Section C

Electrics

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Notes:

Contents **Page No.**

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C-ii

Technical Data

General Electrical Data

System Type	12 Volts, negative earth
Battery	
Cold Crank Amps for 1 minute to 1.4 VPC at -18 °C (0 °F)	420 to 585 according to battery type
Reserve capacity (minutes) for 25 Amp load	170 to 230 according to battery type
Alternator	12V, 40 Amp output

Light Bulbs

Working Lights	55W (Halogen)
Warning Lights	1.2W
Beacon (if fitted)	70W
Interior Light (if fitted)	10W

Fuses - Mini CX

The electrical circuits are protected by fuses. The fuses are located in the battery compartment.

Table 1.

Fuse Number	Service	Fuse Size
A	Primary	50 amp
1	Warning lights and buzzer, Engine shut off solenoid (ESOS), Parking brake buzzer, Hourmeter, Fuel gauge, Neutral relay	5 amp
2	Worklights	15 amp
3	Beacon, Horns, Accessory socket	7.5 amp
4	Spare	

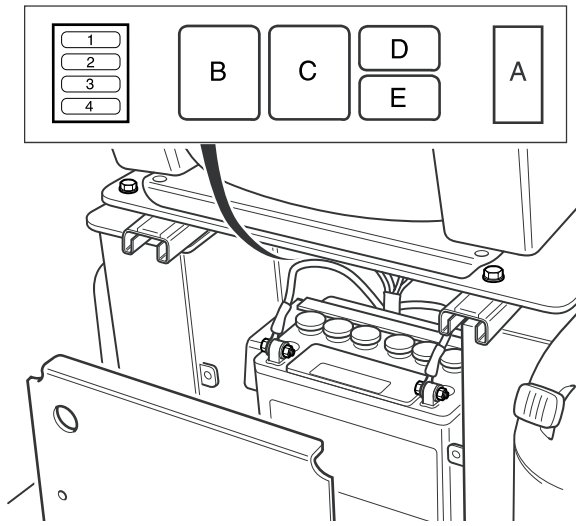

Fig 1. Mini CX

Fuses - Mini CX 4x4

The electrical circuits are protected by fuses. The fuses are located in the battery compartment.

Table 2.

Fuse Number	Service	Fuse Size
A	Primary	50 amp
1	Instrumentation, Engine shut off solenoid (ESOS), Forward and reverse solenoids, Parking brake buzzer and Neutral relay	20 amp
2	Worklights, Accessory socket, Side-shift solenoid (option), Park brake solenoid	10 amp
3	Beacon, Horns	7.5 amp
4	Auxiliary (option)	7.5 amp

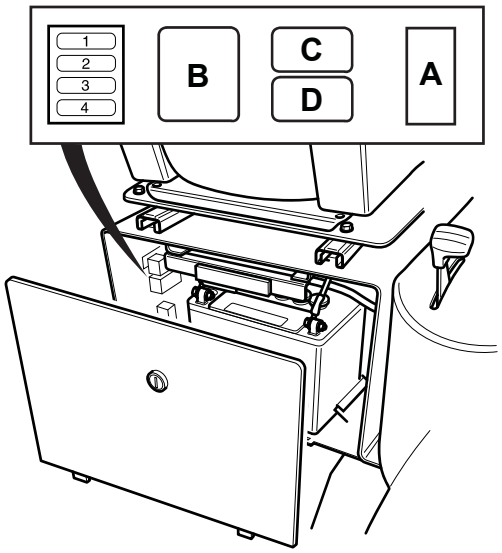

Fig 2. Mini CX 4x4

Relays - Mini CX

The relays are located in the battery compartment.

B	Neutral Start
C	Auxiliary
D	Neutral
E	Parking Brake Buzzer

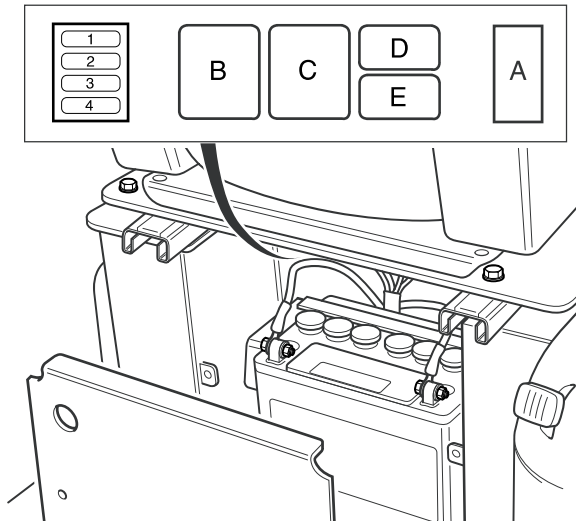

Fig 3. Mini CX

Relays - Mini CX 4x4

The relays are located in the battery compartment.

B	Neutral Start
C	Handbrake Neutral
D	Handbrake Neutral

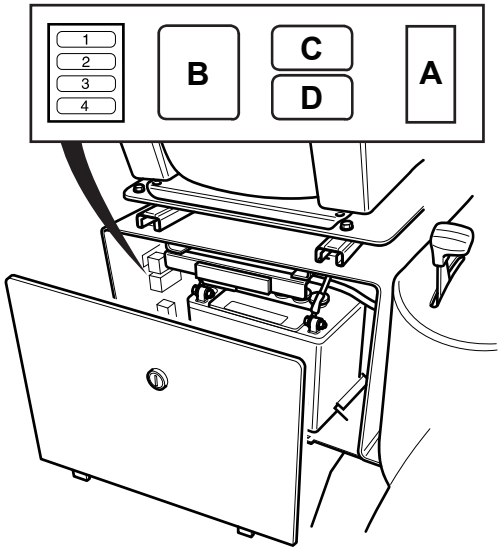

Fig 4. Mini CX 4x4

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Test Methods

Using a Multimeter

TC-002

In order to obtain maximum benefit from the fault finding information contained in Section C it is important that the technician fully understands the approach to fault finding and the use of the recommended test equipment, in this case a FLUKE 85 or AVO 2003 digital multimeter, or a moving pointer (analogue) multimeter. The approach is based on a fault finding check list. In tracing the fault from the symptoms displayed you will be directed to make measurements using a multimeter.

These instructions are intended to cover the use of the recommended multimeters.

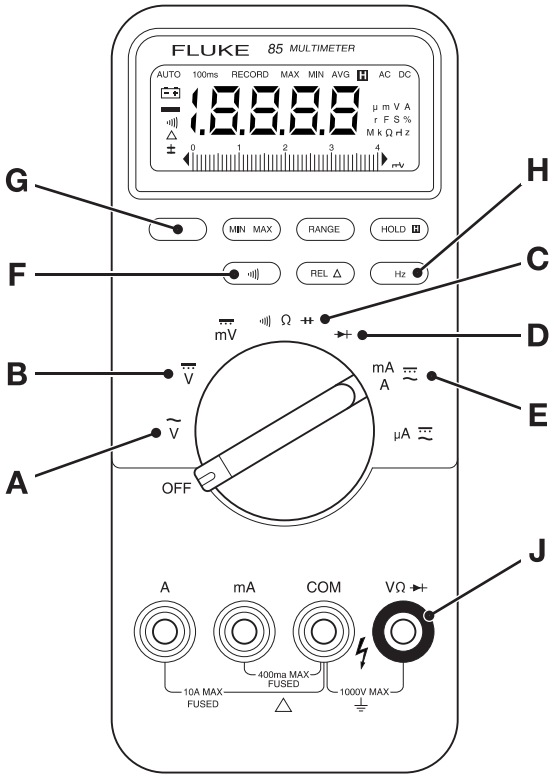

Fig 1. FLUKE 85

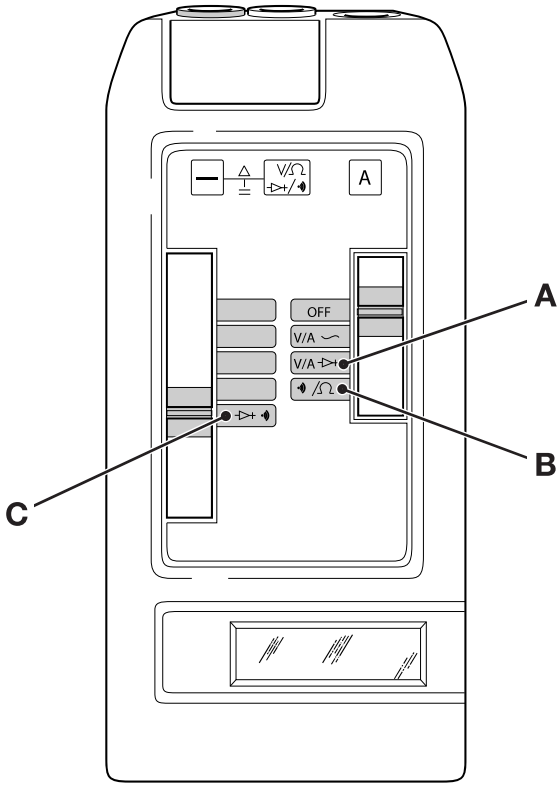

Fig 2. AVO 2003

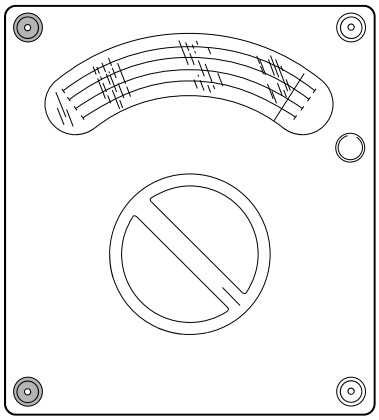

Fig 3. A Typical Analogue Meter

1 Make sure that the test leads are plugged into the correct sockets. The black test lead should be plugged into the black socket (sometimes, this socket is also marked by a "**-**", or "**E**" or marked as "**COMMON**" or "**COM**"). The red test lead should be plugged into the red socket marked with "**+**", "**V**" or "Ω".

2 When making measurements ensure that the test probes have a good clean contact with bare metal, free from grease, dirt, and corrosion as these can cause a false reading.

3 When measuring voltage: Make sure that the correct range is selected, that is set the selector to a value equal to or greater than that you are about to measure. e.g. If asked to measure 12 Volts, set the selector to the 12V range. If there is no 12V range, set the selector to the next range higher, 20V for instance. If the meter is set to a range that is too low, it may be damaged. e.g. setting to the 2V range to measure 12V.

Measuring DC Voltage

1 Select the correct range on the multimeter.

a On the FLUKE 85.

Turn the switch to position **1-B**.

b On the AV0 2003.

Move the right slider switch to position **2-A**, and the left hand slider switch to the appropriate range.

c On an analogue meter.

Turn the dial to the appropriate DC Volts range.

2 Connect the black probe to the nearest available suitable earth point, usually this will be the starter motor earth, the battery negative, or the chassis. Connect the red probe to the wire or contact from which you are measuring the voltage.

Measuring Resistance

1 Make sure there is no power to the part of the circuit you are about to measure.

2 Connect one probe at one end of the component or wire to be checked and the other probe at the other end. It does not matter which way round the two probes are placed.

3 Select the correct range on the multimeter.

a On the FLUKE 85.

i Turn the switch to position **1-C** and check that the W sign at the right hand side of the display window is on. If the **F** sign is on instead, press the blue button **1-G** to change the reading to Ω. Touch the meter lead probes together and press the **REL**[3] key on the meter to eliminate the lead resistance from the meter reading.

b On the AV0 2003.

i Move the right hand slider switch to position **2-B**, and the left hand slider switch to the appropriate Ohms (Ω) range.

c On an analogue meter.

i Move the dial to the appropriate Ohms (Ω) range.

Measuring Continuity

1 Make sure there is no power to the part of the circuit you are checking for continuity.

2 Connect one probe to one end of the component or wire to be checked and the other probe to the other end. It does not matter which way round the two probes are placed.

3 Select the correct range on the multimeter.

a On the FLUKE 85.

Turn the switch to position **1-C** and check that the beeper symbol appears at the left hand side of the display window. If the F sign is on instead, press the button labelled **1-F** in the meter drawing.

If there is continuity in the circuit, the beeper will sound. If there is no continuity (open circuit), the beeper will not sound.

b On the AV0 2003.

Move the right hand slider switch to position **2-B**, and the left hand slider switch to position **2-C**.

If there is continuity (i.e. very low resistance) between two points the buzzer will sound.

c On an analogue meter.

Turn the dial to the lowest Ohms (Ω) range.

If there is continuity (i.e. very low resistance) between two points the needle will move across fully (or almost fully) to the right hand side of the scale.

Measuring Frequency

The AVO 2003 and the analogue meter are not capable of measuring frequency, therefore a Fluke 85 digital multimeter must be used.

1 Insert the black plug into the COM socket on the meter and attach the probe to the nearest suitable earth point on the chassis, for example, the battery negative terminal.

2 Insert the red probe into socket **1-J**.

3 Turn the selector switch to position **1-A** and depress **1-G** repeatedly until **1-F** is highlighted on the top row of the display.

4 Press button **1-H** once.

5 Touch or connect the red probe to the frequency source to be measured. Press and hold button if an average reading is required.

Testing a Diode or a Diode Wire

A diode wire is a diode with male connector fitted on one end and a female connector fitted on the other end. The diode is sealed in heatshrink sleeving.

1 To test a Diode or a Diode Wire

a On the FLUKE 85.

i Turn the switch to position **1-D**.

ii Press the **HOLD** button and check that the H sign appears at the top right hand side of the display window.

iii Connect the black probe to the end of the diode with a band or to the male connector of the diode wire. Connect the red probe to the other end of the diode or diode wire. If the beeper does not sound the diode or diode wire is faulty.

iv Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or diode wire. If the beeper sounds or the meter does not read **O.L.**, the diode or diode wire is faulty.

v Press the HOLD button and check that the **H** sign disappears from the right hand side of the display window.

b On the AV0 2003.

i Move the right hand slider to position **2-A**, and the left hand slider switch to position **2-C**.

ii Connect the black probe to the end of the diode marked with a band, or to the male connector of the diode wire, the red probe should be connected to the other end of the diode or diode wire. If the Avometer does not buzz the diode is faulty.

iii Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or diode wire. If the Avometer does not read "1" the diode is faulty.

c On an analogue meter.

i Select the Ohms 1000s (1k) range.

Connect the black probe to the end of the diode marked with a band, or to the male connector of the diode wire, the red probe should be connected to the other end of the diode or diode wire. The meter should read 20-400 kΩ, if it reads more than this the diode is faulty.

ii Select the Ohms 100s range.

Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or diode wire. The meter should read 300-400Ω, if it reads less than this the diode is faulty.

Service Procedures

Battery

TC-001_3

Maintenance

To ensure that the battery provides optimum performance the following steps should be observed:

1 Make sure that the electrical connections are clean and tight. Smear petroleum jelly on connectors to prevent corrosion.

2 When applicable - never allow the electrolyte level to fall below the recommended level - 6 mm (1/4 in) above the plates. Use only distilled water for topping up.

3 Keep the battery at least three quarters charged, otherwise the plates may become sulphated (hardened) - this condition makes recharging the battery very difficult.

Extra precautions must be taken when bench charging maintenance free batteries, they are more prone to damage by overcharging than the standard type of battery:

- Never boost-charge a maintenance free battery.
- Never charge a maintenance free battery at a voltage in excess of 15.8 Volts.
- Never continue to charge a maintenance free battery after it begins to gas.

⚠ WARNING

Batteries give off an explosive gas. Do not smoke when handling or working on the battery. Keep the battery away from sparks and flames.

Battery electrolyte contains sulphuric acid. It can burn you if it touches your skin or eyes. Wear goggles. Handle the battery carefully to prevent spillage. Keep metallic items (watches, rings, zips etc) away from the battery terminals. Such items could short the terminals and burn you.

Set all switches in the cab to OFF before disconnecting and connecting the battery. When disconnecting the battery, take off the earth (-) lead first.

Re-charge the battery away from the machine, in a well ventilated area. Switch the charging circuit off before connecting or disconnecting the battery. When you have installed the battery in the machine, wait five minutes before connecting it up.

When reconnecting, fit the positive (+) lead first.

First Aid - Electrolyte

Do the following if electrolyte:

GETS INTO YOUR EYES

Immediately flush with water for 15 minutes, always get medical help.

IS SWALLOWED

Do not induce vomiting. Drink large quantities of water or milk. Then drink milk of magnesia, beaten egg or vegetable oil. Get medical help.

GETS ONTO YOUR SKIN

Flush with water, remove affected clothing. Cover burns with a sterile dressing then get medical help.

5-3-4-3_1

Testing

This test is to determine the electrical condition of the battery and to give an indication of the remaining useful `life'.

Before testing ensure that the battery is at least 75% charged (SG of 1.23 to 1.25 for ambient temperature up to 27°C).

Ensure that the battery is completely disconnected from the vehicle.

Connect up the battery tester as follows:

1 Set the CHECK/LOAD switch **1-A** to OFF.

2 Set rocker switch **1-B** to the battery voltage (12V).

3 Connect the red flying lead to the battery positive (+) terminal and the black flying lead to the battery negative (-) terminal.

4 Set the CHECK/LOAD switch **1-A** to CHECK to read the battery no-load voltage which should be at least 12.4 volts.

5 Set the CHECK/LOAD switch **1-A** to LOAD and hold down for 5-10 seconds until the meter reading stabilises. The reading should be at least 9 volts.

Note: *Do not hold the switch in the LOAD position for more than 10 seconds.*

6 ⇒ *Table 1. Fault Diagnosis (C-10)*, if the foregoing tests are unsatisfactory.

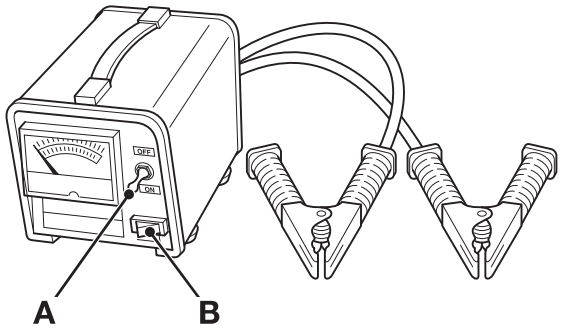

Fig 1. Battery Tester

Table 1. Fault Diagnosis

Battery Tester Readings	Remedy
1 CHECK: 0 - 12.6 Volts LOAD: less than 6 Volts	Renew battery
2 CHECK: 6 - 12.4 Volts LOAD: less than 9 Volts and falls steadily but remains in yellow zone.	Recharge and re-test. If tests still unsatisfactory renew battery.
3 CHECK: less than 10 Volts LOAD: less than 3 Volts	Indicates battery has been over-discharged and unlikely to recover. Renew battery.
4 CHECK: more than 11 Volts LOAD: 6 - 10 Volts steady	Charge battery which will probably recover.

Specific Gravity Testing

The specific gravity of the electrolyte gives an idea of the state of charge of the battery. Readings should be taken using a hydrometer, when the electrolyte temperature is 15°C (60°F). If the battery has recently been on charge, wait approximately one hour (or slightly discharge the battery) to dissipate the surface charge before testing.

Readings should be as tabulated and should not vary between cells by more than 0.04. A greater variation indicates an internal fault on that particular cell.

If the electrolyte temperature is other than 15°C (60°F) a 'correction factor' must be applied to the reading obtained. Add 0.07 per 10°C (18°F) if the temperature is higher than 15°C (60°F) and subtract the same if the temperature is lower.

Table 2. Specific Gravity at 15°C (60°F)

	Fully Charged	Half Discharged	Fully Discharged
Ambient temperature up to 27°C (80°F)	1.270 - 1.290	1.190 - 1.210	1.110 - 1.130
Ambient temperature above 27°C (80°F)	1.240 - 1.260	1.170 - 1.190	1.090 - 1.110

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Harness Data

Wire and Harness Number Identification

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Introduction

This section details the allocation of wire numbers and the identification of wires in the wiring harness.

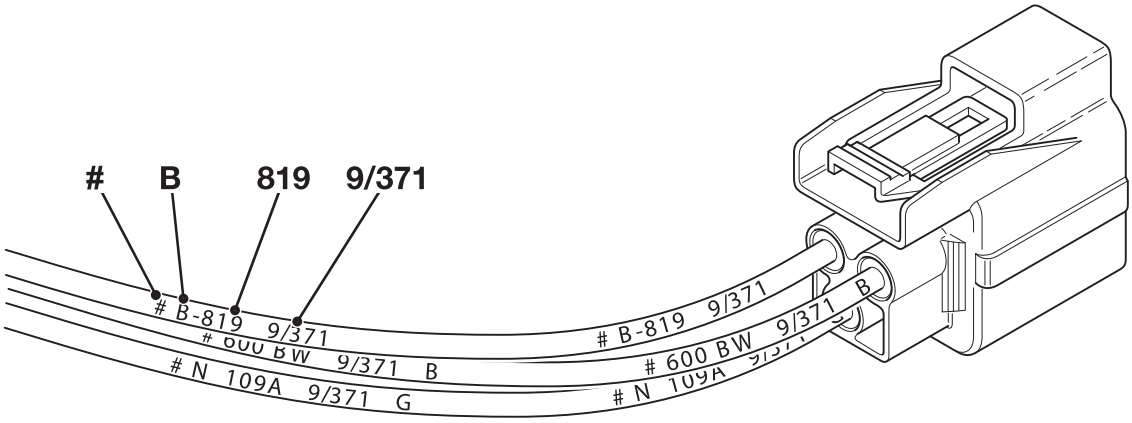

Fig 1. Typical Wire and Harness Number

⇒ *Fig 1. (C-13)*. The illustration shows a typical connector and wires. Each wire has an individual identification number permanently marked on it, at regular intervals along it's length.

The number stamped on the wire identifies the following:

Table 1. Wire and Harness Number Identification

Ident. No.	Description
#	The **#** indicates the start of the identification number. It is always printed to the left of the identification number.
B	If applicable - The colour of the flying lead that the harness wire should mate with. For instance, if wire **819** from harness 719/37100 mated with a flying lead coloured black (colour code **B**) then the number printed on the wire would be **B**-819 9/371.
819	The wire's unique identification number. The wire functions and numbers allocated to them are consistent through out the JCB range of products. ⇒ *Wire Numbers and Functions (C-14)*.
9/371	If applicable - The part number of the harness that the wire originates from. If the harness part number is 719/37100, the number printed on the harness wires will be **9/371** (71 and 00 are common numbers and therefore deleted).

Wire Numbers and Functions

Wires 000-199

These numbers are reserved for ignition feeds, heater start circuits and start circuits. These can be further categorised by:

- Wires **000 - 099** are allocated to unfused ignition feeds.
- Wires **100 - 199** are allocated to fused ignition feeds.

Note: *Feeds via ignition relays are classed as ignition feeds.*

Wires 200-399

These numbers are reserved for battery feeds, They can be further categorised by:

- Wires **200 - 299** are allocated to unfused battery feeds.
- Wires **300 - 399** are allocated to fused battery feeds.

Wires 400-599

These numbers are reserved for instruments, i.e. alternators to tachos, temperature switches to warning lights, etc. and signal wires used in electronic systems.

Wires 600-799

These numbers are used for earth wires. When the number is printed onto a wire **A** it is prefixed by the Earth symbol **B**. ⇨ *Fig 2. (C-14)*. This symbol is printed onto the wire, it may however be omitted from harness drawings.

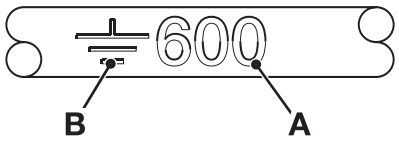

Fig 2.

Where a load is switched negative, the wire number from the load to the switch shall be different to that of the wire from the switch to the earth.

Wires 800-999

These numbers are reserved for switched supplies to electrical loads, i.e. to lights, etc.

Wires In Splices

The main input wire is allocated with a wire number and a suitable description, i.e. Wire **640** earth splice to earth. The additional wires in the splice are allocated the same wire number and a postfix, i.e. **640A**, **640B**, etc. ⇨ *Fig 3. (C-14)*.

Note: *The letters I, O, Q and S are not used.*

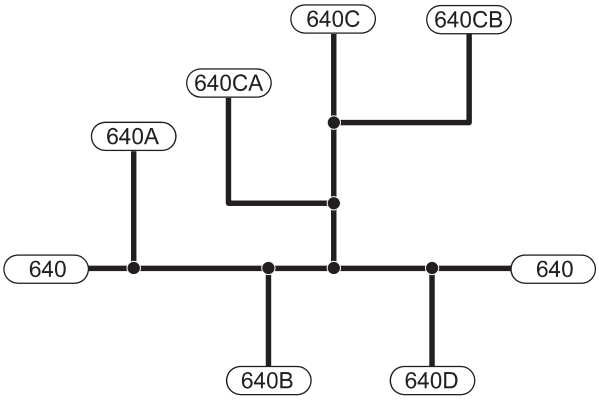

Fig 3.

General Points

1 Wires continue to have the same number even after passing through a connector block to another harness.

2 If all the numbers in a category have been allocated, then the category is re-used with an additional prefix '1', i.e. 1832.

Harness Drawings

Harnesses

Description	Harness Diagram	Wire List
Main Harness - Series 1 Machines	⇨ *Fig 4. (C-16)*	⇨ *Fig 5. (C-17)*
Main Harness - Series 2 Machines	⇨ *Fig 6. (C-18)*	⇨ *Fig 7. (C-19)*
Canopy Harness	⇨ *Fig 8. (C-20)*	⇨ *Fig 8. (C-20)*

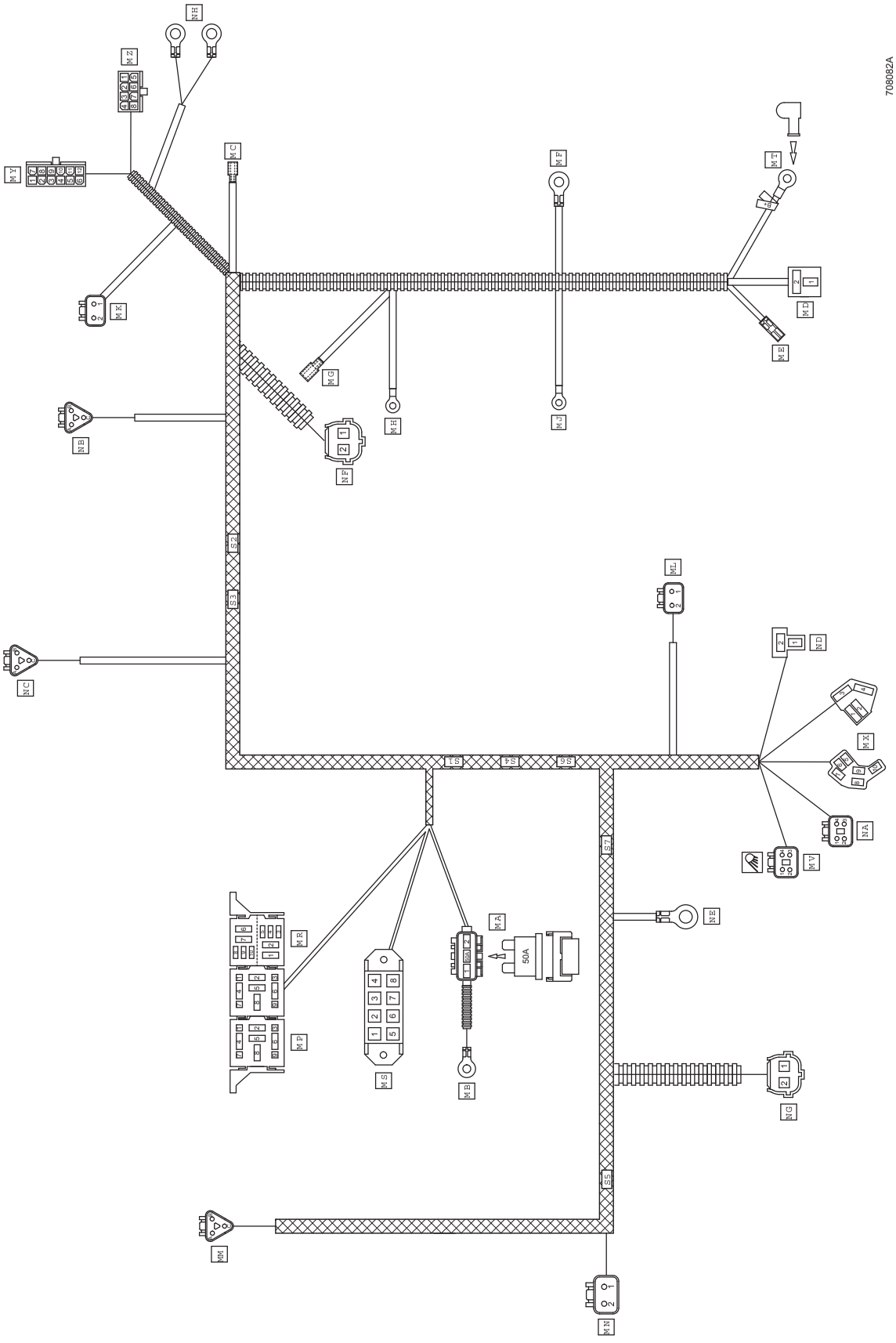

Fig 4. Main Harness Series 1 Machines

MA	PRIMARY FUSE			A,B,D
TERM	WIRE	SIZE	DEST	TYPE
1	310D	6.0	S1	C
2	200G	6.0	MB1	C

MB	BATTERY			-
TERM	WIRE	SIZE	DEST	TYPE
1	200G	6.0	MA 2	Z,BD

MC	STARTER SOLENOID			-
TERM	WIRE	SIZE	DEST	TYPE
1	842	3.0	MP2	L,M

MD	ALTERNATOR			V
TERM	WIRE	SIZE	DEST	TYPE
1	407	1.0	MZ 5	W
2	106BD	1.0	S2	W

ME	TEMP SWITCH			-
TERM	WIRE	SIZE	DEST	TYPE
1	406	1.0	MY 3	AW,AX

MF	EARTH 1			-
TERM	WIRE	SIZE	DEST	TYPE
1	600T	1.0	MZ 4	AA,BC
	600H	1.0	MK 2	
	600EY	1.5	NF 2	

MG	E.S.O.S			-
TERM	WIRE	SIZE	DEST	TYPE
1	106AS	1.0	S2	K,M

MH	GLOW PLUG			-
TERM	WIRE	SIZE	DEST	TYPE
1	003E	4.0	MX 4	Y,BD

MJ	OIL PRESSURE			-
TERM	WIRE	SIZE	DEST	TYPE
1	403	1.0	MY 2	X,BC

MK	HYD OIL TEMP			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	404	1.0	MY 8	AN
2	600H	1.0	MF 1	AN

ML	FUEL SENDER			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	408	1.0	MY 6	AN
2	600CE	1.0	S6	AN

MM	LH CANOPY			AP,AR
TERM	WIRE	SIZE	DEST	TYPE
A	303A	1.5	S4	AN
B	855A	1.5	S5	AN
C	600AS	1.5	NE	AN

MN	RH CANOPY			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	855B	1.5	S5	AN
2	600AR	1.5	NE	AN

MP	NEUTRAL START REL			AB
TERM	WIRE	SIZE	DEST	TYPE
1	-	-	-	-
2	842	3.0	MC 1	AC
3	-	-	-	-
4	600Y	1.0	S6	AD
5	-	-	-	-
6	810A	1.0	MR 8	AD
7	-	-	-	-
8	004	3.0	MX 7	AC
9	-	-	-	-
10	-	-	-	-

MR	HANDBRAKE BUZZER RELAY/ NEUTRAL RELAY			AE
TERM	WIRE	SIZE	DEST	TYPE
1	411	1.0	MY 12	AD
2	444	1.0	MR 6	AD
3	865C	1.0	S3	AF
4	-	-	-	-
5	600JW	1.0	S6	AF
6	444	1.0	MR 2	AD
7	-	-	-	-
8	810A	1.0	MP 6	AG
	810	1.0	NB B	
9	600CV	1.0	S6	AF
10	600BF	1.0	S6	AF

MS	SECONDARY FUSEBOX				E,F
FUSE NO.	TERM	WIRE	SIZE	DEST	TYPE
1	1	001	2.0	MX 5	G
2	2	310B	2.0	S1	G
3	3	310C	1.5	S1	H
4	4	001A	2.0	MX 6	G
1	5	106	1.0	S2	H
2	6	302	2.0	MV 1	G
3	7	303	2.0	S4	G
4	8	-	-	-	-

SUPPLY / DISTRIBUTION

MT	ALTERNATOR B +			-
TERM	WIRE	SIZE	DEST	TYPE
1	310S	6.0	S1	Z,BD

MV	WORK LIGHT SWITCH			AU,AV
TERM	WIRE	SIZE	DEST	TYPE
1	302	2.0	MS 6	AS
2	855	2.0	S5	AS
3	106M	1.0	S2	AN
4	600CJ	1.0	S6	AN

MX	IGNITION SWITCH			AY,AZ
TERM	WIRE	SIZE	DEST	TYPE
1	310A	6.0	S1	S,BC
2	-	-	-	-
3	003A	4.0	MX 8	S
4	003E	4.0	MH 1	S
5	001	2.0	MS 1	P
6	001A	2.0	MS 4	P
7	004	3.0	MP 8	R
8	003A	4.0	MX 3	R
9	003F	1.0	MZ 1	N
10	-	-	-	-

MY	INSTRUMENT PANEL			AH
TERM	WIRE	SIZE	DEST	TYPE
1	-	-	-	-
2	403	1.0	MJ 1	AK
3	406	1.0	ME 1	AK
4	-	-	-	-
5	-	-	-	-
6	408	1.0	ML 1	AK
7	-	-	-	-
8	404	1.0	MK 1	AK
9	-	-	-	-
10	-	-	-	-
11	-	-	-	-
12	411	1.0	MR 1	AK

MZ	INSTRUMENT PANEL			AJ
TERM	WIRE	SIZE	DEST	TYPE
1	003F	1.0	MX 9	AK
2	-	-	-	-
3	-	-	-	-
4	600T	1.0	MF 1	AK
5	407	1.0	MD 1	AK
6	-	-	-	-
7	865B	1.0	S3	AK
8	106B	1.0	S2	AK

NA	HORN SWITCH			AU,AV
TERM	WIRE	SIZE	DEST	TYPE
1	303B	1.5	S4	AN
2	870	2.0	S7	AN
3	106K	1.0	S2	AN
4	600GZ	1.0	S6	AN

NB	NEUTRAL SW			AP,AR
TERM	WIRE	SIZE	DEST	TYPE
A	865A	1.0	S3	AN
B	-	-	-	AT
C	810	1.0	MR 8	AN

NC	HANDBRAKE SW			AP,AR
TERM	WIRE	SIZE	DEST	TYPE
A	106BT	1.0	S2	AN
B	-	-	-	AT
C	865	1.0	S3	AN

ND	ACCESSORY SOCKET			T
TERM	WIRE	SIZE	DEST	TYPE
1	303C	1.0	S4	U
2	600CC	1.0	S6	U

NE	EARTH 2			-
TERM	WIRE	SIZE	DEST	TYPE
1	600A	2.0	S6	BF,BC
	600AS	1.5	MM C	
	600AR	1.5	MN 2	
	600EL	1.5	NG 2	

NF	FRONT HORN			BG,BH
TERM	WIRE	SIZE	DEST	TYPE
1	870A	1.5	S7	BJ,BK
2	600EY	1.5	MF	BJ,BK

NG	REAR HORN			BG,BH
TERM	WIRE	SIZE	DEST	TYPE
1	870B	1.5	S7	BJ,BK
2	600EL	1.5	NE	BJ,BK

NH	HANDBRAKE BUZZER			-
TERM	WIRE	SIZE	DEST	TYPE
-VE	411	1.0	MR 1	BL
+VE	106C	1.0	S2	BL

SPLICE		
S1		BB,BC
WIRE	SIZE	DEST
310A	6.0	MX 1
310B	2.0	MS 2
310C	1.5	MS 3
310D	6.0	MA 1
310S	6.0	MT 1

SPLICE		
S2		BB,BC
WIRE	SIZE	DEST
106	1.0	MS 5
106AS	1.0	MG 1
106B	1.0	MZ 8
106BD	1.0	MD 2
106BT	1.0	NC A
106K	1.0	NA 3
106M	1.0	MV 3

SPLICE		
S3		BB,BC
WIRE	SIZE	DEST
865	1.0	NC C
865A	1.0	NB A
865B	1.0	MZ 7
865C	1.0	MR 3

SPLICE		
S4		BB,BC
WIRE	SIZE	DEST
303	2.0	MS 7
303A	1.5	MM A
303B	1.5	NA 1
303C	1.0	ND 1

SPLICE		
S5		BB,BC
WIRE	SIZE	DEST
855	2.0	MV 2
855A	1.5	MM B
855B	1.5	MN 1

SPLICE		
S6		BB,BC
WIRE	SIZE	DEST
600A	2.0	NE
600CE	1.0	ML 2
600Y	1.0	MP 4
600JW	1.0	MR 5
600CV	1.0	MR 9
600BF	1.0	MR 10
600CJ	1.0	MV 4
600GZ	1.0	NA 4
600CC	1.0	ND 2

SPLICE		
S7		BB,BC
WIRE	SIZE	DEST
870	2.0	NA 2
870A	1.5	NF 1
870B	1.5	NG 1

708082B

Fig 5. Main Harness Series 1 Machines

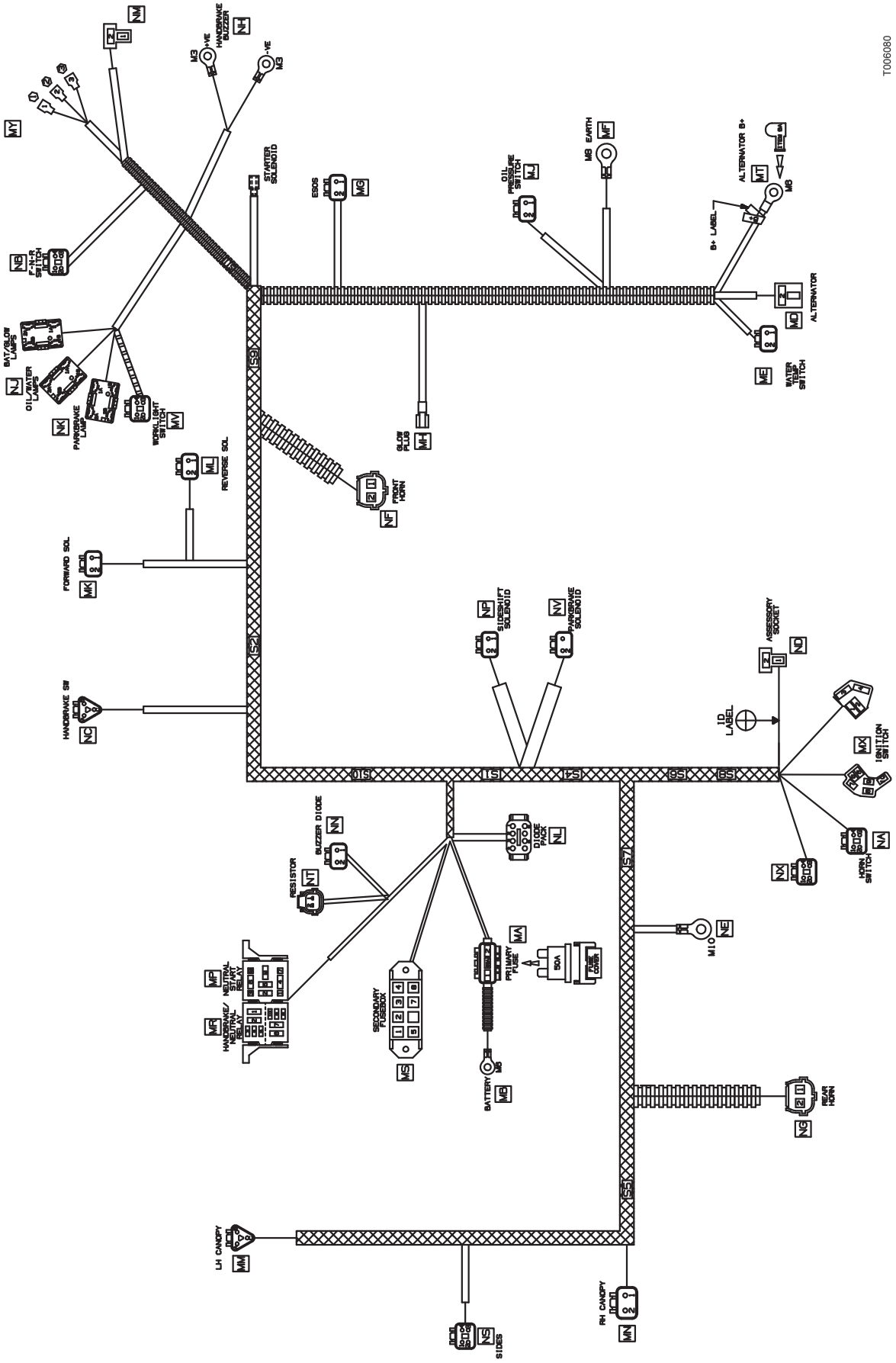

Fig 6. Mainframe Harness - Series 2 machines

MA	PRIMARY FUSE			A,B,D
TERM	WIRE	SIZE	DEST	TYPE
1	310D	6.0	S1	C
2	200G	6.0	MB 1	C

MB	BATTERY			-
TERM	WIRE	SIZE	DEST	TYPE
1	200G	6.0	MA 2	Z,AX

MC	STARTER SOLENOID			-
TERM	WIRE	SIZE	DEST	TYPE
1	842	3.0	MP 2	L,M

MD	ALTERNATOR			V
TERM	WIRE	SIZE	DEST	TYPE
1	407	1.0	MY 3	W
2	106BD	1.0	S2	W

ME	TEMP SWITCH			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	406	1.0	NJ 2B	AN
2	600JC	1.0	MF 1	AN

MF	EARTH 1			-
TERM	WIRE	SIZE	DEST	TYPE
1	600T-2	1.0	MY 2	AA,AW
	600BS	1.0	MK 2	
	600EY	1.5	NF 2	
	600	1.0	MG 2	
	600HH	1.0	MJ 2	
	600JC	1.0	ME 2	
	600BT	1.0	ML 2	
	600D	1.0	MZ 2B	
	600HA	1.0	NK 1B	

MG	E.S.O.S.			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	106AS	1.0	S2	AN
2	600	1.0	MF 1	AN

MH	GLOW PLUG			X
TERM	WIRE	SIZE	DEST	TYPE
1	003E	4.0	MX 4	Y

MJ	OIL PRESSURE			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	403	1.0	NJ 1B	AN
2	600HH	1.0	MF 1	AN

MK	FORWARD SOLENOID			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	939	1.0	NB 4	AN
2	600BS	1.0	MF 1	AN

ML	REVERSE SOLENOID			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	940	1.0	NB 3	AN
2	600BT	1.0	MF 1	AN

MM	LH CANOPY			AP,AR
TERM	WIRE	SIZE	DEST	TYPE
A	303A	1.5	S4	AN
B	855A	1.5	S5	AN
C	600AS	1.5	NE 1	AN

MN	RH CANOPY			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	855B	1.5	S5	AN
2	600AR	1.5	NE 1	AN

MP	NEUTRAL START REL			AB
TERM	WIRE	SIZE	DEST	TYPE
1	-	-	-	-
2	842	3.0	MC 1	AC
3	-	-	-	-
4	600Y	1.0	MR 9	AD
5	-	-	-	-
6	810AA	1.0	NN 2	AD
7	-	-	-	-
8	004	3.0	MX 7	AC
9	-	-	-	-
10	-	-	-	-

MR	HANDBRAKE BUZZER REL			AE
TERM	WIRE	SIZE	DEST	TYPE
1	444	1.0	MR 9	AD
2	600CV	1.0	S6	AD
3	865	1.0	S10	AF
4	-	-	-	-
5	600JW	1.0	S6	AF
NEUTRAL START RELAY				
6	401	1.0	NH -VE	AD
7	-	-	-	-
8	810	1.0	NB 2	AG
	810A	1.0	NN 1	
9	444	1.0	MR 1	AG
	600Y	1.0	MP 4	
10	600BF	1.0	S6	AF

MS	SECONDARY FUSEBOX			E,F
FUSE NO	TERM	WIRE	SIZE	DEST	TYPE
1	1	001	2.0	MX 5	G
2	2	001B	2.0	MX 6	G
3	3	310C	1.5	S1	H
4	4	001A	2.0	MX 6	G
1	5	106	1.0	S2	H
2	6	116	2.0	S8	G
3	7	303	2.0	S4	G
4	8	-	-	-	-

DISTRIBUTION SUPPLY

MT	ALTERNATOR B+			-
TERM	WIRE	SIZE	DEST	TYPE
1	310S	6.0	S1	Z,AX

MV	WORK LIGHT SWITCH			AU,AV
TERM	WIRE	SIZE	DEST	TYPE
1	116A	2.0	S8	AS
2	855	2.0	S5	AS
3	106M	1.0	S2	AN
4	600CJ	1.0	S6	AN

MX	IGNITION SWITCH			AY,AZ
TERM	WIRE	SIZE	DEST	TYPE
1	310A	6.0	S1	S,AW
2	-	-	-	-
3	003A	4.0	MX 8	S
4	003E	4.0	MH 1	S
5	001	2.0	MS 1	P
6	001A	2.0	MS 4	S
	001B	2.0	MS 2	
7	004	3.0	MP 8	R
8	003A	4.0	MX 3	R
9	003F	2.0	MZ 2A	P
10	-	-	-	-

MY	HOURMETER			AW
TERM	WIRE	SIZE	DEST	TYPE
1	106D-1	1.0	S2	BJ
2	600T-2	1.0	MF 1	BJ
3	407	1.0	MD 1	BJ
	407A-3	1.0	NL 8	

MZ	BAT/GLOW LAMP			BM
TERM	WIRE	SIZE	DEST	TYPE
1A	106AA	1.0	S2	BL
	106AC	1.0	NT 1	
1B	434	1.0	S11	BK
2A	003F	2.0	MX 9	BL
2B	600D	1.0	MF 1	BK

NA	HORN SWITCH			AU,AV
TERM	WIRE	SIZE	DEST	TYPE
1	303B	1.5	S4	AN
2	870	2.0	S7	AS
3	106K	1.0	S2	AN
4	600GZ	1.0	S6	AN

NB	F-N-R SWITCH			AU,AV
TERM	WIRE	SIZE	DEST	TYPE
1	106BT	1.0	S2	AN
2	810	1.0	MR 8	AN
3	940	1.0	ML 1	AN
4	939	1.0	MK 1	AN

NC	HAND BRAKE SW			AP,AR
TERM	WIRE	SIZE	DEST	TYPE
A	106AL	1.0	S2	AN
B	-	-	-	AT
C	865A	1.0	S10	AN

ND	ACCESSORY SOCKET			T
TERM	WIRE	SIZE	DEST	TYPE
1	116B	1.0	S8	U
2	600CC	1.0	S6	U

NE	EARTH 2			-
TERM	WIRE	SIZE	DEST	TYPE
1	600A	2.0	S6	BD,AW
	600AS	1.5	MM C	
	600AR	1.5	MN 2	
	600EL	1.5	NG 2	

NF	FRONT HORN			BE,BF
TERM	WIRE	SIZE	DEST	TYPE
1	870A	1.5	S7	BG,BH
2	600EY	1.5	MF 1	BG,BH

NG	REAR HORN			BE,BF
TERM	WIRE	SIZE	DEST	TYPE
1	870B	1.5	S7	BG,BH
2	600EL	1.5	NE 1	BG,BH

NH	HANDBRAKE BUZZER			-
TERM	WIRE	SIZE	DEST	TYPE
-VE	401	1.0	MR 6	AH
+VE	111	1.0	S2	AH

NJ	OIL/WATER LAMP			BM
TERM	WIRE	SIZE	DEST	TYPE
1A	106CU	1.0	S2	BK
1B	403	1.0	MJ 1	BL
	403A	1.0	NL 5	
2A	106AB	1.0	S2	BK
2B	406	1.0	ME 1	BL
	406A	1.0	NL 6	

NK	PARKBRAKE LAMP			BM
TERM	WIRE	SIZE	DEST	TYPE
1A	865D	1.0	S10	BK
1B	600HA	1.0	MF 1	BK
2A	-	-	-	-
2B	-	-	-	-

NL	DIODE PACK			BN,BO
TERM	WIRE	SIZE	DEST	TYPE
1	434C	1.0	S11	AN
2	411	1.0	S9	AN
3	411A	1.0	S9	AN
4	411B	1.0	S9	AN
5	403A	1.0	NJ 1B	AN
6	406A	1.0	NJ 2B	AN
7	434A	1.0	S11	AN
8	407A-3	1.0	MY 3	AN

NM	IP BUZZER			T
TERM	WIRE	SIZE	DEST	TYPE
1	106C	1.0	S2	U
2	411C	1.0	S9	U

NN	BUZZER DIODE			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	810A	1.0	MR 8	AN
2	810AA	1.0	MP 6	AN

NP	SIDESHIFT SOL			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	853	1.0	NS 2	AN
2	600CB	1.0	S6	AN

NS	SIDESHIFT SWITCH			AU,AV
TERM	WIRE	SIZE	DEST	TYPE
1	116C	1.0	S8	AN
2	853	1.0	NP 1	AN
3	106B	1.0	S2	AN
4	600ND	1.0	S6	AN

NT	RESISTOR			BP,BS
TERM	WIRE	SIZE	DEST	TYPE
1	106AC	1.0	MZ 1A	BT,BV
2	434B	1.0	S11	BT,BV

NV	P/B SOLENOID			AL,AM
TERM	WIRE	SIZE	DEST	TYPE
1	866	1.0	NX 3	AN
2	600AT	1.0	S6	AN

NX	P/B SWITCH			AU,AV
TERM	WIRE	SIZE	DEST	TYPE
1	116D	1.0	S8	AN
2	865C	1.0	S10	AN
3	866	1.0	NV 1	AN
4	-	-	-	AT

SPLICE		
S1		BB,AW
WIRE	SIZE	DEST
310A	6.0	MX 1
310C	1.5	MS 3
310D	6.0	MA 1
310S	6.0	MT 1

SPLICE		
S2		BB,AW
WIRE	SIZE	DEST
106	1.0	MS 5
106B	1.0	NS 3
106AS	1.0	MG 1
106BD	1.0	MD 2
106BT	1.0	NB 1
106K	1.0	NA 3
106M	1.0	MV 3
111	1.0	NH +VE
106CU	1.0	NJ 1A
106C	1.0	NM 1
106AB	1.0	MJ 2A
106AA	1.0	MZ 1A
106AL	1.0	NC A
106D-1	1.0	MY 1

SPLICE		
S4		BB,AW
WIRE	SIZE	DEST
303	2.0	MS 7
303A	1.5	MM A
303B	1.5	NA 1

SPLICE		
S5		BB,AW
WIRE	SIZE	DEST
855	2.0	MV 2
855A	1.5	MM B
855B	1.5	MN 1

SPLICE		
S6		BB,AW
WIRE	SIZE	DEST
600A	2.0	NE 1
600JW	1.0	MR 5
600CV	1.0	MR 2
600BF	1.0	MR 10
600CJ	1.0	MV 4
600GZ	1.0	NA 4
600CC	1.0	ND 2
600CB	1.0	NP 2
600ND	1.0	NS 4
600AT	1.0	NV 2

SPLICE		
S7		BB,AW
WIRE	SIZE	DEST
870	2.0	NA 2
870A	1.5	NF 1
870B	1.5	NG 1

SPLICE		
S8		BB,AW
WIRE	SIZE	DEST
116	2.0	MS 6
116A	2.0	MV 1
116B	1.0	ND 1
116C	1.0	NS 1
116D	1.0	NX 1

SPLICE		
S9		BB,AW
WIRE	SIZE	DEST
411	1.0	NL 2
411A	1.0	NL 3
411B	1.0	NL 4
411C	1.0	NM 2

SPLICE		
S10		BB,AW
WIRE	SIZE	DEST
865	1.0	MR 3
865A	1.0	NC C
865C	1.0	NX 2
865D	1.0	NK 1A

SPLICE		
S11		BB,AW
WIRE	SIZE	DEST
434	1.0	MZ 1B
434A	1.0	NL 7
434B	1.0	NT 2
434C	1.0	NL 1

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Fig 7. Mainframe Harness - Series 2 machines

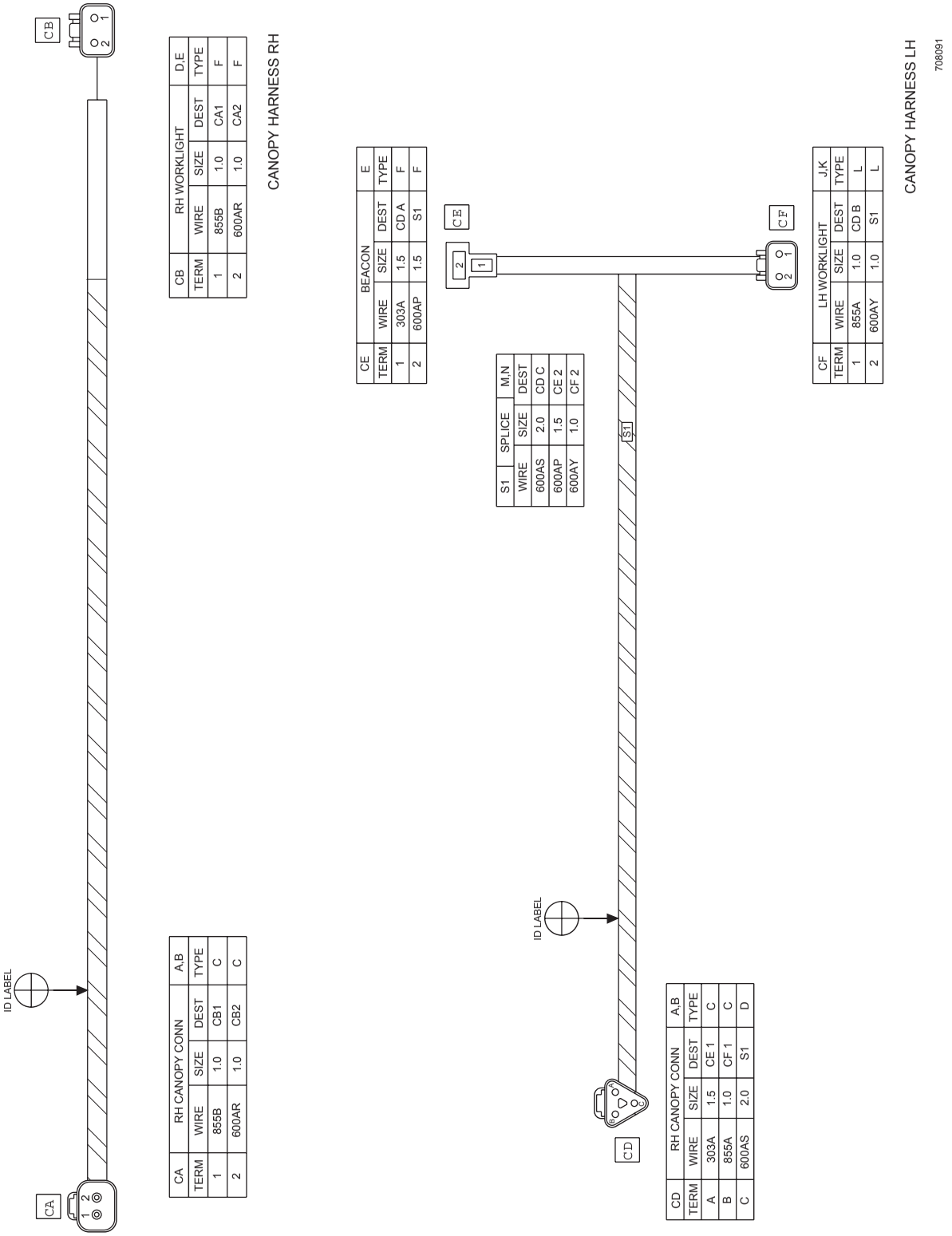

Fig 8. Canopy Harnesses

Circuit Diagrams

Early Series 1 machines

⇒ *Fig 1. (C-22)*

Main Components

1 Battery
2 Starter Switch
3 Glow Plugs
4 Neutral Start Relay
5 Starter Motor
6 Alternator
7 Engine Shut Off Solenoid (ESOS)
8 Warning Buzzer
9 Diodes
10 Excitation resistor
11 Hourmeter
12 Fuel Gauge
13 Shut-down Contact (not used)
14 Instrument Console
15 Engine Coolant Temperature Switch
16 Engine Oil Pressure Switch
17 Transmission Oil Temperature Switch
18 Fuel Gauge Sender
19 Park Brake Buzzer
20 Park Brake Buzzer Relay
21 Park Brake Switch
22 Neutral Switch
23 Neutral Relay
24 Worklight Switch
25 Beacon Motor
26 Horn Button
27 Rear Horn
28 Front Horn
29 Accessory Socket
30 Earth Terminal

Lamps

40 Engine Coolant Temperature Warning
41 Engine Oil Pressure Warning
42 Air Cleaner Block Warning (not used)
43 Transmission Oil Temperature Warning
44 Transmission Oil Pressure Warning (not used)
45 Alternator Warning
46 Instrument Illumination
47 Park Brake Warning
48 2 Speed Indicator (not used)
49 Glow Plug Indicator
50 SAE Indicator (not used)
51 Work Lights
52 Beacon Light

Fuses

80 Primary Fuse
81 Engine Shut Off Solenoid, Warning Lights and Buzzer, Hourmeter, Fuel Gauge, Parking Brake Relay, Neutral Relay
82 Worklights
83 Horns, Beacon, Accessory Socket
84 Options

Note: *For fuse and bulb ratings* ⇒ *Technical Data (C-1)*

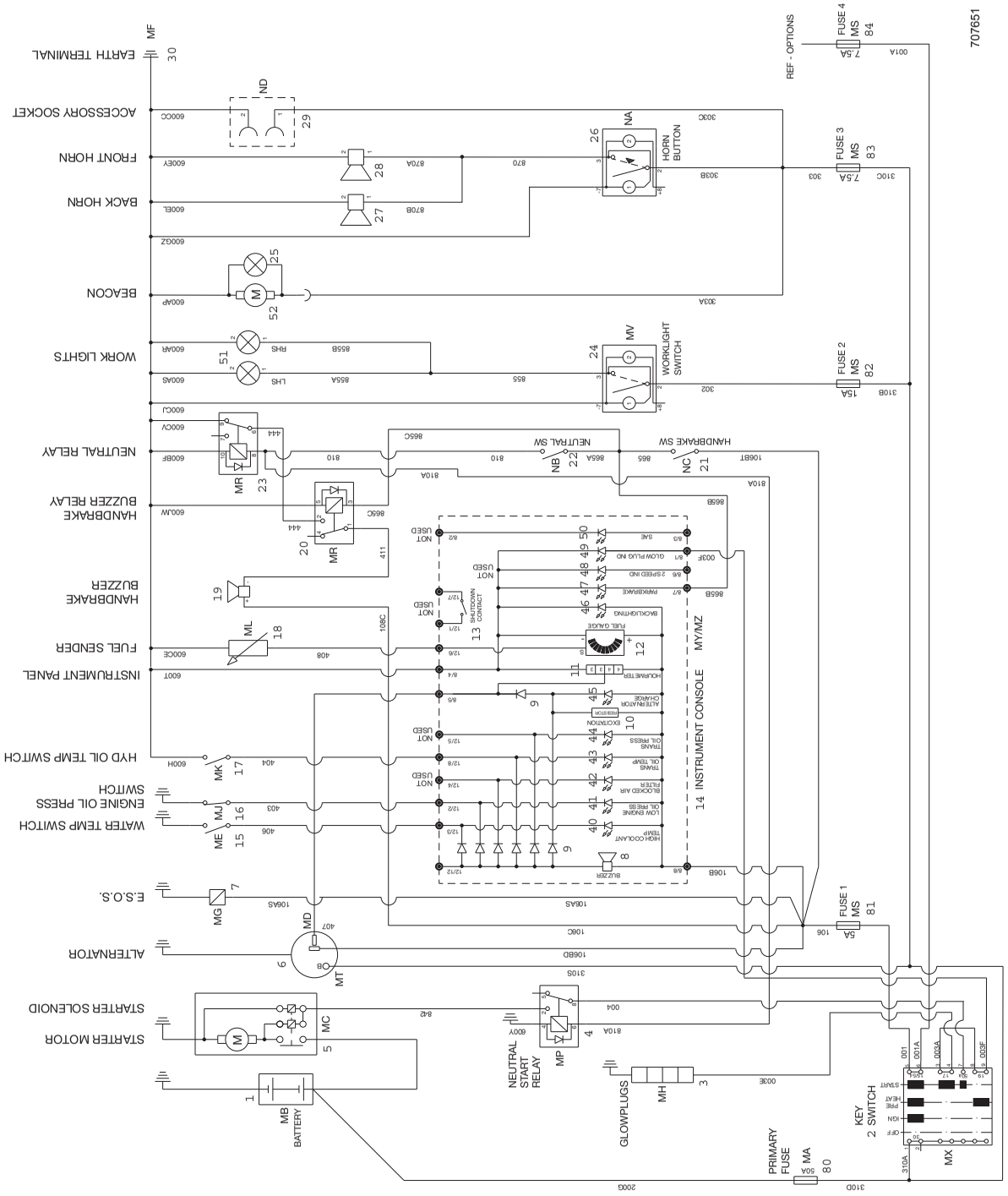

Fig 1. Early Series 1 Machines

Later Series 1 machines

⇒ *Fig 2. (C-24)*

Main Components

1 Battery
2 Starter Switch
3 Glow Plugs
4 Neutral Start Relay
5 Starter Motor
6 Alternator
7 Hourmeter
8 Excitation resistor
9 Diodes
10 Warning Buzzer
11 Engine Coolant Temperature Switch
12 Engine Oil Pressure Switch
13 Park Brake Buzzer
14 Park Brake Buzzer Relay
15 Neutral Relay
16 Neutral Switch
17 Park Brake switch
18 Engine Shut Off Solenoid (ESOS)
19 Worklight Switch
20 Accessory Socket
21 Rear Horn
22 Front Horn
23 Horn Button
24 Earth Terminal

Lamps

40 Glow Plug Indicator
41 Alternator Warning
42 Engine Coolant Temperature Warning
43 Engine Oil Pressure Warning
44 Park Brake Warning
45 Work Lights
46 Beacon Light

Fuses

60 Primary Fuse
61 Engine Shut Off Solenoid, Warning Lights and Buzzer, Hourmeter, Parking Brake Relay, Neutral Relay, Switch Illumination
62 Worklights, Accessory Socket
63 Horns, Beacon
64 Options

Note: *For fuse and bulb ratings* ⇒ *Technical Data (C-1)*

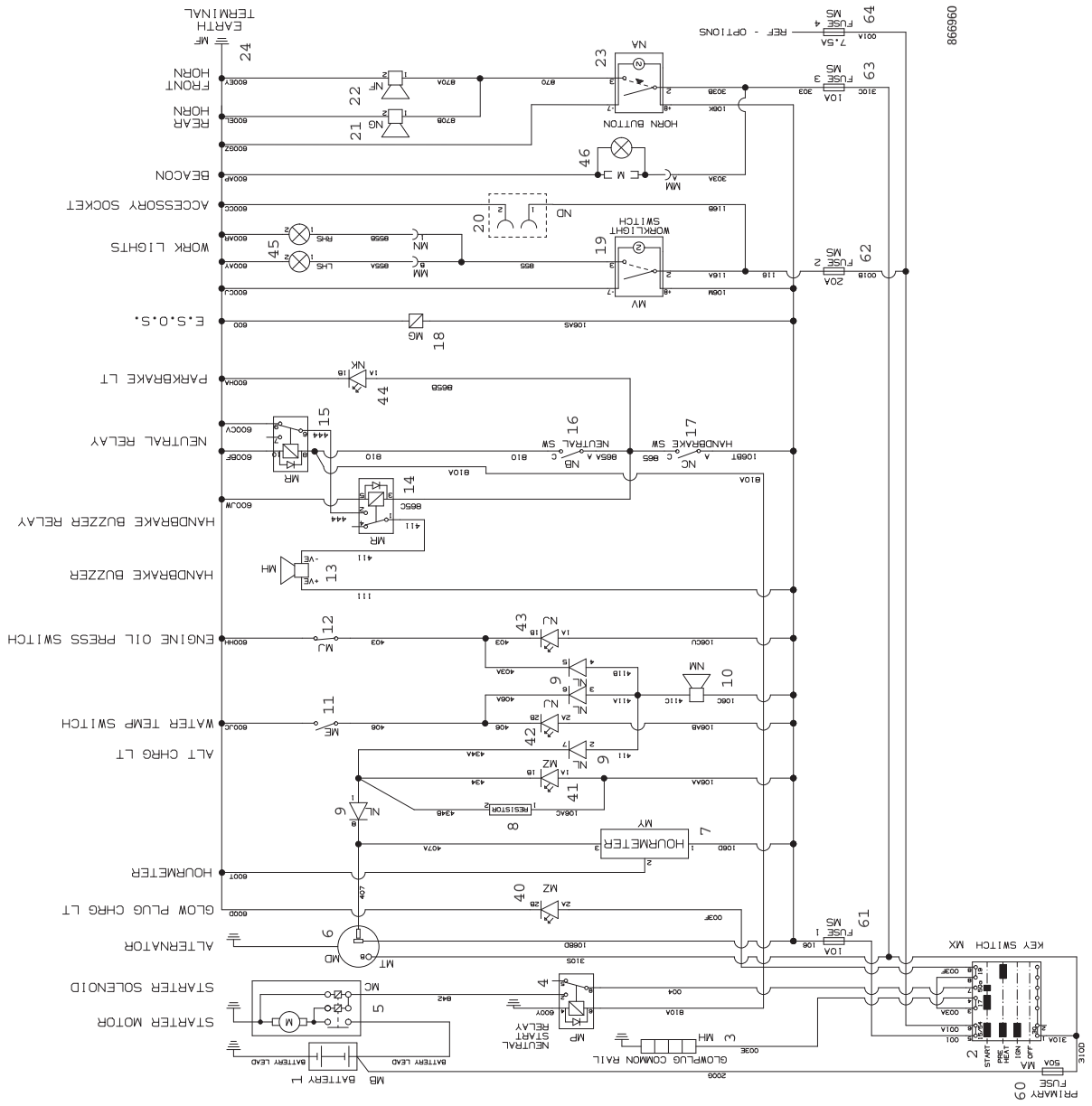

Fig 2. Later Series 1 Machines

⇒ *Fig 3. (C-26)*

Main Components

1 Battery
2 Starter Switch
3 Glow Plugs
4 Neutral Start Relay
5 Starter Motor
6 Alternator
7 Hourmeter
8 Excitation resistor
9 Diodes
10 Warning Buzzer
11 Engine Coolant Temperature Switch
12 Engine Oil Pressure SwitchFuel Gauge
13 Forward Solenoid
14 Reverse Solenoid
15 Neutral Relay
16 Forward/Reverse Switch
17 Park Brake Buzzer
18 Park Brake Lever Switch (manual disc brake)
19 Park Brake Switch (hydraulic brake)
20 Park Brake Buzzer Relay
21 Park Brake Solenoid
22 Engine Shut Off Solenoid (ESOS)
23 Worklight Switch
24 Accessory Socket
25 Sideshift Switch
26 Sideshift Solenoid
27 Rear Horn
28 Front Horn
29 Horn Button
30 Earth Terminal

Lamps

40 Glow Plug Indicator
41 Alternator Warning
42 Engine Coolant Temperature Warning
43 Engine Oil Pressure Warning
44 Park Brake Warning
45 Work Lights
46 Beacon Light

Fuses

60 Primary Fuse
61 Engine Shut Off Solenoid, Warning Lights and Buzzer, Hourmeter, Park Brake Relay, Neutral Relay, Forward/Reverse Solenoid, Switch Illumination
62 Worklights, Park Brake Switch, Sideshift Switch, Accessory Socket
63 Horns, Beacon
64 Options

Note: *For fuse and bulb ratings* ⇒ *Technical Data (C-1)*

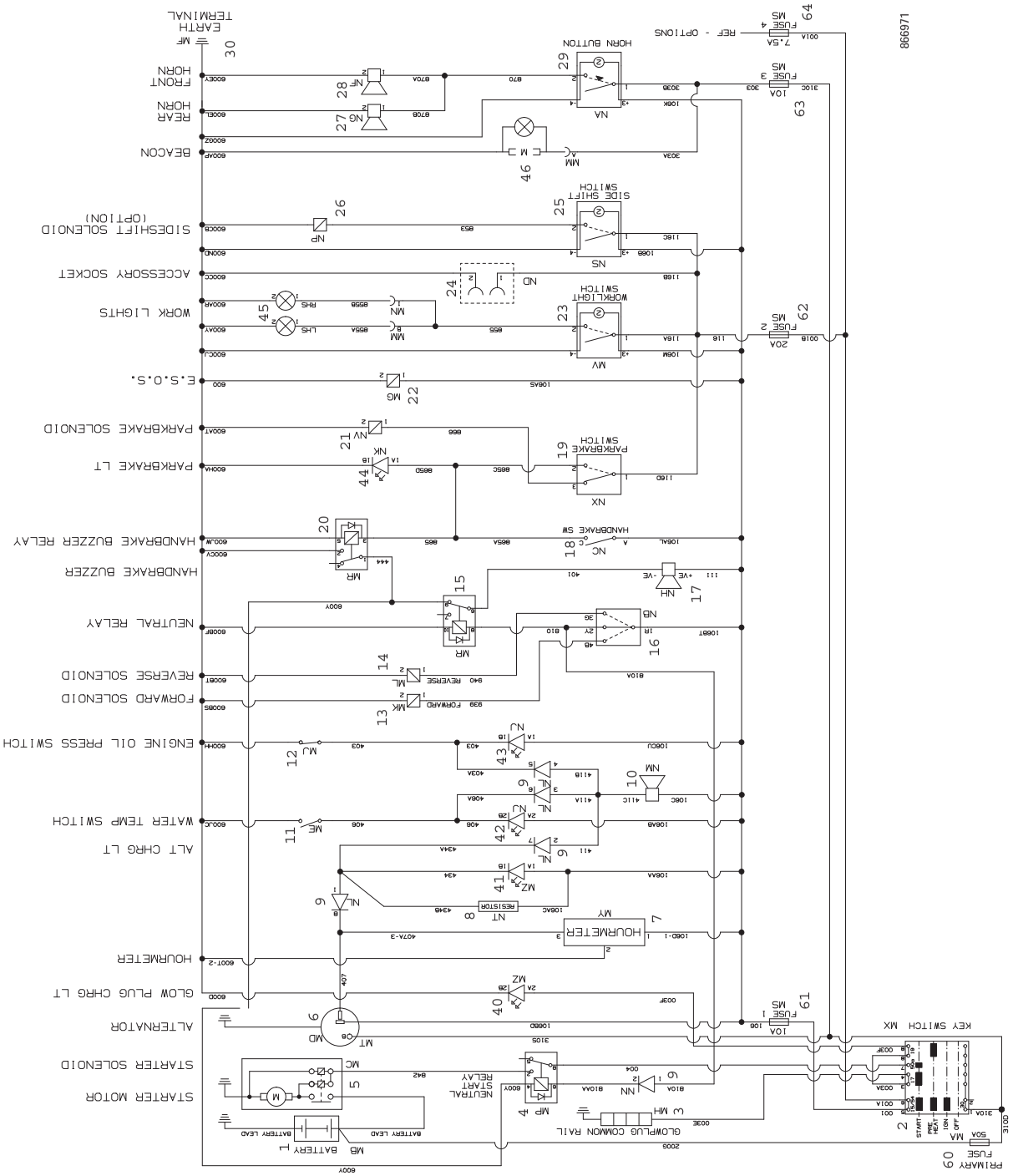

Fig 3. Series 2 Machines

Service Tools

Numerical List

The tools listed in the table are special tools required for carrying out the procedures described in this manual. These tools are available from JCB Service.

Some tools are available as kits or sets, the part numbers for parts within such kits or sets are not listed here. For full details of all tools, including the content of kits and sets, refer to ***Tool Detail Reference, Section 1***.

Note: *Tools other than those listed will be required. It is expected that such general tools will be available in any well equipped workshop or be available locally from any good tool supplier.*

Part Number	Description	Tool Detail Reference
892/00281	AVO Meter	⇒ *Fig 1. (C-28)*
892/00282	Shunt	⇒ *Fig 1. (C-28)*
892/00283	Tool Kit Case	⇒ *Fig 1. (C-28)*
892/00284	Tachometer	⇒ *Fig 1. (C-28)*
892/00285	Hydraulic Oil Temperature Probe	⇒ *Fig 1. (C-28)*
892/00286	Surface Temperature Probe	⇒ *Fig 1. (C-28)*

Tool Detail Reference Section C - Electrics

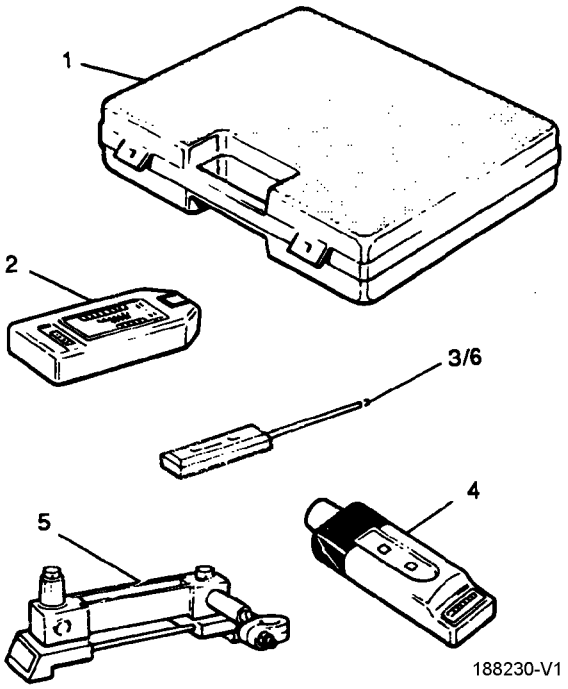

Fig 1.

1	892/00283 Tool Kit Case
2	892/00281 AVO Meter
3	892/00286 Surface Temperature
4	892/00284 Microtach Digital Tachometer
5	892/00282 Shunt - open type
6	892/00285 Hydraulic Oil Temperature Probe