TILECAL ELECTRONICS ADDRESSING SCHEME

K J Anderson
University of Chicago

The purpose of this note is to document the addressing scheme TILECAL will use for the various electronic systems. We wish to avoid any possible conflicts when the detector comes together. We would also like to avoid where possible any constraints on the installation arising from the addressing schemes used by the various subsystems. There are two systems used for communication with TILECAL electronics. These are the Timing, Trigger, and Control (TTC) system and the CANBUS systems.

TTC SYSTEM

The TTC system provides:

- Clock signals and control for synchronizing detector elements with the machine clock
- Trigger accept signals and event identification information
- Control data

In order to use the full capabilities of this system we must assure that there are no addressing conflicts among the various subsystems in TILECAL. It is planned to have four laser branches of the TTC system in TILECAL. One each for the four sections of the detector (extended barrel left, barrel left, barrel right, extended barrel right).

There are three types of addressing of concern with the TTC system:

- TTCrx chip addresses
- Long Format Broadcast Commands
- Short Format Broadcast Commands

TTCrx Chip Addresses

The TTCrx chip receives information transmitted over the TTC laser system. There is a 14 bit address associated with each TTCrx chip. We must insure that no two TTCrx chips on the same laser branch have the same TTCrx address if they are to be individually controlled. (There may be special circumstances in the ROD crates where duplicate addresses are desired). Although addresses could repeat in the separate laser systems, there is sufficient address space to keep all TTCrx addresses unique. This is preferable for module interchangeability. What systems are forseen to use the TTC system?

- 3in1 mother boards – 1 TTCrx chip per superdrawer
- digitizer system – 8 TTCrx chips per superdrawer
- RODs – for fetching the full event identification information
- Others?

These systems must abide by the following TTCrx chip addressing scheme:

- Digitizers 01 xxxx xxxx xxxx (but not all zero)
- 3in1 11 xxxx xxxx xxxx
- RODs 10 xxxx xxxx xxxx
- Others 00 xxxx xxxx xxxx

This gives 4096 addresses available for each system, 8x256=2048 are needed for the digitizer boards, so there is adequate address space (including spares). For the 3in1 mother boards and digitizer boards, addresses will be set (at Chicago and Stockholm) before boards are send for drawer assembly. The addresses will be recorded in a data base which will follow the drawer, linking the address with the bar code on each PC board.

Long Format Broadcast Commands

When a TTCrx chip is addressed in long format mode, a 16 word (subadr-data) is available for configuration of boards etc. Normally these commands are addressed to a specific TTCrx chip address, but if address zero is used, all TTCrx chips on the laser branch receive the command. We plan to use these long format commands in broadcast mode extensively. For example, we can set the charge injected on all 3in1 cards in parallel by this method. In order for the long format broadcast command to be used, we must insure that different systems do not act upon commands not intended for them. We will therefore divide the long format command address space as follows:

- Digitizers 01nnnn00 xxxxxxxx where nnnn=any value but zero
- 3in1 11xxxxxx xxxxxxxx x = any value
- RODS,others 10xxxxxx xxxxxxxx

Note 00xxxxxx xxxxxxxx is not used as the digitizer decodes only the highest order bit.

Short Format Broadcast Commands

With the introduction of the radiation hard version of the TTCrx chip, there will be 6 user bits available in the 8 bit short format broadcast command. We propose to divide this address space as follows:

- Digitizers 01xxxxSS
- 3in1 11xxxxSS
- RODs 10xxxxSS
- Others 00xxxxSS

Where x = any value

SS - these bits are used for system resets and are set to 00 for user commands

CANBUS SYSTEMS

There are 2 CANBUS systems of concern here. These are the CANBUS system used to control the drawer high voltage, and the cesium source ADC CANBUS system. There are other slow control CANBUS systems that will be used for power supply control, environmental monitoring, etc. The former systems are of concern here as they reside inside the drawer and addressing could impact detector installation decisions. Currently the HV system used a 6 bit address, the ADC a 5 bit address. With each system, one controller will manage a chain of 16 superdrawers. It is necessary for each of the 16 superdrawer to have a unique CANBUS address. Both systems use a default address set in switches on cards in the drawer. With both systems, a scheme will be initiated to reset the addresses from software. To reset the address of a particular card, the branch controller will send out a broadcast message containing the boards serial number and a new address. All cards on the branch will receive this message, but only the card with a matching serial number will reset its address. This requires that the serial number of the boards be recorded in the drawer database at assembly time. Should it be necessary, by turning on power to drawers one at a time, eeprom code (including serial numbers) can be re-recorded.