Turbo 2000
Upgrading Atari XC12 Data Recorder

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Draft Version 0.2
2016-11-12

Introduction

This tutorial is devoted to those who have an original ATARI XC12 data recorder and want to upgrade it for the Czechoslovak Turbo 2000 system. It therefore describes modification of the hardware of the data recorder. The solution described in this tutorial is a result of my own experimentation and also modifications of other solutions. The solution was tested with several data recorders and works very reliably.

The modification is not complex and can be made by any handy radio fan.

Note that a data recorder with this upgrade is compatible with the following turbo systems

- Turbo 2000, Super Turbo, Turbo Tape, B-TAPE

- KSO Turbo 2000 and compatible systems (input from SIO port), Atari Super Turbo and compatible systems (ATT and Unerring Master), Hard Turbo, Lower Silesian Turbo 2000, Turbo ROM.

Tools and Parts Required

Tools

- Equipment for soldering (soldering iron, solder, rosin)

- Cross-head screwdriver (size 1)

- Side-cutting pliers

- Flat pliers

- Tweezers

- Steel needle

Parts

Resistors (miniature, e. g. TR191)

- 1x 3k9

- 1x M27

- 1x M22

Capacitors (e. g. TK782)

- 1x 22n
- 1x 100n

Transistors

- 1x KC237 or KC239. NPN type.
  Modern replacements are the following: **BC 546A, BC 546B BC 547A, BC547B**.

Other Parts

- Insulated wire, 15 cm

Upgrade Step-by-Step

Preparation

Turn the unit upside-down and remove the four screws holding the bottom cover in place. Remove the two screws that hold the printed circuit board (PCB) in place.
For easier manipulation with the PCB, unsolder two black wires connected to the motor switch. Remember the location from where you unsoldered the wires.

Modification of the Original Circuitry

- Remove resistor **R6** (10k) and replace it with **3k9**
- Remove resistor **R24** (68k) and replace it with **M27**
- Remove resistor **R38** (56k) and replace it with **M22**
- Remove diode **D3** (1N4148)
- Remove diode **D4** (1N4148)
- Remove capacitor **C4** (4n7)
- Remove capacitor **C13** (50p)
- Remove capacitor **C30** (1n) (only ATARI XC-12 rev.B)
- Remove capacitor **C31** (10n) (only ATARI XC-12 rev.B)
- Remove electrolytic capacitor **C12** (4.7M/50V) and replace with **100n**

Note: Identify the parts using the printed markings on the PCB. Do not damage the parts removed, you will need some of them later.

Integrated Circuit

The LM324 integrated circuit (IC) is located on the PCB. The following figure shows it from the top.
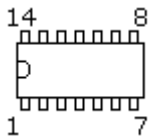
Connect pins **9** and **10** of the **IC** through a **68k** resistor. Use the **R24** resistor that you removed before (blue-gray-orange-red).

Connect the Transistor

Now you will add connect the **output transistor**.

- This figure shows the leads of the transistor (when looking at the transistor from the bottom).

- Connect **collector** through diode **1N4148** to the **white wire** of the SIO cable. The diode has to be properly oriented. Connect the cathode (K) (marked with black bar) to the collector. Use the **D3** diode removed before.
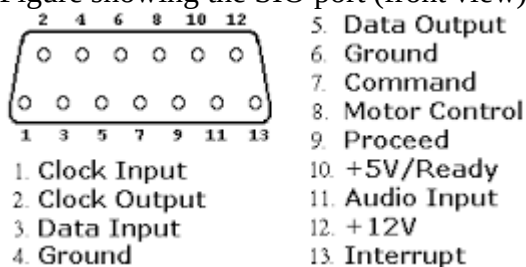

- Connect **base** through resistor **56k** and extra wire o the pin **8** of the **IC**. Use the **R38** resistor removed before (green-blue-orange-red).

- Connect **emitter** to the place on PCB where the **orange (or red) wire** of the SIO cable is connected.

- Connect emitter through diode **1N4148** and extra wire to the pin **12** of the **IC**. Connect the cathode of the diode (marked with black bar) to the emitter. Use the **D4** diode removed before.
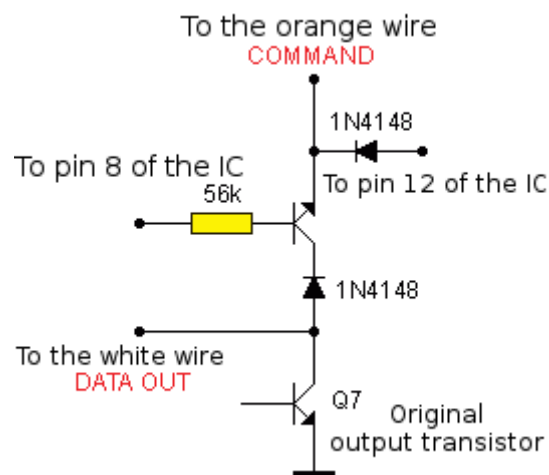
Modify the SIO Connector

- Unscrew and dismantle the SIO connector.

- Using the steel needle, loosen the contacts at positions **7** and **11**.

- Connect the two contacts through the **22n** capacitor.

- Put the contacts back, but switch their positions. The contact from position **11** will go to position **7** and vice versa.

- Shape the capacitor's leads so that the connector can be reassembled.

- Reassemble the SIO connector.

- Figure showing the SIO port (front view) follows.

1. Clock Input
2. Clock Output
3. Data Input
4. Ground
5. Data Output
6. Ground
7. Command
8. Motor Control
9. Proceed
10. +5V/Ready
11. Audio Input
12. +12V
13. Interrupt

Finalization

Double-check your previous work. Put the PCB back, solder the two unsoldered wires back, and attach the data recorder cover with four screws. The turbo 2000 upgrade is complete.