T2K ND280 Upgrade Document
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HA-TPC
FRONT END CARD   (FEC)
HIROSE POWER PINS TESTING
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Abstract

This document describes the test to be realized and the relevant test bench dedicated to check the quality of solder joints made on the power pins of the connector that links to the FEM board (Hirose FX23L series connector).

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ND280 Upgrade – FEC power supply pin soldering tester

Short manual

Introduction

Power pin soldering tester for FEC modules is designed to automate testing of all 4 power pins on connector between FEC and FEM. As connectors are difficult to solder properly one or more pins may have connection problems.

Due to limitations of the design of FEC card measurement can be done in a limited configuration and current flow is as on the picture below.
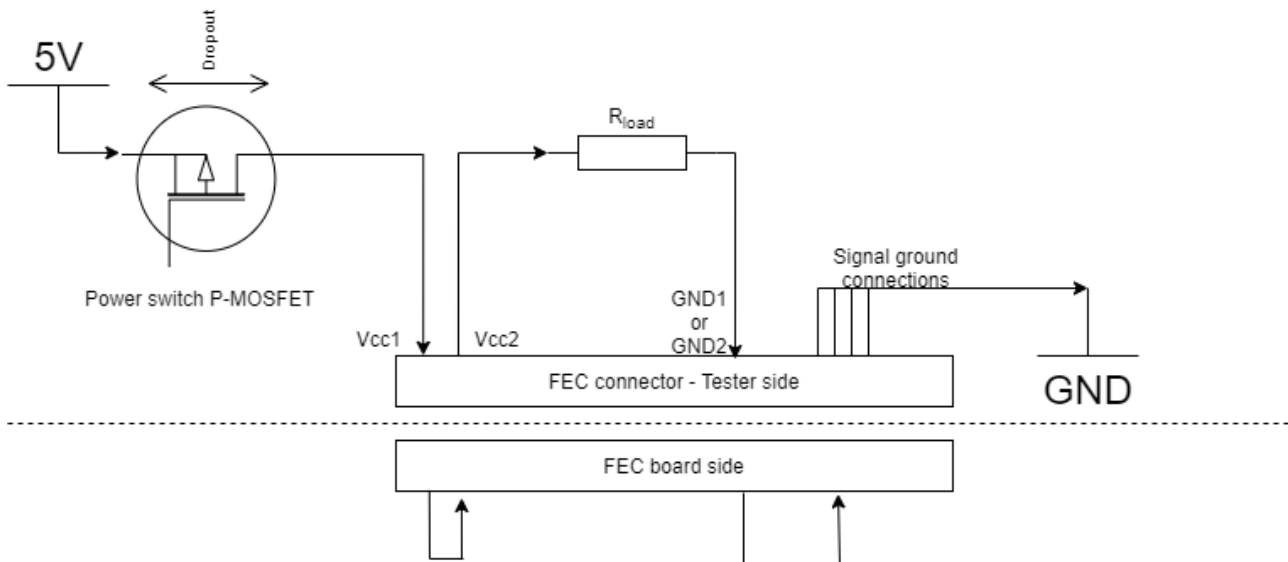
Test current flow on FEC tester board

The test current flows through a P-MOSFET switch (first dropuot at ~150-170mΩ) then flows into VCC1 power pin of a FEC, returns through VCC2 power pin of a FEC connector, passes through load resistor (5Ω or 10Ω, switchable), flows into GND1 or GND2 (switchable) pin of a FEC connector and finally returns via all the signal ground pins of a FEC connector. As a result there are multiple dropouts – P-MOSFET switch and 4 passages through FEC connector.

There are two possible checks of GND ping (they are selectable), but VCC pins are tested together. This tester was designed to load both combination of VCC and GND pins with configurable loads of 0.5 and 1A.

This appliance can be put into two modes:
- testing mode
- configuration mode.

Testing mode is default and is automatically started after power up.

Overview

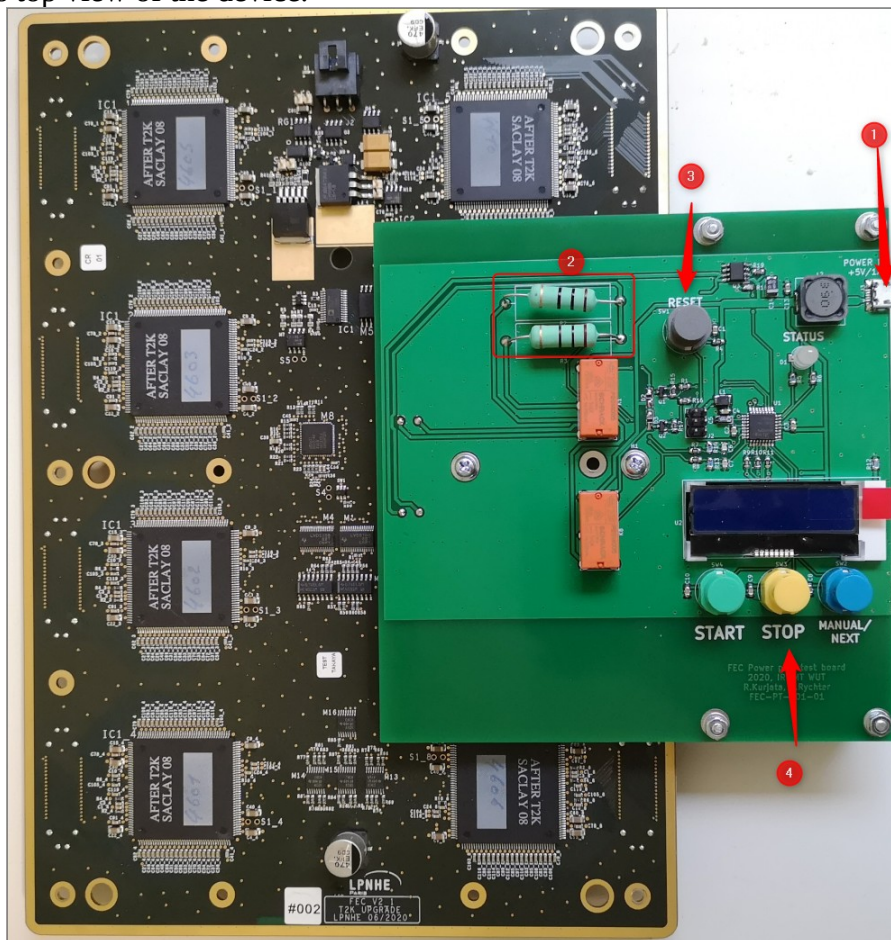Figure 1 shows top view of the device.

Figure 1: Top view of the device

On top view:

- ❶ Power supply connector (micro-usb)
- ❷ Lad resistors
- ❸ RESET button
- ❹ Control buttons (START, STOP, MANUAL/NEXT)

⚠ Warning: Power resistors ❷ will become very hot after prolonged use. Please make a regular pauses between measurements to ensure they cool down.

Requirements

This device requires 5V power supply with micro-usb connector with at least 1.5A current capability.

Testing mode

There are two testing modes – fully automatic and manual. In both modes for each combination of VCC pair and GND1 or GND2 one or more currents are tested (0.5A and 1A). The set of currents used is configurable (see configuration mode).

Note: Some pictures below are made with FEM power pin tester as both devices share most of the functionality

Automatic mode

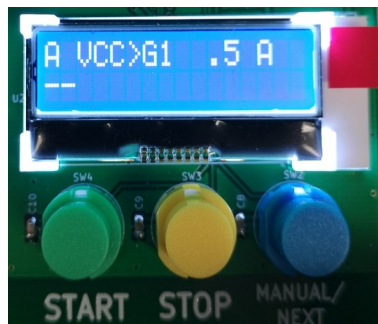When idle Ready message is displayed.

To start automatic measurement press START twice. After first press a confirmation screen will be presented.

Press START again to start measurement. After start each character in bottom line represents one pin combination. Top line contains:
- Mode symbol (A – automatic).
- Pin pair.
- Current tested.

The letter in bottom line can be:
- + - passed
- G – suspected GND connection failure
- V – suspected VCC connection failure
- F – failure detected, measurement not yet completed
- B – suspected failure on VCC and GND.

After all measurements are completed, result window will be presented. In case of any error a fail message will be shown (a pass otherwise).

If failure is detected one can review failed results by pressing MANUAL/NEXT button. Each failed combination can be viewed with result info like below.
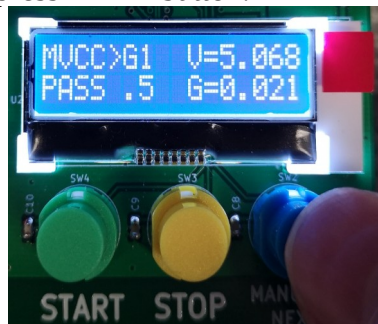

At any time during measurement or review pressing STOP buttons returns to idle state.

Manual mode

To start manual mode press MANUAL/NEXT button.

To move to the first measurement press NEXT button.

During measure green led will be lit. After measurement result will be presented. Top line contains:
- mode symbol (M-manual)
- pin combination
- voltage measured on VCC pin

Bottom line contains
- status (WAIT, PASS, FAIL)
- measurement current
- voltage measured on GND pin.

To move to the next measurement press NEXT button.
To exit this mode and to return to the idle state press STOP.

Configuration mode

To enter configuration mode press RESET button while holding down START button. Configuration mode is signaled with different LED blink pattern (red-green on enter, fast red afterwards).

First screen in test mode presents voltage on VCC and GND pin and this state can be used to make an ADC calibration.

To move to the next setting press NEXT button. Device is already calibrated when received.
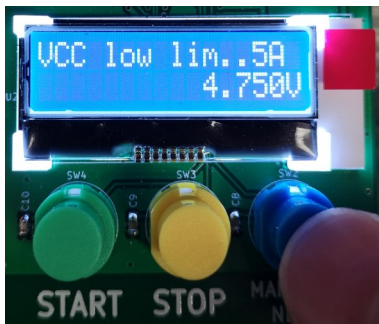
Low threshold for .5A   Low threshold for .1A

Next setting are a VCC low limits. This is the lower limit of acceptable voltage on VCC pin when loaded. As there are intrinsic dropouts in this device, those limits are set independently for 0.5A and 1A load. The preset limits are 4.75V for 0.5A and 4.55V for 1A and can be changed.

If voltage is below this value measurement is considered a failure. To change the value press START (to increase) or STOP (to decrease) buttons. Press NEXT to go to the next setting.

This is the high limit of GND pin voltage. If voltage measured is above this limit it is considered a failure. To change the value press START (to increase) or STOP (to decrease) buttons. Press NEXT to go to the next setting.

Next screen allow to enable/disable measurement at 1A (0.5A range is always active). To toggle between Enable and Disable press START button. Press NEXT to go to the next setting.

This is the time between switching load ON and measurement of the voltages. To change the value press START (to increase) or STOP (to decrease) buttons. Press NEXT to go to the next setting.

This screen presents ADC calibration value at 5V input. To change the value press START (to increase) or STOP (to decrease) buttons. Press NEXT to go to the next screen.

On this screen it is possible to save the settings to non-volatile memory. It is necessary to save settings if they are to be used later. If save is skipped old setting will be used after reset or on next power up. Press NEXT to go to the next screen.

On this screen press START to reset the device and return to the measurement mode (equivalent to pressing RESET button). Press NEXT to return to the first screen of configuration mode.