ROHDE&SCHWARZ

Communications Division

Repair Manual

1 - kW HF TRANSCEIVER
XK 859C1

680.1210

VOLUME 4

Manual consists of 4 volumes

673.4499.62.05 - 7

Repair Manual

1 - kW HF TRANSCEIVER XK 859C1

consisting of:

Volumes 1 and 2

RECEIVER / EXCITER GX 859C1

Volume 3

1 - kW HF POWER AMPLIFIER VK 859C1

and

RACK, STATIONARY KG 859C4

Volume 4

POWER SUPPLY IN 859C1

and

POWER SUPPLY IN 859C2

Volume 4

Repair Manual

1 - kW HF TRANSCEIVER XK 859C1

POWER SUPPLY IN 859C1

POWER SUPPLY IN 859C2

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Communications Division

Repair Manual

POWER SUPPLY IN 859C1

681.0018.02 / .03 / .04

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5. Description of Function

(see circuit diagram 681.0018.01S, sheets 1 and 2)

5.1 Frame (A50)

Note:

The frame also contains the filtering circuit (A501) and the LED board (A502). In the following no further reference is made to this fact.

The voltage from the external three-phase current network (110/208-VAC or 220/380-VAC three-phase current) is fed via connector X76 and input filter Z1 to Z3 / L1 to L3 to the 16-A protective switch K1.

The input filter consists of one EMC filter (Z) and one noise-suppressing choke (L) per phase. The input filter prevents high-frequency noise voltages, which are generated by converters clocked with the primary current to penetrate into the mains network.

If switch K1 is closed, the three-phase current is rectified by rectifier V100 (part of 28-VDC converter A40). By means of varistor R100 switched in parallel the resistance to interference is significantly improved. At the same time the converter frequency is filtered out by noise-suppression chokes L5 to L7 as wel as capacitors C1 and C5. The voltage thus produced is transmitted via interface X201 / X100 tothe 50-VDC converter A20 (see 5.3.1) as well as via interface X202 / X100 to the 50-VDC converter A30 (see 5.4) and via interface X203 / X100 (see 5.5) to the 28-VDC converter A40.

Simultaneously, two of the three phases are connected via fuse F2 (1.6 A) and an insulated jumper to toroidal-core transformer T100. Depending on the available mains voltage the jumper has to be soldered in between the soldering tags according to the following table.

Mains voltage (phase/phase)	Soldering tags
200 VAC	2 - 8
220 VAC	3 - 8
380 VAC	4 - 8
400 VAC	5 - 8
440 VAC	6 - 8

Therefore, the value of the secondary voltage (220 VAC) provided by T100 is independent of the available mains voltage.

The 220-VAC voltage is transferred from the toroidal-core transformer via EMC filter Z4 to socket X71 and at the same time via fuse F3 (100 mA) to the circuit generating the auxiliary voltage. Power for the blowers in the 1-kW Amplifier VK 859C1 is provided via socket X71.

In the circuit generating the auxiliary voltage the 220-VAC voltage is transformed by transformer T1 and rectified by rectifier V10. Filtering is performed by electrolytic capacitors C2 and C3. The voltage thus produced is stabilized to 12 VDC by means of voltage regulator N1. The 12-VDC voltage is fed to LEDs V3 to V6 and via interface X30 / X5 to control circuit A10 (see 5.2).

The output voltage of the regulator is set by means of voltage divider R1 / R2 and the output current is limited by means of resistor R3. LED V6 is connected to ground via resistor R29, that is, if the DC voltage is available LED V6 is illuminated.

The third phase is fed to optocoupler V3. The optocoupler is protected by single-ended rectifier V2 against excessive reverse voltages In the presence of the phase electrolytic capacitor C10 is discharged via optocoupler V3 and transistor V4 (MOSFET) is blocked, that is, the 12-VDC voltage is cut in.

In the absence of the phase electrolytic capacitor C10 is charged via resistor R5 and transistor T10 becomes conductive thus cutting out the 12-VDC voltage.

Therefore, the presence of all three phases is monitored via the charging state of C10.

The stabilized adjustable output voltage available on interface X22 / X150 of the 50-VDC converter A20 (see 5.3.1) is transmitted via contact X506 to socket X75. The 50-VDC converter A30 (see 5.4) is connected via interface X32 / X150 and contact X505 to socket X75. The output voltage is adjustable in the range 45 to 52 VDC in increments of 1 VDC. Contacts X501 and X75 are connected to ground.

The output voltage stabilized to 28-VDC is transferred from interface X42 / X150 of the 28-VDC converter (see 5.5) via contact X504, fuse F1 (20 A) and interface X502 / X512 to sockets X75 and X73 as well as to blowers E1 and E2.

Plug X74 is connected via contact X503, decoupling diodes V104 and V106, the protector against change of polarity V207 and electrolytic capacitors C103 to C106 to contacts X504 to X506.

Switchover operation is possible if to plug X74 a battery (22 to 31 VDC) has been connected, that is, in case of mains power failures the battery takes over. For switchover, transmission or transmit / receive operation with reduced transmitter power is therefore guaranteed.

The decoupling diodes prevent the batteries to be charged by the converters. Fuse F1 protects the output of the 28-VDC converter against excessive currents.

5.2 Control Circuit (A10)

(see circuit diagram 681.0018.01S, sheet 2)

The circuit for control of the 50-VDC converters and 28-VDC converter contains the small-signal control facility for all three converters.

5.2.1 Generation of Clock Frequency

The circuit for generation of the clock frequency contains two crystal oscillators D1 / D4 / C14 to C17 with the crystals B1 (5.000 MHz) and B2 (5.005 MHz) as well as the two adjustable dividers D2 and D3. The division ratio can be set either to 1:50 or 1:51. Depending on which crystal oscillator is switched on and which division ratio is set, one of the following clock frequencies is output:

- 98.04 kHz or
- 100 kHz or
- 100.1 kHz

The clock frequency thus generated is fed from output D3.15 via interface X23 / X110 to the 50-VDC converter A20 (see 5.3.2.1) as well as via interface X33 / X110 to the 50-VDC converter A30 (see 5.4) and via interface X43 / X110 to the 28-VDC converter (see 5.5).

Switchover of the crystal oscillators and setting the division ratio is performed by means of two data lines (DATA 5 and DATA 6) via level converter D11. The inputs D11.5 and .11 are connected via RC low-pass filters and interface X5 to socket X73. By means of level converter D11 the 5-VDC logic is converted into a 12-VDC logic.

Data line DATA 5 provides for switchover between the two crystal oscillators. If the 5.000-MHz crystal oscillator is blocked by DATA 5, divider D2 is simultaneously set to the division ratio 1:50 via contacts 4 and 5 of AND gate D4. If, however, the 5.005-MHz crystal oscillator is blocked, the division ratio of divider D2 can be set to 1:50 or 1:51 via data line DATA 6.

The clock frequency is shifted in all cases where the frequency setting on the receiver / exciter equals xxx50kHz or xx100 kHz and thus the harmonics which are generated by the converters clocked with the primary current can influence the receive frequency.

Depending on the receive frequency the clock frequency is switched over from 100 to 98.04 kHz (f < 5 MHz) or from 100 to 100.1 kHz (f > 5 MHz).

5.2.2 Generation of Nominal Value

The 12-VDC voltage (see 5.1) is transferred from interface X5 to voltage regulator N2 the output voltage of which can be set to exactly 5.2 VDC by means of adjustable resistor R19.

With the aid of the stabilized 5.2-VDC voltage and voltage divider R31 to R38 seven partial voltages are generated. The lowest voltage is determined by resistor R38 (= 4.5 VDC) whereas the voltage jump from one partial voltage to the other is fixed by means of resistors R31 to R37 (0.1 VDC). The partial voltages and the 5.2-VDC voltage itself are fed to the inputs of CMOS switch D5. D5 is a 1- out-of-8 switch with the BCD coded inputs A, B and C.

Switchover between the inputs and thus the nominal values is performed using three data lines (DATA 0 to 2) via level converter D10. The inputs D10.5, .11 and .12 are connected via RC low-pass filters and interface X5 to socket X73. Level converter D10 converts the 5-VDC logic into a 12-VDC logic.

Output D5.3 (nominal value) is connected via interface X23 / X110 to the 50-VDC converter A20 (see 5.3.2.2) as well as via interface X33 / X110 to the 50-VDC converter A30 (see 5.4).

5.2.3 Switch-on of 50-VDC Converters and Fault Evaluation

The two 50-VDC converters are switched on by means of two data lines (DATA 3 and 4) via level converter D11. The inputs D11.4 and .12 are connected via RC low-pass filters and interface X5 to socket X73. Level converter D11 converts the 5-VDC logic into a 12-VDC logic.

Output D11.3 (.13) is connected via interface X23 / X110 (X33 / X110) to the 50-VDC converter A20 (see 5.3.2.6) (A30, see 5.4). Simultaneously, output D11.3 (.13) controls LED V3 (V4), NAND gate D8 and a monoflop. LED V3 (V4) indicates the switch-on state of the converter.

The monoflop consists of NAND gate D6, resistors R20 / R21 (R22 / R23), electrolytic capacitor C18 (C19) and diode V2 (V1). The output signal of the NAND gate and the CM signal (continuous monitoring) from interface X23 / X110 (50-VDC converter A20, see 5.3.2.6 or X33/X110 for 50-VDC converter A20, see 5.4) are linked up by OR gate D7. Thus an error message is prevented during switch-on phase of the converter. The result controls LED V5 (V6) via NAND gate D8 and interface X5

Contact X43.8 (CM, see 5.5) is connected to LED V3 via NAND gate D9 and interface X5.

The fault evaluation circuit consists of the components D4 and D6 to D9. The outputs D8.3, .5 as well as D9.5 drive the LEDs V3 to V5 on the LED board, and output D9.3 is connected to socket X73 via interface X5.

If for example data line DATA 3 is set to high level, 50-VDC converter A20 is cut in via interface X23 (see 5.3.2.6). Simultaneously electrolytic capacitor C18 is charged via resistor R20, that is, approx. 2 s after the switch-on signal (DATA 3 = high) output D6.3 changes from high to low level. During this period OR gate D7 is blocked for the CM signal of the 50-VDC converter A20 (X23.8, see 5.3.2.6). Output D7.3 is high, that is, LED V3 (LED board) is illuminated.

If following the switch-on delay a fault occurs in the converter, the CM signal is low, as a result LED V3 (LED board) goes out and the level on contact X73.A0 changes from high to low (sum test = NoGo).

In reception both 50-VDC converters are cut out via data lines DATA 3 and DATA 4 and LEDs V3 and V4 are dark.

5.3 50-VDC Converter (A20)

(see circuit diagram 681.1266.01S, sheets 1 and 2)

The 50-VDC converter consists of the converter board 50 VDC (A101), the 50-VDC control circuit (A102) and the capacitor board (A103).

5.3.1 Converter Board 50 VDC and Capacitor Board

The rectified and filtered voltage is fed via connector X100 (V_{in}, see 5.1), two insulated jumpers to two single-ended converters of identical design (half-bridge circuit). Depending on the jumper position the two single-ended converters are connected in series or in parallel.

Depending on the available mains voltage the jumper(s) has (have) to be soldered in between the soldering tags according to the following table. At the same time the position of jumper X210 has to be altered acc. to the table.

Mains voltage	Soldering tags	Jumper position
200 VAC	1 - 4 and 2 - 3	parking position
220 VAC	1 - 4 and 2 - 3	parking position
380 VAC	1 - 2	X210.1 to .3
400 VAC	1 - 2	X210.1 to .3
440 VAC	1 - 2	X210.1 to .3

The connection in series or in parallel guarantees that the operating voltage of the single-ended converters is sufficiently high independent of the available mains voltage.

If the two single-ended converters are connected in series (operation on 220/380-VAC three-phase current), the input voltage is divided by interface X100. The centre voltage thus produced and the input voltage are transferred via interface X210 to the balancing circuit (see 5.3.2.3). The balancing circuit ensures that the two voltages are identical, if possible.

On its primary side, each single-ended converter consists of four capacitors, one varistor (resistance depends on the voltage), two switching transistors (MOSFET), two demagnetizing diodes, a transformer and a current transformer.

The input voltage is filtered by capacitors C1 to C4 as well as C11 to C14 and switched via switching transistors V1, V2, V11 and V12. For this purpose the gate of the switching transistors is controlled via interface X120 with a pulsewidth-modulated signal (see 5.3.2.1).

By altering the pulse duration the output voltage is stabilized, that is, for a decrease of the output voltage the pulse duration is automatically extended until the nominal output voltage is obtained again.

The output voltage of the single-ended converters is combined via transformers T3 and T4 as well as diodes V5, V15 and V20. Simultaneously the diodes provide for decoupling of the two single-ended converters. During the blocking state T3 is demagnetized by way of diodes V3 and V4 and T4 by diodes V13 and V14.

The sum signal (clocked signal) is routed via interface X103 to the anticipatory control circuit (see 5.3.2.4) and is simultaneously filtered by means of coils L1 (storage choke) and L2 as well as electrolytic capacitors C21 and C22. Diode V20 is the free-running diode for the two single-ended converters.

The filtered voltage is transmitted via interface X103 to the facility for comparison of the actual and nominal value and to interface X150 (V_{op}, see 5.1).

The current transformer T5 (T6) measures the pulse current through transformer T3 (T4). Decoupling of the measuring device and rectification of the measured currents is performed by diodes V7 and V17. By means of resistor R3 the measuring current is converted into a measuring voltage. The measuring signal is transferred via interface X101 / X102 to the dynamic current limiter (see 5.3.2.5).

5.3.2 Control Circuit 50 VDC

5.3.2.1 Generation of the Pulsewidth-modulated Signal

The voltage-controlled oscillator of integrated circuit N102 is synchronized by the clock signal which is fed via interface X110 (see 5.2.1) to input N102.18 (I_{syn}). The RC combination R123/ C126 / C124 determines the oscillator parameters. The voltage-controlled oscillator triggers a subsequent ramp generator. Via input N102.12 (R_F) and resistor R120 the slope of the ramp voltage (anticipatory control circuit, see 5.3.2.4) can be controlled.

Via a comparator the ramp voltage is compared with the result of the comparison between actual and nominal value (see 5.3.2.2). The pulsewidth-modulated signal thus produced is transmitted to two AND gates. The AND gates are connected to the outputs (Q and Q inverted) of a push-pull flipflop, to the balancing circuit (see 5.3.2.3), the switch-off circuit for unbalances (see 5.3.2.4), the dynamic current limiter (see 5.3.2.5) and the ON / OFF circuit (see 5.3.2.6). The push-pull flipflop guarantees that only one of the two outputs N102.4 and .5 is active at a time.

Outputs N102.4 (Q_2) and .5 (Q_1) control the CMOS switch D105 (see 5.3.2.4) as well as via inverter D101 the transistors (FET) V117 and V118. The drain contacts of the transistors are connected via ignition transformers T101 and T102 with the corresponding networks and via interface X120 to the switching transistors of the converter board (see 5.3.1).

5.3.2.2 Comparison between Actual and Nominal Value

The filtered voltage (see 5.3.1) is transmitted via contact X103.2 to voltage divider R132 / R134. A PI control element compares the partial voltage thus generated (= actual value) with a nominal voltage. The PI control element consists of operational amplifier N102.(15 to 17) and an RC network. The nominal-voltage input N102.17 is connected via voltage divider R110 / R111 and contact X110.7 with the circuit for generation of the nominal value (see 5.2.2).

The resulting control voltage is fed via output N102.15 to comparator input N102.14 and the ON / OFF circuit (N103.6, see 5.3.2.6).

The comparator compares the control voltage with a ramp voltage (see 5.3.2.1).

5.3.2.3 Balancing Circuit

The voltage (V_{in}) from the converter board (see 5.3.1) is fed via interface X210 to the balanced voltage divider R202 / R201. Depending on the polarity of the differential voltage of the nominal (R202/R201) and the real centre voltage (X210.3, see 5.3.1) the respective optocoupler U201 or U202 becomes conductive.

The output voltages of the optocouplers are compared in comparator N103 with a reference voltage. The reference voltage is generated by means of voltage divider R157 / R142 as well as the supply voltage from contact X110.2 / .4.

The comparator outputs control via inputs N102.24 and .6 the AND gates (see 5.3.2.1) of integrated circuit N102.

The single-ended converter with the lower input voltage causes the respective optocoupler, e. g. U201, to become conductive. As a result, the voltage on input N103.5 drops below the reference voltage and output N103.2 changes from low to high level. The high level blocks output N102.5 (Q1) until the two single-ended converters have roughly the same input voltages.

5.3.2.4 Anticipatory Control and Unbalance Switch-off

The sum signal (see 5.3.1) is transferred from interface X103.5 via diode V132 to voltage divider R145 / R146. Simultaneously, the voltage divider is connected via diode V133 to the 12-VDC source. The diodes serve for decoupling the two voltages.

Depending on the inverted pulsewidth-modulated signals (Q and Q inverted, see 5.3.2.1) the partial voltage thus produced is switched to the corresponding capacitor C148 or C149 via the CMOS switches D105. In the capacitors the measured value is stored until the next pulse is emitted. The capacitors are decoupled by voltage followers N104. The outputs of the voltage followers are connected via diodes V130 and V131, resistor R144 and adjustable resistor R131 to input N102.21 (I_{ov}) as well as via differential amplifier N104 to CMOS switch D104.

Depending on the inverted pulsewidth-modulated signals (Q_1 and Q_2, see 5.3.2.1) the CMOS switch D105 switches the corresponding differential voltage via resistor R120 to input N102.12 (R_F, see 5.3.2.1).

The current produced by resistor R120 controls the slope of the rising edge of the ramp signal and thus the pulse duration of the pulsewidth-modulated signals.

Voltage variations which may occur on the on the mains input as well as unbalances are compensated directly by bypassing the control circuit.
If the input voltage (N102.21) adjustable by R131 (switch-off in case of unbalances) exceeds the reference voltage of integrated circuit N102, outputs Q_1 (N102.5) and Q_2 (.4) are immediately switched off. As soon as the unbalance has been eliminated, the control circuit is switched on again via the soft start (N102.8).

5.3.2.5 Dynamic Current Limiter

The measuring voltage (see 5.3.1) is fed from contact X102.2 to voltage divider R112 / R124. In a comparator of integrated circuit N102 the partial voltage thus produced is compared with a reference voltage. The reference voltage is generated by voltage divider R122 / R121 and the reference voltage source (N102.2).

If the input voltage adjustable with resistor R124 exceeds the reference voltage, outputs N102.5 (Q_1) and .4 (Q_2) are blocked for the remaining time of the clock period (see 5.3.2.1).

5.3.2.6 ON / OFF and Monitoring Circuit

The signal available on the switch-on circuit for the 50-VDC converter (see 5.2.3) is transmitted via switch S1 (T = 90° C), contact X110.5 and resistor R151 to input N102.19. This input is also connected to the monitoring circuit.

For switch-on of the 50-VDC converter (N102.19 = high), capacitor C123 is charged via a constant current source of integrated circuit N102. The charging voltage has an influence on the pulsewidth-generating circuit (= soft start).

Comparator N103.(1, 6, 7) of the monitoring circuit compares the charging voltage of capacitor C123 (N102.8) with the output voltage of the actual/nominal-value comparator (see 5.3.2.2) Output N103.1 is connected via contact X110.8 (CM) to the fault evaluation circuit (see 5.2.3) as well as to comparator N103.(10, 11, 13).

If the output voltage of the actual/nominal-value comparator exceeds the charging voltage of C123, the level on contact X110.8 changes

from high to low level (NoGo message) and the 50-VDC converter is switched off via comparator N103.(10, 11, 13). Switch-off is only performed if the charging voltage of C123 has exceeded the Zener voltage of V122.

In order to prevent that for a change of loads a NoGo message is emitted and the unit is switched off, input N103.6 is additionally connected to electrolytic capacitor C140. The capacitor is charged by the reference voltage source N102.2 via diode V134. This ensures that during switch-on of the converters first a NoGo and then a Go are indicated.

In case the temperature of the heat sink rises above 90° C, the switch is automatically opened thus switching off the converter.

5.4 50-VDC Converter (A30)

The 50-VDC converter A30 functions in exactly the same way as the 50-VDC converter A20 (see 5.3).

5.5 28-VDC Converter (A40)

(see circuit diagram 734.9194.01S)

The 28-VDC converter A40 functions in exactly the same way as the 50-VDC converter A20 (see 5.3), except for three differences.

The nominal voltage for the actual/nominal-value comparator (see 5.3.2.2) is not provided by the nominal-value generator (see 5.2.2) but by the reference voltage source N102.2, that is, the 28-VDC converter supplies a fixed voltage. The output voltage can be set by means of adjustable resistor R133.

The ON line (X110.5) is connected via jumper X1012 to the supply voltage, switching on and off via the control circuit is therefore not possible (see 5.2.3). In addition, the ON line is not interrupted by a switch.

If the output voltage of the nominal / actual comparator rises above the load voltage of C123 the level at contact X110.8 changes from high to low (→ NoGo). There is no switch-off of the 28-V converter.

6. Repair

(see circuit diagrams, parts lists and components layouts in the appendix to this Repair Manual, listing on page 0.6)

6.1 Preliminary Remarks

The repair of the Power Supply IN 859C1 consists of troubleshooting and fault elimination, of measurements, alignments and functional tests, of replacing subassemblies and components as well as of a final test.

All information required for repair of the power supply down to components level is contained in this Section 6.

6.1.1 Troubleshooting Instructions

Localize the fault by checking the nominal values at the test points with the aid of the troubleshooting flowcharts given in 6.3.

6.1.2 Restoring Nominal Characteristics

Any component that is proved to be defective - through use of the troubleshooting flowcharts or by performing the measurements, alignments and functional tests - should only be replaced by a component that meets the specifications given in the appendix to this Repair Manual.

Only in this way can the technical data be guaranteed that are given in Section 1 of the User Manual.

6.1.3 Spare Parts

All components are subjected to strict quality control before they are allowed to be used in this item of equipment.

For components from outside suppliers, e.g. resistors, capacitors, diodes, transistors and integrated through to highly integrated circuits, R&S have set down their own delivery specifications for the purpose of ensuring maximum reliability. For this reason we recommend that only original spare parts be used for replacing defective components.

When ordering a spare part, please state the following:

Type, ordering code and serial number of equipment, identification number of parts list and designation plus stock number of the component concerned.

All of these details are to be found in the circuit diagrams, parts lists and components layouts that accompany the manual.

6.1.4 Important User Information

The following contains details which are essential when referring to Section 6 "Repair". This is in order to prevent misunderstandings at a later stage.

- For troubleshooting the given sequence should be adhered to.
- All voltage measurements are referred to ground, if not stated otherwise.
- All measurements and alignments are to be performed at the permissible operating voltage.
- Abbreviations in the text, such as X43.8, N103.(1, 6, 7) or D11.5 are to be understood as follows:
  - Connector X43 - contact 8
  - Integrated circuit N103 - functional block (1, 6, 7)
  - Intergrated circuit D11 - contact 5
- When performing electrical or mechanical repairs disassemble the power supply as well as the subassemblies only to the extent which is necessary to eliminate all faults.
- Before performing any soldering works on the unit or a subassembly the operating voltage must be disconnected.

CAUTION ESD!

Among the components incorporated in the power supply there are MOS, MOSFET and CMOS components. Components of this kind are extremely sensitive to high extraneous voltages (static discharge). Therefore subassemblies containing components of this kind should be tested and repaired on a special CMOS work station.

CAUTION

Connecting the mains voltage accidentally to ground, e.g. with the probe of an oscilloscope, may cause consequential damages.

WARNING

Touching the open power supply accidentally presents a danger to life. Repair works are only to be performed by qualified personnel.

6.2 Test Equipment and Special Tools

For performing the repairs in this section test equipment is required as listed below. Equivalent items of test equipment can be used provided that their technical data are as good as or better than those stated here. No special tools are necessary.

6.2.1 Test Equipment List

No.	Test equipment, required data	Recommended R&S equipment	Ordering code
1	Power Supply V ≥ 28 V, I ≥ 30 A	NGRE	100.8283
2	Double Power Suuply V = 5 V / I = 100 mA V = 12 / I = 500 mA	NGMD	117.7127.02
3	Three-phase variable-ratio separating transformer 400 V, 3 x 16 A		
4	Variable-ratio separating transformer 220 V, 100 VA		
5	Generator TTL, 100 kHz		
6	Frequency counter ± 1 Hz		
7	Slide resistor (as load resistor) approx. 1.5 Ω / max. 35 A		
8	2-channel Oscilloscope	BOL	374.2000.02
9	Digital Multimeter Clamp-on Current Probe	UDL 44 UDL 4-Z3	265.5015.02 346.8113.02

6.3 Troubleshooting

Troubleshooting is based on the following requirements:

- Power Supply IN 859C1 has been localized as being defective.
- The power supply has been removed acc. to 6.6.1.
- The operating voltages are applied externally.

The following troubleshooting flowcharts cover troubleshooting as well as fault elimination on

- the power supply itself (Fig. 6.1)
- the filtering circuit (Fig. 6.2)
- the control circuit (Fig. 6.3)
- the 50-VDC converters (Fig. 6.4)
- the 28-VDC converter (Fig. 6.5).

The given sequence for the troubleshooting should be adhered to so that faults can be detected and remedied as speedily and rationally as possible.

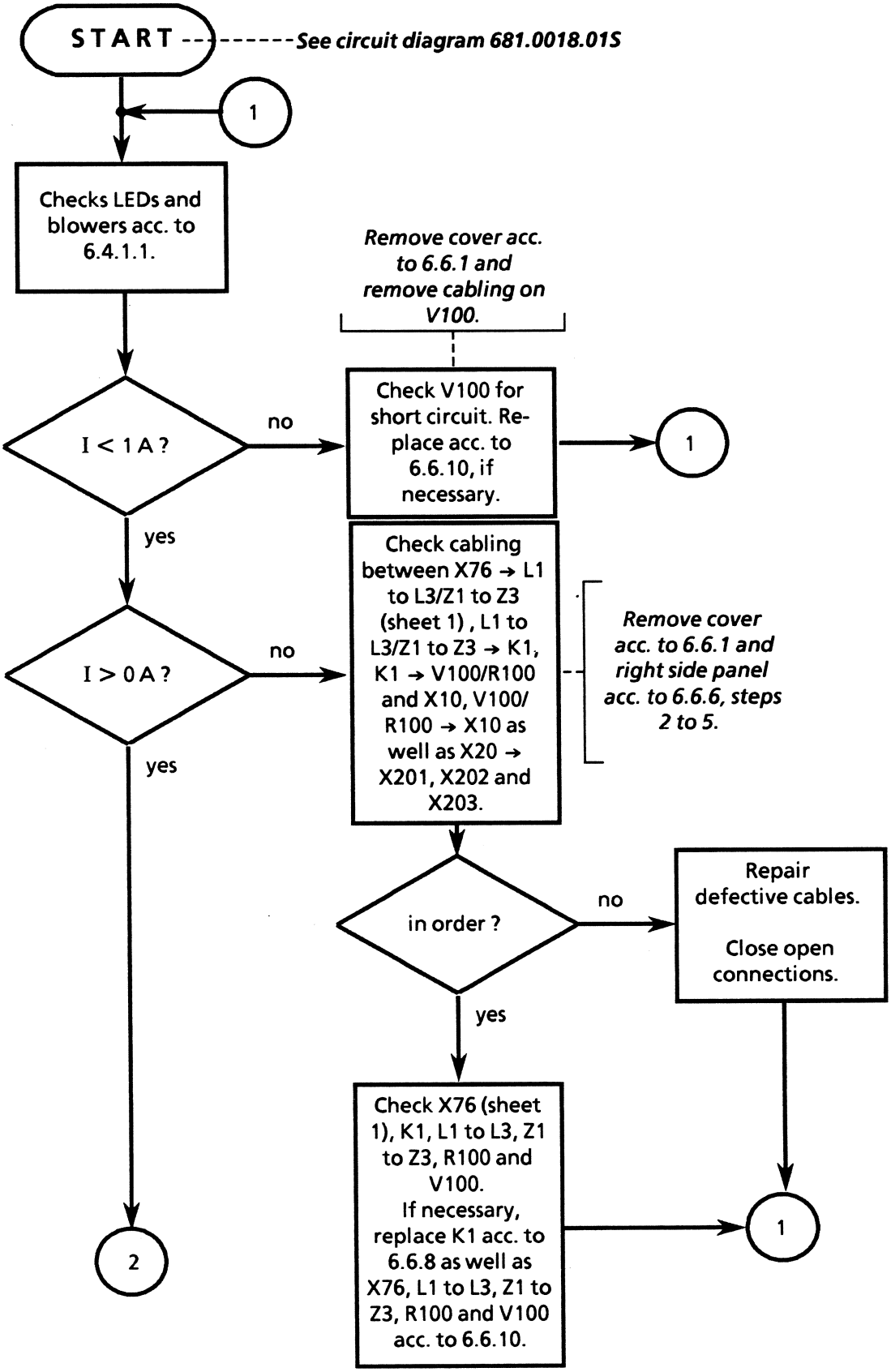


Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 1 of 10)

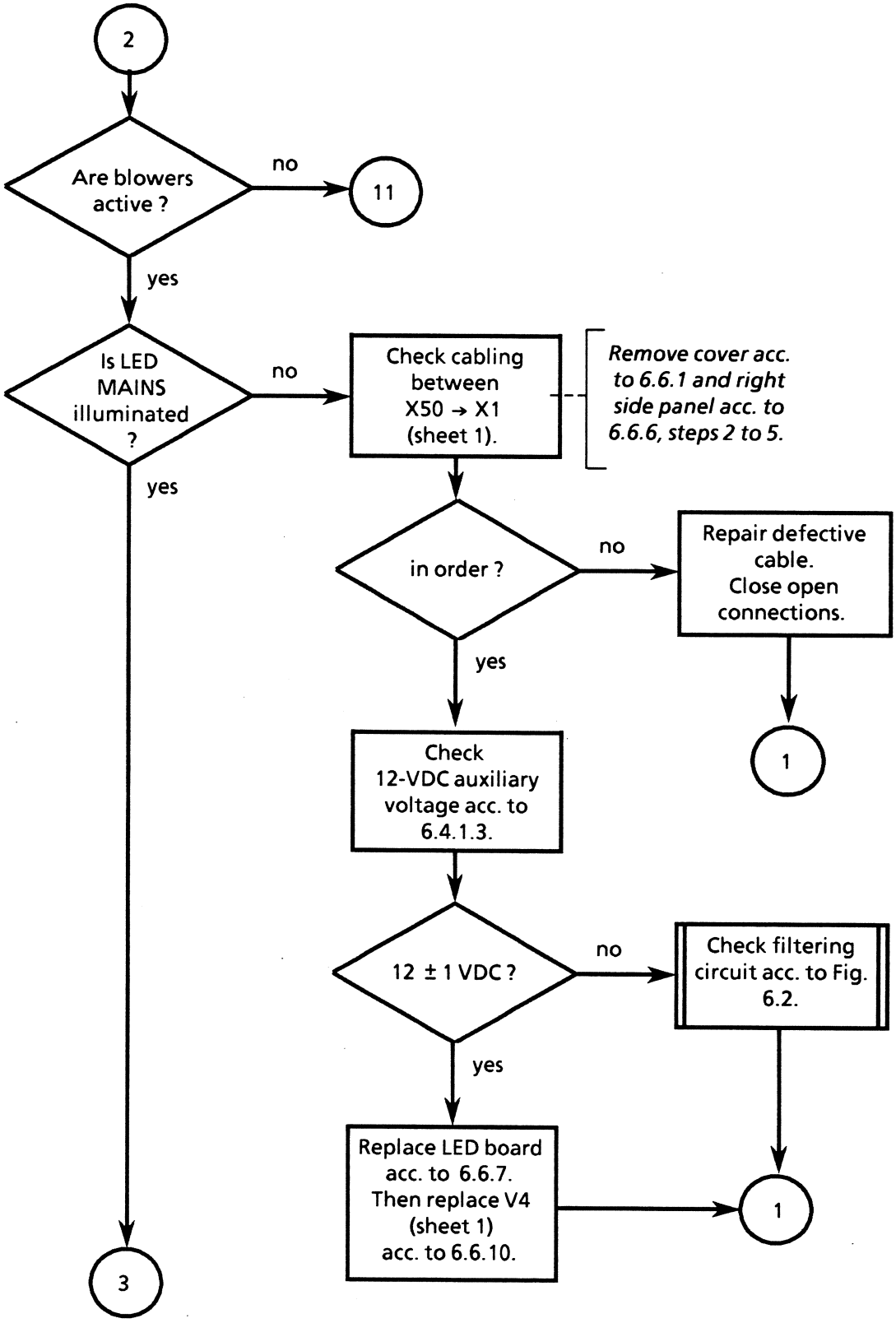


Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 2 of 10)

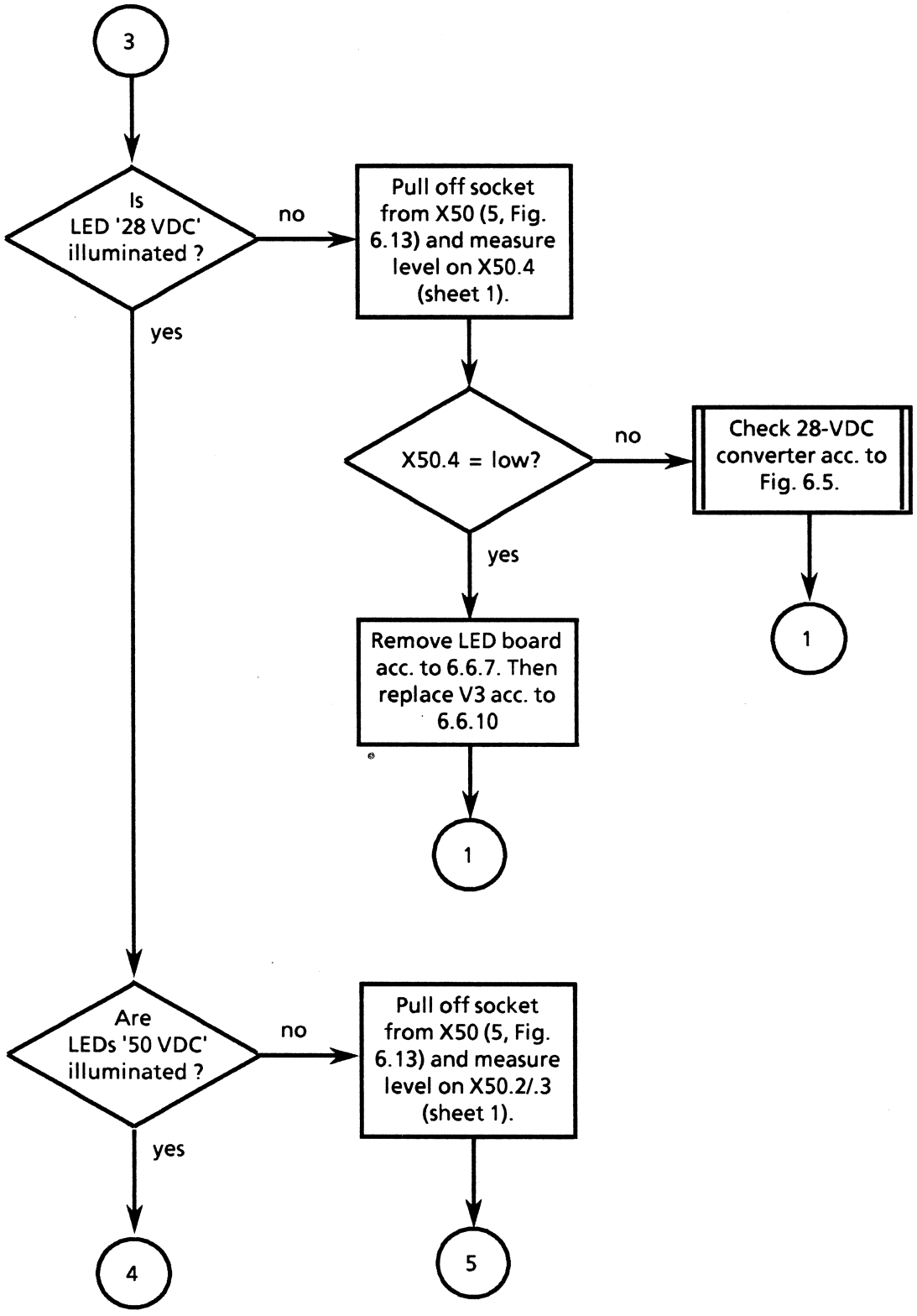


Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 3 of 10)

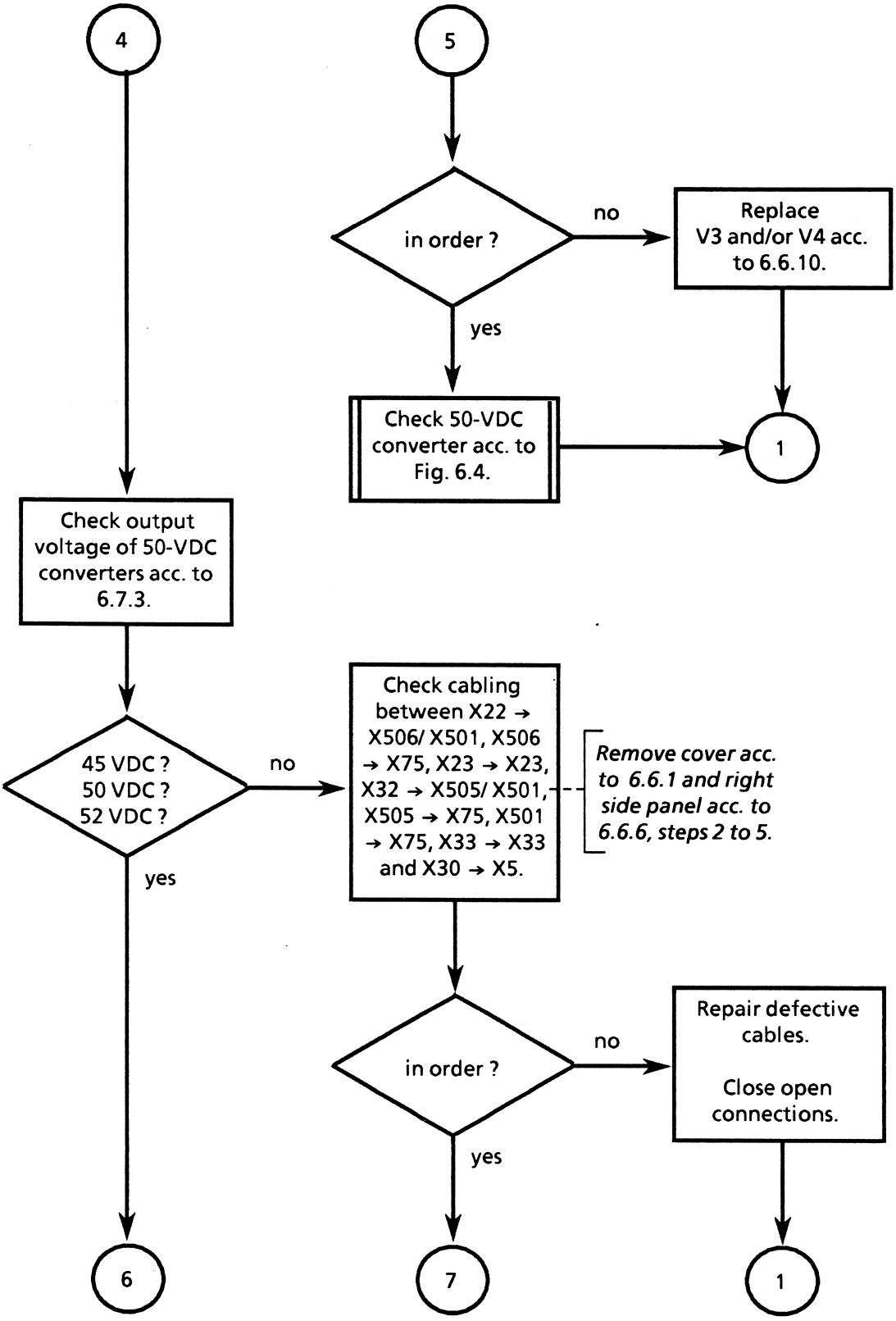


Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 4 of 10)

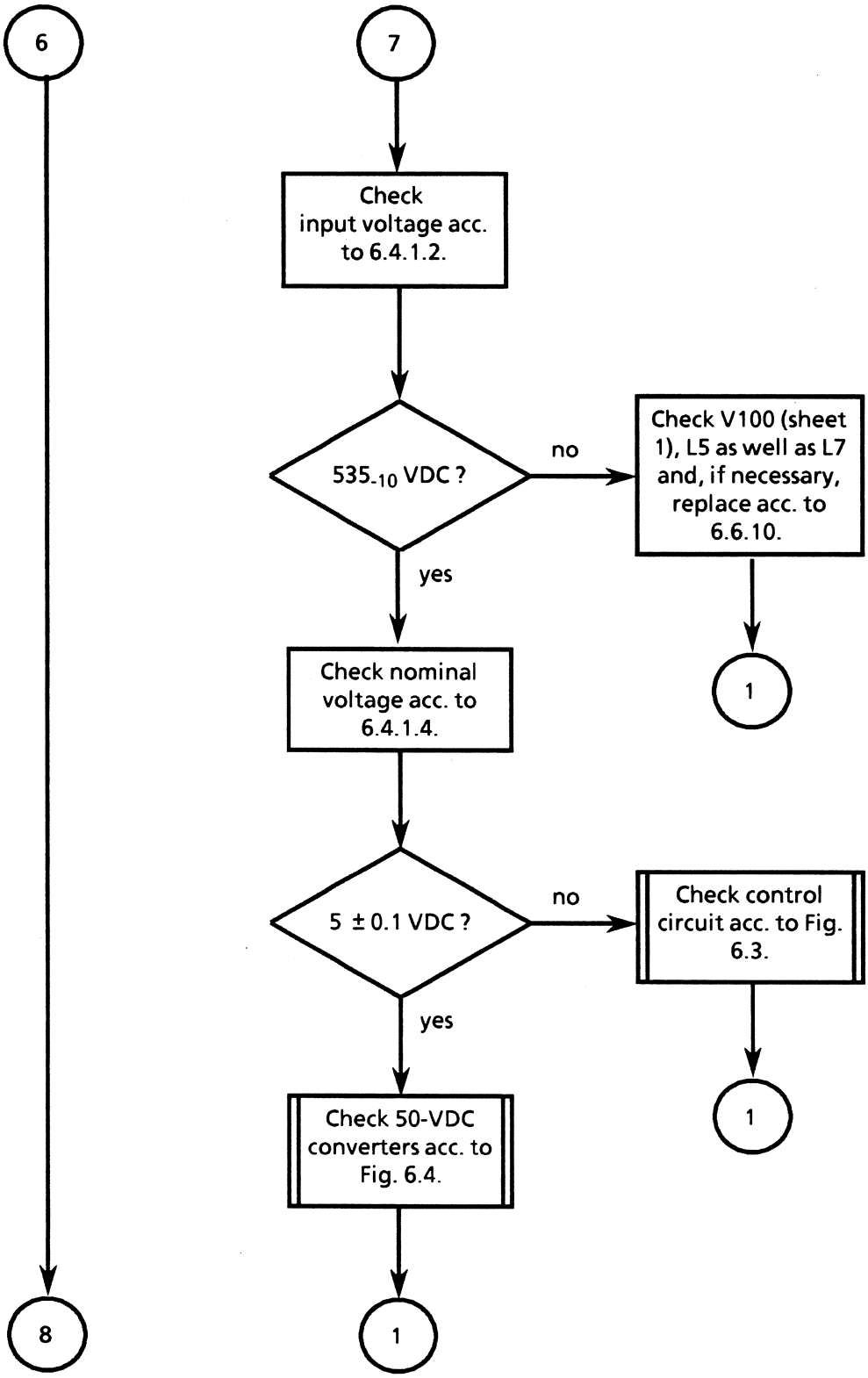


Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 5 of 10)

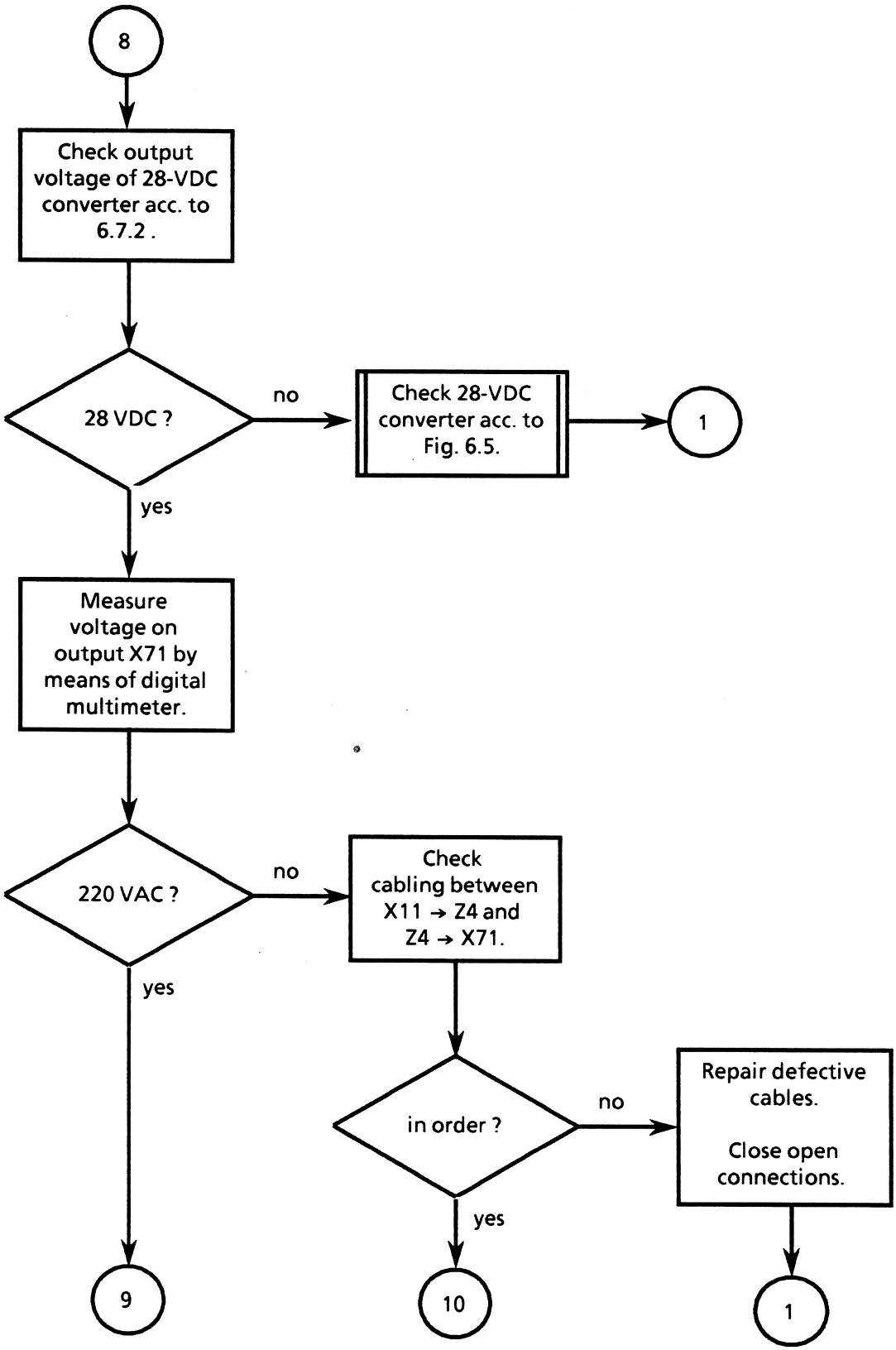


Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 6 of 10)

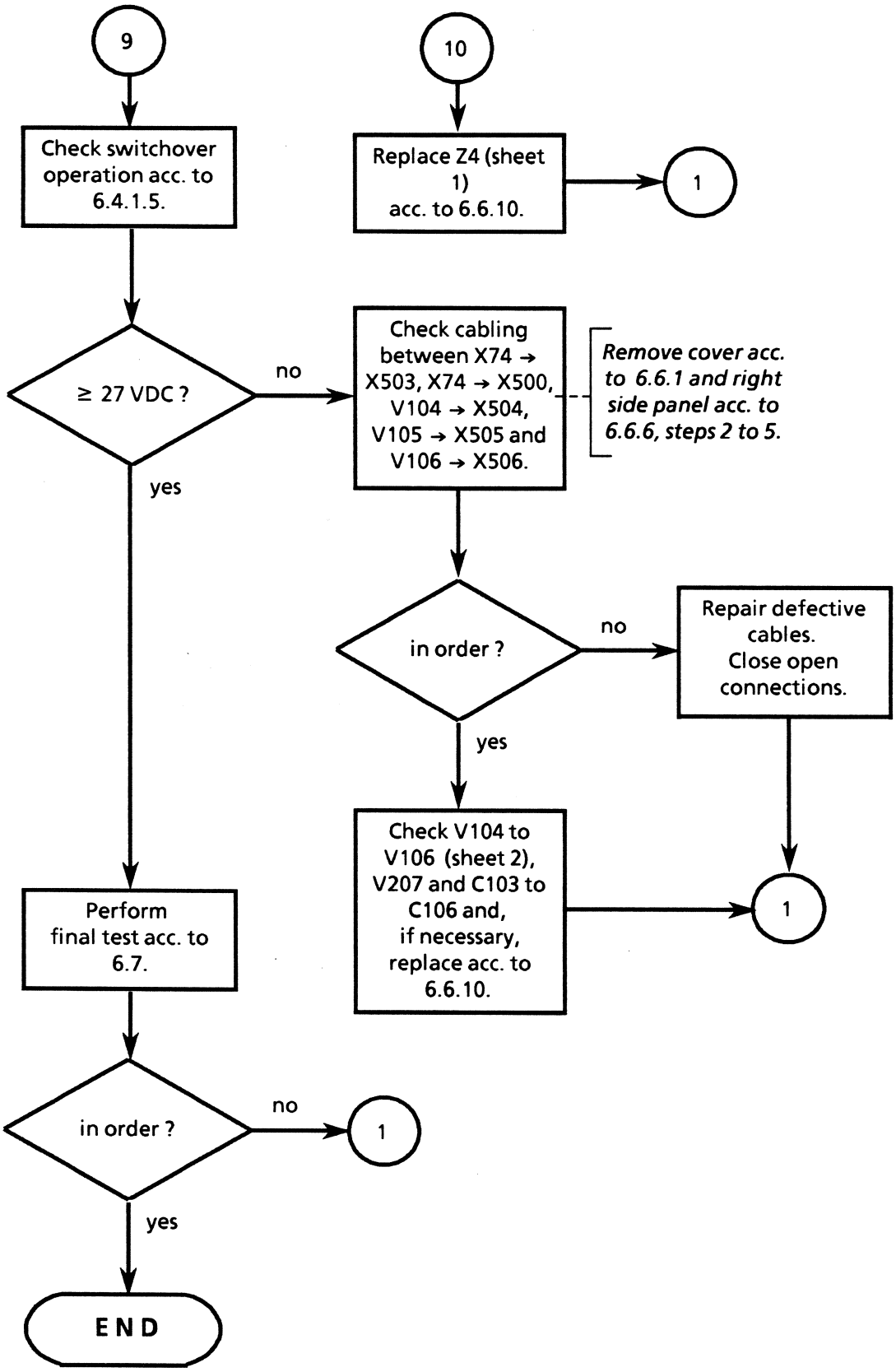


Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 7 of 10)

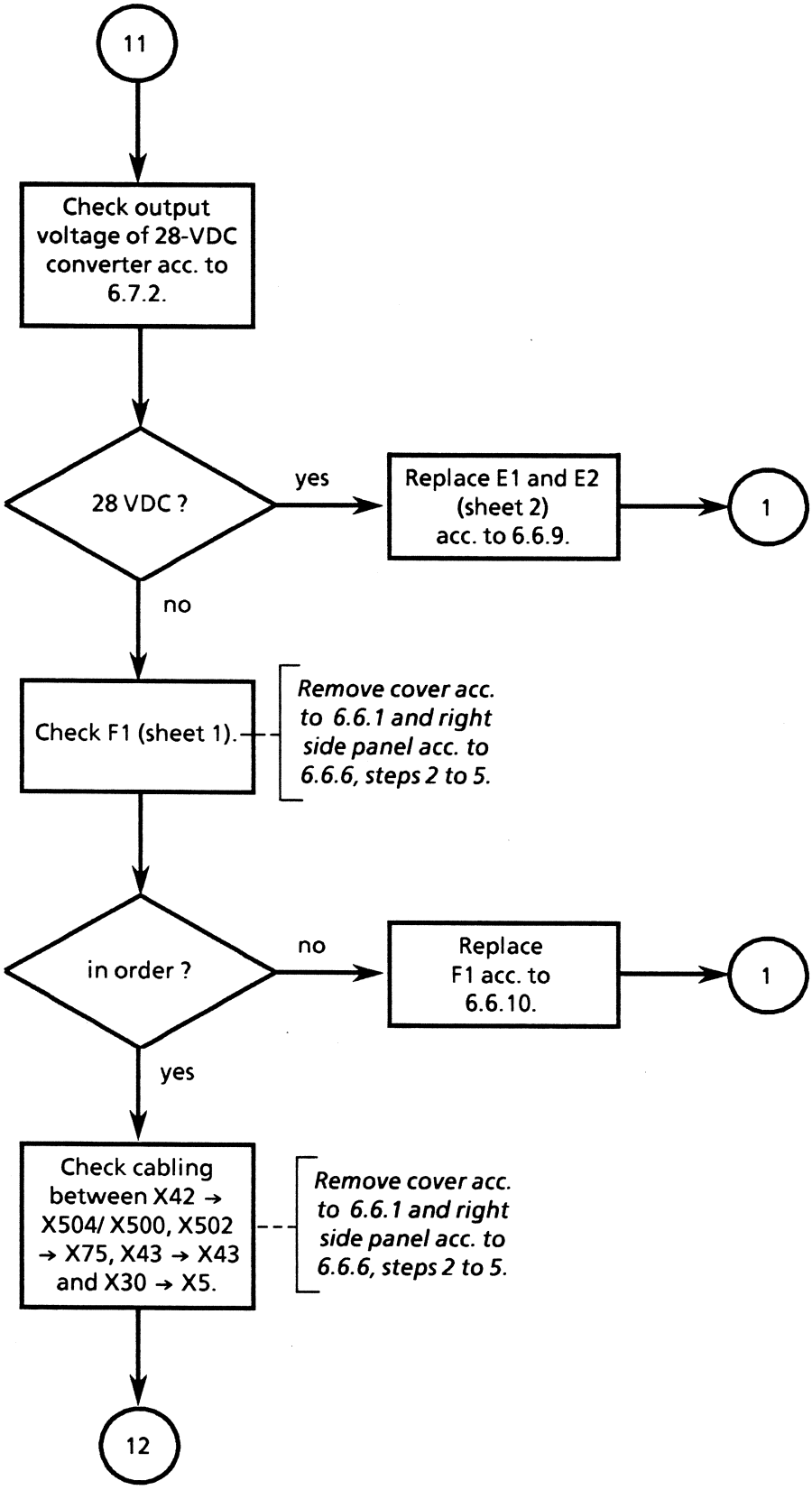


Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 8 of 10)

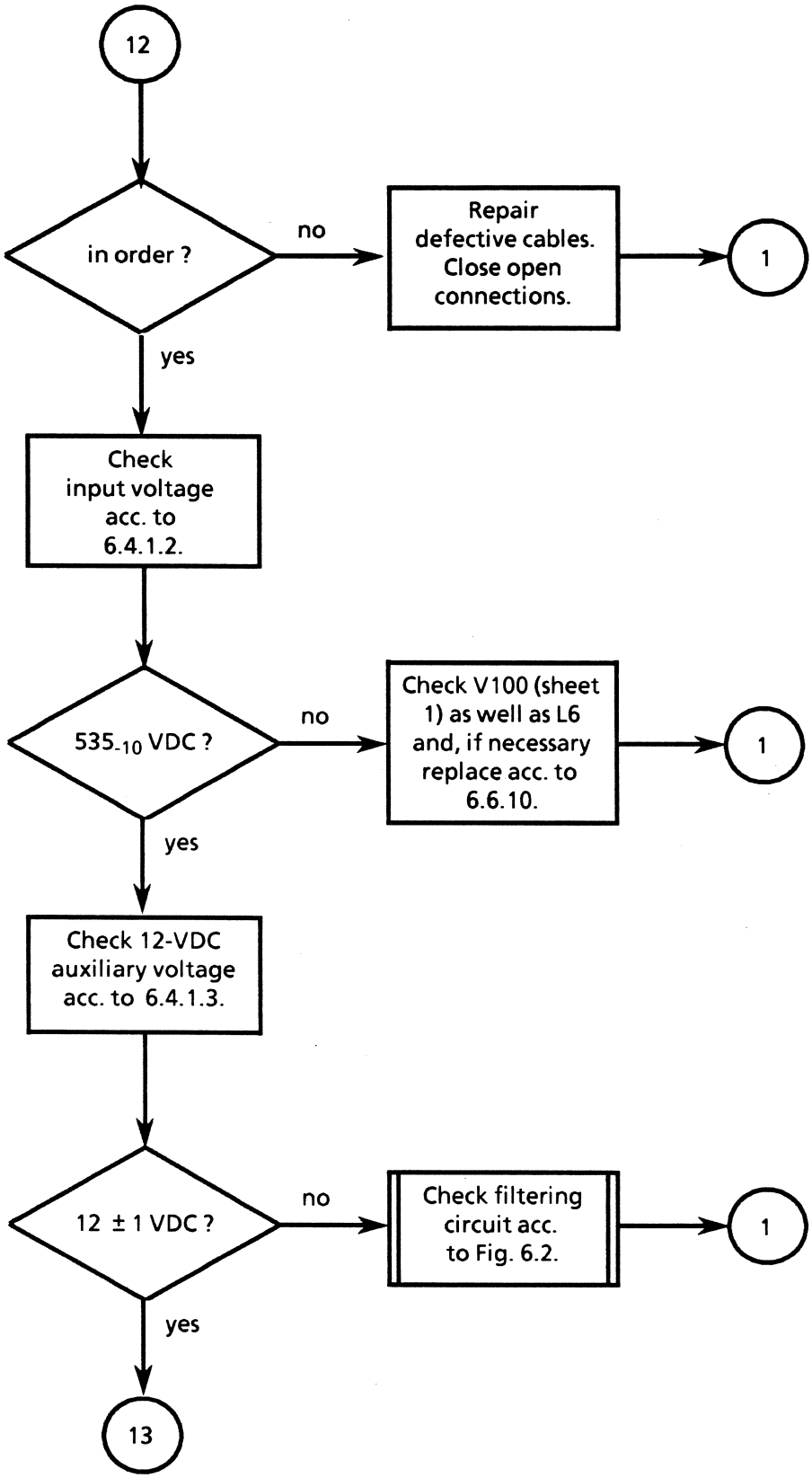


Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 9 of 10)

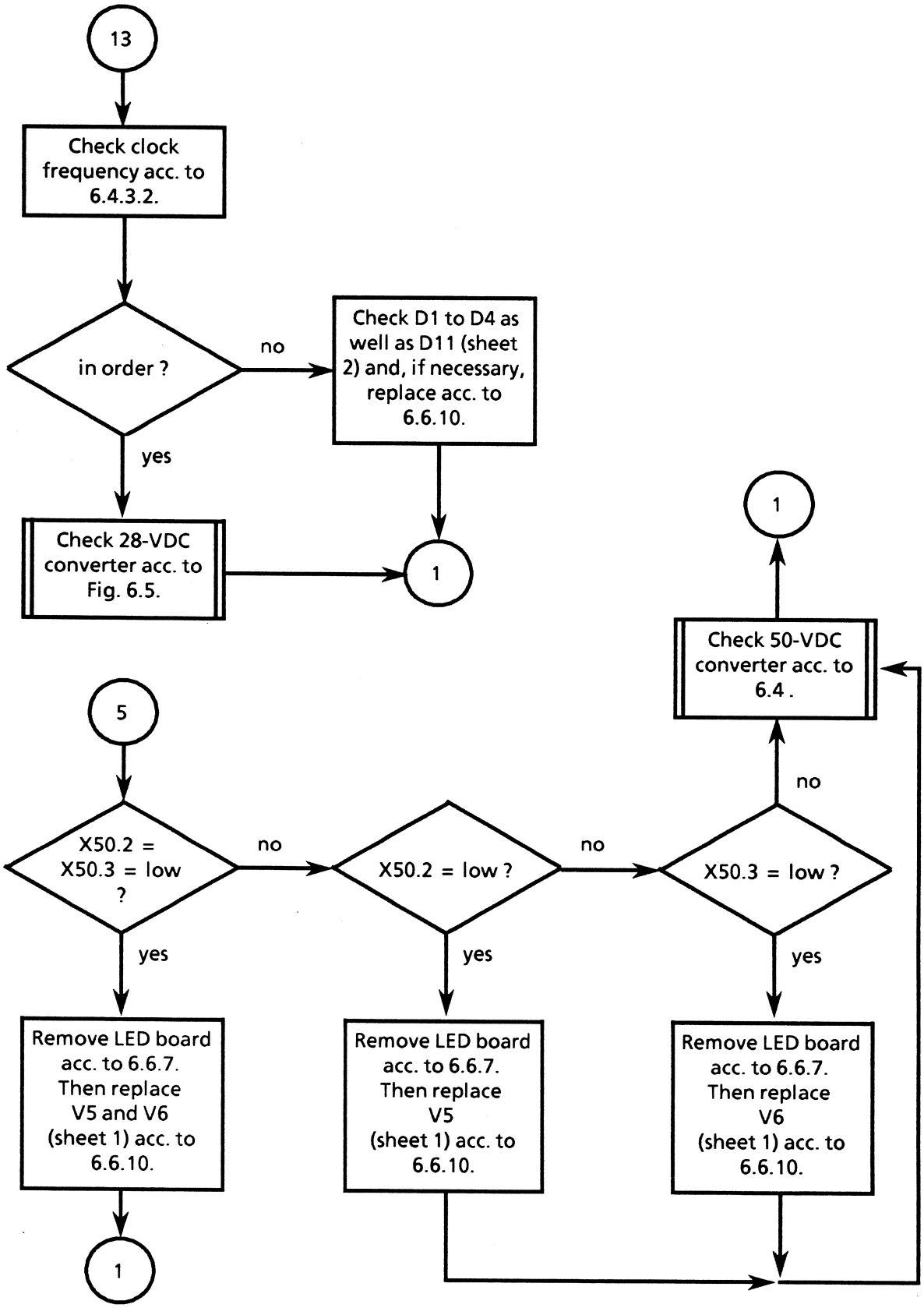
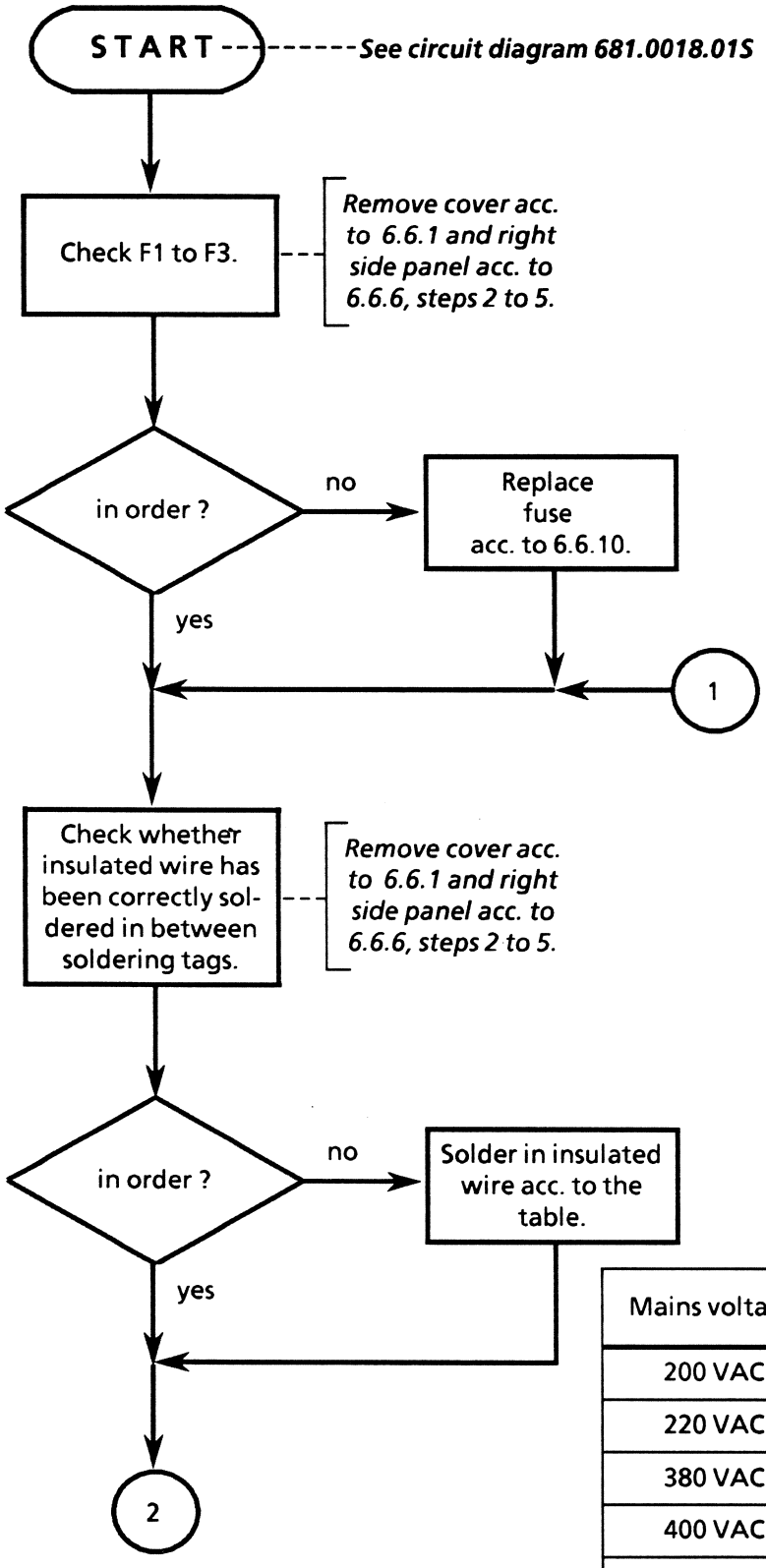


Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 10 of 10)



Mains voltage	Soldering tags
200 VAC	2 - 8
220 VAC	3 - 8
380 VAC	4 - 8
400 VAC	5 - 8
440 VAC	6 - 8

Fig. 6.2 Troubleshooting Flowchart, Filtering Circuit (page 1 of 2)

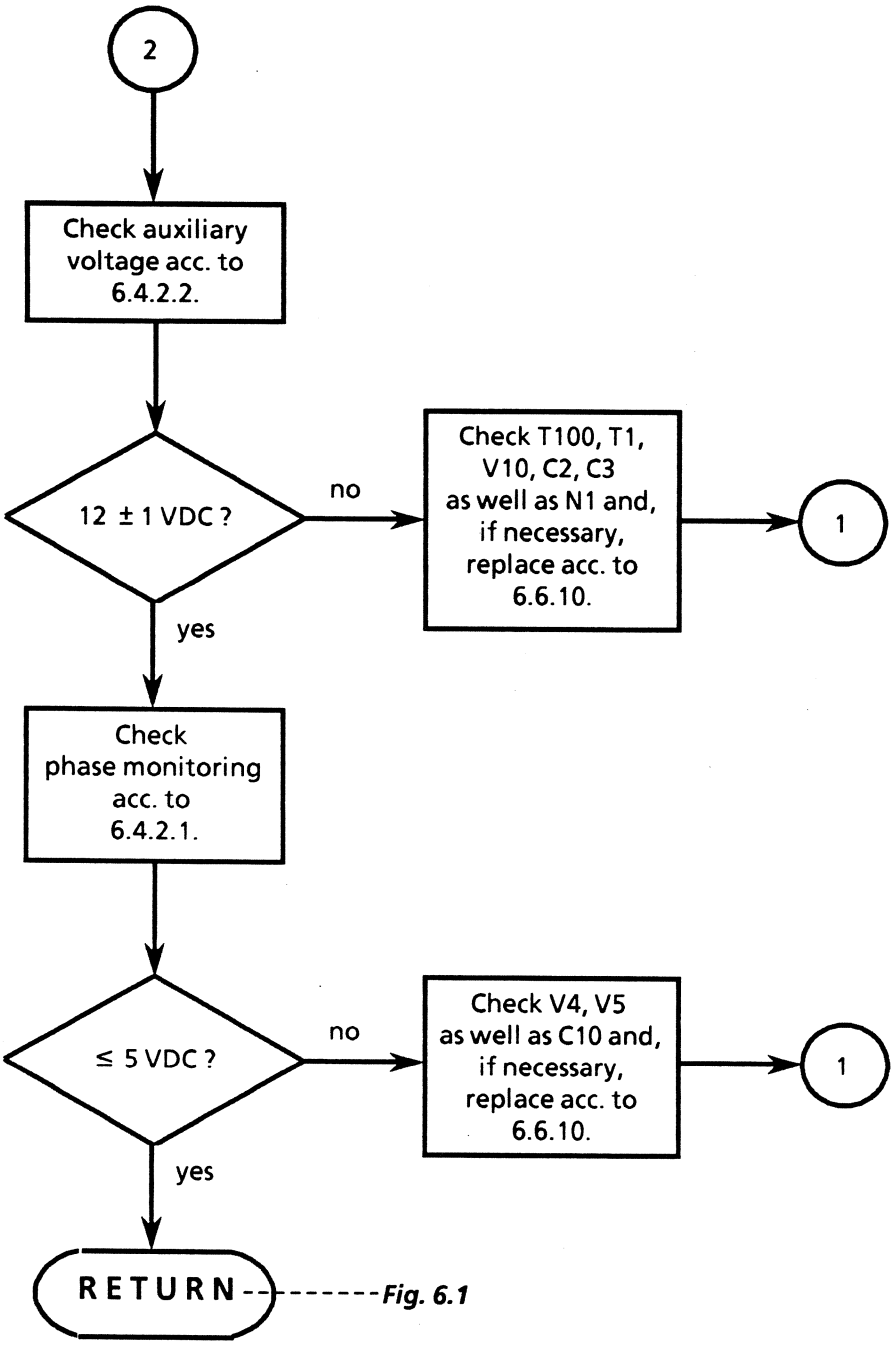


Fig. 6.2 Troubleshooting Flowchart, Filtering Circuit (page 2 of 2)

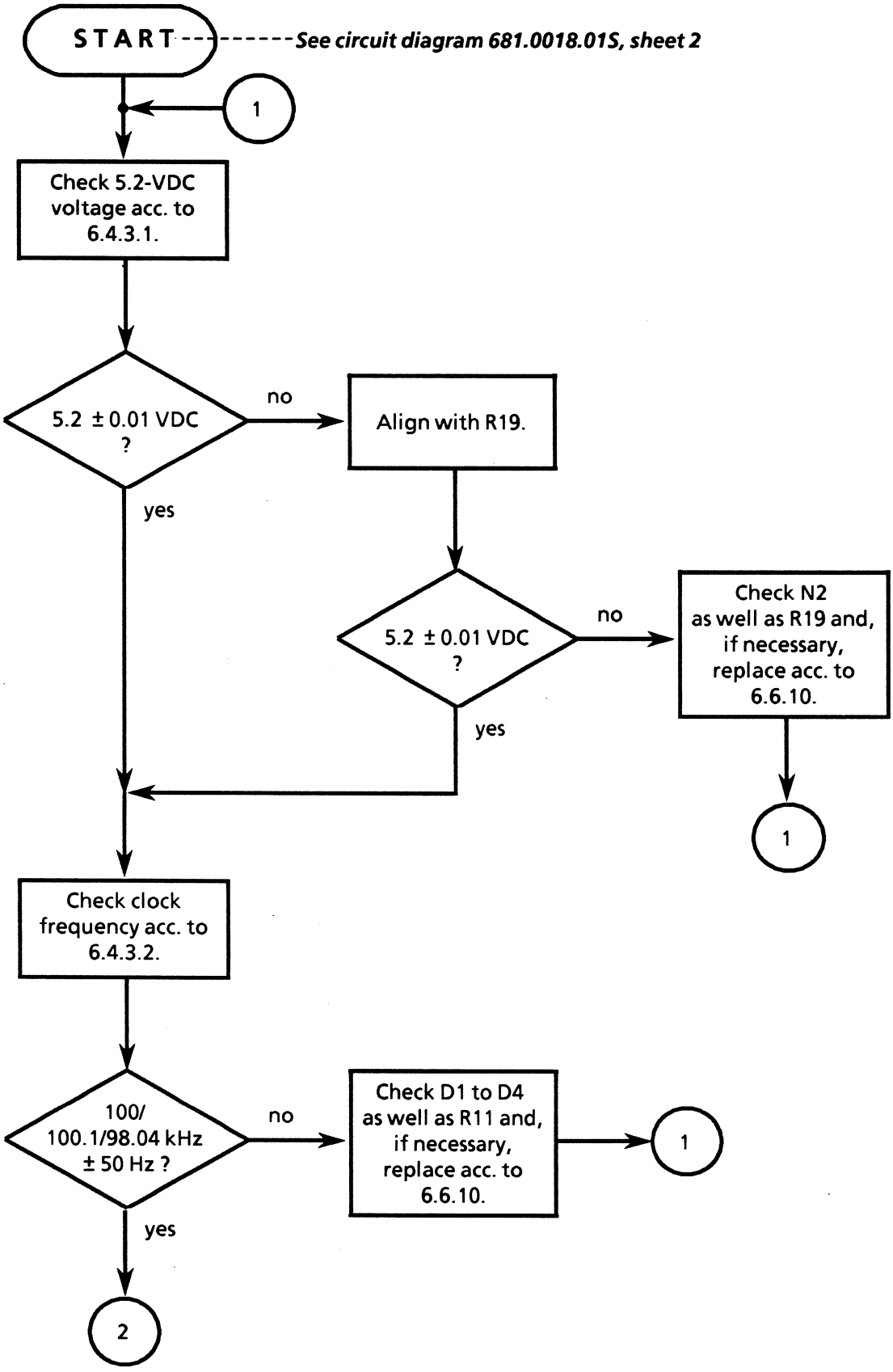


Fig. 6.3 Troubleshooting Flowchart, Control Circuit (page 1 of 2)

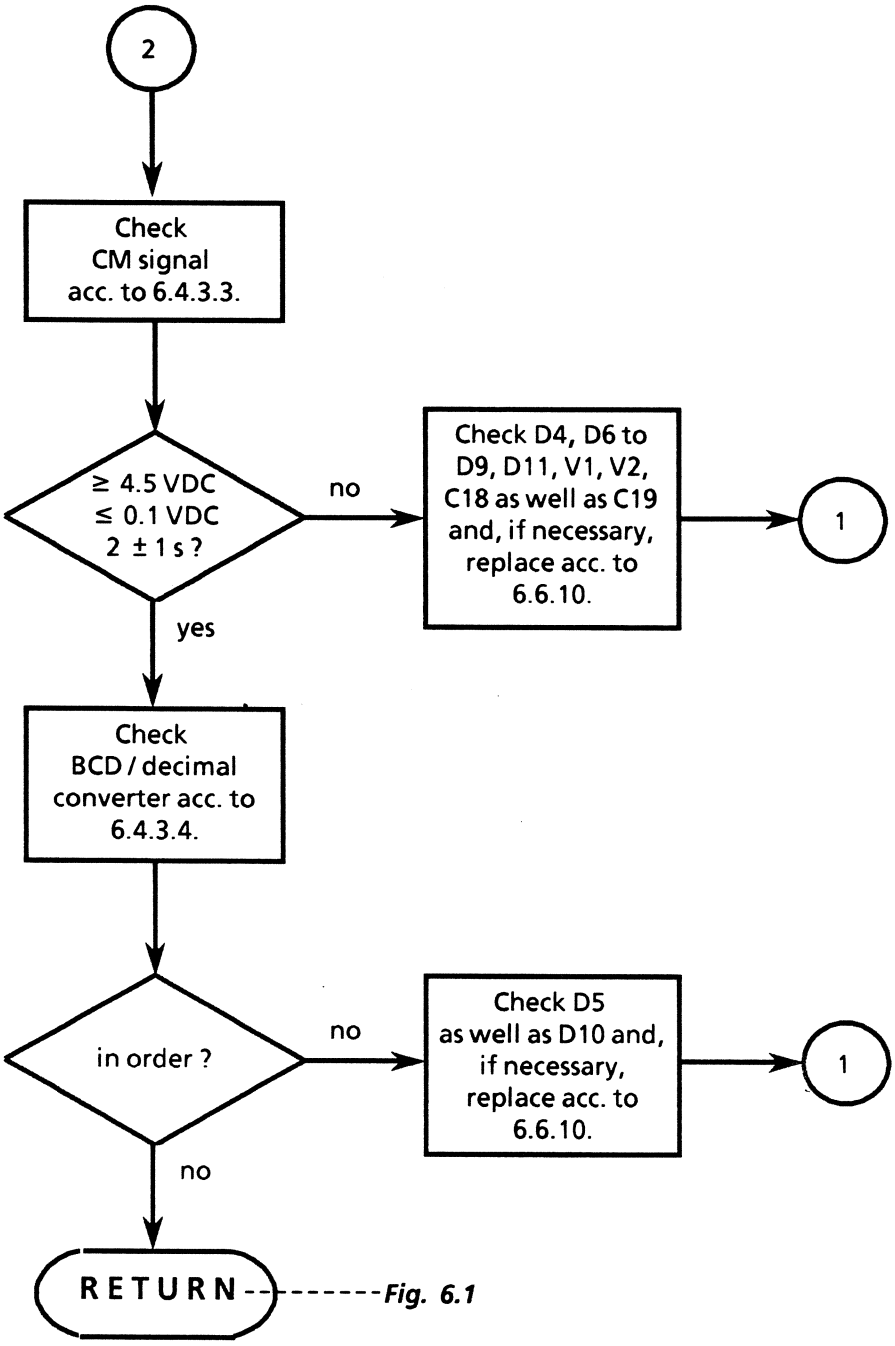
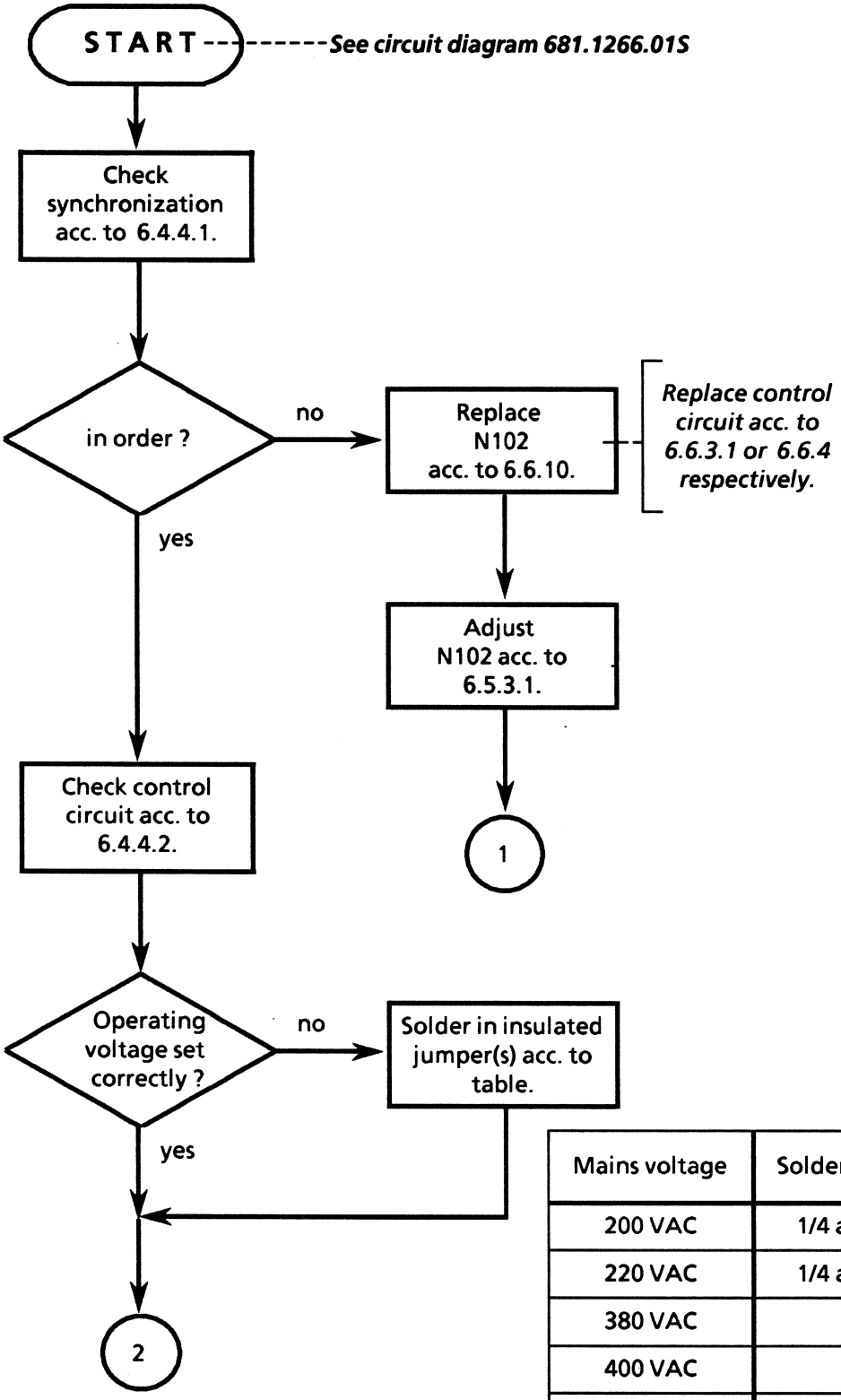


Fig. 6.3 Troubleshooting Flowchart, Control Circuit (page 2 of 2)



Mains voltage	Soldering tags
200 VAC	1/4 and 2/3
220 VAC	1/4 and 2/3
380 VAC	1/2
400 VAC	1/2
440 VAC	1/2

Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 1 of 7)

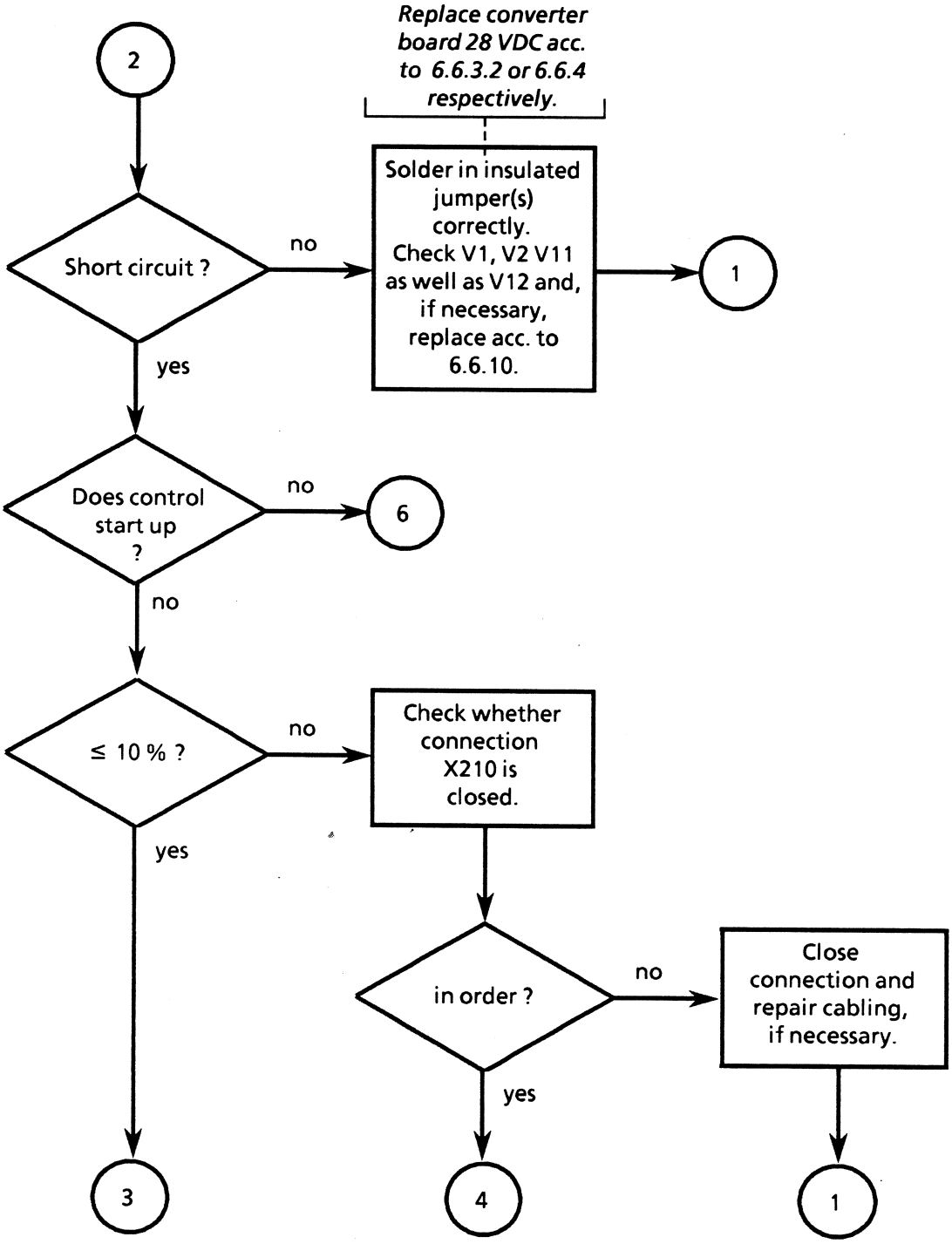


Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 2 of 7)

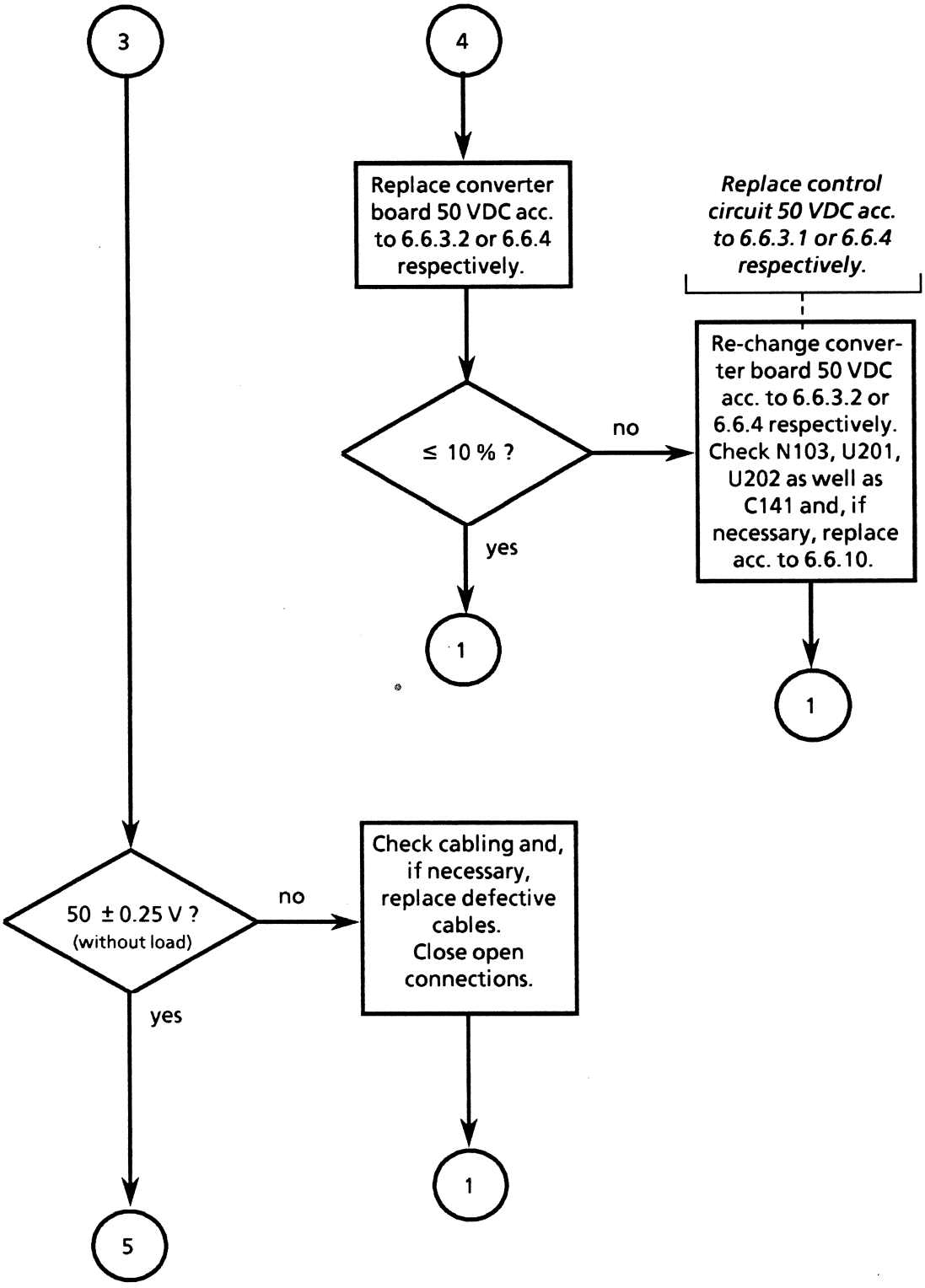


Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 3 of 7)

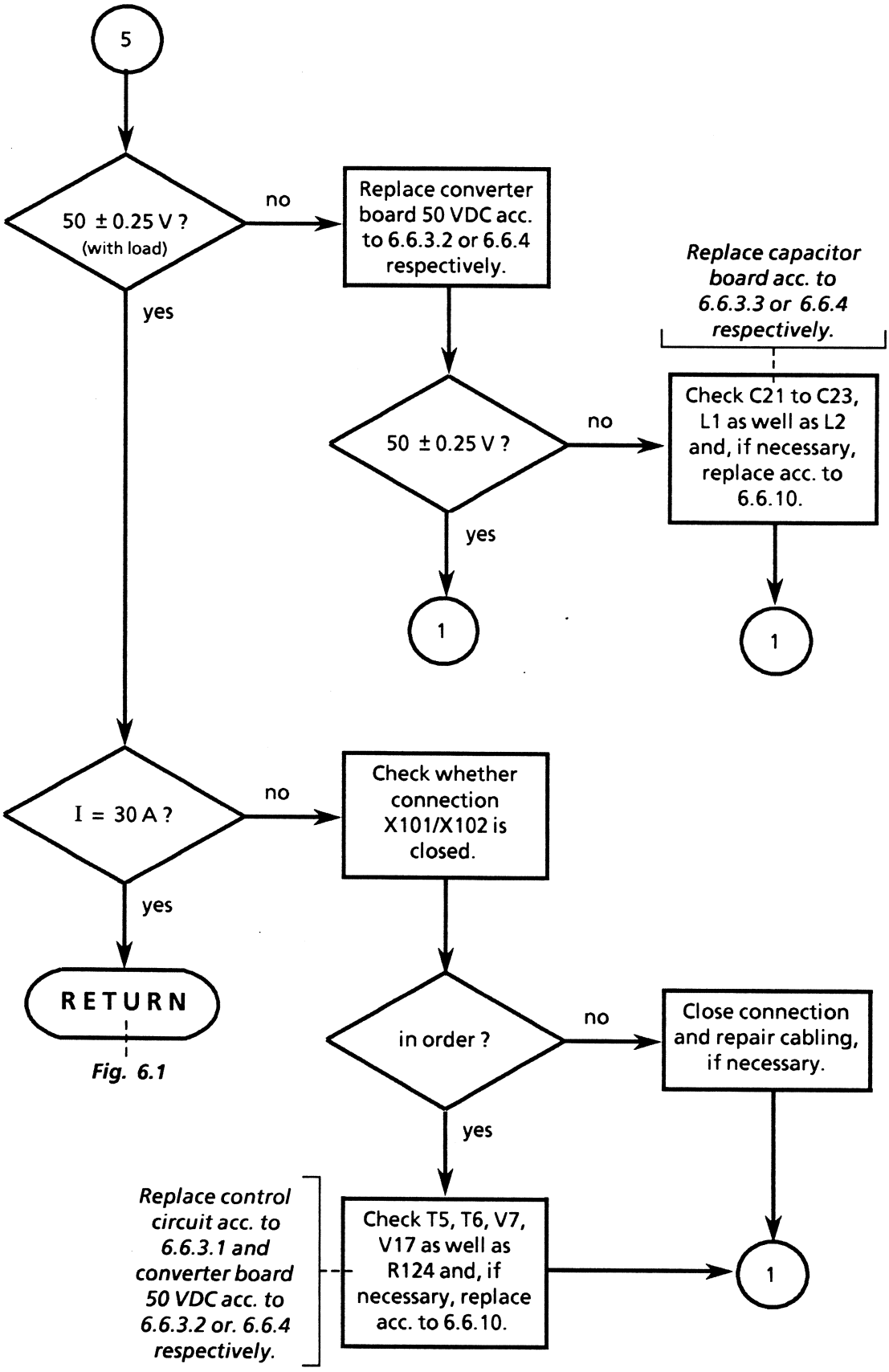


Fig. 6.1

Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 4 of 7)

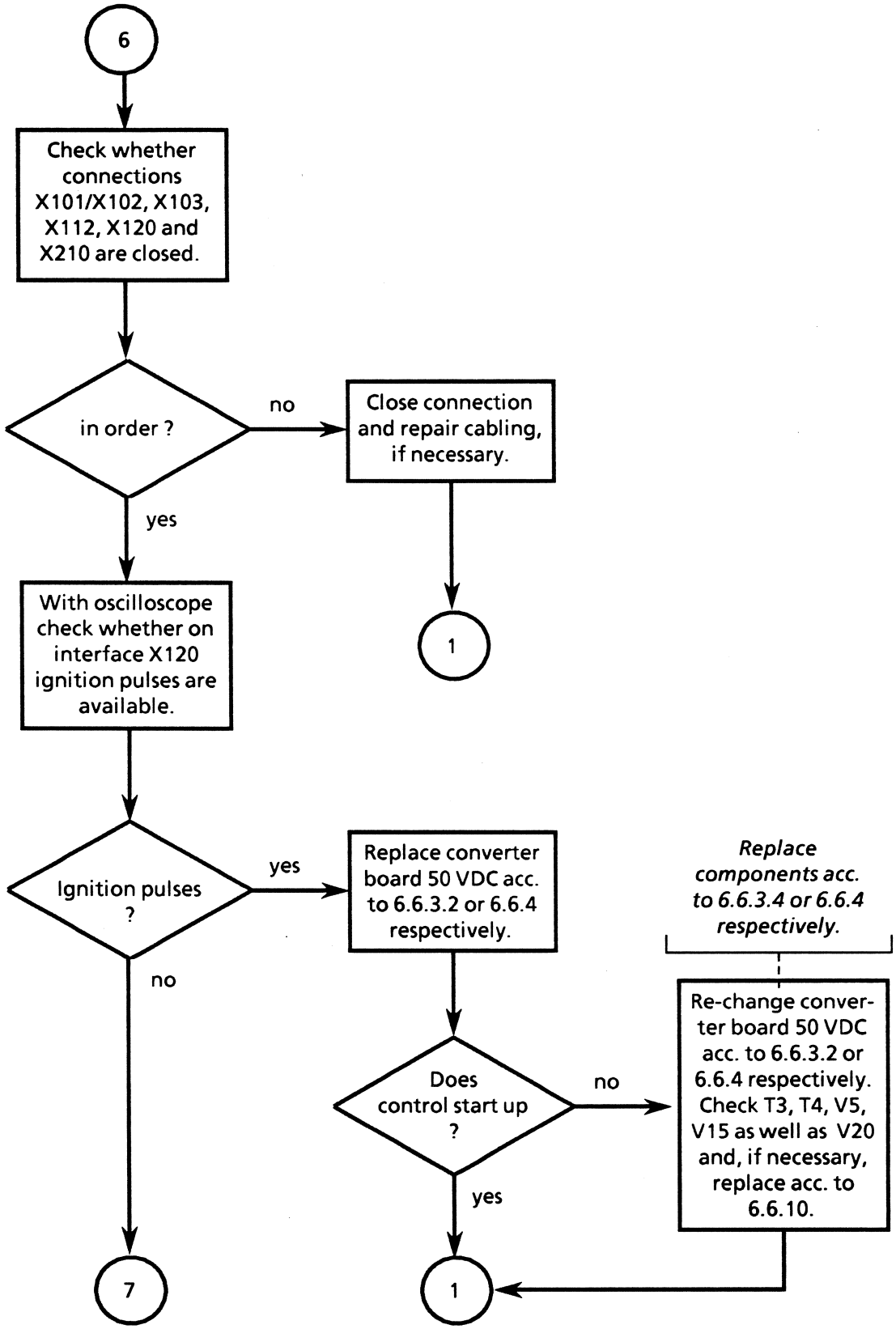


Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 5 of 7)

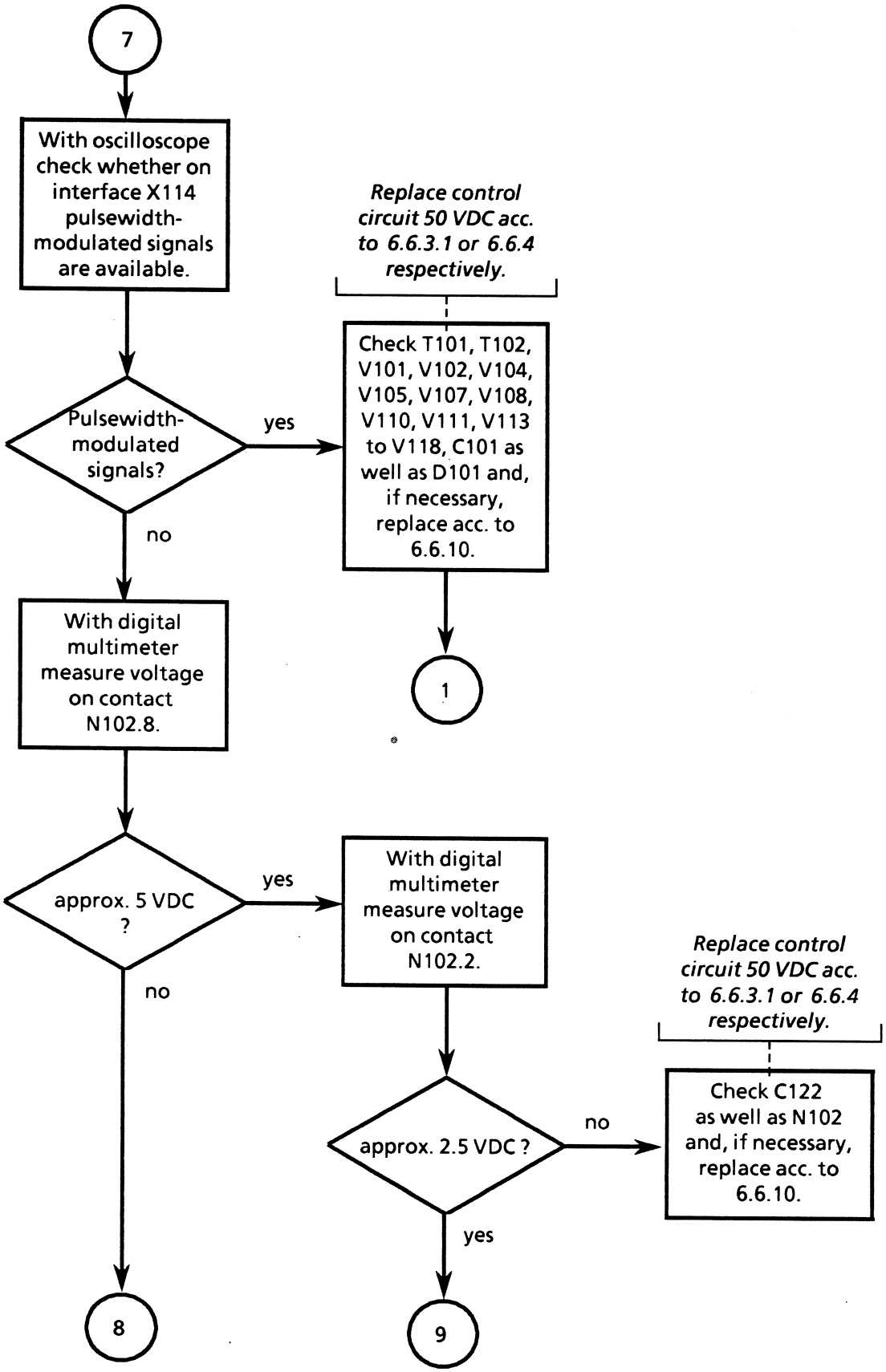


Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 6 of 7)

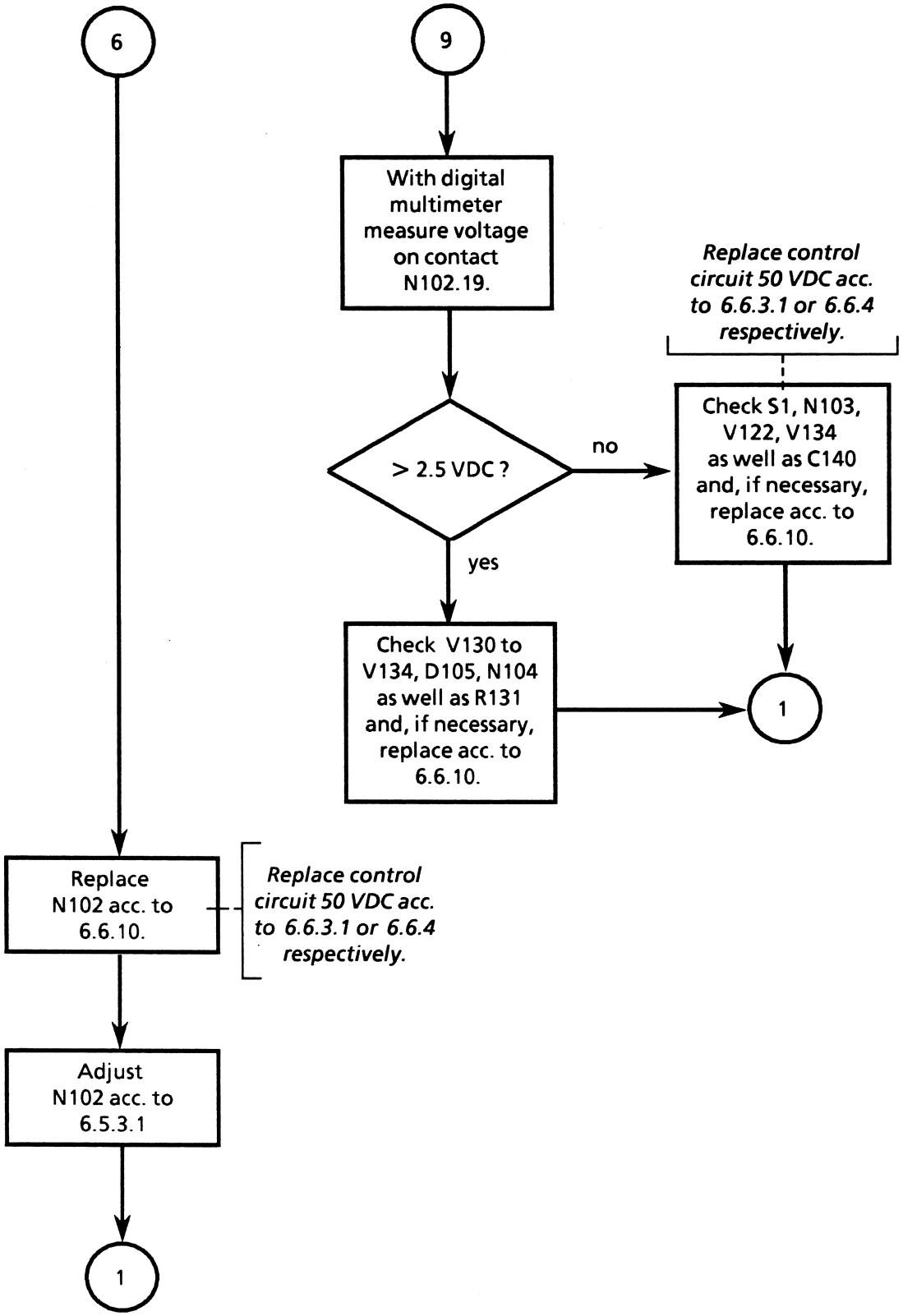
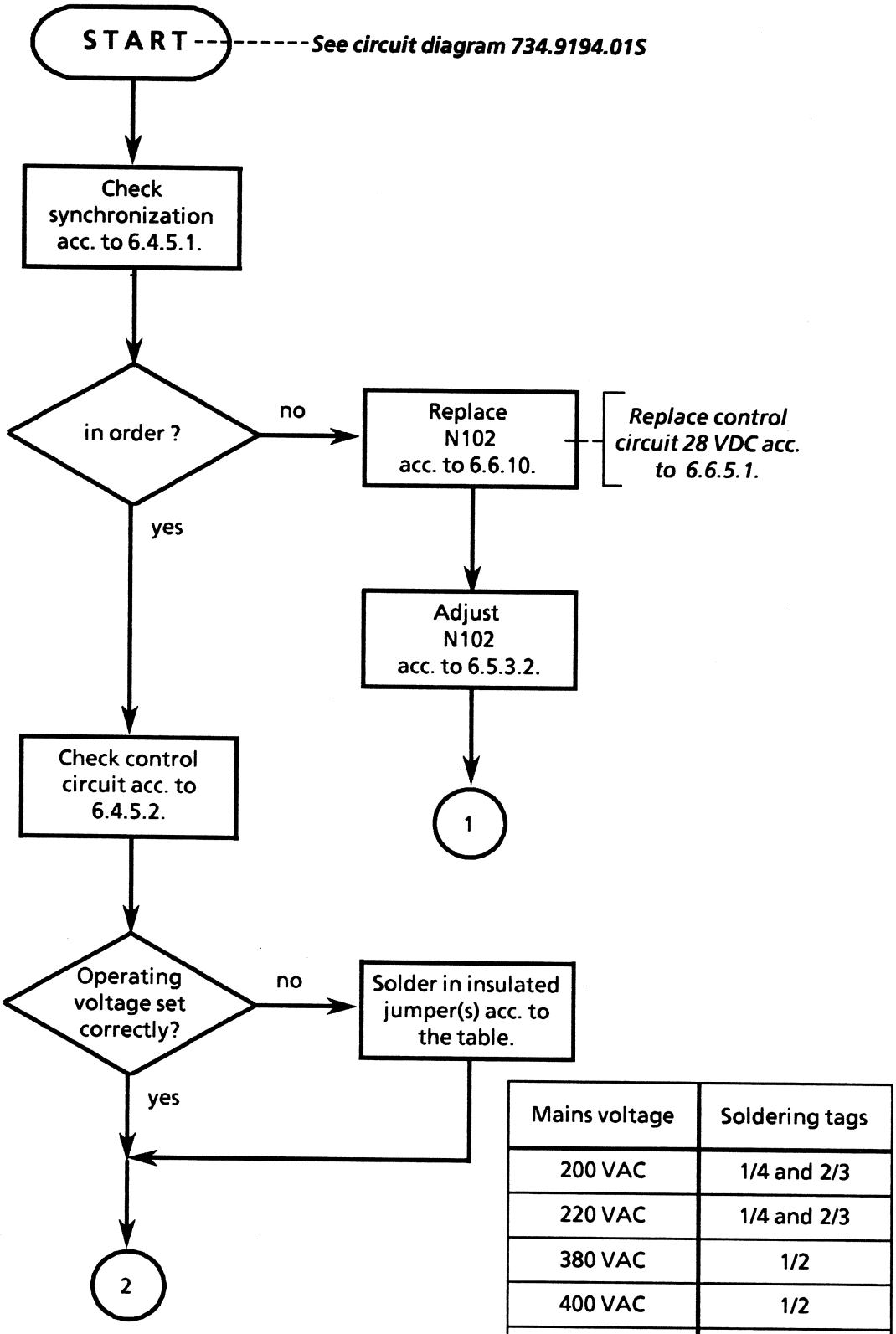


Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 7 of 7)



Mains voltage	Soldering tags
200 VAC	1/4 and 2/3
220 VAC	1/4 and 2/3
380 VAC	1/2
400 VAC	1/2
440 VAC	1/2

Fig. 6.5 Troubleshooting Flowchart, 28-VDC Converter (page 1 of 7)

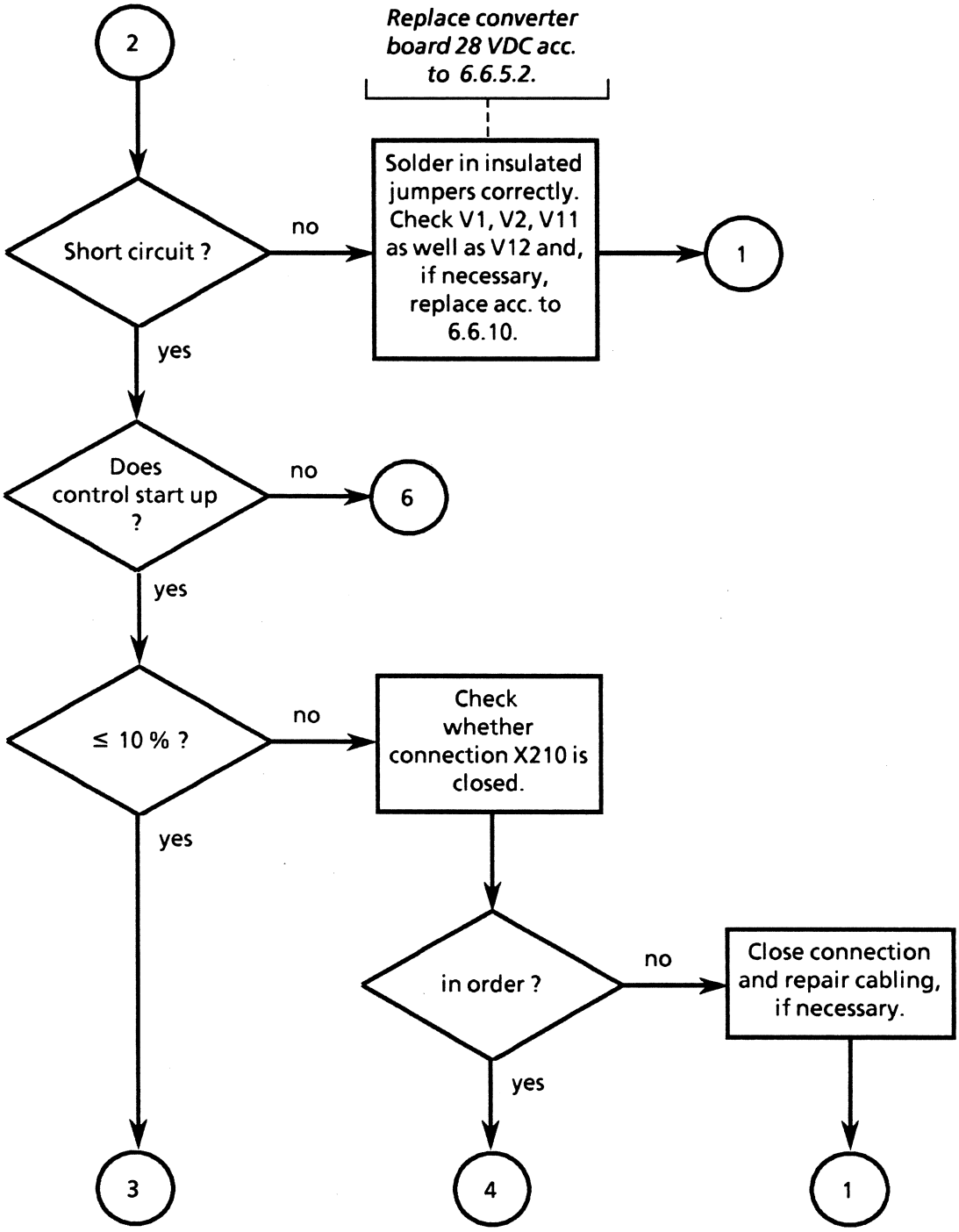


Fig. 6.5 Troubleshooting Flowchart, 28-VDC Converter (page 2 of 7)

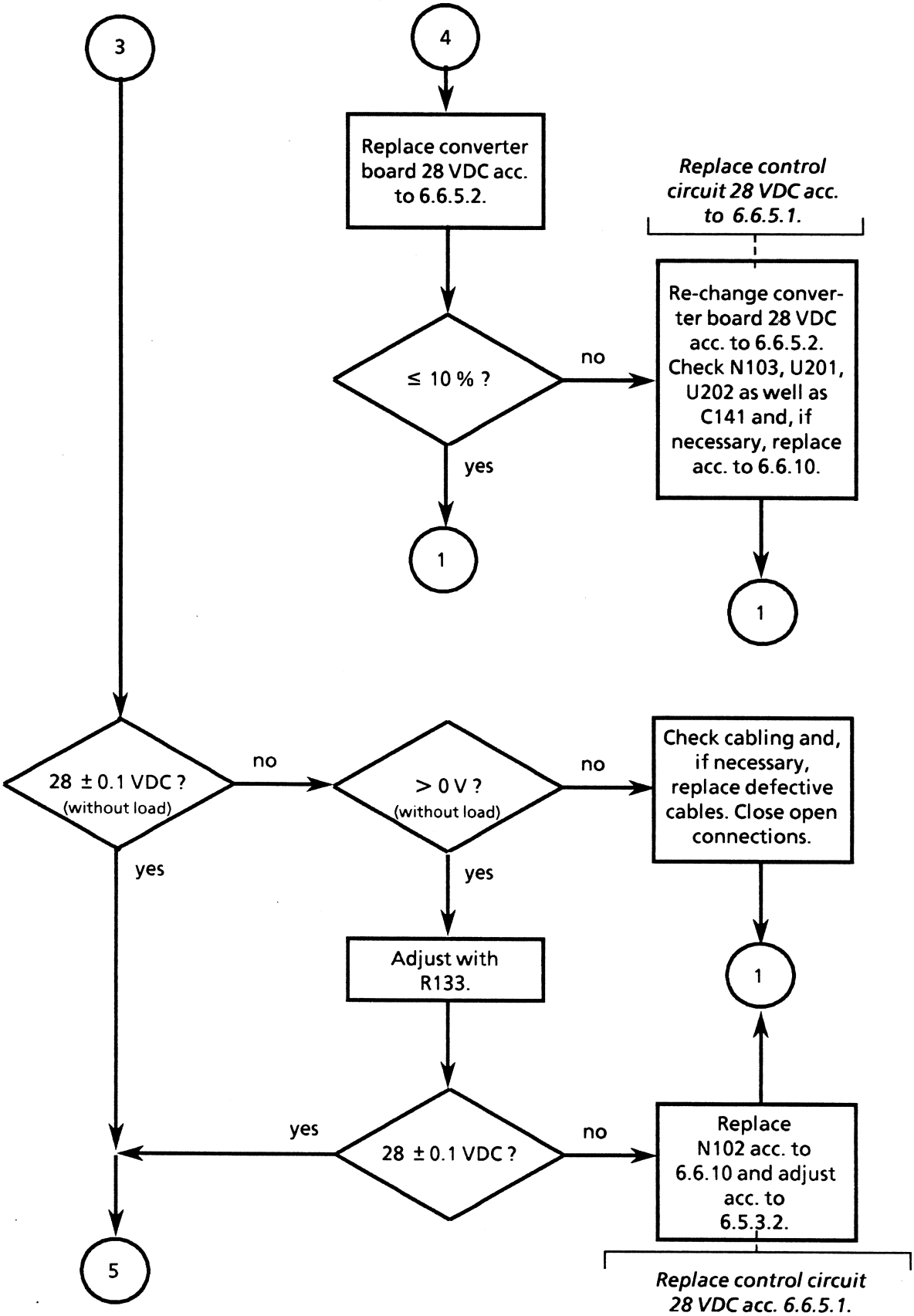


Fig. 6.5 Troubleshooting Flowchart, 28-VDC Converter (page 3 of 7)

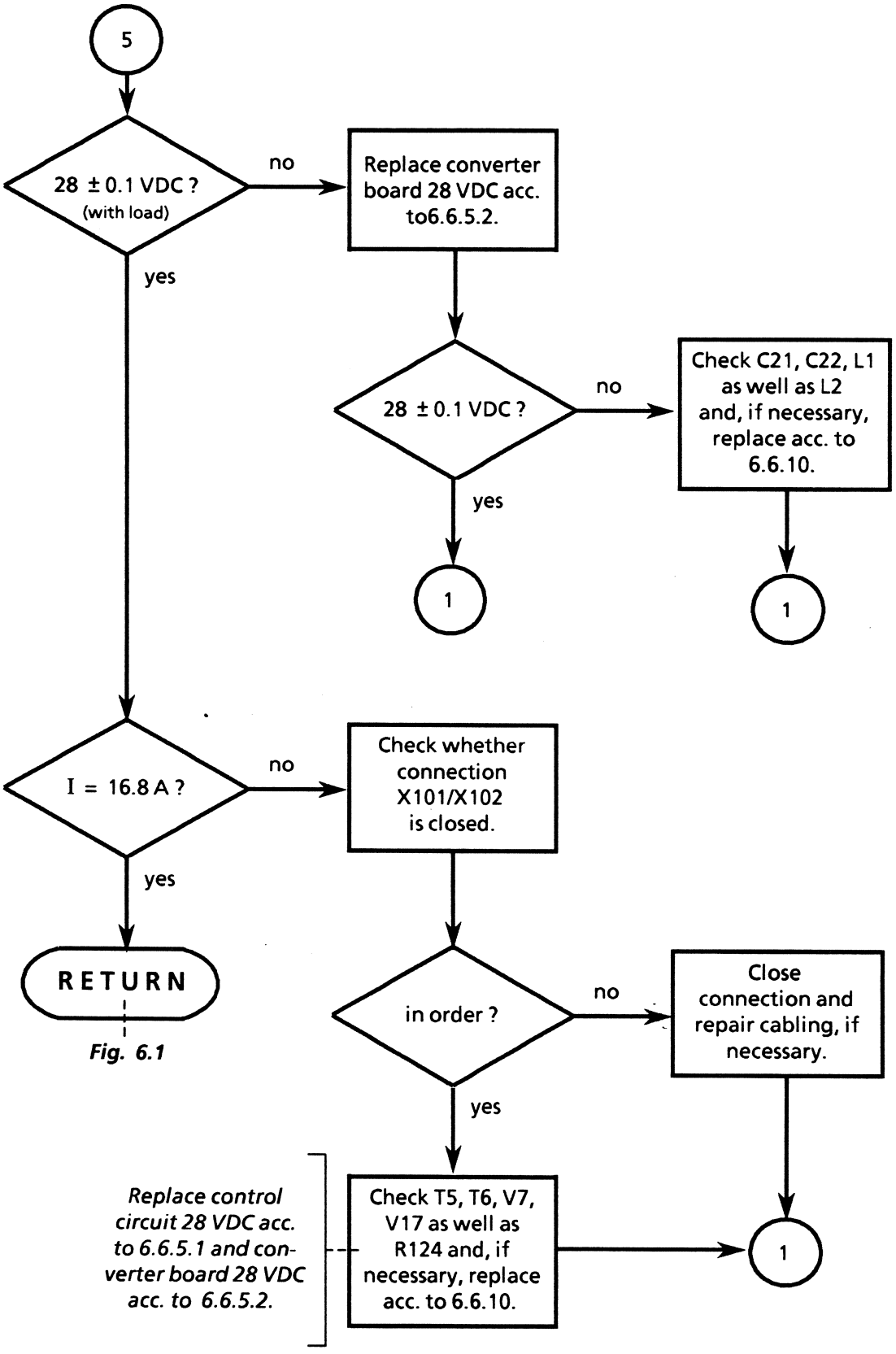


Fig. 6.1

Fig. 6.5 Troubleshooting Flowchart, 28-VDC Converter (page 4 of 7)

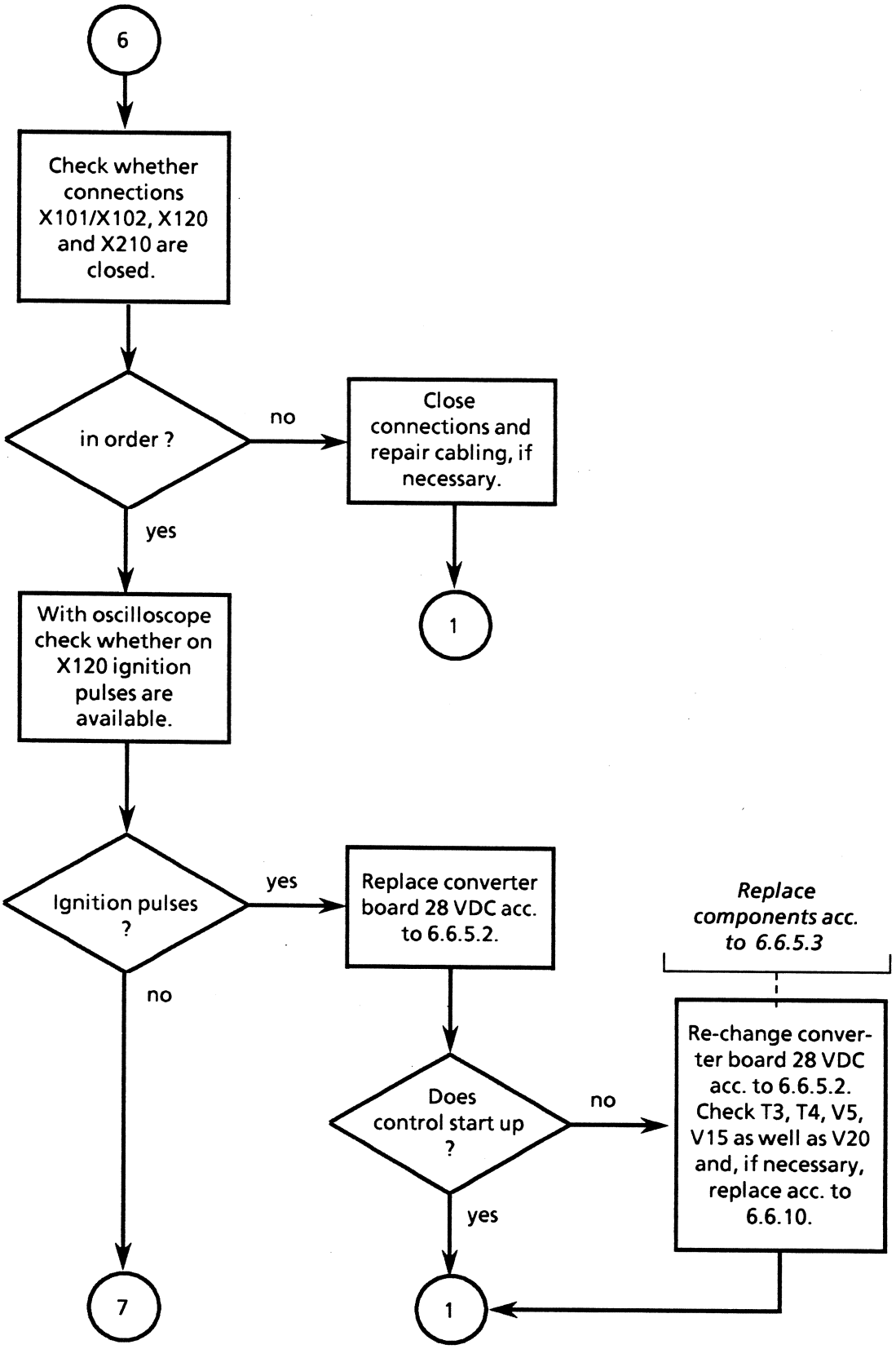


Fig. 6.5 Troubleshooting Flowchart, 28-VDC Converter (page 5 of 7)

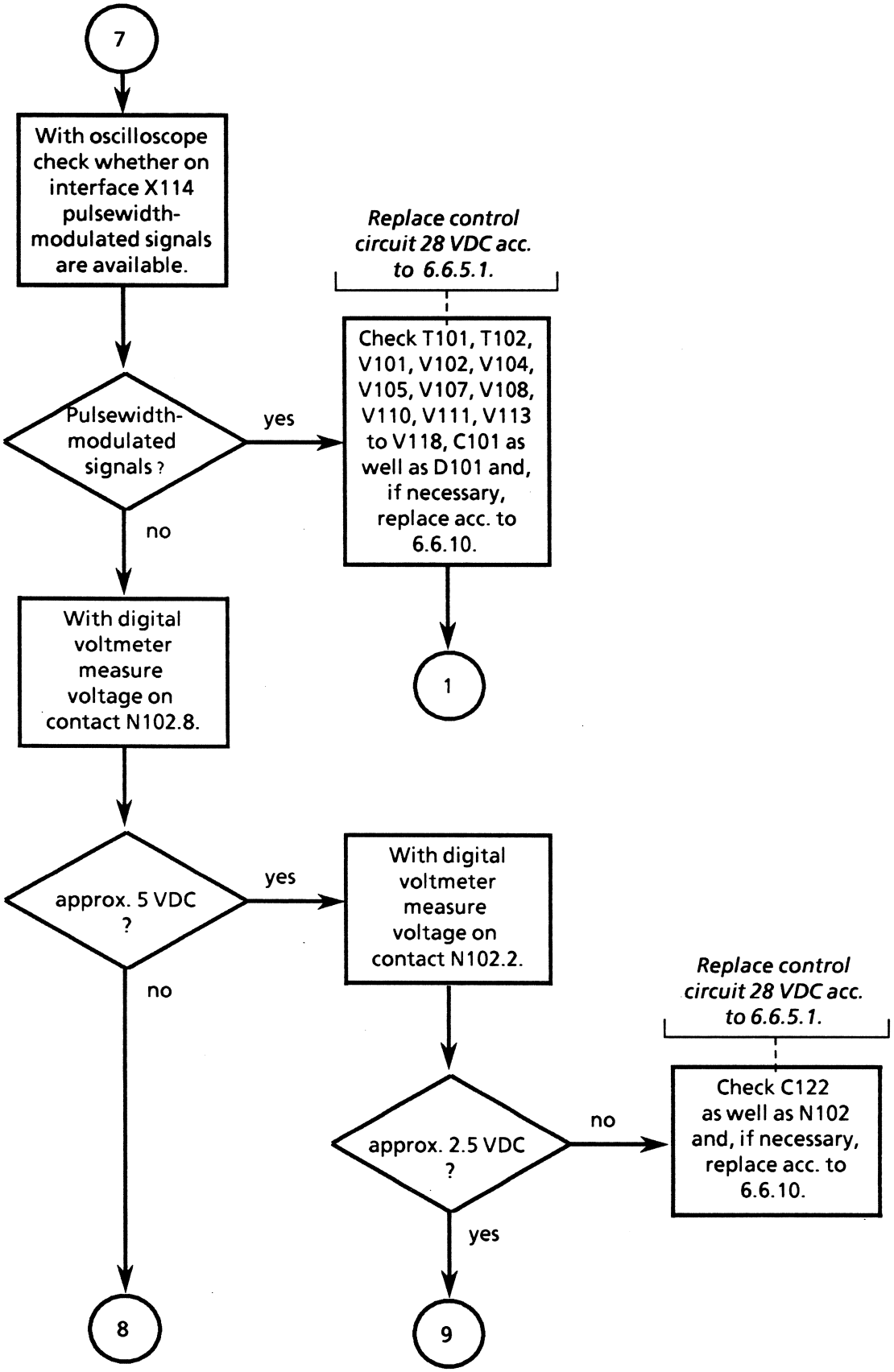


Fig. 6.5 Troubleshooting Flowchart, 28-VDC Converter (page 6 of 7)

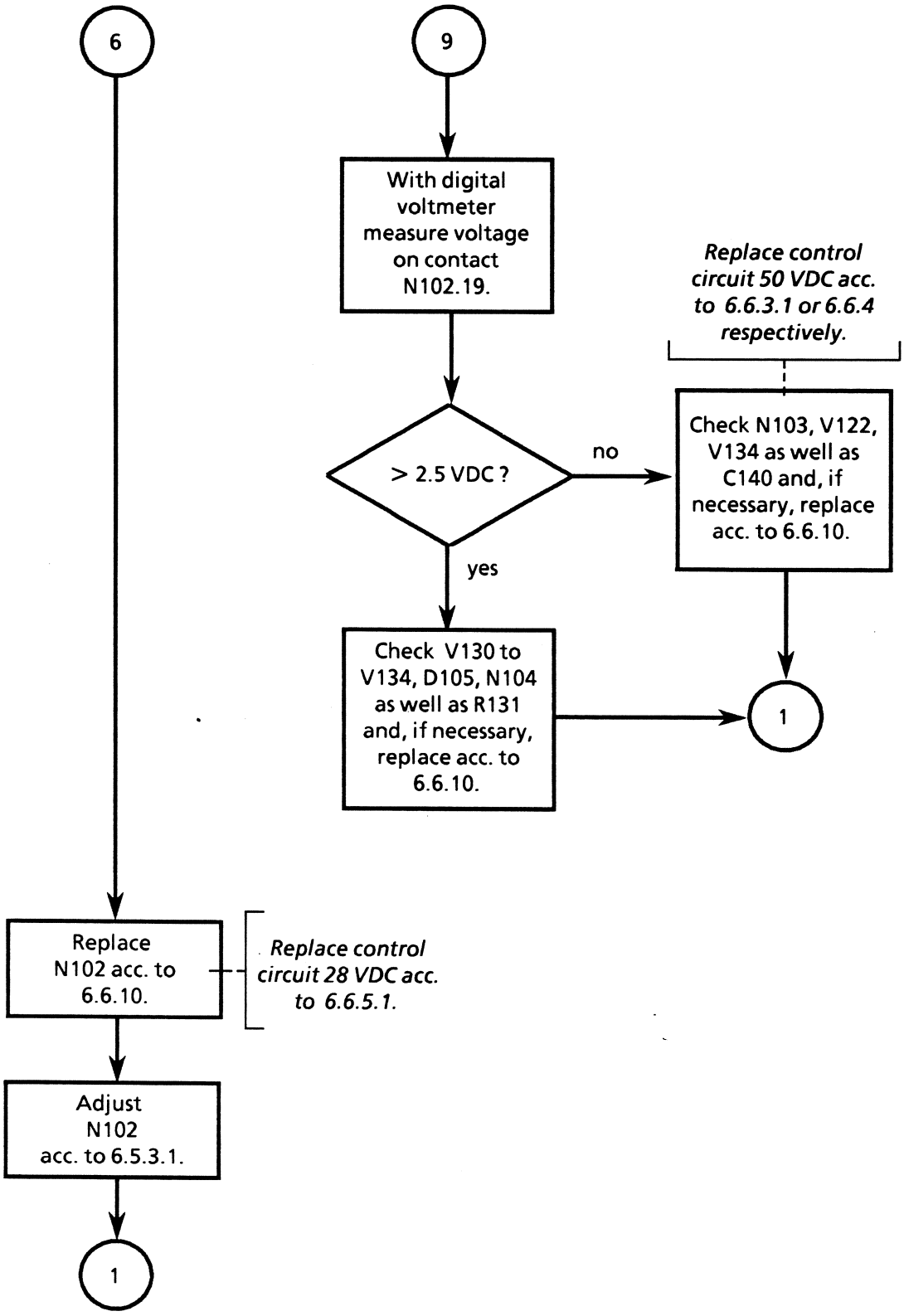


Fig. 6.5 Troubleshooting Flowchart, 28-VDC Converter (page 7 of 7)

6.4 Measurements and Functional Tests

The measurements and functional tests that are described below are the more detailed procedures to the instructions given in condensed form in the troubleshooting flowcharts. Consequently one will usually undertake these measurements and functional tests by branching out of the troubleshooting flowcharts at a particular point. When the measurement etc. has been performed, return to the troubleshooting at the same point where it has been left.

If a fault has been clearly identified beforehand, however, one can of course commence with one of these measurements etc. directly.

6.4.1 Housing (A50)

(see circuit diagram 681.0018.01S)

6.4.1.1 Check of LEDs and Blowers

1. Arrange test set-up acc. to Fig. 6.6.
2. Switch on Power Supply IN 859C1.
3. On variable separating transformer slowly increase output voltage until the nominal voltage (380 VAC) is reached and observe input current, LEDs MAINS and 28 VAC as well as the blowers.

   Nominal values: $I < 1A$
   blowers are on
   LEDs are illuminated

   Note:

   For voltage increase observe maximum current.
4. Via test adapter (Fig. 6.9) switch on the two 50-VDC converters (S1.1 = S1.2 = high) and observe LEDs 50 VDC (I) and 50 VDC (II).

   Nominal value: LEDs are illuminated
5. After the functional check has been terminated perform steps 1 and 2 in the reverse order.

6.4.1.2 Measuring Input Voltage for Converters

1. Remove cover acc. to 6.6.1.
2. Undo and remove eight M4 x 8 screws (4, Fig. 6.11) fixing the right side panel to the power supply.
3. Pull off three flat sleeves on filter Z4 (1, Fig. 6.12).
4. Press straps on socket and pull off socket from 6-way male connector strip X11 (1, Fig. 6.13).
5. Remove right side panel.
6. Check whether insulated wire is located correctly between soldering tags 4 and 8 (for 380-VAC operation). If necessary, solder insulated wire in anew.
7. Press straps on socket and pull off socket from 6-way male connector strip X20 (3).
8. Arrange test set-up acc. to Fig. 6.6.
9. Switch on Power Supply IN 859C1.
10. On variable separating transformer set output voltage to 380 VAC.
11. With digital voltmeter measure voltage between contacts X20.4 (+) and .5 (-), .1 (+) and .2 as well as .6 (+) and .3 (-).

    Nominal value: 535_{-10} VDC
12. After the functional check perform steps 1 to 9 in the reverse order.

6.4.1.3 Measuring 12-VDC Auxiliary Voltage

1. Remove cover acc. to 6.6.1.
2. Push locking devices on 10-way male connector strips X23 (2, Fig. 6.12), X33 (3) and X43 (4) sideways and pull off sockets.
3. Arrange test set-up acc. to Fig. 6.6.
4. Switch on Power Supply IN 859C1.
5. On variable separating transformer set output voltage to 380 VAC.
6. With digital voltmeter measure voltage between contacts X23.2 and .1 (ground), X33.2 and .1 (ground) as well as X43.2 and .1 (ground).

   Nominal value: 12 ± 1 VDC
7. After the functional perform steps 1 to 4 in the reverse order.

6.4.1.4 Measuring Nominal Voltage

1. Remove cover acc. to 6.6.1.
2. Push locking devices on 10-way male connector strips X23 (2, Fig. 6.12) and X33 (3) sideways and pull off sockets.
3. Arrange test set-up acc. to Fig. 6.6.
4. Switch on Power Supply IN 859C1.
5. On variable separating transformer set output voltage to 380 VAC.
6. Via test adapter (Fig. 6.9) switch on the two 50-VDC converters (S1.1 = S1.2 = high) and set to 50 VDC (S1.5 = S1.7 = high and S1.6 = low).
7. With digital multimeter measure voltage between contacts X23.7 and .1 (ground) as well as X33.7 and .1 (ground).

   Nominal value: 5 ± 0.1 VDC
8. After the functional check perform steps 1 to 4 in the reverse order.

6.4.1.5 Functional Check of Switchover Operation

1. Arrange test set-up acc. to Fig. 6.6.
2. On interface X74 set supply voltage to 28 + 0.5 VDC and switch on.

   Nominal value: both blowers are active
3. Connect adjustable resistor R_L between contacts X75.3 and .5 (ground).
4. Set output current on interface X75 via resistor R_L to 10 A and measure output voltage.

   Nominal value: ≥ 27 VDC (≥ V_{in} -1 V)
5. Repeat measurement for contacts X75.4 and .2 (ground = .5).
6. After the functional check has been terminated perform steps 1 and 2 in the reverse order.

6.4.2 Filtering Circuit (A501)

(see circuit diagram 681.0018.01S)

6.4.2.1 Functional Check of Phase Monitoring

1. Remove filtering circuit acc. to 6.6.6.
2. Connect variable separating transformer to contacts X10.1 and .4.
3. Solder in insulated wire between soldering tags 3 and 8.

CAUTION

When reinstalling the filtering circuit the insulated wire has to be soldered in in the original position.

4. With digital voltmeter measure voltage between contacts X30.A1 and .A4 (ground).

   Nominal value: ≤ 5 VDC

6. After the functional check has been terminated perform steps 1 and 3 in the reverse order.

6.4.2.2 Measuring Auxiliary Voltage

1. Remove filtering circuit acc. to 6.6.6.

2. Connect variable separating transformer to contacts X10.1 and .4. In addition, connect contacts X10.4 and .2 to each other.

3. Solder in insulated wire between soldering tags 3 and 8.

CAUTION

When reinstalling the filtering circuit the insulated wire has to be soldered in in the original position.

4. With digital voltmeter measure voltage between contacts X30.A1 and .A4 (ground).

   Nominal value: 12 ± 1 VDC

5. After the functional check has been terminated perform steps 1 to 3 in the reverse order.

6.4.3 Control Circuit (A10)

(see circuit diagram 681.0018.01S)

6.4.3.1 Measuring 5.2-VDC Voltage

1. Remove control circuit acc. to 6.6.2.

2. Connect power supply to contacts X5.8 (+) and .9 (-).

3. Set output voltage of the power supply to 12 VDC and switch on.

4. With digital multimeter measure voltage on contact N2.5.

   Nominal value: 5.2 ± 0.01 VDC

   For deviations from the nominal value adjust with resistor R19.

5. After the measurement has been terminated perform steps 1 to 3 in the reverse order.

6.4.3.2 Measuring Clock Frequency

1. Remove control circuit acc. to 6.6.2.

2. Connect power supply to contacts X5.8 (+) and .9 (-).

3. Set output voltage of the power supply to 12 VDC and switch on.

4. Connect contacts X5.17 (DATA 5) and .18 (DATA 6) to + 5 VDC.

5. With frequency counter measure frequency on contacts X23.6, X33.6 and X43.6.

   Nominal value: 100 ± 0.050 kHz

6. Connect contact X5.17 (DATA 5) to ground.

7. With frequency counter measure frequency on contacts X23.6, X33.6 and X43.6.

   Nominal value: 100.1 ± 0.050 kHz

8. Connect contact X5.18 (DATA 6) to ground.

9. With frequency counter measure frequency on contacts X23.6, X33.6 and X43.6.

   Nominal value: 98.04 ± 0.050 kHz

10. After the measurement has been terminated perform steps 1 to 3 in the reverse order.

6.4.3.3 Measuring CM Signal

1. Remove control circuit acc. to 6.6.2.
2. Connect power supply to contacts X5.8 (+) and .9 (-).
3. Set output voltage of power supply to 12 VDC and switch on.
4. Connect contacts X23.8, X33.8 and X43.8 to + 12 VDC.
5. With digital multimeter measure voltage on contact X5.11.

   Nominal value: ≥ 4.5 VDC
6. Connect in turn one, two and all contacts mentioned in step 4 to ground and measure voltage on contact X5.11.

   Nominal value: ≤ 0.1 VDC
7. Connect contacts X23.8 and X33.8 to ground and X43.8 to + 12 VDC.
8. Connect oscilloscope to contact X5.11.
9. Connect contact X5.19 (DATA 3) to + 12 VDC and measure time until on contact X5.11 a high pulse appears.

   Nominal value: 2 ± 1 s

10 Repeat measurement with contact X5.16 (DATA 4) being connected to 12 VDC.

11. Perform steps 1 to 3 in the reverse order.

6.4.3.4 Functional Check of BCD / Decimal Converter

1. Remove control circuit acc. to 6.6.2.
2. Connect power supply to contacts X5.8 (+) and .9 (-).
3. Set output voltage of the power supply to 12 VDC and switch on.
4. Connect contacts X5.12 (DATA 0), .13 (DATA 1) and .14 (DATA 2) acc. to the table to + 12 VDC (= H) and ground (L) and with digital multimeter measure voltage on contacts X23.7 and X33.7.

   Nominal value:

X5 .12, .13, .14	X23 / X33
L L L	4.5 ± 0.10 VDC
H L L	4.6 ± 0.10 VDC
L H L	4.7 ± 0.10 VDC
H H L	4.8 ± 0.10 VDC
L L H	4.9 ± 0.10 VDC
H L H	5.0 ± 0.10 VDC
L H H	5.1 ± 0.10 VDC
H H H	5.2 ± 0.10 VDC

5. Perform steps 1 to 3 in the reverse order.

6.4.4 50-VDC Converters (A20 / A30)

(see circuit diagram 681.1266.02S)

6.4.4.1 Functional Check of Synchronization

1. Remove 50-VDC converter A20 acc. to 6.6.3 and A30 acc. to 6.6.4.
2. Undo and remove 17 M2.5 x 5 screws (1, Fig. 6.14) fixing the screening hood to the 50-VDC converter.
3. Remove hood.
4. Connect power supply to contacts X110.2 (+) and .1 (-).

5. Set output voltage of the power supply to 12 VDC and switch on.

6. Connect rectangular-wave generator to contact X110.6.

7. Set output frequency of the generator to 100 kHz and switch on.

8. With frequency counter measure frequency on interface X113.

   Nominal value: 100 kHz

9. Repeat functional check at frequencies of 90 and 110 kHz.

10. Perform steps 1 to 7 in the reverse order.

6.4.4.2 Functional Check of Control Loop

1. Remove 50-VDC converters A20 and A30 acc. to 6.6.3 and 6.6.4 respectively.

2. Undo and remove 17 M2.5 x 5 screws (1, Fig. 6.13) fixing the screening hood to the 50-VDC converter.

3. Remove hood.

4. Undo and remove five M3 x 10 screws fixing the printed circuit board "Control circuit 50 VDC" (A102) to the 50-VDC converter.

5. Laterally fold back printed circuit board.

6. Remove protective plate.

7. On the printed circuit board of converter 50 VDC (A101) check whether insulated jumper(s) has (have) been soldered in correctly between soldering tags 1 to 4 acc. to the available mains voltage. If necessary, solder in insulated jumper(s) anew.

8. Arrange test set-up acc. to Fig. 6.7.

9. Set resistance of load resistor R_L to 5 Ω.

10. On test adapter (Fig. 6.10) close switch "ON".

11. Slowly increase output voltage of power supply unit on connector X100 to 150 VDC and in doing so observe input current (short circuit!).

12. Increase nominal voltage (5-VDC power supply). With oscilloscope monitor voltage on common contact of diodes V5, V15 and V20 (15, Fig. 6.14) and with digital voltmeter measure voltage on interface X150.

    Nominal value: at approx. 9 VDC (X150) control sets in and oscilloscope shows roughly the same pulse voltages for both halves of the converter

13. Increase output voltage of power supply on connector X100 to 510 VDC.

14. Set nominal voltage to 5 ± 0.01 VDC.

15. With oscilloscope measure unbalance between the halves of the converter.

    Nominal value: ≤ 10 %

16. With digital voltmeter measure voltage on contact X150A (B = ground).

    Nominal value: 50 ± 0.25 VDC

17. With load resistor R_L set output current of 30 A and with digital voltmeter measure voltage on contact X150A (B = ground).

    Nominal value: 50 ± 0.25 VDC

18. Reduce output voltage of power supply on connector X100 to 425 VDC and repeat measurement acc. to step 17.

19. Set switching regulator acc. to 6.5.3.1.

20. Perform steps 1 to 8 in the reverse order.

6.4.5 28-VDC Converter (A40)

(see circuit diagram 734.9194.01S)

6.4.5.1 Functional Check of Synchronization

1. Remove 28-VDC converter A40 acc. to 6.6.5.
2. Undo and remove 11 M2.5 x 5 screws (1, Fig. 6.15) as well as two M3 x 8 screws fixing the screening hood to the 28-VDC converter.
3. Remove the hood.
4. Connect power supply to contacts X110.2 (+) and .1 (-).
5. Set output voltage of the power supply to 12 VDC and switch on.
6. Connect rectangular-wave generator to contact X110.6.
7. Set output frequency of the generator to 100 kHz and switch on.
8. With frequency counter measure frequency on interface X113.

   Nominal value: 100 kHz
9. Repeat functional check at frequencies of 90 and 110 kHz.
10. Perform steps 1 to 7 in the reverse order.

6.4.5.2 Functional Check of Control Loop

1. Remove 28-VDC converter acc. to 6.6.5.
2. Undo and remove 11 M2.5 x 5 screws (1, Fig. 6.15) and two M3 x 8 screws (2) fixing the screening hood to the 28-VDC converter.
3. Remove the hood.
4. Undo and remove four M3 x 12 screws (3) fixing the printed circuit board "Control 28 VDC" (A102) to the 28-VDC converter.
5. Laterally fold back printed circuit board.
6. Remove protective plate.
7. On converter board 28 VDC (A101) check whether insulated jumper(s) has (have) been soldered in correctly between soldering tags 1 to 14 according to the available mains voltage. If necessary, solder in insulated jumper(s) anew.
8. Arrange test set-up acc. to Fig. 6.8.
9. Set resistance of load resistor R_L to 5 Ω.
10. On test adapter (Fig. 6.10) open switch 'ON'.
11. Slowly increase output voltage of power supply on connector X100 to 150 VDC and simultaneously observe input current (short circuit!!).
12. By means of oscilloscope observe voltage on the common contact of diodes V5, V15 and V20 (10, Fig. 6.15)

    Nominal value: oscilloscope shows roughly the same pulse voltages for either of the converter halves.
13. Increase output voltage of power supply unit on connector X100 to 515 VDC.
14. By means of oscilloscope measure unbalance between the two converter halves.

    Nominal value: ≤ 10%
15. With load resistor R_L set output current of 16.8 A and with digital voltmeter measure voltage on contact X150A (B = ground).

    Nominal value: 28 ± 0.1 VDC

    For deviations from the nominal value align with adjustable resistor R133.
16. Reduce output voltage of power supply unit on connector X100 to 425 VDC and repeat measurement acc. to step 14.
17. Set switching regulator acc. to 6.5.3.2.
18. Perform steps 1 to 8 in the reverse order.

6.5 Setting and Alignment

Within repair of the power supply no special alignment is required.

6.5.1 Setting of Operating Voltage

1. If the power supply is still installed in the 19" rack proceed acc. to the following steps:

   a) Switch off power supply.

   b) Undo four screws (1, Fig. 6.11) fixing the power supply to the rack.

   c) Carefully pull out power supply until a resistance is felt.

   d) Press securing devices (2) preventing the power supply from falling out of the rack upwards on both sides and pull out power supply completely.

2. Place power supply in such a way that the cover and side panels are accessible.

3. Undo and remove 22 M3 x 8 screws (3) fixing the cover to the power supply.

4. Remove cover.

5. Undo eight M4 x 8 screws (4) fixing the right side panel to the power supply.

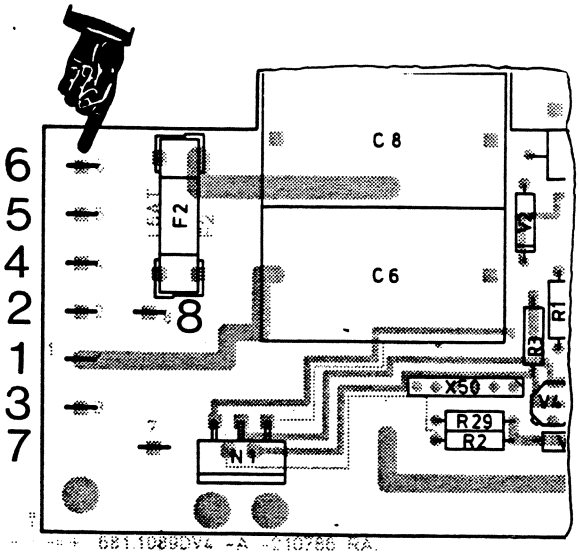
6. Pull off three flat sleeves from filter Z4 (1, Fig. 6.12).

7. On printed circuit board "Filtering circuit" (A501) press straps on sockets and pull off socket from 6-way plug X11 (1, Fig. 6.12).

8. Remove right side panel.

9. On printed circuit board A501 (see figure and components layout 681.1072.01) unsolder insulated jumper between soldering tags 8 and 2 or 3 (4 to 6) and solder back in according to the table.

Voltage	Soldering tags
200 VAC	2 / 8
220 VAC	3 / 8
380 VAC	4 / 8
400 VAC	5 / 8
440 VAC	6 / 8



10. For 50-VDC converters proceed acc. to the following steps:

    a) On printed circuit board "Control circuit" (A10) press locking devices on 10-way male connector strip X23 (2, Fig. 6.21) or X33 (3) respectively sideways and pull off sockets.

    b) For removal of 50-VDC converter A20, additionally press the locking devices on 10-way male connector strip X43 (4) located on printed circuit board A10 sideways and pull off socket.

    c) Press straps on socket and pull off socket from 2-way male connector strip X100 (5).

    d) Undo two screws securing the plug and pull off plug from 3-way female connector strip X150 (6).

e) Undo two screws (M6 x 30) through the openings (7) in the screening hood.

f) Carefully pull out 50-VDC converter on screening hood.

g) Undo and remove 17 M2.5 x 5 screws (12, Fig. 6.14) fixing the screening hood to the 50-VDC converter.

h) Remove screening hood.

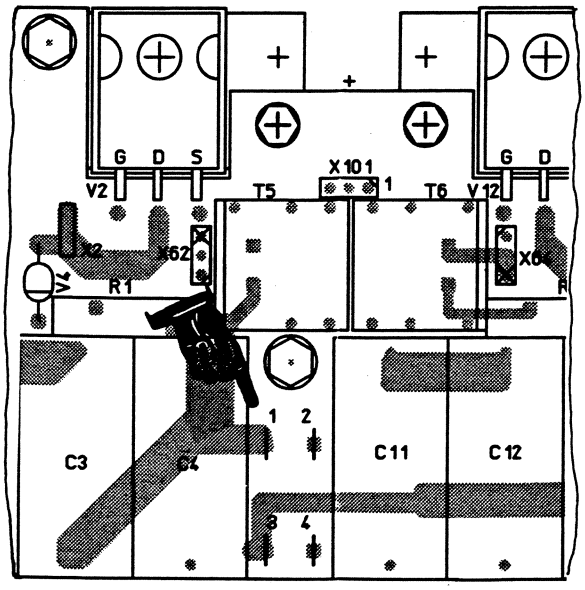
i) Undo and remove five M3 x 10 screws (2) fixing the PCB "Control circuit 50 VDC" (A102) to the 50-VDC converter.

j) Laterally fold back printed circuit board. If necessary, the printed circuit board can also be removed. For this purpose on PCB "Control circuit 50 VDC" pull off sockets from male connector strips X102 (4-way - 3), X103 (6-way - 4), X112 (2-way - 5), X120 (11-way - 6) and X210 (3-way - 7).

k) Remove protective plate.

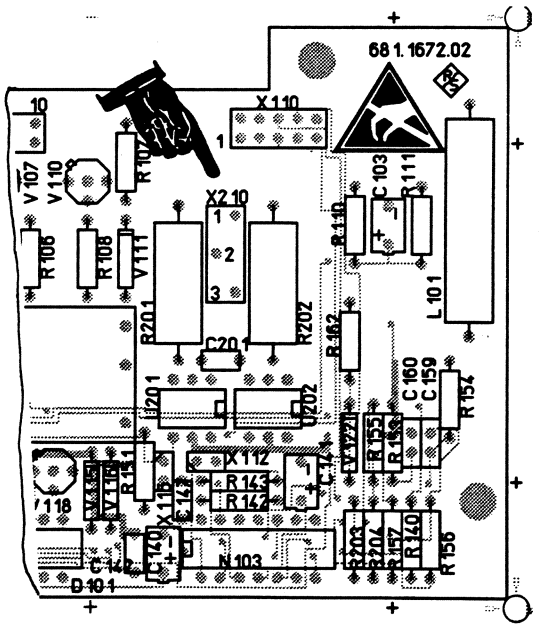
l) On printed circuit board "Converter board 50 VDC " (A101) carefully unsolder insulated jumper(s) between soldering tags 1 and 4 (see figure as well as component layout 734.9059) and solder back in according to the table.

Voltage	Soldering tags
200 VAC	1 / 4 and 2 / 3
220 VAC	1 / 4 and 2 / 3
380 VAC	1 / 2
400 VAC	1 / 2
440 VAC	1 / 2



m) The following is only to be performed if the 50-VDC converter is set to an operating voltage of 200 or 220 VAC.

Pull off socket from 3-way connector strip X210 (see figure as well as components layout 681.1672) and connect again to X210 one position in direction of capacitor C201 (parking position).



n) Perform steps a) to k) in the reverse order.

11. For the 28-VDC converter proceed as follows:

a) On printed circuit board "Control circuit" (A10) press locking devices on 10-way male connector strip X43 (4, Fig. 6.12) sideways and pull off socket.

b) Press straps on socket and pull off socket from 2-way male connector strip X100 (5 and 8).

c) Pull off 2-way socket from flat connectors X150A and B (9).

d) Undo and remove the two M4x20 screws (10) fixing rectifier V100 and varistor R100 to the 28-V converter.

e) Carefully remove rectifier and varistor with cable harness.

f) Undo three of four M6 x 30 screws through the openings (11) in the screening hood and the fourth (12) directly.

g) Carefully pull out 28-VDC converter on screening hood.

h) Undo and remove 11 M2.5 x 5 screws (1, Fig. 6.14) as well as two M3 x 8 screws (2) fixing the screening hood to the 28-VDC converter.

i) Remove screening hood.

j) Undo and remove four M3 x 12 screws (3) fixing the printed circuit board "Control circuit 28 VDC" to the converter 28 VDC.

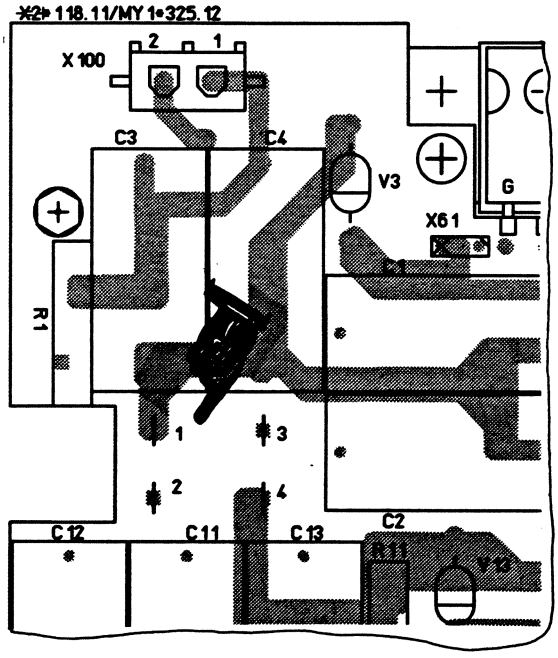
k) Laterally fold back printed circuit board "Control circuit 28 VDC" (A102).

If necessary, the printed circuit board can also be removed. For this purpose, on printed circuit board A102 pull off sockets from 6-way male connector strip X102 (4), 11-way male connector strip X120 (5) and 3-way male connector strip X210 (6).

l) Remove protective plate.

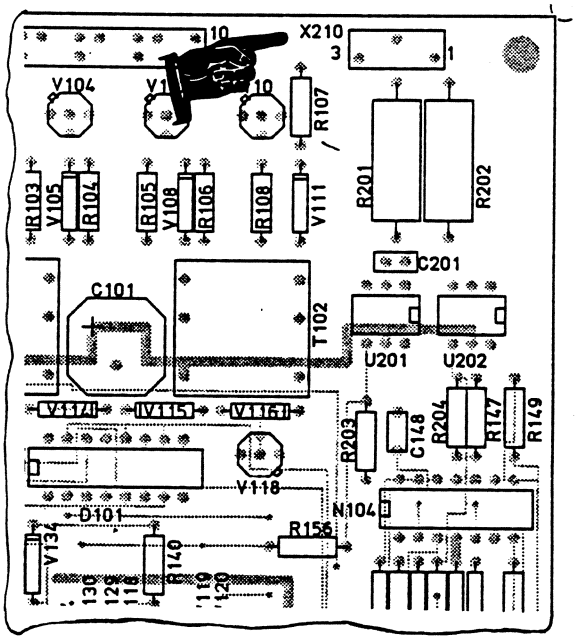
m) On printed circuit board "Converter board 28 VDC" (A101) carefully unsolder insulated jumper(s) between soldering tags 1 to 4 (see figure as well as component layout 734.9007) and solder back in according to the table.

Voltage	Soldering tags
200 VAC	1 / 4 and 2 / 3
220 VAC	1 / 4 and 2 / 3
380 VAC	1 / 2
400 VAC	1 / 2
440 VAC	1 / 2



n) The following has only to be performed, if the 28-VDC converter is set to an operating voltage of 200 or 220 VAC.

Pull off socket from 3-way plug X210 (see figure as well as components lay-out 681.2533) and reconnect it to X210 one position in direction of resistor R107 (parking position).



o) Perform steps a) to l) in the reverse order.

12. Check whether all cable connections undone have been reestablished.

13. Perform steps 1 to 8 in the reverse order.

14. On power switch fix a new label (13, Fig. 6.12) showing to which new operating voltage the power supply has been set.

6.5.2 Setting of Voltage Regulator N2

(see circuit diagram 681.0018.01S, sheet 2)

1. If it has not been done yet, remove control circuit acc. to 6.6.2.

2. Connect power supply unit to contacts X5.1 (+ 12 VDC) and .9 (ground).

3. Set output voltage of power supply to + 12 VDC and switch on unit.

4. Set voltage on contact N2.5 via adjustable resistor R19 to 5.2 ± 0.01 VDC.

5. Switch off power supply.

6. Perform steps 1 and 2 in the reverse order.

6.5.3 Setting of Switching Regulator N102

6.5.3.1 50-VDC Converter

(see circuit diagram 681.1266.01S)

1. If it has not been done yet, remove 50-VDC converter A20 acc. to 6.6.3 and A30 acc. to 6.6.4.

2. Undo and remove 17 M2.5 x 5 screws (1, Fig. 6.14) fixing the screening hood to the 50-VDC converter.

3. Remove screening hood.

4. Arrange test set-up acc. to Fig. 6.7.

5. Set output voltage of power supply unit on connector X100 to 510 VDC and switch on.

6. On test adapter (Fig. 6.10) close switch "ON".

7. Set output current on interface X150 via load resistor R_L to 37 A.

8. With 2-channel oscilloscope measure signals on interface X114. Alter resistance of resistor R124 until oscilloscope indicates low levels instead of pulsewidth-modulated signals.

9. Turn adjustable resistor R131 fully clockwise.

10. Perform steps 1 to 6 in the reverse order.

6.5.3.2 28-VDC Converter

(see circuit diagram 734.9194.01S)

1. If it has not been done yet, remove converter 28 VDC acc. to 6.6.5.
2. Undo and remove 11 M2.5 x 5 screws (1, Fig. 6.15) as well as two M3 x 8 screws (2) fixing the screening hood to the 28-VDC converter.
3. Remove screening hood.
4. Arrange test set-up acc. to Fig. 6.8.
5. Set output voltage of power supply unit on plug X100 to 515 VDC and switch on.
6. On test adapter (Fig. 6.10) open switch 'ON'.
7. Set output current on interface X150 via load resistor R_L to 16.8 A.
8. Set voltage on contact X150A via adjustable resistor R133 to 28 ± 0.1 VDC.
9. Set output current on interface X150 via load resistor R_L to 20 A.
10. With 2-channel oscilloscope measure signals on interface X114. Alter resistance of resistor R124 until the oscilloscope indicates low levels instead of pulsewidth-modulated signals.
11. Turn adjustable resistor R131 fully clockwise.
12. Perform steps 1 to 6 in the reverse order.

6.6 Replacement of Subassemblies and Components

6.6.1 Removing the Cover

1. If Power Supply IN 859C1 is still installed in the 19" rack, proceed according to the following steps:

   a) Switch off power supply.

   b) Undo four screws (1, Fig. 6.11) fixing the power supply to the rack.

   c) Carefully pull out power supply until a resistance is felt.

   d) Press securing devices preventing the power supply from falling out of the rack on both sides upwards and pull out power supply completely.

2. Place power supply in such a way that the cover and side panels are accessible.

3. Undo and remove 22 M3 x 8 screws (3) fixing the cover to the power supply.

4. Remove the cover.

6.6.2 Replacement of Control Circuit (A10)

1. Remove cover acc. to 6.6.1.

2. Press locking devices on 10-way male connector strips X23 (2, Fig. 6.12), X33 (3) and X43 (4) sideways and pull off sockets.

3. Pull off socket from 2 x 12-way male connector strip X5 (14).

4. Undo and remove six M3 x 8 screws (15) fixing the printed circuit board to the housing.

5. Carefully remove printed circuit board to the top. As soon as a resistance is felt, check that none of the mechanical and electrical connections to be undone has been missed. If necessary, undo these connections.

6. Repair or replace removed control circuit.

7. Install a functioning control circuit in the reverse order to steps 1 to 5.

6.6.3 Replacement of 50-VDC Converter (A20)

1. Remove cover acc. to 6.6.1.

2. On printed circuit board "Control circuit" A10 press locking devices on 10-way male connector strips X23 (2, Fig. 6.12) and X43 (4) sideways and pull off sockets.

3. Press straps on sockets and pull off socket from 2-way plug X100 (5).

4. Undo two screws securing the plug and pull it off from 3-way female connector strip X150 (6).

5. Undo two M6 x 30 screws through the openings (7) in the screening hood.

6. Carefully pull 50-VDC converter on screening hood out to the top.

7. Replace removed 50-VDC converter or further disassemble it acc. to 6.6.3.1 to .4.

8. Install functioning 50-VDC converter (A20) in the reverse order to steps 1 to 6.

6.6.3.1 Replacement of Control Circuit 50 VDC (A102)

1. Remove 50-VDC converter acc. to 6.6.3.

2. Undo and remove 17 M2.5 x 5 screws (1, Fig. 6.14) fixing the screening hood to the 50-VDC converter.

3. Remove screening hood.

4. Pull off socket from 4-way male connector strip X102 (3).

5. Pull off socket from 6-way male connector strip X103 (4).

6. Pull off socket from 2-way male connector strip X112 (5).

7. Pull off socket from 11-way male connector strip X120 (6).

8. Pull off socket from 3-way male connector strip X210 (7).

9. Undo and remove five M3 x 10 screws (2) fixing the printed circuit board A102 to the 50-VDC converter.

10. Carefully remove the printed circuit board to the top. As soon as a resistance is felt, check that none of the mechanical and electrical connections to be undone has been missed. If necessary, undo these connections.

11. Repair or replace removed control circuit 50 VDC.

12. Install a functioning control circuit 50 VDC (A102) in the reverse order to steps 1 to 10.

6.6.3.2 Replacement of Converter Board 50 VDC (A101)

1. Remove control circuit 50 VDC acc. to 6.6.3.1.

2. Remove protective plate.

3. Undo and remove the five spacers (8, Fig. 6.14) fixing the printed circuit board A101 to the 50-VDC converter.

4. Carefully remove printed circuit board to the top. As soon as a resistance is felt, check that none of the mechanical and electrical connections to be undone has been missed. If necessary, undo these connections.

5. Repair or replace removed converter board 50 VDC.

6. Install a functioning 50-VDC converter board (A101) in the reverse order to steps 1 to 4.

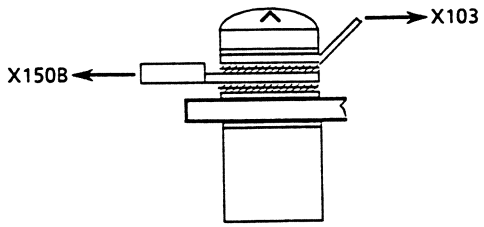
6.6.3.3 Replacement of Capacitor Board (A103)

1. Remove 50-VDC converter acc. to 6.6.3.

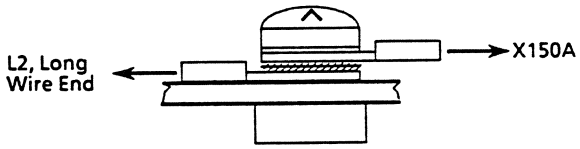
2. Undo and remove 17 M2.5 x 5 screws (1, Fig. 6.14) fixing the screening hood to the 50-VDC converter.

3. Remove screening hood.

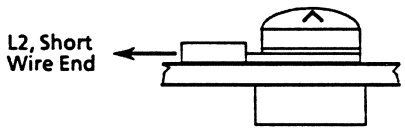
4. Undo and remove M4 x 20 screw (9) fixing a cable terminal as well as a soldering tag to the printed circuit board (see figure below).



5. Undo and remove M5 x 10 screw (10) fixing two cable terminals to the printed circuit board (see figure below).

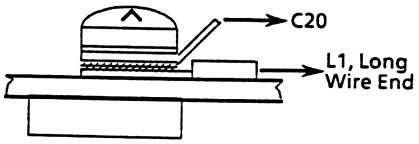


6. Undo and remove M5 x 10 screw (11) fixing a cable terminal to the printed circuit board (see figure below).



7. Undo and remove M3 x 6 screw (12) fixing a soldering tag to the printed circuit board

8. Undo and remove M5 x 10 screw (13) fixing a cable terminal as well as a soldering tag to the printed circuit board (see figure below).



9. Undo and remove four M3 x 8 screws (14) fixing printed circuit board A103 to the 50-VDC converter.

10. Carefully remove printed circuit board to the top. As soon as a resistance is felt, check that none of the mechanical and electrical connections to be undone has been missed. If necessary, undo these connections.

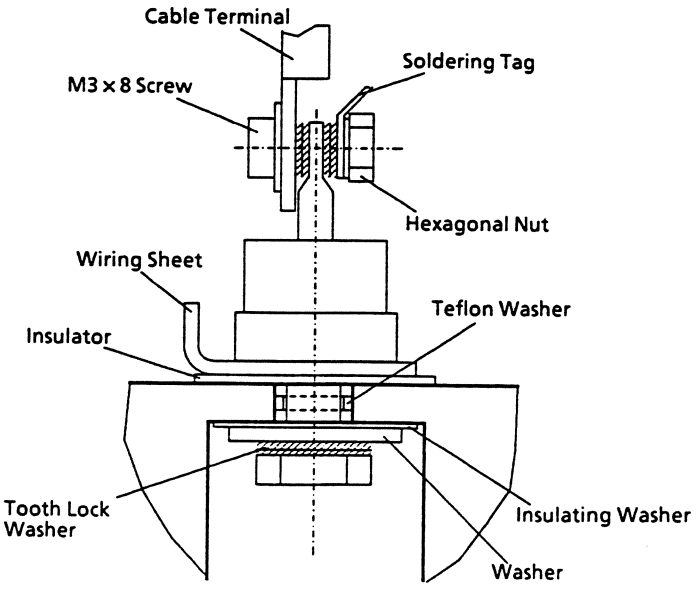
11. Repair or replace removed capacitor board.

12. Install a functioning capacitor board (A103) in the reverse order to steps 1 to 10.

6.6.3.4 Replacement of Components Mounted onto the Heat Sink

Replacement of components mounted onto the heat sink is to be performed acc. to common workshop procedures. Except for the diodes V5, V15 and V20 no special instructions are therefore required.

Install the diodes acc. to the following figure:



6.6.4 Replacement of 50-VDC Converter (A30)

Except for one step the procedure for replacement of the 50-VDC converter A30 is the same as for the 50-VDC converter A20 (see 6.6.3).

In step 2 (see 6.6.3) only the locking devices on 10-way male connector strip X33 (3, Fig. 6.12) have to be pressed sideways and the socket is to be pulled off.

6.6.5 Replacement of 28-VDC Converter (A40)

1. Remove cover acc. to 6.6.1.

2. On the printed circuit board "Control circuit" A10 press locking devices on 10-way male connector strip X43 (4, Fig. 6.12) sideways and pull off socket.

3. Press straps on socket and pull off socket from 2-way plug X100 (5 and 8).

4. Pull off 2-way socket from flat connectors X150A and B (9).

5. Undo and remove the two M4x20 screws (10) fixing rectifier V100 and varistor R100 to the 28-V converter.

6. Carefully remove rectifier and varistor with cable harness.

7. Undo three of four M6 x 30 screws through the openings (11) in the screening hood and the fourth (12) directly.

8. Carefully remove the 28-VDC converter on the screening hood to the top. As soon as a resistance is felt, check that none of the mechanical and electrical connections to be undone has been missed. If necessary, undo these connections.

9. Replace removed 28-VDC converter A40 or further disassemble it acc. to 6.6.5.1 to .3.

10. Install a functioning 28-VDC converter (A40) in the reverse order to steps 1 to 8.

6.6.5.1 Replacement of Control Circuit 28 VDC (A102)

1. Remove 28-VDC converter acc. to 6.6.5.

2. Undo and remove 11 M2.5 x 5 screws (1, Fig. 6.15) as well as two M3 x 8 screws (2) fixing the screening hood to the 28-VDC converter.

3. Remove the screening hood.

4. Pull off socket from 6-way male connector strip X102 (4).

5. Pull off socket from 11-way male connector strip X120 (5).

6. Pull off socket from 3-way male connector strip X210 (6).

7. Undo and remove four M3 x 12 screws (3) fixing the printed circuit board "Control circuit 28 VDC" (A102) to the 28-VDC converter.

8. Carefully remove printed circuit board to the top. As soon as a resistance is felt, check that none of the mechanical and electrical connections to be undone has been missed. If necessary, undo these connections.

9. Repair or replace removed control circuit 28 VDC.

10. Install a functioning control circuit 28 VDC (A102) in the reverse order to steps 1 to 8.

6.6.5.2 Replacement of Converter Board 28 VDC (A101)

1. Remove control circuit 28 VDC acc. to 6.6.5.1.

2. Remove protective plate.

3. Pull off sleeves from flat connector X21 (7, Fig. 6.15).

4. Pull off sleeves from flat connector X23 (8).

5. Pull off sleeves from flat connector X24 (10).

6. Pull off sleeves from flat connector X22 (8).

7. Undo and remove two M4 x 64 screws (11) fixing transformers T3 and T4 to the converter board.

Note:

For installation it has to be ensured that the screws (11) also fix the corresponding spacers (12).

8. Undo and remove four M3 x 6 screws (13) as well as four spacers (14) fixing the printed circuit board A101 to the 28-VDC converter.

9. Carefully remove the printed circuit board to the top. As soon as a resistance is felt, check that none of the mechanical and electrical connections to be undone has been missed. If necessary, undo these connections.

10. Repair or replace removed converter board 28 VDC.

11. Install a functioning converter board 28 VDC (A101) in the reverse order to steps 1 to 8.

6.6.5.3 Replacement of Diodes V5, V15 and V20

1. If the screening hood of the 28-VDC converter has not yet been removed, proceed acc. to the following steps:

   a) Remove 28-VDC converter acc. to 6.6.5.

   b) Undo and remove 11 M2.5 x 5 screws (1, Fig. 6.15) as well as two M3 x 8 screws (2) fixing the screening hood to the 28-VDC converter.

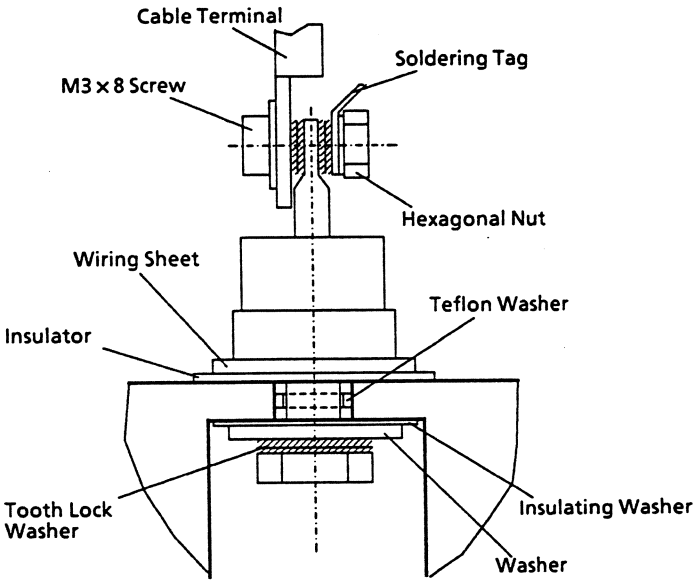
   c) Remove screening hood.

2. Pull off sleeve from flat connector X21 (7) and / or

   sleeve from flat connector X23 (8) and / or

   sleeve from flat connector X24 (9).

3. Remove diodes acc. to the following figure:



4. Replace removed diode(s).

5. Install a functioning diode in the reverse order to steps 1 to 3.

6.6.6 Replacement of Filtering Circuit (A501)

1. Remove cover acc. to 6.6.1.

2. Undo and remove eight M4 x 8 screws (4, Fig. 6.11) fixing the right side panel to the power supply.

3. Pull off three flat sleeves from filter Z4 (1, Fig. 6.12).

4. Press straps on socket and pull off socket from 6-way male connector strip X11 (1, Fig. 6.13).

5. Remove right side panel.

6. Press strap on socket and pull off socket from 6-way male connector strip X10 (2).

7. Press strap on socket and pull off socket from 6-way male connector strip X20 (3).

8. Pull off socket on 2 x 5-way male connector strip X30 (4).

9. Pull off socket from 6-way male connector strip X50 (5).

10. Pull off sleeve from flat connector X502 (6).

11. Pull off sleeve from flat connector X503 (7).

12. Undo and remove M4 x 10 screw (16, Fig. 6.12) fixing a cable terminal (red cable) to diode V104.

13. Undo and remove M4 x 10 screw (17) fixing two cable terminals (black cables) to diode V106.

14. Undo and remove M4 x 10 screw (18) fixing two cable terminals (brown cables) to diode V105.

15. Undo and remove M4 x 10 screw (19) fixing two cable terminals (blue cables) to diode V207.

16. Undo and remove M4 x 8 screw (20) fixing a cable terminal to the terminal strip.

17. Undo and remove two M5 x 10 screws (8, Fig. 6.123 fixing the cable terminals to the printed circuit board.

18. Undo and remove M3 x 8 screws (21, Fig. 6.11) fixing the block to the housing.

19. Undo and remove two M3 x 10 screws (22) fixing the noise-suppressing coil to the housing.

20. Laterally fold back noise-suppressing coil.

21. Undo and remove seven M3 x 12 screws (9, Fig. 6.13) fixing printed circuit board A501 to the housing.

22. Undo and remove M6 x 50 screw fixing transformer T100 to the housing.

23. Carefully take out printed circuit board and transformer. As soon as a resistance is felt, check that none of the mechanical and electrical connections to be undone has been missed. If necessary, undo these connections.

24. Repair or replace removed filtering circuit.

25. Install a functioning filtering circuit (A501) in the reverse order to steps 1 to 23.

6.6.7 Replacement of LED Board (A502)

1. Remove cover acc. to 6.6.1.

2. Undo and remove eight M4 x 8 screws (4, Fig. 6.11) fixing the right side panel to the power supply.

3. Pull off the three flat sleeves from filter Z4 (1, Fig. 6.12).

4. Press straps on socket and pull off socket from 6-way male connector strip X11 (1, Fig. 6.13).

5. Remove right side panel.

6. Pull off socket from 6-way male connector strip X1 (23, Fig. 6.12).

7. Undo and remove the two M3 x 20 screws (1, Fig. 6.16) fixing the printed circuit board to the housing.

8. Carefully remove printed circuit board. As soon as a resistance is felt, check that none of the mechanical and electrical connections to be undone has been missed. If necessary, undo these connections.

9. Repair or replace removed LED board.

10. Install functioning LED board (A502) in the reverse order to steps 1 to 8.

6.6.8 Replacement of Protective Switch K1

1. Remove cover acc. to 6.6.1.

2. Undo and remove eight M4 x 8 screws (4, Fig. 6.11) fixing the right side panel to the power supply.

3. Pull off three flat sleeves from filter Z4 (1, Fig. 6.12).

4. Press straps on socket and pull off socket from 6-way male connector strip X11 (1, Fig. 6.13).

5. Remove right side panel.

6. Pull off three flat sleeves (24, Fig. 6.12) from protective switch K1.

7. Undo and remove four M3 x 8 screws (2, Fig. 6.16) fixing the protective switch to the housing.

8. Remove protective switch.

9. Install a functioning protective switch in the reverse order to steps 1 to 8.

6.6.9 Replacement of Blowers

1. Remove cover acc. to 6.6.1.

2. Pull off two flat sleeves (25, Fig. 6.12) from blower E1 and / or two flat sleeves (26) from blower E2.

CAUTION

Plus pole = brown, minus pole = blue

3. Undo and remove eight M3 x 16 screws (3, Fig. 6.16) fixing the blower to the housing.

4. Remove blower(s).

5. Install a functioning blower in the reverse order to steps 1 to 4.

6.6.10 Replacement of Individual Components

For components which are mounted onto heat sinks proceed acc. to the following steps:

1. Clean heat sink and component from heat-conducting paste.

2. Apply heat-conducting paste thinly and over the whole surface on the heat sink where the component is to be mounted.

3. When mounting a component make sure that the respective component is mounted in a coplanar way.

6.7 Final Test

(see circuit diagram 681.0018.01S)

After repair the power supply should be subjected to the following final test to ensure that its technical data can still be guaranteed.

If this final test is successful, the repair can be regarded as terminated, otherwise, however, the test and troubleshooting acc. to the flowcharts will have to be repeated. This procedure is to be performed as many times as is necessary to detect and eliminate all faults.

6.7.1 Check of LEDs and Blowers

1. Arrange test set-up acc. to Fig.6.6.
2. Switch on Power Supply IN 859C1.
3. Slowly increase output voltage on variable separating transformer to the nominal voltage (380 VAC) and simultaneously observe input current, LEDs MAINS and 28 VDC as well as the blowers.

   Nominal value: for V_{in} = 380 VAC
   I < 1 A
   blowers are running
   LEDs are illuminated
4. Via test adapter (Fig. 6.9) switch on the two converters 50 VDC (S1.1 = S1.2 = high) and observe LEDs 50-VDC-I and II.

   Nominal value: LEDs are illuminated

6.7.2 Check of Output Voltage of 28-VDC Converter

1. Arrange test set-up acc. to Fig. 6.6.
2. Switch on Power Supply IN 859C1.
3. Set output voltage on variable separating transformer to 380 VAC.
4. Measure no-load voltage between contacts X75.3 and .5 (ground).

   Nominal value: 28 + 1.0 / -0.5 VDC
5. Connect adjustable resistor R_L between contacts X75.3 and .5 (ground).
6. Set output current on interface X75 via resistor R_L to 15 A and measure output voltage.

   Nominal value: 28 ± 0.5 VDC
7. Connect adjustable resistor R_L between contacts X73.B2 and .C2 (ground).
8. Set output current on interface X73 via resistor R_L to 5 A and measure output voltage.

   Nominal value: 28 ± 0.5 VDC
9. Repeat measurement for contacts B3 to B5 (ground = C3 to C5).

6.7.3 Check of Output Voltage of 50-VDC Converters

1. Arrange test set-up acc. to Fig. 6.6.
2. Switch on Power Supply IN 859C1.
3. Set output voltage on variable separating transformer to 380 VAC.
4. Via test adapter (fig. 6.9) switch on the two converters 50 VDC (S1.1 = S1.2 = high) and set to 50 VDC (S1.5 = S1.7 = high).
5. Measure no-load voltage between contacts X75.4 and .5 (ground) and X75.2 and .5 (ground) respectively.

   Nominal value: 50 + 1.0 / -0.5 VDC
6. Connect adjustable resistor R_L between contacts X75.4 and .5 (ground) and X75.2 and .5 (ground) respectively.

7. Set output current on interface X75 via resistor R_L to 30 A and measure output voltage.

   Nominal value: 50 ± 0.5 VDC

8. Via test adapter (Fig. 6.9) set the two 50-VDC converters to 52 VDC (S1.5 = S1.6 = S1.6 = high).

9. Set output current on interface X75 via resistor R_L to 30 A and measure output voltage.

   Nominal value: 52 ± 0.5 VDC

10. Via test adapter set the two 50-VDC converters to 45 VDC (S1.5 = S1.6 = S1.6 = low).

11. Set output current on interface X75 via resistor R_L to 30 A and measure output voltage.

    Nominal value: 45 ± 0.5 VDC

6.7.4 Check of Switchover Operation

1. Arrange test set-up acc. to Fig. 6.6.

2. Set power supply on interface X74 to 28 ± 0.5 VDC and switch on.

3. Connect adjustable resistor R_L between contacts X75.3 and .5 (ground).

4. Set output current on interface X75 via resistor R_L to 10 A and measure output voltage.

   Nominal value: ≥ 26.8 VDC

5. Repeat measurement for contacts X75.4 and .2 (ground = .5).

6.7.5 Check for Undervoltage

1. Arrange test set-up acc. to Fig. 6.6.

2. Switch on Power Supply IN 859C1.

3. Set output voltage on variable separating transformer to 320 VAC.

4. Via test adapter (Fig. 6.9) switch on the two converters 50 VDC (S1.1 = S1.2 = high) and set to 52 VDC (S1.5 = S1.6 = S1.7 = high).

5. Connect adjustable resistor R_L between contacts X73.B2 and C2 (ground).

6. Set output current on interface X73 via resistor R_L to 5 A and measure output voltage.

   Nominal value: 28 ± 0.5 VDC

7. Repeat measurement for contacts B3 to B5 (ground = C3 to C5).

8. Connect adjustable resistor R_L between contacts X75.4 and .5 (ground) and X75.2 and .5 (ground) respectively.

9. Set output current on interface X75 via resistor R_L to 30 A and measure output voltage.

   Nominal value: 52 ± 0.5 VDC

6.7.6 Check for Overvoltage

1. Arrange test set-up acc. to Fig. 6.6.
2. Switch on Power Supply IN 859C1.
3. Set output voltage on variable separating transformer to 420 VAC.
4. Via test adapter (Fig. 6.9) switch on the two converters 50 VDC (S1.1 = S1.2 = high) and set to 52 VDC (S1.5 = S1.6 = S1.7 = high).
5. Connect adjustable resistor R_L between contacts X73.B2 and .C2 (ground).
6. Set output current on interface X73 via resistor R_L to 5 A and measure output voltage.

   Nominal value: 28 ± 0.5 VDC
7. Repeat measurement for contacts B3 to B5 (ground = C3 to C5).
8. Connect adjustable resistor R_L between contacts X75.4 and .5 (ground) and X75.2 and .5 (ground) respectively.
9. Set output current on interface X75 via resistor R_L to 30 A and measure output voltage.

   Nominal value: 52 ± 0.5 VDC

6.8 External Interfaces

The external interface descriptions for Power Supply IN 859C1 are contained in the appendix to this Repair Manual.

ROHDE&SCHWARZ

Communications Division

Appendix

INTERFACE DESCRIPTION
CIRCUIT DIAGRAMS
PARTS LISTS
COMPONENTS LAYOUTS

6012.1234 - 8

Interface Description, Power Supply IN 859C1

Contact	Signal Name Description	Direction	Type	Range of Value	Remarks
X71.1	Mains output	test point	power	220 VAC ± 5 % for V_{mains} = nominal voltage, load max. 150 VA	supply for blowers of amplifier
X71.2	Mains output	test point	power	220 VAC ± 5 % for V_{mains} = nominal voltage, load max. 150 VA	supply for blowers of amplifier
X71.3	Protective wire	bidirec-tional	power		
X73.A0	CM power supply	output	high	high = Go 4 VDC ≤ V ≤ 5.2 VDC low = NoGo V ≤ 1 VDC	
X73.A1	Signal ground	bidirec-tional		0 V	A1, B1, C1 parallel
X73.A2	Data 2	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A3	Data 6	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A4	Data 5	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A5	Data 4	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A6	Data 3	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A7	Data 7	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	

Interface Description, Power Supply IN 859C1 (continued)

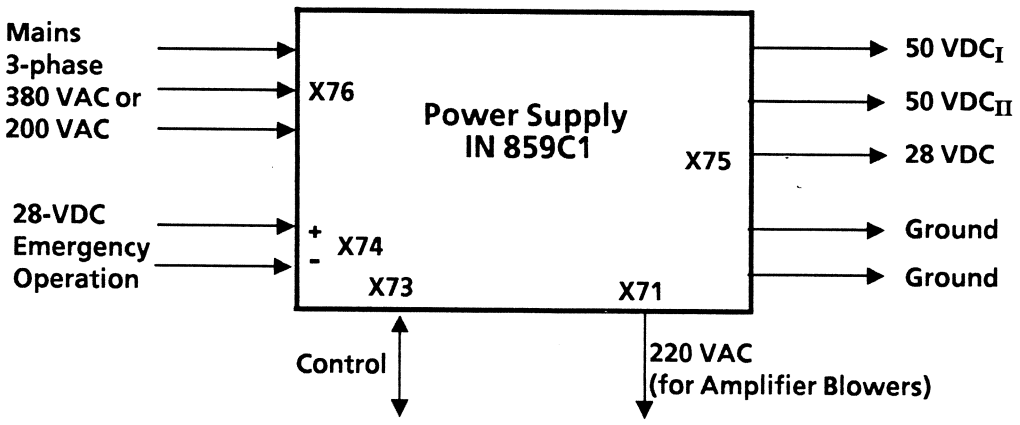
Contact	Signal Name Description	Direction	Type	Range of Value	Remarks
X73.A8	Data 1	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A9	Data 0	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.B1	Signal ground	bidirec-tional		0 V	A1, B1, C1 parallel
X73.B2	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A Vout = 28 + 1 / -0.5 VDC for battery operation: Vout ≥ (V_{batt} -1.2 VDC)	B2, B3, B4, B5 parallel for supply of exciter
X73.B3	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A Vout = 28 + 1 / -0.5 VDC for battery operation: Vout ≥ (V_{batt} -1.2 VDC)	B2, B3, B4, B5 parallel for supply of exciter
X73.B4	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A Vout = 28 + 1 / -0.5 VDC for battery operation: Vout ≥ (V_{batt} -1.2 VDC)	B2, B3, B4, B5 parallel for supply of exciter
X73.B5	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A Vout = 28 + 1 / -0.5 VDC for battery operation: Vout ≥ (V_{batt} -1.2 VDC)	B2, B3, B4, B5 parallel for supply of exciter
X73.C1	Signal ground	bidirec-tional		0 V	A1, B1, C1 parallel
X73.C2	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X73.C3	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter

Interface Description, Power Supply IN 859C1 (continued)

Contact	Signal Name Description	Direction	Type	Range of Value	Remarks
X73.C4	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X73.C5	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X74.2	$-V_{op}$, battery input	input	power	0 V ground	
X74.4	$+ V_{op}$, battery input	input	power	19 to 31 VDC I ≤ 35 A	
X75.1	0 V ground	output	power	0 V	ground for 50 VDC_I, 50 VDC_{II} and 28 VDC
X75.2	50 VDC_{II} DC output	output	power	adjustable between 45 and 52 VDC via data bus $V_{out} = V_{nom} \pm 0.5$ VDC I_{max} = 30 A for battery operation: $V_{out} \geq (V_{batt} - 1.2$ VDC)	
X75.3	28-VDC output	output	power	mains operation: 28 ± 0.5 VDC, I ≤ 16 A Vout = 28 + 1 / -0.5 VDC for battery operation: Vout ≥ (V_{batt} -1.2 VDC)	I_{cont} 16 A I_{peak} 18A protected with 20 A
X75.4	50 VDC_I DC output	output	power	adjustable between 45 and 52 VDC via data bus $V_{out} = V_{nom} \pm 0.5$ VDC I_{max} = 30 A for battery operation: $V_{out} \geq (V_{batt} - 1.2$ VDC)	
X75.5	0 V ground	output	power	0 V	ground for 50 VDC_I, 50 VDC_{II} and 28 VDC
X76.1	Mains input	test point	power	can be set to 200 VDC + 10 / -15 % or 380 / 400 / 440 VDC + 10 / -15 %	3-phase mains input together with X76.2 and .3

Interface Description, Power Supply IN 859C1 (continued)

Contact	Signal Name Description	Direction	Type	Range of Value	Remarks
X76.2	Mains input	test point	power	can be set to 200 VDC + 10 / -15 % or 380 / 400 / 440 VDC + 10 / -15 %	3-phase mains input together with X76.1 and .3
X76.3	Mains input	test point	power	can be set to 200 VDC + 10 / -15 % or 380 / 400 / 440 VDC + 10 / -15 %	3-phase mains input together with X76.1 and .2
X76.4	not connected				
X76.5	Protective wire	bidirec-tional	power		



Interface Description, Housing of Power Supply IN 859C1

Contact	Signal Name / Description	Direction	Type	Range of Value	Remarks
X22	50 VDC_I DC output	output	power	adjustable between 45 and 52 VDC via data bus $V_{out} = V_{nom} \pm 0.5$ VDC $I_{max} = 30$ A	
X23.1	Ground	bidirectional		0 V	
X23.2	+ 12 VDC supply voltage	output	power	12 ± 1 VDC	
X23.3	Ground	bidirectional		0 V	
X23.4	+ 12 VDC supply voltage	output	power	12 ± 1 VDC	
X23.5	ON	output	analog	CMOS output 12 VDC	
X23.6	Clock	output		CMOS output 12 VDC	
X23.7	V_{nom}	output	analog	4.5 ± 0.05 VDC for data 0, 1 , 2 low	
X23.8	CM	input	low	CMOS input 12 VDC	
X23.9	not used				
X23.10	not used				
X32	50 VDC_I DC output	output	power	djustable between 45 and 52 VDC via data bus $V_{out} = V_{nom} \pm 0.5$ VDC $I_{max} = 30$ A	
X33.1	Ground	bidirectional		0 V	
X33.2	+ 12 VDC supply voltage	output	power	12 ± 1 VDC	
X33.3	Ground	bidirectional		0 V	
X33.4	+ 12 VDC supply voltage	output		12 ± 1 VDC	

Interface Description, Housing of Power Supply IN 859C1 (continued)

Contact	Signal Name Description	Direction	Type	Range of Value	Remarks
X33.5	ON	output	analog	CMOS output 12 VDC	
X33.6	Clock	output		CMOS output 12 VDC	
X33.7	V_{nom}	output	analog	4.5 ± 0.05 VDC for data 0, 1 , 2 low	
X33.8	CM	input	low	CMOS input 12 VDC	
X33.9	not used				
X33.10	not used				
X42	28 VDC DC output	output	power	mains operation: 28 ± 0.5 VDC I ≤ 16 A V_{out} = 28 + 1 / -0.5 VDC	I_{cont} 16 A I_{peak} 18 A protected with 20 A
X43.1	Ground	bidirec-tional	power	0 V	
X43.2	+ 12 VDC supply voltage	output	power	12 ± 1 VDC	
X43.3	Ground	bidirec-tional		0 V	
X43.4	+ 12 VDC supply voltage	output	power	12 ± 1 VDC	
X43.5	+ 12 VDC supply voltage	output	power	12 ± 1 VDC	
X43.6	Clock	output		CMOS output 12 VDC	
X43.7	not used				
X43.8	CM	input		CMOS output 12 VDC	
X43.9	not used				
X43.10	not used				

Interface Description, Housing of Power Supply IN 859C1 (continued)

Contact	Signal Name / Description	Direction	Type	Range of Value	Remarks
X71.1	Mains output	test point	power	220 VAC ± 5 % for V_{mains} = nominal voltage, load max. 150 VA	supply for blowers of amplifier
X71.2	Mains output	test point	power	220 VAC ± 5 % for V_{mains} = nominal voltage, load max. 150 VA	supply for blowers of amplifier
X71.3	Protective wire	bidirec-tional	power		
X73.A0	CM power supply	output	high	high = Go 4 VDC ≤ V ≤ 5.2 VDC low = NoGo V ≤ 1 VDC	
X73.A1	Signal ground	bidirec-tional		0 V	A1, B1, C1 parallel
X73.A2	Data 2	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A3	Data 6	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A4	Data 5	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A5	Data 4	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A6	Data 3	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A7	Data 7	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	

Interface Description, Housing of Power Supply IN 859C1 (continued)

Contact	Signal Name / Description	Direction	Type	Range of Value	Remarks
X73.A8	Data 1	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A9	Data 0	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.B1	Signal ground	bidirec-tional		0 V	A1, B1, C1 parallel
X73.B2	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A Vout = 28 + 1 / -0.5 VDC for battery operation: Vout ≥ (V_{batt} -1.2 VDC)	B2, B3, B4, B5 parallel for supply of exciter
X73.B3	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A Vout = 28 + 1 / -0.5 VDC for battery operation: Vout ≥ (V_{batt} -1.2 VDC)	B2, B3, B4, B5 parallel for supply of exciter
X73.B4	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A Vout = 28 + 1 / -0.5 VDC for battery operation: Vout ≥ (V_{batt} -1.2 VDC)	B2, B3, B4, B5 parallel for supply of exciter
X73.B5	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A Vout = 28 + 1 / -0.5 VDC for battery operation: Vout ≥ (V_{batt} -1.2 VDC)	B2, B3, B4, B5 parallel for supply of exciter
X73.C1	Signal ground	bidirec-tional		0 V	A1, B1, C1 parallel
X73.C2	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X73.C3	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter

Interface Description, Housing of Power Supply IN 859C1 (continued)

Contact	Signal Name Description	Direction	Type	Range of Value	Remarks
X73.C4	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X73.C5	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X74.2	$-V_{op}$, battery input	input	power	0 V ground	
X74.4	$+ V_{op}$, battery input	input	power	19 to 31 VDC I ≤ 35 A	
X75.1	0 V ground	output	power	0 V	ground for 50 VDC_I, 50 VDC_{II} and 28 VDC
X75.2	50 VDC_{II} DC output	output	power	adjustable between 45 and 52 VDC via data bus $V_{out} = V_{nom} \pm 0.5$ VDC I_{max} = 30 A for battery operation: $V_{out} \geq (V_{batt} - 1.2$ VDC)	
X75.3	28-VDC output	output	power	mains operation: 28 ± 0.5 VDC, I ≤ 16 A Vout = 28 + 1 / -0.5 VDC for battery operation: Vout ≥ (V_{batt} -1.2 VDC)	I_{cont} 16 A I_{peak} 18A protected with 20 A
X75.4	50 VDC_I DC output	output	power	adjustable between 45 and 52 VDC via data bus $V_{out} = V_{nom} \pm 0.5$ VDC I_{max} = 30 A for battery operation: $V_{out} \geq (V_{batt} - 1.2$ VDC)	
X75.5	0 V ground	output	power	0 V	ground for 50 VDC_I, 50 VDC_{II} and 28 VDC
X76.1	Mains input	test point	power	can be set to 200 VDC + 10 / -15 % or 380 / 400 / 440 VDC + 10 / -15 %	3-phase mains input together with X76.2 and .3

Interface Description, Housing of Power Supply IN 859C1 (continued)

Contact	Signal Name / Description	Direction	Type	Range of Value	Remarks
X76.2	Mains input	test point	power	can be set to 200 VDC + 10 / -15 % or 380 / 400 / 440 VDC + 10 / -15 %	3-phase mains input together with X76.1 and .3
X76.3	Mains input	test point	power	can be set to 200 VDC + 10 / -15 % or 380 / 400 / 440 VDC + 10 / -15 %	3-phase mains input together with X76.1 and .2
X76.4	not connected				
X76.5	Protective wire	bidirec-tional	power		
X201.1	DC voltage	output	power	$V_c \geq (V_{mains} \times \sqrt{2}) - 10$ V	ref. to X201.2
X201.2	DC voltage	output	power	$V_c \geq (V_{mains} \times \sqrt{2}) - 10$ V	ref. to X201.1
X202.1	DC voltage	output	power	$V_c \geq (V_{mains} \times \sqrt{2}) - 10$ V	ref. to X202.2
X202.2	DC voltage	output	power	$V_c \geq (V_{mains} \times \sqrt{2}) - 10$ V	ref. to X202.1
X203.1	DC voltage	output	power	$V_c \geq (V_{mains} \times \sqrt{2}) - 10$ V	ref. to X203.2
X203.2	DC voltage	output	power	$V_c \geq (V_{mains} \times \sqrt{2}) - 10$ V	ref. to X203.1

Interface Description, 50-VDC Converter of Power Supply IN 859C1

Contact	Signal Name / Description	Direction	Type	Range of Value	Remarks
X100.1	DC voltage	input	power	+ 535 -10 VDC for V_{mains} 380 VAC I ≤ 2 A floating	referred to X100.2
X100.2	DC voltage	input	power	-535 -10 VDC for V_{mains} 380 VAC I ≤ 2 A floating	referred to X100.1
X110.1	Ground	bidirec-tional		0 V	
X110.2	+ 12-VDC supply voltage	input	power	12 ± 1 VDC	
X110.3	Ground	bidirec-tional		0 V	
X110.4	+ 12-VDC supply voltage	input	power	12 ± 1 VDC	
X110.5	ON	input	analog	≥ 8.15 VDC	
X110.6	Clock	input		high V ≤ 33 VDC ≤ 2 VDC low V ≤ 0.8 VDC	
X110.7	V_{nom}	input	analog	V = 4.5 to 5.2 ± 0.05 VDC 5 VDC corresponds to 50 V (V_{out})	
X110.8	CM	output	low	high ≥ 10 VDC low ≤ 1 VDC	
X110.9	not used				
X110.10	not used				
X150	50 VDC DC output	output	power	adjustable between 45 and 52 VDC via data bus V_{out} = V_{nom} ± 0.5 VDC I_{max} ≤ 30 A	

Interface Description, 28-VDC Converter of Power Supply IN 859C1

Contact	Signal Name	Signal Description	Direction	Type	Range of Value	Remarks
X100.1	DC voltage		input	power	+ 535 -10 VDC for V_{mains} 380 VAC I ≤ 2 A floating	referred to X100.2
X100.2	DC voltage		input	power	-535 -10 VDC for V_{mains} 380 VAC I ≤ 2 A floating	referred to X100.1
X110.1	Ground		bidirec-tional		0 V	
X110.2	+ 12-VDC supply voltage		input	power	12 ± 1 VDC	
X110.3	Ground		bidirec-tional		0 V	
X110.4	+ 12-VDC supply voltage		input	power	12 ± 1 VDC	
X110.5	+ 12-VDC supply voltage		input	analog	12 ± 1 VDC	
X110.6	Clock		input		high V ≤ 33 VDC ≤ 2 VDC low V ≤ 0.8 VDC	
X110.7	not used					
X110.8	CM		output	low	high ≥ 10 VDC low ≤ 1 VDC	
X110.9	not used					
X110.10	not used					
X150	28 VDC	DC output	output	power	mains operation: 28 ± 0.5 VDC I ≤ 16 A V_{out} = 28 + 1 / -0.5 VDC battery operation = V_{bat}	I_{cont} 16 A I_{peak} 18 A

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = RAL7035 LICHTGRAU VAR 03 = RAL6014 OLIV VAR 04 = RAL7001 MAR.GRAU VAR 11 = RAL6031 BRONZEGN.				
A20	ZE WANDLER 50V TRANSFORMER 50V HIERZ.STROML.681.1266 BL.2 SEE CIRC.DIA.681.1266 BL.2	681.1266.03			
A30	ZE WANDLER 50V TRANSFORMER 50V HIERZ.STROML.681.1266 BL.2 SEE CIRC.DIA.681.1266 BL.2	681.1266.03			
A40	ZE WANDLER 28V TRANSFORMER 28V NUR VAR/ONLY MOD: 11 HIERZ.STROML.681.2179 BL.2 SEE CIRC.DIA.681.2179 BL.2	681.2179.03			
A40	ZE WANDLER 28V NUR VAR/ONLY MOD: 02 03 04 HIERZU STROML.734.9194 S SEE CIRC.DIAG.734.9194 S	734.9194.02			
A50	ZE GEHAEUSE CASE NUR VAR/ONLY MOD: 02 HIERZ.STROML. 681.0018.01S SEE CIRC.DIAG.681.0018.01S	681.0060.02			
A50	ZE GEHAEUSE CASE NUR VAR/ONLY MOD: 03 HIERZ.STROML. 681.0018.01S SEE CIRC.DIAG.681.0018.01S	681.0060.03			
A50	ZE GEHAEUSE CASE NUR VAR/ONLY MOD: 04 HIERZ.STROML. 681.0018.01S SEE CIRC.DIAG.681.0018.01S	681.0060.04			
A50	ZE GEHAEUSE CASE NUR VAR/ONLY MOD: 11 HIERZ.STROML. 681.0018.01S SEE CIRC.DIAG.681.0018.01S	681.0060.11			
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = RAL7035 LICHTGRAU VAR 03 = RAL6014 OLIV VAR 04 = RAL7001 MAR.GRAU VAR 11 = RAL6031 BRONZEGN.				
A10	ED STEUERUNG CONTROL CIRCUIT HIERZU STROML.681.0018.01S SEE CIRC.DIAG.681.0018.01S	681.1014.02			
A501	ED SIEBUNG HIERZ.STROML.681.0018.01S SEE CIRC.DIAG.681.0018.01S	681.1072.02			
A502	ED LED-PLATTE LED BOARD HIERZ.STROML. 681.0018.01S SEE CIRC.DIAG.681.0018.01S	681.0999.02			681.2733.01
E1	EV 119X119X38 50L/S 24V- BLOWER 24V 50L/S	EV 730.9131	PAPST	4124	
E2	EV 119X119X38 50L/S 24V- BLOWER 24V 50L/S	EV 730.9131	PAPST	4124	
K1	SS SCHUTZSCH.MAN.3P.16A SAFETY SWITCH	681.1214	AIRPAX	IEG-111-1-69-16.0-A-	681.2733.01
L1	LD ENTSTOERDR 10A 500V RADIO SCREENING CHOKE	681.1220	SIEMENS	B82504-W-A5	
L2	LD ENTSTOERDR 10A 500V RADIO SCREENING CHOKE	681.1220	SIEMENS	B82504-W-A5	
L3	LD ENTSTOERDR 10A 500V RADIO SCREENING CHOKE	681.1220	SIEMENS	B82504-W-A5	
T100	LT RK AUTO-TRAFO 200-440 TRANSFORMER	681.1243	TALEMA	N.R&S-ZCHNG.681.1243	
X1	BESTEHT AUS/CONSISTING OF 5X FP458.0194 1X 734.9971 1X FP418.0041				734.9836
X5	BESTEHT AUS/CONSISTING OF 11X FP458.0194 1X 734.9959 1X 734.9965 1X FP418.0041				734.9771
X5	BESTEHT AUS/CONSISTING OF 7X FP458.0194 1X 734.9942 1X FP418.0041				734.9842
X10	BESTEHT AUS/CONSISTING OF 5X FP343.4946 1X FP805.7800				734.9794
X11	BESTEHT AUS/CONSISTING OF 2X FP343.4946 1X FP805.7800				734.9765
X20	BESTEHT AUS/CONSISTING OF 6X FP343.4946 1X FP805.7800				734.9820
X22	FM STECKERLEISTE 3 KOAXK MULTIPOINT CONNECTOR	FM 070.0780	CANNON	DAM-3W3P	734.9859
X30	BESTEHT AUS/CONSISTING OF 7X FP458.0194 1X 734.9936 1X FP418.0041				734.9842
X32	FM STECKERLEISTE 3 KOAXK MULTIPOINT CONNECTOR	FM 070.0780	CANNON	DAM-3W3P	734.9859
X50	BESTEHT AUS/CONSISTING OF 5X FP458.0194 1X 734.9988 1X FP418.0041				734.9836
X71	FM BUCHSENLEISTE3P.NETZSP	FM 282.6397	SCHROFF	69001-652	
X73	BESTEHT AUS/CONSISTING OF 20X FM547.0776 1X FM547.0760				734.9771
X74	ZM STECKERLEISTE 2-POL. 2-PIN CONNECTOR	681.0582			
X75	ZM BUCHSENLEISTE 5-POLIG	681.4994			

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
X76 X201 ..203	ZM STECKERLEISTE 4+E BESTEHT AUS/CONSISTING OF 6X FP343.4946 3X FP681.1189	681.0599			734.9820
Z1	LD 20 DB (20MHZ)2X2500 PF LEAD-THROUGH FILTER	LD 006.8061	SIEMENS	B85321-AB06	
Z2	LD 20 DB (20MHZ)2X2500 PF LEAD-THROUGH FILTER	LD 006.8061	SIEMENS	B85321-AB06	
Z3	LD 20 DB (20MHZ)2X2500 PF LEAD-THROUGH FILTER	LD 006.8061	SIEMENS	B85321-AB06	
Z4	LD NETZF.2A 55DB/10MHZ CHOKE	LD 344.1428	CORCOM	2B1	
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS				
	VAR 02 = GRUNDAUSFUEHRUNG				
	MOD 02 = BASIC MODEL				
..	ZUGEH.STROML./CIRC.DIAGR. 681.0018.01 S				
V3	AF HLMP3502 LED GN RD5	235.4862	HEWLETT	HLMP3502	
..6	LED				
X1	FP STIFTLEISTE 36P.R2,54	FP 279.1669	BINDER	742-5-11-0201-00-36	
	PIN CONNECTOR				
	6-POLIG/6 PINS				
					- ENDE -

ROHDE & SCHWARZ	Äl	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock No.	Blatt Page
	05	1290	ED LED-PLATTE LED BOARD	681.0999.01 SA	1-

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL				
..	ZUGEH.STROML./CIRC.DIAGR. 681.0018 S				
C1	CS 330NF 400V 32X18X28 X2 RADIO SCREENING CAPACITOR	681.1237	SIEMENS	B81121-C-B100	
C2	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR	CE 087.0572	ROEDERST	ELKO EK470/40	
C3	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR	CE 087.0572	ROEDERST	ELKO EK470/40	
C4	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
C5 ..8	CS 330NF 400V 32X18X28 X2 RADIO SCREENING CAPACITOR	681.1237	SIEMENS	B81121-C-B100	
C9	CS 100NF+-10%400V/50HZ X2-CAPACITOR	681.1208	SIEMENS	B81121-C-B97	
C10	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR	CE 006.7142	ROEDERST	EK 00 CB 247 G	
C103 ..106	CE 10000UF+-20%63V 40X45 ELECTROLYTIC CAPACITOR	681.2062	VALVO	2222 051 48103	
C107	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	060.1149	UNION CARB	CKO6BX104K	
C108	CC 1UF+-10%50V7K1200VIEL CAPACITOR	084.5538	UNION CARB	CKO6BX105K	
C109	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	060.1149	UNION CARB	CKO6BX104K	
F1	SS SCHMELZS.6,3X32M20A32V FUSE 20A 32V	520.4858	WICKMANN	307.020	
F2	SS SCHMELZS.T1,6DDIN41571 FUSE	SS 020.7500	WICKMANN	T1,6D DIN 41571 TROP	
F3	SS SCHMELZS.T100 DIN41662 FUSE	SS 020.7146	WICKMANN	T0,1 DIN 41662 TROP	
L5	LD ENTSTOERDR 2X1,8MH 10A RADIO-SCREENING-CHOKE	681.1250	HARTMANN	215100-13	
L6	LD ENTSTOERDR 2X1,8MH 10A RADIO-SCREENING-CHOKE	681.1250	HARTMANN	215100-13	
L7	LD ENTSTOERDR 2X1,8MH 10A RADIO-SCREENING-CHOKE	681.1250	HARTMANN	215100-13	
N1	BO L200CV +ADJ2A0 VREGL VOLTAGE REGULATOR	336.7643	SGS	L200CV	
R1	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR	RL 083.0990	DRALORIC	SMA0207/3,32K-F-D	
R2	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R3	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R4	RL 1W 274 KOHM+-1%TK100 METAL FILM RESISTOR	RL 006.5940	RESISTA	MK5 274KOHM 2%TK100	
R5	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R6	RL 1W 274 KOHM+-1%TK100 METAL FILM RESISTOR	RL 006.5940	RESISTA	MK5 274KOHM 2%TK100	
R7	RD 2.4W 4,7KOHM+-3% WIRE-WOUND RESISTOR	RD 087.5197	SAGE	1200S4,7K+3%	
R29	RL 0,35W 681 OHM+-1%TK50 RESISTOR	RL 083.0490	DRALORIC	SMA0207/681OHM-F-D	
R200	RD 2.4W 1,5KOHM+-3% WIRE-WOUND RESISTOR	RD 087.5168	SAGE	1200S 3W TK20	
R201	RD 2.4W 1,5KOHM+-3% WIRE-WOUND RESISTOR	RD 087.5168	SAGE	1200S 3W TK20	
T1	LT TRAFO 2X9V 14VA TRANSFORMER	513.9370	SCHAFFER	KLF 14VA/2X9V	
V2	AD BAV21 250V 0A25 UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V3	BP SFH601-2 OPT.KOPPL.5KV OPTO COUPLER	346.5795	SIEMENS	Q68000-A5058	
V4	AM BSS89 N-E200V MOSF FET	651.7666	SIEMENS	BSS89	
V5	AE BZX79/C15 0,5W ZDI ZENER DIODE	AE 012.2555	VALVO	BZX79/C15 GEGURTET	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
V10	AG B80C700 80V 0A8 BRGL RECTIFIER	AG 092.9345	GEN-INSTR	B80C800DM	
V104 ..106	AG BYW93/200 GL 200V60A0 RECTIFIER	681.2104	VALVO	BYW93/200	
V207	AE BZY91/C33R 100W ZDI# ZENER DIODE	012.4606	VALVO	BZY91/C33R	
X10	FP EINLOETSTECKER 6POL CONNECTOR 6POL	681.1172	AMP	350711-1	
X11	FP EINLOETSTECKER 6POL CONNECTOR 6POL	681.1172	AMP	350711-1	
X20	FP EINLOETSTECKER 6POL CONNECTOR 6POL	681.1172	AMP	350711-1	
X30	FP STECKERLEISTE 36POL. PIN CONNECTOR 2X5POLIG/2X5PINS	FP 279.1669	BINDER	742-5-11-0201-00-36	
X50	FP STECKERLEISTE 36POL. PIN CONNECTOR 6POLIG/6PINS	FP 279.1669	BINDER	742-5-11-0201-00-36	
X502	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
X503	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL				
..	ZUGEH.STROML./CIRC.DIAGR. 681.0018.01 S				
B1	EQ 5,000 MHZ CL30PF HC43U CRYSTAL 5,000MHZ	EQ 091.0280	KRISTALLVE N. R&S	SACHNUMMER	
B2	EQ 5,005 MHZ CL30PF HC43U QUARTZ CRYSTAL UNIT	EQ 091.8339	KRISTALLVE N. R&S	SACHNUMMER	
C5	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
C6	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
C7	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
C14	CC 100PF+-10%200V5K 1200VI CAPACITOR	CC 084.5250	UNION CARB	CKO5BX101K	
C15	CC 33PF+-10%200V5K 1200VIE CAPACITOR	CC 084.5196	UNION CARB	CKO5BX330K	
C16	CC 100PF+-10%200V5K 1200VI CAPACITOR	CC 084.5250	UNION CARB	CKO5BX101K	
C17	CC 33PF+-10%200V5K 1200VIE CAPACITOR	CC 084.5196	UNION CARB	CKO5BX330K	
C18	CE 4,7UF+-20%20V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8110	ROEDERSTEI	ETR 2 4,7/20 20%	
C19	CE 4,7UF+-20%20V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8110	ROEDERSTEI	ETR 2 4,7/20 20%	
C20	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
C21	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
C22	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
C23	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
C24	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
C25	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
C26	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
C27	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CKO5BX104K	
D1	BL 4011BDM 4X2IN.NANDG NAND GATE	587.9116	FAIRCHILD	4011BDM	
D2	BL HEF4522BD BCD COUNTER PROGR.BCD DOWN COUNTER	645.7022	VALVO	HEF4522BD	
D3	BL HEF4522BD BCD COUNTER PROGR.BCD DOWN COUNTER	645.7022	VALVO	HEF4522BD	
D4	BL MC14073BAL 3X3IN. ANDG AND GATE	418.0141	RCA	CD4073BF	
D5	BL CD4051BF 8CH. MUX MULTIPLEXER	517.7520	RCA	CD4051BF	
D6	BL CD4093BF 4XSCHM.TRIG SCHMITT TRIGGER	517.7589	RCA	CD4093BF	
D7	BL MC14071BAL 4X2IN. ORG OR GATE	418.0158	MOTOROLA	MC14071BAL	
D8	BL CD40107BE 2X2INP.BUFF BUFFER	303.1169	RCA	CD40107BE	
D9	BL CD40107BE 2X2INP.BUFF BUFFER	303.1169	RCA	CD40107BE	
D10	BL HEF4104BP 4XCONV. 3S LEVEL CONVERTER	252.7395	VALVO	HEF4104BP	
D11	BL HEF4104BP 4XCONV. 3S LEVEL CONVERTER	252.7395	VALVO	HEF4104BP	
N2	BO L200CH +ADJ2AO VREGL VOLTAGE REGULATOR	300.6301	SGS	L200CH	
R3	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R4	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R5	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
R6	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R7	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R8	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R9	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R10	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R11	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R12	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R13	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R14	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R15	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R16	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R17	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R18	RL 0,35W 1,50KOHM+-1%TK50 RESISTOR	RL 083.0732	DRALORIC	SMA0207/1,50K-F-D	
R19	RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7884	BOURNS	3386F-1-202	
R20	RL 0,35W 475 KOHM+-1%TK50 RESISTOR	RL 083.2593	DRALORIC	SMA0207/475K-F-C	
R21	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R22	RL 0,35W 475 KOHM+-1%TK50 RESISTOR	RL 083.2593	DRALORIC	SMA0207/475K-F-C	
R23	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R24	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R25	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R26 ..29	RL 0,35W 681 OHM+-1%TK50 RESISTOR	RL 083.0490	DRALORIC	SMA0207/681OHM-F-D	
R30	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R31 ..37	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R38	RL 0,35W 4,53KOHM+-1%TK50 RESISTOR	RL 083.1080	DRALORIC	SMA0207/4,53K-F-D	
R39	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R40	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R41	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R42	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R43	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R44 ..47	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R49	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R50	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R51	RN 9X100KOHM+-2%SIL10 H5 RESISTOR NETWORK	RN 542.5092	BOURNS	4310R-101-104	
V1	AD BAV21 250V 0A25 UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V2	AD BAV21 250V 0A25 UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V3	AF HLMP1700 LED RT RD3 LED	AF 099.9134	HP	HLMP1700	
V4	AF HLMP1700 LED RT RD3 LED	AF 099.9134	HP	HLMP1700	
X5	FP STECKERLEISTE 36POL. PIN CONNECTOR	FP 279.1669	BINDER	742-5-11-0201-00-36	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
	2X 12-POLIG				
X23	FP STECKERLEISTE 10POL. CONNECTOR 10POL.	FP 649.4428	PANDUIT	050-010-133 BC	
X33	FP STECKERLEISTE 10POL. CONNECTOR 10POL.	FP 649.4428	PANDUIT	050-010-133 BC	
X43	FP STECKERLEISTE 10POL. CONNECTOR 10POL.	FP 649.4428	PANDUIT	050-010-133 BC	
X90	FP INDIREKT.STECKERL.36P. PIN CONNECTOR 1X10-POLIG	FP 242.3600	BINDER	742-5-11-0178-00-36	
					- ENDE -

Kennz. Comp.No.	Benennung Designation		Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = MIT 681.1637.02 (T0238) MOD 02 = WITH 681.1637.02 (T0238) VAR 03 = MIT 734.9059.02 (T0247) MOD 03 = WITH 734.9059.02 (T0247)					
A101	ED WANDLERPLATTE 50V NUR VAR/ONLY MOD: 02 HIERZ.STROML./SEE CIRC DIA 681.1266.01 S BL.1		681.1637.02			
A101	ED WANDLERPLATTE 50V NUR VAR/ONLY MOD: 03 HIERZ.STROML./SEE CIRC DIA 681.1266.01 S BL.2		734.9059.02			
A102	ED STEUERUNG 50V CONTROL UNIT 50V HIERZ.STROML./SEE CIRC DIA 681.1266.01 S BL.2		681.1672.02			
A103	ED KONDENSATORPLATTE HIERZ.STROML./SEE CIRC.DIA 681.1266.01 S BL.2		681.1695.02			
C16	CC 10NF+50-20%HDK6000RD19 CERAMIC CAPACITOR		022.0710	RESISTA	QBX619/10NF/2KV	
C17	CC 10NF+50-20%HDK6000RD19 CERAMIC CAPACITOR		022.0710	RESISTA	QBX619/10NF/2KV	
C20	CC 10NF+50-20%HDK6000RD19 CERAMIC CAPACITOR		022.0710	RESISTA	QBX619/10NF/2KV	
L1	LD SP.DROSSEL 20UH 45A CHOKE		586.8945	TALEMA	TYP S853-P1	
L2	LD SP.DROSSEL 20UH 45A CHOKE		586.8945	TALEMA	TYP S853-P1	
R14	RD 5W 50 OHM+-3% GEHAEUSE WIRE-WOUND RESISTOR	RD	566.3502	DALE	NH-5 50 OHM 3%	
R15	RD 5W 50 OHM+-3% GEHAEUSE WIRE-WOUND RESISTOR	RD	566.3502	DALE	NH-5 50 OHM 3%	
R20	RD 5W 50 OHM+-3% GEHAEUSE WIRE-WOUND RESISTOR	RD	566.3502	DALE	NH-5 50 OHM 3%	
S1	ST OEFFNER 90 GRD C +-3 G THERMAL SWITCH	ST	020.0587	EBERLE	2455-R-B203-T149	
T3	LU ET 53V 30A F. 2 UEBTR TRANSFORMER		681.2079	VAC	ZKB440/676-51-XDF	
T4	LU ET 53V 30A F. 2 UEBTR TRANSFORMER		681.2079	VAC	ZKB440/676-51-XDF	
V1	AM BUZ48 N-E 500V MOSF POWER MOSFET NUR VAR/ONLY MOD: 02		681.2156	SIEMENS	BUZ48	
V2	AM BUZ48 N-E 500V MOSF POWER MOSFET NUR VAR/ONLY MOD: 02		681.2156	SIEMENS	BUZ48	
V5	AG BYT30/400 GL 400V30A0 RECTIFIER		689.0669	THOMSON	BYT30/400	
V11	AM BUZ48 N-E 500V MOSF POWER MOSFET NUR VAR/ONLY MOD: 02		681.2156	SIEMENS	BUZ48	
V12	AM BUZ48 N-E 500V MOSF POWER MOSFET NUR VAR/ONLY MOD: 02		681.2156	SIEMENS	BUZ48	
V15	AG BYT30/400 GL 400V30A0 RECTIFIER		689.0669	THOMSON	BYT30/400	
V20	AG BYW93/200 GL 200V60A0 RECTIFIER		681.2104	VALVO	BYW93/200	
X101	BESTEHT AUS/CONSISTING OF 2X FP458.0194 1X 681.0930 1X FP418.0041					681.0924
X102	BESTEHT AUS/CONSISTING OF					681.0924

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
	2X FP458.0194 1X 641.1108 1X FP418.0041				
X103	BESTEHT AUS/CONSISTING OF 3X FP458.0194 1X 681.0976 1X FP418.0041				681.0960
X112	BESTEHT AUS/CONSISTING OF 2X FP458.0194 1X 681.1950				681.1943
X120	BESTEHT AUS/CONSISTING OF 8X FP458.0194 1X 681.1920 1X FP418.0041				681.0947
X150	FM BUCHSENLEISTE 3 KOAXK	FM 070.0800	CANNON	DAM-3W3S	
X210	BESTEHT AUS/CONSISTING OF 3XFP458.0194 1X681.2633 1XFP418.0041				681.1650
					- ENDE -

ROHDE & SCHWARZ	Äl	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	26	0290	ZE WANDLER 50V TRANSFORMER 50V	681.1266.01 SA	2-

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
C1	CK 2,2UF+-5%400V RM27,5	681.2133	SIEMENS	B32650-K4225-J	
..4	FILM-CAPACITOR				
C5	CK 470PF+-10% 400VRM10KC	CK 006.4720	ROEDERST	KC1849-147/4+10%	
	PLASTIC-FOIL CAPACITOR				
C11	CK 2,2UF+-5%400V RM27,5	681.2133	SIEMENS	B32650-K4225-J	
..14	FILM-CAPACITOR				
C15	CK 470PF+-10% 400VRM10KC	CK 006.4720	ROEDERST	KC1849-147/4+10%	
	PLASTIC-FOIL CAPACITOR				
R1	RK VARISTOR 275V6,5KA 1W	681.2056	SIEMENS	Q69-X3233	
	VARISTOR				
R2	RJ 4W 220 OHM+-5%TK400	475.0147	DRALORIC	SXA0922/220R/5%TK400	
	RESISTOR				
R3	RG 12,1 OHM+-1%TK100 1206	RG 006.8661	DALE	CRCW1206-10 12R1 F-T	
	CHIP RESISTOR				
R4	RG 10 KOHM+-1%TK100 1206	RG 007.0793	DALE	CRCW1206-10 10K F-T	
..7	CHIP RESISTOR				
R11	RK VARISTOR 275V6,5KA 1W	681.2056	SIEMENS	Q69-X3233	
	VARISTOR				
R12	RJ 4W 220 OHM+-5%TK400	475.0147	DRALORIC	SXA0922/220R/5%TK400	
	RESISTOR				
T5	LU IMP.STROMTRANSFORMATOR	811.2520	VAC	ZKB 472/121-02-W	
	TRANSFORMER				
T6	LU IMP.STROMTRANSFORMATOR	811.2520	VAC	ZKB 472/121-02-W	
	TRANSFORMER				
V1	AM IRFP460 N-E 500V MOSF	734.9142	INT.RECT.	IRFP460	
	POWER MOSFET				
V2	AM IRFP460 N-E 500V MOSF	734.9142	INT.RECT.	IRFP460	
	POWER MOSFET				
V3	AG BYW95C GL 600V 3A0	681.2091	VALVO	BYW95C	
	RECTIFIER				
V4	AG BYW95C GL 600V 3A0	681.2091	VALVO	BYW95C	
	RECTIFIER				
V7	AD BAV103 250V 0A25 UDI	006.9780	VALVO	BAV103	
	DIODE				
V11	AM IRFP460 N-E 500V MOSF	734.9142	INT.RECT.	IRFP460	
	POWER MOSFET				
V12	AM IRFP460 N-E 500V MOSF	734.9142	INT.RECT.	IRFP460	
	POWER MOSFET				
V13	AG BYW95C GL 600V 3A0	681.2091	VALVO	BYW95C	
	RECTIFIER				
V14	AG BYW95C GL 600V 3A0	681.2091	VALVO	BYW95C	
	RECTIFIER				
V17	AD BAV103 250V 0A25 UDI	006.9780	VALVO	BAV103	
	DIODE				
X1	FV FLACHSTECKER GR.6,3	FV 530.5457	VOGT	3866A/MS-SN8	
..4	FLAT-CABLE PLUG				
X61	FP STECKERLEISTE 36POL.	FP 279.1669	BINDER	742-5-11-0201-00-36	
	PIN CONNECTOR				
	3-POLIG				
X62	FP STECKERLEISTE 36POL.	FP 279.1669	BINDER	742-5-11-0201-00-36	
	PIN CONNECTOR				
	3-POLIG				
X63	FP STECKERLEISTE 36POL.	FP 279.1669	BINDER	742-5-11-0201-00-36	
	PIN CONNECTOR				
	3-POLIG				
X64	FP STECKERLEISTE 36POL.	FP 279.1669	BINDER	742-5-11-0201-00-36	
	PIN CONNECTOR				
	3-POLIG				
X100	FP EINLOETSTECKER 2POL	681.1195	AMP	350786-1	
	CONNECTOR 2POL				
X101	FP STECKERLEISTE 36POL.	FP 279.1669	BINDER	742-5-11-0201-00-36	
	PIN CONNECTOR				
	3-POLIG/3 PINS				
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	02	0889	ED WANDLERPLATTE 50V	734.9059.01 SA	1-

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL				
C101	CE 220UF-10+50%40V12,5X20 ALUMINIUM CAPACITOR	565.9494	ROEDERST	EKR00FE322G	
C102	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C103	CE 10 UF+-20%25V 7X 5X11 ELECTROLYTIC CAPACITOR	CE 023.5980	ROEDERSTEI	ETR 3 10/25 20%	
C115	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	PHILIPS-CO	2222 63051 102	
C120	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C121	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C122	CE 22 UF+-20%16V 7X 5X11 ELECTROLYTIC CAPACITOR	CE 022.8091	ROEDERSTEI	ETR 3 22/16 20%	
C123	CK 68ONF+-10%50VRM MKT CAPACITOR	CK 099.2981	WIMA	MKS2/50/0,68UF/10%	
C124	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C125	CC 820PF+- 5%100V NPO VIE CERAMIC CAPACITOR	060.0888	ERIE	8133-100C0G-820PF	
C126	CC 4.7NF+-10%100V5K1200VI CERAMIC CAPACITOR	CC 068.4053	UNION CARB	CK05BX472K	
C127	CC 100PF+-10%200V5K1200VI CAPACITOR	CC 084.5250	UNION CARB	CK05BX101K	
C140	CE 4,7UF+-20%35V 7X 5X11 ELECTROLYTIC CAPACITOR	CE 022.8204	ROEDERSTEI	ETR 3 4,7/40 20%	
C141	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8085	ROEDERSTEI	ETR 2 10/16 20%	
C142	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C143	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C144	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C146	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C147	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C148	CC 100PF+-10%200V5K1200VI CAPACITOR	CC 084.5250	UNION CARB	CK05BX101K	
C149	CC 100PF+-10%200V5K1200VI CAPACITOR	CC 084.5250	UNION CARB	CK05BX101K	
C159	CC 100PF+-2%6X7N150 CAPACITOR	CC 087.6712	PHILIPS-CO	2222 678 34101	
C160	CC 100PF+-2%6X7N150 CAPACITOR	CC 087.6712	PHILIPS-CO	2222 678 34101	
C170	CC 47PF+-10%200V5K1200VIE CAPACITOR	CC 084.5215	UNION CARB	CK05BX470K	
C201	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR	CC 068.4060	UNION CARB	CK05BX103K	
D101	BL CD4049UBF 6XINVERTER HEXINVERTER	086.8192	RCA	CD4049UBF	
D105	BL MC14066BAL 4X ANALOGSW ANALOG SWITCH	418.0135	MOTOROLA	MC14066BAL	
L101	LD 100UH 20% 1A 0,650OHM CHOKE	LD 155.9446	SIEMENS	B82111-E-C25	
N102	BO TDA4700 0A02SCH.REGL REG.PULSE WIDTH MODULATOR	569.1317	SIEMENS	TDA4700	
N103	BO LM139J 4X COMPAR COMPARATOR	BO 455.2873	NAT. SEMIC	LM139J	
N104	BO TL074IN LN 4XFET OPAMP OPERATIONAL AMPLIFIER	568.7528	TEXAS INST	TL074IN	
R101	RL 0,60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	
R102	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R103	RL 0,60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	
R104	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
R105	RL 0,60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	
R106	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R107	RL 0,60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	
R108	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R110	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R111	RL 0,60W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R112	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R118	RL 0,60W 1MOHM+-1%TK50 RESISTOR	RL 082.7862	DRALORIC	SMA0207/1M-F-D	
R120	RL 0,60W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R121	RL 0,60W 100 OHM+-1%TK50 RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R122	RL 0,60W 475 OHM+-1%TK50 RESISTOR	RL 083.0390	DRALORIC	SMA0207/475OHM-F-D	
R123	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R124	RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 087.7560	BOURNS	3386F-1-102	
R125	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R126	RL 0,60W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R127	RL 0,60W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R129	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R130	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R131	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T	RS 247.7878	BOURNS	3386F-1-501	
R132	RL 0,35W90,9KOHM+-0,1%T25 RESISTOR	RL 084.4902	DRALORIC	SMA 0207	
R134	RL 0,35W10,0KOHM+-0,1%T25 RESISTOR	RL 084.3064	DRALORIC	SMA0207/10K-B-E	
R140	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R142	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R143	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R144	RL 0,60W 475 OHM+-1%TK50 RESISTOR	RL 083.0390	DRALORIC	SMA0207/475OHM-F-D	
R145	RL 0,60W 13,0KOHM+-1%TK50 RESISTOR	RL 083.1368	DRALORIC	SMA0207/13,0K-F-D	
R146	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R147 ..150	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R151	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R153	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R154	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R155	RL 0,60W 47,5KOHM+-1%TK50 RESISTOR	RL 083.1800	DRALORIC	SMA/207/47,5K-F-C	
R156	RL 0,60W 47,5KOHM+-1%TK50 RESISTOR	RL 083.1800	DRALORIC	SMA/207/47,5K-F-C	
R157	RL 0,60W 12,1KOHM+-1%TK50 RESISTOR	RL 083.1351	DRALORIC	SMA0207/12,1K-F-D	
R162	RL 0,60W 6,81KOHM+-1%TK50 RESISTOR	RL 082.2560	DRALORIC	SMA 0207/6,81K-F-C	
R201	RL 1W 182 KOHM+-1%TK100 METAL FILM RESISTOR	RL 006.5927	RESISTA	MK5 182 KOHM 1%TK100	
R202	RL 1W 182 KOHM+-1%TK100 METAL FILM RESISTOR	RL 006.5927	RESISTA	MK5 182 KOHM 1%TK100	
R203	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R204	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
T101	LU ZUENDUEBERTR.0,4W IGNATION TRANSFORMER	645.7316	VAC	ZKB 409/020-01-PF	
T102	LU ZUENDUEBERTR.0,4W IGNATION TRANSFORMER	645.7316	VAC	ZKB 409/020-01-PF	
U201	BP SFH601-2 OPT.KOPPL.5KV OPTO COUPLER	346.5795	SIEMENS	Q68000-A5058	
U202	BP SFH601-2 OPT.KOPPL.5KV OPTO COUPLER	346.5795	SIEMENS	Q68000-A5058	
V101	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V102	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V104	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V105	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V107	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V108	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V110	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V111	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V113	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V114	AE BZX79/C15 0,5W ZDI ZENER DIODE	AE 012.2555	PHILIPS-CO	BZX79/C15 GEGURTET	
V115	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V116	AE BZX79/C15 0,5W ZDI ZENER DIODE	AE 012.2555	PHILIPS-CO	BZX79/C15 GEGURTET	
V117	AM BSS89 N-E200V MOSF FET	651.7666	SIEMENS	BSS89	
V118	AM BSS89 N-E200V MOSF FET	651.7666	SIEMENS	BSS89	
V122	AE BZX55/B4V7 0,5W ZDI ZENER DIODE	AE 080.4014	INTERMETAL	ZPD4,7+-2,5%	
V130	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V131	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V132	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V133	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V134	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
X102	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X103	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X110	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 2-POLIG/2PINS 2X 5-POLIG	FP 242.3600	BINDER	742-5-11-0178-00-36	
X112	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 2-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X113	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR	FP 242.3600	BINDER	742-5-11-0178-00-36	
X114	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR	FP 242.3600	BINDER	742-5-11-0178-00-36	
X115	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 2X 2-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X120	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X210	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X1015	FP KURZSCHLUSSBUCHSE SHORTING PLUG	FP 491.7042	PK	452-70302	
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Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
C21	CE 10000UF+-20%63V 40X45 ELECTROLYTIC CAPACITOR	681.2062	VALVO	2222 051 48103	
C22	CE 10000UF+-20%63V 40X45 ELECTROLYTIC CAPACITOR	681.2062	VALVO	2222 051 48103	
C23	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	060.1149	UNION CARB	CK06BX104K	
R21	RD 2.4W 1,5KOHM+-3% WIRE-WOUND RESISTOR	RD 087.5168	SAGE	1200S 3W TK20	
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	01	0889	ED KONDENSATORPLATTE CAPACITOR BOARD	681.1695.01 SA	1-

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL				
A101	ED WANDLERPLATTE 28V HIERZ.STROML./SEE CIRC DIA 734.9194 S	734.9007.02			
A102	ED STEUERUNG 28V CONTROL UNIT 28V HIERZ.STROML./SEE CIRC DIA 681.2179.01 S BL.2	681.2533.02			
R100	RK VARISTOR 460VAC 1,4W VARISTOR	734.9188	SIEMENS	R&S-ZCHNG.0734.9188	
V5	AG BYW93/200 GL 200V60AO RECTIFIER	681.2104	PHILIPS-CO	BYW93/200	
V15	AG BYW93/200 GL 200V60AO RECTIFIER	681.2104	PHILIPS-CO	BYW93/200	
V20	AG BYW93/200 GL 200V60AO RECTIFIER	681.2104	PHILIPS-CO	BYW93/200	
V100	AG SKD31/16 3PH RECTIFIER	734.8930	SEMIKRON	SKD31/16	
X101	BESTEHT AUS/CONSISTING OF 4X FP458.0194 1X 681.2710 1X FP418.0041				681.2585
X102	BESTEHT AUS/CONSISTING OF 4X FP458.0194 1X 681.2727 1X FP418.041				681.2585
X210	BESTEHT AUS/CONSISTING OF 3X FP458.0194 1X 681.2633 1X FP418.0041				681.2579
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Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
C1	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C2	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C3	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C4	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C5	CC 100PF+-10%N750RD16KV3 CAPACITOR	516.2925	ROEDERST	RCU615100PF+-10% 3KV	
C11	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C12	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C13	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C14	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C15	CC 100PF+-10%N750RD16KV3 CAPACITOR	516.2925	ROEDERST	RCU615100PF+-10% 3KV	
C17	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C18	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C20	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C21	CE 1800UF-10+75%40V26X55 ELECTROLYTIC CAPACITOR	586.8616	SANGAMO	350JL182U040B	
C22	CE 22MIF+-20%40V40RDX55 ELECTROLYTIC CAPACITOR	681.2756	VALVO	2222 051 57223	
C23	CK 1UF+-10%50V5RM MKT CAPACITOR	CK 099.2998	WIMA	MKS2/50/1UF/10%	
C24	CC 2,2NF+-10%100V5K1200VI CERAMIC CAPACITOR	CC 067.9022	UNION CARB	CK05BX222K	
L1	LD SPEICHERDR.50UH 18A STORAGE CHOKE	681.2985	VAC	ZKB-419/808-51-H2	
L2	LD SPEICHERDR.50UH 18A STORAGE CHOKE	681.2985	VAC	ZKB-419/808-51-H2	
R1	RK VARISTOR 275V6,5KA 1W VARISTOR	681.2056	SIEMENS	Q69-X3233	
R2	RJ 2,0W 150 OHM+-2%TK400 RESISTOR	316.1856	RESISTA	WK5 150OHM 2%	
R3	RG 12,1 OHM+-1%TK100 1206 CHIP RESISTOR	RG 006.8661	DALE	CRCW1206-10 12R1 F-T	
R4 ..7	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR	RG 007.0793	DALE	CRCW1206-10 10K F-T	
R11	RK VARISTOR 275V6,5KA 1W VARISTOR	681.2056	SIEMENS	Q69-X3233	
R12	RJ 2,0W 150 OHM+-2%TK400 RESISTOR	316.1856	RESISTA	WK5 150OHM 2%	
R14	RJ 2,0W 150 OHM+-2%TK400 RESISTOR	316.1856	RESISTA	WK5 150OHM 2%	
R15	RJ 2,0W 150 OHM+-2%TK400 RESISTOR	316.1856	RESISTA	WK5 150OHM 2%	
R20	RJ 2,0W 150 OHM+-2%TK400 RESISTOR	316.1856	RESISTA	WK5 150OHM 2%	
R23	RD 2.4W 1,5KOHM+-3% WIRE-WOUND RESISTOR	RD 087.5168	SAGE	1200S 3W TK20	
R24	RJ 4W 47 OHM+-5%TK400 METAL-OXIDE RESISTOR	080.1621	RESISTA	WK8,470HM5%	
T3	LT WANDLERTRAFO 5,37:1 TRANSFORMER	681.2991	VAC	ZKB490/...-51-W	
T4	LT WANDLERTRAFO 5,37:1 TRANSFORMER	681.2991	VAC	ZKB490/...-51-W	
T5	LU IMP.STROMTRANSFORMATOR TRANSFORMER	811.2520	VAC	ZKB 472/121-02-W	
T6	LU IMP.STROMTRANSFORMATOR TRANSFORMER	811.2520	VAC	ZKB 472/121-02-W	
V1	AM IRFP450 N-E 500V MOSF POWER MOSFET	686.9571	INT.RECT.	IRFP450	
V2	AM IRFP450 N-E 500V MOSF POWER MOSFET	686.9571	INT.RECT.	IRFP450	
V3	AG BYW95C GL 600V 3AO RECTIFIER	681.2091	VALVO	BYW95C	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
V4	AG BYW95C GL 600V 3AO RECTIFIER	681.2091	VALVO	BYW95C	
V7	AD BAV103 250V 0A25 UDI DIODE	006.9780	VALVO	BAV103	
V11	AM IRFP450 N-E 500V MOSF POWER MOSFET	686.9571	INT.RECT.	IRFP450	
V12	AM IRFP450 N-E 500V MOSF POWER MOSFET	686.9571	INT.RECT.	IRFP450	
V13	AG BYW95C GL 600V 3AO RECTIFIER	681.2091	VALVO	BYW95C	
V14	AG BYW95C GL 600V 3AO RECTIFIER	681.2091	VALVO	BYW95C	
V17	AD BAV103 250V 0A25 UDI DIODE	006.9780	VALVO	BAV103	
X21 ..24	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
X61	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X62	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X63	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X64	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X100	FP EINLOETSTECKER 2POL CONNECTOR 2POL	681.1195	AMP	350786-1	
X101	FP STECKERLEISTE 36POL., PIN CONNECTOR 6-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X150A	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
X150B	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
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Kennz. Comp.No.	Benennung Designation		Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL					
C101	CE 220UF-10+50%40V12,5X20 ALUMINIUM CAPACITOR		565.9494	ROEDERST	EKR00FE322G	
C102	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
C115	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC	068.4047	UNION CARB	CK05BX102K	
C120	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
C121	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
C122	CE 22 UF+-20%16V 7X 5X11 ELECTROLYTIC CAPACITOR	CE	022.8091	ROEDERSTEI	ETR 3 22/16 20%	
C123	CK 330NF+-5%63V5RM MKT CAPACITOR	CK	099.2969	WIMA	MKS2	
C124	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC	068.4047	UNION CARB	CK05BX102K	
C125	CC 820PF+- 5%100V NP0 VIE CERAMIC CAPACITOR		060.0888	ERIE	8133-100C0G-820PF	
C126	CC 4,7NF+-10%100V5K1200VI CERAMIC CAPACITOR	CC	068.4053	UNION CARB	CK05BX472K	
C127	CC 100PF+-10%200V5K1200VI CAPACITOR	CC	084.5250	UNION CARB	CK05BX101K	
C140	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE	022.8085	ROEDERSTEI	ETR 2 10/16 20%	
C141	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE	022.8085	ROEDERSTEI	ETR 2 10/16 20%	
C142	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
C143	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
C144	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
C146	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
C147	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
C148	CC 100PF+-10%200V5K1200VI CAPACITOR	CC	084.5250	UNION CARB	CK05BX101K	
C149	CC 100PF+-10%200V5K1200VI CAPACITOR	CC	084.5250	UNION CARB	CK05BX101K	
C170	CC 47PF+-10%200V5K1200VIE CAPACITOR	CC	084.5215	UNION CARB	CK05BX470K	
C201	CC 10NF-20+50%7X8R4000 CAPACITOR	CC	087.7525	PHILIPS-CO	2222 63051 64051103	
D101	BL CD4049UBF 6XINVERTER HEXINVERTER		086.8192	RCA	CD4049UBF	
D105	BL MC14066BAL 4X ANALOGSW ANALOG SWITCH		418.0135	MOTOROLA	MC14066BAL	
L101	LD 100UH 20% 1A 0,650OHM CHOKE	LD	155.9446	SIEMENS	B82111-E-C25	
N102	BO TDA4700 0A02SCH.REGL REG.PULSE WIDTH MODULATOR		569.1317	SIEMENS	TDA4700	
N103	BO LM139J 4X COMPAR COMPARATOR	BO	455.2873	NAT. SEMIC	LM139J	
N104	BO TL074IN LN 4XFET OPAMP OPERATIONAL AMPLIFIER		568.7528	TEXAS INST	TL074IN	
R101	RL 0,60W15 OHM 1%TK50 RESISTOR	RL	082.9020	DRALORIC	SMA0207/150HM-F-D	
R102	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL	082.2160	DRALORIC	SMA0207/1K-F-C	
R103	RL 0,60W15 OHM 1%TK50 RESISTOR	RL	082.9020	DRALORIC	SMA0207/150HM-F-D	
R104	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL	082.2160	DRALORIC	SMA0207/1K-F-C	
R105	RL 0,60W15 OHM 1%TK50 RESISTOR	RL	082.9020	DRALORIC	SMA0207/150HM-F-D	
R106	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL	082.2160	DRALORIC	SMA0207/1K-F-C	
R107	RL 0,60W15 OHM 1%TK50 RESISTOR	RL	082.9020	DRALORIC	SMA0207/150HM-F-D	

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R108	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R112	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R118	RL 0,60W 1MOHM+-1%TK50 RESISTOR	RL 082.7862	DRALORIC	SMA0207/1M-F-D	
R120	RL 0,60W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R121	RL 0,60W 100 OHM+-1%TK50 RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R122	RL 0,60W 475 OHM+-1%TK50 RESISTOR	RL 083.0390	DRALORIC	SMA0207/475OHM-F-D	
R123	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R124	RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 087.7560	BOURNS	3386F-1-102	
R125	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R126	RL 0,60W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R127	RL 0,60W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R129	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R130	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R131	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T	RS 247.7878	BOURNS	3386F-1-501	
R132	RL 0,60W 121KOHM+-1%TK50 RESISTOR	RL 083.2070	DRALORIC	SMA/207/121K-F-C	
R133	RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7903	BOURNS	3386F-1-103	
R134	RL 0,60W 12,1KOHM+-1%TK50 RESISTOR	RL 083.1351	DRALORIC	SMA0207/12,1K-F-D	
R140	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R142	RL 0,60W 2,74KOHM+-1%TK50 RESISTOR	RL 083.0926	DRALORIC	SMA0207/2,74K-F-D	
R143	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R144	RL 0,60W 475 OHM+-1%TK50 RESISTOR	RL 083.0390	DRALORIC	SMA0207/475OHM-F-D	
R145	RL 0,60W 6,81KOHM+-1%TK50 RESISTOR	RL 082.2560	DRALORIC	SMA 0207/6,81K-F-C	
R146	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R147 ..150	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R151	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R153	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R154	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R155	RL 0,60W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R156	RL 0,60W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R157	RL 0,60W 12,1KOHM+-1%TK50 RESISTOR	RL 083.1351	DRALORIC	SMA0207/12,1K-F-D	
R159	RL 0,60W 1MOHM+-1%TK50 RESISTOR	RL 082.7862	DRALORIC	SMA0207/1M-F-D	
R160	RL 0,60W 1MOHM+-1%TK50 RESISTOR	RL 082.7862	DRALORIC	SMA0207/1M-F-D	
R162	RL 0,60W 6,81KOHM+-1%TK50 RESISTOR	RL 082.2560	DRALORIC	SMA 0207/6,81K-F-C	
R201	RL 1W 182 KOHM+-1%TK100 METAL FILM RESISTOR	RL 006.5927	RESISTA	MK5 182 KOHM 1%TK100	
R202	RL 1W 182 KOHM+-1%TK100 METAL FILM RESISTOR	RL 006.5927	RESISTA	MK5 182 KOHM 1%TK100	
R203	RL 0,60W 33,2KOHM+-1%TK50 RESISTOR	RL 083.1674	DRALORIC	SMA0207/33,2K-F-C	
R204	RL 0,60W 33,2KOHM+-1%TK50 RESISTOR	RL 083.1674	DRALORIC	SMA0207/33,2K-F-C	
T101	LU ZUENDUEBERTR.0,4W IGNATION TRANSFORMER	645.7316	VAC	ZKB 409/020-01-PF	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
T102	LU ZUENDUEBERTR.0,4W IGNATION TRANSFORMER	645.7316	VAC	ZKB 409/020-01-PF	
U201	BP SFH601-2 OPT.KOPPL.5KV OPTO COUPLER	346.5795	SIEMENS	Q68000-A5058	
U202	BP SFH601-2 OPT.KOPPL.5KV OPTO COUPLER	346.5795	SIEMENS	Q68000-A5058	
V101	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V102	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V104	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V105	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V107	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V108	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V110	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V111	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V113	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V114	AE BZX79/C15 0,5W ZDI ZENER DIODE	AE 012.2555	PHILIPS-CO	BZX79/C15 GEGURTET	
V115	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V116	AE BZX79/C15 0,5W ZDI ZENER DIODE	AE 012.2555	PHILIPS-CO	BZX79/C15 GEGURTET	
V117	AM BSS89 N-E200V MOSF FET	651.7666	SIEMENS	BSS89	
V118	AM BSS89 N-E200V MOSF FET	651.7666	SIEMENS	BSS89	
V119	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V120	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V122	AE BZX55/B4V7 0,5W ZDI ZENER DIODE	AE 080.4014	INTERMETAL	ZPD4,7+-2,5%	
V130	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V131	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V132	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V133	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V134	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
X102	VL WIRE-WRAP PIN WIRE-WRAP PIN 6-POLIG	VL 088.4542	BERG	NR. 75 403-003	
X110	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR	FP 242.3600	BINDER	742-5-11-0178-00-36	
X112 ..115	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 4X2-POLIG	FP 242.3600	BINDER	742-5-11-0178-00-36	
X120	VL WIRE-WRAP PIN WIRE-WRAP PIN 11-POLIG	VL 088.4542	BERG	NR. 75 403-003	
X210	VL WIRE-WRAP PIN WIRE-WRAP PIN 3-POLIG	VL 088.4542	BERG	NR. 75 403-003	
X1012	FP KURZSCHLUSSBUCHSE SHORTING PLUG	FP 491.7042	PK	452-70302	
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ROHDE&SCHWARZ

Communications Division

Repair Manual

POWER SUPPLY IN 859C2

6034.5003

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5. Description of Function

6. Repair

List of Figures

Appendix
Interface Description, Circuit Diagrams, Parts Lists and Components Layouts

5. Description of Function

5.1 Frame (A50)

(See circuit diagrams 6034.5003.01S and 6034.5303.01S)

Note:

The filtering circuit (A501) and the LED board (A502) are part of the frame. In the following no further reference is made to this fact.

The 230-VAC voltage (single-phase) is routed to the 30-A protective switch F1 via plug X76 and an input filter.

The input filter consists of capacitors C1 and C2 and noise-suppressing chokes L1 and L2. The input filter prevents high-frequency noise voltages, generated by converters clocked with the primary current, from penetrating into the mains network.

If switch F1 is closed, the 230-VAC voltage is rectified by rectifier V100 (part of 28-V converter A40). By means of varistor R100 switched in parallel the resistance to interference is significantly improved. Filtering is carried out by electrolytic capacitors C9, C10, C13 and C14. The DC voltage thus generated is then routed to the converters via a filter and the respective interface.

- X201 / X100 → 50-VDC converter A20 (see also 5.3.1)
- X202 / X100 → 50-VDC converter A30
- X203 / X100 → 28-VDC converter A40 (see also 5.4)

The filter consists of capacitors C1 and C12 as well as noise-suppressing chokes L1 to L3. By means of this filter the converter frequency is filtered out.

If switch F1 is closed, the 230-VAC voltage is also routed via fuse F2 (1.6 A) and the EMC filter Z4 to socket X71 and, at the same time, via fuse F3 (100 mA) to the 12-VDC auxiliary voltage generator. Via socket X71 the blowers in Amplifier VK 859C1 are supplied with current.

In the 12-VDC auxiliary voltage generator the 230 VAC are transformed by transformer T1 and rectified by rectifier V11. Filtering-out is by means of electrolytic capacitors C15 and C16. The voltage thus generated is stabilized by voltage regulator N1 to 12 VDC.

Via LED V4 and resistor R8 output N1.2 of the voltage regulator is connected to ground. LED V4 lights up as soon as the 12-VDC voltage is available.

Via a timing element output N1.2 of the voltage regulator is connected to input N2.11 (+) of the comparator. The timing element is made up of resistor R11, transistor V15 and capacitor C17.

Comparator N2A compares the charging voltage of C17 to a reference voltage. The latter is derived from voltage divider R12 / R15 and the 12-VDC auxiliary voltage.

As soon as the charging voltage exceeds the reference voltage, current begins to flow through relay K1, thus bypassing resistor R1 in the input current circuit.

By means of the time-delayed bypassing of R1 input current peaks are prevented.

Output N1.2 of the voltage regulator is connected to optocoupler U1. As soon as the 12-VDC voltage is no longer available, the transistor in the optocoupler is inhibited, thus rendering transistor (MOSFET) V1 conductive.

In this way electrolytic capacitors C9, C10, C13 and C14 can be discharged via resistor R2 and transistor V1.

Via LEDs V3, V5 and V6 as well as interface X30 / X5, output N1.2 of the voltage regulator is connected to control circuit A10 (refer to 5.2).

The stabilized adjustable output voltage at interface X22 / X150 of the 50-VDC converter A20 (see also 5.3.1) is routed via interface X506 to socket X75. The 50-VDC converter A30 (see also 5.4) is connected to socket X75 via interfaces X32 / X150 and X505. The output voltage in the range from 45 to 52 V can be varied in steps of 1 V. Via interface X501 ground is connected to contacts 75.1 and .2 as well as to contacts X73.C2 to .C5.

The output voltage stabilized to 28 V is routed from interface X42 / X150 of the 28-VDC converter (see also 5.4) via interface X504, fuse F1 (20 A) and interface X507 / X508 to socket X73 and via interface X509 to blowers E1 and E2. Interface X504 is connected to socket X75, in addition. Ground is connected to contacts X75.1 and .2 as well as to contacts X73.C2 to .C5 via interface X500.

Via interface X503, decoupling diodes V2, V4 and V10 as well as via electrolytic capacitors C2, C3, C7 and C8, plug X74 is connected to interfaces X505 to X509.

Switchover operation is possible if a battery (22 to 31 V) is connected at plug X74 This means that in the event of a mains failure the battery will carry out the current supply. Thus transmission or transmit / receive operation is still possible at a reduced transmit power.

By means of the decoupling diodes battery charging by the converters is prevented. Fuse F1 protects the 28-VDC converter output from excessive currents.

5.2 Control Circuit (A10)

(See circuit diagram 6034.5003.01S, sheet 2)

The circuit for control of the 50-VDC converters and 28-VDC converter contains the small-signal control facility for all three converters.

5.2.1 Generation of Clock Frequency

The circuit for generation of the clock frequency contains two crystal oscillators D1 / D4 / C14 to C17 with the crystals B1 (5.000 MHz) and B2 (5.005 MHz) as well as the two adjustable dividers D2 and D3. The division ratio can be set either to 1:50 or 1:51. Depending on which crystal oscillator is switched on and which division ratio is set, one of the following clock frequencies is output:

- 98.04 kHz or
- 100 kHz or
- 100.1 kHz

The clock frequency thus generated is fed from output D3.15 via interface X23 / X110 to the 50-VDC converter A20 (see 5.3.2.1) as well as via interface X33 / X110 to the 50-VDC converter A30 and via interface X43 / X110 to the 28-VDC converter (see 5.4).

Switchover of the crystal oscillators and setting of the division ratio is carried out by means of two data lines (DATA 5 and DATA 6) via level converter D11. Inputs D11.5 and .11 are connected via RC low-pass filters and interface X5 to socket X73. By means of level converter D11 the 5-VDC logic is converted into a 12-VDC logic.

Data line DATA 5 provides for switchover between the two crystal oscillators. If the 5.000-MHz crystal oscillator is inhibited by DATA 5, divider D2 is simultaneously set to the division ratio 1:50 via contacts 4 and 5 of AND gate D4. If, however, the 5.005-MHz crystal oscillator is inhibited, the division ratio of divider D2 can be set to 1:50 or 1:51 via data line DATA 6.

The clock frequency is shifted in all cases where the frequency setting on the receiver / exciter equals xxx50 kHz or xx100 kHz. Thus the harmonics which are generated by the converters clocked with the primary current can affect the receive frequency.

Depending on the receive frequency the clock frequency is switched over from 100 to 98.04 kHz ($f < 5$ MHz) or from 100 to 100.1 kHz ($f < 5$ MHz).

5.2.2 Generation of Nominal Value

The 12-VDC voltage (see 5.1) is also routed from interface X5 to voltage regulator N2 the output voltage of which can be set to exactly 5.2 VDC by means of adjustable resistor R19.

With the aid of the stabilized 5.2-VDC voltage and voltage divider R31 to R38 seven partial voltages are generated. The lowest voltage is determined by resistor R38 (= 4.5 VDC) whereas the voltage jump from one partial voltage to another is fixed by means of resistors R31 to R37 (0.1 VDC). The partial voltages and the 5.2-VDC voltage itself are fed to the inputs of CMOS switch D5. D5 is a 1- out-of-8 switch. Via its BCD-coded inputs A, B and C the respective switch is closed.

Switchover between the inputs and thus between the nominal values is carried out by means of three data lines (DATA 0 to 2) via level converter D10. Inputs D10.5, .11 and .12 are connected to socket X73 via RC low-pass filters and interface X5. Level converter D10 converts the 5-VDC logic into a 12-VDC logic.

Via interface X23 / X110 output D5.3 (nominal value) is connected to the 50-VDC converter A20 (see 5.3.2.1) as well as via interface X33 / X110 to the 50-VDC converter A30 (see 5.4).

5.2.3 Switch-on of 50-VDC Converters and Fault Evaluation

The two 50-VDC converters are switched on by means of two data lines (DATA 3 and 4) via level converter D11. The inputs D11.4 and .12 are connected to socket X73 via RC low-pass filters and interface X5. Level converter D11 converts the 5-VDC logic into a 12-VDC logic.

Output D11.3 (.13) is connected via interface X23 / X110 (X33 / X110) to the 50-VDC converter A20 (see also 5.3.2.6) (A30, see 5.4).

At the same time, output D11.3 (.13) controls LED V3 (V4), NAND gate D8 and a monoflop. LED V3 (V4) indicates the switch-on state of the converter.

The monoflop consists of NAND gate D6, resistors R20 / R21 (R22 / R23), electrolytic capacitor C18 (C19) and diode V2 (V1). The output signal of the NAND gate and the CM signal (continuous monitoring) from interface X23 / X110 (50-VDC converter A20, see 5.3.2.6 or X33/X110 for 50-VDC converter A30, see 5.4) are linked up by OR gate D7. Thus error messages are prevented from being generated during the switch-on phase of the converter. As result of the link-up LED V5 (V6) is controlled via NAND gate D8 and interface X5

Contact X43.8 (CM, see 5.4) is connected to LED V3 via NAND gate D9 and interface X5.

The fault evaluation circuit consists of the components D4 and D6 to D9. The outputs D8.3, .5 as well as D9.5 drive the LEDs V3 to V5 on the LED board, and output D9.3 is connected to socket X73 via interface X5.

If for example data line DATA 3 is set to high level, 50-VDC converter A20 is cut in via interface X23 (see 5.3.2.6). Simultaneously electrolytic capacitor C18 is charged via resistor R20, that is, approx. 2 s after the switch-on signal (DATA 3 = high) output D6.3 changes from high to low level. During this period OR gate D7 is inhibited for the CM signal of the 50-VDC converter A20 (X23.8, see 5.3.2.6). Output D7.3 is high, that is, LED V5 is illuminated.

If following the switch-on delay a fault occurs in the converter, the CM signal is low, as a result LED V5 goes out and the level at contact X73.A0 changes from high to low (sum test = NoGo).

In reception both 50-VDC converters are cut out via data lines DATA 3 and DATA 4 and LEDs V5 and V6 are dark.

5.3 50-VDC Converters (A20, A30)

(See circuit diagram 681.1266.01S, sheets 1 + 2)

The two 50-VDC converters A20 and A30 are of identical design. Each converter consists of a converter board 50 VDC (A101), a 50-VDC control circuit (A102) and a capacitor board (A103).

5.3.1 Converter Board 50 VDC and Capacitor Board

The rectified and filtered voltage is fed via plug X100 (V_{in}, see 5.1) and insulated wire jumpers to two single-ended converters of identical design (half-bridge circuit). The two single-ended converters are switched in parallel by means of the wire jumpers between soldering tags 1 and 4 as well as soldering tags 2 and 3. The socket on plug X210 is in the parking position.

On the primary side, each single-ended converter consists of four capacitors, a varistor (resistance depends on the voltage), two switching transistors (MOSFETs), two demagnetizing diodes, a transformer and of a current transformer.

The input voltage is filtered by capacitors C1 to C4 and C11 to C14 and switched via switching transistors V1, V2, V11 and V12. For this purpose the gate of the switching transistors is driven via interface X120 by a pulsewidth-modulated signal (see also 5.3.2.1).

Due to the altering pulse duration the output voltage is stabilized. In other words, as the output voltage decreases, the pulse duration increases automatically until the nominal output voltage is attained once more.

The output voltage of the single-ended converters is combined via transformers T3 and T4 as well as via diodes V5, V15 and V20. At the same time, the two single-ended converters are decoupled by the diodes. During the inhibit phase T3 is demagnetized by way of diodes V3 and V4, and T4 by diodes V13 and V14.

The sum signal (clocked signal) is routed via interface X103 to the anticipatory control (see also 5.3.2.4) and simultaneously filtered by means of coils L1 (storage choke) and L2 as well as electrolytic capacitors C21 and C22. Diode V20 is the free-running diode for the two single-ended converters.

The filtered voltage is routed via interface X103 to the actual / nominal value comparator (see also 5.3.2.2) and to interface X150 (V_{op}, see 5.1).

By means of current transformer T5 (T6) the pulse current through transformer T3 (T4) is measured. Diodes V7 and V17 provide for decoupling of the current transformers and for rectification of the measuring currents. Resistor R3 is used to convert the measuring current into a measuring voltage. The measuring signal is routed via interface X101 / X102 to the dynamic current limiting circuit (see also 5.3.2.5).

5.3.2 Control Circuit 50 VDC

5.3.2.1 Generation of the Pulsewidth-modulated Signal

The voltage-controlled oscillator of integrated circuit N102 is synchronized by the clock signal which is fed via interface X110 (see 5.2.1) to input N102.18 (I_{syn}). The RC combination R123/ C126 / C124 determines the oscillator parameters. The voltage-controlled oscillator triggers a subsequent ramp generator. Via input N102.12 (R_F) and resistor R120 the slope of the ramp voltage (anticipatory control circuit, see 5.3.2.4) can be controlled.

Via a comparator, the ramp voltage is compared with the result of the comparison between actual and nominal value (see 5.3.2.2). The pulsewidth-modulated signal thus produced is routed to two AND gates.

The AND gates are connected to the outputs (Q and Q inverted) of a push-pull flipflop, to the balancing circuit (see 5.3.2.3), the unbalance switch-off circuit (see 5.3.2.4), the dynamic current limiting circuit (see 5.3.2.5) and to the ON / OFF circuit (see 5.3.2.6). The push-pull flipflop ensures that only one of the two outputs N102.4 and .5 is active at a time.

Outputs N102.4 (Q_2) and .5 (Q_1) control the CMOS switch D105 (see 5.3.2.4) as well as via inverter D101 the transistors (FETs) V117 and V118. The drain contacts of the transistors are connected via ignition transformers T101 and T102 to the corresponding networks and via interface X120 to the switching transistors of the converter board (see 5.3.1).

5.3.2.2 Actual / Nominal Value Comparator

The filtered voltage (see 5.3.1) is routed via contact X103.2 to voltage divider R132 / R134. A PI regulator compares the partial voltage thus generated (= actual value) with a nominal voltage. The PI regulator consists of operational amplifier N102.(15 to 17) and an RC network. The nominal-voltage input N102.17 is connected via voltage divider R110 / R111 and contact X110.7 to the circuit for generation of the nominal value (see 5.2.2).

The resulting control voltage is fed via output N102.15 to comparator input N102.14 and the ON / OFF circuit (N103.6, see 5.3.2.6).

The comparator compares the control voltage with a ramp voltage (see 5.3.2.1).

5.3.2.3 Balancing Circuit

The balancing circuit is only required if the two single-ended converters are switched in series. This is not so in this particular case.

5.3.2.4 Anticipatory Control and Unbalance Switch-off

The sum signal (see 5.3.1) is routed from interface X103.5 via diode V132 to voltage divider R145 / R146. At the same time, the voltage divider is connected via diode V133 to the 12-VDC source. The two voltages are decoupled by diodes.

Depending on the inverted pulsewidth-modulated signals (Q and Q inverted, see 5.3.2.1) the partial voltage thus produced is switched to the corresponding capacitor (C148 or C149) via CMOS switches D105.

In the capacitors the measured value is stored until the next pulse is emitted. The capacitors are decoupled by voltage followers N104. The outputs of the voltage followers are connected via diodes V130 and V131, resistor R144 and adjustable resistor R131 to input N102.21 (I_{ov}) as well as via differential amplifier N104 to CMOS switch D104.

Depending on the inverted pulsewidth-modulated signals the CMOS switch D105 switches the corresponding differential voltage via resistor R120 to input N102.12 (R_F, see 5.3.2.1).

The current produced by resistor R120 controls the slope of the rising edge of the ramp signal and thus the pulse duration of the pulsewidth-modulated signals.

Voltage variations which may occur at the mains input as well as unbalances are compensated directly by bypassing the control circuit.

If the input voltage (N102.21) adjustable by R131 (unbalance switch-off) exceeds the reference voltage of integrated circuit N102, outputs Q_1 (N102.5) and Q_2 (.4) are immediately switched off.

As soon as the unbalance has been eliminated, the control circuit is switched on again via the soft start (N102.8).

5.3.2.5 Dynamic Current Limiting Circuit

The measuring voltage (see 5.3.1) is fed from contact X102.2 to voltage divider R112 / R124. In a comparator of integrated circuit N102 the partial voltage thus produced is compared with a reference voltage. The reference voltage is generated by voltage divider R122 / R121 and the reference voltage source (N102.2).

If the input voltage adjustable with resistor R124 exceeds the reference voltage, outputs N102.5 (Q_1) and .4 (Q_2) are inhibited for the remaining time of the clock period.

In addition, input N103.6 is connected to electrolytic capacitor C140. This prevents NoGo messages from being issued during load changes and thus switch-off from taking place. The capacitor is charged by the reference voltage source N102.2 via diode V134.

This ensures that during switch-on the converter first signals a NoGo and then a Go.

In case the temperature of the heat sink rises above 90° C, switch S1 is automatically opened thus switching off the converter.

5.3.2.6 ON / OFF and Monitoring Circuits

The signal available on the switch-on circuit for the 50-VDC converter (see 5.2.3) is routed via switch S1 (T = 90° C), contact X110.5 and resistor R151 to input N102.19. This input is also connected to the monitoring circuit.

As soon as the 50-VDC converter is switched on (N102.19 = high) capacitor C123 is charged via a constant current source in the integrated circuit N102. The charging voltage affects the pulsewidth generation (= soft start).

Comparator N103.(1, 6, 7) of the monitoring circuit compares the charging voltage of capacitor C123 (N102.8) with the output voltage of the actual / nominal-value comparator (see 5.3.2.2). Output N103.1 is connected via contact X110.8 (CM) to the fault evaluation circuit (see 5.2.3) as well as to comparator N103.(10, 11, 13).

If the output voltage of the actual/nominal-value comparator exceeds the charging voltage of C123, the level on contact X110.8 changes from high to low (NoGo message) and the 50-VDC converter is switched off via comparator N103.(10, 11, 13). Switch-off is only carried out if the charging voltage of C123 has exceeded the Zener voltage of V122.

5.4 28-VDC Converter (A40)

(See circuit diagram 734.9194.01S)

The 28-VDC converter A40 functions in exactly the same way as the 50-VDC converters A20 and A30 (see 5.3), except for three differences.

The nominal voltage for the actual/nominal-value comparator (see 5.3.2.2) is not provided by the nominal-value generator (see 5.2.2) but by the reference voltage source N102.2, that is, the 28-VDC converter supplies a fixed voltage. The output voltage can be set by means of adjustable resistor R133.

The ON line (X110.5) is connected via jumper X1012 to the supply voltage, switching on and off via the control circuit is therefore not possible (see 5.2.3). In addition, the ON line is not interrupted by a switch.

If the output voltage of the nominal / actual comparator rises above the charging voltage of C123 the level at contact X110.8 changes from high to low (→ NoGo). However, the 28-VDC converter is not switched off.

6. Repair

(See circuit diagrams, parts lists and components layouts in the appendix to this Repair Manual, list on page 0.6)

6.1 Preliminary Remarks

6.1.1 General

The repair of the Power Supply IN 859C2 consists of troubleshooting and fault elimination, of measurements, alignment and functional checks, of replacing assemblies and components as well as of a final test.

All information required for repair of the power supply down to components level is contained in this Section.

6.1.2 Restoring Nominal Characteristics

Any component that is proved to be defective - through use of the troubleshooting flowcharts or by performing the measurements, alignment and functional checks - should only be replaced by a component that meets the specifications given in the parts lists in the appendix to this Repair Manual.

Only in this way can the technical data be guaranteed that are given in Section 1 of the User Manual.

Following replacement it is absolutely essential to carry out the final test according to 6.7.

6.1.3 Spare Parts

All components are subjected to strict quality control before they are allowed to be used in this item of equipment.

For components from outside suppliers, e.g. resistors, capacitors, diodes, transistors and integrated through to highly integrated circuits, R&S have set down their own delivery specifications for the purpose of ensuring maximum reliability. For this reason we recommend that only original spare parts be used for replacing defective components.

When ordering a spare part, please state the following:

Type, ordering code and serial number of equipment, identification number of parts list and designation plus stock number of the component concerned.

All of these details are to be found in the circuit diagrams, parts lists and components layouts that accompany the manual.

6.1.4 Important User Information

The following contains details which are essential when referring to Section 6 "Repair". This is in order to prevent misunderstandings at a later stage.

- For troubleshooting the given order should be kept.
- All voltage measurements are referred to ground, if not stated otherwise.
- All measurements and alignment are to be performed at the permissible operating voltage.
- Abbreviations in the text, such as X43.8, N103.(1, 6, 7) or D11.5 are to be understood as follows:
  - Connector X43 - contact 8
  - Integrated circuit N103 - functional block (1, 6, 7)
  - Integrated circuit D11 - contact 5
- When carrying out any electrical or mechanical repairs disassemble the power supply as well as the subassemblies only to the extent necessary for the repairs involved.
- Before performing any soldering on the unit itself or on one of its assemblies the operating voltage must be disconnected.

CAUTION ESD!

Among the components incorporated in the power supply there are MOS, MOSFET and CMOS components. Components of this kind are extremely sensitive to high extraneous voltages (static discharge). Therefore subassemblies containing components of this kind should be tested and repaired at a special CMOS work station.

CAUTION

Connecting the mains voltage accidentally to ground, e.g. with the probe of an oscilloscope, may result in damage to the unit.

WARNING

Touching the opened power supply accidentally constitutes a danger to life. Repair works are only to be performed by trained personnel.

6.2 Test Equipment and Special Tools

For performing the repairs in this section test equipment is required as listed below. Equivalent items of test equipment can be used. No special tools are required.

6.2.1 Test Equipment List

No.	Test equipment, required data	Test equipment recommended by R & S	Ordering code
1	Power Supply V ≥ 28 VDC, I ≥ 30 A	NGRE	100.8283
2	Double Power Supply V = 5 VDC / I = 100 mA V = 12DC / I = 500 mA	NGMD	117.7127.02
3	Variable-ratio separating transformer 300 VAC, 32 A		
4	Power Supply 700 VDC, 5 A		
5	Generator TTL, 100 kHz		
6	Frequency counter ± 1 Hz		
7	Slide resistor (as load resistor) approx. 1.5 Ω / max. 35 A		
8	2-channel Oscilloscope	conventional workshop model	
9	Digital Multimeter Clamp-on Current Probe 150 A	UDL 45 UDL 4-Z3	1037.1507.02 346.8113.02

6.3 Troubleshooting

6.3.1 Visual Check

In the event of a fault, first of all carry out a visual check. For this proceed as follows:

1. Examine the internal cabling for possibly loose connectors and discoloured cables. Replace any defective components according to section 6.6.

2. Examine the connectors for broken, corroded or bent pins / sockets. If necessary, replace defective connectors according to section 6.6.

CAUTION

If there are any signs of discolouration caused by heat on a connector, the mating connector is also defective. Both must be replaced.

3. Examine the PCBs for any signs of discolouration and disruptions. If any discolouration or damage is found replace the entire PCB according to section 6.6.

4. Replace any discoloured components according to section 6.6.

6.3.2 Troubleshooting Flowcharts

6.3.2.1 General

The following flowcharts comprise fault-finding and fault elimination on the following equipment items:

- Power supply (Fig. 6.1),
- Filter (Fig. 6.2),
- Control circuit (Fig. 6.3),
- 50-VDC converters (Fig. 6.4)
- 28-VDC converter (Fig. 6.5)

For ease of troubleshooting and to keep the flowcharts as clear as possible there are references to other checks.

In the interest of rational and speedy fault-finding and fault elimination the given sequence should be kept.

Note:

In the following troubleshooting flowcharts, in addition to the address the page number is stated on which the particular procedure is continued.

If the procedure in question is continued on the very next page, however, then the page number is not given.

6.3.2.2 Requirements

Troubleshooting is based on the following assumptions:

- The power supply is proved to be defective.
- The power supply has been removed according to 6.6.1.
- The operating voltages have been connected externally.

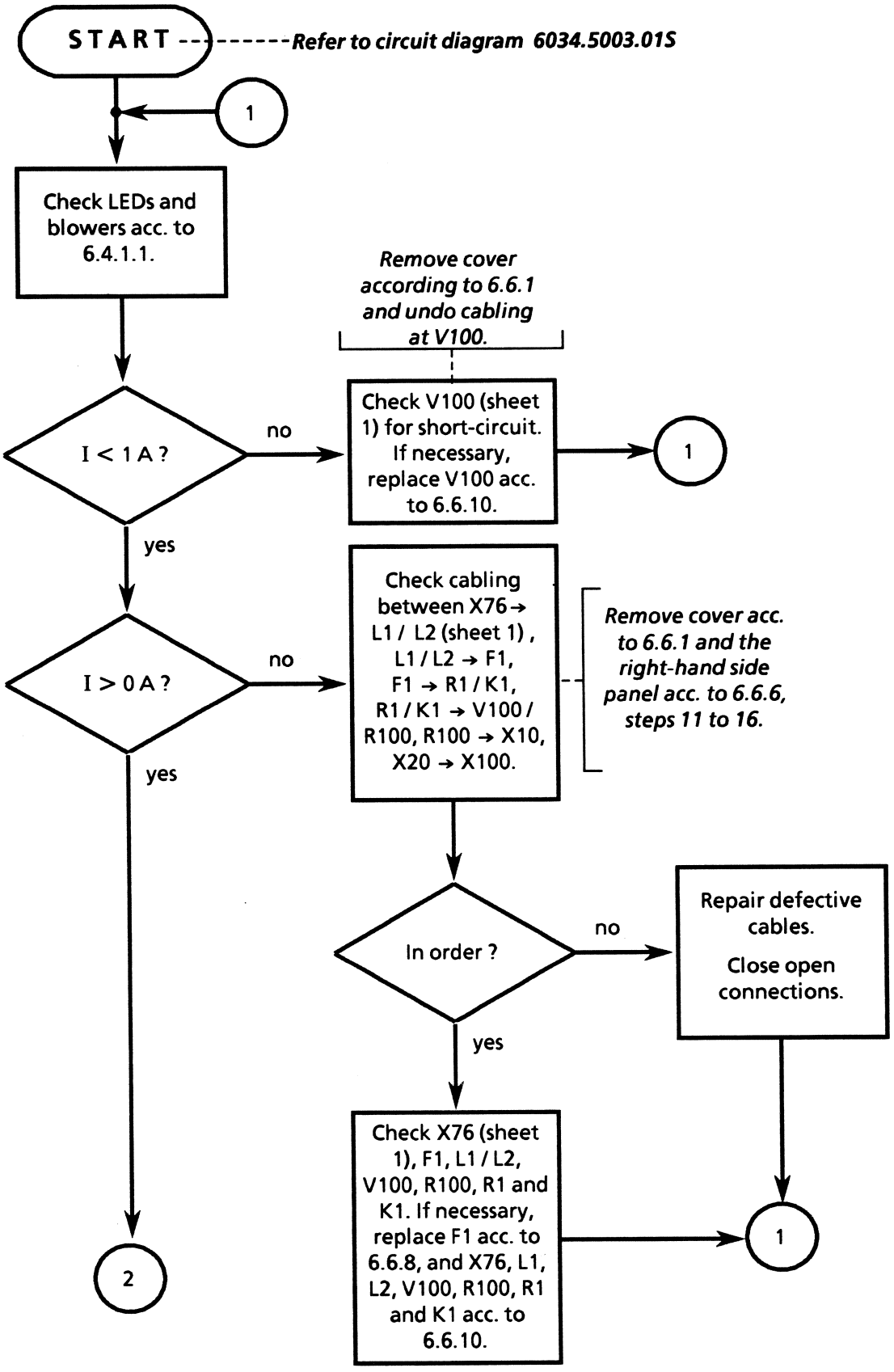

Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 1 of 10)

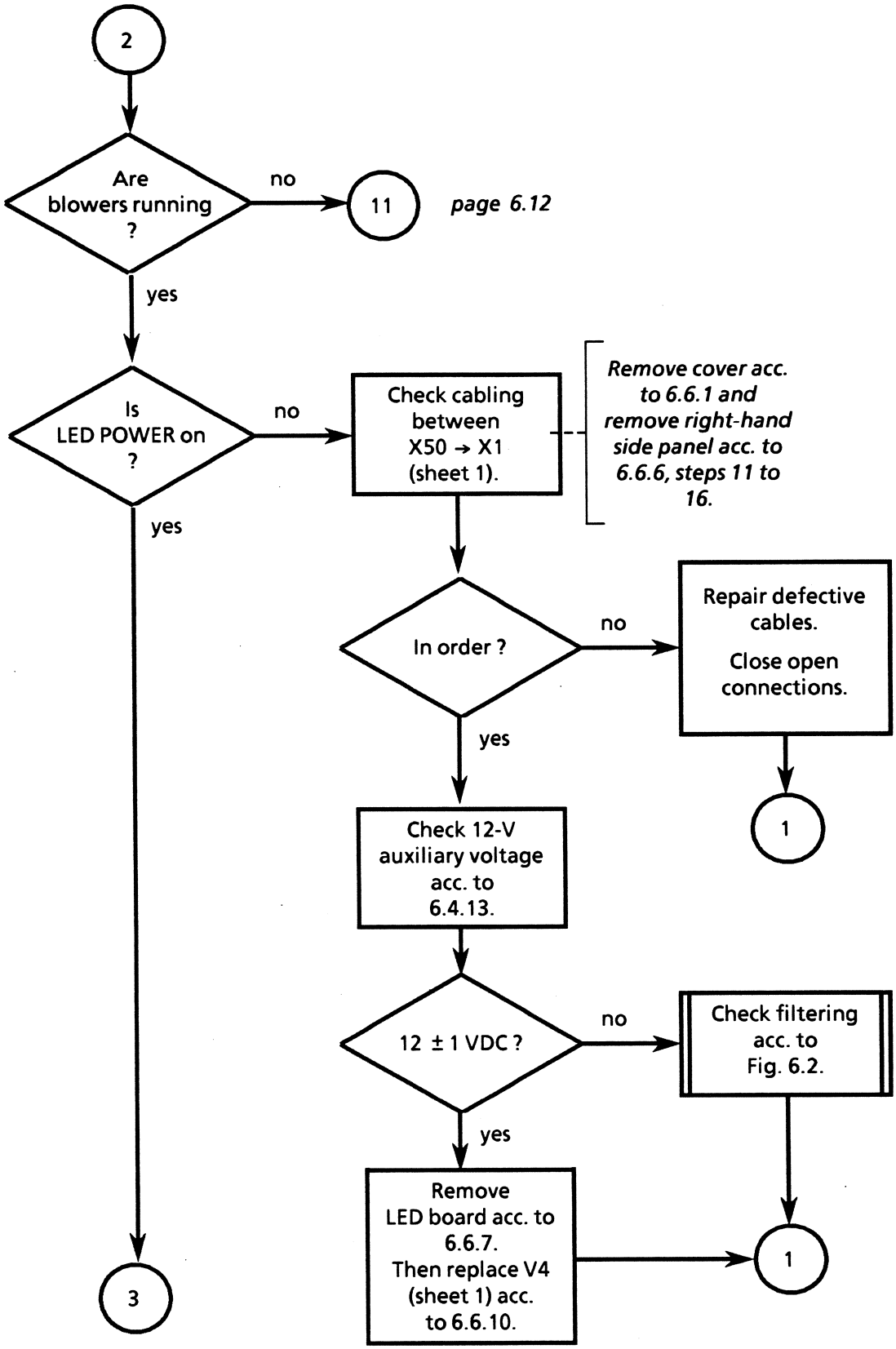

Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 2 of 10)

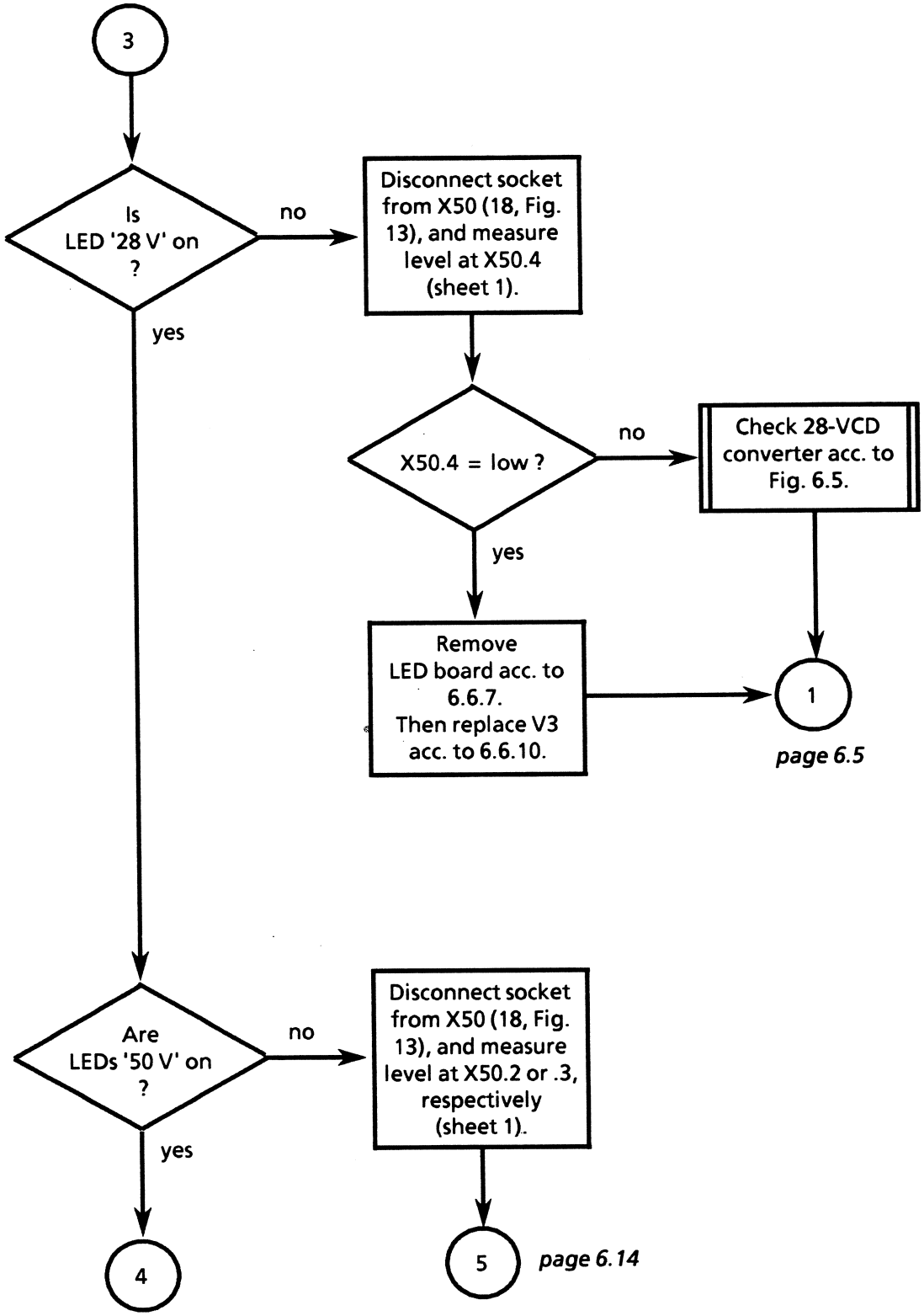

Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 3 of 10)

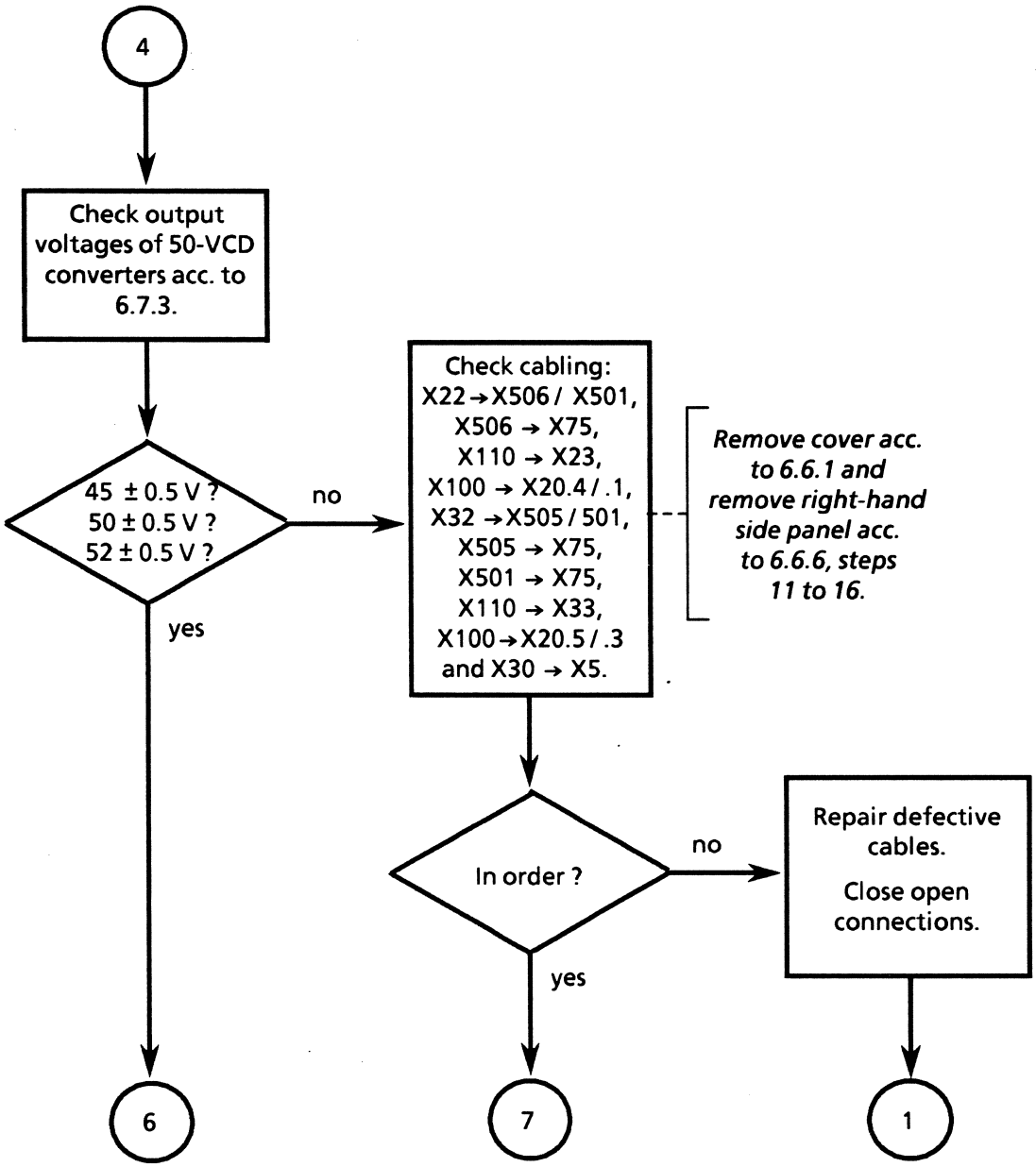

Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 4 of 10)

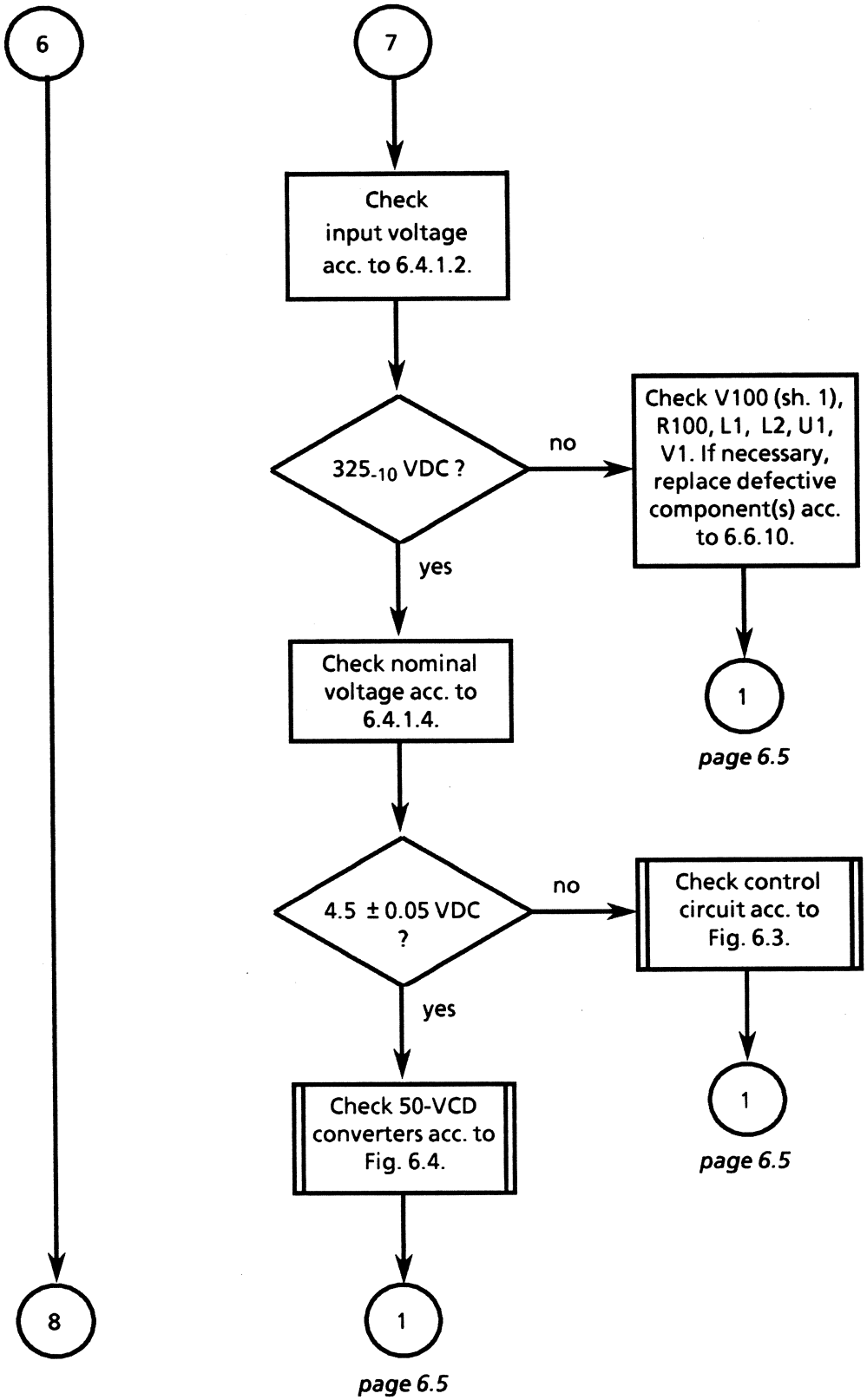

Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 5 of 10)

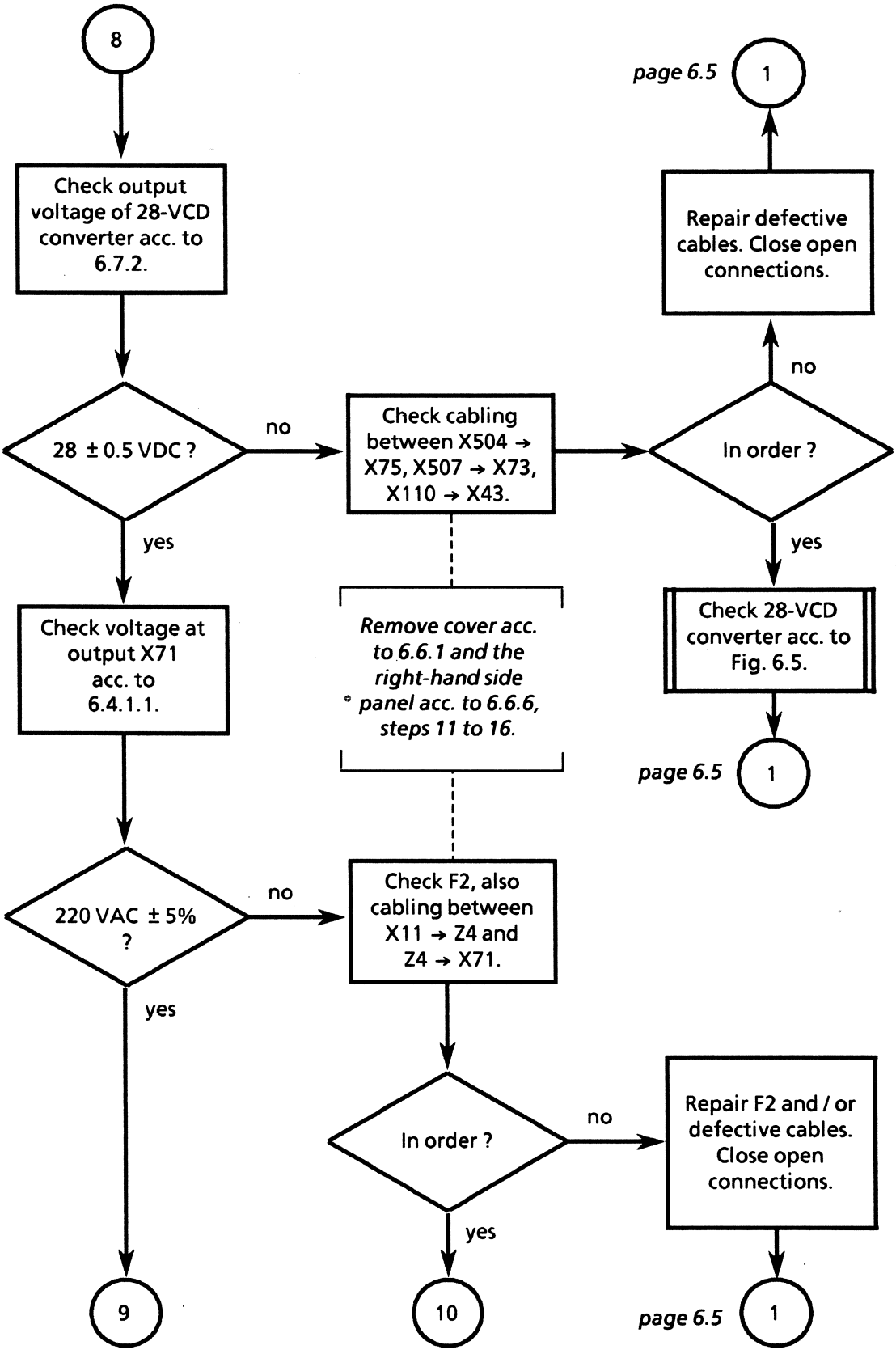

Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 6 of 10)

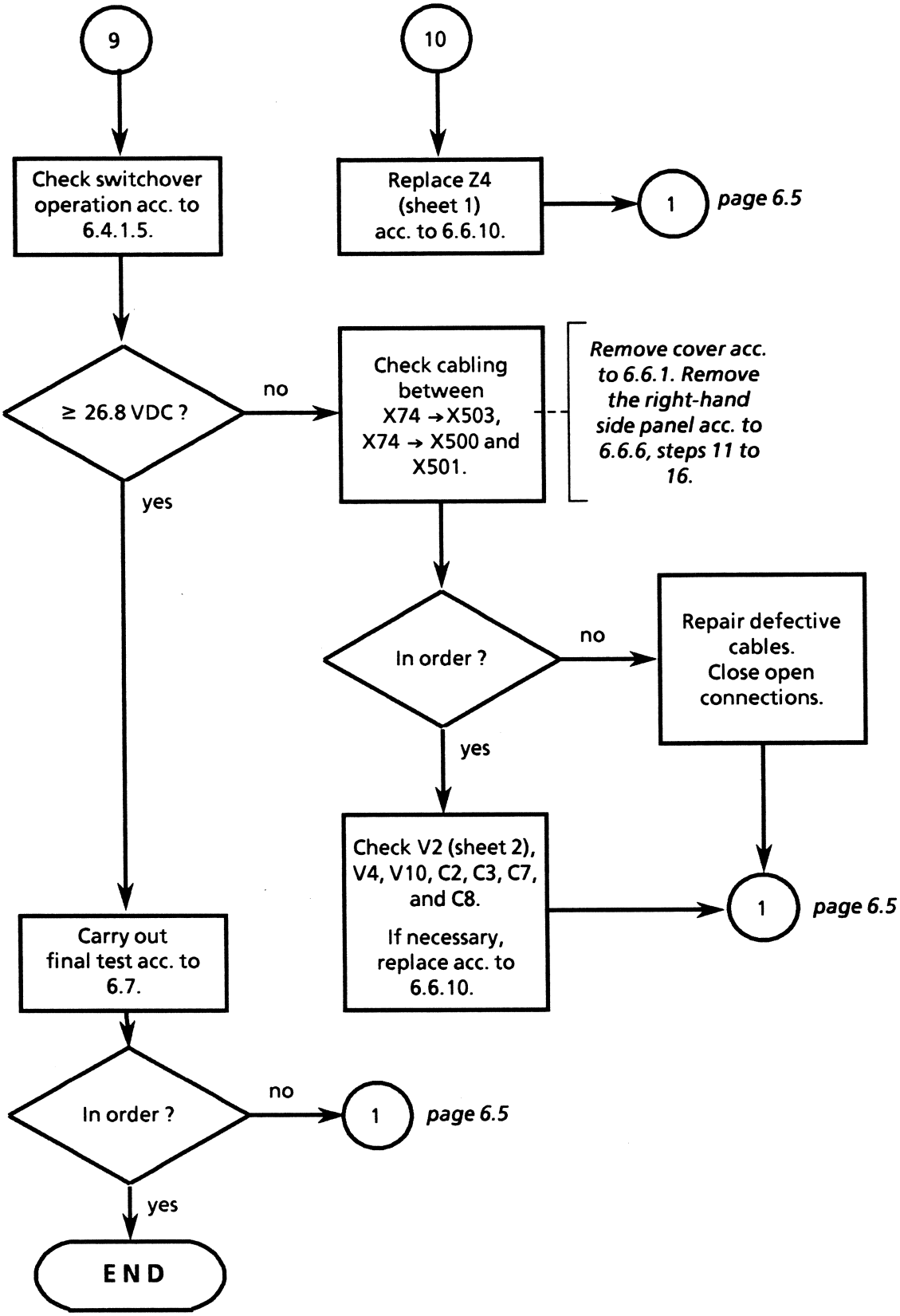

Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 7 of 10)

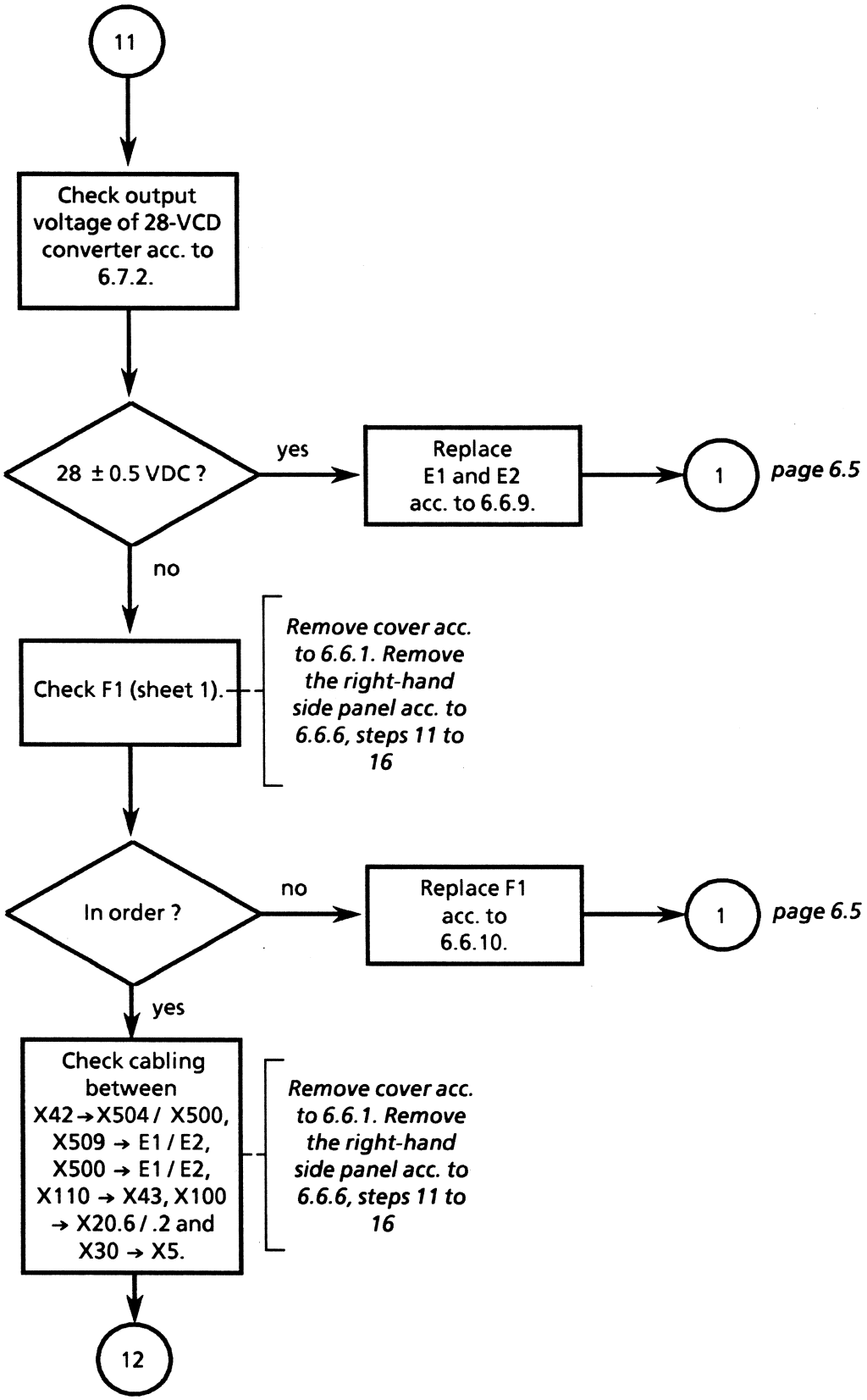

Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 8 of 10)

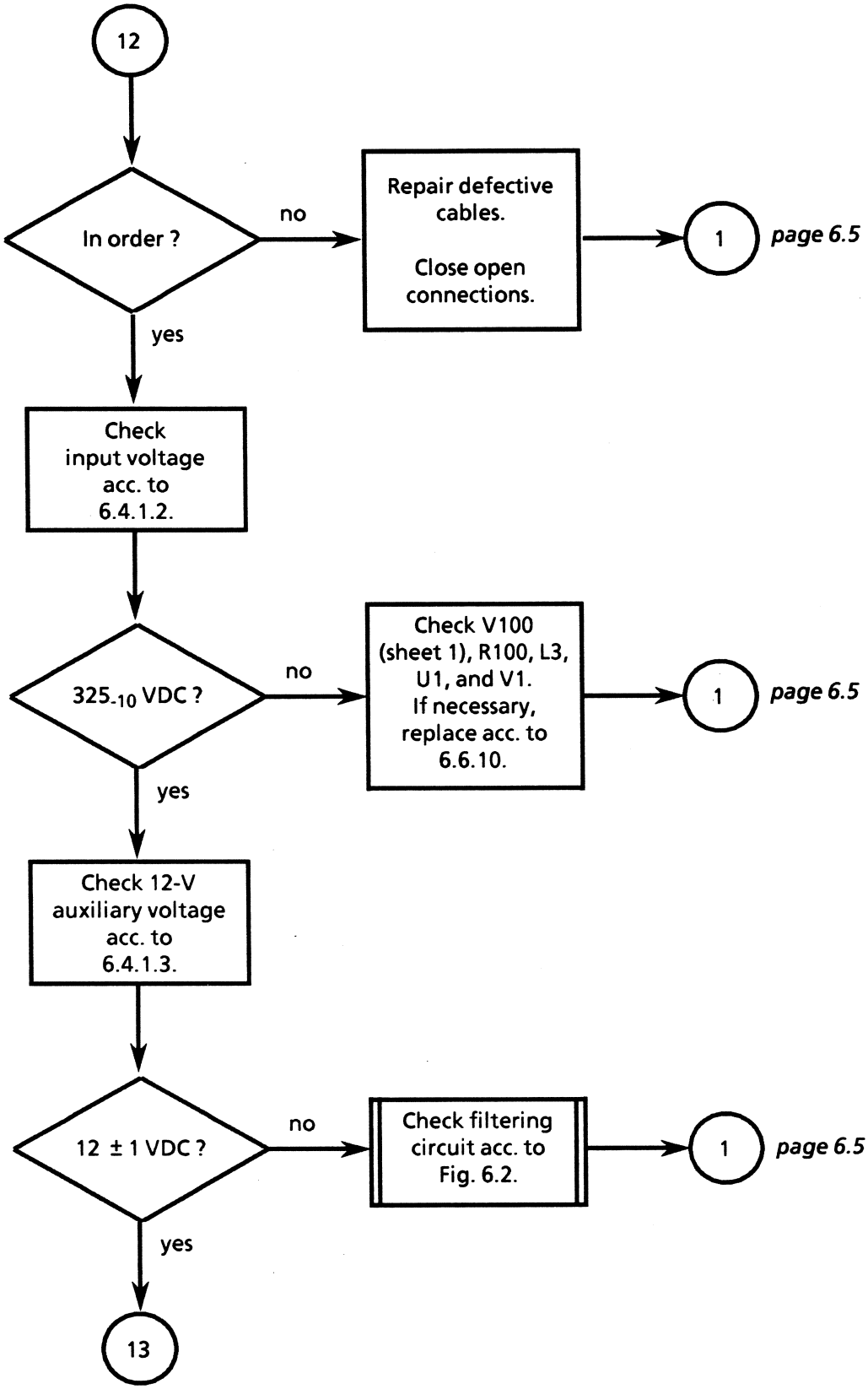

Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 9 of 10)

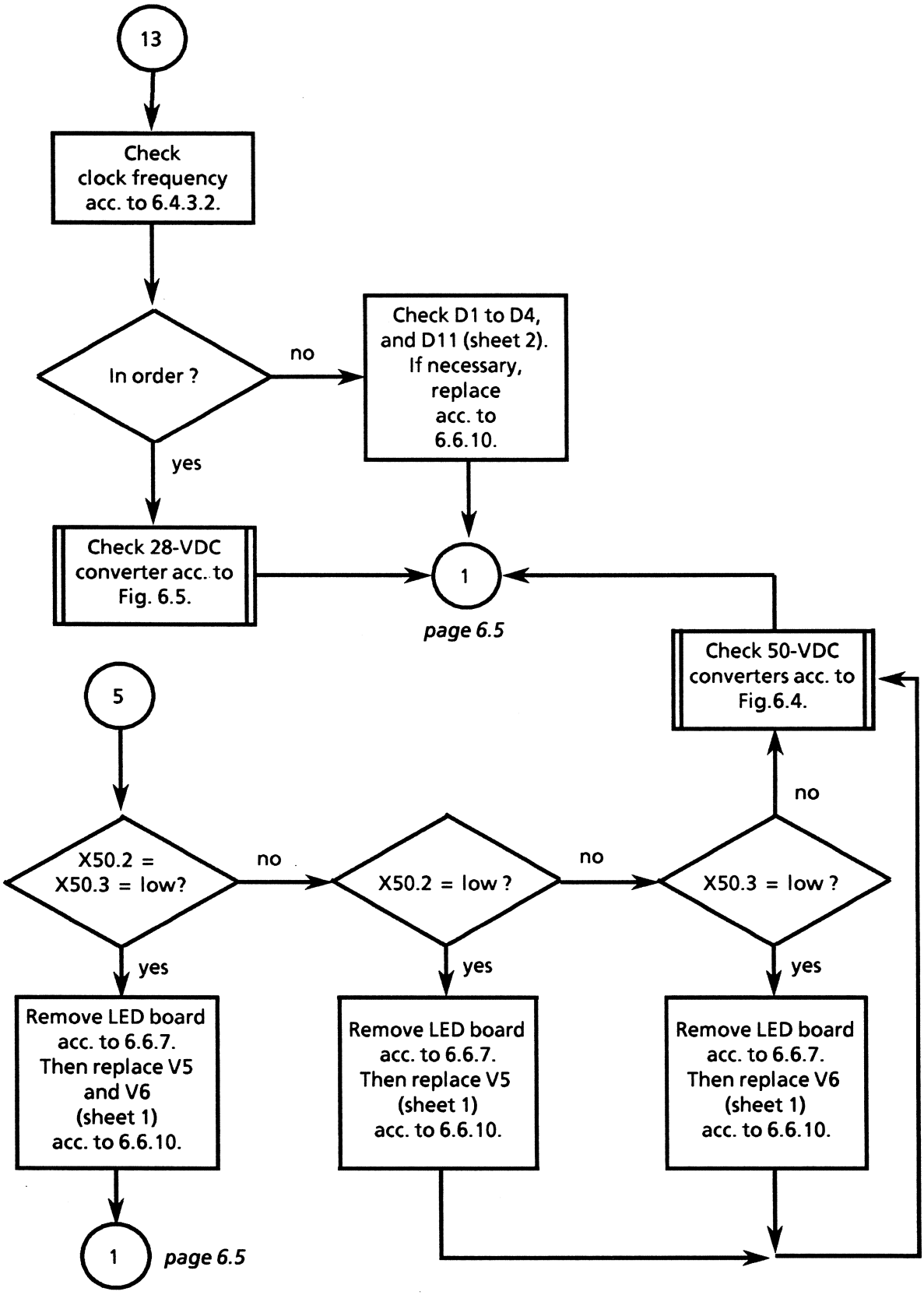

Fig. 6.1 Troubleshooting Flowchart, Power Supply (page 10 of 10)

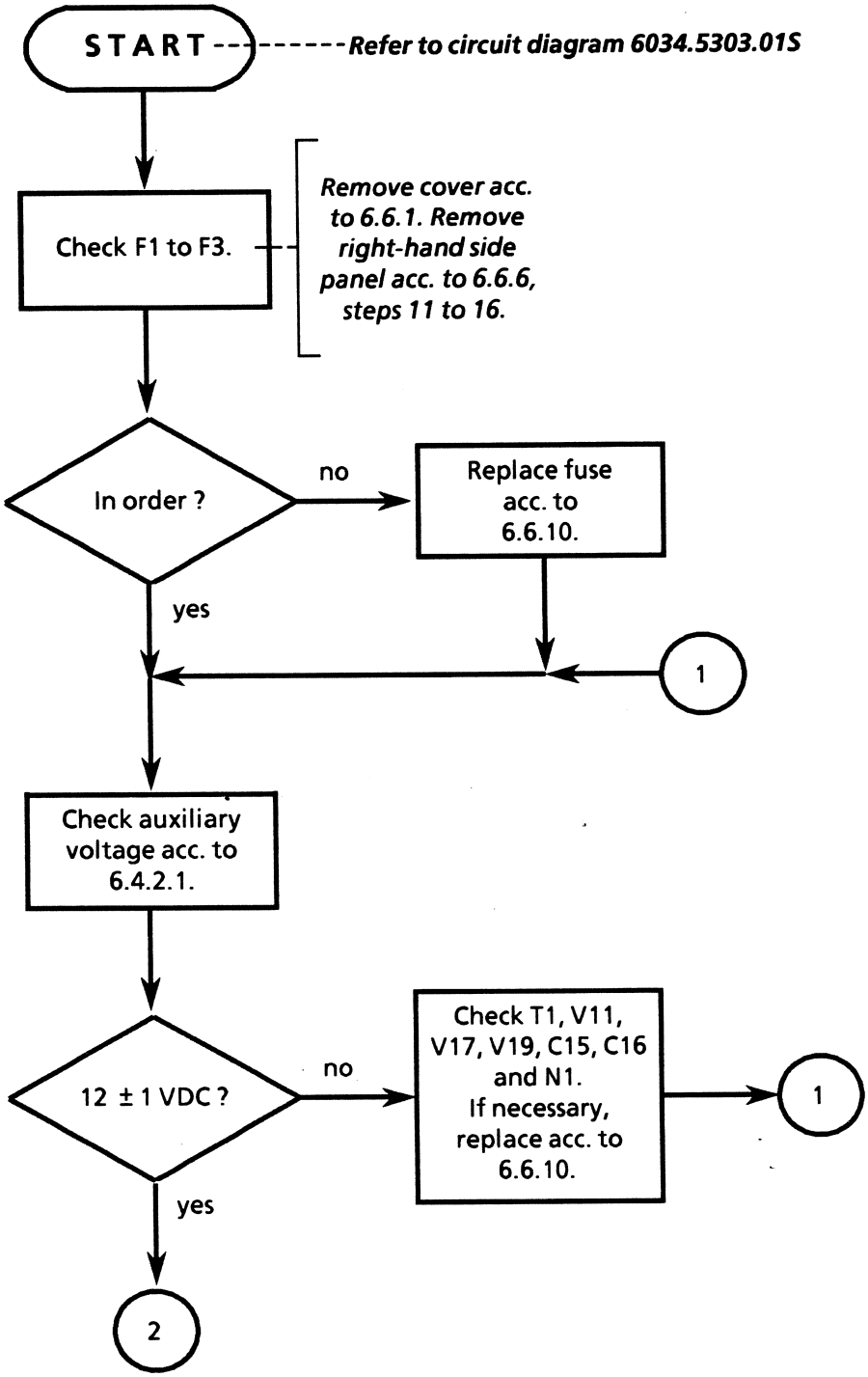

Fig. 6.2 Troubleshooting Flowchart, Filtering Circuit (page 1 of 2)

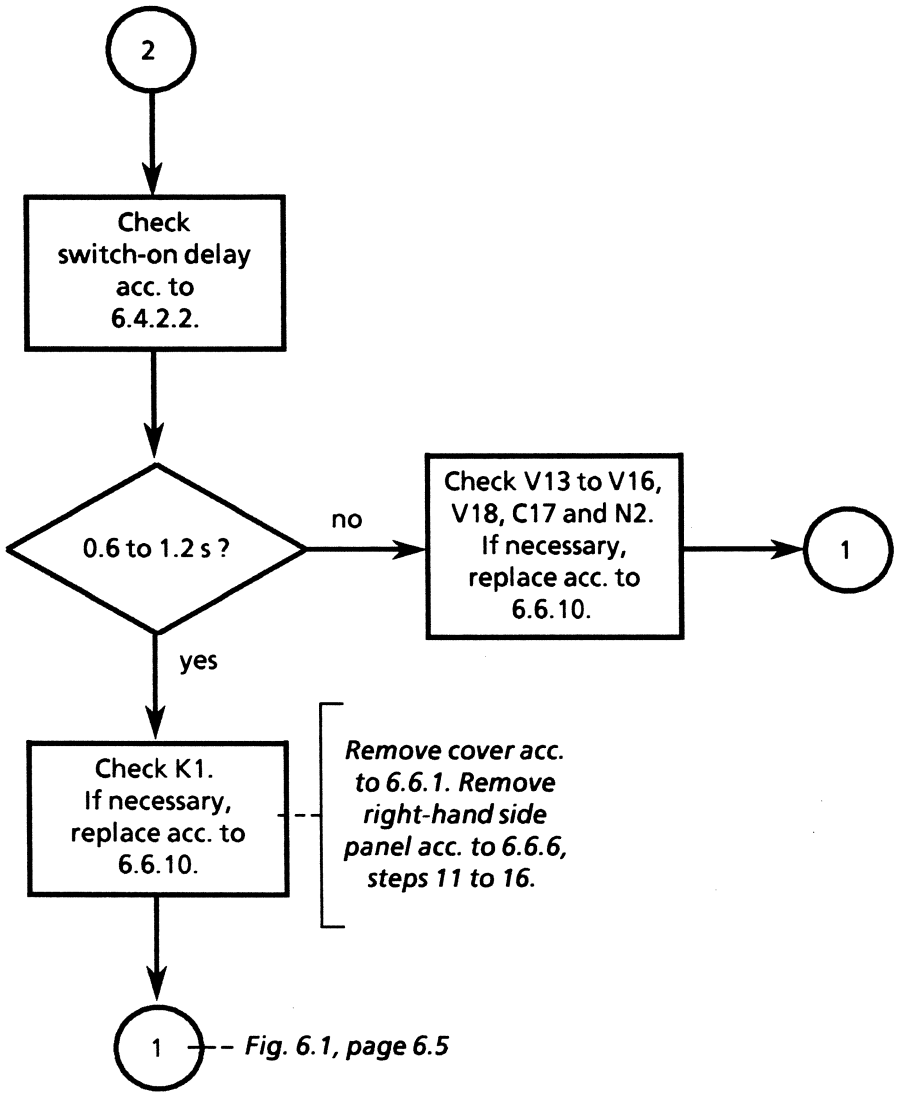

Fig. 6.2 Troubleshooting Flowchart, Filtering Circuit (page 2 of 2)

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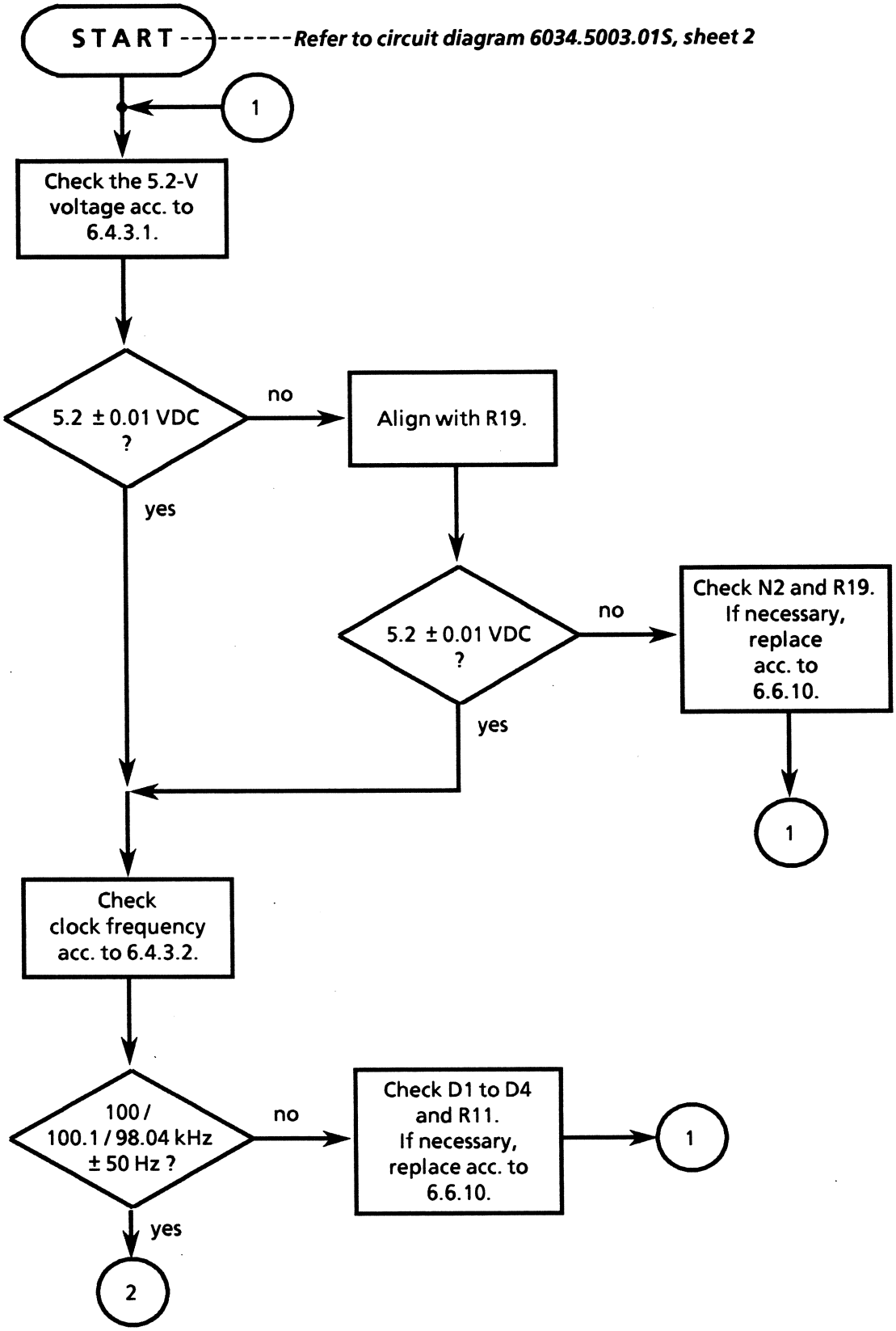

Fig. 6.3 Troubleshooting Flowchart, Control Circuit (page 1 of 2)

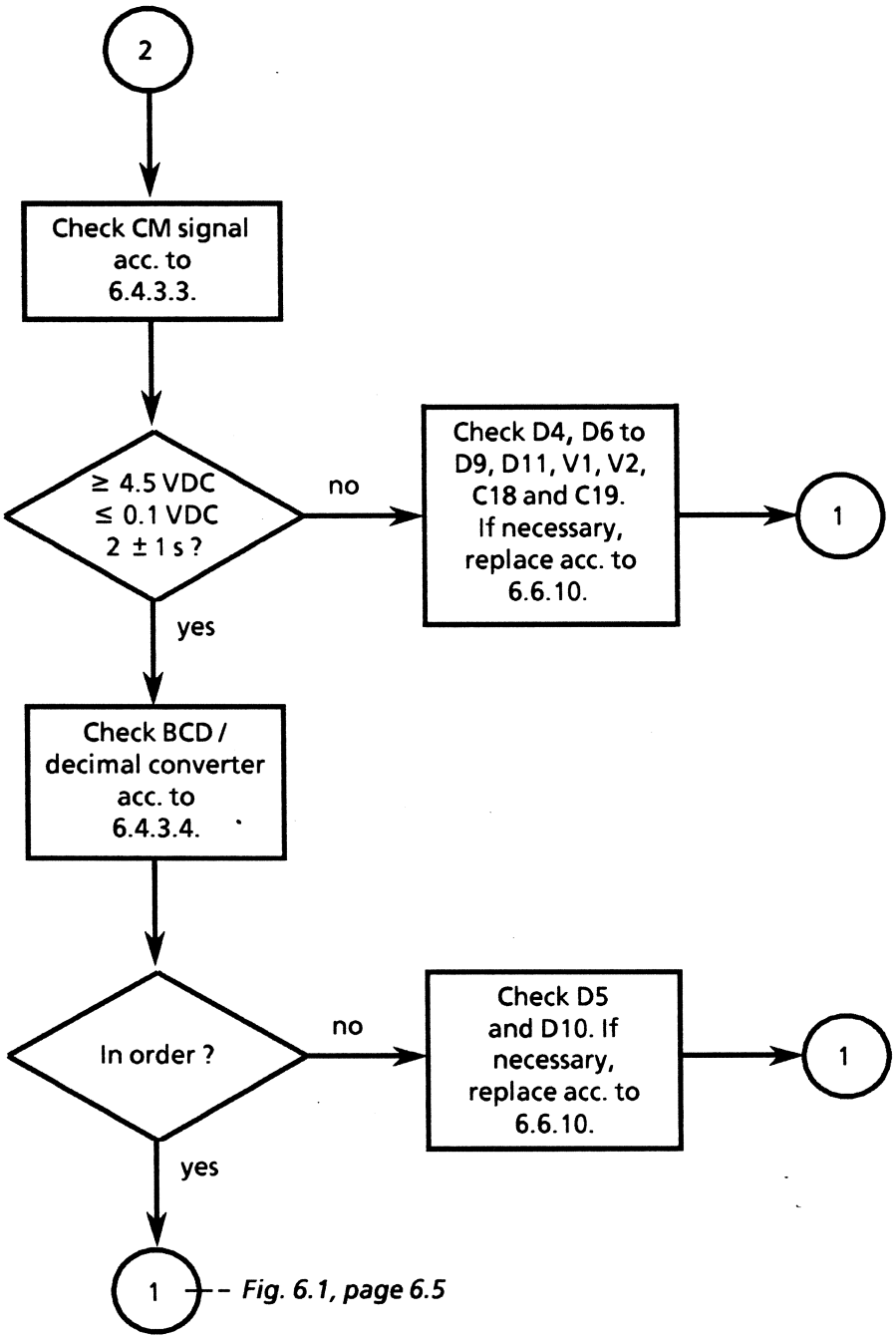

Fig. 6.3 Troubleshooting Flowchart, Control Circuit (page 2 of 2)

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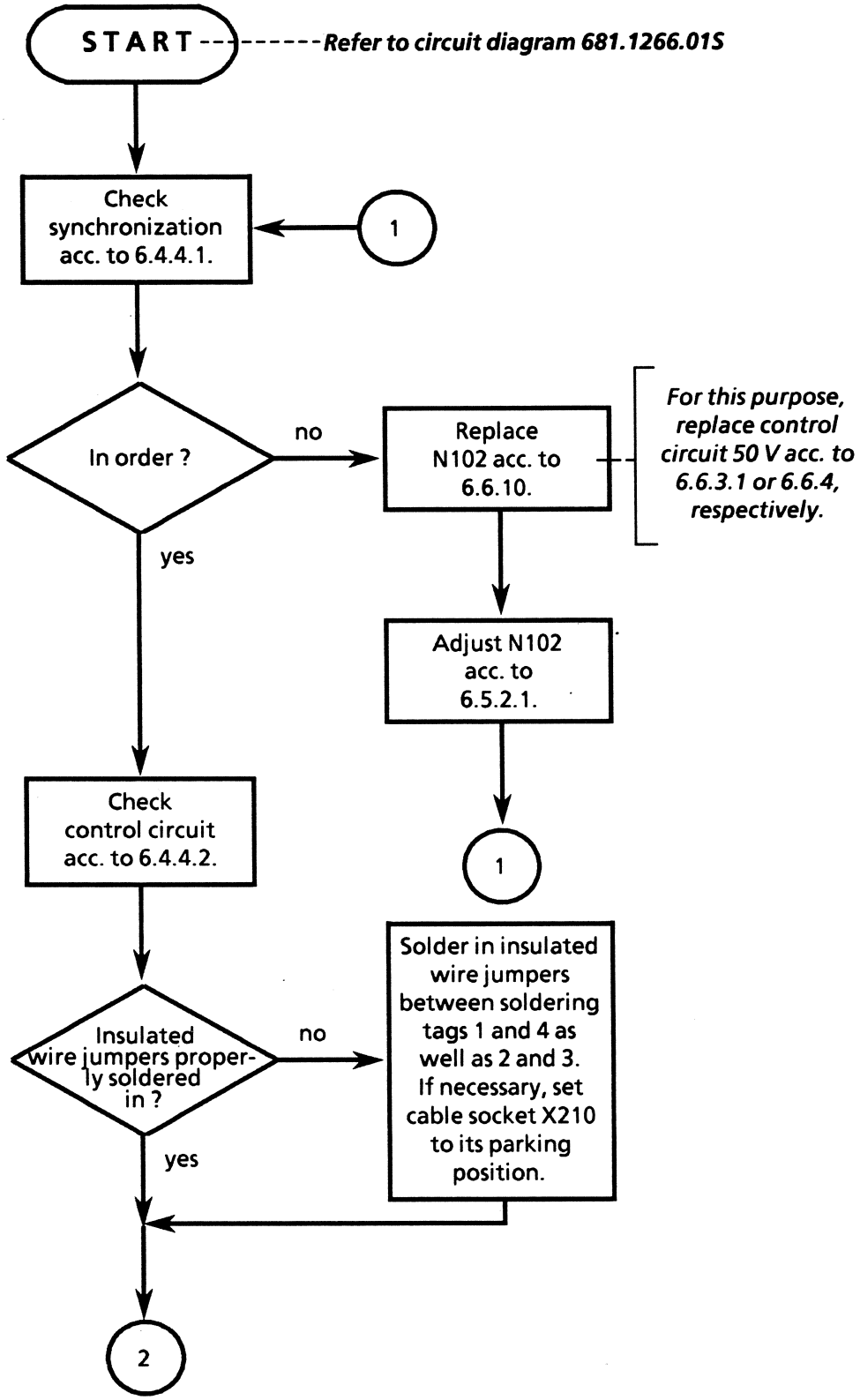


Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 1 of 7)

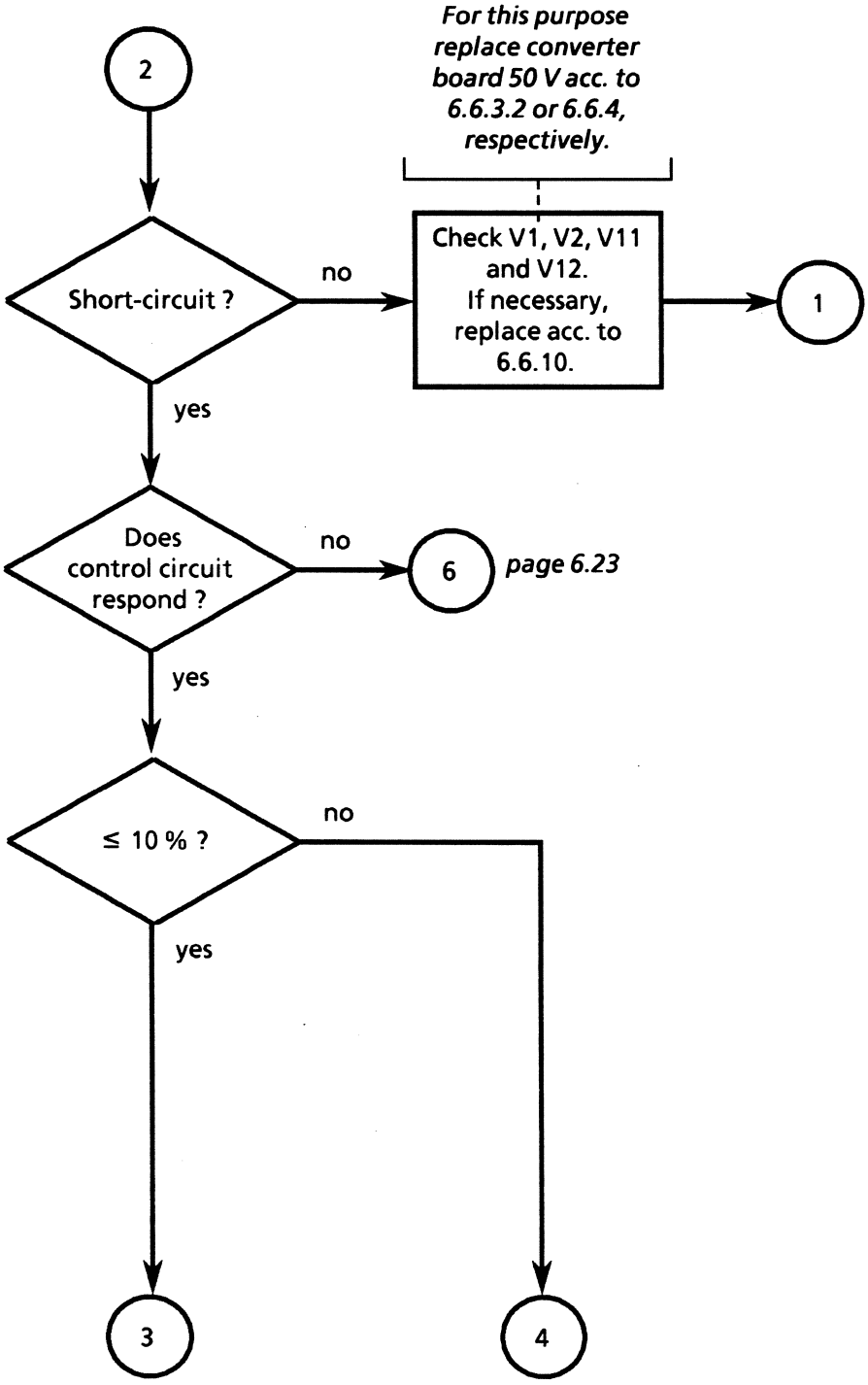


Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 2 of 7)

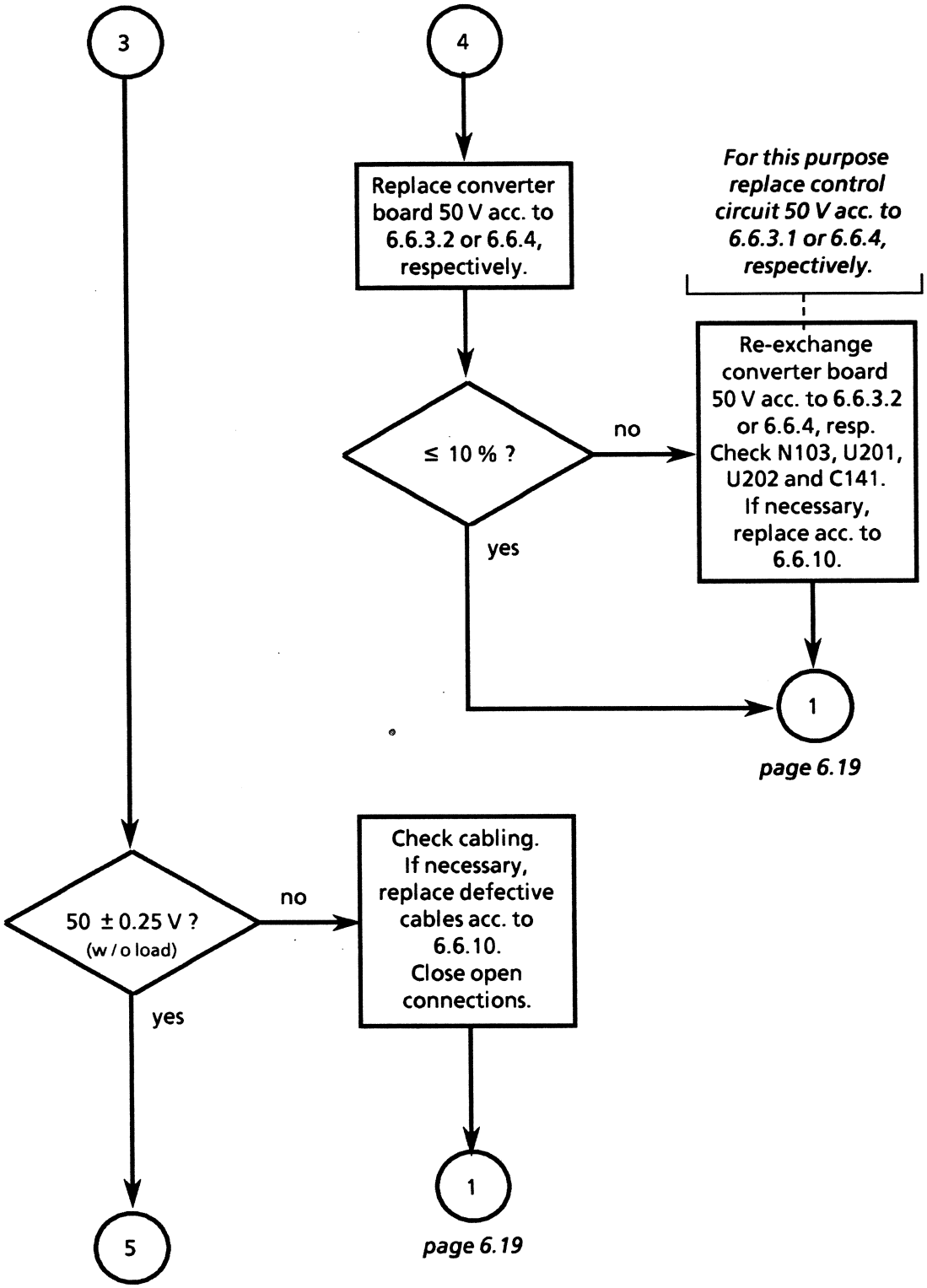


Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 3 of 7)

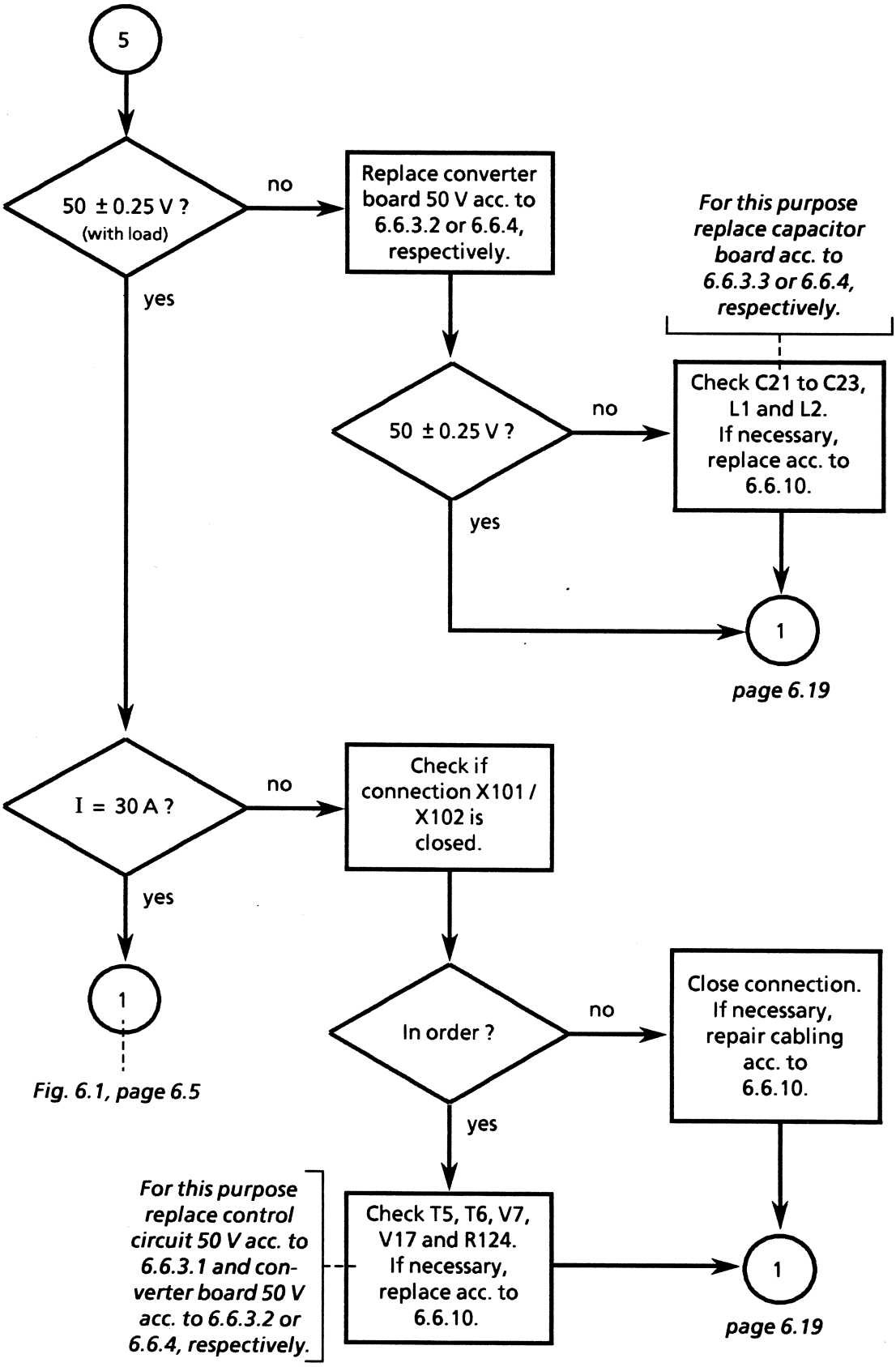


Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 4 of 7)

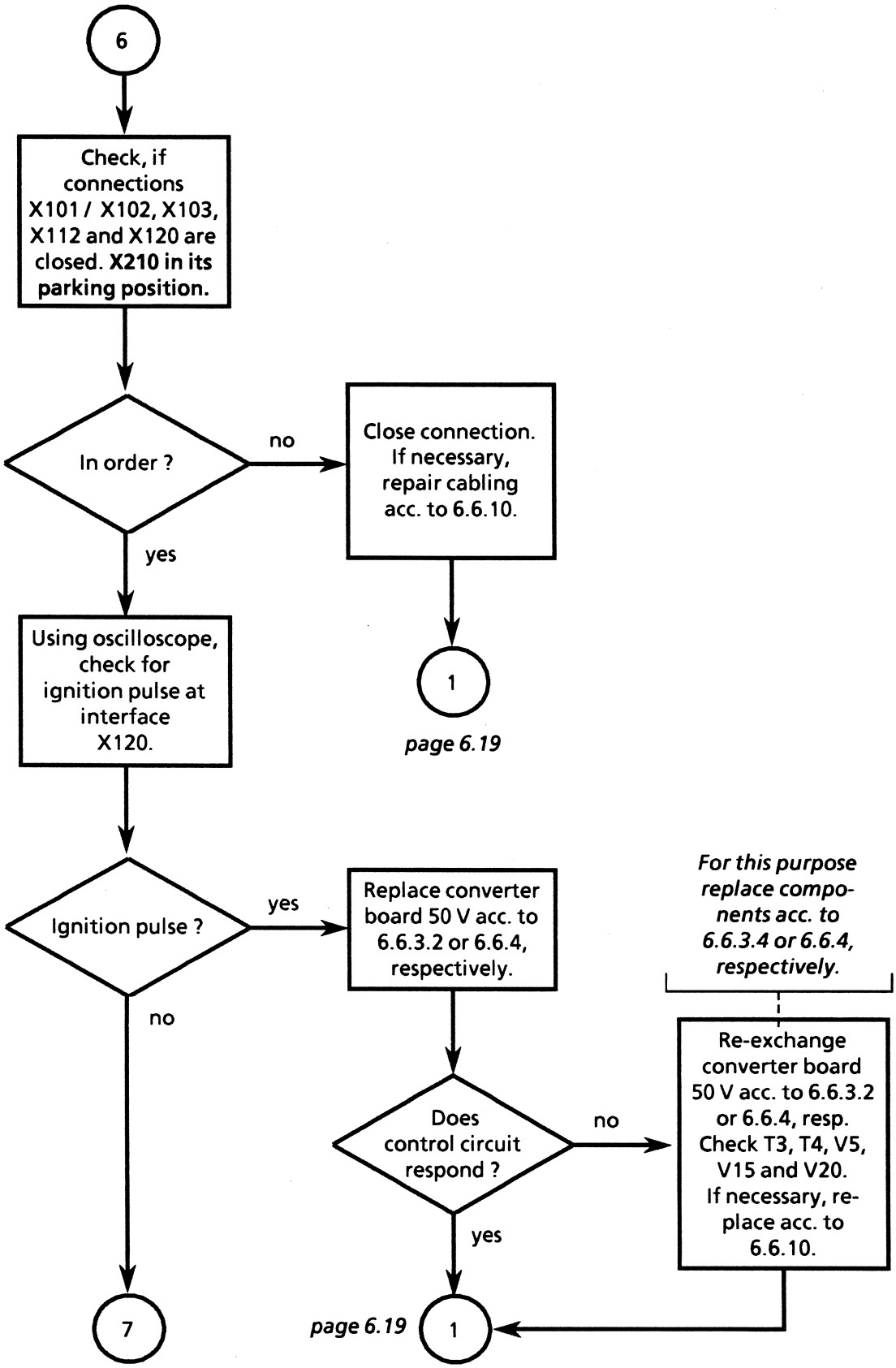


Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 5 of 7)

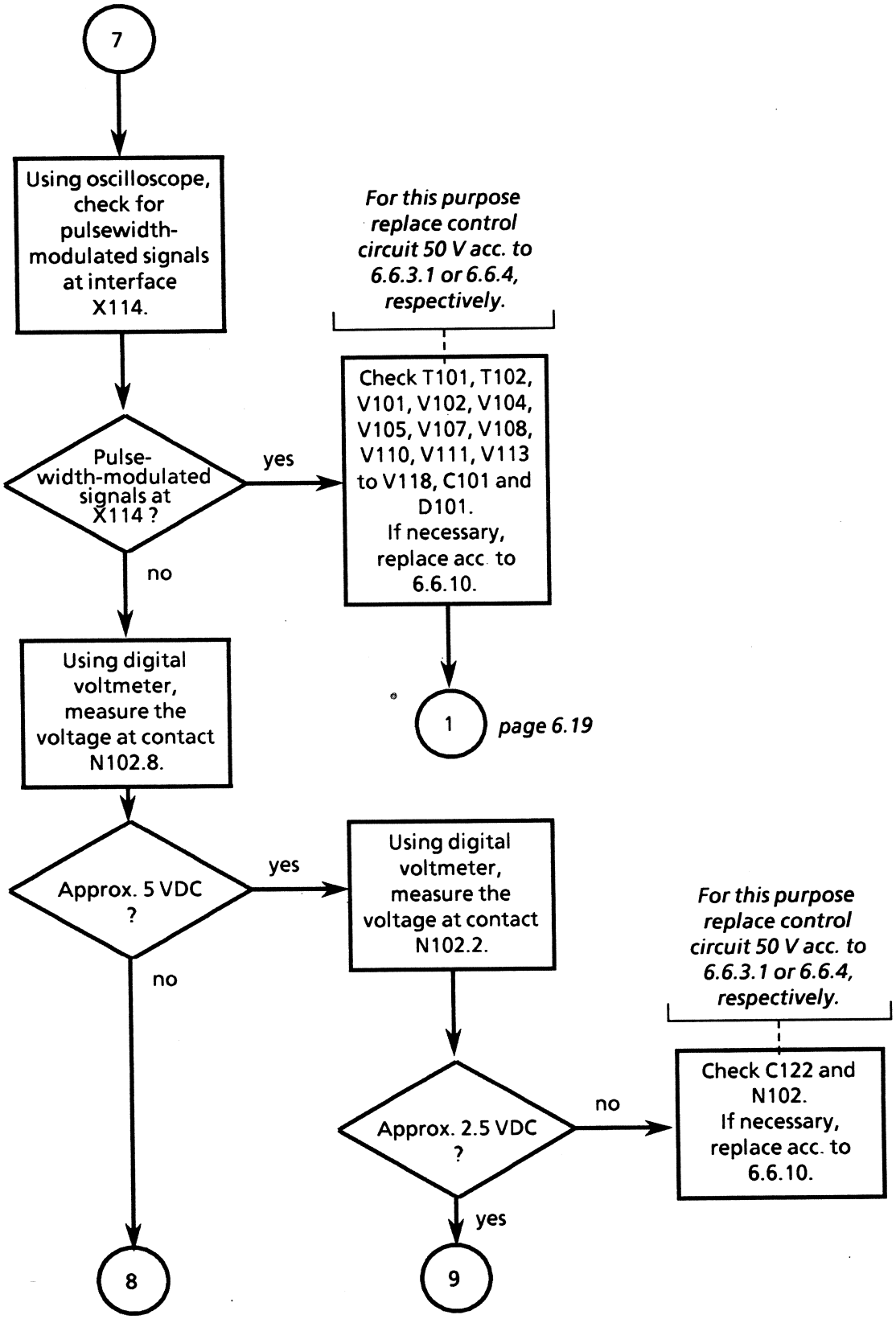


Fig. 6.4 Troubleshooting Flowchart, 50-VDC Converters (page 6 of 7)

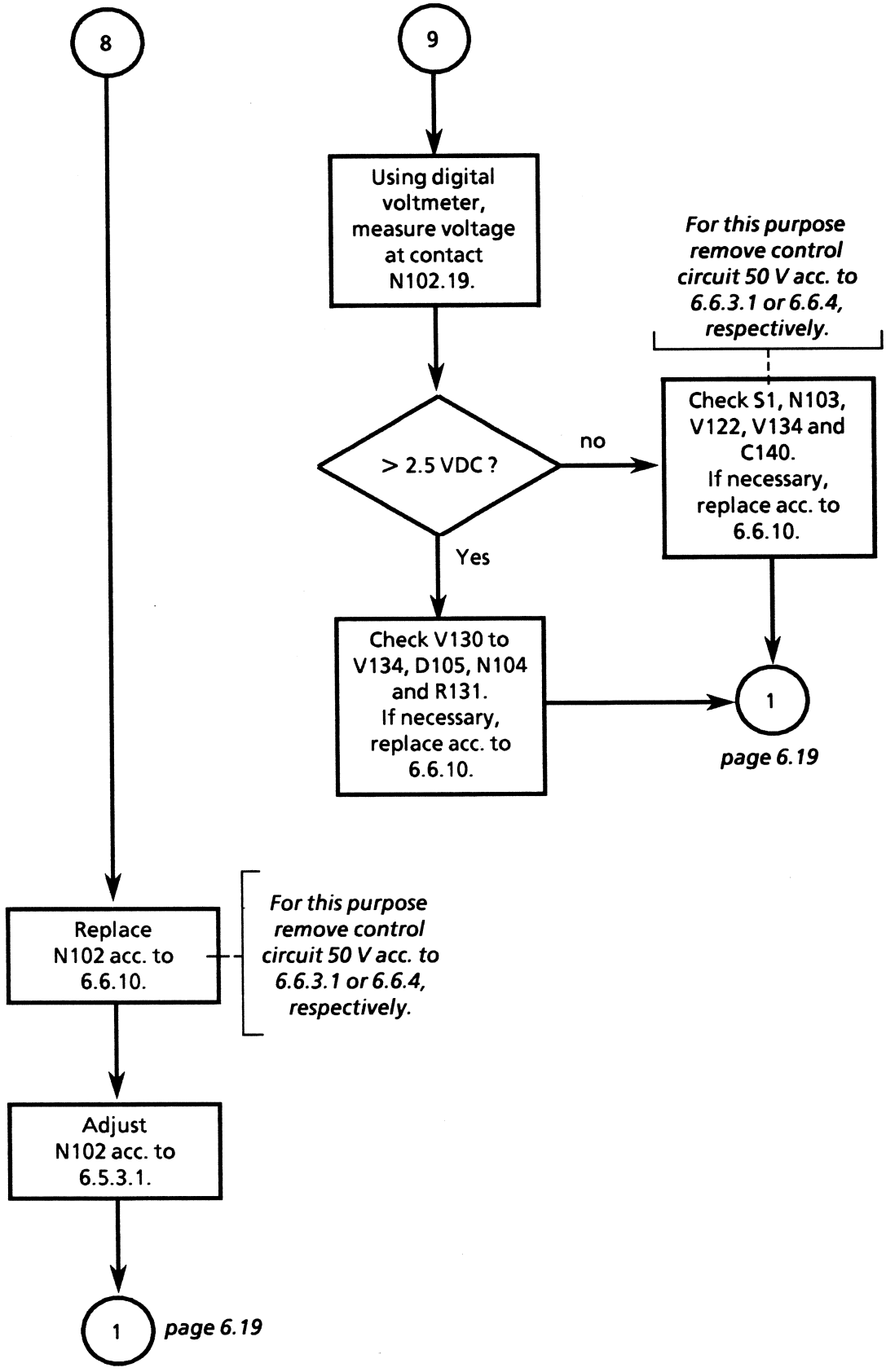


Fig. 6.4 Troubleshooting Flowchart, 50-VCD Converters (page 7 of 7)

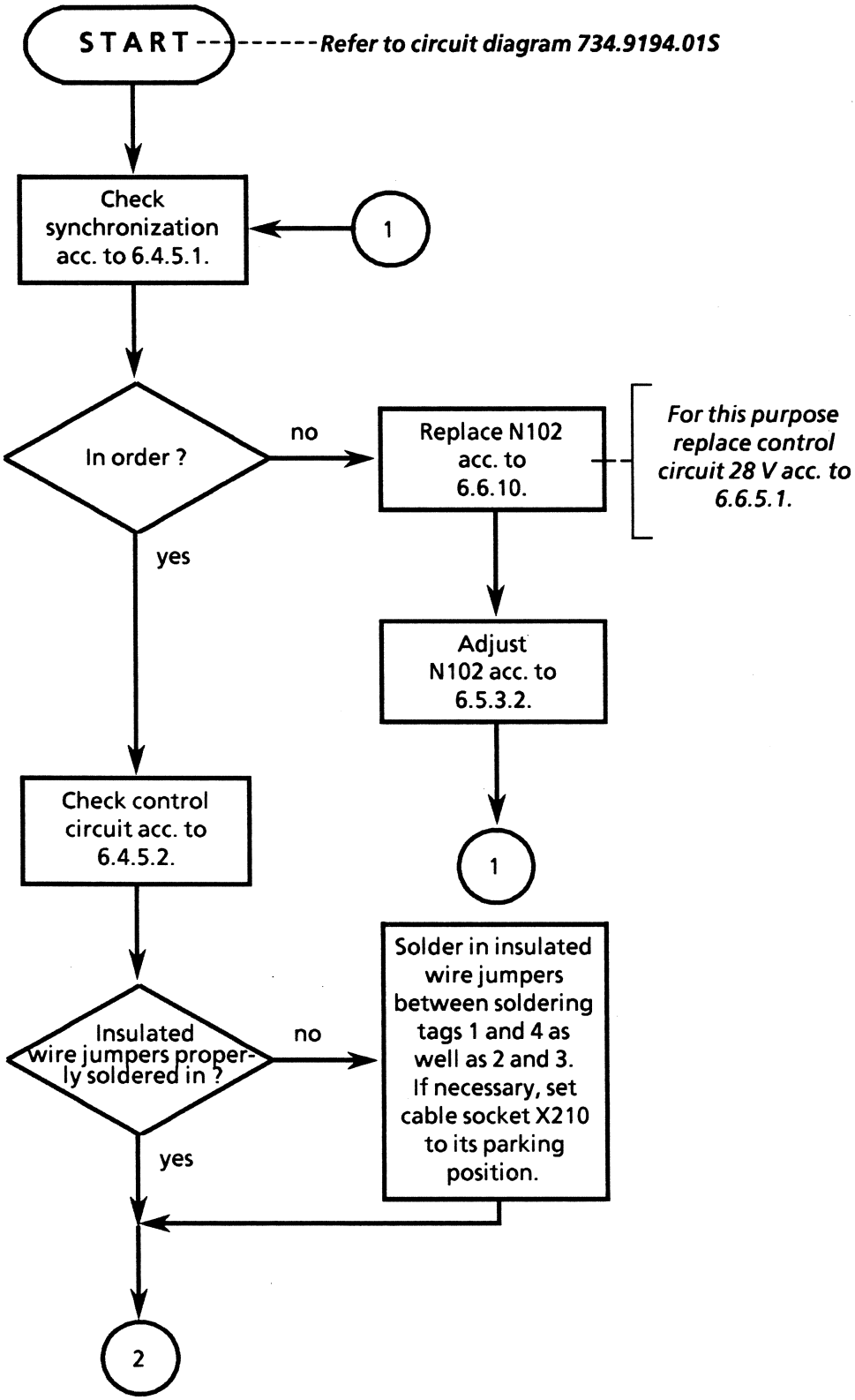


Fig. 6.5 Troubleshooting Flowchart, 28-VCD Converter (page 1 of 7)

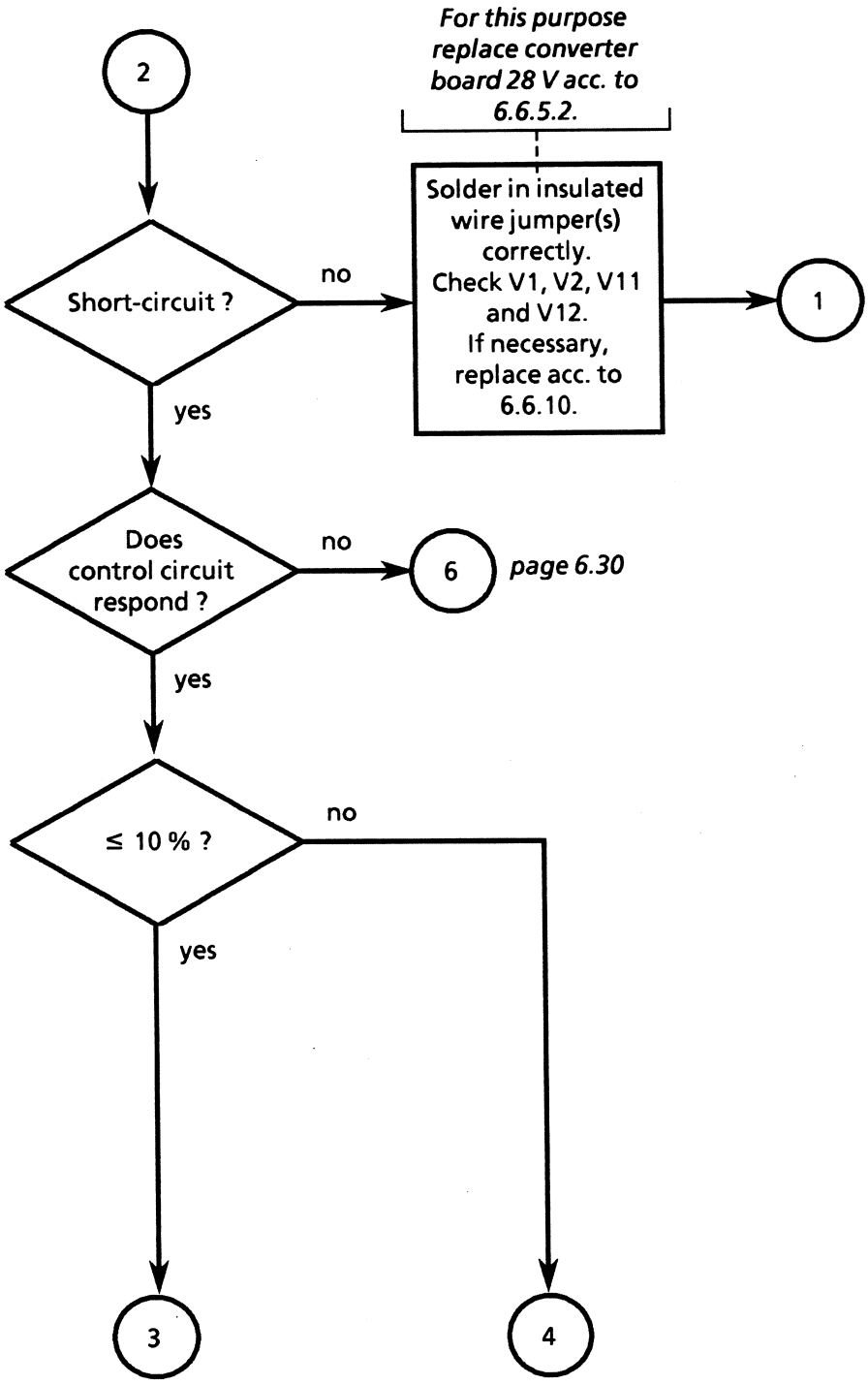


Fig. 6.5 Troubleshooting Flowchart, 28-VCD Converter (page 2 of 7)

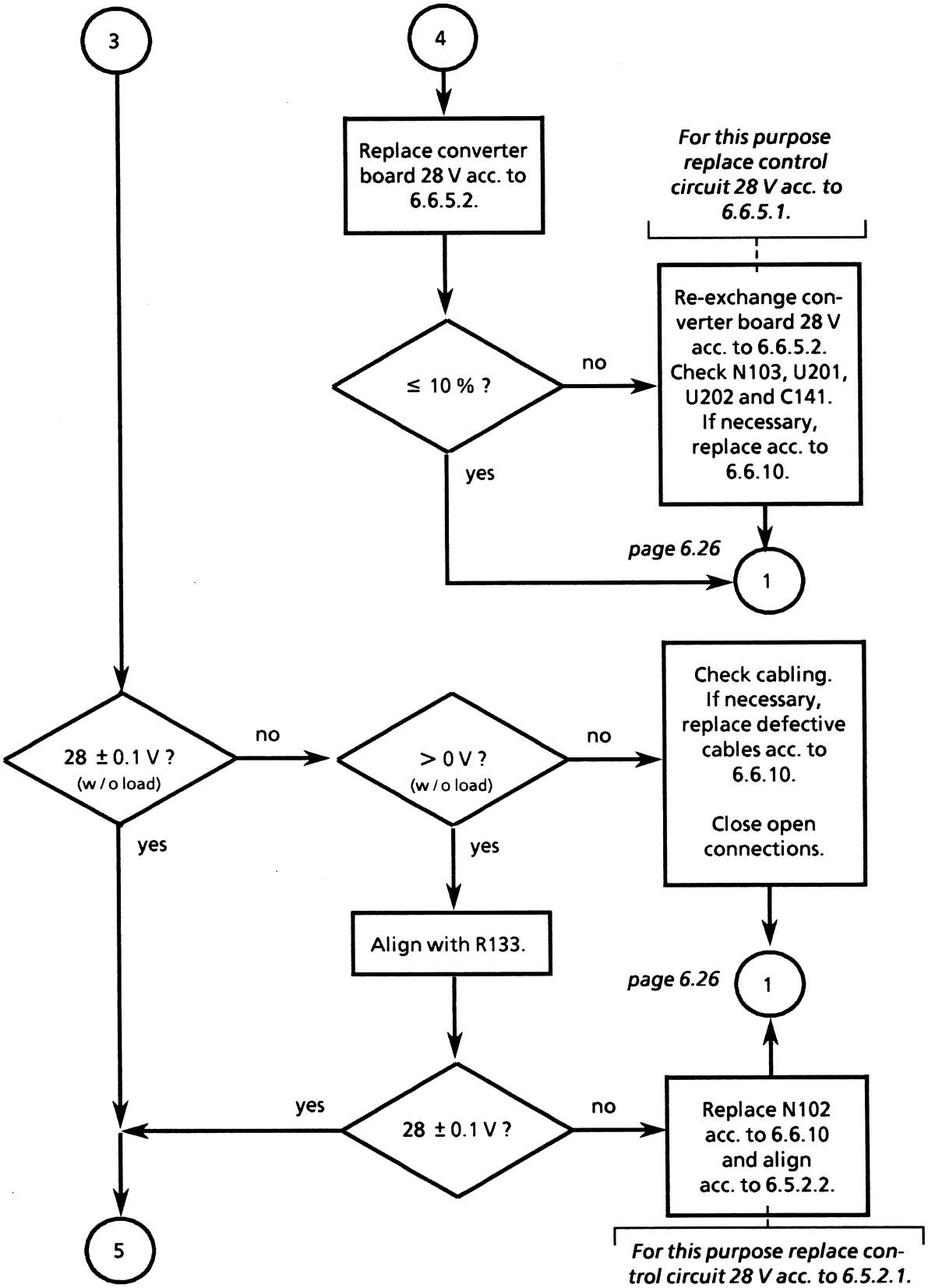


Fig. 6.5 Troubleshooting Flowchart, 28-VCD Converter (page 3 of 7)

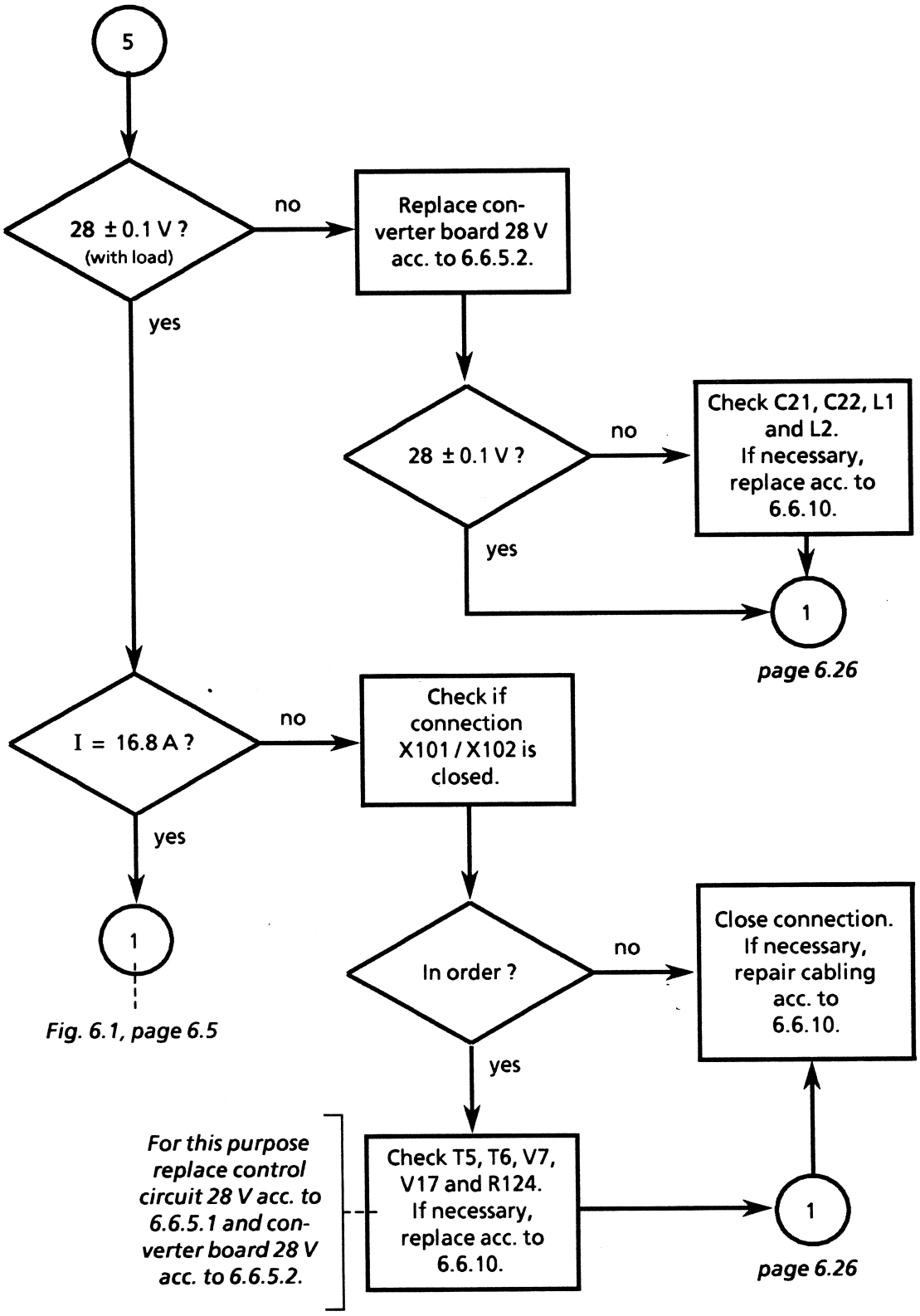


Fig. 6.5 Troubleshooting Flowchart, 28-VCD Converter (page 4 of 7)

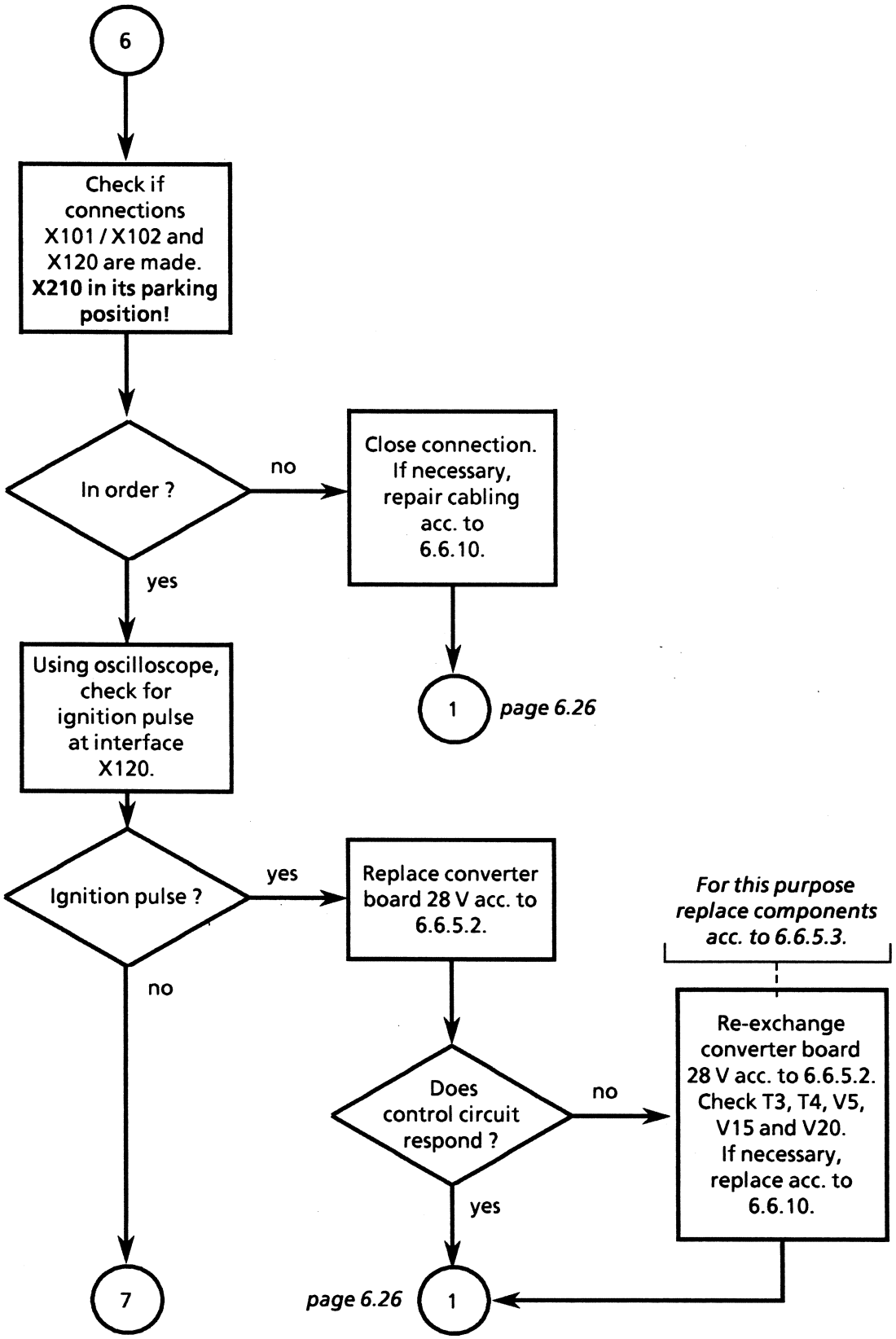


Fig. 6.5 Troubleshooting Flowchart, 28-VCD Converter (page 5 of 7)

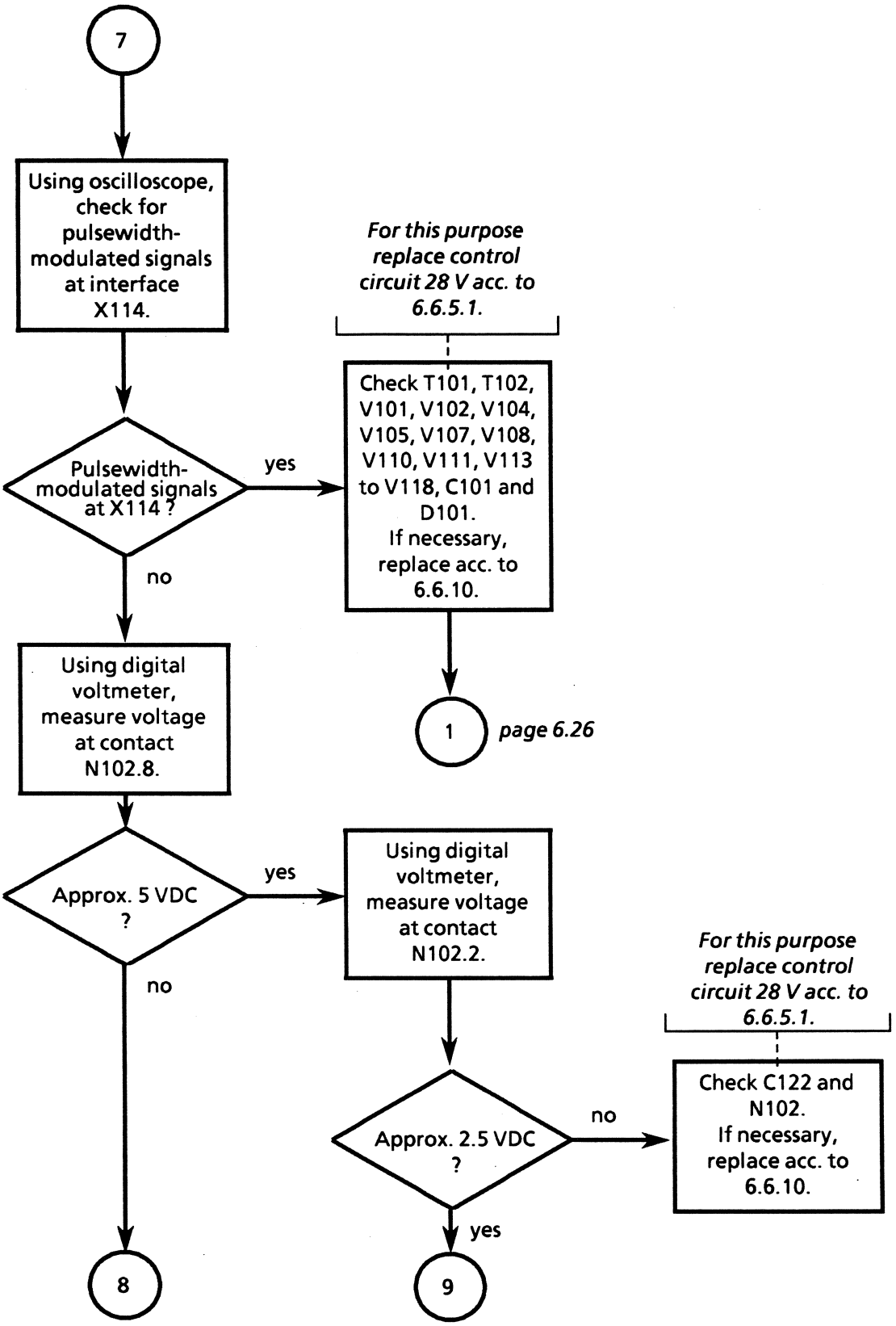


Fig. 6.5 Troubleshooting Flowchart, 28-VCD Converter (page 6 of 7)

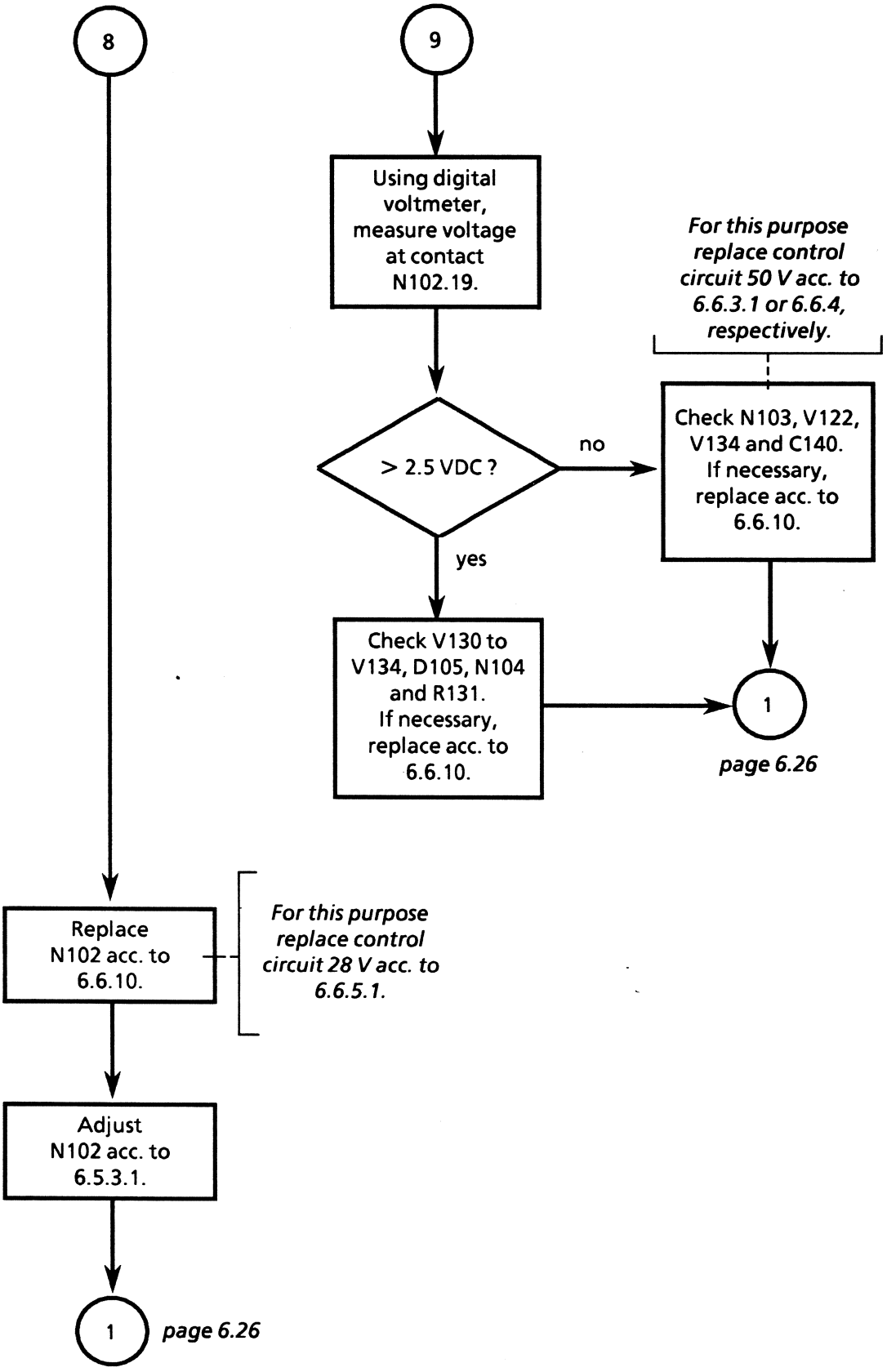


Fig. 6.5 Troubleshooting Flowchart, 28-VCD Converter (page 7 of 7)

6.4 Measurements and Functional Checks

The measurements and functional checks that are described below are the more detailed procedures to the instructions given in condensed form in the troubleshooting flowcharts. Consequently, these measurements and functional checks are usually undertaken by branching out of the troubleshooting flowcharts at a particular point. When the measurement etc. has been performed, return to the troubleshooting flowcharts and continue at the same point where it was previously left.

If a fault has been clearly identified beforehand, however, one can of course commence with one of these measurements, etc. directly.

6.4.1 Frame (A50)

(Refer to circuit diagram 6034.5003.01S)

6.4.1.1 Check of LEDs, Blowers and Mains Output Voltage

1. Arrange test set-up acc. to Fig. 6.6.
2. Switch on Power Supply IN 859C2.
3. Gradually increase output voltage on variable separating transformer until the nominal value (230 VAC) is reached. At the same time, observe the input current, LEDs POWER and 28 V as well as the blowers.

   Nominal values: I < 1 A, blowers are running, LEDs are illuminated

   Note:

   When increasing the voltage, keep in mind the maximum current.
4. Using digital multimeter, measure the AC voltage between contacts X71.A and .C (sheet 1).

   Nominal value: 230 V ± 5 %
5. Via test adapter (Fig. 6.9) switch on the two 50-VDC converters (S1.1 = S1.2 = high) and observe LEDs 50-V-I and 50-V-II.

   Nominal value: LEDs are illuminated
6. Following the functional check, carry out steps 1 and 2 in the reverse order.

6.4.1.2 Measuring Input Voltage for the Converters

1. Remove the cover acc. to 6.6.1.
2. Undo and remove the eight M4 x 8 screws (4, Fig. 6.11), fixing the right-hand side panel to the power supply.
3. Ease off flat sleeve (violet cable) from filter Z4 (12, Fig. 6.12).
4. Ease off flat sleeve (green / yellow cable) from filter Z4 (13).
5. Ease off flat sleeve (black cable) from filter Z4 (14).
6. Press locking devices on socket and disengage socket from 6-way male connector strip X11 (17, Fig. 6.13).
7. Remove the right-hand side panel.
8. Press locking devices on socket and disengage socket from 6-way male connector strip X20 (2).
9. Arrange test set-up according to Fig. 6.6.
10. Switch on Power Supply IN 859C2.
11. Set the output voltage on the variable separating transformer to 230 VAC.

12. Using digital multimeter, measure the voltage between contacts X20.4 (+ , sheet 1) and .5 (-), .1 (+) and .2 (-) as well as between contacts .6 (+) and .3 (-).

    Nominal value: 325_{-10} VDC

13. Following the measuring, carry out steps 1 to 11 in the reverse order.

6.4.1.3 Measuring the 12-VDC Auxiliary Voltage

1. Remove the cover according to 6.6.1.
2. Push locking levers on 10-way male connector strips X23 (5, Fig. 6.12), X33 (9) and X43 (1) sideways and disengage sockets.
3. Arrange test set-up according to Fig. 6.6.
4. Switch on Power Supply IN 859C2.
5. Set the output voltage on the variable separating transformer to 230 VAC.
6. Using digital multimeter, measure the voltage between contacts X23.2 (sheet 2) and .1 (ground), X33.2 and .1 (ground) as well as between contacts X43.2 and .1 (ground).

   Nominal value: 12 ± 1 VDC

7. Following the measuring, carry out steps 1 to 4 in the reverse order.

6.4.1.4 Measuring the Nominal Voltage

1. Remove the cover according to 6.6.1.
2. Push locking levers on 10-way male connector strip X23 (5, Fig. 6.12) and X33 (9) sideways and disengage sockets.
3. Arrange test set-up according to Fig. 6.6.
4. Switch on Power Supply IN 859C2.
5. Set the output voltage on the variable separating transformer to 230 VAC.
6. Via the test adapter (Fig. 6.9) switch on the two converters (S1.1 = S1.2 = high) and set to 45 VDC (S1.5 = S1.6 = S1.7 = low).
7. Using digital multimeter, measure the voltage between contacts X23.7 (sheet 2) and .1 (ground) as well as between contacts X33.7 and .1 (ground).

   Nominal value: 4.5 ± 0.05 VDC

8. Following the measuring, carry out steps 1 to 5 in the reverse order.

6.4.1.5 Functional Check of Switchover Operation

1. Arrange test set-up according to Fig. 6.6.
2. Set the power supply at interface X74 to 28 ± 0.5 VDC and switch on.

   Nominal value: both blowers are running

3. By means of an ammeter switch variable resistor R_L between contacts X75.3 and .5 (ground).
4. Using resistor R_L, set the output current at interface X75 to 10 A and measure the output voltage via R_L.

   Nominal value: ≥ 26.8 VDC

5. Repeat the measurement for contacts X75.4 (sheet 1) and .2 (ground = .5).
6. Following the functional check, carry out steps 1 to 3 in the reverse order.

6.4.2 Filtering Circuit (A501)

(Refer to circuit diagram 6034.5303.01S)

6.4.2.1 Measuring the Auxiliary Voltage

1. Remove the filtering circuit acc. to 6.6.6.
2. Connect a variable separating transformer to contacts X10.1 (sheet 1) and .4.
3. Set the output voltage on the variable separating transformer to 230 VAC.
4. Connect a 100-Ω resistor to contacts X80.1 and .2.
5. Using digital voltmeter, measure the voltage between contacts X30.A1 and .A4 (ground) and, in addition, between X50.7 and .9 (ground).

   Nominal value: 12 ± 1 VDC into 68 Ω
6. Following the measuring, carry out steps 1 to 4 in the reverse order.

6.4.2.2 Measuring the Switch-on Delay

1. Remove the filtering circuit acc. to 6.6.6.
2. Connect a variable separating transformer to contacts X10.1 (sheet 1) and .4.
3. Connect a 100-Ω resistor to contacts X80.1 and .2.
4. Connect a storage oscilloscope to the filtering circuit as follows:

   Channel A: X30.A1 and .A4
   Channel B: X80.1 and .2
5. Switch on the variable separating transformer, set to 230 V and determine the time delay.

   Nominal value: 0.6 to 1.2 s referred to Mains ON
6. Following the measuring, carry out steps 1 to 5 in the reverse order.

6.4.3 Control Circuit (A10)

(Refer to circuit diagram 6034.5003.01S)

6.4.3.1 Measuring the 5.2-VDC Voltage

1. Remove the control circuit acc. to 6.6.2.
2. Connect a power supply unit to contacts X5.8 (+) and .9 (-).
3. Set the output voltage of the power supply unit to 12 VDC and switch on.
4. Using a digital multimeter, measure the voltage at contact N2.5.

   Nominal value: 5.2 ± 0.01 VDC

   Adjust any deviation from the nominal value with resistor R19.
5. Following the measuring, carry out steps 1 to 3 in the reverse order.

6.4.3.2 Measuring the Clock Frequency

1. Remove the control circuit acc. to 6.6.2.
2. Connect a power supply unit to contacts X5.8 (+) and .9 (-).
3. Set the output voltage of the power supply unit to 12 VDC and switch on.

4. Connect contacts X5.17 (DATA5) and .18 (DATA6) to + 5 VDC.

5. Using a frequency counter, measure the frequency at contacts X23.6, X33.6 and X44.6.

   Nominal value: 100 ± 0.050 kHz

6. Connect contact X5.17 (DATA5) to ground.

7. Using a frequency counter, measure the frequency at contacts X23.6, X33.6 and X44.6.

   Nominal value: 100.1 ± 0.050 kHz

8. Connect contact X5.18 (DATA6) to ground.

9. Using a frequency counter, measure the frequency at contacts X23.6, X33.6 and X44.6.

   Nominal value: 98.04 ± 0.050 kHz

10. Following the measuring, carry out steps 1 to 3 in the reverse order.

6.4.3.3 Measuring the CM Signal

1. Remove the control circuit acc. to 6.6.2.

2. Connect a power supply unit to contacts X5.8 (+) and .9 (-).

3. Set the output voltage of the power supply unit to 12 VDC and switch on.

4. Connect contacts X23.8, X33.8 and X43.8 to + 12 VDC.

5. Using a digital multimeter, measure the voltage at contact X5.11.

   Nominal value: ≥ 4.5 VDC

6. First connect one, then two and, finally, all contacts from step 4 to ground. At the same time, measure the voltage at contact X5.11.

   Nominal value: ≤ 0.1 VDC

7. Connect contacts X23.8 and X33.8 to ground and contact X43.8 to + 12 VDC.

8. Connect an oscilloscope to contact X5.11.

9. Connect contact X5.19 (DATA3) to + 12 VDC and measure the time it takes for a high pulse to appear on contact X5.11.

   Nominal value: 2 ± 1 s

10. Repeat the measurement if contact X5.16 (DATA4) is connected to + 12 VDC.

11. Following the measuring, carry out steps 1 to 3 in the reverse order.

6.4.3.4 Functional Check of BCD / Decimal Converter

1. Remove the control circuit acc. to 6.6.2.

2. Connect a power supply unit to contacts X5.8 (+) and .9 (-).

3. Set the output voltage of the power supply unit to 12 VDC and switch on.

4. Connect contacts X5.12 (DATA0), .13 (DATA1) and .14 (DATA2) to + 12 VDC (= high) or ground (= low) in compliance with the following Table. At the same time, measure the voltage at contacts X23.7 and X33.7 with a digital multimeter.

   Nominal values:

X5			X23 / X33
.12	.13	.14	
L	L	L	4.5 ± 0.10 V
H	L	L	4.6 ± 0.10 V
L	H	L	4.7 ± 0.10 V
H	H	L	4.8 ± 0.10 V
L	L	H	4.9 ± 0.10 V
H	L	H	5.0 ± 0.10 V
L	H	H	5.1 ± 0.10 V
H	H	H	5.2 ± 0.10 V

5. Carry out steps 1 to 3 in the reverse order.

6.4.4 50-VDC Converters (A20 / A30)

(Refer to circuit diagram 681.1266.01S)

6.4.4.1 Functional Check of Synchronization

1. Remove 50-VDC converter A20 acc. to 6.6.3 and A30 acc. to 6.6.4.
2. Undo and remove the 17 M2.5 x 5 screws (1, Fig. 6.14) fixing the screening hood to the 50-VDC converter.
3. Remove hood.
4. Connect a power supply unit to contacts X110.2 (+) and .1 (-).
5. Set the output voltage of the power supply unit to 12 VDC and switch on.
6. Connect a rectangular-wave generator to contact X110.6.
7. Set the output frequency of the generator to 100 kHz and switch on.
8. Using a frequency counter, measure the frequency at interface X113.

   Nominal value: 100 kHz

9. Repeat the functional check at frequencies of 90 and 110 kHz.
10. Carry out steps 1 to 7 in the reverse order.

6.4.4.2 Functional Check of Control Loop

1. Remove 50-VDC converters A20 and A30 acc. to 6.6.3 and 6.6.4, respectively.
2. Undo and remove the 17 M2.5 x 5 screws (1, Fig. 6.14) fixing the screening hood to the 50-VDC converter.
3. Remove hood.
4. Undo and remove the five M3 x 10 screws (2) fixing the printed circuit board "Control Circuit 50 VDC" (A102) to the 50-VDC converter.
5. Fold back PCB sideways.
6. Remove protective plate.
7. On the PCB of converter 50 VDC (A101) check whether insulated jumpers have been soldered in correctly between soldering tags 1 and 4 and soldering tags 2 and 3. If necessary, solder in insulated jumpers anew.
8. Arrange test set-up acc. to Fig. 6.7.
9. Set resistance of load resistor R_L to 5 Ω.
10. On the test adapter (Fig. 6.10) open switch "ON".
11. Gradually increase output voltage of the power supply at connector X100 to 150 VDC, and in doing so observe input current (short-circuit!!).

12. Increase the nominal voltage (5-VDC power supply). By means of oscilloscope monitor the voltage on common contact of diodes V5, V15 and V20 (15, Fig. 6.14). Using a digital voltmeter, measure the voltage at interface X150.

    Nominal value: At about 9 VDC (X150) control sets in and oscilloscope shows roughly the same pulse voltages for both halves of the converter.

13. Increase the output voltage of the power supply unit at connector X100 to 510 VDC.

14. Set the nominal voltage to 5 ± 0.01 VDC.

15. Using oscilloscope, measure unbalance between the two converter halves.

    Nominal value: ≤ 10 %

16. Using a digital voltmeter, measure the voltage at contact X150A (B = ground).

    Nominal value: 50 ± 0.25 VDC

17. Using load resistor R_L, set an output current of 30 A and measure the voltage at contact X150A (B = ground) by means of digital voltmeter.

    Nominal value: 50 ± 0.25 VDC

18. Reduce the output voltage of the power supply unit at connector X100 to 425 VDC and repeat measurement acc. to step 17.

19. Set switching regulator acc. to 6.5.2.1.

20. Carry out steps 1 to 8 in the reverse order.

6.4.5 28-VDC Converter (A40)

(Refer to circuit diagram 734.9194. 01S)

6.4.5.1 Functional Check of Synchronization

1. Remove the 28-VDC converter A40 acc. to 6.6.5.

2. Undo and remove the 11 M2.5 x 5 screws (1, Fig. 6.15) and the two M3 x 8 screws (2) fixing the screening hood to the 28-VDC converter.

3. Remove screening hood.

4. Connect a power supply unit to contacts X110.2 (+) and .1 (-).

5. Set the output voltage of the power supply unit to 12 VDC and switch on.

6. Connect a rectangular-wave generator to contact X110.6.

7. Set the output frequency of the generator to 100 kHz and switch on.

8. Using a frequency counter, measure the frequency at interface X113.

   Nominal value: 100 kHz

9. Repeat the functional check at frequencies of 90 and 110 kHz.

10. Carry out steps 1 to 7 in the reverse order.

6.4.5.2 Functional Check of Control Loop

1. Remove the 28-VDC converter acc. to 6.6.5.

2. Undo and remove the 11 M2.5 x 5 screws (1, Fig. 6.15) and the two M3 x 8 screws (2) fixing the screening hood to the 28-VDC converter.

3. Remove screening hood.

4. Undo and remove the four M3 x 12 screws (3) fixing the printed circuit board "Control Circuit 28 VDC" (A102) to the 28-VDC converter.

5. Fold PCB back sideways.

6. Remove protective plate.

7. On the PCB of converter 28 VDC (A101) check whether insulated jumpers have been soldered in correctly between soldering tags 1 and 4 and soldering tags 2 and 3. If necessary, solder in insulated jumpers anew.

8. Arrange test set-up acc. to Fig. 6.8.

9. Set resistance of load resistor R_L to 5 Ω.

10. On test adapter (Fig. 6.10) open switch "ON".

11. Gradually increase output voltage of the power supply unit at connector X100 to 150 VDC, and in doing so observe input current (short-circuit!!).

12. By means of an oscilloscope observe the voltage on the common contact of diodes V5, V15 and V20 (10, Fig. 6.15).

    Nominal value: The oscilloscope shows roughly the same pulse voltages for both halves of the converter.

13. Increase the output voltage of the power supply unit at connector X100 to 515 VDC.

14. By means of oscilloscope measure the unbalance between the two converter halves.

    Nominal value: ≤ 10 %

15. Using load resistor R_L, set an output current of 16.8 A and with digital voltmeter measure the voltage at contact X150A (B = ground).

    Nominal value: 28 ± 0.1 VDC

    Align any deviation from the nominal value with adjustable resistor R133.

16. Reduce the output voltage of the power supply unit at connector X100 to 425 VDC and repeat measurement acc. to step 14.

17. Set switching regulator acc. to 6.5.2.2.

18. Carry out steps 1 to 8 in the reverse order.

6.5 Setting and Alignment

During repairs to the power supply no special alignment procedures are required.

6.5.1 Setting of Switching Regulator N2

(Refer to circuit diagram 6034.5003.01S, sheet 2)

1. If not already done so, remove the control circuit acc. to 6.6.2.
2. Connect a power supply unit to contacts X5.1 (+ 12 VDC) and .9 (ground).
3. Set the output voltage of the power supply unit to + 12 VDC and switch on.
4. Set the voltage at contact N2.5 with variable resistor R19 to 5.2 ± 0.01 VDC.
5. Switch on the power supply unit.
6. Carry out steps 1 and 2 in the reverse order.

6.5.2 Setting of Switching Regulator N102

6.5.2.1 50-VDC Converter

(Refer to circuit diagram 681.1266.01S)

1. If not already done so, remove the 50-VDC converters A20 and A30 acc. to 6.6.3 and 6.6.4, respectively.
2. Undo and remove the 17 M2.5 x 5 screws (1, Fig. 6.14) fixing the screening hood to the 50-VDC converter.
3. Remove screening hood.
4. Arrange test set-up acc. to Fig. 6.7.
5. Set the output voltage of the power supply unit at connector X100 to 510 VDC and switch on.
6. On the test adapter (Fig. 6.10) open switch "ON".
7. Set the output current at interface X150 to 37 A, using load resistor R_L.
8. By means of a two-channel oscilloscope measure the signal at interface X114. Vary resistance of the variable resistor until the oscilloscope indicates a low level instead of pulsewidth-modulated signals.
9. Turn variable resistor R131 fully clockwise.
10. Carry out steps 1 to 6 in the reverse order.

6.5.2.2 28-VDC Converter

(Refer to circuit diagram 734.9194.01S)

1. If not already done so, remove the 28-VDC converter acc. to 6.6.5.
2. Undo and remove the 11 M2.5 x 5 screws (2) as well as the two M3 x 8 screws (2) fixing the screening hood to the 28-VDC converter.
3. Remove the screening hood.
4. Arrange test set-up acc. to Fig. 6.8.
5. Set the output voltage on the power supply unit at connector X100 to 515 VDC and switch on.

6. On the test adapter (Fig. 6.10) open switch "ON".

7. Set the output current at interface X150 to 16.8 A, using load resistor R_L.

8. Set the voltage at contact X150A with variable resistor R133 to 28 ± 0.1 VDC.

9. Set the output current at interface X150 to 20 A, using load resistor R_L.

10. By means of a two-channel oscilloscope measure the signals at interface X114.

    Vary resistance of variable resistor R124 until the oscilloscope indicates a low level instead of pulsewidth-modulated signals.

11. Turn variable resistor R131 fully clockwise.

12. Carry out steps 1 to 6 in the reverse order.

6.6 Replacement of Assemblies and Components

6.6.1 Removing the Cover

1. If Power Supply IN 859C2 is still installed in the 19" rack, proceed as follows:

   a) Switch off the power supply.

   b) Undo the four screws (1, Fig. 6.11) fixing the power supply to the rack.

   c) Carefully pull out the power supply until resistance is felt.

   d) Press securing devices on both sides of the power supply upwards and pull out the power supply completely.

2. Place the power supply in such a way that cover and side panels are accessible.

3. Undo and remove 22 M3 x 8 screws (3) fixing the cover to the power supply.

4. Remove the cover.

6.6.2 Replacement of Control Circuit (A10)

1. Remove the cover acc. to 6.6.1.

2. Press the locking devices on 10-way male connector strips X23 (5, Fig. 6.12), X33 (9) and X43 (1) sideways and disengage sockets.

3. Disconnect the socket from 2 x 12-way male connector strip X5 (10).

4. Undo and remove the six M3 x 8 screws (4) fixing the printed board to the frame.

5. Carefully remove the printed circuit board towards the top. As soon as resistance is felt make sure that none of the electrical or mechanical connections to be undone has been overlooked. If necessary, undo these connections.

6. Repair or replace the removed control circuit.

7. Install a properly functioning control circuit (A10) in the reverse order to steps 1 to 5.

6.6.3 Replacement of 50-VDC Converter (A20)

1. Remove the cover acc. to 6.6.1.

2. On the printed circuit board "Control Circuit" A10 press the locking devices on 10-way male connector strips X23 (5, Fig. 6.12) and X43 (1) sideways and disengage sockets.

3. Press locking devices on socket and disengage socket from 2-way male connector strip X100 (26).

4. Undo the two screws securing the connector and disengage the latter from 3-way female connector strip X150 (6).

5. Undo the two M6 x 30 screws through the openings (27) in the screening hood.

6. Carefully remove the 50-VDC converter on the screening hood towards the top. As soon as resistance is felt make sure that none of the electrical or mechanical connections to be undone has been overlooked. If necessary, undo these connections.

7. Replace the removed 50-VDC converter A20 or carry on with its disassembly acc. to 6.6.3.1 to 6.6.3.4.

8. Install a properly functioning 50-VDC converter (A20) in the reverse order to steps 1 to 6.

6.6.3.1 Replacement of Control Circuit 50 VDC (A102)

1. Remove the 50-VDC converter acc. to 6.6.3.

2. Undo and remove the 17 M2.5 x 5 screws (1, Fig. 6.14) fixing the screening hood to the 50-VDC converter.

3. Remove the screening hood.

4. Disconnect the socket from 4-way male connector strip X102 (3).

5. Disconnect the socket from 6-way male connector strip X103 (4).

6. Disconnect the socket from 2-way male connector strip X112 (4).

7. Disconnect the socket from 11-way male connector strip X120 (6).

8. Disconnect the socket from 3-way male connector strip X210 (7, parking position!!).

9. Undo and remove the five M3 x 10 screws fixing the printed circuit board A102 to the 50-VDC converter.

10. Carefully remove the PCB towards the top. As soon as resistance is felt make sure that none of the electrical or mechanical connections to be undone has been overlooked. If necessary, undo these connections.

11. Repair or replace the removed control circuit 50 VDC.

12. Install a properly functioning control circuit 50 VDC (A102) in the reverse order to steps 1 to 10.

6.6.3.2 Replacement of Converter Board 50 VDC (A101)

1. Remove the control circuit 50 VDC acc. to 6.6.3.1.

2. Remove the protective plate.

3. Undo and remove the five spacers (8, Fig. 6.14) fixing the PCB A101 to the 50-VDC converter.

4. Carefully remove the PCB towards the top. As soon as resistance is felt make sure that none of the electrical or mechanical connections to be undone has been overlooked. If necessary, undo these connections.

5. Repair or replace the removed converter board 50 VDC.

6. Install a properly functioning converter board 50 VDC (A101) in the reverse order to steps 1 to 4.

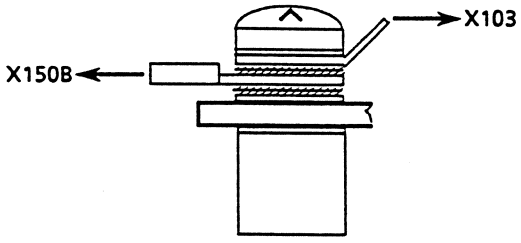
6.6.3.3 Replacement of Capacitor Board (A103)

1. Remove the 50-VDC converter acc. to 6.6.3.

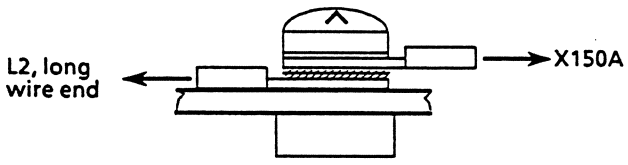
2. Undo and remove the 17 M2.5 x 5 screws (1, Fig. 6.14) fixing the screening hood to the 50-VDC converter.

3. Remove the screening hood.

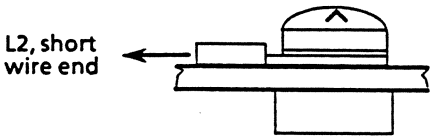
4. Undo and remove the M4 x 20 screw (9) fixing a cable terminal as well as a soldering tag to the PCB (see Fig. below).



5. Undo and remove the M5 x 10 screw (10) fixing two cable terminals to the PCB (see Fig. below).

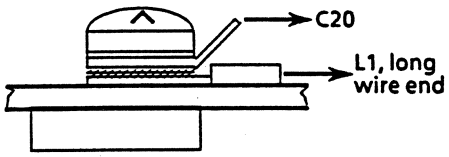


6. Undo and remove the M5 x 10 screw (11) fixing a cable terminal to the PCB (see Fig. below).



7. Undo and remove the M3 x 6 screw (12) fixing a soldering tag to the PCB.

8. Undo and remove the M5 x 10 screw (13) fixing a cable terminal as well as a soldering tag to the PCB (see Fig. below).



9. Undo and remove the four M3 x 8 screws (14) fixing PCB A103 to the 50-VDC converter.

10. Carefully remove the PCB towards the top. As soon as resistance is felt make sure that none of the electrical or mechanical connections to be undone has been overlooked. If necessary, undo these connections.

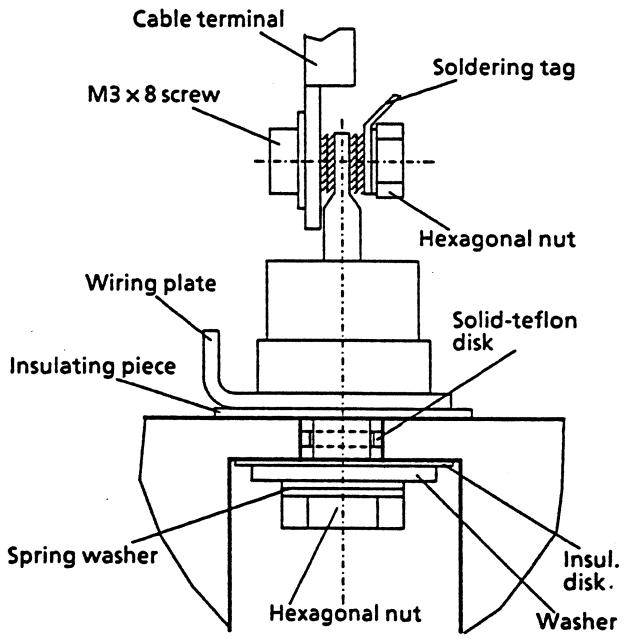
11. Repair or replace the removed capacitor board.

12. Install a properly functioning capacitor board (A103) in the reverse order to steps 1 to 10.

6.6.3.4 Replacement of Components Mounted onto the Heat Sink

Replacement of components mounted onto the heat sink is to be carried out acc. to conventional workshop practice. An exception to this general rule are diodes V5, V15 and V20.

Replace the diodes acc. to the following figure:



6.6.4 Replacement of 50-VDC Converter (A30)

Except for one step the procedure for replacement of the 50-VDC converter A30 is the same as that for the 50-VDC converter A20 (refer to 6.6.3).

In step 2 (refer to 6.6.3) only the locking devices on 10-way male connector strip X33 (9, Fig. 6.12) have to be pressed sideways prior to disengaging the socket.

6.6.5 Replacement of 28-VDC Converter (A40)

1. Remove the cover acc. to 6.6.1.
2. On the printed circuit board "Control circuit" A10 press locking devices on 10-way male connector strip X43 (1, Fig. 6.12) sideways and disengage socket.
3. Press locking devices on socket and disengage socket from 2-way male connector strip X100 (25).
4. Disconnect the 2-way female connector strip from flat connectors X150A and B (22).
5. Undo and remove the two M4 x 20 screws (17) fixing rectifier V100 to the 28-VDC converter.
6. Undo and remove the M4 screw (21) fixing two cable terminals (blue cable) to varistor R100.
7. Undo and remove the M4 screw (23) fixing two cable terminals (red cable) to varistor R100.
8. Carefully remove the rectifier together with the cable harness.
9. Undo three of the four M6 x 30 screws through the openings (11) in the screening hood and the fourth (12) directly.
10. Carefully remove the 28-VDC converter on the screening hood towards the top. As soon as resistance is felt make sure that none of the electrical or mechanical connections to be undone has been overlooked. If necessary, undo these connections.
11. Replace the removed 28-VDC converter A40 or carry on with its disassembly acc. to 6.6.5.1 to 6.6.5.3.
12. Install a properly functioning 28-VDC converter (A40) in the reverse order to steps 1 to 10.

6.6.5.1 Replacement of Control Circuit 28 VDC (A102)

1. Remove the 28-VDC converter acc. to 6.6.5.
2. Undo and remove the 11 M2.5 x 5 screws (1, Fig. 6.15) as well as the two M3 x 8 screws (2) fixing the screening hood to the 28-VDC converter.
3. Remove the screening hood.
4. Disconnect the socket from 6-way male connector strip X102 (4).
5. Disconnect the socket from 11-way male connector strip X120 (5).
6. Disconnect the socket from 3-way male connector strip X210 (6, parking position!!).
7. Undo and remove the four M3 x 12 screws (3) fixing the printed circuit board "Control circuit 28 VDC" (A102) to the 28-VDC converter.
8. Carefully remove the PCB towards the top. As soon as resistance is felt make sure that none of the electrical or mechanical connections to be undone has been overlooked. If necessary, undo these connections.
9. Repair or replace the removed control circuit 28 VDC.
10. Install a properly functioning control circuit 28 VDC (A102) in the reverse order to steps 1 to 8.

6.6.5.2 Replacement of Converter Board 28 VDC (A101)

1. Remove control circuit 28 VDC acc. to 6.6.5.1.
2. Remove the protective plate.
3. Ease off sleeves from flat connector X21 (7, Fig. 6.15).
4. Ease off sleeves from flat connector X23 (8).
5. Ease off sleeves from flat connector X24 (9).
6. Ease off sleeves from flat connector X22 (10).
7. Undo and remove the two M4 x 64 screws (11) fixing transformers T3 and T4 to the converter board.

Note:

During installation take care that the respective spacers (12) are also fixed by the screws (11).

8. Undo and remove the four M3 x 6 screws (13) as well as the four spacers (14) fixing PCB A101 to the 28-VDC converter.
9. Carefully remove the PCB towards the top. As soon as resistance is felt make sure that none of the electrical or mechanical connections to be undone has been overlooked. If necessary, undo these connections.
10. Repair or replace the removed converter board 28 VDC.
11. Install a properly functioning converter board 28 VDC (A101) in the reverse order to steps 1 to 9.

6.6.5.3 Replacement of Diodes V5, V15 and V20

1. If the screening hood of the 28-VDC converter is still installed, proceed as follows:

   a) Remove the 28-VDC converter acc. to 6.6.5.

   b) Undo and remove the 11 M2.5 x 5 screws (1, Fig. 6.15) as well as the two M3 x 8 screws (2) fixing the screening hood to the 28-VDC converter.

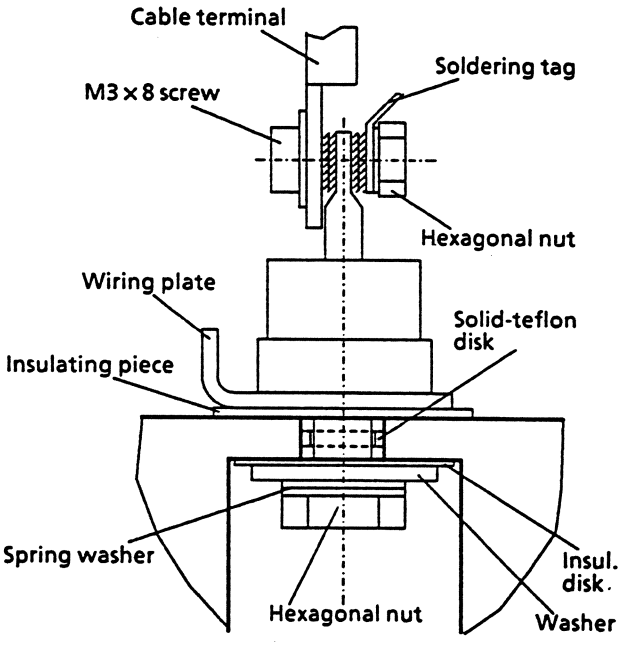
   c) Remove the screening hood.

2. Ease off sleeve from flat connector X21 (7) and / or

   sleeve from flat connector X23 (8) and / or

   sleeve from flat connector X24 (9).

3. Remove diodes acc. to the following figure:



4. Replace removed diode(s).

5. Install a properly functioning diode in the reverse order to steps 1 to 3.

6.6.6 Replacement of Filtering Circuit (A501)

1. Remove the cover acc. to 6.6.1.

2. Press locking devices on socket and disengage socket from 2-way male connector strip X100 (16, Fig. 6.12).

3. Press locking devices on socket and disengage socket from 2-way male connector strip X100 (25).

4. Press locking devices on socket and disengage socket from 2-way male connector strip X100 (26).

5. Disconnect the 2-way female connector strip from flat connectors X150A and B (22).

6. Undo the two screws securing the connector and disconnect the latter from 3-way female connector strip X150 (6).

7. Undo the two screws securing the connector and disconnect the latter from 3-way female connector strip X150 (11).

8. Undo and remove the two M4 x 20 screws (17) fixing rectifier V100 to the 28-VDC converter.

9. Undo and remove the M4 screw (21) fixing two cable terminals (blue cable) to varistor R100.

10. Undo and remove the M4 screw (23) fixing two cable terminals (red cable) to varistor R100.

11. Ease off sleeve (violet cable) from filter Z4 (12).

12. Ease off sleeve (green / yellow cable) from filter Z4 (13).

13. Ease off sleeve (black cable) from filter Z4 (14).

14. Undo and remove the eight M4 x 8 screws (4, Fig. 6.11) fixing the right-hand side panel to the power supply.

15. Press locking devices on socket and disengage socket from 6-way male connector strip X11 (17, Fig. 6.13).

16. Remove the right-hand side panel.

17. Press locking device on socket and disengage socket from 6-way male connector strip X10 (1).

18. Press locking device on socket and disengage socket from 6-way male connector strip X20 (2).

19. Ease off sleeve (orange cable) from flat connector X95 (3).

20. Ease off sleeve (violet cable) from flat connector X96 (4).

21. Undo and remove the M5 x 10 screw (5) fixing the two cable terminals (black cable) to contact X506.

22. Undo and remove the M5 x 10 screw (6) fixing the two cable terminals (brown cable) to contact X505.

23. Undo and remove the M5 x 10 screw (7) fixing the two cable terminals (red and brown cables) to contact X504.

24. Undo and remove the M5 x 10 screw (8) fixing the cable terminal (red cable) to contact X503.

25. Ease off sleeve (blue shrink-on sleeve) from flat connector X507 (9).

26. Ease off sleeve (yellow and black shrink-on sleeve) from flat connector X509 (11).

27. Undo and remove the M5 x 10 screw (12) fixing the four cable terminals (blue cable) to contact X501.

28. Undo and remove the M5 x 10 screw (13) fixing the four cable terminals (blue cable) to contact X500.

29. Disconnect the socket from 2 x 5-way male connector strip X30 (14).

30. Disconnect the socket from 3-way male connector strip X80 (15).

31. Disconnect the socket from 6-way male connector strip X50 (18).

32. Carefully remove the cable harness together with rectifier V100.

33. Undo and remove the two M3 x 12 screws (16) fixing the block to the frame.

34. Undo and remove the twelve M3 x 10 screws (19) fixing PCB A501 to the partition.

35. Tip the PCB towards the front and carefully remove towards the top. As soon as resistance is felt make sure that none of the electrical or mechanical connections to be undone has been overlooked. If necessary, undo these connections.

36. Repair or replace the removed filtering circuit.

37. Install a properly functioning filtering circuit (A501) in the reverse order to steps 1 to 35.

6.6.7 Replacement of LED Board (A502)

1. Remove the cover acc. to 6.6.1.

2. Undo and remove the eight M4 x 8 screws (4, Fig. 6.11) fixing the right-hand side panel to the power supply.

3. Ease off the sleeve (violet cable) from filter Z4 (12, Fig. 6.12).

4. Ease off the sleeve (green / yellow cable) from filter Z4 (13).

5. Ease off the sleeve (black cable) from filter Z4 (14).

6. Press locking devices on socket and disengage socket from 6-way male connector strip X11 (17, Fig. 6.13).

7. Remove the right-hand side panel.

8. Disconnect the socket from 6-way male connector strip X1 (20, Fig. 6.12).

9. Undo and remove the two M3 x 20 screws (1, Fig. 6.16) fixing the PCB to the frame.

10. Carefully remove the PCB. As soon as resistance is felt make sure that none of the electrical or mechanical connections to be undone has been overlooked. If necessary, undo these connections.

11. Repair or replace the removed LED board.

12. Install a properly functioning LED board (A502) in the reverse order to steps 1 to 10.

6.6.8 Replacement of Protective Switch F1

1. Remove the cover acc. to 6.6.1.

2. Undo and remove the eight M4 x 8 screws (4, Fig. 6.11) fixing the right-hand side panel to the power supply.

3. Ease off sleeve (violet cable) from filter Z4 (12, Fig. 6.12).

4. Ease off sleeve (green / yellow cable) from filter Z4 (13).

5. Ease off sleeve (black cable) from filter Z4 (14).

6. Press locking devices on socket and disengage socket from 6-way male connector strip X11 (17, Fig. 6.13).

7. Remove the right-hand side panel.

8. Ease off sleeve (18, Fig. 6.12) from protective switch F1.

9. Ease off sleeve (19, Fig. 6.12) from protective switch F1.

10. Undo and remove the four M3 x 8 screws (2, Fig. 6.16) fixing the protective switch to the frame.

11. Remove the protective switch.

12. Install a properly functioning protective switch in the reverse order to steps 1 to 11.

6.6.9 Replacement of Blowers

1. Remove the cover acc. to 6.6.1.

2. Ease off sleeve (2, Fig. 6.12) from the positive pole of blower E1 (brown cable) and / or
the sleeve (7) from the positive pole of blower E2 (brown cable).

3. Ease off sleeve (3) from the positive pole of blower E1 (blue cable) and / or
the sleeve (8) from the positive pole of blower E2 (blue cable).

CAUTION

Positive pole = brown,
negative pole = blue

4. Undo and remove the eight M3 x 16 screws (3, Fig. 6.16) fixing the blower to the frame.

5. Remove the blower(s).

6. Install a properly functioning blower in the reverse order to steps 1 to 5.

6.6.10 Replacement of Individual Components

For components which are mounted onto heat sinks, proceed as follows:

1. Clean both heat sink and component from heat-conducting compound.

2. Apply heat-conducting compound sparingly to whole area on the heat sink where the component is to be mounted.

3. When mounting a component make sure that the respective component is mounted in a coplanar way.

6.7 Final Test

(Refer to circuit diagram 6034.5003.01S)

Following repairs the power supply must be subjected to the following final test to ensure that its technical data are fully maintained.

If the final test is successful, repairs may be regarded as terminated. Otherwise, however, the troubleshooting acc. to 6.3 will have to be repeated as many times as is necessary to detect and eliminate all faults.

6.7.1 Check of LEDs, Blowers and Mains Output Voltage

1. Arrange the test set-up acc. to Fig. 6.6.
2. Switch on Power Supply IN 859C2.
3. Gradually increase the output voltage on the variable separating transformer to the nominal voltage (230 VAC). At the same time observe the input currents, LEDs POWER and 28 VDC and the blowers.

   Nominal values: for V_{in} = 230 VAC
   I < 1 A
   blowers are running
   LEDs are illuminated
4. Using a digital multimeter, measure the mains voltage between contacts X71.A and .C (sheet 1).

   Nominal value: 230 V ± 5 %
5. Via test adapter (Fig. 6.9) switch on the two 50-VDC converters (S1.1 = S1.2 = high) and observe LEDs 50-VDC-I and 50-VDC-II.

   Nominal value: LEDs are illuminated

6.7.2 Check of Output Voltage of 28-VDC Converter

1. Arrange the test set-up acc. to Fig. 6.6.
2. Switch on Power Supply IN 859C2.
3. Set the output voltage on the variable separating transformer to 230 VAC.
4. Measure the no-load voltage between contacts X75.3 and .5 (ground).

   Nominal value: 27.5 to 29 VDC
5. Via an ammeter switch variable resistor R_L between contacts X75.3 and .5 (ground).
6. Set the output current at interface X75 to 15 A with resistor R_L and measure the output voltage via R_L.

   Nominal value: 28 ± 0.5 VDC
7. Via an ammeter switch variable resistor R_L between contacts B2 and C2 (ground) of the test adapter.
8. Set the output current with resistor R_L to 5 A and measure the output voltage via R_L.

   Nominal value: 28 ± 0.5 VDC
9. Repeat the measurement for contacts B3 to B5 (ground = C3 to C5).

6.7.3 Check of Output Voltage of 50-VDC Converters

1. Arrange the test set-up acc. to Fig. 6.6.
2. Switch on Power Supply IN 859C2.
3. Set the output voltage on the variable separating transformer to 230 VAC.
4. Via test adapter (Fig. 6.9) switch on the two 50-VDC converters (S1.1 = S1.2 = high) and set to 50 VDC (S1.5 = S1.7 = high and S1.6 = low).
5. Measure the no-load voltage between contacts X75.4 and .5 (ground) and contacts X75.2 and .5.

   Nominal value: 49.5 to 51 VDC
6. Via an ammeter switch variable resistor R_L between contacts X75.4 and .5 (ground) and contacts X75.2 and .5.
7. Set the output current at interface X75 with resistor R_L to 30 A and measure the output voltage via R_L.

   Nominal value: 50 ± 0.5 VDC
8. Via test adapter (Fig. 6.9) set the two 50-VDC converters to 52 VDC (S1.5 = S1.6 = S1.7 = high).
9. Set the output current at interface X75 with resistor R_L to 30 A and measure the output voltage via R_L.

   Nominal value: 52 ± 0.5 VDC
10. Via test adapter (Fig. 6.9) set the two 50-VDC converters to 45 VDC (S1.5 = S1.6 = S1.7 = low).
11. Set the output current at interface X75 with resistor R_L to 30 A and measure the output voltage via R_L.

    Nominal value: 45 ± 0.5 VDC

6.7.4 Check of Switchover Operation

1. Arrange the test set-up acc. to Fig. 6.6.
2. Set the power supply at interface X74 to 28 ± 0.5 VDC and switch on.
3. Via an ammeter switch variable resistor R_L between contacts X75.3 and .5 (ground).
4. Set the output current at interface X75 with resistor R_L to 10 A and measure the output voltage via R_L.

   Nominal value: < 26.8 VDC
5. Repeat the measurement for contacts X75.4 and .2 (ground = .5).

6.7.5 Check for Undervoltage

1. Arrange the test set-up acc. to Fig. 6.6.
2. Switch on Power Supply IN 859C2.
3. Set the output voltage on the variable separating transformer to 195 VAC.
4. Via test adapter (Fig. 6.9) switch on the two 50-VDC converters (S1.1 = S1.2 = high) and set to 52 VDC (S1.5 = S1.6 = S1.7 = high).
5. Via an ammeter switch variable resistor R_L between contacts B2 and C2 (ground) of the test adapter.
6. Set the output current with resistor R_L to 5 A and measure the output voltage via R_L.

   Nominal value: 28 ± 0.5 VDC

7. Repeat measurement for contacts B3 to B5 (ground = C3 to C5).

8. Via an ammeter switch variable resistor R_L between contacts X75.4 and .5 (ground) and contacts X75.2 and .5 (ground).

9. Set the output current at interface X75 with resistor R_L to 30 A and measure the output voltage via R_L.

   Nominal value: 52 ± 0.5 VDC

6.7.6 Check for Overvoltage

1. Arrange the test set-up acc. to Fig. 6.6.

2. Switch on Power Supply IN 859C2.

3. Set the output voltage on the variable separating transformer to 253 VAC.

4. Via test adapter (Fig. 6.9) switch on the two 50-VDC converters (S1.1 = S1.2 = high) and set to 52 VDC (S1.5 = S1.6 = S1.7 = high).

5. Via an ammeter switch variable resistor R_L between contacts B2 and C2 (ground) of the test adapter.

6. Set the output current with resistor R_L to 5 A and measure the output voltage via R_L.

   Nominal value: 28 ± 0.5 VDC

7. Repeat the measurement for contacts B3 to B5 (ground = C3 to C5).

8. Via an ammeter switch variable resistor R_L between contacts X75.4 and .5 (ground) and contacts X75.2 and .5 (ground).

9. Set the output current at interface X75 with resistor R_L to 30 A and measure the output voltage via R_L.

   Nominal value: 52 ± 0.5 VDC

6.8 External Interfaces

The descriptions for the external interfaces of Power Supply IN 859C2 are contained in the appendix to this Repair Manual.

ROHDE&SCHWARZ

Communications Division

Appendix

INTERFACE DESCRIPTION
CIRCUIT DIAGRAMS
PARTS LISTS
COMPONENTS LAYOUTS

6012.1234 - 8

Interface Description, Power Supply IN 859C2

Contact	Signal Name	Signal Description	Direction	Type	Range of Value	Remarks
X71 1	Mains output		test point	power	230 VAC ± 5 % for V_{mains} = nominal voltage, load max. 150 VA	supply for blowers of amplifier
X71.2	Mains output		test point	power	230 VAC ± 5 % for V_{mains} = nominal voltage, load max. 150 VA	supply for blowers of amplifier
X71.3	Earthed conductor		bidirec-tional	power		
X73.A0	CM power supply		output	high	high = Go 4 VDC ≤ V ≤ 5.2 VDC low = NoGo V ≤ 1 VDC	
X73.A1	Signal ground		bidirec-tional		0 V	A1, B1, C1 parallel
X73.A2	Data 2		input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A3	Data 6		input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A4	Data 5		input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A5	Data 4		input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A6	Data 3		input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A7	Data 7		input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	

Interface Description, Power Supply IN 859C2 (cont.)

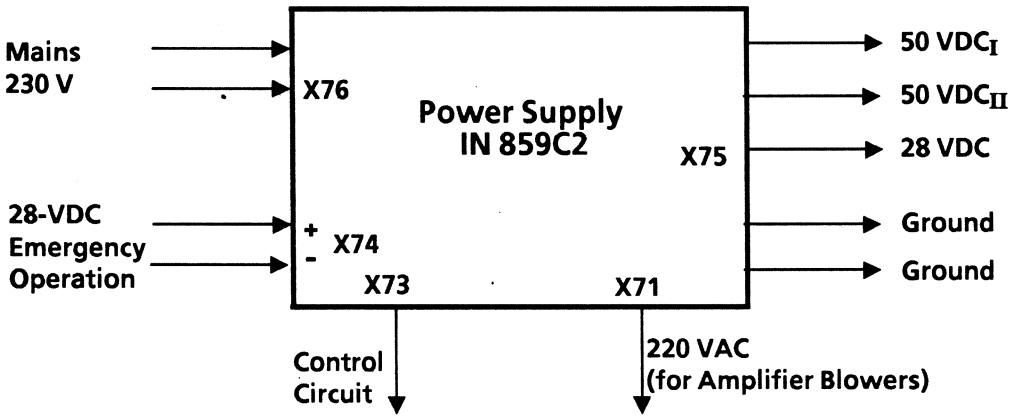
Contact	Signal Name Description	Direction	Type	Range of Value	Remarks
X73.A8	Data 1	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A9	Data 0	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.B1	Signal ground	bidirec-tional		0 V	A1, B1, C1 parallel
X73.B2	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A	B2, B3, B4, B5 parallel for supply of exciter
X73.B3	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A	B2, B3, B4, B5 parallel for supply of exciter
X73.B4	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A	B2, B3, B4, B5 parallel for supply of exciter
X73.B5	V_{out}, output 28 VDC	output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A	B2, B3, B4, B5 parallel for supply of exciter
X73.C1	Signal ground	bidirec-tional		0 V	A1, B1, C1 parallel
X73.C2	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X73.C3	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X73.C4	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X73.C5	Ground	output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter

Interface Description, Power Supply IN 859C2 (cont.)

Contact	Signal Name	Signal Description	Direction	Type	Range of Value	Remarks
X74.2		$-V_{op}$, battery input	input	power	0 V ground	
X74.4		$+ V_{op}$, battery input	input	power	19 to 31 VDC $I \leq 35$ A	
X75.1		0 V ground	output	power	0 V	ground for $50\ VDC_I$, $50\ VDC_{II}$ and 28 VDC
X75.2		$50\ VDC_{II}$ DC output	output	power	adjustable between 45 and 52 VDC via data bus $V_{out} = V_{nom} \pm 0.5$ VDC $I_{max} = 30$ A for batt. operation: 10 A $V_{out} \geq (V_{batt} - 1.2\ VDC)$	
X75.3		28-VDC output	output	power	mains operation: 28 ± 0.5 VDC, $I \leq 15$ A $V_{out} = 28 + 1 / -0.5$ VDC for battery operation: $V_{out} \geq (V_{batt} - 1.2\ VDC)$	I_{cont} 16 A I_{peak} 18 A protected with 20 A
X75.4		$50\ VDC_I$ DC output	output	power	adjustable between 45 and 52 VDC via data bus $V_{out} = V_{nom} \pm 0.5$ VDC $I_{max} = 30$ A for batt. operation: 10 A $V_{out} \geq (V_{batt} - 1.2\ VDC)$	
X75.5		0 V ground	output	power	0 V	ground for $50\ VDC_I$, $50\ VDC_{II}$ and 28 VDC
X76.1		Mains input	test point	power	230 V + 10 % / - 15 % test voltage 2500 VDC no-load current $\leq 1\ A_{rms}$	single-phase mains input
X76.2		Mains input	test point	power	parallel to X76.1	
X76.3		Mains input	test point	power	230 V + 10 % / - 15 % test voltage 2500 VDC no-load current $\leq 1\ A_{rms}$	one-phase mains input

Interface Description, Power Supply IN 859C1 (cont.)

Contact	Signal Name / Description	Direction	Type	Range of Value	Remarks
X76.4	Mains input	test point	power	parallel to X76.1	
X76.5	Earthed conductor	bidirec-tional	power		



Interface Description, Frame of Power Supply IN 859C2

Contact	Signal Name	Signal Description	Direction	Type	Range of Value	Remarks
X22	50 V I	DC output	output	power	45 to 52 VDC	
X23.1	Ground		bidirec-tional		0 V	
X23.2	+ 12 VDC	supply voltage	output	power	12 ± 1 VDC	
X23.3	Ground		bidirec-tional		0 V	
X23.4	+ 12 VDC	supply voltage	output	power	12 ± 1 VDC	
X23.5	On		output	analog	CMOS output 12 VDC	
X23.6	Clock		output		CMOS output 12 VDC	
X23.7	V_{nom}		output	analog	4.5 ± 0.05 VDC for data 0, 1, 2 low	
X23.8	CM		input	low	CMOS input 12 VDC	
X23.9	Not used					
X23.10	Not used					
X32	50 V I	DC output	output	power	45 to 52 VDC	
X33.1	Ground		bidirec-tional		0 V	
X33.2	+ 12 VDC	supply voltage	output	power	12 ± 1 VDC	
X33.3	Ground		bidirec-tional		0 V	
X33.4	+ 12 VDC	supply voltage	output	power	12 ± 1 VDC	
X33.5	On		output	analog	CMOS output 12 VDC	
X33.6	Clock		output		CMOS output 12 VDC	
X33.7	V_{nom}		output	analog	4.5 ± 0.05 VDC for data 0, 1, 2 low	
X33.8	CM		input	low	CMOS input 12 VDC	

Interface Description, Frame of Power Supply IN 859C2 (cont.)

Contact	Signal Name	Signal Description	Direction	Type	Range of Value	Remarks
X33.9	Not used					
X33.10	Not used					
X42	28 V	DC output	output	power	Mains operation: 28 ± 0.5 VDC I ≤ 16 A V_{out} = 28 VDC + 1 VDC / - 0.5 VDC	$I_{cont.}$ = 16 A I_{peak} = 18 A fused with 20 A
X43.1	Ground		bidirec-tional		0 V	
X43.2	+ 12 VDC	supply voltage	output	power	12 ± 1 VDC	
X43.3	Ground		bidirec-tional		0 V	
X43.4	+ 12 VDC	supply voltage	output	power	12 ± 1 VDC	
X43.5	+ 12 VDC	supply voltage	output	power	12 ± 1 VDC	
X43.6	Clock		output		CMOS output 12 VDC	
X43.7	Not used					
X43.8	CM		input	low	CMOS input 12 VDC	
X43.9	Not used					
X43.10	Not used					
X71.1	Mains output		test point	power	230 VDC ± 5 % for V_{mains} = nom. voltage, max. load 150 VA	Supply for blowers of amplifier
X71.2	Mains output		test point	power	230 VDC ± 5 % for V_{mains} = nom. voltage, max. load 150 VA	Supply for blowers of amplifier
X71.3	Earthed conductor		bidirec-tional	power		

Interface Description, Frame of Power Supply IN 859C2 (cont.)

Contact	Signal Name / Description	Direction	Type	Range of Value	Remarks
X73.A0	CM power supply	output	high	high = Go 4 VDC ≤ V ≤ 5.2 VDC low = NoGo V ≤ 1 VDC	
X73.A1	Signal ground	bidirec-tional		0 V	A1, B1, C1 parallel
X73.A2	Data 2	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A3	Data 6	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A4	Data 5	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A5	Data 4	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A6	Data 3	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A7	Data 7	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A8	Data 1	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	
X73.A9	Data 0	input	high	CMOS B series input V_{op} = 5.2 VDC, low ≤ 1.5 VDC high ≥ 3.5 VDC	

Interface Description, Frame of Power Supply IN 859C2 (cont.)

Contact	Signal Name	Description	Direction	Type	Range of Value	Remarks
X73.B1	Signal ground		bidirectional		0 V	A1, B1, C1 parallel
X73.B2	V_{out}, output 28 VDC		output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A	B2, B3, B4, B5 parallel for supply of exciter
X73.B3	V_{out}, output 28 VDC		output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A	B2, B3, B4, B5 parallel for supply of exciter
X73.B4	V_{out}, output 28 VDC		output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A	B2, B3, B4, B5 parallel for supply of exciter
X73.B5	V_{out}, output 28 VDC		output	power	28 ± 0.5 VDC for mains operation, I ≤ 5 A	B2, B3, B4, B5 parallel for supply of exciter
X73.C1	Signal ground		bidirectional		0 V	A1, B1, C1 parallel
X73.C2	Ground		output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X73.C3	Ground		output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X73.C4	Ground		output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X73.C5	Ground		output	power	0 V	C2, C3, C4, C5 parallel for supply of exciter
X74.2	$-V_{op}$	battery input	input	power	0 V ground	
X74.4	$-V_{op}$	battery input	input	power	19 to 31 VDC I ≤ 35 A	

Interface Description, Frame of Power Supply IN 859C2 (cont.)

Contact	Signal Name Description	Direction	Type	Range of Value	Remarks
X75.1	0 V ground	output	power	0 V	ground for 50 VDC I, 50 VDC II and 28 VDC
X75.2	50 VDC II DC output	output	power	for batt. operation: 10 A $V_{out} \geq (V_{batt} - 1.2\ VDC)$	
X75.3	28-VDC output	output	power	for batt. operation: 10 A $V_{out} \geq (V_{batt} - 1.2\ VDC)$	I_{cont} 16 A I_{peak} 18 A fused with 20 A
X75.4	50 VDC I DC output	output	power	for batt. operation: 10 A $V_{out} \geq (V_{batt} - 1.2\ VDC)$	
X75.5	0 V ground	output	power	0 V	ground for 50 VDC I, 50 VDC II and 28 VDC
X76.1	Mains input	test point	power	230 VDC + 10 % / - 15 %	single-phase mains input
X76.2	Mains input	test point	power	parallel to X76.1	
X76.3	Mains input	test point	power	230 VDC + 10 % / - 15 %	single-phase mains input
X76.4	Mains input	test point	power	parallel to X76.3	
X76.5	Earthed conductor	bidirec-tional	power		
X201.1	DC voltage	output	power	$V_s \geq (V_{mains} \times \sqrt{2}) - 10\ V$	ref. to X201.2
X201.2	DC voltage	output	power	$V_s \geq (V_{mains} \times \sqrt{2}) - 10\ V$	ref. to X201.1
X202.1	DC voltage	output	power	$V_s \geq (V_{mains} \times \sqrt{2}) - 10\ V$	ref. to X202.2
X202.2	DC voltage	output	power	$V_s \geq (V_{mains} \times \sqrt{2}) - 10\ V$	ref. to X202.1
X203.1	DC voltage	output	power	$V_s \geq (V_{mains} \times \sqrt{2}) - 10\ V$	ref. to X203.2
X203.2	DC voltage	output	power	$V_s \geq (V_{mains} \times \sqrt{2}) - 10\ V$	ref. to X203.1

Interface Description, Filtering Circuit of Power Supply IN 859C2

Contact	Signal Name Description	Direction	Type	Range of Value	Remarks
X10.1	Mains input	input	power	230 VDC + 10 / -15 %	Single-phase mains input
X10.2	Not used				
X10.3	DC voltage	input	power	-266 to 358 VDC	
X10.4	Mains input	input	power	230 VDC + 10 / -15 %	Single-phase mains input
X10.5	Not used				
X10.6	DC voltage	input	power	-266 to 358 VDC	
X11.1	Mains output	test point	power	230 VDC + 10 / -15 % V_{mains} = nom. voltage max. load 150 VA	Supply for blowers in amplifier
X11.2	Mains output	test point	power	230 VDC + 10 / -15 % V_{mains} = nom. voltage max. load 150 VA	Supply for blowers in amplifier
X20.1	DC voltage	output	power	-266 to 358 VDC	
X20.2	DC voltage	output	power	-266 to 358 VDC	
X20.3	DC voltage	output	power	-266 to 358 VDC	
X20.4	DC voltage	output	power	+ 266 to 358 VDC	
X20.5	DC voltager	output	power	+ 266 to 358 VDC	
X20.6	DC voltage	output	power	+ 266 to 358 VDC	
X50.1	+ 12 VDC	output	analog	+ 12 ± 1 VDC delay ref. to mains On 0.6 to 1.2 s	
X50.2				Connection to X30B4	
X50.3		input		681 Ω to ground	
X50.4				Connection to X30B2	
X50.5				Connection to X30B3	
X50.6	Not used				

Interface Description, Filtering Circuit of Power Supply IN 859C2 cont.

Contact	Signal Name	Signal Description	Direction	Type	Range of Value	Remarks
X80.1	+ K1	output	output	analog	+ 12 ± 1 VDC	
X80.2	Not used					
X80.3	-K1	output	output	digital	≤ 1 VDC active delay ref. to mains On 0.6 to 1.2 s	
X95.1	DC voltage		output	power	+ 266 to 358 VDC	
X96.1	Decharging		input	digital	≤ 5 Ω active for V1	
X500	$-V_{op}$	battery input	input	power	0 V ground	
X501	Ground		bidirec-tional	power	0 V	
X503	$-V_{op}$	battery input	input	power	19 to 31 VDC I ≤ 35 A	
X504	28-VDC output		output	power	Mains operation: 28 ± 0.5 VDC I ≤ 16 A V_{out} = 28 VDC + 1 VDC / -0.5 VDC	$I_{cont.}$ = 16 A I_{peak} = 18 A fused with 20 A
X505	50 V I	DC output	bidirec-tional	power	45 to 52 VDC	
X506	50 V I	DC output	bidirec-tional	power	45 to 52 VDC	
X507	28 V	DC output	output	power	Mains operation: 28 ± 0.5 VDC I ≤ 16 A V_{out} = 28 VDC + 1 VDC / -0.5 VDC	$I_{cont.}$ = 16 A I_{peak} = 18 A fused with 20 A
X508	28 V	DC output	output	power	Mains operation: 28 ± 0.5 VDC I ≤ 16 A V_{out} = 28 VDC + 1 VDC / -0.5 VDC	$I_{cont.}$ = 16 A I_{peak} = 18 A fused with 20 A
X509	28 V	DC output	output	power	Mains operation: 28 ± 0.5 VDC I ≤ 16 A V_{out} = 28 VDC + 1 VDC / -0.5 VDC	I_{cont} = 16 A I_{peak} = 18 A fused with 20 A

Interface Description, Filtering Circuit of Power Supply IN 859C2 cont.

Contact	Signal Name Description	Direction	Type	Range of Value	Remarks
X30A1	+ 12 VDC	output	analog	+ 12 ± 1 VDC delay ref. to mains On 0.6 to 1.2 s	
X30A2	+ 12 VDC	output	analog	+ 12 ± 1 VDC delay ref. to mains On 0.6 to 1.2 s	
X30A3	Not used				
X30A4	Ground	bidirec-tional		0 V	
X30A5	Ground	bidirec-tional		0 V	
X30B1	Not used				
X30B2				Connection to X50.4	
X30B3				Connection to X50.5	
X30B4				Connection to X50.2	
X30B5	Not used				

Interface Description, 50-VDC Converter of Power Supply IN 859C2

Contact	Signal Name Description	Direction	Type	Range of Value	Remarks
X100.1	DC voltage	input	power	+ 535 -10 VDC for V_{mains} 380 VAC I ≤ 2 A floating	referred to X100.2
X100.2	DC voltage	input	power	-535 -10 VDC for V_{mains} 380 VAC I ≤ 2 A floating	referred to X100.1
X110.1	Ground	bidirec-tional		0 V	
X110.2	+ 12-VDC supply voltage	input	power	12 ± 1 VDC	
X110.3	Ground	bidirec-tional		0 V	
X110.4	+ 12-VDC supply voltage	input	power	12 ± 1 VDC	
X110.5	ON	input	analog	≥ 8.15 VDC	
X110.6	Clock	input		high V ≤ 33 VDC ≥ 2 VDC low V ≤ 0.8 VDC	
X110.7	V_{nom}	input	analog	V = 4.5 to 5.2 ± 0.05 VDC 5 VDC corresponds to 50 V (V_{out})	
X110.8	CM	output	low	high ≥ 10 VDC low ≤ 1 VDC	
X110.9	Not used				
X110.10	Not used				
X150	50 VDC DC output	output	power	Adjustable between 45 and 52 VDC via data bus V_{out} = V_{nom} ± 0.5 VDC I_{max} ≤ 30 A	

Interface Description, 28-VDC Converter of Power Supply IN 859C1

Contact	Signal Name	Signal Description	Direction	Type	Range of Value	Remarks
X100.1	DC voltage		input	power	+ 535 -10 VDC for V_{mains} 380 VAC I ≤ 2 A floating	referred to X100.2
X100.2	DC voltage		input	power	-535 -10 VDC for V_{mains} 380 VAC I ≤ 2 A floating	referred to X100.1
X110.1	Ground		bidirec-tional		0 V	
X110.2	+ 12-VDC supply voltage		input	power	12 ± 1 VDC	
X110.3	Ground		bidirec-tional		0 V	
X110.4	+ 12-VDC supply voltage		input	power	12 ± 1 VDC	
X110.5	+ 12-VDC supply voltage		input	power	12 ± 1 VDC	
X110.6	Clock		input		100 kHz ± 10 kHz high V ≤ 33 VDC ≥ 2 VDC low V ≤ 0.8 VDC	TTL compatible for synchroniz-ing of internal oscillator
X110.7	Not used					
X110.8	CM		output	low	high ≥ 10 VDC low ≤ 1 VDC	Signals when control ampli-fier is outside range
X110.9	Not used					
X110.10	Not used					
X150	28 VDC	DC output	output	power	Mains operation: 28 ± 0.5 VDC I ≤ 16 A V_{out} = 28 + 1 / -0.5 VDC battery operation = V_{bat}	I_{cont} 16 A I_{peak} 18 A

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = RAL7035 LICHTGRAU				.
A20	ZE WANDLER 50V TRANSFORMER 50V HIERZ.STROML.681.1266.01 S SEE CIRC.DIA.681.1266.01 S	681.1266.03			
A30	ZE WANDLER 50V TRANSFORMER 50V HIERZ.STROML.681.1266.01 S SEE CIRC.DIA.681.1266.01 S	681.1266.03			
A40	ZE WANDLER 28V HIERZU STROML.734.9194.01S SEE CIRC.DIAG.734.9194.01S	734.9194.02			
A50	ZE GEHAEUSE . HIERZ.STROML.6034.5103.01S SEE CIRC.DIA.6034.5103.01S	6034.5103.02			
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL				
..	ZUGEH.STROML./CIRC.DIAGR. 681.0018.01 S				
B1	EQ 5,000 MHZ CL30PF HC43U CRYSTAL 5,000MHZ	EQ 091.0280	KRISTALLVE	N. R&S SACHNUMMER	
B2	EQ 5,005 MHZ CL30PF HC43U QUARTZ CRYSTAL UNIT	EQ 091.8339	KRISTALLVE	N. R&S SACHNUMMER	
C5	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C6	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C7	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C14	CC 100PF+-10%200V5K 1200VI CAPACITOR	CC 084.5250	UNION CARB	CK05BX101K	
C15	CC 33PF+-10%200V5K 1200VIE CAPACITOR	CC 084.5196	UNION CARB	CK05BX330K	
C16	CC 100PF+-10%200V5K 1200VI CAPACITOR	CC 084.5250	UNION CARB	CK05BX101K	
C17	CC 33PF+-10%200V5K 1200VIE CAPACITOR	CC 084.5196	UNION CARB	CK05BX330K	
C18	CE 4,7UF+-20%20V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8110	ROEDERSTEI	ETR 2 4,7/20 20%	
C19	CE 4,7UF+-20%20V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8110	ROEDERSTEI	ETR 2 4,7/20 20%	
C20	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C21	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C22	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C23	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C24	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C25	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C26	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C27	CC 100NF+-10%50V5K 1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
D1	BL 4011BDM 4X2IN.NANDG NAND GATE	587.9116	FAIRCHILD	4011BDM	
D2	BL HEF4522BD BCD COUNTER PROGR.BCD DOWN COUNTER	645.7022	VALVO	HEF4522BD	
D3	BL HEF4522BD BCD COUNTER PROGR.BCD DOWN COUNTER	645.7022	VALVO	HEF4522BD	
D4	BL MC14073BAL 3X3IN. ANDG AND GATE	418.0141	RCA	CD4073BF	
D5	BL CD4051BF 8CH. MUX MULTIPLEXER	517.7520	RCA	CD4051BF	
D6	BL CD4093BF 4XSCHM.TRIG SCHMITT TRIGGER	517.7589	RCA	CD4093BF	
D7	BL MC14071BAL 4X2IN. ORG OR GATE	418.0158	MOTOROLA	MC14071BAL	
D8	BL CD40107BE 2X2INP.BUFF BUFFER	303.1169	RCA	CD40107BE	
D9	BL CD40107BE 2X2INP.BUFF BUFFER	303.1169	RCA	CD40107BE	
D10	BL HEF4104BP 4XCONV. 3S LEVEL CONVERTER	252.7395	VALVO	HEF4104BP	
D11	BL HEF4104BP 4XCONV. 3S LEVEL CONVERTER	252.7395	VALVO	HEF4104BP	
N2	BO L200CH +ADJ2AO VREGL VOLTAGE REGULATOR	300.6301	SGS	L200CH	
R3	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R4	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R5	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
R6	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R7	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R8	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R9	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R10	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R11	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R12	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R13	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R14	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R15	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R16	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R17	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R18	RL 0,35W 1,50KOHM+-1%TK50 RESISTOR	RL 083.0732	DRALORIC	SMA0207/1,50K-F-D	
R19	RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7884	BOURNS	3386F-1-202	
R20	RL 0,35W 475 KOHM+-1%TK50 RESISTOR	RL 083.2593	DRALORIC	SMA0207/475K-F-C	
R21	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R22	RL 0,35W 475 KOHM+-1%TK50 RESISTOR	RL 083.2593	DRALORIC	SMA0207/475K-F-C	
R23	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R24	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R25	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R26 ..29	RL 0,35W 681 OHM+-1%TK50 RESISTOR	RL 083.0490	DRALORIC	SMA0207/681OHM-F-D	
R30	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R31 ..37	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R38	RL 0,35W 4,53KOHM+-1%TK50 RESISTOR	RL 083.1080	DRALORIC	SMA0207/4,53K-F-D	
R39	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R40	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R41	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R42	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R43	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R44 ..47	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R49	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R50	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R51	RN 9X100KOHM+-2%SIL10 H5 RESISTOR NETWORK	RN 542.5092	BOURNS	4310R-101-104	
V1	AD BAV21 250V 0A25 UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V2	AD BAV21 250V 0A25 UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V3	AF HLMP1700 LED RT RD3 LED	AF 099.9134	HP	HLMP1700	
V4	AF HLMP1700 LED RT RD3 LED	AF 099.9134	HP	HLMP1700	
X5	FP STECKERLEISTE 36POL. PIN CONNECTOR	FP 279.1669	BINDER	742-5-11-0201-00-36	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
	2X 12-POLIG				
X23	FP STECKERLEISTE 10POL. CONNECTOR 10POL.	FP 649.4428	PANDUIT	050-010-133 BC	
X33	FP STECKERLEISTE 10POL. CONNECTOR 10POL.	FP 649.4428	PANDUIT	050-010-133 BC	
X43	FP STECKERLEISTE 10POL. CONNECTOR 10POL.	FP 649.4428	PANDUIT	050-010-133 BC	
X90	FP INDIREKT.STECKERL.36P. PIN CONNECTOR 1X10-POLIG	FP 242.3600	BINDER	742-5-11-0178-00-36	
					- ENDE -

Kennz. Comp.No.	Benennung Designation		Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = MIT 681.1637.02 (T0238) MOD 02 = WITH 681.1637.02 (T0238) VAR 03 = MIT 734.9059.02 (T0247) MOD 03 = WITH 734.9059.02 (T0247)					
A101	ED WANDLERPLATTE 50V NUR VAR/ONLY MOD: 02 HIERZ.STROML./SEE CIRC DIA 681.1266.01 S BL.1		681.1637.02			
A101	ED WANDLERPLATTE 50V NUR VAR/ONLY MOD: 03 HIERZ.STROML./SEE CIRC DIA 681.1266.01 S BL.2		734.9059.02			
A102	ED STEUERUNG 50V CONTROL UNIT 50V HIERZ.STROML./SEE CIRC DIA 681.1266.01 S BL.2		681.1672.02			
A103	ED KONDENSATORPLATTE HIERZ.STROML./SEE CIRC.DIA 681.1266.01 S BL.2		681.1695.02			
C16	CC 10NF+50-20%HDK6000RD19 CERAMIC CAPACITOR		022.0710	RESISTA	QBX619/10NF/2KV	
C17	CC 10NF+50-20%HDK6000RD19 CERAMIC CAPACITOR		022.0710	RESISTA	QBX619/10NF/2KV	
C20	CC 10NF+50-20%HDK6000RD19 CERAMIC CAPACITOR		022.0710	RESISTA	QBX619/10NF/2KV	
L1	LD SP.DROSSEL 20UH 45A CHOKE		586.8945	TALEMA	TYP S853-P1	
L2	LD SP.DROSSEL 20UH 45A CHOKE		586.8945	TALEMA	TYP S853-P1	
R14	RD 5W 50 OHM+-3% GEHAEUSE WIRE-WOUND RESISTOR	RD	566.3502	DALE	NH-5 50 OHM 3%	
R15	RD 5W 50 OHM+-3% GEHAEUSE WIRE-WOUND RESISTOR	RD	566.3502	DALE	NH-5 50 OHM 3%	
R20	RD 5W 50 OHM+-3% GEHAEUSE WIRE-WOUND RESISTOR	RD	566.3502	DALE	NH-5 50 OHM 3%	
S1	ST OEFFNER 90 GRD C +-3 G THERMAL SWITCH	ST	020.0587	EBERLE	2455-R-B203-T149	
T3	LU ET 53V 30A F. 2 UEBTR TRANSFORMER		681.2079	VAC	ZKB440/676-51-XDF	
T4	LU ET 53V 30A F. 2 UEBTR TRANSFORMER		681.2079	VAC	ZKB440/676-51-XDF	
V1	AM BUZ48 N-E 500V MOSF POWER MOSFET NUR VAR/ONLY MOD: 02		681.2156	SIEMENS	BUZ48	
V2	AM BUZ48 N-E 500V MOSF POWER MOSFET NUR VAR/ONLY MOD: 02		681.2156	SIEMENS	BUZ48	
V5	AG BYT30/400 GL 400V30A0 RECTIFIER		689.0669	THOMSON	BYT30/400	
V11	AM BUZ48 N-E 500V MOSF POWER MOSFET NUR VAR/ONLY MOD: 02		681.2156	SIEMENS	BUZ48	
V12	AM BUZ48 N-E 500V MOSF POWER MOSFET NUR VAR/ONLY MOD: 02		681.2156	SIEMENS	BUZ48	
V15	AG BYT30/400 GL 400V30A0 RECTIFIER		689.0669	THOMSON	BYT30/400	
V20	AG BYW93/200 GL 200V60A0 RECTIFIER		681.2104	VALVO	BYW93/200	
X101	BESTEHT AUS/CONSISTING OF 2X FP458.0194 1X 681.0930 1X FP418.0041					681.0924
X102	BESTEHT AUS/CONSISTING OF					681.0924

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
	2X FP458.0194 1X 641.1108 1X FP418.0041				
X103	BESTEHT AUS/CONSISTING OF 3X FP458.0194 1X 681.0976 1X FP418.0041				681.0960
X112	BESTEHT AUS/CONSISTING OF 2X FP458.0194 1X 681.1950				681.1943
X120	BESTEHT AUS/CONSISTING OF 8X FP458.0194 1X 681.1920 1X FP418.0041				681.0947
X150	FM BUCHSENLEISTE 3 KOAXK	FM 070.0800	CANNON	DAM-3W3S	
X210	BESTEHT AUS/CONSISTING OF 3XFP458.0194 1X681.2633 1XFP418.0041				681.1650
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
C1 ..4	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C5	CK 470PF+-10% 400VRM10KC PLASTIC-FOIL CAPACITOR	CK 006.4720	ROEDERST	KC1849-147/4+10%	
C11 ..14	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C15	CK 470PF+-10% 400VRM10KC PLASTIC-FOIL CAPACITOR	CK 006.4720	ROEDERST	KC1849-147/4+10%	
R1	RK VARISTOR 275V6,5KA 1W VARISTOR	681.2056	SIEMENS	Q69-X3233	
R2	RJ 4W 220 OHM+-5%TK400 RESISTOR	475.0147	DRALORIC	SXA0922/220R/5%TK400	
R3	RG 12,1 OHM+-1%TK100 1206 CHIP RESISTOR	RG 006.8661	DALE	CRCW1206-10 12R1 F-T	
R4 ..7	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR	RG 007.0793	DALE	CRCW1206-10 10K F-T	
R11	RK VARISTOR 275V6,5KA 1W VARISTOR	681.2056	SIEMENS	Q69-X3233	
R12	RJ 4W 220 OHM+-5%TK400 RESISTOR	475.0147	DRALORIC	SXA0922/220R/5%TK400	
T5	LU IMP.STROMTRANSFORMATOR TRANSFORMER	811.2520	VAC	ZKB 472/121-02-W	
T6	LU IMP.STROMTRANSFORMATOR TRANSFORMER	811.2520	VAC	ZKB 472/121-02-W	
V1	AM IRFP460 N-E 500V MOSF POWER MOSFET	734.9142	INT.RECT.	IRFP460	
V2	AM IRFP460 N-E 500V MOSF POWER MOSFET	734.9142	INT.RECT.	IRFP460	
V3	AG BYW95C GL 600V 3A0 RECTIFIER	681.2091	VALVO	BYW95C	
V4	AG BYW95C GL 600V 3A0 RECTIFIER	681.2091	VALVO	BYW95C	
V7	AD BAV103 250V 0A25 UDI DIODE	006.9780	VALVO	BAV103	
V11	AM IRFP460 N-E 500V MOSF POWER MOSFET	734.9142	INT.RECT.	IRFP460	
V12	AM IRFP460 N-E 500V MOSF POWER MOSFET	734.9142	INT.RECT.	IRFP460	
V13	AG BYW95C GL 600V 3A0 RECTIFIER	681.2091	VALVO	BYW95C	
V14	AG BYW95C GL 600V 3A0 RECTIFIER	681.2091	VALVO	BYW95C	
V17	AD BAV103 250V 0A25 UDI DIODE	006.9780	VALVO	BAV103	
X1 ..4	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
X61	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X62	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X63	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X64	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X100	FP EINLOETSTECKER 2POL CONNECTOR 2POL	681.1195	AMP	350786-1	
X101	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG/3 PINS	FP 279.1669	BINDER	742-5-11-0201-00-36	
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL				
C101	CE 220UF-10+50%40V12,5X20 ALUMINIUM CAPACITOR	565.9494	ROEDERST	EKR00FE322G	
C102	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C103	CE 10 UF+-20%25V 7X 5X11 ELECTROLYTIC CAPACITOR	CE 023.5980	ROEDERSTEI	ETR 3 10/25 20%	
C115	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	PHILIPS-CO	2222 63051 102	
C120	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C121	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C122	CE 22 UF+-20%16V 7X 5X11 ELECTROLYTIC CAPACITOR	CE 022.8091	ROEDERSTEI	ETR 3 22/16 20%	
C123	CK 680NF+-10%50VRM MKT CAPACITOR	CK 099.2981	WIMA	MKS2/50/0,68UF/10%	
C124	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C125	CC 820PF+- 5%100V NPO VIE CERAMIC CAPACITOR	060.0888	ERIE	8133-100C0G-820PF	
C126	CC 4,7NF+-10%100V5K1200VI CERAMIC CAPACITOR	CC 068.4053	UNION CARB	CK05BX472K	
C127	CC 100PF+-10%200V5K1200VI CAPACITOR	CC 084.5250	UNION CARB	CK05BX101K	
C140	CE 4,7UF+-20%35V 7X 5X11 ELECTROLYTIC CAPACITOR	CE 022.8204	ROEDERSTEI	ETR 3 4,7/40 20%	
C141	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8085	ROEDERSTEI	ETR 2 10/16 20%	
C142	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C143	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C144	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C146	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C147	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C148	CC 100PF+-10%200V5K1200VI CAPACITOR	CC 084.5250	UNION CARB	CK05BX101K	
C149	CC 100PF+-10%200V5K1200VI CAPACITOR	CC 084.5250	UNION CARB	CK05BX101K	
C159	CC 100PF+-2%6X7N150 CAPACITOR	CC 087.6712	PHILIPS-CO	2222 678 34101	
C160	CC 100PF+-2%6X7N150 CAPACITOR	CC 087.6712	PHILIPS-CO	2222 678 34101	
C170	CC 47PF+-10%200V5K1200VIE CAPACITOR	CC 084.5215	UNION CARB	CK05BX470K	
C201	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR	CC 068.4060	UNION CARB	CK05BX103K	
D101	BL CD4049UBF 6XINVERTER HEXINVERTER	086.8192	RCA	CD4049UBF	
D105	BL MC14066BAL 4X ANALOGSW ANALOG SWITCH	418.0135	MOTOROLA	MC14066BAL	
L101	LD 100UH 20% 1A 0,650OHM CHOKE	LD 155.9446	SIEMENS	B82111-E-C25	
N102	BO TDA4700 0A02SCH.REGL REG.PULSE WIDTH MODULATOR	569.1317	SIEMENS	TDA4700	
N103	BO LM139J 4X COMPAR COMPARATOR	BO 455.2873	NAT. SEMIC	LM139J	
N104	BO TL074IN LN 4XFET OPAMP OPERATIONAL AMPLIFIER	568.7528	TEXAS INST	TL074IN	
R101	RL 0,60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	
R102	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R103	RL 0.60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	
R104	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
R105	RL 0,60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	
R106	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R107	RL 0,60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	
R108	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R110	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R111	RL 0,60W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R112	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R118	RL 0,60W 1MOHM+-1%TK50 RESISTOR	RL 082.7862	DRALORIC	SMA0207/1M-F-D	
R120	RL 0,60W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R121	RL 0,60W 100 OHM+-1%TK50 RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R122	RL 0,60W 475 OHM+-1%TK50 RESISTOR	RL 083.0390	DRALORIC	SMA0207/475OHM-F-D	
R123	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R124	RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 087.7560	BOURNS	3386F-1-102	
R125	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R126	RL 0,60W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R127	RL 0,60W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R129	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R130	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R131	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T	RS 247.7878	BOURNS	3386F-1-501	
R132	RL 0,35W90,9KOHM+-0,1%T25 RESISTOR	RL 084.4902	DRALORIC	SMA 0207	
R134	RL 0,35W10,0KOHM+-0,1%T25 RESISTOR	RL 084.3064	DRALORIC	SMA0207/10K-B-E	
R140	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R142	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R143	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R144	RL 0,60W 475 OHM+-1%TK50 RESISTOR	RL 083.0390	DRALORIC	SMA0207/475OHM-F-D	
R145	RL 0,60W 13,0KOHM+-1%TK50 RESISTOR	RL 083.1368	DRALORIC	SMA0207/13,0K-F-D	
R146	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R147 ..150	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R151	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R153	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R154	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R155	RL 0,60W 47,5KOHM+-1%TK50 RESISTOR	RL 083.1800	DRALORIC	SMA/207/47,5K-F-C	
R156	RL 0,60W 47,5KOHM+-1%TK50 RESISTOR	RL 083.1800	DRALORIC	SMA/207/47,5K-F-C	
R157	RL 0,60W 12,1KOHM+-1%TK50 RESISTOR	RL 083.1351	DRALORIC	SMA0207/12,1K-F-D	
R162	RL 0,60W 6,81KOHM+-1%TK50 RESISTOR	RL 082.2560	DRALORIC	SMA 0207/6,81K-F-C	
R201	RL 1W 182 KOHM+-1%TK100 METAL FILM RESISTOR	RL 006.5927	RESISTA	MK5 182 KOHM 1%TK100	
R202	RL 1W 182 KOHM+-1%TK100 METAL FILM RESISTOR	RL 006.5927	RESISTA	MK5 182 KOHM 1%TK100	
R203	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R204	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
T101	LU ZUENDUEBERTR.0,4W IGNATION TRANSFORMER	645.7316	VAC	ZKB 409/020-01-PF	
T102	LU ZUENDUEBERTR.0,4W IGNATION TRANSFORMER	645.7316	VAC	ZKB 409/020-01-PF	
U201	BP SFH601-2 OPT.KOPPL.5KV OPTO COUPLER	346.5795	SIEMENS	Q68000-A5058	
U202	BP SFH601-2 OPT.KOPPL.5KV OPTO COUPLER	346.5795	SIEMENS	Q68000-A5058	
V101	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V102	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V104	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V105	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V107	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V108	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V110	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V111	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V113	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V114	AE BZX79/C15 0.5W ZDI ZENER DIODE	AE 012.2555	PHILIPS-CO	BZX79/C15 GEGURTET	
V115	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V116	AE BZX79/C15 0.5W ZDI ZENER DIODE	AE 012.2555	PHILIPS-CO	BZX79/C15 GEGURTET	
V117	AM BSS89 N-E200V MOSF FET	651.7666	SIEMENS	BSS89	
V118	AM BSS89 N-E200V MOSF FET	651.7666	SIEMENS	BSS89	
V122	AE BZX55/B4V7 0.5W ZDI ZENER DIODE	AE 080.4014	INTERMETAL	ZPD4,7+-2,5%	
V130	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V131	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V132	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V133	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V134	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
X102	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X103	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X110	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 2-POLIG/2PINS 2X 5-POLIG	FP 242.3600	BINDER	742-5-11-0178-00-36	
X112	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 2-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X113	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR	FP 242.3600	BINDER	742-5-11-0178-00-36	
X114	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR	FP 242.3600	BINDER	742-5-11-0178-00-36	
X115	FP STIFTLEISTE 36P.R2.54 PIN CONNECTOR 2X 2-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X120	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X210	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X1015	FP KURZSCHLUSSBUCHSE SHORTING PLUG	FP 491.7042	PK	452-70302	
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
C21	CE 10000UF+-20%63V 40X45 ELECTROLYTIC CAPACITOR	681.2062	VALVO	2222 051 48103	
C22	CE 10000UF+-20%63V 40X45 ELECTROLYTIC CAPACITOR	681.2062	VALVO	2222 051 48103	
C23	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	060.1149	UNION CARB	CKO6BX104K	
R21	RD 2.4W 1,5KOHM+-3% WIRE-WOUND RESISTOR	RD 087.5168	SAGE	1200S 3W TK20	
					- ENDE -

ROHDE & SCHWARZ	Äl	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	01	0889	ED KONDENSATORPLATTE CAPACITOR BOARD	681.1695.01 SA	1-

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL				
A101	ED WANDLERPLATTE 28V HIERZ.STROML./SEE CIRC DIA 734.9194 S	734.9007.02			
A102	ED STEUERUNG 28V CONTROL UNIT 28V HIERZ.STROML./SEE CIRC DIA 681.2179.01 S BL.2	681.2533.02			
R100	RK VARISTOR 460VAC 1,4W VARISTOR	734.9188	SIEMENS	R&S-ZCHNG.0734.9188	
V5	AG BYW93/200 GL 200V60AO RECTIFIER	681.2104	PHILIPS-CO	BYW93/200	
V15	AG BYW93/200 GL 200V60AO RECTIFIER	681.2104	PHILIPS-CO	BYW93/200	
V20	AG BYW93/200 GL 200V60AO RECTIFIER	681.2104	PHILIPS-CO	BYW93/200	
V100	AG SKD31/16 3PH RECTIFIER	734.8930	SEMIKRON	SKD31/16	
X101	BESTEHT AUS/CONSISTING OF 4X FP458.0194 1X 681.2710 1X FP418.0041				681.2585
X102	BESTEHT AUS/CONSISTING OF 4X FP458.0194 1X 681.2727 1X FP418.041				681.2585
X210	BESTEHT AUS/CONSISTING OF 3X FP458.0194 1X 681.2633 1X FP418.0041				681.2579
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
C1	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C2	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C3	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C4	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C5	CC 100PF+-10%N750RD16KV3 CAPACITOR	516.2925	ROEDERST	RCU615100PF+-10% 3KV	
C11	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C12	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C13	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C14	CK 2,2UF+-5%400V RM27,5 FILM-CAPACITOR	681.2133	SIEMENS	B32650-K4225-J	
C15	CC 100PF+-10%N750RD16KV3 CAPACITOR	516.2925	ROEDERST	RCU615100PF+-10% 3KV	
C17	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C18	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C20	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C21	CE 1800UF-10+75%40V26X55 ELECTROLYTIC CAPACITOR	586.8616	SANGAMO	350JL182U040B	
C22	CE 22MIF+-20%40V40RDX55 ELECTROLYTIC CAPACITOR	681.2756	VALVO	2222 051 57223	
C23	CK 1UF+-10%50V5RM MKT CAPACITOR	CK 099.2998	WIMA	MKS2/50/1UF/10%	
C24	CC 2,2NF+-10%100V5K1200VI CERAMIC CAPACITOR	CC 067.9022	UNION CARB	CK05BX222K	
L1	LD SPEICHERDR.50UH 18A STORAGE CHOKE	681.2985	VAC	ZKB-419/808-51-H2	
L2	LD SPEICHERDR.50UH 18A STORAGE CHOKE	681.2985	VAC	ZKB-419/808-51-H2	
R1	RK VARISTOR 275V6,5KA 1W VARISTOR	681.2056	SIEMENS	Q69-X3233	
R2	RJ 2,0W 150 OHM+-2%TK400 RESISTOR	316.1856	RESISTA	WK5 1500HM 2%	
R3	RG 12,1 OHM+-1%TK100 1206 CHIP RESISTOR	RG 006.8661	DALE	CRCW1206-10 12R1 F-T	
R4 ..7	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR	RG 007.0793	DALE	CRCW1206-10 10K F-T	
R11	RK VARISTOR 275V6,5KA 1W VARISTOR	681.2056	SIEMENS	Q69-X3233	
R12	RJ 2,0W 150 OHM+-2%TK400 RESISTOR	316.1856	RESISTA	WK5 1500HM 2%	
R14	RJ 2,0W 150 OHM+-2%TK400 RESISTOR	316.1856	RESISTA	WK5 1500HM 2%	
R15	RJ 2,0W 150 OHM+-2%TK400 RESISTOR	316.1856	RESISTA	WK5 1500HM 2%	
R20	RJ 2,0W 150 OHM+-2%TK400 RESISTOR	316.1856	RESISTA	WK5 1500HM 2%	
R23	RD 2.4W 1,5KOHM+-3% WIRE-WOUND RESISTOR	RD 087.5168	SAGE	1200S 3W TK20	
R24	RJ 4W 47 OHM+-5%TK400 METAL-OXIDE RESISTOR	080.1621	RESISTA	WK8,47OHM5%	
T3	LT WANDLERTRAFO 5,37:1 TRANSFORMER	681.2991	VAC	ZKB490/...-51-W	
T4	LT WANDLERTRAFO 5,37:1 TRANSFORMER	681.2991	VAC	ZKB490/...-51-W	
T5	LU IMP.STROMTRANSFORMATOR TRANSFORMER	811.2520	VAC	ZKB 472/121-02-W	
T6	LU IMP.STROMTRANSFORMATOR TRANSFORMER	811.2520	VAC	ZKB 472/121-02-W	
V1	AM IRFP450 N-E 500V MOSF POWER MOSFET	686.9571	INT.RECT.	IRFP450	
V2	AM IRFP450 N-E 500V MOSF POWER MOSFET	686.9571	INT.RECT.	IRFP450	
V3	AG BYW95C GL 600V 3A0 RECTIFIER	681.2091	VALVO	BYW95C	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
V4	AG BYW95C GL 600V 3AO RECTIFIER	681.2091	VALVO	BYW95C	
V7	AD BAV103 250V 0A25 UDI DIODE	006.9780	VALVO	BAV103	
V11	AM IRFP450 N-E 500V MOSF POWER MOSFET	686.9571	INT.RECT.	IRFP450	
V12	AM IRFP450 N-E 500V MOSF POWER MOSFET	686.9571	INT.RECT.	IRFP450	
V13	AG BYW95C GL 600V 3AO RECTIFIER	681.2091	VALVO	BYW95C	
V14	AG BYW95C GL 600V 3AO RECTIFIER	681.2091	VALVO	BYW95C	
V17	AD BAV103 250V 0A25 UDI DIODE	006.9780	VALVO	BAV103	
X21 ..24	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
X61	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X62	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X63	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X64	FP STECKERLEISTE 36POL. PIN CONNECTOR 3-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X100	FP EINLOETSTECKER 2POL CONNECTOR 2POL	681.1195	AMP	350786-1	
X101	FP STECKERLEISTE 36POL., PIN CONNECTOR 6-POLIG	FP 279.1669	BINDER	742-5-11-0201-00-36	
X150A	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
X150B	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL				
C101	CE 220UF-10+50%40V12.5X20 ALUMINIUM CAPACITOR	565.9494	ROEDERST	EKR00FE322G	
C102	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C115	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C120	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C121	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C122	CE 22 UF+-20%16V 7X 5X11 ELECTROLYTIC CAPACITOR	CE 022.8091	ROEDERSTEI	ETR 3 22/16 20%	
C123	CK 330NF+-5%63V5RM MKT CAPACITOR	CK 099.2969	WIMA	MKS2	
C124	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	UNION CARB	CK05BX102K	
C125	CC 820PF+- 5%100V NPO VIE CERAMIC CAPACITOR	060.0888	ERIE	8133-100C0G-820PF	
C126	CC 4,7NF+-10%100V5K1200VI CERAMIC CAPACITOR	CC 068.4053	UNION CARB	CK05BX472K	
C127	CC 100PF+-10%200V5K1200VI CAPACITOR	CC 084.5250	UNION CARB	CK05BX101K	
C140	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8085	ROEDERSTEI	ETR 2 10/16 20%	
C141	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8085	ROEDERSTEI	ETR 2 10/16 20%	
C142	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C143	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C144	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C146	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C147	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	UNION CARB	CK05BX104K	
C148	CC 100PF+-10%200V5K1200VI CAPACITOR	CC 084.5250	UNION CARB	CK05BX101K	
C149	CC 100PF+-10%200V5K1200VI CAPACITOR	CC 084.5250	UNION CARB	CK05BX101K	
C170	CC 47PF+-10%200V5K1200VIE CAPACITOR	CC 084.5215	UNION CARB	CK05BX470K	
C201	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	PHILIPS-CO	2222 63051 64051103	
D101	BL CD4049UBF 6XINVERTER HEXINVERTER	086.8192	RCA	CD4049UBF	
D105	BL MC14066BAL 4X ANALOGSW ANALOG SWITCH	418.0135	MOTOROLA	MC14066BAL	
L101	LD 100UH 20% 1A 0.650OHM CHOKE	LD 155.9446	SIEMENS	B82111-E-C25	
N102	BO TDA4700 0A02SCH.REGL REG.PULSE WIDTH MODULATOR	569.1317	SIEMENS	TDA4700	
N103	BO LM139J 4X COMPAR COMPARATOR	BO 455.2873	NAT. SEMIC	LM139J	
N104	BO TL074IN LN 4XFET OPAMP OPERATIONAL AMPLIFIER	568.7528	TEXAS INST	TL074IN	
R101	RL 0,60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	
R102	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R103	RL 0,60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	
R104	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R105	RL 0,60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	
R106	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R107	RL 0,60W15 OHM 1%TK50 RESISTOR	RL 082.9020	DRALORIC	SMA0207/150HM-F-D	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
R108	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R112	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R118	RL 0,60W 1MOHM+-1%TK50 RESISTOR	RL 082.7862	DRALORIC	SMA0207/1M-F-D	
R120	RL 0,60W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R121	RL 0.60W 100 OHM+-1%TK50 RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R122	RL 0.60W 475 OHM+-1%TK50 RESISTOR	RL 083.0390	DRALORIC	SMA0207/4750HM-F-D	
R123	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R124	RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 087.7560	BOURNS	3386F-1-102	
R125	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R126	RL 0,60W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R127	RL 0,60W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R129	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R130	RL 0.60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R131	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T	RS 247.7878	BOURNS	3386F-1-501	
R132	RL 0.60W 121KOHM+-1%TK50 RESISTOR	RL 083.2070	DRALORIC	SMA/207/121K-F-C	
R133	RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7903	BOURNS	3386F-1-103	
R134	RL 0,60W 12,1KOHM+-1%TK50 RESISTOR	RL 083.1351	DRALORIC	SMA0207/12,1K-F-D	
R140	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R142	RL 0.60W 2,74KOHM+-1%TK50 RESISTOR	RL 083.0926	DRALORIC	SMA0207/2,74K-F-D	
R143	RL 0.60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R144	RL 0.60W 475 OHM+-1%TK50 RESISTOR	RL 083.0390	DRALORIC	SMA0207/4750HM-F-D	
R145	RL 0.60W 6,81KOHM+-1%TK50 RESISTOR	RL 082.2560	DRALORIC	SMA 0207/6,81K-F-C	
R146	RL 0.60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R147 ..150	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R151	RL 0.60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R153	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R154	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R155	RL 0.60W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R156	RL 0,60W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
R157	RL 0.60W 12,1KOHM+-1%TK50 RESISTOR	RL 083.1351	DRALORIC	SMA0207/12,1K-F-D	
R159	RL 0,60W 1MOHM+-1%TK50 RESISTOR	RL 082.7862	DRALORIC	SMA0207/1M-F-D	
R160	RL 0.60W 1MOHM+-1%TK50 RESISTOR	RL 082.7862	DRALORIC	SMA0207/1M-F-D	
R162	RL 0.60W 6,81KOHM+-1%TK50 RESISTOR	RL 082.2560	DRALORIC	SMA 0207/6,81K-F-C	
R201	RL 1W 182 KOHM+-1%TK100 METAL FILM RESISTOR	RL 006.5927	RESISTA	MK5 182 KOHM 1%TK100	
R202	RL 1W 182 KOHM+-1%TK100 METAL FILM RESISTOR	RL 006.5927	RESISTA	MK5 182 KOHM 1%TK100	
R203	RL 0.60W 33,2KOHM+-1%TK50 RESISTOR	RL 083.1674	DRALORIC	SMA0207/33,2K-F-C	
R204	RL 0,60W 33,2KOHM+-1%TK50 RESISTOR	RL 083.1674	DRALORIC	SMA0207/33,2K-F-C	
T101	LU ZUENDUEBERTR.0,4W IGNATION TRANSFORMER	645.7316	VAC	ZKB 409/020-01-PF	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
T102	LU ZUENDUEBERTR.0,4W IGNATION TRANSFORMER	645.7316	VAC	ZKB 409/020-01-PF	
U201	BP SFH601-2 OPT.KOPPL.5KV OPTO COUPLER	346.5795	SIEMENS	Q68000-A5058	
U202	BP SFH601-2 OPT.KOPPL.5KV OPTO COUPLER	346.5795	SIEMENS	Q68000-A5058	
V101	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V102	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V104	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V105	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V107	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V108	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V110	AK BC560B P 45V 100MA TRANSISTOR	AK 007.2044	SIEMENS	BC560B GURT,POL.CBE	
V111	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V113	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V114	AE BZX79/C15 0,5W ZDI ZENER DIODE	AE 012.2555	PHILIPS-CO	BZX79/C15 GEGURTET	
V115	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V116	AE BZX79/C15 0,5W ZDI ZENER DIODE	AE 012.2555	PHILIPS-CO	BZX79/C15 GEGURTET	
V117	AM BSS89 N-E200V MOSF FET	651.7666	SIEMENS	BSS89	
V118	AM BSS89 N-E200V MOSF FET	651.7666	SIEMENS	BSS89	
V119	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V120	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V122	AE BZX55/B4V7 0,5W ZDI ZENER DIODE	AE 080.4014	INTERMETAL	ZPD4,7+-2,5%	
V130	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V131	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V132	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V133	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V134	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
X102	VL WIRE-WRAP PIN WIRE-WRAP PIN 6-POLIG	VL 088.4542	BERG	NR. 75 403-003	
X110	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR	FP 242.3600	BINDER	742-5-11-0178-00-36	
X112 ..115	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 4X2-POLIG	FP 242.3600	BINDER	742-5-11-0178-00-36	
X120	VL WIRE-WRAP PIN WIRE-WRAP PIN 11-POLIG	VL 088.4542	BERG	NR. 75 403-003	
X210	VL WIRE-WRAP PIN WIRE-WRAP PIN 3-POLIG	VL 088.4542	BERG	NR. 75 403-003	
X1012	FP KURZSCHLUSSBUCHSE SHORTING PLUG	FP 491.7042	PK	452-70302	
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = RAL7035 LICHTGRAU MOD 02 = RAL7035 GREY				
..	ZUGEH.STROML./CIRC.DIAGR. 6034.5003.01 S				
A10	ED STEUERUNG CONTROL CIRCUIT HIERZ.STROML.6034.5003.01S SEE CIRC.DIA.6034.5003.01S	681.1014.02			
A501	ED SIEBUNG FILTER HIERZ.STROML.6034.5303.01S SEE CIRC.GIA.6034.5303.01S	6034.5303.02			
A502	ED LED-PLATTE LED BOARD HIERZ.STROML. 681.0018.01S SEE CIRC.DIAG.691.0018.01S	681.0999.02			6034.5155.01
C1	CS 10NF+-20% 250V RD12X30 ANTI-INTERFERENCE CAPACIT	355.9802	SIEMENS	B81121-A-B44	
C2	CS 10NF+-20% 250V RD12X30 ANTI-INTERFERENCE CAPACIT	355.9802	SIEMENS	B81121-A-B44	
E1	EV 119X119X38 50L/S 24V- BLOWER 24V 50L/S	EV 730.9131	PAPST	4124	
E2	EV 119X119X38 50L/S 24V- BLOWER 24V 50L/S	EV 730.9131	PAPST	4124	
F1	:: 2KNH/BU/ SCHUTZSCH.	6034.5284			6034.5155.01
K1	SN 12V- 2XU 15A AG/NI RELAY	552.0929	SIEMENS	V23009-A0006-A052	
L1	ZM FUNKENTSTOERDROSSEL WITH NOISE SUPPRESSION	6034.5332			
L2	ZM FUNKENTSTOERDROSSEL WITH NOISE SUPPRESSION	6034.5332			
R1	RD 50W 43 OHM+-1% GEH.	317.5010	DALE	RE 75 G 0430	
R2	RD 50W 1,2KOHM+-1% GEH.	490.3520	DALE	R&S-ZCHNG.490.3520	
X1	BESTEHT AUS/CONSISTING OF 5X FP458.0194 1X 734.9971 1X FP418.0041				6034.5578
X5	BESTEHT AUS/CONSISTING OF 11X FP458.0194 1X 734.9959 1X 734.9965 1X FP418.0041				6034.5526
X5	BESTEHT AUS/CONSISTING OF 7X FP458.0194 1X 734.9942 1X FP418.0041				6034.5561
X10	BESTEHT AUS/CONSISTING OF 4X FP343.4946 1X FP805.7800				6034.5603
X11	BESTEHT AUS/CONSISTING OF 1X FP681.1189 2X FP343.4946				6034.5626
X20	BESTEHT AUS/CONSISTING OF 6X FP343.4946 1X FP805.7800				6034.5590
X22	FM STECKERLEISTE 3 KOAXK MULTIPOINT CONNECTOR	FM 070.0780	CANNON	DAM-3W3P	6034.5555
X30	BESTEHT AUS/CONSISTING OF 7X FP458.0194 1X 734.9936 1X FP418.0041				6034.5561
X32	FM STECKERLEISTE 3 KOAXK MULTIPOINT CONNECTOR	FM 070.0780	CANNON	DAM-3W3P	6034.5555
X50	BESTEHT AUS/CONSISTING OF 5X FP458.0194 1X 734.9988 1X FP418.0041				6034.5578
X71	FM BUCHSENLEISTE3P.NETZSP	FM 282.6397	SCHROFF	69001-652	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
X73	BESTEHT AUS/CONSISTING OF 20X FM547.0776 1X FM547.0760				6034.5526
X74	ZM STECKERLEISTE 2-POL. 2-PIN CONNECTOR	681.0582			
X75	ZM BUCHSENLEISTE 5-POLIG	681.4994			
X76	ZM STECKERLEISTE 4+E	681.0599			
X80	BESTEHT AUS/CONSISTING OF 1X FP528.6914 2X FP458.0194 1X FP418.0041				6034.5610
X201 ..203	BESTEHT AUS/CONSISTING OF 6X FP343.4946 3X FP681.1189				6034.5590
Z4	LD NETZF.2A 55DB/10MHZ CHOKE	LD 344.1428	CORCOM	2B1	
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL				
..	ZUGEH.STROML./CIRC.DIAGR. 681.0018.01 S				
V3 ..6	AF HLMP3502 LED GN RD5 LED	235.4862	HEWLETT	HLMP3502	
X1	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 6-POLIG/6 PINS	FP 279.1669	BINDER	742-5-11-0201-00-36	
					- ENDE -

Kennz. Comp.No.	Benennung Designation		Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
..	ZUGEH.STROML./CIRC.DIAGR. 6034.5303.01 S					
C1	CS 330NF 400V 32X18X28 X2 RADIO SCREENING CAPACITOR		681.1237	SIEMENS	B81121-C-B100	
C2	CE 10000UF+-20%63V 40X45 ELECTROLYTIC CAPACITOR		681.2062	PHILIPS-CO	2222 051 48103	
C3	CE 10000UF+-20%63V 40X45 ELECTROLYTIC CAPACITOR		681.2062	PHILIPS-CO	2222 051 48103	
C4	CC 1UF+-10%50V7K1200VIEL CAPACITOR		084.5538	UNION CARB	CK06BX105K	
C5	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR		060.1149	UNION CARB	CK06BX104K	
C6	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR		060.1149	UNION CARB	CK06BX104K	
C7	CE 10000UF+-20%63V 40X45 ELECTROLYTIC CAPACITOR		681.2062	PHILIPS-CO	2222 051 48103	
C8	CE 10000UF+-20%63V 40X45 ELECTROLYTIC CAPACITOR		681.2062	PHILIPS-CO	2222 051 48103	
C9	CE 470UF+-20%385V RD40X55 ELECTROLYTIC CAPACITOR		686.9513	PHILIPS-CO	2222 053 58471	
C10	CE 470UF+-20%385V RD40X55 ELECTROLYTIC CAPACITOR		686.9513	PHILIPS-CO	2222 053 58471	
C11	CS 330NF 400V 32X18X28 X2 RADIO SCREENING CAPACITOR		681.1237	SIEMENS	B81121-C-B100	
C12	CS 330NF 400V 32X18X28 X2 RADIO SCREENING CAPACITOR		681.1237	SIEMENS	B81121-C-B100	
C13	CE 470UF+-20%385V RD40X55 ELECTROLYTIC CAPACITOR		686.9513	PHILIPS-CO	2222 053 58471	
C14	CE 470UF+-20%385V RD40X55 ELECTROLYTIC CAPACITOR		686.9513	PHILIPS-CO	2222 053 58471	
C15	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR	CE	087.0572	ROEDERST	ELKO EK470/40	
C16	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR	CE	087.0572	ROEDERST	ELKO EK470/40	
C17	CE 4,7UF-10+50% 40V 9X13B ELECTROLYTIC CAPACITOR	CE	086.4397	ROEDERST	ELKO EKU 4/40	
C18	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
C19	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
F1	SS SCHMELZS.6,3X32M20A32V FUSE 20A 32V		520.4858	WICKMANN	307.020	
F2	SS SCHMELZ.T1,6IEC127-2/V FUSE	SS	020.7500	WICKMANN	T1.6 NR.19181	
F3	SS SCHMELZS.T100 IEC127/3 FUSE	SS	020.7146	WICKMANN	TO.1 NR.19195	
L1	LD ENTSTOERDR 2X1,8MH 10A RADIO-SCREENING-CHOKE		681.1250	HARTMANN	215100-13	
L2	LD ENTSTOERDR 2X1,8MH 10A RADIO-SCREENING-CHOKE		681.1250	HARTMANN	215100-13	
L3	LD ENTSTOERDR 2X1,8MH 10A RADIO-SCREENING-CHOKE		681.1250	HARTMANN	215100-13	
N1	BO L200CV +ADJ2A0 VREGL VOLTAGE REGULATOR		336.7643	SGS	L200CV	
N2	BO LM139J 4X COMPAR COMPARATOR	BO	455.2873	NAT. SEMIC	LM139J	
R1	RL 1W 475 KOHM+-1%TK100 METAL FILM RESISTOR	RL	006.5979	ROEDERSTEI	MK 5	
R2	RD 2.4W 1,5KOHM+-1% WIRE-WOUND RESISTOR	RD	087.5168	SAGE	1200S 3W TK20	
R3	RD 2.4W 1,5KOHM+-1% WIRE-WOUND RESISTOR	RD	087.5168	SAGE	1200S 3W TK20	
R4	RL 0,60W 100KOHM+-1%TK50 RESISTOR	RL	082.1764	DRALORIC	SMA0207/100K-F-C	
R5	RL 0,60W 5,62KOHM+-1%TK50 RESISTOR	RL	082.2190	DRALORIC	SMA0207/5,62K-F-C	
R6	RL 1W 274 KOHM+-1%TK100 METAL FILM RESISTOR	RL	006.5940	ROEDERSTEI	MK 5	
R7	RL 1W 274 KOHM+-1%TK100 METAL FILM RESISTOR	RL	006.5940	ROEDERSTEI	MK 5	
R8	RL 0,60W 681 OHM+-1%TK50 RESISTOR	RL	083.0490	DRALORIC	SMA0207/681OHM-F-D	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
R10	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R11	RL 0,60W 82,5KOHM+-1%TK50 RESISTOR	RL 082.2302	DRALORIC	SMA0207/82,5K-F-C	
R12	RL 0,60W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R14	RL 0,60W 3,32KOHM+-1%TK50 RESISTOR	RL 083.0990	DRALORIC	SMA0207/3,32K-F-D	
R15	RL 0,60W 18,2KOHM+-1%TK50 RESISTOR	RL 083.1480	DRALORIC	SMA/207/18,2K-F-C	
R16	RL 0,60W 47,5KOHM+-1%TK50 RESISTOR	RL 083.1800	DRALORIC	SMA/207/47,5K-F-C	
R17	RL 0,60W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R18	RL 0,60W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMA0207/100K-F-C	
T1	LT TRAFO 2X9V 14VA TRANSFORMER	513.9370	SCHAFFER	KLF 14VA/2X9V	
U1	BP SFH601-2 OPT.KOPPL.5KV OPTO COUPLER	346.5795	SIEMENS	Q68000-A5058	
V1	AM IRFP450 N-E 500V MOSF POWER MOSFET	686.9571	INT.RECT.	IRFP450	
V2	AG BYV74/400 2GL200V30A0 RECTIFIER	686.8698	PHILIPS-CO	BYV74/400	
V3	AE BZT03/C68 3.2W ZDI ZENER DIODE	AE 007.4318	PHILIPS-CO	BZT03/C68	
V4	AG BYV74/400 2GL200V30A0 RECTIFIER	686.8698	PHILIPS-CO	BYV74/400	
V5	AE BZT03/C33 3.2W ZDI ZENER DIODE	AE 007.4260	PHILIPS-CO	BZT03/C33	
V6	AE BZT03/C33 3.2W ZDI ZENER DIODE	AE 007.4260	PHILIPS-CO	BZT03/C33	
V7	AE BZT03/C68 3.2W ZDI ZENER DIODE	AE 007.4318	PHILIPS-CO	BZT03/C68	
V8	AE BZT03/C68 3.2W ZDI ZENER DIODE	AE 007.4318	PHILIPS-CO	BZT03/C68	
V9	AE BZT03/C68 3.2W ZDI ZENER DIODE	AE 007.4318	PHILIPS-CO	BZT03/C68	
V10	AG BYV74/400 2GL200V30A0 RECTIFIER	686.8698	PHILIPS-CO	BYV74/400	
V11	AG B80C700 80V 0A8 BRGL RECTIFIER	AG 092.9345	SIEMENS	A 0512	
V12	AE BZX79B15 2% 0.5W ZDI ZENER	AE 008.7610	PHILIPS	BZX79B15	
V13	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V14	AE RICHTIGE SNR.008.7762 ZENER DIODE	AE 086.8228	AEG-TELEF.	BZX55/C2V7	R
V15	AK BCY79IX P 45V 200MA TRANSISTOR	AK 010.3777	PHILIPS-CO	BCY79IX	
V16	AK BCY59IX N 45V 200MA TRANSISTOR	AK 010.5163	PHILIPS-CO	BCY59IX	
V17	AE BZT03/C30 3.2W ZDI ZENERDIODE	AE 394.8761	PHILIPS-CO	BZT03/C30	
V18	AD BAV21 250V UDI DIODE	AD 082.6837	INTERMETAL	BAV21	
V19	AM RFP12P10 P-E 100V MOSF POWER MOSFET	711.4609	RCA	RFP12P10	
X10	FP STIFTSOCKEL F.GS 6P. CONNECTOR 6POL	681.1172	AMP	350711-1	
X11	FP STIFTSOCKEL F.GS 2P. CONNECTOR 2POL	681.1195	AMP	350786-1	
X20	FP STIFTSOCKEL F.GS 6P. CONNECTOR 6POL	681.1172	AMP	350711-1	
X50	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 6-POLIG/6 PINS	FP 279.1669	BINDER	742-5-11-0201-00-36	
X80	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 3-POLIG/3 PINS	FP 279.1669	BINDER	742-5-11-0201-00-36	
X95	FV FLACHSTECKER GR4,8X0,8 PLUG	FV 545.4000	VOGT&CO	3826 MS/0,8 VERZINNT	
X96	FV FLACHSTECKER GR4,8X0,8 PLUG	FV 545.4000	VOGT&CO	3826 MS/0,8 VERZINNT	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
X500	BEMERKUNG / PLEASE NOTE NICHT BESTUECKT/NOT FITTED				
X501	BEMERKUNG / PLEASE NOTE NICHT BESTUECKT/NOT FITTED				
X503 ..506	MZ HALTEBLECH	6034.5378			
X507	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
X508	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
X509	FV FLACHSTECKER GR.6,3 FLAT-CABLE PLUG	FV 530.5457	VOGT	3866A/MS-SN8	
X30A	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 2X5-POLIG/2X5 PINS	FP 279.1669	BINDER	742-5-11-0201-00-36	
X30B	FP STIFTLEISTE 36P.R2,54 PIN CONNECTOR 2X5-POLIG/2X5 PINS	FP 279.1669	BINDER	742-5-11-0201-00-36	
					- ENDE -