EMTiming Installation Procedure and Checkout for the PEM

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Version 1.2 (7/14/03)

This note describes the installation and the checkout of the PEM portion of the EMTiming system. The highest priority is the safety of the already working plug calorimeter so all installation work on the detector itself will be done by under the instruction and supervision of Dervin. This document is designed to put into writing a chronologically detailed and pictorial description of the instructions and what are the places to be particularly careful of. It follows closely the installation of the 3 wedges that were successfully done in January 2003. We have detailed the set of checks the TAMU group will perform before and after every day of installation to test if the installation adversely affects any other detector system; allowing any problems to be caught and fixed in real time. Section 1 describes the before and after testing, Section 2 describes the installation itself and Section 3 shows more pictures of the parts which are the most sensitive to being disturbed during the installation itself.

Section 1
Before and After Hardware System Checks

(Work done by TAMU group)

Verification checkout schedule: at the beginning and at the end of each day of the installation.

Texas A&M People: Slava Krutelyov (630-218-8916, x2120), Sung-Won Lee (x6647), Max Goncharov (630-476-0774, x2120); all have ACE training

System Experts: in event of a problem detected the experts for the affected system will be called immediately. They are:

Light Box (Plug PMTs, High Voltage connectors and cables)	Willis Sakumoto, Howard Budd, Mike Lindgren
Plug Front End Electronics	Mark Mattson, Robin Erbacher
PES, PPR	Karen Byrum, Mike Lindgren, Steve Kuhlmann

Upon detection of the problem we stop the installation until the experts for the affected system allow the installation to proceed.

While working on the PEM the installers will come close physically to several PEM parts that are sensitive to being not treated carefully. One needs to check the state of the system before and after installation. There are two points in the PEM that might be affected: PEM light box[1] and PEM relay rack. We will perform the standard calibrations to check that the installation did not affect other parts of the system. To perform calibrations we

[1] PEM, PHA PMT outputs, as well as high voltage lines and ShowerMax readout.

need a running DAQ system. It is expected that the system will be available with the exception of 3 days scheduled (from Frank Chlebana) for the system upgrade. We will do the following (summarized in Table 1):

1. Standard Plug Laser Calibration. This checks if the amp connectors on the light box for PMT (both PEM and PHA) anode and dynode outputs are read out and that the high voltage lines are intact. The calibration takes ~30 minutes and the results are easily accessed through the DBANA database interface for comparison. The calibration checks both anode lines and newly installed dynode lines. The most likely failure is bumping AMP connector on the Light Box. It is very unlikely to happen at a level to cause problems, but in case if one occurs Howard Budd will be called.
2. ShowerMax Strips, Wires, and PPR calibrations: This QIE test checks from the input of the ShowerMax crate through the readout path and tests for any cables which might be knocked loose during the installation. The standard calibration takes ~10 min plus 10 minutes to access the database. The most likely problem is that a cable is bumped and needs to be reseated. In this case Mike Lindgren will be called.
3. Cosmic Ray overnight runs: Since the ShowerMax tests only checks the crate and the path from the crate to the DAQ, we will run cosmics overnight and look at the occupancy plots for the Strips, Wires, and PPR. We are in the process of working with Steve Kuhlmann to update his diagnostic software that was used for checkout during the main Run IIa installation.

The calibration is standard and can be performed by any ACE on a regular basis; we have 3 persons with ACE training to run them (Sung-Won Lee, Slava Krutelov, and Max Goncharov). The test takes ~50 min. We are going to perform the calibrations at the beginning and at the end of every day of the installation. There is a standard way in DBANA to determine if there are changes in the system. If any changes in any of the systems occur an expert will be called and the installation will be stopped and not resumed unless there is time to evaluate why the failure occurred, so it won't happen again. The installation will not be resumed without the approval of SPLs/operations. The installation of a single wedge (Section 2) takes much more time than the full set of calibrations, so we have enough time to catch failures in real time.

Calibrations:	**Components:**				**Time**
Plug Laser	CHA PMT CEM PMT	High Voltage	Cables	Readout	~30 min
ShowerMax	Crate			Readout	~15 min
Cosmic Rays	Strips & Wires	PPR	Cables	(Readout)	~8 hours (overnight)

Table 1: Calibration – System hardware map. Here "Cables" means the cables that connect the Light Box with the boards in the readout crates. By Readout we mean the cables from the crate to upstairs (Crate, ADMEM, long cables).

Section 2
Harness Installation on the Detector Itself

Work done by:
Jamie Grado, Lew Morris (FNAL)
Fabio Happacher, Andrea Sansoni, Giovanni Bisogni, Mario Anelli (Frascati)

Only people approved and trained by Dervin will do the installation. Each crew consists of 2 persons under his supervision, and they are to work with safety and carefulness (rather than speed) being their highest priority. In this section we detail the steps to install each wedge as well as point out the potential danger spots. In January 2003 it took approximately one hour per harness. Section 3 provides more pictures about some of the more sensitive parts that require extra attention during installation.

The general layout of the plug detector is shown on Figure 1. All harnesses connect the Plug Light Box dynode outputs with the TB/ASD that are installed in the middle crate of the Relay Rack. Each harness has 2 AMP connectors for the Light Box side and lemo connectors for the TB side; see Figure 2.

The installation procedure:

- Bring three coiled harnesses to the Plug Relay Rack.
- Slide the AMP connector side of a harness onto the inside of the Plug detector through the insertion hole (see Figure 3). If the space is limited, bring the harness to the other side and try to slide the lemo connector side of a harness from the inside to the outside. Note that the AMP connector is covered to protect it and help it slide through the insertion hole.
- Lay the harness inside the plug along the cable tray and then into the panduit for the designated Light Box (see Figure 4).
- At the relay rack bring the harness along the standard path to the middle crate of the Relay Rack.
- Remove the 50 Ohm AMP terminators that are currently on the Light Box and carefully connect the harness AMP connectors.

Texas A&M people (Max Goncharov, Sung-Won Lee, Slava Krutelyov) after training from Dervin will assist with plugging the AMP connectors into the Light Box. When the installation moves to the other side of the Plug detector (North-South), a person from Texas A&M group will check if all AMP connector pins are functioning[2]. After that the harness LEMO connectors can be hooked up to the Transition Board and the cables can be dressed at both ends. The dressing is expected to take 1 person day per side.

[2] Check is done at the Relay Rack side and does not require touching AMP connectors.

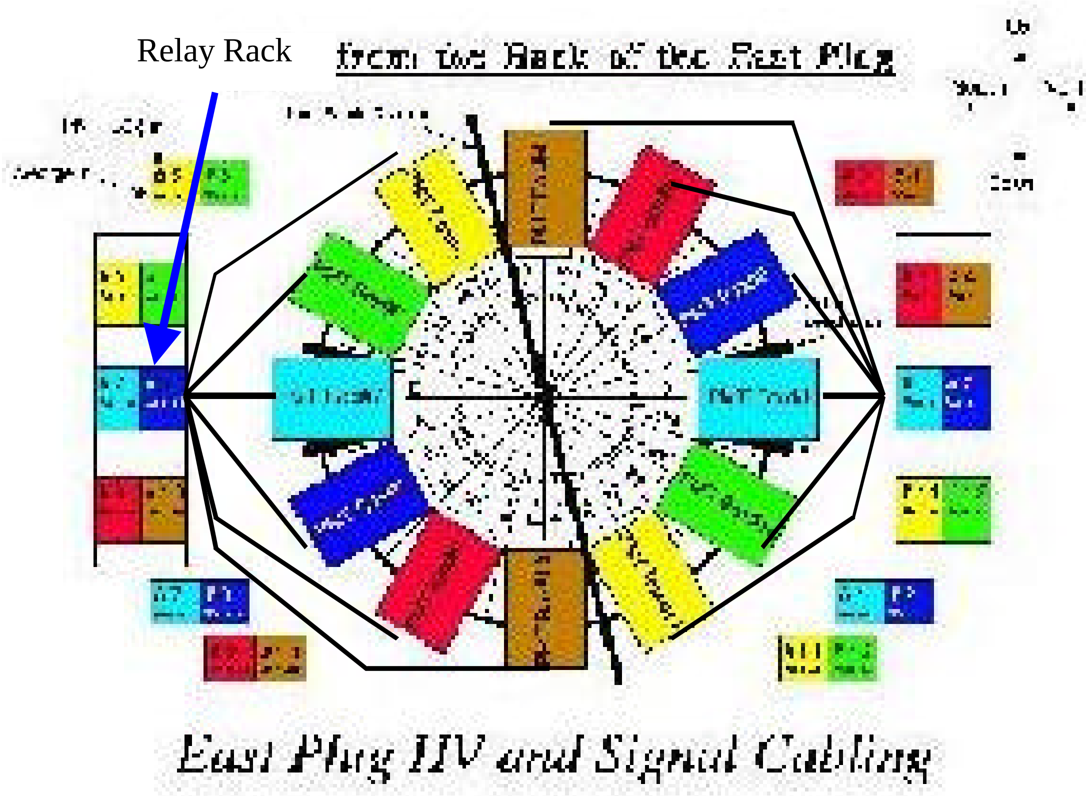

Figure 1
Plug detector layout. All Harnesses go into the central crate of the relay rack. Each black line indicates two harnesses and which Relay Rack/Crate they go to, but not their pass through the penetrations.

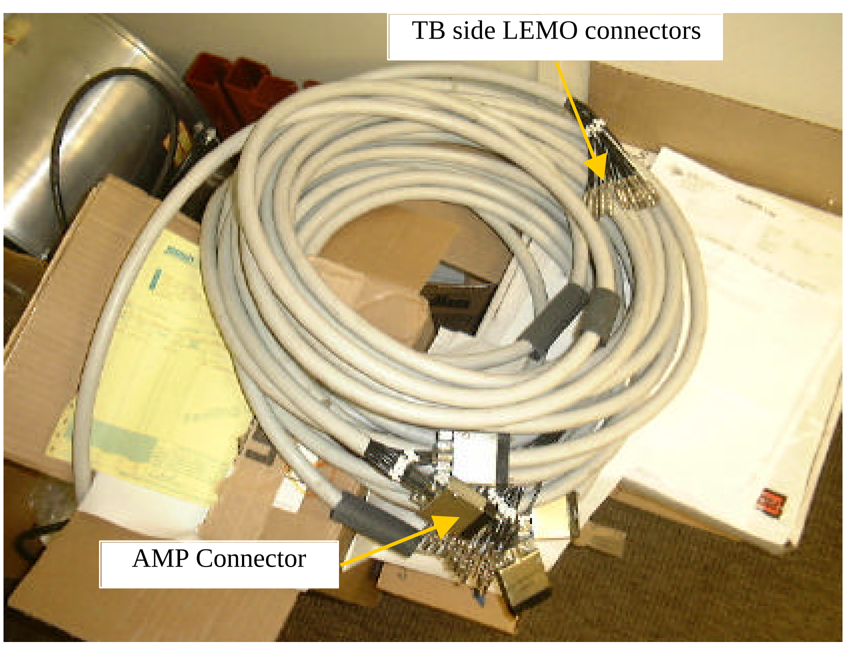

Figure 2

Full view of the PEM harness.

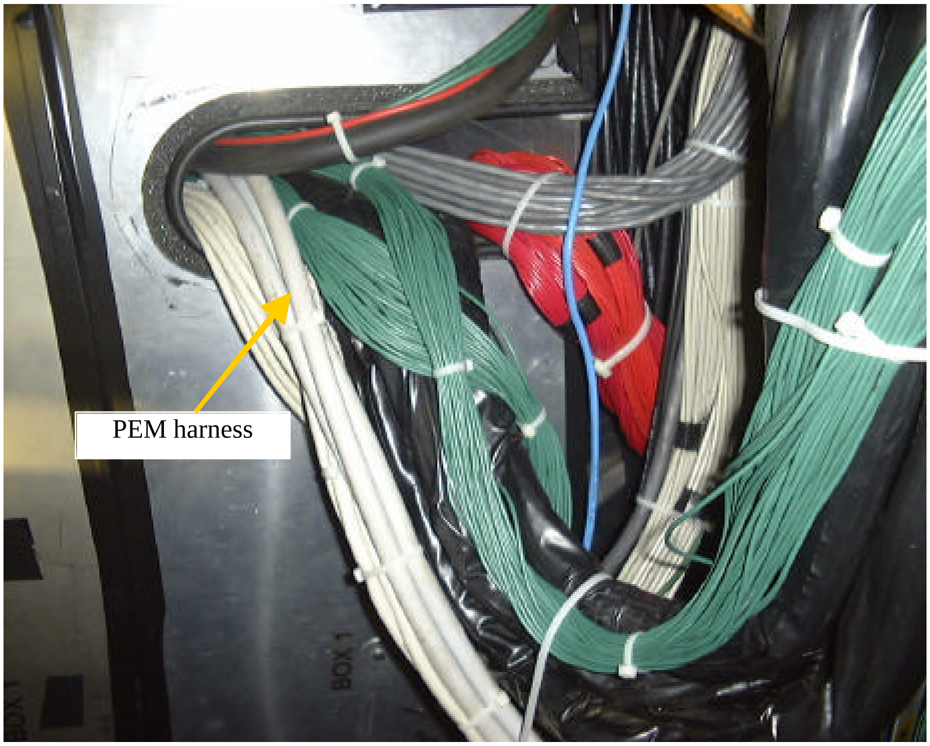

Figure 3
Insertion Hole in the Plug. This shows three PEM harnesses on their path from the Relay Rack to the cable tray and Light Box.

Section 3
More Pictures of the Most Sensitive Parts on the Detector

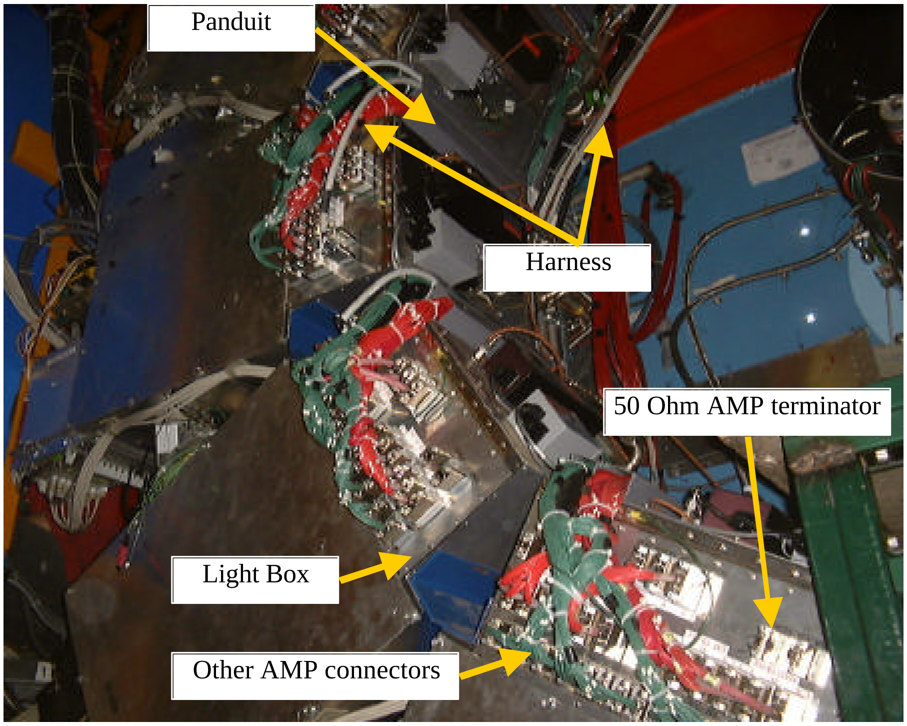

Figure 4
This picture shows the Plug Light Box and the plug harness already installed but not connected (See next Figure). The most sensitive parts are the other AMP connectors that should not be bumped. There are 2 PEM harnesses per box, each harness has two AMP connectors. Right now PMT dynode outputs are terminated into 50 Ohm AMP terminator.

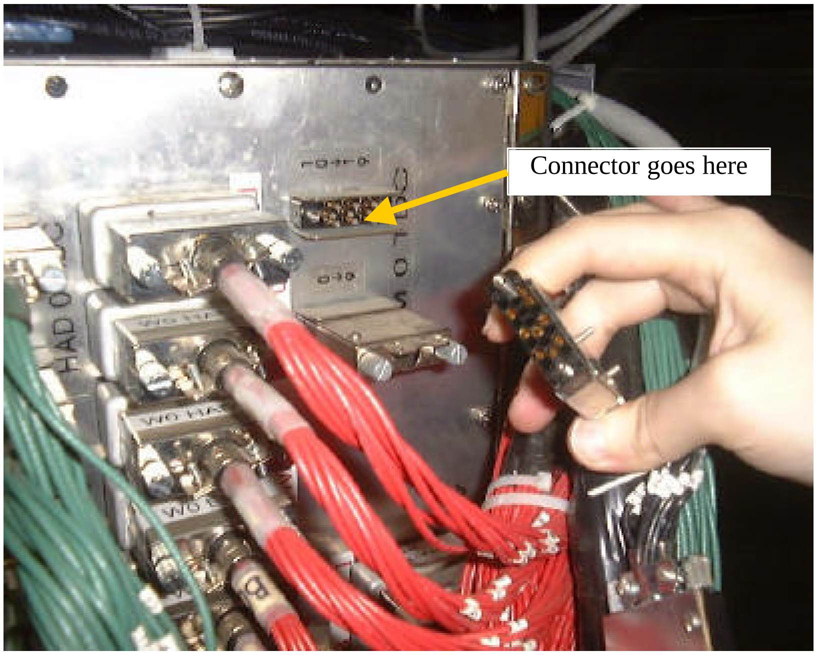

Figure 5
The Plug Light Box: one of the old 50 Ohm AMP terminators has been removed and the PEM harness AMP connector is ready to be plugged into the Light Box. The pins inside AMP connectors are very delicate and can be easily damaged or bent and not make proper connection. Plugging them incorrectly is the most sensitive part of the installation.

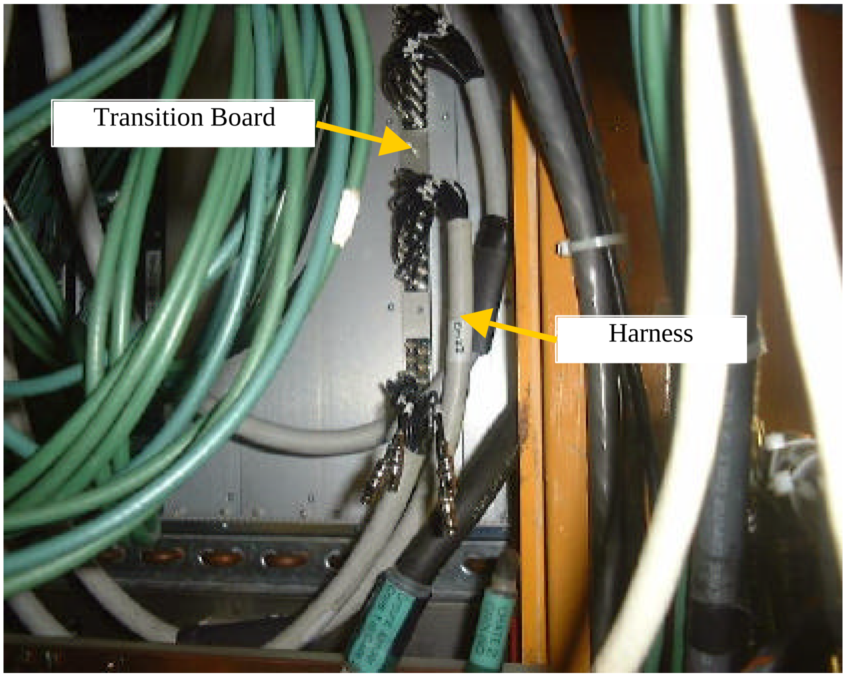

Figure 6
Three PEM harnesses plugged into the back of a transition board in the middle crate of the relay rack.