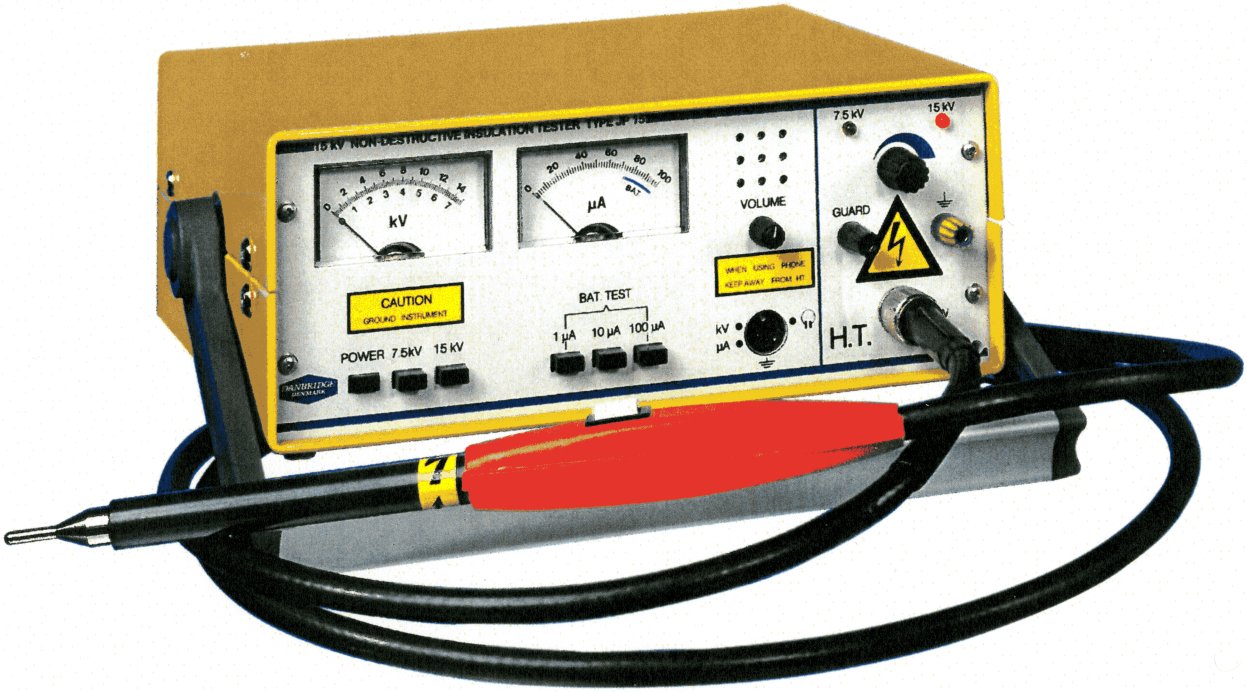
danbridge

INSTRUCTION MANUAL

JP15

Non-Destructive Insulation Tester



Service manual

CONTENTS:

INTRODUCTION

The JP15 Non-destructive Insulation Tester provides a dc voltage adjustable up to 1kV. The output voltage and current are indicated on separate meters.

Ionisation is audible indicated by a built-in loudspeaker.

SPECIFICATIONS

Test Voltage:	0-7,5kV, and 0-15kV DC adjustable by a 10-turn potentiometer.
Voltmeter:	2 ranges, 7,5kV,and 15kV f.s., accuracy +/- 5% f.s.
Current Meter:	3 ranges, 1µA-10µA-100µA f.s., accuracy +/- 5% f.s.
Max. Output Current:	Approximately. 300µA to 200 µA from 0 to15kV
Output Resistance:	Approximately 200kΩ at 15kV decreasing to 120kΩbetween 10kV and 2,5kV Approximately 350kΩ below 1kV (Measured by I-out 100µA)
Stability:	Output voltage varies less than +/-1% for +/-10% supply voltage variation.
Indication of Ionisation:	An active L.P. filter amplifier in series with an integrated audio amplifier feed a loudspeaker providing an audible indication of ionisation. Amplifier gain adjustable by a potentiometer. An output DIN socket provides external indication, using headphones or oscilloscope. Min. load 100Ω.
Test Voltage Output:	The test voltage is supplied via a shielded test cable terminated in a teat probe with a build-in HT switch The test probe is terminated with a straight tip with 4 mm shank. Low tension lead is connected to ground terminal.

Test Voltage Switch:

The high tension is switched on with the H.T. switch on the handle of the test probe.
The switch lead is connected by means of a jack connector marked SW next to HT output socket.
A similar jack plug can be used for remote control of the H.T. switch

Meter Outputs:

A 5V f.s. meter output is provided on the DIN socket. Load min 10kΩ.

Guard Terminal: (Black)

For connection to guard electrode. Current to this terminal by-passes the current meter. Max Guard current 100 µA

Ground Terminal: (Green/Yellow)

Grounding the JP15 if the mains outlet is not provided with a ground. In addition the ground terminal must be connected to the neutral side of the test object.

Power Supply:

A. External 12-13,8 V DC, 2 Amp. The external 12 V DC power supply must be able to deliver at least 2 Amps in order to blow the fuse in case of a failure. "Max. 51 ripple voltage.

B. Built-in mains supply for 100-130 V and 200-260 V AC 45-400 Hz, 15-30 VA, depending on output voltage and load. Space 1S provided for an optional maintenance free, rechargeable 12 V battery, 2 Ah. When fitted, the battery can be charged from the AC mains or from an external 13.8 V DC source. In addition the JP15 can be powered from external 12-13.8 V DC.

C. A battery cassette containing either 9 standard D-cells or 10 rechargeable NiCd cells at your choice.

Power Consumption:

At 13.8 V DC up to 0.8 Amp at full output voltage and max. Load.

Dimensions:

Height: 106 mm
Width: 255 mm
Depth: 225 mm

Weight:

3.2 kg less battery pack/power supply.
4.5 kg wHh battery pack/power supply.

OPERATING INSTRUCTIONS

INSTALLATION

Check that the mains voltage switch has been set to the actual supply voltage. The selector switch is located on the rear panel below the mains voltage inlet.
Change of the setting: Slide the switch to the correct position. Check also that the correct fuse is fitted, on 115 V AC 0.5 A slow (T), on 230 V AC 0.25 A slow (T).
The fuse is fitted in the mains voltage inlet and is opened from outside. the fuse holder has room for a spare fuse. If a 3-Lead power socket with ground is not available, the instrument must be grounded using the front panel ground terminal (green/yellow).

WARNING! **If a 3 lead power socket with earth is not available, the instrument must be earthed using the front panel earth terminal (green/yellow).**

The Universal Mains Power Module (JP15/UM) has room for an optional rechargeable battery. For this application see Sections: **Installation of rechargeable battery in JP15** and **Charging the optional battery used with JP15/U.**

FUNCTIONS OF CONTROLS, METERS, CONNECTORS, ETC

Power Switch

Connect the mains power cable to your outlet and turn it on.
The JP15 has no mains power switch. The push-button marked POWER is switching the internal 12 V DC supply on and off. The internal 12 V DC supply has a 1.6 A (T) fuse mounted in the positive lead. The fuse holder is mounted on the power supply board. One of the red LED's (upper right hand corner of the front panel) will indicate that the JP15 is turned on. At the same time the LED will indicate the HT range selected

MAKE SURE THAT THE INSTRUMENT IS PROPERLY GROUNDED.

H.T. Switch on the test probe

Applies high tension to the tip of the test probe when pressed.
One of the red LED's will flash as long as the HT switch is pressed giving visual warning of HT presence an the test probe.

H.T. Control

A 10-turn potentiometer adjusts the nigh tension from zero to full scale meter deflection as set by the HT range selector (7.5 or 15 kV)

H.T. Range Switch

Selects the full scale kV meter deflection and the high tension ranges O - 7.5 kV or O - 15 kV. Selected range is indicated by one of the two LED's in the upper right hand corner of the front panel.

µA Meter Range Switch

Switches the µA meter ranges in steps of 1 µA, 10 µA and 100 µA full scale meter deflection.

Amplifier Gain

The potentiometer below the Loudspeaker adjusts the noise amplifier gain to provide a suitable noise output.

Ground Terminal (green/yellow)

For connection to the low terminal of the test object and for grounding the JP15, if the mains outlet has no ground terminal.

Guard Terminal (black)

For connection to a guard electrode on the test object to eliminate unwanted Leakage currents from the measurements.

External HI Switch Jack Socket

Located next to the HT output connector. Used for remote control of the HT switch.

Auxiliary Socket

A 5-pole DIN socket on the front panel provides connections for external meter outputs (5V f.s.d.) and audio output. Pin 3: kV meter, Pin 2: Common, Pin 5: µA meter, Load min. 10kΩ.

Between Pin 1 and 2 headphones or an oscilloscope can be connected. Load min. 100 Ohm.

WARNING! Any discharge from the HT test probe to this socket will cause a severe damage to the electronic circuits.

OPERATION

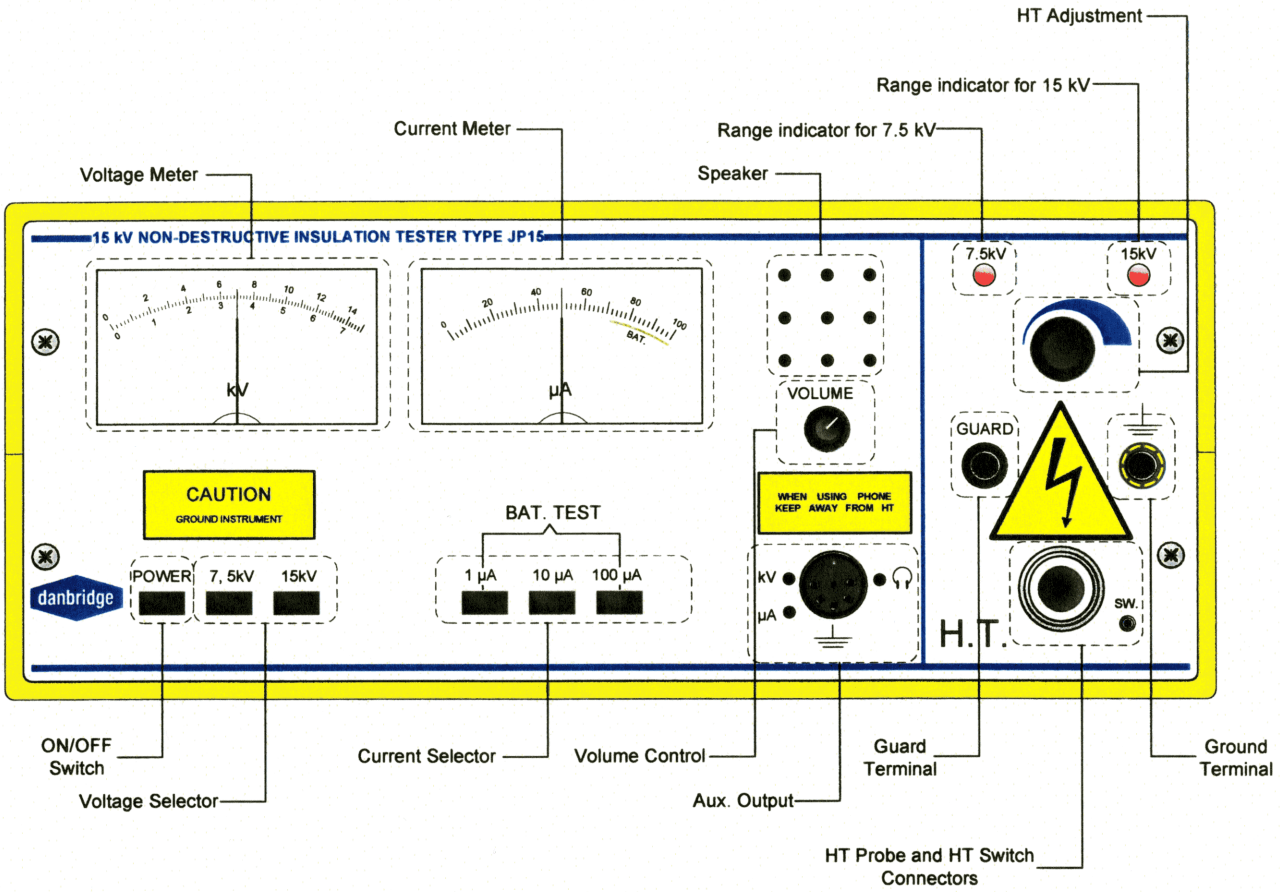


Fig. 1 JP15 Front panel

* MAKE SURE THAT THE INSTRUMENT IS PROPERLY GROUNDED!

* Insert the plugs of the test probe cable in their proper sockets and tighten the connector cap nut.

* Connect ground lead to low terminal of the test object.

* Turn the HT control fully anti-clockwise.

* Set the audio gain control to mid-position.

* Set meter range switches to required ranges (kV and μA).

* Apply high tension probe to test object terminal.

* Press the switch in the probe handle - this switches-on the HT as indicated by the flashing red LED.

* Increase the HT gradually by turning the HT control clockwise.

Check the voltage and leakage current on the meters.

When the HT output is increased above a certain value, in most cases a noise is heard from the loudspeaker. This is an indication of ionisation in the material tested.

The ionisation current produces a characteristic noise signal, usually starting with at hissing sound. When increasing the voltage the noise gets louder, and eventually sharp clicks are heard, which indicate partial break-down of the insulation.

Finally, total break-down occurs and the test voltage drops to zero.

Ionisation normally occurs in air voids or other inhomogenities in the insulation. Thus, completely homogenous materials, e.g. plastics do not produce any noise before complete break-down occurs.

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OPERATION INSTRUCTIONS WITH EXTERNAL 12V SUPPLY

The connector supplied as standard accessory is connected to the inlet marked "EXT.POWER 12 V". A red ~ire is connected to the positive terminal, a black wire to the negative terminal of a power supply which is rated for 2 Amp at 12-13.8 Volt. The cable can also be connected to the 12 V battery in a car. The cable should be twisted or flat type 2 x 0.75 mm in order to prevent noise pick-up. A built-in silicon diode protects the JP15 against wrong polarity from the external 12 V DC supply

Operation is carried out as described in the section **OPERATION**

An optional protective carrying bag with harness can be supplied for portable use.

INSTALLATION OF A RECHARGEABLE BATTERI IN JP15/UM

Loosen the tour Philips screws in the rear panel and pull the power module out. Loosen the screws holding the mounting bracket for the optional battery.

A VARTA Accu CF 12 V 2 Ah or Sonnenschein Dryfit A 312/1.8S measuring 178 x 34 x 60 mm (LxWxH) will fit into this compartment.

Connect the black lead to the negative terminal and the red lead to the positive terminal of the battery.

Fasten the mounting bracket and put the power module in place and secure it with the tour Philips screws.

The JP15/U is now ready for portable use, provided that the battery is charged.

OPERATING INSTRUCTIONS WITH BATTERY PAC (JP15/BM)

The battery module is supplied without batteries. You have the choice of using standard Alkaline D-cells (9 pcs.) or rechargeable Ni-Cd cells (10 pes.) of the same physical size.

A built-in switch in the battery module must be set to either 9 dry cells or 10 Ni-Cd cells. One of the battery holders is marked "Ni-Cd only" and should be left free when using dry cells. When the plug for external 12 V DC is inserted, the internal battery power supply is automatically switched off.

To charge the Ni-Cd batteries disconnect the battery module by loosening the 4 Philips screws in the bottom. Lift the cover and remove the 10 cells. Follow the instructions from the manufacturer of the Ni-Cd cells very carefully with respect to charging procedure.

A stow 1.6 A fuse (T) is mounted on the rear panel of the battery module.

To check the battery voltage press the buttons "1 µA " and "100 µA" simultaneously. The pointer of the µA-meter should then be within the green area (BAT).

With proper battery voltage the operation takes place as described in the section **OPERATION**

An optional protective carrying bag with harness can be supplied for portable use.

OPERATIONAL NOTES

When the high tension output is increased gradually, a small noise output will be observed. This is due to charging effects in the dielectrics of the HT unit and probe cable, and it disappears when the output stabilizes. A momentary deflection of the current meter will also be observed due to charging of the cable capacitance, but this disappears in a few seconds.

When switching from a low HT range to a higher HT range the HT control must be turned anti-clockwise in order to avoid a sudden voltage rise on the test object.

WARNING! The discharge energy is less than 0.1 Joule at maximum output voltage, ensuring safe operation. However, if used for testing capacitors of above 500 pF at high voltages, the usual precautions are necessary to prevent access to high potentional points. For this reason it is dangerous to extend the Length of the HI cable.

When the instrument is used for testing high value capacitors or long cables with high cable capacitance (above 0.1 µF) an excessive charging time will result, *as* the available charging current is Limited to about 300 µA.

The probe tip may also be used as screw terminal by fixing a lead between the tip and the insulating probe shaft.

MAINTENANCE OF Ni-Cd BATTERIES USED WITH THE JP15

Characteristics and Life-time of the Ni-Cd batteries may vary from manufacturer to manufacturer. You should therefore always follow the manufacturer's instructions carefully with respect to charging method and charging current.

Below you will find some general, but useful, remarks about maintenance of the cylindrical, sealed Ni-Cd cells which can be used in connection with the JP15 non-destructive Insulation Tester.

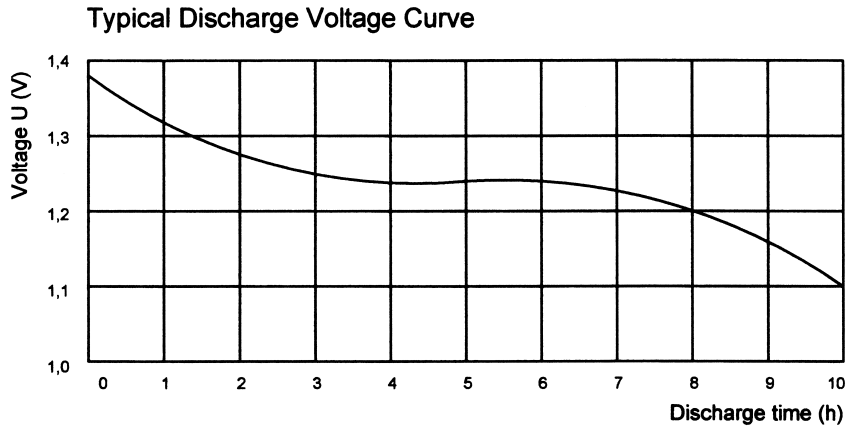


Fig. 2 Discharge Curve

Due to the flat discharge voltage curve for Ni-Cd cells it is almost impossible to determine the state of charge of such a battery. Consequently the user frequently overloads the battery with a reduction of its life-time as result.

A peculiar characteristic of the Ni-Cd cell is the so-called "elasticity-effect". This means, that the capacity of the cell gradually will decrease if it has not been almost discharged before each charging period. Trickle charging will of course solve this problem, but it is not applicable to the JP15. It is therefore advisable to let the JP15 run idling once in a while, thereby discharging the battery pack before it is recharged.

the charge factor for all types of Ni-cd batteries is 1.4 which means, that to obtain 100% energy, a charge of 140% is needed. Nominal charge current refers to a 10 hours discharge current (110) needed to recharge a discharged battery for 14 hours.

A typical D-size 4 Ah Ni-Cd battery should therefore be charged with 0.4 A for 14 hours.

Do not use QUICK CHARGE, unLe5s it 15 permitted by the manufacturer of the battery in question.

Check the label of the batteries for information about capacity. You will find same cell size with different capacity. However, the weight is notable - and so is the price.

Do NOT mix cells with different capacity.

Before use, stored cells should be charged for 24 hours at the nominal charge current in order to obtain appropriate overcharge. The cells are then activated and will achieve their full capacity after 2 or 3 normal charge/discharge cycles.

CHARGING THE OPTIONAL BATTERY USED WITH JP15/U

When proper Ly installed the battery can be charged either from the AC mains or from an external 13.8 V DC source, f.inst. from a vehicle's attenuator during a ride. It is not necessary to turn the JP15/U on when charging the built-in battery from the AC-mains.

A built-in silicon diode will protect the battery from wrong polarity from the external 13.8 V DC source. At the same time this diode will prevent discharging of the built-in battery, if the 13.8 V is supplied from the vehicle and the motor is started.

Both recommended types of lead-acid batteries are sealed and maintenance-free, and they adjust automatically the charging current when charged. The capacity is sufficient to run the JP15/U for at least 24 hours with a duty cycle of 5. full load.

A completely discharged 2 Ah battery will be fully charged within 4-5 hours. VARTA and Sonnenehein estimate a lifetime of 4 to 5 years for these batteries.

CIRCUIT DESCRIPTION

The JP15 uses a regulated pulse width modulator and a HT transformer to generate a 0-7.5 kV Ac. This Ac voltage is rectified in a capacitive doubler circuit which generates the 0-15 kV DC output.

POWER SUPPLY

Mains (with optional PB ACCU)
The mains supply consists of a mains transformer, a bridge rectifier and a three-terminal 3 A 12 V regulator mounted on the rear panel.

The 12 V regulator, U01D (78T12) is lifted to give 13.8 V by means of the three diodes D02D - D04D and R01D in order to charge the optional 12 V PB ACCU via the diode D06D and the 1.6 AT fuse F01D.

The JP15 may also be supplied from an external 12-13.8 V DC supply (13.8 V if the PB ACCU is installed) connected via Sc5 on the rear panel.

The Jp15 is secured against wrong polarity of the external DC supply by means of the diode D05D. The fuse F02D secures the PB ACCU against heavy discharge in case of failures in the JP15.

NiCd or Dry Cells

9 standard 1.5 V Dry Cells or 10 NiCd cells inserted in the battery box on the rear panel supply the JP15 via the 1.6 AT fuse F2 and the connector Sc6. The switch $w4 selects between the 9 or 10 cells which are coupled in series.

The JP15 may also be supplied from an external 12-13.8 V DC supply connected via Sc5 on the rear panel. The batteries are disconnected when the plug PL5 is inserted.

12 V External Supply

The external 12-13.8 V DC supply is connected to the JP15 via Se5 on the rear panel, the 1.6 AT fuse F2 and the internal connector Sc6.

Internal 12 V supply.

The internal 12 V supplies the OP AMP's U02A - U02B and U04B with +/- 12 V. U07A senses the + 12 V (pin 7) and switches off the PMW , if it is bellow 11.5 V.

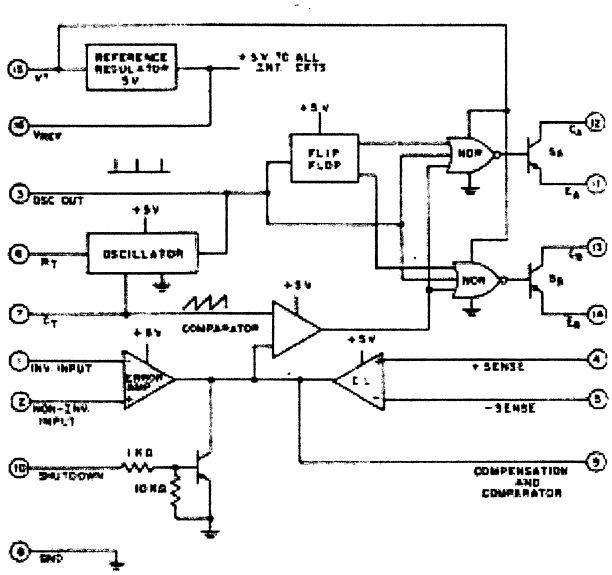
The internal oscillator in the PMW (U01A pin 3) feeds the buffer and pulse stretcher transistor T01A with app. 45 kHz pulses.
The integrated pulses at T01A's collector feed the TMOS switch T03A via the buffer and driver U06A.

The pulses from the drain of T03A feed the split transformer TR2A. The output of TR2A is rectified by D02A - D05A and filtered by COSA and C06A and fed to the three terminal 12 V regulators U03A and U04A.

A03A controls the width of the pulses on T01A's collector and thereby the DC voltage on COSA and C06A (see 10.2.1 for adjustment).

HT CONTROL CIRCUIT

PMW HT Power control



The HT power control consists of the PWM U01A (see picture on page 1) driving the push pull TMOS switch transistors (T04Aand TO5A) via the CMOS driver UOSA. The pulse output of T04A and TO5A is transformed to 7.5 kV AC by the HT transformer TR1C in the HT unit

The output frequency of the PMW circuit app. 22 kHz, set by C17A, R15A and AOZA, is adjusted to be in resonance with the HT transformer and the input capacitance of the HT rectifier giving a sinusoidal output of the transformer. R14A and the thermistor TH1A temperature compensate the PWM frequency according to the temperature change of resonance frequency of the HT transformer.

The HT output from the HT rectifier is sensed by the voltage divider R03C (in the HT rectifier) and R30B feeding the kV meter preamplifier UOZB. This output is fed back to the error amplifier in U01A (pin 1) via the Level shifter UOZA (pin 1-3). The Level shifter secures that the feed back voltage remains within the dynamic range of the error amplifier.

The other input of the error amplifier senses the HT output setting of the front panel potentiometer A06B (see diagram -Z) via the buffer amplifier UOZA (pin 1Z-14). A06B is connected as a voltage divider supplied from A01A ' s 5 V reference output (pin 16) via R16A, RE1A and R10A. R16A is shorted in the 15 kV f.s. range by Sw2A, and C34A ensures a "soft start" when the HT is switched on with preset output voltage.

HT Rectifier

The output of the HT transformer TR1C (max 7.5 kV) is rectified and doubled by 001C, OOZC, C01C and COZC. The doubler output is smoothed by R01C and C03C and fed to the output connector via RO2C.

R03C is part of a voltage divider for the kV-meter circuit and C04C couples the noise voltage~ developed across ROZC into the audio amplifier.

D03C and D04C suppress high-voltage spikes.

The negative Line is floating and connected to the inverting input of the ~A-meter amplifier via R19B, and to the guard terminal via R04C.

C33A decouples the negative Line (guard) to ground

Current Limiting Circuits

U02A (pin 8-10) senses the guard voltage which is proportional to the HT output current to ground. The voltage divider from -12 V formed by R27A and R26A adds a DC offset to the guard voltage thereby setting the current Limit to app. 300 µA, and R25A and R26A set the gain of the amplifier. The output of U02A pin 8 is connected to the input of the current limit amplifier in U01A (pin 5).

The buffer amplifier U02A (pin 5-7) senses the current from the HT output to the front panel guard terminal which develops a voltage across R04C. The output from U02A is OR'ed with the output of U07A on the input of T06A by means of R2BA, R29A and R31A. If one of the outputs goes high T06A goes ON. The collector of T06A is connected to the compensation input of U10A (pin 9) via D07A, and a LOW at pin 9 shuts down U01A thereby removing the HT output.

The RC network (R30A and C26A) on the collector of T06A gives a "Dead Time" before the HT is ON again after a shut down. D07A isolates the shut down circuit from the compensation network (C16A and R13A).

METER AMPLIFIERS

kV-Meter Amplifier

The kV-meter preamplifier U02B is connected as a non-inverting amplifier. A01B adjusts the gain to compensate for variations in the high voltage resistor R03C (5% accuracy). The current through the voltage divider (R03C and R30B) returns to the negative voltage line in the HT unit via R19B and is not measured on the µA-meter.

The kV-meter output amplifier U03B (pin 1-3) drives the kV meter via A02B (f.s. adjustment) and R18B. The amplifier is connected as a x1 in the 7.5 kV range and as a xO.5 in the 15 kV range, selected by Sw2A.

µA-meter Amplifier

The µA-meter amplifier U03B (pin 5-7) is connected as an inverting amplifier with current feedback through the range resistors. A03B adjusts the offset in U03B (pin 5-7), T02B is an overload protection of U03B. When the output of U03B exceeds app. 5.5 V, T02B saturates and short circuits the range resistors. D03B protects the µA-meter against negative output voltages on U03B pin 7

AUDIO CIRCUIT

The audio amplifier comprises an active L.P. filter amplifier U04B followed by an integrated audio amplifier U05B. UO5B drives the loudspeaker via C29B and RS8B.

The L.P. filter rejects ripple at the PWM frequency to prevent amplifier overload, and 007B - 008B are spike suppressors.

MAINTENANCE AND SERVICE

ACCESS TO INTERNAL PARTS FOR SERVICE

In order to get access to potentiometers for adjustment, Loosen the four screws on the top cover and remove the cover.

In order to get access to the HT control circuit pc-board (mounted along the Left side panel) in case of repair, Loosen the four screws on the bottom cover and remove the cover. Remove the screw on the Left side of the handle and the two screws on the Left side an the rear panel (seen from the front). Loosen the two screws on the Left side on the front panel (don't remove them completely) and Loosen the three nuts on the Left side panel. Loosen upper rear screw and the side panel and remove the side panel.

In order to remove the HT control circuit pc-board completely remove the three cable plugs (note the position of the different cables on the pc-board). Unsolder the coax-cable, the 1µF capacitor from the HT unit and the red and the yellow/green wires. Loosen the three nuts on the rear of the pc-board, disconnect the connector between the two pc-boards and remove the pc board.

In order to get access to the front panel pc-board containing the meter amplifiers and the audio amplifier, remove the top and the bottom cover *(see* above), Loosen the four screws on the front panel (note the position of the different insulation parts) and pull the front panel plus the pc-board out.

To get access to the solder side of the pc-board in case of repair, remove the two knob covers on the potentiometers, Loosen the screws in the knobs and remove them. Pull the front apart from the pc-board, unsolder the wires to the ground and the guard terminals and remove the front panel.

NB! Check the mechanical zero adjustment on the two meters before assembly.

ADJUSTMENTS

Normally no adjustments are necessary, except when certain components are replaced.

The following instruments are necessary for a complete calibration of the JP15:

An oscilloscope (OSC) with a high impedance probe,
A digital voltmeter (DVM),
An accurate HT voltmeter (HTV) with 15 kV f.s. and an input current less than 50 µA,
A 1% 100 MO HT resistor.

In order to carry out a check of the current Limit circuits a resistor network composed of two 1% 10 MO 1 W metal film resistors in parallel connected in series with a similar set of parallel resisters (giving a total resistance of 10 MO 4 W).

Internal 12 V Supply

Measure the +12 V * supply with the DVM connected to top of C32B (the 47µF/25 V capacitor mounted to the right of the µA meter).

Connect the DVM to COSA mounted at the bottom of the HT control pc-board (remove the bottom cover first (see above) for easy access).

Adjust the potentiometer A03A according to the following table.

+12 V *	Voltage at CO5A
11-12 V	15 V
12-13 V	16 V
13-14 V	17 V
14-14.5 V	18 V

Put the bottom cover back in place before the next adjustments are carried out.

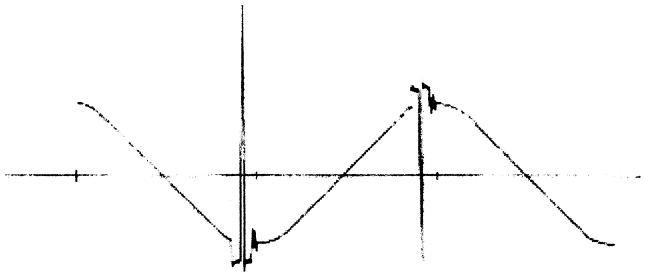
µA meter Amplifier Offset Adjustment

If U03B is replaced adjust A03B for ~A-meter zero (with the HT deactivated). Connect the DVM to pin S on the DIN socket on the front panel (use pin 2 as common) and adjust A03B to zero reading.

PWM Frequency Adjustment

This adjustment should only be carried out if U01A is replaced, if the components connected to U01A pin 6 and 7 are replaced, or if the ferrite core in the HT transformer is replaced.

Connect the osc probe to the upper wire from the primary of the HT transformer. Set the time base of the osc to 5 µsec. Set the JP15 in the 7.5 kV range, switch on the HT and adjust to 6 kV. Adjust A02A until the PWM frequency is just below the resonance frequency of the HT circuit (see picture below) Change the HT slowly down to almost zero and observe that no instabilities occur at Low HT outputs (Listen to the Loudspeaker), readjust if necessary.



NB! This adjustment should always be carried out shortly after the HT is switched on (i.e. no warm up time) in order to avoid conflicts with the temperature compensation circuit.

kV-Meter Amplifier Adjustment

Connect the DVM to pin 3 on the DIN socket on the front panel (use pin 2 as common) and connect the HTV to the HT output (via the HT probe).

NB The HTV must be grounded to the JP15 via the ground terminal on the front panel.

Set the JP15 in the 7.5 kV range and switch on the HT. Turn the HT control clockwise until the DVM shows 5.0 V. Adjust A01B (to the right on the front panel pc-board) to 7.5 kV reading on the HTV. Adjust A02B (above the kV-meter) to 7.5 kV reading on the kV-meter. Switch off the HT.

Set the JP15 in the 15 kV range, switch on the Hl and check the f.s. reading on the kV-meter, the HTV and the DVM (readjust the Hl control to the 15 kV output).

µA-Meter f.s. Adjustment

Connect the DVM to pin 5 and the DIN socket and mount the 100 MO resistors between the HT probe and the ground terminal on the front panel. Set the JP15 in the 15 kV range and in the 100 µA range, switch on the HT and adjust the HT output to 10 kV reading on the kV-meter (or use the HTV for best accuracy).

Adjust A04B (to the right of the µA-meter) to 5.0 V reading on the DVM, and check that the µA-meter shows 100 µA.

Battery Check Circuit Adjustment

Connect the DVM to the +12 V * (the top of C32B 47 µF/25 V mounted to the right of the µA-meter). Switch to BAT.TEST on the front panel. Multiply the DVM reading with 6.5 and adjust A05B (to the left of the µA-meter) until the µA-meter shows the product in µA.

Check the Current Limit Circuits

Mount the 10 MO 4 W resistor network to the probe tip and connect the free end of the network to the ground terminal on the front panel. Switch on the HT (7.5 V range) and turn the HT control fully clockwise. The kV-meter should show appr. 3 kV, i.e. 300 ~A output current (the reading must not show more than 3.5 kV).
Switch off the HT and move the free end of the network from the ground terminal to the guard terminal. Switch on the HT again and the kV-meter should show appr. 2 kV (the reading must not exceed 3 kV).
NB Ignore the audio noise during this last test.

HINTS ON FAULT FINDING

NO HT OUTPUT

A. Check the +12 V *
Disconnect Sc6 and check the rear panel supply. If OK, reconnect Sc6 and disconnect the wires to T04A and TO5A.

If the +12 V * is OK, check T04A and TO5B, else check T03A, U06A and UO5B.

B. Check the +12 V

Check R32A. If this is defective check U01A, U05A, U06A and U07A.

C. Check internal 12 V

Connect the OSC to the gate of T03A. If the oscillator pulses are missing, check U01A pin 3 for pulses. If the pulses are OK on the gate of T03A, check the output af U03A and U04A for heavy Loading (defective U02A, U02B, U03B or U04B).

D. Check RE1A

Check the probe switch and its connections.

E. Check U01A pin 12 and 13 for PWM pulses

Check the collector of T06A (+12 V). If LOW check U02A pin 7 (if LOW, check U07A).
Check U01A pin 5. If negative, check U02A and U03B. The guard voltage must be appr. O V).
Check the voltages at U01A pin 1 and 2. If pin 1 is lower than pin 2, U01A may be defective. Check UO5A.

F. If A to E is OK
The HT rectifier or the HT transformer is defective.

HI ADJUSTMENT NOT POSSIBLE

Check that the output U02A pin 14 follows the variations in the HT control setting Check A06B and U02A.

B. Check that U01A pin 1 traces pin Z with variations in the HT .control setting
Check U02A pin 1-3, U02B and the coax cable from R03C in the HT rectifier.

MAX HI OUTPUT LESS IHAN 15 kV

Noise output increases with voltage
Check for flashover in the HI unit or the HT cable.
Check that the ferrite core is intact.
Check C33a's connection.
Check for unstabilities in the PWM circuit

B. Noise normal

Check HT cable (appr. 6kO series resistance).
Check the kV-meter amplifier (U03B).
The HI rectifier is defective.

HT OUTPUT OK, BUT ABNORMAL NOISE
Check the Audio Circuit, U04B and U05B.

danbridge as

Overensstemmelseserklæring efter EMC direktivet 89/336/EØF
Certificate of agreement according to EMC regulation 89/336/EEC

Apparat: **JP15U**
Equipment:

Kategori **Category**	High Voltage Insulation Tester
Type	JP15U HA04
Beskrivelse **Description**	Portable non-destructive insulation tester 0 - 7,5 KV. and 0 - 15 KV. 1µA - 10 µA - 100 µA. Resolution 20 nA. Accuracy ± 5%

Fabrikat: *DANBRIDGE A/S*
Manufacturer: **Hirsemarken 5, DK-3520 Farum, Denmark**

Overensstemmelsen er erklæret i henhold til:
The conformity is declared according to:

De aktuelle standarder: *EN 50081-1* and *EN 50082-1*
The current standards:

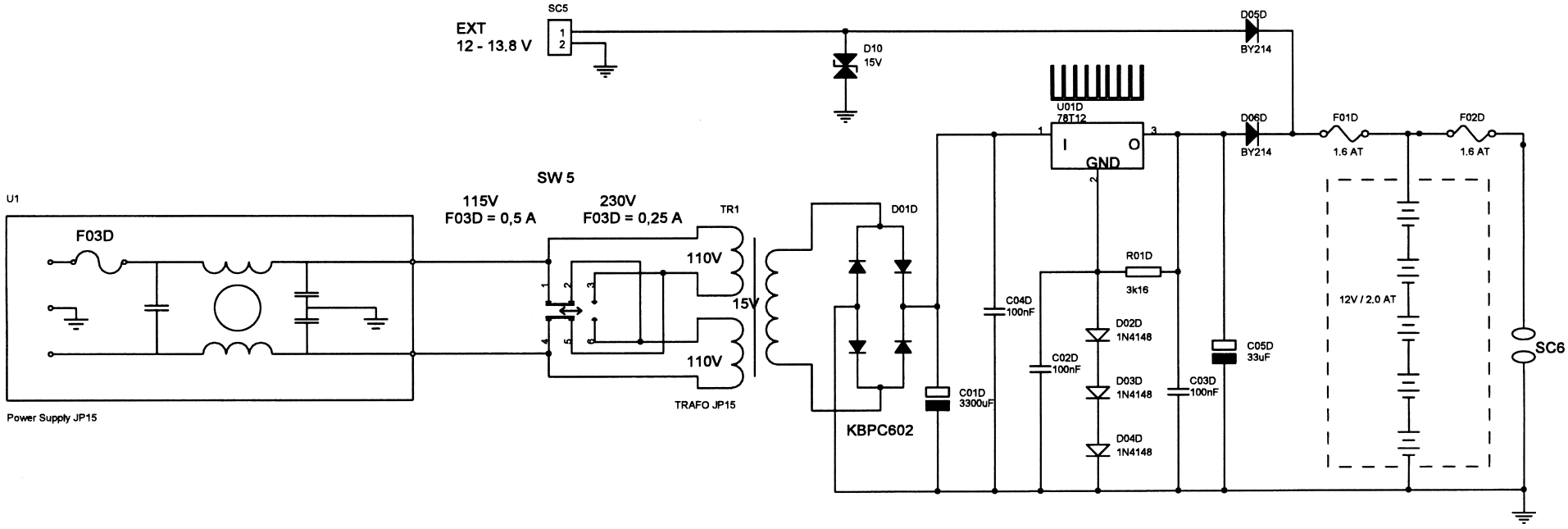
Dato: 95-10-09
Date:

Underskrift:
Signature:

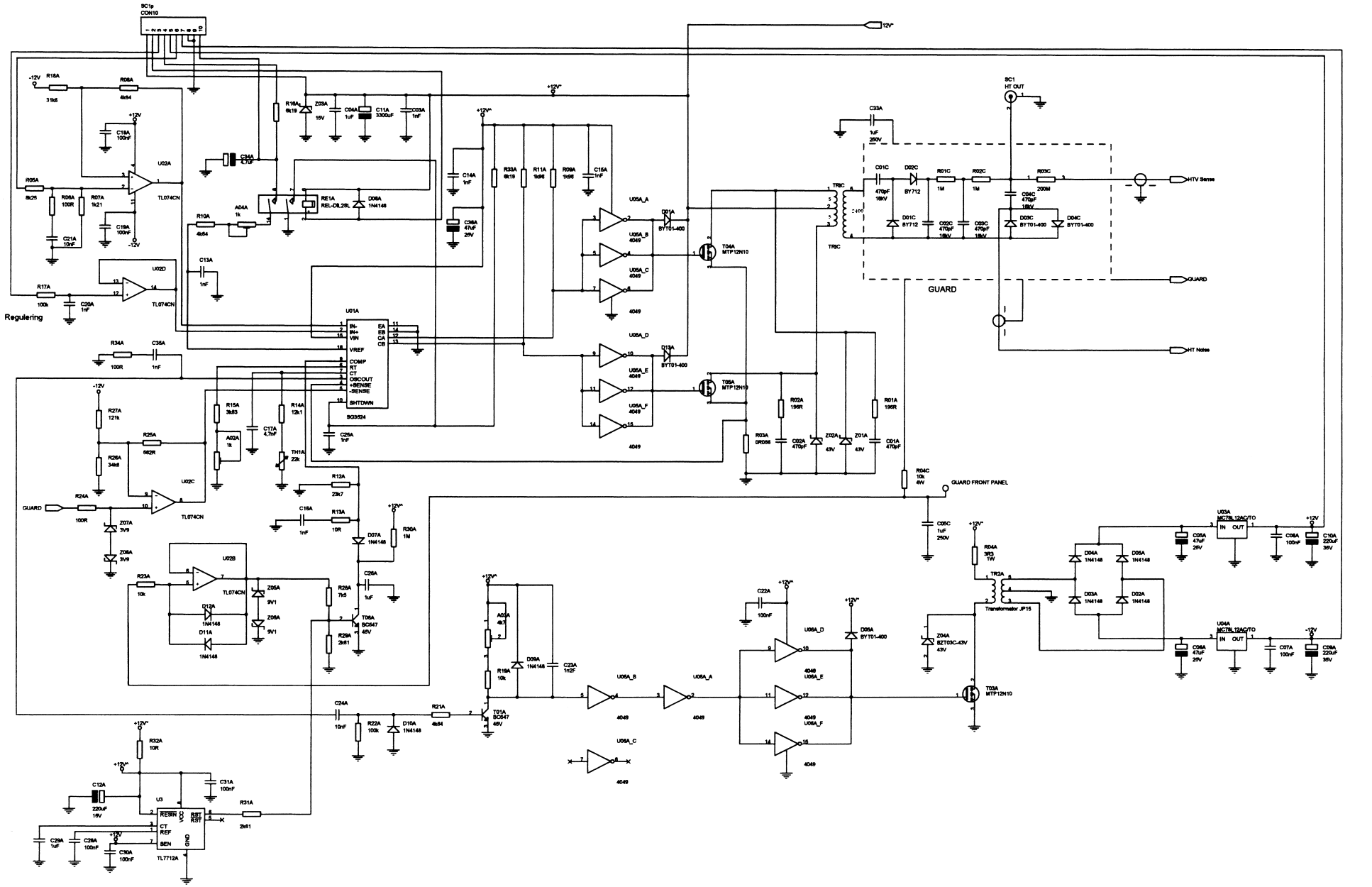
Søren Skov Olsen, salgs og marketing direktør
Sales and Marketing Director

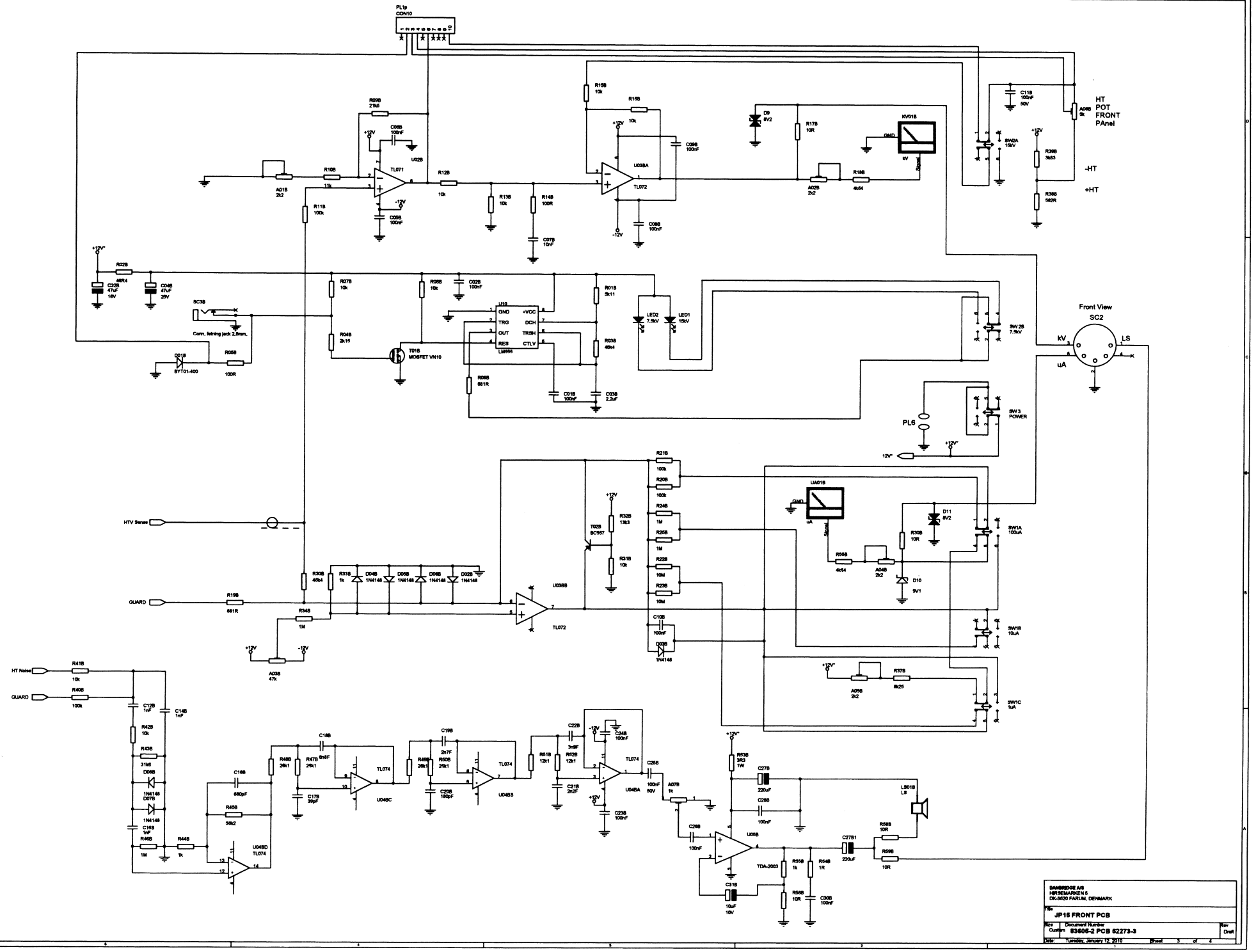
DANBRIDGE AS
HIRSEMARKEN 5
DK-3520 FARUM
DENMARK

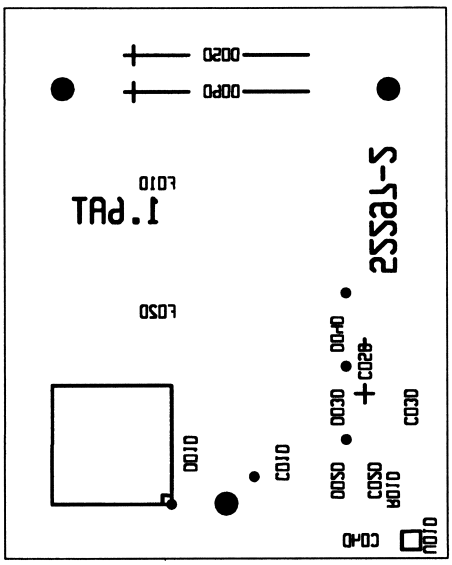
TELEPHONE +45 42 95 55 22
TELEFAX +45 42 95 45 04
TELEX 37579 DANBRI DK
A/S REG. NO. 22 153

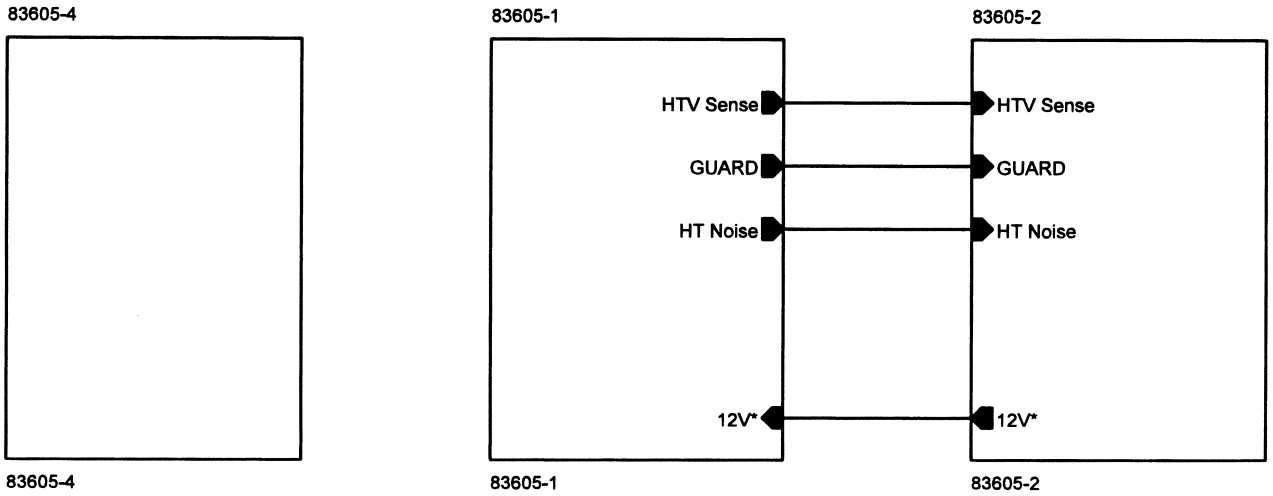


DANBRIDGE A/S HIRSEMARKEN 5 DK-3520 FARUM, DENMARK	
Title	**JP15 Power Supply**
Size: B	Document Number: **83605-4 PCB 52297-2** — Rev: Draft
Date: Tuesday, January 12, 2010	Sheet 4 of 4

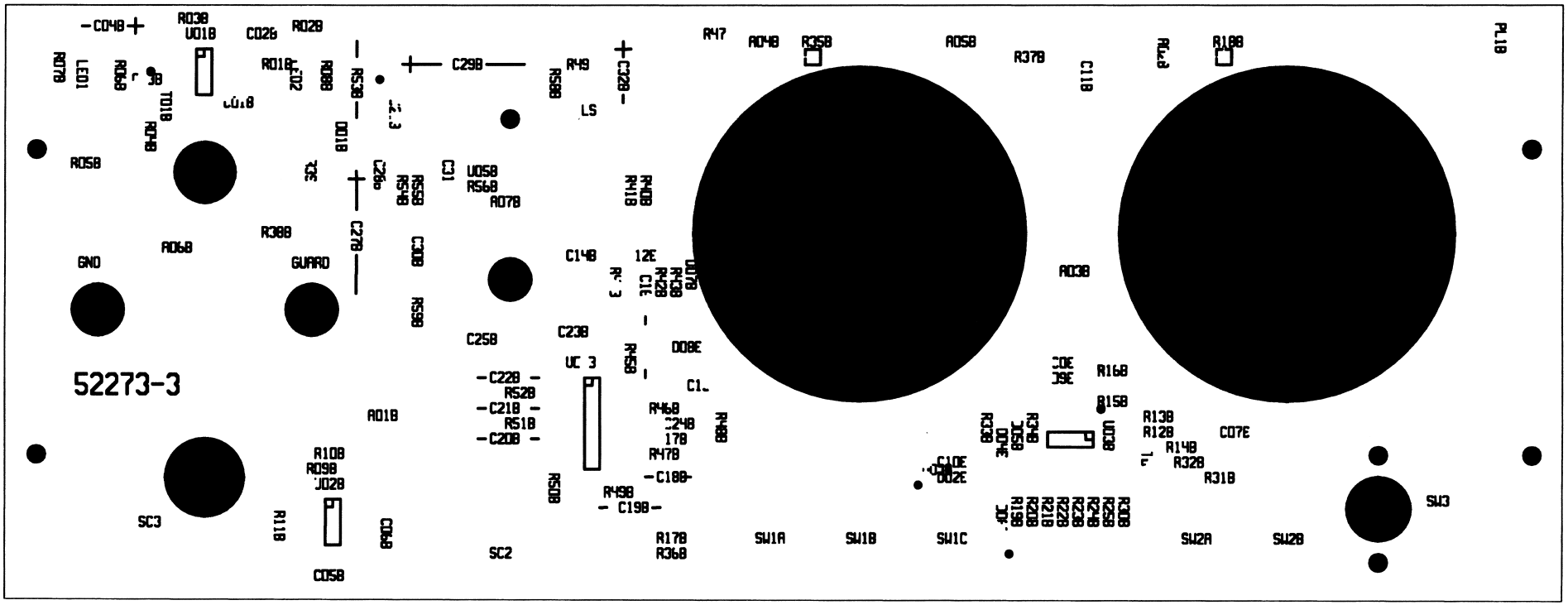

SC1p
CON10
12V
-12V
Regulering
GUARD
GUARD FRONT PANEL
SC1
HT OUT
HTV Sense
HT Notes
TRIC
2400
Transformator JP15
U01A
SG3524
TL074CN
TL7712A
4049
MTP12N10
BYT01-400
1N4148
BC547
MC78L12ACP
JP15 HT
BAMBRIDGE A/S
HIRSEMARKEN 5
DK-3020 FARUM, DENMARK
Document Number
83605-1 PCB 82292-6
Rev
Draft
Tuesday, January 12, 2010
Sheet 2 of 4

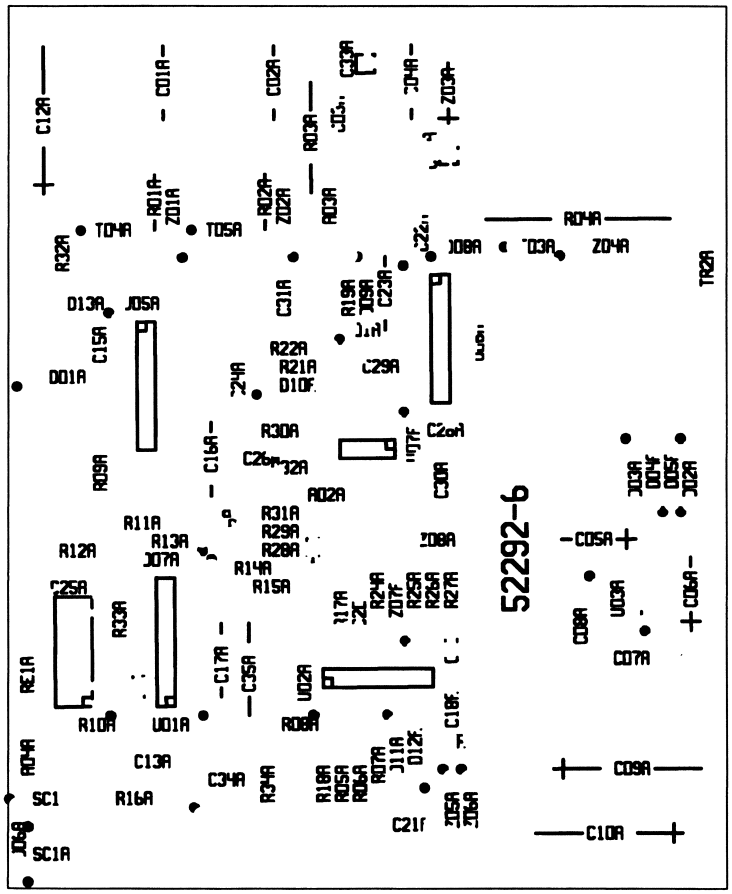

PL1p
CON10
HT
POT
FRONT
PAnel
-HT
+HT
Front View
SC2
KV
LS
uA
PL6
HTV Sense
GUARD
HT Noise
TL071
TL072
TL074
LM555
TDA-2003
MOSFET VN10
BC557
BYT01-400
1N4148
Conn, fetning jack 2,6mm.
SW1A 100uA
SW1B 10uA
SW1C 1uA
SW2B 7.5kV
SW3 POWER
SW2A 15kV
JP15 FRONT PCB
BANGBORG A/S
HELSEMARKEN 5
DK-3620 FARUM, DENMARK
Document Number
83606-2 PCB 82273-3
Rev
Draft
Tuesday, January 12, 2010
Sheet 3 of 4


52297-2
1.6AT



DANBRIDGE A/S HIRSEMARKEN 5 DK-3520 FARUM, DENMARK	
Title **JP15**	
Size A	Document Number **83605-0**
Rev Draft	
Date: Tuesday, January 12, 2010	Sheet 1 of 4


52273-3
GND
GUARD
SC3
SC2
SW1A
SW1B
SW1C
SW2A
SW2B
SW3


52292-6

DANBRIDGE A/S
LYKKEGÅRDSVEJ 15
DK-4000 ROSKILDE
DENMARK

Dok. Nr.:

TI-0047

Titel:

Testinstruktion
For
JP-15

Udarb.	**Dato:22-10-2013**	**Jesper Askholm**
Godk.	**Dato:**	

Revisions log:

Revision	Dato	Rev sider	Bemærkninger
01	2006-03-23	Alle	Ny testinstruktion
02	2010-03-22	5,6,7	Rettelser og bedre forklaring

Distribution:	Testhåndbog

Indholdsfortegnelse

1 Formål

At beskrive proceduren for funktionstest af JP 15

2 Gyldighedsområde

Gælder for produktionstest og service.

3 Referencer

QC/INST/98025	Uddannelse og træning
QC/INST/98019	Håndtering
QC/PROC/96002	ESD-forebyggende foranstaltninger
QC/INST/98006	Styring af afvigende produkter
QC/INST/98009	Inspektions og afprøvningsstatus

4 Bilag

Intet.

5 Metode, ansvar og aktivitet

5.1 Ledelse

Udviklingschefen er ansvarlig for vedligeholdelsen af denne instruktion.

Udviklingschefen er ansvarlig for uddannelse og træning af teknikeren der udfører testen.

5.2 Uddannelse og træning

Kun teknikere der er bekendt med denne instruktion og godkendt af udviklingschefen/produktionschefen må udføre beskrevne test.

5.3 Arkivering

Ingen arkivering ved test af underenheder.

5.4 Mærkning

Procedure QC/INST/98009.
..\..\..\Systemhåndbog\S-98009-Insp-prøvstatus.doc
Printet mærkes med undersamlingsnummer (89-nr.) plus evt. kundespecifikt optionsnummer.

5.5 Afvigelser

Udarbejder fejlrapport i h.h.t. QC/INST/98006.
..\..\..\Systemhåndbog\S-98006 Afvigende-produkter.doc

5.6 Sikkerhed

Ingen specielle forbehold.

6 Visuel Inspektion

Kontroller at IC-kredsene, Elektrolytter og Dioder er monteret korrekt.
Spændingsforsyningenerne er rigtig loddet på main boardet.
Drejespole instrumenterne er mekanisk nulstillet
Potmetrene stilles i midterpossion.
Der kontrolleres at der er ingen kolde lodninger.

7 Kontrol af JP 15

I det følgende beskrives sluttest af JP15

7.1 Testudstyr

Skilletrafo f.eks. Blichfelt type 260-3.
Oscilloskop f.eks. Hameg HM 1507-3.
Multimeter f.eks. Calibreret Agilent 33401A.
Testudstyr til JP15 og JP30

7.2 Opstilling

Skilletrafo skrues ned på nul og netspændings omstilleren stilles på 115 V.
Højspændings regulator skrues helt ned CCW (counterclock wise)
Højtaler potmeter indstilles til middel

7.3 Testprocedure

- Indstil skilletrafo til 115V og vær opmærksom på at strømforbruget ikke overstiger 150mA
- Kontroller at 7,5kV og 15kV lamperne ikke blinker
- Skru ned for skilletrafoen og sæt netspændingsomstilleren på 230V
- Indstil skilletrafo til 230V vær opmærksom på at strømforbruget ikke overstiger 50mA

7.3.1 89292 Justering af 12V

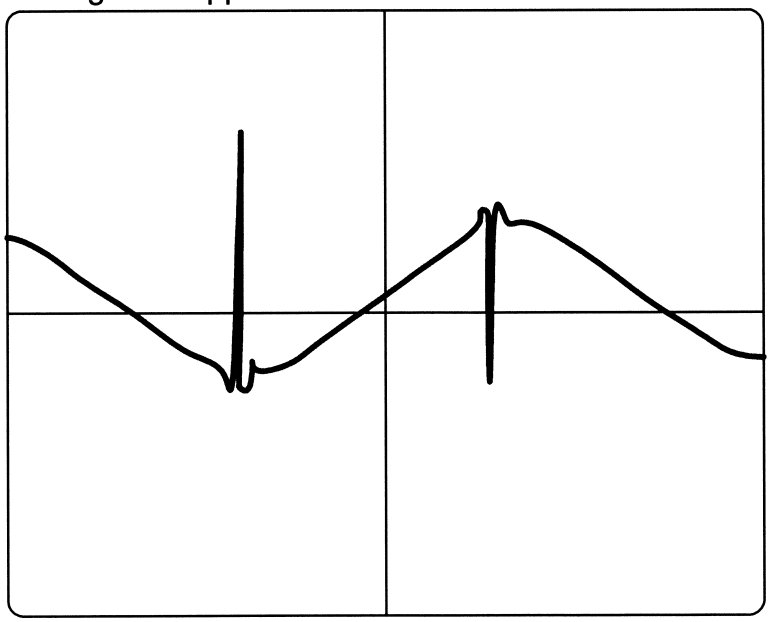
- Kontroller at der er 12VDC ± 0,5VDC på C12A.

- Juster med A03A til spændingen er:
  20 - 30VDC på C05A.
  -20 - 30VDC på C06A

- Kontroller at der er 12VDC ± 0,5VDC på C10A.
- Kontroller at der er -12VDC ± 0,5VDC på C09A.

Sluk for JP15 og tilslut scope på T05A Drain eller Z02A Katode.
Sæt Jp15 til 15kV og 100µA
Tænd JP15 og isæt Jackstik på forpladen i SW for at aktivere højspændingen
Kontroller at Lysdioden 15kV blinker
Juster Højspændingsregulator (potentiometer A06B) på forpladen til 7,5kV.

- Justér A02A til skift lige før toppen af sinuskurven.



- Kontroller at der ikke er selvsving eller støj i højtaleren i hele højspændings området.
- Fjern Jackstiket.
- Sluk JP15 og fjern scope proben.

7.3.2 89273 Justering af offset µA meter

- Monter DIN Test stik til forpladen
- Monter DIN stik SORT (stel) & GRØN (µA meter) i multimeteret.
- Justér på A03B til 0VDC ± 0,1mVDC.

7.3.3 89273 Justering af 15kV output.

- Isæt det BLÅ stik (KV) på multimeteret i stedet for det GRØNNE (µA meter) Tilslut JP15 testkabel og højspændings probe til multimeter
- Aktiver Højspændingen
- Justér Højspændingsregulator (potentiometer A06B) på forpladen til der er 5,00V på multimeteret der er tilsluttet via DIN Test stik
- Justér A01B til der er 15kV ±100V på højspændings proben

  Hvis der er problemer med at tilpasse spændingen kan R10B ændres (R10B → ∞,

  Højspændingen → ∞) **OBS!!** For høj værdi ændrer de 5,000VDC
- Justér A02B til 15kV metervisning er korrekt på JP15

7.3.4 89292 Justering af max. Output 16kV og 7,5kV

- Skru helt op for højspændingsregulator (potentiometer A06B) på forpladen
- Justér A04A til max 16kV på højspændings proben
- Skru ned for spændingen og aktiver 7,5kV området
- Justér højspændingsregulator (potentiometer A06B) på forpladen til der er 5,00V på multimeteret der er tilsluttet via DIN Test stik
- Kontroller at der er 7,5kV ± 500V på højspændings proben og at meter visningen er korrekt
- Skru ned og sluk for højspændningen

7.3.5 89273 Justering af µA Meter

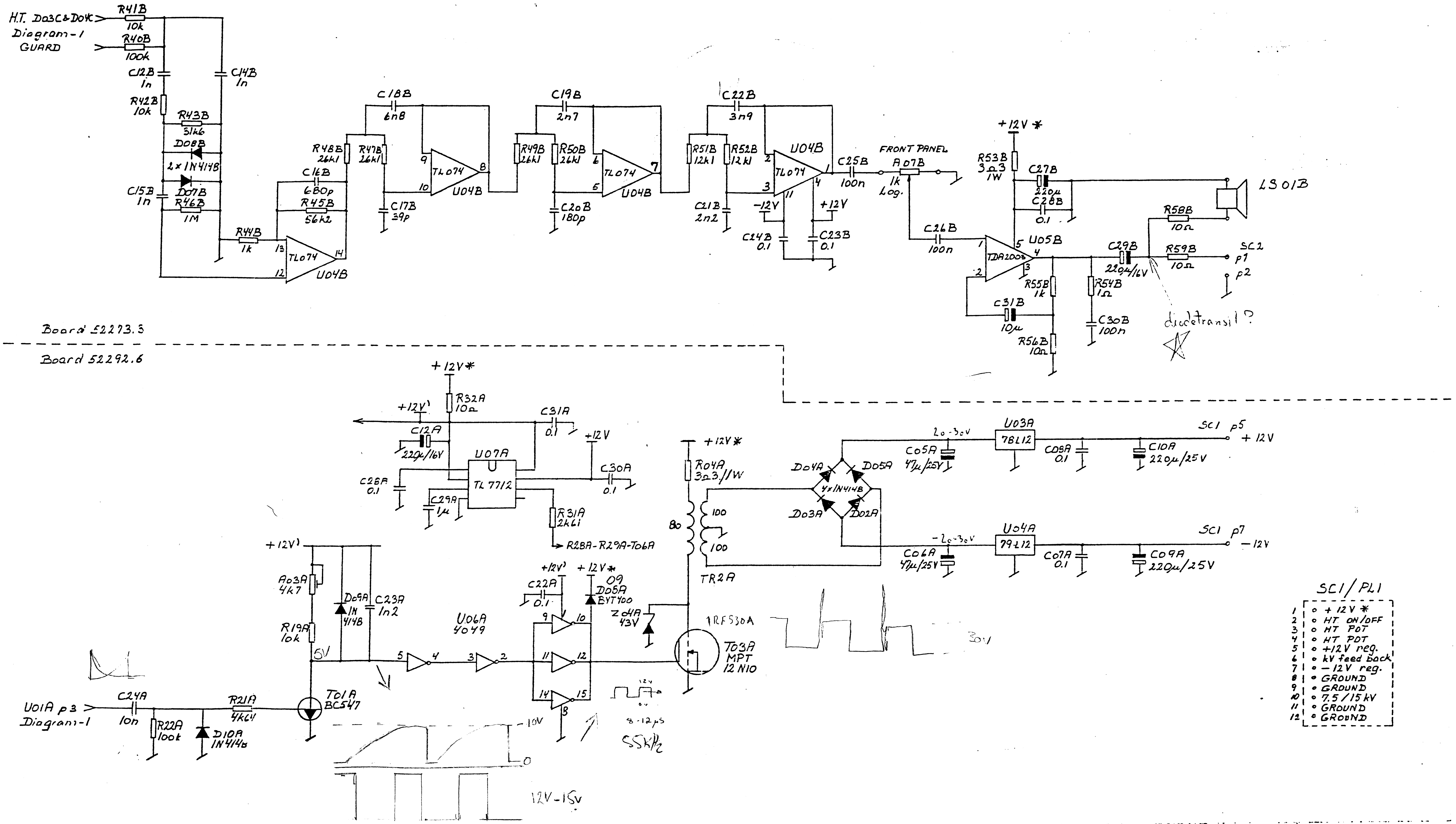
- Tilslut en belastnings modstand på 100MΩ mellem højspændings proben og stel
- Flyt højspændingsproben så den sidder i Guard
- Aktiver højspændingen
- Indstil højspændingsregulator (potentiometer A06B) på forpladen til output til 10kV (svarer til ca. 3,3V på DIN stik, målt i mellem sort (stel) & blå (kV meter))
- Monter DIN stik SORT (stel) & GRØN (µA meter) i multimetret
- Kontroller at der er 5,00V på mulitmetret
- Justér A04B til metervisningen svarer til 100µA
- Skru ned for spændingen og kontroller områderne 10 µA og 1µA ved 5,00V på multimetret og meter visningen er henholdsvis 10µA og 1µA
- Sluk for højspændingen
- Skift belastnings modstand til 10MΩ
- Justér højspændingsregulator til max.
- Kontroller at spændingen er i mellem 2,5 - 3,5kV
- Kontroller at strømmetret går i max
- Flyt modstanden så den er i mellem probe og guard
- Kontroller at strømmetret ikke overskrider max

7.3.6 89273 Justering af batteri indikator visning

- Tilslut en ekstern power supply
- Indstil power supply'en til 10,0V
- Tryk 1µA og 100µA ind for at aktivere batteri indikator
- Justér A05B så meter visningen er lige overlapper det grønne område.
  (R37B ændres hvis den ikke kan indstilles til det grønne område)

  (R37B $\rightarrow$0, metervisning $\rightarrow\infty$)
- Indstil power supply spændingen til 10,5V
- Justér A03A til min. 15V på indgangen af +/- 12V

Sæt top og bund og sæt instrumentet til varme test i ca. en uge
Med ca. 8kV i 15kV området



83605-3	JP15 A+B	220889BR	PDL
		RETTET	GODK.
danbridge a-s	AUDIO CIRCUIT AND INTERNAL ±12V SUPPLY	TEGNET	080988 BRÅS
		KONSTRUERET	S.KOFOED OLSEN
		GODK.	

* måling ved 15KV

BOARD 52292.6

SCI p10 SCI p11 SCI p1

+12V* → Diagram-2

Z03A 15V C04A 1µ C11A C03A 0.1 3300µ

-12V R18A 31k6 R08A 4k64

Feedback SCI p6 R05A 8k25 0→1,2V U02A TL074 R06A 100 C11A 10n R07A 1k21

ca 3,2 vdc 15kw

15→38V

+12V* C14A 0.1 C34A 47µ 25V C15A 0.1

C34A 4µ7 R11A 6k19 R33A 6k19 R11A 1k% R09A 1k%

Regulering 55KHz SCI p3 R17A 100k C20A 1n U02A TL074 R10A 4k64 R04A 1k C13A a1 U01A

R34A 100 C35A 1n

C24A Diagram 3

I-Guardfeter. SG 3524 9,1 mV

D01A BYT 400 ½ 4049 U05A D13A BYT 400 ½ 4049 TO4A TO5A MTP 12N10 MTP 12N10

C33A 1µ/250V

SCHT OUT 0-15kV

TRIC C01C 470p/16 kV D02C BY 712 R01C 1M R02C 1M R03C 200M C04C 470p/16kV

5 5 2400

D01C BY712 C02C 470p/16kV C03C 470p/16kV D03C D04C 2 x BYT01-400

R11B R30B Diagram-2

GUARD

R19B Diagram-2

R41B Diagram-3

-12V R27A 121k R26A 34k8 R25A 562 U02A TL074 R15A 3k33 C17A 4n7 R14A 12k1 R02A 1k THIA 22k R12A 23k7 C25A 0.1 RE1A 4/3 D06A IN4148

GUARD R24A 100 +12V -12V Z07A 2x3V9 Z08A C18A 0.1 C19A 0.1

ca 16mV* stram retur.

R02A 196 R01A 196 R03A 0,056 C02A 470p Z02A Z01A 2x43V C01A 470p

12Vpp

R04C 10k/4W

GUARD FRONT PANEL

C05C 1µ/250V

C16A 1n R13A 10 +12V D07A IN4148 R30A 1M C26A 1µ

U01A, Ben 7

4mV→-44mV

R23A 0→50mV 10k U02A TL074 D12A 2x IN4148 D11A Z05A 2x9V1 Z06A R28A 7k5 R29A 2k61 T06A BC547

R31A Diagram 3

SCI p2

PROBE PL HT 6k PL 3 SW

83605-1	JP15	Å+C	
danbridge a-s	H.T. CONTROL CIRCUIT		
230889BR PDL			
060189 PNS			
RETTET GODK.			
TEGNET	080988 BRAS		
KONSTRUERET	SKOFOED OLSEN		
GODK.			

BOARD 52273.3

3.54 vdc/15kv

10.0 vdc/15kv

3.69

33pF

HT- R03C .Diagram-1

HT Diagram-1 9 and

SC2

VN 10KM

1455

TL071

TL072

BC557

BYT400

4x IN4148

IN4148

Diagram 4

HT POT FRONT PANEL

SW2A 15kV

SW2B 7.5kV

SW3 POWER

SW1A 100µA

SW1B 10µA

SW1C 1µA

LED2 7.5kV

LED1 15kV

KV01B kV

UA01B µA

*=udført på 57258

83605-2	JP15	B	
P.L.M. danbridge a-s	METER AMPLIFIERS	2208898 PDL RETTET / GODK.	
		TEGNET	080988 BRAS
		KONSTRUERET	S KOFOED OLSEN
		GODK.	