GORAT80

GOttlieb Rom And Test for System80

ralf@lisy.dev

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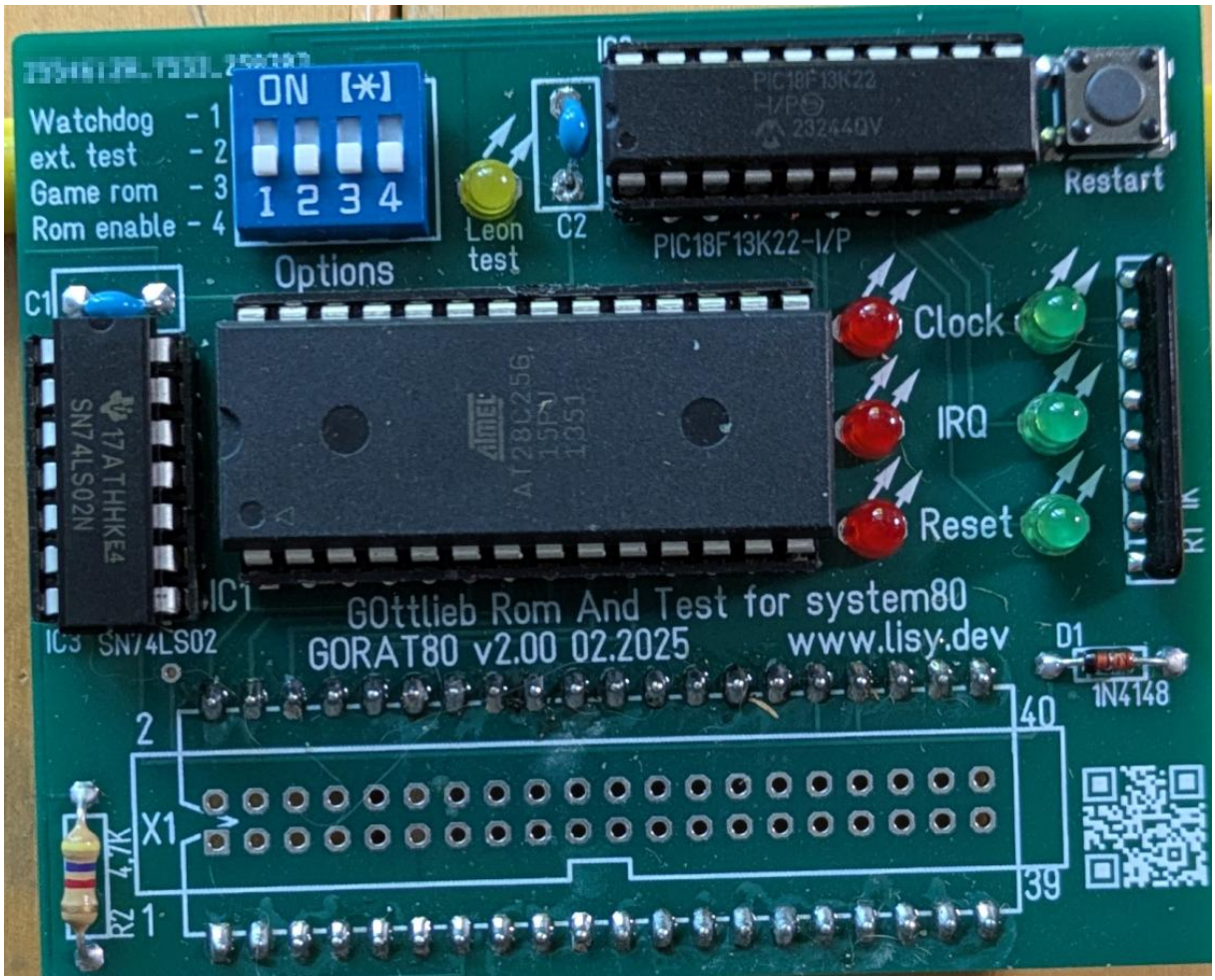
1. Introduction

GORAT80 (GOttliebRomAndTest system80) is an 'intelligent' adapter board which is plugged into the 'TC-1 slot' of a Gottlieb System 80 (including 80A and 80B) MPU and provides the following functionalities:

- Monitoring and visualization (also during operation)
- Replacement for all ROMs (Game Rom and System ROMs Prom1, Prom2,U2 and U3)
- Replacement for the System 80 Reset Board (including visualization when triggered)
- Test of the hardware: CPU, RAM and the three RIOTs (Leon Borre or Marco test ROM)



picture 1: GORAT80 Version 2.00

2. Quickstart

Upon boot, IRQ, Clock & Reset will be checked and indicated via the LEDs without regard to DIP settings. By setting DIP switch 1,3 & 4 (DIP2 not used) the behaviour of Gorat80 can be adjusted.

2.1.Monitoring mode (default, all DIPs off)

No ROM mapping, GORAT80 is passive

2.2.Monitoring mode with watchdog (DIP1 on)

DIP1 activates Watchdog which resets the CPU if no IRQs are detected

2.3.rom mapping (DIP4 on)

ROM mapping is activated with DIP4 set to ON.
The original ROMs need to be deactivated (via jumper) or removed.

2.3.1.test rom selected (DIP3 off)

DIP3 = OFF
DIP4 = ON
Test ROM is selected, 'dedicated LED' blinks per either Leon or Marco test ROM.

Note: as the testrom do not use IRQs the IRQ detection of Gorat80 will show ‚red‘ during test!

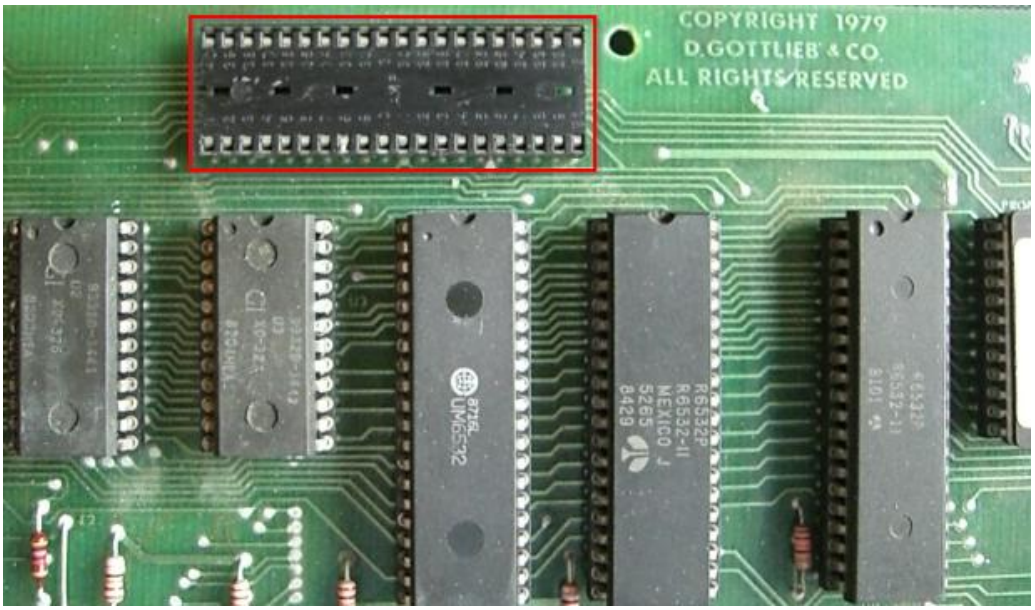
2.3.2.game rom rom selected (DIP3 on)

DIP3 = ON
DIP4 = ON
Game ROM is selected (must be included in ROM memory map)

3. operations

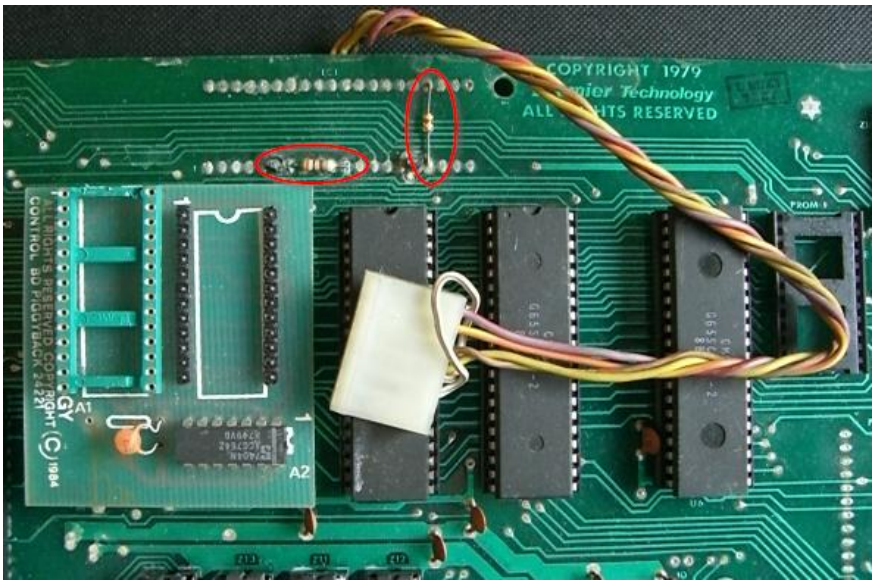
3.1.TC-1 socket

On the MPU, the slot 'TC-1' (top centre of every System 80 MPU) must either be socketed to accommodate GORAT80. (Alternatively, GORAT80 can also be soldered in place). This should be the case for all System80 and 80A MPUs



picture 2: System80 MPU with TC1-socket

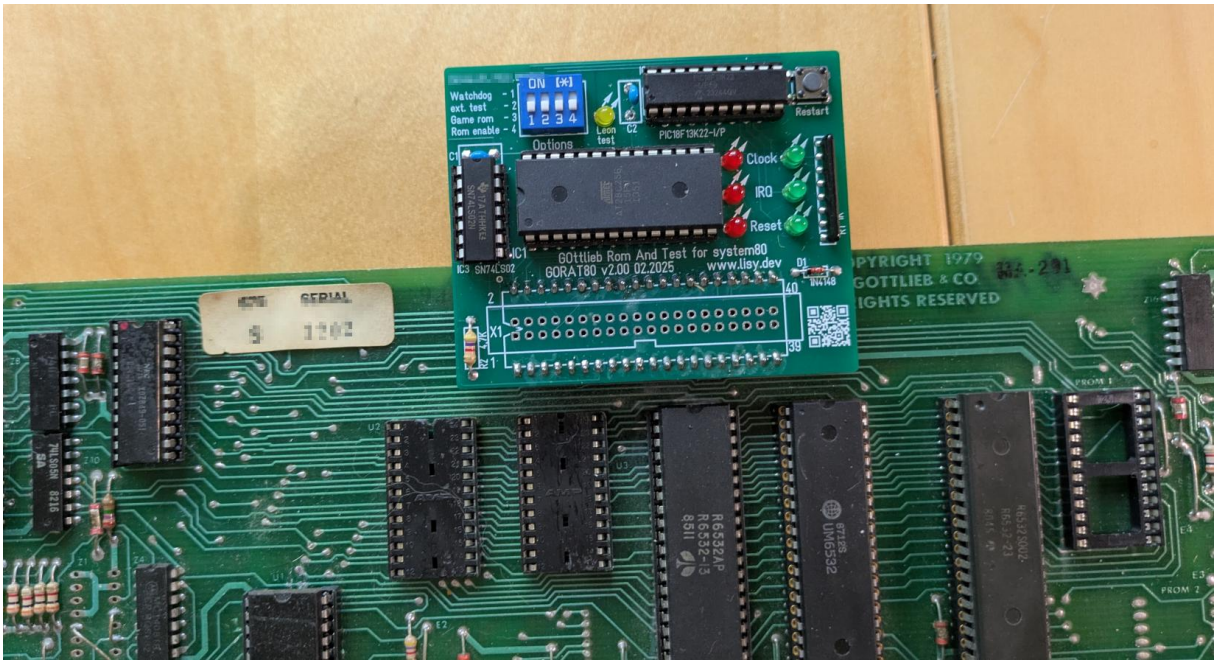
Some System 80B MPUs are missing the IC socket, in which case the connection for the reset board is usually soldered there (pin connector). In this case, the pin connector must be removed and a 40- pin IC socket soldered in instead. NOTE: In this case, the diode and resistor on these connections must also be removed, as they are already present on the GORAT80! (Circled in red in the image below)



Picture 3: System80B MPU without socket for TC-1

3.2.placement

Gorat80 can be place directly on the TC-1 socket by using ‘adapter strips‘, or by using a 40 Pin Male IDC Connector Ribbon Cable with Female Socket.



Gorat80 placed with adapter strips.

3.3.preparation for monitoring mode

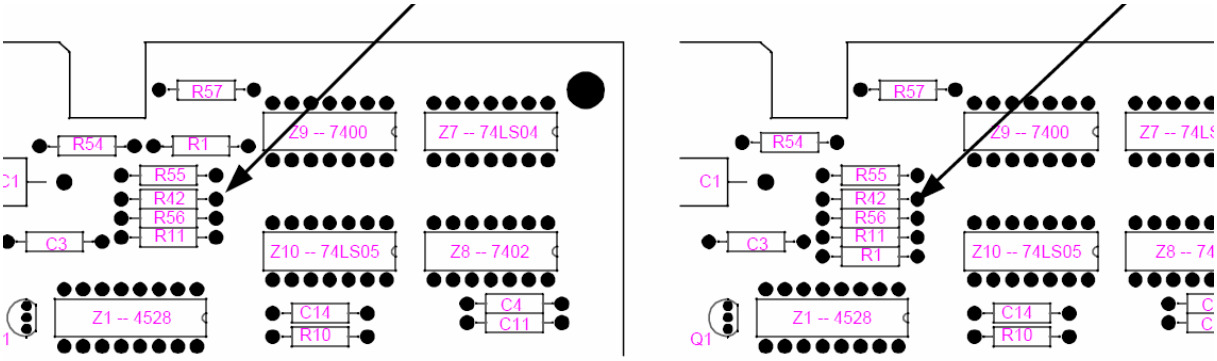
No further preparation needed for monitoring mode.

3.4.preparation for rom mapping mode

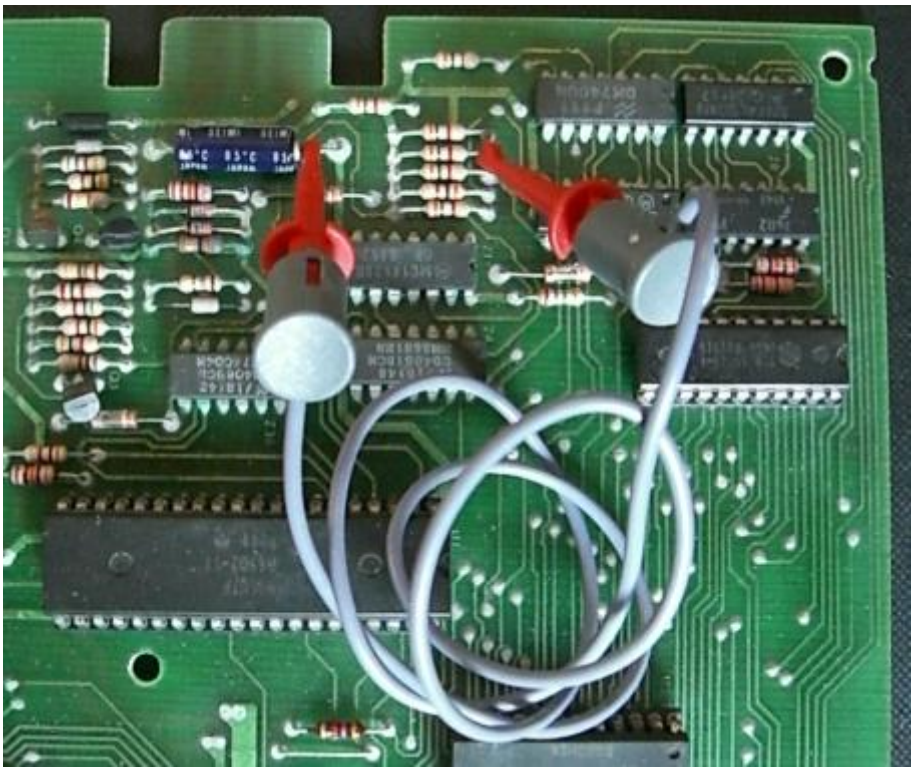
In rom mapping mode some additional preparation is necessary so that Gorat80 can ‚take control ‘

The easiest way is to remove all original ROMS (game ROMs and system ROMs).

For non-socket PROMs, you can either do this non-destructively by desoldering them, or simply use a small side cutter to cut off the 'legs'. If you want to leave one of the ROMs on the board, you have to set a bridge on the MPU to prevent the selection of these PROMS. To do this, one leg of resistor R42 is pulled to ground (marked with an arrow in the image below). Figure



Connection point for System80 MPU ‘old’ (left) and ‘new’ (right). The easiest way is to connect the ground connection (-) on the capacitor directly to the 5V supply. The image below shows the bridge as an example.



4. eprom 27256

The EPROM contains the images of the original System 80 ROMs (depending on the pinball machine) as well as the image of the test PROM from Leon Borre. The address assignment is shown below. Alternatively, a 27512 can be used (the second half is then not used) or, if you only want to replace the ROMs and can do without the 'Leon Borre' test function, a 27128. If you only want to monitor the Clock, IRQ and Reset signals, the EPROM can also be omitted.

Kbyte	address	GORAT80 usage	27C256 (32 KByte)	27C128(16KByte)
0	0	(N/A)	not used	not used
2	0x800	(N/A)	not used	not used
4	0x1000	Game ROM - 0x1000 - 0x17FF	Game Rom	Game Rom
8	0x1800	(N/A)	not used	not used
10	0x2000	System ROM - 0x2000 - ox3FFF	System Rom	System Rom
12	0x2800	(U2/U3 ROMS)	System Rom	System Rom
14	0x3000		System Rom	System Rom
16	0x3800		System Rom	System Rom
18	0x4000	Not used	not used	
20	0x4800	Not used	not used	
22	0x5000	Not used	not used	
24	0x5800	Not used	not used	
26	0x6000	LEON	Test Rom	
28	0x6800	LEON	Test Rom	
30	0x7000	LEON	Test Rom	
32	0x7800	LEON	Test Rom	
	0x8000	Not used		

4.1.examples of creating an image

To create the EPROM image, I refer to the naming conventions in the '.zip' packages available for Pinmame. Files with '0xFF' in the appropriate size (1K-Free.bin, 2K-Free.bin, 4K-Free.bin, 8K-Free.bin) are placed in the 'Not used' areas.
(The Pinmame files can NOT be found there because they are subject to copyright).

4.1.1.System80 with two 1K proms

Sometimes two 1K proms are used for the game prom. In the zip files these are stored according to the convention Gamename-1.cpu and - Gamename-2.cpu Using the example of the original ROMs for a Gottlieb Star Race (System80 Game #657), the following mapping results:

GORAT80 usage	27C256 (32 KByte)
(N/A) (N/A)	4K-Free.bin
Game ROM - 0x1000 - 0x17FF	657-1.cpu+657-2.cpu
(N/A)	2K-Free.bin
System ROM - 0x2000 - ox3FFF (U2/U3 ROMS)	u2_80.bin
	u3_80.bin
Not used Not used Not used Not used	8K-Free.bin
LEON LEON LEON LEON	2764af.bin

Command line: copy /b 4K-Free.bin + 657-1.cpu + 657-2.cpu + 2K-Free.bin + u2_80.bin + u3_80.bin + 8K-Free.bin + 2764af.bin gorat80_661.bin

4.1.2.System80 and 80A with one 2K prom

If a 2K-prom is used for the game prom, the following mapping results using the example of the original ROMs for a Gottlieb Panthera (System80 Game #652):

GORAT80 usage	27C256 (32 KByte)
(N/A) (N/A)	4K-Free.bin
Game ROM - 0x1000 - 0x17FF	652.cpu
(N/A)	2K-Free.bin
System ROM - 0x2000 - ox3FFF (U2/U3 ROMS)	u2_80.bin
	u3_80.bin
Not used Not used Not used Not used	8K-Free.bin
LEON LEON LEON LEON	2764af.bin

Command line: "copy /b 4K-Free.bin + 652.cpu + 2K-Free.bin + u2_80.bin + u3_80.bin + 8K-Free.bin + 2764af.bin gorat80_652.bin" AlsoSystem80ADevices have a 2K game prom. Here, analogous to u2_80.bin/u3_80.bin, the files u2_80a.bin and u3_80a.bin should be used. Command line for a Devils Dare: "copy /b 4K-Free.bin + 670.cpu + 2K-Free.bin + u2_80a.bin + u3_80a.bin + 8K-Free.bin + 2764af.bin gorat80_670.bin"

4.1.3.System80B with 2K Prom

System 80B packages usually have two files, two prom files, 'Prom1-cpu' (8K bytes, the system ROM) and 'Prom2-cpu' (2K bytes, the game prom). This results in the following mapping using the example of a tag team (System80B Game#698):

GORAT80 usage	**27C256 (32 KByte)**
(N/A) (N/A)	4K-Free.bin
Game ROM - 0x1000 - 0x17FF	Prom-2.cpu
(N/A)	2K-Free.bin
System ROM - 0x2000 - ox3FFF (U2/U3 ROMS)	Prom1.cpu
Not used Not used Not used Not used	8K-Free.bin
LEON LEON LEON LEON	2764af.bin

Commandline: „ copy /b 4K-Free.bin + Prom-2.cpu + 2K-Free.bin + Prom-1.cpu + 8K-Free.bin + 2764af.bin gorat80_698.bin“

4.1.4.System80B with 4K Game-Prom (not supported by Gorat80)

Starting with Game #715 'Excalibur', Gottlieb used 4K EPROMs (2732) instead of 2K PROMs (2716). Address 'A15' was used for the first time. **Prom simulation on these devices is not supported with GORAT80!**

Manual reconfiguration, with v02 if the 'Leon' ROM functionality is lost, can be done by disconnecting pin 27 of the EPROM (A14) on the underside and connecting it to pin 35 (A15) of the TC1 adapter. (Untested!, picture follows). Mapping:

GORAT80 usage	**27C256 (32 KByte)**
(N/A) (N/A)	4K-Free.bin
Game ROM - Part1 (N/A)	Prom-2.cpu
System ROM - 0x2000 - ox3FFF (U2/U3 ROMS)	Prom1.cpu
Not used Game ROM - Part 2	Prom-2.cpu
Not used Not used	4K-Free.bin
LEON LEON LEON LEON	2764af.bin