

ITPS

Low Dropout Regulator and Power Sequencer Module

Installation Guide

Version 1.0
P/N ITPS-01

Before you start...

Please take a moment and read this manual before you install the ITPS in your vehicle. Often times, rushing into installing the ITPS can result in serious damage to your ITPS board, computer and probably your car's electrical system.

The ITPS board has 7 wires that need to be installed in various places. Please be careful when performing the installation, **always double check the polarity** of your wires with a voltmeter before installing.

Introduction

Thank you for purchasing the ITPS power sequencer and LDO unit!

This unit was designed to work with a wide variety of ATX DC-DC converter boards such as the PW-70/70/120 or most of the DC converters as well as with other computers systems operating at 12V. The main purpose of this board is to provide power sequencing and strict 12V regulation functions for automotive systems.

1.0 ITPS Logic diagram

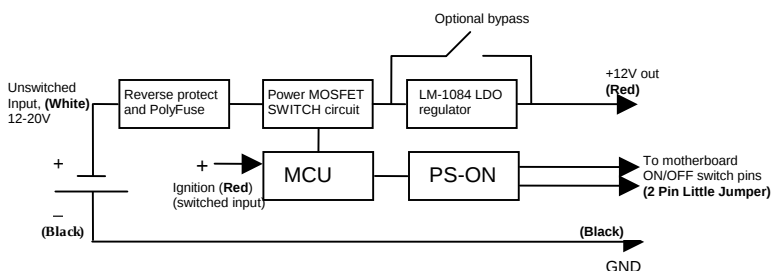


Fig 1.0, ITPS Logic diagram

The ITPS unit is composed off several functions, as shown in fig. 1.0:

- 1) Reverse protection and resetable fuse.** This function provides reverse polarity protection in case the power leads are accidentally reversed. The Polyfuse, F1 will protect against currents greater than 8A.
- 2) MCU.** The 8 bit Microchip controller is at the heart of ITPS. The MCU controls timing and sends signals to the power switch MOSFET and controls the motherboard ON/OFF switch terminals based on status of ignition key.
- 3) Power MOSFET switching circuit.** Q2, the power MOSFET, controlled by the MCU, provides ON/OFF switching to the main power line. When used alone, this MOSFET can switch currents in excess of 15A.
- 4) LM-1084 LDO regulator.** The LM-1084 is a low dropout voltage IC that provides regulation for the ATX DC-DC converters or any other attached device. In case 12V regulation is not needed, the LM-1084 can be bypassed by applying a solder bump as described in fig 1.1.
- 5) PS-ON.** The PS-ON circuit triggers the motherboard ON/OFF switch for 'soft' start/stop sequences. PS-ON is activated 5 seconds after the Ignition circuit is turned on and 10 seconds after the ignition turned OFF.

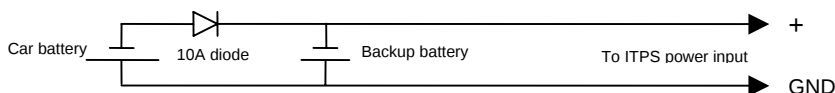
1.1 Mode of operation

The ITPS performs several timing routines and takes actions as follows:

- 1) Ignition=OFF. Nothing happens. IPTS is waiting for ignition signals.
- 2) Ignition=ON. IPTS waits for 3-4 seconds then turns on the main 12V rail. This function provides enough time for battery levels to reach a stable output. After another 1 second the MCU sends an "ON" signal to the motherboard via the 2 wires connected to the motherboard's ON/OFF pins. The motherboard will turn ON and your system should start booting.
- 3) Ignition=ON during driving: Nothing happens. Your computer will remain ON.
- 4) Ignition=OFF. IPTS waits for about 5 seconds and then it turns the motherboard OFF by sending a signal to the motherboard's ON/OFF switch. Your computer should turn off gracefully (shutdown procedure). During this time, power will still be available for your PC to perform shutdown.
- 5) Ignition=OFF after 5 seconds. Power will still be provided for another 45 seconds, long enough for most soft shutdown processes. In the event where the shutdown process is hanging, power will be shut down hard, turning off your computer's main power source to prevent battery drain. If ignition is turned on during this step, your computer should start again. Please note that your 12V might dip below 12V at startup. See NOTE2.
- 6) IPTS will go to step 1, until ignition is turned ON again.

NOTE1: During the times when Ignition=off, the MCU is still running and waiting for signals. The power consumption is in the mW ranges, thus not affecting your battery. Your car alarm system will drain more current than your IPTS.

NOTE2: If you want to ensure that your 12V system never goes below 12V, use a diode to isolate IPTS from your car battery. Install a small SLA battery (12V/1Ah) to the input of your IPTS. The diode will prevent discharging your SLA battery when the main battery dips below 12V.



1.2 Power dissipation

A typical car voltage is in between 13.4-15 V, the regulator power dissipation will be:

$$P_D = (V_{in} - V_{out}) \times I_{in},$$

where V_{in} is the input voltage, V_{out} is the 12 V regulated voltage, and I_{in} is the total current consumed by your mini-ITX board. Here is an example:

$$P_D = (13.8 \text{ V} - 12.0 \text{ V}) \times 2 \text{ A} = 3.6 \text{ Watts}.$$

The ITPS board is equipped with a 10 Watt heat sink, being able to deliver currents in excess of 5A (power out=70Watt), suitable for most mini-ITX board configurations.

NOTE: The heat sink may get hot at times. The ITPS has advanced thermal protection, the board will not be damaged. Do not touch, surfaces may be hot!

1.3 Wiring diagram

Warning! Proceed with caution!

Step 1. Place the board with components facing up.

- Left side 3 pin white connector (input).
- Right side, 2 pin white connector (out).
- Right side, top, J2, motherboard power ON jumper.

Step 2. Hook up the input wires: Black is GND. White is unswitched power. Red (center) is switched power (ignition). Unswitched power can be found at the cigarette plug. Unswitched power can be found near alarm circuits or by connecting straight to the battery. You can use the blue/yellow Faston crimp connectors to clip into running wires.

Step 3. Hook up the output power wires. Black is GND. Red is +12V out.

Step 4. Hook up motherboard ON/OFF switch. Using a 2 pin wire, hook up the output of J2 to your motherboard PS-ON jumpers. Polarity is not important. Consult your motherboard manual for location.

Step 5. Turn on you car. In few seconds, your motherboard should power on.

1.4 Troubleshooting

Problem: motherboard is not turning ON. Check input cables. Measure voltage on unswitched 12V. You should get 12V even if your car is turned OFF. Measure unswitched pin (red) while turning the car ON/OFF. You should see 12V (car on) or 0V (car off). If no voltage on both switch or unswitched circuits, check your car fuse system.

Problem: Motherboard is not turning ON (cont). Check your output cables, make sure polarity is OK. Turn on the car while measuring the output wires (black and red). After few seconds, you should see 12V on the red wire.

1.5 ITPS Characteristics

Input Min. voltage	5V
Input Max. voltage	20V
Current limit, regulated	6A@17V input.
Max Current (out), unregulated	15A
Line regulation	0.015%
Load Regulation	0.1%
Dropout Voltage	1.1V@3A
Operating temperature	-20 to +125 degrees Celsius
Storage temperature	-40 to +125 degrees Celsius