ERBE

Service manual

ICC 50

ICC 80

ICC BIPOLAR

08.99

ICC 50, ICC 80, ICC BIPOLAR

Service manual

10122-003, 10122-008, 10122-010, 10122-040, 10122-041
10122-100, 10122-101, 10122-102, 10122-103, 10122-104
10122-054, 10122-055, 10122-060, 10122-061

08.99

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Please contact me directly with your suggestions, criticisms or information regarding this manual. Your feedback helps me to design this document according to your requirements and to constantly improve it.

Printed by: ERBE Elektromedizin GmbH, Tübingen Art. No.: 80116-251

Printed in Germany

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Test programs

ICC 50, ICC 80, ICC BIPOLAR

Calling up the test programs

When switching on the unit, hold down the CUT effect key. »Pr. 1« appears in the displays on the front panel.

The required test program number can be selected via the »Up/Down« keys in the COAG field.

The selected test program is started by pressing the CUT effect key.

If not described differently, the individual test programs can be cancelled and exited again by briefly pressing the CUT effect key.

1 Basic setting of the front panel

Set the front panel as required. (Attention: to switch over the CUT effect, only press the effect key briefly, since the Save process is started if it is pressed for a longer period of time!)

To save, the CUT effect key must be held down for about 3 seconds. At the same time, the Save process is indicated symbolically in the display together with an acoustic signal. Once the Save has been completed, there is a short tone. If the CUT effect key is released too soon, nothing is saved and therefore the previous setting or the setting preprogrammed at the factory for the front panel is again valid.

Once the Save has been completed, Test program 1 is exited by releasing the CUT effect key.

If Test program 1 is exited without storing a new front panel setting, the unit must be switched off to do this.

2 Calling up the ERROR list

The ICC units are equipped with a system for error detection, error indication and error memory. Every error is labelled with an error number (ERROR No.). The ICC 50, ICC 80 and ICC BIPOLAR units store the last 20 ERROR numbers. Test program 2 indicates the stored ERROR numbers. The most recent error is in Memory location 1.

After activating Test program 2, the display »Er-.—« appears for about 1 second, and then 1. xx, where »1.« stands for the last error and »xx« is the number of the error described in the error list.

Using the Up/Down keys in the CUT field, the 20 stored errors can be selected. For example, »2.« then stands for the penultimate error, »3.« stands for one before that, etc.

Press the CUT effect key for 3 seconds to delete the entire error memory. This is indicated acoustically and symbolically in the displays. The deletion is complete when a short tone is heard. If the CUT effect key is released too soon, the memory is not deleted.

Then exit the test program.

To exit the test program without deleting the memory *only briefly* press the CUT effect key.

3 Programming the required activation time limit

Display of »tL.« for time limit and »—«for the required limit value.

Using the Up/ Down keys in the COAG field, the permissible activation time is set in seconds.

Range: 1…99 seconds.

This value must be stored in memory by pressing the CUT effect key for about 3 seconds. Refer to Test program 1.

It is possible to exit the test program without saving a new value to memory by briefly pressing the CUT effect key.

4 Activation of all visual front panel displays

5 Activation of all acoustic signals

Audible signals are selected using the »Up/Down« buttons in the CUT field (display t.x). By pressing any button in the COAG field, the alarm volume can be adjusted.

- t.1: Signal for activation CUT
- t.2: Signal for activation FORCED and SOFT
- t.3: Signal for activation BIPOLAR
- t.4: Alarm signal

6 Manual closing of the output relay

Display: r.x xx, in which »r.x« stands for the relay number.

By pressing any button in the COAG field, the two relays can be switched as required, which is indicated by »on« in the COAG display.

- r.1: Bipolar output
- r.2: Monopolar output with neutral electrode output
- r.r.: Both outputs

7 (not assigned)

8 Display of software version number (Display: S.n. xx)

9 (not assigned)

10 Measurement of the internal 15 volt supply voltage (»U dd« for Vdd)

11 Automatic checking of the power supply unit for the entire range 0…90 V

Automatic testing is activated with the footswitch for CUT. During the run of the test, indicated symbolically in the COAG display, the footswitch must remain pressed.

The voltage is increased from 0 to 90 volts and measured internally at the same time. If there is a difference, this may be displayed as an error (ERROR 80 and 81).

After this run, a voltage of 90 volts is set which can be measured between MP2 and MP1. The measurement value of the internal measurement is indicated in the COAG display.

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By pressing the CUT effect button, the voltage is decreased to 50 volts.

By pressing the CUT effect key again, the test program is exited.

Test program 12

12 Adjustment of the phase control for the HF generator

This adjustment is made as the generator idles, but with the monopolar patient lines connected.

After starting up the test program, the power unit voltage is set to 10 volts (Display: U_ 10).

Using the CUT footswitch, the generator is activated. The HF voltage is measured using an oscilloscope and adjusted to a sinusoidal characteristic at TP3. During activation, the power unit current (I_ xx) is displayed, which must at the same time be at its minimum.

As soon as the footswitch is released, the power unit voltage is automatically set to 50 volts. The generator is again activated using the CUT footswitch and set at this higher voltage as described above.

Then the whole process is repeated for a power unit voltage of 90 volts. For the final adjustment, the clean sinusoidal characteristic has a higher priority than the power unit current, which should nevertheless be close to its minimum.

By then releasing the CUT footswitch, the test program is automatically exited.

13 Calibration of the HF power output (c.P. hF)

ATTENTION

This test program can only be conducted in the unit's Special Test Mode. To do this, the bridge J7 must be connected, otherwise the display »J7 n.c.« will appear.

An HF power meter (APM 600) is connected to the monopolar output. CUT is activated with the footswitch at a load resistance of 500 ohms set at the output. Via the »Up/Down« keys in the CUT field, the output power is adjusted in such a way that the value measured by the power meter corresponds to the setup value on the front panel.

Proceed in the same manner at a load resistance of 200 ohms when activating SOFT. Here the power is set via the »Up/Down« keys in the COAG field to the preset value.

To save the calibration values, the CUT effect key must be held down for approx. 3 seconds until a high tone is heard which indicates that these have been saved to memory.

14 Automatic calibration of the NE monitoring

ATTENTION

This program can only be conducted in the unit's Special Test Mode. To do this, the bridge J7 must be connected. Otherwise the display »J7 n.c.« will appear.

At the NE socket a resistance of 260 ohms is connected via a standard NE cable. Then the reference value for the NE monitoring is automatically adjusted by the unit, which is indicated by the appearance of an unbroken line (»—«) in the COAG display and the illumination of both the red and the green NE LEDs.

This calibration value must now be stored by holding down the CUT effect key for 3 seconds.

15 Checking the activation signals (accessories) and safety shut off feature

All four activation signals (finger- and footswitch) must be pressed at least once so that instead of »— —« a display of »oo oo« appears and the test program is automatically finished.

16 Automatic burn-in procedure for 2 hours (»2h b.i.«)

Automatic burn-in procedure for 2 hours (»2h b.i.«) with 25% activation (10 sec ON, 30 sec OFF), in which the maximum power (50 watts) is output for CUT at 500 ohms.

A 500 ohm load resistance (noninductive and noncapacitive) is connected to the monopolar output.

Before the burn-in procedure can be started, the CUT footswitch signal must be present.

Start the procedure with the CUT effect key.

17 Setting programmable options (»P.O.«)

For example, to lock the activation signals according to Spanish regulations.

ATTENTION

This program can only be conducted in the unit's Special Test Mode. To do this, the bridge J7 must be connected. Otherwise the display »J7 n.c.« will appear.

The possible options can be called up in the COAG field via the »Up/Down« keys. To save the option currently displayed, or to switch the unit to this mode, the CUT effect key must be held down for approx. 3 seconds as for all save procedures.

Options:

- St.: Standard
- SP.: Spanish version: if another activation signal is detected during activation, the unit switches off immediately with an error message.

18 (not assigned)

19 (not assigned)

20 Display contents of the CONFIG register

Display the contents of the CONFIG register to determine the basic initialization of the microcontroller (»c.r. xx«).

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21 Verification of the modulation timer and the modulation monitor (»t.t.«)

At the test program start, the timer is initialized and switched on. Activation using the CUT footswitch turns on the generator (with the output relay open) and the feedback is measured. In the COAG display, the measurement value for the feedback is indicated. This must accept a value of 30 (28–32). Greater deviations are not permitted.

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CHAPTER 2

ERROR list

ERROR list V 3.X

ERBOTOM ICC 50, ICC 80, ICC BIPOLAR

Automatic error detection, indication and documentation

ERBOTOM ICC series high-frequency surgical units are equipped with a device for automatic error detection, indication and documentation (ERROR monitor).

Error detection

For ERBOTOM ICC series equipment with software version 1.07, the ERROR monitor can detect up to 91 different errors, depending on the type of equipment and its features, and indicate these on the display.

Error indication

Error numbers (ERROR nos.) are assigned to the various errors. If an error is detected, it is immediately reported. The error report is both and visual and audible.

Error documentation

The error numbers of detected errors are automatically saved in chronological order. Since only 20 memory locations are available, only the last 20 error messages are displayed. If the same error is detected several times in a row, the corresponding error number is then saved only once in consideration of the limited number of available memory locations. The error numbers documented in memory can be displayed via Test program 2 and deleted.

Troubleshooting for ICC family equipment

The ICC equipment family is equipped with an error detection system which records the last 20 (ICC 50, ICC 80, ICC BIPOLAR) errors in an ERROR list and saves them in memory. This error memory can be called up via Test program no. 2. The idea of troubleshooting is to help the user of the equipment in the event of malfunction. He should thus be capable of localizing errors himself and deciding whether this is an operational error or an error originating with the accessories which he can possibly remedy himself, or whether it is necessary to contact the technical service.

If there is a complete failure of the system and no display is visible, the power supply may have been interrupted or the voltage supply inside the unit is defective. In such a case, first check whether the outlet used is live or a fuse in the house power supply has been tripped (Does a different unit function at this outlet?). If the outlet used is live, check the powerline to the unit and replace if necessary. The equipment fuses on the rear panel should also be checked and replaced if necessary.

If these efforts produce no results, there is presumably an error within the unit. You should then contact the technical service.

In the case of a malfunction with a properly functioning display, but without indication of an ERROR number on the display, the error may be located in defective accessories. There may, for example, be a defect in the fingerswitch or footswitch, or there may be a power interruption. The cause of the error may be determined by exchanging the accessories used.

To determine other causes of errors, an ERROR number in the unit display indicates the course of further action according to the following table.

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ERROR nos. 1–13

Error no.	Explanation and remedy
1	Activation time limit reached. *If the activation time limit has been set too short, extend this by using Test program no. 3.*
2	During monopolar activation, the NE monitor produces an impermissible value. *Check whether the NE is correctly applied and connected to the unit. Check the NE lines.* *Tech. Service: Check NE monitor.*
3	Activation of the unit without prior acknowledgement of the front panel setting. *Setup values on the front panel must be acknowledged by pressing any key before the unit can be reactivated.*
4	Activation of CUT with nonspecified power setting. *With a nonspecified power setting, the CUT function is inactive.*
5	Activation of COAG with nonspecified power setting. *With a nonspecified power setting, the COAG function is inactive.*
6	Activation of COAG with fingerswitch at BIPOLAR setting. *The unit is setup for bipolar coagulation and cannot therefore be activated with the fingerswitch for coagulation, but rather only with the footswitch or via AUTO START.*
7	Several activation signals simultaneously. *If several activation signals were not simultaneously activated, check the fingerswitch and footswitch for correct functioning.* *Check the activation detection of the unit with the help of Test program 15. If errors are detected: Tech. Service*
8	(Only for the version according to Spanish regulations: During activation, a further activation signal leads to shutdown.)
9	(not assigned.)
10	Power supply unit voltage too high during self-check. *Equipment error: Tech. Service.*
11	Incorrect dosage during activation phase: Power supply unit current too high before switching on the generator. *Generator defective: Tech. Service*
12	Incorrect dosage during activation phase: Power supply voltage too high. *Equipment error: Tech. Service*
13	Incorrect dosage during activation phase: Power supply voltage too high. *Equipment error: Tech. Service*

ERROR nos. 14–25

Error No.	Explanation and remedy
14	Incorrect dosage during CUT: Voltage 20% too high. *Equipment error: Tech. Service.*
15	Incorrect dosage during FORCED: 20% too high. *Equipment error: Tech. Service.*
16	Incorrect dosage during SOFT or BIPOLAR: Voltage 20% too high. *Equipment error: Tech. Service.*
17	Incorrect dosage during CUT Effect 2 or FORCED: Modulation pulse length outside permissible tolerance limits. *Equipment error: Tech. Service.*
18	Incorrect dosage during CUT Effect 2 or FORCED: Modulation frequency outside permissible tolerance limits. *Equipment error: Tech. Service.*
19	Current measurement produces impermissibly low value during activation phase. *Equipment error: Tech. Service.*
20	Activation signal present when switching on the unit *Release footswitch CUT key.* *Check function of footswitch.* *Check activation detection of the unit with the help of Test program 15.*
21	Activation signal present when switching on the unit *Release footswitch COAG key.* *Check function of footswitch.* *Check activation detection of the unit with the help of Test program 15.*
22	Activation signal present when switching on the unit *Release fingerswitch CUT key.* *Check function of fingerswitch.* *Check activation detection of the unit with the help of Test program 15.*
23	Activation signal present when switching on the unit *Release fingerswitch COAG key.* *Check function of fingerswitch.* *Check activation detection of the unit with the help of Test program 15.*
24	»Up« key in CUT field of the unit pressed or defective. Check whether the corresponding key was pressed before switching on the unit. If not: Front panel or unit defective, Tech. Service.
25	»Down« key in CUT field of the unit pressed or defective. Check whether the corresponding key was pressed before switching on the unit. If not: Front panel or unit defective, Tech. Service.

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ERROR nos. 26–64

Error No.	Explanation and remedy
26	»COAG« mode scroll key pressed when switching on the unit or defective. *Check whether the corresponding key was pressed before switching on the unit.* *If not: Front panel or unit defective, Tech. Service.*
27	»Up« key in COAG field pressed when switching on the unit or defective *Check whether the corresponding key was pressed before switching on the unit.* *If not: Font panel or unit defective, Tech. Service.*
28	»Down« key in COAG field pressed when switching on the unit or defective. *Check whether the corresponding key was pressed before switching on the unit.* *If not: Front panel or unit defective, Tech. Service.*
29	(not assigned.)
30	During the activation phase, no feedback is present at the safety shut off feature. *Equipment error: Tech. Service.*
31–59	(not assigned.)
60	Error when switching on the unit: Memory value for calibration of power control invalid or power control not yet calibrated. *Unit is available but the power output is limited to lower value, which is indicated with every activation by a brief blinking of the incorrect dosage LED. Power must be calibrated with the help of Test program 13.* *Otherwise: Memory failure, Tech. Service.*
61	Error when switching on the unit: Memory value for calibration of the NE monitor invalid or NE monitor not yet calibrated. *Unit is available but only non-split neutral electrodes should be used. NE monitor must be calibrated with the help of Test program 14.* *Otherwise: Memory failure, Tech. Service.*
62	Error in calibration (Test programs 13 and 14): Value to be stored in memory is impermissible. *Possibly no adjustment or an incorrect adjustment was made.* *For NE adjustment (Test program 14), check whether the correct resistance is connected to the NE line.* *Otherwise: Equipment error, Tech. Service*
63	Error when storing a value in memory (front panel basic setting or calibration value) in EEPROM. Storage not successful. *Memory failure, Tech. Service.*
64	Error when switching on the unit: The value stored in memory is invalid for the programmable option. *Unit is available.* *Otherwise: Memory failure, Tech. Service.*

ERROR nos. 65–93

Error No.	Explanation and remedy
65–79	(not assigned.)
80	Error when checking the power supply unit (Test program 11): Voltage too low. *Equipment error: Tech. Service.*
81	Error when checking the power supply unit (Test program 11): Voltage too high. *Equipment error: Tech. Service.*
82	Error when checking the power supply unit (Test program 11): Power supply unit current too high. *Equipment error: Tech. Service.*
83	Burn-in procedure started without CUT footswitch. *Before activation of the burn-in procedure (Test program 16), the footswitch signal for CUT must be present.*
84–89	(not assigned.)
90	System error: Watch Dog has triggered Interrupt and Reset *Equipment error: Tech. Service.*
91	System error: Clock monitor has triggered Interrupt and Reset *Equipment error: Tech. Service.*
92	System error: Faulty opcode; Interrupt triggered. *Equipment error: Tech. Service.*
93	System error: Stack range exceeded. *This error is only stored in memory, i.e. no immediate display on the front panel.* *Equipment error: Tech. Service.*

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CHAPTER 3

Adjustment and testing instructions

Adjustment and testing instructions

ICC 50, ICC 80, ICC BIPOLAR

General remarks

All ERBE equipment is adjusted before shipping and subjected to a burn-in test and a final inspection. Nevertheless, repairs, the replacement of boards, extremely abnormal operating conditions or customization require readjustment of the equipment under certain circumstances.

The following instructions for adjustment of HF surgical units ICC 50, ICC 80 and ICC BIPOLAR allow the service technician to perform all adjustment work. This adjustment work must only be performed by the manufacturer or by third parties expressly authorized to do this by the manufacturer in consideration of the particular safety requirements for electromedical equipment.

WARNING ⚠

A maladjustment can lead to patient injury as well as to damage to the equipment.

ATTENTION

If nonauthorized persons perform improper adjustments, modifications or repairs to the unit or accessories, the manufacturer accepts no liability. In addition, the guarantee becomes void in this case.

No.	Adjustment or testing of:
1	Basic initialization
2	Testing the internal power supply Vdd (+15 V)
3	Checking the power supply unit, voltage control and monitor
4	Setting the phase control of the HF generator
5	Calibration of the HF power output
6	Calibration of the NE monitor
7	Checking the activation signals and safety interlock signal.

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ATTENTION

If individual assemblies are replaced during repairs, either a partial readjustment or a complete reset must be performed, depending on the assembly involved.

Adjustment and testing instructions

ICC 50, ICC 80, ICC BIPOLAR

An essential component of the ICC 50, ICC 80 and ICC BIPOLAR unit is the microcontroller (68HC11A1), which directly influences almost all functions of equipment and unifies a large number of functions through its capabilities. These include, for example, the analog measurement inputs, self-monitoring functions, and much more. Of particular importance is the internal EEPROM, which is used to store data, calibration values etc. permanently and independent of the supply voltage.

On the other hand, this microcontroller requires basic initialization for its application in order to activate required functions and adapt to its environment. This basic initialization must be conducted *first* for the ICC 50, ICC 80 and ICC BIPOLAR, while at the same time the specific parameters are automatically saved.

ATTENTION

The adjustment or testing of nos. 1–7 absolutely must be performed in the indicated order for new equipment and also after replacement of the microcontroller!

Since most setup values are stored as calibration values in the EEPROM of the microcontroller, the test programs in which these calibration values can be changed are only accessible in the so-called »Special Test Mode«. This is used to prevent unintentional alteration of the calibration values. To operate the unit in the Special Test Mode, a shorting bridge must be attached at J7 (main board). If the presence of this shorting bridge is detected when the unit is switched on, this is made clear in that the unit is automatically in the test program mode after switching on and Test program 10 (»Pr. 10«) is displayed. Furthermore, when first switching on the unit in Special Test Mode, the basic initialization is automatically performed and saved.

The shorting bridge absolutely must be removed once the setting has been completed, as otherwise several internal safety monitors of the microcontroller are not activated, In addition, the unit would always be in test program mode after switching on and not in the normal operating mode.

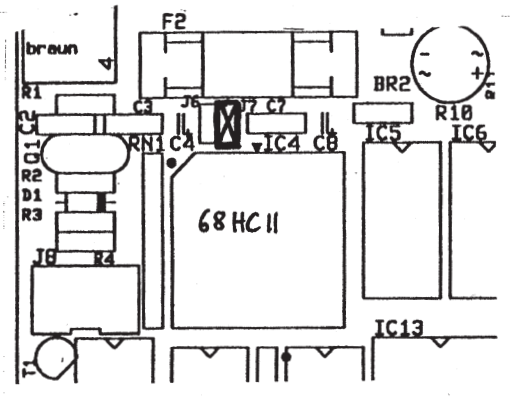

Fig.: Position of J7 on the main board (refer to text above).

Adjustment and testing instructions

ICC 50, ICC 80, ICC BIPOLAR

1 Basic initialization

Attach the shorting bridge to J7.

Switch the unit on.

At the same time, basic initialization is automatically performed insofar as this has not already occurred with the respective microcontroller.

The unit is in the test program mode after switching on. On the front panel appears »Pr. 10«.

2 Testing the internal supply voltage Vdd (+15V)

Activate Test program 10.

Display on the front panel: U dd for Vdd (for about 1 second)

Next follows the display of the voltage measured: xx. yy.

(xx = integer volt; yy = tenth and hundreth volt).

Voltage must be 15 V, tolerance: ±0.5 V.

Although only the voltage Vdd (+15 V) is directly measured, this test program also checks the 5 V voltage used as a measurement reference. In the event of malfunction, this should therefore also be measured.

Deactivate the test program.

3 Checking the power supply unit, voltage control and monitoring

Both measurements should be checked using a meter at MP2 (main board; mass = MP1)!

Activate Test program 11.

Display on the front panel: U_ for »DC power supply unit«.

The check is started by activating with the CUT footswitch.

CAUTION

During the automatic run, the footswitch must remain depressed, as otherwise the power supply unit is switched on, which results in an error report (Error 80).

The power supply voltage is now slowly increased from 0 to 90 volts, measured simultaneously and monitored for uniformity within a narrow tolerance. In the event of a malfunction, the error is displayed and the test program interrupted. The voltage increase is indicated symbolically in the COAG display.

After a complete check of the entire voltage range, the voltage remains at 90 volts, and the internal measurement value is indicated in whole volts in the COAG display. Here as well, the footswitch must remain depressed.

The measurement value must be 90 V, tolerance: ±2 V.

By pressing the CUT effect key, the voltage is reduced to 50 V and displayed as described above.

The measurement value must be 50 V, tolerance: ±1 V.

By pressing the CUT effect key again, the test program is concluded.

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4 Setup of the phase control for the HF generator

Connect the monopolar patient lines with no load. This is important for a precise setup!

Connect the oscilloscope and probe at MP4 to MP5. Probe 100:1 recommended.

It is recommended to set the trim potentiometer TP3 to about the center before starting the setup.

Activate Test program 12.

Display on the front panel: Ph. (for about 1 second).

Then the display U_ 10 appears, which means that the power supply unit is regulated to 10 volts at the next activation.

Activate using the CUT footswitch. In this way, the generator is switched on at a voltage of 10 volts with no load.

Set the phase control using the voltage characteristic shown on the oscilloscope.

The setup criterion is a voltage characteristic that is as sinusoidal as possible.

In the COAG display, the power supply current is displayed relatively (I_ xx) and is also used as a setup criterion for the purpose of the power supply current assuming as minimal a value as possible.

Deactivate at the footswitch.

Display on the front panel: U_ 50, i.e. the power supply is regulated to 50 volts at the next activation.

Activate with the CUT footswitch.

Repeat the above procedure, but at 50 volts power supply voltage.

After deactivation, the display for 90 volt power supply voltage appears, at which the final setup is performed. At the same time, ensuring that the characteristic of the HF output voltage is as sinusoidal as possible has priority over the absolute minimum of the power supply unit current. However, this should be close to its minimum (typical display of approx. 65).

Additionally, the HF voltage at 90 volt power supply voltage should have a peak value of approx. 700 volts.

As soon as the setup is completed and deactivated via the footswitch, the test program is also completed.

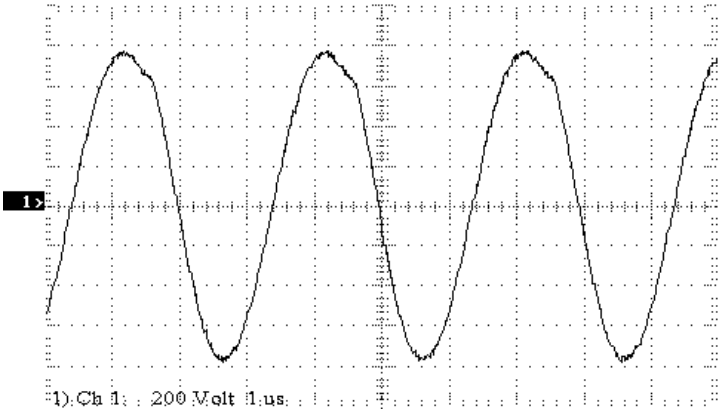

Fig.: HF voltage characteristic at 90 volts power unit voltage with no load.

Adjustment and testing instructions

ICC 50, ICC 80, ICC BIPOLAR

5 Calibration of the HF power output

Connect the monopolar patient lines to the HF power meter (APM 600).

Activate Test program 13 (only possible in Special Test Mode, see above).

Display on the front panel: cP hf (for about 1 second).

Then the front panel sets itself up for CUT effect 1, 30 (watts) and SOFT, 20 (watts), which represents the setup for the following calibration.

To calibrate, CUT is activated at a load resistance of 500 ohms via the footswitch.

Now the power output can be set to the values indicated in the CUT display via the »Up/Down« keys in the CUT field, i.e. for a setting of 30, 30 watts must be measured at the HF power meter.

The same is performed for COAG, however at a load resistance of 200 ohms, (setting = 20 and HF output power = 20 watts).

If both calibrations have thus been performed, the values must be saved in EEPROM. To do this, the CUT effect key must be held down for about 3 seconds. After about 0.5 seconds, an audible signal (deep tone) is heard and a symbolic display of the Save process appears. After about 3 seconds, an alarm is heard with the »full« display, which signals that the Save is successfully completed.

If the key is not held down until the alarm is heard, no value is saved.

By pressing only briefly, the test program can also be exited without saving.

6 Calibration of the NE monitor

Connect the NE line to the NE socket. In place of a neutral electrode, the NE line is terminated with a resistance of 250 ohms.

Activate Test program 14 (only possible in Special Test Mode, see above).

Display on the front panel: NE xx.

Now an automatic adjustment follows which is completed when a straight line (»—«) appears in the COAG display and the red and the green NE displays light up at the same time.

The calibration value must now be stored in the EEPROM using the CUT effect key as described above.

7 Checking the the activation signals and the safety interlock signal

Activate Test program 15.

Display on the front panel: oo oo for about 1 second.

Then display of : — —.

By starting all 4 activation possibilities (2 x footswitch, 2 x fingerswitch), the lines in the displays are converted into »o«. As soon as all activation possibilities have been operated once, the test program is automatically interrupted.

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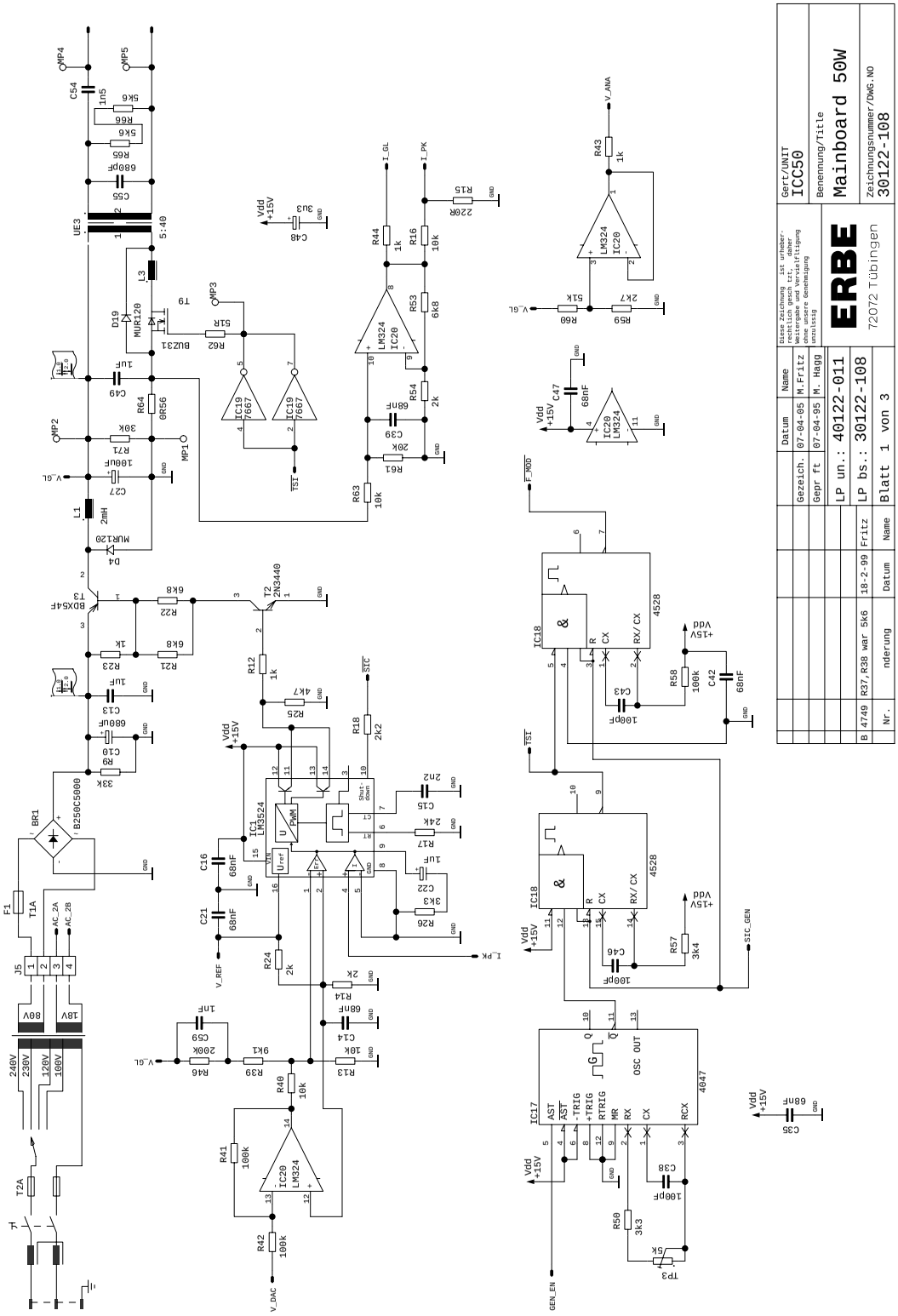
CHAPTER 4

Circuit diagrams

ICC 50

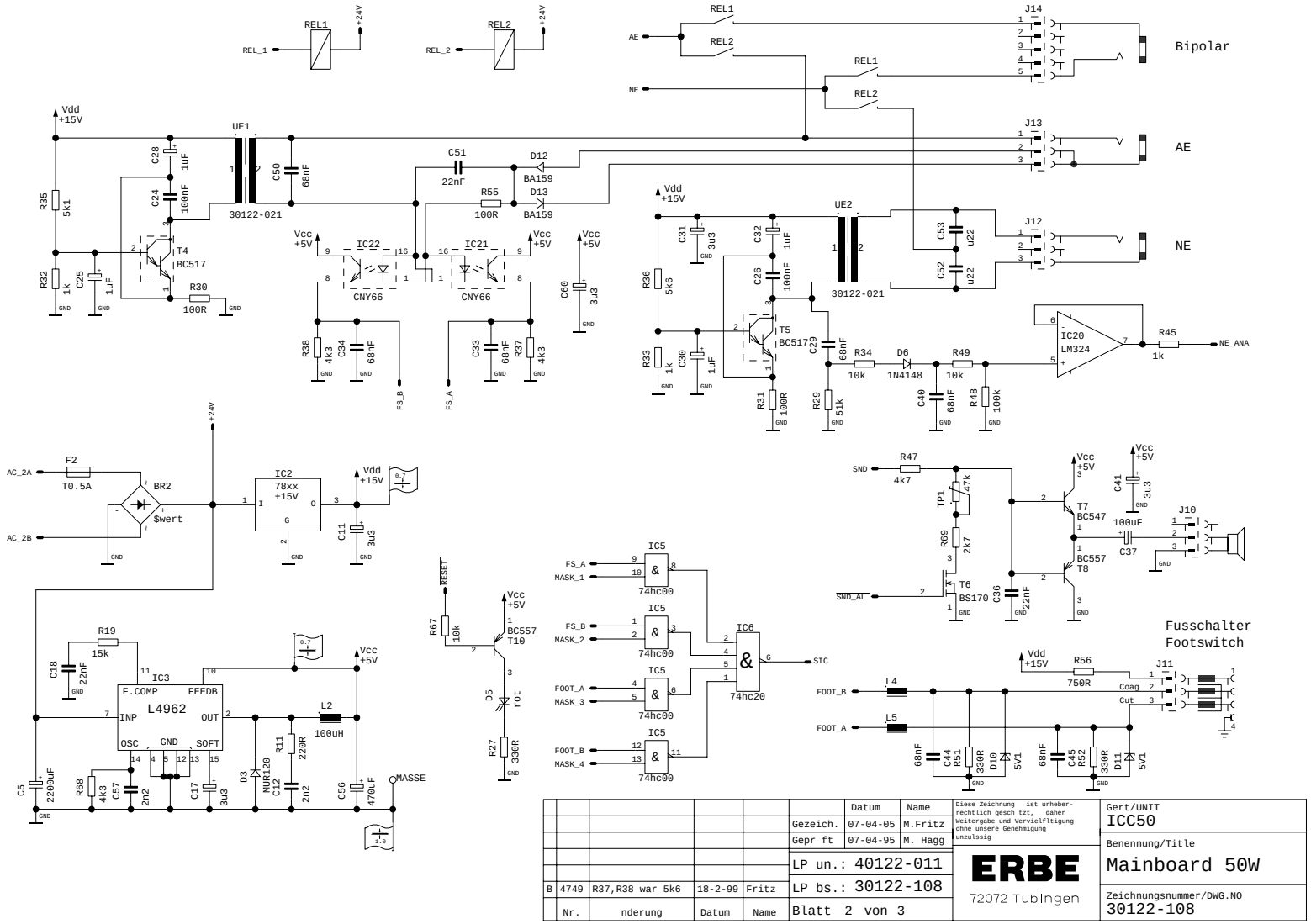
ICC 50

Mainboard
30122-108



ICC 50

Mainboard
30122-108



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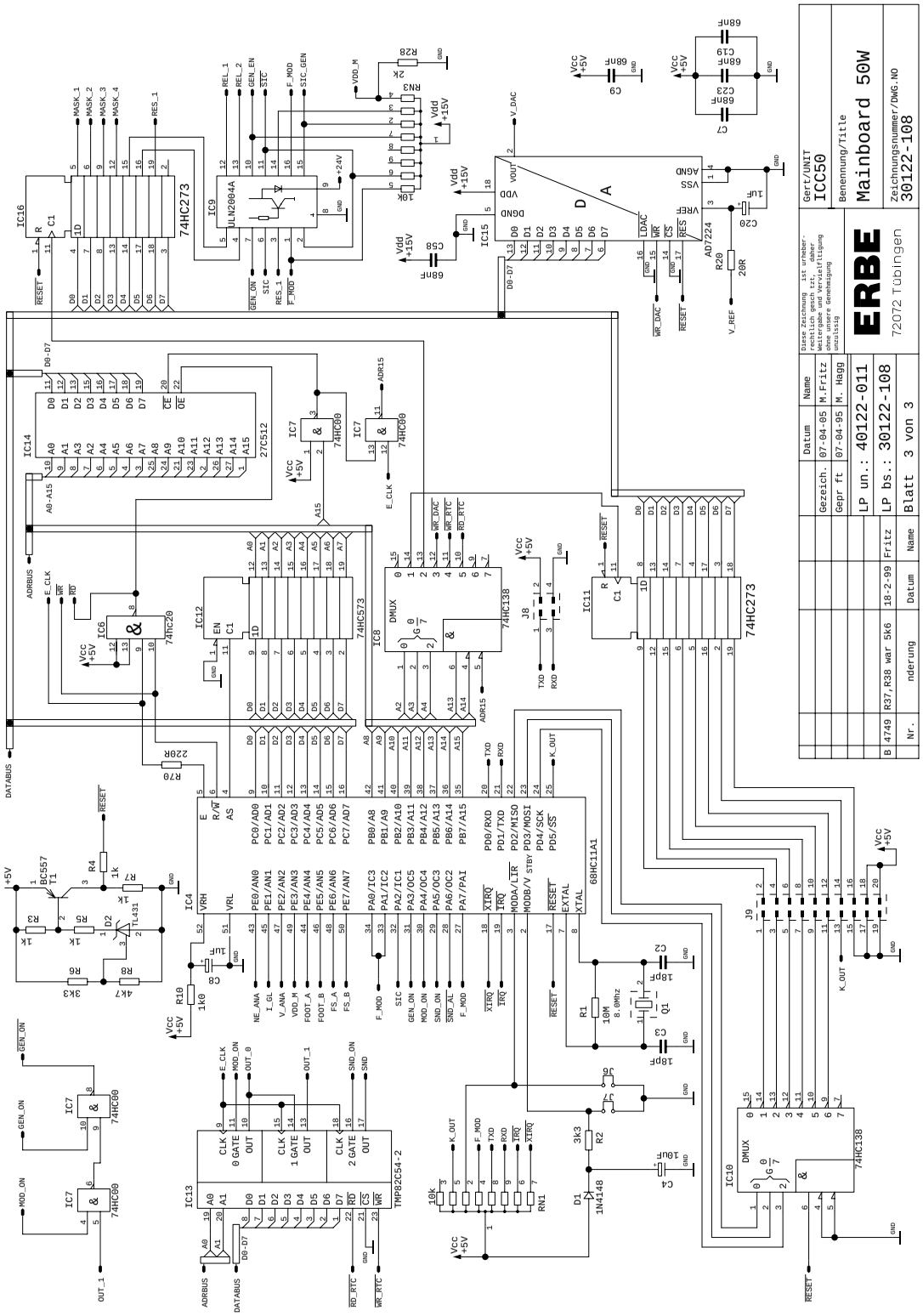
					Gezeich.	07-04-95	M.Fritz		
					Gepr ft	07-04-95	M. Hagg	ERBE 72072 Tübingen	Benennung/Title Mainboard 50W
					LP un.: 40122-011				
B	4749	R37,R38 war 5k6	18-2-99	Fritz	LP bs.: 30122-108				Zeichnungsnummer/DWG.NO 30122-108
	Nr.	nderung	Datum	Name	Blatt 2 von 3				

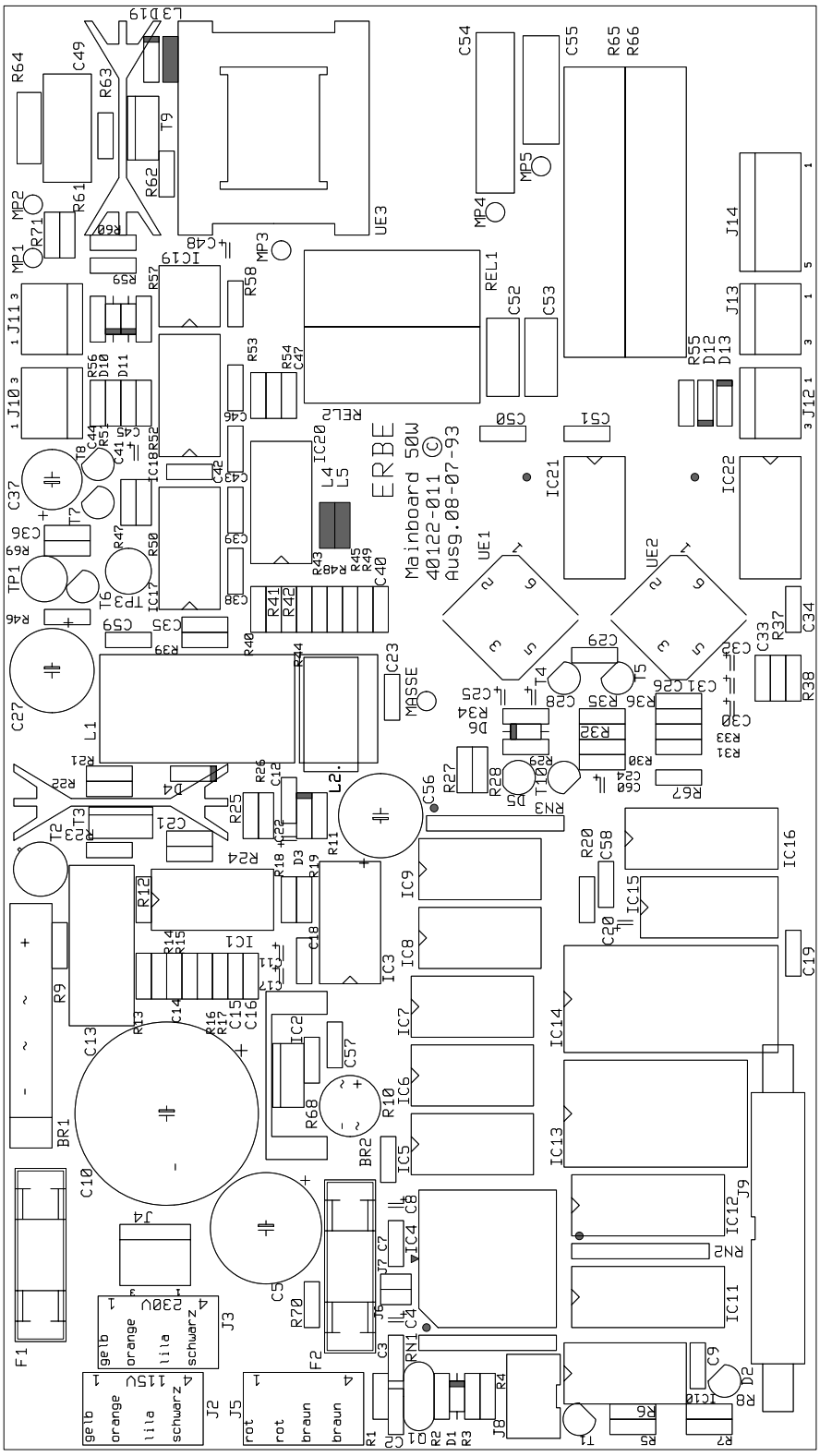
ICC 50

Mainboard
30122-108



ICC 50

Mainboard
40122-011



gelb	**yellow**
orange	**orange**
lila	**purple**
schwarz	**black**
rot	**red**
braun	**brown**
MASSE	**GROUND**
Ausg.	**Issue**

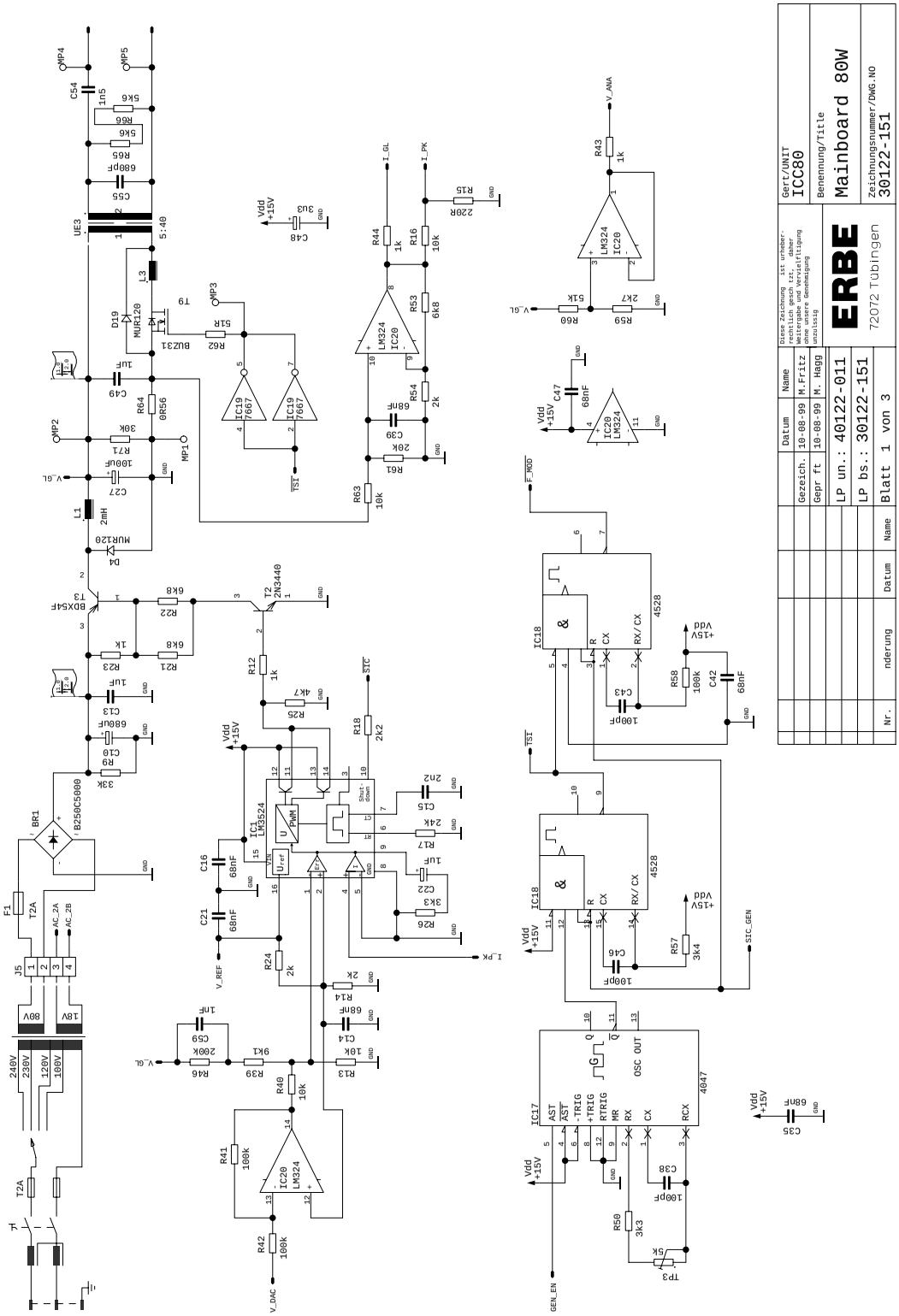
Mainboard 50W
40122-011
08-07-93

Art. No. 80116-251
08 / 99

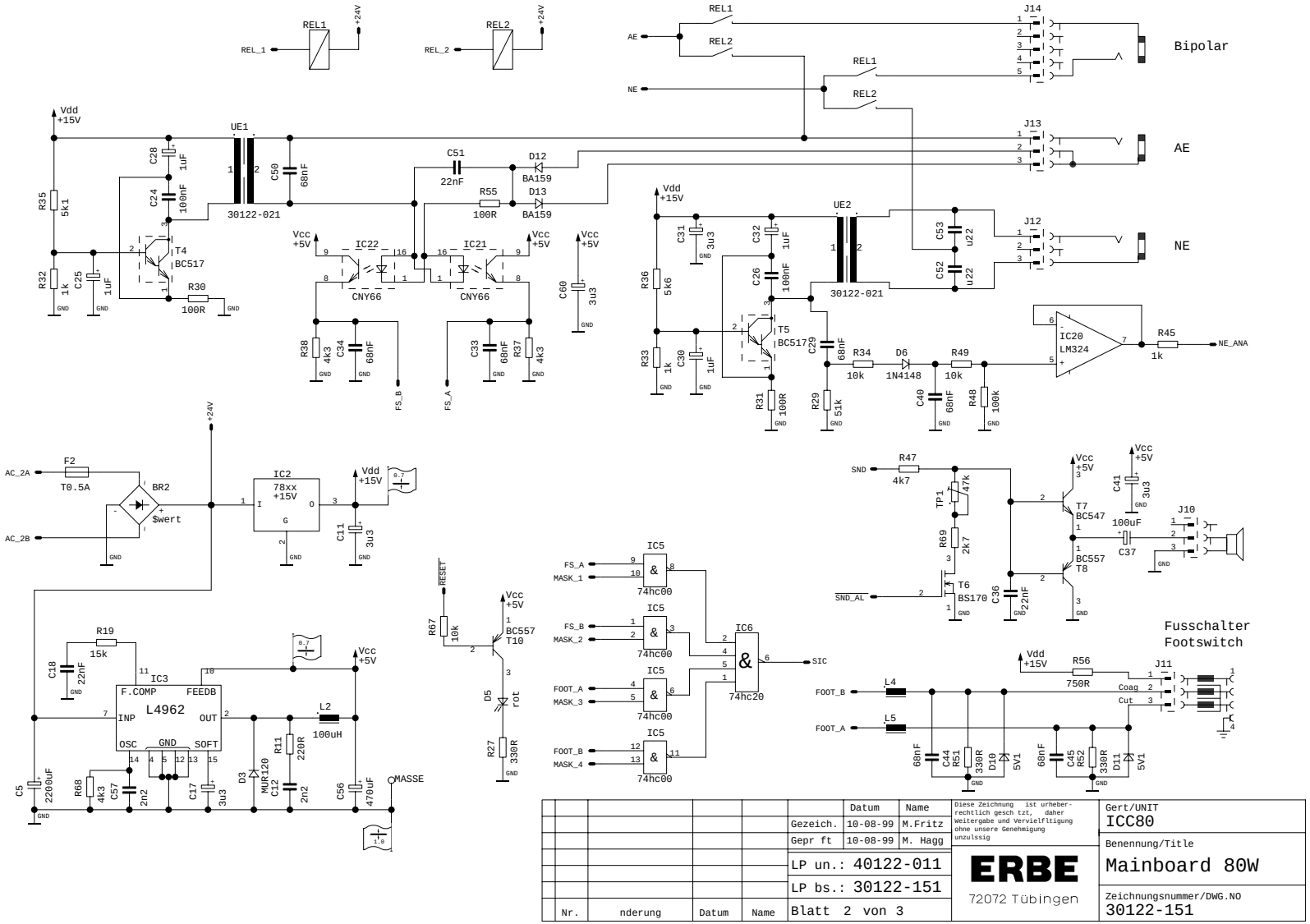
ICC 80

ICC 80

Mainboard
30122-151



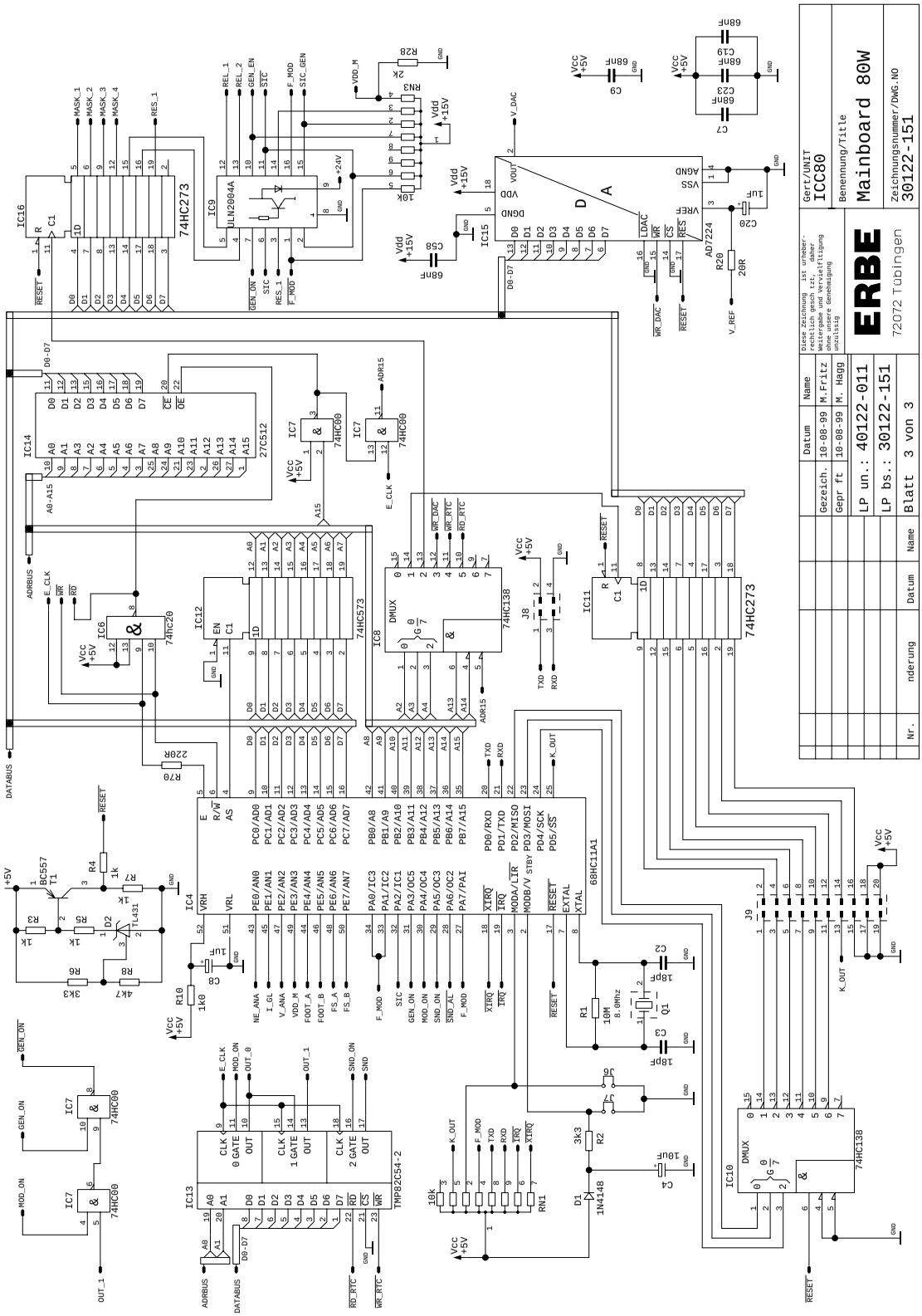
ICC 80
Mainboard
30122-151



						Datum	Name	Diese Zeichnung ist urheberrechtlich gesch tzt, daher Weitergabe und Vervielfltigung ohne unsere Genehmigung unzulssig	Gert/UNIT ICC80
					Gezeich.	10-08-99	M.Fritz		
					Gepr ft	10-08-99	M. Hagg		Benennung/Title Mainboard 80W
					LP un.: 40122-011			ERBE 72072 Tübingen	
					LP bs.: 30122-151				Zeichnungsnummer/DWG.NO 30122-151
	Nr.	nderung	Datum	Name	Blatt 2 von 3				

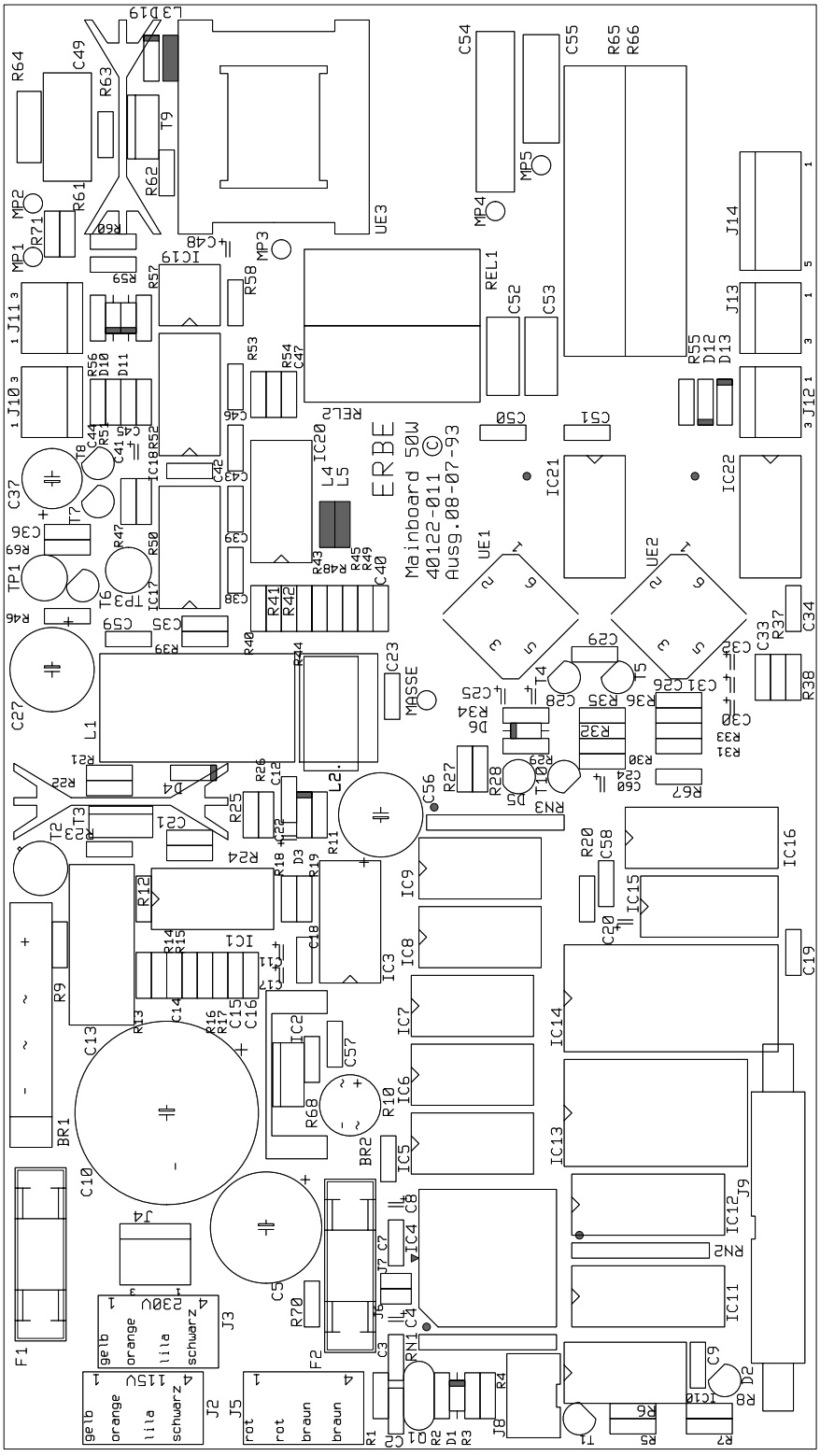
ICC 80

Mainboard
30122-151



ICC 80

Mainboard
40122-011



gelb	**yellow**
orange	**orange**
lila	**purple**
schwarz	**black**
rot	**red**
braun	**brown**
MASSE	**GROUND**
Ausg.	**Issue**

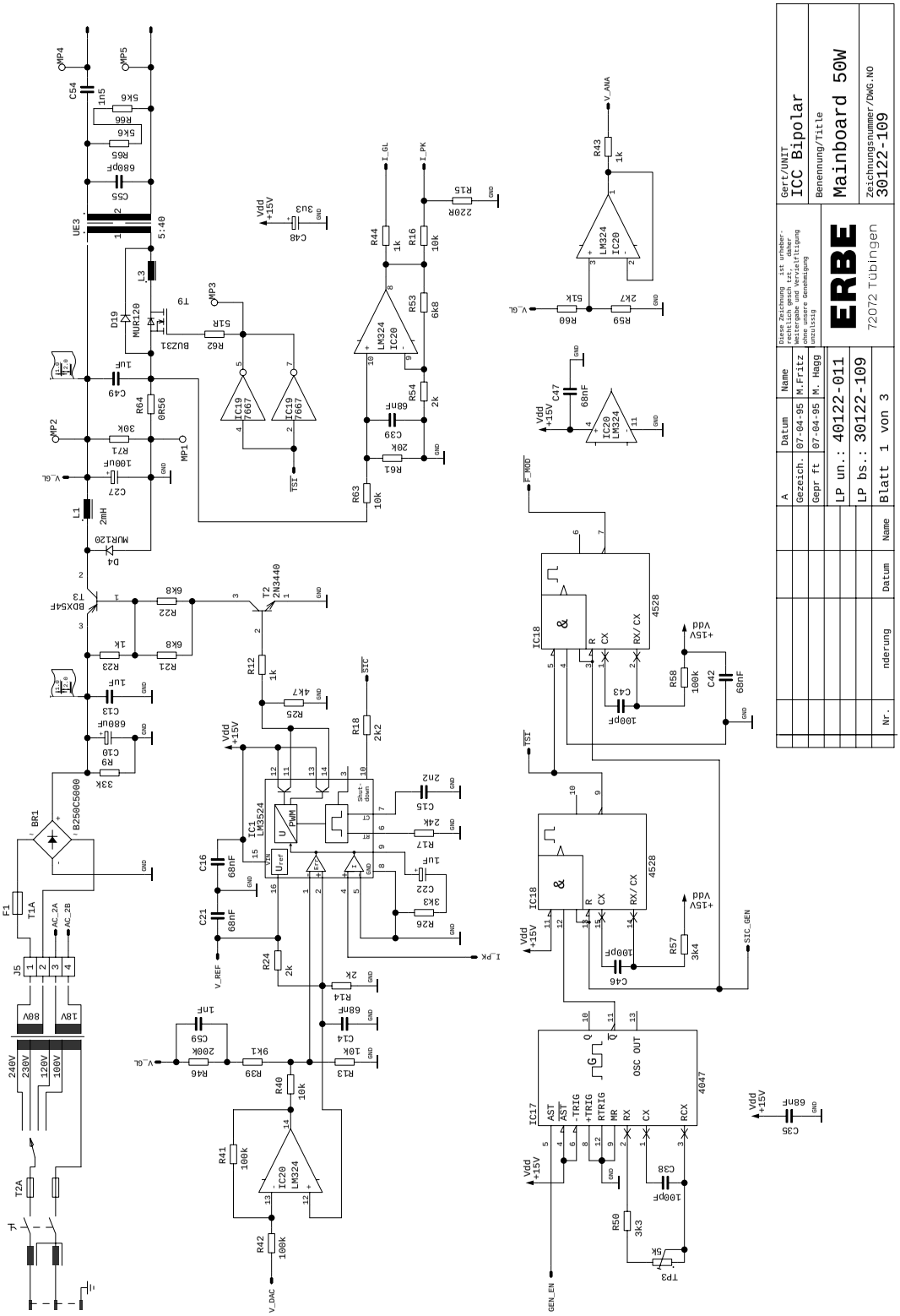
Mainboard 50W
40122-011
08-07-93

Art. No. 80116-251
08 / 99

ICC BIPOLAR

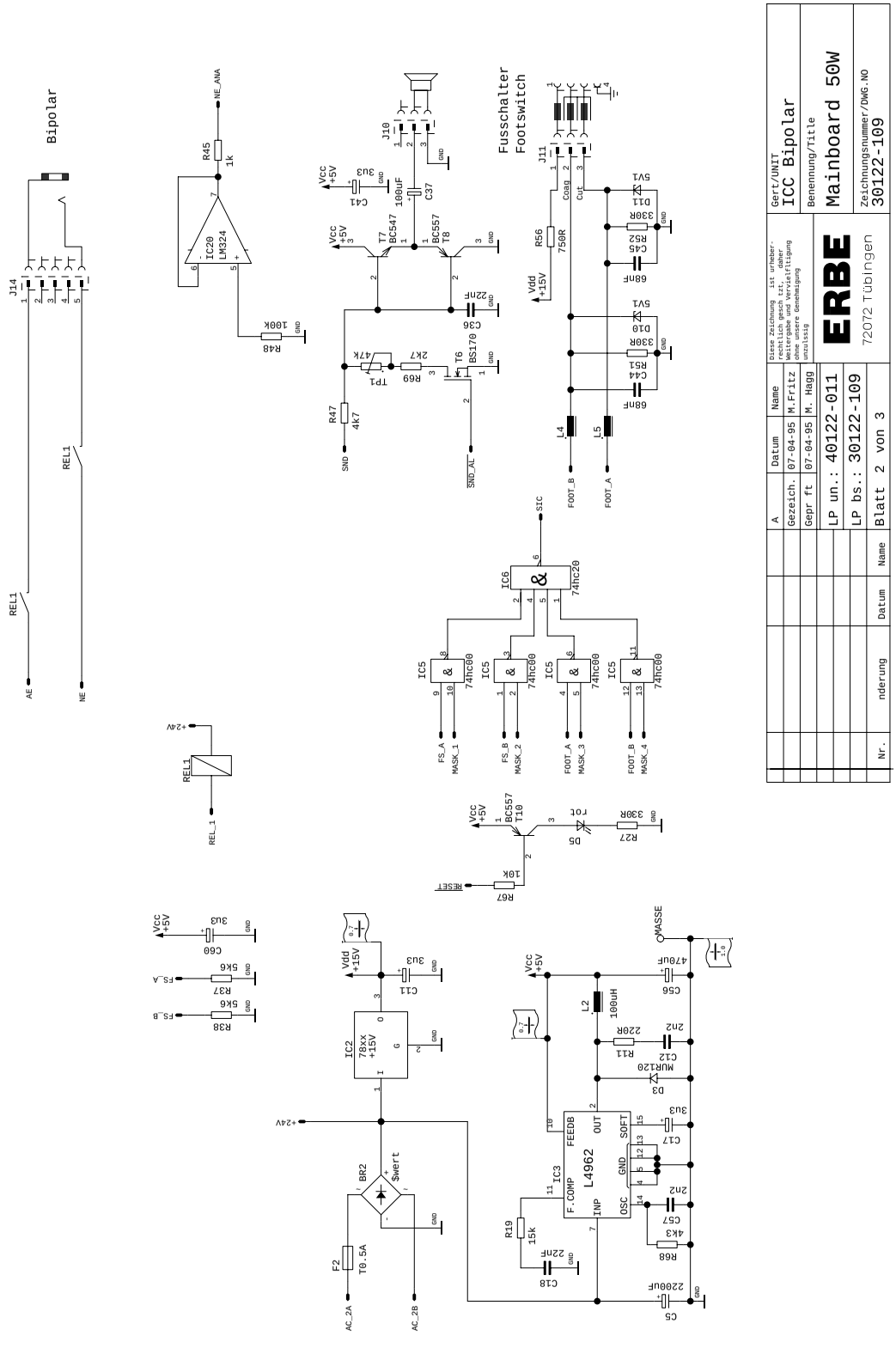
ICC BIPOLAR

Mainboard
30122-109



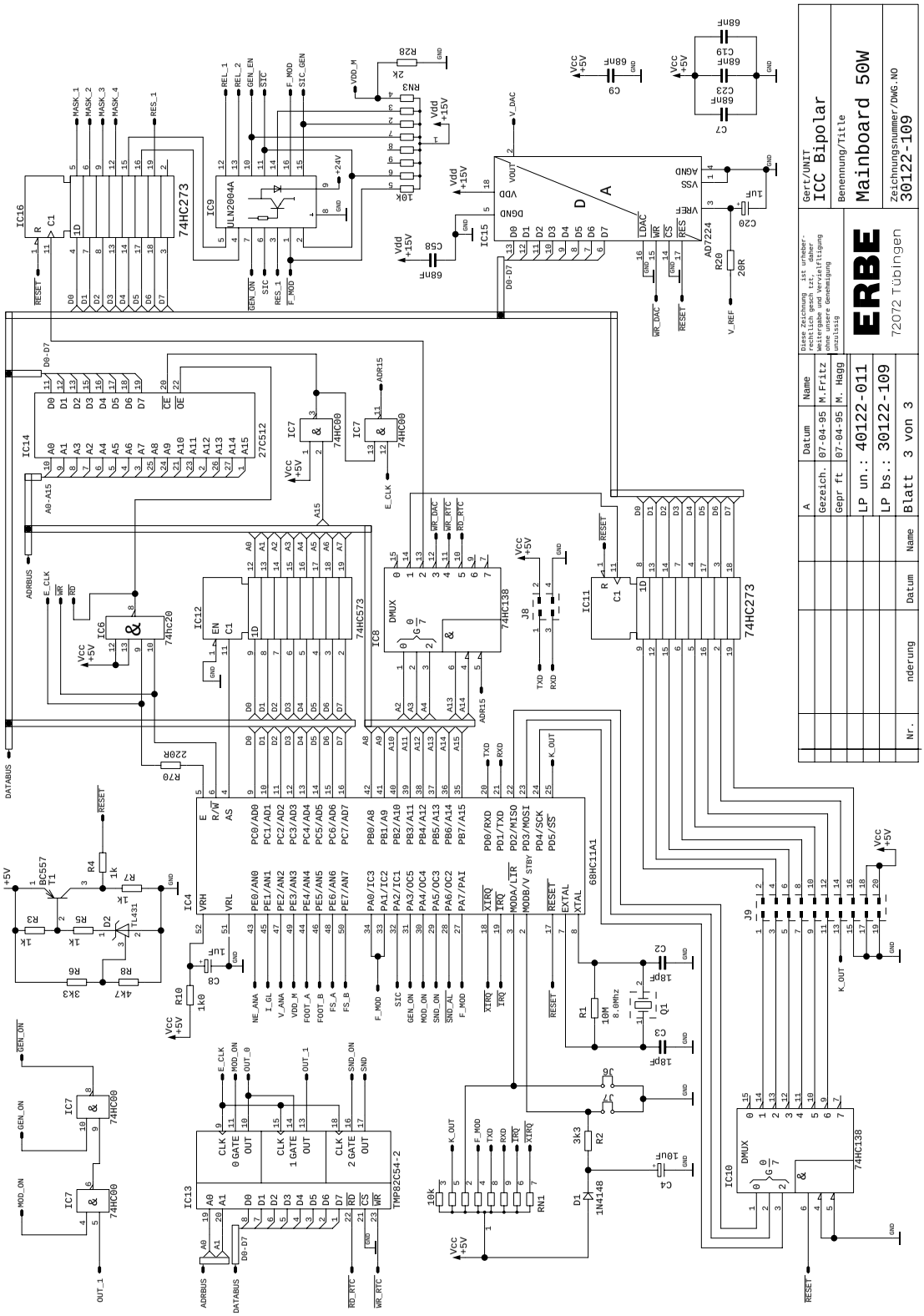
ICC BIPOLAR

Mainboard
30122-109



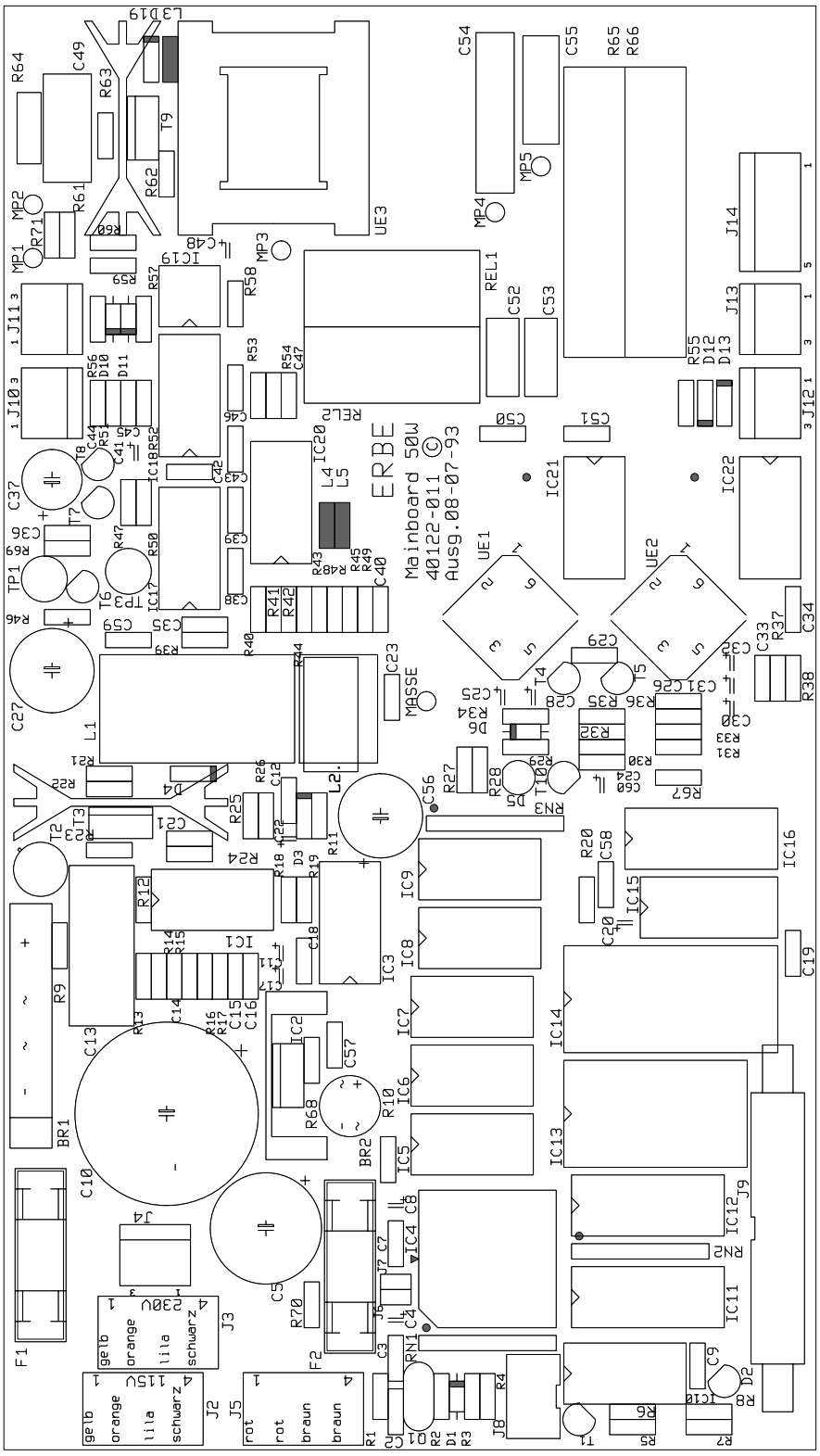
ICC BIPOLAR

Mainboard
30122-109



ICC BIPOLAR

Mainboard
40122-011



gelb	**yellow**
orange	**orange**
lila	**purple**
schwarz	**black**
rot	**red**
braun	**brown**
MASSE	**GROUND**
Ausg.	**Issue**

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Mainboard 50W
40122-011
08-07-93

CHAPTER 5

Appendix and Addresses

Appendix

ATTENTION

The unit contains a lithium battery which can only be disposed of in old battery collection containers when completely discharged! Otherwise make certain that a short circuit is prevented!

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Your notes