TFM (TTC Fanout Module) Specification

Version 1.0

Weiming, 04th September 2003

1 Scope

The TTCFanout module provides electrical TTC fanout for TTCDec daughter cards on the 6U ROD and DSS modules (those requiring front panel electric TTC input) within the ATLAS calorimeter first level trigger test systems.

In the testing of ATLAS calorimeter first level trigger systems, there is one TTCvx module for each subsystem which provides the TTC encoded signal. The TTC encoded signal is available on the TTCvx module front panel as one AC-coupled ECL output, two LVDS output and four fibre optics transmitter output. A TTCFanout module is needed to provide enough electrical TTC signals for the whole subsystem, or at least an entire 6U crate of modules. The TTCFanout module should be able to accept an optical, AC-coupled, ECL or LVDS TTC encoded signal input from the TTCvx module, convert it into PECL differential signal and then distribute to as many destinations as possible. (Currently, 16 fanout destinations are foreseen).

2 Requirements and Specifications

2.1 Dimensions

TTCFanout module is a standard VME 6U, single-width board.

2.2 VME capabilities

None. Only the +5V and ground power supply lines on J1 of the VME backplane are used.

2.3 Input signals

The TTCFanout module can accept the optical, ECL or LVDS TTC encoded signal inputs. A front panel switch is used to select the TTC encoded signal input source.

2.3.1 Optical TTC input:

The input is accepted on a standard ST (HFBR-2119T) type connector.
This module is intended for low power optical input from the TTCvx (~ -19dBm). When TTCex (0dBm optical output) is used directly as optical input source, an optical attenuator of about 20dB must be inserted at the transmitter output to avoid overloading.

2.3.2 ECL TTC input:

The module accepts AC-coupled ECL single-ended TTC encoded signal from the TTCvx. The input is accepted on a single-pole Lemo connector (EPL.00.250).

2.3.3 LVDS/PECL TTC input:

The module accepts the differential PECL signal. The input is accepted on a two-pole Lemo connector (EPG.00.302), thereby allowing the TTCFanout module to be used in daisy chain mode.
Given an appropriate adapter cable, this input may also accept the differential LVDS TTC encoded signal output from the TTCvx.

Description	**Logic Level**	**Connector**
Optical TTC input	Optical	HFBR-2119T
ECL TTC input (Single-ended)	ECL (AC-coupled)	EPL.00.250 Single-pole
LVDS/PECL TTC input (Differential)	LVDS/PECL (AC-coupled)	EPG.00.302 Two-pole

2.4 Output signals

16 differential PECL TTC fanout signals.
Logic level: PECL (+5V, compatible with the rad-hard TTCrxDec)
Couple type: DC
Connectors: Two-pole Lemo socket EPG.00.302, all output connectors must be electrically **insulated** from the front panel.

This output can be used as input for another TTCFanout module in daisy chain mode.

2.5 Termination

PECL TTC Fanout termination:
Standard parallel termination at the receiver end (TTCrxDec) is used. There is **no** series termination on the TTC Fanout module.

ECL TTC input termination:
This signal is AC-coupled and single-ended, so the termination resistors must both match the cable impedance (50ohm) and set the DC bias voltage in the middle of the ECL input range (VCC-1.3V). In absence of input signal, the DC bias on the receiver inputs should force the output to logic 0.

LVDS/PECL TTC input termination:
This signal is AC-coupled and differential. Since the LVDS standard requires a DC path, the termination resistor should be put before the AC-coupling to the receiver inputs. In absence of input signal, the DC bias on the receiver inputs should force the output to logic 0.

2.6 Signal Track Timing and Impedance

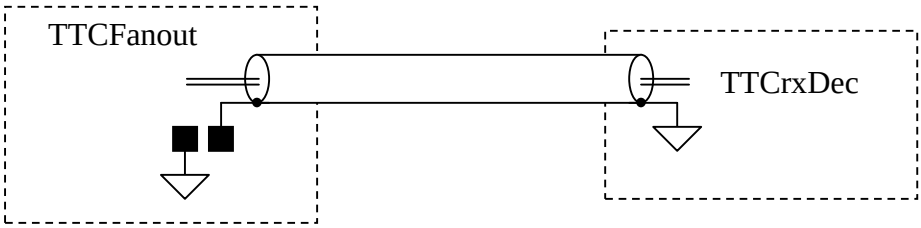
The timing skew between different TTC fanout channels is specified to be no more than 0.5ns, which can be easily compensated in the TTCrx chip by setting the internal de-skew registers. Equalization of the track length of the different fanout channels is not proposed.

The track impedance is specified to match the cable (shielded twisted pair ~100ohm).

2.7 Ground Points and Ground loop

A ground point should be provided for scope probe grounding in an exposed area of the module.

To cope with the potential ground loop problem between different crates and racks, the following solution is proposed. The cable shield is connected to the ground of the TTCrxDec. At the TTCFanout end, two pads are put near each other with one connected to the cable shield and the other connected to the ground of the TTCFanout Module. A capacitor or resistor can be put across these two pads if needed.



Cable shield grounding

2.8 Test Points

Differential probe points should be provided on the board for the TTC Fanout signal. It is probably sufficient to terminate one spare TTCFanout signal on the board and put two testpoints on two ends of the termination resistor and one ground testpoint near them.

2.9 Indicators

There should be one LED on the front panel for +5V power supply and one for TTC input detected.

2.10 Testing

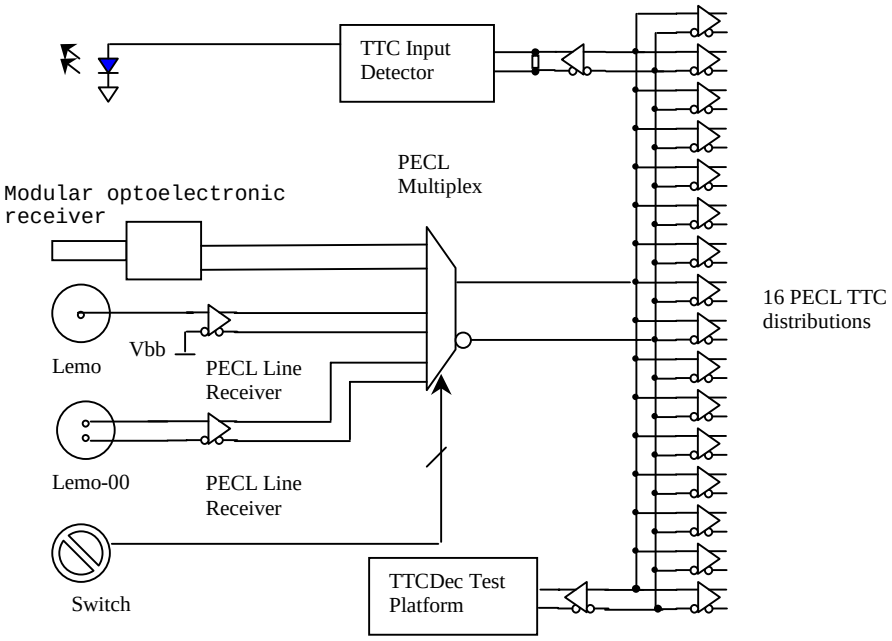
This TTC Fanout module also serves as a New TTCDec card test platform. The sockets for the New TTCDec card and accessory circuits should be implemented on the PCB design.

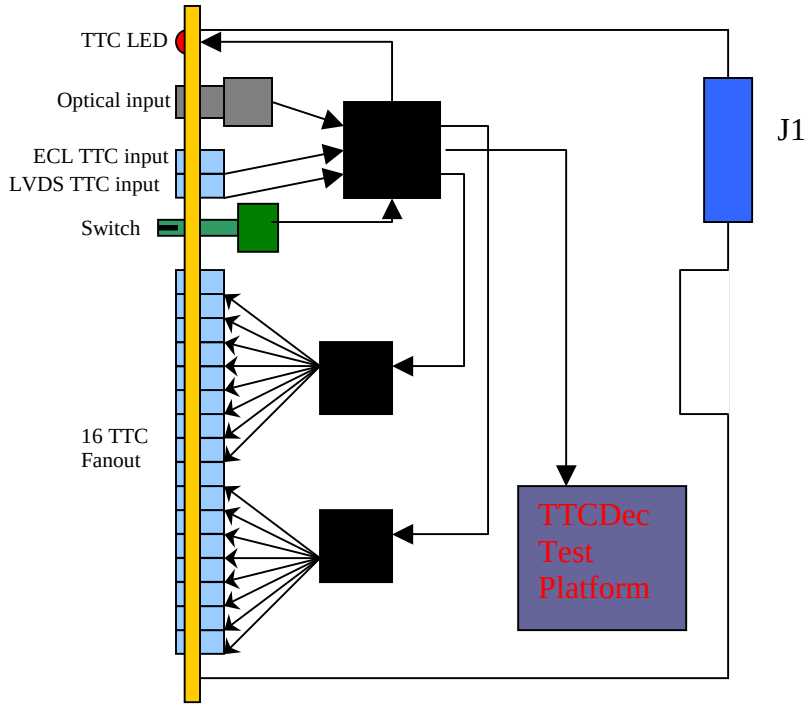
Two steps can be used to test the TTC Fanout module:

1. Use a digital scope to do the eye-pattern test on the TTC Fanout signals.
2. Put a New TTCDec card on TTCFanout module and do an online test.

3 Implementation

3.1 TTCFanout block diagram

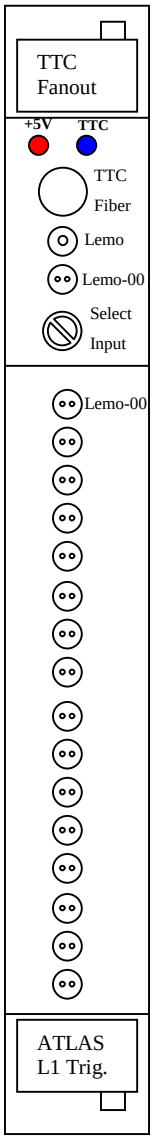




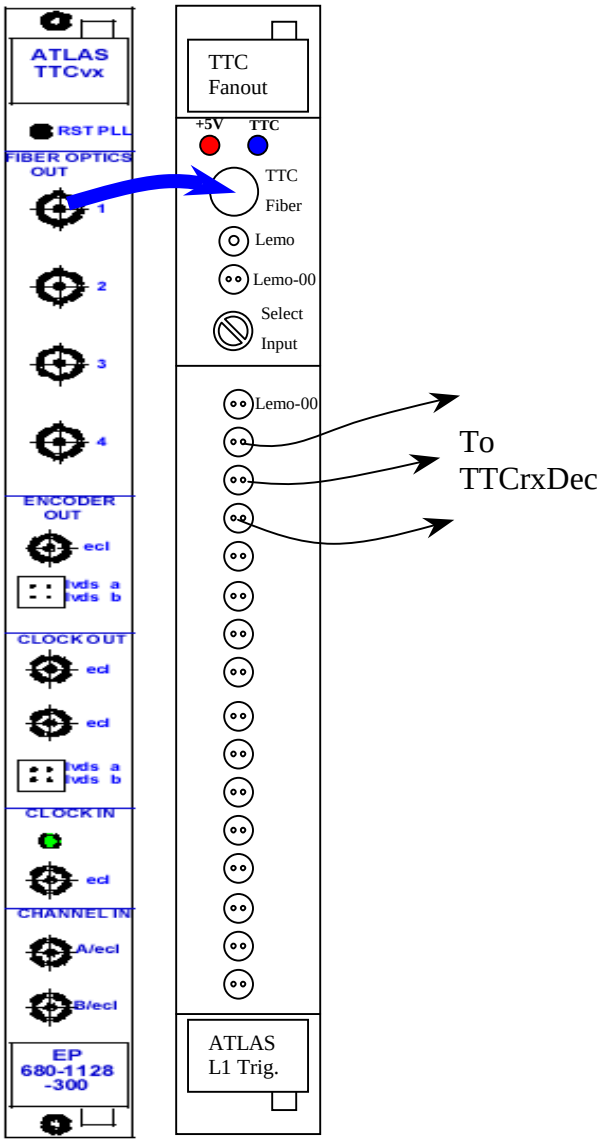
3.2 Power Requirements

+5V supply comes from J1 of VME connector.

3.3 Front panel layout

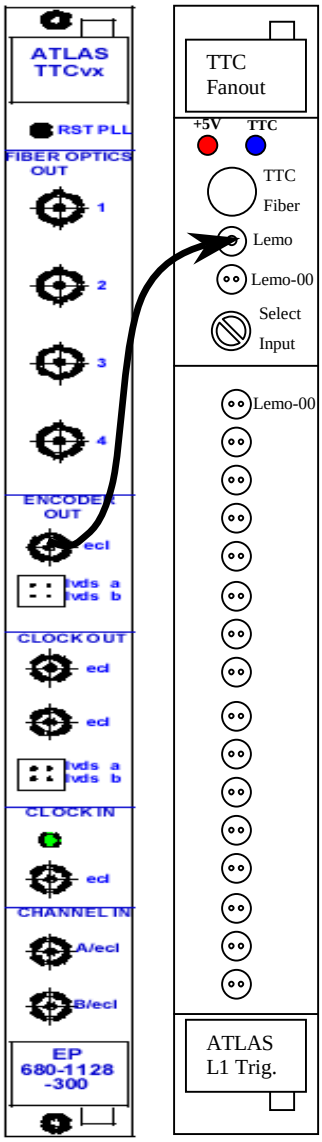


TTC Fanout Module Front Panel

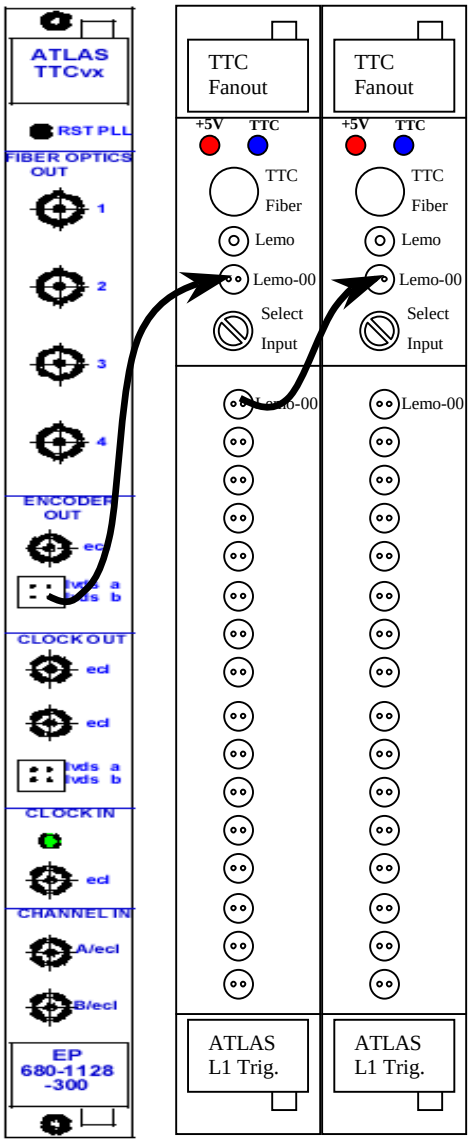


TTC Fanout using Optical Input

3.4 Example use diagrams



TTC Fanout using
ECL Input



TTC Fanout using LVDS Input
& daisy chain