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# IRT Eurocard

# Type AA-780

# 4 x Audio Matching Amplifiers



**Designed and manufactured in Australia**

**IRT can be found on the Internet at:**
**http://www.irtelectronics.com**

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# Type AA-780

# 4 x Audio Matching Amplifiers

# Instruction Book

Table of Contents



This instruction book applies to units later than S/N 9500000.

## Operational Safety:

### WARNING

Operation of electronic equipment involves the use of voltages and currents that may be dangerous to human life. Note that under certain conditions dangerous potentials may exist in some circuits when power controls are in the **OFF** position. Maintenance personnel should observe all safety regulations.

Do not make any adjustments inside equipment with power **ON** unless proper precautions are observed. All internal adjustments should only be made by suitably qualified personnel. All operational adjustments are available externally without the need for removing covers or use of extender cards.

# GENERAL DESCRIPTION

The AA-780 Eurocard audio interface amplifier module contains four separate amplifiers designed to provide level matching and interfacing between balanced 600 Ω and unbalanced high impedance audio signals.

The AA-780 is a standard IRT Eurocard module and is compatible with other IRT Eurocard products.

A gain control for each of the four channels is accessible through the front panel.

Each of the four channels can be individually configured as either balanced to unbalanced or unbalanced to balanced.

This allows the one module type to be used for a variety of interfacing purposes including:

- Gain matching of multiple unbalanced signals to balanced audio signals at a central location. (Nominally -6 dBV unbalanced to +8 dBu balanced and vice versa.)
- Matching balanced signals to unbalanced lines.
- Using hi-fi components such as CD players in a professional studio chain.
- Matching studio signals to unbalanced recorders.
- Matching transducers to instrumentation recorders.

## Standard features:

- User configurable
- Unbalanced to balanced or balanced to unbalanced operation for each channel individually selectable.
- High common mode rejection
- Wide gain range
- High packaging density

## Equipment provided:

AA-780 4 x audio matching amplifier module.
RB-780 Rear assembly

## Accessories available:-

FR-700 Eurocard module mounting frame:- Provides mounting for up to 12 AA-780 amplifiers and one PT-700 Dual AC power supply side by side in 134 mm of standard Rack space (3 Rack Units).

FR-722 1 RU chassis conversion/PSU The FR-722 provides a means of converting Eurocards to a 1 rack unit format. The FR-722 can be fitted with either one or two Eurocards in a horizontal side by side format. A single AC power supply is included to power the cards.

TME-6 Eurocard extender board.

Instruction Book.

# TECHNICAL SPECIFICATIONS
# IRT Eurocard module
# Type AA-780

## Inputs:

| | | |
|---|---|---|
| Type | | Tranformerless, choice of balanced or unbalanced. |
| Number | | 1 per amplifier. |
| Impedance | | > 10KΩ |
| Maximum input level | | 24 dBu |
| Input CMR | | > 45 dB 20 Hz to 20 KHz |

## Outputs:

| | | |
|---|---|---|
| Type | | Transformerless, choice of balanced or unbalanced. |
| Number | | 1 per amplifier. |
| Impedance | Balanced | < 40 Ω. |
| Impedance | Unbalanced | < 60 Ω. |
| Maximum output level | | 24 dBu |
| DC on Output | | < ±20 mV. |

## Performance:

| | |
|---|---|
| Overall gain | Set by front panel control<br>Adj. from no output to a max. of +10 dB |
| Frequency response (20 Hz to 20 KHz) | ±0.5 dB |
| Total harmonic distortion 20 Hz to 20 KHz | < 0.01% (measured @ +10 dBm input) |
| Phase difference between channels: 20 Hz to 15 KHz | < $0.1^{o}$ |
| Noise | < -75 dBm unweighted |
| Crosstalk ratio | > 80 dB |

| | | |
|---|---|---|
| **Connectors**: | Balanced | Plugable screw block connectors |
| | Unbalanced | RCA phono) |

## General:

| | | |
|---|---|---|
| Input power | | 28 Vac CT (14-0-14)<br>supplied from PT-700 (dual) or FR-722 (single)<br>or<br>± 16V DC |
| Power consumption | | 55 mA ( no signal ) |
| Temperature range | | 0 - 50° C ambient |
| Mechanical | | Suitable for mounting in IRT 19" rack chassis types FR-700 & FR-722 with input output and power connections on the rear panel |
| Finish: | Front escutcheon | Grey enamel, silk screened black lettering & red IRT logo |
| | Rear assembly | Detachable silk screened PCB with direct mount connectors to Eurocard and external signals |
| Dimensions | | 6 HP x 3 U x 220 mm IRT Eurocard |
| Standard accessories | | Matching balanced audio connectors<br>Instruction manual |
| Optional accessories | | TME-6 module extender card |

# CIRCUIT DESCRIPTION

(Refer to circuit diagram drawing # 803606)

Reference to the circuit shows that the AA-780 comprises a DC power supply section and four identical independent audio circuits. A description of these follows.

## Power supply:

Input power to the module may be fed by a number of means.

1. One or two 14 - 0 - 14 Vac supplies via connections on the 64 pin DIN rear connector of the module. (Used when module is mounted in FR-700 chassis or FR-748A chassis fitted with one or two PT-701 PSU's.)
2. Two ±16 Vdc supplies via connections on the 64 pin DIN rear connector of the module. (Used when module is mounted in FR-748A chassis fitted with one or two PT-748A PSU's.)
3. One 14 - 0 - 14 Vac supply and one ±16 Vdc supply via connections on the 64 pin DIN rear connector of the module. (Used when module is mounted in a FR-748A chassis fitted with 1 x PT-701 PSU and 1 x PT-748A PSU.)
4. A single 14 - 0 - 14 Vac supply connected to SK 2 on the rear assembly. (Used when module is mounted in FR-722 chassis.)

The input power is isolated by fusible resistors F 1 to F 4. Should these fail they should be only replaced by a similar type of the same value or protection of the common power supply will be compromised.

If an AC supply is provided, the isolated AC is full wave rectified by diodes D 1 to D4 and D5 to D 8 to provide a raw DC voltage of approximately 20 V at filter capacitors C 17 and C 18. The actual voltage will vary depending on the type of frame, loading of PSU by other modules and the local mains supply voltage.

If a DC supply is provided, the isolated DC passes through the diodes D 1 to D4 and D5 to D 8 which provide protection against accidental reverse polarity connection of the DC supply. Where a DC supply is used the input voltage must be at least ±15 Vdc under all conditions to ensure sufficient margin for the proper operation of the following voltage regulators and losses in the input fusible resistors and diodes.

The raw DC power is fed to three terminal regulator IC's which provide ±12 Vdc rails for the operating circuits.

A number of 10 μF tantalum tag capacitors are located at key points in the circuit to suppress interference on the DC rails. Should any of these fail they should be replaced by high quality tantalum tag capacitors of at least 16 Vdc rating.

## Audio matching amplifiers:

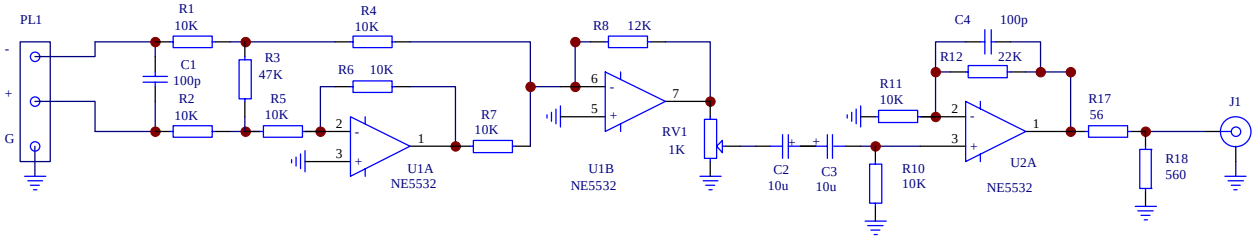
Four identical circuits are provided on the module. Only that for channel 1 will be described.

The circuit consists of the following parts:

1. Selection for balanced or unbalanced input and unbalanced or balanced output.
2. Balanced input amplifier
3. Balanced summing amplifier and unbalanced input amplifier
4. Output amplifier

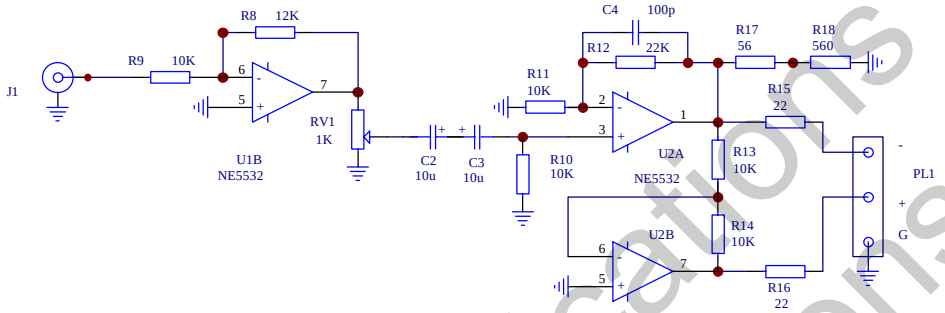
It should be noted that the three jumpers J 1 A, B & C should be set only according to the pattern described in the configuration section. Failure to observe this may cause damage to the module or associated equipment.

Simplified diagram of AA-780 in Balanced to Unbalanced configuration:




The balanced input amplifier U 1A inverts the incoming +ve signal and sums the result with the incoming -ve signal providing common mode rejection.

Simplified diagram of AA-780 in Unbalanced to Balanced configuration:




Amplifier U 1B acts as a summing amplifier for a balanced input signal or as an input amplifier for an unbalanced input signal. Its output is fed to the gain control potentiometer RV 1 which may be accessed by a screwdriver through the front panel to provide attenuation from full output to zero.

Up until this point the circuit has been DC coupled. In order to prevent DC bias fluctuations from possible DC content on the input, the output stage U 2A / U 2B is AC coupled by back to back high quality tantalum tag capacitors.

The output stage U 2A / U 2B provides a balanced output and additional gain. For unbalanced output operation only U 2A is effectively employed.

For unbalanced output operation R 17 and R 18 form a voltage divider to set the correct output level and provide an output sourcing impedance of approximately 60 Ω.

For balanced output operation R 15 and R 16 provide an output sourcing impedance of approximately 40 Ω.

## Wideband modification:

(For use with timecode, composite stereo and other extended frequency response signals.)
Capacitor C 4 in the feedback loop of U 2A provides high frequency rolloff above 20 KHz. If a higher frequency response is required the value of C 4 may be decreased from 100 pF to 22 pF. This will provide a useful response to 100 KHz ±0.5 dB.

## Gain range extension modification:

It can be seen from the above simplified diagrams that that amplifier U 1b is common to both configurations and that resistor R 8 sets the gain of this stage. Increasing the value of R 8 to 27 KΩ will result in approximately a 6 dB gain increase and to 47 KΩ in approximately a 12 dB gain increase.

Note however that the increase in gain will also result in an increase in noise. Whilst the NE5532 amplifier is a low noise type it is not considered to be sufficiently quiet for use as a preamplifier for dynamic microphones or other very low level signals.

## Internal Adjustments

There are no internal adjustments required except as noted in the configuration section.

# CONFIGURATION

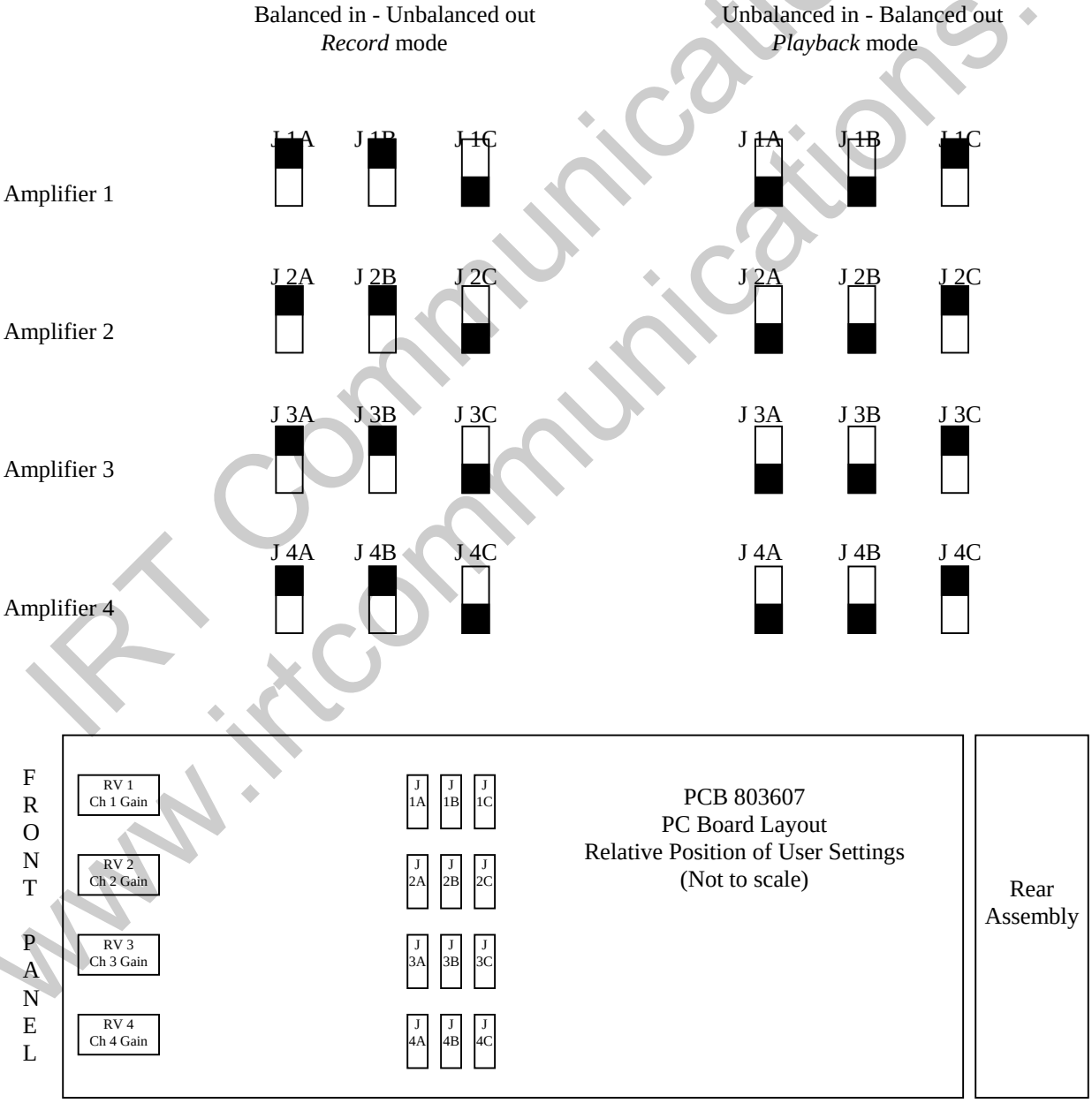
Each of the four amplifiers on the AA-780 module must be set for correct operation prior to being connected to external equipment.

When shipped all four amplifiers are set for unbalanced input and balanced output. This may also be described as “Playback” mode as it is the normal mode for connecting a CD, DAT or VHS player with unbalanced outputs to the AA-780 to provide balanced outputs to connect to a studio balanced system.

Operation with balanced input and unbalanced output may conversely be described as “Record” mode as it is the normal mode for connecting a balanced studio output line to the unbalanced record input of a VHS or DAT recorder.

The main module PCB is labelled with the jumper settings required for *Record* or *Playback* operation of each of the four amplifiers.

These are as follows:



# INSTALLATION

## Pre-installation:

### Handling:

This equipment may contain or be connected to static sensitive devices and proper static free handling precautions should be observed.

Where individual circuit cards are stored, they should be placed in antistatic bags. Proper antistatic procedures should be followed when inserting or removing cards from these bags.

### Power:

AC mains supply: Ensure that operating voltage of unit and local supply voltage match and that correct rating fuse is installed for local supply.

DC supply: Ensure that the correct polarity is observed and that DC supply voltage is maintained within the operating range specified.

### Earthing:

The earth path is dependent on the type of frame selected. In every case particular care should be taken to ensure that the frame is connected to earth for safety reasons. See frame manual for details.

**Signal earth:** For safety reasons a connection is made between signal earth and chassis earth. No attempt should be made to break this connection.

> It is strongly recommended that where double insulated equipment is being used that a proper connection be made between the signal earth and true ground earth at some point in the external circuit.

## Installation in frame or chassis:

See details in separate manual for selected frame type.

## Audio Connections:

Note that the connectors on the rear assembly are not marked as input or output. The function of each connector is dependent on the mode selected by the jumpers on the main PCB. See configuration section for details.

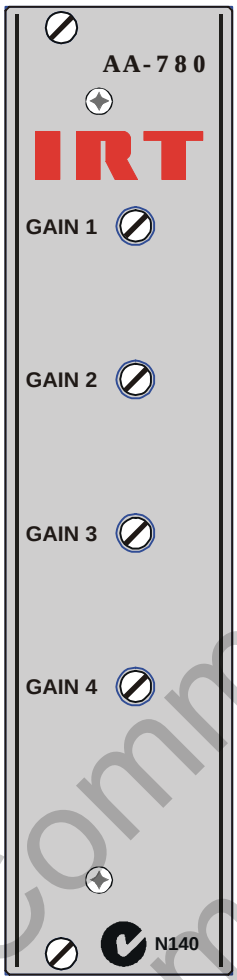
**Balanced connectors**: Connection is made to the removable screw down terminal blocks provided with the module. Observe the polarity markings on the rear assembly for correct phasing of outputs.
For channels operated with balanced inputs the normal input impedance is 10 kOhms. If a lower input termination is required then termination resistors should be fitted to the input sockets.

**RCA phono connectors**: For stereo operation it is conventional to connect the Left channel to the black connector and the Right channel to the red connector.

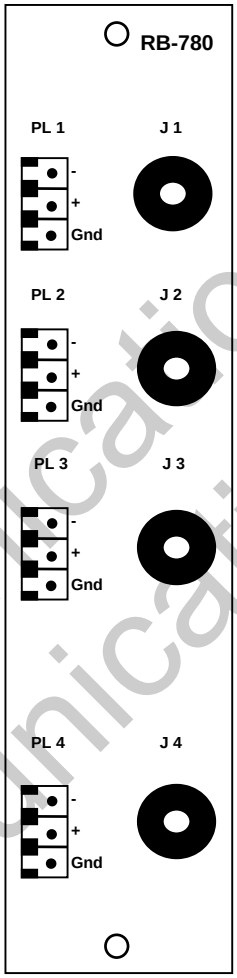
## Front & rear panel connector diagrams

The following drawings are not to scale and are intended to show comparative locations only.

Front




Rear



# Maintenance & Storage

## Maintenance:

No regular maintenance is required.

Care however should be taken to ensure that all connectors are kept clean and free from contamination of any kind. This is especially important in fibre optic equipment where cleanliness of optical connections is critical to performance.

## Storage:

If the equipment is not to be used for an extended period, it is recommended the whole unit be placed in a sealed plastic bag to prevent dust contamination. In areas of high humidity a suitably sized bag of silica gel should be included to deter corrosion.

Where individual circuit cards are stored, they should be placed in antistatic bags. Proper antistatic procedures should be followed when inserting or removing cards from these bags.

# Warranty & Service

Equipment is covered by a limited warranty period of three years from date of first delivery unless contrary conditions apply under a particular contract of supply. For situations when "**No Fault Found**" for repairs, a minimum charge of 1 hour's labour, at IRT's current labour charge rate, will apply, whether the equipment is within the warranty period or not.

Equipment warranty is limited to faults attributable to defects in original design or manufacture. Warranty on components shall be extended by IRT only to the extent obtainable from the component supplier.

## Equipment return:

Before arranging service, ensure that the fault is in the unit to be serviced and not in associated equipment. If possible, confirm this by substitution.

Before returning equipment contact should be made with IRT or your local agent to determine whether the equipment can be serviced in the field or should be returned for repair.

The equipment should be properly packed for return observing antistatic procedures.

The following information should accompany the unit to be returned:

1. A fault report should be included indicating the nature of the fault
2. The operating conditions under which the fault initially occurred.
3. Any additional information, which may be of assistance in fault location and remedy.
4. A contact name and telephone and fax numbers.
5. Details of payment method for items not covered by warranty.
6. Full return address.
7. For situations when "**No Fault Found**" for repairs, a minimum charge of 1 hour's labour will apply, whether the equipment is within the warranty period or not. Contact IRT for current hourly rate.

Please note that all freight charges are the responsibility of the customer.

The equipment should be returned **to the agent who originally supplied the equipment** or, where this is not possible, to IRT direct as follows.

Equipment Service
IRT Electronics Pty Ltd
26 Hotham Parade
ARTARMON
N.S.W. 2064
AUSTRALIA

Phone: 61 2 9439 3744 Fax: 61 2 9439 7439
Email: service@irtelectronics.com

# DRAWING LIST INDEX

| Drawing # | Sheet # | Description |
|---|---|---|
| 803606 | 1 | AA-780 main circuit schematic |