

P1000

Installation & Operation

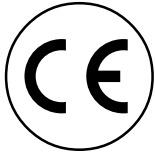


Hafler®

trans•ana▶

DESIGNED AND
ASSEMBLED IN THE
USA

PROFESSIONAL POWER AMPLIFIER



Declaration of Conformity

Application of Council Directive: 73 / 23 / EEC (Low Voltage Directive)
89 / 336 / EEC (EMC Directive)

Standard(s) to which Conformity is Declared: EN55103-1
EN55103-2
EN60065

Manufacturer's Name: Hafler

Manufacturer's Address: 546 South Rockford Drive, Tempe, Arizona 85281

Importer's Name: _____

Importer's Address: _____

Type of Equipment: 2-channel Audio Power Amplifier/Speaker

Model No.: P1000CE ☐ P1500CE ☐ P3000CE ☐ P4000CE ☐ 9505CE ☐
TRM6CE ☐ TRM8CE ☐ TRM10sCE ☐ TRM12sCE ☐

Year of Manufacturing: 1999 ☐ 2000 ☐ 2001 ☐ 2002 ☐ 2003 ☐

Serial Number: _____

*I, the undersigned, hereby declare that the equipment specified above conforms
to the above Directive(s) and Standard(s)*

Place: Hafler

Date: 09/01/1999

James C. Strickland, VP Engineering

Technical drawing of the Hafler P2000D speaker cabinet, showing top and side views with dimensions.

Top View Dimensions:

- Overall width: 19.00
- Overall height: 8.410
- Internal width (between side baffles): 16.00

Side View Dimensions:

- Depth: 7.24

Front Panel Features:

- Two diamond-shaped cutouts for tweeters.
- Two circular cutouts for woofers.
- Control knobs for "TREBLE" and "BASS".
- Volume knob labeled "VOLUME".
- Input selector switch labeled "AUX" and "FM".
- Power switch labeled "POWER".
- Speaker grille with "HAFLER" and "P2000D" text.

NOTICE - IMPORTANT SAFETY INFORMATION



**WARNING: TO PREVENT FIRE OR SHOCK HAZARD
DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.**

The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure, that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

1. READ INSTRUCTIONS

All the safety and operating instructions of your Hafler equipment should be read before power is applied to the equipment.

2. RETAIN OWNER'S MANUAL

These safety and operating instructions should be retained for future reference.

3. HEED WARNINGS

All warnings on the equipment and in the operating instructions are important and should be followed.

4. FOLLOW INSTRUCTIONS

All operating and use instructions are important and should be followed.

5. HEAT

The equipment should be kept away from areas of high temperature, i.e., heater vents, radiators, stoves/ovens, fireplaces, etc.

6. VENTILATION

The equipment should be used in an area suitable for proper ventilation. Care should be taken not to impede airflow in and around the cabinet.

7. WATER AND MOISTURE

The equipment should not be used in or around water, such as a bathtub, sink, or swimming area. Also, the equipment should not be used in areas prone to flooding, such as a basement.

8. POWER SOURCES

The equipment should be connected only to a power source of the same voltage and frequency as that listed on the rear panel above the power cord entry point.

9. POWER CORD PROTECTION

Power cords should be arranged so they do not interfere with the movement of objects in the room: people, fan blades, utility carts, etc. Also, care should be taken that the cord is not pinched or cut, and placed so it is not in danger of being pinched or cut, as in under a rug, around a tight corner, etc.

10. POWER CORD GROUNDING

The power supply cord is of a three wire grounded type, designed to reduce the risk of electric shock sustained from a live cabinet. It is assumed to be of suitable length for most uses of the equipment. The use of extension cords and power strips is discouraged unless they are of suitable rating to deliver the required total current for safe operation of all connected equipment. Furthermore, extension cords or power strips must provide the same three wire grounded

connection. It is important that the blades of the equipment's plug be able to fully insert into the mating receptacle. **Never remove the round grounding pin on the plug in an attempt to mate to a two wire ungrounded receptacle:** use a grounding adaptor with the grounding tab or wire suitably connected to earth ground.

11. NON-USE PERIODS

During periods of extended non-use, the power cord should be unplugged from the power source.

12. CLEANING

The equipment should be cleaned only as detailed in the operating instructions.

13. OBJECT AND LIQUID ENTRY

Care should be taken so that objects and/or liquids, such as cleaning fluids or beverages, are not spilled into the enclosure of the equipment.

14. DAMAGE REQUIRING SERVICE

Hafler equipment should be serviced by qualified service personnel when:

A. The power supply cord or plug has been damaged, or

B. Objects have fallen onto, or liquid has been spilled into the equipment, or

C. The equipment has been exposed to rain, or

D. The equipment does not appear to operate normally or exhibits a marked change in performance, or

E. The equipment has been dropped, or the enclosure has been damaged.

15. SERVICING

The user should not attempt to service the equipment beyond that which is described in the operating instructions. All other service should be referred to qualified service personnel.

16. CARTS AND STANDS

The equipment should be used with carts or stands only of sufficient strength and stability for the use intended.

An equipment and cart combination should be moved with care. Quick stops and starts, excessive force, and uneven surfaces may cause the equipment and cart combination to topple.

ADVERTENCIA – INFORMACION DE SEGURIDAD IMPORTANTE



El símbolo de flecha relámpago dentro de un triángulo equilátero, es para alertar al usuario de la presencia de “voltajes peligrosos” no aislados en el interior del aparato, los cuales pueden ser de suficiente magnitud para constituir un riesgo de choque eléctrico a las personas.

El símbolo de exclamación dentro de un triángulo equilátero, es para alertar al usuario de la presencia de instrucciones importantes de operación y mantenimiento (servicio) en la documentación que acompaña al equipo.

1. LEA LAS INSTRUCCIONES

Todas las instrucciones de seguridad y operación de su equipo Hafler, deben ser leídas antes de que el equipo sea conectado eléctricamente.

2. CONSERVE EL MANUAL DEL PROPIETARIO

Estas instrucciones de seguridad y operación, deben ser conservadas para futuras referencias.

3. CUADROS DE ADVERTENCIAS

Todas las advertencias en el equipo y en las instrucciones de operación, son importantes y deben ser seguidas.

4. SIGA LAS INSTRUCCIONES

Todas las instrucciones de uso y operación son importantes y deben ser seguidas.

5. CALOR

El equipo debe ser mantenido lejos de áreas de alta temperatura, como por ejemplo: ventilaciones de calentadores, radiadores, estufas/hornos, hogueras, etc.

6. VENTILACION

El equip debe ser usado en áreas con ventilación adecuada. Deben er tornadas las precauciones necesarias para no impedir el flujo de aire dentro y alrededor del aparato.

7. AGUA Y HUMEDAD

El equipo no debe ser usado en el agua ó alrededor de ésta, tales como en una bañera, tanque o áreas de nado. También, el equipo no debe ser usado en áreas propensas a inundaciones, tales como en un sótano.

8. FUENTES DE PODER

El equipo debe ser conectado a una fuente de poder del mismo voltaje y frecuencia que el indicado en el panel trasero sobre el punto de entrada del cable de corriente.

9. PROTECCION DEL CABLE DE CORRIENTE

Los cables de corriente deben ser dispuestos de forma tal que no interfieran con el movimiento de objetos en la sala: personas, aspas de ventilación, carretillas, etc. También, es necesario tener cuidado de que el cable no esté punzado o cortado, y debe estar ubicado de forma tal que esto no ocurra, como podría suceder debajo de una alfombra o al pasar el cable por una esquina aguda, etc.

10. ATERRAMIENTO DEL CABLE DE CORRIENTE

El cable de corriente es del tipo aterrado de tres hilos, diseñado para reducir el riesgo de una descarga eléctrica procedent de un chasis energizado. Se asume que su longitud es suficiente para la mayoría de usos del equipo. El uso de extensiones y multienchufes no es recomendado, a menos que tengan el amperaje adecuado para

poder suministrar la corrioente requerida pra la operación segura de todo el equipo conectado. Aun más, las extensiones deben proveer de la misma conección aterrada de tres hiles. Es importante que el enchufe se pueda introducir completamente en el receptáculo. Nunca remeva el pin de aterramiento en un intento por conectar el cable en un receptáculo de dos hilos no aterrado: use un adaptador de aterramiento que esté adecuadamente conectado a un punto de tierra.

11. PERIODOS SIN USO

Durante periodos prolongados sin uso del equipo, el cable de corriente debe ser desconectado de la fuente de electricidad.

12. LIMPIEZA

El equip debe ser limpiado solo en la forma que se detalla en las instrucciones de operación.

13. INTRODUCCIÓN DE OBJETOS Y LIQUIDO

Deben ser tornadas precauciones con el fin de que objetos y/ó líquidos, tales como fluidos de limpieza y gaseosas, no sean derramados dentro del chasis del aparato.

14. DAÑOS QUE REQUIEREN DE SERVICIO

Los equipos Hafler deben ser llevados a servicio por personal calificado cuando:

A. El cable de corriente ó el enchufe haya sido dañado, ó

B. Objetos ó líquido hayan sido introducidos ó derramado en el equipo, ó

C. El equipo haya sido expuesto a lluvia, ó

D. El equipo aparenta no operar normalmente ó exhibe un marcado cambio en su desempeño, ó

E. El equipo se ha caído, o el chasis ha sido golpeado.

15. SERVICIO

El usuario no deberá intentar darle servicio al equipo más allá de lo que está descrito en el instructivo de operación. Todo lo demás, deberá ser referido a servicio por personal calificado.

16. CARRETIILLAS Y SOPORTES

El equipo podrá ser usado con carretillas y soportes que tengan la fortaleza y estabilidad suficiente para el uso previsto.

La combinación equipo/carretilla deberá ser movida con cuidado. Rápidas paradas y arranques, excesiva fuerza y superficies imparejas, pueden causar el volcamiento del conjunto de carretilla/equipo.

ATTENTION: INFORMATIONS IMPORTANTES DE SÉCURITÉ



La lumière clignotante du symbole de la flèche à l'intérieur d'un triangle équilatéral, à pour objet d'alerter l'utilisateur de la présence "d'un voltage dangereux" non-isolé à l'intérieur du produit, qui pourrait être de magnitude suffisante au risque d'électrocution.

Le point d'exclamation, à l'intérieur d'un triangle équilatéral, à pour objet de prévenir l'utilisateur de l'importance des instructions de fonctionnement et de maintenance, jointes à l'appareil.

1. LIRE LES INSTRUCTIONS

Le mode d'emploi et les mesures de sécurité de votre équipement Hafler devraient être consultés avant sa mise en marche.

2. CONSERVER LE GUIDE DE L'UTILISATEUR

Le mode d'emploi et les mesures de sécurité devraient être conservés pour des références futures.

3. CONSIDÉRATIONS DE MISE EN GARDE

Le mode d'emploi et les mises en garde concernant cet équipement sont de grande importance et devraient être suivis.

4. SUIVRE LE MODE D'EMPLOI

Le mode d'emploi et les conseils d'utilisation sont importants et devraient être suivis.

5. CHALEUR

Le matériel devrait être préservé loin de toute source de chaleur: radiateurs, cuisinière/fours, cheminées,...etc.

6. VENTILATION

Le matériel devrait être utilisé dans un endroit à bonne ventilation. Il reste nécessaire de respecter la circulation de flux d'air à l'intérieur et autour du meuble.

7. EAU ET HUMIDITÉ

Le matériel ne devrait pas être utilisé près d'une source d'eau, telle qu'une baignoire, un évier, ou une aire de baignade. De plus, le matériel ne devrait pas être utilisé dans des lieux sujets aux inondations, tels que les sous-sols.

8. SOURCES D'ÉNERGIE

Le matériel devrait seulement être relié à une source d'énergie de même voltage et fréquence que celle indiquée sur le tableau arrière, au dessus de la fiche d'entrée de la prise de courant.

9. PROTECTION DE LA PRISE DE COURANT

La prise de courant devrait être arrangée de façon à ne pas interférer avec le déplacement d'objets (chariots, pales de ventilateurs...etc.) ou de personnes à l'intérieur de la pièce. D'autre part, il faudrait faire très attention à ce que la prise ne soit pas percée ou coupée, ou disposée de façon à risquer de l'être, comme sous un tapis, autour d'un angle pointu...etc.

10. PRISE DE COURANT À TROIS FICHES

La prise de courant est composée de trois fiches, désignées à réduire le risque de décharge électrique de l'appareil.

Elle devrait être de longueur suffisante pour la plupart des utilisations de ce matériel. L'utilisation de rallonge et d'adaptateur est déconseillée à moins d'être en mesure de fournir la charge électrique requise à un fonctionnement sans risque, de tout matériel relié.

11. PÉRIODES DE NON-UTILISATION

Durant les périodes de non-utilisation, la prise de courant ne devrait pas être branchée à une source d'énergie.

12. NETTOYAGE

Le matériel devrait être nettoyé en respectant les instructions indiquées.

13. PÉNÉTRATION DES LIQUIDES

Une attention particulière est exigée quant à la dispersion de liquides tels que les produits de nettoyage et boissons, de façon à éviter toute pénétration dans l'enceinte du matériel.

14. DÉGÂT NÉCESSITANT UNE RÉVISION

Le matériel Hafler devrait être révisé par des personnes qualifiées de service après-vente, lorsque:

- A. Les fiches ou la prise de courant ont été endommagés, ou:
- B. Des objets sont tombés sur le matériel, ou des liquides s'y sont dispersés, ou:
- C. Le matériel a été exposé à la pluie, ou:
- D. Le matériel ne semble pas fonctionner correctement, ou affiche un changement de performance, ou:
- E. Le matériel a été renversé à terre, ou l'enceinte a été endommagée.

15. RÉVISION

L'utilisateur ne devrait pas essayer de réviser le matériel en allant plus loin que ce qui a été décrit dans le mode d'emploi. Toute autre révision devrait être confiée à un personnel qualifié.

16. CHARRIOTS ET MEUBLES

Le matériel devrait être utilisé avec des chariots et meubles de qualité et stabilité suffisante à son utilisation préconçue.

L'ensemble du matériel et du charriot devrait être déplacé avec précaution. Des mises en marche et arrêts brusques, des collisions excessives ainsi que des surfaces inégales peuvent renverser l'ensemble du matériel et du charriot.

ACHTUNG – WICHTIGE SICHERHEITS – INFORMATIONEN



Der Blitz mit dem Pfeil, in einem gleichschenkligen Dreieck, soll den Benutzer vor unisolierter "gefährlicher Spannung" innerhalb des Gerätes warnen.

Das Ausrufezeichen, in einem gleichschenkligen Dreieck, soll den Benutzer darauf aufmerksam machen, daß dem Gerät wichtige Operations - und Service - Informationen beigelegt sind.

1. INSTRUKTIONEN LESEN

Alle Sicherheits- und Operationshinweise Ihres Hafler Equipments sollten vor der Inbetriebnahme gelesen werden.

2. BETRIEBSANLEITUNG AUFBEWAHREN

Bewahren Sie die Bedienungsanleitung sorgfältig auf, damit Sie in dieser auch in Zukunft nachschlagen können.

3. WARNUNGEN BEACHTEN

Alle Warnungen des Gerätes und der Bedienungsanleitung sind extrem wichtig und müssen befolgt werden.

4. INSTRUKTIONEN BEACHTEN

Alle Operations- und Gebrauchshinweise sind extrem wichtig und müssen beachtet werden.

5. HITZE

Das Equipment sollte fern von Hitze ausstrahlenden Geräten aufgestellt werden, wie z.B. Heizungen, Öfen etc.

6. VENTILATION

Das Equipment sollte so aufgestellt werden, daß eine ausreichende Ventilation gewährt wird.

7. WASSER UND FEUCHTIGKEIT

Das Equipment sollte nicht im oder in der Nähe von Wasser benutzt werden, wie z.B. in Schwimmbädern, Saunen etc. Es sollte ebenfalls nicht in Überschwemmungsgefährdeten Gebieten aufgestellt werden, wie z.B. Kellerräumen.

8. STROMANSCHLUß

Das Equipment darf nur an eine Stromversorgung angeschlossen werden, die die gleichen Parameter aufweist, welche auf der Rückseite, über dem Anschlußterminal des Gerätes, aufgelistet sind.

9. SCHUTZ DER ZULEITUNG

Die Zuleitungen sollten so verlegt werden, daß diese nicht in den Bewegungsbereich anderer Möbelstücke oder Personen hereinragen. Achten Sie darauf, daß das Kabel nicht gequetscht oder durchschnitten wird, wie z.B. unter Schränken oder an scharfen Kanten etc.

10. MASSEANSCHLUß

Das dreidrähtige Anschlußkabel ist mit einem Erdungsleiter ausgestattet, welcher die Risiken eines Elektroschocks verringert. Das Kabel hat eine Länge, welche für die meisten Anwendungen völlig ausreicht. Wenn Sie Verlängerungskabel benutzen, achten Sie darauf, daß dies die erforderlichen Ströme übertragen können. Benutzen Sie immer dreidrähtige Verlängerungskabel.

11. ZEITRÄUME IN DENEN DAS GERÄT NICHT GENUTZT WIRD

Wird das Gerät über einen längeren Zeitraum nicht genutzt (z.B. Urlaub), ziehen Sie bitte den Netzstecker aus der Steckdose.

12. REINIGEN

Reinigen Sie das Gerät nur, wie in der Bedienungsanleitung detailliert beschrieben.

13. EINDRINGEN VON FREMDKÖRPERN

Achten Sie darauf, daß weder Fremdkörper, noch Flüssigkeiten in das Gerät eindringen.

14. ERFORDERLICHER REPARATURSERVICE

Hafler Equipment sollte nur von qualifizierten Service-Technikern instand gesetzt werden, wenn:

A. Das Stromversorgungskabel beschädigt wurde

B. Eine Flüssigkeit in das Gerät eingedrungen ist

C. Das Gerät Regen ausgesetzt wurde

D. Das Gerät nicht mehr ordnungsgemäß funktioniert, ggf. nicht mehr die volle Leistung abgibt

E. Das Gerät runtergefallen ist oder das Gehäuse beschädigt wurde

15. SERVICE

Der Benutzer sollte nur den Service ausführen, der in der Bedienungsanleitung für den Benutzer freigegeben wird. Den weiterführenden Service sollte nur von qualifizierten Technikern durchgeführt werden.

16. AUFSTELLUNG

Das Equipment sollte so aufgestellt werden, daß der gewählte Untergrund die erforderliche Stabilität aufweist, so daß eine gefahrlose Benutzung gewährleistet wird.

Das Equipment und der Untergrund sollte mit äußerster Vorsicht bewegt werden. Bei schnellen Bewegungen oder starkem Abbremsen, kann es zum Umkippen des Equipments kommen.

NOTARE – IMPORTANTI INFORMAZIONI SULLA SICUREZZA



Il simbolo del fulmine in un triangolo equilatero vuole avvertire della presenza di tensioni elevate non isolate e di valore sufficiente per costituire rischio di shock elettrico alle persone.

Il punto esclamativo contenuto in un triangolo equilatero vuole avvertire l'utente della presenza di parti di servizio e di manutenzione che sono dettagliate nel manuale di istruzioni.

1. LEGGETE LE ISTRUZIONI

Tutte le istruzioni riguardanti la sicurezza ed il funzionamento devono essere lette prima di applicare tensione all'apparato.

2. CONSERVATE IL MANUALE

Queste istruzioni riguardanti la sicurezza ed il funzionamento devono essere conservate come riferimento futuro.

3. AVVERTENZE

Tutte le avvertenze poste sull'apparato e sul libretto di istruzioni sono importanti e devono essere seguite.

4. SEGUIRE LE ISTRUZIONI

Tutte le istruzioni operative e di funzionamento devono essere seguite.

5. TEMPERATURA

L'apparato deve essere mantenuto lontano da tutte le zone ad alta temperatura, termosifoni, termoconvettori, stufe e forni, caminetti ed altro.

6. VENTILAZIONE

L'apparato deve essere posizionato in aree convenienti per una corretta ventilazione. Prestare attenzione che sia consentita circolazione d'aria attorno e dentro il cabinet.

7. ACQUA E POLVERE

L'apparato deve essere posizionato lontano da zone contenenti acqua, come vasche a bagno, acquari e piscine. Inoltre non deve essere impiegato in aree soggette ad allagamento, come le cantine.

8. REQUISITI DI ALIMENTAZIONE

L'apparato deve essere connesso solo ad un'alimentazione della stessa tensione e frequenza di quanto scritto sulla parte posteriore del telaio.

9. PROTEZIONE DEL CAVO DI ALIMENTAZIONE

Il cavo di alimentazione deve essere posizionato in modo di non interferire con il movimento di oggetti nella stanza: persone, ventilatori, carrelli, ecc...prestate attenzione anche che il cavo non sia tagliato o spellato e che non possa tagliarsi e spellarsi.

10. MESSA A TERRA

Il cavo di alimentazione è del tipo a tre fili con terra ed è progettato per ridurre il rischio di shock elettrici. Si presume che sia della lunghezza sufficiente per la maggior parte degli impieghi. L'impiego di prolunghe e adattatori è sconsigliato se questi non garantiscono la potenza sufficiente per il corretto funzionamento degli apparati connessi. È altresì importante che vengano sempre impiegate prolunghe con la configurazione a tre fili con terra.

11. PERIODI DI NON UTILIZZO

Durante lunghi periodi di non utilizzo, staccare il cavo di alimentazione.

12. PULIZIA

L'apparato deve essere pulito solo come indicato dalle istruzioni.

13. INGRESSO DI OGGETTI E LIQUIDI

Si deve prestare attenzione che oggetti e liquidi, come fluidi detergenti e bibite, non vengano versati all'interno dell'apparato.

14. RIPARAZIONI

Gli apparati Hafler devono essere riparati da personale qualificato quando:

A. Il cavo di alimentazione o la spina sono danneggiati

B. Oggetti sono caduti all'interno del telaio o quando del liquido è entrato

C. Quando l'apparato è stato esposto a pioggia

D. Quando l'apparato non sembra funzionare normalmente o quando esibisce un cambiamento di prestazioni o

E. Quando è caduto o il telaio è stato danneggiato

15. ASSISTENZA

L'utente non deve tentare di prestare assistenza all'apparato, se non per quanto esposto nelle istruzioni. Tutti gli altri interventi devono essere effettuati da un tecnico specializzato.

16. CARRELLI E STAND

L'apparato deve essere impiegato su carrelli o stand solo se questi sono sufficientemente solidi e stabili per la funzione a cui si vuole dedicarli.

La combinazione di carrello ed apparato deve essere mossa con cautela. Fermate e partenze improvvise, forze eccessive e superfici irregolari, possono ribaltare la combinazione carrello e apparato.

TABLE OF CONTENTS

DECLARATION OF CONFORMITY	i
PERFORMANCE SPECIFICATIONS	ii
SAFETY PRECAUTIONS	iii
INTRODUCTION	1
FRONT & REAR PANEL VIEW	2
INSTALLATION	
Location	3
AC Line	3
Unbalanced Input	3
Balanced Input	4
Headphone Jack	4
Output Connections	4
Monophonic Use	4
OPERATION	
Power Switch	5
Level Controls	5
Input Configuration Switches	5
Ground Switch	5
NOMAD Safe Area Protection	6
LED Indicators	6
Warm Up	6
Cleaning and Maintenance	6
TECHNICAL REFERENCE	
Schematic Diagram	7
Field Service Considerations	9
Theory and Operation of trans•ana	9
PC Board Layout	10
Parts List	11
P1000 Functional Block Diagram	13
Circuit Operation	14
Amplifier Module Replacement	17
WARRANTY	18

INTRODUCTION

The **Hafler P1000** is a single rack height, two channel professional power amplifier suitable for use in any situation where a moderately powered compact amplifier is required. The P1000 is particularly attractive for use in broadcast monitoring situations. Our *trans•ana* circuit topology and MOSFET output stage ensures trouble-free, long term operation and is backed by our five year warranty.

This manual contains information on using the P1000 amplifiers. It is organized into three main sections. **“Installation”** covers the location and connection of the amplifier in the system. Like many precision components, careful attention to the initial setup can yield dividends in higher performance and trouble-free use. **“Operation”** covers the controls and features of the amplifiers and how to use them to get the best effect. The **“Technical Reference”** section contains field service information; in addition to the schematic and parts list there are block diagrams and circuit operation explanations useful for technicians. We strongly urge reading over the Installation and Operation portions of this manual before putting the amplifier into service.

The circuitry used in the Hafler Professional power amplifiers is our **trans•ana (TRAN**sconductance **Active Nodal Amplifier)** topology. The *trans•ana* technology operates the output stage with its full voltage gain, which allows the input stage to operate from a low voltage regulated supply. The signal is then shifted up in level to the high voltage section by the driver stage which forms an active node at ultrasonic frequencies. This results in very stable, highly linear operation.

Safe Area output protection is handled by our proprietary **NOMAD (NO**n-**M**ultiplying **A**dvanced **D**ecision, patent pending) system. NOMAD accurately computes the allowable device current for the device voltage and clamps the gate drive when the actual current exceeds this value. This improved accuracy is achieved by eliminating the dependence upon unreliable analog IE multiplier circuits to model the device operation.

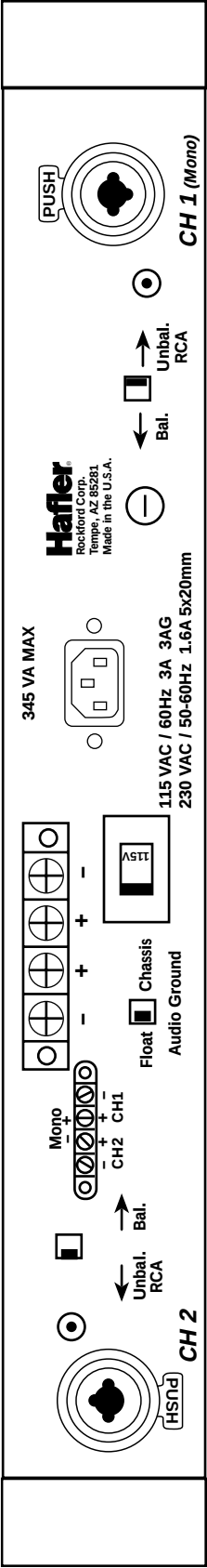
Other specialized circuits which prevent damage to the amplifier and speakers have been carefully implemented. A soft start circuit prevents sending potentially destructive turn-on and turn-off transients to the speakers. A thermal sensing network continuously monitors the heatsink temperature and shuts down the amplifier to protect it from excessive operating heat.

Each channel of the amplifier has been built as a self-contained module. This modular arrangement simplifies construction and improves service accessibility. The circuit board assembly makes extensive use of surface mount components in the low power portion of the audio circuitry. Automated equipment is used to place and solder the components which yields greater uniformity and reliability.

The front panel has controls for input level adjustment and the power switch. In addition, LED indicators give a visual representation of the operating status of each channel. The THERMAL indicator lights to show when this protection circuit has been activated. The CLIP indicator helps prevent damaging the speaker by showing when the amplifier is overdriven. The SIGNAL indicator lights to show the presence of an audio signal.



Front Panel View



Rear Panel View

INSTALLATION

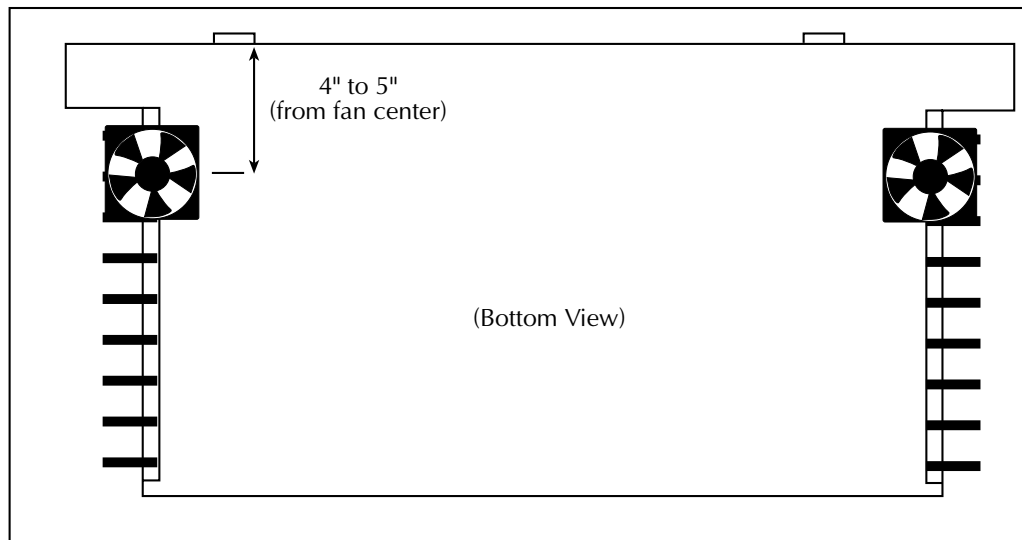
LOCATION

The P1000 power transformer can generate a substantial magnetic field, so caution should be exercised in the placement of low level components such as a tape deck, mixer or mic preamp to avoid inducing noise in the low level circuitry. The amplifiers can also produce considerable heat in normal operation so the primary consideration when determining a location for the amplifiers is to allow for adequate ventilation. The large heatsinks provide unrestricted airflow, but care must be taken to keep the slots in the bottom panel and top cover clear. If the amplifier is mounted in an equipment rack, make sure adjacent equipment does not impede cool air flow.



Rack systems should have two fans 4" to 5" in from the front of the amplifier blowing upward.

Inadequate ventilation can shorten component life, especially when other equipment raises the ambient air temperature, so circulating fans should be considered in tight quarters.



Fan center approximately in line with edge of unit and starting of heatsink fins

- Fans placed 4" to 5" from front of unit
- Fans placed under the unit pointing upwards
- Recommended P1000 fan is 32 CFM x 2

AC LINE

The P1000 is capable of operation from either a 115 VAC/60Hz or a 230 VAC/50-60Hz power line. The power line selector switch is located on the rear panel. Check that the switch is set in the correct position before putting the amplifier into service.

Connection is made by a 16 gauge, IEC Type 320, grounded line cord. For safety considerations only a properly grounded (earthed) receptacle should be used. If a grounded circuit is not available, do not break off the ground pin; use the proper adapter plug for a two wire receptacle.

IMPORTANT: The power line fuse is mounted on the rear panel of the amplifier. If this fuse blows, replace it only with a fuse of the same type and rating. The correct replacement fuse value is printed in the parts list.

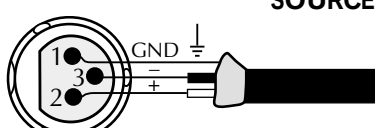
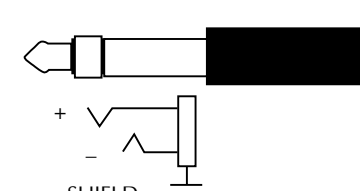


UNBALANCED INPUT

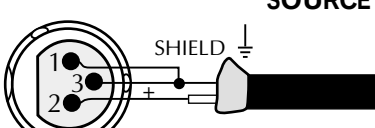
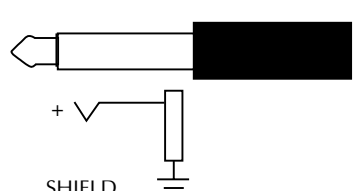
The unbalanced inputs use conventional RCA phone jacks. Set the BALANCED/UNBALANCED switch to the UNBALANCED position to use these jacks.

BALANCED INPUT

The balanced input jacks are dual function connectors which accept 1/4" Phone (Tip Ring Sleeve) or XLR plugs. The 1/4" Phone jack is connected according to conventional usage. The XLR jack is connected according to the IEC and AES standard. Set the BALANCED/UNBALANCED switch to the BALANCED position to use these jacks.

XLR Balanced Input Check output of source unit for proper signal polarity	1/4" TRS Balanced Input Check output of source unit for proper signal polarity
INPUT Pin 1 = GND Pin 2 = (+) Pin 3 = (-)  FROM SOURCE	INPUT Tip = (+) Ring = (-) Sleeve = GND  FROM SOURCE

Many popular mixers use unbalanced outputs and can be used with the Hafler amplifier. To minimize residual ground noise, we recommend using twisted pair cable or short cable lengths in this type of configuration.

XLR Unbalanced Input Connect (-) and GND (shield) terminals at <i>both ends</i> of cable to prevent unstable amplifier operation	1/4" TRS Unbalanced Input
INPUT Pin 1 = GND Pin 2 = (+) Pin 3 = GND  FROM SOURCE	INPUT Tip = (+) Sleeve = GND  FROM SOURCE

HEADPHONE JACK

A standard 1/4" headphone jack is mounted on the front panel of the amplifier. The headphones are connected to the output of the amplifier and can be adjusted by the input level controls or the main volume control.



CAUTION: Using headphones at high power levels can cause permanent hearing damage. Always turn the volume all the way down before putting the headphones on.

OUTPUT CONNECTIONS

The speaker output connectors are screw terminals on a barrier strip. The terminals are sized for 1/4" spade lugs.

MONOPHONIC USE

In systems with high power requirements, the amplifiers can be configured for single channel, bridged mono operation. To bridge the amplifier, set the front panel Normal/Bridged Mono switch to the MONO position. The Channel 1 input and level control is used and the Channel 2 level control is not active. The speaker is connected to the two positive (+) terminals.



When the amplifier is bridged the output is floating. Any speaker which requires a common ground from the amplifier output cannot be used in this application. Never connect a positive (+) terminal to ground.



Since a bridged amplifier shares the load between the two channels, each channel will effectively drive half of the load. Therefore, for bridged mono operation we recommend using an eight ohm load as the minimum impedance.

OPERATION

POWER SWITCH

The POWER switch is located on the front panel of the amplifier. An internal lamp indicates when it is turned on.



Standard practice is to turn the amplifier on last and off first when switching components individually to prevent sending damaging transients, generated in the source components, to the speakers.

It is possible to leave the power switch in the on position and switch the amplifier remotely through a power distribution block or preamp switched outlet. When doing so make sure the switch is rated for the current required by the amplifier.

LEVEL CONTROLS

The input sensitivity, for each channel, can be adjusted individually using the level controls on the front panel. The level controls on the P1000 are configured to allow each channel to be fully attenuated and are marked from 0 (minimum output) to 10 (full output).

In public systems where it is necessary to match levels, the knobs can be removed and the controls adjusted with your fingers or a flathead screwdriver. Cover the holes with the enclosed plugs to restrict access.

INPUT CONFIGURATION SWITCHES

Balanced/Unbalanced

When the Balanced/Unbalanced switch position is in the Unbalanced position, the return (–) terminal is connected to ground to prevent unstable amplifier operation when the RCA input jacks are used. When using the XLR or 1/4" inputs, set the switch in the Balanced position. If the amplifier output is low, or has excessive noise, make sure this switch is set to the correct position.

Normal/Bridged Mono

The amplifier operates in two-channel mode when the front panel NORMAL/BRIDGED MONO switch is in the NORMAL position. To use the amplifier in single channel, bridged mono applications, the front panel switch must be in the BRIDGED MONO position. When the switch is set in the BRIDGED MONO position, the Channel 1 (+) and (–) inputs are connected to Channel 2 in reversed polarity, which inverts the Channel 2 output. Only the Channel 1 input is used, and the speaker is connected to the two positive (+) output terminals. The amplifier gain is adjusted by the Channel 1 level control; the Channel 2 control is not active.



Because of thermal considerations we do not recommend using less than a nominal eight ohm load on the amplifier when running it in bridged mono.

GROUND SWITCH

Ground loops are characterized by a hum or buzz through the speakers and are caused by a voltage potential difference between two points in a ground circuit. Ground loops are aggravated when multiple paths exist for a given circuit. Mounting components in a rack with metal rails may introduce ground loops between associated equipment, because the rails can establish an additional ground path.

The CHASSIS/FLOAT switch allows you to select the amplifier grounding scheme for best system compatibility. With the switch in the CHASSIS position all signal grounds are referred to the chassis and power line ground.

In the FLOAT position the signal ground is decoupled from the chassis. The position of the switch is determined by the overall noise in the system; choose the position which gives the lowest hum.

NOMAD (NO_n-Multiplying Advanced Decision, patent pending) SAFE AREA PROTECTION

The output MOSFETs have an upper limit on the power, current, or voltage they can withstand without being damaged. The operating range within these limits is called the Safe Operating Area.

Traditional amplifier designs use sensing circuits to measure the device voltage and current and a multiplying circuit to determine whether the dissipation (power) is within the Safe Operating Area. Limiter circuits are then activated to prevent exceeding the device ratings. This multiplication method has numerous problems, including temperature sensitivity, nonlinearity and complexity.

The NOMAD circuit, used in the P1000, avoids these problems by deriving the device dissipation by a different method. Sensing circuits measure the device voltage and current. NOMAD determines the allowed current after an established duration. A clamping transistor is activated to limit the gate voltage.

LED INDICATORS

Amplifier operation is monitored internally and each channel has three status LEDs. These indicators can be used for system troubleshooting in case of aberrant behavior.

Signal

Monitors the amplifier output and lights when a signal is present. The SIGNAL indicator is calibrated to activate at an equivalent input voltage of 30mV, with the amplifier set for full gain.

Clipping

Monitors the DRIVE SIGNAL and lights when the drive signal voltage exceeds the maximum level for linear operation of the output MOSFETs.

Thermal

Indicates when the thermal protection has shut down the amplifier. This occurs when the heatsink temperature becomes excessive.

WARM UP

In order to achieve the best sonic performance and image stability from the amplifier, we recommend letting it warm up for 1 hour before beginning any critical listening.

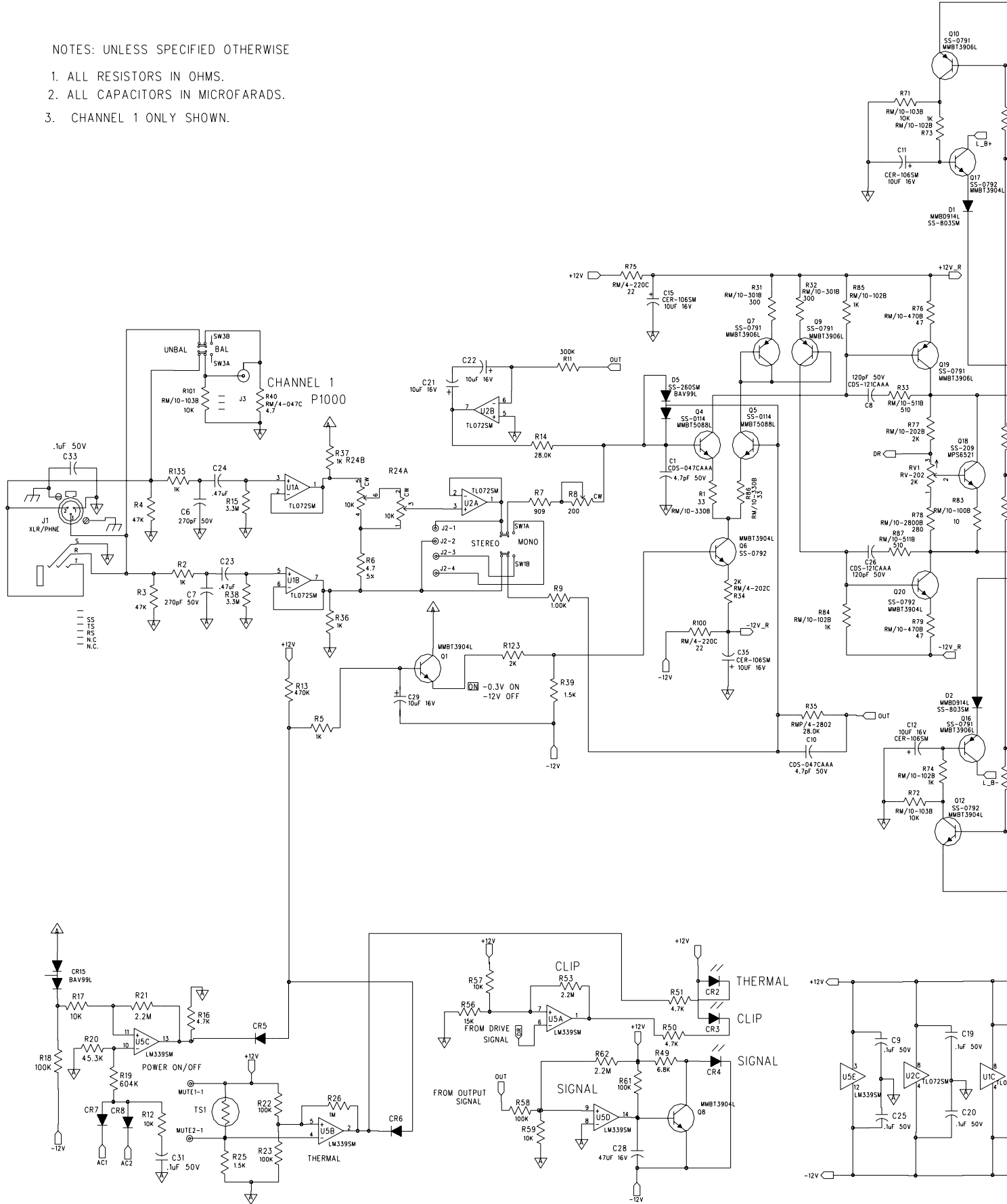
CLEANING AND MAINTENANCE

There is no requirement for regular maintenance on the electronic components of the amplifier. If the case becomes soiled it can be cleaned using a soft cloth and a mild detergent, such as spray window or glass cleaner. If the amplifier is located in a particularly dusty environment, cleaning the inside with compressed air or vacuuming every 18 to 24 months is sufficient.

SCHEMATIC DIAGRAM

NOTES: UNLESS SPECIFIED OTHERWISE

1. ALL RESISTORS IN OHMS.
2. ALL CAPACITORS IN MICROFARADS.
3. CHANNEL 1 ONLY SHOWN.





TECHNICAL REFERENCE

FIELD SERVICE CONSIDERATIONS

A primary focus during the design and development of the P1000 was to ensure the dependability of the amplifiers. The use of MOSFET output transistors and the low voltage *trans•ana* input stage combined with careful component selection for the circuit assembly made the reliability goals achievable. However, a parallel effort was also undertaken to make sure any down time caused by an amplifier fault was minimized by making the amplifier technician “friendly.” The modular construction allows exchanging the entire operational portion of either channel quickly and easily without the need for soldering or specialized equipment.

This section of the manual contains descriptions of circuit operation and block diagrams to assist technicians with component level repairs.

THEORY AND OPERATION OF *trans•ana*

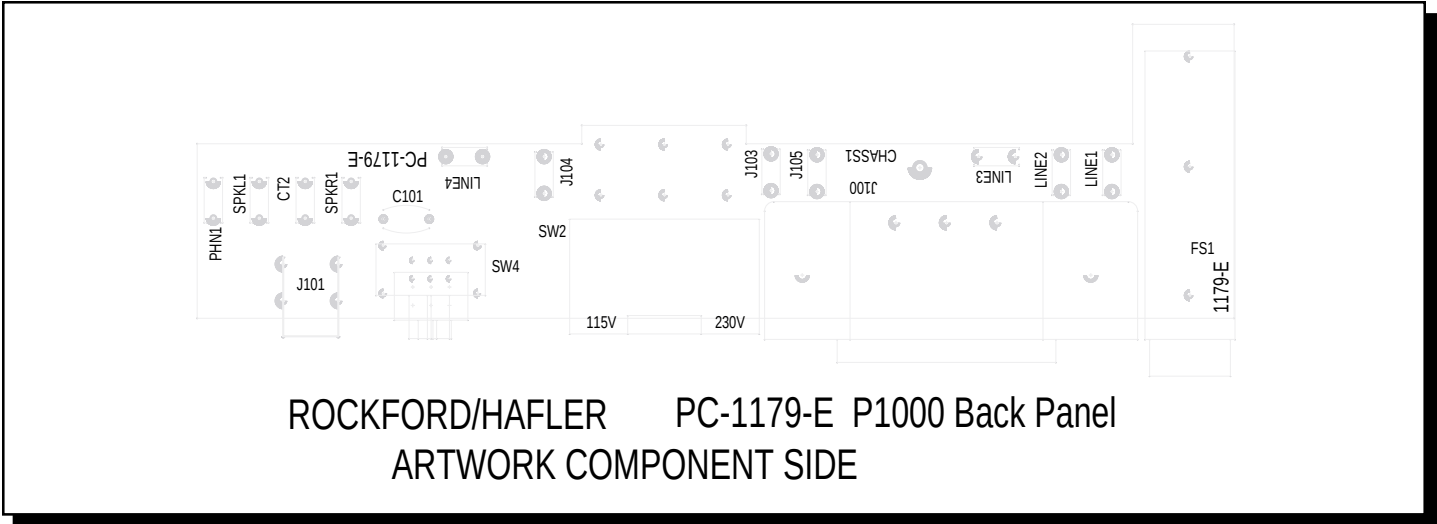
The *trans•ana* (TRANsconductance Active Nodal Amplifier) circuit is an efficient, short loop amplifier design using Vertical MOSFET output transistors. The input and pre-driver stages operate at low voltage and the output MOSFETs are connected in a source-on-rail configuration to deliver their full voltage gain.

Using the output stage to supply voltage gain inherently increases the power gain (for the same bandwidth) of the output stage by typically ten times over the conventional follower connection, using the same MOSFET devices. This increase in efficiency allows the use of a much simpler input section than in the more common high voltage designs. The number of serial stages, from input to output has been reduced from five or more to only four in the P1000.

The transition from the low voltage input processing to the high voltage output operation is handled by a pair of complementary bipolar driver transistors. The drivers form an *active node* at ultrasonic frequencies and couple very accurately to the gates of the MOSFETs. This results in highly stable and highly linear performance.

The *trans•ana* topology is particularly well suited for use in a moderately powered compact amp like the P1000 because of its simplicity and efficiency. The circuit configuration does not require separate high voltage power supplies thus reducing the size and complexity of the power transformer. The vertical MOSFETs used in the P1000 have a lower “on resistance” than the lateral MOSFETs used in our other amplifiers which results in less operating heat. This allows for a reduction in the size of the heatsinks and makes the single rack size of the P1000 practical.

The sonic character of the P1000 is similar to our larger *trans•nova* amplifiers and delivers realism and accuracy which surpasses any other similarly sized amplifiers.



PARTS LIST

DESIGNATOR VALUE

ALL RESISTORS IN OHMS

R1	33, 1/10W
R2	1k, 1/4W, 1%
R3	47k, 1/4W, 5%
R4	47k, 1/4W, 5%
R5	1k, 1/4W, 1%
R6	4.7, 1/4W
R7	909, 1/4W
R8	200, Trim Pot
R9	1k, 1/4W, 1%
R10	4.7, 1/4W
R11	300k, 1/4W, 5%
R12	10k, 1/4W
R13	470k, 1/4W, 5%
R14	28k, 1/4W
R15	3.3M, 1/4W, 5%
R16	4.7k, 1/4W, 5%
R17	10k, 1/4W, 5%
R18	100k, 1/4W
R19	604k, 1/4W, 1%
R20	45.3k, 1/4W, 1%
R21	2.2M, 1/4W, 5%
R22	100k, 1/4W
R23	100k, 1/4W
R24	10k Pot, Dual
R25	1.5k, 1/4W
R26	1M, 1/4W, 5%
R27	301, 1/4W, 1%
R28	301, 1/4W, 1%
R29	2.67k, 1/4W, 1%
R30	2.67k, 1/4W, 1%
R31	300, 1/10W
R32	300, 1/10W
R33	510, 1/10W
R34	2k, 1/4W
R35	28k, 1/4W, 1%
R36	1k, 1/4W, 1%
R37	1k, 1/4W, 1%
R38	3.3M, 1/4W, 5%
R39	1.5k, 1/4W, 5%
R40	4.7, 1/4W
R41	82k, 1/10W
R42	82k, 1/10W
R43	1k, 1/10W
R44	36k, 1/10W
R45	1k, 1/10W
R46	82k, 1/10W
R47	82k, 1/10W
R48	82k, 1/10W
R49	6.8k, 1/4W, 5%
R50	4.7k, 1/4W, 5%
R51	4.7k, 1/4W, 5%
R52	36k, 1/10W
R53	2.2M, 1/4W, 5%
R54	1k, 1/10W
R55	1k, 1/10W
R56	15k, 1/4W, 5%
R57	10k, 1/4W, 5%
R58	100k, 1/4W, 5%
R59	10k, 1/4W, 5%
R60	82k, 1/10W
R61	100k, 1/4W, 5%
R62	2.2M, 1/4W, 5%
R63	620, 1/10W
R64	620, 1/10W
R65	10, 1/10W
R66	10, 1/10W
R67	10, 1/10W
R68	10, 1/10W
R69	0.1, 2W

PART

RM/10-330B
RM/4-1001C
RM/4-473C
RM/4-473C
RM/4-1001C
RM/4-047C
RM/4-9090C
RVH-201
RM/4-1001C
RM/4-047C
RM/4-304C
RM/4-103C
RM/4-474C
RM/4-2802C
RM/4-335C
RM/4-472C
RM/4-103C
RM/4-104C
RM/4-6043C
RM/4-4532C
RM/4-225C
RM/4-104C
RM/4-104C
RV-0818
RM/4-152C
RM/4-105C
RM/4-3010C
RM/4-3010C
RM/4-2671C
RM/4-2671C
RM/10-301B
RM/10-301B
RM/10-511B
RM/4-202C
RMP/4-2802-03
RM/4-1001C
RM/4-1001C
RM/4-335C
RM/4-152C
RM/4-047C
RM/10-823B
RM/10-823B
RM/10-102B
RM/10-363B
RM/10-102B
RM/10-823B
RM/10-823B
RM/10-823B
RM/4-682C
RM/4-472C
RM/4-472C
RM/10-363B
RM/4-225C
RM/10-102B
RM/10-102B
RM/4-153C
RM/4-103C
RM/4-104C
RM/10-823B
RM/4-104C
RM/4-225C
RM/10-621B
RM/10-621B
RM/10-100B
RM/10-100B
RM/10-100B
RM/10-100B
RM/2-001

DESIGNATOR VALUE

R70	0.1, 2W
R71	10k, 1/10W
R72	10k, 1/10W
R73	1k, 1/10W
R74	1k, 1/10W
R75	22, 1/4W, 5%
R76	47, 1/10W
R77	2k, 1/10W, 1%
R78	280, 1/10W
R79	47, 1/10W
R80	300, 1/10W
R81	300, 1/10W
R82	10, 1W
R83	10, 1/10W
R84	1k, 1/10W
R85	1k, 1/10W
R86	33, 1/10W
R87	510, 1/10W
R88	20, 1/10W
R89	20, 1/10W
R90	20, 1/10W
R91	20, 1/10W
R92	0.1, 2W
R93	10, 1/10W
R94	39, 1/10W
R95	39, 1/10W
R96	10, 1/10W
R97	0.1, 2W
R98	39, 1/10W
R99	39, 1/10W
R100	22, 1/4W
R101	10k, 1/10W
R102	10k, 1/4W
R123	2k, 1/4W, 5%
R135	1k, 1/4W, 1%

RV1

C1	4.7pF, 50V
C2	100μF, 50V, Electrolytic
C3	3300μF, 50V, Electrolytic
C4	0.1μF, 100V, Mylar
C5	3300μF, 50V, Electrolytic
C6	270pF, 50V
C7	270pF, 50V
C8	120pF, 50V
C9	0.1μF, 50V
C10	4.7pF, 50V
C11	10μF, 16V, Electrolytic
C12	10μF, 16V, Electrolytic
C13	100μF, 50V, Electrolytic
C15	10μF, 16V, Electrolytic
C16	.047μF, 50V, Mylar
C17	0.1μF, 50V
C18	0.1μF, 50V
C19	0.1μF, 50V
C20	0.1μF, 50V
C21	10μF, 16V, Electrolytic
C22	10μF, 16V, Electrolytic
C23	0.47μF, 50V
C24	0.47μF, 50V
C25	0.1μF, 50V
C26	120pF, 50V
C28	47μF, 16V, Electrolytic
C29	10μF, 50V, Electrolytic
C31	0.1μF, 50V
C32	100pF, 50V
C33	0.1μF, 50V
C34	100pF, 50V
C35	10μF, 16V, Electrolytic

PART

RM/2-001
RM/10-103B
RM/10-103B
RM/10-102B
RM/10-102B
RM/4-220C
RM/10-470B
RM/10-202B
RM/10-2800B
RM/10-470B
RM/10-301B
RM/10-301B
RM/1-100-04
RM/10-100B
RM/10-102B
RM/10-102B
RM/10-330B
RM/10-511B
RM/10-200B
RM/10-200B
RM/10-200B
RM/10-200B
RM/2-001
RM/10-100B
RM/10-390B
RM/10-390B
RM/10-100B
RM/2-001
RM/10-390B
RM/10-390B
RM/4-220C
RM/10-103B
RM/4-103C
RM/4-202C
RM/4-1001C
RV-202
CDS-047CAAA
CER-107C-024
CERS-338C
CY-104-024
CERS-338C
CDS-271CAAA
CDS-271CAAA
CDS-121CAAA
CDS-104CCDB
CDS-047CAAA
CER-106SM
CER-106SM
CER-107C-024
CER-106SM
CYV-473-024
CDS-104CCDB
CDS-104CCDB
CDS-104CCDB
CDS-104CCDB
CER-106SM
CER-106SM
CYV-474-024
CYV-474-024
CDS-104CCDB
CDS-121CAAA
CER-476-024
CER-106SM
CDS-104CABB
CDS-101CAAA
CDS-104CCDB
CDS-101CAAA
CER-106SM

DESIGNATOR	VALUE	PART #	DESIGNATOR	VALUE	PART #
C101	0.01µF, 1kV	CD-103-20	CR7	MMBD914L Diode	SS-803SM
C119	0.1µF, 100V, Mylar	CY-104-024	CR8	MMBD914L Diode	SS-803SM
C120	0.1µF, 100V, Mylar	CY-104-024	CR9	Bridge Rectifier	SS-0799-068
			CR15	BAV99L Dual Diode	SS-260SM
Q1	MMBT3904L, NPN	SS-0792	D1	MMBD914L Diode	SS-803SM
Q2	LM-317 + Regulator	SS-239	D2	MMBD914L Diode	SS-803SM
Q3	LM-337 – Regulator	SS-240	D3	MMBD914L Diode	SS-803SM
Q4	MMBT5088L, NPN	SS-0114	D4	MMBD914L Diode	SS-803SM
Q5	MMBT5088L, NPN	SS-0114	D5	BAV99L Dual Diode	SS-260SM
Q6	MMBT3904L, NPN	SS-0792	D6	BAV99L Dual Diode	SS-260SM
Q7	MMBT3906L, PNP	SS-0791	D7	BAV99L Dual Diode	SS-260SM
Q8	MMBT3904L, NPN	SS-0792			
Q9	MMBT3906L, PNP	SS-0791	U1	TL072CD Opamp	SS-143SM
Q10	MMBT3906L, PNP	SS-0791	U2	TL072CD Opamp	SS-143SM
Q11	MMBT3906L, PNP	SS-0791	U5	LM339SM Quad Comparator	SS-730SM
Q12	MMBT3904L, NPN	SS-0792			
Q13	MMBT3904L, NPN	SS-0792	J1	Input Jack, Combo	CC-0588
Q14	IRF9540, P Channel MOSFET	SS-0111T	J3	Input Jack, Phono	CCH-232
Q15	IRF540, N Channel MOSFET	SS-0170T		4 Position Barrier Strip	CC-1173
Q16	MMBT3906L, PNP	SS-0791		Headphone Jack	CC-1177
Q17	MMBT3904L, NPN	SS-0792	J100	Line Cord Socket	CC-1174
Q18	MPS6521	SS-209		Line Cord	FAH-146
Q19	MMBT3906L, PNP	SS-0791		Fuse Holder, Cap	FS-1175
Q20	MMBT3904L, NPN	SS-0792		Fuse Holder, Body	FS-1176
Q21	MPS-A06, NPN	SS-102A		Level Control Cover	HP-0878
Q22	MPS-A56, PNP	SS-101A		Level Control Knob	KN-0838
Q23	MMBT3906L, PNP	SS-0791		Adhesive Feet	HWH-169
Q24	MMBT3904L, NPN	SS-0792	SW1	DPDT Slide Switch	SW-0280
Q25	MMBT3904L, NPN	SS-0792	SW2 (PC-1179-D)	Voltage Select	SW-1172
Q26	IRF540, N Channel MOSFET	SS-0170T	SW2 (PC-1179-E)	Voltage Select	SW-1651
Q27	IRF9540, P Channel MOSFET	SS-0111T	SW3	DPDT Slide Switch	SW-0280
Q28	MMBT3906L, PNP	SS-0791		Power Switch	SWH-1009
CR2	LED Red	SS-741	SW4	DPDT Slide Switch	SW-0280
CR3	LED Red	SS-741			
CR4	LED Green	SS-740	TS1	Thermistor 10k, NTC	SS-1519-A
CR5	MMBD914L Diode	SS-803SM		Transformer	TT-1478
CR6	MMBD914L Diode	SS-803SM		Insulator	IN-1402
			USA	120VAC, 60Hz	
			Line Fuse	Fuse, 2A Slo Blo	FS-1483-A
				Fuse Cap, 3AG	FS-1175
			International	230VCA, 50-60Hz	
			Line Fuse	Fuse, 0.8A Slo Blo	FS-1484-A
				Fuse Cap, 5x20mm	FS-1269-A

Components marked with this symbol are safety critical and should only be replaced with identical components.

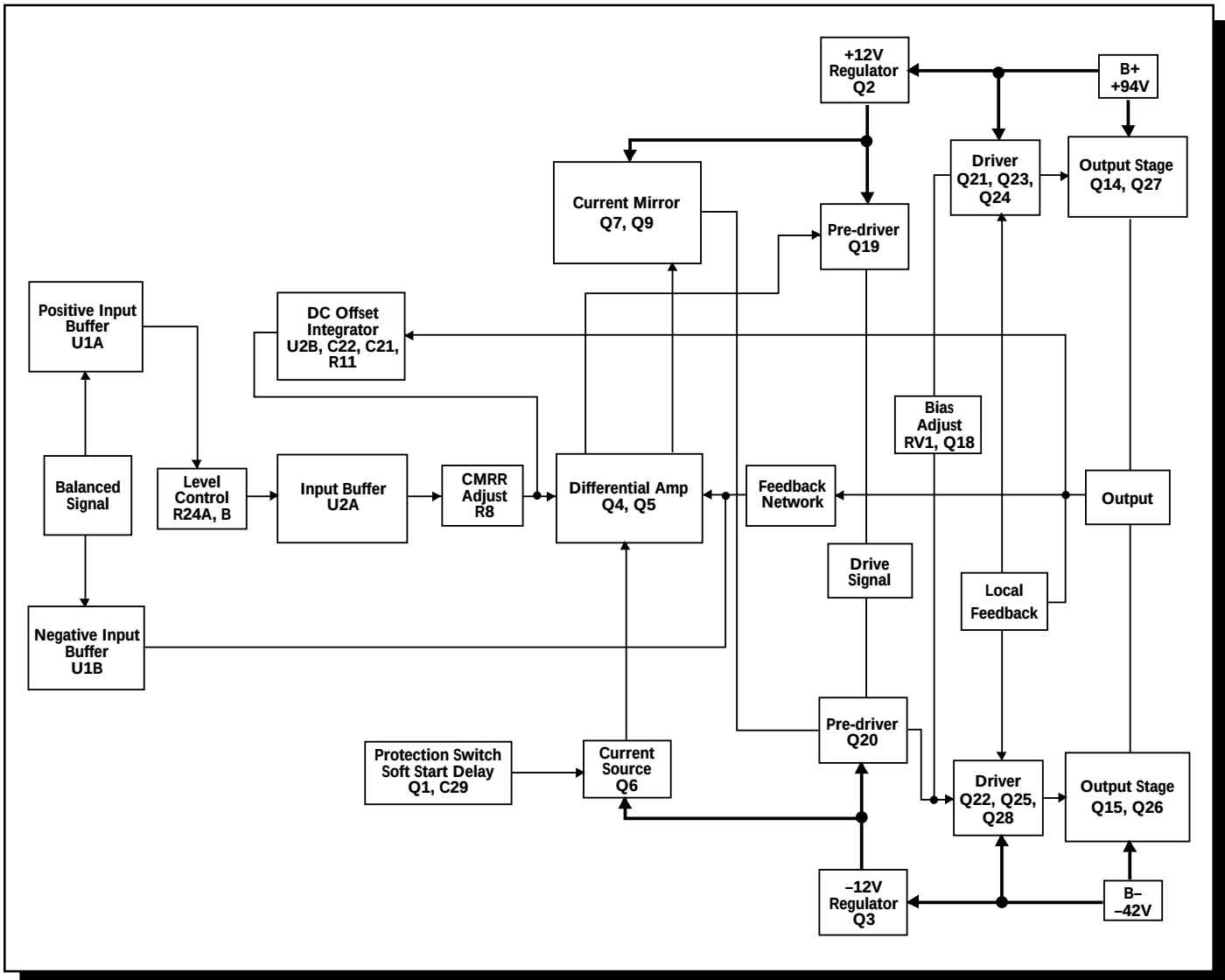
Los componentes marcados con el simbolo son imprescindibles para la protección del equipo, por lo cual que solo sean reemplazados por los mismos componentes.

Les composants marqués du symbole sont indispensables à la sécurité et ne peuvent être remplacés qu'avec des composants identiques.

Bauteile, die mit einem gekennzeichnet sind, sind sehr wichtig und dürfen nur mit den original Ersatzteilen ausgetauscht werden.

I componenti contrassegnati da sono critici per la sicurezza e devono essere rimpiazzati solo con ricambi di valore identico.

P1000 FUNCTIONAL BLOCK DIAGRAM



CIRCUIT OPERATION

trans•ana Implementation

The transistor Q1 is configured to operate as a switch which controls the constant current source, Q6, of the input differential amp, Q4 and Q5. When Q1 is off the emitter voltage is low turning off Q6. Timing of the Soft Start function is controlled by the charging time of C29 through R13. The THERMAL Protection circuit uses Q1 to shut down the channel when excessive heat is detected.

U1A and U1B are buffer amps configured as unity gain, non-inverting voltage followers. The output of these buffers is fed to the attenuator network controlled by R24. The buffer amp U2A stabilizes the impedance at the non-inverting differential input Q4. U2B is configured as a DC servo-integrator to null the output offset voltage.

Transistors Q19 and Q20 are the second gain stage and are the pre-drivers of the output stage drivers Q21 and Q22.

The driver stage level-shifts the signal from the low voltage operation of the input circuit to the high voltage operation of the output stage. Drive current for the positive output MOSFETs is supplied by the current amplifier Q23 and Q24. Drive current for the negative output MOSFETs is supplied by the current amplifier Q25 and Q28.

Class AB bias current is established by Q18 and adjusted by RV1. Local feedback is supplied by the network C16, R82 and R102, and global feedback by C10 and R35.

CALIBRATION



WARNING: Only a competent technician should attempt the following procedure.

Adjusting Bias:

The bias control establishes the quiescent Class AB output current of the amplifier. The bias should not need readjustment from the factory setting; however, if the amplifier is repaired and output devices have been changed, or if the two channels of the amplifier do not run at the same temperature, recalibrating the bias is necessary. **Disconnect the power to the amplifier before removing the cover.** To adjust the bias, disconnect the input and speakers and remove the jumper J4. Connect an amp meter across the exposed pins. The correct polarity is marked adjacent to the jumper. Adjust RV1 to get a current reading of 100mA.

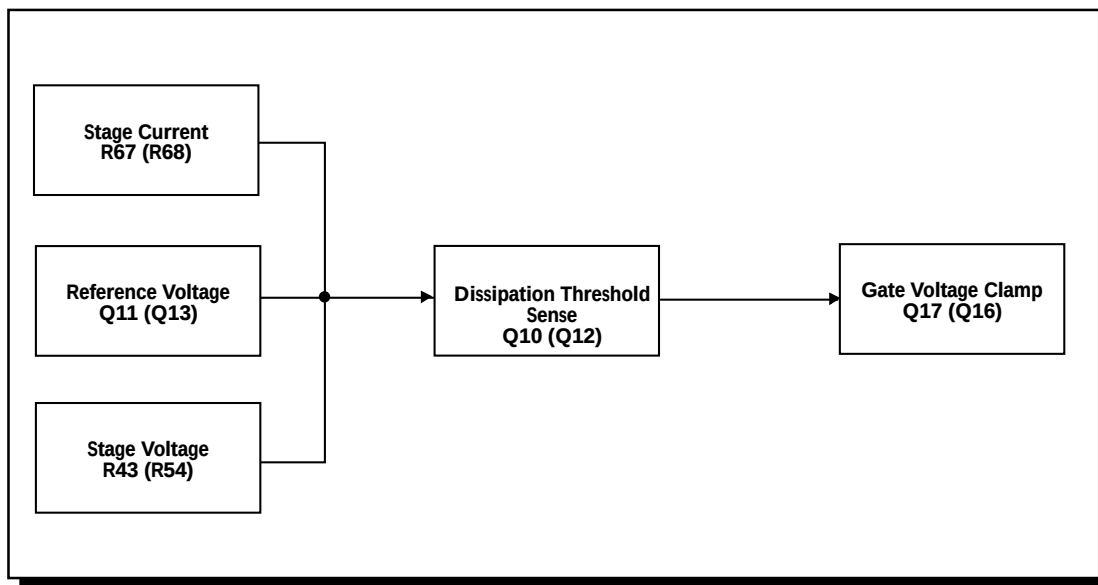


WARNING: Only a competent technician should attempt the following procedure.

Calibrating Common Mode Rejection:

The input common mode null is adjusted by the trim pot R8. The CMRR should be greater than 70dB below rated output. If the CMRR requires adjustment, feed the amplifier input with a common mode signal and adjust R8. **Disconnect the power to the amplifier before removing the cover.** Use a sinewave generator set to 1 volt output at 1kHz. Connect the generator signal output to the tip and ring of a 1/4" plug and ground to the sleeve. Plug this into the amplifier input. Connect an AC voltmeter to the amplifier output binding posts. Adjust R8 to give the lowest voltage output from the amplifier. For a temporary adjustment when a signal generator and voltmeter are not available, use an FM tuner and tune it to an unused station as your signal source, and connect the signal to the amplifier as described above. Connect the amplifier output to a small full range speaker. Turn the amplifier level controls full down and turn the amplifier on. Turn up the level control until you hear a signal through the speaker. Alternate between adjusting R8 for the lowest output signal and increasing the input control until you have the level control full. There should be very low output from the amplifier if any is detected at all.

NOMAD (NON-Multiplying Advance Decision)

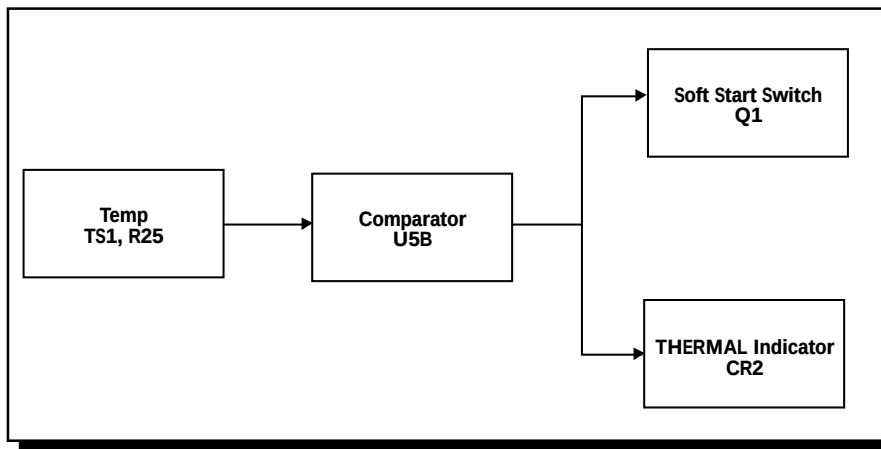


Maximum power delivery, within the output MOSFET ratings for power, voltage and current, is ensured by our NOMAD (**NO**n-**M**ultiplying **A**dvance **D**ecision, patent pending) circuit. The device current and voltage are electrically measured and the drive voltage is clamped to limit the power demand when the operation exceeds the device dissipation limits. NOMAD is comprised of separate, symmetrical sections which monitor operating conditions of the positive and negative output devices.

The voltage drop across R67 (R68) is proportional to, and represents, the positive output current (the negative circuit components are shown in parentheses). The voltage drop across R43 (R54) is a shaped function of the positive output device voltage. The emitter to collector voltage of Q11 (Q13) is constant and supplies the circuit reference voltage. When the sum of these voltages exceeds 0.6V, Q10 (Q12) is turned on. If the condition persists long enough to charge C11 (C12), Q17 (Q16) is activated and clamps the output gate voltage.

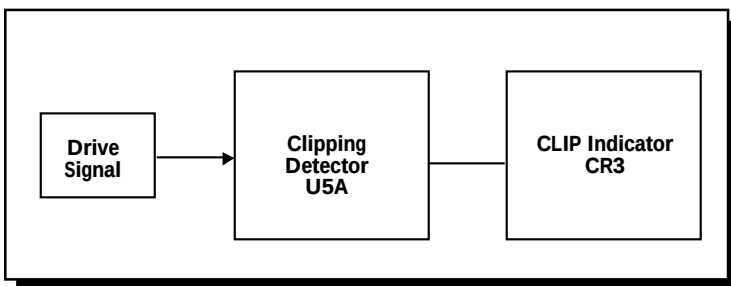
The NOMAD circuit can be disengaged by removing D1 (D2). This allows amplifier operation without protection.

Thermal Protection



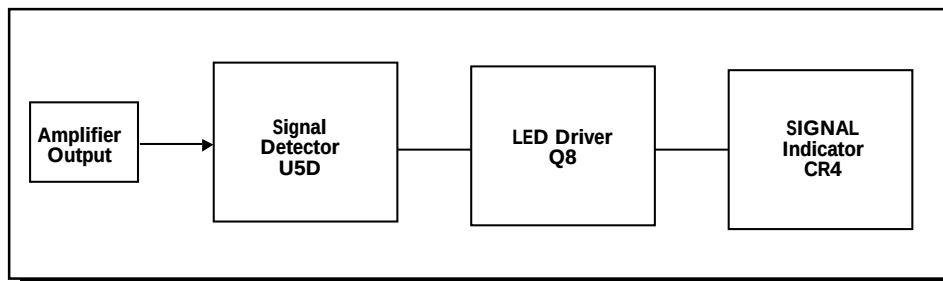
The thermal protection is activated, and shuts down audio operation, when the amplifier heatsink reaches an excessively high temperature. The voltage divider R22 and R23 establishes the reference voltage on pin 5 of U5B. The control voltage, on pin 4 is established by the voltage divider TS1 and R25. TS1 is a NTC (Negative Temperature Coefficient) thermistor, mounted on the heatsink. As TS1 warms and the resistance falls, the voltage on pin 4 rises. When the voltage on pin 4 exceeds the voltage on pin 5, the output on pin 2 goes low, shutting down the Soft Start switch Q1 and lighting the THERMAL indicator.

Clipping Indicator



The CLIP indicator is driven by the comparator U5A. The voltage divider R56 and R57 established the reference voltage for the Clipping detector at pin 7 of U5A. The reference voltage scales the output of U5A to indicate when the Drive Signal, at pin 6, demands an excessive amount of the available voltage or current of the output stage.

Signal Present Indicator



The SIGNAL indicator is controlled by the comparator U5D and the transistor Q8. The amplifier output is connected to the input pin 9. The voltage divider R58 and R59 scales the output voltage to change the comparator output stage at an equivalent input voltage of 30mV. The output at pin 14 controls the transistor Q8 to shunt across and turn off the LED CR4.

AMPLIFIER MODULE REPLACEMENT

The amplifier modules have been designed to eliminate the need for a special workplace if a field exchange becomes necessary. All wire connections are made with quick connect terminals so soldering is not necessary. The following tools are needed to disassemble the amplifier:

Allen wrench, 9/64
Phillips screwdriver, #1 tip
Thin nose pliers



WARNING: Only a competent technician should attempt the following procedure.

1. Disconnect the power to the amplifier before proceeding
2. Locate the 9/64 Allen head screws on the top edge of the amplifier between the heatsink fins. Remove these and the Phillips head screws holding the input jacks on the rear panel. Lift the rear of the cover and remove it from the amplifier. Take the knobs off the level controls.
3. Remove the 9/64 Allen screw located behind the rack ears and the two 9/64 screws on the bottom edge of the heatsink. This frees the module from the chassis and it can be lifted clear.
4. Unplug the gray Mono cable connecting the two modules. Disconnect the red and black output wires and the orange transformer secondary wires from the PC board.
5. Prepare a new Channel 1 module for installation by setting the NORMAL/Bridged MONO switch to the default position according to the arrow marked on the PC board. Prepare a Channel 2 module by duplicating the switch setting of the module which was removed.
6. Install the new module and check the position and alignment of the LEDs. Replace the level control knob and check its alignment while securing the module.
7. After the module is secured, reconnect the wires according to the following chart:

Wire Color	Function	Terminal
Red	Audio Output	RED
Black	Output Ground	BLK
Orange/White	Transformer Center Tap	CT1
Short Orange	Transformer Secondary	AC1
Long Orange	Transformer Secondary	AC2

SERVICE POLICY AND LIMITED WARRANTY

Rockford Corporation (Hafler Division) offers a limited warranty on Hafler products on the following terms:

- **Length of Warranty**

- 5 years on P1000, P1500, P3000, P4000
- 7 years on P9505 and P7000
- 90 days on all B-Stock (receipts are required)

- **What is Covered**

This warranty applies only to products sold to the original owner (non-transferable). This only applies to units sold in the Continental United States. You are required to have a copy of the receipt stating the customer's name, dealer name, product purchased and date of purchase.

- **Products found to be defective during the warranty period** will be repaired or replaced (with product deemed to be equivalent) at Hafler's discretion.

- **What is NOT Covered**

1. Damage caused by accident, abuse, improper operations, water, theft
2. Service performed by anyone other than Hafler or an Authorized Hafler service center
3. Any product purchased outside the United States (please contact your local dealer)
4. Shipping charges to get the unit to Hafler
5. Any product which has had the serial number defaced, altered, or removed

- **Limit on Implied Warranties**

Any implied warranties including warranties of fitness for use and merchantability are limited in duration to the period of the express warranty set forth above. Some states do not allow limitations on the length of an implied warranty, so this limitation may not apply. No person is authorized to assume for Rockford Fosgate any other liability in connection with the sale of the product.

- **How to obtain service or technical support**

Please call 1-800-669-9899 for Rockford/Hafler support. You must obtain an RA # (return authorization number) to return any products to Hafler. You are responsible for shipment of product to Hafler.

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