries)
S30	Adjustable or articulated boom switch
S53	Front working light switch
S56	Quick-attach switch
V50	Quick-attach diode
V51	Quick-attach diode
V52	Quick-attach diode
H15	Audible warning

ENGINE MODULE AND UPPERSTRUCTURE WIRING (OPTIONAL EQUIPMENT)

ELECTRICAL CABINET

1 4 unit strip

△ 7, △ 10, △ 12, △ 22, △ 23 (1) (2), △ 33

UPPERSTRUCTURE

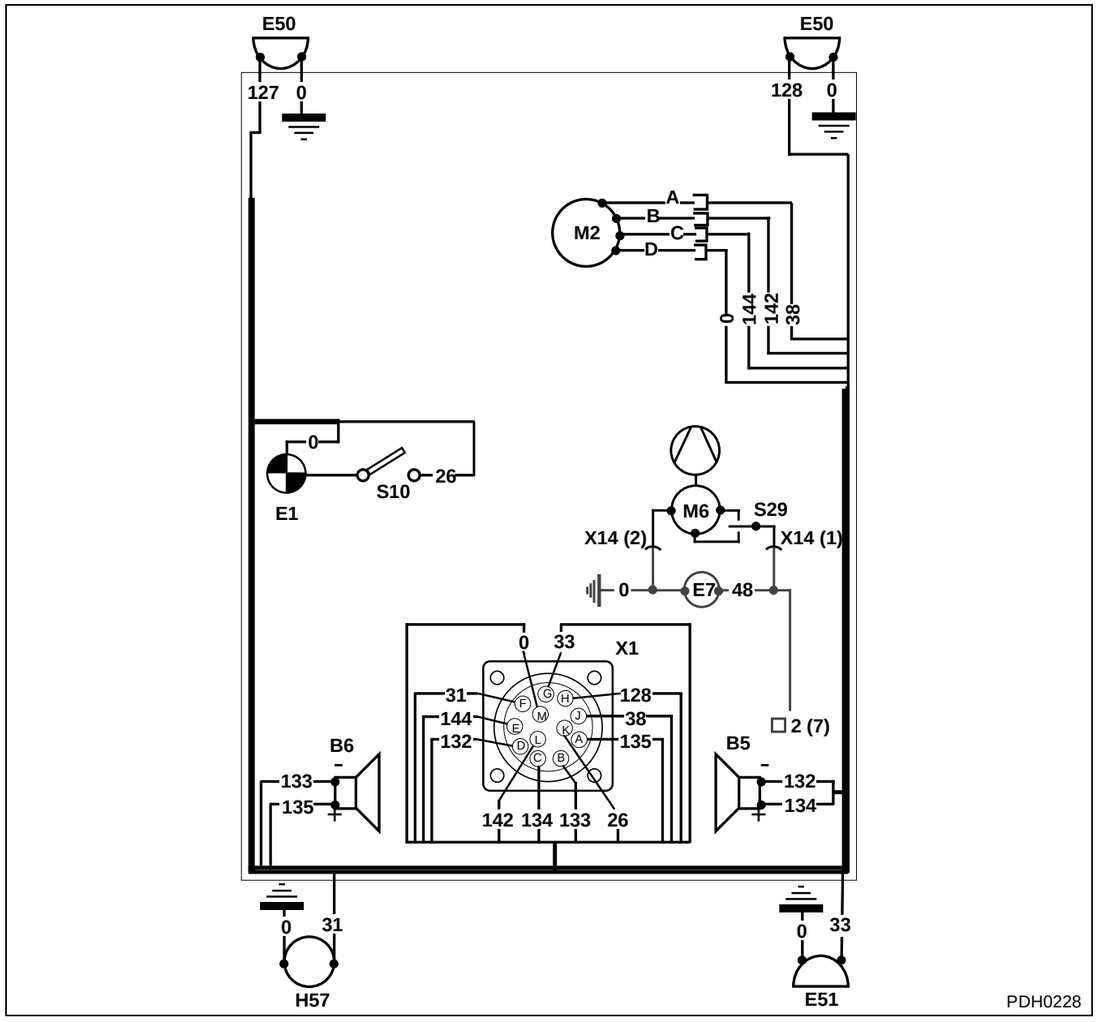
B23	Overload indicator
B56	Boom raising range limitation detector
K50	Boom raising range limitation relay
K51	Adjustable boom lowering range limitation relay
K53	Fuel heater relay
R50	Fuel oil heating device
Y7	Adjustable or articulated boom extending electro-valve
Y8	Adjustable boom solenoid valve
Y50	Adjustable boom raising range limitation solenoid valve
Y51	Quick-attach solenoid valve
Y52	Quick-attach solenoid valve

ENGINE

E12	Engine compartment light
R10	Cold start assistance resistor
R11	Cold start assistance glow plug
S28	Engine compartment working light switch

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CAB AND CAB OPTIONAL EQUIPMENT WIRING



A White wire
B Grey wire
C Blue wire
D Black wire
E1 Cab lighting
E7 Cigarette lighter (see wiring pages 28)
E50 Front working lights (optional)
E51 Rear working light (optional)
H57 Rotary light (optional)
B5 RH Loudspeaker (optional)
B6 LH Loudspeaker (optional)
M2 Windshield wiper motor
M6 Cab blower motor (optional)
S10 Cab lighting switch
S29 Cab blower switch (optional)

X1 (A) (B) (C) (D) Cab floor/cab RH and LH loudspeaker power connector
X1 (H) (G) Cab floor/cab front and rear working light power connector (optional)
X1 (E) (J) (M) (L) Cab floor/cab windshield wiper and working light power connector
X1 (F) Cab floor/cab rotary light power connector
X1 (K) Cab floor/cab lighting power connector
X14 (1) (2) Cab blower plug (optional)
□ **2 (7)** 10-way connector (see printed circuit wiring page 5)

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Section

4001

ELECTRICAL SCHEMATICS

Crawler excavators

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SPECIFICATIONS

Circuit voltage	24 volt negative earth and 12 volt negative earth
Batteries	2 x 12 Volt 120 A/hrs, low maintenance
Alternator	Bosch, 28 volt, 45 amps
Starter motor	Bosch, 24 volt, 4.0 kW

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SCHEMATIC SYMBOLS

A (n) Radio/housings
B (n) Indicators/pressure switches/loud-speakers/detectors/thermal detector/gauge
E (n) Lighting components
F (n) Fuses
G (n) Electrical supply generators
H (n) Warning devices (lighted and audible)
K (n) Relays
M (n) Motors
P (n) Instruments
R (n) Resistors/heating elements/heating plugs
S (n) Switches/rotating switches/main circuit breaker
Sh (n) Shunt resistors
V (n) Diodes
X (n) Supply line connections
Y (n) Solenoid valves, solenoid shut-off valves

NOTE: *The (n) shows the component number.*
Example: K2 is relay N°2.

(n) Supply on printed circuit

(n) Battery terminal

(n) Printed circuit connection terminal

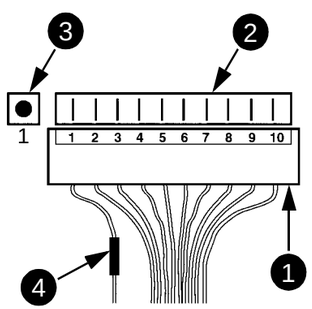
Printed circuit earth connector

A1 Instrument panel connector

1 or △ 1 or ▼ 1 Identification of harness

1(1) or △ 1(1) or ▼ 1(1) Identification of harness, followed by path identification number

▽ (1) or ▼ (1) Printed circuit earth connectors



The installation position for the harness connector (1) on connector (2) of the printed circuit is identified by a red mark (3) followed by the figure 1 on the printed circuit. This identification corresponds to the position of path 1 of the harness connector (1). This position is completed when the path 1 line is shown by a red ring (4) located on line 1 wire, or by red paint marking on the housing.

Local earth

Wire number

NC Closed circuit

NO Open circuit

Intersection of two wires with connection point

Intersection of two wires without connection point

Link with following plate

Link with preceding plate

Return to another plate with the same letter

Bulbs

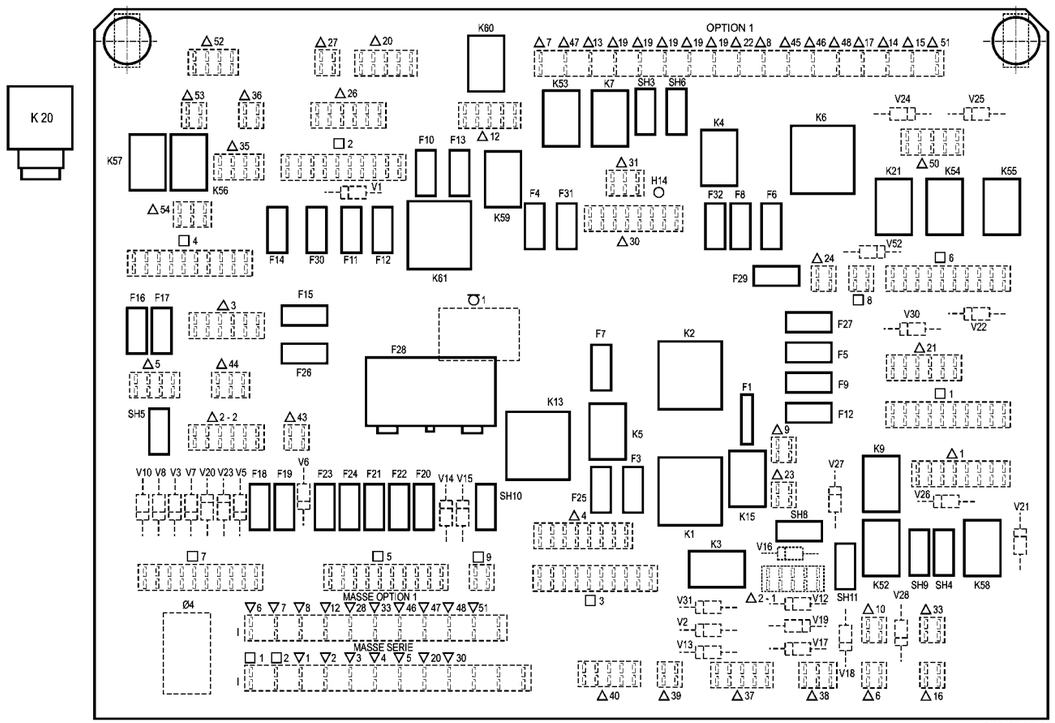
Test bulb

Light emitting diode (LED)

Regulator

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DESCRIPTION OF ELECTRICAL CABINET PRINTED CIRCUIT (STANDARD)



CI99K501

❑ **1** 24 volt printed circuit supply
❑ **2** 24 volt printed circuit supply
⌀ **4** (1) Printed circuit earth
⌀ **4** (2) Printed circuit earth
F1 Fuse, 30 A, starter motor solenoid, thermostart
F2 Fuse, 5 A, starter key switch
F3 Fuse, 7.5 A, instrument panel, hourmeter
F4 Fuse, 5 A, cab lighting, horn (control), hood lighting
F5 Fuse, 10 A, working lights (control), rotary light (std), night lighting for switch on instrument panel and electronics
F6 Fuse, 15 A, attachment working light, rear cab light, upperstructure working lights
F7 Fuse, 10 A, horn (power)
F8 Fuse, 15 A, upperstructure socket, fuel pump
F9 Fuse, 10 A, windshield washer, windshield wiper (BAT + R)
F10 Fuse, 10 A, heater
F11 Fuse, 7.5 A, cigar lighter, cab blower
F12 Fuse, 10 A, pilot safety, overload indicator
F14 Fuse, 10 A, step-down transformer / radio
F15 Fuse, 15 A, general lighting
F27 Fuse, 5 A, remote controlled or articulated boom, tool quick coupler, air suspension seat, speed threshold detector (788P heavy lift)
F28 Fuse, 40 A, engine stop/start solenoid (injection)
F30 Fuse, 10 A, windshield wiper (BAT +)
F32 Fuse, 5 A, (BAT +) electronics
H14 Troubleshooting test LED
K1 Starter motor relay
K2 Battery relay
K3 Hourmeter relay
K4 Electronic supply relay
K5 Horn relay
K6 Working light relay
K13 Engine stop solenoid relay
K20 Windshield wiper intermittent action
K21 Safety relay piloting pressure switch piloting
K54 Frequency threshold detector relay (threshold: 1 = 1600 rpm) (788)
K55 Frequency threshold detector relay (threshold: 2 = 1400 rpm) (788)
K61 Battery relay (heater/air conditioner)
Sh3, Sh4, Sh6 Shunt
V1 Starter key switch diode
V24 K54 relay diode
V25 K55 relay diode
V30 Buzzer diode

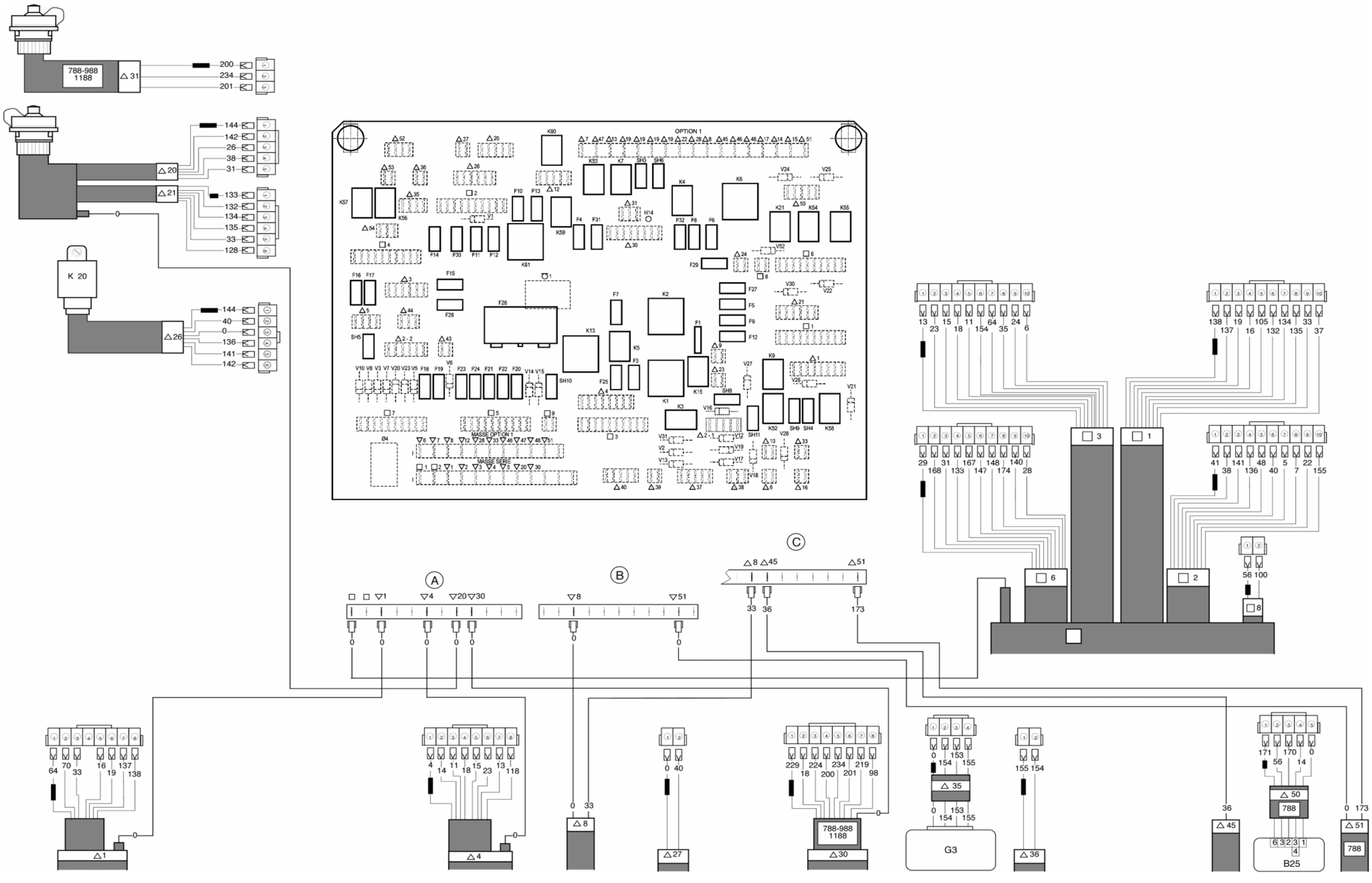
ELECTRICAL CABINET PRINTED CIRCUIT WIRING (STANDARD)

❑ **1** Floor harness, 10 way connector
❑ **2** Floor harness, 10 way connector
❑ **3** Floor harness, 10 way connector
❑ **6** Floor harness, 10 way connector
❑ **8** Floor harness, 2 way connector

△ **1** Common harness, 8-way connector
△ **4** Engine harness, 8-way connector
△ **8** Harness, RH front upperstructure working light, clip,
△ **20** Cab socket harness, 5-way connector
△ **21** Cab socket harness, 6-way connector
△ **26** Harness time delay, 6-way connector
△ **27** Harness windshield washer, 2-way connector
△ **30** Electronic harness, 8-way connector (788/988/1188)
△ **31** Diagnostic plug harness, 4-way connector (788/988/1188)
△ **35** Step-down transformer harness 24V - 12V, 4-way connector
△ **36** 12V socket harness, 2-way connector
△ **45** Upperstructure socket harness
△ **50** Threshold detector harness, 5-way connector (788)
△ **51** Harness, heavy lift solenoid valve (788)
▽ **8** Harness earth, front RH upperstructure working light, clip

A Standard earth
B Optional earth 1
C Option 1

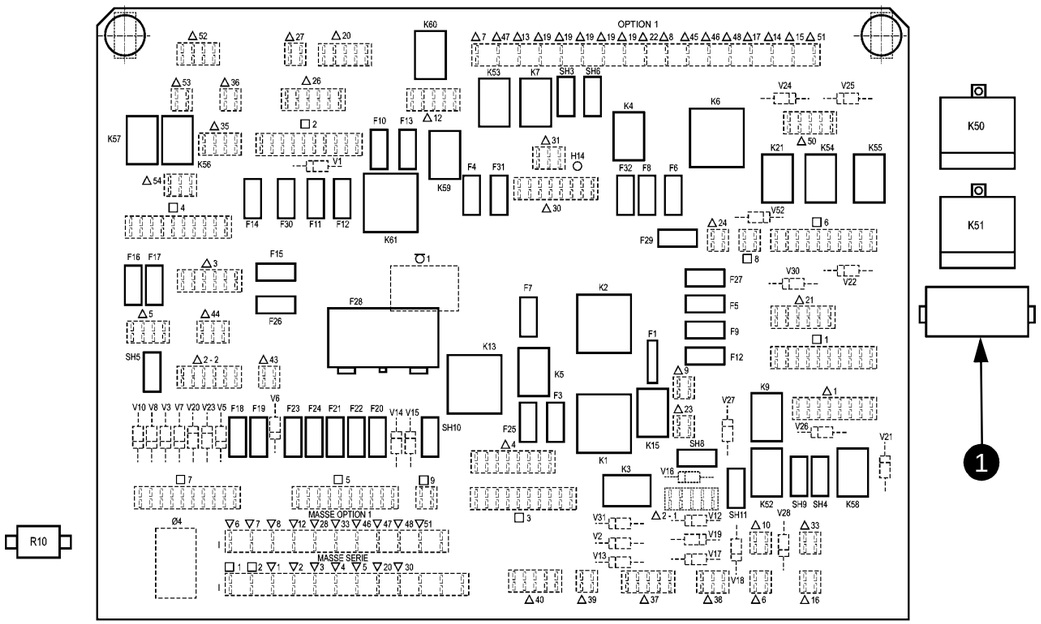
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DESCRIPTION OF ELECTRICAL CABINET PRINTED CIRCUIT (OPTIONAL)



F1 Fuse, 30 A, starter motor solenoid, thermostart
F4 Fuse, 5 A, cab lighting, horn (control), hood lighting
F5 Fuse, 10 A, working lights (control), rotary light (std), night lighting for switch on instrument panel and electronics
F8 Fuse, 15 A, upperstructure socket, fuel pump
F11 Fuse, 7.5 A, cigar lighter, cab blower
F13 Fuse, 15 A, air conditioner
F27 Fuse, 5 A, remote controlled or articulated boom, tool quick coupler, air suspension seat, speed threshold detector (788P heavy lift)
F29 Fuse, 10 A, cab front working light
F31 Fuse, 10 A, fuel heater
K15 Thermostart relay
K50 Adjustable boom raising limiter relay
K51 Adjustable boom retracting limitation relay
K53 Fuel heater relay
K59 Air conditioning compressor relay
K60 Air conditioning condenser relay
K61 Battery relay (heater/air conditioner)
R10 Resistor, 0.85 Ohms

V21 Overload indicator lamp diode on instrument panel
V22 Rotary light diode on instrument panel
V52 Quick coupler switch diode

1 Connection strip

ELECTRICAL CABINET PRINTED CIRCUIT WIRING (OPTIONAL)

△ **6** Adjustable boom harness, 2-way connector
△ **7** Hood lighting harness, clip
△ **9** Cold start switch harness, 2-way connector
△ **10** Adjustable boom harness, 2-way connector
△ **12** Air conditioner harness, 5-way connector
△ **16** Overload indicator switch harness, 2-way connector
△ **22** Cold start plug harness, clip
△ **23** Thermostart element harness, 2-way connector
△ **24** Front cab light switch harness, 2-way connector
△ **33** Overload indicator pressure switch harness
△ **46** Fuel pump harness, clip
△ **47** Fuel heater harness, clip
△ **48** Quick coupler solenoid valve harness, clip

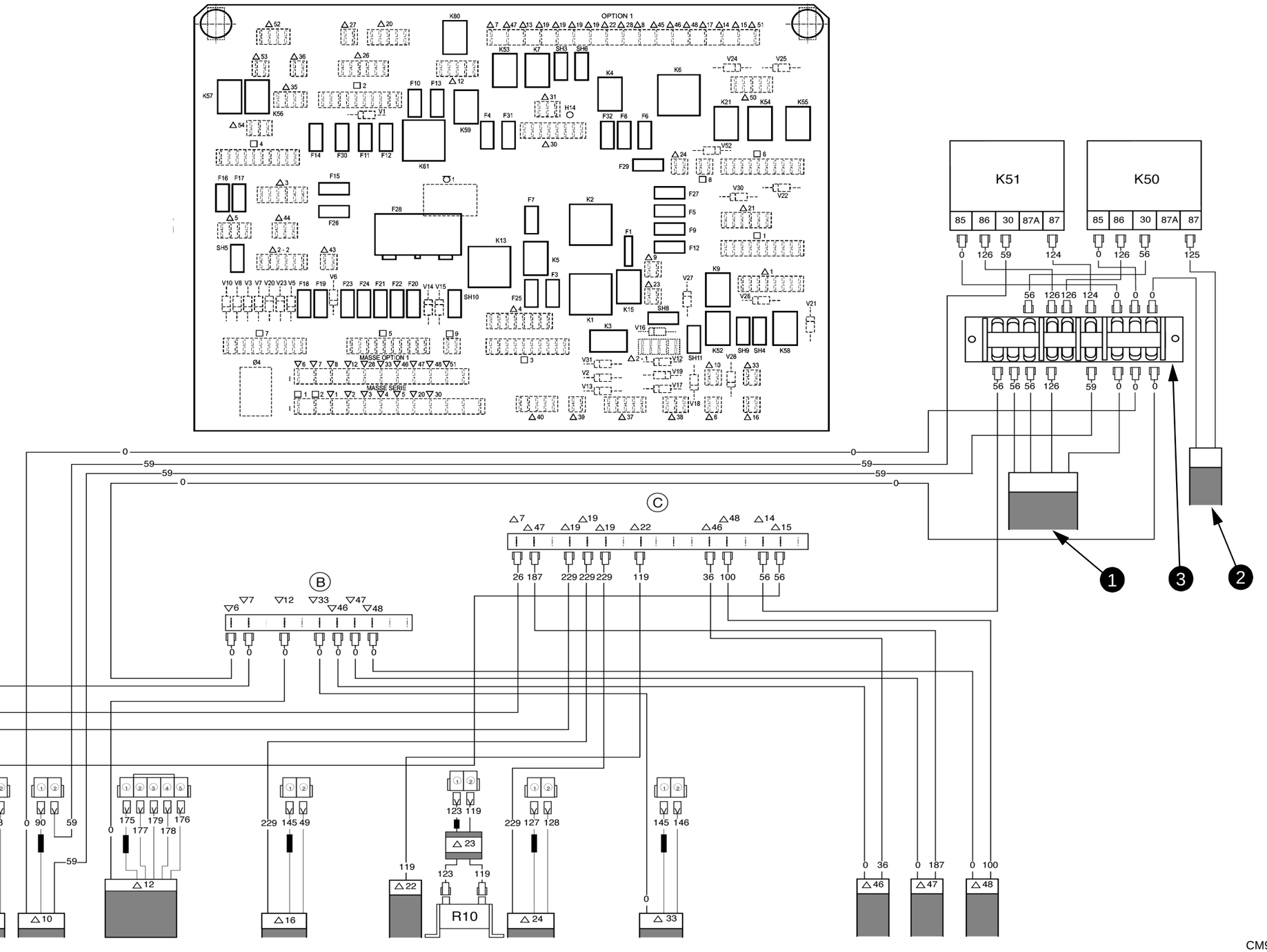
▽ **6** Adjustable boom harness earth, clip
▽ **7** Hood lighting harness earth, clip
▽ **12** Air conditioning harness earth, clip
▽ **33** Overload indicator pressure switch harness earth, clip
▽ **46** Harness earth, fuel pump, clip
▽ **47** Fuel heater harness earth, clip
▽ **48** Tool quick coupler harness earth, clip

1 Boom reach limitation detector cable
2 Boom reach limitation solenoid valve cable
3 Connection strip

B Optional earth
C Option 1

CI99J044

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CM99K019

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PRINTED CIRCUIT SCHEMATIC GUIDE

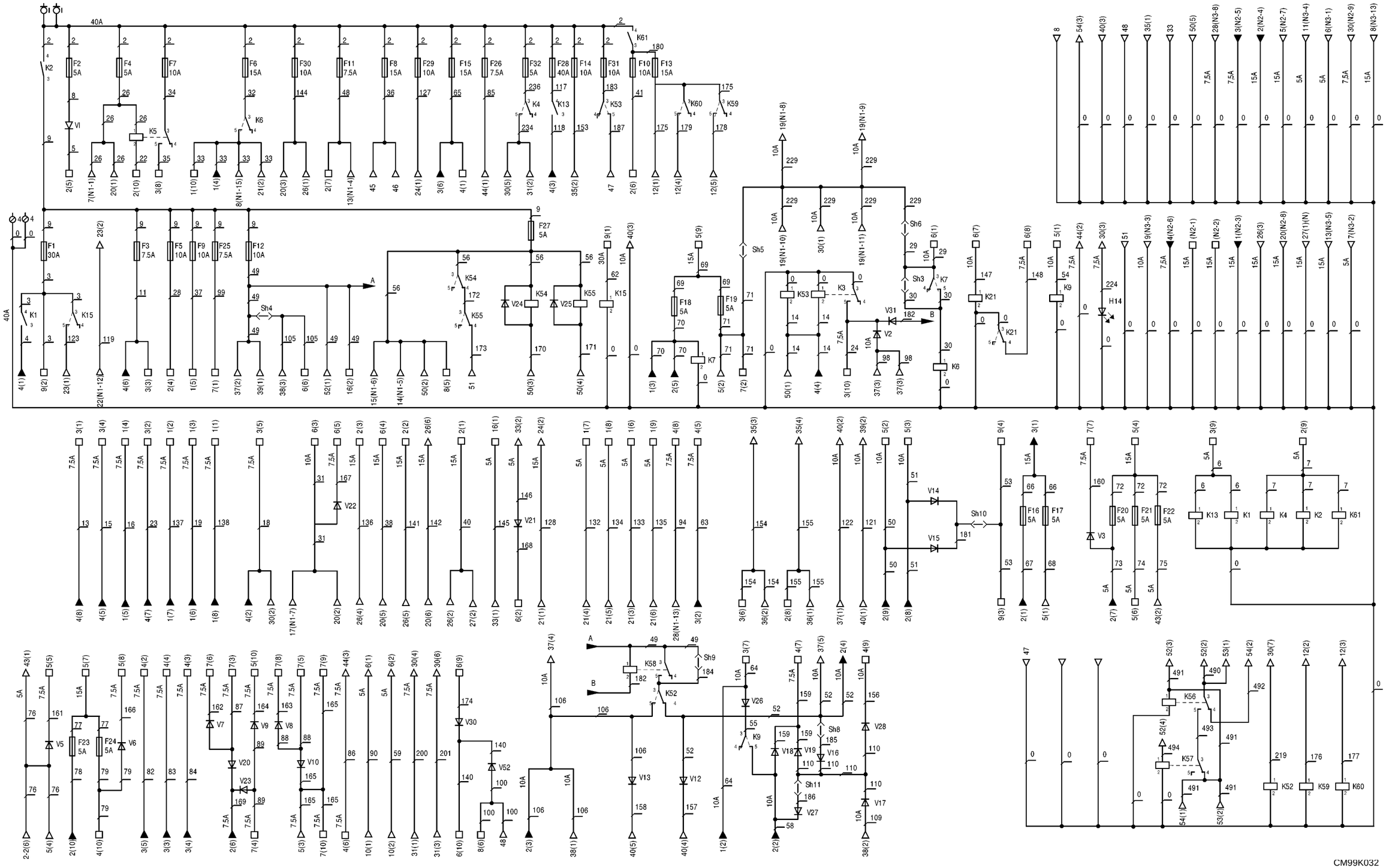
1 (1) 24 V PCB supply
1 (2) 24 V PCB supply
4 (1) Printed circuit earth
4 (2) Printed circuit earth

F1 Fuse, 30 A, starter motor solenoid, thermostart
F2 Fuse, 5 A, starter key switch
F3 Fuse, 7.5 A, instrument panel, hourmeter
F4 Fuse, 5 A, cab lighting, horn (control), hood lighting
F5 Fuse, 10 A, working lights (control), rotary light (std), night lighting for switch on instrument panel and electronics
F6 Fuse, 15 A, attachment working light, rear cab light, upperstructure working lights
F7 Fuse, 10 A, horn (power)
F8 Fuse, 15 A, upperstructure socket, fuel pump
F9 Fuse, 10 A, windshield washer, windshield wiper (BAT + R)
F10 Fuse, 10 A, heater
F11 Fuse, 7.5 A, cigar lighter, cab blower
F12 Fuse, 10 A, pilot safety, overload indicator
F13 Fuse, 15 A, air conditioner
F14 Fuse, 10 A, step-down transformer / radio
F15 Fuse, 15 A, general lighting
F16 Not used
F17 Not used
F18 Not used
F19 Not used
F20 Not used
F21 Not used
F22 Not used
F23 Not used
F24 Not used
F25 Not used
F26 Not used
F27 Fuse, 5 A, remote controlled or articulated boom, tool quick coupler, air suspension seat, speed threshold detector (788P heavy lift)
F28 Fuse, 40 A, engine stop/start solenoid (injection)
F29 Fuse, 10 A, cab front working light
F30 Fuse, 10 A, windshield wiper (BAT +)
F31 Fuse, 10 A, fuel heater
F32 Fuse, 5 A, (BAT +) electronics
H14 Troubleshooting test LED

K1 Starter motor relay
K2 Battery relay
K3 Hourmeter relay
K4 Electronic supply relay
K5 Horn relay
K6 Working light relay
K7 Not used
K9 Pilot safety relay/axle unlocking
K13 Engine stop solenoid relay
K15 Thermostart relay
K20 Windshield wiper intermittent action
K21 Safety relay piloting pressure switch piloting
K52 Not used
K53 Fuel heater relay
K54 Frequency threshold detector relay (threshold: 1 = 1600 rpm) (788)
K55 Frequency threshold detector relay (threshold: 2 = 1400 rpm) (788)
K56 Not used
K57 Not used
K58 Not used
K59 Air conditioning compressor relay
K60 Air conditioning condenser relay
K61 Battery relay (heater/air conditioner)

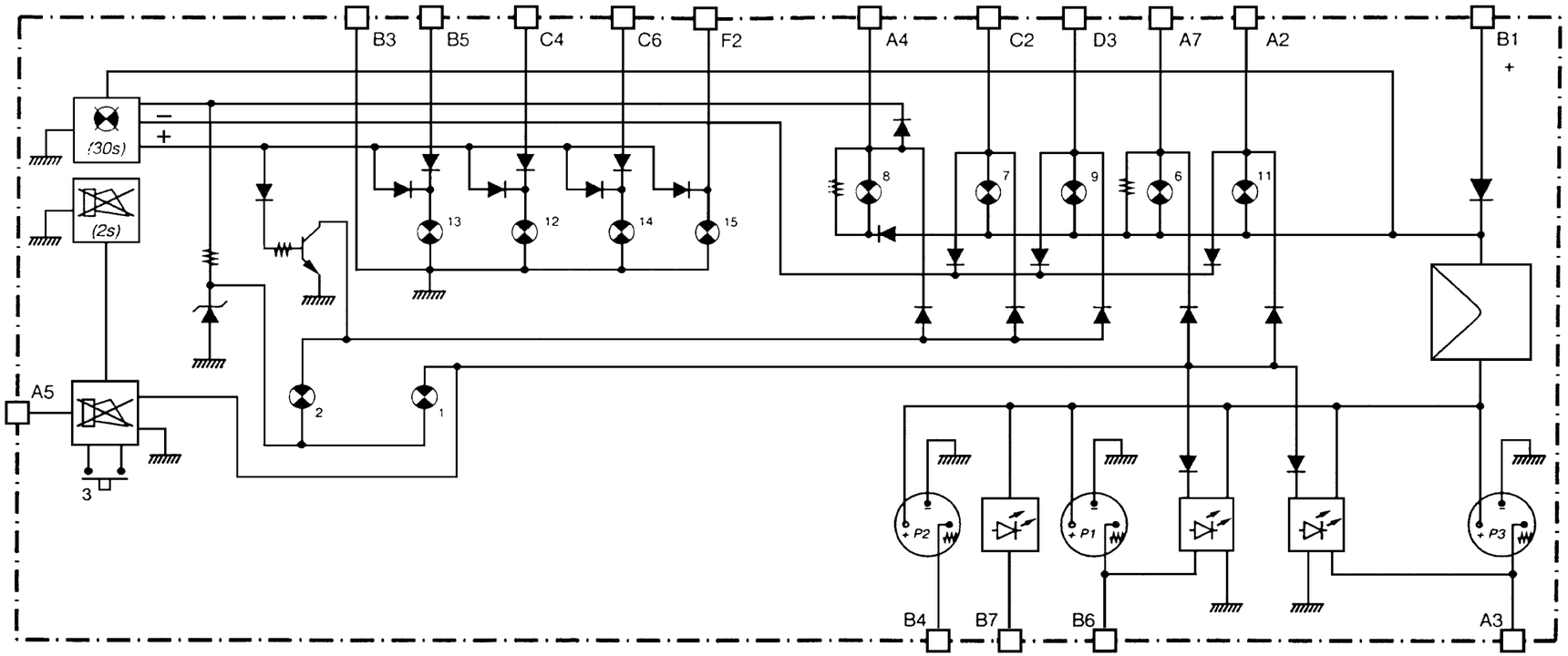
S3 Shunt relay K7
S4 Not used
S5 Not used
S6 Night lighting (switch)
S8 Not used
S9 Not used
S10 Not used
S11 Not used
V1 Starter key switch diode
V2 Diode less engine running
V3 Not used
V5, V6, V7, V8, V9, V10 Not used
V12, V13, V14, V15, V16, V17, V18, V19, V20 Not used
V21 Overload indicator lamp diode on instrument panel
V22 Rotary light diode on instrument panel
V23 Not used
V24 K54 relay diode
V25 K55 relay diode
V26 Not used
V27 Not used
V28 Not used
V30 Buzzer diode
V31 Not used
V52 Quick coupler switch diode

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P10 INSTRUMENT PANEL ELECTRICAL SCHEMATIC P. 10 (PLATE 1)



PDH0233

A2 Minimum pilot pressure red warning lamp connector
A3 Hydraulic oil temperature warning lamp connector
A4 Battery charge red warning lamp
A5 Red and orange warning lamp connector for audible warning device
A7 Engine oil pressure red warning lamp connector

B1 24 volt power supply
B3 Earth
B4 Fuel level warning lamp connector
B5 Gauge lighting connector
B6 Engine coolant solution temperature gauge connector
B7 Fuel minimum connector

C2 Air filter restriction red warning lamp connector
C4 Overload indicator orange warning lamp connector (optional)
C6 Connector not used

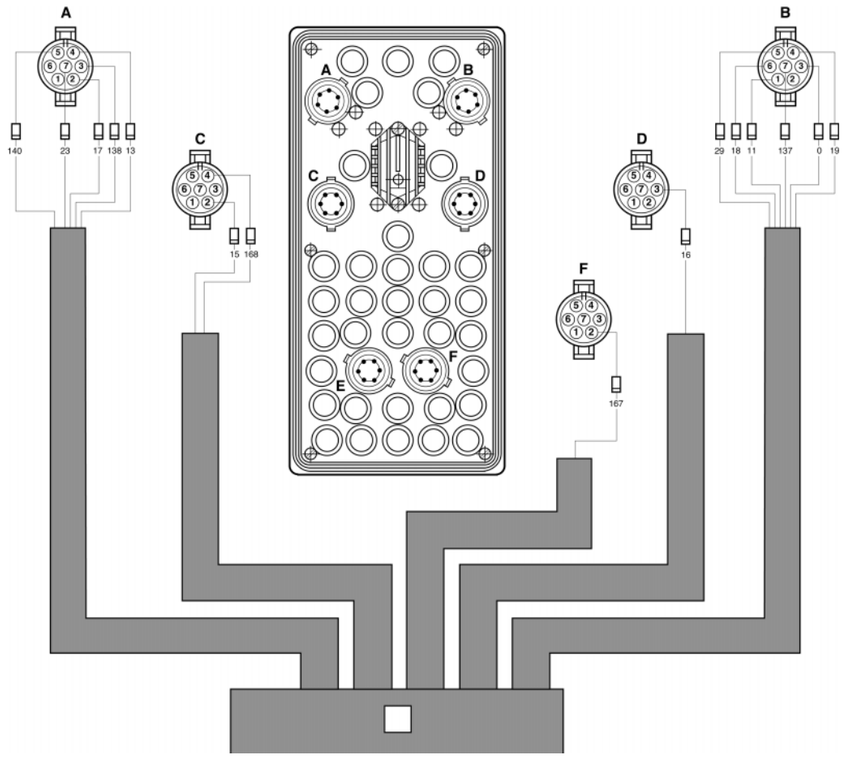
D3 Hydraulic oil filter restriction red warning lamp connector
F2 Rotary light orange indicator lamp connector (special for certain countries)

P1 Engine coolant solution temperature indicator lamp
P2 Fuel level gauge
P3 Hydraulic oil temperature indicator

1 Stop alarm red warning lamp
2 Alarm orange warning lamp
3 Audible warning device stop push-button
6 Engine oil pressure red warning lamp
7 Air filter restriction red warning lamp
8 Battery charge red warning lamp
9 Hydraulic oil filter restriction red warning lamp
11 Minimum pilot pressure red warning lamp
12 Overload indicator orange warning lamp (option)
13 Gauge lighting indicator lamp
14 Not used
15 Rotary light orange indicator lamp (optional)

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INSTRUMENT PANEL WIRING



PDG0235

A 7 way connector: Minimum pilot pressure red warning lamp, hydraulic oil temperature indicator lamp, battery charge red warning lamp, audible warning cancellation push-button, engine oil pressure red warning lamp, orange alarm warning lamp, red stop alarm warning lamp

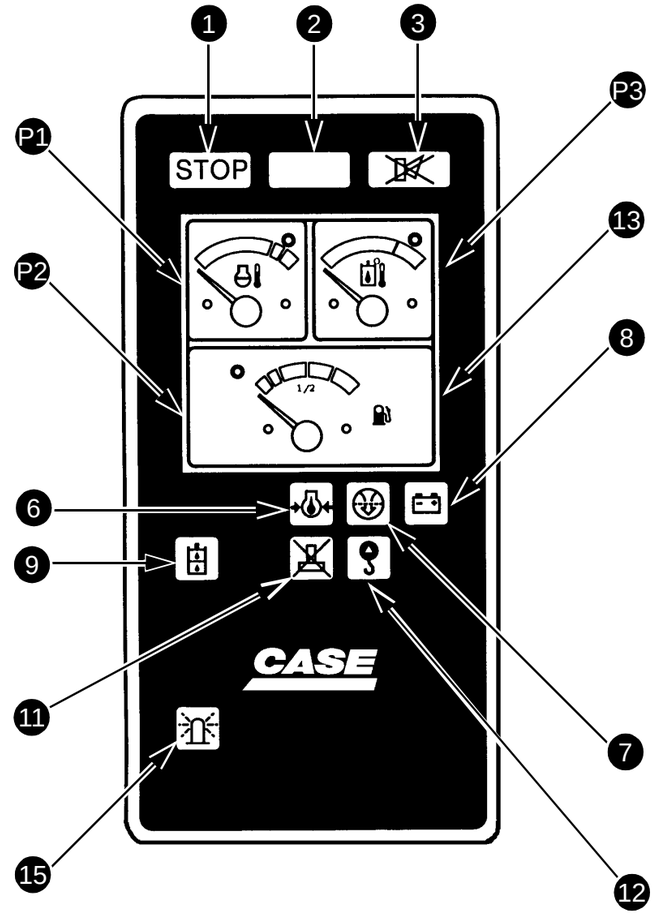
B 7 way connector: 24 Volts supply, earth, fuel level gauge, gauge lighting, engine coolant temperature indicator.

C 7 way connector: air filter restriction red warning lamp, overload indicator orange indicator lamp (optional).

D 7 way connector: hydraulic oil filter restriction red warning lamp.

F 7 way connector: rotary light orange indicator lamp (optional).

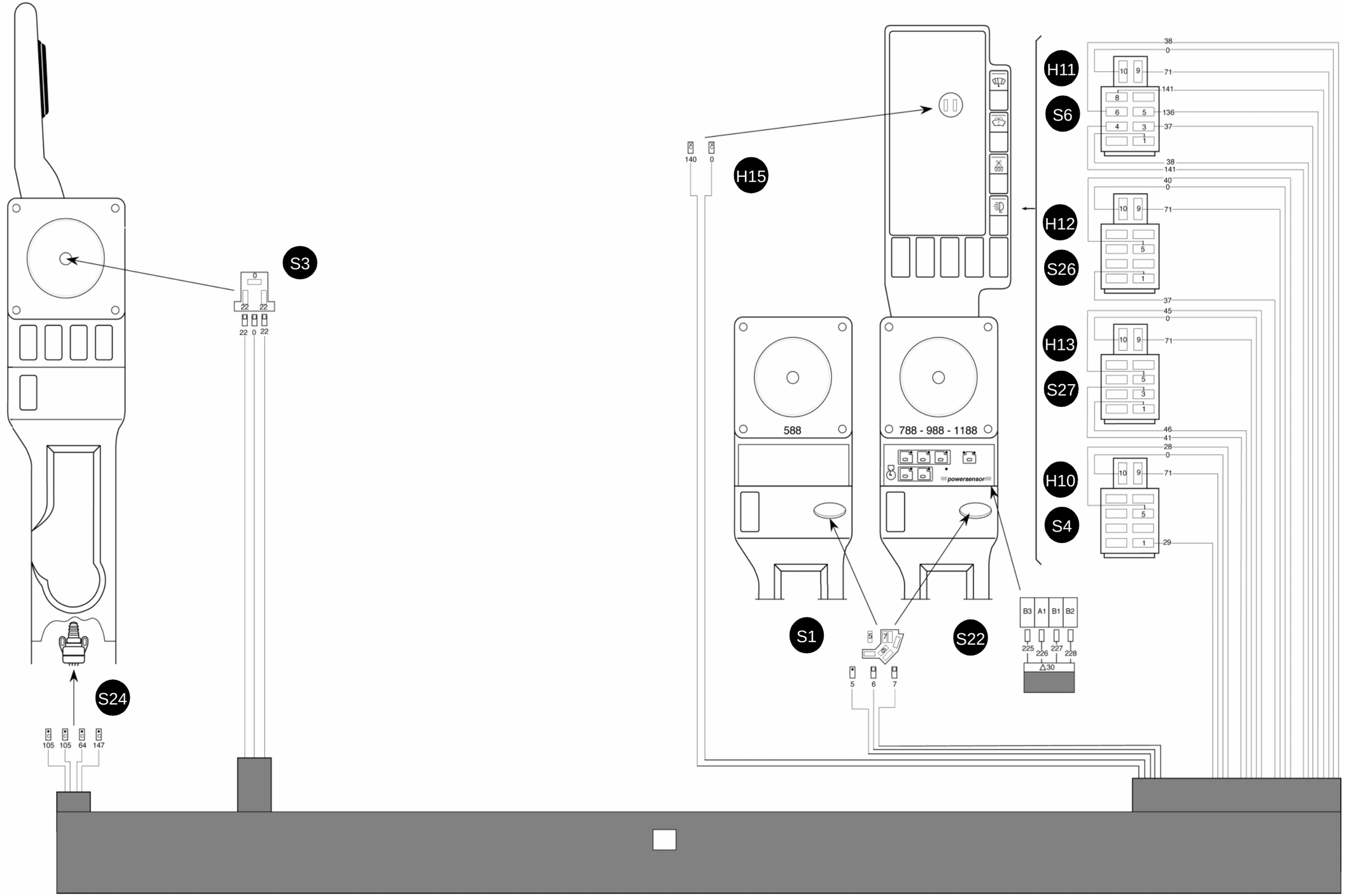
INSTRUMENT PANEL (FRONT FACE)



CS99K502

1 Stop alarm red warning lamp
2 Alarm orange warning lamp
3 Audible warning device stop push-button
6 Engine oil pressure red warning lamp
7 Air filter restriction red warning lamp
8 Battery charge red warning lamp
9 Hydraulic oil filter restriction red warning lamp
11 Minimum pilot pressure red warning lamp
12 Overload indicator orange warning lamp (optional)
13 Gauge lighting indicator lamp
15 Rotary light orange indicator lamp (optional)

P1 Engine coolant solution temperature indicator lamp
P2 Fuel level gauge
P3 Oil temperature indicator


S3
0
22 22
22 0 22
S24
105 105 64 147
H15
140 0
588
788 - 988 - 1188
powersensor
S1
S22
5 6 7
B3 A1 B1 B2
225 226 227 228
△30
H11
S6
H12
S26
H13
S27
H10
S4
38
0
10 9
71
141
8
6 5
136
4 3
37
1
38
141
40
0
10 9
71
5
1
37
45
0
10 9
71
5
3
1
46
41
28
0
10 9
71
5
1
29

CM99K020

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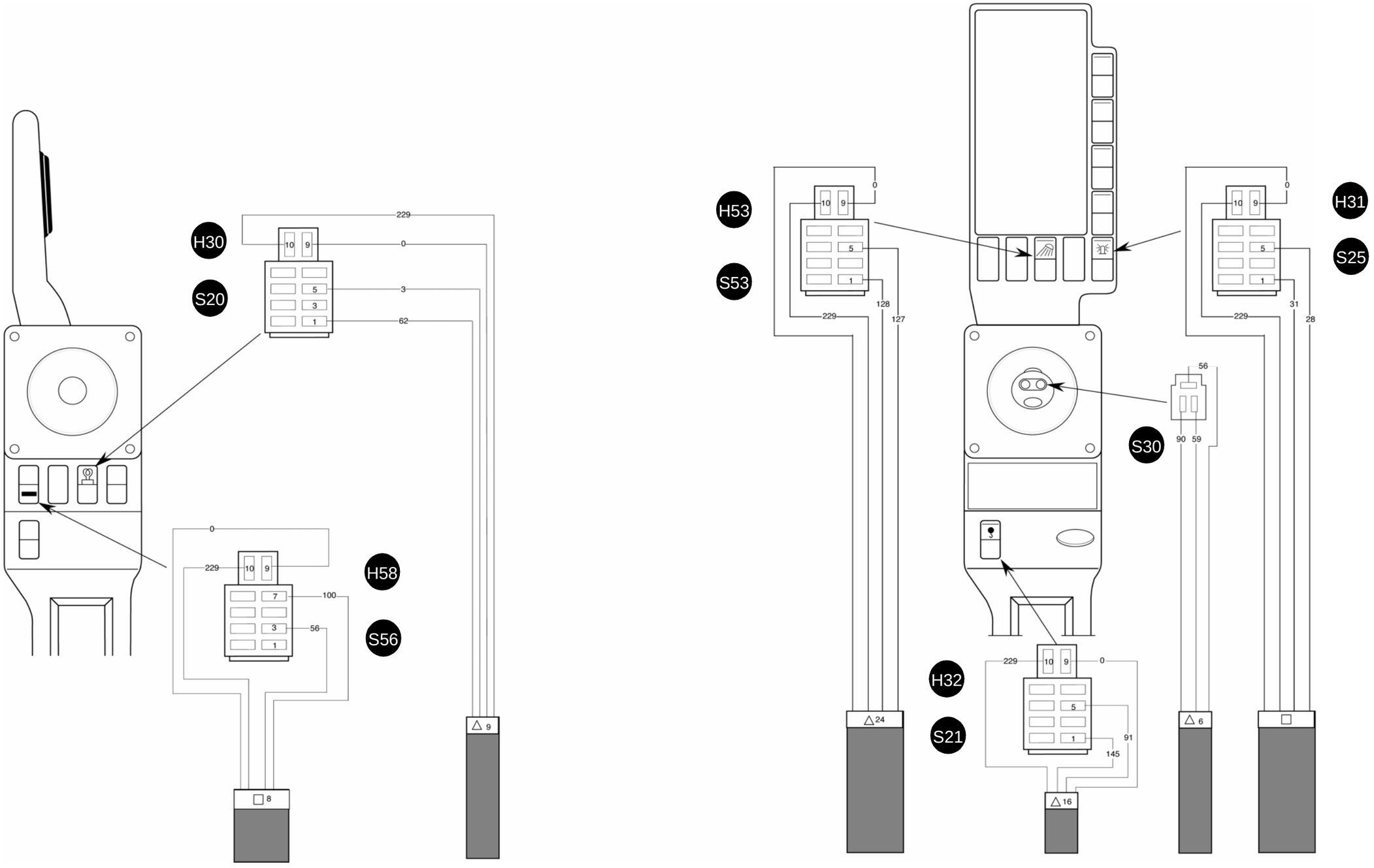
RIGHT-HAND CONTROL ARM AND LEFT-HAND CONTROL ARM WIRING (STANDARD)

H10 Working brake switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lighting
H13 Heater blower switch lighting
H15 Instrument panel audible warning
S1 Key switch
S3 Horn switch
S4 Working light switch
S6 Windshield wiper switch
S22 Control keyboard (788-988-1188)
S24 Pilot safety switch
S26 Windshield washer switch
S27 Heater blower switch

□ Floor harness

△ **30** Electronic harness

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CM99K021

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RIGHT-HAND AND LEFT-HAND CONTROL ARM WIRING (OPTIONAL)

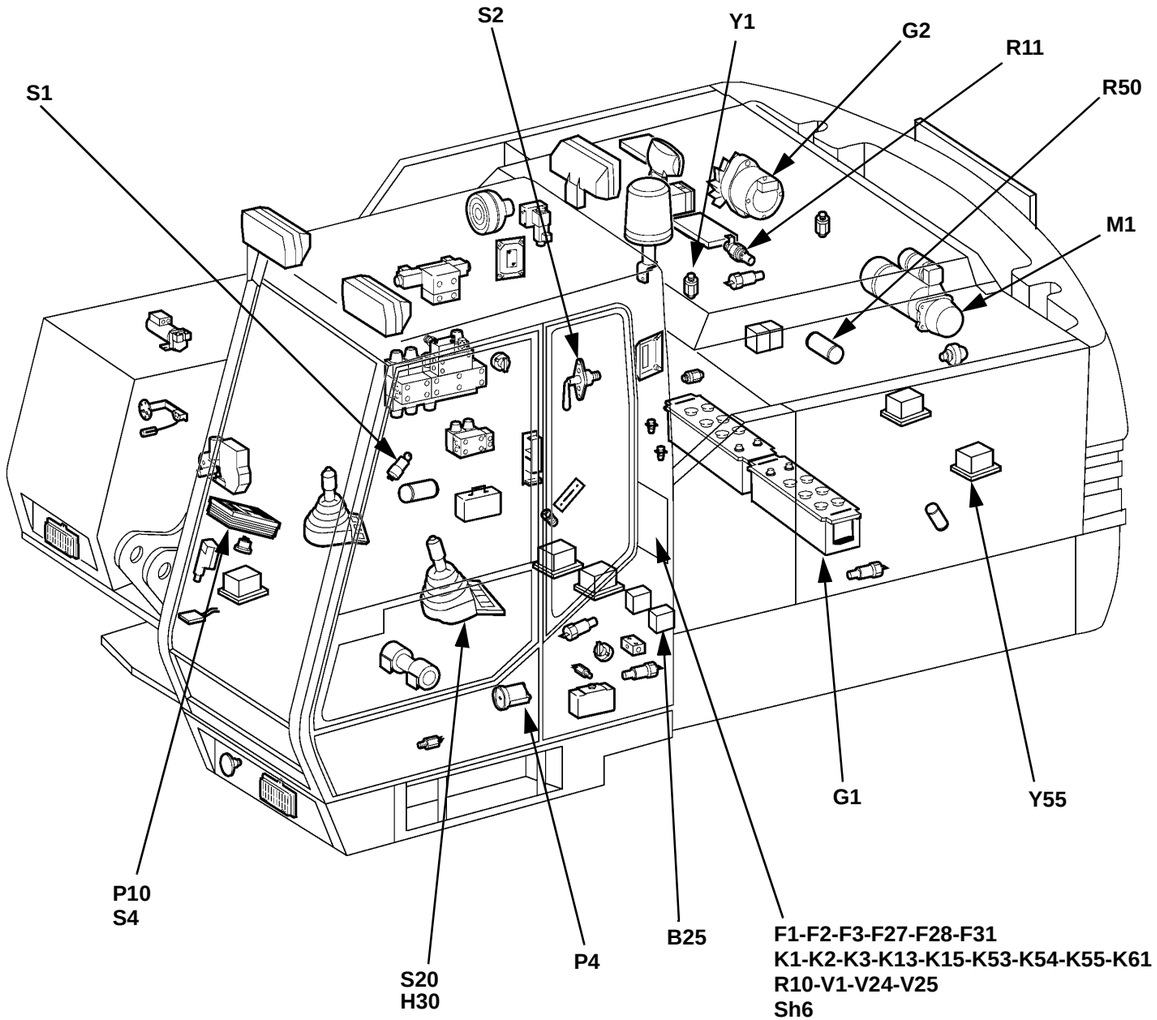
H30 Cold start assistance switch lighting (optional)
H31 Rotary light switch lighting (optional)
H32 Overload indicator switch lighting (optional)
H53 Cab front working light switch lighting (optional)
H58 Quick coupler switch lighting (optional)
S20 Cold start assistance switch (optional)
S21 Overload indicator switch (optional)
S25 Rotary light switch (optional)
S30 Adjustable or articulated boom control switch (optional)
H53 Cab front working light switch lighting (optional)
S56 Quick coupler switch (optional)

△**6** Harness - adjustable boom control
△**9** Cold start assistance harness
△**16** Overload indicator harness
△**24** Harness – front working lights, rear working light

□**8** Floor harness

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ELECTRICAL SCHEMATIC (PLATE 2)



CM99K022

ELECTRICAL CABINET

B25 Threshold detector (788)
F1 Fuse, 30 A, starter motor solenoid, thermostart
F2 Fuse, 5 A, starter key switch
F3 Fuse, 7.5 A, instrument panel, hourmeter
F27 Fuse, 5 A, remote controlled or articulated boom, tool quick coupler, air suspension seat, speed threshold detector (788P heavy lift)
F28 Fuse, 40 A, engine stop/start solenoid (injection)
F31 Fuse, 10 A, fuel heater
K1 Starter motor relay
K2 Battery relay
K3 Hourmeter relay
K13 Engine stop solenoid relay
K15 Thermostart relay
K53 Fuel heater relay
K54 Frequency threshold detector relay (threshold: 1 = 1600 rpm) (788)
K55 Frequency threshold detector relay (threshold: 2 = 1400 rpm) (788)
K61 Battery relay (heater/air conditioner)
R10 Resistor, 0.85 Ohms
V1 Starter key switch diode
V24 K54 relay diode
V25 K55 relay diode
Sh6 Shunt

FLOOR

P4 Hourmeter
P10 Instrument panel
H30 Cold start assistance switch lighting (optional)
S1 Key switch
S4 Working light switch
S20 Cold start assistance switch (optional)

UPPERSTRUCTURE

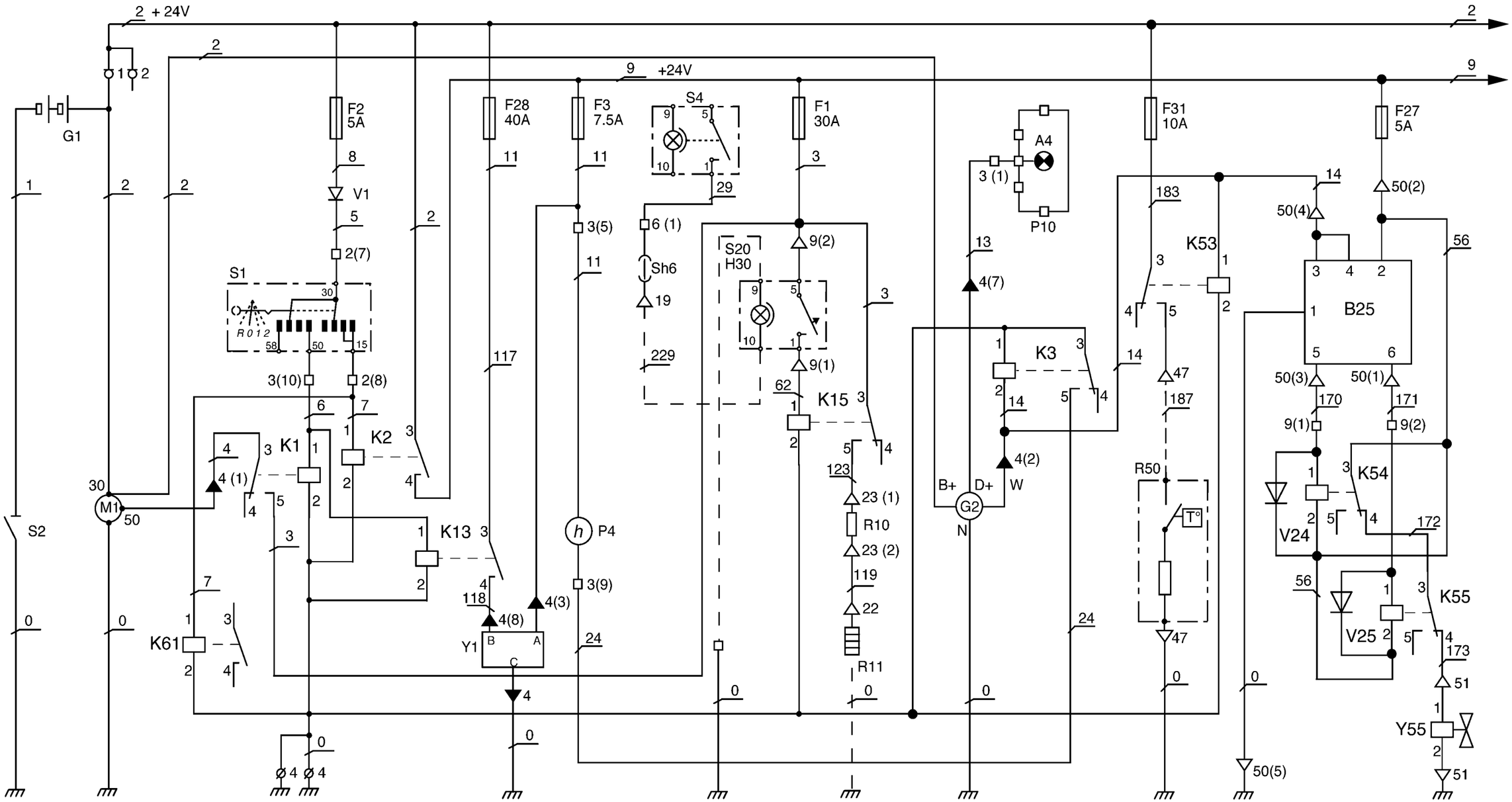
G1 Batteries
S2 Battery master switch
Y55 Heavy lift solenoid valve (788)

ENGINE

G2 Alternator
M1 Starter motor
R11 Cold start assistance plug (optional)
Y1 Engine shut-down solenoid valve
R50 Fuel heater (optional)

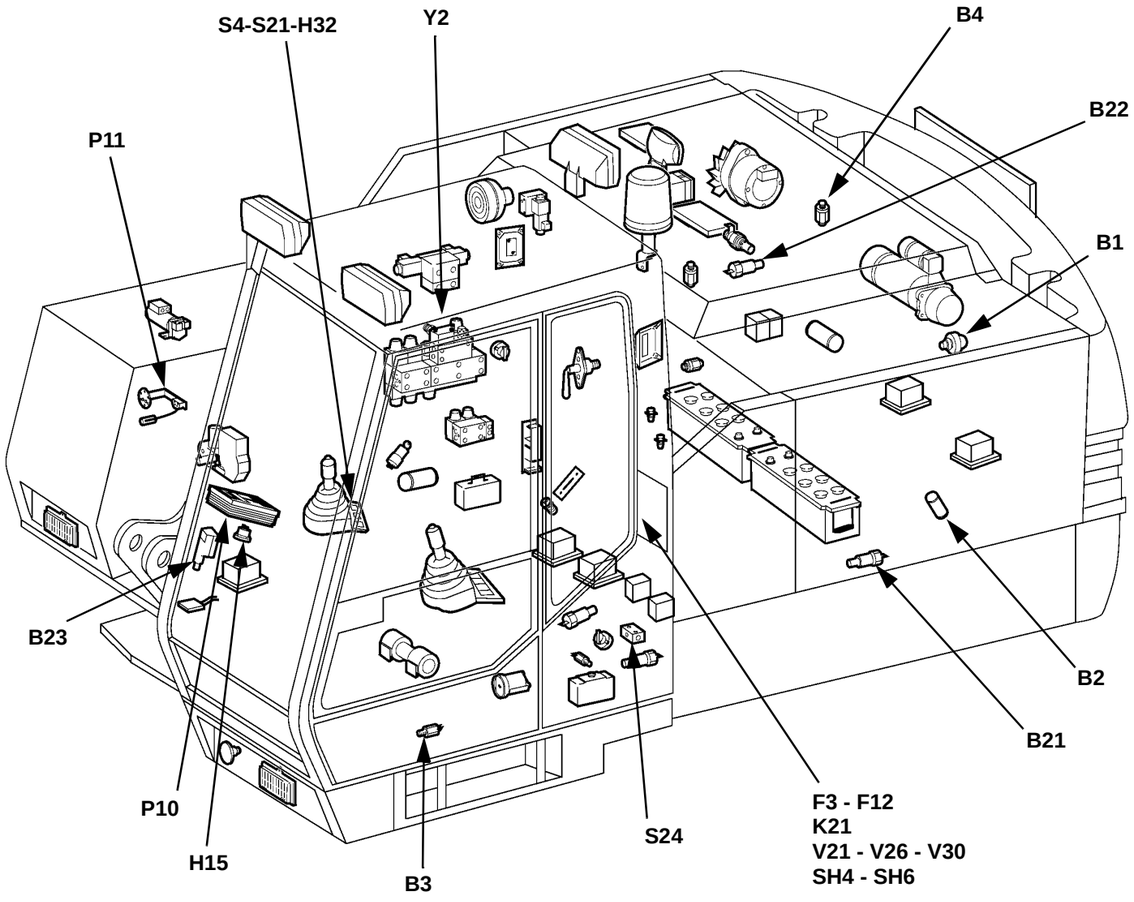
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BATTERIES BATTERY MASTER SWITCH	STARTER MOTOR	STARTER KEY SWITCH BATTERY RELAY HEATER/AIR CONDI- TIONER RELAY	GENERAL RELAY ENGINE STOP RELAY	ENGINE STOP	HOURMETER	COLD START ASSISTANCE	ALTERNATOR	FUEL OIL HEATER	SPEED THRESHOLD DETECTOR



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ELECTRICAL SCHEMATIC (PLATE 3)



CM99K022

INSTRUMENT PANEL

P10 Instrument panel

ELECTRICAL CABINET

F3 Fuse, 7.5 A, instrument panel, hourmeter
F12 Fuse, 10 A, pilot safety, overload indicator
K21 Safety relay piloting pressure switch piloting
Sh4 Shunt
Sh6 Shunt
V21, V26, V30 Diode

ON FLOOR

B3 Pilot pressure switch
H15 Instrument panel audible warning
H32 Overload indicator switch lighting (optional)
S4 Working light switch
S21 Overload indicator switch (optional)
S24 Pilot safety switch

UPPERSTRUCTURE

B1 Air filter restriction pressure switch
B2 Hydraulic oil filter restriction pressure switch
B21 Hydraulic oil temperature sender
B23 Overload indicator (optional)
P11 Fuel level gauge
Y2 Pilot safety solenoid valve

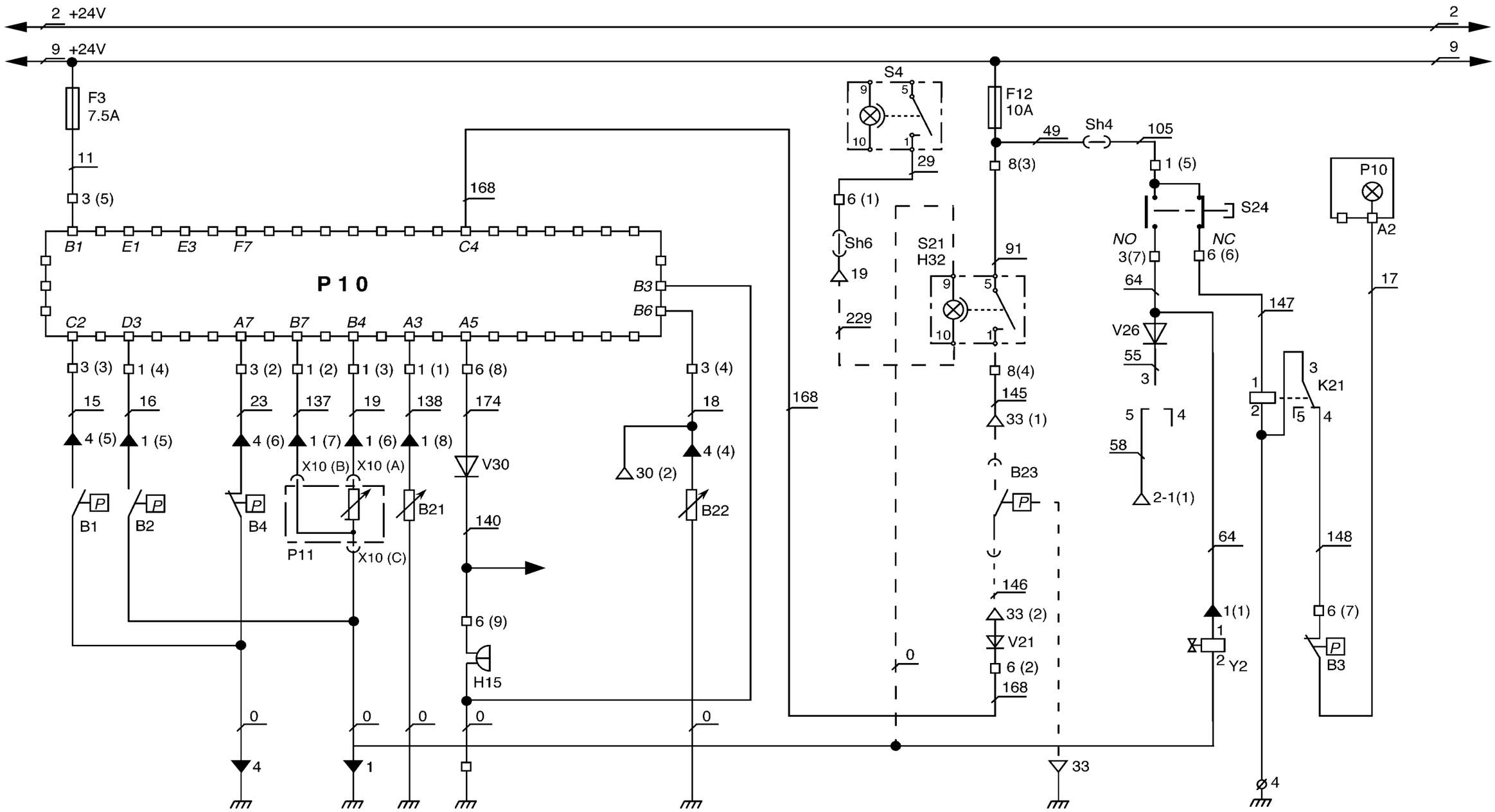
ENGINE

B4 Engine oil pressure switch
B22 Engine coolant temperature sender

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INSTRUMENT PANEL

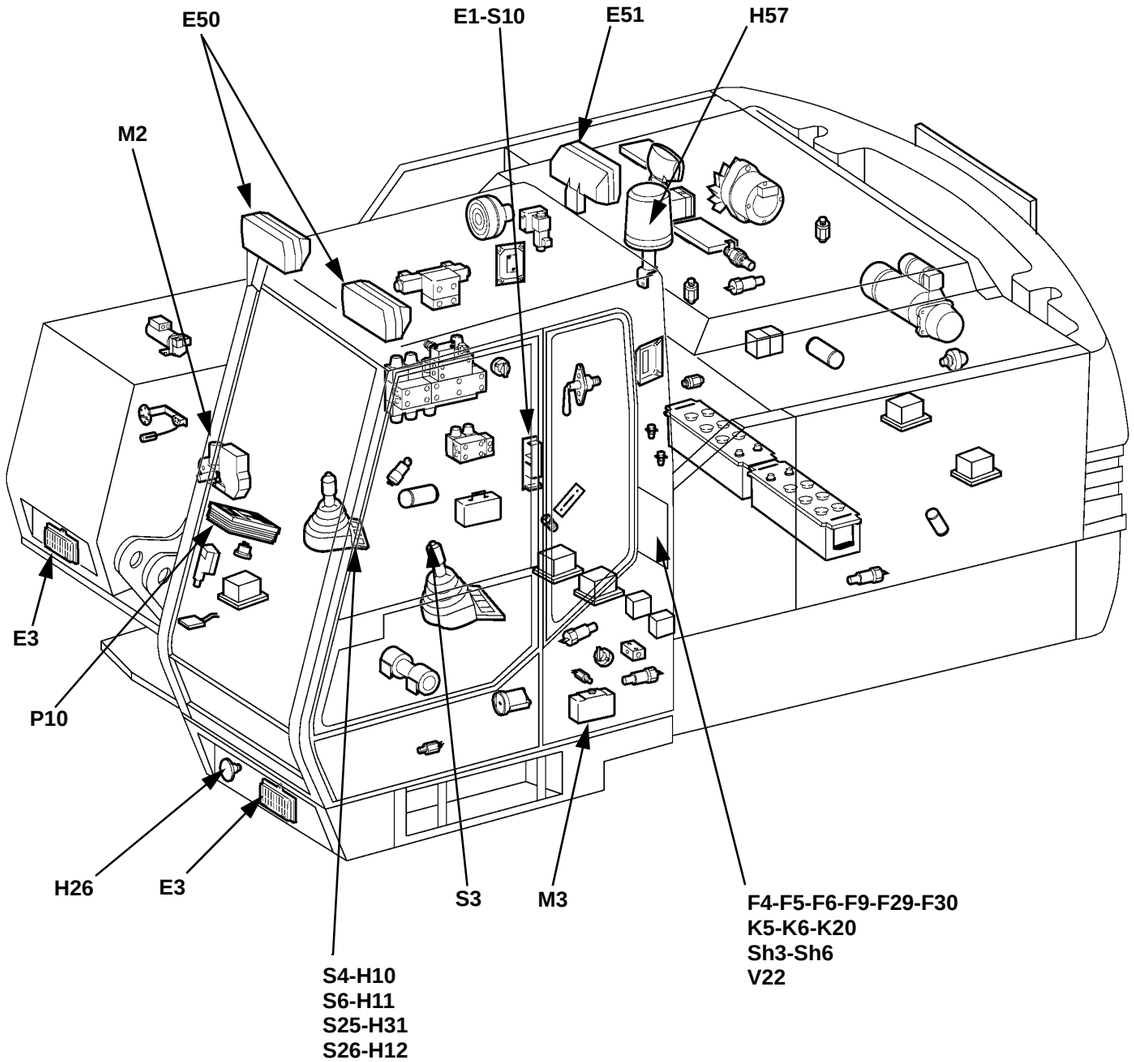
AIR FILTER RESTRICTION | HYDRAULIC OIL FILTER RESTRICTION | ENGINE OIL PRESSURE | FUEL LEVEL RESERVE ALARM | HYDR. FLUID TEMP. | INSTRUMENT PANEL AUDIBLE WARNING | ENGINE TEMPERATURE | OVERLOAD INDICATOR | PILOT SAFETY SYSTEM



CM99K010

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ELECTRICAL SCHEMATIC (PLATE 4)



CM99K022

INSTRUMENT PANEL

H10 Working brake switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lighting
H31 Rotary light switch lighting (optional)
S4 Working light switch
S6 Windshield wiper switch
S25 Rotary light switch (optional)
S26 Windshield washer switch

ELECTRICAL CABINET

F4 Fuse, 5 A, cab lighting, horn (control), hood lighting
F5 Fuse, 10 A, working lights (control), rotary light (std), night lighting for switch on instrument panel and electronics
F6 Fuse, 15 A, attachment working light, rear cab light, upperstructure working lights
F9 Fuse, 10 A, windshield washer, windshield wiper (BAT + R)
F29 Fuse, 10 A, cab front working light
F30 Fuse, 10 A, windshield wiper (BAT +)
K5 Horn relay
K6 Working light relay
K20 Windshield wiper intermittent action
Sh3 Shunt
Sh6 Shunt
V22 Rotary light diode on instrument panel

CAB

E1 Cab lighting
E50 Cab front working lights
E51 Cab rear working light
H57 Standard or Italian rotary light
M2 Windshield wiper motor
E Blue
J White
L Grey
M Black
P10 Instrument panel
S10 Cab lighting switch

ON FLOOR

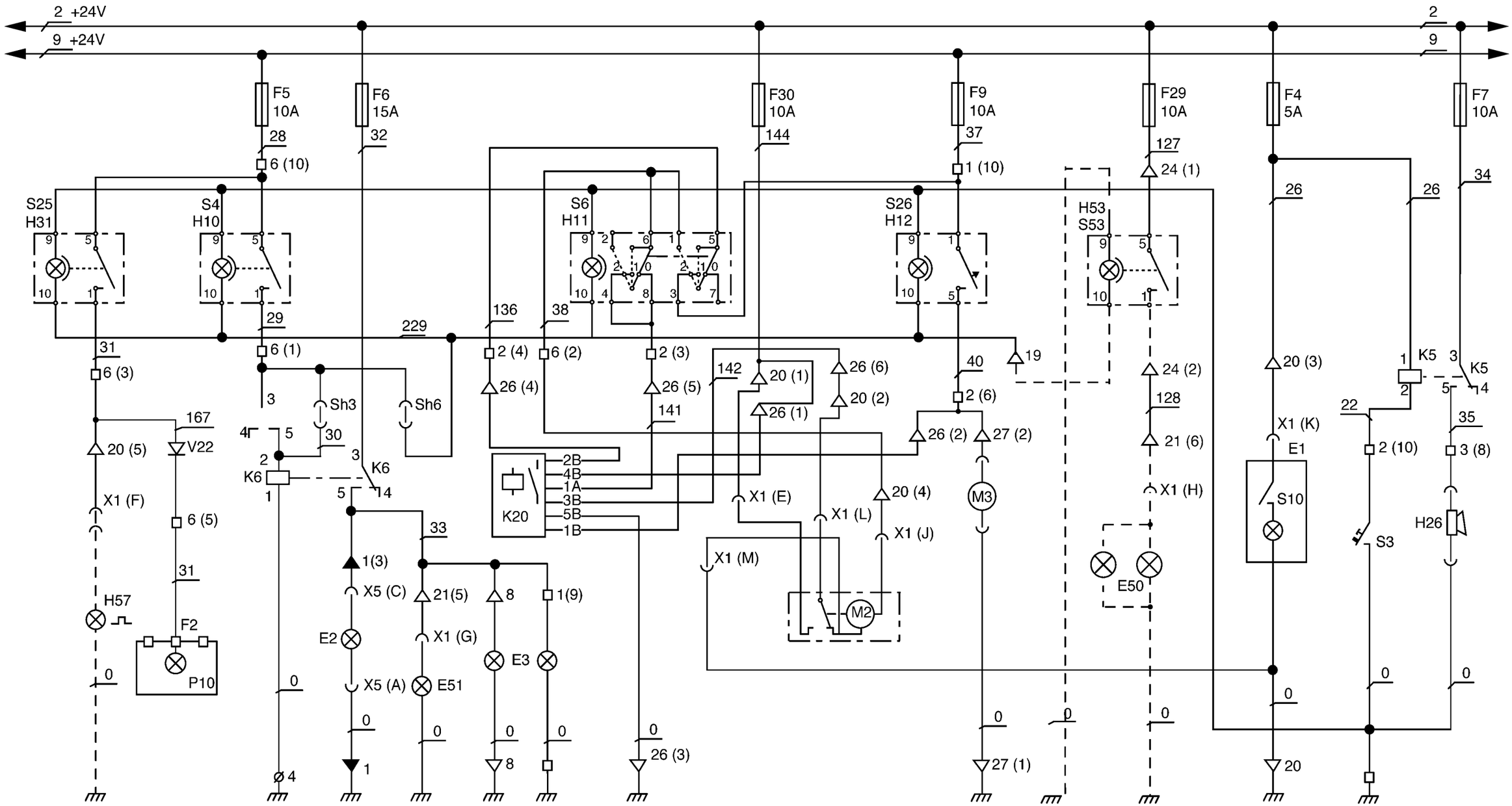
H26 Horn
M3 Windshield washer motor
S3 Horn switch

UPPERSTRUCTURE

E2 Attachment working light on boom
E3 Upperstructure working lights

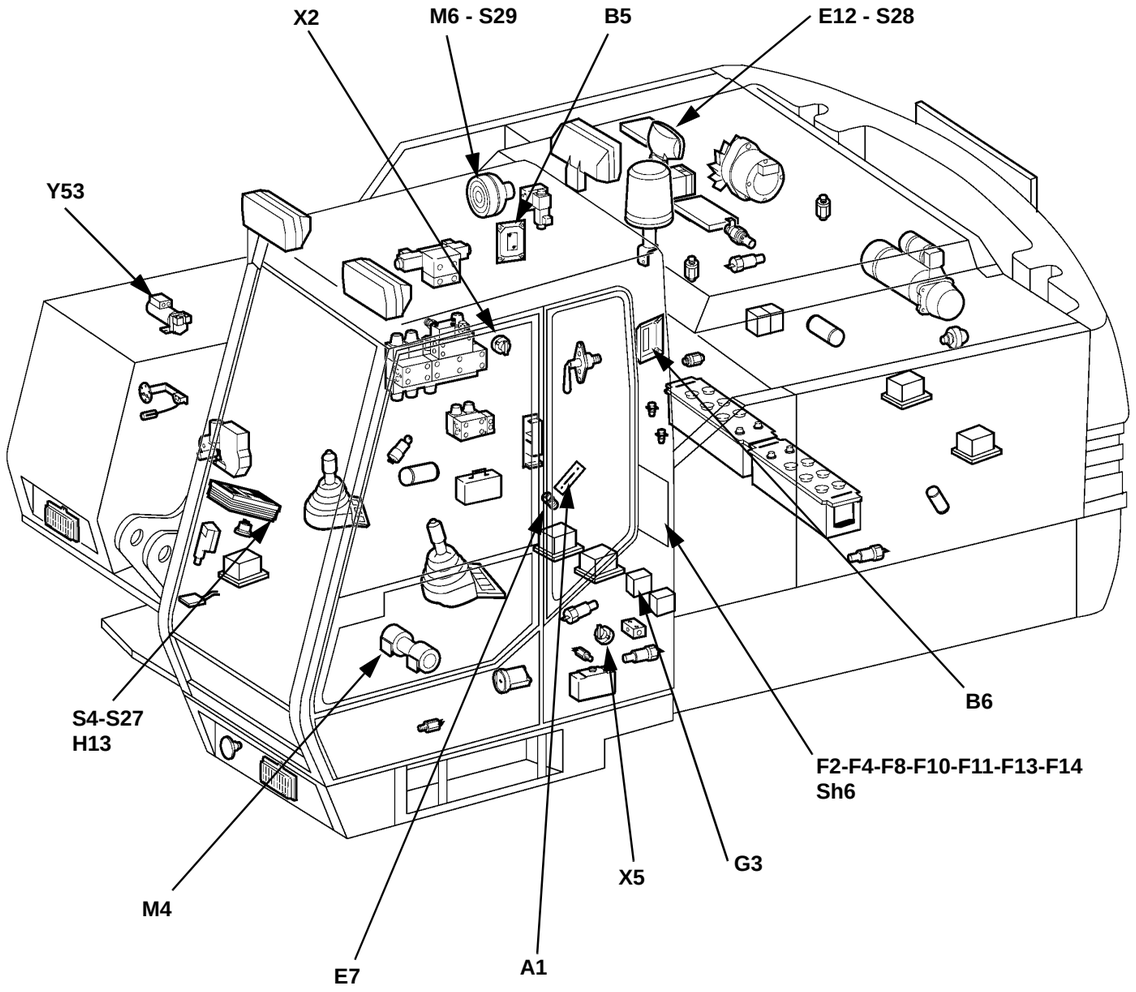
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ROTARY LIGHT | WORKING LIGHTS: ATTACHMENT | REAR OF CAB | UPPERSTRUCTURE | WINDSHIELD WIPER | WINDSHIELD WASHER | WORKING LIGHT AT FRONT OF CAB | CAB LIGHTING | HORN



CM99K011

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CM99K022

ELECTRICAL SCHEMATIC (PLATE 5)

ELECTRICAL CABINET

F2 Fuse, 5 A, starter key switch
F4 Fuse, 5 A, cab lighting, horn (control), hood lighting
F8 Fuse, 15 A, upperstructure socket, fuel pump
F10 Fuse, 10 A, heater
F11 Fuse, 7.5 A, cigar lighter, cab blower
F13 Fuse, 15 A, air conditioner
F14 Fuse, 10 A, step-down transformer / radio
Sh6 Shunt

ON FLOOR

A1 Radio
E7 Cigarette lighter
G3 Step-down transformer 24V / 12V
H13 Heater blower switch lighting
M4 Heater blower motor
S4 Working light switch
S27 Heater blower switch
X5 12V accessories socket

CAB

B5 RH loudspeaker (optional)
B6 LH loudspeaker (optional)
M6 Cab blower motor (optional)
S29 Cab blower switch (optional)

UPPERSTRUCTURE

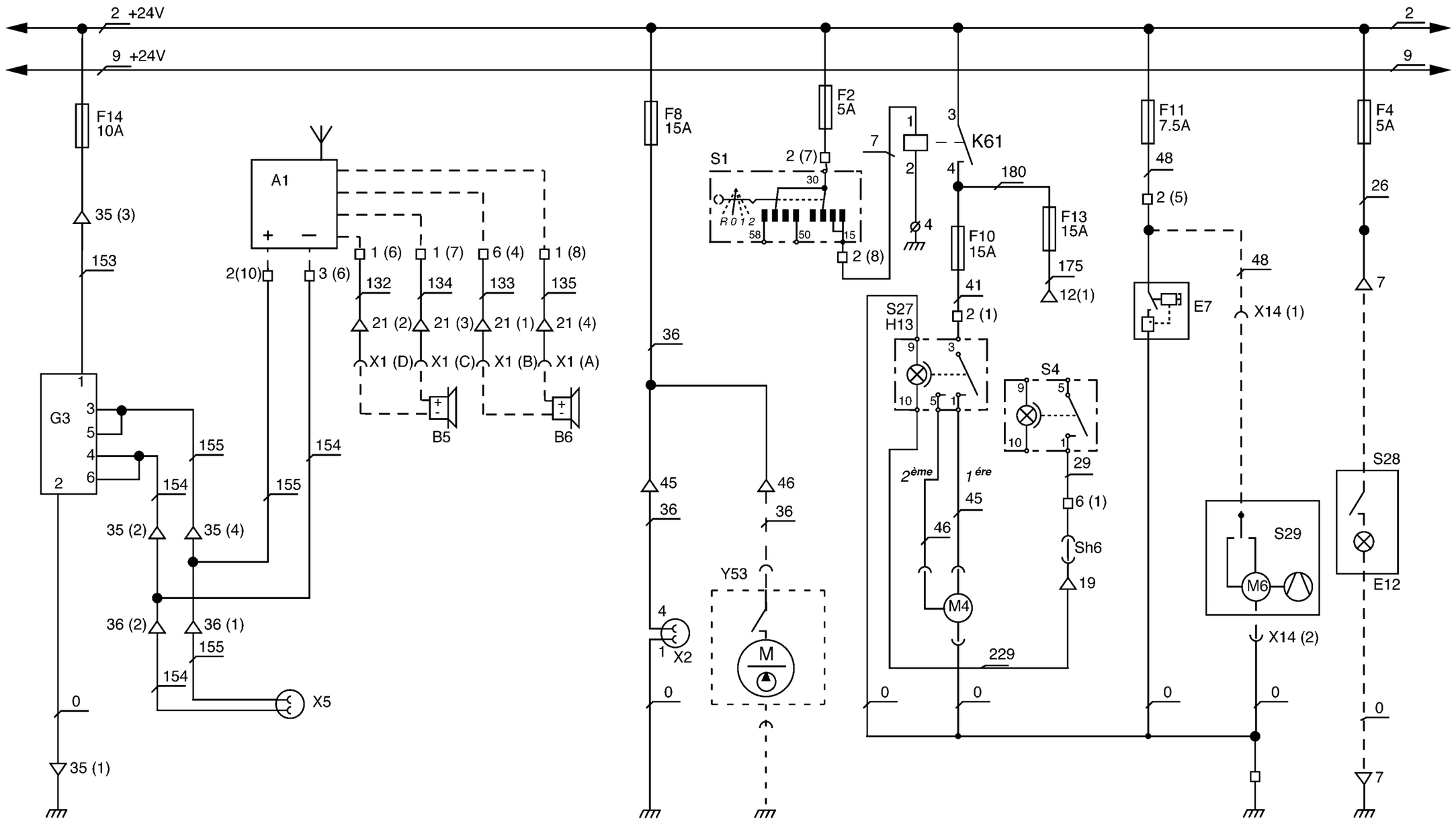
X2 Upperstructure power line connection
Y53 Fuel filler pump (optional)

ENGINE

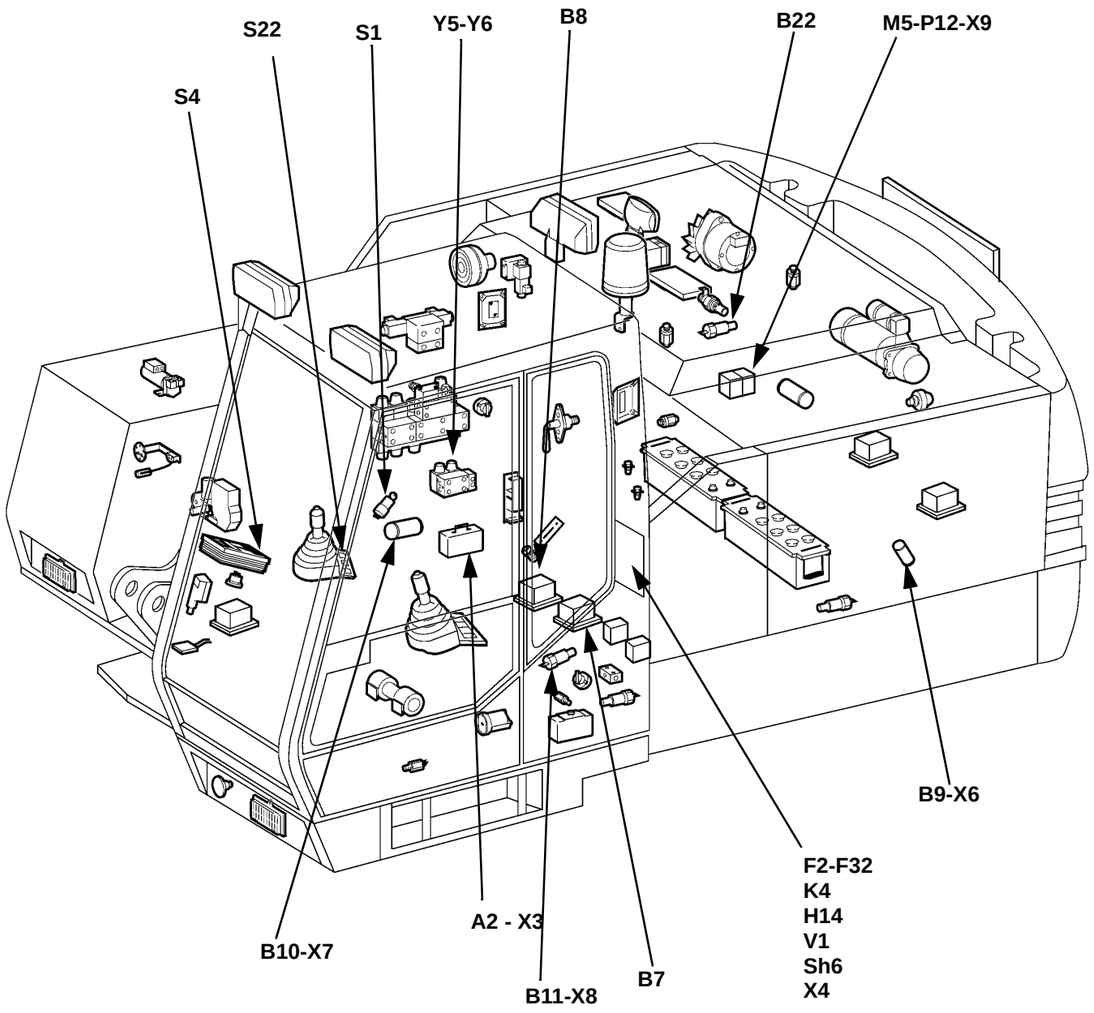
E12 Engine compartment light (optional)
S28 Engine compartment lighting switch (optional)

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24V - 12V STEP-DOWN TRANSFORMER | RADIO LH AND RH LOUDSPEAKERS | UPPERSTRUCTURE POWER LINE CONNECTION | FUEL FILLER PUMP | CAB HEATER | CIGARETTE LIGHTER | CAB VENTILATION | HOOD LIGHTING



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CM99K022

ELECTRICAL SCHEMATIC (PLATE 6) (788C/988C/1188C)

ELECTRICAL CABINET

F2 Fuse, 5 A, starter key switch
F32 Fuse, 5 A, (BAT +) electronics
K4 Electronic supply relay
H14 Troubleshooting test LED
Sh6 Shunt
V1 Diode

CAB

A2 Electronic control box (788-988-1188)
S22 Control keyboard (788-988-1188)
X3 35-way connector (788-988-1188)
X4 Troubleshooting test socket (788-988-1188)

ON FLOOR

B8 Travel detector pressure switch (788-988-1188)
S1 Key switch
S4 Working light switch

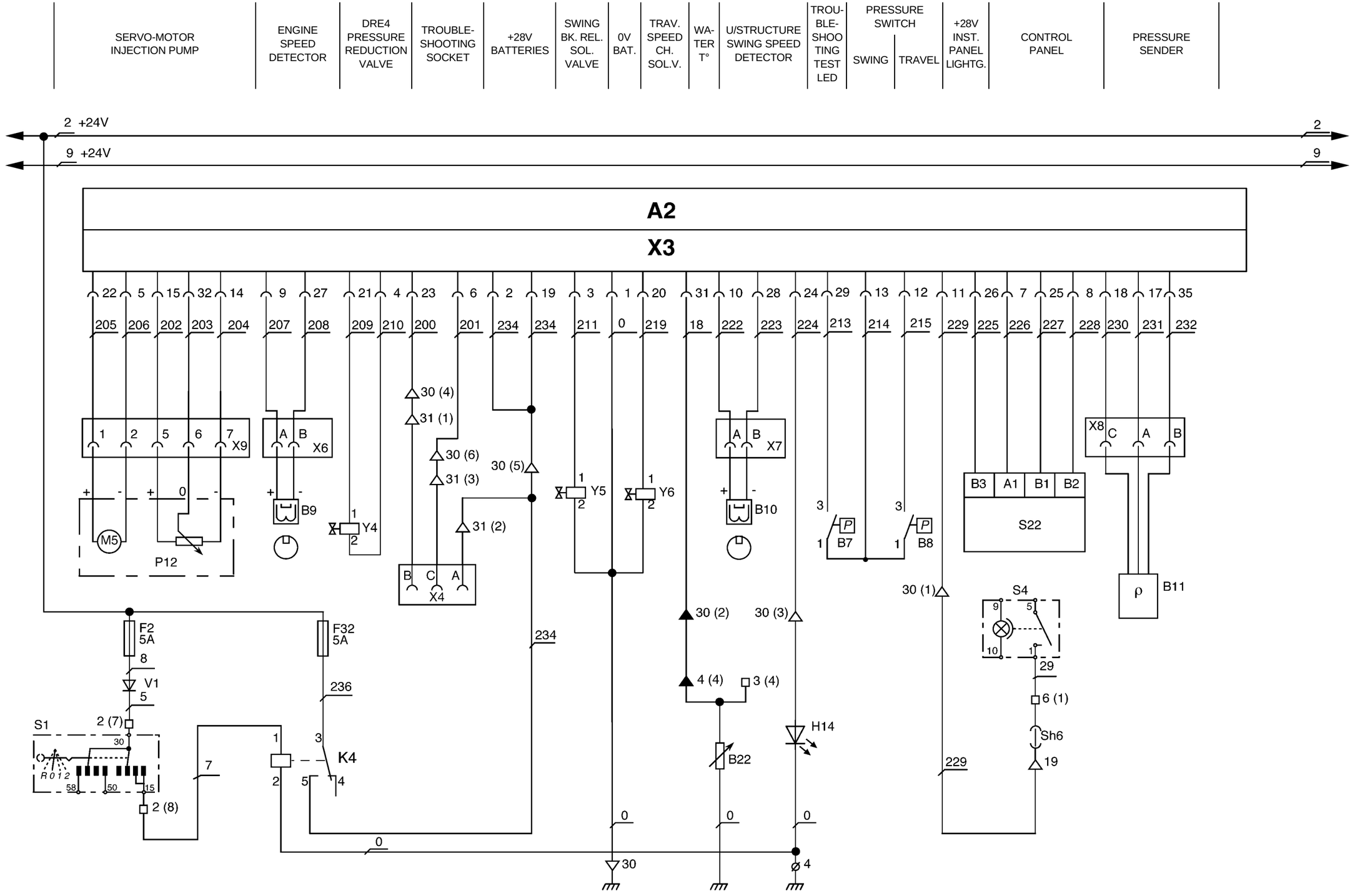
UPPERSTRUCTURE

B7 Swing detection pressure switch (788-988-1188)
B10 Swing motor speed detector (788-988-1188)
B11 Hydraulic pressure sender (788-988-1188)
Y5 Upperstructure brake release control solenoid valve
Y6 Travel motor displacement change electro-control valve

ENGINE

B9 Engine speed detector (788-988-1188)
B22 Engine coolant temperature sender
M5 Injection pump servo-motor (788-988-1188)
P12 Servo-motor potentiometer (788-988-1188)
X6 Engine speed detector connector (788-988-1188)
X7 Upperstructure swing speed detector connector
X8 Hydraulic pressure sender connector (788-988-1188)
X9 Injection pump servo-motor connector (788-988-1188)
Y4 DRE4 proportional pressure reduction valve

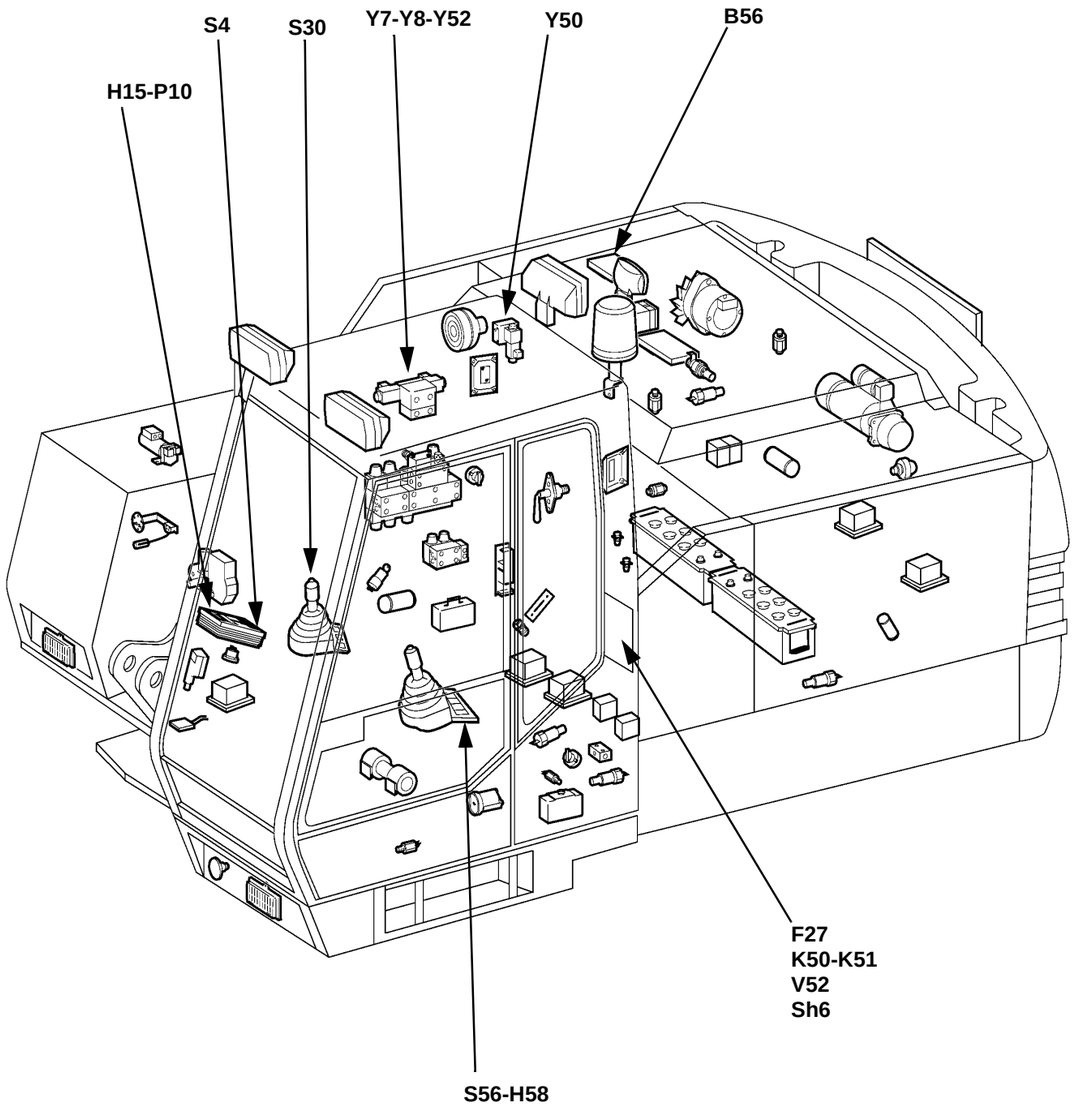
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CM99K013

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ELECTRICAL SCHEMATIC (PLATE 7)



CM99K022

ELECTRICAL CABINET

F27 Fuse, 5 A, remote controlled or articulated boom, tool quick coupler, air suspension seat, speed threshold detector (788P heavy lift)
K50 Adjustable boom raising limiter relay
K51 Adjustable boom retracting limitation relay
Sh6 Shunt
V52 Diode

CAB

H58 Quick coupler switch lighting (optional)
S4 Working light switch
S30 Adjustable or articulated boom control switch (optional)
S56 Quick coupler switch (optional)

UPPERSTRUCTURE

B56 Boom raising range limitation detector (optional)
Y7 Adjustable or articulated boom extending electro-valve (optional)
Y8 Adjustable or articulated boom retracting electro-valve (optional)
Y50 Adjustable boom raising height limiter solenoid valve (optional)
Y52 Quick coupler solenoid valve (optional)

INSTRUMENT PANEL

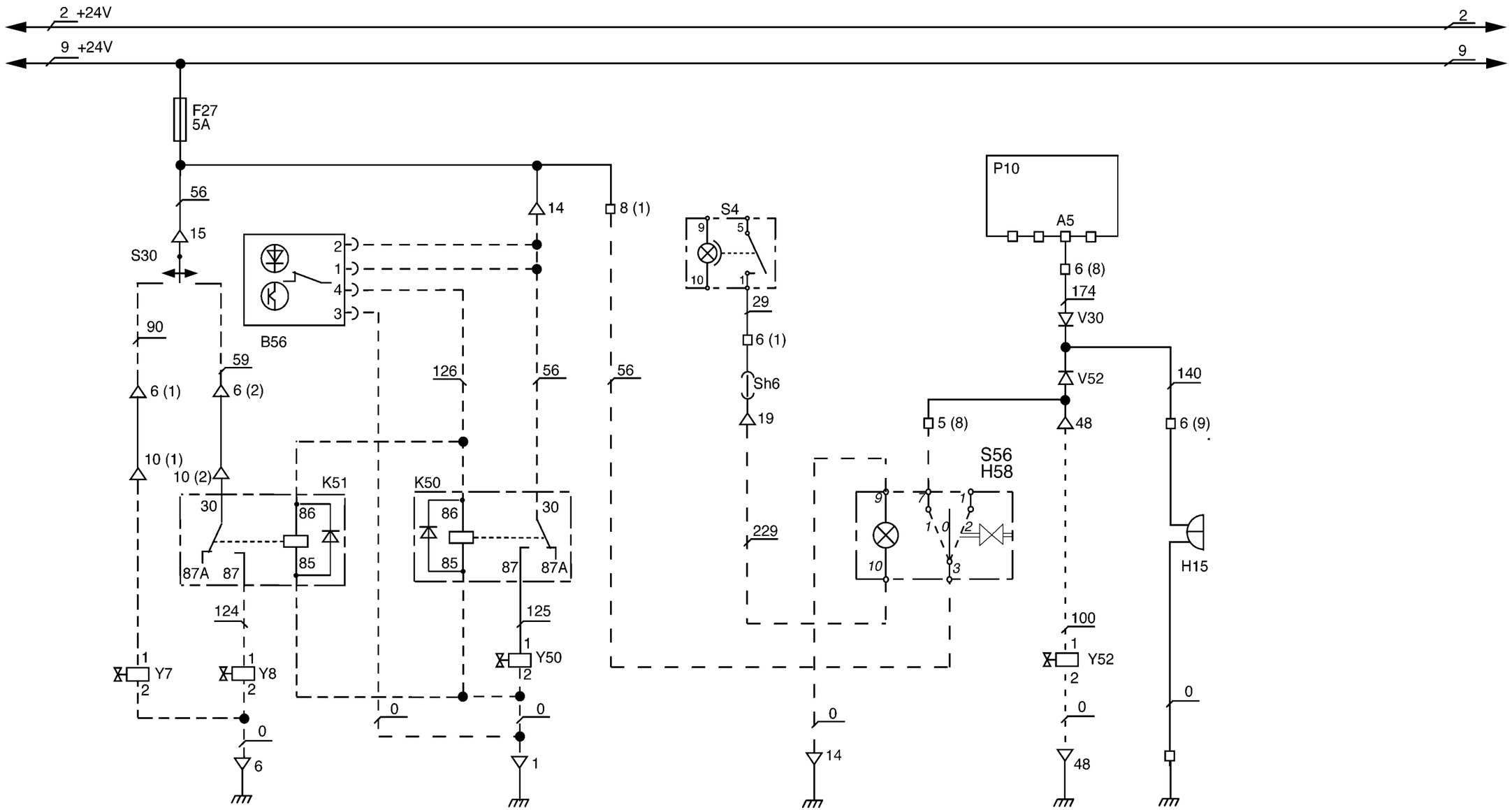
H15 Instrument panel audible warning
P10 Instrument panel

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ADJUSTABLE BOOM
OR
ARTICULATED BOOM

ADJUSTABLE BOOM
RANGE LIMITATION

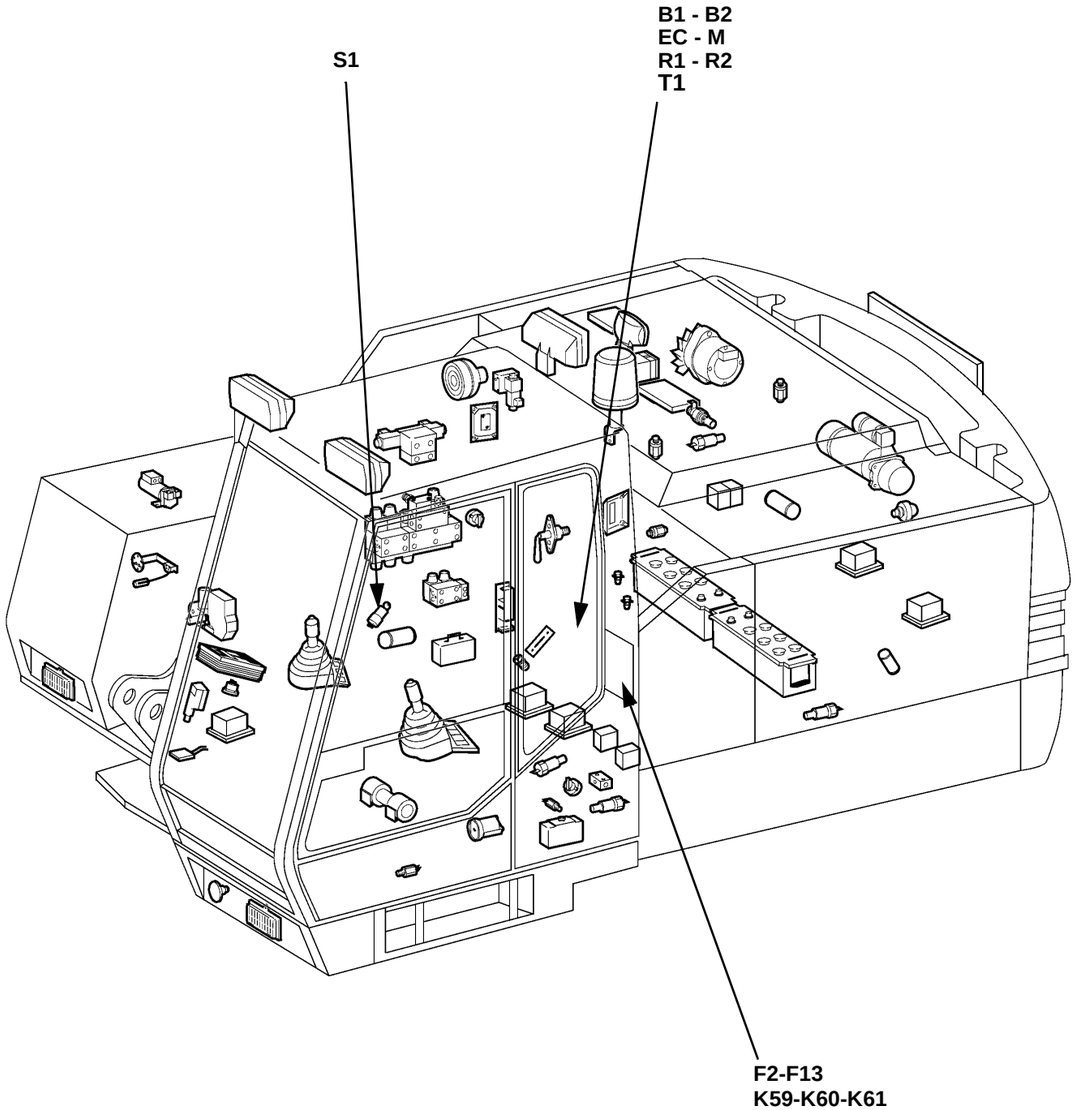
QUICK TOOL COUPLER



CM99K014

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ELECTRICAL SCHEMATIC (PLATE 8)



CM99K022

ELECTRICAL CABINET

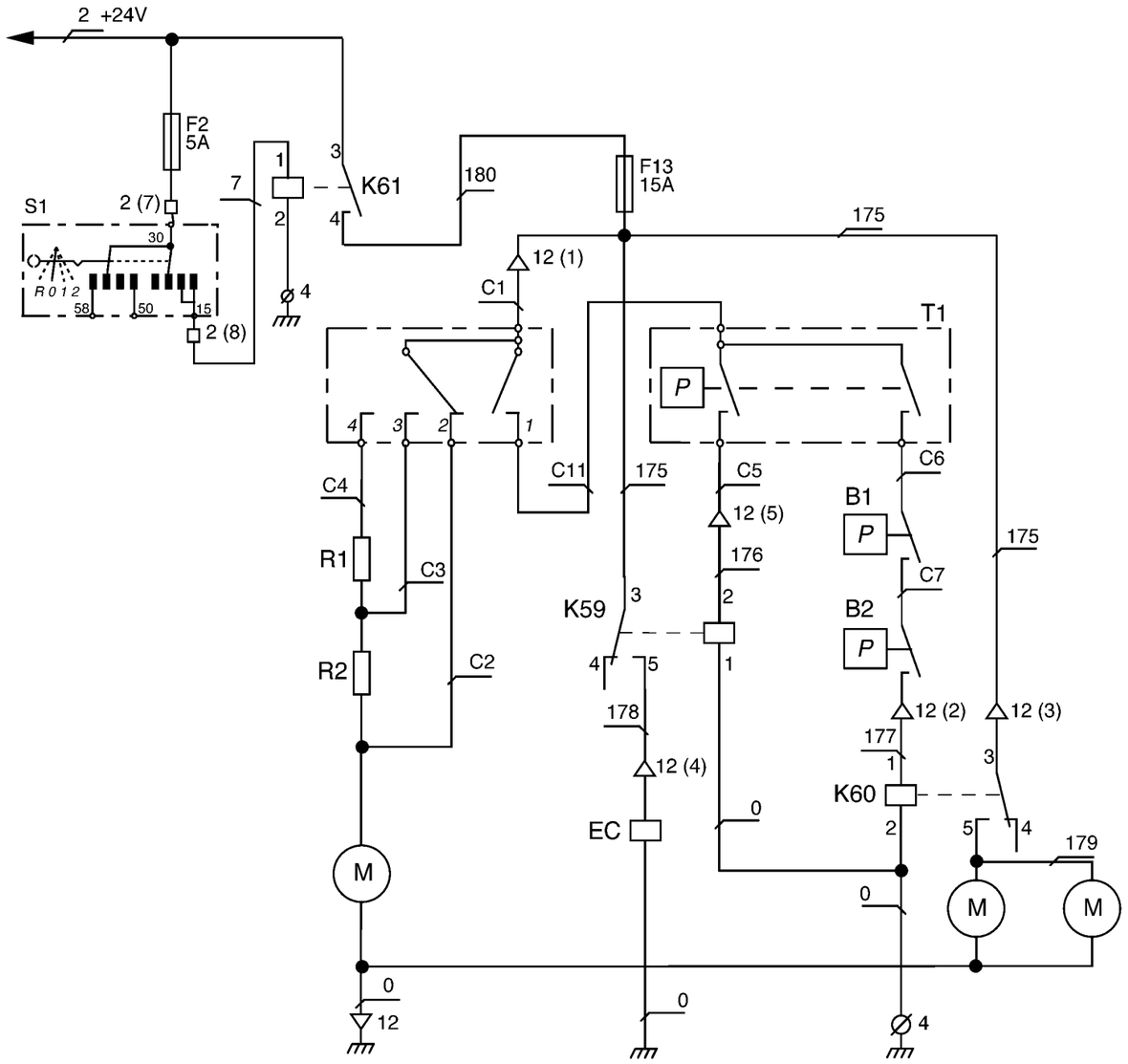
F2 Fuse, 5 A, starter key switch
F13 Fuse, 15 A, air conditioner
K59 Air conditioning compressor relay
K60 Air conditioning condenser relay
K61 Battery relay (heater/air conditioner)

CAB

B1 Air filter restriction pressure switch
B2 Hydraulic oil filter restriction pressure switch
EC Compressor
M Condenser blower and blower motors
R1 Blower speed resistor
R2 Blower speed resistor
S1 Key switch
T1 Pressure switch

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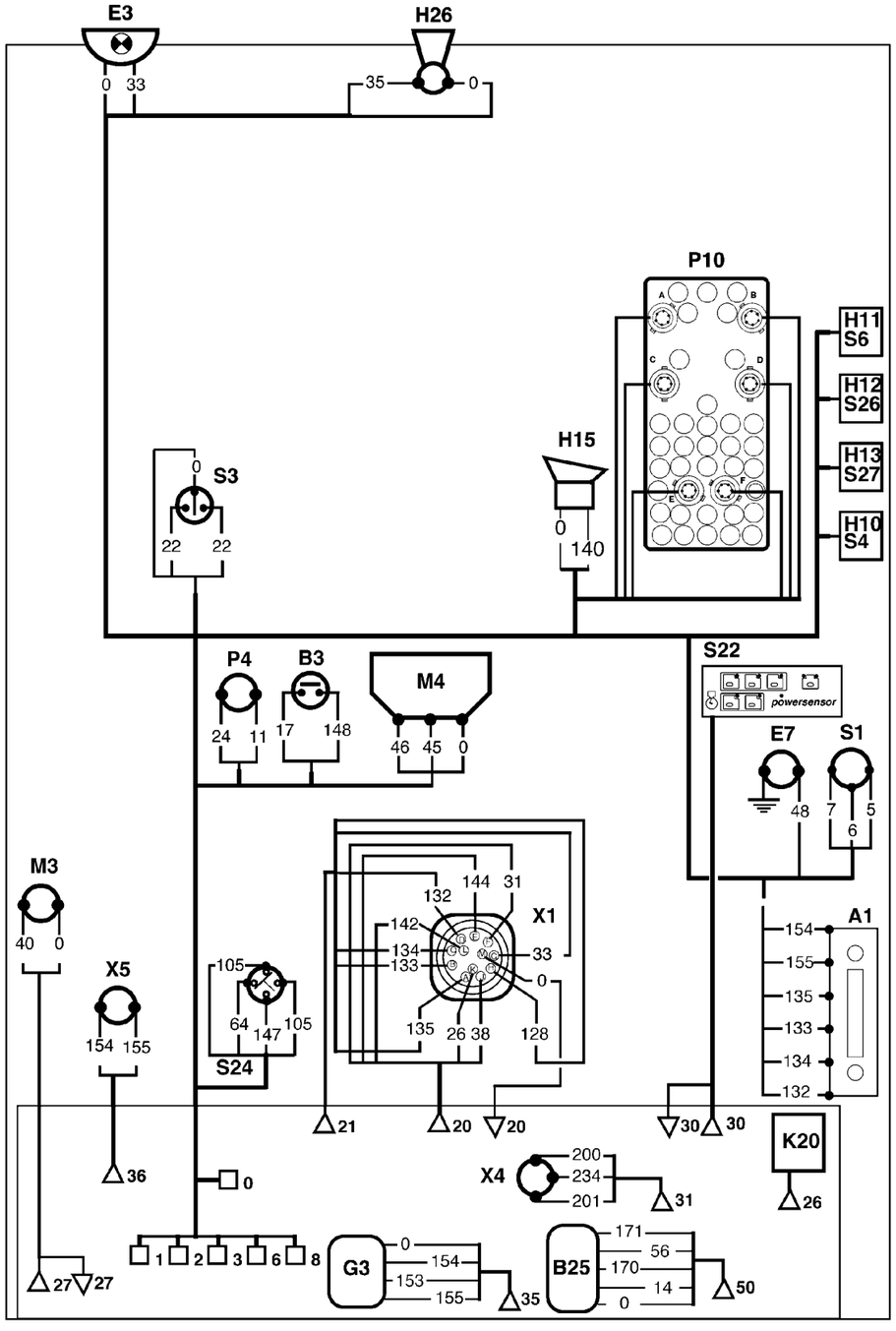
STARTER KEY SWITCH | AIR CONDITIONER



CM99K015

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CAB FLOOR WIRING (STANDARD)



CM99K023

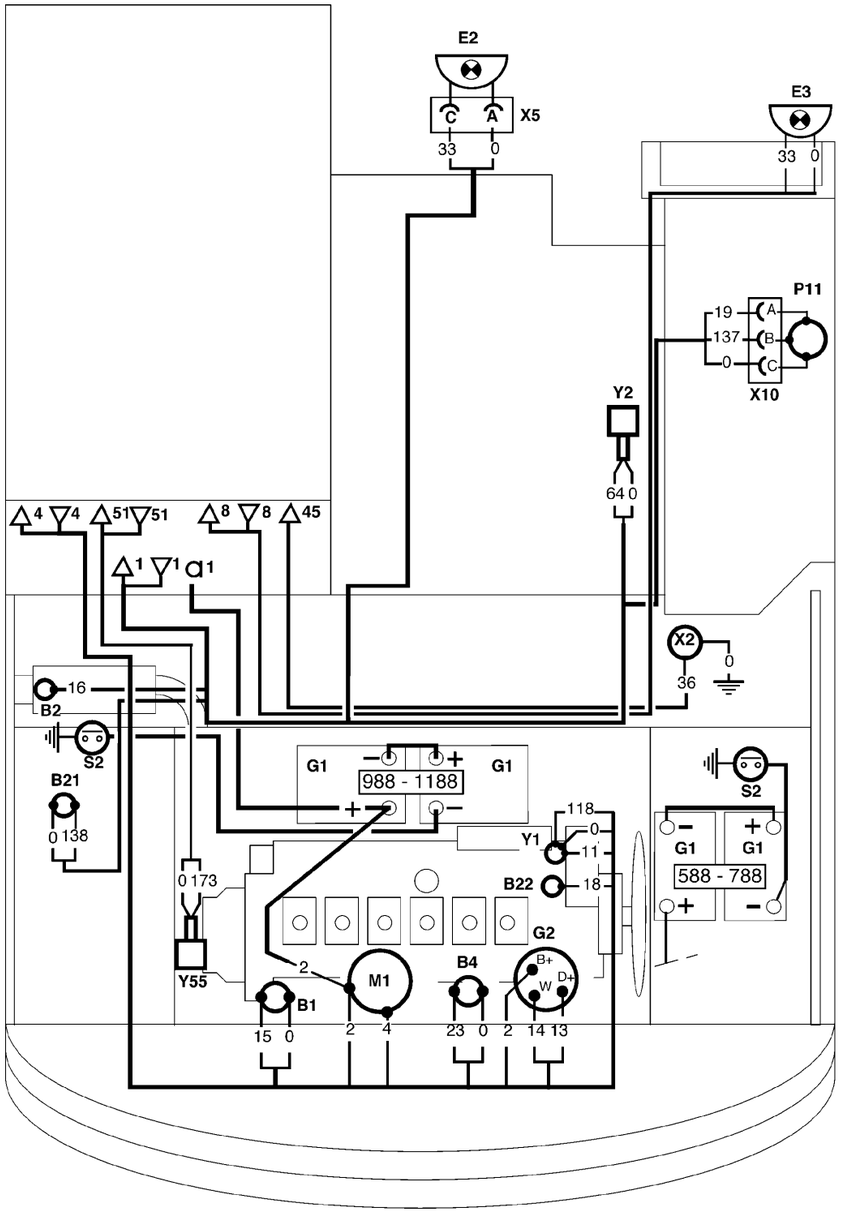
△▽□ See page 4

FLOOR

A1 Radio
B3 Pilot pressure switch
B25 Threshold detector (788)
E3 Upperstructure working lights
E7 Cigarette lighter
G3 Step-down transformer 24V / 12V
H10 Working brake switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lighting
H13 Heater blower switch lighting
H15 Instrument panel audible warning
H26 Horn
K20 Windshield wiper intermittent action
M3 Windshield washer motor
M4 Heater blower motor
P4 Hourmeter
P10 Instrument panel
S1 Key switch
S3 Horn switch
S4 Working light switch
S6 Windshield wiper switch
S22 Control keyboard (788-988-1188)
S24 Pilot safety switch
S26 Windshield washer switch
S27 Heater blower switch
X1 Cab floor/cab connector
X4 Troubleshooting test socket (788-988-1188)
X5 12V accessories socket

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ENGINE MODULE AND UPPERSTRUCTURE WIRING (STANDARD)



CM99K027

△ ▽ ɑ See page 4

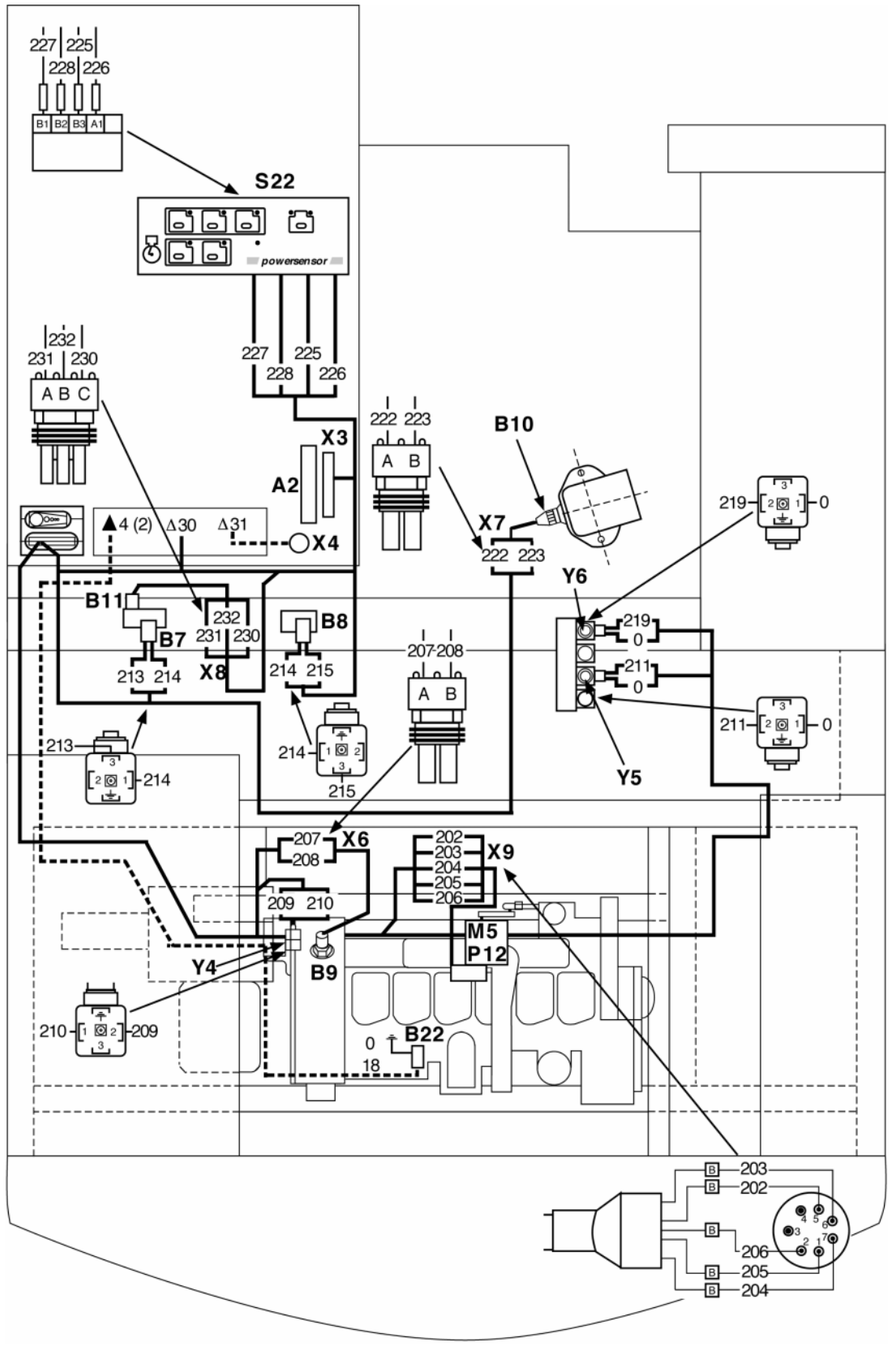
UPPERSTRUCTURE

B1 Air filter restriction pressure switch
B2 Hydraulic oil filter restriction pressure switch
B21 Hydraulic oil temperature sender
E2 Attachment working light on boom
E3 Upperstructure working lights
G1 Batteries
P11 Fuel level gauge
S2 Battery master switch
X2 Upperstructure power line connection
X5 Attachment working light power connection
X10 Fuel level indicator connector
Y2 Pilot safety solenoid valve
Y55 Heavy lift solenoid valve (788)

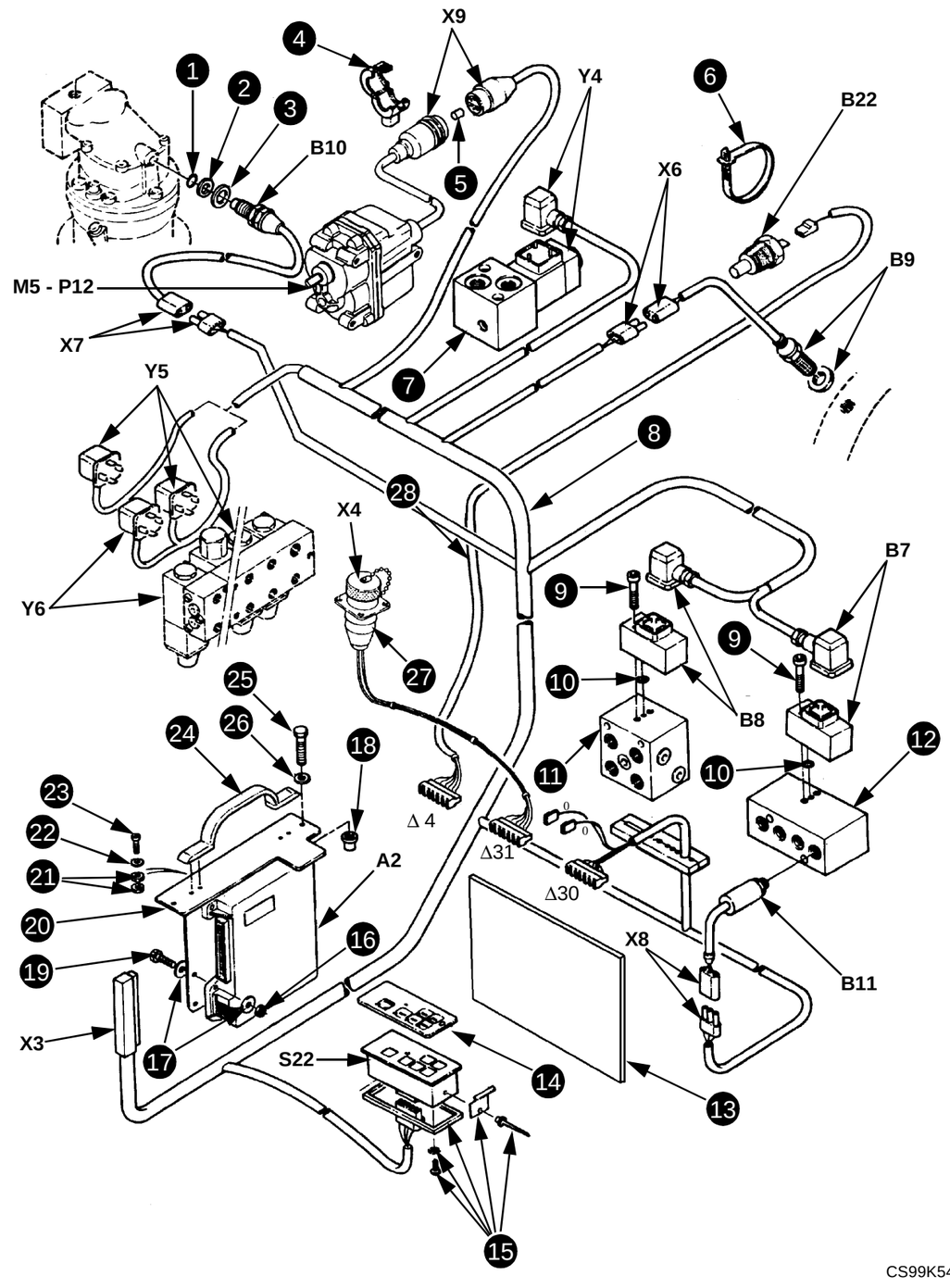
ENGINE

B4 Engine oil pressure switch
B22 Engine coolant temperature sender
G2 Alternator
M1 Starter motor
Y1 Engine shut-down solenoid valve

788C-988C-1188C ELECTRONIC WIRING CIRCUIT



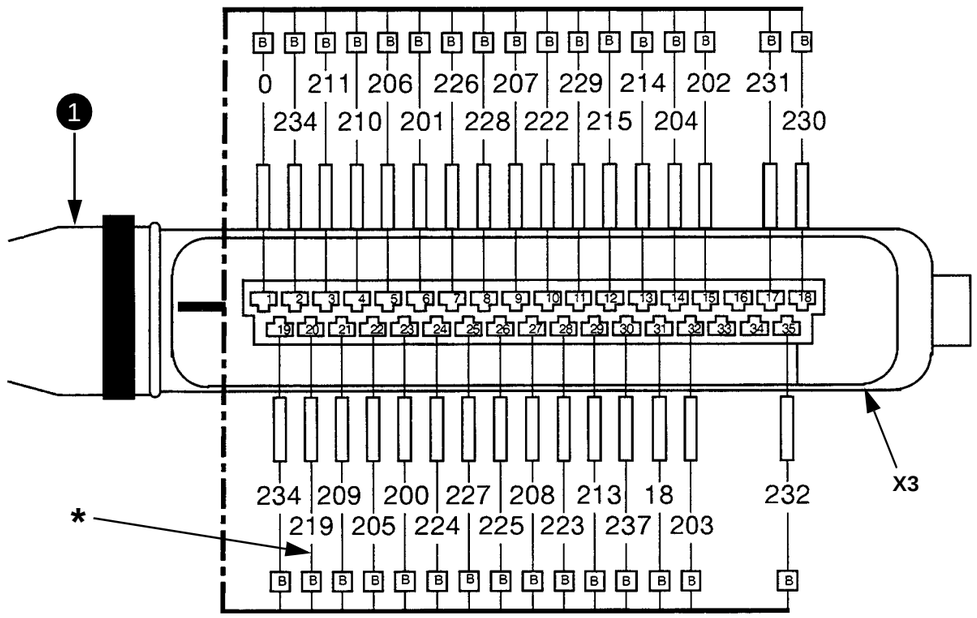
CM99K026



CS99K540

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DETAILS OF 35 PINS CONNECTOR X3 ON 788C-988C-1188C EXCAVATORS



CS99K546

***** Wire 219, only on two-speed excavators

1 Electronic harness

X3 35-pin connector

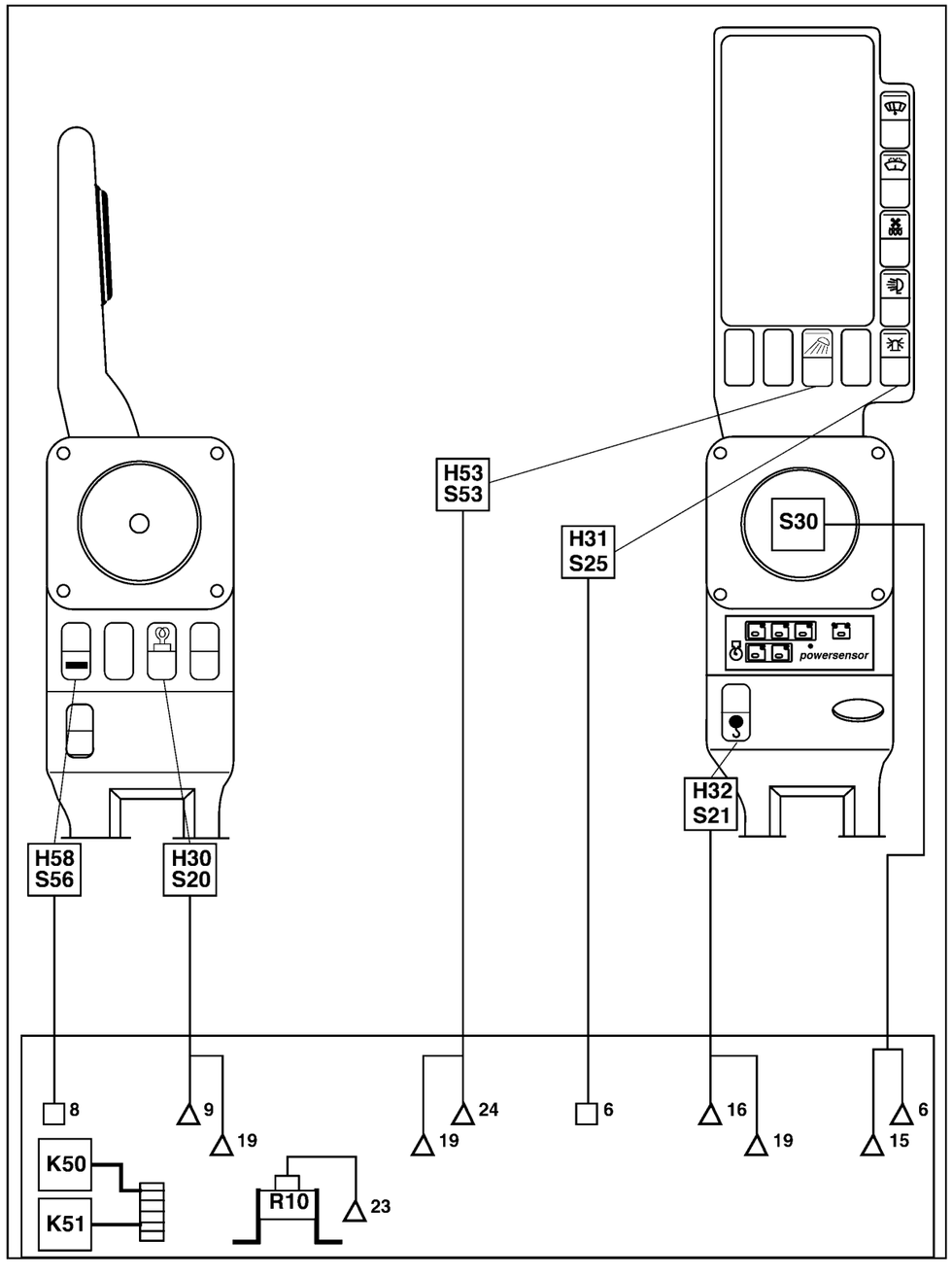
788C-988C-1188C ELECTRONIC WIRING CIRCUIT

A2 Electronic control box (788-988-1188)
B7 Swing detection pressure switch (788-988-1188)
B8 Travel detector pressure switch (788-988-1188)
B9 Engine speed detector (788-988-1188)
B10 Swing motor speed detector (788-988-1188)
B11 Hydraulic pressure sender (788-988-1188)
B22 Engine coolant temperature sender
M5 Injection pump servo-motor (788-988-1188)
P12 Servo-motor potentiometer (788-988-1188)
S22 Control keyboard (788-988-1188)
X3 35-way connector (788-988-1188)
X4 Troubleshooting test socket (788-988-1188)
X6 Engine speed detector connector (788-988-1188)
X7 Upperstructure swing speed detector connector
X8 Hydraulic pressure sender connector (788-988-1188)
X9 Injection pump servo-motor connector (788-988-1188)
Y4 DRE4 proportional pressure reduction valve
Y5 Upperstructure brake release control solenoid valve
Y6 Travel motor displacement change electro-control valve

1 O-ring
2 Ring
3 Washer
4 Lock
5 Plug
6 Clamp
7 Pressure reduction valve
8 Electronic harness
9 Screw
10 O-ring
11 Travel block
12 Swing block
13 Printed circuit card
14 Decal
15 Control panel retention
16 Nut
17 Washer
18 Rivet
19 Screw
20 Bracket
21 Nuts
22 Washer
23 Screw
24 Handle
25 Screw
26 Washer
27 Troubleshooting socket harness
28 Engine harness

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CAB FLOOR WIRING (OPTIONAL)



CM99K024

ELECTRICAL CABINET

1 Connecting strip

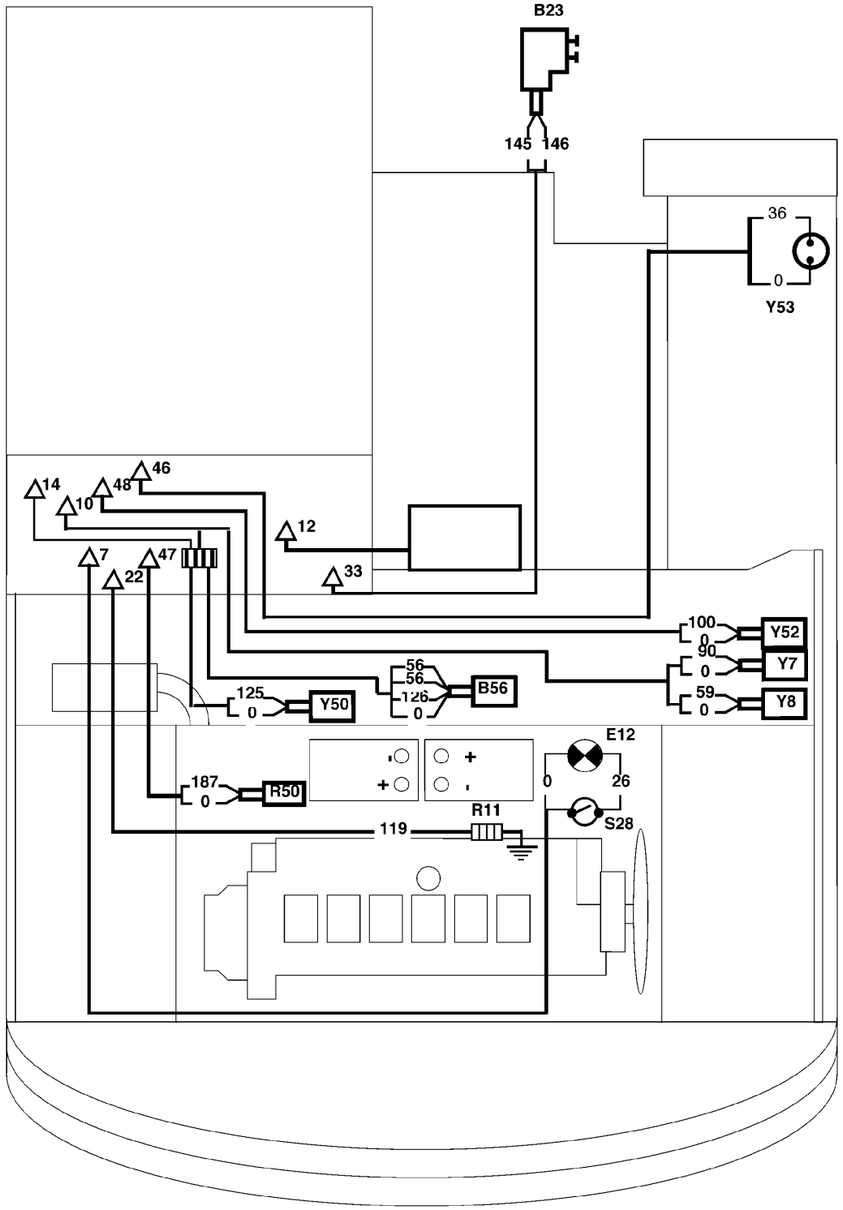
△▽□ See page 6

INSTRUMENT PANEL

H30 Cold start assistance switch lighting (optional)
H31 Rotary light switch lighting (optional)
H32 Overload indicator switch lighting (optional)
H53 Cab front working light switch lighting (optional)
H58 Quick coupler switch lighting (optional)
K50 Adjustable boom raising limiter relay
K51 Adjustable boom retracting limitation relay
R10 Resistor, 0.85 Ohms
S20 Cold start assistance switch (optional)
S21 Overload indicator switch (optional)
S25 Rotary light switch (optional)
S30 Adjustable or articulated boom control switch (optional)
S53 Front working lights switch (optional)
S56 Quick coupler switch (optional)
V52 Quick coupler switch diode

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ENGINE MODULE AND UPPERSTRUCTURE WIRING (OPTIONAL)



CM99K028

ELECTRICAL CABINET

1 Connecting strip

2 Air conditioner

△▽ See page 6

UPPERSTRUCTURE

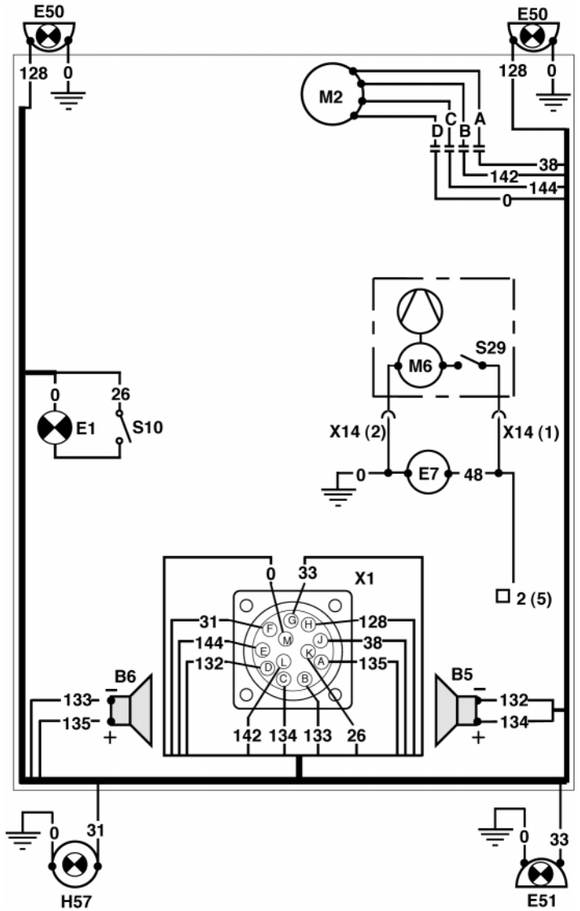
B23 Overload indicator (optional)
B56 Boom raising range limitation detector (optional)
R50 Fuel heater (optional)
Y7 Adjustable or articulated boom extending electro-valve (optional)
Y8 Adjustable or articulated boom retracting electro-valve (optional)
Y50 Adjustable boom raising height limiter solenoid valve (optional)
Y52 Quick coupler solenoid valve (optional)
Y53 Fuel filler pump (optional)

ENGINE

E12 Engine compartment light (optional)
R11 Cold start assistance plug (optional)
S28 Engine compartment lighting switch (optional)

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CAB AND CAB OPTION WIRING



A White wire
B Grey wire
C Blue wire
D Black wire
E1 Cab lighting
E7 Cigarette lighter
E50 Cab front working lights
E51 Cab rear working light
H57 Standard or Italian rotary light
B5 RH loudspeaker (optional)
B6 LH loudspeaker (optional)
M2 Windshield wiper motor
M6 Cab blower motor (optional)
S10 Cab lighting switch
S29 Cab blower switch (optional)

X1 (A) (B) (C) (D) Cab floor/cab LH and RH loudspeaker connector
X1 (H) (G) Cab floor/cab front and rear working lights connector (optional)
X1 (E) (J) (M) (L) Cab floor/cab working light, windshield wiper motor connector
X1 (F) Cab floor/cab rotary light connector (specific to certain countries)
X1 (K) Cab floor/cab interior lighting connector.
X14 (1) (2) Cab blower plug (optional)
□ **2 (7)** 10 way connector (see printed circuit wiring on page 5)

CM99J052

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Section

4001

ELECTRICAL SCHEMATICS

788/988 Wheeled Excavators

988 series: CGG0127801 to CGG0128301 CGG0128304 to CGG0128313.
988 series *"Plus"*: CGG0128302, CGG0128303, CGG0128314 and after

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SPECIFICATIONS

System voltage	24 Volts negative earth and 12 Volts negative earth
Batteries	2 x 12 Volts 120 A/hrs, low maintenance batteries
Alternator	BOSCH, 28 Volts, 45 Amps
Motor starter	BOSCH, 24 Volts, 4.0 kW

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SCHEMATIC SYMBOLS

A(n) Radio/housings
B (n) Indicators/pressure switches/loudspeakers/pressures switches/senders/heat sender/gauge
E (n) Lighting components
F (n) Fuses
G (n) Electrical supply generators
H (n) Warning devices (visible and audible)
K (n) Relays
M (n) Motors
P (n) Instruments
R (n) Resistors/heater plugs
S (n) Shunt resistors/switches/battery master switch
Sh (n) Shunt
V (n) Diodes
X (n) Supply line connections
Y (n) Solenoid valves, solenoids

NOTE : *The (n) shows the component number.*
Example : K2 is relay No. 2.

(n) Supply on printed circuit

(n) Battery terminal

(n) Printed circuit connection terminal

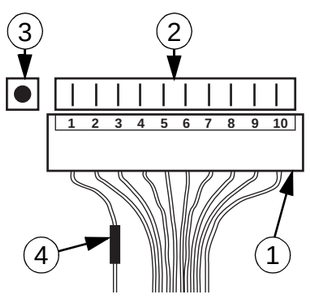
Printed circuit earth connector

A1 Instrument panel connector

1 or 1 or 1 Harness identification

1(1) or 1(1) or 1 (1) Harness identification followed by path identification number

(1) or (1) Printed circuit earth connectors



The installation position for the harness connector (1) on connector (2) of the printed circuit is identified by a red mark (3) followed by the figure 1 on the printed circuit. This identification corresponds to the position of path 1 of the harness connector (1). This position is completed when the path 1 line is shown by a red ring (4) located on line 1 wire, or by red paint marking.

Local earth

Wire number

NC Closed circuit

NO Open circuit

Intersection of two wires with connection point

Intersection of two wires without connection point

Link with following plate

Link with preceding plate

Return to another plate with the same letter

Bulbs

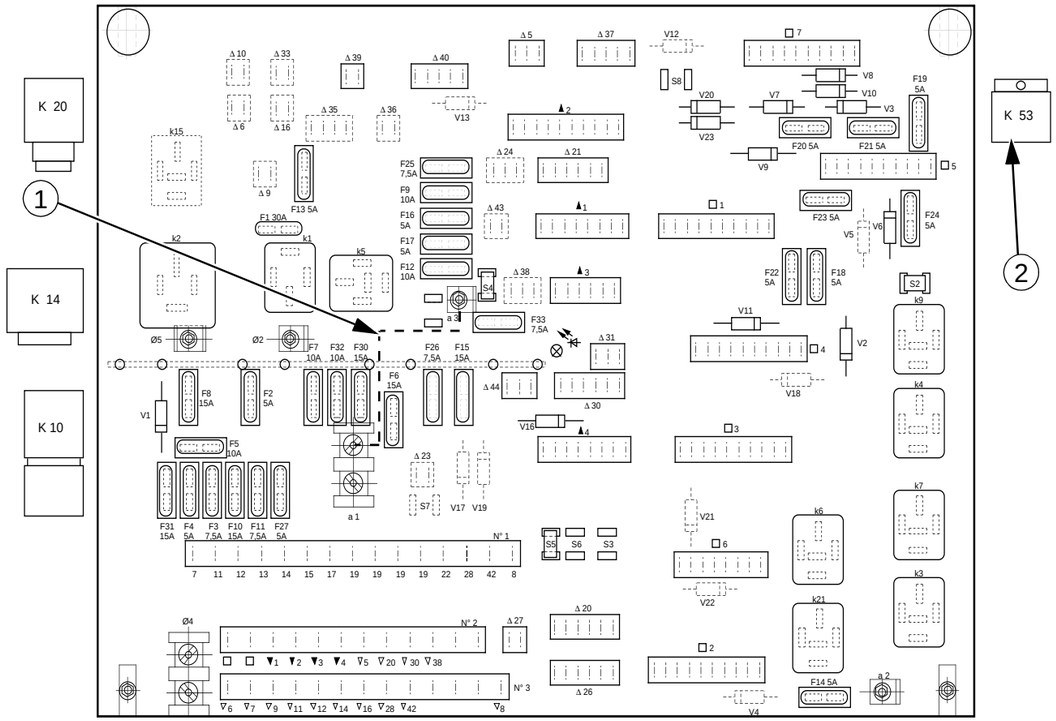
Test bulb

Light emitting diode (LED)

Regulator

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DESCRIPTION OF ELECTRICAL CABINET PRINTED CIRCUIT (STANDARD EQUIPMENT)



CM97G025

- **1** 24 Volts supply before contact
- **2** 12 Volts supply before contact (radio)
- **3** Electronic control box 24 volt supply and troubleshooting test socket
- **F2** Fuse, 5 A, starter switch
- **F3** Fuse, 7.5 A, instrument panel
- **F4** Fuse, 5 A, cab lighting, horn relay
- **F6** Fuse, 15 A, upperstructure working lights
- **F7** Fuse, 10 A, horn
- **F8** Fuse, 15 A, upperstructure power line connection
- **F9** Fuse, 10 A, windshield washer, windshield wiper
- **F10** Fuse, 15 A, ventilation, heater, fuel heater
- **F11** Fuse, 7.5 A, cigarette lighter
- **F12** Fuse, 10 A, pilot safety
- **F15** Fuse, 15 A, main beam headlights
- **F16** Fuse, 5 A, RH brake lights
- **F17** Fuse, 5 A, LH brake light
- **F18** Fuse, 5 A, RH front side light
- **F19** Fuse, 5 A, LH front side light
- **F20** Fuse, 5 A, RH front dipped headlight
- **F21** Fuse, 5 A, LH front dipped headlight
- **F23** Fuse, 5 A, RH main beam headlight
- **F24** Fuse, 5 A, LH main beam headlight
- **F25** Fuse, parking brake (7.5 A)
- **F26** Fuse, 7.5 A, direction indicators, hazard warning
- **F31** Fuse, 15 A, windshield wiper momentary action
- **F32** Fuse, 10 A, not used
- **F33** Fuse, 7.5 A, electronic control box
- **H14** LED troubleshooting
- **K1** Starter motor relay
- **K2** General contact relay 24 V, 50 A
- **K3** Hourmeter relay
- **K4** Electrical control box supply relay
- **K5** Horn relay
- **K6** Attachment and cab rear working light relay
- **K7** Upperstructure headlight and working light relay
- **K9** Axle unlocking relay
- **K10** Flasher unit relay
- **K52** Speed change relay
- **K20** Windshield wiper intermittent action
- **K21** LH control arm pilot safety relay
- **Sh2, Sh4, Sh5** Shunt
- **Sh1, Sh3, Sh6, Sh7, Sh8** Not used
- **V1** General contact diode
- **V2** K3 relay diode
- **V3** Dipped headlight indicator lamp diode
- **V6** Main beam headlight indicator lamp diode
- **V7** RH direction indicator green indicator lamp
- **V8** LH direction indicator green indicator lamp
- **V9** Hazard warning diode
- **V10** LH direction indicator diode
- **V18** Axle unlocking indicator lamp diode
- **V20** RH direction indicator diode
- **V23** Hazard warning diode
- **Ø 2** Starter motor - solenoid control connection
- **Ø 4** Printed circuit earth
- **Ø 5** Upperstructure power line connection
- **1** Electronic control box supply wire
- **2** K53 relay base
- **3** Connecting strip

ELECTRICAL CABINET PRINTED CIRCUIT WIRING (STANDARD)

- ☐**1** Harness 10-way connector, floor harness
- ☐**2** Harness 10-way connector, floor harness
- ☐**3** Harness 10-way connector, floor harness
- ☐**4** Harness 10-way connector, floor harness
- ☐**5** Harness 10-way connector, floor harness
- ☐**6** Harness 8-way connector, floor harness
- ☐**7** Harness 10-way connector, floor harness

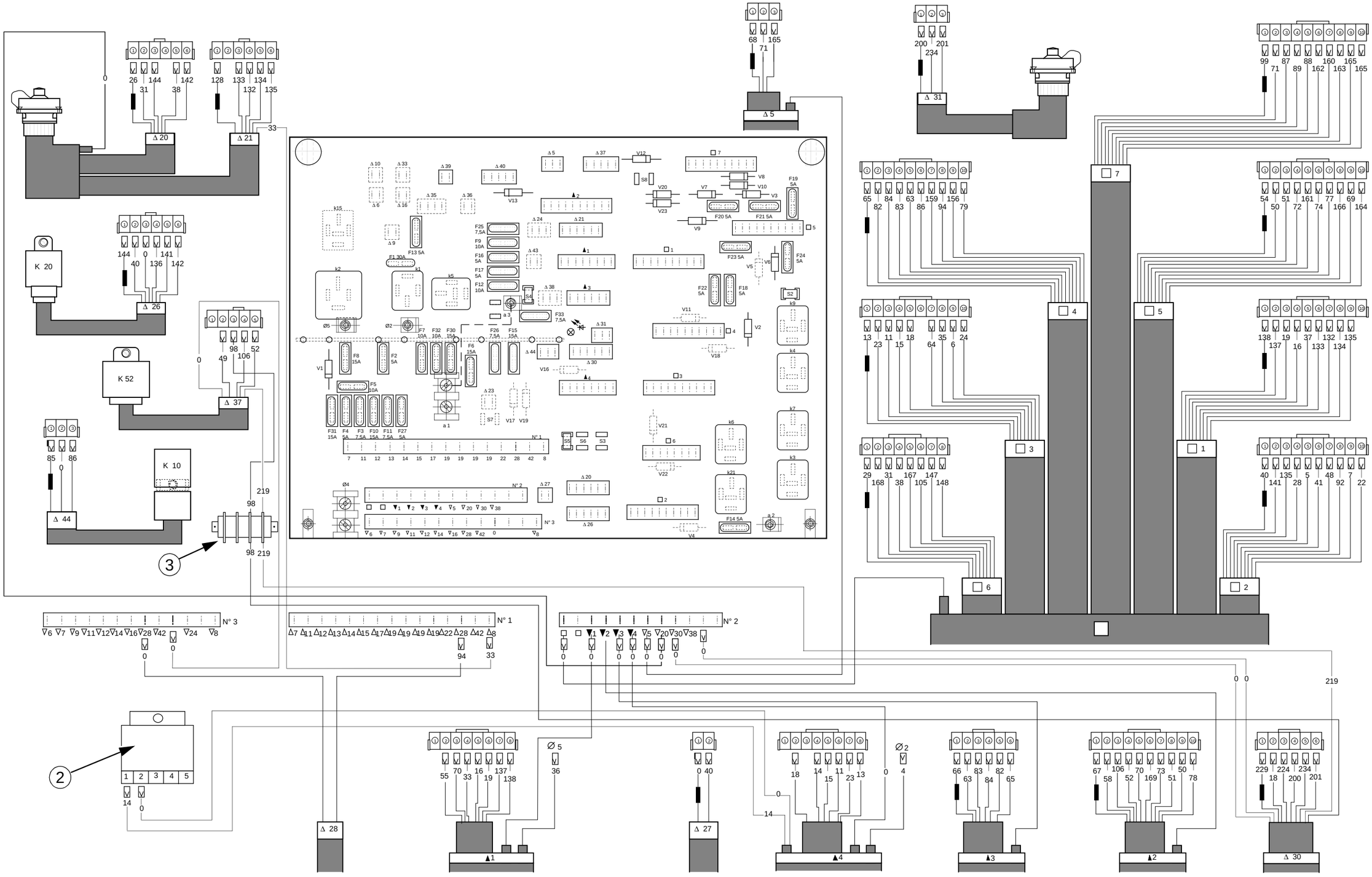
- △**5** Harness, 3 way connector, direction indicator, hazard warning
- △**20** Harness, 6-way connector, cab power connection
- △**21** Harness, 6-way connector, cab power connection
- △**26** Harness, 6-way connector, windshield wiper K20 intermittent action
- △**27** Harness, 2-way connector, windshield washer
- △**28** Safety clips, working brake, parking brake
- △**30** Harness, 6-way connector, electronic control box
- △**31** Harness, 3-way connector, troubleshooting test socket
- △**37** Harness, 5 way connector, two-speed
- △**44** Harness, 3 way connector, flasher unit

- ▲**1** Harness, 8-way connector, common harness
- ▲**2** Harness, 10 way connector, lighting and electro
- ▲**3** Harness, 6 way connector, brake unit
- ▲**4** Harness, 8-way connector, engine

- ▼**1** Clip, common harness
- ▼**2** Clip, lighting and solenoid valve
- ▼**3** Clip, brake unit
- ▼**4** Clip, engine

- ▽**28** Clip, working brake, parking brake
- ▽**5** Clip, direction indicator, hazard warning
- ▽**20** Clip, cab power connection

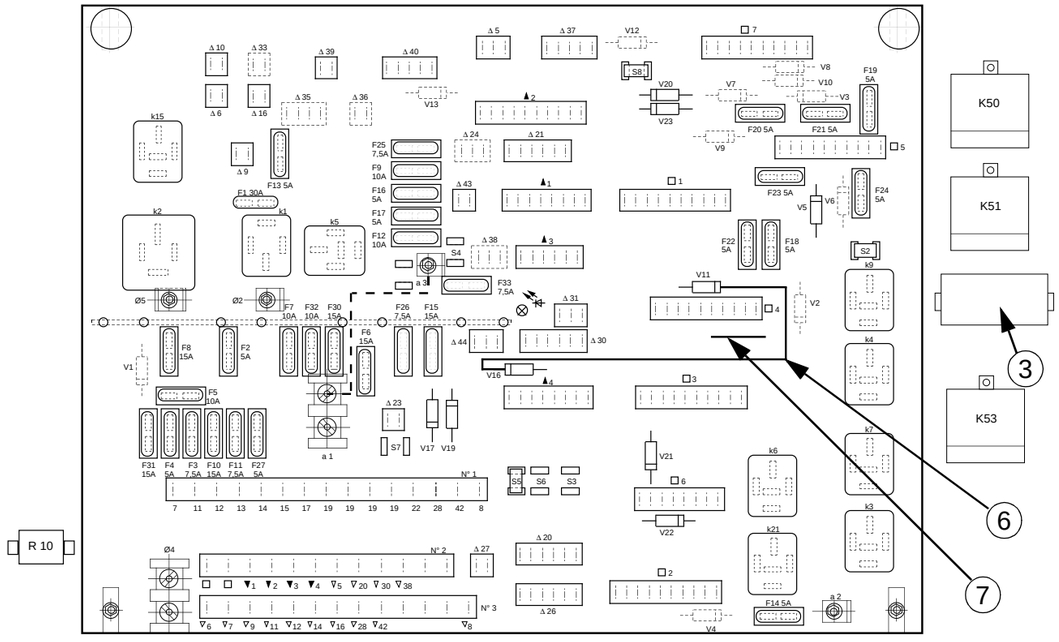
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CM97G026

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DESCRIPTION OF ELECTRICAL CABINET PRINTED CIRCUIT (OPTIONAL)



CM97G027

F1 Fuse, 30 A, cold start assistance (optional)
F5 Fuse, 10 A, headlight and rotary light relay (specific to certain countries)
F13 Fuse, 5 A, overload indicator (optional)
F14 Fuse, 5 A, radio (optional)
F22 Fuse, 5 A, Rear fog light (specific to certain countries)
F27 Fuse, 5 A, adjustable or articulated boom (optional)
F30 Fuse, 15 A, cab working lights (optional)
K15 Cold start assistance relay (optional)
K50 Adjustable boom raising height limiter relay
K51 Adjustable boom lowering range limitation relay
K53 Fuel heater relay
R10 Resistor 0.85 Ohm

V4 Radio diode (optional)
V5 Rear fog light indicator lamp diode (specific to certain countries)
V11 Pilot system cancellation diode (specific to certain countries)
V16, V17, V19 Pilot system cancellation diode (specific to certain countries)
V21 Overload indicator diode (optional)
V22 Rotary light indicator diode (specific to certain countries)
Sh8 Shunt (pilot system cancellation) remove shunt Sh4 and install it at Sh8

6 Second travel speed indicator lamp shunt (Italy only)
7 Axle unlocking solenoid valve shunt (Italy only)

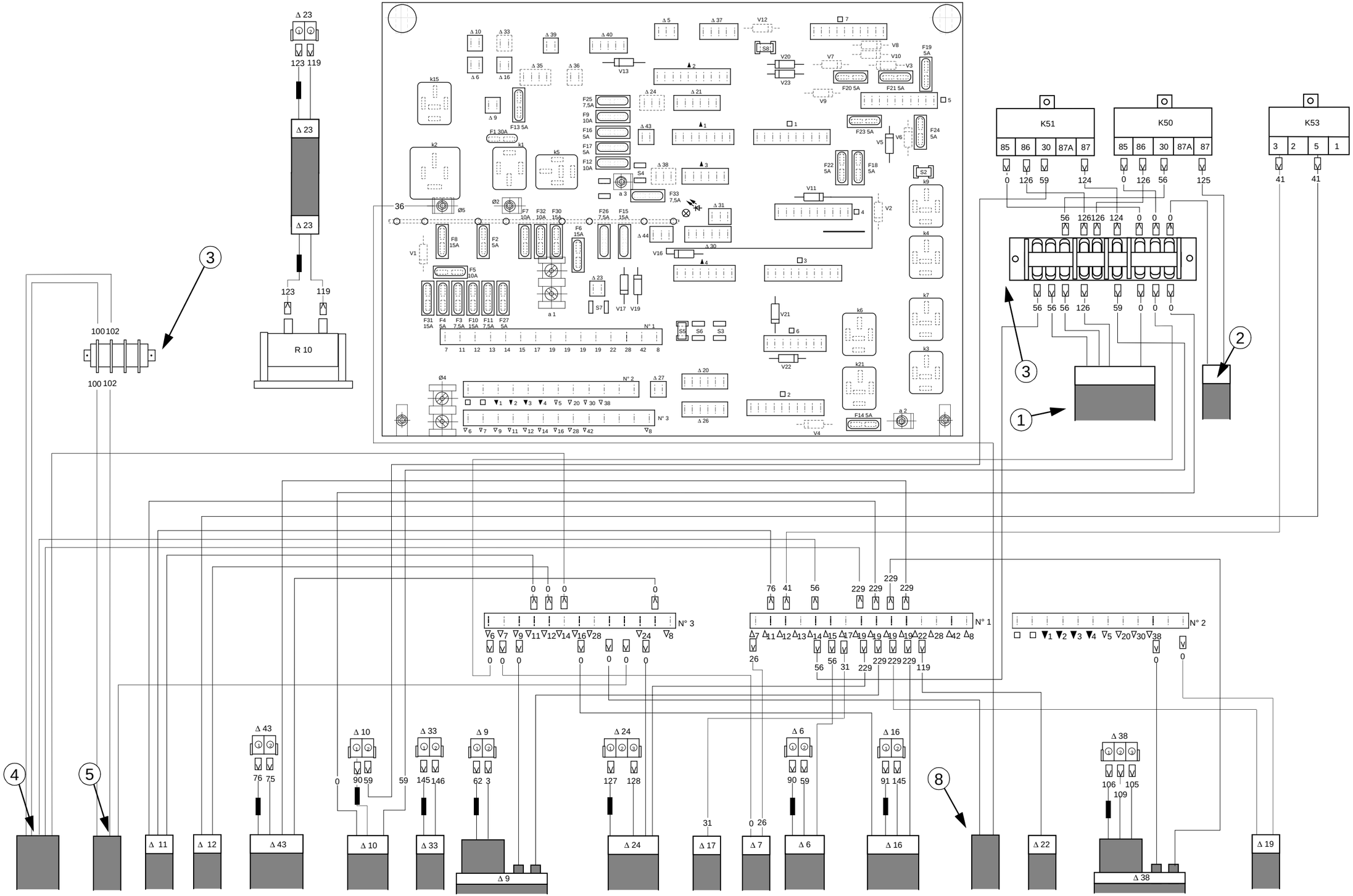
ELECTRICAL CABINET PRINTED CIRCUIT WIRING (OPTIONAL)

1 Adjustable boom raising and lowering range limitation detector cable (specific to certain countries)
2 Harness, adjustable boom raising and lowering range limitation electro-control (specific to certain countries)
3 Connecting strip (specific to certain countries)
4 Quick coupler control harness
5 Quick-coupler electro-control harness
8 Fuel pump supply cable (optional)

▽ Cable, adjustable boom raising height limiter (to terminal No. 3)

△ **6** Harness, adjustable boom (PM version, special for Germany)
△ **7** Hood lighting harness (optional)
△ **9** Harness, cold start assistance (optional)
△ **10**Harness, adjustable boom (PM version, special for Germany)
△ **11**Rear fog light harness (specific to certain countries)
△ **12**Harness, fuel heating device (optional)
△ **14**Wire to terminal No. 1, adjustable boom raising and lowering range limitation (specific to certain countries)
△ **16**Harness, overload indicator (optional)
△ **17**Harness, upperstructure rotary light (specific to certain countries)
△ **22**Harness, cold start assistance glow plug (optional)
△ **23**Harness, cold start assistance resistor (optional)
△ **24**Harness, front working lights on cab (optional)
△ **33**Harness, overload indicator (optional)
△ **38**Harness, pilot system cancellation (specific to certain countries)
△ **43**Rear fog light harness (specific to certain countries)
△ **19**Cable, registration plate light (optional)

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PRINTED CIRCUIT SCHEMATIC GUIDE

❍1 24 Volts supply before contact
❍2 12 Volts supply before contact (radio)
❍3 Electronic control box 24 volt supply and troubleshooting test socket

F1 Fuse, 30 A, cold start assistance (optional)
F2 Fuse, starter switch (5 A)
F3 Fuse, instrument panel (7.5 A)
F4 Fuse, cab lighting, horn relay (5 A)
F5 Fuse, 10 A, headlight and rotary light relay (specific to certain countries)
F6 Fuse, upperstructure headlights (15 A)
F7 Fuse, horn (10 A)
F8 Fuse, upperstructure power line connection (15 A)
F9 Fuse, windshield washer, windshield wiper (10 A)
F10 15 A Fuse, ventilation, heater, fuel heater
F11 Fuse, 7.5 A, cigarette lighter
F12 Fuse, 10 A, pilot safety
F13 Fuse, 5 A, overload indicator (optional)
F14 Fuse, 5 A, radio (optional)
F15 Fuse, 15 A, main beam headlight
F16 Fuse, 5 A, RH stop light
F17 5 A Fuse, LH stop light
F18 Fuse, 5 A, RH front position light
F19 Fuse, 5 A, LH front position light
F20 Fuse, 5 A, RH front dipped headlight
F21 Fuse, 5 A, LH front dipped headlight
F22 Fuse, 5 A, Rear fog light (specific to certain countries)
F23 Fuse, 5 A, RH main beam headlight
F24 Fuse, 5 A, LH main beam headlight
F25 Fuse, 7.5 A, parking brake
F26 Fuse, 7.5 A, direction indicators, hazard warning
F27 Fuse, 5 A, adjustable or articulated boom
F30 Fuse, 15 A, cab working lights (optional)
F31 Fuse, 15 A, windshield wiper intermittent action
F32 10 A fuse, not used
F33 Fuse, 7.5 A, electronic control box

H14 LED troubleshooting

K1 Starter motor relay
K2 General contact relay 24 V, 50 A
K3 Hourmeter relay
K4 Electrical control box supply relay
K5 Horn relay
K6 Attachment and cab rear working light relay
K7 Upperstructure headlight and working light relay
K9 Axle unlocking relay
K10 Flasher unit relay
K15 Cold start assistance relay (optional)
K21 LH control arm pilot safety relay

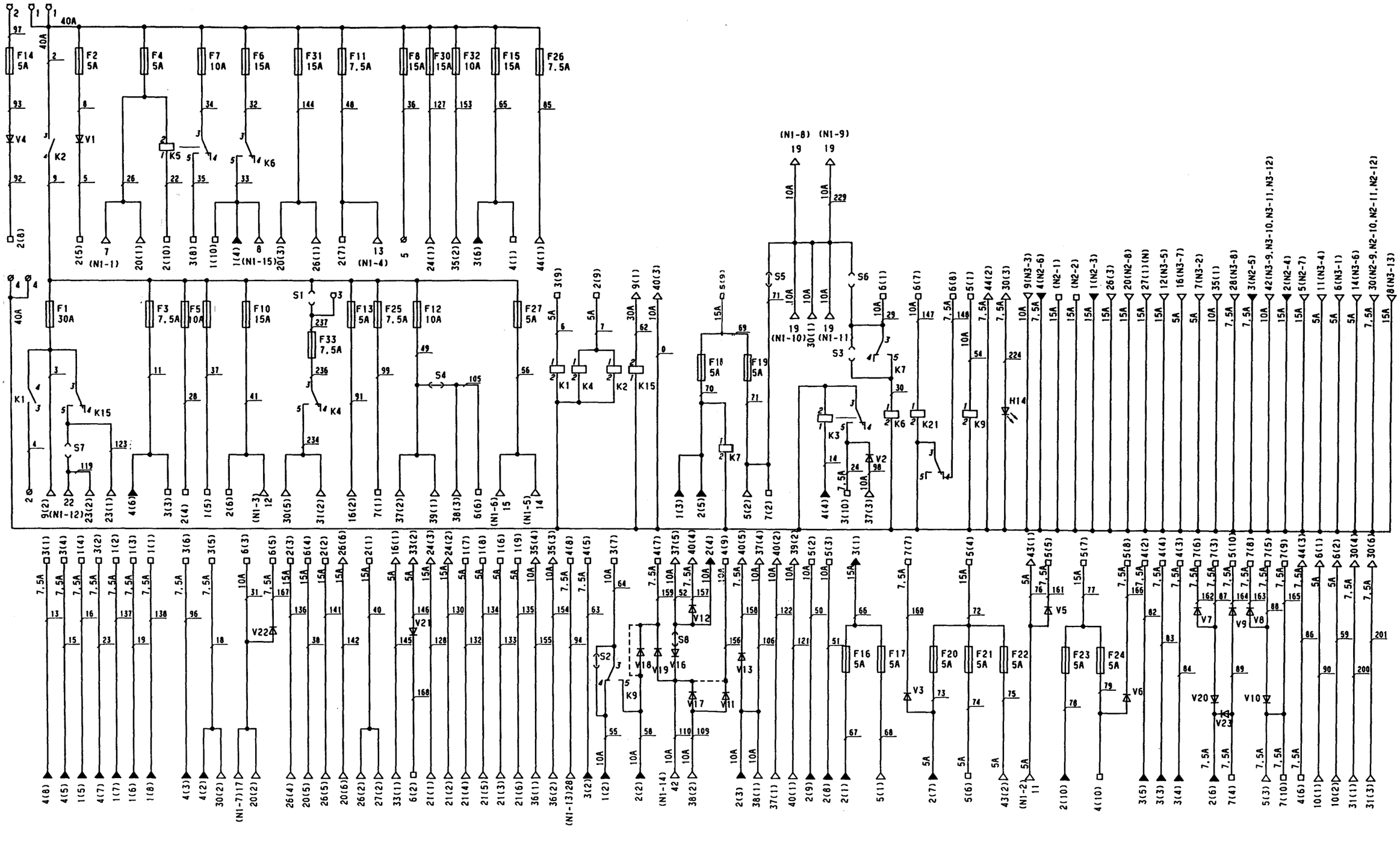
Sh2 Shunt
Sh4 Shunt
Sh5 Shunt
Sh1, Sh3, Sh6, Sh7 Not used
Sh8 Shunt (pilot system cancellation) remove shunt Sh4 and install it at Sh8

V1 General contact diode
V2 K3 relay diode
V3 Dipped headlight indicator lamp diode
V4 Radio diode (optional)
V5 Rear fog light indicator lamp diode (specific to certain countries)
V6 Main beam headlight indicator lamp diode
V7 RH direction indicator green indicator lamp
V8 LH direction indicator green indicator lamp
V9 Hazard warning diode
V10 LH direction indicator diode
V11 Pilot system cancellation diode (specific to certain countries)
V16, V17, V19 Pilot system cancellation diode (specific to certain countries)
V18 Axle unlocking indicator lamp diode (specific to certain countries)
V20 RH direction indicator diode
V21 Overload indicator diode (optional)
V22 Rotary light indicator diode (specific to certain countries)
V23 Hazard warning diode

Ø 2 Connection, starter motor - starter motor solenoid valve control
Ø 4 Printed circuit earth
Ø 5 Connection, upperstructure socket - fuel filler pump (optional)

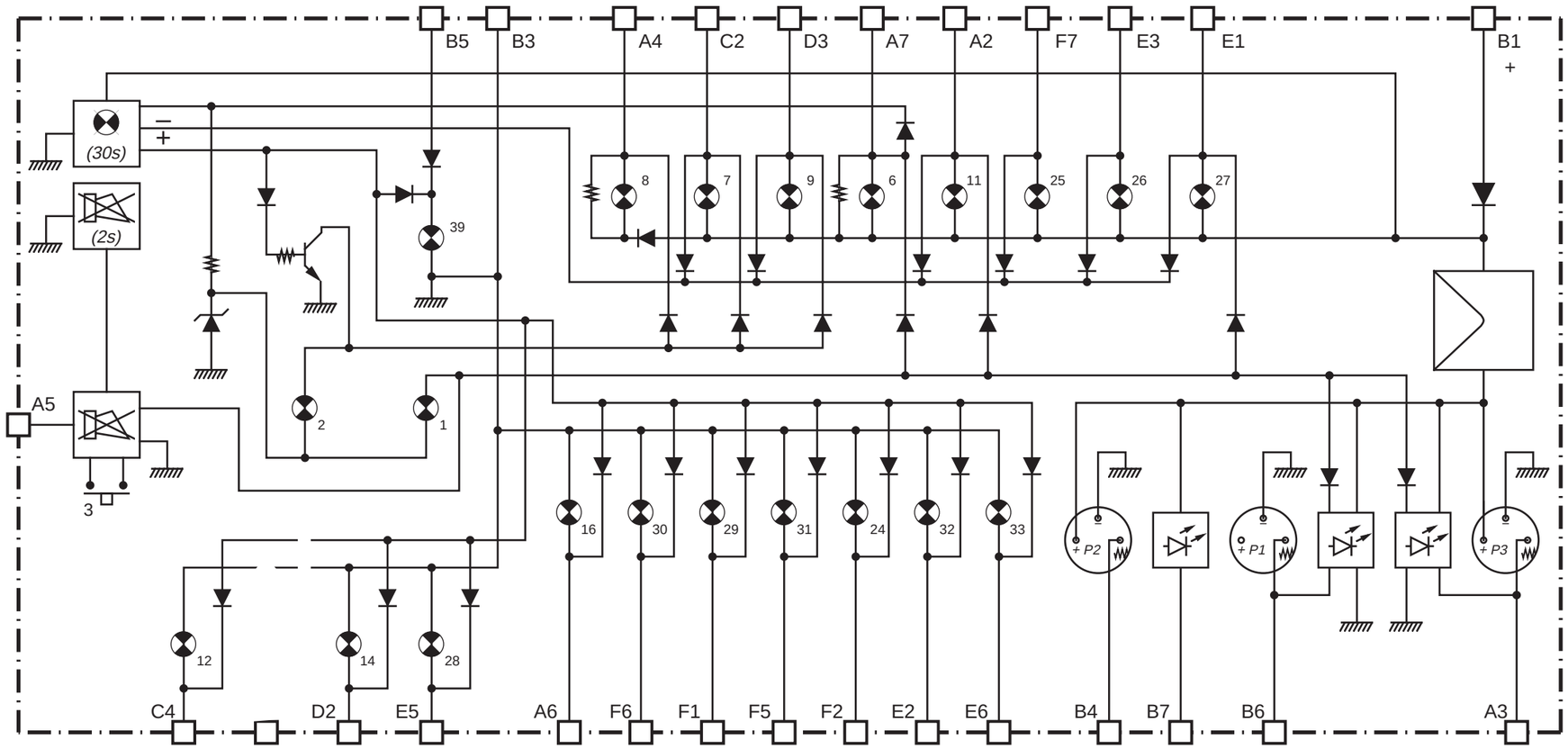
□ △ ▽ ▲ ▼: see page 4

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P10 INSTRUMENT PANEL ELECTRICAL SCHEMATIC (PLATE 1)



CM97G029

A2 Minimum pilot pressure red warning lamp connector
A3 Hydraulic oil temperature indicator connector
A4 Battery charge red warning lamp connector
A5 Audible warning red, orange indicator lamp connector
A6 Front axle unlocking orange indicator lamp connector
A7 Engine oil pressure red warning lamp connector

B1 24 Volts supply
B3 Earth
B4 Fuel level indicator connector
B5 Indicator lighting connector
B6 Engine coolant temperature indicator connector
B7 Fuel minimum level connector

C2 Air filter restriction red warning lamp connector
C4 Overload indicator orange warning lamp connector (optional)

D2 Pilot system cancellation green indicator lamp connector (specific to certain countries)
D3 Hydraulic oil filter restriction red warning lamp connector

E1 Minimum braking pressure red warning lamp connector
E2 Hazard warning red warning lamp connector
E3 Parking brake red warning lamp connector
E5 Rear fog light orange indicator lamp connector (specific to certain countries)
E6 RH direction indicators green warning lamp connector

F1 LH direction indicators green indicator lamp connector
F2 Rotary light orange indicator lamp connector (specific to certain countries)
F5 Side light green indicator lamp connector
F6 Main beam blue indicator lamp connector
F7 Minimum steering pressure red warning lamp connector

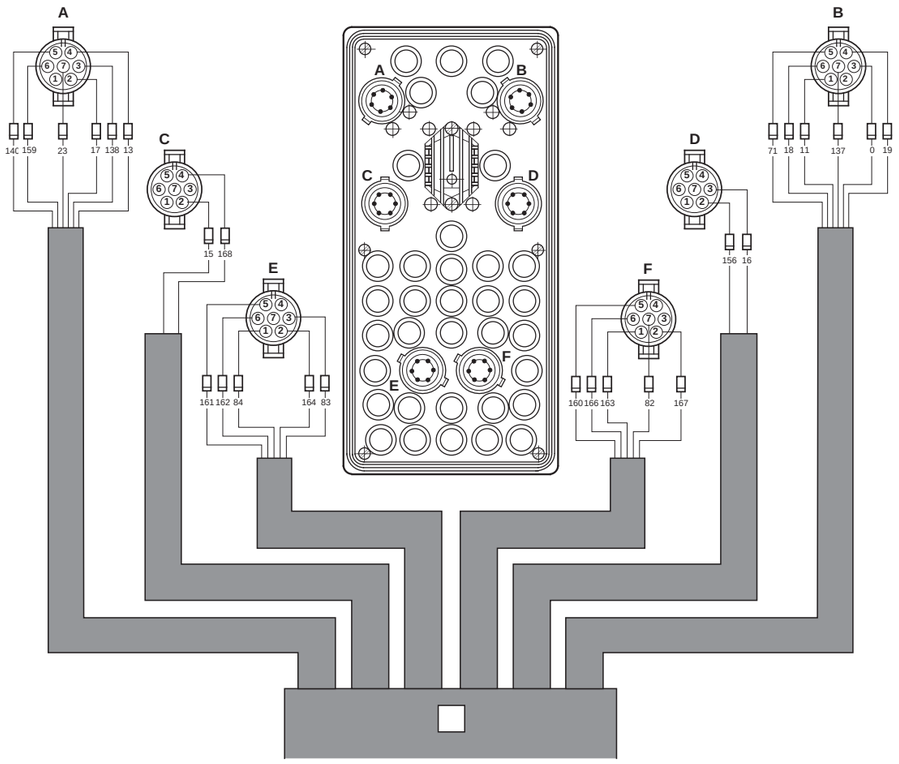
P1 Engine coolant temperature indicator
P2 Fuel level indicator
P3 Hydraulic oil temperature indicator

1 Stop alarm red warning lamp
2 Alarm orange indicator lamp
3 Audible warning stop push button
6 Engine oil pressure red warning lamp
7 Air filter restriction red warning lamp
8 Battery charge red warning lamp

9 Hydraulic oil filter restriction red warning lamp
11 Minimum pilot pressure red warning lamp
12 Overload indicator orange indicator lamp (optional)
14 Pilot system cancellation green indicator lamp (specific to certain countries)
16 Front axle unlocking orange indicator lamp
24 Rotary light orange indicator lamp (specific to certain countries)
25 Minimum steering pressure red warning lamp
26 Parking brake and working brake red warning lamp
27 Minimum braking pressure red warning lamp
28 Rear fog light orange indicator lamp (specific to certain countries)
29 LH direction indicator green indicator lamp
30 Main beam blue indicator lamp
31 Side light green indicator lamp
32 Hazard warning red warning lamp
33 RH direction indicator green indicator lamp
39 Instrument panel lamp

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INSTRUMENT PANEL WIRING



CM97G031

A 7 way connector : minimum pilot pressure red warning lamp, hydraulic oil temperature indicator, battery charge red warning lamp, audible warning stop push button, front axle unlocking orange indicator lamp, engine oil pressure red warning lamp, alarm orange warning lamp, stop alarm red warning lamp.

B 7 way connector : 24 Volts supply, earth, fuel level gauge, gauge lighting, engine coolant temperature indicator.

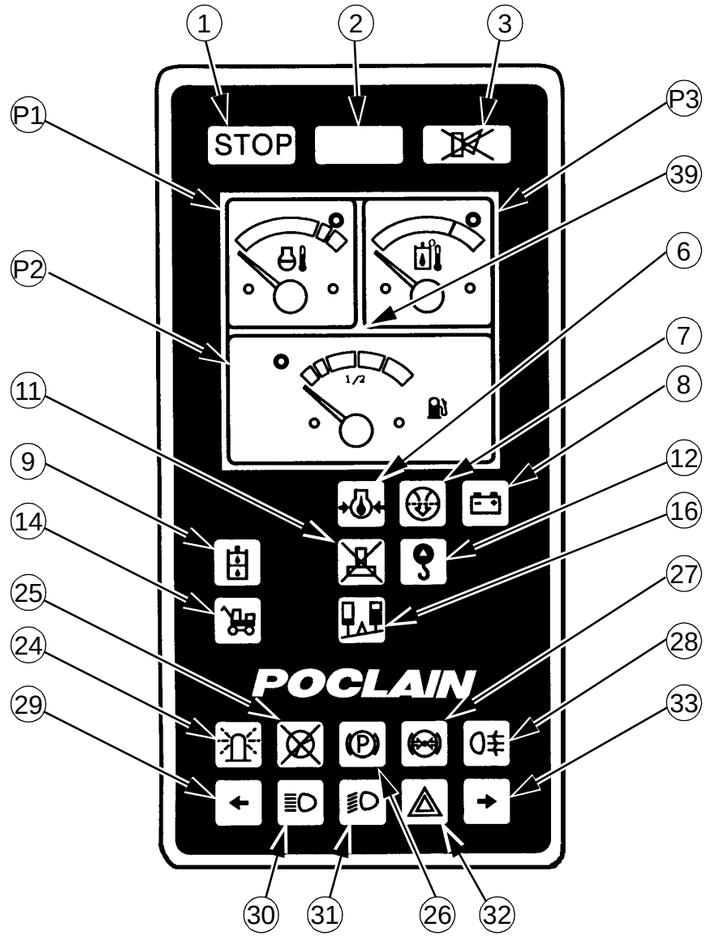
C 7 way connector : air filter restriction red warning lamp, overload indicator orange indicator lamp (optional).

D 7 way connector : pilot system cancellation green indicator lamp (specific to certain countries), hydraulic oil filter restriction red warning lamp.

E 7 way connector : minimum braking pressure red warning lamp, hazard warning red warning lamp, parking brake red warning lamp, rear fog light orange indicator lamp (specific to certain countries), RH direction indicators green indicator lamp.

F 7 way connector : LH direction indicator green indicator lamps, rotary light orange indicator lamp (specific to certain countries), side light green indicator lamp, main beam blue indicator lamp, minimum steering pressure red warning lamp.

INSTRUMENT PANEL (FRONT FACE)

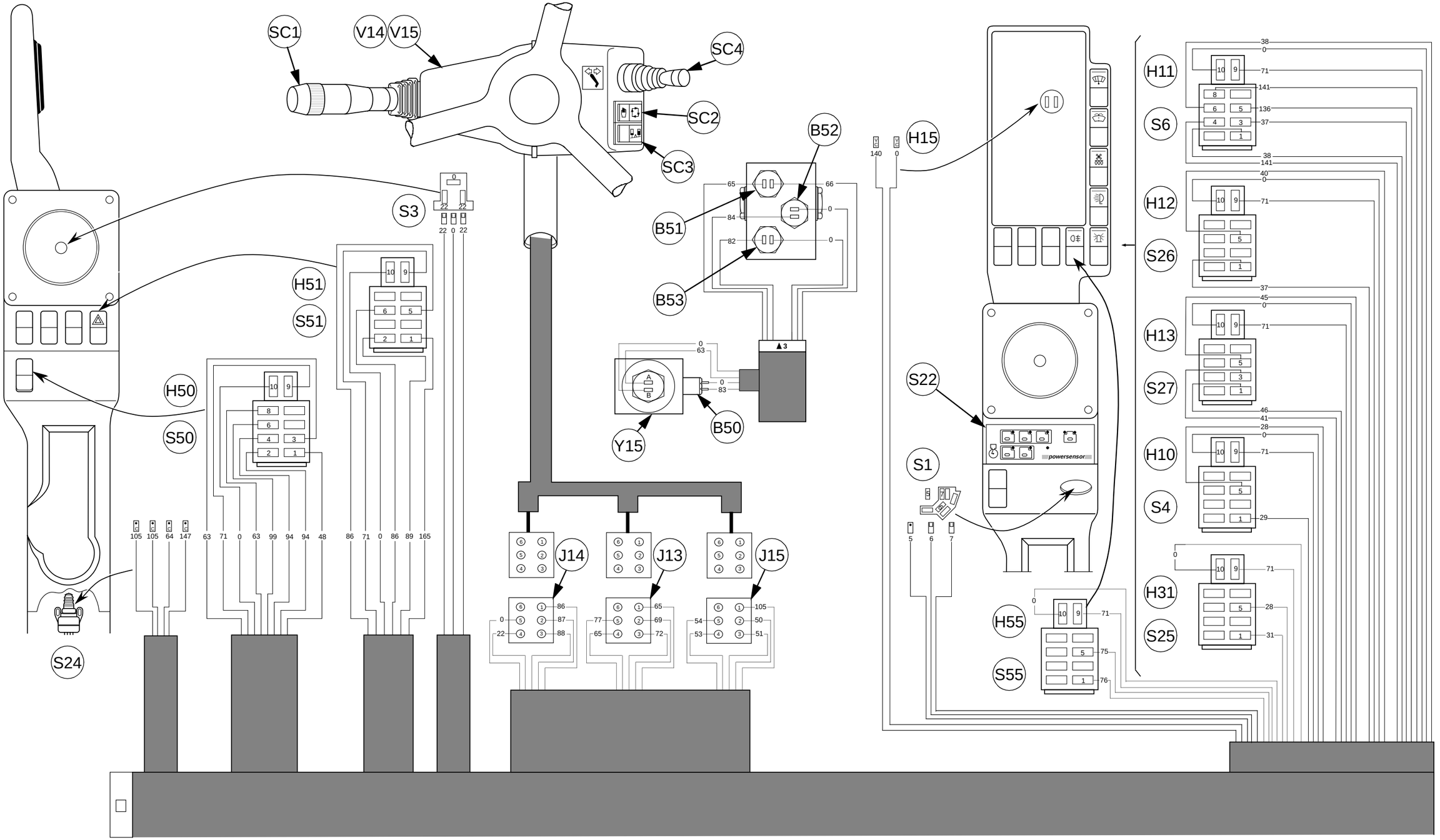


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1 Stop alarm red warning lamp
2 Alarm orange indicator lamp
3 Audible warning stop push button
6 Engine oil pressure red warning lamp
7 Air filter restriction red warning lamp
8 Battery charge red warning lamp
9 Hydraulic oil filter restriction red warning lamp
11 Minimum pilot pressure red warning lamp
12 Overload indicator orange indicator lamp (optional)
14 Pilot system cancellation green indicator lamp (specific to certain countries)
16 Front axle unlocking orange indicator lamp
24 Rotary light orange indicator lamp (specific to certain countries)
25 Minimum steering pressure red warning lamp
26 Parking brake red warning lamp
27 Minimum braking pressure red warning lamp
28 Rear fog light orange indicator lamp (specific to certain countries)
29 LH direction indicator green indicator lamp
30 Main beam blue indicator lamp
31 Side light green indicator lamp
32 Hazard warning red warning lamp
33 RH direction indicator green indicator lamp
39 Instrument panel lamp

P1 Engine coolant temperature indicator
P2 Fuel level indicator
P3 Hydraulic oil temperature indicator

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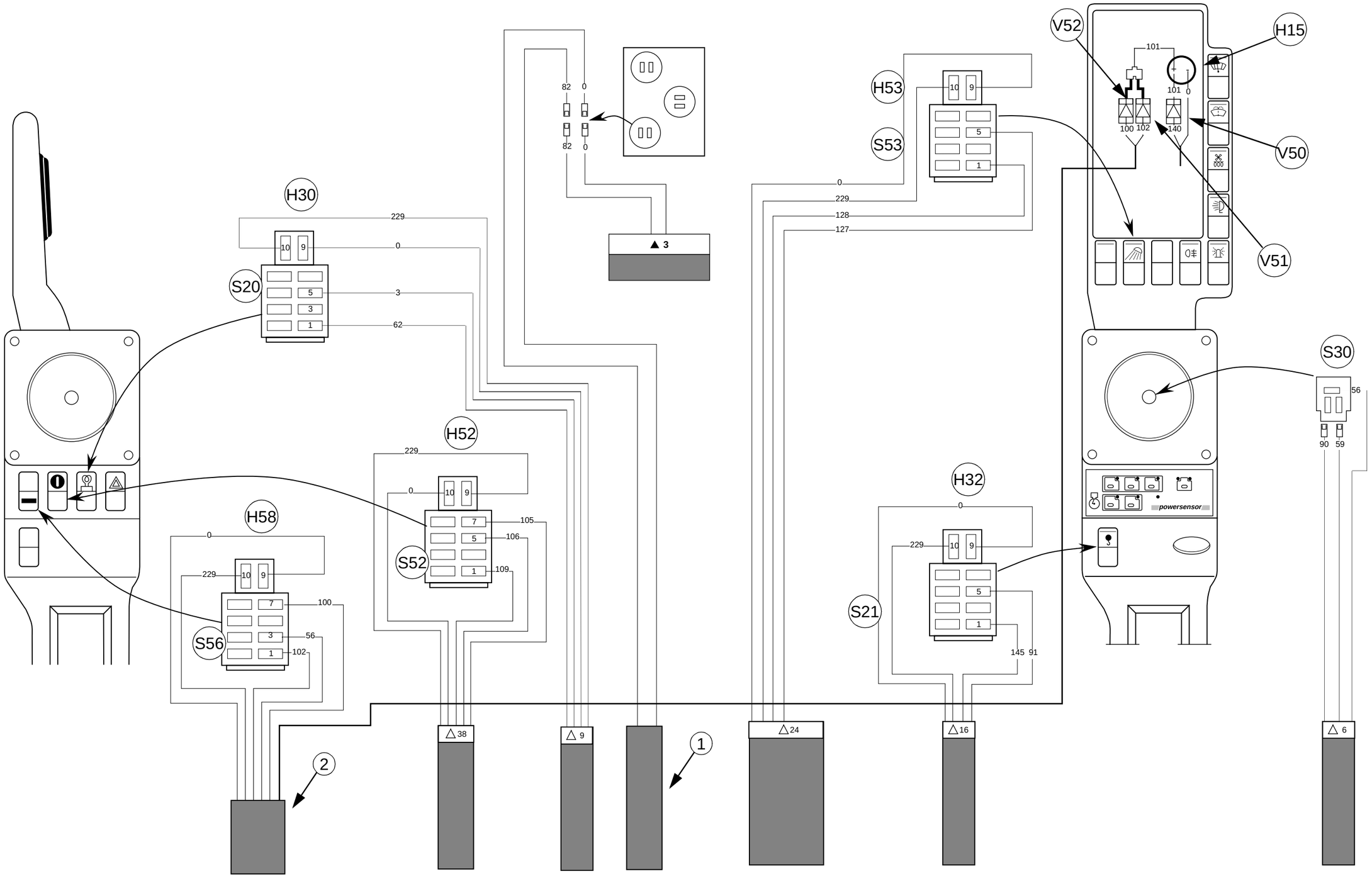
RIGHT-HAND CONTROL ARM, LEFT-HAND CONTROL ARM AND COMBINATION SWITCH WIRING (STANDARD)

B50 Parking brake pressure switch
B51 Stop light pressure switch
B52 Minimum braking pressure switch
B53 Steering pressure switch
H10 Working light switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lighting
H13 Heater blower switch lighting
H15 Instrument panel audible warning
H31 Rotary switch lighting
H50 Working brake and parking brake switch lighting
H51 Hazard warning switch lighting
H55 Rear fog light switch lighting
J13 Steering column connector
J14 Steering column connector
J15 Steering column connector
S1 Key switch
S3 Horn switch
S4 Working light switch
S6 Windshield wiper switch
S50 Parking brake and working brake switch
S51 Hazard warning switch
S22 Control panel (see Section 4002)
S24 Pilot safety switch
S25 Rotary light switch
S26 Windshield washer switch
S27 Heater blower switch
S55 Rear working lights switch
SC1 Combination switch for direction indicator (commodo), dipped headlights, headlights main beam, sidelights, headlight flasher and horn
SC2 Front axle automatic and manual unlocking switch
SC3 Front axle locking switch
SC4 Stabilizer lowering and raising momentary inverter switch
V14-V15 Stabilizer solenoid valve diodes
Y15 Parking brake and working brake control solenoid valve

▲ **3** Braking unit harness

□ Floor harness

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RIGHT-HAND AND LEFT-HAND CONTROL ARM WIRING (OPTIONAL)

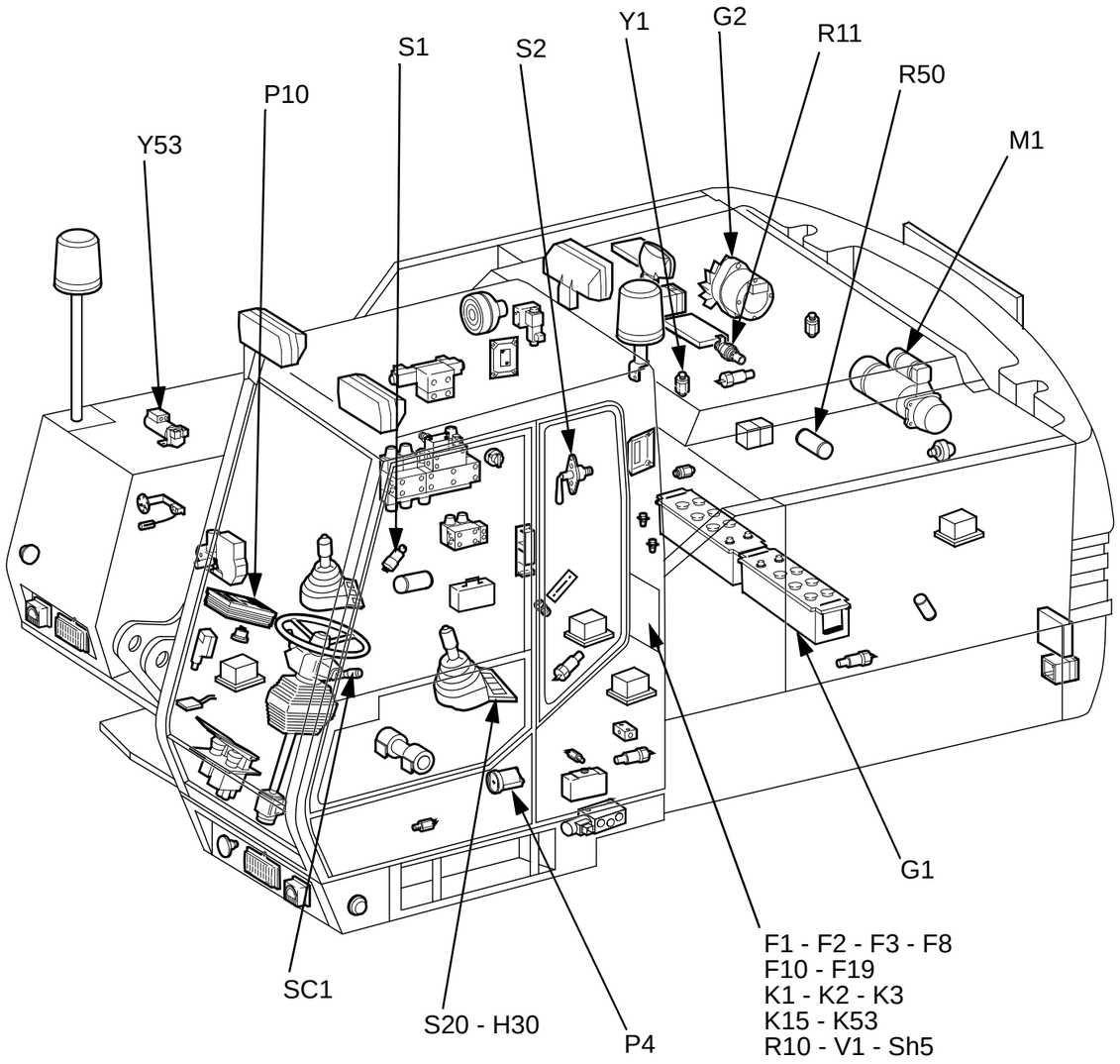
H30 Cold start assistance switch lighting (optional)
H32 Overload indicator switch lighting (optional)
H52 Pilot system cancellation switch lighting (specific to certain countries)
H53 Front working light switch lighting (optional)
H58 Quick coupler switch lighting (optional)
H15 Audible warning
S20 Cold start assistance switch (optional)
S21 Overload indicator switch (optional)
S30 Adjustable or articulated boom switch
S52 Pilot system cancellation switch (specific to certain countries)
S53 Front working lights switch (optional)
S56 Quick coupler switch (optional)
V50 Quick coupler diode (optional)
V51 Quick coupler diode (optional)
V52 Quick coupler diode (optional)
1 Steering brake harness (specific to certain countries)
2 Quick coupler harness (optional)

▲ **3** Braking unit harness (standard)

△ **6** Adjustable boom control harness (specific to certain countries)

△ **9** Cold start assistance harness (optional)
△ **16** Overload indicator harness (optional)
△ **24** Front working lights harness (optional)
△ **38** Pilot system cancellation harness (specific to certain countries)

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ELECTRICAL SCHEMATIC (PLATE 2)

ELECTRICAL CABINET

F1 Fuse, 30 A, cold start assistance
F2 Fuse, starter switch (5 A)
F3 Fuse, 7.5 A, injection pump solenoid valve, hourmeter
F8 Fuse, 15 A, fuel filler pump
F10 Fuse, 15 A, fuel heater
F19 Fuse, 5 A, switch lighting
K1 Starter motor relay
K2 General contact relay 24 Volts, 50 A
K3 Hourmeter relay
K53 Fuel heater relay
K15 Cold start assistance relay
R10 Resistor 0.85 Ohm
Sh5 Shunt
V1 General contact diode

△ □ ▲ **Ø2, Ø4, Ø5** : see page 4

FLOOR

S1 Key switch
H30 Cold start assistance switch lighting (optional)
S20 Cold start assistance momentary switch (optional)

UPPERSTRUCTURE

G1 Batteries
S2 Battery master switch
Y53 Fuel filler pump (optional)

ENGINE

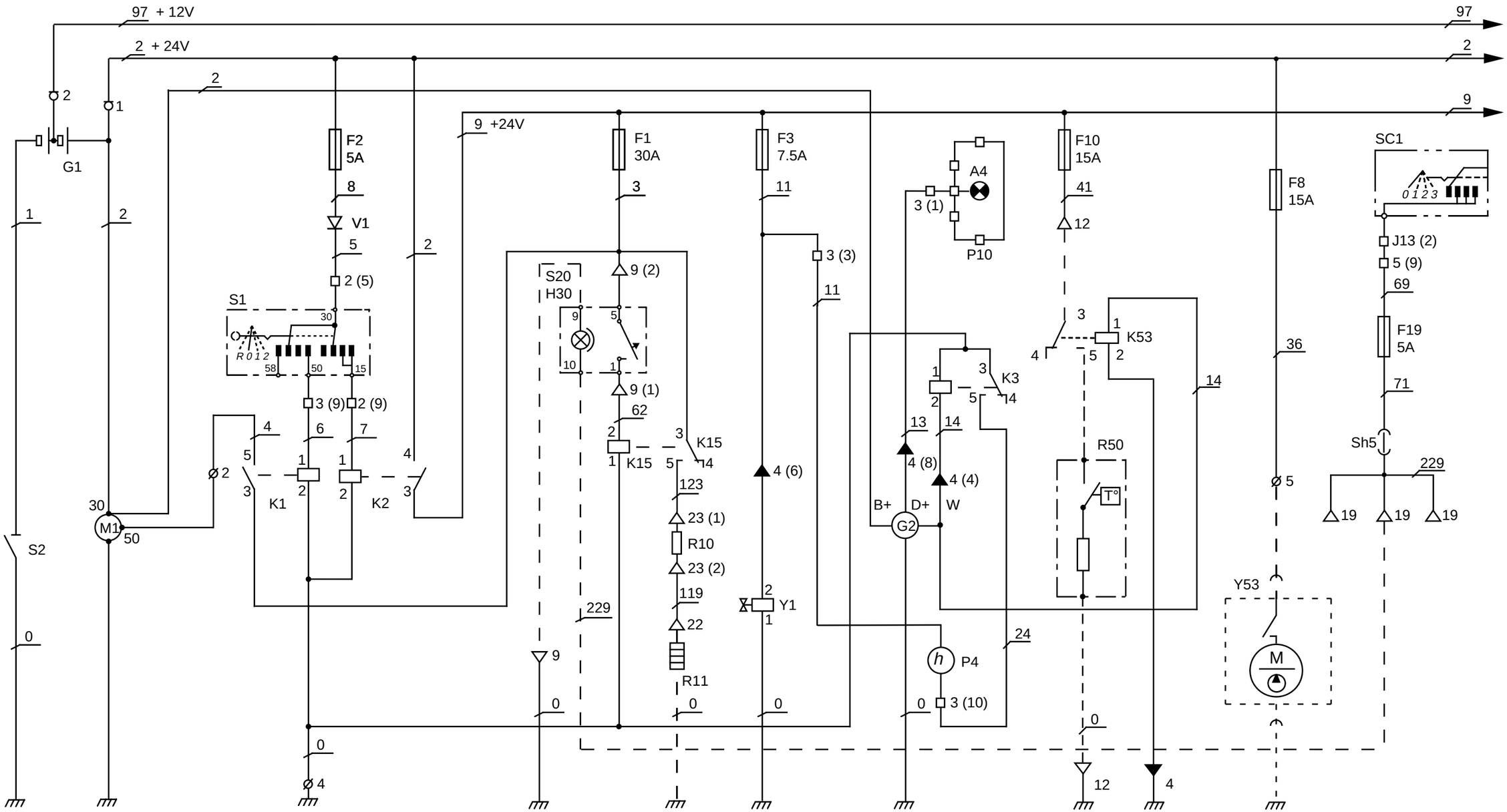
G2 Alternator
M1 Starter motor
R11 Pre-heater plug
R50 Fuel heater (optional)
Y1 Injection pump solenoid

CAB

P4 Hourmeter
P10 Instrument panel (See page 19)
SC1 Combination switch for direction indicator (commodo),dipped headlights, headlights main beam, sidelights, headlight flasher and horn

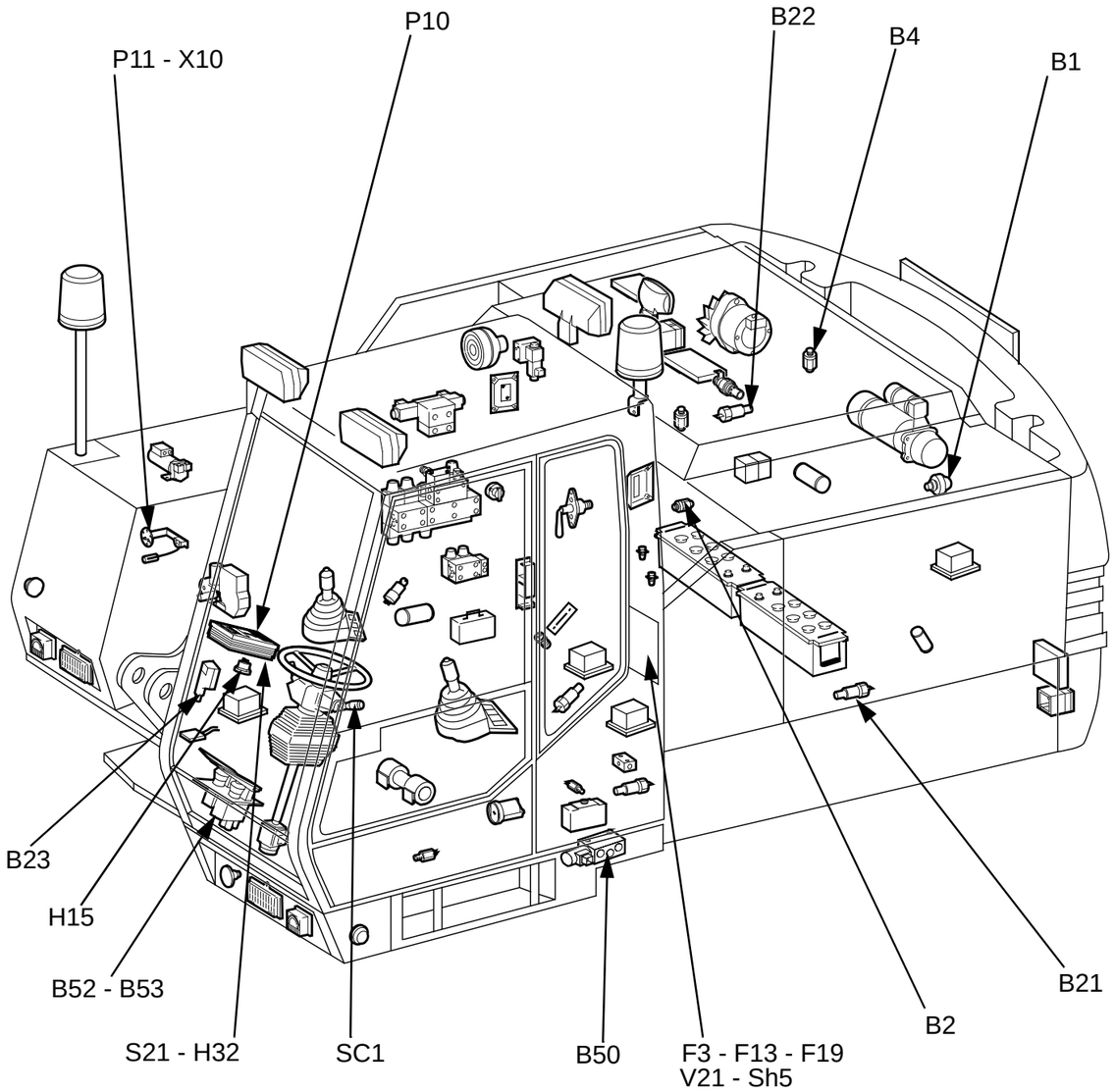
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BATTERY MASTER SWITCH	MASTER SWITCH STARTER MOTOR	STARTER KEY SWITCH STARTER MOTOR RELAY	MAIN RELAY	COLD START ASSISTANCE (OPTIONAL	ENGINE SHUT DOWN	ALTERNATOR HOURMETER	CHARGE WARNING LAMP	FUEL HEATER (OPTIONAL)	FUEL FILLER PUMP (OPTIONAL)	COMBINATION SWITCH (COMMODO)



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ELECTRICAL SCHEMATIC (PLATE 3)

INSTRUMENT PANEL

P10 Instrument panel (see schematic plate 1 page 8)
H32 Overload indicator switch lighting (optional)
S21 Overload indicator switch (optional)

ELECTRICAL CABINET

F3 Fuse, instrument panel (7.5 A)
F13 Fuse, 5 A, overload indicator
F19 Fuse, 5 A, switch lighting
Sh5 Shunt
V21 Overload indicator diode (optional)

△ □ ▲ see page 4

CAB

SC1 Combination switch for direction indicator (commodo),dipped headlights, headlights main beam, sidelights, headlight flasher and horn

FLOOR

B50 Parking brake pressure switch
B52 Brake pressure switch
B53 Orbitrol pressure switch
H15 Instrument panel audible warning

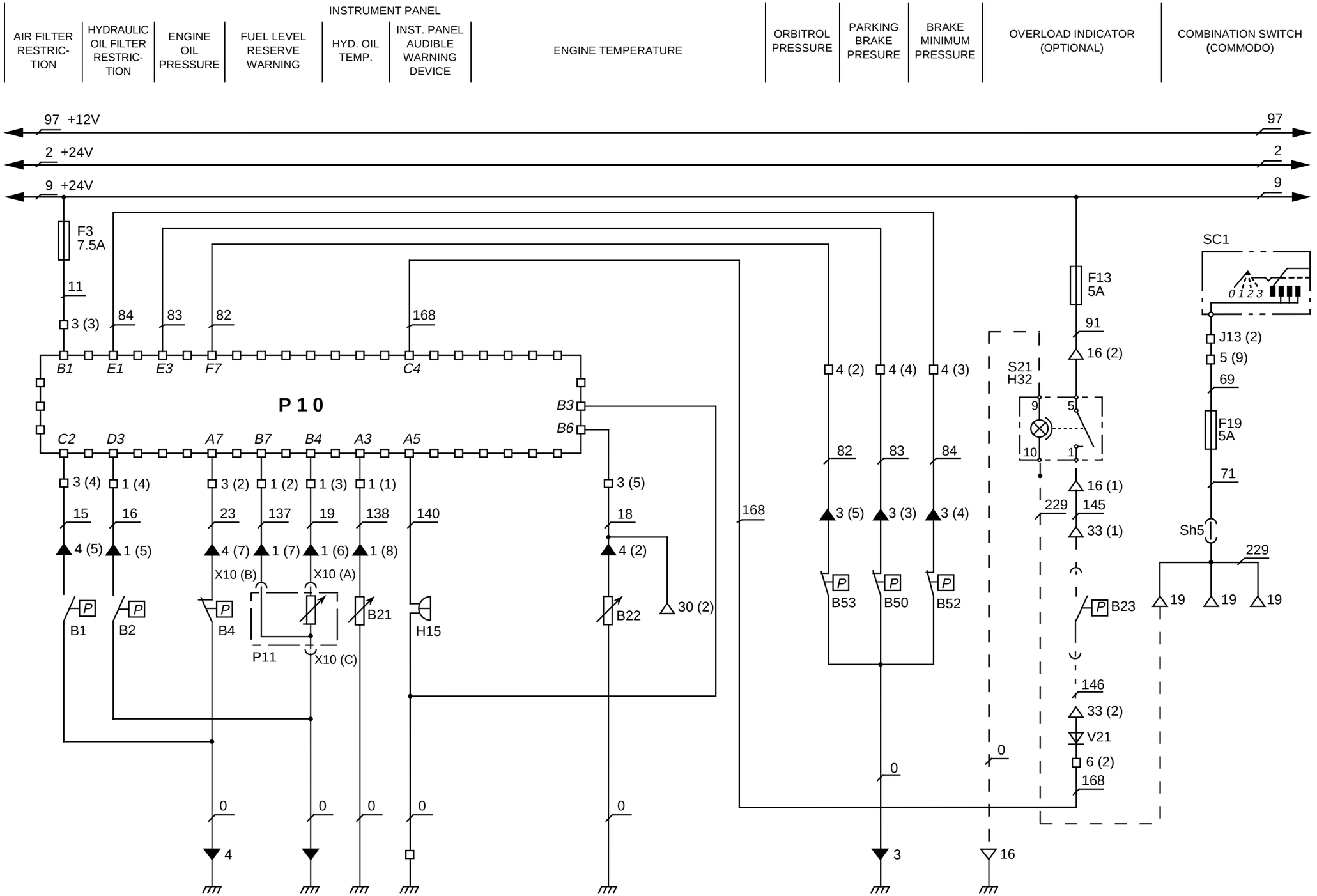
UPPERSTRUCTURE

B1 Air filter restriction pressostat
B2 Hydraulic oil filter pressostat
B21 Hydraulic oil temperature sender
B23 Overload indicator pressure switch (optional)
P11 Fuel level indicator
X10 **(A) (B) (C)** Fuel level indicator connectors.

ENGINE

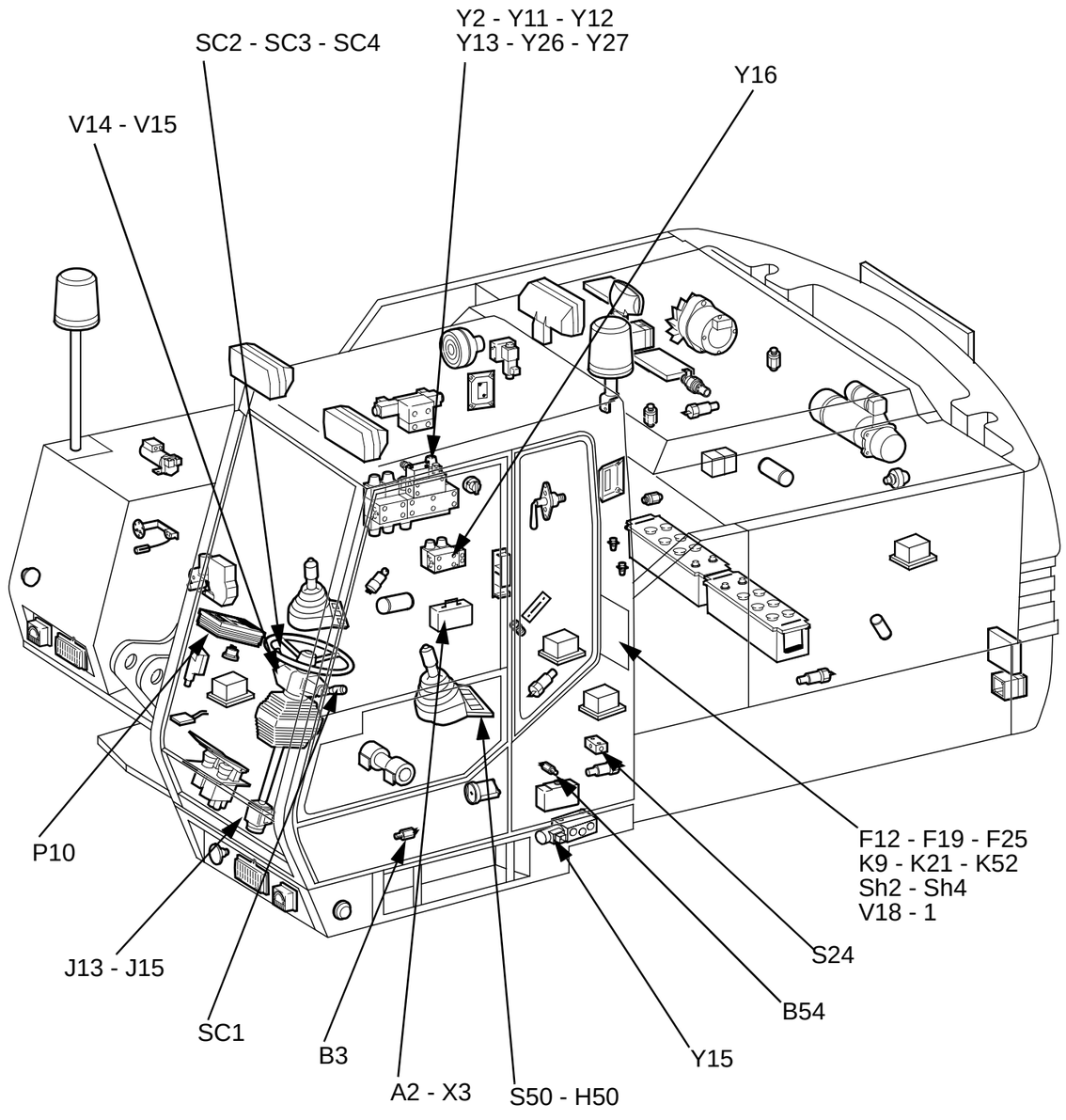
B4 Engine oil pressure switch
B22 Engine coolant temperature sender

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ELECTRICAL SCHEMATIC (PLATE 4)

ELECTRICAL CABINET

F12 Fuse, 10 A, pilot safety
F19 Fuse, 5 A, switch lighting
F25 Fuse, parking brake (7.5 A)
K9 Front axle unlocking relay
K21 Pilot safety relay
K52 Speed change relay
Sh4 Shunt (standard equipment)
V18 Axle unlocking diode
Sh2 Shunt
1 Connecting strip

□ △ ▽ ▲ **Ø4** : see page 4

FLOOR

A2 Electronic control box
B3 Pilot pressure switch
SC2 Front axle automatic and manual unlocking switch
SC3 Front axle locking and unlocking switch (in unlocked position)
SC4 Stabilizer raising and lowering momentary inverter switch
B54 Front axle unlocking pressure switch
H50 Working brake and parking brake switch lighting
J13 Steering column connectors
J15 Steering column connectors
S24 Pilot safety switch (hand control lever shown in raised position)
S50 Parking brake and working brake switch
V14-V15 Stabilizer solenoid valve diodes (in combination switch (commodo)
X3(20) Connector, 35-way

UPPERSTRUCTURE

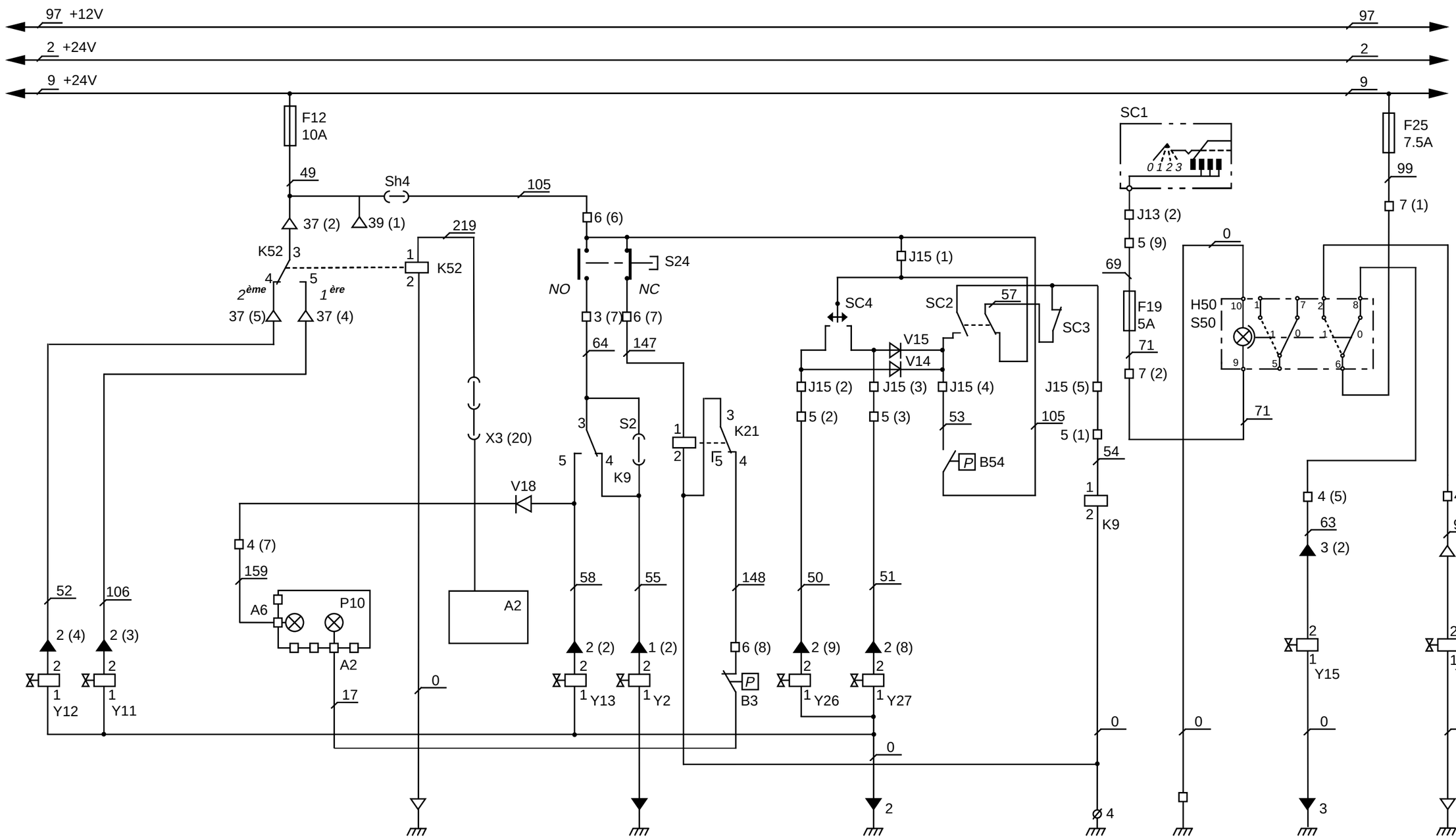
Y2 Pilot safety solenoid valve
Y11 Gear box solenoid valve (first speed)
Y12 Gear box solenoid valve (second speed)
Y13 Front axle unlocking solenoid valve
Y15 Parking brake and working brake control solenoid valve
Y16 Working brake solenoid valve (Standard)
Y26, Y27 Stabilizer solenoid valves

CAB

P10 Instrument panel
SC1 Combination switch for direction indicator (commodo), dipped headlights, headlights main beam, sidelights, headlight flasher and horn

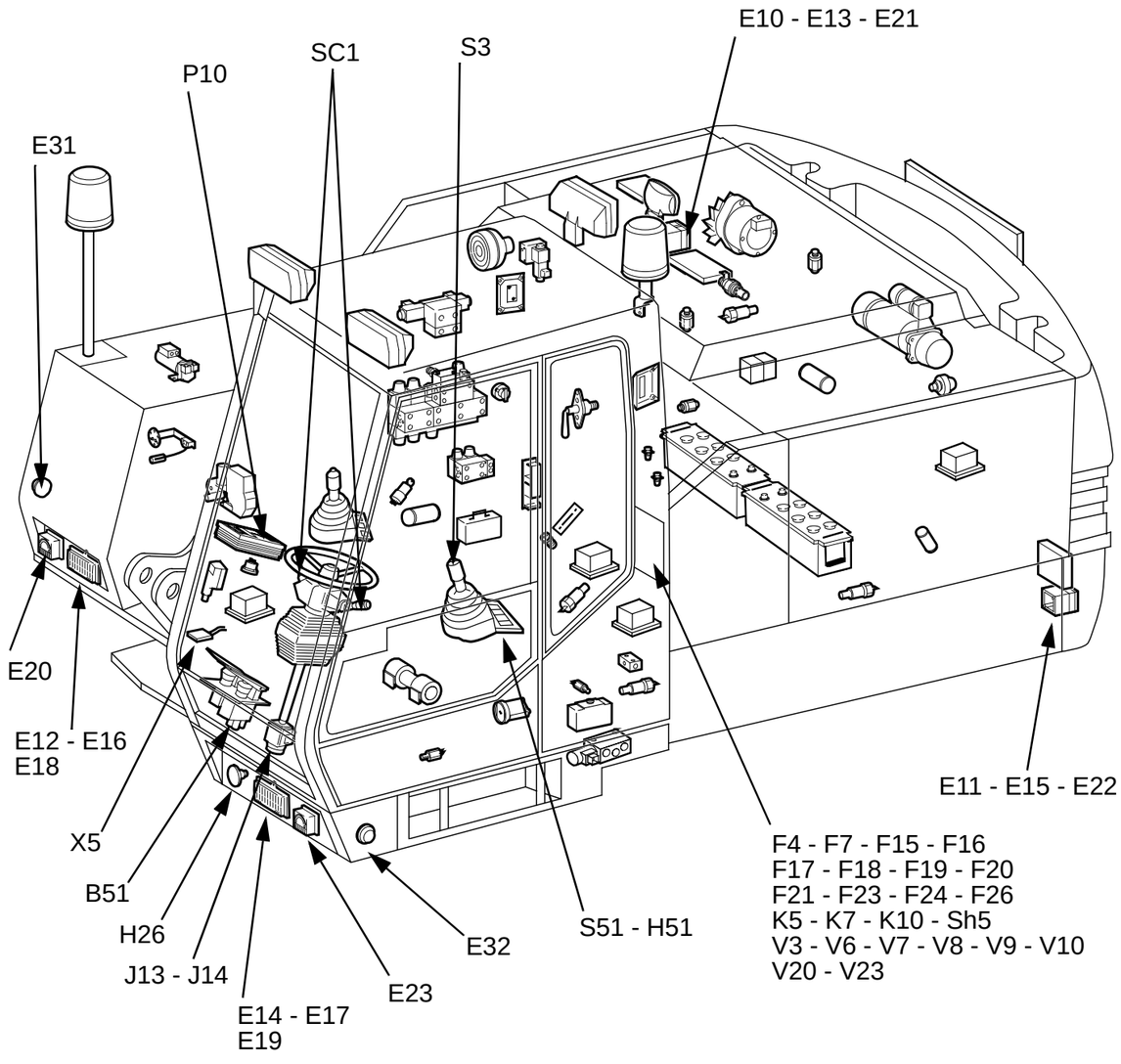
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SECOND SPEED SOLENOID VALVE | FIRST SPEED SOLENOID VALVE | AXLE UNLOCKING INDICATOR LAMP | PILOT PRESSURE WARNING LAMP | TWO-SPEED RELAY | AXLE UNLOCKING SOLENOID VALVE | PILOT SAFETY SYSTEM | STABILIZERS | AXLE UNLOCKING CONTROL | COMBINATION SWITCH (COMMODO) | PARKING BRAKE | STANDARD WORKING BRAKE



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ELECTRICAL SCHEMATIC (PLATE 5)

ELECTRICAL CABINET

F4 Fuse, 5 A, driving position lighting, torque converter relay
F7 Fuse, 10 A, horn
F15 Fuse, 15 A, main beam headlights
F16 Fuse, 5 A, RH brake lights
F17 Fuse, 5 A, LH brake lights
F18 Fuse, 5 A, RH front position light
F19 Fuse, 5 A, LH front position light
F20 Fuse, 5 A, RH front dipped headlight
F21 Fuse, 5 A, LH front dipped headlight
F23 Fuse, 5 A, RH main beam headlight
F24 Fuse, 5 A, LH main beam headlight
F26 Fuse, 7.5 A, direction indicator, hazard warning lights
K5 Horn relay
K7 Upperstructure and attachment working light relay
K10 Flasher unit
Sh5 Shunt
V3 Dipped headlight indicator lamp diode
V6 Main beam headlight indicator lamp diode
V7 RH direction indicator green indicator lamp
V8 LH direction indicator green indicator lamp
V9 Hazard warning diode
V10 LH direction indicator diode
V20 RH direction indicator diode
V23 Hazard warning diode

□△▽▲: see page 4

CAB

H51 Hazard warning switch lighting
P10 Instrument panel (See page 19)
S3 Horn switch
S51 Hazard warning switch
SC1 Direction indicator (commodo), main beam and dip switch, side lights and headlight flasher switch

FLOOR

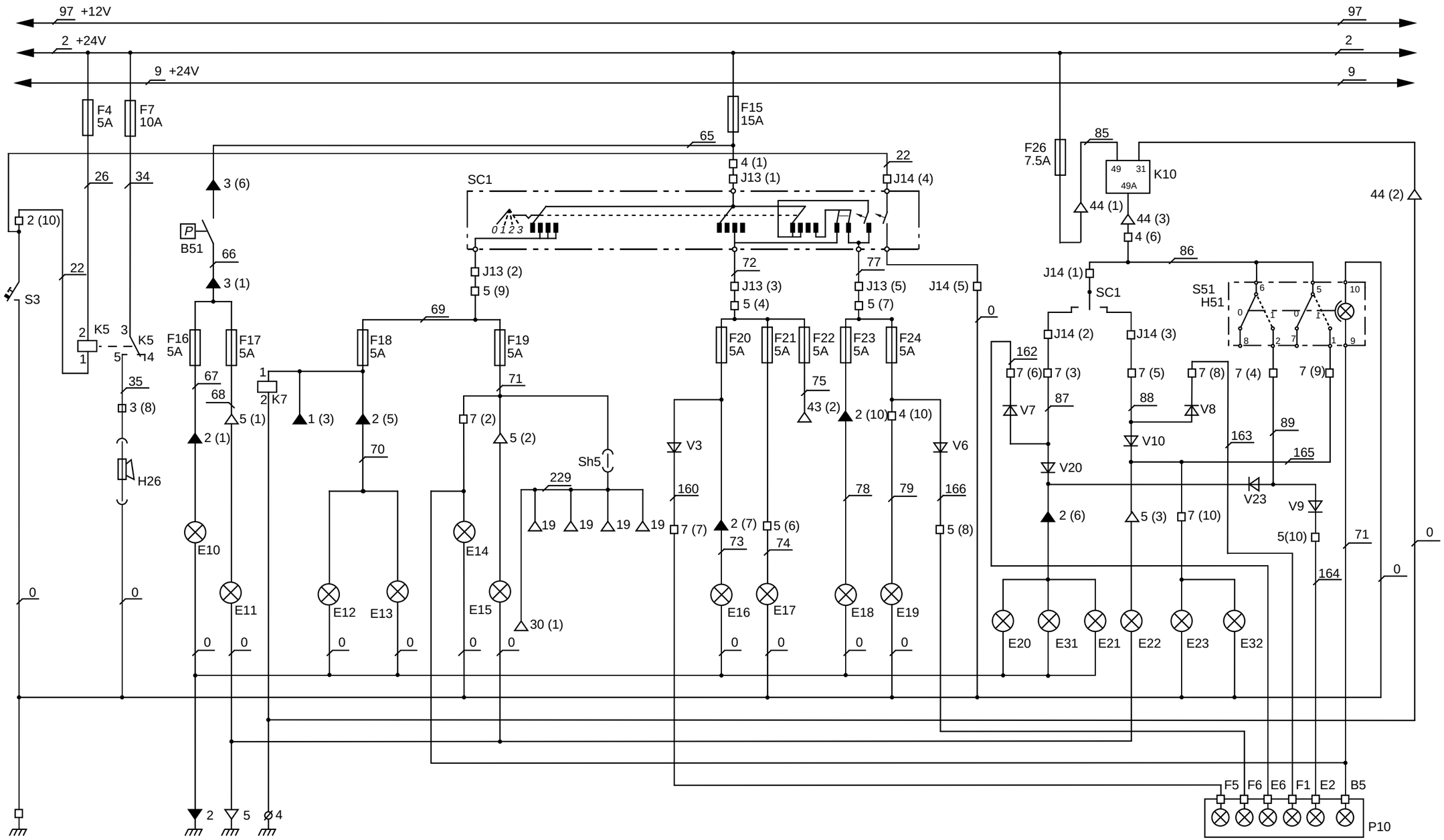
B51 Stop light pressure switch
H26 Horn
J13 Steering column connectors
J14 Steering column connectors
X5(B) Steering brake pressure switch

UPPERSTRUCTURE

E10 RH rear stop light
E11 LH rear stop light
E12 Front RH side light
E13 Rear RH side light
E14 Front LH side light
E15 Rear LH side light
E16 Front RH dipped headlight
E17 Front LH dipped headlight
E18 RH main beam headlight
E19 LH main beam headlight
E20 RH front direction indicator
E21 RH rear direction indicator
E22 LH rear direction indicator
E23 LH front direction indicator
E31 RH front side mounted direction indicator
E32 LH front side mounted direction indicator

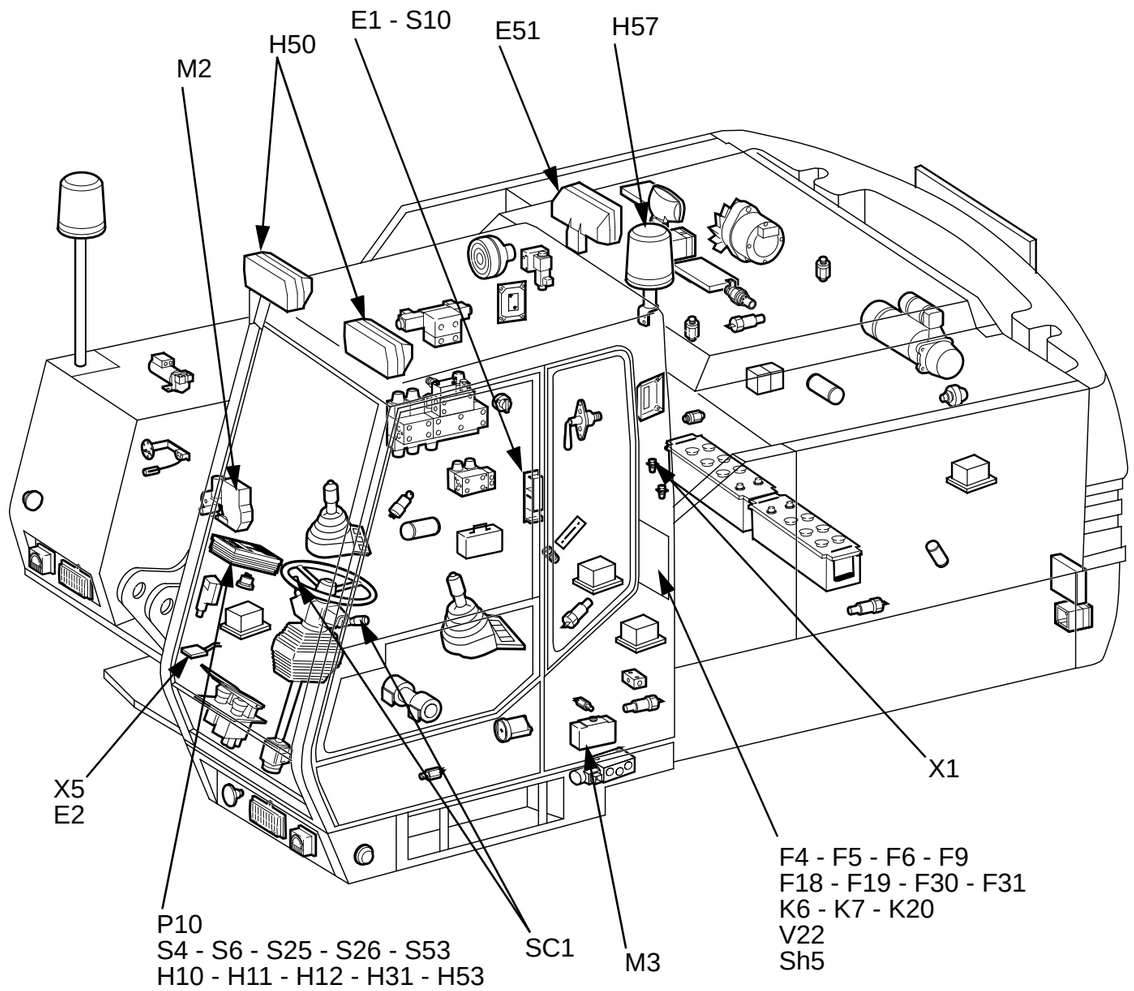
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HORN | BRAKE LIGHT | SIDE LIGHT | COMBINATION SWITCH (COMMODO) | DIPPED HEADLIGHTS | MAIN BEAM HEADLIGHTS | DIRECTION INDICATOR LIGHTS | HAZARD WARNING LIGHTS



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ELECTRICAL SCHEMATIC (PLATE 6)

INSTRUMENT PANEL

H10 Working light switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lighting
H31 Rotary light switch lighting (optional)
H53 Front cab working light switch lighting (optional)
S4 Working light switch
S6 Windshield wiper switch
S25 Rotary light switch (optional)
S26 Windshield washer switch
S53 Front cab working light switch lighting (optional)

ELECTRICAL CABINET

F4 Fuse, 5 A, cab interior light
F5 Fuse, 10 A, headlight and rotary light relay (specific to certain countries)
F6 Fuse, 15 A, upperstructure working lights
F9 Fuse, 10 A, windshield washer, windshield wiper
F18 Fuse, 5 A, K7 relay coil
F19 Fuse, 5 A, switch lighting
F30 Fuse, 15 A, front cab working lights
F31 Fuse, 15 A, windshield wiper intermittent action
K6 Working light relay
K7 Upperstructure and attachment working light relay
K20 Windshield wiper intermittent action
Sh5 Shunt
V22 Rotary light indicator lamp diode (specific to certain countries)

△ □ ▲ **Ø4** : see page 4

CAB

E1 Cab interior light
E50 Front cab working lights (optional)
E51 Rear cab working lights
M2 Windshield wiper motor
cable item 144 = blue cable
cable item 142 = grey cable
cable item 0 = black cable
cable item 38 = white cable
P10 Instrument panel (See page 19)
S10 Cab interior light
SC1 Direction indicator (commodo), main beam and dip switch, side lights and headlight flasher switch
X1 (E) Cab floor/Cab windshield wiper motor blue connector
X1 (G) Cab floor/cab connector
X1 (J) Cab floor/Cab windshield wiper motor white connector
X1 (K) Cab floor/cab connector
X1 (L) Cab floor/Cab windshield wiper motor grey connector
X1 (M) Cab floor/Cab windshield wiper motor black connector
X1 (F) Cab floor/Cab rotary light connector (optional)

FLOOR

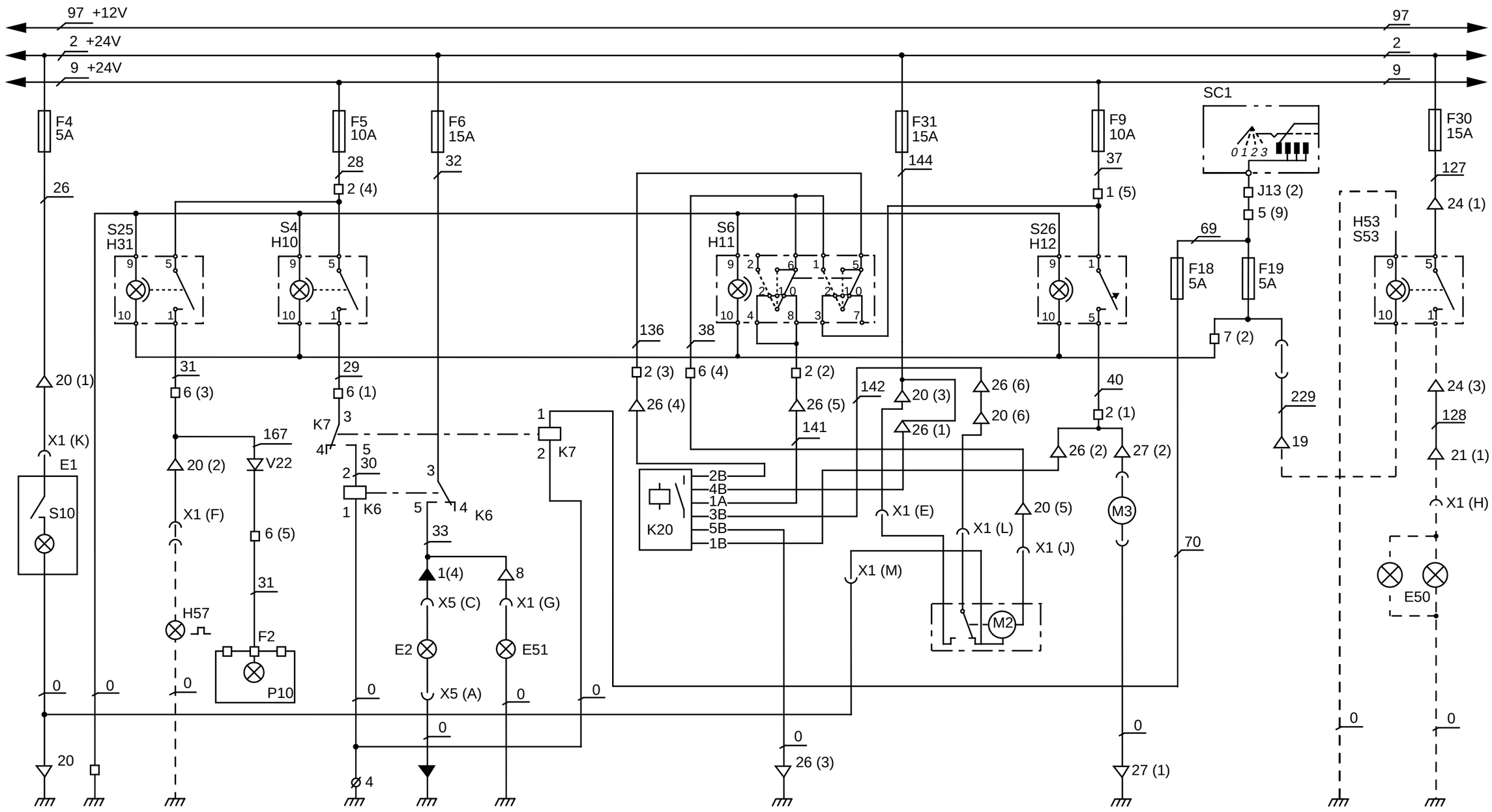
M3 Windshield washer motor

UPPERSTRUCTURE

E2 Attachment working light on boom
H57 Standard rotary light (optional)
X5 (A), (C) Attachment working light power connection

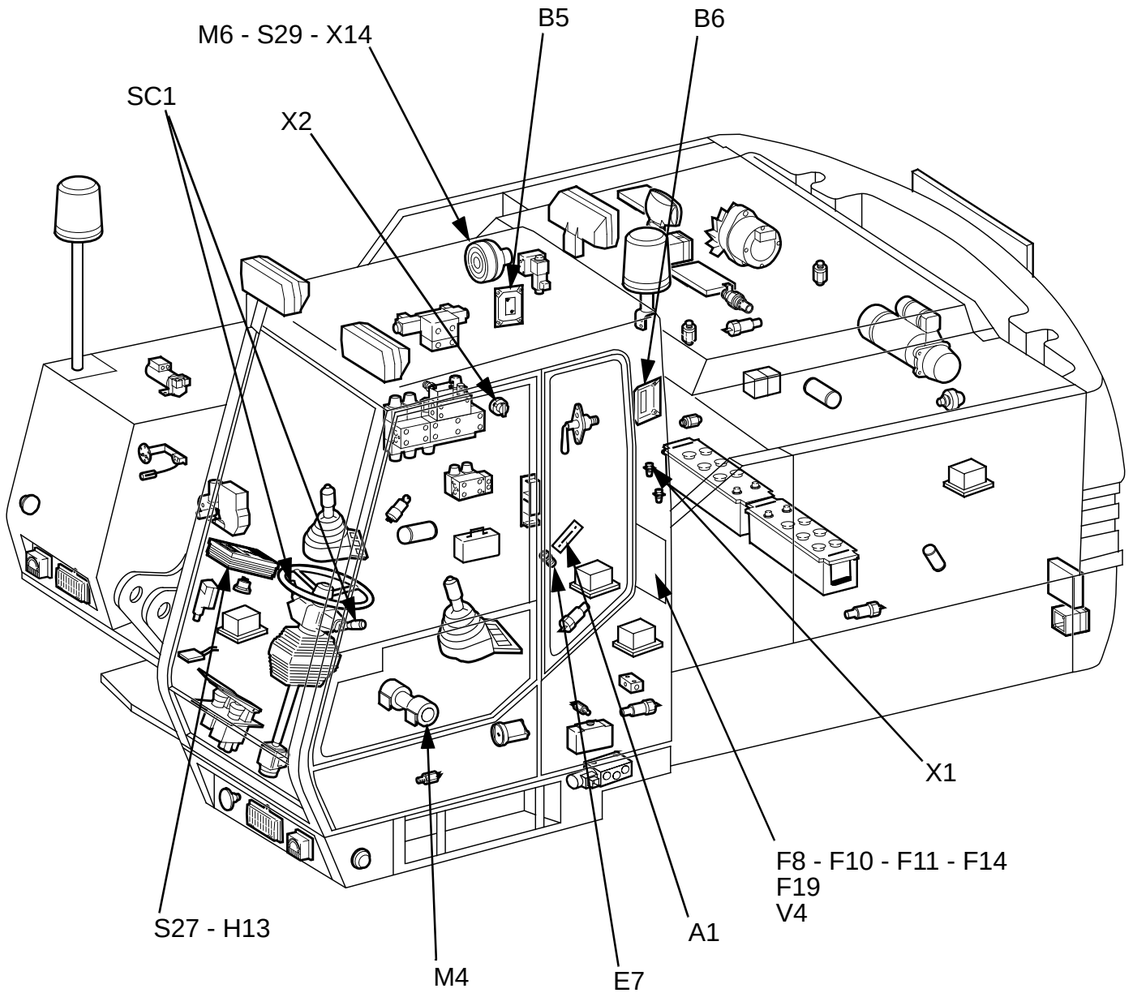
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CAB LIGHTING | ROTARY LIGHT (OPTIONAL) | ROTARY LIGHT INDICATOR LAMP | ATTACHMENT WORKING LIGHT | REAR CAB WORKING LIGHT | WINDSHIELD WIPER | WINDSHIELD WASHER | COMBINATION SWITCH (COMMODO) | FRONT CAB WORKING LIGHTS (OPTIONAL)



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ELECTRICAL SCHEMATIC (PLATE 7)

ELECTRICAL CABINET

F8 Fuse, 15 A, upperstructure power line connection
F10 Fuse, 15 A, blower, heater
F11 Fuse, 7.5 A, cigarette lighter/cab blower (optional)
F14 Fuse, 5 A, radio
F19 Fuse, 5 A, switch lighting
V4 Radio diode (optional)

□ △ ▼ ▽ **Ø5** : see page 4

INSTRUMENT PANEL

H13 Blower/heater switch lighting
S27 Blower/heater switch
S29 Blower switch (optional)

FLOOR

A1 Radio (optional)
E7 Cigarette lighter
M4 Blower/heater motor
SC1 Direction indicator (commodo), main beam and dip switch, side lights and headlight flasher switch

CAB

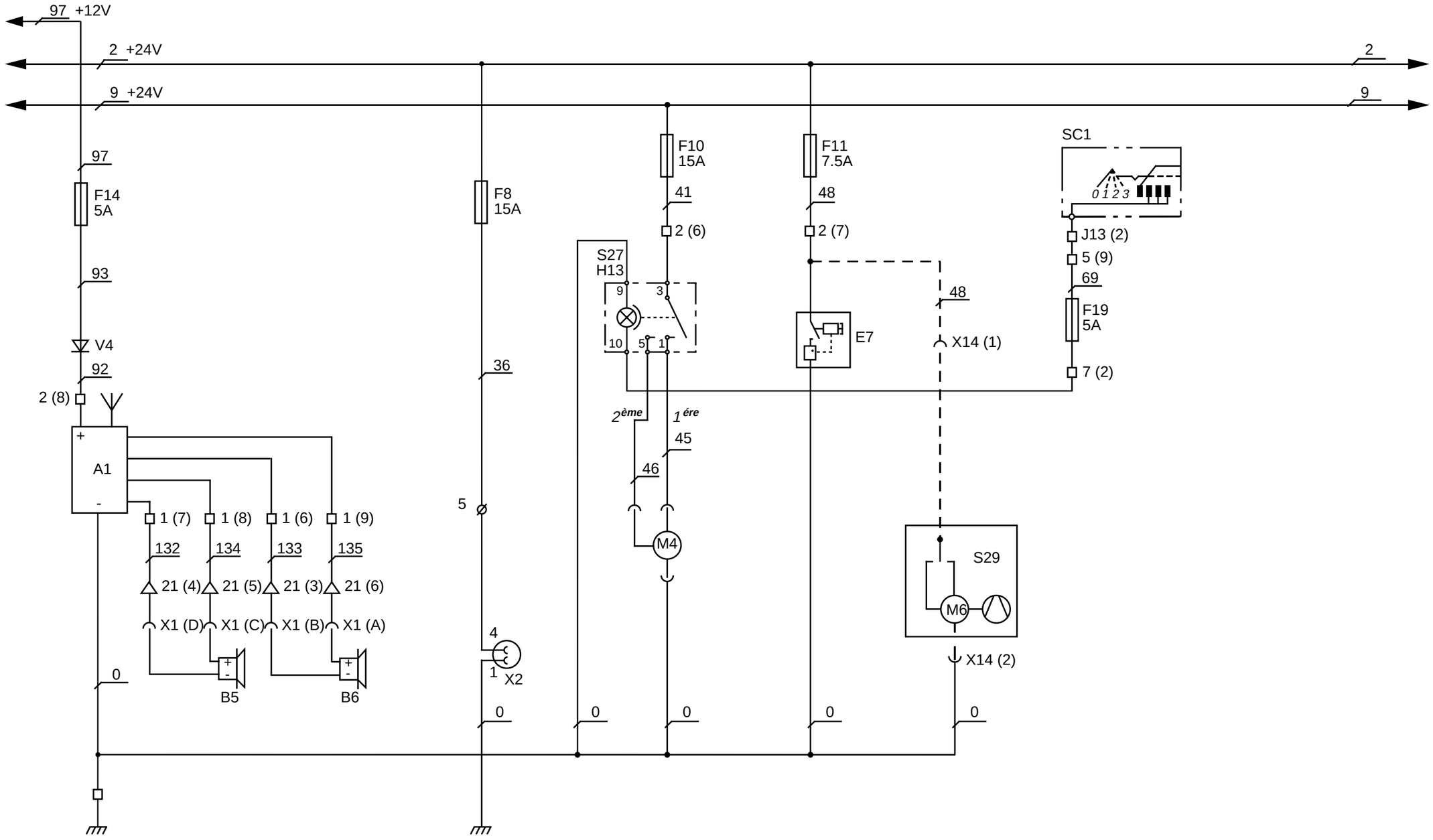
B5 Right-hand loudspeaker (optional)
B6 Left-hand loudspeaker (optional)
M6 Blower motor (optional)
X1(A),(B),(C),(D) Cab floor/cab LH and RH loudspeaker connector (optional)
X14 (1),(2) Blower motor connector (optional)

UPPERSTRUCTURE

X2 Upperstructure power connection

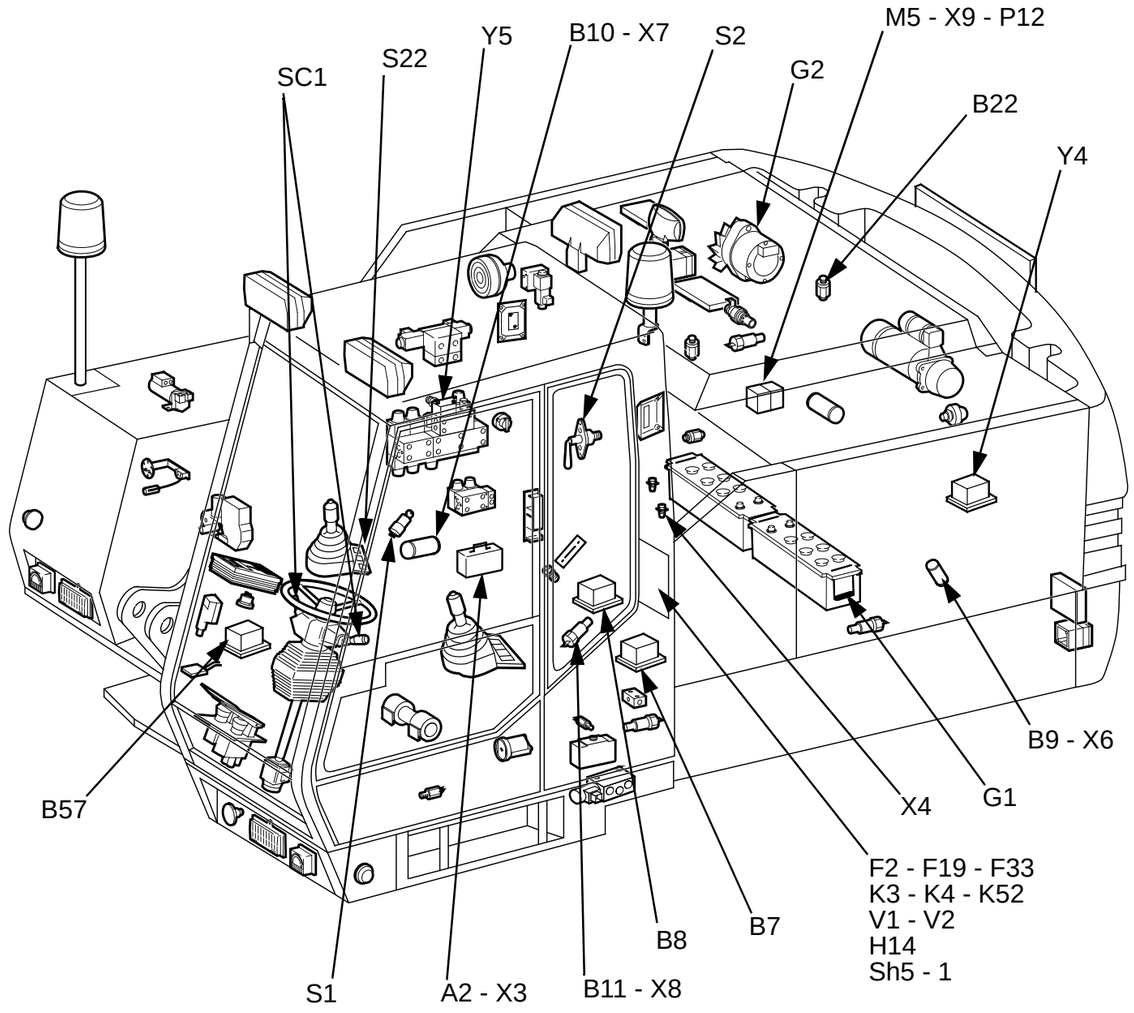
https://truckmanualshub.com/

RADIO (OPTIONAL) | UPPERSTRUCTURE POWER LINE CONNECTION | VENTILATION/HEATING | CIGARETTE LIGHTER | CAB BLOWER (OPTIONAL) | COMBINATION SWITCH (COMMODO)



CM97G046

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CM97G035

ELECTRICAL SCHEMATIC (PLATE 8)

ELECTRICAL CABINET

F2 Fuse, 5 A, starter switch
F19 Fuse, 5 A, switch lighting
F33 Fuse, 7.5 A, electronic control box
H14 Diagnostic (LED) lamp
K3 Hourmeter relay
K52 Speed change relay
K4 Electrical control box supply relay
Sh5 Shunt
V1 General contact diode
V2 K3 relay diode
1 Connecting strip

CAB

A2 Electronic control box
S22 Control panel
SC1 Direction indicator (commodo), main beam and dip switch, side lights and headlight flasher switch
X3 35 -way connector
X4 Troubleshooting socket

FLOOR

B8 Travel detector pressure switch
S1 Key switch

□ △ ▼ ▽ **Ø4** : see page 4

UPPERSTRUCTURE

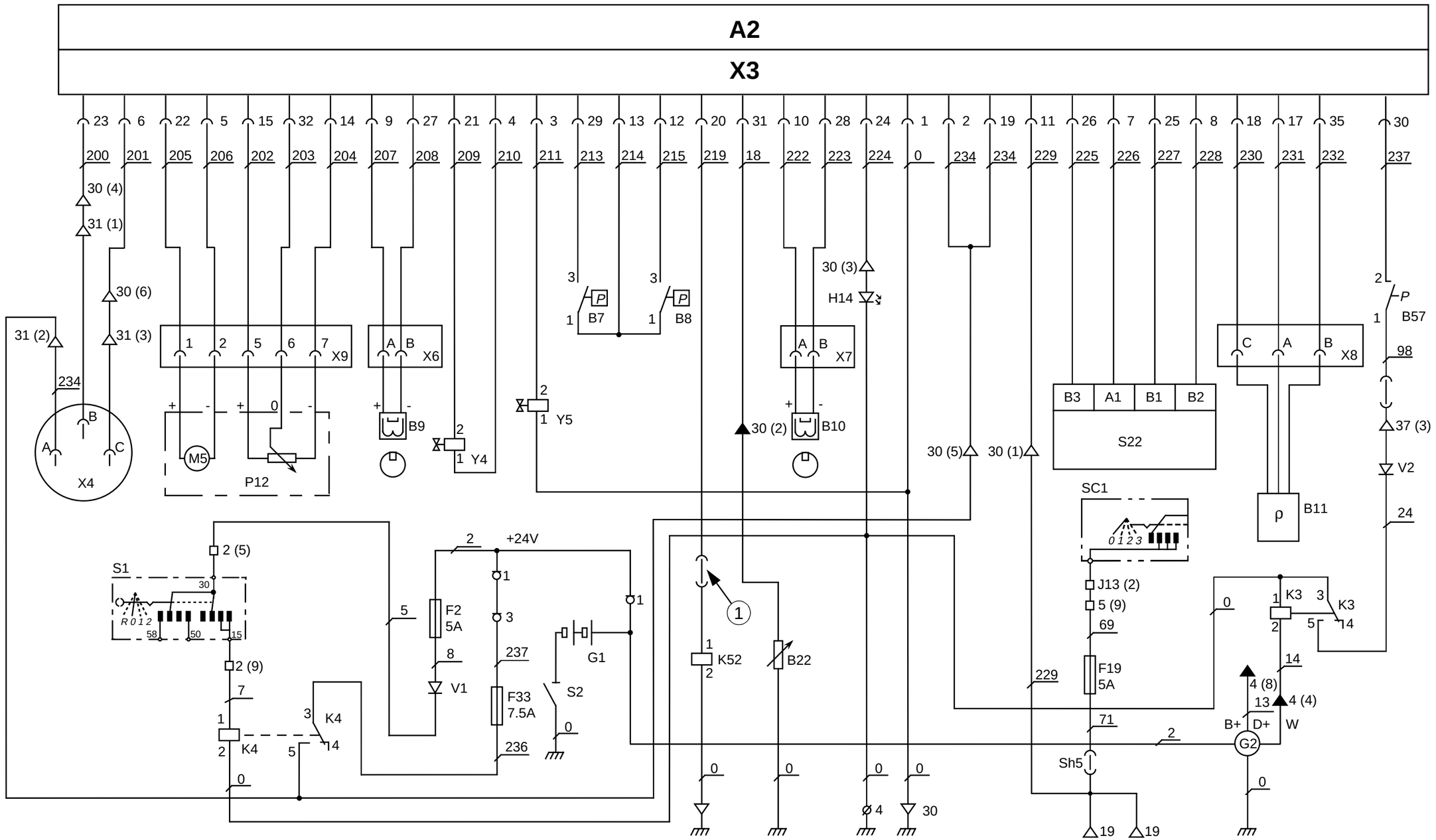
B7 Swing detector pressure switch
B10 Swing motor speed detector
B11 Hydraulic pressure sender
B57 Speed change pressure switch
G1 Batteries
S2 Battery master switch
Y5 Upperstructure brake release control solenoid valve

ENGINE

B9 Engine speed detector
B22 Engine coolant temperature sender
G2 Alternator
M5 Injection pump servo-motor
P12 Servo-motor potentiometer
X6 Engine speed detector connector
X7 Upperstructure swing speed detector connector
X8 Hydraulic pressure sender connector
X9 Injection pump servo-motor connector
Y4 DRE 4 proportional pressure reduction valve

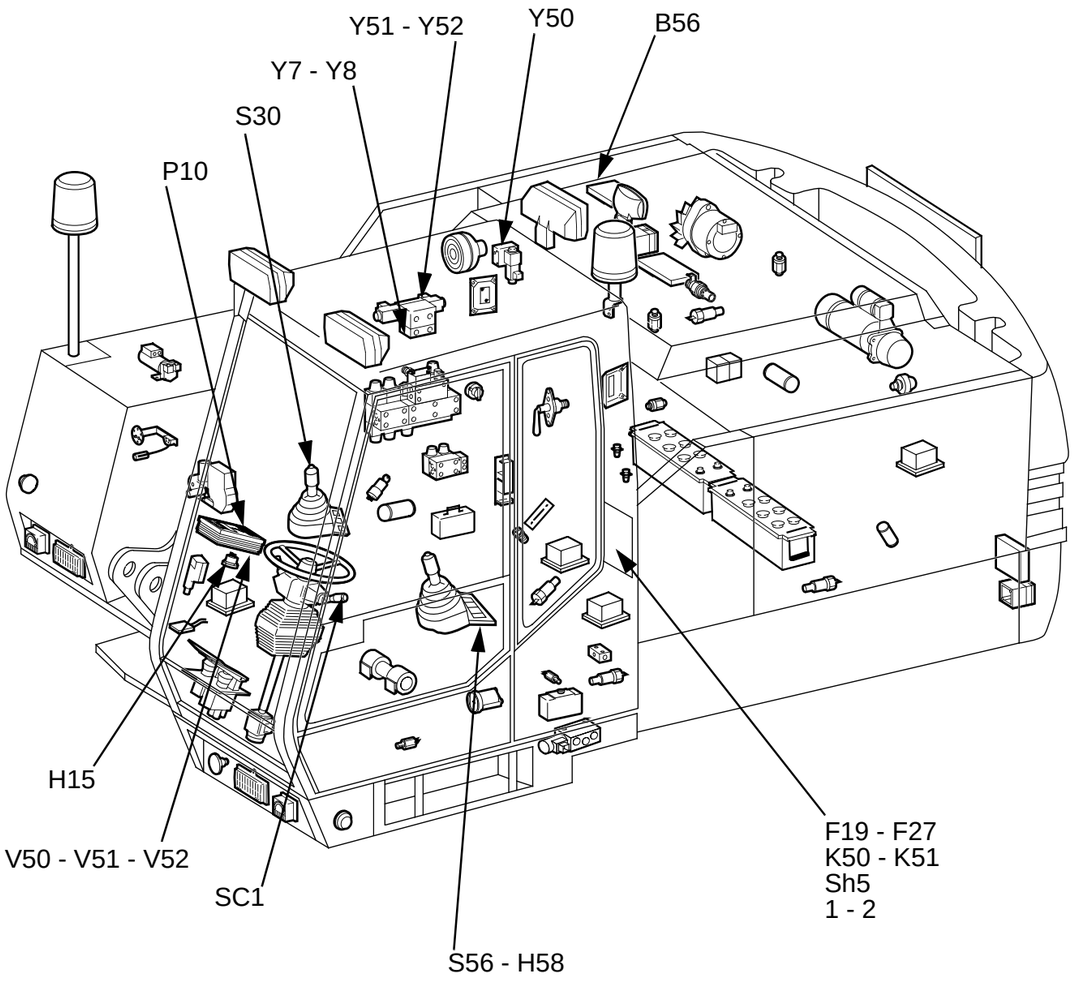
https://truckmanualshub.com/

TROUBLESHOOTING SOCKET | INJECTION PUMP SERVO-MOTOR | ENGINE SPEED DETECTOR | DRE4 PRES-SURE REDUCING VALVE | SWING BRAKE RELEASE SOLENOID VALVES | PRESSURE SWITCH: SWING, TRAVEL | TRAVEL SPEED RELAY | WATER T | UPPER-STRUC-TURE SWING SPEED DETECTOR | DIAG NOS-TIC LED | 0V BAT-TERY | +28V BAT-TERY | +28V INST. PANEL LIGHTG | CONTROL PANEL | PRESSURE SENDER | SPEED CHANGE PRESSURE SWITCH



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ELECTRICAL SCHEMATIC (PLATE 9)



CM97G035

ELECTRICAL CABINET

F19 Fuse, 5 A, switch lighting
F27 Fuse, 5 A, adjustable boom and adjustable boom range limitation
K50 Adjustable boom raising range limitation relay (optional)
K51 Adjustable boom lowering range limitation relay (optional)
Sh5 Shunt
1-2 Connecting strip

□ △ ▼ ▽ see page 4

CAB

H58 Quick coupler switch lighting (optional)
SC1 Direction indicator combination switch (commodo) (dipped headlights, main beam headlights, parking lights and headlight flasher selection)
S30 Adjustable or articulated boom switch
S56 Quick coupler switch (optional)

UPPERSTRUCTURE

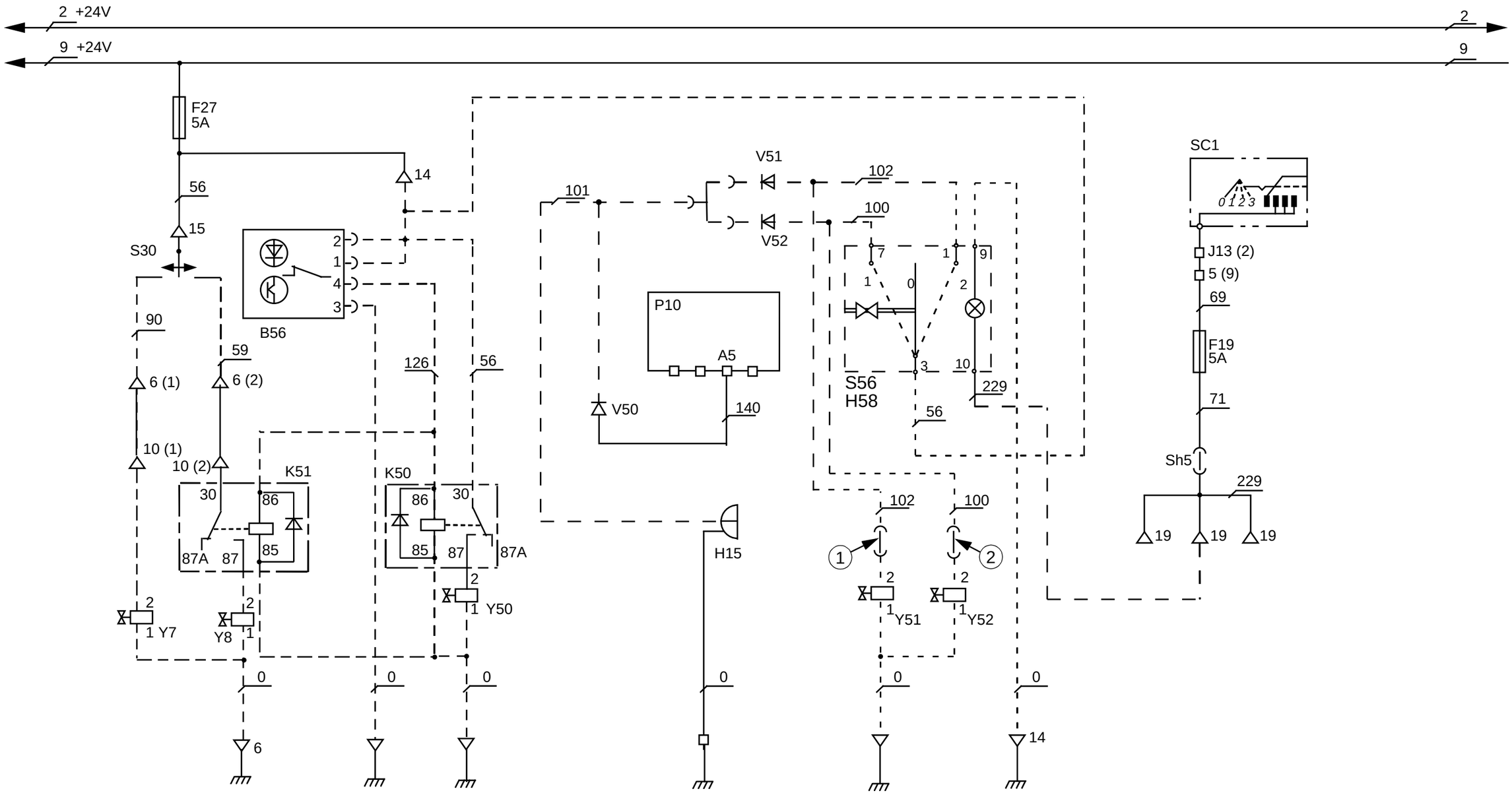
B56 Adjustable boom raising range limitation detector (optional)
Y7 Adjustable or articulated boom extending electro-valve
Y8 Adjustable or articulated boom retracting electro-valve
Y50 Adjustable boom raising height limiter solenoid valve (optional)
Y51 Quick coupler attach solenoid valve (optional)
Y52 Quick coupler attach solenoid valve (optional)

INSTRUMENT PANEL

H15 Instrument panel audible warning
P10 Instrument panel (See page 19)
V50 Quick coupler diode
V51 Quick coupler diode
V52 Quick coupler diode

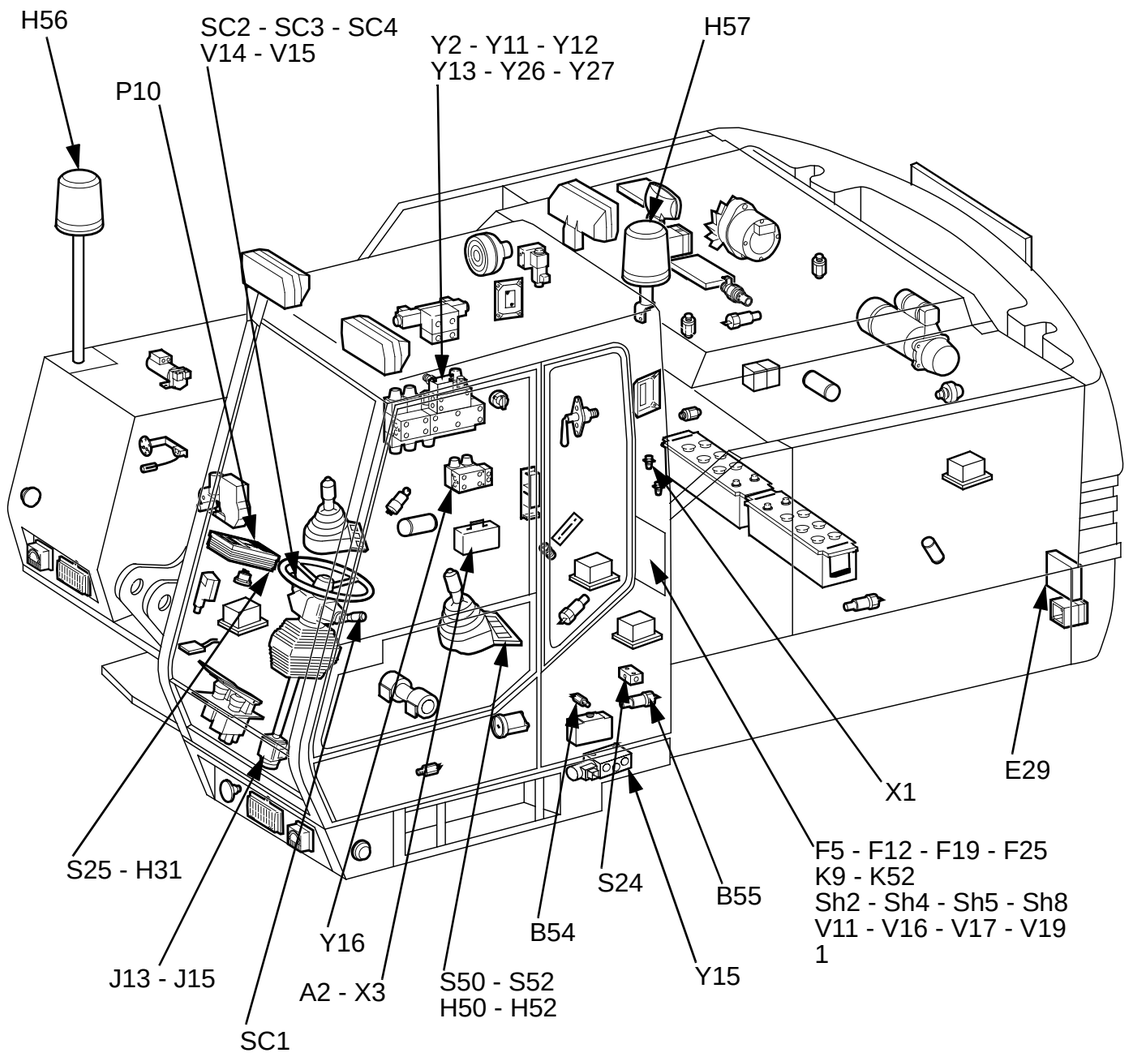
https://truckmanualshub.com/

ADJUSTABLE BOOM OR ARTICULATED BOOM (OPTIONAL) | ADJUSTABLE BOOM RANGE LIMITATION (OPTIONAL) | QUICK COUPLER (OPTIONAL) | COMBINATION SWITCH (COMMODO)



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CM97G035

ELECTRICAL SCHEMATIC (PLATE 10)

Supplement for Italy

ELECTRICAL CABINET

F5 Fuse, 10 A **,** Headlight/rotary light relay (Italy)
F12 Fuse, 10 A, pilot safety
F19 Fuse, 5 A, switch lighting
F25 Fuse, 7.5 A, parking brake
K9 Front axle unlocking relay
K52 Speed change relay
Sh2 Shunt
Sh4 Shunt (not used)
Sh5 Shunt
Sh8 Shunt (pilot cancellation option special for Italy), remove shunt Sh4 and install it at Sh8)
V11 Pilot system cancellation indicator lamp (specific to certain countries)
V16, V17, V19 Pilot system cancellation indicator lamps (specific to certain countries)
1 Connecting strip

□ △ ▼ ▽ **Ø4**: see page 4

FLOOR

A2 Electronic control box
B54 Front axle unlocking pressure switch
B55 Steering brake pressure switch (Italy)
H50 Working brake and parking brake switch lighting
H52 Pilot system cancellation switch lighting (specific to certain countries)
J13 Steering column connectors
J15 Steering column connectors
SC2 Front axle automatic and manual unlocking switch
SC3 Front axle locking and unlocking switch (locked axle shown)
SC4 Stabilizer raising and lowering momentary inverter switch
S24 Pilot safety switch (hand control lever shown in raised position)
S50 Parking brake and working brake switch
S52 Pilot system cancellation switch (specific to certain countries)
V14-V15 Stabilizer solenoid valve diodes (in combination switch)
X3(20) A2 electronic control box 35-way connector

UPPERSTRUCTURE

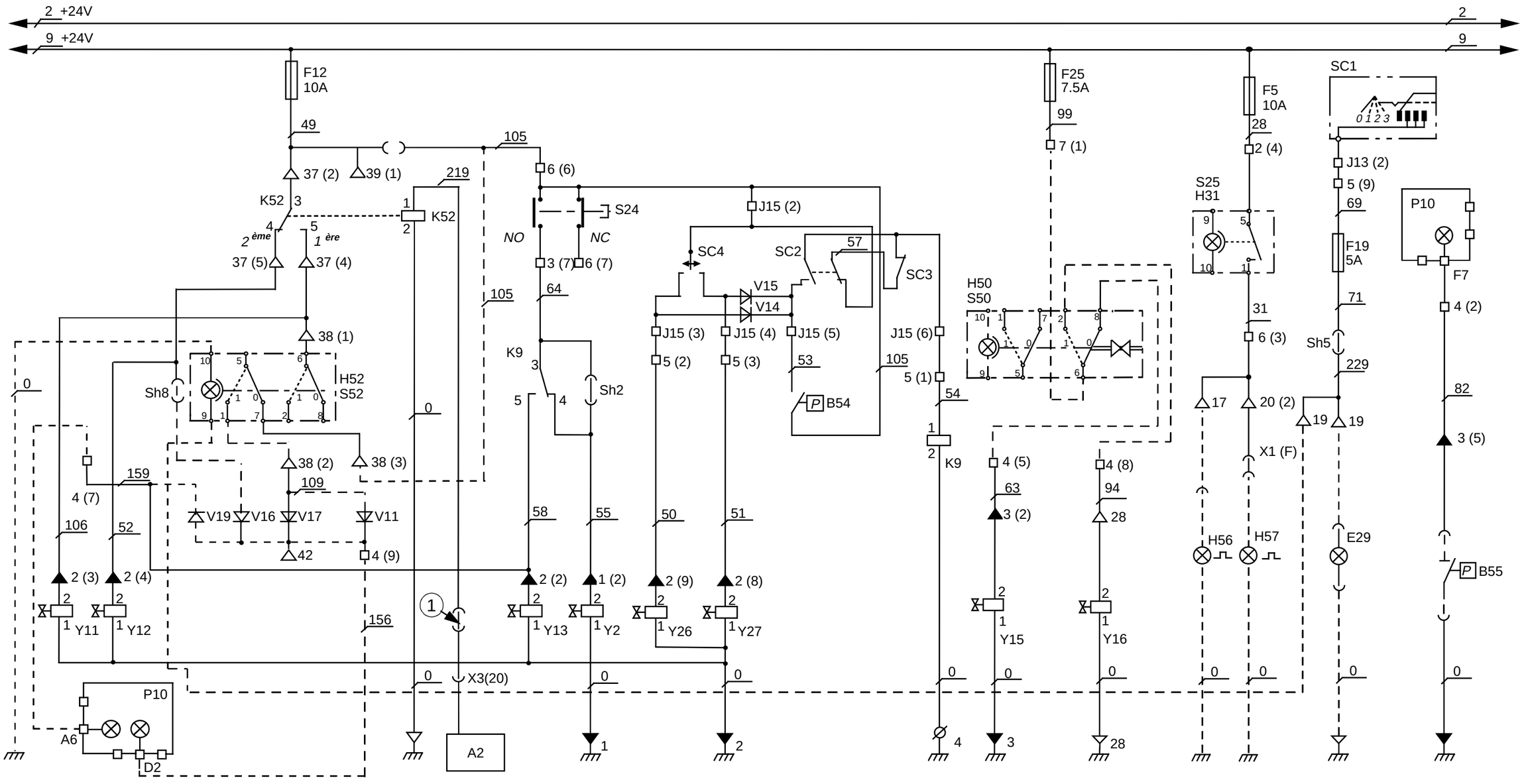
E29 Registration plate lighting (Italy)
H56 Upperstructure rotary light (Italy)
Y2 Pilot safety solenoid valve
Y11 Gear box solenoid valve (first speed)
Y12 Gear box solenoid valve (second speed)
Y13 Front axle unlocking solenoid valve
Y15 Parking brake and working brake control solenoid valve
Y16 Working brake solenoid valve (Standard)
Y26, Y27 Stabilizer solenoid valves

CAB

H31 Rotary switch lighting
H57 Cab rotary light (Italy)
P10 Instrument panel (See page 19)
SC1 Direction indicator (commodo), main beam and dip switch, side lights and headlight flasher switch
S25 Rotary light switch
X1 (F) Cab floor/cab connector

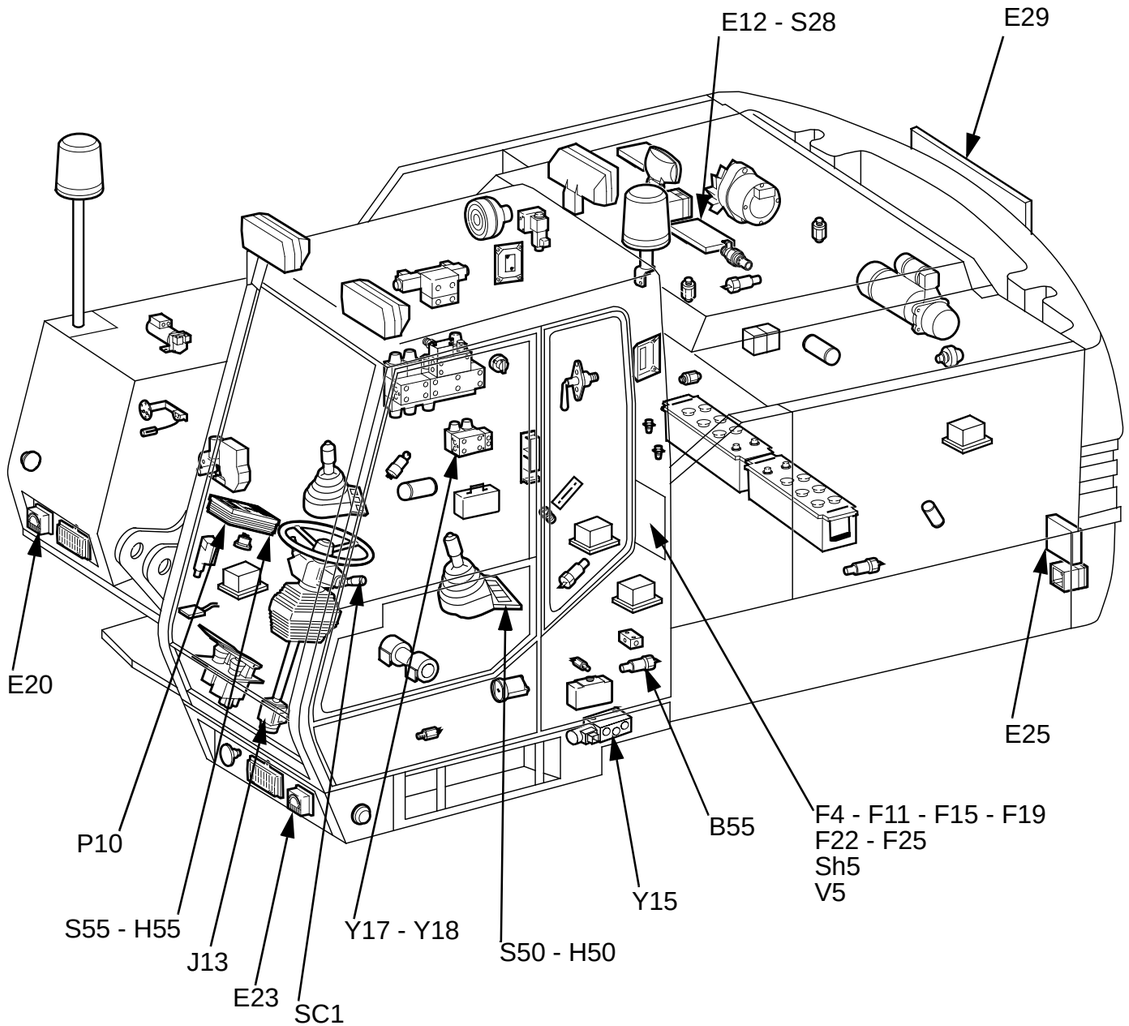
https://truckmanualshub.com/

FIRST SPEED SOLENOID VALVE | SECOND SPEED SOLENOID VALVE | TWO-SPEED RELAY ROAD POSITION - ITALY | AXLE UNLOCKING SOLENOID VALVE | PILOT SAFETY | STABILIZER | AXLE UNLOCKING CONTROL | PARKING BRAKE | WORKING BRAKE - ITALY | ROTARY LIGHT - ITALY | CAB ROTARY LIGHT | REGISTRA-TION PLATE - ITALY | STEERING BRAKE PRESSURE



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ELECTRICAL SCHEMATIC (PLATE11)



CM97G035

Supplement for Switzerland

ELECTRICAL CABINET

F11 Fuse, 7.5 A, cigarette lighter/brake (Germany)
F25 Fuse, 7.5 A, working brake/parking brake
Sh5 Shunt

CAB

H50 Working brake and parking brake switch lighting
P10 Instrument panel
S50 Parking brake and working brake switch

FLOOR

B55 Steering brake pressure

UPPERSTRUCTURE

E20 RH front direction indicator
E23 LH front direction indicator
Y15 Parking brake solenoid valve
Y17 Working brake solenoid valve (Germany)
Y18 Working brake solenoid valve (Germany)

Supplement for Northern Europe

ELECTRICAL CABINET

F4 Fuse, 5 A, engine compartment lighting
Sh5 Shunt

ENGINE

E12 Engine compartment light
S28 Engine compartment lighting

Supplement for Belgium

ELECTRICAL CABINET

F15 Fuse, 15 A, combination switch
F19 Fuse, 5 A, switch lighting
F22 Fuse, 5 A, rear fog light
Sh5 Shunt
V5 Rear fog light diode

FLOOR

J13 Steering column connector

CAB

H55 Rear fog light switch lighting
P10 Instrument panel (See page 19)
SC1 Direction indicator (commodo), main beam and dip switch, side lights and headlight flasher switch
S55 Rear working lights switch

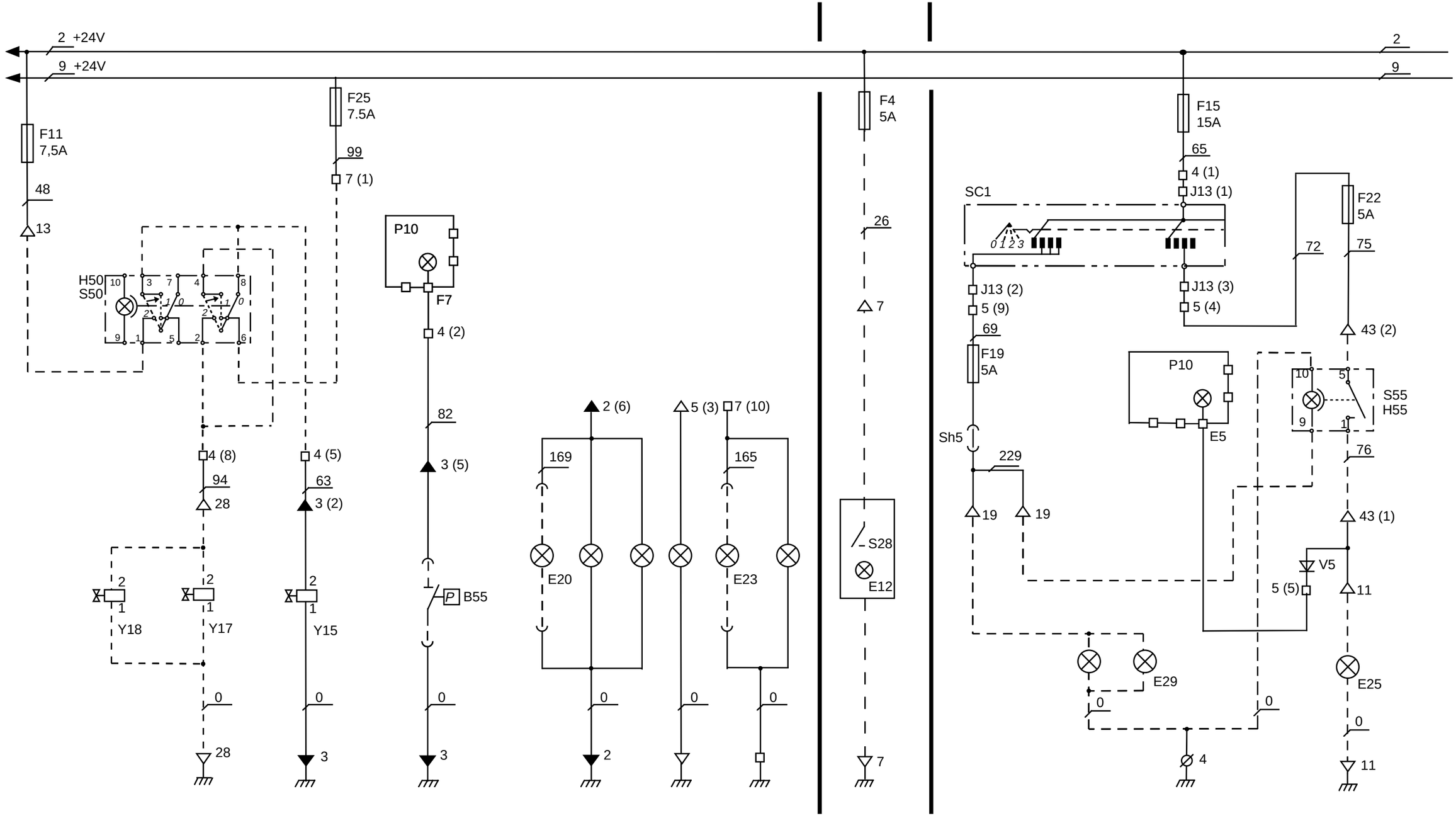
UPPERSTRUCTURE

E25 Rear fog light
E29 Registration plate lighting

□ △ ▼ ▽ **Ø4**: see page 4

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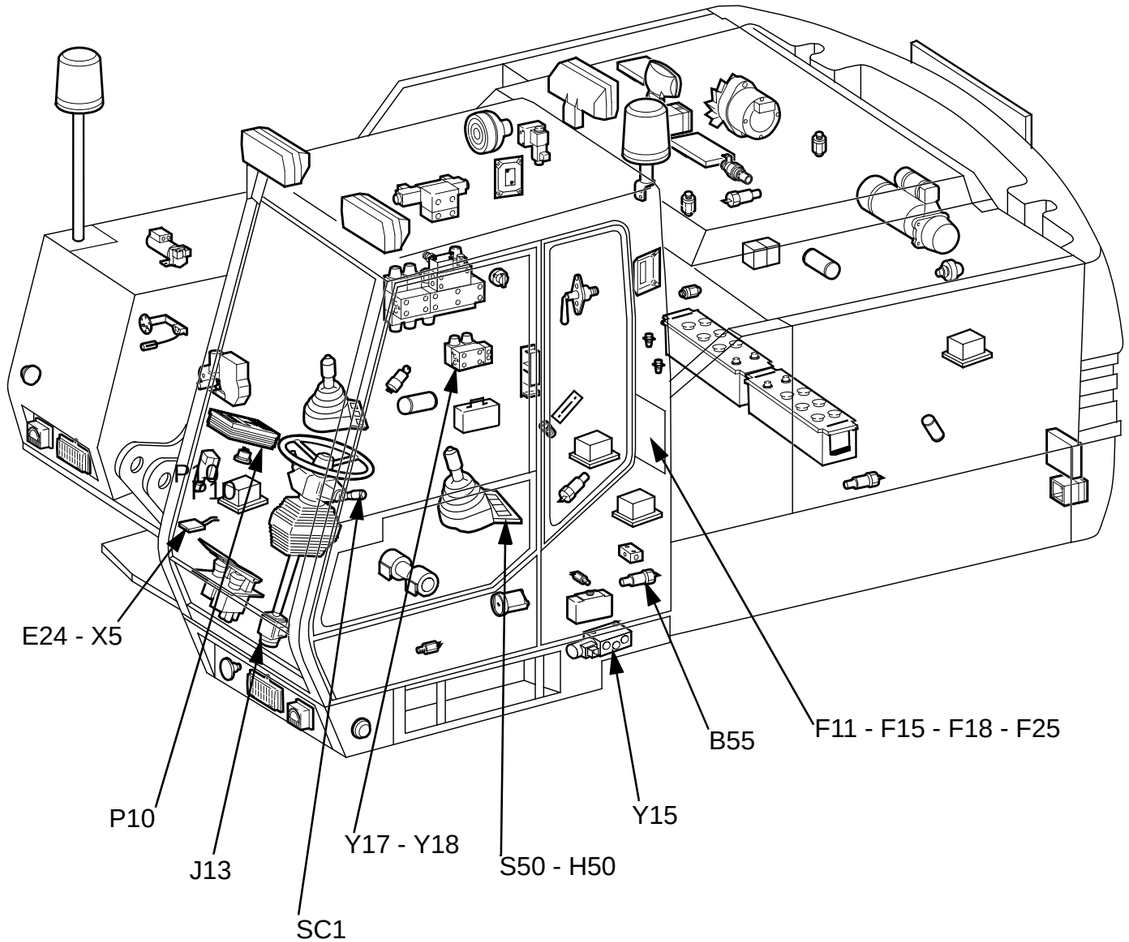
WORKING BRAKE - SWITZERLAND | PARKING BRAKE | STEERING BRAKE PRESSURE | FRONT RIGHT-HAND DIRECTION INDICATOR LIGHT - SWITZERLAND | FRONT LEFT-HAND DIRECTION INDICATOR LIGHT - SWITZERLAND | ENGINE COMPARTMENT LIGHTING - NORTHERN EUROPE | REGISTRATION PLATE LIGHTING - BELGIUM | REAR FOG LIGHT INDICATOR LAMP - BELGIUM | FOG LIGHT - BELGIUM



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ELECTRICAL SCHEMATIC (PLATE 12)



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Supplement for Germany

ELECTRICAL CABINET

F11 Fuse, 7.5 A, cigarette lighter/brake (Germany)
F15 Fuse, 15 A, combination switch
F18 Fuse, 5 A, dipper lighting
F25 Fuse, 7.5 A, working brake/parking brake

CAB

H50 Working brake and parking brake switch lighting
P10 Instrument panel (See page 19)
SC1 Direction indicator (commodo), main beam and dip switch, side lights and headlight flasher switch
S50 Parking brake and working brake switch

□ △ ▼ ▽ **Ø4**: see page 4

FLOOR

B55 Steering brake pressure switch
J13 Steering column connectors

UPPERSTRUCTURE

E24 Dipper lighting
X5(A), X5(B) Dipper lighting connector
Y15 Parking brake solenoid valve
Y17 Working brake solenoid valve (Germany)
Y18 Working brake solenoid valve (Germany)

Supplement for Austria

CAB

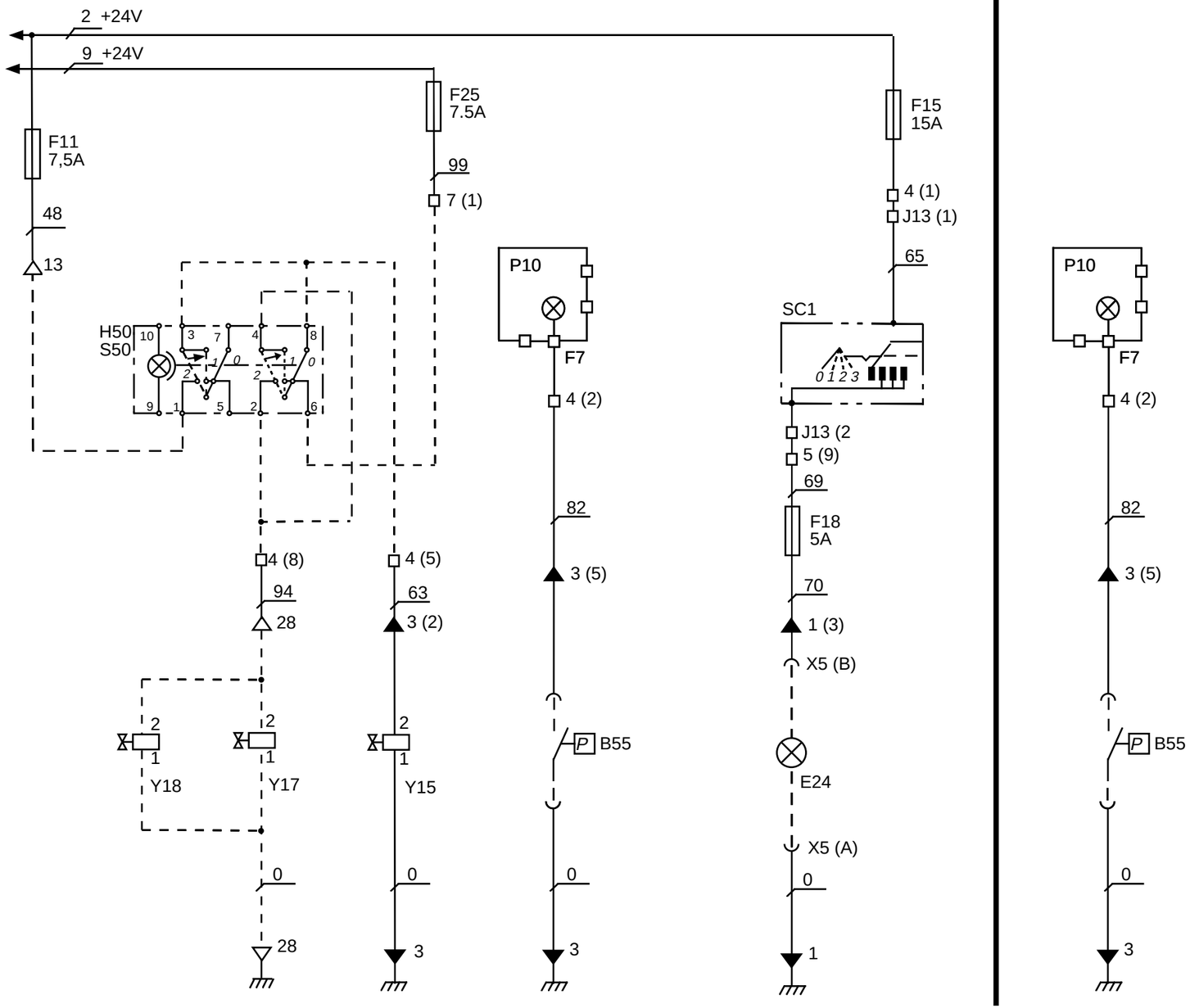
P10 Instrument panel (See page 19)

FLOOR

B55 Steering brake pressure switch

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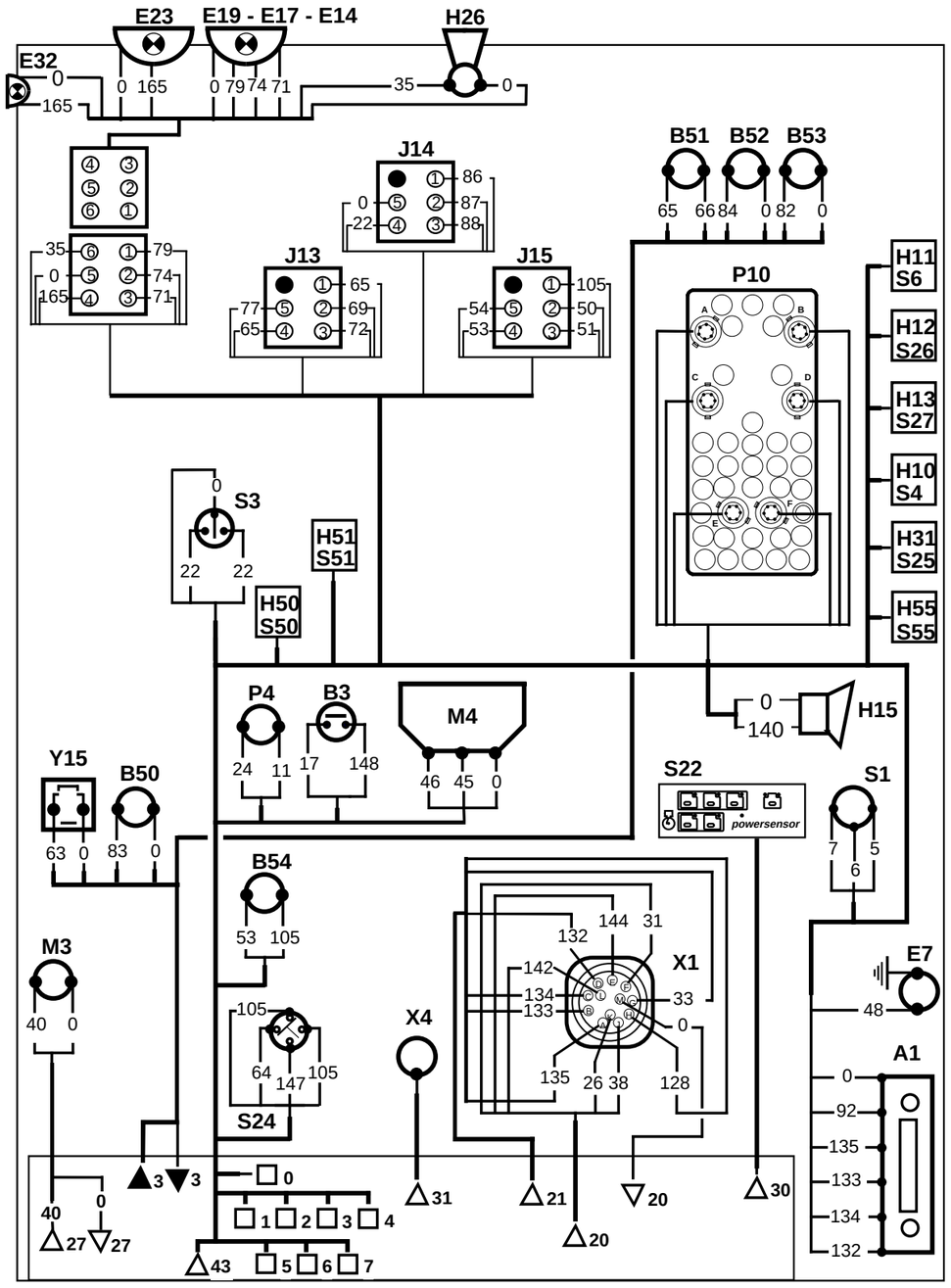
WORKING BRAKE - GERMANY | PARKING BRAKE | STEERING BRAKE PRESSURE | DIPPER LIGHTING - GERMANY | STEERING BRAKE PRESSURE - AUSTRIA



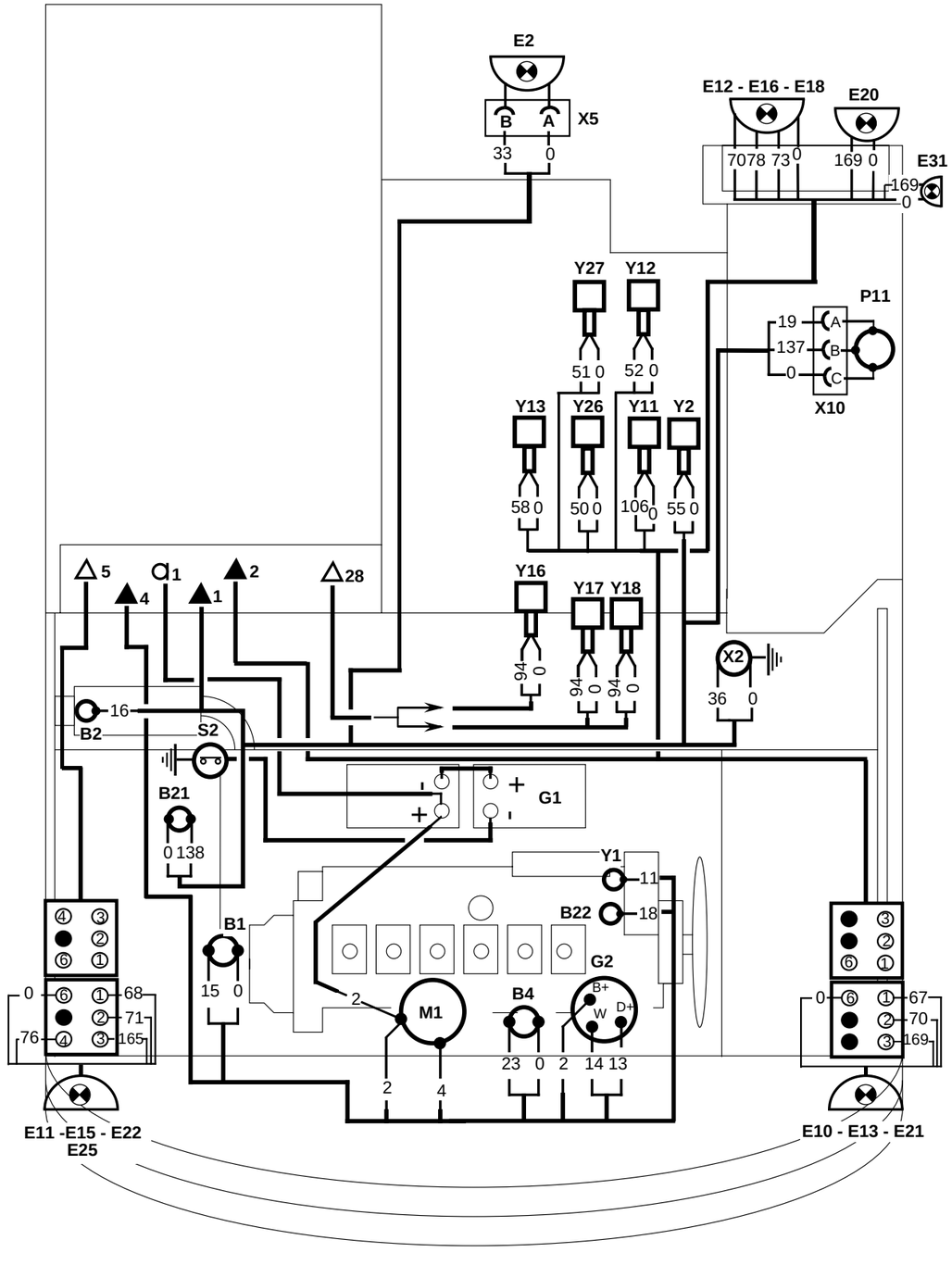
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CAB FLOOR WIRING (STANDARD)



ENGINE MODULE AND UPPERSTRUCTURE WIRING (STANDARD)



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CAB FLOOR WIRING (STANDARD)

▲ 3,▼ 3,△ 20,▽ 20,△ 21,▽ 27,△ 31,△ 30,

☐ 1,☐ 2,☐ 3,☐ 4,☐ 5,☐ 6,☐ 7,☐ 0,△ 43

FLOOR

A1 Radio (optional)
B3 Pilot pressure pressostat
B50 Parking brake pressure switch
B51 Stop light pressure switch
B52 Braking minimum pressure switch
B53 Steering pressure switch
B54 Front axle unlocking pressure switch
E7 Cigarette lighter
E14 Front LH side light
E17 Front LH dipped headlight
E19 LH main beam headlight
E23 LH front direction indicator
E32 LH side-mounted direction indicator
H10 Working light switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lighting
H13 Heater blower switch lighting
H15 Instrument panel audible warning
H26 Horn
H31 Rotary switch lighting
H50 Working brake and parking brake switch lighting
H51 Hazard warning switch lighting
H55 Rear fog light switch lighting
J13 Steering column connector (commodo)
J14 Steering column connector (commodo)
J15 Steering column connector (commodo)
M3 Windshield washer motor
M4 Heater blower motor
P4 Hourmeter
P10 Instrument panel
S1 Key switch
S3 Horn switch
S4 Working light switch
S6 Windshield wiper switch
S22 Control panel (see Section 4002)
S24 Pilot safety switch
S25 Rotary light switch (optional)
S26 Windshield washer switch
S27 Heater blower switch
S50 Parking brake and working brake switch
S51 Hazard warning switch
S55 Rear working lights switch
X1 Cab floor/cab power connector
X4 Troubleshooting socket
Y15 Parking brake solenoid valve

ENGINE MODULE AND UPPERSTRUCTURE WIRING (STANDARD EQUIPMENT)

❍ 1 24 volt supply before contact

▲ 1,▲ 2,▲ 4,△ 5 and △ 28

UPPERSTRUCTURE

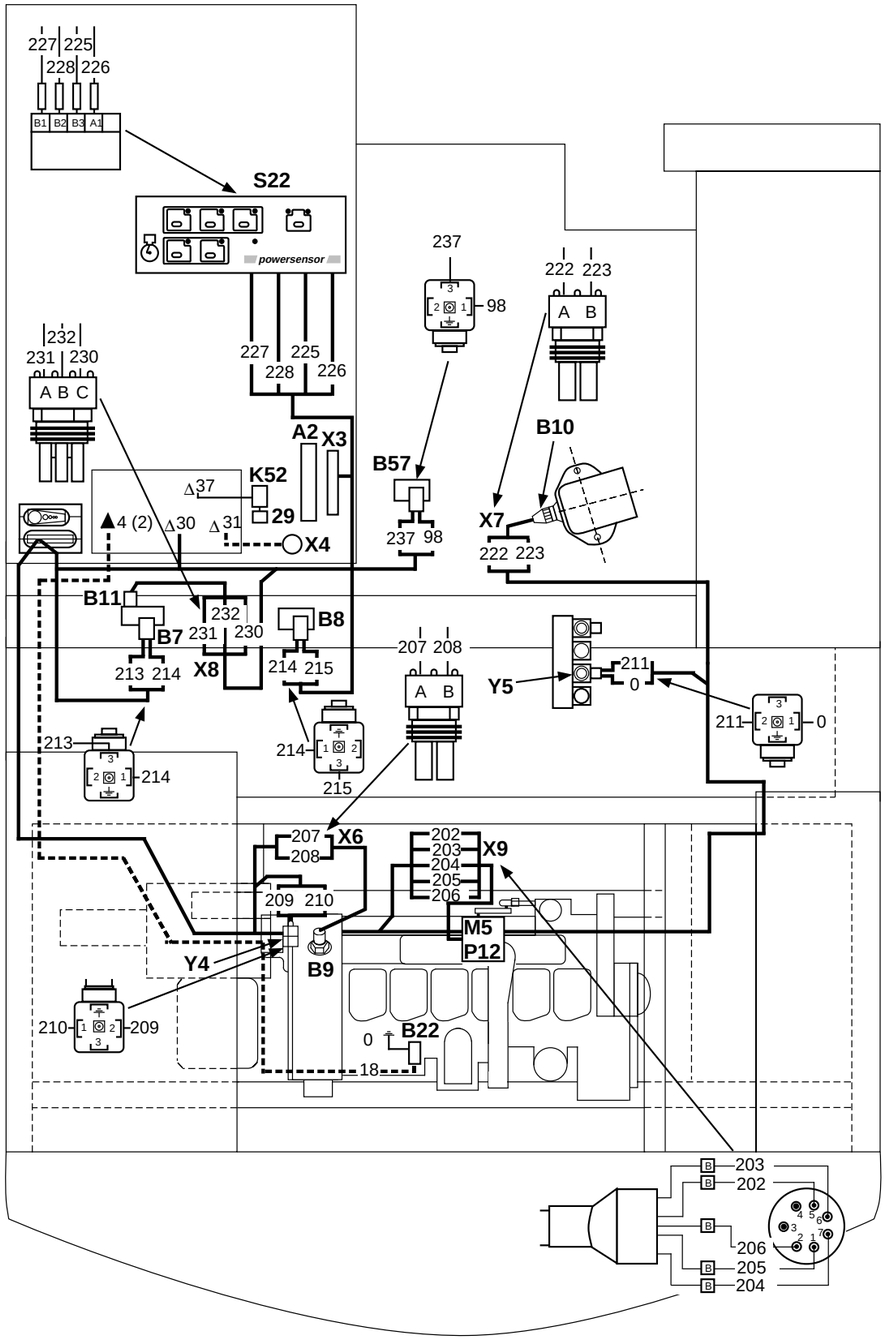
B1 Air filter restriction pressostat
B2 Hydraulic oil filter pressostat
B21 Hydraulic oil temperature sender
E2 Attachment working light on boom
E10 RH rear stop light
E11 LH rear stop light
E12 Front RH side light
E13 Rear RH side light
E15 Rear LH side light
E16 Front RH dipped headlight
E18 RH main beam headlight
E20 RH front direction indicator
E21 RH rear direction indicator
E22 LH rear direction indicator
E25 Rear fog light
E31 RH side-mounted direction indicator
G1 Batteries
P11 Fuel level indicator
S2 Battery master switch
X2 Upperstructure power connection
X5 Attachment working light power connection
X10 Fuel level indicator connector
Y2 Pilot safety solenoid valve
Y11 Gear box solenoid valve (first speed)
Y12 Gear box solenoid valve (second speed)
Y13 Front axle unlocking solenoid valve
Y16 Working brake solenoid valve (Standard)
Y17-Y18 Working brake solenoid valves (specific to certain countries)
Y26-Y27 Stabilizer raising and lowering solenoid valves

ENGINE

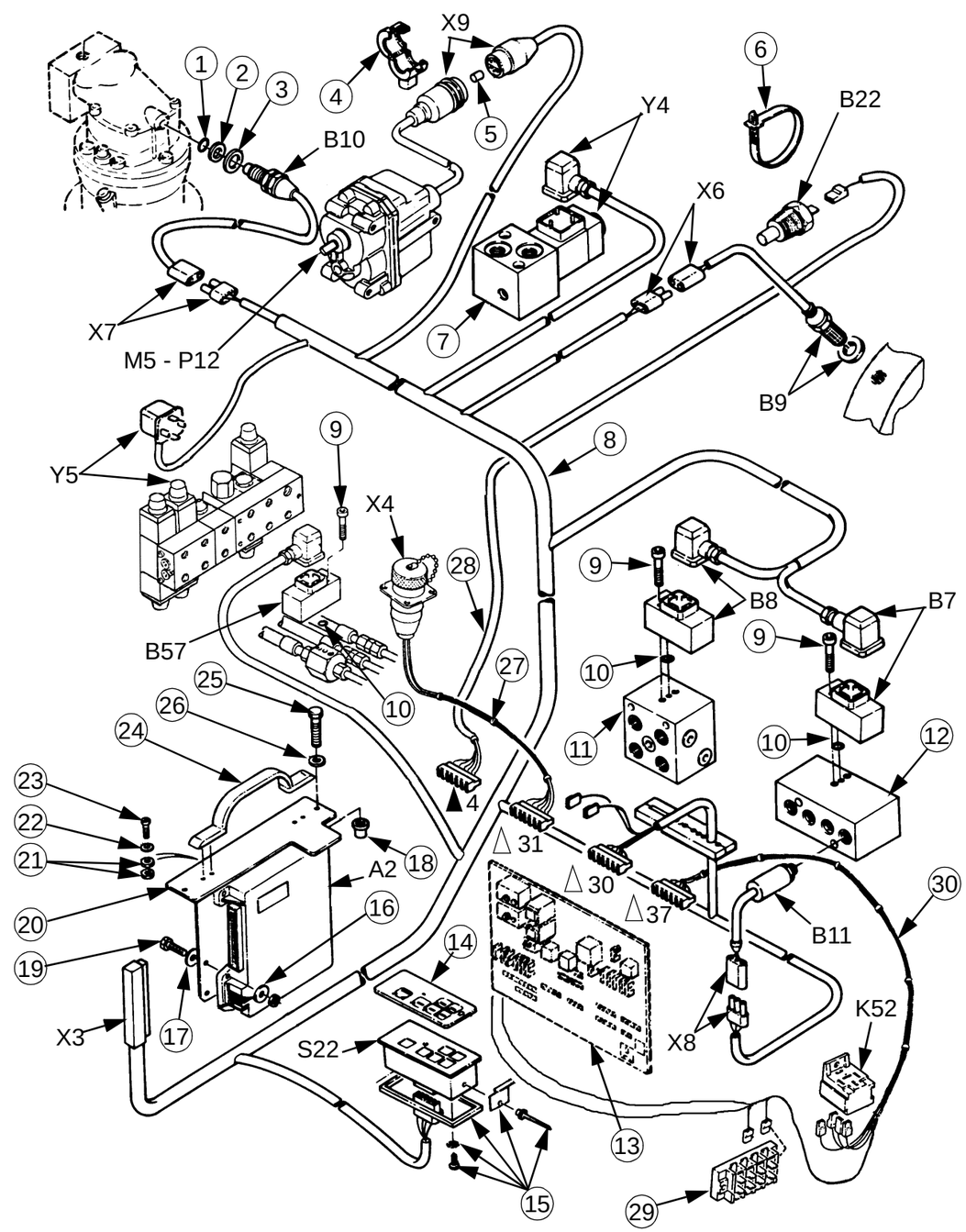
B4 Engine oil pressure pressostat
B22 Engine coolant temperature sender
G2 Alternator
M1 Starter motor
Y1 Engine stop solenoid valve

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ELECTRONIC SYSTEM WIRING



CM97G058



CS97G033

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ELECTRONIC SYSTEM WIRING

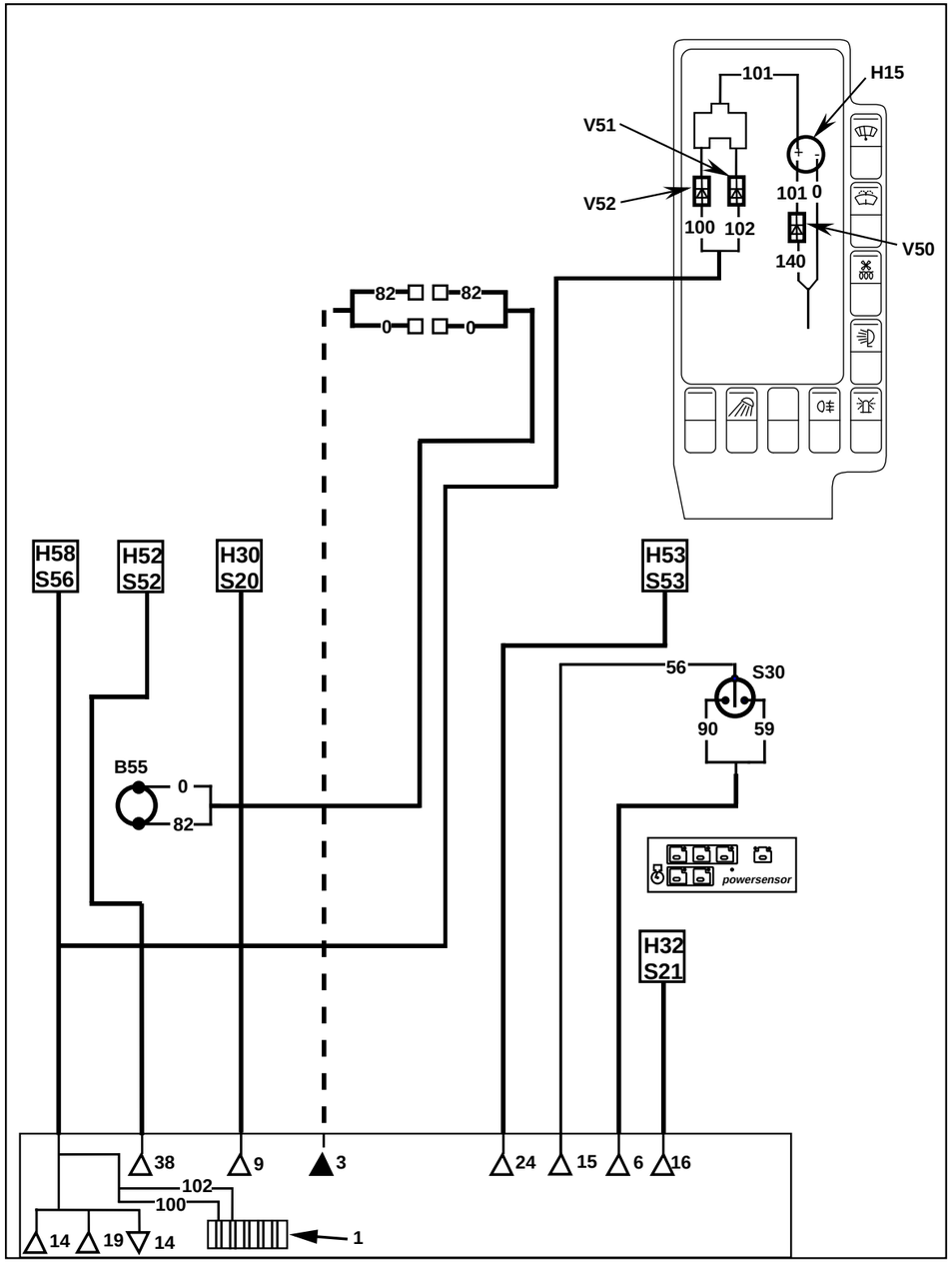
A2 Electronic control box
B7 Swing detector pressure switch
B8 Travel detector pressure switch
B9 Engine speed detector
B10 Swing motor speed detector
B11 Hydraulic pressure sender
B22 Engine coolant temperature sender
B57 Brake pressure switch
K52 Speed change relay
M5 Injection pump servo-motor
P12 Servo-motor potentiometer
S22 Control panel
X3 35 -way connector
X4 Troubleshooting socket
X6 Engine speed detector connector
X7 Upperstructure swing speed detector connector
X8 Hydraulic pressure sender connector
X9 Injection pump servo-motor connector
Y4 DRE 4 proportional pressure reduction valve
Y5 Upperstructure brake release control solenoid valve

△**30** Harness, 6-way connector, electronic control box
△**31** Harness, 3-way connector, troubleshooting test socket
▲4 Harness, 8-way connector, engine
△**37** Harness, 5-way connector, speed change

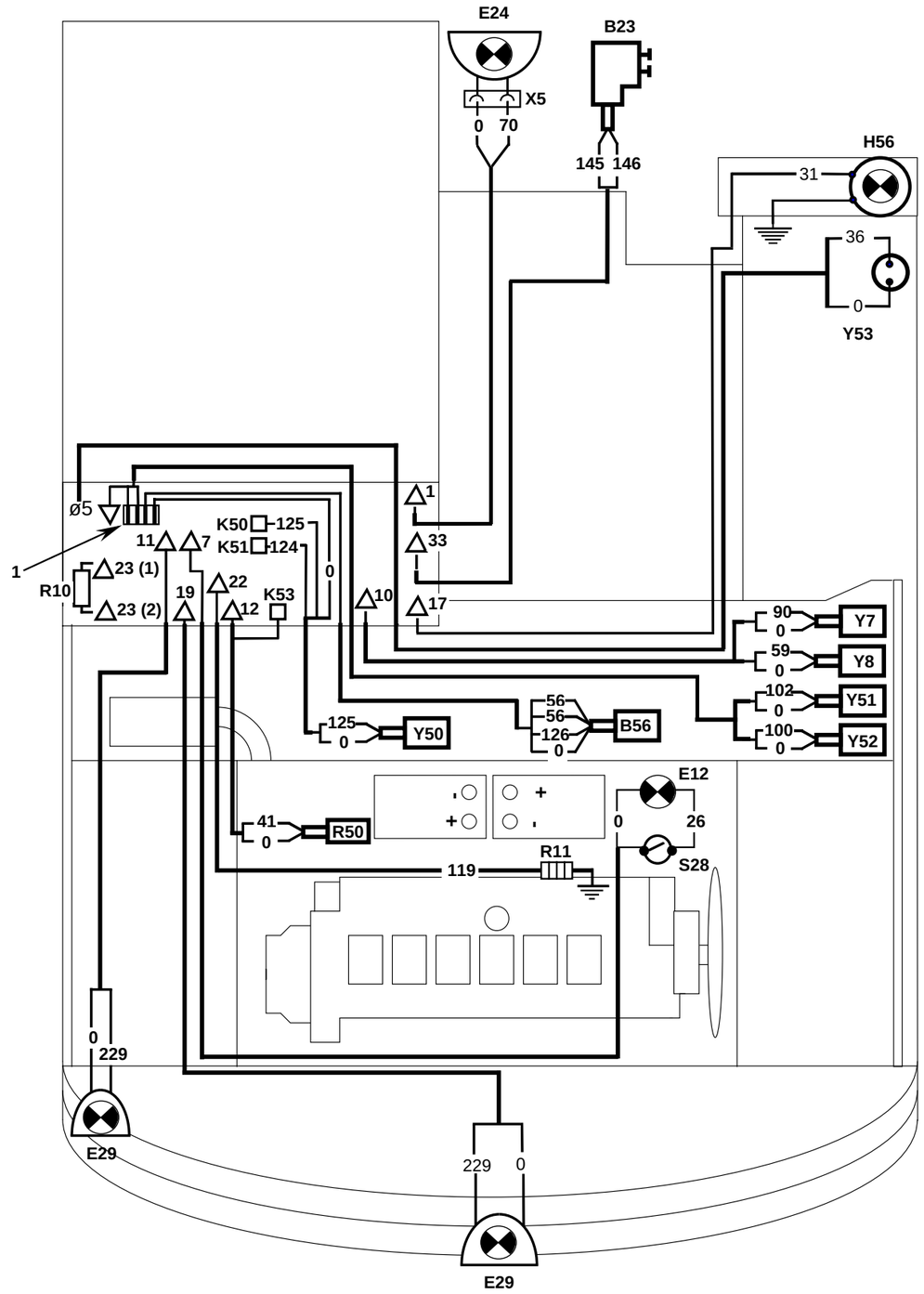
1 O-ring
2 Ring
3 Washer
4 Lock
5 Plug
6 Clamp
7 Pressure reduction valve
8 Electronic harness
9 Screw
10 O-ring
11 Travel block
12 Swing block
13 Printed circuit card
14 Decal
15 Control panel fixing hardware
16 Nut
17 Washer
18 Rivet
19 Screw
20 Bracket
21 Nuts
22 Washer
23 Screw
24 Handle
25 Screw
26 Washer
27 Troubleshooting socket harness
28 Engine harness
29 Strip
30 Harness, speed change

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CAB FLOOR WIRING (OPTIONAL)



ENGINE MODULE AND UPPERSTRUCTURE WIRING (OPTIONAL)



CM97G060

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CAB FLOOR WIRING (OPTIONAL)

ELECTRICAL CABINET

1 Connecting strip

▲ **3,** △ **6,** △ **9,** △ **14,** ▽ **14,** △ **15,** △ **16,** △ **19,** △ **24 and** △ **38**

INSTRUMENT PANEL

B55 Steering brake pressure switch
H30 Cold start assistance switch lighting
H32 Overload indicator switch lighting
H52 Pilot system cancellation switch lighting
H53 Front working light switch lighting
H58 Quick coupler switch lighting
S20 Cold start assistance switch
S21 Overload indicator switch
S30 Adjustable or articulated boom switch
S52 Pilot system cancellation switch
S53 Front working lights switch
S56 Quick coupler switch
V50 Quick coupler diode
V51 Quick coupler diode
V52 Quick coupler diode
H15 Audible warning

ENGINE MODULE AND UPPERSTRUCTURE WIRING (OPTIONAL)

ELECTRICAL CABINET

1 Connecting strip

▲ **1,** ▲ **4,** △ **6,** △ **10,** △ **11,** △ **12,** △ **19,** △ **22** △ **23 (1) (2) ,** △ **33,** △ **17,** △ **7,** ∅ **5**

UPPERSTRUCTURE

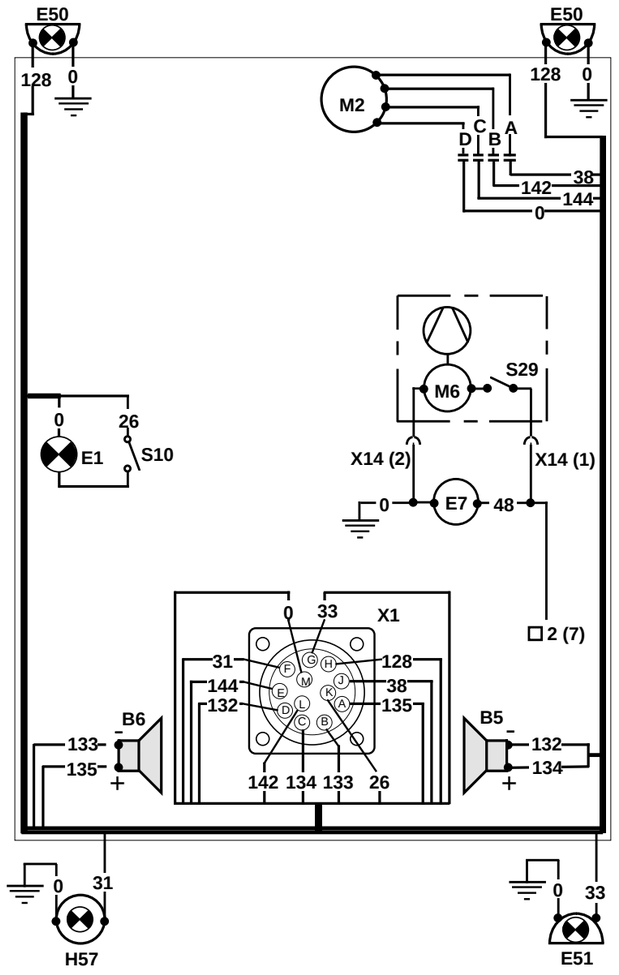
B23 Overload indicator
B56 Boom raising range limitation detector
E24 Dipper lighting
E29 Registration plate lighting
Belgium : left-hand rear centre lighting
Italy : left-hand rear lighting
H56 Upperstructure rotary light (Italy)
K50 Adjustable boom raising range limitation relay
K51 Adjustable boom lowering range limitation relay
K53 Fuel heater relay
R50 Fuel heating device
Y7 Adjustable or articulated boom extending electro-valve
Y8 Adjustable or articulated boom retracting electro-valve
Y50 Adjustable boom raising range limitation solenoid valve
Y51 Quick coupler solenoid valve
Y52 Quick coupler solenoid valve
Y53 Fuel filler pump
X5 Steering column connector

ENGINE

E12 Engine compartment light
R10 Cold start assistance resistor
R11 Cold start assistance glow plug
S28 Engine compartment working light switch

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CAB AND CAB OPTION WIRING



CM97G061

A White wire
B Grey wire
C Blue wire
D Black wire
B5 Right-hand loudspeaker (optional)
B6 Left-hand loudspeaker (optional)
E1 Cab lighting
E7 Cigarette lighter (See Wiring, page 38)
E50 Front working lights (optional)
E51 Rear working light
H57 Standard cab or Italy (option)
M2 Windshield wiper motor
M6 Cab blower motor (optional)
S10 Cab lighting switch
S29 Cab blower switch (optional)

X1 (A) (B) (C) (D) Cab floor/cab LH and RH loud-speaker connector (optional)
X1 (H) (G) Cab floor/cab front and rear working lights connector (optional)
X1 (E) (J) (M) (L) Cab floor/cab windshield wiper motor connector
X1 (F) Cab floor/cab rotary light connector (specific to certain countries)
X1 (K) Cab floor/cab operator's compartment lighting.
X14 (1) (2) Cab blower plug (optional)
□ **2 (7)** Connector 10 way (see printed circuit wiring page 5)

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Section

4001

ELECTRICAL SCHEMATICS

Wheeled excavators

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SPECIFICATIONS

Circuit voltage	24 volt negative earth and 12 volt negative earth
Batteries	2 x 12 Volt 120 A/hrs, low maintenance
Alternator	Bosch, 28 volt, 45 amps
Starter motor	Bosch, 24 volt, 4.0 kW

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SCHEMATIC SYMBOLS

A (n) Radio/housings
B (n) Indicators/pressure switches/loud-speakers/detectors/thermal detector/gauge
E (n) Lighting components
F (n) Fuses
G (n) Electrical supply generators
H (n) Warning devices (lighted and audible)
K (n) Relays
M (n) Motors
P (n) Instruments
R (n) Resistors/heating elements/heating plugs
S (n) Shunt resistors/switches/rotating switches/main switch
Sh (n) Shunt
V (n) Diodes
X (n) Supply line connections
Y (n) Solenoid valves, solenoids

NOTE: *The (n) shows the component number.*
Example: K2 is relay N°2.

(n) Supply on printed circuit

(n) Battery terminal

(n) Printed circuit connection terminal

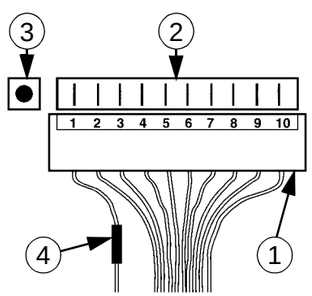
Printed circuit earth connector

A1 Instrument panel connector

1 or △ 1 or ▼ 1 Identification of harness

1(1) or △ 1(1) or ▼ 1(1) Identification of harness, followed by path identification number

(1) or ▼ (1) Printed circuit earth connectors



The installation position for the harness connector (1) on connector (2) of the printed circuit is identified by a red mark (3) followed by the figure 1 on the printed circuit. This identification corresponds to the position of path 1 of the harness connector (1). This position is completed when the path 1 line is shown by a red ring (4) located on line 1 wire, or by red paint marking.

Local earth

Wire number

NC Closed circuit

NO Open circuit

Intersection of two wires with connection point

Intersection of two wires without connection point

Link with following plate

Link with preceding plate

Return to another plate with the same letter

Bulbs

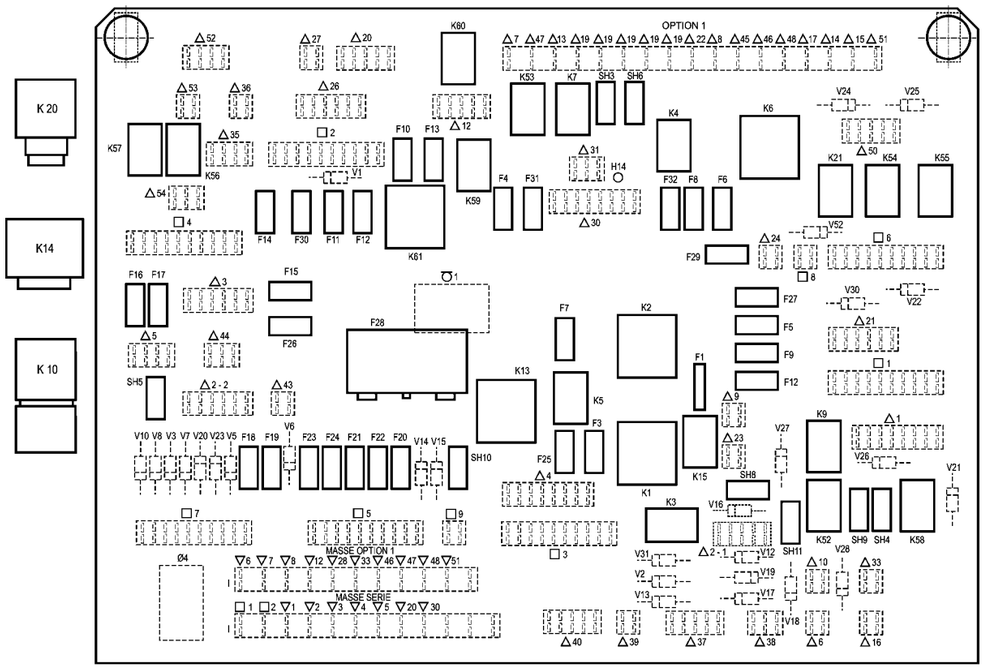
Test bulb

Light emitting diode (LED)

Regulator

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DESCRIPTION OF ELECTRICAL CABINET PRINTED CIRCUIT (STANDARD)



CI99J043

F1 Fuse, 30 A, starter motor solenoid, thermostart
F2 Fuse, 5 A, starter switch
F3 Fuse, 7.5 A, instrument panel, hourmeter
F4 Fuse, 5 A, cab lighting, horn (control), hood lighting
F5 Fuse, 10 A, working lights (control), rotary light (std), rotary light (Italy)
F6 Fuse, 15 A, attachment working light, rear cab light
F7 Fuse, 10 A, horn (power)
F8 Fuse, 15 A, upperstructure socket, fuel pump
F9 Fuse, 10 A, windshield washer, windshield wiper (BAT + R)
F10 Fuse, 10 A, heater
F11 Fuse, 7,5 A, cigarette-lighter, cab blower, batt.+ working brake for Germany
F12 Fuse, 10 A, two-speed electro, axle unlocking, piloting neutralisation (std - Italy), stabilizers, direction of travel control, overload indicator
F14 Fuse, 10 A, step-down transformer / radio
F15 Fuse, 15 A, general lighting
F16 Fuse, 5 A, RH rear brake light
F17 Fuse, 5 A, LH rear brake light
F18 Fuse, 5 A, RH front/rear sidelight, dipper lighting + cassette
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
F20 Fuse, 5 A, RH front dipped headlight
F21 Fuse, 5 A, LH front dipped headlight
F22 Fuse, 5 A, rear fog light
F23 Fuse, 5 A, RH main beam headlight
F24 Fuse, 5 A, LH main beam headlight
F25 Fuse, 7.5 A, parking brake electro, working brake electro (std/D/I)
F26 Fuse, 7.5 A, flasher, warning
F27 Fuse, 5 A, remote controlled or articulated boom, tool quick coupler, air suspension seat, speed threshold detector (788P heavy lift)
F28 Fuse, 40 A, engine stop/start solenoid (injection)
F30 Fuse, 10 A, windshield wiper (BAT +)
F32 Fuse, 5 A, (BAT +) electronics
H14 Troubleshooting test LED
K1 Starter motor relay
K2 Battery relay
K3 Hourmeter + transmission brake pressure switch + two-speed supply relay
K4 Electronic supply relay
K5 Horn relay
K6 Working light relay
K7 Relay authorizing working lights if sidelights on
K9 Pilot safety relay/axle unlocking
K10 Flasher unit relay
K13 Engine stop solenoid relay
K14 Speed change relay (588)
K20 Windshield wiper intermittent action
K21 Safety relay piloting pressure switch piloting
K52 Speed change relay (except 588)
K54 Frequency threshold detector relay (threshold: 1 = 1600 rpm)
K55 Frequency threshold detector relay (threshold: 2 = 1400 rpm)
K56 Reverse travel relay
K57 Forward travel relay
K58 Two-speed supply relay
K61 Battery relay (heater/air conditioner)
Sh4, Sh5, Sh9 Shunt

Sh6, Sh8, Sh10, Sh11 Not used
V1 Starter key switch diode
V2 Diode less engine running
V3 Dipped headlight indicator lamp diode on instrument panel
V6 Main beam headlight indicator lamp diode on instrument panel
V7 RH flashing indicator lamp diode on instrument panel
V8 LH flashing indicator lamp diode on instrument panel
V9 Warning indicator lamp diode on instrument panel
V10 LH flasher diode
V12 2nd speed indicator lamp diode on 588P
V13 1st speed indicator lamp diode on 588P
V14 Stab lowering diode
V15 Stab raising diode
V18 Axle unlocking indicator lamp diode on instrument panel
V20 RH flasher diode
V22 Rotary light diode on instrument panel
V23 Warning diode
V24 K54 relay diode
V25 K55 relay diode
V26 Axle unlocking diode
V30 Buzzer diode
V31 K58 relay diode

PRINTED CIRCUIT WIRING (STANDARD)

1 (1) 24 volt printed circuit supply
1 (2) 24 volt printed circuit supply

4 (1) Printed circuit earth
4 (2) Printed circuit earth

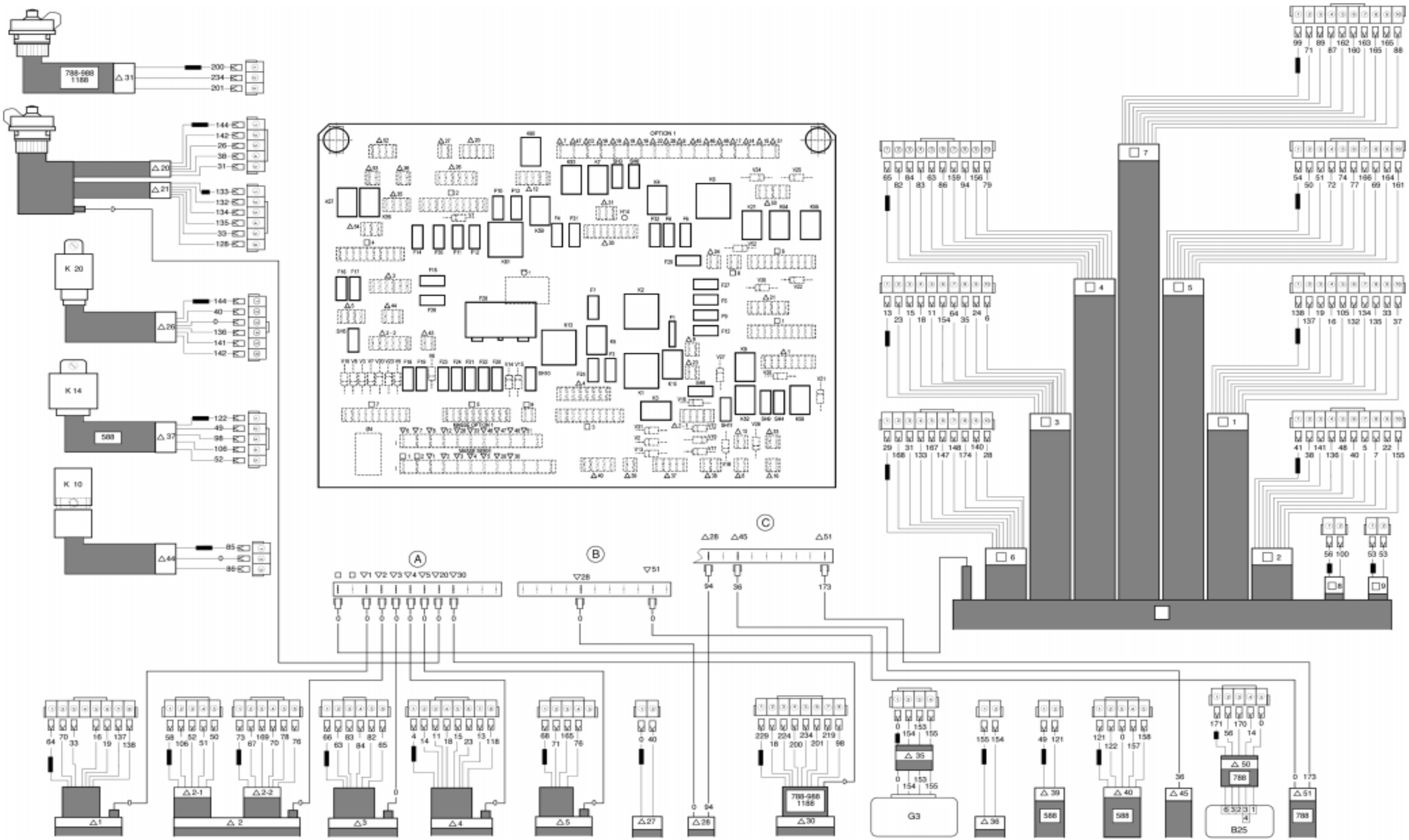
1 Floor harness, 10 way connector
2 Floor harness, 10 way connector
3 Floor harness, 10 way connector
4 Floor harness, 10 way connector
5 Floor harness, 10 way connector
6 Floor harness, 10 way connector
7 Floor harness, 10 way connector
8 Floor harness, 2 way connector
9 Floor harness, 2 way connector

1 Common harness, 8-way connector
2-1 Lighting / solenoid valve harness, 5-way connector
2-2 Lighting / solenoid valve harness, 6-way connector
3 Central brake harness, 6-way connector
4 Engine harness, 8-way connector
5 LH rear lighting harness, 4-way connector
20 Cab socket harness, 5-way connector
21 Cab socket harness, 6-way connector
26 Windshield wiper time delay harness, 6-way connector
27 Windshield washer, 2-way connector
28 Working brake solenoid valve harness, clip
30 Electronic harness, 8-way connector (788/988/1188)
31 Diagnostic plug harness, 3-way connector (788/988/1188)
35 Step-down transformer harness 24V - 12V, 4-way connector
36 12V socket harness, 2-way connector
37 Bi-stable relay harness on 588, 5-way connector
39 Brake pressure switch harness on 588, 2-way connector
40 Two-speed control box harness, 5-way connector (588)
44 Flasher unit harness, 3-way connector
45 Upperstructure socket harness
50 Threshold detector harness, 5-way connector (788)
51 Heavy lift solenoid valve harness (788), clip

1 Floor harness earth, clip
2 Floor harness earth, clip

1 Common harness earth, clip
2 Lighting / solenoid valve harness earth, clip
3 Brake unit earth harness, clip
4 Engine harness earth, clip
5 LH rear harness earth, clip
20 Cab socket harness, clip
28 Working brake solenoid valve harness, clip
30 Electronic harness earth, clip
51 Heavy lift solenoid valve harness, clip

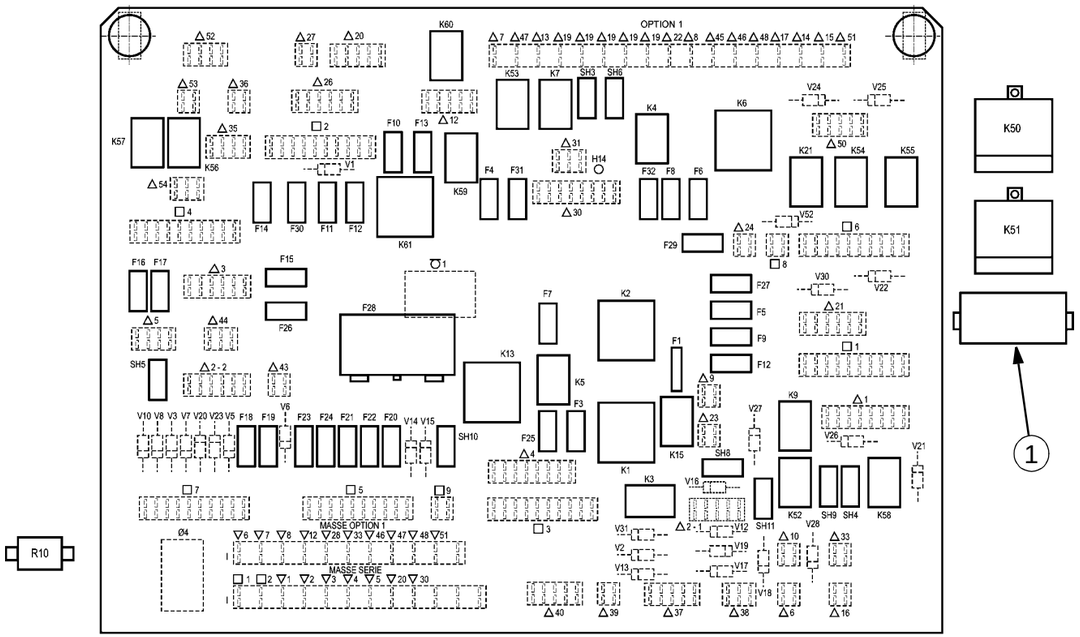
A Standard earth
B Optional earth
C option


OPTION 1
788-988
1188
△31
200
234
201
△20
△21
144
142
26
38
31
133
132
134
135
33
128
K 20
△26
144
40
138
141
142
K 14
588
△37
122
49
98
106
52
K 10
△44
85
86
A
B
C
▽1 ▽2 ▽3 ▽4 ▽5 ▽20 ▽30
▽28
▽51
△28
△45
△51
94
36
173
△1
△2
△2-1
△2-2
△3
△4
△5
△27
△28
788-988
1188
△30
△35
G3
△36
△39
588
△40
588
△45
△50
788
B25
△51
788
7
4
5
3
1
6
2
8
9

CM99J047

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DESCRIPTION OF ELECTRICAL CABINET PRINTED CIRCUIT (OPTIONAL)



CI99J044

F1 Fuse, 30 A, starter motor solenoid, thermostart
F4 Fuse, 5 A, cab lighting, horn (control), hood lighting
F5 Fuse, 10 A, working lights (control), rotary light (std), rotary light (Italy)
F6 Fuse, 15 A, attachment working light, rear cab light
F8 Fuse, 15 A, upperstructure socket, fuel pump
F11 Fuse, 7,5 A, cigarette-lighter, cab blower, batt.+ working brake for Germany
F12 Fuse, 10 A, two-speed electro, axle unlocking, piloting neutralisation (std - Italy), stabilizers, direction of travel control, overload indicator
F13 Fuse, 15 A, air conditioner
F18 Fuse, 5 A, RH front/rear sidelight, dipper lighting + cassette
F22 Fuse, 5 A, rear fog light
F27 Fuse, 5 A, remote controlled or articulated boom, tool quick coupler, air suspension seat, speed threshold detector (788P heavy lift)
F29 Fuse, 10 A, cab front working light
F31 Fuse, 10 A, fuel heater
K15 Thermostart relay
K50 Adjustable boom raising limiter relay (optional)
K51 Adjustable boom retracting limitation relay (optional)
K53 Fuel heater relay
K59 Air conditioning compressor relay
K60 Air conditioning condenser relay
R10 Resistor, 0.85 Ohms
V5 Fog light indicator lamp diode on instrument panel
V16, V17, V19 Diode for Italy
V21 Overload indicator lamp diode on instrument panel
V27 Axle electro unlocking diode for Italy
V28 Pilot system cancellation indicator lamp diode on instrument panel
V52 Quick coupler switch diode
Sh8, Sh9, Sh10, Sh11 Shunt
Sh3, Sh4, Sh5, Sh6 Not used

1 Connection strip

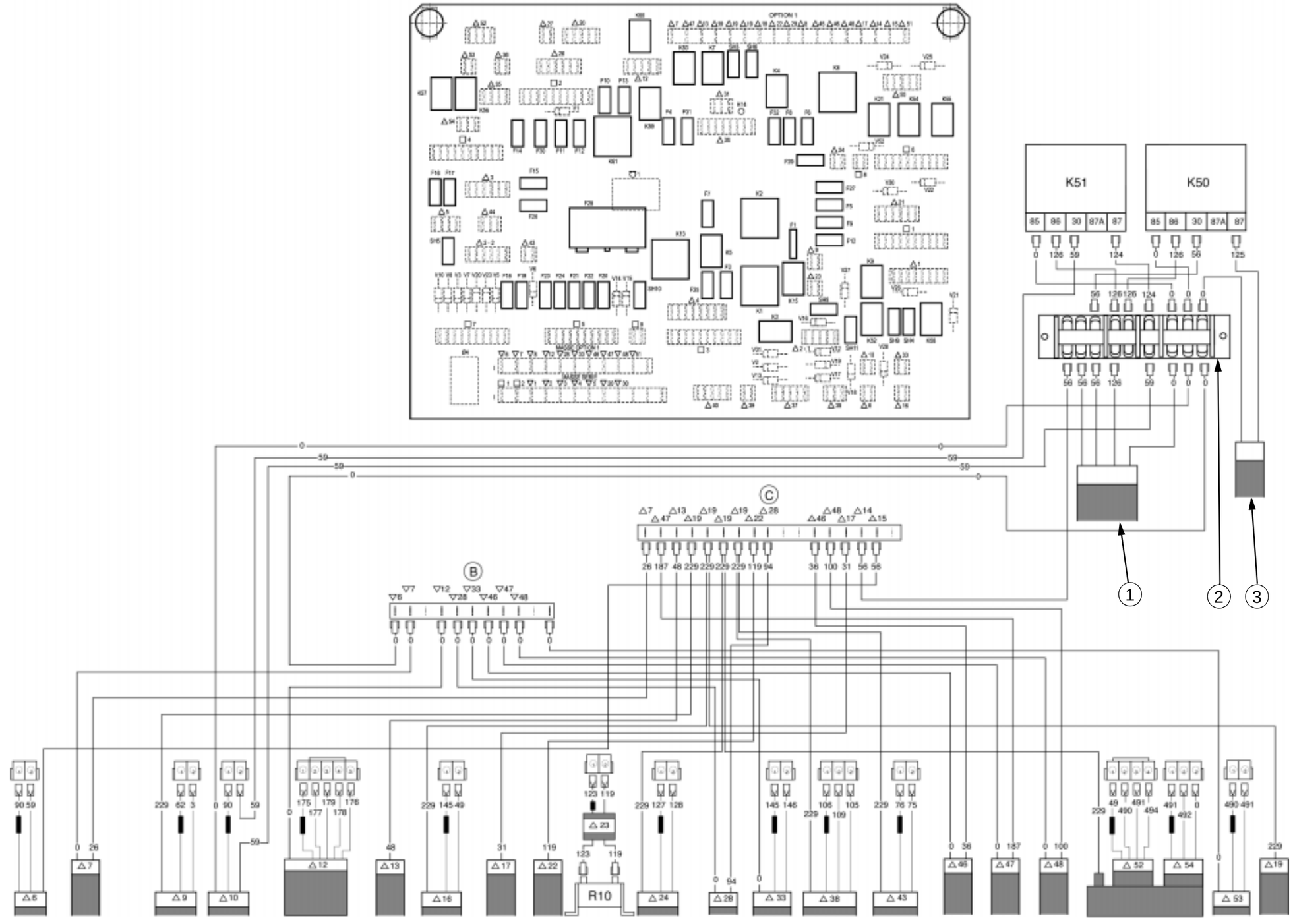
PRINTED CIRCUIT WIRING (OPTIONAL)

△ **6** Adjustable boom harness, 2-way connector
△ **7** Hood lighting harness, clip
△ **9** Cold start switch harness, 2-way connector
△ **10** Adjustable boom harness, 2-way connector
△ **12** Air conditioner harness, 5-way connector
△ **13** Working brake
14 Adjustable boom maximum reach limitation harness, clip
△ **16** Overload indicator switch harness, 2-way connector
△ **17** Upperstructure rotary light harness, clip
△ **19** Registration plate harness, clip
△ **19** Option switches lighting harness, clip
△ **22** Cold start plug harness, clip
△ **23** Thermostart element harness, 2-way connector
△ **24** Front cab light switch harness, 2-way connector
△ **28** Working brake solenoid valve harness
△ **33** Overload indicator pressure switch, 2-way connector
△ **38** Pilot system cancellation switch, Italy, 3-way connector
△ **43** Rear fog light switch harness, 2-way connector
△ **46** Fuel pump harness
△ **47** Fuel heater harness, clip
△ **48** Quick coupler solenoid valve harness, clip
△ **52** Direction of travel reverser switch harness, 4-way connector
△ **53** Direction of travel reverser relay harness, 2-way connector
△ **54** Direction of travel reverser indicator lamp, 3-way connector

▽ **6** Adjustable boom harness earth, clip
▽ **7** Hood lighting harness earth, clip
▽ **12** Air conditioning harness earth, clip
▽ **33** Overload indicator pressure switch harness earth, clip
▽ **47** Fuel heater harness earth, clip
▽ **48** Tool quick coupler harness earth, clip

1 Boom reach limitation solenoid valve cable
2 Connection strip
3 Boom reach limitation detector cable

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PRINTED CIRCUIT SCHEMATIC GUIDE

C1 (1) 24 V PCB supply
C1 (2) 24 V PCB supply

F1 Fuse, 30 A, starter motor solenoid, thermostart
F2 Fuse, 5 A, starter switch
F3 Fuse, 7.5 A, instrument panel, hourmeter
F4 Fuse, 5 A, cab lighting, horn (control), hood lighting
F5 Fuse, 10 A, working lights (control), rotary light (std), rotary light (Italy)
F6 Fuse, 15 A, attachment working light, rear cab light
F7 Fuse, 10 A, horn (power)
F8 Fuse, 15 A, upperstructure socket, fuel pump
F9 Fuse, 10 A, windshield washer, windshield wiper (BAT + R)
F10 Fuse, 10 A, heater
F11 Fuse, 7,5 A, cigarette-lighter, cab blower, batt.+ working brake for Germany
F12 Fuse, 10 A, two-speed electro, axle unlocking, piloting neutralisation (std - Italy), stabilizers, direction of travel control, overload indicator
F13 Fuse, 15 A, air conditioner
F14 Fuse, 10 A, step-down transformer / radio
F15 Fuse, 15 A, general lighting
F16 Fuse, 5 A, RH rear brake light
F17 Fuse, 5 A, LH rear brake light
F18 Fuse, 5 A, RH front/rear sidelight, dipper lighting + cassette
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
F20 Fuse, 5 A, RH front dipped headlight
F21 Fuse, 5 A, LH front dipped headlight
F22 Fuse, 5 A, rear fog light
F23 Fuse, 5 A, RH main beam headlight
F24 Fuse, 5 A, LH main beam headlight
F25 Fuse, 7.5 A, parking brake electro, working brake electro (std/D/I)
F26 Fuse, 7.5 A, flasher, warning
F27 Fuse, 5 A, remote controlled or articulated boom, tool quick coupler, air suspension seat, speed threshold detector (788P heavy lift)
F28 Fuse, 40 A, engine stop/start solenoid (injection)
F29 Fuse, 10 A, cab front working light
F30 Fuse, 10 A, windshield wiper (BAT +)
F31 Fuse, 10 A, fuel heater
F32 Fuse, 5 A, (BAT +) electronics

H14 Troubleshooting test LED

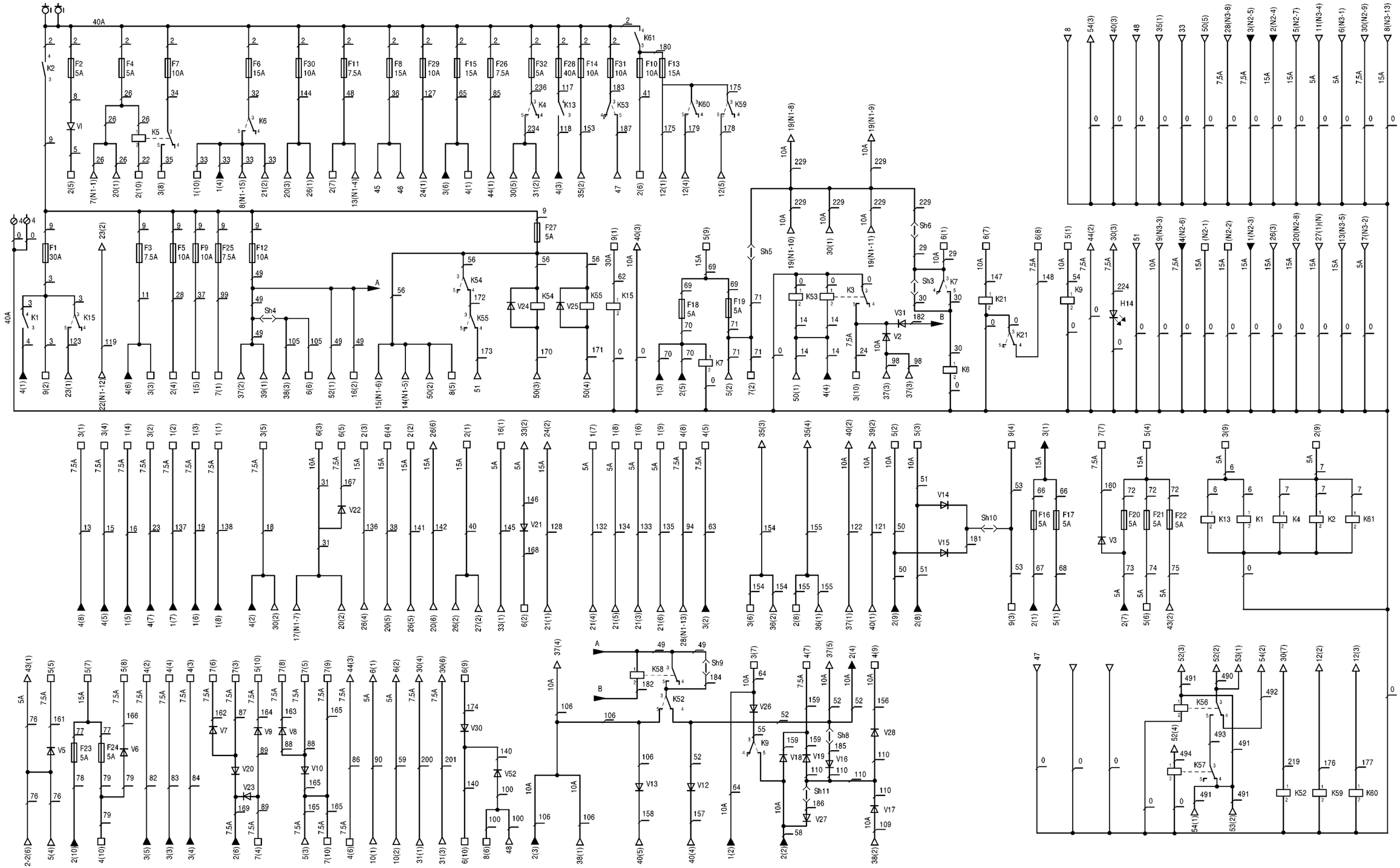
K1 Starter motor relay
K2 Battery relay
K3 Hourmeter + transmission brake pressure switch + two-speed supply relay
K4 Electronic supply relay
K5 Horn relay
K6 Working light relay
K7 Relay authorizing working lights if sidelights on
K9 Pilot safety relay/axle unlocking
K13 Engine stop solenoid relay
K15 Thermostart relay
K21 Safety relay piloting pressure switch piloting
K52 Speed change relay (except 588)
K53 Fuel heater relay
K54 Frequency threshold detector relay (threshold: 1 = 1600 rpm)
K55 Frequency threshold detector relay (threshold: 2 = 1400 rpm)
K56 Reverse travel relay
K57 Forward travel relay
K58 Two-speed supply relay
K59 Air conditioning compressor relay
K60 Air conditioning condenser relay
K61 Battery relay (heater/air conditioner)

Sh4 Shunt OK Standard - not Italy
Sh5 Shunt Night lighting (switch) + P excavator registration plate
Sh8 Shunt OK Italy - not standard
Sh9 Shunt contact K58 two-speed supply
Sh10 Shunt if dozer - stab independent
Sh11 Shunt - Italy axle unlocking

V1 Starter key switch diode
V2 Diode less engine running
V3 Dipped headlight indicator lamp diode on instrument panel
V5 Fog light indicator lamp diode on instrument panel
V6 Main beam headlight indicator lamp diode on instrument panel
V7 RH flashing indicator lamp diode on instrument panel
V8 LH flashing indicator lamp diode on instrument panel
V9 Warning indicator lamp diode on instrument panel
V10 LH flasher diode
V12 2nd speed indicator lamp diode on 588P
V13 1st speed indicator lamp diode on 588P
V14 Stab lowering diode
V15 Stab raising diode
V16 Diode for Italy
V17 Diode for Italy
V18 Axle unlocking indicator lamp diode on instrument panel
V19 Diode for Italy
V20 RH flasher diode
V21 Overload indicator lamp diode on instrument panel
V22 Rotary light diode on instrument panel
V23 Warning diode
V24 K54 relay diode
V25 K55 relay diode
V26 Axle unlocking diode
V27 Axle electro unlocking diode for Italy
V28 Pilot system cancellation indicator lamp diode on instrument panel
V30 Buzzer diode
V31 K58 relay diode
V52 Quick coupler switch diode

Ø 4 (1) printed circuit earth
Ø 4 (2) printed circuit earth

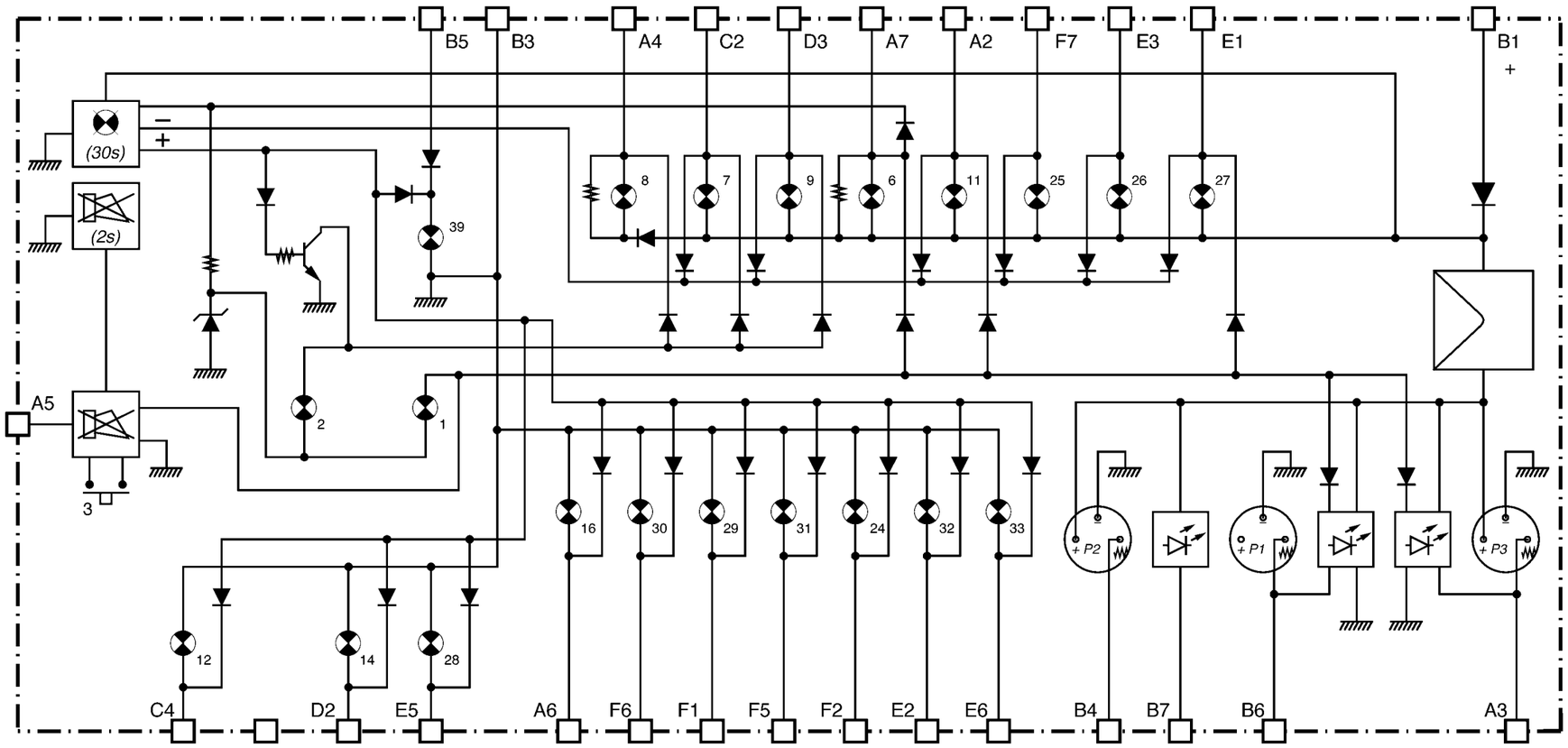
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P10 INSTRUMENT PANEL ELECTRICAL SCHEMATIC P. 10 (PLATE 1)



CM97G029

A2 Minimum pilot pressure red warning lamp connector
A3 Hydraulic oil temperature warning lamp connector
A4 Battery charge red warning lamp
A5 Red and orange warning lamp connector for audible warning device
A6 Orange warning lamp connector for front axle unlocking
A7 Engine oil pressure red warning lamp connector

B1 24 volt power supply
B3 Earth
B4 Fuel level warning lamp connector
B5 Gauge lighting connector
B6 Engine coolant solution temperature gauge connector
B7 Fuel minimum connector

C2 Air filter restriction red warning lamp connector
C4 Overload indicator orange warning lamp connector (optional)

D2 Pilot system cancellation green indicator lamp (special for certain countries)
D3 Hydraulic oil filter restriction red warning lamp connector

E1 Brake minimum pressure red warning lamp connector
E2 Hazard warning red indicator lamp connector
E3 Parking brake red warning lamp connector
E5 Rear fog light orange indicator lamp connector (special for certain countries)
E6 Right-hand direction indicator green indicator lamp connector

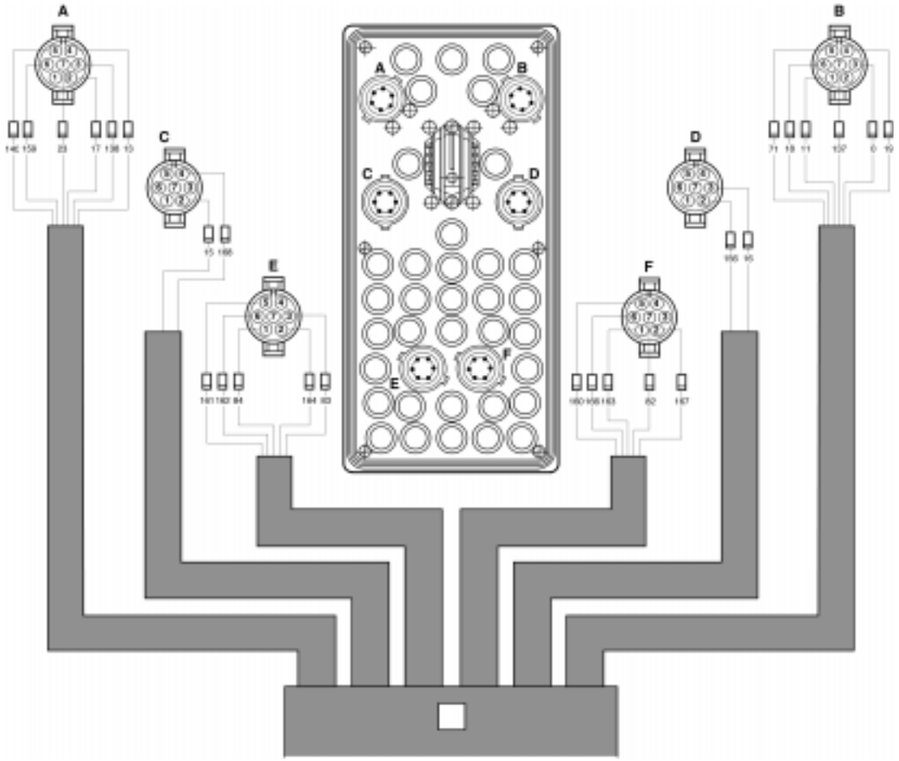
F1 Left-hand direction indicator green indicator lamp connector
F2 Rotary light orange indicator lamp connector (special for certain countries)
F5 Dipped headlight green indicator lamp connector
F6 Main beam headlight blue connector
F7 Steering minimum pressure red warning lamp connector

P1 Engine coolant solution temperature indicator
P2 Fuel level gauge
P3 Hydraulic oil temperature indicator

1 Stop alarm red warning lamp
2 Orange alarm warning lamp
3 Audible warning device stop push-button
6 Engine oil pressure red warning lamp
7 Air filter restriction red warning lamp
8 Battery charge red warning lamp
9 Hydraulic oil filter restriction red warning lamp
11 Minimum pilot pressure red warning lamp
12 Overload indicator orange warning lamp (option)
14 Pilot system cancellation green indicator lamp (special for certain countries)
16 Front axle unlocking orange warning lamp
24 Rotary light orange indicator lamp (special for certain countries)
25 Minimum steering pressure red warning lap
26 Parking brake and working brake red warning lamp
27 Minimum braking pressure red warning lamp
28 Rear fog light orange indicator lamp (special for certain countries)
29 Left-hand direction indicator green indicator lamp
30 Main beam headlight blue indicator lamp
31 Dipped headlight green indicator lamp
32 Hazard warning light red warning lamp
33 Right-hand direction indicator green indicator lamp
39 Gauge lighting indicator lamp

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INSTRUMENT PANEL WIRING



CM97G031

A 7 way connector: minimum pilot pressure red warning lamp, hydraulic oil temperature indicator, battery charge red warning lamp, audible warning stop push button, front axle unlocking orange indicator lamp, engine oil pressure red warning lamp, alarm orange warning lamp, stop alarm red warning lamp.

B 7 way connector: 24 Volts supply, earth, fuel level gauge, gauge lighting, engine coolant temperature indicator.

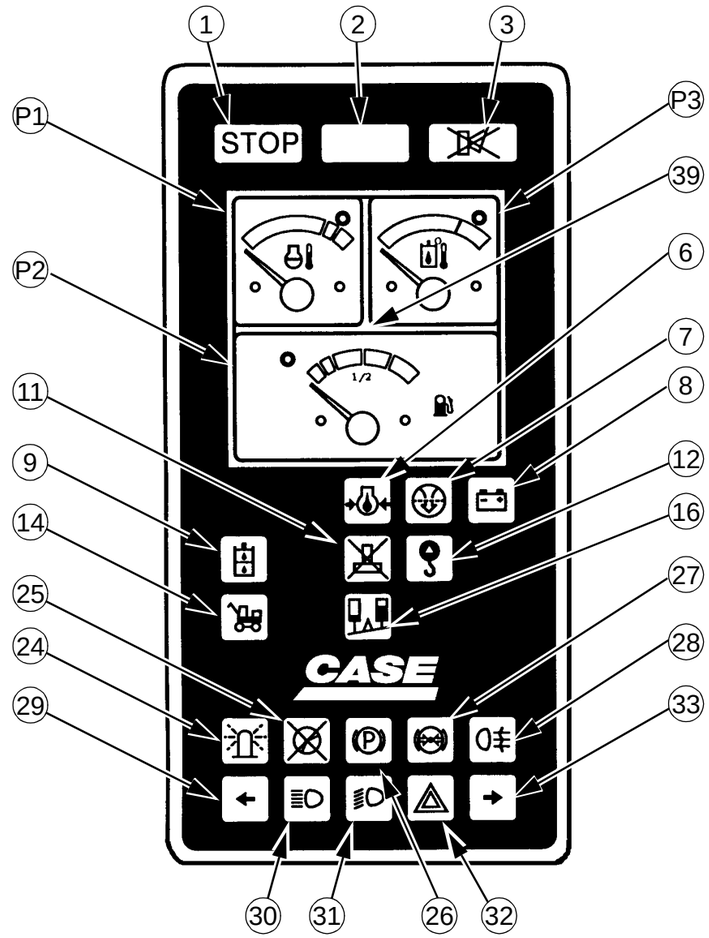
C 7 way connector: air filter restriction red warning lamp, overload indicator orange indicator lamp (optional).

D 7 way connector: pilot system cancellation green indicator lamp (specific to certain countries), hydraulic oil filter restriction red warning lamp.

E 7 way connector: minimum braking pressure red warning lamp, hazard warning red warning lamp, parking brake red warning lamp, rear fog light orange indicator lamp (specific to certain countries), RH direction indicators green indicator lamp.

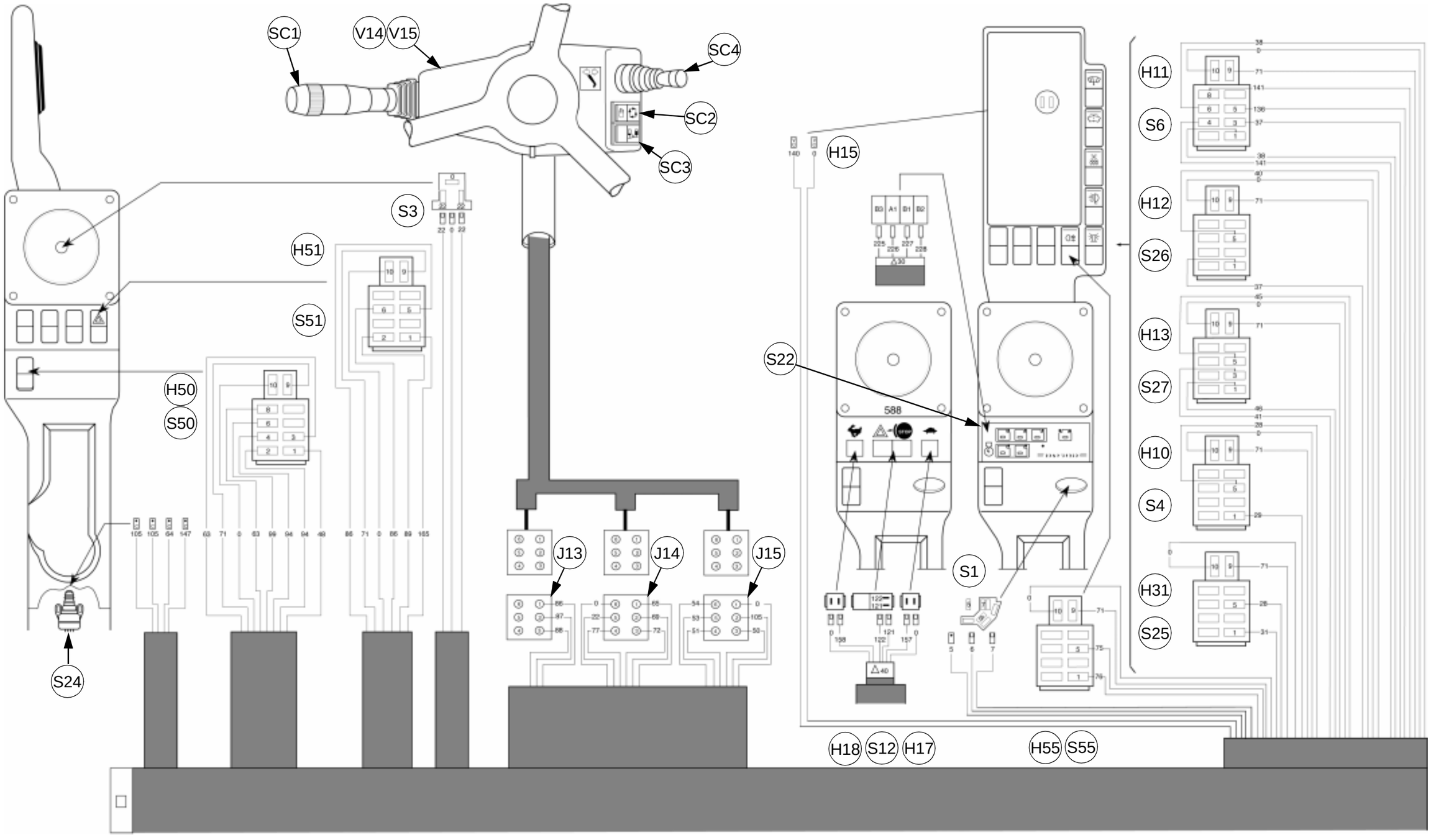
F 7 way connector: LH direction indicator green indicator lamps, rotary light orange indicator lamp (specific to certain countries), side light green indicator lamp, main beam blue indicator lamp, minimum steering pressure red warning lamp.

INSTRUMENT PANEL (FRONT FACE)



CS9K501

1 Stop alarm red warning lamp
2 Alarm orange warning lamp
3 Audible warning device stop push-button
6 Engine oil pressure red warning lamp
7 Air filter restriction red warning lamp
8 Battery charge red warning lamp
9 Hydraulic oil filter restriction red warning lamp
11 Minimum pilot pressure red warning lamp
12 Overload indicator orange warning lamp (optional)
14 Pilot cancellation green indicator lamp (special for certain countries)
16 Front axle unlocking orange indicator lamp
24 Rotary light orange indicator lamp (special for certain countries)
25 Minimum steering pressure red warning lamp
26 Parking brake red warning lamp
27 Minimum braking pressure red warning lamp
28 Rear fog light orange indicator lamp (special for certain countries)
29 Left-hand direction indicator green indicator lamp
30 Headlight main beam blue indicator lamp
31 Dipped headlight green indicator lamp
32 Hazard warning light red warning lamp
33 Right-hand direction indicator green indicator lamp
39 Gauge lighting indicator lamp
P1 Engine coolant solution temperature indicator lamp
P2 Fuel level gauge
P3 Oil temperature indicator


SC1
V14
V15
SC4
SC2
SC3
S3
H51
S51
H50
S50
S24
J13
J14
J15
H15
S22
S1
H11
S6
H12
S26
H13
S27
H10
S4
H31
S25
H18
S12
H17
H55
S55

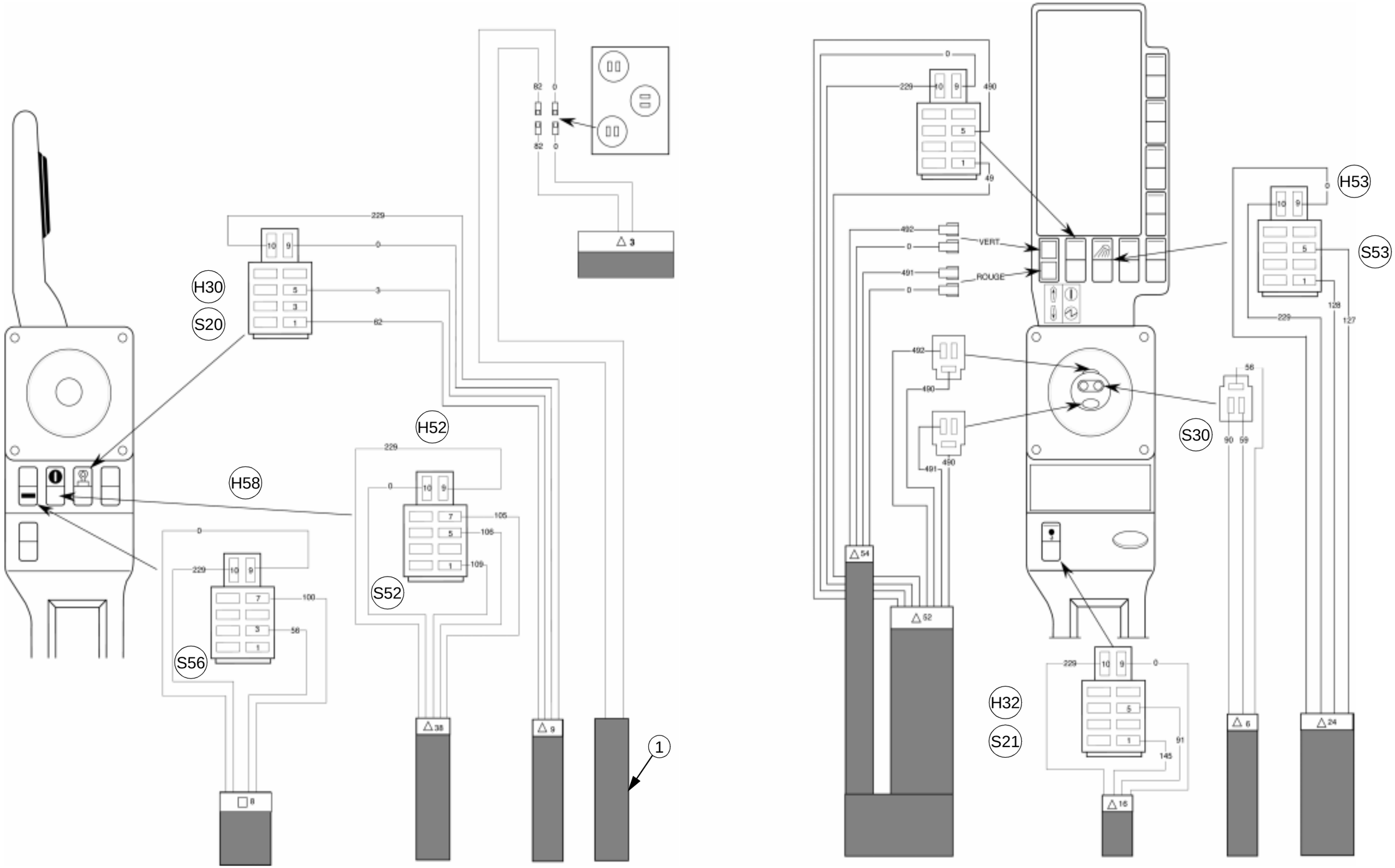
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RIGHT-HAND CONTROL ARM, LEFT-HAND CONTROL ARM AND COMMODO WIRING (STANDARD)

H10 Working brake switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lighting
H13 Heater blower switch lighting
H14 Troubleshooting test LED
H15 Instrument panel audible warning
H17 First speed green indicator light (588)
H18 Second speed blue indicator light (588)
H31 Rotary light switch lighting
H50 Working brake and parking brake switch lighting (optional)
H51 Hazard warning switch lighting
H55 Rear fog light switch lighting
J13 Steering column connector
J14 Steering column connector
J15 Steering column connector
S1 Key switch
S3 Horn switch
S4 Working light switch
S6 Windshield wiper switch
S12 Two-speed switch (588)
S22 Control keyboard (788-988-1188)
S24 Pilot safety switch
S25 Rotary light switch (optional)
S26 Windshield washer switch
S27 Heater blower switch
S51 Hazard warning switch
S52 Pilot system cancellation switch (optional)
S55 Rear fog light switch
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch
SC2 Front axle automatic and manual unlocking switch
SC3 Front axle locking and unlocking switch (in the axle unlocked position)
SC4 Stabilizer raising and lowering momentary inverter switch
V14-V15 Stabilizer solenoid valve diodes (in combination switch (commodo)

☐ Floor harness

△ **30** Electronic harness
△ **40** Two-speed control box harness (588)


H30
S20
H58
H52
S52
S56
H53
S53
S30
H32
S21
VERT
ROUGE
229
0
3
62
105
106
109
100
58
128
127
91
145
90
59
82
49
492
491
490
△3
△38
△9
△54
△52
△6
△24
△16
□8
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RIGHT-HAND AND LEFT-HAND CONTROL ARM WIRING (OPTIONAL)

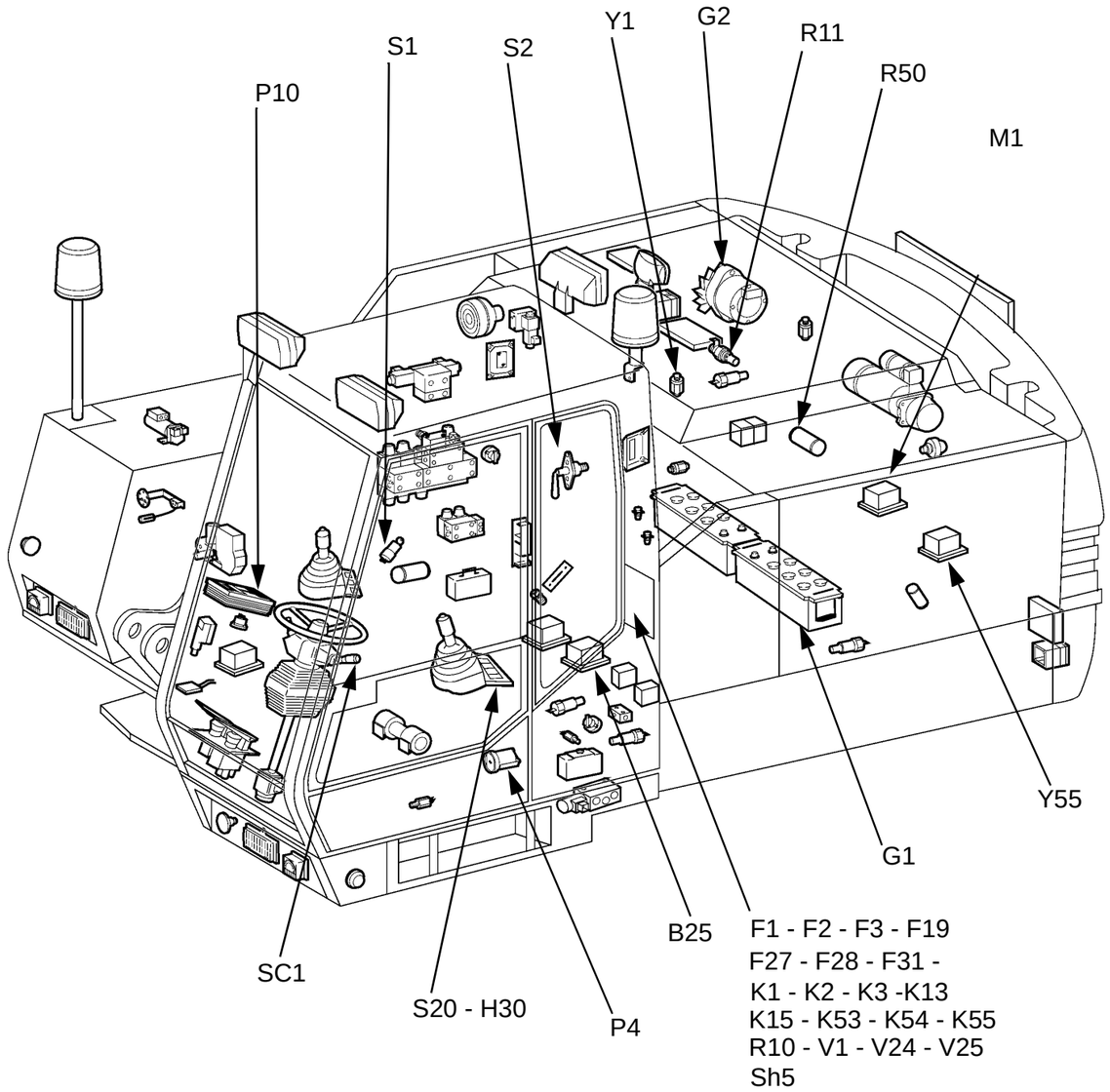
H30 Cold start assistance switch lighting (optional)
H32 Overload indicator switch lighting (optional)
H52 Pilot system cancellation switch lighting (optional)
H53 Cab front working light switch lighting (optional)
H58 Quick coupler switch lighting (optional)
S20 Cold start assistance switch (optional)
S21 Overload indicator switch (optional)
S30 Adjustable or articulated boom control switch (optional)
S52 Pilot system cancellation switch (optional)
S53 Cab front working light switch (optional)
S56 Quick coupler switch (optional)
1 Steering brake harness

▲ **3** Central braking harness (standard)

△ **6** Adjustable boom control harness
△ **9** Cold start assistance harness
△ **16** Overload indicator harness
△ **24** Front working lights harness
△ **38** Pilot system cancellation harness

□ **8** Floor harness

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ELECTRICAL SCHEMATIC (PLATE 2)

ELECTRICAL CABINET

F1 Fuse, 30 A, starter motor solenoid, thermostart
F2 Fuse, 5 A, starter switch
F3 Fuse, 7.5 A, instrument panel, hourmeter
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
F27 Fuse, 5 A, remote controlled or articulated boom, tool quick coupler, air suspension seat, speed threshold detector (788P heavy lift)
F28 Fuse, 40 A, engine stop/start solenoid (injection)
F31 Fuse, 10 A, fuel heater
K1 Starter motor relay
K2 Battery relay
K3 Hourmeter + transmission brake pressure switch + two-speed supply relay
K13 Engine stop solenoid relay
K15 Thermostart relay
K53 Fuel heater relay
K54 Frequency threshold detector relay (threshold: 1 = 1600 rpm)
K55 Frequency threshold detector relay (threshold: 2 = 1400 rpm)
K61 Battery relay (heater/air conditioner)
R10 Resistor, 0.85 Ohms
Sh5 Shunt Night lighting (switch) + P excavator registration plate
V1 Starter key switch diode
V24 K54 relay diode
V25 K55 relay diode

FLOOR

S1 Key switch
H30 Cold start assistance switch lighting (optional)
S20 Cold start assistance switch (optional)

UPPERSTRUCTURE

G1 Batteries
S2 Battery master switch
B25 Threshold detector (788)
Y55 Heavy lift solenoid valve (788)

ENGINE

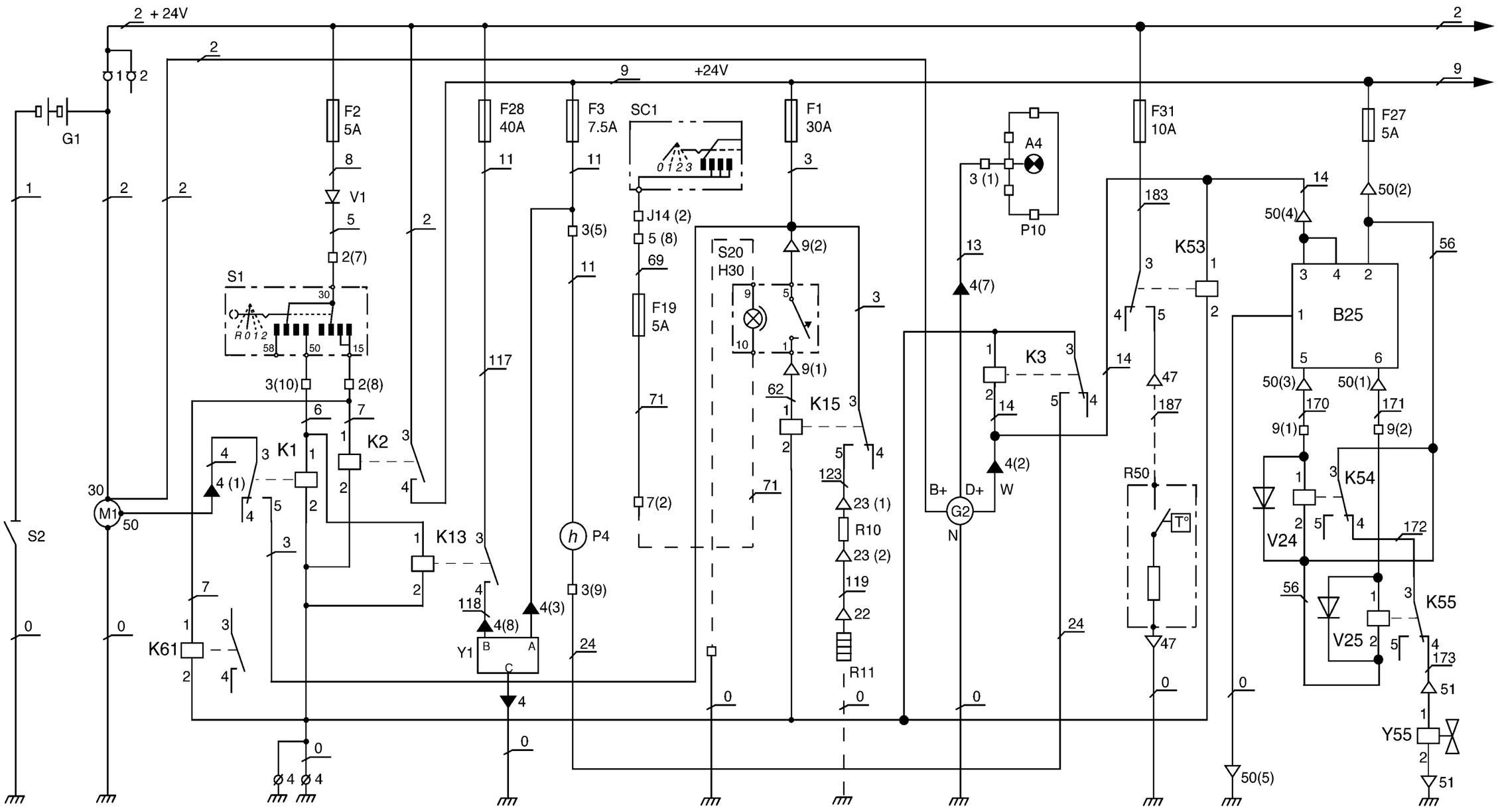
G2 Alternator
M1 Starter motor
R11 Cold start assistance plug (optional)
R50 Fuel heater (optional)
Y1 Engine shut-down solenoid valve

CAB

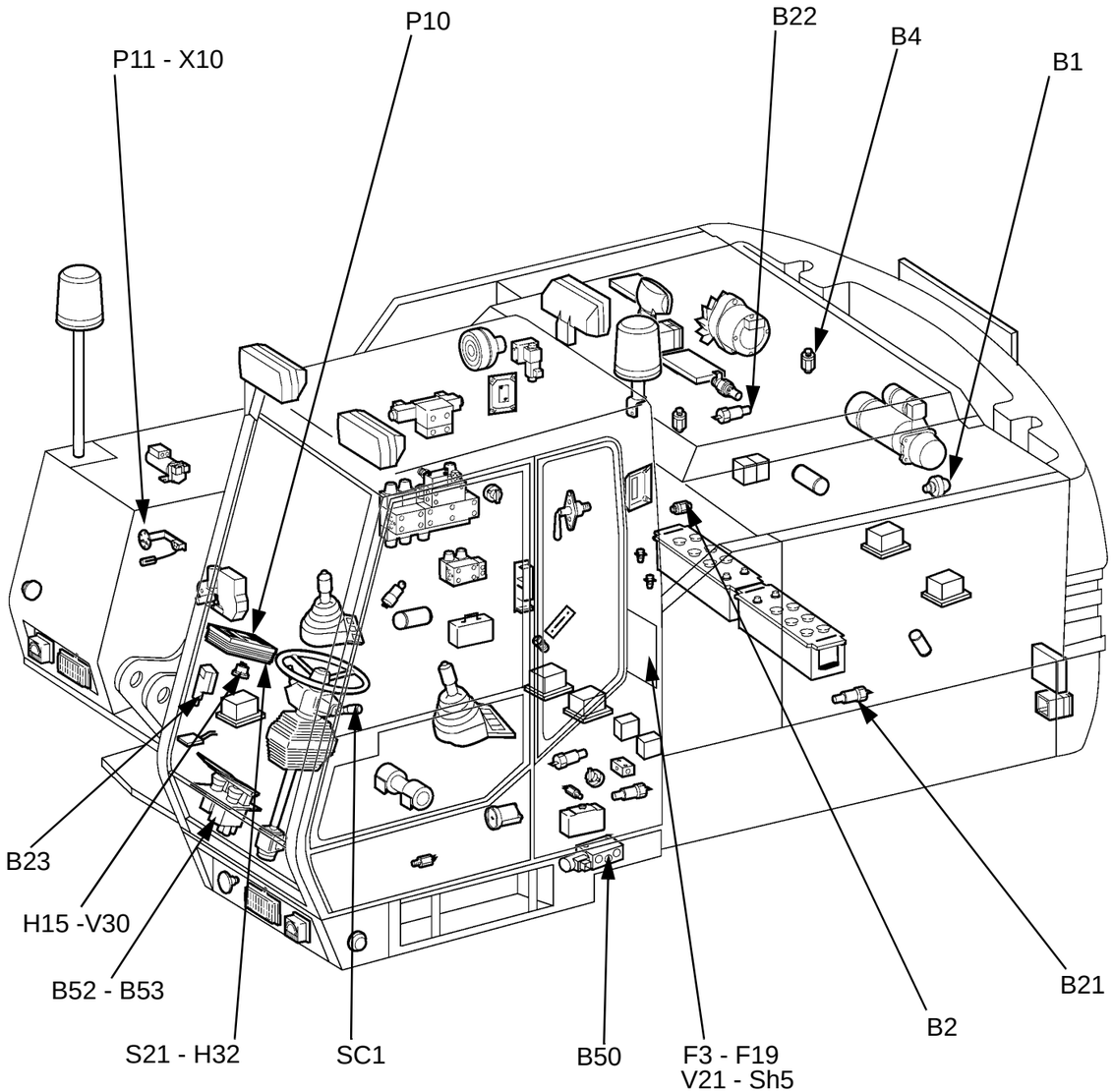
P4 Hourmeter
P10 Instrument panel
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch

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BATTERY MASTER SWITCH BATTERIES | STARTER MOTOR | STARTER KEY SWITCH STARTER MOTOR RELAY HEATER RELAY AIR CONDITIONER RELAY | GENERAL RELAY ENGINE STOP RELAY ENGINE STOP | HOUR-METER | COLD START ASSISTANCE (OPTIONAL) | ALTERNATOR | FUEL HEATER | SPEED THRESHOLD DETECTOR HEAVY LIFT SOLENOID VALVE (788)



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ELECTRICAL SCHEMATIC (PLATE 3)

INSTRUMENT PANEL

P10 Instrument panel
H32 Overload indicator switch lighting (optional)
S21 Overload indicator switch (optional)

ELECTRICAL CABINET

F3 Fuse, 7.5 A, instrument panel, hourmeter
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
Sh5 Shunt Night lighting (switch) + P excavator registration plate
V21 Overload indicator lamp diode on instrument panel
V30 Buzzer diode

CAB

SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch

FLOOR

B50 Parking brake pressure switch
B52 Pressure switch for minimum braking pressure
B53 Steering pressure switch
E15 Rear LH side light

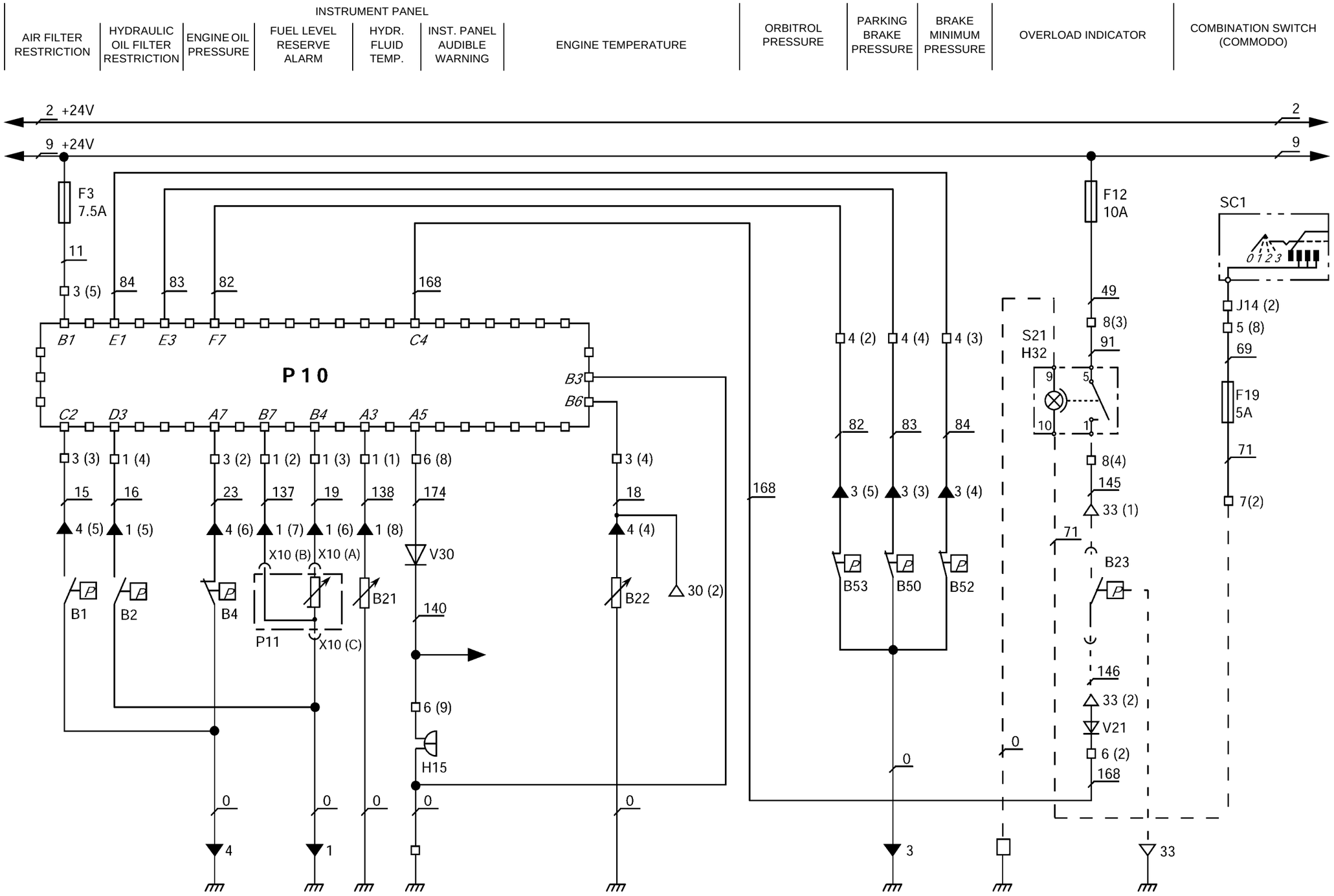
UPPERSTRUCTURE

B1 Air filter restriction pressure switch
B2 Hydraulic oil filter restriction pressure switch
B21 Hydraulic oil temperature sender
B23 Overload indicator (optional)
P11 Fuel level gauge
X10 Fuel level indicator connector

ENGINE

B4 Engine oil pressure switch
B22 Engine coolant temperature sender

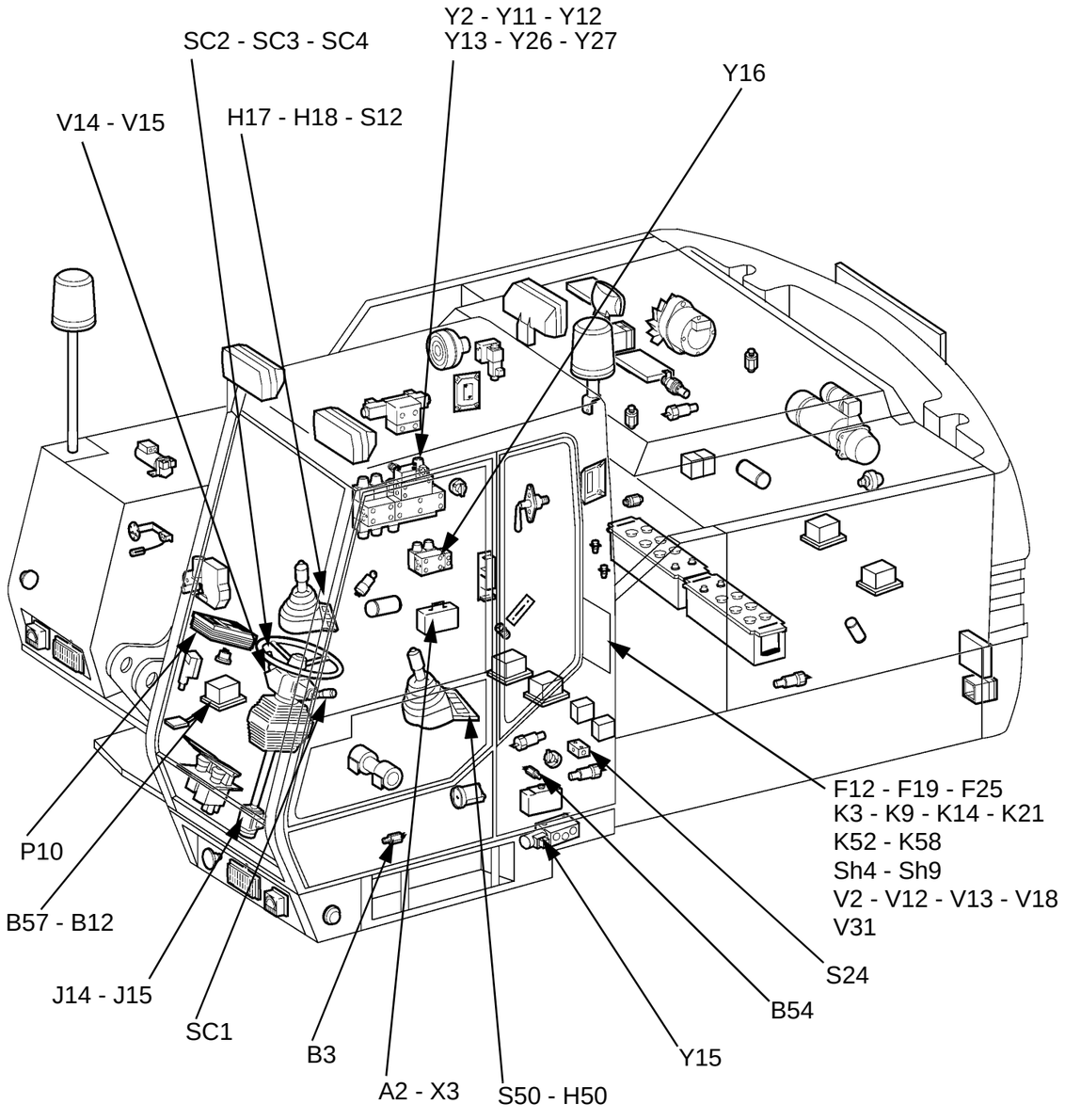
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ELECTRICAL SCHEMATIC (PLATE 4)



CM99K025

ELECTRICAL CABINET

F12 Fuse, 10 A, two-speed electro, axle unlocking, piloting neutralisation (std - Italy), stabilizers, direction of travel control, overload indicator
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
F25 Fuse, 7.5 A, parking brake electro, working brake electro (std/D/I)
K3 Hourmeter + transmission brake pressure switch + two-speed supply relay
K9 Pilot safety relay/axle unlocking
K14 Speed change relay (588)
K21 Safety relay piloting pressure switch piloting
K52 Speed change relay (except 588)
K58 Two-speed supply relay
Sh4 Shunt OK Standard - not Italy
Sh9 Shunt contact K58 two-speed supply
V2 Diode less engine running
V12 2nd speed indicator lamp diode on 588P
V13 1st speed indicator lamp diode on 588P
V18 Axle unlocking indicator lamp diode on instrument panel
V31 K58 relay diode

FLOOR

A2 Electronic control box (788-988-1188)
B3 Pilot pressure switch
B12 Brake pressure switch (588)
B54 Front axle unlocking pressure switch
B57 Speed change pressure switch
H50 Working brake and parking brake switch lighting (optional)
J14 Steering column connector
J15 Steering column connector
SC2 Front axle automatic and manual unlocking switch
SC3 Front axle locking and unlocking switch (in the axle unlocked position)
SC4 Stabilizer raising and lowering momentary inverter switch
S12 Two-speed switch (588)
S24 Pilot safety switch
S50 Parking brake and working brake switch (optional)
V14-V15 Stabilizer solenoid valve diodes (in combination switch (commodo)
X3 35-way connector (788-988-1188)

UPPERSTRUCTURE

Y2 Pilot safety solenoid valve
Y11 Gear box solenoid valve (first speed)
Y12 Gear box solenoid valve (second speed)
Y13 Front axle unlocking solenoid valve
Y15 Parking brake solenoid valve
Y16 Working brake solenoid valve
Y26 Stabilizer raising solenoid valve
Y27 Stabilizer lowering solenoid valve

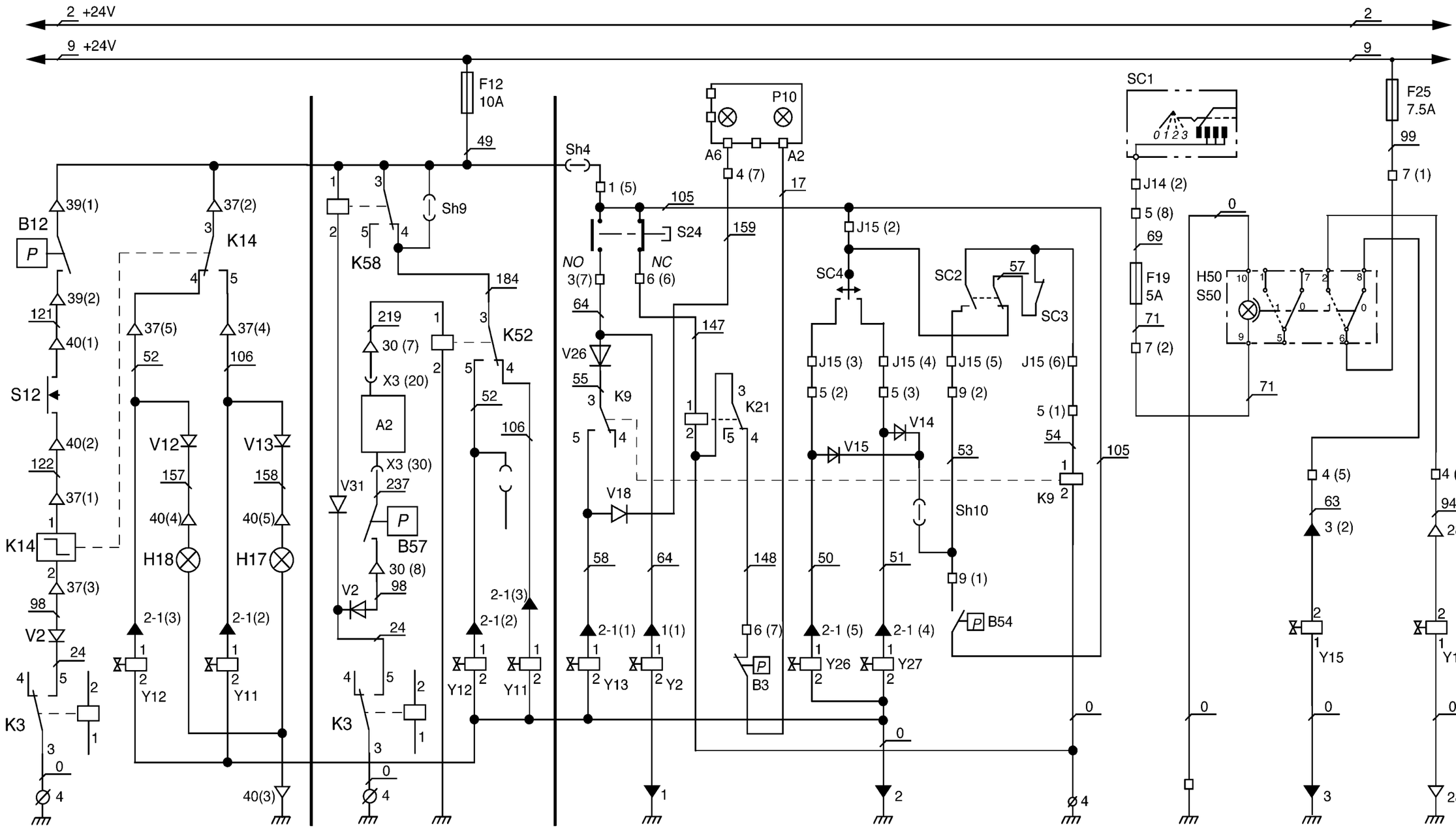
CAB

H17 First speed green indicator light (588)
H18 Second speed blue indicator light (588)
P10 Instrument panel
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch

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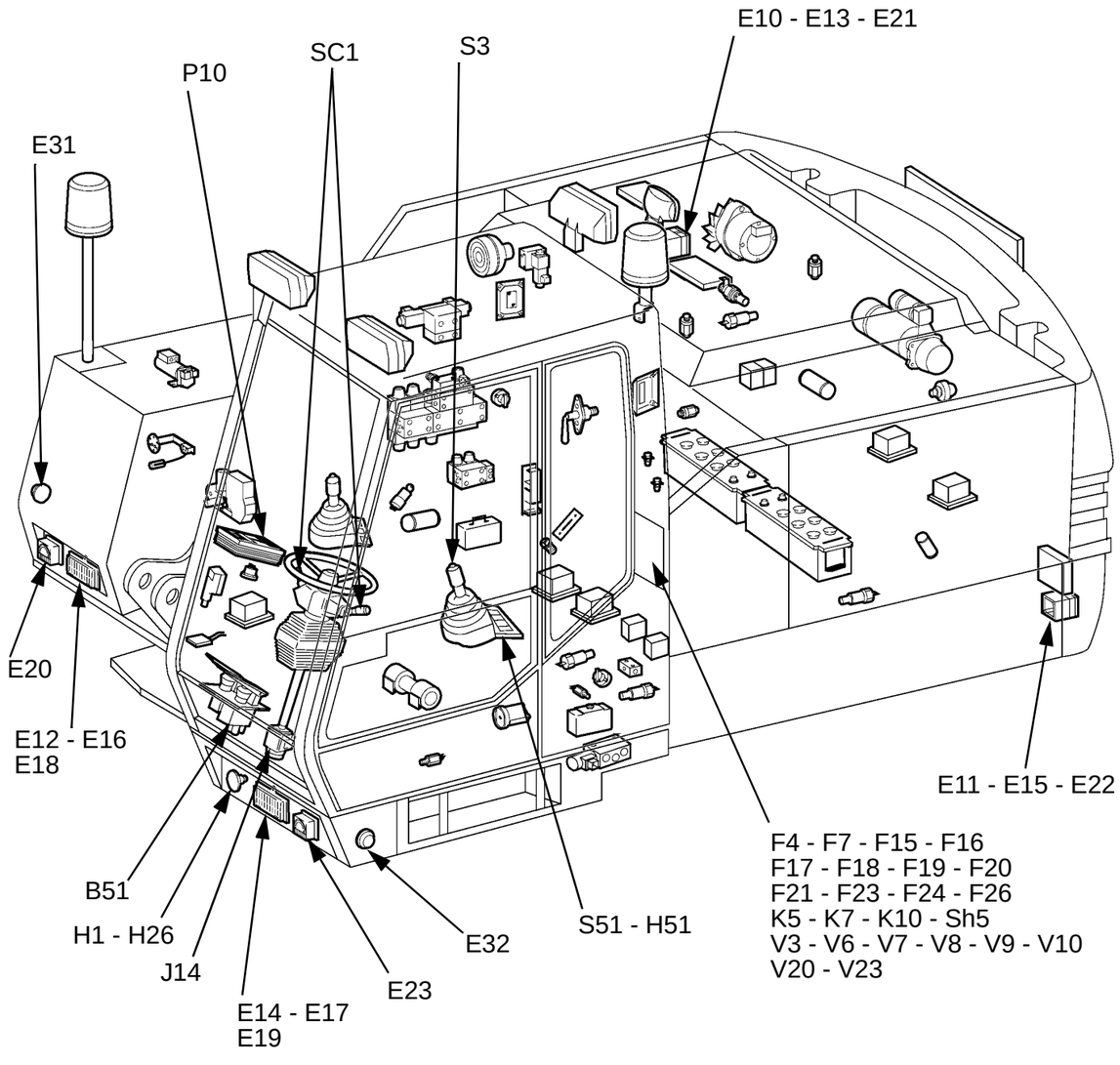
588 TWO-SPEED TRAVEL | 788/988/1188 TWO-SPEED TRAVEL | PILOT SYSTEM SAFETY | PILOT PRESSURE AXLE LOCKING INDICATOR LAMPS | STABILIZERS | AXLE LOCKING | COMBINATION SWITCH (COMMODO) | PARKING BRAKE | WORKING BRAKE

TWO-SPEED RELAY | TWO-SPEED INDICATOR LAMPS TWO-SPEED SOLENOID VALVE | TWO-SPEED RELAY | TWO-SPEED SOLENOID VALVE



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CM99K025

ELECTRICAL SCHEMATIC (PLATE 5)

ELECTRICAL CABINET

F4 Fuse, 5 A, cab lighting, horn (control), hood lighting
F7 Fuse, 10 A, horn (power)
F15 Fuse, 15 A, general lighting
F16 Fuse, 5 A, RH rear brake light
F17 Fuse, 5 A, LH rear brake light
F18 Fuse, 5 A, RH front/rear sidelight, dipper lighting + cassette
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
F20 Fuse, 5 A, RH front dipped headlight
F21 Fuse, 5 A, LH front dipped headlight
F23 Fuse, 5 A, RH main beam headlight
F24 Fuse, 5 A, LH main beam headlight
F26 Fuse, 7.5 A, flasher, warning
K5 Horn relay
K7 Relay authorizing working lights if sidelights on
K10 Flasher unit relay
Sh5 Shunt Night lighting (switch) + P excavator registration plate
V3 Dipped headlight indicator lamp diode on instrument panel
V6 Main beam headlight indicator lamp diode on instrument panel
V7 RH flashing indicator lamp diode on instrument panel
V8 LH flashing indicator lamp diode on instrument panel
V9 Warning indicator lamp diode on instrument panel
V10 LH flasher diode
V20 RH flasher diode
V23 Warning diode

CAB

H51 Hazard warning switch lighting
P10 Instrument panel
S3 Horn switch
S51 Hazard warning switch
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch

FLOOR

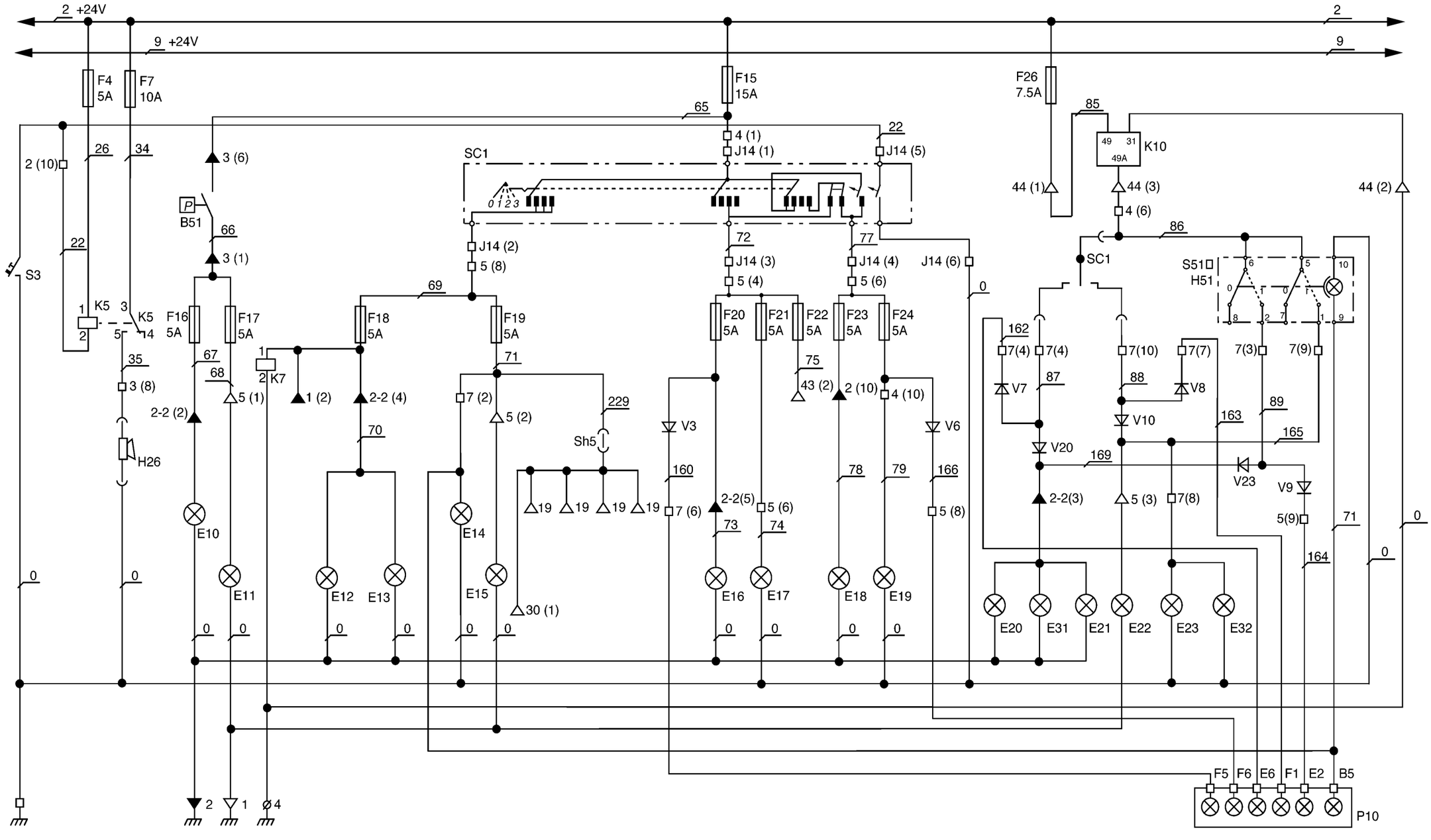
B51 Brake light pressure switch
H26 Horn
J14 Steering column connector

UPPERSTRUCTURE

E10 RH rear brake light
E11 LH rear brake light
E12 Engine compartment light (optional)
E12 Front RH side light
E13 Rear RH side light
E14 Front LH side light
E15 Rear LH side light
E16 Front RH dipped headlight
E17 Front LH dipped headlight
E18 RH main beam headlight
E19 LH main beam headlight
E20 RH front direction indicator
E21 RH rear direction indicator
E22 LH rear direction indicator
E23 LH front direction indicator
E31 RH side-mounted direction indicator
E32 LH side-mounted direction indicator

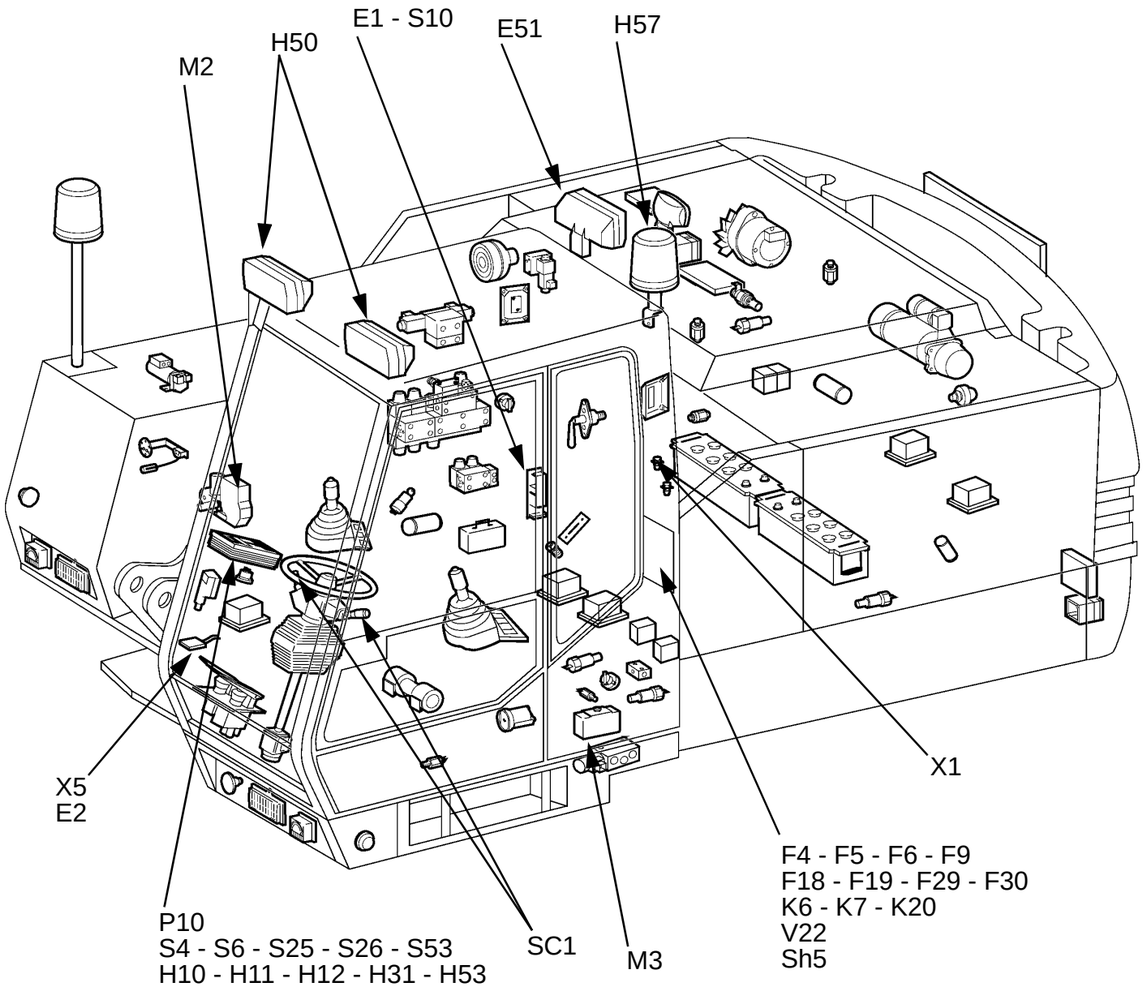
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HORN | BRAKE LIGHTS | SIDE LIGHTS | COMBINATION SWITCH (COMMODO) | DIPPED HEADLIGHTS | MAIN BEAM HEADLIGHTS | INDICATOR LIGHTS | HAZARD WARNING LIGHTS



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ELECTRICAL SCHEMATIC (PLATE 6)



CM99K025

INSTRUMENT PANEL

H10 Working brake switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lightin**H31**Rotary light switch lighting (optional)
H53 Cab front working light switch lighting (optional)
S4 Working light switch
S6 Windshield wiper switch
S25 Rotary light switch (optional)
S26 Windshield washer switch
S53 Cab front working light switch (optional)

ELECTRICAL CABINET

F4 Fuse, 5 A, cab lighting, horn (control), hood lighting
F5 Fuse, 10 A, working lights (control), rotary light (std), rotary light (Italy)
F6 Fuse, 15 A, attachment working light, rear cab light
F9 Fuse, 10 A, windshield washer, windshield wiper (BAT + R)
F18 Fuse, 5 A, RH front/rear sidelight, dipper lighting + cassette
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
F29 Fuse, 10 A, cab front working light
F30 Fuse, 10 A, windshield wiper (BAT +)
H57 Standard or Italian rotary light
K6 Working light relay
K7 Relay authorizing working lights if sidelights on
K20 Windshield wiper intermittent action
Sh5 Shunt Night lighting (switch) + P excavator registration plate
V22 Rotary light diode on instrument panel

CAB

E1 Cab lighting
H50 Working brake and parking brake switch lighting (optional)
H51 Hazard warning switch lighting
M2 Windshield wiper motor
cable item 144 = blue cable
cable item 142 = grey cable
cable item 0 = black cable
cable item 38 = white cable
P10 Instrument panel
S10 Cab lighting switch
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch
X1 (E) Cab floor/Cab windshield wiper motor blue connector
X1 (G) Cab floor/cab connector
X1 (J) Cab floor/Cab windshield wiper motor white connector
X1 (K) Cab floor/cab connector
X1 (L) Cab floor/Cab windshield wiper motor grey connector
X1 (M) Cab floor/Cab windshield wiper motor black connector
X1 (F) Cab floor/Cab rotary light connector (optional)

FLOOR

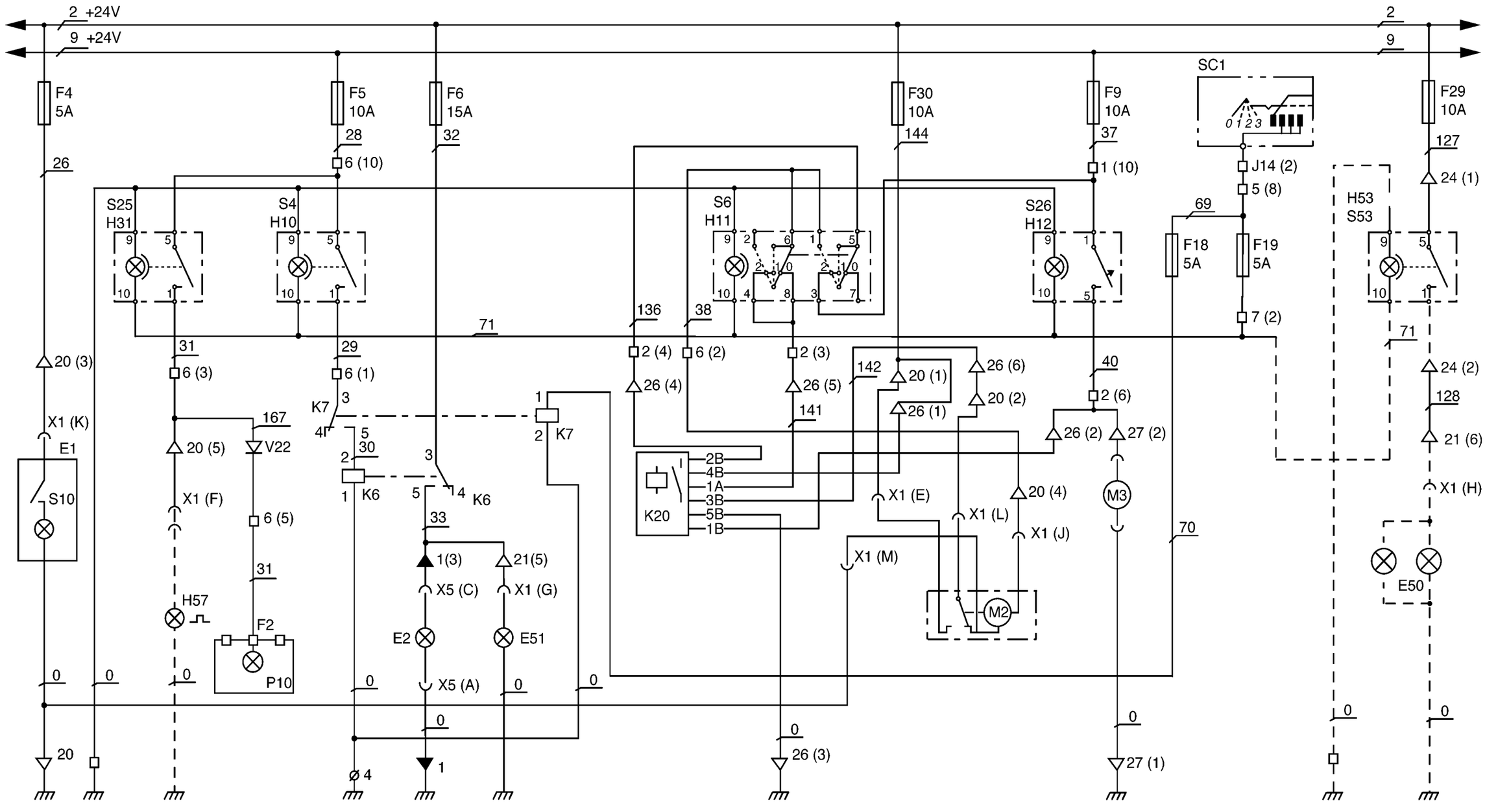
M3 Windshield washer motor

UPPERSTRUCTURE

E2 Attachment working light on boom
H57 Standard or Italian rotary light
X5 (A), (C) Attachment working light power connection

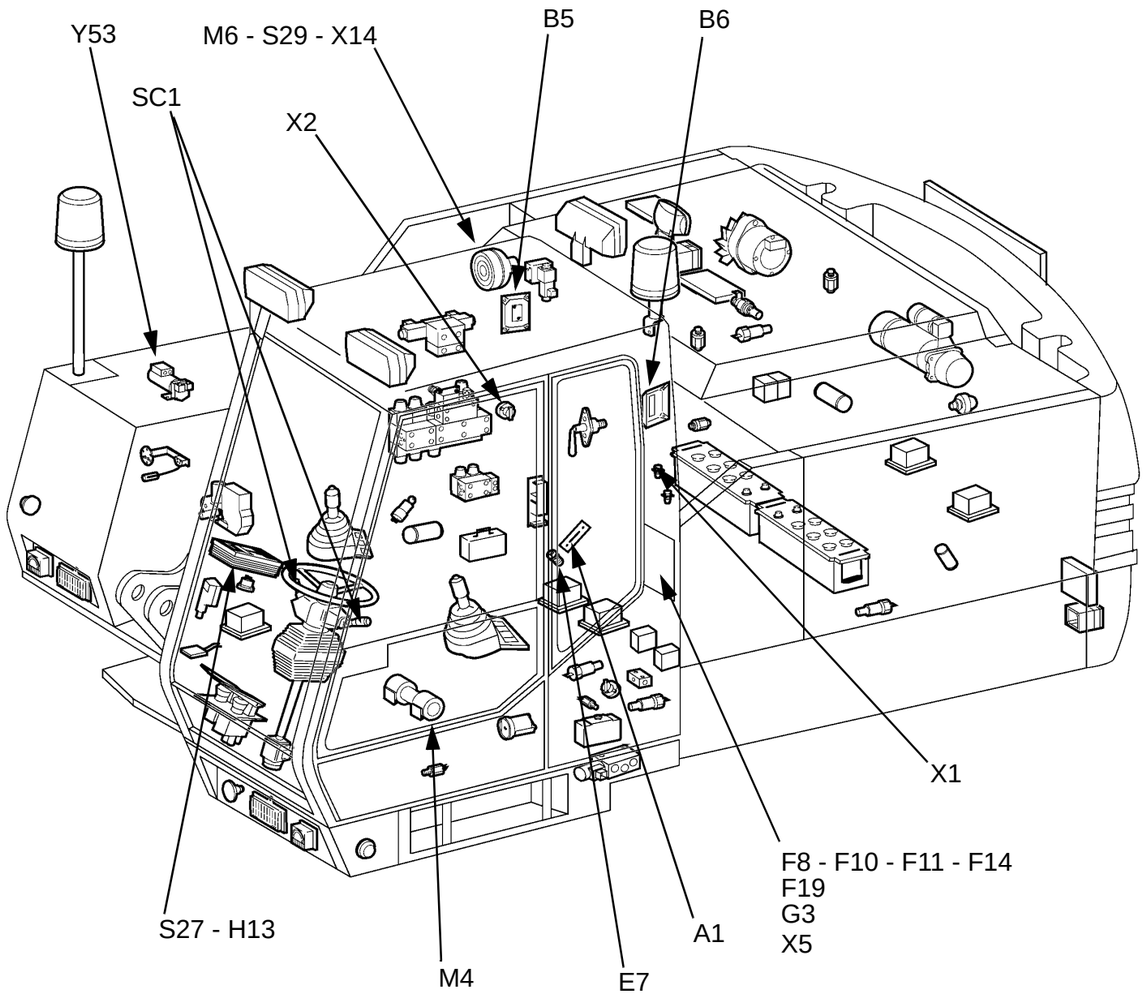
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CAB LIGHTING | ROTARY LIGHT | ROTARY LIGHT INDICATOR LAMP | ATTACHMENT WORKING LIGHT | CAB REAR WORKING LIGHT | WINDSHIELD WIPER | WINDSHIELD WASHER | COMBINATION SWITCH (COMMODO) | CAB FRONT WORKING LIGHTS (OPTIONAL)



CM99H005

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ELECTRICAL SCHEMATIC (PLATE 7)

ELECTRICAL CABINET

F8 Fuse, 15 A, upperstructure socket, fuel pump
F10 Fuse, 10 A, heater
F11 Fuse, 7,5 A, cigarette-lighter, cab blower, batt.+ working brake for Germany
F14 Fuse, 10 A, step-down transformer / radio
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
G3 Step-down transformer 24V / 12V

INSTRUMENT PANEL

H13 Heater blower switch lighting
S27 Heater blower switch
S29 Cab blower switch (optional)

FLOOR

A1 Radio (optional)
E7 Cigarette lighter
M4 Heater blower motor
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch

CAB

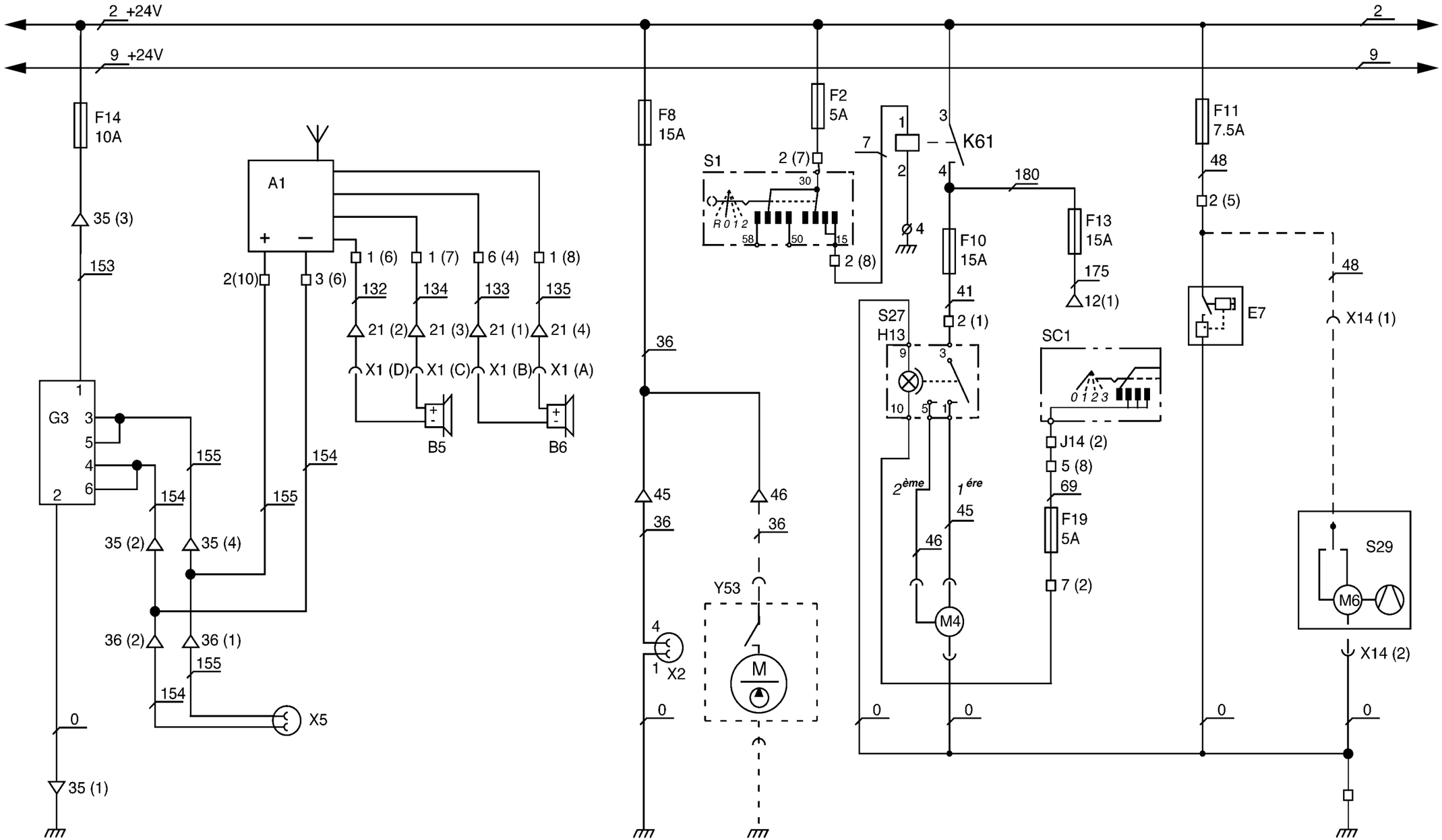
B5 RH loudspeaker (optional)
B6 LH loudspeaker (optional)
M6 Cab blower motor (optional)
X1(A),(B),(C),(D) Cab floor/cab LH and RH loudspeaker connector (optional)
X5 12V accessories socket
X14 (1),(2) Blower motor connector (optional)

UPPERSTRUCTURE

X2 Upperstructure power line connection
Y53 Fuel filler pump (optional)

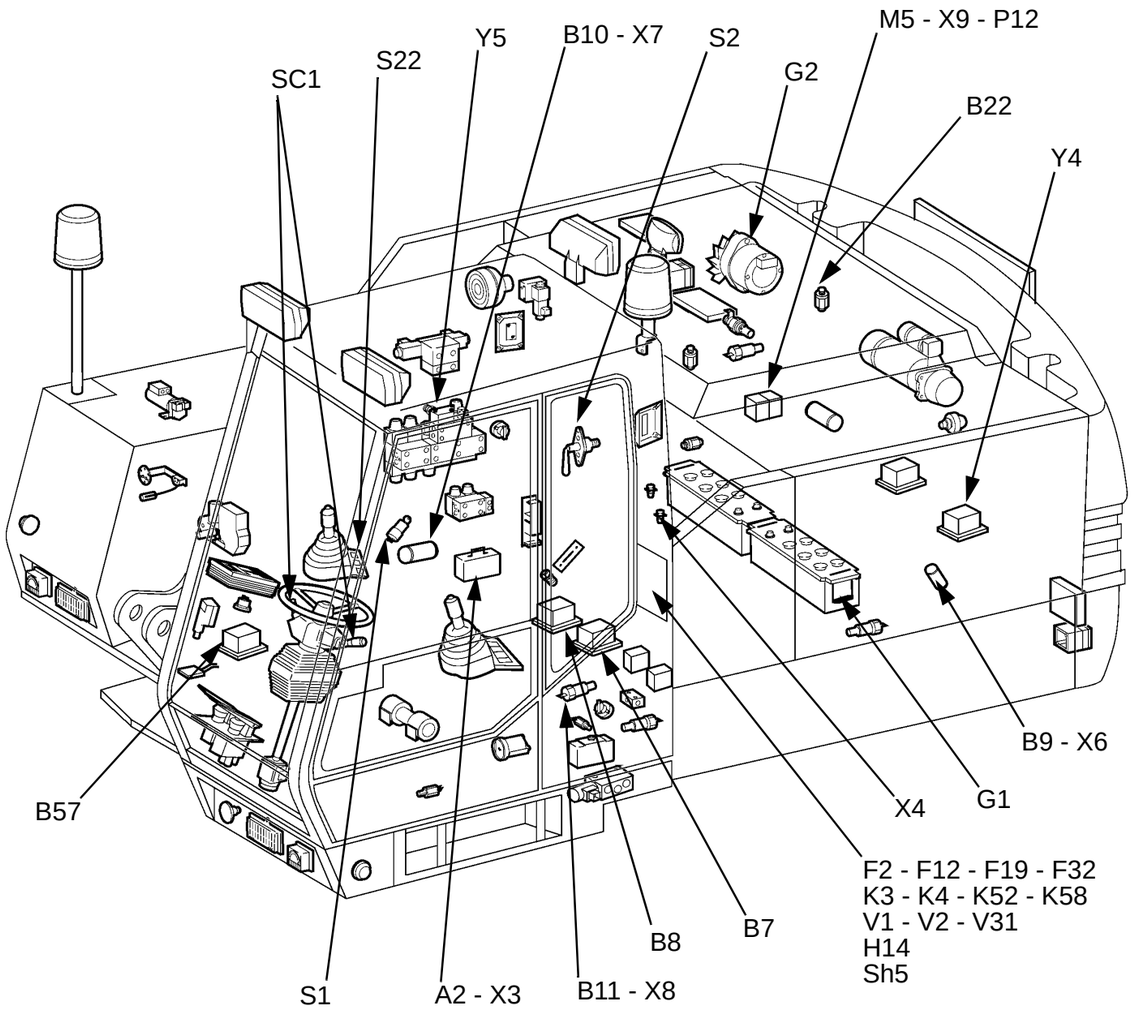
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STEP-DOWN TRANSFORMER 24V - 12V | RADIO (OPTIONAL) ACCESSORY SOCKET | UPPER-STRUCTURE POWER LINE CONNECTION | FUEL FILLER PUMP (OPTIONAL) | VENTILATION/HEATING | COMBINATION SWITCH (COMMODO) | CIGARETTE LIGHTER | CAB BLOWER (OPTIONAL)



CM99H006

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ELECTRICAL SCHEMATIC (PLATE 8)

ELECTRICAL CABINET

F2 Fuse, 5 A, starter switch
F12 Fuse, 10 A, two-speed electro, axle unlocking, piloting neutralisation (std - Italy), stabilizers, direction of travel control, overload indicator
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
F32 Fuse, 5 A, (BAT +) electronics
H14 Troubleshooting test LED
K3 Hourmeter + transmission brake pressure switch + two-speed supply relay
K4 Electronic supply relay
K52 Speed change relay (except 588)
K58 Two-speed supply relay
Sh5 Shunt Night lighting (switch) + P excavator registration plate
V1 Starter key switch diode
V2 Diode less engine running
V31 K58 relay diode

CAB

S1 Key switch
S22 Control keyboard (788-988-1188)
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch
X3 35-way connector (788-988-1188)
X4 Troubleshooting test socket (788-988-1188)

FLOOR

B8 Travel detector pressure switch
S1 Key switch

UPPERSTRUCTURE

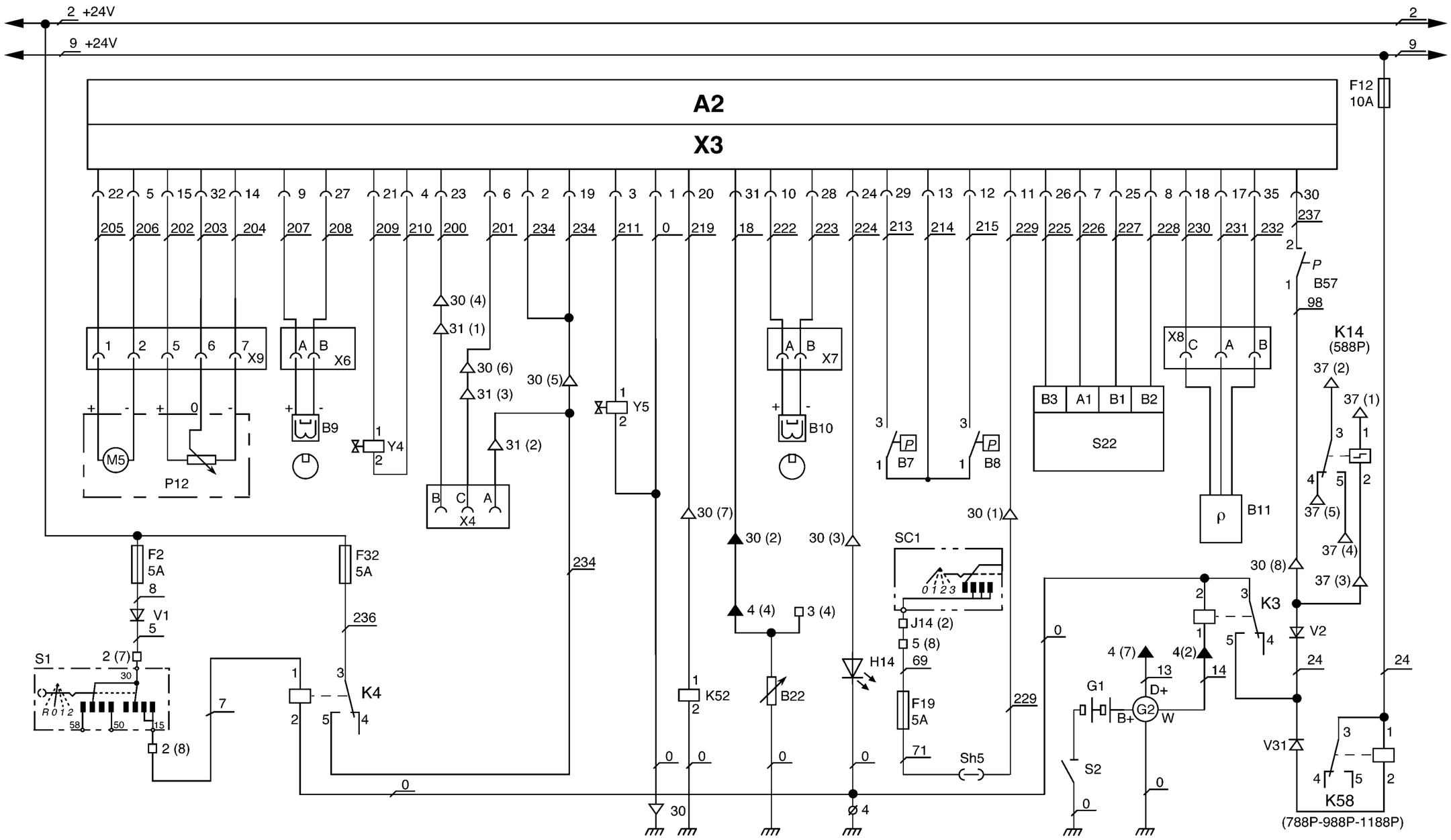
B7 Swing detection pressure switch
B10 Swing motor speed detector
B11 Hydraulic pressure sender (788-988-1188)
B57 Speed change pressure switch
G1 Batteries
S2 Battery master switch
Y5 Upperstructure brake release control solenoid valve

ENGINE

B9 Engine speed detector (788-988-1188)
B22 Engine coolant temperature sender
G2 Alternator
M5 Injection pump servo-motor (788-988-1188)
P12 Servo-motor potentiometer (788-988-1188)
X6 Engine speed detector connector (788-988-1188)
X7 Upperstructure swing speed detector connector
X8 Hydraulic pressure sender connector (788-988-1188)
X9 Injection pump servo-motor connector (788-988-1188)
Y4 DRE4 proportional pressure reduction valve

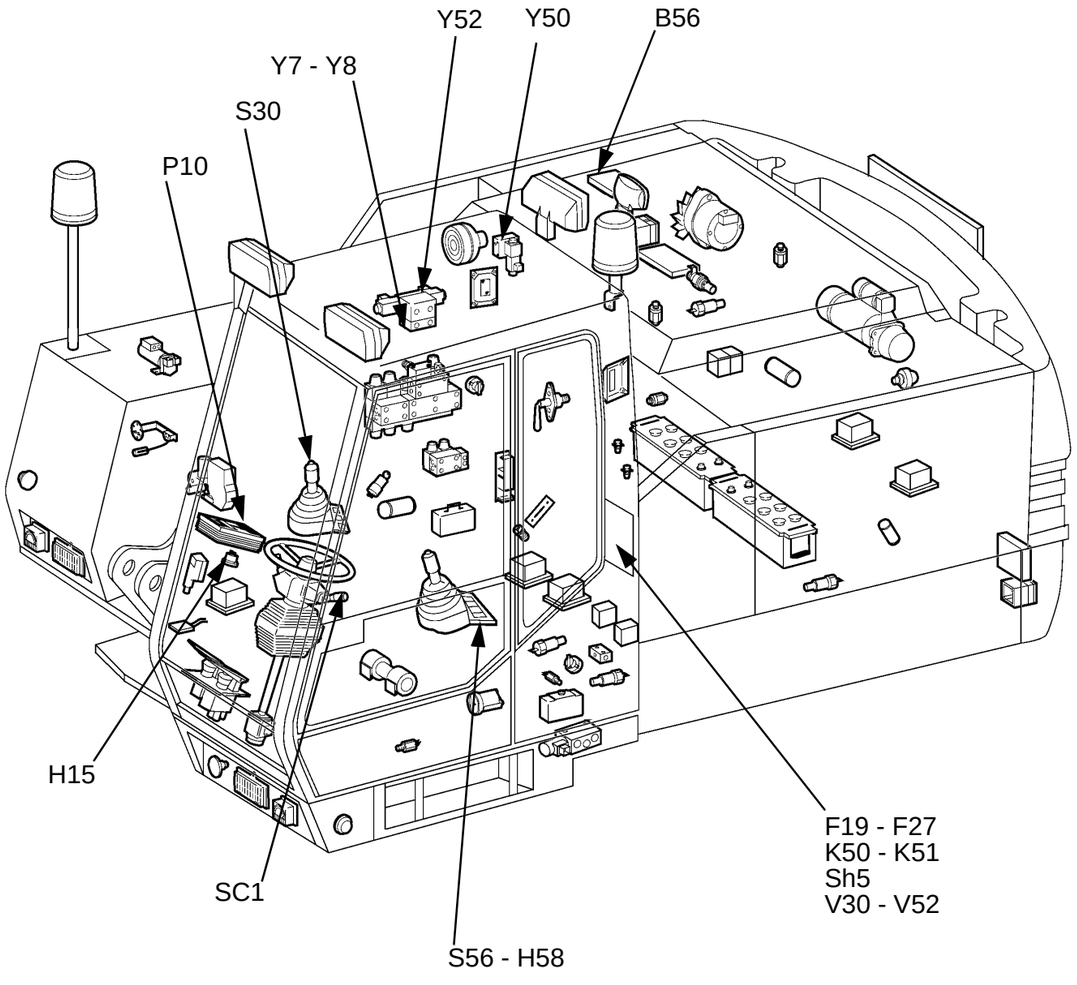
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INJECTION PUMP SERVO-MOTOR	ENGINE SPEED DETECTOR	DRE4 PRESSURE REDUCTION VALVE	TROUBLE-SHOOTING TEST SOCKET	+ 28V BATTERIES	SWING BRAKE RELEASE SOLE-NOID VALVES	0V BAT-TERY	TRAV-EL SPEED RELAY	WA-TER T°	UPPER-STRUC-TURE SWING SPEED DETECTOR	TROU BLE-SHOO TING TEST LED	PRESSURE SWITCH		+28V INSTRU-MENT PANEL LIGHT-ING	CONTROL PANEL KEYBOARD	PRESSURE SENDER	SPEED CHANGE PRESSURE SWITCH
											SWING	TRAVEL				



CM99H007

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ELECTRICAL SCHEMATIC (PLATE 9)

ELECTRICAL CABINET

F19 Fuse, 5 A, LH front/rear sidelight + night lighting
F27 Fuse, 5 A, remote controlled or articulated boom, tool quick coupler, air suspension seat, speed threshold detector (788P heavy lift)
K50 Adjustable boom raising limiter relay (optional)
K51 Adjustable boom retracting limitation relay (optional)
Sh5 Shunt Night lighting (switch) + P excavator registration plate

CAB

H58 Quick coupler switch lighting (optional)
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch
S30 Adjustable or articulated boom control switch (optional)
S56 Quick coupler switch (optional)

UPPERSTRUCTURE

B56 Boom raising range limitation detector (optional)
Y7 Adjustable or articulated boom extending electrovalve (optional)
Y8 Adjustable or articulated boom retracting electrovalve (optional)
Y50 Adjustable boom raising height limiter solenoid valve (optional)
Y52 Quick coupler solenoid valve (optional)

INSTRUMENT PANEL

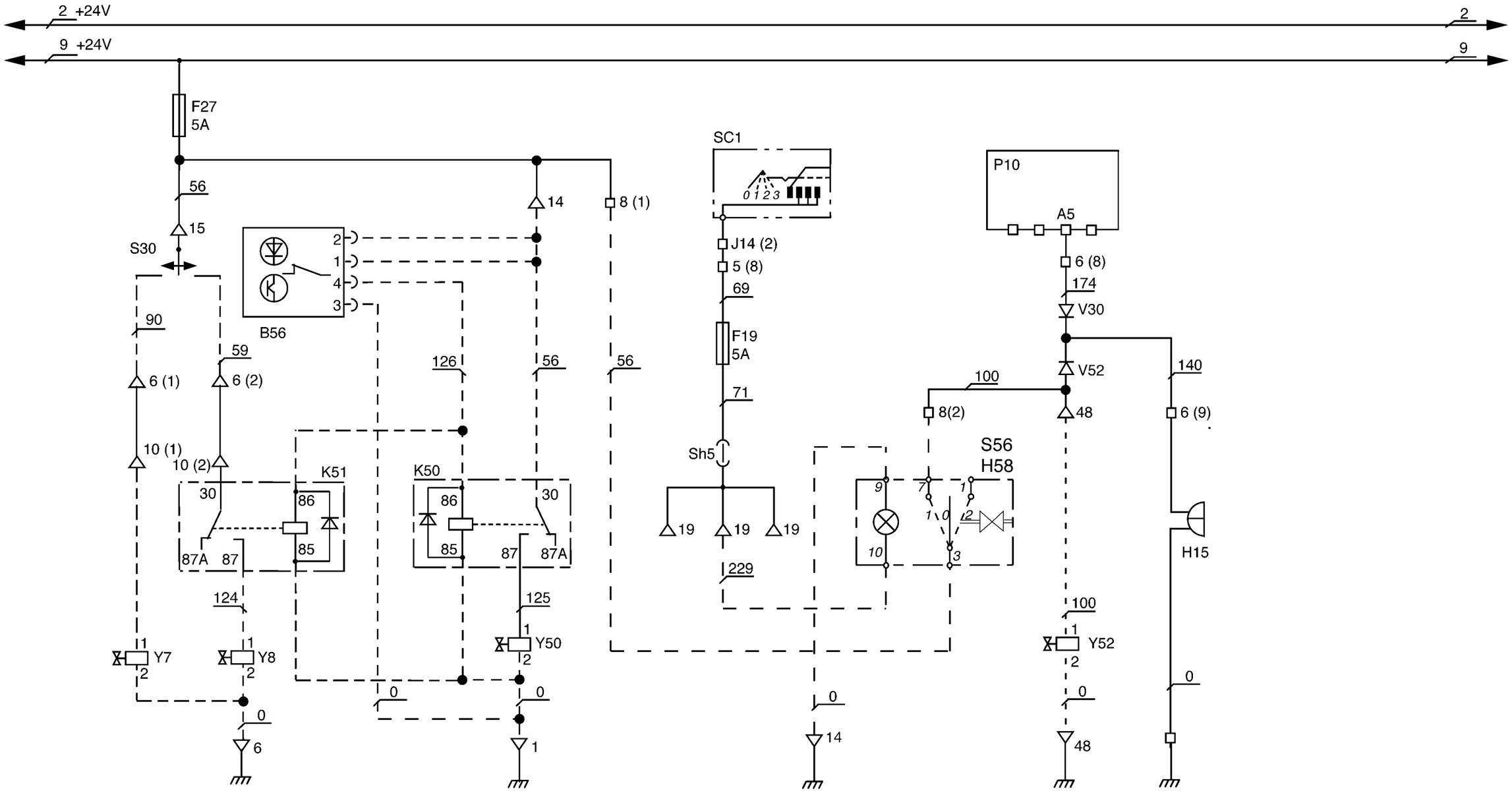
H15 Instrument panel audible warning
P10 Instrument panel
V30 Buzzer diode
V52 Quick coupler switch diode

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ADJUSTABLE BOOM
OR
ARTICULATED BOOM (OPTIONAL)

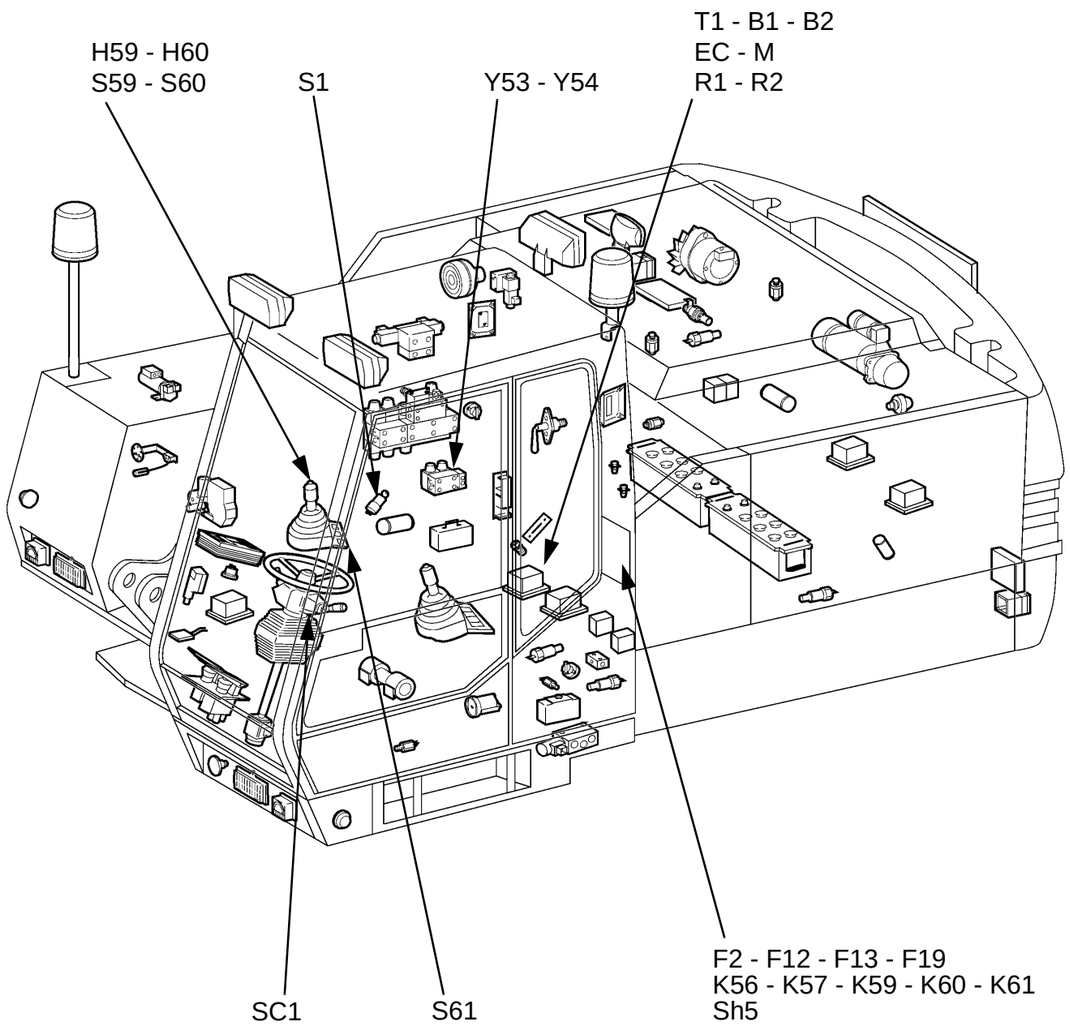
ADJUSTABLE BOOM RANGE
LIMITATION (OPTIONAL)

QUICK COUPLER (OPTIONAL)



CM99H008

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ELECTRICAL SCHEMATIC (PLATE 10)

ELECTRICAL CABINET

F2 Fuse, 5 A, starter switch
F12 Fuse, 10 A, two-speed electro, axle unlocking, piloting neutralisation (std - Italy), stabilizers, direction of travel control, overload indicator
F13 Fuse, 15 A, air conditioner
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
K56 Reverse travel relay
K57 Forward travel relay
K59 Air conditioning compressor relay
K60 Air conditioning condenser relay
K61 Battery relay (heater/air conditioner)
Sh5 Shunt Night lighting (switch) + P excavator registration plate

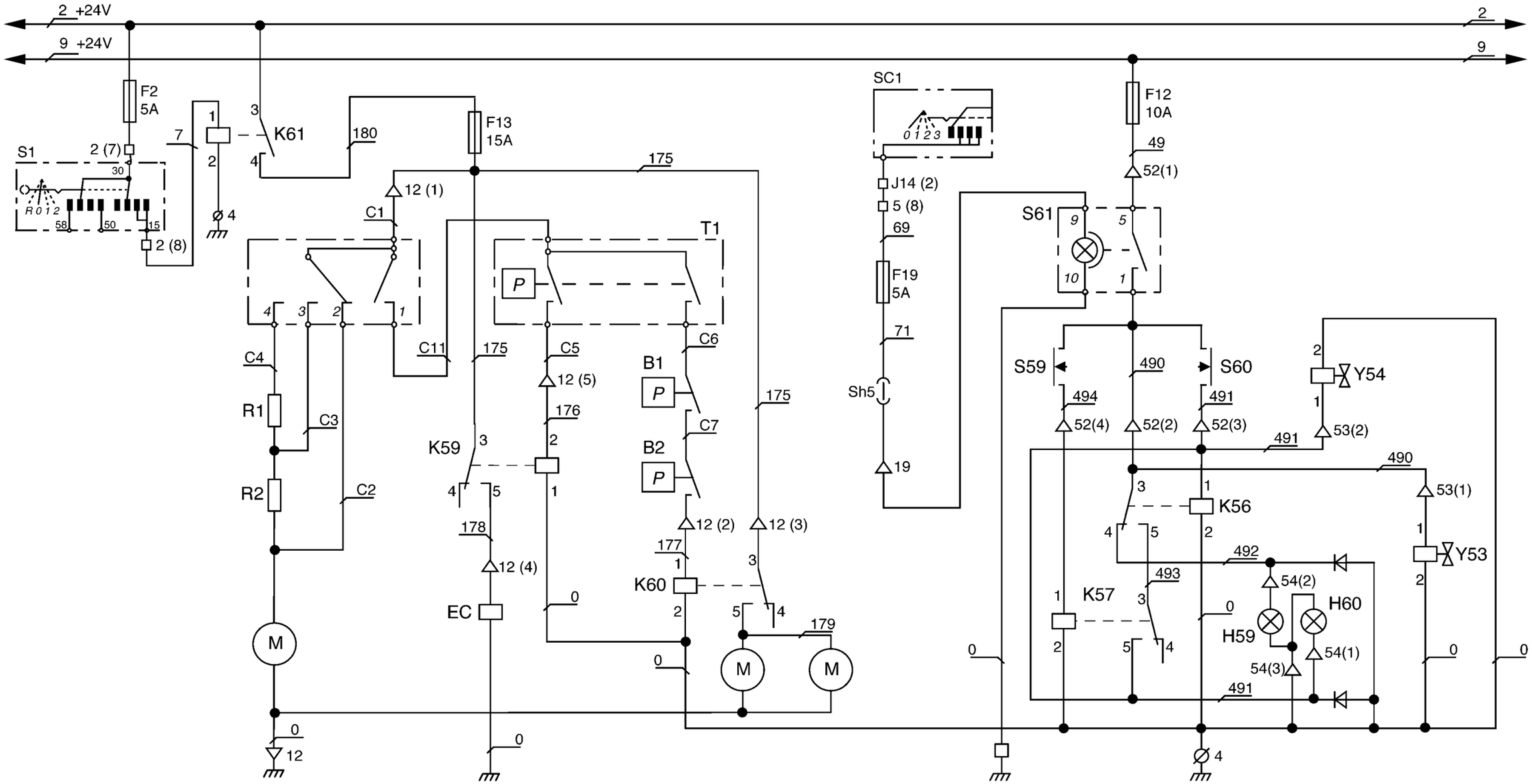
CAB

B1 Condenser blower relay pressure switch
B2 Condenser blower relay pressure switch
EC Compressor
H59 Forward travel green indicator lamp (optional)
H60 Reverse travel red indicator lamp (optional)
M Condenser blower and blower motors
R1 Blower speed resistor
R2 Blower speed resistor
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch
S1 Key switch
S59 Forward travel switch (optional)
S60 Reverse travel switch (optional)
S61 Direction of travel reverser switch (optional)
T1 Pressure switch

UPPERSTRUCTURE

Y53 Forward travel solenoid valve (optional)
Y54 Reverse travel solenoid valve (optional)

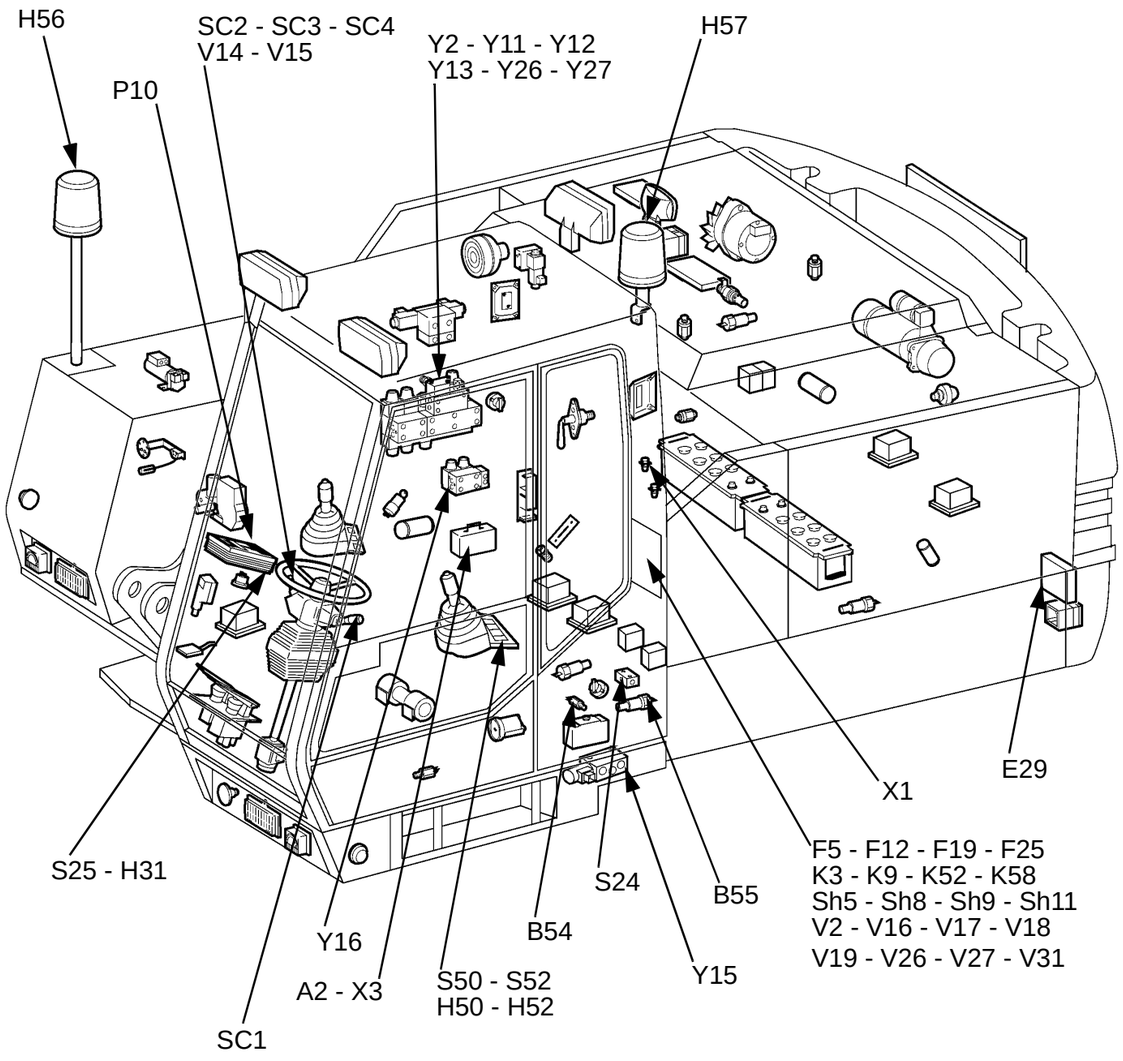
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ELECTRICAL SCHEMATIC (PLATE 11)



CM99K025

Supplement for Italy

ELECTRICAL CABINET

F5 Fuse, 10 A, working lights (control), rotary light (std), rotary light (Italy)
F12 Fuse, 10 A, two-speed electro, axle unlocking, piloting neutralisation (std - Italy), stabilizers, direction of travel control, overload indicator
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
F25 Fuse, 7.5 A, parking brake electro, working brake electro (std/D/I)
K3 Hourmeter + transmission brake pressure switch + two-speed supply relay
K9 Pilot safety relay/axle unlocking
K52 Speed change relay (except 588)
K58 Two-speed supply relay
Sh5 Shunt Night lighting (switch) + P excavator registration plate
Sh8 Shunt OK Italy - not standard
Sh9 Shunt contact K58 two-speed supply
Sh11 Shunt - Italy axle unlocking
V2 Diode less engine running
V16 Diode for Italy
V17 Diode for Italy
V18 Axle unlocking indicator lamp diode on instrument panel
V19 Diode for Italy
V26 Axle unlocking diode
V27 Axle electro unlocking diode for Italy
V31 K58 relay diode

FLOOR

A2 Electronic control box (788-988-1188)
B54 Front axle unlocking pressure switch
B55 Steering brake pressure switch (optional)
H50 Working brake and parking brake switch lighting (optional)
H52 Pilot system cancellation switch lighting (optional)
SC2 Front axle automatic and manual unlocking switch
SC3 Front axle locking and unlocking switch (in the axle unlocked position)
SC4 Stabilizer raising and lowering momentary inverter switch
S24 Pilot safety switch
S50 Parking brake and working brake switch (optional)
S52 Pilot system cancellation switch (optional)
V14-V15 Stabilizer solenoid valve diodes (in combination switch (commodo)
X3(20) 35-way connector for A2 control box

UPPERSTRUCTURE

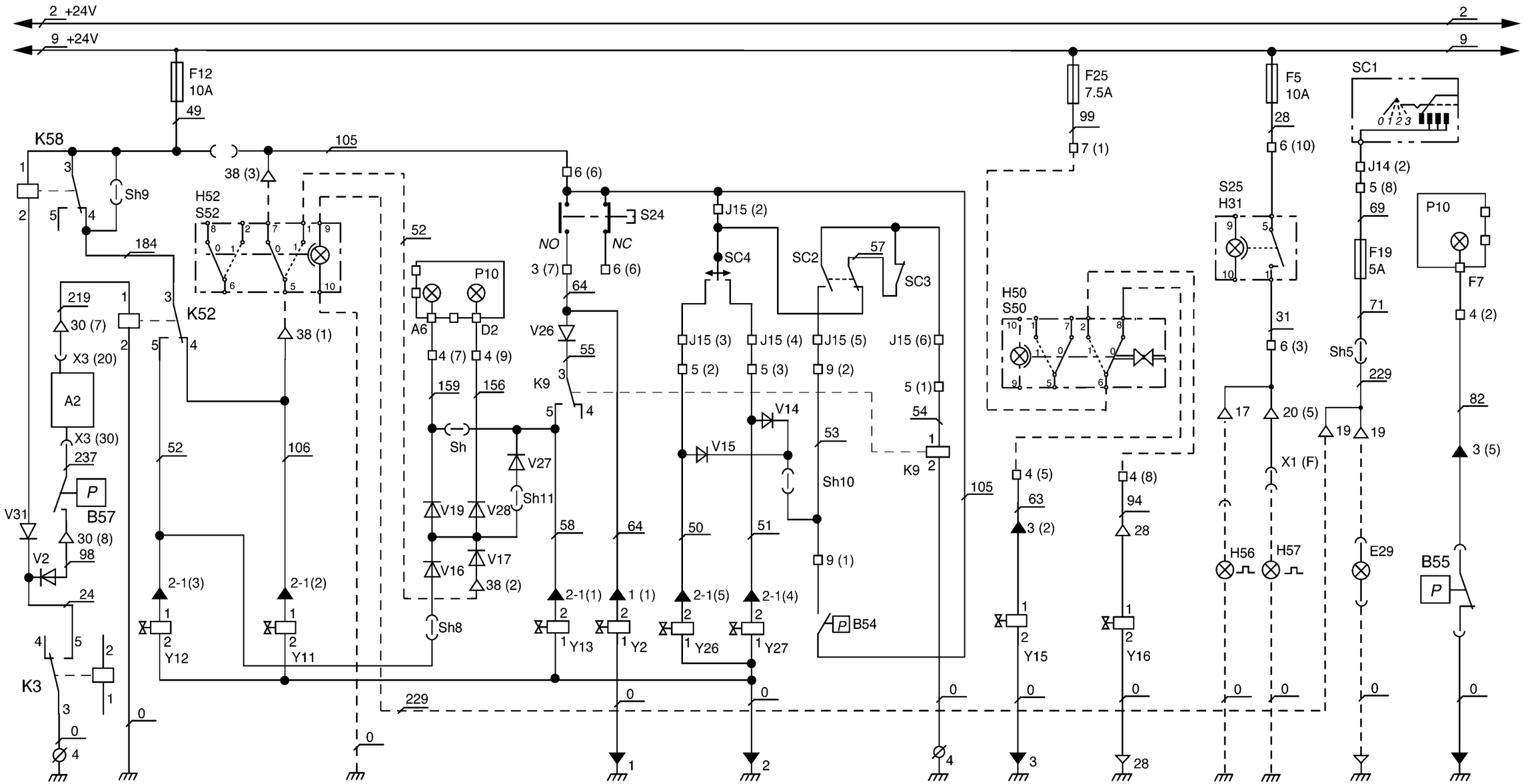
E29 Registration plate lighting (optional)
H56 Upperstructure rotary light (Italy) (optional)
Y2 Pilot safety solenoid valve
Y11 Gear box solenoid valve (first speed)
Y12 Gear box solenoid valve (second speed)
Y13 Front axle unlocking solenoid valve
Y15 Parking brake solenoid valve
Y16 Working brake solenoid valve
Y26 Stabilizer raising solenoid valve
Y27 Stabilizer lowering solenoid valve

CAB

H31 Rotary light switch lighting
H57 Standard or Italian rotary light
P10 Instrument panel
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch
S25 Rotary light switch (optional)
X1 Cab floor/cab connector

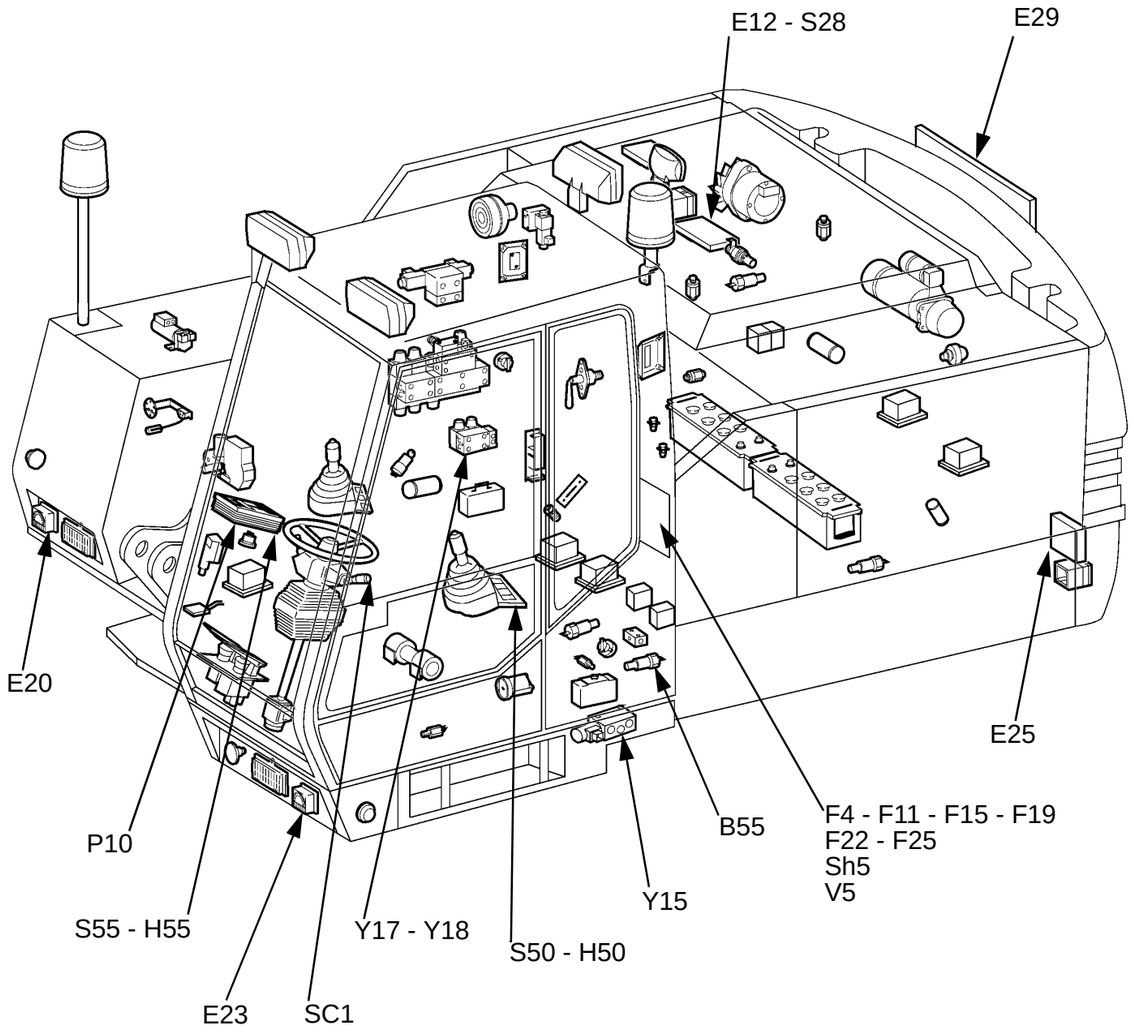
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FIRST SPEED SOLENOID VALVE	SECOND SPEED SOLENOID VALVE	MAIN BEAM POSITION FOR ITALY	AXLE UNLOCKING SOLENOID VALVE	PILOT SAFETY SYSTEM	STABILIZER	AXLE UNLOCKING CONTROL	PARKING BRAKE	WORKING BRAKE FOR ITALY	UPPER-STRUCTURE ROTARY LIGHT FOR ITALY	CAB ROTARY LIGHT	REGISTRA-TION PLATE FOR ITALY	STEERING BRAKE PRESSURE



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ELECTRICAL SCHEMATIC (PLATE 12)

Supplement for Switzerland

ELECTRICAL CABINET

F11 Fuse, 7,5 A, cigarette-lighter, cab blower, batt.+ working brake for Germany
F25 Fuse, 7.5 A, parking brake electro, working brake electro (std/D/I)

CAB

H50 Working brake and parking brake switch lighting (optional)
P10 Instrument panel
S50 Parking brake and working brake switch (optional)

FLOOR

B55 Steering brake pressure switch (optional)

UPPERSTRUCTURE

E20 RH front direction indicator
E23 LH front direction indicator
Y15 Parking brake solenoid valve
Y17 Working brake solenoid valve (Germany) (optional)
Y18 Working brake solenoid valve (Germany) (optional)

Supplement for Belgium

ELECTRICAL CABINET

F15 Fuse, 15 A, general lighting
F19 Fuse, 5 A, LH front/rear sidelight + night lighting
F22 Fuse, 5 A, rear fog light
Sh5 Shunt Night lighting (switch) + P excavator registration plate
V5 Rear fog light diode

CAB

H55 Rear fog light switch lighting
P10 Instrument panel
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch
S55 Rear fog light switch

UPPERSTRUCTURE

E25 Rear fog light
E29 Registration plate lighting (optional)

Supplement for Northern Europe

ELECTRICAL CABINET

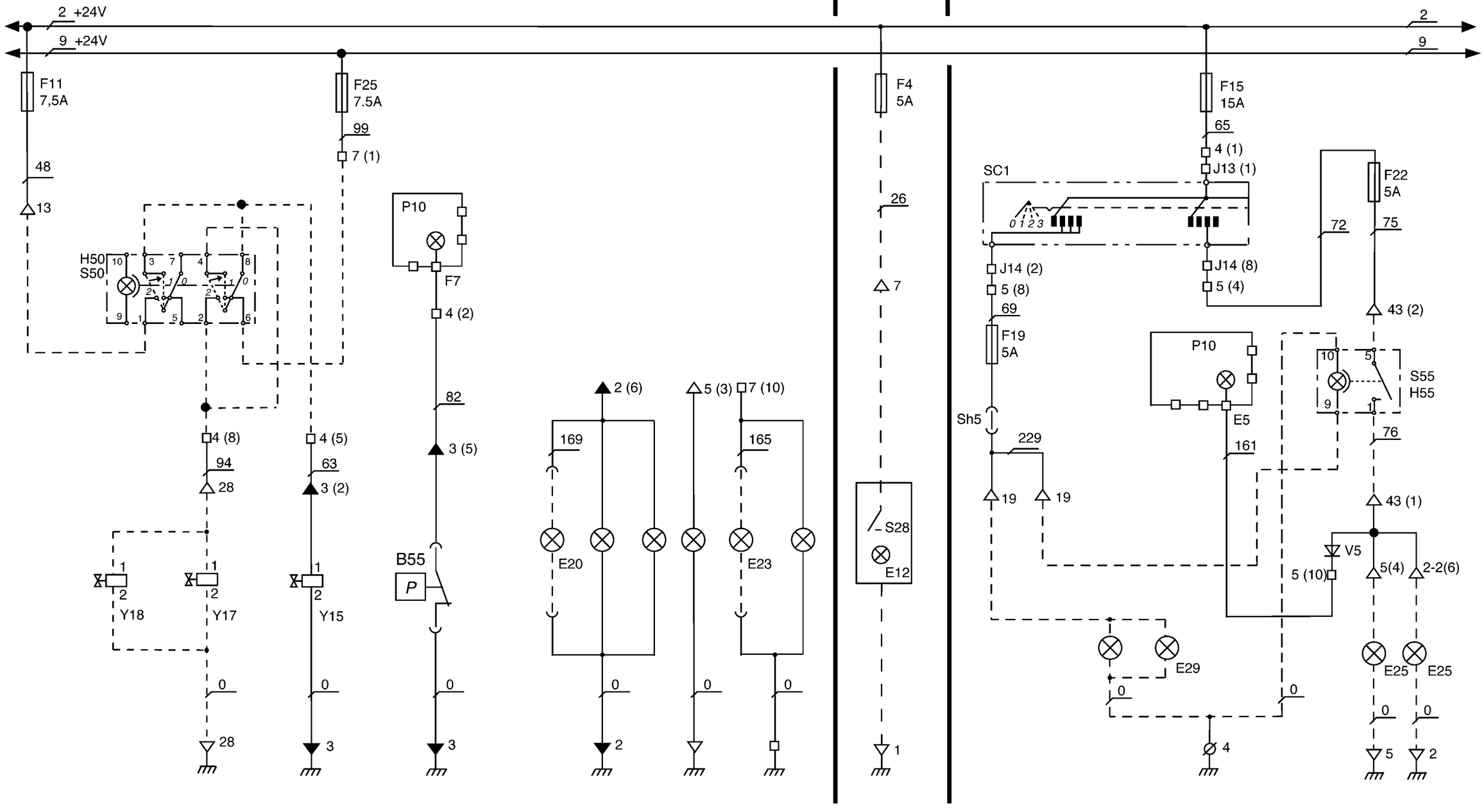
F4 Fuse, 5 A, cab lighting, horn (control), hood lighting

ENGINE

E12 Engine compartment light (optional)
S28 Engine compartment lighting switch (optional)

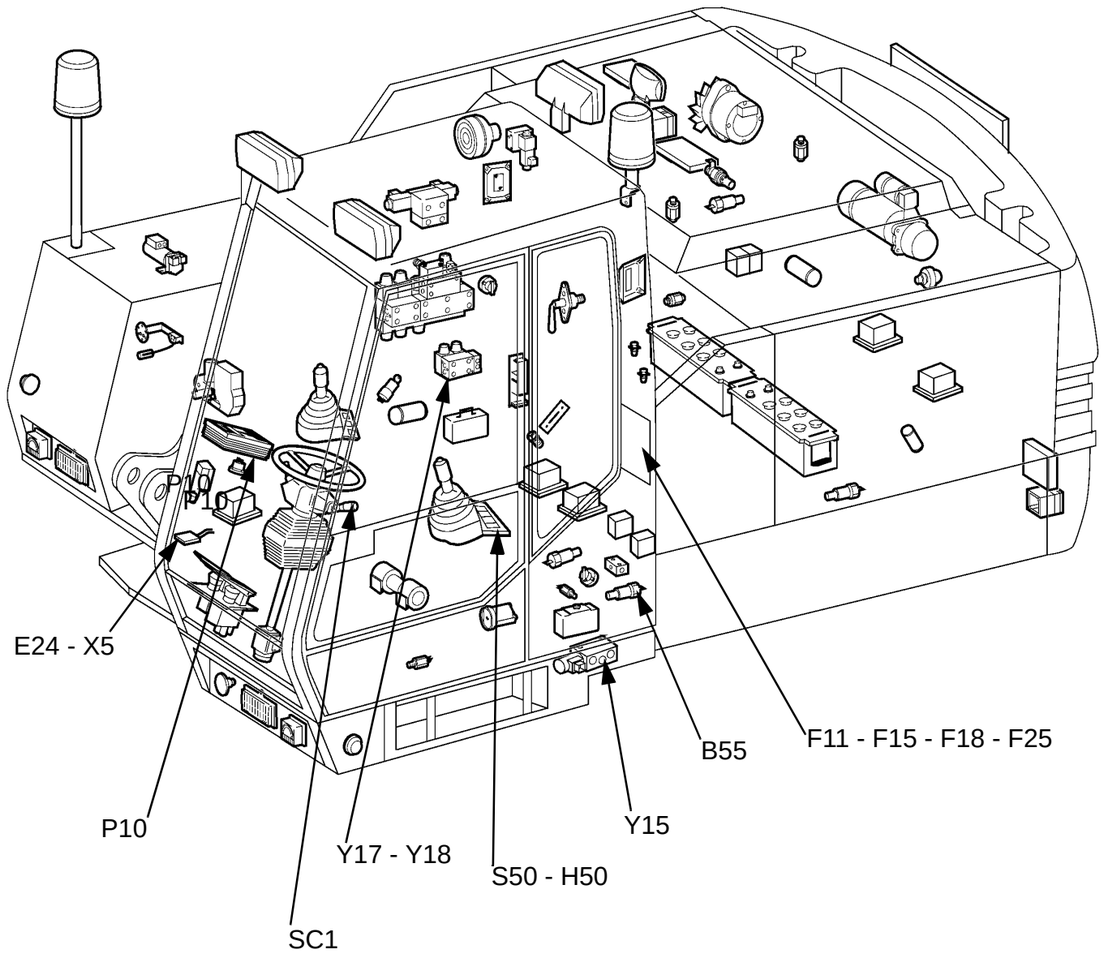
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WORKING BRAKE FOR SWITZERLAND | PARKING BRAKE | STEERING BRAKE PRESSURE | FRONT RIGHT-HAND DIRECTION INDICATOR FOR SWITZERLAND | FRONT LEFT-HAND DIRECTION INDICATOR FOR SWITZERLAND | ENGINE COMPARTMENT LIGHTING FOR NORTHERN EUROPE | REGISTRATION PLATE LIGHTING FOR BELGIUM | REAR FOG LIGHT INDICATOR LAMP FOR BELGIUM | FOG LIGHT FOR BELGIUM



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ELECTRICAL SCHEMATIC (PLATE 13)

Supplement for Germany

ELECTRICAL CABINET

F11 Fuse, 7,5 A, cigarette-lighter, cab blower, batt.+ working brake for Germany
F15 Fuse, 15 A, general lighting
F18 Fuse, 5 A, RH front/rear sidelight, dipper lighting + cassette
F25 Fuse, 7.5 A, parking brake electro, working brake electro (std/D/I)

CAB

H50 Working brake and parking brake switch lighting (optional)
P10 Instrument panel
SC1 Direction indicator combination switch (commodo), main beam and dip switch, side lights and headlight flasher switch
S50 Parking brake and working brake switch (optional)

ON FLOOR

B55 Upperstructure steering brake pressure

SWITCH

E24 Dipper lighting (optional)
X5(A), X5(B) Dipper lighting connector (optional)
Y15 Parking brake solenoid valve
Y17 Working brake solenoid valve (Germany) (optional)
Y18 Working brake solenoid valve (Germany) (optional)

Supplement for Austria

CAB

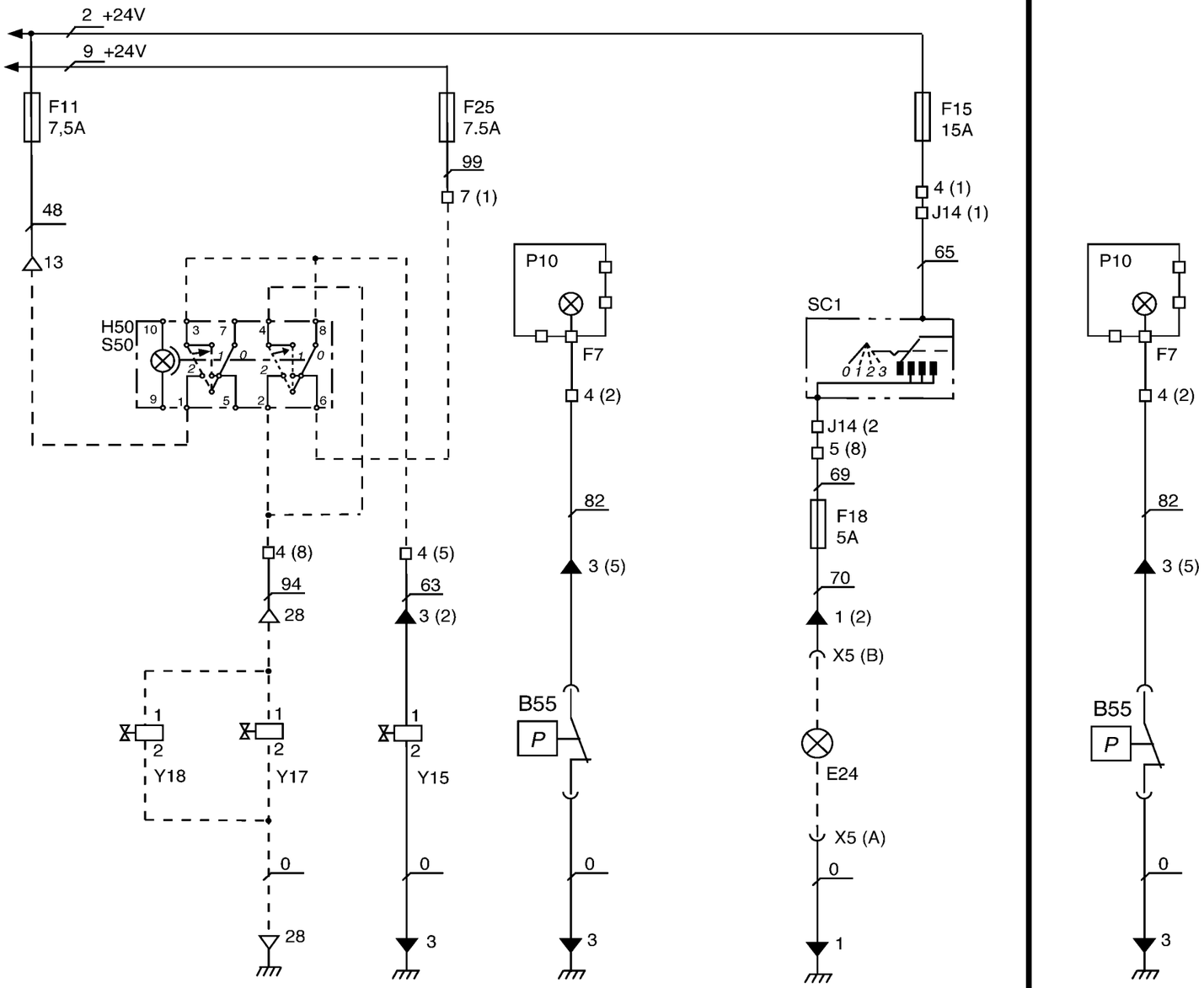
P10 Instrument panel

ON FLOOR

B55 Upperstructure steering brake pressure

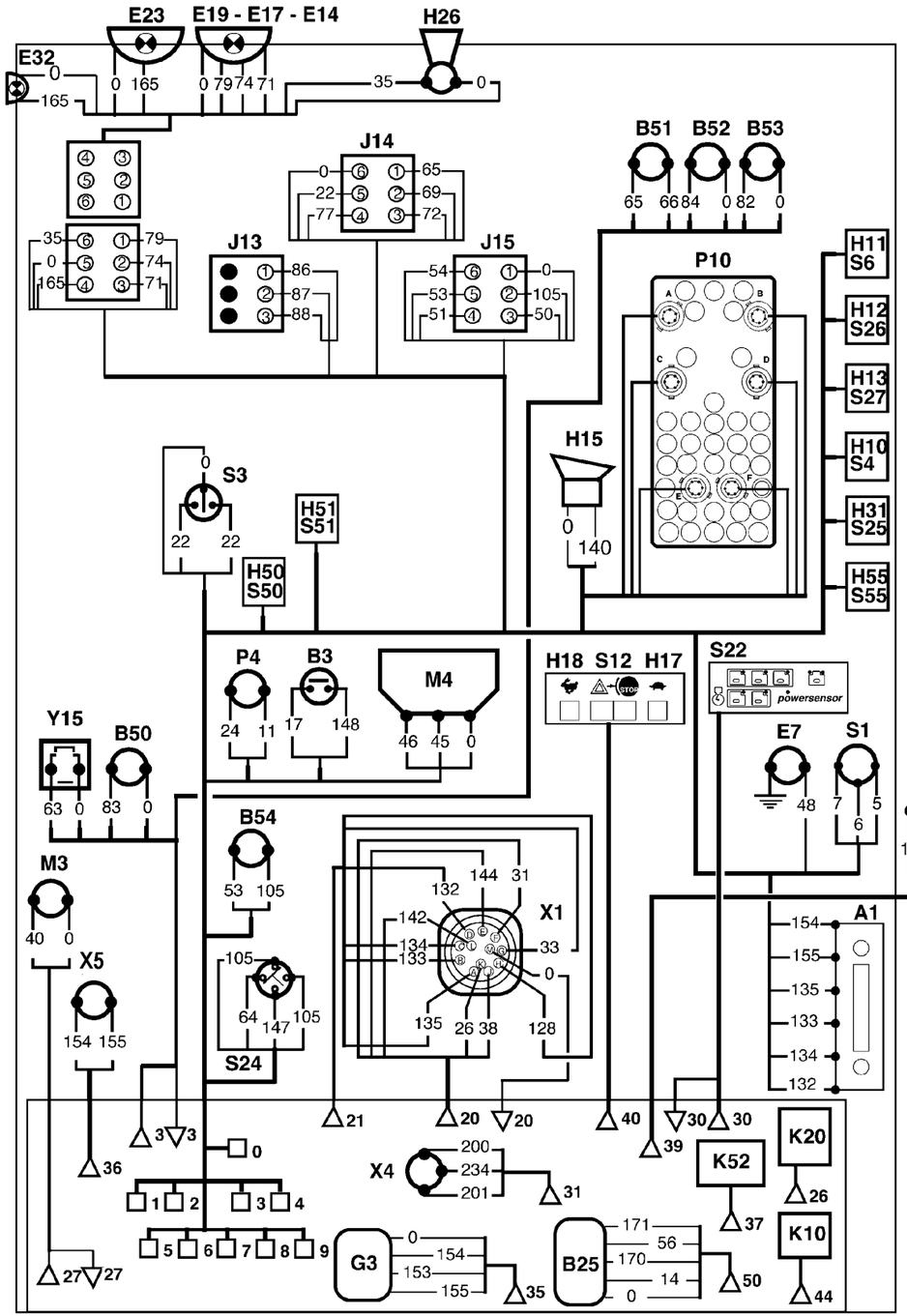
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WORKING BRAKE FOR GERMANY | PARKING BRAKE | STEERING BRAKE PRESSURE | DIPPER LIGHTING FOR GERMANY | STEERING BRAKE PRESSURE FOR AUSTRIA



CM99H012

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CM99J049

CAB FLOOR WIRING (STANDARD)

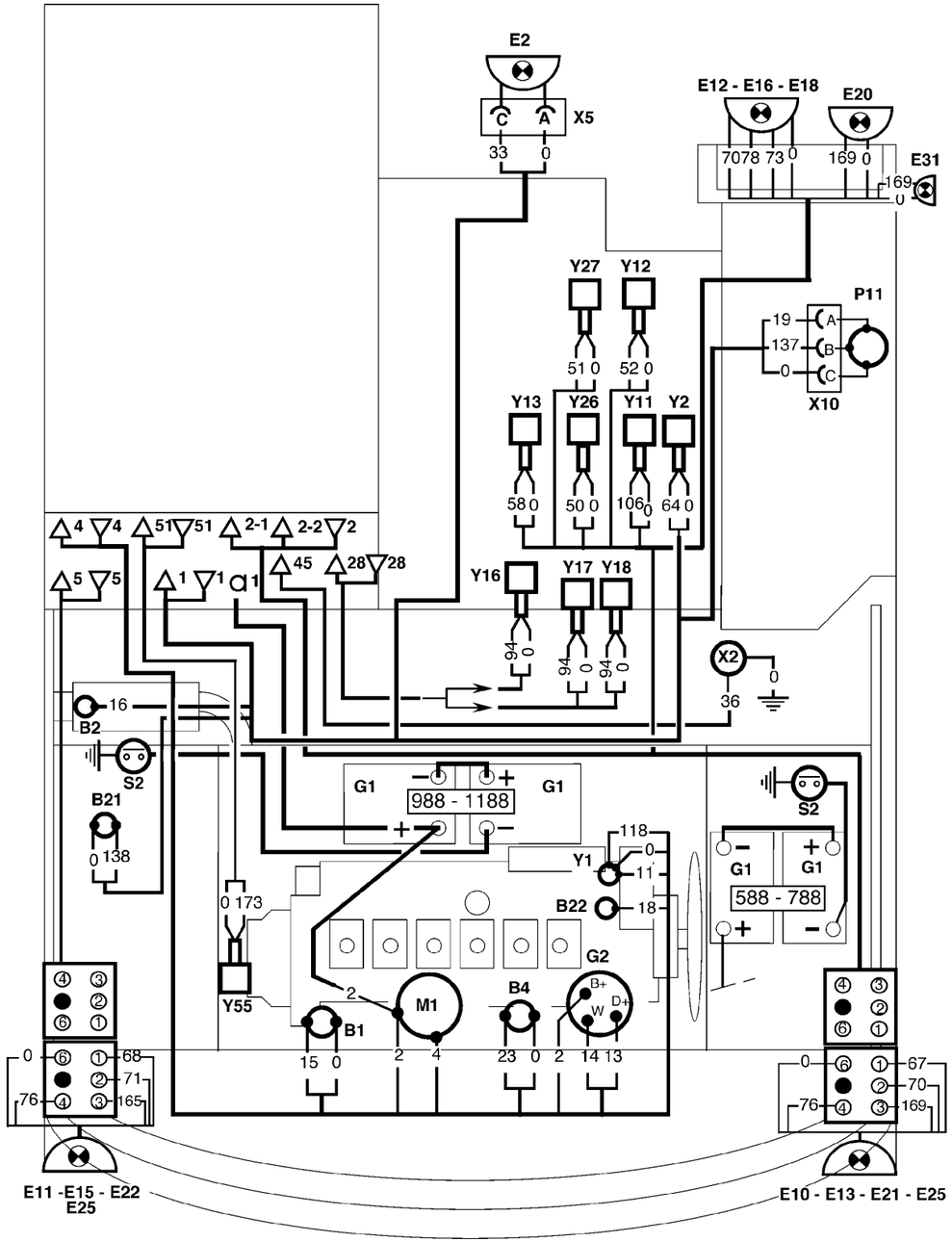
△▽□ See page 4

FLOOR

A1 Radio (optional)
B3 Pilot pressure switch
B12 Brake pressure switch (588)
B25 Threshold detector (788)
B50 Parking brake pressure switch
B51 Brake light pressure switch
B52 Pressure switch for minimum braking pressure
B53 Steering pressure switch
B54 Front axle unlocking pressure switch
E7 Cigarette lighter
E14 Front LH side light
E17 Front LH dipped headlight
E19 LH main beam headlight
E23 LH front direction indicator
E32 LH side-mounted direction indicator
G3 Step-down transformer 24V / 12V
H10 Working brake switch lighting
H11 Windshield wiper switch lighting
H12 Windshield washer switch lighting
H13 Heater blower switch lighting
H15 Instrument panel audible warning
H17 First speed green indicator light (588)
H18 Second speed blue indicator light (588)
H26 Horn
H31 Rotary light switch lighting
H50 Working brake and parking brake switch lighting (optional)
H51 Hazard warning switch lighting
H55 Rear fog light switch lighting
K10 Flasher unit relay
K20 Windshield wiper intermittent action
K52 Speed change relay (except 588)
M3 Windshield washer motor
M4 Heater blower motor
P4 Hourmeter
P10 Instrument panel
S1 Key switch
S3 Horn switch
S4 Working light switch
S6 Windshield wiper switch
S12 Two-speed switch (588)
S22 Control keyboard (788-988-1188)
S24 Pilot safety switch
S25 Rotary light switch (optional)
S26 Windshield washer switch
S27 Heater blower switch
S50 Parking brake and working brake switch (optional)
S51 Hazard warning switch
S55 Rear fog light switch
X4 Troubleshooting test socket (788-988-1188)
X5 12V accessories socket
Y15 Parking brake solenoid valve

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ENGINE MODULE AND UPPERSTRUCTURE WIRING (STANDARD)



CM99K029

△ ▽ ◁ See page 4

UPPERSTRUCTURE

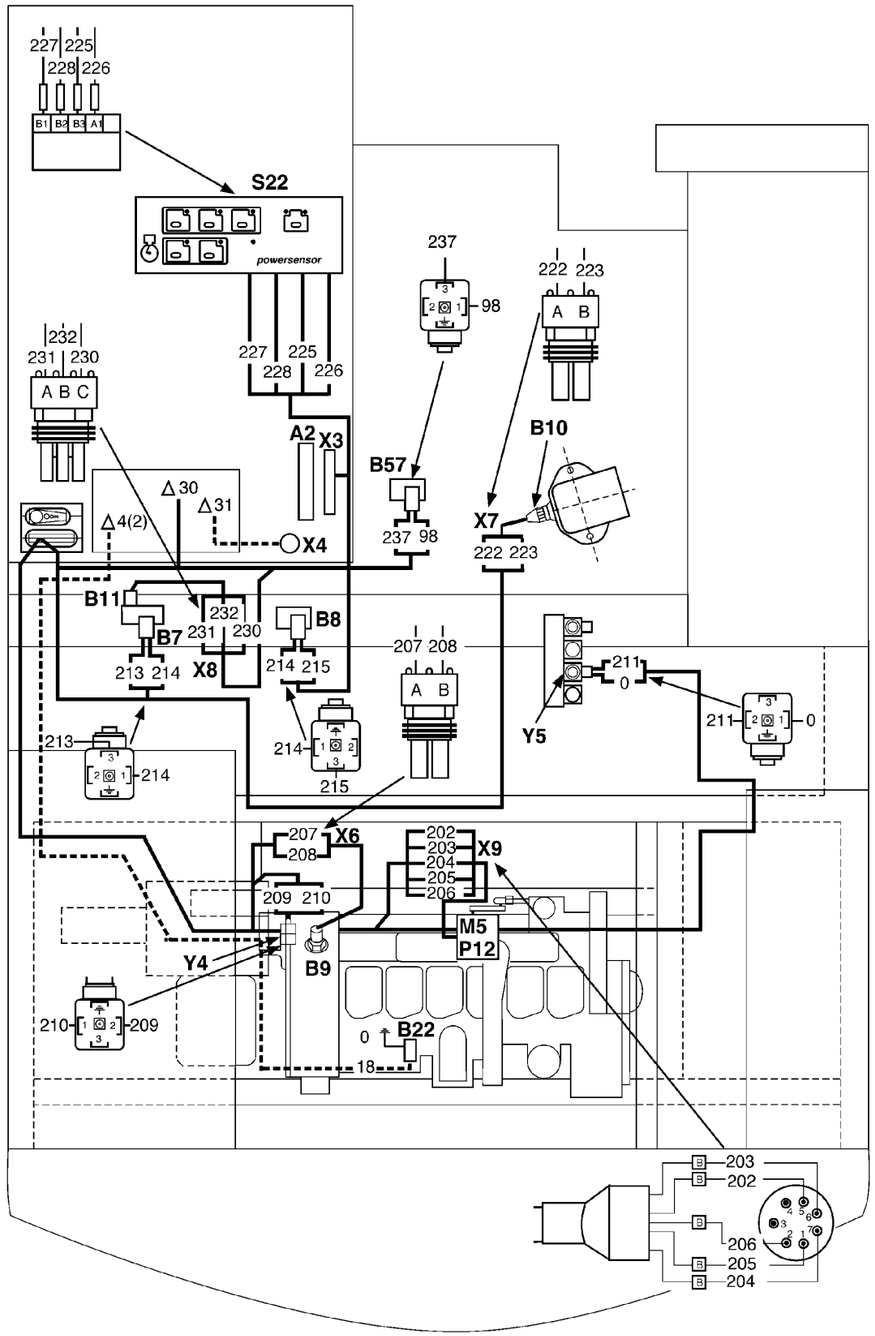
B1 Air filter restriction pressure switch
B2 Hydraulic oil filter restriction pressure switch
B21 Hydraulic oil temperature sender
E2 Attachment working light on boom
E10 RH rear brake light
E11 LH rear brake light
E12 Front RH side light
E13 Rear RH side light
E15 Rear LH side light
E16 Front RH dipped headlight
E18 RH main beam headlight
E20 RH front direction indicator
E21 RH rear direction indicator
E22 LH rear direction indicator
E25 Rear fog light
E31 RH side-mounted direction indicator
G1 Batteries
P11 Fuel level gauge
S2 Battery master switch
X2 Upperstructure power line connection
X5 Attachment working light power connection
X10 Fuel level indicator connector
Y2 Pilot safety solenoid valve
Y11 Gear box solenoid valve (first speed)
Y12 Gear box solenoid valve (second speed)
Y13 Front axle unlocking solenoid valve
Y16 Working brake solenoid valve
Y17 Working brake solenoid valve (Germany) (optional)
Y18 Working brake solenoid valve (Germany) (optional)
Y26 Stabilizer raising solenoid valve
Y27 Stabilizer lowering solenoid valve
Y55 Heavy lift solenoid valve (788)

ENGINE

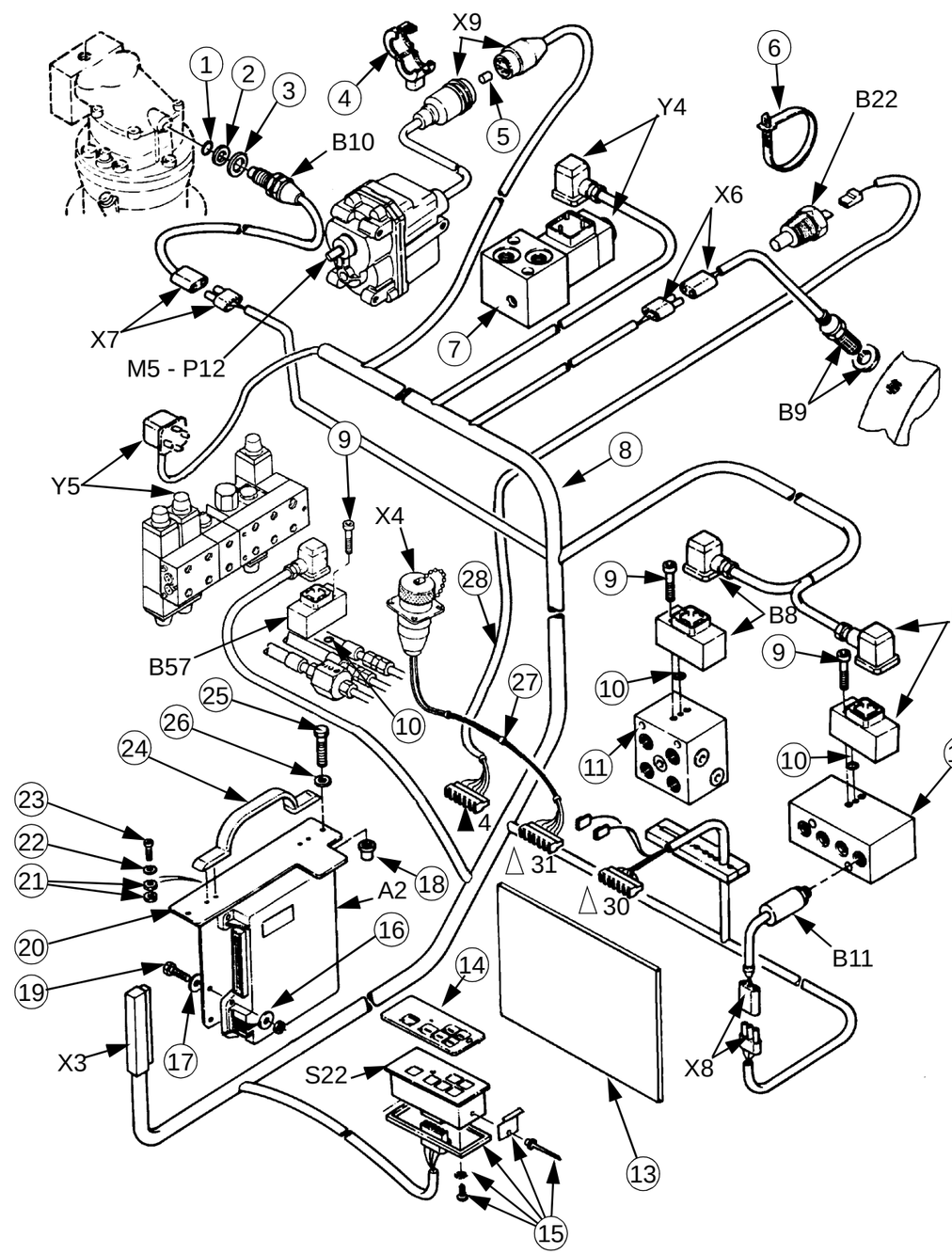
B4 Engine oil pressure switch
B22 Engine coolant temperature sender
G2 Alternator
M1 Starter motor
Y1 Engine shut-down solenoid valve

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ELECTRONIC CIRCUIT WIRING (788P-988P-1188P)



CM99J050



CS99J591

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ELECTRONIC CIRCUIT WIRING (788P-988P-1188P)

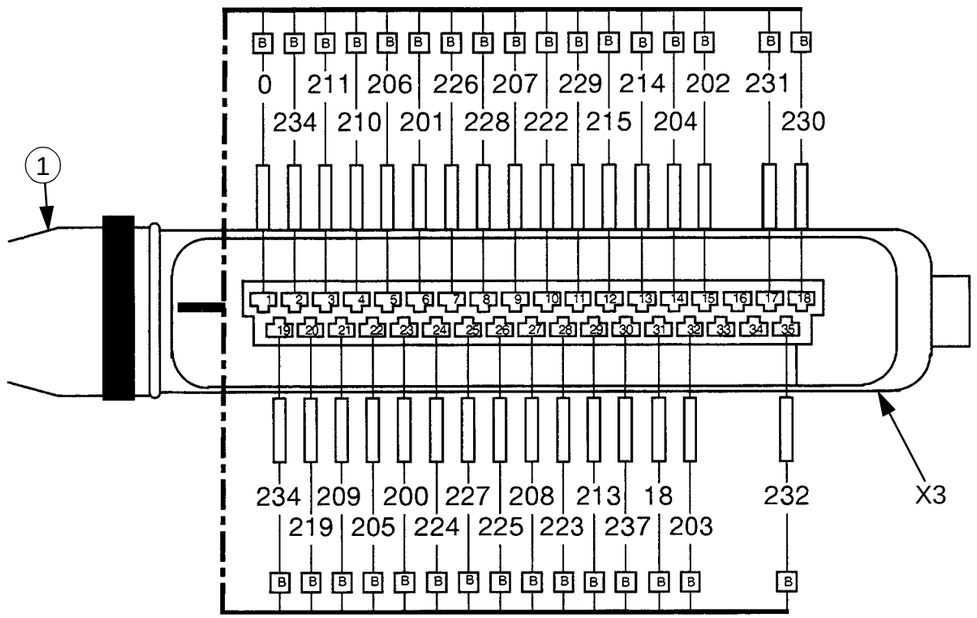
△ See page 4

1 Electrical harness

A2 Electronic control box (788-988-1188)
B7 Swing detection pressure switch
B8 Travel detector pressure switch
B9 Engine speed detector (788-988-1188)
B10 Swing motor speed detector
B11 Hydraulic pressure sender (788-988-1188)
B22 Engine coolant temperature sender
B57 Speed change pressure switch
M5 Injection pump servo-motor (788-988-1188)
P12 Servo-motor potentiometer (788-988-1188)
S22 Control keyboard (788-988-1188)
X3 35-way connector (788-988-1188)
X4 Troubleshooting test socket (788-988-1188)
X6 Engine speed detector connector (788-988-1188)
X7 Upperstructure swing speed detector connector
X8 Hydraulic pressure sender connector (788-988-1188)
X9 Injection pump servo-motor connector (788-988-1188)
Y4 DRE4 proportional pressure reduction valve
Y5 Upperstructure brake release control solenoid valve

1 O-ring
2 Ring
3 Washer
4 Lock
5 Plug
6 Clamp
7 Pressure reduction valve
8 Electronic harness
9 Screw
10 O-ring
11 Travel block
12 Swing block
13 Printed circuit card
14 Decal
15 Control panel fixing hardware
16 Nut
17 Washer
18 Rivet
19 Screw
20 Bracket
21 Nuts
22 Washer
23 Screw
24 Handle
25 Screw
26 Washer
27 Troubleshooting socket harness
28 Engine harness

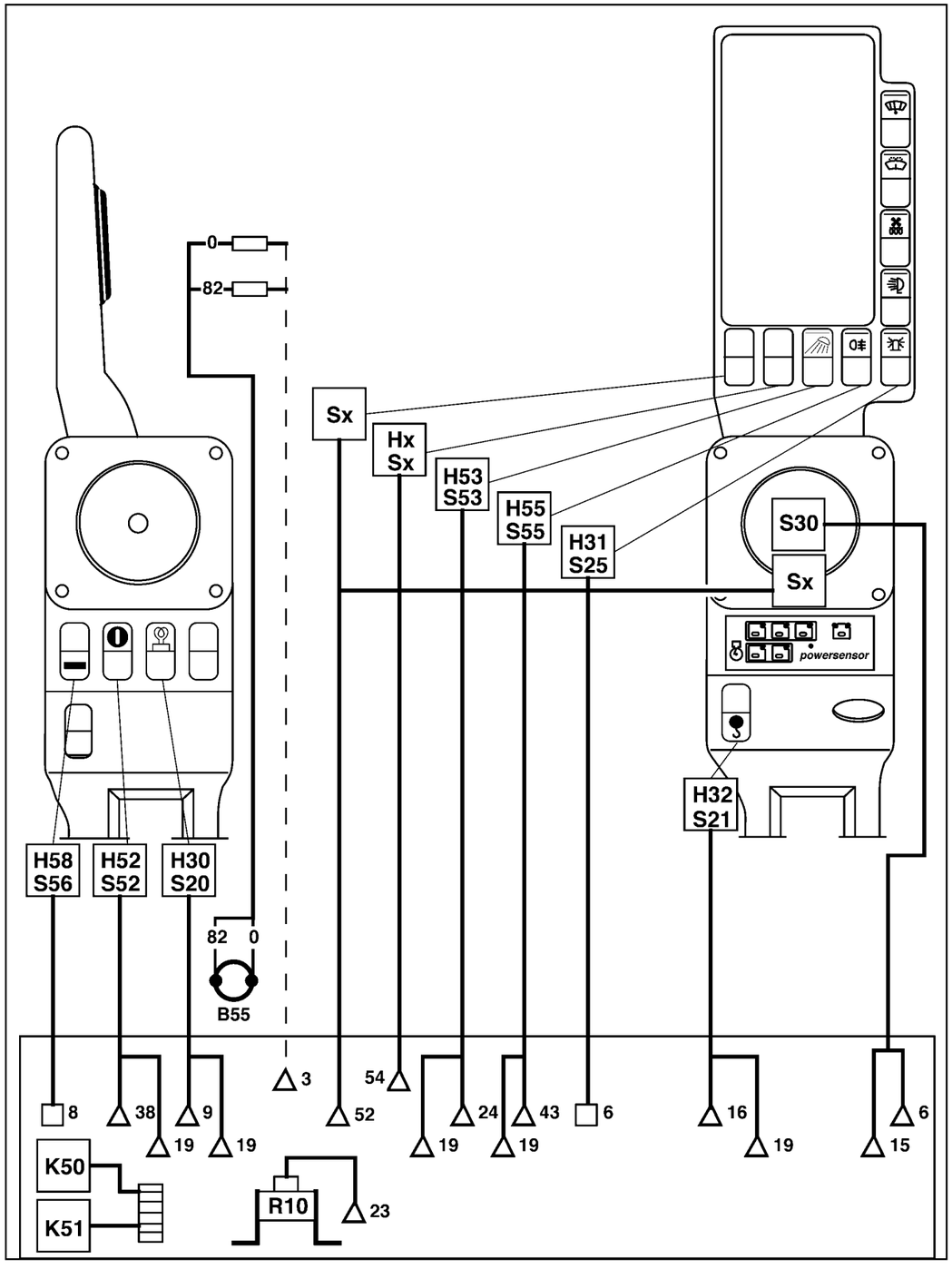
DETAILS OF 35 PIN CONNECTOR X3 EXCAVATORS 788P/988P/1188P



CS99K546

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CAB FLOOR WIRING (OPTIONAL)



CM99J051

ELECTRICAL CABINET

1 Connecting strip

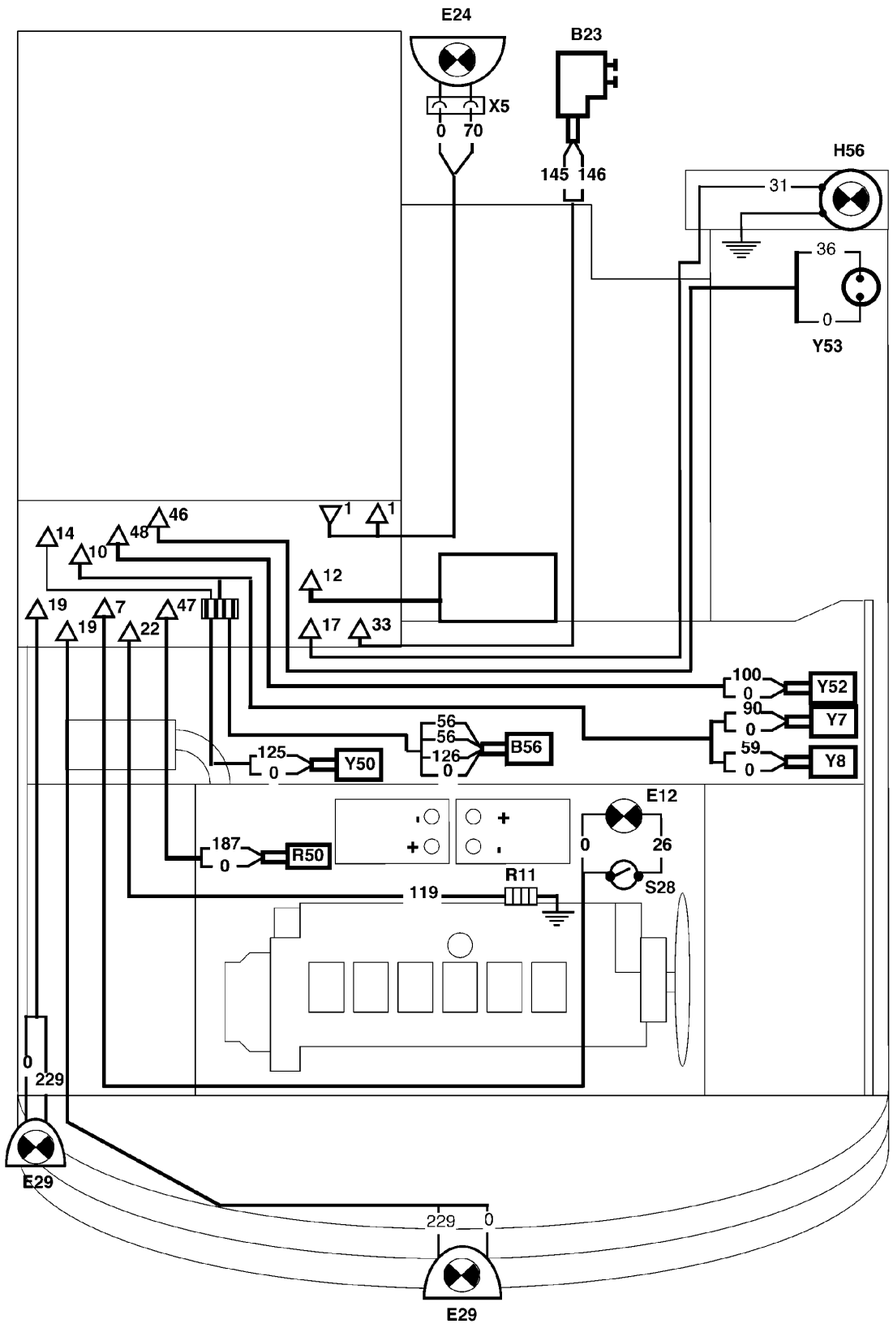
△▽□ See page 6

INSTRUMENT PANEL

B55 Steering brake pressure switch (optional)
H30 Cold start assistance switch lighting (optional)
H32 Overload indicator switch lighting (optional)
H52 Pilot system cancellation switch lighting (optional)
H53 Cab front working light switch lighting (optional)
H58 Quick coupler switch lighting (optional)
K50 Adjustable boom raising limiter relay (optional)
K51 Adjustable boom retracting limitation relay (optional)
R10 Resistor, 0.85 Ohms
S20 Cold start assistance switch (optional)
S21 Overload indicator switch (optional)
S30 Adjustable or articulated boom control switch (optional)
S52 Pilot system cancellation switch (optional)
S53 Cab front working light switch (optional)
S56 Quick coupler switch (optional)

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ENGINE MODULE AND UPPERSTRUCTURE WIRING (OPTIONAL)



CM99K030

ELECTRICAL CABINET

1 Connecting strip
2 Air conditioner

△▽ See page 6

UPPERSTRUCTURE

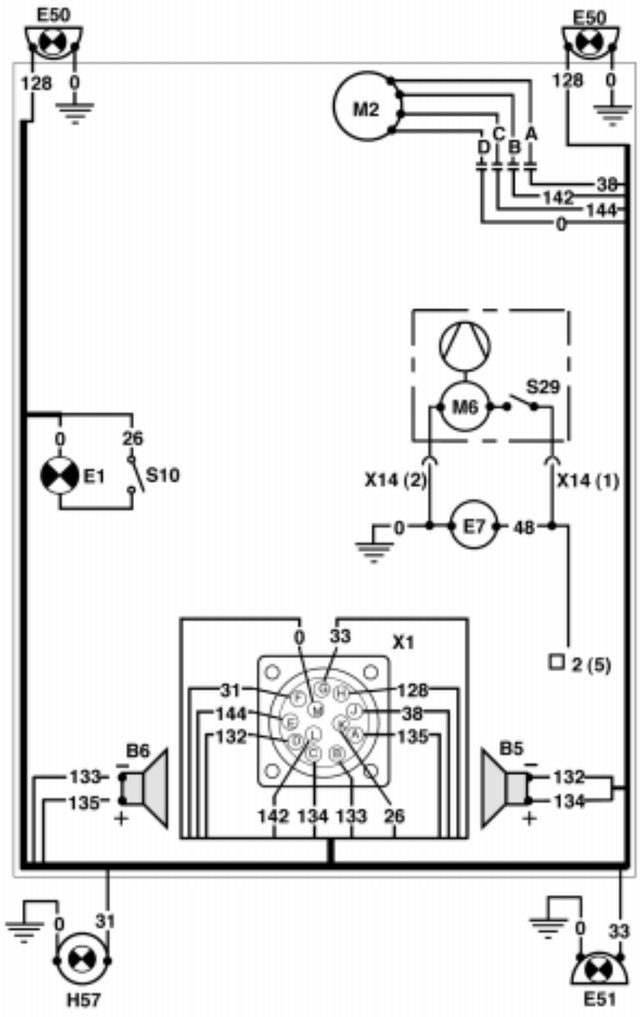
B23 Overload indicator (optional)
B56 Boom raising range limitation detector (optional)
E24 Dipper lighting (optional)
E29 Registration plate lighting (optional)
H56 Upperstructure rotary light (Italy) (optional)
R50 Fuel heater (optional)
X5 Dipper lighting connector (optional)
Y7 Adjustable or articulated boom extending electro-valve (optional)
Y8 Adjustable or articulated boom retracting electro-valve (optional)
Y50 Adjustable boom raising height limiter solenoid valve (optional)
Y52 Quick coupler solenoid valve (optional)
Y53 Fuel filler pump (optional)

ENGINE

E12 Engine compartment light
R11 Cold start assistance plug (optional)
S28 Engine compartment lighting switch (optional)

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CAB AND CAB OPTION WIRING



CM99J052

A White wire
B Grey wire
C Blue wire
D Black wire
B5 RH loudspeaker (optional)
B6 LH loudspeaker (optional)
E1 Cab lighting
E7 Cigarette lighter
E50 Cab front working lights
E51 Cab rear working light
H57 Standard or Italian rotary light
M2 Windshield wiper motor
M6 Cab blower motor (optional)
S10 Cab lighting switch
S29 Cab blower switch (optional)

X1 (A) (B) (C) (D) Cab floor/cab LH and RH loudspeaker connector
X1 (H) (G) Cab floor/cab front and rear working lights connector (optional)
X1 (E) (J) (M) (L) Cab floor/cab windshield wiper motor connector
X1 (F) Cab floor/cab rotary light connector (specific to certain countries)
X1 (K) Cab floor/cab interior lighting connector
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Section

4002

ELECTRONIC AND TROUBLESHOOTING SYSTEM

Crawler excavators

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This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.



Turn the battery master switch to the "Off" position before carrying out any service work on the circuit.

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TOOLS REQUIRED



PD00012

1. *PHOTO-DIGITAL TACHOMETER CAS 10449*
2. *AEROSOL M1703414*
   (For cleaning and de-oxidation of electrical contacts)

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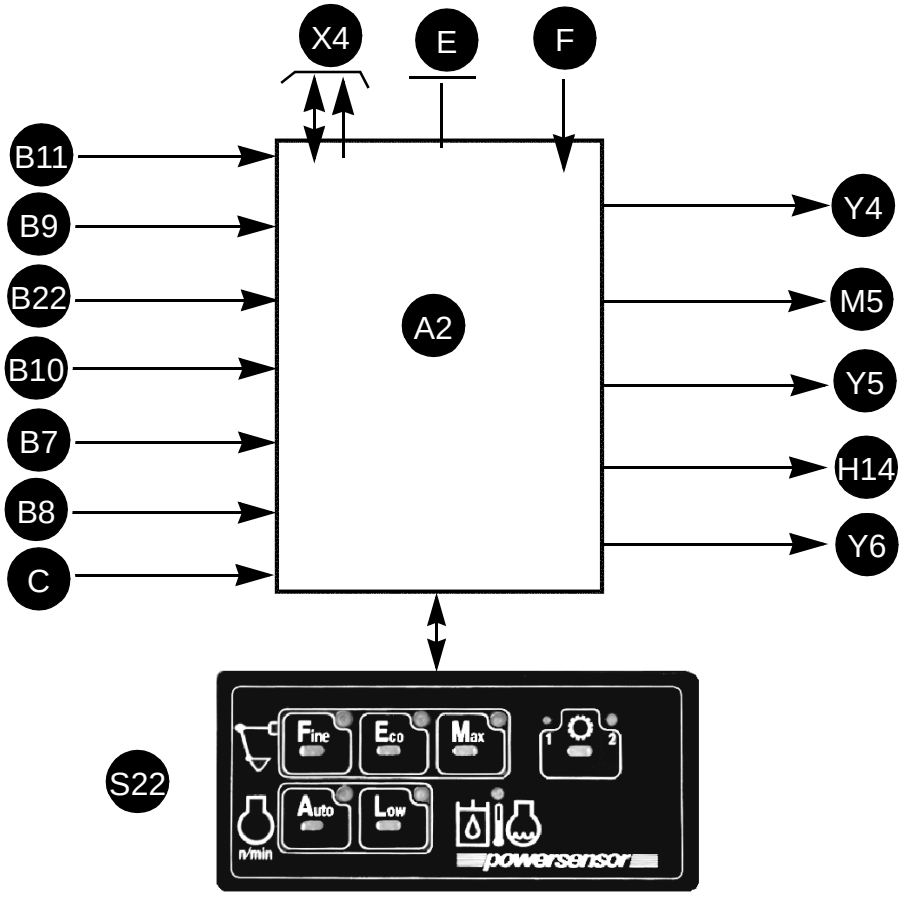
ELECTRONIC SYSTEM

General

Some of the machine’s functions are managed and checked electronically. The functions concerned are as follows:

- Cold start assistance.
- Electric acceleration.
- Automatic return to idle.
- Engine overheating safety system.
- Engine / hydraulic system power regulation: "Speed sensing".
- Swing braking and brake release.
- Automatic travel sequencing (Two-speed excavators only).
- Electronic system diagnosis.

Components connected to electronic system

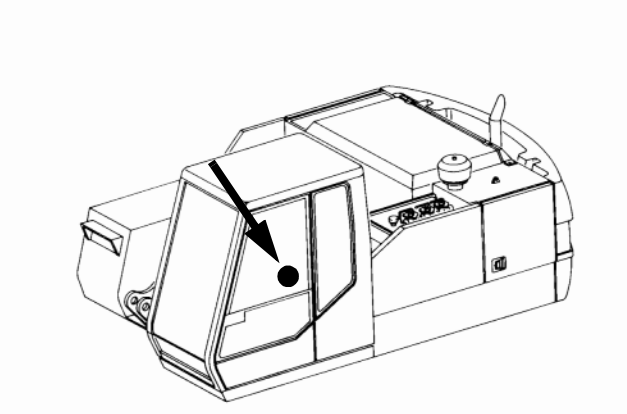


A2 Electronic control box
B7 Swing detector pressure switch
B8 Travel detector pressure switch
B9 Engine speed detector
B10 Swing motor speed detector
B11 Hydraulic pressure detector
B22 Engine coolant temperature sender
H14 Correct operation indicator light (LED)
M5 Injection pump servo-motor
S22 Control keyboard
X4 Diagnostic socket
Y4 Proportional pressure reduction valve DRE4
Y5 Upperstructure brake release electro-control valve
Y6 Travel motor displacement change electro-control valve (two-speed excavators only)
C Lighting 28 volts
E Earth
F 28 volt battery

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Location of components on the excavator

(A2) Electronic control box



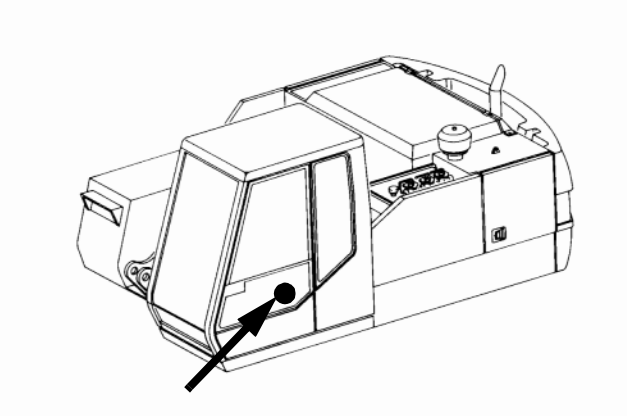
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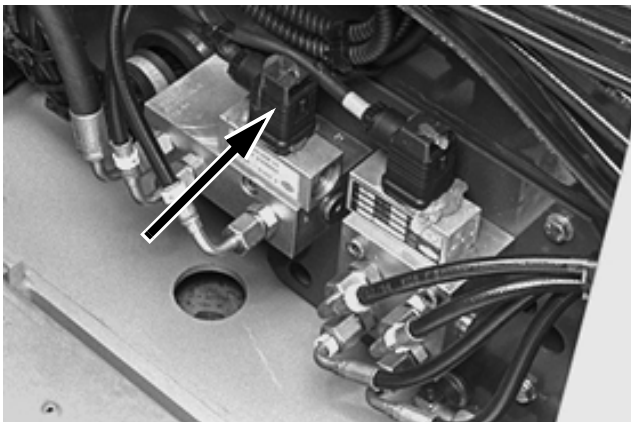
PE09306

Located to the right of the operator's seat, it contains the electronic card through which all information passes. The card is connected to the other components by means of a 35-pin connector.

(B7) Swing detection pressure switch



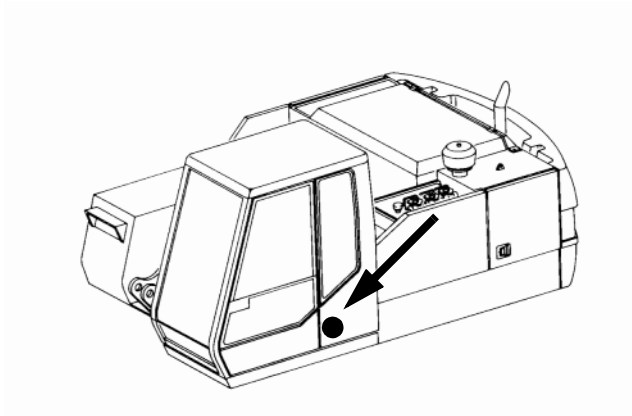
PDH0472



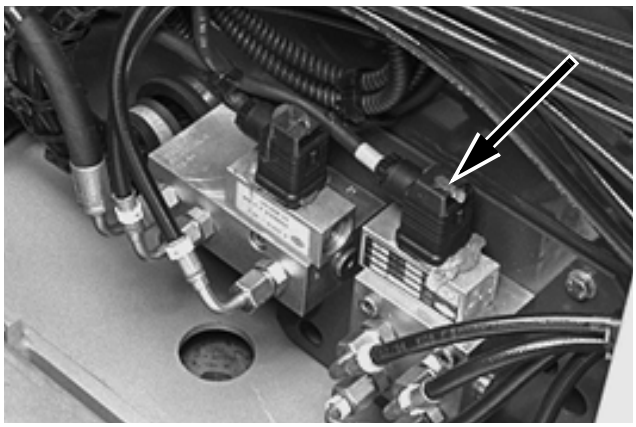
PDH08504

Located on the rear panel of the cab floor, it closes at about 6 bar (RH or LH swing pilot pressure).

(B8) Travel detector pressure switch



PDH0472

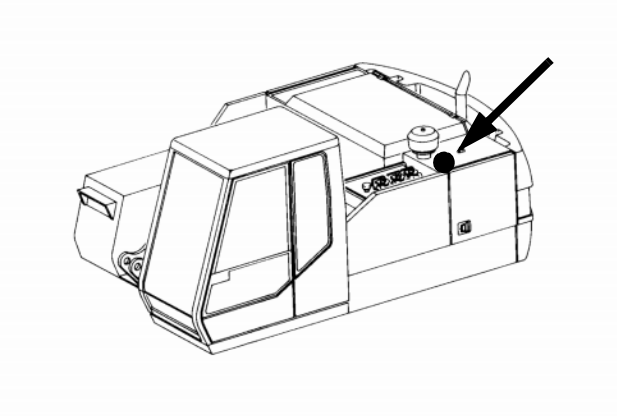


PH08504

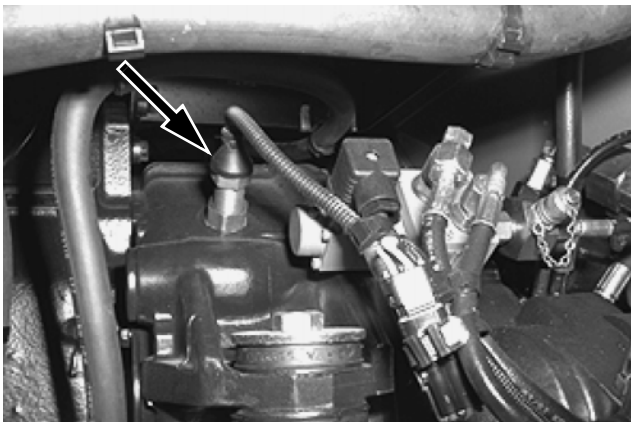
Located on the rear panel of the cab floor, it closes at about 6 bar (travel brake release pilot pressure).

https://truckmanualshub.com/

(B9) Engine speed detector



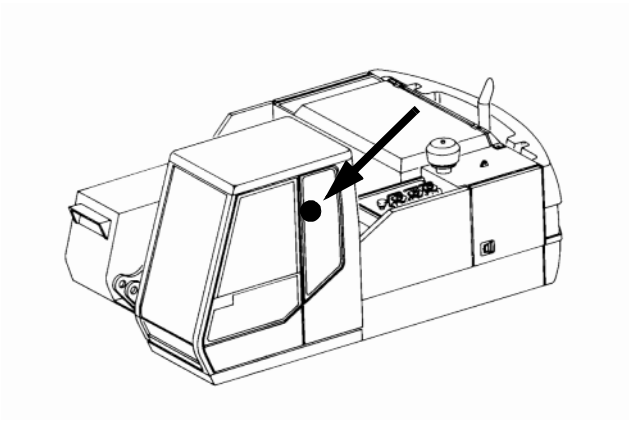
PDH0472



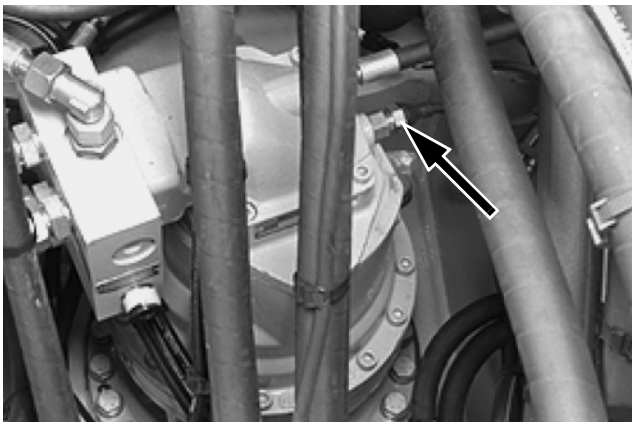
PH00918

Mounted in line with the starter ring teeth, it delivers a signal with a frequency corresponding to the time interval between the passage of two consecutive teeth.

(B10) Swing motor speed detector



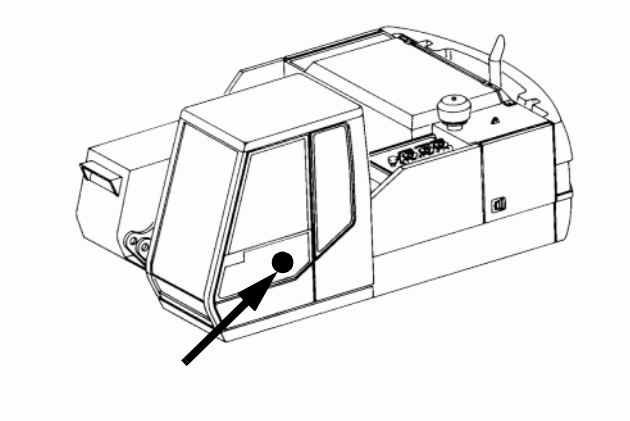
PDH0472



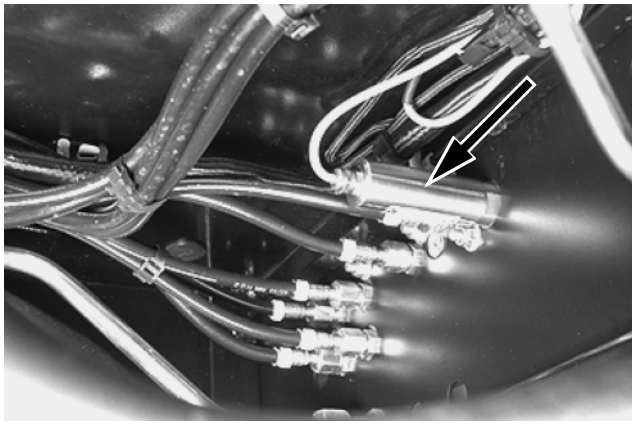
PH01002

Located behind the hydraulic motor housing and opposite a sprocket, it delivers a signal with a frequency corresponding to the passage of two consecutive teeth.

(B11) Hydraulic pressure sender



PDH0472

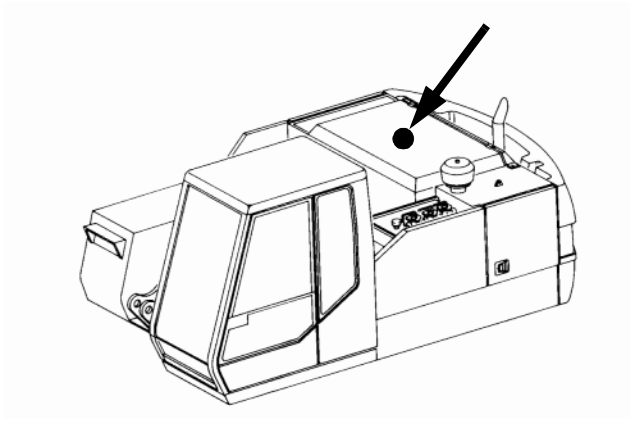


PH01034

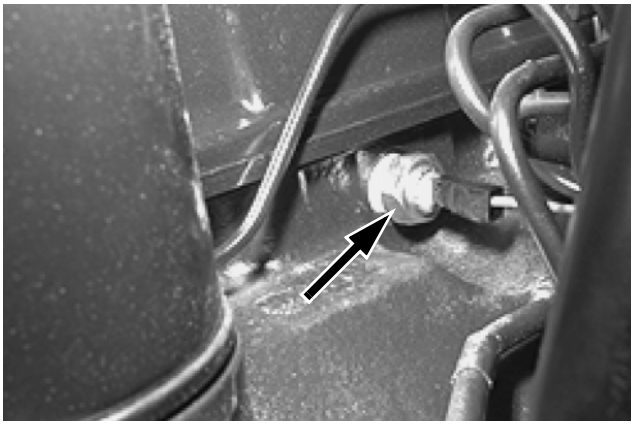
Located under the cab floor, it measures the highest pressure (Load-Sensing) in the excavator attachment and travel hydraulic systems.

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(B22) Engine coolant temperature sender



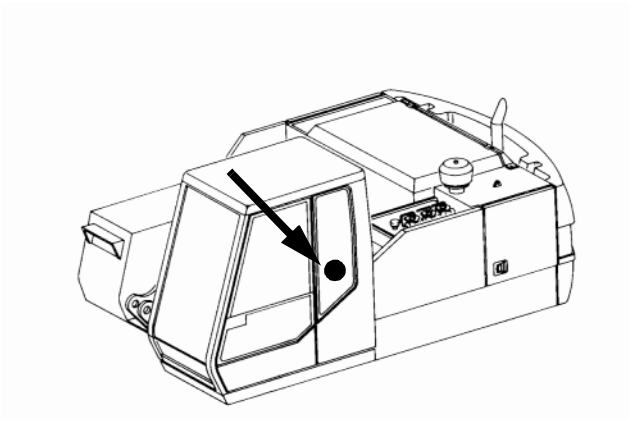
PDH0472



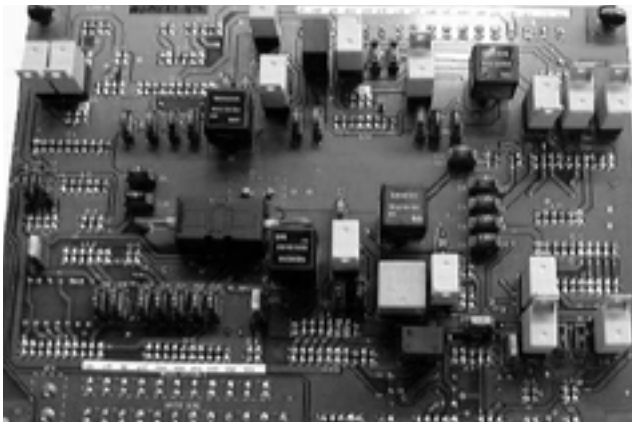
PH00917

Mounted on the engine block, it delivers a pressure of between 0 and 28 volts. It is the ratio between this voltage and the battery voltage which is used for information processing purposes

(H14) Led diagnostic (LED)



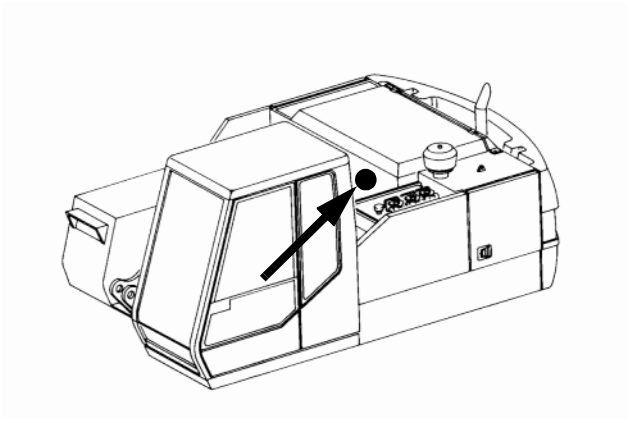
PDH0472



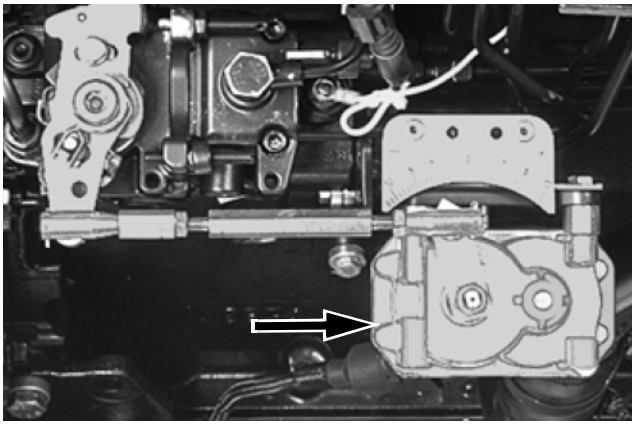
CD99J017

This consists of a red warning lamp (Light-Emitting Diode) mounted on the printed circuit board. This indicator lamp is continuously "on" when the circuit is trouble-free. It starts to flash on and off if one or more defects occur in the system. Such defects can be identified by means of a lighting code system (See page 10).

(M5) Servo-motor (injection pump lever control)



PDH0472

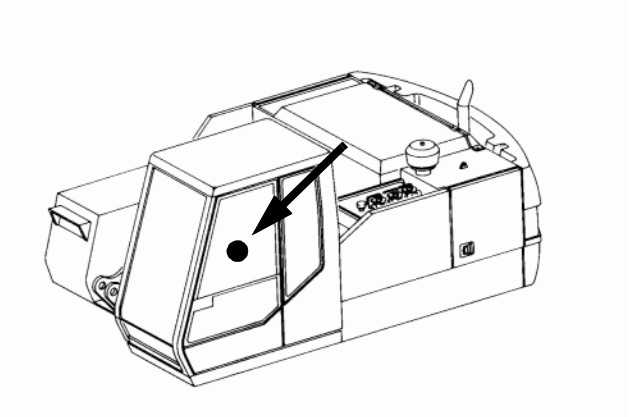


PH08508

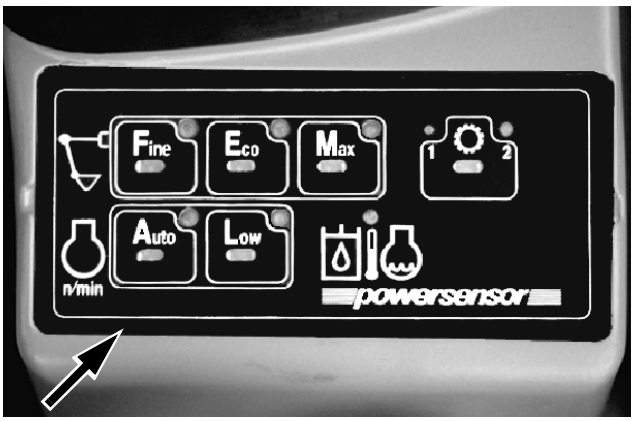
Mounted on the engine, it control the injection pump lever.

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(S22) Control panel



PDH0472



PH07328

Located near the right-hand control lever, it has a front face covered with a silk-screened plastic film, an electronic circuit board with six momentary-action push-buttons, eight LED type indicator lamps, electronic components and a connector.

The functions of the control panel can be classified under four modes:

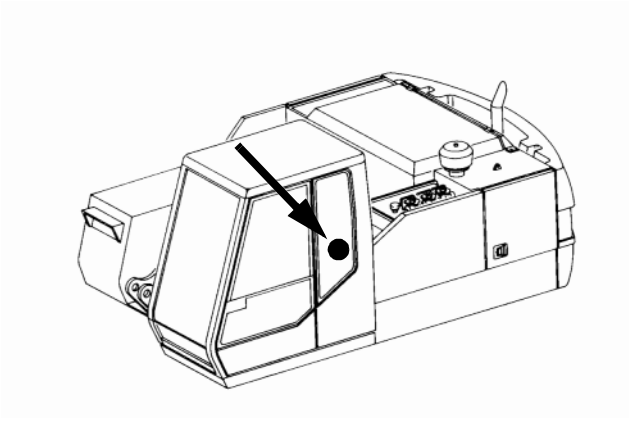
- The "Work" mode, consisting of the following push-buttons: "FINE" 1580 to 1620 rpm (low flow work, handling), "ECO" 1880 to 1920 rpm (economical, digging) and "MAX" 2180 to 2220 rpm (maximum power, hard work).

- The "Idle" mode consisting of the following push-buttons: "LOW" 900 to 1000 rpm (low idle) and "AUTO" 1180 to 1220 rpm (automatic idle).

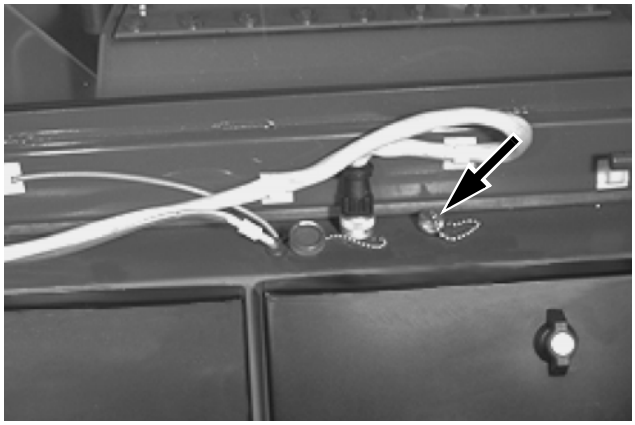
- The "Travel" mode (two-speed excavators only) has two indicator lamps: "POSITION 1" (low speed) and "POSITION 2" (high speed).

- The "Pre-heat" mode has an indicator lamp: a flashing lamp shows the machine has not yet reached its normal operating temperature. When that lamp goes out the machine is ready to work.

(X4) Troubleshooting test socket



PDH0472

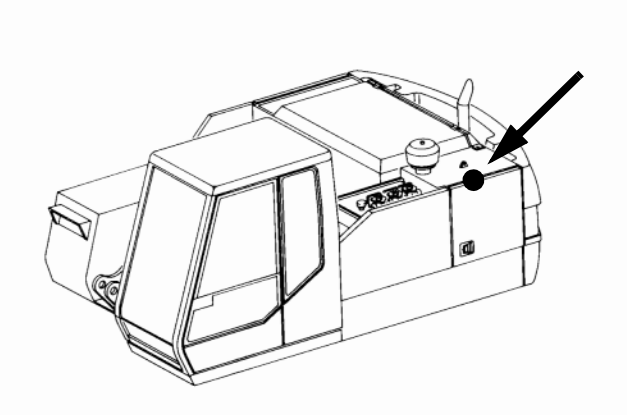


PH010834D

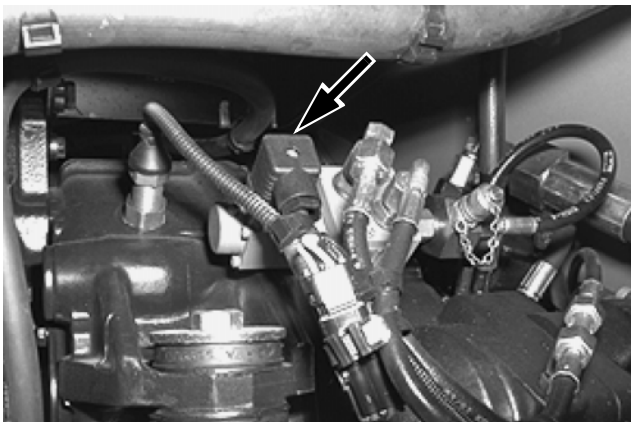
Located in the cab, behind the seat, it is protected by a trim panel. It is for use connected to a dialogue console which can perform in-depth diagnosis of the machine and which is also used for reading and modifying the "excavator parameters".

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(Y4) Proportional pressure reduction valve DRE4



PDH0472

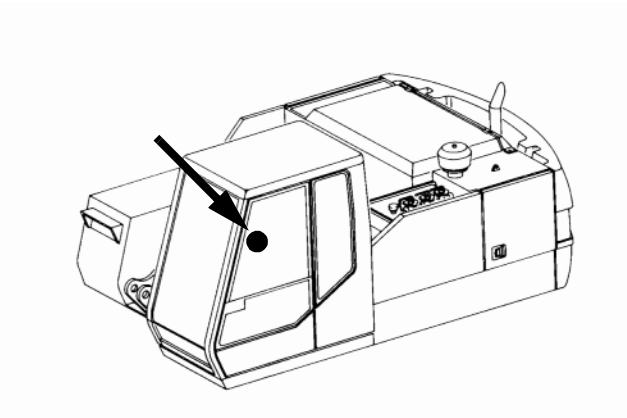


PH00918

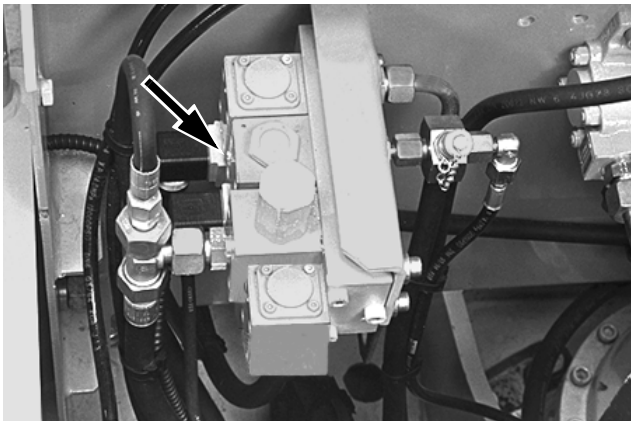
Mounted on the main pump, it delivers an output pressure which is proportional to the current passing through it, thus enabling a check to be made of the variable flow pump hydraulic torque.

NOTE: *The photo shows the DRE4 reduction valve on the 988 excavator. On the 788 the DRE4 reduction valve is identical, but is mounted in a different manner.*

(Y5) Upperstructure brake release control solenoid valve



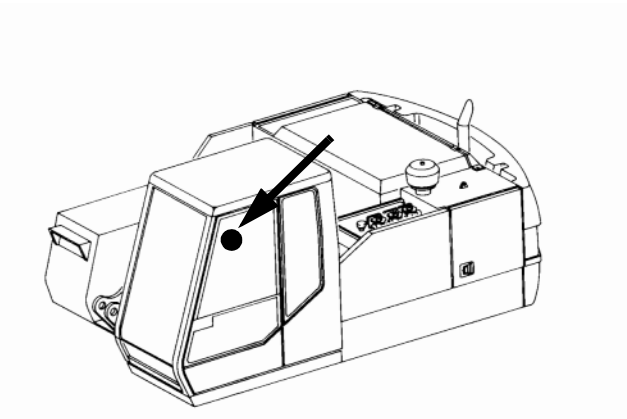
PDH0472



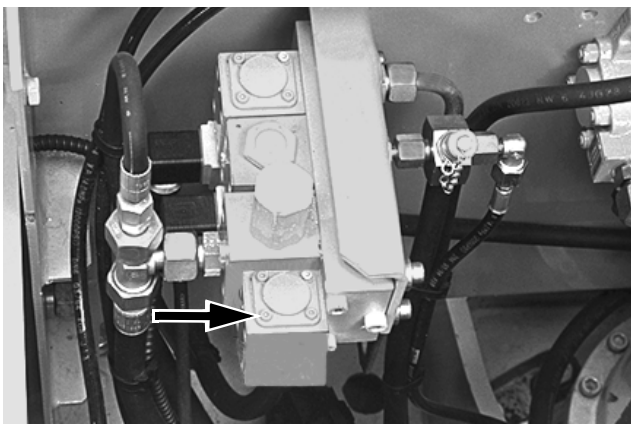
PH08422

Located behind the cab on the valve bank partition, it is actuated to release the upperstructure brake. It brakes the upperstructure when not actuated.

(Y6) Travel motor displacement change electro-control valve (Two-speed excavators only)



PDH0472



PH08524

Located behind the cab on the valve bank partition, it selects high speed (low displacement) when it is actuated, or low speed (high displacement) when it is not actuated.

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ELECTRONIC SYSTEM DIAGNOSIS

Diagnosis without console

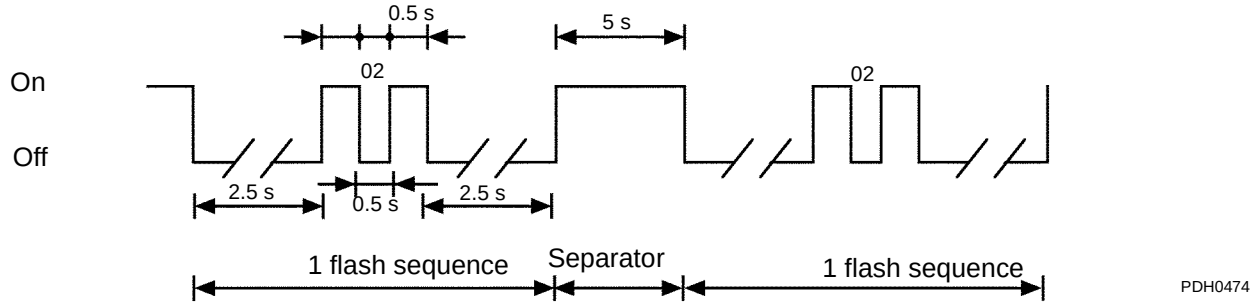
General

The machine is equipped with an integrated diagnostic system which is designed to locate problems which may occur in the system. Such defects are displayed by means of an indicator lamp (LED) inserted in the printed circuit located in the cab behind the operator's seat This indicator lamp (LED) is on continuously when the system is fault-free. It starts to flash when one or more defects appear.

The defect signalling code is as follows:

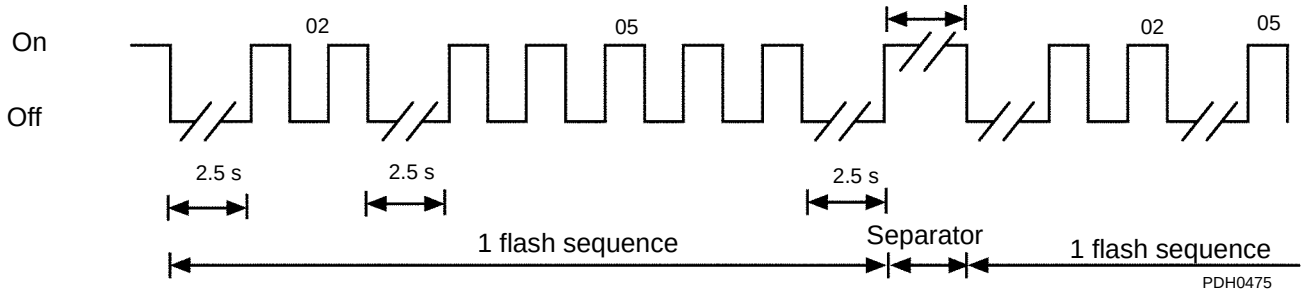
The indicator lamp lights up for half a second, then goes out for half a second, a number of times equal to the code. At the end of the cycle the indicator lamp lights up for 5 seconds, the cycle starts again.

Example: 1 defect to be displayed:
- Servo-motor failure: Associated defect code 02



One flashing sequence may contain more than one defect, in which case they will be listed in numerical sequence and coded as shown in the example below:

Example: 2 defects to be displayed:
- Failure of components connected with the measurement of water temperature: Associated defect code 05.
- Failure of components connected with the engine electrical acceleration: Associated defect code 02.



The defect codes are as follows:

Defect code 01 Not used
Defect code 02 Components connected with the engine electrical acceleration
Defect code 03 Components associated with the measurement of hydraulic pressure
Defect code 04 Components associated with the measurement of engine speed
Defect code 05 Components associated with the measurement of water temperature
Defect code 06 Components associated with pressure reduction
Defect code 07 Components associated with the control of travel motor displacement (two-speed excavators only)
Defect code 08 Components associated with upperstructure braking and brake release
Defect code 09 Components associated with the control keyboard
Defect code 10 Components associated with the control box
Defect code 11 Calibration impossible
Defect code 12 Components associated with the control box
Defect code 13 Components associated with the control box

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Defect code 01

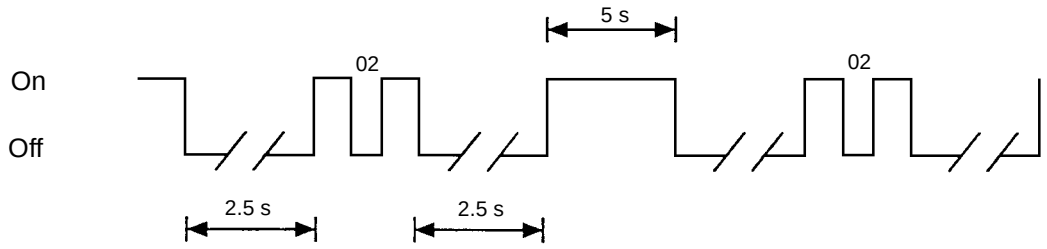
Not used.

Defect code 02: Components associated with engine electrical acceleration

Problems found:

- Engine returns automatically to idle (lever against the injection pump minimum stop)
- Control keyboard completely off except travel mode on two-speed excavators only
- The code appears regardless of the type of electric motor failure (short-circuit or open circuit)

Illustration of the indicator lamp signal



PDH0491

Check the connection of the connector (X9) which connects the servo-motor to the electronic harness. Connection 1. 2. 5. 6 and 7 on (M5)

NO → If there are traces of oxidation, spray with the appropriate product. Reconnect the connector (X9) correctly.

YES

Make a visual check of the condition of the servo-motor cable. Is it in good condition? (with no traces of crushing or cutting)

NO → Change the servo-motor (M5)

YES

Make a visual check of the condition of the electronic harness. Is it in good condition? (with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Check the length of the servo-motor connecting rod. Is the length 171 mm ± 1?

NO

YES

Actuate the fuel injection pump lever back and forth from one stop to the other. Is the movement correct? (no seizing or stiff places)

NO → Ensure that the system for mechanical transmission of movement is in good condition. Change the servo-motor (M5) if the fault persists.

Adjust the length of the connecting rod, see page 23 or 24.

Calibrate the servo-motor (M5), see page 25.

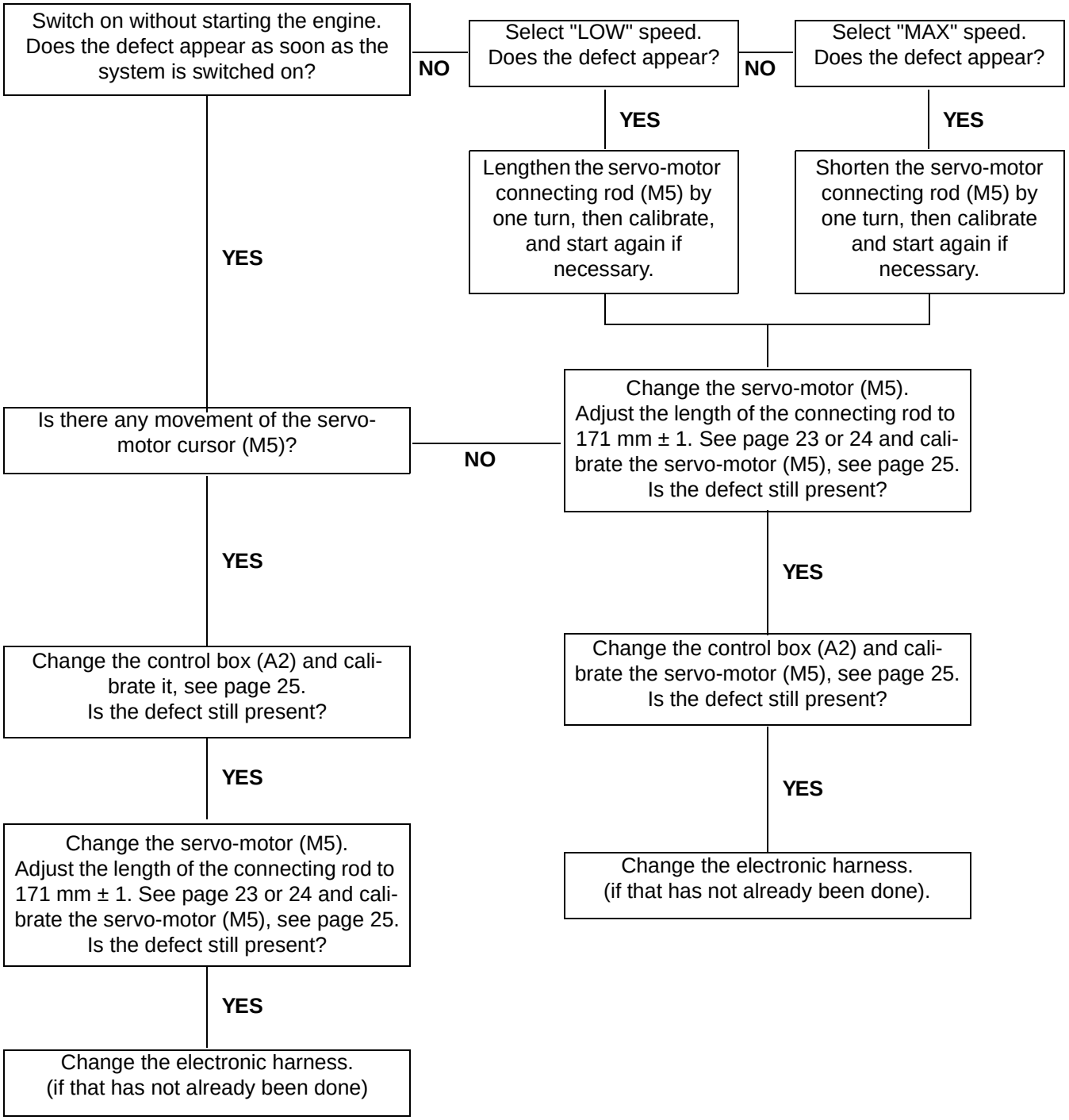
YES

(continued on next page)

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NOTE: *After each corrective action, switch off and on again to reset the system.*

(continued from previous page)



NOTE: *Switch off and on again after each corrective action to reset the system. In the event of a servo-motor failure, a temporary repair solution is possible consisting of fixing the control connecting rod into one of the holes in the graduated strip, thus allowing the engine to run at constant speed. Disconnect the servo-motor plug (X9). If this temporary solution is used, it is essential that the connecting rod fastening is disconnected before stopping the engine, to allow it to run at idle (otherwise there is a danger of damaging the turbo-charger).*

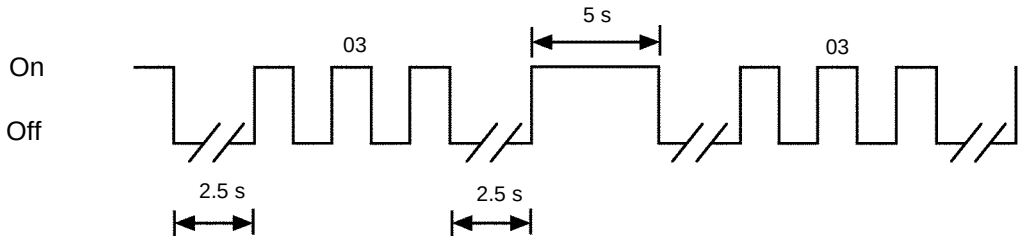
https://truckmanualshub.com/

Defect code 03: Components associated with the measurement of hydraulic pressure (L.S.)

Problems found:

- "Auto" (automatic idle) inoperative
- Automatic travel speed system inoperative
- This defect is indicated in all cases of failure of the pressure detector (B11) (short-circuit, open circuit etc.)

Illustration of the indicator lamp signal



PDH0476

Check the connection of the connector (X8) connecting the hydraulic pressure detector (B11) to the electronic harness. Connection A, B and C on detector (B11) Is the connection correct?

NO → Reconnect the connector (X8) correctly

YES

Make a visual check of the condition of the hydraulic pressure detector cable (B11). Is it in good condition? (with no traces of crushing or cutting)

NO → Change the hydraulic pressure detector (B11).

YES

Make a visual check of the condition of the electronic harness. Is it in good condition? (with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25. Is the defect still present?

YES

Change the electronic harness. (if that has not already been done)

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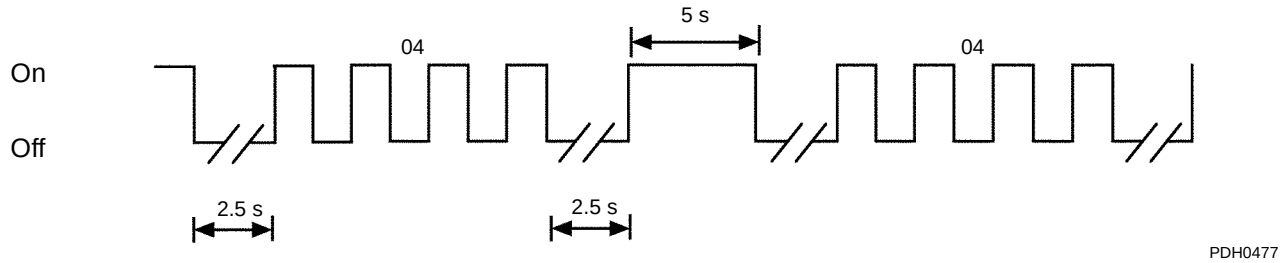
Defect code 04: Components associated with the measurement of engine speed

Problems found:

- Reduced hydraulic power, DRE4 pressure fixed when swing is not actuated
- Engine speed safety system inoperative
- Engine starts up directly in "ECO" mode and stays there
- No Auto Idle

NOTE: *The failure is more often detected by these symptoms than by the LED flashing.*

Illustration of the indicator lamp signal



Check the connection of the connector (X6) from the engine speed detector (B9) to the electronic harness.
Connection A and B on detector (B9)
Is the connection correct?

NO → Reconnect the connector (X6) correctly.

YES

Make a visual check of the condition of the engine speed detector cable (B9). Is it in good condition?
(with no traces of crushing or cutting)

NO → Change the engine speed detector (B9).

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Adjust the position of the engine speed detector (B9), see page 25.
Is the defect still present?

YES

Change and adjust the position of the engine speed detector (B9), see page 25.
Is the defect still present?

NO → Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

YES

Change the electronic harness.
(if that has not already been done)

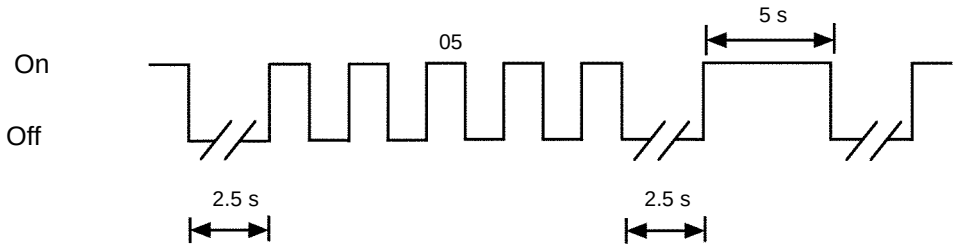
https://truckmanualshub.com/

Defect code 05: Components associated with the measurement of water temperature

Problems found:

- Indicator on instrument panel inoperative
- When starting up from cold, warm-up time reduced to one minute
- Over-heating safety system inoperative
- Short-circuits and open circuits on following items cause this failure: sender, wire, indicator and printed circuit board

Illustration of the indicator lamp signal



PDH0478

Is it possible to select speeds other than "LOW" and "FINE") at the control keyboard (S22)?

NO → Battery voltage too low: recharge or change.

YES

Check the connection connecting the water temperature sender (B22) to the electronic harness.
Connector Δ 30 (2)
(see schematic in Section 4001)
Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the water temperature sender (B22).
Is the defect still present?

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

YES

Change the electronic harness.
(if that has not already been done)

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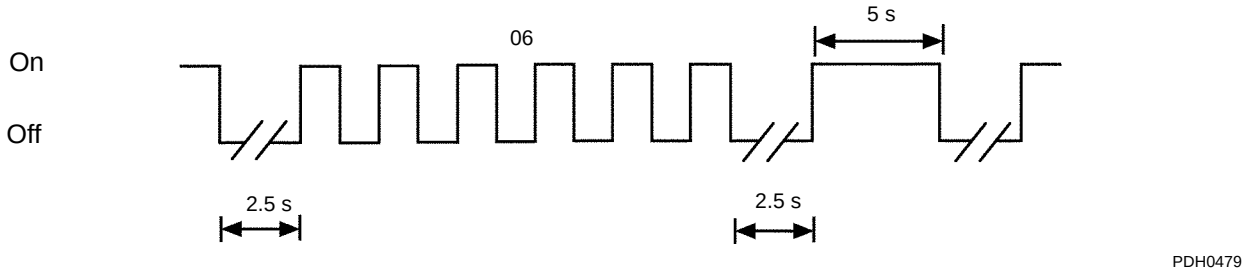
Defect code 06: Components associated with pressure reduction

Problems found:

- Engine stalls under load
- Zero pressure at valve

NOTE: *This defect is indicated by valve short-circuits and open circuits.*

Illustration of the indicator lamp signal



PDH0479

Check the connection from the proportional pressure reduction valve DRE4 (Y4) and the electronic harness.
Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the proportional pressure reduction valve DRE4 (Y4).
Is the defect still present?

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

YES

Change the electronic harness.
(if that has not already been done)

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Defect code 07: Components associated with the control of travel motor displacement (two-speed excavators only)

Problems found:

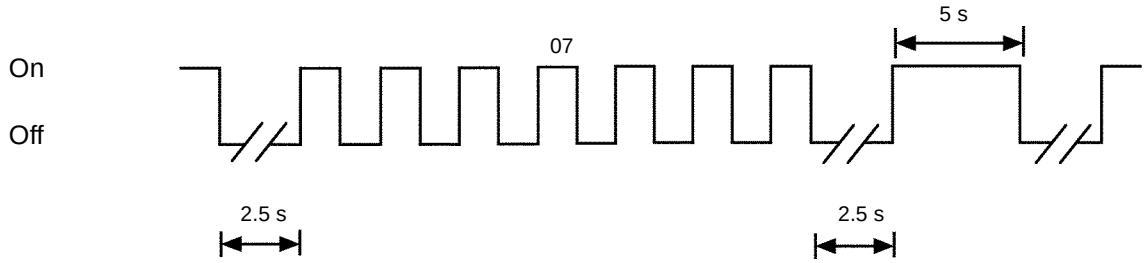
- Speed change inoperative (control panel locked in 1st speed)

NOTE: *This defect is indicated if the displacement change solenoid valve (Y6) is short-circuited or cut off.*

Travel pressure switch failure

- No defect indicated on the LED
- Open circuit: 1st and 2nd speeds operate but no automatic return to 2nd speed → 1
- Circuit broken: Automatic return from 2nd → 1st when the attachment circuit pressure increases
- No Auto Idle

Illustration of the indicator lamp signal



PDH0480

Check the line connecting the travel motor displacement control solenoid valve (Y6) to the electronic harness.
Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the solenoid valve (Y6).
Is the defect still present?

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

YES

Change the electronic harness.
(if that has not already been done)

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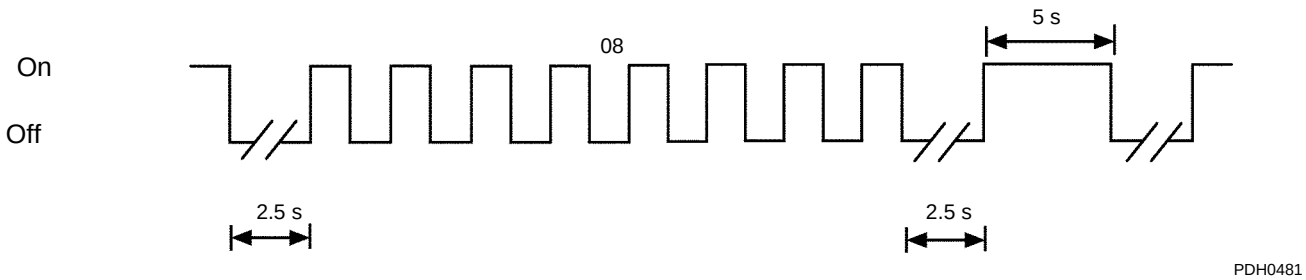
Defect code 08: Components associated with the upperstructure braking and brake release

Problems found:
- Upperstructure swing impossible
- No brake release

Brake release solenoid valve defective:
- Short circuit and open circuit detected by electronics

Swing pressure switch failure:
- Not detected by electronics
- Short circuit: continuous brake release
- Open circuit: no brake release

Illustration of the indicator lamp signal



Check the connection from the upperstructure brake release solenoid valve (Y5) to the electronic harness.
Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the solenoid valve (Y5).
Is the defect still present?

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

YES

Change the electronic harness.
(if that has not already been done)

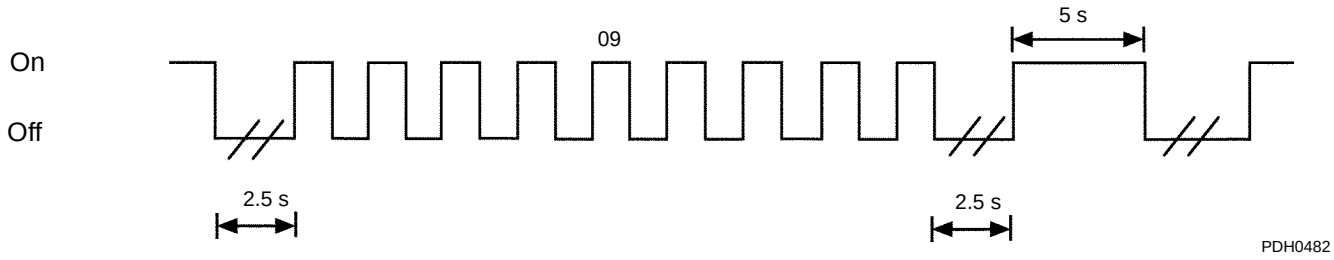
https://truckmanualshub.com/

Defect code 09: Components associated with the control keyboard

Problems found:

- Control keyboard jammed, generally "off" except travel and "LOW IDLE" in certain cases
- "Auto" (automatic idle) inoperative
- Machine on "FINE" and travel on position 2.

Illustration of the indicator lamp signal



Check the connection from the control keyboard (S22) to the electronic harness. Connection A1. B1. B2 and B3 on (S22). Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness. Is it in good condition? (with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the control keyboard (S22). Is the defect still present?

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25. Is the defect still present?

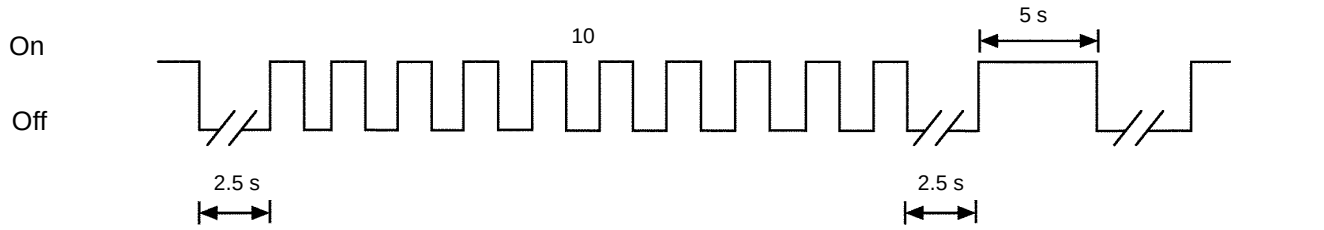
YES

Change the electronic harness. (if that has not already been done)

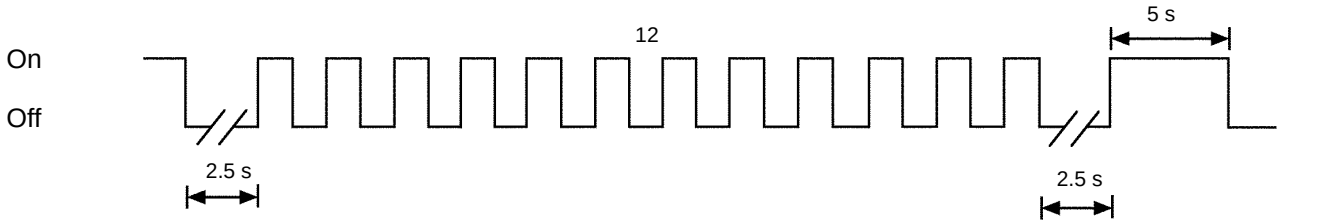
https://truckmanualshub.com/

Defect code 10, 12 and 13: Components associated with the control box

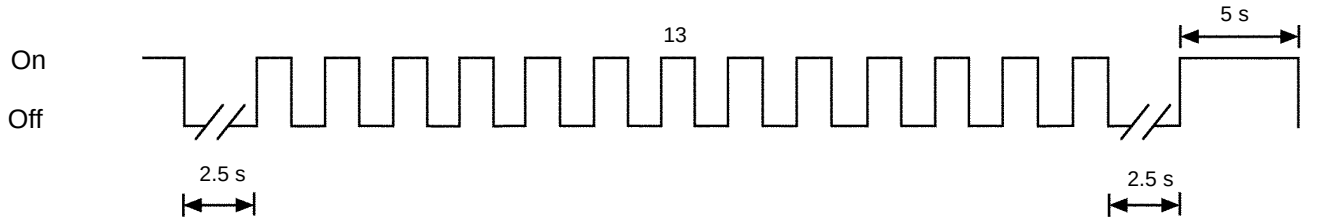
Illustration of the indicator lamp signal



PDH0483



PDH0484



PDH0485

Check the connection of the connector (X3) from the control box (A2) to the electronic harness.
Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

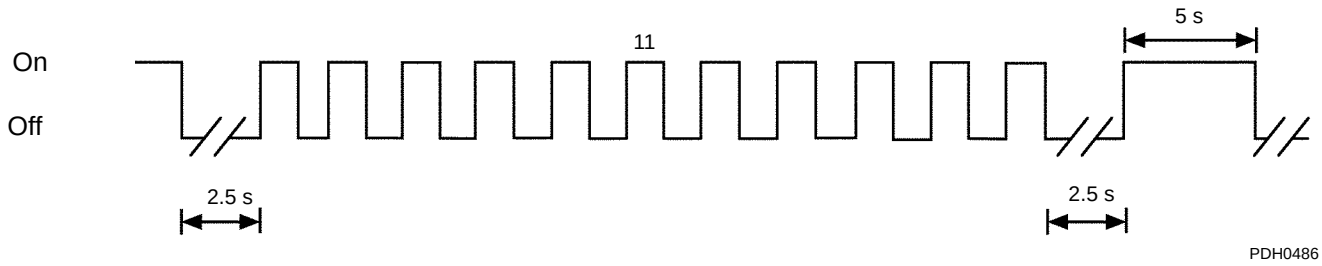
YES

Change the electronic harness.
(if that has not already been done)

https://truckmanualshub.com/

Defect code 11: Calibration impossible

Illustration of the indicator lamp signal



Defect appearing after the calibration procedure

Disconnect the servo-motor (M5) and use tachometer CAS 10449 to check the engine speed by actuating the injection pump lever manually.
Is the engine speed equal to or lower than 900 rpm at the idle stop and equal to or lower than 2200 rpm at the maximum speed stop?

NO → Check the engine and adjust if necessary, check and, if necessary, repair the air supply circuit and the fuel supply circuit.

YES

Check the length of the connecting rod.
171 mm ± 1.
Is the length correct?

NO → Adjust the length of the connecting rod to 171 mm ± 1. See page 23 or 24.

Calibrate the servo-motor (M5), see page 25.

YES

Actuate the fuel injection pump lever back and forth from one stop to the other.
Is the movement correct?
(no seizing, no stiff places, etc.)

NO → Overhaul and repair the control linkage.
Change the servo-motor (M5) if the defect still remains.

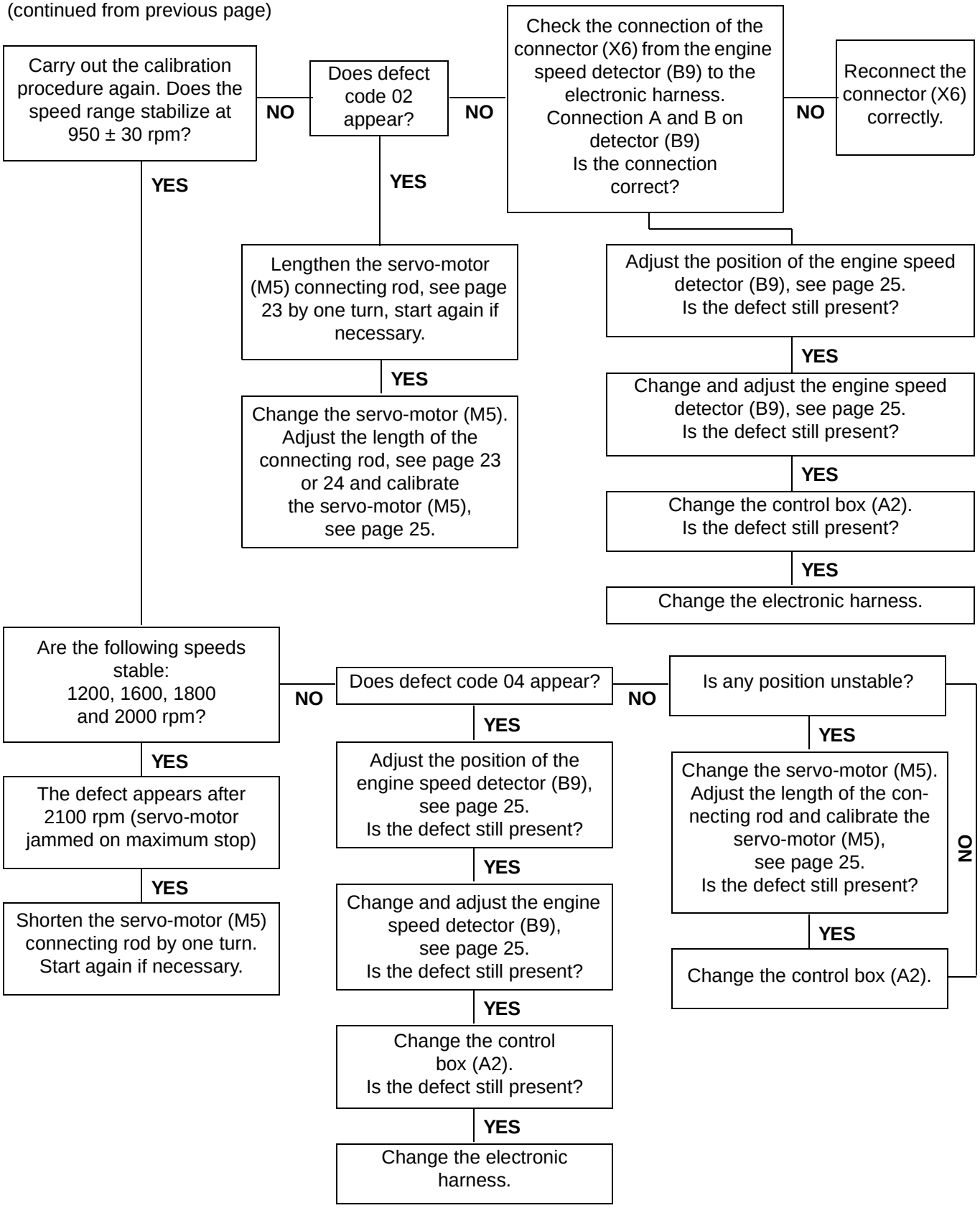
YES

(continued on next page)

NOTE: *Switch off and on again after each corrective action to reset the system. and start the calibration procedure again.*

https://truckmanualshub.com/

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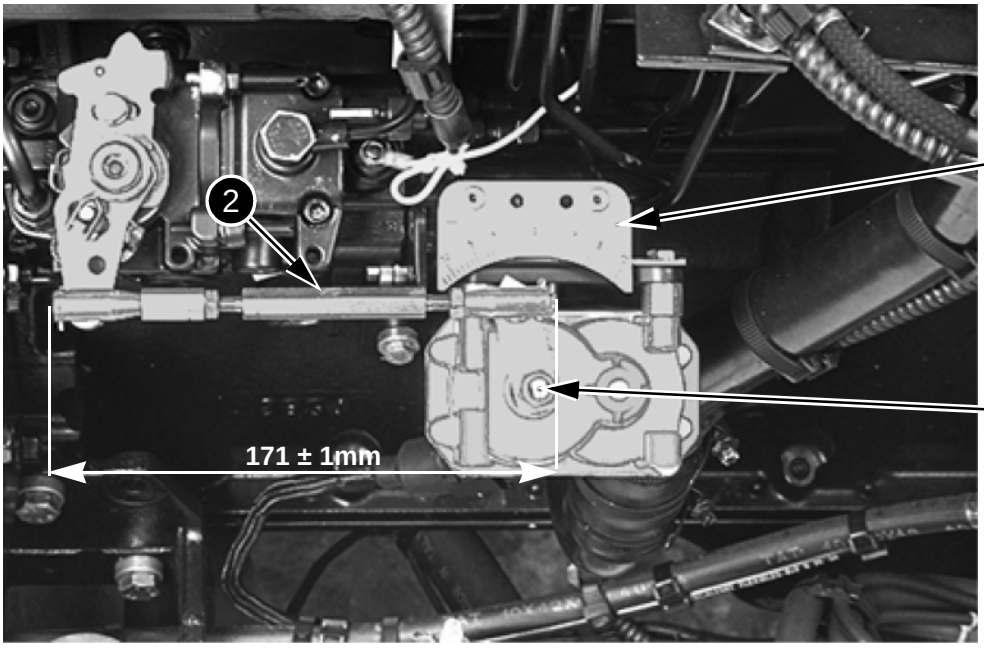


NOTE: *If the calibration procedure is not completed after 300 seconds:* ***Calibration impossible****. Switch off and on again after each corrective action to reset the system. and start the calibration procedure again.*

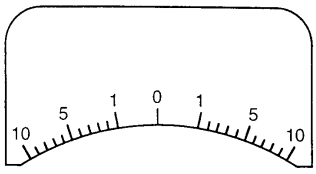
https://truckmanualshub.com/

Settings

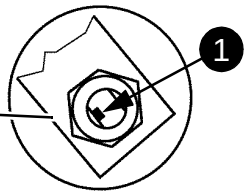
Electric acceleration (M5) mechanical adjustment - old type fitting (graduations centred on the gauge)



PH08508



CM99J036



PDH0487

STEP 1

Turn the battery master switch to the "Off" position.

STEP 2

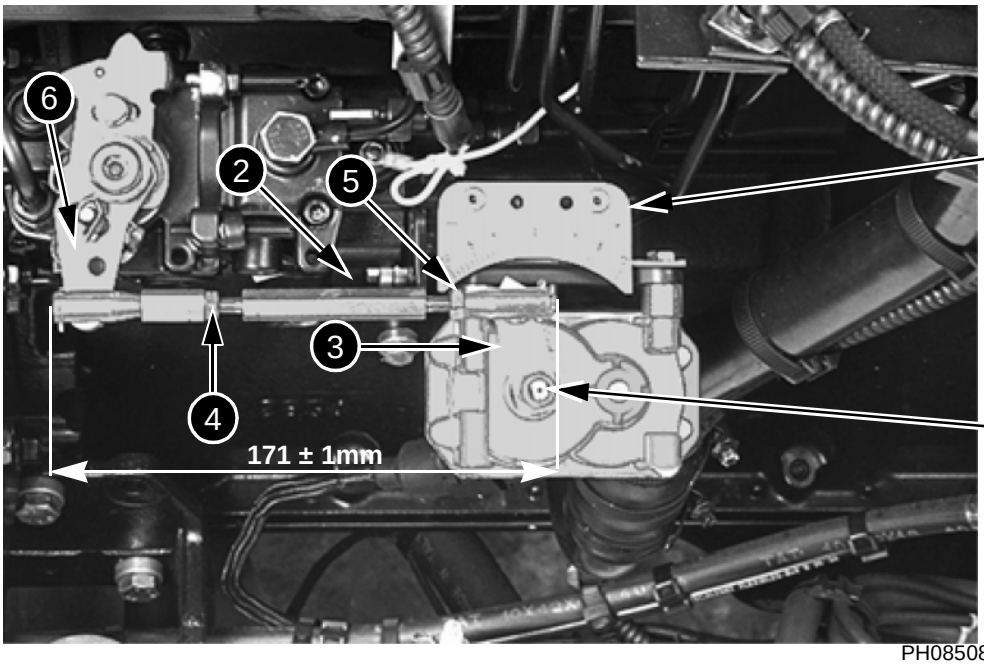
Make sure that the servo-motor (1) axis mark is correctly positioned.

STEP 3

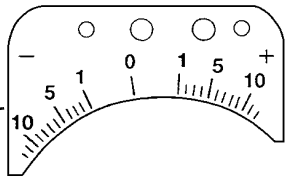
Adjust the connecting rod (2) to the following length: 171 ± 1 mm.

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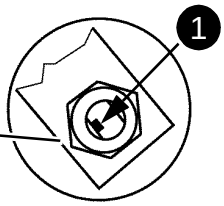
Electric acceleration (M5) mechanical adjustment - new type fitting (graduations offset 15° on the gauge)



PH08508



CM95F018



PDH0487

STEP 1

Turn the battery master switch to the "Off" position.

STEP 2

Make sure that the servo-motor (1) axis mark is correctly positioned.

STEP 3

Adjust the connecting rod (2) to the following length: 171 ± 1 mm.

STEP 4

Install the connecting rod (2) on the lever (3) of the acceleration motor.

STEP 5

Place the injection pump lever (6) in the "idle" position (LH stop), mark its position and then place the lever in the "accelerated" position (RH stop) and mark its position.

STEP 6

Check if the two marks previously noted are located on the same graduation but with opposite signs. If this is not the case, use the connecting rod (2) to make the "idle/accelerated" positions more symmetrical and then tighten the two lock-nuts (4) and (5).

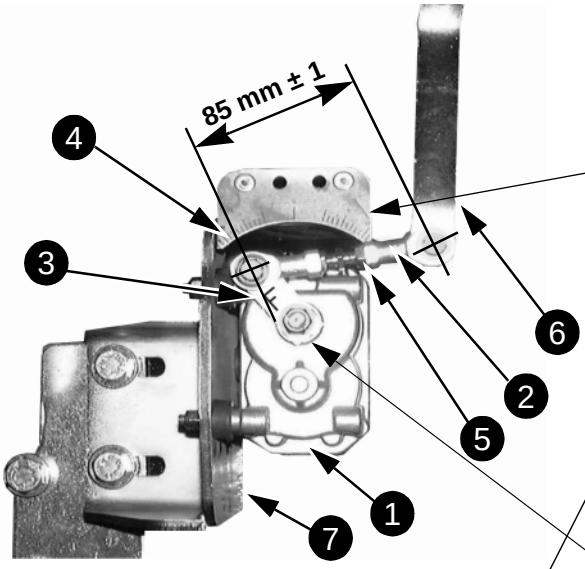
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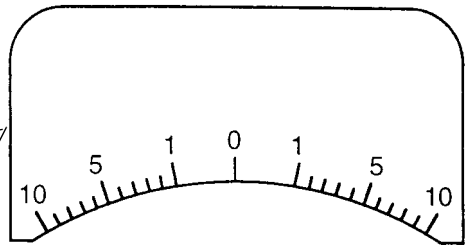
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Mechanical adjustment of electrical acceleration (M5) on "low emissions" models

788

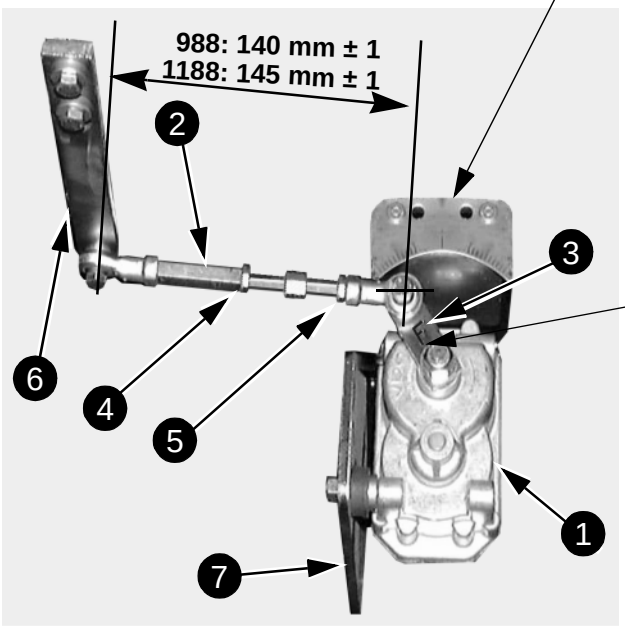


CD99J001

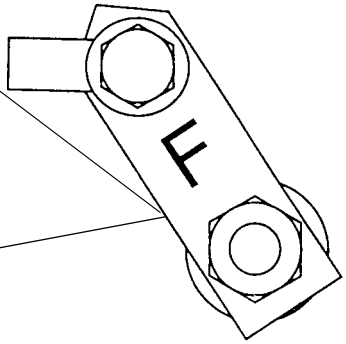


CM99J036

988/1188



CD99J002



CM99J035

https://truckmanualshub.com/

STEP 1

Turn the battery master switch to the "Off" position.

STEP 2

Make sure that the lever (3) of the Servo-motor (1) is correctly positioned (letter F facing the operator).

STEP 3

Position bracket (7) on the engine block, with the apertures centred.

STEP 4

Adjust the connecting rod (2) to the recommended length for the excavator model concerned:

788: 85 mm ±1

988: 140 mm ±1

1188: 145 mm ±1

STEP 5

Install the connecting rod (2) on the lever (3) of the acceleration motor.

STEP 6

Place the injection pump lever (6) in the "idle" position (LH stop), mark its position on the gauge and then place the lever (6) in the "accelerated" position (RH stop) and mark its position on the gauge.

STEP 7

Check if the two marks previously noted are located on the same graduation but with opposite signs. If this is not the case, change the position of the bracket (7) on the engine block and lock the screws.

STEP 8

Change the length of the connecting rod to make the "idle/accelerated" positions more symmetrical.

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Electric acceleration calibration

STEP 1

Start the engine and warm it up to normal operating temperature, then press the "LOW" (low idle) key. Switch off the engine.

STEP 2

Place the LH control arm in the "Safety" position.

STEP 3

Using the left hand, press simultaneously on the "LOW" and "MAX" keys on the control panel.

STEP 4

Using the right hand, switch on the machine.

STEP 5

Wait for the LED's on the keyboard, except for the "ECO" key, to go out, and then release the keys.

STEP 6

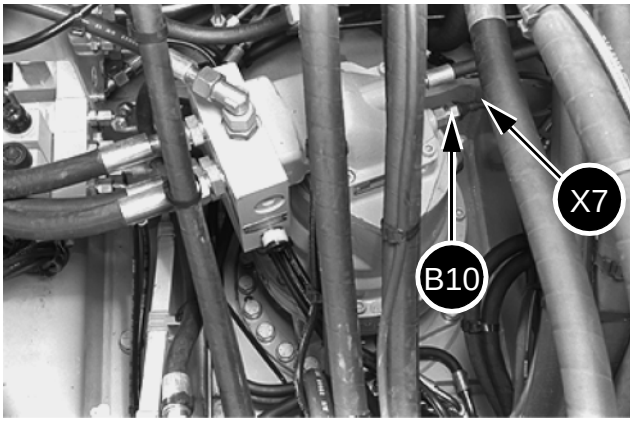
Start the engine. The "LOW" and "MAX" indicator lamps should flash, showing that the calibration phase is starting.

NOTE: *This phase lasts less than six minutes. The engine will run successively at 950, 1200, 1600, 1800, 2000 and 2240 rpm, and will then stay at "medium idle" speed (not shown on control panel), which is 1200 rpm.*

STEP 7

Check that the printed circuit board indicator lamp (LED) stays on continuously.
If this is not the case, note the defect code(s) and refer to the corresponding page.
If defect code 11 is displayed (calibration impossible) refer to page 4002-21.

Adjusting the engine speed detector (B10)



PH01002

STEP 1

Disconnect the connector (X7).

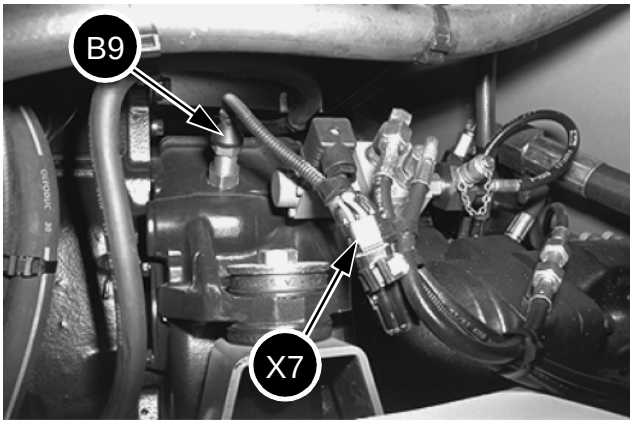
STEP 2

Check the condition of the seal and that the washers are present. Loosen the lock-nut and screw the detector up to the stop, then unscrew it one turn.

STEP 3

Tighten the lock-nut to a torque of 10 Nm and reconnect the connector (X7).

Adjusting the engine speed detector (B9)



PH00918

STEP 1

Disconnect the connector (X6).

STEP 2

Loosen the lock-nut and screw the detector up to the stop, then unscrew it one turn.

STEP 3

Tighten the lock-nut to a torque of 10 Nm and reconnect the connector (X6).

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Section

4002

ELECTRONIC AND TROUBLESHOOTING SYSTEM

Wheeled excavators

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This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.



Turn the battery master switch to the "Off" position before carrying out any service work on the circuit.

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TOOLS REQUIRED



PD00012

1. *PHOTO-DIGITAL TACHOMETER CAS 10449*
2. *AEROSOL M1703414*
   (For cleaning and de-oxidation of electrical contacts)

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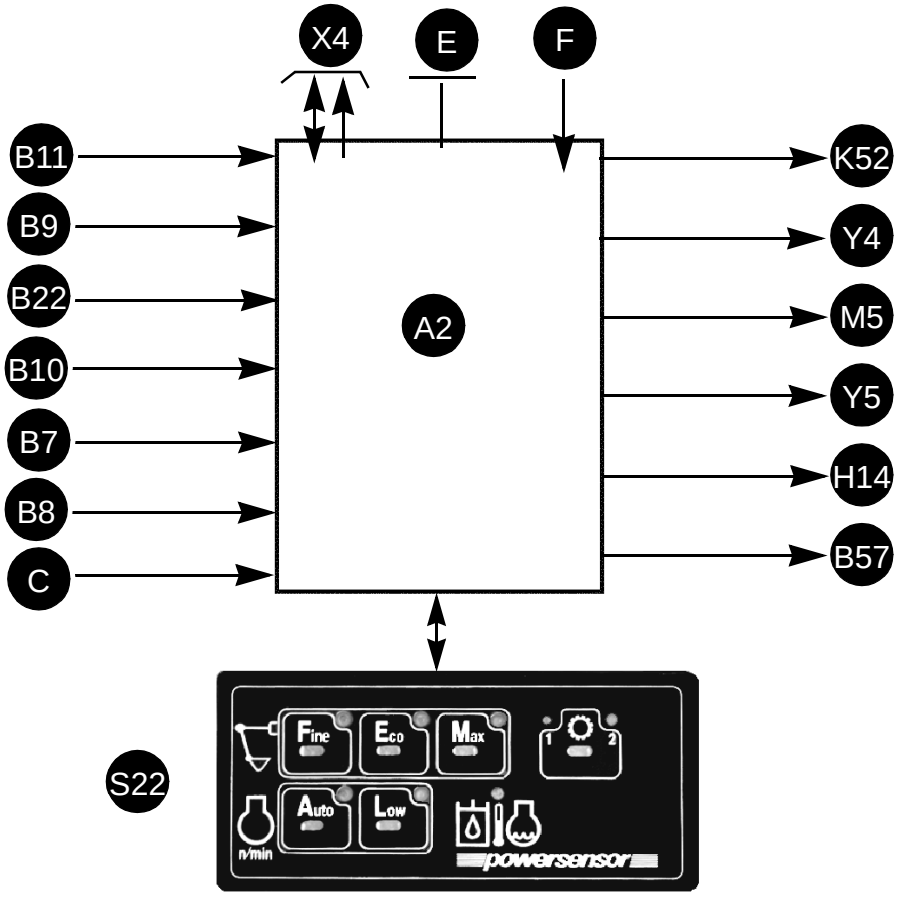
ELECTRONIC SYSTEM

General

Some of the machine’s functions are managed and checked electronically. The functions concerned are as follows:

- Cold start assistance.
- Electric acceleration.
- Automatic return to idle.
- Engine overheating safety system.
- Engine / hydraulic system power regulation: "Speed sensing".
- Swing braking and brake release.
- Speed change.
- Electronic system diagnosis.

Components connected to electronic system

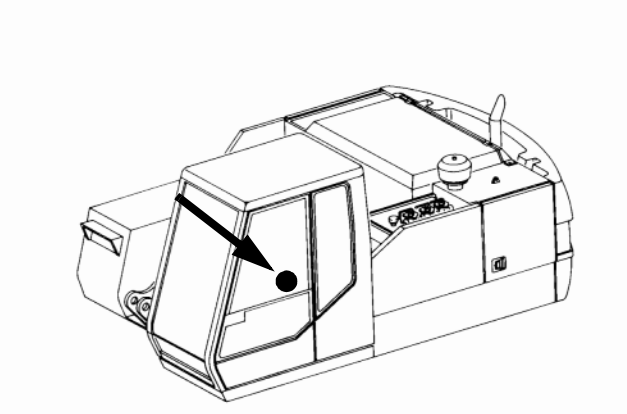


A2 Electronic control box
B7 Swing detector pressure switch
B8 Travel detector pressure switch
B9 Engine speed detector
B10 Swing motor speed detector
B11 Hydraulic pressure detector
B57 Brake pressure switch
B22 Engine coolant temperature sender
H14 Correct operation indicator light (LED)
K52 Two-speed relay
M5 Injection pump servo-motor
S22 Control keyboard
X4 Diagnostic socket
Y4 Proportional pressure reduction valve DRE4
Y5 Upperstructure brake release electro-control valve
C Lighting 28 volts
E Earth
F 28 volt battery

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Location of components on the excavator

(A2) Electronic control box



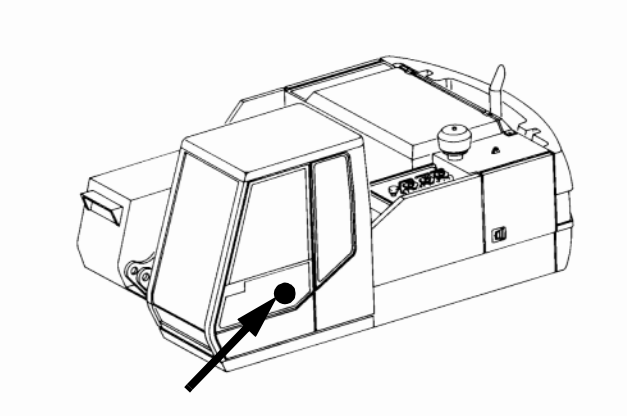
PDH0472



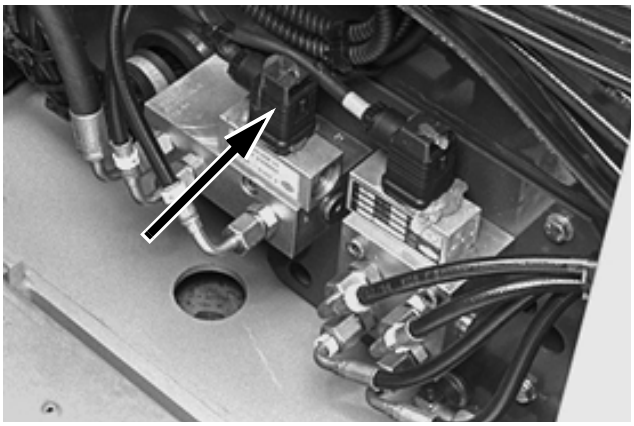
PE09306

Located to the right of the operator's seat, it contains the electronic card through which all information passes. The card is connected to the other components by means of a 35-pin connector.

(B7) Swing detection pressure switch



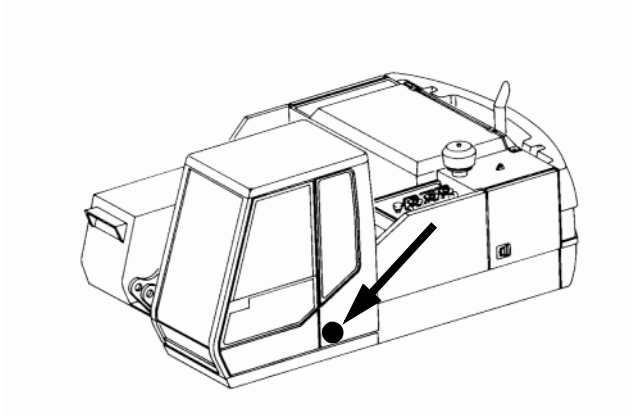
PDH0472



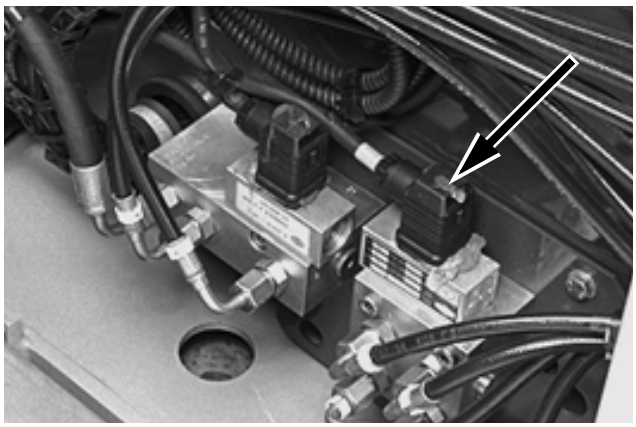
PDH08504

Located on the rear panel of the cab floor, it closes at about 6 bar (RH or LH swing pilot pressure).

(B8) Travel detector pressure switch



PDH0472

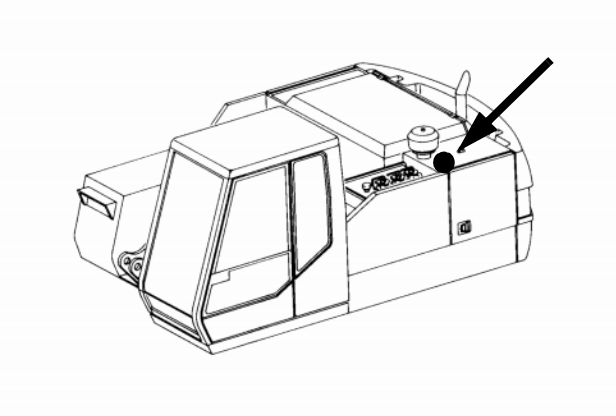


PH08504

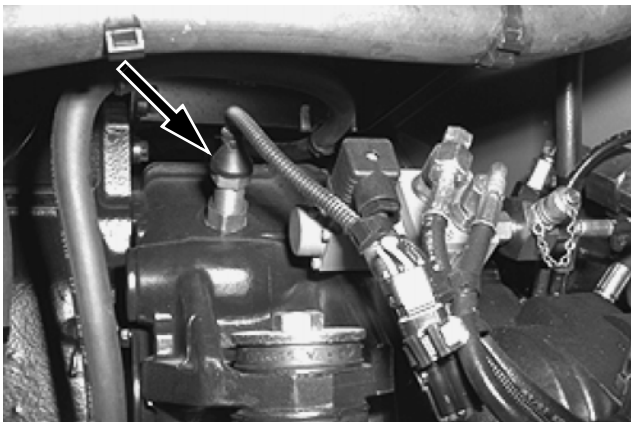
Located on the rear panel of the cab floor, it closes at about 6 bar (travel brake release pilot pressure).

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B9 Engine speed detector



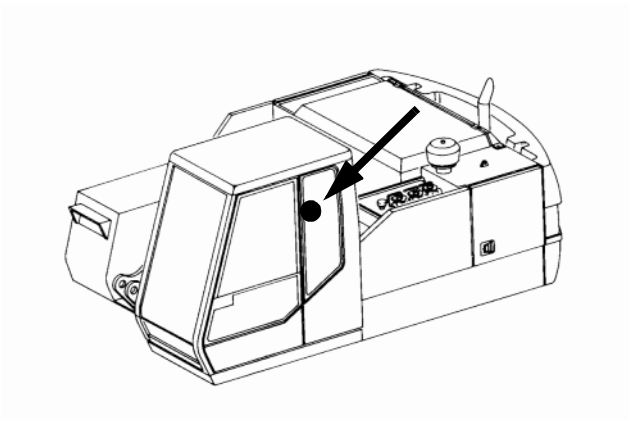
PDH0472



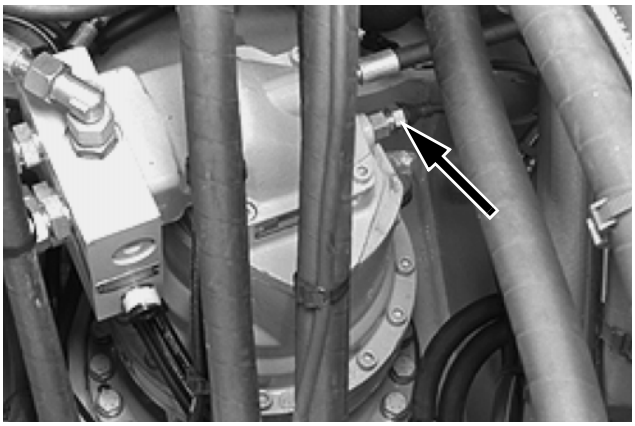
PH00918

Mounted in line with the starter ring teeth, it delivers a signal with a frequency corresponding to the time interval between the passage of two consecutive teeth.

B10 Swing motor speed detector



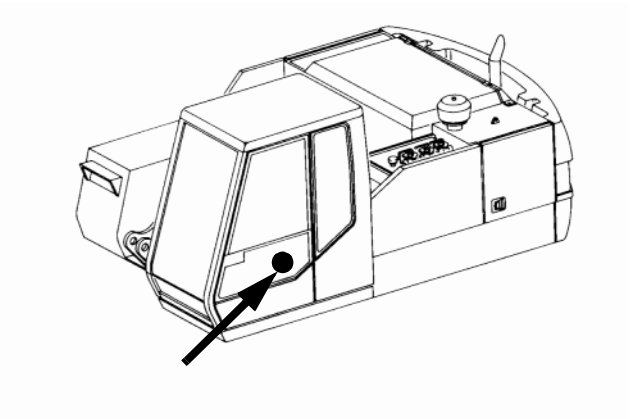
PDH0472



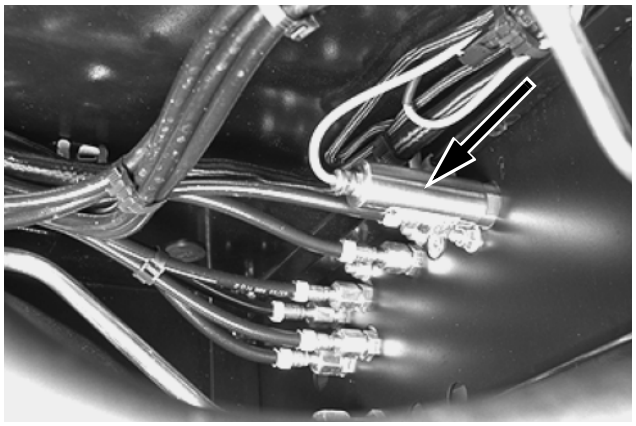
PH01002

Located behind the hydraulic motor housing and opposite a sprocket, it delivers a signal with a frequency corresponding to the passage of two consecutive teeth.

B11 Hydraulic pressure sender



PDH0472

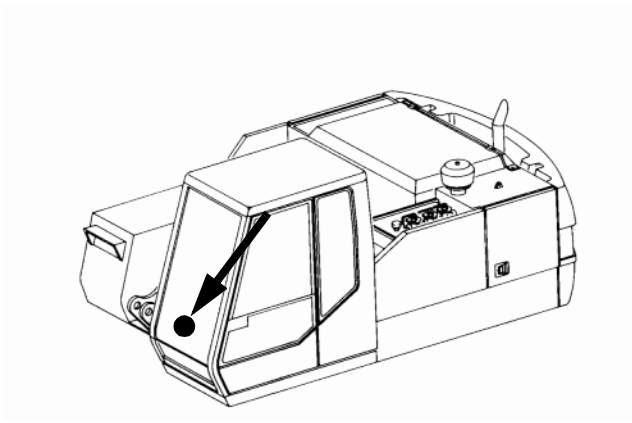


PH01034

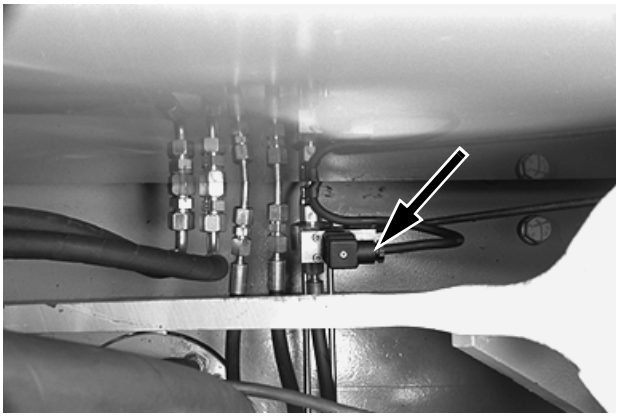
Located under the cab floor, it measures the highest pressure (Load-Sensing) in the excavator attachment and travel hydraulic systems.

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B57 Brake pressure switch (speed change)



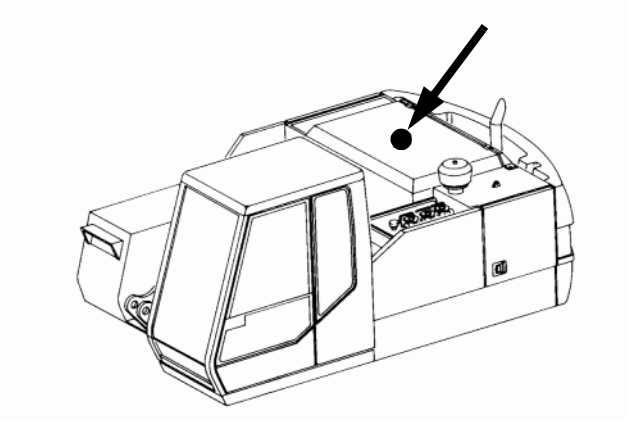
PDH0472



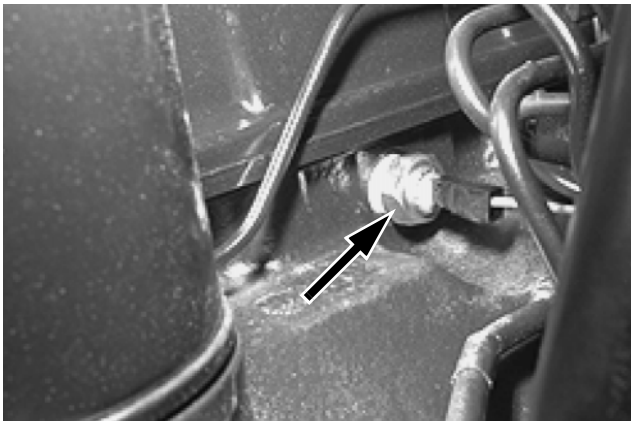
PH01012

Located under the upperstructure and the undercarriage frame, it closes at about 40 bar (brake circuit pressure).

B22 Engine coolant temperature sender



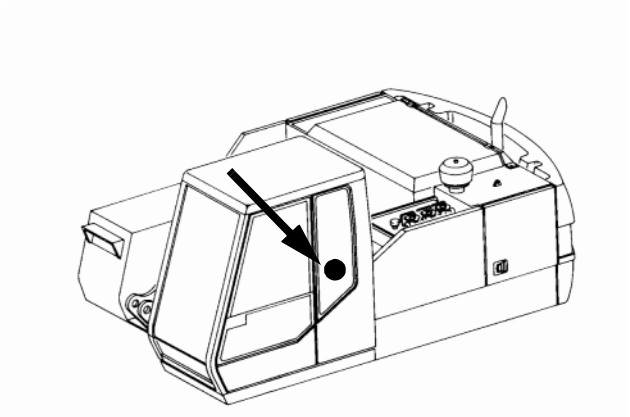
PDH0472



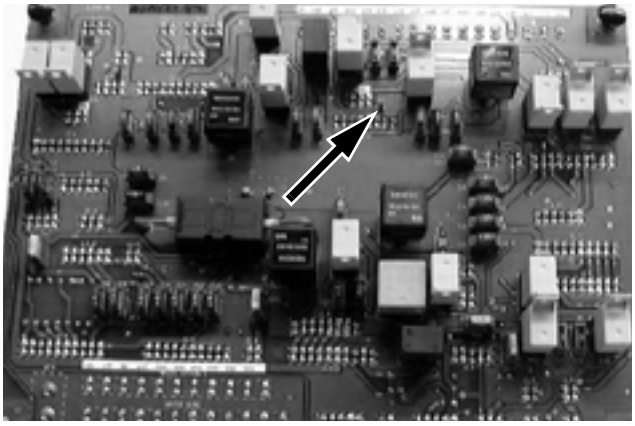
PH00917

Mounted on the engine block, it delivers a pressure of between 0 and 28 volts. It is the ratio between this voltage and the battery voltage which is used for information processing purposes

H14 Led diagnostic (LED)



PDH0472

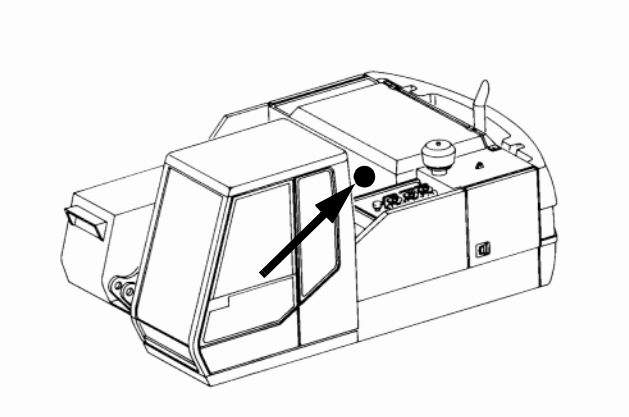


CD99J017

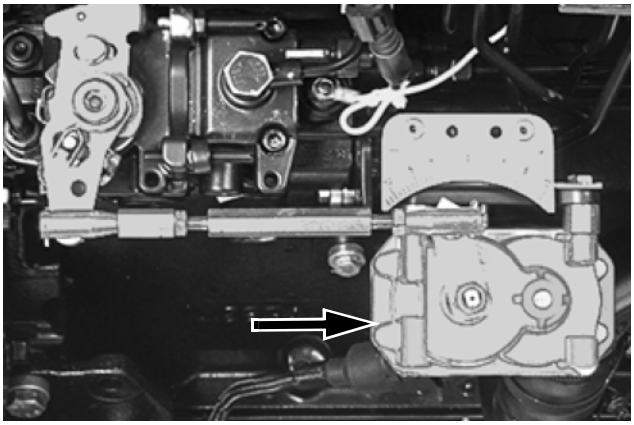
This consists of a red warning lamp (Light-Emitting Diode) mounted on the printed circuit board. This indicator lamp is continuously "on" when the circuit is trouble-free. It starts to flash on and off if one or more defects occur in the system. Such defects can be identified by means of a lighting code system (See page 10).

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(M5) Servo-motor (injection pump lever control)



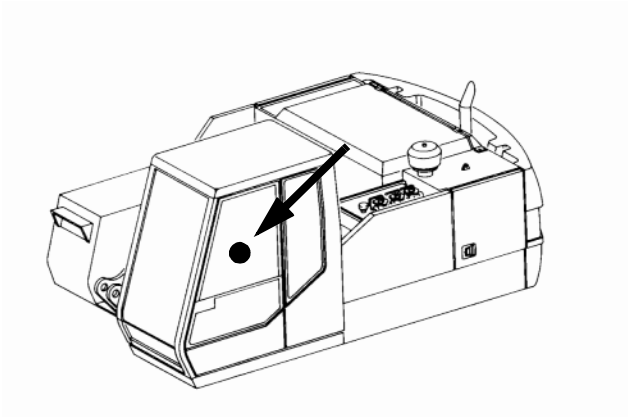
PDH0472



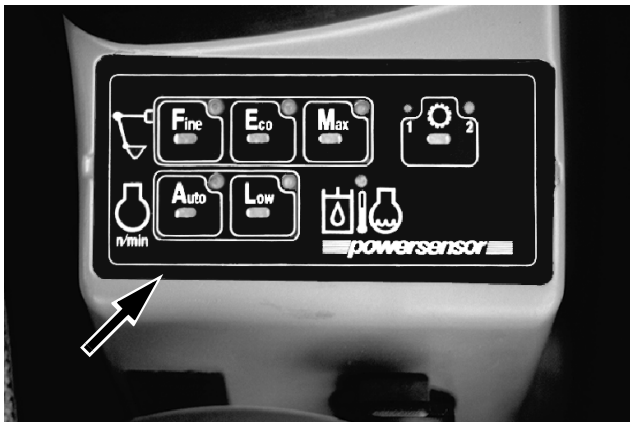
PH08508

Mounted on the engine, it control the injection pump lever.

(S22) Control panel



PDH0472



PH07328

Located near the right-hand control lever, it has a front face covered with a silk-screened plastic film, an electronic circuit board with six momentary-action push-buttons, eight LED type indicator lamps, electronic components and a connector.

The functions of the control panel can be classified under four modes:

- The "Work" mode, consisting of the following push-buttons: "FINE" 1580 to 1620 rpm (low flow work, handling), "ECO" 1880 to 1920 rpm (economical, digging) and "MAX" 2180 to 2220 rpm (maximum power, hard work).

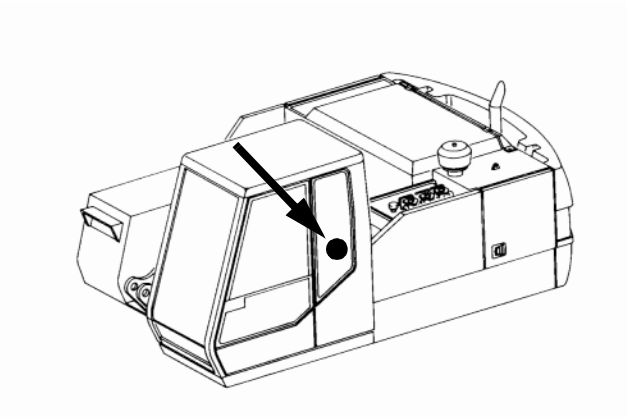
- The "Idle" mode consisting of the following push-buttons: "LOW" 900 to 1000 rpm (low idle) and "AUTO" 1180 to 1220 rpm (automatic idle).

- The "Travel" mode (two-speed excavators only) has two indicator lamps: "POSITION 1" (low speed) and "POSITION 2" (high speed).

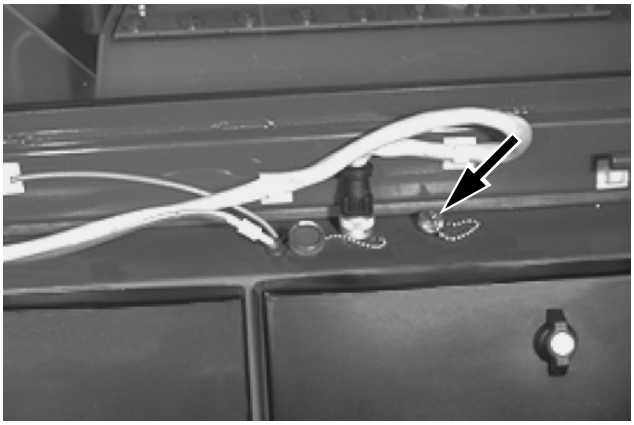
- The "Pre-heat" mode has an indicator lamp: a flashing lamp shows the machine has not yet reached its normal operating temperature. When that lamp goes out the machine is ready to work.

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(X4) Troubleshooting test socket



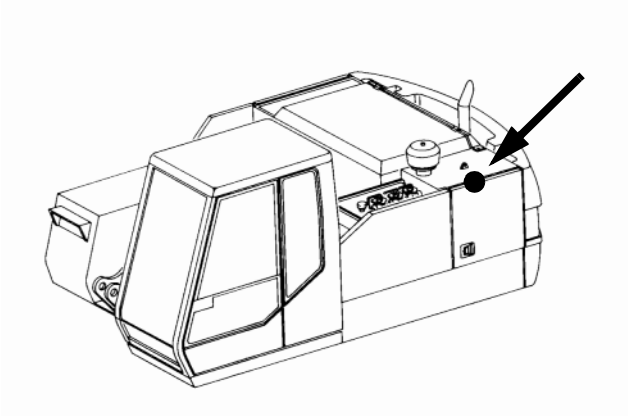
PDH0472



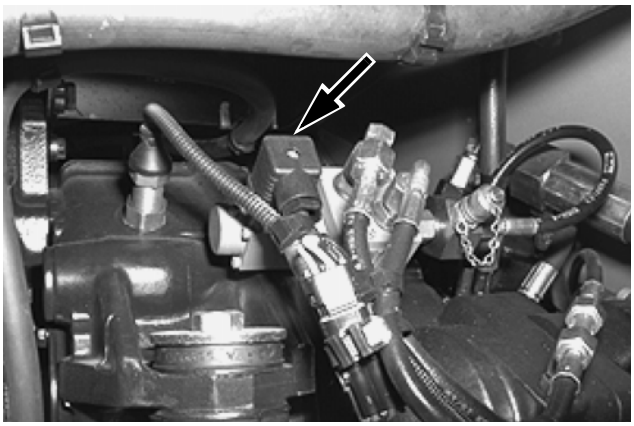
PE10834

Located in the cab, behind the seat, it is protected by a trim panel. It is for use connected to a dialogue console which can perform in-depth diagnosis of the machine and which is also used for reading and modifying the "excavator parameters".

(Y4) Proportional pressure reduction valve DRE4



PDH0472

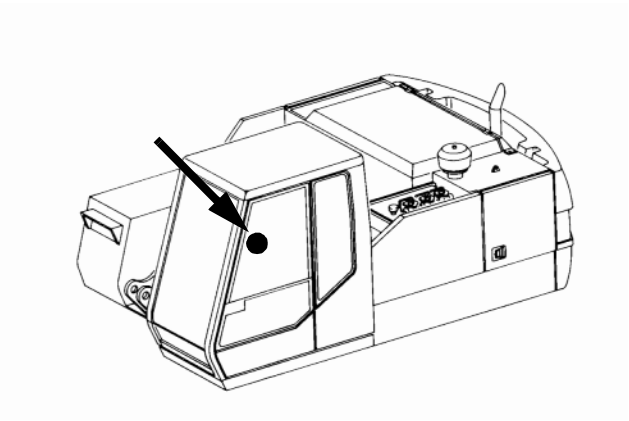


PH00918

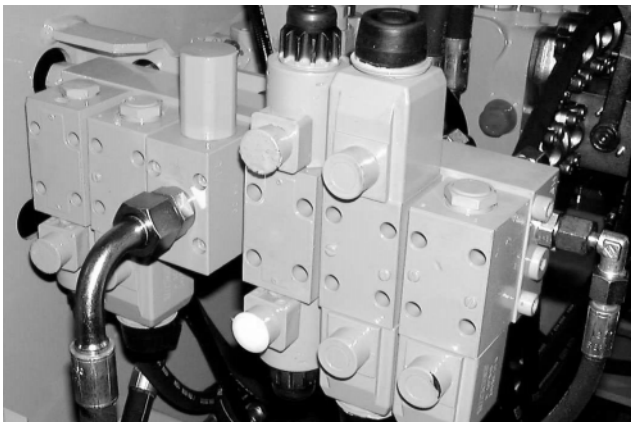
Mounted on the main pump, it delivers an output pressure which is proportional to the current passing through it, thus enabling a check to be made of the variable flow pump hydraulic torque.

NOTE: *The photo shows the DRE4 reduction valve on the 988 excavator. On the 788 the DRE4 reduction valve is identical, but is mounted in a different manner.*

(Y5) Upperstructure brake release control solenoid valve



PDH0472



CD99J018

Located behind the cab on the valve bank partition, it is actuated to release the upperstructure brake. It brakes the upperstructure when not actuated.

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ELECTRONIC SYSTEM DIAGNOSIS

Diagnosis without console

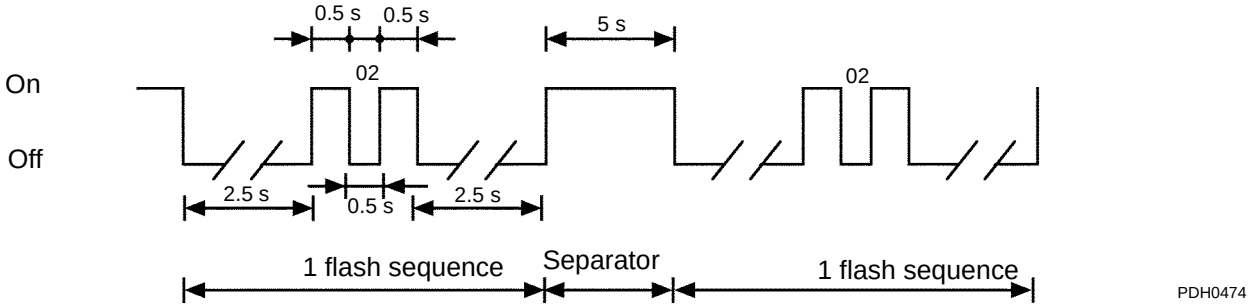
General

The machine is equipped with an integrated diagnostic system which is designed to locate problems which may occur in the system. Such defects are displayed by means of an indicator lamp (LED) inserted in the printed circuit located in the cab behind the operator's seat This indicator lamp (LED) is on continuously when the system is fault-free. It starts to flash when one or more defects appear.

The defect signalling code is as follows:

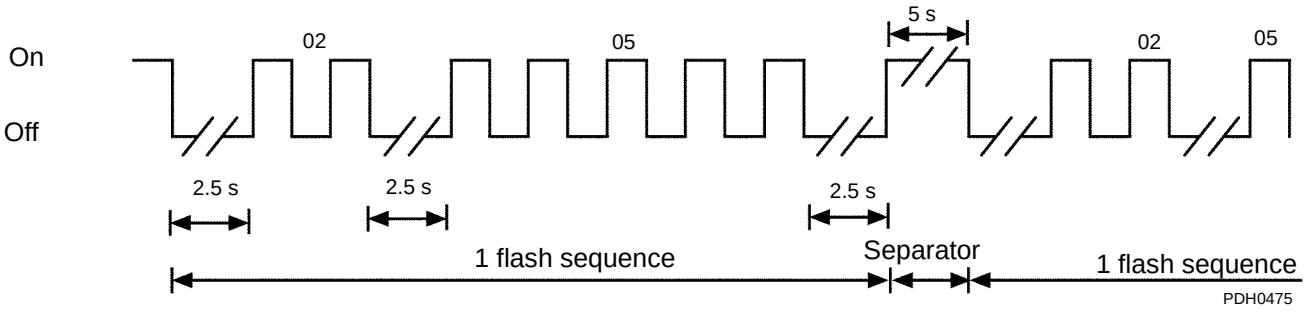
The indicator lamp lights up for half a second, then goes out for half a second, a number of times equal to the code. At the end of the cycle the indicator lamp lights up for 5 seconds, the cycle starts again.

Example: 1 defect to be displayed:
- Servo-motor failure: Associated defect code 02



One flashing sequence may contain more than one defect, in which case they will be listed in numerical sequence and coded as shown in the example below:

Example: 2 defects to be displayed:
- Failure of components connected with the measurement of water temperature: Associated defect code 05.
- Failure of components connected with the engine electrical acceleration: Associated defect code 02.



The defect codes are as follows:

Defect code 01 Not used
Defect code 02 Components connected with the engine electrical acceleration
Defect code 03 Components associated with the measurement of hydraulic pressure
Defect code 04 Components associated with the measurement of engine speed
Defect code 05 Components associated with the measurement of water temperature
Defect code 06 Components associated with pressure reduction
Defect code 07 Components associated with speed change control
Defect code 08 Components associated with upperstructure braking and brake release
Defect code 09 Components associated with the control keyboard
Defect code 10 Components associated with the control box
Defect code 11 Calibration impossible
Defect code 12 Components associated with the control box
Defect code 13 Components associated with the control box

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Defect code 01

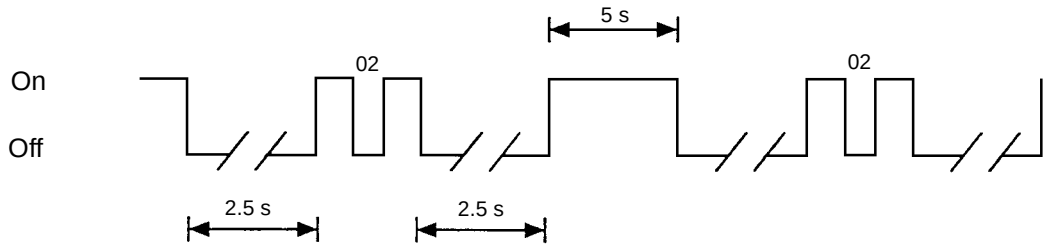
Not used.

Defect code 02: Components associated with engine electrical acceleration

Problems found:

- Engine returns automatically to idle (lever against the injection pump minimum stop)
- Control keyboard completely off except travel mode on two-speed excavators only
- The code appears regardless of the type of electric motor failure (short-circuit or open circuit)

Illustration of indicator lamp



PDH0491

Check the connection of the connector (X9) which connects the servo-motor to the electronic harness.
Connection 1. 2. 5. 6 and 7 on (M5)

NO → If there are traces of oxidation, spray with the appropriate product. Reconnect the connector (X9) correctly.

YES

Make a visual check of the condition of the servo-motor cable. Is it in good condition? (no traces of crushing or cutting)

NO → Change the servo-motor (M5)

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(no traces of crushing or cutting)

NO → Repair or change the harness

YES

Check the length of the servo-motor connecting rod.
Is the length 171 mm ± 1?

NO

YES

Move the injection pump lever manually from one stop to the other.
Is the movement correct?
(no seizing or stiff places)

NO → Ensure that the system for mechanical transmission of movement is in good condition.
Change the servo-motor (M5) if the fault persists.

Adjust the length of the connecting rod, see page 23 or 24.

Calibrate the servo-motor (M5), see page 25.

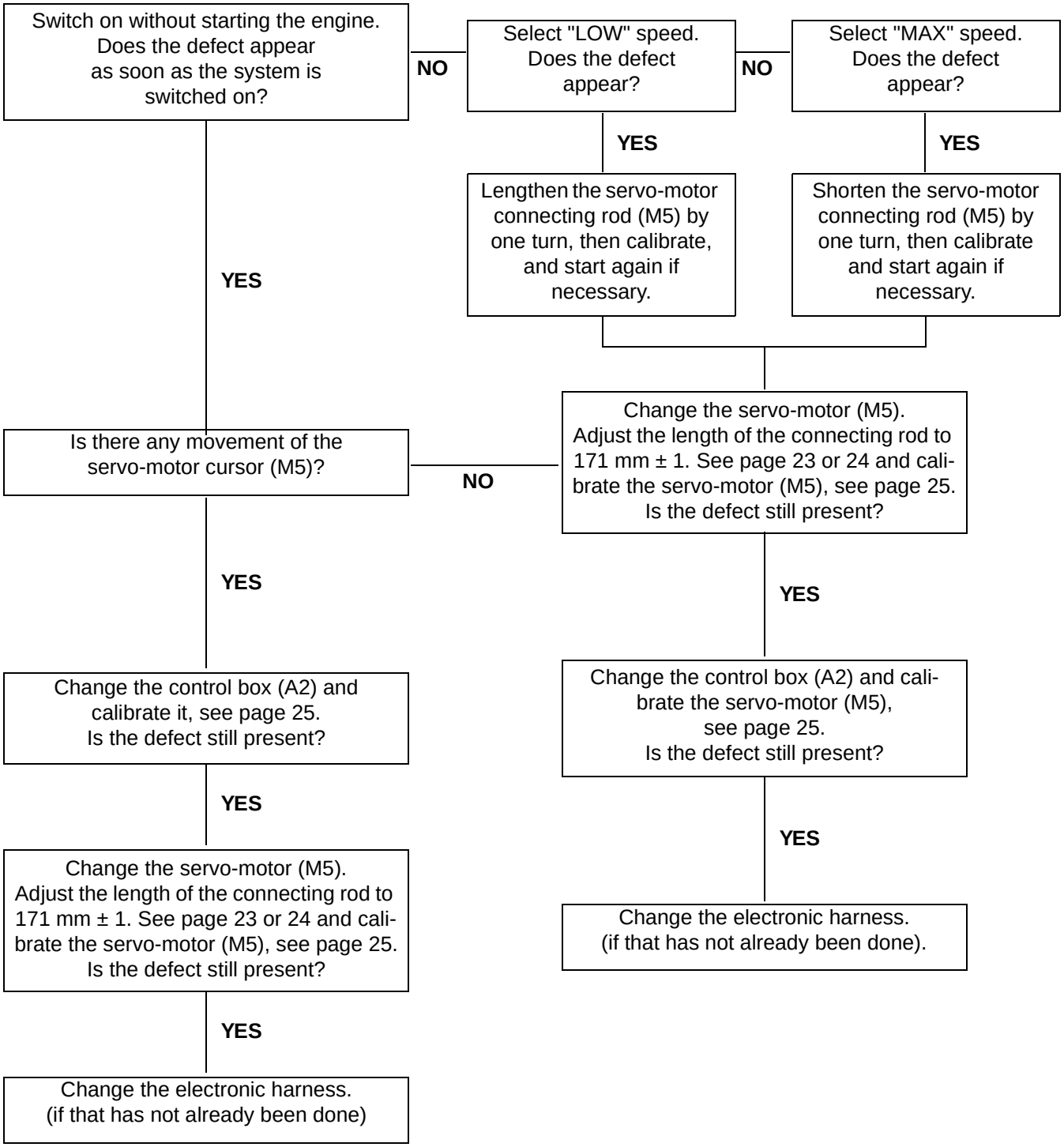
YES

(continued on next page)

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NOTE: *After each corrective action, switch off and on again to reset the system.*

(continued from previous page)



NOTE: *Switch off and on again after each corrective action to reset the system. In the event of a servo-motor failure, a temporary repair solution is possible consisting of fixing the control connecting rod into one of the holes in the graduated strip, thus allowing the engine to run at constant speed. Disconnect the servo-motor plug (X9). If this temporary solution is used, it is essential that the connecting rod fastening is disconnected before stopping the engine, to allow it to run at idle (otherwise there is a danger of damaging the turbo-charger).*

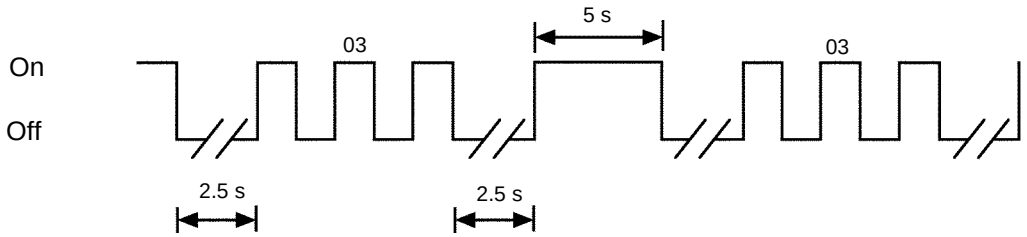
https://truckmanualshub.com/

Defect code 03: Components associated with the measurement of hydraulic pressure (L.S.)

Problems found:

- "Auto" (automatic idle) inoperative
- Automatic travel speed system inoperative
- This defect is indicated in all cases of failure of the pressure detector (B11) (short-circuit, open circuit etc.)

Illustration of indicator lamp signal



PDH0476

Check the connection of the connector (X8) connecting the hydraulic pressure detector (B11) to the electronic harness.
Connection A, B and C on detector (B11)
Is the connection correct?

NO → Reconnect the connector (X8) correctly

YES

Make a visual check of the condition of the hydraulic pressure detector cable (B11).
Is it in good condition?
(with no traces of crushing or cutting)

NO → Change the hydraulic pressure detector (B11).

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

YES

Change the electronic harness.
(if that has not already been done)

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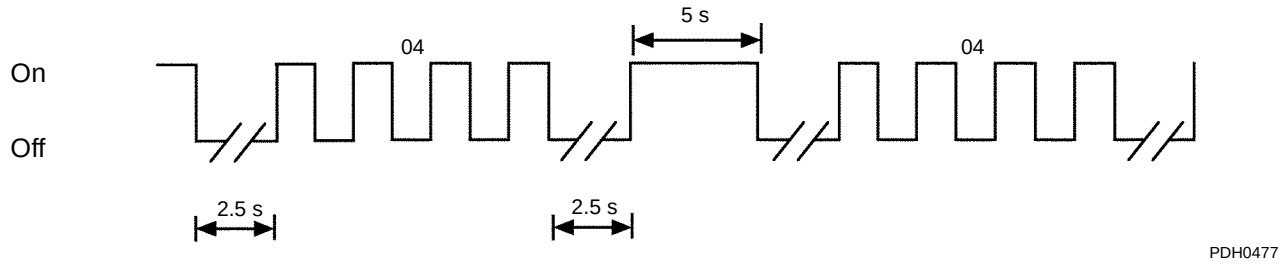
Defect code 04: Components associated with the measurement of engine speed

Problems found:

- Reduced hydraulic power, DRE4 pressure fixed when swing is not actuated
- Engine speed safety system inoperative
- Engine starts up directly in "ECO" mode and stays there
- No Auto Idle

NOTE: *The failure is more often detected by these symptoms than by the LED flashing.*

Illustration of indicator lamp signal



Check the connection of the connector (X6) which connects the engine speed detector (B9) to the electronic harness.
Connection A and B on detector (B9)
Is the connection correct?

NO → Reconnect the connector (X6) correctly.

YES

Make a visual check of the condition of the engine speed detector cable (B9). Is it in good condition?
(with no traces of crushing or cutting)

NO → Change the engine speed detector (B9).

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Adjust the position of the engine speed detector (B9), see page 25.
Is the defect still present?

YES

Change and adjust the position of the engine speed detector (B9), see page 25.
Is the defect still present?

NO → Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

YES

Change the electronic harness.
(if that has not already been done)

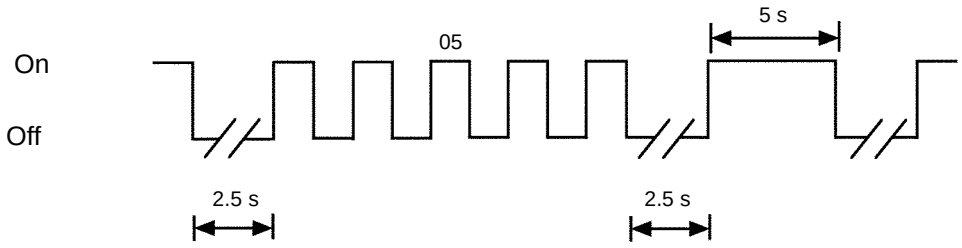
https://truckmanualshub.com/

Defect code 05: Components associated with the measurement of water temperature

Problems found:

- Indicator on instrument panel inoperative
- When starting up from cold, warm-up time reduced to one minute
- Over-heating safety system inoperative
- Short-circuits and open circuits on following items cause this failure: sender, wire, indicator and printed circuit board
- Open circuits: sender, unconnected wires, no defect code 5. Each time the engine is stopped, there is 5 minutes pre-heating time

Illustration of the indicator lamp signal



PDH0478

Is it possible to select speeds other than "LOW" and "FINE") at the control keyboard (S22)?

NO → Battery voltage too low: recharge or change.

YES

Check the connection connecting the water temperature sender (B22) to the electronic harness.
Connector Δ 30 (2)
(see schematic in Section 4001)
Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the water temperature sender (B22).
Is the defect still present?

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

YES

Change the electronic harness.
(if that has not already been done)

https://truckmanualshub.com/

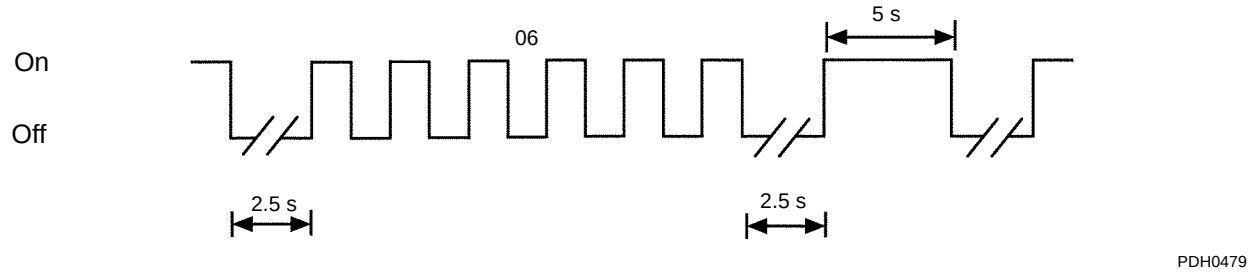
Defect code 06: Components associated with pressure reduction

Problems found:

- Engine stalls under load
- Zero pressure at valve

NOTE: *This defect is indicated by valve short-circuits and open circuits.*

Illustration of the indicator lamp signal



PDH0479

Check the connection from the proportional pressure reduction valve DRE4 (Y4) and the electronic harness.
Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the proportional pressure reduction valve DRE4 (Y4).
Is the defect still present?

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

YES

Change the electronic harness.
(if that has not already been done)

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Defect code 07: Components associated with the speed change control

Problems found:

- Speed change inoperative (the excavator is stuck in second speed)

NOTE: *The electronic system does not detect failures in the K52 relay. Open circuit or short-circuit*

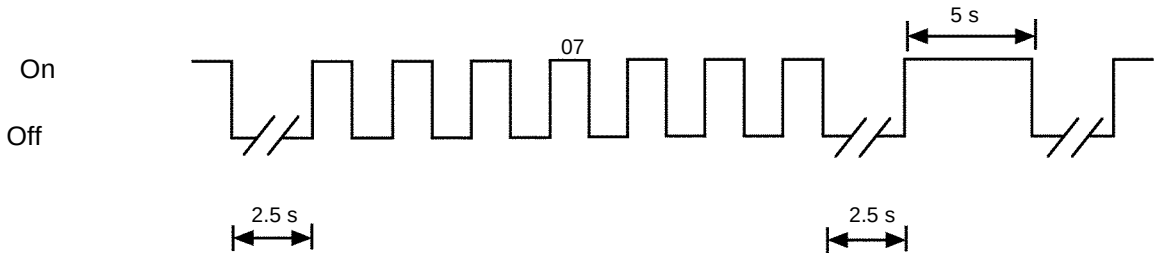
Travel pressure switch failure

- Open circuit: Impossible to change speed when pressing brake pedal
- Circuit broken: It is possible to change speed without pressing the brake pedal

Solenoid valve failure (not displayed on the LED)

- It should always be excited (at one side or the other) as soon as the machine is switched on
- If it is supplied with current but does not move, change it.
- If it is not supplied with current and no failure is indicated, check the contacts in the relay K52

Illustration of the indicator lamp signal



PDH0480

Check the connection from the relay K52 to the electronic harness.
Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the relay (K52).
Is the defect still present?

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

YES

Change the electronic harness.
(if that has not already been done)

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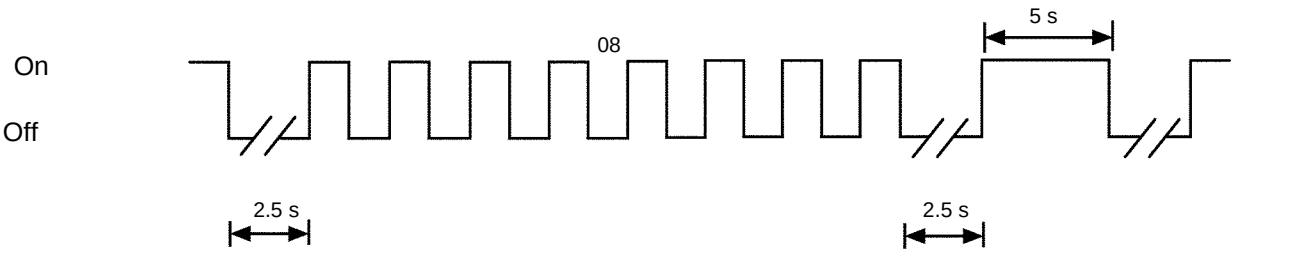
Defect code 08: Components associated with the upperstructure braking and brake release

Problems found:
- Upperstructure swing impossible
- No brake release

Brake release solenoid valve defective:
- Short circuit and open circuit detected by electronics

Swing pressure switch failure:
- Not detected by electronics
- Short circuit: continuous brake release
- Open circuit: no brake release

Illustration of the indicator lamp signal



Check the connection from the upperstructure brake release solenoid valve (Y5) to the electronic harness.
Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the solenoid valve (Y5).
Is the defect still present?

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

YES

Change the electronic harness.
(if that has not already been done)

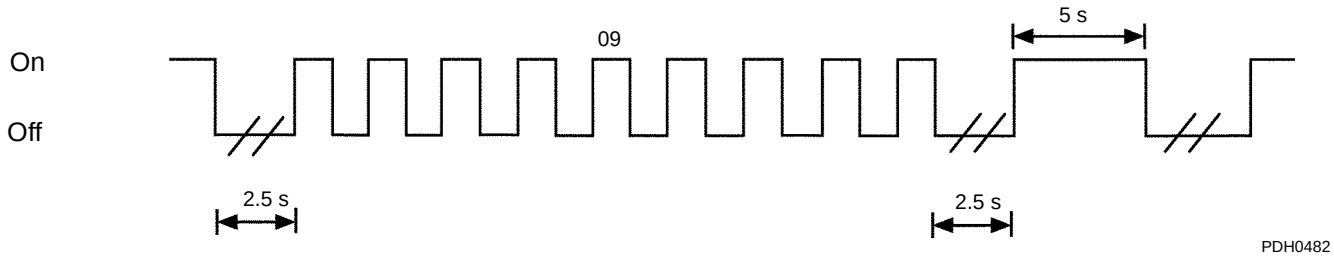
https://truckmanualshub.com/

Defect code 09: Components associated with the control keyboard

Problems found:

- Control keyboard jammed, generally "off" except travel and "LOW IDLE" in certain cases
- "Auto" (automatic idle) inoperative
- Machine on "FINE" and travel on position 2.

Illustration of the indicator lamp signal



Check the connection from the control keyboard (S22) to the electronic harness. Connection A1. B1. B2 and B3 on (S22). Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness. Is it in good condition? (with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the control keyboard (S22). Is the defect still present?

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25. Is the defect still present?

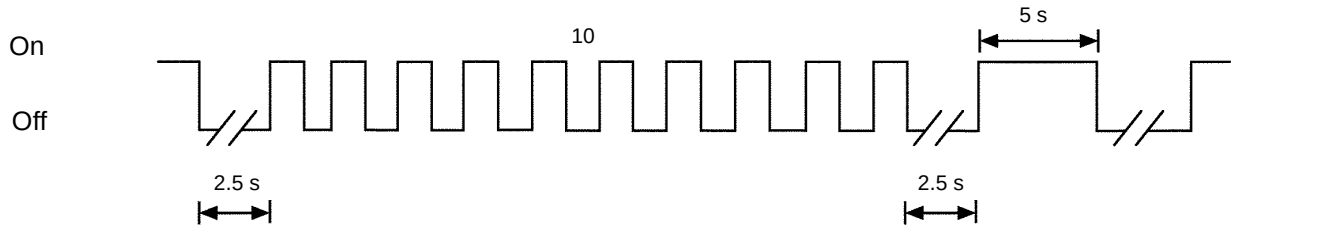
YES

Change the electronic harness. (if that has not already been done)

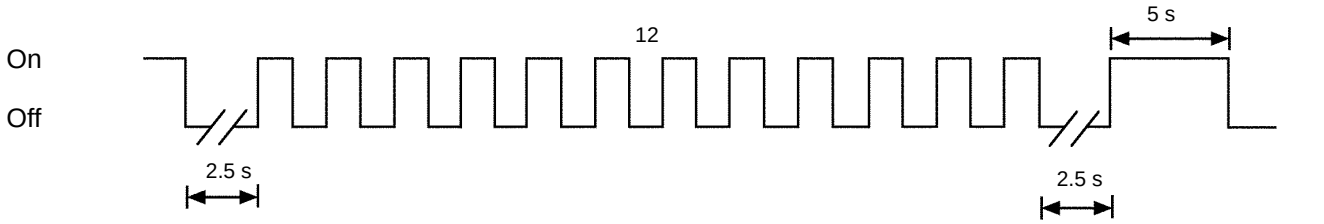
https://truckmanualshub.com/

Defect code 10, 12 and 13: Components associated with the control box

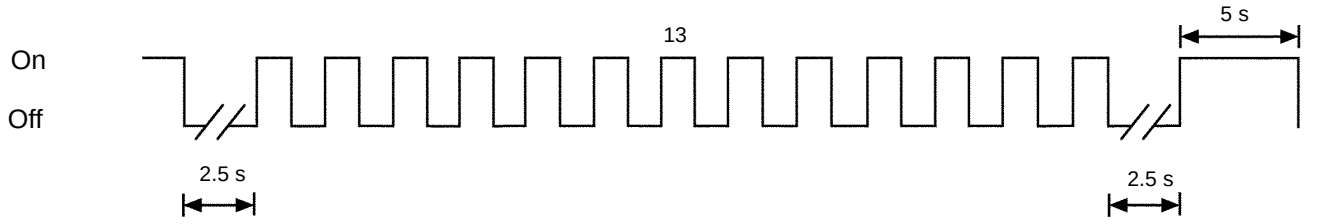
Illustration of the indicator lamp signal



PDH0483



PDH0484



PDH0485

Check the connection of the connector (X3) from the control box (A2) to the electronic harness.
Is the connection correct?

NO → Reconnect correctly.

YES

Make a visual check of the condition of the electronic harness.
Is it in good condition?
(with no traces of crushing or cutting)

NO → Repair or change the harness.

YES

Change the control box (A2) and calibrate the servo-motor (M5), see page 25.
Is the defect still present?

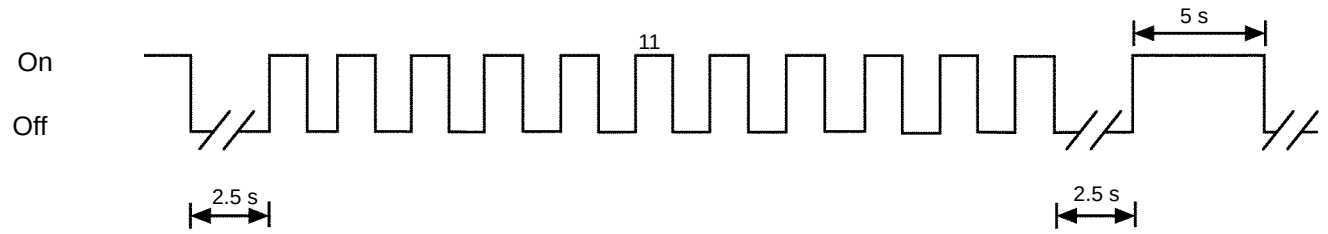
YES

Change the electronic harness.
(if that has not already been done)

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Defect code 11: Calibration impossible

Illustration of the indicator lamp signal



PDH0486

Defect appearing after the calibration procedure

Disconnect the servo-motor (M5) and use tachometer CAS 10449 to check the engine speed by actuating the injection pump lever manually. Is the engine speed equal to or lower than 900 rpm at the idle stop and equal to or lower than 2200 rpm at the maximum speed stop?

NO → Check the engine and adjust if necessary, check and, if necessary, repair the air supply circuit and the fuel supply circuit.

YES

Check the length of the connecting rod. 171 mm ± 1. Is the length correct?

NO → Adjust the length of the connecting rod to 171 mm ± 1. See page 23 or 24.

Calibrate the servo-motor (M5), see page 25.

YES

Actuate the fuel injection pump lever back and forth from one stop to the other. Is the movement correct? (no seizing, no stiff places, etc.)

NO → Overhaul and repair the control linkage. Change the servo-motor (M5) if the defect still remains.

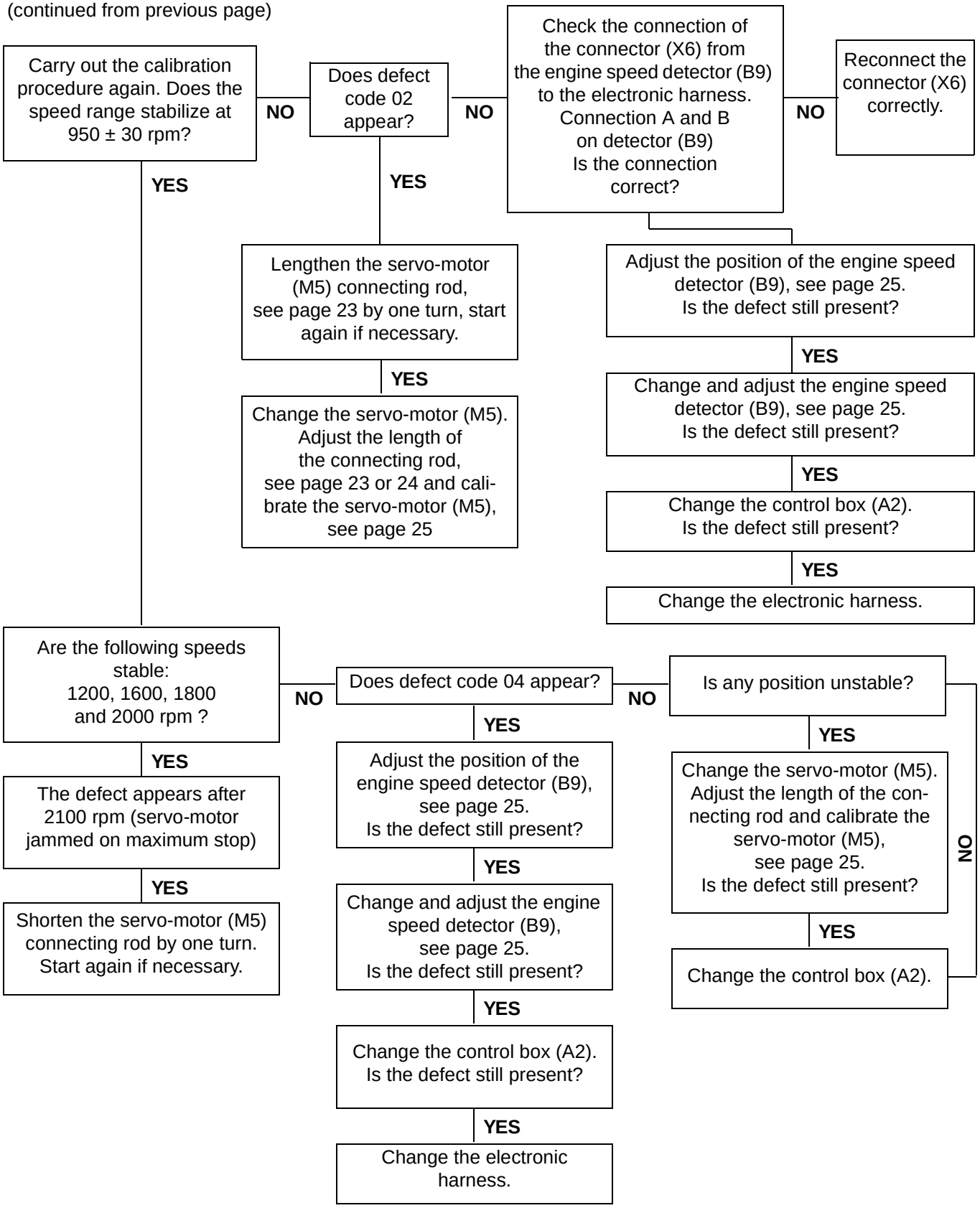
YES

(continued on next page)

NOTE: *Switch off and on again after each corrective action to reset the system. and carry out the calibration procedure again.*

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(continued from previous page)

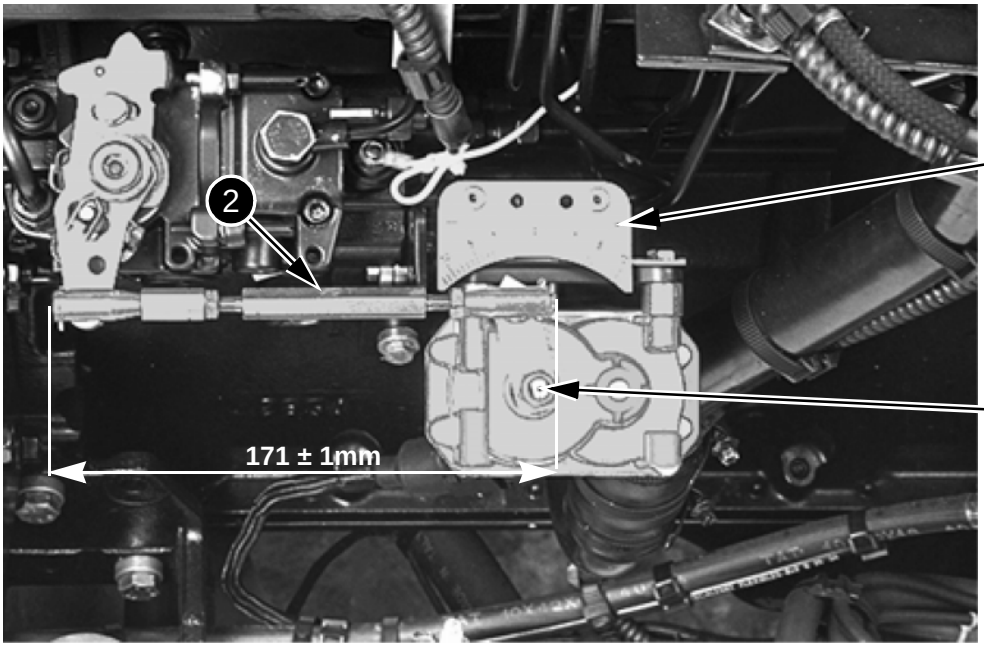


NOTE: *If the calibration procedure is not completed after 300 seconds:* ***Calibration impossible****. Switch off and on again after each corrective action to reset the system. and start the calibration procedure again.*

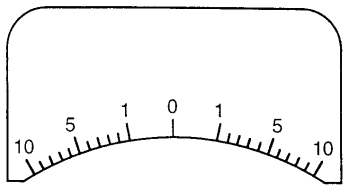
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Settings

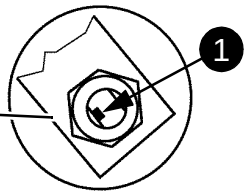
Electric acceleration (M5) mechanical adjustment - old type fitting (graduations centred on the gauge)



PH08508



CM99J036



PDH0487

STEP 1

Turn the battery master switch to the "Off" position.

STEP 2

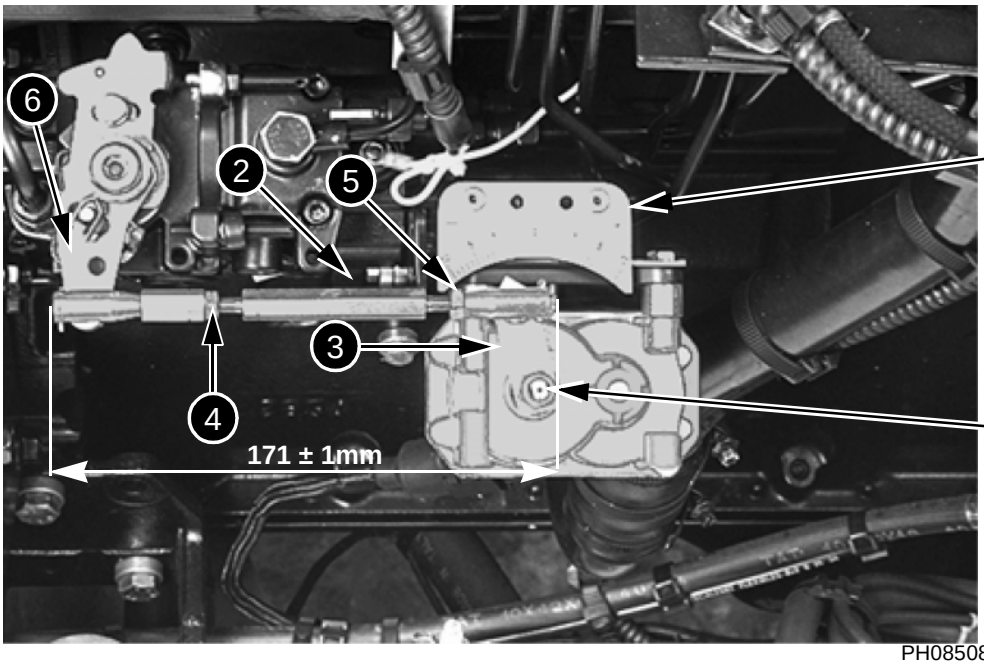
Make sure that the servo-motor (1) axis mark is correctly positioned.

STEP 3

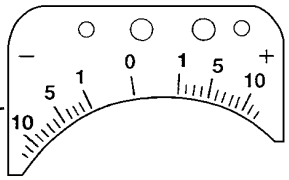
Adjust the connecting rod (2) to the following length: 171 ± 1 mm.

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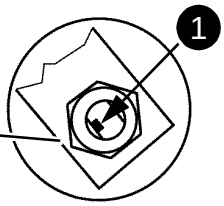
Electric acceleration (M5) mechanical adjustment - new type fitting (graduations offset 15° on the gauge)



PH08508



CM95F018



PDH0487

STEP 1

Turn the battery master switch to the "Off" position.

STEP 2

Make sure that the servo-motor (1) axis mark is correctly positioned.

STEP 3

Adjust the connecting rod (2) to the following length: 171 ± 1 mm.

STEP 4

Install the connecting rod (2) on the lever (3) of the acceleration motor.

STEP 5

Place the injection pump lever (6) in the "idle" position (LH stop), mark its position and then place the lever in the "accelerated" position (RH stop) and mark its position.

STEP 6

Check if the two marks previously noted are on the same graduation but with opposite signs. If this is not the case, use the connecting rod (2) to make the "idle/accelerated" positions more symmetrical and then tighten the two lock-nuts (4) and (5).

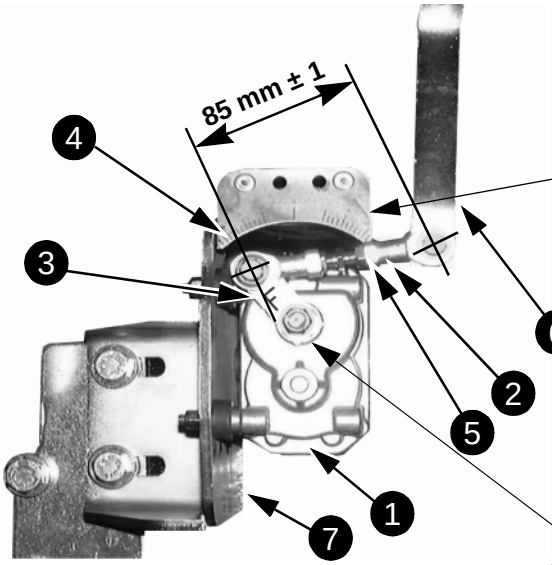
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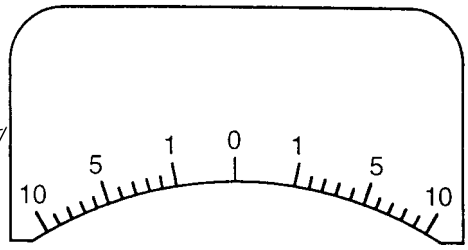
https://truckmanualshub.com/

Mechanical adjustment of electrical acceleration (M5) on "low emissions" models

788

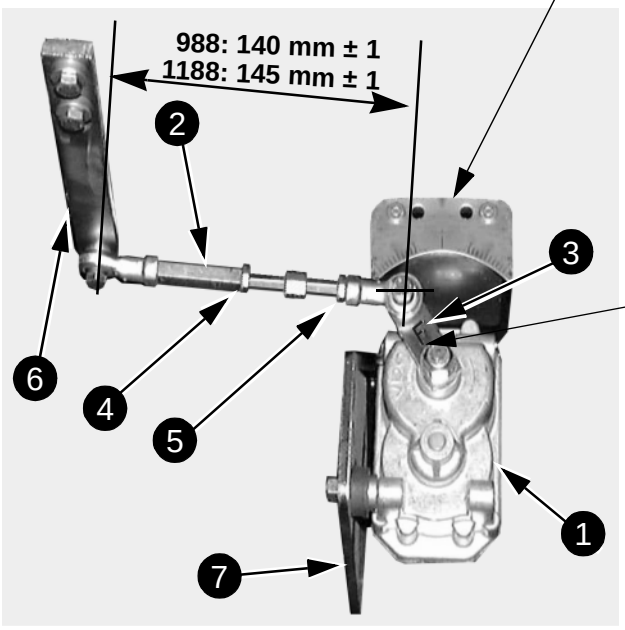


CD99J001

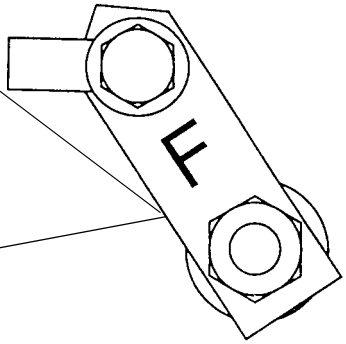


CM99J036

988/1188



CD99J002



CM99J035

https://truckmanualshub.com/

STEP 1

Turn the battery master switch to the "Off" position.

STEP 2

Make sure that lever (3) of the servo-motor (1) is correctly positioned (letter F facing the operator).

STEP 3

Position bracket (7) on the engine block, with the apertures centred.

STEP 4

Adjust the connecting rod (2) to the recommended length for the excavator model concerned:

788: 85 mm ± 1

988: 140 mm ± 1

1188: 145 mm ± 1

STEP 5

Install the connecting rod (2) on the lever (3) of the acceleration motor.

STEP 6

Place the injection pump lever (6) in the "idle" position (LH stop), mark its position on the gauge and then place the lever (6) in the "accelerated" position (RH stop) and mark its position on the gauge.

STEP 7

Check if the two marks previously noted are located on the same graduation but with opposite signs. If this is not the case, change the position of the bracket (7) on the engine block and lock the screws.

STEP 8

Change the length of the connecting rod to make the "idle/accelerated" positions more symmetrical.

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Electric acceleration calibration

STEP 1

Start the engine and warm it up to normal operating temperature, then press the "LOW" (low idle) key. Switch off the engine.

> *Do not actuate any of the controls during this procedure.*

STEP 2

Place the LH control arm in the "Safety" position.

STEP 3

Using the left hand, press simultaneously on the "LOW" and "MAX" keys on the control panel.

STEP 4

Using the right hand, switch on the machine.

STEP 5

Wait for the LED's on the keyboard, except for the "ECO" key, to go out, and then release the keys.

STEP 6

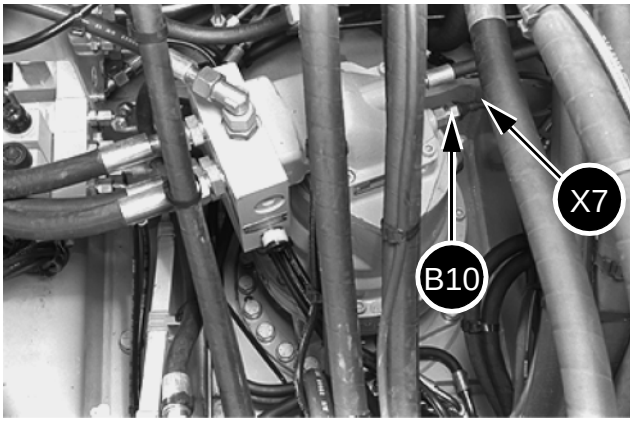
Start the engine. The "LOW" and "MAX" indicator lamps should flash, showing that the calibration phase is starting.

NOTE: *This phase lasts less than six minutes. The engine will run successively at 950, 1200, 1600, 1800, 2000 and 2240 rpm, and will then stay at "medium idle" speed (not shown on control panel), which is 1200 rpm.*

STEP 7

Check that the printed circuit board indicator lamp (LED) stays on continuously.
If this is not the case, note the defect code(s) and refer to the corresponding page.
If defect code 11 is displayed (calibration impossible) refer to page 4002-21.

Adjusting the engine speed detector (B10)



PH01002

STEP 1

Disconnect the connector (X7).

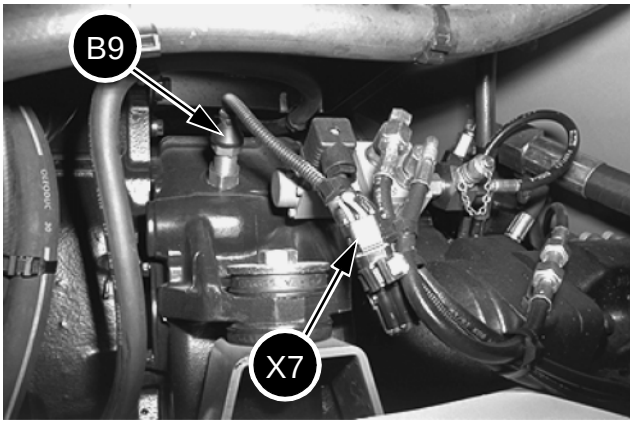
STEP 2

Check the condition of the seal and that the washers are present. Loosen the lock-nut and screw the detector up to the stop, then unscrew it one turn.

STEP 3

Tighten the lock-nut to a torque of 10 Nm and reconnect the connector (X7).

Adjusting the engine speed detector (B9)



PH00918

STEP 1

Disconnect the connector (X6).

STEP 2

Loosen the lock-nut and screw the detector up to the stop, then unscrew it one turn.

STEP 3

Tighten the lock-nut to a torque of 10 Nm and reconnect the connector (X6).

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Section

8001

TESTS, ADJUSTMENTS
AND HYDRAULIC SCHEMATICS
Crawler excavators

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TOOLS REQUIRED

1. TEST EQUIPMENT

There are three possible choices:

a) Multi-Handi test kit 2051 ..... E5444449



CP96E001

The Multi-Handi test kit is recommended as the basic tool of the mechanic.

The Multi-Handi can carry out the following tests:
Two pressure measurements, pressure peaks, pressure differential (Delta P), temperature, rotational speed and volumetric flow.
The test kit includes:

1 Multi-Handi 2051 unit D5444448
2 pressure detectors 0-600 bar V5344460
2 straight adaptors for detector W5344461
1 elbow adaptor for detector X5344462
1 rotational speed detector Z5344463
2 cables length 5 m E3144472
1 x 220 V 50 Hz power supply D5344467
1 cigarette lighter cable E5344468
1 instruction manual ..... ----------
1 carry-case N5344476

b) Multi-Test 4020 test kit T5344458



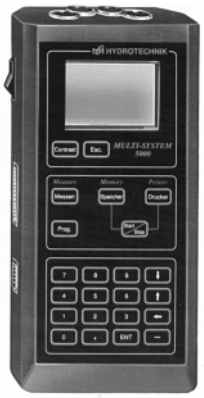
CP96E003

The Multi-Test is recommended to carry out in-depth diagnostics. Values read can be recorded in its memory and transferred to a PC and a printer.

The Multi-Test can carry out the following tests:
Two pressure measurements, pressure peaks, pressure differential (Delta P), temperature, temperature differential, rotational speed and volumetric flow, amperage, voltage, connection to PC and printer, memory capacity 60000.
The test kit includes:

1 Multi-Test 4020 unit Q5344455
2 pressure detectors 0-600 bar V5344460
2 straight adaptors for detector W5344461
1 elbow adaptor for detector X5344462
1 rotational speed detector Z5344463
1 temperature sender B3144469
2 double PT cables B5344465
4 cables length 5 m E3144472
1 x 220 V 50 Hz power supply D5344467
1 cigarette lighter cable E5344468
1 instruction manual ..... ----------
1 carry-case P5344477

c) Multi-System 5000 test kit U5344459



CP96E002

The Multi-System is recommended for specialist departments (Engineering Design Office and tests at customer's premises).

The Multi-System can carry out the following tests:
Two pressure measurements, pressure peaks, pressure differential (Delta P), temperature, temperature differential, rotational speed and volumetric flow, amperage, voltage, torque, force, movement, speed, connection to PC and printer, memory capacity 120000.
The test kit includes:

1 Multi-System 5000 unit R5344456
2 pressure detectors 0-600 bar V5344460
2 straight adaptors for detector W5344461
1 elbow adaptor for detector X5344462
1 rotational speed detector Z5344463
1 temperature sender A5344464
2 double PT cables B5344465
4 cables length 5 m E3144472
1 x 220 V 50 Hz power supply D5344467
1 cigarette lighter cable E5344468
1 instruction manual ..... ----------
1 carry-case P5344477

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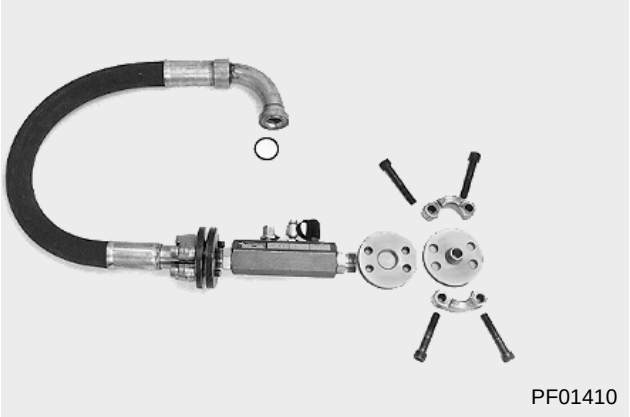
CP96E004

2. TEMPERATURE SENDER A5344464

Use with Multi-Handi 2051 test kit

3. MAGNETIC BASE G5344470

Use with Multi-Handi 2051, Multi-Test 4020 and Multi-System 5000 test kits



PF01410

4. 600 LITRES FLOWMETER, ORDER THE FOLLOWING:
ONE FLOWMETER RE3 Z5344486
TWO PLATES (M45 X 2) D4323359
TWO FLANGES (DIA. 24) B8230183
ONE HIGH PRESSURE HOSE DN25 W5431976
TWO SEALS D330421
FOUR HALF-FLANGES D4024267
EIGHT SCREWS (12 X 75) Z1232983

5. ONE HIGH PRESSURE HOSE DN19 Q5931990
ONE LOW PRESSURE HOSE DN12 B8031969



PG04005

6. ONE PRESSURE TEST POINT M14 X 1.5 A3237549



PE18402

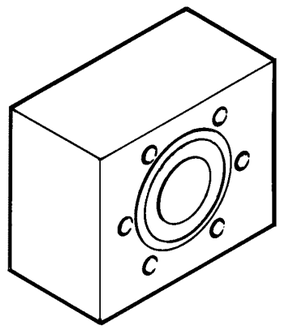
7. TWO MINIMESS HOSES LENGTH 2500 mm P2144487
TWO HOSE UNIONS C5144412



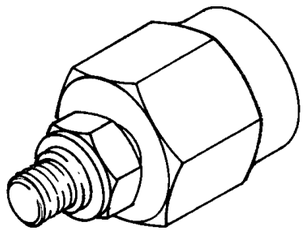
PG04006

8. TWO PLUGS 27 X 200 Q3337452
ONE FEMALE UNION 27 X 200 P4237556
ONE MALE/FEMALE UNION D12 L3237536

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PDH0505

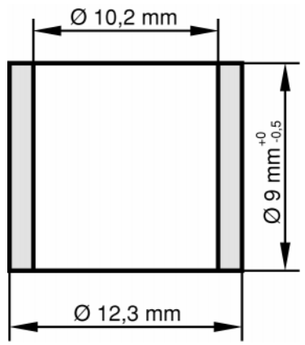


PDH0506

9. TWO REDUCTION GEARS DN25 - DN19 G1037352

10.ONE SPECIAL UNION W5137530

TOOLS TO BE MANUFACTURED



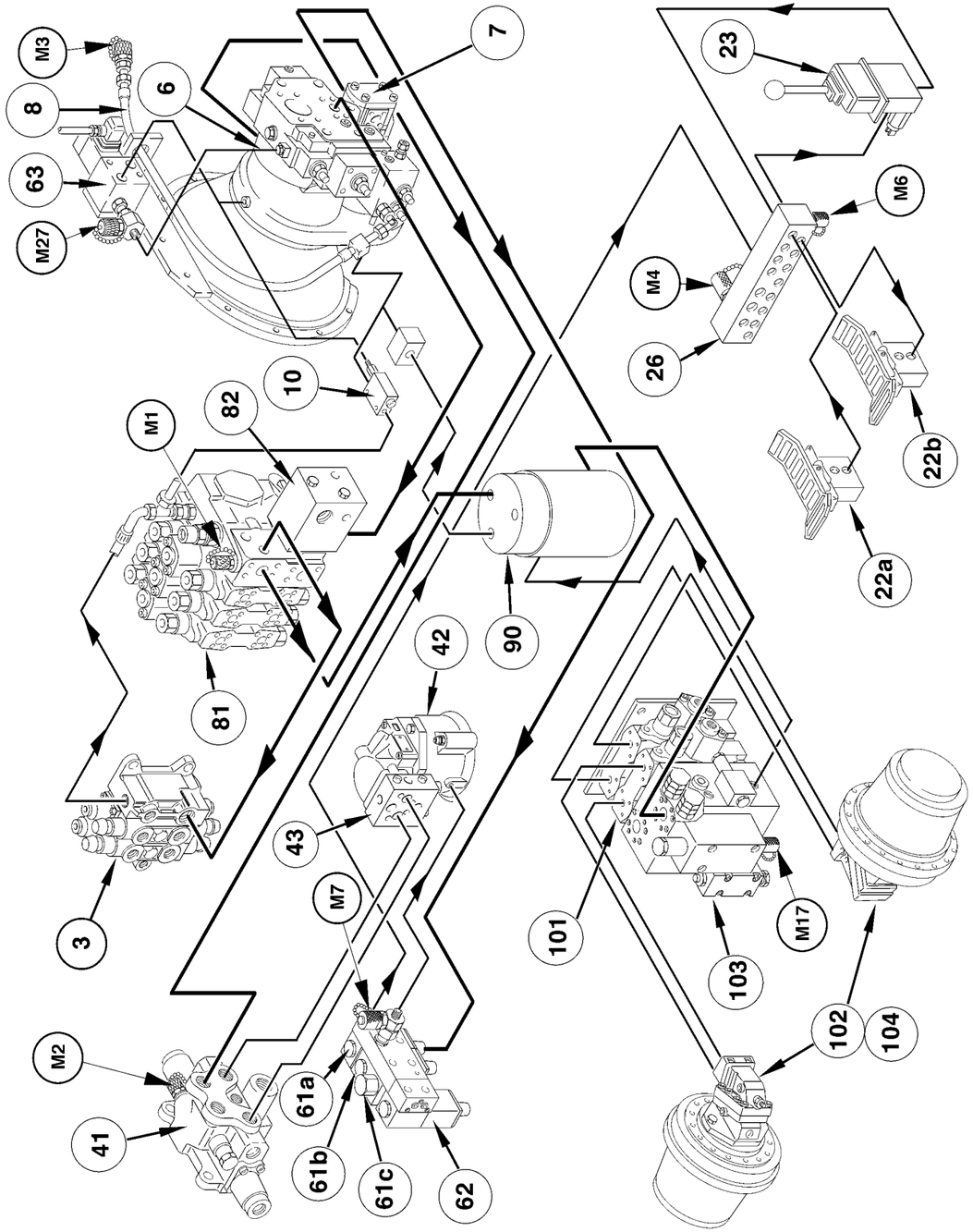
PDG0239

1. ONE SPACER TO LIMIT THE STROKE OF THE CONTROL LEVER SPOOLS

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788C hydraulic system

Location of hydraulic components



CM99J025

3 - Low flow options control valve (clamshell rotation, articulated boom)
6 - High pressure pump with:
1 fixed flow body for the swing function
1 variable flow body for the attachment, travel and options
7 - Low pressure pump for the pilot system
8 - Hose/accumulator on variable flow pump LS information circuit
10 - Anti-surge valve on pump LS circuit

22a - Foot control valve for the RH travel function
22b - Foot control valve for the LH travel function
23 - Manual travel control block (INCHING)
26 - Pilot systems supply and return circuit manifold

41 - Swing control valve block
42 - Hydraulic swing motor
43 - Swing safety and force-feed flange

61 - Electro-control valve including:
61a - Control arm safety electro-control valve
61b - Swing automatic braking and brake release electro-control valve
61c - Pressure limiter P35
62 - Hydraulic travel motor displacement change control electro-control valve (two-speed excavators)
63 - Electrically controlled proportional reducing valve (**DRE4**)

81 - Attachment control valve block (boom, dipper, bucket)
82 - P10 counter-pressure valve

90 - Hydraulic swivel

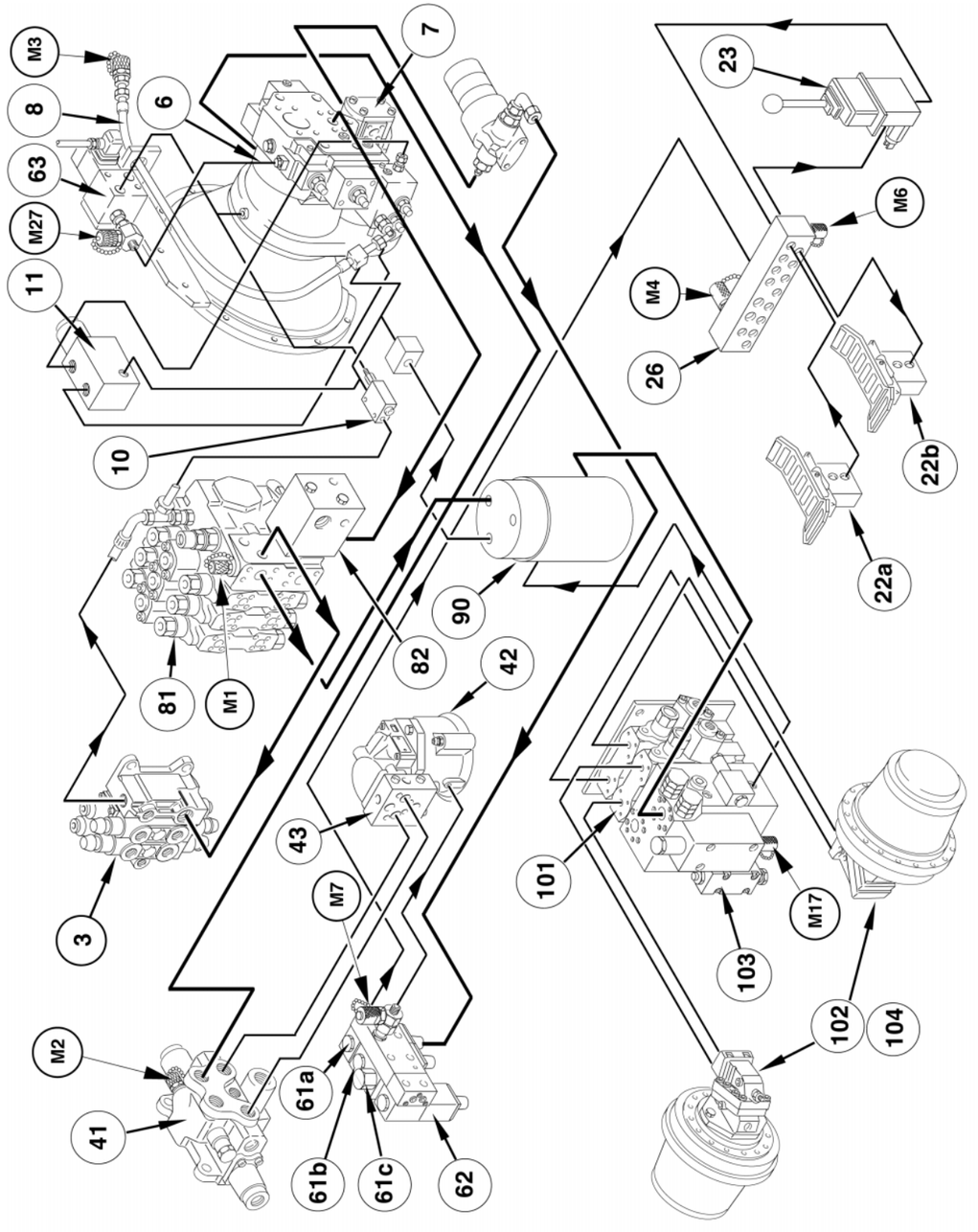
101 - Travel control valve block
102 - Fixed displacement hydraulic travel motors (single speed excavators)
103 - Travel drift control block
104 - Variable displacement hydraulic travel motors (two-speed excavators)

M1 - Pressure test point for attachment/travel and options (if any)
M2 - Pressure test point for the swing function
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M17 - Pressure test point for travel on speed limiter
M27 - Pressure test point for proportioning valve outlet

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788C Plus hydraulic system

Location of hydraulic components



CM99J026

3 - Low flow options control valve (clamshell rotation, articulated boom)
6 - High pressure pump with:
1 fixed flow pump for the swing
1 variable flow body for the attachment, travel and options
7 - Low flow pump for pilot system
8 - Hose/accumulator on the variable flow pump LS information circuit
10 - Anti-surge valve on attachment LS circuit
12 - Filter on pilot circuit

22a - Foot control block for RH travel function
22b - Foot control block for LH travel function
23 - Manual travel control block (INCHING)
26 - Pilot systems supply and return circuit manifold

41 - Swing control valve block
42 - Hydraulic swing motor
43 - Swing safety and force-feed flange

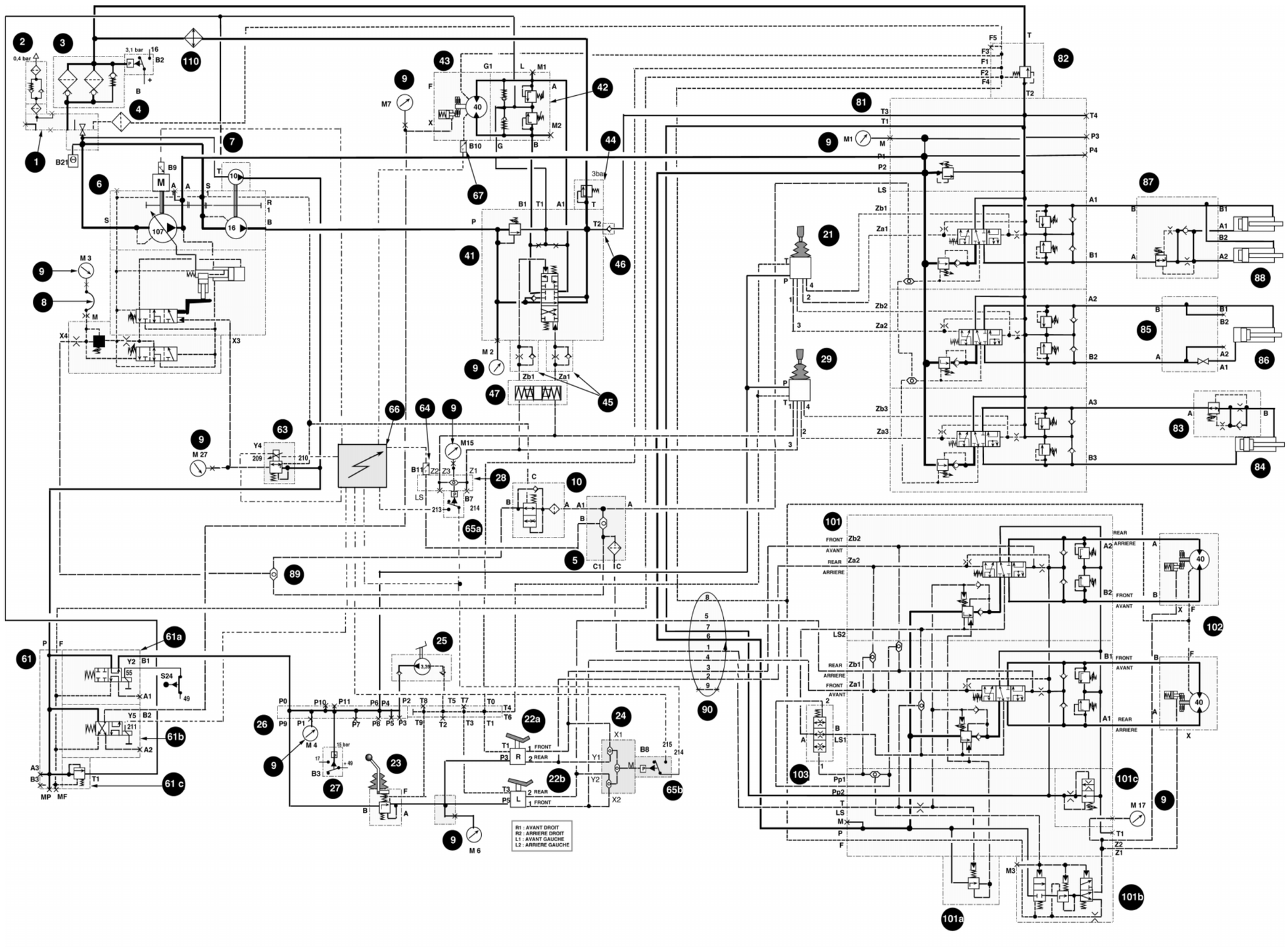
61 - Electro-control valve including:
61a - Control arm safety electro-control valve
61b - Automatic swing braking and brake release electro-control valve
61c - Pressure limiter P35
61d - Hydraulic travel motor displacement change electro-control valve (two-speed excavators)
63 - Electrically controlled proportional reducing valve (**DRE4**)

81 - Attachment control valve block (boom, dipper, bucket)
82 - P10 counter-pressure valve

90 - Hydraulic swivel

101 - Travel control valve block
102 - Fixed displacement travel hydraulic motors (single speed excavators)
103 - Travel drift control block
104 - Variable displacement hydraulic travel motors (two-speed excavators)

M1 - Pressure test point for attachment/travel and options (if any)
M2 - Pressure test point for the swing function
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot systems
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M17 - Pressure test point for travel on speed limiter
M27 - Pressure test point for proportioning valve outlet


R1 : AVANT DROIT
R2 : ARRIERE DROIT
L1 : AVANT GAUCHE
L2 : ARRIERE GAUCHE

CM99J029

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788C GENERAL HYDRAULIC SYSTEM

Single-speed 788C B general hydraulic system

Description

1 - Reservoir
2 - Reservoir filler cap with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Magnetic filter
5 - LS detector information selector block with filter on travel LS information
6 - High pressure hydraulic pump with:
1 fixed flow body for the swing function
1 variable flow body for attachment, travel and options
7 - Fixed flow low pressure pump for pilot circuit
8 - Hose/accumulator
9 - Pressure test point
M1 - Pressure test point for attachment, travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M15 - Pressure test point for swing pilot system
M17 - Pressure test point travel brake release on speed limiter
M27 - Pressure test point for proportioning valve outlet
10 - Anti-surge valve and filter on LS information (attachment/options)

21 - Boom and bucket (or clamshell) manual control block)
22a - RH travel control block
22b - LH travel control block
23 - Manual travel control block
24 - Travel pilot pressure selector block (AUTO-IDLE)
25 - Pressure release pump (foot control)
26 - Pilot circuit manifold
27 - Pilot circuit minimum pressure switch
28 - Swing pilot pressure information selector block (swing braking and brake release function + AUTO-IDLE function)
29 - Dipper and swing function manual control block

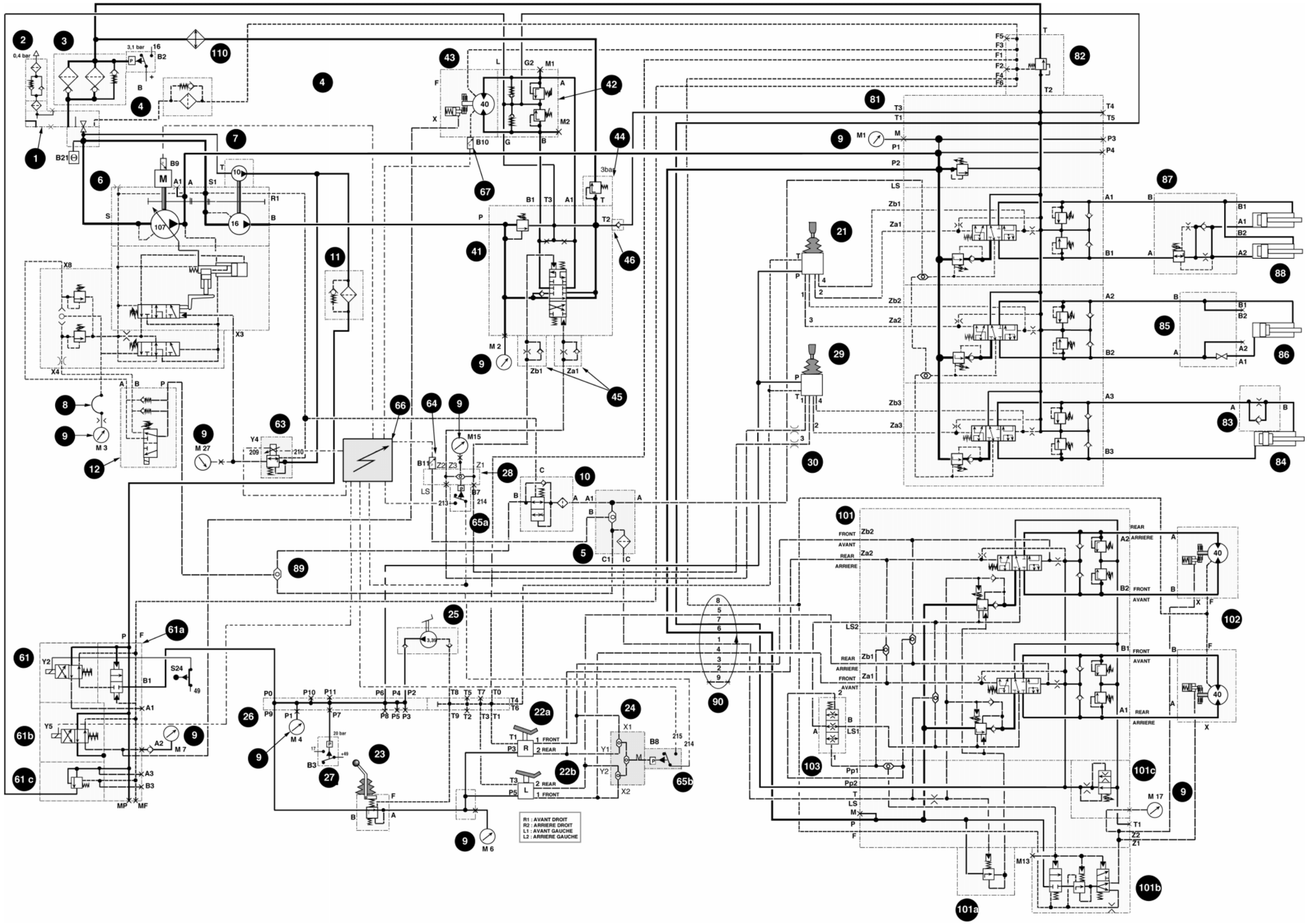
41 - Swing control valve block
42 - Hydraulic swing motor with static brake
43 - Safety/force-feed flange on swing function
44 - 3 bar counter-pressure valve
45 - Braking check valves on swing control valve spool pilot systems
46 - 0.5 b check valve on force-feed circuit (mounted on swing control valve)
47 - Double spring type accumulator

61 - Electro-control valve including:
61a - Control arm safety electro-control valve
61b - Automatic swing braking and brake release electro-control valve
61c - P35 pressure limiter
63 - Electro-hydraulic proportioning valve (**DRE4**)
64 - LS information pressure detector

65a - Swing pilot pressure switch (6 bar)
65b - Travel pilot pressure switch (6 bar)
66 - Electronic control box
67 - Swing motor speed detector (for braking function)

81 - Attachment control valve block (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter on dipper cylinder small chamber
84 - Dipper cylinder with dashpot on large and small chambers
85 - Backhoe / clamshell selector block
86 - Bucket cylinder with dashpot on the small chamber
87 - Boom cylinder supply distribution block with flow limiter on cylinder large chambers
88 - Boom cylinders with dashpot on the large chambers
89 - Pressure selector between the attachment/options and travel LS information circuits
90 - Hydraulic swivel

101 - Travel control valve block
101a - Anti-excess flow valve
101b - Hydraulic travel motor automatic brake release valve
101c - Speed limiter
102 - Fixed displacement hydraulic travel motors (with static brake)
103 - Travel drift control block
110 - Hydraulic oil cooler


R1 : AVANT DROIT
R2 : ARRIERE DROIT
L1 : AVANT GAUCHE
L2 : ARRIERE GAUCHE

CM99J031

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788C PLUS GENERAL HYDRAULIC SYSTEM

Single-speed 788C B general hydraulic system

Description

1 - Reservoir
2 - Reservoir filler cap with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Magnetic filter
5 - LS detector information selector block with filter on travel LS information
6 - High pressure hydraulic pump with:
1 fixed flow body for the swing function
1 variable flow body for attachment, travel and options
7 - Fixed flow low pressure pump for the pilot circuit
8 - Hose/accumulator
9 - Pressure test point
M1 - Pressure test point for attachment, travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for manual travel control block outlet
M7 - Pressure test point for swing braking and brake release
M15 - Pressure test point for swing pilot system
M17 - Pressure test point for travel brake release on speed limiter
M27 - Pressure test point for proportioning valve outlet
10 - Anti-surge valve and filter on LS information (attachment/options)
11 - Pilot circuit filter
12 - Work/heavy lift position selector

21 - Boom and bucket (or clamshell) manual control block
22a - RH travel control block
22b - LH travel control block
23 - Manual travel control block
24 - Travel pilot pressure selector block (AUTO-IDLE)
25 - Pressure release block (foot control)
26 - Pilot circuit manifold
27 - Pilot circuit minimum pressure switch
28 - Swing pilot pressure information selector block (swing braking and brake release function + AUTO-IDLE function)
29 - Dipper and swing function manual control block
30 - Jet in swing circuit

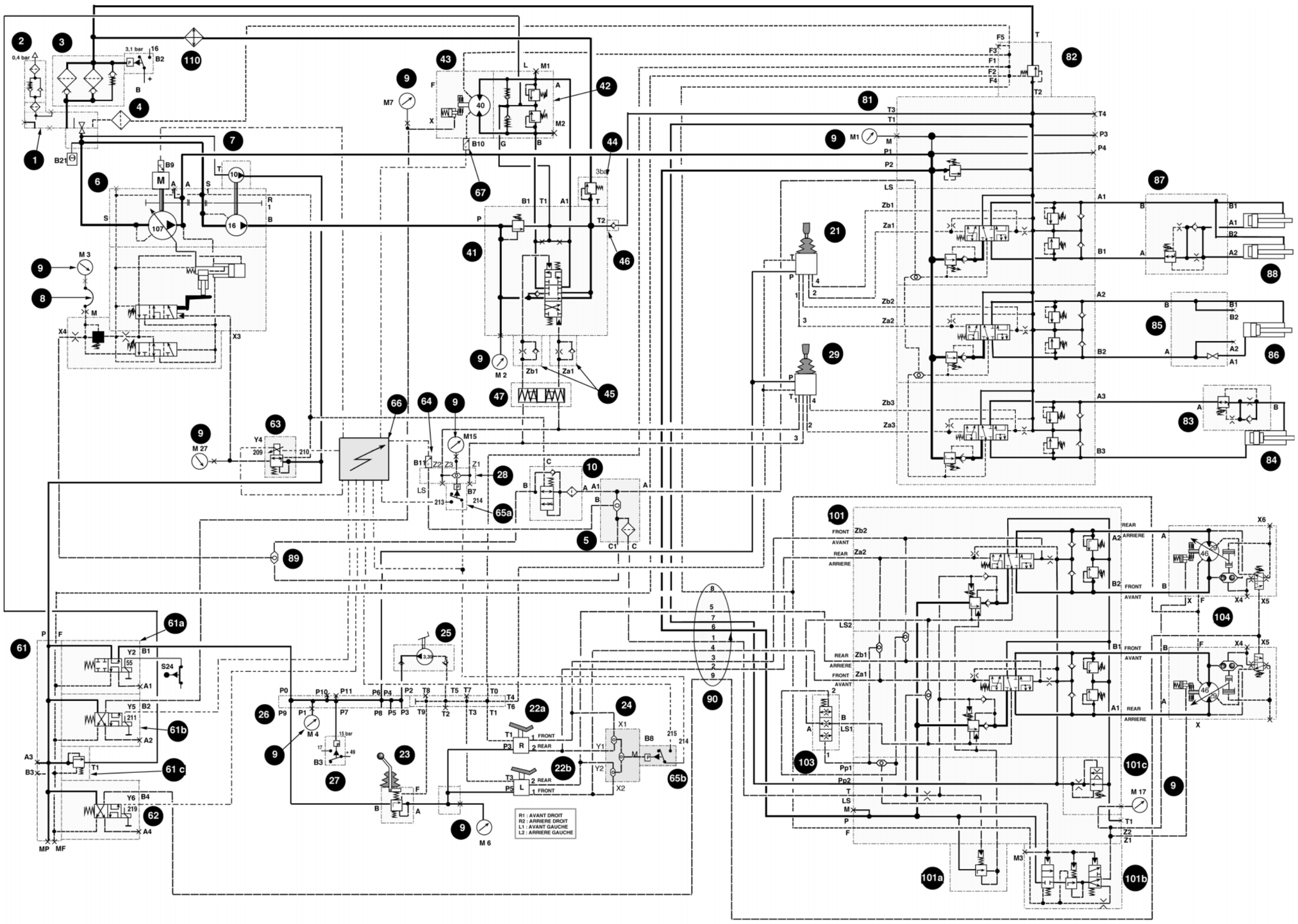
41 - Swing control valve block
42 - Hydraulic swing motor with static brake
43 - Safety / force-feed flange on swing function
44 - 3 bar counter-pressure valve
45 - Braking check valves on swing control valve spool pilot systems
46 - 0.5 b check valve on force-feed circuit (mounted on swing control valve)

61 - Electro-control valve including:
61a - Control arm safety electro-control valve
61b - Automatic swing braking and brake release electro-control valve
61c - P35 pressure limiter
63 - Electro-hydraulic proportioning valve (**DRE4**)
64 - LS information pressure detector

65a - Swing pilot pressure switch (6 bar)
65b - Travel pilot pressure switch (6 bar)
66 - Electronic control box
67 - Swing motor speed detector (for braking)

81 - Attachment control valve block (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter on dipper cylinder small chamber
84 - Dipper cylinder with dashpot on large and small chamber
85 - Backhoe/clamshell selector block
86 - Bucket cylinder with dashpot on small chamber
87 - Boom cylinder supply distribution block with flow limiter on cylinder large chambers
88 - Boom cylinders with dashpot on large chambers
89 - Pressure selector between attachment/options and travel LS information circuits
90 - Hydraulic swivel

101 - Travel control valve block
101a - Anti-excess flow valve
101b - Hydraulic travel motor automatic brake release valve
101c - Speed limiter
102 - Fixed displacement hydraulic travel motors (with static brake)
103 - Travel drift control block
110 - Hydraulic oil cooler


R1 : AVANT DROIT
R2 : ARRIERE DROIT
L1 : AVANT GAUCHE
L2 : ARRIERE GAUCHE

CM99J030

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788C GENERAL HYDRAULIC SYSTEM

Two-speed 788C B general hydraulic system

1 - Reservoir
2 - Reservoir filler cap with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Magnetic filter
5 - LS detector information selector block with filter on travel LS information
6 - High pressure hydraulic pump with:
1 fixed flow body for the swing
1 variable flow body for the attachment, travel and options
7 - Fixed flow low pressure pump for the pilot circuit
8 - Hose/accumulator
9 - Pressure test point
M1 - Pressure test point for attachment, travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for manual travel control block outlet
M7 - Pressure test point for swing braking and brake release
M15 - Pressure test point for swing pilot system
M17 - Pressure test point for travel brake release on speed limiter
M27 - Pressure test point for proportioning valve outlet
10 - Anti-surge valve and filter on LS information (attachment/options)

21 - Boom and bucket (or clamshell) manual control block
22a - RH travel control block
22b - LH travel control block
23 - Manual travel control block
24 - Travel pilot pressure selector block (AUTO-IDLE)
25 - Pressure release pump (foot control)
26 - Pilot circuits manifold
27 - Pilot circuit minimum pressure switch
28 - Swing pilot pressure information selector block (automatic swing braking and brake release + AUTO-IDLE)
29 - Dipper and swing function manual control block

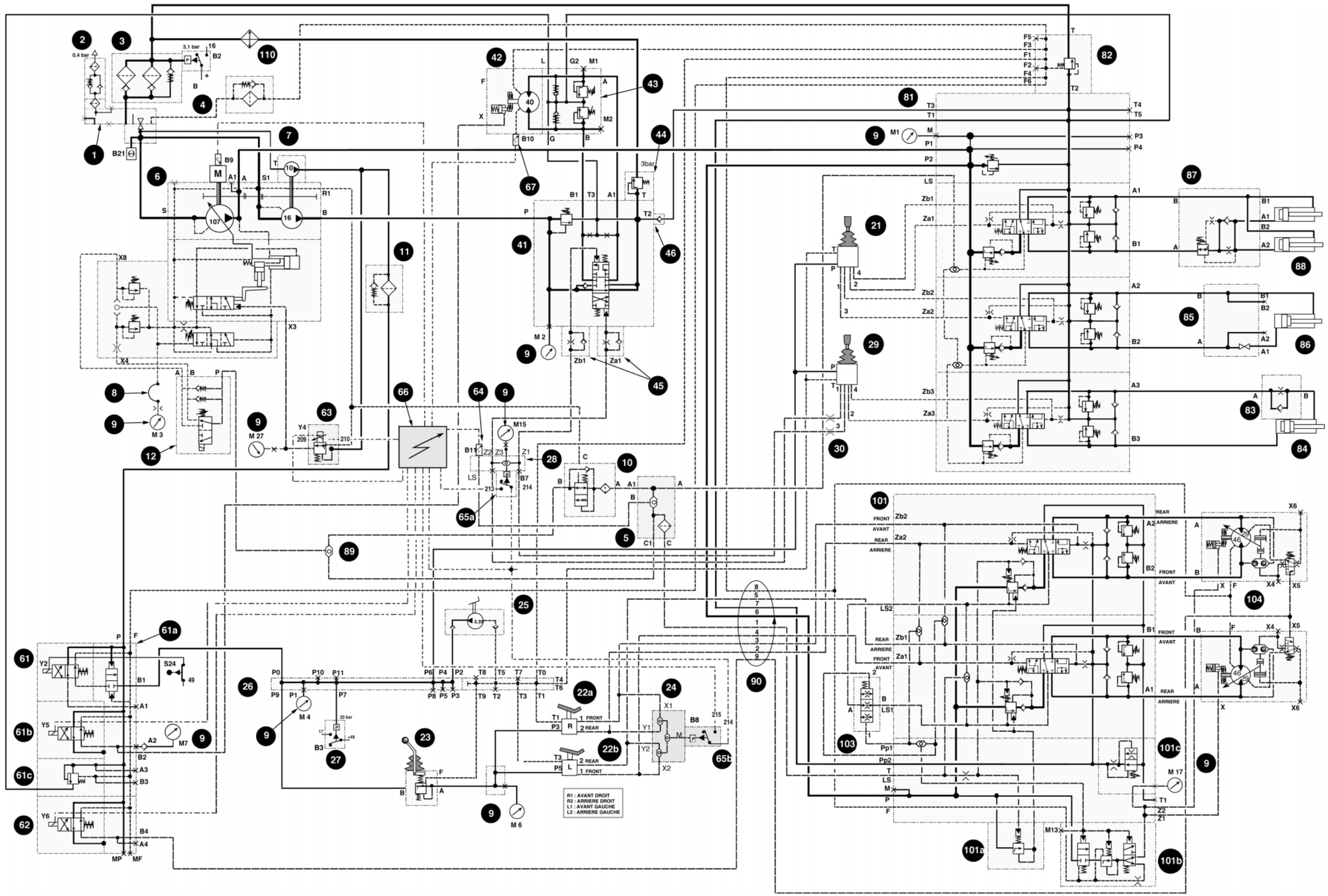
41 - Swing control valve block
42 - Hydraulic swing motor with static brake
43 - Safety/force-feed flange on swing function
44 - 3 bar counter-pressure valve
45 - Braking valves on swing control valve spool pilots
46 - 0.5 b valve on the force-feed circuit (mounted on the swing control valve)
47 - Double spring type accumulator

61 - Electro-control valve block consisting of:
61a - Safety control arm electro-control valve
61b - Automatic swing braking and brake release electro-control valve
61c - P35 pressure limiter
62 - Hydraulic travel motor displacement change electro-control valve
63 - Electro-hydraulic proportioning valve (**DRE4**)
64 - LS information pressure detector
65a - Swing pilot pressure switch (6 bar)
65b - Travel pilot pressure switch (6 bar)
66 - Electronic control box
67 - Swing motor speed detector (for braking function)

81 - Attachment control valve block (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter on dipper cylinder small chamber
84 - Dipper cylinder with dashpot on large and small chamber
85 - Backhoe/clamshell selector block
86 - Bucket cylinder with dashpot on the small chamber
87 - Boom cylinder supply distributor with flow limiter on cylinder large chambers
88 - Boom cylinders with dashpot on the large chambers
89 - Pressure selector between the attachment/option and travel LS information circuits
90 - Hydraulic swivel

101 - Travel control valve block
101a - Anti-excess flow valve
101b - Hydraulic travel motor automatic brake release valve
101c - Speed limiter
103 - Travel drift control block
104 - Variable displacement hydraulic travel motors
110 - Hydraulic oil cooler

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CM99J032

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788C PLUS GENERAL HYDRAULIC SYSTEM

Two-speed 788C Plus general hydraulic system

Description

1 - Reservoir
2 - Reservoir filler cap with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Magnetic filter
5 - LS detector information selector block with filter on travel LS information filter
6 - High pressure hydraulic pump with:
1 fixed flow body for swing
1 variable flow body for the attachment, travel and options
7 - Fixed flow low pressure pump for the pilot circuit
8 - Hose/accumulator
9 - Pressure test point
M1 - Pressure test point for attachment, travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control point outlet
M7 - Pressure test point for swing braking and brake release
M15 - Pressure test point for swing pilot system
M17 - Pressure test point for travel brake release on speed limiter
M27 - Pressure test point for proportioning valve outlet
10 - Anti-surge valve and filter on LS information (attachment/options)
11 - Pilot circuit filter
12 - Work/heavy lift position selector

21 - Boom and bucket (or clamshell) manual control block
22a - RH travel control block
22b - LH travel control block
23 - Manual travel control block
24 - Travel pilot pressure selector block (AUTO-IDLE)
25 - Pressure release pump (foot control)
26 - Manifold for pilot circuits
27 - Pilot circuit minimum pressure switch
28 - Swing pilot pressure information selector block (swing automatic braking and brake release function + AUTO-IDLE function)
29 - Dipper and swing function manual control block
30 - Jet in swing circuit

41 - Swing control valve block
42 - Hydraulic swing motor with static brake
43 - Safety/force-feed flange on swing function
44 - 3 bar counter-pressure valve
45 - Braking check valves on swing control valve spool pilot systems
46 - 0.5 b check valve on force-feed circuit (mounted on the swing control valve)
61 - Electro-control valve block:
61a - Control arm safety electro-control valve
61b - Automatic swing braking and brake release electro-control valve
61c - P35 pressure limiter
62 - Hydraulic travel motor displacement change electro-control valve
63 - Electro-hydraulic proportioning valve (**DRE4**)
64 - LS information pressure detector

65a - Swing pilot pressure switch (6 bar)
65b - Travel pilot pressure switch (6 bar)
66 - Electronic control box
67 - Hydraulic swing motor speed detector (for braking function)

81 - Attachment control valve block (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter on dipper cylinder small chamber
84 - Dipper cylinder (dashpot on large and small chamber)
85 - Backhoe/clamshell selector block
86 - Bucket cylinder (dashpot on small chamber)
87 - Boom cylinder supply distribution block with flow limiter on the cylinder large chambers
88 - Boom cylinders (dashpot on large chambers)
89 - Pressure selector between LS/options and travel
90 - Hydraulic swivel

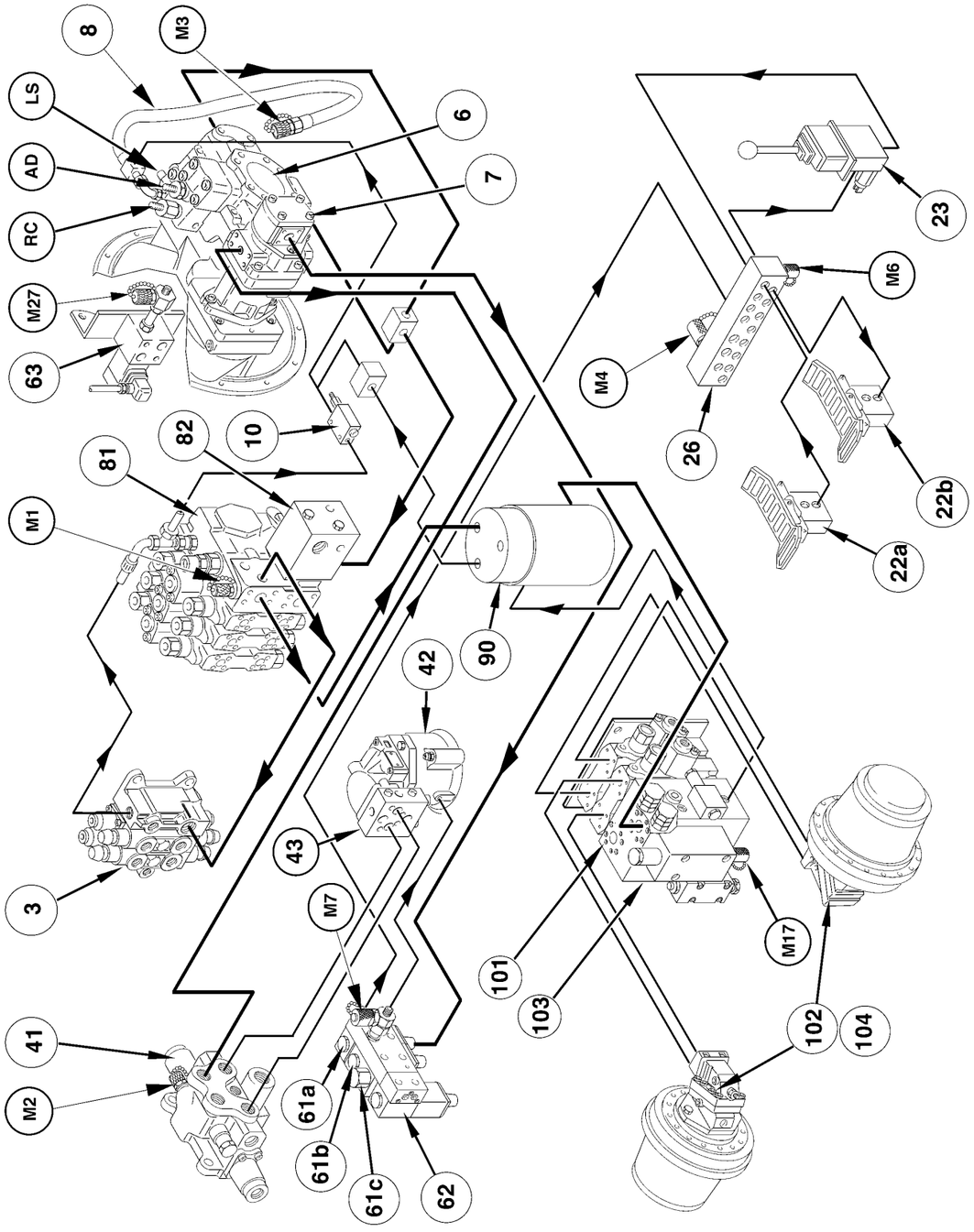
101 - Travel control valve block
101a - Anti-excess flow valve
101b - Hydraulic travel motor automatic brake release valve
101c - Speed limiter
103 - Travel drift control block
104 - Variable displacement hydraulic travel motors
110 - Hydraulic oil cooler

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988C GENERAL HYDRAULICS

988C hydraulic system

Location of hydraulic components



CM99J027

3 - Low flow option control valve (clamshell rotation, articulated boom)
6 - High pressure pump with:
1 fixed flow body for the swing
1 variable flow body for the attachment, travel and options
7 - Low pressure pump for the pilot circuit
8 - Hose/accumulator on the variable flow pump LS information circuit
10 - Anti-surge valve on the attachment LS circuit

22a - Foot control block for the RH travel function
22b - Foot control block for the LH travel function
23 - Manual travel control block
26 - Manifold for supply circuits and pilot return circuits

41 - Swing control valve block
42 - Hydraulic swing motor
43 - Swing function safety and force-feed flange

61 - Electro-control valve block consisting of:
61a - Automatic swing braking and brake release electro-control valve
61b - Safety control arm electro-control valve
61c - P35 pressure limiter
62 - Hydraulic travel motor displacement change electro-control valve (two-speed excavators)
63 - Electrically controlled proportional reduction valve (**DRE4**)

81 - Attachment control valve
82 - P10 counter-pressure valve

90 - Hydraulic swivel

101 - Travel control valve
102 - Fixed displacement hydraulic travel motors (single-speed excavators)
103 - Travel anti-drift block
104 - Variable displacement hydraulic travel motors (two-speed excavators)

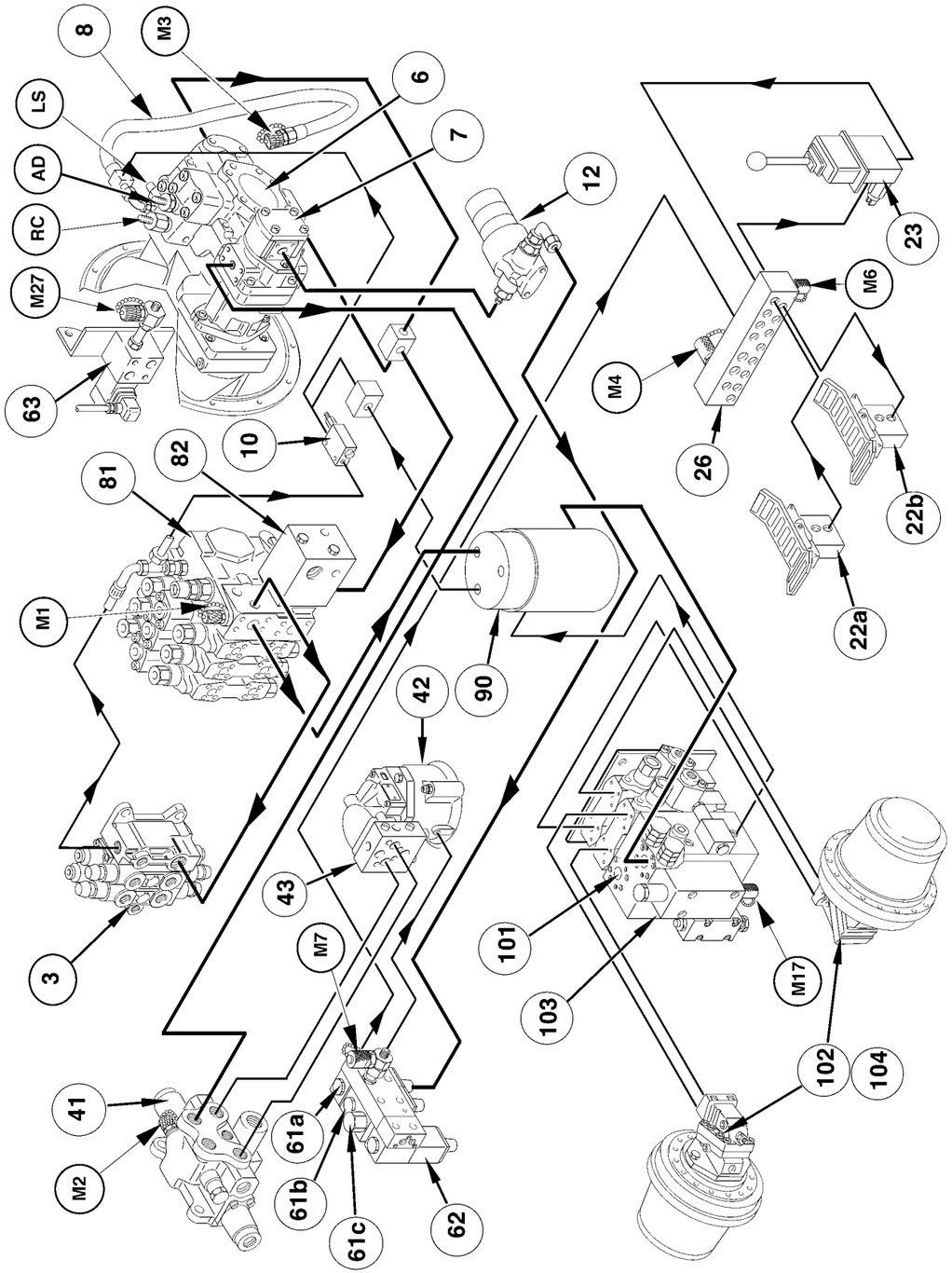
M1 - Pressure test point for attachment/travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M17 - Pressure test point for travel on the speed limiter
M27 - Pressure test point for proportioning valve outlet

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988C PLUS GENERAL HYDRAULICS

988C Plus hydraulic system

Location of hydraulic components



CM99J028

- **3** - Low flow option control valve (clamshell rotation, articulated boom)
- **6** - High pressure hydraulic pump with:
  1 fixed flow body for the swing
  1 variable flow body for the attachment, travel and options
- **7** - Low pressure hydraulic pump for the pilot circuit
- **8** - Hose/accumulator on the variable flow pump LS information
- **10** - Anti-surge valve on the pump LS circuit
- **12** - Pilot circuit filter

- **22a** - Foot control block for the RH travel function
- **22b** - Foot control block for the LH travel function
- **23** - Manual travel control block
- **26** - Pilot supply and return circuit manifold

- **41** - Swing control valve
- **42** - Hydraulic swing motor
- **43** - Swing function safety and force-feed flange

- **61** - Electro-control valve block consisting of:
  - **61a** - Safety control arm electro-control valve
  - **61b** - Automatic swing braking and brake release electro-control valve
  - **61c** - P35 pressure limiter
- **62** - Hydraulic travel motor displacement change electro-control valve (two-speed excavators)
- **63** - Electrically controlled proportional reduction valve (**DRE4**)

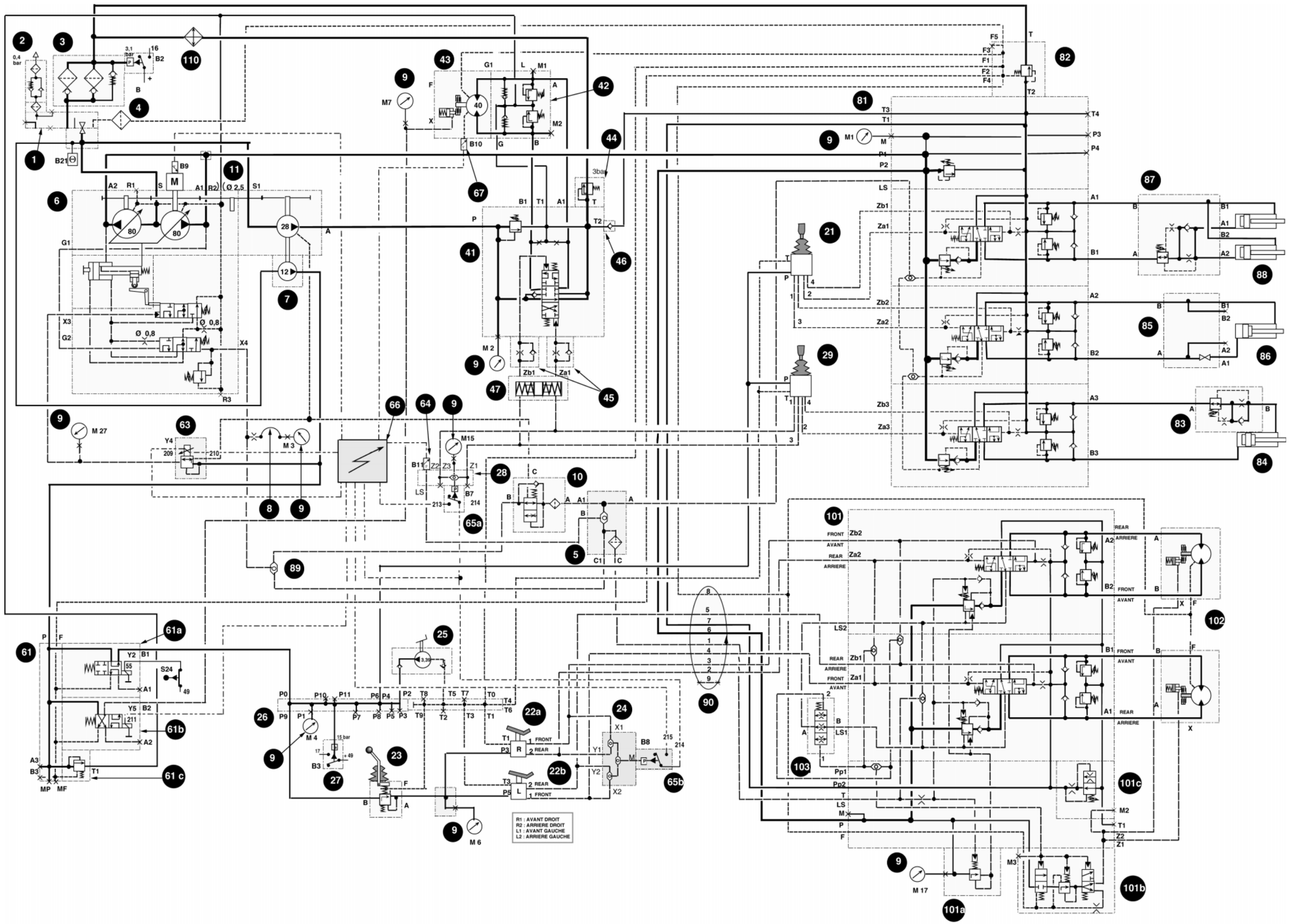
- **81** - Attachment control valve
- **82** - P10 counter-pressure block

- **90** - Hydraulic swivel

- **101** - Travel control valve
- **102** - Fixed displacement hydraulic travel motors (single-speed excavators)
- **103** - Travel anti-drift block
- **104** - Variable displacement hydraulic travel motors (two-speed excavators)

- **M1** - Pressure test point for attachment/travel and options (if any)
- **M2** - Pressure test point for swing
- **M3** - Pressure test point for LS circuit
- **M4** - Pressure test point for pilot circuits
- **M7** - Pressure test point for swing braking and brake release
- **M17** - Pressure test point for travel on speed limiter
- **M27** - Pressure test point for proportioning valve outlet

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CM99M027

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988C GENERAL HYDRAULIC SYSTEM

Single-speed 988C general hydraulic system

Description

1 - Reservoir
2 - Reservoir filler cap with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Magnetic filter
5 - LS detector information selector block with filter on travel LS information
6 - High pressure hydraulic pump with:
1 fixed flow body for the swing circuit
2 variable flow bodies for the attachment, travel and options
7 - Low pressure pump for the pilot circuit
8 - Hose/accumulator
9 - Pressure test point
M1 - Pressure test point for attachment, travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M15 - Pressure test point for swing pilot system
M17 - Pressure test point for travel on the speed limiter
M27 - Pressure test point for proportioning valve outlet
10 - Anti-surge valve and filter on LS information (attachment/options)
11 - Calibrated orifice (Ø: 2.5 mm) on main pump irrigation circuit

21 - Boom and bucket (or clamshell) function manual control
22a - RH travel control block
22b - LH travel control block
23 - Manual travel control block
24 - Travel pilot pressure selector block (AUTO-IDLE)
25 - Decompression pump (foot control)
26 - Pilot circuit manifold
27 - Pilot system minimum pressure switch
28 - Swing pilot pressure information selector block (automatic swing braking and brake release + AUTO-IDLE function)
29 - Dipper and swing function manual control block

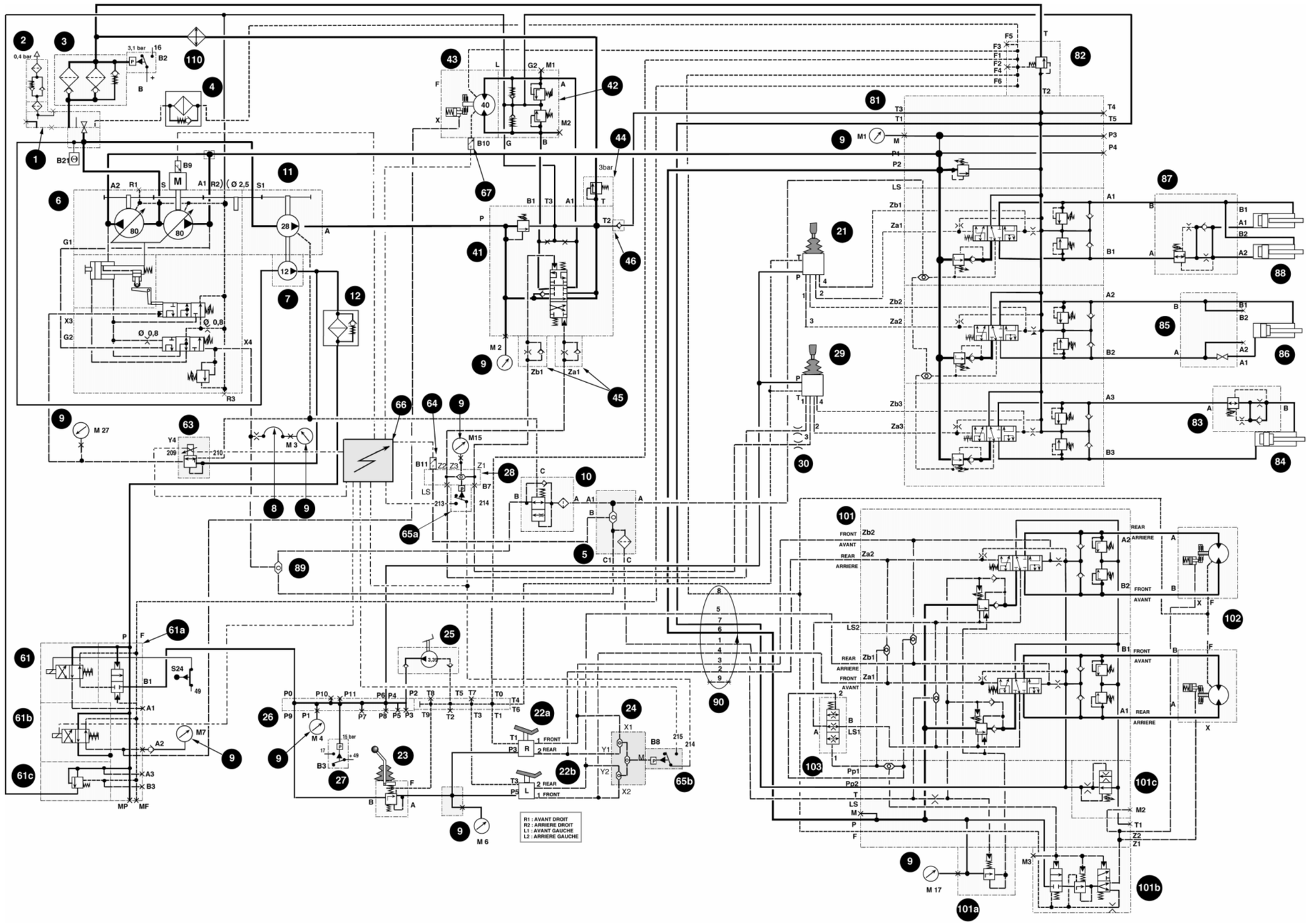
41 - Swing control valve block
42 - Hydraulic swing motor with static brake
43 - Safety/force-feed flange on swing function
44 - 3 bar valve block
45 - Braking valves on swing control valve spool pilots
46 - 0.5 b check valve on force-feed circuit (mounted on swing control valve)
47 - Accumulator

61 - Electro-control valve including:
61a - Automatic swing braking and brake release electro-control valve
61b - Safety control arm electro-control valve
61c - P35 pressure limiter
63 - Electro-hydraulic proportioning valve (**DRE4**)
64 - LS information pressure detector
65a - Swing pilot pressure switch (6 bar)
65b - travel pilot pressure switch (6 bar)
66 - Electronic control box
67 - Hydraulic swing motor speed detector

81 - Attachment control valve block (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter on dipper cylinder small chamber
84 - Dipper cylinder with dashpot on large and small chamber
85 - Backhoe/clamshell selector block
86 - Bucket cylinder with dashpot on the small chamber
87 - Boom cylinder supply distribution block with flow limiter on the cylinder large chambers
88 - Boom cylinders with dashpot on the large chambers
89 - Pressure selector between attachment/option and travel LS information circuits
90 - Hydraulic swivel

101 - Travel control valve block
101a - Speed limiter
101b - Automatic hydraulic motor brake release valve
101c - Anti-excess flow valve
102 - Fixed displacement hydraulic travel motors (with static brake)
103 - Travel anti-drift block
110 - Hydraulic oil cooler

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CM99J033

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988C PLUS GENERAL HYDRAULIC SYSTEM

Single-speed 988C Plus general hydraulic system

Description

1 - Reservoir
2 - Reservoir filler plug with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Filter on return circuit
5 - LS detector information selector block with filter on travel LS information
6 - High pressure hydraulic pumps with:
1 fixed flow body for the swing
2 variable flow bodies for the attachment, travel and the options
7 - Low pressure fixed flow pump for the pilot circuit
8 - Hose/accumulator
9 - Pressure test point
M1 - Pressure test point for attachment, travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M15 - Pressure test point for swing pilot
M17 - Pressure test point for travel on the speed limiter
M27 - Pressure test point for proportioning valve outlet
10 - Anti-surge valve and filter on LS information (attachment/options)
11 - Calibrated orifice (Ø: 2.5 mm) on the main pump irrigation circuit
12 - Pilot circuit filter

21 - Boom and bucket (or clamshell) function manual control block
22a - RH travel control block
22b - LH travel control block
23 - Manual travel control block
24 - Travel pilot pressure selector block (AUTO-IDLE)
25 - Decompression pump (foot control)
26 - Pilot circuits manifold
27 - Pilot circuit minimum pressure switch
28 - Swing pilot pressure information selector block (automatic swing braking and brake release + AUTO-IDLE function)
29 - Dipper and swing function manual control block
30 - Jets on swing pilot circuit

41 - Swing control valve block
42 - Hydraulic swing motor with static brake
43 - Safety/force-feed flange on swing function
44 - 3 bar valve block
45 - Braking valves on swing control valve spool pilots
46 - 0.5 b valve on force-feed circuit (mounted on swing control valve)

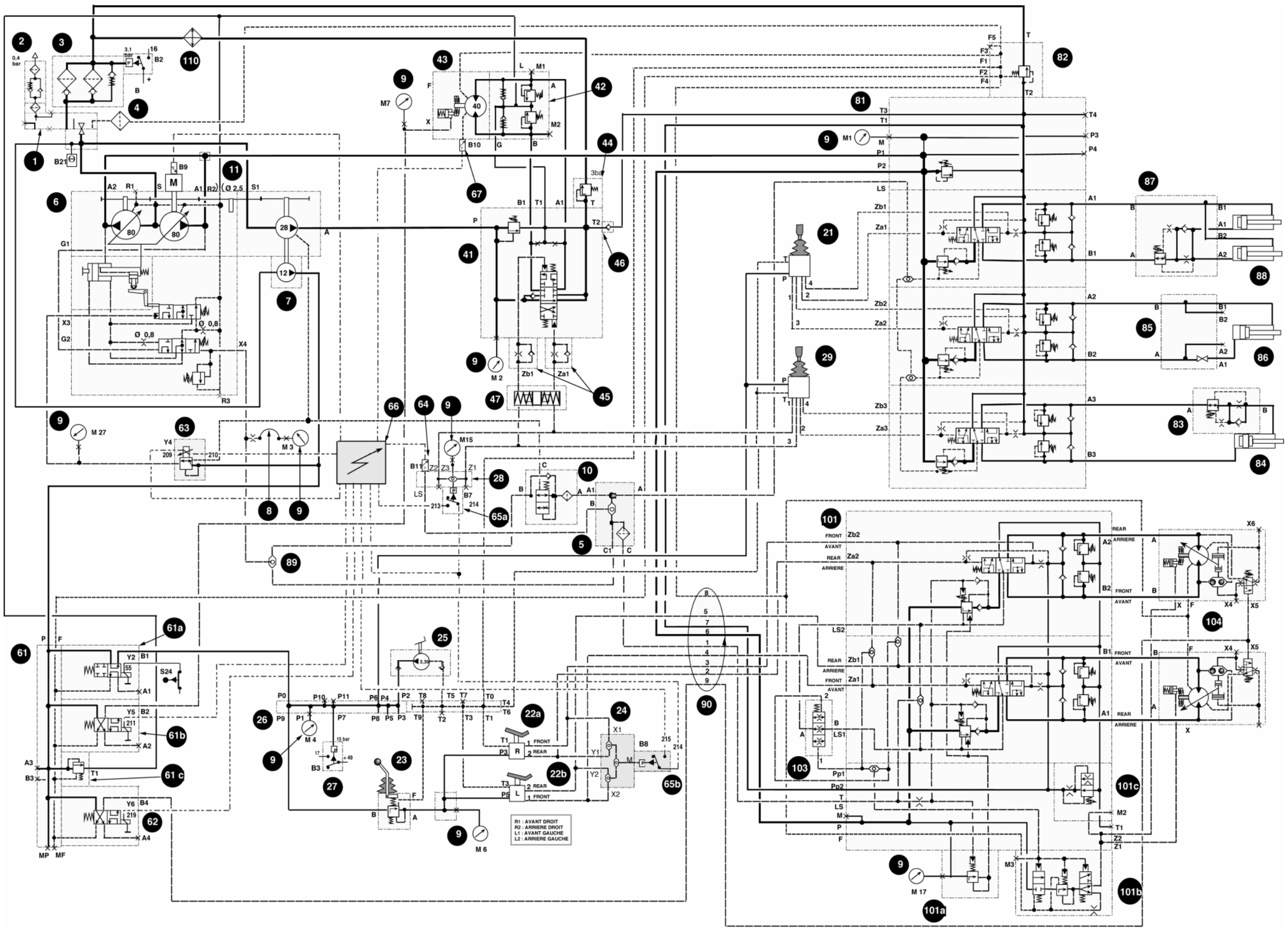
61 - Electro-control valve block including:
61a - Safety control arm electro-control valve
61b - Automatic swing braking and brake release electro-control valve
61c - P35 pressure limiter
63 - Electro-hydraulic proportioning valve (**DRE4**)
64 - LS information pressure detector

65a - Swing pilot pressure switch (6 bar)
65b - Travel pilot pressure switch (6 bar)
66 - Electronic control box
67 - Swing motor speed detector (for braking)

81 - Attachment control valve block (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter on dipper cylinder small chamber
84 - Dipper cylinder with dashpot on large and small chamber
85 - Backhoe/clamshell selector block
86 - Bucket cylinder with dashpot on the small chamber
87 - Boom cylinder supply distribution block with flow limiter on the cylinder large chambers
88 - Boom cylinders with dashpot on the big chambers
89 - Pressure selector between attachment/option and travel LS information circuits
90 - Hydraulic swivel

101 - Travel control valve blocks
101a - Speed limiter
101b - Automatic hydraulic travel motor brake release valve
101c - Anti-excess flow valve
102 - Fixed displacement hydraulic travel motors (with static brake)
103 - Travel anti-drift block
110 - Hydraulic oil cooler

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CM99M028

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988C GENERAL HYDRAULIC SYSTEM

Two-speed 988C general hydraulic system

Description

1 - Reservoir
2 - Reservoir filler cap with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Magnetic filter
5 - LS detector information selection block with filter on travel LS information line
6 - High pressure hydraulic pumps with:
1 fixed flow body for the swing
2 variable flow bodies for the attachment, travel and options
7 - Fixed flow low pressure pump for the pilot circuit
8 - Hose/accumulator
9 - Pressure test point
M1 - Pressure test point for attachment, travel and option (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for manual travel control block outlet
M7 - Pressure test point for swing brake and brake release
M15 - Pressure test point for swing pilot system
M17 - Pressure test point for travel brake release on speed limiter
M27 - Pressure test point for proportioning valve outlet
10 - Anti-surge valve and filter on LS information (attachment/options)
11 - Calibrated orifice (dia: 2.5 mm) on main pump irrigation circuit

21 - Boom and bucket (or clamshell) function manual control block
22a - RH travel control block
22b - LH travel control block
23 - Travel manual control block
24 - Travel pilot pressure selection block (AUTO-IDLE)
25 - Decompression pump (foot control)
26 - Pilot circuits manifold
27 - Minimum pilot pressure switch
28 - Swing pilot pressure information selector block (swing auto braking and brake release + AUTO-IDLE)
29 - Dipper and swing manual control block

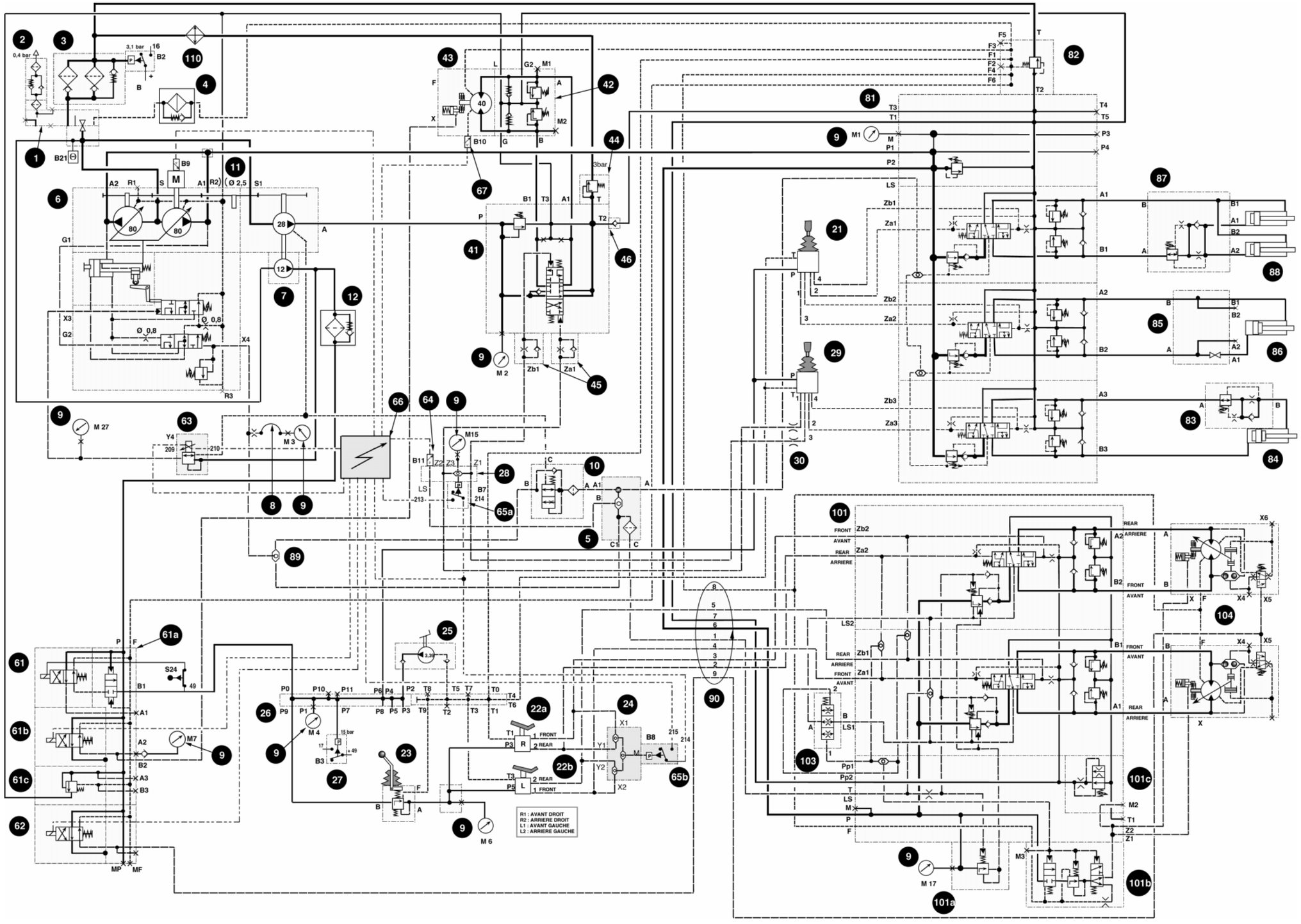
41 - Swing control block
42 - Hydraulic swing motor with static brake
43 - Safety/force-feed flange on swing
44 - 3 bar check valve block
45 - Braking valves on swing control valve spool pilots
46 - 0.5 b check valve on force-feed circuit (mounted on the swing control valve)
47 - Accumulator

61 - Electro-control valve block including:
61a - Automatic swing braking and brake release electro-control valve
61b - Safety control arm electro-control valve
61c - P35 pressure limiter
62 - Travel motor displacement change electro-control valve block
63 - Elector-hydraulic proportioning valve (**DRE4**)
64 - LS information pressure detector
65a - Swing pilot pressure switch (6 bar)
65b - Travel pilot pressure switch (6 bar)
66 - Electronic control box
67 - Hydraulic swing motor speed detector

81 - Attachment control valve (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter on dipper cylinder small chamber
84 - Dipper cylinder with dashpot on large and small chamber
85 - Backhoe/clamshell selector block
86 - Bucket cylinder with dashpot on small chamber
87 - Boom cylinder supply distributor with flow limiter on cylinder large chambers
88 - Boom cylinders with dashpot on the large chambers
89 - Pressure selector between attachment/options and travel LS information circuits
90 - Hydraulic swivel

101 - Travel control valve block
101a - Speed limiter
101b - Travel hydraulic motor automatic brake release valve
101c - Anti-excess flow valve
103 - Travel anti-drift block
104 - Variable displacement hydraulic travel motors
110 - Hydraulic oil cooler

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CM99J034

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988C PLUS GENERAL HYDRAULIC SYSTEM

Two-speed 988C Plus general hydraulic system

Description

1 - Reservoir
2 - Reservoir filler cap with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Return circuit filter
5 - LS detector information selection block with filter on travel LS information
6 - High pressure hydraulic pumps with:
1 fixed flow body for the swing
2 variable flow bodies for the attachment, travel and options
7 - Low pressure fixed flow pump for the pilot circuit
8 - Hose/accumulator
9 - Pressure test point
M1 - Pressure test point attachment/travel and options (if any)
M2 - Swing pressure test point
M3 - LS circuit pressure test point
M4 - Pilot circuit pressure test point
M6 - Travel manual control block outlet pressure test point
M7 - Swing braking and brake release pressure test point
M15 - Swing pilot system pressure test point
M17 - Travel pressure test point on speed limiter
M27 - Proportioning valve outlet pressure test point
10 - Anti-surge valve and filter on LS information LS (attachment/options)
11 - Calibrated orifice (Ø: 2.5 mm) on main pump irrigation circuit
12 - Pilot circuit filter

21 - Boom and bucket (or clamshell) function manual control block
22a - RH travel control block
22b - LH travel control block
23 - Manual travel control block
24 - Travel pilot pressure selection block (AUTO-IDLE)
25 - Decompression pump (foot control)
26 - Pilot circuits manifold
27 - Pilot circuit minimum pressure switch
28 - Swing pilot pressure information selector block (automatic swing + AUTO-IDLE braking and brake release function)
29 - Dipper and swing function manual control block
30 - Jets on swing pilot circuit

41 - Swing control valve block
42 - Hydraulic swing motor with static brake
43 - Safety/force-feed flange on swing function
44 - 3 bar block
45 - Braking valves on swing control valve spool pilots
46 - 0.5 b check valve on force-feed circuit (mounted on swing control valve)

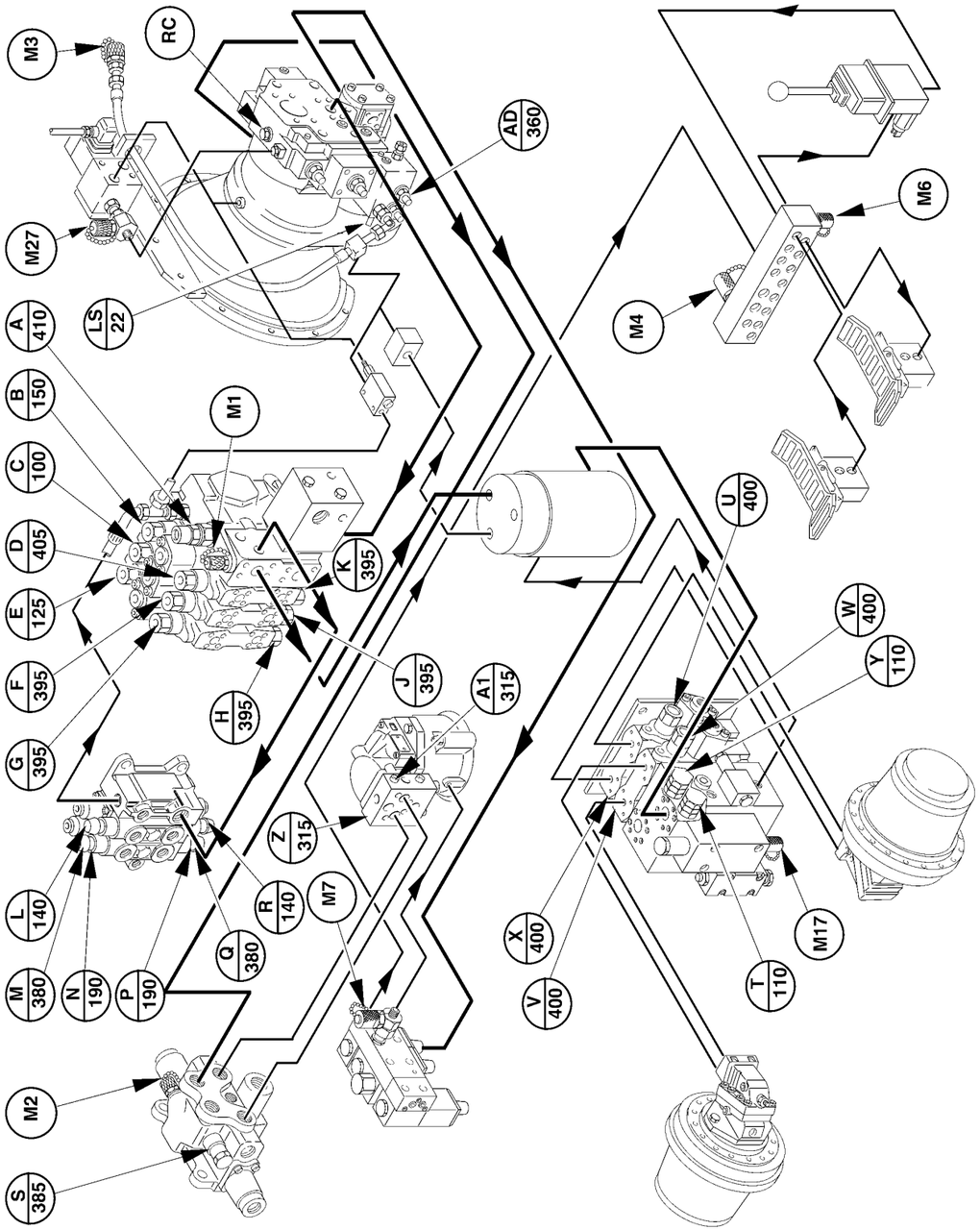
61 - Electro-control valve block including:
61a - Safety control arm electro-control valve
61b - Automatic swing braking and brake release electro-control valve
61c - P35 pressure limiter
62 - Hydraulic travel motor displacement change electro-control valve block
63 - Electro-hydraulic proportioning valve (**DRE4**)
64 - LS information pressure detector

65a - Swing pilot pressure switch (6 bar)
65b - Travel pilot pressure switch (6 bar)
66 - Electronic control box
67 - Hydraulic swing motor speed detector

81 - Attachment control valve block (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter on dipper cylinder small chamber
84 - Dipper cylinder with dashpot on large and small chamber
85 - Backhoe/clamshell selector block
86 - Bucket cylinder with dashpot on small chamber
87 - Boom cylinder supply distribution block with flow limiter on cylinder large chambers
88 - Boom cylinders with dashpot on large chambers
89 - Pressure selector between attachment/options and travel LS information circuits
90 - Hydraulic swivel

101 - Travel control valve block
101a - Speed limiter
101b - Automatic hydraulic travel motor brake release valve
101c - Anti-excess flow valve
103 - Travel anti-drift block
104 - Variable displacement hydraulic travel motors
110 - Hydraulic oil cooler

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CM99J040

SETTING THE PRESSURES ON THE 788C

Location of the various pressure test points installed on the machine

M1 on the attachment control valve
M2 on the swing control valve
M3 on the anti-surge hose
M4 on the manifold
M7 on the swing brake supply hose
M27 on the proportioning valve

Location of pressure test points to be installed

M6 on the manifold
M17 on the speed limiter

Installing the flowmeter on the A1 attachment and travel (pump body)

Disconnect the variable displacement pump body outlet hose **A1**, from the union block mounted on the power module longitudinal member, at the earthing end.
Install the flowmeter (**C3744471**) using the hose recommended (**W5431976**) in the tooling list.

Raising circuit temperature to between 50 and 55°C

Use the attachment to raise one track.
Operate the bucket or clamshell against the stops.

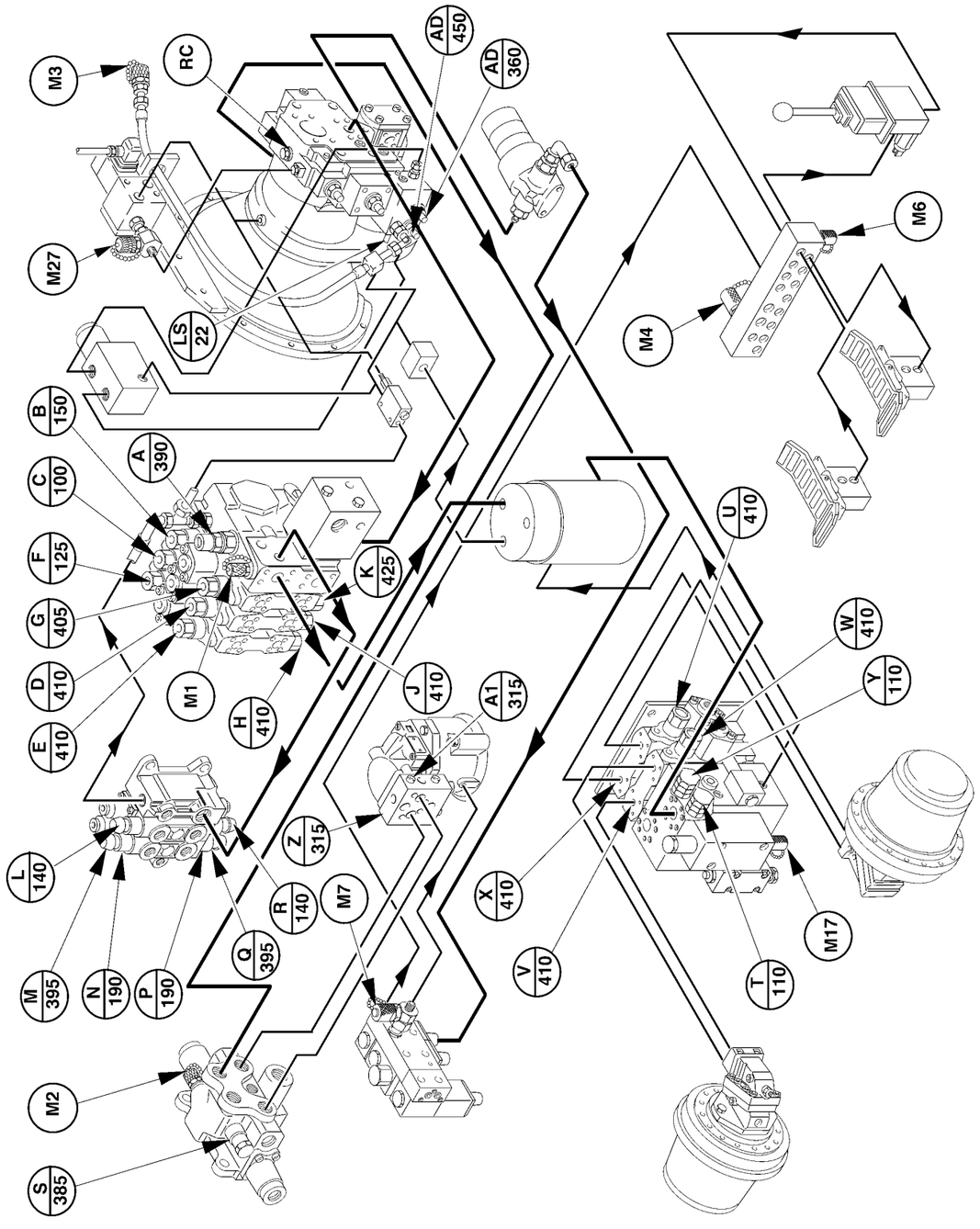
Checking the engine speeds without load and the pressures supplied by the proportioning valve

Install the tachometer and connect the multitester at **M27**.

MODES	SPEEDS					PRESSURES				
AUTO - IDLE	**1150**	to	**1250**	(rpm)		**19.5**	to	**23.5**	(bar)	
LOW - IDLE	**900**	to	**1000**	(rpm)		**19.5**	to	**23.5**	(bar)	
FINE	**1570**	to	**1630**	(rpm)		**13.5**	to	**17.5**	(bar)	
ECO	**1920**	to	**1980**	(rpm)		**8.5**	to	**12.5**	(bar)	
MAX	**2190**	to	**2250**	(rpm)		**5.5**	to	**9.5**	(bar)	

If the speeds are outside tolerances, check first of all the servomotor connecting rod geometry (length end-to-end = **171** + or - **1** mm) and then recalibrate.

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CM99J038

SETTING THE PRESSURES ON THE 788C PLUS

Location of the various pressure test points installed on the machine

M1 on the attachment control valve
M2 on the swing control valve
M3 on the anti-surge valve
M4 on the manifold
M7 on the swing brake supply hose
M27 on the proportioning valve

Location of pressure test points to be installed

M6 on the travel control block circuit
M17 on the speed limiter

Installing the flowmeter on the A1 pump body (for the attachment and travel)

Disconnect the pump body hose from the port **A1** of the pump.
Install the flowmeter (**Z5344486**) using the hose (**W5431976**) recommended in the tool list.

Raising the circuit temperature to between 50 and 55°C

Use the attachment to raise one track.
Operate the bucket or clamshell against the stops.

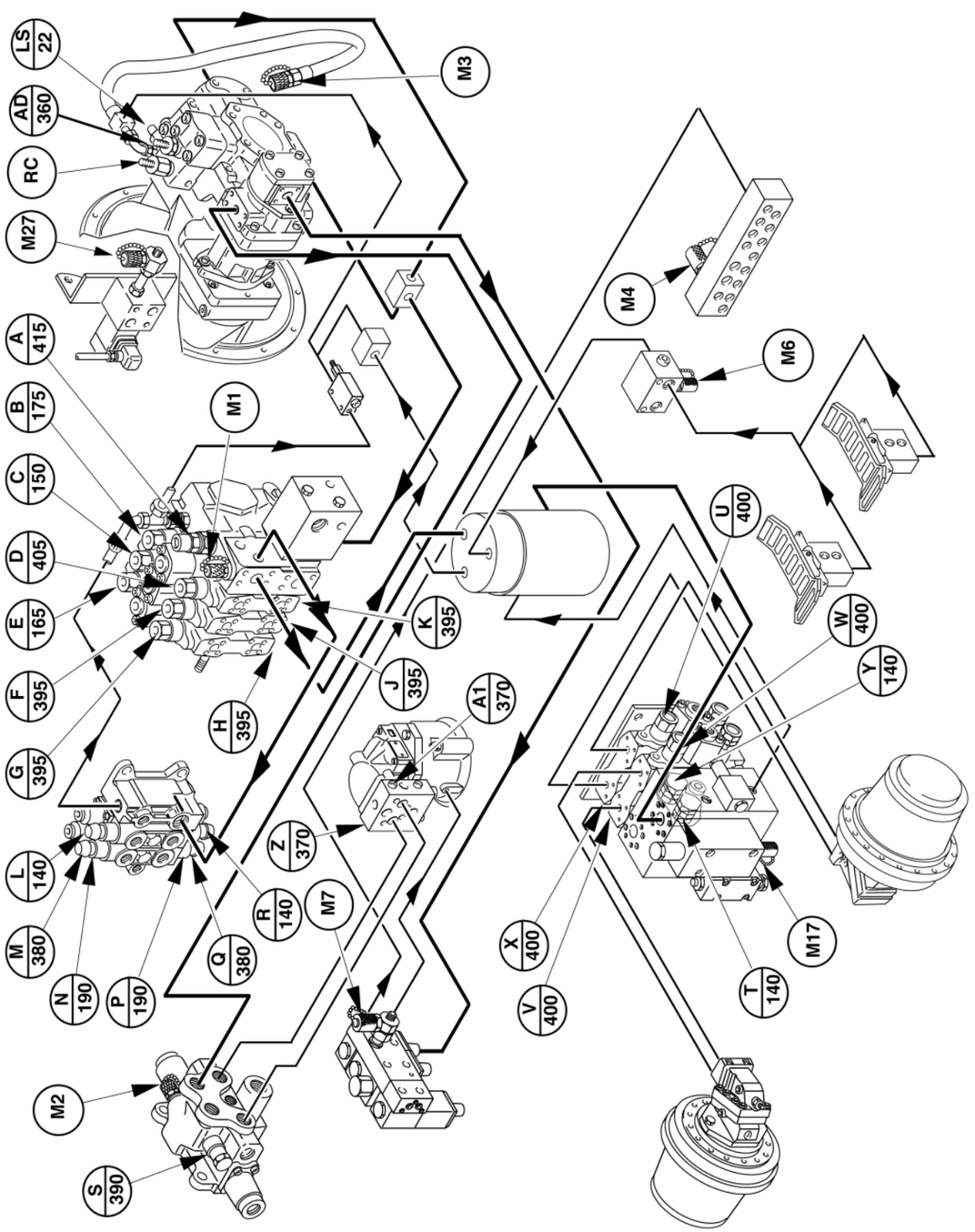
Checking the engine speeds without load and the pressures delivered by the proportioning valve

Install the tachometer and connect the multitester at **M27**.

MODES	SPEEDS				PRESSURES			
AUTO - IDLE	**1170**	to	**1230**	(rpm)	**19**	to	**24**	(bar)
LOW - IDLE	**900**	to	**1000**	(rpm)	**19**	to	**24**	(bar)
FINE	**1570**	to	**1630**	(rpm)	**19**	to	**18**	(bar)
ECO	**1920**	to	**1980**	(rpm)	**6**	to	**11**	(bar)
MAX	**2190**	to	**2250**	(rpm)	**5**	to	**10**	(bar)

If the speeds are not within tolerances, check first of all the geometry of the servomotor connecting rod (see Section 4002).

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CM99J041

SETTING THE PRESSURES ON THE 988C

Location of the various pressure test points installed on the machine

M1 on the attachment control valve
M2 on the swing control valve
M3 on the anti-surge valve
M4 on the manifold
M7 on the swing brake supply hose
M27 on the proportioning valve

Location of pressure test points to be installed

M6 on the manifold
M17 on the speed limiter

Installing the flowmeter on the A1 pump body (for the attachment and travel)

Disconnect the variable displacement pump body outlet hose **A1**, on the union block mounted on the power module longitudinal member, at the earthing end
Install the flowmeter (**C3744471**) using the hose (**W5431976**) recommended in the tool list.

Raising the circuit temperature to between 50 and 55°C

Use the attachment to raise one track.
Operate the bucket or clamshell against the stops.

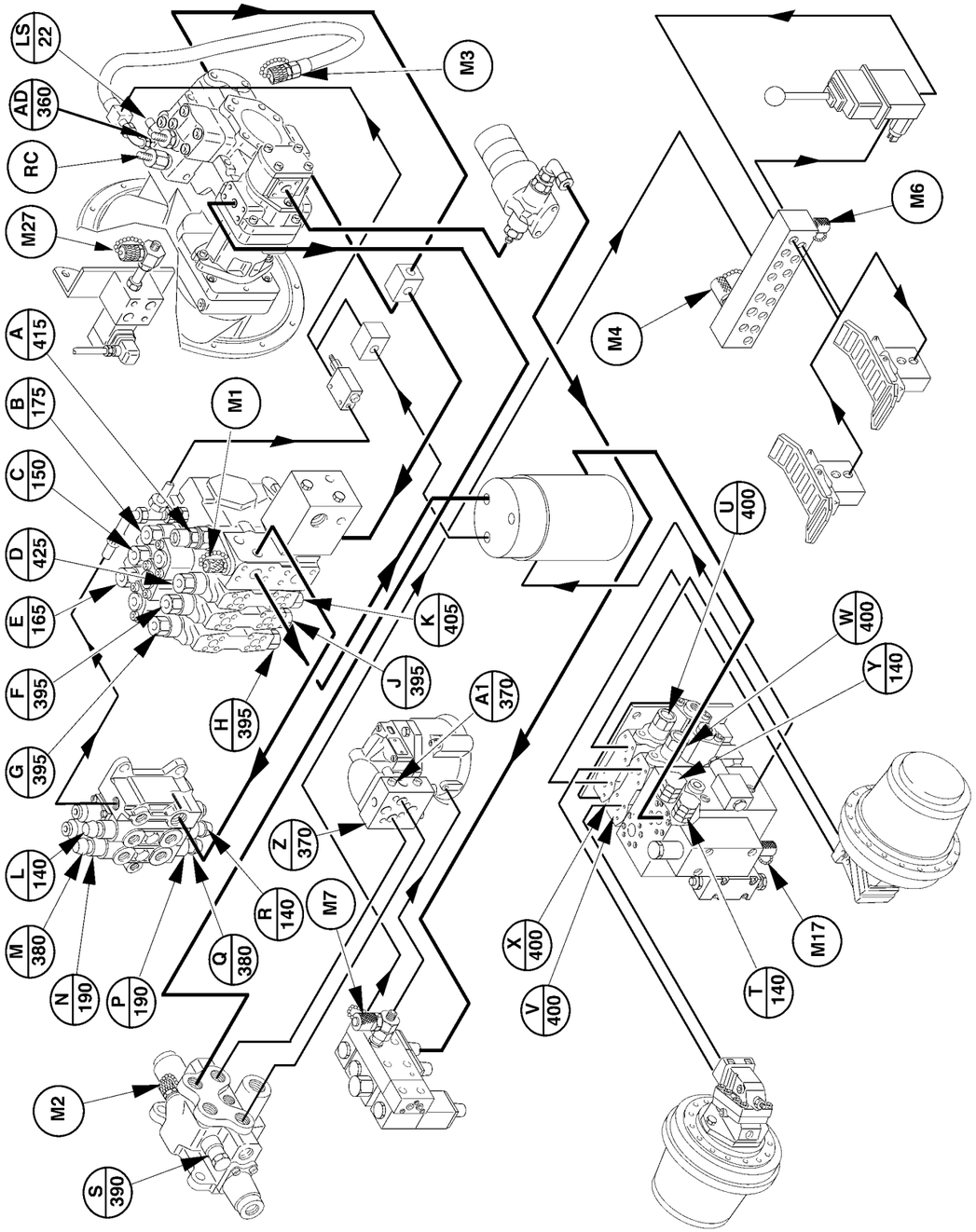
Checking the engine speeds without load and the pressures delivered by the proportioning valve

Installer the tachometer and connect the multitester at **M27**.

MODES	SPEEDS					PRESSURES				
AUTO - IDLE	**1150**	to	**1250**	(rpm)		**23**	to	**27**	(bar)	
LOW - IDLE	**900**	to	**1000**	(rpm)		**26**	to	**30**	(bar)	
FINE	**1570**	to	**1630**	(rpm)		**15**	to	**19**	(bar)	
ECO	**1920**	to	**1980**	(rpm)		**9.5**	to	**13.5**	(bar)	
MAX	**2190**	to	**2250**	(rpm)		**7.5**	to	**11.5**	(bar)	

If the speeds are not within tolerances, check first of all the servomotor connecting rod (length end-to-end = **171** + or - **1** mm) and then recalibrate.

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CM99J039

SETTING THE PRESSURES ON THE 988C PLUS

Location of the various pressure test points installed on the machine

M1 on the attachment control valve
M2 on the swing control valve
M3 on the anti-surge valve
M4 on the manifold
M7 on the swing brake supply hose
M27 on the proportioning valve

Location of pressure test points to be installed

M6 on the manifold
M17 on the speed limiter

Installing the flowmeter on the A1 pump body (for the attachment and travel)

Disconnect the variable displacement pump body outlet hose **A1**, on the union block mounted on the power module longitudinal member, at the earthing end.
Install the flowmeter (**Z5344486**) using the hose (**W5431976**) recommended in the tool list.

Raising the circuit temperature to between 50 and 55°C

Use the attachment to raise one track.
Operate the bucket or clamshell against the stops.

Checking the engine speeds without load and the pressures delivered by the proportioning valve

Installer the tachometer and connect the multitester at **M27**.

MODES	SPEEDS				PRESSURES			
AUTO - IDLE	**1170**	to	**1230**	(rpm)	**22**	to	**27**	(bar)
LOW - IDLE	**1070**	to	**1130**	(rpm)	**22**	to	**27**	(bar)
FINE	**1570**	to	**1630**	(rpm)	**13**	to	**17**	(bar)
ECO	**1920**	to	**1980**	(rpm)	**6**	to	**11**	(bar)
MAX	**2190**	to	**2250**	(rpm)	**5**	to	**10**	(bar)

If the speeds are not within tolerances, check first of all the servomotor connecting rod geometry (see Section 4002).

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Pressure settings (continued)

WARNING! *All checks and adjustments are carried out at various engine speeds and at a temperature of 50°C.*

WARNING! ***The flows specified on the 988 are those read on the flowmeter (1 pump body).***

Checking the pilot pressure with the control arm lowered

Connect the multitester to the manifold at **M4**.
Set the **MAX** mode.
The pressure must be greater than **34** (bar).
If it is not, check the **P35** or the electrical circuit.

AFTER EACH CHECK, IF THE PARAMETERS ARE INCORRECT, ADJUST AT THE COMPONENT CONCERNED OR CHANGE THE COMPONENT.

Setting the LS valve pressure

Static test using the same 0/40 bar pressure gauge:

WARNING! *Start the engine running, before connecting the pressure gauge at **M1**.*

Raise the left-hand control arm as a safety measure.
Set the **FINE** mode.
Connect the pressure gauge at **M3**. The pressure should be between **8** and **12** (bar). If it is not, check the P10.
Connect the pressure gauge at **M1**. The difference between **M1** and **M3** should be **21** to **25** (bar).

Dynamic test using multitester:

Assemble the spacer on the boom raising control lever push-rod.
Connect the two outlets from the multitester at **M1** and **M3**.
Operate the boom raising control.
The pressure difference (ΔP) should be between **21** and **23** (bar).

Checking the maximum flow from the variable displacement pump, using one flowmeter only

Set the **MAX** mode.
Connect the multitester for flow measurement.
Retract the dipper and close the bucket simultaneously.
The flow should be greater than **205** (l/min) and the pressure at **M1** lower than **125** (bar) on the 788.
The flow should be greater than **153** (l/min) and the pressure at **M1** lower than **100** (bar) on the 988.

Checking the flow adjustment valve flows

Attachment control valves

Supply the large chambers of the boom, bucket and dipper cylinders, one after another.
The flows should be between:

788C, 788C Plus	988C, 988C Plus
140 - 160 l/min on the boom	83 - 93 l/min on the boom
90 - 110 l/min on the bucket	70 - 80 l/min on the bucket
115 - 135 l/min on the dipper	78 - 88 l/min on the dipper

Travel control valve

WARNING! *The difference in the flows between the two tracks **should not exceed 4 (l/min)**.*

Forward travel:

Select the speed **1** (two-speed excavators).
Use the attachment to raise each track. Set the inching valve control lever to maximum.
Operate each track in the forward direction.
The flows noted should be between **100** and **120** (l/min) on the 788 and between **65** and **75** (l/min) on the 988.
If the values noted are between **95** and **125** (l/min) on the 788 and between **61** and **81** (l/min) on the 988, adjust the flow adjustment valves.
If not, check the adjustment of the automatic flow distribution.

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Using a chronometer:

The number of revolutions of the sprocket must be between **30** and **36** (rpm) on the 788 and between **28** and **32** (rpm) on the 988.
If the values noted are between **29** and **37** (rpm) on the 788, and between **27** and **33** (rpm) on the 988, adjust at the flow adjustment valves.
If not, check the adjustment of the automatic flow distribution. (A.F.D.) (See page 36).

Reverse travel:

The process is the same as for forward travel.
If the value of flows noted is between **100** and **120** (l/min) on the 788 and between **61** and **81** (l/min) on the 988, or if the sprocket revolutions are between **30** and **36** (rpm) on the 788 and between **27** and **33** (rpm) on the 988, adjust the mechanical stops in the control valve spool caps.
LH travel (section at inlet plate end): small cap.
RH travel large cap.
If the values noted are lower or higher than those shown above, adjust the automatic flow distribution (A.F.D.) (See page 36).

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Checking the hydraulic power supplied by the proportioning valve, with the engine under load

	Engine speed	DRE4 pressure	Output	DRE4 pressure with swing
788C →09/97	1980 - 2020	11 - 16.5	92 l/min	20 - 27
988C (1) →09/97	1980 - 2020	12 - 17	66 l/min	21 - 27
788C 09/97 →	1980 - 2020	11 - 16,5	92 l/min	20 - 27
988C (1) 09/97 →	1980 - 2020	12 - 17	58 l/min	21 - 27
988C Plus (2) 09/97 →			60 l/min	21 - 27
788C Plus	1980 - 2020	11 - 16	102 l/min	20 - 26

(1) 988 C not sound-proofed (fan ratio = 1.1 on cooling).
(2) 988 C sound-proofed (fan ratio 0.87 on cooling).

Check or adjustment of all valves

Connect the multitester at **M1**.
Set to **MAX** mode.
Overtighten the relief valve by one turn.
Overtighten the attachment and travel flow cancellation valve by two turns.

Safety valves on the attachment control valve

Attachment control valve		
	788 - 988 - 988 Plus	**788 Plus**
Attachment limiter	390 - 425	380 - 400
Boom raising	390 - 420	410 - 440
Boom lowering	380 - 410	390 - 420
Extending dipper	380 - 410	395 - 425
Retracting dipper	380 - 410	395 - 425
Extending bucket	380 - 410	395 - 425
Retracting bucket	380 - 410	395 - 425

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Safety valves on travel control valve

Lock the tracks mechanically in both travel directions.
Set to **MAX** mode, with the inching lever at full travel.
Supply each track, one after another, in both directions
The pressures noted should be between **385** and **415** (bar) on the 788 and 988 and between **395** and **425** (bar) on the 788C Plus.

Adjusting the relief valve

Supply the bucket opening function.
Untighten the relief valve until the same pressure is obtained as the bucket secondary relief valve.

Adjusting the attachment and travel flow cancellation valve

Untighten this valve two turns.
Operate the bucket against the stop.
Adjust to a value between **355** and **365** (bar).

Adjusting the flow cancellation valve (heavy lift - 788 Plus)

Overtighten the attachment control valve relief valve.
Overtighten the boom raising safety valve.
Operate the attachment against the stops.
Set the engine to FINE mode.
Adjust the flow cancellation valve to **450** (bar).
Adjust the boom raising safety valve to its value (**420** bar).
Adjust the relief valve to its value **390** (bar).

Checking or adjusting the swing

Circuit pressure without load

Connect the multitester at **M2**.
Set the **MAX** mode.
The pressure noted should be between **15** and **17** (bar).
If it is not, check the **P3**.

Relief valve

Lock the upperstructure mechanically.
Overtighten one safety valve by one turn.
Supply the direction of swing concerned.
The pressure noted should be between **370** and **400** (bar) on the 788, and between **375** and **405** (bar) on the 988.

Swing secondary relief valves

Supply the swing in both directions.
The pressure noted should be between **305** and **330** (bar) on the 788, and between **345** and **365** (bar) on the 988.

Checking the swing brake release

Connect the two outlets of the multitester at **M2** and **M7**.
With the upperstructure immobilised, feather the swing control lever.
The pressure at **M7** should be **35** (bar) before the pressure rises at **M2**.
If it is not, check the brake release circuit.

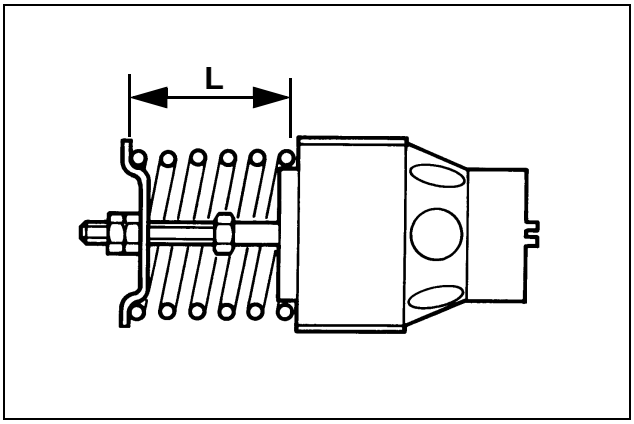
Checking the travel brake release

Install a pressure test point at **M17**.
Connect the two outlets of the multitester at **M1** and **M17**.
Lock one track mechanically.
Press down fully on the foot pedal concerned.
Feather at the inching valve.
The pressure at **M17** should be **11** (bar) before the pressure rises at **M1**.
If it is not, check the brake release circuit.

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Checking the boom and dipper flow limiters (Previous type)

When the dipper is retracted, the pressure at **M1** should be between **30** and **70** (bar).
If it is not, adjust the limiter spring to L = **21** mm on the 788, and **17** mm on the 988.
If the boom lowering speed is not correct, adjust the spring to L = **26.5** mm.



PDH509

Procedure for complete adjustment of single and two-speed excavator travel control valves

1 The troubleshooting method

This method is used for complete adjustment of the flow adjustment valves and the anti-excess flow valve.

This procedure should be applied when the control valve has been completely misadjusted or when an in-depth inspection is taking place.

It can be applied by means of either of the following methods:
- measuring the flow by means of a flowmeter.
- measuring the number of revolutions per minute.

BASIC ASSUMPTIONS

- The following values are correct:
  a) Maximum engine speed.
  b) Pilot system pressures.
  c) Δp L.S.
  d) Main pump maximum output.
  e) Spool pilot pressures $\geq$ 24 bar.
- The hydraulic oil is at 50°C.

METHODS

Use the attachment to raise each track, one after the other.
Push the control lever to maximum on the single speed and to the indexing point on the two-speed.
Operate each track in both directions of travel.
Note the flows at the flowmeter or count the number of sprocket revolutions.

The flows should be between:
- **110** and **120** (l/min) on the 788 and between **69** and **74** (l/min) on the 988

The number of sprocket revolutions should be between:
- **33** and **36** (rpm) on the 788 and between **29** and **31** (rpm) on the 988

IF THE FLOWS OR THE NUMBER OF SPROCKET REVOLUTIONS ARE INCORRECT:

Overtighten the anti-excess flow valve.

Remove the valve.
Eliminate the adjustment protection ring.
Overtighten the adjusting screw by screwing it fully home.

2 If a control valve section has been changed if the sprocket revolutions do not correspond to the indicated values or if a complete overhaul is taking place

This method is used for complete adjustment of the flow adjustment valves and the anti-excess flow valve.

This procedure should be applied when the control valve has been completely misadjusted or when an in-depth inspection is taking place.

It can be applied by means of either of the following methods:
- measuring the flow by means of a flowmeter.
- measuring the number of revolutions per minute.

BASIC ASSUMPTIONS

- The following values are correct:
  a) Maximum engine speed.
  b) Pilot system pressures.
  c) Δp L.S.
  d) Main pump maximum output.
  e) Spool pilot pressures $\geq$ 24 bar.
- The hydraulic oil is at 50°C.

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METHODS

Preparation for the various adjustments.

Overtighten the anti-excess flow valve fully home.
Disassemble the springs and push-rods from the flow adjustment valves.
Disconnect the pilot pipes.
Untighten the spool mechanical stops in the caps and place them in contact with the Installations.
Reconnect the pilot pipes.

Measure the flows on each track.

Use the attachment to raise each track in turn.
Operate each track in both directions of travel.
Read the flows on the flowmeter or count the number of sprocket revolutions.
Note these values.

Adjusting so as to provide symmetrical flows

TAKE THE LOWEST FLOW READING OR SPROCKET SPEED INTO CONSIDERATION

For the other three flows:

Disconnect the pilot line opposite to the spool movement.
Operate the direction of travel concerned.
Read the flow or count the number of sprocket revolutions.
Screw in the stop until the flow or the number of revolutions of the sprocket is equal to the value shown for the slower of the two tracks.
Reconnect the pilot line.

NOTE: *It is normal to find leaks at the caps during these adjustments They are due to the pilot system heating system.*

Adjusting flows or track speeds in forward travel

Assemble the springs and push-rods of the flow adjustment valves on each section.
Operate each forward travel.

Adjust the flows between:
- **115** and **125** (l/min) on the 788 and between **89** and **94** (l/min) on the 988.

The number of sprocket revolutions between:
- **34** and **38** (rpm) on the 788 and between **38** and **40** (rpm) on the 988.

WARNING! *Unscrew to increase the flow and vice versa.*

Adjusting the anti-excess flow valve

Remove that valve.
Unscrew the pressure setting screw a quarter of a turn.
Install the valve.
Operate one forward travel.

The flows should be between:
- **110** and **120** (l/min) on the 788 and between **69** and **74** (l/min) on the 988.

The number of sprocket revolutions should be between:
- **33** and **36** (rpm) on the 788 and between **29** and **31** (rpm) on the 988.

If they are not, adjust the anti-excess flow valve again.

WARNING! *Screw in to increase the flow and vice versa.*

Then carry out a complete check again.

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Checking excess flow on each track

Operate each track in both directions of travel.
Read the flows at the flowmeter or count the number of revolutions of the sprockets.

The flows should be between:
- **115** and **125** (l/min) on the 788 and between **89** and **94** (l/min) on the 988.

The number of revolutions of the sprockets should be between:
- **34** and **38** (rpm) on the 788 and between **38** and **40** (rpm) on the 988.

IF THE FLOWS OR THE NUMBER OF REVOLUTIONS OF THE SPROCKETS ARE INCORRECT.

Cancel the effect of the spool stops

Disconnect the pilot pipes.
Unscrew the spool mechanical stops in the caps and put them in contact with the installations.
Reconnect the pilot lines.

Cancel the action of the flow adjustment valve springs

Remove the springs and push-rods.

Measure the flow on each track.

Use the attachment to raise each track in turn.
Operate each track in both directions of travel.
Read the flows at the flowmeter or count the number of sprocket revolutions.
Note these values.

Adjusting so as to provide symmetrical flows

TAKE THE LOWEST FLOW VALUE OR NUMBER OF SPROCKET REVOLUTIONS INTO CONSIDERATION

For the 3 other flows:

Disconnect the pilot line opposite to the spool movement.
Operate the direction of travel concerned.
Read the flow or count the number of sprocket revolutions.
Tighten the stop until the flow or the number of sprocket revolutions is equal to the value found on the slowest track.

NOTE: *It is normal to find leaks at the caps during these adjustments.*
They are due to the pilot heating system.

Adjusting the track speeds in forward travel

Assemble the springs and push-rods on each section
Operate each forward travel.

Adjust the flows between:
- **115** and **125** (l/min) on the 788 and between **89** and **94** (l/min) on the 988.

The number of sprocket revolutions should be between:
- **34** and **38** (rpm) on the 788 and between **38** and **40** (rpm) on the 988.

WARNING! *Unscrew to increase flow and vice versa.*

Adjusting the anti-excess flow valve

Remove the valve.
Untighten the pressure adjustment screw a quarter turn.
Install the valve.
Operate one forward travel.

The flow should be between:
- **115** and **125** (l/min) on the 788 and between **89** and **94** (l/min) on the 988.

The number of sprocket revolutions should be between:
- **34** and **38** (rpm) on the 788 and between **38** and **40** (rpm) on the 988.

If they are not so, carry out the adjustment of the anti-excess flow valve again.

WARNING! *Screw in to increase flow and vice versa.*

Then carry out a complete check again.

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Section

8001

TESTS, ADJUSTMENTS
AND HYDRAULIC SCHEMATICS
Wheeled excavators

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TOOLS REQUIRED

1. TEST EQUIPMENT

There are three possible choices:

a) Multi-Handi test kit 2051 ..... E5444449



CP96E001

The Multi-Handi test kit is recommended as the basic tool of the mechanic.

The Multi-Handi can be used to carry out the following tests:

Two pressure measurements, pressure peaks, pressure differential (Delta P), temperature, rotational speed and volumetric flow.

The test kit includes:

1 Multi-Handi 2051 unit D5444448
2 pressure detectors 0-600 bar V5344460
2 straight adaptors for detector W5344461
1 elbow adaptor for detector X5344462
1 rotational speed detector Z5344463
2 cables length 5 m E3144472
1 x 220 V 50 Hz power supply D5344467
1 cigarette lighter cable E5344468
1 instruction manual ..... ----------
1 carry-case N5344476

b) Multi-Test 4020 test kit T5344458



CP96E003

The Multi-Test is recommended to carry out in-depth diagnostics. Values read can be recorded in its memory and transferred to a PC and a printer.

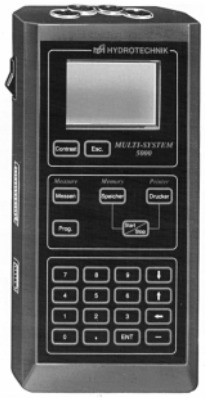
The Multi-Test can be used to carry out the following tests:

Two pressure measurements, pressure peaks, pressure differential (Delta P), temperature, temperature differential, rotational speed and volumetric flow, amperage, voltage, connection to PC and printer, memory capacity 60000.

The test kit includes:

1 Multi-Test 4020 unit Q5344455
2 pressure detectors 0-600 bar V5344460
2 straight adaptors for detector W5344461
1 elbow adaptor for detector X5344462
1 rotational speed detector Z5344463
1 temperature sender B3144469
2 double PT cables B5344465
4 cables length 5 m E3144472
1 x 220 V 50 Hz power supply D5344467
1 cigarette lighter cable E5344468
1 instruction manual ..... ----------
1 carry-case P5344477

c) Multi-System 5000 test kit U5344459



CP96E002

The Multi-System is recommended for specialist departments (Engineering Design Office and tests at customer's premises).

The Multi-System can carry out the following tests:

Two pressure measurements, pressure peaks, pressure differential (Delta P), temperature, temperature differential, rotational speed and volumetric flow, amperage, voltage, torque, force, movement, speed, connection to PC and printer, memory capacity 120000.

The test kit includes:

1 Multi-System 5000 unit R5344456
2 pressure detectors 0-600 bar V5344460
2 straight adaptors for detector W5344461
1 elbow adaptor for detector X5344462
1 rotational speed detector Z5344463
1 temperature sender A5344464
2 double PT cables B5344465
4 cables length 5 m E3144472
1 x 220 V 50 Hz power supply D5344467
1 cigarette lighter cable E5344468
1 instruction manual ..... ----------
1 carry-case P5344477

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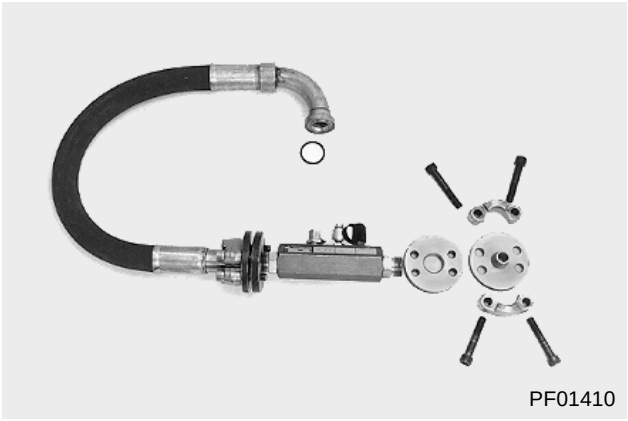
CP96E004

2. SONDE DE TEMPERATURE A5344464

Use with Multi-Handi 2051 test kit

3. MAGNETIC BASE G5344470

Use with Multi-Handi 2051, Multi-Test 4020 and Multi-System 5000 test kits



PF01410

4. 600 LITRES FLOWMETER, ORDER THE FOLLOWING:

ONE FLOWMETER RE3 Z5344486
TWO PLATES (M45 X 2) D4323359
TWO FLANGES (DIA. 24) B8230183
ONE HIGH PRESSURE HOSE DN25 W5431976
TWO SEALS D330421
FOUR HALF-FLANGES D4024267
EIGHT SCREWS (12 X 75) Z1232983

5. ONE HIGH PRESSURE HOSE DN19 Q5931990
ONE LOW PRESSURE HOSE DN12 B8031969



PG04005

6. ONE PRESSURE TEST POINT M14 X 1.5 A3237549



PG03824

7. ONE PRESSURE TEST POINT UNION U1237211 AND W1237213



PE18402

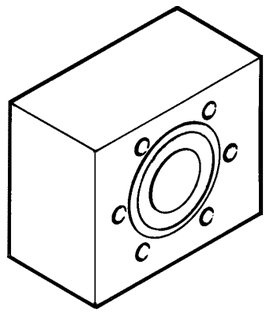
8. TWO MINIMESS HOSES LENGTH 2500 mm P2144487
TWO HOSE UNIONS C5144412

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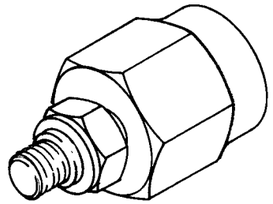


PG04006

9. TWO PLUGS 27 X 200 Q3337452
ONE FEMALE UNION 27 X 200 P4237556
ONE MALE/FEMALE UNION D12 L3237536



PDH0505

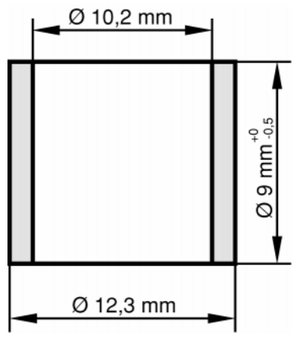


PDH0506

11. ONE SPECIAL UNION W5137530

10. TWO REDUCTION GEARS DN25 - DN19 G1037352

TOOLS TO BE MANUFACTURED

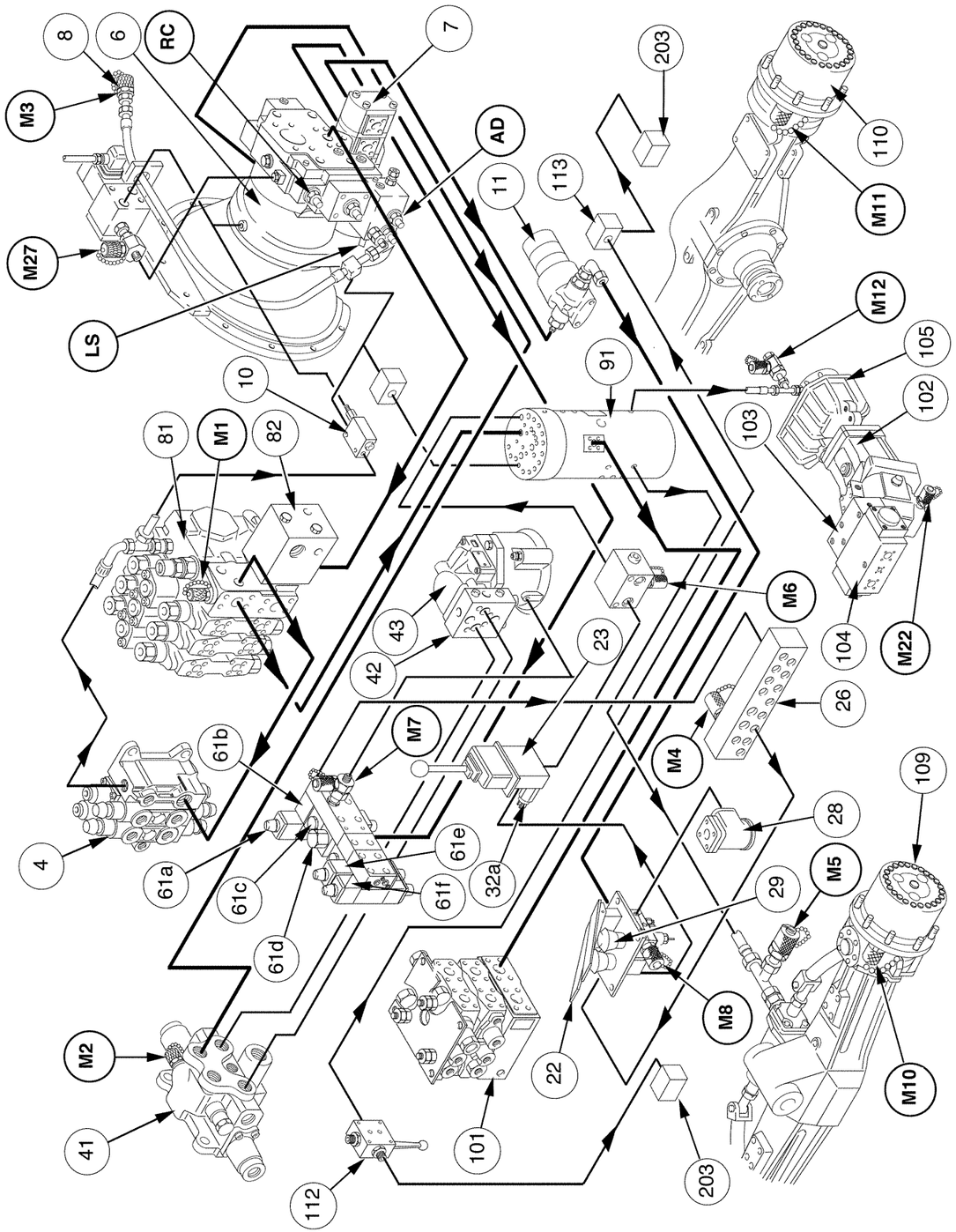


PDG0239

1. ONE SPACER TO LIMIT THE STROKE OF THE CONTROL LEVER SPOOLS

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788P GENERAL HYDRAULICS



CM99J015

Location of hydraulic components

4 - Low flow option control valve (clamshell rotation, articulated boom)
6 - High pressure pump with:
1 fixed flow body for the swing
1 variable flow body for the attachment and travel
7 - Low pressure pump for the steering/braking system
Low pressure pump for the pilot systems
8 - Hose/accumulator on the pump LS information circuit
10 - Anti-surge valve on the attachment LS circuit
11 - Filter on steering/braking system

22 - Travel control pedal
23 - Travel direction reverser (INCHING)
26 - Pilot circuits manifold
28 - Steering box (ORBITROL)
29 - Braking unit
32a - Travel pilot pressure switch
(automatic front axle unlocking)
41 - Swing control valve block
42 - Hydraulic swing motor safety flange
43 - Fixed displacement hydraulic swing motor

61 - Hydraulic pilot block including:
61a - Electro-control valve (**Y2** and **Y13**) for control arm raising safety - front axle locking and unlocking
61b - Automatic swing braking and brake release electro-control valve
61c - 35 bar pressure limiter
61d - Travel speed change electro-control valve (**Y11**: job-site speed - **Y12**: road speed)
61e - Stabilizer and blade electro-control valve (**Y26**: raising - **Y27**: lowering)

81 - Attachment control valve (boom, dipper, bucket)
82 - P10 counter-pressure block

91 - 16 passage hydraulic swivel

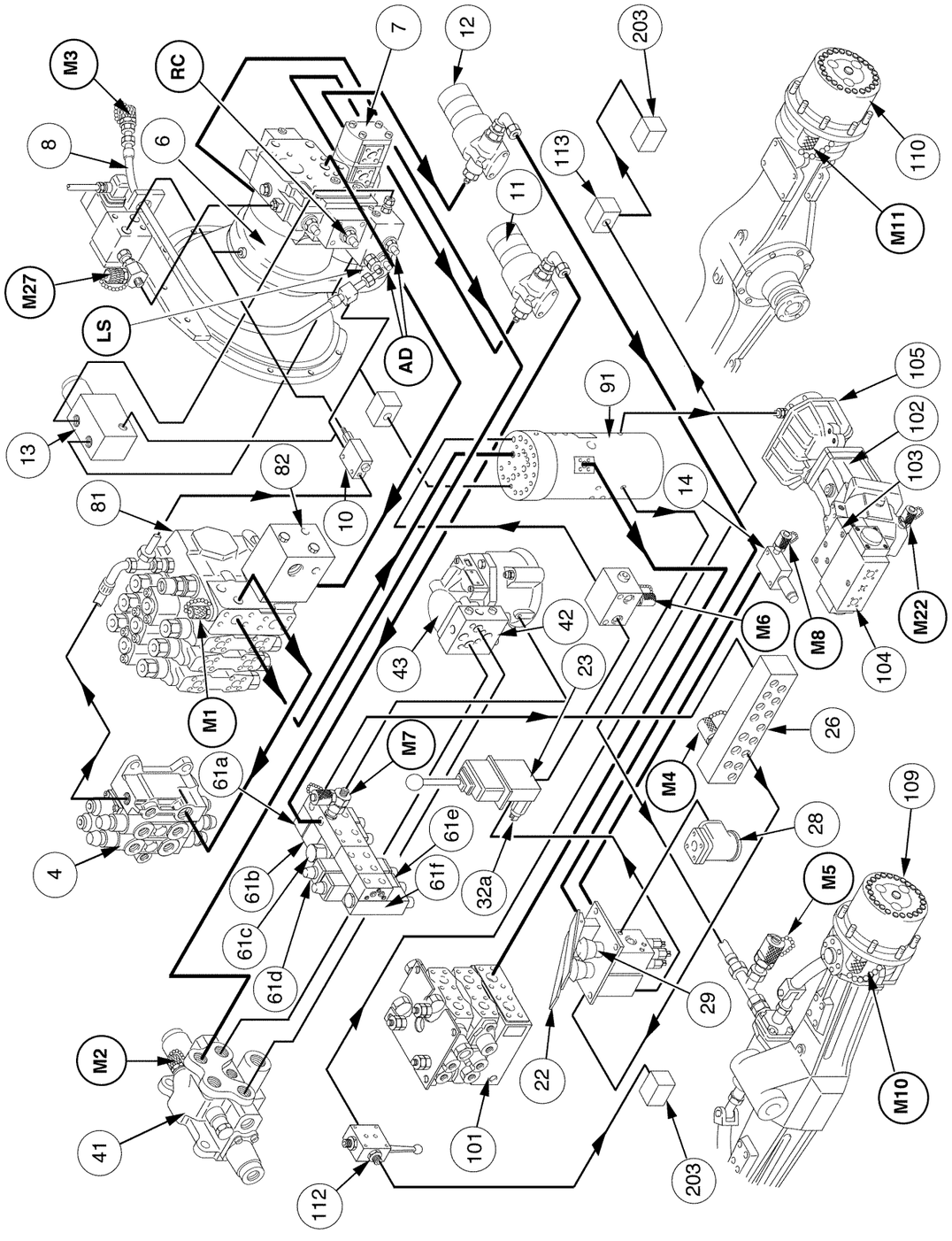
101 - Travel and stabilizer/blade control valve block
102 - Hydraulic travel motors (with displacement change)
103 - Travel motor force-feed flange
104 - Speed limiter and safety block
105 - Two-speed block with parking brake
109 - Brakes on front axle
110 - Brakes on rear axle
112 - Stabilizer/blade selector lever valve
113 - Union block on stabilizer or rear blade small chamber supply

203 - Flow limiter on stabilizer cylinder small chambers

M1 - Pressure test point for attachment/travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M8 - Pressure test points for braking circuits
M22 - Pressure test points for hydraulic travel motor displacement change circuit

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788P PLUS GENERAL HYDRAULICS



CM99J016

Location of hydraulic components

4 - Low flow option control valve (clamshell rotation, articulated boom)
6 - High pressure pump with:
1 fixed flow body for the swing
1 variable flow body for the attachment and travel
7 - Low pressure pump for the steering/braking system
Low pressure pump for the pilot systems
8 - Hose/accumulator on the pump LS information circuit
10 - Anti-surge valve on the attachment LS circuit
11 - Filter on steering/braking system
12 - Filter on pilot circuit
13 - FC (Fine Mode) overpressurizing selector block
14 - Parking brake electro-control valve (**Y15**)

22 - Travel control pedal
23 - Travel direction reverser (INCHING)
26 - Pilot circuits manifold
28 - Steering box (ORBITROL)
29 - Braking unit
32a - Travel pilot pressure switch
(automatic front axle unlocking)
41 - Swing control valve block
42 - Hydraulic swing motor safety flange
43 - Fixed displacement hydraulic swing motor

61 - Hydraulic pilot block including:
61a - Electro-control valve (**Y2**): control arm raising safety
61b - Automatic swing braking and brake release electro-control valve
61c - P35 pressure limiter
61d - Travel speed change electro-control valve for (**Y11**: job-site speed - **Y12**: road speed)
61e - Stabilizers and blade electro-control valve (**Y26**: raising - **Y27**: lowering)
61f - Electro-control valve (**Y13**): for front axle locking and unlocking

81 - Attachment control valve (boom, dipper, bucket)
82 - P10 counter-pressure valve

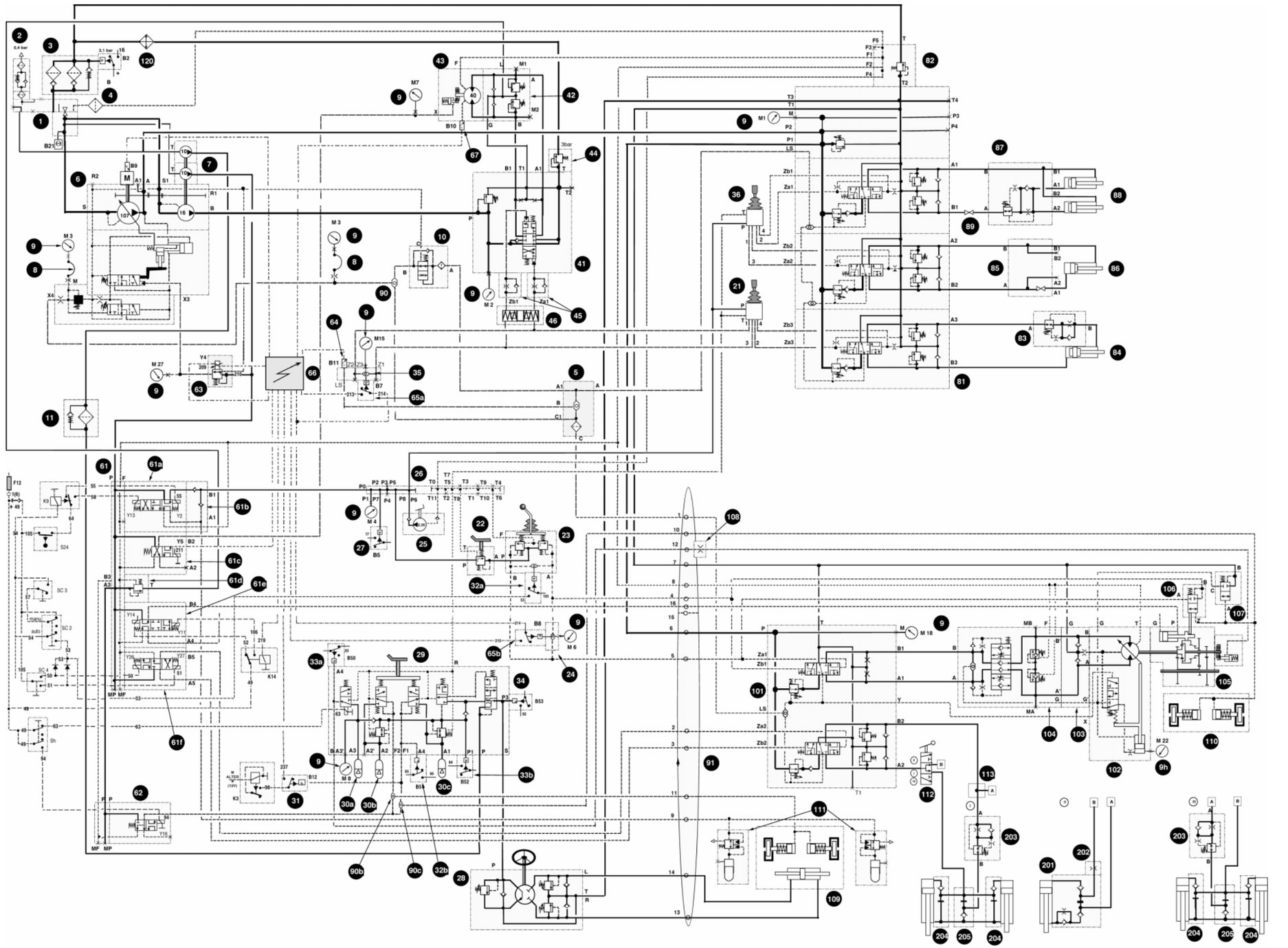
91 - 16 passage hydraulic swivel

101 - Travel and stabilizer/blade control valve block
102 - Hydraulic travel motors (with displacement change)
103 - Travel motor force-feed flange
104 - Speed limiter and safety block
105 - Two-speed block with parking brake
109 - Brakes on front axle
110 - Brakes on rear axle
112 - Stabilizer/blade selector lever valve
113 - Union block on stabilizer or rear blade small chamber supply

203 - Flow limiter on stabilizer cylinder small chambers

M1 - Pressure test point for attachment/travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M8 - Pressure test point for parking brake electro-control valve
M22 - Pressure test point for hydraulic travel motor displacement change circuit

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CM99J019

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788P GENERAL HYDRAULIC SYSTEM

788P general hydraulic system
List of hydraulic components

1 - Reservoir
2 - Reservoir filler cap with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Magnetic filter on functional leak return lines
5 - LS information selector block for LS information detector and filter on travel/stabilizer LS information circuit
6 - High pressure pump with:
1 fixed flow body for the swing
1 variable flow body for the attachment, travel and option
7 - Low pressure pump
1 body for the steering/braking system
1 body for the pilot systems
8 - Hose/accumulator on the pump LS information circuit
9 - Pressure test points
M1 - Pressure test point for attachment/ travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M8 - Pressure test point for brake unit
M22 - Pressure test point for for hydraulic travel motor displacement change circuit
M27 - Pressure test point for proportioning valve outlet
10 - Anti-surge valve on the attachment LS circuit
11 - Steering/braking system filter

21 - Dipper and swing function manual control block
22 - Travel control pedal
23 - Travel direction reverser (INCHING)
24 - Travel spool pilot selector block for the AUTO-IDLE function
25 - Pressure release pump (foot control)
26 - Pilot circuits manifold
27 - Pilot circuit minimum pressure switch
28 - Steering box (ORBITROL)
29 - Braking unit

30a - Accumulator on the parking brake circuit
30b - Accumulator on the front axle braking circuit
30c - Accumulator on the rear axle braking circuit
31 - Brake pressure switch for travel speed change
32a - Travel pilot pressure switch (automatic front axle unlocking)
32b - Pressure switch (brake lights)
33a - Parking brake pressure switch
33b - Braking minimum pressure switch
34 - Minimum steering pressure switch
35 - Swing spool pilot selector block for automatic swing brake release
36 - Boom - bucket function manual control block

41 - Swing control valve block
42 - Hydraulic swing motor safety/force-feed flange
43 - Fixed displacement hydraulic swing motor (with static brake)
44 - 3 bar check valve for swing force-feed
45 - Braking valves on swing control valve pilots
46 - Double spring-type accumulator on swing control valve spool pilots

61 - Hydraulic pilot block including:
61a - Control arm safety or control arm safety and axle locking pressure selector block
61b - Automatic swing braking and brake release electro-control valve
61c - Electro-control valve (**Y2** and **Y13:** control arm safety, front axle locking and unlocking)
61d - 35 bar pressure limiter (**P35**)
61e - Travel speed change electro-control valve (**Y11**: job-site speed - **Y12**: road speed)
61f - Stabilizer and blade electro-control valve (**Y26**: raising - **Y27**: lowering)
62 - Working brake electro-control valve (**Y15**)
63 - Electro-hydraulic proportioning valve (**DRE4**)
64 - LS information detector
65a - Swing control valve spool pilot pressure switch for swing brake release
65b - Travel control valve spool pilot pressure switch for AUTO-IDLE function
66 - Electronic control box
67 - Swing motor speed detector (for braking)

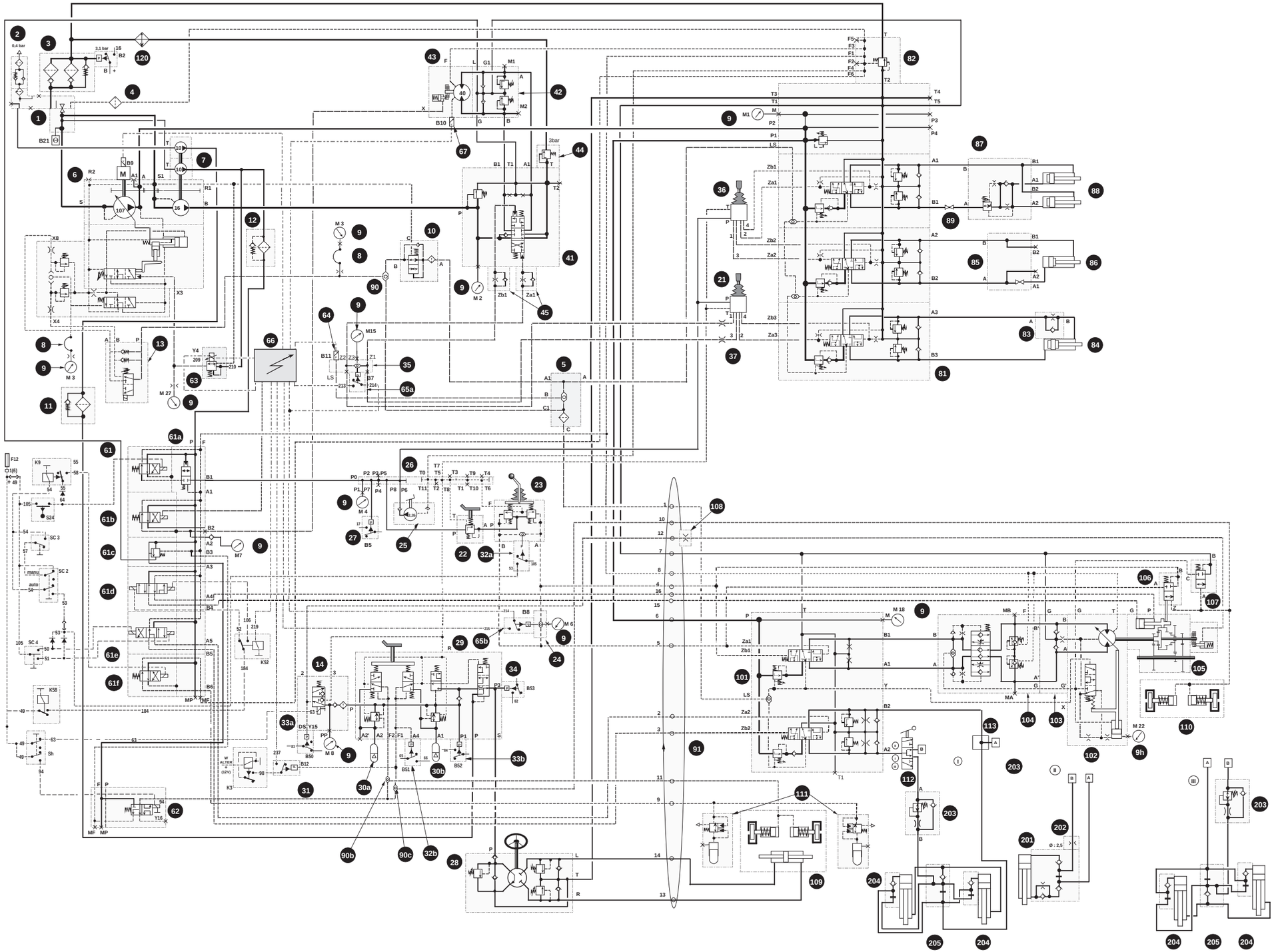
81 - Attachment control valve (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter on dipper cylinder small chamber
84 - Dipper cylinder with dashpot on large and small chamber
85 - Backhoe/clamshell selector lever valve (optional)
86 - Bucket cylinder with dashpot on large chamber
87 - Boom cylinder supply block with flow limiter on the large chambers
88 - Boom cylinders with dashpot on large chambers
89 - Lever valve on the boom cylinder large chambers (for the transportation position)

90 - Pressure selector on the attachment and travel/stabilizer LS circuits
90b and 90c - Pressure selector on the braking circuits (working brake and dynamic brake)
91 - 16 passage hydraulic swivel

101 - Travel and stabilizer/blade control valve block
102 - Hydraulic travel motors (with displacement change)
103 - Travel motor force-feed flange
104 - Speed limiter and safety block
105 - Two-speed box with parking brake and speed range change cylinder
106 - Indexing and speed range change safety block
107 - Hydraulic travel motor pressure release block (for speed range change)
108 - Calibrated orifice on the parking brake circuit
109 - Brakes on front axle
- Steering cylinder
110 - Brakes on rear axle
111 - Front axle locking cylinder
112 - Stabilizer/blade selector lever valve
113 - Union block on stabilizer or rear blade cylinder small chamber supply

201 - Blade cylinder
202 - Calibrated orifice on blade cylinder large chamber
203 - Flow limiter on stabilizer cylinder small chambers
204 - Stabilizer cylinders
205 - Stabilizer cylinder piloted check valve (on the small chambers)

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788P PLUS GENERAL HYDRAULIC SYSTEM

788P Plus general hydraulic system
List of hydraulic components

1 - Reservoir
2 - Reservoir filler cap with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Magnetic filter on functional leak return lines
5 - LS information selector block for LS information detector and filter on the travel/stabilizer LS circuit
6 - High pressure pump with:
1 fixed flow body for the swing
1 variable flow body for the attachment, travel and options
7 - Low pressure pump:
1 body for the steering/braking circuit
1 body for the pilot systems
8 - Hose/accumulator on the pump LS information circuit
9 - Pressure test points
M1 - Pressure test point for attachment/travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M8 - Pressure test point for braking unit
M22 - Pressure test point for hydraulic travel motor displacement change circuit
M27 - Pressure test point for proportioning valve outlet
10 - Anti-surge valve and filter on the attachment LS circuit
11 - Steering/braking system filter
12 - Pilot circuit filter
13 - Work/heavy lift position selector
14 - Parking brake electro-control valve (**Y15**)

21 - Manual control block for dipper and swing
22 - Travel control pedal
23 - Travel direction reverser (INCHING)
24 - Travel spool pilot selector block for the AUTO-IDLE function
25 - Pressure release pump (foot control)
26 - Pilot circuits manifold
27 - Pilot circuit minimum pressure switch
28 - Steering box (ORBITROL)
29 - Braking unit
30a - Accumulator on front axle braking circuit
30b - Accumulator on rear axle braking circuit
31 - Braking pressure switch for travel speed change
32a - Travel pilot pressure switch (automatic front axle unlocking)
32b - Pressure switch (brake lights)
33a - Parking brake pressure switch
33b - Minimum braking pressure switch
34 - Minimum steering pressure switch
35 - Swing spool pilot selector block for automatic swing brake release
36 - Manual control block for boom - bucket
37 - Calibrated union

41 - Swing control valve block
42 - Hydraulic swing motor safety/force-feed flange
43 - Fixed displacement hydraulic swing motor (with static brake)
44 - 3 bar check valve for swing force-feed
45 - Braking valves on swing control valve pilot circuits

61 - Hydraulic pilot block consisting of:
61a - Electro-control valve (**Y2**) for control arm safety
61b - Electro-control valve (**Y5**) for automatic swing braking and brake release
61c - 35 bar pressure limiter (**P35**)
61d - Travel speed change electro-control valve (**Y11**: road speed - **Y12**: job-site speed)
61e - Stabilizer and blade electro-control valve (**Y26**: raising - **Y27**: lowering)
61f - Electro-control valve (**Y13**) for axle locking
62 - Working brake electro-control valve (**Y16**)
63 - Electro-hydraulic proportioning valve (**DRE4**)
64 - LS information detector
65a - Swing control valve spool pilot pressure switch for swing brake release
65b - Travel control valve spool pilot for AUTO-IDLE function
66 - Electronic control box
67 - Swing motor speed detector (for braking)

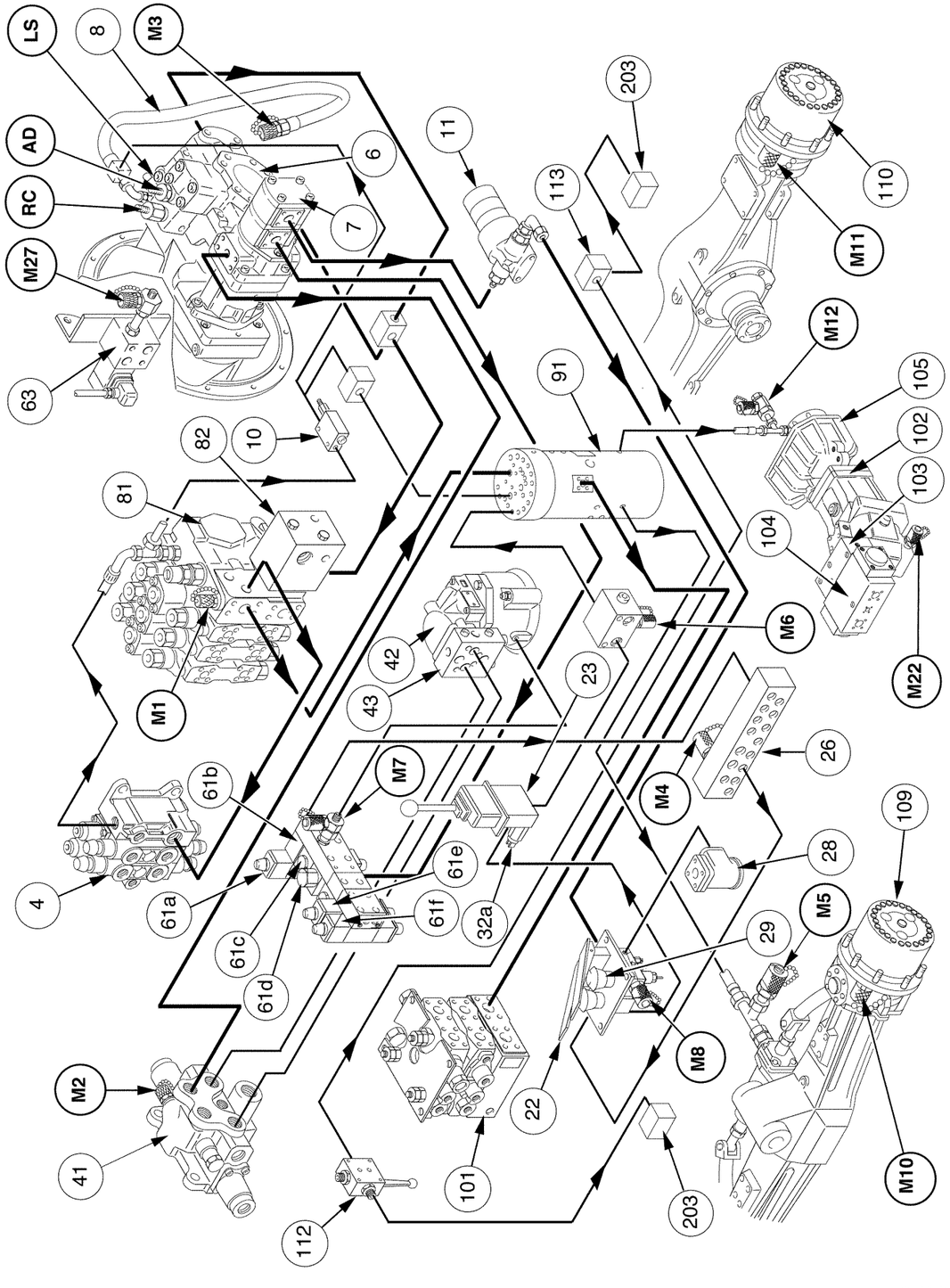
81 - Attachment control valve block (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter on dipper cylinder small chamber
84 - Dipper cylinder with dashpot on large and small chambers
85 - Backhoe/clamshell selector lever valve (optional)
86 - Bucket cylinder with dashpot on large chamber
87 - Boom cylinder supply block with flow limiter on the large chambers
88 - Boom cylinders with dashpot on large chambers
89 - Lever valve on the boom cylinder large chambers (for the transportation position)

90 - Pressure selector on the attachment and travel/stabilizer LS circuits
90b and 90c - Pressure selector on the brake circuits (working brake and dynamic brake)
91 - 16 passage hydraulic swivel

101 - Travel and stabilizer/blade control valve block
102 - Hydraulic travel motors (with displacement change)
103 - Travel motor force-feed flange
104 - Speed limiter and safety block
105 - Two-speed block with parking brake and speed range change cylinder
106 - Indexing and speed range change safety block
107 - Hydraulic travel motor pressure release block (for speed range change)
108 - Calibrated orifice on parking brake circuit
109 - Brakes on front axle
- Steering cylinder
110 - Brakes on rear axle
111 - Front axle locking cylinder
112 - Stabilizer/blade selector lever valve
113 - Union block on stabilizer or rear blade small chamber supply

201 - Blade cylinder
202 - Calibrated orifice on blade cylinder large chamber
203 - Flow limiter on stabilizer cylinder small chambers
204 - Stabilizer cylinder
205 - Stabilizer cylinder piloted check valve (on the small chambers)

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988P GENERAL HYDRAULICS

988P hydraulic system

Location of hydraulic components

4 - Low flow option control valve (clamshell rotation, articulated boom)
6 - High pressure pump with 1 fixed flow body for swing and 2 variable flow bodies for the attachment, travel and any options
7 - Low pressure pump for the steering/braking system
Low pressure pump for the pilot systems
8 - Hose/accumulator on the pump LS information circuit
10 - Anti-surge valveand filter on the attachment LS circuit
11 - Filter on the steering/braking circuit

22 - Travel control pedal
23 - Travel direction reverser (INCHING)
26 - Pilot circuits manifold
28 - Steering box (ORBITROL)
29 - Braking unit

32a - Travel pilot pressure switch (automatic front axle unlocking)

41 - Swing control valve block
42 - Fixed flow hydraulic swing motor
43 - Hydraulic swing motor safety flange

61 - Hydraulic pilot block including:
61a - Electro-control valve (**Y2** and **Y13**) control arm safety - front axle locking and unlocking
61b - Circuit selector flange for control arm safety - front axle locking and unlocking
61a - Automatic swing braking and brake release electro-control valve
61c - Pressure limiter (**P35**)
61e - Travel speed change electro-control valve (**Y11**: job-site speed - **Y12**: road speed)
61f - Stabilizer and blade electro-control valve (**Y26**: raising - **Y27**: lowering)

81 - Attachment control valve (boom, dipper, bucket)
82 - P10 counter-pressure valve

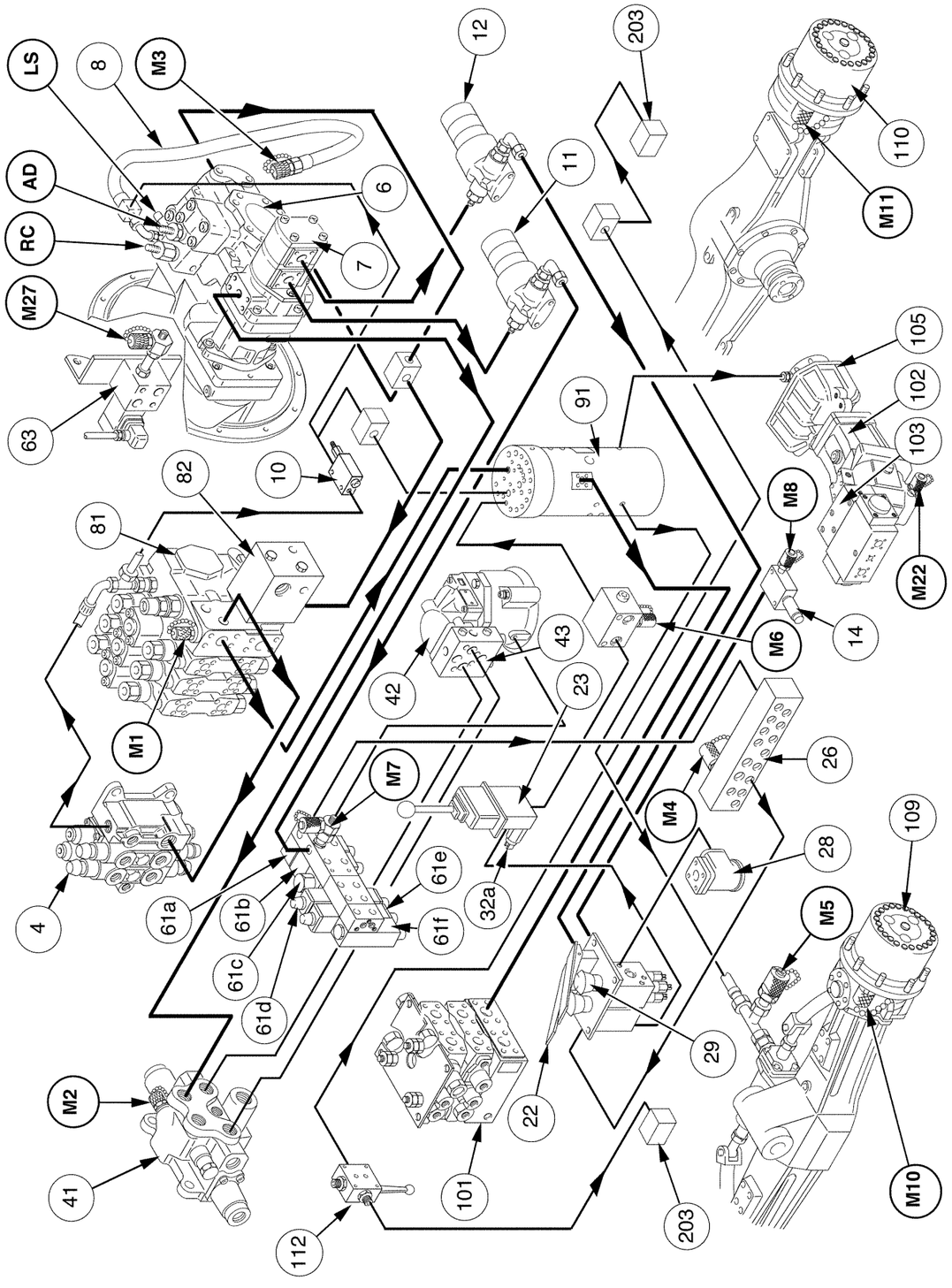
91 - 16 passage hydraulic swivel

101 - Travel and stabilizer/blade control valve block
102 - Hydraulic travel motors (with displacement change)
103 - Travel motor force-feed flange
104 - Speed limiter and safety block
105 - Two-speed box with parking brake
109 - Brakes on front axle
110 - Brakes on rear axle
112 - Stabilizer/blade selector lever valve
113 - Union block on stabilizer or rear blade cylinder small chambers

203 - Flow limiter on stabilizer cylinder small chambers

M1 - Pressure test point for attachment/travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M8 - Pressure test point for brake system
M22 - Pressure test point for hydraulic travel motor displacement change circuit
M27 - Pressure test point for proportioning valve outlet

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CM99J018

988P PLUS GENERAL HYDRAULICS

988P Plus hydraulic system

Location of hydraulic components

4 - Low flow option control valve (clamshell rotation, articulated boom)
6 - High pressure pump with 1 fixed flow body for the swing
2 variable flow bodies for the attachment, travel and any options
7 - Low pressure pump for the steering/braking system
Low pressure pump for the pilot systems
8 - Hose/accumulator on the pump LS information circuit
10 - Anti-surge valve on the attachment LS circuit
11 - Filter on the steering/braking system
12 - Filter on pilot circuit
14 - Parking brake electro-control valve

22 - Travel control pedal
23 - Travel direction reverser (INCHING)
26 - Pilot circuits manifold
28 - Steering box (ORBITROL)
29 - Braking unit
32a - Travel pilot pressure switch (automatic front axle unlocking)
41 - Swing control valve block
42 - Fixed flow hydraulic swing motor
43 - Hydraulic swing motor safety flange

61 - Hydraulic pilot block including:
61a - Electro-control valve (**Y2**): for control arm safety
61b - Automatic swing braking and brake release electro-control valve
61c - Pressure limiter
61d - Travel speed change electro-control valve (**Y11**: job-site speed - **Y12**: road speed)
61e - Stabilizer and blade electro-control valve (**Y26**: raising - **Y27**: lowering)
61f - Front axle locking and unlocking electro-control valve (**Y13**)

81 - Attachment control valve (boom, dipper, bucket)
82 - P10 counter-pressure block

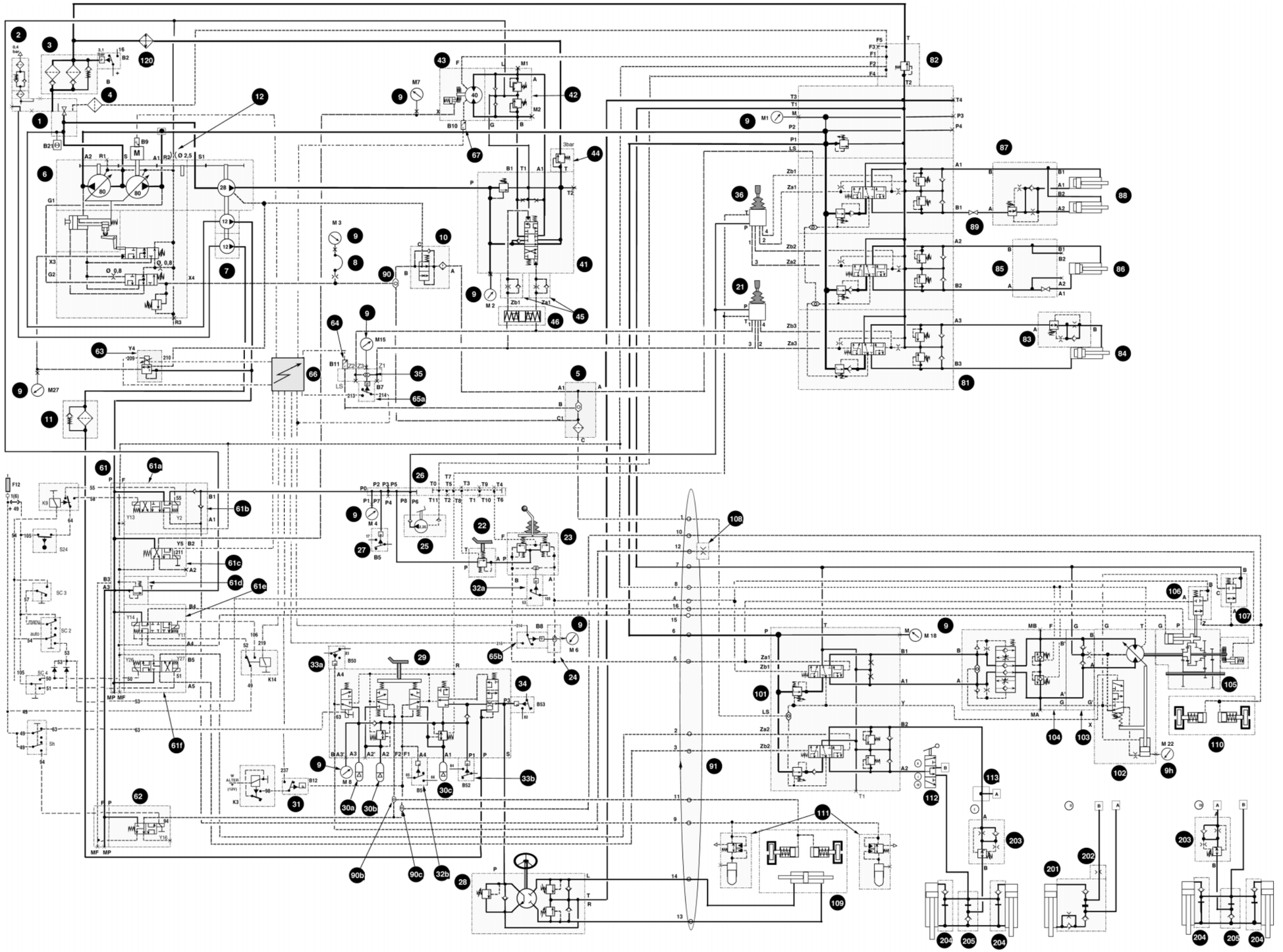
91 - 16 passage hydraulic swivel

101 - Travel and stabilizer/blade control valve block
102 - Hydraulic travel motors (with displacement change)
103 - Travel motor force-feed flange
104 - Speed limiter and safety block
105 - Two-speed box with parking brake
109 - Brakes on front axle
110 - Brakes on rear axle
112 - Stabilizer/blade selector lever valve
113 - Union block stabilizer or rear blade small chamber supply

203 - Flow limiter on stabilizer cylinder small chambers

M1 - Pressure test point for attachment/travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M8 - Pressure test point for parking brake electro-control valve
M22 - Pressure test point for hydraulic travel motor displacement change circuit
M27 - Pressure test point for proportioning valve outlet

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988P GENERAL HYDRAULIC SYSTEM

988P general hydraulic system

List of hydraulic components

1 - Reservoir
2 - Reservoir filler cap with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Element type filter on the functional leak return line
5 - Information selector block for LS detector and filter on travel/stabilizer LS circuit
6 - High pressure pump with:
1 fixed flow body for the swing
2 variable flow bodies for the attachment, travel and options
7 - Low pressure pump
1 body for the steering/braking system
1 body for the pilot system
8 - Hose/accumulator on the pump LS information circuit
9 - Pressure test points
M1 - Pressure test point for attachment/travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M8 - Pressure test point for braking circuits
M22 - Pressure test point for hydraulic travel motor displacement change circuit
M27 - Pressure test point for proportioning valve outlet
10 - Anti-surge valve on the attachment LS circuit
11 - Steering/braking circuit filter
12 - Calibrated orifice (dia.: 2.5 mm) on main pump irrigation circuit
21 - Dipper and swing function manual control block
22 - Travel control pedal
23 - Travel direction reverser (INCHING)
24 - Travel spool piloting selector block for the AUTO-IDLE function
25 - Pressure release pump (foot control)
26 - Pilot circuits manifold
27 - Pilot circuit minimum pressure switch
28 - Steering box (ORBITROL)
29 - Braking unit

30a - Accumulator on the parking brake circuit
30b - Accumulator on the front axle braking circuit
30c - Accumulator on the rear axle braking circuit
31 - Braking pressure switch for travel speed change
32a - Travel pilot pressure switch (automatic front axle unlocking)
32b - Pressure switch (brake lights)
33a - Parking brake pressure switch
33b - Minimum braking pressure switch
34 - Minimum steering pressure switch
35 - Swing spool piloting selector block for automatic swing brake release
36 - Boom - bucket function manual control block

41 - Swing control valve block
42 - Hydraulic swing motor safety/force-feed flange
43 - Fixed displacement hydraulic swing motor (with static brake)
44 - 3 bar check valve for swing force-feed
45 - Braking valves on swing control valve spool pilots
46 - Spring type accumulator on swing control valve spool pilot system

61 - Hydraulic piloting block, including:
61a - Circuit selector flange for control arm raising safety and front axle locking and unlocking
61b - Electro-control valve (**Y2** and **Y13**: control arm raising safety, front axle locking and unlocking)
61c - Electro-control valve (**Y2** and **Y13:** control arm raising safety, front axle locking and unlocking)
61d - 35 bar pressure limiter (**P35**)
61e - Travel speed change electro-control valve (**Y11**: job-site speed - **Y12**: road speed)
61f - Stabilizer and blade electro-control valve (**Y26**: raising - **Y27**: lowering)
62 - Working brake electro-control valve (**Y16**)
63 - Electro-hydraulic proportioning valve (**DRE4**)
64 - LS information detector
65a - Pressure switch for swing control valve spool pilot system pressure for release of swing brake and for the AUTO-IDLE function.
65b - Pressure switch for travel control valve spool pilot system pressure for the AUTO-IDLE function.
66 - Electronic control box
67 - Hydraulic swing motor speed detector

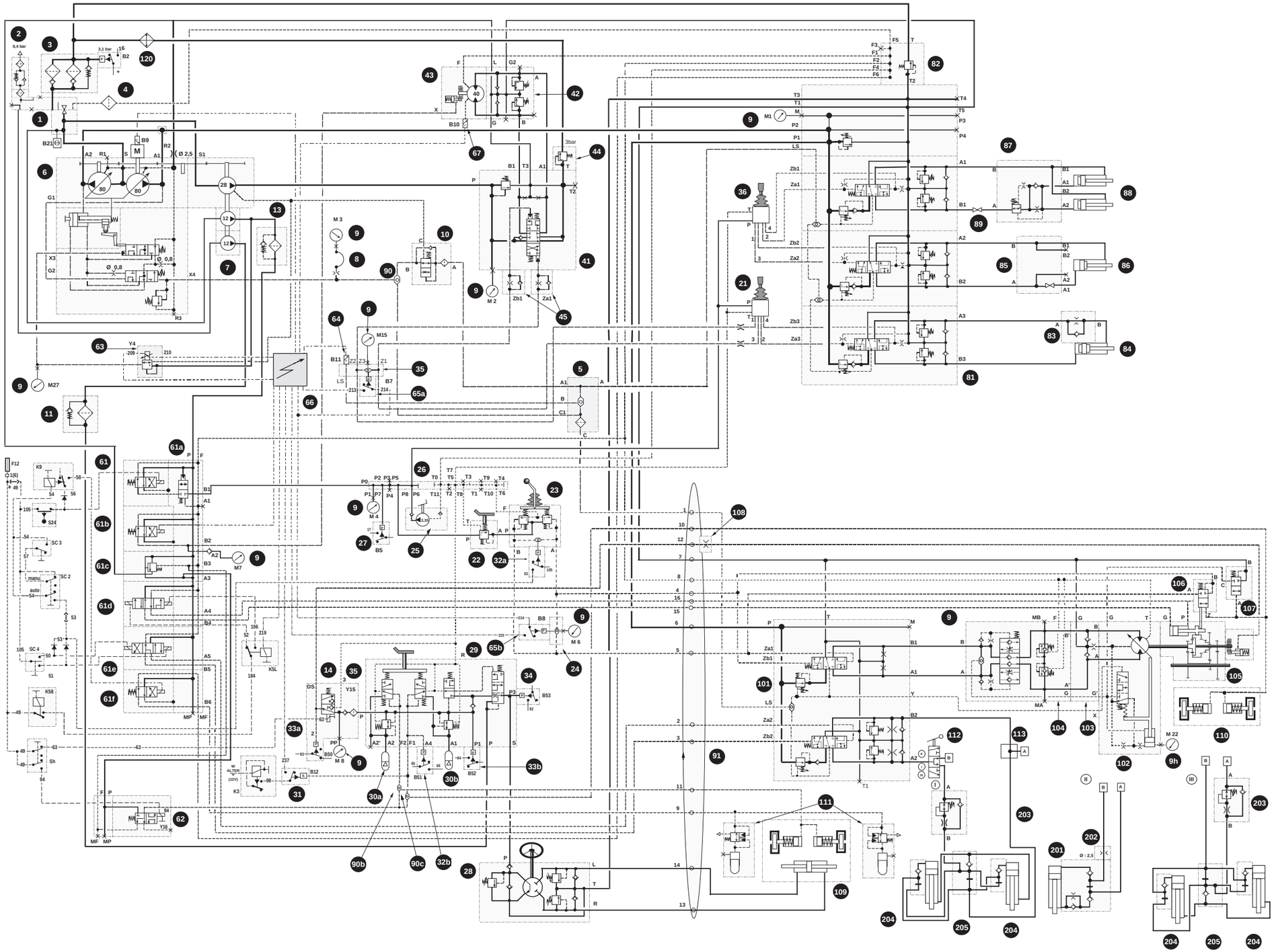
81 - Attachment control valve (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter block on dipper cylinder small chamber
84 - Dipper cylinder with dashpot on large and small chamber
85 - Backhoe/clamshell selector lever valve (optional)
86 - Bucket cylinder with dashpot on large chamber
87 - Boom cylinder supply block with flow limiter on large chambers
88 - Boom cylinders with dashpot on large chambers
89 - Lever valve on the boom cylinder large chambers (for the transportation position).

90 - Pressure selector on the attachment and travel/stabilizer LS circuits
90b and 90c - Pressure selector on braking circuits (working brake and dynamic brake)
91 - 16 passage hydraulic swivel

101 - Travel and stabilizer/blade control valve block
102 - Hydraulic travel motors (with displacement change)
103 - Travel motor force-feed flange
104 - Speed limiter and safety block
105 - Two-speed box with parking brake and speed range change cylinder
106 - Speed range change indexing and safety block
107 - Hydraulic travel motor clutch release block (for changing speed range)
108 - Calibrated orifice on the parking brake circuit
109 - Brakes on front axle
- Steering cylinder
110 - Brakes on rear axle
111 - Front axle locking cylinder
112 - Stabilizer/blade selector lever valve
113 - Union block on supply to stabilizer or blade cylinder small chambers

201 - Blade cylinder
202 - Calibrated orifice on blade cylinder large chamber
203 - Flow limiter on stabilizer cylinder small chambers
204 - Stabilizer cylinder
205 - Stabilizer cylinder piloted check valve

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CM99J014

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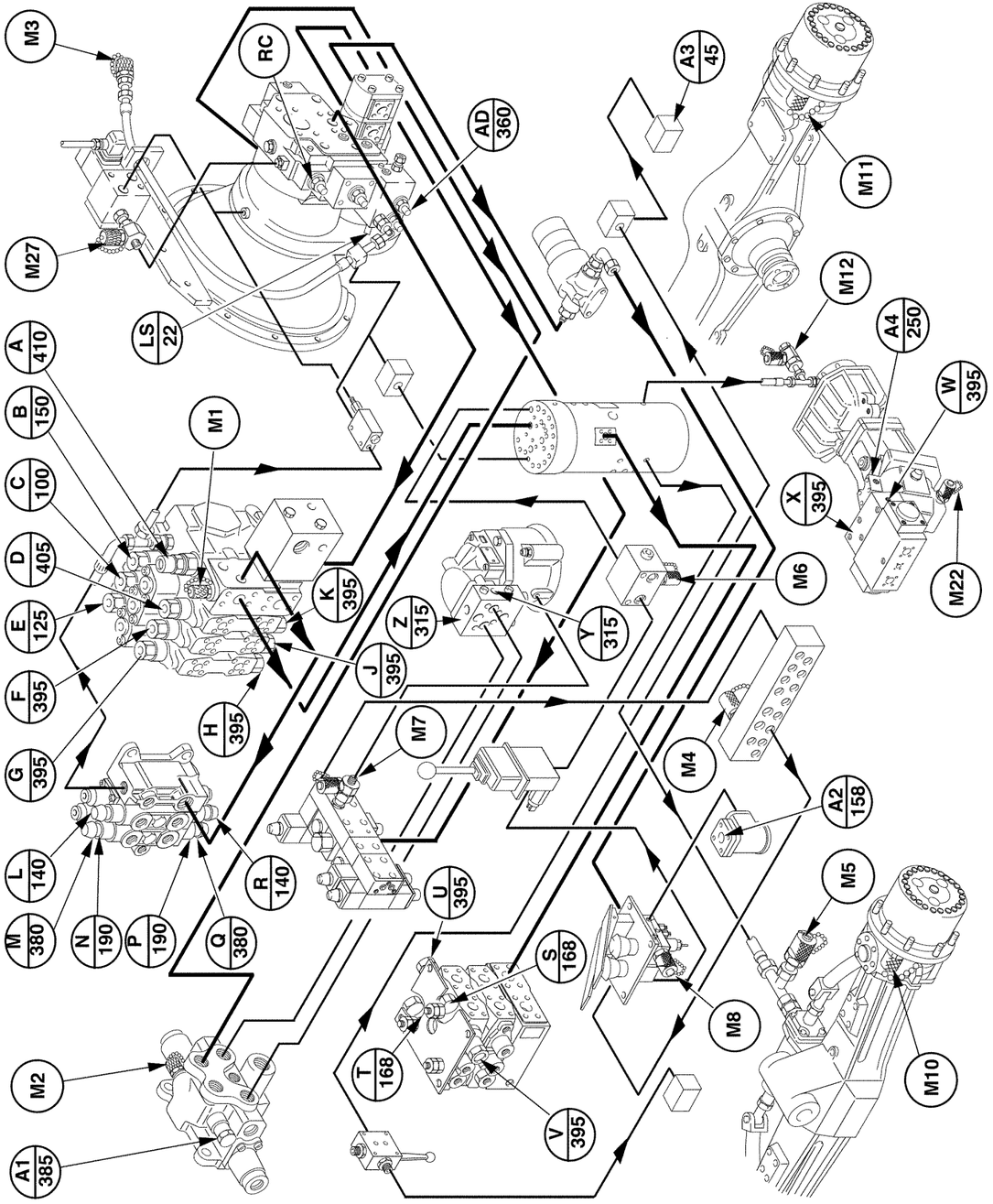
988P PLUS GENERAL HYDRAULIC SYSTEM

988P Plus general hydraulic system

List of hydraulic components

1 - Reservoir
2 - Reservoir filler cap with self-pressurizing valve and screen filter
3 - Return manifold with element type filters and restriction indicator
4 - Element type filter on functional leak return lines
5 - Information selector block for LS detector and filter on travel/stabilizer LS circuit
6 - High pressure pump with:
1 fixed flow body for the swing
2 variable flow bodies for the attachment, travel and options
7 - Low pressure pump:
1 body for the steering/braking system
1 body for the pilot systems
8 - Hose/accumulator on the pump LS information circuit
9 - Pressure test points
M1 - Pressure test point for attachment/travel and options (if any)
M2 - Pressure test point for swing
M3 - Pressure test point for LS circuit
M4 - Pressure test point for pilot circuits
M6 - Pressure test point for travel manual control block outlet
M7 - Pressure test point for swing braking and brake release
M8 - Pressure test point for braking circuits
M22 - Pressure test point for hydraulic travel motor displacement change circuit
M27 - Pressure test point for proportioning valve outlet
10 - Anti-surge valve on the attachment LS circuit
11 - Steering/braking system filter
12 - Calibrated orifice (dia.: 2.5 mm) on main pump irrigation circuit
13 - Pilot system filter
14 - Parking brake electro-control valve (**Y15**)
21 - Dipper and swing function manual control block
22 - Travel control pedal
23 - Travel direction reverser (INCHING)
24 - Travel spool piloting selector for the AUTO-IDLE function
25 - Pressure release pump (foot control)
26 - Pilot circuits manifold
27 - Pilot circuit minimum pressure switch
28 - Steering box (ORBITROL)
29 - Braking unit
30a - Accumulator on the rear axle braking circuit
30b - Accumulator on the rear axle braking circuit
31 - Braking pressure switch for travel speed change
32a - Travel pilot pressure switch (automatic front axle unlocking)
32b - Pressure switch (brake lights)
33a - Parking brake pressure switch
33b - Minimum braking pressure switch
34 - Minimum steering pressure switch
35 - Swing spool pilot selector block for automatic swing brake release
36 - Dipper and swing function manual control block
41 - Swing control valve block
42 - Hydraulic swing motor safety/force-feed flange
43 - Fixed displacement hydraulic swing motor (with static brake)
44 - 3 bar check valve for swing force-feed
45 - Braking valves on swing control valve pilot circuits
46 - Spring type accumulator on swing control valve spool pilot
61 - Hydraulic piloting block including:
61a - Electro-control valve (**Y2**) for control arm safety
61b - Electro-control valve (**Y5**) for automatic swing braking and brake release
61c - 35 bar pressure limiter
61d - Travel speed change electro-control valve (**Y11**: road speed - **Y12**: job-site speed)
61e - Stabilizer and blade electro-control valve (**Y26**: raising - **Y27**: lowering)
61f - Axle locking electro-control valve
62 - Working brake electro-control valve (**Y16**)
63 - Electro-hydraulic proportioning valve (**DRE4**)
64 - LS information detector
65a - Swing control valve spool pilot pressure switch for swing brake release and for the AUTO-IDLE function
65b - Travel control valve spool pilot pressure switch for the AUTO-IDLE function
66 - Electronic control box
67 - Hydraulic swing motor speed detector
81 - Attachment control valve (boom, dipper, bucket)
82 - P10 counter-pressure valve
83 - Flow limiter on dipper cylinder small chamber
84 - Dipper cylinder with dashpot on large and small chamber
85 - Backhoe/clamshell selector lever valve (optional)
86 - Bucket cylinder with dashpot on large chamber
87 - Boom cylinder supply block with flow limiter on the large chambers
88 - Boom cylinders with dashpot on large chambers
89 - Lever valve on boom cylinder large chambers (for transportation position)
90 - Pressure selector on attachment and travel/stabilizer LS circuits
90b and 90c - Pressure selector on braking circuits (working brake and dynamic brake)
91 - 16 passage hydraulic swivel
101 - Travel and stabilizer/blade control valve block
102 - Variable displacement hydraulic travel motors
103 - Travel motor force-feed flange
104 - Speed limiter and safety block
105 - Two-speed box with parking brake and speed range change cylinder
106 - Speed range change indexing and safety block
107 - Hydraulic travel motor clutch release block (for speed range change)
108 - Calibrated orifice on the parking brake circuit
109 - Brakes on front axle
- Steering cylinder
110 - Brakes on rear axle
111 - Front axle locking cylinder
112 - Stabilizer/blade selector lever valve
113 - Union block on stabilizer or blade cylinder small chamber supply
201 - Blade cylinder
202 - Calibrated orifice on blade cylinder large chamber
203 - Flow limiter on stabilizer cylinder small chambers
204 - Stabilizer cylinder
205 - Stabilizer cylinder piloted check valve

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CM99J021

SETTING THE PRESSURES ON THE 788P

Location of the various pressure test points installed on the machine

M1 on the attachment control valve
M2 on the swing control valve
M3 on the anti-surge valve
M4 on the manifold
M6 on the shuttle ball block (at the back, at the bottom of the cab)
M7 on the swing brake supply hose
M8 on the braking unit
M22 on the travel motor
M27 on the proportioning valve

Location of pressure test points to be installed

M5 on the Orbitrol steering
M10 on the front axle
M11 on the rear axle
M12 on the parking brake

Installing the flowmeter on the A1 pump body (for the attachment and travel)

Disconnect the pump body hose from the port **A1** of the pump.

Install the flowmeter (**Z5344486**) using the hose (**W5431976**) recommended in the tool list.

Raising the circuit temperature to between 50 and 55°C

Use the stabilizers and the blade to raise the excavator.
Operate the bucket or clamshell against the stops.

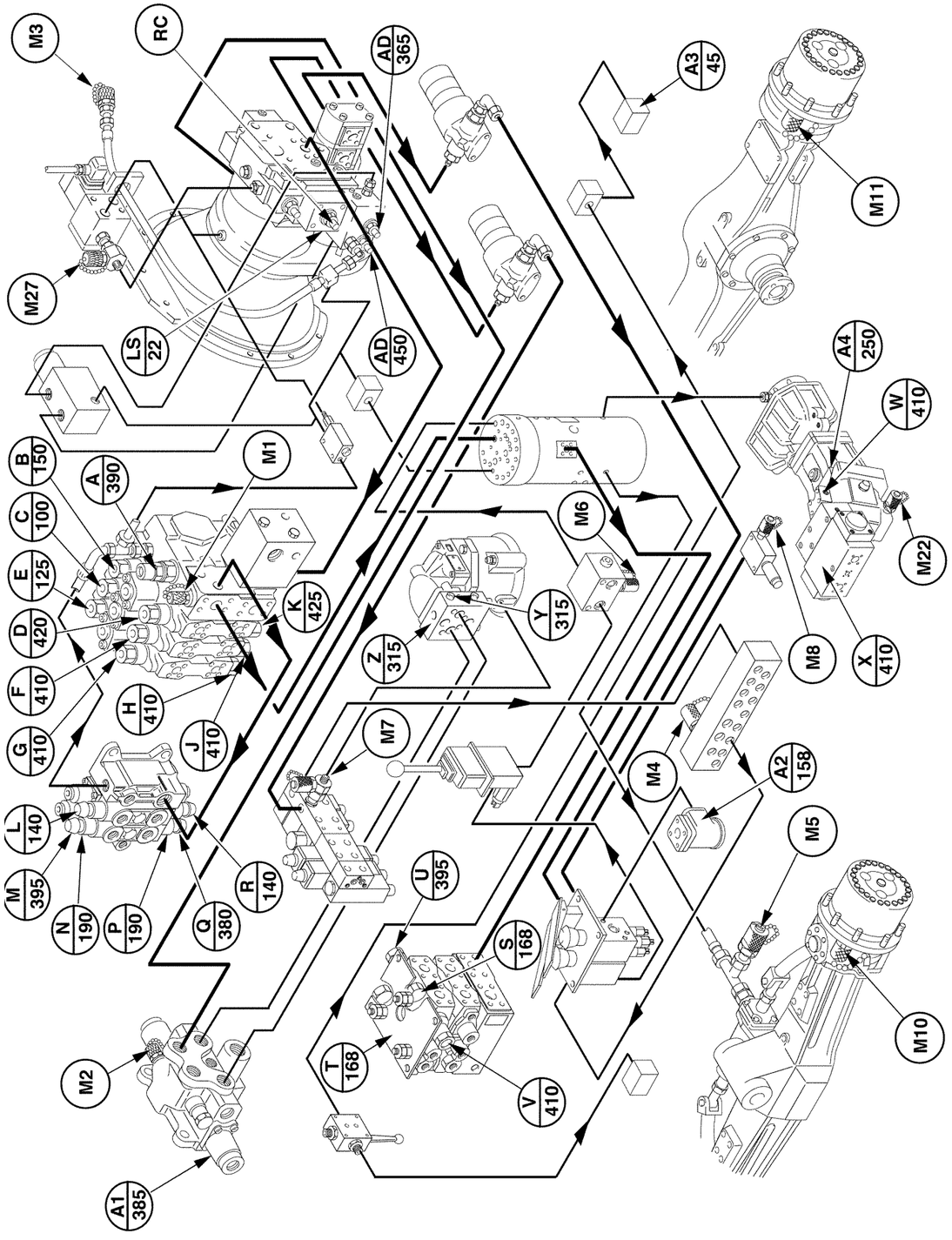
Checking the engine speeds without load and the pressures delivered by the proportioning valve

Installer the tachometer and connect the multitester at **M27**.

MODES	SPEEDS				PRESSURES			
AUTO - IDLE	**1150**	to	**1250**	(rpm)	**19.5**	to	**23.5**	(bar)
LOW	**900**	to	**1000**	(rpm)	**19.5**	to	**23.5**	(bar)
FINE	**1570**	to	**1630**	(rpm)	**13.5**	to	**17.5**	(bar)
ECO	**1920**	to	**1980**	(rpm)	**8.5**	to	**12.5**	(bar)
MAX	**2190**	to	**2250**	(rpm)	**5.5**	to	**9.5**	(bar)

If the speeds are out of tolerance, see Section 4002.

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CM99J022

SETTING THE PRESSURES ON THE 788P PLUS

Location of the various pressure test points installed on the machine

M1 on the attachment control valve
M2 on the swing control valve
M3 on the anti-surge valve
M4 on the manifold
M6 on the shuttle ball block (at the back, at the bottom of the cab)
M7 on the swing brake supply hose
M8 on the parking brake electro-control valve
M22 on the travel motor
M27 on the proportioning valve

Location of pressure test points to be installed

M5 on the Orbitrol steering
M10 on the front axle
M11 on the rear axle

Installing the flowmeter on the A1 pump body (for the attachment and travel)

Disconnect the pump body hose from the port **A1** of the pump.

Install the flowmeter (**Z5344486**) using the hose (**W5431976**) recommended in the tool list.

Raising the circuit temperature to between 50 and 55°C

Use the stabilizers and the blade to raise the excavator.
Operate the bucket or clamshell against the stops.

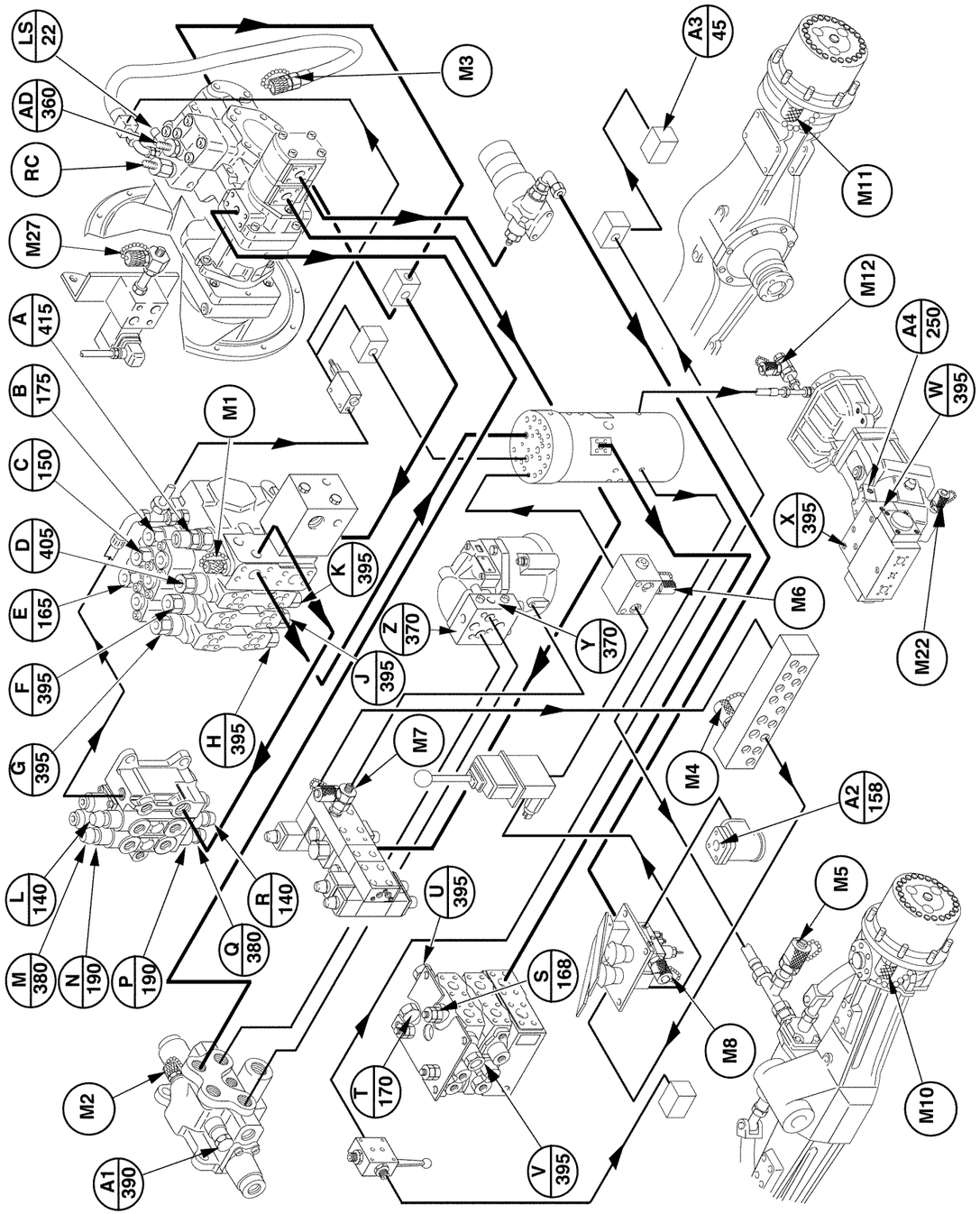
Checking the engine speeds without load and the pressures delivered by the proportioning valve

Installer the tachometer and connect the multitester at **M27**.

MODES	SPEEDS				PRESSURES			
AUTO - IDLE	**1170**	to	**1230**	(rpm)	**19**	to	**24**	(bar)
LOW	**900**	to	**1000**	(rpm)	**19**	to	**24**	(bar)
FINE	**1570**	to	**1630**	(rpm)	**13**	to	**18**	(bar)
ECO	**1920**	to	**1980**	(rpm)	**8**	to	**13**	(bar)
MAX	**2190**	to	**2250**	(rpm)	**5**	to	**10**	(bar)

If the speeds are out of tolerance, see Section 4002.

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CM99J023

SETTING THE PRESSURES ON THE 988P

Location of the various pressure test points installed on the machine

M1 on the attachment control valve
M2 on the swing control valve
M3 on the anti-surge valve
M4 on the manifold
M6 on the shuttle ball block (at the back, at the bottom of the cab)
M7 on the swing brake supply hose
M8 on the braking unit
M22 on the travel motor
M27 on the proportioning valve

Location of pressure test points to be installed

M5 on the Orbitrol steering
M10 on the front axle
M11 on the rear axle
M12 on the parking brake

Installing the flowmeter on the A1 pump body (for the attachment and travel)

Disconnect the variable displacement pump body outlet hose **A1**, on the union block mounted on the power module longitudinal member, at the earthing end.

Install the flowmeter (**Z5344486**) using the hose (**W5431976**) recommended in the tool list.

Raising the circuit temperature to between 50 and 55°C

Use the stabilizers and the blade to raise the excavator.
Operate the bucket or clamshell against the stops.

Checking the engine speeds without load and the pressures delivered by the proportioning valve

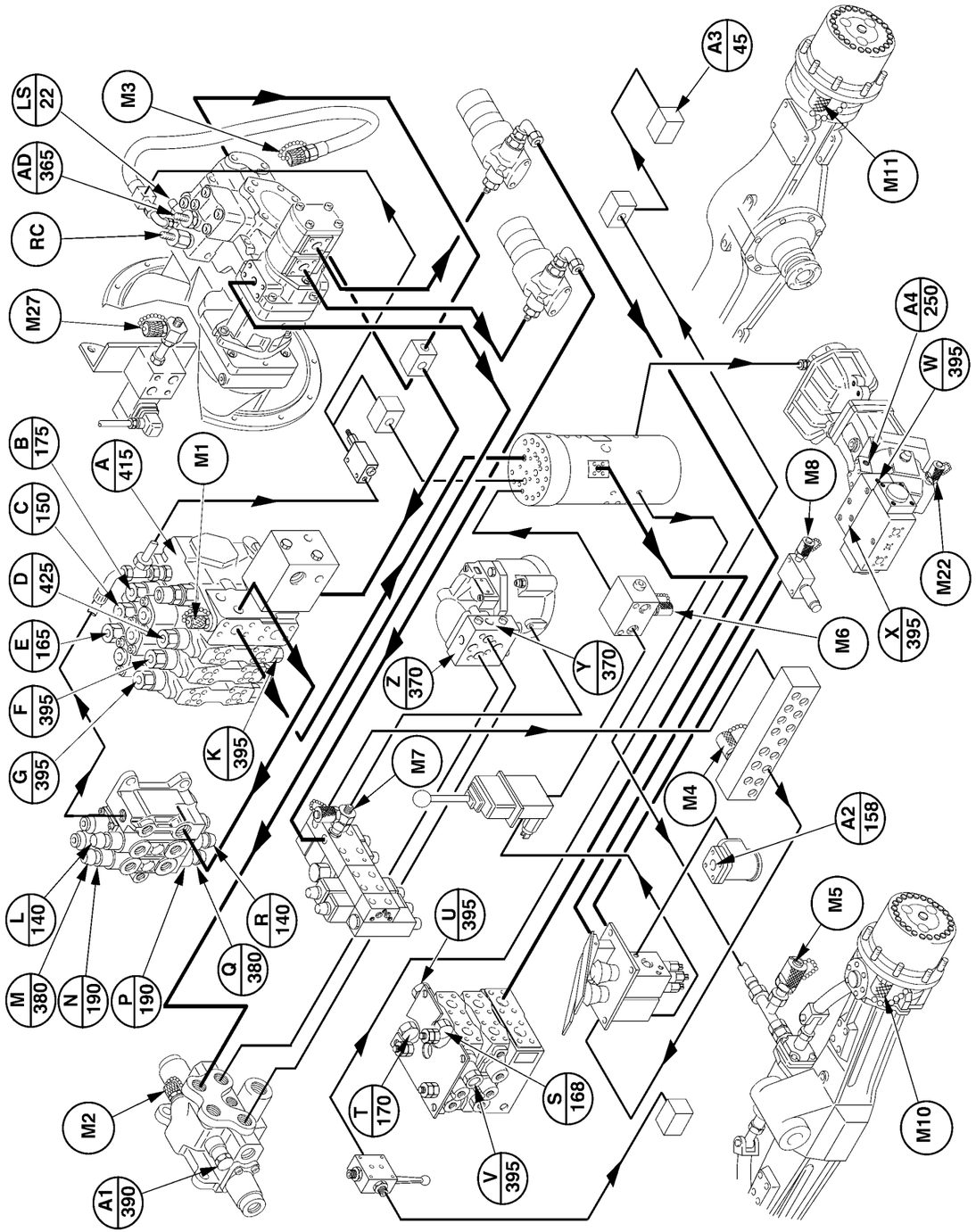
Installer the tachometer and connect the multitester at **M27**.

MODES	SPEEDS			PRESSURES		
MEDIUM - IDLE	**1150**	to **1250**	(rpm)	**23**	to **27**	(bar)
LOW - IDLE	**900**	to **1000**	(rpm)	**26**	to **30**	(bar)
FINE	**1570**	to **1630**	(rpm)	**15**	to **19**	(bar)
ECO	**1920**	to **1980**	(rpm)	**9.5**	to **13.5**	(bar)
MAX	**2190**	to **2250**	(rpm)	**7.5**	to **11.5**	(bar)

If the speeds are out of tolerance, see Section 4002.

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SETTING THE PRESSURES ON THE 988P PLUS



CM99J024

Location of the various pressure test points installed on the machine

M1 on the attachment control valve
M2 on the swing control valve
M3 on the anti-surge valve
M4 on the manifold
M6 on the shuttle ball block (at the back, at the bottom of the cab)
M7 on the swing brake supply hose
M8 on the parking brake electro-control valve
M22 on the travel motor
M27 on the proportioning valve

Location of pressure test points to be installed

M5 on the Orbitrol steering
M10 on the front axle
M11 on the rear axle

Installing the flowmeter on the A1 pump body (for the attachment and travel)

Disconnect the variable displacement pump body outlet hose **A1**, on the union block mounted on the power module longitudinal member, at the earthing end.

Install the flowmeter (**Z5344486**) using the hose (**W5431976**) recommended in the tool list.

Raising the circuit temperature to between 50 and 55°C

Use the stabilizers and the blade to raise the excavator.
Operate the bucket or clamshell against the stops.

Checking the engine speeds without load and the pressures delivered by the proportioning valve

Installer the tachometer and connect the multitester at **M27**.

MODES	SPEEDS				PRESSURES			
MEDIUM - IDLE	**1170**	to	**1230**	(rpm)	**22**	to	**27**	(bar)
LOW - IDLE	**1070**	to	**1230**	(rpm)	**22**	to	**27**	(bar)
FINE	**1570**	to	**1630**	(rpm)	**13**	to	**18**	(bar)
ECO	**1920**	to	**1980**	(rpm)	**6**	to	**11**	(bar)
MAX	**2190**	to	**2250**	(rpm)	**5**	to	**10**	(bar)

If the speeds are out of tolerance, see Section 4002.

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788, 988 pressure setting (continued)

WARNING! ***All checks and adjustments are carried out at various engine speeds and at a temperature of 50°C.***

WARNING! ***The flows specified on the 988 are those read on the flowmeter (1 pump body)****.*

Checking the pilot pressure with the control arm lowered

Connect the multitester to the manifold at **M4**.
Set the **MAX** mode.
The pressure should be greater than **34** (bar).
If it is not, check the **P35** or the electrical circuit.

AFTER EACH CHECK, IF THE PARAMETERS ARE INCORRECT, ADJUST AT THE COMPONENT CONCERNED OR CHANGE THE COMPONENT.

Setting the LS valve pressure

Static test using the same 0/40 bar pressure gauge:

WARNING! *Start the engine running, before connecting the pressure gauge at* **M1***.*

Raise the left-hand control arm as a safety measure.
Set the **FINE** mode.
Connect the pressure gauge at **M3**. The pressure should be between **8** and **12** (bar). If it is not, check the P10.
Connect the pressure gauge at **M1**. The difference between **M1** and **M3** should be **21** to **25** (bar).

Dynamic test using multitester:

Assemble the spacer on the boom raising control lever push-rod.
Connect the two outlets from the multitester at **M1** and **M3**.
Operate the boom raising control.
The pressure differential should be between **21** and **23** (bar).

Checking the variable displacement pump maximum flow (using only one flowmeter on the 988)

Set the **MAX** mode.
Connect the multitester for flow measurement.
Retract the dipper and close the bucket simultaneously.
The flow should be greater than **205** (l/min) and the pressure at **M1** lower than **125** (bar).
The flow should be greater than **153** (l/min) and the pressure at **M1** lower than **100** (bar) on the 988.

Checking the flow adjustment valve flows

Attachment control valves

Supply the large chambers of the boom, bucket and dipper cylinders, one after another.
The flows should be between:

788P, 788P Plus	988P, 988P Plus
140 and 160 (l/min) on the boom.	83 and 193 (l/min) on the boom.
90 and 110 (l/min) on the bucket.	70 and 80 (l/min) on the bucket.
115 and 135 (l/min) on the dipper.	78 and 88 (l/min) on the dipper.

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Travel control valve

Connect the multitester at **M6** to check the travel control valve pilot system in forward and reverse travel.
Raise the excavator using the stabilizers and the blade.
Select job-site speed, travel forward and reverse.
The pressures read should be **24** (bar) minimum. If they are not, adjust the pressure regulator or add shims under the travel reverser spool spring(s).

	788P, 788P Plus	988P, 988P Plus
Forward travel	163 and 173 l/min	82 and 87 l/min
Reverse travel	160 and 173 l/min	80 and 87 l/min
Universal joint speed, job-site range, forward	649 and 659 rpm	649 and 659 rpm
Universal joint speed, job-site range, forward, Germany	547 and 556 rpm	547 and 556 rpm
Universal joint speed, job-site range, reverse	627 and 659 rpm	627 and 659 rpm
Universal joint speed, job-site range, reverse, Germany	523 and 556 rpm	523 and 556 rpm
Universal joint speed, road travel range, forward	2166 and 2136 rpm	2166 and 2196 rpm
Universal joint speed, road travel range, forward, Germany	1825 and 1855 rpm	1825 and 1855 rpm
Universal joint speed, road travel range, reverse	2091 and 2196 rpm	2091 and 2196 rpm
Universal joint speed, road travel range, reverse, Germany	1745 and 1855 rpm	1745 and 1855 rpm

Stabilizer and dozer blade control valve. Beam A

When descending a slope, the flow should be:

	788P, 788P Plus	988P, 988P Plus
2 pads	45 - 55 l/min	
1 blade	45 - 55 l/min	
2 pads + blade	45 - 55 l/min	
4 pads		

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Stabilizer and dozer blade control valve. Beam B

When descending a slope, the flow should be:

	788P, 788P Plus	988P, 988P Plus
2 pads forward and reverse	150 - 180 l/min	75 - 90 l/min
1 blade	60 - 80 l/min	30 - 40 l/min
2 pads + blade	150 - 180 l/min	80 - 90 l/min
4 pads	150 - 180 l/min	80 - 90 l/min

If not, adjust the balance valve, or check the jet at the large chamber inlet for the blade.

Checking the hydraulic power supplied by the proportioning valve, with the engine under load

Connect the multitester at **M1** and **M2**.
Set the **MAX** mode.
Lock an attachment and the swing to check their maximum pressures which should be between **355** and **365** (bar) for the attachment and between **305** and **330** (bar) on the 788 swing and between **345** and **365** (bar) for the 988 swing.

Adjust the dipper cylinder large chamber safety valve to **300** (bar).
Supply the dipper retracting function only.
a) The pressure delivered by the proportional valve should be between:

	Engine speed	DRE4 pressure	Output	DRE4 pressure with swing
788P → 09/97	1980 - 2020	11 - 16.5	88 l/min	20 - 27
988P → 09/97	1980 - 2020	12 - 17	66 l/min	21 - 27
788P 09/97 →	1980 - 2020	11 - 16.5	82 l/min	20 - 27
988P, 988P Plus 09/97 →	1980 - 2020	12 - 17	61 l/min	21 - 27
788P Plus	1980 - 2020	11 - 16	102 l/min	20 - 26

WHEN THESE ADJUSTMENTS HAVE BEEN COMPLETED, REMOVE THE FLOWMETER.

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Check or adjustment of all valves

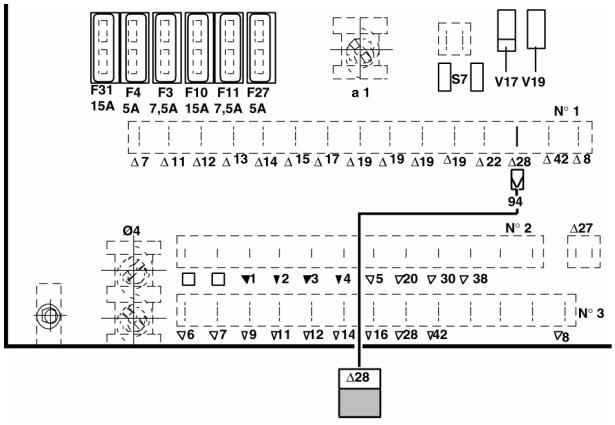
Connect the multitester at **M1**.
Set the **MAX** mode.
Overtighten the relief valve by one turn.
Overtighten the attachment and travel flow cancellation valve by two turns.

Safety valves on the attachment control valve

Attachment control valve		
	788P, 988P, 988P Plus	**788P Plus**
Attachment limiter	390 - 425	380 - 400
Boom raising	390 - 420	410 - 440
Boom lowering	380 - 410	390 - 420
Extending dipper	380 - 410	395 - 425
Retracting dipper	380 - 410	395 - 425
Extending bucket	380 - 410	395 - 425
Retracting bucket	380 - 410	395 - 425

Travel safety valve (on speed limiter)

Disconnect the wire **94** (brown colour) at ∆**28**, behind the cabinet printed circuit board.



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Set the **MAX** mode.
Apply the parking brake.
Select road speed.
Operate the direction of travel reverser in one direction.
Press the travel pedal.
Repeat the operation in the opposite direction of travel.
The pressures read should be between **380** and **410** (bar) on the 788, 988, 988 Plus, and between **395** and **425** (bar) on the 788 Plus.

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Secondary relief valves on travel control valve

Operate against the stop, raising and lowering.
The pressures read should be **380** and **410** (bar) on the 788, 988, 988 Plus and **395** to **425** (bar) on the 788 Plus.

Adjusting the relief valve except 788P Plus (see FC adjustment)

Supply the bucket opening function.
Untighten the relief valve until the same pressure is obtained as the bucket secondary relief valve.

Adjusting the attachment and travel flow cancellation valve

Untighten this valve two turns.
Operate the bucket against the stop.
Adjust to a value between **355** and **365** (bar).

Adjusting the flow cancellation valve (heavy lift 788P Plus)

Overtighten the attachment control valve relief valve.
Overtighten the boom raising safety valve.
Operate the attachment against the stops.
Set engine in FINE mode.
Adjust the heavy lift flow cancellation valve to **450** (bar).
Adjust the boom raising secondary relief valve to its value (**420** bar).
Adjust the relief valve to its value **395** (bar).

Checking the stabilizer and blade control valve flows (raising)

Beam A: **the flow should be:**

	788	**788P Plus**	**988**
2 pads	45 - 55 l/min	45 - 55 l/min	20 - 25 l/min
1 blade	45 - 55 l/min	45 - 55 l/min	20 - 25 l/min
2 pads + blade	45 - 55 l/min	45 - 55 l/min	20 - 25 l/min
4 pads			

Beam B: **the flow should be:**

	788	**788P Plus**	**988**
2 pads	40 - 50 l/min	40 - 50 l/min	21 - 26 l/min
1 blade	15 - 30 l/min	15 - 30 l/min	8 - 16 l/min
2 pads + blade	60 - 20 l/min	60 - 20 l/min	31 - 41 l/min
4 pads	80 - 100 l/min	80 - 100 l/min	41 - 51 l/min

If it is not, check the flow limiter(s) at the front or rear of the chassis for the pads.

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Hydraulic travel motor displacement change

Connect the two outlets from the multitester at **M1** and **M22**.
Unscrew the travel reverser brake.
Set the**FINE** mode.
With the wire **94** still disconnected.
Apply the parking brake.
Select the **road speed**.
Press the travel pedal.
Feather the travel reverser.
At a pressure between **240** and **260** (bar) at **M1**, the pressure at **M22** should start to rise.

WARNING! *Unscrew to increase pressure.*

Retighten the travel reverser brake.
Reconnect the wire **94**.

Orbitrol steering box relief valve

Install a pressure test union (**W1237213**) at **M5** at the inlet **P** to the steering box.
Connect the multitester.
Turn it against the stops in both directions.
The pressures read should be between **155** and **160** (bar).
If they are not, disassemble the steering box and check all the valves.

Braking unit disengagement and engagement pressures

Connect the multitester at **M8** on the unit.
Operate the parking brake several times.
The minimum engagement pressure should be between **120** and **135** (bar).
The maximum disengagement pressure should be **160** (bar).
If not, check the braking unit.

Parking brake pressure

Install a pressure test union (**U1237211**) at **M12** on the previous type assembly.
Bleed the parking brake circuit.
Connect the multitester at **M8** (new type assembly) or at **M12** (previous type assembly).
With the parking brake control in the disengaged position, the pressure read should be between **120** and **160** (bar).
With the control in the brake engaged position, the pressure should not exceed **0.5** (bar).
If not, check the circuit.

Service brake pressures

On the front axle

Install a Minimess pressure test union (**A3237549**) at **M10** in place of the bleed screw adaptor.
Bleed the circuit. Connect the multitester.
Press the brake pedal.
The pressure read should be between **45** and **60** (bar).
Release the brake pedal, the pressure should drop to a value below **0.5** (bar).
If not, check the circuit or the braking unit.

On the rear axle

Same as the front axle at **M11**.

Checking or adjusting the swing

Checking the circuit pressure without load

Connect the multitester at **M2**.
Set the **MAX** mode.
The pressure read should be between **15** and **17** (bar).
If it is not, check the **P3**.

Checking the relief valve

Lock the upperstructure mechanically.
Overtighten one safety valve by one turn.
Supply the direction of swing concerned.
The pressure read should be between **370** and **400** (bar) (788) and between **375** and **405** (bar) (988).

Checking the safety valves

Supply the swing in both directions.
The pressure should be between **305** and **330** (bar) (788) and between **345** and **365** (bar) (988).

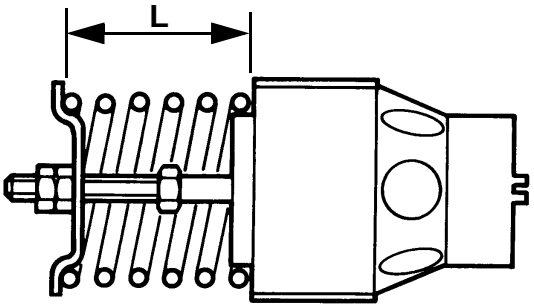
Checking the swing brake release

Connect the two outlets of the multitester at **M2** and **M7**.
With the upperstructure immobilised, feather the swing control lever.
The pressure at **M7** should be **35** (bar) before the pressure rises at **M2**.
If it is not, check the brake release circuit.

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Checking the boom and dipper flow limiters (Previous type)

When the dipper is retracted, the pressure at **M1** should be between **40** and **70** (bar).
If it is not, adjust the limiter spring to L = **21** mm on the 788, and L = **17** mm on the 988.
If the boom lowering speed is not correct, adjust the spring to L = **26.5** mm.



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