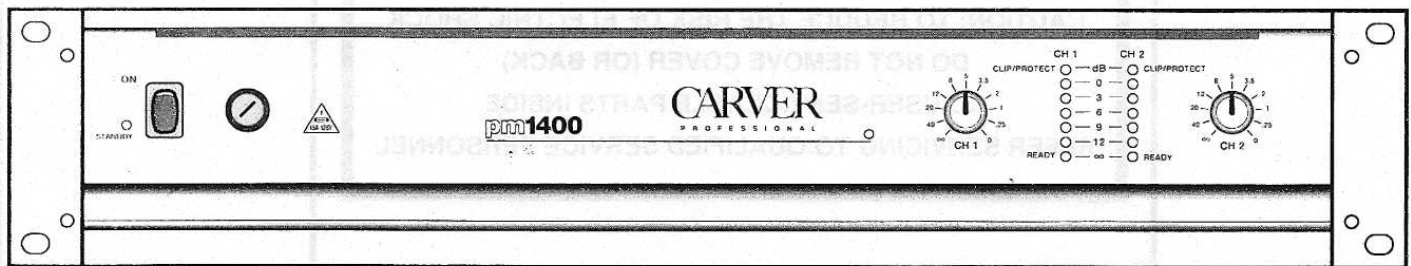


# CARVER

P R O F E S S I O N A L



**pm1400**

Professional Stereo Power Amplifier

**Owner's Manual**

## Safety Information

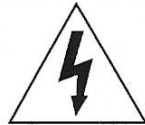


### CAUTION

RISK OF ELECTRIC SHOCK  
DO NOT OPEN



CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK  
DO NOT REMOVE COVER (OR BACK)  
NO USER-SERVICEABLE PARTS INSIDE  
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL



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.



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# 1. Introduction

Congratulations on your purchase of a new Carver Professional Power Amplifier. It is backed by state-of-the-art engineering and manufacturing techniques to bring you the best in quality craftsmanship and reliable performance.

The pm1400 is specially designed for pro-sound applications. Its rugged construction and low profile make it ideal for sustaining the abuses of the road with reliability and space-saving economy. And its accurate sound and ample power make it ideal for critical studio applications as well.

The pm1400 is rated at 700 watts per channel into 4 ohms and 475 watts per channel into 8 ohms. In bridged mono operation it is rated at 1400 watts into 8 ohms.

The sophisticated protection circuits designed into the pm1400 will protect your system should an unexpected fault occur. They also protect the amplifier from excessive temperature, continuous current limiting and shorted outputs.

The balanced input uses a high quality, high common-mode rejection differential amplifier for exceptional hum and noise rejection.

In addition, the pm1400 amplifier is equipped to install the optional PowerLink™ module, Carver's own proprietary hardware and firmware that talks to MediaLink™. This allows the amplifier to be controlled and monitored in real-time with any MediaLink compatible system.

The sequencing feature allows a rack of amplifiers to be powered up from a remote location. The daisy-chain connection scheme causes each amplifier to turn on in sequence, preventing the large in-rush current that can occur when an entire rack of amplifiers is turned on simultaneously.

This power amplifier was designed and manufactured by people with a lifetime commitment to providing the world's finest components for music and sound reproduction. Thanks for placing your confidence in Carver. We know our amplifier will provide many years of dependable service and reliable sound reproduction.

# 2. Features and Specifications

## pm1400 Special Features

- ☐ 475 watts per channel into 8 ohms  
700 watts per channel into 4 ohms
- ☐ XLR and 1/4" TRS input connectors
- ☐ Accepts balanced or unbalanced lines
- ☐ Independent CH 1 and CH 2 Level Controls with 11 detented positions
- ☐ Level Control Defeat Switch
- ☐ Dual Mono mode for operating both channels with a single mono input
- ☐ Bridged Mono mode for combining the power of both channels into a single higher powered channel
- ☐ Internally configurable for Parallel Mono mode for single channel low impedance operation
- ☐ Internally configurable for 0.775V or 1.5V rms input sensitivity
- ☐ Internally configurable input polarity
- ☐ Internal connection points for add-on accessories
- ☐ Power ON Sequencer
- ☐ Carver's patented Magnetic Field Power Supply
- ☐ Class H dual-rail power supply
- ☐ Independent CH 1/CH 2 Speaker relays will instantly disconnect if one of the following fault conditions is detected:
  - D.C. Offset
  - Over Temperature
  - Short Circuit
- ☐ Additional protection circuitry includes:
  - Clipping Eliminator
  - AC Line Fuse
- ☐ Power Connected/Standby indicator
- ☐ 7 LED display per channel, including Power Ready and Clip/Protect indicators
- ☐ Optional PowerLink™ interface module for MediaLink™ monitoring and computer control
- ☐ 2-speed fan cooled
- ☐ 70-volt stereo direct drive operation



## Specifications for pm1400

### Power Output:

Continuous Average Output Power, both channels driven:

475 watts per channel into 8 ohms from 20Hz to 20kHz, with no more than 0.2% THD

700 watts per channel into 4 ohms at 1kHz, with no more than 0.2% THD (675 watts, 20Hz-20kHz)

#### Bridged-mono operation:

1400 watts into 8 ohms at 1kHz, with no more than 0.2% THD

#### Parallel-mono operation:

900 watts into 4 ohms from 20Hz to 20kHz, with no more than 0.2% THD

Dynamic Headroom: > 2.0 dB

Power Bandwidth: 5Hz to 40kHz (+0, -3 dB)

Frequency Response: 20Hz to 20kHz ( $\pm 0.75$  dB)

Channel Separation: > 65 dB @ 1kHz

Damping Factor: 200 nominal

Input Impedance: 25 kilohms unbalanced, each leg to ground  
50 kilohms balanced

### Sensitivity:

High: 0.775V rms for rated power into 4 ohms @ 1kHz

58mV rms for 1W into 4 ohms @ 1kHz

Low: 1.5 V rms for rated power into 4 ohms at 1 kHz

116mV rms for 1W into 4 ohms @ 1 kHz

### Gain:

High: 36.7 dB ( $\pm 0.5$ dB)

Low: 30.7 dB ( $\pm 0.5$ dB)

Input Overload: +18 dBu

IM Distortion: < 0.1%

### THD:

@ 0.775V Sensitivity: < 0.2%

@ 1.5V Sensitivity: < 0.1%

### Signal-to-Noise Ratio:

> 100 dB, A-weighted, ref. to rated power into 4 ohms (High gain)

> 78 dBW, A-weighted, referenced to 1W into 4 ohms (High gain)

Slew Rate: 40V/ $\mu$ S (Bandwidth limited)

CMRR: > 80 dB @ 1kHz

### Power Consumption:

40W at idle

800W with musical program

1500W at full power into 8 ohms (continuous)

2400W at full power into 4 ohms (continuous)

### Power Requirements:

120VAC/60Hz (USA and Canada)

Other voltages as required for export

### Fusing:

15 amp slo-blo (120V/60Hz)

8 amp slo-blo (230V/50Hz)

### Sequence Receive Terminal:

+7V to +15VDC

50mA minimum current requirement

### Display:

7 LED indicators per channel

1 green READY, 5 yellow SIGNAL,

1 red CLIP/PROTECT

### Size (H x W x D):

3.5" (2U) x 19" x 13.25"

89mm x 483mm x 337mm

### Net Weight:

34.2 lbs. (15.5 kgs)

### Shipping Weight:

40 lbs. (18.1 kgs)

Features and specifications are subject to change without notice.

### 3. Unpacking and Paperwork

Carefully unpack the amplifier and keep the original carton and packing materials for future moving, shipment or long-term storage.

After opening the box, please check for any visible signs of damage that were not apparent from the outside of the box. If you do encounter what appears to be concealed damage, please consult your Carver Dealer before proceeding to further unpack or install the unit.

#### Important Paperwork

**Make sure to save your sales receipt.** Your receipt is extremely important to establish the duration of your Limited Warranty, and for insurance purposes. Next, make a note of the serial number which is located on the back of the amplifier. Record it in the space provided below for convenient reference.

**Model:** pm1400

**Serial Number:** \_\_\_\_\_

**Purchased at:** \_\_\_\_\_

**Date:** \_\_\_\_\_

Finally, take a moment to fill out and return the Warranty Registration Card packed with the amplifier and return it to Carver. This will allow us to keep you informed about new products as they become available.

### 4. Operation

#### Front Panel Features

##### 1. POWER switch

When this switch is pressed, the power turns ON and the READY indicators illuminate. Be sure all connections are made and double-checked before switching the power amplifier ON.

##### 2. STANDBY LED

This indicator illuminates when the power switch is turned OFF. It also lets you know when the amplifier is connected to AC power. When the power switch is OFF and the amplifier is plugged into an AC outlet, the LED illuminates to indicate that AC power is available and the amplifier can be powered up. When the power switch is ON, the LED turns off.

##### 3. AC Power Fuse

This protects the amplifier from catastrophic failures that could damage internal circuitry. Repeated fuse blowing is a sign of internal distortion. Refer to an authorized Carver Service Center for evaluation.

**CAUTION:** REPLACE WITH THE SAME TYPE 15A-125V FUSE.

**ATTENTION:** UTILISER UN FUSIBLE DE RECHANGE DE MEME TYPE DE 15A 125V.

##### 4. MediaLink indicator

This is an LED that lets you know when the PowerLink circuit (if installed) is communicating with a MediaLink control and monitoring system. This LED will illuminate green when the PowerLink circuit is active. It can be changed to red via MediaLink to "flag" the amplifier should it require attention.

##### 5. CH 1 and CH 2 Level Controls

These controls are used to adjust the input level of each channel. When the controls are fully clockwise the amplifier operates at maximum gain. Turning the controls counter-clockwise attenuates the input signal.

The Level controls can be bypassed internally to lock the amplifier at its full gain capacity. See page 20 for information about the Level Defeat Switch.



⚠ **Note:** When using the PowerLink module, the Level controls should be defeated to assure accurate computer control over the levels.

⚠ **Note:** A precision attenuator is available as an option for the pm1400, which can be installed inside the amplifier (see page 14). Contact Carver Customer Service for details.

## 6. CH 1 and CH 2 Status Indicators

These LEDs display information about the operation of the amplifier.

**READY** – This LED illuminates green when the power is on and the amplifier is ready to operate. The READY LED illuminates red when the power switch is first turned on (while the power supply is stabilizing prior to the speaker output relays switching in), or when the amplifier is in protect mode.

**SIGNAL** – These five LEDs illuminate yellow when a signal is present at the Speaker Output jacks to provide an indication of output power relative to full power (0dB).

**CLIP/PROTECT** – This LED illuminates red when the power switch is first turned on, when the output begins to clip, or whenever there is a fault condition detected that causes the output relay(s) to disengage. These fault conditions include excessive DC Offset, excessive heatsink temperature and short circuits at the speaker output(s).

⚠ **Note:** The relays operate independently for each channel. Therefore, it is possible for one channel to operate normally while the other is in "protect" mode.

# 5. Installation

## Location and General Precautions

Observe the following precautions when choosing a location for the pm1400:

- ❑ Do not expose the unit to rain or moisture. If a fluid or foreign object should enter the unit, disconnect the power plug and contact an authorized dealer or service center. Do not pull out the plug by pulling on the cord; grasp the plug firmly.
- ❑ Protect from heat and allow adequate ventilation. Place away from direct sources of heat, such as heating vents and radiators. All components produce some heat during operation, so make sure that the ventilation holes are not covered and that air is allowed to circulate freely behind, beside and above the unit. Excessive heat is the single greatest source of both short-term and long-term component failure.

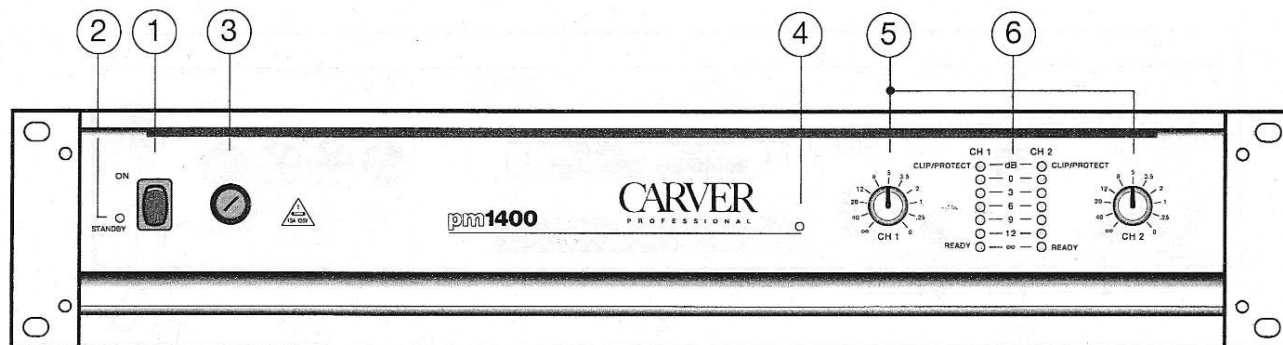


Figure 1. pm1400 Front Panel

## Rear Panel Connections and Controls

### 7. BRIDGED Operation

The STEREO/MONO switch is located just behind the input panel. This switch is used to select between NORMAL STEREO operation, DUAL MONO operation or BRIDGED MONO operation. For NORMAL STEREO operation, use CH 1 and CH 2 inputs. For DUAL MONO or BRIDGED MONO operation, **use CH 2 input only** (see page 20 for instructions on how to access the Stereo/Mono switch, and page 11 for more information about Bridged Operation).

### 8. SEQUENCE SND/RCV

These barrier strip screw terminals are used to link multiple amplifiers for sequenced turn-on. Connect the SND (SEND) terminal of the first amplifier to the RCV (RECEIVE) terminal of the second amplifier. Connect the SND terminal of the second amplifier to the RCV terminal of the third amplifier, and so on (see page 13 for more information on Power ON sequencing).

### 9. CLIPPING ELIMINATOR Switch

The Clipping Eliminator circuit can be bypassed with a switch located just behind the input panel. Turning the switch OFF will deactivate the Clipping Eliminator, allowing the amplifier to clip when driven beyond its maximum output capability.

To access the CLIPPING ELIMINATOR DEFEAT Switch, see page 20 for instructions.

### 10. CH 1 and CH 2 Input Connectors

There are two methods for making input connections to the amplifier. 1/4-inch TRS (Tip-Ring-Sleeve) connections are provided as well as professional XLR connectors. They can be used with balanced signals or unbalanced signals (see *INPUT WIRING* on page 9 for more information).

**Note:** A high quality Input Transformer option is available for the pm1400 power amplifier. Contact Carver Customer Service for details.

### 11. Ventilator

This opening expels hot air from inside the amplifier to keep the amplifier cool. Be sure this vent is clear of obstructions for maximum cooling efficiency.

### 12. MEDIALINK BACK-UP POWER

These terminals are provided to allow connection of an external power supply to keep the PowerLink circuit active (if installed) should the amplifier blow a fuse or fail in some other way. This will allow the MediaLink system to continue monitoring the amplifier and "flag" it should it require attention or maintenance.

It will accept an AC or DC voltage between 9 and 12 volts. The voltage is rectified internally so the polarity of the connection doesn't matter.

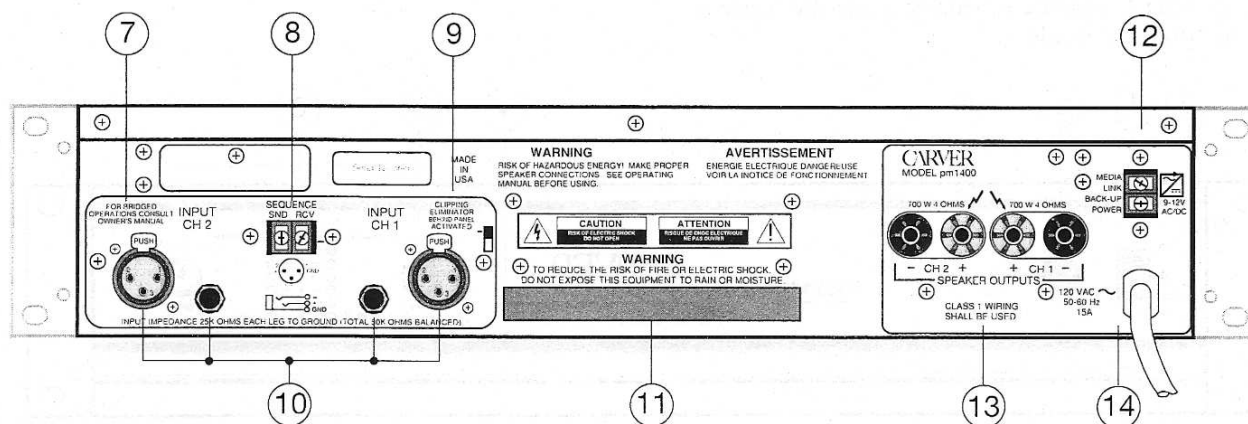


Figure 2. pm1400 Rear Panel



### 13. CH 1/CH 2 SPEAKER OUTPUTS

Multi-way binding posts are used to connect the loudspeakers to the amplifier outputs. The red terminals are the signal connection ("+") and the black terminals are the signal return connection ("-"). The black terminals are internally tied together and to signal ground.

### 14. Power Cord

Connect to a properly configured outlet providing the line voltage specified for your model.

## Mechanical Considerations

The pm1400 requires two rack space units (3.5"). It requires 15" depth inside the rack, including the rear supports. Secure the unit mechanically using four screws with washers to prevent marring the front panel. Neoprene rubber washers are a good choice because they grip the screw head and prevent them from backing out when vibrated or transported.

### Rear Support for Road Applications

If the pm1400 is rack-mounted and the rack is transported, mechanical support for the rear of the amplifier is required. This could take the form of a shelf across the rear of the amplifier or brackets that engage the rear of the unit. This practice is recommended for all electronic instruments.

## Thermal Considerations

When the pm1400 is used free-standing, no thermal considerations are necessary other than keeping the ventilation holes open.

If the amplifier is rack-mounted, ensure that adequate ventilation exists in front of and behind the amplifier. When several amplifiers are mounted together in a rack, you may need to provide air inlets from the outside of the rack.

The pm1400 is fan cooled. The fan is internally mounted so that it draws air in from the front and exhausts it out the rear. This allows cool air from outside the amplifier to flow over and cool the power supply components located in front of the

heatsinks before being warmed by the heat-producing output devices, thus providing optimum cooling efficiency.

The pm1400 amplifiers may be stacked directly on top of each other without spacer panels. If the amplifier is used with other amplifiers, ensure that the heat output from the other amplifiers doesn't interfere with the ventilation of the pm1400 (or vice versa).

## AC Power Considerations

Ensure that the pm1400 is plugged into an outlet capable of supplying the correct voltage specified for your model and enough current to allow full-power operation of all the amplifiers plugged into it.

The current demand of a power amplifier varies depending on several factors, including the impedance of the load, the output level of the amplifier, and the crest factor and duty cycle of the program material.

Under typical conditions reproducing rock music, with both channels driven into 4 ohms to the point where musical peaks are just at the clipping point, the pm1400 requires an average of 6.7 amps for 120V versions (3.5 amps for 230V versions).

## Magnetic Leakage Considerations

The pm1400 may be mounted without concern for magnetic flux leakage, within the confines of common sense. For example, it's not a good idea to mount any power amplifier near a microphone input transformer or magnetic storage media.

## Input Wiring

The 1/4-inch phone jacks and XLR connectors for the input signal can be used with either unbalanced 2-conductor or balanced 3-conductor cables. Use shielded coaxial cable to conduct the signal from the source (i.e. mixer, equalizer, CD player) to the amplifier.

### For balanced operation:

**1/4-inch phone jack:** Use a 3-conductor TRS 1/4" phone plug. The tip of the plug carries the "+" (hot, non-inverting) side of the signal, the ring carries the "-" (low, inverting) side of the signal and the sleeve is ground (see Figure 3A).

**XLR:** Use a male XLR connector. Pin 2 carries the "+" (hot, non-inverting) side of the signal, Pin 3 carries the "-" (low, inverting) side of the signal, and Pin 1 is ground (see Figure 3B).

### For unbalanced operation:

**1/4-inch phone plug:** Use a 2-conductor (Tip-Sleeve) 1/4" phone plug. The tip of the plug carries the signal and the sleeve is ground. The ring

connection in the jack is automatically grounded by the sleeve (see Figure 4A).

**XLR:** Pin 2 carries the "+" (hot, non-inverting) side of the signal, and Pin 1 is ground. Short Pin 3 to Pin 1 in order to reference the input differential amplifier for the correct gain (see Figure 4B).

For both amplifiers, the gain remains the same regardless of whether the input is balanced or unbalanced.

**Note:** The polarity of the balanced inputs can be reversed by changing four jumpers located on the Input Board. See page 20 for more information.

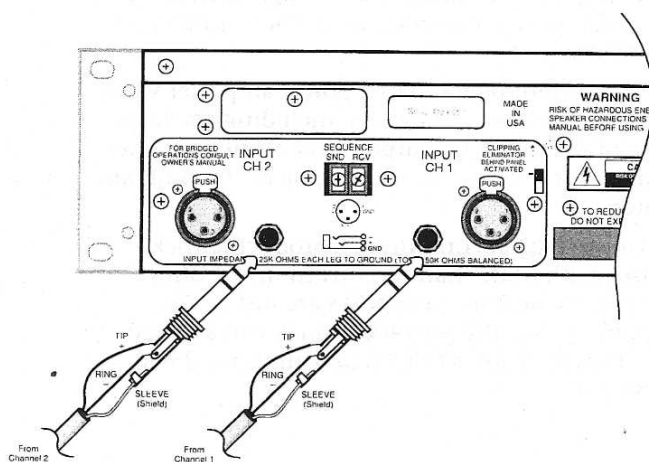


Figure 3A. 1/4" Balanced Input Connection

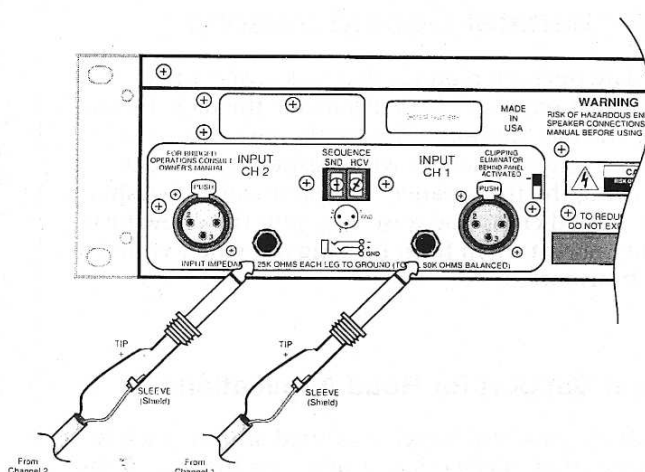


Figure 4A. 1/4" Unbalanced Input Connection

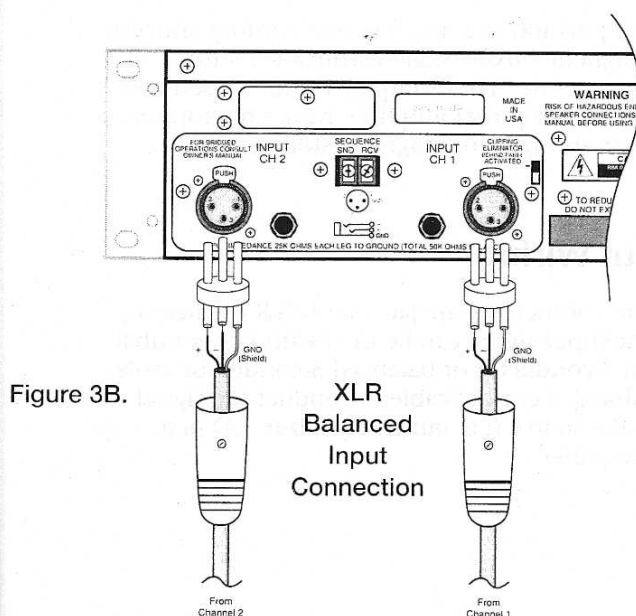


Figure 3B.

XLR  
Balanced  
Input  
Connection

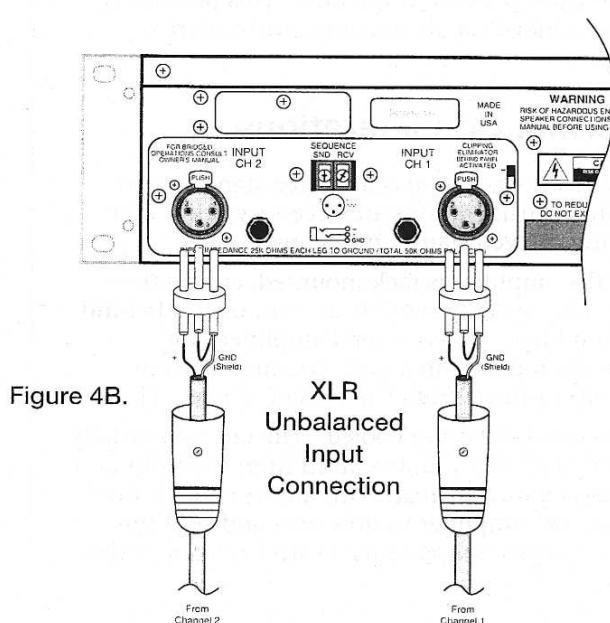


Figure 4B.

XLR  
Unbalanced  
Input  
Connection



## Input Sensitivity

The input sensitivity of the amplifier is set at the factory to 0.775V rms for rated output. The input sensitivity can be changed to 1.5V rms by removing two jumpers on the Main Amplifier Board. See page 20 for more information.

## Output Wiring

Use heavy gauge wire for speaker connections. The greater the distance between the amplifier and the speakers, the larger the diameter the wire should be to minimize power losses across the wire and improve the damping of the speaker. Wire thickness specifications or "gauges" get larger as the wire gets thinner; thus 14-gauge wire is thicker than 18-gauge wire. Use the following chart as a guide:

Wire Length	Gauge of Wire
Up to 15 ft.	18 gauge
Up to 25 ft.	16 gauge
Up to 40 ft.	14 gauge
Up to 60 ft.	12 gauge
Up to 100 ft.	10 gauge
Up to 150 ft.	8 gauge
Up to 250 ft.	6 gauge

This will insure that the resistance of the speaker wire is less than 5% of 4 ohms, resulting in a transmission loss of less than 0.5dB.

The multi-way binding posts can accept spade lug, bare wire or banana connections. Be sure that all the fine strands of the wire are twisted together and contained within the connector. If even one strand is loose and can touch the adjacent terminal, a short circuit may result.

Class I (NEC) wiring must be used.

## Polarity

Loudspeakers must be connected with consistent polarity for correct phasing between them. Incorrect phasing will do no physical harm, but bass response will be diminished. The key is to make sure that both speakers connected to the speaker terminals are hooked up the same way.

Connect "-" at the speaker outputs to "-" on the back of the speaker, and "+" at the speaker outputs to "+" on the back of the speaker.

## Dual Mono

For dual-mono operation, follow the instructions on page 20. The Stereo/Mono switch is located on the Input Board which is just behind the input panel. **Connect the input signal to CH 2 input** (CH 1 input becomes disabled). Connect the speakers to the Speaker Outputs on the amplifier in the same way that you would for normal stereo operation. Both speaker outputs will carry the signal that is connected to the CH 2 input.

## Bridged Mono

For bridged-mono operation, follow the instructions on page 20. The Stereo/Mono switch is located on the Input Board which is just behind the input panel. **Connect the input signal to CH 2 input** (CH 1 input becomes disabled). Connect the speaker(s) to the two "+" speaker terminals. The CH 2 "+" terminal is the hot (non-inverting) side, and the CH 1 "+" terminal is the low ("-", inverting) side (see Figure 5).

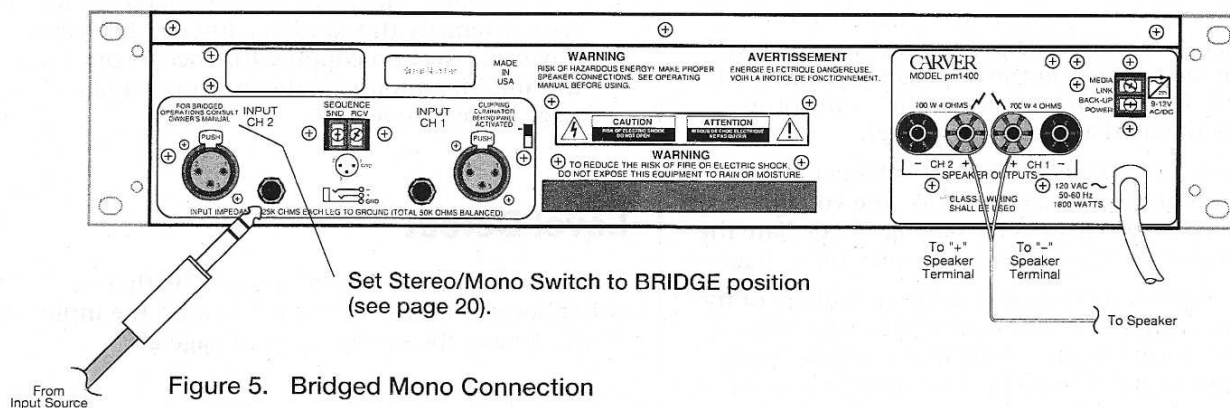


Figure 5. Bridged Mono Connection



When connected in this way, each channel "sees" one-half the impedance of the speaker that is connected between them. If an 8 ohm speaker is used, each channel will see a 4 ohm load. Therefore it is not recommended that any load lower than 8 ohms be connected in this mode of operation. Use Parallel Mono operation for lower impedances (see below).

⚠ **Note:** Be sure to set both of the input level controls to the **exact** same setting for equal power distribution per channel. Switching the Level Defeat Switch OFF is a handy way to insure that both channels are operating at the same level.

**CAUTION:** In bridged mono operation, the output connections are actually a balanced output configuration. **This means that both output terminals have voltage present** (neither one may be grounded).

## Parallel Mono

Parallel-mono operation is useful when you are running sustained high levels into a single load, or when driving a low impedance load.

To configure the amplifier for parallel-mono operation, contact Carver Technical Service Department for Field Application Bulletin **pm1400-1**. It contains detailed instructions describing the simple procedure for modifying the pm1400 for parallel-mono operation.

## 70V Distribution Systems

The pm1400 has sufficient output voltage capability in stereo mode to drive 70-volt distribution systems without using a step-up transformer at the amplifier. In this configuration, the pm1400 delivers up to 475 watts per channel to the 70-volt system, depending on the impedance of the total system. As with all 70-volt systems, transformers are still required at each loudspeaker.

The pm1400 can deliver 475 watts per channel into an 8 ohm impedance (61.6V line voltage). The price for going direct is having to calculate the new transformer tap values at the new line voltage.

Since watts are proportional to the square of the voltage, compute the correction factor by taking the ratio of the square of the line voltages. Then multiply each tap value by this correction factor.

For example, choose a transformer that has taps at 10W, 5W and 2.5W when used in a 70.7 volt distribution. Its new tap values when used with a pm1400 are computed as follows:

1. Compute correction factor  $K$ :

$$K = 61.6V^2 / 70.7V^2$$

$$K = .7591$$

2. Apply to tap value:

$$\text{marked tap value} * K = \text{new tap value}$$

$$10W * .7591 = 7.591W$$

$$5W * .7591 = 3.796W$$

$$2.5W * .7591 = 1.898W$$

When used in a 70.7V distribution system, this transformer's new tap values are 7.6W, 3.8W and 1.9W. Note that the 3dB power relationship between each tap still holds true. Similarly, maximum amplifier loading occurs when the sum of the NEW tap values equals the amplifier's output power (475W).

## Clipping Eliminator

This circuit prevents the input signal from exceeding the point where it would drive the amplifier into hard clipping. It has no effect on the signal until it reaches the point where clipping would occur. The larger the input signal the more the signal is reduced to keep the output just below clipping.

The clipping eliminator circuit is operational when shipped from the factory. However, it can be defeated by accessing the Clipping Eliminator Defeat Switch located just behind the input panel. See instructions on page 20.

⚠ **Note:** If the Input Level control(s) are turned down far enough, a sufficiently large input signal can drive the input differential amplifier into clipping. The Clipping Eliminator circuit cannot remedy this kind of clipping. Likewise, it has no effect on clipping that occurs prior to the amplifier inputs (at the mixer or equalizer stage, for example).

## Level Defeat

The Level controls can be defeated with a switch located on the I/O Board, behind the input panel. Follow the instructions on page 20.



## Power ON Sequencing

The Sequencer allows remote turn-on of any number of pm1400 amplifiers (or other Carver amplifiers equipped with sequencing capability). In multiple amplifier applications, the power-on for each amplifier is delayed by 1.5 to 2 seconds. This allows powering up an entire rack of amplifiers without the turn-on surge "popping" the circuit breaker.

Connect the SND (SEND) terminal to the RCV (RECEIVE) terminal of another Carver amplifier. Connect that amplifier's SND terminal to the RCV terminal of the next amplifier in line, and so on (see Figure 6). The last amplifier in line has nothing connected to its SND terminal.

If the signal/chassis ground connection has been disconnected on any of the amplifiers, it may be necessary to install a common ground wire between the signal ground input terminals of the amplifiers being sequenced.

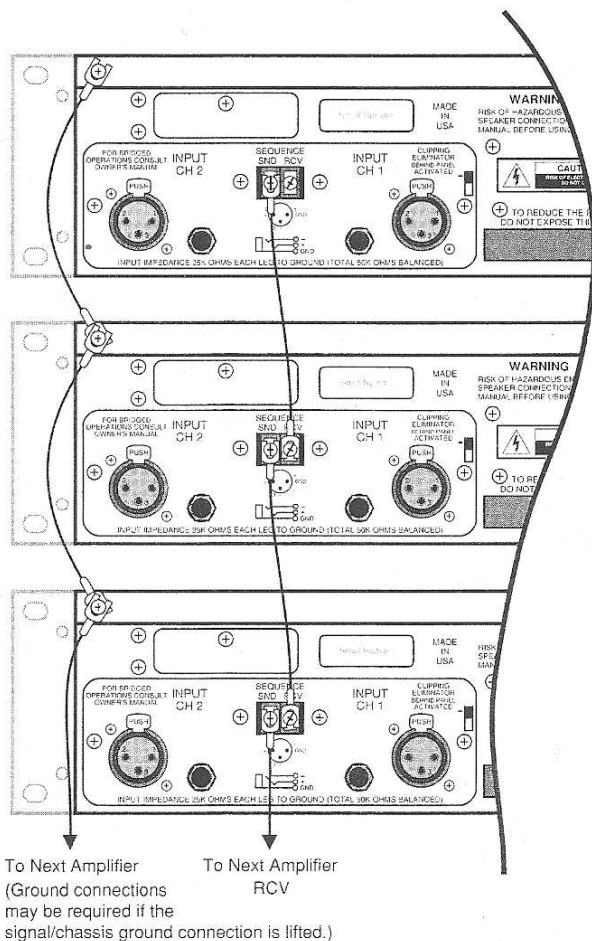


Figure 6. Sequential Turn-On Connection

**Sequencing ON** – Set the MAIN power switch of the amplifiers to OFF. The amplifiers are now ready to be sequenced ON in one of three ways.

1. The first amplifier may be switched on remotely via an external DC voltage of +5V to +15V (a common 9V battery will work); OR
2. The first amplifier may be switched on manually with its main power switch; OR
3. The first amplifier has its power switch in the ON position and all the amplifiers' AC power is controlled remotely with an AC mains switch.

The design of the Sequencing feature insures that the system will continue to operate even if an amplifier in the sequencing chain should fail or blow a fuse. The control voltage will "carry through" from the RCV terminal to the SND terminal. Furthermore, once an amplifier has been turned on at the SEQUENCE RCV terminal, its own power supply will keep the amplifier operating even if the voltage at the RCV terminal is accidentally disconnected or removed.

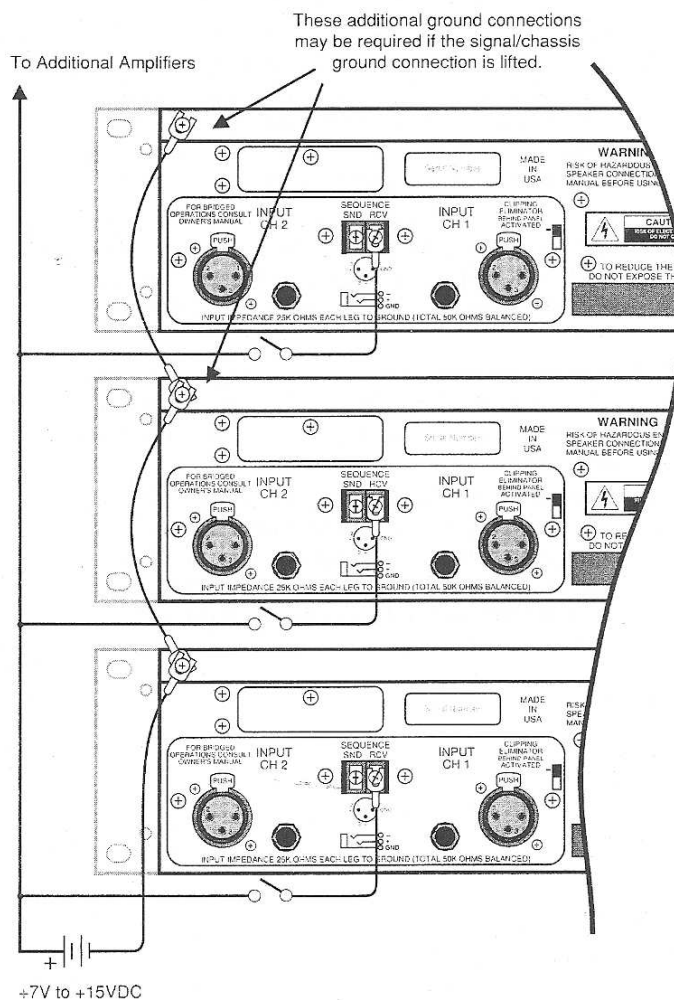


Figure 7. Remote Turn-On Connection

## Remote Turn-On of One or More Amplifiers

The sequencing feature can be used to remotely turn on one amplifier as well as several amplifiers. Leave the MAIN power switch OFF and connect an external DC voltage as described in step 1 above. A simple single-pole switch can be used to turn the external DC voltage ON and OFF from a remote location (see Figure 7).

## Using the pm1400

Once the amplifier has been installed and wired into the system, you are ready to use it. Here are some tips to help you get the most from it.

- ❑ Verify that the switches (Stereo/Mono, Clipping Eliminator and Level Defeat Switch) have been set to the mode that you want.
- ❑ When you power the system up for the first time (out of the carton), it's a good idea to start with all of the amplifier level controls turned down, then advance them slowly, one at a time, so that you can confirm that each amplifier channel is operating normally.
- ❑ Be sure that the Input Level controls are set sufficiently high to allow the preceding device to drive the amplifier to full output. For most installations, this is wide open (fully clockwise).
- ❑ Once you have established settings, it is a good idea to mark them down, either on paper, or on pieces of tape or sticky-dots attached to the amplifier's panel.
- ❑ In bi-amplified (multi-amp) systems, it is a good idea to start with the low-frequency amplifiers turned off or down, and to check each frequency range from highest to lowest to ensure that each loudspeaker component is operating correctly.

## pm1400 Accessory Options

The amplifier has internal connections for installing a variety of accessories to provide additional features for specific applications. Some of the options available are:

- 1) A precision attenuator which provides attenuation in 0.5dB increments down to -60dB. Settings are made with a series of DIP switches on the module.
- 2) A programmable two-way electronic crossover that outputs the high frequencies through one channel and the low frequencies through the other channel.
- 3) High quality balanced input transformers for applications that require electrical isolation.
- 4) The PowerLink interface module, for use with MediaLink communications and control network.

Contact Carver Customer Service Department for information on these and other accessory modules that are available for the pm1400.



## 6. Technical Information

### CIRCUIT DESCRIPTION pm1400

This section discusses the theory of operation of the pm1400. For a better understanding of the circuitry involved, refer to the schematic diagrams presented later in this manual. Op-amps described in the circuitry use the following notation: U1(7) means U1 at pin 7. Unless otherwise noted, this discussion centers around the CH 1 circuitry. The CH 2 circuitry is essentially identical.

#### Low Level Circuitry

Input signals enter the circuit via the rear-panel XLR connectors or 1/4-inch phone jacks, which are in parallel with each other, located on the Input Board. JP3 and JP4 allow the polarity of the XLR connector to be configured for pin 2 hot or pin 3 hot. The pm1400 is supplied from the factory configured for pin 2 hot. Note that changing the jumpers does not affect the polarity of the TRS 1/4" phone jacks.

The signal passes through S1 which directs the signal according to the mode of operation selected (Dual Mono, Normal Stereo, Bridged Mono).

The amplifier may be configured to operate as a conventional 2-channel stereo amplifier, as a 2-channel stereo amplifier with a common mono input (Dual Mono), or as a single-channel mono amplifier with high-voltage output (Bridged Mono). It can also be configured to operate as a single channel mono amplifier with high-current output (Parallel Mono). For now, assume that S1 is set for 2-channel, stereo operation (NORMAL).

P7 through P10 are provided as insert points for accessories.

U1A(6) is a high common-mode rejection differential amplifier configured for unity gain operation. D12-D15 provide protection to U1 from ESD (electrostatic discharge). The signal then passes to the I/O Board via J1-16. Switch S1B allows the signal to bypass the Level Control R102. R8 and U3 form an attenuator whose loss is dependent on the resistance of U3, an LED-LDR module. The drive for the LED portion of U3 comes from the clipping eliminator circuitry, which will be discussed later on.

C3, R8 and R10 form a subsonic filter (-3dB @ 5Hz), and U1B, C4, C8 and R12 provide low-pass filtering (-3dB @ 45kHz). The signal then passes to the Amplifier Board via J200-6/J201-6.

#### Power Amplifier Circuitry

The pm1400 uses a conventional class AB push-pull power amplifier circuit, with a commutated 2-stage (dual-rail, class H) power supply. U100A(1) is the input stage, providing differential inputs for input and

feedback connections as well as most of the open-loop voltage gain of the circuit. Local and global negative feedback from the output stage via R109, R113, R111/R112 and R129 sets the closed-loop gain at 36.7 dB. Removing jumper JP100 disconnects R111 from the circuit and sets the closed-loop gain at 30.7 dB. The output of U100A(1) drives Q100 and Q101, operating as common emitters that level-shift the drive signal and couple it to the pre-driver amplifiers Q102 and Q103. Q102 and Q103 provide additional voltage gain, and when combined with the voltage gain of the input op-amp is sufficient to swing the input signal between the  $\pm 106V$  power supply rails. Q104 and Q122 are connected as an NPN-PNP conjugate pair and used as a  $V_{BE}$  multiplier for bias control. Q104 is thermally connected to the output transistors and together with Q122 provides bias stabilization over a wide temperature range. R124 allows the bias current to be adjusted to its optimum value.

The predrivers (Q102 and Q103) provide the base current to the drivers Q108 and Q109. These drive the output transistors; Q110, Q112, Q114, Q116, Q118 and Q120 for the positive half-cycle, and Q111, Q113, Q115, Q117, Q119 and Q121 for the negative half-cycle.

Q105 operates as a V-I limiter, sensing the voltage drop across emitter resistor R150 (Q106 across R151 for the negative side), and reducing the drive signal to the output stage under overload conditions (see section on Over-Current Protection further on).

From the Amplifier Board, the signal passes to the Output Board via E100. R100, L100, R110 and C100 comprise the output pole circuit for amplifier stabilization. Relay K100 is used to connect the output signal to the Speaker Output Binding Posts.

#### Magnetic Field Power Supply

The main power supply for the pm1400 is a dual-voltage design which provides no-load voltages of  $\pm 106$  and  $\pm 53$  volts DC. The triac drives the primary of the magnetic field power transformer by operating as a phase controlled switch; its gate signal depends on the signal supplied to opto-isolator U3 located on the regulator board. U4B provides steering for the photo-diode in U3, allowing the triac to fire on both alternations of the power line.

U2 on the Regulator Board provides AC to DC conversion, with the AC line voltage providing the input to the converter through limit resistors R3/R4, and the 12.5VDC output determined by feedback resistor R6. This voltage provides the positive supply for U4, DC reference for comparators U4C and U4D, and the current through opto-isolator U1 which sets the voltage for the voltage-to-current converter U4A. Note that U4 (MC3405) is a dual op-amp and dual voltage comparator in a single package (U4A/U4B are op-amps and U4C/U4D are open collector comparators).



## Start-up Sequence

When the power switch is OFF (S1 across E1 and E2) and the linecord is connected to an AC voltage, D1 illuminates (STANDBY LED). When the power switch is turned ON (S1 across E2 and E3), the LED goes off and AC HI is supplied to the Regulator Board.

D2 and D3 on the Regulator Board provide overvoltage protection to U4. U4B(14) is a full-wave rectifier that outputs positive pulses to comparator U4C. The reference voltage is set at 0.7VDC by D1 at pin 3. When pin 2 crosses the threshold, the output of U4C(1) goes open and C6 begins to charge through R21 and U4A(8).

U4A is a voltage-to-current converter (Howland current pump), whose output current is determined by the voltage at the junction of R12 and R13. As the voltage increases, the charging current to C6 increases.

The voltage on C6 is connected to comparator U4D(6). The reference voltage is set at 0.7VDC by D10 at pin 5. When pin 6 crosses the threshold, the output of U4D(7) goes open and base current is supplied to Q1 through R14. Q1 turns on, and current flows through the LED portion of U3, illuminating it and turning on the diac. This applies voltage to the gate of triac Q1 on the Power Supply Board which fires it and allows it to conduct current through the primary side of the power transformer.

When the output of U4B(14) drops below the threshold voltage of U4C(3), U4C(1) goes low and C6 discharges rapidly through it. When the voltage on C6 drops below the threshold voltage of U4D(5), U4D(7) goes low and Q1 and U3 turn off, removing the gate voltage to the triac, momentarily interrupting the current through the primary side of the transformer.

The triac is switched on and off every half-cycle of the 60Hz AC line. Thus, the triac switches the AC line current off at a rate twice the line frequency, at the instant the line current crosses the zero axis. The triac will then remain off for a number of degrees of the sinusoid, before switching on again. The phase angle at which the triac switches on is the "firing angle" of the triac.

This produces enough voltage to the primary of the power transformer to allow the secondary regulator stage to begin to operate.

## Power Supply Regulation

The firing angle of the triac controls the voltage on the primary of the transformer, and is determined by the conduction of the optocoupler U3 on the Regulator Board.

As the conduction of the optocoupler increases, so does the conduction angle of the triac. The photodiode conduction of the optocoupler is controlled by the current through the LED portion of the optocoupler; the amount of current through the LED is equal to the amount of current through transistor Q1. When the LED in U3 is fully ON, the triac conducts earliest in the

AC cycle: the power supply is operating at maximum output. The LED current is supplied by voltage regulator U2 on the Power Supply Board. This differential amplifier senses the secondary supply voltages through R37 and R38. The output voltage at U5A(1) increases at the rate determined by R30 and C8 (slow start-up). The idle secondary voltages are set by R36 on the Regulator Board.

## Load Regulation

When the amplifier is driven at high power into a load, the high DC supplies (rail voltages) will begin to "sag". Differential amplifier U5A(1) senses this and increases the LED current to optocoupler U1. This action increases the phototransistor conduction, which increases the output current of U4(8), increasing the charging rate on C6. This ultimately increases the triac conduction, which increases the primary voltage, which increases the secondary voltages, thus providing steady, regulated DC supplies for the amplifier stage.

The -15VDC supplied to U5A(4) is backed up with a voltage divider off the -106VDC supply (R26/R27). Without this, if the -15VDC supply should fail for some reason, the output of U5A(1) would go high, drawing maximum current through the LED in U1 and latching the triac into full conduction. To prevent this, D8 will become forward biased and supply negative DC to U5A(4), keeping it operating normally. Note that if the +15VDC supply should fail, the output of U5A(1) would go negative, turning off the triac.

## Secondary Voltages

The secondary winding of the power transformer has two taps that supply the two pairs of DC supply voltages,  $\pm 106\text{V}$  and  $\pm 53\text{V}$ , each having its own bridge rectifier and filter capacitors.

The  $\pm 15\text{VDC}$  supply is tapped from the  $\pm 53\text{VDC}$  supply through R6 and R8, and regulated by Q2, Q3 and zener diodes D3 and D6. The  $\pm 15\text{VDC}$  supply powers the op-amps and small-signal transistors.

## Sequence Send/Receive

The amplifier can be powered up while the power switch is in the OFF position by applying a DC control voltage of +7V to +15V to the Sequence RCV terminal. Q3 on the Input Board will turn on and carry the control voltage through to the SND terminal, which is connected to the next amplifier in the sequential chain. Q1 also turns on which turns on Q2, providing enough current to pass through the LED portion of optocoupler U1 on the Power Supply Board to illuminate it and turn on the diac. This provides a gate voltage to fire triac Q1, which powers up the primary circuit. Once the secondary voltages are up, the +15V DC supply keeps the Receive circuit operating.



## Commutators

Under idle or small-signal conditions, the low rail voltage is applied to the collectors of the output transistors through D13 and D19 on the Power Supply Board. The output of the amplifier is connected to the Power Supply Board via J1-10/J2-10. The signal is half-wave rectified by D7 and D14, sending the positive half of the signal to comparator U2A(1) and the negative half to comparator U2B(7). When the signal level exceeds the threshold of the comparator, Q4 (positive) or Q10 (negative) turns on. Current can now flow from ground through Q8, which acts as a current source for Q6. Q6 or Q11 turn on, providing gate drive to the power FET Q9 (positive) or Q14 (negative). When the FETs turn on, the high-rail voltage is connected to the collectors of the output transistors. D13 and D19 become reversed biased and switch off the low-rail voltage from the circuit.

Zener diodes D11 and D18 provide gate protection to the FETs. Q7 and Q12 speed up the turn off time of the FETs.

This two-stage approach minimizes the voltage across each of the output devices which also minimizes the power dissipation required. Without this approach, the output transistors would be required to support the entire power supply voltage under small-signal conditions and the "unused" portion of the power supply voltage would be turned into heat.

## Output Relays

The CH 1 and CH 2 output relays are energized independently of each other. In CH 1, immediately after the power switch is turned on, +6V DC is applied to terminal 2 of D105 (READY LED) on the Display Board via the voltage divider formed by R112/R113. Terminal 1 of D105 is connected to pin 6 of K100 via J6-5 and J3-8 on the I/O Board. A small amount of current is drawn through R102 and the relay coil, which is enough to illuminate the red LED portion of D105 but not enough to activate the relay.

In the meantime, C13 begins to charge through R26 on the I/O Board, which delays turning on Q2 and Q3 by a few seconds. When Q3 turns on, VLF+ is applied to pin 6 of K100 which activates the relay. VLF+ is also applied to terminal 1 of D105 which reverse biases the red LED and D107, and forward biases the green LED, drawing current from ground through R112.

## Display Circuit

In addition to the READY LEDs just discussed, the Display Board contains five Signal LEDs and one CLIP/PROTECT LED per channel.

The clipping indicators are driven by transistors Q100 (CH 1), and Q200 (CH 2) located on the Display Board. The signal for the clipping indicators initially comes from U100A(1) and U100B(7) on the Amplifier Board. This is the same signal that operates the anti-clipping

opto-isolator on the I/O Board. D30 on the I/O Board half-wave rectifies the negative-going portion of the signal and drives comparator U9B, which is a switch. C9 and R62 establish the time constant of the clipping indicator. When clipping occurs, U9B(7) changes from positive to negative, which forward biases D100 on the Display Board and turns on Q100. Q100 supplies current for the clipping LED D104, causing it to illuminate.

The output signal is sensed at the speaker output via the I/O Board (J2-3 Output Board to J6-3 I/O Board to J3-6 I/O Board to J1-6 Display Board). D22 half-wave rectifies the signal and provides a DC voltage proportional to the amplifier's output to drive the signal display circuit. C2 and R19 determine the response characteristics of the display.

The signal driver circuit comprised of U1 - U4 is basically a ladder comparator driving LEDs, with a twist. Assume that the signal at U2A(3) is zero volts (ignore R24 and D23 for now). R13 and R14 are a voltage divider that establishes a reference voltage for the comparators (four per channel). The comparators compare this reference voltage against the voltages established by the tapped voltage divider made up of R22, R20, R15 and R25. The CH 1 LEDs are in the following sequence (lowest to highest): D105 (red/green), D13 (amber), D15 (amber), D14 (amber), D12 (amber), D11 (amber), and D104 (red).

With the input at zero volts, all of the comparator outputs are at -12V, except for U2B(7) which is high. None of the signal LEDs have any voltage across them; all are extinguished. As the input signal rises, it crosses in sequence, the thresholds established at each of the four comparators. First U2A(1) fires; its output goes high and D13 illuminates. Next U1B(7) fires, its output goes high; D13 extinguishes (no net voltage across it) and D15 illuminates. Finally U1A(1) fires; D15 extinguishes, and (this is the twist) D23/R24 supply current to the bottom of the R15, R20 and R22 voltage divider, which inverts the relationship of the comparators to each other.

When U1A(1) fires, the current through R24 reverses the sequence of the voltages that establish the thresholds for the three comparators. This allows the same comparators to perform double-duty. The new thresholds leave U1A(1) high, U2B(7) low, U2A(1) and U1B(7) low and D14 on. D11 and D12 are off. As the input signal rises further, U1B(7) fires, extinguishing D14 and illuminating D12. Next U2A(1) fires, extinguishing D12 and illuminating D11. Finally U2B(7) fires, extinguishing D11. The last LED is the clipping indicator, D104.

## Protection Circuitry

Protection functions are provided that will deactivate the output relays. Protection is provided for the following fault conditions:



### Over-Current Protection

The amplifiers are protected from short-term excess current through the output stage by electronic current-limiters. When the current through the output transistors becomes excessive, the voltage drop across the emitter resistors R150 and R151 bias the current limiter transistors Q105 and Q106 on, which shunt the drive current via D106 and D107. R139, D102, R140 and D103 determine the V-I limits.

When the current-limiters turn on, the voltage at voltage divider R127/R128 becomes less positive, providing base current for Q1 on the I/O Board through R38. When Q1 turns on two things happen. Current flows through U3 (LED/LDR module) via D31 which attenuates the input signal, removing the high current condition. Base current is also provided to Q5 through D1 which turns off Q2 and Q3, causing the relay to disengage. C13 provides a time delay to prevent the relay from disengaging during momentary program peaks. When the relay disengages, it causes the red LED in D105 (READY LED) to illuminate and also turns on Q100 and D104 (CLIP/PROTECT LED).

### Clipping Eliminator Circuit

This circuit is controlled by the LED/LDR optoisolator U3, located on the I/O Board. The LED portion of this component is driven from a bridge rectifier (D4) that gets its input signal from U100A(1) on the Amplifier Board. Under normal conditions (undistorted amplifier output) there is almost no signal at this point. If the amplifier is driven into clipping, the signal level at U100A(1) rises rapidly because the feedback signal no longer represents the input signal. Once this occurs, the LED in U3 illuminates, reducing the resistance of the LDR portion which in turn reduces the input signal. The clipping-eliminator circuit is activated by switch S2B on the I/O Board. When the switch is off, the signal driving the bridge rectifier is shorted to ground.

The clipping eliminator circuit can also be switched on and off with the PowerLink circuit. Grounding J2-17 disables the clipping eliminator circuit prior to the LED/LDR module U3.

### DC Offset

DC offset is sensed by the comparator amplifier U2A on the I/O Board. If a DC component should appear at the output, it is sensed through either D6 or D7, depending on its polarity. The output of U2A(1) will switch from -14VDC to +14VDC, which turns on Q5 via D8. This deactivates the relay, turns the READY LED red, and turns on the CLIP/PROTECT LED.

In addition, the output of U2A(1) is conveyed to the Regulator Board via D15, J1-12 and D9. The positive voltage on U5A(2) causes the output of U5A(1) to become less positive, shutting off the conduction current through optocoupler U1, which shuts off the triac and primary current.

### Overheated Output Transistors

A thermistor (RT100) is positioned near each heatsink. As the negative coefficient thermistor heats up, the voltage on comparator U2B(6) drops. When it crosses the reference voltage set up by voltage divider R42/R43, U2B(7) goes positive. This forward biases D17, turning on Q5, which deactivates relay K100.

As the heatsink temperature cools, the thermistor will cool until the voltage at U2B(6) once again crosses the reference voltage at U2B(5), allowing the relay to reactivate.

### Fan Speed Control

The fan operates at low speed when the amplifier is first turned on. The voltage at the thermistor is connected to the Fan Drive circuit on the Output Board via D16 (on the I/O Board) and J6-4/J2-4. As the heatsink temperature increases, the voltage at U1A(3) on the Output Board decreases until it crosses the threshold set by voltage divider R4 and R6. When this occurs, the output of U1A(1) toggles low, which turns on Q1. Q1 shorts across R1 and applies the full V<sub>F+</sub> voltage to the fan, kicking it into high speed.

J2-10 provides a direct connection for the PowerLink module to U1A(2). A positive DC voltage can be applied here via MediaLink to force the output of U1A(1) low, and the fan into high-speed operation (low-speed bypass).

### Major Faults

The slo-blo line fuse protects the unit from further damage when a major fault such as a shorted output transistor or a secondary power supply fault occurs.

If the unit is run at or near its rated power, the fuse will eventually blow. The rated line fuse allows the unit to be operated without interruption for all musical applications.

### Bridged Mono/Dual Mono Switching

The Stereo/Mono Switch (S1) on the Input Board is a 3-position switch used to select Normal Stereo, Bridged Mono or Dual Mono operation. In the Bridged Mono position, it connects CH 1 in parallel with the CH 2 input, but inverts the signal to CH 1. The CH 1 input connection becomes disabled. The speaker output signals are identical except CH 1 is 180 degrees out of phase. In this way, a single speaker can be connected between the two "+" speaker terminals and receive twice the voltage as a single channel. When connected in this way, each channel "sees" one-half the impedance of the speaker that is connected between them. If an 8 ohm speaker is used, each channel will see a 4 ohm load. Each channel can still be independently controlled with its own level control, so **it is important that both level controls be set to the same position for a balanced output.** The result is twice the rated power (per channel) into twice the rated impedance.



When S1 is switched to the Dual Mono position, CH 1 is connected in parallel with the CH 2 input, but in phase. The CH 1 input connection becomes disabled. This allows both channels to be driven with the same signal without the use of special patching cords. Each channel can still be independently controlled with its own level control.

### Parallel Mono

To operate in Parallel Mono mode, leave S1 in the Normal Stereo position. Removing jumpers JP201 and JP203 will disconnect the CH 2 predrivers from the output stage. Installing jumpers JP102, JP104, JP202 and JP204 will connect the CH 1 predrivers to the CH 2 output stage. In this way, both channels will operate at exactly the same level, and will be controlled by the CH 1 level control.

In addition, removing JP1 will prevent the CH 2 clip LED from activating, and installing a 16 ga. jumper wire between WL100 and WL200 on the Output Board will tie both amplifier outputs together before the relays. Consult Carver Field Application Bulletin pm1400-1 for details.

When operating in parallel mono, either of the speaker output terminals (CH 1 or CH 2) can be used since they both have exactly the same signal present. When a speaker is connected to the output terminals it can be driven with twice the current capacity of a single channel. The result is twice the rated power (per channel) into half the rated impedance.

### PowerLink Circuitry

Various monitoring and control circuits are incorporated in the design of the amplifier to accommodate the optional PowerLink circuit board that is used to interface with MediaLink systems. The PowerLink module replaces the input board. Contact Carver Customer Service for complete details (see page 33).

### MediaLink Back-Up Power

This connection provides power to the PowerLink circuit, if installed in the amplifier, to keep it operating if the amplifier should fail or shut down. +5V to +15V AC or DC can be applied to the Back-Up terminals. A bridge rectifier located on the PowerLink module converts the applied voltage to a constant DC of the correct polarity, and regulates it to +5V DC.

### Power Control

The amplifier can be turned on and off remotely via MediaLink. A +5VDC control signal is sent to J1-10 on the I/O Board from the PowerLink circuit. This energizes optocoupler U1 on the Power Supply Board, turning the amplifier on in the same way that the Sequencer circuit does. Removing the +5VDC signal turns the amplifier off.

### Temperature Sense

J1-7 and J1-8 send a voltage to the PowerLink Board that is inversely proportional to the temperature of the heatsinks. This allows MediaLink to continuously monitor heatsink temperatures.

### Fan Speed Control

U1A(2) on the Output Board is connected to the PowerLink module via J2-10 and allows the fan to be switched to high-speed through MediaLink.

### Communication Indicator

When the PowerLink circuit links to MediaLink, it sends a DC voltage to the Display Board via J1-12. This sinks current through the communication LED D1, causing it to illuminate green. The same indicator can be switched to red as an alert flag by MediaLink. Since D1 is a dual-color LED, reversing the polarity of the voltage sent to the Display Board via J1-12 reverses the current through D1, causing it to illuminate red.

### Clipping Monitor

If the amplifier should begin to clip, the same signal that is sent to the Display Board to illuminate the Clip/Protect LED is also sent to the PowerLink module via J2-15 on the I/O Board.

### Clipping Eliminator Control

The Clipping Eliminator circuit can be turned on and off via MediaLink through J2-17. This disables the Clipping Eliminator circuit by grounding the input control signal prior to the LED/LDR module U3. Note that the Clipping Eliminator Switch S2 must be in the ON position for MediaLink control to operate correctly.

### Output Current Monitor

A voltage representing the output current is fed back to the PowerLink module for the purpose of monitoring the output power (in watts). R103 on the Output Board acts as a current sense resistor on the output of the amplifier. The voltage drop across the resistor is differentially fed to the PowerLink module via J2-1 and J2-2.

### Current Limit Monitor

If the V-I current limiters are activated during operation of the amplifier, a signal is sent to the I/O Board (J101-5 on Amplifier Board to J100-5 on I/O Board) which turns on Q1. This forward biases D1 and sends a positive voltage to the PowerLink module via J1-5 to indicate activation of the current limit circuit.

### DC Fault/Protection Circuit Monitor

If DC should appear at the output of the amplifier, the same signal that causes the relays to disengage is sent to the PowerLink module via J2-19 on the I/O Board.



## Schematic Diagrams and Servicing Instructions

The schematic diagrams presented here are for example only, to be used with the accompanying circuit description. If you discover a discrepancy between the schematic drawing and your particular model, contact Carver Technical Service Department for information. Minor changes in parts values are occasionally made for various reasons.

**CAUTION:** These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

### Instructions

#### *To remove the input panel and input board:*

1. Be sure the amplifier is switched **OFF** and **UNPLUGGED** from the AC socket.
2. Remove the two screws located on either side of the input panel.
3. Carefully pull the input board out of the chassis.
4. See Figure 8 for the locations of the Level Defeat Switch, Stereo/Mono Switch, Clipping Eliminator Switch and Input Polarity jumpers.

See Figure 9 for the location of the Input Sensitivity jumpers.

#### *To reinstall the input board and input panel:*

5. Carefully insert the input board back into the access hole in the chassis.
6. Reinstall the two screws to secure the input panel.

**CAUTION:** To avoid the risk of electric shock, refer all internal adjustments to qualified service personnel.

### Stereo/Mono Switch

The Stereo/Mono Switch is located on the input board, which is attached to the input panel (see Figure 8). Leave the switch centered for normal stereo operation, move it to the left for Bridged Mono operation, and move it to the right for Dual Mono operation.

### Level Defeat Switch

The Level controls can be bypassed by moving the switch located just inside the input panel to the left (see Figure 8). This will lock the amplifier into full gain (as if the Level pots were fully clockwise). Moving the switch to the right will return the Level controls to normal operation.

### Input Sensitivity Modification

The input sensitivity of the amplifier is set at the factory to 0.775V rms for rated output. To reduce the sensitivity by 6dB to 1.5V rms, simply remove JP100 (CH 1) and JP200 (CH2), located on the Main Amplifier Board (see Figure 9).

### Input Polarity

The XLR input connectors on the pm1400 are shipped from the factory with pin 2 hot (+), as indicated on the rear panel. The polarity of the balanced inputs can be reversed by changing four jumpers located on the Input Board. Cross-wire JP3 and JP4 to change the input polarity of CH 1 and cross-wire JP1 and JP2 to change CH2 (see Figure 8). This modification also changes the polarity of the 1/4-inch TRS input connectors: thus the tip becomes "-" and the ring becomes "+".

### Clipping Eliminator Defeat

The clipping eliminator circuit is operational when shipped from the factory. However, it can be defeated by moving the switch located just inside the input panel to the down position (see Figure 8). Moving the switch up will return the Clipping Eliminator to normal operation.



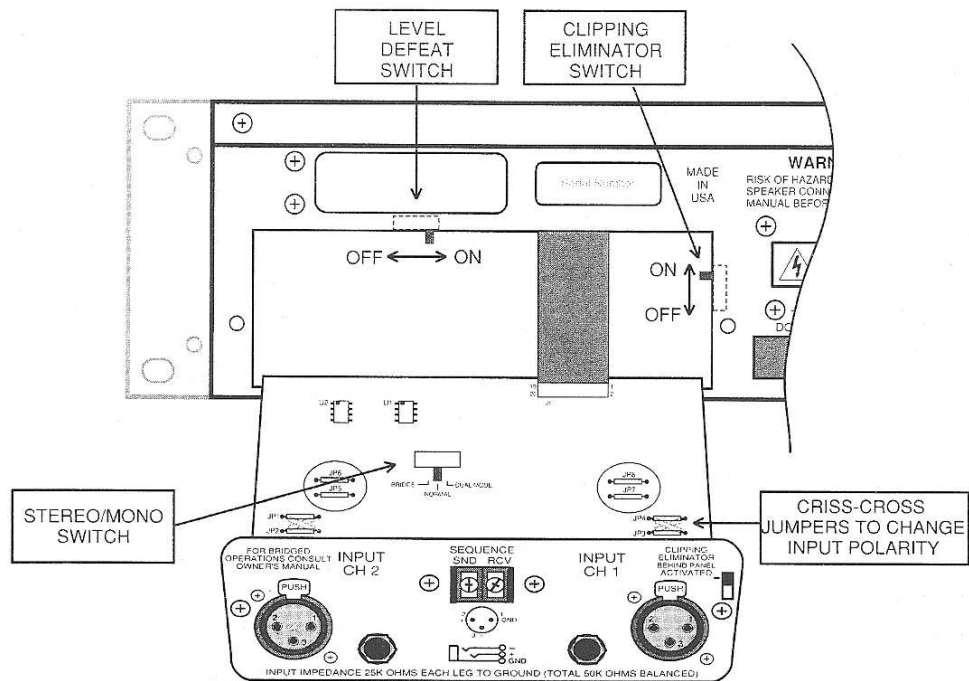


Figure 8. Operational Modifications

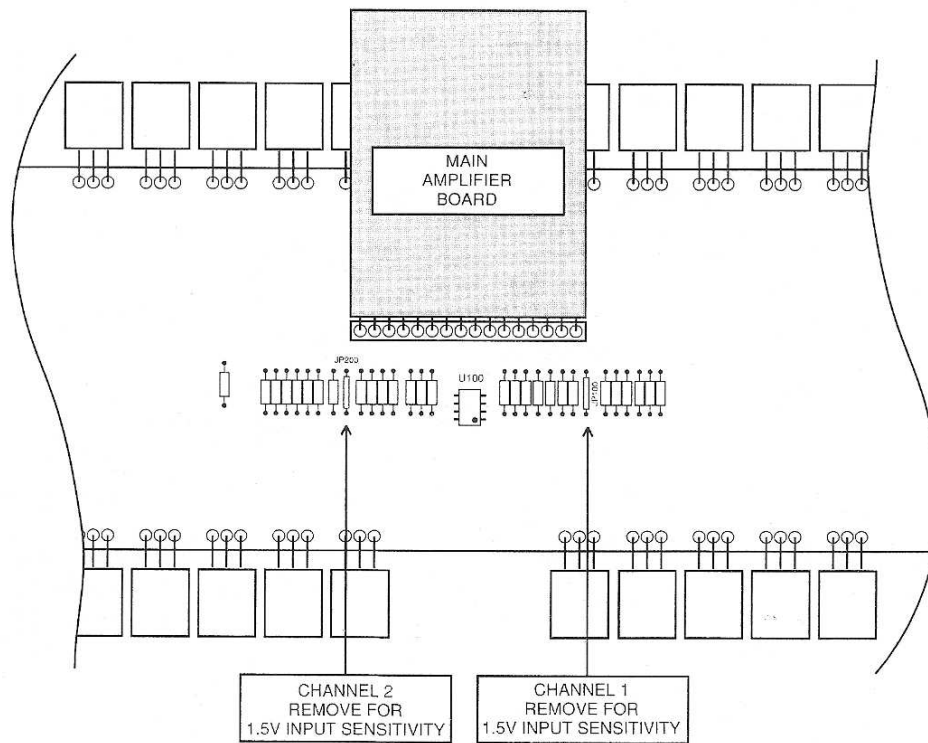


Figure 9. Input Sensitivity Modification

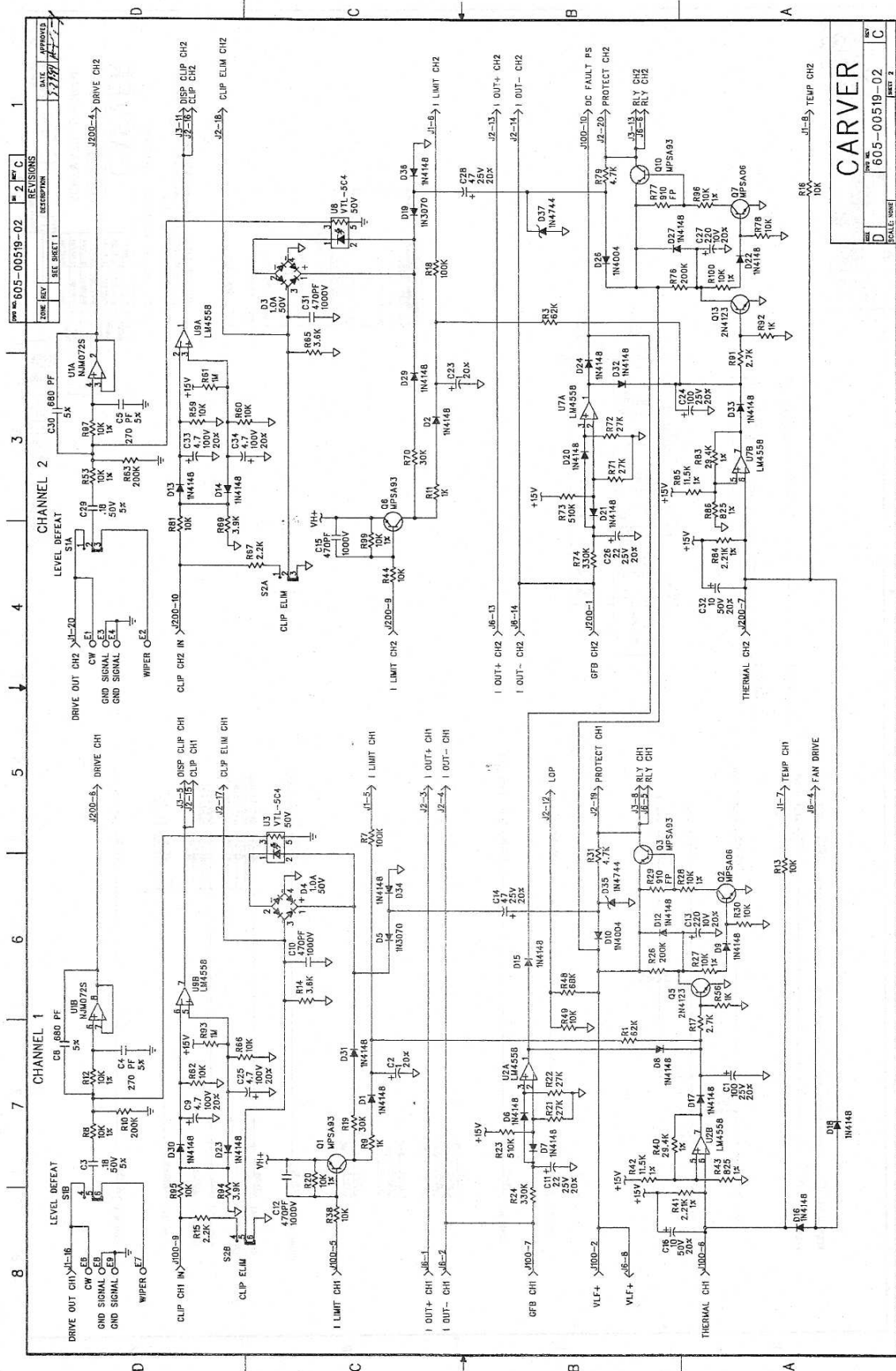


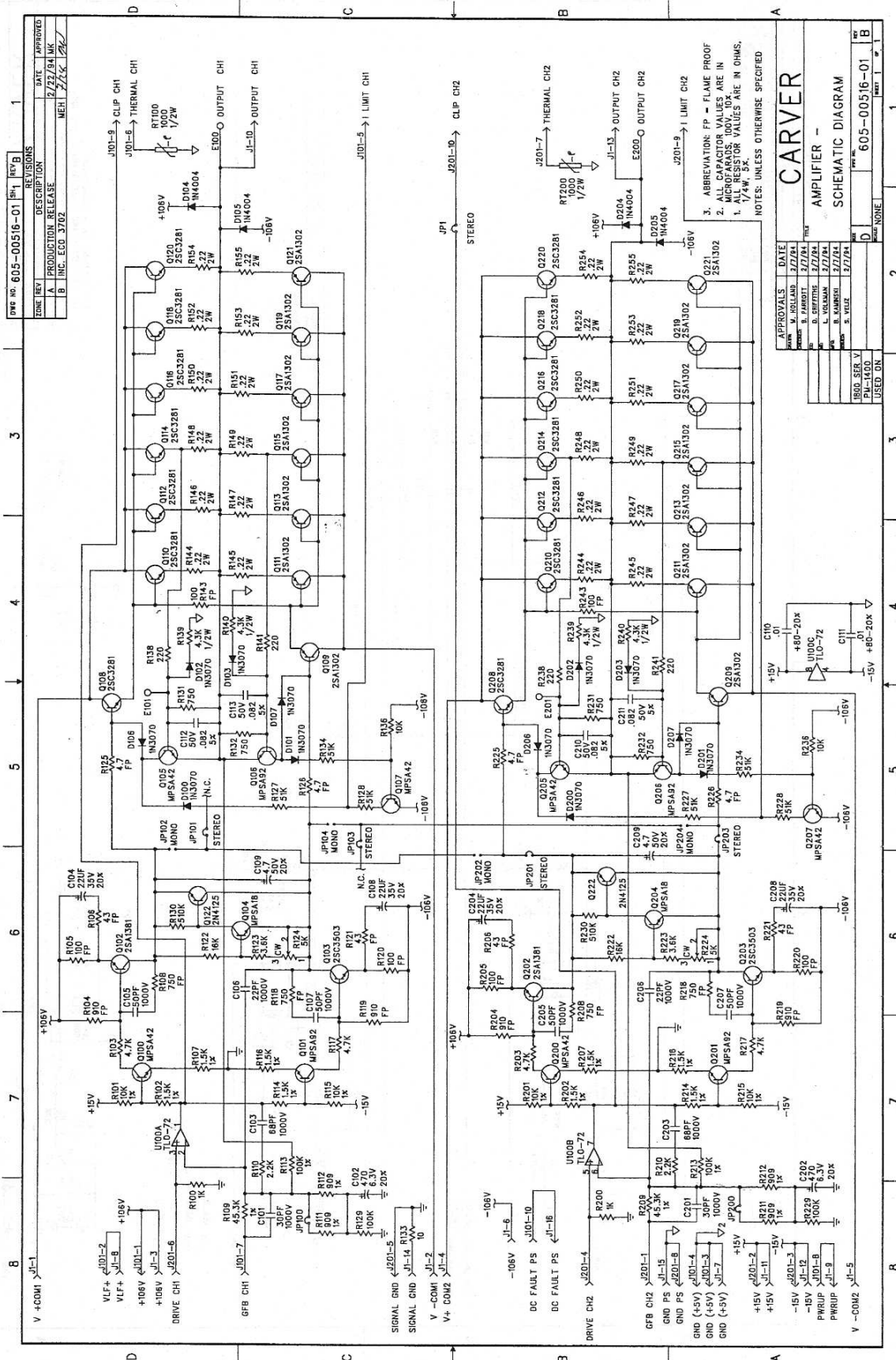




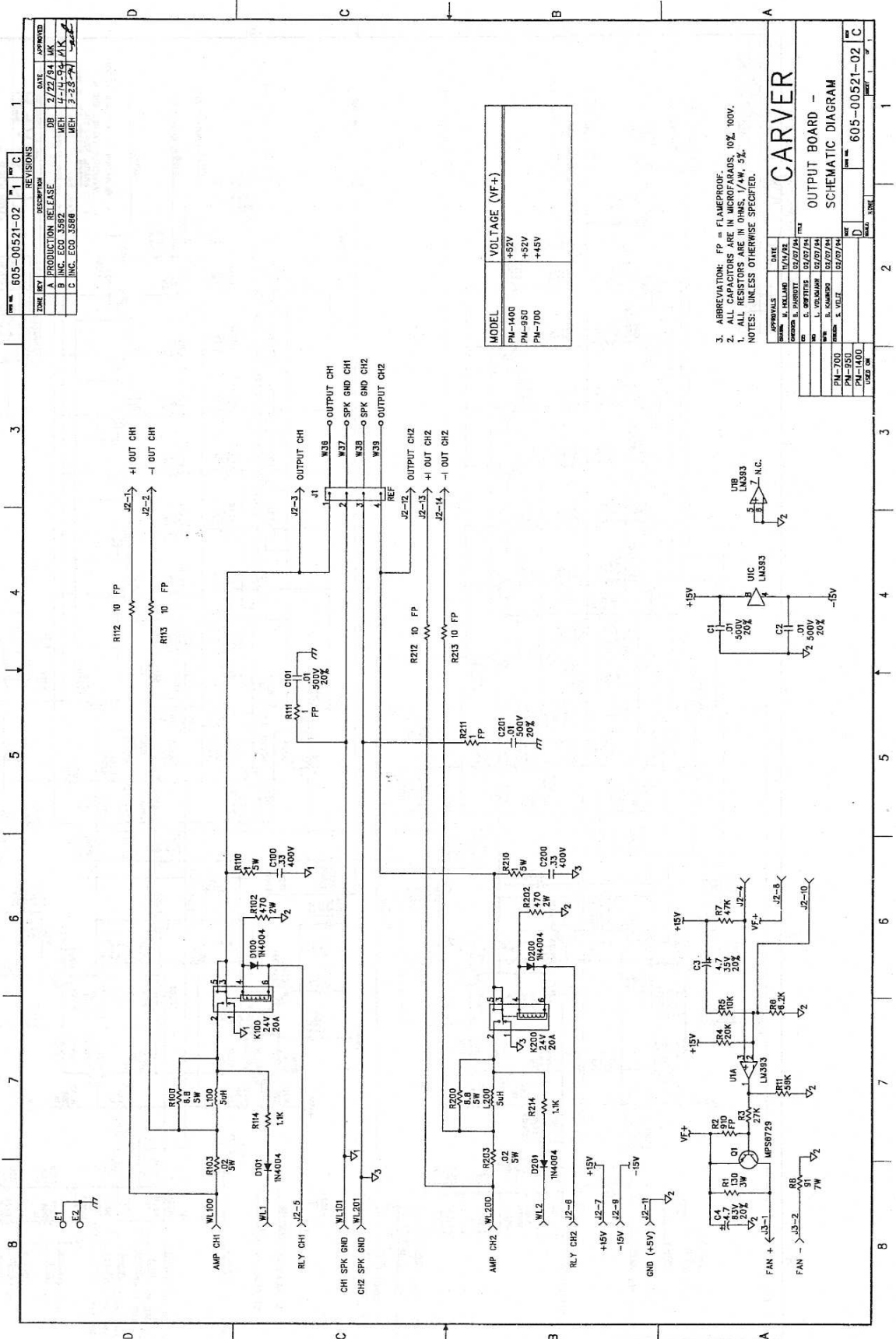




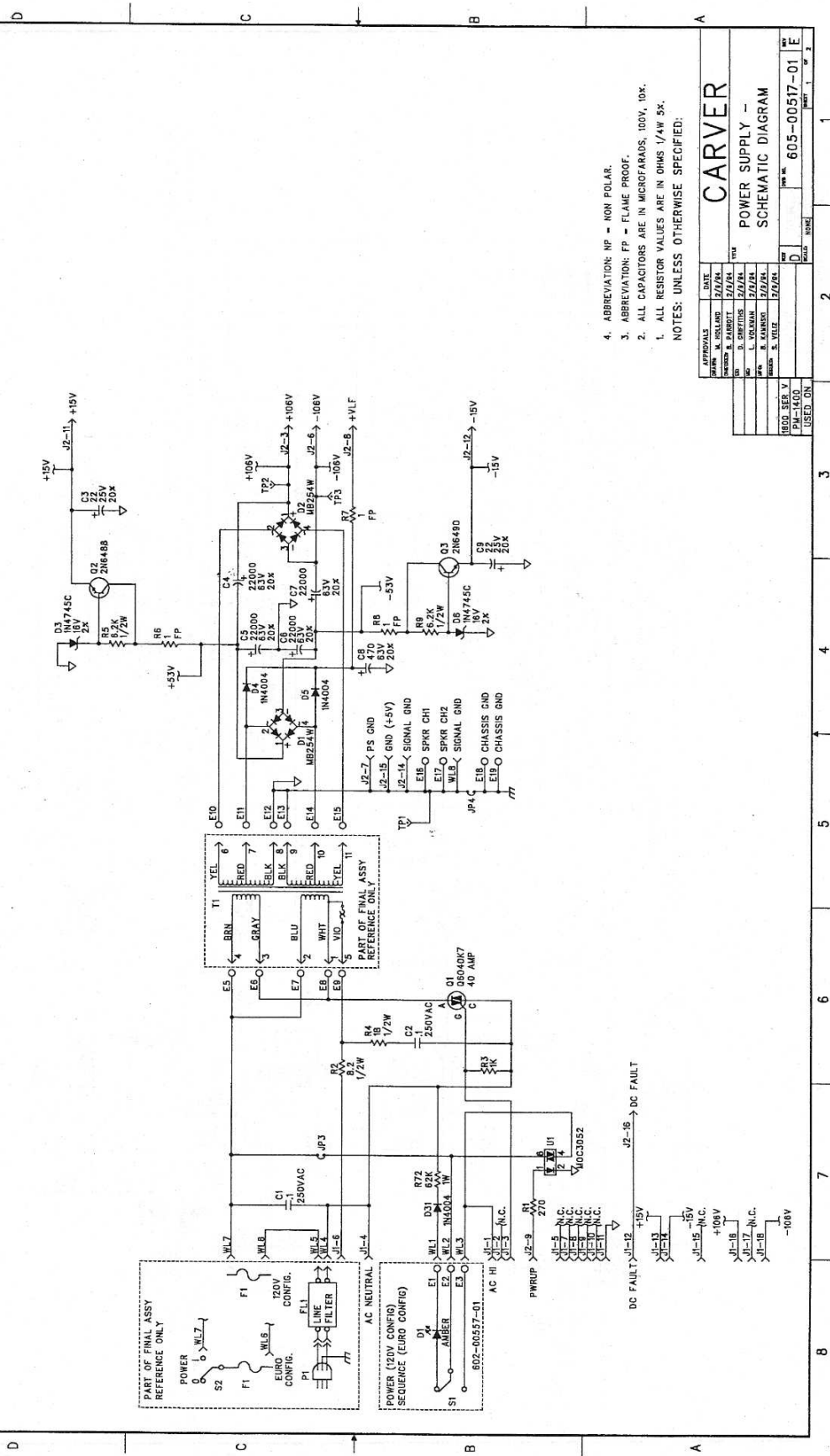








REV. 605-00517-01			REV. E	
ZONE	REV.	DESCRIPTION	DATE	APPROVED
A	1	PRODUCTION RELEASE	2/10/84	UK
B	2	INC ECD 3554	3/9/84	BP MK
C	3	INC ECD 3698	MEH 9/24/84	BP RH
D	4	INC ECD 3738	MEH 9/28/84	RH
E	5	INC ECD 3783	MEH 10/27/84	RH

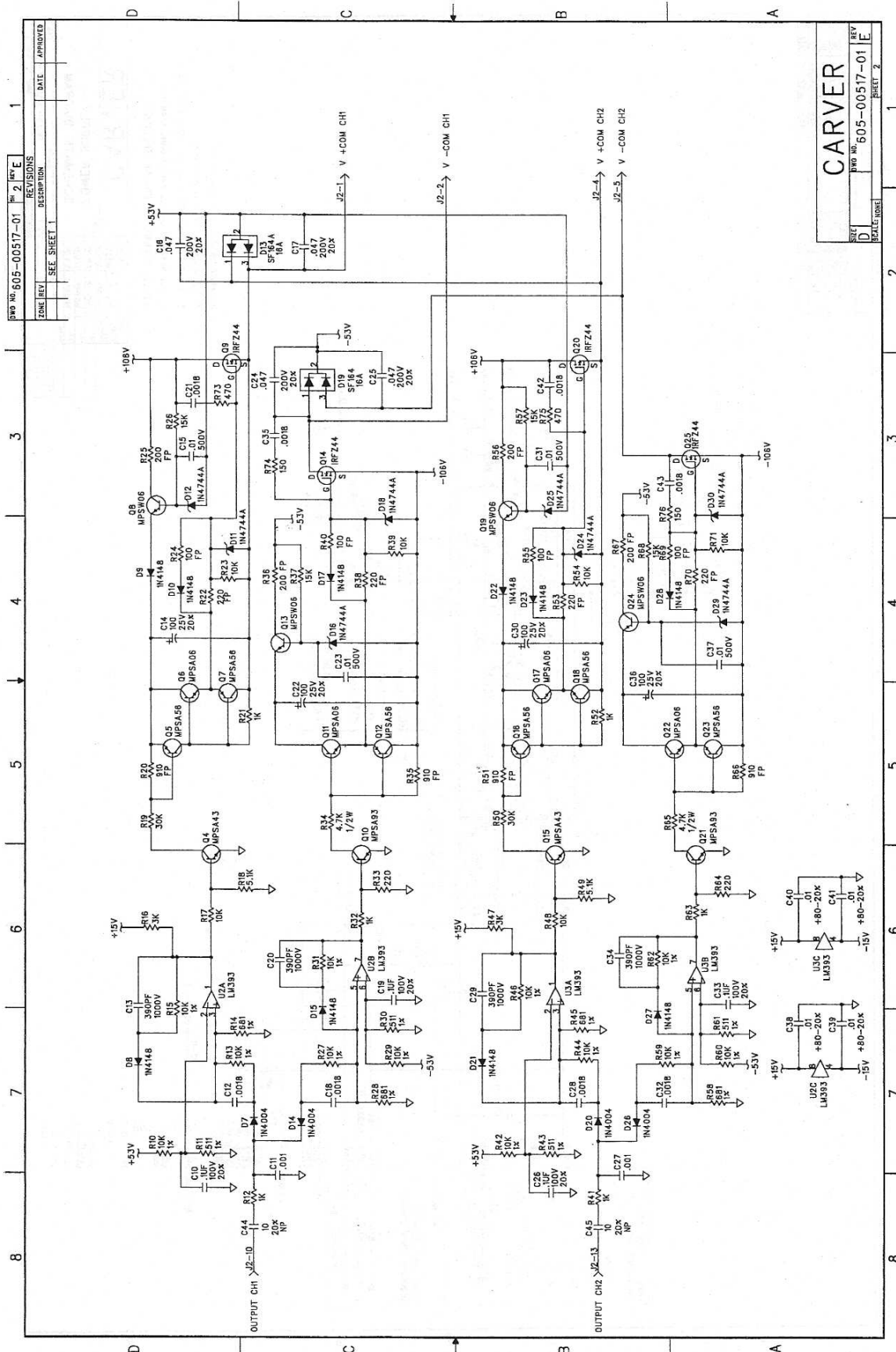


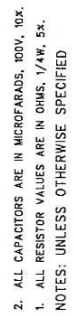
4. ABBREVIATION: NP = NON POLAR.
  5. ABBREVIATION: FP = FLAME PROOF.
  6. ALL CAPACITORS ARE IN MICROFARADS, 100V, 10K.
  7. ALL RESISTOR VALUES ARE IN OHMS 1/4W 5%.
- NOTES: UNLESS OTHERWISE SPECIFIED:

CARVER		
APPROVALS	DATE	REV.
DESIGNED BY: M. HOSLAND	2/2/84	1
CHECKED BY: B. PARSONS	2/2/84	1
APPROVED BY: L. VORAKAN	2/2/84	1
APPROVED BY: R. KANNON	2/2/84	1
APPROVED BY: S. VILIZ	2/2/84	1

RECD SEP 1	1984
FILED IN	605-00517-01 E









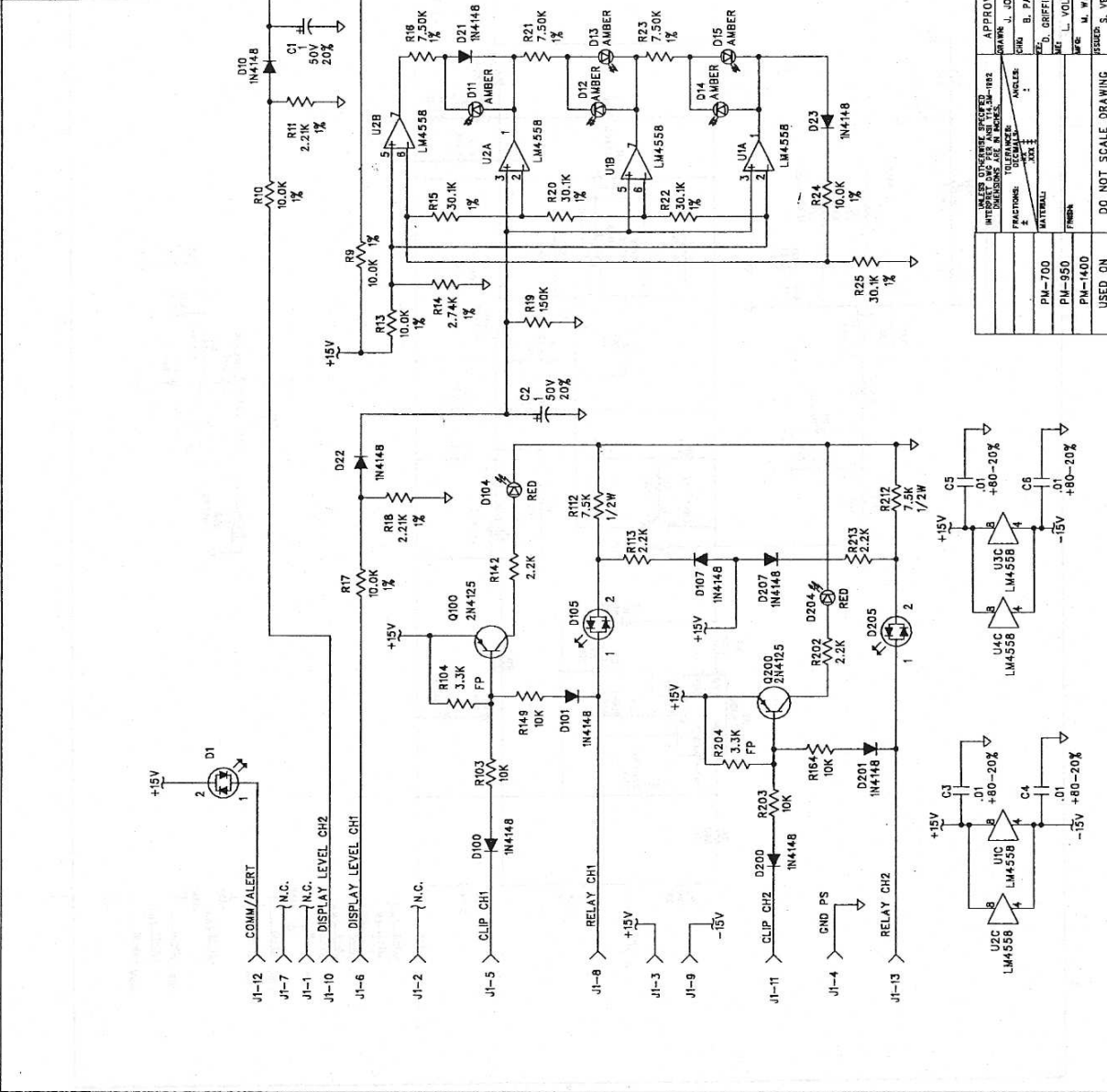
605-00561-01

2

3

4

REV	DESCRIPTION	DATE	APPROVED
A	PRODUCTION RELEASE	DB 2-10-94	



CARVER

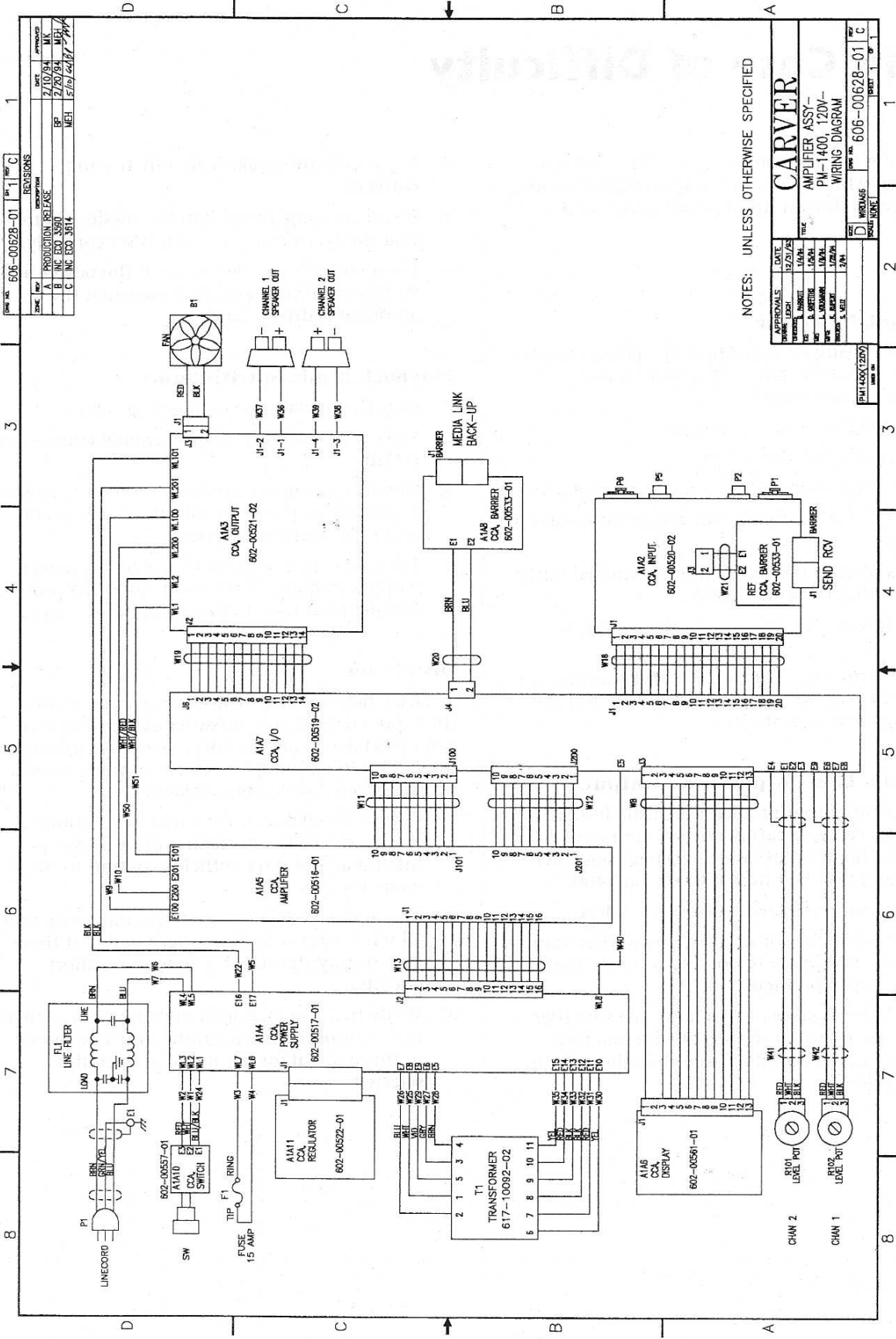
DISPLAY -  
SCHEMATIC DIAGRAM

APPROVALS:	DATE:
DESIGNED BY: J. JOHNSON	04/29/93
CHECKED BY: B. PARROTT	02/07/94
TESTED BY: D. GRIFFITHS	02/07/94
ISSUED BY: L. VOIGTMANN	02/07/94
ISSUED BY: M. WALTERS	02/07/94
ISSUED BY: S. VELZ	02/07/94

2

3

4





## 7. In Case of Difficulty

If you're having trouble or suspect a problem with the pm1400, try some simple troubleshooting before contacting an Authorized Carver Service Center.

### No Sound, No Power.

This is usually an indication of a power supply problem, either the power line itself or the amplifier's power supply.

1. pm1400 power is switched off.
2. Linecord is disconnected.
3. Poor fit between the plug and AC receptacle.
4. Power off at AC receptacle (check with tester or lamp).
5. The amplifier is plugged into a switched outlet. Verify that the outlet is live.
6. pm1400 fuse has blown. Check and replace fuse.
7. The thermal breaker in the power transformer has opened. Allow amplifier to cool and the breaker will reset itself.

### Power On, Low Output or No Output

Low or no output problems are usually signal-source, bad cable or partial output short circuit related. If the items listed below check out, then the problem may be internal to the pm1400.

1. The Input Level controls are set too low.
2. Move the input connections to another amplifier that you know is working to verify that it is not a source problem.
3. Check the speaker connections. Be sure that there are no small strands of wire touching similar strands coming from the other wire in the cable.

4. Make sure the speakers are functioning correctly.
5. If you are using bridged-mono mode, ensure that the Stereo/Mono switch is set correctly.
6. Use a voltmeter to determine if the power line voltage is dropping excessively when the amplifier is driven hard.

### Playback is mixed with hum.

1. Check or replace the connecting cables.
2. Make sure that each screw terminal connection is tight.
3. Signal cables may have been routed too closely to AC cables, power transformers, motors or other EMI inducing device.
4. Try connecting another source to the power amplifier inputs. If the hum stops, the problem lies with the original source component.

### Distortion

Distortion is usually caused by excessive loss in the input controls (the mixer/equalizer/crossover can't produce enough output), overdriving resulting in output clipping, or current limiting caused by excessively low load impedances.

1. Check the setting of the Input Level controls. If set too low, the preceding piece of equipment may not have sufficient output to overcome the loss.
2. Check the speaker connections and verify that all screw connections are tight and that there are no stray strands of wire to cause short circuits.
3. Verify that the total load impedance presented to the amplifier is within the limits described in this manual for the mode of operation selected.

## 8. Care and Service Assistance

### Care

You'll want to wipe off the pm1400's front panel and chassis from time-to-time with a soft, dry cloth. If you have something stubborn to remove, use a mild dish soap or detergent sparingly applied to a soft cloth. Don't use alcohol, ammonia, or other strong solvents.

### Service Assistance

We suggest that you read the LIMITED WARRANTY completely to fully understand your warranty/service coverage. Please promptly complete and return the WARRANTY REGISTRATION CARD. Also be sure to save the sales receipt in a safe place. It will be necessary for warranty service.

If your CARVER product should require service, you may contact the CARVER Technical Service Department by phoning (206) 775-6245 or by writing to us at the Factory address shown at the right. We will then direct you to the nearest in our national network of Authorized Warranty Service Centers or give you detailed instructions on how to return the product to us for prompt action.



**PowerLink™**

**MediaLink**

If you should have questions or comments, please write to the Factory address given below. Please include the model and serial number of your Carver product, your complete address and a daytime phone number.

#### Factory Address

Carver Corporation Service Department  
P.O. Box 1237  
Lynnwood, WA 98046-1237

(206) 775-6245	<i>Customer Service and Technical Information</i>
(206) 778-0509	<i>Repair Information</i>
(206) 775-9180	<i>Customer Service Fax</i>
(206) 775-1202	<i>Main Office, General Business</i>
(206) 778-9453	<i>Main Office Fax</i>

Carver Corporation reserves the right to improve its products at any time. Therefore, specifications are subject to change without notice.

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MediaLink is a trademark of Lone Wolf Corporation.

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Part #990-20195-00  
Rev. B

Written, designed and printed in the U.S.A.



## 9. Warranty Information

# CARVER

## CARVER CORPORATION LIMITED WARRANTY PROFESSIONAL AUDIO PRODUCTS

### Product

pm1400 Professional Power Amplifier ..... 5 years

### Warranty Period

YOU MUST RETAIN AND PROVIDE YOUR SALES RECEIPT TO OBTAIN COVERAGE UNDER THIS LIMITED WARRANTY. The Warranty Period begins from the date of first consumer purchase from an Authorized Carver Dealer.

**WHAT IS COVERED:** THIS WARRANTY COVERS DEFECTS IN MATERIAL AND WORKMANSHIP ONLY. This Limited Warranty DOES NOT extend to: (1) Damage caused by shipment; (2) damage caused by accident, misuse, abuse, failure to perform owner maintenance, or operation contrary to the instructions in the Carver Corporation owner's manual; (3) units on which the serial number has been defaced, modified or removed; and (4) damage resulting from modification or attempted repair by any person other than authorized by Carver Corporation.

**WHAT WE WILL PAY FOR:** Carver will pay all labor and material expenses for items covered under this Limited Warranty. See the next section concerning shipping charges.

**WHAT YOU MUST DO TO OBTAIN WARRANTY SERVICE:** In the event your Carver product requires service, write to Carver Corporation (Attention: Customer Service Department), P. O. Box 1237, Lynnwood, Washington 98046-1237 or call the Customer Service Department directly at (206) 775-6245. You will be directed to an Authorized Carver Service Station or receive instructions to ship the unit to the factory. Please save the original shipping carton and packing materials in case shipping is required. Please DO NOT ship Parcel Post. Include a complete description of the problem, the associated components and connections, and a copy of the purchase receipt. Initial shipping costs are not paid by Carver Corporation; return shipping costs will be pre-paid if repairs were covered by the scope of this warranty.

### Shipping Address

CARVER CORPORATION  
20121 - 48th Avenue West  
Lynnwood, WA 98036

**LIMITATIONS OF IMPLIED WARRANTIES:** ALL IMPLIED WARRANTIES FOR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION TO THE WARRANTY PERIOD FOR YOUR PRODUCT, UNLESS OTHERWISE PROVIDED BY STATE LAW.

**EXCLUSION OF CERTAIN DAMAGES:** IN NO EVENT SHALL CARVER CORPORATION BE LIABLE FOR PROPERTY OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM THE FAILURE OF THIS PRODUCT. IF YOUR CARVER PRODUCT PROVES DEFECTIVE IN MATERIAL OR WORKMANSHIP, THE LIABILITY OF CARVER CORPORATION SHALL BE LIMITED TO THE REPAIR OR REPLACEMENT, AT THE OPTION OF CARVER CORPORATION, OF ANY DEFECTIVE PART.

**STATE LAWS MAY DIFFER:** SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS AND/OR DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

**OTHER IMPORTANT PROVISIONS:** Carver Corporation reserves the right to make changes in design and improvements to its products without the responsibility of installing such changes or improvements on products previously sold by Carver.

We suggest that you attach your purchase receipt to this Warranty and keep both documents in a safe place. Thank you for your choice of a Carver Corporation product.

**NOTE:** The preceding warranty is exclusive to the United States and its possessions and territories. Please see your Carver dealer or distributor for the correct warranty information in your area or locale.

April 1, 1993

## NOTES

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NOTES

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P R O F E S S I O N A L