

ATLAS Level-1 Calorimeter Trigger  
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# **Level-1 Calorimeter Trigger Test Rigs**

Verion 1.0

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## **Summary**

The institutes building the Level-1 Calorimeter Trigger require test rigs for module diagnosis and repair. Extra copies of some production modules are needed for these rigs. This document defines the test rig requirements and numbers of modules involved.

# 1 Test Rig Requirements

In discussing the number of test rigs required for the level-1 calorimeter trigger, the collaboration has to make a balance between cost and anticipated repair needs. Maximum flexibility could be achieved by siting test rigs in every institute associated with the trigger, but past experience shows that such equipment is not heavily used once the experiment is running smoothly. However, although the majority of board-level repairs require tooling only available in industry, it is important that each manufacturing country has access to test equipment, and this is the model chosen.

1. It is assumed that three test rigs will be used, one each situated in CERN, Germany, and the UK.. The rig at CERN may be used to check spare modules, to confirm that suspect modules are in fact defective, and in some cases to localise a fault, but it will not be used for non-trivial module repairs (as the specialist knowledge is unlikely to be available there). Rather, failed modules will be investigated further in the test rig nearest to the appropriate home institute, and then probably sent to a specialist company for repair. After repair, the local test rigs will be used to confirm that repaired modules are fully functional before they are returned as spares to CERN.  
The rig at CERN may be used to load updates to firmware onto production modules.
2. Test rigs in institutes will be used to identify and repair faults and test resulting repaired modules, including soak tests. These rigs may also be used to test firmware updates and develop DAQ software.
3. Each module under test should be provided with data sources and sinks for all inputs and outputs, but not necessarily all at the same time. An LSM is regarded as an acceptable substitute for a PPM, and a DSS for the CTP. A DSS cannot substitute for a ROD as it cannot check the DAV gap.
4. A VME64x crate with +48v supply can be used to house both PPM and ROD. However, once the (ROD or PPM-specific) TTC auxiliary backplane is fitted, only the corresponding type of module can be fully tested in the crate.
5. The test rigs may also be used in production module testing, as the requirements are similar.
6. In some cases, prototype modules may be acceptable to provide part of the test environment. For each type of module, the decision depends on cost, hardware, firmware and software compatibility.

## 1.1 CERN

Aim: Check all types of module.

- Custom processor crate with 2 CPMs, 2 JEMs, 2 CMMs, CPU + VMM, TCM
- 9U VME64 crate with +48V, PPM, TCM (TCM-AUX-PPM backplane), CPU.
- 9U VME64 crate with PPM, TCM (TCM-AUX-ROD backplane, CPU
- 6U VME crate with TTCvi, TTCex, LSM, LTP, DSS (L1A generation), VMEDis, CPU
- PC used as ROS and console.

## 1.2 Germany

Aim: Check and repair JEMs, PPMs and daughterboards.

- Custom processor crate with 2 JEMs, CMM, CPU + VMM, TCM
- 9U VME64 crate with +48V, ROD, TCM (TCM-AUX-PPM backplane), CPU.

- 6U VME crate with TTCvi, TTCex, LSM, LTP,DSS (L1A generation),VMEDis, CPU
- PC used as console.

### 1.3 UK

Aim: Check and repair CMMs, CPMs, RODs, TCMs, LSMs, DSSs and daughterboards. Capable of running with or without PPM as required.

- Custom processor crate with 2 CPMs, JEM, 2 CMMs, CPU + VMM, TCM
- 9U VME64 crate with +48V, PPM, ROD, TCM (TCM-AUX-ROD backplane, CPU.
- 6U VME crate with TTCvi, TTCex, LTP, DSS (L1A generation),VMEDis, CPU
- PC used as ROS and console.

## 2 Module Numbers

The numbers of modules of different types are given in the following table Rear-mounted transition modules are shown indented.

	<b>CERN</b>	<b>Germany</b>	<b>UK</b>	<b>Total</b>
<b>9U VME64 crate +48V</b>	1	1	1	3
PPM	1	1	1	3
PPM RTM	1	1	1	3
ROD	1	1	1	3
ROD S-Link RTM	1	0	1	2
TCM – VME	1	1	1	3
TCM (PPM) Backplane	1	1	0	2
TCM (ROD) Backplane	1	0	1	2
<b>9U Custom crate</b>	1	1	1	3
CPM	2	0	2	4
JEM	2	2	1	5
CMM	2	1	2	5
CMM RTM	2	0	2	4
VMM	1	1	1	3
TCM – custom	1	1	1	3
<b>6U VME crate</b>	1	1	1	3
TTCvi	1	1	1	3
TTCex	1	1	1	3
LSM	1	1	1	3
LTP	1	1	1	3
DSS	1	1	1	3
CPU	3	3	3	9