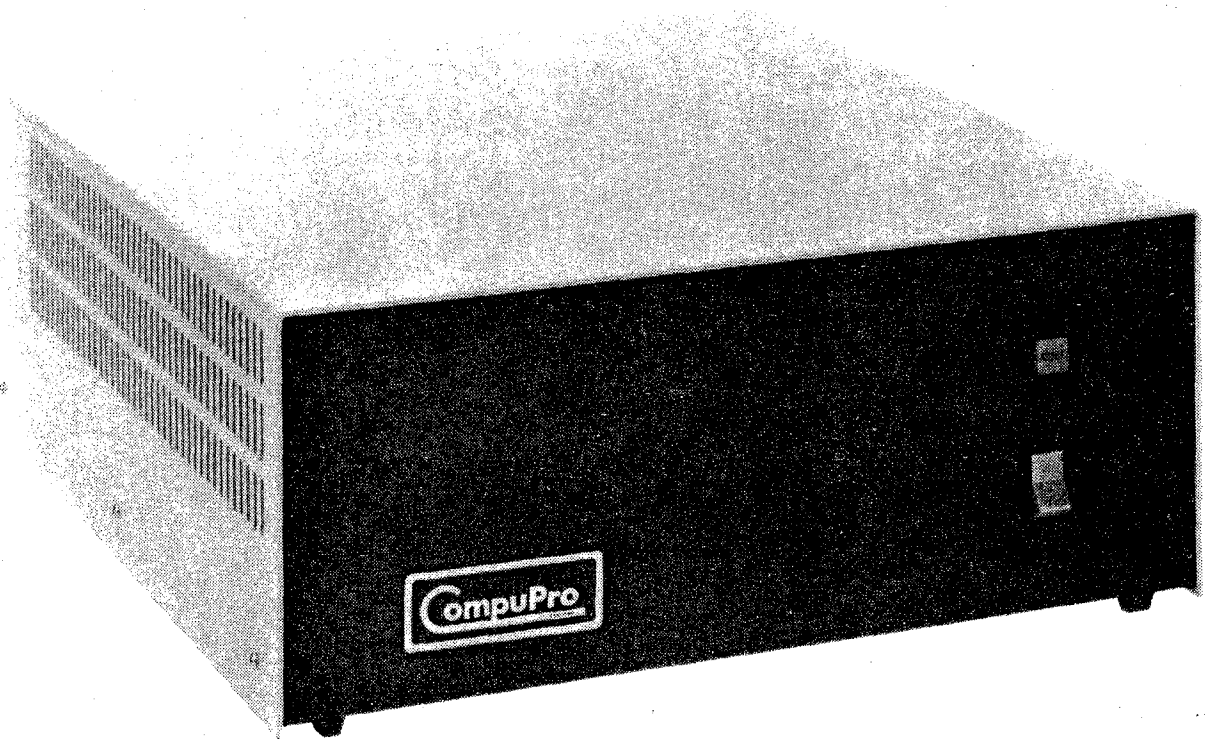
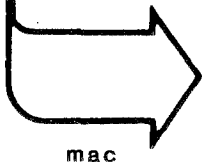


# SYSTEM ENCLOSURE™ & MOTHERBOARDS™

## TECHNICAL MANUAL



IEEE 696 / S-100



A **GODBOUT** COMPANY

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# CONTENTS

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SYSTEM ENCLOSURE .....	3
Before configuring your system .....	3
AC power distribution .....	4
Power supply schematic .....	4
MOTHERBOARDS (6, 12, & 20 SLOT) .....	5
Termination circuitry .....	5
IMASI mainframe modification .....	6
Motherboard schematic .....	6
Active termination theory .....	6

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# SYSTEM ENCLOSURE

The **CompuPro System Enclosure** is one of the most versatile and reliable microcomputer enclosures on the market today. It provides a home for your computer now, and plenty of room to expand your system if your needs change. The enclosure is available either as rack mount for a standard 19" rack, or as a desk top model.

Major features include:

- Quiet ventilation fan.
- Three switched convenience outlets on rear.
- Lighted RESET button for "POWER" indication.
- Circuit breaker for safe operation.
- Punchouts for 14 DB-25 connectors on rear.
- Provisions for other connectors.
- A.C. line filter for noise isolation.
- Fused D.C. power for motherboard.
- Constant voltage power supply which provides 8 Volts at 25 Amps and 6 Amps total for the +16 and -16 Volts. This power will remain constant regardless of A.C. power dips or surges.

## Follow the Steps Below Before Configuring Your System in this Enclosure

1. Upon receipt of your CompuPro System Enclosure, inspect inside and out for any shipping damage or things that may have come loose during transit. Check with your CompuPro dealer if you have any questions.
2. Pick a home for your system that will provide adequate cooling for the system. Note that the air flow is into the fan hole, and out the left side of the enclosure. Both of these areas should have 2-3" free room for proper air circulation and system cooling.
3. Your system **MUST** be plugged into a grounded wall outlet. If you are not sure of the ground, have an electrician verify that the outlet has a proper ground. This is necessary for safety, and proper system operation.
4. Plug in any devices that you wish to switch on and off with the computer into the outlets on the rear. These outlets are intended for terminals, printers or disk drives only (NOT high current devices like broiler ovens), each outlet is rated for a maximum of 120 Watts.
5. With the motherboard empty, turn the system on and verify that the outlets on the rear are switched on with the breaker/switch.
6. With the system **ON**, check the voltages on the edge connectors. The following voltages should be observed:

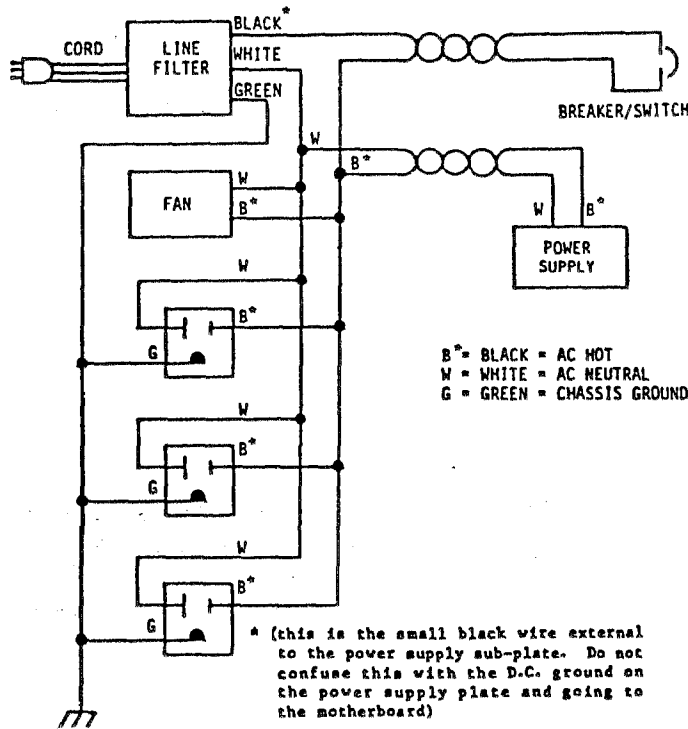
PIN	VOLTAGE
1 & 51	+8 to +10 Volts DC
2	+16 to +18 Volts DC
52	-16 to -18 Volts DC
50 & 100	GND ref. (0 Volts)

All the other S-100 pins should have the proper termination voltage of 2.6-2.7 Volts. Checking one of these pins is sufficient.
7. After verifying power to the motherboard, turn the system off. The reset button will glow for some time due to the stored charge on the power supply, and you should wait for it to stop glowing before you proceed with your system bring-up. This could take 15-20 minutes.
8. Populate your enclosure, connect all interface cables, turn the system on, and you should now be up and running.
9. If you experience any problems, check all switch settings on memory boards, Baud rate on serial communication boards, and the proper polarity of cables for disk drives. Your CompuPro Dealer can provide more help if you need it.

**NOTE:** All of the above steps may have been done for you by your CompuPro dealer, but you still should *make sure that you perform STEPS 2 & 3.*

## AC Power Distribution

The System Enclosure is color coded to provide easy identification of voltages. The following drawing and schematic can be used to identify any system power problems.



**CAUTION:** As with any electrical device which plugs into the wall there are voltages present that can cause a bad shock or possible death. The power supply should not be touched except by experienced technicians. The oval capacitor near the transformer has very high voltage on it and should be avoided at all times.

If there is any reason to put your hand down into the power supply area, make sure the system is off, unplugged from the wall, and let set for at least 5 minutes to let the stored charge bleed off. Remove any rings, watches or other metal objects before reaching carefully into the power supply area.

**NOTE:** For best system cooling, always have a board in the rearmost slot, and keep the cover on. To ensure proper cooling and electrical safety, never operate your CompuPro system with the cover removed.

Figure 1. AC Power Distribution

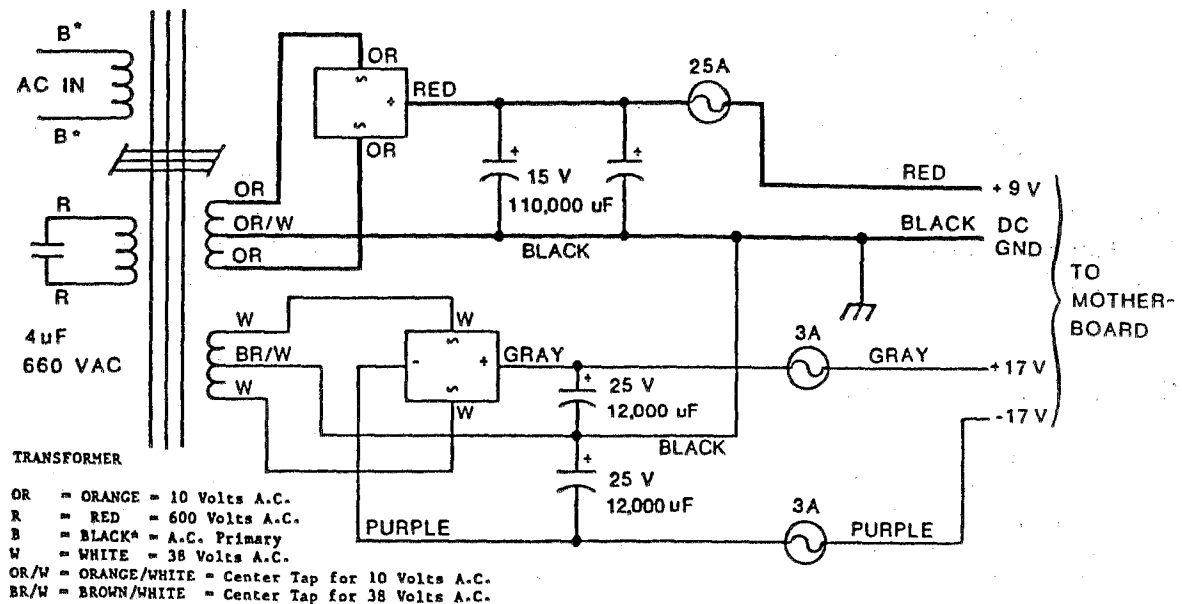


Figure 2. Power Supply Schematic

# MOTHERBOARDS (6, 12, & 20 SLOT)

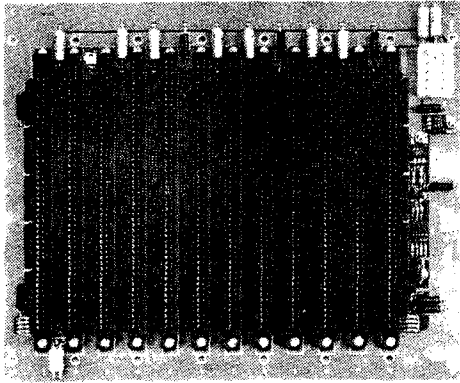


Figure 4. 12 Slot MotherBoard

We are sure you will find the **CompuPro MotherBoards**, to be a very high quality product that will give you years of dependable service.

## Termination Circuitry

The termination circuitry has evolved over the last few years and is a tried and proven method of reducing noise in your system. As shipped the termination circuitry is adjusted to maintain a voltage of +2.7 VDC on all bus pins (other than power distribution). This should be checked by measuring between any bus pin and ground with no boards in the motherboard and readjusted if needed with trimpot R6. This is the only calibration necessary.

The connector on the left edge of the board is connected to ground and bus pin 75. This can be used for connecting a RESET pushbutton to a system which has no other means of generating RESET. The power socket makes for a convenient method of distributing the system power to the motherboard, and is rated for more than 30 AMPS on the +9 volt line. There are four pins for ground, four pins for +9 volts, and one each for the +17 and -17 volts. The connector is keyed to prevent connecting errors, and the power wires are color coded as follows.

COLOR	VOLTAGE
Black . . . . .	GND
Red . . . . .	+9V
Gray . . . . .	+17V
Purple . . . . .	-17V

		TOP VIEW				
P1	—	GND	GND	+9	+9	-17
		GND	GND	+9	+9	+17

**NOTE:** On all but the 6 slot mother board there are provisions for using a fast-tab connector to distribute the +9 volts to the bus with very little loss due to board trace resistance. These fast-tabs should be connected to one of the +9 volt distribution wires coming from the power supply.

## IMSAI Mainframe Modification

**Bus pins 20 & 70** – The IEEE 696 standard states these pins should be at ground, but if you try to put a **CompuPro MotherBoard** with these pins grounded into an **IMSAI type mainframe**, the front panel stops working. This occurs because there are some front panel signals pulled up with a pull-up resistor, which also connects to bus pins 20 & 70. Grounding these pins pulls down the front panel signals and disables the front panel. The solution is to disconnect the front panel signals that connect to these bus pins. This fix *must be implemented on the front panel itself!* There is no reason to have them connected, and the panel will still function properly.

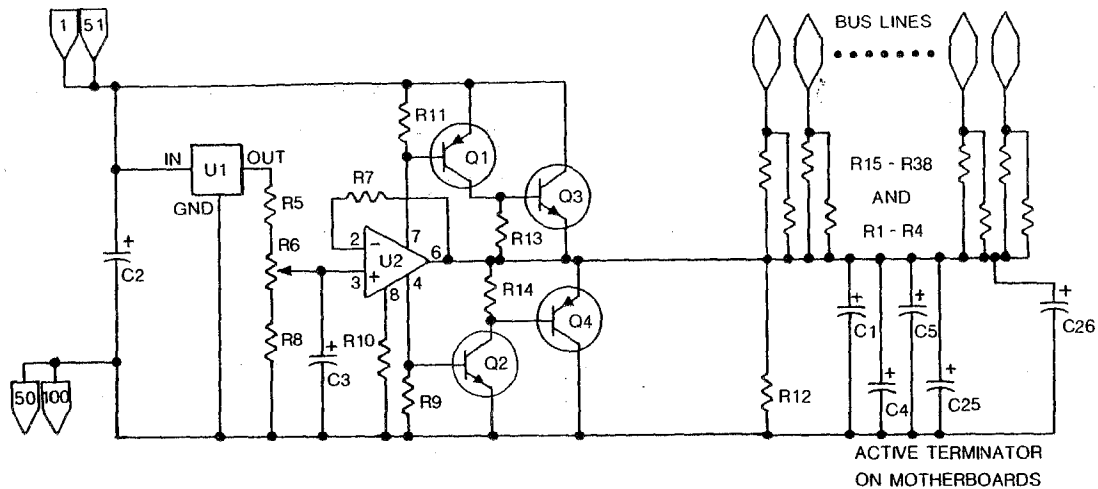


Figure 5. MotherBoard Schematic

## Active Termination Theory

The standard TTL termination is a 2.7V reference, comprising a 360 ohm and a 390 ohm resistor in series across the power supply; the TTL line terminates at the junction of these two resistors. This type of passive termination allows for proper sourcing and sinking of the TTL line, and keeps the impedance of the line to a minimum to minimize pickup of noise and crosstalk. Each one of these terminations, however, also draws about 6.7 mA from the power supply. So, terminating 92 lines in this manner means a standby current drain through the terminators of well over half an Amp! These passive terminations don't just put a strain on your power supply, they waste energy and create heat inside your computer's cabinet. We don't have to go much further to realize that passive termination is not such a good way to do things, although it's better than no termination at all.

The active termination in the CompuPro MotherBoard takes advantage of the fact that there is an equivalent *ACTIVE* structure, based around a voltage source and isolating resistor, that can accomplish the same results (see schematic). Current can either source or sink through the 750 ohm resistance (two 1.5K ohm resistors in parallel), either dumping into or drawing from the voltage source. Terminating more lines simply means adding more series resistors between the line and voltage source. As a result, the standby current is slashed to the standby current of the voltage source circuitry . . . about 15 or 20 mA, which is quite a savings in energy.

The current requirement goes up as lines require more sourcing or sinking, but here we also are somewhat fortunate. At any given moment, on 92 lines there will be a fairly random mix of 1's and 0's from instant to instant . . . these tend to cancel out and thus reduce the current drive requirements of the voltage source. Nonetheless, although this keeps average current consumption down, there are instances when you might have an extreme momentary need for current. As a result, the voltage source has enough capacity built-in to take care of the most adverse cases.

The structure of the voltage source is fairly simple (see schematic page 6); IC-1 sets up a stable voltage reference independent of master supply variations. IC-2, a micropower op amp, hooked up as a simple voltage divider with Q1-Q4 set up as current boosting devices to cover any large current demands. R6, the trimpot, adjusts the output voltage of the op amp . . . hence the terminator voltage . . . to 2.7V. Since the op amp is forced to run from +5V when the motherboard is powered from a regulated +5V supply, you might expect some problems since that low a supply voltage range is marginal for most op amp types. However, the 4250 micropower op amp chosen for this application can work quite well down to +3V, so it's working well within specifications.

IF YOU NEED ASSISTANCE ALWAYS CONTACT  
YOUR COMPUPRO DEALER FIRST

**CUSTOMER SERVICE INFORMATION**

Our paramount concern is that you be satisfied with any CompuPro product. If any product fails to operate properly, it may be returned to us for service; see warranty information below. If you need further information feel free to write us at:

**Box 2355, Oakland Airport, CA 94614**

**LIMITED WARRANTY INFORMATION**

CompuPro will repair or replace, at our option, any parts found to be defective in either materials or workmanship for a period of 1 year from date of invoice. Defective parts **MUST** be returned for replacement.

If a defective part causes a CompuPro product to operate improperly during the 1 year warranty period, we will service it free (original owner only) if delivered and shipped at owner's expense to and from our Service Center in Building 725, Oakland Airport, CA 94614. If improper operation is due to error or errors on the part of the purchaser, there may be a repair charge. Purchaser will be notified if this charge exceeds \$50.00. If the warranty period has expired, service for CompuPro products is available at a rate of \$50.00 per hour labor plus parts.

We are not responsible for damage caused by use of solder intended for purposes other than electronic equipment construction, failure to follow printed instructions, misuse or abuse, unauthorized modifications, use of our products in applications other than those intended by CompuPro, theft, fire, or accidents.

Return to purchaser of a fully functioning unit meeting all advertised specifications in effect as of date of purchase is considered to be complete fulfillment of all warranty obligations assumed by CompuPro, a Godbout Company. This warranty covers only products marketed by CompuPro, a Godbout Company and does not cover other equipment used in conjunction with said products. We are not responsible for incidental or consequential damages.

Prices and specifications are subject to change without notice.



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