

Power Amplifiers

procon plus

service manual
schematic diagrams

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Notice

Service must be carried out by qualified personnel only. Any tampering carried out by unqualified personnel during the guarantee period will forfeit the right to guarantee.

For a correct operation of the instrument, after having switched off, be careful to wait at least 3 seconds before switching on again.

To improve the device's specifications, the schematic diagrams may be subject to change without prior notice.

All components marked by this symbol have special safety characteristics, when replacing any of these components use only manufacturer's specified parts.

The (μ) micro symbol of capacitance value is substituted by U.

The (Ω) omega symbol of resistance value is substituted by E.

The electrolytic capacitors are 25Vdc rated voltage unless otherwise specified.

All resistors are 1/8W unless otherwise specified.

All switches shown in the "OFF" position. All DC voltages measured to ground with a voltmeter 20KOhm/V.

← Soldering point.

↑ Supply voltage.

⊥ Logic supply ground.

• Male connector.

□ Test point.

⊥ Analog supply ground.

○ Female connector.

◊ Flag joined with one or more flags with the same signal name inscribed.

⊥ Chassis ground.

⊔ M/F faston connector.

⊕ Earth ground.



ATTENTION Observe precautions when handling electrostatic sensitive devices.



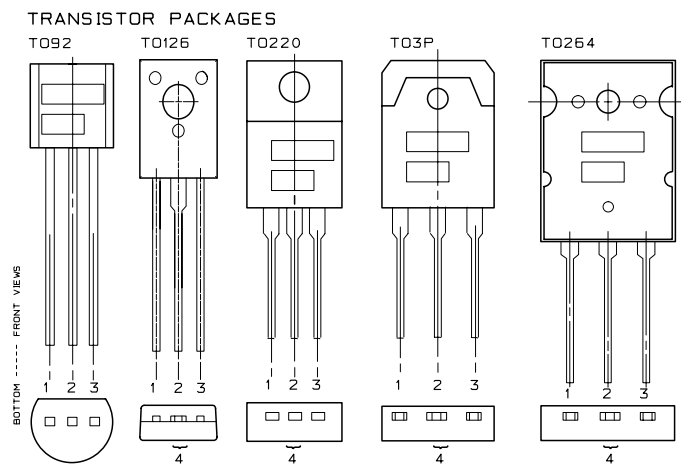
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PROCON PLUS SERIES • TECHNICAL SPECIFICATIONS

POWER SPECIFICATIONS		400P	750P	1000P	1250P	1500P	1800P	2200P
EIA output power	8 ohm	125+125	215+215	300+300	375+375	450+450	550+550	650+650
1kHz, THD maximum 1%	4 ohm	200+200	375+375	550+550	625+625	750+750	900+900	1100+1100
Both channels	8 ohm BRIDGED	400	750	1100	1250	1500	1800	2200
ELECTRICAL SPECIFICATIONS		400P	750P	1000P	1250P	1500P	1800P	2200P
INPUT SENSITIVITY		0dB (0.775V)						
INPUT IMPEDANCE		10 kOhms (balanced)						
FREQUENCY RESPONSE		10+50000 Hz (-0.5dB)						
VOLTAGE GAIN		32dB	33dB	35dB	36dB	37dB	37dB	39dB
SLEW RATE		22 V/ms						
DAMPING FACTOR		>400:1 @ 1kHz, 80hms						
CROSSTALK		-82 dB (1KHz)						
S/N ratio		-100 dB						
Harmonic distortion THD		<0.1% (ref 20Hz -20KHz)						
Intermodulation distortion SMPTE		<0.1% (SMPTE method, 60Hz & 7kHz, 4:1 ratio)						
GENERAL SPECIFICATIONS		400P	750P	1000P	1250P	1500P	1800P	2200P
PROTECTIONS		Power transformer thermal protection Short circuit protection Sensor for current on outputs CLIP Limiter on each channel Soft-start circuit (1000P to 2200P)						
CONTROLS		ON/OFF switch 21-detect input level control for each channel MODE selector SHIELD selector						
INDICATORS		POWER ON: 1 red LED BRIDGE: 1 red LED PROTECT: 1 red LED LEVEL: 2 x 5-LED meters LIMIT: 1 red LED						
CONNECTORS	IN OUT	1 XLR-F + 1 JACK in parallel for each channel 2 x BINDING POST + 1 SPEAKON for each channel (400-1500) 1 SPEAKON for each channel + 1 SPEAKON for BRIDGE output (1800-2200)						
POWER SUPPLY		see label on the unit						
DIMENSIONS	mm (WxHxD)	483x88x366		483x88x428			483x88x456	
WEIGHT	kg	13	15	18	19.5	21	23.5	25



PROCON400p - Test procedures

PRECAUTION

- To prevent short circuit during any test, the oscilloscope must be EARTH INSULATED, this occurs because some test require to connect its probe to the amplifier output, non-compliance may cause damages to oscilloscope inputs circuitry.
- Before removing or installing any modules and connectors, disconnect the amplifier from AC MAINS and measure the DC supply voltages across each of the power supply capacitors. If your measurement on any of the caps is greater than 10Vdc, connect a 100E 60W resistor across the applicable caps to discharge them for your safety. Remember to remove the discharge resistor immediately after discharging caps. Do not power up the amplifier with the discharge resistor connected.
- Do not check the amplifier with the speakers connected use the appropriate load resistors only.
- BE CAREFUL increasing the Variac you must not exceed the nominal mains voltage plus its tolerance (see specifications) any upper voltage can be cause of damage.

VISUAL CHECK

- Use compressed air to clear dust in the amplifier chassis.
- Before proceed to supply the amplifier check visually the internal assembly, if appears an evident damage find the most possible reasons that cause it.
- Check the wiring cables for possible interruptions or shorts.
- If the damage has burnt a printed circuit board don't try to repair it, replace with a new one.

TESTING GEAR

- Audio Generator
- Dual Trace Oscilloscope
- Digital Multimeter
- 4E 300W, 8E 450W, 100E 60W resistors
- Variac
- Digital Thermometer (not indispensable)

SETUP

- Connect the Variac between the Mains and the amplifier and set it at zero voltage.
- Turn full counter-clockwise the LEVEL potentiometers.
- Connect the audio generator to the channel inputs and set it to 1KHz 775mVrms (0dBu) sinusoidal signal.
- Connect the two scope traces to the amplifier outputs, before the relay, and set them in DC at 20V/div. 2mS/div.

SUPPLY CHECK

- Verify with the Multimeter the insulation between the heatsinks and all transistor collectors mounted on them; placing the multimeter tips between the screw heads and the collector pins you can exclude an erroneous reading due to the insulation of the heatsink anodization.
- Verify with the Multimeter the NTC (RT1) and R1 paralleled resistor value, it must be about 1080ohm (at 25°C).
- Disconnect the amplifier module supplies of each channel (red and yellow wires).
- Set the Variac to the nominal mains voltage, turn on the Amplifier, then check with the Multimeter the AC supply voltages:

F1-F2 = 29±2Vac.

RED secondary wires = 87±9Vac.

- Re-set the Variac at zero voltage, turn off the amplifier and reconnect the supplies at each amplifier module.
- Set up the Variac slowly monitoring the oscilloscope screen, it should display no signal; if you notice a DC voltage or a protection trips check the amplifier as suggested in the ADVICES.
- As soon as the +12VF supply circuit reaches its nominal value, all cooling fans run at their minimum and the speaker output relays (J201-202) switch.
- When the Variac ac voltage reaches the nominal voltage verify the DC supplies as follow:

+VCC = +59±6Vdc

-VCC = -59±6Vdc

U101 pin 8 = +12±0.5Vdc

U101 pin 4 = -12±0.5Vdc

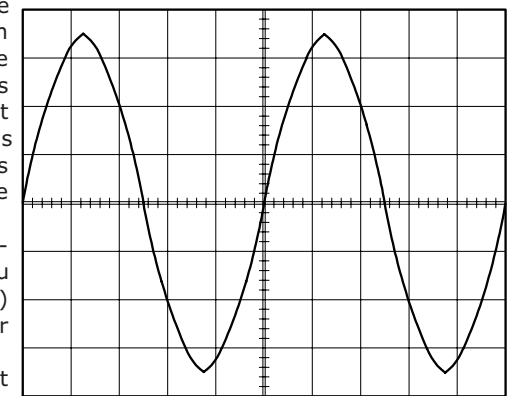
U403 pin 3 = +12±0.5Vdc

- If one or more voltages don't correspond, check the rectifiers, capacitors and transformers disconnecting them from circuitry.

CHANNEL CHECK

- Be sure you have disconnected the load resistor.
- Increasing the input signal also the output signal raise accordingly, it must be symmetrical without visible distortion or oscillation as shown in figure (note: the figure is representative don't refer to the levels displayed). If there is a distortion read the section ADVICES.
- When the input signal exceeds -20dBu (20Vpp on output) the fans turn at their maximum speed.
- Firstly you must check the channel without load, afterwards you must repeat the check with the loads attached, the following table reports the approx. maximum level obtainable with this amp:

OSCILLOSCOPE FIGURE



TRACE setting:
TIMEBASE: 2mS/div.
AMPLITUDE: 20V/div.

	out level	in level
no load	113Vpp	+1.5dBu
1CH 4E	91Vpp	-0.2dBu
2CH 4E	82Vpp	-2.0dBu
Bridge 8E	161Vpp	-2.3dBu

LEVEL METER ADJUSTMENT

- Check if the clip led lights at -2dBu on input (~80Vpp on output), if necessary adjust the trimmers W301/2 on display board.

OFFSET ADJUSTMENT

- Set the input level at minimum (no signal), the output dc offset voltage must be within range ±20mV, if necessary adjust the VR201 trimmer (for each channel) to be within this range.

BIAS ADJUSTMENT

- No bias adjustment is necessary for this amplifier circuitry.

ADVICES

- If you have determinate that the problem is a short on a rail, you must check the output transistors.
- To determine which transistor devices are bad, use a soldering iron to lift one leg of each emitter pin and measure the resistance across emitter and collector of each device. Unsolder and lift one leg of each base pin and check the base-collector resistance. Replace any device that measure as a short.
- If all the transistors are OK, unsolder and lift one leg of each diode and check them.
- Check the circuit board for open foil traces.
- Use the Multimeter to check the resistors, particularly the base and emitter resistors of damaged transistor.
- If the input sinewave appears to be distorted during the negative cycle, you can assume that the problem is located somewhere in the circuitry of the positive rail.
- If the positive cycle appears distorted, you can assume that the problem is in the circuitry of the negative rail.
- The dc voltages printed on the schematics are measured with the amplifier in steady state without input signal and nominal mains voltage supply, it can be useful to localize a damage.

PROCON750p - Test procedures

PRECAUTION

- To prevent short circuit during any test, the oscilloscope must be EARTH INSULATED, this occurs because some test require to connect its probe to the amplifier output, non-compliance may cause damages to oscilloscope inputs circuitry.
- Before removing or installing any modules and connectors, disconnect the amplifier from AC MAINS and measure the DC supply voltages across each of the power supply capacitors. If your measurement on any of the caps is greater than 10Vdc, connect a 100E 70W resistor across the applicable caps to discharge them for your safety. Remember to remove the discharge resistor immediately after discharging caps. Do not power up the amplifier with the discharge resistor connected.
- Do not check the amplifier with the speakers connected use the appropriate load resistors only.
- BE CAREFUL increasing the Variac you must not exceed the nominal mains voltage plus its tolerance (see specifications) any upper voltage can be cause of damage.

VISUAL CHECK

- Use compressed air to clear dust in the amplifier chassis.
- Before proceed to supply the amplifier check visually the internal assembly, if appears an evident damage find the most possible reasons that cause it.
- Check the wiring cables for possible interruptions or shorts.
- If the damage has burnt a printed circuit board don't try to repair it, replace with a new one.

TESTING GEAR

- Audio Generator
- Dual Trace Oscilloscope
- Digital Multimeter
- 4E 450W, 8E 800W, 100E 70W resistors
- Variac
- Digital Thermometer (not indispensable)

SETUP

- Connect the Variac between the Mains and the amplifier and set it at zero voltage.
- Turn full counter-clockwise the LEVEL potentiometers.
- Connect the audio generator to the channel inputs and set it to 1KHz 775mVrms (0dBu) sinusoidal signal.
- Connect the two scope traces to the amplifier outputs, before the relay, and set them in DC at 20V/div. 2mS/div.

SUPPLY CHECK

- Verify with the Multimeter the insulation between the heatsinks and all transistor collectors mounted on them; placing the multimeter tips between the screw heads and the collector pins you can exclude an erroneous reading due to the insulation of the heatsink anodization.
- Verify with the Multimeter the NTC (RT1) and R1 paralleled resistor value, it must be about 1080ohm (at 25°C).
- Disconnect the amplifier module supplies of each channel (red and yellow wires).
- Set the Variac to the nominal mains voltage, turn on the Amplifier, then check with the Multimeter the AC supply voltages:

F1-F2 = 29±2Vac.

RED secondary wires = 106±10Vac.

- Re-set the Variac at zero voltage, turn off the amplifier and reconnect the supplies at each amplifier module.
- Set up the Variac slowly monitoring the oscilloscope screen, it should display no signal; if you notice a DC voltage or a protection trips check the amplifier as suggested in the ADVICES.
- As soon as the +12VF supply circuit reaches its nominal value, all cooling fans run at their minimum and the speaker output relays (J201-202) switch.
- When the Variac ac voltage reaches the nominal voltage verify the DC supplies as follow:

+VCC = +72±7Vdc

-VCC = -72±7Vdc

U101 pin 8 = +12±0.5Vdc

U101 pin 4 = -12±0.5Vdc

U403 pin 3 = +12±0.5Vdc

- If one or more voltages don't correspond, check the rectifiers, capacitors and transformers disconnecting them from circuitry.

CHANNEL CHECK

- Be sure you have disconnected the load resistor.
- Increasing the input signal also the output signal raise accordingly, it must be symmetrical without visible distortion or oscillation as shown in figure (note: the figure is representative don't refer to the levels displayed). If there is a distortion read the section ADVICES.
- When the input signal exceeds -20dBu (20Vpp on output) the fans turn at their maximum speed.
- Firstly you must check the channel without load, afterwards you must repeat the check with the loads attached, the following table reports the approx. maximum level obtainable with this amp:

	out level	in level
no load	139Vpp	+3.0dBu
1CH 4E	117Vpp	+1.5dBu
2CH 4E	109Vpp	+0.9dBu
Bridge 8E	214Vpp	+0.7dBu

LEVEL METER ADJUSTMENT

- Check if the clip led lights at -1dBu on input (~90Vpp on output), if necessary adjust the trimmers W301/2 on display board.

OFFSET ADJUSTMENT

- Set the input level at minimum (no signal), the output dc offset voltage must be within range ±20mV, if necessary adjust the VR201 trimmer (for each channel) to be within this range.

BIAS ADJUSTMENT

- No bias adjustment is necessary for this amplifier circuitry.

ADVICES

- If you have determinate that the problem is a short on a rail, you must check the output transistors.
- To determine which transistor devices are bad, use a soldering iron to lift one leg of each emitter pin and measure the resistance across emitter and collector of each device. Unsolder and lift one leg of each base pin and check the base-collector resistance. Replace any device that measure as a short.
- If all the transistors are OK, unsolder and lift one leg of each diode and check them.
- Check the circuit board for open foil traces.
- Use the Multimeter to check the resistors, particularly the base and emitter resistors of damaged transistor.
- If the input sinewave appears to be distorted during the negative cycle, you can assume that the problem is located somewhere in the circuitry of the positive rail.
- If the positive cycle appears distorted, you can assume that the problem is in the circuitry of the negative rail.
- The dc voltages printed on the schematics are measured with the amplifier in steady state without input signal and nominal mains voltage supply, it can be useful to localize a damage.

PROCON1000p - Test procedures

PRECAUTION

- To prevent short circuit during any test, the oscilloscope must be EARTH INSULATED, this occurs because some test require to connect its probe to the amplifier output, non-compliance may cause damages to oscilloscope inputs circuitry.
- Before removing or installing any modules and connectors, disconnect the amplifier from AC MAINS and measure the DC supply voltages across each of the power supply capacitors. If your measurement on any of the caps is greater than 10Vdc, connect a 100E 80W resistor across the applicable caps to discharge them for your safety. Remember to remove the discharge resistor immediately after discharging caps. Do not power up the amplifier with the discharge resistor connected.
- Do not check the amplifier with the speakers connected use the appropriate load resistors only.
- BE CAREFUL increasing the Variac you must not exceed the nominal mains voltage plus its tolerance (see specifications) any upper voltage can be cause of damage.

VISUAL CHECK

- Use compressed air to clear dust in the amplifier chassis.
- Before proceed to supply the amplifier check visually the internal assembly, if appears an evident damage find the most possible reasons that cause it.
- Check the wiring cables for possible interruptions or shorts.
- If the damage has burnt a printed circuit board don't try to repair it, replace with a new one.

TESTING GEAR

- Audio Generator
- Dual Trace Oscilloscope
- Digital Multimeter
- 4E 700W, 8E 1100W, 100E 80W resistors
- Variac
- Digital Thermometer (not indispensable)

SETUP

- Connect the Variac between the Mains and the amplifier and set it at zero voltage.
- Turn full counter-clockwise the LEVEL potentiometers.
- Connect the audio generator to the channel inputs and set it to 1KHz 775mVrms (0dBu) sinusoidal signal.
- Connect the two scope traces to the amplifier outputs, before the relay, and set them in DC at 50V/div. 2mS/div.

SUPPLY CHECK

- Verify with the Multimeter the insulation between the heatsinks and all transistor collectors mounted on them; placing the multimeter tips between the screw heads and the collector pins you can exclude an erroneous reading due to the insulation of the heatsink anodization.
- Verify with the Multimeter the NTC (RT1) and R1 paralleled resistor value, it must be about 7Kohm (at 25°C).
- Disconnect the amplifier module supplies of each channel (red and yellow wires).
- Set the Variac to the nominal mains voltage, turn on the Amplifier, then check with the Multimeter the AC supply voltages:

F1-F2 = 29±2Vac.

RED secondary wires = 125±6Vac.

- Re-set the Variac at zero voltage, turn off the amplifier and reconnect the supplies at each amplifier module.
- Set up the Variac slowly monitoring the oscilloscope screen, it should display no signal; if you notice a DC voltage or a protection trips check the amplifier as suggested in the ADVICES.
- As soon as the +12VF supply circuit reaches its nominal value, all cooling fans run at their minimum and the speaker output relays (J201-202) switch.
- When the Variac ac voltage reaches the nominal voltage verify the DC supplies as follow:

+VCC = +82±5Vdc

-VCC = -82±5Vdc

U501 pin 8 = +12±0.5Vdc

U501 pin 4 = -12±0.5Vdc

U403 pin 3 = +12.5±0.5Vdc

- If one or more voltages don't correspond, check the rectifiers, capacitors and transformers disconnecting them from circuitry.

CHANNEL CHECK

- Be sure you have disconnected the load resistor.
- Increasing the input signal also the output signal raise accordingly, it must be symmetrical without visible distortion or oscillation as shown in figure (note: the figure is representative don't refer to the levels displayed). If there is a distortion read the section ADVICES.
- When the input signal exceeds -20dBu (24Vpp on output) the fans turn at their maximum speed.
- Firstly you must check the channel without load, afterwards you must repeat the check with the loads attached, the following table reports the approx. maximum level obtainable with this amp:

	out level	in level
no load	162Vpp	+2.0dBu
1CH 4E	141Vpp	+1.7dBu
2CH 4E	131Vpp	+1.0dBu
Bridge 8E	258Vpp	+0.5dBu

LEVEL METER ADJUSTMENT

- Check if the clip led lights at -2dBu on input (~150Vpp on output), if necessary adjust the trimmers W301/2 on display board.

OFFSET ADJUSTMENT

- Set the input level at minimum (no signal), the output dc offset voltage must be within range ±20mV, if necessary adjust the VR201 trimmer (for each channel) to be within this range.

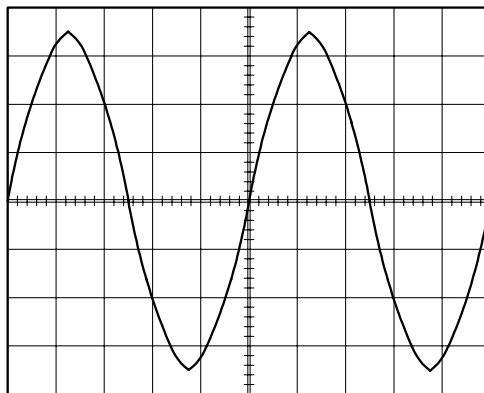
BIAS ADJUSTMENT

- No bias adjustment is necessary for this amplifier circuitry; in any case the amplifier has the possibility to adjust it if necessary. To check properly the bias proceed as follows:
- Using a sinusoidal signal (1KHz or more) and the 4E load attached, wait till the heatsink temperature reaches about 60°C.
- Turn down the signal at the smallest intensity you can read on your oscilloscope trace connected at the amplifier output.
- Zoom in the crossing region using the amplitude, timebase and trigger controls of your oscilloscope. If you see a distortion, try to eliminate it adjusting the VR202 trimmer.
- Finally, set the input level at minimum and verify with the multimeter attached across an emitter resistance (p.e. R232) that the dc voltage doesn't exceed 10mV.

ADVICES

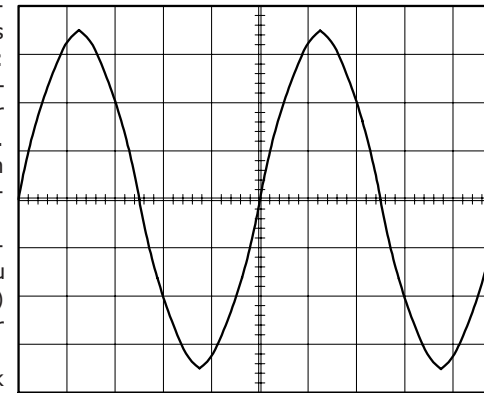
- If you have determinate that the problem is a short on a rail, you must check the output transistors.
- To determine which transistor devices are bad, use a soldering iron to lift one leg of each emitter pin and measure the resistance across emitter and collector of each device. Unsolder and lift one leg of each base pin and check the base-collector resistance. Replace any device that measure as a short.
- If all the transistors are OK, unsolder and lift one leg of each diode and check them.
- Check the circuit board for open foil traces.
- Use the Multimeter to check the resistors, particularly the base and emitter resistors of damaged transistor.
- If the input sinewave appears to be distorted during the negative cycle, you can assume that the problem is located somewhere in the circuitry of the positive rail.
- If the positive cycle appears distorted, you can assume that the problem is in the circuitry of the negative rail.
- The dc voltages printed on the schematics are measured with the amplifier in steady state without input signal and nominal mains voltage supply, it can be useful to localize a damage.

OSCILLOSCOPE FIGURE



TRACE setting:
TIMEBASE: 2mS/div.
AMPLITUDE: 20V/div.

OSCILLOSCOPE FIGURE



TRACE setting:
TIMEBASE: 2mS/div.
AMPLITUDE: 20V/div.

PROCON1250p - Test procedures

PRECAUTION

- To prevent short circuit during any test, the oscilloscope must be EARTH INSULATED, this occurs because some test require to connect its probe to the amplifier output, non-compliance may cause damages to oscilloscope inputs circuitry.
- Before removing or installing any modules and connectors, disconnect the amplifier from AC MAINS and measure the DC supply voltages across each of the power supply capacitors. If your measurement on any of the caps is greater than 10Vdc, connect a 100E 90W resistor across the applicable caps to discharge them for your safety. Remember to remove the discharge resistor immediately after discharging caps. Do not power up the amplifier with the discharge resistor connected.
- Do not check the amplifier with the speakers connected use the appropriate load resistors only.
- BE CAREFUL increasing the Variac you must not exceed the nominal mains voltage plus its tolerance (see specifications) any upper voltage can be cause of damage.

VISUAL CHECK

- Use compressed air to clear dust in the amplifier chassis.
- Before proceed to supply the amplifier check visually the internal assembly, if appears an evident damage find the most possible reasons that cause it.
- Check the wiring cables for possible interruptions or shorts.
- If the damage has burnt a printed circuit board don't try to repair it, replace with a new one.

TESTING GEAR

- Audio Generator
- Dual Trace Oscilloscope
- Digital Multimeter
- 4E 800W, 8E 1300W, 100E 90W resistors
- Variac
- Digital Thermometer (not indispensable)

SETUP

- Connect the Variac between the Mains and the amplifier and set it at zero voltage.
- Turn full counter-clockwise the LEVEL potentiometers.
- Connect the audio generator to the channel inputs and set it to 1KHz 775mVrms (0dBu) sinusoidal signal.
- Connect the two scope traces to the amplifier outputs, before the relay, and set them in DC at 50V/div. 2mS/div.

SUPPLY CHECK

- Verify with the Multimeter the insulation between the heatsinks and all transistor collectors mounted on them; placing the multimeter tips between the screw heads and the collector pins you can exclude an erroneus reading due to the insulation of the heatsink anodization.
- Verify with the Multimeter the NTC (RT1) and R1 paralleled resistor value, it must be about 7Kohm (at 25°C).
- Disconnect the amplifier module supplies of each channel (red and yellow wires).
- Set the Variac to the nominal mains voltage, turn on the Amplifier, then check with the Multimeter the AC supply voltages:

F1-F2 = 29±2Vac.
RED secondary wires = 137±7Vac.

- Re-set the Variac at zero voltage, turn off the amplifier and reconnect the supplies at each amplifier module.
- Set up the Variac slowly monitoring the oscilloscope screen, it should display no signal; if you notice a DC voltage or a protection trips check the amplifier as suggested in the ADVICES.
- As soon as the +12VF supply circuit reaches its nominal value, all cooling fans run at their minimum and the speaker output relais (J201-202) switch.
- When the Variac ac voltage reaches the nominal voltage verify the DC supplies as follow:

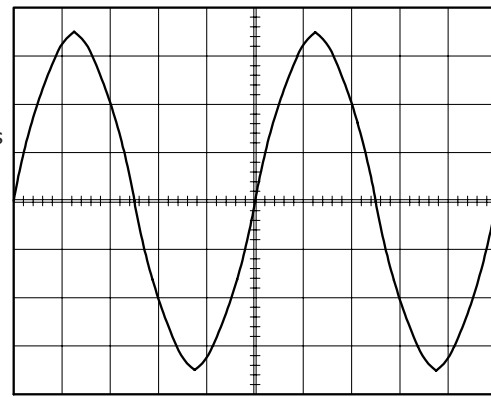
+VCC = +92±6Vdc
-VCC = -92±6Vdc
U501 pin 8 = +12±0.5Vdc
U501 pin 4 = -12±0.5Vdc
U403 pin 3 = +12.5±0.5Vdc

- If one or more voltages don't correspond, check the rectifiers, capacitors and transformers disconnecting them from circuitry.

CHANNEL CHECK

- Be sure you have disconnected the load resistor.
- Increasing the input signal also the output signal raise accordingly, it must be symmetrical without visible distortion or oscillation as shown in figure (note: the figure is representative don't refer to the levels displayed). If there is a distortion read the section ADVICES.

OSCILLOSCOPE FIGURE



- When the input signal exceeds -20dBu (24Vpp on output) the fans turn at their maximum speed.
- Firstly you must check the channel without load, afterwards you must repeat the check with the loads attached, the following table reports the approx. maximum level obtainable with this amp:

	out level	in level
no load	178Vpp	+1.0dBu
1CH 4E	154Vpp	+0.8dBu
2CH 4E	141Vpp	+0.0dBu
Bridge 8E	278Vpp	-0.5dBu

LEVEL METER ADJUSTMENT

- Check if the clip led lights at -2dBu on input (~130Vpp on output), if necessary adjust the trimmers W301/2 on display board.

OFFSET ADJUSTMENT

- Set the input level at minimum (no signal), the output dc offset voltage must be within range ±20mV, if necessary adjust the VR201 trimmer (for each channel) to be within this range.

BIAS ADJUSTMENT

- No bias adjustment is necessary for this amplifier circuitry; in any case the amplifier has the possibility to adjust it if necessary. To check properly the bias proceed as follows:
- Using a sinusoidal signal (1KHz or more) and the 4E load attached, wait till the heatsink temperature reaches about 60°C.
- Turn down the signal at the smallest intensity you can read on your oscilloscope trace connected at the amplifier output.
- Zoom in the crossing region using the amplitude, timebase and trigger controls of your oscilloscope. If you see a distortion, try to eliminate it adjusting the VR202 trimmer.
- Finally, set the input level at minimum and verify with the multimeter attached across an emitter resistance (p.e. R232) that the dc voltage doesn't exceed 10mV.

ADVICES

- If you have determinate that the problem is a short on a rail, you must check the output transistors.
- To determine which transistor devices are bad, use a soldering iron to lift one leg of each emitter pin and measure the resistance across emitter and collector of each device. Unsolder and lift one leg of each base pin and check the base-collector resistance. Replace any device that measure as a short.
- If all the transistors are OK, unsolder and lift one leg of each diode and check them.
- Check the circuit board for open foil traces.
- Use the Multimeter to check the resistors, particularly the base and emitter resistors of damaged transistor.
- If the input sinewave appears to be distorted during the negative cycle, you can assume that the problem is located somewhere in the circuitry of the positive rail.
- If the positive cycle appears distorted, you can assume that the problem is in the circuitry of the negative rail.
- The dc voltages printed on the schematics are measured with the amplifier in steady state without input signal and nominal mains voltage supply, it can be useful to localize a damage.

PROCON1500p - Test procedures

PRECAUTION

- To prevent short circuit during any test, the oscilloscope must be EARTH INSULATED, this occurs because some test require to connect its probe to the amplifier output, non-compliance may cause damages to oscilloscope inputs circuitry.
- Before removing or installing any modules and connectors, disconnect the amplifier from AC MAINS and measure the DC supply voltages across each of the power supply capacitors. If your measurement on any of the caps is greater than 10Vdc, connect a 100E 100W resistor across the applicable caps to discharge them for your safety. Remember to remove the discharge resistor immediately after discharging caps. Do not power up the amplifier with the discharge resistor connected.
- Do not check the amplifier with the speakers connected use the appropriate load resistors only.
- BE CAREFUL increasing the Variac you must not exceed the nominal mains voltage plus its tolerance (see specifications) any upper voltage can be cause of damage.

VISUAL CHECK

- Use compressed air to clear dust in the amplifier chassis.
- Before proceed to supply the amplifier check visually the internal assembly, if appears an evident damage find the most possible reasons that cause it.
- Check the wiring cables for possible interruptions or shorts.
- If the damage has burnt a printed circuit board don't try to repair it, replace with a new one.

TESTING GEAR

- Audio Generator
- Dual Trace Oscilloscope
- Digital Multimeter
- 4E 900W, 8E 1500W, 100E 100W resistors
- Variac
- Digital Thermometer (not indispensable)

SETUP

- Connect the Variac between the Mains and the amplifier and set it at zero voltage.
- Turn full counter-clockwise the LEVEL potentiometers.
- Connect the audio generator to the channel inputs and set it to 1KHz 775mVrms (0dBu) sinusoidal signal.
- Connect the two scope traces to the amplifier outputs, before the relay, and set them in DC at 50V/div. 2mS/div.

SUPPLY CHECK

- Verify with the Multimeter the insulation between the heatsinks and all transistor collectors mounted on them; placing the multimeter tips between the screw heads and the collector pins you can exclude an erroneus reading due to the insulation of the heatsink anodization.
- Verify with the Multimeter the NTC (RT1) and R1 paralleled resistor value, it must be about 7Kohm (at 25°C).
- Disconnect the amplifier module supplies of each channel (red and yellow wires).
- Set the Variac to the nominal mains voltage, turn on the Amplifier, then check with the Multimeter the AC supply voltages:

F1-F2 = 29±2Vac.
RED secondary wires = 145±8Vac.

- Re-set the Variac at zero voltage, turn off the amplifier and reconnect the supplies at each amplifier module.
- Set up the Variac slowly monitoring the oscilloscope screen, it should display no signal; if you notice a DC voltage or a protection trips check the amplifier as suggested in the ADVICES.
- As soon as the +12VF supply circuit reaches its nominal value, all cooling fans run at their minimum and the speaker output relais (J201-202) switch.
- When the Variac ac voltage reaches the nominal voltage verify the DC supplies as follow:

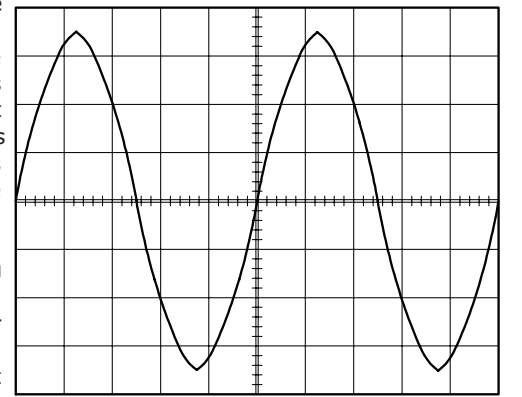
+VCC = +97±6Vdc
-VCC = -97±6Vdc
U501 pin 8 = +12±0.5Vdc
U501 pin 4 = -12±0.5Vdc
U403 pin 3 = +12.5±0.5Vdc

- If one or more voltages don't correspond, check the rectifiers, capacitors and transformers disconnecting them from circuitry.

CHANNEL CHECK

- Be sure you have disconnected the load resistor.
- Increasing the input signal also the output signal raise accordingly, it must be symmetrical without visible distortion or oscillation as shown in figure (note: the figure is representative don't refer to the levels displayed). If there is a distortion read the section ADVICES.

OSCILLOSCOPE FIGURE



- When the input signal exceeds -20dBu (24Vpp on output) the fans turn at their maximum speed.
- Firstly you must check the channel without load, afterwards you must repeat the check with the loads attached, the following table reports the approx. maximum level obtainable with this amp:

	out level	in level
no load	189Vpp	+1.0dBu
1CH 4E	166Vpp	+0.7dBu
2CH 4E	154Vpp	+0.2dBu
Bridge 8E	307Vpp	+0.0dBu

LEVEL METER ADJUSTMENT

- Check if the clip led lights at -2dBu on input (~130Vpp on output), if necessary adjust the trimmers W301/2 on display board.

OFFSET ADJUSTMENT

- Set the input level at minimum (no signal), the output dc offset voltage must be within range ±20mV, if necessary adjust the VR201 trimmer (for each channel) to be within this range.

BIAS ADJUSTMENT

- No bias adjustment is necessary for this amplifier circuitry; in any case the amplifier has the possibility to adjust it if necessary. To check properly the bias proceed as follows:
- Using a sinusoidal signal (1KHz or more) and the 4E load attached, wait till the heatsink temperature reaches about 60°C.
- Turn down the signal at the smallest intensity you can read on your oscilloscope trace connected at the amplifier output.
- Zoom in the crossing region using the amplitude, timebase and trigger controls of your oscilloscope. If you see a distortion, try to eliminate it adjusting the VR202 trimmer.
- Finally, set the input level at minimum and verify with the multimeter attached across an emitter resistance (p.e. R232) that the dc voltage doesn't exceed 10mV.

ADVICES

- If you have determinate that the problem is a short on a rail, you must check the output transistors.
- To determine which transistor devices are bad, use a soldering iron to lift one leg of each emitter pin and measure the resistance across emitter and collector of each device. Unsolder and lift one leg of each base pin and check the base-collector resistance. Replace any device that measure as a short.
- If all the transistors are OK, unsolder and lift one leg of each diode and check them.
- Check the circuit board for open foil traces.
- Use the Multimeter to check the resistors, particularly the base and emitter resistors of damaged transistor.
- If the input sinewave appears to be distorted during the negative cycle, you can assume that the problem is located somewhere in the circuitry of the positive rail.
- If the positive cycle appears distorted, you can assume that the problem is in the circuitry of the negative rail.
- The dc voltages printed on the schematics are measured with the amplifier in steady state without input signal and nominal mains voltage supply, it can be useful to localize a damage.

PROCON1800p - Test procedures

PRECAUTION

- To prevent short circuit during any test, the oscilloscope must be EARTH INSULATED, this occurs because some test require to connect its probe to the amplifier output, non-compliance may cause damages to oscilloscope inputs circuitry.
- Before removing or installing any modules and connectors, disconnect the amplifier from AC MAINS and measure the DC supply voltages across each of the power supply capacitors. If your measurement on any of the caps is greater than 10Vdc, connect a 100E 120W resistor across the applicable caps to discharge them for your safety. Remember to remove the discharge resistor immediately after discharging caps. Do not power up the amplifier with the discharge resistor connected.
- Do not check the amplifier with the speakers connected use the appropriate load resistors only.
- BE CAREFUL increasing the Variac you must not exceed the nominal mains voltage plus its tolerance (see specifications) any upper voltage can be cause of damage.

VISUAL CHECK

- Use compressed air to clear dust in the amplifier chassis.
- Before proceed to supply the amplifier check visually the internal assembly, if appears an evident damage find the most possible reasons that cause it.
- Check the wiring cables for possible interruptions or shorts.
- If the damage has burnt a printed circuit board don't try to repair it, replace with a new one.

TESTING GEAR

- Audio Generator
- Dual Trace Oscilloscope
- Digital Multimeter
- 4E 1100W, 8E 2000W, 100E 120W resistors
- Variac
- Digital Thermometer (not indispensable)

SETUP

- Connect the Variac between the Mains and the amplifier and set it at zero voltage.
- Turn full counter-clockwise the LEVEL potentiometers.
- Connect the audio generator to the channel inputs and set it to 1KHz 775mVrms (0dBu) sinusoidal signal.
- Connect the two scope traces to the amplifier outputs, before the relay, and set them in DC at 50V/div. 2mS/div.

SUPPLY CHECK

- Verify with the Multimeter the insulation between the heatsinks and all transistor collectors mounted on them; placing the multimeter tips between the screw heads and the collector pins you can exclude an erroneous reading due to the insulation of the heatsink anodization.
- Verify with the Multimeter the NTC (RT1) and R1 paralleled resistor value, it must be about 7Kohm (at 25°C).
- Disconnect the amplifier module supplies of each channel (red and yellow wires).
- Set the Variac to the nominal mains voltage, turn on the Amplifier, then check with the Multimeter the AC supply voltages:

F1-F2 = 29±2Vac.
RED secondary wires = 164±9Vac.

- Re-set the Variac at zero voltage, turn off the amplifier and reconnect the supplies at each amplifier module.
- Set up the Variac slowly monitoring the oscilloscope screen, it should display no signal; if you notice a DC voltage or a protection trips check the amplifier as suggested in the ADVICES.
- As soon as the +12VF supply circuit reaches its nominal value, all cooling fans run at their minimum and the speaker output relays (J201-202) switch.
- When the Variac ac voltage reaches the nominal voltage verify the DC supplies as follow:

+VCC = +110±7Vdc
-VCC = -110±7Vdc
U501 pin 8 = +12±0.5Vdc
U501 pin 4 = -12±0.5Vdc
U403 pin 3 = +12.5±0.5Vdc

- If one or more voltages don't correspond, check the rectifiers, capacitors and transformers disconnecting them from circuitry.

CHANNEL CHECK

- Be sure you have disconnected the load resistor.
- Increasing the input signal also the output signal raise accordingly, it must be symmetrical without visible distortion or oscillation as shown in figure (note: the figure is representative don't refer to the levels displayed). If there is a distortion read the section ADVICES.

- When the input signal exceeds -20dBu (24Vpp on output) the fans turn at their maximum speed.
- Firstly you must check the channel without load, afterwards you must repeat the check with the loads attached, the following table reports the approx. maximum level obtainable with this amp:

	out level	in level
no load	210Vpp	+2.0dBu
1CH 4E	184Vpp	+1.7dBu
2CH 4E	170Vpp	+1.0dBu
Bridge 8E	343Vpp	+0.6dBu

LEVEL METER ADJUSTMENT

- Check if the clip led lights at -2dBu on input (~140Vpp on output), if necessary adjust the trimmers W301/2 on display board.

OFFSET ADJUSTMENT

- Set the input level at minimum (no signal), the output dc offset voltage must be within range ±20mV, if necessary adjust the VR201 trimmer (for each channel) to be within this range.

BIAS ADJUSTMENT

- No bias adjustment is necessary for this amplifier circuitry; in any case the amplifier has the possibility to adjust it if necessary. To check properly the bias proceed as follows:
 - Using a sinusoidal signal (1KHz or more) and the 4E load attached, wait till the heatsink temperature reaches about 60°C.
 - Turn down the signal at the smallest intensity you can read on your oscilloscope trace connected at the amplifier output.
 - Zoom in the crossing region using the amplitude, timebase and trigger controls of your oscilloscope. If you see a distortion, try to eliminate it adjusting the VR202 trimmer.
 - Finally, set the input level at minimum and verify with the multimeter attached across an emitter resistance (p.e. R232) that the dc voltage doesn't exceed 10mV.

ADVICES

- If you have determinate that the problem is a short on a rail, you must check the output transistors.
- To determine which transistor devices are bad, use a soldering iron to lift one leg of each emitter pin and measure the resistance across emitter and collector of each device. Unsolder and lift one leg of each base pin and check the base-collector resistance. Replace any device that measure as a short.
- If all the transistors are OK, unsolder and lift one leg of each diode and check them.
- Check the circuit board for open foil traces.
- Use the Multimeter to check the resistors, particularly the base and emitter resistors of damaged transistor.
- If the input sinewave appears to be distorted during the negative cycle, you can assume that the problem is located somewhere in the circuitry of the positive rail.
- If the positive cycle appears distorted, you can assume that the problem is in the circuitry of the negative rail.
- The dc voltages printed on the schematics are measured with the amplifier in steady state without input signal and nominal mains voltage supply, it can be useful to localize a damage.

PROCON2200p - Test procedures

PRECAUTION

- To prevent short circuit during any test, the oscilloscope must be EARTH INSULATED, this occurs because some test require to connect its probe to the amplifier output, non-compliance may cause damages to oscilloscope inputs circuitry.
- Before removing or installing any modules and connectors, disconnect the amplifier from AC MAINS and measure the DC supply voltages across each of the power supply capacitors. If your measurement on any of the caps is greater than 10Vdc, connect a 100E 150W resistor across the applicable caps to discharge them for your safety. Remember to remove the discharge resistor immediately after discharging caps. Do not power up the amplifier with the discharge resistor connected.
- Do not check the amplifier with the speakers connected use the appropriate load resistors only.
- BE CAREFUL increasing the Variac you must not exceed the nominal mains voltage plus its tolerance (see specifications) any upper voltage can be cause of damage.

VISUAL CHECK

- Use compressed air to clear dust in the amplifier chassis.
- Before proceed to supply the amplifier check visually the internal assembly, if appears an evident damage find the most possible reasons that cause it.
- Check the wiring cables for possible interruptions or shorts.
- If the damage has burnt a printed circuit board don't try to repair it, replace with a new one.

TESTING GEAR

- Audio Generator
- Dual Trace Oscilloscope
- Digital Multimeter
- 4E 1300W, 8E 2200W, 100E 150W resistors
- Variac
- Digital Thermometer (not indispensable)

SETUP

- Connect the Variac between the Mains and the amplifier and set it at zero voltage.
- Turn full counter-clockwise the LEVEL potentiometers.
- Connect the audio generator to the channel inputs and set it to 1KHz 775mVrms (0dBu) sinusoidal signal.
- Connect the two scope traces to the amplifier outputs, before the relay, and set them in DC at 50V/div. 2mS/div.

SUPPLY CHECK

- Verify with the Multimeter the insulation between the heatsinks and all transistor collectors mounted on them; placing the multimeter tips between the screw heads and the collector pins you can exclude an erroneous reading due to the insulation of the heatsink anodization.
- Verify with the Multimeter the NTC (RT1) and R1 paralleled resistor value, it must be about 7Kohm (at 25°C).
- Disconnect the amplifier module supplies of each channel (red and yellow wires).
- Set the Variac to the nominal mains voltage, turn on the Amplifier, then check with the Multimeter the AC supply voltages:

F1-F2 = 29±2Vac.
RED secondary wires = 173±10Vac.

- Re-set the Variac at zero voltage, turn off the amplifier and reconnect the supplies at each amplifier module.
- Set up the Variac slowly monitoring the oscilloscope screen, it should display no signal; if you notice a DC voltage or a protection trips check the amplifier as suggested in the ADVICES.
- As soon as the +12VF supply circuit reaches its nominal value, all cooling fans run at their minimum and the speaker output relays (J201-202) switch.
- When the Variac ac voltage reaches the nominal voltage verify the DC supplies as follow:

+VCC = +115±8Vdc
-VCC = -115±8Vdc
U501 pin 8 = +12±0.5Vdc
U501 pin 4 = -12±0.5Vdc
U403 pin 3 = +12.5±0.5Vdc

- If one or more voltages don't correspond, check the rectifiers, capacitors and transformers disconnecting them from circuitry.

CHANNEL CHECK

- Be sure you have disconnected the load resistor.
- Increasing the input signal also the output signal raise accordingly, it must be symmetrical without visible distortion or oscillation as shown in figure (note: the figure is representative don't refer to the levels displayed). If there is a distortion read the section ADVICES.

- When the input signal exceeds -20dBu (20Vpp on output) the fans turn at their maximum speed.
- Firstly you must check the channel without load, afterwards you must repeat the check with the loads attached, the following table reports the approx. maximum level obtainable with this amp:

	out level	in level
no load	225Vpp	+2.0dBu
1CH 4E	200Vpp	+1.7dBu
2CH 4E	185Vpp	+1.0dBu
Bridge 8E	373Vpp	+0.6dBu

LEVEL METER ADJUSTMENT

- Check if the clip led lights at -2dBu on input (~150Vpp on output), if necessary adjust the trimmers W301/2 on display board.

OFFSET ADJUSTMENT

- Set the input level at minimum (no signal), the output dc offset voltage must be within range ±20mV, if necessary adjust the VR201 trimmer (for each channel) to be within this range.

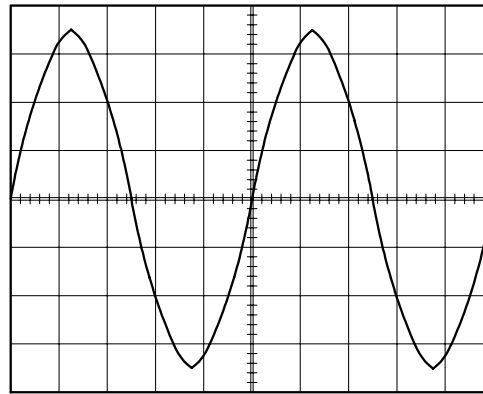
BIAS ADJUSTMENT

- No bias adjustment is necessary for this amplifier circuitry; in any case the amplifier has the possibility to adjust it if necessary. To check properly the bias proceed as follows:
 - Using a sinusoidal signal (1KHz or more) and the 4E load attached, wait till the heatsink temperature reaches about 60°C.
 - Turn down the signal at the smallest intensity you can read on your oscilloscope trace connected at the amplifier output.
 - Zoom in the crossing region using the amplitude, timebase and trigger controls of your oscilloscope. If you see a distortion, try to eliminate it adjusting the VR202 trimmer.
 - Finally, set the input level at minimum and verify with the multimeter attached across an emitter resistance (p.e. R232) that the dc voltage doesn't exceed 10mV.

ADVICES

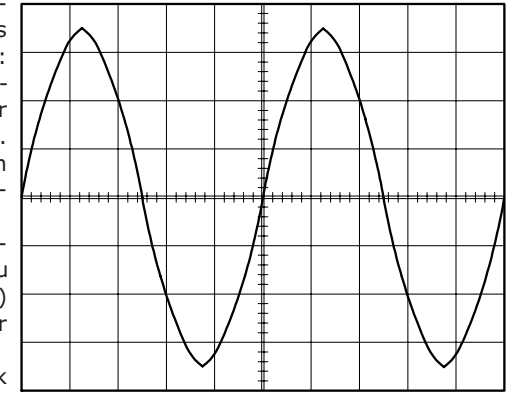
- If you have determinate that the problem is a short on a rail, you must check the output transistors.
- To determine which transistor devices are bad, use a soldering iron to lift one leg of each emitter pin and measure the resistance across emitter and collector of each device. Unsolder and lift one leg of each base pin and check the base-collector resistance. Replace any device that measure as a short.
- If all the transistors are OK, unsolder and lift one leg of each diode and check them.
- Check the circuit board for open foil traces.
- Use the Multimeter to check the resistors, particularly the base and emitter resistors of damaged transistor.
- If the input sinewave appears to be distorted during the negative cycle, you can assume that the problem is located somewhere in the circuitry of the positive rail.
- If the positive cycle appears distorted, you can assume that the problem is in the circuitry of the negative rail.
- The dc voltages printed on the schematics are measured with the amplifier in steady state without input signal and nominal mains voltage supply, it can be useful to localize a damage.

OSCILLOSCOPE FIGURE

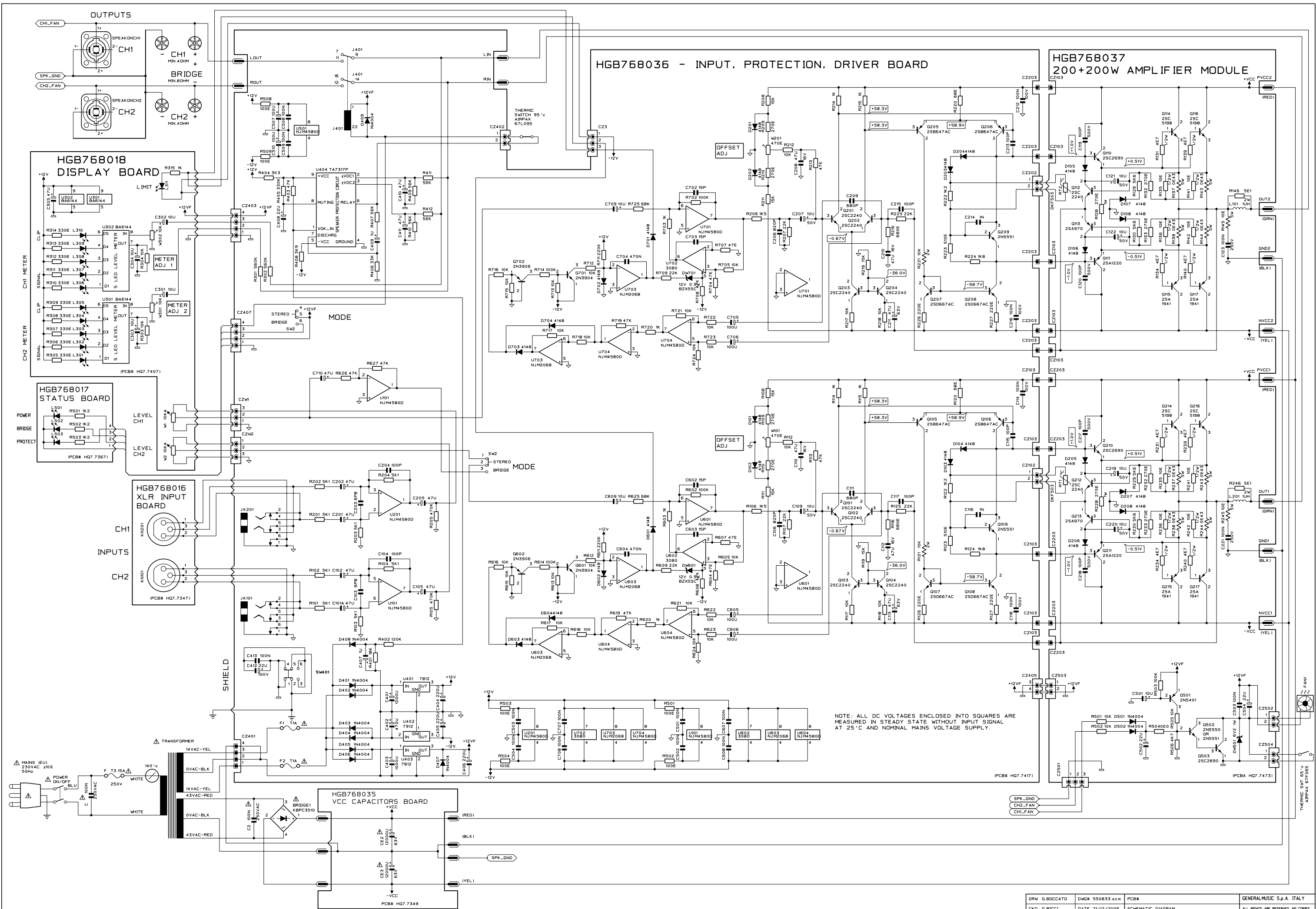


TRACE setting:
 TIMEBASE: 2mS/div.
 AMPLITUDE: 20V/div.

OSCILLOSCOPE FIGURE

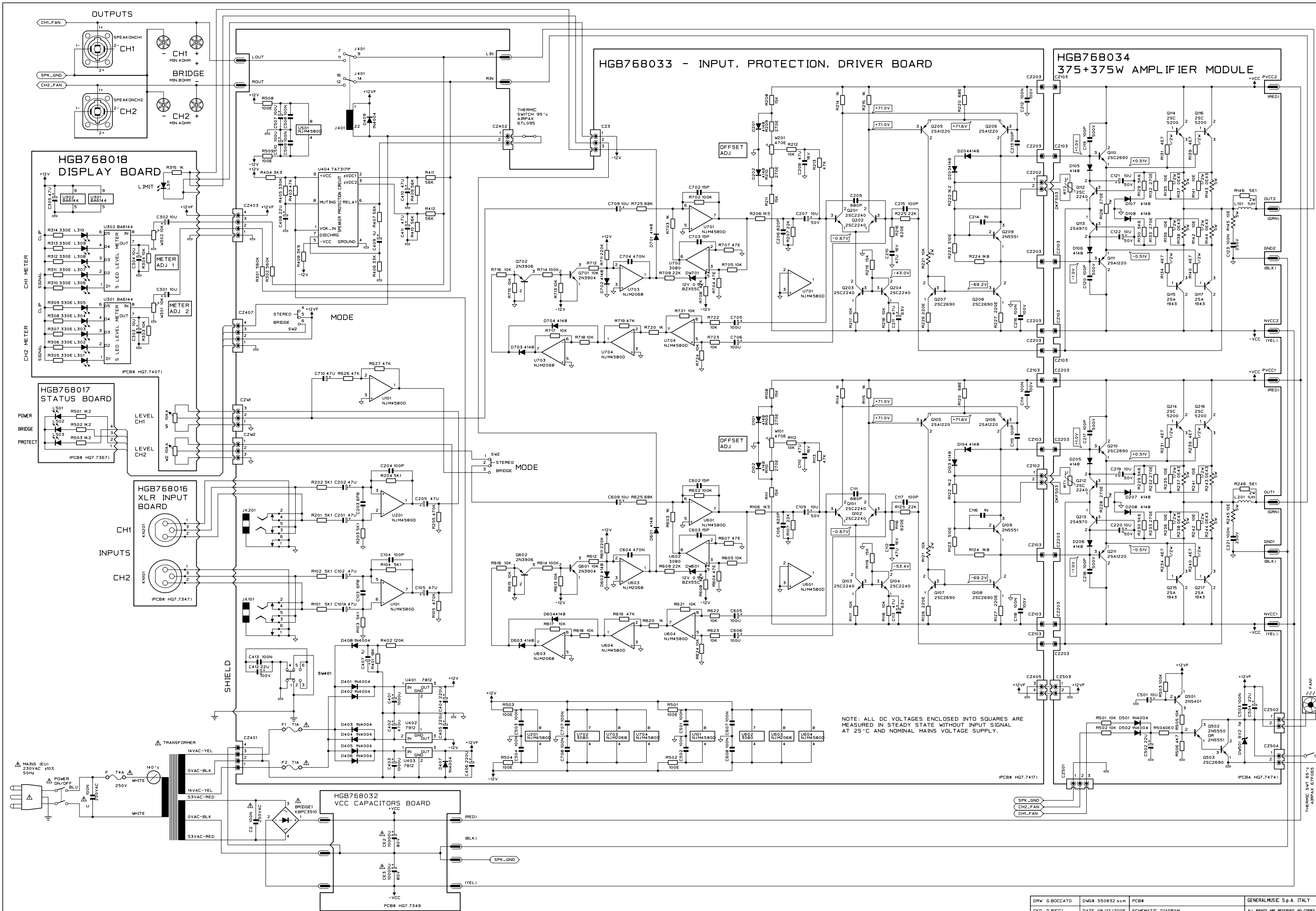


TRACE setting:
 TIMEBASE: 2mS/div.
 AMPLITUDE: 20V/div.



NOTE: ALL DC VOLTAGES ENCLOSED INTO SQUARES ARE MEASURED IN STEADY STATE WITHOUT INPUT SIGNAL AT 25°C AND NOMINAL MAINS VOLTAGE SUPPLY.

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HGB768033 - INPUT, PROTECTION, DRIVER BOARD

HGB768034 375+375W AMPLIFIER MODULE

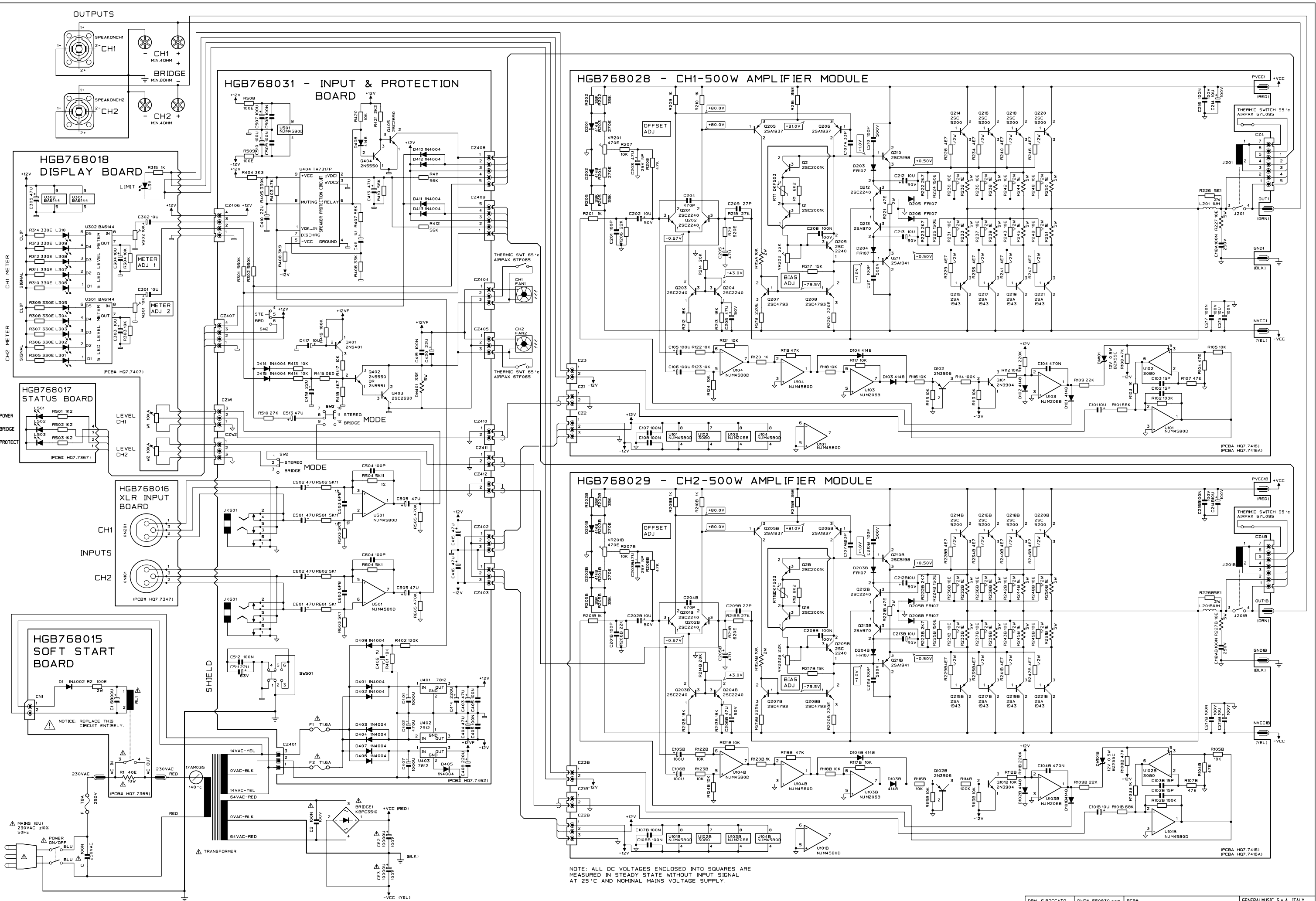
HGB768018 DISPLAY BOARD

HGB768017 STATUS BOARD

HGB768016 XLR INPUT BOARD

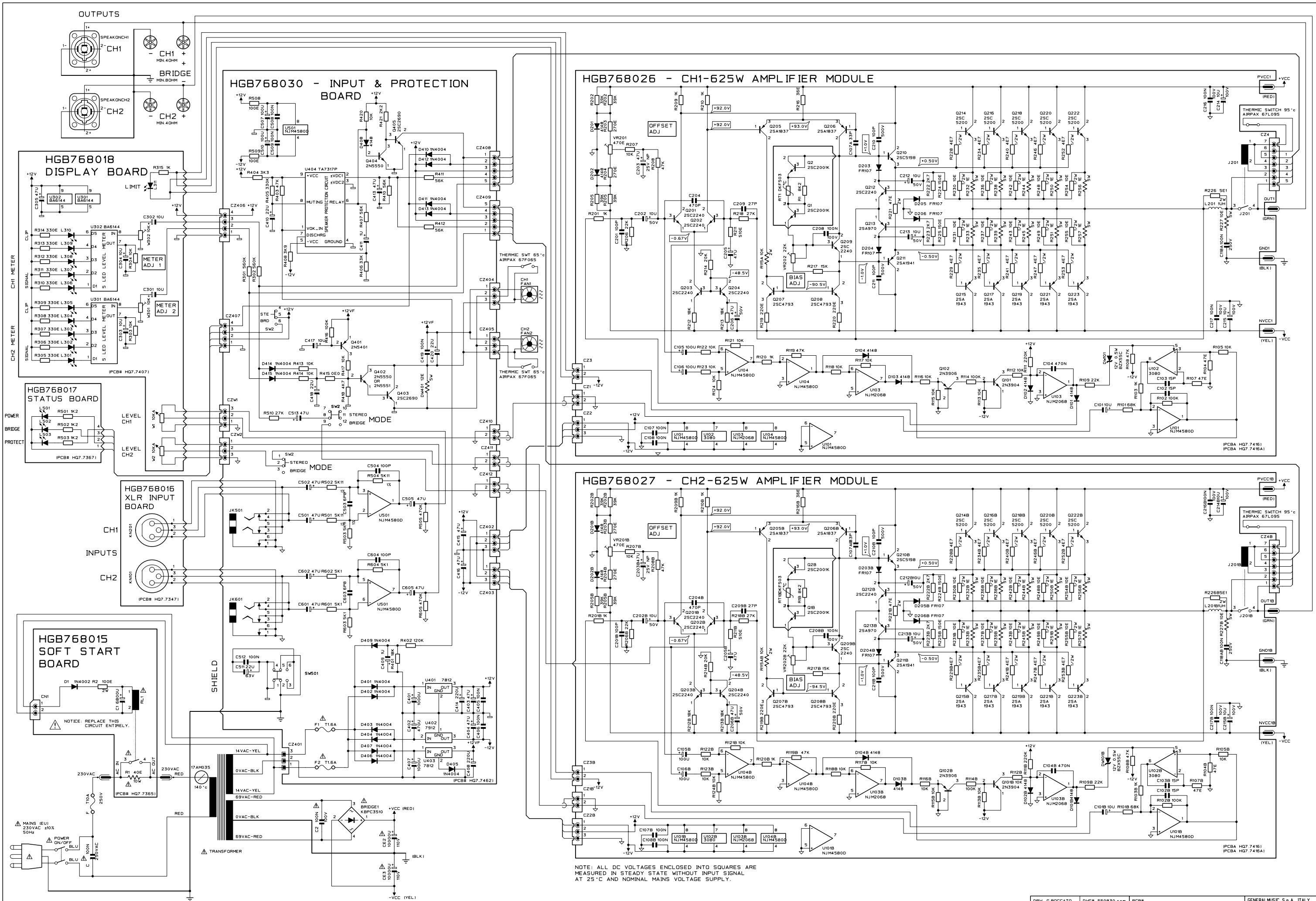
HGB768032 VCC CAPACITORS BOARD

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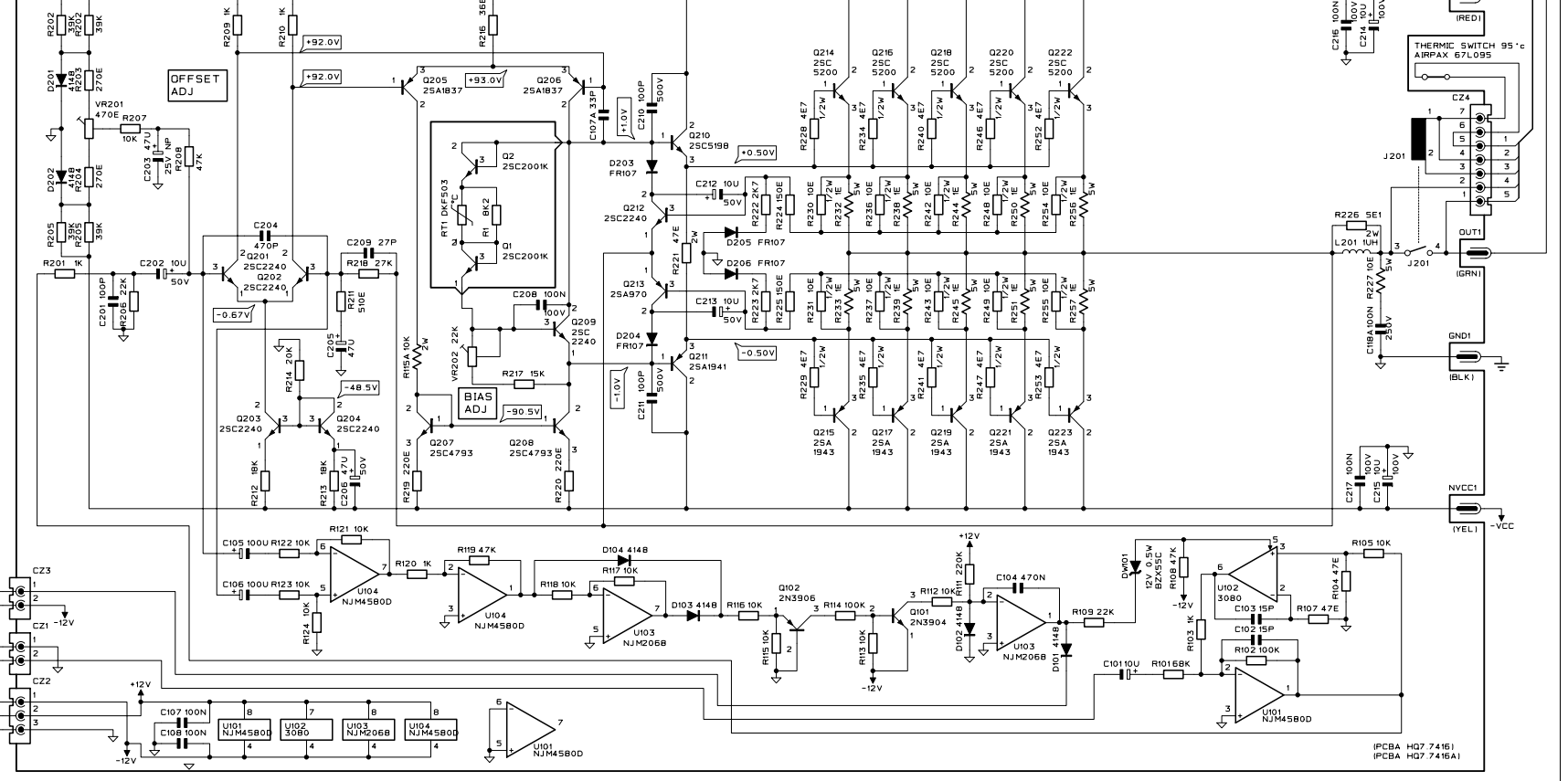


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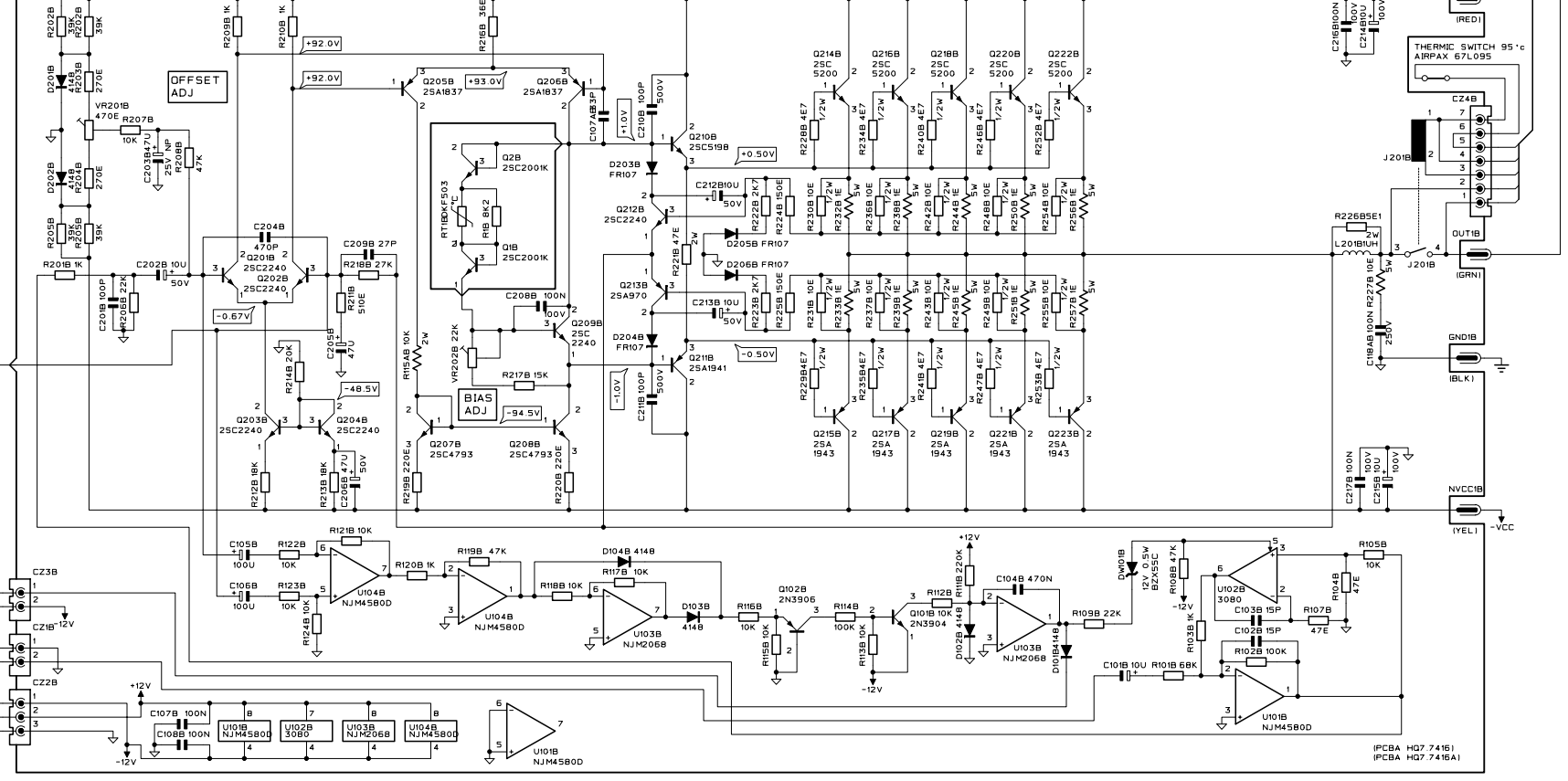
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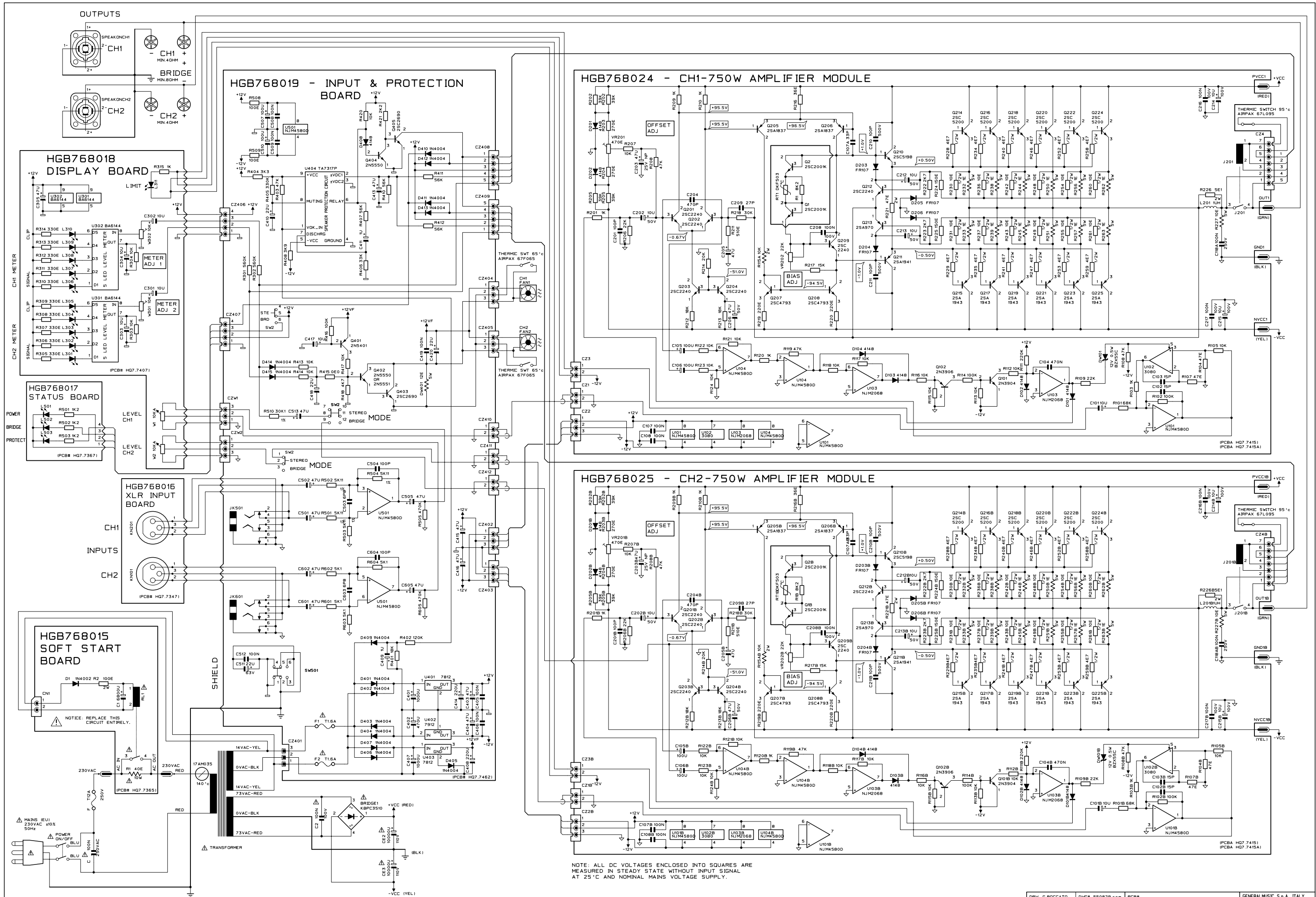
HGB768026 - CH1-625W AMPLIFIER MODULE



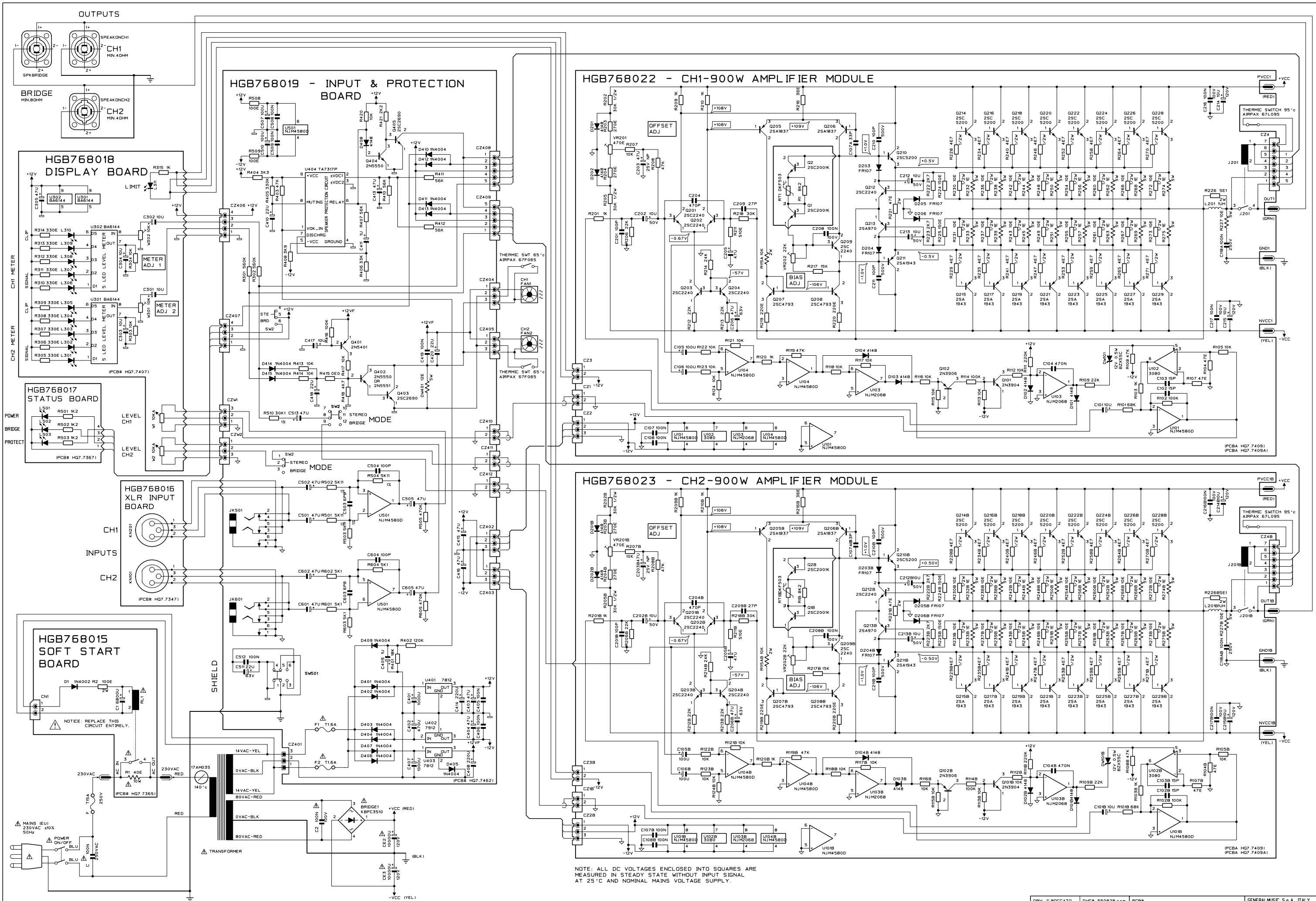
HGB768027 - CH2-625W AMPLIFIER MODULE



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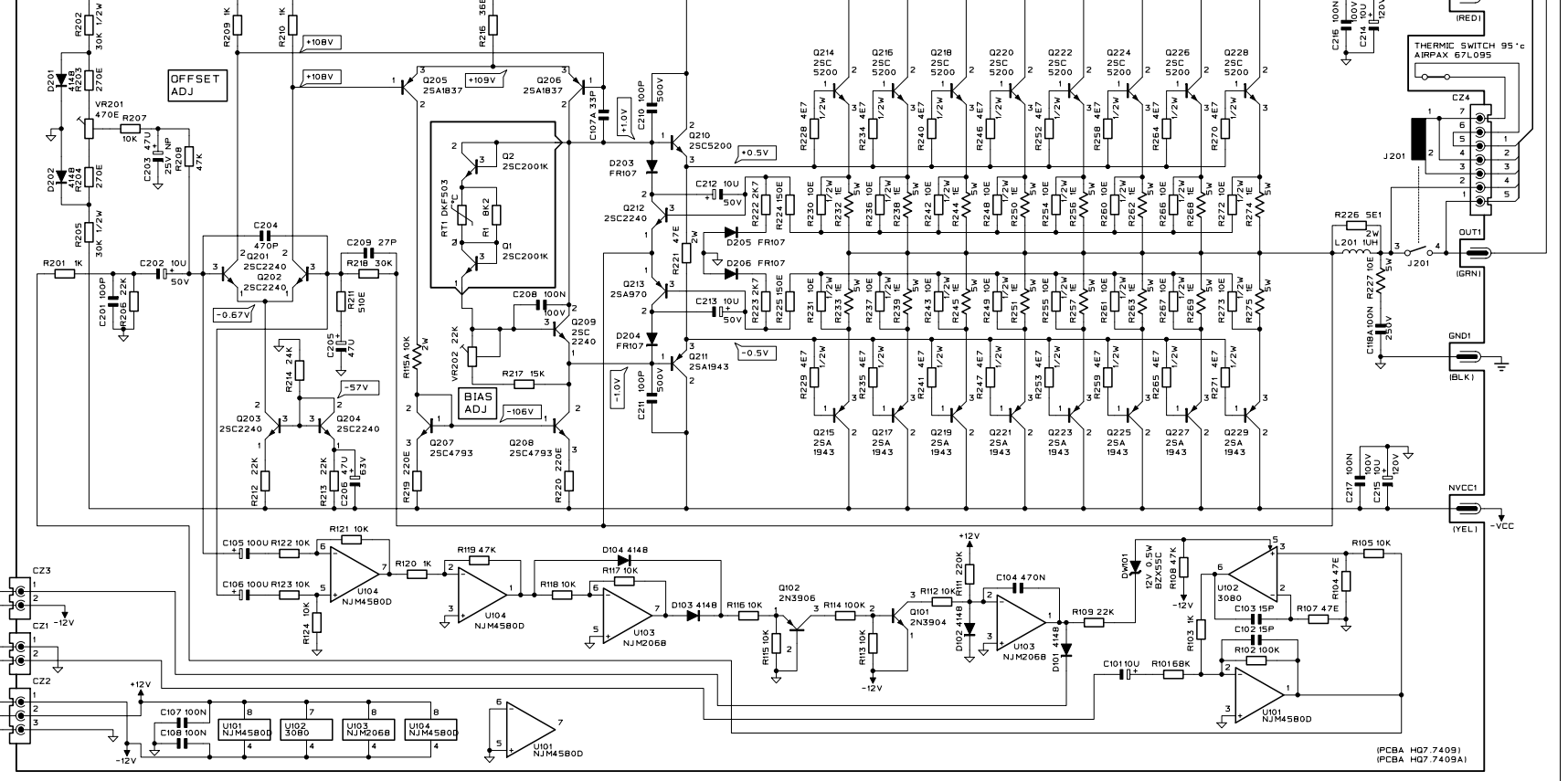


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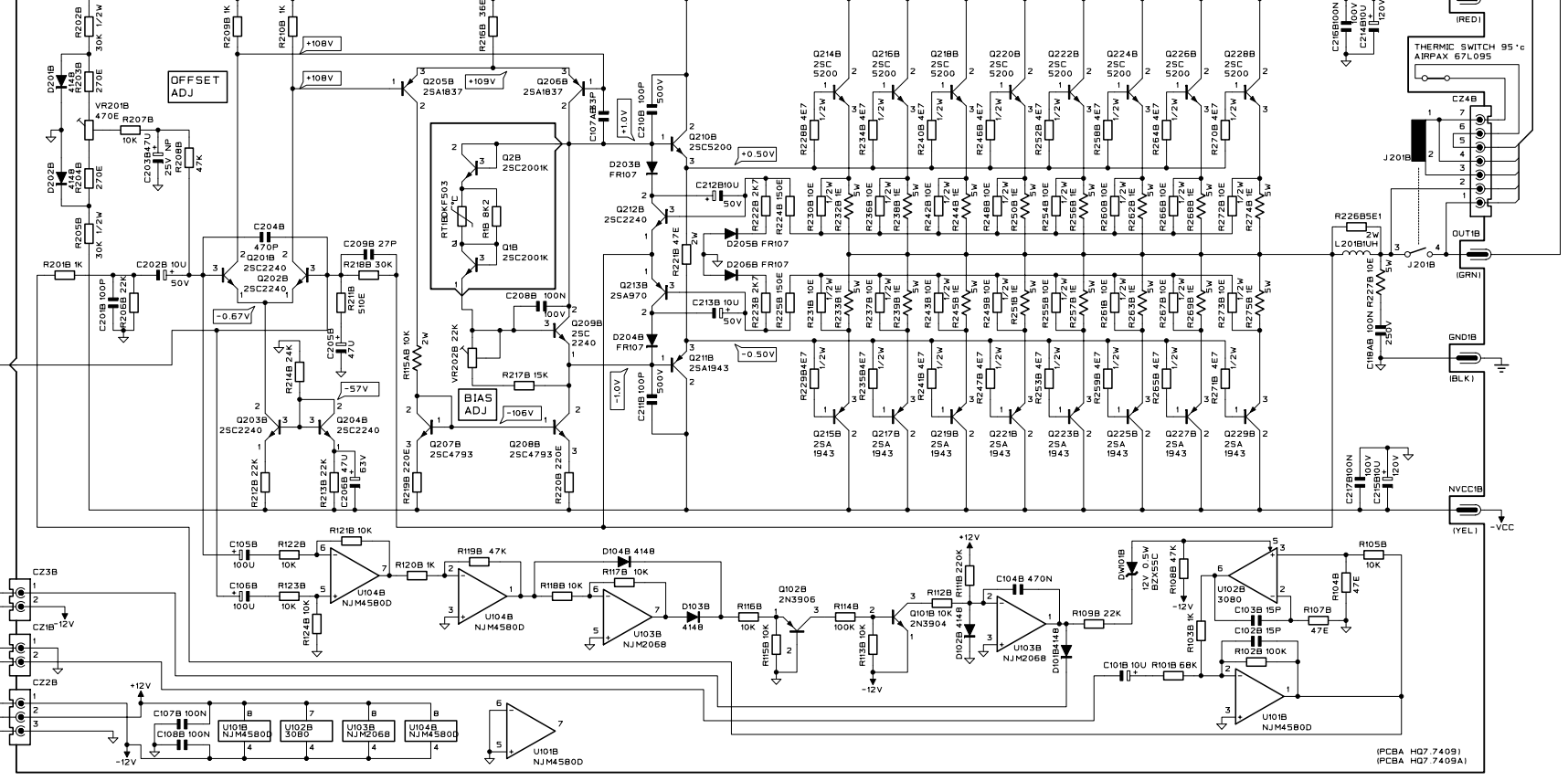


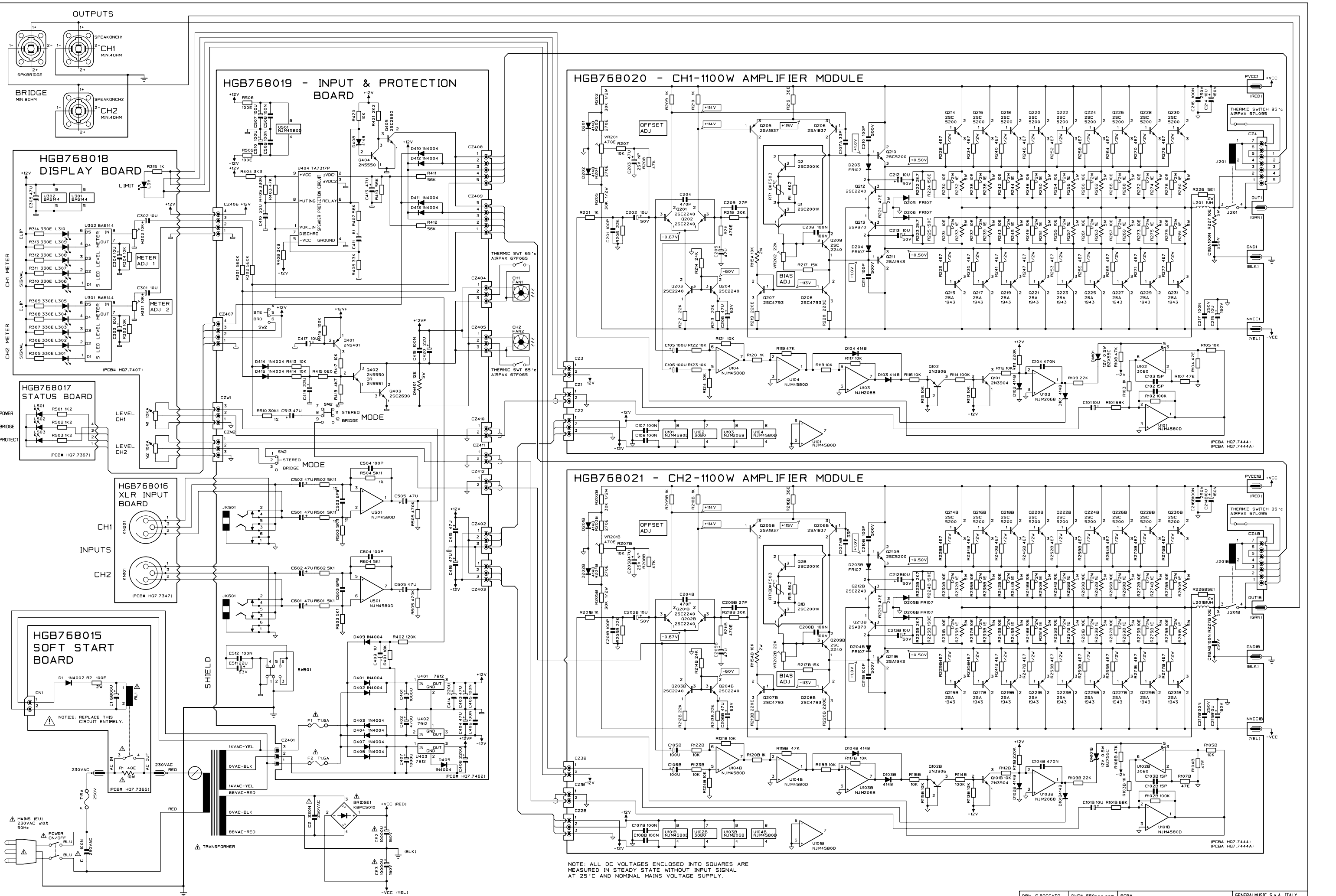
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HGB768022 - CH1-900W AMPLIFIER MODULE



HGB768023 - CH2-900W AMPLIFIER MODULE





NOTE: ALL DC VOLTAGES ENCLOSED INTO SQUARES ARE MEASURED IN STEADY STATE WITHOUT INPUT SIGNAL AT 25°C AND NOMINAL MAINS VOLTAGE SUPPLY.

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