EXPAnDDR Interface Board

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The **EXPAnDDR** adds a BOOT PROM socket, a parallel port, and a memory expansion board addressor port to your ADAM computer.

This document contains all the information you will need to get the **EXPAnDDR** up and running. It's as simple as plugging it in and booting the supplied software. The detailed instructions contained herein will take you through the installation and checkout process.

We know you are anxious to get started. But first please read all the way through the instructions so you'll be somewhat familiar with the process before you actually start the installation.

A WORD OF WARNING ABOUT STATIC ELECTRICITY!

Before you get started, just a word of warning about static electricity. The integrated circuit chips on the **EXPAnDDR** can be destroyed by static charges. If you notice that you get shocks when you touch metal appliances after walking around the room, then you should take precautions to prevent static discharges when handling it. There are a couple of common precautions you can take if you suspect static electricity is a problem in your installation environment.

One precaution you can take is to discharge yourself each time before you touch the **EXPAnDDR**. You can do this by performing your installation near an appliance you can touch to discharge the static electricity just prior to handling it. Another way is to connect a wire to a water pipe or the metal

By the way, the **EXPAnDDR** chips are not particularly sensitive to static electricity, but like all normal 74LS series integrated circuits, they can be destroyed if hit with a big enough discharge.

INSTALLATION

As mentioned earlier, the **EXPAnDDR** has a parallel port, and a memory expander board addressor port on it. The following steps will take you through the installation process for the **EXPAnDDR** cables. If you do not have a particular device to connect to the **EXPAnDDR** please disregard the installation instructions for that cable.

Parallel Printer Cable

Let's start with the parallel printer cable. This cable has a 26-pin socket connector on one end and a 36-pin Centronics connector on the other. The socket connector plugs in to **EXPAnDDR** connector J5. Use the **EXPAnDDR** layout drawing included as Figure 1 to locate its position. It is recommended you key the connector so that it plugs in to J5 in only one orientation (See Appendix B Parallel Cable Construction). The board connector J5 is labelled "Printer". Gently push the socket onto J5. For now, leave the other end unconnected. If you have too many pieces of equipment connected at first, you may have difficulty making the cables reach as you are installing the **EXPAnDDR** into

your computer.

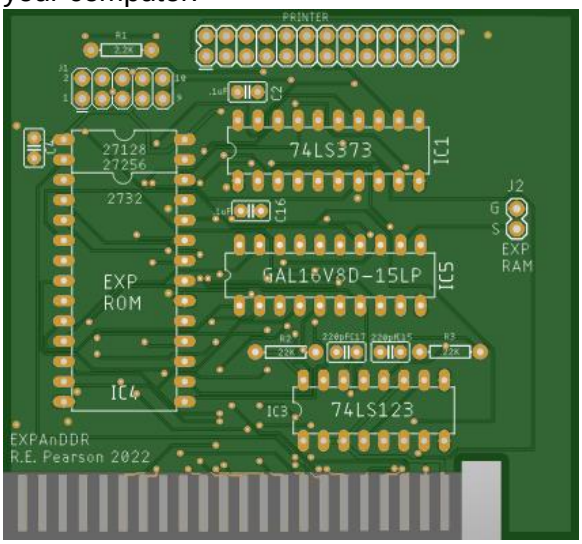


Figure 1 EXPAnDDR Board Layout

Boot Prom

If you have a BOOT PROM for the **EXPAnDDR** you should install it now. The PROM goes into the socket IC4 with its notch facing the top of the board and its other end flush with the bottom end of the socket. An IDE BOOT PROM should have two empty socket positions at the top on each side of the socket when installed correctly. Now place shorting jumpers on the 10-pin connector (labelled J1) according to the type of PROM installed. The following table will help you make those choices:

#	**J1 Jumper Function**
1-2	Disables Printer port
3-4	2764 or 27128 PROM
5-6	27256 PROM
7-8	2732 PROM (use this selection for a 4K IDE BOOT PROM)
9-10	27128 or 27256 PROM

Okay, we are ready to plug the **EXPAnDDR** into the computer! Pick up the **EXPAnDDR** with its dangling cables and take it to the computer. Note that the board is keyed to ONLY fit into slot #2, the center slot, and ONLY with the components facing towards the right side of the computer. (However, it is possible to insert the board backwards if you have the upper case removed or have cut out your plastic keying barriers.) Note that when the board is installed properly, the cable must be wrapped back over the top of the board to have them exit the computer on the left side.

If you have a board in the center slot, it will have to be removed. If you do have a board in slot #2, the center slot, it is most likely a parallel printer interface or memory addressor board. The **EXPAnDDR** will replace all the functions of the board you have to remove, so don't worry that you will lose your printer port or memory expansion board addressing capability. You can take the removed board and sell it to someone who does not have an **EXPAnDDR**!

Expansion RAM Addressor

If you have a memory expander board installed in slot #3 (the right slot), you'll have one or two wires running from it to the board you are removing. The **EXPAnDDR** provides the same signal (and its return wire – a ground connection) to your memory expander board, so detach the wire(s) at the printer board end.

Locate connector J2 (labelled 'EXP RAM') on the **EXPAnDDR** (see Figure 1 to locate it). It consists of two pins – pin 'S' is for the bank switch signal to the memory board and pin 'G' is for a ground line. If you experience erratic operation of your memory board, you'll have to use both pins and twisted wire between the boards. Twisted wire will reduce the amount of noise that the signal wire will pick up. If you're using a single wire from the memory expansion board, connect it to J2 pin 'S'. The most common color codes for the wires are red or white for the signal wire and black for the ground wire.

Connect the memory board wire (if needed) to the **EXPAnDDR** and insert it into the center expansion slot. Make sure that the **EXPAnDDR** sits straight up in the center slot (the cables can pull the **EXPAnDDR** so adjust their tension so that the board sits up straight in the slot). The top cover can be put back in place but won't close all the way unless you cut a narrow slot to allow the cables to exit.

POWERING UP

Turn on your ADAM with no disks or tapes in your drives. SmartWriter should launch as usual. If it does, skip the next paragraph.

If you have a hard disk BOOT PROM installed, you'll see the Micro Innovations splash screen, followed by the SmartWriter screen (with the hard disk interface board out of the ADAM).

If SmartWriter does not start up, turn of the power and remove the **EXPAnDDR**. Try it again with the **EXPAnDDR** removed. If SmartWriter comes up fine without the **EXPAnDDR** installed, it is likely that your **EXPAnDDR** is defective. Incorrect construction of the **EXPAnDDR** or static electricity are two possibilities.

APPENDIX A – Parallel Port

Parallel Printer Port Signals for EXPANDDR Interface Board

Interface Board Signal Name	Interface Board Pin No.	Centronics Connector Pin No.	Centronics Printer Signal Name
Strobe	1	1	Strobe
Signal Ground	14	19	Strobe Return
D1	2	2	Data Bit 1
Signal Ground	15	20	Data 1 Return
D2	3	3	Data Bit 2
Signal Ground	16	21	Data 2 Return
D3	4	4	Data Bit 3
Signal Ground	17	22	Data 3 Return
D4	5	5	Data Bit 4
Signal Ground	18	23	Data 4 Return
D5	6	6	Data Bit 5
Signal Ground	19	24	Data 5 Return
D6	7	7	Data Bit 6
Signal Ground	20	25	Data 6 Return
D7	8	8	Data Bit 7
Signal Ground	21	26	Data 7 Return
D8	9	9	Data Bit 8
Signal Ground	22	27	Data 8 Return
No Connection	10	10	Acknowledge
Signal Ground	23	28	Ack Return
Printer Busy	11	11	Busy
Signal Ground	24	29	Busy Return
No Connection	12	12	Paper Error
Signal Ground	25	30	Reset Return
No Connection	13	13	Select
No Connection	26	31	Reset

Centronics Pinout

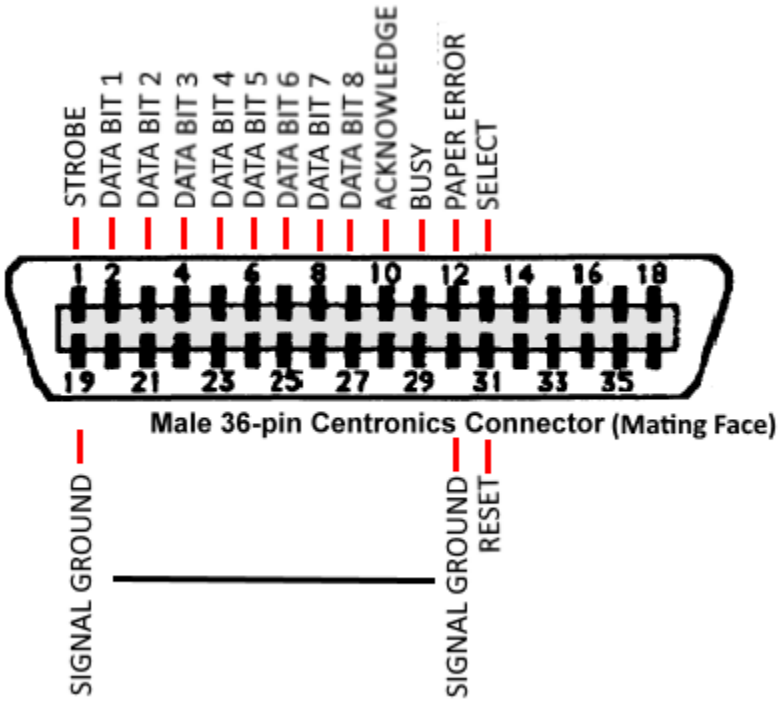


Figure 2 Centronics typical pinout

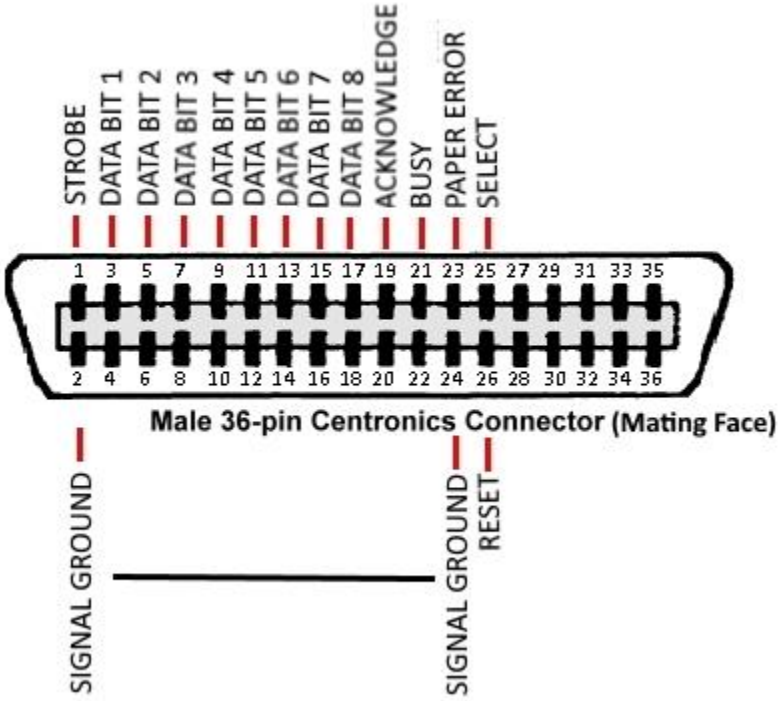


Figure 3 Centronics ribbon cable pinout

The parallel pinout numbering inf Figure 6 can be confusing since it does not illustrate correctly how the ribbon cable actually connects to the parallel connector (Centronics or DB25 parallel). This is shown in Figure 5.

Figure 7 shows the **EXPAnDDR** parallel port connector ribbon cable pinout. You can see there are only 26 pins so no connection is made at all to the parallel port connector for pins 27 through 36.

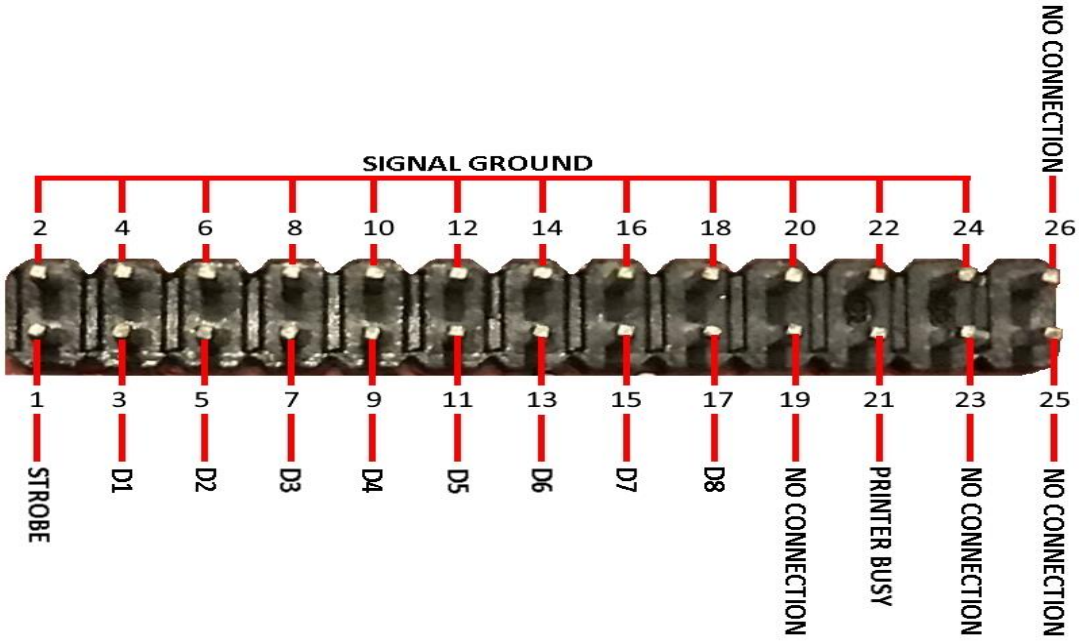


Figure 4 EXPAnDDR Parallel Connector Pinout

Parallel Cable Construction

Follow the illustration below to construct your **EXPAnDDR** Parallel Printer Cable to connect to the Parallel Printer Connector. Select a length of ribbon cable with 26 conductors. Cable length should be 24 inches. On the Centronics side, line the cable up with pin 1. The Centronics connector will have 10 pins with no wire connection.

Figure 5 Parallel Cable Diagram

It is recommended you "key" your Parallel port cable and connector so it can only connect in the correct orientation.

Instructions for Keying (See diagrams):

1. On connector J5 cut pin number 26.
2. On the cable that will connect to connector J3 block the plug for pin number 26 with a small amount of epoxy or super glue.

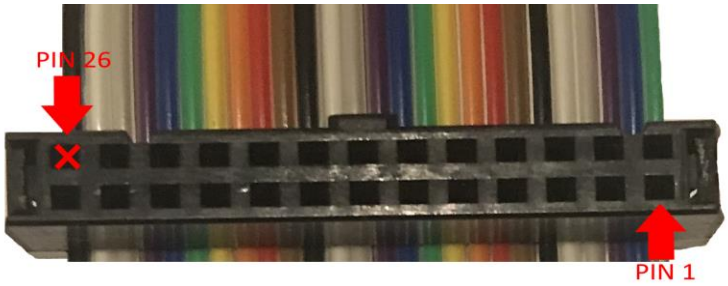


Figure 6 Parallel Cable Keying

Example Z80 Code

An example of practical Z80 code for the parallel port is given below:

```
PRINT
      in       a,(40h)        ;check printer status
      and      01h            ;is printer busy?
      jr       z,PRINT        ;yes, wait
      ld       a,(BUFFER)     ;get character to print from buffer
      out      (40h),a        ;send character to printer
```

APPENDIX B – Bill of Materials

Bill of Materials

PART	QTY
Board	1
GAL16V8D-15LP	1
SN74LS123N	1
SN74LS373N	1
28 pin DIP socket (double wipe)	1
20 pin DIP socket (double wipe)	2
16 pin DIP socket (double wipe)	1
2x40 header connector	1
2x5 header connector	1
.1 uF ceramic radial capacitors	2
33 uF 16v electrolytic radial capacitor	1
220 pF ceramic disc capacitor	2
22k 1/4 watt resistors	2
2.2k 1/14 resistor	1
OPTIONAL	
2732,27128, 27256 eprom	1
Cables	
Parallel	
26-pin IDC female connector	1
36 Pin Centronics male IDC Ribbon Cable Crimp Connector	1
Ribbon Cable (30-40 conductor) 2 meters	1

APPENDIX C - Construction

PCB Fabrication

You can send the Gerber file included with this package to the PCB fabrication house of your choice. Some PCB fabrication companies have slightly different naming conventions for Gerber files so you may need to adjust them. PCBWAY will accept the Gerber files as is. Below are basic parameters you may need to enter when completing your order. NOTE: Gold fingers are an option to improve the durability/longevity of the board but does add significant additional cost. If you decide to go with Gold fingers, I recommend the 'Immersed Gold' option.

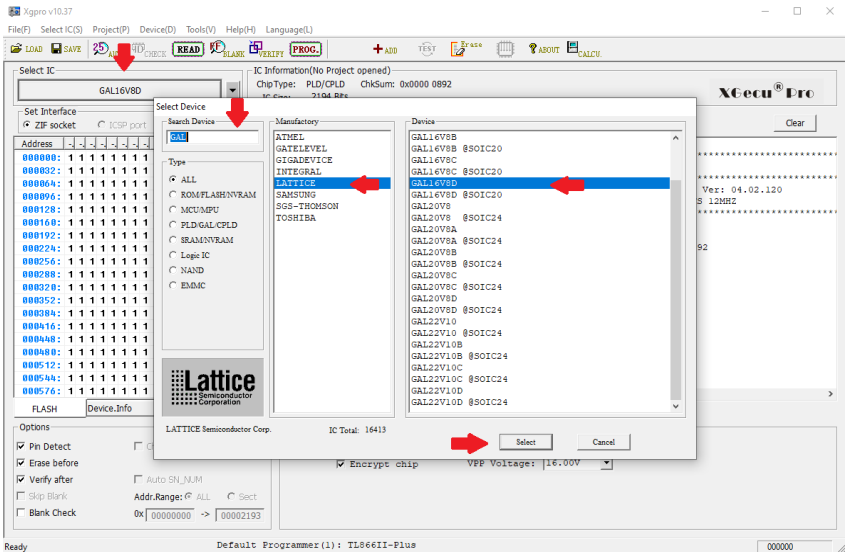
Parameter Information

Board type :	Single pieces
Size :	72.9 x 67.1 mm
Quantity :	5 or 10 (usually the same cost)
Layer :	2 Layers
Material :	FR-4: TG130
Thickness :	1.6 mm
Min Track/Spacing :	6/6mil
Min Hole Size :	0.3mm
Solder Mask :	Green
Silkscreen :	White
Gold fingers :	No
Surface Finish :	HASL with lead
"HASL" to "ENIG"	No
Via Process :	Tenting vias
Finished Copper :	1 oz Cu

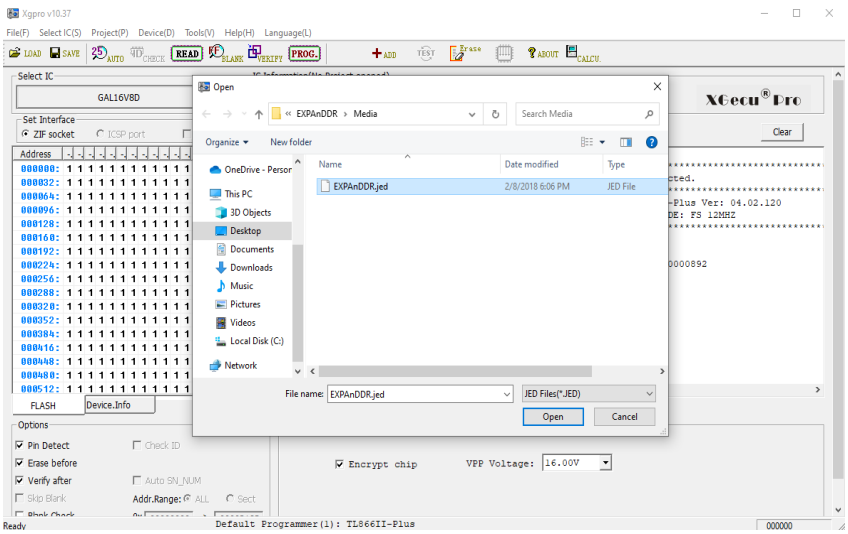
Programming the Lattice GAL18V8D-15LP

Example uses the MiniPro TL866II Plus

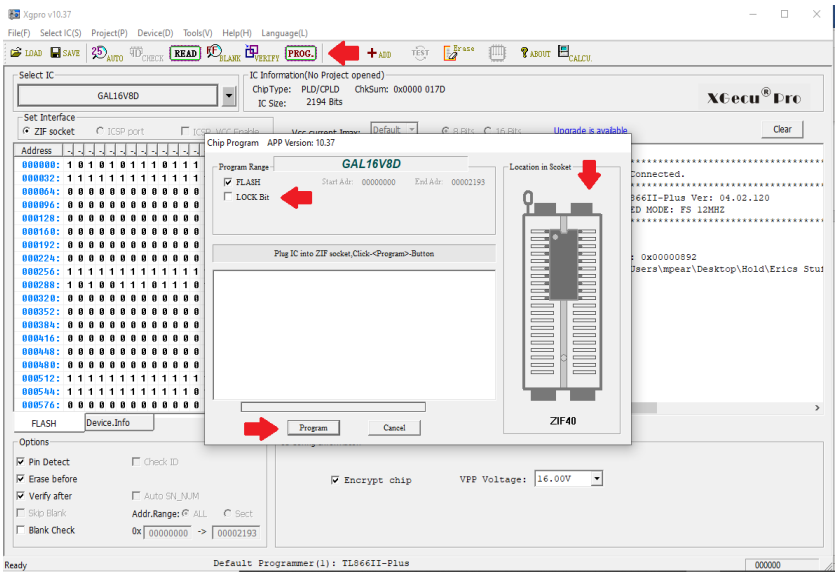
1. Connect the MiniPro programmer to your PC with the USB cable.
2. Launch the MiniPro programmer software.
3. Click the ‘Select IC’ button and in ‘Search Device’ type ‘GAL’. The list of manufacturers will update with your search. Select ‘LATTICE’ in the ‘Manufactory’ field and the ‘Devices’ will update. Select ‘GAL16V8D’. Then click the ‘Select’ button.



4. Go to the ‘File (F)’ menu and select ‘Open’.
5. From the open file dialog box select the ‘EXPAnDDR.jed’ file that was included in the Distribution Media of this package.
6. Click the ‘Open’ button to the load the .JED file in.



7. Click the ‘PROG’ button for Program.
8. When the ‘Chip Program’ dialog box opens uncheck the ‘LOCK BIT’ checkbox.
9. Position your GAL16V8D-15LP chip in the chip programmer as indicated by the diagram and lower the locking arm.
10. Click the ‘Program’ button to program the chip.



APPENDIX D - MEDIA

Distribution Media

EXPAnDDR.jed – File required to program the GAL16V8-15LP chip.

IDEBOOTROM.BIN – 4K binary of the IDE BOOT ROM for 2732 EPROM.

EXROM_Diagnostic_v3_27128.zip – 16K Coleco ADAM Diagnostic utility to diagnose RAM, Video RAM, ADAMNet, Keyboard and Controller failures.

EXROM_Diagnostic_Instructions.txt – Instructions for the EXROM_Diagnostic_v3_27128.zip

EXROM_smartbasic11_v5a_27256.bin – 32K SmartBASIC 1.1 Boot Prom.

EXROM_smartbasicajm_patch_27256.zip – 32K AJM SmartBASIC Boot Prom.

ADAM's Desktop_Walters_Software_Co._27256.bin.zip – 32K Walter's Software ADAM's Desktop Boot Prom.