TPC geometry utilities

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Introduction

This report documents the information flow used to create the header files *key_map.h* and *offsets.h* used in the TPC mezzanine code. Key_map.h is the basis for the TPCPADK bank which contains the pad, pad row associated with every timebin sequence in the ADC, pedestal, RMS, gain, and configuration banks exported from DAQ. The offsets.h file is used by the mezzanines to generate pointers to physical pad data for the purpose of cluster finding and formatting zero-suppressed ADC data.
In addition, the file *padfinder.h* is used in offline to determine which mezzanine banks are required in order to access all of a given padrow.

Organization

The include files all reside in the directory:

/STAR_DAQ/include/tpc.

The utilities which generate most of them are found in:

/STAR_DAQ/utils/tpc/bin,

and the sources for these programs are found in:

/STAR_DAQ/utils/tpc/src.

The include files

- fee_default.h (Hand-crafted by Roy Bossingham)

```
static unsigned char fee_default[6][36] = {

/* RDO location 1 */
        {175, 177, 178, 179, 180, 181, 166, 167, 168,
         255, 169, 170, 154, 155, 156, 157, 158, 159,
         255, 255, 255, 255, 255, 255, 171, 255, 172,
         176, 173, 174, 160, 161, 162, 163, 164, 165,},/* per
Fred B 3/11/98 */.....
```

- fee_maps.h (handcrafted)

```
static unsigned char fee_default[6][36] = {
/* RDO location 1 */
        {175, 177, 178, 179, 180, 181, 166, 167, 168,
         255, 169, 170, 154, 155, 156, 157, 158, 159,
         255, 255, 255, 255, 255, 255, 171, 255, 172,
         176, 173, 174, 160, 161, 162, 163, 164, 165,},/* per
Fred B 3/11/98 */.....
```

- tpcPhysicalMaps.h

```
static const unsigned char
tpcPhysicalRowLen[TPC_ROWS_PER_SECTOR] = {
88,96,104,...
```

- pads_rows.h

```
#define ROWS 45
#define PADS_PER_ROW 182
static short sequence[ROWS+1][PADS_PER_ROW+1]= {
/* row 0 */
        {-1,-1,-1,-1,-1,-1,-1,-1,-1,...},
/* row 1 */
        {-1,2,38,74,110,146,182,218,254,290,326,362,398,
        4,40,76,112,148,184,220,256,292,328,364,400,436,
        472,508,544,580,616,652,688,724,760,796,832,868,
        904,940,976,1012,1048,1084,1120,5,41,77,113,149,
        185,221,257,293,329,365,401,437,473,509,545,581,
        617,653,689,725,761,797,833,869,905,941,977,1013,
        1049,1085,1121,723,759,795,831,867,903,939,975,
        1011,1047,1083,1119,... },
        ...
```

- offsets.h

  Contains information on the ADC and CPP offsets for each pad, padrow combination in the sector. The information is encoded as follows:

- inner_sector.h
- outer_sector.h

  Continuation of *inner_sector.h*. Both files must be included, with *inner_sector.h* preceding *outer_sector.h*

- rdo_vs_pad.h
  static unsigned char rdo[46][183] = {

- microdaq.h

  #define ROWS 45
  #define PADS_PER_ROW 182
  static short rdo[ROWS+1][PADS_PER_ROW+1]= {
  ...
  static short mezz[ROWS+1][PADS_PER_ROW+1]= {

- pads_rows.h

  #define ROWS 45
  #define PADS_PER_ROW 182
  static short sequence[ROWS+1][PADS_PER_ROW+1]= {

- key_map.h

  #define NPADS 384
  unsigned short pad_key[6][3][NPADS] = {

- rdo6.h

  static unsigned char row[PADS]= {
  ...
  static unsigned char pad[PADS]= {
  ...

- inner_sector.h

- outer_sector.h (continuation of inner_sector.h)

```
struct MINMAXPADS {
unsigned short row;
unsigned short min1;
unsigned short max1;
unsigned short min2;
unsigned short max2;
};

struct MINMAXPADS minmax[6][3][6]= {
{{{1,1,88,255,0},
{2,1,96,255,0},
{3,1,4,101,104},
{0,255,0,255,0},
{0,255,0,255,0},
{0,255,0,255,0}},

{{3,5,100,255,0},
{4,1,112,255,0},
{5,4,115,255,0},
{0,255,0,255,0},
{0,255,0,255,0},
{0,255,0,255,0}}, . . .
```

- offsets.h

```
/* offsets are defined as:
 RB# bits 12-14
 MZ# bits 9-11
 absolute offset bits 0-8 (including gaps in memory)
*/

static unsigned short adc_offset[ROWS+1][PADS_PER_ROW+1] = {
```

- padfinder.h

```
struct PADFINDER {
  int rdo;
  int mezz;
  int minpad;
  int maxpad;
} padfinder[45][3] = {
```

Genealogy:

Consistency:

In order to guarantee a consistent set of include files, whenever it is necessary to modify the master include files (fee_defaults.h and fee_maps.h) the script file

/STAR_DAQ/utils/tpc/src/build

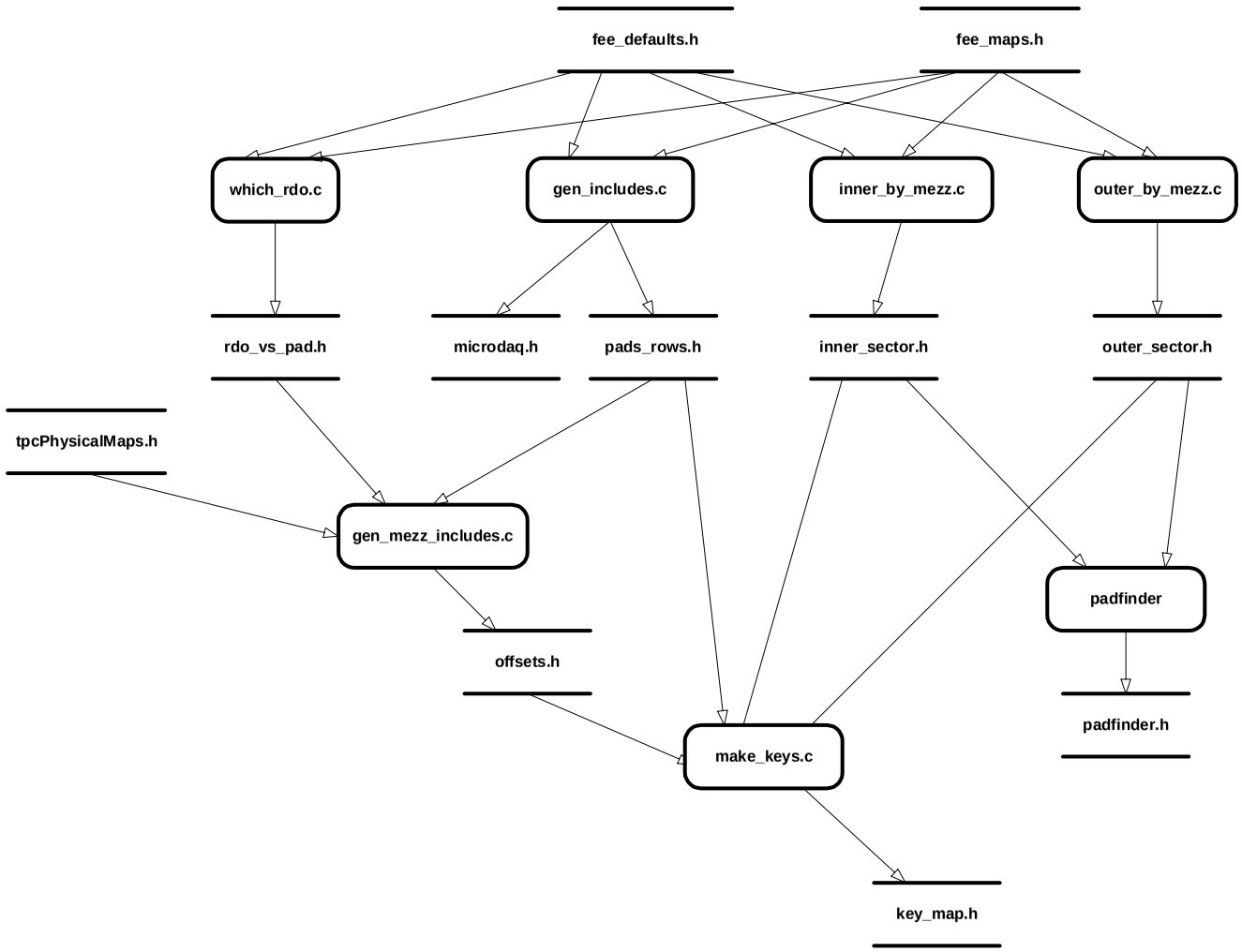
should be executed. This guarantees that the various applications are run in the correct order.

dependencies:

fee_default.h,fee_maps.h + internal➔outer_by_mezz
fee_default.h,fee_maps.h + internal➔inner_by_mezz
fee_default.h,fee_maps.h + internal➔gen_includes
fee_default.h,fee_maps.h ➔which_rdo
pads_rows.h, offsets.h, inner_sector.h,outer_sector.h ➔make_keys
tpcPhysicalMaps.h,pads_rows.h,rdo_vs_pad.h ➔gen_mezz_includes
inner_sector.h, outer_sector.h ➔padfinder

output:

which_rdo ➔rdo_vs_pad.h
gen_includes ➔microdaq.h
gen_includes ➔pads_rows.h
gen_includes ➔rdo1.h..rdo6.h
inner_by_mezz ➔inner_sector.h
outer_by_mezz ➔outer_sector.h
make_keys ➔key_map.h
gen_mezz_includes ➔offsets.h
padfinder ➔ padfinder.h


fee_defaults.h
fee_maps.h
which_rdo.c
gen_includes.c
inner_by_mezz.c
outer_by_mezz.c
rdo_vs_pad.h
microdaq.h
pads_rows.h
inner_sector.h
outer_sector.h
tpcPhysicalMaps.h
gen_mezz_includes.c
padfinder
offsets.h
padfinder.h
make_keys.c
key_map.h