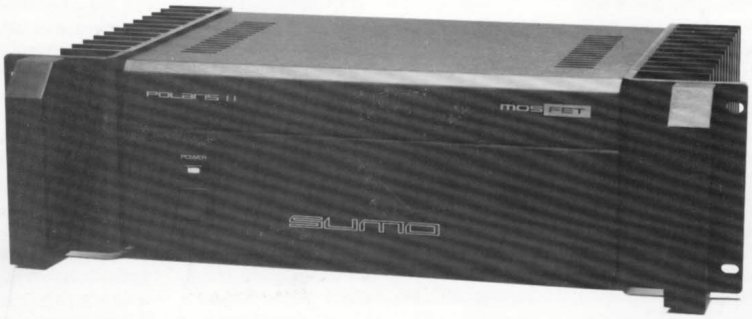
SUMO



SUMO

FINAL TEST CERTIFICATION

MAX POWER	140 W	THD	.03%	VOLTAGE	120
MODEL	Polaris II			SOUND TEST	OK
SERIAL NO.	[redacted]				

POLARIS II

1 SETTING UP THE SYSTEM

FIRST CONSIDERATIONS

First and foremost, we would like to stress that the Polaris II is only one part of a total system. This amplifier is capable of quite remarkable performance when used with the proper speakers and front-end equipment.

It should be noted, though, that the other parts of the total system will affect the overall performance. If the Polaris II is used with inferior-quality front-end equipment (that is, CD players and turntables), the system cannot be expected to perform to its fullest potential. Similarly, if the speakers are of inferior quality, or are too difficult a load to drive, then system performance will not be optimum.

The Polaris II is stable into any load, including capacitive and very low impedance loads (even 2 ohms, or 1 ohm). However, when this amplifier is used with speakers where the impedance drops to less than 2 ohms, especially throughout the bass region, it must be expected that the amplifier will blow power-supply rail fuses when played hard. This is a normal protective mechanism, since both the power supply and the output stage have finite limits. If the amplifier blows power-supply rail fuses repeatedly, you probably have a speaker which is rather difficult to drive. The solution to this problem may be found in purchasing a larger amplifier, or perhaps by bi-amping the system, if it is possible.

UNPACKING

After unpacking the Polaris II, the first thing to do is to take a good look at it. Did any damage occur during shipping? Are there any cosmetic flaws? In the unlikely event that either of these conditions exist, you should call your dealer immediately. It's better to remedy any problems like this early in the game.

Assuming that your amplifier is undamaged, let us recommend that you save the original box and packing materials. These items are truly the best way to ship the amplfier. If you ever move, or have to send the amplifier somewhere (for service or otherwise), you'll be glad you kept the packing.

LOCATION

When choosing a location for your amplifier, it's important to keep in mind a couple of facts: first, that the Polaris II likes to breathe. Circulation of air through the external heatsinks is necessary for proper heat dissipation. It is also important that this circulating air be COOL air. Therefore, you should not place the amplifier inside cabinetry which might restrict the air flow. It is recommended that there be at least 2" of free space above the external heatsinks for proper operation. The amplifier should also be kept away from hot air vents, direct sunlight, and should never be stacked on top of other heat-generating components.

Should the amplifier overheat for any reason, a thermal breaker will trip and the unit will shut down. This, like blowing rail fuses into low-impedance loads, is a perfectly normal protection mechanism. If this thermal breaker trips during normal operation, then it may be necessary to relocate the amplifier. If the amplifier is inside a cabinet, it may be necessary to add forced ventilation.

Second, the amplfier's chassis should be isolated from the system ground. This means that if you plan to install the Polaris II in a standard 19" rack, the chassis and metalwork should be isolated from the rack. If they are not, then an audible hum (due to ground loops) may be present. In addition, placing a preamplifier on top of the amplifier may cause an audible hum, again due to ground loops in the system.

CONNECTIONS

Before you go around connecting up everything, we'd like to scare you a little.

First of all, you should do all of the connections with the amplifier unplugged. Anybody who has plugged a typical RCA cable into a "hot" amplifier can attest to this fact. Unless you want a good demonstration of what the 1906 San Francisco quake was like (and possibly blown speakers in the bargain), don't do it. Similarly, never touch the hot lead of the input cable with your finger while the amplifier is on. You'll get the same results.

Also, it's a good idea to check your speaker cables for shorts. Although each Polaris II is factory short-tested as part of the manufacturing procedure, it's never a good idea to apply a direct short to the speaker terminals of an amplifier.

With that over with, we can get on with the input connections. For this, you'll need a pair of high-quality shielded audio cables. Connect the left and right channel outputs of your preamp to the Polaris II's respective left and right inputs. And while short interconnects are admirable, we recommend that you do not stack the preamplifier and the amplifier. Apart from blocking proper airflow over the amplifier's heatsinks, this also may create an induced hum due to the field of the Polaris II's transformer.

For output connections, the Polaris II uses five-way binding posts. These accept most high-quality terminations, including spade lugs, banana jacks, and bare wire.

When connecting the output, care should be taken to ensure that the speakers are in phase. Out-of-phase wiring will cause a lack of bass and a weak, diffuse stereo image. Proper phasing is accomplished simply by noting the indication on the speaker wire which differentiates one lead from another. This may be color, or a ridge, or a printed marking. Identify the lead that is attached to the (-) terminal of the amplifier and make sure the same lead is attached to the (-) termainal on the speaker. Repeat this procedure for the (+) terminals, and for the second channel. Once this has been done, your speaker should be in phase.

Finally, you can plug the amplifier in and turn it on. The Polaris II uses an international type three-prong (grounded) cord with an IEC socket mounted on the back panel of the amplifier. Due to the vagaries of different house wiring systems, it may be necessary to isolate the Polaris II's chassis from the AC ground. This can be done by using a three-prong to two-prong adapter ("cheater") on the cord. We recommend that you avoid plugging this amplifier into a preamp's convenience outlet, since it will probably exceed the current capability of the preamplifier. Turn on the amplifier only after the rest of the system has been turned on. Many preamplifiers and source components emit LARGE transients when first powered up, so it's best to turn on the amplifier only after these have stabilized.

2 OPERATION

GENERAL RECOMMENDATIONS

The Polaris II, like most high-quality amplifiers, sounds best after it has been warmed up. In fact, it sounds best if left on at all times. This will not in any way harm the amplifier, but we realize that it may not be feasable for all owners. In the event that the amplifier cannot be left on, it is recommended that it be left to warm up for thirty minutes or so for best sound. A burn-in period (where the amplifier is left on for a period of a week or so after it is first purchased) is not a bad idea, either.

PROTECTION

During normal operation, you should never encounter the Polaris II's protective devices. The Polaris II is protected in three ways; first, by a thermal breaker, as discussed previously, second, by power supply rail fuses which will blow if an over-current condition exists, and third, by a power-line fuse.

The thermal breaker is self-resetting. If the amplifier shuts down due to thermal stress, it will turn back on after it has cooled. This can take anywhere from 10 minutes to 1/2 hour. The cool-down time can be reduced by placing a fan near the amplifier, blowing on the heatsinks.

All of the fuses are located on the back of the amplifier, and so are easily replaceable if the need arises. They should be replaced with the same type and size of fuse. Since they are an integral part of the amplifier's protection mechanism, wrapping them with foil or replacing them with 35 amp car fuses won't do. It'll just void the warranty, and may destroy the amplifier. If you experience a chronic fuse-blowing problem, it may be time to consider a larger amplifier.

MONO CONVERSION

The Polaris II can be converted to a mono 400 watt amplifier in either of two ways. The first "traditional" method is with an external bridging adapter or with a crossover (such as the Sumo Delilah) that offers both normal and inverted phase outputs. The second method is a simple internal operation. You should have an authorized Sumo service center perform this procedure, but we'll outline it here in any case.

NOTE! The Polaris II, when operated in mono mode, is not "bridged". It is a true differential balanced amplifier. In mono mode, both of the output terminals are being driven by an amplifier. Common-ground situations should be avoided at all costs, and speaker switchboxes should be examined carefully to determine their compatibility with balanced amplifiers. In mono mode, both of the input terminals are also still active. We provide you with a shorting plug to place in the unused input. In no case should the Polaris II be operated without the shorting plug in place.

With those cautions, here's the procedure for converting the Polaris II to mono operation:

1. Remove the top cover by unscrewing the 12 screws that fasten it to the heatsinks and loosening the remaining four screws on one side (so that one heatsink can move slightly to allow the top cover to be lifted off). For this operation, you will need a 7/64" hex wrench ("Allen" style). Note: the popular "all-in-one" hex wrench sets don't have very much clearance around the bolts near the front rack mounts. You may scratch the back of the front rack mounts if you use this type of wrench.
2. On the PC board at the back of the amplifier, near the center, you will see an orange wire. This wire, terminated with a slip-on connector, will be connected to a terminal marked "STEREO". To convert to mono operation, move this connector to the nearby terminal marked "MONO."
3. Replace the top cover, using the reverse procedure as (1).
4. Insert the shorting plug into one of the rear panel RCA jack inputs, If you want to use the Polaris II as a non-inverting amplifier, insert it in the lower (-) RCA jack and connect the preamplifier output to the top (+) RCA jack. If you want to use the Polaris II as an inverting amplifier, reverse these connections.
5. Take the speaker output from the two red (+) outputs of the Polaris II. For non-inverting operation, connect the loudspeaker's (+) terminal to the Polaris II's left-channel output and the (-) terminal to the right-hand output. For inverting operation, connect the loudspeaker's (+) terminal to Polaris II's right-channel output and the (-) terminal to the left-channel output.
6. Share and enjoy.

3 TECHNICAL INFO

CIRCUIT DESCRIPTION

The Polaris II is, in many ways, a unique amplifier. Perhaps the most obvious of these is the use of Sumo's proprietary transconductance linearization (TL) circuit around the MOSFET output stage. Contrary to popular belief, power MOSFETs are actually more nonlinear in their behavior than a bipolar transistor. This has been dealt with previously in two ways. The first is just to increase the level of overall negative feedback, which may cause TIM, RF noise floor modulation, and other problems associated with a nonlinear open-loop. The second is just to set the bias on the output stage rather high and live with the second-order distortion products (sometimes more than 1% at 20 kHz!). Sumo, however, uses a special, dedicated circuit around the output stage to linearize the transconductance of the MOSFETs. This "TL" circuit cannot properly be called a feedback loop, or a servo; it is in a class by itself. Each channel's TL circuit is adjusted individually during production for minimum nonlinearity. The result? A linear output stage, driven by a linear voltage-gain stage. Extremely low levels of low-order harmonic distortion, without having to resort to large amounts of negative feedback.

But the TL circuit is not all the Polaris II can boast about. Consider its all-discrete, class-A voltage amplifier stage. This stage is based exclusively on bipolar transistors, since these devices are inherently more linear than a FET and thus require very little feedback. Consider the "stacked" power supply. A separate high-voltage supply is used for the voltage amplifier stage, to ensure that the output stage is always the last to clip. This gives more predictable (and polite) behavior in an overload condition. In addition, there are two separate regulated supplies for the front end differential amplifiers, which eliminate the chance of power supply fluctuations modulating the output of the front end.

And then there are such "minor" considerations as an all-aluminum chassis, Mylar input coupling cap (bypassed by a polystyrene), mil-spec glass-epoxy PC board, 1% metal-film resistors, and a DC servo to prevent excess DC from appear-

ing at the output.

SPECIFICATIONS

Power Output: 120 watts per channel into 8 ohms, both channels driven, from 20 Hz to 20 kHz with less than 0.05% THD. 200 watts per channel into 4 ohms, both channels driven, from 20 Hz to 20 kHz with less than 0.1% THD.
SMPTE IM distortion: less than 0.05% (.25W to 120W, 8 ohms).
TIM: unmeasurable
Hum and noise: 105 dB below rated power, 90 db below 1 watt
Frequency response: -0.1db from 20 Hz to 20 Khz, -3dB from 1 Hz to 200 kHz.
Input sensitivity at rated output: 1.3V
Input sensitivity at 1 watt: 130 mV
Input impedance: 47k ohms
Damping factor: greater than 500
Rise time: less than 2 uS
Separation: greater than 80 dB
Dimenstions: 19"W x 5.25" H x 11.5" D
Shipping Weight: 30 lbs

4 IN CASE OF TROUBLE

MAINTENA NCE

The Polaris II requires very little in the way of maintenance. If you want to clean it periodically, this is best done with a mild cleaning solution such as glass cleaner. A lye solution should be avoided, as it may attack the anodized surfaces. Similarly, a solvent-based solution may remove the silk-screened lettering. And, of course, abrasive cleaners should be avoided.

TROUBLESHOOTING

Here's a short list of some of the problems that may be encountered with an improperly-used Polaris II.

Amplifier shuts down after a period of time. If the fuses are okay, then it is most likely that the thermal breaker shut off the power supply. This usually happens one channel at a time. If you let the amplifier cool down, then the thermal breaker will reset and it will become usable again. The solution to this problem is to relocate the amplifier to a position where it gets adequate cooling, or check the load. You may be using the Polaris II with a load that it can handle only marginally.

Amplifier blows rail fuses regularly: If you are blowing rail fuses (the 4A fuses) with some regularity, you should check your speaker wires for shorts, In addition, the speaker you are driving may be too tough a load for the Polaris II. Speakers with nominal ratings below 4 ohms, or severe dips below 2 ohms, are not recommended for use with the Polaris II.

Amplifier blows line fuse: If the amplifier blows the line fuse, it has been in an over-current condition for some period of time. Again, this may be because of a low-impedance speaker. You should take care not to overdrive the amplifier to the point of distortion.

Amplifier hums: If the Polaris II hums audibly though the speakers from several feet away, it is most likely because of ground loops. If your preamplifier is near the Polaris II, try re-locating it farther away. If the amplifier is installed in a steel rack, take care to ensure that the chassis is electrically isolated from the rack. If neither of these is the case, then the Polaris II chassis needs to be isolated from the AC ground. This can be done by using a standard three-prong to two-prong adapter plug on the AC cord. These adapters are available at most hardware stores. Note: the use of "line conditioners/stabilizers/filters" will most likely NOT reduce the level of hum in the system.

When using the Polaris II in mono mode, a hum may occur if the supplied shorting RCA plug is not inserted into the unused input.

Service procedure: If your Polaris II ever needs to be returned to Sumo for service, you should call the customer service number listed below and obtain a return authorization number. No unit will be received without a RA number.

SUMO LIMITED WARRANTY

This product is warranted under the following conditions:
1. The product is purchased from an authorized Sumo dealer.
2. The warranty covers normal operating conditions of home use.
3. Warranty period begins as of date of sale, provided it is registered by the authorized Sumo dealer where the product was purchased. The registry period is 20 days.
4. Deliberate misuse, mishandling, failure to report recieving damaged merchandise, or unauthorized tampering with or modifying of this merchandise automatically voids all warranties.
5. The warranty period for all Sumo factory-wired products is three years. This covers both parts and labor, excluding fuses and transportation costs to the factory.
6. Warranty of all Sumo products used in any other fashion will reduce the warranty time period and other conditions to negotiations between Sumo and the prospective user.
7. This warranty shall extend to each successive owner, provided that Sumo is notified by registered mail within 20 days of resale by the initial or present owner. This notification shall consist of date of sale, and the name and address of the new owner.
8. Sumo guarantees that its products are free from defects in materials and workmanship for the required warranty period.
9. This warranty is not valid unless accompanied by a sales slip validation or properly stated copy of the invoice.
10. This warranty is valid only in the United States. Service in other countries will be provided by the exclusive Sumo representative or his agents. Because of verying governmental regulations, the service period may differ from country to country. The service agreement can be honored only in the country where the unit was purchased. The warranty is valid from date of purchase for the required warranty period for purchases made by returning overseas US service personnel.

Except as specifically provided for in this limited warranty, there are no other warranties, express or implied at law or otherwise, including any implied warranty of merchantability or any implied warranty of fitness for a particular purpose.

SUMO, 9829 INDEPENDENCE AVENUE, CHATSWORTH, CA 91311. PHONE (818) 718-8381 FAX (818) 718-0267